MOTT MACDONALD

Airport City Link

Construction Works Schedule and Location Plans

April 2023

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Airport Authority Hong Kong

Airport City Link

Construction Works Schedule and Location Plans

April 2023

Mott MacDonald Hong Kong Limited
registered in Hong Kong no. 236497

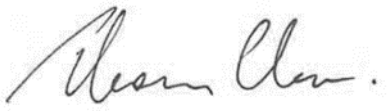
This Submission of Construction Works Schedule and Location Plans

has been reviewed and certified by

the Environmental Team Leader (ETL) in accordance with

Conditions 1.9 and 2.4 of Environmental Permit No. EP-581/2020

of the Project.

Certified by: 

Ir Thomas Chan
Environmental Team Leader (ETL)
Mott MacDonald Hong Kong Limited

Date 21 April 2023

AECOM Imagine it. Delivered.

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By Email

Airport Authority Hong Kong
HKIA Tower, 1 Sky Plaza Road,
Hong Kong International Airport,
Lantau, Hong Kong

Attn: Collin Chan (Manager, Civil)

21 April 2023

Dear Sir,

Contract C21C02 – Independent Environmental Checker Consultancy Services for Airport City Link
Construction Works Schedule and Location Plans

Reference is made to the Permit Holder's submission of Construction Works Schedule and Location Plans in accordance with Condition 2.4 of the Environmental Permit (No: EP-581/2020) of the Project certified by the ET Leader on 21 April 2023.

We would like to inform you that we have verified the captioned submission in accordance with the requirement stipulated in Condition 1.9 of EP-581/2020.

Should you have any queries, please feel free to contact the undersigned at 3922 9366.

Yours faithfully,
AECOM Asia Co. Ltd.

Y W Fung
Independent Environmental Checker

Contents

Appendices

1.1 Project Description

The Airport City Link (ACL) (hereinafter as “the Project”) is situated between the Airport Island and Hong Kong Port (HKP) Island, at the south of existing SkyPier on the Airport Island. To enhance vehicular mobility and walkability between HKP Island and the SKYCITY, the Project serves as a connection bridge providing shuttle services and pedestrian pathway.

The construction for the Project consists of a marine section in a marine area between the Airport Island and HKP Island, and a land section on the Airport Island and HKP Island. The connection bridge comprises of approximately 400m long marine section and 450m long land section. The construction works of marine section will be carried out by marine works Contractor, while the construction works of land section will be carried out by land works Contractor.

In July 2020, a Project Profile (PP) (Register No.: PP-606/2020) of the Project was submitted for the application for permission to apply directly for an Environmental Permit (EP), which was approved by Environmental Protection Department (EPD) in August 2020. The EP of the Project (EP No.: EP-581/2020) was obtained in October 2020.

On 10 June 2021, Mott MacDonald Hong Kong Limited (MMHK) was commissioned by Airport Authority Hong Kong (AAHK) under Contract C21C01 to provide Environmental Team (ET) consultancy services for the implementation of an EM&A programme in accordance with the EP requirements throughout the Pre-construction, Construction and Post-construction phases of the Project.

1.2 Purpose of this Submission

As specified in Condition 2.4 of the EP:

“The Permit Holder shall, no later than 2 months before the commencement of construction of the Project, deposit 3 hard copies and 1 electronic copy of a Construction Works Schedule and Location Plans (CWSLP) with the Director. The CWSLP shall include at least the following information / specifications:

i. the construction method to be adopted and a detailed phasing programme of the marine and land based construction works of the Project, demonstrating the avoidance of concurrent marine construction activities below sea water level of the Intermodal Transfer Terminal – Bonded Vehicular Bridge and Associated Roads Project (Environmental Permit No. EP-561/2018); and

ii. location plan of all construction works in appropriate scale showing the locations of proposed plant room, cofferdams, the excavation areas and the proposed bridge piers and / or abutments of the Project.”

1.3 Background and Purpose of the Submission

The Construction Works Schedule and Location Plans (the Plan) was first deposited to Environmental Protection Department (EPD) in March 2022 as per Condition 2.4 and EPD expressed no comment on the Plan in April 2022.

In June 2022, as the contractor of land portion has been awarded, the Plan has been updated to supplement the construction works schedule and location plan of ACL land portion. In addition, the construction works schedule and review of marine ecology and water quality impact incurred by the installation of temporary access platforms of ACL marine portion have also been updated.

To enhance the stability of the segment construction falsework for Pier 3 to 5 and Pier 7 to 8 during the bridge deck construction stage of the marine portion, temporary supporting casings will be used to ensure the engineering safety. Therefore, in March 2023, the construction method for the segment construction falsework in bridge deck construction stage has been changed. The

Plan has been updated to reflect the latest construction works schedule (refer to **Appendix A-A1**), construction method (refer to **Appendix C**), impact on the marine ecology and water quality (refer to **Appendix D**), and barge phasing plan (refer to **Appendix E**) of ACL marine portion.

1.4 Construction Works Schedule

The construction works that below sea water level of Intermodal Transfer Terminal – Bonded Vehicular Bridge and Associated Roads Project (ITT-BVB) were completed on 25 July 2022, while the construction works that below sea water level of ACL were commenced on 26 July 2022 right after the completion of the construction works below sea water level of ITT-BVB. Therefore, no concurrent marine construction activities below sea water level for ITT-BVB and ACL projects.

The Construction Works Schedule of marine portion and land portion of the Project is provided in **Appendix A-A1** and **Appendix A-A2**.

1.5 Location Plan

The location plan for the planned construction works for both marine and land portion of the Project based on the best available information is presented in **Appendix B-B1** and **Appendix B-B2**.

1.6 Major Construction Works

The major construction works of the Project involved marine and land portions.

1.6.1 Marine Portion

The marine portion involved substructure and superstructure works. Substructure consists of bored piles and pile caps; while superstructure consists of pier columns, deck surface and the rest of the road furniture.

Graphical illustrations of substructure and superstructure works involved are presented in **Appendix C**. The overall construction sequence starts from the substructure works to superstructure works. The major construction works are described below,

1.6.1.1 Substructure Works

Construction of bored piles and pile caps from Piers 3 to 8 will be carried out at marine section. After installation of temporary access platform and deployment of silt curtain, bored piling works will be conducted which involve the use of Reverse Circulation Drill (RCD) and sediment excavation works. A funnel will be placed at the top of steel pile casing during sediment excavation. Upon completion of bored piles, cofferdams (i.e. pre-casted steel panels) will be installed for pile cap construction.

A review of marine ecology (in terms of temporary marine habitat loss) and water quality (in terms of hydrodynamic and marine sediment displacement) impacts incurred by the installation of temporary access platforms and construction works (i.e. bored piling and pile cap construction works) are shown in **Appendix D**.

There will be in maximum of 5 marine work fronts working concurrently at the same time, which comprises 3 marine work fronts for foundation works (which involve the use of RCD and sediment excavation works) and 2 marine work fronts for pile cap construction (with installation of cofferdams).

To minimize mobilization of working vessels (e.g. barge), working vessels may be shared by marine work fronts for material transport and construction means, and also through the following working vessels deployment arrangement:

- In general, preparation works of bored pilling could be completed within a short period of time in approximately 10 days,
- Working vessel is not required for a marine work front after installation of cofferdam until concreting, because a dry working environment have been provided by the cofferdam for works before concrete casting. Therefore, idling of working vessels in the vicinity of marine work front for pile cap construction for long period of time is not anticipated.

In the PP, a maximum of 4 marine vessels (including barges, tug boats, etc.) per day would be required during the construction period. Each marine vessels would manoeuvre around 4 times per day for material transport and construction means. In addition, a maximum of 2 marine construction vessels would be allowed within 50m from the seawall of the Airport Island.

With reference to the updated construction method prepared by the marine works Contractor in March 2023, there are no changes on the maximum number of vessels with this Plan compared to the previous approved Plan. During the marine construction peak period, there are maximum number of 5 working vessels, which 3 working vessels will remain within the works area during construction making occasionally transits into and out of the works area, and 2 working vessels will manoeuvre maximum 16 trips per day in total where mainly for material delivery and disposal. In addition, no more than 2 marine construction vessels will be within 50m from the seawall of the Airport Island. Since the total number of vessel travelling trips are almost the same as in PP and no more than 2 marine construction vessels will be within 50m from the seawall of the Airport Island, therefore, it is considered that there is no additional environmental impact based on the PP.

The Barge Phasing Plan of the Project is given in **Appendix E**.

1.6.1.2 Superstructure Works

Construction of pier columns will be carried out right after each individual pile cap construction. Afterwards, hammer head will be constructed and followed by deck construction. Both hammer head and bridge deck will be constructed by in-situ casting method. Road furniture will then be installed to complete the entire bridge construction.

1.6.2 Land Portion

The land portion involved substructure works for underground utilities diversion, piling works, and superstructure works for single 2-lane carriageway vehicular bridge with cantilevered walkway, plant room, as well as SKYCITY platform at Airport Island and HKP platform at HKP Island respectively.

The overall construction sequence starts from substructure works to superstructure works. The major construction works are described below.

1.6.2.1 Substructure Works

Construction of bored piles and pile caps from S-P1 to S-P12, Pier 2, Pier 9 to 15 and H-P1 to H-P21 will be carried out at land section for land viaduct, SKYCITY platform and HKP platform respectively.

For bored pile construction, hydraulic oscillator will be set up at centre of the pile and place the temporary steel casing downward to the required soil depth. Crawler crane, hammer grab, chisel, and reverse circulation drill (RCD) will be employed for excavation until the founding level is reached. Placing the concrete for the bored pile by tremie method until concrete level above 1.5m from pile cut off level reached.

For pile cap construction, the excavation will be supported by the approved Earth Lateral Support (ELS) design adopting sheet pile cofferdam. The sheet piles will be driven by a vibratory hammer

for forming the cofferdam. The hydraulic excavator will be employed to excavate and expose the pile head and trimming the pile head concrete to the required cut off level. After the pile cap has been backfilled, the sheet pile cofferdam will be removed.

1.6.2.2 Superstructure Works

The superstructure of the project in land portion comprised of SKYCITY platform, HKP platform and pier columns for land viaducts and platforms.

Construction of pier columns for land viaducts and platforms will be carried out right after each individual pile cap construction. The steel mound will be used for construction of pier column and 1 to 2 concrete pours for whole column until pier head is reached.

For the construction of the SKYCITY platform, to minimize the impact on the live traffic, pre-cast cross beams over the existing Sky City Road (SCR) East will be constructed to serve as an elevated working platform for the floor slab construction. Joints reserved at the end of floor slab will be poured with concrete to form a permanent connection with land viaduct.

For the construction of the HKP platform, modular metal formwork would be adopted. The platform beam and slab will be constructed by the in-situ casting method construction method. To protect the existing toilet and maintain the HKP operation area within the construction site, a heavy-duty falsework system with steel beams will be adopted to form an elevated working platform to bridge over the HKP operation area and provide headroom for the vehicle passing through.

In addition, to facilitate the HKP operation, the superstructure of proposed HKP platform will be constructed phase by phase with the implementation of agreed temporary traffic arrangement with relevant authorities.

Appendices

A. Construction Works Schedules
B. Location Plans
C. Graphical Illustration of Substructure and Superstructure Works for Marine Portion
D. Review of Marine Ecology and Water Quality Impact Incurred by the Installation of Temporary Access Platforms and Temporary Supporting Casings for Segment Construction Falsework for Marine Portion
E. Barge Phasing Plan for Marine Portion

A. Construction Works Schedules

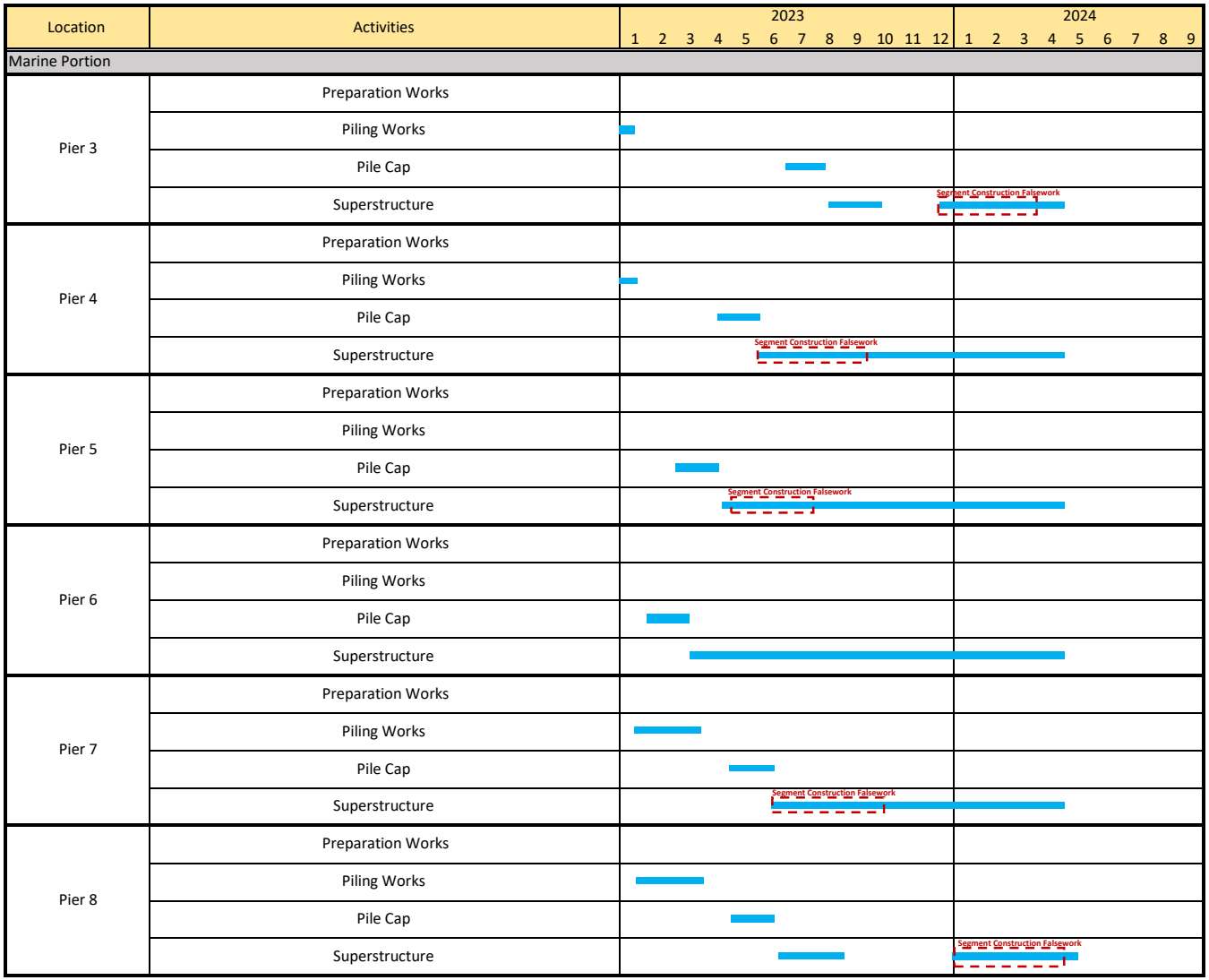
A1. Construction Works Schedule (Marine Portion)

