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PLANS AND DOCUMENTS
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Queensland Government

Technical Note

Date:	04/03/2024
To:	Meredith Hutton, Northpoint Planning
From:	Andy Symonds
Subject:	SeaLink Berth 4 Assessment
Classification:	Project Related
Version:	0.2

1. Introduction

SeaLink North Queensland are proposing to establish a new pontoon for the fourth vessel they operate to the north of the existing SeaLink Breakwater Terminal. The Terminal currently has three berths and so the fourth vessel has been temporarily moored further upstream of the Terminal near Reef HQ, but this temporary berthing arrangement is set to expire on 31 May 2024. The new Berth 4 would require bed levelling to be undertaken to deepen areas of the berth to allow safe vessel access.

SeaLink have had a pre-lodgement meeting with Economic Development Queensland (EDQ) and following the meeting EDQ provided pre-lodgement advice which noted that the following is required to be undertaken to support the application:

- an assessment of the hydraulic impact of the seabed profiling external to the site;
- consideration of the stability of the existing creek bank due to the lowering of the seabed at the berth; and
- an understanding of the likely future sedimentation in the new berth and the resultant requirement for periodic removal of sedimentation.

This technical note is aimed at providing additional information related to these three points through a desktop assessment and analysis of available bathymetric data.

2. Proposed Seabed Profiling

To support this assessment the Port of Townsville Limited (PoTL) provided bathymetric data for the Ross Creek from 2021, 2022 and 2023. These data have been used to generate 2 m resolution gridded digital elevation models (DEMs) for the Ross Creek to provide a better understanding of the existing bathymetry and how this has changed over a two year period.

The 2023 DEM is shown along with the existing pontoons and berthed vessel positions and the proposed Berth 4 pontoon and berthed vessel position. The plot shows that the bathymetry around the existing berthed vessels is predominantly deeper than -3 m LAT, while at the berthed vessel location in Berth 4 the bathymetry is between -2.75 and -1 m LAT. For safe navigation SeaLink require a depth of -2.5 m LAT meaning that localised deepening of the berth is required. The proposed berth area is approximately 40 m by 12 m and based on the 2023 bathymetry the average depth within the berth area is -1.7m LAT, meaning that on average 0.8 m depth is required to be removed from the berth area to achieve a depth of -2.5 m LAT. Based on this, the volume of sediment which requires moving from the berth area has been estimated to be in the order of 370 m^3. Due to the relatively small volume of sediment which requires removing and the deep area of channel located 25 m south of the berth (depths of -4 to -5.25 m LAT), the sediment is proposed to be removed from the berth using a bed leveller and dragged to the deeper area of channel to the south of Berth 4.

Given the minor scale of the seabed profiling required for Berth 4, and the fact that the sediment will not be removed from the system but relocated to a deeper area of the creek, any changes to hydrodynamics

and hydraulics will remain localised to the areas where the sediment is removed from and to. At Berth 4 where the sediment is removed from a small reduction in current speed is expected due to the local deepening, while in the deeper area of the channel where the sediment is moved to there is likely to be a localised small increase in current speed due to the localised shallowing. For reference, the 3.5 million m^3 of capital dredging (10,000 larger volume than proposed for this project) being undertaken by the PoTL as part of the Port of Townsville Channel Upgrade was not predicted to result in any changes to the flood levels, flood extends or times of inundation (outside of the port limits) or cause any significant obstruction to conveyance at the mouth of the Ross Creek (BMT WBM, 2012). Overall, no changes to water levels, tidal phasing or flow speeds away from the local area are expected for this scale of works and no change to flood levels in the area are expected either given that the project is not changing the volume of sediment present in the Ross Creek.

It is also worth noting that the PoTL currently has a tidal works approval for Ross Creek (including the area where Berth 4 is proposed) with an approved dredge depth of -5.8 m LAT (Port of Townsville Limited, 2020). Therefore, the minor localised changes to flow speeds due to the proposed seabed profiling at Berth 4 can be considered to be insignificant compared to the potential impacts if the PoTL deepened the whole area to the approved dredge design depth.

