

Director's Report

Project Name: Gateway Crossing
 Description: Preliminary site plan and special land use approvals
 Date on Agenda this packet pertains to: April 4, 2024

- Public Hearing
- Initial Submittal
- Revised Plans
- Preliminary Approval
- Final Approval
- Special Land Use
- Rezoning
- Other:

Contact	Consultants & Departments	Approval	Denial	Approved w/Conditions	Other	Comments
Sean O'Neil	Planning Director	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
DLZ	Engineering Consultant	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See letter dated 03/27/24.
Justin Quagliata	Staff Planner	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See letter dated 03/28/24.
Jason Hanifen	WLT Fire Marshal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	See letter dated 03/26/24.

WHITE LAKE TOWNSHIP PLANNING COMMISSION

REPORT OF THE COMMUNITY DEVELOPMENT DEPARTMENT

TO: Planning Commission

FROM: Sean O'Neil, AICP, Community Development Director
Justin Quagliata, Staff Planner

DATE: March 28, 2024

RE: Gateway Crossing
Preliminary Site Plan and Special Land Uses – Review #4

Staff reviewed the revised site plan prepared by Boss Engineering (revision date January 12, 2024). The following comments from the first review dated January 23, 2023, second review dated September 26, 2023, and third review dated February 8, 2024 are listed below. Responses to those comments are provided in **(green)**.

Najor Companies (Brian Najor) has requested preliminary site plan and special land use (2) approval to construct a commercial/retail center on Parcel Number 12-20-426-003 and Parcel Number 12-20-402-003, located at the southwest corner Bogie Lake Road and Highland Road. **The two legal descriptions on Sheet 1 conflict with the combined legal description on Sheet 2 and the size of the parcels listed in the Site Data Table on Sheet 3. Revise for consistency. The lot width listed in the Site Data table is also inconsistent with the combined legal description on Sheet 2 and the dimension labeled on the drawing. Revise for consistency.** **(Comments addressed. Acreage is now consistent between plan sheets and the Site Data Table).** Currently the parcels are zoned GB (General Business). Combined the parcels comprising the subject site are approximately 5.836 acres in size (to be confirmed based on previous comments). **If the project proceeds to construction, an application to combine the parcels shall be submitted to the Assessing Department prior to issuance of a building permit.** **final site plan submission (comment remains as a notation).** The design engineer stated the Applicant acknowledges this requirement.

The Applicant is proposing to construct ~~two~~ **one** single-story buildings totaling ~~12,380~~ **8,573** **8,620** square feet in size. **(Total area of the building and each tenant space size listed on Sheet 3 are all inconsistent with the preliminary floor plan. Revise for consistency).** **(Comment addressed. The total area of the building and each tenant space size listed on Sheet 4 are now consistent with the floor plan).** ~~**The size of the retail and coffee shop building labeled on the drawing (8,320 square feet) is two square feet less than the size of the building listed in the Site Data table on Sheet 3 (8,322 square feet). Revise for consistency.**~~ **(Comment addressed. The Site Data Table now shows the correct total area for the building and it matches what is shown on the site plan).** Special land use approval is requested as ~~two~~ **one** drive-thru windows are **is** proposed; the easterly unit of the east building is identified as a coffee shop ~~and the westerly building is identified as a Culver's drive-thru restaurant.~~ Special land use approval is also requested to allow outdoor dining at the retail and coffee shop building ~~and Culver's.~~ **(The Culver's building is no longer being proposed on this site).**

Based on the nature of the proposed project, the Applicant shall state whether the development would be a commercial condominium project or consist of another ownership arrangement. **(Comment addressed. A note about the building having a single owner and leasable units as well as a west parcel for sale is now noted in the Site Data Table. However, it appears the proposed west parcel would share a driveway and drive aisle(s) with the east parcel; the appropriate easement agreements would need to be submitted for review and approval prior to scheduling a pre-construction meeting).**

Master Plan

The Future Land Use Map from the Master Plan designates the subject site in the Planned Business category. All development in Planned Business is required to adhere to strict access management principles in order to minimize traffic conflict and maximize safety throughout the M-59 corridor. Connections to and segments of the Township community-wide pathway system are required as an integral part of all Planned Business development.

The Future Land Use Map from the draft 2024 Master Plan designates the subject site in the Commercial Corridor category, which is intended to provide regional goods and services (such as large box-stores and drive-thrus) to residents and non-residents.

FUTURE LAND USE MAP



Zoning

Both parcels comprising the subject site are located in the GB (General Business) zoning district, which requires a minimum of 200 feet of lot width and one acre of lot area. Both parcels meet the minimum standards for both lot area and lot width of the GB zoning district. Retail commercial uses are a permitted principal use in the GB zoning district. Beverage and restaurant establishments with drive-thru window service are a special land use in the GB zoning district.

ZONING MAP



Physical Features

There appear to be EGLE (Michigan Department of Environment, Great Lakes, and Energy) regulated wetlands on the site. However, a wetland delineation was not provided. **A delineation prepared by a wetland specialist/ecologist must be provided by the Applicant at preliminary site plan.** (Comment outstanding. Provide a copy of a delineation report). (Comment addressed. A delineation report dated November 3, 2023 has been provided). EGLE has regulatory authority regarding the wetland boundary location(s) and jurisdictional status of wetlands on this site. **Prior to final site plan, wetland boundary verification shall be completed by EGLE. Note the proposed layout may require revision in response to the EGLE review. Based on the submitted plans, the Applicant proposes to grade within the Natural Features Setback. Grading activities should not occur in the Natural Features Setback as the intent is to, as much as possible, leave said area in its natural state. If grading is permitted to occur in the Natural Features Setback, the area must be restored to its natural, undisturbed state. A Natural Features Setback restoration plan is required and must be submitted at final site plan.** (Comments remain as notations. These requirements were acknowledged by the Applicant's engineer in the response letter provided to the first and second review).

The following should be conditions of any approval:

- Prior to any construction or grading on the site, the Applicant shall install silt fencing at the upland edge of Natural Features Setbacks / limits of grading. The silt fencing shall be removed after construction once the area is stabilized and vegetation has been established.
- Wetland limits shall be clearly identified with permanent markers. The size, number, location, and language on the markers shall be subject to the approval of the Community Development Director.

Access

The site fronts on Highland Road and Bogie Lake Road. Highland Road (state trunkline) along the subject site is a four-lane divided highway designated as a Principal Arterial on the Township Thoroughfare Plan. Development of the subject site requires the installation of an eight-foot-wide sidewalk along the Highland Road property frontage (shown on plans; **the existing paved shoulder shall be removed and converted to greenbelt.** (Comment addressed. The existing paved shoulder along Highland Road will be removed and converted to greenbelt except for the area being used for the right-turn taper). Along the east side of the property the northern portion of Bogie Lake Road is a four-lane road (three lanes going north (two right-turn lanes to eastbound Highland Road, one northbound lane through Highland Road), and one lane going south). There is also an existing right-turn taper at the Bogie Lake Road driveway approach. Bogie Lake Road along the southern portion of the property is a two-lane road.

While the zoning ordinance requires site plans incorporate (where feasible and appropriate) cross-access with neighboring sites, the property to the west is owned by ITC. There is no opportunity for vehicle access through the ITC corridor, so constructing a frontage road to the west is not required.

The zoning ordinance requires a minimum six-foot-wide sidewalk placed one-foot from the inside edge of the right-of-way along the Bogie Lake Road property frontage. The plan shows eight-foot-wide sidewalk and boardwalk (195 linear feet of boardwalk) along Bogie Lake Road property frontage. **Direct pedestrian access from the frontage sidewalks to the buildings should be provided. (Comment addressed. Direct pedestrian access is now provided from the sidewalks along Highland Road and Bogie Lake Road). Note it appears the Applicant is proposing to construct offsite sidewalk to the west along Highland Road (whether or not the offsite sidewalk is in the road right-of-way shall be clarified on the plan). Easements would be required from the adjacent property owner to construct offsite sidewalk (if not in the right-of-way). (Comment addressed. Per the design engineer, the sidewalk is located in the right-of-way). The boardwalk details on Sheet 9 conflict with the boardwalk width shown on Sheet 3. Revise for consistency. (Comment addressed. The boardwalk width on Sheet 9 is now shown to be eight-foot-wide). Additionally, some of the sidewalk (boardwalk) along Bogie Lake Road is proposed outside of the right-of-way; the sidewalk (boardwalk) must be relocated inside the road right-of-way or an easement be provided. Right-of-way/easement widths for public walkways when not adjacent to or a part of street rights-of-way must be at least 15 feet and dedicated to the use of the public. Only a 10-foot-wide sidewalk easement is proposed. Revise accordingly. (Comment addressed. The sidewalk easement has been changed to be 15 feet as required instead of the 10 feet previously proposed). Furthermore, sidewalk shall be constructed to the south property line, or a variance is required from the Zoning Board of Appeals. (Comment addressed. A portion of the sidewalk is now proposed to the south property line (south side of the church driveway).**

DLZ reviewed the submitted traffic impact study (TIS) and stated the methodology is in line with standard practices and the findings are supported by the data provided. Additionally, DLZ was in agreement with the conclusions and recommended treatments.

The development would be accessed from a driveway on Highland Road and Bogie Lake Road. **Both driveways—The Highland Road driveway would require variances from the zoning ordinance access management standards.** As a preface to the following comments regarding access management, the Planning Commission should note the zoning ordinance states direct access drives should generally be minimized in number and maximized in separation. Reasonable access is not necessarily the same as direct access. The number of driveways permitted for a site shall be the minimum number necessary to provide safe and efficient access for regular traffic and emergency vehicles.

The minimum distance between a proposed driveway and the nearest intersection shall not be less than 455 feet when the speed limit is greater than or equal to 50 miles per hour (mph). Along the Highland Road frontage the speed limit is 55 mph. The proposed distance of the Highland Road driveway to the Bogie Lake Road intersection is 300 feet. **Therefore, a 155-foot variance is required from the Zoning Board of Appeals. (Comment outstanding; however, the Applicant intends to seek a variance from the Zoning Board of Appeals).** The minimum distance between a proposed driveway and the nearest intersection shall not be less than 350 feet when the speed limit is 45 miles per hour (mph). Along the Bogie Lake Road frontage, the speed limit is 45 mph. **As the driveway is not 350 feet from the intersection, a variance is required from the Zoning Board of Appeals. (Comment rescinded. See response to following comment). Note the dimension of the centerline of the Bogie Lake Road driveway to Highland Road on the site plan. (Comment addressed. A dimension (350.6 feet) has been added to the plan).**

Utilities

The project would be served by both the municipal water and sanitary sewer systems. The Township Engineering Consultant will perform an analysis of stormwater, location and capacity of utilities, and grading to ensure compliance with all applicable ordinances as well as the Township Engineering Design Standards.

Staff Analysis – Preliminary Site Plan

The development standards for the GB district require 50-foot front yard setbacks, 20-foot rear yard setbacks, and 15-foot side yard setbacks. **The proposed front (east) setback listed in the Site Data table on Sheet 3 is incorrect. Revise accordingly. (Comment addressed. The proposed east setback in the Site Data Table is now shown correctly). General Note 2 on Sheet 7 identifies the west setback as a front yard and not a side yard. Revise accordingly. (Comment addressed. The note has been revised).** The maximum building height allowed is 35 feet or two stories, whichever is less. Article 4, Section 17 of the zoning ordinance provides additional standards for drive-in or drive-thru window service, including a front yard setback of 60 feet (see Page 8 of this report regarding this requirement).

Building Architecture and Design

Generally, exterior building materials should be comprised primarily of high quality, durable, low maintenance material, such as masonry, stone, brick, glass, or equivalent materials. Buildings should be completed on all sides with acceptable materials. ~~The proposed building materials for the Culver's are a mix of stone (vener) and EFIS (exterior insulation finishing system). Canvas awnings are also proposed.~~ The proposed building materials for the multi-tenant building are a mix of brick (vener), fiber cement siding, and ~~hardie~~ paneling. Metal canopies are also proposed.

While building materials will be reviewed in detail at final site plan, the Applicant should be aware of the Township's architectural character requirements. EFIS, fiber cement siding, and hardie panel are not considered high-quality materials. **Seventy (70) percent of all elevations of both buildings should be covered with some combination of brick or stone or glass.** (Comment outstanding. The building is unattractive in appearance, and the fiber cement paneling and siding are substandard materials. All sides of the building will be visible from adjacent roads and must be comprised of high-quality materials. Also, a brown/tan/taupe color scheme should be utilized on the building as opposed to dark grey, light grey, and black). (Comment addressed. The building materials have been revised to include almost all brick veneer with a light, medium, and dark brown color scheme). **Furthermore, all buildings shall have windows at eye level covering at least 30 percent of the front facade (north and east elevations of the buildings). Calculations for window coverage on the front facades shall be provided on the elevations at final site plan.** (Comment remains as a notation. This requirement was acknowledged by the Applicant's engineer in the response letter provided to the first review). While front facade window coverage calculations are not provided at this time, it appears the north elevation meets the 30% requirement. However, the east elevation does not meet the 30% requirement; if the east elevation is not updated to provide the required window coverage, a variance must be requested from the Zoning Board of Appeals. (Glass coverage calculations have been added to the preliminary elevations. The required window coverage is provided on the north elevation, but a variance is required on the east elevation as only 9.27% window coverage is proposed. The required variance has been added to the variance list on Sheet 4 of the plan set).

A sample board of building materials to be displayed at the Planning Commission meeting and elevations in color are required by the zoning ordinance and must be submitted at final site plan. Additionally, the address (street number) locations shall be shown on the building. Six-inch-tall numbers visible from the street shall be required. The address locations are subject to approval of the Fire Marshal. (Comments remain as notations. These requirements were acknowledged by the Applicant's engineer in the response letter provided to the first review).

Outdoor patios are located on the site. **Details for the items to be located on the patios and details for the patios' surfacing shall be provided at final site plan.** (Comment remains as a notation. This requirement was acknowledged by the Applicant's engineer in the response letter provided to the first review). **An ornamental paving treatment should be required by the Planning Commission.** The treatment should be something either decorative or something to provide aesthetic quality to the patios. Potential options for ornamental paving treatments include, but are not limited to, CMU pavers; brick; stone; or stamped, stained, and sealed concrete. Accessory items such as railings, benches, trash receptacles, outdoor seating (such as tables and chairs), or sidewalk planters located in the vicinity of sidewalks and/or outdoor seating areas are required to be of commercial quality and complement the building design and style. **These details shall be provided at final site plan.** (Comment remains as a notation. This requirement was acknowledged by the Applicant's engineer in the response letter provided to the first review).

Landscaping and Screening

Landscaping must comply with the provisions of the zoning ordinance and should be designed to preserve existing significant natural features and to buffer service areas, parking lots, and dumpsters. A mix of evergreen and deciduous plants and trees are preferred, along with seasonal accent plantings. A landscape plan will be provided and reviewed in detail during final site plan if the preliminary site plan is approved. Following are initial comments relative to a landscape plan:

- **A snow storage plan was not provided. Information on method of snow storage shall be provided at final site plan. Winter maintenance of parking lot landscape islands (insufficient parking lot landscape islands for plant material – variance required from the Zoning Board of Appeals (add to list of variances to be requested on Sheet 4 or demonstrate the required amount of parking lot landscaping can be provided (this can be demonstrated without having a landscape architect prepare a landscape plan)) (Comment addressed at this level of review. Proposed areas for parking lot landscaping have been shown on Sheet 4. Note not all of the proposed areas identified will count as parking lot landscaping; this will be reviewed further when a landscape plan is submitted at final site plan)) shall be required where heavy applications of salt and de-icing products occur through the use of salt tarps which minimize soil absorption and ultimately reduce plant disorders. (Comments remain as notations. The response letter provided to the first review states a snow storage plan will be provided at final site plan along with a landscape plan).**

Trash Receptacle Screening

The zoning ordinance requires dumpsters to be surrounded by a six-foot-tall wall on three sides and an obscuring wood gate on a steel frame on the fourth side, located on a six-inch concrete pad extending 10 feet in front of the gate, with six-inch concrete-filled steel bollards to protect the rear wall and gates. Furthermore, the zoning ordinance states dumpsters and trash storage enclosures shall be constructed of the same decorative masonry materials as the buildings to which they are accessory. Brickform concrete (simulated brick pattern) or stained, decorative CMU block are not permitted where the principal building contains masonry. Plain CMU block is also prohibited. A dumpster enclosure detail was provided on Sheet PP-1. **(The aforementioned sheet has been renumbered as PP-3 with the second submittal).** **(The aforementioned sheet has been renumbered as PP-4 with the third submittal).** **(The aforementioned sheet has been renumbered as PP-5 with the third submittal).**

At the time of trash pick-up, the location of the dumpster enclosure could cause conflict with traffic entering and exiting the site. The dumpster enclosure location should be evaluated when considering circulation around the site. (Comment addressed. One dumpster enclosure has been eliminated and the other dumpster enclosure location has been revised to reduce conflict with traffic).

Parking

The parking calculations in the Site Data table on Sheet 3 are incorrect and shall be revised. (Comment outstanding. When units or measurements determining number of required parking spaces result in fractional space, any fraction up to and including one-half shall be disregarded and fractions over one-half shall require one parking space). (Comment addressed. Required parking calculations have been updated. See following comments). ~~54 parking spaces are required for Culver's, not 46. 31 parking spaces are required for the coffee shop, not 19.~~ The fast food standard shall be applied to the coffee shop. (Comment outstanding. Revise accordingly). (Comment addressed. Required parking calculations have been updated. See following comments). ~~Retail tenant space #1 requires 13 12 parking spaces, not 11 13. Retail tenant spaces #2 and #3 each require nine parking spaces, not seven. Additionally, gross floor area is utilized for fast food and retail uses, not useable floor area. It is unacceptable to remove 15 percent of the floor area from the parking calculations.~~ (Comment addressed). 116 65-77 parking spaces and 8 stacking spaces are required to serve the development and 90 48-61 parking spaces and 16 stacking spaces are proposed; therefore, a 26 17-16-parking space variance is required from the Zoning Board of Appeals. (Revise parking variance note on Sheet 3 accordingly). (Comment addressed. The applicable note on Sheet 4 has been updated).

The Planning Commission should note per the proposed zoning ordinance amendment to the off-street parking requirements, a maximum of 77 parking spaces would be allowed on the site and a minimum of 58 parking spaces would be required. Therefore, with 61 parking spaces proposed, a parking space variance would not be required.

Staff recommends the Planning Commission require the six easterly parking spaces be removed. Traffic circulation at the northeast corner of the site will make these spaces dangerous and difficult to access; vehicles attempting to access these spaces could cause traffic conflicts with vehicles exiting the drive-thru and bypass lane. Additionally, staff suggests the three northwesterly parking spaces be removed. Traffic circulation at the northwest corner of the site will make these spaces dangerous and difficult to access; vehicles attempting to access these spaces could cause traffic conflicts with vehicle ingress/egress from/to the Highland Road driveway and vehicles entering the drive-thru. (Comment outstanding. The nine aforementioned parking spaces remain as previously proposed. A dimension (19 feet) has been added to the back side of the six parking spaces on the east side of the site; this has been noted as an attempt to demonstrate reduced interference from these parking spaces with the bypass lane. Staff continues to recommend revisions to this area of the site plan; see recommendation on Page 15).

Two-way drives are required to be a minimum of 24 feet in width. At the east end of the northerly drive aisle, the proposed width is 22.8 feet. Revise the site plan to increase the width to 24 feet; if not revised, a variance is required from the Zoning Board of Appeals. (Comment addressed. The aforementioned two-way drive aisle has been revised to be 24 feet in width).

The one-way drive (approximately 40 feet in length) north of the Bogie Lake Road driveway shall be removed. (Comment outstanding. See third comment in green in this paragraph). One-way drives are required to be a minimum of 20 feet in width, so the proposed width of 12 feet would require a variance from the Zoning Board of Appeals. (Comment addressed. The one-way drive aisle has been increased to 20 feet in width). However, removing this drive will improve vehicle circulation around the site. Funneling traffic north through said area would conflict with drive-thru and bypass lane traffic (maintaining the bypass lane is important for the efficient and safe function of the drive-thru). Also, vehicles attempting to enter the drive-thru from the Bogie Lake Road driveway would also have to traverse west across the drive aisle north of the building where pedestrians are accessing vehicles north of said drive aisle and vehicles on both sides of said drive aisle are entering/exiting the site from the west. Removing the aforementioned section of one-way drive aisle will also allow the landscape island in this area to be extended east to the east property line. (Staff concerns remain regarding the internal traffic circulation near the northeast corner of the site. Vehicles backing out of the easternmost parking spaces may have difficulties).

The zoning ordinance requires each individual parking space be delineated by dual stripes, two feet apart centered on the dividing lines and painted white. Revise the site plan and the typical parking space detail on Sheet 3. If the required striping is not provided, a variance is required from the Zoning Board of Appeals. (Comment addressed. The plans as well as the parking space detail on Sheet 3 (now Sheet 4) now show white dual striping).

All dimensions for drive widths and parking space depth shall be revised. The site plan measures drive widths to the face of curb; road measurement surface is taken between the edges of the gutter pan (drive width shall be provided between the edges of the gutter pan). (Comment partially addressed. There are still some drive aisles/maneuvering lanes with width measured to the curb, not the edge of the gutter pan. Revise accordingly). (Comment addressed. The measurements have been revised accordingly). Furthermore, gutter pan shall not be included in the measurement of parking space depth. Revise the site plan and the typical parking space detail on Sheet 3. (Comment partially addressed. Sheet 3 shows 18-foot-deep parking spaces in some areas of the site while other spaces are 17-feet in depth. Gutter pan is also being counted as width in parking spaces abutting such. Revise accordingly). (Comment addressed. The typical parking space detail now shows the space length to be 17-feet and matching what is proposed on the site plan, and the space measurements have been revised accordingly).

The typical parking space detail shows spaces 18 feet in length and the site plan shows the spaces 17 feet in length. Revise for consistency. (See previous comment. While the typical parking space detail shows parking spaces 17 feet in depth, the plan shows 18-foot-deep spaces in some areas). (Comment addressed. See previous comment).

While provided on the typical angled parking space detail, label the length and width dimensions of the angled parking on the site plan. (Comment rescinded. Angled parking is no longer proposed).

The sidewalk north of the southernmost parking spaces shall be increased to seven feet in width to be eligible for 17-foot-deep parking spaces abutting the aforementioned sidewalk. Otherwise, 18-foot-deep parking spaces shall be required. (Comment outstanding. Clarification is required. While in the response letter provided to the second review the Applicant’s engineer stated the sidewalk width has been increased to seven feet in width, on Sheet 4 there is a 6.5-foot dimension label appearing to indicate the width of said sidewalk). (Comment addressed. **The dimension has been revised and now shows the full seven-foot width.** **Label the parking space depth and width, width of the sidewalk north of the spaces, and width of the sidewalk west of the spaces.** (Comment partially addressed. Parking space depth and width have been added, but the sidewalk width west of the spaces is not labeled and the width of the sidewalk north of the spaces is unclear (see previous comment)). (Comment addressed. **Additional sidewalk width dimensions have been added to the site plan.** **Additionally, staff recommends the 10 southernmost parking spaces be restricted to employee parking and designated/marked accordingly.** (Comment partially addressed. The number of parking spaces south of the building has increased to 24. Staff continues to suggest the southernmost spaces (12) be restricted to employee parking and designated/marked accordingly. While in the response letter provided to the second review the Applicant’s engineer stated they acknowledge this recommendation, a note stating such could not be located by staff on Sheet 4). (Comment addressed. **Site Plan Note 4 has been added to Sheet 4 of the plan set).**

For the proposed drive-thrus, eight vehicle stacking spaces inclusive of the vehicle at the window are required. The site plan shall show nine-foot-wide and 18-foot-long stacking spaces, and the parking calculations in the Site Data table on Sheet 3 shall be revised to show the required and proposed stacking spaces. (Comment addressed. **The Site Data Table now shows the correct number of required and proposed stacking spaces).**

Off-Street Loading Requirements

The zoning ordinance requires ~~two~~ **one** loading spaces for a development of this size (~~one for each building~~). Such loading and unloading spaces must be an area 10 feet by 50 feet, with a 15-foot height clearance. **No loading spaces are proposed, so a variance is required from the Zoning Board of Appeals.** (Comment partially addressed. **A loading space is now provided northeast of the proposed dumpster enclosure (label the length and width); however, staff agrees with DLZ regarding the location presenting conflict with traffic entering and exiting the site from Bogie Lake Road).** (Comment addressed. The loading space north of the proposed dumpster is now shown outside of the drive aisle).

Signs

The zoning ordinance requires the area, quantity, location, and dimensions of all signs to be provided with the preliminary site plan. The site plan shows the location of ~~two~~ **one** monument signs, each with a 10-foot setback from the Highland Road and Bogie Lake Road rights-of-way. **(The proposed sign area of the monument sign is 125 square feet, which exceeds the allowed sign area by 65 square feet and would require a variance from the Zoning Board of Appeals (a note on Sheet 4 incorrectly states the allowed sign area is 65 square feet when the allowed sign area is 60 square feet based on the proposed sign setback; revise accordingly). (Comment addressed. The monument sign has been revised with additional setback and reduced sign area to comply with the zoning ordinance). Freestanding signs on parcels containing a multi-tenant building in the GB zoning district are allowed six square feet of sign area for each one foot of setback, up to a maximum of 150 square feet in area (with a 25-foot setback)). (The Applicant will be requesting a variance for sign area (has been added to the list of variances to be requested on Sheet 4)). (Comment rescinded. See previous comment in green in this paragraph).** In instances where a parcel has frontage on two thoroughfares, a second freestanding sign may be permitted along the secondary thoroughfare. This provision is contingent upon the second sign being no more than 50 percent of the size permitted the first sign, a minimum 150 feet of separation exists between any freestanding signs on the site, and all other setback requirements are met. Sheet PP-1 shows a detail labeled “existing pylon sign.” There is no existing pylon sign on the site. **(The aforementioned sheet has been renumbered as PP-3 with the second submittal).** Furthermore, the zoning ordinance prohibits pylon signs. **Remove the aforementioned detail from the plan set. (Comment addressed. The aforementioned detail has been removed).** Any proposed freestanding sign must be of the monument type (which is indicated on Sheet 3 of the site plan). While monument sign details were not provided **(a detail is now provided on Sheet PP-3) (the aforementioned sheet has been renumbered as PP-4 with the third submittal) (the aforementioned sheet has been renumbered as PP-5 with the third submittal)**, staff can administratively review and approve signage. Any/all signage would be required to comply with the zoning ordinance.

~~The Culver’s building elevations show three wall signs (one on every façade except the south elevation). In instances where a parcel has frontage on two streets, an additional wall sign may be permitted on the building facing the secondary thoroughfare, which is no greater than five percent of the wall area on which the sign is placed. Where permitted, wall signs must be located flat against the building’s front façade or parallel to the front façade on a canopy. **The wall sign on the west elevation shall be removed, or a variance is required from the Zoning Board of Appeals.** Additionally, wall signs cannot extend above the roofline of a building. **Variances are required to install wall signs above the roofline of the building.** Staff does not support any variances for signage. **The building elevations should be revised to comply with the sign standards.** Note signage is not permitted on the awnings. **(These comments are no longer applicable as the Culver’s building is no longer being proposed on this site).**~~

~~The multi-tenant (four tenants) retail and coffee shop building elevations show wall signs on every facade, except the south elevation.~~ In the case of a building with two or more tenants, one wall sign is permitted per tenant. In instances where a parcel has frontage on two streets, an additional wall sign may be permitted on the building facing the secondary thoroughfare, which is no greater than five percent of the wall area on which the sign is placed. **The wall sign on the west elevation shall be removed, or a variance is required from the Zoning Board of Appeals.** (Comment outstanding). (The Applicant will be seeking a variance for this wall sign (has been added to the list of variances to be requested on Sheet 4)). (Comment rescinded. The wall sign on the west elevation has been removed). Additionally, wall signs cannot extend above the roofline of a building. **Variances are required to install wall signs above the roofline of the building.** (Comment outstanding). (The Applicant will be seeking a variance for the placement of walls signs (has been added to the list of variances to be requested on Sheet 4)). (Comment rescinded. The wall signs on the north elevation have been removed. The response letter provided to the third review stated until tenants are known sign placement is unknown, and sign permits will be sought as tenants are selected). Staff does not support any variances for signage. **The building elevations should be revised to comply with the sign standards.** (Comment remains as a notation). Note signage is not permitted on the canopies.

Outdoor Lighting

Site lighting is required to comply with the zoning ordinance. Information on site lighting will be provided and reviewed in detail during final site plan. While the building elevations show wall-mounted lighting, outdoor lighting is reviewed and approved via a photometric plan and required attachments. **All luminaries shall be removed from existing sheets in the plan set.** (Comment outstanding. Note the type of wall-mounted sconce lighting (appears to be outward, unshielded lighting) shown on the preliminary elevations is not permitted in the Township and would require a variance from the Zoning Board of Appeals). (Comment rescinded. The sconce lighting has been removed from the plans. A photometric plan indicating light sources and styles will be provided at final site plan).

Staff Analysis – Special Land Use (Drive-thru)

Special land uses for drive-thrus are evaluated using the general standards for all special land uses listed in Article 6, Section 10 of the zoning ordinance and the following specific standards for outdoor dining found in Article 4, Section 17 of the zoning ordinance:

A. A front yard setback of at least sixty (60) feet shall be required.

The coffee shop drive-thru tenant space is only 50 feet from the Bogie Lake Road right-of-way. However, the drive-thru window is over 60 feet from the Bogie Lake Road right-of-way. **The Applicant may request the Zoning Board of Appeals make an interpretation allowing the setback as proposed being conforming to the 60-foot front yard setback.** (Comment outstanding; however, the Applicant intends to seek an interpretation/variance from the Zoning Board of Appeals). ~~The Culver's building is conforming.~~

B. Entrance and exit drives shall be at least one hundred (100) feet from any street intersection and two hundred (200) feet from any residential district.

The Highland Road driveway is not 200 feet from the residential zoning district to the west. **Therefore, a variance is required from the Zoning Board of Appeals.** (Comment outstanding; however, the Applicant intends to seek a variance from the Zoning Board of Appeals). The Bogie Lake Road driveway is compliant.

C. An outdoor lighting plan shall specify the type of fixtures to be used, light intensity, and method of shielding the fixtures so that light does not project onto adjoining properties or on any public or private street or right-of-way. Dropped fixtures shall not be allowed. The site plan shall include a photometric plan and catalog details for all proposed fixtures. Outdoor lights must meet the performance standards of Section 5.18.

Site lighting is required to comply with the zoning ordinance. Information on site lighting will be provided and reviewed in detail during final site plan.

Staff Analysis – Special Land Use (Outdoor Dining)

Special land uses for outdoor dining are evaluated using the general standards for all special land uses listed in Article 6, Section 10 of the zoning ordinance and the following specific standards for outdoor dining found in Article 4, Section 18 of the zoning ordinance:

A. The Planning Commission shall determine that the use is designed and will be operated so as not to create a nuisance to property owners adjacent to or nearby the eating establishment. As such, the proposed use shall meet the following minimum criteria:

i. The establishment may operate only during the following hours:

- *Monday thru Thursday: 8:00 a.m. – 12:00 midnight*
- *Friday: 8:00 a.m. – 2:00 a.m.*
- *Saturday: 10:00 a.m. – 2:00 a.m.*
- *Sunday: 10:00 a.m. – 10:00 p.m.*

~~Culver's and t~~The coffee shop would be required to adhere to said hours of operation. **(Revise Site Plan Note 3 on Sheet 3. The hours of operation pertain to the outdoor dining hours, not hours of operation for the coffee shop).** (Comment addressed. The note on Sheet 4 has been updated accordingly).

ii. The use of exterior loudspeakers is prohibited where the site abuts a residential district or use. The noise level at the lot line shall not exceed 70 dB.

~~Culver's and t~~The coffee shop would be required to adhere to said performance standard.

iii. An outdoor lighting plan shall specify the type of fixtures to be used, light intensity, and method of shielding the fixtures so that light does not project onto adjoining properties or on any public or private street or right-of-way. Dropped fixtures shall not be allowed. The site plan shall include a photometric plan and catalog details for all proposed fixtures. Outdoor lights must meet the performance standards of Section 5.18.

Site lighting is required to comply with the zoning ordinance. Information on site lighting will be provided and reviewed in detail during final site plan.

B. Additional parking spaces must be provided according to the following:

- i. *Outdoor dining areas for more than 30 people or which include either permanent or seasonal structures, such as awning, roofs, or canopies, may be required to provide additional parking according to the following:*
 - a. *If the outdoor seating is 25% of the indoor seating or less, no additional parking is necessary.*
 - b. *If the outdoor seating is 26%-50% of the indoor seating, the restaurant may be required to provide up to 125% of the parking required for the indoor space.*
 - c. *If the outdoor seating is over 50% of the indoor seating capacity, the restaurant may be required to provide up to 150% of the parking required for the indoor space.*

According to the site plan, ~~a 656 square foot patio is proposed on the northeast corner of the Culver's building and a 253~~ **232** square foot patio is proposed on the northeast corner of the retail and coffee shop building. From an occupancy perspective, the Building Code states assembly without fixed seating – unconcentrated (tables and chairs) is F15 square feet per person. Maximum patio occupancy is subject to approval of the Building Official. ~~The site plan shows seating for 16 patrons on the Culver's patio (four, four-top tables). Based on a restaurant dining room with 80 seats, the outdoor seating does not warrant additional parking. The site plan shows seating for eight patrons on the coffee shop patio (two, four-top tables). The submitted floor plan does not show the coffee shop seating capacity; however, the tenant space would be limited to 32 seats in order to not warrant additional parking to serve the outdoor seating.~~ **(Per the design engineer, the outdoor seating is less than 25% of the indoor seating. Therefore, no additional parking is required).**

Planning Commission Options / Recommendation

The Planning Commission may recommend approval, approval with conditions, or denial of the preliminary site plan to the Township Board; action on the special land use is determined by the Planning Commission. ~~Staff recommends the plans be revised and resubmitted to address the items identified in this memorandum. An updated list of any requested variances shall also be provided.~~ **The majority of staff comments have been addressed. While there are variances required, the plan demonstrates land use feasibility. Concerns remain regarding the internal traffic circulation, especially near the northeast corner of the site. At a minimum the southerly three parking spaces of the easternmost six parking spaces should be removed; doing so would also allow the direct pedestrian access to the building from the frontage sidewalk along Bogie Lake Road to be shifted north. As proposed, the location of the pedestrian access is a safety concern as it crosses the bypass lane just north of the drive-thru window. Eliminating the three aforementioned parking spaces and shifting the pedestrian access north would provide separation from vehicles at the drive-thru window.**

The following plans were reviewed:

- Plans prepared by Boss Engineering dated January 5, 2023 (~~revision date-September 8, 2023~~
~~January 12~~February 28, 2024). The utility, grading, and drainage plans for the site are subject to the approval of the Township Engineering Consultant and shall be completed in accordance with the Township Engineering Design Standards. **Note 2 on Sheet 1 shall be removed (the zoning ordinance requires plans be to scale).** (Comment addressed. The note has been removed).
- Preliminary floor plan and elevations prepared by Detroit Architectural Group dated ~~January 4~~~~September 6~~~~November 15,~~ 2023February 28, 2024. **These plans shall be sealed by the Registered Architect who prepared the plans.** (Comment addressed. The aforementioned plan sheets have been sealed).
- ~~Floor plan and exterior elevations prepared by AMAG dated May 15, 2020 (revision date May 28, 2020). These plans shall be sealed by the Registered Architect who prepared the plans. (Comment rescinded. This comment is no longer applicable as the west building is no longer being proposed).~~



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

March 27, 2024

Sean O' Neil
Community Development Department
Charter Township of White Lake
7525 Highland Road
White Lake, Michigan 48383

RE: Gateway Crossing- Preliminary Site Plan Review – 4th Review

Ref: DLZ No. 2345-7567-01

Design Professional: Boss Engineering

Dear Mr. O' Neil,

Our office has performed a Preliminary Site Plan review for the above-mentioned plan dated February 28, 2024. The plans were reviewed for feasibility based on general conformance with the Township Engineering Design Standards.

General Site Information

This site is located at the southwest corner of M-59 and Bogie Lake Road. Total site acreage is approximately 5.36 acres.

Site Improvement Information:

- Construction of a retail and coffee shop building (8,620 sq.ft.) with associated parking, including ADA parking.
- Site to be serviced by proposed water main and sanitary sewer.
- Storm water runoff is proposed to be routed via storm sewer to and detained underground located south of the proposed building.

The following items should be noted with respect to Planning Commission review:

Note that comments from our previous review dated February 13,2024 are in *italics*. Responses to those comments are in **bold**. New comments are in standard font.

- a) *Provide wetland delineation report. In addition, a wetland permit from EGLE will be required due to the construction of the boardwalk within the wetlands and wetland buffer and due to the proximity of site construction in general to the wetlands. Comment outstanding. Although a delineation has been provided, our office requests a copy of the wetland report. Comment addressed. A copy of the wetland report has now been provided. A wetland boundary verification shall be done by EGLE.*
Comment remains as a notation regarding EGLE wetland boundary verification and EGLE wetland permit requirement.
- b) *We defer to the Township Fire Department regarding hydrant spacing/coverage.* **Comment remains.**
- c) *Show the location/continuation of the existing sanitary sewer to the south relative to the location of the proposed boardwalk. It appears that construction of the boardwalk may impact the existing sewer and that construction of the boardwalk may be in an existing sanitary sewer easement. Permission from the Township would be required for construction within the easement.* **Comment remains as a notation. The existing sanitary sewer is now shown. Per the design engineer response, the property owner acknowledges that permission from the Township will be required for work within the sanitary sewer easement.**
- d) *Provide fire truck turning plan to demonstrate adequate turning radii for fire trucks, please use a 40 foot long vehicle for the analysis. Comment addressed. A truck turning plan has been provided. We note that fire truck clearance will be tight in the area of the dumpster location. Per the current submittal, we now note that the fire truck clearance in the vicinity of the proposed dumpster location appears to be improved from the previous plan submittal.* **Comment remains as a notation.**
- e) *The proposed watermain stub to the west shall end with a blow off assembly or hydrant.* **Comment addressed. A GV&W as well as a temporary blowoff assembly have now been provided at the stub.**
- f) *The drive width near the northeastern portion of parking now shows a width less than the required 24'. Is the intent for the parking area in the NE corner to only be accessed from the south? (i.e. one way). In addition, the drive width near the SE area of the site has been reduced from 15' to 12'. Is one way circulation the intent? Current zoning standards for drives require one way circulation drives to be a minimum of 20' width and two way to be 24'. There are also circulation concerns relative to the 6 parking spaces near the NE corner of the site. We defer to the Township regarding these items.*
Comment addressed. The two way drive width near the northeastern parking area now shows a width of 24'. The one way drive width near the southeastern area of the site is now shown as 20' wide. Both drive widths now meet ordinance requirements. We continue to defer to the Township regarding the internal traffic circulation concerns near the northeastern corner of the site. We do note that dimension (19.0') was added to the back side of the six parking spaces on
-

the east side to demonstrate reduction in interference from these parking spaces with the drive thru lane.

- g) *We note that OCWRC Sanitary Sewer Details have been included in the plan submittal but are unnecessary as the White Lake details are what apply to this site. **Comment addressed. OCWRC sanitary sewer details have been removed from the plan set.***
- h) *Sheet 9-Basin Summary- Basin size provided (26,207 cu. ft.) should be 27,646 cu.ft. based on DHWL. **Comment addressed. The basin size provided has now been revised to that based on the DHWL.***

Recommendation

The plan now demonstrates feasibility from an engineering perspective. We defer to the Township regarding the remainder of comment f) above.

Please feel free to contact our office should you have any questions.

Sincerely,

DLZ Michigan



Michael Leuffgen, P.E.
Department Manager



Victoria Loemker, P.E.
Senior Engineer

Encl. None

Cc: Justin Quagliata, Community Development, *via email*
Hannah Kennedy-Galley, Community Development, *via email*
Aaron Potter, DPS Director, White Lake Township, *via email*
Jason Hanifen, Fire Marshall, White Lake Township, *via email*



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

January 19, 2023

Sean O'Neil, Director
Community Development Department
Charter Township of White Lake
7525 Highland Road
White Lake, Michigan 48383

**Re: Gateway Crossing Development
TIS Memorandum Response**

Ref: DLZ File No. 2345-7567-01

Date of Memo: 1/3/23

Design Professional: Jacob Swanson, PE and
Kyle Paulson; Fleis & VandenBrink

The applicant has submitted a Traffic Impact Study (TIS) for the Gateway Crossings Development located in the southwest quadrant of the Bogie Lake Road and Highland Road (M-59) intersection. The proposed development in the TIS includes 6,031 square feet of retail, 4,060 square feet of restaurant with a drive-through, and 2,289 square feet of coffee shop with a drive-through. The TIS utilized turning movement traffic counts at the Bogie Lake Road and Highland Road intersection, EB Highland Road (M-59) and WB-EB Crossover (west of Bogie Lake Road), WB Highland Road (M-59) & Nordic Drive / EB-WB Crossover (east of Bogie Lake Road), and the SB Bogie Lake Road and NB-SB Crossover (north of Highland Road (M-59)) on Thursday, November 3, 2022.

DLZ has reviewed the analysis; the methodology is in line with standard practices, and the findings are supported by the data provided. Based on data from the Shopping Plaza and Fast Food with Drive-Through sections of the 11th edition of the "ITE Trip Generation Manual", the additional daily trips are 2,835 trips per day. Additionally, 109 AM Peak Hour trips per day and 111 PM Peak Hour trips per day are anticipated to be added to the existing traffic volumes. Based on the White Lake Zoning Ordinance, the number of daily trips generated by the site is above the minimum threshold for requiring a Traffic Impact Study (750+ daily trips).

The TIS evaluated the existing traffic conditions at each intersection, the future background conditions (existing conditions with natural traffic volume growth) at each intersection and the future conditions at each intersection with the full proposed build-out of the site. The TIS data indicates that with traffic signal optimization, each intersection will operate in a similar manner to the future background condition. It also shows that no traffic movements will operate below a level of service (LOS) of "D", with the exception of the southbound right turn movement, which will continue to operate a LOS of "E".

The future traffic conditions were also evaluated at proposed site drives along both Bogie Lake Road and Highland Road (M-59). During both the AM and PM peak hours, the site drives operate with all turning movements at a LOS of "C" or greater.

The TIS also evaluated the need for turn lanes or tapers at the proposed site driveways based on MDOT and Road Commission for Oakland County (RCOC). Based on the trip generation peak hour's traffic, it was determined that a right turn lane is warranted at the site driveway along Highland Road (M-59), but no treatment is required at the site driveway along Bogie Lake Road. However, while the TIS indicates a right turn taper is not warranted along Bogie There appears to be an existing right turn taper at the Bogie Lake Road site drive location, but the owner should evaluate the existing right turn taper to ensure it meets current RCOC dimensional requirements. RCOC and MDOT ROW permits will be required prior to construction.

As previously stated, we are in agreement with the conclusions and recommended treatments, with the exception of the right turn taper on Bogie Lake Road.

If you have any questions, please feel free to contact to me.

Respectfully,
DLZ Michigan, Inc.



Leigh Merrill, P.E.
Project Manager

Cc: Michael Leuffgen, P.E., DLZ *via email*
Craig Burnside, Community Development *via e-mail*



**Fire Department
Charter Township
of White Lake**

Fire Department
Charter Township
of White Lake

**Fire Department
Charter Township
of White Lake**

**Fire Department
Charter Township
of White Lake**

Site / Construction Plan Review

To: Sean O'Neil, Planning Department Director

Date: 03/26/2024

Project: Gateway Crossing

Job #: 22-029-1

Date on Plans: 02/28/2024

The Fire Department has the following comments with regards to the 4th review of preliminary site plans for the project known as Gateway Crossing

The Fire Department has no further comments at this time.

Jason Hanifen
Fire Marshal
Charter Township of White Lake
(248)698-3993
jhanifen@whitelaketwp.com

Plans are reviewed using the International Fire Code (IFC), 2015 Edition and Referenced NFPA Standards.

CHARTER TOWNSHIP OF WHITE LAKE
SITE PLAN REVIEW APPLICATION
Community Development Department, 7525 Highland
Road, White Lake, Michigan 48383
(248) 698-3300 x5

APPLICANT AND PROPERTY INFORMATION

Applicant: Najor Companies, Brian Najor
Phone: 248-433-7000 / 248-703-8900 Email Address: brian@najorcompanies.com
Address: 600 N. Old Woodward, Suite 100 Birmingham, MI 48009
(Street) (City) (State) (Zip)
Applicant's Legal Interest in Property: Owner
Property Owner: Same as above Phone: _____
Address: _____
(Street) (City) (State) (Zip)

PROJECT INFORMATION

Project Name: Gateway Commons Parcel I.D. No.: 12-20-40-003, 12-20-426-003
Proposed Use: DRIVE-THROUGH RESTAURANT, RETAIL AND COFFEE SHOP WITH DRIVE-THROUGH Current Zoning: General Business
Existing Use: Vacant Parcel Size: 4.79 AC & 1.07 AC Floor Area / No. of Units: 4,060 AND 8,322 GSF

TYPE OF DEVELOPMENT

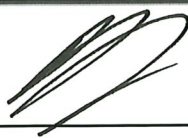
Subdivision Site Condominium Commercial
 Multiple Family Special Land Use Industrial
 Adult Entertainment

SITE PLAN SUBMITTAL CHECKLIST

PDF File ^{TWO} and ~~One~~ Paper Copy (sealed and no larger than 24x36)
 Application Review Fees (to be calculated by the Community Development Department)

*** PLANS WILL NOT BE ACCEPTED UNLESS FOLDED ***

REQUIRED SIGNATURES



(Signature of Property Owner)

12/21/22
(Date)

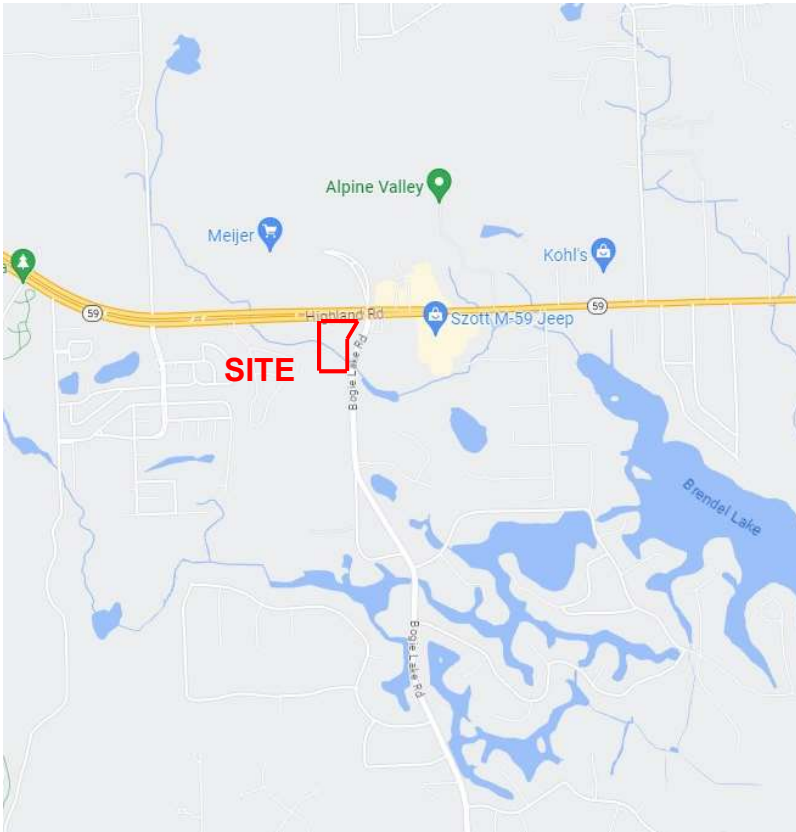
(Signature of Applicant)

(Date)

SIGNATURES TO BE VERIFIED BY THE TOWNSHIP

WETLAND DELINEATION FOR:

Gateway Crossing Highland Road and Bogie Lake Road White Lake Township, Oakland County, MI



I. Summary

A wetland delineation was conducted at the property (parcel #'s 12-20-402-003 & 12-20-426-003) in White Lake, MI. The site location is shown in the map figure at left. The study area is on the west parcel (12-20-402-003). The study area was currently undeveloped but disturbed. There was evidence of previous development at the top of slope that defined the north/northwest borders of the wetland, a constructed driveway along the south, and a mowed field along the west / southwest border of the wetland. The purpose of the delineation was to determine existing conditions and establish development limits.

Report Index:

- I. Summary
- II. Wetland Description
- III. Reference Maps
- IV. Representative Photos
- V. Drawing / Boundary Map (excerpt)
- VI. Data Sheets

As part of the work the following information was reviewed and is included in this report:

- National Wetland Inventory (NWI) Map 1
- USDA NRCS Soil Survey Map 2
- Aerial Maps / Photos

A site visit was conducted on June 3, 2022, and the wetland flagged. Further documentation was collected during a second site visit on November 3, 2023. Conditions were drier than normal during the initial visit and considered normal for the season during the second visit but there was no change to the wetland boundary.

The site investigation substantiated the Palustrine environment and also determined a likely Riverine condition that runs northwest to southeast through the western corner of the site, the entire area included in an area determined to be a wetland.

Owner: Gateway Crossing, LLC
600 North Old Woodward, Suite 101
Birmingham, MI 48009
Contact: Brian Najor
Email: brian@najorcompanies.com
Phone: 248-433-7000

Prepared By:



3121 E. Grand River Howell, MI 48843
517.546.4838 fax 517.548.1670
www.bosseng.com

Contact: Patrick Cleary, PLA - Landscape Architect

November 3, 2023

The delineation was completed in accordance with the 1987 U.S. Army Corps of Engineers (USACOE) Wetland Delineation Manual, the Regional Supplement for the Midwest Region August 2010, and USACOE MI State Plan List 2018. Wetlands were determined by the soil, vegetation and hydrology criteria that have been established by the USACOE - and adopted by the Michigan Department of Environment, Great Lakes and Energy (EGLE).

There are larger Palustrine wetlands directly west of the study area as shown on the NWI map excerpt (Map 1) that most likely include more than 5- acres. This size of connected wetlands along with the potential Riverine environment indicates that this wetland would be regulated by EGLE. EGLE is the final arbiter for wetland determinations in the state (non-coastal) and it is recommended that they be consulted for an official determination if any wetland impact is contemplated.

The White Lake Township Zoning Ordinance contains provisions for natural features including wetlands. Section 3.11 (Q) states *"No building or structure shall be located closer than 25-feet to any regulated wetland, submerged land, watercourse, pond, stream, lake or like body of water. The setback shall be measured from the edge of the established wetland boundary as reviewed and approved by the Township."* This setback is shown and noted on the Wetland Boundary Map in Section V of this report. This setback should be taken into account with any development scenario.

II. Wetland Descriptions

Two wetlands were flagged in the field. Wetland 'A' with three transects, A1 to A3 and Wetland 'B' with two transects, B1 and B2. Wetland 'A' is the primary depressional area that includes approximately 1.33 acres on site, and substantially more off-site. Wetland 'B' can be described as essentially a left over 'hole' from some previous construction activity with steep 3:1 or steeper sides, rounded shape (+-15-ft x 30-ft) and a flat bottom, in total measuring only approximately 375 sq ft. However, due to its configuration it does not appear to drain well and therefore exhibits wetland characteristics.

Wetland 'A': This wetland is a well-defined depression. Near the northwest corner of the site, it is at the bottom of a steep constructed fill slope located near the west property line and continues south and then east towards Bogie Lake Road. At the east side, bordering the road, and then along its south side it appears to be a more natural depression with flatter bank slopes (5-8%). The sampling points were taken at the first at the steep fill slope at the west side of the site (northeast area of the wetland), further east where there was a change in vegetation, and then along the south side of the wetland where it appeared as a more natural depression with shallower slopes and another change in vegetation.

TRANSECT A1:

This transect was taken near the northern end of the site and wetland, near the west property line, along a steep (3:1) embankment probably fill embankment (See 'Wetland Boundary Map' for specific location.)

Soils & Hydrology: Upland soils were a 10YR 5/3 loamy sand to sand, possible fill, although the color was consistent with Oakland County NRCS description of 18B Fox Sandy Loam at depths greater than 9-inches. The upland sample was taken near the toe of the slope with a 10YR 4/1 loamy clay transition at 11-inches, consistent with the soil color and texture further downslope at the wetland edge. Due to the sandy texture the soil was quite dry. Down slope to the wetland edge soil saturation and standing water occurred before hydric soil indicators were prominent – a 10YR 4/1 silty/loamy clay. Approximately 8-10 further downslope it became a much more defined Houghton/Adrian Muck with 10YR 2/1 color and mucky texture. The boundary was confirmed where the hydrology & hydric soil characteristics agreed, meeting the 'F1' Loamy Mucky Mineral criteria, and consistent with the 6-2-22 site visit flagging.

Vegetation: The vegetation going up the slope was a mixture of invasives & lawn-type grasses. There was a quick transition from a near monoculture of Phragmites to a near monoculture of Goldenrod (*Solidago canadensis*) then more Autumn Olive (*Elaeagnus umbellata*) and Cottonwood (*Populus*) further up to the top of the slope along with an increasing density of lawn-type grasses (*Festuca* & *Poa*). At the wetland edge, at the transect, there was a large clump of Willow (*Salix alba*) along with smaller amounts of Green Ash (Saplings only), Red and Gray Dogwoods (*Cornus alba / sericea* & *racemosa*). Just above the wetland edge the general area was dominated by Phragmites for approximately 15-20-ft up slope.

TRANSECT A2:

This transect was taken further east through the toe of a less steep slope (10-15%+-) primarily where was a change in the vegetation mix. (See 'Wetland Boundary Map' for specific location.)

Soils & Hydrology: Upland soils were consistent with Transect A1-1 with a 10YR 5/3 color, sandy texture, and dry condition. At the wetland edge the same soil and hydrologic conditions continued with an approximately 6-8-inch layer of 10YR 4/1 silty/loamy clay between the 10YR 2/1 Muck and the 10YR 5/3 Loamy Sand above, again meeting the 'F1' hydric soil indicator.

Vegetation: The vegetation at this transect generally became more woody with more in the tree stratum dominated by Cottonwood of varying sizes, and Russian Olive. The herbaceous layer was still dominated by Phragmites at the wetland edge, then Goldenrod, and lawn-type grasses further up slope, but then Crown Vetch became much more prevalent near and the top of the slope.

TRANSECT A3:

This transect was taken along the south side of the wetland with more moderate boundary slopes (5-8%). Although dominated by invasives this boundary appeared to be more natural and less disturbed (See 'Wetland Boundary Map' for specific location.)

Soils & Hydrology: Upland soils were similar to the previous transects with a 10YR 5/2 color, sandy texture, and dry condition. At the wetland edge, however, it continued sandy but darker at 10YR 3/1 with soil saturation (approximately 10-15-ft further downslope soil was inundated). The 11-inches of 10YR 3/1 met the Dark Surface (S7) hydric soil indicator. Other hydrologic evidence included water-stained leaves and geomorphic position. Generally the entire wetland – saturation if not inundation was evident on aerial images going back 20-years or more.

Vegetation: The vegetation at this transect generally became more scrubby /woody with more in the tree stratum dominated by Boxelder (*Acer negundo*) along with the Cottonwood and Green Ash. Vines became dominant – Riverbank Grape (*Vitis riparia*) along with Blackberry (*Rubus occidentalis*). The herbaceous layer was still dominated by Phragmites at the wetland edge, but with scattered Sedges (*Carex lacustris*) then much more Buckthorn and Honeysuckle (*Lonicera japonica*) scattered Gray Dogwood, and several prominent clumps of Sumac (*Rhus typhina*) nearer the road.

Wetland 'B' Adjacent to Wetland Flags 'A13' & 'A14', separated by a ridge/mound there was a small (+-375 sq ft) 'hole', most likely left over from some previous construction. Highly disturbed, irregularly rounded in shape and with steep 3:1 plus side slopes. This area is the result of construction, and its 'borderline' wetland status may need further confirmation by EGLE.

TRANSECT B1: One transect was taken for this wetland including representative upland conditions data sheet and a sampling wetland data sheet near the middle of the flat bottom to document existing conditions.

Soils & Hydrology: Soils around the 'hole' and in it are the same 10YR 5/3 sandy soils as other upland areas on the site, including the flat bottom of this area. Except a hardpan was encountered at 8-inches precluding further determination of the soil conditions. Hydrologically, however, it was sparsely vegetated (B8), contained water-stained leaves (B9) and met the conditions of Geomorphic Position (D2). The encountered hardpan may be precluding adequate drainage.

Vegetation: The vegetation could be discounted as inside the hole it was dominated by volunteer invasives Buckthorn, Phragmites, Boxelder, but also Riverbank Grape and some Green Ash to meet the FAC neutral test criteria. Outside was more of the same but also with Sumac supporting the dry surrounding conditions.

III. Reference Maps



22-029_NWI Wetlands



March 3, 2022

Wetland Types

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory
This page was produced by the NWI m

MAP 1 – National Wetland Inventory (NWI) Map

Hydric Rating by Map Unit—Oakland County, Michigan
(22-029_Hydric Soils)



MAP 2 – USDA NRCS Hydric Soils Map

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
18B	Fox sandy loam, till plain, 2 to 6 percent slopes	4	11.3	39.6%
19	Sebewa loam, disintegration moraine, 0 to 2 percent slopes	94	2.7	9.4%
27	Houghton and Adrian mucks	100	6.3	22.2%
46A	Dixboro loamy fine sand, 0 to 3 percent slopes	7	3.2	11.2%
47C	Fox-Riddles sandy loams, 6 to 12 percent slopes	3	0.8	3.0%
50B	Udipsamments, undulating	0	3.7	12.9%
W	Water	0	0.5	1.7%
Totals for Area of Interest			28.4	100.0%

MAP LEGEND

<p>Area of Interest (AOI)</p> <p> Area of Interest (AOI)</p> <p>Soils</p> <p>Soil Rating Polygons</p> <p> Hydric (100%)</p> <p> Hydric (66 to 99%)</p> <p> Hydric (33 to 65%)</p> <p> Hydric (1 to 32%)</p> <p> Not Hydric (0%)</p> <p> Not rated or not available</p> <p>Soil Rating Lines</p> <p> Hydric (100%)</p> <p> Hydric (66 to 99%)</p> <p> Hydric (33 to 65%)</p> <p> Hydric (1 to 32%)</p> <p> Not Hydric (0%)</p> <p> Not rated or not available</p> <p>Soil Rating Points</p> <p> Hydric (100%)</p> <p> Hydric (66 to 99%)</p> <p> Hydric (33 to 65%)</p> <p> Hydric (1 to 32%)</p> <p> Not Hydric (0%)</p> <p> Not rated or not available</p> <p>Water Features</p> <p> Streams and Canals</p>	<p>Transportation</p> <p> Rails</p> <p> Interstate Highways</p> <p> US Routes</p> <p> Major Roads</p> <p> Local Roads</p> <p>Background</p> <p> Aerial Photography</p>
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IV. Site Photos



PHOTO 1 – Near Northwest Corner, At Toe of Steep Slope – Looking West



PHOTO 2 – Southeast Side, Near Culvert Crossing – Looking North



PHOTO 3 – South Side – Looking North



PHOTO 4 – Southwest Corner – Looking North

MEMO

VIA EMAIL keith@najorcompanies.com

To: Keith Maziasz
Gateway Crossing, LLC

From: Jacob Swanson, PE
Kyle Paulson
Fleis & VandenBrink

Date: January 3, 2023

Re: Gateway Crossing Development
White Lake Township, Michigan
Traffic Impact Study

1 INTRODUCTION

This memorandum presents the results of the Traffic Impact Study (TIS) for the Gateway Crossing Development located in the southwest quadrant of the Highland Road (M-59) & Bogie Lake Road intersection, in White Lake Township, Michigan. The proposed development includes retail and restaurant land uses, including two (2) restaurants with drive-through services. Site access is proposed via one (1) right-in/right-out (RIRO) driveway on EB Highland Road (M-59) and one (1) full access driveway on Bogie Lake Road, as shown on the attached **Figure 1**. The study section of Highland Road (M-59) and Bogie Lake Road are under the jurisdiction of the Michigan Department of Transportation (MDOT) and the Road Commission for Oakland County (RCOC), respectively. The completion of a TIS has been required (in accordance with the MDOT Geometric Design Guidance Section 1.2.4) as part of the site plan approvals and driveway permitting process.

The scope of work for this study was developed based on the requirements and input provided by MDOT, Fleis & VandenBrink's (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practices, and information published by the Institute of Transportation Engineers (ITE). The study analyses were completed using Synchro/SimTraffic (Version 11). Sources of data for this study include F&V subconsultant Quality Counts, LLC (QC), MDOT, ITE, RCOC, and the Southeast Michigan Council of Governments (SEMCOG).

2 BACKGROUND

2.1 EXISTING ROAD NETWORK

Vehicle transportation for the study area is provided by Highland Road (M-59) and Bogie Lake Road. The lane uses and traffic control at the study intersections are shown on the attached **Figure 2** and the study roadways are further described below. For the purposes of this study, all minor streets, crossovers, and site driveways are assumed to have an operating speed of 25 miles per hour (mph), unless otherwise noted.

Highland Road (M-59) generally runs in the east and west directions, adjacent to the north side of the project site. The roadway is classified as an *Other Principal Arterial* and is under the jurisdiction of MDOT. The study section of Highland Road (M-59) has a posted speed limit of 55 mph and an Average Annual Daily Traffic (AADT) volume of approximately 40,000 vehicles per day (SEMCOG 2016). The roadway provides a four-lane, median divided cross-section, with two (2) lanes in each direction; left-turns are facilitated via exclusive left-turn lanes provided at the crossovers (U-turns) intersections.

Bogie Lake Road generally runs in the north and south directions, adjacent to the east side of the project site. Bogie Lake Road begins/ends, to the north of Highland Road (M-59), at the Meijer parking lot. Left turn movements are prohibited at the signalized intersection with Highland Road (M-59); these movements are facilitated via the median crossovers (U-turns) intersections along Highland Road (M-59).

- **South of Highland Road (M-59):** The study section of Bogie Lake Road, south of M-59, has a posted speed limit of 45mph, is classified as a *Minor Arterial*, is under the jurisdiction of MDOT, and has an AADT volume of approximately 10,200 vehicles per day (SEMCOG 2021). Bogie Lake Road provides a two-lane cross-section, with one (1) lane in each direction. At the intersection with Highland Road (M-59), Bogie Lake Road widens to provide three (3) northbound lanes; one (1) exclusive through lane and dual (2) right-turn lanes.
- **North of Highland Road (M-59):** This study section of Bogie Lake Road has a posted speed limit of 25mph, is classified as a *Local Road*, and is under the jurisdiction of RCOC. Bogie Lake Road provides a four-lane, median divided cross-section, with two (2) lanes in each direction. At the intersection with Highland Road (M-59), Bogie Lake Road widens to provide three (3) southbound lanes; one (1) exclusive through lane and dual (2) right-turn lanes. Additionally, at the NB-to-SB crossover, north of Highland Road (M-59), northbound Bogie Lake Road widens to provide an exclusive left-turn lane.

Nordic Drive intersects WB Highland Road (M-59), serving as the 4th-leg of the EB-to-WB Crossover intersection. Southbound Nordic Drive provides right-turn egress-only onto WB Highland Road (M-59).

2.2 EXISTING TRAFFIC VOLUMES

F&V subconsultant QC collected existing Turning Movement Count (TMC) data at the following study intersections on Thursday, November 3, 2022, during the AM (7:00 AM-9:00 AM) and PM (4:00 PM-6:00 PM) peak periods:

- EB Highland Road (M-59) & WB-to-EB Crossover, West of Bogie Lake Road
- Highland Road (M-59) & Bogie Lake Road
- WB Highland Road (M-59) & Nordic Drive / EB-to-WB Crossover, East of Bogie Lake Road
- SB Bogie Lake Road & NB-to-SB X/O, North of Highland Road (M-59)

During collection of the turning movement counts, Peak Hour Factors (PHFs) and commercial truck percentages were recorded and used in the traffic analysis. The peak hours of the study intersections were utilized and the through volumes were carried through the roadway network and balanced upwards at the proposed site driveway. Therefore, the traffic volumes used in the analysis and shown on the attached traffic volume figures may not match the raw traffic volumes shown in the data collection. The weekday AM and PM peak hours for the adjacent roadway network were observed to generally occur between 7:15 AM to 8:15 AM and 4:30 PM to 5:30 PM, respectively. F&V collected an inventory of existing lane use and traffic controls, as shown on the attached **Figure 2**. Additionally, F&V obtained the current signal timing permits from RCOC for the signalized study intersection. The existing 2022 peak hour traffic volumes used in the analysis are shown on the attached **Figure 3**.

3 EXISTING CONDITIONS

Existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro/SimTraffic (Version 11) traffic analysis software. This analysis was based on the existing lane use and traffic control shown on the attached **Figure 2**, the existing peak hour traffic volumes shown on the attached **Figure 3**, and the methodologies presented in the *Highway Capacity Manual, 6th Edition* (HCM6). The signalized intersections within the study roadway network operate with non-NEMA phasing and clustered signals, which are not supported by HCM6; therefore, HCM2000 was determined to be more appropriate for use at these intersections. Descriptions of LOS "A" through "F" as defined in the HCM6, are attached. Typically, LOS D is considered acceptable, with LOS A representing minimal delay and LOS F indicating failing conditions. The existing conditions results are attached and summarized in **Table 1**.

The results of the existing conditions analysis indicates that all approaches and movements are currently operating acceptably, at LOS D or better during both peak periods, with the exception of the following:

Highland Road (M-59) & Bogie Lake Road

- **During the AM peak hour:** The southbound right-turn movement is currently operating at LOS E.

- During the PM peak hour: The northbound through movement, the southbound through movement, and the southbound right-turn movement are currently operating at LOS E.

Although the Synchro LOS analysis indicates poor operations, a review of SimTraffic network simulations indicates generally acceptable operations during both the AM and PM peak hours. SimTraffic microsimulations indicate that all vehicle queues along the northbound and southbound approaches were observed to be processed through the intersection within each cycle length.

WB Highland Road (M-59) & EB-to-WB Crossover / Nordic Drive

- During the PM peak hour: The northbound (crossover) approach is currently operating at LOS E.

Review of SimTraffic microsimulations indicates generally acceptable operations at this signalized study intersection. Occasional periods of vehicle queues were present during the PM peak hour; however, the majority of queues were observed to be serviced each cycle, leaving minimal residual vehicle queueing. Additionally, vehicle queues were observed to dissipate and were not present throughout the PM peak hour.

SimTraffic network simulations indicate acceptable operations throughout the remainder of the study roadway network during both the AM and PM peak hours. All vehicles at the remaining signalized study intersections were observed to be serviced within each cycle length.

Table 1: Existing Intersection Operations

	Intersection	Control	Approach	Existing Conditions			
				AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
10 & 11	EB Highland Road (M-59) & WB-to-EB X/O	Signalized	EBT	15.3	B	9.6	A
			SBL	0.4	A	0.3	A
			Overall	13.6	B	8.3	A
20 & 21	Highland Road (M-59) & Bogie Lake Road	Signalized	EBT	3.2	A	2.9	A
			EBR	3.0	A	2.0	A
			WBT	6.5	A	14.2	B
			WBR	3.7	A	2.1	A
			NBT	31.8	C	59.3	E
			NBR	33.7	C	51.8	D
			SBT	36.8	D	61.2	E
			SBR	59.6	E	66.4	E
Overall	9.6	A	17.3	B			
30 & 31	WB Highland Road (M-59) & EB-to-WB X/O / Nordic Drive	Signalized	WBT	9.5	A	11.2	B
			WBR	6.1	A	5.0	A
			NBTL	36.9	D	65.0	E
			SBR	26.4	C	42.2	D
Overall	13.3	B	19.7	B			
40 & 41	Bogie Lake Road & NB-to-SB X/O	Signalized	WBL	0.3	A	0.3	A
			SB	5.9	A	4.7	A
			Overall	1.5	A	1.0	A

4 BACKGROUND CONDITIONS (2024 NO BUILD)

Historical population and economic profile data was obtained for White Lake Township from SEMCOG in order to calculate a background growth rate to project the existing 2022 peak hour traffic volumes to the site buildout year of 2024. Population and employment projections from 2020 to 2045 were reviewed and show an average annual growth of 0.16% and 0.01%, respectively. Therefore, a conservative background growth rate of **0.5%** per year was applied to the existing peak hour traffic volumes to forecast the background 2024 traffic volume **without the proposed development**, as shown on the attached **Figure 4**.



In addition to the background traffic growth, it is 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, neither MDOT nor White Lake Township identified any planned background developments within the vicinity of the project site.

Background peak hour vehicles delays and LOS **without the proposed development** were calculated at the study intersections based on the existing lane use and traffic control shown on the attached **Figure 2**, the background peak hour traffic volumes shown on the attached **Figure 4**, and the methodologies presented in the HCM. The results of the background conditions analysis are attached and summarized in **Table 2**.

Table 2: Background Intersection Operations

Intersection	Control	Approach	Existing Conditions				Background Conditions				Difference			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		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
10 & 11	Signal	EBT	15.3	B	9.6	A	15.6	B	9.7	A	0.3	-	0.1	-
		SBL	0.4	A	0.3	A	0.4	A	0.3	A	0.0	-	0.0	-
		Overall	13.6	B	8.3	A	13.9	B	8.4	A	0.3	-	0.1	-
20 & 21	Signal	EBT	3.2	A	2.9	A	3.1	A	2.9	A	-0.1	-	0.0	-
		EBR	3.0	A	2.0	A	3.0	A	2.0	A	0.0	-	0.0	-
		WBT	6.5	A	14.2	B	6.6	A	14.4	B	0.1	-	0.2	-
		WBR	3.7	A	2.1	A	3.7	A	2.0	A	0.0	-	-0.1	-
		NBT	31.8	C	59.3	E	31.9	C	59.6	E	0.1	-	0.3	-
		NBR	33.7	C	51.8	D	33.8	C	52.2	D	0.1	-	0.4	-
		SBT	36.8	D	61.2	E	36.7	D	61.0	E	-0.1	-	-0.2	-
		SBR	59.6	E	66.4	E	60.4	E	66.1	E	0.8	-	-0.3	-
Overall	9.6	A	17.3	B	9.8	A	17.5	B	0.2	-	0.2	-		
30 & 31	Signal	WBT	9.5	A	11.2	B	9.6	A	11.4	B	0.1	-	0.2	-
		WBR	6.1	A	5.0	A	6.1	A	5.0	A	0.0	-	0.0	-
		NBTL	36.9	D	65.0	E	36.0	D	65.7	E	-0.9	-	0.7	-
		SBR	26.4	C	42.2	D	26.4	C	42.3	D	0.0	-	0.1	-
		Overall	13.3	B	19.7	B	13.2	B	19.9	B	-0.1	-	0.2	-
40 & 41	Signal	WBL	0.3	A	0.3	A	0.3	A	0.3	A	0.0	-	0.0	-
		SB	5.9	A	4.7	A	5.9	A	4.7	A	0.0	-	0.0	-
		Overall	1.5	A	1.0	A	1.5	A	0.9	A	0.0	-	-0.1	-

* Decreased delays are the result of improved progression and/or HCM weighting methodologies

The results of the background conditions analysis indicates that all approaches and movements at the study intersections are expected to continue operating acceptably, in a manner similar to the existing conditions analysis. Additionally, review of SimTraffic network simulations indicates acceptable operations throughout the study roadway network, similar to the observations made during existing conditions.

5 SITE TRIP GENERATION

The number of weekday peak hour (AM and PM) and daily vehicle trips generated by the proposed development were calculated using the rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation, 11th Edition*. The proposed development includes retail and restaurant land uses, including two (2) restaurants with drive-through service. Additionally, one (1) of the proposed drive-through restaurants is currently planned to be a Culver’s restaurant, which does not operate during the AM peak hours (7AM-9AM); therefore, the AM peak trip generation was excluded. Site access is proposed via one (1) right-in/right-out (RIRO) driveway on Highland Road (M-59) and one (1) full access driveway on Bogie Lake Road. The site trip generation forecast utilized for the proposed development is summarized in **Table 3**.



Table 3: Site Trip Generation Summary

Land Use	ITE Code	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour (vph)			PM Peak Hour (vph)		
					In	Out	Total	In	Out	Total
Strip Retail Plaza (<40k SF)	822	6,031	SF	484	8	6	14	27	27	54
Internal Capture					1	1	2	14	8	22
Pass-By		0% AM, 40% PM		97	0	0	0	6	6	12
New Trips				387	7	5	12	7	13	20
Fast Food with Drive-Through	934	4,060	SF	1,898	0	0	0	70	64	134
Internal Capture					0	0	0	5	8	13
Pass-By		0% AM, 55% PM		408	0	0	0	33	33	66
New Trips				1,490	0	0	0	32	23	55
Coffee Shop with Drive-Through	937	2,289	SF	1,221	100	97	197	45	44	89
Internal Capture					1	1	2	3	6	9
Pass-By		50% AM; 55% PM		263	49	49	98	22	22	44
New Trips				958	50	47	97	20	16	36
Total Trips				3,603	108	103	211	142	135	277
Total Internal Capture					2	2	4	22	22	44
Total Pass-By				768	49	49	98	61	61	122
Total New Trips				2,835	57	52	109	59	52	111

As is typical of commercial developments, a portion of the trips generated by the proposed development are from vehicles currently on the adjacent roadway that will pass the site on the way from an origin to their ultimate destination. Therefore, not all traffic at the site driveways is necessarily new traffic added to the street system. This percentage of the trips generated by the development are considered “pass-by” trips and do not add new traffic to the adjacent street system. The percentage of pass-by trips used in this analysis was determined based on the rates published by ITE in the *Trip Generation Manual, 11th Edition*. However, ITE does not provide pass-by data for either LUC 822: Strip Retail Plaza or LUC 937: Coffee Shop with Drive-Through; therefore, the pass-by data for LUC 821: Shopping Plaza and LUC 934: Fast Food with Drive-Through were utilized for this analysis, respectively.

Additionally, the table also presents internal trip capture estimates, which are the portion of trips generated by a mixed-used development that would begin and end within the development site, resulting in no additional trips added to the adjacent road network. The internal trip capture projections follow the Transportation Research Board’s (TRB) *Report 684: Enhancing Internal Trip Capture Estimation for Mixed-Use Development*. The internal trips estimation calculations spreadsheets are attached.

These pass-by trips and the internal trips were reduced from the total trips generated by the site, in order to calculate the total new trip generation that was distributed to the study roadway network.

6 SITE TRIP DISTRIBUTION

The vehicular trips that would be generated by the proposed development were assigned to the study roads based on the proposed site access plan and driveway configurations, the existing peak hour traffic patterns in the adjacent roadway network, and the methodologies published by ITE. The ITE trip distribution methodology assumes that new trips will enter the network and access the development, then leave the development and return to their direction of origin, whereas pass-by trips will enter and exit the development in their original direction of travel. The site trip distributions utilized in the analysis are summarized in **Table 6**.

The vehicular traffic volumes shown in **Table 3** were distributed to the study roadway network according to the distribution shown in **Table 4**. The site-generated trips shown on the attached **Figure 5** were added to the background peak hour traffic volumes shown on the attached **Figure 4**, in order to calculate the future peak hour traffic volumes, with the addition of the proposed development. Future peak hour traffic volumes are shown on the attached **Figure 6**.



Table 4: Site Trip Distribution

To/From	Via	New Trips		Pass-By	
		AM	PM	AM	PM
East	Highland Road (M-59)	34%	46%	47% (EB)	38% (EB)
West	Highland Road (M-59)	53%	39%	27% (WB)	41% (WB)
South	Bogie Lake Road	13%	15%	15% (SB)	9% (SB)
North	Bogie Lake Road	N/A	N/A	11% (NB)	12% (NB)
Total		100%	100%	100%	100%
Trip Volumes					
East	Highland Road (M-59)	36	51	46	46
West	Highland Road (M-59)	58	43	23	50
South	Bogie Lake Road	15	17	10	14
North	Bogie Lake Road	0	0	16	12
Total		109	111	98	122

7 FUTURE CONDITIONS (2024 BUILDOUT)

Future peak hour vehicle delays and LOS *with the proposed development* were calculated based on the proposed lane use and traffic controls shown on the attached **Figure 2**, future peak hour traffic volumes shown on the attached **Figure 6**, and the methodologies presented in the HCM. The results of the future conditions analysis are attached and summarized in **Table 5**.

Table 5: Future Intersection Operations

Intersection	Control	Approach	Background Conditions				Future Conditions				Difference			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		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
10 & 11	Signal	EBT	15.6	B	9.7	A	16.1	B	9.9	A	0.5	-	0.2	-
		SBL	0.4	A	0.3	A	0.5	A	0.3	A	0.1	-	0.0	-
		Overall	13.9	B	8.4	A	14.1	A	8.3	A	0.2	B→A	-0.1	-
20 & 21	Signal	EBT	3.1	A	2.9	A	4.1	A	3.8	A	1.0	-	0.9	-
		EBR	3.0	A	2.0	A	2.5	A	1.7	A	-0.5	-	-0.3	-
		WBT	6.6	A	14.4	B	8.3	A	16.6	B	1.7	-	2.2	-
		WBR	3.7	A	2.0	A	3.3	A	3.0	A	-0.4	-	1.0	-
		NBT	31.9	C	59.6	E	31.9	C	59.6	E	0.0	-	0.0	-
		NBR	33.8	C	52.2	D	34.1	C	53.3	D	0.3	-	1.1	-
		SBT	36.7	D	61.0	E	36.4	D	61.2	E	-0.3	-	0.2	-
		SBR	60.4	E	66.1	E	60.7	E	66.0	E	0.3	-	-0.1	-
Overall	9.8	A	17.5	B	11.0	B	19.2	B	1.2	A→B	1.7	-		
30 & 31	Signal	WBT	9.6	A	11.4	B	9.7	A	11.6	B	0.1	-	0.2	-
		WBR	6.1	A	5.0	A	6.1	A	5.0	A	0.0	-	0.0	-
		NBTL	36.0	D	65.7	E	32.6	C	91.2	F	-3.4	D→C	25.5	E→F
		SBR	26.4	C	42.3	D	26.4	C	42.4	D	0.0	-	0.1	-
		Overall	13.2	B	19.9	B	13.6	B	25.2	C	0.4	-	5.3	B→C
40 & 41	Signal	WBL	0.3	A	0.3	A	0.3	A	0.3	A	0.0	-	0.0	-
		SB	5.9	A	4.7	A	5.9	A	4.7	A	0.0	-	0.0	-
		Overall	1.5	A	0.9	A	1.5	A	0.9	A	0.0	-	0.0	-



Intersection	Control	Approach	Background Conditions				Future Conditions				Difference				
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		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	
50	EB M-59 & W. Site Drive	Stop (Minor)	EB	N/A				Free				N/A			
			NBR	15.2	C	15.0	C								
60	Bogie Lake Rd. & E. Site Drive	Stop (Minor)	EB	N/A				14.0	B	13.8	B	N/A			
			NBL	8.9	A	8.2	A								
			SB	Free											

* Decreased delays are the result of improved progression and/or HCM weighting methodologies

The results of the future conditions analysis indicates that all the study intersection approaches and movements will continue to operate acceptably, in a manner similar to the background conditions analysis, with the exception of the following:

WB Highland Road (M-59) & EB-to-WB Crossover / Nordic Drive

- During the PM peak hour: The northbound (crossover) approach is expected to operate at LOS F.

Although the Synchro LOS analysis indicates failing operations, a review of SimTraffic network simulations indicates generally acceptable operations. Occasional periods of long vehicle queues were present during the PM peak hour; however, the majority of queues were observed to be serviced each cycle, leaving minimal residual vehicle queueing. Additionally, any vehicle queues present were contained within the available left-turn storage area and were observed to dissipate within the PM peak hour.

SimTraffic network simulations indicate acceptable operations throughout the remainder of the study roadway network during both the AM and PM peak hours. All vehicles at the remaining signalized study intersections were observed to be serviced within each cycle length. Additionally, all approaches and movements at the proposed site driveways are expected to operate acceptably at LOS D or better during both peak periods; the stop-controlled egress traffic was observed to find adequate gaps within the through traffic.

7.1 FUTURE CONDITIONS WITH IMPROVEMENTS

Mitigation measures were investigated in order to improve the projected future traffic operations to LOS D or better for all approaches and movements during both peak periods. Signal timing adjustments, geometric improvements, and traffic control modifications were investigated at the study intersections. The results of the evaluation indicates that signal timing optimizations alone will adequately mitigate increases in delay due to the additional traffic generated by the proposed development.

Table 6: Future Intersection Operations with Improvements

Intersection	Control	Approach	Future Conditions				Future w/ IMPs				Difference				
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		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	
20 & 21	Highland Road (M-59) & Bogie Lake Rd.	Signal	EBT	4.1	A	3.8	A	11.5	B	9.5	A	7.4	A→B	5.7	-
			EBR	2.5	A	1.7	A	3.8	A	2.2	A	1.3	-	0.5	-
			WBT	8.3	A	16.6	B	14.7	B	23.5	C	6.4	A→B	6.9	B→C
			WBR	3.3	A	3.0	A	3.1	A	10.1	B	-0.2	-	7.1	A→B
			NBT	31.9	C	59.6	E	24.4	C	41.8	D	-7.5	-	-17.8	E→D
			NBR	34.1	C	53.3	D	26.1	C	41.1	D	-8.0	-	-12.2	-
			SBT	36.4	D	61.2	E	31.8	D	53.3	D	-4.6	-	-7.9	E→D
			SBR	60.7	E	66.0	E	52.9	D	58.2	E	-7.8	E→D	-7.8	-
Overall	11.0	B	19.2	B	15.6	B	24.1	C	4.6	-	4.9	B→C			



Intersection	Control	Approach	Future Conditions				Future w/ IMPs				Difference							
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		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				
30 & 31 WB Highland Rd. (M-59) & EB-to-WB X/O / Nordic Drive	Signal	WBT	9.7	A	11.6	B	No Change				28.5	C	No Change				16.9	B→C
		WBR	6.1	A	5.0	A					11.2	B					6.2	A→B
		NBTL	32.6	C	91.2	F					53.0	D					-38.2	F→D
		SBR	26.4	C	42.4	D					28.8	C					-13.6	D→C
		Overall	13.6	B	25.2	C					32.1	C					6.9	-

With the implementation of the recommended signal timing optimizations, all study intersection approaches and movements are expected to operate acceptably, at LOS D or better during both peak periods, with the exception of the following:

Highland Road (M-59) & Bogie Lake Road

- During the PM peak hour: The southbound right-turn movement is expected to continue operating at LOS E.

Although the Synchro LOS analysis still indicates poor operations, a review of SimTraffic network simulations indicates acceptable operations during the PM peak hour. SimTraffic microsimulations indicate that all southbound vehicle queues were observed to be processed through the intersection within each cycle length, leaving no residual vehicle queues.

With the implementation of the recommended mitigation measures, SimTraffic network simulations indicate acceptable operations throughout the remainder of the study roadway network and proposed site driveways during both peak periods.

8 ACCESS MANAGEMENT

8.1 AUXILIARY TURN LANE EVALUATION

Highland Road (M-59) and Bogie Lake Road are under the jurisdiction of MDOT and RCOC, respectively; therefore, the MDOT and RCOC warranting criteria were utilized in order to determine the need for auxiliary turn lanes at the proposed site driveways. Highland Road (M-59) is a four-lane, median-divided roadway; therefore, the left-turn warrants were not evaluated at the proposed W. Site Drive. The result of the analyses shown on the attached MDOT/RCOC warrant charts and are summarized in **Table 7**.

Table 7: Turn Lane Warrant Analysis Summary

Site Driveway Intersection	Right-Turn Treatment	Left-Turn Treatment
EB Highland Road (M-59) & W. Site Drive	Right-Turn Lane	N/A
Bogie Lake Road & E. Site Drive	No Treatment	No Treatment

The results of the auxiliary turn lane evaluation indicates that a full-width right-turn deceleration lane is recommended along eastbound Highland Road (M-59) at the proposed W. Site Drive.

8.2 DRIVEWAY SPACING EVALUATION

The MDOT Geometric Design Guidance (Section 1.2.2) was utilized to evaluate the location of the proposed site driveways in relation to nearby intersections, crossovers, and driveways within close proximity to the project site. The AASHTO intersection corner clearance criteria were evaluated for the 55-mph section of Highland Road (M-59) and the 45-mph section of Bogie Lake Road. The proposed development plans include two (2) proposed access points: one (1) right-in/right-out (RIRO) site driveway along EB Highland Road (M-59) and one (1) full access driveway along Bogie Lake Road. The distance of the proposed site driveways from nearby access points and the warranting criteria are summarized in **Table 8** and displayed in **Exhibit 1**.

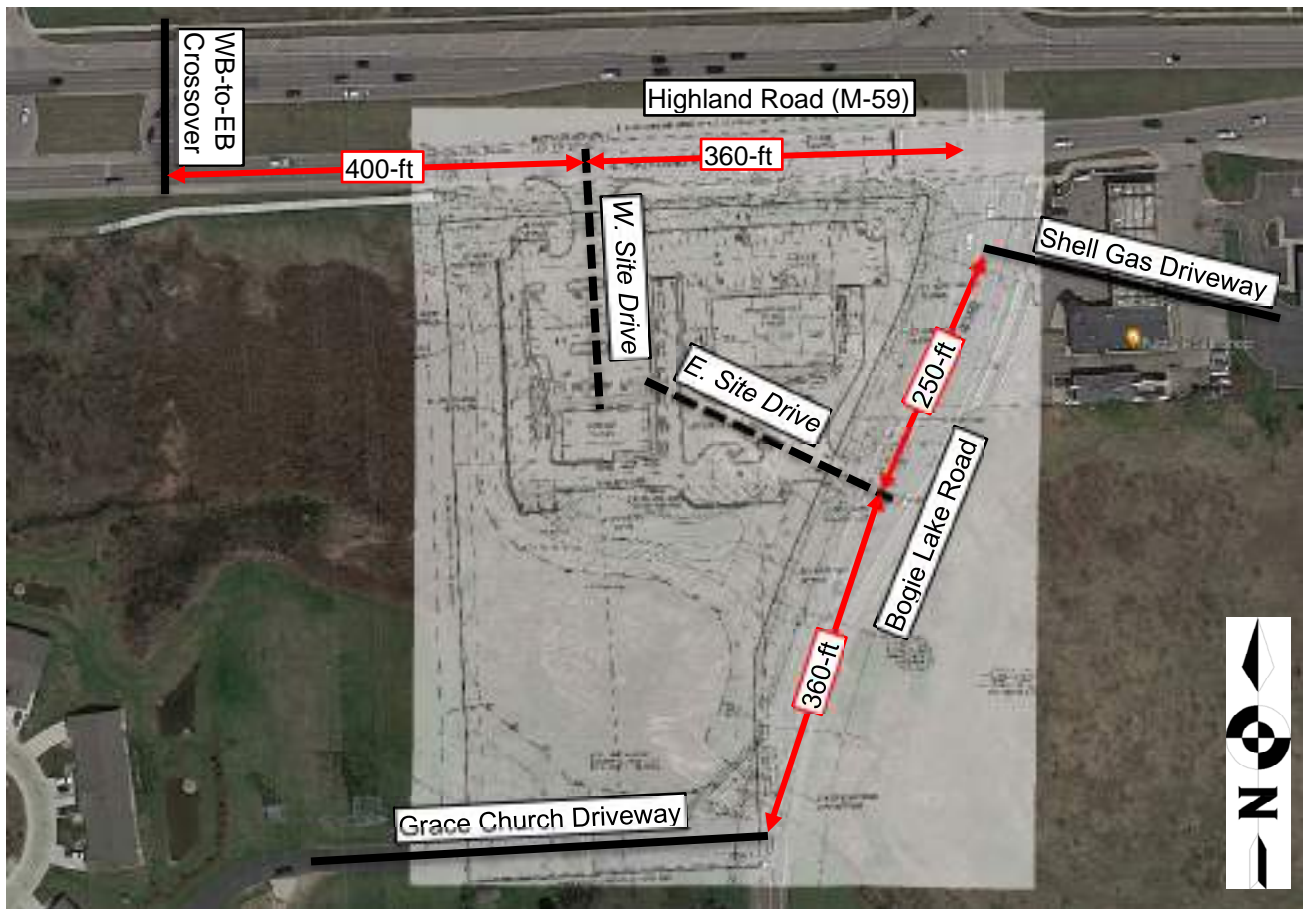


Table 8: Desirable Corner Clearance Summary

Adjacent Driveways & Intersections			Distance	Criteria	Meets
W. Site Drive	to	WB-to-EB Crossover	400 feet	150 feet	YES
W. Site Drive	to	Bogie Lake Road	360 feet	230 feet	YES
E. Site Drive	to	Shell Gas Station	250 feet	630 feet	NO
E. Site Drive	to	Grace Church	360 feet	350 feet	YES

The results of the analysis indicates that the proposed E. Site Drive is not expected to meet the desirable MDOT spacing criteria in relation to the nearby Shell Gas Station driveway on the opposite side of Bogie Lake Road. However, the proposed location of the E. Site Drive location currently meets the driveway spacing requirements from the Grace Church driveway; therefore, shifting the driveway location further south to increase the spacing from the Shell Drive would result in the driveway no longer meeting spacing requirements to the south.

Exhibit 1: Proposed Driveway Spacing



9 SITE CIRCULATION AND QUEUEING

9.1 COFFEE SHOP DRIVE-THROUGH

The projected drive-through vehicle queuing was reviewed to determine if the proposed on-site drive-through storage is adequate to accommodate the projected operations. Typical restaurants with drive-through have an average service rate of approximately 60 vehicles/hour; additionally, approximately 70% of customers will utilize a drive-through. Therefore, of the total of 100 vehicles generated by the coffee shop during the AM peak hour, it is estimated that approximately 70 vehicles per hour will use the drive-through facility, with the remaining 30 vehicles using walk-in service. The evaluation of the queue length included two criteria:

- 1) A queuing analysis was performed to determine if the projected demand of the proposed development exceeds the service rate and calculate the projected queuing. The projected demand (70 veh/hr) is greater than the service rate (60 veh/hr) of the site; therefore, a surplus of 10 vehicles is expected.
- 2) In addition, a Poisson Distribution was performed to determine the probability of random arrivals; the results indicate a maximum potential of five (5) vehicles arriving at any given time.

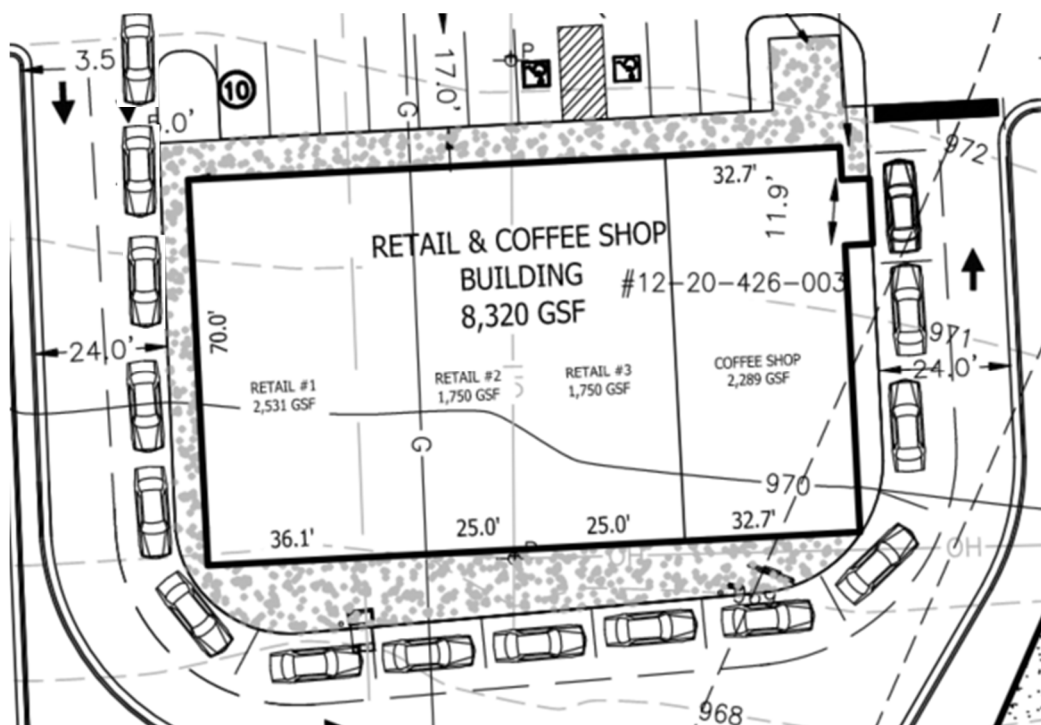
Therefore, providing queuing for a total drive-through queue of 15 vehicles is recommended. The proposed drive-through provides vehicle queuing storage, at 25-ft each vehicle, for four (4) vehicles from the order board to the pick-up window and 11 vehicles past the order boards, for a total drive-through queue of 15 vehicles (375 feet) within the allotted drive-through area without impacting the parking spaces or internal site circulation.

The proposed vehicle queuing storage for this project site can adequately accommodate the projected vehicle queue lengths for the proposed development. In the event that the vehicle demands exceed the drive-through capacity, the internal site circulation has adequate space to accommodate the additional vehicle storage lengths on-site without impacting the adjacent street operations on Highland Road (M-59). The projected vehicle queuing is summarized in **Table 9** and the expected queuing is shown in the attached site plan.

Table 9: Coffee Shop Vehicle Queuing Analysis

COFFEE SHOP DRIVE-THROUGH STACKING SPACE CALCULATOR	
Number of Arrivals	70
Time per Vehicle (s)	60
Service Rate (veh/hr)	60
Drive-Through Queue (veh)	10
Peak Arrival (veh)	5
Vehicle Length	25
TOTAL QUEUE (ft)	375

Exhibit 2: Coffee Shop Vehicle Queuing



9.2 CULVERS DRIVE-THROUGH

The peak trip generation for the proposed Culver’s restaurant is expected during the PM peak period; therefore, the projected drive-through vehicle queuing for the PM was reviewed to determine if the proposed on-site queue length for the drive-through is adequate to accommodate the projected operations.

Fast-food restaurants with drive-through windows typically service approximately 70% of customers via a drive-through, with the remaining patrons choosing to dine-in. Therefore, of the total of 70 vehicles generated by the fast-food restaurant during the PM peak hour, it is estimated that approximately 49 vehicles per hour will use the drive-through facility, with the remaining 21 vehicles using walk-in service.

Culver’s operates similar to a typical fast-food restaurant, wherein food is ordered at menu board and drivers pay for their orders at the window. Upon receipt of payment, drivers that order food (not drinks or frozen custard) are issued an order number and must pull ahead to wait for their food to be delivered to their vehicle in the queue past the pickup window. Therefore, the vehicle queue for Culver’s is calculated two ways: Before the Payment Window and After the Payment Window

Before the Payment Window

The estimated service rate for a typical fast-food restaurant (90 veh/hr) is greater than the projected arrival rate at the drive-through (49 veh/hr); therefore, the required queueing for the drive-through is based on the maximum potential for random arrivals.

A Poisson Distribution was performed to determine the probability of random arrivals; the results are attached and indicate a maximum potential of four (4) vehicles arriving simultaneously at any given time. The proposed site utilizes two (2) menu order boards and one (1) pick up window. The proposed drive-through provides vehicle queueing storage, at 25-ft each vehicle, for eight (8) vehicles from the order boards to the pick-up window and seven (7) vehicles past the order boards, for a total drive-through queue of 15 vehicles (375 feet) within the allotted drive-through area without impacting the parking spaces or internal site circulation.

After the Payment Window

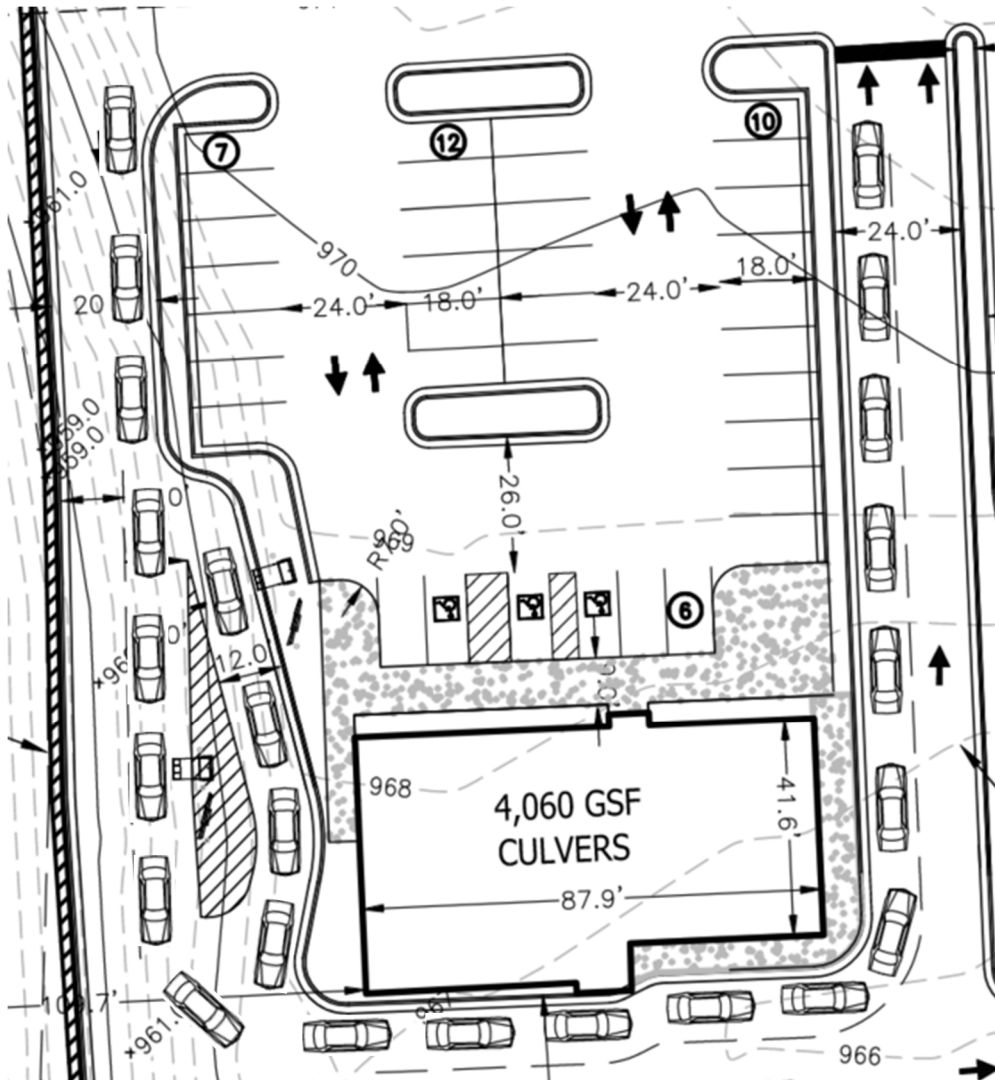
The estimated service rate is one (1) vehicle served food every 120 seconds (2 min) past the payment window. It was assumed that 80% of the vehicles in the drive-through will order food, then will enter the food queue lane past the payment window. The results of the analysis are summarized below and show a projected peak queue of nine (9) vehicles past the payment window.

Table 10: Culver’s Vehicle Queuing Analysis

CULVER'S DRIVE-THROUGH STACKING SPACE CALCULATOR	
Before Payment Window	
Number of Arrivals	49
Time per Vehicle (s)	40
Service Rate (veh/hr)	90
Order Board to Pick-up Window (veh)	8
Peak Arrival (veh)	4
Vehicle Length	25
TOTAL QUEUE (ft)	300
After Payment Window	
Number of Arrivals	39
Time per Vehicle (s)	120
Vehicle Queue Past Window (veh)	9
Vehicle Length	25
TOTAL QUEUE (ft)	225



Exhibit 3: Fast-Food Restaurant Vehicle Queuing



10 CONCLUSIONS

The conclusions of this TIS are as follows:

10.1 EXISTING CONDITIONS (2022)

The result of the existing conditions analysis indicates that all of the study intersections, approaches, and movements, are currently operating acceptably at LOS D or better during both peak periods, with the exception of the following:

Highland Road (M-59) & Bogie Lake Road

- During AM peak hour: The SB right-turn movement is currently operating at LOS E.
- During PM peak hour: The NB through, SB through, and SB right-turn movements are currently operating at LOS E.

Review of SimTraffic network simulations indicates generally acceptable operations throughout the study roadway network. All vehicle queues along the northbound/southbound approaches were observed to be serviced within each cycle length, leaving no residual queueing.

WB Highland Road (M-59) & EB-to-WB Crossover / Nordic Drive

- During PM peak hour: The NB (crossover) approach is currently operating at LOS E.

Although the Synchro LOS analysis indicates poor operations, a review of SimTraffic network simulations indicates generally acceptable operations. SimTraffic microsimulations indicate that occasional periods of vehicle queues were present during the PM peak hour; however, the majority observed to be serviced each cycle, leaving minimal residual vehicle queueing. Additionally, vehicle queues were observed to dissipate and were not present throughout the peak hour.

10.2 BACKGROUND CONDITIONS (2024 No BUILD):

- A conservative 0.5% annual background growth rate was utilized in order to project the existing 2022 peak hour traffic volumes to the buildout year of 2024. Additionally, no planned developments were identified within the vicinity of the project site.
- The results of the background conditions analysis indicates that all approaches and movements at the study intersections will continue to operate in a manner similar to existing conditions. Additionally, review of SimTraffic microsimulations indicates acceptable operations, with minimal vehicle queueing.

10.3 FUTURE CONDITIONS (2024 BUILDOUT)

The results of the future conditions analysis indicates that all of the study intersection approaches and movements will continue to operate in a manner similar to background conditions with the following additional delays:

Highland Road (M-59) & EB-to-WB Crossover / Nordic Drive

- During PM peak hour: The NB approach is expected to operate at LOS F.

Review of SimTraffic network simulations indicates generally acceptable operations, similar to those observations made during the background conditions analysis. Occasional periods of long vehicle queues were present; however, the majority of queues were observed to be serviced each cycle, leaving minimal residual vehicle queueing. Additionally, any vehicle queues present were contained within the available left-turn storage area and were observed to dissipate within the PM peak hour.

The proposed site driveways are expected to operate acceptably, at LOS D or better during both peak periods.

10.4 FUTURE CONDITIONS WITH IMPROVEMENTS

- Mitigation measures were reviewed at the study intersections in order to mitigate the impact that the site-generated traffic from the proposed development.
- Signal timing optimizations were reviewed during both peak periods and were determined to adequately mitigate increases in delay due to the additional traffic generated by the proposed development.

10.5 ACCESS MANAGEMENT

- The MDOT and RCOC auxiliary turn lane warranting criteria were reviewed at the proposed site driveways on Highland Road (M-59) and Bogie Lake Road, respectively. The results of the evaluation indicates the following:
 - A full-width right-turn deceleration lane is recommended at the proposed W. Site Drive on eastbound Highland Road (M-59).
 - No treatments are recommended at the proposed E. Site Drive on Bogie Lake Road.
- Review of the proposed driveway location and adjacent crossover intersections indicates that the proposed E. Site Drive does not meet the MDOT minimum desirable spacing criteria, in relation to the existing Shell Gas Station driveway. However, shifting the driveway further south to increase the spacing would result in insufficient spacing to the south (from existing Grace Church driveway).

10.6 SITE CIRCULATION

- The results of the drive-through queueing evaluation indicates that the proposed site plan can adequately accommodate the projected vehicle queueing generated by the fast-food restaurant and the coffee shop drive-through operations, without impacting the internal site circulation or the adjacent roadway network.

11 RECOMMENDATIONS

The recommendation of this TIS are as follows:

Recommended Improvements
Highland Road (M-59) & Bogie Lake Road
<ul style="list-style-type: none"> • Optimize the traffic signal timing during both peak periods
WB Highland Road (M-59) & EB-to-WB Crossover / Nordic Drive
<ul style="list-style-type: none"> • Optimize the traffic signal timing during the PM peak hour
EB Highland Road (M-59) & W. Site Drive
<ul style="list-style-type: none"> • Provide a full-width right-turn deceleration lane at the proposed E. Site Drive

Any questions related to this memorandum, study, analysis, and results should be addressed to Fleis & VandenBrink.



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Michigan.

