



Data Submittal for Neap Tide Dissolved Oxygen Monitoring on 17-18 September 2003 Providence River and Harbor Maintenance Dredging Project

Event Monitored: CAD Cell 5R – neap ebb tide disposal on 17 September
– neap flood tide disposal on 18 September

Applicable Water Quality Certification Condition:

- 40 – dissolved oxygen monitoring during neap tide periods in June, July, August, September

Associated Files:

- Prov_R_DO_2-summary – Microsoft Word document containing this summary
- Prov_R_DO_2_figures - pdf file containing the following:
 - Figure 1 - 17 September monitoring locations
 - Figure 2 - 18 September monitoring locations
 - Figure 3 – Temperature and salinity profiles
 - Figure 4 – 17 September dissolved oxygen profiles
 - Figure 5 – 18 September dissolved oxygen profiles

Criteria Exceedences: No criteria are specified in the Water Quality Certification for this monitoring. No issues of concern were identified during the monitoring.

Summary:

Condition 40 of the Water Quality Certification for the project specifies that monitoring of dissolved oxygen (as well as temperature and salinity) be performed following CAD cell disposal events during neap tide periods in June, July, August, and September (3 days each month). The dissolved oxygen monitoring was not performed during June, as disposal into CAD cells was not performed during the neap tide period for the month. During the neap tide period for July, disposal into a CAD cell was only performed over a one-day period (21 July). A full CAD cell disposal monitoring event (#9) was performed on this day, and additional dissolved oxygen monitoring was performed as a part of the event. The results of the dissolved oxygen monitoring were presented in the summary submittal dated 7 August 2003. The dissolved oxygen monitoring was not performed during August, as disposal into CAD cells was not performed during the neap tide period for the month. During the neap tide period for September, dissolved oxygen monitoring was performed over a two-day period (17-18 Sep). The third day of monitoring could not be performed because of weather conditions associated with the passage of Hurricane Isabel. The results of the September dissolved oxygen monitoring are summarized below.



Monitoring of dissolved oxygen on 17 September was performed in conjunction with the ebb tide disposal event. High tide was predicted to occur at 1324, with a height of 4.2 feet and a range of 3.1 feet to the following low tide. The disposal event occurred at 1529. Monitoring on 18 September was performed in conjunction with the flood tide disposal event. Low tide was predicted to occur at 0641, with a height of 0.7 feet and a range of 3.4 feet to the following high tide. The disposal event occurred at 1108. Maintenance material that was removed by Dredge 51 from the top of cell 3AR (being unsuitable for open water disposal) was disposed into cell 5R (see Figures 1 and 2). Dredge 55 was also working in the area during the monitoring event, removing parent material from cell 7R.

Water quality monitoring was performed at multiple stations along a longitudinal transect extending through cell 5R, both prior to and following the disposal event. Stations ranged from approximately 1000 feet up current of cell 5R to 2000 feet down current, and included a station located directly over the cell. Measurement of dissolved oxygen, salinity, and temperature were performed over two time periods, one approximately 30 minutes prior to the disposal event and one approximately 30 to 60 minutes following the disposal event. Figure 1 presents the water quality stations monitored on 17 September, and Figure 2 presents the stations monitored on 18 September.

Water quality was also monitored along several transects in the vicinity of the disposal and throughout the harbor by towing the YSI instrument sonde. Discussions with the instrument manufacturer indicated that the sonde could be used for towing (by attachment to a v-fin) in addition to a standard drop application. However, after deployment of the sonde/v-fin unit to the target depth, the measured dissolved oxygen levels decreased by 20 to 40% with the initiation of towing. Dissolved oxygen measurements rebounded with the cessation of forward velocity. This inconsistency was likely due to flow patterns around the probe membrane induced during towing that artificially lowered the measurement value. Therefore, only the drop measurements have been included in this summary report.

A subset of the salinity and temperature measurements observed on both days of monitoring are presented in Figure 3. Salinity values displayed the characteristic increase with depth that has been observed in previous disposal monitoring events with values of approximately 24 ppt in the upper water column and an increase to approximately 29 to 30 ppt in the lower water column. Temperature decreased slightly with depth, with values of approximately 22°C in the upper water column decreasing to approximately 20°C near the bottom. Salinity and temperature profiles were similar prior to and following the disposal events at all locations.

Profiles of dissolved oxygen (DO) concentration with depth are presented in Figure 4 (17 September) and Figure 5 (18 September). The upper graph in each figure presents DO profiles along the longitudinal transect prior to the disposal event, and the lower graph presents DO profiles along the transect following the disposal event (see Figures 1 and 2 for sampling locations). Both monitoring events revealed similar



patterns in dissolved oxygen. Dissolved oxygen concentrations were fairly uniform in the upper 12 to 20 feet of the water column. Below this, DO concentrations decreased with depth, and values near the bottom of the water column were 2-3 mg/L lower than those near the surface.

For the monitoring performed during the ebb tide on 17 September, DO concentrations ranged from approximately 7 mg/L near the surface to 4.5 mg/L near the bottom prior to the disposal event (Figure 4a). Following the disposal event, DO concentrations were quite similar and ranged from approximately 7.5 mg near the surface to 4.5 mg/L near the bottom (Figure 4b). For the monitoring performed during the flood tide on 18 September, DO concentrations ranged from approximately 6 mg/L near the surface to 3.5 mg/L near the bottom prior to the disposal (Figure 5a). Following the disposal event, DO concentration increased slightly, ranging from approximately 6.5 mg/L near the surface to 4 mg/L near the bottom (Figure 5b). An increase in DO concentration is a normal feature of the flood tide cycle.

In summary, monitoring performed prior to and following the disposal events on 17 and 18 September did not identify any significant variations in DO concentrations relative to the disposal.