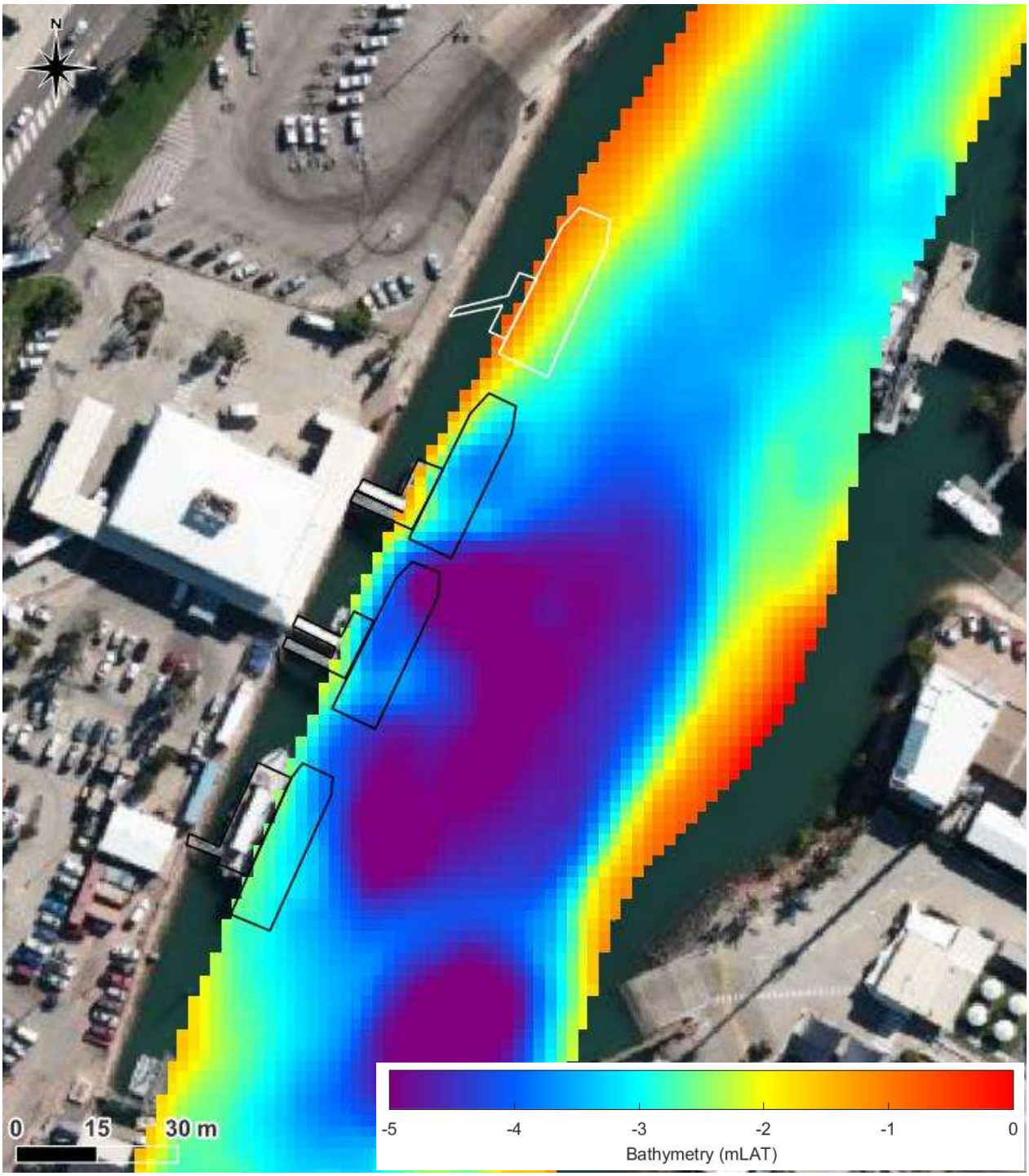

Figure 1. **Ross Creek 2023 bathymetry along with the existing pontoons and berthed vessel positions (black polygons) and the proposed Berth 4 pontoon and vessel position (white polygons).**

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3. Bathymetric Analysis

The DEMs representing the 2021, 2022 and 2023 bathymetry in the Ross Creek have been analysed to better understand the existing depths and recent sedimentation which has occurred in the area.

A series of transects have been extracted from the DEMs to show how the bathymetry has changed over time relative to the design depth, with the transects focused mainly around the proposed location of Berth 4 and the existing Berth 3 (Figure 2). The transects are shown in Figure 3 to Figure 7 and the results discussed below:

- the long section transect through all the berths shows that there has been both deepening and shallowing in areas of the Berths 1 to 3, while the bathymetry at the proposed Berth 4 has experienced little change. The areas of shallowing have been adjacent to areas of deepening, indicating that these localised changes are due to erosion of the seabed due to the propeller wash of vessel operating at Berths 2 and 3 and the subsequent deposition of this eroded sediment nearby where such high propeller wash does not occur;
- the transects across Berth 4 show that the bathymetry in this area has been stable between 2021 and 2023 with limited change occurring. The plots also show that a gradual increase in bathymetry from the east side of the berth to the west side, with the bathymetry continuing to shallow between the berth and the creek bank. The 2022 bathymetric survey at Berth4b ended 5 m from the creek bank where the bathymetry was 0.2 m above LAT; and
- the transects across Berth 3 (and the northern end of Berth 2) show that depths in the berth are typically more than 2 m deeper than the design depth of -2.5 m LAT. The berth will not have originally been deepened to this depth and so this shows how erosion of the berth has occurred due to the propeller wash of the vessels, demonstrating that ongoing sedimentation is not likely to occur while the vessels are regularly operating. At the western end of the berth the depths can be seen to quickly shallow from the design depth, with a stable bed slope of more than 1 in 3 between the end of the berth and the creek bank at transect Berth3b.