AAHK Contract C19W10/01
Airport City Link - Marine Portion

Gammon

Overall Construction Programme

Airport City Link - Marine Portion



A2. Construction Works Schedule (Land Portion)

AAHK Contract C21W18

Airport City Link - Land Portion

SKYCITY Platform and Viaduct at Airport Island

Location	Duration	Year / Month																											
		2022							2023													2024							
		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
SKYCITY - Viaduct																																
Bored Pile	10/22 - 11/22																															
Cap	11/22 - 4/23																															
Pier	1/24 - 1/24																															
Viaduct	1/24 - 6/24																															
Architectural Builders Works and Finishes (ABWF) + Electrical & Mechanical (E&M)	6/24 - 9/24																															
SKYCITY - Platform																																
Bored Pile	12/22 - 2/23																															
Column	2/23 - 5/23																															
Main Beam	4/23 - 7/23																															
Cross Beam + Slab	7/23 - 7/24																															
Architectural Builders Works and Finishes (ABWF) + Electrical & Mechanical (E&M)	1/24 - 9/24																															
Roadworks	3/24 - 9/24																															

Hong Kong Port Platform, Viaduct and Plant Room at HKP Island

Location	Duration	Year / Month																											
		2022							2023													2024							
		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
HKP - Viaduct																																
Bored Pile	12/22 - 7/23																															
Cap + Column	3/23 - 12/23																															
Viaduct - Cantilever Method from P8 to P12	12/23 - 4/24																															
Viaduct - Insitu Method from P12 to P15	8/23 - 1/24																															
Architectural Builders Works and Finishes (ABWF) + Electrical & Mechanical (E&M)	1/24 - 9/24																															
Roadworks	1/24 - 9/24																															
HKP - Platform																																
Bored Pile	12/22 - 6/23																															
Cap + Column	3/23 - 11/23																															
Cross Beam + Slab	8/23 - 2/23																															
Architectural Builders Works and Finishes (ABWF) + Electrical & Mechanical (E&M)	11/23 - 7/24																															
Roadworks	2/24 - 9/24																															
HKP - Plantroom																																
Structure	2/23 - 9/23																															
Architectural Builders Works and Finishes (ABWF) + Electrical & Mechanical (E&M)	9/23 - 6/24																															
Roadworks	9/23 - 7/24																															

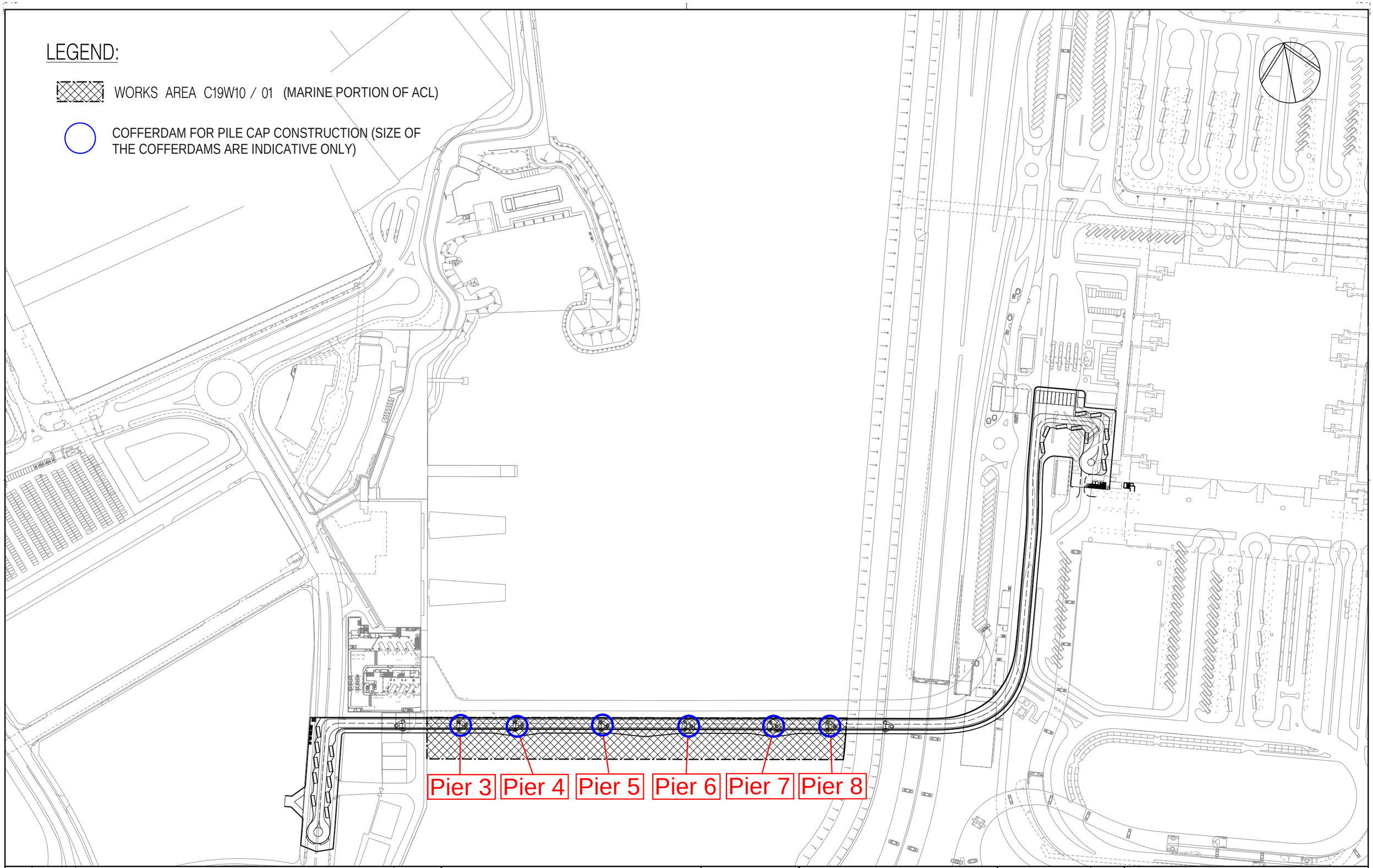
B. Location Plans

B1. Location Plan (Marine Portion)

LEGEND:

WORKS AREA C19W10 / 01 (MARINE PORTION OF ACL)

COFFERDAM FOR PILE CAP CONSTRUCTION (SIZE OF THE COFFERDAMS ARE INDICATIVE ONLY)



Rev.	Date	Description	Checked
A	07OCT2021	ISSUE FOR TENDER	HARRY CHAU

Airport Authority
HKIA Tower, 1 Sky Plaza Road,
Hong Kong International Airport,
Lantau, Hong Kong.

Tel : (852) 2188 7111
Fax : (852) 2824 0717

香港國際機場 HONG KONG INTERNATIONAL AIRPORT

Key Plan

Title SUPPLEMENTAL AGREEMENT C19W10/01 AIRPORTCITY LINK - MARINE PORTION

WORKS AREA PLAN

Signatures for Approval	Date
Design Supervisor : HARRY CHAU	31JUL2021
Checkers : HARRY CHAU	31JUL2021
Authorised Representative : –	31JUL2021

Hong Kong International Airport

Drawing No.
CWD/C19W10–01 /AAACL/C/DR/0100000

Scale 1:3000 (A3)

Rev. A

File Name : U:\Tender\C19W10 - ITT - Bonded Vehicular Bridge and Associated Roads\CAD\C\CWD_C19W10-01_AAACL_C_DR_0100000A.dgn

User Name : HUI_WWS

Plot Date : 04/10/2021

B2. Location Plan (Land Portion)

Land portion

Marine portion

SHEET PILE COFFERDAM AND EXCAVATION AREA FOR PILE CAP CONSTRUCTION
(SIZE OF THE SHEET PILE COFFERDAM AND EXCAVATION AREA ARE INDICATIVE ONLY)

Bored pile H-P1 to H-P21

HKP Platform

Pier 15

Pier 14

Pier 13

Pier 12

Pier 11

Pier 10

Pier 9

Pier 2

Marine Portion Area
(Refer to Appendix B -B 1)

SKYCITY Platform

Bored pile S-P1 to S-P6

Bored pile S-P7 to S-P12

Plant Room

1 GROUND FLOOR LEVEL DEMOLITION PLAN

SCALE 1: 1000

Notes :
1. Measurements are based on metric system.
2. All levels are in metres to Principal Datum (mPD) unless noted otherwise.
3. Do not scale drawing.
4. Figure dimensions are to be followed.
5. Do not use for construction unless expressly permitted.
6. The Contractor shall verify all conditions on the Site & notify the Project Manager of any variations from dimensions before construction.

Rev.	Date	Description	Checked
A	15-DEC-2021	ISSUE FOR TENDER	KW

Consultant's Signatures for Approval

Drawn LKW	Date DEC 2021	Design MAL	Date DEC 2021
Checkers KW	Date DEC 2021	Plot Date	DEC 2021
Design Supervisor KW			Date DEC 2021
Authorised Representative KW			Date DEC 2021

ARUP

Airport Authority HKIA Tower, 1 Sky Plaza Road, Hong Kong International Airport, Lantau, Hong Kong
Tel : (852) 2188 7111 Fax : (852) 2824 0717

Key Plan

Hong Kong International Airport

Title

WORKS AREA PLAN

Scale	Location	Originator	Design Ref	Location	Discipline	Type	Number	Status	Rev.
		Drawing No. OAP	C20C17	AAACL	A	DR	990201	Tender	A1

File Name : U:\STUDIO_K\PROJ_DATA\2020\20080L\I\DRAWING\TENDER\MAIN CONTRACT\PLOT\990201 -WP GF PLAN

User Name :

Plot Date : December 11, 2021

C. Graphical Illustration of Substructure and Superstructure Works for Marine Portion

Marine Bridge Elements

Superstructure

Deck

Pier

Substructure

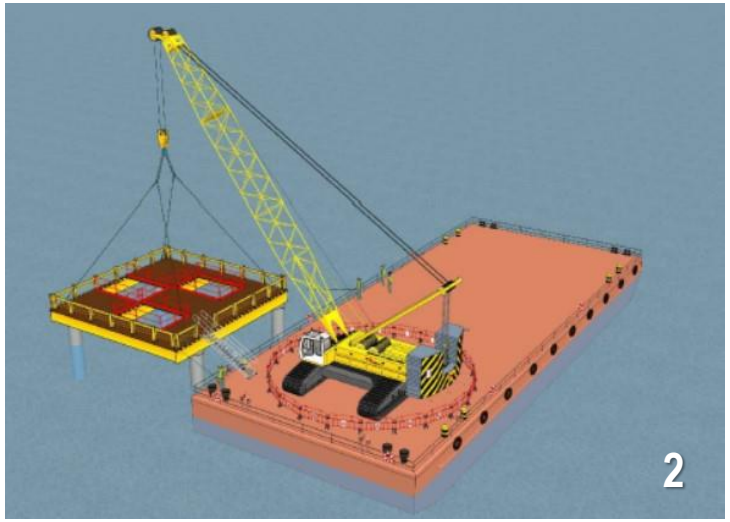
Pile cap

Bored Piles

Construction Sequence

Figure C1

Construction Method

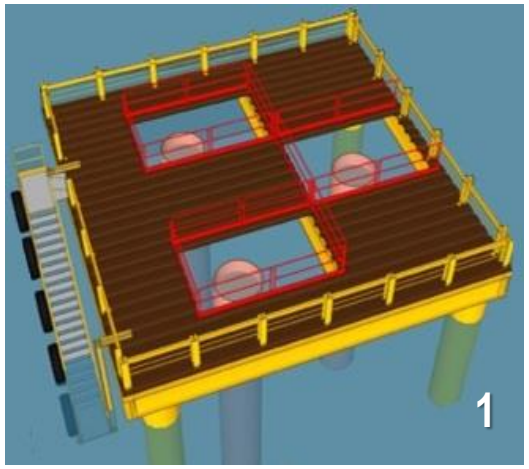


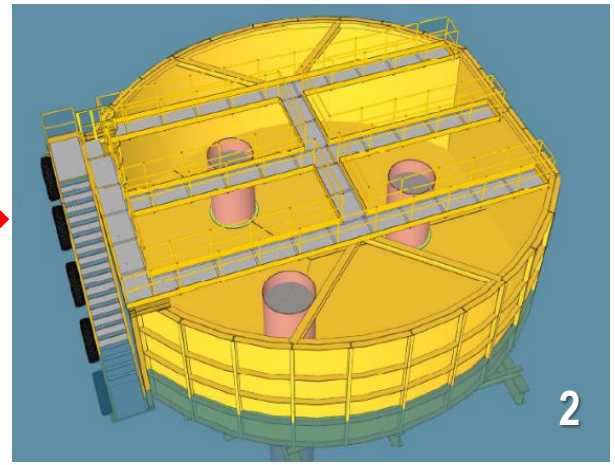
- For Pier 3 to 8, the temporary supporting casings for access platform will be installed by vibratory hammer.
- Access platform will be prefabricated on barge and lift to install on temporary supporting casings.
- All piling plants including crane will be set up on barge.
- Silt curtain with indicators will be installed before bored piling commenced.