- Attached:**
- Figures 1 – 6
 - Proposed Site Plan
 - Traffic Volume Data
 - Signal Timing Permits
 - Internal Capture Spreadsheet
 - Synchro / SimTraffic Results
 - Auxiliary Lane Warrant
 - Poisson Distribution

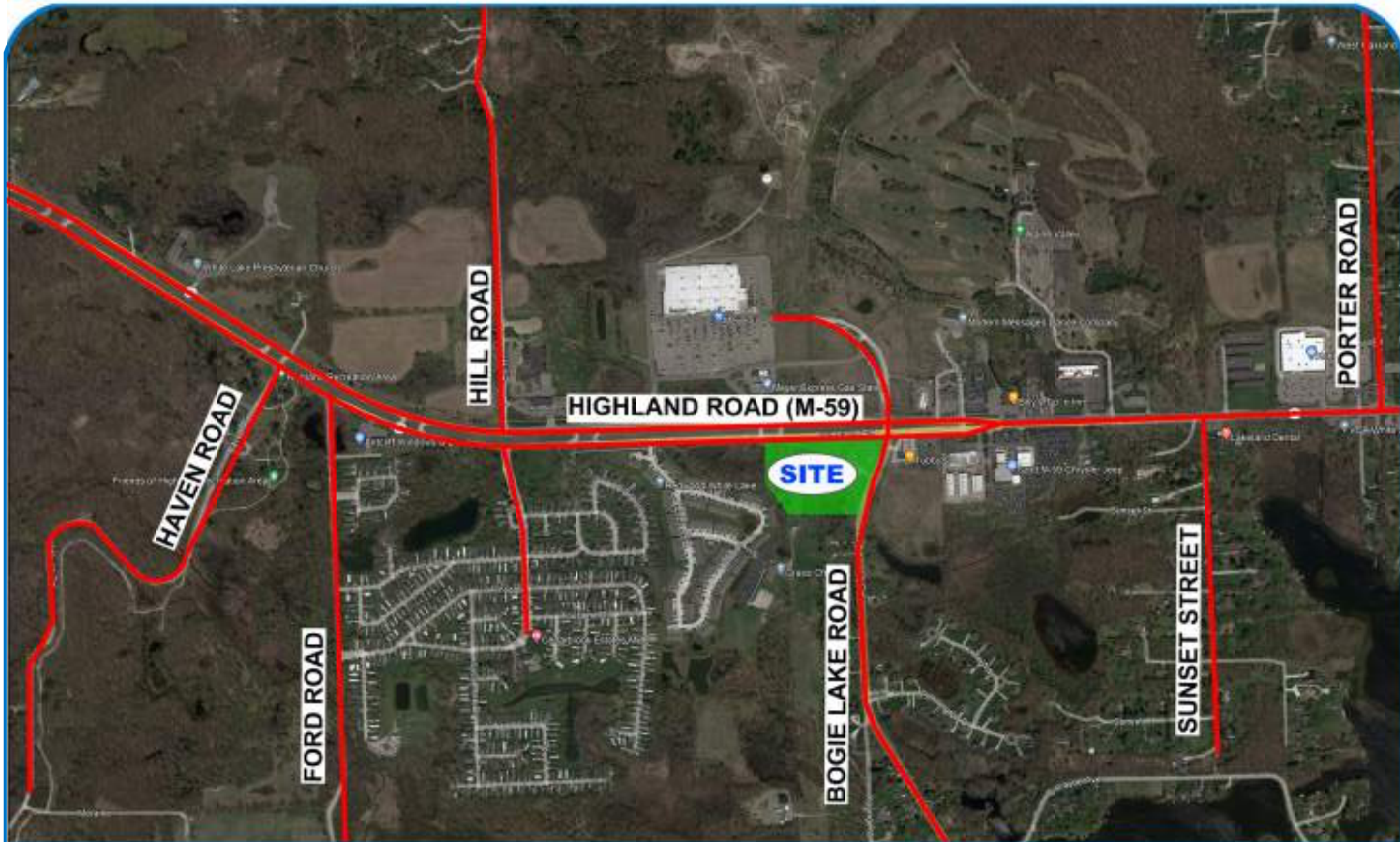


FIGURE 1
SITE LOCATION

GATEWAY CROSSINGS TIS - WHITE LAKE CHARTER TOWNSHIP, MI

LEGEND

 SITE LOCATION



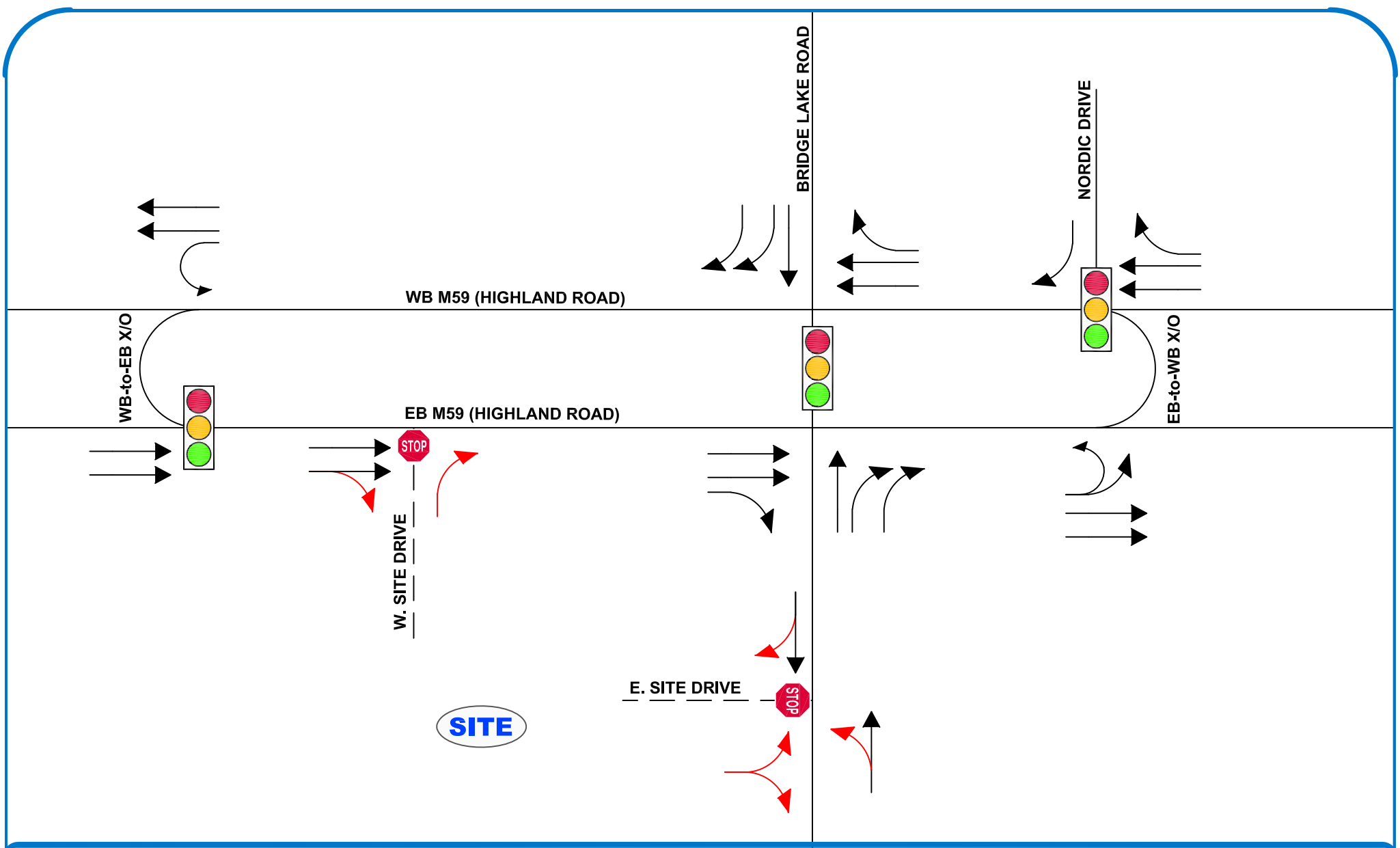










FIGURE 2
LANE USE AND TRAFFIC CONTROL

GATEWAY CROSSINGS TIS - WHITE LAKE CHARTER TOWNSHIP, MI

LEGEND

-  ROADS
-  PROPOSED ROADS
-  LANE USE
-  PROPOSED LANE USE
-  SIGNALIZED INTERSECTION
-  UNSIGNALIZED INTERSECTION
-  ROUNDABOUT INTERSECTION
-  NORTH
- SCALE: NOT TO SCALE

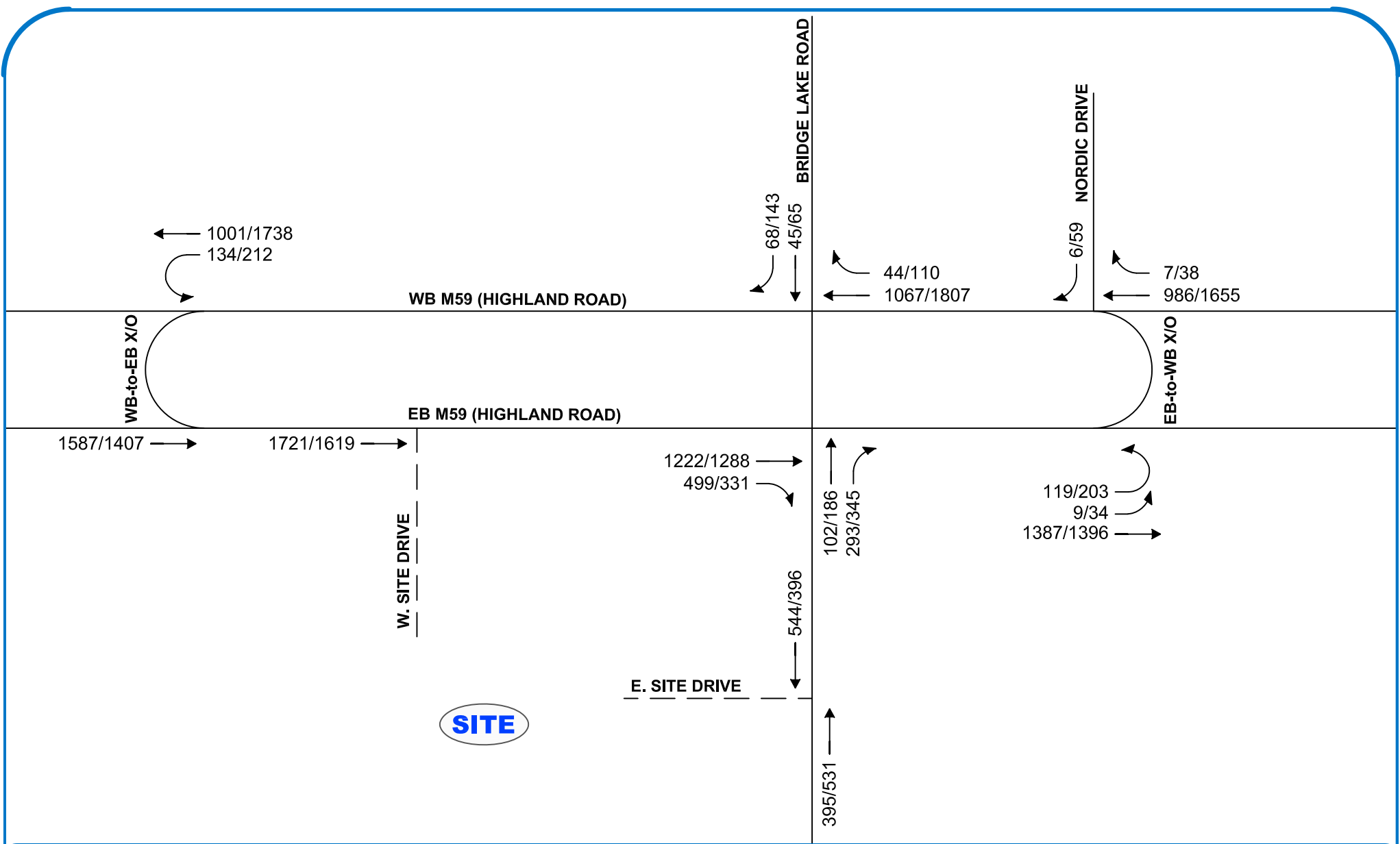


FIGURE 3

EXISTING TRAFFIC VOLUMES

GATEWAY CROSSINGS TIS - WHITE LAKE CHARTER TOWNSHIP, MI

LEGEND

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



NORTH
SCALE: NOT TO SCALE

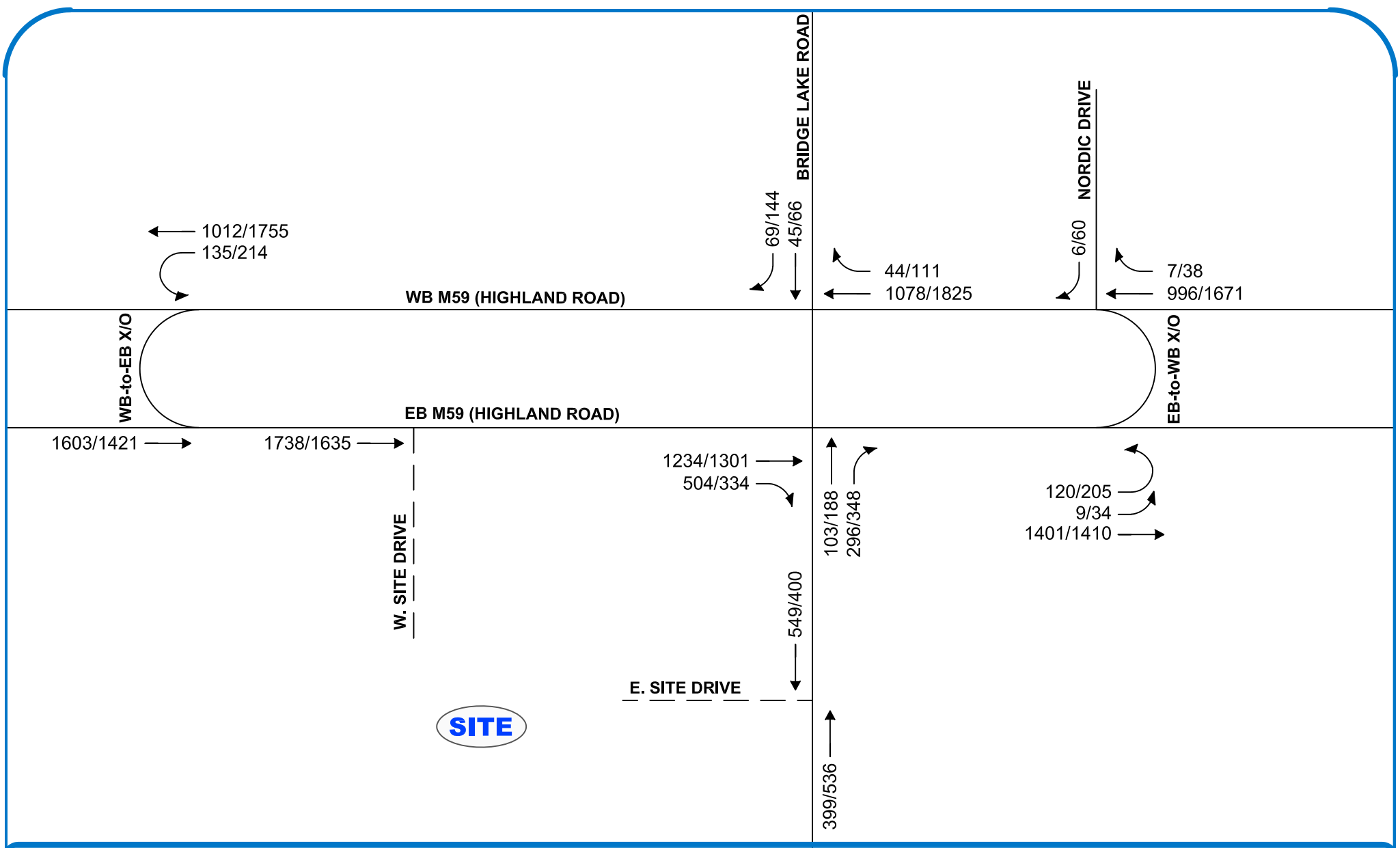


FIGURE 4

BACKGROUND TRAFFIC VOLUMES

GATEWAY CROSSINGS TIS - WHITE LAKE CHARTER TOWNSHIP, MI



LEGEND

- ROADS
- - - PROPOSED ROADS
- ↑↓ TRAFFIC VOLUMES (AM/PM)



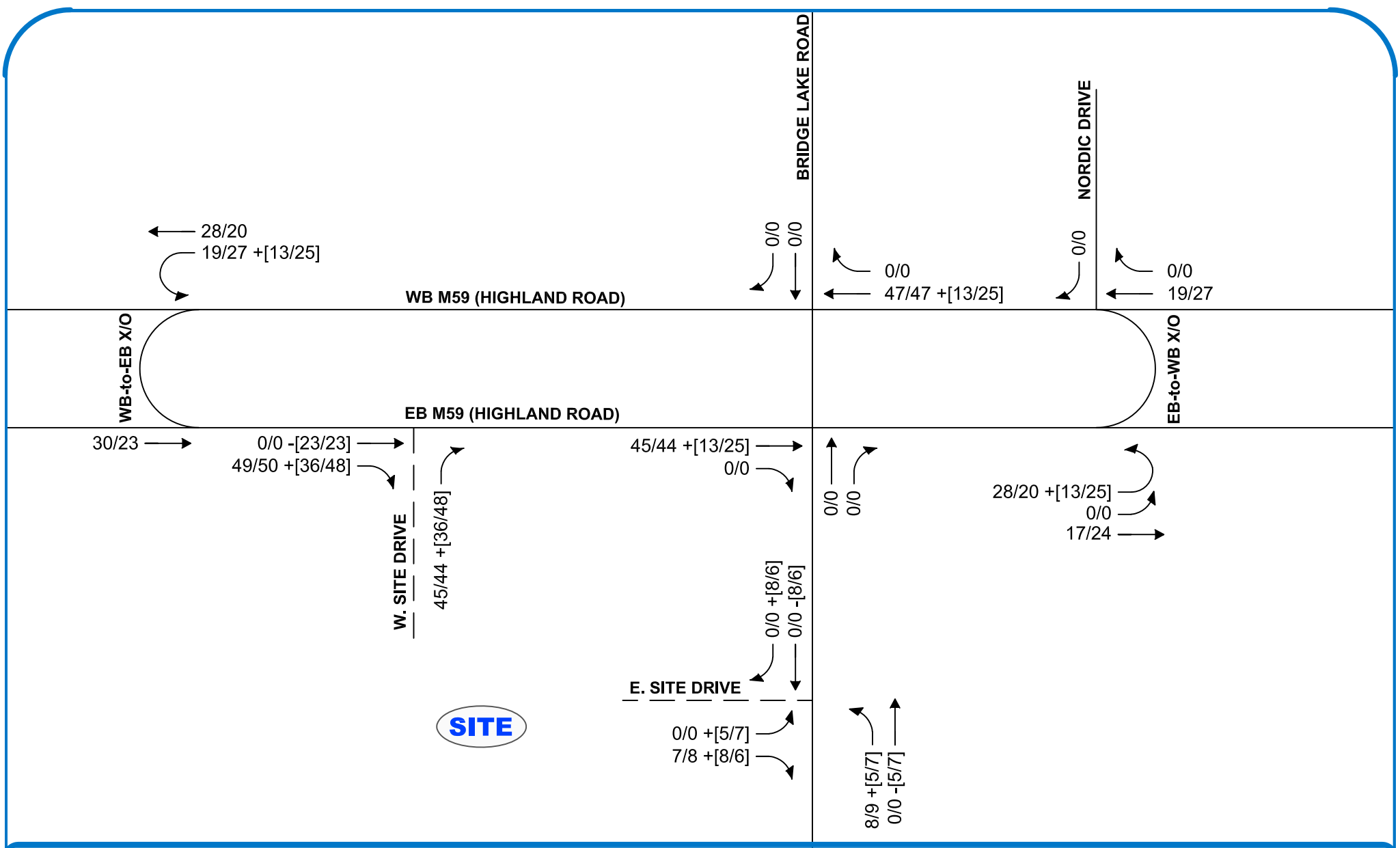


FIGURE 5
SITE-GENERATED TRAFFIC VOLUMES

GATEWAY CROSSINGS TIS - WHITE LAKE CHARTER TOWNSHIP, MI

LEGEND

- ROADS
- - - PROPOSED ROADS
- ↑↓ TRAFFIC VOLUMES (AM/PM)



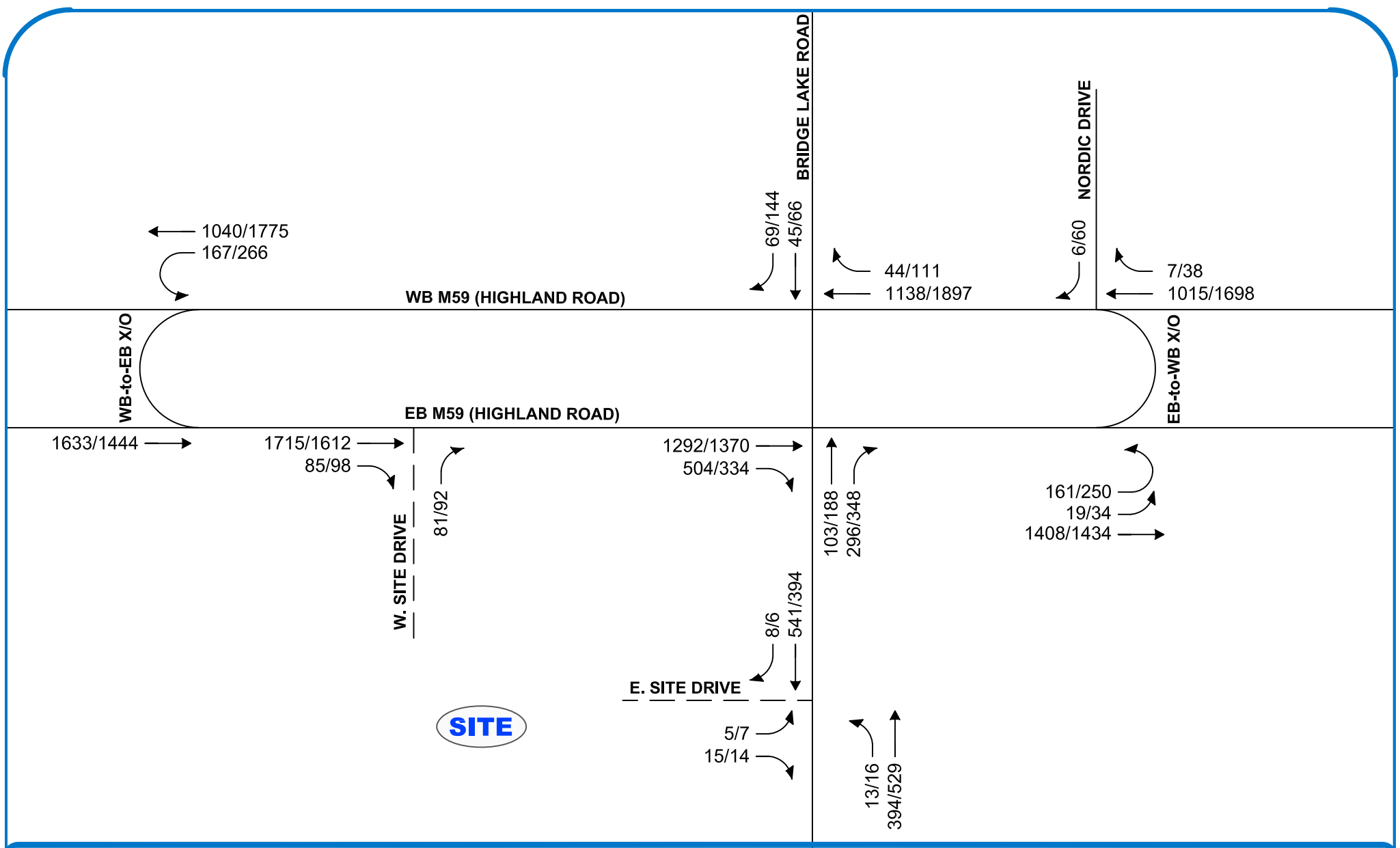


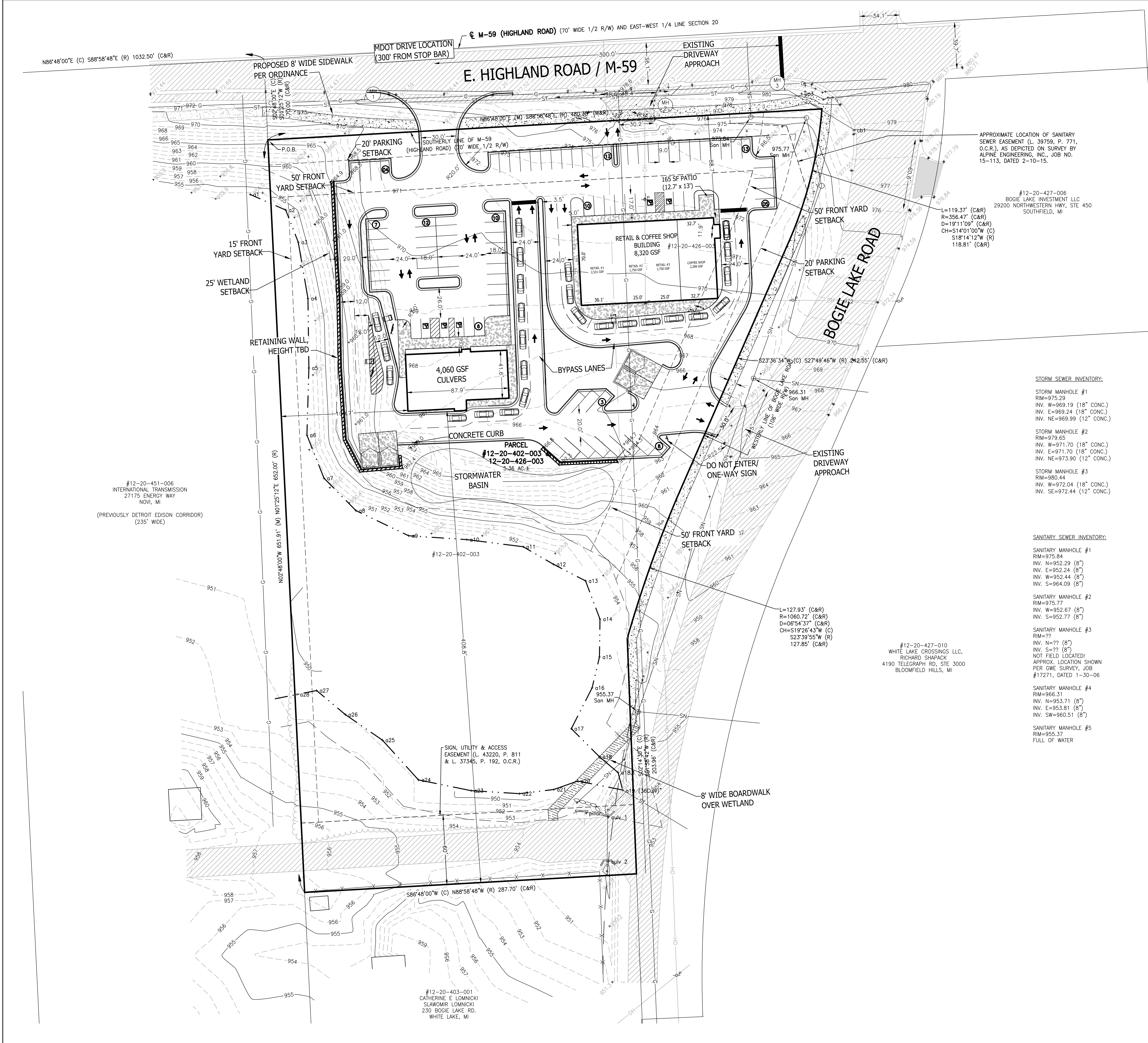
FIGURE 6
FUTURE TRAFFIC VOLUMES

GATEWAY CROSSINGS TIS - WHITE LAKE CHARTER TOWNSHIP, MI

LEGEND

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





LEGEND

PROPOSED (PR)	EXISTING (EX)	DESCRIPTION
FF	FF	CONTOUR
FG	FG	SPOT ELEVATION
T/A	T/A	FINISHED FLOOR ELEVATION
T/W	T/W	FINISHED GRADE ELEVATION
F/L	F/L	TOP OF ASPHALT
T/P	T/P	TOP OF CURB / CONCRETE
B/P	B/P	TOP OF WALK
RM	RM	FLOW LINE
INV	INV	TOP OF PIPE
MH	MH	BOTTOM OF PIPE
CB	CB	RIM ELEVATION
RY	RY	INVERT ELEVATION
ES	ES	MANHOLE STRUCTURE
OV	OV	INLET STRUCTURE
HY	HY	CATCHBASIN STRUCTURE
UP	UP	REAR YARD STRUCTURE
SL	SL	END-SECTION
FM	FM	GATEVALVE STRUCTURE
PS	PS	HYDRANT
ST	ST	UTILITY POLE
WM	WM	SANITARY SEWER
WL	WL	SANITARY LEAD
CO	CO	FORCE MAIN
CH	CH	PRESSURE SEWER
C	C	STORM SEWER
G	G	WATER MAIN
T	T	WATER LEAD
X	X	FIBER OPTIC
+	+	OVERHEAD WIRE
□	□	CABLE
○	○	ELECTRIC
○	○	GAS
○	○	TELEPHONE
○	○	FENCE
○	○	SILT FENCE
○	○	WETLAND BOUNDARY
○	○	LIMITS OF GRADING/CLEARING
○	○	MANHOLE
○	○	INLET / CATCHBASIN
○	○	FLARED END-SECTION
○	○	GATE VALVE
○	○	HYDRANT
○	○	UTILITY POLE
○	○	SIGN
○	○	NOT FIELD VERIFIED
○	○	TO BE REMOVED
○	○	SANITARY SEWER LABEL
○	○	STORM SEWER LABEL
○	○	WATER MAIN LABEL
○	○	SOIL EROSION CONTROL MEASURE
○	○	(P=PERMANENT, T=TEMPORARY)
○	○	CONCRETE
○	○	ASPHALT
○	○	MODIFIED CURB

SITE DATA:

WHITE LAKE TOWNSHIP
 PARCEL # 4712-20-402-003
 6350 HIGHLAND ROAD
 WHITE LAKE, MI 48383
 4.79 AC +/-

AND

PARCEL # 4712-20-426-003
 6340 HIGHLAND ROAD
 WHITE LAKE, MI 48383
 1.07 AC +/-

ZONING: GENERAL BUSINESS

USE: DRIVE-THROUGH RESTAURANT (SPECIAL USE) AND RETAIL
 BUILDING SQUARE FOOTAGE (FOOTPRINT): CULVERS 4,060 GSF AND RETAIL WITH DRIVE-THROUGH 8,322 GSF

MIN. LOT AREA REQUIRED FOR ZONING: 1 ACRE
 MIN. LOT WIDTH: 200 FT
 TOTAL EX. LOT WIDTH: 485.39
 MAX. LOT COVERAGE: 40% BLDG, 85% IMPERVIOUS
 PROPOSED LOT COVERAGE: 4.5% BLDG, APPROX 23% IMPERVIOUS (W/O BLDGS)

MIN. SETBACKS REQUIRED:
 FRONT: 50'-FT
 REAR: 20'-FT
 SIDE: 15'-FT

PROPOSED SETBACKS:
 FRONT (NORTH): 88.7'-FT
 FRONT (EAST): 35.4'-FT
 SIDE (WEST): 103.2'-FT
 REAR (SOUTH): 408.7'-FT

PARKING CALCULATION (GENERAL COMMERCIAL):
 CULVERS RESTAURANT (FAST FOOD WITH DRIVE-THROUGH)
 = 1.0 SPACE PER 75 GROSS FLOOR AREA
 4,060 GSF * 85% = 3,451 UFA / 75 SF = 46 SPACES
 PLUS 8 STACKING SPACES

COFFEE SHOP W/ DRIVE-THROUGH
 (ESTABLISHMENT FOR SALE AND CONSUMPTION ON THE PREMISES OF BEVERAGES, FOOD OR REFRESHMENTS)
 = 1.0 SPACE PER 100 GROSS FLOOR AREA
 2,531 GFA * 85% = 1,945.65 / 100 = 19.46 SPACES ~ 19
 PLUS 8 STACKING SPACES

RETAIL #1 = 1.0 SPACE PER 200 GFA
 2,531 GFA * 85% = 2,151 UFA / 200 = 10.75 SPACES ~ 11

RETAIL #2 = 1.0 SPACE PER 200 GFA
 1,750 GFA * 85% = 1,487.50 UFA / 200 = 7.44 SPACES ~ 7

RETAIL #3 = 1.0 SPACE PER 200 GFA
 1,750 GFA * 85% = 1,487.50 UFA / 200 = 7.44 SPACES ~ 7

SPACES REQUIRED: 90 SPACES
PROVIDED: 90 SPACES INCLUDING 4 ADA SPACES, PLUS 16 STACKING SPACES

PROPOSED LINEAR FEET OF CONCRETE SIDEWALK: 1,025 LF
 PROPOSED LINEAR FEET OF BOARDWALK: 111 LF

BEBOSS Engineering
 Engineers Surveyors Planners Landscape Architects
 3121 E. GRAND RIVER AVE.
 HOWELL, MI. 48843
 517.546.4836 FAX 517.548.1670

GATEWAY CROSSING
 GATEWAY CROSSING, LLC
 600 NORTH OLD WOODWARD, SUITE 101
 BIRMINGHAM, MI 48009
 248-433-7000

DRAFT SITE PLAN

PROJECT	PREPARED FOR	TITLE
GATEWAY CROSSING	GATEWAY CROSSING, LLC	DRAFT SITE PLAN

NO.	DATE	REVISION PER	BY
1	11/04/22		JA

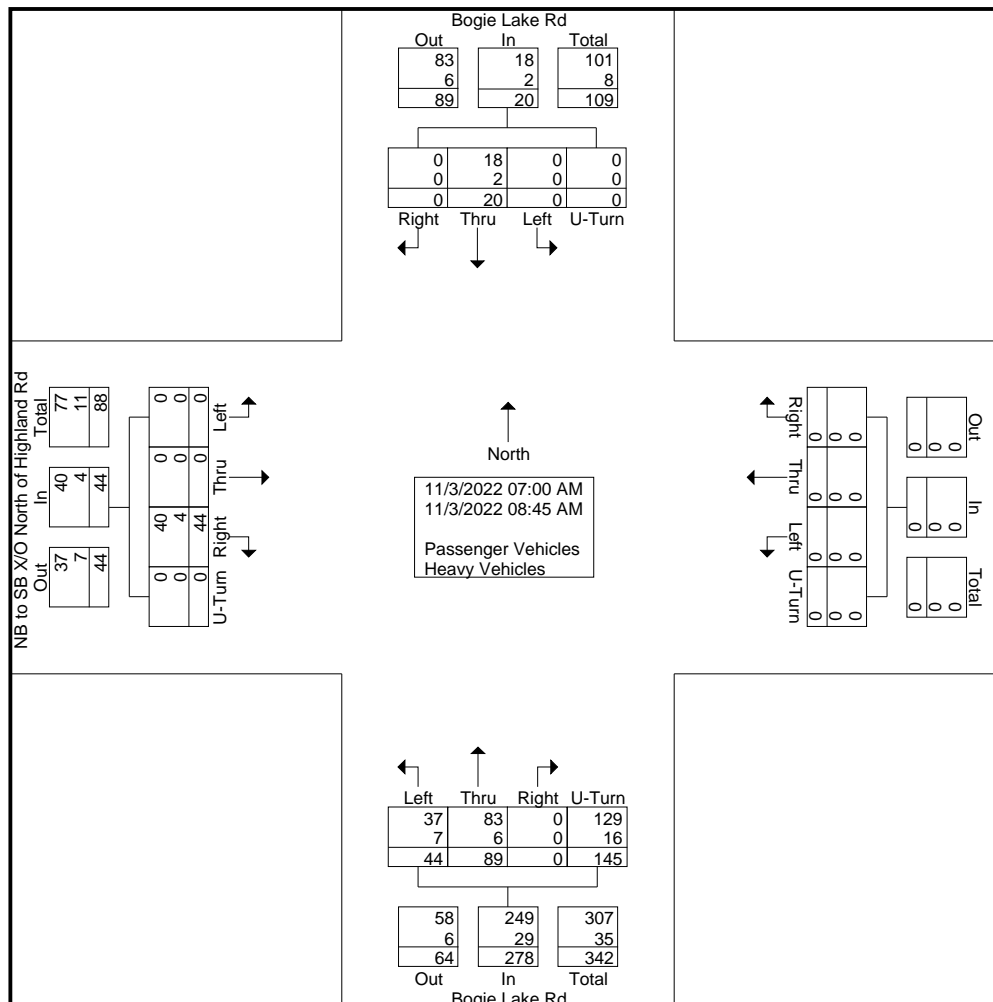
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 DATE: 11/04/22
 SHEET NO. **2**



File Name : 15997001 - Bogie Lake Rd -- NB to SB X_O North of Highland Rd
 Site Code : 15997001
 Start Date : 11/3/2022
 Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

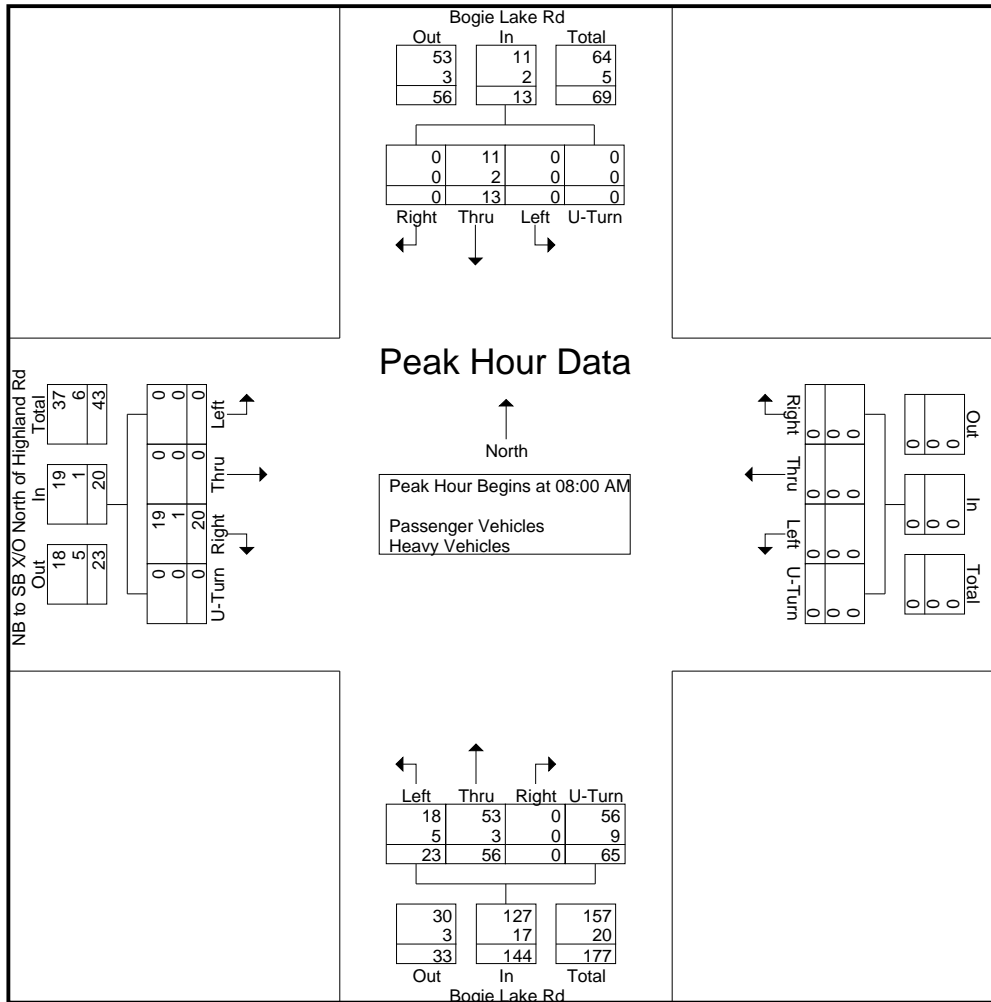
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	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
07:00 AM	0	0	7	0	7	0	0	0	0	0	8	10	0	29	47	0	2	0	0	2	56
07:15 AM	0	0	3	0	3	0	0	0	0	0	6	7	0	23	36	0	2	0	0	2	41
07:30 AM	0	0	7	0	7	0	0	0	0	0	4	4	0	13	21	0	1	0	0	1	29
07:45 AM	0	0	7	0	7	0	0	0	0	0	3	12	0	15	30	0	2	0	0	2	39
Total	0	0	24	0	24	0	0	0	0	0	21	33	0	80	134	0	7	0	0	7	165
08:00 AM	0	0	7	0	7	0	0	0	0	0	5	9	0	13	27	0	3	0	0	3	37
08:15 AM	0	0	2	0	2	0	0	0	0	0	6	14	0	24	44	0	3	0	0	3	49
08:30 AM	0	0	7	0	7	0	0	0	0	0	7	16	0	12	35	0	3	0	0	3	45
08:45 AM	0	0	4	0	4	0	0	0	0	0	5	17	0	16	38	0	4	0	0	4	46
Total	0	0	20	0	20	0	0	0	0	0	23	56	0	65	144	0	13	0	0	13	177
Grand Total	0	0	44	0	44	0	0	0	0	0	44	89	0	145	278	0	20	0	0	20	342
Apprch %	0	0	100	0		0	0	0	0		15.8	32	0	52.2		0	100	0	0		
Total %	0	0	12.9	0	12.9	0	0	0	0	0	12.9	26	0	42.4	81.3	0	5.8	0	0	5.8	
Passenger Vehicles	0	0	40	0	40	0	0	0	0	0	37	83	0	129	249	0	18	0	0	18	307
% Passenger Vehicles	0	0	90.9	0	90.9	0	0	0	0	0	84.1	93.3	0	89	89.6	0	90	0	0	90	89.8
Heavy Vehicles	0	0	4	0	4	0	0	0	0	0	7	6	0	16	29	0	2	0	0	2	35
% Heavy Vehicles	0	0	9.1	0	9.1	0	0	0	0	0	15.9	6.7	0	11	10.4	0	10	0	0	10	10.2





File Name : 15997001 - Bogie Lake Rd -- NB to SB X_O North of Highland Rd
 Site Code : 15997001
 Start Date : 11/3/2022
 Page No : 2

Start Time	NB to SB X/O North of Highland Rd Eastbound					Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	7	0	7	0	0	0	0	0	5	9	0	13	27	0	3	0	0	3	37
08:15 AM	0	0	2	0	2	0	0	0	0	0	6	14	0	24	44	0	3	0	0	3	49
08:30 AM	0	0	7	0	7	0	0	0	0	0	7	16	0	12	35	0	3	0	0	3	45
08:45 AM	0	0	4	0	4	0	0	0	0	0	5	17	0	16	38	0	4	0	0	4	46
Total Volume	0	0	20	0	20	0	0	0	0	0	23	56	0	65	144	0	13	0	0	13	177
% App. Total	0	0	100	0		0	0	0	0		16	38.9	0	45.1		0	100	0	0		
PHF	.000	.000	.714	.000	.714	.000	.000	.000	.000	.000	.821	.824	.000	.677	.818	.000	.813	.000	.000	.813	.903
Passenger Vehicles	0	0	19	0	19	0	0	0	0	0	18	53	0	56	127	0	11	0	0	11	157
% Passenger Vehicles	0	0	95.0	0	95.0	0	0	0	0	0	78.3	94.6	0	86.2	88.2	0	84.6	0	0	84.6	88.7
Heavy Vehicles	0	0	1	0	1	0	0	0	0	0	5	3	0	9	17	0	2	0	0	2	20
% Heavy Vehicles	0	0	5.0	0	5.0	0	0	0	0	0	21.7	5.4	0	13.8	11.8	0	15.4	0	0	15.4	11.3

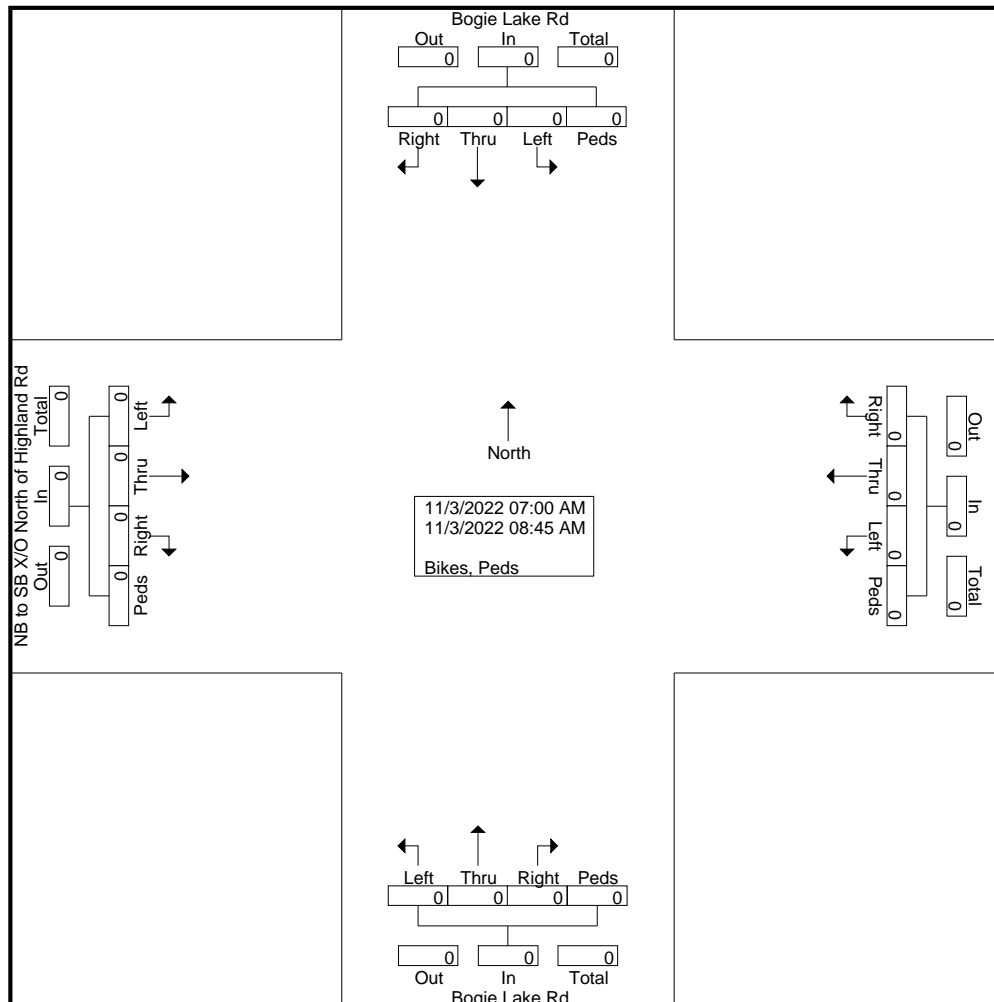




File Name : 15997001 - Bogie Lake Rd -- NB to SB X_O North of Highland Rd
 Site Code : 15997001
 Start Date : 11/3/2022
 Page No : 1

Groups Printed- Bikes, Peds

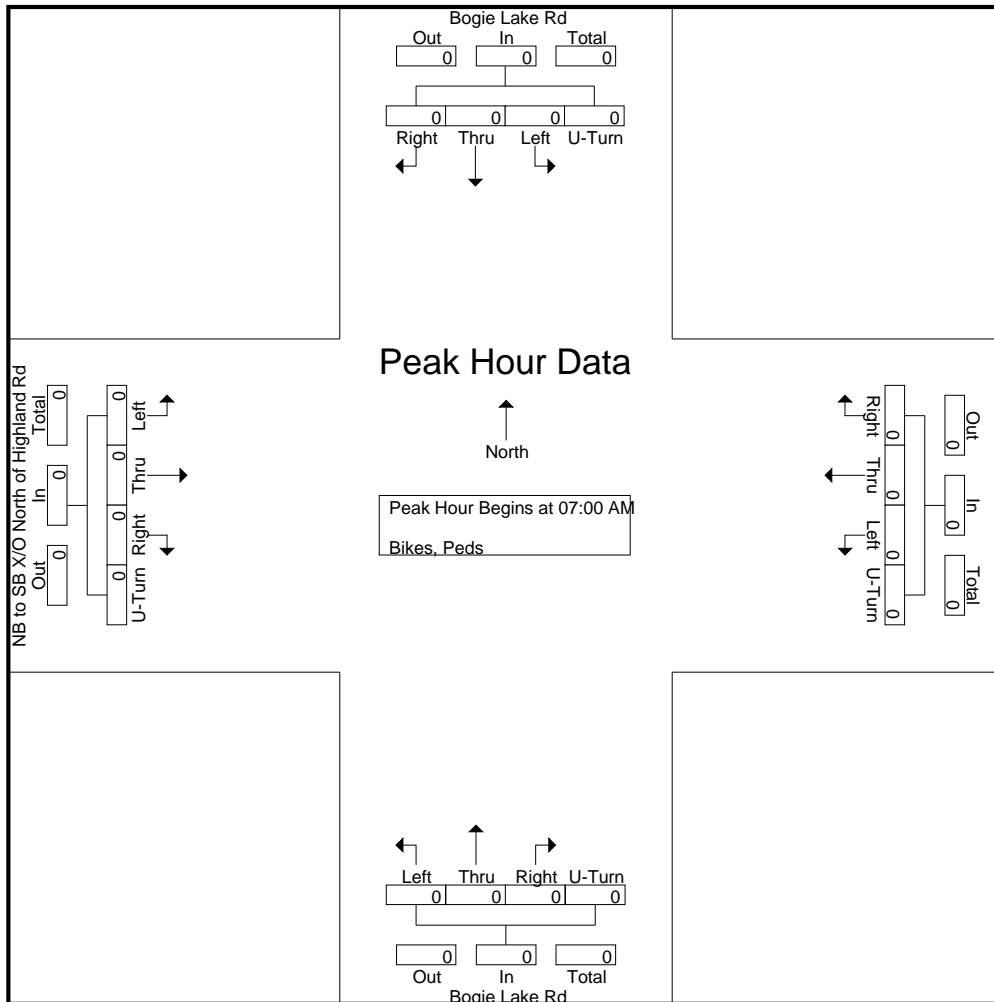
Start Time	NB to SB X/O North of Highland Rd Eastbound					Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					





File Name : 15997001 - Bogie Lake Rd -- NB to SB X_O North of Highland Rd
 Site Code : 15997001
 Start Date : 11/3/2022
 Page No : 2

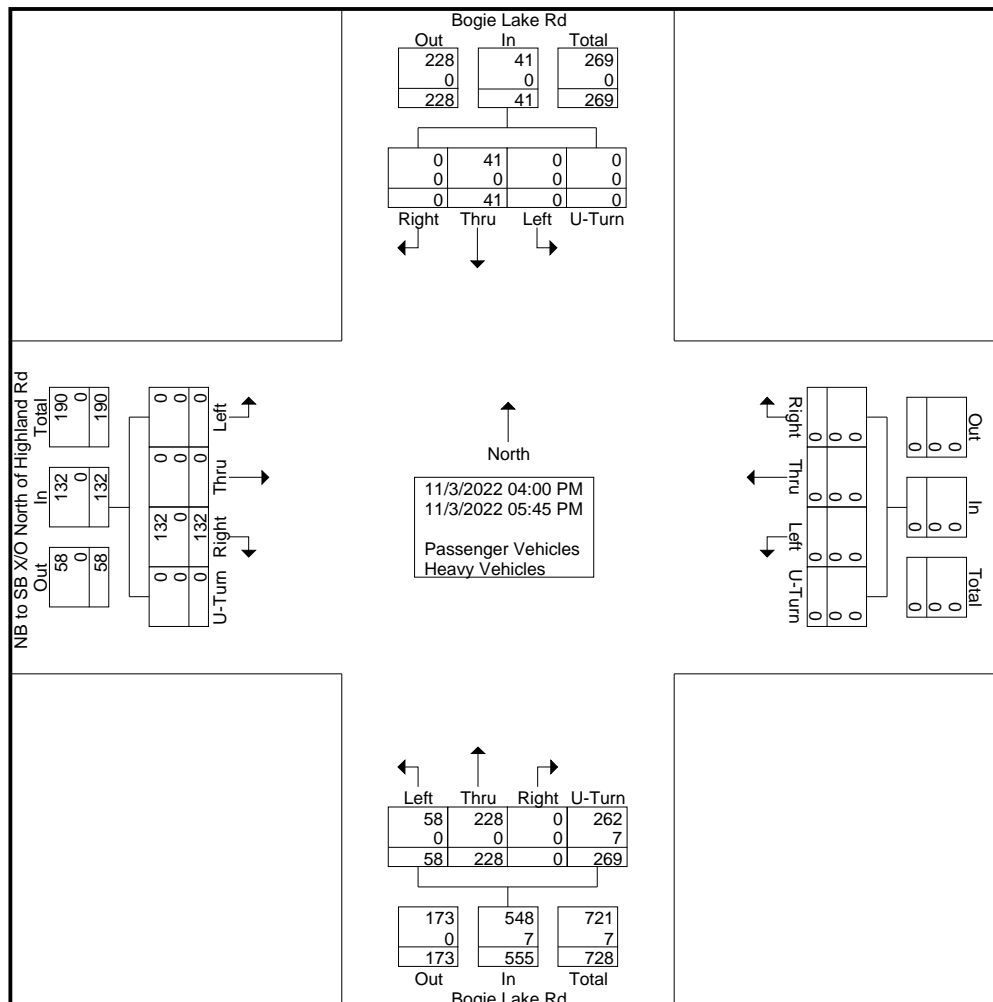
Start Time	NB to SB X/O North of Highland Rd Eastbound					Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:00 AM																						
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000





Groups Printed- Passenger Vehicles - Heavy Vehicles

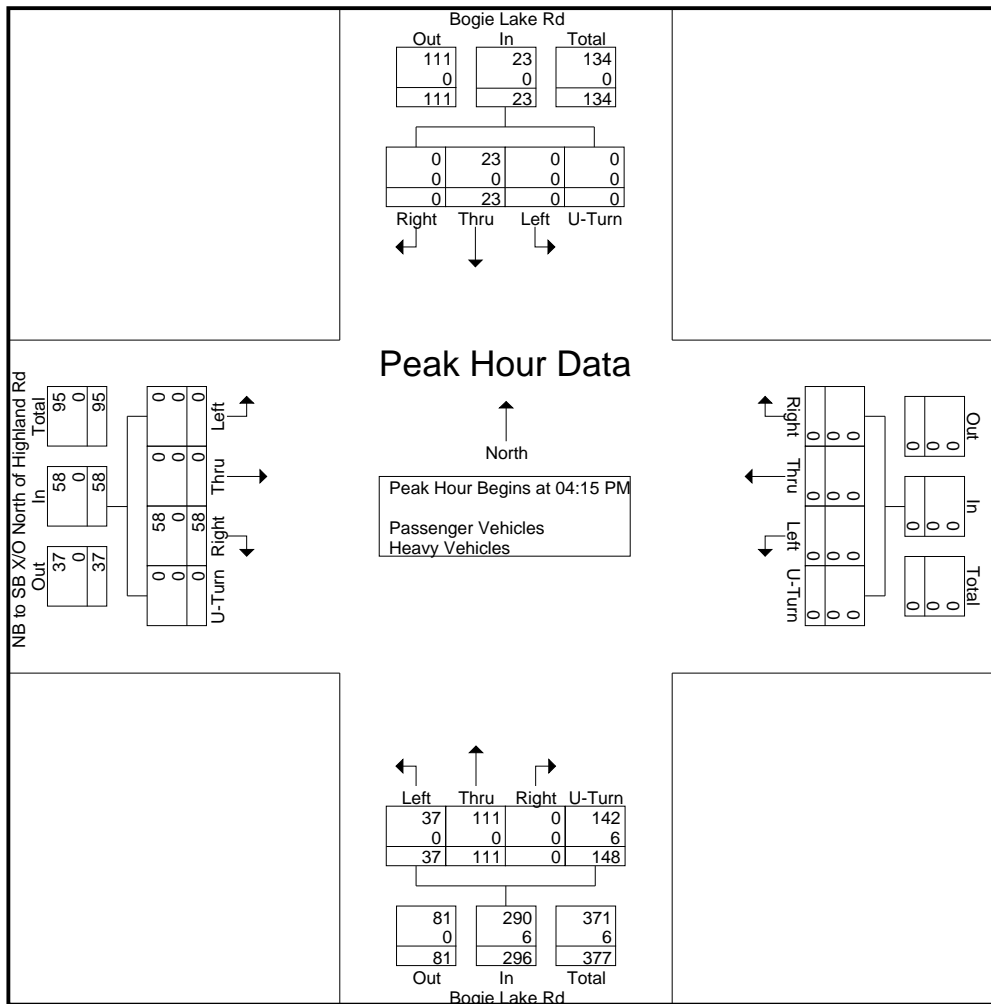
Start Time	NB to SB X/O North of Highland Rd Eastbound					Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
04:00 PM	0	0	18	0	18	0	0	0	0	0	4	28	0	30	62	0	2	0	0	2	82
04:15 PM	0	0	12	0	12	0	0	0	0	0	7	34	0	43	84	0	11	0	0	11	107
04:30 PM	0	0	13	0	13	0	0	0	0	0	8	16	0	36	60	0	3	0	0	3	76
04:45 PM	0	0	18	0	18	0	0	0	0	0	12	34	0	40	86	0	4	0	0	4	108
Total	0	0	61	0	61	0	0	0	0	0	31	112	0	149	292	0	20	0	0	20	373
05:00 PM	0	0	15	0	15	0	0	0	0	0	10	27	0	29	66	0	5	0	0	5	86
05:15 PM	0	0	18	0	18	0	0	0	0	0	5	26	0	38	69	0	9	0	0	9	96
05:30 PM	0	0	15	0	15	0	0	0	0	0	6	30	0	26	62	0	4	0	0	4	81
05:45 PM	0	0	23	0	23	0	0	0	0	0	6	33	0	27	66	0	3	0	0	3	92
Total	0	0	71	0	71	0	0	0	0	0	27	116	0	120	263	0	21	0	0	21	355
Grand Total	0	0	132	0	132	0	0	0	0	0	58	228	0	269	555	0	41	0	0	41	728
Apprch %	0	0	100	0	100	0	0	0	0	0	10.5	41.1	0	48.5	100	0	100	0	0	100	
Total %	0	0	18.1	0	18.1	0	0	0	0	0	8	31.3	0	37	76.2	0	5.6	0	0	5.6	
Passenger Vehicles	0	0	132	0	132	0	0	0	0	0	58	228	0	262	548	0	41	0	0	41	721
% Passenger Vehicles	0	0	100	0	100	0	0	0	0	0	100	100	0	97.4	98.7	0	100	0	0	100	99
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	0	0	0	0	0	7
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0	2.6	1.3	0	0	0	0	0	1





File Name : 15997002 - Bogie Lake Rd -- NB to SB X_O North of Highland Rd
 Site Code : 15997002
 Start Date : 11/3/2022
 Page No : 2

Start Time	NB to SB X/O North of Highland Rd Eastbound					Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	12	0	12	0	0	0	0	0	7	34	0	43	84	0	11	0	0	11	107
04:30 PM	0	0	13	0	13	0	0	0	0	0	8	16	0	36	60	0	3	0	0	3	76
04:45 PM	0	0	18	0	18	0	0	0	0	0	12	34	0	40	86	0	4	0	0	4	108
05:00 PM	0	0	15	0	15	0	0	0	0	0	10	27	0	29	66	0	5	0	0	5	86
Total Volume	0	0	58	0	58	0	0	0	0	0	37	111	0	148	296	0	23	0	0	23	377
% App. Total	0	0	100	0		0	0	0	0		12.5	37.5	0	50		0	100	0	0		
PHF	.000	.000	.806	.000	.806	.000	.000	.000	.000	.000	.771	.816	.000	.860	.860	.000	.523	.000	.000	.523	.873
Passenger Vehicles	0	0	58	0	58	0	0	0	0	0	37	111	0	142	290	0	23	0	0	23	371
% Passenger Vehicles	0	0	100	0	100	0	0	0	0	0	100	100	0	95.9	98.0	0	100	0	0	100	98.4
Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	0	0	0	0	0	6
% Heavy Vehicles	0	0	0	0	0	0	0	0	0	0	0	0	0	4.1	2.0	0	0	0	0	0	1.6

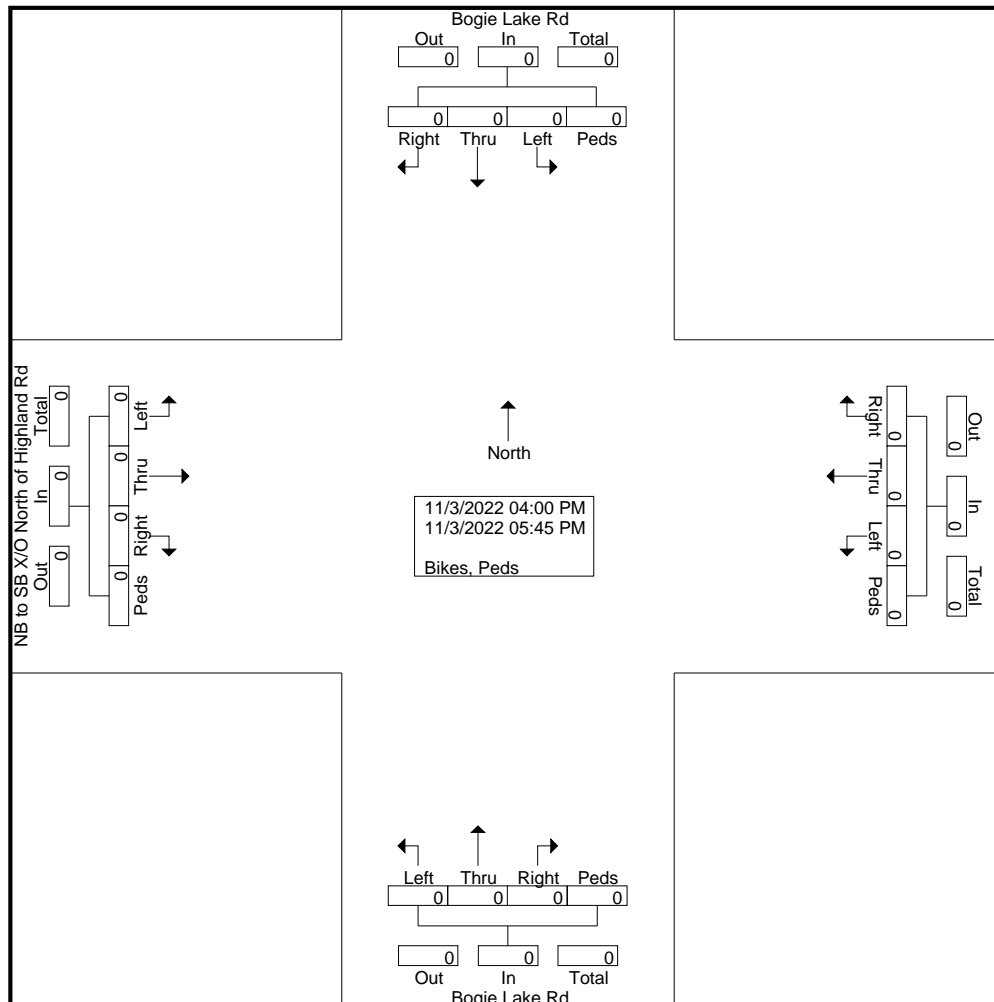




File Name : 15997002 - Bogie Lake Rd -- NB to SB X_O North of Highland Rd
 Site Code : 15997002
 Start Date : 11/3/2022
 Page No : 1

Groups Printed- Bikes, Peds

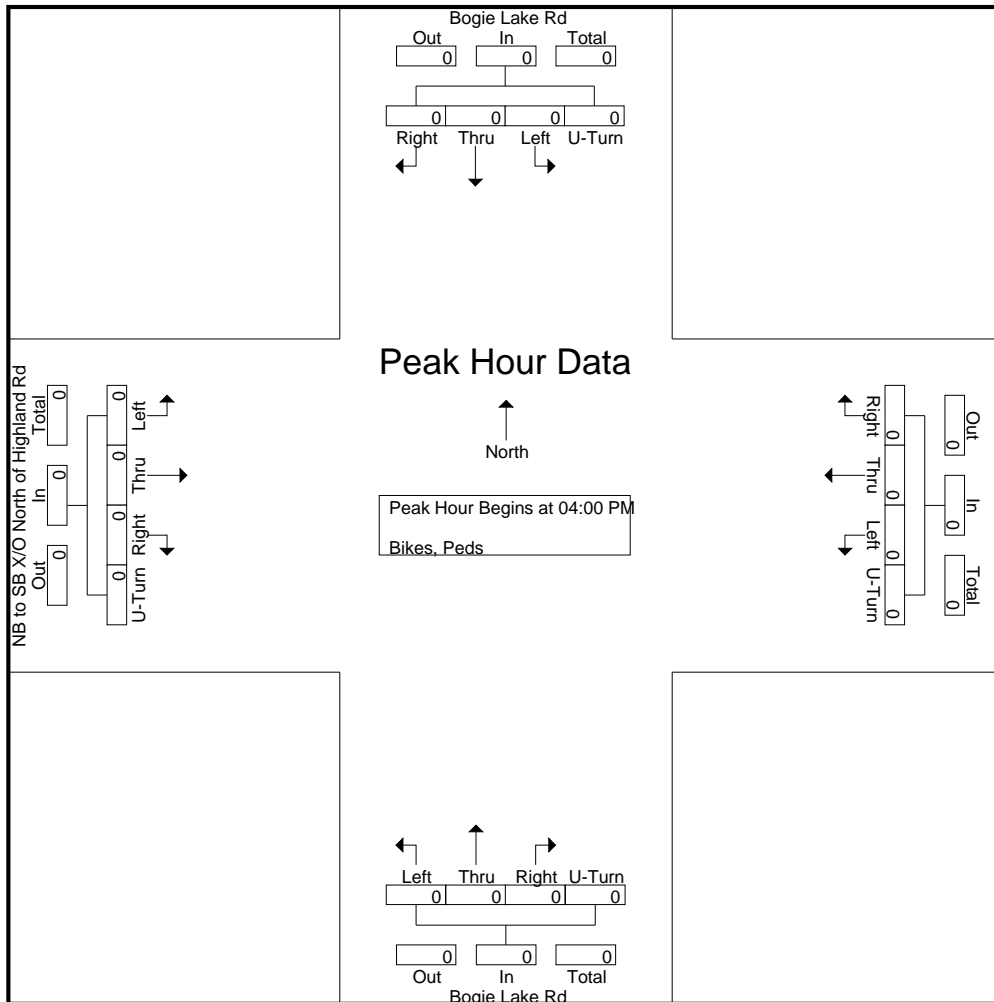
Start Time	NB to SB X/O North of Highland Rd Eastbound					Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					





File Name : 15997002 - Bogie Lake Rd -- NB to SB X_O North of Highland Rd
 Site Code : 15997002
 Start Date : 11/3/2022
 Page No : 2

Start Time	NB to SB X/O North of Highland Rd Eastbound					Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 04:00 PM																						
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

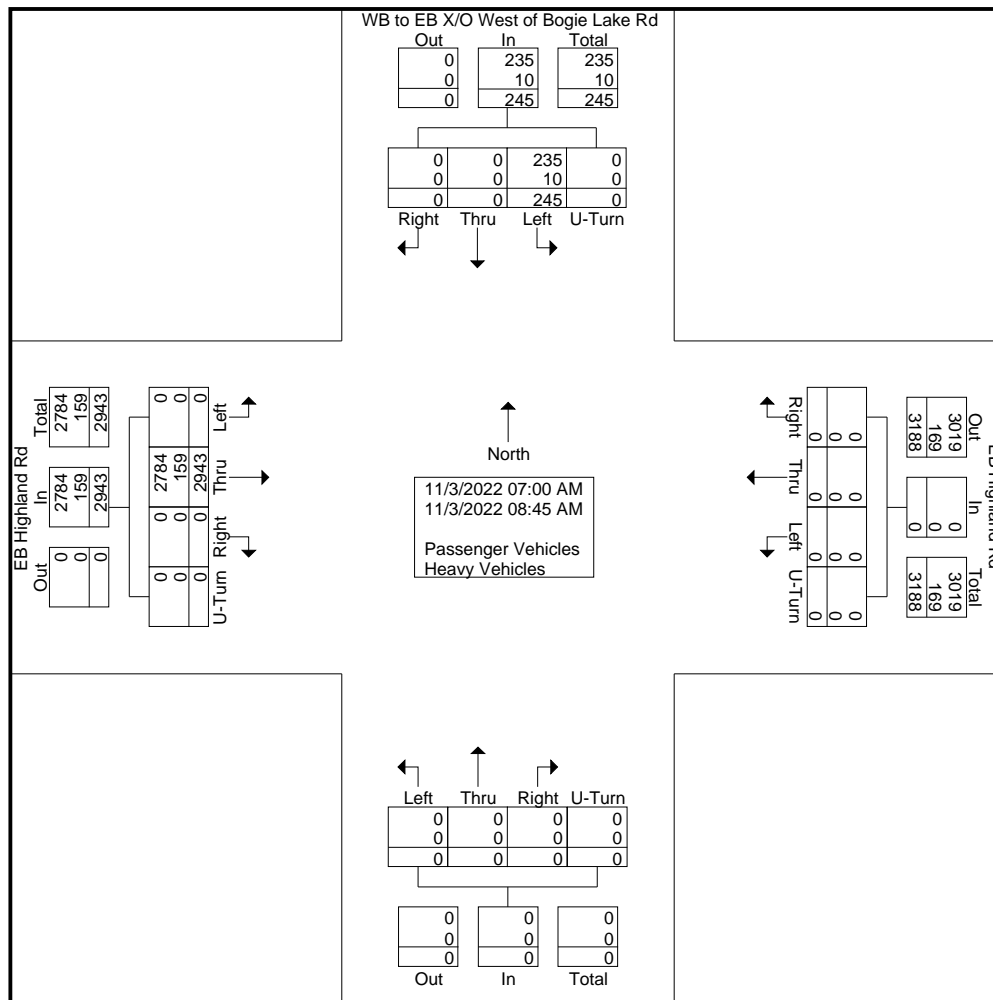




File Name : 15997003 - WB to EB X_O West of Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997003
 Start Date : 11/3/2022
 Page No : 1

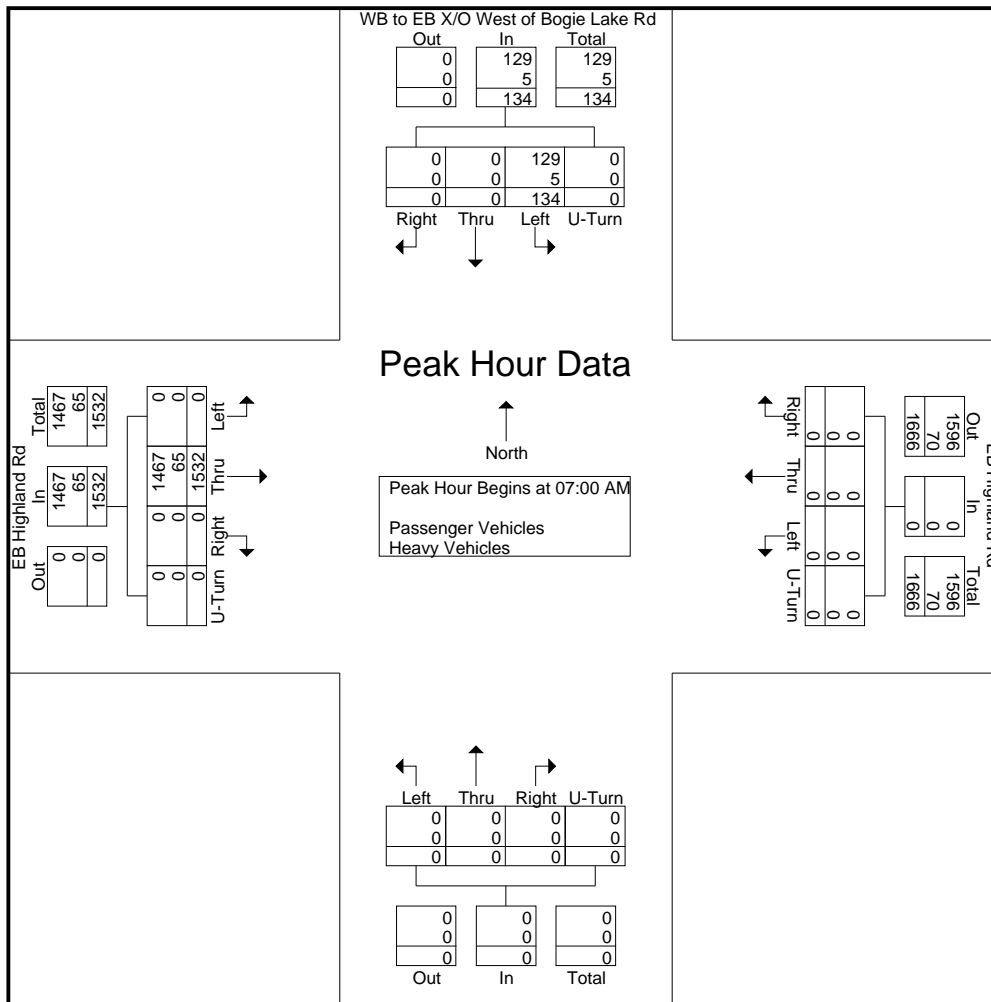
Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Northbound					WB to EB X/O West of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
07:00 AM	0	423	0	0	423	0	0	0	0	0	0	0	0	0	0	55	0	0	0	55	478
07:15 AM	0	369	0	0	369	0	0	0	0	0	0	0	0	0	0	25	0	0	0	25	394
07:30 AM	0	393	0	0	393	0	0	0	0	0	0	0	0	0	0	20	0	0	0	20	413
07:45 AM	0	347	0	0	347	0	0	0	0	0	0	0	0	0	0	34	0	0	0	34	381
Total	0	1532	0	0	1532	0	0	0	0	0	0	0	0	0	0	134	0	0	0	134	1666
08:00 AM	0	356	0	0	356	0	0	0	0	0	0	0	0	0	0	41	0	0	0	41	397
08:15 AM	0	361	0	0	361	0	0	0	0	0	0	0	0	0	0	28	0	0	0	28	389
08:30 AM	0	343	0	0	343	0	0	0	0	0	0	0	0	0	0	11	0	0	0	11	354
08:45 AM	0	351	0	0	351	0	0	0	0	0	0	0	0	0	0	31	0	0	0	31	382
Total	0	1411	0	0	1411	0	0	0	0	0	0	0	0	0	0	111	0	0	0	111	1522
Grand Total	0	2943	0	0	2943	0	0	0	0	0	0	0	0	0	0	245	0	0	0	245	3188
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
Total %	0	92.3	0	0	92.3	0	0	0	0	0	0	0	0	0	0	7.7	0	0	0	7.7	
Passenger Vehicles	0	2784	0	0	2784	0	0	0	0	0	0	0	0	0	0	235	0	0	0	235	3019
% Passenger Vehicles	0	94.6	0	0	94.6	0	0	0	0	0	0	0	0	0	0	95.9	0	0	0	95.9	94.7
Heavy Vehicles	0	159	0	0	159	0	0	0	0	0	0	0	0	0	0	10	0	0	0	10	169
% Heavy Vehicles	0	5.4	0	0	5.4	0	0	0	0	0	0	0	0	0	0	4.1	0	0	0	4.1	5.3





Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Northbound					WB to EB X/O West of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	423	0	0	423	0	0	0	0	0	0	0	0	0	0	55	0	0	0	55	478
07:15 AM	0	369	0	0	369	0	0	0	0	0	0	0	0	0	0	25	0	0	0	25	394
07:30 AM	0	393	0	0	393	0	0	0	0	0	0	0	0	0	0	20	0	0	0	20	413
07:45 AM	0	347	0	0	347	0	0	0	0	0	0	0	0	0	0	34	0	0	0	34	381
Total Volume	0	1532	0	0	1532	0	0	0	0	0	0	0	0	0	0	134	0	0	0	134	1666
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
PHF	.000	.905	.000	.000	.905	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.609	.000	.000	.000	.609	.871
Passenger Vehicles	0	1467	0	0	1467	0	0	0	0	0	0	0	0	0	0	129	0	0	0	129	1596
% Passenger Vehicles	0	95.8	0	0	95.8	0	0	0	0	0	0	0	0	0	0	96.3	0	0	0	96.3	95.8
Heavy Vehicles	0	65	0	0	65	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5	70
% Heavy Vehicles	0	4.2	0	0	4.2	0	0	0	0	0	0	0	0	0	0	3.7	0	0	0	3.7	4.2

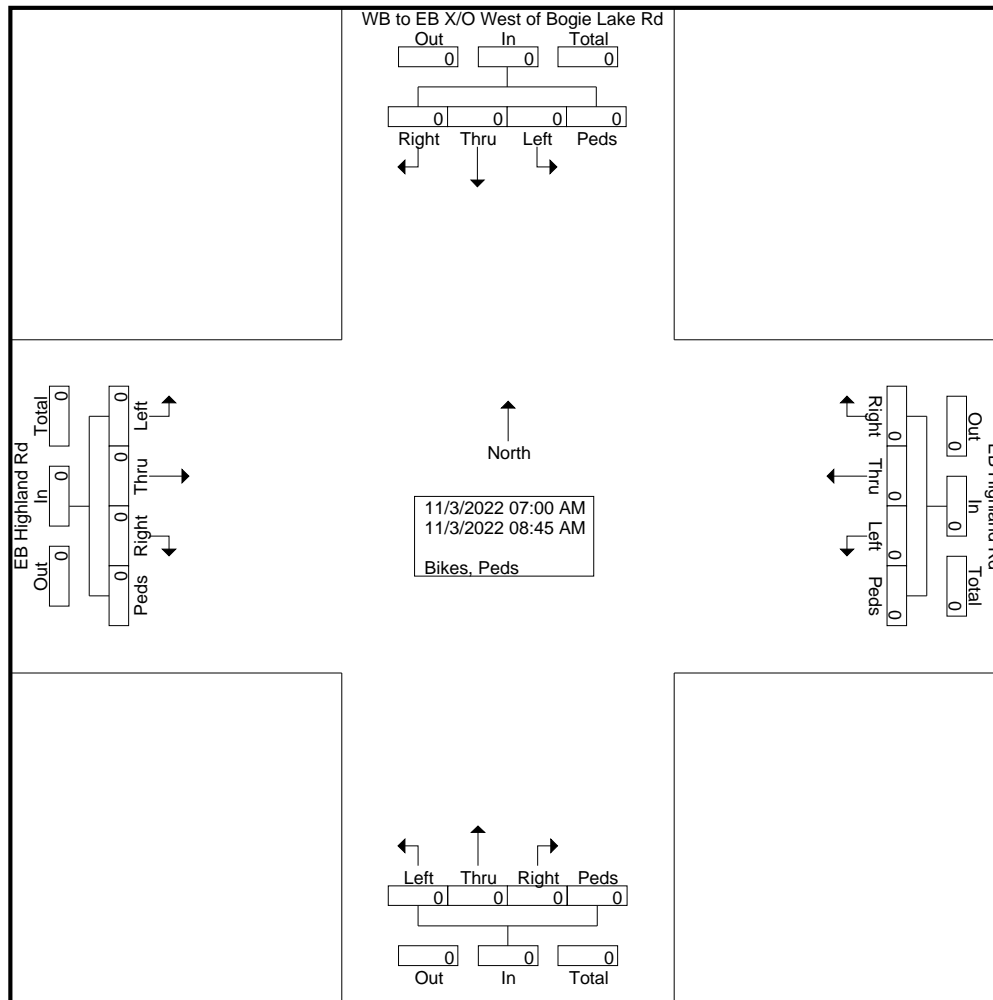




File Name : 15997003 - WB to EB X_O West of Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997003
 Start Date : 11/3/2022
 Page No : 1

Groups Printed- Bikes, Peds

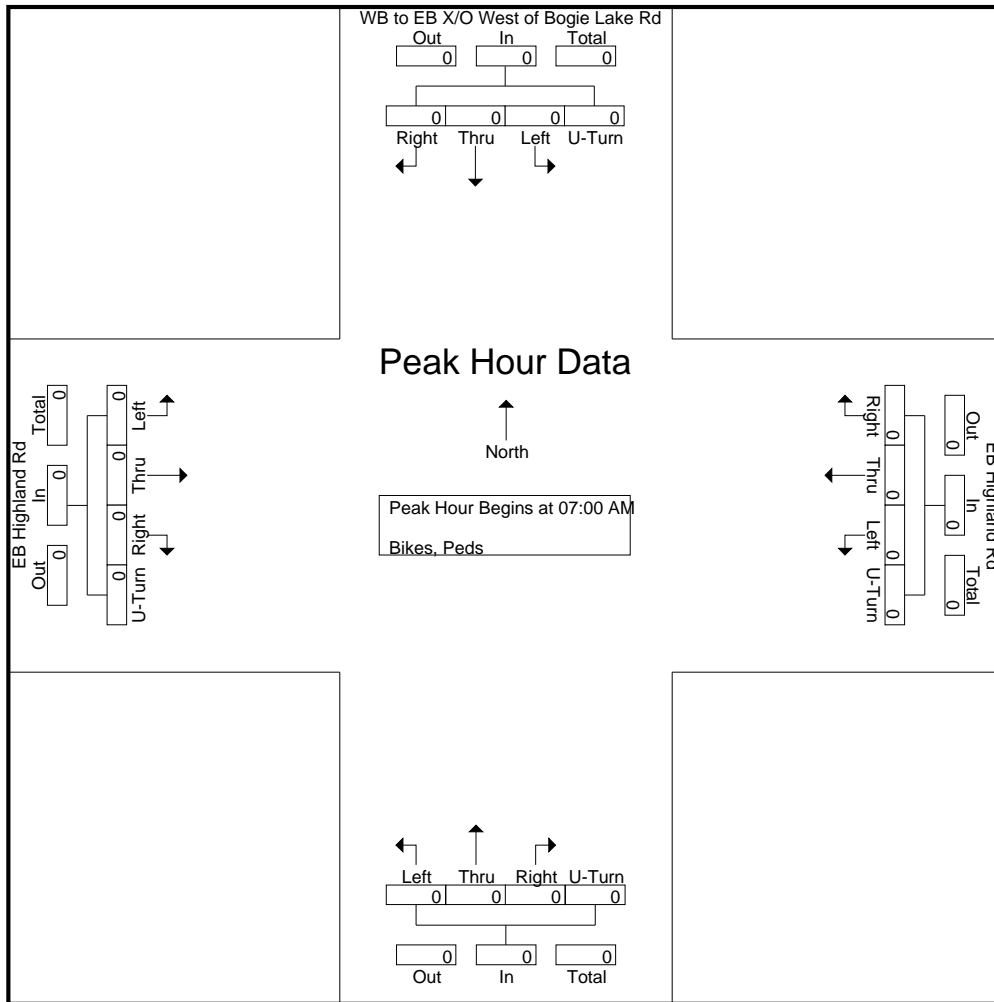
Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Northbound					WB to EB X/O West of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					





File Name : 15997003 - WB to EB X_O West of Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997003
 Start Date : 11/3/2022
 Page No : 2

	EB Highland Rd Eastbound					EB Highland Rd Westbound					Northbound					WB to EB X/O West of Bogie Lake Rd Southbound						
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:00 AM																						
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

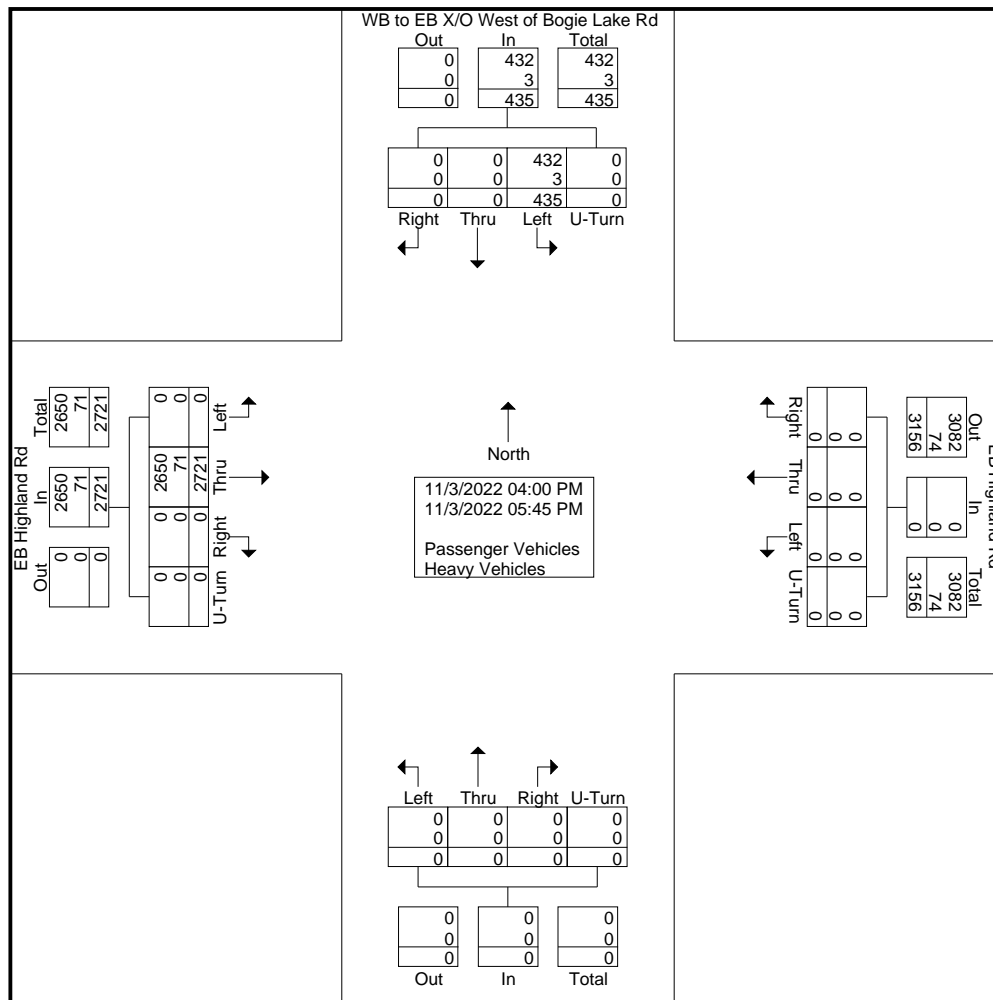




File Name : 15997004 - WB to EB X_O West of Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997004
 Start Date : 11/3/2022
 Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

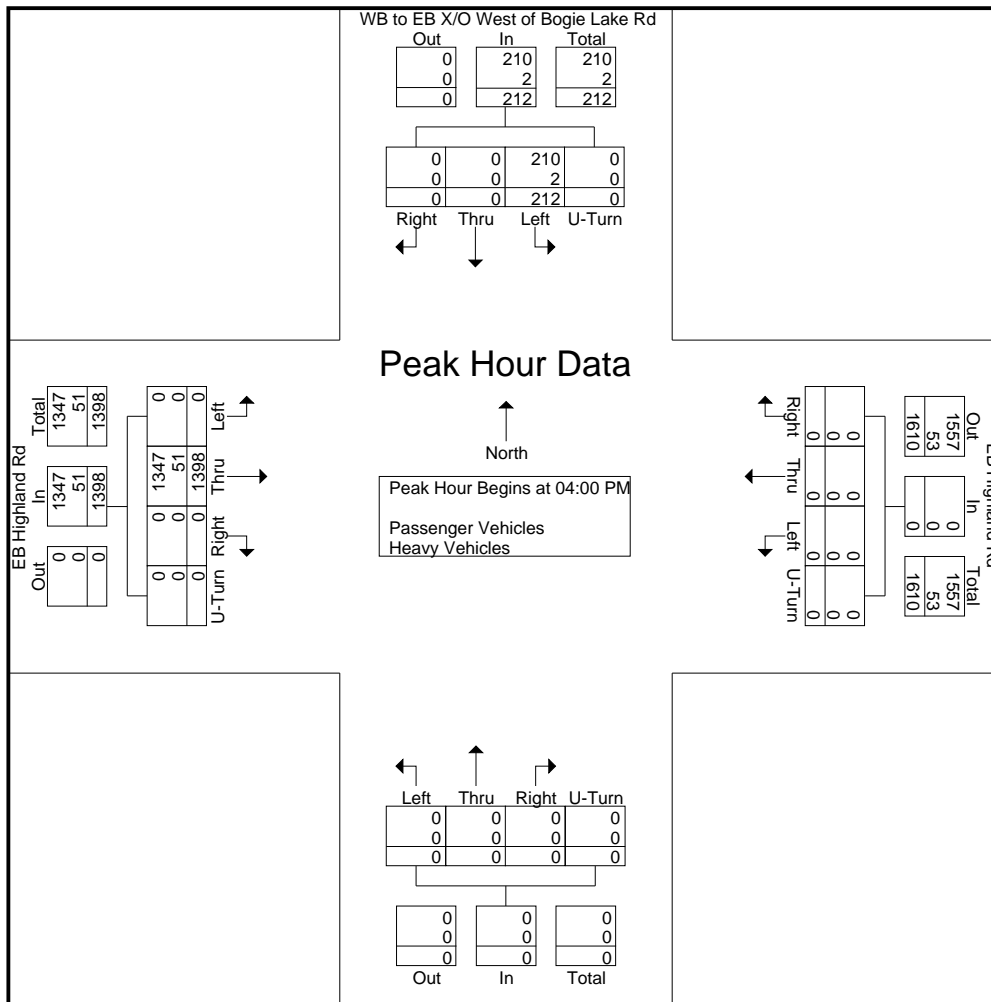
Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Northbound					WB to EB X/O West of Bogie Lake Rd Southbound					Int. Total	
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total		
04:00 PM	0	352	0	0	352	0	0	0	0	0	0	0	0	0	0	52	0	0	0	0	52	404
04:15 PM	0	338	0	0	338	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	60	398
04:30 PM	0	373	0	0	373	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0	43	416
04:45 PM	0	335	0	0	335	0	0	0	0	0	0	0	0	0	0	57	0	0	0	0	57	392
Total	0	1398	0	0	1398	0	0	0	0	0	0	0	0	0	0	212	0	0	0	0	212	1610
05:00 PM	0	309	0	0	309	0	0	0	0	0	0	0	0	0	0	64	0	0	0	0	64	373
05:15 PM	0	355	0	0	355	0	0	0	0	0	0	0	0	0	0	61	0	0	0	0	61	416
05:30 PM	0	334	0	0	334	0	0	0	0	0	0	0	0	0	0	60	0	0	0	0	60	394
05:45 PM	0	325	0	0	325	0	0	0	0	0	0	0	0	0	0	38	0	0	0	0	38	363
Total	0	1323	0	0	1323	0	0	0	0	0	0	0	0	0	0	223	0	0	0	0	223	1546
Grand Total	0	2721	0	0	2721	0	0	0	0	0	0	0	0	0	0	435	0	0	0	0	435	3156
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		100	0	0	0			
Total %	0	86.2	0	0	86.2	0	0	0	0	0	0	0	0	0	0	13.8	0	0	0	0	13.8	
Passenger Vehicles	0	2650	0	0	2650	0	0	0	0	0	0	0	0	0	0	432	0	0	0	0	432	3082
% Passenger Vehicles	0	97.4	0	0	97.4	0	0	0	0	0	0	0	0	0	0	99.3	0	0	0	0	99.3	97.7
Heavy Vehicles	0	71	0	0	71	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	74
% Heavy Vehicles	0	2.6	0	0	2.6	0	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0.7	2.3





File Name : 15997004 - WB to EB X_O West of Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997004
 Start Date : 11/3/2022
 Page No : 2

Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Northbound					WB to EB X/O West of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	352	0	0	352	0	0	0	0	0	0	0	0	0	0	52	0	0	0	52	404
04:15 PM	0	338	0	0	338	0	0	0	0	0	0	0	0	0	0	60	0	0	0	60	398
04:30 PM	0	373	0	0	373	0	0	0	0	0	0	0	0	0	0	43	0	0	0	43	416
04:45 PM	0	335	0	0	335	0	0	0	0	0	0	0	0	0	0	57	0	0	0	57	392
Total Volume	0	1398	0	0	1398	0	0	0	0	0	0	0	0	0	0	212	0	0	0	212	1610
% App. Total	0	100	0	0		0	0	0	0	0	0	0	0	0	0	100	0	0	0		
PHF	.000	.937	.000	.000	.937	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.883	.000	.000	.000	.883	.968
Passenger Vehicles	0	1347	0	0	1347	0	0	0	0	0	0	0	0	0	0	210	0	0	0	210	1557
% Passenger Vehicles	0	96.4	0	0	96.4	0	0	0	0	0	0	0	0	0	0	99.1	0	0	0	99.1	96.7
Heavy Vehicles	0	51	0	0	51	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	53
% Heavy Vehicles	0	3.6	0	0	3.6	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0	0.9	3.3

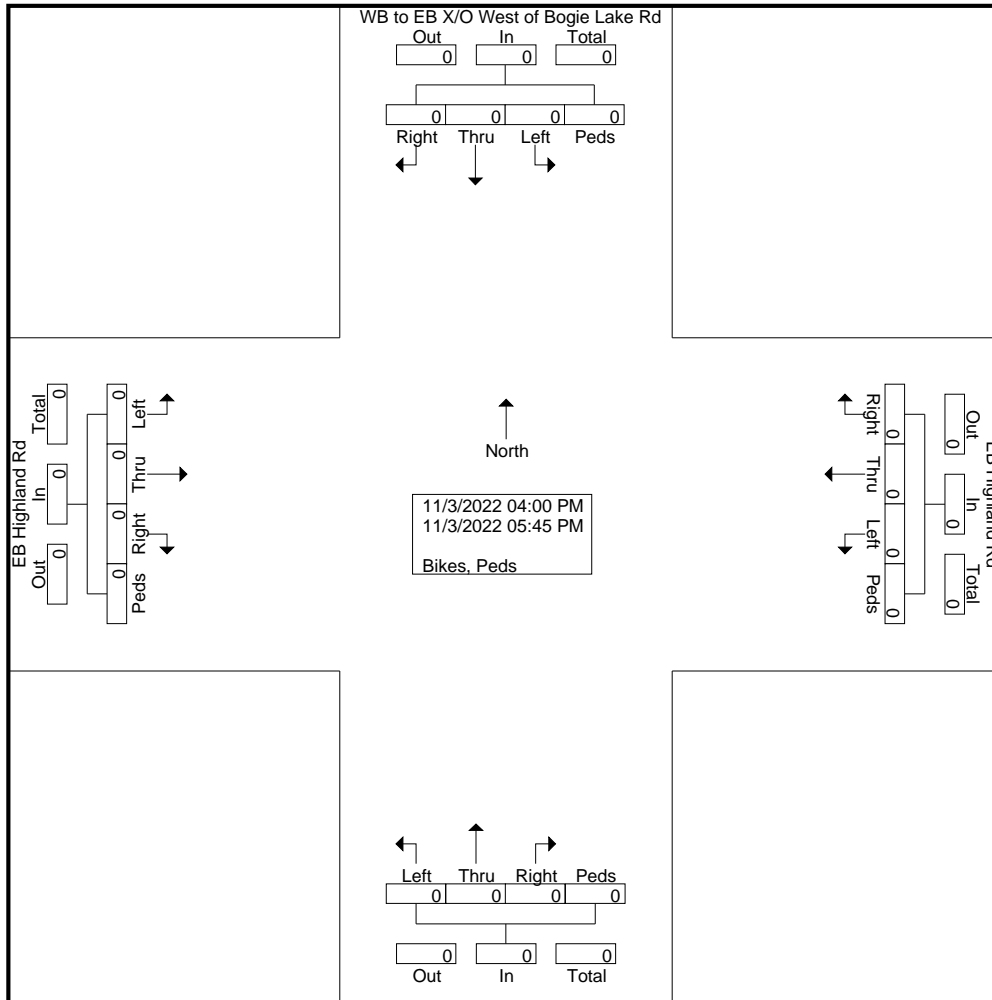




File Name : 15997004 - WB to EB X_O West of Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997004
 Start Date : 11/3/2022
 Page No : 1

Groups Printed- Bikes, Peds

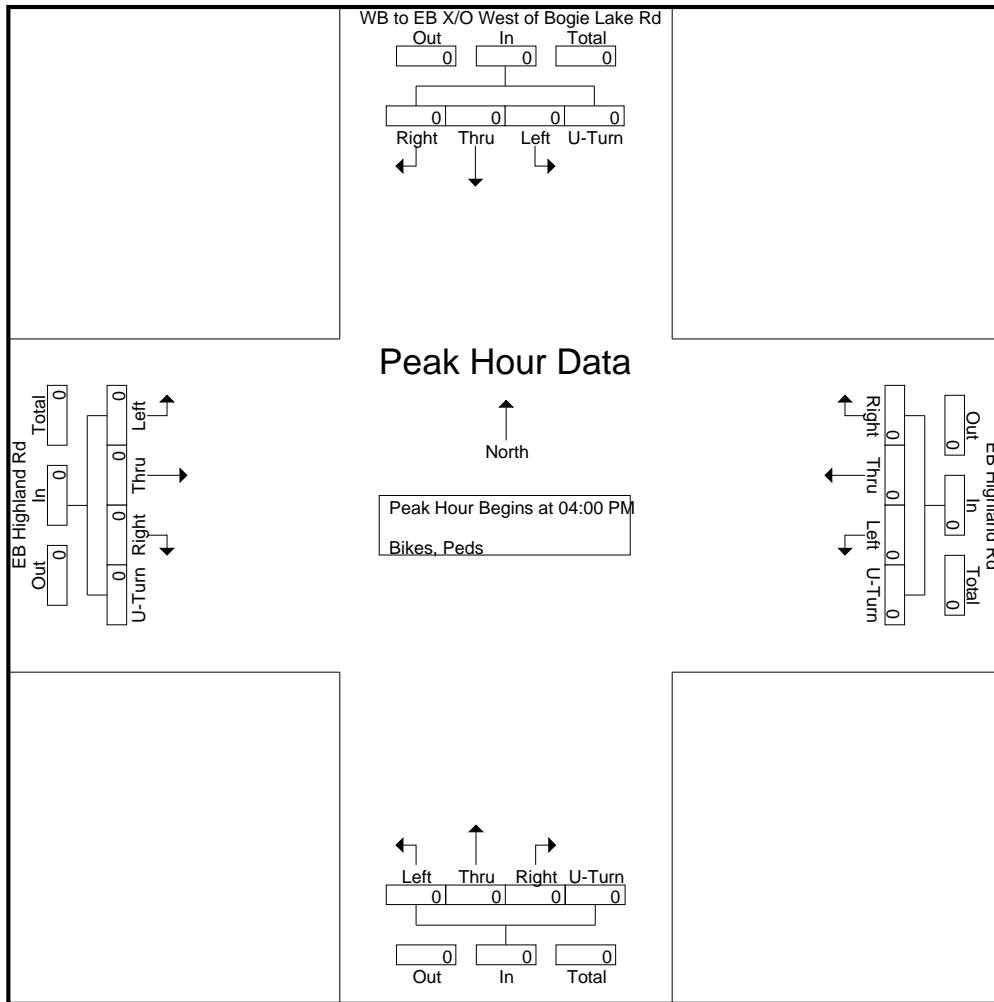
Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Northbound					WB to EB X/O West of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					





File Name : 15997004 - WB to EB X_O West of Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997004
 Start Date : 11/3/2022
 Page No : 2

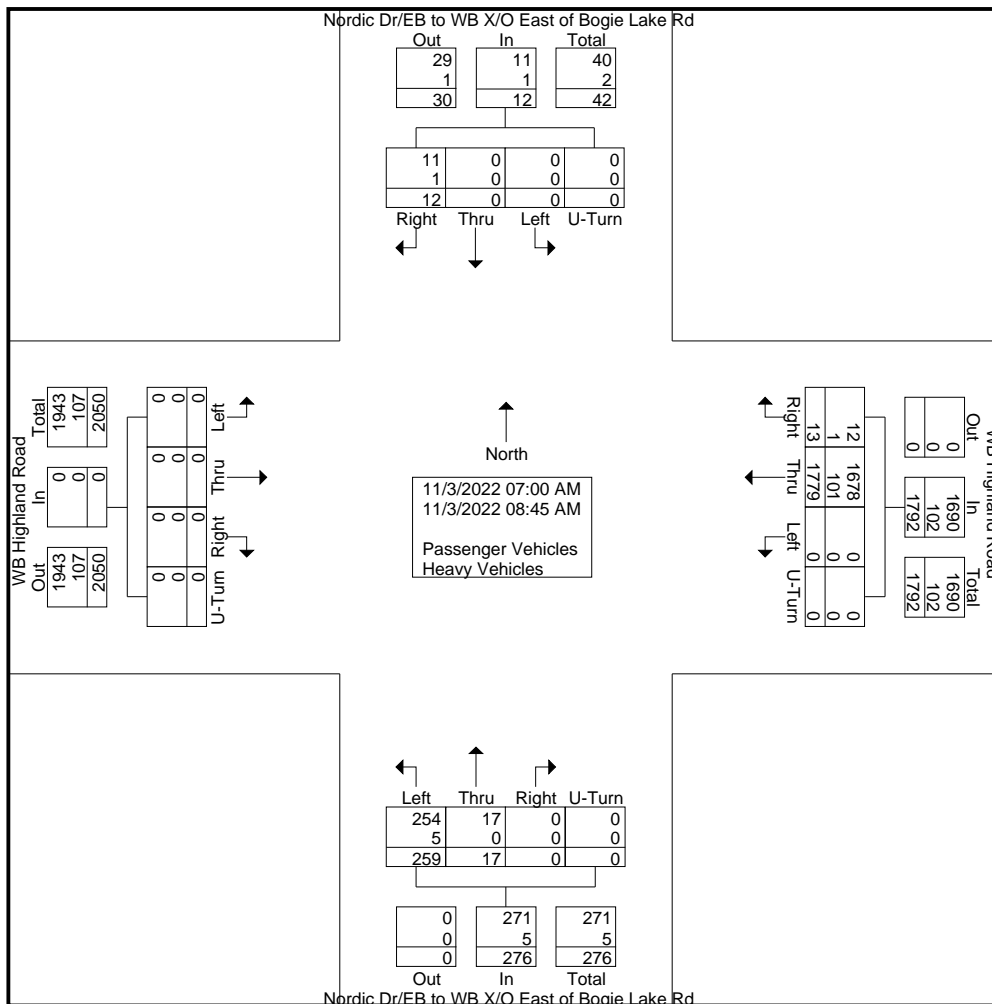
	EB Highland Rd Eastbound					EB Highland Rd Westbound					Northbound					WB to EB X/O West of Bogie Lake Rd Southbound						
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 04:00 PM																						
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000





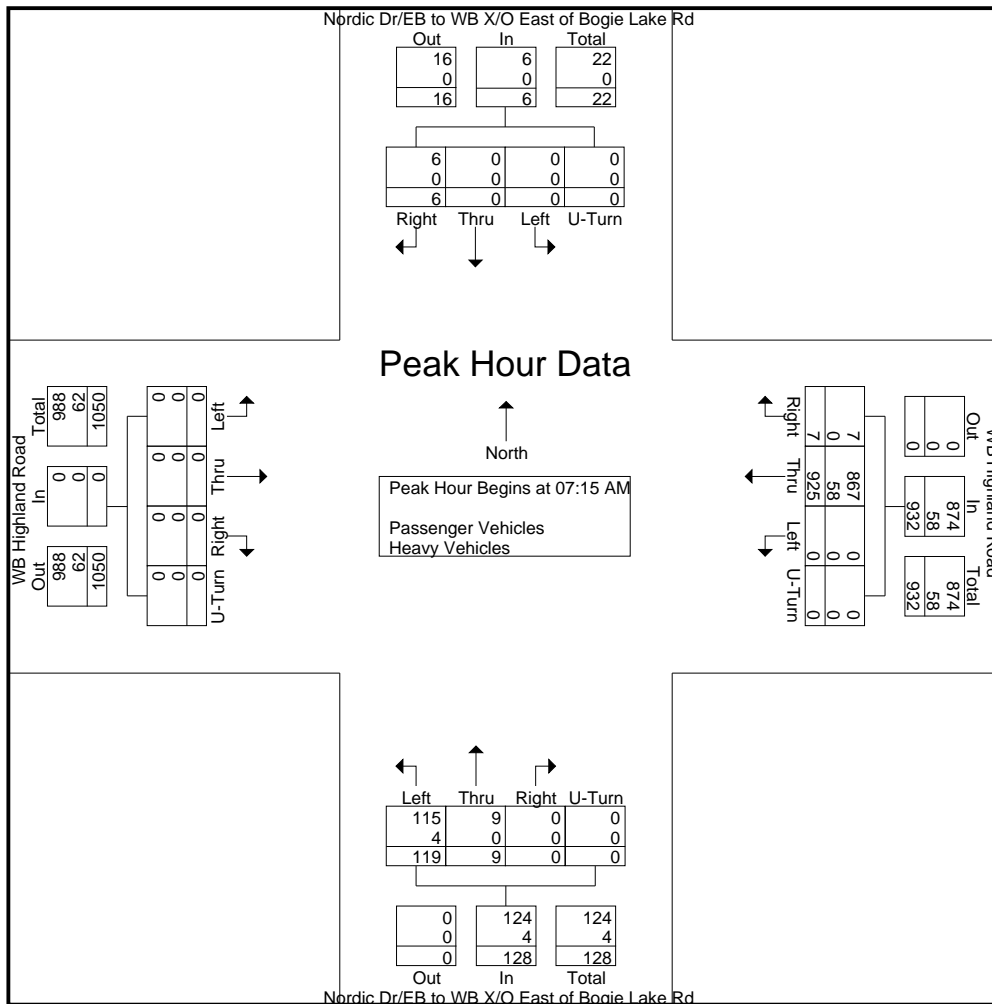
Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	WB Highland Road Eastbound					WB Highland Road Westbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Northbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
07:00 AM	0	0	0	0	0	0	189	1	0	190	28	0	0	0	28	0	0	1	0	1	1
07:15 AM	0	0	0	0	0	0	220	1	0	221	37	4	0	0	41	0	0	2	0	2	2
07:30 AM	0	0	0	0	0	0	231	2	0	233	27	1	0	0	28	0	0	1	0	1	1
07:45 AM	0	0	0	0	0	0	243	3	0	246	30	3	0	0	33	0	0	2	0	2	2
Total	0	0	0	0	0	0	883	7	0	890	122	8	0	0	130	0	0	6	0	6	6
08:00 AM	0	0	0	0	0	0	231	1	0	232	25	1	0	0	26	0	0	1	0	1	1
08:15 AM	0	0	0	0	0	0	208	0	0	208	46	2	0	0	48	0	0	1	0	1	1
08:30 AM	0	0	0	0	0	0	226	2	0	228	29	1	0	0	30	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	231	3	0	234	37	5	0	0	42	0	0	4	0	4	4
Total	0	0	0	0	0	0	896	6	0	902	137	9	0	0	146	0	0	6	0	6	6
Grand Total	0	0	0	0	0	0	1779	13	0	1792	259	17	0	0	276	0	0	12	0	12	2080
Apprch %	0	0	0	0	0	0	99.3	0.7	0	99.3	93.8	6.2	0	0	93.8	0	0	100	0	0	
Total %	0	0	0	0	0	0	85.5	0.6	0	86.2	12.5	0.8	0	0	13.3	0	0	0.6	0	0.6	
Passenger Vehicles	0	0	0	0	0	0	1678	12	0	1690	254	17	0	0	271	0	0	11	0	11	1972
% Passenger Vehicles	0	0	0	0	0	0	94.3	92.3	0	94.3	98.1	100	0	0	98.2	0	0	91.7	0	91.7	94.8
Heavy Vehicles	0	0	0	0	0	0	101	1	0	102	5	0	0	0	5	0	0	1	0	1	108
% Heavy Vehicles	0	0	0	0	0	0	5.7	7.7	0	5.7	1.9	0	0	0	1.8	0	0	8.3	0	8.3	5.2





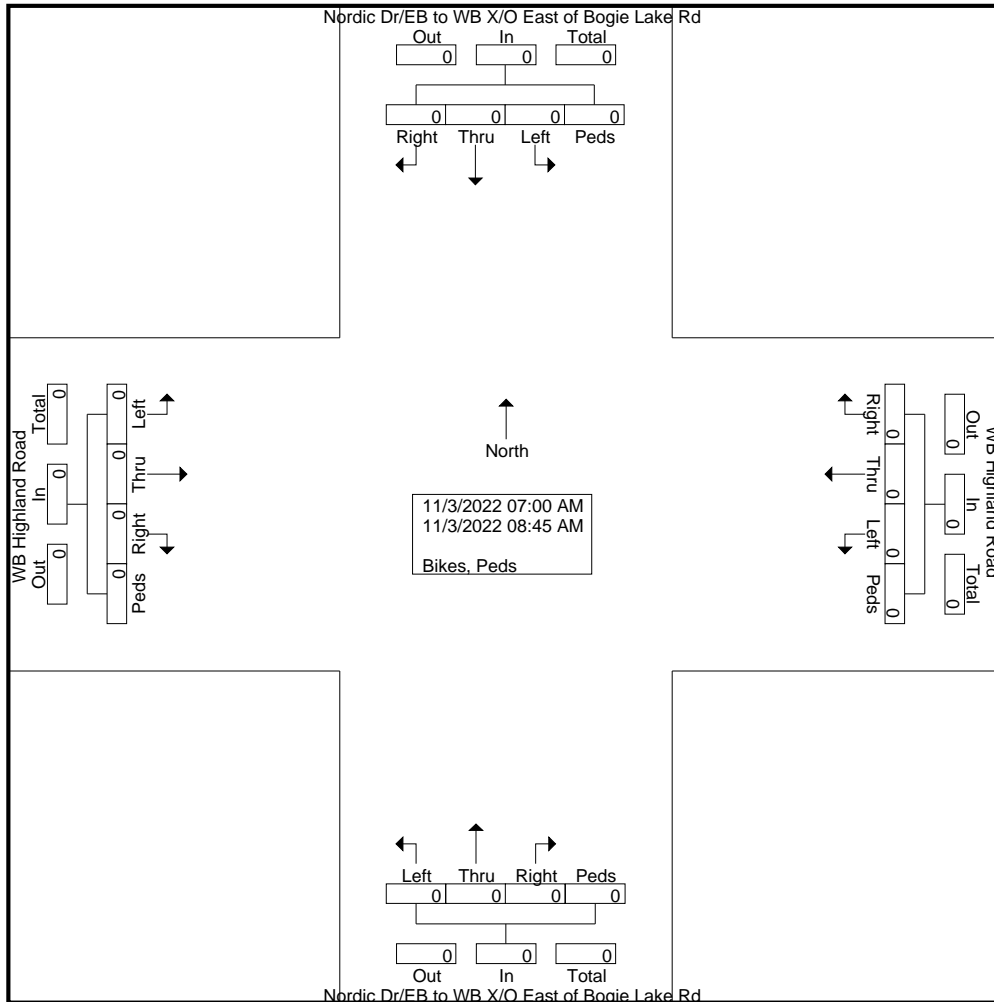
Start Time	WB Highland Road Eastbound					WB Highland Road Westbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Northbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	0	0	0	0	0	220	1	0	221	37	4	0	0	41	0	0	2	0	2	264
07:30 AM	0	0	0	0	0	0	231	2	0	233	27	1	0	0	28	0	0	1	0	1	262
07:45 AM	0	0	0	0	0	0	243	3	0	246	30	3	0	0	33	0	0	2	0	2	281
08:00 AM	0	0	0	0	0	0	231	1	0	232	25	1	0	0	26	0	0	1	0	1	259
Total Volume	0	0	0	0	0	0	925	7	0	932	119	9	0	0	128	0	0	6	0	6	1066
% App. Total	0	0	0	0	0	0	99.2	0.8	0	0	93	7	0	0	0	0	0	100	0	0	
PHF	.000	.000	.000	.000	.000	.000	.952	.583	.000	.947	.804	.563	.000	.000	.780	.000	.000	.750	.000	.750	.948
Passenger Vehicles	0	0	0	0	0	0	867	7	0	874	115	9	0	0	124	0	0	6	0	6	1004
% Passenger Vehicles	0	0	0	0	0	0	93.7	100	0	93.8	96.6	100	0	0	96.9	0	0	100	0	100	94.2
Heavy Vehicles	0	0	0	0	0	0	58	0	0	58	4	0	0	0	4	0	0	0	0	0	62
% Heavy Vehicles	0	0	0	0	0	0	6.3	0	0	6.2	3.4	0	0	0	3.1	0	0	0	0	0	5.8





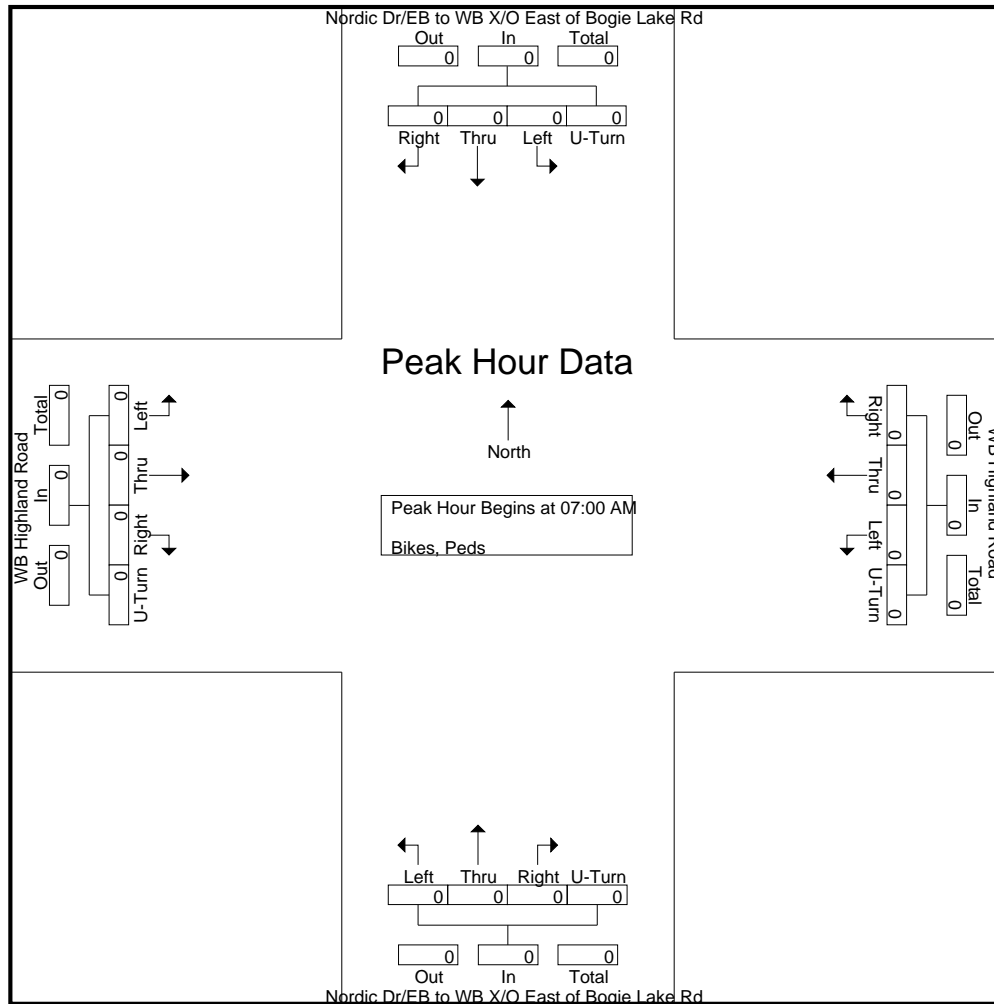
Groups Printed- Bikes, Peds

Start Time	WB Highland Road Eastbound					WB Highland Road Westbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Northbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					





Start Time	WB Highland Road Eastbound					WB Highland Road Westbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Northbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Southbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:00 AM																						
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

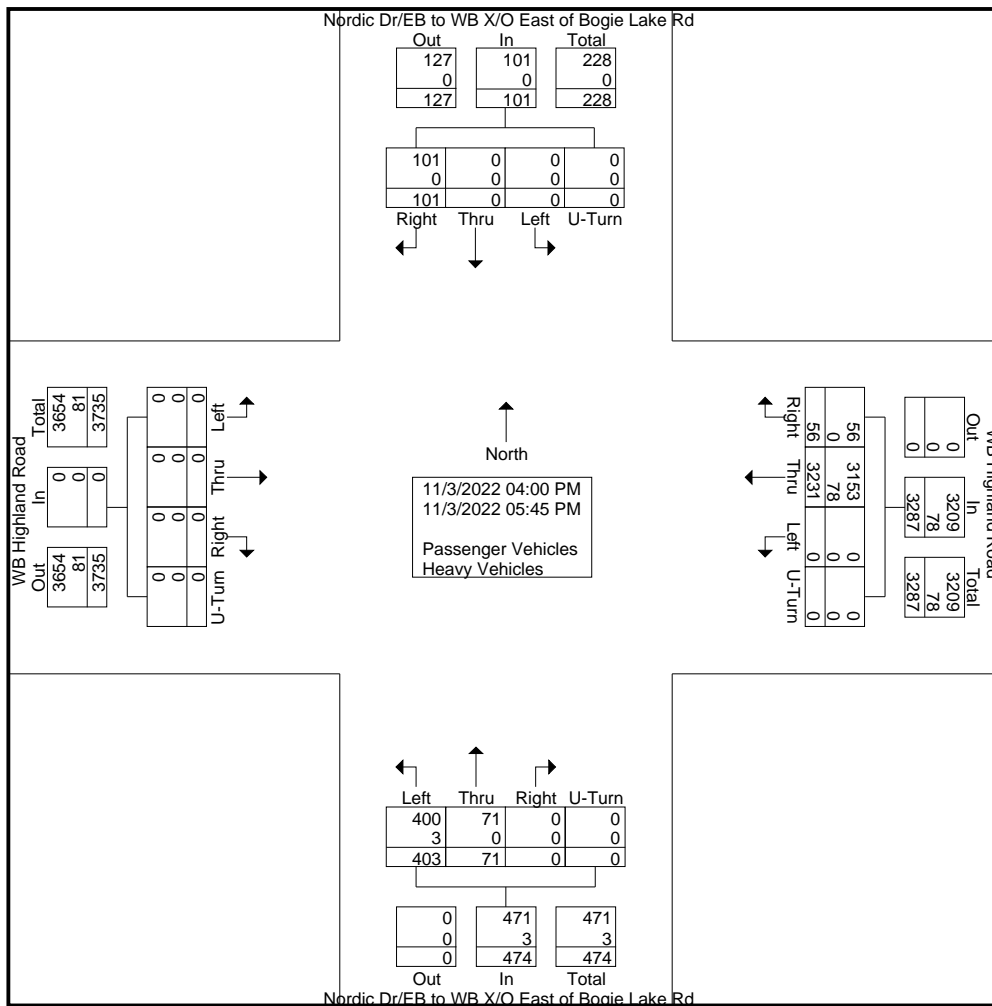




File Name : 15997006 - Nordic Dr_EB to WB X_O East of Bogie Lake Rd -- WB Highland Road
 Site Code : 15997006
 Start Date : 11/3/2022
 Page No : 1

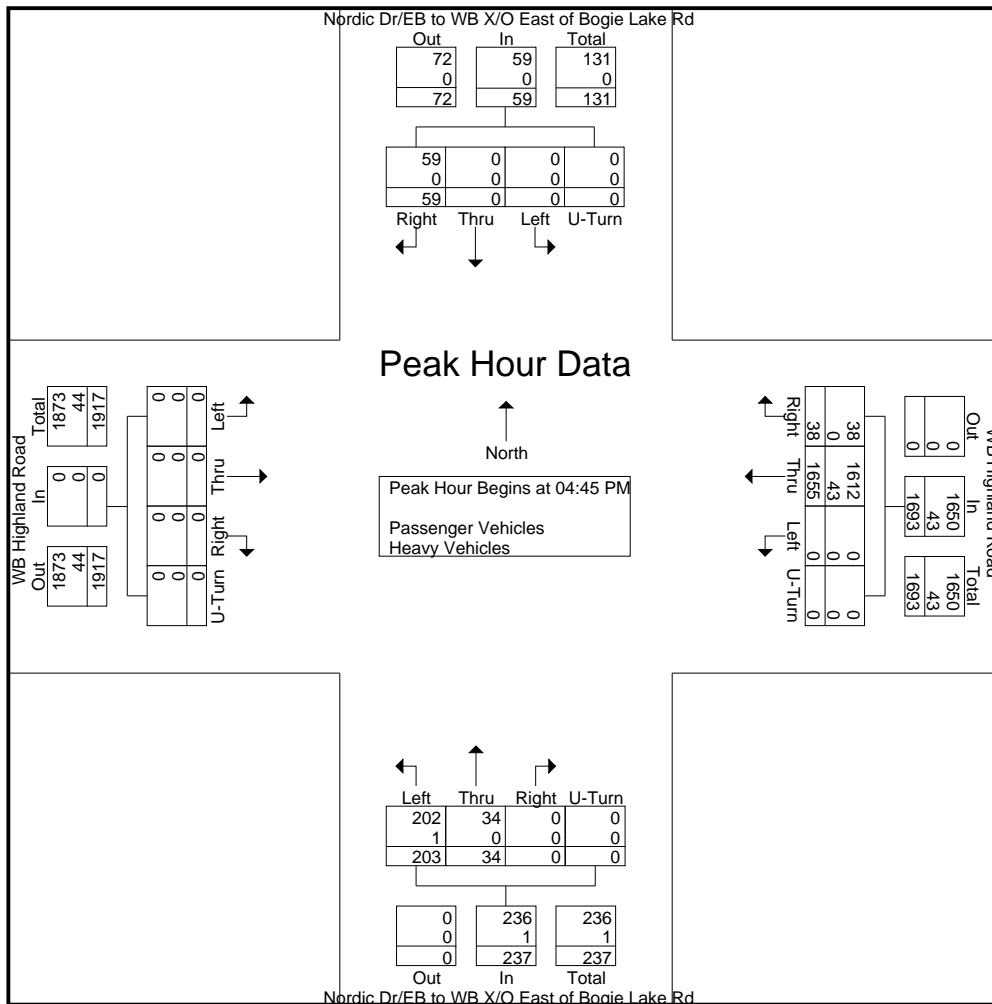
Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	WB Highland Road Eastbound					WB Highland Road Westbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Northbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
04:00 PM	0	0	0	0	0	0	426	4	0	430	50	7	0	0	57	0	0	6	0	6	493
04:15 PM	0	0	0	0	0	0	438	3	0	441	58	7	0	0	65	0	0	14	0	14	520
04:30 PM	0	0	0	0	0	0	381	5	0	386	45	11	0	0	56	0	0	10	0	10	452
04:45 PM	0	0	0	0	0	0	438	7	0	445	45	12	0	0	57	0	0	19	0	19	521
Total	0	0	0	0	0	0	1683	19	0	1702	198	37	0	0	235	0	0	49	0	49	1986
05:00 PM	0	0	0	0	0	0	416	7	0	423	46	8	0	0	54	0	0	8	0	8	485
05:15 PM	0	0	0	0	0	0	411	13	0	424	67	8	0	0	75	0	0	12	0	12	511
05:30 PM	0	0	0	0	0	0	390	11	0	401	45	6	0	0	51	0	0	20	0	20	472
05:45 PM	0	0	0	0	0	0	331	6	0	337	47	12	0	0	59	0	0	12	0	12	408
Total	0	0	0	0	0	0	1548	37	0	1585	205	34	0	0	239	0	0	52	0	52	1876
Grand Total	0	0	0	0	0	0	3231	56	0	3287	403	71	0	0	474	0	0	101	0	101	3862
Apprch %	0	0	0	0	0	0	98.3	1.7	0		85	15	0	0		0	0	100	0		
Total %	0	0	0	0	0	0	83.7	1.5	0	85.1	10.4	1.8	0	0	12.3	0	0	2.6	0	2.6	
Passenger Vehicles	0	0	0	0	0	0	3153	56	0	3209	400	71	0	0	471	0	0	101	0	101	3781
% Passenger Vehicles	0	0	0	0	0	0	97.6	100	0	97.6	99.3	100	0	0	99.4	0	0	100	0	100	97.9
Heavy Vehicles	0	0	0	0	0	0	78	0	0	78	3	0	0	0	3	0	0	0	0	0	81
% Heavy Vehicles	0	0	0	0	0	0	2.4	0	0	2.4	0.7	0	0	0	0.6	0	0	0	0	0	2.1





Start Time	WB Highland Road Eastbound					WB Highland Road Westbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Northbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	0	0	0	0	438	7	0	445	45	12	0	0	57	0	0	19	0	19	521
05:00 PM	0	0	0	0	0	0	416	7	0	423	46	8	0	0	54	0	0	8	0	8	485
05:15 PM	0	0	0	0	0	0	411	13	0	424	67	8	0	0	75	0	0	12	0	12	511
05:30 PM	0	0	0	0	0	0	390	11	0	401	45	6	0	0	51	0	0	20	0	20	472
Total Volume	0	0	0	0	0	0	1655	38	0	1693	203	34	0	0	237	0	0	59	0	59	1989
% App. Total	0	0	0	0	0	0	97.8	2.2	0		85.7	14.3	0	0		0	0	100	0		
PHF	.000	.000	.000	.000	.000	.000	.945	.731	.000	.951	.757	.708	.000	.000	.790	.000	.000	.738	.000	.738	.954
Passenger Vehicles	0	0	0	0	0	0	1612	38	0	1650	202	34	0	0	236	0	0	59	0	59	1945
% Passenger Vehicles	0	0	0	0	0	0	97.4	100	0	97.5	99.5	100	0	0	99.6	0	0	100	0	100	97.8
Heavy Vehicles	0	0	0	0	0	0	43	0	0	43	1	0	0	0	1	0	0	0	0	0	44
% Heavy Vehicles	0	0	0	0	0	0	2.6	0	0	2.5	0.5	0	0	0	0.4	0	0	0	0	0	2.2

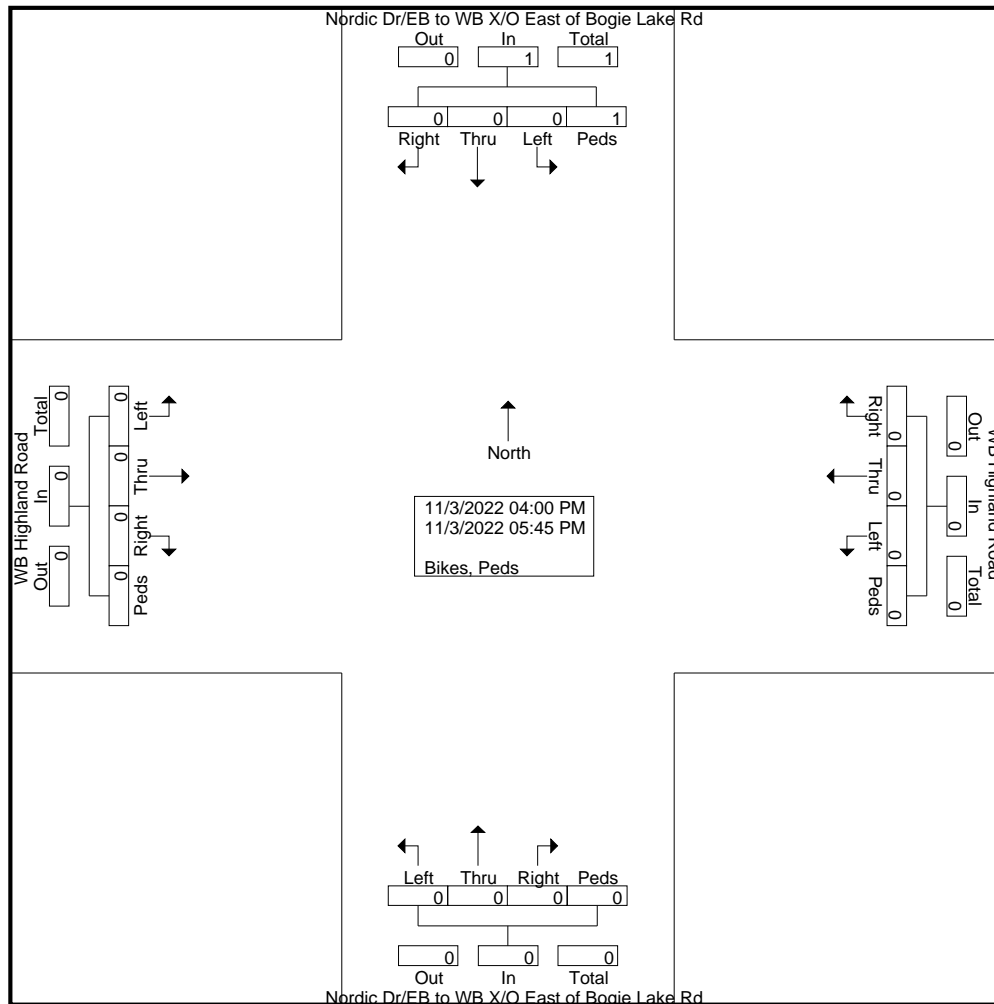




File Name : 15997006 - Nordic Dr_EB to WB X_O East of Bogie Lake Rd -- WB Highland Road
 Site Code : 15997006
 Start Date : 11/3/2022
 Page No : 1

