

Memo



Stantec

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File: 163401146
Date: October 5, 2012

Reference: Richmond Pump Station – Design Level of Service

EXISTING CONDITIONS / BACKGROUND

The Richmond Pumping Station (RPS), located at 63 York Street consists of a dry well/wet well configuration equipped with emergency power, communication and control systems. The RPS moves wastewater collected from the villages of Richmond and Munster through a 13.85 km, 500 mm diameter forcemain to an outfall along the Glen Cairn trunk located on Eagleson Road across from the Hazeldean Mall. The RPS has an overflow to the Jock River and a bypass with two (2) portable connections to protect the station from flooding. Sewage can also be pumped to a lagoon cell C located off Eagleson Road during high flows or directly to the river in extreme measures. A biological odor control system is also installed in the wet well to remove hydrogen sulfide from the air.

The RPS has four (4) pumps utilizing a lead-lag configuration with a maximum firm capacity discharge flow of 160 L/s.

Typical water levels in the Jock River at the Station are 90.89m with a 100 year water level of 93.80m, which means the overflow is currently not effective to protect local residential basements should a catastrophic pump station failure occur during high water conditions.

TARGET LEVEL OF SERVICE

It is our understanding that City Staff have requested consideration for the following level of service with respect to sanitary servicing of the new development area:

- Provide a firm capacity of the station (i.e. largest pump out of service) with a 1:100 year peak flow to the station;
- Provide the ability to pump flow with primary power failure;
- Provide the ability to overflow should the secondary diesel generator backup power fail (i.e. catastrophic failure);

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MINISTRY OF THE ENVIRONMENT (MOE) DESIGN GUIDELINES

The following excerpts from the 2008 MOE Design Guidelines for Sewage Works are generally considered as the minimum requirements for pump station design:

- 7.1.1 Station Capacity – “Sewage pump stations serving sanitary sewer systems should be able to pump the design peak instantaneous sewage flow.”
 - *Comment: This condition is currently met and will be met with the proposed MSS upgrades.*
- 7.1.2 Flooding – “Sewage pumping stations structures and electrical and mechanical equipment should be protected from physical damage by the 100 year design event. Sewage pumping stations should remain fully operational and accessible during the 25-year flood event.”
 - *Comment: This condition is currently met as floor elevation of pump station structure is at 94.0m, which is above the reported 1:100yr HWL of 93.80m thereby protecting electrical and mechanical equipment. The station is also fully operational in the 100 year event. The proposed upgrades at the station will not impact this condition.*
- 7.2.3 Pumps – “Multiple pumps should be provided. Where only two units are provided, they should be of the same size, to provide a firm capacity with one unit out-of service and at least capable of handling the 10-year design peak hourly flow.”
 - *Comment: Condition currently met as there are four pumps (2 small and 2 large) to provide firm capacity. The MSS proposes to provide sufficient capacity to meet or exceed this condition.*
- 7.7 Standby Power and Emergency Operation – “Emergency pumping capability is required unless on-system overflow prevention is provided by adequate storage capacity. Emergency pumping capability should be accomplished by provision of portable or in-place internal combustion engine equipment, which will generate electrical or mechanical energy, or by the provision of portable pumping equipment. For engine driven generating equipment, an automatic transfer switch should be provided to allow for bypass of unit for service. Such emergency standby systems should have sufficient capacity to start up and maintain the design capacity of the pumping station. Regardless of the type of emergency standby system provided, a portable pump connection to the forcemain with rapid connection capabilities and appropriate valving should be provided outside the dry well and wet well.”
 - *Comment: This condition is currently met with a backup diesel generator and automatic transfer switch should primary power be unavailable. The system has sufficient capacity to provide the existing station with a firm capacity of 160L/s and is proposed to be upgraded with sufficient backup power to meet future firm capacity requirements. There is also provision at the station to connect portable pumps should they be required.*

