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Attention: The Director

Response to Comments – Comments by the Ministry of the Environment and Climate Change on Risk Assessment Pre-Submission Form for Pier 8, Hamilton, Ontario [PSF1519 – 16, IDS Ref No. 3673-A9GSFX]

Dillon Consulting Limited (Dillon) has reviewed comments from the Ministry of the Environment and Climate Change (MOECC) associated with the Risk Assessment (RA) Pre-Submission Form (PSF) for Pier 8 in Hamilton, Ontario (the Site). The following summarizes the July 21, 2016 MOECC comments and associated Dillon responses on the PSF and its supporting documents.

Specific Review Comments

1) Volume 1 PSF, Section 3.3, p. 4 of 32: It is indicated that free product has been observed and measured at the Site, and that analytical results suggest the potential for free product. The RA will need to fully describe the nature and extent of free product at the Site and how it will be addressed. Free product on a site should be removed to the extent technologically practical and standards specified in a RA should not result in the formation of free product. The QP has indicated in Appendix A, p. 5 that a pre-consultation meeting with the MOECC was held and that LNAPL recovery as a RMM may be required.

Dillon Response – Acknowledged. Dillon implemented a total fluids extraction system at Shed 6, where LNAPL was identified beneath the building. The extraction system included the installation of 10 extraction wells within the LNAPL area and removal of the free phase product using vacuum trucks. The results of the extraction system program indicated that the free phase product was removed to the extent practicable. The summary of efforts undertaken to extract the identified LNAPL is provided in Appendix B.4 of the RA. Requirements for residual LNAPL were included in the RMP for the site and vapour mitigation RMMs were specified for this area.

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2) Volume 1 PSF, Section 3.5, p. 4 of 32: It is indicated that a non-potable groundwater condition exists for the Site. A comment has been provided below related to confirming the groundwater condition at the Site with the City of Hamilton.

Dillon Response – Refer to the response to Comment # 14.

3) Volume 1 PSF, Section 3.6, p. 8 of 32: The QP has listed 2 groundwater units to the depth of concern on the Site. This has not been made clear in the hydrogeologic setting in the Phase Two CSM (Appendix B, p. 33) which suggests an unconfined water table aquifer in the fill and shallow sand deposits. These would seem to represent the same aquifer. Please clarify.

Dillon Response –The QP agrees that the number of groundwater units to the depth of concern at the Site is better characterized as one, which coincides with the unconfined water table aquifer situated in the shallow fill. The underlying units (Sand to Silty Sand; and Interbedded Silt, Sand and Clay units) are saturated and hydraulically connected to the water table aquifer in the fill; however, the hydraulic conductivity of these units decreases with depth.

Below the Interbedded Silt, Sand and Clay unit is a Silt and Clay unit which is identified as having a till origin (Halton Till). This unit is considered to be an aquitard based on low permeability testing results (10^{-10} to 10^{-9} m/s) from hydraulic conductivity tests performed as part of the P2ESA studies. Underlying the Silt and Clay unit is shale bedrock (Queenston Formation), which is considered a confined bedrock aquifer under artesian conditions. Groundwater and soil testing performed as part of the P2ESA assessment indicates that neither the Silt and Clay unit nor the bedrock unit has been impacted, and therefore these units are not considered to be within the depth of concern at the Site.

4) Volume 1 PSF, Section 3.6, p. 8 of 32: In future PSF submissions, the QP should include more accurate groundwater parameters when available. Approximated values are provided in this section for depth to water table and hydraulic conductivity, while more accurate derived values are provided in the Phase Two CSM (Appendix B).

Dillon Response – Acknowledged.

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5) Volume 1 PSF, Section 5, p. 17-18 of 32: It is unclear why surface water ingestion and skin contact were considered incomplete for off-Site residents since Hamilton Harbour is located adjacent to the Site and residential land use exists south of the Site and is planned for the Site. This comment also applies to recreational visitors.

Dillon Response – Acknowledged. Surface water incidental ingestion and skin contact was considered complete for off-site residents and property visitors.

6) Volume 1 PSF, Section 5, p. 22 of 32: It is unclear why soil inhalation was not considered a potential pathway for off-Site recreational visitors, since this was considered complete for residents and construction workers. This should be explained in the RA.