To help understand how the bed levelling activity is likely to influence the bathymetry between Berth 4 and the adjacent creek bank a stable bed slope of 1 in 3 has been assumed (as a steeper bed slope is present at Berth 3) to extend from the edge of the berth to the creek bank (Figure 8). The plot also shows the 2023 bathymetry from Berth 3, showing that the existing bathymetry has a slope steeper than a 1 in 3. The plot shows that assuming this stable bed slope results in a bed elevation of 1 m above LAT at the creek bank (located at chainage -3 m on the plot) and based on the existing natural bed slope a similar existing bed elevation is expected to be present adjacent to the creek bank. This demonstrates that the proposed seabed profiling at Berth 4 is not expected to result in a noticeable change in bed elevation adjacent to the creek bank and as a result the seabed profiling is not expected to impact the stability of the creek bank.

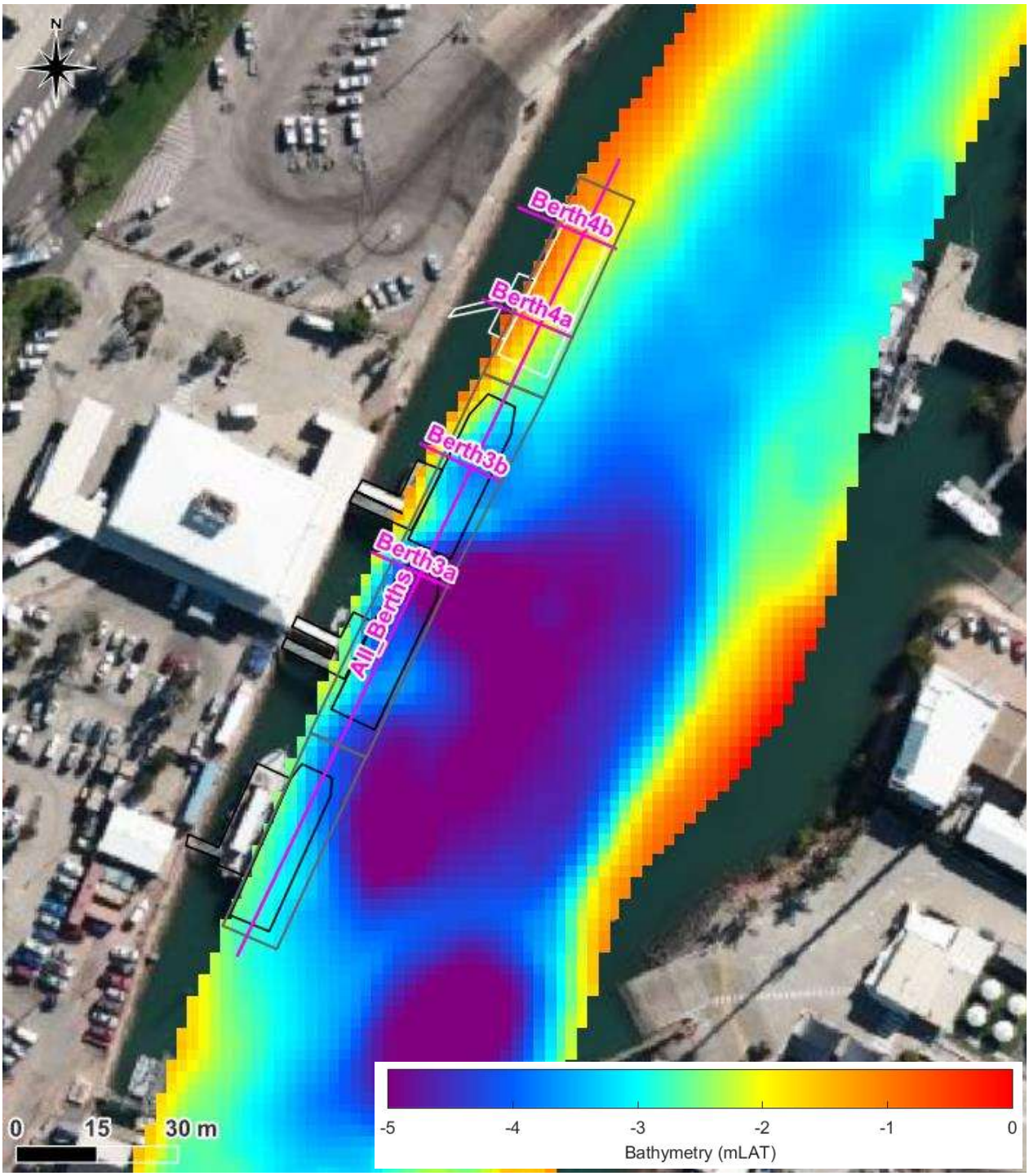

Figure 2. **Transect locations (pink lines) and berth regions adopted for the bathymetric analysis.**

