Stantec

# ST. ROSE STORMWATER PUMPING STATION MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT – SCHEDULE 'C'

Comparative Evaluation of Site Location

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Prepared by:
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**ST. ROSE STORMWATER PUMPING STATION**
**MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT – SCHEDULE 'C'**
COMPARATIVE EVALUATION OF SITE LOCATION

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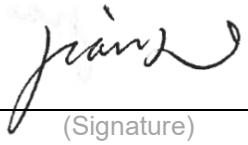
Prepared by: 
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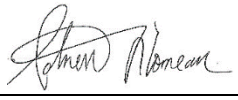
Reviewed by: 
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# 1.0 INTRODUCTION

## 1.1 BACKGROUND

### 1.1.1 GENERAL

The City of Windsor (City) has experienced a significant increase in extreme storm events in recent years in addition to record high water levels in Lake St. Clair and the Detroit River. These climatic and hydrological factors have resulted in significant basement, coastal, and surface level flooding throughout the city and surrounding municipalities. Coastal zones and low-lying areas, which includes Riverside and a majority of East Windsor, are at considerable risk for flood events that can negatively impact the community and cause damage to municipal infrastructure, residential / commercial properties, and local transportation networks. To address widespread flooding concerns, the City completed a comprehensive study known as the Sewer & Coastal Flood Protection Master Plan (SMP). The SMP identified the need for a new stormwater pumping station and new storm sewer outlet to the Detroit River to service the St. Rose drainage area.

The new pumping station is proposed to be in the vicinity of the existing stormwater outlet which is located on the north side of Riverside Drive East opposite St. Rose Avenue (within St. Rose Beach Park). The new pumping station will improve the outlet capacity and provide flood relief to the St. Rose drainage area. The pumping station capacity will provide a 1:100-year storm level of service for the areas generally from St. Rose Avenue / Virginia Avenue on the east to Thompson Boulevard / Esdras Place on the west and South National Street on the South to the Detroit River on the North. This will provide improved flood resilience for major roadways in the area such as Riverside Drive East and Jefferson Boulevard.

The evaluation under the SMP recommended the proposed St. Rose stormwater pumping station be located in the St. Rose Beach Park on the north side of Riverside Drive East within the existing sheet pile / break wall area of the park. This location is in close proximity to the existing outfall and does not require displacement of any existing residences. As evaluated in the SMP, this location has relatively straightforward means of construction and operation, low requirements and extent of maintenance, shorter timeline for implementation, minimal disruption during construction, and results in a lower capital cost compared to other potential sites. This location will impact the amount of available park space and unobstructed waterfront views in the area. There is potential that these impacts could be mitigated in the design phase through the use of landscaping

amenities to improve the overall aesthetics of the facility and recreational functionality of the site. Local residents will have an opportunity to provide input during the high-level design process which will assist in selecting a design that is suitable for the neighbourhood.

### 1.1.2 PURPOSE OF REPORT

The SMP consisted of a comprehensive study with the objective to understand the causes and locations of basement, surface, and coastal flooding across the City. The SMP was developed as a high-level solution to address these flooding concerns. The solution identified to address issues in the St. Rose drainage area was a new stormwater pumping station. Four (4) locations were identified as a possible site based on various technical considerations and feasibility for implementation. An evaluation was completed under the SMP to identify the best location which was determined to be St. Rose Beach Park. Through the continuation of the Environmental Assessment process and in consideration of the comments received through the stakeholder consultation process (during the SMP study), a further in-depth evaluation is being completed and presented in this technical memorandum (memo) to confirm which of the four alternatives is most preferred. The SMP report can be accessed through the following weblink: Sewer and Coastal Flood Protection Master Plan (citywindsor.ca).

This Memo reviews the decision-making process and outcomes of a comparative analysis of the four (4) alternative locations presented in the SMP. For more details, refer to appendix 'E-2: St. Rose Avenue Pumping Station – Pumping Station Location Comparative Evaluation (October 2020)' which can be found within 'Appendix E – Technical Volume 2: Flood Reduction Alternative Solution Development' of the SMP.

This Memo will provide a more specific evaluation of the four (4) alternatives presented in the SMP based on the following evaluation criteria: social factors (impacts to local communities, archaeological and historic sites, recreational areas, other utilities, etc.), natural environment factors (air, climate, vegetation, fish and wildlife, surface drainage and groundwater, soil and geology, utilization of existing infrastructure, etc.), and economic factors (capital and O&M cost). The evaluation process is based on minimizing undesirable social, natural environment, and economic impacts while maximizing performance and efficiency, minimizing space requirements, and reducing operation and maintenance requirements. This Memo presents detailed rationale for each evaluation criterion and summarizes these findings using a scoring system to quantify these criteria. Where impacts to these evaluation criteria are unavoidable, either through

construction or operation of the proposed facility, proposed mitigation measures are presented for consideration to minimize or negate those impacts.

# 2.0 REVIEW OF ALTERNATIVES FROM THE SEWER & COASTAL FLOOD PROTECTION MASTER PLAN

## 2.1 SITE LOCATION ALTERNATIVES

The SMP identified four (4) viable site locations for the proposed St. Rose pumping station. The locations are in the vicinity of the existing St. Rose Avenue storm sewer which is the primary outlet for the expanded St. Rose drainage area. The alternative locations were selected for further analysis based on their proximity to the existing outlet and the distance to the receiving watercourse. The four alternative locations are as follows:

- Alternative No. 1 – Construct the St. Rose Avenue pumping station in the St. Rose Beach Park on the north side of Riverside Drive East.
- Alternative No. 2 – Construct the St. Rose Avenue pumping station to the south of Riverside Drive and east of St. Rose Avenue.
- Alternative No. 3 – Construct the St. Rose Avenue pumping station to the south of Riverside Drive and west of St. Rose Avenue.
- Alternative No. 4 – Construct the St. Rose Avenue pumping station at the northwest corner of the intersection at St. Rose Avenue and Wyandotte Street East.

The evaluation criteria selected for the comparative location analysis under the SMP were the following:

- Meet Flood Mitigation Objectives
- Flexibility to Adjust to Climate Change
- Water Quality
- Impacts to the Natural Environment
- Coastal Flood Risk
- Complexity of Installation and Operation
- Anticipated Extent of Maintenance Required
- Length of Time Required for Implementation
- Disruption During Construction
- Permanent Changes to Urban Community
- Impacts to Archaeological, Built Heritage, and Cultural Heritage
- Relative Capital Cost

In the SMP, the evaluation of the four site alternatives took into consideration the following functional design elements: new pumping station wet well structure to house three (3) large sized pumps and two (2) smaller sized pumps (firm capacity of 13.5 $m^3/s$); building structure to house the electrical systems and pump controls; back-up power generator to provide standby power; on-site power transformer; vehicle access points; and landscaping amenities. The layout and functional design of the pumping station and other site features would be subject to fine tuning based on further stakeholder input and other factors during the Class Environmental Assessment Process.

## 2.2 SUMMARY OF EVALUATION OF ALTERNATIVE SITE LOCATIONS UNDER THE SMP

### 2.2.1 MEET FLOOD MITIGATION OBJECTIVES, FLEXIBILITY TO ADJUST TO CLIMATE CHANGE, WATER QUALITY, AND IMPACTS TO THE NATURAL ENVIRONMENT

In terms of the flood mitigation objectives; flexibility to adjust to climate change; ability to meet water quality objectives; and impact to the natural environment, all four location alternatives received equivalent ranks within each category. This means that during the SMP process the alternatives were considered to provide the same functionality and to have the same capacity to meet flood mitigation objectives which would be achieved through unique design solutions at each site location. In addition, the alternatives were deemed to have the same ability to adjust to climate change. In the SMP, the four locations were determined to have the same effect on the water quality during construction and same effect on the surrounding natural environment due to design solutions which mitigate these issues.

### 2.2.2 COASTAL FLOOD RISK

Coastal flooding is characterized as flooding caused by unusually high tides or storm surges in low lying areas located along shorelines. This type of flooding is typically dictated by the topography or elevation of the shoreline and surrounding areas. Alternative No. 4 was determined to be the preferred alternative in terms of the coastal flood risk. Alternative No.'s 1, 2 and 3, were determined to be at equivalent risk of coastal flooding due to their proximity to the Detroit River (less than or approximately equal to 75 meters). Alternative No. 4 has the lowest risk of coastal flooding because it is located significantly farther from the Detroit River (approximately 200 meters).

### 2.2.3 COMPLEXITY OF INSTALLATION AND OPERATION

Although each site presents various challenges for the construction of the proposed stormwater pumping station and sewers, Alternative No. 1 was determined to be the least complex because it has the shallowest pumping chambers and the lowest hydraulic head loss. These circumstances would allow for reduced pumping requirements, smaller pumping equipment, and improved pumping efficiency leading to easier installation and operation. To compare the complexities of construction for each location, the SMP process included a detailed breakdown of the following construction components: the pumping station wet well and equipment, pumping station excavation dewatering, excavation material, proximity to existing shoreline, shoreline flood protection, demolition of existing structures, sewer trench excavation dewatering, storm sewer installation, extent of existing utility relocation. Based on this analysis, it was determined that site specific challenges would be minimized for Alternative No. 1 making it the most preferred option. The challenges with constructing two large storm sewers along St. Rose Avenue make Alternative No. 4 the least preferred option.

### 2.2.4 ANTICIPATED EXTENT OF MAINTENANCE REQUIRED

In its evaluation, the SMP anticipated that the standard maintenance practices for the proposed pumping equipment and accessories will be similar for all four of the location alternatives. However, designs which incorporate enclosed forcemains will require additional forcemain maintenance. Moreover, any forcemain maintenance would require the pumping station to be shutdown or by-passed. Alternative No. 1 is the preferred alternative because no forcemain is required.