Dillon Response - Acknowledged. Soil particulate inhalation was considered complete for off-site property visitors.

7) Volume 1 PSF, Section 6, p. 26 of 32: It is unclear why no off-Site aquatic plant or animal VECs have been identified. As on-Site COCs may impact off-Site aquatic receptors, VECs related to this receptor group will need to be described in the Receptor Characterization section of the ERA.

Dillon Response – Acknowledged. Additional discussion of off-site aquatic receptors was included in the ERA.

8) Volume 1 PSF, Section 6, p. 27 of 32: Inhalation and stem/foliar uptake of ambient air pathways are marked as potentially complete in the PSF, but these pathways are not included in CSM Figures 9.3 to 9.6. Also, it is not clear why all off-Site pathways for terrestrial ecological receptors have been marked as incomplete considering the potential migration of groundwater COCs to the off-Site portion of Pier 8 and adjacent surface water. Justification for all complete and incomplete exposure pathways will be needed in the ERA.

Dillon Response – Acknowledged. Inhalation and stem/foliar uptake of ambient air pathways were marked as complete pathways in the CSM Figures 9.3 and 9.4. In addition, potential ingestion/root uptake pathway for off-site terrestrial receptors was considered complete (CSM Figures 9.3 and 9.4) and discussed in the RA.

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9) Volume 1 PSF, Section 7, p. 28 of 32: The reviewer was unable to determine if the RA team has the required expertise to complete the RA in accordance with the CSMs since resumes could not be found in the PSF submission. Note that resumes for the RA team members need to be included in the RA.

Dillon Response – Acknowledged. The CVs for the RA team have been provided in Appendix G of the RA.

10) Volume 1 PSF, Attachment 3.1: The QP has entered 'Unknown' for the name of property owner during the period 1830-1930. This could result in difficulty in filing a RSC.

Dillon Response – Acknowledged. The name of the property owner(s) will be extracted from the Chain of Title at the time of RSC filling.

11) Volume 1 PSF, Attachments 3.6a and 3.6b: Rationale for excluding data from use in the RA (e.g., historical and/or elevated DLs), similar to that provided in the Phase Two ESA (p. 41 and 58), will need to be provided in the RA. The QP should ensure that all excluded data is discussed, as it was noted that rationale to discount elevated DLs related to soil metals was not found in the Phase Two ESA. In addition, the QP should explain in the RA why some groundwater COCs have the potential to exceed applicable SCSs at the nearest off-Site receptor and others do not as indicated in Attachment 3.6b.

Dillon Response – Acknowledged. The rationale for excluding soil and groundwater data is provided in Sections 3.6.3 and 3.6.4 of the RA, respectively. These sections provide discussion regarding the elevated DLs for soil metals. The potential for the proposed groundwater PSS to result in exceedances of the applicable SCS at the nearest off-site receptors are discussed in Sections 4.4.6 and 5.5.5 of the RA, respectively. This was based on consideration of the spatial distribution of groundwater quality impacts at the Site, the directions of groundwater flow, and the assumption that groundwater conditions at the Site are stable, such that future increases in concentrations are unlikely.

12) Volume 1 PSF, Attachments 3.6a and 3.6b: It was noted that several substances that were analyzed and listed in the data tables in the Phase Two ESA (e.g., Tables 4.3 to 6.2) do not appear in Attachments 3.6a or 3.6b. Some of these

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substances include, but are not limited to nitrate/nitrite, phosphorus, potassium, sulphur, calcium, iron, etc. The QP will need to evaluate and provide a discussion in the RA as to whether these substances are considered COCs or not. This discussion should also consider whether some of these substances were related to the bulk storage of materials that include fertilizer. If these substances are considered to be COCs, they will need to be evaluated in the RA and PSS will need to be set.

