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Maple Knappett Joint Venture

**Project name:**  
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Sewer Conveyance Project

**Project ref:**  
60436108

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**Date:**  
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# Memorandum

**Subject:** Adjusting pH for Dewatering Activities – 1992 Comox Road, Proposed Courtenay Pump Station

AECOM was requested by Maple Knappett Joint Venture (MKJV) to provide a high-level discussion for proposed pH adjustment to support efforts to acquire a sanitary discharge permit from the City of Courtenay. AECOM identified low pH (4.18) conditions in the groundwater at 1992 Comox Road “the Site”, on July 16, 2024, while collecting groundwater for routine discharge parameter analysis. The groundwater sample was collected from a test pit located near the northern boundary of the Site. None of the laboratory analysed parameters exceeded the applicable City of Courtenay Bylaw No. 1327, governing sanitary sewer use.

Based on the Site location and other factors, two potential discharge locations have been identified.

1. City of Courtenay sanitary manholes located along Comox Road, with a pH ranging from 5.0 (lower bound) to 9.5 (upper bound).
2. Glen Urquhart Creek located north of the Site, with a pH ranging from 6.5 to 9.0 based on the BC Approved Water Quality Guidelines for aquatic life.

Refer to the New Courtenay Pump Station Dewatering Discharge Location Recommendations memorandum, prepared by AECOM on July 18, 2024, for further details regarding water quality requirements and the discharge location point.

## Low pH in Site Groundwater

The pH scale is a logarithmic representation of potential for hydrogen activity, typically ranging from a pH of 0 to 14. Low pH values signify acidic conditions, while high pH values indicate alkaline conditions. Limited groundwater monitoring at the Site identified acidic condition in groundwater (pH of 4.18). For buffering of pH to the desired ranges (5.0 to 9.5 for sanitary; or 6.5 to 9.0 for environment), an alkaline substance would be added to neutralize (raise pH) to the water collected from excavation dewatering prior to discharge.

## **Dewatering System Description:**

### Dewatering wells

It is understood that MKJV will install four 15 m deep 500 mm diameter caissons and equip each well with 5,300 L/min (1,400 US gal/min) flow capacity pumps. Flow / extraction rates of water necessary to reach the desired draw-down have not been established. A pump test is planned.

AECOM will complete an assessment of the dewatering wells to confirm the initial pH results obtained from the test pit, utilizing field measurements, litmus paper and laboratory analysis. If the pH remains below 5 at the dewatering wells, MKJV shall raise the pH above 5 before discharging to the sanitary sewer, in accordance with Bylaw 1327.

### Settlement Tank

Water from the wells will be discharged to an 80,000 L (21,000 US Gal) baffled settlement tank on-site. The tank model is 1SSWTT, manufactured by OSW.

### Injection System (Treatment by Neutralization)

AECOM proposes the use of chemical injection equipment to dose the low pH water extracted from the dewatering system. To neutralize the acidic groundwater, an alkaline substance such as sodium hydroxide or lime shall be employed. The chemical injection box will be situated at the influent port of the settlement tank, with the chemical stored in drum(s) and within a secondary containment system. Effluent from the settlement tank will be monitored to confirm the desired pH range is met prior to discharge. In the event that effluent from the tank is not within the desired range, it will be recirculated back to the tank influent and the injection system adjusted and monitored until the effluent reaches the desired pH range.

Installation and setup will be the responsibility of the successful subcontractor supplying the equipment and chemical. Regular maintenance will be conducted by the subcontractor. All workers engaging in works associated with or in proximity to the chemical storage or injection equipment must be informed of the hazard and be adequately trained in hazardous materials.

Whether sodium hydroxide, lime, or an alternative caustic is selected, none of these chemicals are considered to generate harmful biproducts as a result of the neutralization reaction. Consequently, the use of caustic in the neutralization reaction is not considered to represent a risk to the environment or the sanitary sewer discharge locations.