### 2.2.5 LENGTH OF TIME REQUIRED FOR IMPLEMENTATION

In terms of the length of time required for the implementation, Alternative No. 1 would be the preferred alternative. For Alternative No.'s 2, 3, and 4 there is a need to acquire private property and demolish existing structures which would delay the implementation timeline. In addition, there are risks associated with property acquisitions, such as the need to expropriate, which could further delay the implementation timeline. Any delays to the implementation timeline for the stormwater pumping station impact the timelines for the overall SMP implementation plan.

### 2.2.6 DISRUPTION DURING CONSTRUCTION

Temporary road closures and disruptions to St. Rose Avenue and Riverside Drive East will be required for all the location alternatives. Alternative No. 1 was determined to be the least disruptive because it is located on park land; is farther from residences and businesses; and would require the least amount of time for construction. Alternative No. 4 would require the most disruption due to the need to construct additional sewers and a forcemain along St. Rose Avenue to the Detroit River outlet. In addition, extensive utility relocation would be required; temporary sanitary flow pumping would be potentially required; and interim water distribution would be required during the construction of Alternative No. 4. Therefore, Alternative 1 was identified to be the preferred option.

### 2.2.7 PERMANENT CHANGES TO URBAN COMMUNITY

In the SMP the evaluation of the permanent changes to the urban community included the following considerations:

- Noise and Vibration Impacts
- Displacement of Existing Residents and Businesses
- Disruption to Greenspace and Parks
- Disruption to Waterfront Views

Noise and vibration impacts to the local residents as a result of the operation of the facility are expected to be negligible. As part of the pumping station design noise abatement measures, noise enclosures, landscaping and / or fencing buffers will be utilized to mitigate these impacts. In addition, the wet well structure and generator foundations will be adequately designed to mitigate vibrations.

In terms of the displacement of existing residents and businesses, Alternative No. 1 is considered the preferred site location. Alternative No.'s 2, 3, and 4 require the acquisition of property and displacement of existing residents and businesses to accommodate the proposed pumping station and equipment.

In terms of the disruption to greenspaces / parks and waterfront views, Alternative No. 1 is considered the least preferred site location. Constructing the pumping station and equipment

within the park will have the highest permanent impact on the urban community. Therefore, Alternative No.'s 2, 3, and 4 would be the preferred alternatives.

### 2.2.8 IMPACTS TO ARCHAEOLOGICAL, BUILT HERITAGE, AND CULTURAL HERITAGE

In the vicinity of the four alternative locations there are no heritage classified or designated properties; therefore, minimal impacts are anticipated for each of the alternative sites. Further (Stage 2) archaeological assessments would be required for Alternative No.'s 1, 2, and 3 whereas Alternative No. 4 is anticipated to have the least potential for archaeological impacts. As a result, Alternative No. 4 would be considered the preferred alternative in terms of the impact to archaeological, built heritage, and cultural heritage.

### 2.2.9 RELATIVE CAPITAL COST

The SMP estimated Alternative No. 1 to have the lowest cost, Alternative No. 4 to have the highest cost, and Alternative No.'s 2 and 3 to have a cost between the other options. The SMP completed a detailed cost analysis for Alternative No.'s 1 and 4; however, this did not include the cost associated with property acquisitions or relocation of residents and businesses. The cost of construction for Alternative No. 1 is anticipated to be 15 – 20 % lower than Alternative No. 4; hence, Alternative No. 1 is the preferred option.

## 2.3 PREFERRED LOCATION FROM THE SMP

In summary, the initial comparative evaluation of the four alternative locations determined that Alternative No. 1, St. Rose Beach Park, was the preferred location. The comparative evaluation found that Alternative No. 4, the intersection of St. Rose Avenue and Wyandotte Street East, was not significantly less preferred than Alternative No. 1. However, Alternative No. 1 was selected as the preferred alternative due to constructability and operation requirements, minimal maintenance requirements, minimal time requirements for implementation, minimal disruption during construction, and a lower relative capital cost. In addition, this location would not displace existing residences or businesses.

# 3.0 DETAILED EVALUATION OF SITE SELECTION

## 3.1 SITE LOCATION ALTERNATIVES

The four (4) viable site locations identified for the St. Rose pumping station in the SMP will be further evaluated in this Memo. The four alternative locations are as follows:

- Alternative No. 1 – Construct the St. Rose Avenue pumping station in the St. Rose Beach Park on the north side of Riverside Drive East.
- Alternative No. 2 – Construct the St. Rose Avenue pumping station to the south of Riverside Drive and east of St. Rose Avenue.
- Alternative No. 3 – Construct the St. Rose Avenue pumping station to the south of Riverside Drive and west of St. Rose Avenue.
- Alternative No. 4 – Construct the St. Rose Avenue pumping station at the northwest corner of the intersection at St. Rose Avenue and Wyandotte Street East.

The location and general layout for the four options is depicted in **Figure 3-1** and available in **Appendix A** of this Memo. **Figures 3-2**, **3-3**, **3-4**, and **3-5**, available in **Appendix A**, depict the proposed pumping station layout for the four alternative locations. **Figures 3-6**, **3-7**, **3-8**, and **3-9** shown below depict the current land use at the four locations.

The evaluation of the four site alternatives took into consideration the following functional design elements that were determined in the SMP: new pumping station wet well structure to house 3 large sized pumps and two smaller sized pumps (firm capacity of 13.5 $m^3/s$); building structure to house the electrical systems and pump controls; back-up power generator to provide standby power; on-site power transformer; vehicle access points; and landscaping amenities. The proposed layout and functional design of the pumping station and other site features are subject to fine tuning during the detailed design process.


**Figure 3-6: Location Alternative No. 1**


**Figure 3-7: Location Alternative No. 2**


**Figure 3-8: Location Alternative No. 3**


**Figure 3-9: Location Alternative No. 4**

## 3.2 EVALUATION OF ALTERNATIVE SITE LOCATIONS

The four alternative sites were considered through a detailed evaluation. Evaluation criteria were developed based on those outlined in the SMP and considerations heard through consultation. Evaluation criteria were developed and categorized to assess potential short-term and longer-term impacts of the alternative site locations. The evaluation criteria are as follows:

Technical Criteria:

- Ability to Meet Flood Mitigation Objectives
- Flexibility to Adapt to Climate Change
- Coastal Flood Risk
- Anticipated Maintenance Requirements
- Time Required for Implementation

- Complexity of Installation and Operation
    - Pumping Station Wet Well and Equipment
    - Pumping Station Excavation Dewatering
    - Excavation Material Management
    - Demolition of Existing Structures
    - Storm Sewer Installation
    - Extent of Existing Utility Relocation

Social Criteria:

- Disruption During Construction
- Impacts to Archaeological, Built Heritage, and Cultural Heritage
- Development Policies
- Permanent Changes to Urban Community
    - Noise and Vibration Impacts
    - Generator Emission Impacts
    - Displacement of Existing Residents and Businesses
    - Disruption to Waterfront Parklands
    - Disruption to Waterfront Views

Natural Environment Criteria:

- Impacts to the Natural Environment
- Better Use of Existing Infrastructure

Economic Factors:

- Relative Capital Cost
- Relative Operation and Maintenance Cost

In order to objectively compare the four location alternatives, an evaluation matrix with a four-point scoring system was utilized. For each of the evaluation criteria, the four locations were scored on a scale of one to four (1 → 4), with one (1) being the least desirable and four (4) being the most desirable based on how well it performed in addressing the individual criterion. The individual evaluation criteria were assessed, and each site location was awarded an overall score based on the standard definitions outlined in **Table 3-1**. A summary of the scores is provided in the **Table**

**3-3**. Additional details and descriptions for the scores awarded for each of the evaluation criteria are provided in **Section 3.2.1** through **Section 3.2.4**.

**Table 3-1: Evaluation Criteria Score Rating**

| Score | Scale | Score Description |
|---|---|---|
| 1 | Poor | Unsuitable or not fit for the desired application; negative impacts; disadvantageous; and/or undesirable given the project timeline, budget, scope, and standards. |
| 2 | Fair | Acceptable for the desired application; minimal negative impacts; adequate given the project timeline, budget, scope, and standards. |
| 3 | Good | Suitable or good for the desired application; negligible impacts; and/or agreeable given the project timeline, budget, scope, and standards. |
| 4 | Very Good | Favourable; positive impacts; advantageous; excellent given the project timeline, budget, scope, and standards. |

### 3.2.1 TECHNICAL CRITERIA

#### *3.2.1.1 Ability to Meet Flood Mitigation Objectives*

Alternative No. 1 Score: 4

Alternative No. 3 Score: 4

Alternative No. 2 Score: 4

Alternative No. 4 Score: 4

During the SMP process it was identified that all stormwater infrastructure upgrades proposed throughout the City would be designed to meet the flood mitigation objective of providing service for the climate change storm (1 in 100-year storm + a 40% climate change factor). This pumping station capacity was selected due to its ability to meet the flood mitigation objectives, provide enhanced service to the vulnerable coastal areas, and adjust to climate change. However, based on public consultation, which occurred as a part of the SMP process, it was determined that the design of the proposed St. Rose stormwater pumping station would provide service in the case of a 1 in 100-year storm event with no climate change factor. This flood mitigation objective was set to reduce the required pumping capacity and size requirements of the proposed stormwater pumping station and minimize impact on the community. This flood mitigation objective corresponds to a firm stormwater pumping capacity of 13.5 $m^3/s$.

The design of the pumping station required to meet the capacity would be determined during the Schedule C Class Environmental Assessment and detailed design phases. Although the functional design of the pumping station will be the same for each of the location alternatives, site-specific features such as the layout, number of pumps, pumping equipment, and length of forcemains will be accounted for during these design phases. Each alternative site location would present individual challenges, that would affect the complexity of the installation, operation, and capital cost. However, based purely on the ability to meet flood mitigation objectives each alternative is considered a viable option for the stormwater pumping station. Because of this Alternative No.'s 1, 2, 3, and 4 all received a score of 'Very Good'.