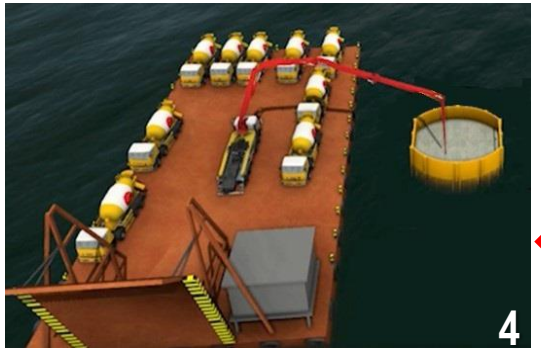
Bored Piles

Figure C2

Construction Method





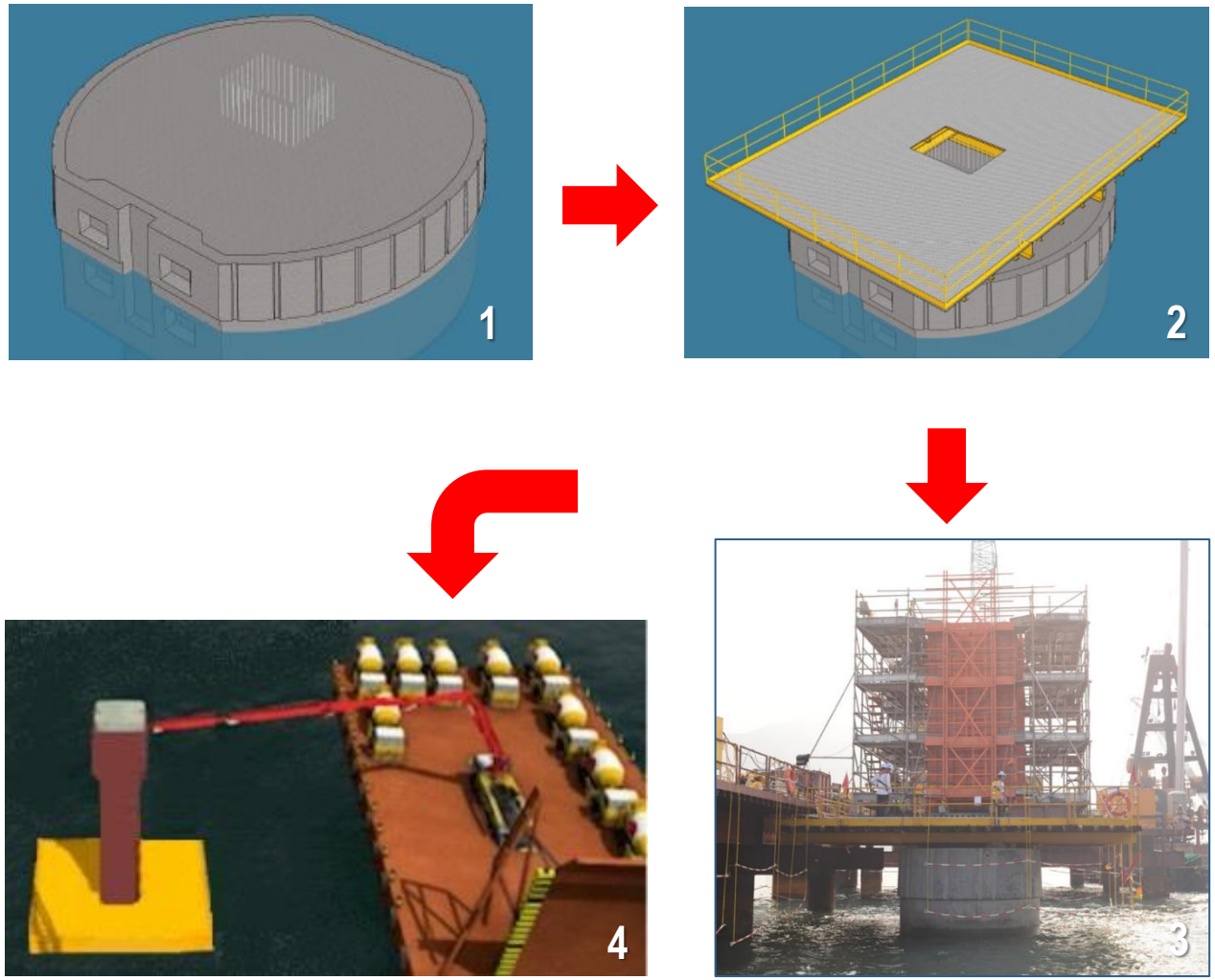


- Upon completion of bored piles, the access platform will be removed. The steel cofferdams (i.e. pre-casted steel panels) will then be installed for pile cap construction.
- Rebar fixing and concreting will be carried out inside the cofferdam
- Concreting will be carried out by RoRo barge and concrete pump truck.

Pile cap

Figure C3

Construction Method

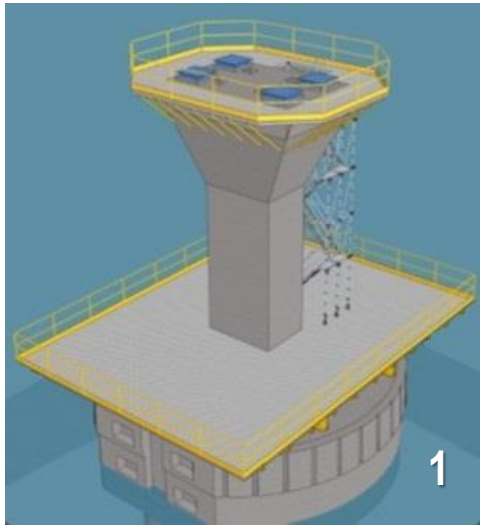


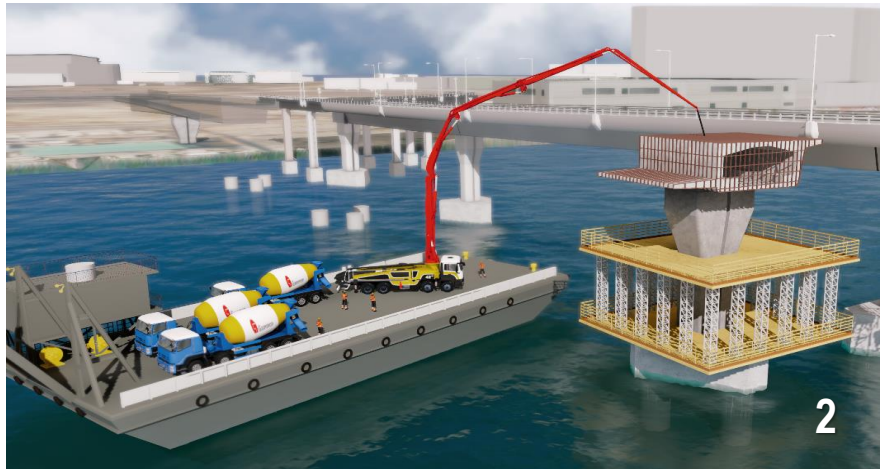
- A segment construction falsework made of steel will be installed on the pile cap formed (which is above the water level) for pier steel mould and construction access.
- Concreting will be similar as pile cap.
- For Pier 3 to Pier 5 and Pier 7 to Pier 8, the segment construction falsework will be further supported by Temporary Supporting Casing to ensure engineering safety.

Pier

Figure C4

Construction Method





- An in-situ hammer head will be constructed using segment construction falsework on the pile cap.
- A prefabricated steel travelling form will then be installed at the end tips of the cantilever deck to in-situ cast the first segment of the deck.
- The travelling form will be moved onto the new cast segment and another travelling form will then be installed on the other end tip of the deck for construction of the new deck.

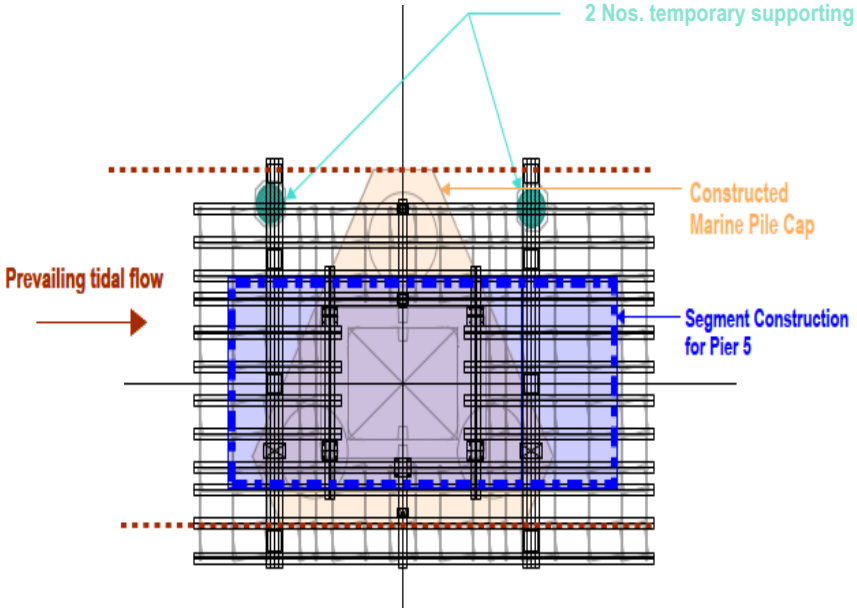
Deck

Figure C5

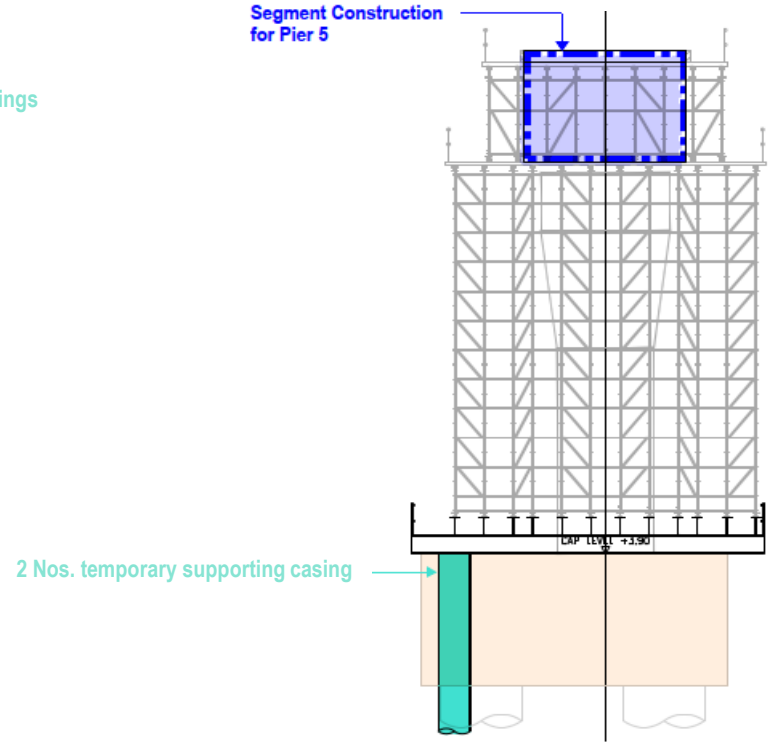
Construction Method - Temporary Supporting Casings For Segment Construction Falsework at Pier 3-5, Pier 7-8

- To enhance the stability of the Segment Construction Falsework for Pier 3-5, Pier 7-8 during bridge deck construction stage, temporary supporting casings will be used to ensure engineering safety.
- The arrangement of temporary supporting casings for each Pier is presented below;

For Pier 5



Plan View



Elevation

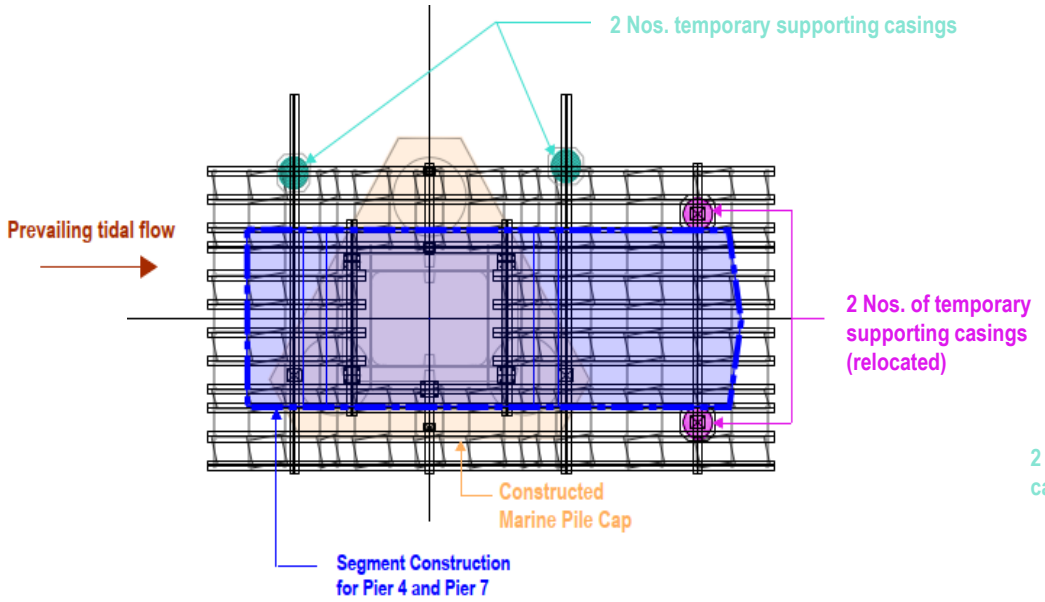
*Remark: After completion of bored piles, access platform was removed, number of temporary supporting casings reduced from 4 to 2 in segment construction stage.