Dillon Response – Table 4.3 in Appendix B.3 of the RA provides all data reported by the laboratory as part of their standard analytical packages, regardless of whether the parameter is identified as a contaminant of concern or not. As a result, additional data not used in the P2ESA or Risk Assessment is captured in the summary tables and is presented for completeness purposes only. As presented in Section 5.2.1.3 and Section 5.2.2.3 of the P2CSM (Appendix B.2 of the RA), parameters that do not have a Table 1 SCS were evaluated to determine whether the parameters could be excluded from the final list of COCs. These conditions were:

1. The maximum observed soil concentration was within the range of 98th percentile of the Ontario Typical Range (OTR-98) for soil (MOECC, 1993) or the maximum observed groundwater concentration was within the MOECC background percentile concentrations for groundwater (MOECC, 2011).
2. The parameter was not found at concentrations above the laboratory Reported Detection Limit (RDL), or the detection limit was elevated from the application of laboratory dilution factors to allow for quantification of other parameters, and the parameter was not associated with the historical activities at the Site.
3. The parameter was recognized as having low toxicity because it was an essential nutrient.
4. The parameter was not associated with the historical activities at the Site.

Based on this evaluation, no additional substances that did not have a Table 1 SCS were identified as a COC. Only those substances that were identified as COCs were included in Tables 6.1 and 6.2 in Appendix B.3 of the RA.

A discussion on the potential for impacts from the bulk storage of fertilizer materials (APEC 21) is presented in Section 2.3.2 of the P2CSM in Appendix B.2 of the RA. This APEC had the potential for the nutrients potassium, nitrogen and phosphorus to be

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present in the soil and groundwater from surface to depth at the Site. As identified in Section 5.2.1.3 and 5.2.2.3 of the P2CSM in Appendix B.2 of the RA, these parameters are considered essential nutrients, and are not identified as contaminants of concern for the purposes of the P2ESA. Nevertheless, soil and groundwater samples were analyzed for select parameters that may be associated with fertilizer.

Soil samples (total of 10) obtained from within the footprint of the APEC at borehole locations MW109, MW131, and MW132 contained potassium concentrations ranging from 830 µg/g to 3540 µg/g and phosphorus concentrations ranging from 531 µg/g and 886 µg/g. The Ontario Typical Range (98th percentile) for potassium and phosphorus are 5000 µg/g and 1200 µg/g, respectively (MOE, 1993). Therefore, the observed concentrations of these parameters in soil at this APEC are deemed typical of background concentrations.

Groundwater samples from monitoring wells MW131, MW132, and MW133, all screened across or near the water table in the fill, and MW180, screened in the lower interbedded silt and clay, were tested for potassium and total phosphorus. Phosphorus concentrations ranged from <0.05 mg/L (at MW131) to 0.425 mg/L (at MW180). Potassium concentrations ranged from 4.04 mg/L (at MW133) to 56.7 mg/L (at MW131), with an average of 21.9 mg/L. As presented in the document Rationale for the Development of Soil and Ground Water Standards for use at the Contaminated Sites in Ontario, MOECC, 2011, the 97.5th percentile for potassium and phosphorus in groundwater is 20.7 mg/L and 7.97 mg/L, respectively. Based on this comparison, the total phosphorus concentrations within the samples were within typical background ranges. The potassium concentration in MW131 exceeded the 97.5th percentile concentration of 20.7 mg/L, but was lower than the maximum value (80.6 mg/L) in the MOECC document. All other values were lower than the 97.5th percentile concentration, and the average concentration was consistent with this concentration.

A groundwater sample from MW175 was analyzed for nitrogen (nitrates and nitrites), and the detected concentrations (nitrate – 0.063 mg/L; nitrite – 0.029 mg/L) were well below the 95th percentile of the Ontario background groundwater concentration data (MOECC, 2011) of 7.12 and 0.059 mg/L, respectively.

Based on the review of the soil and groundwater data for parameters that are deemed to be potentially associated with the former bulk storage of fertilizer at the

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Site, these are not suggestive of fertilizer impacts to the environment. Therefore, APEC 21 has been closed.

13) Appendix A, Section 1.1, p. 1: The QP indicates that 8 APECs remain open. This is unconventional since 23 APECs were developed from PCAs and evaluated. By consulting the Phase Two CSM it appears that some of the on-Site APECs include multiple PCAs (i.e., 4a). This should be re-assessed into separate APECs otherwise difficulty in filing a RSC may occur.