#### *3.2.1.2 Flexibility to Adapt to Climate Change*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 2

Alternative No. 3 Score: 2

Alternative No. 4 Score: 2

The City of Windsor has a long-standing commitment to Climate Change Mitigation and Adaptation Planning. This corporate environmental commitment was made through the development of an Environmental Master Plan in 2017 and was further developed through the Climate Change Adaptation Plan in 2020. In the Windsor Climate Change Adaptation Plan, the City determined that average precipitation values are expected to increase in the future, particularly in the seasons of winter and spring. The summer months may see a slight decrease in precipitation coupled with increasingly warm seasonal temperatures. In terms of extreme precipitation, the intensity and frequency of events is expected to increase in the future corresponding to a 25% increase in 10-year storm events and a 40% increase in 100-year storm events. For example, the City of Windsor has already experienced two 100-year storms in the years 2016 and 2017. On average more rain is expected to fall (in terms of mm/hr) during these periods of extreme precipitation. The water levels in Lake Erie and Lake St. Clair have been above average since 2013 and, in 2019, the Detroit River reached a high-water level of 176.08 meters. In the near future, water levels are expected to continue to be high.

Based on these climate change predictions, the required capacity of the proposed stormwater pumping station for this drainage area is only expected to increase in the future. For this reason, it is beneficial for the selected site to have additional space for future expansion. Alternative No. 1 is located in the St. Rose Beach Park and the proposed pumping station would occupy approximately 50 % of the lot. Of the four alternative locations only Alternative No.1 would have

flexibility to adapt to climate change as there is opportunity for the pumping chambers to be expanded in the future. Therefore, this alternative received a score of 'Very Good'. Alternative No.'s 2, 3, and 4 are located in the midst of residential and commercial zones. In the future, if the pumping station is required to be expanded to meet climate change needs it will be more difficult and require the acquisition of additional residential or commercial properties. Hence, Alternative No.'s 2, 3, and 4 received a score of 'Fair'.

#### *3.2.1.3 Coastal Flood Risk*

Alternative No. 1 Score: 3

Alternative No. 2 Score: 4

Alternative No. 3 Score: 4

Alternative No. 4 Score: 4

Coastal flooding is characterized as flooding caused by unusually high tides or storm surges in low lying areas located along shorelines. This type of flooding is typically dictated by the topography or elevation of the shoreline and surrounding areas. The elevation of each site is approximately 175.00 meters; therefore, there is no significant difference in topography between the four alternatives. Coastal flooding events may be mitigated via engineered defense systems such as flood barriers, break walls, and levees or natural defence systems such as soil berms, gravel bars, and vegetation/wetlands. Due to the low elevation in many areas of East Windsor, and the record high water levels in the Detroit River and Lake St. Clair, a majority of the Riverside area is at increased risk of coastal flooding. However, this is being addressed City wide through the addition of two new stormwater pumping stations, improved or additional storm sewer outlets, and various stormwater pumping station upgrades. In addition, the City is planning to construct a landform barrier or earth berm at an elevation of 176.50 meters along Riverside Drive East to provide protection to in-land areas and low-lying properties.

Alternative No. 1 would be located inside of the existing Detroit River break wall barrier but outside of the proposed landform barrier; therefore, this location is at higher risk for coastal flooding. Alternative No.'s 2, 3, and 4 would be located inland of the proposed landform barrier and the existing Detroit River break wall barrier. Regardless of the chosen location, to provide protection against coastal flooding, all the sites would be designed such that the generator, electrical building, and top elevation of the pumping station are at or above an elevation of 176.50 meters, the instantaneous 1:100-year water level. As a result, the proposed stormwater pumping station would be at minimal risk for coastal flooding for all locations. For these reasons, Alternatives No. 1 received a score of 'Good' and Alternative No.'s 2, 3 and 4 received a score of 'Very Good'.

#### *3.2.1.4 Anticipated Maintenance Requirements*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 3

Alternative No. 3 Score: 3

Alternative No. 4 Score: 3

The standard maintenance practices for the screen equipment, pumping equipment, pumping chambers, electrical building, electrical equipment, and instrumentation & controls are anticipated to be the same regardless of the pumping station location. Standard maintenance of the screens, pumps, and other equipment will require an access driveway for maintenance vehicles and crane trucks. In addition, lighting and security cameras will be required on site for maintenance and safety purposes.

The maintenance requirements are anticipated to vary based on the location of the pumping station and the forcemain to the outlet structure. The use of a forcemain will necessitate forcemain maintenance and clean outs. The outlet structure is incorporated into the pumping station's discharge piping for Alternative No. 1; therefore, forcemain maintenance will not be required. In addition, Alternative No. 1 would repurpose the existing outlet structure as a bypass which can be utilized to provide service when maintenance is required for the pumping station. Alternative No.'s 2 and 3 will each have a forcemain length of approximately 75 meters which would require regular maintenance. Alternative No. 4 would have a forcemain length of approximately 200 meters which would also require regular maintenance. For these alternatives, the existing outlet structure would not be able to act as a by-pass during maintenance events. Any forcemain or pump maintenance would require the pumping station to be shutdown or bypassed through external pumping, which needs to be scheduled around anticipated dry weather periods and leaves the area at risk while non-operational. Eliminating the need for forcemain maintenance would be beneficial resulting in Alternative No. 1 being the most preferred alternative. For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No. 2, 3, and 4 received a score of 'Good'.

#### *3.2.1.5 Time Required for Implementation*

Alternative No. 1 Score: 3

Alternative No. 2 Score: 2

Alternative No. 3 Score: 2

Alternative No. 4 Score: 1

The length of time required for the implementation and construction of the St. Rose stormwater pumping station is anticipated to vary based on the proposed location. The length of time required for the Class Environmental Assessment, detailed design process, and construction of the pumping chambers is expected to be similar regardless of the pumping station location. However, the implementation timeline will be affected by four main factors: (1) the time required for zoning amendments (2) the time required for property acquisition, (3) potential time required for the expropriation of residents/businesses, and (4) the time required for design and construction of the linear infrastructure surrounding the pumping station.

Alternative No.'s 1, 2, and 3 would likely require a zoning by-law amendment to be utilized for the proposed pumping station. This process would add to the time required for implementation. Alternative No. 4 would likely not require a zoning by-law amendment; therefore, would not require additional time for this step.

Alternative No. 1 occupies one lot which is owned by the City and would not require any property acquisition. Alternative No.'s 2 and 3 would require the acquisition of two and three residential properties, respectively. Alternative No. 4 would require the acquisition of one residential property, one commercial property, and a portion of the adjacent commercial parking lot. Due to the need for property acquisition, the timelines for implementation for Alternative No.'s 2, 3, and 4 will be longer. The locations that require the acquisition of properties have a risk of requiring additional time for the expropriation process. According to the Ontario Expropriation Association, in a majority of instances the expropriation of a property takes 9 to 12 months.

In terms of the time required for design and construction of the linear infrastructure surrounding the pumping station, Alternatives No. 1 will require the least amount of time because the distance to the outlet location is minimal. Alternative No.'s 2 and 3 will require more time due to the need to construct forcemains across Riverside Drive East and a new outlet chamber in the St. Rose Beach Park. Alternative No. 4 will require even more time due to the need to construct a forcemain down St. Rose Avenue and across Riverside Drive East, as well as construct a new outlet chamber in St. Rose Beach Park. In addition to the construction of the forcemain down St. Rose

Avenue, Alternative No. 4 would require the relocation of pole lines, gas mains, and other telecommunication utilities which are currently located in the 20-meter right-of-way. For these reasons Alternative No. 1 received a score of 'Good', Alternative No. 2 and 3 received a score of 'Fair', and Alternative No. 4 received a score of 'Poor'.

#### *3.2.1.6 Complexity of Installation and Operation*

Although each site presents various challenges for the construction of the proposed stormwater pumping station and related sewers, Alternative No. 1 was determined to be the least complex in terms of installation and operation. To compare the complexities of construction for each location the following construction components were evaluated: Pumping Station Wet Well and Equipment, Pumping Station Excavation Dewatering, Excavation Material, Demolition of Existing Structures, Storm Sewer Installation, and Extent of Existing Utility Relocation.

*Pumping Station Wet Well and Equipment*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 3

Alternative No. 3 Score: 3

Alternative No. 4 Score: 1

From a constructability and operation standpoint the most preferred alternative for the pumping station wet well and pumping equipment would be the alternative with the shallowest pumping chambers and the lowest hydraulic head loss. These circumstances would allow for reduced pumping requirements, smaller pumping equipment, and improved pumping efficiency which contribute to ease of construction and long-term cost savings. These factors are directly related to the distance between the pumping station and the receiving outlet or outlet chamber. Based on this, Alternative No. 1 would be the most preferred alternative as this pumping station will have the lowest head loss and shortest discharge piping requirements. This means a less complex design, a shorter construction timeline, and more efficient operating conditions. Alternative No. 4 is located the farthest away from the outlet chamber therefore it would require increased pumping power to overcome the head losses that results from the long forcemain (approximately 200-meter). This would result in less favourable operating conditions such as increased pumping pressure and longer pump run times which increase wear and tear on the pumping equipment. Alternative No.'s 2 and 3 would require a pumping station depth and head loss between that of Alternative No. 1 and 4.

From an operational standpoint the pumping station design, which incorporates engineering redundancies and allows for bypassing during maintenance or failure events, would be the most desirable. Alternative No. 1 would repurpose the existing outlet structure as a by-pass which can be utilized to provide service during maintenance or pumping station failure events. Alternative No.'s 2, 3, and 4, would not have bypass infrastructure in place for maintenance or failure events. During planned maintenance events the pumping station would need to be shutdown or by-passed through external pumping and needs to be scheduled around anticipated dry weather periods. In the case of failure, the pumping station would need to be bypassed through external pumping, which leaves the area at risk while non-operational. For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No. 2 and 3 received a score of 'Good', and Alternative No. 4 received a score of 'Poor'.