Figure C5.1

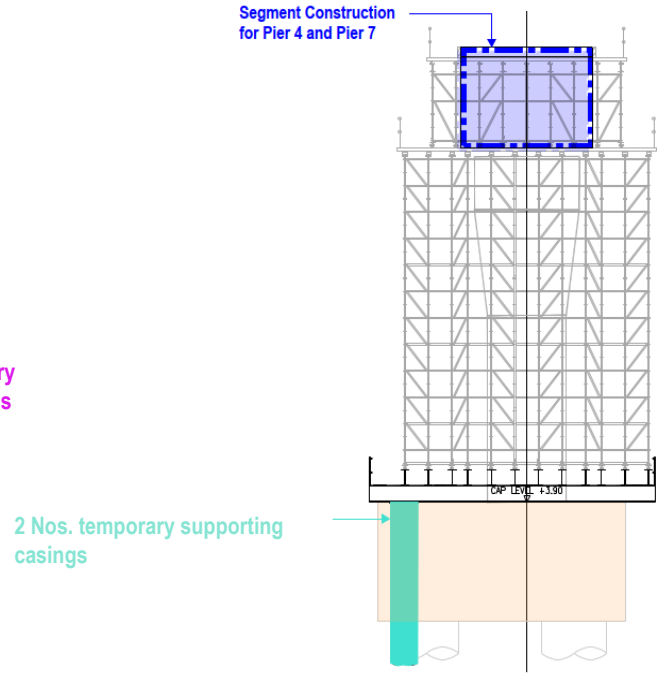
Construction Method - Temporary Supporting Casings For Segment Construction Falsework at Pier 3-5, Pier 7-8

- To enhance the stability of the Segment Construction Falsework for Pier 3-5, Pier 7-8 during bridge deck construction stage, temporary supporting casings will be used to ensure engineering safety.
- The arrangement of temporary supporting casings for each Pier is presented below;

For Pier 4 and Pier 7



Plan View



Elevation

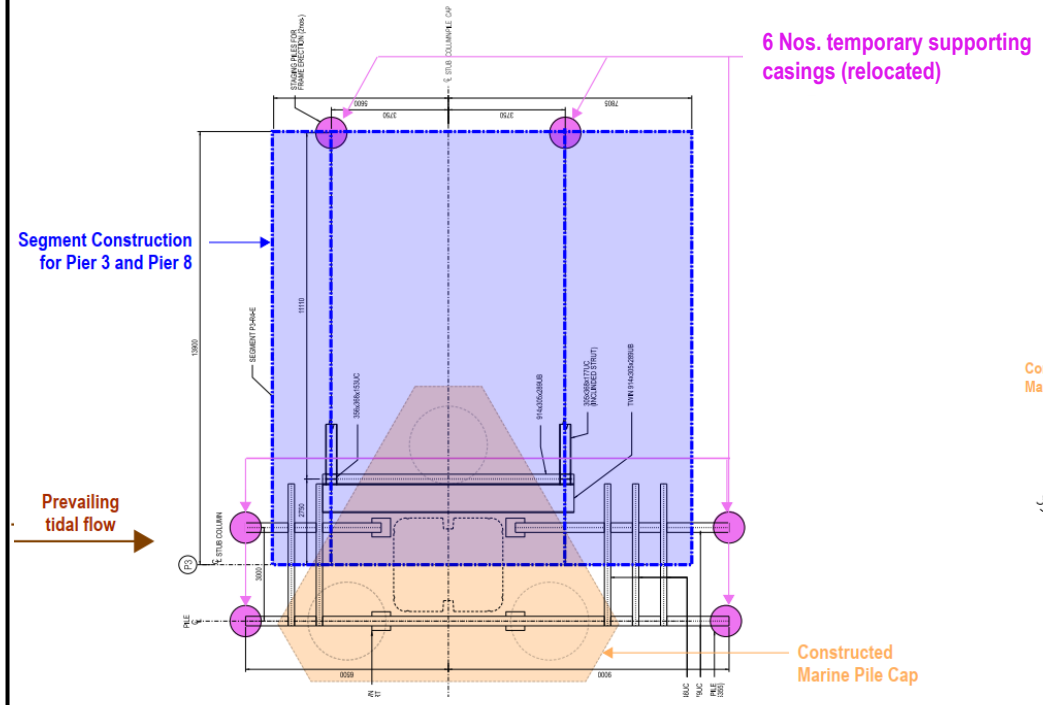
*Remark: After completion of bored piles, access platform was removed, number of temporary supporting casings remain 4 in segment construction stage.

Figure C5.2

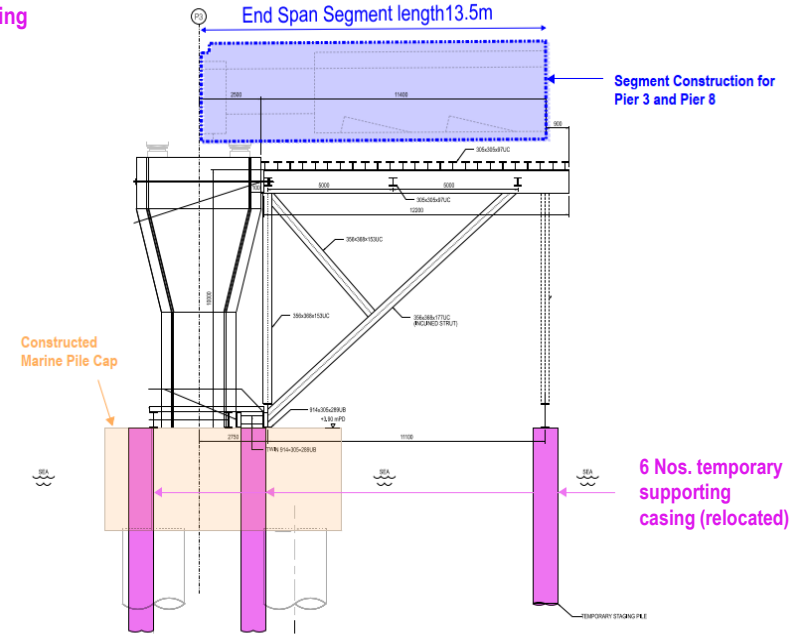
Construction Method - Temporary Supporting Casings For Segment Construction Falsework at Pier 3-5, Pier 7-8

- To enhance the stability of the Segment Construction Falsework for Pier 3-5, Pier 7-8 during bridge deck construction stage, temporary supporting casings will be used to ensure engineering safety.
- The arrangement of temporary supporting casings for each Pier is presented below;

For Pier 3 and Pier 8



Plan View



Elevation

*Remark: After completion of bored piles, access platform was removed, number of temporary supporting casings increased from 4 to 6 in segment construction stage.

Figure C5.3

D. Review of Marine Ecology and Water Quality Impact Incurred by the Installation of Temporary Access Platforms and Temporary Supporting Casings for Segment Construction Falsework for Marine Portion

Overview

Installation of temporary access platforms is proposed by the marine works Contractor after approval of PP, which is part of the temporary and preparation works due to the following reasons:

1) Providing safe working environment for construction workers
2) Facilitating permanent structures construction
3) Facilitating installation and deployment of silt curtain. Without the presence of temporary access platform, additional temporary support such as sheet pile or H-pile, more marine vessels/barges as well as anchors would be deployed to sufficiently weighted to hold the silt curtain in a vertical position above seabed. Additional hydrodynamic impact and temporary habitat loss are anticipated.

The 1m-diameter supporting casing column of temporary access platforms for Pier 3 to Pier 8 would be installed by vibratory hammer.

To enhance the stability of the segment construction falsework for Pier 3 to Pier 5 and Pier 7 to Pier 8 during bridge deck construction stage, temporary supporting casings will be used to ensure engineering safety.

A review on the potential impact of the 2 most prominent environmental aspects, marine ecology (in terms of temporary marine habitat loss) and water quality (in terms of hydrodynamic and marine sediment displacement) is provided.

D.1 Review on Temporary Marine Habitat Loss

The maximum total temporary marine habitat loss induced by the installation of access platforms (with diameter of 1m), steel pile casings (with diameter of 2.5 m) and temporary supporting casings for segment construction falsework for bridge deck construction (with diameter of 1m) is about 0.0003ha.

The worst-case scenario is anticipated during the period of commencement of superstructure works at Pier 5 and undergoing piling works at Pier 3, 4, 7 and 8 before the removal of temporary access platform.

Due to the heavy loading of segment structure at Pier 5, 2 numbers of temporary supporting casings are needed to support the segment construction falsework to increase the engineering safety.

Compared to Pier 5, Pier 4 and 7 comprise wider segments and Pier 3 and 8 comprise the longest end span segment, therefore, 4 and 6 numbers of temporary supporting casings are needed respectively to support the larger segment construction falsework to increase the engineering safety.

Given the area affected is very small and scattered, also, in comparison with the estimation of temporary habitat loss stated in PP (i.e. about 0.0087ha in total), it is expected that the impact of temporary habitat loss is minor which is aligned with the PP.

Mathematical calculations of temporary marine habitat loss and associated comparison are given in **Table D1.1** to **Table D1.4** respectively.

Calculation of Temporary Habitat Loss in ITT-BVB EIA Report

Table D1.1 Total Temporary Habitat Loss Estimation in ITT-BVB EIA Report ^

Type of Casing	Casing Parameters				Temporary Habitat Loss by Installation of Casing/ m^2	No. of Steel Pile Casing	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
	Diameter/ m	Thickness/ m	Outer Area/ m^2	Inner Area/ m^2				
Steel Pile Casing	2.8	0.4	6.16	3.14	3.02	29	87.46	0.0087

Remarks:

^ Since the scale and habitat loss due to the Project are similar to the ITT-BVB therefore the habitat loss calculation / estimation is extracted from ITT-BVB EIA Report.

Table D1.2 Calculation of Temporary Habitat Loss by Each Casing

Type of Casing	Casing Parameters				Temporary Habitat Loss by Installation of Casing/ m^2
	Diameter/ m	Thickness/ m	Outer Area/ m^2	Inner Area/ m^2	
Supporting Casing of Access Platforms at Pier 3-8	1	0.012	0.79	0.75	0.04
Steel Pile Casing	2.5	0.020	4.91	4.75	0.16
Supporting Casing for Segment Construction Falsework	1	0.012	0.79	0.75	0.04

Table D1.3 Calculation of the Maximum Total of Temporary Habitat Loss by Supporting Casing of Access Platforms, Steel Pile Casing & Temporary Supporting Casings for Segment Construction Falsework during the Marine Construction Works Peak Period

Pier ID	No. of Access Platform	No. of Bored Pile	No. of Supporting Casing for Segment Construction Falsework	Temporary Habitat Loss by Access Platform/ m^2	Temporary Habitat Loss by Access Platform/ ha	Temporary Habitat Loss by Steel Pile Casing/ m^2	Temporary Habitat Loss by Steel Pile Casing/ ha	Temporary Habitat Loss by Segment Construction Falsework/ m^2	Temporary Habitat Loss by Segment Construction Falsework/ ha	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
Pier 3*	1	3	0	0.15	0.000015	0.47	0.000047	0.00	0.000000	0.62	0.000062
Pier 4*	1	3	0	0.15	0.000015	0.47	0.000047	0.00	0.000000	0.62	0.000062
Pier 5*	0	3	2	0.00	0.000000	0.47	0.000047	0.07	0.000007	0.54	0.000054
Pier 7*	1	3	0	0.15	0.000015	0.47	0.000047	0.00	0.000000	0.62	0.000062
Pier 8*	1	3	0	0.15	0.000015	0.47	0.000047	0.00	0.000000	0.62	0.000062
			Total:	0.60	0.000060	2.34	0.000234	0.07	0.000007	3.01	0.000301

Remarks:

* Each Access Platform of Pier 3 - 8 is with 4 Supporting Casings

Comparison of the Maximum Total of Temporary Habitat Loss According to Updated Construction Method Prepared by the Marine Works Contractor in Mar 2023 with Estimation in PP and approved ITT-BVB EIA Report

Table D1.4 Comparison of Total Temporary Habitat Loss

Scenario	Total Temporary Habitat Loss/ m^2	Total Temporary Habitat Loss/ ha
The maximum total of temporary habitat loss according to updated construction method prepared by the marine works contractor in Mar 2023 during the marine construction works peak period	3.01	0.0003
Total of temporary habitat loss estimation in PP and approved ITT-BVB EIA Report	87.00	0.0087

Given that the total number of bored piles for the latest design is 18 with diameter of steel pile casing 2.5m while the total number of bored piles in the ITT-BVB EIA Report is 29 with diameter of steel pile casing 2.8m.

The maximum total of temporary habitat loss induced by updated construction method prepared by the marine works Contractor in Mar 2023 (which involving reduced number of bored piles, installation of temporary access platforms and installation of temporary supporting casings for segment construction falsework) is estimated to be around 0.0003ha during the marine construction works peak period, which is less than the estimation that stated in the PP and the approved ITT-BVB EIA Report (i.e. about 0.0087ha in total). Therefore, it is expected that the impact of temporary habitat loss induced by the current construction method (which involving reduced number of bored piles, installation of temporary access platforms and installation of temporary supporting casings for segment construction falsework) is estimated to be around 0.0003ha during the marine construction works peak period, which is less than the estimation that stated in the PP and the approved ITT-BVB EIA Report (i.e. about 0.0087ha in total) is minor which is aligned with PP.

D.2 Review on Water Quality Impact

D.2.1 Hydrodynamic Impact

Assumption was made in the PP that the marine foundation works will be constructed by two phases, such that construction of bridge piers will not be constructed at the same time, therefore, it is expected that the hydrodynamic impact during operational phase is worse than at the interim construction stages. To reaffirm the above assumption, the worst-case scenario for the total width of marine board piles, pile caps, access platform supporting casings, cofferdam and temporary supporting casings for segment construction falsework for bridge deck construction during the marine construction works peak period is estimated and would be 64m under the prevailing tidal flow (i.e. north-south direction). Since that is comparable to the PP estimation of 65m (where the estimation in the PP is cited from the ITT-BVB Environmental Impact Assessment Report (EIA Report), with features and good practices presented in Section 5.3.6 in the PP), therefore, the above assumption is still valid. Mathematical calculations are given in **Table D.2**.

As the above assumption is still valid during construction phase, hydrodynamic impacts are within the PP prediction.