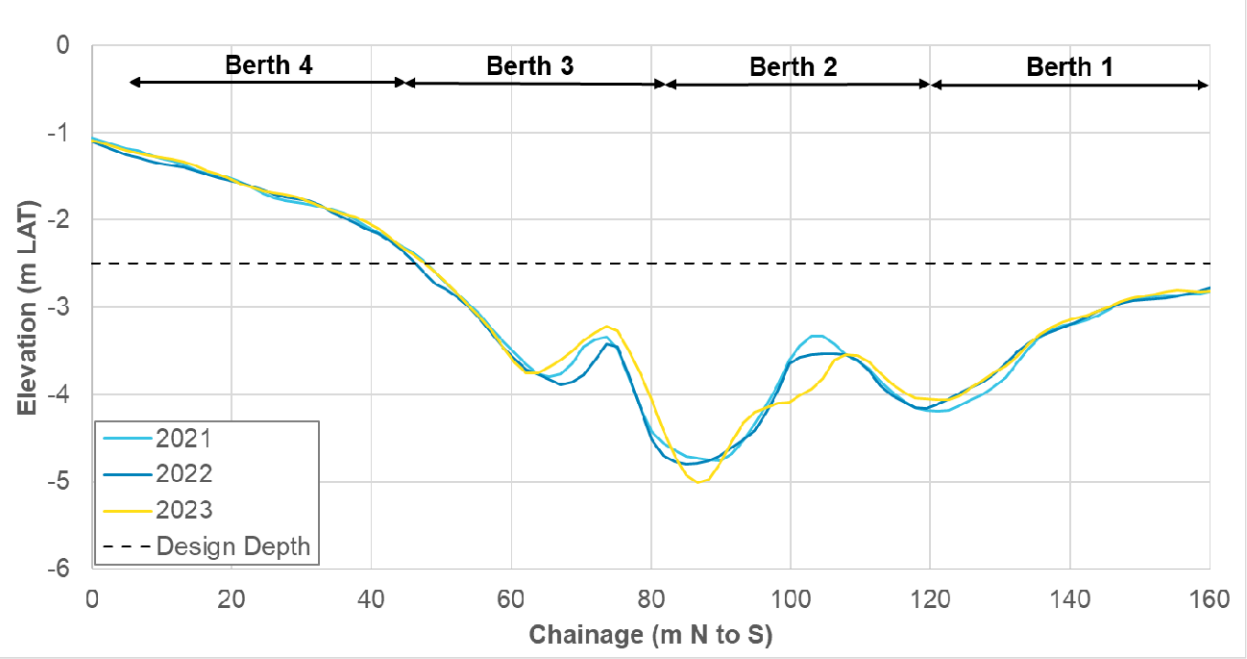

Figure 3. Bathymetry along All Berths transect in 2021, 2022 and 2023.

