DELTAPORT THIRD BERTH PROJECT
Adaptive Management Strategy
2014 Annual Report
Response from the Scientific Advisory Committee
November 3, 2015

Port Metro Vancouver and its consultant Hemmera Envirochem Inc. (Hemmera) have released [October 2015] the Annual Report for the 2014 Adaptive Management Strategy (AMS). This is last of eight (2007 – 2014) such reports, compiling and interpreting results of the work investigating the potential environmental impacts of the construction of Deltaport Third Berth (DP3). The Scientific Advisory Committee (SAC) reviewed and wrote responses to Annual Reports in 2007, 2008, 2009, and 2010. The current response is SAC's assessment of the entire program following a description of the development of the AMS and SAC.

BACKGROUND

What is the Adaptive Management Strategy?

The AMS was initiated as a result of the cooperative federal-provincial Environmental Assessment of DP3 carried out under the *Canadian Environmental Assessment Act* 1992 and the *British Columbia Environmental Assessment Act* 2002. An Environmental Assessment is a federally-mandated process required of all such major projects. The AMS took a science-based systematic approach to monitoring and managing potential impacts on the 'intercauseway ecosystem' (i.e. between the container port and BC Ferry jetties) that may arise as a consequence of the construction of DP3. The AMS had the goal of assessing the potential for significant negative impacts on the ecosystem that may occur as a result of DP3 construction. Of particular interest were marine eutrophic events and dendritic channelization leading to erosion. The AMS is a public document available at the following website:

http://www.portmetrovancouver.com/wp-content/uploads/2015/03/Final_Deltaport_Adaptive_Mgmt_Strategy_April_2006.pdf

The core activity was a monitoring program to provide data on the environmental situation in and around the intercauseway area. The monitoring program began with the start of construction in 2007, and was scheduled to continue for five years following substantial completion of DP3, which took place in December 2009. The AMS program therefore concluded in December 2014. Throughout, data were collected on geomorphological factors, on surface water and sediment quality, the distribution and community structure of eelgrass beds, benthic organisms, and the bird population in the area. The data were summarized in quarterly and annual reports for each program year (2007 – 2014) depending on sampling frequency. The annual report provided preliminary interpretations of the results.

What is the Scientific Advisory Committee?

The SAC was established in response to the Environmental Assessment process, as a means to provide independent scientific and technical advice to Port Metro Vancouver, and upon request to Environment Canada, in relation to the implementation of the AMS. The SAC is composed of three scientists, one appointed by Environment Canada (Dr. Terri Sutherland, Research Scientist, Fisheries and Oceans Canada (FOC)), one appointed by Port Metro Vancouver (Mr. Rowland Atkins, M.Sc., P.Geo. Principal & Senior Geomorphologist, Golder Associates Ltd.), and a third selected jointly by Environment Canada and Port Metro Vancouver to chair the committee (Dr. Ron Ydenberg, Professor of Biological Sciences, SFU). All three scientists have extensive experience with various ecosystem components within the intercauseway site. It is important to note that these scientists were appointed as members of an independent technical committee set up by Port Metro Vancouver and that they do not represent either their employers or the agencies that appointed them.

The SAC was appointed and began work in the spring of 2007, just after the AMS was established and the monitoring program was initiated. SAC met several times per year to review quarterly reports, discuss annual reports with the consultants, Hemmera, northwest hydraulic consultants, and Precision Identification, and carry out field excursions to observe the ecosystem first hand. SAC reviewed the monitoring data presented in the annual reports to determine if any emerging trends were taking place in the intercauseway ecosystem in relation to DP3 construction. On occasion, a member of SAC met with various public bodies interested in the development of DP3. Part of SAC's mandate was to help steer the 'adaptive' part of the AMS process. Modifications to the AMS along with corresponding rationales are listed in Tables 2 and 3 of the annual reports following the 2010 report. These modifications involved minor technical changes to sampling or laboratory procedures, changes to the sampling frequency of several ecosystem variables, and additions to the sampling program to respond to emerging trends (e.g. drainage channels).

RESPONSE TO THE ANNUAL REPORTS

The 2014 Annual Report contains an analysis of seven years of data including spatial and temporal trends in ecosystem variables (Figure 32; *pdf pages 157 – 160*). Data are tabulated and presented in different ways to help emphasize particular attributes and so aid in analysis. The report is a public document and is available at the following website.

http://www.portmetrovancouver.com/working-with-us/permitting/project-and-environmental-reviews/status-of-applications/deltaport-third-berth-project/

SAC's Assessment of the AMS

The consultants, Hemmera, Northwest Hydraulic and Precision Identification, provide an overall AMS Program Summary (*pdf page 107*) of the 2014 Annual Report which includes the objectives and key findings of the program as a whole (2007-2014). The Executive Summary (*pdf pages 2-8*) provides additional details. Together these parts of the Annual Report provide a short but comprehensive overview of the AMS written from the point-of-view of Port Metro Vancouver's consultants. Here we summarize SAC's independent assessment of the AMS.