*Pumping Station Excavation Dewatering*

Alternative No. 1 Score: 3

Alternative No. 2 Score: 3

Alternative No. 3 Score: 3

Alternative No. 4 Score: 4

From a constructability standpoint the requirements for excavation dewatering are directly related to the soil characteristics on site and the proximity to the existing shoreline. Based on preliminary sub-surface soil and groundwater assessments conducted at St. Rose Beach Park, the Detroit River water surface is approximately 0.9 – 1.1 meters below grade and the groundwater table is approximately 12.5 – 14.1 meters below grade. This indicates that the native silty clay soils have a low permeability; therefore, ground water control during the construction process will not be a substantial issue. It is anticipated that groundwater inflows from excavation can be managed by pumping the water with filtered sump pumps. Based on these soil characteristics and the distance to the shoreline, excavation pumping will be required and manageable by sump pump for Alternative No.'s 1, 2, and 3. Due to the larger distance from the shoreline, excavation pumping will be less for Alternative No. 4, making it more preferrable. For these reasons, Alternative No. 1, 2, and 3 received a score of 'Good' and Alternative No. 4 received a score of 'Very Good'.

*Excavation Material Management*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 2

Alternative No. 3 Score: 2

Alternative No. 4 Score: 2

Based on the preliminary soil assessment carried out at St. Rose Beach Park, the excavation materials will be composed of two types (1) native sandy silty clay material and (2) sandy silty clay fill material. The silty clay fill materials may be re-used for industrial, commercial, and community land use onsite or offsite. This will be beneficial as the excess soil produced from excavation may be used for landscaping features within the park or at other community locations across the City. The native sandy silty clay materials were found to have molybdenum concentrations exceeding the Ontario Excess Soil Quality Standards (ESQS) Table 1. This excess concentration was determined to be naturally occurring and is well known to occur in southwestern Ontario due to glacial silt or clay deposits. This native soil can be re-used onsite for landscaping features; however, offsite re-use may be subject to regulatory restrictions. While the excess soil produced for the construction of the proposed pumping station is anticipated to exceed landscaping soil requirements, it is disadvantageous to have excess native soil materials on site. Alternative No. 1 will contain native soil material, which can be prioritized for re-use onsite, and fill material, which can be beneficially re-used for other projects across the City. Alternative No.'s 2, 3, and 4 are expected to contain mostly native soil material; a portion of which can be re-used for landscaping features onsite while excess is subject to regulatory restrictions. For these reasons, Alternative No. 1 received a score of 'Very Good' and Alternative No. 2, 3 and 4 received a score of 'Fair'.

*Demolition of Existing Structures*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 1

Alternative No. 3 Score: 1

Alternative No. 4 Score: 1

Alternative No. 1 would not require the demolition of any buildings or other infrastructure; therefore, it would be the most preferred alternative. Alternative No. 2 would require the demolition of two residential buildings, landscaping features, and other concrete/asphalt surfaces. Similarly, Alternative No. 3 would require the demolition of three residential buildings, landscaping features, and other concrete/asphalt surfaces. Alternative No. 4 would require the demolition of one residential building, one commercial building, landscaping features, and a

significant amount of concrete/asphalt surfaces. Alternative No.'s 2, 3, and 4 will require significantly more time and resources for demolition making them less desirable options. For these reasons, Alternative No. 1 received a score of 'Very Good' and Alternative No. 2, 3 and 4 received a score of 'Poor'.

*Storm Sewer Installation*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 2

Alternative No. 3 Score: 2

Alternative No. 4 Score: 1

The installation of storm sewers leading to and from the pumping station to the outlet structure will also impact the constructability of the project. For ease of construction, it is desirable for the surrounding storm sewers to be short in length and shallow in depth. Alternative No. 1 is located close to the existing storm outlet and will incorporate the new outlet chamber into the pumping structure, reducing the number and complexity of surrounding storm sewers. The required storm sewers for this alternative will be the shortest and shallowest compared to the other locations.

Alternative No. 2 and 3 will require the construction of additional sewers along Riverside Drive and a small portion of St. Rose Avenue. These proposed sewers will increase the complexity of construction. The sewers will need to be installed at a sufficient depth to reduce conflicts with other utilities and water/wastewater infrastructure.

Alternative No. 4 will have the most complex requirements for the storm sewers due to its distance from the outlet location. Alternative No. 4 will require the construction of additional sewers along Riverside Drive, St. Rose Avenue, and a portion of Wyandotte Street. Due to the layout of the proposed stormwater infrastructure, two large stormwater sewers will be required along St. Rose Avenue. There is limited space in the St. Rose Avenue right-of-way; therefore, this alternative would require significantly longer and deeper storm sewers, which will significantly impact the constructability of these sewers. The sewers will need to be installed at a sufficient depth to reduce conflicts with other utilities and water/wastewater infrastructure. The sewers will need to be installed at an approximate depth of 6.0 meters which will require extensive utility relocation, specialized equipment and excavation, additional safety precautions, and full closure of the St. Rose Avenue right-of-way. For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No.'s 2 and 3 received a score of 'Fair', and Alternative No. 4 received a score of 'Poor'.

*Extent of Existing Utility Relocation*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 3

Alternative No. 3 Score: 3

Alternative No. 4 Score: 1

Utility relocation poses challenges to the planning, design and construction of municipal projects, timelines may vary, and operational constraints may make it restrictive. Ideally, the location with the least amount of utility relocations will be the preferred option. In this scenario, Alternative No. 1 is the preferred alternative because there would be minimal requirements and likely no need for utility relocation. Alternative No.'s 2 and 3 would require some utility relocation for the gas mains and aerial services. Alternative No. 4 would require extensive utility relocation to accommodate the two large sewers which need to be installed in the St. Rose Avenue right-of-way. Utility relocation along St. Rose Avenue will include pole lines, gas mains, and other telecommunication utilities, which will require property acquisition or easements on the east and west side of St. Rose Avenue. There is also a potential need to provide temporary wastewater flow pumping, on-grade water distribution, and other measures to maintain service during construction. This significantly increases the complexity for construction for Alternative No. 4 making it the least preferred alternative. For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No. 2 and 3 received a score of 'Good', and Alternative No. 4 received a score of 'Poor'.

### 3.2.2 SOCIAL CRITERIA

#### *3.2.2.1 Disruption During Construction*

Alternative No. 1 Score: 3

Alternative No. 2 Score: 2

Alternative No. 3 Score: 2

Alternative No. 4 Score: 1

During the construction phase of this project, it is anticipated that all site locations would result in some level of temporary disruption to the community and nearby residents. When considering the temporary disruptions, it is important to consider the impact the operation of equipment and movement of construction vehicles can have on air quality, noise and vibration, community life, and pedestrians and traffic routes. The impacts on air quality, noise, and vibration, and community life will be mitigated through standard construction procedures. A proposed mitigation measure to be employed during the construction phase of this project is the use of a field ambassador. This field ambassador would be available to the community as a point of contact to maintain

dialogue ahead of and during construction. This allows impacted community members voice their concerns throughout the process and stay informed of planned construction activities and mitigation measures. All alternatives will have similar impacts in these categories; however, the duration of these impacts is anticipated to be longer for Alternative No.'s 2, 3, and 4 due to the need to construct additional upstream and downstream infrastructure.

All pumping station locations would require the temporary closure of Riverside Drive East for the installation of storm sewers or, in the case of Alternative No.'s 2, 3, and 4, a forcemain to the outlet structure. In addition, the movement of construction vehicles and equipment would cause continued traffic disruptions on Riverside Drive and St. Rose Avenue throughout construction. Alternative No.'s 2, 3, and 4 would also require some temporary closure of St. Rose Avenue. Due to the required depth and size of the storm sewers in the St. Rose Avenue right-of-way and the need for advanced utility relocation, there would be significant disruptions to the surrounding community for Alternative No. 4. Moreover, this alternative would potentially require temporary sanitary flow pumping, interim on-grade water distribution, and other measures to maintain service to the area during construction. Throughout the construction process access to driveways on St. Rose Avenue and emergency vehicle access to the region will be restricted. In addition, the construction requirements for Alternative No. 4 would impact the traffic and pedestrian routes on Wyandotte Street East. This would include impacts to a bus stop located on Wyandotte Street East in front of the proposed pumping station location. Alternative No. 4 is considered the least preferred option. Alternative No. 1 is considered the most preferred option and Alternative No.'s 2 and 3 are considered slightly less preferred.

It is also important to consider the anticipated timeline for the construction based on the different alternatives. Alternative No.'s 2, 3, and 4 will require demolition of the existing structures, which adds to the construction timeline and therefore the length of disruptions to the community. Alternative No. 1 would not require any additional demolition; therefore, it will not be as disruptive. Further, Alternative No. 1 will require the shortest timeline for construction because the distance to the outlet location is minimal. Alternative No.'s 2 and 3 will require more time due to the need to construct forcemains across Riverside Drive East and a new outlet chamber in St. Rose Beach Park. Alternative No. 4 will require more time due to the need to construct a forcemain down the length of St. Rose Avenue and across Riverside Drive East as well as the new outlet chamber in St. Rose Beach Park. For these reasons, Alternative No. 1 received a score of 'Good', Alternative No.'s 2 and 3 received a score of 'Fair', and Alternative No. 4 received a score of 'Poor'.

#### *3.2.2.2 Impacts to Archaeological, Built Heritage, and Cultural Heritage*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 4

Alternative No. 3 Score: 4

Alternative No. 4 Score: 4

In order to determine the impacts to archaeological resources, Stage 1 archaeological assessments were carried out for each of the site alternatives. During the Stage 1 assessment carried out for St. Rose Beach Park, it was determined that the northern portion of the study area was artificially created between 1975 and 2000 through a process of infilling the south shore of the Detroit River. These artificial lands which make up a majority of the St. Rose Beach park hold no to low archaeological potential. The northern edge of Riverside Drive was determined to potentially represent the original shoreline of the Detroit River and therefore holds some potential for archaeological resources. For these reasons, a Stage 2 assessment is required for the sites located near Riverside Drive which includes Alternative No.'s 1, 2, and 3.