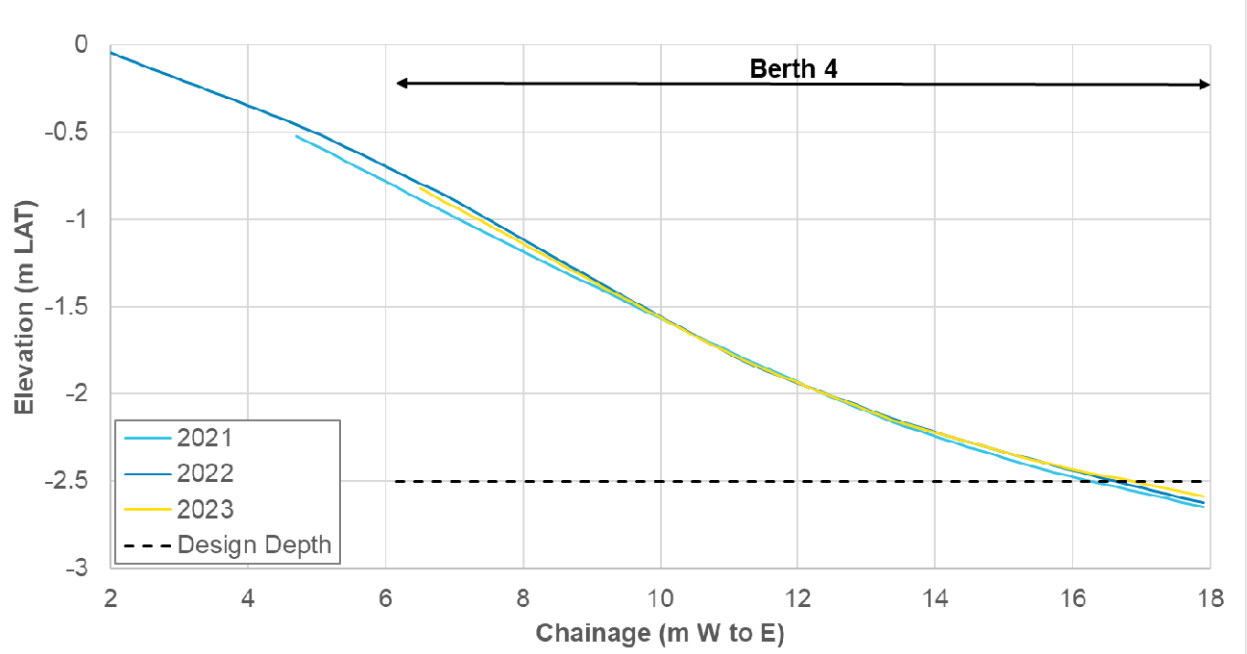

Figure 4. Bathymetry along Berth 4a transect in 2021, 2022 and 2023.

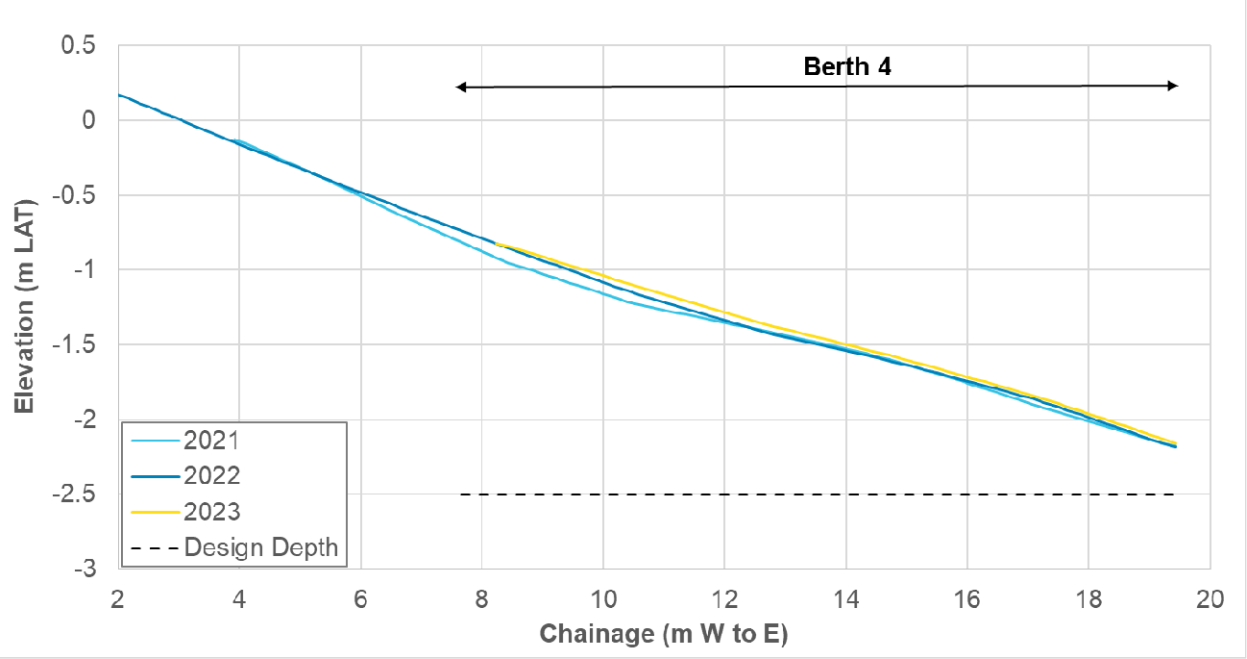

Figure 5. Bathymetry along Berth 4b transect in 2021, 2022 and 2023.