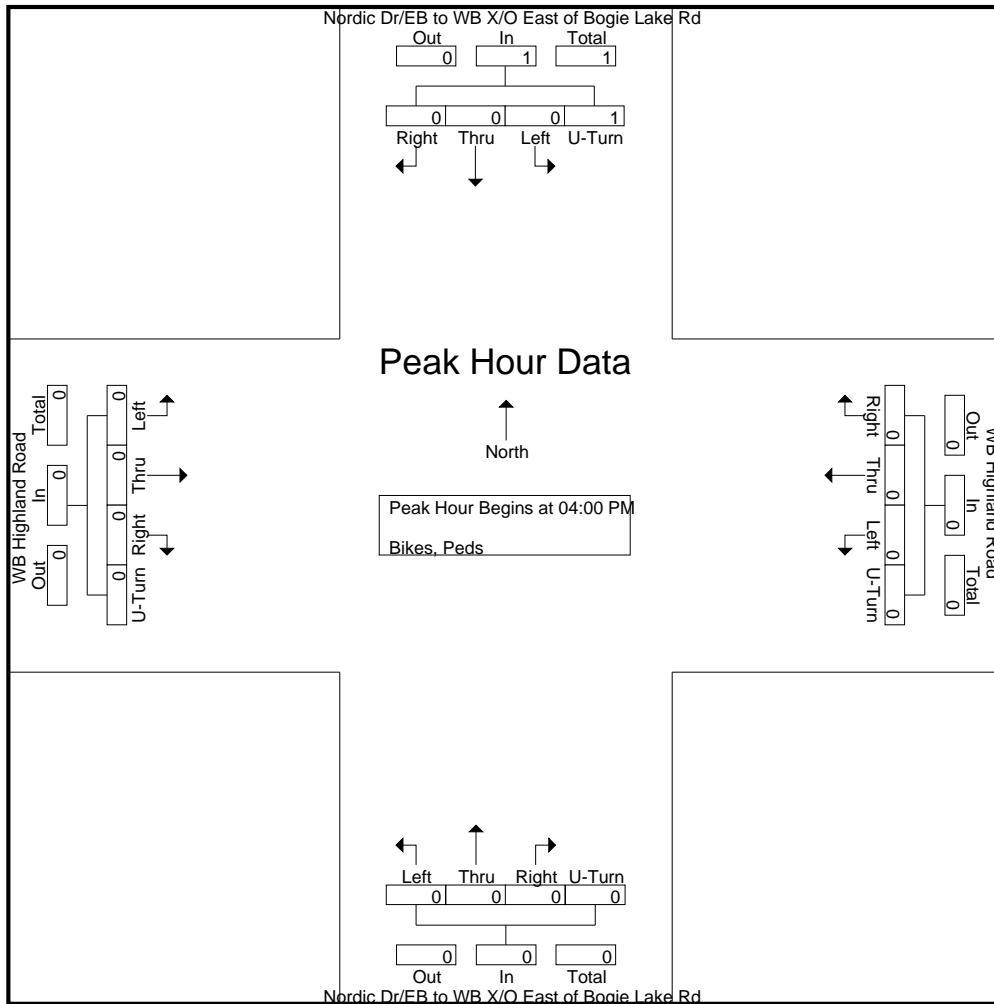
Groups Printed- Bikes, Peds

Start Time	WB Highland Road Eastbound					WB Highland Road Westbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Northbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Southbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	
Apprch %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100		
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100		





Start Time	WB Highland Road Eastbound					WB Highland Road Westbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Northbound					Nordic Dr/EB to WB X/O East of Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	100
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.250

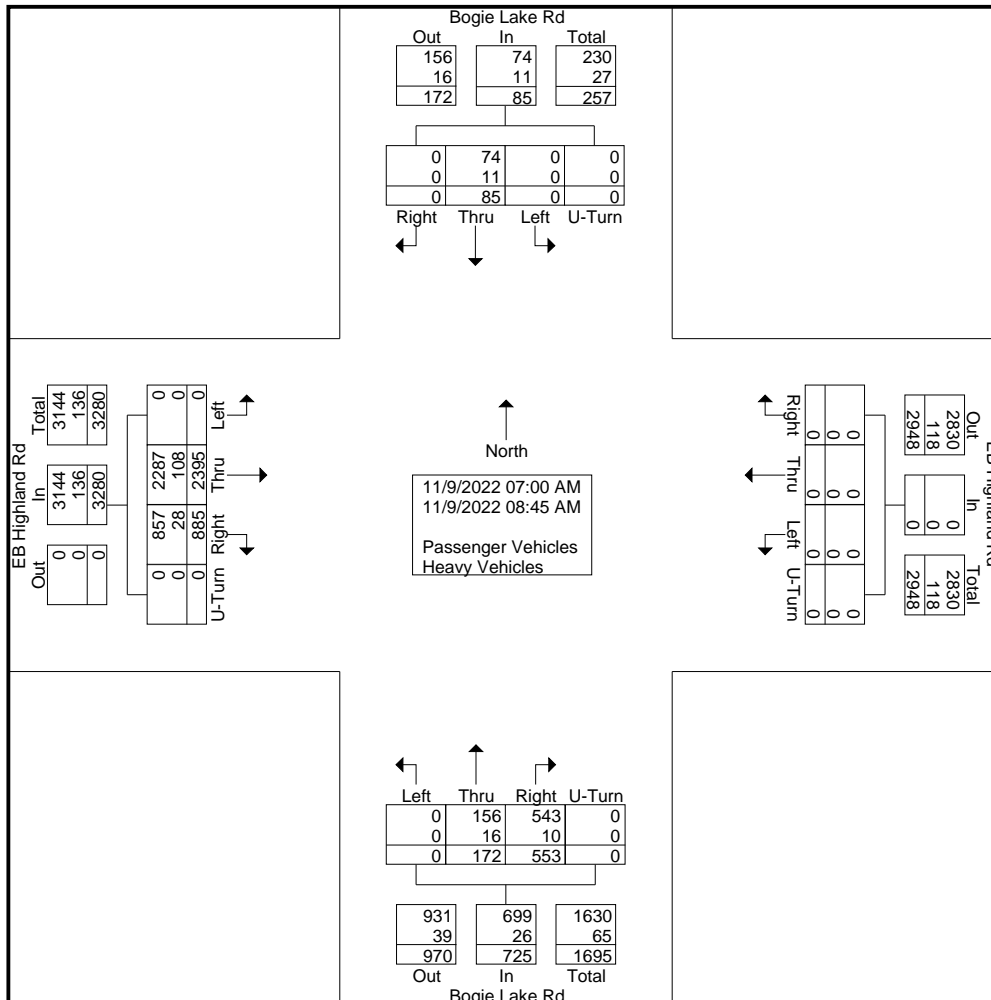




File Name : 15997007 - Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997007
 Start Date : 11/9/2022
 Page No : 1

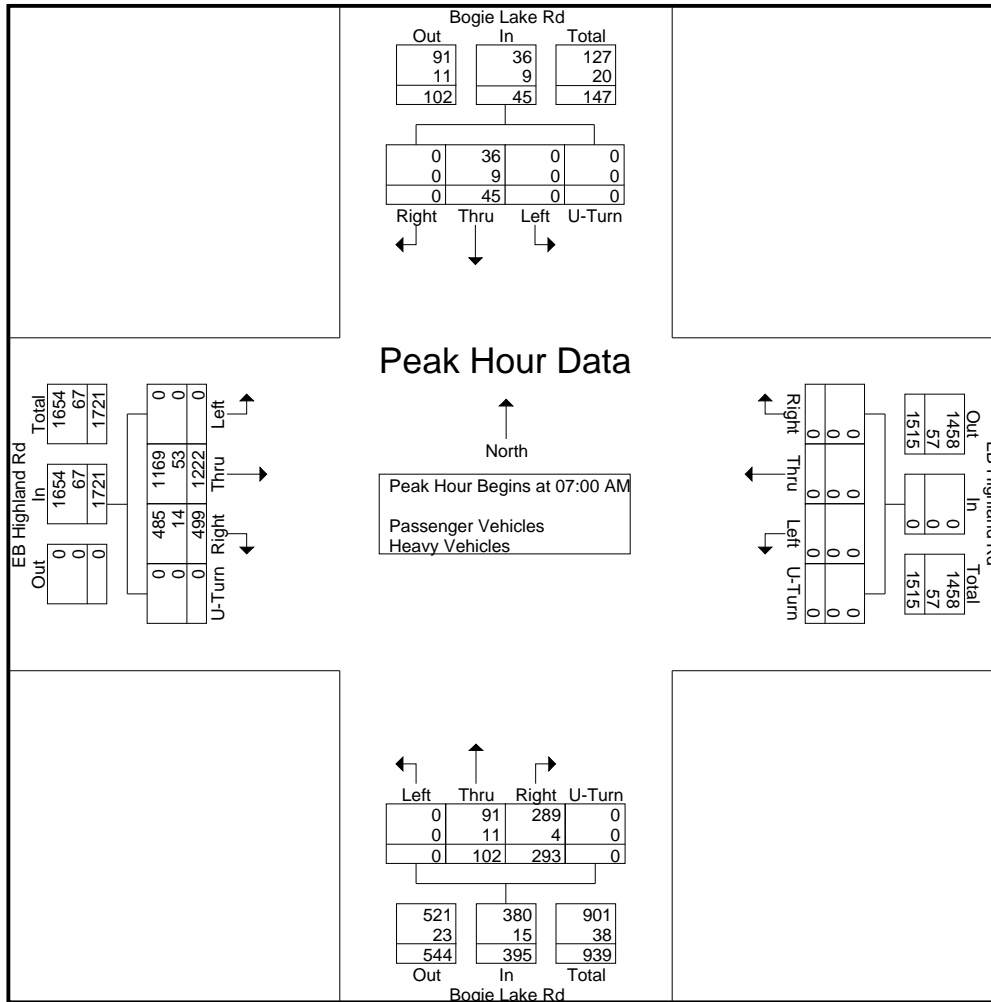
Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
07:00 AM	0	294	190	0	484	0	0	0	0	0	0	32	76	0	108	0	14	0	0	14	606
07:15 AM	0	331	85	0	416	0	0	0	0	0	0	29	84	0	113	0	7	0	0	7	536
07:30 AM	0	313	110	0	423	0	0	0	0	0	0	24	69	0	93	0	10	0	0	10	526
07:45 AM	0	284	114	0	398	0	0	0	0	0	0	17	64	0	81	0	14	0	0	14	493
Total	0	1222	499	0	1721	0	0	0	0	0	0	102	293	0	395	0	45	0	0	45	2161
08:00 AM	0	293	130	0	423	0	0	0	0	0	0	26	78	0	104	0	11	0	0	11	538
08:15 AM	0	317	91	0	408	0	0	0	0	0	0	19	64	0	83	0	7	0	0	7	498
08:30 AM	0	283	68	0	351	0	0	0	0	0	0	14	49	0	63	0	7	0	0	7	421
08:45 AM	0	280	97	0	377	0	0	0	0	0	0	11	69	0	80	0	15	0	0	15	472
Total	0	1173	386	0	1559	0	0	0	0	0	0	70	260	0	330	0	40	0	0	40	1929
Grand Total	0	2395	885	0	3280	0	0	0	0	0	0	172	553	0	725	0	85	0	0	85	4090
Apprch %	0	73	27	0		0	0	0	0	0	0	23.7	76.3	0		0	100	0	0		
Total %	0	58.6	21.6	0	80.2	0	0	0	0	0	0	4.2	13.5	0	17.7	0	2.1	0	0	2.1	
Passenger Vehicles	0	2287	857	0	3144	0	0	0	0	0	0	156	543	0	699	0	74	0	0	74	3917
% Passenger Vehicles	0	95.5	96.8	0	95.9	0	0	0	0	0	0	90.7	98.2	0	96.4	0	87.1	0	0	87.1	95.8
Heavy Vehicles	0	108	28	0	136	0	0	0	0	0	0	16	10	0	26	0	11	0	0	11	173
% Heavy Vehicles	0	4.5	3.2	0	4.1	0	0	0	0	0	0	9.3	1.8	0	3.6	0	12.9	0	0	12.9	4.2





Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	294	190	0	484	0	0	0	0	0	0	32	76	0	108	0	14	0	0	14	606
07:15 AM	0	331	85	0	416	0	0	0	0	0	0	29	84	0	113	0	7	0	0	7	536
07:30 AM	0	313	110	0	423	0	0	0	0	0	0	24	69	0	93	0	10	0	0	10	526
07:45 AM	0	284	114	0	398	0	0	0	0	0	0	17	64	0	81	0	14	0	0	14	493
Total Volume	0	1222	499	0	1721	0	0	0	0	0	0	102	293	0	395	0	45	0	0	45	2161
% App. Total	0	71	29	0		0	0	0	0	0	0	25.8	74.2	0		0	100	0	0		
PHF	.000	.923	.657	.000	.889	.000	.000	.000	.000	.000	.000	.797	.872	.000	.874	.000	.804	.000	.000	.804	.892
Passenger Vehicles	0	1169	485	0	1654	0	0	0	0	0	0	91	289	0	380	0	36	0	0	36	2070
% Passenger Vehicles	0	95.7	97.2	0	96.1	0	0	0	0	0	0	89.2	98.6	0	96.2	0	80.0	0	0	80.0	95.8
Heavy Vehicles	0	53	14	0	67	0	0	0	0	0	0	11	4	0	15	0	9	0	0	9	91
% Heavy Vehicles	0	4.3	2.8	0	3.9	0	0	0	0	0	0	10.8	1.4	0	3.8	0	20.0	0	0	20.0	4.2

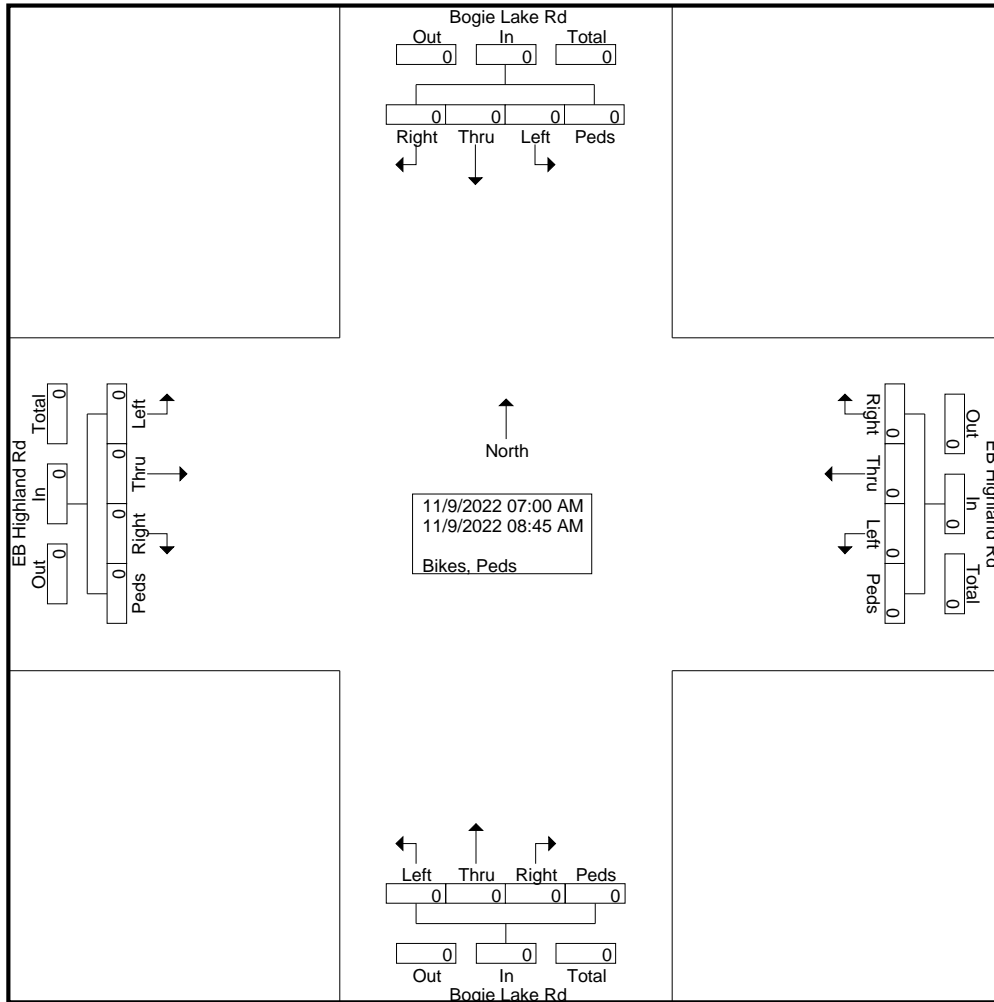




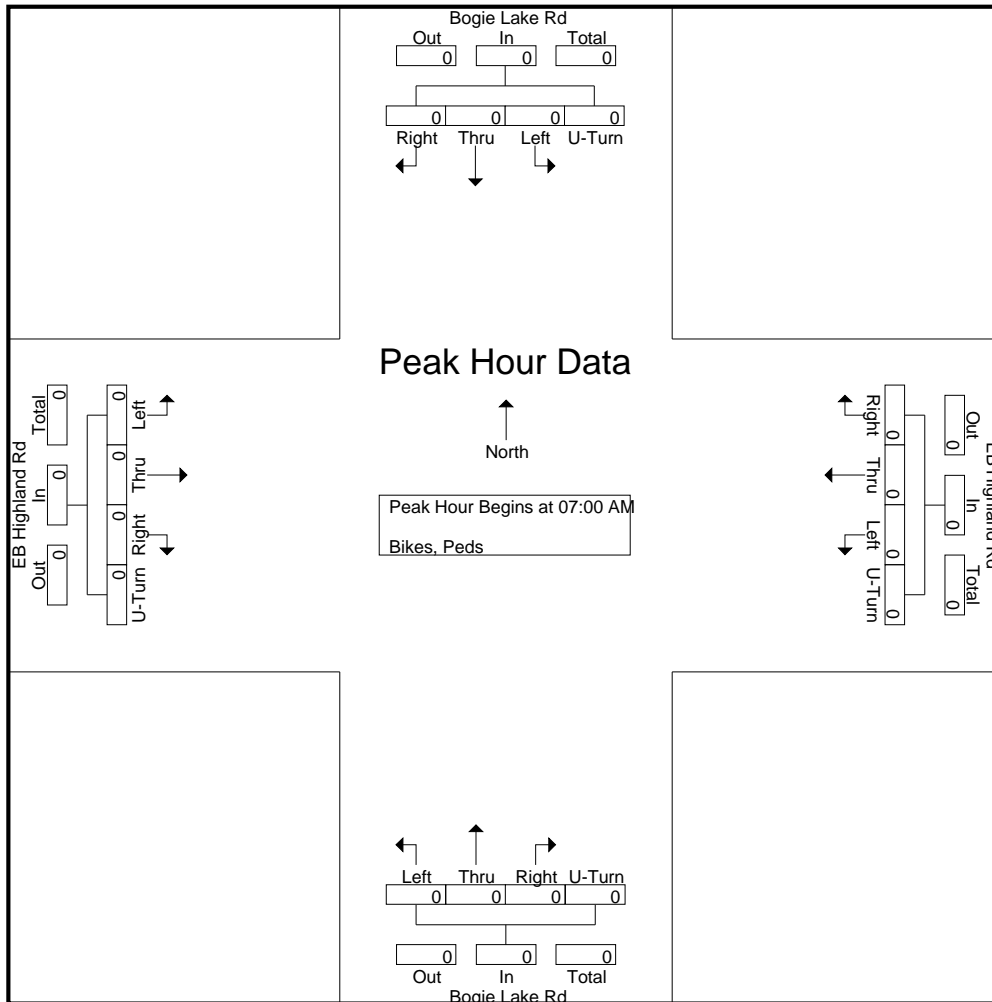
File Name : 15997007 - Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997007
 Start Date : 11/9/2022
 Page No : 1

Groups Printed- Bikes, Peds

Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total						
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																										



Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

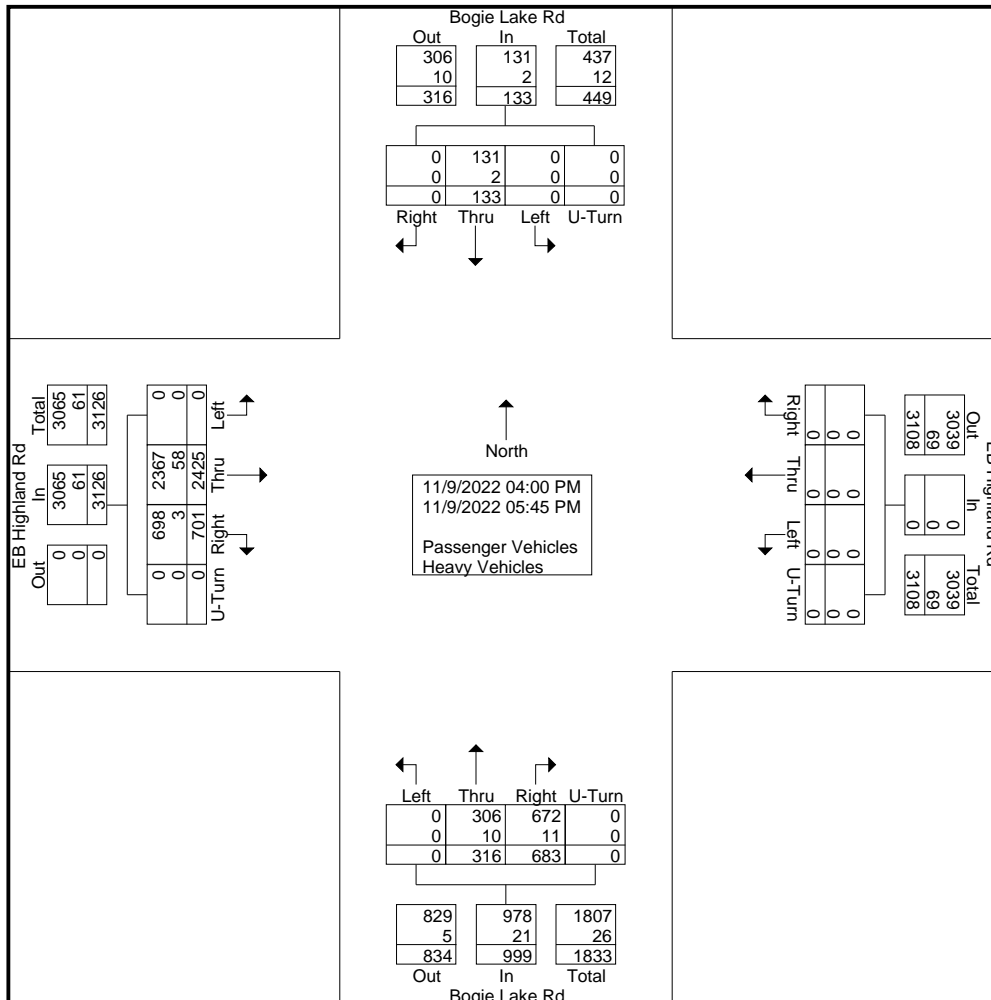




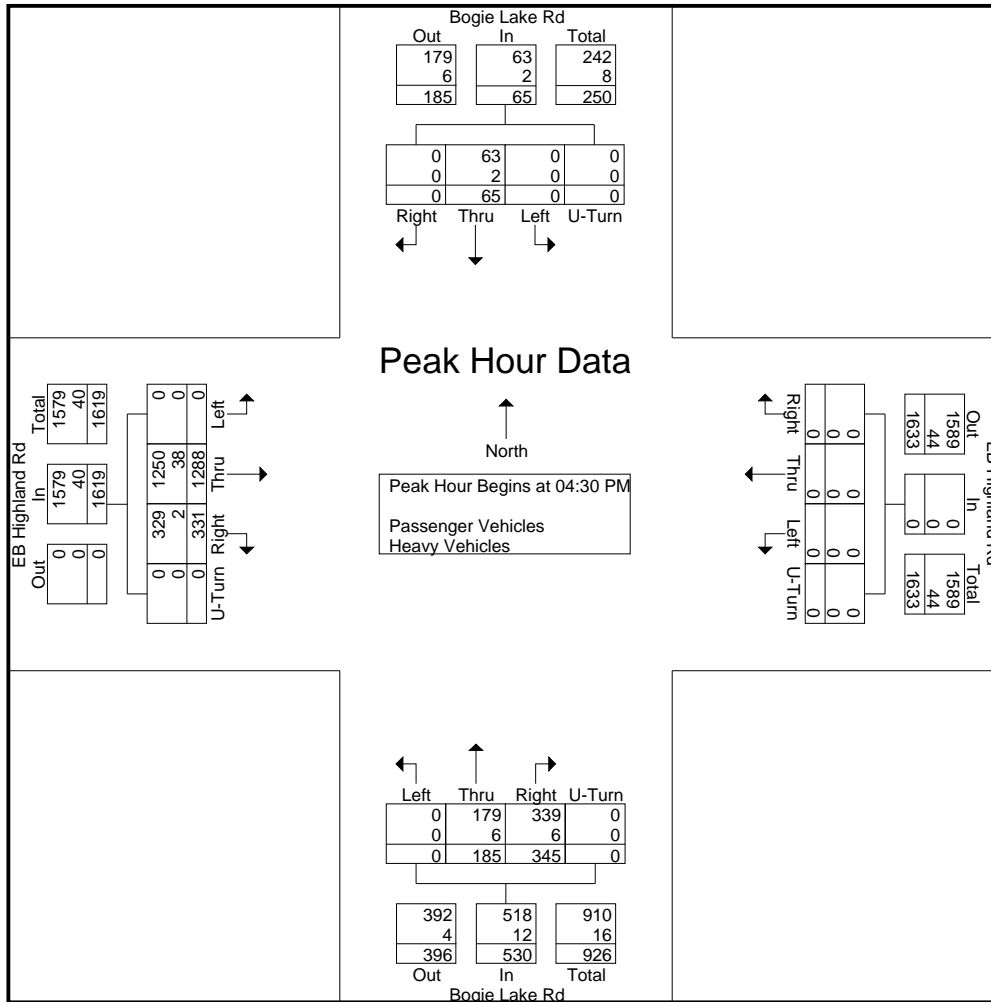
File Name : 15997008 - Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997008
 Start Date : 11/9/2022
 Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
04:00 PM	0	266	64	0	330	0	0	0	0	0	0	31	106	0	137	0	18	0	0	18	485
04:15 PM	0	291	82	0	373	0	0	0	0	0	0	40	100	0	140	0	15	0	0	15	528
04:30 PM	0	336	80	0	416	0	0	0	0	0	0	48	87	0	135	0	19	0	0	19	570
04:45 PM	0	334	82	0	416	0	0	0	0	0	0	44	86	0	130	0	15	0	0	15	561
Total	0	1227	308	0	1535	0	0	0	0	0	0	163	379	0	542	0	67	0	0	67	2144
05:00 PM	0	295	85	0	380	0	0	0	0	0	0	54	88	0	142	0	16	0	0	16	538
05:15 PM	0	323	84	0	407	0	0	0	0	0	0	39	84	0	123	0	15	0	0	15	545
05:30 PM	0	306	100	0	406	0	0	0	0	0	0	39	66	0	105	0	16	0	0	16	527
05:45 PM	0	274	124	0	398	0	0	0	0	0	0	21	66	0	87	0	19	0	0	19	504
Total	0	1198	393	0	1591	0	0	0	0	0	0	153	304	0	457	0	66	0	0	66	2114
Grand Total	0	2425	701	0	3126	0	0	0	0	0	0	316	683	0	999	0	133	0	0	133	4258
Apprch %	0	77.6	22.4	0		0	0	0	0	0	0	31.6	68.4	0		0	100	0	0		
Total %	0	57	16.5	0	73.4	0	0	0	0	0	0	7.4	16	0	23.5	0	3.1	0	0	3.1	
Passenger Vehicles	0	2367	698	0	3065	0	0	0	0	0	0	306	672	0	978	0	131	0	0	131	4174
% Passenger Vehicles	0	97.6	99.6	0	98	0	0	0	0	0	0	96.8	98.4	0	97.9	0	98.5	0	0	98.5	98
Heavy Vehicles	0	58	3	0	61	0	0	0	0	0	0	10	11	0	21	0	2	0	0	2	84
% Heavy Vehicles	0	2.4	0.4	0	2	0	0	0	0	0	0	3.2	1.6	0	2.1	0	1.5	0	0	1.5	2



Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	336	80	0	416	0	0	0	0	0	0	48	87	0	135	0	19	0	0	19	570
04:45 PM	0	334	82	0	416	0	0	0	0	0	0	44	86	0	130	0	15	0	0	15	561
05:00 PM	0	295	85	0	380	0	0	0	0	0	0	54	88	0	142	0	16	0	0	16	538
05:15 PM	0	323	84	0	407	0	0	0	0	0	0	39	84	0	123	0	15	0	0	15	545
Total Volume	0	1288	331	0	1619	0	0	0	0	0	0	185	345	0	530	0	65	0	0	65	2214
% App. Total	0	79.6	20.4	0		0	0	0	0	0	0	34.9	65.1	0		0	100	0	0		
PHF	.000	.958	.974	.000	.973	.000	.000	.000	.000	.000	.000	.856	.980	.000	.933	.000	.855	.000	.000	.855	.971
Passenger Vehicles	0	1250	329	0	1579	0	0	0	0	0	0	179	339	0	518	0	63	0	0	63	2160
% Passenger Vehicles	0	97.0	99.4	0	97.5	0	0	0	0	0	0	96.8	98.3	0	97.7	0	96.9	0	0	96.9	97.6
Heavy Vehicles	0	38	2	0	40	0	0	0	0	0	0	6	6	0	12	0	2	0	0	2	54
% Heavy Vehicles	0	3.0	0.6	0	2.5	0	0	0	0	0	0	3.2	1.7	0	2.3	0	3.1	0	0	3.1	2.4

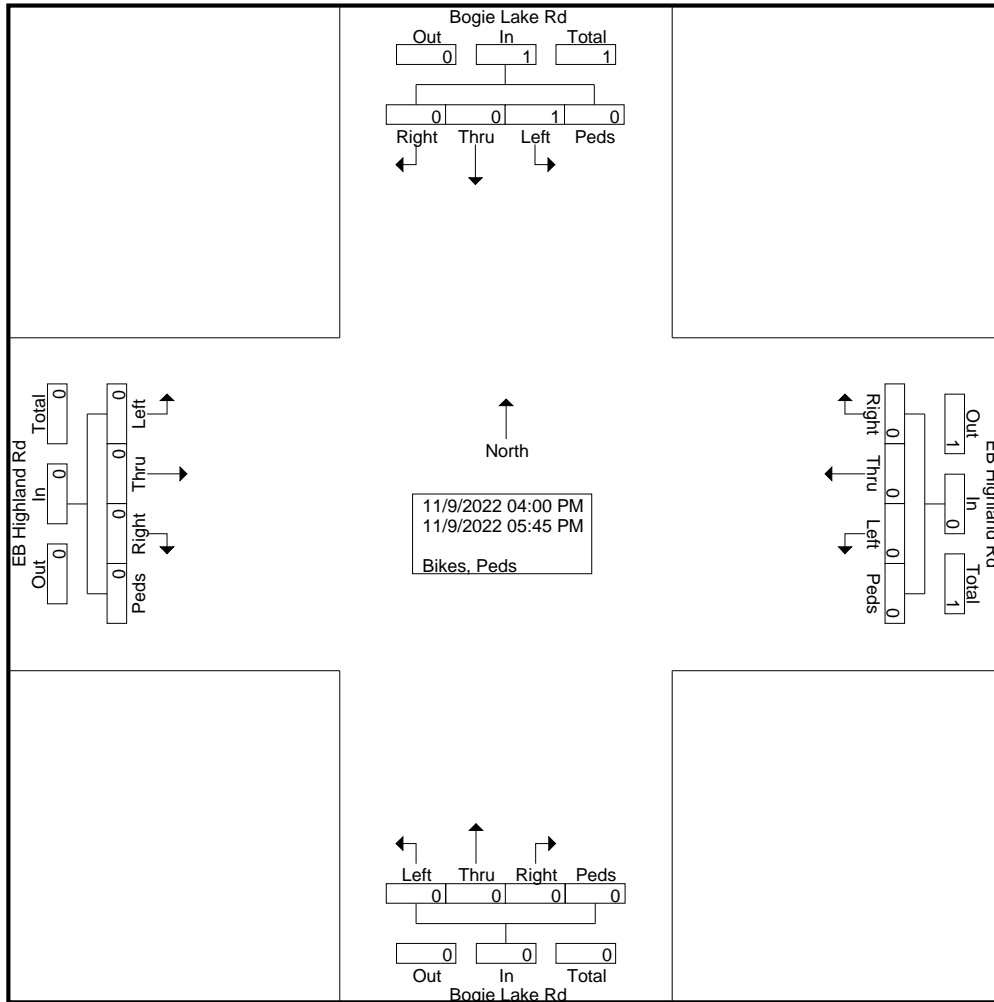




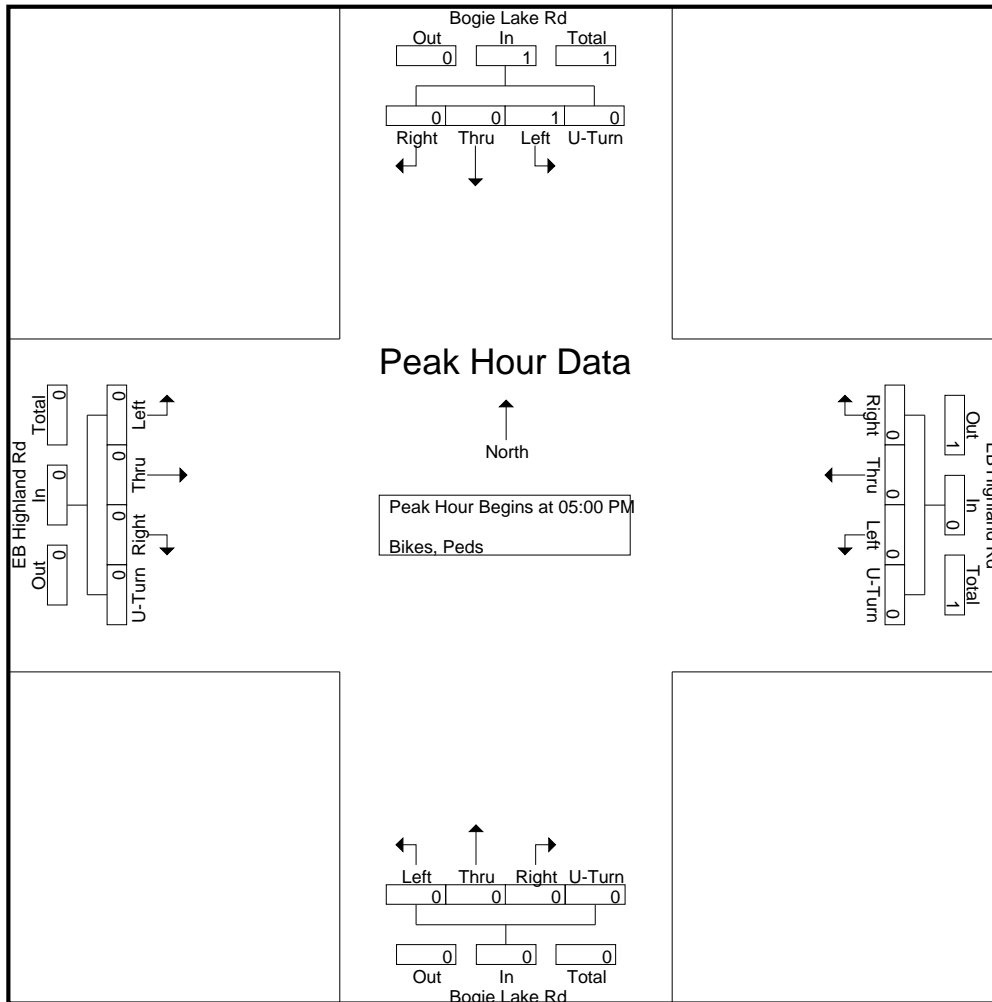
File Name : 15997008 - Bogie Lake Rd -- EB Highland Rd
 Site Code : 15997008
 Start Date : 11/9/2022
 Page No : 1

Groups Printed- Bikes, Peds

Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		100	0	0	0		
Total %	0	0	0	0		0	0	0	0		0	0	0	0		100	0	0	0	100	



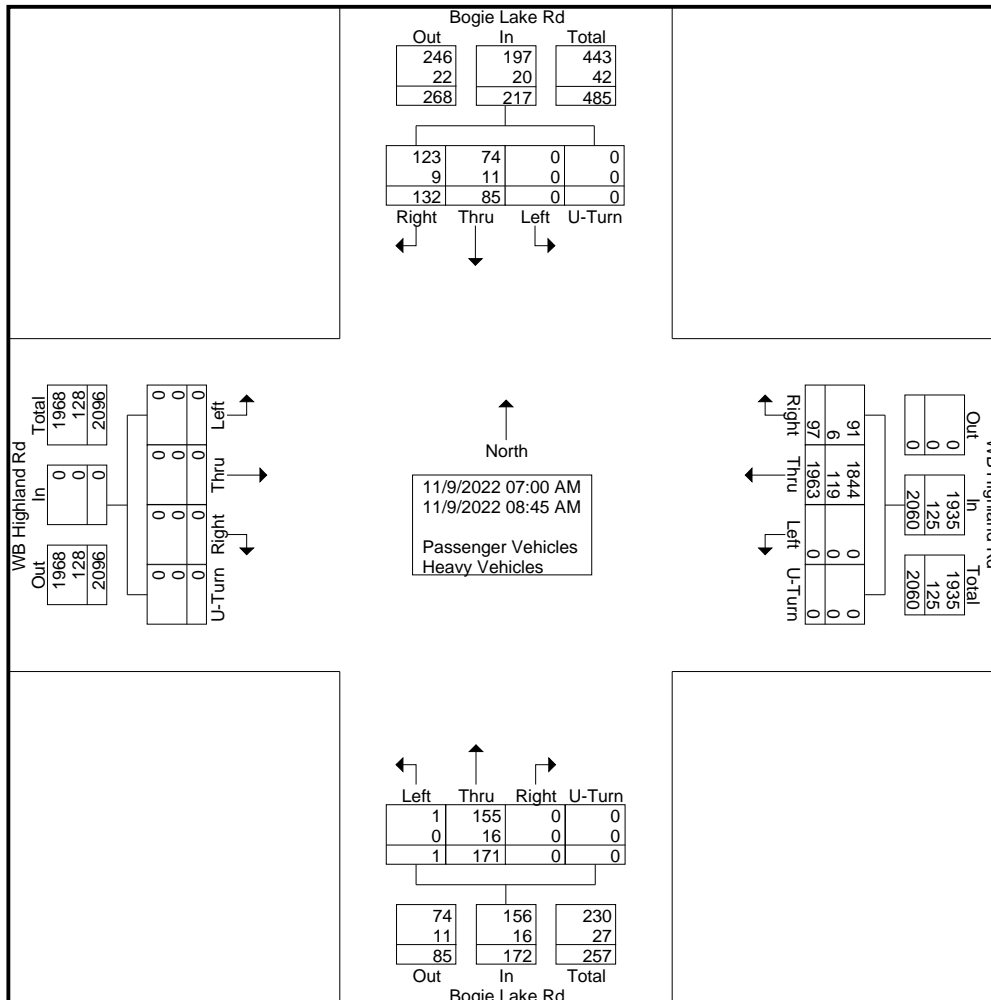
Start Time	EB Highland Rd Eastbound					EB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	1
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.000	.250	.250





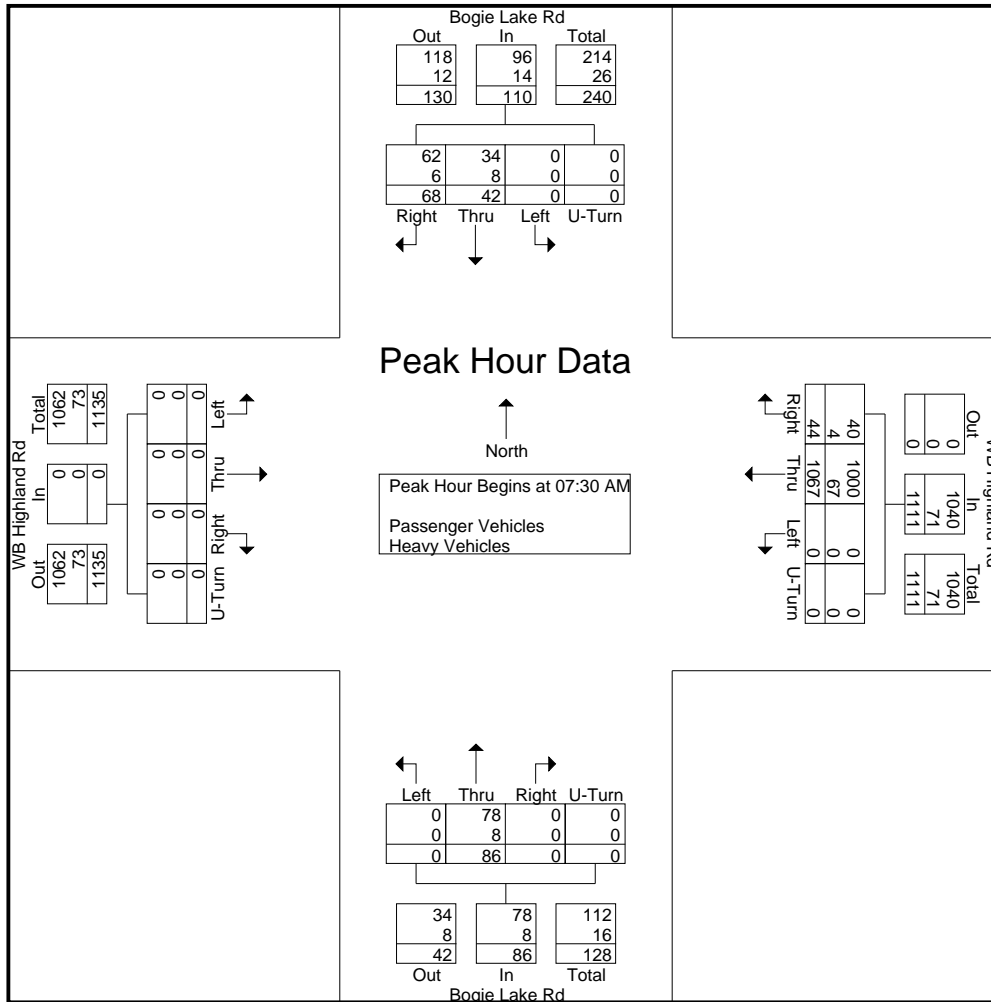
Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	WB Highland Rd Eastbound					WB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
07:00 AM	0	0	0	0	0	0	211	9	0	220	1	31	0	0	32	0	14	24	0	38	290
07:15 AM	0	0	0	0	0	0	218	9	0	227	0	29	0	0	29	0	7	23	0	30	286
07:30 AM	0	0	0	0	0	0	290	11	0	301	0	24	0	0	24	0	10	16	0	26	351
07:45 AM	0	0	0	0	0	0	282	9	0	291	0	17	0	0	17	0	14	14	0	28	336
Total	0	0	0	0	0	0	1001	38	0	1039	1	101	0	0	102	0	45	77	0	122	1263
08:00 AM	0	0	0	0	0	0	247	14	0	261	0	26	0	0	26	0	11	18	0	29	316
08:15 AM	0	0	0	0	0	0	248	10	0	258	0	19	0	0	19	0	7	20	0	27	304
08:30 AM	0	0	0	0	0	0	229	16	0	245	0	14	0	0	14	0	7	9	0	16	275
08:45 AM	0	0	0	0	0	0	238	19	0	257	0	11	0	0	11	0	15	8	0	23	291
Total	0	0	0	0	0	0	962	59	0	1021	0	70	0	0	70	0	40	55	0	95	1186
Grand Total	0	0	0	0	0	0	1963	97	0	2060	1	171	0	0	172	0	85	132	0	217	2449
Apprch %	0	0	0	0		0	95.3	4.7	0		0.6	99.4	0	0		0	39.2	60.8	0		
Total %	0	0	0	0	0	0	80.2	4	0	84.1	0	7	0	0	7	0	3.5	5.4	0	8.9	
Passenger Vehicles	0	0	0	0	0	0	1844	91	0	1935	1	155	0	0	156	0	74	123	0	197	2288
% Passenger Vehicles	0	0	0	0	0	0	93.9	93.8	0	93.9	100	90.6	0	0	90.7	0	87.1	93.2	0	90.8	93.4
Heavy Vehicles	0	0	0	0	0	0	119	6	0	125	0	16	0	0	16	0	11	9	0	20	161
% Heavy Vehicles	0	0	0	0	0	0	6.1	6.2	0	6.1	0	9.4	0	0	9.3	0	12.9	6.8	0	9.2	6.6





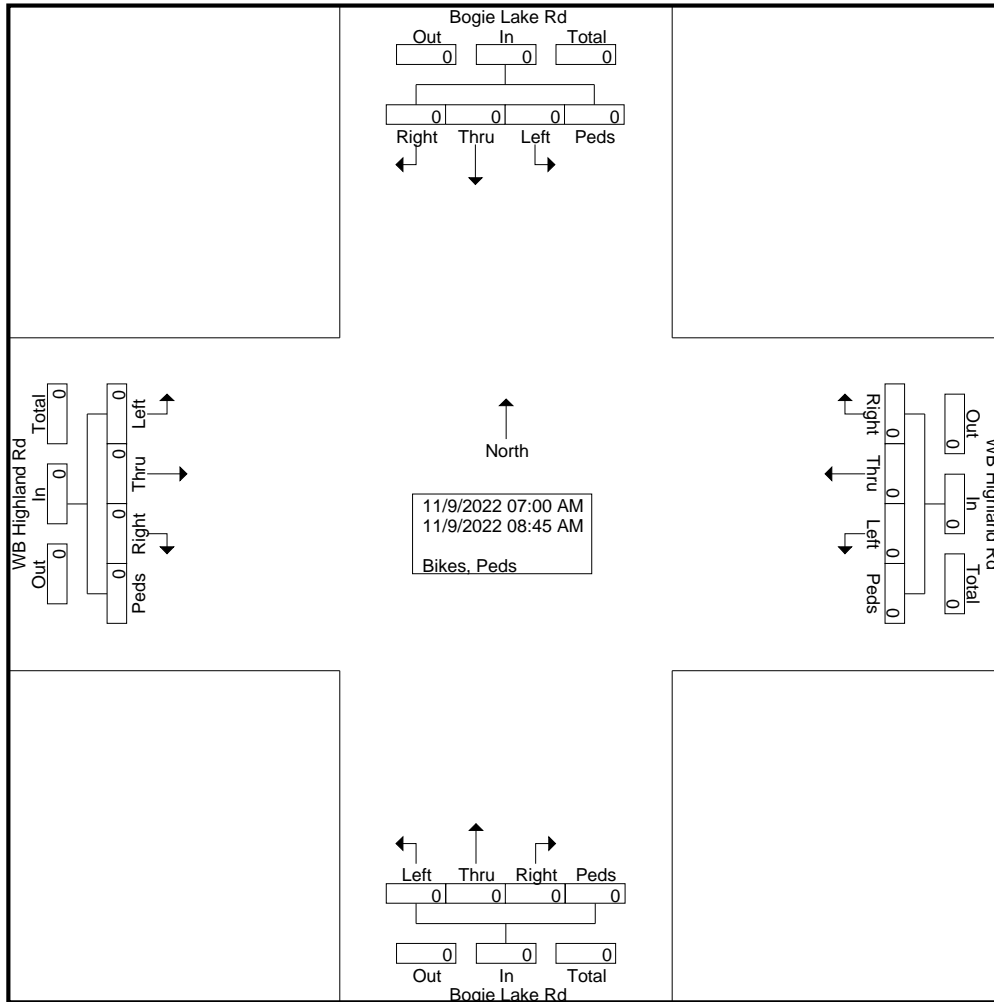
Start Time	WB Highland Rd Eastbound					WB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	0	290	11	0	301	0	24	0	0	24	0	10	16	0	26	351
07:45 AM	0	0	0	0	0	0	282	9	0	291	0	17	0	0	17	0	14	14	0	28	336
08:00 AM	0	0	0	0	0	0	247	14	0	261	0	26	0	0	26	0	11	18	0	29	316
08:15 AM	0	0	0	0	0	0	248	10	0	258	0	19	0	0	19	0	7	20	0	27	304
Total Volume	0	0	0	0	0	0	1067	44	0	1111	0	86	0	0	86	0	42	68	0	110	1307
% App. Total	0	0	0	0	0	0	96	4	0	100	0	100	0	0	100	0	38.2	61.8	0	100	
PHF	.000	.000	.000	.000	.000	.000	.920	.786	.000	.923	.000	.827	.000	.000	.827	.000	.750	.850	.000	.948	.931
Passenger Vehicles	0	0	0	0	0	0	1000	40	0	1040	0	78	0	0	78	0	34	62	0	96	1214
% Passenger Vehicles	0	0	0	0	0	0	93.7	90.9	0	93.6	0	90.7	0	0	90.7	0	81.0	91.2	0	87.3	92.9
Heavy Vehicles	0	0	0	0	0	0	67	4	0	71	0	8	0	0	8	0	8	6	0	14	93
% Heavy Vehicles	0	0	0	0	0	0	6.3	9.1	0	6.4	0	9.3	0	0	9.3	0	19.0	8.8	0	12.7	7.1





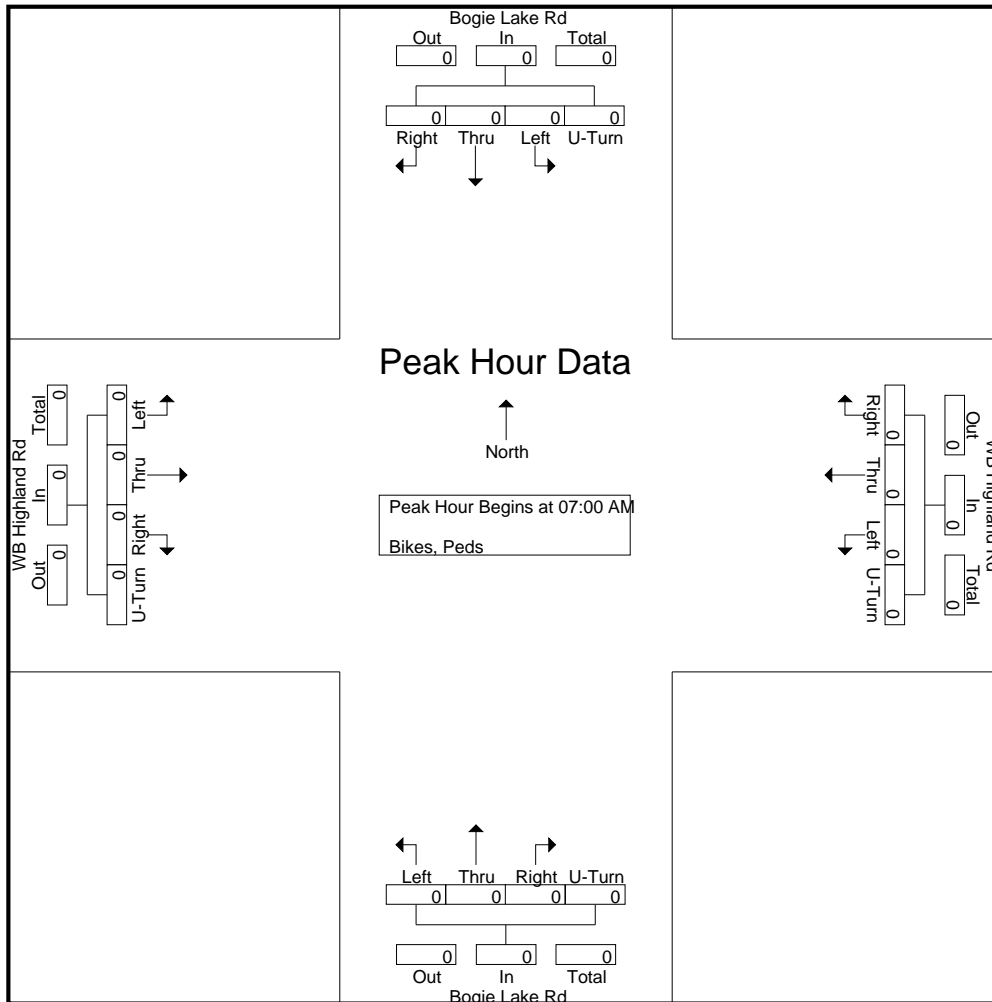
Groups Printed- Bikes, Peds

Start Time	WB Highland Rd Eastbound					WB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					





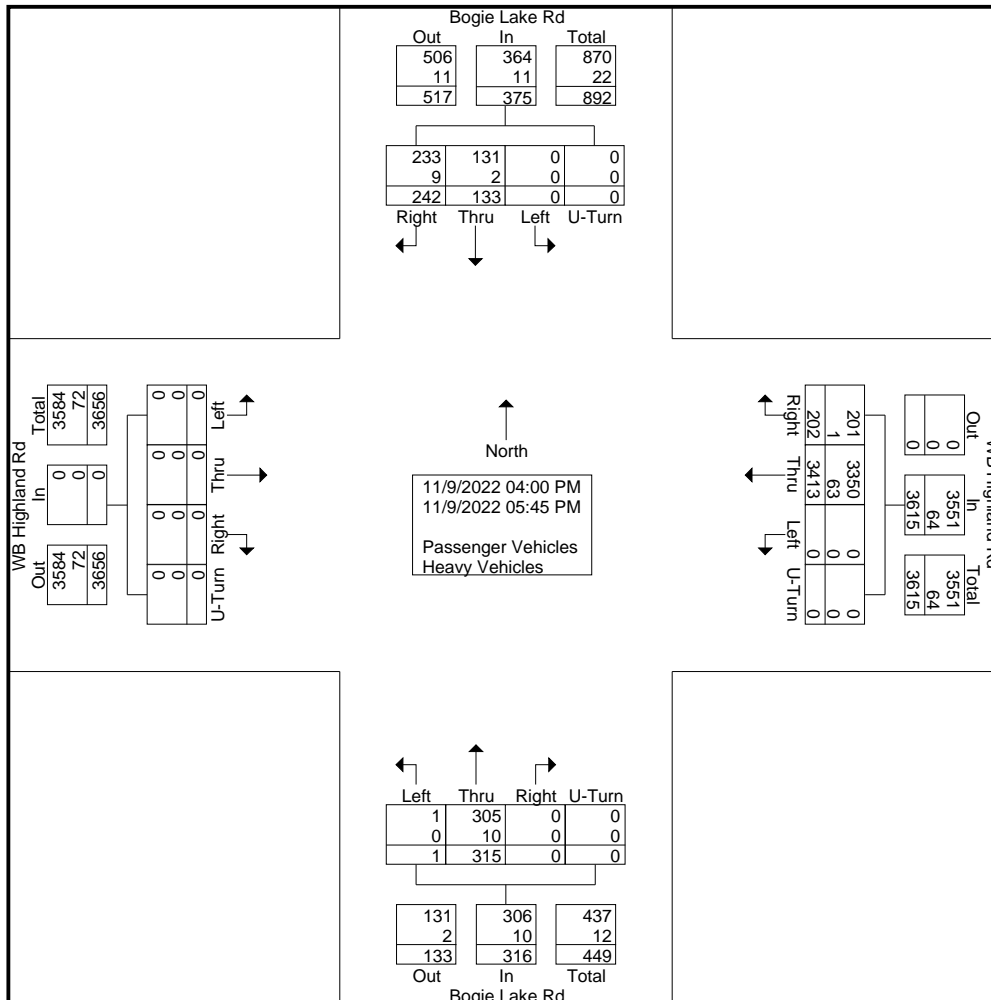
Start Time	WB Highland Rd Eastbound					WB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000





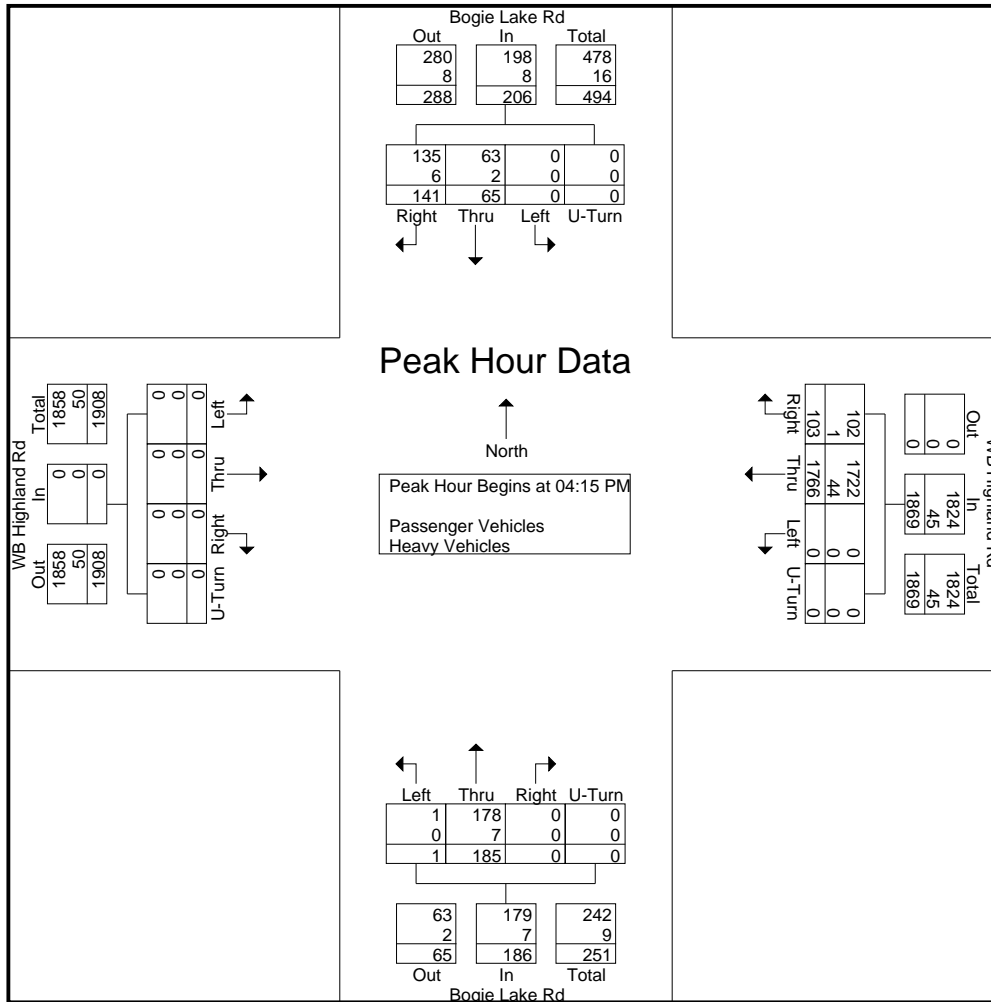
Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	WB Highland Rd Eastbound					WB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
04:00 PM	0	0	0	0	0	0	378	21	0	399	0	31	0	0	31	0	18	23	0	41	471
04:15 PM	0	0	0	0	0	0	489	29	0	518	1	39	0	0	40	0	15	30	0	45	603
04:30 PM	0	0	0	0	0	0	390	24	0	414	0	48	0	0	48	0	19	34	0	53	515
04:45 PM	0	0	0	0	0	0	454	29	0	483	0	44	0	0	44	0	15	37	0	52	579
Total	0	0	0	0	0	0	1711	103	0	1814	1	162	0	0	163	0	67	124	0	191	2168
05:00 PM	0	0	0	0	0	0	433	21	0	454	0	54	0	0	54	0	16	40	0	56	564
05:15 PM	0	0	0	0	0	0	456	26	0	482	0	39	0	0	39	0	15	34	0	49	570
05:30 PM	0	0	0	0	0	0	420	36	0	456	0	39	0	0	39	0	16	30	0	46	541
05:45 PM	0	0	0	0	0	0	393	16	0	409	0	21	0	0	21	0	19	14	0	33	463
Total	0	0	0	0	0	0	1702	99	0	1801	0	153	0	0	153	0	66	118	0	184	2138
Grand Total	0	0	0	0	0	0	3413	202	0	3615	1	315	0	0	316	0	133	242	0	375	4306
Apprch %	0	0	0	0		0	94.4	5.6	0		0.3	99.7	0	0		0	35.5	64.5	0		
Total %	0	0	0	0	0	0	79.3	4.7	0	84	0	7.3	0	0	7.3	0	3.1	5.6	0	8.7	
Passenger Vehicles	0	0	0	0	0	0	3350	201	0	3551	1	305	0	0	306	0	131	233	0	364	4221
% Passenger Vehicles	0	0	0	0	0	0	98.2	99.5	0	98.2	100	96.8	0	0	96.8	0	98.5	96.3	0	97.1	98
Heavy Vehicles	0	0	0	0	0	0	63	1	0	64	0	10	0	0	10	0	2	9	0	11	85
% Heavy Vehicles	0	0	0	0	0	0	1.8	0.5	0	1.8	0	3.2	0	0	3.2	0	1.5	3.7	0	2.9	2





Start Time	WB Highland Rd Eastbound					WB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	0	489	29	0	518	1	39	0	0	40	0	15	30	0	45	603
04:30 PM	0	0	0	0	0	0	390	24	0	414	0	48	0	0	48	0	19	34	0	53	515
04:45 PM	0	0	0	0	0	0	454	29	0	483	0	44	0	0	44	0	15	37	0	52	579
05:00 PM	0	0	0	0	0	0	433	21	0	454	0	54	0	0	54	0	16	40	0	56	564
Total Volume	0	0	0	0	0	0	1766	103	0	1869	1	185	0	0	186	0	65	141	0	206	2261
% App. Total	0	0	0	0	0	0	94.5	5.5	0		0.5	99.5	0	0		0	31.6	68.4	0		
PHF	.000	.000	.000	.000	.000	.000	.903	.888	.000	.902	.250	.856	.000	.000	.861	.000	.855	.881	.000	.920	.937
Passenger Vehicles	0	0	0	0	0	0	1722	102	0	1824	1	178	0	0	179	0	63	135	0	198	2201
% Passenger Vehicles	0	0	0	0	0	0	97.5	99.0	0	97.6	100	96.2	0	0	96.2	0	96.9	95.7	0	96.1	97.3
Heavy Vehicles	0	0	0	0	0	0	44	1	0	45	0	7	0	0	7	0	2	6	0	8	60
% Heavy Vehicles	0	0	0	0	0	0	2.5	1.0	0	2.4	0	3.8	0	0	3.8	0	3.1	4.3	0	3.9	2.7

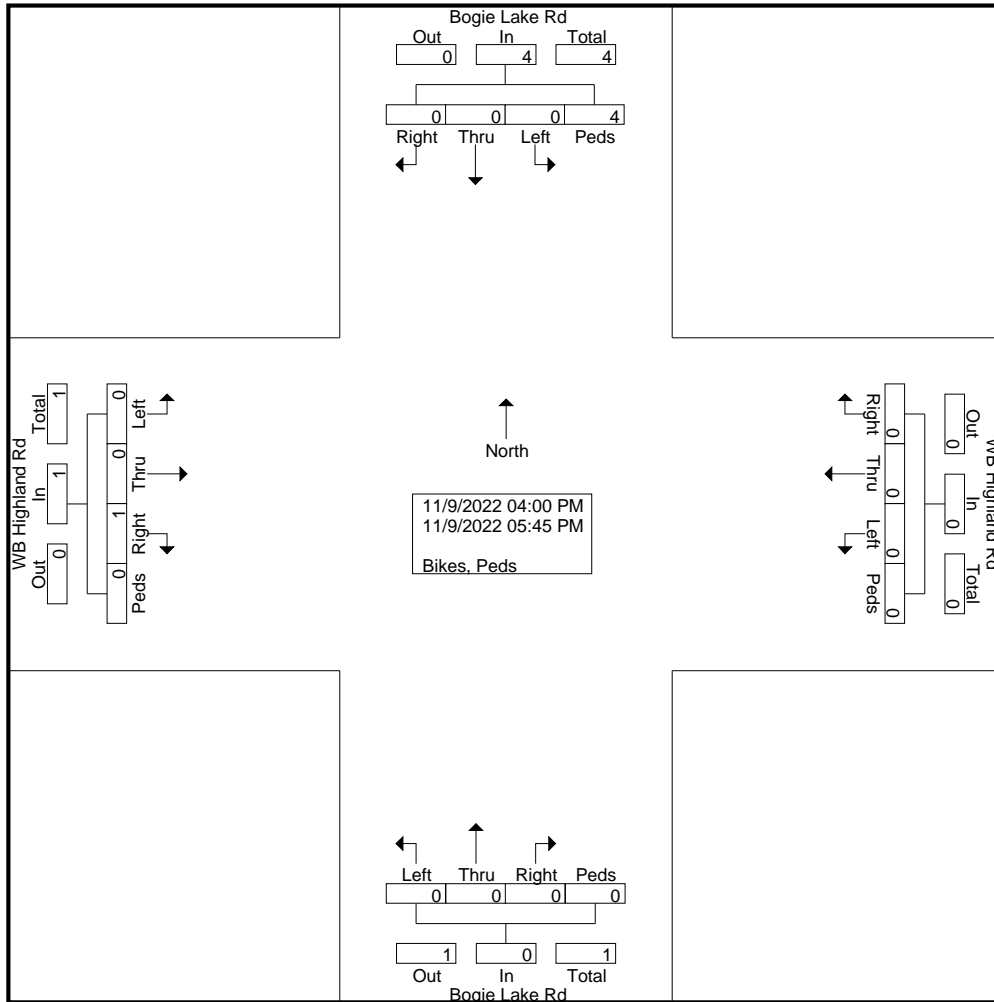




File Name : 15997010 - Bogie Lake Rd -- WB Highland Rd
 Site Code : 15997010
 Start Date : 11/9/2022
 Page No : 1

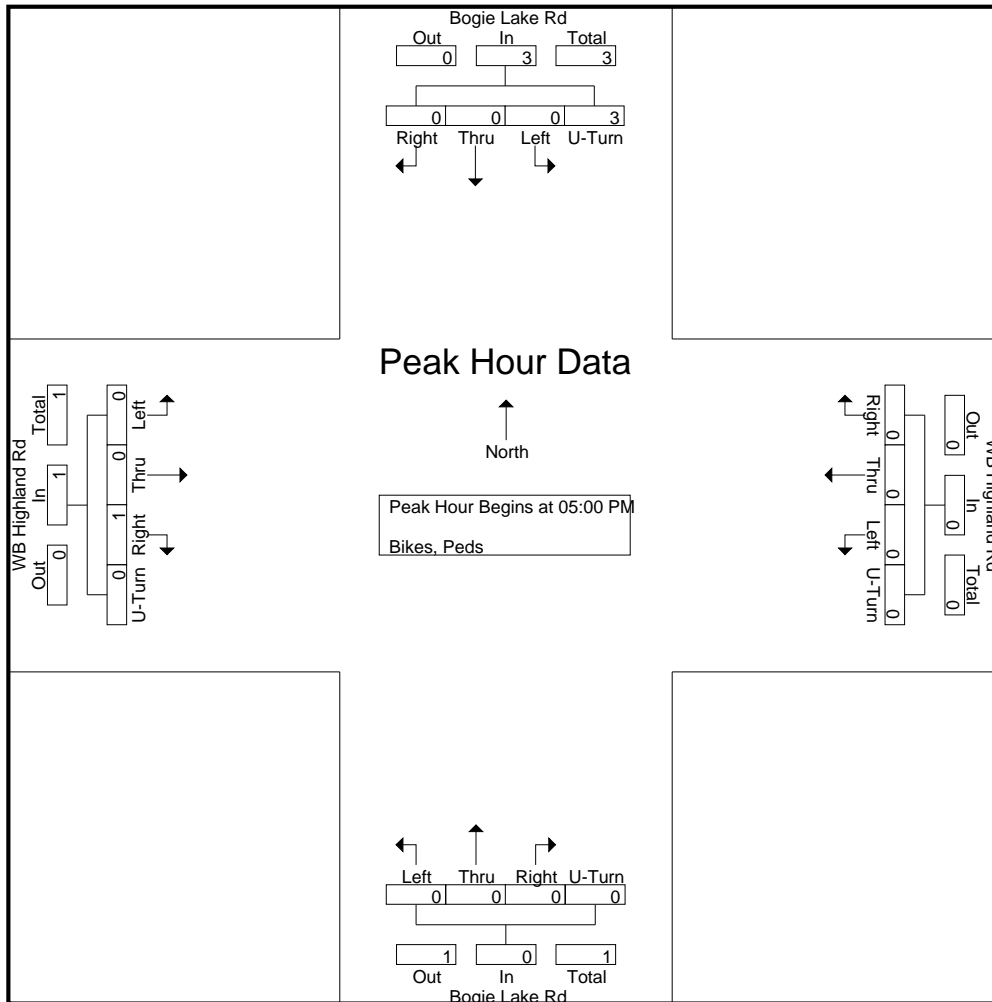
Groups Printed- Bikes, Peds

Start Time	WB Highland Rd Eastbound					WB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	4
Grand Total	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	5
Apprch %	0	0	100	0		0	0	0	0		0	0	0	0		0	0	0	100		
Total %	0	0	20	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	80	80	





Start Time	WB Highland Rd Eastbound					WB Highland Rd Westbound					Bogie Lake Rd Northbound					Bogie Lake Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	4
% App. Total	0	0	100	0		0	0	0	0		0	0	0	0		0	0	0	100		
PHF	.000	.000	.250	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.333





Crash and Road Data

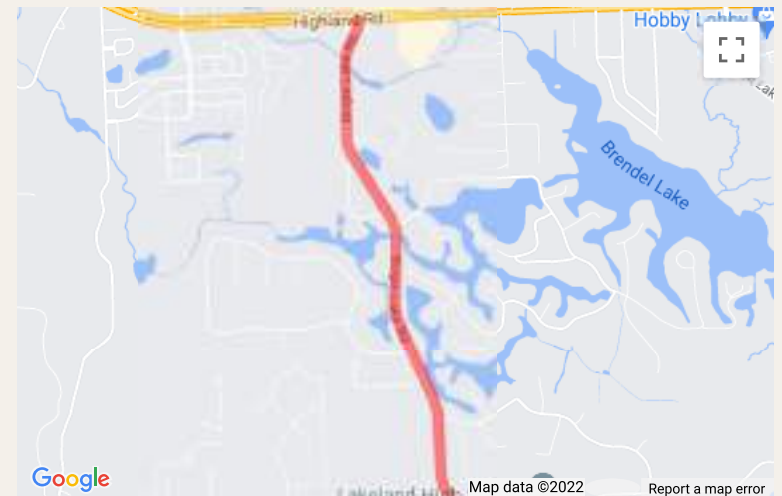
Road Segment Report

Bogie Lake Rd, (PR Number 703507)

From:	Bogie Lake Rd 0.000 BMP
To:	Highland Rd 1.555 EMP
Jurisdiction:	County
FALINK ID:	2902
Community:	White Lake Township
County:	Oakland
Functional Class:	4 - Minor Arterial
Direction:	1 Way
Length:	1.555 miles
Number of Lanes:	2
Posted Speed:	45 (source: TCO)
Route Classification:	Not a route
Annual Crash Average 2017-2021:	<u>21</u>
Traffic Volume (2021)*:	10,200 (Observed AADT)
Pavement Type (2021):	Asphalt
Pavement Rating (2021):	Fair
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	No long-range projects for this segment.

* AADT values are derived from **Traffic Counts**

Street View





Crash and Road Data

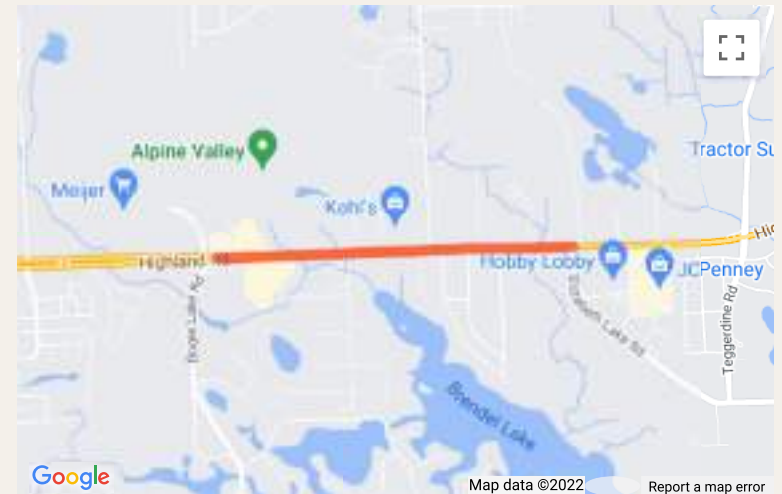
Road Segment Report

Highland Rd, (PR Number 648906)

From:	Highland Rd 8.294 BMP
To:	Elizabeth Lake Rd 9.396 EMP
Jurisdiction:	State
FALINK ID:	1764
Community:	White Lake Township
County:	Oakland
Functional Class:	3 - Other Principal Arterial
Direction:	2 Way
Length:	1.102 miles
Number of Lanes:	5
Posted Speed:	50 (source: TCO)
Route Classification:	I-75
Annual Crash Average 2017-2021:	<u>42</u>
Traffic Volume (2016)*:	40,000 (Observed AADT)
Pavement Type (2021):	Asphalt
Pavement Rating (2021):	Poor
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	No long-range projects for this segment.

* AADT values are derived from **Traffic Counts**

Street View



**OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER**

LOCATION: BOGIE LAKE & X10 N/O M-59 DATE: 9-25-18
 CITY/TOWNSHIP: WHITE LAKE TWP BY: RACHEL JONES
 COUNTY#: 1228 STATE#: — CHARGES: 78 012280

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE
 UNDERGROUND: _____
 EDISON OK: YES NO JOB#: _____
 COORDINATE W/DISTRICT 7: _____

CHANGE TIMING.....
 CHANGE OFFSET.....
 CHANGE CYCLE LENGTH.....
 ADD DIAL/SPLIT.....

DIAL..	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
SPLIT.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

CHANGE BREAKOUT OR EPROM: _____
 CHANGE HOURS OF OPERATION:
 OLD: _____
 NEW: _____

REPROGRAM TBC
 INSTALL INTERCONNECT: TBC MINITROL TONE
 MBT OK: YES NO
 NO CHANGE - RECORD CORRECTION

OTHER: CREW INSTALLED GPS 9-13-18. PLEASE CHECK DST
AND GPS W/PANTS.

(RWS)

APPROVED BY: [Signature] DATE: 9/25/18
 DATE INSTALLED: 9/25/18
 INSTALLED BY: Richardson Wickert

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 52 EPAC**

INTERSECTION: BOGIE LAKE & X/O N/O M-59

CITY/VILLAGE/TOWNSHIP: WHITE LAKE TWP

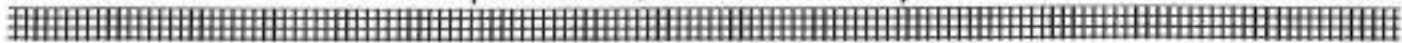
COUNTY#: 1228 MDOT#: - REV#: 5 DETROIT EDISON#: _____

DRAWN BY: Rachel Jones APPROVED BY: [Signature] DATE DRAWN: 9/25/18

INSTALLED BY: _____ DATE INSTLD: 1 1

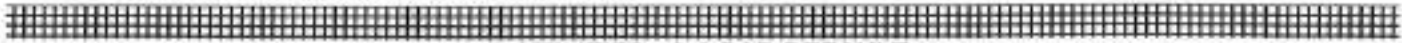
HOURS OF OPERATION: M-F: 6am-8pm; SAT & SUN: 8am-8pm

HOURS OF FLASHING: M-F: 8pm-6am; SAT & SUN: 8pm-8am



2. UTILITIES - 1. ACCESS

CODE.....: 1642 CODE: Four digits (0000 - 9999)



2. UTILITIES - 6. LOAD DEFAULT

C - CHANGE CURRENT SOFTWARE OPTION

SELECT SOFTWARE OPTION 1 1- FIO (TS1 ONLY); 2- TS2 (TS2 ONLY)



4. UNIT DATA - 5. RING STRUCTURE

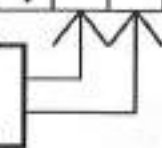
**** NOTE: INSERT ALL RING #'S FIRST, THEN NXT & CONCUR ****

CHANNEL:	RING	PHNXT	CONCURRENT PHASES																CHANNEL							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VEH	PED						
PHASE 1:			1																							
PHASE 2:	1	4		1																						2
PHASE 3:					1																					
PHASE 4:	1	2				1																				4
PHASE 5:							1																			
PHASE 6:								1																		
PHASE 7:									1																	
PHASE 8:										1																
PHASE 9:											1															
PHASE 10:												1														
PHASE 11:													1													
PHASE 12:														1												
PHASE 13:															1											
PHASE 14:																1										
PHASE 15:																	1									
PHASE 16:																		1								

CODES:

RING Ring Number for Phase (1-4)
 PHNXT Phase Next in Ring (1-16)
 CONCUR PH Phases To Be Concurrent (0=NO, 1=YES)

For vehicle channel & ped channel, enter "1" under channel# shown.



3. PHASE DATA - 1. BASIC TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE										
Minimum Green		15		5																						00-99	
Passage																											0.0-9.9
Maximum #1		50		25																							000-999
Maximum #2																											000-999
Yellow Clearance		3.5		3.5																							3.0-9.9
Red Clearance		1.9		1.4																							0.0-9.9

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 52 EPAC**

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk																	00-99
Pedest Clearance																	00-99
Flashing Walk																	
Extend Ped Clear																	0-no, 1-Y+R, 2-Y
Act Rest In-Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial		4		1												
NA Response																

CODES: 0 1 2 3 4

Initial none inactive red yellow green

NA Response none to 1 to 2 both ----

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		3												
Pedestrian Recall																

CODES: 0 1 2 3 4

Vehicle none 1 call min max soft

Pedestrian none 1 call ped bot N. A. ----

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nonlock Memory																
Dual Entry																
Last Car Passage																
Conditional Service																

CODES: 0 = NO 1 = YES

3. PHASE DATA - 7. SPECIAL SEQUENCE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Omit																
-Yel																
Ocal																

3. PHASE DATA - 8. SPECIAL DETECTOR - 0. SPC 1-8 (TS1 ONLY)

Detector # on Print	1	2	3	4	5	6	7	8
Assigned Phase								

CODES: 0 1 2 3 4

Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

3. PHASE DATA - 8. SPECIAL DETECTOR - 1. VEH 1-8 OR 2. VEH 9-16 (TS2 ONLY)

Detector # on Print	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Assigned Phase																

CODES: 0 1 2 3 4

Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 52 EPAC**

3. PHASE DATA - 0. MISC PED+VEH OPT

Phase	1	2	3	4	5	6	7	8
WOFF/10								
MODE								
Walk Offset MODE: 0 = Advance Walk 1 = Delay Walk								
GDLY/10								
YDLY/10								

GDLY = Amt of time Advance Warning remains ON after the beginning of Green
YDLY = Amt of time the Advance Warning turns ON before the end of Green

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 10 (00-99) State : 0 (0 = fl, 1 = red)
Auto ped clear : 0 Red revert : 7.0 (2.0 - 9.9)
Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
FLASH																
ALT																
ENTER				1												
EXIT		1														

(0=No; 1=R, 2=Y)
(0=On/Off; 1=Off/On)

Test A = Remote Flash: 0 (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME
AS 8-15 = OLI - P FL G PHS
AS 8-15 = OLI - P FL R PHS

SPC FUNC							
1	2	3	4	5	6	7	8

NOTE: Go up after entering to get this screen.

**4. UNIT DATA - 6. ALT SEQ. 08-15
EPAC ALT SEQ (PHASE PAIR TO REVERSE)**

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08						
09						
10						
11						

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
12						
13						
14						
15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#
OVL A Phses									
+GRN Phses									
OVL B Phses									
+GRN Phses									
OVL C Phses									
+GRN Phses									
OVL D Phses									
+GRN Phses									

Phase	1	2	3	4	5	6	7	8	CH#
Overlap I									
Overlap J									
Overlap K									
Overlap L									
Overlap M									
Overlap N									
Overlap O									
Overlap P									

* For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green																
Trail yellow																
Trail red																
-Green / -yellow (-G/Y)																
TG Preempt																

* Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow
* For FYA operation, '-G/Y' entry defines the phase that is the green arrow

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 52 EPAC**

4. UNIT DATA - 7. PORT 1 / ITS DATA (TS2 ONLY)

ADDRESS	DESCRIPTION	PRES	M40
0	T&F BIU #1 TS2		
1	T&F BIU #2 TS2		
2	T&F BIU #3 TS2		
3	T&F BIU #4 TS2		
4	T&F BIU #5 RESERVED		
5	T&F BIU #6 RESERVED		
6	T&F BIU #7 MFG USE		
7	T&F BIU #8 MFG USE		
8	DET BIU #1 TS2		
9	DET BIU #2 TS2		
10	DET BIU #3 TS2		
11	DET BIU #4 TS2		
12	DET BIU #5 RESERVED		
13	DET BIU #6 RESERVED		
14	DET BIU #7 MFG USE		
15	DET BIU #8 MFG USE		
16	MALFUNCTION UNIT		
17	DIAGNOSTIC (MSG 30)		
18	CONTROLLER UNIT		

CODES: 0=NO / 1=YES

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4
Input Response	1			
Output Select				

I/O Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector		

Controller with Detection (TS1 ONLY):

EPAC300/M52 enter "1" under D Conn Input

2070 enter "0" under D Conn Input

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER: <u>1</u>	FRE	AUT	MAN	-----	-----	-----
MODE: <u>0</u>	PRM	YLD	PYL	POM	SOM	FAC
MAX : <u>0</u>	INH	MX1	MX2	-----	-----	-----
CORR: <u>2</u>	DWL	MDW	SWY	SW+	-----	-----
OFST: _____	BEG END OF GREEN					
FRCE: _____	PLN CYC LE TIME					
MX DWELL: _____	YIELD PERIOD: _____					

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

Mode: 0 = actuated
 1 = coord phase
 2 = minimum recall
 3 = maximum recall
 4 = pedestrain recall
 5 = maximum + pedestrain recall
 6 = phase omit
 7 = dual coord phase

Sequence: 00 - 15 (Unit data has definition)

Ring Lag: Ring offset from local cycle zero when not barrier locked to Ring #1.

Time: 00 - 99 seconds.

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 52 EPAC**

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 1 / SPLIT 1 CYCLE LENGTH: 110 SEC

PHASE	1	2	3	4	5	6	7	8
TIME		86		24				
MODE		1		3				

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: 90 SEC

PHASE	1	2	3	4	5	6	7	8
TIME		63		27				
MODE		1		3				

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	21		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	1		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 52 EPAC**

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: 120 SEC

PHASE	1	2	3	4	5	6	7	8
TIME		92		28				
MODE		1		3				

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	40		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

~~DIAL 4 / SPLIT 1 CYCLE LENGTH:~~

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

~~DIAL 4 / SPLIT 2 CYCLE LENGTH:~~

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

~~DIAL 4 / SPLIT 3 CYCLE LENGTH:~~

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

~~DIAL 4 / SPLIT 4 CYCLE LENGTH:~~

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER - MOD 52 EPAC**

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4	
MIN GREEN/WALK					
OVERRIDE	FL	1/2	2/3	3/4	4/5
STATUS					
CODES	0 = NO, 1 = YES				

7. PREEMPT DATA - PREEMPT 1

1. MISC DATA: (0 = no, 1 = yes)

TEST.: _____ N-LOCK.: _____ LINK PR#.: _____
 DELAY: _____ EXTEND: _____ DURATION: _____
 MXCALL: _____ LOCK OUT: _____

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

2. INTERVAL TIMES:

SEL PED CLR : _____ TRK YEL CHG : _____
 SEL YEL CHG : _____ TRK RED CLR : _____
 SEL RED CLR : _____ DWELL GREEN: _____
 TRACK GREEN: _____ RET PED CLR : _____
 TRK PED CLR : _____ RET YEL CHG : _____
 RET YEL CLR : _____

3. VEHICLE STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE _____
 (0=no, 1=act, 2=min recall, 3=max recall)

4. PEDESTRIAN STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=dont wlk, 1=wlk, 2=flwik, 3=dark)

CYCLE _____
 (0 = no, 1 = act, 2 = recall)

5. OVERLAP STATUS:

OVERLAP	A	B	C	D
TRK GRN				
DWELL				

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE _____
 (0 = no, 1 = act)

6. LOW PRIORITY: (0=no, 1=yes)

TEST.: _____ N-LOCK.: _____ SKIP.....: _____
 DELAY: _____ EXTEND: _____ DURATION: _____
 DWELL: _____ MXCALL: _____ LOCK OUT: _____

RING	1	2	3	4	5	6	7	8
DWELL								
CALLS								

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	BOGIE LAKE	A	2	FLA
3				
4	X10 N/O M-59	B	4	FLR
5				
6				
7				
8				
OLA				
OLB				
OLC				
OLD				
1PED				
2PED				
3PED				
4PED				
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
For Mod 52 EPAC
Pole Mount "M" Cabinet

Intersection: Bogie Lake & X/O N/O M-59
County No: 1228
State No: -
Prepared By: Dawn Bierlein
Date: 12-09-17

Phasing:

Load Switch 2:	Bogie Lake	A	FLA
Load Switch 4:	X/O N/O M-59	B	FLR

Jumpers:

121-213, 151-152, 153-154, 155-156, 173-174, 175-176, 177-178, 233-PB1,
237-PB1, 241-PB1, 255-256, 257-258, 259-260, 261-262, 263-PB1.

Conflict Monitor: None.

All switches OFF EXCEPT: Dual Select A&B; G&Y Enable; SSM 2,4.
Minimum Flash = 4 + 2 + 1

F ROAD GRADE

MADE
REFERENCE



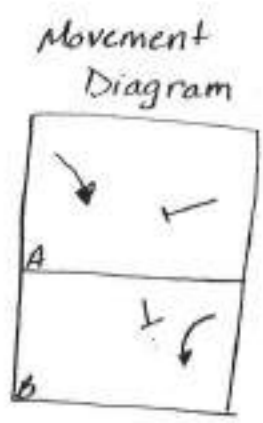
- POCH = 25' - 3"
- ⑨⑩⑬ 36' ANCHOR BASE STEEL STRAIN POLE PROVIDE SECONDARY SERVICE (BY DELCO)
- ⑥⑦ S.S. ACTUATED CONTROLLER & CABINET

- POCH = 27' 4"
- 36' ANCHOR BASE STEEL STRAIN POLE ⑨⑩

CONTROLLER SHALL BE EAGLE 2070N OR EQUIVALENT S.C.A.T.S COMPATIBLE CONTROLLER.

- ⑪⑫ ALLUMINUM PEDESTAL
- ④ SEE DETAIL "A-2" SHEET ST-5

- ⑤ 4-WAY 24" x 30" ILLUMINATED CASE SIGN
- ① 1-3" DB

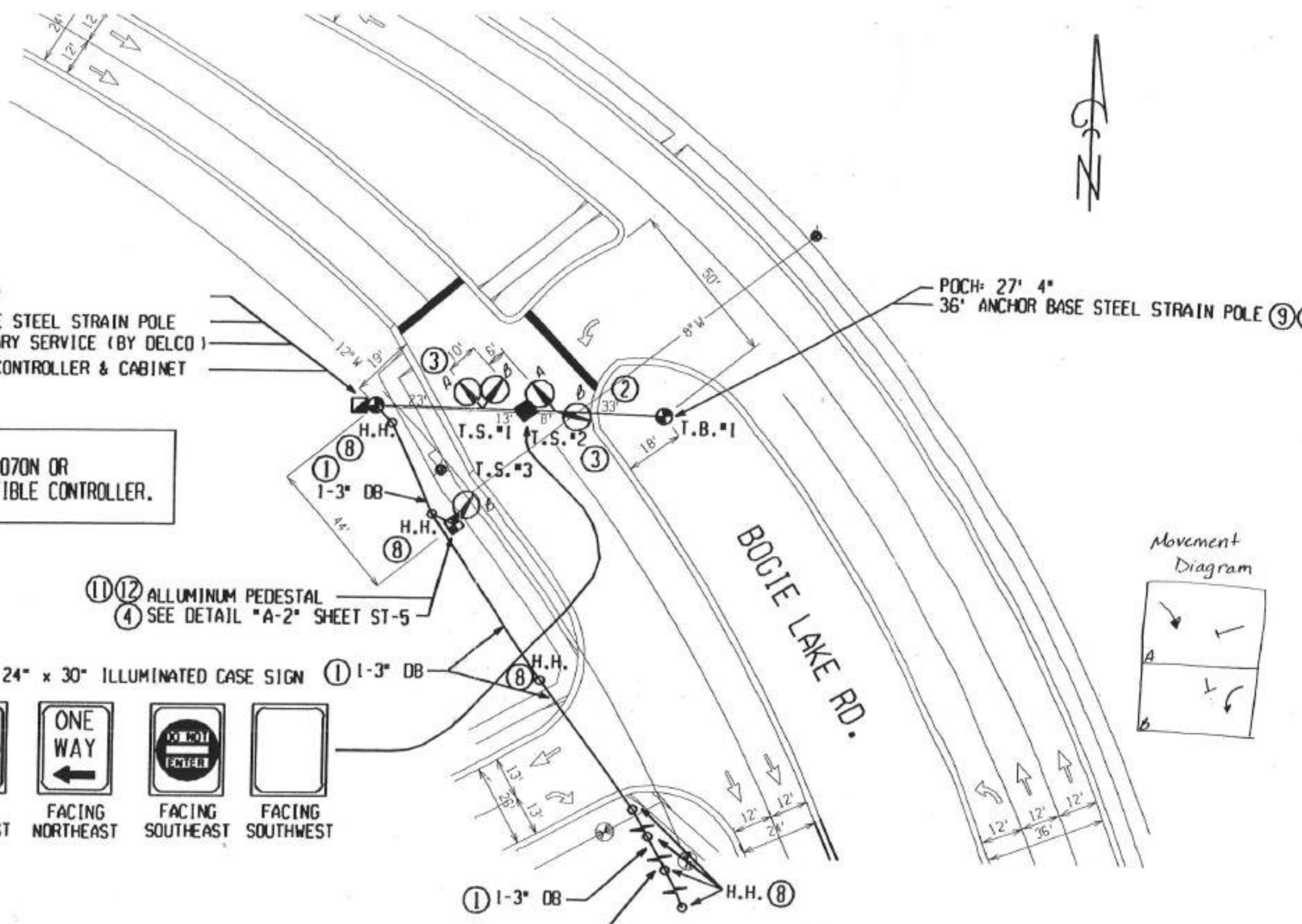


- ⑭ CONTRACTOR SHALL PROVIDE 1-3" CONDUIT RUN EXTENDING TO THE 40' / 1 DECO POLE IN NORTHWEST QUADRANT OF BOGIE LK. & M-59. SEE SHEET C944 FOR DETAILS. CONDUIT AND HANDHOLE QUANTITIES ARE INCLUDED ON THIS SHEET. HANDHOLES SHALL BE SPACED AT 150' INTERVALS.

ALL CONDUIT IS 1-3" UNLESS SPECIFIED DIFFERENTLY ON PLANS

PLAN
1" = 30'

Co #1228
Bogie Lake + 1/2 North of
SAFETY SWITCH M-59



OAKLAND COUNTY ROAD COMMISSION
 TRAFFIC - SAFETY DEPARTMENT
 SIGNAL WORK ORDER

JAN 23 2017

1-17-17

LOCATION: Bogie LK & M-59 DATE: 12/9/16
 CITY/TOWNSHIP: White Lake BY: E Labiano
 COUNTY#: 4110 STATE#: 63041-01-029 CHARGES: WO 168612

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE
 UNDERGROUND: _____
 EDISON OK: YES NO JOB#: _____
 COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
SPLIT:	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<input type="checkbox"/> CHANGE TIMING.....																
<input checked="" type="checkbox"/> CHANGE OFFSET.....	<input checked="" type="checkbox"/>															
<input type="checkbox"/> CHANGE CYCLE LENGTH.....																
<input checked="" type="checkbox"/> ADD DIAL/SPLIT.....													<input checked="" type="checkbox"/>			

CHANGE BREAKOUT OR EPROM: _____
 CHANGE HOURS OF OPERATION:
 OLD: 5am - Midnight
 NEW: 5:30am - 11pm
 REPROGRAM TBC (Traffic Events)
 INSTALL INTERCONNECT: TBC MINITROL TONE
 MBT OK: YES NO
 NO CHANGE - RECORD CORRECTION
 OTHER: Rev 23

* MDOT RETIMING - FINAL *

APPROVED BY: [Signature] DATE: 1/17/17
 DATE INSTALLED: 1/21/17
 INSTALLED BY: Richardson Carey

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

INTERSECTION: BOGIE LAKE & M-59

CITY/VILLAGE/TOWNSHIP: WHITE LAKE

COUNTY#: 4110 MDOT#: 63041-01-029 REV#: 23 DETROIT EDISON#: 1043

DRAWN BY: E Labiano APPROVED BY: [Signature] DATE DRAWN: 1/17/17

INSTALLED BY: _____ DATE INSTLD: 1/1

HOURS OF OPERATION: 7 DAYS: 5:30AM - 11:00PM

HOURS OF FLASHING: 7 DAYS: 11:00PM - 5:30AM

2. UTILITIES - 1. ACCESS
 CODE:: 1642 CODE: Four digits (0000 - 9999)

4. UNIT DATA - 5. RING STRUCTURE

***** NOTE: INSERT ALL RING #'S FIRST, THEN NXT & CONCUR *****

CHANNEL:	RING	PHNXT	CONCURRENT PHASES																CHANNEL			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VEH	PED		
PHASE 1:			1																			
PHASE 2:	1	4		1																	2	9
PHASE 3:					1																	
PHASE 4:	1	2				1															4	10
PHASE 5:							1															
PHASE 6:								1														
PHASE 7:									1													
PHASE 8:										1												
PHASE 9:											1											
PHASE 10:												1										
PHASE 11:													1									
PHASE 12:														1								
PHASE 13:															1							
PHASE 14:																1						
PHASE 15:																	1					
PHASE 16:																		1				

CODES:
 RING Ring Number for Phase (1-4)
 PHNXT Phase Next In Ring (1-16)
 CONCUR PH Phases To Be Concurrent (0=NO, 1=YES)

For vehicle channel & ped channel, enter "1" under channel# shown.

3. PHASE DATA - 1. BASIC TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE
Minimum Green		10		7													00-99
Passage																	0.0-9.9
Maximum #1		92		29													000-999
Maximum #2																	000-999
Yellow Clearance		4.7		4.3													3.0-9.9
Red Clearance		2.0		6.6													0.0-9.9

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk		7		7													00-99
Pedest Clearance		20		12													00-99
Flashing Walk																	
Extend Ped Clear		0		0													
Act Rest in Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial		4		1												
NA Response																

CODES: 0 1 2 3 4
 Initial none inactive red yellow green
 NA Response none to 1 to 2 both -----

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		3												
Pedestrian Recall		0		0												

CODES: 0 1 2 3 4
 Vehicle none 1 call min max soft
 Pedestrian none 1 call ped bot N. A. -----

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nonlock Memory																
Dual Entry																
Last Car Passage																
Conditional Service																

CODES: 0 = NO 1 = YES

3. PHASE DATA - 8. SPECIAL DETECTOR - 0. SPC 1-8 (Epac 300/M52)

Detector # on Print	1	2	3	4	5	6	7	8
EPAC/M52 "D" Connector	1	6	7	8	4	5	2	3
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

See attached detection sheet
for D-connector pin
assignments

3. PHASE DATA - 8. SPECIAL DETECTOR - 2. VEH 9-16 (2070)

Detector # on Print	1	2	3	4	5	6	7	8
2070 "D" Connector	9	10	11	12	13	14	15	16
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

See attached detection sheet
for D-connector pin
assignments

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
 PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 10 (00-99) State : 0 (0 = fl, 1 = red)
 Auto ped clear : 0 Red revert : 7.0 (2.0 - 9.9)
 Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	A	B	C	D	E	F	G	H
FLASH																
YEL																
ALT																
ENTER				1												
EXIT		1														

Test A = Remote Flash: (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME
 AS 8-15 = OLI - P FL G PHS
 AS 8-15 = OLI - P FL R PHS

SPC FUNC

1	2	3	4	5	6	7	8

NOTE: Go up after entering to get this screen.

4. UNIT DATA - 6 ALT SEQ. 08-15

EPAC ALT SEQ (PHASE PAIR TO REVERSE)

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08						
09						
10						
11						

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
12						
13						
14						
15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#
Overlap A				1					13
Overlap B									
Overlap C									
Overlap D									
Overlap E									
Overlap F									
Overlap G									
Overlap H									

Phase	1	2	3	4	5	6	7	8	CH#
Overlap I									
Overlap J									
Overlap K									
Overlap L									
Overlap M									
Overlap N									
Overlap O									
Overlap P									

Enter a "1" in the channel # shown.

0 = Phase not part of overlap; 1 = Phase part of overlap.

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green	4															
Trail yellow	A.3															
Trail red	2.6															
-Green / -yellow (-G/Y)																
+Green (+GRN)																

- * Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow
- * For FYA operation, '-G/Y' entry defines the phase that is the green arrow
- * For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4	CONN	MODE
Input Response	1				"D"	
Output Select	1				"D"	

Connector "D" : 0 = Standard & 1 = Alternate

I/O Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector		

Controller with Solo Detection:
EPAC300/M52 enter "1" under D Conn Input
2070 enter "0" under D Conn Input

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER: <u>1</u>	FRE	AUT	MAN	-----	-----	-----
MODE: <u>2</u>	PRM	YLD	PYL	POM	SOM	FAC
MAX : <u>0</u>	INH	MX1	MX2	-----	-----	-----
CORR: <u>2</u>	DWL	MDW	SWY	SW+	-----	-----
OFST: _____	BEG END OF GREEN					
FRCE: _____	PLN CYC LE TIME					
MX DWELL: _____	YIELD PERIOD: _____					

5. COORDINATION DATA - 2. MANUAL CONTROL

DIAL: _____ SPLIT: _____ OFFSET: _____ SYNC: _____

To set cycle zero in manual control enter "1" for sync then press "E".

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

Mode: 0 = actuated, 1 = coord phase, 2 = minimum recall, 3 = maximum recall,
4 = pedestrian recall, 5 = maximum + pedestrian recall, 6 = phase omit,
7 = dual coord phase.

Sequence: 00 - 15 (Unit data has definition)

Ring Lag: Ring offset from local cycle zero when not barrier locked to Ring #1.

Time: 00 - 99 seconds.

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 1 / SPLIT 1 CYCLE LENGTH: **110 SECS** *PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		80		24				
MODE		1		3				

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: **90 SECS** *PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		60		27				
MODE		1		3				

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	42		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	56		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: *120 SECS PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		90		28				
MODE		1		3				

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH: *110 SECS*

PHASE	1	2	3	4	5	6	7	8
TIME		75		35				
MODE		1		3				

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	93		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	36		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4		
MIN GREEN/WALK						
OVERRIDE	FL	1/2	2/3	3/4	4/5	5/6
STATUS						
CODES	0 = NO, 1 = YES					

7. PREEMPT DATA - PREEMPT 1

1. MISC DATA: (0 = no, 1 = yes)
 TEST...: N-LOCK.: LINK PR#.:
 DELAY: EXTEND: DURATION:
 MXCALL: LOCK OUT:
 RING EXIT CALLS

1	2	3	4	5	6	7	8

4. PEDESTRIAN STATUS:
 PHASE

1	2	3	4	5	6	7	8

(0=dont wlk, 1=wlk, 2=flwk, 3=dark)
 CYCLE

--	--	--	--	--	--	--	--

(0 = no, 1 = act, 2 = recall)

2. INTERVAL TIMES:
 SEL PED CLR: TRK YEL CHG:
 SEL YEL CHG: TRK RED CLR:
 SEL RED CLR: DWELL GREEN:
 TRACK GREEN: RET PED CLR:
 TRK PED CLR: RET YEL CHG:
 RET YEL CLR:

5. OVERLAP STATUS:
 OVERLAP

A	B	C	D

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)
 CYCLE

--	--	--	--	--	--	--	--

(0 = no, 1 = act)

3. VEHICLE STATUS:
 PHASE

1	2	3	4	5	6	7	8

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)
 CYCLE

--	--	--	--	--	--	--	--

(0=no, 1=act, 2=min recall, 3=max recall)

6. LOW PRIORITY: (0=no, 1=yes)
 TEST...: N-LOCK.: SKIP.....:
 DELAY: EXTEND: DURATION:
 DWELL: MXCALL: LOCK OUT:
 RING

1	2	3	4	5	6	7	8

DWELL
 CALLS

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	M-59	A	2	A
3				
4	BOGIE LAKE (NEAR)	B	4	R
5				
6				
7				
8				
OLA	BOGIE LAKE (FAR)	C	5	R
OLB				
OLC				
OLD				
1PED				
2PED	M-59 PED	WA	6	
3PED				
4PED	BOGIE LAKE PED	WB	8	
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
For 4 Phase EPAC
Pole Mount Cabinet

Intersection: M-59 and Bogie Lake Rd
County No: 04110
State No: 63041-01-029
Prepared By: Rachel Jones
Date: 11-30-11

Phasing:

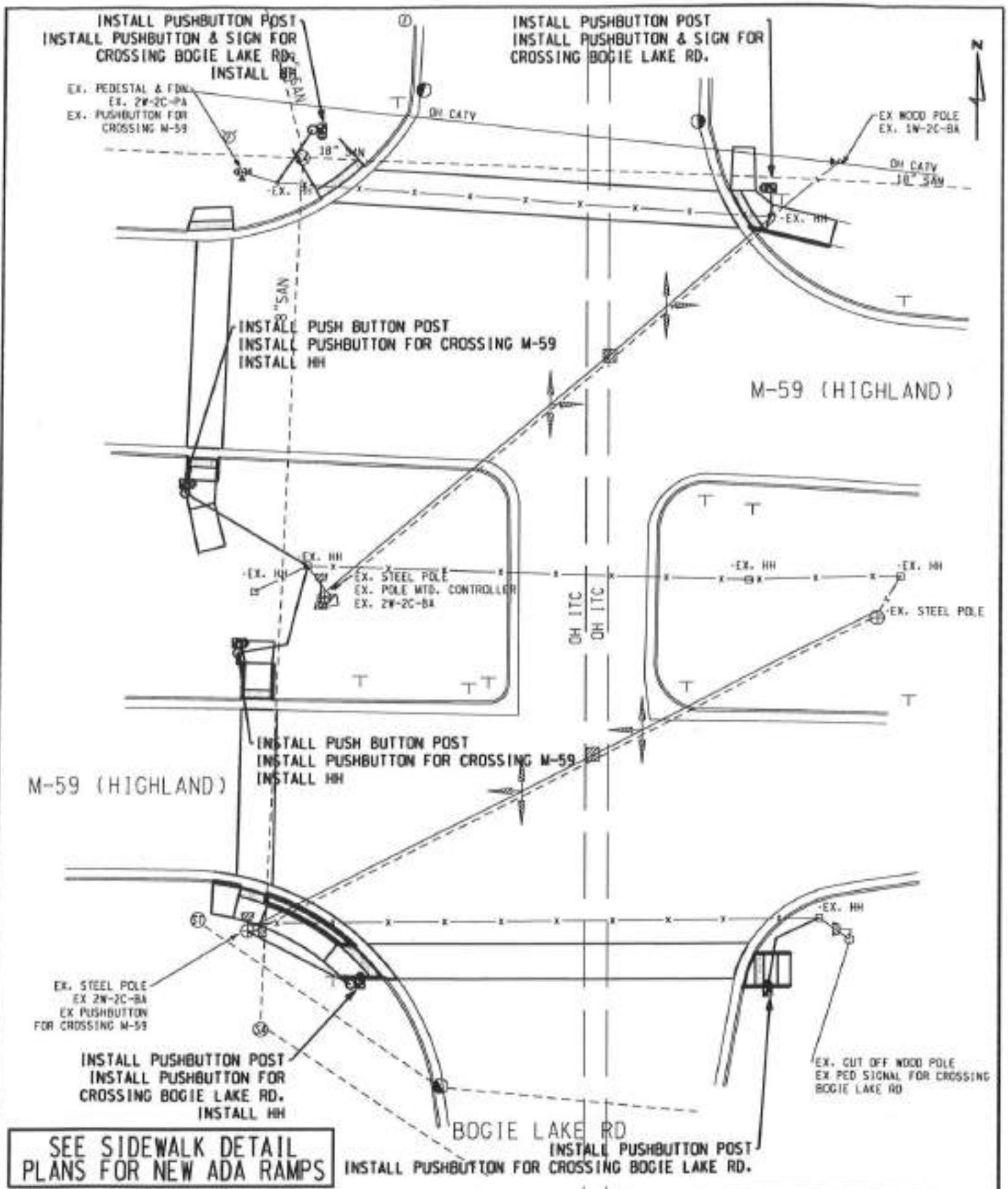
Load Switch 2:	M-59	A	FLA
Load Switch 4:	Bogie Lake Near	B	FLR
Load Switch 5:(OLA)	Bogie Lake Far	C	FLR
Load Switch 6:	M-59 Peds	WA	
Load Switch 8:	Bogie Lake Ped West	WB	

Jumpers:

121-213, 151-152, 153-154, 155-156, 158-159, 161-162, 164-165, 173-174,
175-176, 177-178, 179-180, 185-186, 223-224, 229-230, 233-PB1, 237-PB1,
241-242, 243-244, 245-246, 255-256, 257-258, 259-260, 261-262, 263-PB1,
268-269, 273-274.

Conflict Monitor: 4-5.

All switches OFF EXCEPT: Dual Select A&B; G&Y Enable; SSM 2,4,5.
Minimum Flash = 4 + 2 + 1



SEE SIDEWALK DETAIL
PLANS FOR NEW ADA RAMP



AUTH. NO.	DRAWN DJP
CONT. SEC. 63041	DATE 03-08-11
REF. 110761	SCALE N.T.S.
PLAN 63041-01-029	SHEET 3 OF 4

M-59 (HIGHLAND) AT BOGIE LAKE RD
WHITE LAKE TOWNSHIP
OAKLAND COUNTY

OAKLAND COUNTY ROAD COMMISSION
 TRAFFIC - SAFETY DEPARTMENT
 SIGNAL WORK ORDER

JAN 23 2017

1-13-17

LOCATION: EB M-59 & X/O W/O Bogie LK DATE: ~~1/23/17~~
 CITY/TOWNSHIP: White Lake BY: E Labiano
 COUNTY#: 4136 STATE#: 63041-01-129 CHARGES: WO 168612

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE
 UNDERGROUND: _____
 EDISON OK: YES NO JOB#: _____
 COORDINATE W/DISTRICT 7: _____

	DIAL..								3				4			
	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
SPLIT.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<input type="checkbox"/> CHANGE TIMING.....																
<input checked="" type="checkbox"/> CHANGE OFFSET.....	<input checked="" type="checkbox"/>															
<input type="checkbox"/> CHANGE CYCLE LENGTH.....																
<input checked="" type="checkbox"/> ADD DIAL/SPLIT.....													<input checked="" type="checkbox"/>			

CHANGE BREAKOUT OR EPROM: _____
 CHANGE HOURS OF OPERATION:
 7DAYS: 5am - Midnight
 OLD: _____
 7DAYS: 5:30am - 11pm
 NEW: _____
 REPROGRAM TBC (Traffic events)
 INSTALL INTERCONNECT: TBC MINITROL TONE
 MBT OK: YES NO
 NO CHANGE - RECORD CORRECTION
 OTHER: Rev 12

* MOOT RETIMING - FINAL *

APPROVED BY: [Signature] DATE: 1/17/17
 DATE INSTALLED: 1/24/17
 INSTALLED BY: RICHARDSON CASEY

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk																	00-99
Pedest Clearance																	00-99
Flashing Walk																	
Extend Ped Clear																	
Act Rest-in-Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial		4		1												
NA Response																

CODES: 0 1 2 3 4
 Initial none inactive red yellow green
 NA Response none to 1 to 2 both -----

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		3												
Pedestrian Recall																

CODES: 0 1 2 3 4
 Vehicle none 1 call min max soft
 Pedestrian none 1 call ped bot N. A. -----

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nonlock Memory																
Dual Entry																
Last Car Passage																
Conditional Service																

CODES: 0 = NO 1 = YES

3. PHASE DATA - 8. SPECIAL DETECTOR - 0. SPC 1-8 (Epac 300/M52)

Detector # on Print	1	2	3	4	5	6	7	8
EPAC/M52 "D" Connector	1	6	7	8	4	5	2	3
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

See attached detection sheet
for D-connector pin
assignments

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

3. PHASE DATA - 8. SPECIAL DETECTOR - 2. VEH 9-16 (2070)

Detector # on Print	1	2	3	4	5	6	7	8
2070 "D" Connector	9	10	11	12	13	14	15	16
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

See attached detection sheet
for D-connector pin
assignments

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 10 (00-99) State : 0 (0 = fl, 1 = red)
 Auto ped clear : 0 Red revert : 7-0 (2.0 - 9.9)
 Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	A	B	C	D	E	F	G	H
FLASH																
YEL																
ALT																
ENTER				1												
EXIT		1														

Test A = Remote Flash: (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME
 AS 8-15 = OLI - P FL G PHS
 AS 8-15 = OLI - P FL R PHS

SPC FUNC							
1	2	3	4	5	6	7	8

NOTE: Go up after entering to get this screen.

4. UNIT DATA - 6. ALT SEQ. 08-15

EPAC ALT SEQ (PHASE PAIR TO REVERSE)

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08						
09						
10						
11						

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
12						
13						
14						
15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#
Overlap A									
Overlap B									
Overlap C									
Overlap D									
Overlap E									
Overlap F									
Overlap G									
Overlap H									

Phase	1	2	3	4	5	6	7	8	CH#
Overlap I									
Overlap J									
Overlap K									
Overlap L									
Overlap M									
Overlap N									
Overlap O									
Overlap P									

Enter a "1" in the channel # shown: _____

0 = Phase not part of overlap; 1 = Phase part of overlap.

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green																
Trail yellow																
Trail red																
-Green / -yellow (-G/Y)																
+Green (+GRN)																

- * Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow
- * For FYA operation, '-G/Y' entry defines the phase that is the green arrow
- * For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4	CONN	MODE
Input Response	1				"D"	
Output Select	1				"D"	

Connector "D" : 0 = Standard & 1 = Alternate

I/O Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector		

Controller with Solo Detection:

EPAC300/M52 enter "1" under D Conn Input

2070 enter "0" under D Conn Input

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER: <u>1</u>	FRE	AUT	MAN	-----	-----	-----
MODE: <u>0</u>	PRM	YLD	PYL	POM	SOM	FAC
MAX : <u>0</u>	INH	MX1	MX2	-----	-----	-----
CORR: <u>2</u>	DWL	MDW	SWY	SW+	-----	-----
OFST: _____	BEG END OF GREEN					
FRCE: _____	PLN CYC LE TIME					
MX DWELL: _____	YIELD PERIOD:					

5. COORDINATION DATA - 2. MANUAL CONTROL

DIAL: _____ SPLIT: _____ OFFSET: _____ SYNC: _____

To set cycle zero in manual control enter "1" for sync then press "E".

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

Mode: 0 = actuated, 1 = coord phase, 2 = minimum recall, 3 = maximum recall,
4 = pedestrian recall, 5 = maximum + pedestrian recall, 6 = phase omit,
7 = dual coord phase.

Sequence: 00 - 15 (Unit data has definition)

Ring Lag: Ring offset from local cycle zero when not barrier locked to Ring #1.

Time: 00 - 99 seconds.

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 1 / SPLIT 1 CYCLE LENGTH: *110 sec*

PHASE	1	2	3	4	5	6	7	8
TIME		86		24				
MODE		1		3				

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: *90 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		63		27				
MODE		1		3				

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	25		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	41		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: *120 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		<i>92</i>		<i>28</i>				
MODE		<i>1</i>		<i>3</i>				

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH: *110 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		<i>75</i>		<i>35</i>				
MODE		<i>1</i>		<i>3</i>				

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	<i>78</i>		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	<i>25</i>		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4	
MIN GREEN/WALK					
OVERRIDE	FL	1/2	2/3	3/4	4/5
STATUS					
CODES	0 = NO, 1 = YES				

7. PREEMPT DATA - PREEMPT 1

1. MISC DATA: (0 = no, 1 = yes)

TEST.: N-LOCK.: LINK PR#.:
 DELAY: EXTEND: DURATION:
 MXCALL: LOCK OUT:

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

2. INTERVAL TIMES:

SEL PED CLR: TRK YEL CHG:
 SEL YEL CHG: TRK RED CLR:
 SEL RED CLR: DWELL GREEN:
 TRACK GREEN: RET PED CLR:
 TRK PED CLR: RET YEL CHG:
 RET YEL CLR:

3. VEHICLE STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE

(0=no, 1=act, 2=min recall, 3=max recall)

4. PEDESTRIAN STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=dont wlk, 1=wlk, 2=flwlk, 3=dark)

CYCLE

(0 = no, 1 = act, 2 = recall)

5. OVERLAP STATUS:

OVERLAP	A	B	C	D
TRK GRN				
DWELL				

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE

(0 = no, 1 = act)

6. LOW PRIORITY: (0=no, 1=yes)

TEST.: N-LOCK.: SKIP.....:
 DELAY: EXTEND: DURATION:
 DWELL: MXCALL: LOCK OUT:

RING	1	2	3	4	5	6	7	8
DWELL								
CALLS								

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	EB M-59	A	2	A
3				
4	X10 W/O BOGIE LAKE	B	A	R
5				
6				
7				
8				
OLA				
OLB				
OLC				
OLD				
1PED				
2PED				
3PED				
4PED				
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
4 Phase EPAC

Intersection : EB M-59 & X/O W/O Bogie Lake
City/Twp : White Lake
State No. : 63041-01-129
County No. : 4136
Prepared By : Rachel Jones
Date : 11/1/11

Phasing:

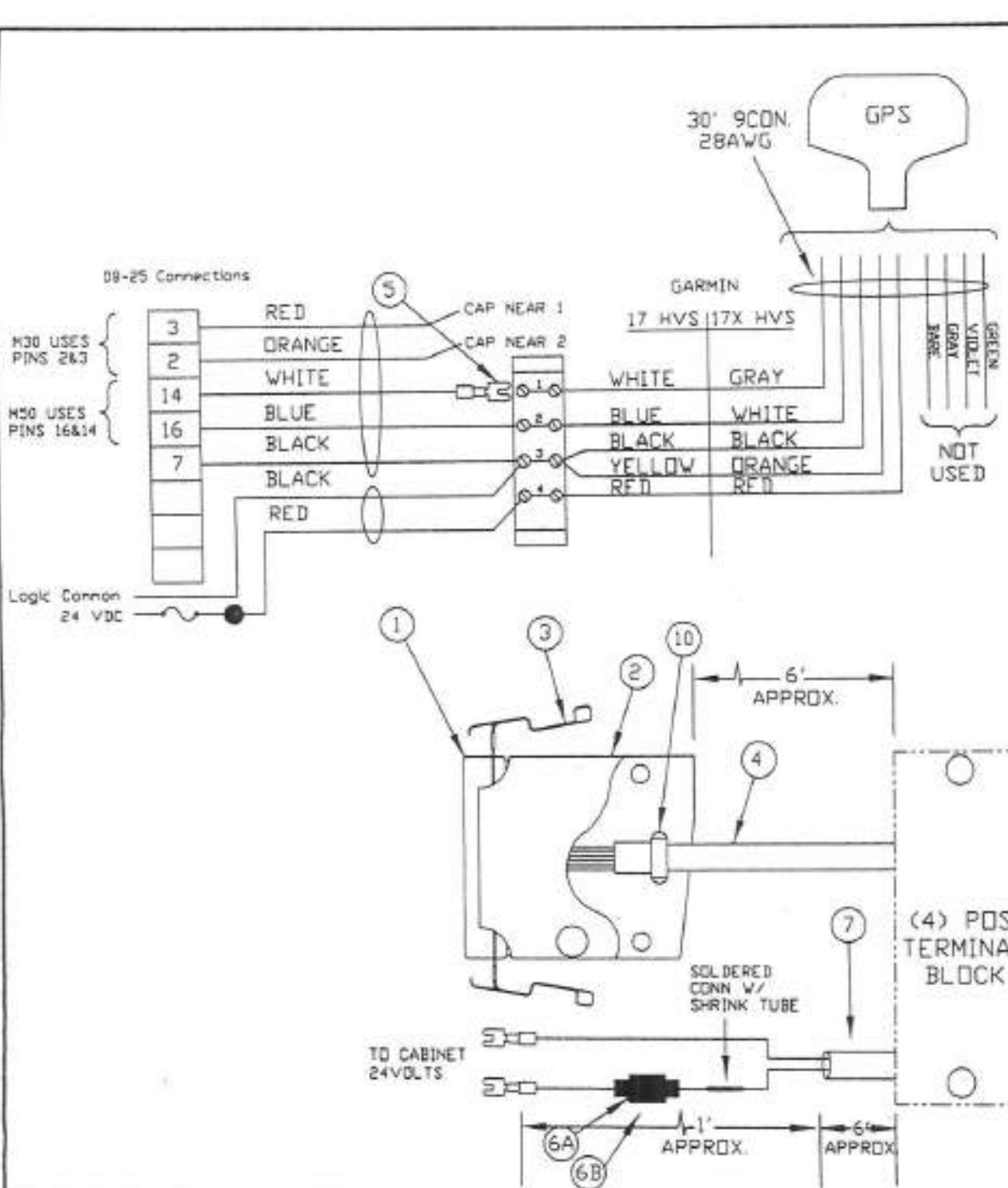
Load Switch 2: EB M-59	A	FLA
Load Switch 4: X/O W/O Bogie Lake	B	FLR

Jumpers:

121-213, 151-152, 153-154, 155-156, 173-174, 175-176, 177-178, 233-PB1, 237-PB1, 241-PB1,
255-256, 257-258, 259-260, 261-262, 263-PB1.