A Stage 2 archaeological assessment was carried out for the southern portion of St. Rose Beach Park along Riverside Drive. During the Stage 2 assessment, no archaeological resources were discovered during test pit surveying and thus no further land-based archaeological assessment of the study area is required. Based on these assessments, all the site alternatives are anticipated to have minimal to no archaeological impacts.

In the Municipal Class Environmental Assessment process, built and cultural heritage considers historical plaques, park monuments, murals, sculptures, heritage building(s) or site(s), and/or museums that have historic, aesthetic, or social significance to a community. Properties or sites of built and cultural heritage in the City of Windsor are recognized by their inclusion in the Windsor Municipal Heritage Register. There are no listed or designated properties on or surrounding the proposed site locations. The heritage resources around the proposed work area were identified based on the Windsor Municipal Heritage Register provided by the City of Windsor. The City of Windsor's Planning and Building Services Department was also consulted to determine the location and details of Built Heritage and Cultural Heritage Landscapes. The proposed work is located away from these built heritage and cultural heritage landscapes; therefore, it is not expected to impact heritage resources in the area.

The pumping station and related structures will incorporate the general aesthetic and character of the neighbourhood. This will be accomplished by selecting architectural and landscaping

features that compliment the St. Rose/Riverside neighbourhood. As part of the design process, local residents will be consulted to provide input on design features and finishes. For these reasons, Alternative No.'s 1, 2, 3, and 4 received a score of 'Very Good' for this evaluation criterion.

#### *3.2.2.3 Development Policies*

Alternative No. 1 Score: 1

Alternative No. 2 Score: 4

Alternative No. 3 Score: 4

Alternative No. 4 Score: 4

The Class EA process for the St. Rose stormwater pumping station will consider development policies and practices at the municipal, provincial, and federal level. Municipal development policies that were of particular interest for this project include the Windsor 2017 Environmental Master Plan (EMP) and the City of Windsor Official Plan. The 2017 EMP aims to make the City of Windsor more environmentally friendly and sustainable through five goals: (A) improving air quality, (B) improving water quality, (C) responsible land use, (D) increase resource efficiency, (E) promote awareness. The design and implementation of the St. Rose stormwater pumping station will conform to the 2017 EMP for any of the four alternative site locations by improving upon Goal B - Objective B2 'Improve Stormwater Management to Reduce the Risk of Flooding to Residents'.

The City of Windsor Official Plan is a policy document adopted by City Council under the Ontario Planning Act which provides guidance for development within the municipality. Policy 8.9 of the Official Plan relates to Views and Vistas and identifies the need to protect and improve views of significant landmarks and features such as the Detroit River. Alternative No. 1 would impact the view of the Detroit River at St. Rose Beach Park. Further, Policy 6.7.3.15 of the Official Plan outlines the considerations required for the disposition of lands acquired for public open space. These considerations include: (a) the adequacy of other Public Open Space within the area to serve the recreation and leisure needs of residents; (b) the ability of the Municipality to provide alternative or suitable Public Open Space in the event the standards are not met; (c) the suitability of the site for other land uses; (d) the environmental significance and ecological sensitivity of the site; (e) public input; (f) any legal agreements, easements or covenants affecting the property; and (g) the historical significance of the Public Open Space. While not technically a disposition of public open space lands, Alternative No. 1 would involve a reduction in some of the open space in St. Rose Beach Park (as discussed in more detail under 3.2.2.4 "Disruption to Waterfront Parklands") and is less desirable than Alternative No's. 2, 3, and 4 from this perspective.

As part of the Municipal Class Environmental Assessment process this study will be reviewed by Windsor City Council, Essex Regional Conservation Authority (ERCA), Ontario Ministry of Environment, Conservation and Parks (MECP), Ontario Ministry of Heritage, Sport, Tourism and Cultural Industries (MHSTC), and other regulatory agencies. Additionally, the proposed pumping station will require a Site Plan Control approval to ensure the final design complies with appropriate provincial plans and policy statements, official plans, zoning-by-laws, community planning permit systems, and building permits.

St. Rose Beach Park (Alternative No.1) is currently zoned Green District 1.1 (GD1.1) and would require a zoning by-law amendment to permit a pumping station at this location. In addition, Alternative No. 1 has a historic restrictive covenant in the deed for the property which indicates buildings or motor vehicles are not permitted on the property. While this restrictive covenant is deemed expired under the Land Titles Act as it is has been registered to the property for over forty (40) years, it should be removed from title to be utilized for the proposed pumping station. Alternative No.'s 2 and 3 are currently zoned Residential District 1.6 (RD1.6) and would only require a zoning by-law amendment if the proposed pumping station does not comply with the least restrictive provisions for Zoning District RD1.6. Alternative No. 4 is currently zoned Commercial District 2.1 (CD2.1) and would also only require a zoning by-law amendment if the proposing pumping station did not comply with the provisions for CD2.1 zoning. Based on the existing zoning policies and restrictions on the St. Rose Beach park property, Alternative No.'s 2, 3, and 4 are the preferred site options in this category. These alternatives received a score of 'Very good' and Alternative No. 1 received a score of 'Poor'.

#### *3.2.2.4 Permanent Changes to Urban Community*

Permanent changes to the urban community will be assessed based on the anticipated long-term impacts that the operational phase of the proposed St. Rose stormwater pumping station will have on the local community. Factors that will be used to determine the level of impact are to include the noise and vibration, generator emissions, displacement of existing residences and businesses, disruption to parklands, and disruption to waterfront views. Overall, the implementation of the St. Rose stormwater pumping station will have positive permanent impacts on the urban community by reducing the risk of surface and coastal flooding.

*Noise and Vibration Impacts*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 2

Alternative No. 3 Score: 2

Alternative No. 4 Score: 3

In terms of the noise and vibration, permanent changes to the urban community are anticipated to be minimal due to the abatement measures and mitigation methods that will be implemented in the pumping station design. The proposed pumping station will be designed in accordance with the Ontario Ministry of Environment, Conservation and Parks (MECP) Environmental Noise Guidelines. The MECP has stringent sound attenuation requirements, which will ensure the appropriate engineering control measures are in place and minimize noise and vibration emissions to the surrounding neighbourhood.

It is important to note that this is a stormwater pumping station and the stormwater pumps are designed to operate during rainfall events; therefore, equipment on the site will not produce noise or vibrations on a regular basis. The main source of noise and vibration during the operation of the pumping station will be the pumps operating in the wet well structure and the generator operating on the generator foundation. The noise and vibrations caused by the pumps in the wet well structure will be minimized by properly designing the foundation structure. The noise and vibrations caused by the generator will be minimized by properly designing the generator foundation structure, ensuring proper installation and alignment, noise enclosures, landscape or fencing buffers and/or other mitigation measures.

In addition to these mitigation measures, increasing the distance between the pumping station and the nearby residences will minimize the noise and vibration impacts. For Alternative No. 1, the generator and the pumping structure will be located at a minimum of approximately 50 meters from the nearest residents. Whereas for Alternative No.'s 2, 3, and 4, the generator and the pumping structure will be located at a minimum of approximately 30 meters. Compared to Alternative No.'s 2 and 3, Alternative No. 4 is located on a lot zoned as commercial which would allow for higher noise and vibration tolerances. For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No.'s 2 and 3 received a score of 'Fair', and Alternative No. 4 received a score of 'Good'.

*Generator Emission Impacts*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 2

Alternative No. 3 Score: 2

Alternative No. 4 Score: 3

In terms of the generator, permanent changes to the urban community are anticipated to be minimal due to abatement measures and mitigation methods that will be employed in the pumping station design. It is important to note that this is a stormwater pumping station and the generator equipment will only operate during a significant rainfall event in which there is a power outage or during regular maintenance testing. Modern emergency power generators are manufactured to comply with MECP regulations and are more efficient than traditional diesel generators. The emissions caused by the generator will be minimized by proper design of the generator exhaust system, ensuring regular maintenance and servicing, landscaping, or fencing buffers and/or other mitigation methods. The proposed pumping station will be designed in accordance with the MECP Guidelines. The MECP has stringent emission requirements which will ensure the appropriate engineering control measures are in place and minimize emissions to the surrounding neighbourhood.

In addition to these mitigation measures, increasing the distance between the pumping station and the nearby residences will minimize impacts to the community. For Alternative No. 1, the generator will be located farther from the nearest residents. Moreover, the Detroit River to the north and the small bay to the west provide adequate separation from other residential properties. Whereas for Alternative No.'s 2, 3, and 4, the generator and the pumping structure will be located closer to the nearest residents. Alternative No. 4 is located in a commercial zoning area which may allow for slightly higher emission allowances. For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No.'s 2 and 3 received a score of 'Fair', and Alternative No. 4 received a score of 'Good'.

*Disruption or Displacement of Existing Residents and Businesses*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 1

Alternative No. 3 Score: 1

Alternative No. 4 Score: 1

In considering the preferred site location, the size and space requirements of the pumping station had to be taken into consideration. Three of the four sites identified, require property acquisition to allow for the pumping station build out and to provide a mandatory buffer from surrounding properties. Alternative No.'s 2, 3, and 4 require the acquisition of property and therefore will displace some residents. Alternative No. 1 does not require the acquisition or displacement of any residents or business. Alternative No. 2 requires the displacement of two existing residences. Alternative No. 3 requires the displacement of three existing residences. Alternative No. 4 requires the displacement of one residential property, one commercial property, and a portion of the adjacent parking lot.

In terms of the disruption to existing residents and businesses, it is important to consider the distance between the nearest resident and the pumping station equipment. For Alternative No. 1, the generator and the pumping structure will be located at a minimum of approximately 50 meters from the nearest residents. Whereas for Alternative No.'s 2, 3, and 4, the generator and the pumping structure will be located at a minimum of approximately 30 meters. For this reason, it can be expected that Alternative No. 1 will cause the least disturbance to existing residents. Therefore, Alternative No. 1 received a score of 'Very Good', and Alternative No.'s 2, 3, and 4 received a score of 'Poor'.