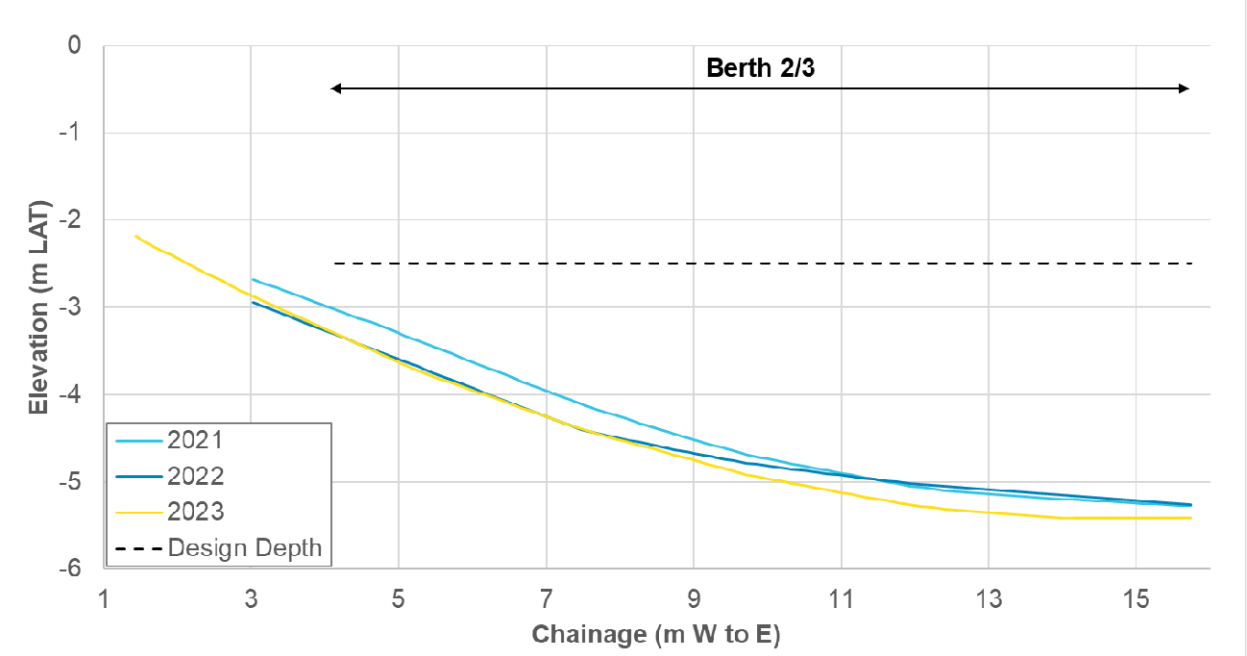

Figure 6. Bathymetry along Berth 3a transect in 2021, 2022 and 2023.