Dillon Response – The APEC list has been revised to more closely follow the principle of one PCA per APEC where possible; however, in some cases multiple PCAs have been assigned to one APEC, where multiple Off-Site PCAs affect a common area on the Site.

Based on this revised approach, the P2CSM has been updated to reflect the evaluation of 29 APECs. Based on the results of the P2ESA investigations, 19 of these APECs were "closed" and 10 remain "open". The rationale for closing an APEC is described in Section 2.3 of the P2CSM in Appendix B.2 of the RA, and states that closed refers to APECs where the data indicates that there are no impacts above SCS deemed to be associated with the PCA in question, and therefore, no further consideration of the APEC is required; open refers to APECs where impacts above SCS associated with the PCA are either confirmed or suspected, and the APEC is carried forward in the assessment process. An APEC is also closed if it is encompassed within another APEC that has common COCs, and it is not possible to distinguish impacts between the two APECs. For example, APEC 20a (associated with impacted fill that extends over the entire P2ESA Property) has the same footprint as APEC 20b (historical port activities) and APEC 20c (associated with boat repair and maintenance). All COCs associated with APEC 20b and 20c are a subset of COCs associated with APEC 20a, and therefore, the QP has elected to close APEC 20b and 20c for reporting and tracking purposes.

14) Appendix A, Section 1.3, p. 2: It is indicated that secondary screening completed for the HHRA will involve the use of non-potable SCSs and/or component values. It has not been clearly stated in the letter provided in Appendix E if the City of Hamilton approves or objects to the use of non-potable SCSs at the Site. Clarification in this matter should be obtained from the City of Hamilton;

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otherwise SCSs and/or component values related to potable water use will need to be included in the HHRA.

Dillon Response – As indicated in the City of Hamilton response letter provided in Appendix B.6 of the RA (letter dated March 15, 2016), the Site and all properties located within 250 m of the Site are supplied by a municipal drinking water system and the Site is not located in an area designated as a well-head protection area or other designation identified by the municipality for the protection of groundwater. Section 41 of the O.Reg.153/04 has been considered applicable to the Site since the soil pH was greater than 9 in some areas and since portions of the Site may provide habitat for species classified as threatened or endangered. The elevated pH levels in soil may affect the mobilization of some metals species; however, it would not preclude the assumption of non-potable groundwater conditions at the Site. Similarly, the potential presence of threatened or endangered species at the Site would not preclude the assumption of non-potable groundwater conditions at the Site with respect to human receptors (which is the only context in which this assumption was applied).

15) Appendix A, Section 1.4.1, p. 3: The QP indicates that with the exception of residents, indoor workers and construction workers, other on-Site receptors will be evaluated qualitatively. The QP should ensure that a defensible rationale is provided in the RA to support a qualitative analysis for the outdoor maintenance worker, considering that some receptor characteristics for this receptor will differ from those applied to residents and construction workers.

Dillon Response – Acknowledged. The outdoor worker (maintenance worker) was evaluated quantitatively in the RA.

16) Appendix A, Section 1.4.1 and Figures 9.1 to 9.2: The following issues were identified related to the human health CSM:

    a) Groundwater dermal contact and ingestion was identified as complete for the outdoor maintenance worker, but was not marked as a potential pathway in PSF Section 5 (p. 24 of 32). This should be clarified in the RA, considering the fact that groundwater was shallow in some areas of the Site.

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b) It was not clear why on-Site soil erosion to off-Site sediment and/or surface water was considered 'not applicable' in Figures 9.1 and 9.2. This should be explained in the RA, considering the Site is adjacent to a surface water body.

Dillon Response –

a) This pathway was marked as complete for the outdoor maintenance worker in error. The measured depth to groundwater table on the Site ranged from 0.5 to 2.9 m below ground surface (mbgs), with depths between 1.0 and 2.0 mbgs being the most common. Given that exposure to groundwater at depths of 0.5 or greater is not anticipated for the outdoor worker (maintenance worker), the groundwater incidental ingestion and dermal contact pathways were only considered complete for the subsurface worker.
b) The potential for on-site soil erosion to off-site sediment and/or surface water has now been included for additional assessment in the RA.