Table D.2 Calculation of The Worst-Case Scenario for Total Width[(1)] of Marine Bored Piles, Pile Caps, Access Platform Supporting Casings, Cofferdam, Temporary Supporting Casings for Segment Construction Falsework during the Marine Construction Works Peak Period

Pier ID	Pile Cap Width[(1)] Assumption in the PP/ m	Pile Cap Width[(1)] under Detailed Design in Mar 2023 / m	Cofferdam Width[(1)] under Detailed Design in Mar 2023 / m	Additional Width[(1)] caused by Supporting Casing for Segment Construction Falsework under Detailed Design in Mar 2023 / m	Remark
3	5	9.50	10.50	1	(4)
4	5	9.50	10.50	0	(2)(3)
5	5	9.50	10.50	0	(3)
6	10	12.00	13.00	N/A	N/A
7	10	12.00	13.00	0	(2)(3)
8	5	9.50	10.50	1	(4)

[(1)] Width under the prevailing tidal flow (i.e. north-south direction)

[(2)] Additional temporary supporting casing at south and obsured by constructed marine pile cap, which will not affect the width under prevailing tidal flow (i.e. north-south direction)

[(3)] The retained temporary supporting casings are within affected prevailing tidal flow area constructed marine pile cap, and thus will not cause additional impact to prevailing tidal flow. (i.e. north-south direction)

[(4)] As the two temporary supporting casings are installed in a parallel direction, therefore only one temporary supporting casing will affect the prevailing tidal flow area (i.e. north-south direction)

The Calculated Maximum Hydrodynamic Impact during the Marine Construction Works Peak Period

Pier ID	Pile Cap Width[(1)] Assumption in the PP/ m	Width[(1)] of Structure under Detailed Design in Mar 2023 / m						
		Access Platform	Bored Piles	Cofferdam	Pile Cap	Segment Construction Falsework	Remark	
3	5	N/A	N/A	N/A	9.50	1.00	(4)	
4	5	N/A	N/A	N/A	9.50	N/A	(2)(3)	
5	5	N/A	N/A	N/A	9.50	N/A	(3)	
6	10	N/A	N/A	N/A	12.00	N/A	N/A	
7	10	N/A	N/A	N/A	12.00	N/A	(2)(3)	
8	5	N/A	N/A	N/A	9.50	1.00	(4)	
Total width[(1)]	40	0.00	0.00	0.00	62.00	2.00	Total width[(1)] during the marine construction works peak period/ m	64.00

Remark:

[(1)] Width under the prevailing tidal flow (i.e. north-south direction)

[(2)] Additional temporary supporting casing at south and obsured by constructed marine pile cap, which will not affect the width under prevailing tidal flow (i.e. north-south direction)

[(3)] The retained temporary supporting casings are within affected prevailing tidal flow area constructed marine pile cap, and thus will not cause additional impact to prevailing tidal flow. (i.e. north-south direction)

[(4)] As the two temporary supporting casings are installed in a parallel direction, therefore only one temporary supporting casing will affect the prevailing tidal flow area (i.e. north-south direction)

D.2.2 Marine Sediment Displacement

With reference to Section S.5.3.1 of the PP, which is cited from the ITT-BVB EIA Report S.5.7.3, installation of steel pile casing would only cause minor displacement of marine sediment, which will quickly settle without significant increase in suspended solids. The installation of supporting casings of temporary access platforms and temporary supporting casings for segment construction falsework could be compared with the installation of steel pile casings of bored piles in three major aspects so as to review the level of marine sediment displacement due to installation of access platforms.

Table D.3 Comparison of Major Aspects for Installation of Temporary Supporting Casings of Access Platforms, Temporary Supporting Casings for Segment Construction Falsework for bridge deck construction and Installation of Steel Pile Casings of Bored Piles

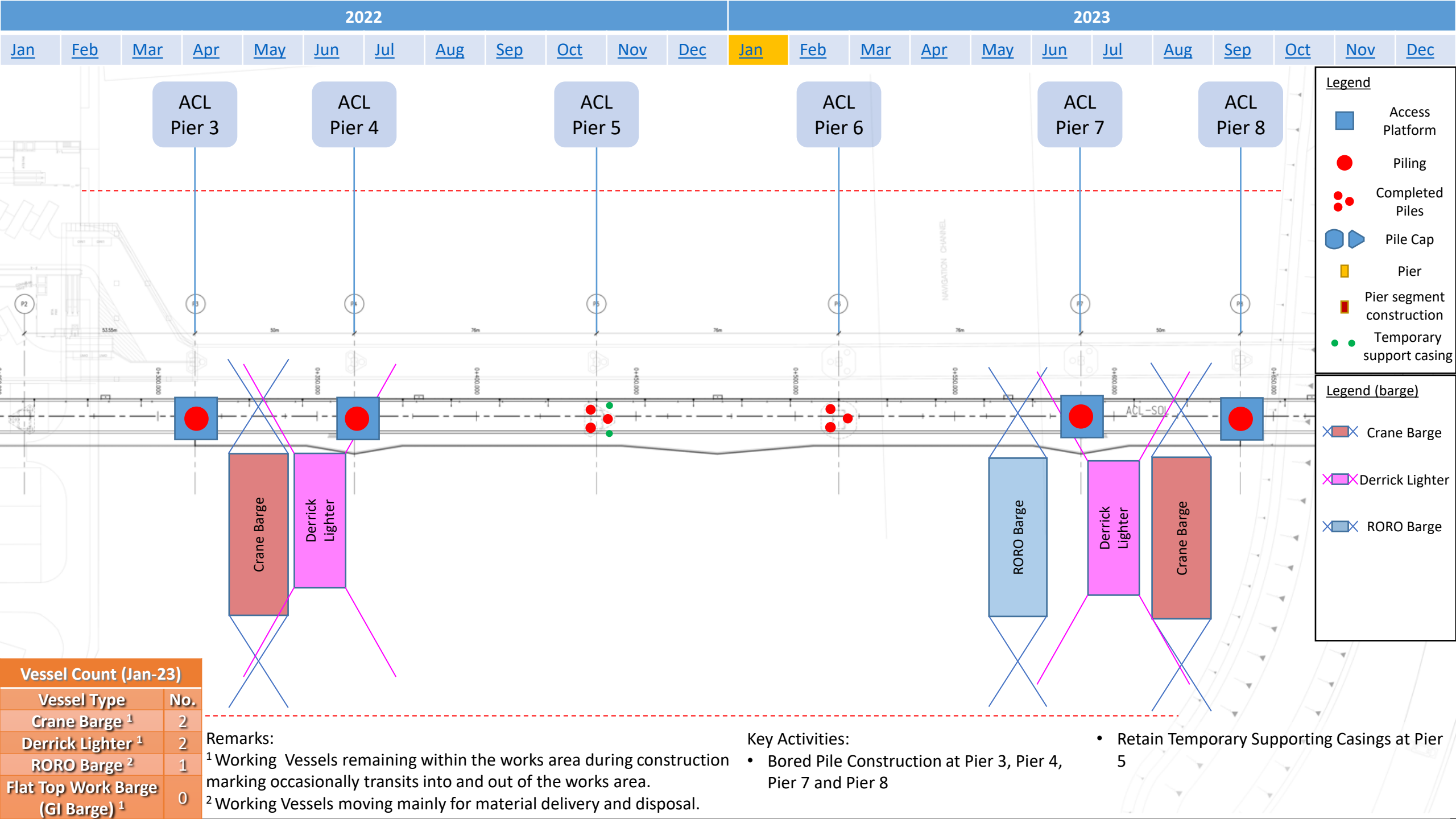
	Temporary supporting casings of access platform at Pier 3 - 8	**Temporary supporting casings for segment construction falsework for bridge deck construction**	**Steel pile casings of bored pile**
Diameter, m	1	1	2.5
Duration of installation, day(s)	1-1.5 (for each casing)	1-1.5 (for each casing)	14 (for each casing)
Depth of casing	From -15 mPD to -36 mPD	From -15 mPD to -36 mPD	From -30 mPD to -65 mPD

Given the diameter, duration of installation and depth of temporary supporting casings of access platforms and temporary supporting casings for segment construction falsework are substantially smaller and shorter than the steel pile casings of bored piles, it is expected that the marine sediment displacement impact of supporting casings due to installation of temporary access platform is minor which is aligned with the PP.

D.2.3. Conclusion

In view of the result given in **Section D.2.1** and **Section D.2.2**, it is considered that there is no additional environmental impact due to installation of temporary access platform and temporary supporting casings for segment construction falsework based on the PP.

E. Barge Phasing Plan for Marine Portion



Vessel Count (Jan-23)	
Vessel Type	No.
Crane Barge [1]	2
Derrick Lighter [1]	2
RORO Barge [2]	1
Flat Top Work Barge (GI Barge) [1]	0

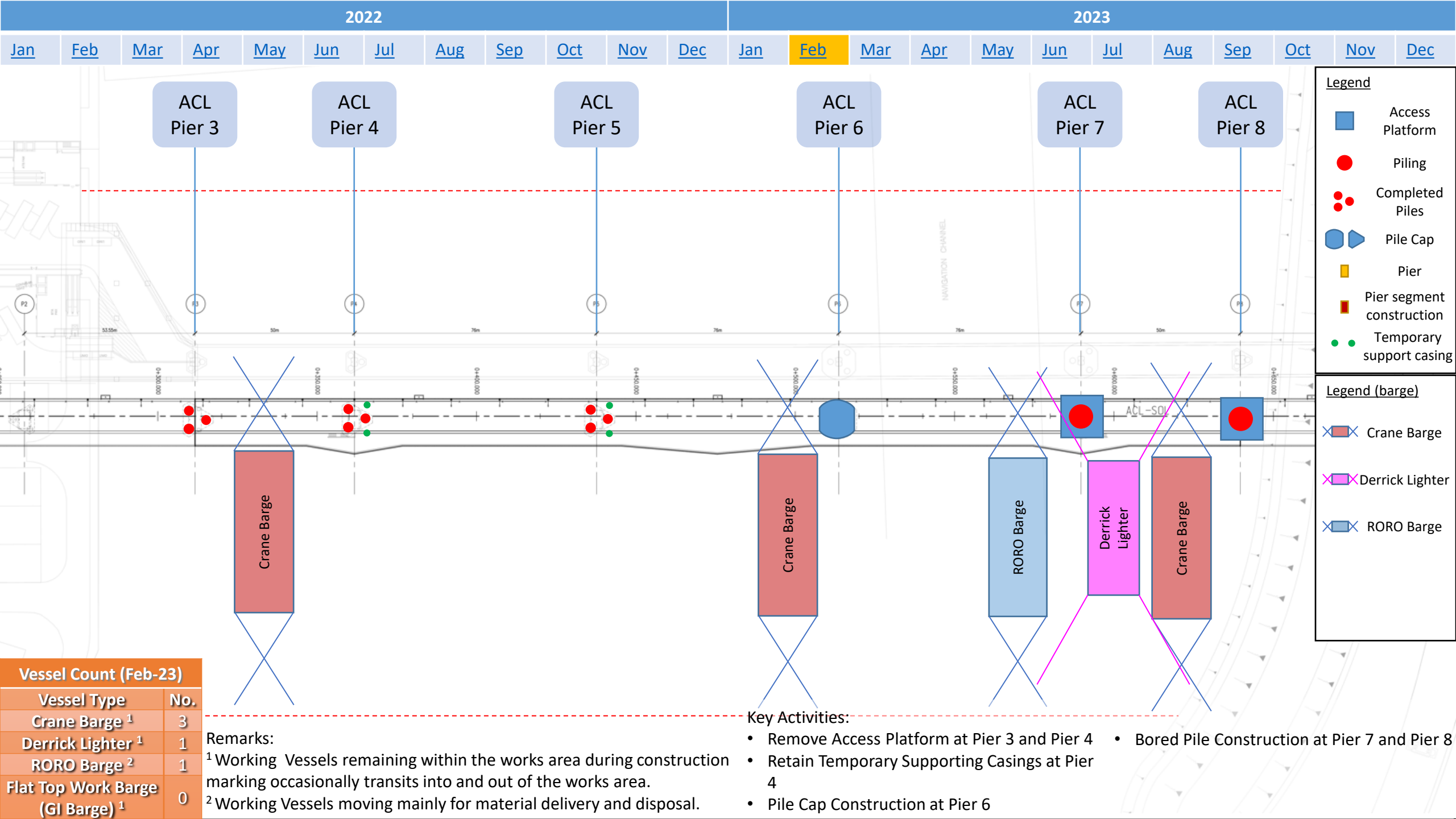
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Bored Pile Construction at Pier 3, Pier 4, Pier 7 and Pier 8
- Retain Temporary Supporting Casings at Pier 5



Vessel Count (Feb-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	1
RORO Barge [2]	1
Flat Top Work Barge (GI Barge) [1]	0

