

S0004-03 Dublin Port Maintenance Dredging 2024 Dredging Campaign

Incident Number: INCI028241

Date of Incident: 11/07/2024

Further Investigation Report 01/08/24

Background

Dissolved oxygen (DO) levels at the East Link monitoring site fell below the threshold value of 5mg/l on the 11/07/24 in more than two successive sample records. This was one week prior to commencement of dredging but during the pre-dredging monitoring period. DO has intermittently fallen below 5mg/l at this site since then with intervening periods of recovery (Figure 1).

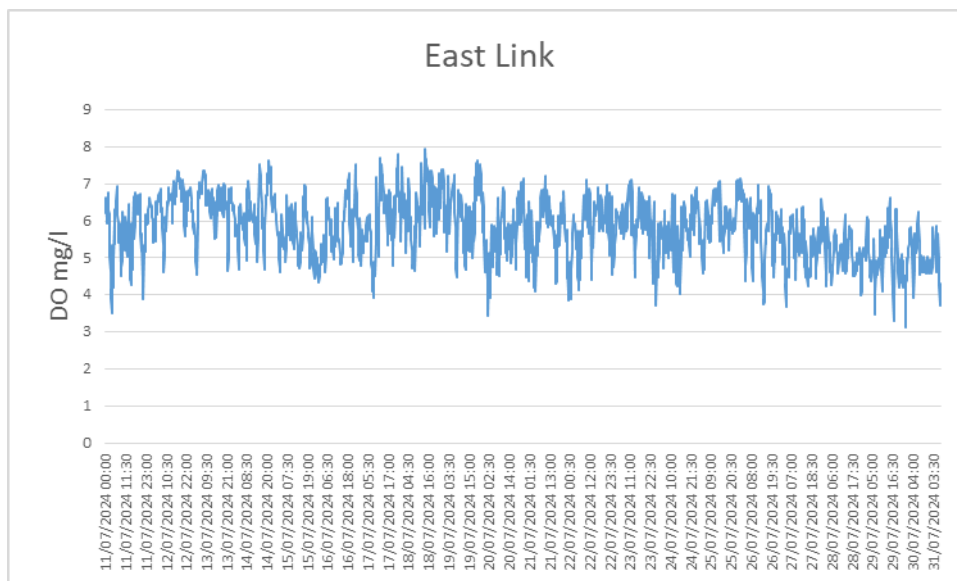


Figure 1 East Link DO from 11th July to 31st July 2024

Service Records

Regular service visits have been made to the monitoring stations before and during the dredging monitoring period. Dates of the most recent service visits are listed in Table 1. Sondes are cleaned and sensors calibrated at each visit. During the visit of the 25th June the Dissolved Oxygen sensor cap (SN-23205) was replaced due to low DO readings and subsequently transmitted without issues.

Table 1 Dates of service visits to Liffey Monitoring Sondes

Recent Service Visits				
22 July	18 July	12 July	03 July	25 June

Seasonal Factors and Previous Incidents

Low DO's have been reported at this site in previous years at this time of the year. A number of possible factors may play a role in this seasonal DO sag.

Elevated temperatures result in reduced solubility of oxygen and lower DO levels. When fresh water is saturated with oxygen it can hold about 12.7 mg of oxygen per litre at a temperature of 5°C. At 20°C it can only hold 9.1 mg per litre. However other factors, including atmospheric pressure, can also affect DO levels. For example sea water holds about 20% less oxygen than freshwater when saturated, and algae produce oxygen during the daylight hours and use it up during darkness. This produces daily and tidal rhythms of higher and lower DO levels.

Ambient Water Quality and Factors Influencing DO

The WFD status classification for 2016 to 2021 is shown in Table 2 for each of the Liffey transitional and coastal water bodies. The Liffey Estuary Lower transitional water body has been reported as “moderate” in 2021, and this is due to biological elements, notable the increase in phytoplankton. The Tolka Estuary transitional water body has most recently been reported as “poor” in 2021, a drop in status from ‘moderate’ in the previous monitoring cycle. Again this is due to biological elements, in particular the extent and biomass of macroalgae in the Tolka Estuary.