Signal Monitor : NONE

All switched OFF EXCEPT: Dual Select A&B; G&Y Enable; SSM 2,4.
Minimum Flash = 4+2+1

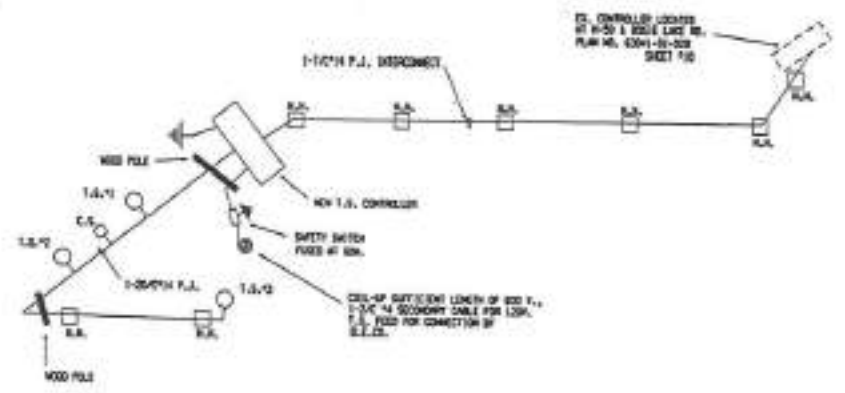
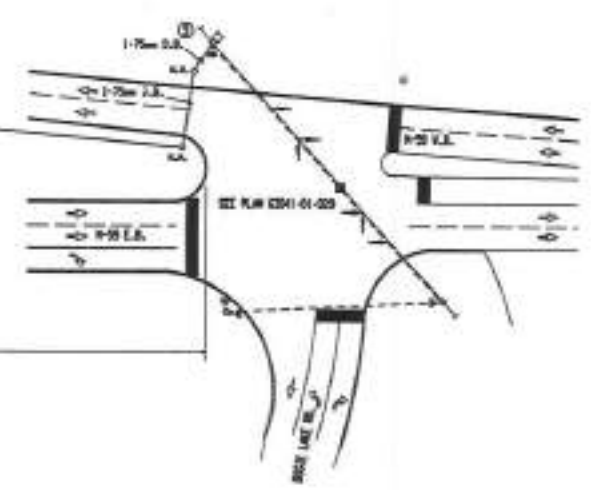
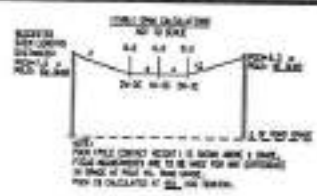
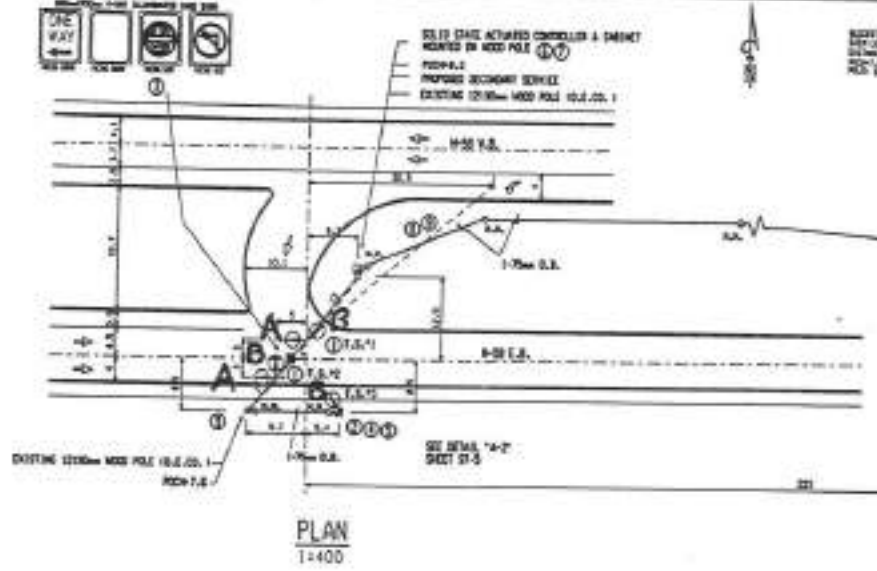


DET. No.	DESCRIPTION	VENDOR	PART No.	QTY.
1	28-25 MALE	AMP	747912-4	1
2	HOUSING KIT	AMP	207343-1	1
3	SPRING LATCH D9 CONNECTOR	NEWARK	44F8751	2
4	6 CONDUCTOR 28AWG	Alpha	1176C	6 FT
5	TERMINAL	3M	HV08-1078	7
6A	FUSE HOLDER NEWARK #67K1434			
6B	FUSE (1/2A), NEWARK #277654			
7	2 CONDUCTOR BOLDEN CABLE # 8205-060			
8	(2) CHANNEL NUTS UNISTRUT TEAL #A4006-1032EG			
8A	(2) Screw 10-32 x 1" pan head phillips SS			
8B	(2ea) #10 lock washer/flat washer/fender washer			
9	4 POSITION TERMINAL BLOCK NEWARK #28F724			
10	TIE-RAP			

REVISED 11/10/09 DG (17X HVS)

CARRIER AND GABLE INC.
TECH SERVICES

5020
GPS TO SEPAC



CONTACT: GARY WILLIAMS (D.E.C.O.)
 248-745-9036 FOR INSTALLATION OF 12 x 12190mm
 WOOD POLES, SPAN WIRE AND SECONDARY SERVICE.
 NO COST TO CONTRACTOR.

FOR ELECTRICAL SERVICE INSPECTION
 CONTACT THE MICHIGAN DEPARTMENT OF
 LABOR AT 517-241-9320.
 COST TO CONTRACTOR WILL BE \$40.00.

LIST OF MATERIAL

NO.	ITEM	QUANTITY	UNIT COST
①	75, 2 Wg Span Wire Pole	2 EACH	400028
②	75, 1 Wg Federal Pole	1 EACH	900080
③	Case Study, Four Wg, 600 mm by 750 mm	1 EACH	400028
④	Federal, Pole	1 EACH	6000428
⑤	Federal, Pole	1 EACH	6000436
⑥	Controller and Cabinet, Solid State Actuated	1 EACH	6000306
⑦	Controller and Cabinet, Solid State Actuated, Delivered	1 EACH	6000330
⑧	Safety Switch	1 EACH	6000456
⑨	Wood Pole, 7.5 Dia, 12 Cable Pole	3 EACH	6100040
⑩	Wg, Round	6 EA	6100047
⑪	Conductors, 3/4, 75 mm	230m	6100054
⑫	Conductors, Jacketed Round	10.5m	6100100
⑬	P.J. Cable, 800V, 1, 120/714	240m	6100067

All dimensions are in meters unless otherwise noted.

CONTROL SECTION	JOB NUMBER	PROJECT	ITEM	DATE	BY	SCALE	NO. OF SHEETS	SHEET NO.
HW 63900	457506							

COLLECTOR: 2200
 DRAWN BY: 300
 CHECKED BY: 300
 DATE: 08-21-98
 SCALE: 1:100
 NO. OF SHEETS: 05
 SHEET NO.: 05
 PROJECT: HW 63900-01-003
 TITLE: H-55 TRUCKWAY E.S. AT
 RIVER K. OF BOULEVARD NO.
 WHITE LAKE TWP.
 EAST LANSING

OAKLAND COUNTY ROAD COMMISSION
 TRAFFIC - SAFETY DEPARTMENT
 SIGNAL WORK ORDER

1-17-17

LOCATION: WB M-59 & X/O E/O Bogie LK/No DATE: ~~12/9/16~~

CITY/TOWNSHIP: White Lake BY: E Labiano

COUNTY#: 4139 STATE#: 63041-01-229 CHARGES: WO 168612

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE

UNDERGROUND: _____ JAN 23 2017

EDISON OK: YES NO JOB#: _____

COORDINATE W/DISTRICT 7: _____

	DIAL								3				4			
	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
	SPLIT								1				2			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<input checked="" type="checkbox"/> CHANGE TIMING/MODE.....									X							
<input checked="" type="checkbox"/> CHANGE OFFSET.....	X															
<input type="checkbox"/> CHANGE CYCLE LENGTH.....																
<input checked="" type="checkbox"/> ADD DIAL/SPLIT.....													X			

CHANGE BREAKOUT OR EPROM: _____

CHANGE HOURS OF OPERATION:
 OLD: 5am - Midnight
 NEW: 5:30 am - 11pm

REPROGRAM TBC (Traffic Events)

INSTALL INTERCONNECT: TBC MINITROL TONE

MBT OK: YES NO

NO CHANGE - RECORD CORRECTION

OTHER: Rev 9

* MDOT RETIMING - FINAL

APPROVED BY:  DATE: 1/17/17

DATE INSTALLED: 1/24/17

INSTALLED BY: Richardson Casey

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

INTERSECTION: WB M50 (HIGHLAND) & X/O E/O BOGIE LAKE (NORDIC)

CITY/VILLAGE/TOWNSHIP: WHITE LAKE

COUNTY#: 4139 MDOT#: 63041-01-229 REV#: 9 DETROIT EDISON#: _____

DRAWN BY: E Labiano APPROVED BY: [Signature] DATE DRAWN: 1/17/17

INSTALLED BY: _____ DATE INSTLD: 1/1

HOURS OF OPERATION: 7 DAYS: 5:30 AM - 11:00 PM

HOURS OF FLASHING: 7 DAYS: 11:00 PM - 5:30 AM

2. UTILITIES - 1. ACCESS

CODE: _____; 1612 CODE: Four digits (0000 - 9999)

4. UNIT DATA - 5. RING STRUCTURE

 ***** NOTE: INSERT ALL RING #'S FIRST, THEN NXT & CONCUR *****

CHANNEL:	RING	PHNXT	CONCURRENT PHASES																CHANNEL								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VEH	PED							
PHASE 1:			1																								
PHASE 2:	1	4		1																						2	9
PHASE 3:					1																						
PHASE 4:	1	2				1																					4
PHASE 5:							1																				
PHASE 6:								1																			
PHASE 7:									1																		
PHASE 8:										1																	
PHASE 9:											1																
PHASE 10:												1															
PHASE 11:													1														
PHASE 12:														1													
PHASE 13:															1												
PHASE 14:																1											
PHASE 15:																	1										
PHASE 16:																		1									

CODES:
 RING Ring Number for Phase (1-4)
 PHNXT Phase Next in Ring (1-16)
 CONCUR PH Phases To Be Concurrent (0=NO, 1=YES)
 For vehicle channel & ped channel, enter "1" under channel# shown.

3. PHASE DATA - 1. BASIC TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE	
Minimum Green		10		7														00-99
Passage																		0.0-9.9
Maximum #1		9.2		2.8														000-999
Maximum #2																		000-999
Yellow Clearance		4.7		3.0														3.0-9.9
Red Clearance		1.4		2.9														0.0-9.9

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk		7															00-99
Pedestrian Clearance		11															00-99
Flashing Walk																	
Extend Ped Clear																	
Act Rest in Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial		4		1												
NA Response																

CODES: 0 1 2 3 4
 Initial none inactive red yellow green
 NA Response none to 1 to 2 both -----

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		3												
Pedestrian Recall		2														

CODES: 0 1 2 3 4
 Vehicle none 1 call min max soft
 Pedestrian none 1 call ped bot N. A. -----

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nonlock Memory																
Dual Entry																
Last Car Passage																
Conditional Service																

CODES: 0 = NO 1 = YES

3. PHASE DATA - 8. SPECIAL DETECTOR - 0. SPC 1-8 (Epac 300/M52)

Detector # on Print	1	2	3	4	5	6	7	8
EPAC/M52 "D" Connector	1	6	7	8	4	5	2	3
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

See attached detection sheet
for D-connector pin
assignments

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

3. PHASE DATA - 8. SPECIAL DETECTOR - 2. VEH 9-16 (2070)

Detector # on Print	1	2	3	4	5	6	7	8
2070 "D" Connector	9	10	11	12	13	14	15	16
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

See attached detection sheet
for D-connector pin
assignments

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 10 (00-99) State : 0 (0 = fl, 1 = red)
 Auto ped clear : 0 Red revert : 7-0 (2.0 - 9.9)
 Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	A	B	C	D	E	F	G	H
FLASH																
YEL																
ALT																
ENTER				1												
EXIT		1														

Test A = Remote Flash: 0 (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME	SPC FUNC							
	1	2	3	4	5	6	7	8
AS 8-15 = OLI - P FL G PHS								
AS 8-15 = OLI - P FL R PHS								

NOTE: Go up after entering to get this screen.

4. UNIT DATA - 6. ALT SEQ. 08-15

EPAC ALT SEQ (PHASE PAIR TO REVERSE)

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.	SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08							12						
09							13						
10							14						
11							15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#	Phase	1	2	3	4	5	6	7	8	CH#	
Overlap A										Overlap I										
Overlap B										Overlap J										
Overlap C										Overlap K										
Overlap D										Overlap L										
Overlap E										Overlap M										
Overlap F										Overlap N										
Overlap G										Overlap O										
Overlap H										Overlap P										

Enter a "1" in the channel # shown.

0 = Phase not part of overlap; 1 = Phase part of overlap.

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green																
Trail yellow																
Trail red																
-Green / -yellow (-G/Y)																
+Green (+GRN)																

- * Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow
- * For FYA operation, '-G/Y' entry defines the phase that is the green arrow
- * For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4	CONN	MODE
Input Response	1				"D"	
Output Select	1				"D"	

Connector "D" : 0 = Standard & 1 = Alternate

I/O Modes	INPUT	OUTPUT
"ABC" Connector	1	
"D" Connector		

Controller with Solo Detection:
EPAC300/M52 enter "1" under D Conn Input
2070 enter "0" under D Conn Input

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER: <u>1</u>	FRE	AUT	MAN	-----	-----	-----
MODE: <u>0</u>	PRM	YLD	PYL	POM	SOM	FAC
MAX : <u>0</u>	INH	MX1	MX2	-----	-----	-----
CORR: <u>2</u>	DWL	MDW	SWY	SW+	-----	-----
OFST: <u>0</u>	BEG	END	OF GREEN			
FRCE: <u>0</u>	PLN	CYC	LE TIME			
MX DWELL: <u>0</u>			YIELD PERIOD: <u>0</u>			

5. COORDINATION DATA - 2. MANUAL CONTROL

DIAL: _____ SPLIT: _____ OFFSET: _____ SYNC: _____

To set cycle zero in manual control enter "1" for sync then press "E".

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

Mode: 0 = actuated, 1 = coord phase, 2 = minimum recall, 3 = maximum recall,
4 = pedestrian recall, 5 = maximum + pedestrian recall, 6 = phase omit,
7 = dual coord phase.

Sequence: 00 - 15 (Unit data has definition)

Ring Lag: Ring offset from local cycle zero when not barrier locked to Ring #1.

Time: 00 - 99 seconds.

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 1 / SPLIT 1 CYCLE LENGTH: *110 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		86		24				
MODE		1		3				

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: *90 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		63		27				
MODE		1		3				

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	29		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	45		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: *120 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		<i>92</i>		<i>28</i>				
MODE		<i>1</i>		<i>3</i>				

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH: *110 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		<i>75</i>		<i>35</i>				
MODE		<i>1</i>		<i>3</i>				

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	<i>31</i>		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	<i>29</i>		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4		
MIN GREEN/WALK						
OVERRIDE	FL	1/2	2/3	3/4	4/5	5/6
STATUS						
CODES	0 = NO, 1 = YES					

7. PREEMPT DATA - PREEMPT 1

1. MISC DATA: (0 = no, 1 = yes)

TEST..: _____ N-LOCK.: _____ LINK PR#..: _____
 DELAY: _____ EXTEND: _____ DURATION: _____
 MXCALL: _____ LOCK OUT: _____

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

2. INTERVAL TIMES:

SEL PED CLR: _____ TRK YEL CHG: _____
 SEL YEL CHG: _____ TRK RED CLR: _____
 SEL RED CLR: _____ DWELL GREEN: _____
 TRACK GREEN: _____ RET PED CLR: _____
 TRK PED CLR: _____ RET YEL CHG: _____
 RET YEL CLR: _____

3. VEHICLE STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								
(0=red, 1=grn, 2=flr, 3=fly, 4=dark)								
CYCLE								
(0=no, 1=act, 2=min recall, 3=max recall)								

4. PEDESTRIAN STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								
(0=dont wlk, 1=wlk, 2=flwk, 3=dark)								
CYCLE								
(0 = no, 1 = act, 2 = recall)								

5. OVERLAP STATUS:

OVERLAP	A	B	C	D
TRK GRN				
DWELL				
(0=red, 1=grn, 2=flr, 3=fly, 4=dark)				
CYCLE				
(0 = no, 1 = act)				

6. LOW PRIORITY: (0=no, 1=yes)

TEST..: _____	N-LOCK.: _____	SKIP.....: _____						
DELAY: _____	EXTEND: _____	DURATION: _____						
DWELL: _____	MXCALL: _____	LOCK OUT: _____						
RING	1	2	3	4	5	6	7	8
DWELL								
CALLS								

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	M59	A	2	A
3				
4	X10 E10 BOGIE LAKE / NORDIC	B&C	4	R
5				
6				
7				
8				
OLA				
OLB				
OLC				
OLD				
1PED				
2PED	WB M-59 PED (NORTH LEG)	WA	6	-
3PED				
4PED				
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
4 Phase EPAC
M Cabinet

Intersection WB M-59 & X/O EIO Bogie Lake / Nordic
City/Twp State No. White Lake
County No. Prepared 63041-01-229
By Date 4139
Dawn Bierlein
11/16/15

Phasing:

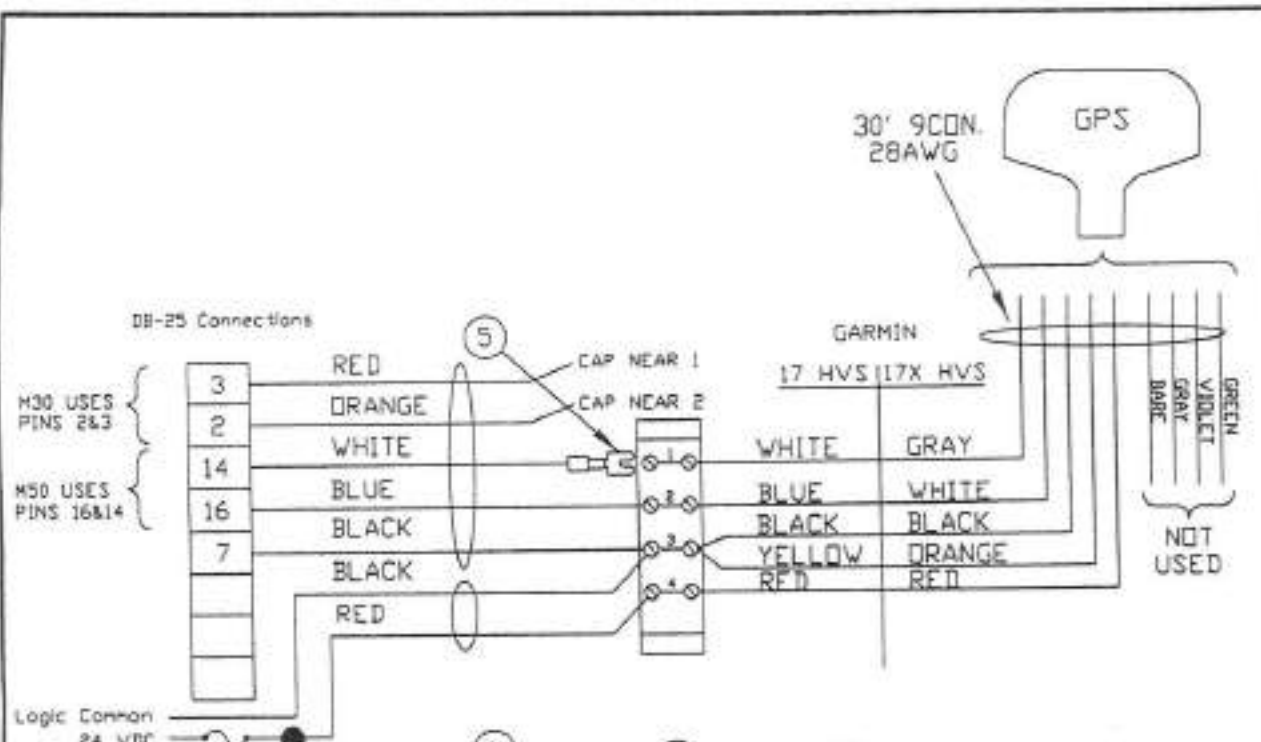
Load Switch 2: M-59	A	FLA
Load Switch 4: X/O EIO Bogie Lake / Nordic	B&C	FLR
Load Switch 6: WB M-59 Ped (North Leg)	WA	

Jumpers:

121-213, 151-152, 153-154, 155-156, 173-174, 175-176, 177-178, 179-180, 185-186,
233-PB1, 237-PB1, 241-PB1, 255-256, 257-258, 259-260, 261-262, 263-PB1, 268-269.

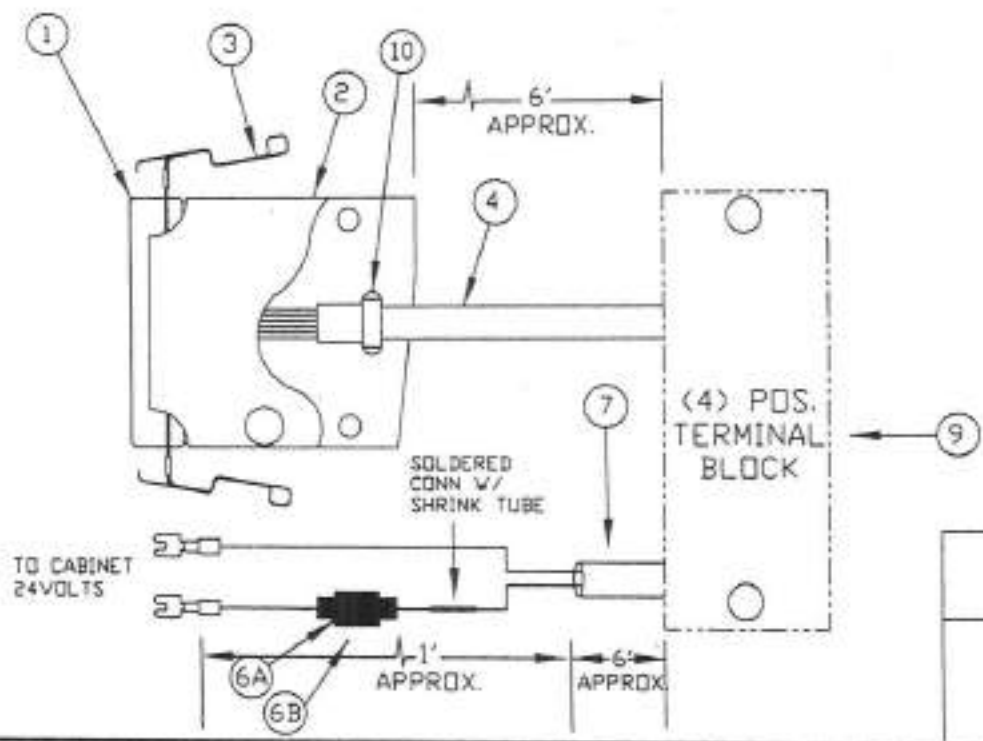
Signal Monitor : NONE

All switched OFF EXCEPT: Dual Select A&B; G&Y Enable; SSM 2,4.
Minimum Flash = 4+2+1



DET. No.	DESCRIPTION	VENDOR	PART No.	QTY.
1	DB-25 MALE	AMP	747912-4	1
2	HOUSING KIT	AMP	207345-1	1
3	SPRING LATCH DB CONNECTOR	NEWARK	44F8751	2
4	6 CONDUCTOR 28AWG	Alpha	1176C	6 FT
5	TERMINAL	3M	nv108-109ax	7
6A	FUSE HOLDER NEWARK #67K1434			
6B	FUSE (1/2A), NEWARK #27F654			
7	2 CONDUCTOR BELDEN CABLE # B205-060			
8	(2) CHANNEL NUTS UNISTRUT TEAL #A4006-103REG			
8A	(2) Screw 10-32 x 1" pan head philips SS			
8B	(2ea) #10 lock washer/flat washer/fender washer			
9	4 POSITION TERMINAL BLOCK NEWARK #28F724			
10	TIE-RAP			

REVISED 11/10/09 DG (17X HVS)



CARRIER AND GABLE INC.
TECH SERVICES

5020
GPS TO SEPAC



④ PEDESTRIAN PEDESTAL
 ③ PEDESTAL FOUNDATION
 ⑤② SEE DETAIL "I-2" SIG-028-A

NORDIC DRIVE
 SPEED LIMIT = 25 MPH

PROPOSED HIGHWAY EASEMENT

EX 45' / 4 WOOD POLE
 SEE DETAIL "B-1" SIG-029-B⑥

1-3" CONDUIT

EX 50' / 4 WOOD POLE
 EX SERVICE DISCONNECT
 EX ELECTRICAL SERVICE

① 1-1 1/2" DB
 PROPOSED CONSENT TO GRADE

EX WOOD POLE

EXISTING SANITARY EASEMENT

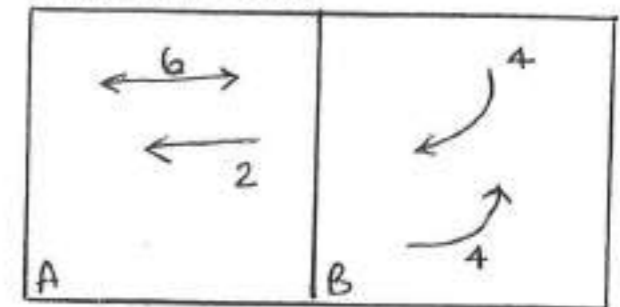
CS #1

EXISTING 24" X 30" 4-WAY ILLUMINATED CASE SIGN



WESTBOUND M-59 (HIGHLAND ROAD)
 SPEED LIMIT = 55 MPH

WESTBOUND M-59 (HIGHLAND ROAD)
 SPEED LIMIT = 55 MPH



EX INTERCONNECT TO
 BOGIE LAKE & M-59

EX HH

EASTBOUND M-59 (HIGHLAND ROAD)
 SPEED LIMIT = 55 MPH

EASTBOUND M-59 (HIGHLAND ROAD)
 SPEED LIMIT = 55 MPH

EX 36' STEEL STRAIN POLE
 EX SOLID STATE ACTUATED
 CONTROLLER & CABINET
 EX GPS MODULE

EX ROW

EX ROW

PLAN

LIST OF MATERIAL		
NO.	ITEM	QUANTITIES
①	Conduit, 08, 1, 1 1/2 inch	10 FT
②	TS, One Way Pedestal Mtd (LED)	1 Ea
③	Pedestal, Alum	1 Ea
④	Pedestal, Fdn	1 Ea
⑤	TS, Pedestrian, One Way Pedestal Mtd (LED) Countdown	1 Ea
⑥	TS, Pedestrian, One Way Bracket Arm Mtd (LED) Countdown	1 Ea
⑦	Conduit, 08, 1, 3 inch	11 FT

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Gateway Crossing TIS	Organization:	
Project Location:	White Lake Twp	Performed By:	Fleis & VandenBrink Engineering
Scenario Description:		Date:	12/13/2022
Analysis Year:		Checked By:	
Analysis Period:	AM Street Peak Hour	Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				14	8	6
Restaurant				197	100	97
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses ²				0		
				211	108	103

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		1	0	0	0
Restaurant	0	1		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	211	108	103
Internal Capture Percentage	2%	2%	2%
External Vehicle-Trips ⁵	207	106	101
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	13%	17%
Restaurant	1%	1%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:		Organization:	
Project Location:		Performed By:	
Scenario Description:		Date:	
Analysis Year:		Checked By:	
Analysis Period:	PM Street Peak Hour	Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				54	27	27
Restaurant				223	115	108
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses ²				0		
				277	142	135

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		8	0	0	0
Restaurant	0	14		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	277	142	135
Internal Capture Percentage	16%	15%	16%
External Vehicle-Trips ⁵	233	120	113
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	52%	30%
Restaurant	7%	13%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

HCM Signalized Intersection Capacity Analysis
 10: EB Highland Road & WB-to-EB X/O

Existing Conditions
 AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↙	
Traffic Volume (vph)	0	1587	0	0	134	0
Future Volume (vph)	0	1587	0	0	134	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1			5.9	
Lane Util. Factor		0.95			1.00	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3471			1736	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3471			1736	
Peak-hour factor, PHF	0.91	0.91	0.92	0.92	0.61	0.61
Adj. Flow (vph)	0	1744	0	0	220	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1744	0	0	220	0
Heavy Vehicles (%)	4%	4%	2%	2%	4%	4%
Turn Type		NA			Prot	
Protected Phases		2!			4 2!	
Permitted Phases						
Actuated Green, G (s)		56.9			90.0	
Effective Green, g (s)		56.9			83.9	
Actuated g/C Ratio		0.63			0.93	
Clearance Time (s)		6.1				
Vehicle Extension (s)		3.0				
Lane Grp Cap (vph)		2194			1618	
v/s Ratio Prot		c0.50			c0.13	
v/s Ratio Perm						
v/c Ratio		0.79			0.14	
Uniform Delay, d1		12.2			0.2	
Progression Factor		1.00			1.00	
Incremental Delay, d2		3.1			0.2	
Delay (s)		15.3			0.4	
Level of Service		B			A	
Approach Delay (s)		15.3	0.0		0.4	
Approach LOS		B	A		A	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.0%	ICU Level of Service	D
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Bogie Lake Road & EB Highland Road













Existing Conditions
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗					↑	↗↗		↑		
Traffic Volume (vph)	0	1222	499	0	0	0	0	102	293	0	45	0	
Future Volume (vph)	0	1222	499	0	0	0	0	102	293	0	45	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.7	6.7					10.9	10.9		6.9		
Lane Util. Factor		0.95	1.00					1.00	0.88		1.00		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		3471	1553					1827	2733		1681		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		3471	1553					1827	2733		1681		
Peak-hour factor, PHF	0.89	0.89	0.89	0.92	0.92	0.92	0.87	0.87	0.87	0.95	0.95	0.95	
Adj. Flow (vph)	0	1373	561	0	0	0	0	117	337	0	47	0	
RTOR Reduction (vph)	0	0	229	0	0	0	0	0	67	0	0	0	
Lane Group Flow (vph)	0	1373	332	0	0	0	0	117	270	0	47	0	
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	13%	13%	13%	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		2						4			8		
Permitted Phases			2						4				
Actuated Green, G (s)		53.3	53.3					19.1	19.1		23.1		
Effective Green, g (s)		53.3	53.3					19.1	19.1		23.1		
Actuated g/C Ratio		0.59	0.59					0.21	0.21		0.26		
Clearance Time (s)		6.7	6.7					10.9	10.9		6.9		
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0		
Lane Grp Cap (vph)		2055	919					387	580		431		
v/s Ratio Prot		c0.40						0.06			0.03		
v/s Ratio Perm			0.21						c0.10				
v/c Ratio		0.67	0.36					0.30	0.47		0.11		
Uniform Delay, d1		12.4	9.5					29.8	31.0		25.6		
Progression Factor		0.16	0.24					1.00	1.00		0.00		
Incremental Delay, d2		1.2	0.7					2.0	2.7		0.5		
Delay (s)		3.2	3.0					31.8	33.7		0.5		
Level of Service		A	A					C	C		A		
Approach Delay (s)		3.1			0.0			33.2			0.5		
Approach LOS		A			A			C			A		
Intersection Summary													
HCM 2000 Control Delay			8.7									HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.61										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	17.6
Intersection Capacity Utilization			58.7%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis













21: Bogie Lake Road & WB Highland Road

Existing Conditions
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑			↑	↑↑
Traffic Volume (vph)	0	0	0	0	1067	44	0	102	0	0	45	68
Future Volume (vph)	0	0	0	0	1067	44	0	102	0	0	45	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.7	6.7		6.9			10.9	10.9
Lane Util. Factor					0.95	1.00		1.00			1.00	0.88
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					3406	1524		1827			1681	2515
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					3406	1524		1827			1681	2515
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.87	0.87	0.87	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1160	48	0	117	0	0	47	72
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	57
Lane Group Flow (vph)	0	0	0	0	1160	28	0	117	0	0	47	15
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	13%	13%	13%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					53.3	53.3		23.1			19.1	19.1
Effective Green, g (s)					53.3	53.3		23.1			19.1	19.1
Actuated g/C Ratio					0.59	0.59		0.26			0.21	0.21
Clearance Time (s)					6.7	6.7		6.9			10.9	10.9
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					2017	902		468			356	533
v/s Ratio Prot					c0.34			c0.06			0.03	
v/s Ratio Perm						0.02						0.01
v/c Ratio					0.58	0.03		0.25			0.13	0.03
Uniform Delay, d1					11.3	7.6		26.6			28.7	28.1
Progression Factor					0.48	0.47		0.00			1.25	2.12
Incremental Delay, d2					1.1	0.1		1.2			0.8	0.1
Delay (s)					6.5	3.7		1.3			36.8	59.6
Level of Service					A	A		A			D	E
Approach Delay (s)		0.0			6.4			1.3			50.6	
Approach LOS		A			A			A			D	
Intersection Summary												
HCM 2000 Control Delay			9.6		HCM 2000 Level of Service						A	
HCM 2000 Volume to Capacity ratio			0.50									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)						17.6	
Intersection Capacity Utilization			58.7%		ICU Level of Service						B	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Existing Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Volume (vph)	0	0	0	0	986	7	119	9	0	0	0	6
Future Volume (vph)	0	0	0	0	986	7	119	9	0	0	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.1	6.1		5.9				5.9
Lane Util. Factor					0.95	1.00		1.00				1.00
Frt					1.00	0.85		1.00				0.86
Flt Protected					1.00	1.00		0.96				1.00
Satd. Flow (prot)					3406	1524		1763				1644
Flt Permitted					1.00	1.00		0.96				1.00
Satd. Flow (perm)					3406	1524		1763				1644
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.78	0.78	0.78	0.75	0.75	0.75
Adj. Flow (vph)	0	0	0	0	1038	7	153	12	0	0	0	8
RTOR Reduction (vph)	0	0	0	0	0	3	0	96	0	0	0	6
Lane Group Flow (vph)	0	0	0	0	1038	4	0	69	0	0	0	2
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	3%	3%	3%	0%	0%	0%
Turn Type					NA	Perm	custom	NA				Perm
Protected Phases					2!			4				
Permitted Phases						2	4 2!					4
Actuated Green, G (s)					56.9	56.9		21.1				21.1
Effective Green, g (s)					56.9	56.9		21.1				21.1
Actuated g/C Ratio					0.63	0.63		0.23				0.23
Clearance Time (s)					6.1	6.1		5.9				5.9
Vehicle Extension (s)					3.0	3.0		3.0				3.0
Lane Grp Cap (vph)					2153	963		413				385
v/s Ratio Prot					c0.30							
v/s Ratio Perm						0.00		0.04				0.00
v/c Ratio					0.48	0.00		0.17				0.00
Uniform Delay, d1					8.8	6.1		27.5				26.4
Progression Factor					1.00	1.00		1.32				1.00
Incremental Delay, d2					0.8	0.0		0.7				0.0
Delay (s)					9.5	6.1		36.9				26.4
Level of Service					A	A		D				C
Approach Delay (s)		0.0			9.5			36.9			26.4	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
40: Bogie Lake Road & NB-to-SB X/O

Existing Conditions
AM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖		↑	↗	↘	↕
Traffic Volume (vph)	88	0	0	0	0	25
Future Volume (vph)	88	0	0	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9					5.4
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1556					3139
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1556					3139
Peak-hour factor, PHF	0.82	0.82	0.92	0.92	0.81	0.81
Adj. Flow (vph)	107	0	0	0	0	31
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	107	0	0	0	0	31
Heavy Vehicles (%)	16%	16%	2%	2%	15%	15%
Turn Type	Prot					NA
Protected Phases	4 2!					2!
Permitted Phases						
Actuated Green, G (s)	90.0					57.6
Effective Green, g (s)	84.6					57.6
Actuated g/C Ratio	0.94					0.64
Clearance Time (s)						5.4
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)	1462					2008
v/s Ratio Prot	c0.07					0.01
v/s Ratio Perm						
v/c Ratio	0.07					0.02
Uniform Delay, d1	0.2					5.9
Progression Factor	1.00					1.00
Incremental Delay, d2	0.1					0.0
Delay (s)	0.3					5.9
Level of Service	A					A
Approach Delay (s)	0.3		0.0			5.9
Approach LOS	A		A			A

Intersection Summary

HCM 2000 Control Delay	1.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.08		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	25.2%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: EB Highland Road & WB-to-EB X/O

Existing Conditions
 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Volume (vph)	0	1407	0	0	212	0
Future Volume (vph)	0	1407	0	0	212	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1			5.9	
Lane Util. Factor		0.95			1.00	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3471			1787	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3471			1787	
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.88	0.88
Adj. Flow (vph)	0	1497	0	0	241	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1497	0	0	241	0
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Turn Type		NA			Prot	
Protected Phases		2!			4 2!	
Permitted Phases						
Actuated Green, G (s)		85.9			120.0	
Effective Green, g (s)		85.9			113.9	
Actuated g/C Ratio		0.72			0.95	
Clearance Time (s)		6.1				
Vehicle Extension (s)		3.0				
Lane Grp Cap (vph)		2484			1696	
v/s Ratio Prot		c0.43			c0.13	
v/s Ratio Perm						
v/c Ratio		0.60			0.14	
Uniform Delay, d1		8.5			0.2	
Progression Factor		1.00			1.00	
Incremental Delay, d2		1.1			0.1	
Delay (s)		9.6			0.3	
Level of Service		A			A	
Approach Delay (s)		9.6	0.0		0.3	
Approach LOS		A	A		A	

Intersection Summary

HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.4%	ICU Level of Service	F
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis













20: Bogie Lake Road & EB Highland Road

Existing Conditions
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗					↑	↗↗		↑		
Traffic Volume (vph)	0	1288	331	0	0	0	0	186	345	0	65	0	
Future Volume (vph)	0	1288	331	0	0	0	0	186	345	0	65	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.7	6.7					10.9	10.9		6.9		
Lane Util. Factor		0.95	1.00					1.00	0.88		1.00		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		3505	1568					1863	2787		1827		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		3505	1568					1863	2787		1827		
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92	
Adj. Flow (vph)	0	1356	348	0	0	0	0	200	371	0	71	0	
RTOR Reduction (vph)	0	0	106	0	0	0	0	0	120	0	0	0	
Lane Group Flow (vph)	0	1356	242	0	0	0	0	200	251	0	71	0	
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	4%	4%	4%	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		2						4			8		
Permitted Phases			2						4				
Actuated Green, G (s)		83.3	83.3					19.1	19.1		23.1		
Effective Green, g (s)		83.3	83.3					19.1	19.1		23.1		
Actuated g/C Ratio		0.69	0.69					0.16	0.16		0.19		
Clearance Time (s)		6.7	6.7					10.9	10.9		6.9		
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0		
Lane Grp Cap (vph)		2433	1088					296	443		351		
v/s Ratio Prot		c0.39						c0.11			0.04		
v/s Ratio Perm			0.15						0.09				
v/c Ratio		0.56	0.22					0.68	0.57		0.20		
Uniform Delay, d1		9.2	6.6					47.5	46.6		40.7		
Progression Factor		0.23	0.24					1.00	1.00		0.00		
Incremental Delay, d2		0.8	0.4					11.7	5.2		1.3		
Delay (s)		2.9	2.0					59.3	51.8		1.3		
Level of Service		A	A					E	D		A		
Approach Delay (s)		2.7			0.0			54.4			1.3		
Approach LOS		A			A			D			A		
Intersection Summary													
HCM 2000 Control Delay			15.2									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.58										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	17.6
Intersection Capacity Utilization			71.1%									ICU Level of Service	C
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
21: Bogie Lake Road & WB Highland Road













Existing Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↗		↑			↑	↗↗
Traffic Volume (vph)	0	0	0	0	1807	110	0	186	0	0	65	143
Future Volume (vph)	0	0	0	0	1807	110	0	186	0	0	65	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.7	6.7		6.9			10.9	10.9
Lane Util. Factor					0.95	1.00		1.00			1.00	0.88
Frbp, ped/bikes					1.00	0.99		1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					3539	1562		1863			1827	2670
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					3539	1562		1863			1827	2670
Peak-hour factor, PHF	0.92	0.92	0.92	0.90	0.90	0.90	0.93	0.93	0.93	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	2008	122	0	200	0	0	71	155
RTOR Reduction (vph)	0	0	0	0	0	37	0	0	0	0	0	31
Lane Group Flow (vph)	0	0	0	0	2008	85	0	200	0	0	71	124
Confl. Peds. (#/hr)						3						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					83.3	83.3		23.1			19.1	19.1
Effective Green, g (s)					83.3	83.3		23.1			19.1	19.1
Actuated g/C Ratio					0.69	0.69		0.19			0.16	0.16
Clearance Time (s)					6.7	6.7		6.9			10.9	10.9
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					2456	1084		358			290	424
v/s Ratio Prot					c0.57			c0.11			0.04	
v/s Ratio Perm						0.05						0.05
v/c Ratio					0.82	0.08		0.56			0.24	0.29
Uniform Delay, d1					13.0	5.9		43.8			44.1	44.5
Progression Factor					0.91	0.33		0.00			1.34	1.45
Incremental Delay, d2					2.3	0.1		4.5			2.0	1.7
Delay (s)					14.2	2.1		4.6			61.2	66.4
Level of Service					B	A		A			E	E
Approach Delay (s)		0.0			13.5			4.6			64.8	
Approach LOS		A			B			A			E	
Intersection Summary												
HCM 2000 Control Delay			17.3		HCM 2000 Level of Service						B	
HCM 2000 Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						17.6	
Intersection Capacity Utilization			71.1%		ICU Level of Service						C	
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Existing Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Volume (vph)	0	0	0	0	1655	38	203	34	0	0	0	59
Future Volume (vph)	0	0	0	0	1655	38	203	34	0	0	0	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.1	6.1		5.9				5.9
Lane Util. Factor					0.95	1.00		1.00				1.00
Frbp, ped/bikes					1.00	0.98		1.00				1.00
Flpb, ped/bikes					1.00	1.00		1.00				1.00
Frt					1.00	0.85		1.00				0.86
Flt Protected					1.00	1.00		0.96				1.00
Satd. Flow (prot)					3505	1536		1822				1644
Flt Permitted					1.00	1.00		0.96				1.00
Satd. Flow (perm)					3505	1536		1822				1644
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.79	0.79	0.79	0.74	0.74	0.74
Adj. Flow (vph)	0	0	0	0	1742	40	257	43	0	0	0	80
RTOR Reduction (vph)	0	0	0	0	0	7	0	33	0	0	0	33
Lane Group Flow (vph)	0	0	0	0	1742	33	0	267	0	0	0	47
Confl. Peds. (#/hr)						1						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	0%	0%	0%	0%	0%	0%
Turn Type					NA	Perm	custom	NA				Perm
Protected Phases					2!			4				
Permitted Phases						2	4 2!					4
Actuated Green, G (s)					85.9	85.9		22.1				22.1
Effective Green, g (s)					85.9	85.9		22.1				22.1
Actuated g/C Ratio					0.72	0.72		0.18				0.18
Clearance Time (s)					6.1	6.1		5.9				5.9
Vehicle Extension (s)					3.0	3.0		3.0				3.0
Lane Grp Cap (vph)					2508	1099		335				302
v/s Ratio Prot					c0.50							
v/s Ratio Perm						0.02		0.15				0.03
v/c Ratio					0.69	0.03		0.80				0.15
Uniform Delay, d1					9.6	5.0		46.8				41.1
Progression Factor					1.00	1.00		1.06				1.00
Incremental Delay, d2					1.6	0.1		15.1				1.1
Delay (s)					11.2	5.0		65.0				42.2
Level of Service					B	A		E				D
Approach Delay (s)		0.0			11.1			65.0			42.2	
Approach LOS		A			B			E			D	
Intersection Summary												
HCM 2000 Control Delay			19.7		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					12.0		
Intersection Capacity Utilization			79.5%		ICU Level of Service					D		
Analysis Period (min)			15									
! Phase conflict between lane groups.												
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
40: Bogie Lake Road & NB-to-SB X/O

Existing Conditions
PM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘					↑↑
Traffic Volume (vph)	185	0	0	0	0	23
Future Volume (vph)	185	0	0	0	0	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9					5.4
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1752					3610
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1752					3610
Peak-hour factor, PHF	0.86	0.86	0.92	0.92	0.60	0.60
Adj. Flow (vph)	215	0	0	0	0	38
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	215	0	0	0	0	38
Heavy Vehicles (%)	3%	3%	2%	2%	0%	0%
Turn Type	Prot					NA
Protected Phases	4 2!					2!
Permitted Phases						
Actuated Green, G (s)	120.0					86.6
Effective Green, g (s)	114.6					86.6
Actuated g/C Ratio	0.95					0.72
Clearance Time (s)						5.4
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)	1673					2605
v/s Ratio Prot	c0.12					0.01
v/s Ratio Perm						
v/c Ratio	0.13					0.01
Uniform Delay, d1	0.1					4.7
Progression Factor	1.00					1.00
Incremental Delay, d2	0.2					0.0
Delay (s)	0.3					4.7
Level of Service	A					A
Approach Delay (s)	0.3		0.0			4.7
Approach LOS	A		A			A

Intersection Summary

HCM 2000 Control Delay	1.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.13		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Intersection: 10: EB Highland Road & WB-to-EB X/O

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	295	316	69
Average Queue (ft)	152	150	36
95th Queue (ft)	250	258	68
Link Distance (ft)	708	708	35
Upstream Blk Time (%)			12
Queuing Penalty (veh)			20
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB-to-EB X/O & WB Highland Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	100
Average Queue (ft)	21
95th Queue (ft)	73
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	325
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Bogie Lake Road & EB Highland Road

Movement	EB	EB	EB	NB	NB	NB	SB
Directions Served	T	T	R	T	R	R	T
Maximum Queue (ft)	132	138	95	130	136	120	14
Average Queue (ft)	35	42	41	55	61	48	0
95th Queue (ft)	88	94	75	108	109	94	10
Link Distance (ft)	330	330	330	291	291	291	37
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 21: Bogie Lake Road & WB Highland Road

Movement	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	114	100	39	94	67	47
Average Queue (ft)	28	29	3	30	25	16
95th Queue (ft)	79	82	18	73	55	42
Link Distance (ft)	477	477	477	152	152	152
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Movement	WB	WB	WB	NB	SB
Directions Served	T	T	R	LT	R
Maximum Queue (ft)	196	180	21	55	30
Average Queue (ft)	112	64	1	35	5
95th Queue (ft)	180	132	11	62	23
Link Distance (ft)	905	905		11	94
Upstream Blk Time (%)				17	
Queuing Penalty (veh)				23	
Storage Bay Dist (ft)			50		
Storage Blk Time (%)		9			
Queuing Penalty (veh)		1			

Intersection: 31: EB Highland Road & EB-to-WB X/O

Movement	EB
Directions Served	L
Maximum Queue (ft)	114
Average Queue (ft)	23
95th Queue (ft)	73
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 40: Bogie Lake Road & NB-to-SB X/O

Movement	WB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	10	54	6
Average Queue (ft)	0	8	0
95th Queue (ft)	5	34	4
Link Distance (ft)	28	192	192
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 41: Bogie Lake Road & NB-to-SB X/O

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: W. Site Drive & EB Highland Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 60: Bogie Lake Road & E. Site Drive

Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)

Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 44

Intersection: 10: EB Highland Road & WB-to-EB X/O

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	255	250	56
Average Queue (ft)	148	120	45
95th Queue (ft)	231	214	61
Link Distance (ft)	708	708	35
Upstream Blk Time (%)			22
Queuing Penalty (veh)			47
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB-to-EB X/O & WB Highland Road

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	127	10
Average Queue (ft)	31	0
95th Queue (ft)	89	7
Link Distance (ft)		745
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	325	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: Bogie Lake Road & EB Highland Road

Movement	EB	EB	EB	NB	NB	NB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	90	104	62	238	154	137
Average Queue (ft)	35	39	24	124	77	62
95th Queue (ft)	75	83	57	206	128	110
Link Distance (ft)	330	330	330	291	291	291
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 21: Bogie Lake Road & WB Highland Road

Movement	WB	WB	WB	NB	SB	SB	SB
Directions Served	T	T	R	T	T	R	R
Maximum Queue (ft)	226	240	46	5	111	127	116
Average Queue (ft)	68	77	7	0	50	52	48
95th Queue (ft)	151	160	30	6	95	101	94
Link Distance (ft)	477	477	477	37	152	152	152
Upstream Blk Time (%)		0		1	0	0	0
Queuing Penalty (veh)		0		1	0	0	0
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Movement	WB	WB	WB	NB	SB
Directions Served	T	T	R	LT	R
Maximum Queue (ft)	300	263	28	48	77
Average Queue (ft)	175	140	6	47	31
95th Queue (ft)	266	234	23	54	62
Link Distance (ft)	905	905		11	94
Upstream Blk Time (%)				54	0
Queuing Penalty (veh)				129	0
Storage Bay Dist (ft)			50		
Storage Blk Time (%)		15			
Queuing Penalty (veh)		6			

Intersection: 31: EB Highland Road & EB-to-WB X/O

Movement	EB
Directions Served	L
Maximum Queue (ft)	250
Average Queue (ft)	112
95th Queue (ft)	214
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	0
Queuing Penalty (veh)	1

Intersection: 40: Bogie Lake Road & NB-to-SB X/O

Movement	WB	SB
Directions Served	L	T
Maximum Queue (ft)	34	35
Average Queue (ft)	2	4
95th Queue (ft)	15	22
Link Distance (ft)	28	192
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 41: Bogie Lake Road & NB-to-SB X/O

Movement	NB
Directions Served	L
Maximum Queue (ft)	11
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: W. Site Drive & EB Highland Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 60: Bogie Lake Road & E. Site Drive

Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)

Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 184

HCM Signalized Intersection Capacity Analysis
 10: EB Highland Road & WB-to-EB X/O

Background Conditions
 AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Volume (vph)	0	1603	0	0	135	0
Future Volume (vph)	0	1603	0	0	135	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1			5.9	
Lane Util. Factor		0.95			1.00	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3471			1736	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3471			1736	
Peak-hour factor, PHF	0.91	0.91	0.92	0.92	0.61	0.61
Adj. Flow (vph)	0	1762	0	0	221	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1762	0	0	221	0
Heavy Vehicles (%)	4%	4%	2%	2%	4%	4%
Turn Type		NA			Prot	
Protected Phases		2!			4 2!	
Permitted Phases						
Actuated Green, G (s)		56.9			90.0	
Effective Green, g (s)		56.9			83.9	
Actuated g/C Ratio		0.63			0.93	
Clearance Time (s)		6.1				
Vehicle Extension (s)		3.0				
Lane Grp Cap (vph)		2194			1618	
v/s Ratio Prot		c0.51			c0.13	
v/s Ratio Perm						
v/c Ratio		0.80			0.14	
Uniform Delay, d1		12.4			0.2	
Progression Factor		1.00			1.00	
Incremental Delay, d2		3.2			0.2	
Delay (s)		15.6			0.4	
Level of Service		B			A	
Approach Delay (s)		15.6	0.0		0.4	
Approach LOS		B	A		A	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Bogie Lake Road & EB Highland Road













Background Conditions
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗					↑	↗↗		↑		
Traffic Volume (vph)	0	1234	504	0	0	0	0	103	296	0	45	0	
Future Volume (vph)	0	1234	504	0	0	0	0	103	296	0	45	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.7	6.7					10.9	10.9		6.9		
Lane Util. Factor		0.95	1.00					1.00	0.88		1.00		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		3471	1553					1827	2733		1681		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		3471	1553					1827	2733		1681		
Peak-hour factor, PHF	0.89	0.89	0.89	0.92	0.92	0.92	0.87	0.87	0.87	0.95	0.95	0.95	
Adj. Flow (vph)	0	1387	566	0	0	0	0	118	340	0	47	0	
RTOR Reduction (vph)	0	0	231	0	0	0	0	0	65	0	0	0	
Lane Group Flow (vph)	0	1387	335	0	0	0	0	118	275	0	47	0	
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	13%	13%	13%	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		2						4			8		
Permitted Phases			2						4				
Actuated Green, G (s)		53.3	53.3					19.1	19.1		23.1		
Effective Green, g (s)		53.3	53.3					19.1	19.1		23.1		
Actuated g/C Ratio		0.59	0.59					0.21	0.21		0.26		
Clearance Time (s)		6.7	6.7					10.9	10.9		6.9		
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0		
Lane Grp Cap (vph)		2055	919					387	580		431		
v/s Ratio Prot		c0.40						0.06			0.03		
v/s Ratio Perm			0.22						c0.10				
v/c Ratio		0.67	0.36					0.30	0.47		0.11		
Uniform Delay, d1		12.5	9.5					29.9	31.0		25.6		
Progression Factor		0.16	0.23					1.00	1.00		0.00		
Incremental Delay, d2		1.2	0.7					2.0	2.8		0.5		
Delay (s)		3.2	3.0					31.9	33.8		0.5		
Level of Service		A	A					C	C		A		
Approach Delay (s)		3.1			0.0			33.3			0.5		
Approach LOS		A			A			C			A		
Intersection Summary													
HCM 2000 Control Delay			8.7									HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.62										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	17.6
Intersection Capacity Utilization			59.1%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis













21: Bogie Lake Road & WB Highland Road

Background Conditions
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑	↑		↑			↑	↑↑	
Traffic Volume (vph)	0	0	0	0	1078	44	0	103	0	0	45	69	
Future Volume (vph)	0	0	0	0	1078	44	0	103	0	0	45	69	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					6.7	6.7		6.9			10.9	10.9	
Lane Util. Factor					0.95	1.00		1.00			1.00	0.88	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					3406	1524		1827			1681	2515	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					3406	1524		1827			1681	2515	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.87	0.87	0.87	0.95	0.95	0.95	
Adj. Flow (vph)	0	0	0	0	1172	48	0	118	0	0	47	73	
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	58	
Lane Group Flow (vph)	0	0	0	0	1172	28	0	118	0	0	47	15	
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	13%	13%	13%	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					6			8			4		
Permitted Phases						6						4	
Actuated Green, G (s)					53.3	53.3		23.1			19.1	19.1	
Effective Green, g (s)					53.3	53.3		23.1			19.1	19.1	
Actuated g/C Ratio					0.59	0.59		0.26			0.21	0.21	
Clearance Time (s)					6.7	6.7		6.9			10.9	10.9	
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0	
Lane Grp Cap (vph)					2017	902		468			356	533	
v/s Ratio Prot					c0.34			c0.06			0.03		
v/s Ratio Perm						0.02						0.01	
v/c Ratio					0.58	0.03		0.25			0.13	0.03	
Uniform Delay, d1					11.4	7.6		26.6			28.7	28.1	
Progression Factor					0.48	0.47		0.00			1.25	2.15	
Incremental Delay, d2					1.1	0.1		1.3			0.8	0.1	
Delay (s)					6.6	3.7		1.3			36.7	60.4	
Level of Service					A	A		A			D	E	
Approach Delay (s)		0.0			6.5			1.3			51.1		
Approach LOS		A			A			A			D		
Intersection Summary													
HCM 2000 Control Delay			9.8		HCM 2000 Level of Service						A		
HCM 2000 Volume to Capacity ratio			0.51										
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					17.6			
Intersection Capacity Utilization			59.1%		ICU Level of Service					B			
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Background Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Volume (vph)	0	0	0	0	996	7	120	9	0	0	0	6
Future Volume (vph)	0	0	0	0	996	7	120	9	0	0	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.1	6.1		5.9				5.9
Lane Util. Factor					0.95	1.00		1.00				1.00
Frt					1.00	0.85		1.00				0.86
Flt Protected					1.00	1.00		0.96				1.00
Satd. Flow (prot)					3406	1524		1763				1644
Flt Permitted					1.00	1.00		0.96				1.00
Satd. Flow (perm)					3406	1524		1763				1644
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.78	0.78	0.78	0.75	0.75	0.75
Adj. Flow (vph)	0	0	0	0	1048	7	154	12	0	0	0	8
RTOR Reduction (vph)	0	0	0	0	0	3	0	93	0	0	0	6
Lane Group Flow (vph)	0	0	0	0	1048	4	0	73	0	0	0	2
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	3%	3%	3%	0%	0%	0%
Turn Type					NA	Perm	custom	NA				Perm
Protected Phases					2!			4				
Permitted Phases						2	4 2!					4
Actuated Green, G (s)					56.9	56.9		21.1				21.1
Effective Green, g (s)					56.9	56.9		21.1				21.1
Actuated g/C Ratio					0.63	0.63		0.23				0.23
Clearance Time (s)					6.1	6.1		5.9				5.9
Vehicle Extension (s)					3.0	3.0		3.0				3.0
Lane Grp Cap (vph)					2153	963		413				385
v/s Ratio Prot					c0.31							
v/s Ratio Perm						0.00		0.04				0.00
v/c Ratio					0.49	0.00		0.18				0.00
Uniform Delay, d1					8.8	6.1		27.5				26.4
Progression Factor					1.00	1.00		1.28				1.00
Incremental Delay, d2					0.8	0.0		0.7				0.0
Delay (s)					9.6	6.1		36.0				26.4
Level of Service					A	A		D				C
Approach Delay (s)		0.0			9.6			36.0			26.4	
Approach LOS		A			A			D			C	
Intersection Summary												
HCM 2000 Control Delay			13.2		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.40									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					12.0		
Intersection Capacity Utilization			55.4%		ICU Level of Service					B		
Analysis Period (min)			15									
! Phase conflict between lane groups.												
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
40: Bogie Lake Road & NB-to-SB X/O

Background Conditions
AM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵					↵↵
Traffic Volume (vph)	89	0	0	0	0	25
Future Volume (vph)	89	0	0	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9					5.4
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1556					3139
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1556					3139
Peak-hour factor, PHF	0.82	0.82	0.92	0.92	0.81	0.81
Adj. Flow (vph)	109	0	0	0	0	31
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	109	0	0	0	0	31
Heavy Vehicles (%)	16%	16%	2%	2%	15%	15%
Turn Type	Prot					NA
Protected Phases	4 2!					2!
Permitted Phases						
Actuated Green, G (s)	90.0					57.6
Effective Green, g (s)	84.6					57.6
Actuated g/C Ratio	0.94					0.64
Clearance Time (s)						5.4
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)	1462					2008
v/s Ratio Prot	c0.07					0.01
v/s Ratio Perm						
v/c Ratio	0.07					0.02
Uniform Delay, d1	0.2					5.9
Progression Factor	1.00					1.00
Incremental Delay, d2	0.1					0.0
Delay (s)	0.3					5.9
Level of Service	A					A
Approach Delay (s)	0.3		0.0			5.9
Approach LOS	A		A			A

Intersection Summary

HCM 2000 Control Delay	1.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.08		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 10: EB Highland Road & WB-to-EB X/O

Background Conditions
 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Volume (vph)	0	1421	0	0	214	0
Future Volume (vph)	0	1421	0	0	214	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1			5.9	
Lane Util. Factor		0.95			1.00	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3471			1787	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3471			1787	
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.88	0.88
Adj. Flow (vph)	0	1512	0	0	243	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1512	0	0	243	0
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Turn Type		NA			Prot	
Protected Phases		2!			4 2!	
Permitted Phases						
Actuated Green, G (s)		85.9			120.0	
Effective Green, g (s)		85.9			113.9	
Actuated g/C Ratio		0.72			0.95	
Clearance Time (s)		6.1				
Vehicle Extension (s)		3.0				
Lane Grp Cap (vph)		2484			1696	
v/s Ratio Prot		c0.44			c0.14	
v/s Ratio Perm						
v/c Ratio		0.61			0.14	
Uniform Delay, d1		8.6			0.2	
Progression Factor		1.00			1.00	
Incremental Delay, d2		1.1			0.1	
Delay (s)		9.7			0.3	
Level of Service		A			A	
Approach Delay (s)		9.7	0.0		0.3	
Approach LOS		A	A		A	













Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	96.2%	ICU Level of Service	F
Analysis Period (min)	15		

! Phase conflict between lane groups.
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Bogie Lake Road & EB Highland Road













Background Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗					↑	↗↗		↑	
Traffic Volume (vph)	0	1301	334	0	0	0	0	188	348	0	66	0
Future Volume (vph)	0	1301	334	0	0	0	0	188	348	0	66	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.7	6.7					10.9	10.9		6.9	
Lane Util. Factor		0.95	1.00					1.00	0.88		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3505	1568					1863	2787		1827	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3505	1568					1863	2787		1827	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92
Adj. Flow (vph)	0	1369	352	0	0	0	0	202	374	0	72	0
RTOR Reduction (vph)	0	0	108	0	0	0	0	0	117	0	0	0
Lane Group Flow (vph)	0	1369	244	0	0	0	0	202	257	0	72	0
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		83.3	83.3					19.1	19.1		23.1	
Effective Green, g (s)		83.3	83.3					19.1	19.1		23.1	
Actuated g/C Ratio		0.69	0.69					0.16	0.16		0.19	
Clearance Time (s)		6.7	6.7					10.9	10.9		6.9	
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0	
Lane Grp Cap (vph)		2433	1088					296	443		351	
v/s Ratio Prot		c0.39						c0.11			0.04	
v/s Ratio Perm			0.16						0.09			
v/c Ratio		0.56	0.22					0.68	0.58		0.21	
Uniform Delay, d1		9.2	6.6					47.6	46.7		40.7	
Progression Factor		0.23	0.23					1.00	1.00		0.00	
Incremental Delay, d2		0.8	0.4					12.1	5.5		1.3	
Delay (s)		2.9	2.0					59.6	52.2		1.3	
Level of Service		A	A					E	D		A	
Approach Delay (s)		2.7			0.0			54.8			1.3	
Approach LOS		A			A			D			A	
Intersection Summary												
HCM 2000 Control Delay			15.3					HCM 2000 Level of Service			B	
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			120.0					Sum of lost time (s)		17.6		
Intersection Capacity Utilization			71.7%					ICU Level of Service		C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

21: Bogie Lake Road & WB Highland Road

Background Conditions
PM Peak Hour













													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑	↑		↑			↑	↑↑	
Traffic Volume (vph)	0	0	0	0	1825	111	0	188	0	0	66	144	
Future Volume (vph)	0	0	0	0	1825	111	0	188	0	0	66	144	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					6.7	6.7		6.9			10.9	10.9	
Lane Util. Factor					0.95	1.00		1.00			1.00	0.88	
Frbp, ped/bikes					1.00	0.99		1.00			1.00	0.98	
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					3539	1562		1863			1827	2670	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					3539	1562		1863			1827	2670	
Peak-hour factor, PHF	0.92	0.92	0.92	0.90	0.90	0.90	0.93	0.93	0.93	0.92	0.92	0.92	
Adj. Flow (vph)	0	0	0	0	2028	123	0	202	0	0	72	157	
RTOR Reduction (vph)	0	0	0	0	0	38	0	0	0	0	0	30	
Lane Group Flow (vph)	0	0	0	0	2028	85	0	202	0	0	72	127	
Confl. Peds. (#/hr)						3						1	
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					6			8			4		
Permitted Phases						6						4	
Actuated Green, G (s)					83.3	83.3		23.1			19.1	19.1	
Effective Green, g (s)					83.3	83.3		23.1			19.1	19.1	
Actuated g/C Ratio					0.69	0.69		0.19			0.16	0.16	
Clearance Time (s)					6.7	6.7		6.9			10.9	10.9	
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0	
Lane Grp Cap (vph)					2456	1084		358			290	424	
v/s Ratio Prot					c0.57			c0.11			0.04		
v/s Ratio Perm						0.05						0.05	
v/c Ratio					0.83	0.08		0.56			0.25	0.30	
Uniform Delay, d1					13.1	5.9		43.9			44.2	44.5	
Progression Factor					0.91	0.33		0.00			1.34	1.44	
Incremental Delay, d2					2.4	0.1		4.6			2.0	1.8	
Delay (s)					14.4	2.0		4.7			61.0	66.1	
Level of Service					B	A		A			E	E	
Approach Delay (s)		0.0			13.7			4.7			64.5		
Approach LOS		A			B			A			E		
Intersection Summary													
HCM 2000 Control Delay			17.5		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.80										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					17.6			
Intersection Capacity Utilization			71.7%		ICU Level of Service					C			
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Background Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Volume (vph)	0	0	0	0	1671	38	205	34	0	0	0	60
Future Volume (vph)	0	0	0	0	1671	38	205	34	0	0	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.1	6.1		5.9				5.9
Lane Util. Factor					0.95	1.00		1.00				1.00
Frbp, ped/bikes					1.00	0.98		1.00				1.00
Flpb, ped/bikes					1.00	1.00		1.00				1.00
Frt					1.00	0.85		1.00				0.86
Flt Protected					1.00	1.00		0.96				1.00
Satd. Flow (prot)					3505	1536		1822				1644
Flt Permitted					1.00	1.00		0.96				1.00
Satd. Flow (perm)					3505	1536		1822				1644
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.79	0.79	0.79	0.74	0.74	0.74
Adj. Flow (vph)	0	0	0	0	1759	40	259	43	0	0	0	81
RTOR Reduction (vph)	0	0	0	0	0	7	0	33	0	0	0	33
Lane Group Flow (vph)	0	0	0	0	1759	33	0	269	0	0	0	48
Confl. Peds. (#/hr)						1						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	0%	0%	0%	0%	0%	0%
Turn Type					NA	Perm	custom	NA				Perm
Protected Phases					2!			4				
Permitted Phases						2	4 2!					4
Actuated Green, G (s)					85.9	85.9		22.1				22.1
Effective Green, g (s)					85.9	85.9		22.1				22.1
Actuated g/C Ratio					0.72	0.72		0.18				0.18
Clearance Time (s)					6.1	6.1		5.9				5.9
Vehicle Extension (s)					3.0	3.0		3.0				3.0
Lane Grp Cap (vph)					2508	1099		335				302
v/s Ratio Prot					c0.50							
v/s Ratio Perm						0.02		0.15				0.03
v/c Ratio					0.70	0.03		0.80				0.16
Uniform Delay, d1					9.7	5.0		46.9				41.1
Progression Factor					1.00	1.00		1.07				1.00
Incremental Delay, d2					1.7	0.1		15.7				1.1
Delay (s)					11.4	5.0		65.7				42.3
Level of Service					B	A		E				D
Approach Delay (s)		0.0			11.3			65.7			42.3	
Approach LOS		A			B			E			D	
Intersection Summary												
HCM 2000 Control Delay			19.9		HCM 2000 Level of Service						B	
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						12.0	
Intersection Capacity Utilization			80.1%		ICU Level of Service						D	
Analysis Period (min)			15									
! Phase conflict between lane groups.												
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
40: Bogie Lake Road & NB-to-SB X/O

Background Conditions
PM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖					↗↗
Traffic Volume (vph)	187	0	0	0	0	23
Future Volume (vph)	187	0	0	0	0	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9					5.4
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1752					3610
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1752					3610
Peak-hour factor, PHF	0.86	0.86	0.92	0.92	0.60	0.60
Adj. Flow (vph)	217	0	0	0	0	38
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	217	0	0	0	0	38
Heavy Vehicles (%)	3%	3%	2%	2%	0%	0%
Turn Type	Prot					NA
Protected Phases	4 2!					2!
Permitted Phases						
Actuated Green, G (s)	120.0					86.6
Effective Green, g (s)	114.6					86.6
Actuated g/C Ratio	0.95					0.72
Clearance Time (s)						5.4
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)	1673					2605
v/s Ratio Prot	c0.12					0.01
v/s Ratio Perm						
v/c Ratio	0.13					0.01
Uniform Delay, d1	0.1					4.7
Progression Factor	1.00					1.00
Incremental Delay, d2	0.2					0.0
Delay (s)	0.3					4.7
Level of Service	A					A
Approach Delay (s)	0.3		0.0			4.7
Approach LOS	A		A			A

Intersection Summary			
HCM 2000 Control Delay	0.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.14		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	30.7%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Intersection: 10: EB Highland Road & WB-to-EB X/O

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	285	308	55
Average Queue (ft)	147	157	36
95th Queue (ft)	240	263	65
Link Distance (ft)	708	708	35
Upstream Blk Time (%)			12
Queuing Penalty (veh)			19
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB-to-EB X/O & WB Highland Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	108
Average Queue (ft)	15
95th Queue (ft)	59
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	325
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Bogie Lake Road & EB Highland Road

Movement	EB	EB	EB	NB	NB	NB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	99	112	110	126	111	119
Average Queue (ft)	35	41	46	55	60	48
95th Queue (ft)	80	91	86	107	101	92
Link Distance (ft)	330	330	330	291	291	291
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 21: Bogie Lake Road & WB Highland Road

Movement	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	82	68	38	100	61	50
Average Queue (ft)	28	23	4	34	24	16
95th Queue (ft)	64	57	22	82	51	41
Link Distance (ft)	477	477	477	152	152	152
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Movement	WB	WB	WB	NB	SB
Directions Served	T	T	R	LT	R
Maximum Queue (ft)	207	162	16	61	30
Average Queue (ft)	113	70	1	35	4
95th Queue (ft)	187	141	9	59	21
Link Distance (ft)	905	905		11	94
Upstream Blk Time (%)				16	
Queuing Penalty (veh)				21	
Storage Bay Dist (ft)			50		
Storage Blk Time (%)		9			
Queuing Penalty (veh)		1			

Intersection: 31: EB Highland Road & EB-to-WB X/O

Movement	EB
Directions Served	L
Maximum Queue (ft)	66
Average Queue (ft)	19
95th Queue (ft)	55
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 40: Bogie Lake Road & NB-to-SB X/O

Movement	WB	SB
Directions Served	L	T
Maximum Queue (ft)	16	44
Average Queue (ft)	1	8
95th Queue (ft)	7	32
Link Distance (ft)	28	192
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 41: Bogie Lake Road & NB-to-SB X/O

Movement	NB
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	3
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: W. Site Drive & EB Highland Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 60: Bogie Lake Road & E. Site Drive

Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)

Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 41

Intersection: 10: EB Highland Road & WB-to-EB X/O

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	269	252	60
Average Queue (ft)	153	125	45
95th Queue (ft)	238	216	65
Link Distance (ft)	708	708	35
Upstream Blk Time (%)			23
Queuing Penalty (veh)			49
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB-to-EB X/O & WB Highland Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	135
Average Queue (ft)	32
95th Queue (ft)	91
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	325
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Bogie Lake Road & EB Highland Road

Movement	EB	EB	EB	NB	NB	NB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	98	113	61	243	155	140
Average Queue (ft)	39	45	22	138	79	62
95th Queue (ft)	81	95	52	221	127	110
Link Distance (ft)	330	330	330	291	291	291
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 21: Bogie Lake Road & WB Highland Road

Movement	WB	WB	WB	NB	SB	SB	SB
Directions Served	T	T	R	T	T	R	R
Maximum Queue (ft)	200	189	59	17	133	118	116
Average Queue (ft)	69	78	11	1	61	51	49
95th Queue (ft)	146	152	39	9	114	93	94
Link Distance (ft)	477	477	477	37	152	152	152
Upstream Blk Time (%)				1	0	0	0
Queuing Penalty (veh)				2	0	0	0
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Movement	WB	WB	WB	NB	SB
Directions Served	T	T	R	LT	R
Maximum Queue (ft)	316	285	101	48	88
Average Queue (ft)	169	130	9	47	32
95th Queue (ft)	258	232	58	56	67
Link Distance (ft)	905	905		11	94
Upstream Blk Time (%)				54	0
Queuing Penalty (veh)				131	0
Storage Bay Dist (ft)			50		
Storage Blk Time (%)		14	0		
Queuing Penalty (veh)		5	0		

Intersection: 31: EB Highland Road & EB-to-WB X/O

Movement	EB	EB
Directions Served	L	T
Maximum Queue (ft)	324	198
Average Queue (ft)	121	4
95th Queue (ft)	240	65
Link Distance (ft)		518
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)	1	
Queuing Penalty (veh)	9	

Intersection: 40: Bogie Lake Road & NB-to-SB X/O

Movement	WB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	31	49	6
Average Queue (ft)	2	7	0
95th Queue (ft)	15	30	6
Link Distance (ft)	28	192	192
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 41: Bogie Lake Road & NB-to-SB X/O

Movement	NB
Directions Served	L
Maximum Queue (ft)	12
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: W. Site Drive & EB Highland Road

Movement	EB
Directions Served	TR
Maximum Queue (ft)	9
Average Queue (ft)	0
95th Queue (ft)	7
Link Distance (ft)	348
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: Bogie Lake Road & E. Site Drive

Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)

Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 198

HCM Signalized Intersection Capacity Analysis
 10: EB Highland Road & WB-to-EB X/O

Future Conditions
 AM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Volume (vph)	0	1633	0	0	167	0
Future Volume (vph)	0	1633	0	0	167	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1			5.9	
Lane Util. Factor		0.95			1.00	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3471			1736	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3471			1736	
Peak-hour factor, PHF	0.91	0.91	0.92	0.92	0.61	0.61
Adj. Flow (vph)	0	1795	0	0	274	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1795	0	0	274	0
Heavy Vehicles (%)	4%	4%	2%	2%	4%	4%
Turn Type		NA			Prot	
Protected Phases		2!			4 2!	
Permitted Phases						
Actuated Green, G (s)		56.9			90.0	
Effective Green, g (s)		56.9			83.9	
Actuated g/C Ratio		0.63			0.93	
Clearance Time (s)		6.1				
Vehicle Extension (s)		3.0				
Lane Grp Cap (vph)		2194			1618	
v/s Ratio Prot		c0.52			c0.16	
v/s Ratio Perm						
v/c Ratio		0.82			0.17	
Uniform Delay, d1		12.6			0.2	
Progression Factor		1.00			1.00	
Incremental Delay, d2		3.5			0.2	
Delay (s)		16.1			0.5	
Level of Service		B			A	
Approach Delay (s)		16.1	0.0		0.5	
Approach LOS		B	A		A	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

20: Bogie Lake Road & EB Highland Road













Future Conditions
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗					↑	↗↗		↑		
Traffic Volume (vph)	0	1292	504	0	0	0	0	103	296	0	45	0	
Future Volume (vph)	0	1292	504	0	0	0	0	103	296	0	45	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.7	6.7					10.9	10.9		6.9		
Lane Util. Factor		0.95	1.00					1.00	0.88		1.00		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		3471	1553					1827	2733		1681		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		3471	1553					1827	2733		1681		
Peak-hour factor, PHF	0.89	0.89	0.89	0.92	0.92	0.92	0.87	0.87	0.87	0.95	0.95	0.95	
Adj. Flow (vph)	0	1452	566	0	0	0	0	118	340	0	47	0	
RTOR Reduction (vph)	0	0	231	0	0	0	0	0	56	0	0	0	
Lane Group Flow (vph)	0	1452	335	0	0	0	0	118	284	0	47	0	
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	13%	13%	13%	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		2						4			8		
Permitted Phases			2						4				
Actuated Green, G (s)		53.3	53.3					19.1	19.1		23.1		
Effective Green, g (s)		53.3	53.3					19.1	19.1		23.1		
Actuated g/C Ratio		0.59	0.59					0.21	0.21		0.26		
Clearance Time (s)		6.7	6.7					10.9	10.9		6.9		
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0		
Lane Grp Cap (vph)		2055	919					387	580		431		
v/s Ratio Prot		c0.42						0.06			0.03		
v/s Ratio Perm			0.22						c0.10				
v/c Ratio		0.71	0.36					0.30	0.49		0.11		
Uniform Delay, d1		12.9	9.5					29.9	31.2		25.6		
Progression Factor		0.20	0.18					1.00	1.00		0.00		
Incremental Delay, d2		1.5	0.8					2.0	2.9		0.5		
Delay (s)		4.1	2.5					31.9	34.1		0.5		
Level of Service		A	A					C	C		A		
Approach Delay (s)		3.7			0.0			33.5			0.5		
Approach LOS		A			A			C			A		
Intersection Summary													
HCM 2000 Control Delay			9.0									HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.65										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	17.6
Intersection Capacity Utilization			60.7%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis













21: Bogie Lake Road & WB Highland Road

Future Conditions
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑			↑	↑↑
Traffic Volume (vph)	0	0	0	0	1138	44	0	103	0	0	45	69
Future Volume (vph)	0	0	0	0	1138	44	0	103	0	0	45	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.7	6.7		6.9			10.9	10.9
Lane Util. Factor					0.95	1.00		1.00			1.00	0.88
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					3406	1524		1827			1681	2515
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					3406	1524		1827			1681	2515
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.87	0.87	0.87	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1237	48	0	118	0	0	47	73
RTOR Reduction (vph)	0	0	0	0	0	20	0	0	0	0	0	58
Lane Group Flow (vph)	0	0	0	0	1237	28	0	118	0	0	47	15
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	13%	13%	13%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					53.3	53.3		23.1			19.1	19.1
Effective Green, g (s)					53.3	53.3		23.1			19.1	19.1
Actuated g/C Ratio					0.59	0.59		0.26			0.21	0.21
Clearance Time (s)					6.7	6.7		6.9			10.9	10.9
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					2017	902		468			356	533
v/s Ratio Prot					c0.36			c0.06			0.03	
v/s Ratio Perm						0.02						0.01
v/c Ratio					0.61	0.03		0.25			0.13	0.03
Uniform Delay, d1					11.8	7.6		26.6			28.7	28.1
Progression Factor					0.60	0.42		0.00			1.24	2.16
Incremental Delay, d2					1.3	0.1		1.3			0.8	0.1
Delay (s)					8.3	3.3		1.3			36.4	60.7
Level of Service					A	A		A			D	E
Approach Delay (s)		0.0			8.1			1.3			51.2	
Approach LOS		A			A			A			D	
Intersection Summary												
HCM 2000 Control Delay			11.0		HCM 2000 Level of Service						B	
HCM 2000 Volume to Capacity ratio			0.53									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)						17.6	
Intersection Capacity Utilization			60.7%		ICU Level of Service						B	
Analysis Period (min)			15									
c Critical Lane Group												










HCM Signalized Intersection Capacity Analysis
 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Future Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↓				↑
Traffic Volume (vph)	0	0	0	0	1015	7	161	9	0	0	0	6
Future Volume (vph)	0	0	0	0	1015	7	161	9	0	0	0	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.1	6.1		5.9				5.9
Lane Util. Factor					0.95	1.00		1.00				1.00
Frt					1.00	0.85		1.00				0.86
Flt Protected					1.00	1.00		0.95				1.00
Satd. Flow (prot)					3406	1524		1761				1644
Flt Permitted					1.00	1.00		0.95				1.00
Satd. Flow (perm)					3406	1524		1761				1644
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.78	0.78	0.78	0.75	0.75	0.75
Adj. Flow (vph)	0	0	0	0	1068	7	206	12	0	0	0	8
RTOR Reduction (vph)	0	0	0	0	0	3	0	90	0	0	0	6
Lane Group Flow (vph)	0	0	0	0	1068	4	0	128	0	0	0	2
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	3%	3%	3%	0%	0%	0%
Turn Type					NA	Perm	custom	NA				Perm
Protected Phases					2!			4				
Permitted Phases						2	4 2!					4
Actuated Green, G (s)					56.9	56.9		21.1				21.1
Effective Green, g (s)					56.9	56.9		21.1				21.1
Actuated g/C Ratio					0.63	0.63		0.23				0.23
Clearance Time (s)					6.1	6.1		5.9				5.9
Vehicle Extension (s)					3.0	3.0		3.0				3.0
Lane Grp Cap (vph)					2153	963		412				385
v/s Ratio Prot					c0.31							
v/s Ratio Perm						0.00		0.07				0.00
v/c Ratio					0.50	0.00		0.31				0.00
Uniform Delay, d1					8.9	6.1		28.5				26.4
Progression Factor					1.00	1.00		1.10				1.00
Incremental Delay, d2					0.8	0.0		1.4				0.0
Delay (s)					9.7	6.1		32.6				26.4
Level of Service					A	A		C				C
Approach Delay (s)		0.0			9.7			32.6			26.4	
Approach LOS		A			A			C			C	
Intersection Summary												
HCM 2000 Control Delay			13.6		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.45									
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					12.0		
Intersection Capacity Utilization			58.2%		ICU Level of Service					B		
Analysis Period (min)			15									
! Phase conflict between lane groups.												
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
40: Bogie Lake Road & NB-to-SB X/O

Future Conditions
AM Peak Hour

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						 
Traffic Volume (vph)	89	0	0	0	0	25
Future Volume (vph)	89	0	0	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9					5.4
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1556					3139
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1556					3139
Peak-hour factor, PHF	0.82	0.82	0.92	0.92	0.81	0.81
Adj. Flow (vph)	109	0	0	0	0	31
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	109	0	0	0	0	31
Heavy Vehicles (%)	16%	16%	2%	2%	15%	15%
Turn Type	Prot					NA
Protected Phases	4 2!					2!
Permitted Phases						
Actuated Green, G (s)	90.0					57.6
Effective Green, g (s)	84.6					57.6
Actuated g/C Ratio	0.94					0.64
Clearance Time (s)						5.4
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)	1462					2008
v/s Ratio Prot	c0.07					0.01
v/s Ratio Perm						
v/c Ratio	0.07					0.02
Uniform Delay, d1	0.2					5.9
Progression Factor	1.00					1.00
Incremental Delay, d2	0.1					0.0
Delay (s)	0.3					5.9
Level of Service	A					A
Approach Delay (s)	0.3		0.0			5.9
Approach LOS	A		A			A
Intersection Summary						
HCM 2000 Control Delay			1.5		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.08			
Actuated Cycle Length (s)			90.0		Sum of lost time (s)	10.3
Intersection Capacity Utilization			25.3%		ICU Level of Service	A
Analysis Period (min)			15			
! Phase conflict between lane groups.						
c Critical Lane Group						

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					↑
Traffic Vol, veh/h	1715	85	0	0	0	81
Future Vol, veh/h	1715	85	0	0	0	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	1081577472	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	92	92	92	92
Heavy Vehicles, %	4	4	2	2	2	2
Mvmt Flow	1927	96	0	0	0	88

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	1012
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	*441
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	1
Mov Cap-1 Maneuver	-	-	-	*441
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	15.2
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	441	-	-
HCM Lane V/C Ratio	0.2	-	-
HCM Control Delay (s)	15.2	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.7	-	-

Notes
~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	5	15	13	394	541	8
Future Vol, veh/h	5	15	13	394	541	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	87	87	92	92
Heavy Vehicles, %	2	2	4	4	2	2
Mvmt Flow	5	16	15	453	588	9

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1076	593	597	0	-	0
Stage 1	593	-	-	-	-	-
Stage 2	483	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.14	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.236	-	-	-
Pot Cap-1 Maneuver	*214	*634	*942	-	-	-
Stage 1	*598	-	-	-	-	-
Stage 2	*620	-	-	-	-	-
Platoon blocked, %	1	1	1	-	-	-
Mov Cap-1 Maneuver	*210	*634	*942	-	-	-
Mov Cap-2 Maneuver	*210	-	-	-	-	-
Stage 1	*586	-	-	-	-	-
Stage 2	*620	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	*942	-	421	-	-
HCM Lane V/C Ratio	0.016	-	0.052	-	-
HCM Control Delay (s)	8.9	0	14	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM Signalized Intersection Capacity Analysis
 10: EB Highland Road & WB-to-EB X/O

Future Conditions
 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Volume (vph)	0	1444	0	0	266	0
Future Volume (vph)	0	1444	0	0	266	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1			5.9	
Lane Util. Factor		0.95			1.00	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3471			1787	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3471			1787	
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.88	0.88
Adj. Flow (vph)	0	1536	0	0	302	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1536	0	0	302	0
Heavy Vehicles (%)	4%	4%	2%	2%	1%	1%
Turn Type		NA			Prot	
Protected Phases		2!			4 2!	
Permitted Phases						
Actuated Green, G (s)		85.9			120.0	
Effective Green, g (s)		85.9			113.9	
Actuated g/C Ratio		0.72			0.95	
Clearance Time (s)		6.1				
Vehicle Extension (s)		3.0				
Lane Grp Cap (vph)		2484			1696	
v/s Ratio Prot		c0.44			c0.17	
v/s Ratio Perm						
v/c Ratio		0.62			0.18	
Uniform Delay, d1		8.7			0.2	
Progression Factor		1.00			1.00	
Incremental Delay, d2		1.2			0.1	
Delay (s)		9.9			0.3	
Level of Service		A			A	
Approach Delay (s)		9.9	0.0		0.3	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.4%	ICU Level of Service	F
Analysis Period (min)	15		













! Phase conflict between lane groups.

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis













20: Bogie Lake Road & EB Highland Road

Future Conditions
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗					↑	↗↗		↑		
Traffic Volume (vph)	0	1370	334	0	0	0	0	188	348	0	66	0	
Future Volume (vph)	0	1370	334	0	0	0	0	188	348	0	66	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.7	6.7					10.9	10.9		6.9		
Lane Util. Factor		0.95	1.00					1.00	0.88		1.00		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		3505	1568					1863	2787		1827		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		3505	1568					1863	2787		1827		
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92	
Adj. Flow (vph)	0	1442	352	0	0	0	0	202	374	0	72	0	
RTOR Reduction (vph)	0	0	108	0	0	0	0	0	101	0	0	0	
Lane Group Flow (vph)	0	1442	244	0	0	0	0	202	273	0	72	0	
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	4%	4%	4%	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		2						4			8		
Permitted Phases			2						4				
Actuated Green, G (s)		83.3	83.3					19.1	19.1		23.1		
Effective Green, g (s)		83.3	83.3					19.1	19.1		23.1		
Actuated g/C Ratio		0.69	0.69					0.16	0.16		0.19		
Clearance Time (s)		6.7	6.7					10.9	10.9		6.9		
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0		
Lane Grp Cap (vph)		2433	1088					296	443		351		
v/s Ratio Prot		c0.41						c0.11			0.04		
v/s Ratio Perm			0.16						0.10				
v/c Ratio		0.59	0.22					0.68	0.62		0.21		
Uniform Delay, d1		9.5	6.6					47.6	47.0		40.7		
Progression Factor		0.30	0.20					1.00	1.00		0.00		
Incremental Delay, d2		0.9	0.4					12.1	6.3		1.3		
Delay (s)		3.8	1.7					59.6	53.3		1.3		
Level of Service		A	A					E	D		A		
Approach Delay (s)		3.4			0.0			55.5			1.3		
Approach LOS		A			A			E			A		
Intersection Summary													
HCM 2000 Control Delay			15.6									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.61										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	17.6
Intersection Capacity Utilization			73.7%									ICU Level of Service	D
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
21: Bogie Lake Road & WB Highland Road













Future Conditions
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↗		↑			↑	↗↗
Traffic Volume (vph)	0	0	0	0	1897	111	0	188	0	0	66	144
Future Volume (vph)	0	0	0	0	1897	111	0	188	0	0	66	144
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.7	6.7		6.9			10.9	10.9
Lane Util. Factor					0.95	1.00		1.00			1.00	0.88
Frbp, ped/bikes					1.00	0.99		1.00			1.00	0.98
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00
Frt					1.00	0.85		1.00			1.00	0.85
Flt Protected					1.00	1.00		1.00			1.00	1.00
Satd. Flow (prot)					3539	1562		1863			1827	2670
Flt Permitted					1.00	1.00		1.00			1.00	1.00
Satd. Flow (perm)					3539	1562		1863			1827	2670
Peak-hour factor, PHF	0.92	0.92	0.92	0.90	0.90	0.90	0.93	0.93	0.93	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	2108	123	0	202	0	0	72	157
RTOR Reduction (vph)	0	0	0	0	0	37	0	0	0	0	0	29
Lane Group Flow (vph)	0	0	0	0	2108	86	0	202	0	0	72	128
Confl. Peds. (#/hr)						3						1
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%
Turn Type					NA	Perm		NA			NA	Perm
Protected Phases					6			8			4	
Permitted Phases						6						4
Actuated Green, G (s)					83.3	83.3		23.1			19.1	19.1
Effective Green, g (s)					83.3	83.3		23.1			19.1	19.1
Actuated g/C Ratio					0.69	0.69		0.19			0.16	0.16
Clearance Time (s)					6.7	6.7		6.9			10.9	10.9
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0
Lane Grp Cap (vph)					2456	1084		358			290	424
v/s Ratio Prot					c0.60			c0.11			0.04	
v/s Ratio Perm						0.06						0.05
v/c Ratio					0.86	0.08		0.56			0.25	0.30
Uniform Delay, d1					13.9	5.9		43.9			44.2	44.6
Progression Factor					0.99	0.48		0.00			1.34	1.44
Incremental Delay, d2					2.9	0.1		4.6			2.0	1.8
Delay (s)					16.6	3.0		4.7			61.2	66.0
Level of Service					B	A		A			E	E
Approach Delay (s)		0.0			15.9			4.7			64.5	
Approach LOS		A			B			A			E	
Intersection Summary												
HCM 2000 Control Delay			19.2		HCM 2000 Level of Service						B	
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						17.6	
Intersection Capacity Utilization			73.7%		ICU Level of Service						D	
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Future Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Volume (vph)	0	0	0	0	1698	38	250	34	0	0	0	60
Future Volume (vph)	0	0	0	0	1698	38	250	34	0	0	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.1	6.1		5.9				5.9
Lane Util. Factor					0.95	1.00		1.00				1.00
Frbp, ped/bikes					1.00	0.98		1.00				1.00
Flpb, ped/bikes					1.00	1.00		1.00				1.00
Frt					1.00	0.85		1.00				0.86
Flt Protected					1.00	1.00		0.96				1.00
Satd. Flow (prot)					3505	1536		1820				1644
Flt Permitted					1.00	1.00		0.96				1.00
Satd. Flow (perm)					3505	1536		1820				1644
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.79	0.79	0.79	0.74	0.74	0.74
Adj. Flow (vph)	0	0	0	0	1787	40	316	43	0	0	0	81
RTOR Reduction (vph)	0	0	0	0	0	7	0	31	0	0	0	31
Lane Group Flow (vph)	0	0	0	0	1787	33	0	328	0	0	0	50
Confl. Peds. (#/hr)						1						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	0%	0%	0%	0%	0%	0%
Turn Type					NA	Perm	custom	NA				Perm
Protected Phases					2!			4				
Permitted Phases						2	4 2!					4
Actuated Green, G (s)					85.9	85.9		22.1				22.1
Effective Green, g (s)					85.9	85.9		22.1				22.1
Actuated g/C Ratio					0.72	0.72		0.18				0.18
Clearance Time (s)					6.1	6.1		5.9				5.9
Vehicle Extension (s)					3.0	3.0		3.0				3.0
Lane Grp Cap (vph)					2508	1099		335				302
v/s Ratio Prot					c0.51							
v/s Ratio Perm						0.02		0.18				0.03
v/c Ratio					0.71	0.03		0.98				0.17
Uniform Delay, d1					9.9	5.0		48.7				41.2
Progression Factor					1.00	1.00		1.06				1.00
Incremental Delay, d2					1.8	0.1		39.6				1.2
Delay (s)					11.6	5.0		91.2				42.4
Level of Service					B	A		F				D
Approach Delay (s)		0.0			11.5			91.2			42.4	
Approach LOS		A			B			F			D	
Intersection Summary												
HCM 2000 Control Delay			25.2		HCM 2000 Level of Service					C		
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)					12.0		
Intersection Capacity Utilization			83.3%		ICU Level of Service					E		
Analysis Period (min)			15									
! Phase conflict between lane groups.												
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
40: Bogie Lake Road & NB-to-SB X/O

Future Conditions
PM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘					↑↑
Traffic Volume (vph)	187	0	0	0	0	23
Future Volume (vph)	187	0	0	0	0	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.9					5.4
Lane Util. Factor	1.00					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	1752					3610
Flt Permitted	0.95					1.00
Satd. Flow (perm)	1752					3610
Peak-hour factor, PHF	0.86	0.86	0.92	0.92	0.60	0.60
Adj. Flow (vph)	217	0	0	0	0	38
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	217	0	0	0	0	38
Heavy Vehicles (%)	3%	3%	2%	2%	0%	0%
Turn Type	Prot					NA
Protected Phases	4 2!					2!
Permitted Phases						
Actuated Green, G (s)	120.0					86.6
Effective Green, g (s)	114.6					86.6
Actuated g/C Ratio	0.95					0.72
Clearance Time (s)						5.4
Vehicle Extension (s)						3.0
Lane Grp Cap (vph)	1673					2605
v/s Ratio Prot	c0.12					0.01
v/s Ratio Perm						
v/c Ratio	0.13					0.01
Uniform Delay, d1	0.1					4.7
Progression Factor	1.00					1.00
Incremental Delay, d2	0.2					0.0
Delay (s)	0.3					4.7
Level of Service	A					A
Approach Delay (s)	0.3		0.0			4.7
Approach LOS	A		A			A

Intersection Summary

HCM 2000 Control Delay	0.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.14		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	30.7%	ICU Level of Service	A
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Intersection						
Int Delay, s/veh	0.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑					↑
Traffic Vol, veh/h	1612	98	0	0	0	92
Future Vol, veh/h	1612	98	0	0	0	92
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	1081577472	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	92	92
Heavy Vehicles, %	3	3	2	2	2	2
Mvmt Flow	1697	103	0	0	0	100

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	900
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	*458
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	1
Mov Cap-1 Maneuver	-	-	-	*458
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	15
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	458	-	-
HCM Lane V/C Ratio	0.218	-	-
HCM Control Delay (s)	15	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	0.8	-	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	14	16	529	394	6
Future Vol, veh/h	7	14	16	529	394	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	93	93	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	15	17	569	428	7

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1035	432	435	0	-	0
Stage 1	432	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	237	772	1151	-	-	-
Stage 1	728	-	-	-	-	-
Stage 2	546	-	-	-	-	-
Platoon blocked, %	1	1	1	-	-	-
Mov Cap-1 Maneuver	231	772	1151	-	-	-
Mov Cap-2 Maneuver	231	-	-	-	-	-
Stage 1	712	-	-	-	-	-
Stage 2	546	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.8	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1151	-	434	-	-
HCM Lane V/C Ratio	0.015	-	0.053	-	-
HCM Control Delay (s)	8.2	0	13.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection: 10: EB Highland Road & WB-to-EB X/O

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	300	305	69
Average Queue (ft)	153	159	41
95th Queue (ft)	241	255	68
Link Distance (ft)	708	708	35
Upstream Blk Time (%)			15
Queuing Penalty (veh)			30
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB-to-EB X/O & WB Highland Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	140
Average Queue (ft)	32
95th Queue (ft)	101
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	325
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Bogie Lake Road & EB Highland Road

Movement	EB	EB	EB	NB	NB	NB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	129	144	109	119	120	123
Average Queue (ft)	56	70	46	55	64	49
95th Queue (ft)	110	125	84	104	107	97
Link Distance (ft)	330	330	330	291	291	291
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 21: Bogie Lake Road & WB Highland Road

Movement	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	102	102	39	92	70	52
Average Queue (ft)	40	36	4	31	29	16
95th Queue (ft)	83	83	20	71	62	44
Link Distance (ft)	477	477	477	152	152	152
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Movement	WB	WB	WB	NB	SB
Directions Served	T	T	R	LT	R
Maximum Queue (ft)	203	161	11	52	30
Average Queue (ft)	115	65	1	39	5
95th Queue (ft)	180	137	9	59	23
Link Distance (ft)	905	905		11	94
Upstream Blk Time (%)				22	
Queuing Penalty (veh)				39	
Storage Bay Dist (ft)			50		
Storage Blk Time (%)		9			
Queuing Penalty (veh)		1			

Intersection: 31: EB Highland Road & EB-to-WB X/O

Movement	EB
Directions Served	L
Maximum Queue (ft)	120
Average Queue (ft)	31
95th Queue (ft)	88
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 40: Bogie Lake Road & NB-to-SB X/O

Movement	WB	SB
Directions Served	L	T
Maximum Queue (ft)	5	62
Average Queue (ft)	0	11
95th Queue (ft)	6	40
Link Distance (ft)	28	192
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 41: Bogie Lake Road & NB-to-SB X/O

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: W. Site Drive & EB Highland Road

Movement	EB	NB
Directions Served	TR	R
Maximum Queue (ft)	21	96
Average Queue (ft)	1	42
95th Queue (ft)	11	76
Link Distance (ft)	348	334
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 60: Bogie Lake Road & E. Site Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	40	46
Average Queue (ft)	17	3
95th Queue (ft)	43	21
Link Distance (ft)	294	343
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 70

Intersection: 10: EB Highland Road & WB-to-EB X/O

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	238	236	68
Average Queue (ft)	138	123	48
95th Queue (ft)	218	210	63
Link Distance (ft)	708	708	35
Upstream Blk Time (%)			26
Queuing Penalty (veh)			70
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB-to-EB X/O & WB Highland Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	185
Average Queue (ft)	51
95th Queue (ft)	137
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	325
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Bogie Lake Road & EB Highland Road

Movement	EB	EB	EB	NB	NB	NB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	144	151	69	261	157	140
Average Queue (ft)	58	68	28	125	82	66
95th Queue (ft)	117	128	57	224	135	115
Link Distance (ft)	330	330	330	291	291	291
Upstream Blk Time (%)				0		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 21: Bogie Lake Road & WB Highland Road

Movement	WB	WB	WB	NB	SB	SB	SB
Directions Served	T	T	R	T	T	R	R
Maximum Queue (ft)	239	237	43	15	110	120	117
Average Queue (ft)	78	89	9	1	49	52	46
95th Queue (ft)	144	156	32	11	95	99	94
Link Distance (ft)	477	477	477	37	152	152	152
Upstream Blk Time (%)				2	0		0
Queuing Penalty (veh)				4	0		0
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Movement	WB	WB	WB	NB	SB
Directions Served	T	T	R	LT	R
Maximum Queue (ft)	303	277	95	48	82
Average Queue (ft)	172	126	8	47	31
95th Queue (ft)	265	229	48	52	65
Link Distance (ft)	905	905		11	94
Upstream Blk Time (%)				57	0
Queuing Penalty (veh)				164	0
Storage Bay Dist (ft)			50		
Storage Blk Time (%)		14	0		
Queuing Penalty (veh)		5	0		

Intersection: 31: EB Highland Road & EB-to-WB X/O

Movement	EB	EB
Directions Served	L	T
Maximum Queue (ft)	268	121
Average Queue (ft)	136	4
95th Queue (ft)	252	65
Link Distance (ft)		518
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)	1	
Queuing Penalty (veh)	4	

Intersection: 40: Bogie Lake Road & NB-to-SB X/O

Movement	WB	SB
Directions Served	L	T
Maximum Queue (ft)	25	40
Average Queue (ft)	1	7
95th Queue (ft)	12	29
Link Distance (ft)	28	192
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 41: Bogie Lake Road & NB-to-SB X/O

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: W. Site Drive & EB Highland Road

Movement	NB
Directions Served	R
Maximum Queue (ft)	108
Average Queue (ft)	43
95th Queue (ft)	83
Link Distance (ft)	334
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: Bogie Lake Road & E. Site Drive













Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	45	48
Average Queue (ft)	15	5
95th Queue (ft)	43	25
Link Distance (ft)	294	343
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 248













HCM Signalized Intersection Capacity Analysis
20: Bogie Lake Road & EB Highland Road

Future Conditions w/ IMP
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗					↑	↗↗		↑		
Traffic Volume (vph)	0	1292	504	0	0	0	0	103	296	0	45	0	
Future Volume (vph)	0	1292	504	0	0	0	0	103	296	0	45	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.7	6.7					10.9	10.9		6.9		
Lane Util. Factor		0.95	1.00					1.00	0.88		1.00		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		3471	1553					1827	2733		1681		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		3471	1553					1827	2733		1681		
Peak-hour factor, PHF	0.89	0.89	0.89	0.92	0.92	0.92	0.87	0.87	0.87	0.95	0.95	0.95	
Adj. Flow (vph)	0	1452	566	0	0	0	0	118	340	0	47	0	
RTOR Reduction (vph)	0	0	281	0	0	0	0	0	31	0	0	0	
Lane Group Flow (vph)	0	1452	285	0	0	0	0	118	309	0	47	0	
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	4%	4%	4%	13%	13%	13%	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		2						4			8		
Permitted Phases			2						4				
Actuated Green, G (s)		45.3	45.3					27.1	27.1		31.1		
Effective Green, g (s)		45.3	45.3					27.1	27.1		31.1		
Actuated g/C Ratio		0.50	0.50					0.30	0.30		0.35		
Clearance Time (s)		6.7	6.7					10.9	10.9		6.9		
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0		
Lane Grp Cap (vph)		1747	781					550	822		580		
v/s Ratio Prot		c0.42						0.06			0.03		
v/s Ratio Perm			0.18						c0.11				
v/c Ratio		0.83	0.36					0.21	0.38		0.08		
Uniform Delay, d1		19.1	13.6					23.5	24.8		19.8		
Progression Factor		0.43	0.21					1.00	1.00		0.00		
Incremental Delay, d2		3.4	0.9					0.9	1.3		0.3		
Delay (s)		11.5	3.8					24.4	26.1		0.3		
Level of Service		B	A					C	C		A		
Approach Delay (s)		9.4			0.0			25.7			0.3		
Approach LOS		A			A			C			A		
Intersection Summary													
HCM 2000 Control Delay			12.2									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.66										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	17.6
Intersection Capacity Utilization			60.7%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													













HCM Signalized Intersection Capacity Analysis
21: Bogie Lake Road & WB Highland Road

Future Conditions w/ IMP
AM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑	↑		↑			↑	↑↑	
Traffic Volume (vph)	0	0	0	0	1138	44	0	103	0	0	45	69	
Future Volume (vph)	0	0	0	0	1138	44	0	103	0	0	45	69	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					6.7	6.7		6.9			10.9	10.9	
Lane Util. Factor					0.95	1.00		1.00			1.00	0.88	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					3406	1524		1827			1681	2515	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					3406	1524		1827			1681	2515	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.87	0.87	0.87	0.95	0.95	0.95	
Adj. Flow (vph)	0	0	0	0	1237	48	0	118	0	0	47	73	
RTOR Reduction (vph)	0	0	0	0	0	24	0	0	0	0	0	49	
Lane Group Flow (vph)	0	0	0	0	1237	24	0	118	0	0	47	24	
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	13%	13%	13%	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					6			8			4		
Permitted Phases						6						4	
Actuated Green, G (s)					45.3	45.3		31.1			27.1	27.1	
Effective Green, g (s)					45.3	45.3		31.1			27.1	27.1	
Actuated g/C Ratio					0.50	0.50		0.35			0.30	0.30	
Clearance Time (s)					6.7	6.7		6.9			10.9	10.9	
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0	
Lane Grp Cap (vph)					1714	767		631			506	757	
v/s Ratio Prot					c0.36			c0.06			0.03		
v/s Ratio Perm						0.02						0.01	
v/c Ratio					0.72	0.03		0.19			0.09	0.03	
Uniform Delay, d1					17.4	11.3		20.6			22.6	22.2	
Progression Factor					0.71	0.27		0.00			1.39	2.38	
Incremental Delay, d2					2.4	0.1		0.6			0.4	0.1	
Delay (s)					14.7	3.1		0.7			31.8	52.9	
Level of Service					B	A		A			C	D	
Approach Delay (s)		0.0			14.3			0.7			44.6		
Approach LOS		A			B			A			D		
Intersection Summary													
HCM 2000 Control Delay			15.6		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.53										
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					17.6			
Intersection Capacity Utilization			60.7%		ICU Level of Service					B			
Analysis Period (min)			15										
c Critical Lane Group													













HCM Signalized Intersection Capacity Analysis
20: Bogie Lake Road & EB Highland Road

Future Conditions w/ IMP
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↗					↑	↗↗		↑		
Traffic Volume (vph)	0	1370	334	0	0	0	0	188	348	0	66	0	
Future Volume (vph)	0	1370	334	0	0	0	0	188	348	0	66	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		6.7	6.7					10.9	10.9		6.9		
Lane Util. Factor		0.95	1.00					1.00	0.88		1.00		
Frt		1.00	0.85					1.00	0.85		1.00		
Flt Protected		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (prot)		3505	1568					1863	2787		1827		
Flt Permitted		1.00	1.00					1.00	1.00		1.00		
Satd. Flow (perm)		3505	1568					1863	2787		1827		
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.92	0.92	0.92	
Adj. Flow (vph)	0	1442	352	0	0	0	0	202	374	0	72	0	
RTOR Reduction (vph)	0	0	137	0	0	0	0	0	61	0	0	0	
Lane Group Flow (vph)	0	1442	215	0	0	0	0	202	313	0	72	0	
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	2%	2%	2%	4%	4%	4%	
Turn Type		NA	Perm					NA	Perm		NA		
Protected Phases		2						4			8		
Permitted Phases			2						4				
Actuated Green, G (s)		73.3	73.3					29.1	29.1		33.1		
Effective Green, g (s)		73.3	73.3					29.1	29.1		33.1		
Actuated g/C Ratio		0.61	0.61					0.24	0.24		0.28		
Clearance Time (s)		6.7	6.7					10.9	10.9		6.9		
Vehicle Extension (s)		3.0	3.0					3.0	3.0		3.0		
Lane Grp Cap (vph)		2140	957					451	675		503		
v/s Ratio Prot		c0.41						0.11			0.04		
v/s Ratio Perm			0.14						c0.11				
v/c Ratio		0.67	0.22					0.45	0.46		0.14		
Uniform Delay, d1		15.4	10.5					38.6	38.8		32.8		
Progression Factor		0.52	0.17					1.00	1.00		0.00		
Incremental Delay, d2		1.5	0.5					3.2	2.3		0.6		
Delay (s)		9.5	2.2					41.8	41.1		0.6		
Level of Service		A	A					D	D		A		
Approach Delay (s)		8.1			0.0			41.3			0.6		
Approach LOS		A			A			D			A		
Intersection Summary													
HCM 2000 Control Delay			15.7									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.61										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	17.6
Intersection Capacity Utilization			73.7%									ICU Level of Service	D
Analysis Period (min)			15										
c Critical Lane Group													













HCM Signalized Intersection Capacity Analysis
21: Bogie Lake Road & WB Highland Road

Future Conditions w/ IMP
PM Peak Hour

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑	↑		↑			↑	↑↑	
Traffic Volume (vph)	0	0	0	0	1897	111	0	188	0	0	66	144	
Future Volume (vph)	0	0	0	0	1897	111	0	188	0	0	66	144	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					6.7	6.7		6.9			10.9	10.9	
Lane Util. Factor					0.95	1.00		1.00			1.00	0.88	
Frbp, ped/bikes					1.00	0.99		1.00			1.00	0.98	
Flpb, ped/bikes					1.00	1.00		1.00			1.00	1.00	
Frt					1.00	0.85		1.00			1.00	0.85	
Flt Protected					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (prot)					3539	1562		1863			1827	2673	
Flt Permitted					1.00	1.00		1.00			1.00	1.00	
Satd. Flow (perm)					3539	1562		1863			1827	2673	
Peak-hour factor, PHF	0.92	0.92	0.92	0.90	0.90	0.90	0.93	0.93	0.93	0.92	0.92	0.92	
Adj. Flow (vph)	0	0	0	0	2108	123	0	202	0	0	72	157	
RTOR Reduction (vph)	0	0	0	0	0	37	0	0	0	0	0	26	
Lane Group Flow (vph)	0	0	0	0	2108	86	0	202	0	0	72	131	
Confl. Peds. (#/hr)						3						1	
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%	
Turn Type					NA	Perm		NA			NA	Perm	
Protected Phases					6			8			4		
Permitted Phases						6						4	
Actuated Green, G (s)					73.3	73.3		33.1			29.1	29.1	
Effective Green, g (s)					73.3	73.3		33.1			29.1	29.1	
Actuated g/C Ratio					0.61	0.61		0.28			0.24	0.24	
Clearance Time (s)					6.7	6.7		6.9			10.9	10.9	
Vehicle Extension (s)					3.0	3.0		3.0			3.0	3.0	
Lane Grp Cap (vph)					2161	954		513			443	648	
v/s Ratio Prot					c0.60			c0.11			0.04		
v/s Ratio Perm						0.06						0.05	
v/c Ratio					0.98	0.09		0.39			0.16	0.20	
Uniform Delay, d1					22.5	9.6		35.3			35.8	36.2	
Progression Factor					0.60	1.04		0.00			1.46	1.59	
Incremental Delay, d2					10.0	0.1		2.1			0.8	0.7	
Delay (s)					23.5	10.1		2.1			53.3	58.2	
Level of Service					C	B		A			D	E	
Approach Delay (s)		0.0			22.8			2.1			56.6		
Approach LOS		A			C			A			E		
Intersection Summary													
HCM 2000 Control Delay			24.1		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.83										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						17.6		
Intersection Capacity Utilization			73.7%		ICU Level of Service						D		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Future Conditions w/ IMP
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑	↑		↑				↑
Traffic Volume (vph)	0	0	0	0	1698	38	250	34	0	0	0	60
Future Volume (vph)	0	0	0	0	1698	38	250	34	0	0	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.1	6.1		5.9				5.9
Lane Util. Factor					0.95	1.00		1.00				1.00
Frbp, ped/bikes					1.00	0.98		1.00				1.00
Flpb, ped/bikes					1.00	1.00		1.00				1.00
Frt					1.00	0.85		1.00				0.86
Flt Protected					1.00	1.00		0.96				1.00
Satd. Flow (prot)					3505	1535		1820				1644
Flt Permitted					1.00	1.00		0.96				1.00
Satd. Flow (perm)					3505	1535		1820				1644
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.79	0.79	0.79	0.74	0.74	0.74
Adj. Flow (vph)	0	0	0	0	1787	40	316	43	0	0	0	81
RTOR Reduction (vph)	0	0	0	0	0	11	0	19	0	0	0	19
Lane Group Flow (vph)	0	0	0	0	1787	29	0	340	0	0	0	62
Confl. Peds. (#/hr)						1						
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	0%	0%	0%	0%	0%	0%
Turn Type					NA	Perm	custom	NA				Perm
Protected Phases					2!			4				
Permitted Phases						2	4 2!					4
Actuated Green, G (s)					68.9	68.9		39.1				39.1
Effective Green, g (s)					68.9	68.9		39.1				39.1
Actuated g/C Ratio					0.57	0.57		0.33				0.33
Clearance Time (s)					6.1	6.1		5.9				5.9
Vehicle Extension (s)					3.0	3.0		3.0				3.0
Lane Grp Cap (vph)					2012	881		593				535
v/s Ratio Prot					c0.51							
v/s Ratio Perm						0.02		0.19				0.04
v/c Ratio					0.89	0.03		0.57				0.12
Uniform Delay, d1					22.2	11.1		33.5				28.3
Progression Factor					1.00	1.00		1.48				1.00
Incremental Delay, d2					6.3	0.1		3.2				0.4
Delay (s)					28.5	11.2		53.0				28.8
Level of Service					C	B		D				C
Approach Delay (s)		0.0			28.1			53.0			28.8	
Approach LOS		A			C			D			C	
Intersection Summary												
HCM 2000 Control Delay			32.1		HCM 2000 Level of Service						C	
HCM 2000 Volume to Capacity ratio			0.77									
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						12.0	
Intersection Capacity Utilization			83.3%		ICU Level of Service						E	
Analysis Period (min)			15									
! Phase conflict between lane groups.												
c Critical Lane Group												

Intersection: 10: EB Highland Road & WB-to-EB X/O

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	298	363	61
Average Queue (ft)	157	169	42
95th Queue (ft)	254	287	66
Link Distance (ft)	708	708	35
Upstream Blk Time (%)			15
Queuing Penalty (veh)			29
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB-to-EB X/O & WB Highland Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	109
Average Queue (ft)	26
95th Queue (ft)	83
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	325
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Bogie Lake Road & EB Highland Road

Movement	EB	EB	EB	NB	NB	NB	SB
Directions Served	T	T	R	T	R	R	T
Maximum Queue (ft)	245	260	148	122	123	111	7
Average Queue (ft)	110	116	70	50	64	51	0
95th Queue (ft)	193	201	118	100	108	95	5
Link Distance (ft)	330	330	330	291	291	291	37
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 21: Bogie Lake Road & WB Highland Road

Movement	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	157	158	35	76	74	78
Average Queue (ft)	79	77	9	26	27	18
95th Queue (ft)	133	139	30	62	62	50
Link Distance (ft)	477	477	477	152	152	152
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Movement	WB	WB	WB	NB	SB
Directions Served	T	T	R	LT	R
Maximum Queue (ft)	213	165	24	55	30
Average Queue (ft)	112	62	1	37	3
95th Queue (ft)	183	126	9	60	17
Link Distance (ft)	905	905		11	94
Upstream Blk Time (%)				17	
Queuing Penalty (veh)				30	
Storage Bay Dist (ft)			50		
Storage Blk Time (%)		8			
Queuing Penalty (veh)		1			

Intersection: 31: EB Highland Road & EB-to-WB X/O

Movement	EB
Directions Served	L
Maximum Queue (ft)	113
Average Queue (ft)	31
95th Queue (ft)	85
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 40: Bogie Lake Road & NB-to-SB X/O

Movement	WB	SB
Directions Served	L	T
Maximum Queue (ft)	20	52
Average Queue (ft)	1	7
95th Queue (ft)	10	32
Link Distance (ft)	28	192
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 41: Bogie Lake Road & NB-to-SB X/O

Movement	NB
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: W. Site Drive & EB Highland Road

Movement	NB
Directions Served	R
Maximum Queue (ft)	98
Average Queue (ft)	38
95th Queue (ft)	70
Link Distance (ft)	334
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 60: Bogie Lake Road & E. Site Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	60	38
Average Queue (ft)	18	4
95th Queue (ft)	47	23
Link Distance (ft)	294	343
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 60

Intersection: 10: EB Highland Road & WB-to-EB X/O

Movement	EB	EB	SB
Directions Served	T	T	L
Maximum Queue (ft)	258	265	63
Average Queue (ft)	147	130	48
95th Queue (ft)	232	234	63
Link Distance (ft)	708	708	35
Upstream Blk Time (%)			25
Queuing Penalty (veh)			67
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 11: WB-to-EB X/O & WB Highland Road

Movement	WB
Directions Served	L
Maximum Queue (ft)	156
Average Queue (ft)	45
95th Queue (ft)	122
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	325
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 20: Bogie Lake Road & EB Highland Road

Movement	EB	EB	EB	NB	NB	NB	SB
Directions Served	T	T	R	T	R	R	T
Maximum Queue (ft)	210	217	78	219	171	146	5
Average Queue (ft)	110	112	38	109	78	58	0
95th Queue (ft)	178	185	67	185	130	104	4
Link Distance (ft)	330	330	330	291	291	291	37
Upstream Blk Time (%)	0	0					0
Queuing Penalty (veh)	0	0					0
Storage Bay Dist (ft)							
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 21: Bogie Lake Road & WB Highland Road

Movement	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	T	R	R
Maximum Queue (ft)	488	475	134	105	100	101
Average Queue (ft)	313	308	28	41	46	41
95th Queue (ft)	457	449	85	89	88	83
Link Distance (ft)	477	477	477	152	152	152
Upstream Blk Time (%)	1	0		0		
Queuing Penalty (veh)	4	2		0		
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 30: EB-to-WB X/O/Nordic Drive & WB Highland Road

Movement	WB	WB	WB	NB	SB
Directions Served	T	T	R	LT	R
Maximum Queue (ft)	572	527	200	48	76
Average Queue (ft)	346	309	26	47	28
95th Queue (ft)	494	463	117	53	65
Link Distance (ft)	905	905		11	94
Upstream Blk Time (%)				54	0
Queuing Penalty (veh)				154	0
Storage Bay Dist (ft)			50		
Storage Blk Time (%)		32	0		
Queuing Penalty (veh)		12	0		

Intersection: 31: EB Highland Road & EB-to-WB X/O

Movement	EB	EB
Directions Served	L	T
Maximum Queue (ft)	296	85
Average Queue (ft)	167	3
95th Queue (ft)	260	61
Link Distance (ft)		518
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	3	

Intersection: 40: Bogie Lake Road & NB-to-SB X/O

Movement	WB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	22	44	6
Average Queue (ft)	2	7	0
95th Queue (ft)	12	30	4
Link Distance (ft)	28	192	192
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 41: Bogie Lake Road & NB-to-SB X/O

Movement	NB
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 50: W. Site Drive & EB Highland Road

Movement	EB	EB	NB
Directions Served	T	TR	R
Maximum Queue (ft)	21	6	96
Average Queue (ft)	1	0	39
95th Queue (ft)	11	4	72
Link Distance (ft)	348	348	334
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 60: Bogie Lake Road & E. Site Drive

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	44	68
Average Queue (ft)	16	9
95th Queue (ft)	43	42
Link Distance (ft)	294	343
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

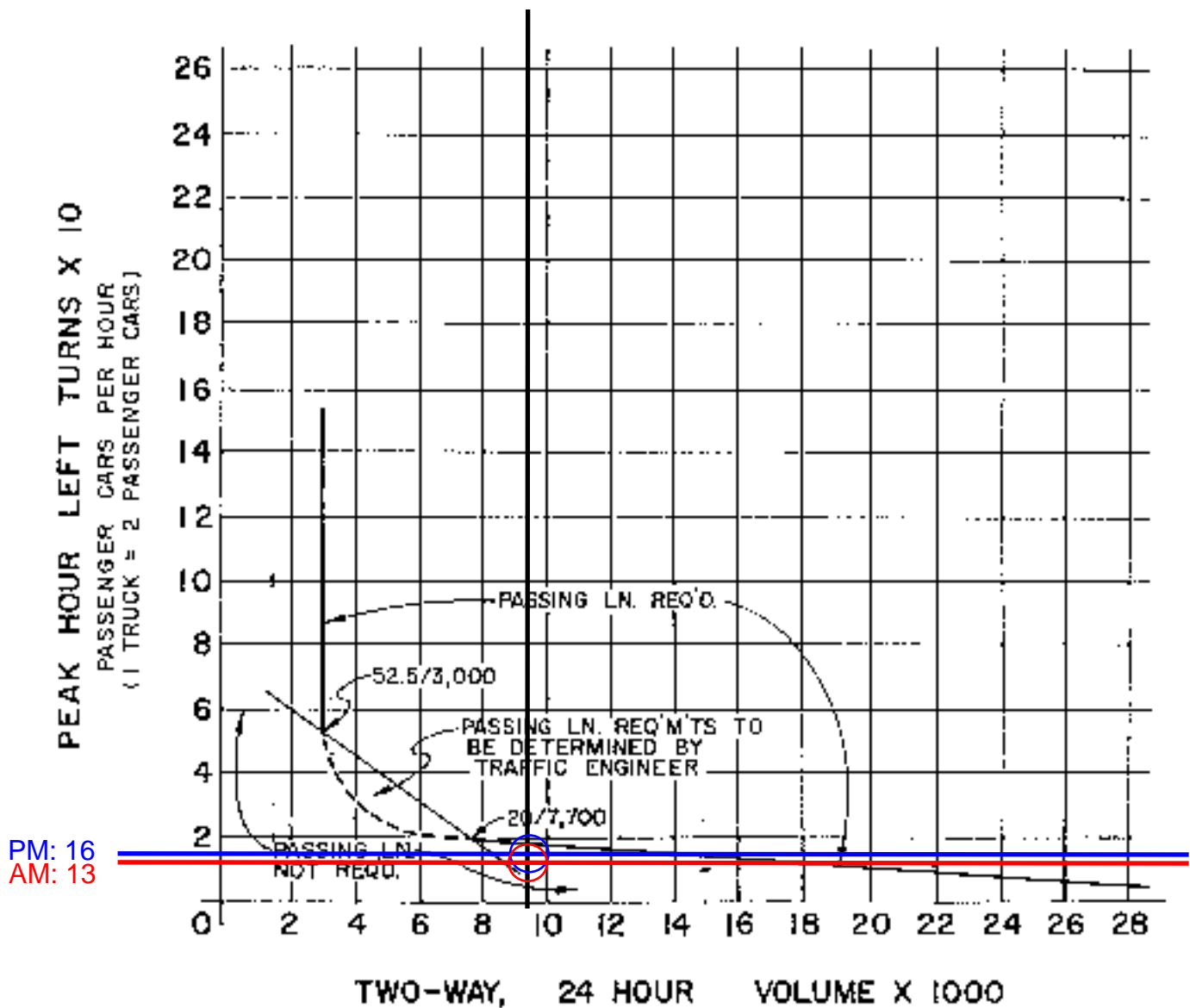
Zone Summary

Zone wide Queuing Penalty: 242

Bogie Lake Road and E. Site Drive (LT Warrant)

WARRANT FOR LEFT TURN PASSING LANE

(BASED ON TOTAL DEVELOPMENT)

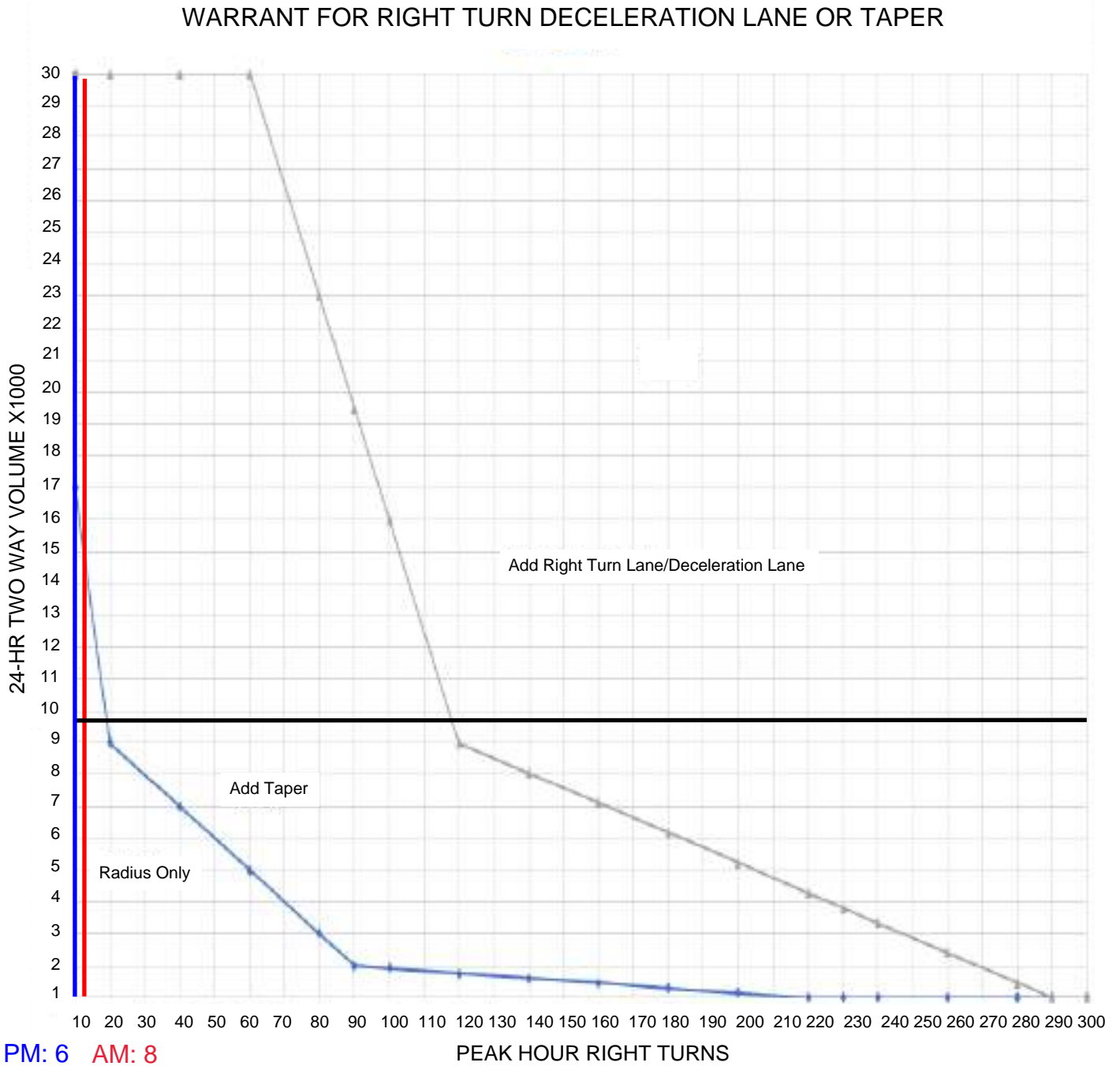


2-way Peak Volume (AM) = 956 vph
 2-way Peak Volume (PM) = 945 vph
 2-way Peak Volume (Avg.) = 951 vph
 Assuming k-factor is 10% of ADT volume
2-way 24-Hr Volume = 9,510 vpd

**LT TREATMENT
NOT
RECOMMENDED**

Bogie Lake Road and E. Site Drive (RT Warrant)

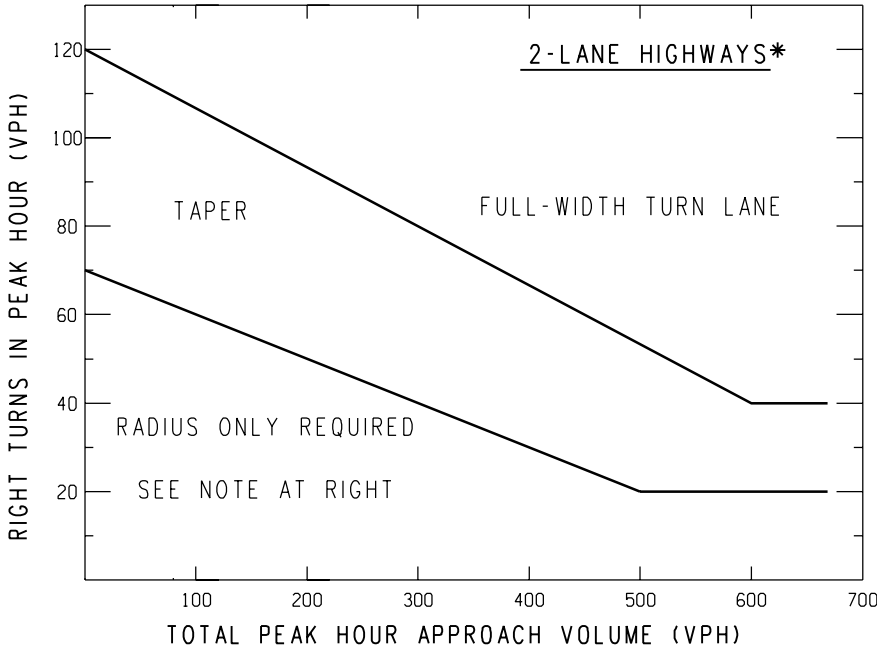
FIGURE 6-3



2-way Peak Volume (AM) = 956 vph
 2-way Peak Volume (PM) = 945 vph
 2-way Peak Volume (Avg.) = 951 vph
 Assuming k-factor is 10% of ADT volume
2-way 24-Hr Volume = 9,510 vpd

RT TREATMENT
NOT
RECOMMENDED

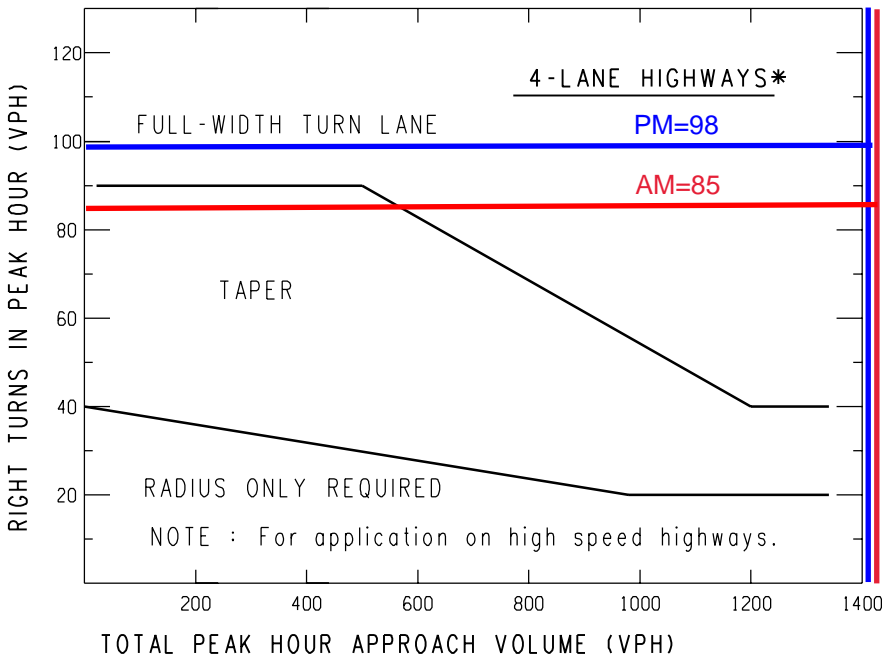
Highland Road (M-59) and W. Site Drive (RT Warrant)



NOTE:

For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour right turns = Peak hour right turns - 20



*If a center left-turn lane exists (i.e. 3 or 5 lane highway), subtract the number of left turns in approach volume from the total approach volume to get an adjusted total approach volume.