17) Appendix A, Section 1.5.2 and Figures 9.3 to 9.6: The following issues were identified related to the ecological CSM:

a) Inhalation and stem/foliar uptake of ambient air pathways are mentioned in Section 1.5.2, but were not included in the CSM figures provided. These pathways should be shown in applicable CSM figures and discussed in the RA.
b) Figures 9.3 and 9.4 show off-Site groundwater pathways as incomplete for terrestrial receptors. Explanation for this evaluation will be needed in the RA as Figure 4.1 suggests that impacted groundwater migrates northwest towards the off-Site portion of Pier 8 where terrestrial receptors may potentially be exposed. In addition, surface water exposure pathways for off-Site terrestrial and semi-aquatic mammals and birds should be included in the CSM figures.
c) It is unclear if there is potential for on-Site soil to erode to sediment. This transport pathway should be shown in the aquatic CSMs and discussed in the RA.
d) Amphibians and reptiles are indicated as VECs in the PSF, but have not been included in the CSM figures.

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e) The QP should separate plants and soil invertebrates in the CSMs since potential pathways are different between the various receptor groups. For example, uptake via dust and ambient air may apply to plants but not soil invertebrates.

f) For accuracy, the soil and groundwater root uptake exposure pathways by terrestrial vegetation need to include direct contact, as in some cases, root contact with contaminated soil or groundwater has more impact than root uptake.

Dillon Response –

a) Acknowledged. Inhalation and stem/foliar uptake of ambient air pathways were marked as complete pathways in the CSM Figures 9.3 and 9.4.

b) Potential ingestion/root uptake for off-site terrestrial receptors was considered complete (refer to CSM Figures 9.3 and 9.4) and discussed in the RA.

Surface water exposure pathways for off-site semi-aquatic mammals and birds were included in the CSM Figures 9.5 and 9.6.

c) As noted above, the potential for on-site soil erosion to off-site sediment and/or surface water has now been included for additional assessment in the RA.

d) Discussion related to amphibians and reptiles is provided in Section 5.2.1 of the RA, including rationale for not considering these as Receptors of Concern at the Site.

e) Clarification has been provided in the CSM figures relating to the differing pathways relevant to these receptors.

f) Clarification regarding root contact has been provided in the CSM figures.

18) Appendix A, Section 1.6 (and Appendix C): The QP indicated that TRVs used in the RA will be consistent with those in MOE, 2011 with the exception of TCE and PCE which will rely on updated TRVs as indicated in Appendix C. The QP should ensure that the RA explains the process by which the most appropriate TRVs were selected for each COC for use in the RA, as it is likely that TRVs for other COCs besides TCE and PCE have also been updated since MOE, 2011 became available. The QP should also ensure that appropriate rationale is provided in the RA for any TRVs that differ from those listed in MOE, 2011. The

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rationale should consider, at a minimum, the following information (some of which was provided in Appendix C):

a) Carcinogenic classification of the contaminant of concern (if applicable);
b) Nature of the TRV derived (e.g., RfD, RfC, TDI, MRL, CSF, unit risk, slope factor, etc.);
c) Critical study from which the TRV was derived (including dose-response data);
d) Model (animal/human) used and study design applied in critical study (including route(s) of exposure);
e) Key end point(s) or effect(s) observed in critical study (including target tissue/organ and mode and/or mechanism of action if available);
f) Point of departure and/or dose-response modeling used in the derivation of the TRV; and
g) Regime of uncertainty factors and modifying factor(s) used in the derivation of the TRV.

Dillon Response – Acknowledged. TRVs used in the RA consisted of values published in MOECC (2011) with the exception of TRVs for copper, chloroform, ethylbenzene, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, vinyl chloride, TCE, and PCE, for which the most updated values from the MOECC Human Toxicology and Air Standards (2017) section of Standards Development Branch were used in the RA.

19) Appendix B, Section 4.6.3, p. 46: The first bulleted paragraph indicates that 'an evaluation of potential LNAPL recovery will be completed.' While it is understood that the issue of LNAPL recovery will be considered going forward, it is not clear how the presence of LNAPL in this area of the Site will be considered during completion of the RA. The QP should note that the presence of LNAPL will need to be discussed in terms of whether this represents a continuous source of contamination at the property, and the QP will need to consider whether the SCS and component values being proposed for secondary screening that assume a depleting source (e.g., S-IA, S-GW1, Soil Odour) are appropriate and conservative for use in this RA.