Table 2 WFD Status Liffey Transitional and Coastal waterbodies

WFD Status 2007-2021	Liffey Estuary Lower WFD Status	Liffey Estuary Upper WFD Status	Tolka Estuary WFD Status	Dublin Bay WFD
	EA_090_0300	EA_090_0400	EA_090_0200	EA_090_0000
Overall WFD Water Quality Status (2016-2021)	Moderate	Good	Poor	Good

Algal abundance at this time of the year is high and strongly influences DO levels. The mean hourly diurnal cycle of DO concentration at East Link based on the monitoring data for the 11/07/24 to the 31/107/24 is shown in Figure 2.

It shows that while individual DO values may fall below 5mg/l, the mean hourly DO has remained above 5mg/l. It also shows that the lowest DO values generally occur between approximately 3am and 5am during this period. This is a clear indication of the role of algal respiration in reducing DO levels during the hours of darkness.

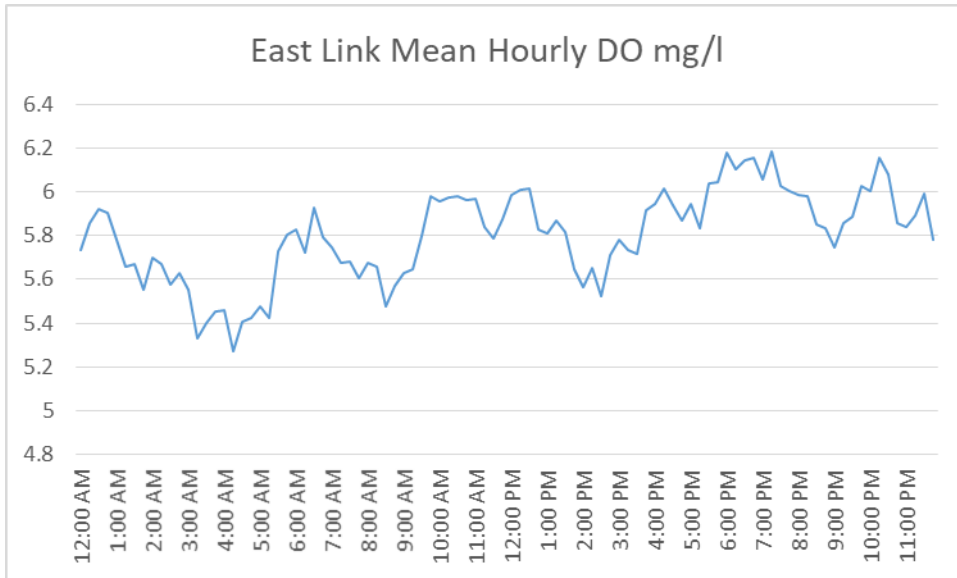


Figure 2 Diurnal trend of mean hourly DO concentration (11/07/24-31/07/24)

Conclusions

Regular frequent cleaning and calibration of the sondes has been carried out, and a new DO cap was fitted to the East Link sensor shortly before commencement of the monitoring programme. However to further investigate the possibility of sensor degradation a new factory calibrated DO sensor will be fitted in the East Link sonde at the next service visit (scheduled for 1st August 2024).

The low DO values observed are not related to maintenance dredging having commenced at least a week before the loading operations, and loading operations were primarily outside the Bull Walls during this interval.

The data suggest that seasonal factors, elevated temperature and the abundance of algae play a significant role in depressing DO, particularly during hours of darkness when algal respiration occurs.

Turbidity data clearly indicates no dredging impact on water quality in the area of operations.

DO is therefore not a primary indicator of dredging impact on water quality and the relevance of implementing a 5mg/l threshold to raise an incident per se is questionable. Monitoring of DO will continue and low DO values will be investigated, but it is proposed that formal incidents are not triggered by low DO alone and should be taken in the context of other supporting data (particularly Turbidity) and relevant on-site investigations.