RT Lane Recommended

AM=1800
PM=1710

Sample Problem:

The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hour is 100 vph. Determine if a right turn lane is recommended.

Solution:

Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus, a right-turn lane may be recommended.

		TRAFFIC VOLUME GUIDELINES FOR RIGHT-TURN LANES AND TAPERS	
TRAFFIC AND SAFETY NOTE			
DRAWN BY: MTS	08/05/2004	604A	SHEET 2 OF 2
CHECKED BY: JAT	PLAN DATE:		
FILE: K:/DGN/ts notes/Note604A tsn.dgn		REV. 08/05/2004	

Coffee Shop Drive Through Lane

95th Percentile Probability - Drive Through Queue Length (# of Vehicles)

Volume = 70 vph
 service rate = 60 veh/hr
 $\lambda = 1.166667$

	1	2	3	4	5	6	7	8	9	
λ^x	No Veh in Cycle	X	X!	$P = (e^{(-\lambda)})(\lambda^x)/X!$	ΣP	P* # Cycle containing Volume in 1	Σ Cycles in 6	Volume in Cycle (1*6)	Σ volume	Poisson Queue
1.0000	0	0	1	31.14%	31.14%	19	19	0	0	NO
1.1667	1	1	1	36.33%	67.47%	22	40	22	22	NO
1.3611	2	2	2	21.19%	88.66%	13	11	25	47	NO
1.5880	3	3	6	8.24%	96.91%	5	16	15	62	NO
1.8526	4	4	24	2.40%	99.31%	1	17	6	68	NO
2.1614	5	5	120	0.56%	99.87%	0	18	2	70	MET
2.5216	6	6	720	0.11%	99.98%	0	18	0	70	MET
2.9419	7	7	5040	0.02%	100.00%	0	18	0	70	MET
3.4322	8	8	40320	0.00%	100.00%	0	18	0	70	MET
4.0042	9	9	362880	0.00%	100.00%	0	18	0	70	MET
4.6716	10	10	3628800	0.00%	100.00%	0	18	0	70	MET
5.4502	11	11	39916800	0.00%	100.00%	0	18	0	70	MET

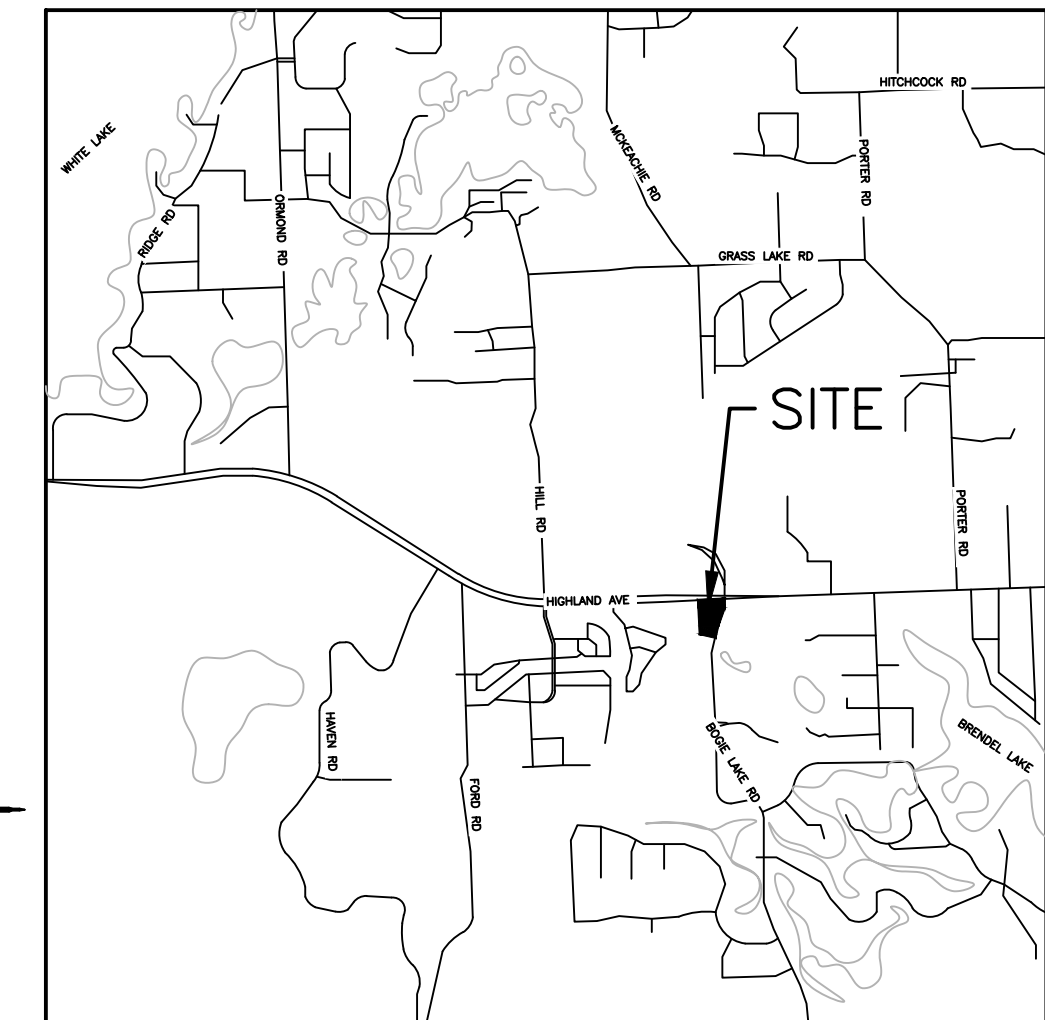
Fast-Food Restaurant Drive Through Lane
 95th Percentile Probability - Drive Through Queue Length (# of Vehicles)

Volume = 49 vph
 service rate = 90 veh/hr
 $\lambda = 0.544444$

	1	2	3	4	5	6	7	8	9	
λ^x	No Veh in Cycle	X	X!	$P = (e^{(-\lambda)})(\lambda^x)/X!$	ΣP	P* # Cycle containing Volume in 1	Σ Cycles in 6	Volume in Cycle (1*6)	Σ volume	Poisson Queue
1.0000	0	0	1	58.02%	58.02%	52	52	0	0	NO
0.5444	1	1	1	31.59%	89.60%	28	81	28	28	NO
0.2964	2	2	2	8.60%	98.20%	8	11	15	44	NO
0.1614	3	3	6	1.56%	99.76%	1	12	4	48	NO
0.0879	4	4	24	0.21%	99.97%	0	13	1	49	MET
0.0478	5	5	120	0.02%	100.00%	0	13	0	49	MET
0.0260	6	6	720	0.00%	100.00%	0	13	0	49	MET
0.0142	7	7	5040	0.00%	100.00%	0	13	0	49	MET
0.0077	8	8	40320	0.00%	100.00%	0	13	0	49	MET
0.0042	9	9	362880	0.00%	100.00%	0	13	0	49	MET
0.0023	10	10	3628800	0.00%	100.00%	0	13	0	49	MET
0.0012	11	11	39916800	0.00%	100.00%	0	13	0	49	MET

PRELIMINARY SITE PLAN FOR GATEWAY CROSSING

PART OF NORTHEAST QUARTER OF SOUTHEAST QUARTER, SECTION 20 WHITE LAKE TOWNSHIP, OAKLAND COUNTY, MICHIGAN



LOCATION MAP

NO SCALE

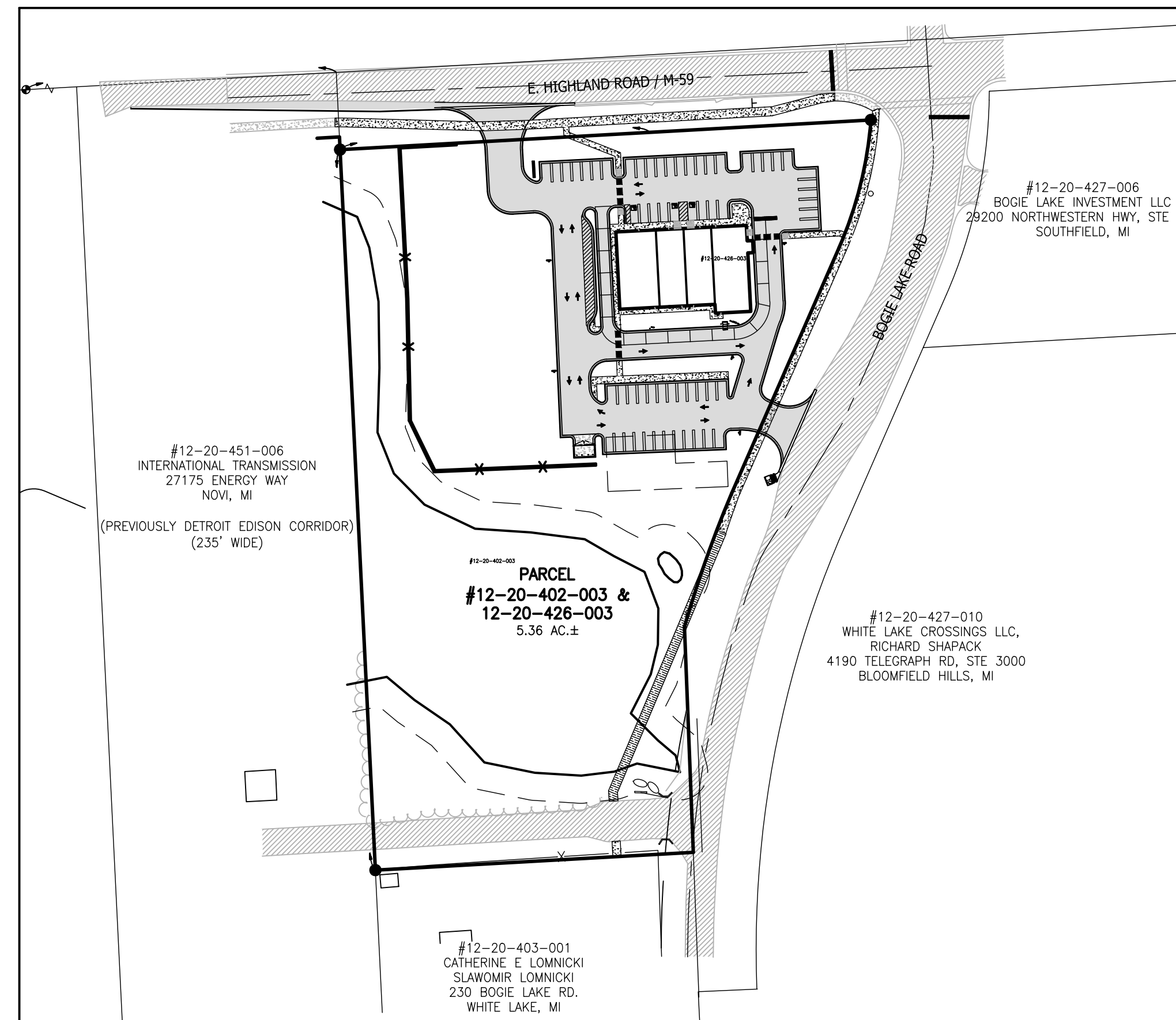
PROPERTY DESCRIPTION:

DESCRIPTION OF COMBINED PARCEL, AS SURVEYED BY KIEFT ENGINEERING, INC., JOB NO. KE 2012.247, DATED 1-30-13, AS SHOWN ON SURVEY BY ALPINE ENGINEERING, INC., JOB NO. 15-113, DATED 2-10-15:

PART OF THE NORTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 20, T3N-R8E, WHITE LAKE TOWNSHIP, OAKLAND COUNTY, MICHIGAN, DESCRIBED AS BEGINNING AT A POINT ON THE SOUTH RIGHT-OF-WAY LINE OF HIGHLAND ROAD (M-59, 70 FOOT HALF WIDTH) LOCATED S88°58'48"E 1032.50 FEET AND S01°25'12"W 70.00 FEET FROM THE CENTER OF SECTION 20, T3N-R8E; THENCE S88°58'48"E 480.35 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF BOGIE LAKE ROAD; THENCE ALONG SAID WESTERLY RIGHT-OF-WAY LINE ON A CURVE TO THE RIGHT 119.37 FEET, SAID CURVE HAVING A RADIUS OF 356.47 FEET, A DELTA OF 19°11'09" AND A LONG CHORD OF S18°14'12"W 118.81 FEET; THENCE S27°49'48"W 242.55 FEET; THENCE ALONG A CURVE TO THE LEFT 127.93 FEET, SAID CURVE HAVING A RADIUS OF 1060.72 FEET, A DELTA OF 06°54'37" AND A LONG CHORD OF S23°39'55"W 127.85 FEET; S01°58'42"W 203.96 FEET; THENCE N88°58'48"W 287.70 FEET; THENCE N01°25'12"E 652.00 FEET TO THE POINT OF BEGINNING. SUBJECT TO THE RIGHTS OF THE PUBLIC IN BOGIE LAKE ROAD. CONTAINING 5.36 ACRES.

CONSTRUCTION NOTES

- THE CONTRACTOR SHALL COMPLY WITH THE FOLLOWING NOTES AND ANY WORK INVOLVED SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
- THE CONTRACTOR SHALL HOLD HARMLESS THE DESIGN PROFESSIONAL, MUNICIPALITY, COUNTY, STATE AND ALL OF ITS SUB CONSULTANTS, PUBLIC AND PRIVATE UTILITY COMPANIES, AND LANDOWNERS FOR DAMAGES TO INDIVIDUALS AND PROPERTY, REAL OR OTHERWISE, DUE TO THE OPERATIONS OF THE CONTRACTOR AND/OR THEIR SUBCONTRACTORS.
 - A GRADING PERMIT FOR SOIL EROSION-SEDIMENTATION CONTROL SHALL BE OBTAINED FROM THE GOVERNING AGENCY PRIOR TO THE START OF CONSTRUCTION.
 - IF DUST PROBLEM OCCURS DURING CONSTRUCTION, CONTROL WILL BE PROVIDED BY AN APPLICATION OF WATER, EITHER BY SPRINKLER OR TANK TRUCK.
 - ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH LOCAL MUNICIPAL STANDARDS AND SPECIFICATIONS.
 - THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL REQUIRED TOWNSHIP, COUNTY, AND STATE OF MICHIGAN PERMITS.
 - PAVED SURFACES, WALKWAYS, SIGNS, LIGHTING AND OTHER STRUCTURES SHALL BE MAINTAINED IN A SAFE, ATTRACTIVE CONDITION AS ORIGINALLY DESIGNED AND CONSTRUCTED.
 - ALL BARRIER-FREE FEATURES SHALL BE CONSTRUCTED TO MEET ALL LOCAL, STATE AND A.D.A. REQUIREMENTS.
 - ANY DISCREPANCY IN THIS PLAN AND ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE DESIGN ENGINEER PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL SETBACKS, EASEMENTS AND DIMENSIONS SHOWN HEREON BEFORE BEGINNING CONSTRUCTION.
 - THE CONTRACTOR SHALL CONTACT ALL OWNERS OF EASEMENTS, UTILITIES AND RIGHTS-OF-WAY, PUBLIC OR PRIVATE, PRIOR TO THE START OF CONSTRUCTION.
 - THE CONTRACTOR SHALL COORDINATE WITH ALL OWNERS TO DETERMINE THE LOCATION OF EXISTING LANDSCAPING, IRRIGATION LINES & PRIVATE UTILITY LINES. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING LANDSCAPING, IRRIGATION LINES, AND PRIVATE UTILITY LINES.
 - THE CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE UPON COMPLETION OF THE PROJECT.
 - THE CONTRACTOR SHALL MAINTAIN THE SITE IN A MANNER SO THAT WORKMEN AND PUBLIC SHALL BE PROTECTED FROM INJURY, AND ADJOINING PROPERTY PROTECTED FROM DAMAGE.
 - THE CONTRACTOR SHALL KEEP THE AREA OUTSIDE THE "CONSTRUCTION LIMITS" BROOM CLEAN AT ALL TIMES.
 - THE CONTRACTOR SHALL CALL MISS DIG A MINIMUM OF 72 HOURS PRIOR TO THE START OF CONSTRUCTION.
 - ALL EXCAVATION UNDER OR WITHIN 3 FEET OF PUBLIC PAVEMENT, EXISTING OR PROPOSED SHALL BE BACKFILLED AND COMPACTED WITH SAND (MDOT CLASS II).
 - ALL PAVEMENT REPLACEMENT AND OTHER WORKS COVERED BY THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE TOWNSHIP, INCLUDING THE LATEST MICHIGAN DEPARTMENT OF TRANSPORTATION (MDOT) SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.
 - THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES.
 - NO ADDITIONAL COMPENSATION WILL BE PAID TO THE CONTRACTOR FOR ANY DELAY OR INCONVENIENCE DUE TO THE MATERIAL SHORTAGES OR RESPONSIBLE DELAYS DUE TO THE OPERATIONS OF SUCH OTHER PARTIES DOING WORK INDICATED OR SHOWN ON THE PLANS OR IN THE SPECIFICATION OR FOR ANY REASONABLE DELAYS IN CONSTRUCTION DUE TO THE ENCOUNTERING OR EXISTING UTILITIES THAT MAY OR MAY NOT BE SHOWN ON THE PLANS.
 - DURING THE CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL NOT PERFORM WORK BY PRIVATE AGREEMENT WITH PROPERTY OWNERS ADJACENT TO THE PROJECT.
 - IF WORK EXTENDS BEYOND NOVEMBER 15, NO COMPENSATION WILL BE DUE TO THE CONTRACTOR FOR ANY WINTER PROTECTION MEASURES THAT MAY BE REQUIRED BY THE ENGINEER.
 - NO TREES ARE TO BE REMOVED UNTIL MARKED IN THE FIELD BY THE ENGINEER.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE PROPERTY BEYOND THE CONSTRUCTION LIMITS INCLUDING BUT NOT LIMITED TO EXISTING FENCE, LAWN, TREES AND SHRUBBERY.
 - ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE NORMAL CONSTRUCTION LIMITS OF THE PROJECT SHALL BE SODDED OR SEEDED AS SPECIFIED OR DIRECTED BY THE ENGINEER.
 - ALL ROOTS, STUMPS AND OTHER OBJECTIONABLE MATERIALS SHALL BE REMOVED AND THE HOLE BACKFILLED WITH SUITABLE MATERIAL. WHERE GRADE CORRECTION IS REQUIRED, THE SUBGRADE SHALL BE CUT TO CONFORM TO THE CROSS-SECTION AS SHOWN IN THE PLANS.
 - TRAFFIC SHALL BE MAINTAINED DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL SIGNS AND TRAFFIC CONTROL DEVICES. FLAG PERSONS SHALL BE PROVIDED BY THE CONTRACTOR IF DETERMINED NECESSARY BY THE ENGINEER. ALL SIGNS SHALL CONFORM TO THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AT NO COST TO THE TOWNSHIP. NO WORK SHALL BE DONE UNLESS THE APPROPRIATE TRAFFIC CONTROL DEVICES ARE IN PLACE.
 - ALL DEMOLISHED MATERIALS AND SOIL SPOILS SHALL BE REMOVED FROM THE SITE AT NO ADDITIONAL COST, AND DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
 - AFTER REMOVAL OF TOPSOIL, THE SUBGRADE SHALL BE COMPACTED TO 95% OF ITS UNIT WEIGHT.
 - ALL GRADING IN THE PLANS SHALL BE DONE AS PART OF THIS CONTRACT. ALL DELETERIOUS MATERIAL SHALL BE REMOVED FROM THE SUBGRADE PRIOR TO COMPACTING.
 - NO SEEDING SHALL BE DONE AFTER OCTOBER 15 WITHOUT APPROVAL OF THE ENGINEER.
 - ANY EXISTING APPURTENANCES SUCH AS MANHOLES, GATE VALVES, ETC. SHALL BE ADJUSTED TO THE PROPOSED GRADE AND SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
 - SOIL EROSION MEASURES SHALL BE MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION HAS BEEN RE-ESTABLISHED.
 - ALL PERMANENT SIGNS AND PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF THE MICHIGAN MUTCD MANUAL AND SHALL BE INCIDENTAL TO THE CONTRACT.



OVERALL SITE MAP

1" = 100'

PERMITS & APPROVALS

AGENCY	DATE SUBMITTED	DATE APPROVED
• TOWNSHIP ENGINEERING APPROVAL	-	-
• RCOC	-	-
• SESC	-	-
• MDEGLE ACT 399	-	-
• MDEGLE PART 41	-	-
• MDEGLE WETLANDS	-	-

INDEMNIFICATION STATEMENT

THE CONTRACTOR SHALL HOLD HARMLESS THE DESIGN PROFESSIONAL, MUNICIPALITY, COUNTY, STATE AND ALL OF ITS SUB CONSULTANTS, PUBLIC AND PRIVATE UTILITY COMPANIES, AND LANDOWNERS FOR DAMAGES TO INDIVIDUALS AND PROPERTY, REAL OR OTHERWISE, DUE TO THE OPERATIONS OF THE CONTRACTOR AND/OR THEIR SUBCONTRACTORS.

SHEET INDEX	
SHEET NO.	DESCRIPTION
1	COVER
2	GENERAL NOTES & LEGEND
3	EXISTING CONDITIONS & DEMOLITION PLAN
4	SITE PLAN
5	UTILITY PLAN
6	GRADING PLAN
7	DRAINAGE PLAN
8	SESC PLAN
9	DETENTION BASIN DETAILS
10	CONTECH UNDERGROUND DETAILS
11	CONSTRUCTION DETAILS
12	TOWNSHIP STORM SEWER DETAILS
13	TOWNSHIP SANITARY DETAILS
14	TOWNSHIP WATERMAIN DETAILS
15	WRC SESC DETAILS
SHEET NO.	DRAWINGS BY DETROIT ARCHITECTURAL GROUP
PP-4	MULTI-TENANT BUILDING PRELIMINARY FLOOR PLAN & DETAILS
PP-4.1	MULTI-TENANT BUILDING PRELIMINARY ELEVATIONS

PREPARED FOR:

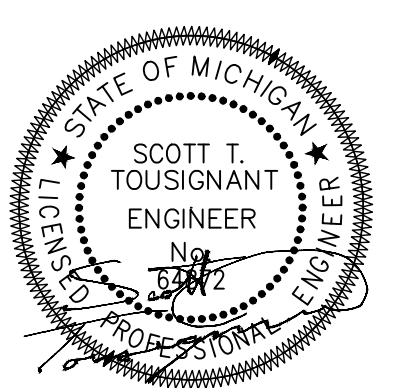
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FOR SITE PLAN APPROVAL ONLY!
NOT FOR CONSTRUCTION

GENERAL NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL REQUIRED TOWNSHIP, COUNTY, AND STATE OF MICHIGAN PERMITS.
2. A GRADING PERMIT FOR SOIL EROSION-SEDIMENTATION CONTROL SHALL BE OBTAINED FROM THE GOVERNING AGENCY PRIOR TO THE START OF CONSTRUCTION.
3. IF DUST PROBLEM OCCURS DURING CONSTRUCTION, CONTROL WILL BE PROVIDED BY AN APPLICATION OF WATER, EITHER BY SPRINKLER OR TANK TRUCK.
4. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH LOCAL MUNICIPAL STANDARDS AND SPECIFICATIONS.
5. PAVED SURFACES, WALKWAYS, SIGNS, LIGHTING AND OTHER STRUCTURES SHALL BE MAINTAINED IN A SAFE, ATTRACTIVE CONDITION AS ORIGINALLY DESIGNED AND CONSTRUCTED.
6. ALL BARRIER-FREE FEATURES SHALL BE CONSTRUCTED TO MEET ALL LOCAL, STATE AND A.D.A. REQUIREMENTS. WHERE EXISTING CONDITIONS AND/OR THE REQUIREMENTS OF THE PLANS WILL RESULT IN FINISHED CONDITIONS THAT DO NOT MEET ADA REQUIREMENTS, THE CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER PRIOR TO WORK COMMENCING.
7. ANY DISCREPANCY IN THIS PLAN AND ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE DESIGN ENGINEER PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL SETBACKS, EASEMENTS AND DIMENSIONS SHOWN HEREON PRIOR TO BEGINNING CONSTRUCTION.
8. THE CONTRACTOR SHALL CONTACT ALL OWNERS OF EASEMENTS, UTILITIES AND RIGHT-OF-WAY, PUBLIC OR PRIVATE, PRIOR TO THE START OF CONSTRUCTION.
9. THE CONTRACTOR SHALL COORDINATE WITH ALL OWNERS TO DETERMINE THE LOCATION OF EXISTING LANDSCAPING, IRRIGATION LINES & PRIVATE UTILITY LINES. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING LANDSCAPING, IRRIGATION LINES, AND PRIVATE UTILITY LINES.
10. THE CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE UPON COMPLETION OF THE PROJECT.
11. THE CONTRACTOR SHALL MAINTAIN THE SITE IN A MANNER SO THAT WORKMEN AND PUBLIC SHALL BE PROTECTED FROM INJURY, AND ADJOINING PROPERTY PROTECTED FROM DAMAGE.
12. THE CONTRACTOR SHALL KEEP THE AREA OUTSIDE THE "CONSTRUCTION LIMITS" BROOM CLEAN AT ALL TIMES.
13. THE CONTRACTOR SHALL CALL MISS DIG A MINIMUM OF 72 HOURS PRIOR TO THE START OF CONSTRUCTION.
14. ALL PAVEMENT REPLACEMENT AND OTHER WORKS COVERED BY THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF THE TOWNSHIP, INCLUDING THE LATEST MICHIGAN DEPARTMENT OF TRANSPORTATION (MDOT) SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.
15. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES.
16. NO ADDITIONAL COMPENSATION WILL BE PAID TO THE CONTRACTOR FOR ANY DELAY OR INCONVENIENCE DUE TO THE MATERIAL SHORTAGES OR RESPONSIBLE DELAYS DUE TO THE OPERATIONS OF SUCH OTHER PARTIES DOING WORK INDICATED OR SHOWN ON THE PLANS OR IN THE SPECIFICATION OR FOR ANY REASONABLE DELAYS IN CONSTRUCTION DUE TO THE ENCOUNTERING OR EXISTING UTILITIES THAT MAY OR MAY NOT BE SHOWN ON THE PLANS.
17. DURING THE CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL NOT PERFORM WORK BY PRIVATE AGREEMENT WITH PROPERTY OWNERS ADJACENT TO THE PROJECT.
18. IF WORK EXTENDS BEYOND NOVEMBER 15, NO COMPENSATION WILL BE DUE TO THE CONTRACTOR FOR ANY WINTER PROTECTION MEASURES THAT MAY BE REQUIRED BY THE ENGINEER.
19. NO TREES ARE TO BE REMOVED UNTIL MARKED IN THE FIELD BY THE ENGINEER.
20. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE PROPERTY BEYOND THE CONSTRUCTION LIMITS INCLUDING BUT NOT LIMITED TO EXISTING FENCE, LAWN, TREES AND SHRUBBERY.
21. TRAFFIC SHALL BE MAINTAINED DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL SIGNS AND TRAFFIC CONTROL DEVICES. FLAG PERSONS SHALL BE PROVIDED BY THE CONTRACTOR IF DETERMINED NECESSARY BY THE ENGINEER. ALL SIGNS SHALL CONFORM TO THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AT NO COST TO THE TOWNSHIP. NO WORK SHALL BE DONE UNLESS THE APPROPRIATE TRAFFIC CONTROL DEVICES ARE IN PLACE.
22. ALL DEMOLISHED MATERIALS AND SOIL SPOILS SHALL BE REMOVED FROM THE SITE AT NO ADDITIONAL COST, AND DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.
23. ANY EXISTING APPURTENANCES SUCH AS MANHOLES, GATE VALVES, ETC. SHALL BE ADJUSTED TO THE PROPOSED GRADE AND SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
24. ALL PERMANENT SIGNS AND PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE LATEST REVISION OF THE MICHIGAN MUTCD MANUAL AND SHALL BE INCIDENTAL TO THE CONTRACT.
25. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL ITEMS REQUIRED FOR CONSTRUCTION OF THE PROJECT ARE INCLUDED IN THE CONTRACT. ANY ITEMS NOT SPECIFICALLY DESIGNATED IN THE PLANS SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT.
26. THE CONTRACTOR IS RESPONSIBLE FOR HAVING A SET OF APPROVED CONSTRUCTION PLANS, WITH THE LATEST REVISION DATE, ON SITE PRIOR TO THE START OF CONSTRUCTION. IN THE EVENT OF ANY QUESTIONS PERTAINING TO THE INTENT OF THE CONSTRUCTION PLANS OR SPECIFICATIONS, THE CONTRACTOR SHALL CONTACT THE DESIGN ENGINEER FOR A FINAL DETERMINATION FROM THE DESIGN ENGINEER.
27. THE CONTRACTOR, NOT THE OWNER OR THE ENGINEER, ARE RESPONSIBLE FOR THE MEANS, METHODS, AND SEQUENCE OF CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR SAFE EXECUTION OF THE PROJECT SCOPE IN ACCORDANCE WITH THE APPROVED CONSTRUCTION PLANS.
28. THE CONTRACTOR IS RESPONSIBLE FOR PRESERVING CONSTRUCTION STAKING AS NECESSARY. CONTRACTOR TO NOTIFY CONSTRUCTION SURVEYOR OF REPLACEMENT STAKES NEEDED WHICH SHALL BE AT THE CONTRACTORS EXPENSE.
29. THE OWNER AND/OR CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING FRANCHISE UTILITY SERVICES (CABLE, ELECTRIC, GAS, ETC.) OWNER AND/OR CONTRACTOR SHALL WORK WITH UTILITY COMPANIES ON FURNISHING SITE UTILITY LAYOUTS AND PROVIDING CONDUIT CROSSINGS AS REQUIRED.
30. DAMAGE TO ANY EXISTING UTILITIES OR INFRASTRUCTURE (INCLUDING PAVEMENT, CURB, SIDEWALK, ETC.) SHALL PROMPTLY BE REPLACED IN KIND AND SHALL BE AT THE CONTRACTORS EXPENSE.
31. COORDINATION OF TESTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND PER ALL CITY/TOWNSHIP/COUNTY REQUIREMENTS. COPIES OF ALL TEST REPORTS SHALL BE FURNISHED TO THE DESIGN ENGINEER.
32. PRIOR TO THE START OF CONSTRUCTION, PROTECTION FENCING SHALL BE ERRECTED AROUND THE TREE DRIPLINE OF ANY TREES INDICATED TO BE SAVED WITHIN THE LIMITS OF DISTURBANCE.
33. THE CONTRACTOR SHALL MAINTAIN DRAINAGE OF THE PROJECT AREA AND ADJACENT AREAS. WHERE EXISTING DRAINAGE FACILITIES ARE IMPACTED/DISTURBED DUE TO CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE ANY NECESSARY TEMPORARY DRAINAGE PROVISIONS.
34. SOIL BORING LOGS ARE REPRESENTATIVE OF SPECIFIC POINTS ON THE PROJECT SITE, AND IF PROVIDED TO THE CONTRACTOR ARE FOR INFORMATIONAL PURPOSES ONLY.
35. WHERE CITY/TOWNSHIP STANDARD CONSTRUCTION DETAILS/SPECIFICATIONS ARE PROVIDED AND ARE IN CONFLICT WITH NOTES AND SPECIFICATIONS HEREIN, THE CITY/TOWNSHIP STANDARD SHALL GOVERN.

INDEMNIFICATION STATEMENT

THE CONTRACTOR SHALL HOLD HARMLESS THE DESIGN PROFESSIONAL, MUNICIPALITY, COUNTY, STATE, AND ALL OF ITS SUB CONSULTANTS, PUBLIC AND PRIVATE UTILITY COMPANIES, AND LANDOWNERS FOR DAMAGES TO INDIVIDUALS AND PROPERTY, REAL OR OTHERWISE, DUE TO THE OPERATIONS OF THE CONTRACTOR AND/OR THEIR SUBCONTRACTORS.

CONTRACTOR TO FOLLOW MANUFACTURER SPECS/RECOMMENDATIONS THAT SUPERCEDE PLANS

GENERAL GRADING & SESC NOTES

1. THE CONTRACTOR SHALL HAVE IN PLACE ALL REQUIRED EROSION CONTROL METHODS AS INDICATED ON THE CONSTRUCTION PLANS AND AS REQUIRED BY GENERAL PRACTICE. SPECIFIC MEANS, METHODS AND SEQUENCES OF CONSTRUCTION MAY DICTATE ADDITIONAL SOIL EROSION CONTROL MEASURES BE NEEDED. THE CONTRACTOR SHALL COORDINATE WITH THE DESIGN ENGINEER ON THESE ANTICIPATED METHODS. ADDITIONAL SOIL EROSION CONTROL METHODS SHALL BE INCIDENTAL TO THE SCOPE OF WORK.
2. ACTUAL FIELD CONDITIONS MAY DICTATE ADDITIONAL OR ALTERNATE SOIL EROSION CONTROL MEASURES BE UTILIZED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DEFICIENCIES OR FIELD CONDITIONS THAT WARRANT ADDITIONAL AND/OR ALTERNATIVE SESC MEASURES BE UTILIZED.
3. AT THE CLOSE OF EACH DAY, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING ALL CONSTRUCTION OPERATIONS, MATERIALS, DEBRIS, ETC ARE CONTAINED ON-SITE.
4. AT THE CLOSE OF EACH WORKING DAY, ALL DRAINAGE STRUCTURES SHALL BE FREE OF DIRT AND DEBRIS AT THE FLOW LINE.
5. ALL SOIL EROSION CONTROL MEASURES SHALL BE INSTALLED IN ACCORDANCE PER MDEGLE REGULATIONS AND BEST PRACTICES, ALL SOIL EROSION CONTROL MEASURES SHALL BE MAINTAINED BY THE CONTRACTOR.
6. THE SOIL EROSION CONTROL MEASURES SHALL BE KEPT IN PLACE UNTIL SUCH A TIME THAT THE SITE IS DETERMINED TO BE ESTABLISHED WITH ACCEPTABLE AMOUNT OF VEGETATIVE GROUND COVER.
7. ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND THE NORMAL CONSTRUCTION LIMITS OF THE PROJECT SHALL BE SODDED OR SEEDED AS SPECIFIED OR DIRECTED BY THE ENGINEER.
8. AFTER REMOVAL OF TOPSOIL, THE SUBGRADE SHALL BE COMPACTED TO 95% OF ITS UNIT WEIGHT.
9. ALL GRADING IN THE PLANS SHALL BE DONE AS PART OF THIS CONTRACT. ALL DELETERIOUS MATERIAL SHALL BE REMOVED FROM THE SUBGRADE PRIOR TO COMPACTING.
10. ALL ROOTS, STUMPS AND OTHER OBJECTIONABLE MATERIALS SHALL BE REMOVED AND THE HOLE BACKFILLED WITH SUITABLE MATERIAL. WHERE GRADE CORRECTION IS REQUIRED, THE SUBGRADE SHALL BE CUT TO CONFORM TO THE CROSS-SECTION AS SHOWN IN THE PLANS.
11. ALL EXCAVATION UNDER OR WITHIN 3 FEET OF PUBLIC PAVEMENT, EXISTING OR PROPOSED SHALL BE BACKFILLED AND COMPACTED WITH SAND (MDOT CLASS II).

GENERAL LANDSCAPE NOTES

1. ALL PLANT MATERIAL SHALL CONFORM TO THE REQUIREMENTS AND SPECIFICATIONS OF THE GOVERNING MUNICIPALITY. ALL STOCK SHALL BE NURSERY GROWN, CONFORMING TO ANSI Z60.1 "AMERICAN STANDARD FOR NURSERY STOCK", AND IN ACCORDANCE WITH GOOD HORTICULTURAL PRACTICE. STOCK SHALL EXHIBIT NORMAL GROWTH HABIT AND BE FREE OF DISEASE, INSECTS, EGGS, LARVAE, & DEFECTS SUCH AS KNOTS, SUN-SCALD, INJURIES, ABRASIONS, OR DISFIGUREMENT. ALL PLANT MATERIAL SHALL BE SUBJECT TO THE APPROVAL OF THE LANDSCAPE ARCHITECT.
2. ALL PLANT MATERIALS SHALL BE BALLED AND BURLAPPED OR CONTAINER STOCK. NO BARE ROOT STOCK IS PERMITTED. ALL PLANT BALLS SHALL BE FIRM, INTACT, AND SECURELY WRAPPED AND BOUND.
3. ALL PLANT BED MATERIALS SHALL BE EXCAVATED OF ALL BUILDING MATERIALS, OTHER EXTRANEIOUS OBJECTS, AND POOR SOILS TO A MINIMUM DEPTH OF 12-INCHES AND BACKFILLED TO GRADE WITH SPECIFIED PLANTING MIX (SEE BELOW).
4. PLANTING MIXTURE SHALL CONSIST OF 5 PARTS TOPSOIL FROM ON-SITE (AS APPROVED), 4 PARTS COARSE SAND, 1 PART SPHAGNUM PEAT MOSS (OR APPROVED COMPOST), AND 5 LBS OF SUPERPHOSPHATE FERTILIZER PER CU. YD. OF MIX. INGREDIENTS SHALL BE THOROUGHLY BLENDED FOR UNIFORM CONSISTENCY.
5. ALL PLANT BEDS AND INDIVIDUAL PLANTS, NOT OTHERWISE NOTED SHALL BE MULCHED WITH A 4-INCH LAYER OF SHREDDED BARK MULCH. EDGE OF MULCH BEDS AS SHOWN. DECIDUOUS TREES IN LAWN AREAS SHALL RECEIVE A 5-FT DIAMETER CIRCLE OF MULCH AND CONIFER TREES 8-FT (PLANTED CROWN OF TREE) UNLESS OTHERWISE NOTED.
6. LANDSCAPE STONE SHALL BE INSTALLED WHERE NOTED OR INDICATED (HATCHED). STONE SHALL BE 3/4"-1-1/4" WASHED RIVER GRAVEL OR AS SELECTED AND SHALL BE INSTALLED TO A MINIMUM DEPTH OF 3-INCHES.
7. ALL LANDSCAPE BEDS, UNLESS OTHERWISE NOTED SHALL BE INSTALLED OVER WEED BARRIER FABRIC - WATER PERMEABLE FILTRATION FABRIC OF NON-WOVEN POLYPROPYLENE OR POLYESTER FABRIC. FABRIC SHALL BE OF SUITABLE THICKNESS FOR APPLICATION.
8. ALL PLANTS AND PLANT BEDS SHALL BE THOROUGHLY WATERED UPON COMPLETION OF PLANTING AND STAKING OPERATIONS.
9. THE CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIALS FOR A PERIOD OF 1 YEAR FROM THE DATE THE WORK IS ACCEPTED, IN WRITING, BY THE LANDSCAPE ARCHITECT. THE CONTRACTOR SHALL REPLACE, WITHOUT COST TO THE OWNER, WITHIN A SPECIFIED PERIOD OF TIME, ALL DEAD PLANTS, AND ALL PLANTS NOT IN A VIGOROUS, THRIVING CONDITION, AS DETERMINED BY THE LANDSCAPE ARCHITECT, DURING AND AT THE END OF THE GUARANTEE PERIOD. REPLACEMENT STOCK SHALL CONFORM TO THE ORIGINAL SPECIFICATIONS.
10. EDGING SHALL BE PROVIDED FOR ALL LANDSCAPE BEDS NOT ADJACENT TO CONCRETE PAVEMENT. EDGING SHALL BE BLACK ALUMINUM EDGING, 3/16-INCH X 4-INCH. INSTALL PER MANUFACTURER'S INSTRUCTIONS, ALL EDGING SHALL BE INSTALLED IN STRAIGHT LINES OR SMOOTH CURVES WITHOUT IRREGULARITIES.
11. SOD SHALL BE DENSE, WELL ROOTED TURF, FREE OF WEEDS. IT SHALL BE COMPRISED OF A BLEND OF AT LEAST TWO KENTUCKY BLUE GRASSES AND ONE FESCUE. IT SHALL HAVE A UNIFORM THICKNESS OF 3/4-INCH AT TIME OF PLANTING, AND CUT IN UNIFORM STRIPS NOT LESS THAN 10-INCHES BY 18-INCHES. SOD SHALL BE KEPT MOIST AND LAID WITHIN 36-HOURS AFTER CUTTING.

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH A DENSE LAWN OF PERMANENT GRASSES, FREE OF LUMPS AND DEPRESSIONS. ALL SODDED AREAS THAT BROWN-OUT OR HAVE NOT FIRMLY KNITTED TO THE SOIL BASE WITHIN A PERIOD OF 1 MONTH SHALL BE REPLACED BY THE CONTRACTOR, AT NO COST TO THE OWNER.
12. ALL AREAS OF THE SITE THAT BECOME DISTURBED DURING CONSTRUCTION AND ARE NOT TO BE PAVED, STONED, LANDSCAPED, OR SODDED SHALL BE SEEDED AND MULCHED.

SEED MIXTURE SHALL BE AS FOLLOWS:
KENTUCKY BLUEGRASS (CHOOSE 3 VARIETIES - ADAPTA, RUGBY, CLADE, OR PARADE) 30%
RUBY RED OR DAWSON RED FINE FESCUE 30%
ATLANTA RED FESCUE 20%
PENNFINE PERENNIAL RYE 20%

THE ABOVE SEED MIXTURE SHALL BE SOWN AT A RATE OF 250 LBS PER ACRE. PRIOR TO SEEDING, THE TOPSOIL SHALL BE FERTILIZED WITH A COMMERCIAL FERTILIZER WITH A 10-0-10 ANALYSIS:
10% NITROGEN - MIN 25% FROM A UREA FORMALDEHYDE SOURCE
0.5% PHOSPHATE
10% POTASH - SOURCE POTASSIUM SULFATE OR POTASSIUM NITRATE

THE FIRST FERTILIZER APPLICATION SHALL BE AT A RATE OF 10 LBS PER 1000 SQ FT OF BULK FERTILIZER.

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ESTABLISH A DENSE LAWN OF PERMANENT GRASSES, FREE OF LUMPS AND DEPRESSIONS. ANY PART OF THE AREA THAT FAILS TO SHOW A UNIFORM GERMINATION SHALL BE RE-SEEDED AND SUCH RE-SEEDED SHALL CONTINUE UNTIL A DENSE LAWN IS ESTABLISHED. DAMAGE TO SEEDED AREAS RESULTING FROM EROSION SHALL BE REPAIRED BY THE CONTRACTOR.
13. ALL AREAS OF THE SITE SCHEDULED FOR SEEDING OR SODDING SHALL FIRST RECEIVE A 6-INCH LAYER OF CLEAN, FRIABLE TOPSOIL. THE SOIL SHALL BE DISCED AND SHALL BE GRADED IN CONFORMANCE WITH THE GRADING PLAN.
14. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION OF ALL UTILITIES AND TO INFORM THE LANDSCAPE ARCHITECT OF ANY CONFLICTS PRIOR TO COMMENCING LANDSCAPING.

GENERAL UTILITY NOTES

1. BEDDING SHALL EXTEND A MINIMUM OF 4" BELOW THE PIPE, UNLESS OTHERWISE NOTED ON THE PLANS. BEDDING SHALL BE OF UNIFORM GRADATION MDOT 6AA STONE OR MDOT CLASS II GRANULAR MATERIAL FOR SANITARY AND STORM PIPE AND MDOT CLASS II GRANULAR MATERIAL ONLY FOR WATERMAIN.
2. WHERE UNSTABLE GROUND CONDITIONS ARE ENCOUNTERED, STONE BEDDING SHALL BE USED AS DIRECTED BY THE ENGINEER.
3. BACKFILL SHALL BE OF A SUITABLE MATERIAL AND SHALL BE FREE OF ANY ORGANIC MATERIALS AND ROCKS.
4. BACKFILL ABOVE THE PIPE SHALL BE OF GRANULAR MATERIAL MDOT CLASS II TO A POINT 12" ABOVE THE TOP OF THE PIPE. WHERE THE TRENCH IS NOT WITHIN THE INFLUENCE OF THE ROAD, SUITABLE SITE MATERIAL MAY BE COMPACTED AND UTILIZED FROM A POINT 12" ABOVE THE PIPE TO GRADE. WHERE THE TRENCH IS WITHIN A 1:1 INFLUENCE OF THE ROAD, GRANULAR MATERIAL, MDOT CLASS II OR III, IS TO BE PLACED AND COMPACTED IN LAYERS NOT EXCEEDING 12" IN THICKNESS. COMPACTION SHALL BE 95% AS DETERMINED BY AASHTO T99.
5. 18" MINIMUM VERTICAL SEPARATION AND 10' HORIZONTAL SEPARATION IS TO BE MAINTAINED BETWEEN WATERMAIN AND SANITARY/STORM SEWER TO THE MAXIMUM EXTENT POSSIBLE.

GENERAL STORM NOTES

1. ALL STORM PIPE LENGTHS ARE SHOWN FROM C/L TO C/L OF STRUCTURE OR FROM C/L OF STRUCTURE TO DISCHARGE END OF FLARED END SECTION.
2. STORM PIPE MATERIALS SHALL BE AS FOLLOWS:
2.1. RCP(REINFORCED CONCRETE PIPE): SHALL MEET THE REQUIREMENTS OF ASTM C76 WITH MODIFIED GROOVED TONGUE AND RUBBER GASKETS MEETING THE REQUIREMENTS OF ASTM C443. RCP TO BE EITHER CLASS IV OR V AS CALLED OUT ON THE PLANS.
2.2. HDPE(HIGH DENSITY POLYETHYLENE): SHALL MEET THE REQUIREMENTS OF ASTM F2648.
2.3. PP(POLYPROPYLENE): SHALL MEET THE REQUIREMENTS OF ASTM F2881.
2.4. PVC(POLYVINYL CHLORIDE): SHALL MEET THE REQUIREMENTS OF ASTM D3034.
3. STORM PIPE JOINTS SHALL MEET THE REQUIREMENTS OF ASTM D3212. HDPE AND PP PIPE GASKETS SHALL MEET THE REQUIREMENTS OF ASTM F477.
4. ALL STORM PIPE TO HAVE WATERTIGHT PREMIUM JOINTS, UNLESS OTHERWISE NOTED ON THE PLANS.
5. STORM DRAINAGE STRUCTURES SHALL BE FURNISHED WITH STEPS WHICH SHALL BE STEEL ENCASED WITH POLYPROPYLENE PLASTIC OR EQUIVALENT. STEPS SHALL BE SET AT 16" CENTER TO CENTER.
6. ALL FLARED END SECTIONS 15" AND LARGER SHALL BE FURNISHED WITH AN ANIMAL GRATE.
7. FLARED END SECTIONS DISCHARGING STORM WATER SHALL RECEIVE A MINIMUM OF 10 SQ YDS OF PLAIN COBBLESTONE RIP RAP WITH A MINIMUM STONE SIZE OF 6" AND SHALL BE PLACED ON A GEOTEXTILE FABRIC WRAP.
8. ALL CATCH BASINS WITHIN THE ROADWAY SHALL INCLUDE INSTALLATION OF 6" DIAMETER PERFORATED PIPE SUBDRAIN.
9. STORM DRAINAGE STRUCTURE COVERS SHALL BE OF THE FOLLOWING (OR APPROVED EQUAL):
COVER USE FRAME GRADE/BACK TYPE 'B'
'A' MANHOLE 1040 TYPE 'B'
'B' TYPE B2 CURB 7085 TYPE 'M1'
'C' VALLEY CURB 7065 7045 TYPE 'M1' GRATE/7060 TYPE 'T1' BACK
'D' PARKING LOTS 1040/5100 TYPE 'M1' GRATE OR 5105 TYPE 'M1' GRATE
'E' LAWN 1040 TYPE 'O2' GRATE
'K' TYPE C & F CURB 7045 TYPE 'M1' GRATE/7050 TYPE 'T1' BACK

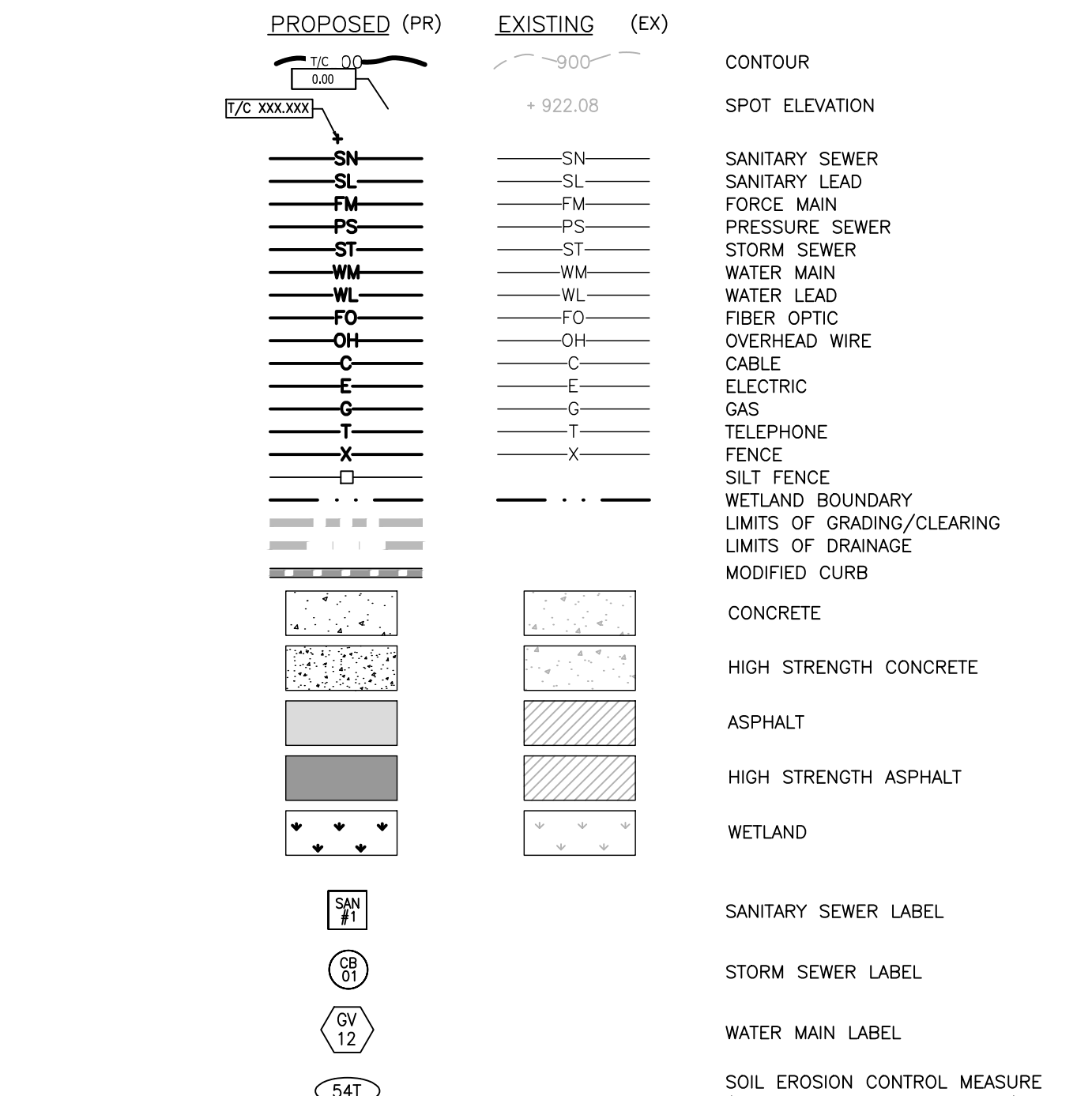
GENERAL SANITARY NOTES

1. ALL SANITARY PIPE LENGTHS ARE SHOWN FROM C/L OF STRUCTURE TO C/L OF STRUCTURE.
2. SANITARY PIPE MATERIALS SHALL BE AS FOLLOWS:
2.1. PVC SDR-26 (SANITARY MAIN)
2.2. PVC SDR-23.5 (SANITARY LEADS)
2.3. HDPE DR-11 (SANITARY FORCEMAIN)
3. ALL PVC SDR SANITARY SEWER PIPE SHALL MEET THE REQUIREMENTS OF ASTM D3034 AND D2241. PVC SCHED 40 PIPE SHALL MEET THE REQUIREMENTS OF ASTM D1785. GASKET JOINTS FOR SANITARY PIPE SHALL MEET THE REQUIREMENTS OF ASTM D3139 AND D3212.
4. SANITARY STRUCTURES SHALL BE FURNISHED WITH STEPS WHICH SHALL BE STEEL ENCASED WITH POLYPROPYLENE PLASTIC OR EQUIVALENT. STEPS SHALL BE SET AT 16" CENTER TO CENTER.
5. ALL NEW MANHOLES SHALL BE MINIMUM 4" DIAMETER. PRECAST MANHOLE SECTIONS AND AN ECCENTRIC CONE. PRECAST MANHOLE JOINTS SHALL BE INSTALLED WITH BUTYL ROPE MEETING THE REQUIREMENTS OF ASTM C990.
6. MANHOLES SHALL BE CONSTRUCTED WITH FLOW CHANNEL WALLS THAT ARE FORMER, AT A MINIMUM, TO THE SPRINGLINE OF THE PIPE.
7. ALL NEW MANHOLES SHALL HAVE AN APPROVED FLEXIBLE, WATERTIGHT SEALS WHERE PIPES PASS THROUGH MANHOLE WALLS.
8. WHEREVER AN EXISTING MANHOLE IS TO BE TAPPED, THE STRUCTURE SHALL BE CORED AND A KOR-N-SEAL BUTYL UTILIZED FOR THE PIPE CONNECTION.
9. ALL MANHOLES SHALL BE PROVIDED WITH WATERTIGHT COVERS. COVERS TO BE EJCO 1040 TYPE 'A' SOLID COVER.
10. A MAXIMUM OF 12" OF GRADE ADJUSTMENT RINGS SHALL BE USED TO ADJUST THE FRAME ELEVATION. BUTYL ROPE SHALL BE USED BETWEEN EACH ADJUSTMENT RING.
11. SANITARY SEWER LATERALS SHALL HAVE A MINIMUM SLOPE OF 1.0%.
12. CLEANOUTS SHALL BE INSTALLED EVERY 100', AT ALL BENDS AND STUBS.
13. PUBLIC SANITARY SEWER SHALL BE CENTERED WITHIN A XX FOOT WIDE SANITARY SEWER EASEMENT.

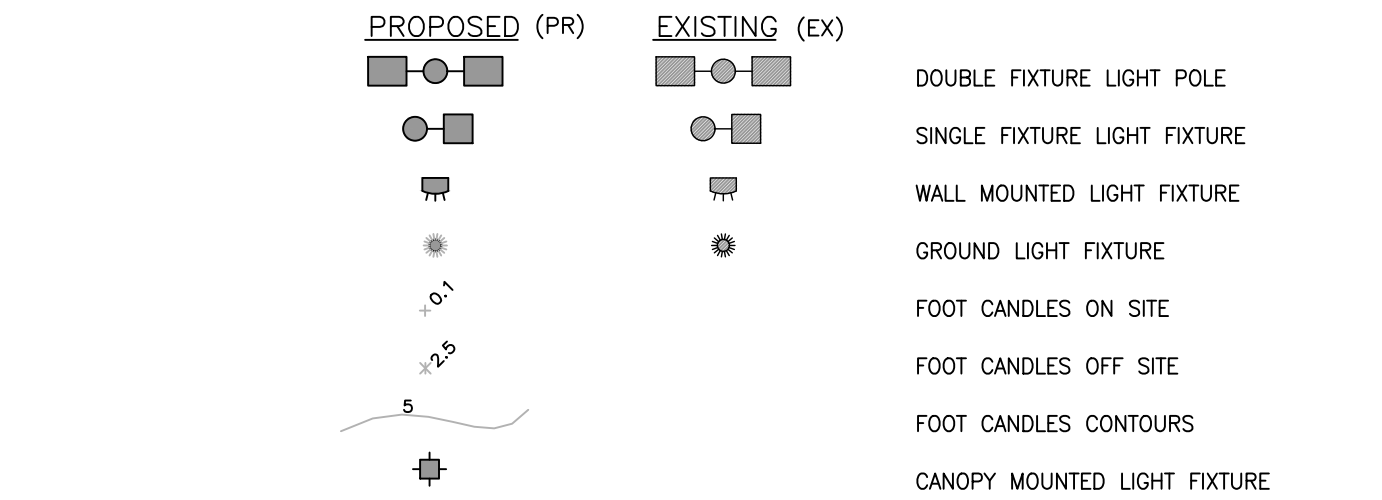
GENERAL WATERMAIN NOTES

1. WATERMAIN PIPE MATERIALS SHALL BE AS FOLLOWS:
1.1. D.I.P. CL52 (WATERMAIN)
1.2. TYPE 'K' COPPER (WATER LATERAL - MAIN TO CURB STOP)
1.3. HDPE DR-9 (WATER LATERAL - CURB STOP TO STUB)
2. WATERMAIN FITTINGS SHALL BE OF DUCTILE IRON WITH CEMENT MORTAR LUBING AND MECHANICAL JOINTS CONFORMING TO AWWA C110.
3. WATERMAINS SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA C651. BAG-T-3 SAMPLES SHALL BE TAKEN IN ACCORDANCE WITH R235.11110 OF THE ADMINISTRATIVE RULES PROMULGATED UNDER MICHIGAN SAFE DRINKING WATER ACT, 1976 PA 399, AS AMENDED.
4. ALLOWABLE LEAKAGE OR HYDROSTATIC PRESSURE TESTING SHALL BE IN ACCORDANCE WITH AWWA C600 AND C605.
5. MAXIMUM DEFLECTION AT PIPE JOINTS SHALL BE IN ACCORDANCE WITH PIPE MANUFACTURERS CURRENT RECOMMENDATIONS AND AWWA SPECIFICATIONS.
6. A FULL STICK OF PIPE SHALL BE LAID CENTERED AT A PIPE CROSSING IN ORDER TO MAINTAIN THE MAXIMUM SEPARATION OF WATERMAIN JOINT TO THE CROSSING PIPE.
7. WATERMAIN SHALL BE INSTALLED WITH A MINIMUM OF 5.5' OF COVER FROM FINISHED GRADE TO TOP OF PIPE AND NO MORE THAN 8' OF COVER, UNLESS SPECIAL CONDITIONS WARRANT.
8. WATERMAIN VALVES SHALL BE IRON BODY RESILIENT WEDGE GATE VALVES, NON-RISING STEMS, COUNTERCLOCKWISE OPEN, AWWA C509.
9. FIRE HYDRANTS SHALL BE INSTALLED WITH AN AUXILIARY VALVE WITH CAST IRON VALVE BOX. THE HYDRANT PUMPER HOSE CONNECTION SHALL FACE THE ROADWAY.
10. THE BREAKAWAY FLANGE AND ALL BELOW GRADE FITTINGS SHALL HAVE STAINLESS STEEL NUTS AND BOLTS.
11. PUBLIC WATERMAIN SHALL BE CENTERED WITHIN A XX FOOT WIDE WATERMAIN EASEMENT.

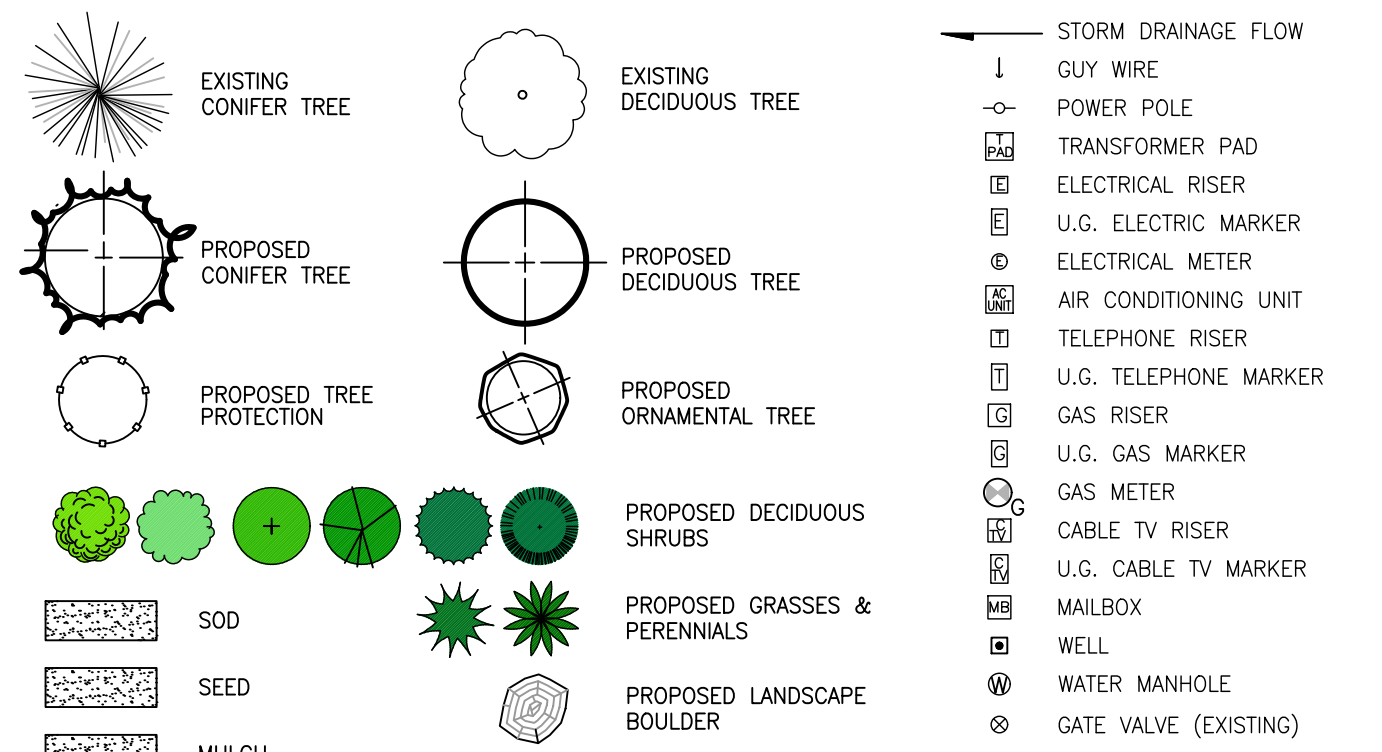
LINES & HATCHES LEGEND



LIGHTING LEGEND



LANDSCAPE LEGEND



ABBREVIATIONS

FFE	FINISHED FLOOR ELEVATION
BFE	BASEMENT FLOOR ELEVATION
GFE	GARAGE FLOOR ELEVATION
FG	FINISHED GRADE
T/A	TOP OF ASPHALT
T/C	TOP OF CONCRETE/CURB
T/W	TOP OF WALK
T/P	TOP OF PIPE
B/P	BOTTOM OF PIPE
F/L	FLOW LINE
RIM	RIM ELEVATION (AT FLOW LINE)
INV	INVERT ELEVATION
MH	MANHOLE
CB	CATCH BASIN
RY	REAR YARD
YD	YARD DRAIN
RD	ROOF DRAIN
FES	FLARED END SECTION
CMP	CORRUGATED METAL PIPE
CPP	CORRUGATED PLASTIC PIPE
RCP	REINFORCED CONCRETE PIPE
HDPE	HIGH DENSITY POLYETHYLENE
PVC	POLYVINYL CHLORIDE
DIP	DUCTILE IRON PIPE
GV	GATE VALVE
GW	GATE VALVE IN WELL
GVB	GATE VALVE IN BOX
HYD	HYDRANT
FDC	FIRE DEPARTMENT CONNECTION
UP	UTILITY POLE
NFV	NOT FIELD VERIFIED
TR	TO BE REMOVED
L	LIBER
P	FACE
L.C.R.	LIVINGSTON COUNTY RECORDS (M&R) MEASURED AND RECORD L.O.B./POINT OF BEGINNING

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OF THESE UTILITIES. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS PRIOR TO THE LOCATION OR DEPTH OFFERS SUBMITTANCE FROM THESE PLANS.

BEFORE ANY MISS DIG CALL MISS DIG 1-800-487-1771 or visit our website www.missdig.com

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Engineers Planners Landscape Architects

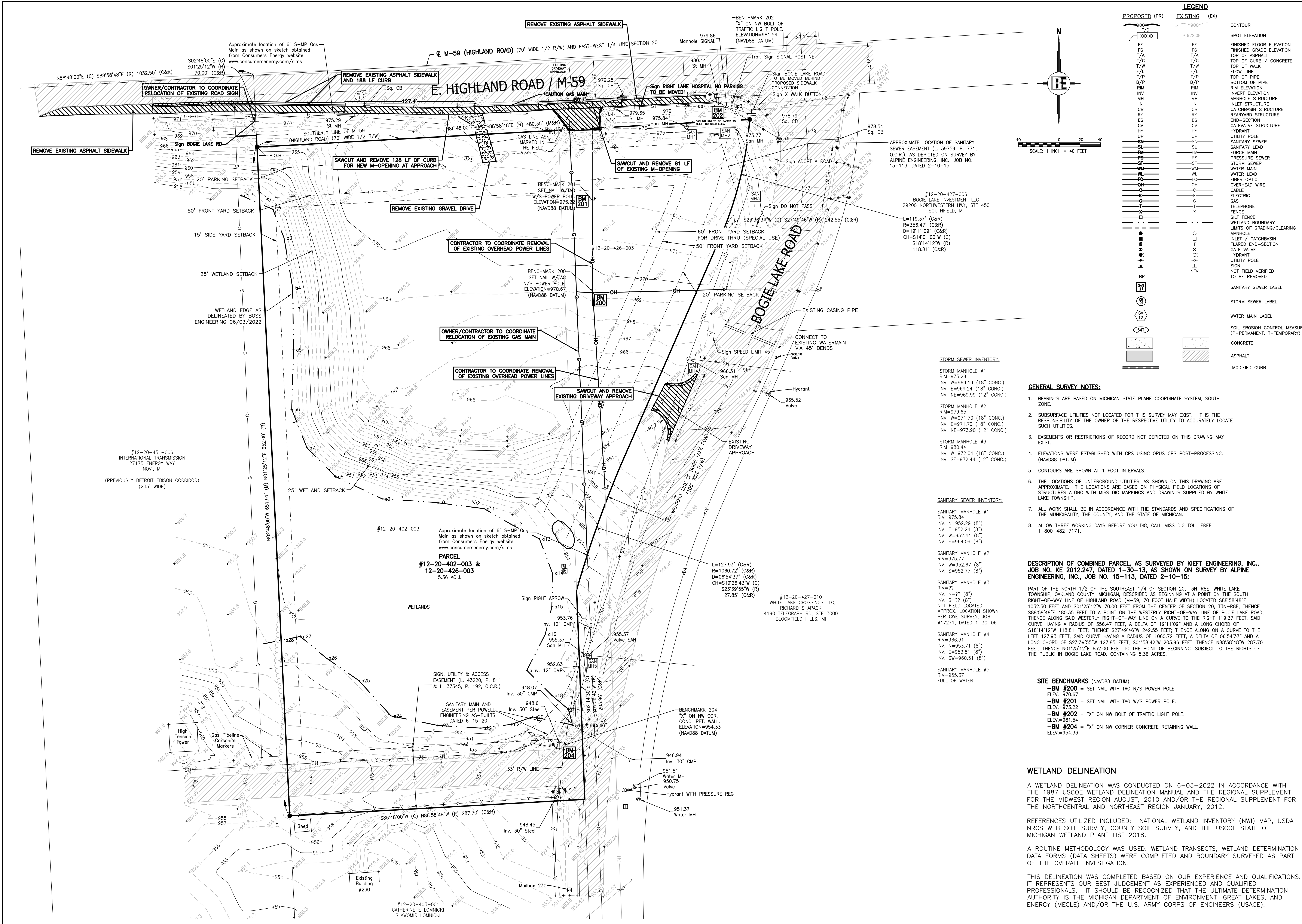
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

GATEWAY CROSSING

GATEWAY CROSSING, LLC
600 NORTH OGD WOODWARD, SUITE 101
BIRMINGHAM, MI 48009
248-433-7000

PROJECT					
PREPARED FOR					
DATE	2/28/24	1/12/24	09/09/23		
REVISION PER TWP P&P REV #3					
REVISION PER TWP P&P REV #2					
REVISION PER TWP P&P REV #1					
DATE					
DESIGNED BY:	ST				
DRAWN BY:	JS				
CHECKED BY:	BL				
SCALE:	NO SCALE				
JOB NO:	22-029-1				
DATE:	01/05/23				
SHEET NO.	2				

BEBOSS
Engineering



LEGEND

PROPOSED (PR)	EXISTING (EX)	DESCRIPTION
900	900	CONTOUR
T/C	XXXXXX	SPOT ELEVATION
FF	FF	FINISHED FLOOR ELEVATION
T/A	T/A	TOP OF ASPHALT
T/W	T/W	TOP OF CURB / CONCRETE
F/L	F/L	TOP OF WALK
T/P	T/P	FLOW LINE
B/P	B/P	TOP OF PIPE
RM	RM	INVERT ELEVATION
INV	INV	MANHOLE STRUCTURE
MH	MH	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REAR-YARD STRUCTURE
ES	ES	END-SECTION
OV	OV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
PS	PS	SANITARY LEAD
ST	ST	PRESSURE SEWER
WM	WM	STORM SEWER
WL	WL	WATER MAIN
CO	CO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
G	G	GAS
T	T	TELEPHONE
F	F	FENCE
S	S	SILT FENCE
W	W	WETLAND BOUNDARY
L	L	LIMITS OF GRADING/CLEARING
IN	IN	INLET / CATCHBASIN
FL	FL	FLARED END-SECTION
GV	GV	GATE VALVE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER LABEL
PS	PS	STORM SEWER LABEL
WM	WM	WATER MAIN LABEL
CO	CO	SOIL EROSION CONTROL MEASURE
OH	OH	(P=PERMANENT, T=TEMPORARY)
C	C	CONCRETE
A	A	ASPHALT
M	M	MODIFIED CURB

STORM SEWER INVENTORY:

SANITARY MANHOLE #1
 RM=975.29
 INV. W=969.19 (18" CONC.)
 INV. E=969.24 (18" CONC.)
 INV. NE=969.99 (12" CONC.)

SANITARY MANHOLE #2
 RM=979.65
 INV. W=971.70 (18" CONC.)
 INV. E=971.70 (18" CONC.)
 INV. NE=973.90 (12" CONC.)

SANITARY MANHOLE #3
 RM=980.44
 INV. W=972.04 (18" CONC.)
 INV. S=972.44 (12" CONC.)

SANITARY SEWER INVENTORY:

SANITARY MANHOLE #1
 RM=975.84
 INV. N=952.29 (8")
 INV. E=952.24 (8")
 INV. W=952.44 (8")
 INV. S=964.09 (8")

SANITARY MANHOLE #2
 RM=975.77
 INV. W=952.67 (8")
 INV. S=952.77 (8")

SANITARY MANHOLE #3
 RM=?
 INV. N=? (8")
 INV. S=? (8")
 NOT FIELD LOCATED!
 APPROX. LOCATION SHOWN
 PER GWE SURVEY, JOB
 #17271, DATED 1-30-06

SANITARY MANHOLE #4
 RM=966.31
 INV. N=953.71 (8")
 INV. E=953.81 (8")
 INV. SW=960.51 (8")

SANITARY MANHOLE #5
 RM=955.37
 FULL OF WATER

GENERAL SURVEY NOTES:

- BEARINGS ARE BASED ON MICHIGAN STATE PLANE COORDINATE SYSTEM, SOUTH ZONE.
- SUBSURFACE UTILITIES NOT LOCATED FOR THIS SURVEY MAY EXIST. IT IS THE RESPONSIBILITY OF THE OWNER OF THE RESPECTIVE UTILITY TO ACCURATELY LOCATE SUCH UTILITIES.
- EASEMENTS OR RESTRICTIONS OF RECORD NOT DEPICTED ON THIS DRAWING MAY EXIST.
- ELEVATIONS WERE ESTABLISHED WITH GPS USING OPUS GPS POST-PROCESSING. (NAVD88 DATUM)
- CONTOURS ARE SHOWN AT 1 FOOT INTERVALS.
- THE LOCATIONS OF UNDERGROUND UTILITIES, AS SHOWN ON THIS DRAWING ARE APPROXIMATE. THE LOCATIONS ARE BASED ON PHYSICAL FIELD LOCATIONS OF STRUCTURES ALONG WITH MISS DIG MARKINGS AND DRAWINGS SUPPLIED BY WHITE LAKE TOWNSHIP.
- ALL WORK SHALL BE IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF THE MUNICIPALITY, THE COUNTY, AND THE STATE OF MICHIGAN.
- ALLOW THREE WORKING DAYS BEFORE YOU DIG, CALL MISS DIG TOLL FREE 1-800-482-7171.

DESCRIPTION OF COMBINED PARCEL, AS SURVEYED BY KIEFT ENGINEERING, INC., JOB NO. KE 2012.247, DATED 1-30-13, AS SHOWN ON SURVEY BY ALPINE ENGINEERING, INC., JOB NO. 15-113, DATED 2-10-15:

PART OF THE NORTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 20, T3N-R8E, WHITE LAKE TOWNSHIP, OAKLAND COUNTY, MICHIGAN, DESCRIBED AS BEGINNING AT A POINT ON THE SOUTH RIGHT-OF-WAY LINE OF HIGHLAND ROAD (M-59, 70 FOOT HALF WIDTH) LOCATED 588'58"48"E 1032.50 FEET AND S01°25'12"W 70.00 FEET FROM THE CENTER OF SECTION 20, T3N-R8E; THENCE S88°58'48"E 480.35 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF BOGIE LAKE ROAD; THENCE ALONG SAID WESTERLY RIGHT-OF-WAY LINE ON A CURVE TO THE RIGHT 119.37 FEET, SAID CURVE HAVING A RADIUS OF 356.47 FEET, A DELTA OF 19°11'09" AND A LONG CHORD OF S18°14'12"W 118.81 FEET; THENCE S27°49'46"W 242.55 FEET; THENCE ALONG ON A CURVE TO THE LEFT 127.93 FEET, SAID CURVE HAVING A RADIUS OF 1060.72 FEET, A DELTA OF 06°54'37" AND A LONG CHORD OF S23°39'55"W 127.85 FEET; S01°58'42"W 203.96 FEET; THENCE N88°58'48"W 287.70 FEET; THENCE N01°25'12"E 652.00 FEET TO THE POINT OF BEGINNING, SUBJECT TO THE RIGHTS OF THE PUBLIC IN BOGIE LAKE ROAD, CONTAINING 5.36 ACRES.

SITE BENCHMARKS (NAVD88 DATUM):

- BM #200 = SET NAIL WITH TAG N/S POWER POLE. ELEV.=970.67
- BM #201 = SET NAIL WITH TAG W/S POWER POLE. ELEV.=973.22
- BM #202 = "X" ON NW BOLT OF TRAFFIC LIGHT POLE. ELEV.=981.54
- BM #204 = "X" ON NW CORNER CONCRETE RETAINING WALL. ELEV.=954.33

WETLAND DELINEATION

A WETLAND DELINEATION WAS CONDUCTED ON 6-03-2022 IN ACCORDANCE WITH THE 1987 USCOE WETLAND DELINEATION MANUAL AND THE REGIONAL SUPPLEMENT FOR THE MIDWEST REGION AUGUST, 2010 AND/OR THE REGIONAL SUPPLEMENT FOR THE NORTH-CENTRAL AND NORTHEAST REGION JANUARY, 2012.

REFERENCES UTILIZED INCLUDED: NATIONAL WETLAND INVENTORY (NWI) MAP, USDA NRCS WEB SOIL SURVEY, COUNTY SOIL SURVEY, AND THE USCOE STATE OF MICHIGAN WETLAND PLANT LIST 2018.

A ROUTINE METHODOLOGY WAS USED. WETLAND TRANSECTS, WETLAND DETERMINATION DATA FORMS (DATA SHEETS) WERE COMPLETED AND BOUNDARY SURVEYED AS PART OF THE OVERALL INVESTIGATION.

THIS DELINEATION WAS COMPLETED BASED ON OUR EXPERIENCE AND QUALIFICATIONS. IT REPRESENTS OUR BEST JUDGEMENT AS EXPERIENCED AND QUALIFIED PROFESSIONALS. IT SHOULD BE RECOGNIZED THAT THE ULTIMATE DETERMINATION AUTHORITY IS THE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY (MEGLE) AND/OR THE U.S. ARMY CORPS OF ENGINEERS (USACE).

BOSS Engineering
 Engineers Surveyors Planners Landscape Architects
 3121 E. GRAND RIVER AVE.
 HOWELL, MI. 48843
 517.546.4836 FAX 517.548.1670

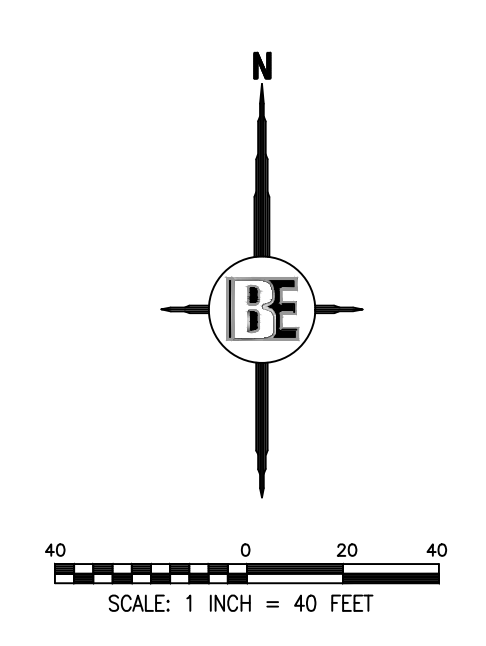
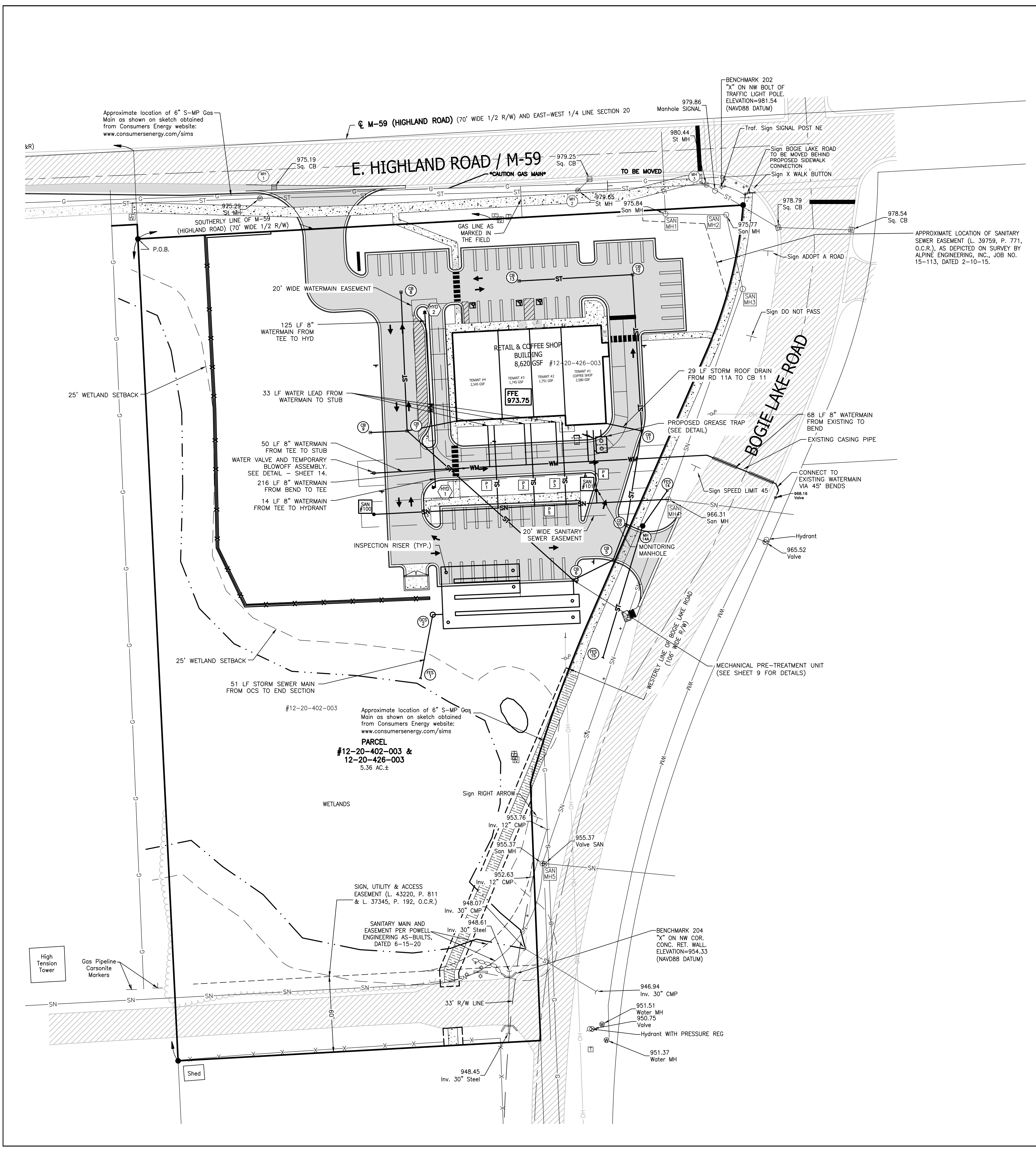
PROJECT: GATEWAY CROSSING

PREPARED FOR: GATEWAY CROSSING, LLC
 600 NORTH OLD WOODWARD, SUITE 101
 BIRMINGHAM, MI 48009
 248-937-7000

TITLE: EXISTING CONDITIONS & DEMOLITION PLAN

NO	BY	DATE	REVISION PER
1	RR/CZ	09/09/23	REV #1
2	RR/CZ	1/12/24	REV #2
3	RR/CZ	2/28/24	REV #3

DESIGNED BY: AEB
 DRAWN BY: RR/CZ
 CHECKED BY:
 SCALE: 1" = 40'
 JOB NO: 22-029-1
 DATE: 01/05/23
 SHEET NO: 3



SITE BENCHMARKS (NAVD88 DATUM):
 -BM #200 = SET NAIL WITH TAG N/S POWER POLE. ELEV.=970.57
 -BM #201 = SET NAIL WITH TAG W/S POWER POLE. ELEV.=973.22
 -BM #202 = "X" ON NW BOLT OF TRAFFIC LIGHT POLE. ELEV.=981.54
 -BM #204 = "X" ON NW CORNER CONCRETE RETAINING WALL. ELEV.=954.33

LEGEND		
PROPOSED (PR)	EXISTING (EX)	
000 T/C	+922.08	CONTOUR
FF	FF	SPOT ELEVATION
T/A	T/A	FINISHED FLOOR ELEVATION
T/C	T/C	FINISHED GRADE ELEVATION
T/W	T/W	TOP OF ASPHALT
F/L	F/L	TOP OF CURB / CONCRETE
T/P	T/P	TOP OF WALK
B/P	B/P	FLOW LINE
RM	RM	TOP OF PIPE
INV	INV	IRIM ELEVATION
MH	MH	INVERT ELEVATION
IN	IN	MANHOLE STRUCTURE
CB	CB	INLET STRUCTURE
RY	RY	CATCHBASIN STRUCTURE
ES	ES	REARWARD STRUCTURE
OV	OV	END-SECTION
HY	HY	GATEVALVE STRUCTURE
UP	UP	HYDRANT
SN	SN	UTILITY POLE
SL	SL	SANITARY SEWER
FM	FM	SANITARY LEAD
PS	PS	FORCE MAIN
ST	ST	PRESSURE SEWER
WM	WM	STORM SEWER
WL	WL	WATER MAIN
FO	FO	WATER LEAD
OH	OH	FIBER OPTIC
C	C	OVERHEAD WIRE
E	E	CABLE
T	T	ELECTRIC
L	L	GAS
F	F	TELEPHONE
+	+	FENCE
□	□	SILT FENCE
○	○	WETLAND BOUNDARY
○	○	LIMITS OF GRADING/CLEARING
○	○	MANHOLE
○	○	INLET / CATCHBASIN
○	○	FLARED END-SECTION
○	○	GATE VALVE
○	○	HYDRANT
○	○	UTILITY POLE
○	○	SN
○	○	NOT FIELD VERIFIED
○	○	TO BE REMOVED
○	○	SANITARY SEWER LABEL
○	○	STORM SEWER LABEL
○	○	WATER MAIN LABEL
○	○	SOIL EROSION CONTROL MEASURE (P=PERMANENT, T=TEMPORARY)
○	○	CONCRETE
○	○	ASPHALT
○	○	MODIFIED CURB

PIPE #	SIZE	LENGTH	MATERIAL	DESCRIPTION
1	6"	66 LF	SDR 23.5	SANITARY LEAD FROM RETAIL #1 TO SANITARY MAIN
2	6"	66 LF	SDR 23.5	SANITARY LEAD FROM RETAIL #2 TO SANITARY MAIN
3	6"	66 LF	SDR 23.5	SANITARY LEAD FROM RETAIL #3 TO SANITARY MAIN
4	6"	56 LF	SDR 23.5	SANITARY LEAD FROM COFFEE SHOP TO SANITARY MAIN
5	8"	222 LF	SDR 26	SANITARY MAIN FROM MH #100 TO EX MH 4

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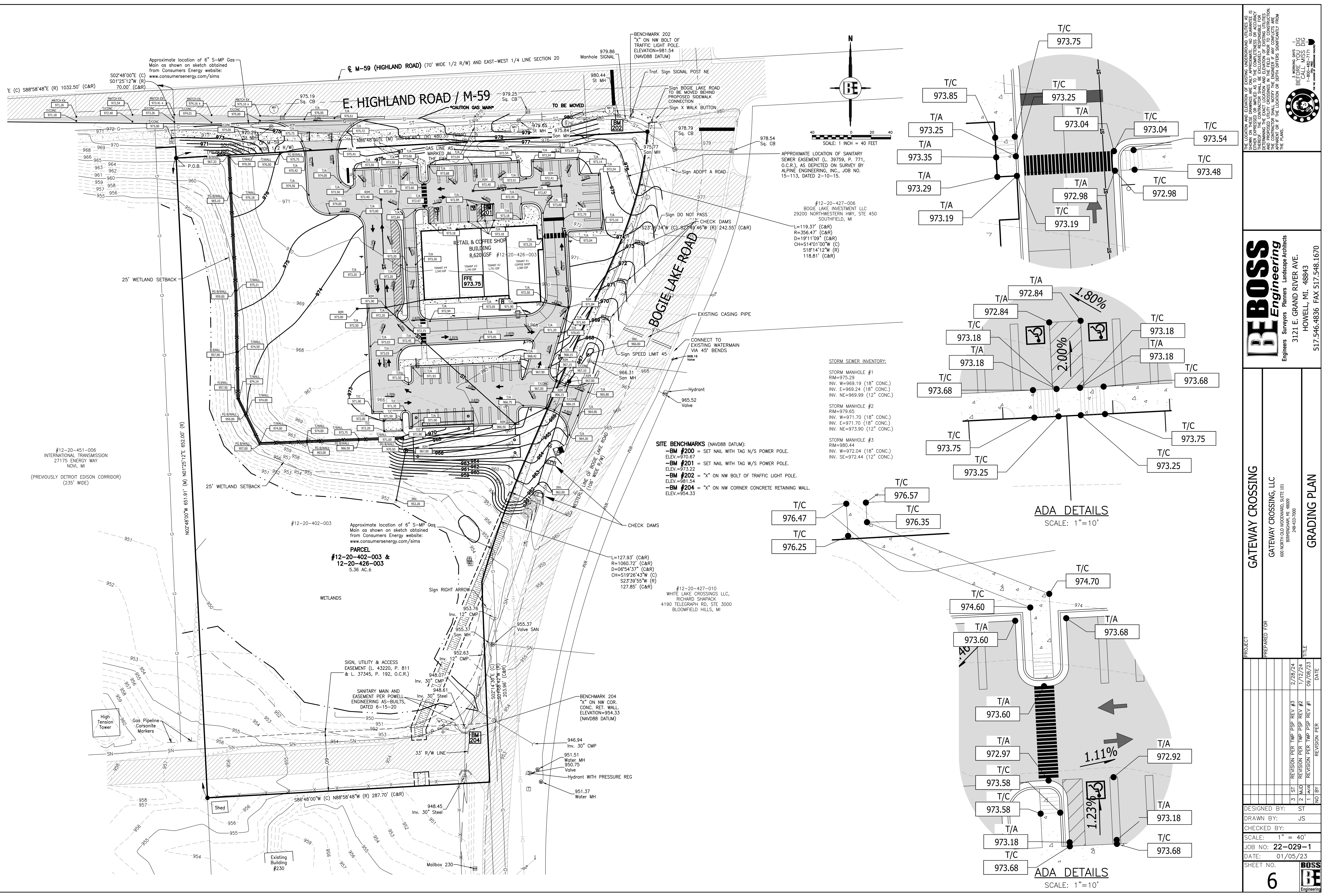
GATEWAY CROSSING
 PREPARED FOR: GATEWAY CROSSING, LLC
 600 NORTH OLD WOODWARD, SUITE 101
 BIRMINGHAM, MI. 38209
 248-433-7000

UTILITY PLAN

PROJECT	DATE
GATEWAY CROSSING	01/05/23

NO	BY	DATE	REVISION PER
1	JAV	09/09/23	REVISION PER
2	MJD	1/12/24	REVISION PER
3	ST	2/28/24	REVISION PER TWP PSP REV #3

DESIGNED BY: ST
 DRAWN BY: JS
 CHECKED BY:
 SCALE: 1" = 40'
 JOB NO: 22-029-1
 DATE: 01/05/23
 SHEET NO. **5**



THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OF THESE UTILITIES. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS BEFORE THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

BE ENGINEERING
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

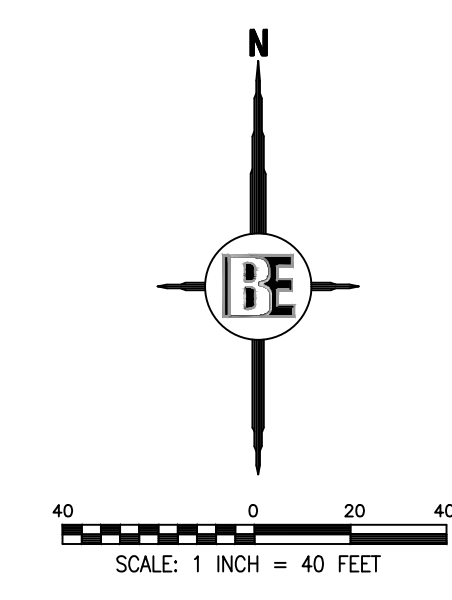
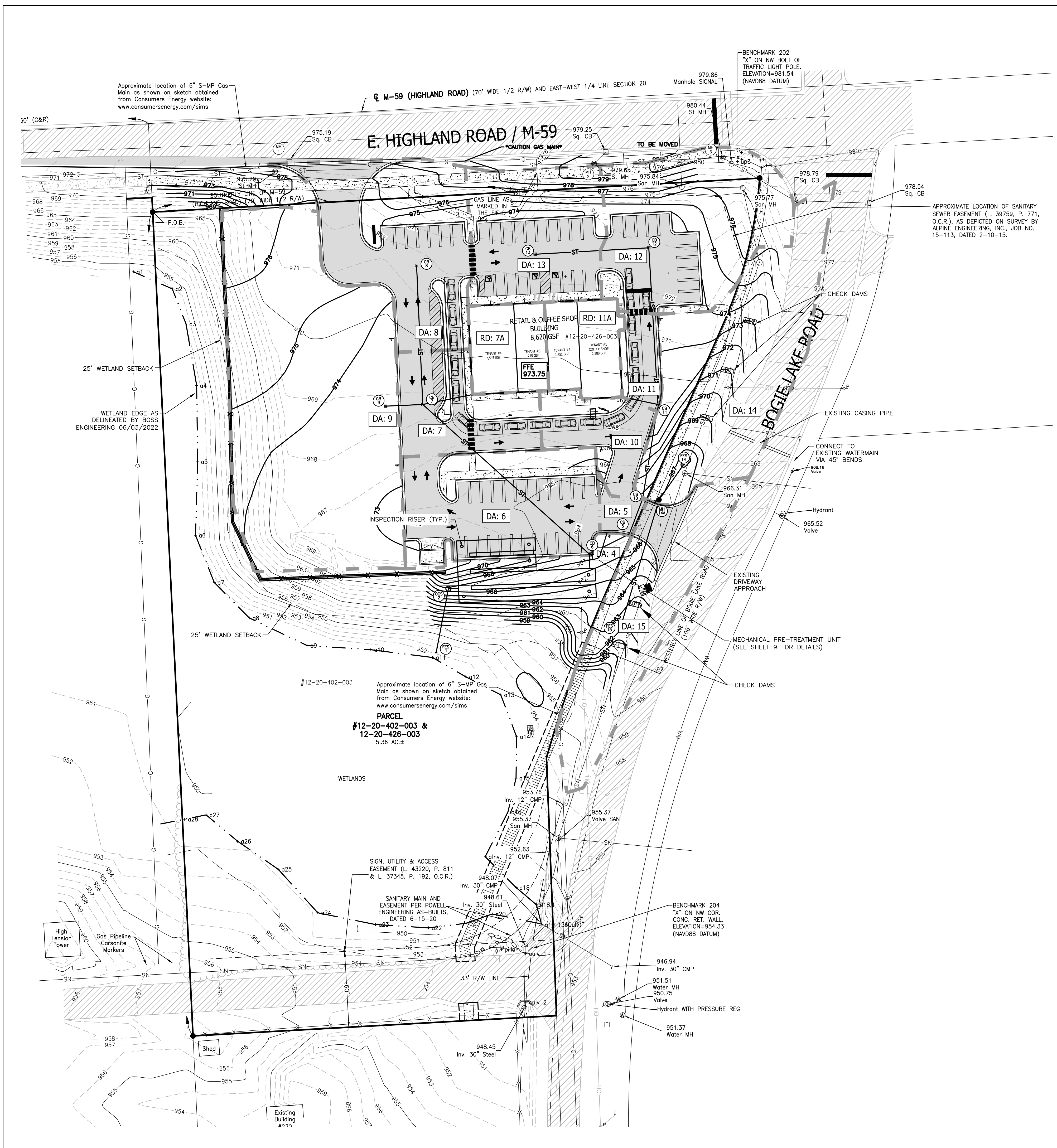
GATEWAY CROSSING

GATEWAY CROSSING, LLC
600 NORTH OGDONWOODWARD, SUITE 101
BIRMINGHAM, MI 38209
248-433-7000

GRADING PLAN

NO.	DATE	REVISION PER	BY
1	09/09/23	REVISION PER	NO BY
2	1/12/24	REVISION PER TWP PSP REV #1	ST
3	2/28/24	REVISION PER TWP PSP REV #2	ST

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE: 1" = 40'
JOB NO: 22-029-1
DATE: 01/05/23
SHEET NO. 6



LEGEND

PROPOSED (PR)	EXISTING (EX)	CONTOUR
FF	FF	FINISHED FLOOR ELEVATION
F/C	F/C	FINISHED GRADE ELEVATION
T/A	T/A	TOP OF ASPHALT
T/C	T/C	TOP OF CURB / CONCRETE
T/W	T/W	TOP OF WALK
F/L	F/L	FLOW LINE
T/P	T/P	TOP OF PIPE
B/P	B/P	BOTTOM OF PIPE
RM	RM	RIM ELEVATION
INV	INV	INVERT ELEVATION
MH	MH	MANHOLE STRUCTURE
IN	IN	INLET STRUCTURE
CB	CB	CATCHBASIN STRUCTURE
RY	RY	REARWARD STRUCTURE
ES	ES	END-SECTION
OV	OV	GATEVALVE STRUCTURE
HY	HY	HYDRANT
UP	UP	UTILITY POLE
SN	SN	SANITARY SEWER
SL	SL	SANITARY LEAD
FM	FM	FORCE MAIN
PS	PS	PRESSURE SEWER
ST	ST	STORM SEWER
WM	WM	WATER MAIN
WL	WL	WATER LEAD
FO	FO	FIBER OPTIC
OH	OH	OVERHEAD WIRE
C	C	CABLE
E	E	ELECTRIC
T	T	TELEPHONE
S	S	SIGN
F	F	FENCE
W	W	WETLAND BOUNDARY
L	L	LIMITS OF GRADING/CLEARING
M	M	MANHOLE
I	I	INLET / CATCHBASIN
G	G	FLARED END-SECTION
V	V	GATE VALVE
H	H	HYDRANT
U	U	UTILITY POLE
N	N	NOT FIELD VERIFIED
R	R	TO BE REMOVED
S	S	SANITARY SEWER LABEL
ST	ST	STORM SEWER LABEL
W	W	WATER MAIN LABEL
SE	SE	SOIL EROSION CONTROL MEASURE (P=PERMANENT, T=TEMPORARY)
C	C	CONCRETE
A	A	ASPHALT
M	M	MODIFIED CURB

STORMWATER NARRATIVE

EXISTING: THE EXISTING SITE IS A HEAVILY SLOPED SITE WITH A WETLAND IN THE SOUTHWEST. THE SITE DRAINS TO THE SOUTH EITHER TO THE WETLAND OR TO A SERIES OF CULVERTS IN THE SOUTH WITH AN ULTIMATE OUTLET TO THE SOUTHEAST THROUGH A 30" CMP PIPE.

PROPOSED: THE PROPOSED SITE WILL UTILIZE A SERIES OF STORM STRUCTURES IN ORDER TO BRING ALL RUNOFF TO THE PROPOSED BASIN IN THE SOUTH. THE STORM SYSTEM WILL UTILIZE A MECHANICAL PRETREATMENT STRUCTURE IN REPLACEMENT OF A FOREBAY AND DRAIN INTO THE BASIN WHERE IT WILL EVENTUALLY OUTLET TO THE WETLAND TO THE SOUTH. THE SYSTEM IS SET TO HANDLE THE RUNOFF EXPECTED FROM DEVELOPMENT OF THE WEST SIDE OF THE SITE AS WELL AS THE ENTIRE SITE PROPOSED. ONCE AGAIN, THE WETLAND WILL ULTIMATELY OUTLET VIA A 24" RCP PIPE TO THE SOUTHEAST.