Dillon Response – Acknowledged. Section 3.6.1 of the RA and Appendix B.4 of the RA provide discussion on the LNAPL extraction program completed at the Site. In general,

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two types of free phase product were observed in the monitoring wells including light and heavy LNAPL products. The source of the light LNAPL appears to be the former heating oil underground storage tank (UST) formerly located along the south side of the building. The source for the heavier LNAPL product is unknown but considering historical port activities on the Site, it may be related to a former spill in this area of the Site. The LNAPL extraction program completed on the Site included the installation of 10 extraction wells within the LNAPL area and removal of the free phase product using vacuum trucks (refer to Appendix B.4 of the RA). The LNAPL were removed to the extent practicable and recoverable. It is also noted that Dillon completed a test pitting program during the Phase Two ESA and confirmed that the tank has been removed from the Site. No ongoing source of free phase product is believed to be present based on the extensive investigation completed in the LNAPL area.

Since the contaminant source has been removed from the Site, the COC concentrations are expected to attenuate over time due to biodegradation and volatilization. Therefore, the use of SCS and component values that assume a depleting source are considered acceptable in the RA. However, the RA also evaluated vapour exposures in this area through soil vapour data, and recommended various Risk Management Measures related to the presence of residual LNAPL.

20) Appendix B, Section 4.6.3, p. 46: The text related to the potential effects of elevated soil pH is acknowledged. The QP should provide additional chemical-specific information in the RA that explains which COCs may specifically be influenced by elevated soil pH, reference the soil and groundwater data that was considered to determine whether there is, or is not, likely to be any effect on COC mobilization, and explain how this was considered in both the HHRA and ERA. If applicable, the potential effects that elevated soil pH may have on the bioavailability of COCs should also be discussed.

Dillon Response – Acknowledged. Section 3.6.6 of the RA provides a discussion on the potential effects of elevated pH levels in soil on contaminants fate and transport.

In general, elevated pH levels above 9 in surface soil (i.e., < 1.5 mbgs) and above 11 in subsurface soil (i.e., > 1.5 mbgs) were detected at a few locations on the Site. Out of 251 soil samples analyzed for pH, elevated pH levels were measured at only 3% of the locations, including five samples collected from surface soil (i.e., MW99, BH104,

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BH107, BH116, and MW174) and two locations collected from the subsurface soil (i.e., MW98 and BH117). Elevated pH levels in surface soil ranged from 9.14 to 10.7, and elevated pH levels in subsurface soil were 11.01 and 11.34. The identified elevated pH conditions on the Site are likely related to the fill and hence do not represent a recent condition.

Under elevated pH (alkaline) conditions most metals become more strongly adsorbed to soils with the possible exception of the oxyanions (i.e., arsenates and chromates) which can mobilize under certain redox conditions and for select metals (i.e., copper, lead and zinc) when organic ligands may complex and increase solubility at higher pH. After review of the groundwater data for the locations with elevated pH and comparison of the arsenic, chromium, copper, lead and zinc concentrations, it does not appear as though there is any correlation that would suggest mobilization of these metals is occurring, with many concentrations generally low and near detection or below detection limits (refer to Figure No. 5.1a and Figure No. 6.1a). Given the age of the fill at the Site, chemical equilibrium between fill contaminants and groundwater would have been reached, and dispersion/advection processes active during the last 55 or more years would have allowed any related groundwater impacts to reach steady state conditions. Therefore, it is highly unlikely that the concentrations will change measurably in the near future.

The elevated pH noted at these select locations may inhibit biodegradation however biodegradation is generally more sensitive to low pH (acidic) conditions than elevated (alkaline) pH conditions and while the pH is elevated in the select locations it is generally below 10 and consistently below the threshold of 12.1 where most biodegradation is inhibited.

Based on the above information, and considering that elevated pH conditions in soil only occur sporadically across the Site with an average level (i.e., 8.1, calculated as a geometric mean) which was not elevated, it is not expected that the identified elevated pH levels would significantly affect COCs fate and transport on the Site.