*Disruption to Waterfront Parklands*

Alternative No. 1 Score: 1

Alternative No. 2 Score: 4

Alternative No. 3 Score: 4

Alternative No. 4 Score: 4

The proposed pumping station, no matter the location, will have some permanent impact on the parkland. Alternative No.'s 2, 3 or 4 will require an outlet structure to be constructed in the park area. The construction of this outlet structure will cause temporary closure of the park space and disruption to park services. Permanent changes to the park space from the selection of Alternative No.'s 2, 3 or 4 will include construction of an underground outlet structure and construction of an on grade access hatch in the park which provides entry to the sewer outlet for maintenance.

Alternative No. 1 will have a larger impact on the waterfront park in comparison to the other alternatives. The construction of the pumping chambers and other equipment will occupy approximately 50 % of the St. Rose Beach Park; however, a portion of the pumping structure will be located below the ground. As a result, the above ground structures and access driveway in the park will occupy approximately 25 % of the park's surface. Potential mitigating features on the site will include enclosed inlet and outlet pumping chambers located beneath the ground level to increase greenspace, permeable 'green' driveway for vehicle access, green roof, garden beds, benches, and other features to be confirmed during final detailed design. While St. Rose Beach Park currently contains minimal park services or landscaping features, the community will be able to enjoy physical activity, picnics, fishing, and other recreational activities in the space unoccupied by the driveway and above ground structures. For these reasons, Alternative No. 1 received a score of 'Poor' and Alternative No.'s 2, 3, and 4 received a score of 'Very Good' within this evaluation criterion.

*Disruption to Waterfront Views*

Alternative No. 1 Score: 1

Alternative No. 2 Score: 4

Alternative No. 3 Score: 4

Alternative No. 4 Score: 4

In terms of the permanent changes the stormwater pumping station will have on waterfront views, Alternative No.'s 2, 3 and 4 are considered the preferred in comparison to Alternative No.1.

Alternative No. 1 will have a greater impact on the waterfront views compared to the other alternatives. The construction of the pumping chambers and other equipment will block a portion of the riverfront view at the St. Rose Beach Park; however, appropriate design measures will be proposed to reduce the number of structures impeding the view. For example, all of the pumping station chambers have been designed to be located at or below the ground level, which reduces the disruption to the waterfront view. In addition, the impact of the disruption can be mitigated by including unique landscaping and architectural features to improve the aesthetic of the pumping station and ensure it blends with the character of the existing neighbourhood. For these reasons, Alternative No. 1 received a score of 'Poor' and Alternative No.'s 2, 3, and 4 received a score of 'Very Good' within this evaluation criterion.

### 3.2.3 NATURAL ENVIRONMENT CRITERIA

#### *3.2.3.1 Impacts to the Natural Environment*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 4

Alternative No. 3 Score: 4

Alternative No. 4 Score: 4

This criterion considered the potential negative effects the pumping station could have on the natural environment based on criteria that are outlined in the Municipal Class Environmental Assessment process including: climate, geology and physiography, soils and subsurface conditions, natural vegetation, and aquatic or terrestrial life and habitats. The location of the proposed pumping station will have negligible effect on most of these natural environment criteria. It is most important to consider the effects that the construction and operation of the pumping station will have on the natural vegetation and terrestrial animal life. The construction phase of this project has potential to cause disturbances to the lands surrounding the pumping station and the waters of the Detroit River near the outlet location. These impacts are applicable for all of the locations due to the need to construct an outlet structure in the park and disrupt the existing break wall. Mitigation measures will be implemented during construction to ensure impacts to the natural environment are minimized.

It is important to consider the current condition of the sites. The four alternatives are located in urban settings and the vegetation in the area has low ecological diversity, which does not support strong terrestrial ecosystems. The four sites are largely covered with landscaping, grass, structures, or concrete surfaces. The design and development of the stormwater pumping station will include additional landscaping features and increased plant diversity to minimize impacts to the existing natural environment and terrestrial habitats. For these reasons, Alternative No.'s 1, 2, 3, and 4 all received a score of 'Very Good' for this evaluation criterion.

#### *3.2.3.2 Better Use of Existing Infrastructure*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 3

Alternative No. 3 Score: 3

Alternative No. 4 Score: 2

Better use of existing infrastructure is characterized by the use of proper planning principles to maximize the life, performance, and value of existing infrastructure including the services the infrastructure can provide. By employing these planning principles, we can ensure that infrastructure meets the current needs of our communities and plans for future needs (including extreme weather conditions). Better use of existing infrastructure also highlights the repair and maintenance of existing infrastructure as opposed to replacement. The implementation of a stormwater pumping station for the St. Rose drainage area is vital to improve efficiency and reduce the risk of flooding caused by severe storm events for current and future generations.

The existing stormwater infrastructure in the area is designed and constructed such that storm runoff flows towards the outlet located in the St. Rose Beach Park. If the proposed pumping station is located near this existing outlet, it will optimize the utilization of the existing stormwater collection system. If the proposed pumping station is not located near the existing outlet, additional sewers will need to be constructed upstream and downstream to convey water between the outlet location and the pumping station. The farther the pumping station is located from the outlet, the more storm sewer infrastructure is required to be constructed. Alternative No. 1 is located the closest to the existing outlet structure, which will eliminate the need for additional storm sewers and is therefore considered a better option since it is utilizing the existing infrastructure. Alternative No. 4 is located the farthest from the existing outlet and will require the construction of additional storm sewers.

Furthermore, Alternative No. 4 requires a large amount of above ground infrastructure (roads, sidewalks, utilities, pole lines, etc.) be removed, relocated, and/or replaced as a part of the storm sewer construction. The extent of this replacement for Alternative No. 4 will include all of St. Rose Avenue. Alternative No.'s 2 and 3 will require some replacement of existing above ground infrastructure. Alternative No. 1 will require a minimal amount of replacement of existing infrastructure. For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No. 2 and 3 received a score of 'Good', and Alternative No. 4 received a score of 'Fair'.

### 3.2.4 ECONOMIC CRITERIA

#### *3.2.4.1 Relative Capital Cost*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 3

Alternative No. 3 Score: 2

Alternative No. 4 Score: 1

In order to evaluate which alternative has the lowest capital cost, a preliminary cost analysis was carried out for each of the site alternatives. The preliminary cost analysis represents a planning level Opinion of Probable Cost (OPC) and is presented in **Table 3-2**. The following is a summary of the key assumptions applied for the OPC analysis:

- The Probable Costs are presented in 2022 dollars.
- Equipment costs are based on vendor supplied price quotations and historical pricing of similar equipment.
- The capital cost is estimated from equipment cost plus 50% installation cost.
- The level of accuracy in projecting costs at this stage of development of a project is typically plus or minus 30% or greater and can be refined as the project develops to a level of plus or minus 10% just prior to tendering. However, the level of accuracy cannot be guaranteed, and the actual final cost of the project will only be determined through the tendering and construction process.

**Table 3-2: Preliminary Capital Cost Analysis (Planning Level Opinion of Probable Cost)**

| Item | Alternative No. 1 | Alternative No. 2 | Alternative No. 3 | Alternative No. 4 |
|---|---|---|---|---|
| Pumping Station and Outlet Structure | $22,000,000 | $22,500,000 | $22,500,000 | $22,500,000 |
| Linear Infrastructure (Additional Storm Sewers Upstream and Downstream from Pump Station) | Included in the Above Cost. | $800,000 | $800,000 | $6,000,000 |
| Utility Relocation | N/A | N/A | N/A | $500,000 |
| Building Demolition | N/A | $200,000 | $300,000 | $200,000 |
| **Total Capital Cost:** | **$22,000,000 (1)** | **$23,500,000 + Acquisition of 2 Properties (2)** | **$23,600,000 + Acquisition of 3 Properties (2)** | **$29,200,000 + Acquisition of 2 Properties (2)** |

(1) The preliminary cost analysis does not include an estimate for the value associated with loss of a portion of this parkland. The loss of parkland will not represent a capital cost expense to the City of Windsor; however, this park does hold a value to the community. It is not possible to produce an accurate estimate of this inherent value and it will not significantly increase the capital cost; therefore, it is not included in this analysis.

(2) The preliminary cost analysis does not include an estimate for the property acquisition or potential relocation. These values are tied to the current real estate market and may vary depending on the resident's willingness to relocate. Therefore, it is not possible to produce an accurate estimate of these costs at this stage of the project. It is anticipated that the cost for property acquisition and relocation will significantly increase the capital cost for Alternative No.'s 2, 3, and 4.

Based on the preliminary analysis Alternative No. 1 is the preferred alternative. Alternative No. 2 is the next most preferred alternative with a cost increase of approximately 7 % plus the cost of acquiring two residential properties (in comparison to Alternative No. 1). Alternative No. 3 is the next most preferred alternative with a cost increase of approximately 7 % plus the cost of acquiring three residential properties (in comparison to Alternative No. 1). Alternative No. 4 is the least preferred alternative with a cost increase of approximately 33 % plus the cost of acquiring one residential property, one commercial property, and one parking lot (in comparison to Alternative No. 1). For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No. 2 received a score of 'Good', Alternative No. 3 received a score of 'Fair', and Alternative No. 4 received a score of 'Poor'.

#### *3.2.4.2 Relative Operation and Maintenance Cost*

Alternative No. 1 Score: 4

Alternative No. 2 Score: 3

Alternative No. 3 Score: 3

Alternative No. 4 Score: 2

The preferred location for the St. Rose stormwater pumping station would have an optimized design that reduces the relative cost for operation and maintenance. Alternative No. 1 is considered the preferred alternative because of its proximity to the outlet location. The proximity to the outlet reduces head losses in the outlet pipe and corresponds to lower pumping power requirements. This decrease in pumping power translates to decreased power usage and thus reduced operational costs. Alternative No. 4 is the least preferred because of the head losses incurred in the approximately 200-meter length of forcemain along St. Rose Avenue. These head losses correspond to increased pump power requirements, power usage, and thus operation costs. The longer the forcemain, the higher the operating cost for pumping. Alternative No.'s 2 and 3 would have higher power requirements and operation costs that are between those of the aforementioned alternatives.