DRAINAGE AREA TABLE

DRAINAGE AREA TABLE (TRIBUTARY TO BASIN)				
DRAINAGE AREA	TOTAL AREA (AC)	IMP. AREA (AC)	C VALUE	A ² C
2	0.00	-	0.00	0.00
4	0.00	-	0.00	0.00
5	0.02	0.02	0.89	0.02
6	0.30	0.25	0.84	0.25
7	0.17	0.15	0.85	0.14
7A	0.10	0.10	0.95	0.09
8	0.34	0.27	0.78	0.27
9	0.79	0.79	0.95	0.75
10	0.11	0.08	0.73	0.08
11	0.05	0.05	0.86	0.05
11A	0.10	0.10	0.95	0.09
12	0.38	0.17	0.54	0.20
13	0.24	0.16	0.70	0.17
TOTAL	2.60	2.13	0.81	2.12

DRAINAGE AREA TABLE (NOT-TRIBUTARY TO BASIN)				
DRAINAGE AREA	TOTAL AREA (AC)	IMP. AREA (AC)	C VALUE	A ² C
14	0.44	0.18	0.51	0.22
15	0.29	0.15	0.59	0.17

FUTURE DRAINAGE AREA REPRESENTS ESTIMATED AREA TO BE CONSTRUCTED ON THE WEST SIDE OF THE SITE FLOWING THROUGH CB 9

SEE SHEET 9 FOR BASIN DETAIL & STORM DRAINAGE CALCULATIONS

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GATEWAY CROSSING
 GATEWAY CROSSING, LLC
 600 NORTH OLD WOODWARD, SUITE 101
 BIRMINGHAM, MI. 48099
 248-437-7000

DRAINAGE PLAN

NO.	DATE	REVISION PER	BY
1	09/09/23	REVISION PER	NO BY
2	1/12/24	REVISION PER TWP PSP REV #1	NO BY
3	2/28/24	REVISION PER TWP PSP REV #2	NO BY

DESIGNED BY: ST
 DRAWN BY: JS
 CHECKED BY:
 SCALE: 1" = 40'
 JOB NO: 22-029-1
 DATE: 01/05/23
 SHEET NO. **7**

OAKLAND COUNTY DETENTION BASIN CALCULATIONS

AREA (ACRES)	IMPERVIOUS FACTOR	IMPERVIOUS	ACRE
2.13	0.95	2.02	
0.00	0.7	0.00	
0.47	0.2	0.09	

COMPOUND C: 0.81
TOTAL DRAINAGE AREA: 2.60 ACRES

WATER QUALITY VOLUME V_{WQ}
 $V_{WQ} = 3.630(CI/A) = 7645 \text{ FT}^3$
 $V_{WQ} = 0.15(V_{WQ}) = 1147 \text{ FT}^3$

WATER QUALITY RATE FOR MECHANICAL STRUCTURE
 $T_c = \text{MAX TIME OF CONCENTRATION} = 10.70 \text{ MIN}$
 $Q_{WQ} = (CI/A)30.2(T_c + 9.17)^{0.81} = 4.55 \text{ CFS}$

CHANNEL PROTECTION VOLUME CONTROL - REQUIRED
 $V_{CPR} = 4.719(CI/A) = 9936 \text{ FT}^3$

CHANNEL PROTECTION VOLUME CONTROL - PROVIDED
 In-Situ Infiltration rate = 0 IN/HR
 Are upstream infiltration BMP's provided? NO
 Basin Footprint Infiltration Area Required = NO INFILTRATION FT^2
 $V_{CPR} = 0 \text{ FT}^3$

CHANNEL PROTECTION RATE CONTROL (EXTENDED DETENTION VOLUME)
 $V_{ED} = 6.897(CI/A) = 14525 \text{ FT}^3$

EXTENDED DETENTION OUTLET RATE
 $Q_{ED} = V_{ED}/(48hr) = 0.084 \text{ CFS}$
 $H_{ED} = V_{ED}/4.666(H)^2 = 1.0 \text{ 1" HOLES}$
 $H = 8.09 \text{ FT}$
 $ELEV_{ED} = 957.70$

100-YEAR ALLOWABLE OUTLET RATE
 $Q_{DRAIN} = \text{Restricted Drain Rate} = 0.2 \text{ CFS/ACRE}$
 $Q_{DR} = 1.1055 - 0.206LN(A) = 0.909 \text{ CFS/ACRE}$
 $Q_{100P} = (\text{LESSER OF } Q_{DRAIN} \text{ \& } Q_{DR}) \times A = 0.520 \text{ CFS}$

100-YEAR DETENTION VOLUME
 $V_{100R} = 16995(CI/A) = 39962 \text{ FT}^3$
 $Q_{100R} = (CI/A)83.3(T_c + 9.17)^{0.81} = 12.56 \text{ CFS}$
 $R = 0.206 - 15 \ln(Q_{100R}/Q_{100R}) = 0.0836$
 $V_{100D} = V_{100R} \times R_{V_{100D}} = 27334 \text{ FT}^3$
 Is $V_{100D} \geq V_{ED}$? YES
 $V_{100D} = 27,334 \text{ FT}^3$

BASIN STORAGE PROVIDED
 LUNAL FOOTAGE OF PIPE IN SYSTEM: 352 LFT

ELEVATION	INCREMENTAL VOLUME / LFT	VOLUME (FT ³)	TOTAL VOLUME (FT ³)	DHWL
962.5	4.0875	1,439	27,646	
961.5	7.0949	2,497	26,207	
960.5	8.6345	3,039	23,710	
959.5	9.5201	3,351	20,670	
958.5	9.9329	3,496	17,316	
957.5	9.9329	3,496	13,823	
956.5	9.5201	3,351	10,327	
955.5	8.6345	3,039	6,976	
954.5	7.0949	2,497	3,966	
953.5	4.0875	1,439	1,439	
952.5	0.0000			

PROVIDED FOOTPRINT OF BASIN BOTTOM AREA 4108 FT²

OUTLET CONTROL STRUCTURE
 $Q_{ED} \text{ ACTUAL} = 1 \text{ (1" HOLES)}$
 $A_{ED} = 0.0055 \text{ FT}^2$
 $Q_{ED} \text{ ACTUAL} = (A_{ED})0.62 \times (2 \times 32.2 \times h)^{0.5} = 0.077 \text{ CFS}$

ORIFICE OUTLET
 $Q_{100} \text{ ACTUAL} = Q_{100P} - Q_{ED} \text{ ACTUAL} = 0.443 \text{ CFS}$
 $A_{100} = Q_{100} \text{ ACTUAL} / (0.62 \times (2 \times 32.2 \times (ELEV_{DHWL} - ELEV_{ED}))^{0.5}) = 0.053 \text{ FT}^2$
 AREA OF 2 INCH DIAMETER ORIFICE = 0.022 FT²
 $\# \text{ ORIFICES} = A_{100} / 0.022 = 2.0 \text{ ORIFICES}$

OVERFLOW SPILLWAY DESIGN
 Design Flow Rate: $Q_{OCH} = 12.56 \text{ CFS}$
 Depth of Spillway: $F_{WELL} = 9 \text{ INCHES}$
 Width of Spillway: $L_{WELL} = Q_{OCH} / 3.33 \times F_{WELL}^{3/4} = 5.8 \text{ FT}$

BASIN DESIGN SUMMARY
 BASIN SIZE REQUIRED = 27,334 FT³
 BASIN SIZE PROVIDED = 27,646 FT³

ORIFICE DESIGN SUMMARY

ELEVATION	# OF HOLES	DIAMETER OF HOLES
952.50	1.0	1-INCH
957.70	2.0	2-INCH

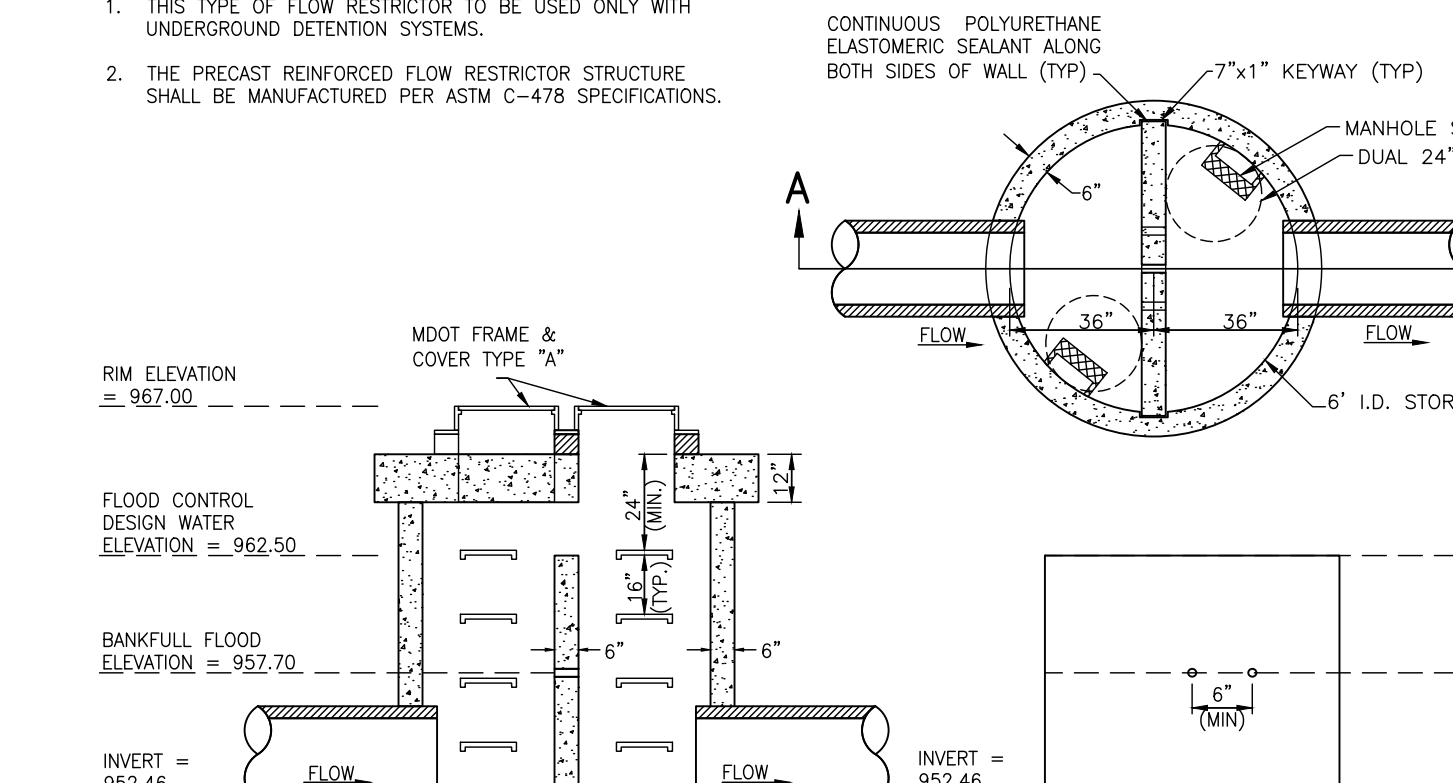
OVERFLOW SPILLWAY SUMMARY
 WIDTH OF OVERFLOW SPILLWAY = 6 FT

100-YEAR PIPE FLOW CALCULATION FOR OCS

BASIN	TO	DRAIN AREA	ACRES	RUNOFF COEFF	EQUIV. AREA A * C	INTEN-SITY I	TIME OF CONC. T _c	ADDL. RUNOFF Q	RUNOFF Q (CFS)	PIPE LENGTH (LF)	PIPE DIA (IN)	VELOCITY FLOWING FULL (FPS)	HYDRAULIC GRADIENT SLOPE %	ACTUAL SLOPE USED	MANNING COEFFICIENT	MANNING FLOW CAPACITY	MANNING'S VELOCITY (FT/SEC)	TIME (MIN)	HG ELEV UPPER END	HG ELEV LOWER END	RIM ELEV UPPER END	RIM ELEV LOWER END	INVERT UPPER END	INVERT LOWER END	DROP DISTANCE (FT)
8	7	8	0.34	0.78	0.27	4.38	15.00		1.18	110	15	2.61	0.24%	0.50%	0.013	4.58	3.73	0.49	967.17	966.62	972.40	971.90	968.17	965.62	3.00
7	6	7	0.17	0.85	0.14	4.32	15.49	3.68	5.47	177	18	4.70	0.62%	0.75%	0.013	9.12	5.16	0.57	963.62	962.29	971.90	966.50	962.42	961.09	3.00
6	BASIN	6	0.30	0.84	0.25	4.26	16.06	2.65	9.19	6	18	6.93	1.35%	1.50%	0.013	12.90	7.30	0.01	959.29	959.20	966.50	-	958.09	958.00	
9	7	9	0.79	0.95	0.75	4.38	15.00		3.27	29	15	3.55	0.45%	0.50%	0.013	4.58	3.73	0.13	967.31	967.17	973.00	971.90	966.31	966.17	
7A	7	7A	0.10	0.95	0.09	4.38	15.00		0.40	40	8	2.69	0.60%	1.00%	0.013	1.21	3.47	0.19	967.57	967.17	973.75	971.90	967.03	966.63	
13	12	13	0.24	0.70	0.17	4.38	15.00		0.74	90	12	1.99	0.19%	0.32%	0.013	2.02	2.57	0.58	965.46	965.17	972.40	972.41	964.66	964.37	
12	11	12	0.38	0.54	0.20	4.31	15.58		1.62	124	12	2.55	0.31%	0.32%	0.013	2.02	2.57	0.80	965.17	964.78	972.41	971.84	964.37	963.98	
11	10	11	0.05	0.86	0.05	4.23	16.39	0.42	2.23	76	15	4.89	0.86%	1.75%	0.013	8.57	6.98	0.18	960.78	959.45	971.84	967.15	959.78	958.45	
10	5	10	0.11	0.73	0.08	4.21	16.57		2.56	30	15	2.56	0.24%	0.24%	0.013	3.17	2.59	0.19	959.45	959.37	967.15	966.15	958.45	958.37	
5	6	5	0.02	0.89	0.02	4.19	16.76		2.65	35	15	2.84	0.29%	0.24%	0.013	3.17	2.59	0.23	965.56	965.46	966.15	966.50	958.37	958.29	
11A	11	11A	0.10	0.95	0.09	4.38	15.00		0.42	29	8	2.69	0.60%	1.00%	0.013	1.21	3.47	0.14	965.46	965.17	973.75	971.84	964.93	964.64	
14	14A	14	0.44	0.51	0.22	4.38	15.00		0.98	34	12	5.79	1.62%	4.50%	0.013	7.58	9.65	0.06	966.80	965.27	-	967.00	966.00	964.47	1.92
14A	13	-	-	-	-	-	15.06		0.98	109	12	2.57	0.32%	0.50%	0.013	2.53	3.22	0.56	963.35	962.80	967.00	972.40	962.55	962.00	
BASIN	2	ALL	-	-	-	-	15.00	9.19	9.19	8	24	4.22	0.34%	0.40%	0.013	14.35	4.57	0.03	954.10	954.06	-	967.00	952.50	952.46	
2	1	-	-	-	-	-	15.03		9.19	51	24	4.22	0.34%	0.40%	0.013	14.35	4.57	0.19	954.06	953.86	967.00	-	952.46	952.26	

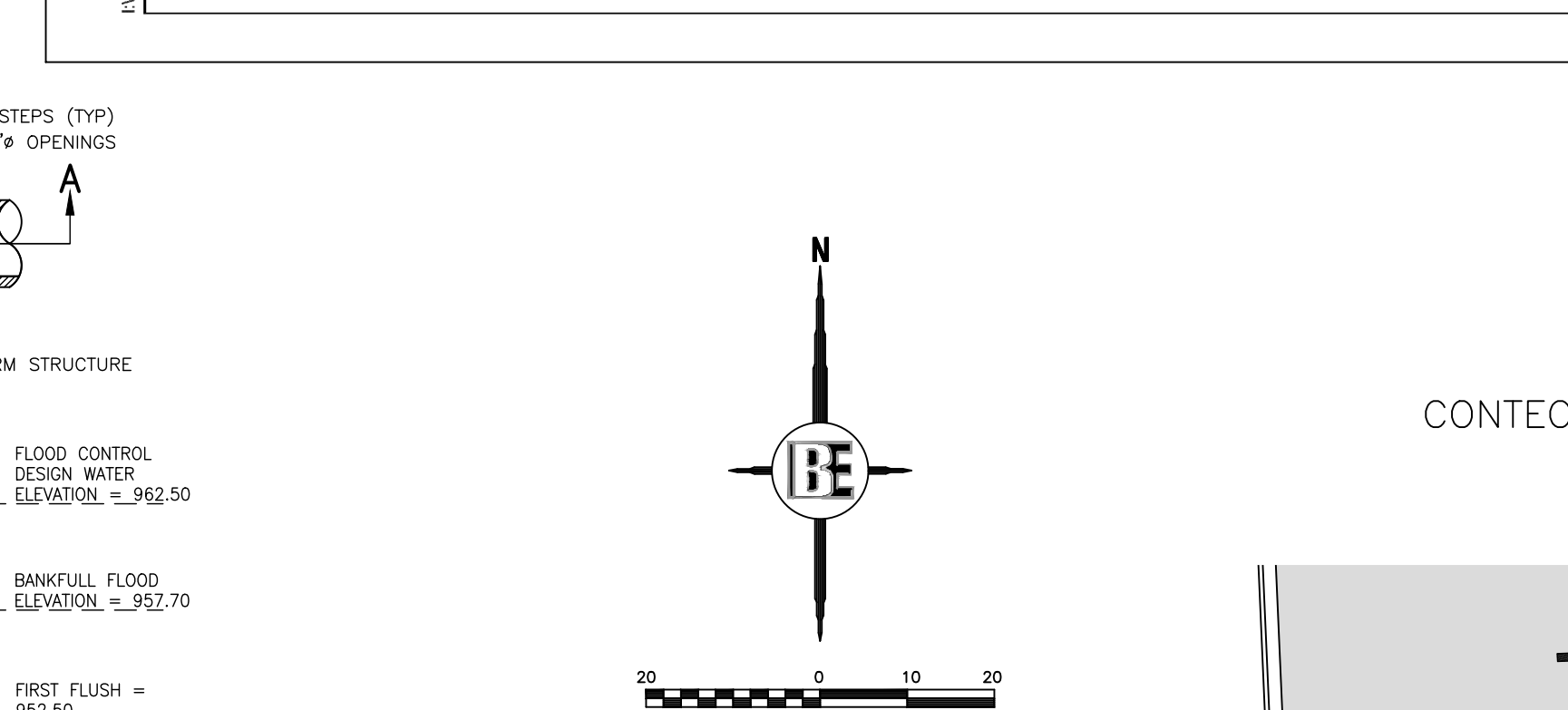
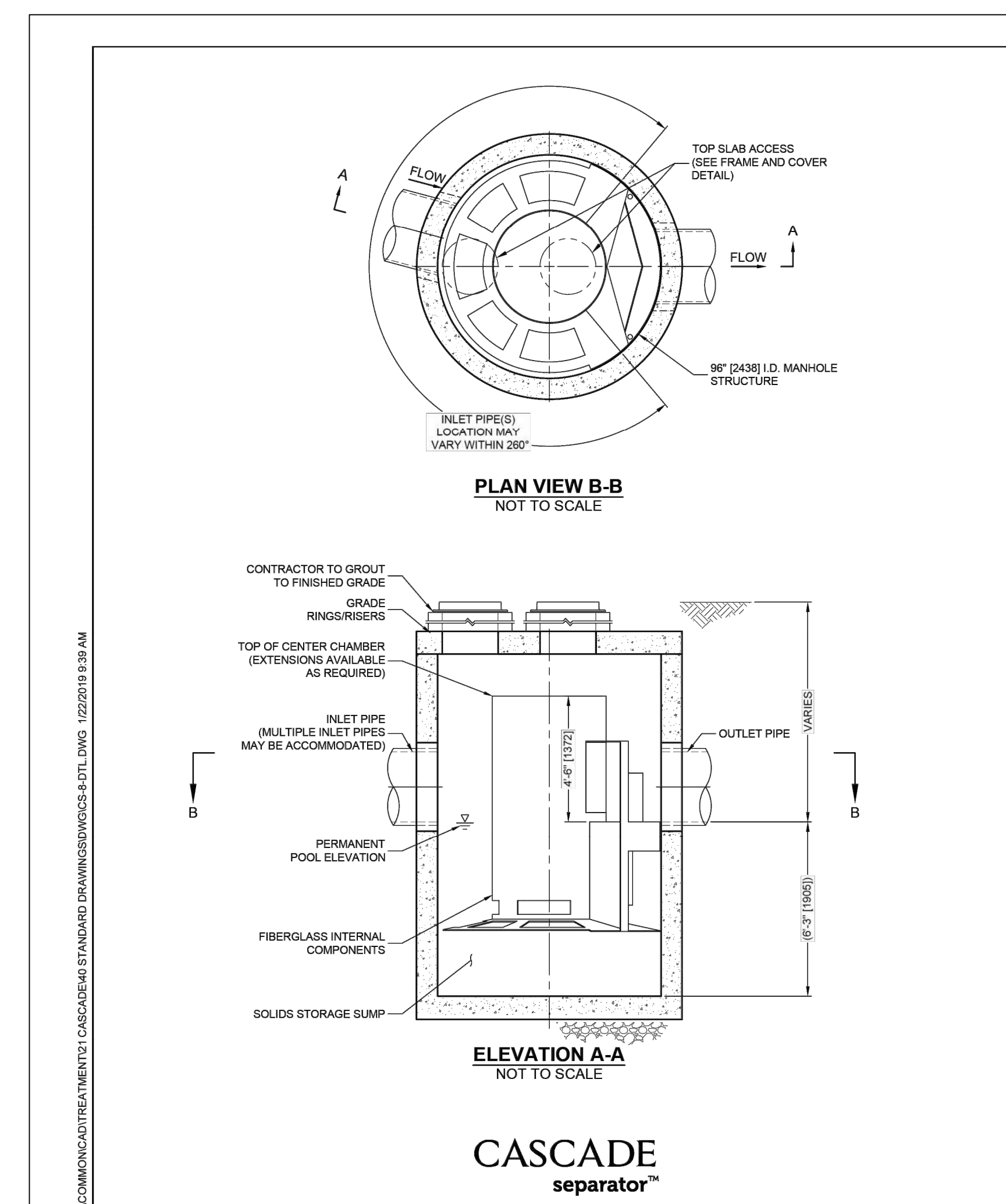
100-YEAR PIPE FLOW CALCULATION FOR OCS

BASIN	TO	DRAIN AREA	ACRES	RUNOFF COEFF	EQUIV. AREA A * C	INTEN-SITY I	TIME OF CONC. T _c	ADDL. RUNOFF Q	RUNOFF Q (CFS)	PIPE LENGTH (LF)	PIPE DIA (IN)	VELOCITY FLOWING FULL (FPS)	HYDRAULIC GRADIENT SLOPE %	ACTUAL SLOPE USED	MANNING COEFFICIENT	MANNING FLOW CAPACITY	MANNING'S VELOCITY (FT/SEC)	TIME (MIN)	HG ELEV UPPER END	HG ELEV LOWER END	RIM ELEV UPPER END	RIM ELEV LOWER END	INVERT UPPER END	INVERT LOWER END	DROP DISTANCE (FT)
BASIN	2	ALL	2.60	0.81	2.117188	5.96	16.76		12.62	8	24	5.48	0.58%	0.40%	0.013	14.35	4.57	0.03	954.20	954.15	-	967.00	952.50	952.46	
2	1	-	-	-	-	-	16.79		12.62	51	24	5.48	0.58%	0.40%	0.013	14.35	4.57	0.19	954.15	953.86	967.00	-	952.46	952.26	



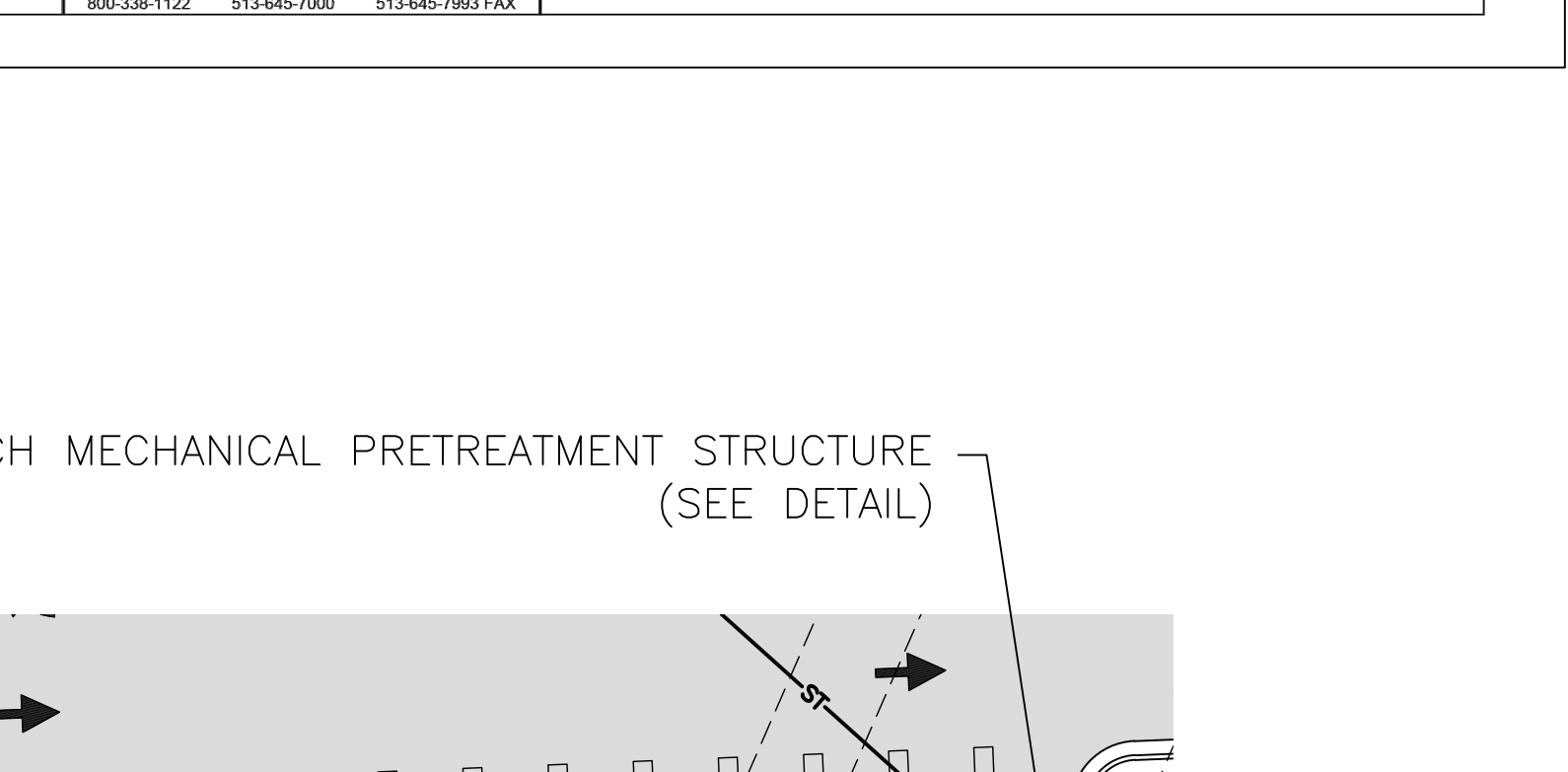
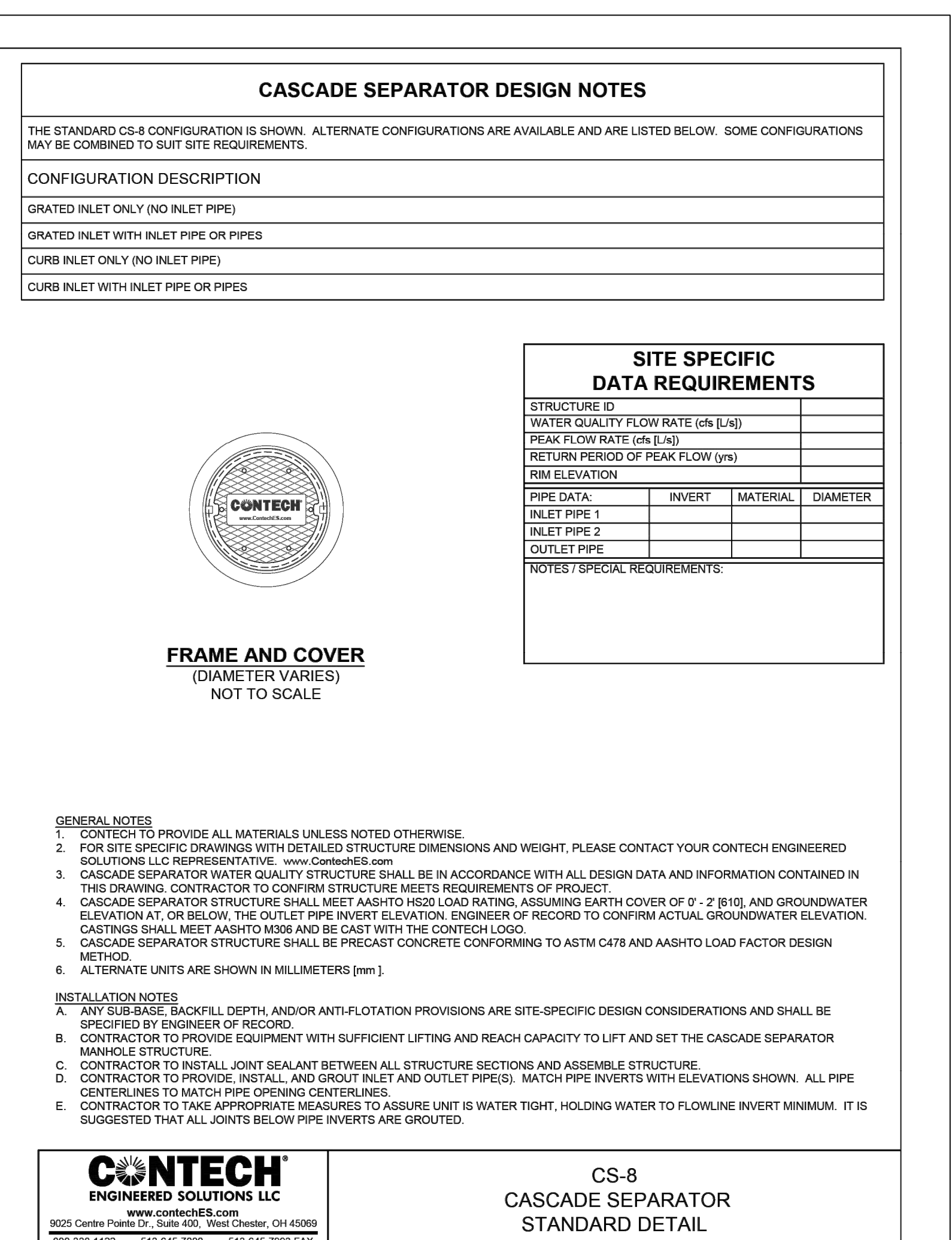
FLOW RESTRICTOR WALL (FRONT VIEW)

1. NUMBER AND SIZE OF ORIFICE HOLES AS PER DESIGN. MINIMUM 1" DIAMETER.



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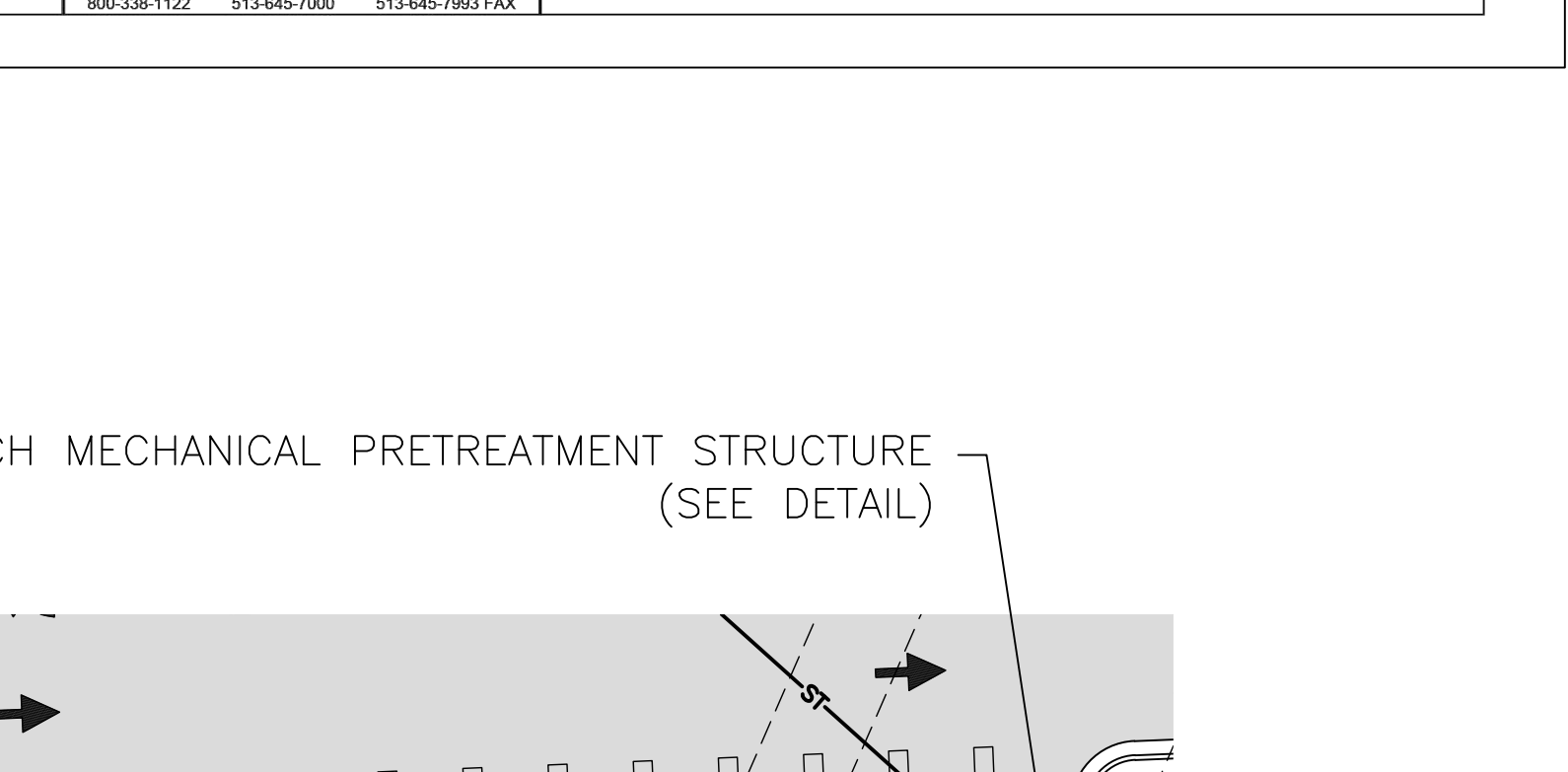
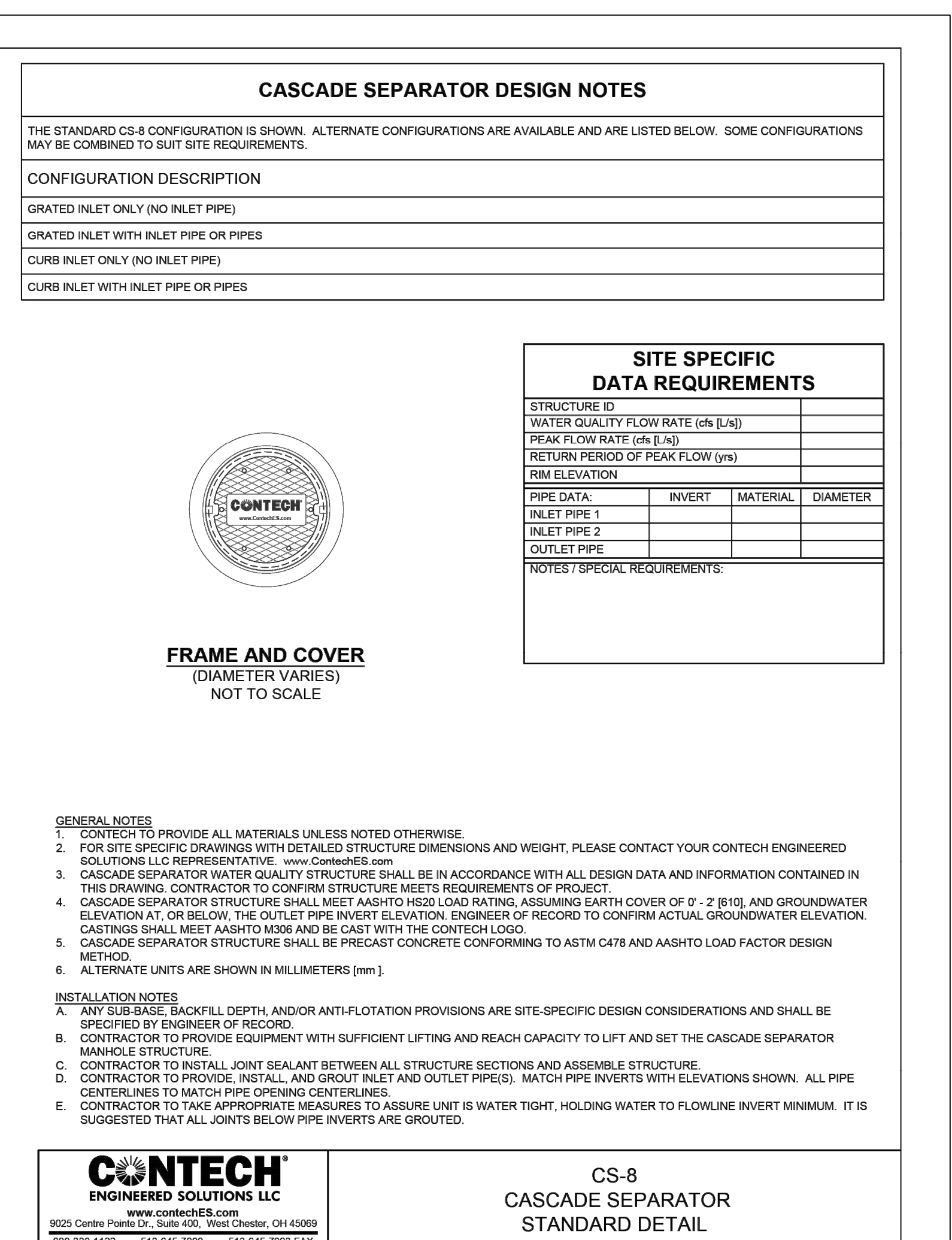
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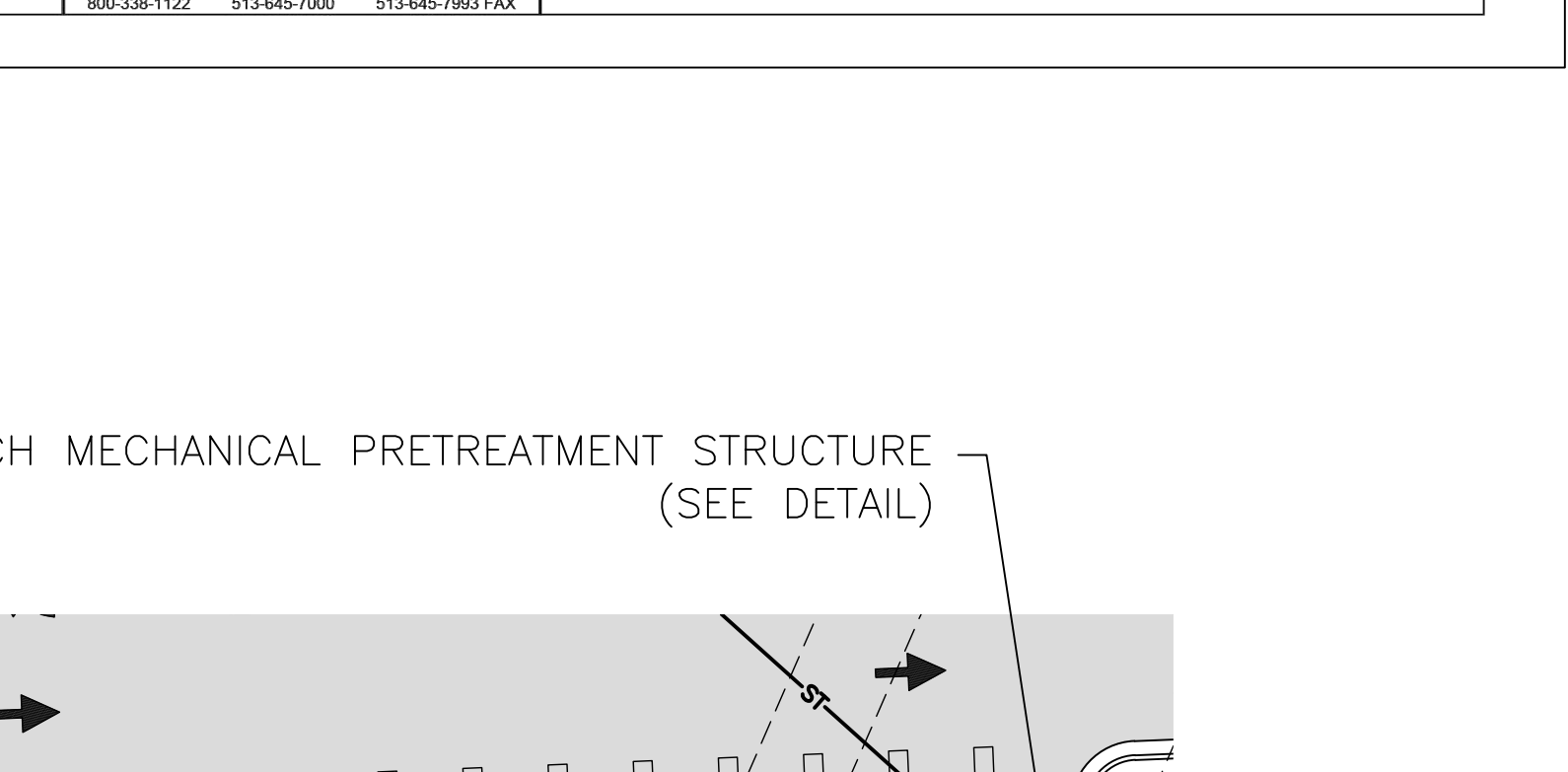
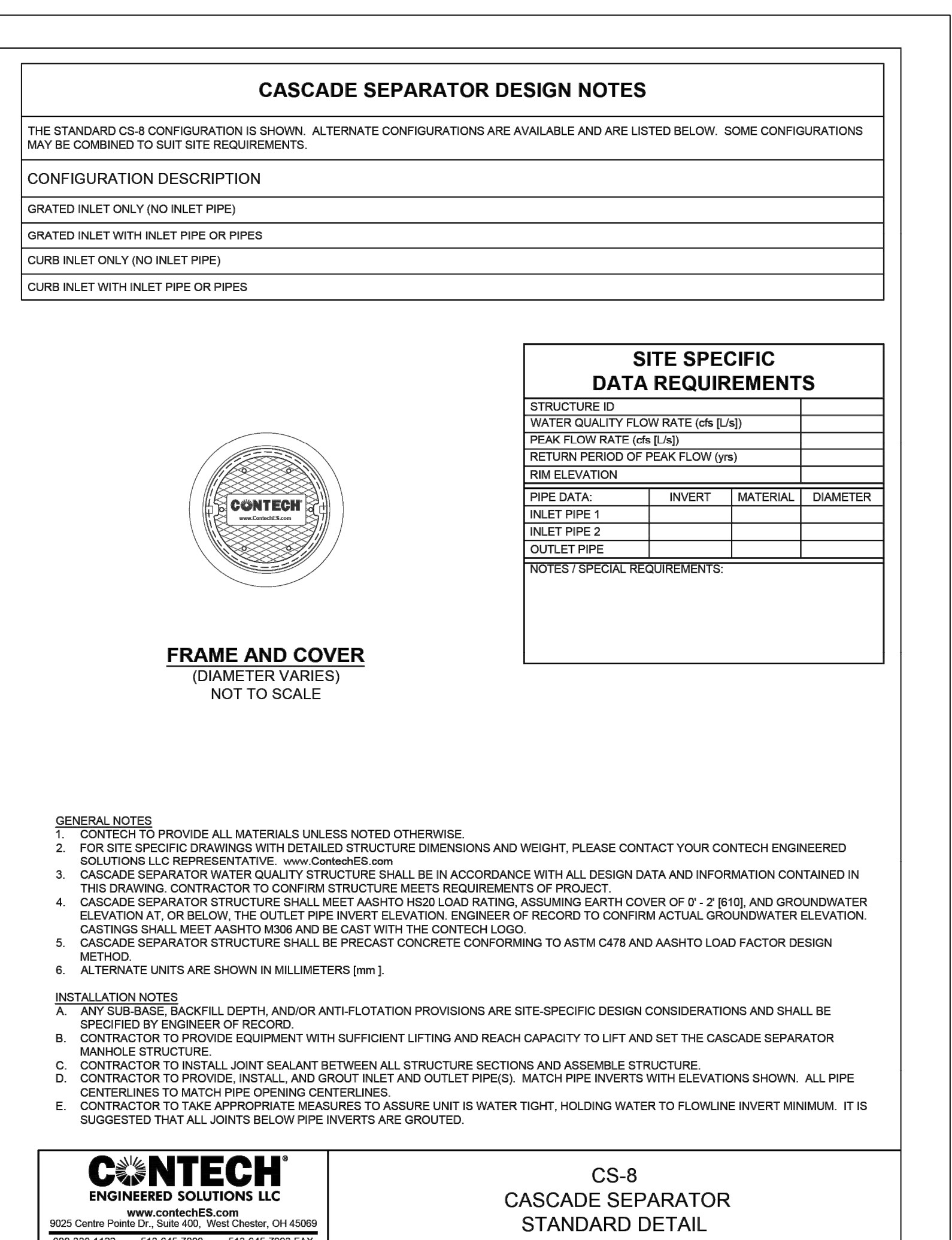
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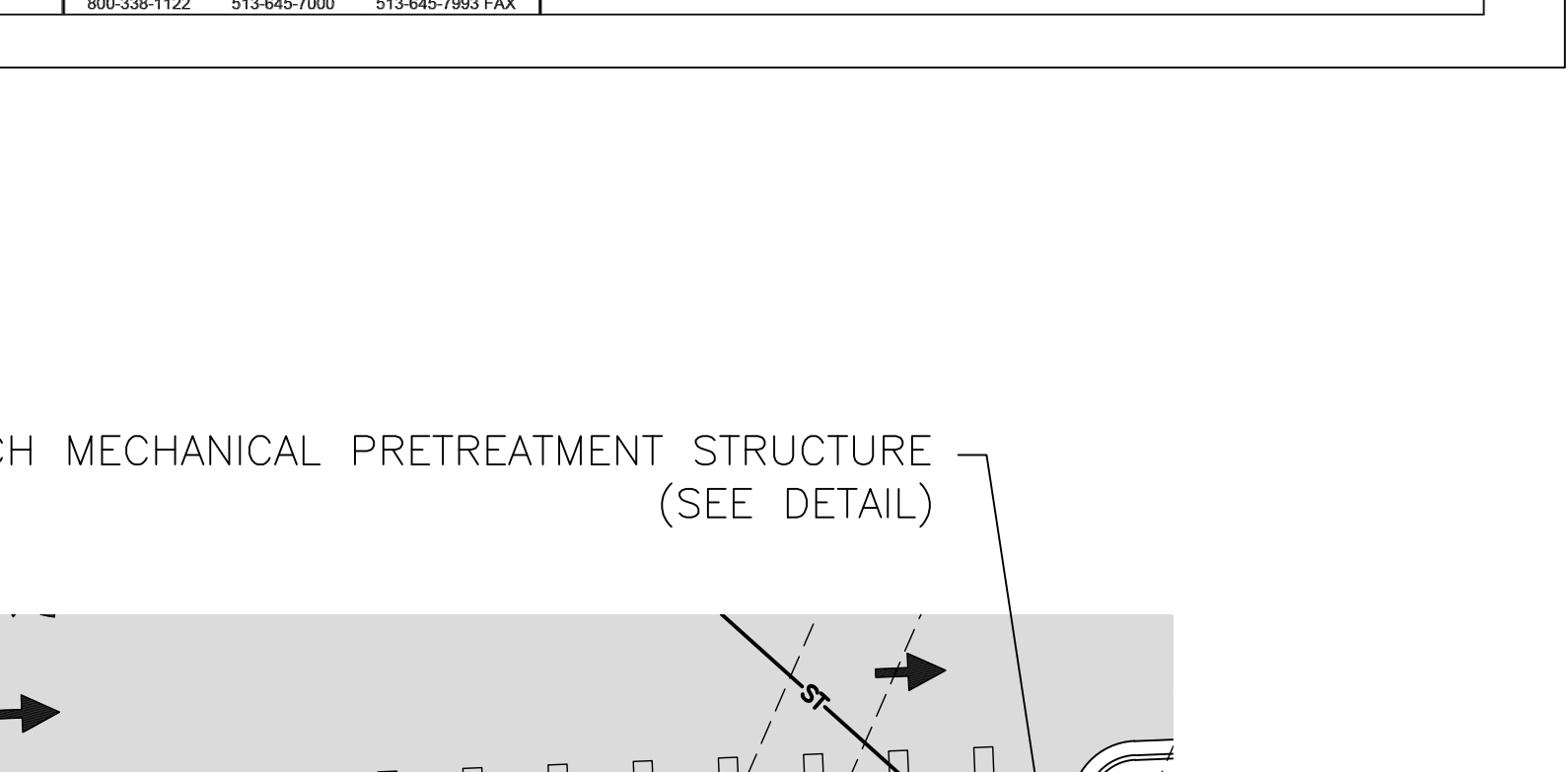
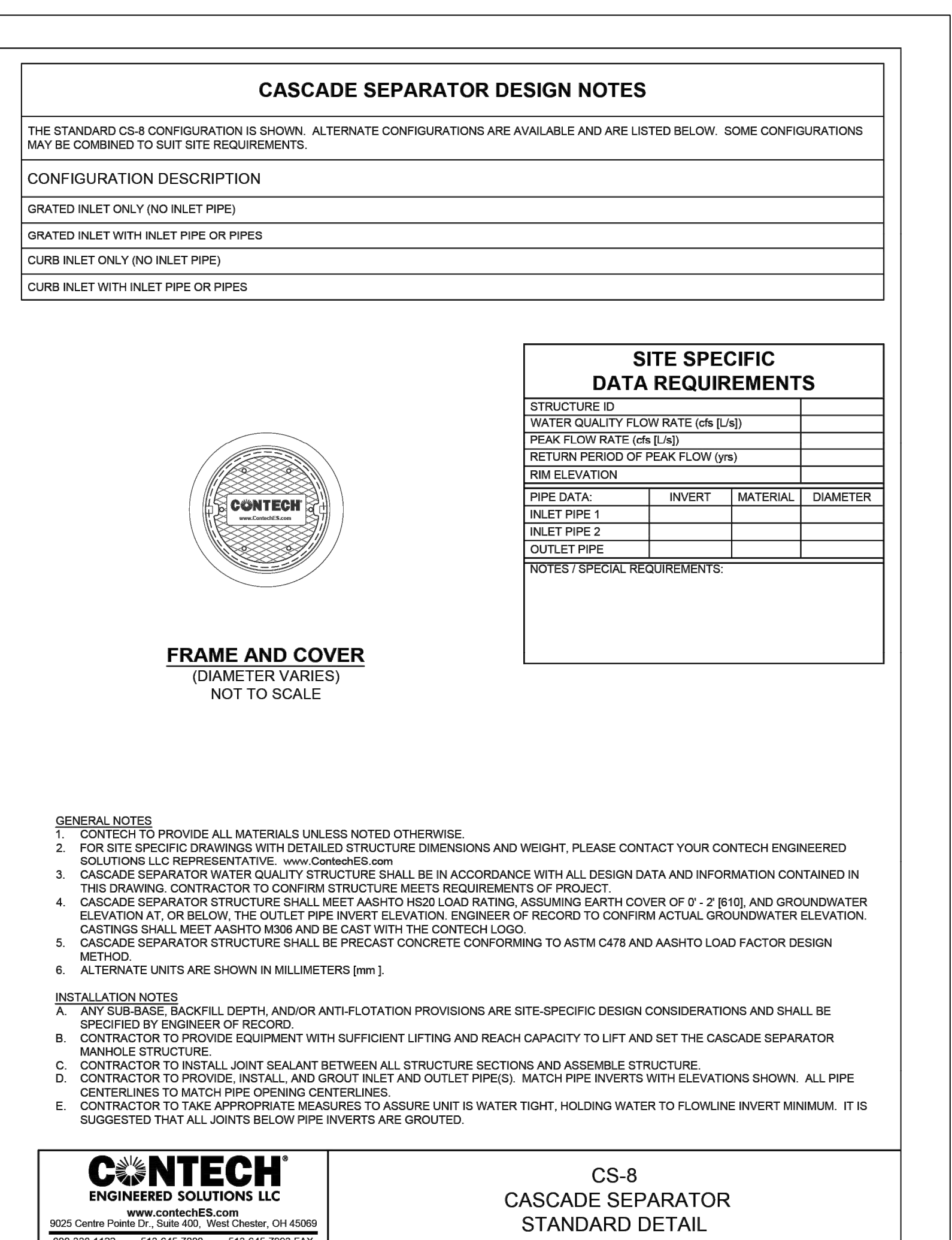
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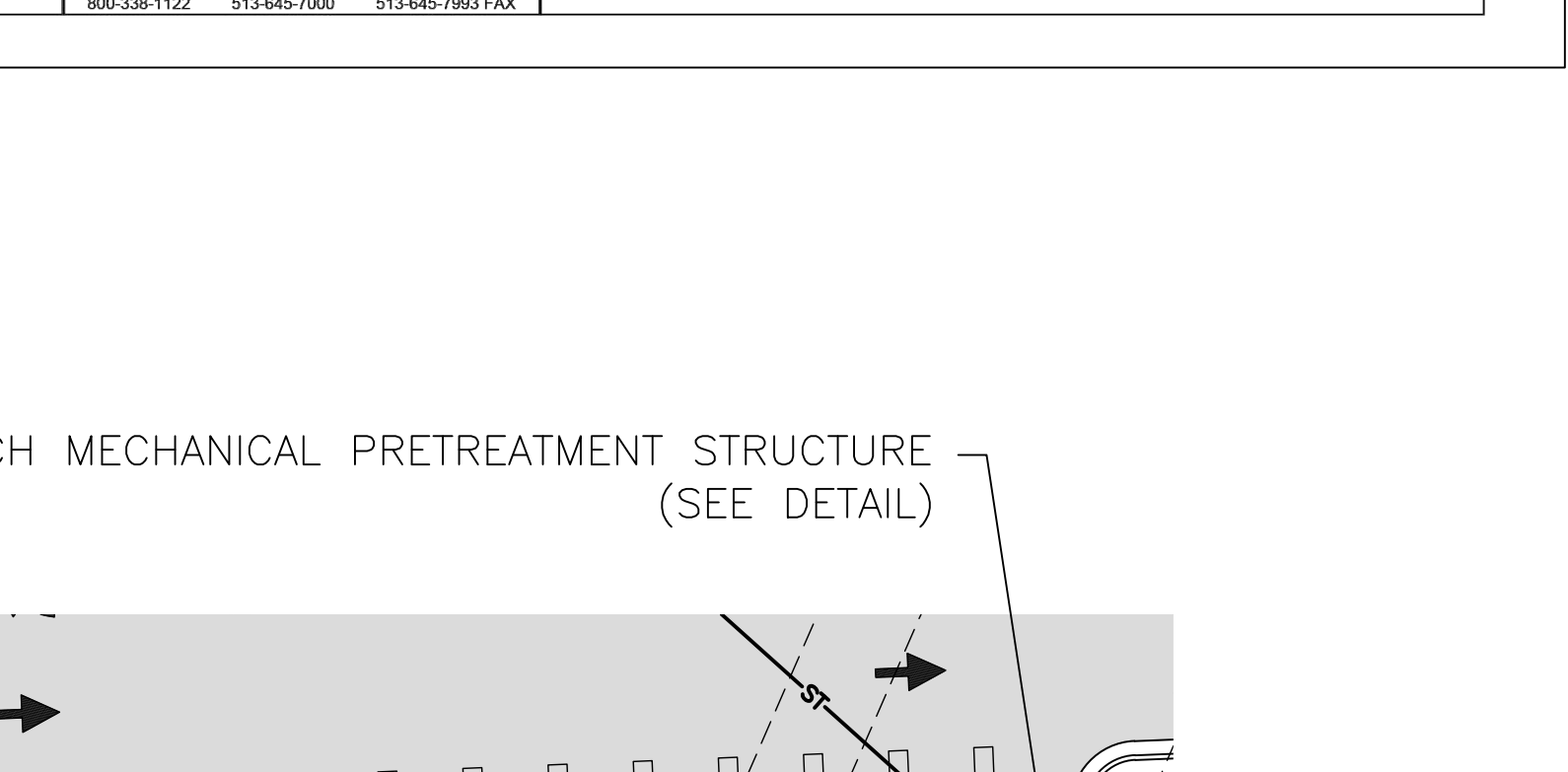
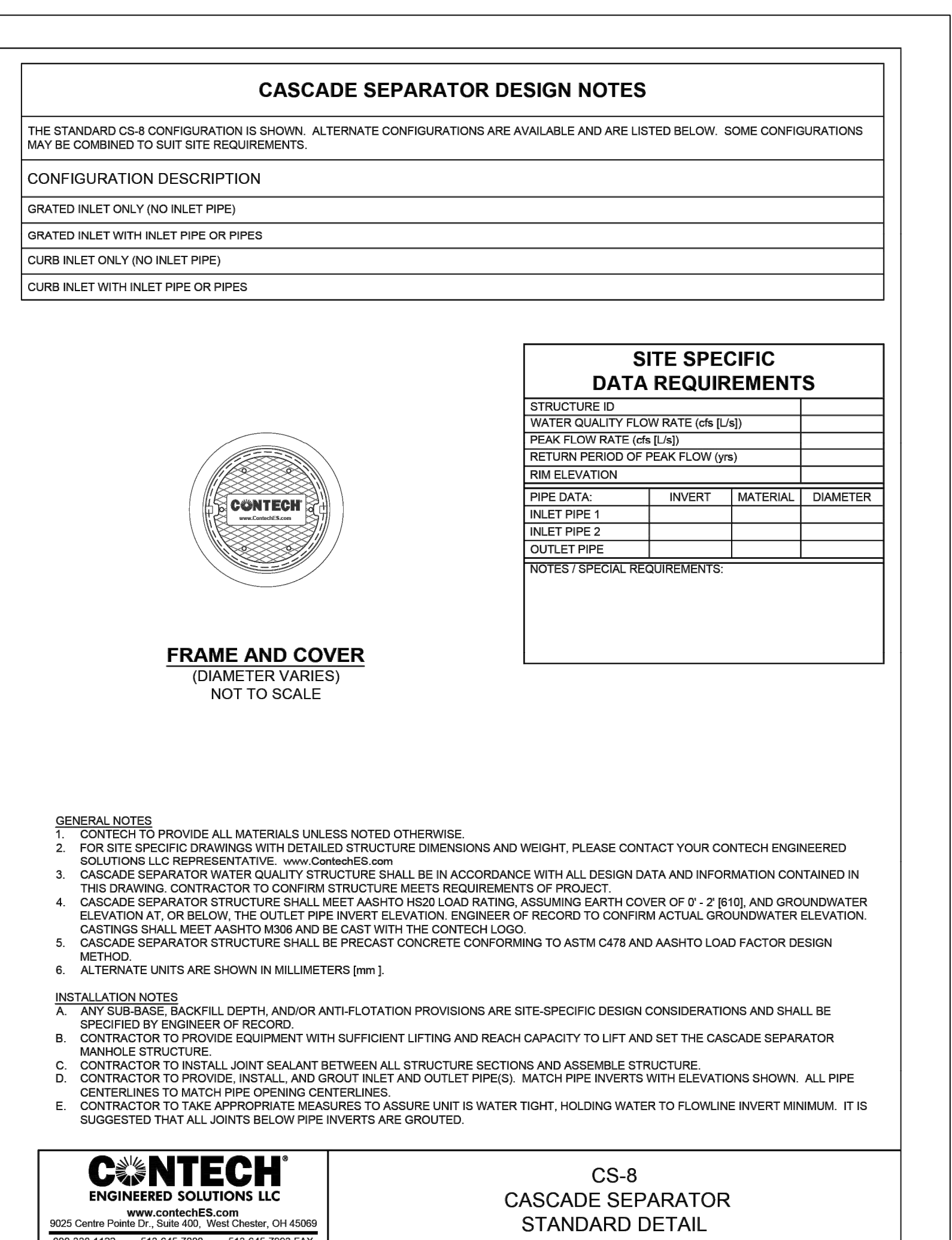
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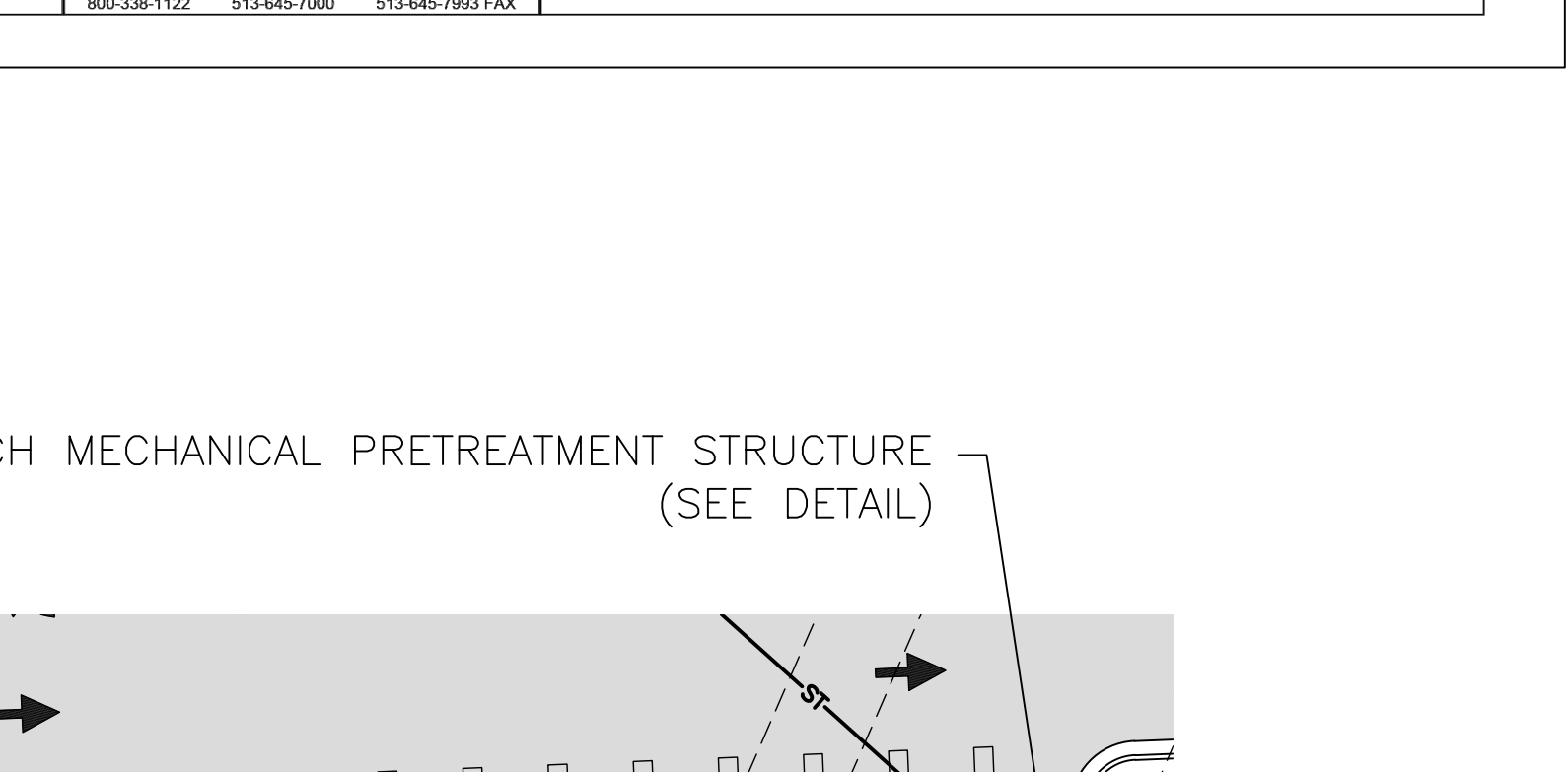
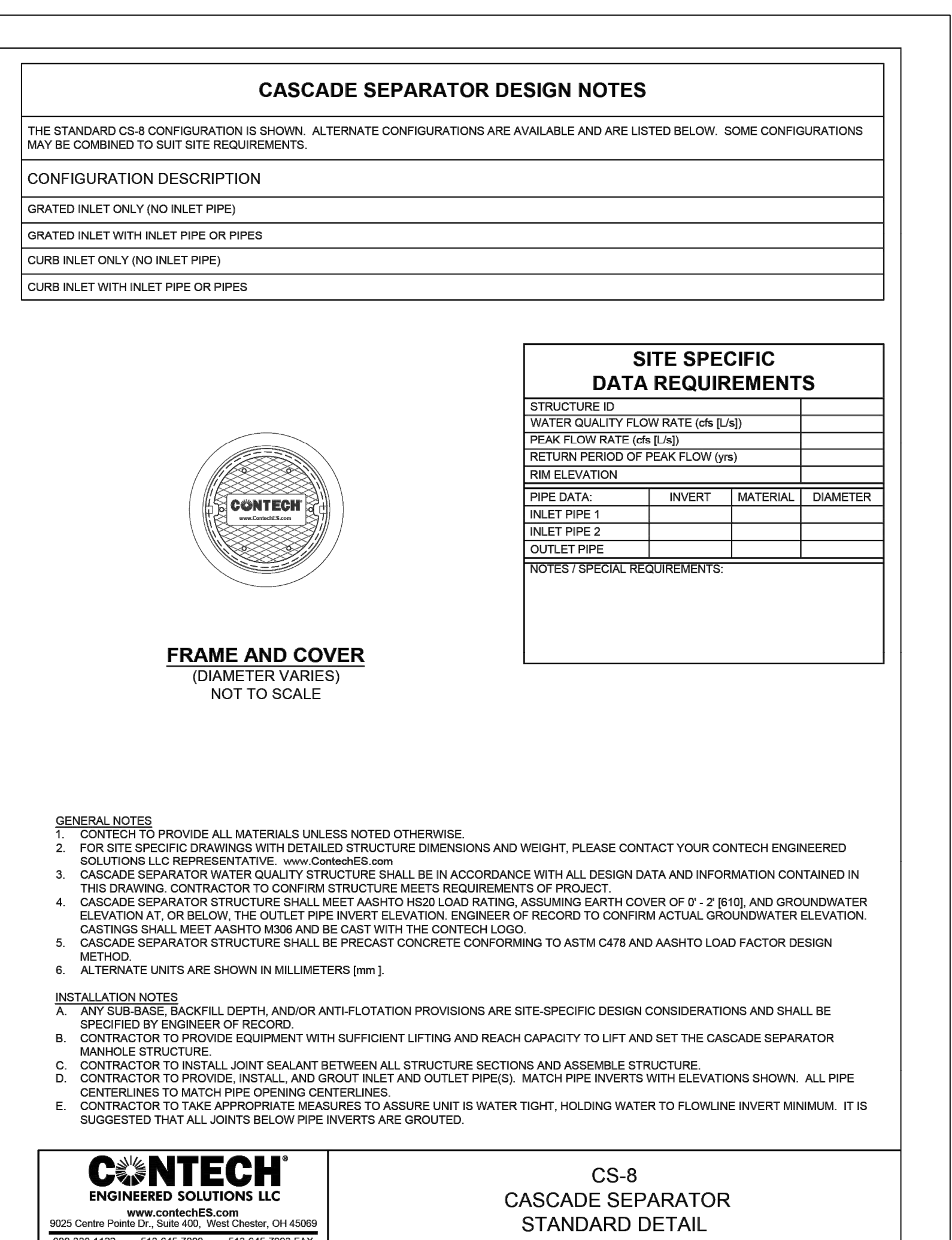
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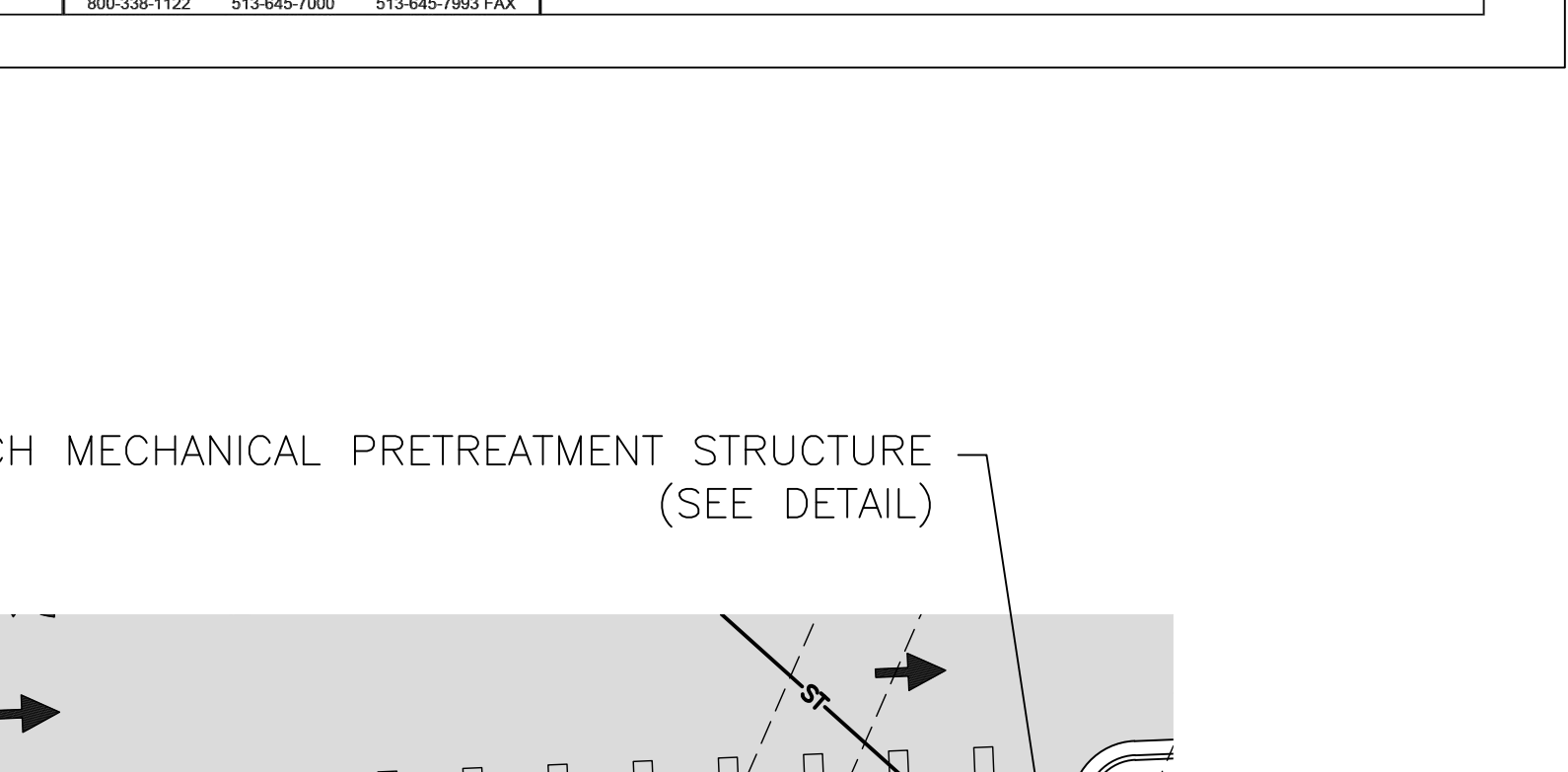
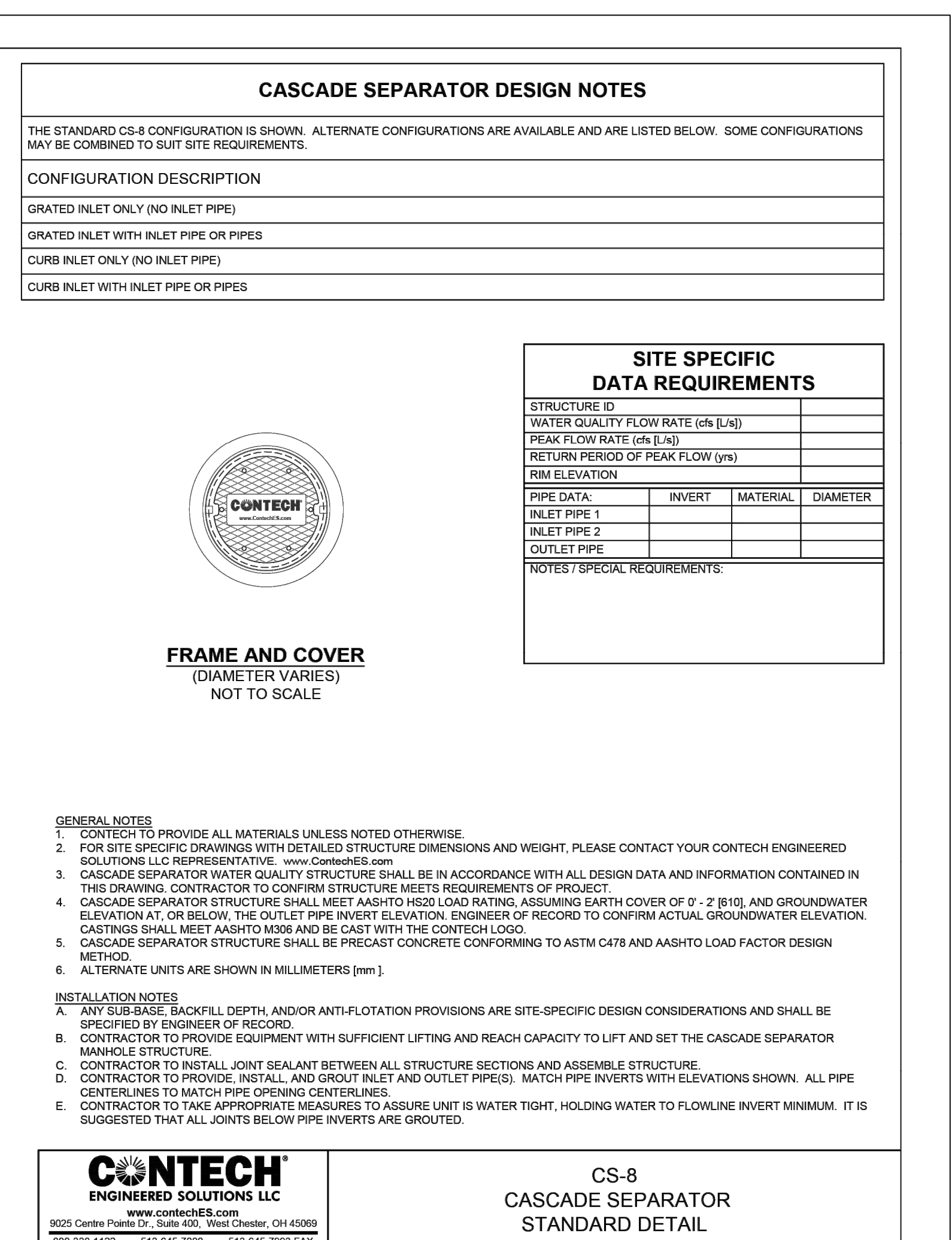
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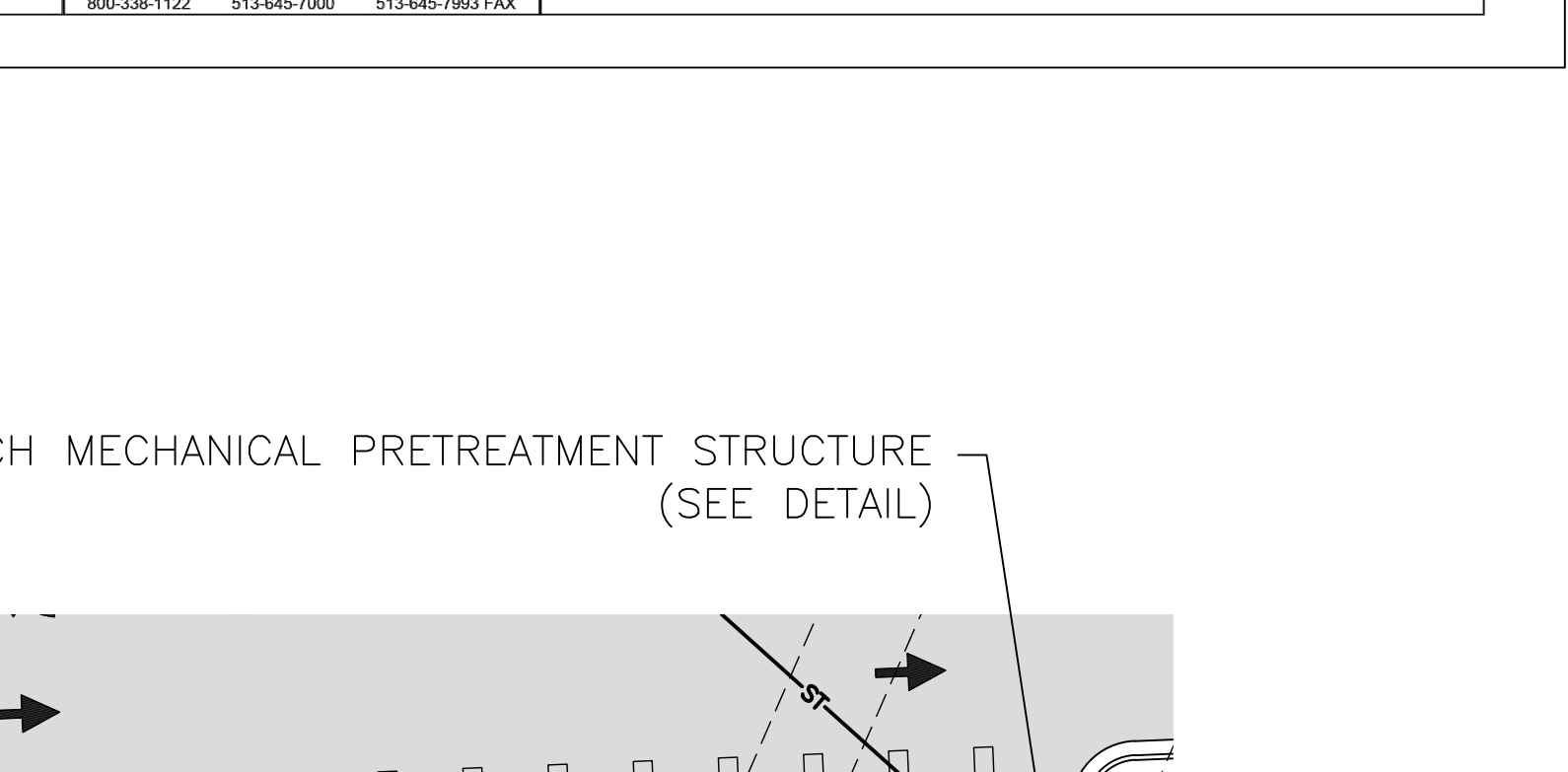
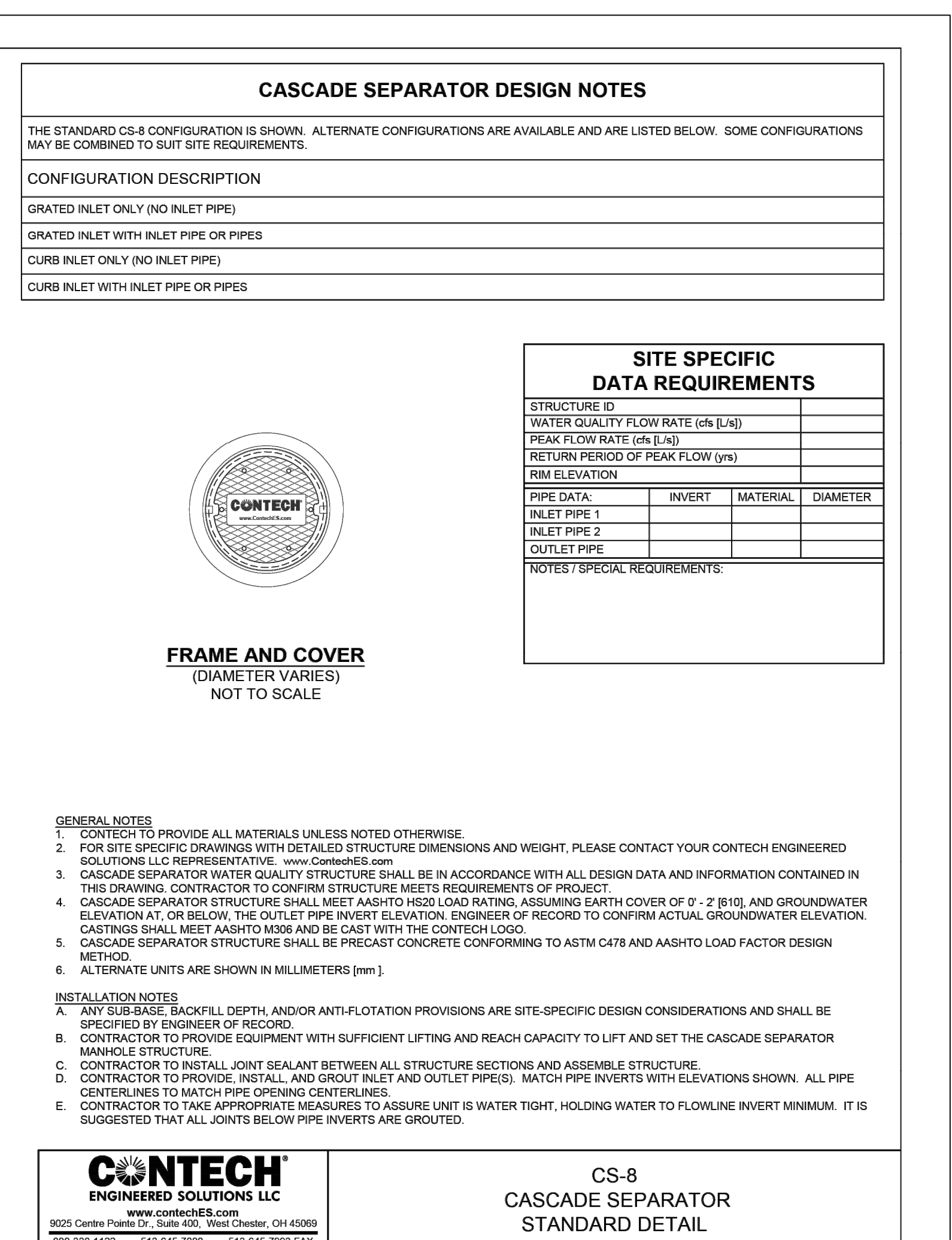
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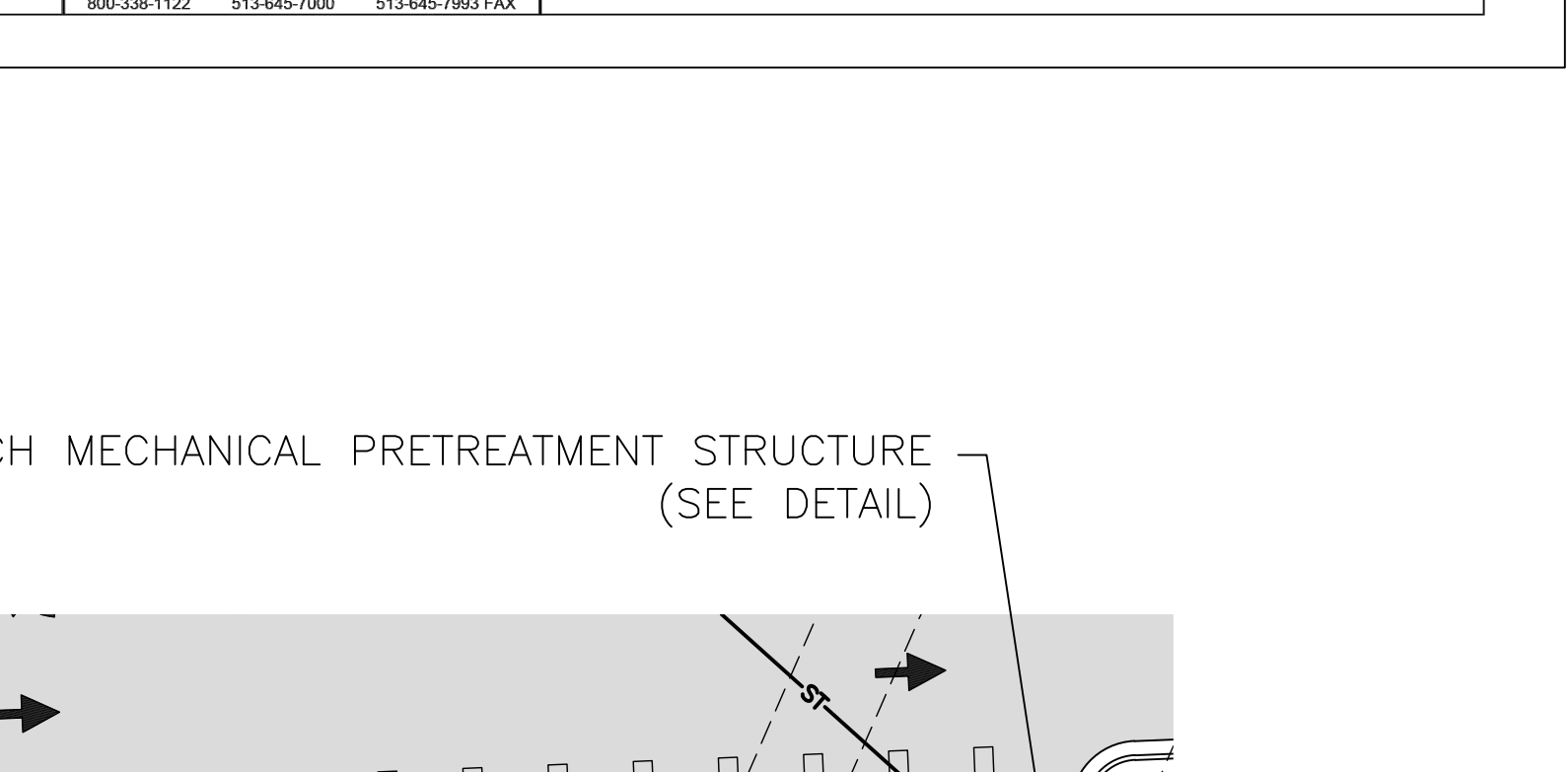
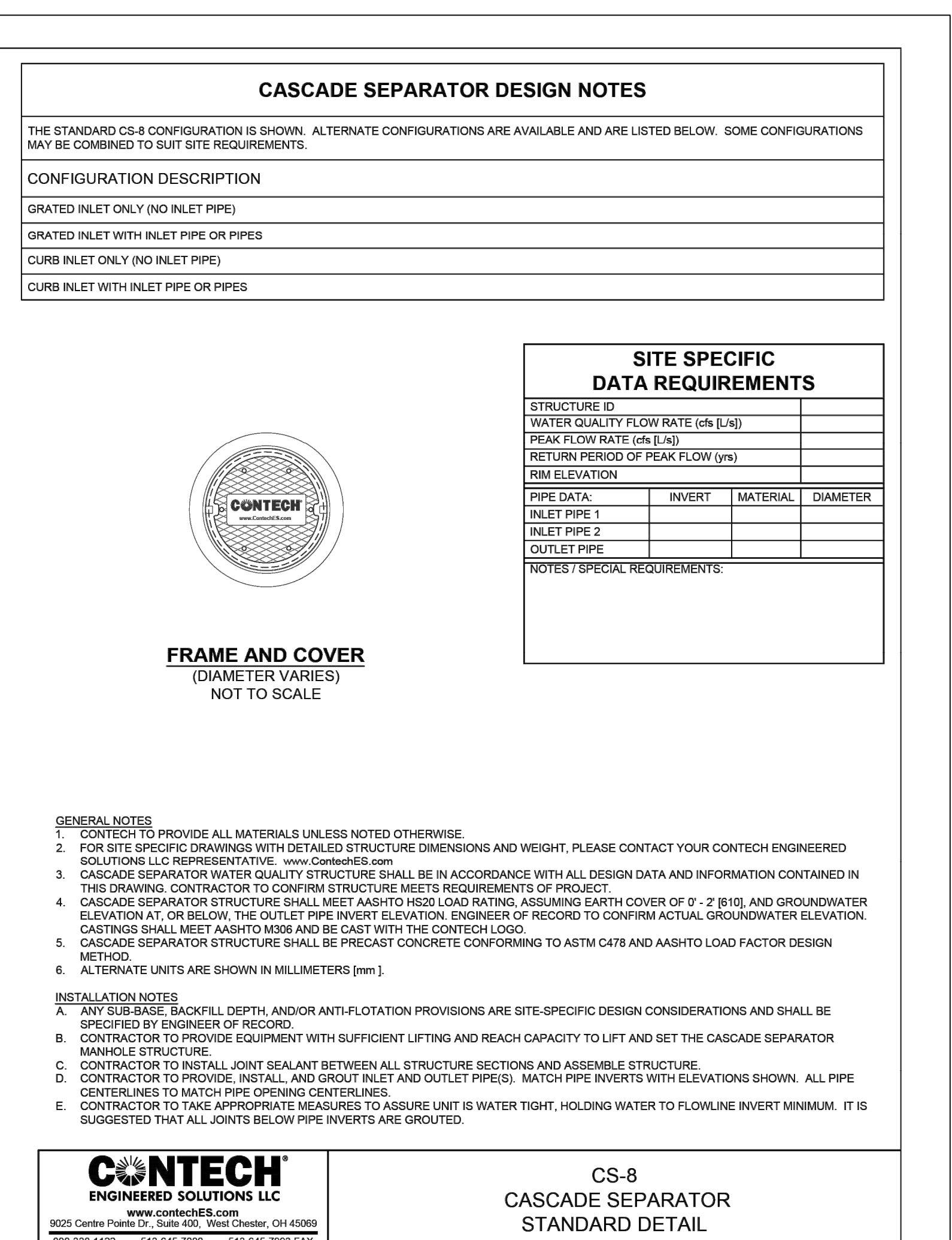
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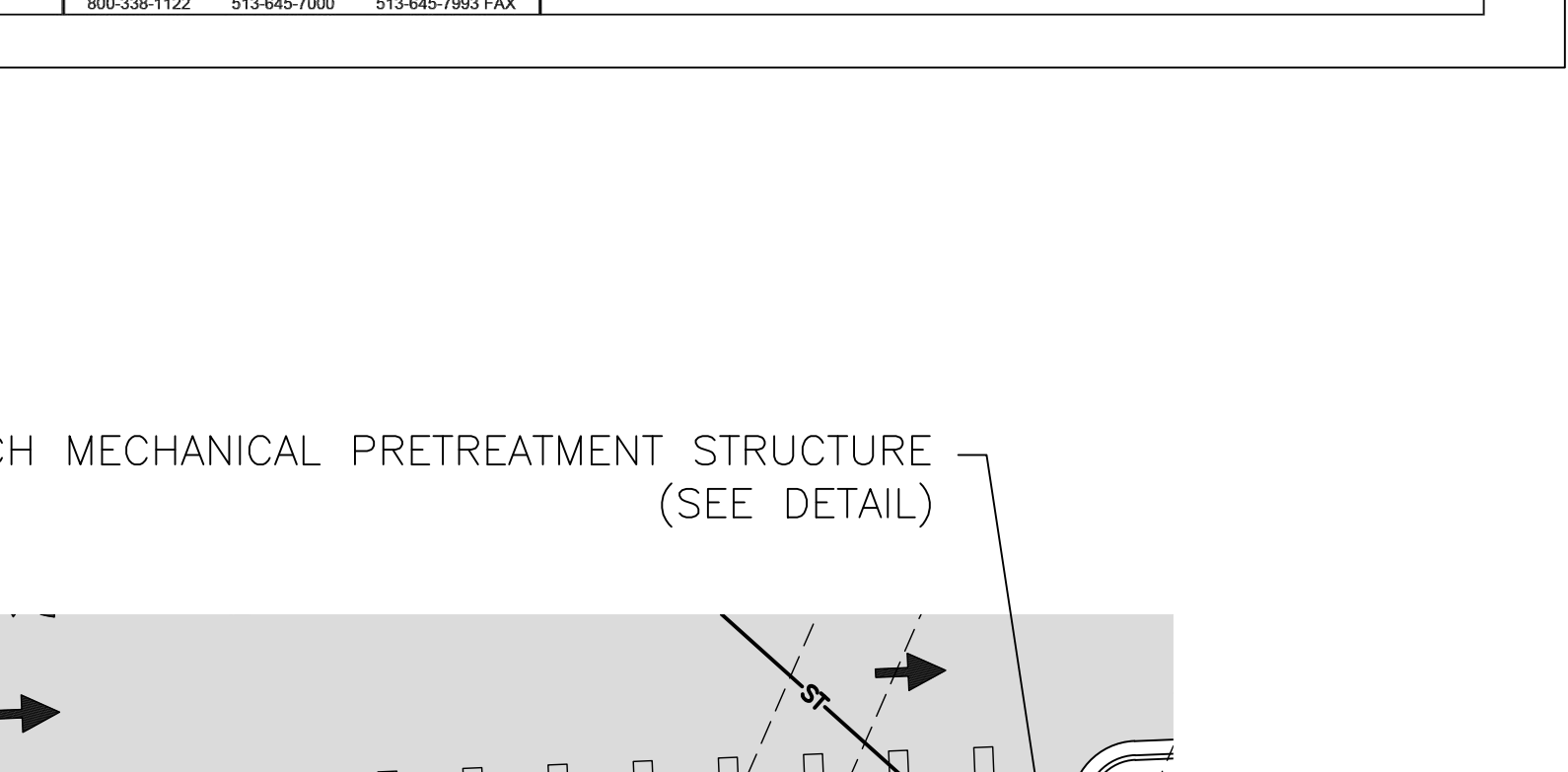
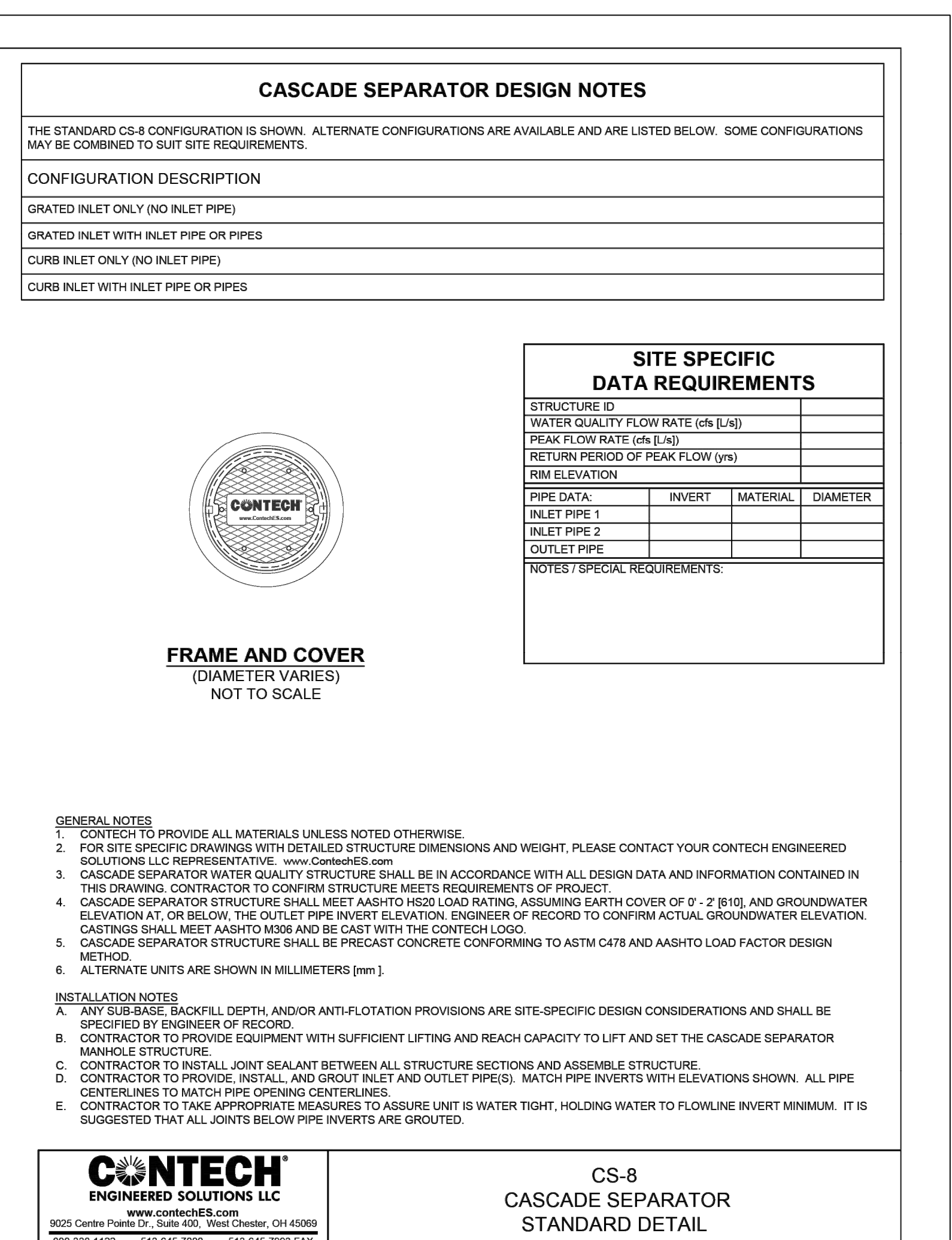
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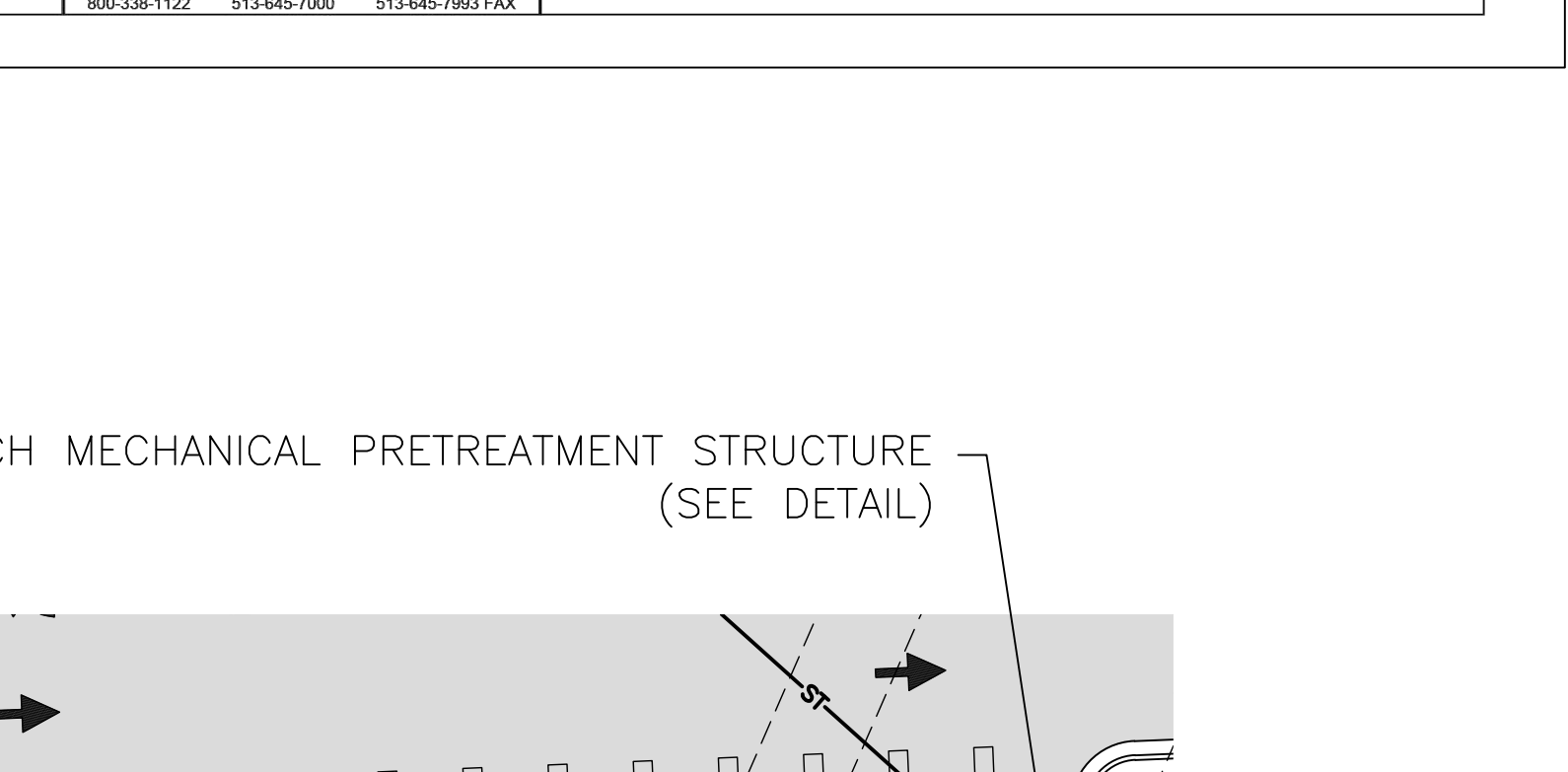
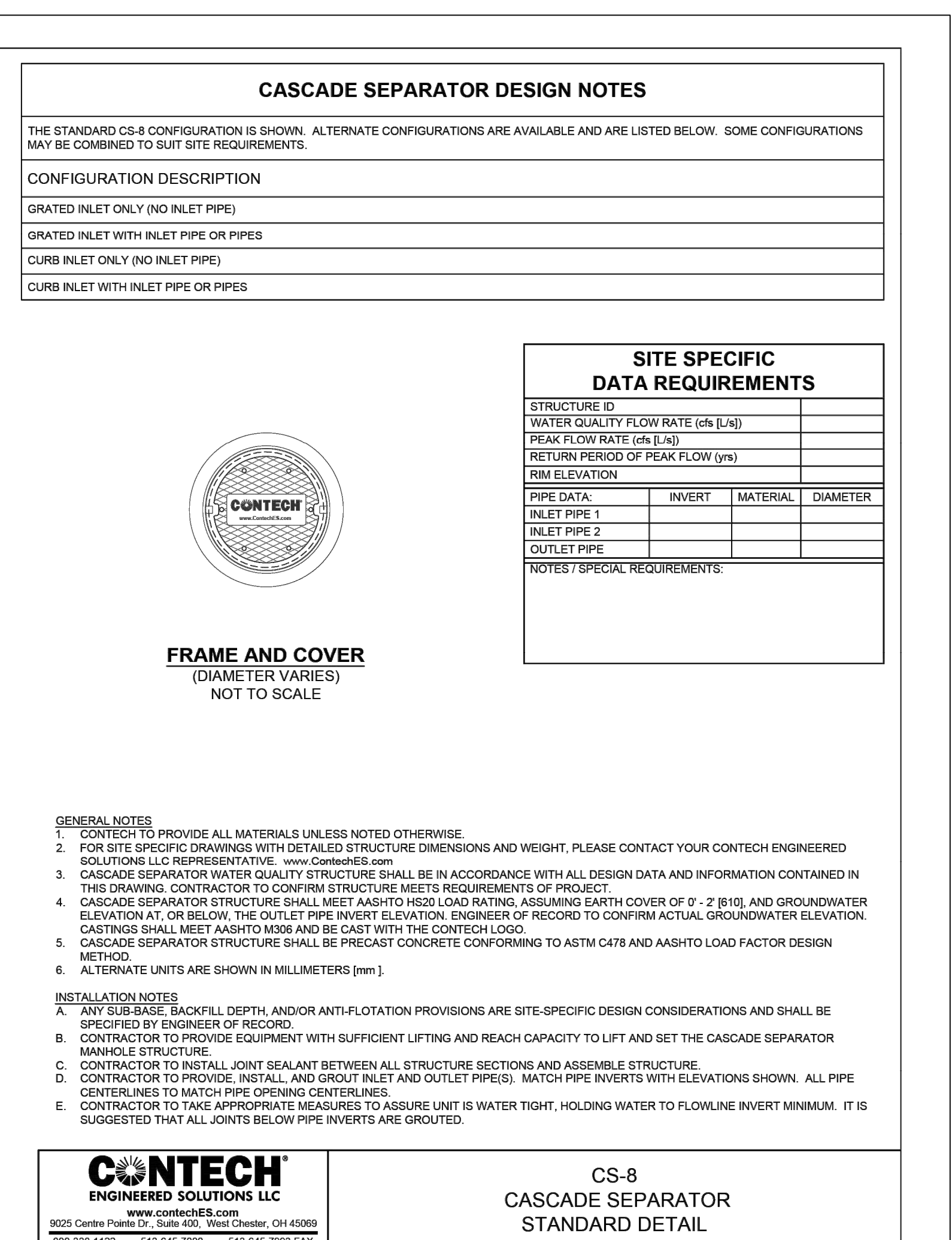
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PROJECT SUMMARY

CALCULATION DETAILS

- LOADING = H20S16.5
-APPROX. LINEAR FOOTAGE = 352 LF

STORAGE SUMMARY

- STORAGE VOLUME REQUIRED = 27,334 CF
-PIPE STORAGE VOLUME = 27,646 CF
-BACKFILL STORAGE VOLUME = 0 CF
-TOTAL STORAGE PROVIDED = 27,646 CF

PIPE DETAILS

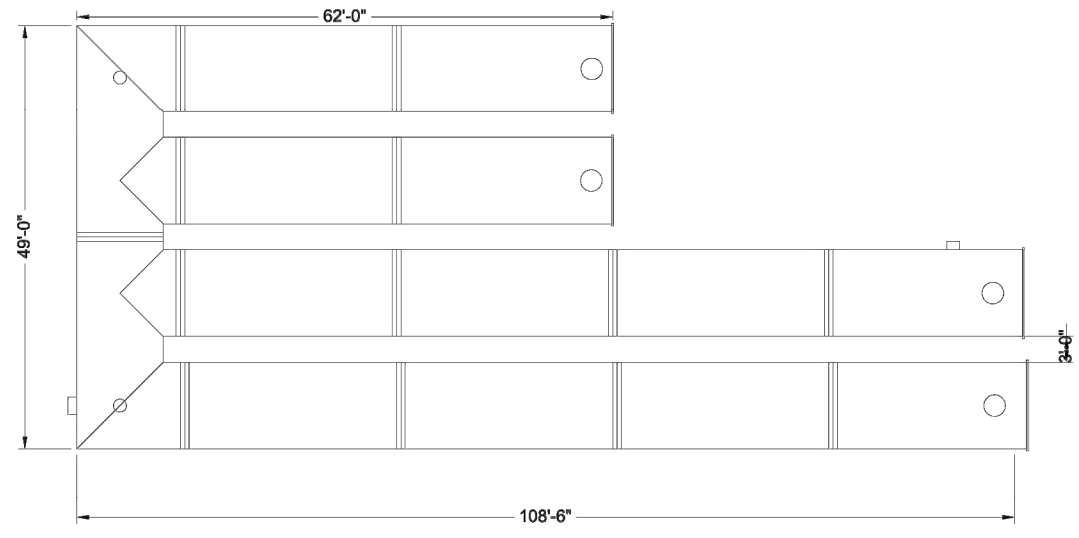
- DIAMETER = 120"
-CORROSION = 5K1
-GAGE = 14
-COATING = ALT2
-WALL TYPE = SOLID
-BARRELS SPACING = 36"

BACKFILL DETAILS

- WIDTH AT ENDS = 12"
-ABOVE PIPE = 0"
-WIDTH AT SIDES = 12"
-BELOW PIPE = 0"

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE...
-ALL RISERS AND STUBS ARE 2 1/2" CORRUGATION...
-QUANTITY OF PIPES SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES...



ASSEMBLY SCALE: 1" = 20'



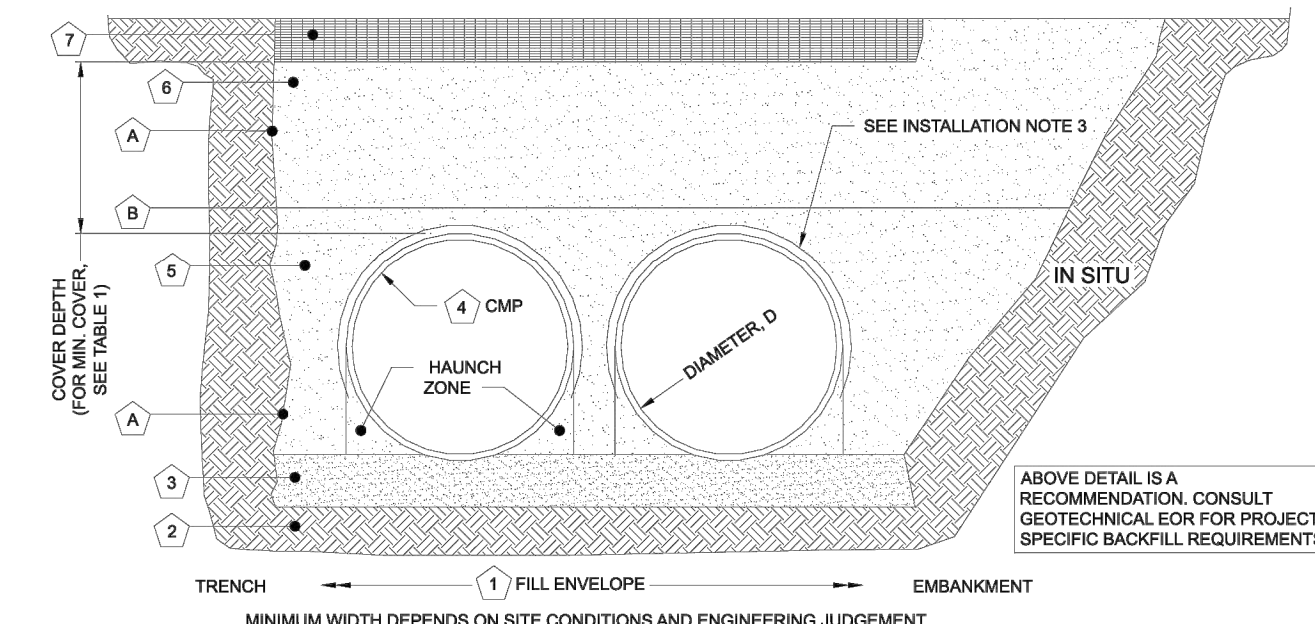
DYO42257 Gateway Commons, LLC
Underground Detention
White Lake, MI
DETENTION SYSTEM

Table with columns: PROJECT NO., SEC. NO., DATE, DESIGNED, DRAWN, CHECKED, APPROVED, SHEET NO.

TABLE 1:

Table with columns: DIAMETER, D, MIN. COVER, CORR. PROFILE

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
-TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT.



INSTALLATION NOTES

- 1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS...

TABLE 2: PERFORATED STANDARD

Table with columns: MATERIAL LOCATION, MATERIAL SPECIFICATION, DESCRIPTION

NOTES

- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPES SHALL BE THE PIPE DIAMETER D BUT NOT LESS THAN 12" FOR DIAMETERS <12"...

MANUFACTURER RECOMMENDED BACKFILL



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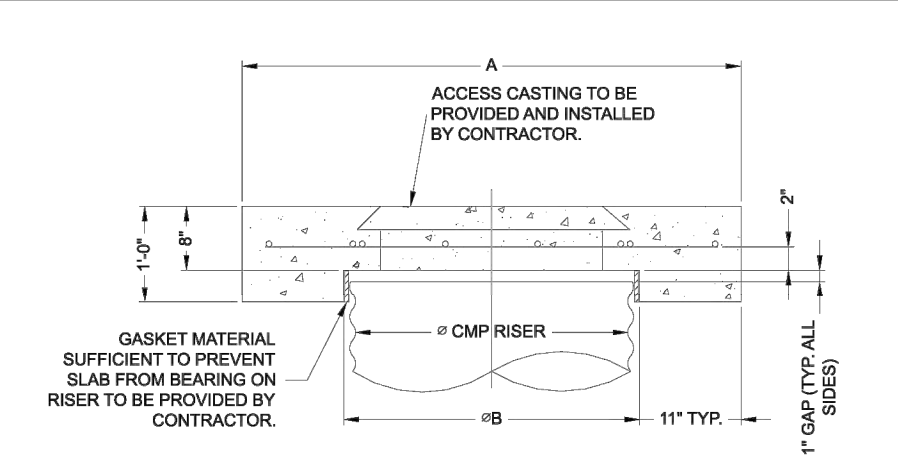
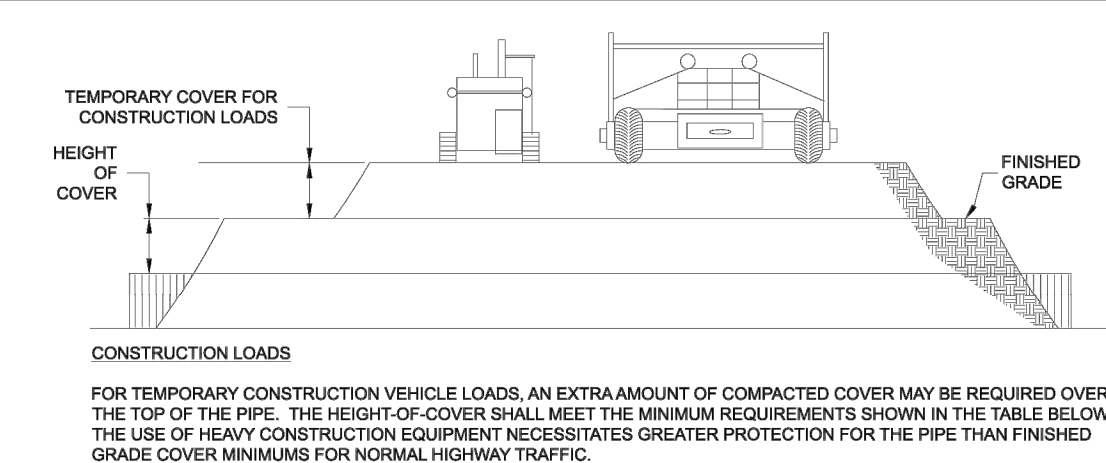
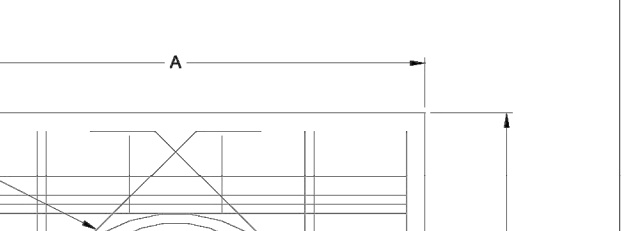
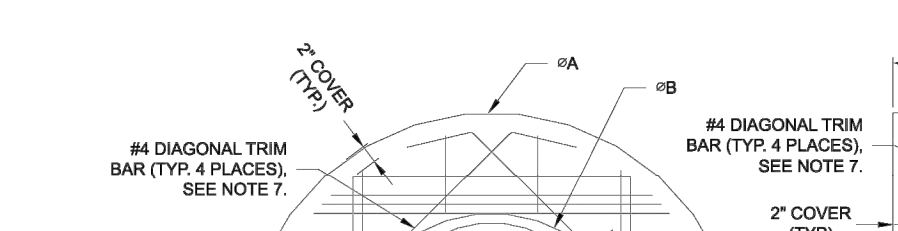


Table with columns: CMP RISER, A, B, REINFORCING, BEARING PRESSURE (PSF)

Table with columns: PIPE SPAN, INCHES, AXLE LOADS (kips), MINIMUM COVER (FT)

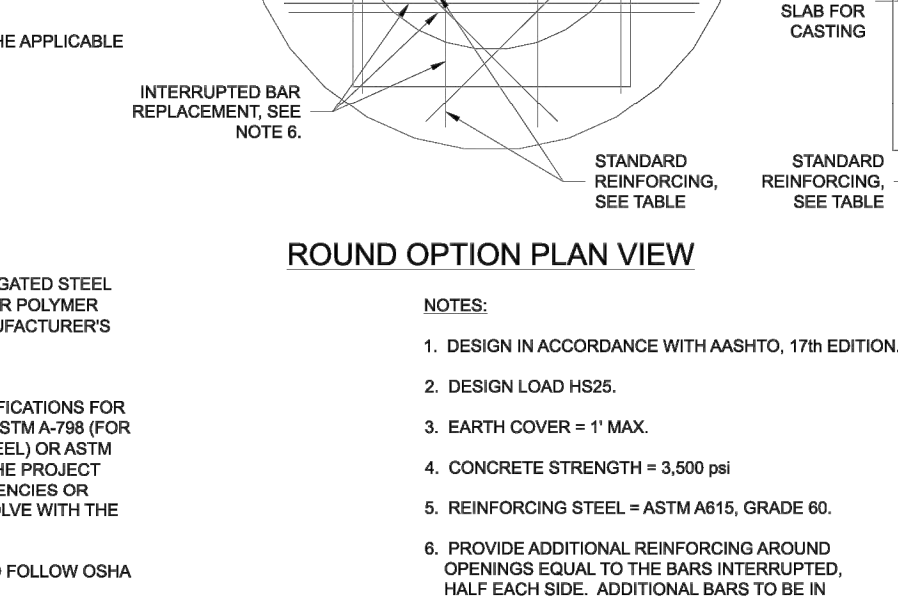


CONSTRUCTION LOADING DIAGRAM SCALE: N.T.S.

ROUND OPTION PLAN VIEW

SQUARE OPTION PLAN VIEW

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:
SCOPE: THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM...
MATERIAL: THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW...



MANHOLE CAP DETAIL SCALE: N.T.S.



DYO42257 Gateway Commons, LLC
Underground Detention
White Lake, MI
DETENTION SYSTEM

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CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE...
FOUNDATION: CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT...

IN-SITU TRENCH WALL

IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE BEARS AS THE SYSTEM IS LOADED...
BACKFILL PLACEMENT: MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLIDING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS...

CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.
INSPECTION: INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED...

CONSTRUCTION LOADING

TYPICALLY THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY...

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION, POTENTIALLY CAUSING FLOATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES...
GEOMEMBRANE BARRIER: A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED...



Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

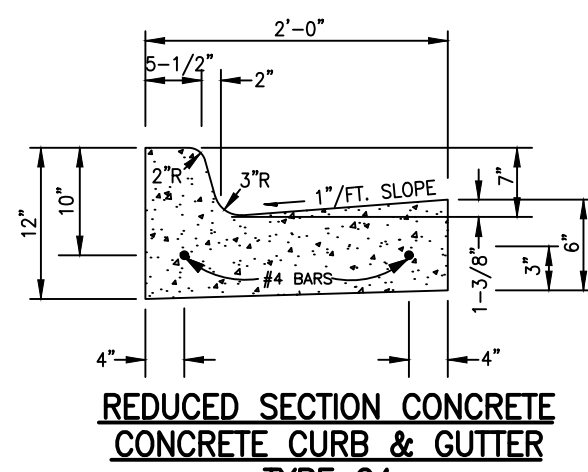
GATEWAY CROSSING
GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 103
BIRMINGHAM, MI 48209
248-933-7000

CONTECH UNDERGROUND DETAILS

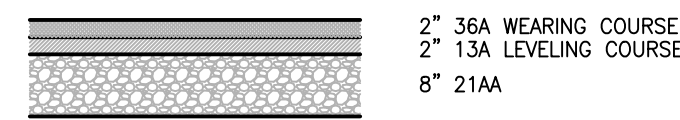
Table with columns: PROJECT, PREPARED FOR, TITLE, DATE, REVISION PER TWP PFS# REV #3, REVISION PER TWP PFS# REV #2, REVISION PER TWP PFS# REV #1, NO BY

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE: 1" = 20'
JOB NO: 22-029-1
DATE: 01/05/23
SHEET NO. 10

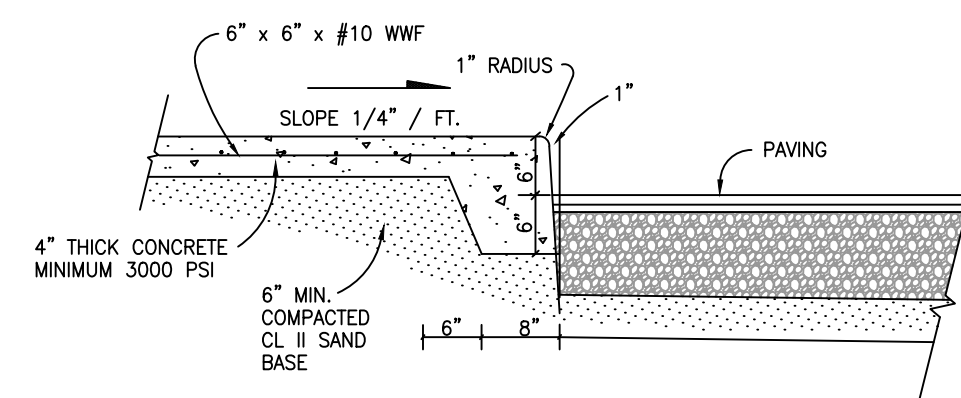




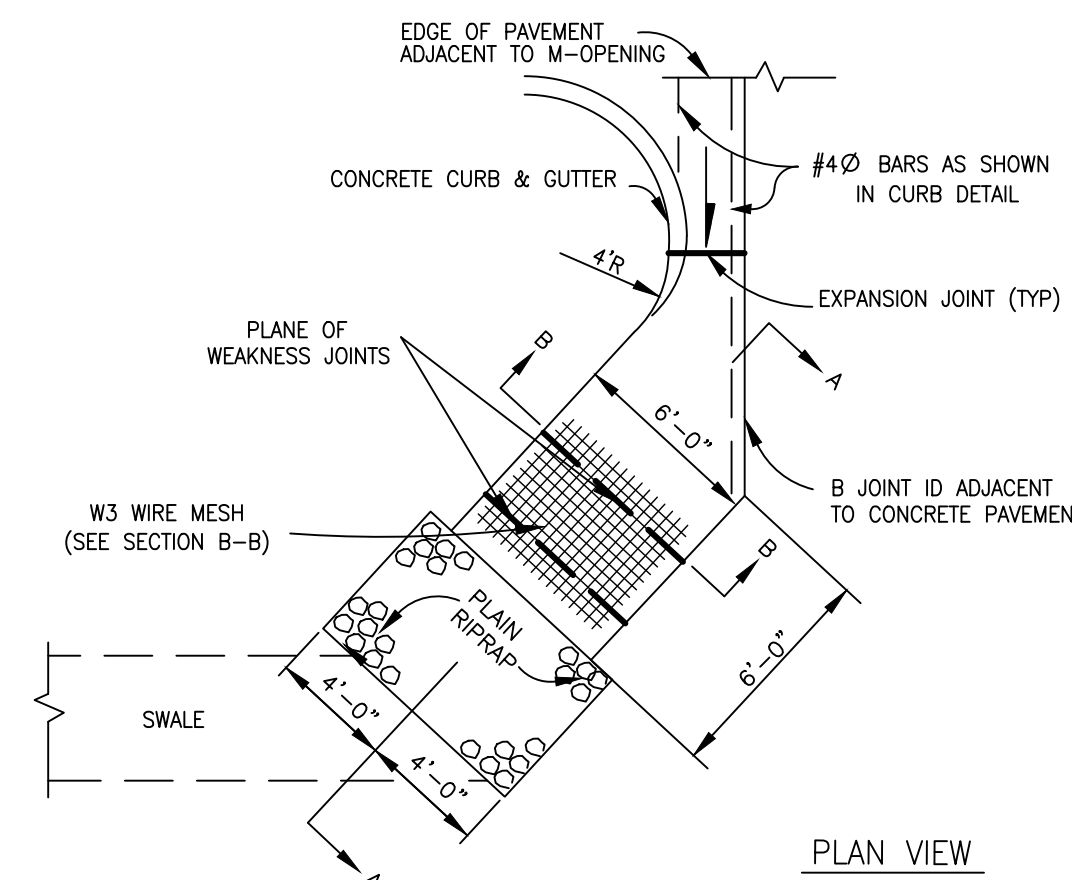
REDUCED SECTION CONCRETE CURB & GUTTER
TYPE C4
(TO BE USED AT OPPOSITE VALLEY TYPE CURB AT BOULEVARDS)
(NO SCALE)



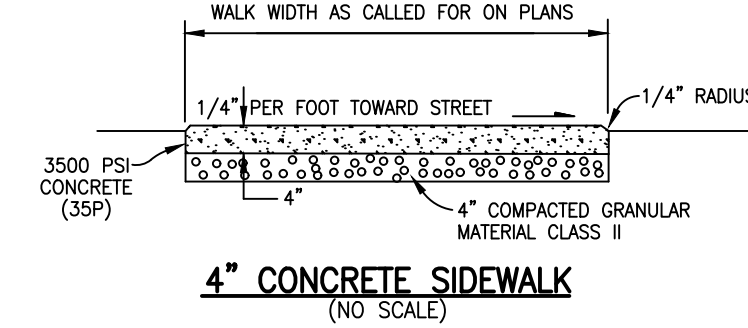
TYPICAL ASPHALT DETAIL
(NO SCALE)



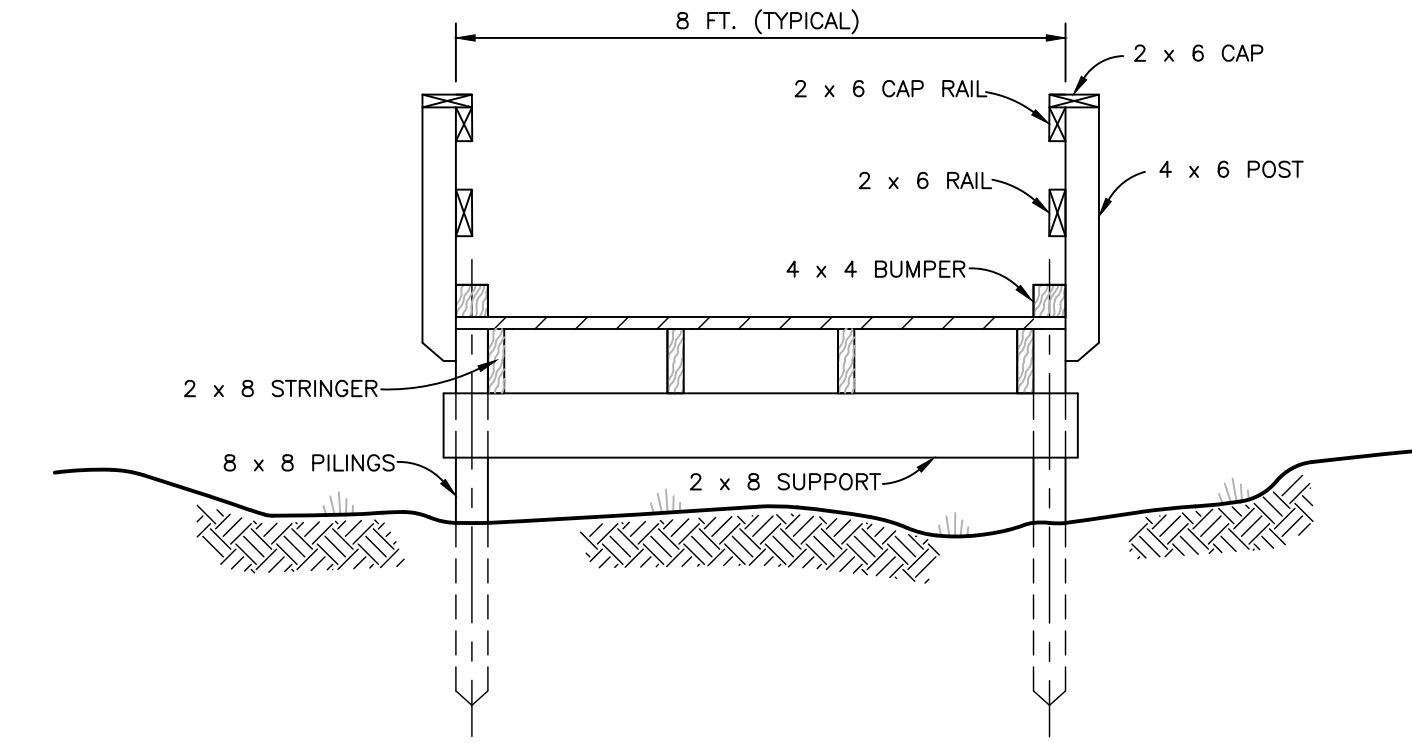
INTEGRAL CONCRETE WALK / CURB DETAIL
(NO SCALE)



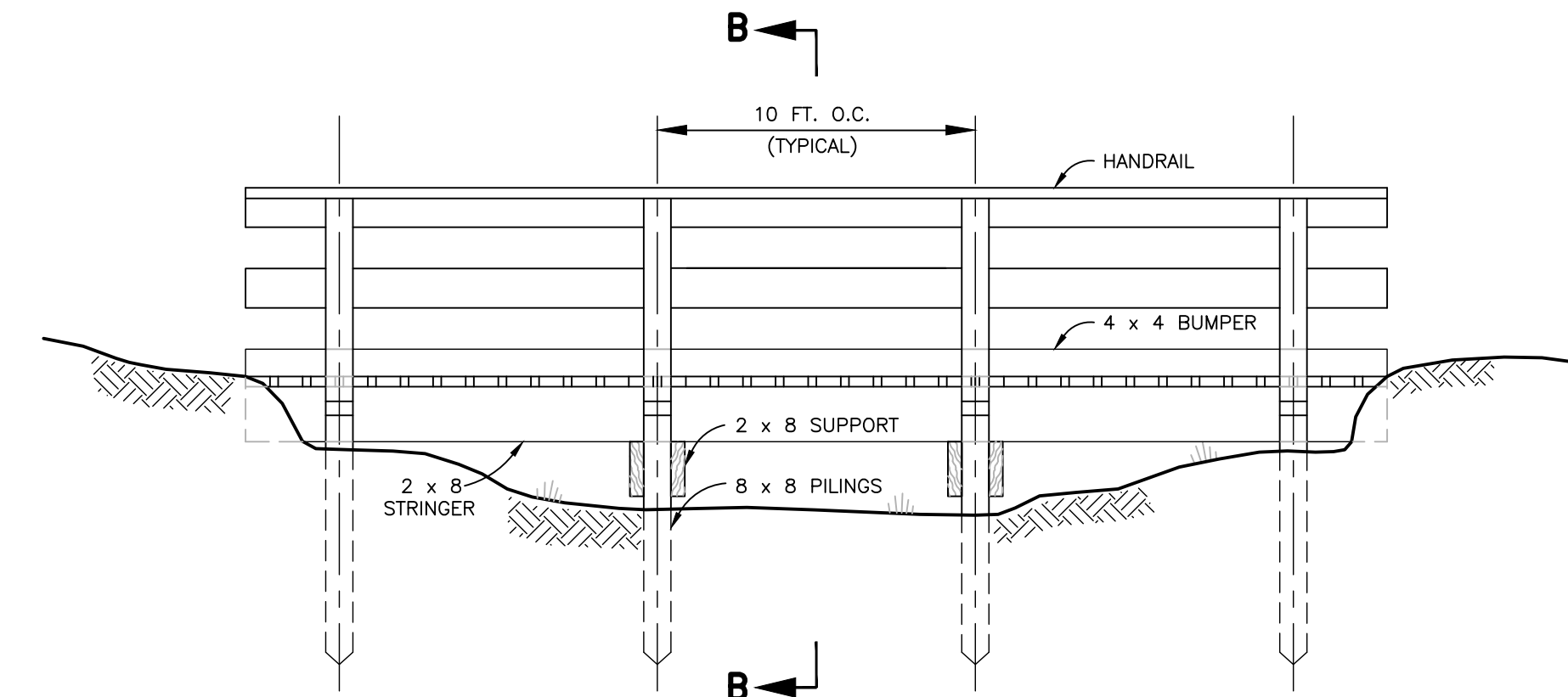
ANGLED CONCRETE SPILLWAY
FOR USE AT END OF CURB (ANGLED)
(NO SCALE)



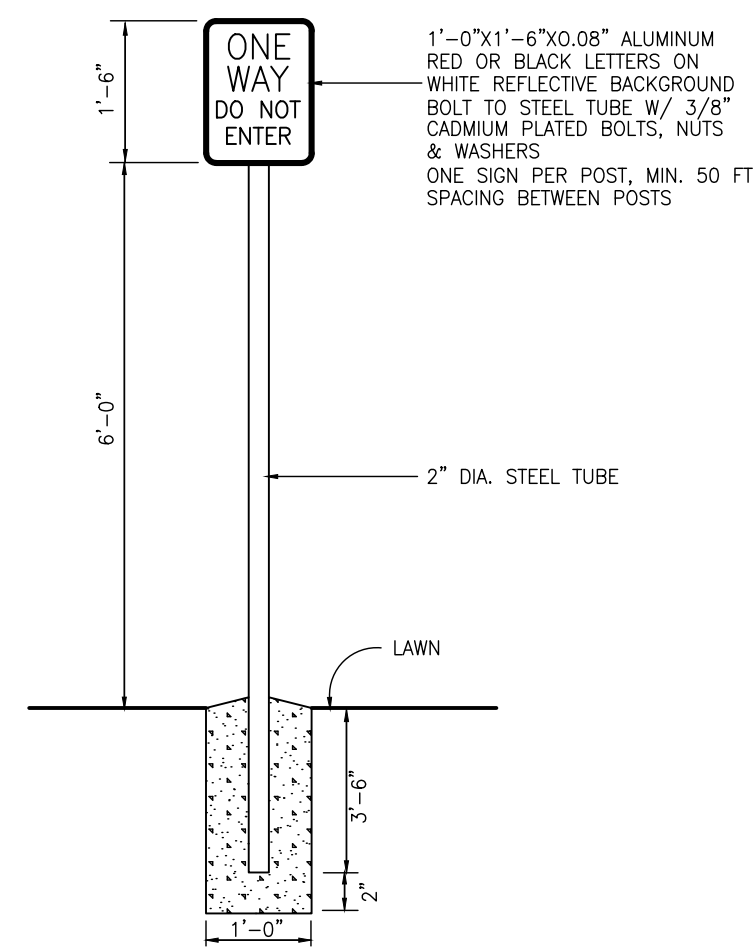
4" CONCRETE SIDEWALK
(NO SCALE)



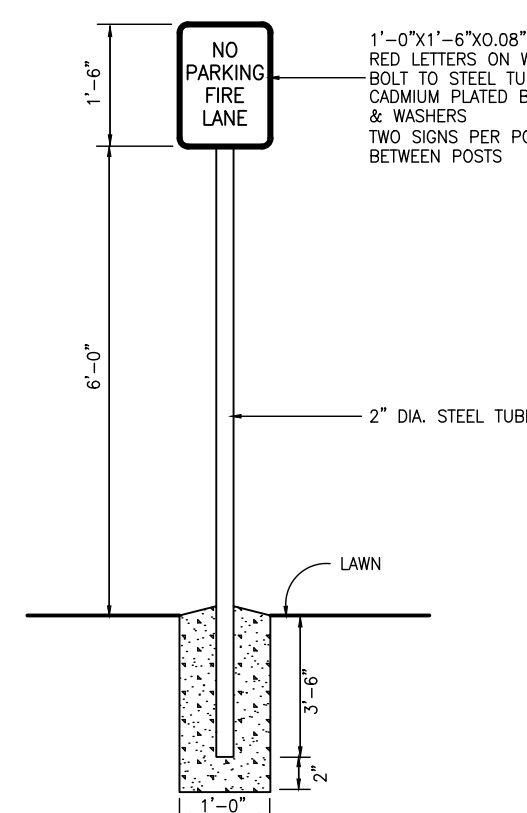
SECTION B-B BOARDWALK DETAIL
SCALE: NONE



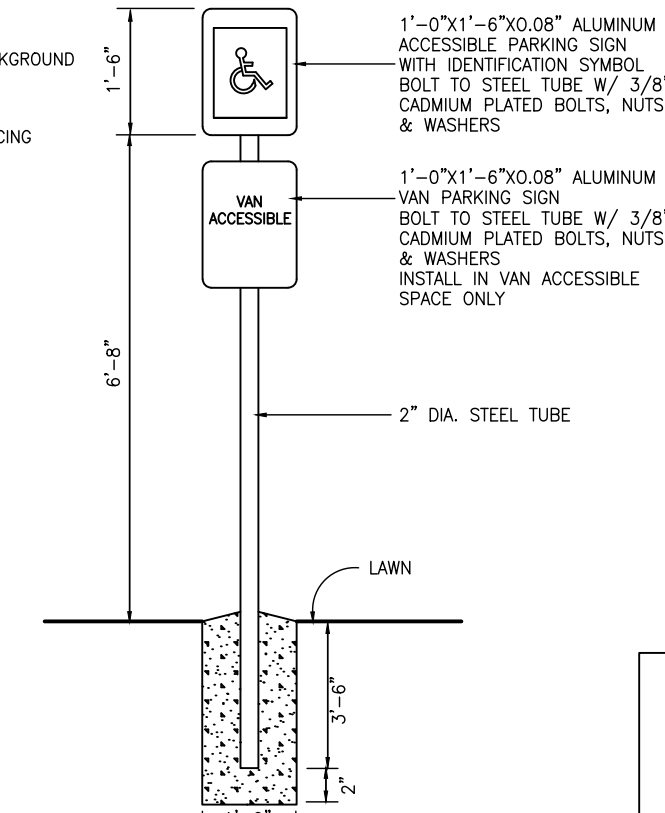
SECTION A-A BOARDWALK DETAIL
SCALE: NONE



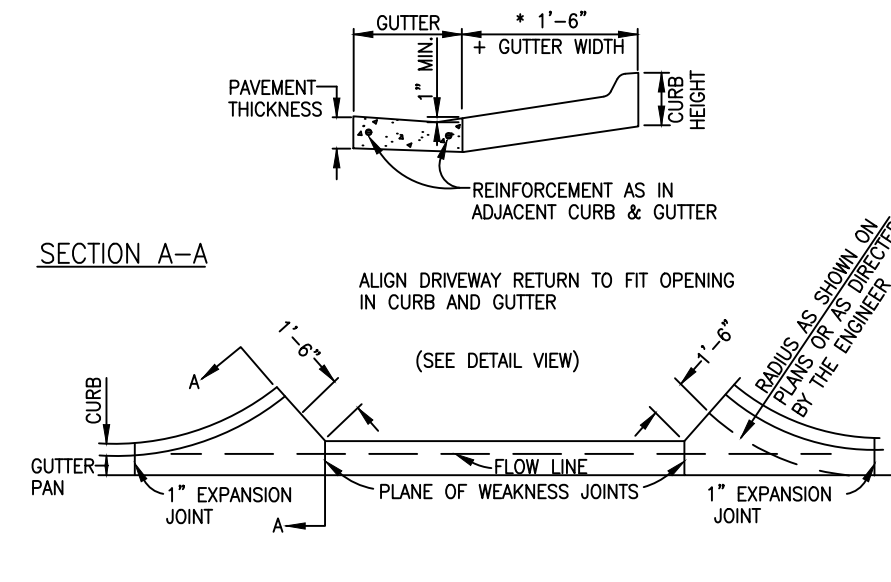
NO PARKING SIGN DETAIL
(NO SCALE)



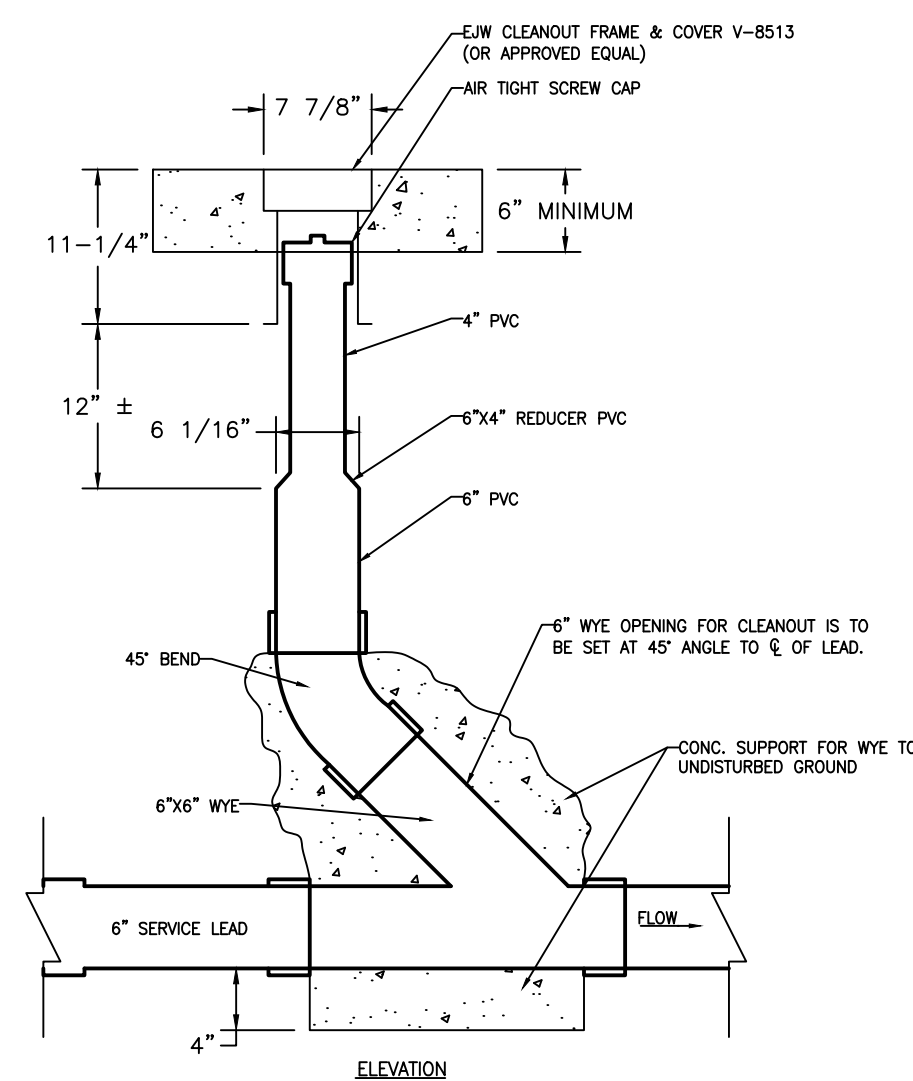
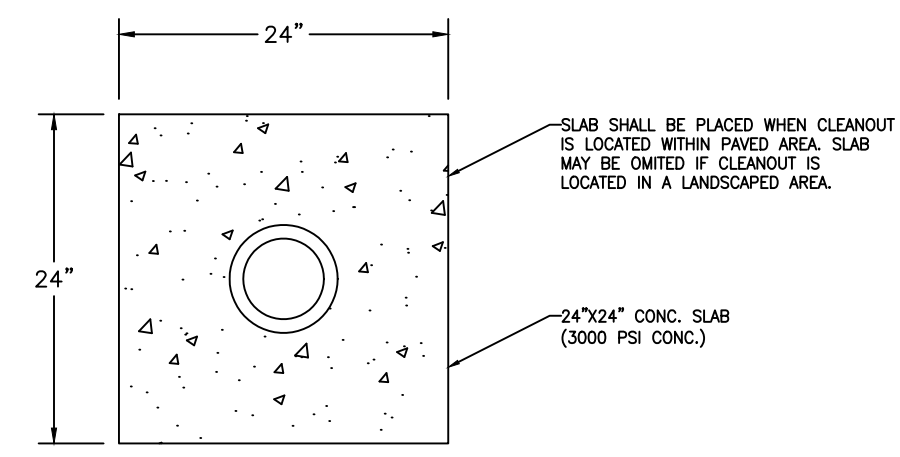
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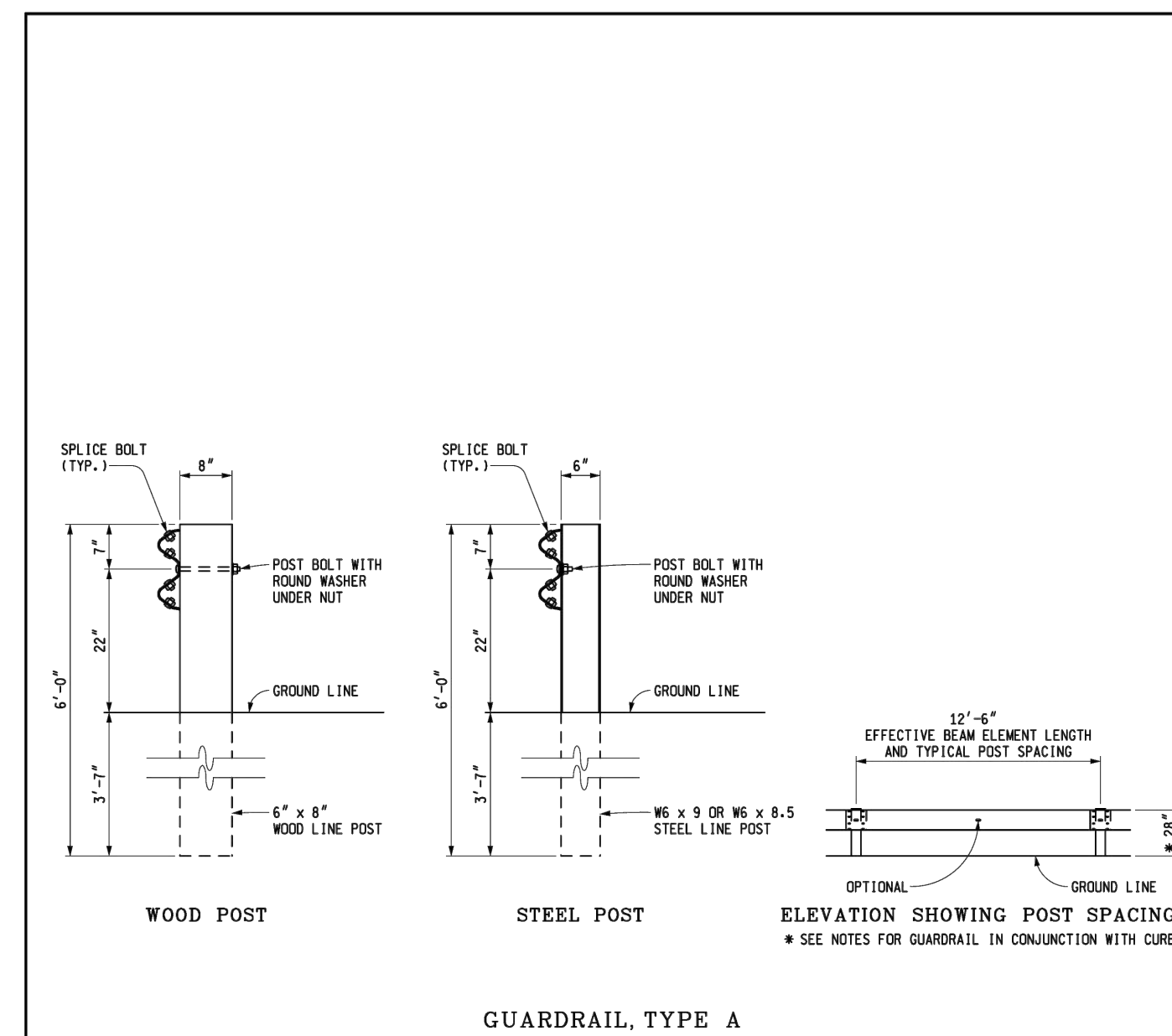
HANDICAP PARKING SIGN DETAIL
(NO SCALE)



CONCRETE DRIVEWAY OPENING - MDOT STANDARD II-42, DETAIL IM
(NO SCALE)



DETAIL OF SANITARY SEWER CLEANOUT
(NO SCALE)



DEPARTMENT DIRECTOR
Paul C. Argus

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-B, & MGS-8D

PREPARED BY: DESIGN DIVISION
DRAWN BY: B.S.L.
CHECKED BY: M.S.P.

APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES

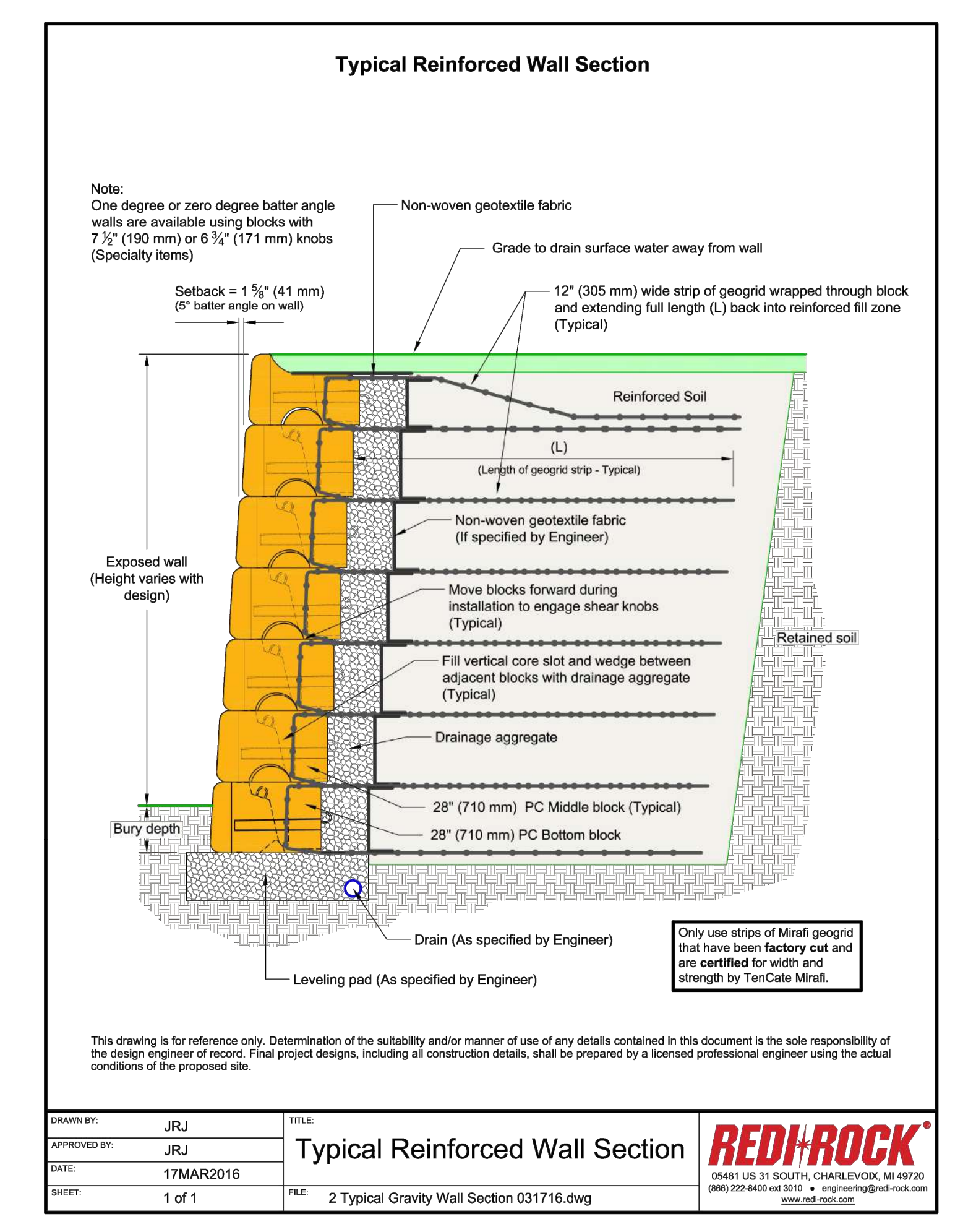
APPROVED BY: DIRECTOR, BUREAU OF DEVELOPMENT

F.R.S.A. APPROVAL

12-3-2021
PLAN DATE

R-60-J

SHEET 1 OF 16



DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE: NO SCALE
JOB NO: 22-029-1
DATE: 01/05/23
SHEET NO. 11

DEPARTMENT DIRECTOR
Paul C. Argus

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-B, & MGS-8D

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12-3-2021
PLAN DATE

R-60-J

SHEET 1 OF 16

DEPARTMENT DIRECTOR
Paul C. Argus

MICHIGAN DEPARTMENT OF TRANSPORTATION
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GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-B, & MGS-8D

PREPARED BY: DESIGN DIVISION
DRAWN BY: B.S.L.
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APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: DIRECTOR, BUREAU OF DEVELOPMENT

F.R.S.A. APPROVAL

12-3-2021
PLAN DATE

R-60-J

SHEET 1 OF 16

DEPARTMENT DIRECTOR
Paul C. Argus

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR
GUARDRAIL,
TYPES A, B, BD, T, TD,
MGS-B, & MGS-8D

PREPARED BY: DESIGN DIVISION
DRAWN BY: B.S.L.
CHECKED BY: M.S.P.

APPROVED BY: DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: DIRECTOR, BUREAU OF DEVELOPMENT

F.R.S.A. APPROVAL

12-3-2021
PLAN DATE

R-60-J

SHEET 1 OF 16

BEBOSSE
Engineering
Engineers Surveyors Planners Landscape Architects
3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843
517.546.4836 FAX 517.548.1670

BEFORE USING THESE DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND DEPTH OF ALL UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS BEFORE THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

THE LOCATION AND DEPTH OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OF THESE UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND DEPTH OF ALL UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS BEFORE THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

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GATEWAY CROSSING

GATEWAY CROSSING, LLC
600 NORTH OLD WOODWARD, SUITE 101
BIRMINGHAM, MI. 38209
248-433-7000

CONSTRUCTION DETAILS

NO.	BY	DATE	REVISION
1	JAV	09/09/23	REVISION PER
2	MJD	1/12/24	REVISION PER TWP P&P REV #2
3	ST	2/28/24	REVISION PER TWP P&P REV #3

DESIGNED BY: ST
DRAWN BY: JS
CHECKED BY:
SCALE: NO SCALE
JOB NO: 22-029-1
DATE: 01/05/23
SHEET NO. 11

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS MADE AS TO THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS BEFORE THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

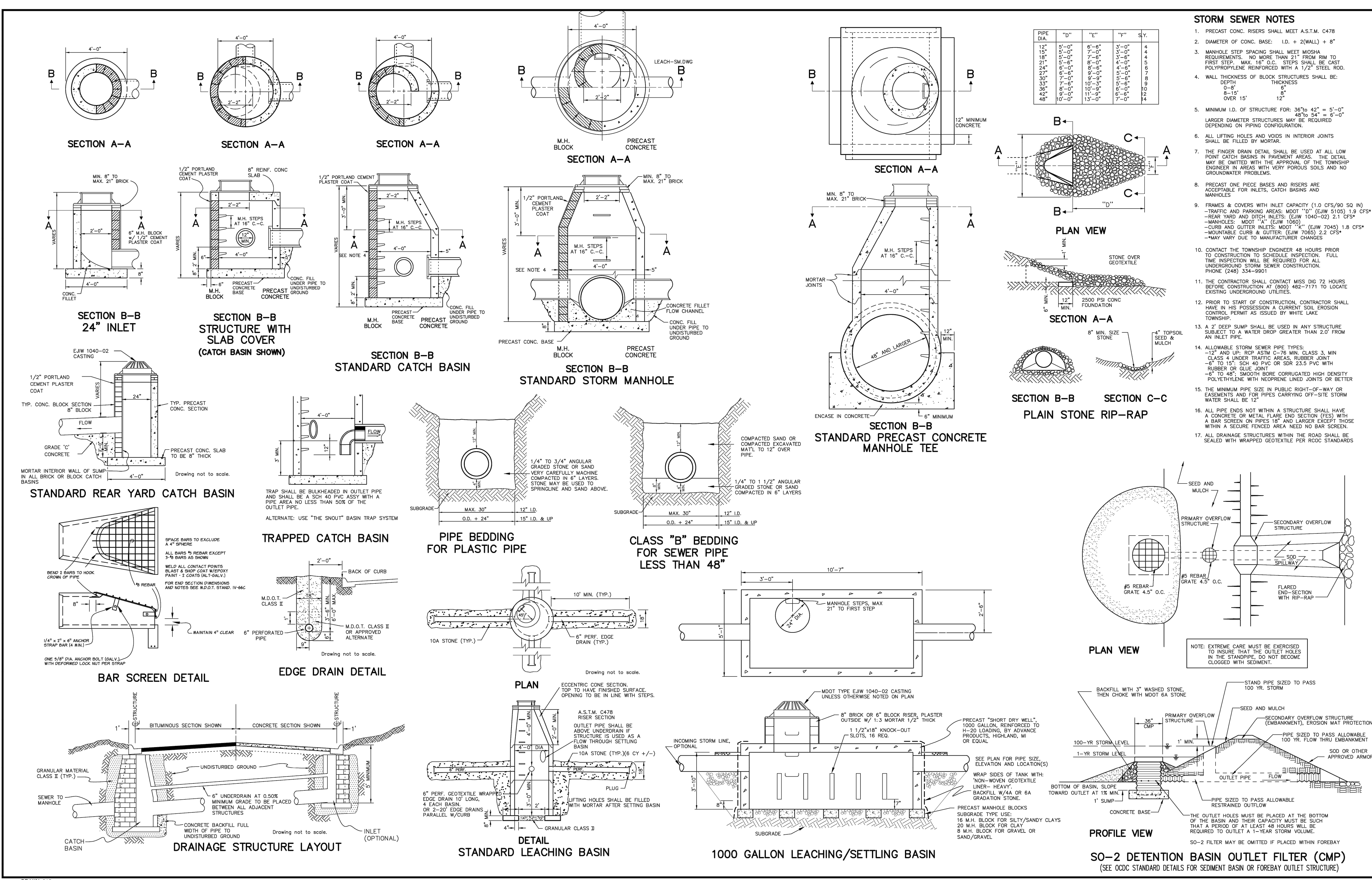
BEFORE ANY WORK BEGINS, THE CONTRACTOR SHALL CALL MISS DIG TO LOCATE ALL UTILITIES. MISS DIG CALL NUMBER: 1-800-487-7171

BEBOSS
Engineering
 Engineers Surveyors Planners Landscape Architects
 3121 E. GRAND RIVER AVE.
 HOWELL, MI. 48843
 517.546.4836 FAX 517.548.1670

GATEWAY CROSSING
 GATEWAY CROSSING, LLC
 600 NORTH OGDON AVENUE, SUITE 101
 BIRMINGHAM, MI 48209
 248-937-7000

NO.	DATE	REVISION PER	BY
1	09/23/24	REV #1	DA
2	11/12/24	REV #2	DA
3	09/09/23	REV #1	DA
1	09/09/23	REV #1	DA

DESIGNED BY: []
 DRAWN BY: []
 CHECKED BY: []
 SCALE: NO SCALE
 JOB NO: 22-029-1
 DATE: 01/05/23
 SHEET NO. 12



NO.	DATE	REVISION PER	BY
1	08/16/95	REV #1	DA
2	08-17-96	REV #2	DA
3	11-03-97	REV #3	DA

Johnson & Anderson
 4494 Elizabeth Lake Road
 Waterford, Michigan 48328
 tel (248) 681-7800 fax (248) 681-2660

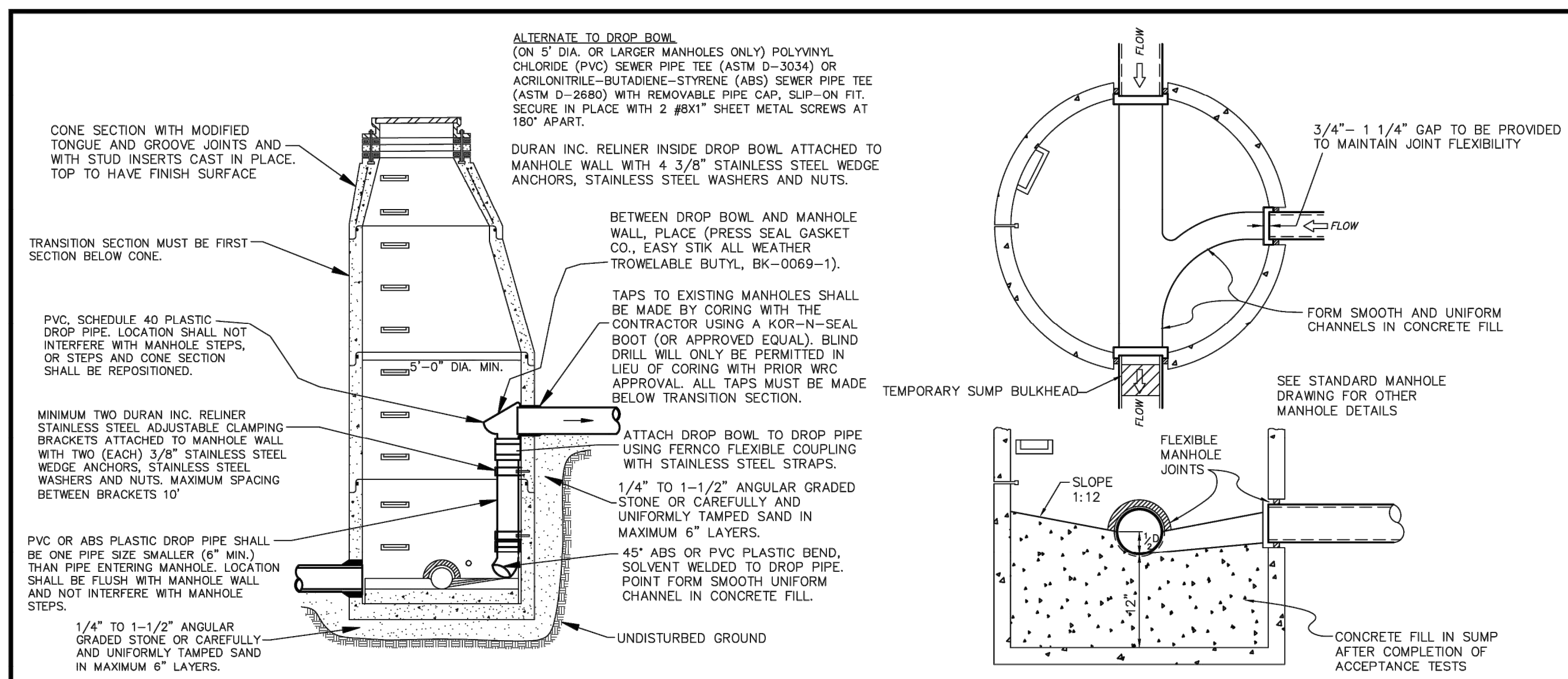
1060 W. Norton Avenue, Suite 7
 Muskegon, Michigan 49441
 tel (231) 760-3100 fax (231) 760-3115

3910 Lapeer Road
 Port Huron, Michigan 48050
 tel (810) 987-7820 fax (810) 987-7895

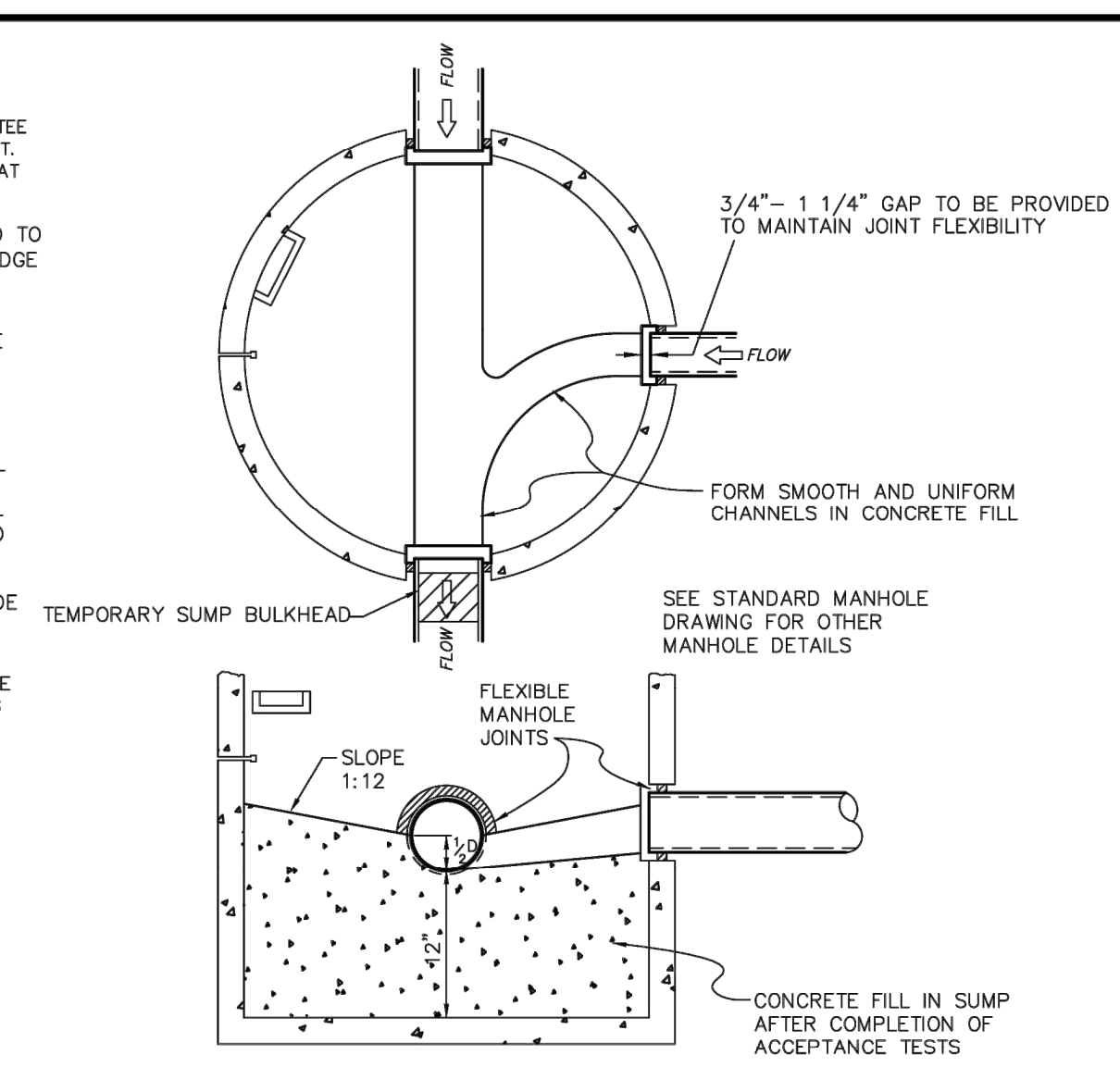
White Lake Township
 7525 Highland Road (M-59)
 White Lake, Michigan 48383
 248-698-3300

STORM SEWER STANDARD DETAILS

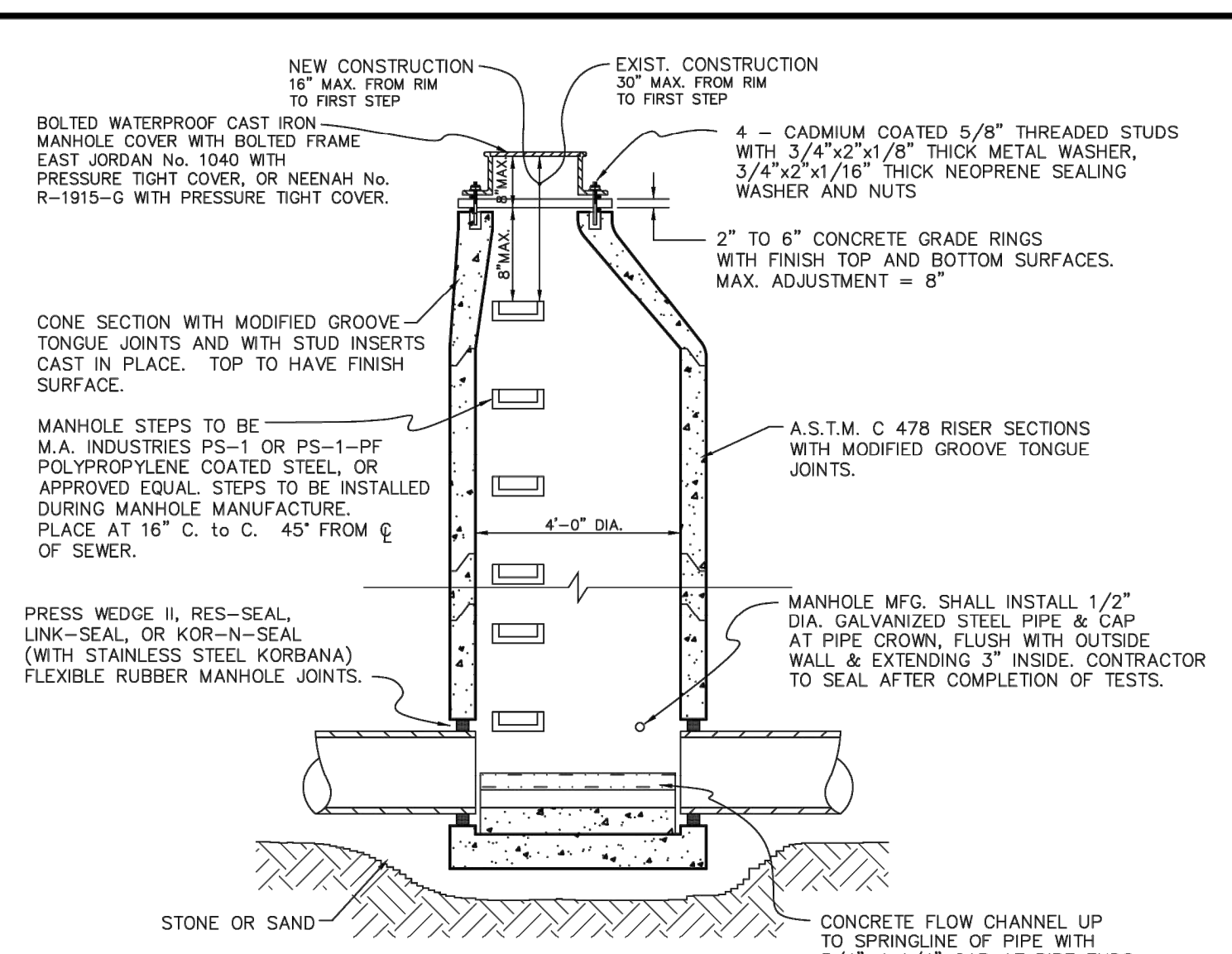
SCALE: VERT. -
 HORZ. AS NOTED



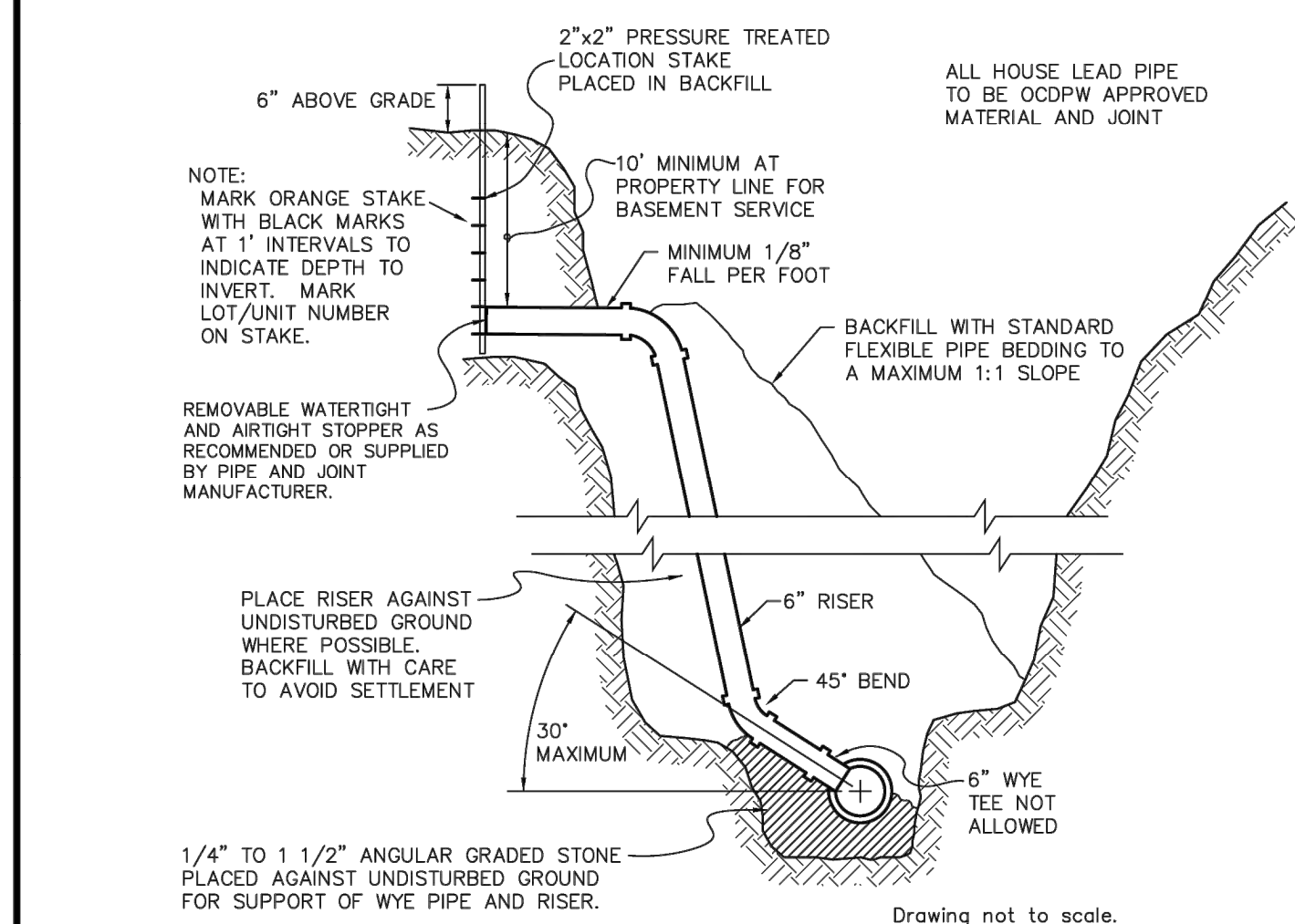
INTERIOR DROP CONNECTION



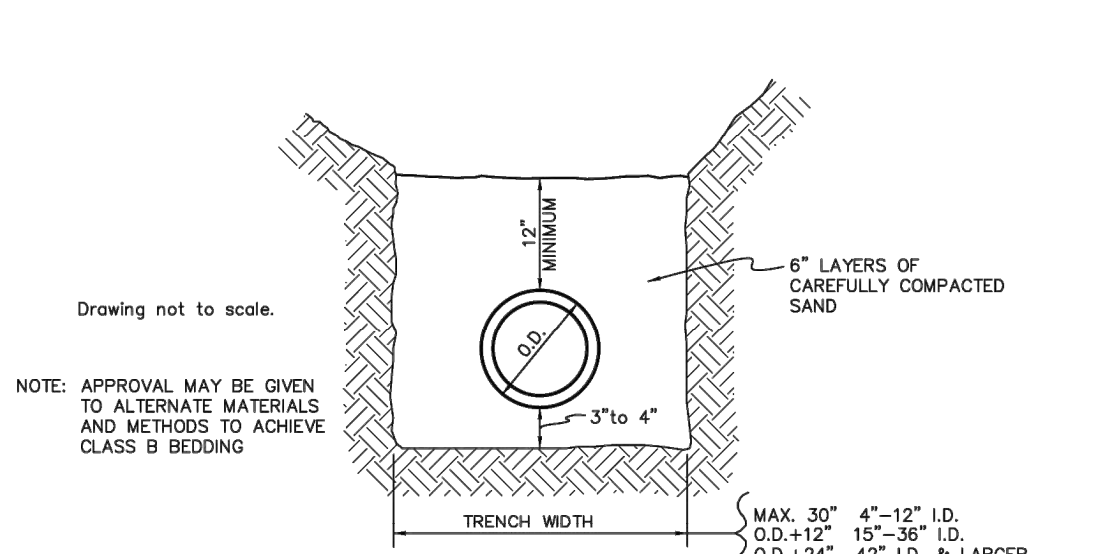
SUMP MANHOLE FOR TESTING, CLEANING, AND DEWATERING



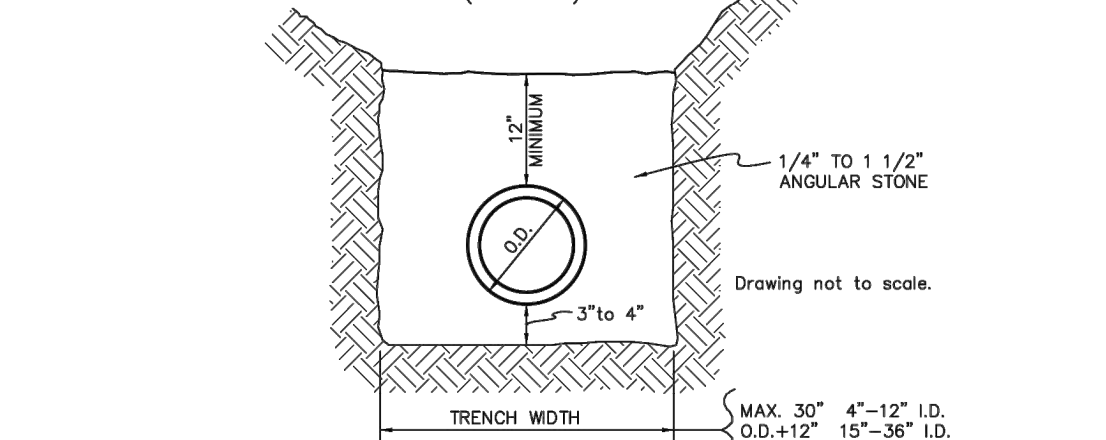
STANDARD MANHOLE ON 8" THROUGH 24" DIAMETER SEWERS



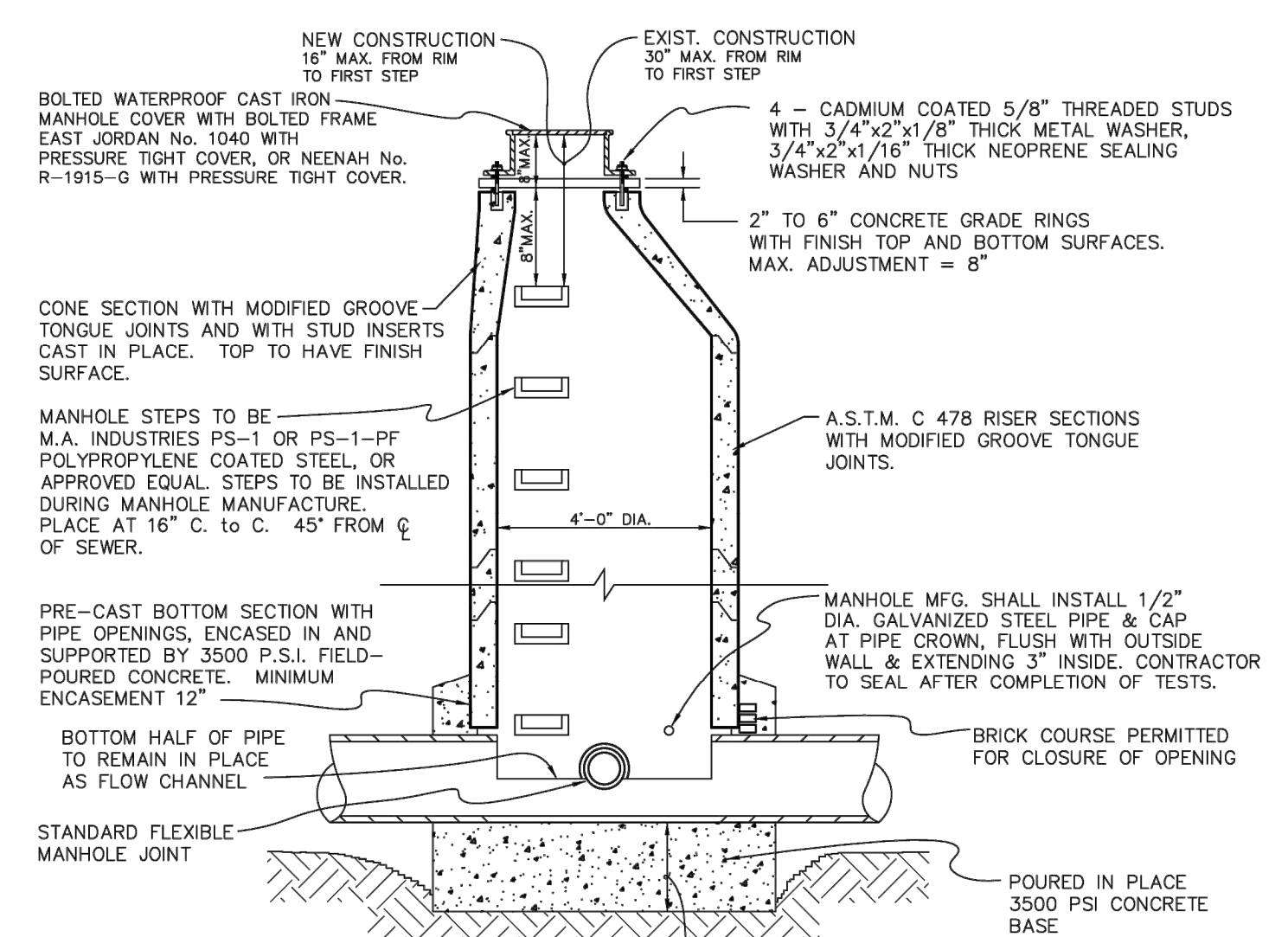
HOUSE/BUILDING LEAD DETAIL



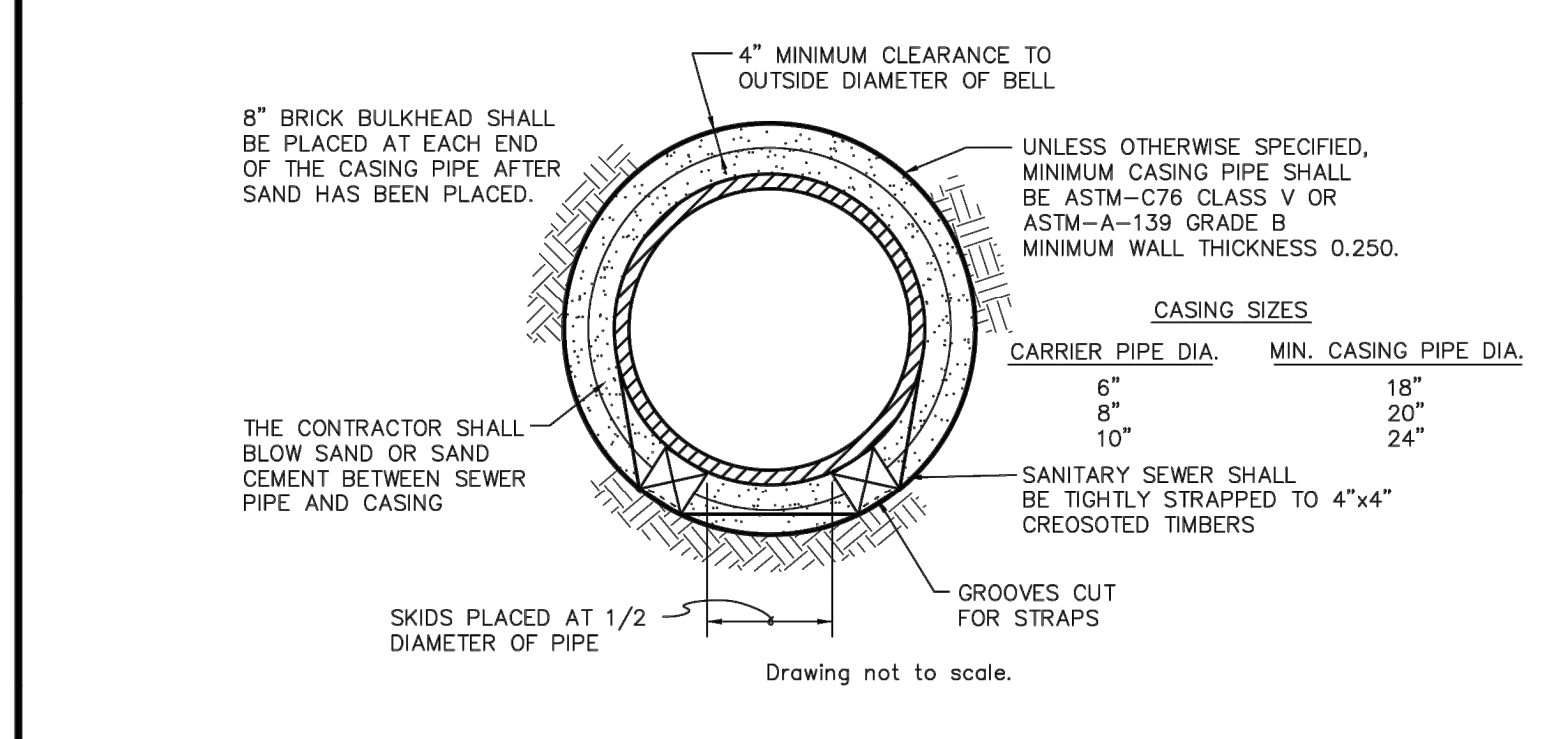
BEDDING DETAIL FOR RIGID PIPE (CLASS B)



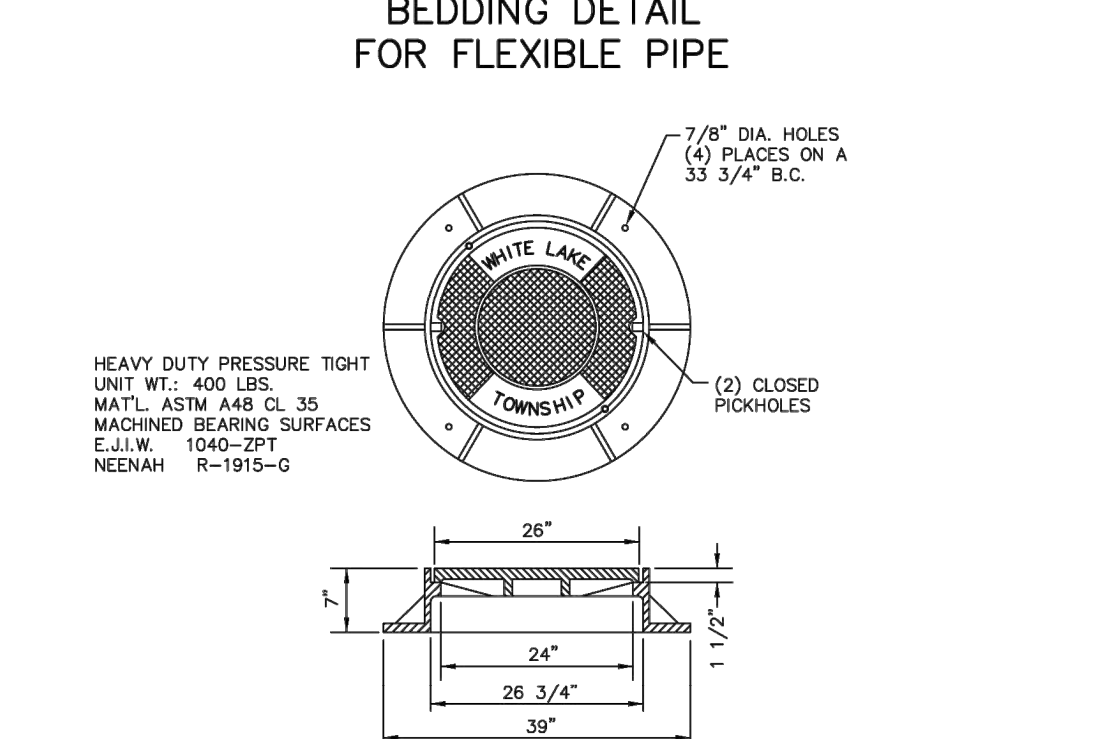
BEDDING DETAIL FOR FLEXIBLE PIPE



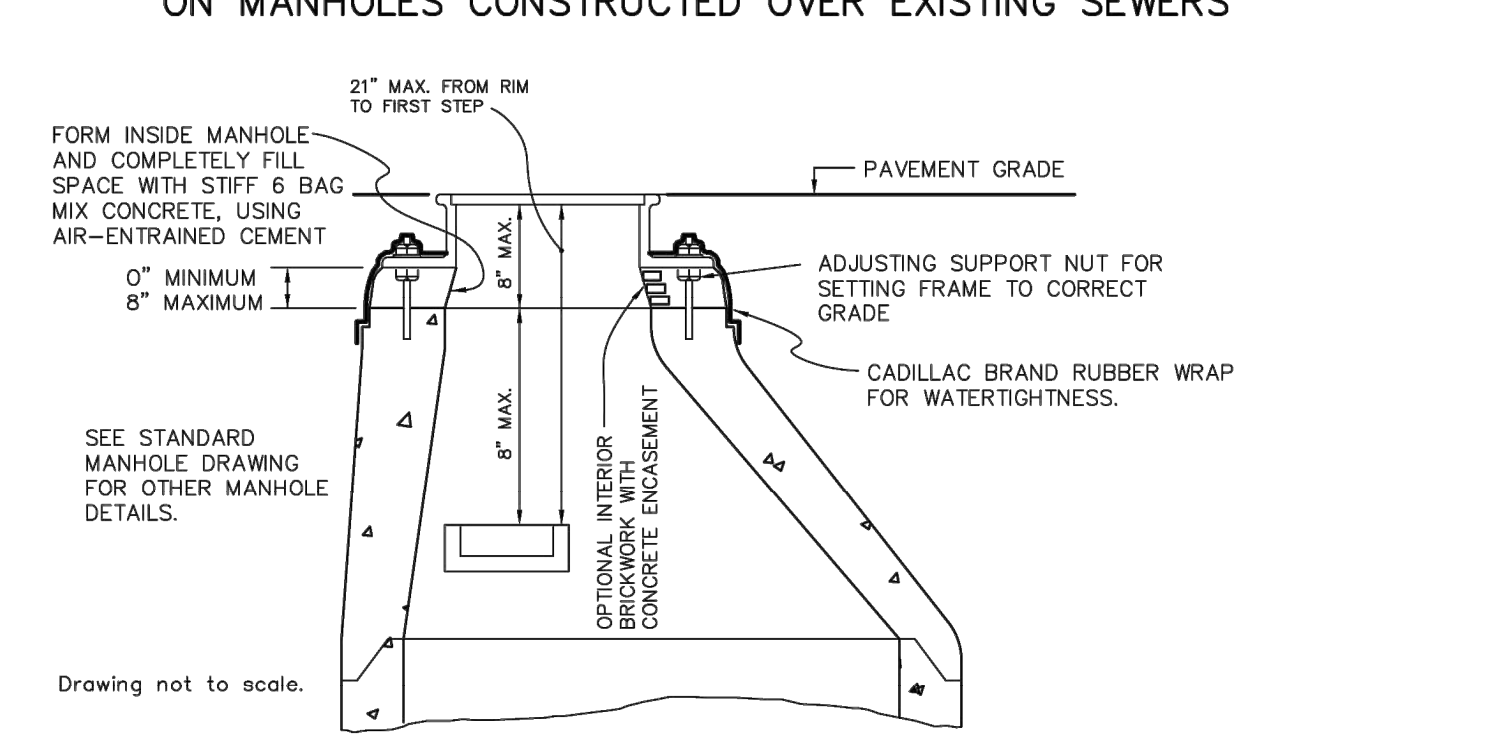
SKETCH OF MINIMUM MANHOLE REQUIREMENTS ON MANHOLES CONSTRUCTED OVER EXISTING SEWERS



PIPE BARREL SUPPORT FOR SEWER



MANHOLE COVER & FRAME



OPTIONAL CONSTRUCTION DETAILS

SANITARY SEWER CONSTRUCTION NOTES

- All construction shall conform to the current standards and specifications of the local unit of government and the Oakland County Water Resources Commissioner (OCWRC). All sanitary sewer construction shall have full time inspection supervised by a professional engineer provided by or caused to be provided by the local unit of government.
- At all connections to Oakland County Water Resources Commissioner's sewers or extensions, and before start of construction, the Contractor must obtain a Sewer Inspection Permit issued by the OCWRC. Gravity sewer permit charges are \$250.00 per each connection plus \$25.00 for each manhole constructed. Pressure sewer permit charges are \$250.00 per 2460 L.F. of force main with a minimum permit fee of \$250.00. Failure to pass any test segment will result in an additional charge to the Contractor for each retest, in accordance with the above price schedule. The Contractor shall also have posted with the OCWRC a \$5,000.00 surety bond and \$500.00 cash deposit. The Contractor shall notify the local unit of government and the OCWRC (248-858-1110) 24 hours prior to the beginning of any construction. Final acceptance tests must be witnessed by County personnel and must be scheduled by Municipality or it's consultant in advance with 24 hour notice at 248-858-1110.
- No sewer installation shall have an infiltration or exfiltration exceeding 100 gallons per inch diameter per mile of pipe in a 24 hour period, and no single run of sewer between manholes shall exceed 100 gallons per inch diameter per mile. Air tests in lieu of infiltration tests shall be as specified in the OCWRC "Acceptance Tests", dated September, 1972. Only pipe and pipe joints approved by the Oakland County Water Resources Commissioner may be used for sanitary sewer construction.
- Located in the first manhole upstream from the point of all connections to an existing OCWRC sewer, or extension thereof, a temporary 12-inch deep sump shall be provided in the first manhole above the connection which will be filled in after such successful completion of any acceptance test up to the standard fill provided for the flow channel. A watertight bulkhead shall be provided on the downstream of the sump manhole.
- All building leads and risers shall be 6-inch S.D.R. 23.5 ABS OR PVC pipe with chemically fused joints, or an approved equal pipe and joint. Sewer pipe wye shall contain factory installed premium joint material of an approved type compatible with that of the building lead pipe used. Building leads to be furnished with removable air tight and water-tight stoppers.
- All rigid sewer pipe shall be installed in Class "B" bedding or better. All flexible, semi-flexible or composite sewer pipe shall be installed in conformance to the Oakland County Water Resources Commissioner specifications.
- All new manholes shall have Oakland County Water Resources Commissioner approved flexible, water-tight seals where pipes pass through walls. Manholes shall be of precast sections with modified groove tongue and rubber gasket type joints. Precast manhole cone sections shall be Oakland County Water Resources Commissioner approved modified eccentric cone type. All manholes shall be provided with bolted, water-tight covers.
- At all connections to manholes on Oakland County Water Resources Commissioner's sewers or extensions thereto drop connections will be required when the difference in invert elevations exceeds 18-inches. Outside drop connections only will be approved.
- Taps to existing manholes shall be made by coring. The Contractor shall place a KOR-N-SEAL boot (or OCWRC approved equal) after coring is completed. Blind drilling will not be permitted in lieu of coring.
- New manholes constructed directly on Oakland County Water Resources Commissioner's sewers shall be provided with covers reading "Oakland County - Sanitary" in raised letters. New manholes built over an existing sanitary sewer shall have monolithic poured bottoms.
- No ground water, storm water, construction water, downspout drainage or weep tile drainage shall be allowed to enter any sanitary sewer installation.
- Prior to excavation, the Contractor shall telephone MISS DIG (647-7344) for the location of underground pipeline and cable facilities, and shall also notify representatives of other utilities located in the vicinity of the work.
- 18" minimum vertical separation and 10' minimum horizontal separation must be maintained between sanitary sewer and water main.
- Manhole frame and cover shall be as follows: East Jordan heavy manhole cover, base flange type #1040 or Neenah Foundry heavy duty #R-1642 manhole frame. Solid lid cover shall be non-rocking and marked "WHITE LAKE TOWNSHIP SEWER DEPARTMENT."

DRAWN CAD
DESIGN DA
CHECKED--

REVISIONS	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE
		FIRST ISSUE	09/11/97		OCWRC COMMENTS	11/06/15
		UPDATED TITLE BLOCK	04/30/13			
		UPDATED NOTES	02/17/15			

Johnson & Anderson
 4484 Elizabeth Lake Road
 Waterford, Michigan 48328
 tel (248) 681-7800 fax (248) 681-2980

1060 W. Norton Avenue, Suite 7
 Muskegon, Michigan 49441
 tel (231) 786-3100 fax (231) 786-3115

2291 Water Street, Suite 6
 Port Huron, Michigan 48060
 tel (810) 987-7820 fax (810) 987-7895

White Lake Township
 7525 Highland Road (M-59)
 White Lake, Michigan 48383
 248-698-3300



SANITARY SEWER STANDARD DETAILS

SCALE: VERT. -
HORIZ. AS NOTED

JOB NO.	09/11/97
DATE ISSUED	09/11/97
SHEET NO.	

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OF THESE UTILITIES. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS BEFORE THE START OF CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS BEFORE THE START OF CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONFLICTS BEFORE THE START OF CONSTRUCTION.

BEFORE ANY WORK BEGINS
 CALL MISS DIG
 1-800-487-7171
 248-858-1110

BEBOSS Engineering
 Engineers Surveyors Planners Landscape Architects
 3121 E. GRAND RIVER AVE.
 HOWELL, MI. 48843
 517.546.4836 FAX 517.548.1670

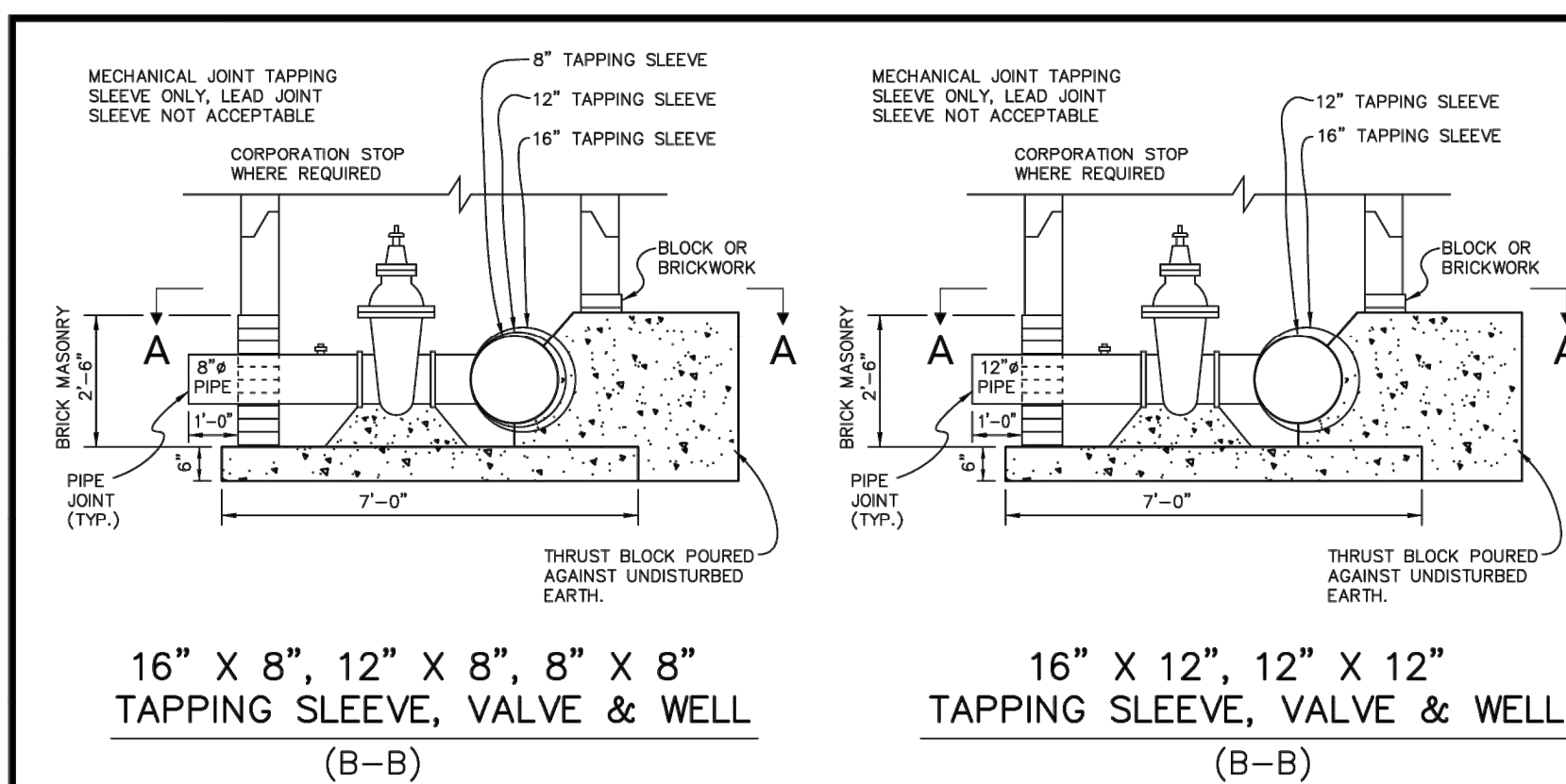
GATEWAY CROSSING
 GATEWAY CROSSING, LLC
 600 NORTH OLD WOODWARD, SUITE 101
 BIRMINGHAM, MI. 48009
 248-937-7000

PROJECT	PREPARED FOR	TITLE	DATE
		TOWNSHIP SANITARY DETAILS	

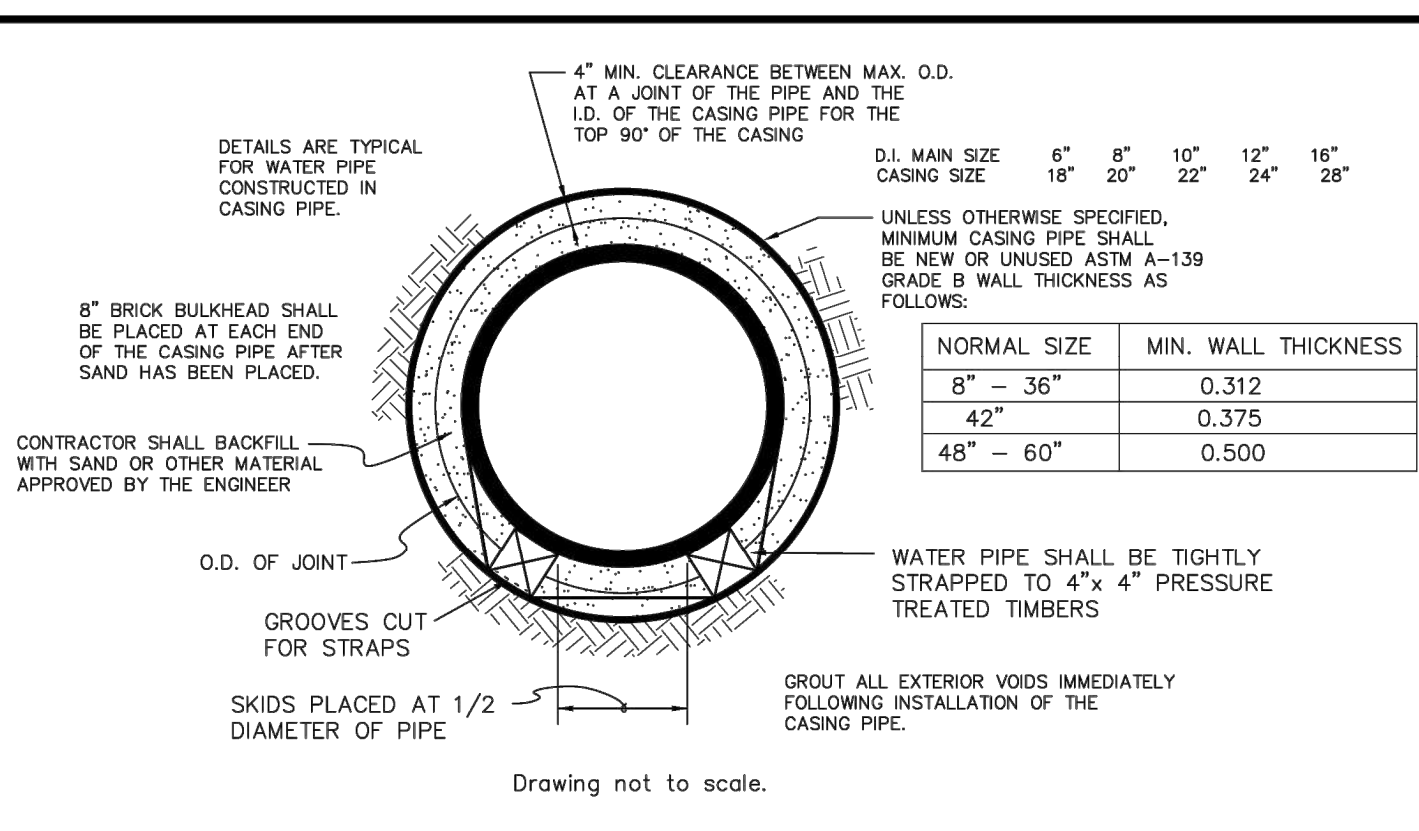
NO.	BY	DATE	REVISION PER
1	DA	09/09/23	REV #1
2	MD	1/12/24	REV #2
3	ST	2/28/24	REV #3

DESIGNED BY:
 DRAWN BY:
 CHECKED BY:
 SCALE: NO SCALE
 JOB NO: 22-029-1
 DATE: 01/05/23
 SHEET NO. 13

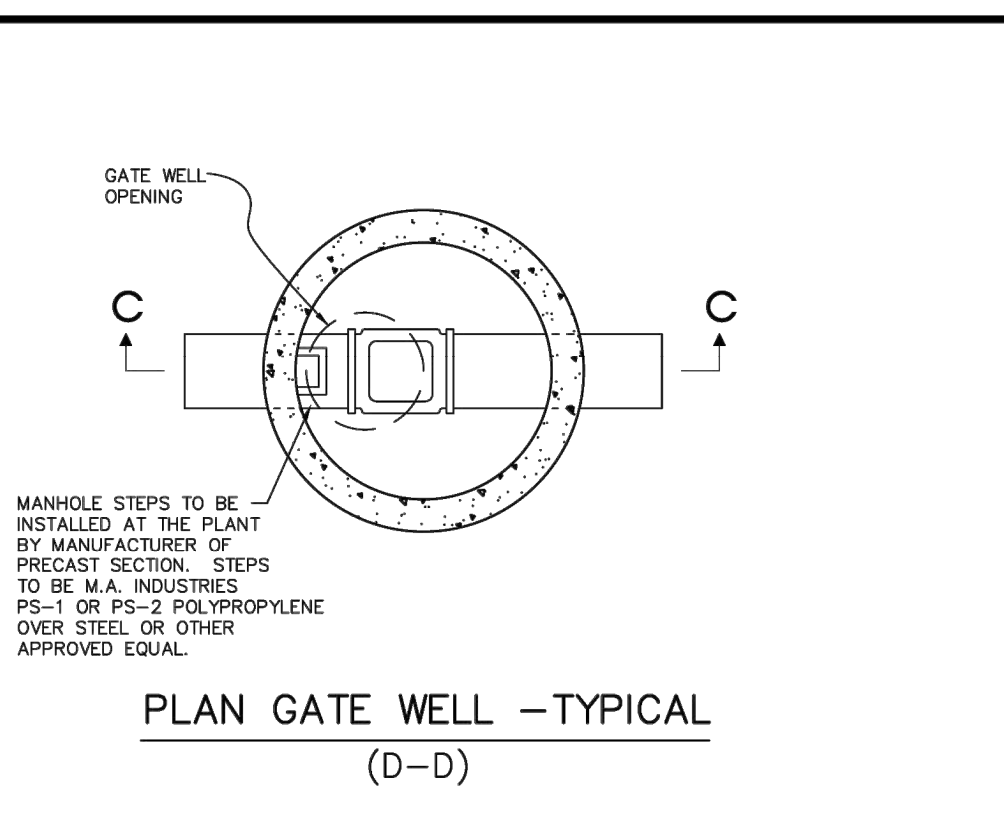




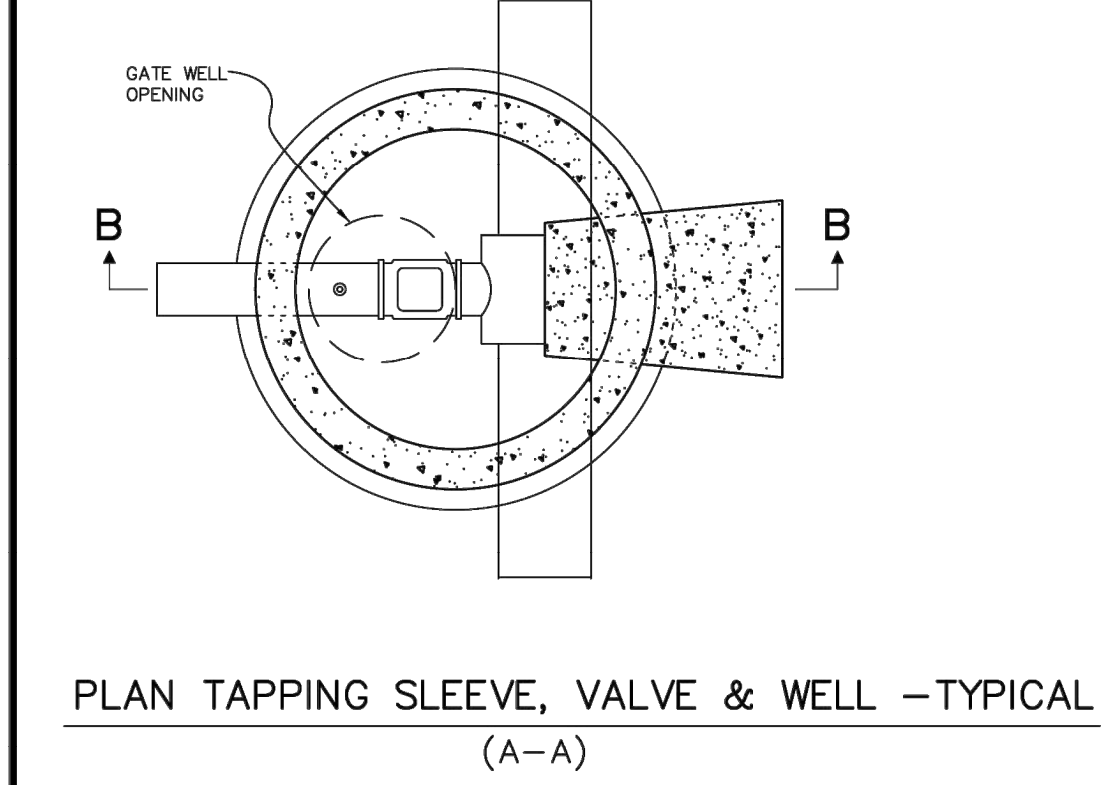
16" X 8", 12" X 8", 8" X 8" TAPPING SLEEVE, VALVE & WELL (B-B)



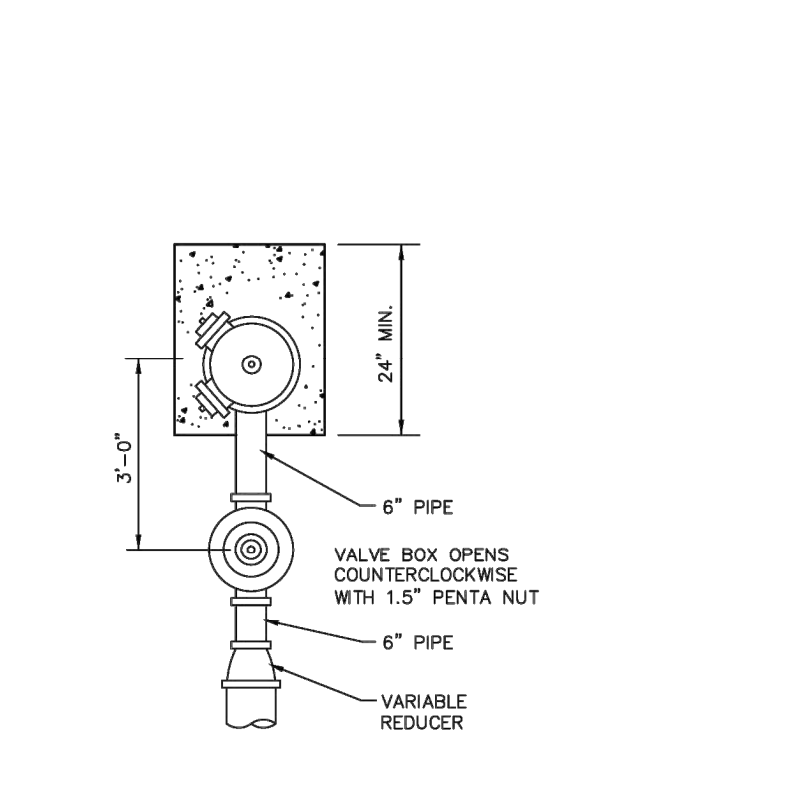
PIPE BARREL SUPPORT FOR WATER MAIN CONSTRUCTED IN CASING



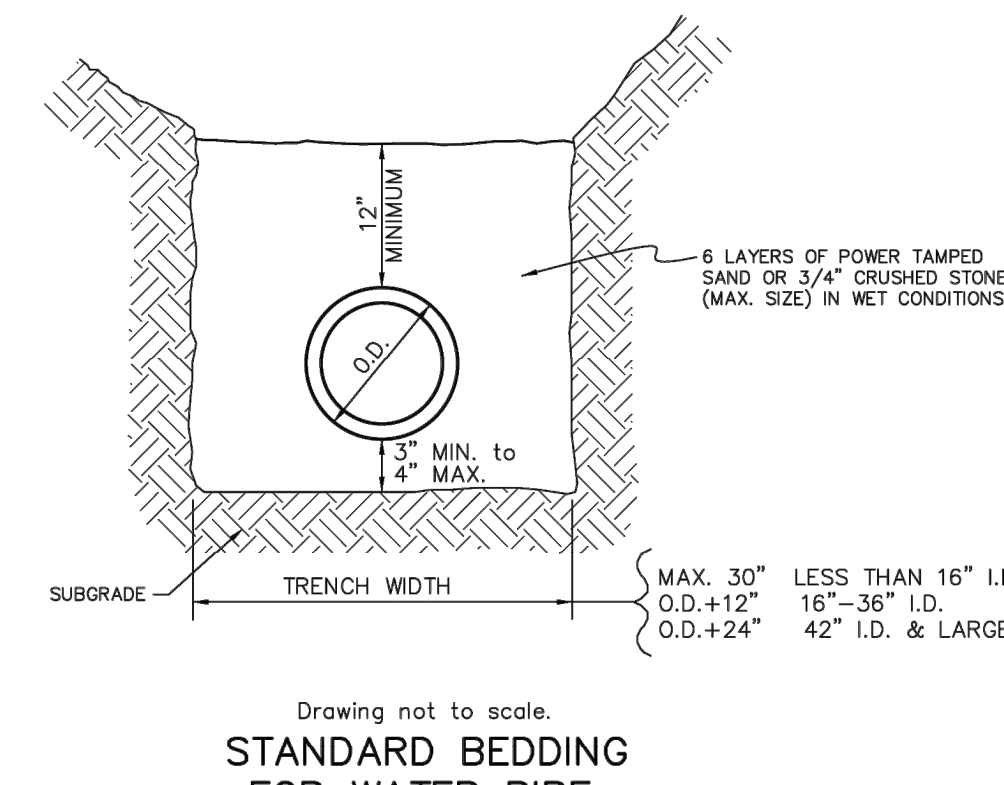
PLAN GATE WELL - TYPICAL (D-D)



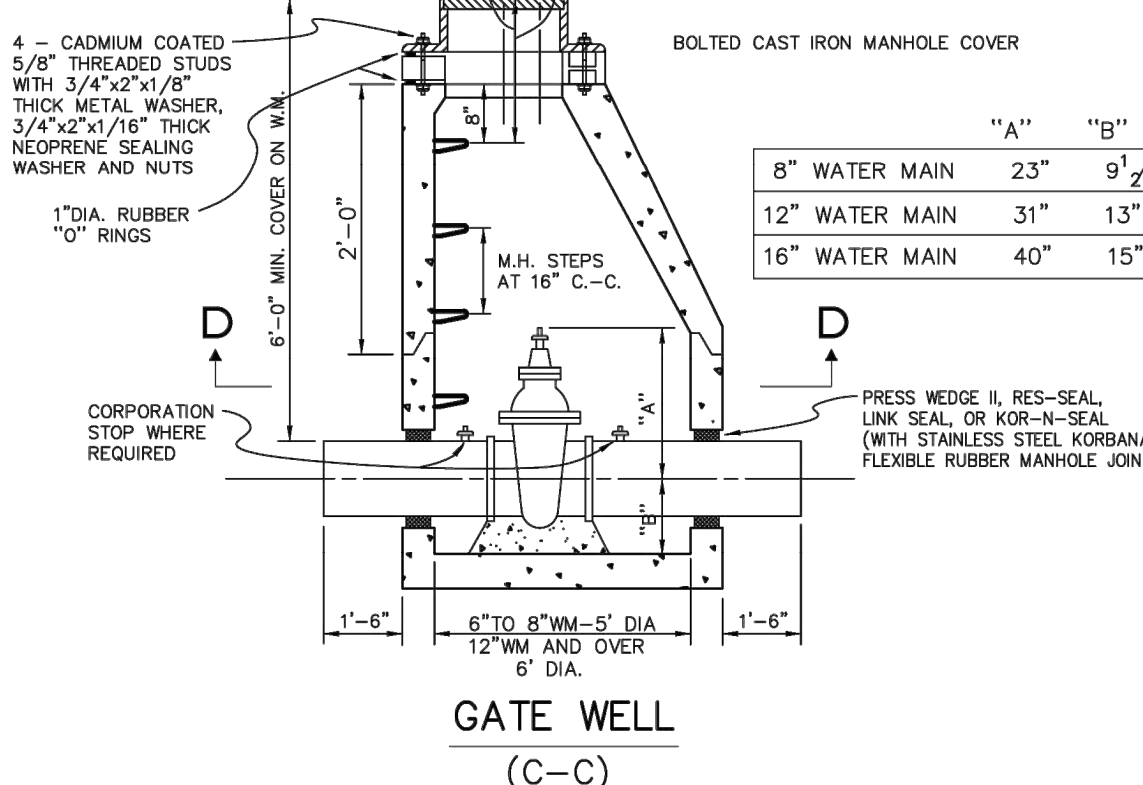
PLAN TAPPING SLEEVE, VALVE & WELL - TYPICAL (A-A)



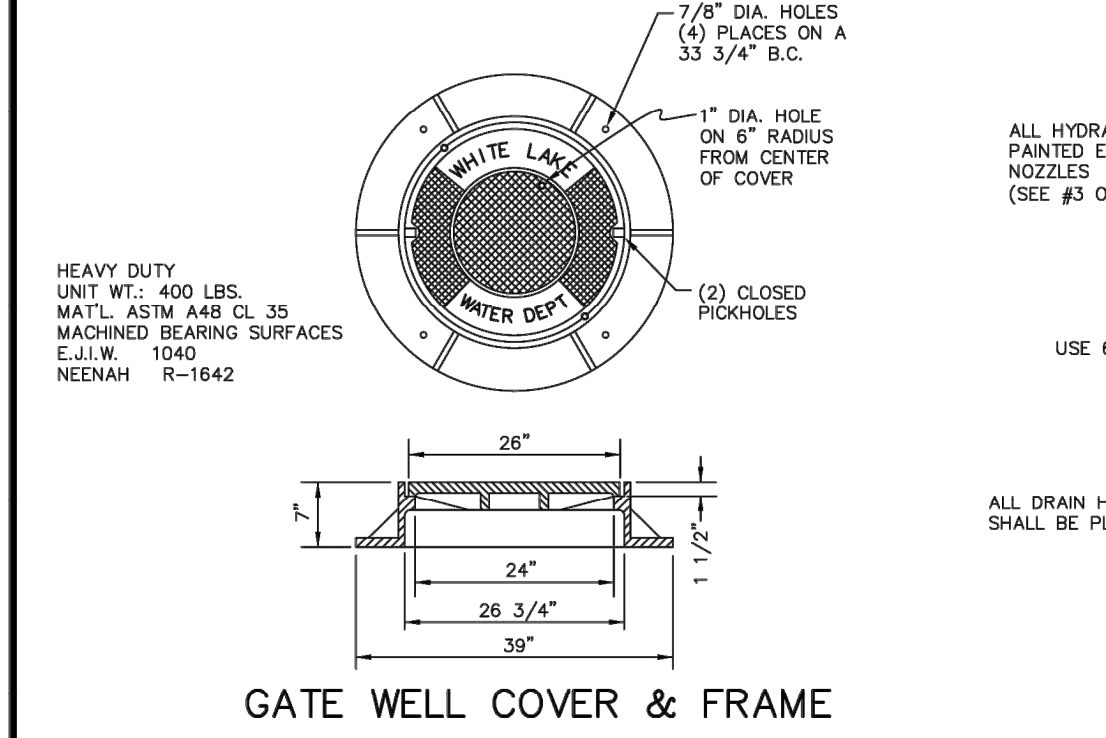
DETAIL OF HYDRANT SETTINGS



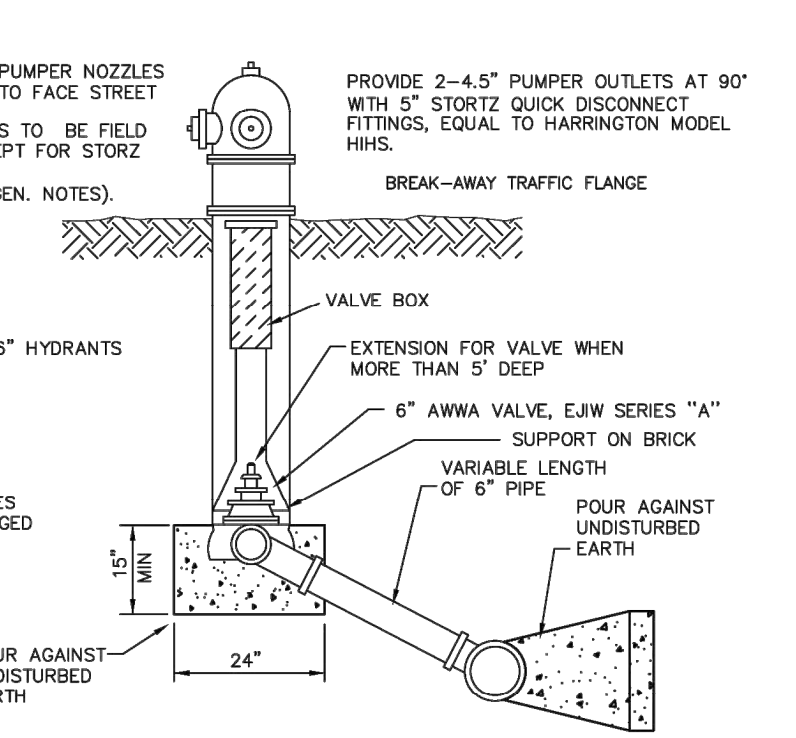
STANDARD BEDDING FOR WATER PIPE



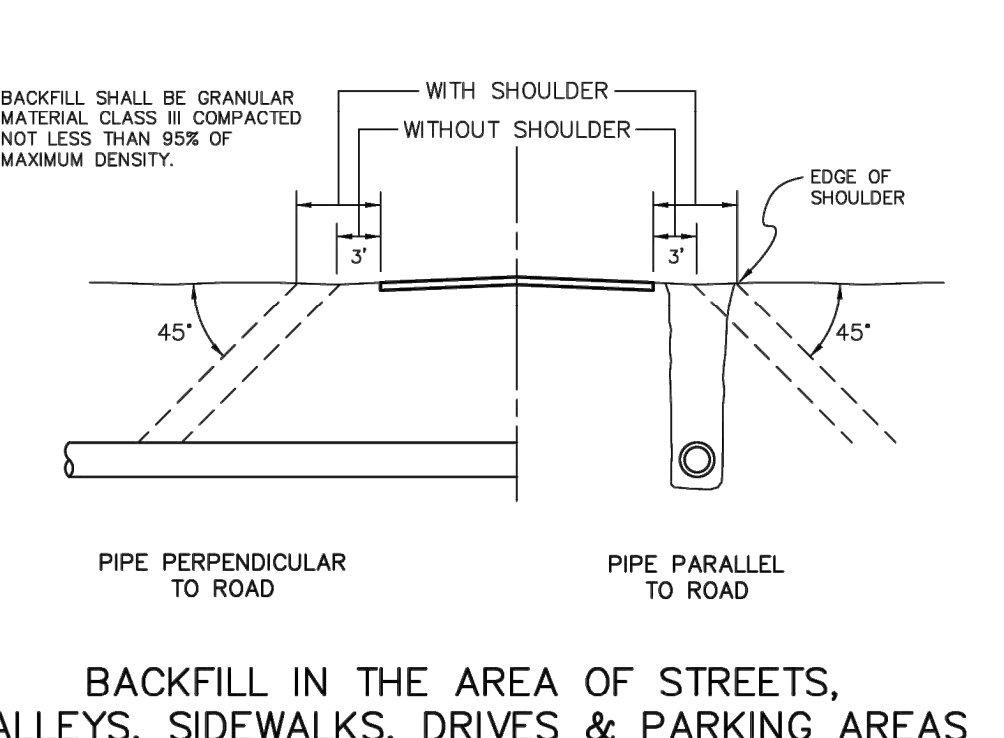
GATE WELL (C-C)



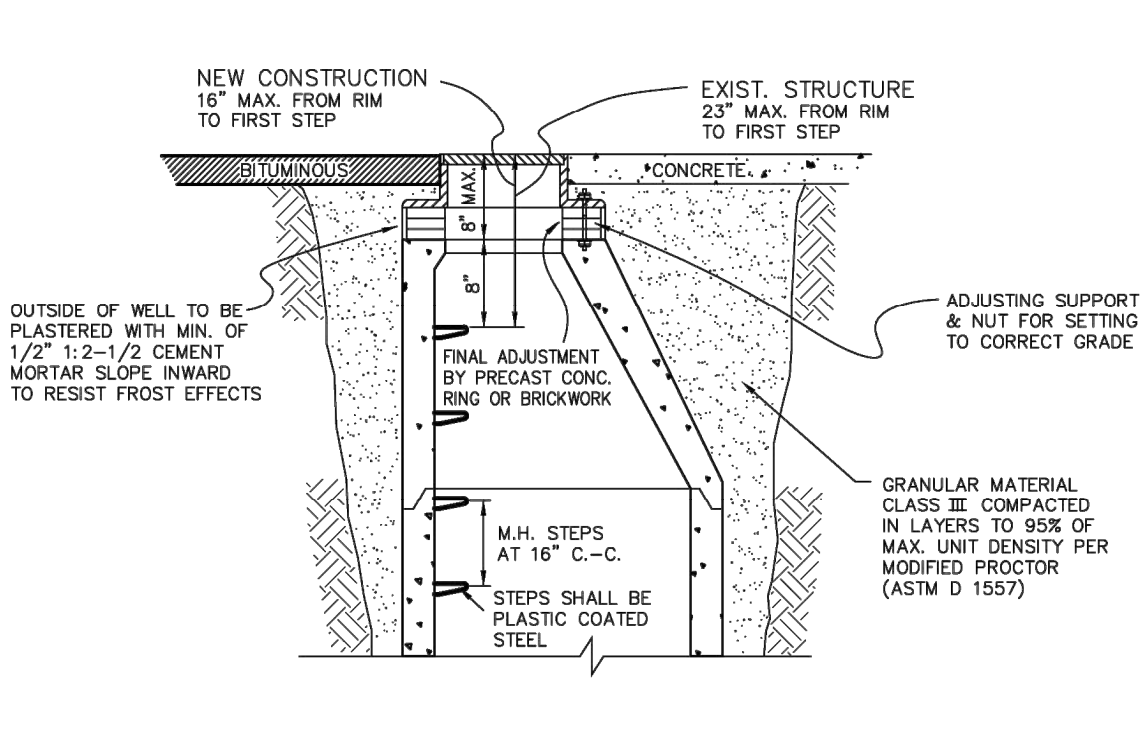
GATE WELL COVER & FRAME



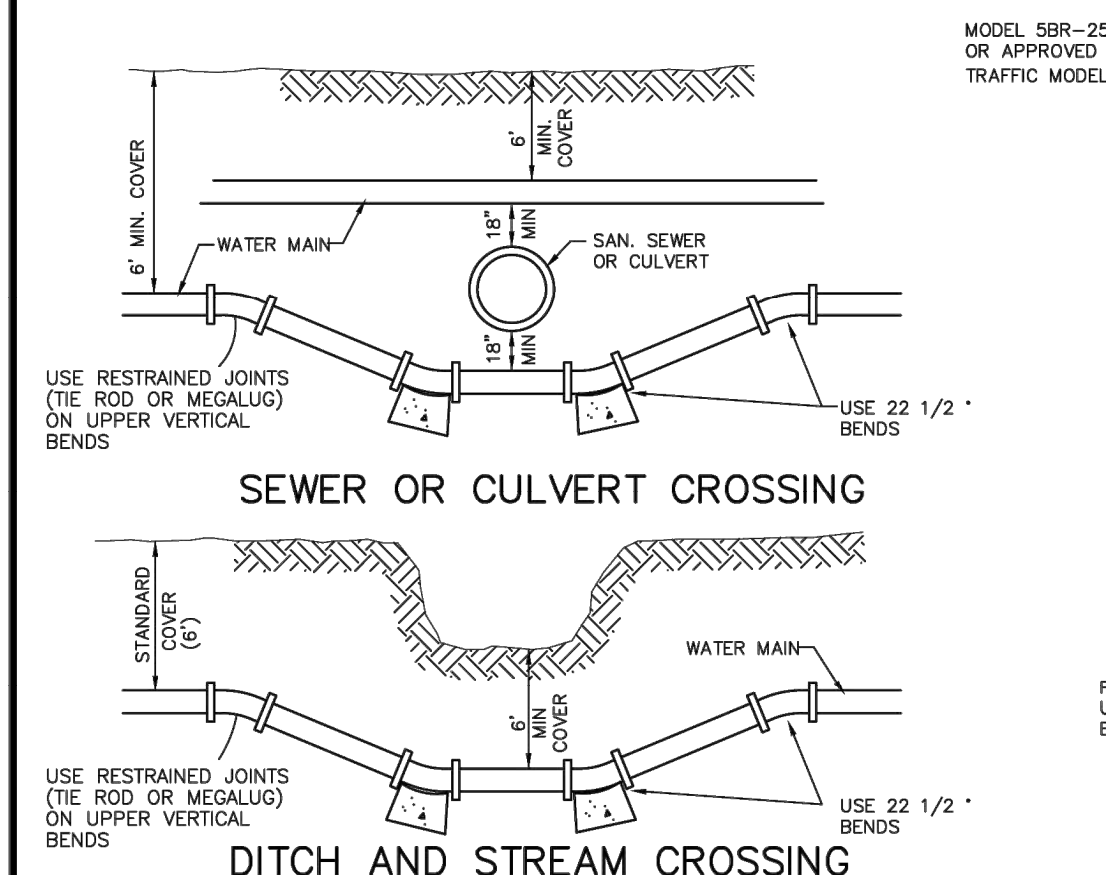
DETAIL OF HYDRANT SETTINGS



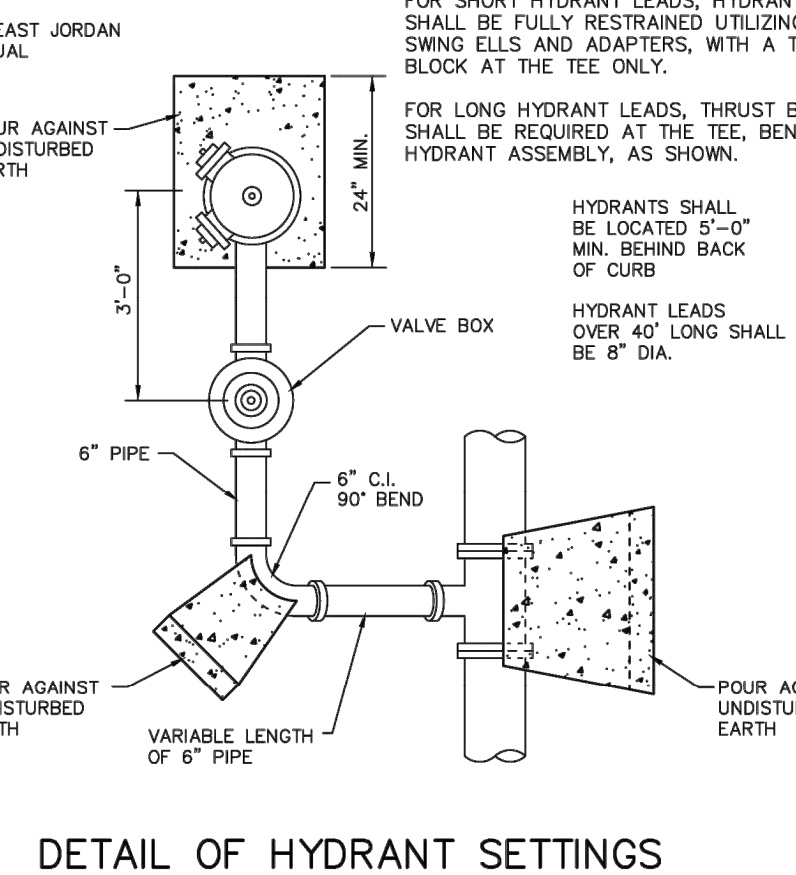
BACKFILL IN THE AREA OF STREETS, ALLEYS, SIDEWALKS, DRIVES & PARKING AREAS



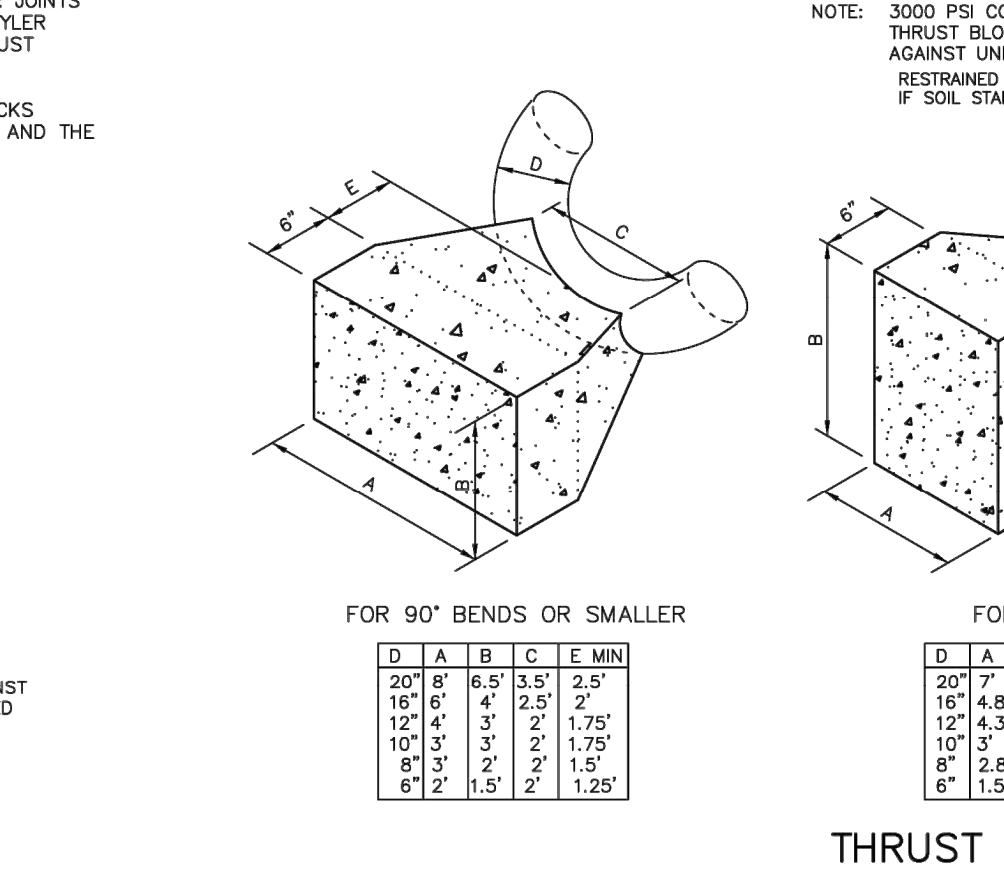
GATE WELL TOPS WITHIN PAVEMENT AREAS



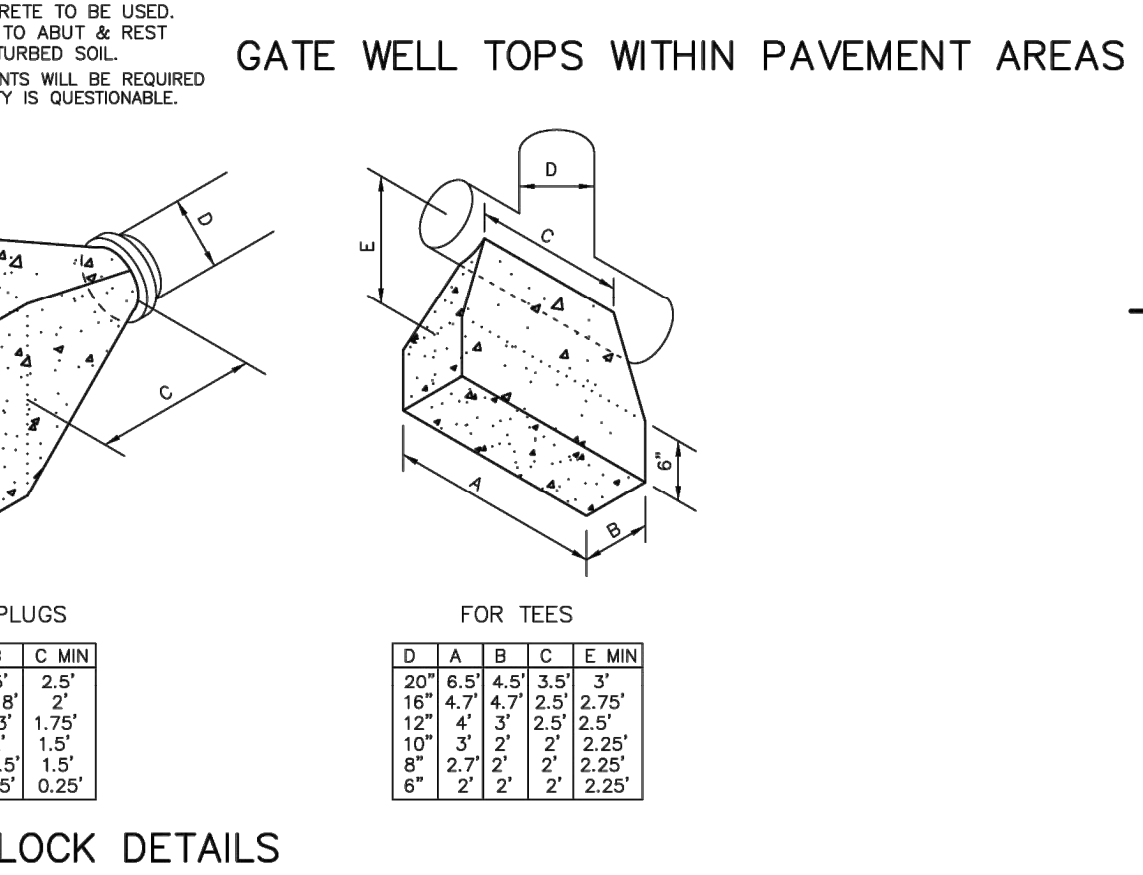
SEWER OR CULVERT CROSSING



DETAIL OF HYDRANT SETTINGS

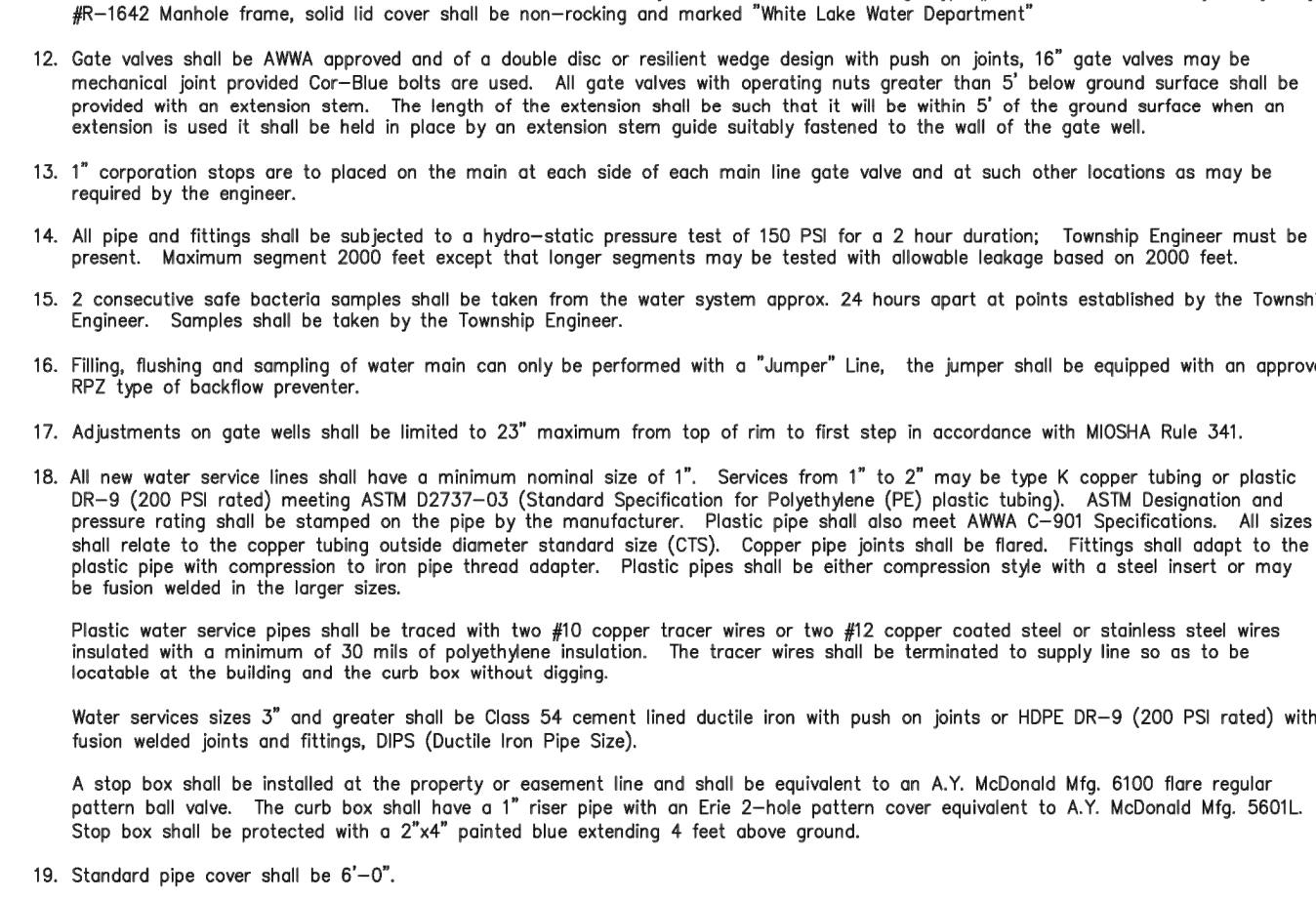


THRUST BLOCK DETAILS

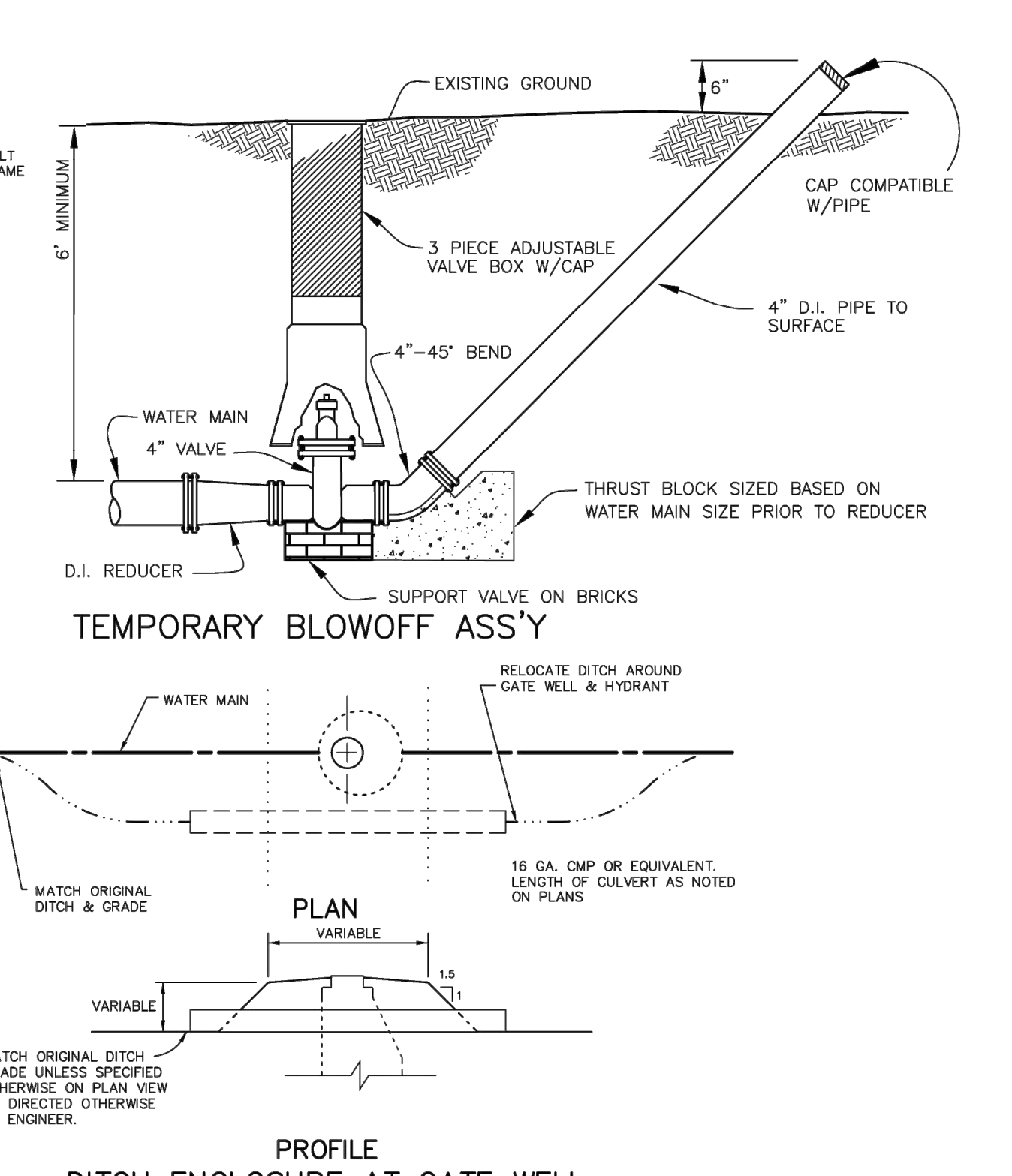


GATE WELL TOPS WITHIN PAVEMENT AREAS

- WATER MAIN NOTES
- All construction procedures and materials used on this project shall conform to White Lake Township current standards and specifications.
 - All hydrants shall be East Jordan Iron Works SBR-250 traffic model. Self-draining hydrants shall not be used. Valve shall have 1-1/2" pentagon nut and shall open counter-clockwise. Provide two 4.5" pumper outlets with 5" Storz quick connect nozzles (Harrington Integral Hydrant Storz, Model HHS) as manufactured by Harrington, Inc. of Erie, PA.
 - All hydrants shall be field painted with a heavy coat of bright safety red polyurethane or alkyd glass enamel, except for the Storz fittings and caps, which shall be left unpainted.
 - All water mains shall be ductile iron pipe Class 54, cement lined with push on joints. Mechanical joints allowed only for tapping sleeves, hydrants & hydrant valves. Only Cor-Blue bolts shall be used for assembling mechanical joints. All bends, tees, valves and hydrant tees shall have a poured concrete thrust block as detailed on this sheet. Joints which have thrust blocks bearing on soil of questionable stability shall be fully restrained utilizing Tyler steel disc and adapters or a system approved by the Township Engineer. HDPE pipe for directional boring, if approved by the Township Engineer, shall meet all of the requirements of the MDEQ and shall be DR9 (200 psi), and shall have two #8 tracer wires, terminated in the nearest gate well at the highest step.
 - Tapping sleeve shall be mechanical joint or approved equal. Ductile iron or stainless steel are allowed.
 - Specifications shall include direction of operation of all valves. All valves shall be counter clockwise open.
 - All necessary easements shall be provided in the name of White Lake Township before acceptance of the water distribution system.
 - The design engineer shall furnish White Lake Township with one reproducible set of "As-Built" water main plans or an AutoCAD file upon completion of the job.
 - All required cross-connection devices shall be installed as required by the local plumbing inspector and in accordance with the standards of the Michigan Department of Public Health.
 - Gate well frame and cover shall be as follows: East Jordan heavy manhole cover, base flange type #1040 or Neenah Foundry heavy duty #R-1642 Manhole frame, solid lid cover shall be non-rocking and marked "White Lake Water Department"
 - Gate valves shall be AWWA approved and of a double disc or resilient wedge design with push on joints, 16" gate valves may be mechanical joint provided Cor-Blue bolts are used. All gate valves with operating nuts greater than 5' below ground surface shall be provided with an extension stem. The length of the extension shall be such that it will be within 5' of the ground surface when an extension is used it shall be held in place by an extension stem guide suitably fastened to the wall of the gate well.
 - 1" corporation stops are to be placed on the main at each side of each main line gate valve and at such other locations as may be required by the engineer.
 - All pipe and fittings shall be subjected to a hydro-static pressure test of 150 PSI for a 2 hour duration; Township Engineer must be present. Maximum segment 2000 feet except that longer segments may be tested with allowable leakage based on 2000 feet.
 - 2 consecutive safe bacteria samples shall be taken from the water system approx. 24 hours apart at points established by the Township Engineer. Samples shall be taken by the Township Engineer.
 - Filling, flushing and sampling of water main can only be performed with a "Jumper" Line. The jumper shall be equipped with an approved RPZ type of backflow preventer.
 - Adjustments on gate wells shall be limited to 23" maximum from top of rim to first step in accordance with MGHSA Rule 341.
 - All new water service lines shall have a minimum nominal size of 1". Services from 1" to 2" may be type K copper tubing or plastic DR-9 (200 PSI rated) meeting ASTM D2277-03 (Standard Specification for Polyethylene (PE) plastic tubing). ASTM Designation and pressure rating shall be stamped on the pipe by the manufacturer. Plastic pipe shall also meet AWWA C-901 Specifications. All sizes shall relate to the copper tubing outside diameter standard size (CTS). Copper pipe joints shall be flared. Fittings shall adapt to the plastic pipe with compression or top pipe thread adaptor. Plastic pipe shall be either compression style with a steel insert or may be fused in the larger sizes.
 - Plastic water service pipes shall be traced with two #10 copper tracer wires or two #12 copper coated steel or stainless steel wires insulated with a minimum of 30 mils of polyethylene insulation. The tracer wires shall be terminated to supply line so as to be locatable at the building and the curb box without digging.
 - Water services sizes 3" and greater shall be Class 54 cement lined ductile iron with push on joints or HDPE DR-9 (200 PSI rated) with fusion welded joints and fittings, DIPS (Ductile Iron Pipe Size).
 - A stop box shall be installed at the property or easement line and shall be equivalent to an A.Y. McDonald Mfg. 6100 fire regular pattern ball valve. The curb box shall have a 1" riser pipe with an Erie 2-hole pattern cover equivalent to A.Y. McDonald Mfg. #561L. Stop box shall be protected with a 2'x4' painted blue extending 4 feet above ground.
 - Standard pipe cover shall be 6'-0".
 - Air release manholes shall consist of a standard 5' diameter gate well style structure with a ValMet Model 25C air release valve mounted on a 1" corporation stop. Air release shall be equipped with the vacuum check option. A 1/2" diameter galvanized pipe air discharge shall be extended to within 12" of the top of the structure. A goose-neck trap shall be installed at the top of the riser to prevent debris & water from entering the valve.