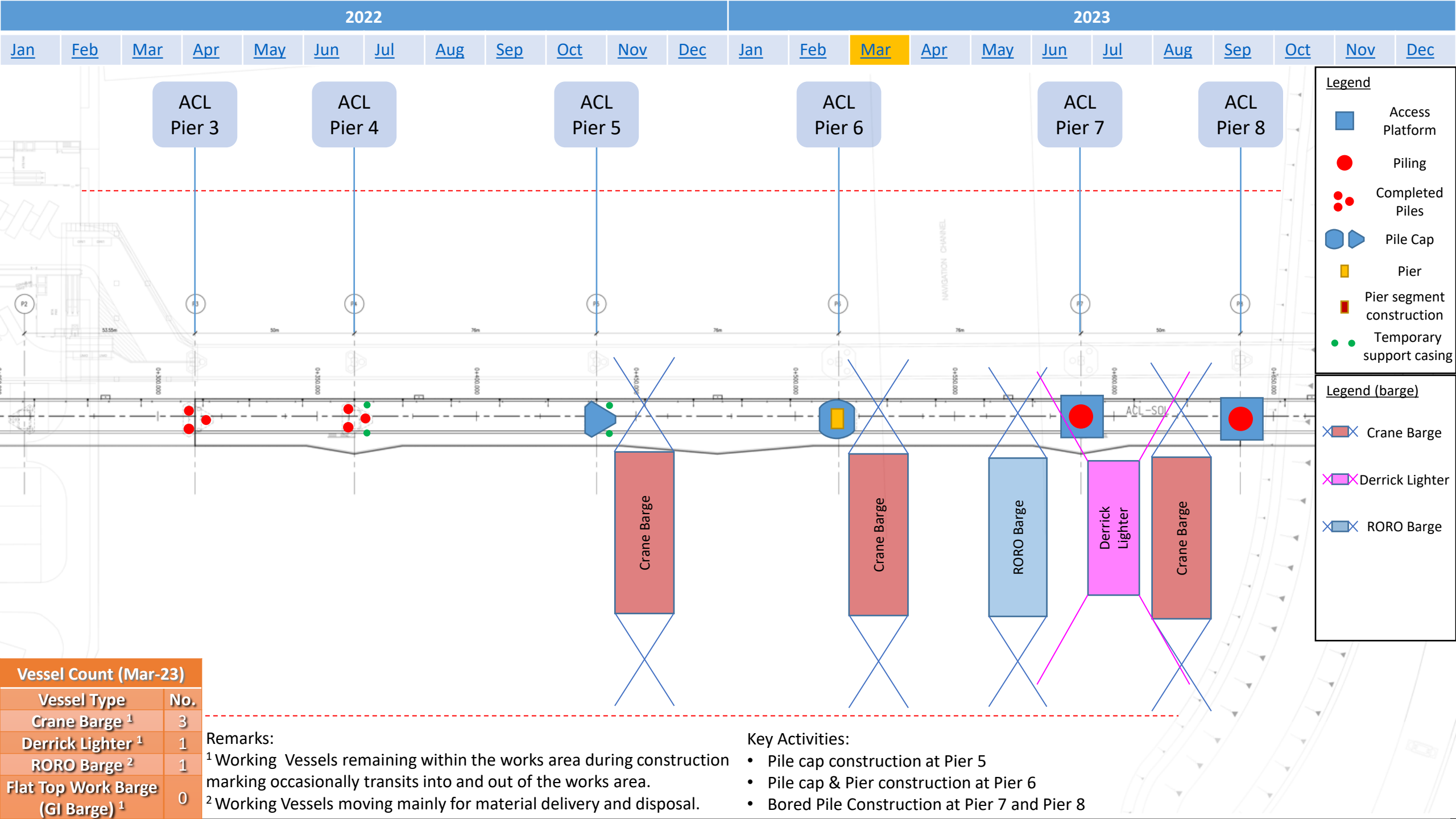
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Remove Access Platform at Pier 3 and Pier 4
- Retain Temporary Supporting Casings at Pier 4
- Pile Cap Construction at Pier 6
- Bored Pile Construction at Pier 7 and Pier 8



Vessel Count (Mar-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	1
RORO Barge [2]	1
Flat Top Work Barge (GI Barge) [1]	0

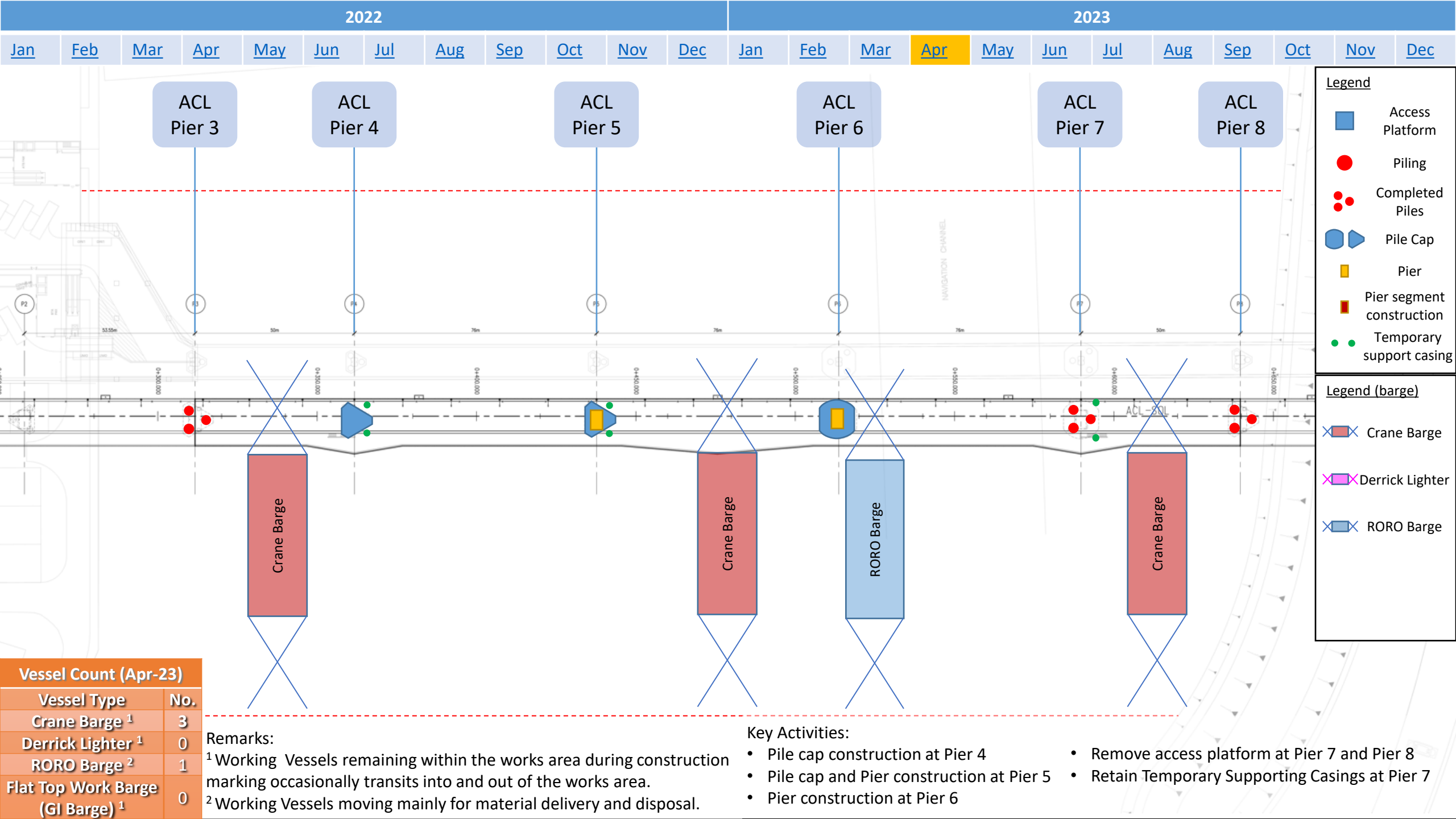
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Pile cap construction at Pier 5
- Pile cap & Pier construction at Pier 6
- Bored Pile Construction at Pier 7 and Pier 8



Vessel Count (Apr-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	1
Flat Top Work Barge (GI Barge) [1]	0

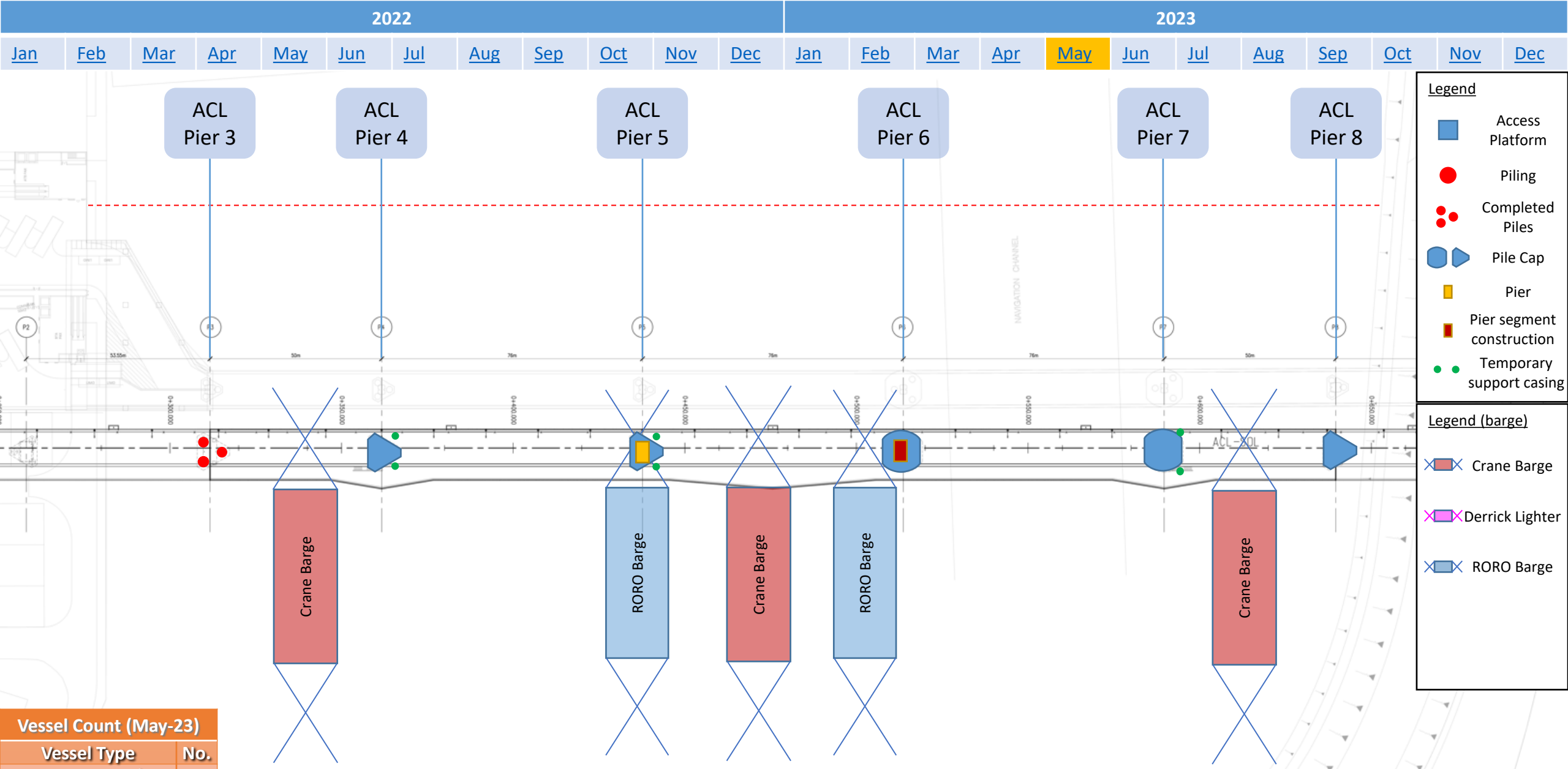
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Pile cap construction at Pier 4
- Pile cap and Pier construction at Pier 5
- Pier construction at Pier 6
- Remove access platform at Pier 7 and Pier 8
- Retain Temporary Supporting Casings at Pier 7



Vessel Count (May-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

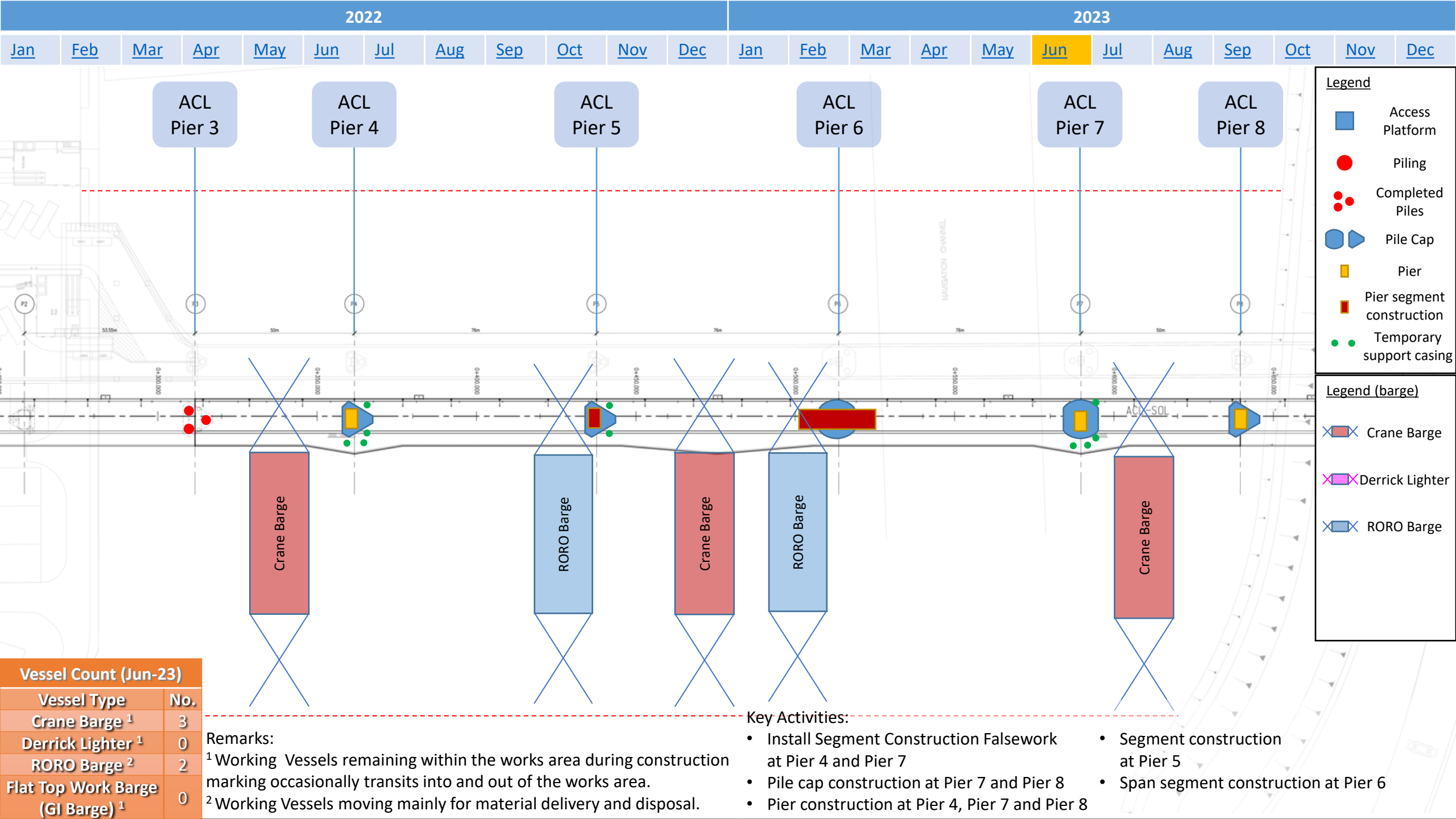
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Pile cap construction at Pier 4, Pier 7 and Pier 8
- Pier construction at Pier 5
- Install Segment Construction Falsework at Pier 5
- Segment construction at Pier 6