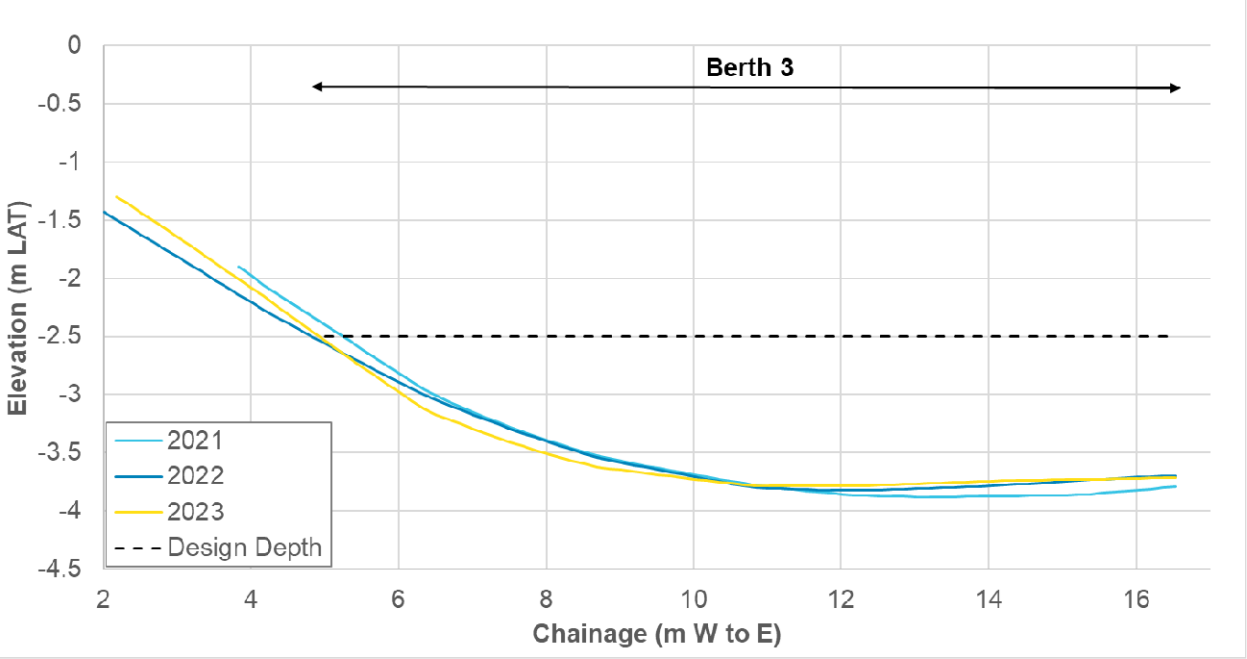

Figure 7. **Bathymetry along Berth 3b transect in 2021, 2022 and 2023.**

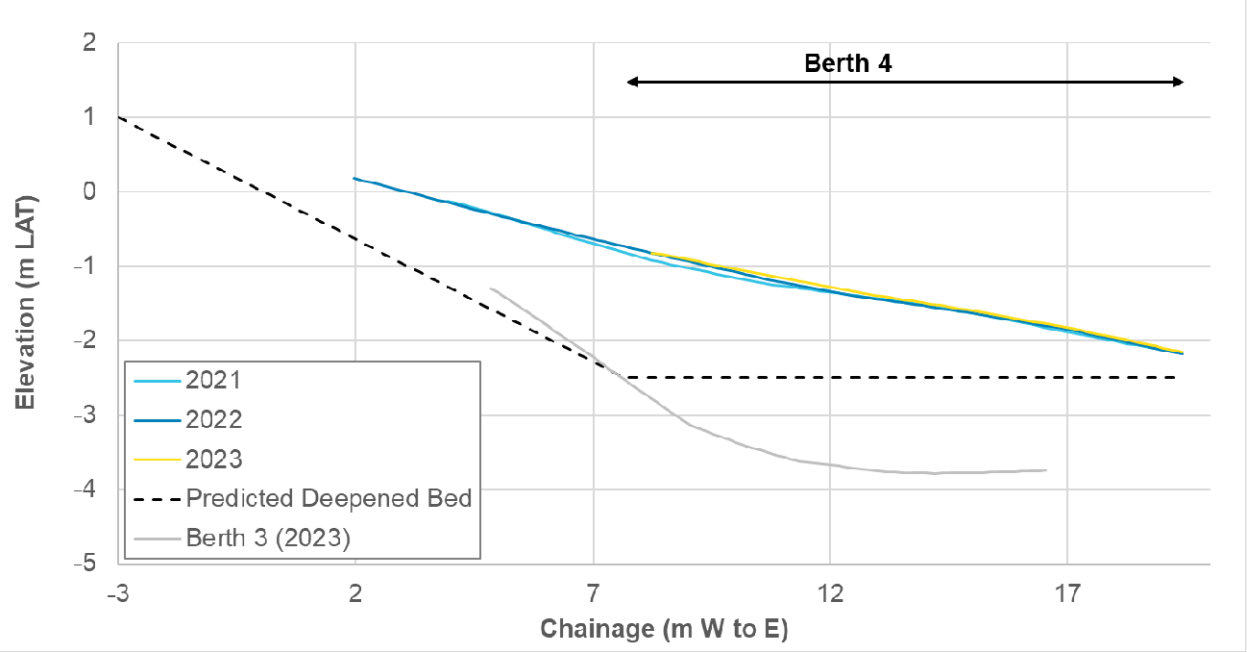

Figure 8. **Bathymetry along Berth 4b transect extending to the creek bank (-3 m chainage) in 2021, 2022 and 2023, the predicted 1 in 3 batter slope adopted from the edge of the deepened channel and the 2023 bathymetry from Berth 3.**

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The depth above and below the design depth of -2.5 m LAT has been calculated for the three DEMs so that any changes above the design depth between 2022 and 2023 can be understood, the depth relative to design depth is shown for 2023 in Figure 9. The average depth relative to the design depth and the volume above the design depth were calculated for the four berth areas (shown in Figure 9), the results for 2021 and 2023 along with the change in volume above design depth between the two are presented in Table 1. The table shows that there has been a small reduction in the volume above design depth at Berths 1 and 3 between 2021 and 2023, while in Berth 2 there was a negligible increase (0.1 m^3). In contrast, in the proposed Berth 4 area there was an increase in volume above design depth of approximately 15 m^3 (equal to an increase in depth of 0.04 m).

Table 1. Comparison between the 2021 and 2023 bathymetry relative to the proposed bed levelling design depth of -2.5 m LAT.

Area	2021 Bathymetry		2023 Bathymetry		Change in Volume above DD (m^3)
	Average depth to DD (m)	Volume above DD (m^3)	Average depth to DD (m)	Volume above DD (m^3)	
Berth 1	-0.79	1.6	-0.75	0.4	-1.2
Berth 2	-1.43	0.0	-1.50	0.1	0.1
Berth 3	-0.71	28.6	-0.68	27.5	-1.1
Berth 4	0.75	356.3	0.79	371.0	14.7

The bathymetric analysis has shown that although minor ongoing sedimentation does naturally occur in the Ross Creek, the operation of the SeaLink vessels prevents the sedimentation in the operating berths. This finding correlates with the following statement from SeaLink regarding sedimentation in the berths:

"Since March 2011, SeaLink has operated Ferry Services to Magnetic Island and Palm Island from the Townsville Breakwater Terminal, which includes three berths within the waterway. Throughout our operation, we have not needed to conduct any maintenance dredging or bed levelling. The wash generated by our vessel motors has effectively prevented the accumulation of sediment, ensuring the ongoing functionality of the berths."