21) Appendix B, Figure 2: Lake Ontario abuts portions of the Site on three sides. The QP should evaluate whether Lake Ontario water quality would represent an off-Site PCA that would contribute to an APEC at the Site particularly given the docking of lake freighters along the Site boundary.

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Dillon Response – It is the QP's opinion that Lake Ontario water quality would not be considered a separate PCA for the following reasons:

- Any spillage of fuels or chemicals from freighters would not be on the Site, but would rather discharge into the Lake. Attenuation processes in the lake caused by wave action, currents and fluctuations in water levels would be expected to dilute contaminant concentrations to such a degree that they would not be expected to contaminant groundwater or soil on the Site to concentrations exceeding the SCS.
- Any spillage on the Site is already captured by on-site PCA #44 (Port Activities, including operation and maintenance of Docks and Wharves), and is therefore already incorporated into the assessment process.
- In general, the lake is located downgradient of the Site based on a comparison of lake levels to the water table elevation on land, where a groundwater mound is present in the water table surface.

22) Appendix B, Figure 3: Site cross sections are depicted on Figure 3 which intersect Lake Ontario. Various cross sections (e.g., Section C-C') list the Site boundary as 'shore'; however, no description of the shore is given in the PSF such as seawall, sheetpile or other. This would be relevant to a CSM and potential contaminant migration. Appendix D: The legal letter included in this appendix suggests that an updated survey of the RA property is being prepared and will be provided when available. Note that an updated legal letter will need to accompany the survey when available, and that the letter should include any municipal address and assessment roll number for the RA property, if available.

Dillon Response – The site boundary along Lake Ontario is a seawall constructed of steel piles. Cross sections have been modified to reflect the presence of the pile wall, and the P2CSM has been modified (See Section 1.2 of the P2CSM in Appendix B.2 of the RA) to describe the pile wall.

<u>EAASIB Phase Two Conceptual Site Model Comments</u>

1. Subsection 7(1) and 16 of Schedule E – The qualified person (QP) shall ensure that all areas on, in or under the phase two property where a contaminant is present at a concentration greater than the applicable site condition standard

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for the contaminant shall be delineated laterally and vertically for each contaminant present in soil, ground water or sediment, on, in or under the phase two property. In addition, section 16 specifies additional characterization requirements for when analysis shows that the contaminant is present at a concentration greater than the applicable site condition standard.

Vertical delineation of groundwater impacts appears to be incomplete based on the phase two conceptual site model (CSM) cross sections and figures provided. Areas identifying metals and petroleum hydrocarbons (PHCs) impacts have not been vertically delineated since deeper samples meeting standards for these parameter groups have not been presented in the draft phase two CSM (see also Item #2).

The figures showing the lateral and vertical distribution of the contaminants should be separated for each parameter group (PHCs, VOCs, etc.) and also for each media (soil and groundwater). While the majority of the figures have been separated by parameter group and media, it is noted that PHCs and BTEX and metals and inorganics have been reported on the same figures for soil and groundwater and should be separated.

Dillon Response – Metals and Inorganics analytical results are now presented separately in both plan view and cross-section (see P2CSM in Appendix B.2 of the RA). The QP has chosen to keep PHCs and BTEX on the same figures, as the parameters are co-contaminants associated with the same PCAs used to define the APECs and since this is a commonly accepted industry practice.

2. The vertical distribution of contaminants in the CSM figures does not follow the requirements of clause 7(3)(c), Schedule E, which states the following:

> "the delineation is conducted by assuming the lateral and vertical extent of the area in which a contaminant is present at a concentration greater than the applicable site condition standard for that contaminant extends laterally or vertically, as the case may be, from a sampling location at which the contaminant is present at a concentration greater than the applicable site condition standard for the contaminant to the next sampling location at which the

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concentration of the contaminant is equal to or below the applicable site condition standard for the contaminant". The vertical extent of the contaminants including metals and PHCs is to be shown extending to the next nearest sample point that meets the applicable site condition standard on both plan view and cross-sectional figures".