The AMS monitoring program is comprised of 3 ecosystem components: 1) coastal geomorphology; 2) water and sediment quality; and 3) biological communities. The coastal geomorphology component was concerned with waves, currents, tides, winds, storms and sediment deposition/erosion and turbidity ('suspended' sediment). Understanding the natural interactions between the physical forces and sediment dynamics within the intercauseway mudflat allows one to assess potential influences of DP3 construction may have on sediment transport and the integrity of the crest protection structure and the dendritic channels. These data and assessments have assured SAC that the dendritic channels have not changed drastically as a result of DP3 construction, and that the risk of large changes to the dendritic channels is minimal. Figures 22-24 (*pdf pages 146 - 149*) provide a good overview and show that the dendritic channels change from year to year, but have retained their basic features over the 8-year monitoring period. Together these physical data show that the mudflat is normally dynamic, shifting a bit from year to year with tides and storms, but appears stable.

The second ecosystem monitoring component, water and sediment quality, contains data on a large number of physical and chemical variables including but not limited to temperature, salinity, oxygen, pigments, nutrients, sulfides, and trace-metals. These measurements are intended to help evaluate whether the construction and subsequent operation of DP3 influenced changes in the concentrations of contaminants or nutrients, potentially leading to eutrophication. A conceptual framework is presented in Figure 1.2-1 (*pdf page 26*). Where possible, the sediment and water variables are compared against established management thresholds mandated by regulatory agencies to determine if exceedances to the quality guidelines occur. In addition, these variables were standardized using geo-normalization techniques (trace metals) and Redfield ratios (carbon:nitrogen:phosphorus) in order to determine deviations from natural balances that occur in nature. Further, temporal sequence and spatial patterns for each variable were examined and compared to reference site variables (Figures 26-41; *pdf pages 151 - 174*).

This multi-disciplinary approach revealed that, with few exceptions, these data do not indicate long-term changes in ecosystem components in the far-field setting over the 8-year monitoring program. It is important to note that trace metal exceedances and elevated nutrients were typically associated with the 'drainage ditch' sampling site located in the southeastern corner of the intercauseway region and can be attributed to terrestrial run-off. No trace metal exceedances were persistent within the water quality data, with the exception of boron, which is a naturally occurring feature of BC marine waters. The sole indicator that DP3 construction might have perturbed normal biochemical functioning of the intercauseway ecosystem is ammonia (*pdf page 345*), which showed high levels at the start of construction followed by a decline over the subsequent two years. This trend might be attributed to dredging activities that may have released ammonia from the seabed or made buried organic matter available for microbial consumption. Note that one of the reference sites (*pdf page 346*) showed relatively higher levels of ammonia over the same period. Taken as a whole, these data give no reason to suspect that eutrophication over the entire intercauseway region occurred, or is a risk.

The third ecosystem monitoring component, biological communities, consisted of bird, benthic macrofauna, and eelgrass surveys. In keeping with the adaptive part of the AMS, the bird surveys were pared back after a few years of monitoring (in 2009) to transfer sampling towards a benthic macrofauna survey, which had not been included in the original AMS. The reasons for this change were that the initial monitoring gave no negative indications, and that while birds are extensively surveyed by a variety of programs (e.g. Coastal Waterbird Watch), benthic fauna are much less well known. Given the inherent variability of macrofauna populations, it is important that future monitoring programs associated with port development encompass a higher temporal and spatial frequency of macrofaunal sampling. Another adaptive component of the AMS included the addition of an eelgrass/macrofauna station between the newly established drainage channels located within the C-shaped mudflat beside the DP3 berth. These channels were created in response to a headwater leak through a recently constructed rock-dyke berth-perimeter. Monitoring results and a recent visit to the area by SAC revealed that eelgrass was in a stage of recovery within and around the drainage channels (Appendix C; *pdf pgs 254 - 296*).

A final major adaptation to the AMS included the creation of a swale designed to increase water flow between the tug-turning basin and mudflat located within the C-shape of the DP3 berth. Port Metro Vancouver initiated this development following the observation that water quality behind the sheltered rip-rap border of the tug-turning basin was showing eutrophic characteristics. Follow-up monitoring and a recent trip to the area by SAC (September 25, 2015) revealed an increase in water circulation and decrease in the epiphytic load on eelgrass. . Further monitoring in the area affected by poor water quality will take place to track the recovery of the existing eelgrass population.

Overall, SAC agrees with the summary conclusions (*pdf page 8*) that the AMS met its goals, and that aside from the near-field influences of the DP3 construction (drainage channels, tug-turning basin), there were no intercauseway-wide impacts on a far-field scale.

Any member of the SAC would of course be pleased to answer questions or assist with technical details.

Sincerely

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