Vessel Count (Jun-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

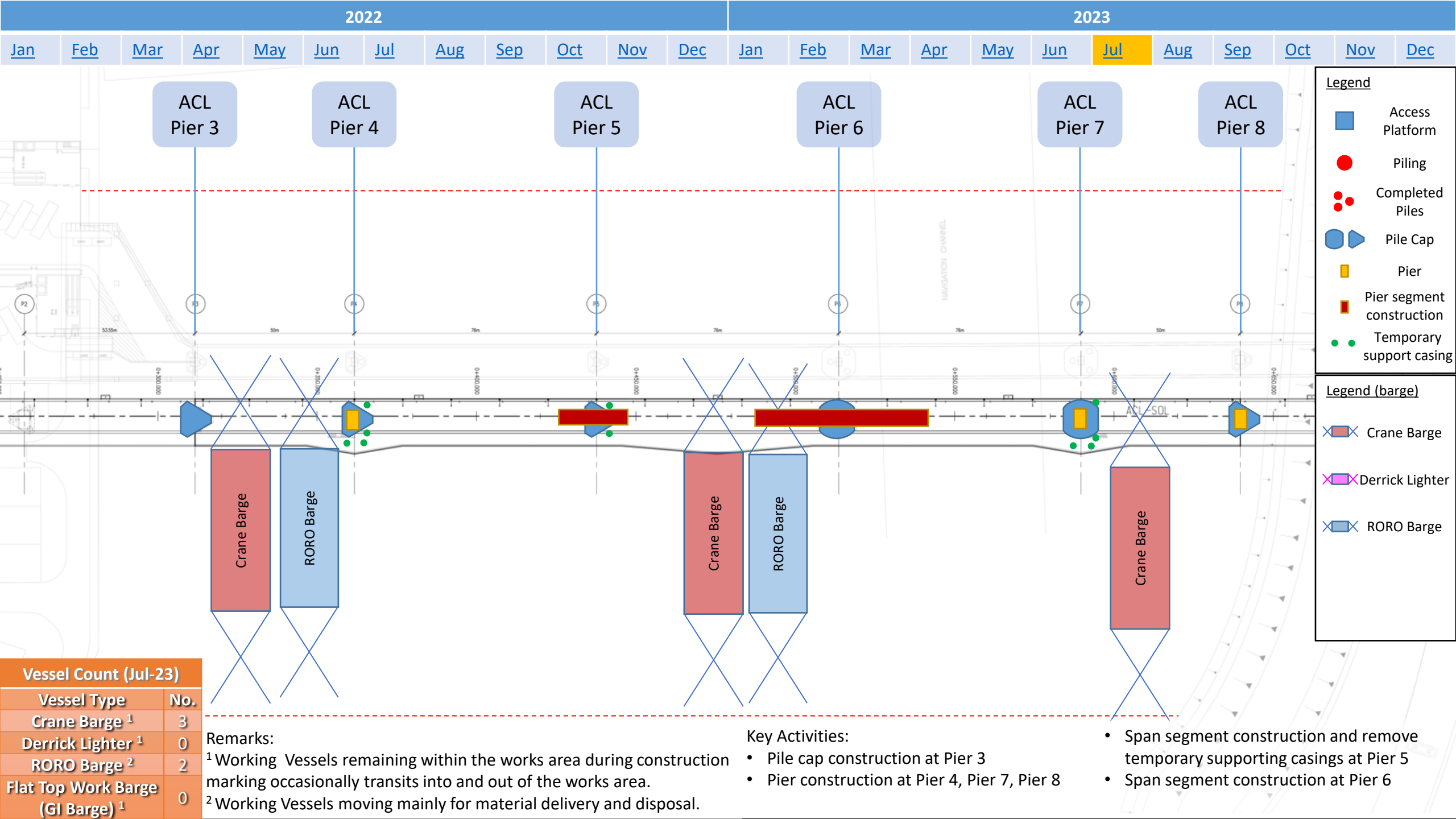
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Install Segment Construction Falsework at Pier 4 and Pier 7
- Pile cap construction at Pier 7 and Pier 8
- Pier construction at Pier 4, Pier 7 and Pier 8
- Segment construction at Pier 5
- Span segment construction at Pier 6



Vessel Count (Jul-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

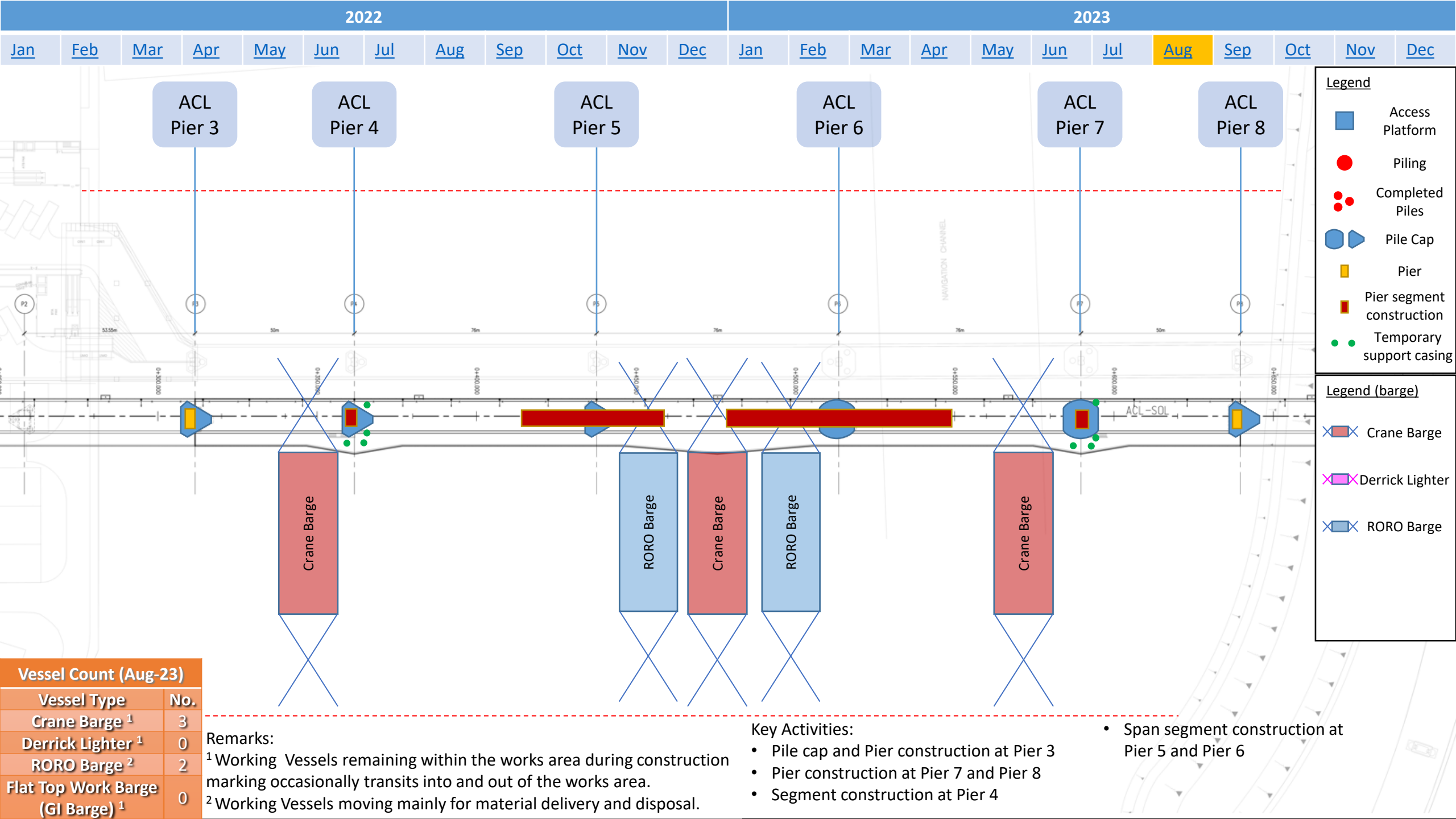
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

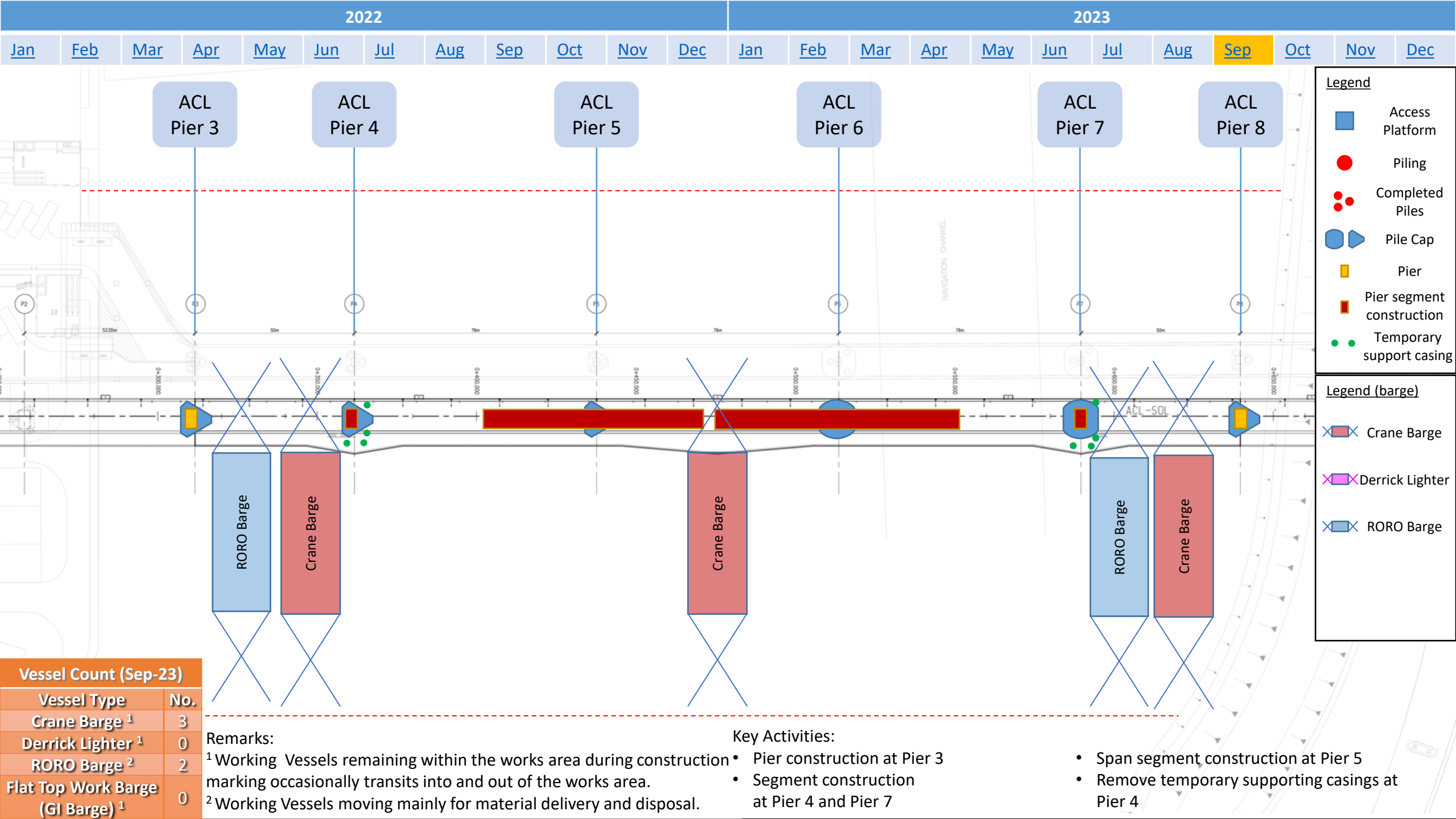
- Pile cap construction at Pier 3
- Pier construction at Pier 4, Pier 7, Pier 8
- Span segment construction and remove temporary supporting casings at Pier 5
- Span segment construction at Pier 6



Vessel Count (Aug-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

Remarks:
[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.
[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:
- Pile cap and Pier construction at Pier 3
- Pier construction at Pier 7 and Pier 8
- Segment construction at Pier 4
- Span segment construction at Pier 5 and Pier 6