TEMPORARY BLOWOFF ASS'Y



DITCH ENCLOSURE AT GATE WELL

REVISIONS	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE
		GENERAL REVISION TO CAD	12/29/95		GW & NUT SIZE	07/23/98		REV. HYD. THRUST, AIR REL.	03/29/04
		ADD NOTE 17	11/04/97		PIPE COVER & FLANGE TAPE	05/12/99		HOPE, HYD. VALVES	07/18/05
		REVISE HYD. & THRUSTING	05/18/98		ADD BLOWOFF	07/06/99		UPDATED TITLE BLOCK	04/20/13

Johnson & Anderson
 4494 Ellsworth Lake Road
 Waterford, Michigan 48328
 tel (248) 681-7800 fax (248) 681-2600

1060 W. Norton Avenue, Suite 7
 Muskegon, Michigan 49441
 tel (231) 780-3100 fax (231) 780-3115

2291 Water Street, Suite 6
 Port Huron, Michigan 48000
 tel (810) 987-7820 fax (810) 987-7895

White Lake Township
 7525 Highland Road (M-59)
 White Lake, Michigan 48383
 248-698-3300

WATER MAIN STANDARD DETAILS

JOB NO. _____
 DATE ISSUED _____
 SHEET NO. _____

MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE
	DESIGNER	DA		CHECKED	DA			

MARK	ADDENDUM/CHANGE ORDER	DATE	MARK	ADDENDUM/CHANGE ORDER	DATE
	DESIGNED BY	DA		CHECKED BY	DA
	DRAWN BY	DA		SCALE	HORZ. AS NOTED
	SCALE	NO SCALE		JOB NO.	22-029-1
	DATE	01/05/23		SHEET NO.	14

REVISION	DATE	BY	REVISION	DATE	BY
1	09/23/21	JAV	1	09/23/21	JAV
2	1/12/24	MJD	2	1/12/24	MJD
3	2/28/24	ST	3	2/28/24	ST

DESIGNED BY: _____
 DRAWN BY: _____
 CHECKED BY: _____
 SCALE: NO SCALE
 JOB NO: 22-029-1
 DATE: 01/05/23
 SHEET NO: 14

BEBOSS Engineering
 Engineers Surveyors Planners Landscape Architects
 3121 N. GRAND RIVER AVE.
 HOWELL, MI. 48843
 517.546.4836 FAX 517.548.1670

GATEWAY CROSSING
 GATEWAY CROSSING, LLC
 600 NORTH OGDON WOODWARD, SUITE 101
 BIRMINGHAM, MI. 48009
 248-833-7000

TOWNSHIP WATERMAIN DETAILS

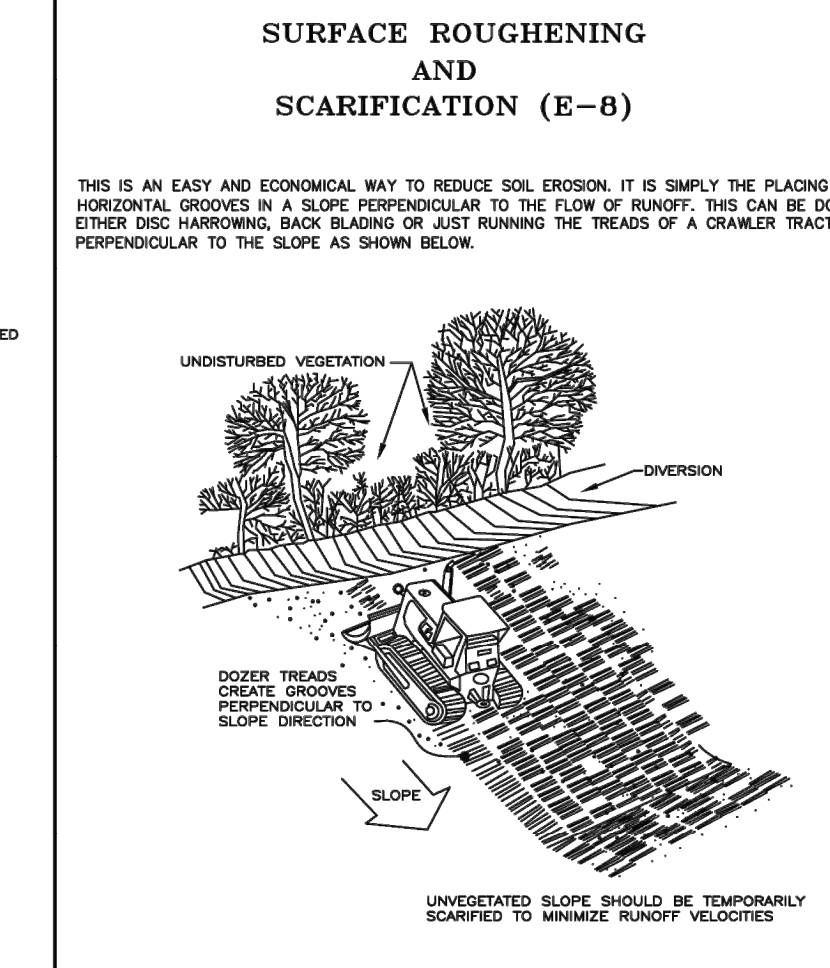
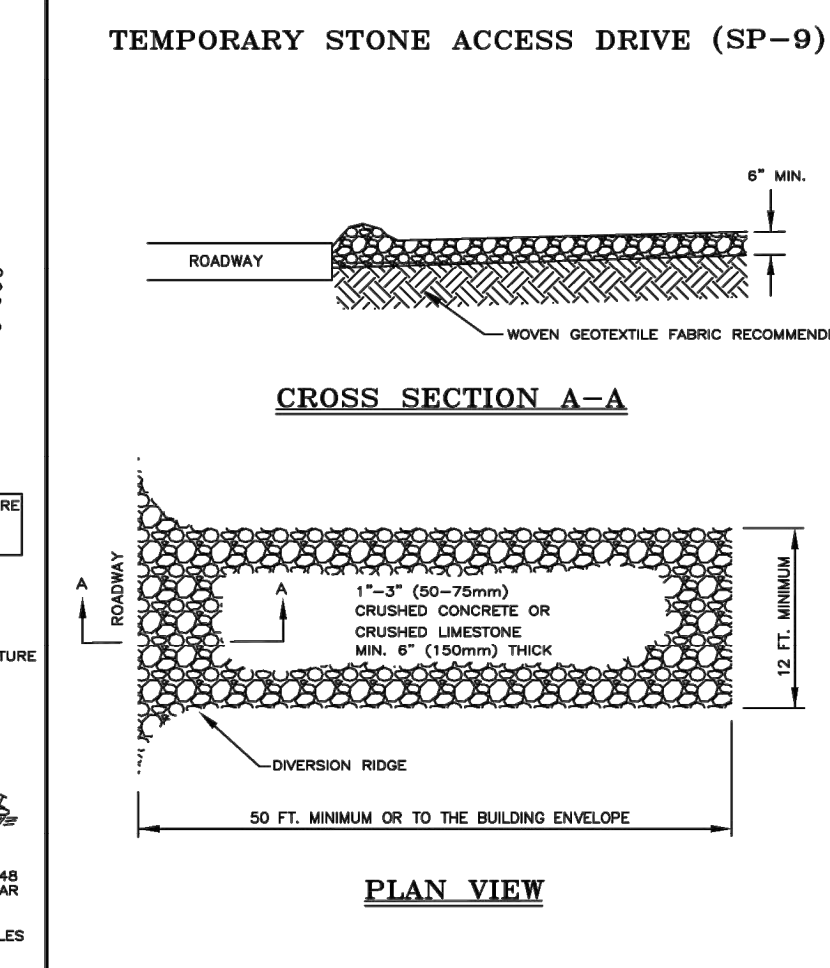
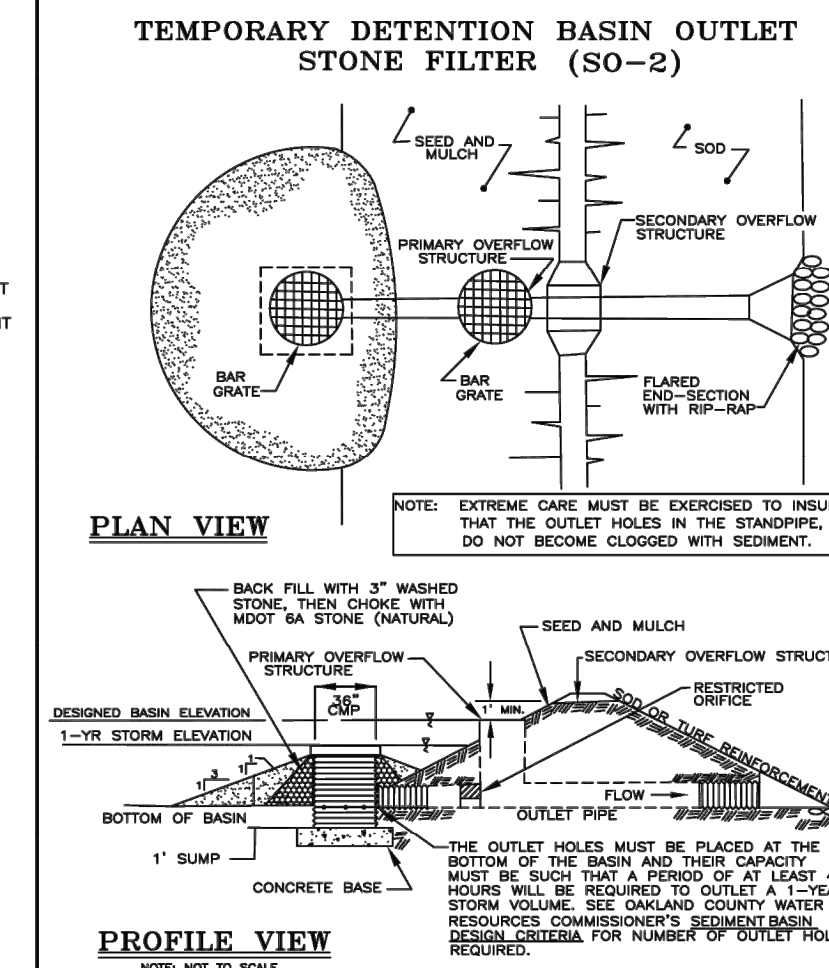
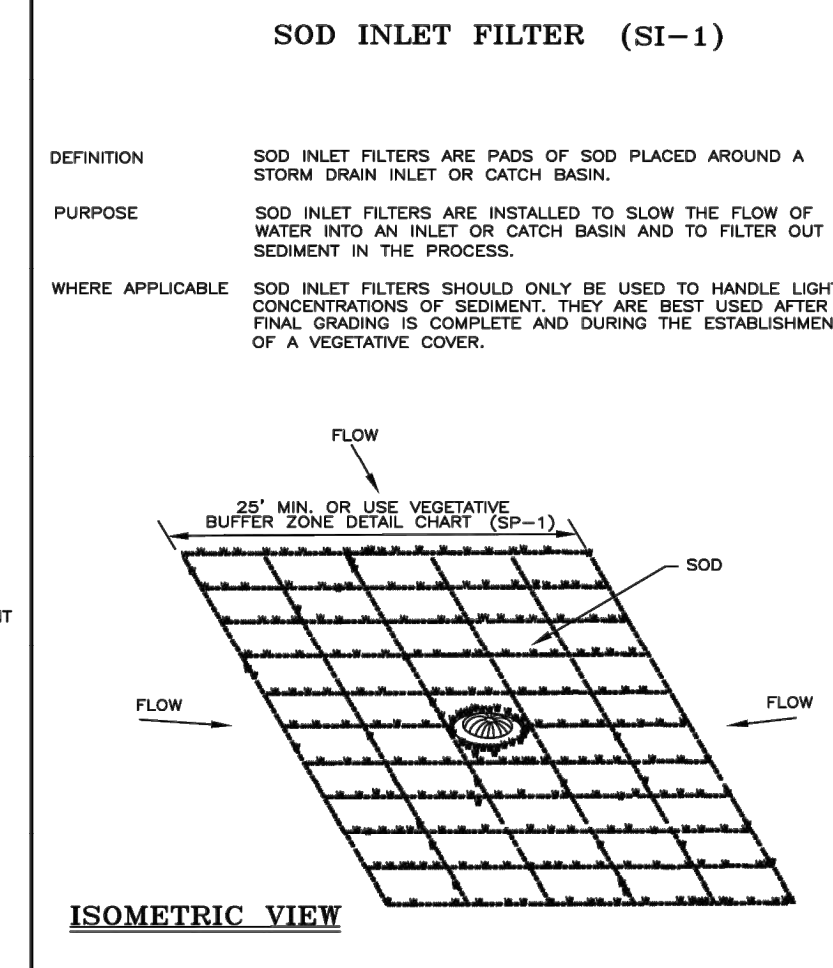
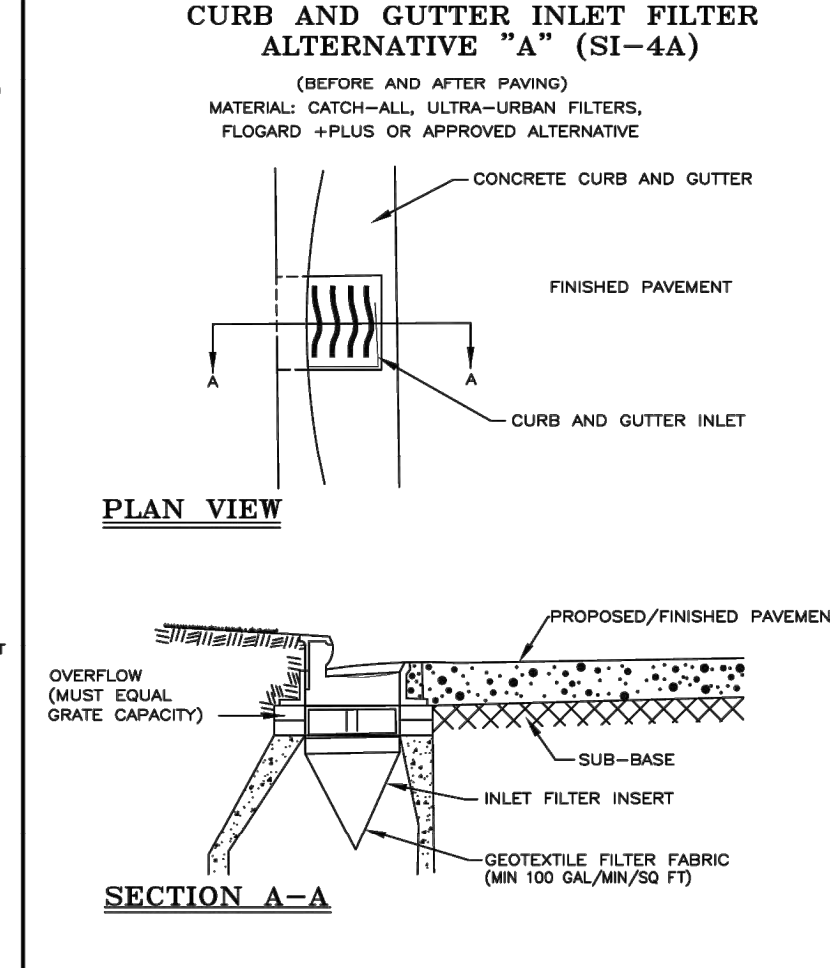
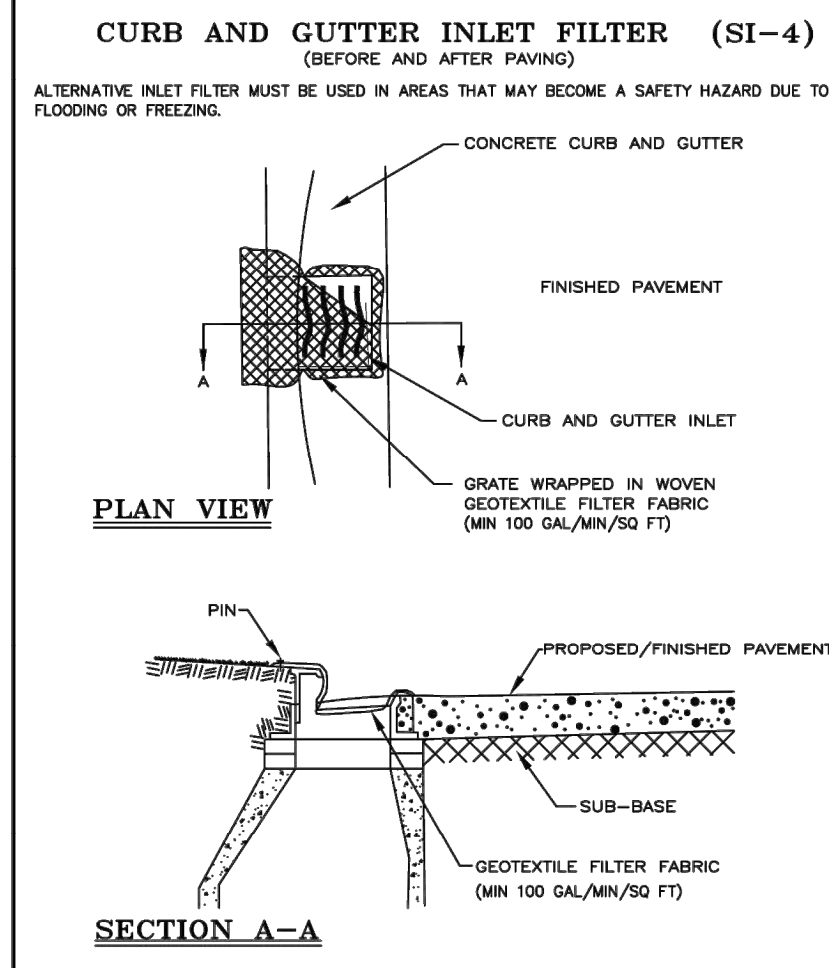
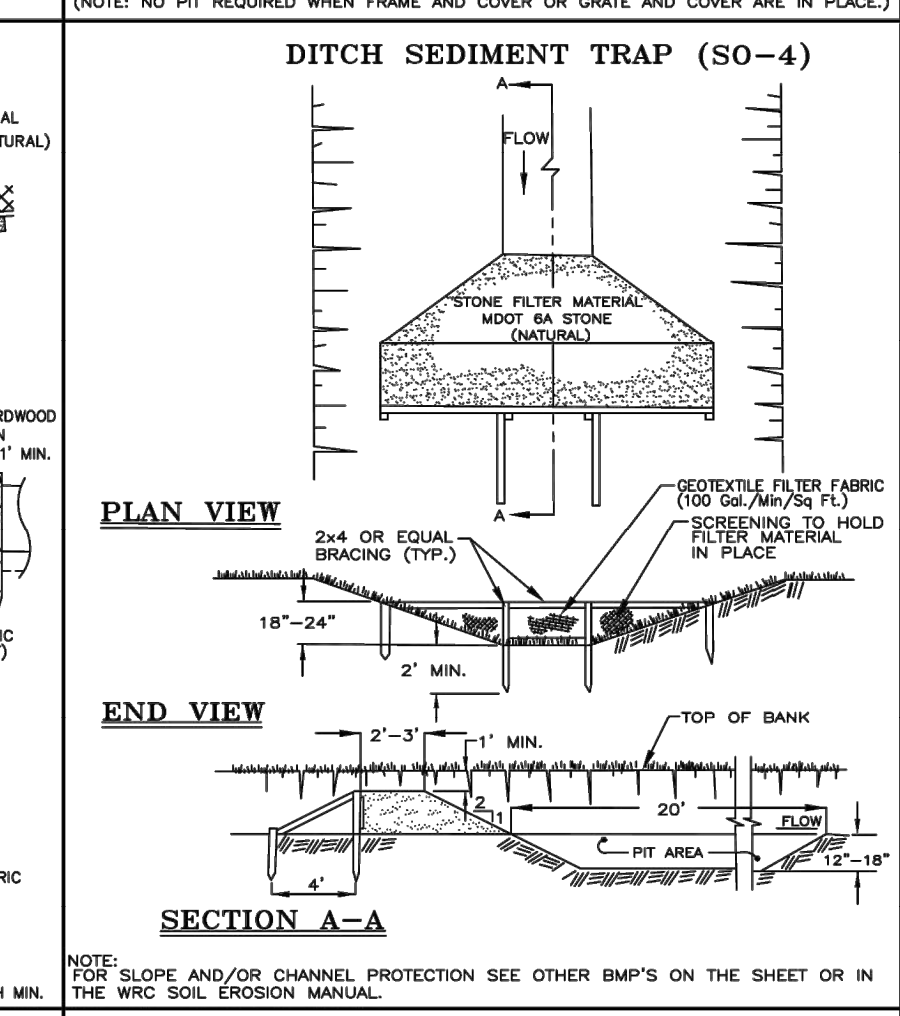
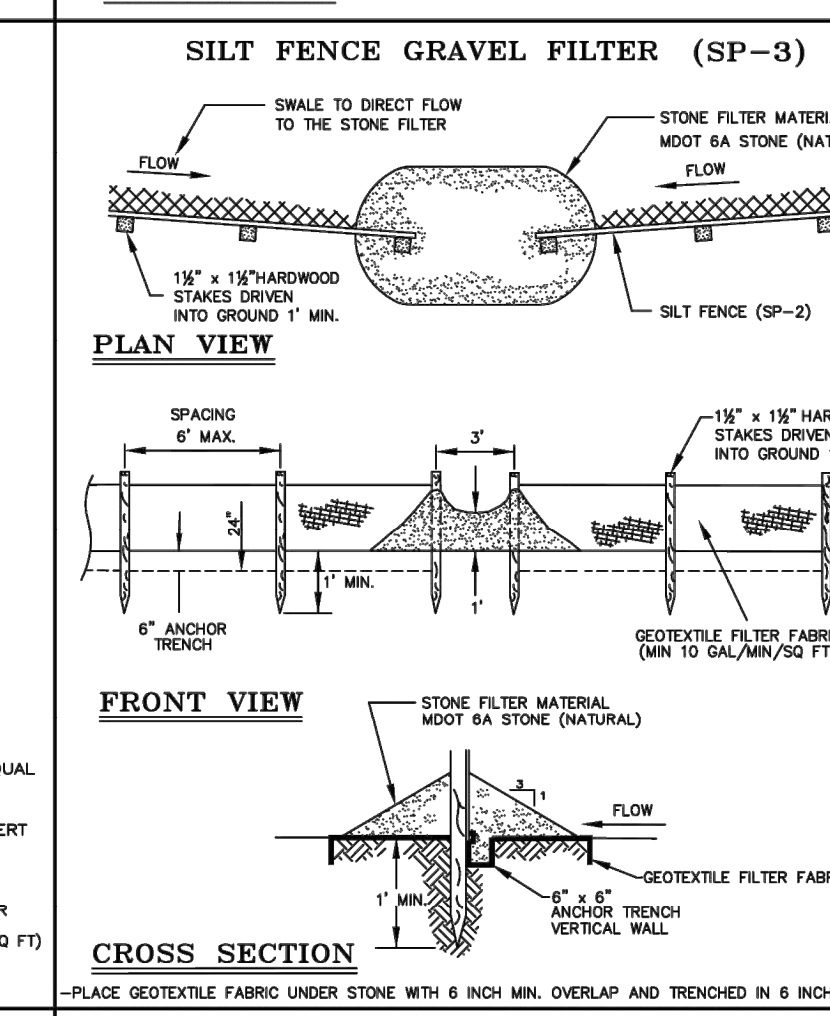
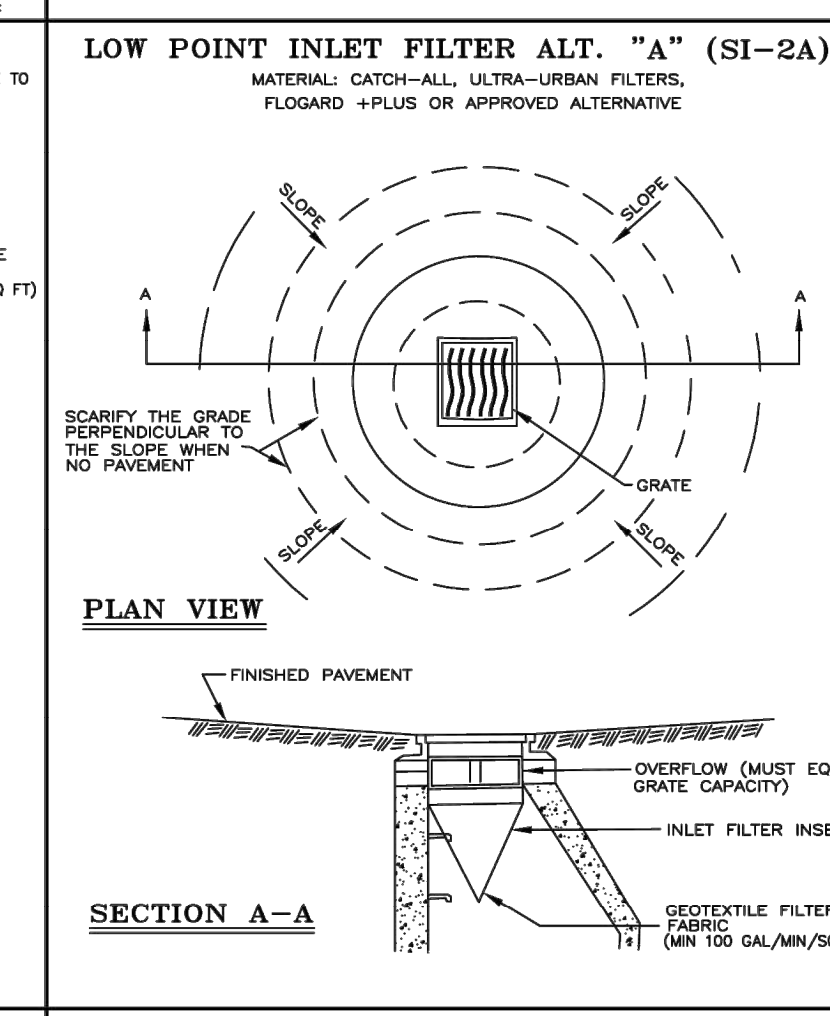
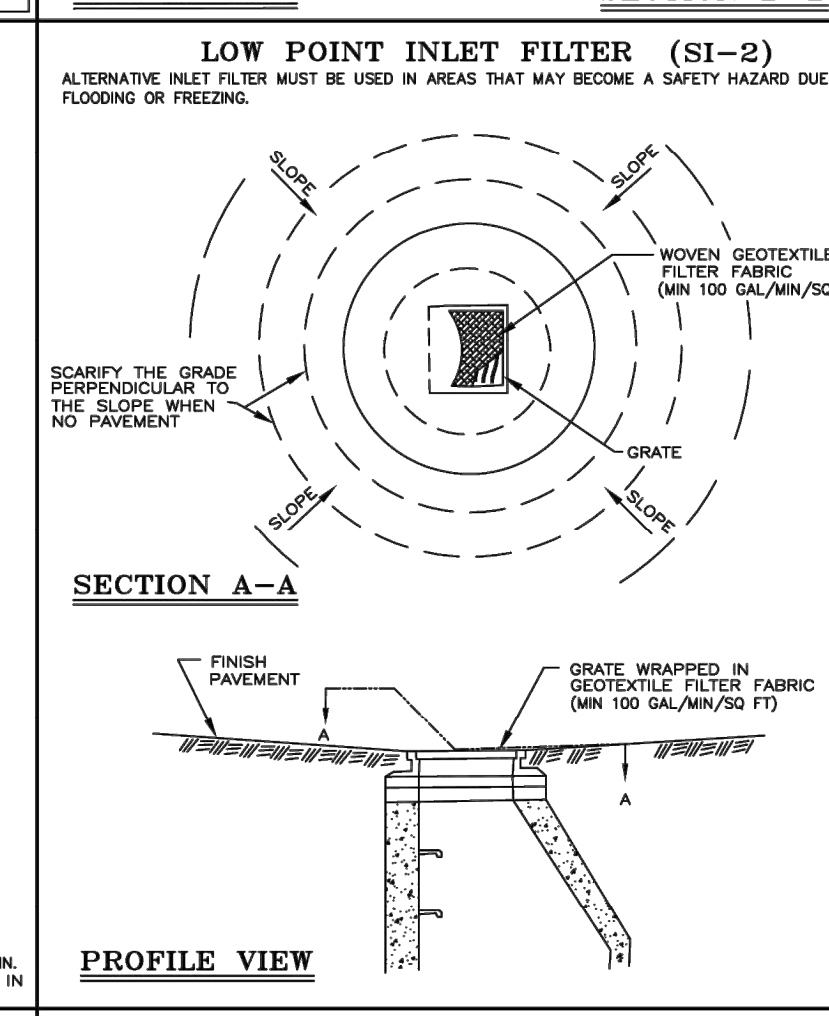
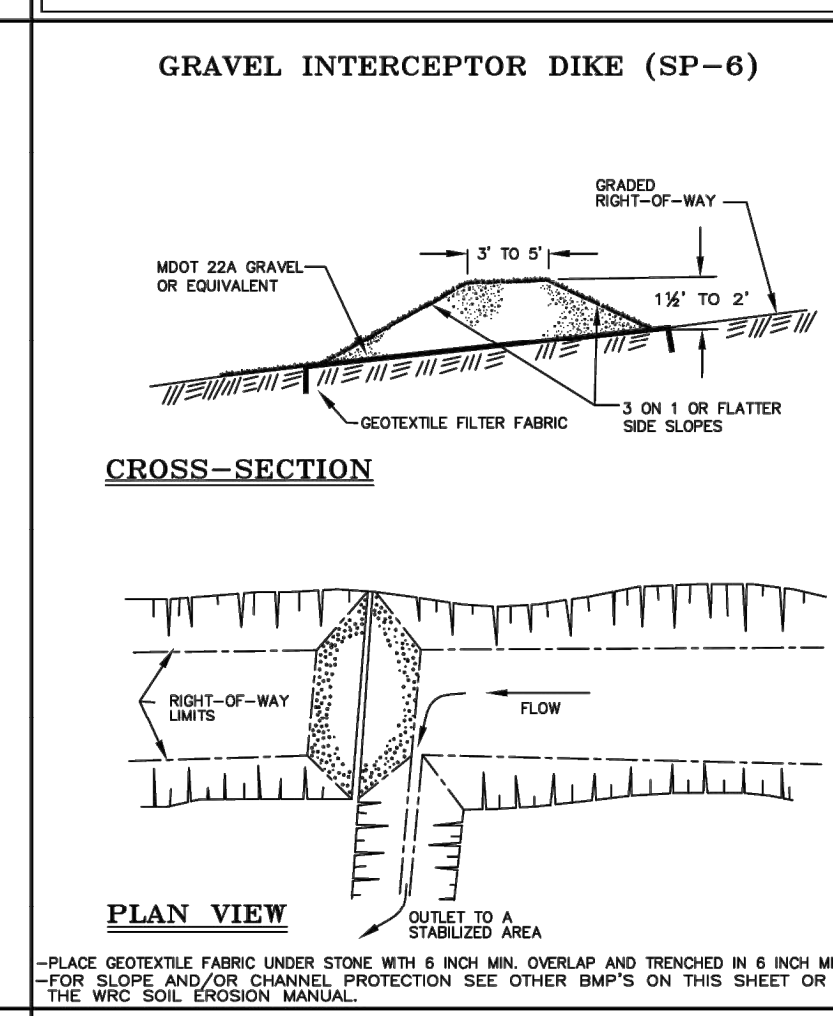
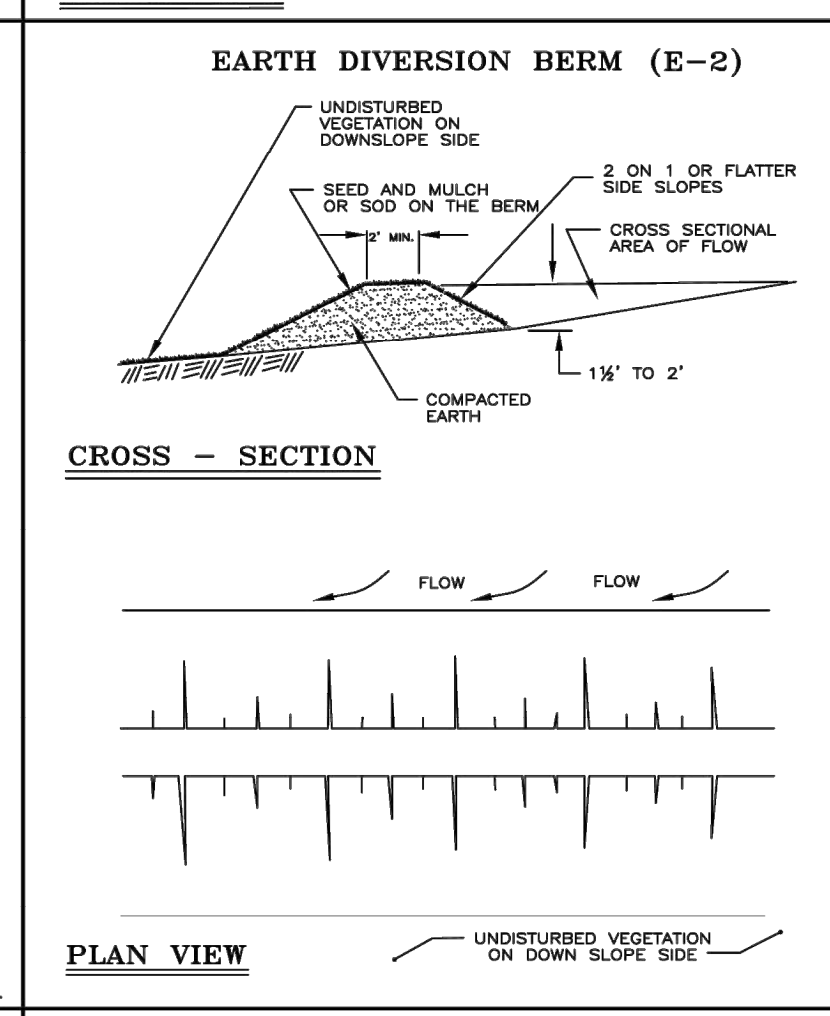
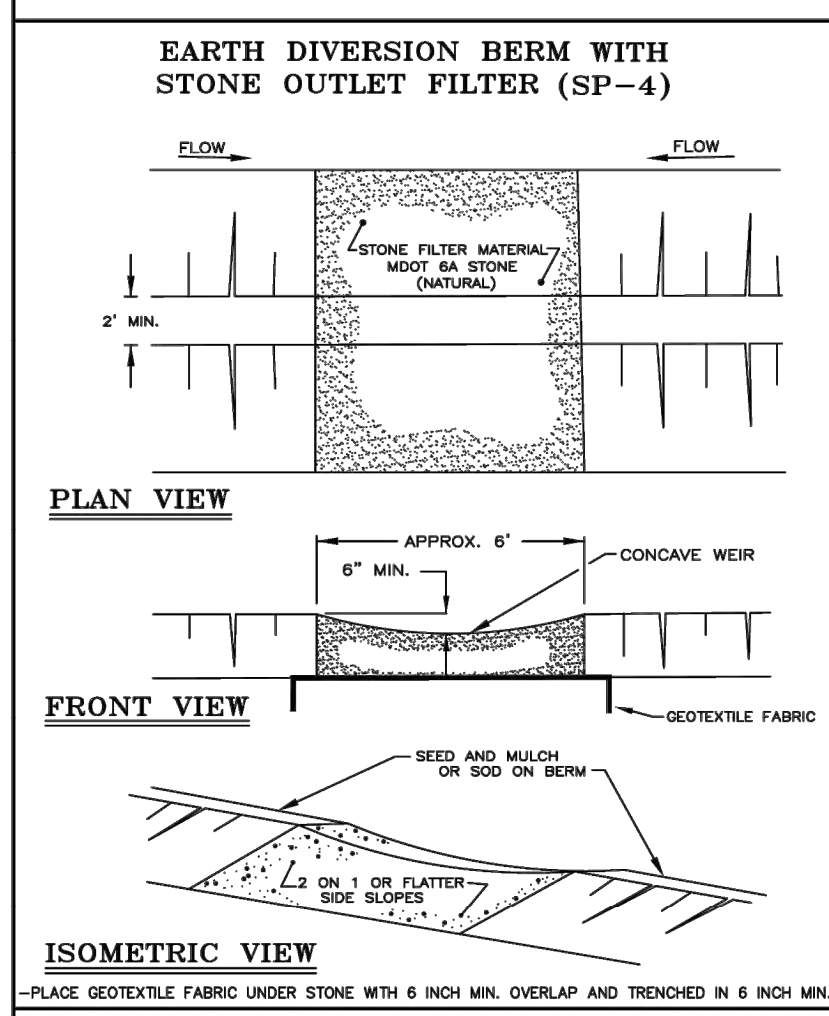
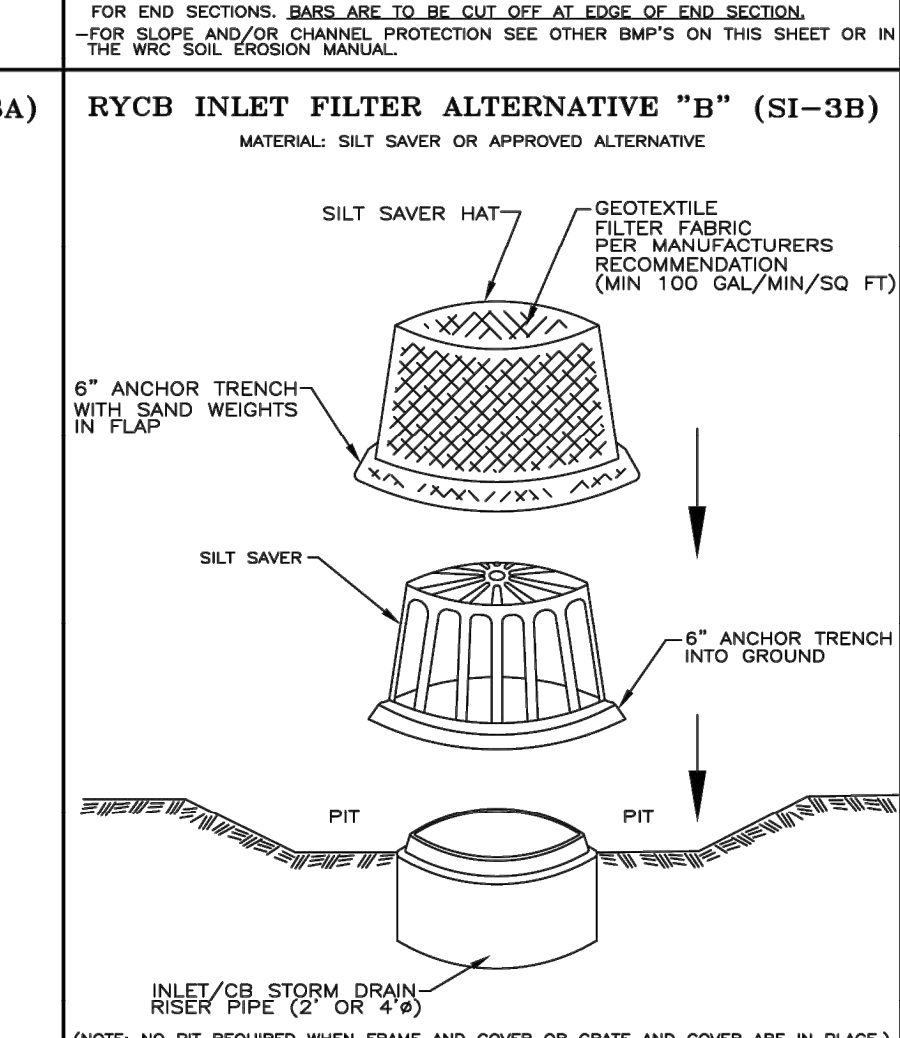
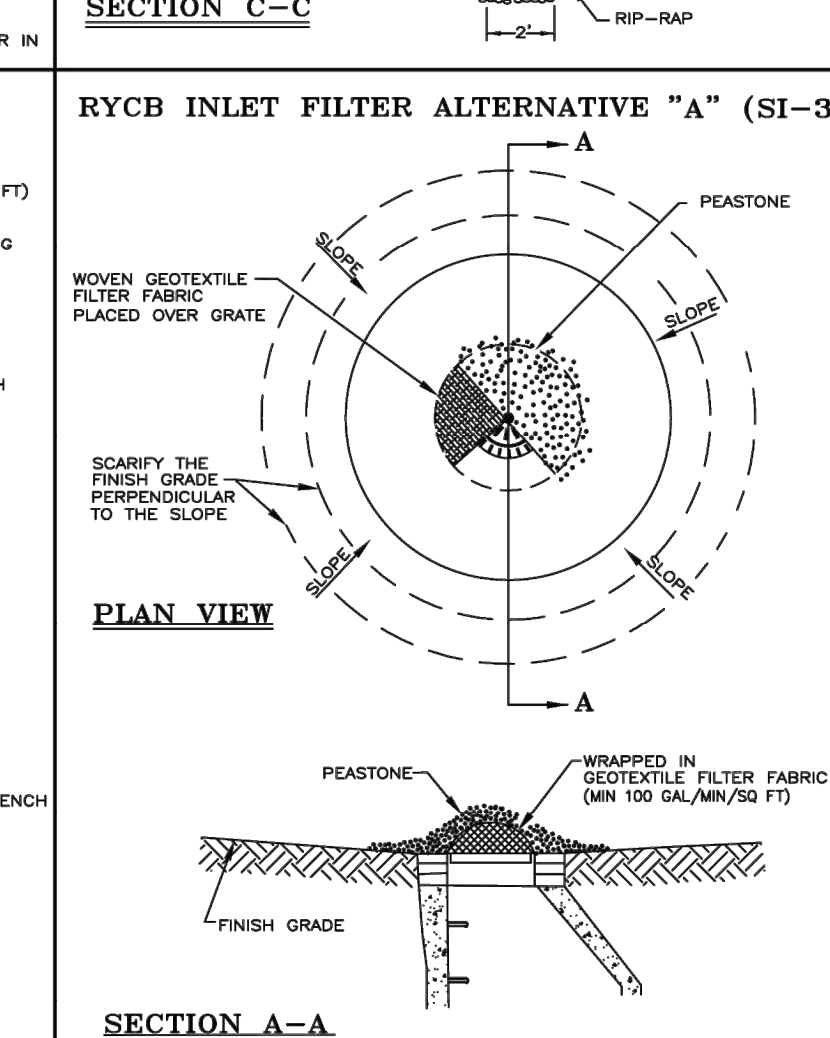
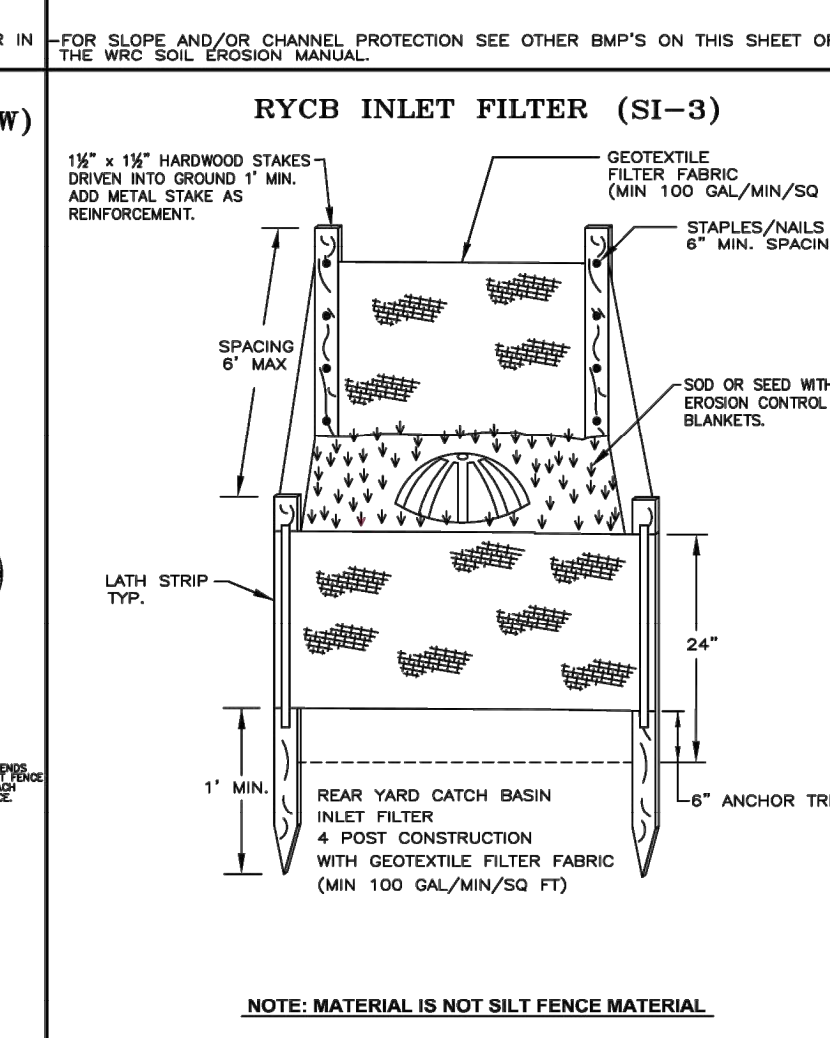
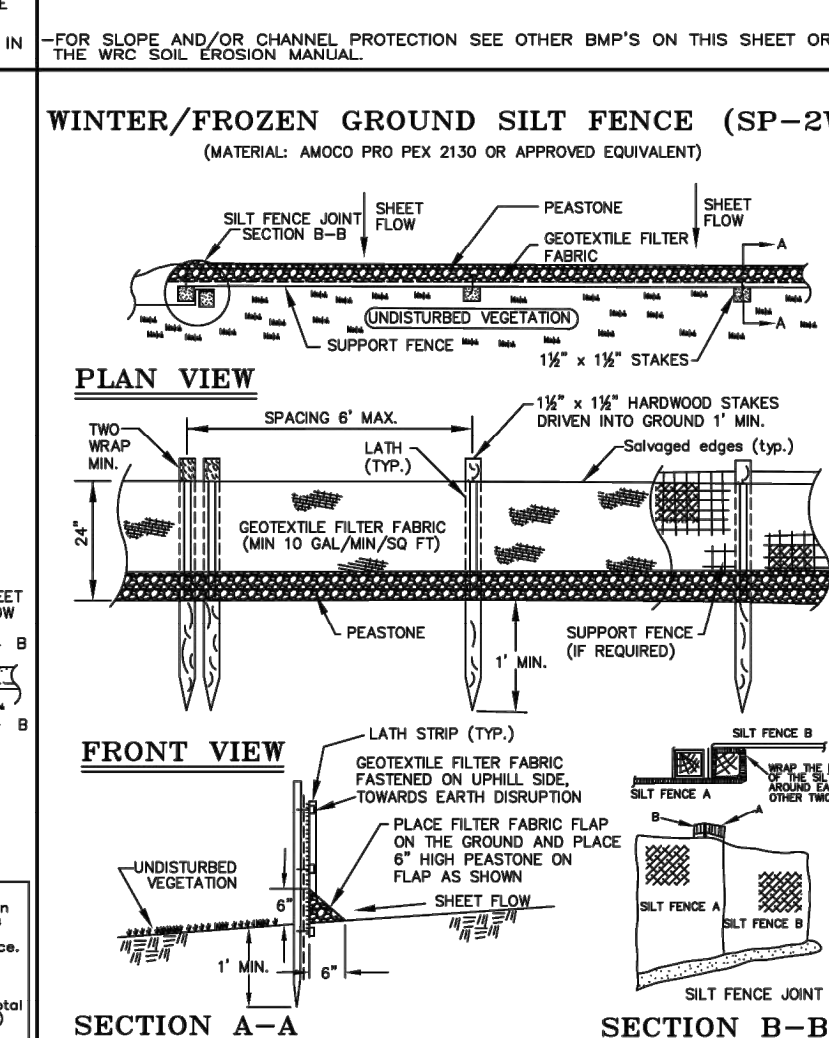
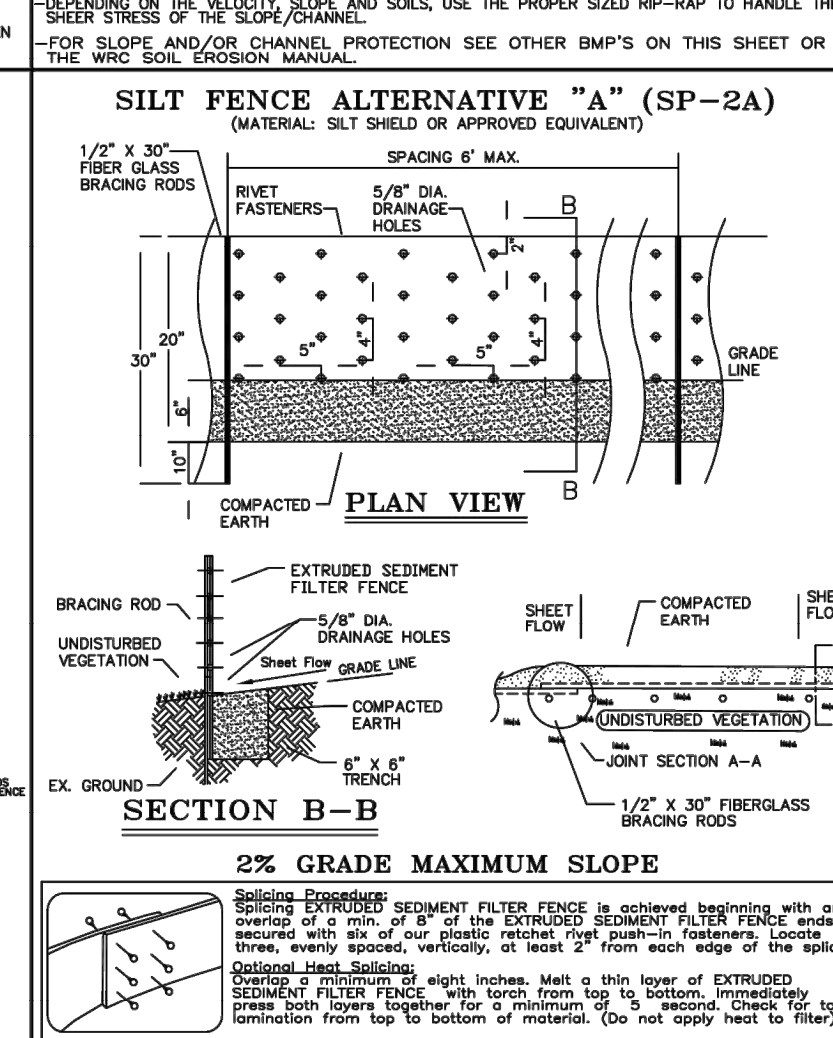
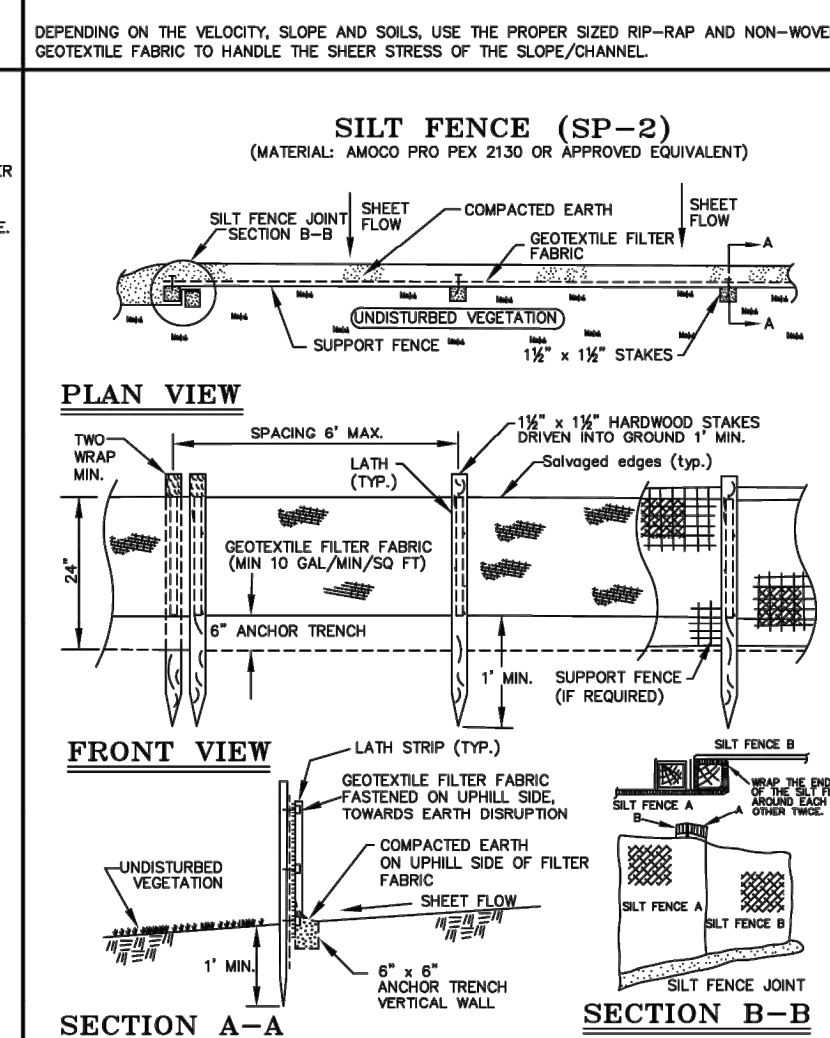
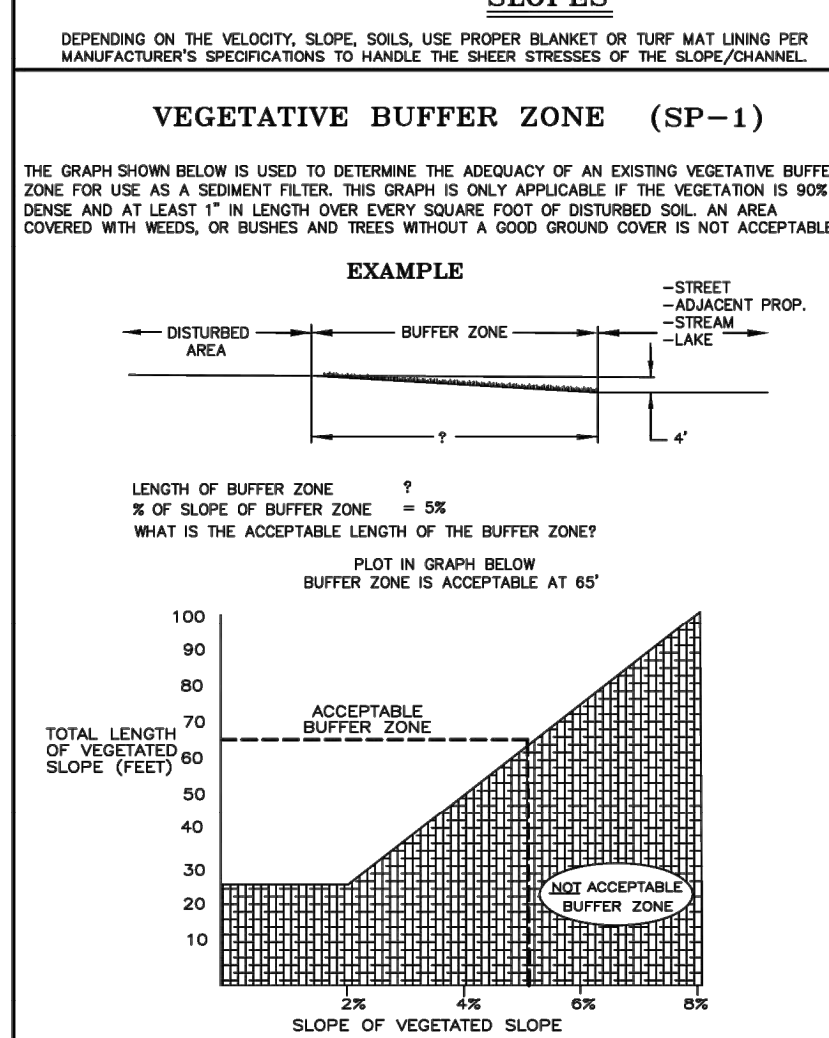
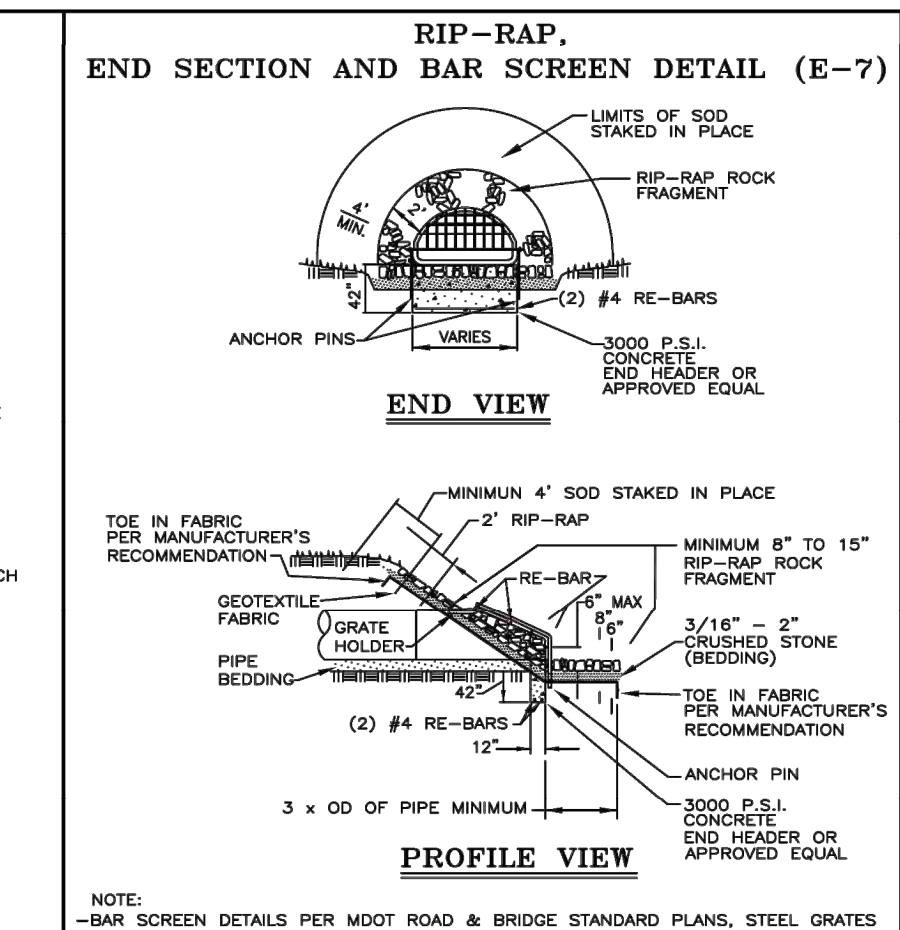
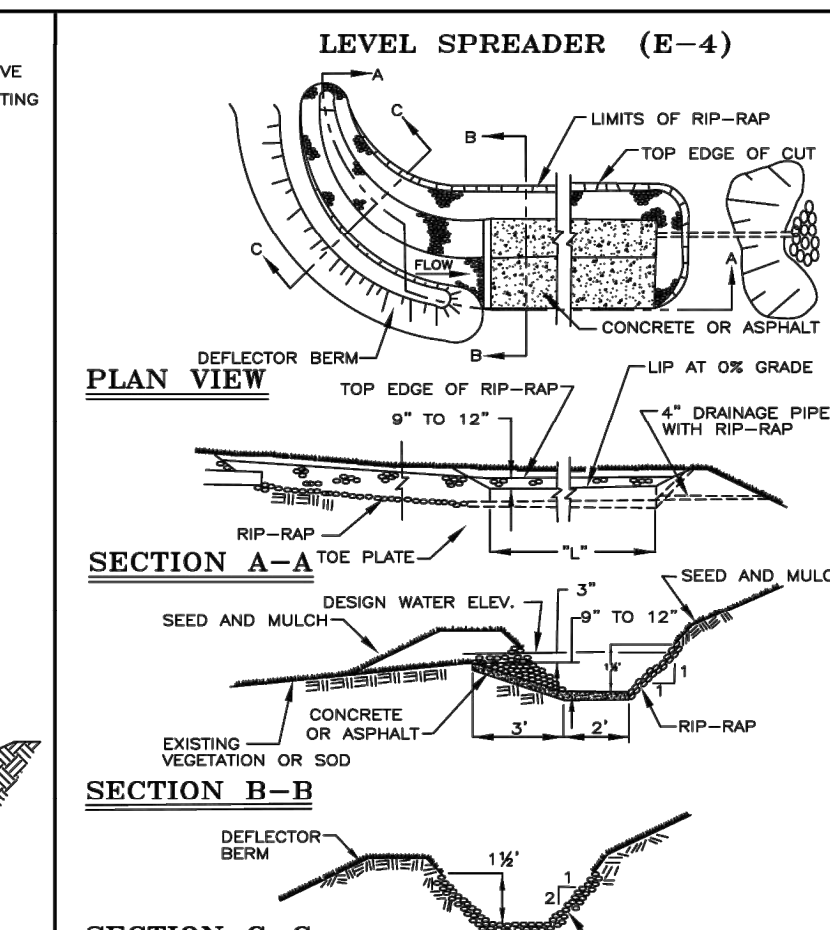
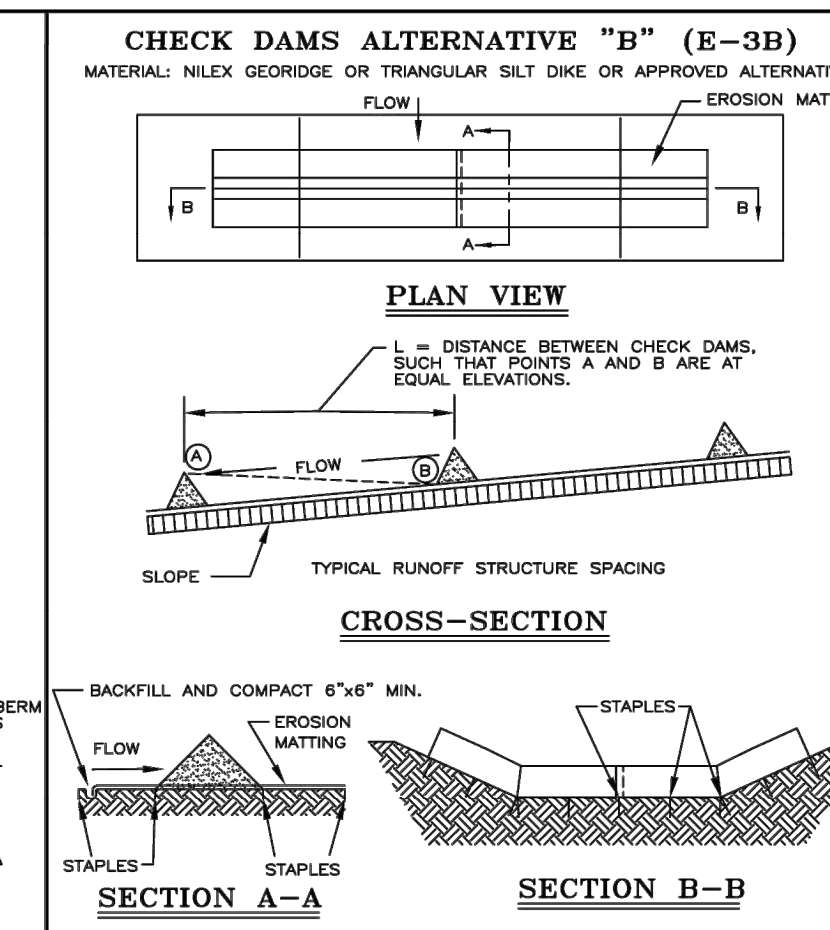
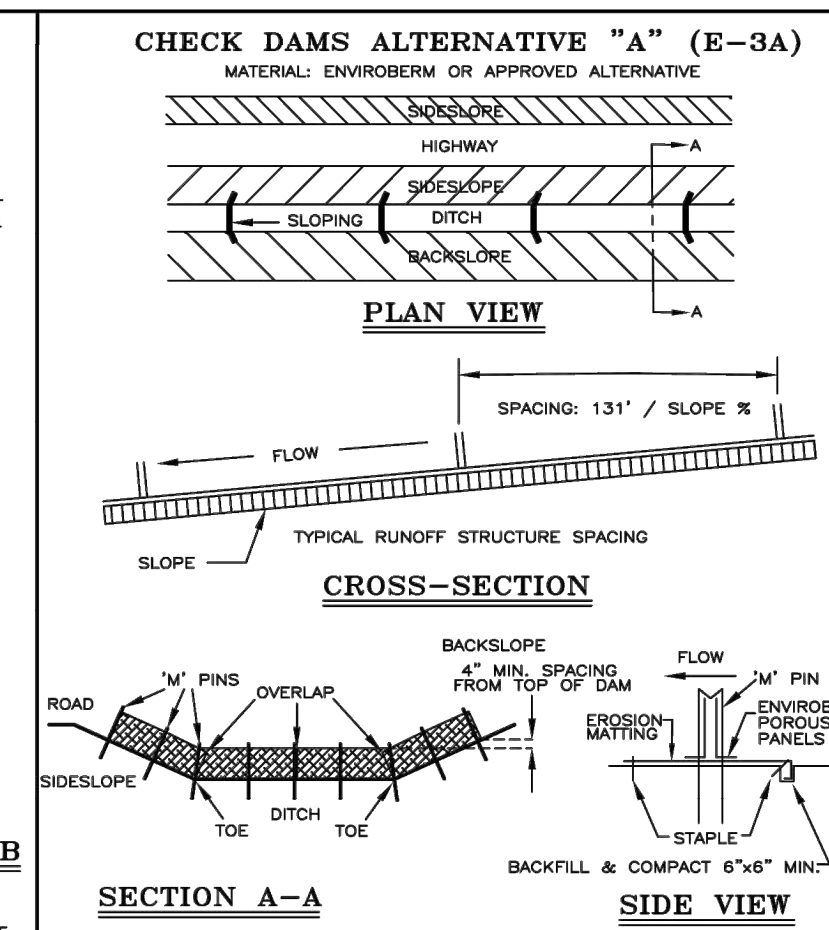
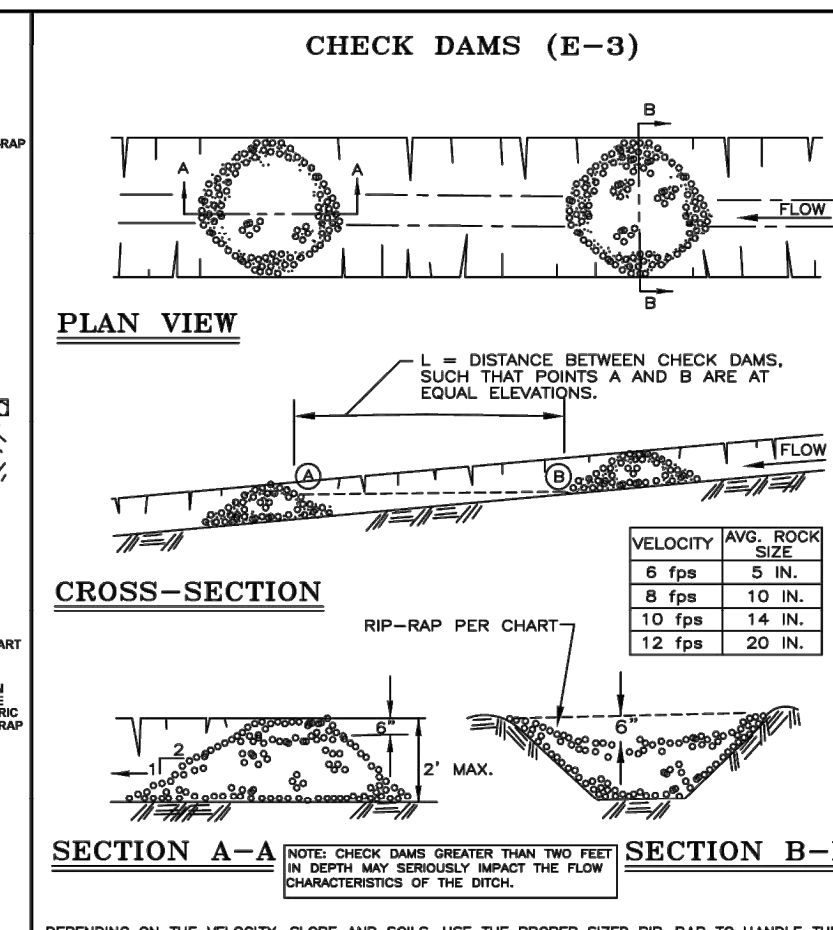
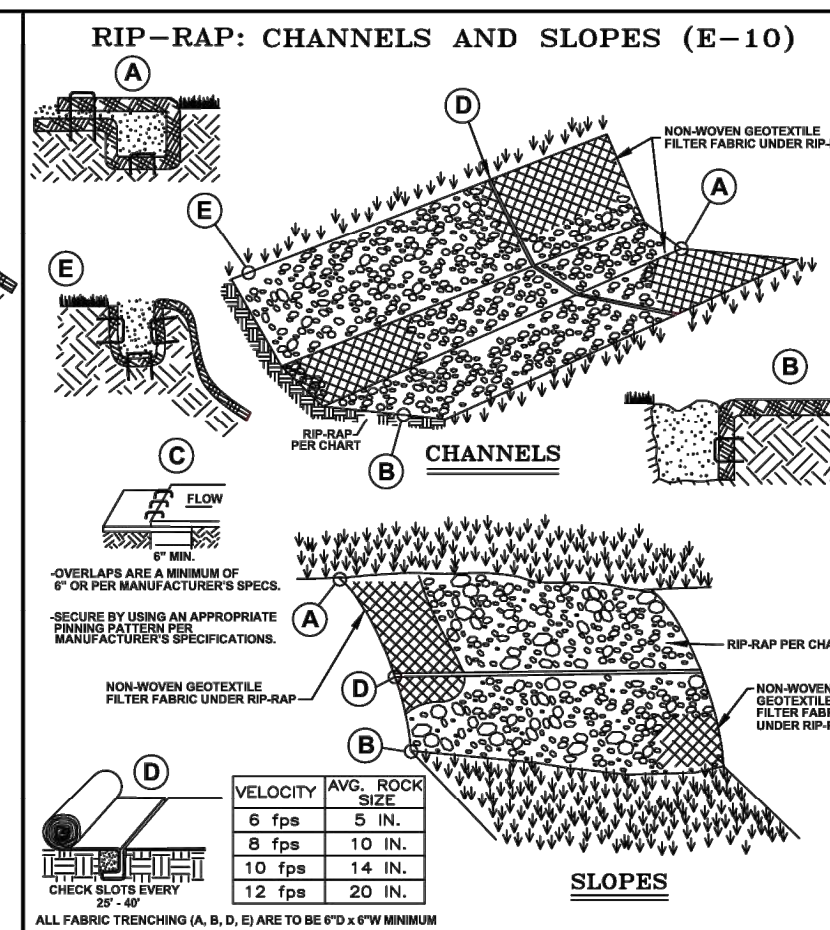
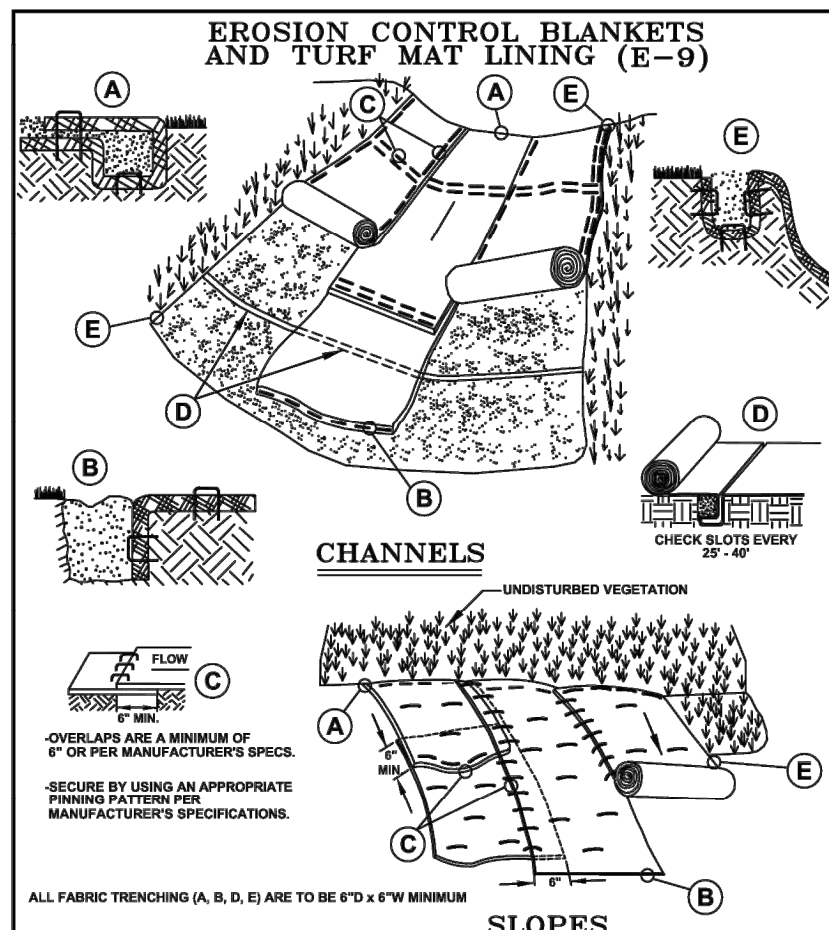
PROJECT: _____
 PREPARED FOR: _____
 TITLE: _____

NO.	DATE	REVISION PER	BY
1	09/23/21	JAV	JAV
2	1/12/24	MJD	MJD
3	2/28/24	ST	ST

SCALE: VERT. - HORZ. AS NOTED

THE LOCATION AND ELEVATION OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE DRAWINGS ARE ONLY APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OF THESE UTILITIES. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT LOCATION AND ELEVATION OF EXISTING UTILITIES. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY CONTACTS BEFORE THE LOCATION OR DEPTH DIFFERS SIGNIFICANTLY FROM THE PLANS.

BEBOSS ENGINEERING
 1-800-882-7171
 1-800-882-7171
 1-800-882-7171



NOTE:

WHILE PERFORMING WORK INVOLVING GROUNDS MAINTENANCE AND/OR THE CONSTRUCTION/MAINTENANCE OF ANY INFRASTRUCTURE, INCLUDING ROADS, WATER MAINS, SANITARY SEWERS, STORM DRAINS AND STORM WATER BEST MANAGEMENT PRACTICES (BMPs), CONTRACTORS SHALL MINIMIZE POLLUTION FROM STORM WATER RUNOFF THAT CAN AFFECT WATER QUALITY RELATED TO WORK ACTIVITIES. POLLUTANTS THAT COULD IMPAIR WATER QUALITY MAY INCLUDE FUEL, GREASE AND OIL, NUTRIENTS, BACTERIA AND PATHOGENS, LITTER AND DEBRIS, AND SOIL EROSION AND SEDIMENTATION. APPLICABLE BMPs SHALL BE IMPLEMENTED BY THE CONTRACTOR TO THE MAXIMUM EXTENT PRACTICABLE TO PROTECT WATER QUALITY AND WILDLIFE HABITAT.

SOIL EROSION AND SEDIMENTATION CONTROL DETAILS

DESIGNED BY: [Blank]

DRAWN BY: [Blank]

CHECKED BY: [Blank]

SCALE: NO SCALE

JOB NO: 22-029-1

DATE: 01/05/23

SHEET NO. 1 of 1

BEBOSS
Engineering
Engineers Surveyors Planners Landscape Architects

3121 E. GRAND RIVER AVE.
HOWELL, MI. 48843

517.546.4836 FAX 517.548.1670

GATEWAY CROSSING
GATEWAY CROSSING, LLC
600 NORTH OGDON WOODWARD, SUITE 101
BIRMINGHAM, MI. 38209
248-937-7000

WRC SECS DETAILS

NO.	BY	DATE	REVISION PER
1	JA	09/09/23	REVISION PER
2	MLD	1/12/24	REVISION PER
3	ST	2/28/24	REVISION PER

DESIGNED BY: [Blank]

DRAWN BY: [Blank]

CHECKED BY: [Blank]

SCALE: NO SCALE

JOB NO: 22-029-1

DATE: 01/05/23

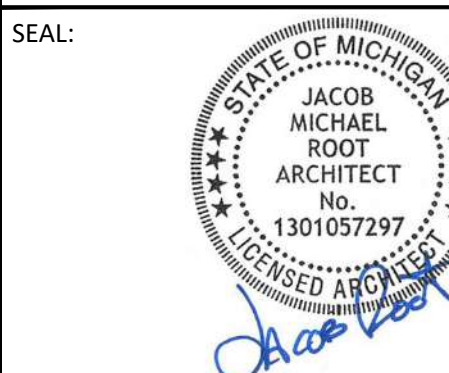
SHEET NO. 1 of 1

Proposed
**MULTI-TENANT
 SHELL BUILDING**

M-59 & BOGIE LAKE RD.
 WHITE LAKE, MI 48383

REV	DATE	ISSUED FOR REVIEW	ISSUED
02-28-24		CITY COMMENTS	
02-22-24		ISSUED FOR REVIEW	

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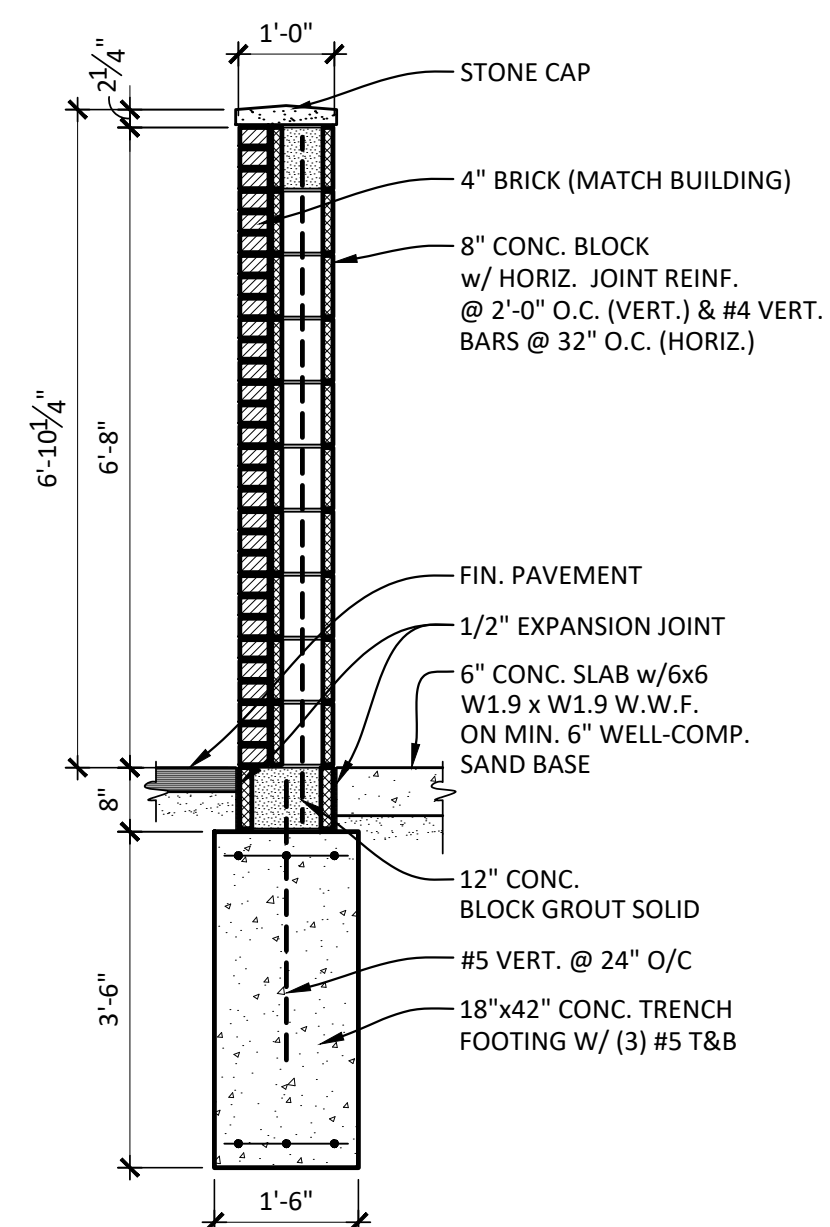


DRAWN BY: CMS
 CHECKED BY: VW, JR
 IN CHARGE: WV, JMR

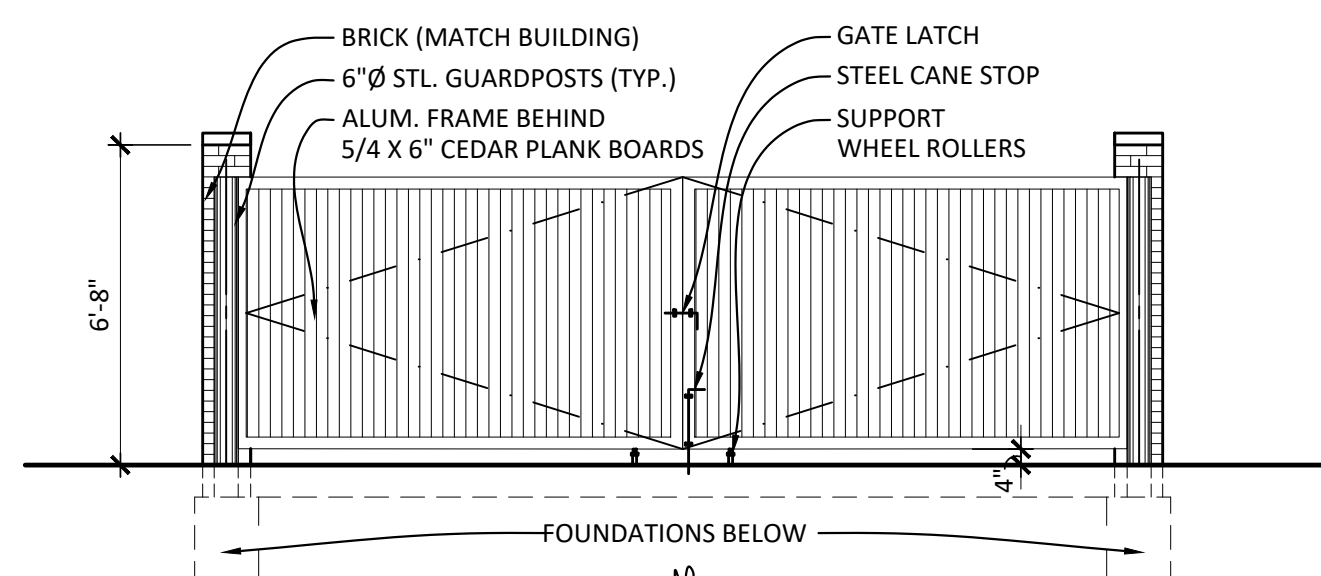
SHEET NAME:
 PRELIMINARY FLOOR PLAN
 & DETAILS

JOB NO:
22-051

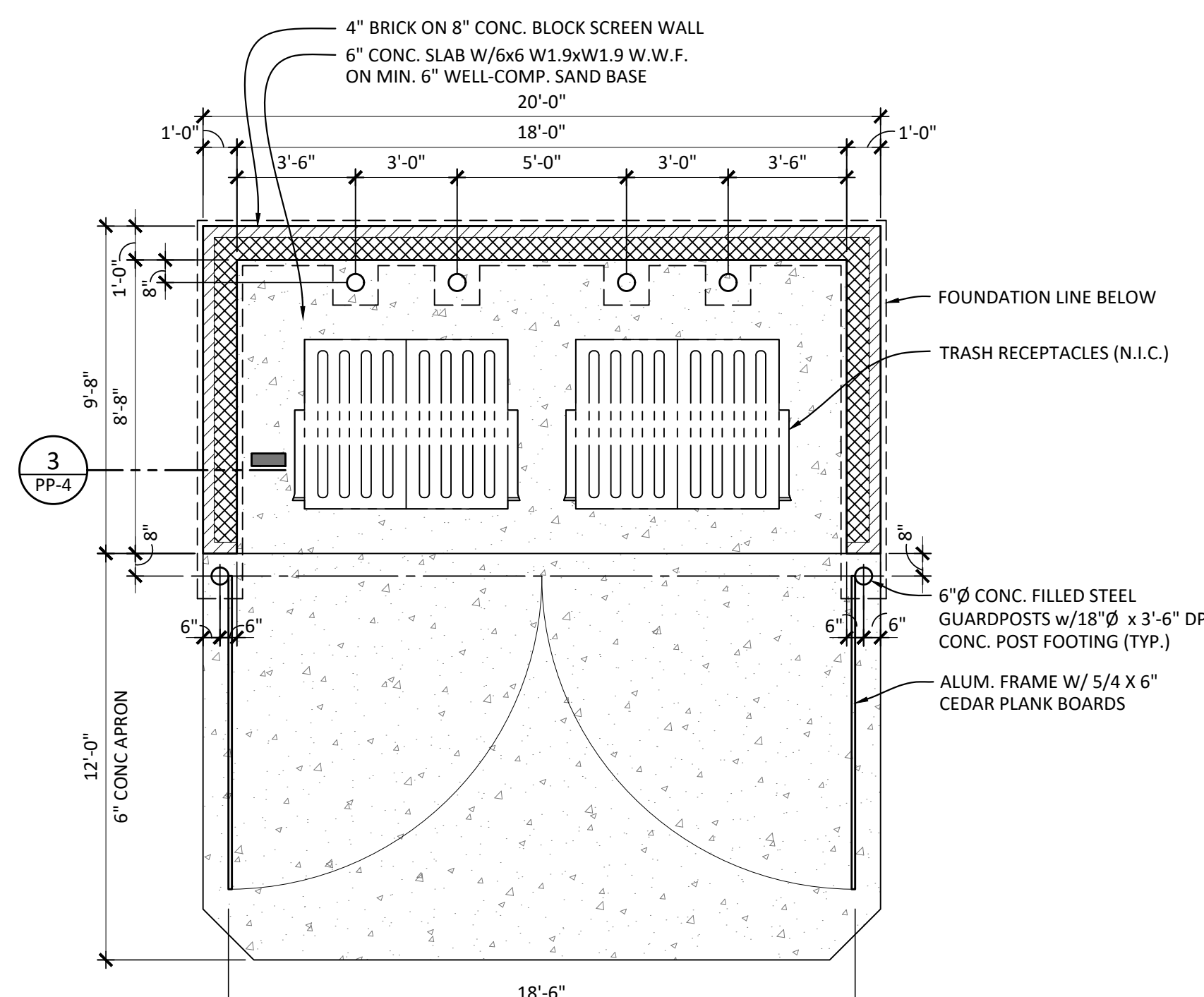
SHEET NO:
PP-5



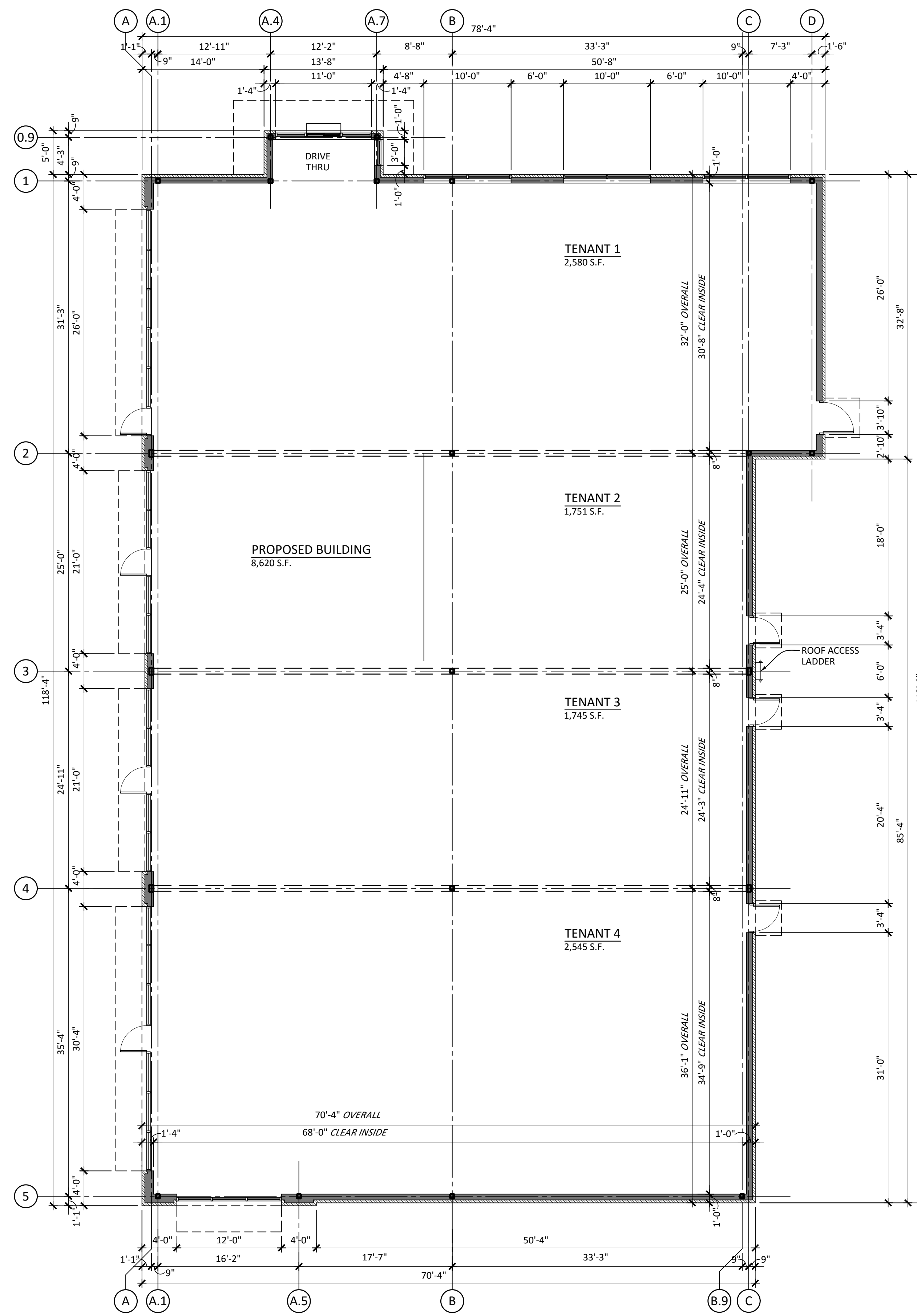
TRASH ENCLOSURE DETAIL 3
 SCALE: 1/2" = 1'-0"



TRASH ENCLOSURE ELEVATION 2
 SCALE: 1/4" = 1'-0"

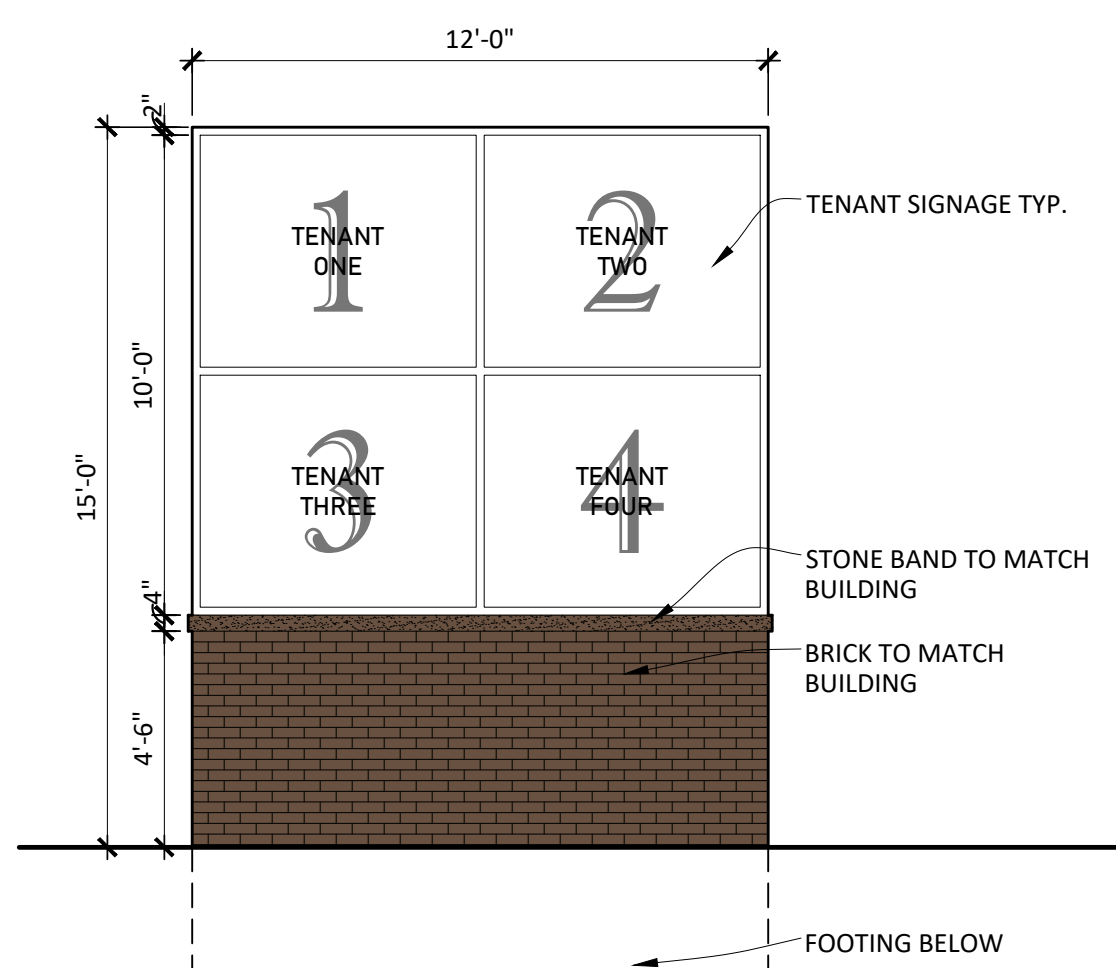


TRASH ENCLOSURE PLAN 1
 SCALE: 1/4" = 1'-0"



PRELIMINARY FLOOR PLAN 1
 SCALE: 1/8" = 1'-0"

SIGNAGE REQUIREMENTS		
ORD. SECTION	REQUIRED	PROPOSED
SEC 5.9.J.1	FREESTANDING SIGN: ONE SIGN AREA: MAX -150FT ² HEIGHT: 15 FT MAX.	PROVIDED 120 FT ² 15'



MONUMENT SIGN 5
 SCALE: 1/4" = 1'-0"

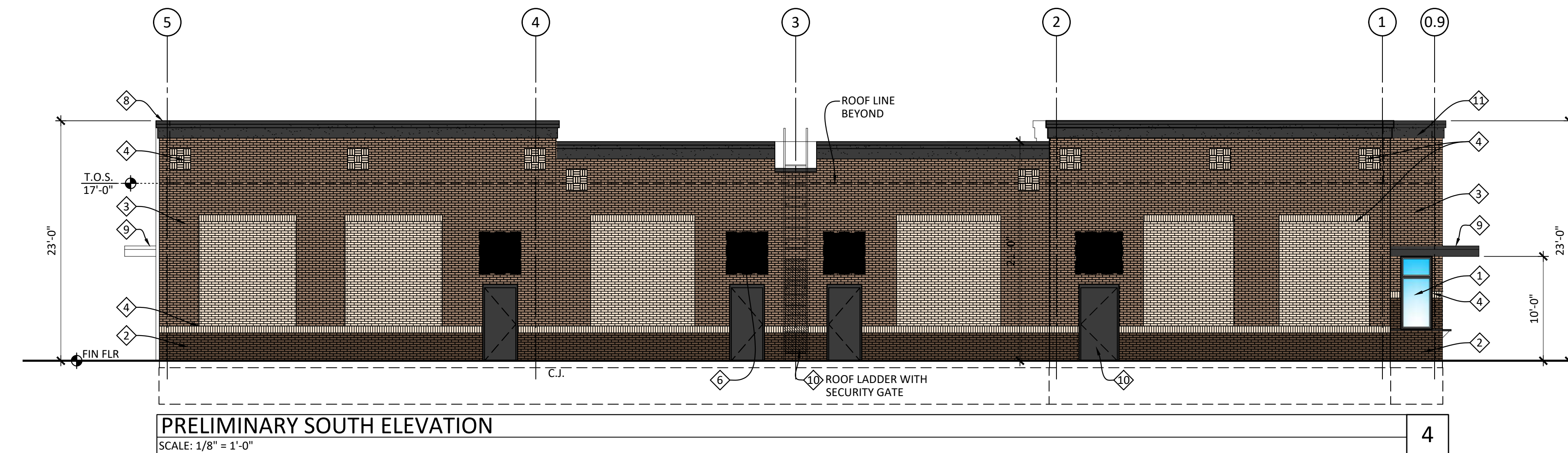
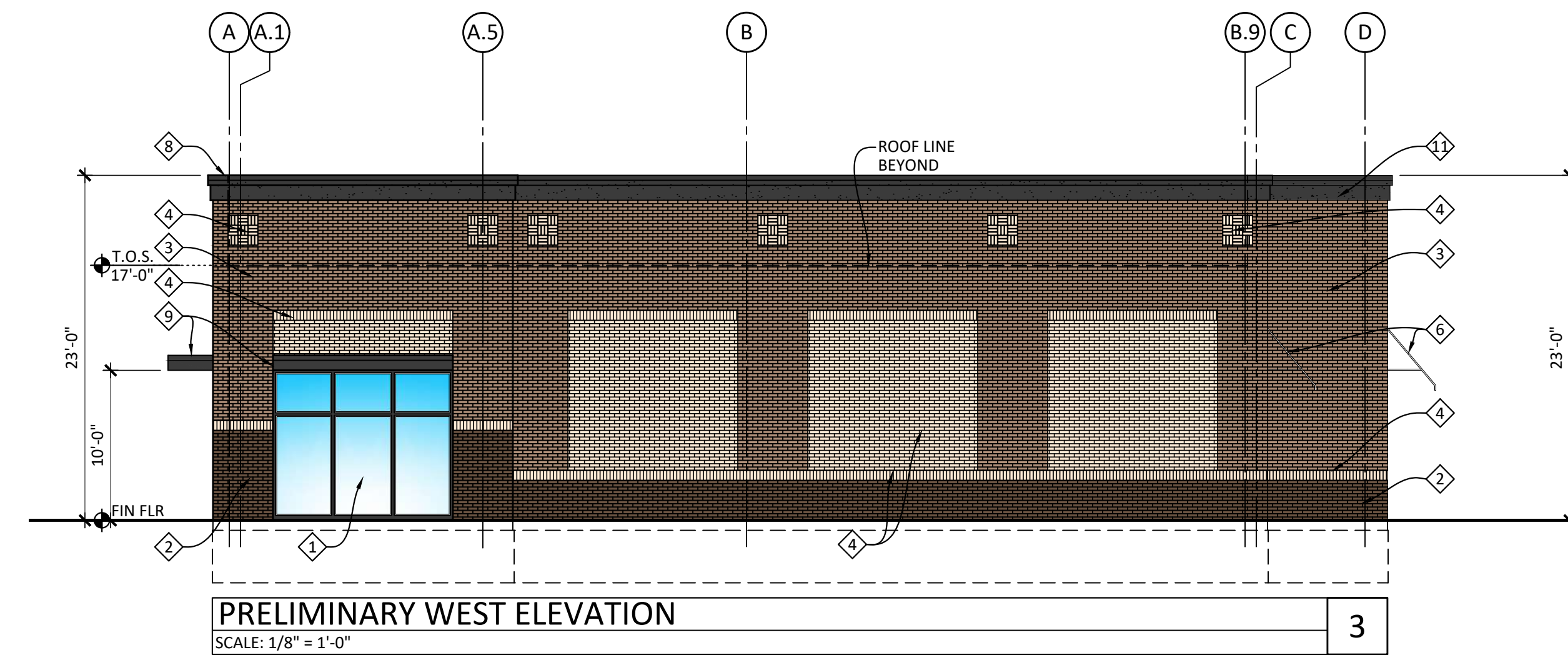
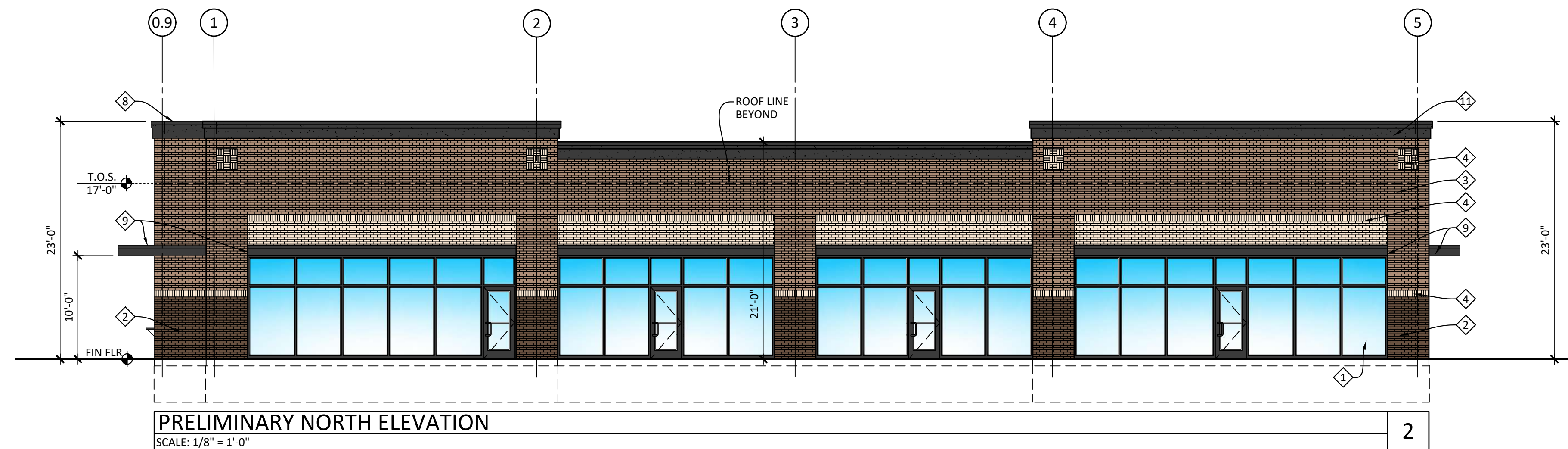
EXTERIOR FINISH KEY

- 1 STOREFRONT
THERMALLY BROKEN ALUM. FRAME
W/INSULATED GLAZING
MFR: T.B.D. COLOR: BLACK
SPL - DENOTES SPANDREL GLAZING
- 2 MODULAR BRICK VENEER
MANUF.: T.B.D.
COLOR: DARK BROWN
- 3 MODULAR BRICK VENEER
MANUF.: T.B.D.
COLOR: MEDIUM BROWN
- 4 MODULAR BRICK VENEER
MANUF.: T.B.D.
COLOR: LIGHT BROWN
- 5 NOT USED
- 6 ALUMINUM FRAME AWNING
FABRIC ON ALUMINUM FRAME AWNING
BY LANDLORD
MANUF.: T.B.D. COLOR: BLACK
- 7 NOT USED
- 8 PREFINISHED METAL COPING
MFR: FIRESTONE
COLOR: (MATCH) DARK BROWN
- 9 METAL CANOPY
MFR: T.B.D.
COLOR: MATTE BLACK
- 10 PAINT
MFR: SHERWIN WILLIAMS
COLOR: SW 6989 "DOMINO"
- 11 EIFS
MFR: T.B.D.
COLOR: DARK BROWN

- NOTES:
1. PROVIDE 5/8" FRP PLYWOOD SUBSTRATE AS REQUIRED AS REQUIRED FOR ALL SIGN BOXES, SCONCES, UTILITIES, AWNINGS.
 2. ALL GLAZING SHALL BE TEMPERED AS REQUIRED ADJACENT TO DOORS AND FINISHED FLOOR

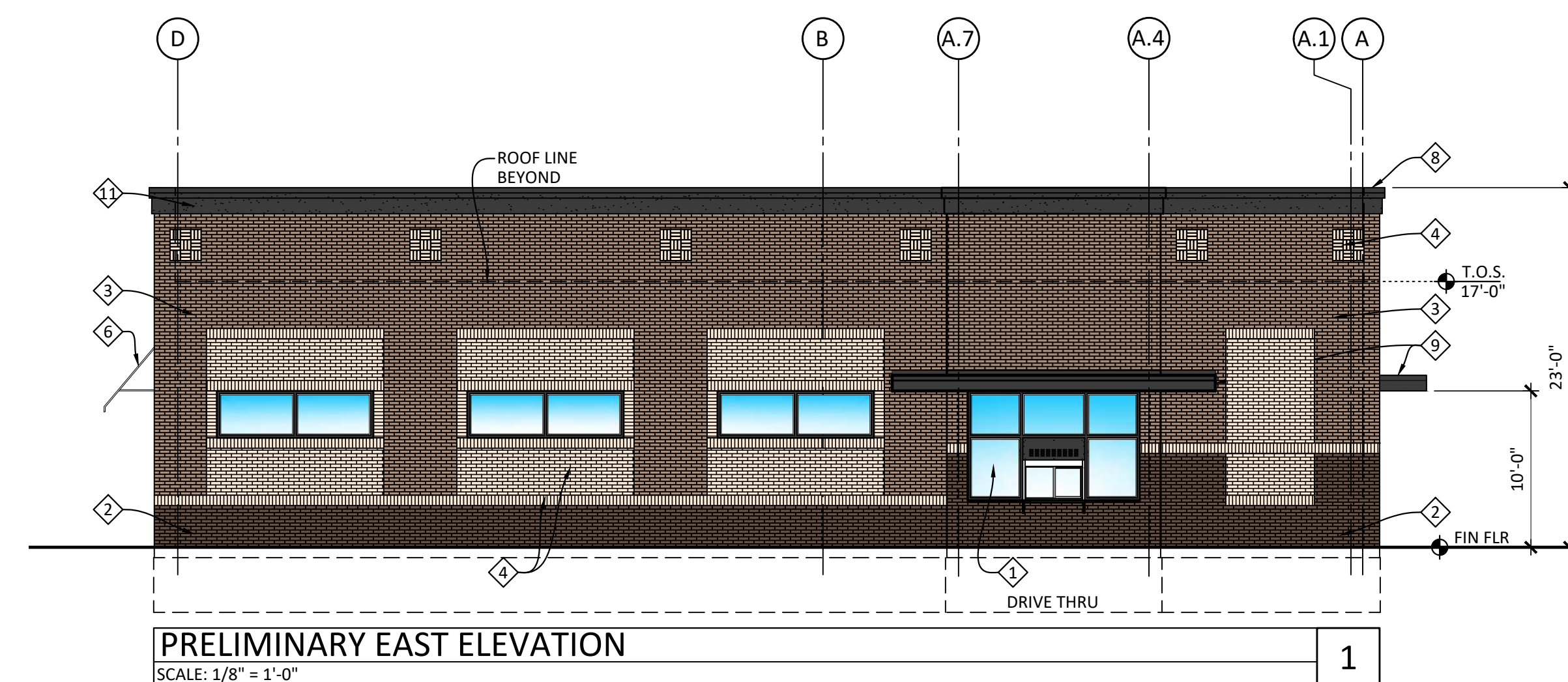
GLASS CALCULATION

ELEVATION AREA: 2,631 SF
GLASS AREA: 983 SF
GLASS RATIO: 983/2,631 = 37.36 %



GLASS CALCULATION

ELEVATION AREA: 1,802 SF
GLASS AREA: 167 SF
GLASS RATIO: 167/1,802 = 9.27 %



**Proposed
MULTI-TENANT
SHELL BUILDING**

M-59 & BOGIE LAKE RD.
WHITE LAKE, MI 48383

REV	DATE	ISSUED
02-28-24		CITY COMMENTS
02-22-24		ISSUED FOR REVIEW

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DRAWN BY: CMS
CHECKED BY: VW, JR
IN CHARGE: VW, JMR
SHEET NAME:
PRELIMINARY ELEVATIONS

JOB NO: 22-051
SHEET NO: PP-5.1