### pH Lowering Mitigations

In the event of excessive alkaline or high pH effluent, due to over-dosing or run-off from concrete pours, carbon dioxide can be bubbled through the settlement tank to reduce the pH back to within the suitable discharge range. The effluent can be recirculated through the tank until the desired pH range for discharge is reached. The use of carbon dioxide is not considered to generate harmful biproducts as a result of the neutralization reaction.

### pH Monitoring and Analytical Testing

A port shall be installed in parallel to the effluent pipe, to allow for monitoring/sampling of water exiting the system to confirm the desired pH range has been reached and is maintained.

The Environmental Monitor will measure pH using a multi-parameter field instrument on a fortnightly basis in conjunction with other EM duties. Additionally, daily (or more frequently if required by permit) measurements of pH will be the contractor's responsibility to ensure that the dosing continues to produce effluent within the desired pH range. The contractor will maintain a log recording dates, times, and pH readings.

As flow rates or system input conditions change (i.e.: heavy rain event; stabilization of draw-down; and/or concrete pour runoff), it is MKJV's responsibility to monitor as necessary to ensure the pH range remains within the appropriate discharge criterion for the active discharge location.

As pH can accurately be measured by regularly calibrated field instruments, laboratory testing is not considered required. Litmus paper can also be used as a means of verifying instrument readings in the field. MKJV shall comply with any analytical

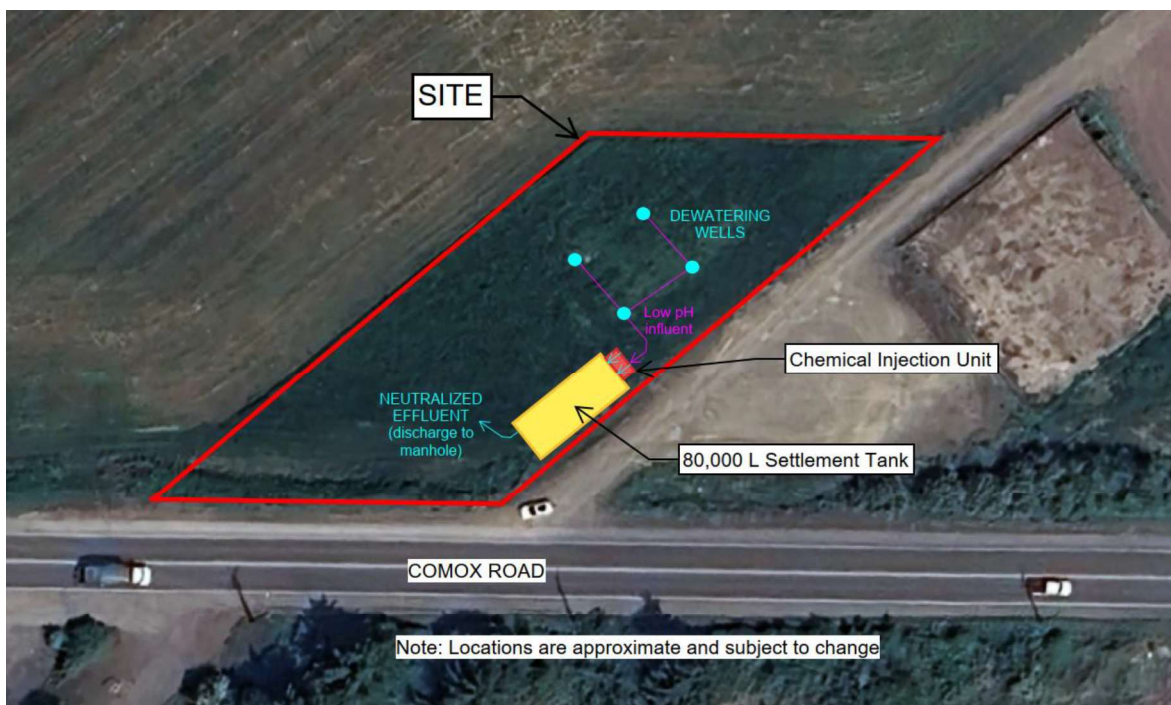
testing required by applicable discharge permits. If conditions at the site change, reanalysis of the water for a discharge parameter suite should be considered.