In terms of the maintenance costs, the alternative's that require forcemains will require additional maintenance and cleaning resulting in increased maintenance costs. As discussed in **Section 3.2.1.4**, Alternative No. 1 would not require forcemain maintenance and Alternative No.'s 2, 3, and 4 will require forcemain maintenance. Based on this, Alternative No. 1 is the most preferred and Alternative No. 4 is the least preferred. For these reasons, Alternative No. 1 received a score of 'Very Good', Alternative No. 2 and 3 received a score of 'Good', and Alternative No. 4 received a score of 'Fair'.

### 3.2.5 SITE EVALUATION MATRIX

The evaluation matrix and scores are summarized in **Table 3-3**. The total score for each alternative was determined as the sum of scores for each of the evaluation criterion. The preferred location for the St. Rose stormwater pumping station is the alternative which received the highest total score. Based on the evaluation, the preferred location for the St. Rose stormwater pumping station is Alternative No. 1 – St. Rose Beach Park with a total score of 79 points. The second most preferred location is Alternative No. 2 with a total score of 65 points. The third most preferred location is Alternative No. 3 with a total score of 64 points. The least preferred location for the St. Rose stormwater pumping station is Alternative No. 4 with a total score of 57 points.

**Table 3-3: Evaluation of Alternative Site Locations**

| Evaluation Criteria | Score (1 → 4) | | | |
|---|---|---|---|---|
| | **Alternative No. 1** | **Alternative No. 2** | **Alternative No. 3** | **Alternative No. 4** |
| Technical Criteria | | | | |
| Ability to Meet Flood Mitigation Objectives | 4 | 4 | 4 | 4 |
| Flexibility to Adapt to Climate Change | 4 | 2 | 2 | 2 |
| Coastal Flood Risk | 3 | 4 | 4 | 4 |
| Anticipated Maintenance Requirements | 4 | 3 | 3 | 3 |
| Time Required for Implementation | 3 | 2 | 2 | 1 |
| Complexity of Installation and Operation | - | - | - | - |
| Pumping Station Wet Well and Equipment | 4 | 3 | 3 | 1 |
| Pumping Station Excavation Dewatering | 3 | 3 | 3 | 4 |
| Excavation Material Management | 4 | 2 | 2 | 2 |
| Demolition of Existing Structures | 4 | 1 | 1 | 1 |
| Storm Sewer Installation | 4 | 2 | 2 | 1 |
| Extent of Existing Utility Relocation | 4 | 3 | 3 | 1 |
| Social Criteria | | | | |
| Disruption During Construction | 3 | 2 | 2 | 1 |
| Impacts to Archaeological, Built Heritage, and Cultural Heritage | 4 | 4 | 4 | 4 |
| Development Policies | 1 | 4 | 4 | 4 |
| Permanent Changes to Urban Community | - | - | - | - |
| Noise and Vibration Impacts | 4 | 2 | 2 | 3 |
| Generator Emissions | 4 | 2 | 2 | 3 |
| Disruption or Displacement of Existing Residents and/or Businesses | 4 | 1 | 1 | 1 |
| Disruption to Waterfront Parklands | 1 | 4 | 4 | 4 |
| Disruption to Waterfront Views | 1 | 4 | 4 | 4 |
| Natural Environment Criteria | | | | |
| Impacts to the Natural Environment | 4 | 4 | 4 | 4 |
| Better Use of Existing Infrastructure | 4 | 3 | 3 | 2 |
| Economic Criteria | | | | |
| Relative Capital Cost | 4 | 3 | 2 | 1 |
| Relative Operation and Maintenance Cost | 4 | 3 | 3 | 2 |
| **Total Score: (xx/92)** | **79** | **65** | **64** | **57** |

## 4.0 SUMMARY

This Technical Memo presents a thorough review and detailed evaluation of the four alternatives that were identified in the Sewer Master Plan (SMP). This assessment includes a detailed review of the comparative evaluation of the four location alternatives under the SMP. **Section 2.0** summarizes the decision-making process and outcomes of the comparative location analysis presented in the SMP.

Further to the SMP analysis, this Memo evaluated the four (4) viable alternatives based on a variety of evaluation criteria and the decision-making process used a four-point scoring system based on consideration of the impacts of each criterion. Further, this Memo presents the detailed rationale for the score given to each alternative for each of the evaluation criterion. The preferred location of the St. Rose stormwater pumping station is considered the location which received the highest total score.

Based on the evaluation, the preferred location for the St. Rose stormwater pumping station is Alternative No. 1 – St. Rose Beach Park with a total score of 79 points. The second most preferred location is Alternative No. 2 with a total score of 65 points. The third most preferred location is Alternative No. 3 with a total score of 64 points. The least preferred location for the St. Rose stormwater pumping station is Alternative No. 4 with a total score of 57 points.

Through this detailed analysis, the St. Rose Beach Park was identified as the preferred site for the proposed pumping station based on its ability to satisfy a majority of the evaluation criteria. Benefits of the St. Rose Beach Park identified through this evaluation include no displacement of existing residents or businesses. This location presents the opportunity to meet flood mitigation objectives and utilize mitigation measures to lessen undesirable social impacts. This site provides the most flexibility to adjust to climate change with room for potential expansion to meet future needs. This location does not require a forcemain and results in relatively simple construction, operation, and maintenance requirements with the shortest timeline for implementation and construction. The disruption to the nearby residents and community during construction is the lowest for this alternative. In addition, the St. Rose Beach Park location would result in the lowest relative capital and operation cost.

# APPENDICES

# APPENDIX A - FIGURES

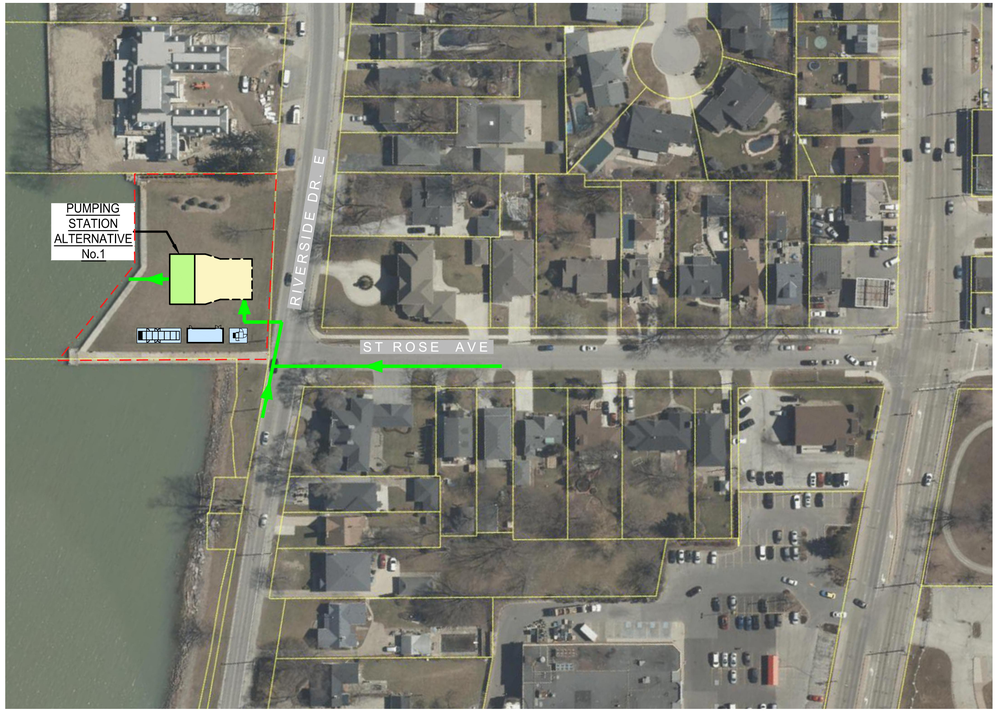
Figure 3-1: Location and General Layout for Alternative Locations

Figure 3-2: Proposed Layout for Alternative No. 1

Figure 3-3: Proposed Layout for Alternative No. 2

Figure 3-4: Proposed Layout for Alternative No. 3

Figure 3-5: Proposed Layout for Alternative No. 4

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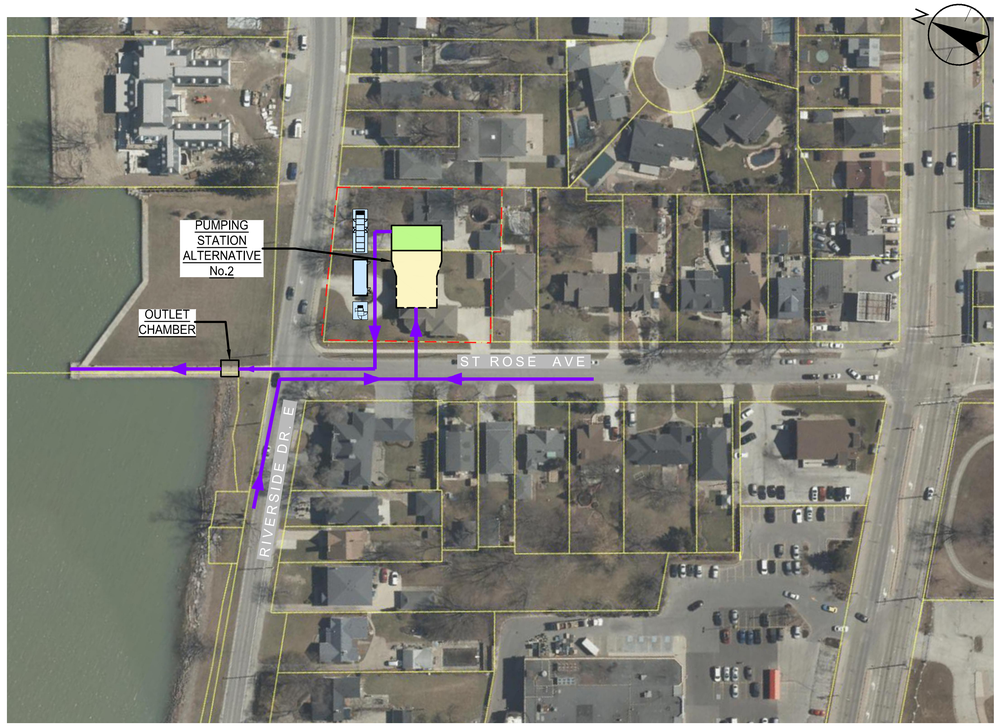