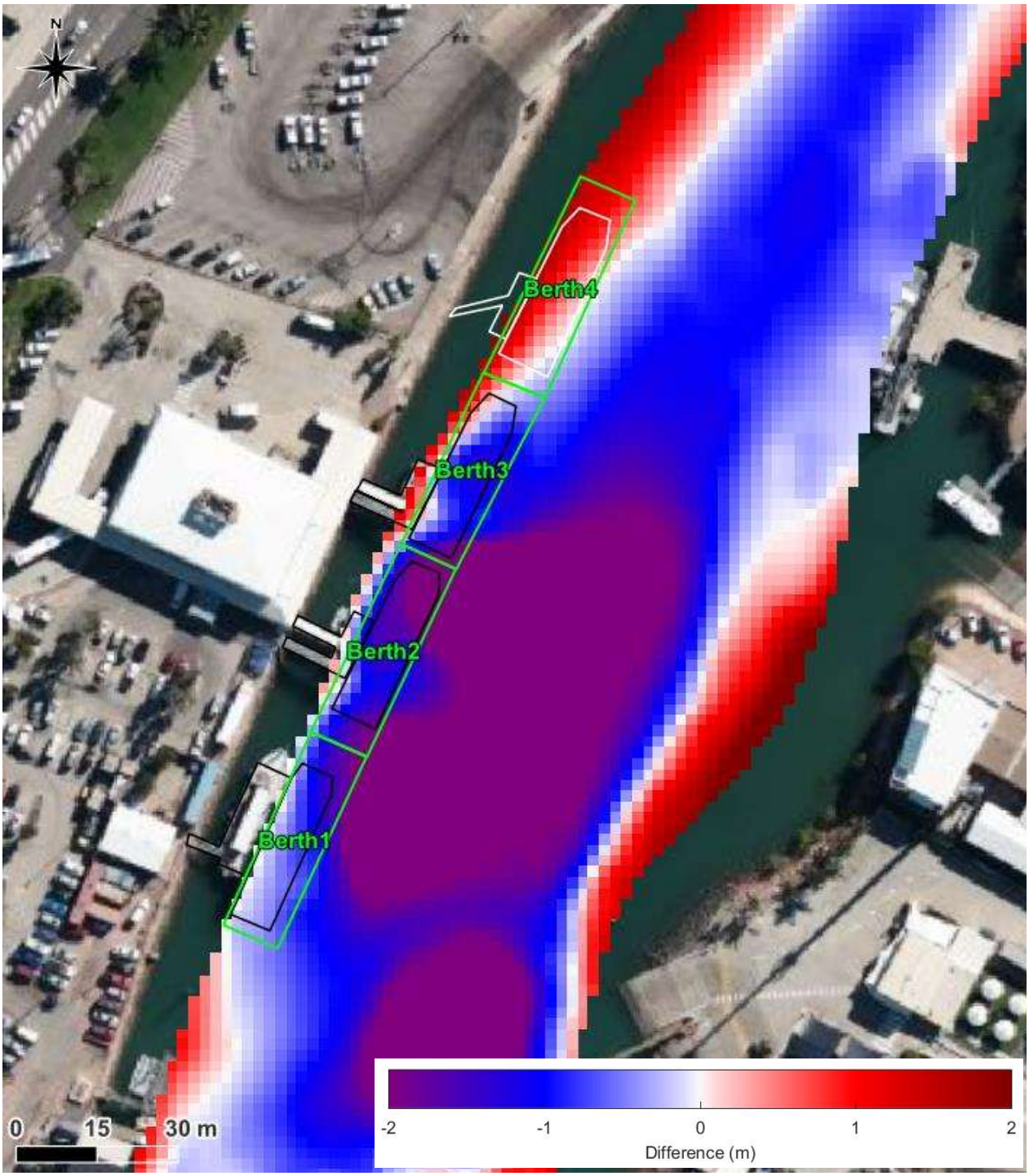

Figure 9. **Ross Creek 2023 depth relative to the proposed Berth 4 design depth of -2.5 m along with berth regions adopted for the analysis.**

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4. Summary

Therefore, based on the results from this desktop assessment and bathymetric analysis it can be concluded that:

- no changes to water levels, tidal phasing or flow speeds away from the local area are expected for the Berth 4 seabed profiling and no change to flood levels in the area are expected either as the project is not changing the volume of sediment present in the Ross Creek;
- based on the existing bathymetry and existing natural stable bed slopes at the other berths, the seabed profiling of Berth 4 is not expected to result in a noticeable change in bed elevation adjacent to the creek bank and as a result the seabed profiling is not expected to impact the stability of the creek bank; and
- ongoing sedimentation in Berth 4 is not expected to occur as the propeller wash of the vessels using the berth will prevent any sedimentation, as has occurred in the existing berths.

5. References

BMT WBM, 2012. Townsville Port Expansion Project EIS, Flood Impacts Study. October 2012.

Port of Townsville Limited, 2020. Long-term Maintenance Dredging Management Plan for Port of Townsville and Port of Lucinda 2019 – 2029. September 2020.