Discharge

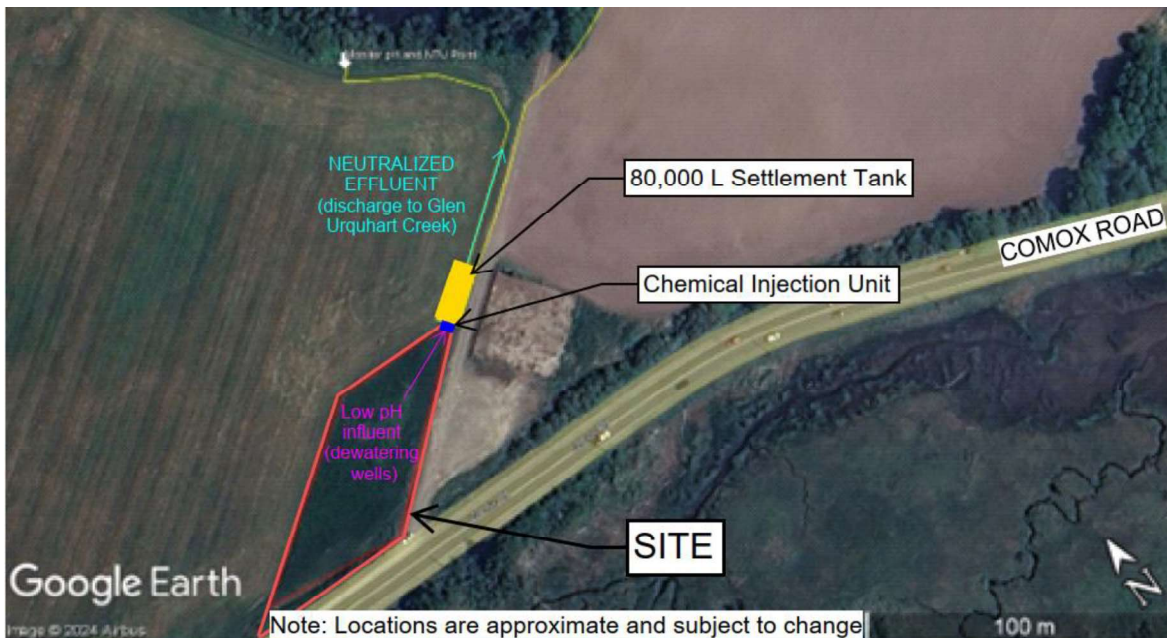
If a suitable pH range of 6.5 to 9.0 can be maintained, the aim is to discharge the treated water to the dry section of Glen Urquhart Creek to the north of the Site. For further details on the discharge to environment, refer to the AECOM memo issued on July 18, 2024, pertaining to the dewatering discharge location recommendations for the Site.

In the event pH or other parameters exceed the British Columbia Approved Water Quality Guidelines (BC AWQGs) for aquatic life but remain within suitable ranges of Bylaw 1327 and any applicable permit, then the water shall be discharged to City of Courtenay sanitary sewer system via the nearest manhole.

**Figure 1** depicts the proposed treatment system configuration for discharge to sanitary sewer and **Figure 2** depicts the proposed configuration for discharge to the environment (Glen Urquhart Creek). Note: figures are not drawn to scale, locations of equipment on figures were arbitrarily selected and are only used to depict the features within the treatment system and are subject to change (including well locations).



**FIGURE 1 – Proposed Dewatering Treatment System (Discharge to Sanitary Manhole)**



**FIGURE 2 – Proposed Dewatering Treatment System (Discharge to Glen Urquhart Creek)**

MKJV shall adhere to all applicable regulations including but not limited to the AWQGs, Bylaw 1327, and all other criteria imposed by permits related to the dewatering and discharge activities. This memo does not serve as a permit for discharge. MKJV shall familiarize themselves with the applicable Bylaw No. 1327 and any permit they acquire to meet monitoring requirements to confirm the effluent discharged to the sanitary sewer (if this option is used for discharge) remains within the acceptable limits set out by the Bylaw or applicable permits.

Sincerely,  
**AECOM Canada Ltd.**

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