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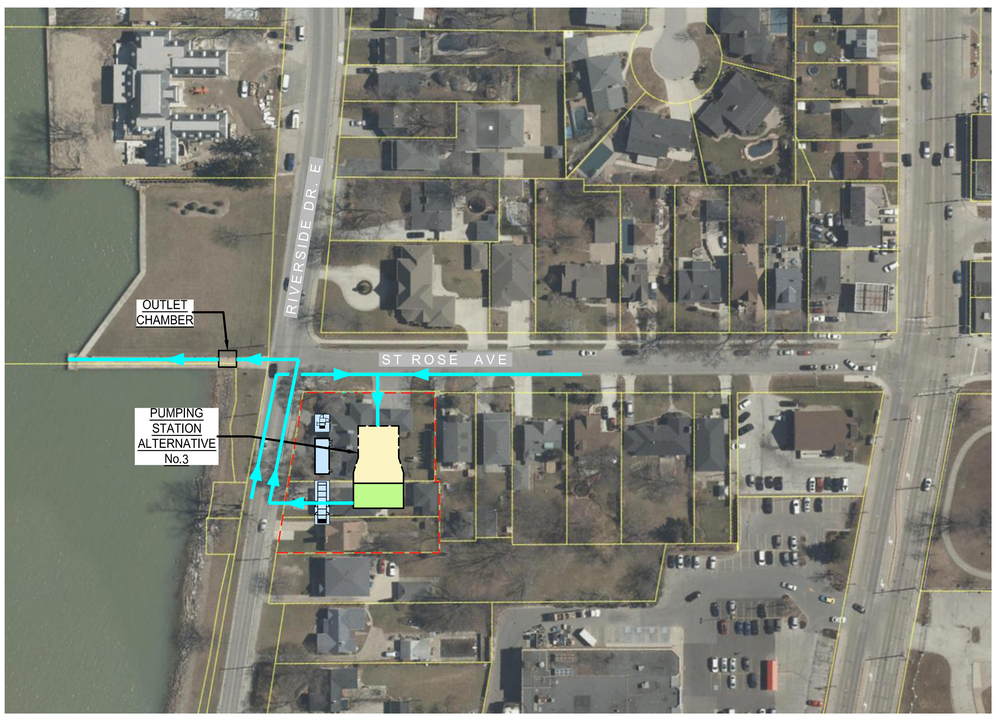


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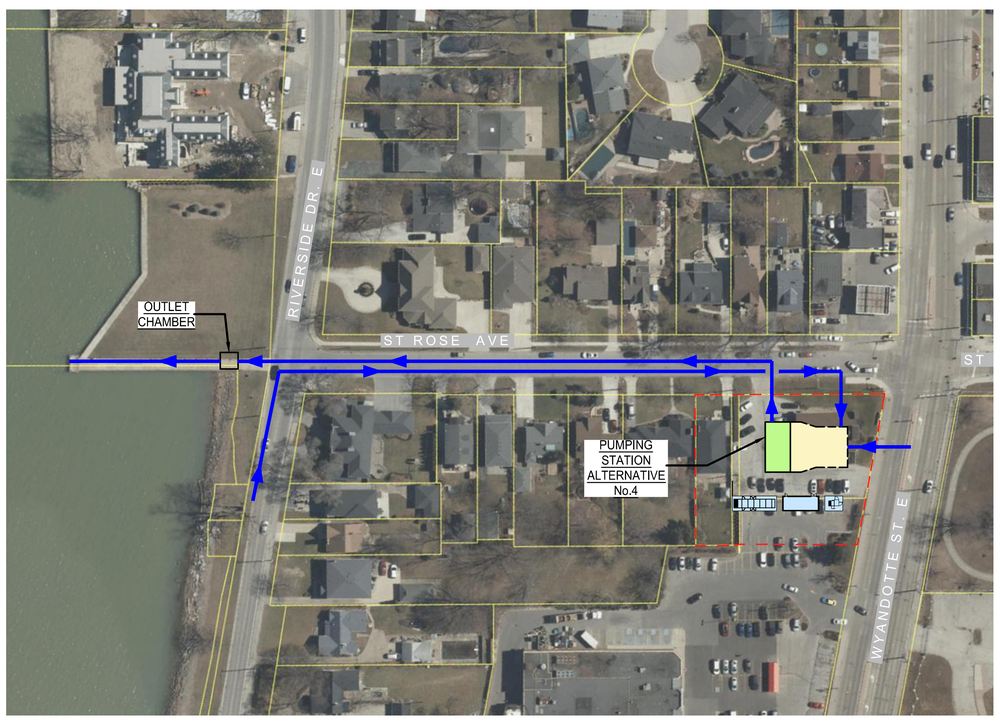


ALTERNATIVE No.4
SCALE: 1:1000

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Client/Project
CORPORATION OF THE CITY OF WINDSOR
ST. ROSE STORM WATER PUMPING STATION

NEW PUMPING STATION

City of Windsor, Ontario

Title
SITE PLAN
ALTERNATIVE LOCATIONS

| Project No. | Scale |
|---|---|
| 165620239 | AS SHOWN |
| Revision Sheet | Drawing No. |

**Figure 3-1**


AERIAL PLAN
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City of Windsor, Ontario

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SITE PLAN
ALTERNATIVE No.1

Project No.
165620239

Scale
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Revision Sheet

Drawing No.

**Figure 3-2**


AERIAL PLAN
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City of Windsor, Ontario

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SITE PLAN
ALTERNATIVE No. 2

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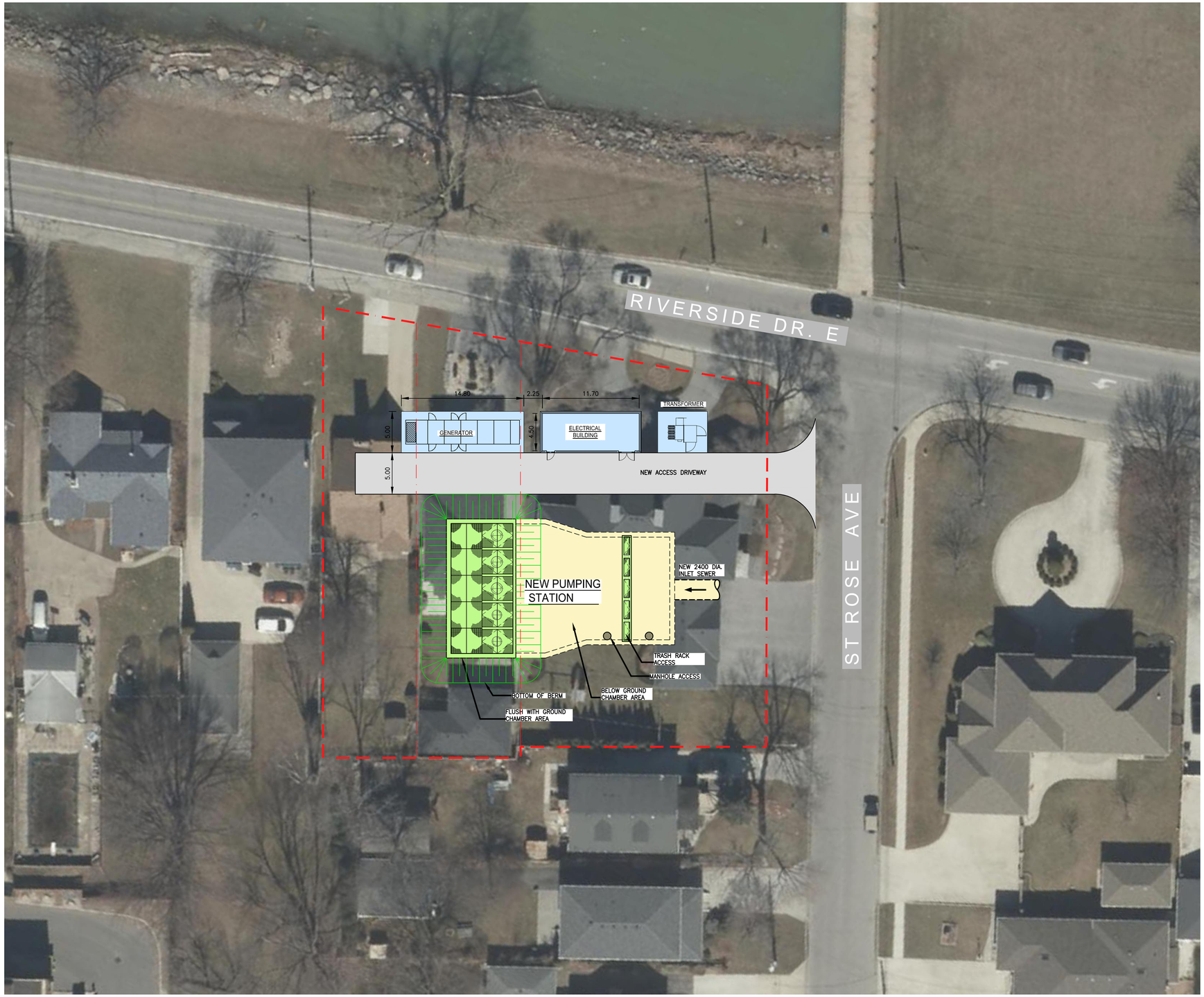
Drawing No.

**Figure 3-3**

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ALTERNATIVE No. 3

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**Figure 3-4**


AERIAL PLAN
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**Figure 3-5**