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- “Emergency High Level Overflows: A controlled, high-level wet well overflow to supplement alarm systems and emergency power generation should be provided for use during possible periods of extensive power outages, mandatory power reductions, or uncontrollable emergency conditions. Where a high level overflow is utilized, consideration should also be given to the installation of storage/detention tanks, or basins, which should be made to drain to the pumping station wetwell. Where such overflows may affect public water supplies or other critical water uses, the ministry should be contacted for the necessary treatment or storage requirements and in the case of combined sewer overflow the application of the ministry Procedure F-5-5 to the site-specific conditions.”
 - *Comment: The station has approval from the MOE to have an existing high level overflow to the Jock River should the station be overwhelmed to prevent basement flooding under normal water river levels.*

CITY OF OTTAWA SEWER DESIGN GUIDELINES

The City's November 2004 sewer design guidelines are consistent with the MOE's requirements as listed above. In addition, the City's guidelines for flood protection/overflow are more prescriptive giving specific design levels for the overflow elevation (i.e. 1m below basement elevation and the overflow **should** be above the 100 year elevation):

“7.2.1.6.8 Emergency Provision for Flood Protection

In anticipation of a potential catastrophic failure of a wastewater pumping facility and above contingency provisions, **the feasibility of providing a gravity based emergency conduit is to be evaluated** as a “last line of protection” against basement flooding. The elevation and hydraulic capacity of emergency conduit connections are to be optimized to minimize the risk of basement flooding due to sanitary system backup. **The elevation of this conduit must be maintained at least 1.0 m below the elevation of the lowest basement elevation within the service area.** This emergency connection should permit the excess flow to bypass the pumping station. If this is not possible, then a conduit from the pumping station wet well will be permitted.

Provision for an emergency conduit connection to an adjacent or downstream sanitary sewer system is preferred; however, a connection of the conduit to a storm sewer system or watercourse is often the only feasible option. Emergency conduit connections to storm sewers with downstream stormwater treatment facilities are preferred over direct connections to watercourses. **Emergency conduit connections should be above the 100-year stormwater elevation.**

Emergency conduit connections to storm sewers, storage facilities, natural water courses, or surface outfall points will be subject to approval by the Ontario Ministry of the Environment. The emergency conduits should also be identified as part of the Municipal Class Environmental Assessment Process. Emergency conduit connections

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shall be provided with suitable protection to prevent backflow from the flow receptor into the pumping station. This may consist of backwater valves and/or shut off valving.”

- *Comment: The existing overflow currently does not meet the City's guidelines of being above the 100 year stormwater elevation (i.e. 93.8m at this location), which states that this elevation “should” be met, but does not state that this condition “shall” be met. There are other pump stations in Ottawa that operate with similar high level overflows that are below the 100 year elevation (i.e. Signature Ridge PS).*

PROPOSED RPS UPGRADES

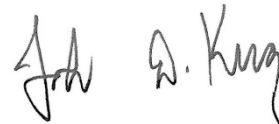
The proposed RPS upgrades within the MSS do not impact the current level of service at the station. The station currently meets, and the future upgrades will meet, the MOE and City's design guidelines. The only concern to be noted is that both the existing condition and proposed future upgrade will have an overflow elevation that is not consistent with the City's 2004 design guideline that the elevation “should” be above the 100 year stormwater elevation. Given the topography of the Richmond area this condition cannot be met.

In the event of catastrophic failure of the pump station, the City can bring additional measures to bear to prevent basement flooding and/or overflow including portable pumping or portable backup generator power. In the unlikely event of a catastrophic failure of the pump station during the 100 year storm event, the Western Development lands would likely not be affected immediately, as these lands lie a distance away from the pump station and the existing village lies between the pump station and the new development.

Given the remote possibility of each of these occurrences happening at the same time (i.e. 100yr event, primary power failure, backup generator failure) a probability cannot be accurately determined.



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