Dillon Response – The P2CSM has been revised to provide additional information to establish the vertical extent of COCs in both soil and groundwater media. Please refer to the P2CSM text (Section 2.3, 5.2 and 5.4), and associated referenced cross-sections (showing vertical contaminant delineation) and plan figures (showing horizontal contaminant delineation). Please note that the plan figures also show vertical contaminant delineation based on colour coded points representing sampling locations (green – Table 1 SCS met, red – Table 1 SCS not met, orange – multiple samples taken, with deepest sample meeting Table 1 SCS). Further information to support the QPs opinion that vertical delineation of all contaminants of concern has been met is summarised as follows:

1. Additional drilling was performed, as described in the P2ESA Addendum (report found on CD of the RA), to confirm vertical COC delineation in soil and groundwater. Additional investigations included drilling of three boreholes into the top of the shale bedrock, instrumentation of these boreholes as monitoring wells, and collection of groundwater samples. In addition, information obtained from recent geotechnical drilling was incorporated into the P2CSM, and involved soil and groundwater sampling from the silty clay unit at select locations. The silty clay unit, which is found at the base of the overburden, is deemed to be an aquitard (based on in-situ K testing and vertical hydraulic gradient data) that defines the maximum vertical extent of soil and groundwater impacts at the Site.
2. With respect to vertical contaminant concentrations in soil, the additional drilling to the shale bedrock has confirmed that the overburden thickness ranges from 28.07 to 33.07 m (see Section 3.1, P2CSM). While soil testing indicates that the maximum vertical extent of impacts varies across the Site but is less than the total thickness of the overburden, the total depth cannot exceed the overburden thickness by definition. Therefore, the maximum vertical extent of soil impacts has been determined.

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3. A number of parameters were measured in groundwater at depth at concentrations exceeding the Table 1 SCS, where the detected concentrations are deemed to represent natural background conditions, and therefore have been excluded from the assessment of the vertical extent of anthropogenic impacts. These parameters include PAH, PHC (F3 range), metals (molybdenum, vanadium, antimony, copper, lead, selenium, boron, sodium) and inorganic (chloride). The rationale supporting the QPs opinion that these parameters are representative of background conditions at depth (in shale bedrock and in silt and clay unit) is presented in Sections 5.2.1.1 and 5.2.2.1 of the P2CSM. Note however, that these parameters (either wholly or individually) are contaminants of concern in shallower hydrostratigraphic units in both soil and groundwater associated with PCAs. In brief, the rationale includes one or more of the following considerations that were assessed using a weight of evidence approach.

    a. Parameter concentrations are below or near the 99th percentile of Ontario background groundwater concentration data presented in the document Rationale for the Development of Soil and Ground Water Standards for use at the Contaminated Sites in Ontario, MOECC, 2011. We note that the source of the MOECC background concentration data is the provincial groundwater monitoring information system (PGMIS). The data set is representative primarily of groundwater concentrations in aquifers, rather than low permeability material such as clay and silt, or shale bedrock. Therefore, the PGMIS data may be considered as biased low, as the lower permeability deposits would likely have higher concentrations of dissolved parameters.
    b. Parameter concentrations meet Table 1 SCS at higher strata in the same general location (i.e., Table 1 SCS are met between the elevated parameter concentration and the nearest potential contaminant source), supporting the conclusion that the detected Table 1 SCS exceedance at depth is not associated with site-related PCAs.
    c. Lack of a transport pathway, supported by the presence of low permeability materials at and above the sampling location (where Table 1 SCS is exceeded) indicating a hydrogeological groundwater flow barrier.

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d. The parameter has a known natural origin in the soil and/or bedrock. For example, biogenic compounds are known to be in the clay and silt unit (Halton Till), and chemical evidence suggests that biogenic compounds are present in soil samples in some strata within the Till, as supported by a reduction in PHC (F3) concentrations following silica gel clean-up to remove polar/semi-polar PHCs. As a result, the presence of low level PHC and PAH concentrations in groundwater in the shale bedrock and in the silty clay unit is attributed in part to natural biogenic related PHCs in the soil.

We trust the above information provides sufficient response to the comments summarized in the July 21, 2016 MOECC correspondence. Should you have any questions or require additional clarification, please do not hesitate in contacting the undersigned.

Sincerely,

DILLON CONSULTING LIMITED

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Associate