Vessel Count (Sep-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

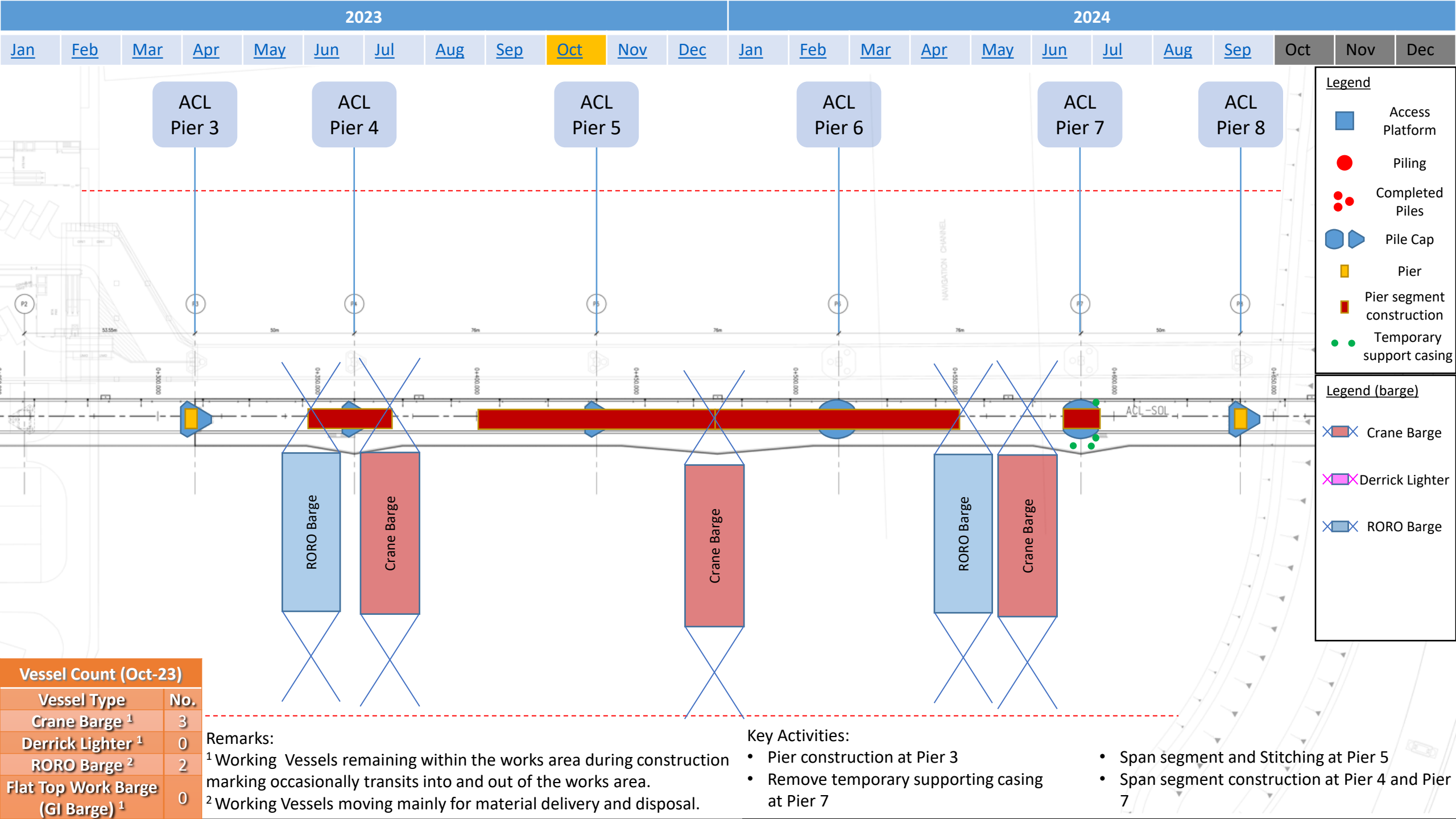
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Pier construction at Pier 3
- Segment construction at Pier 4 and Pier 7
- Span segment construction at Pier 5
- Remove temporary supporting casings at Pier 4



Vessel Count (Oct-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

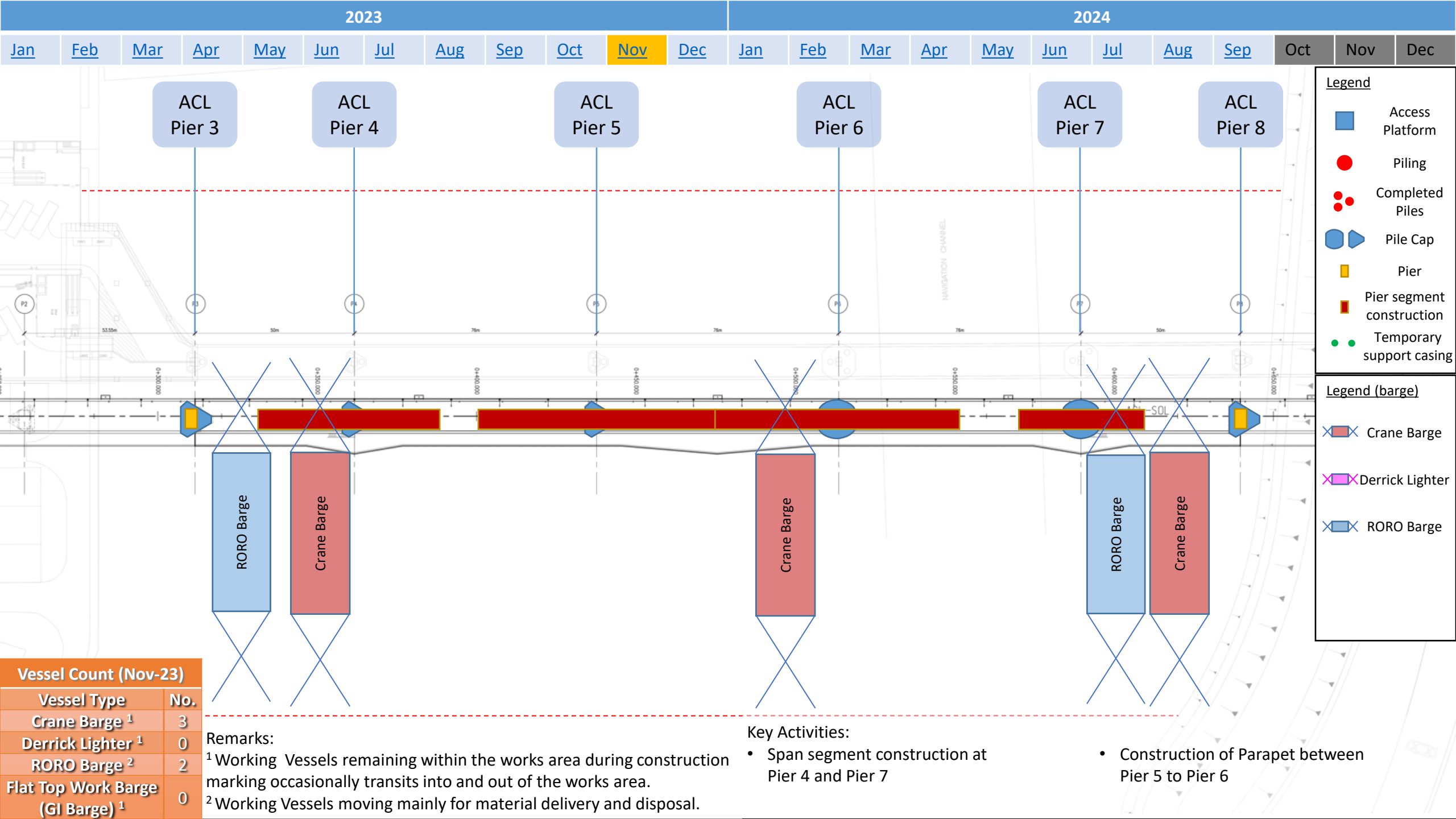
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Pier construction at Pier 3
- Remove temporary supporting casing at Pier 7
- Span segment and Stitching at Pier 5
- Span segment construction at Pier 4 and Pier 7



Vessel Count (Nov-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

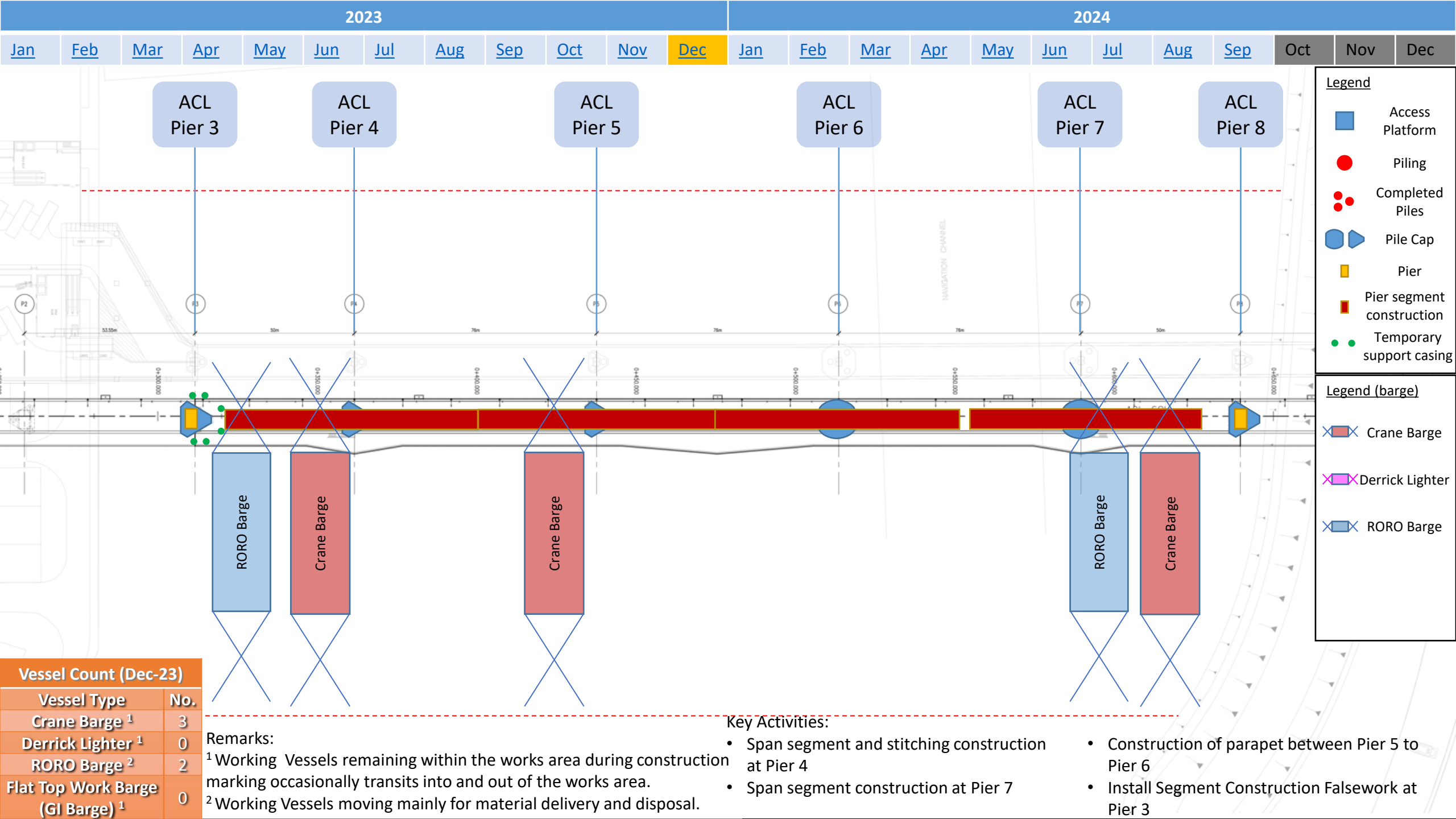
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

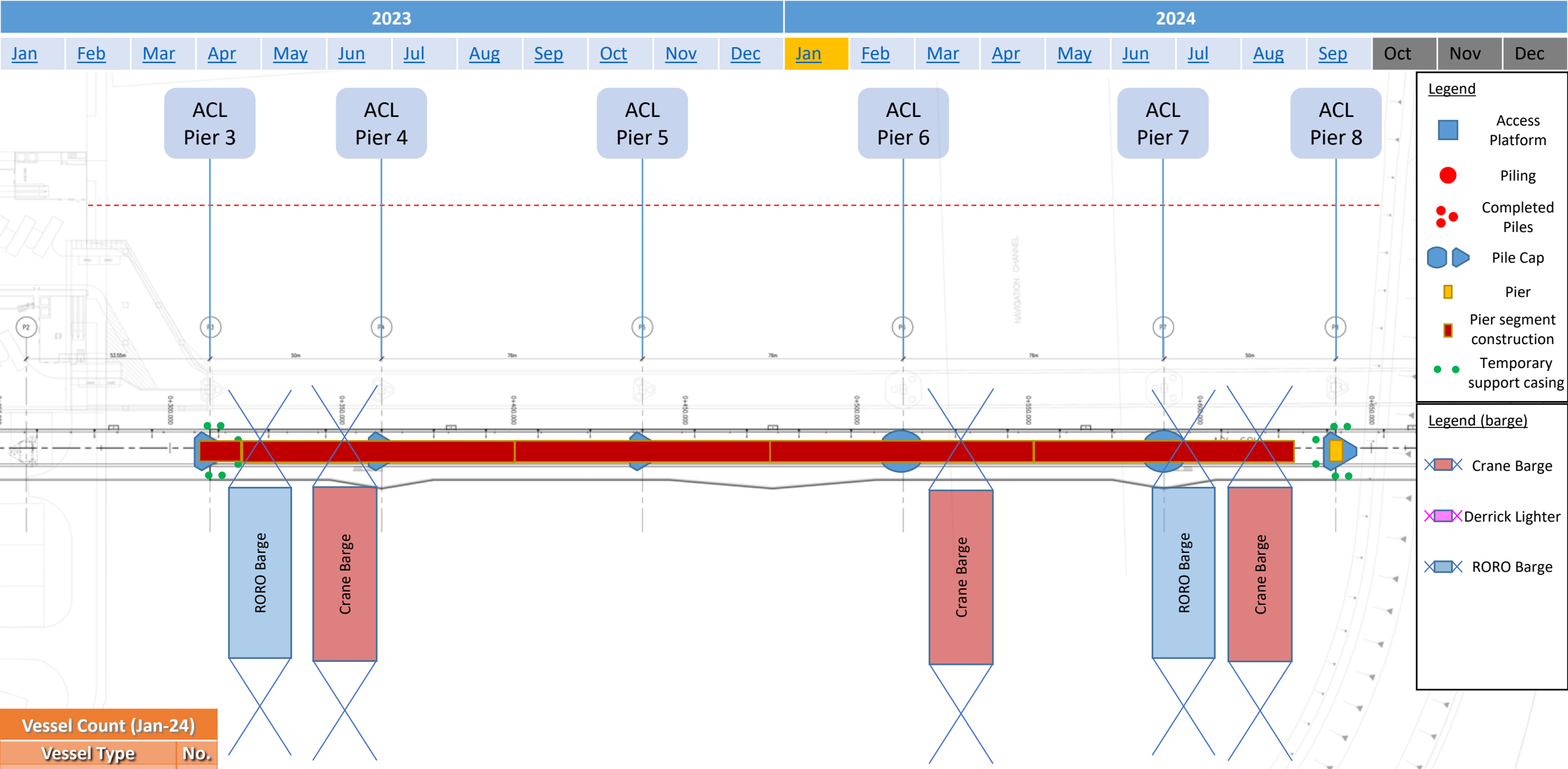
- Span segment construction at Pier 4 and Pier 7
- Construction of Parapet between Pier 5 to Pier 6



Vessel Count (Dec-23)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

Remarks:
[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.
[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:
- Span segment and stitching construction at Pier 4
- Span segment construction at Pier 7
- Construction of parapet between Pier 5 to Pier 6
- Install Segment Construction Falsework at Pier 3



Vessel Count (Jan-24)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

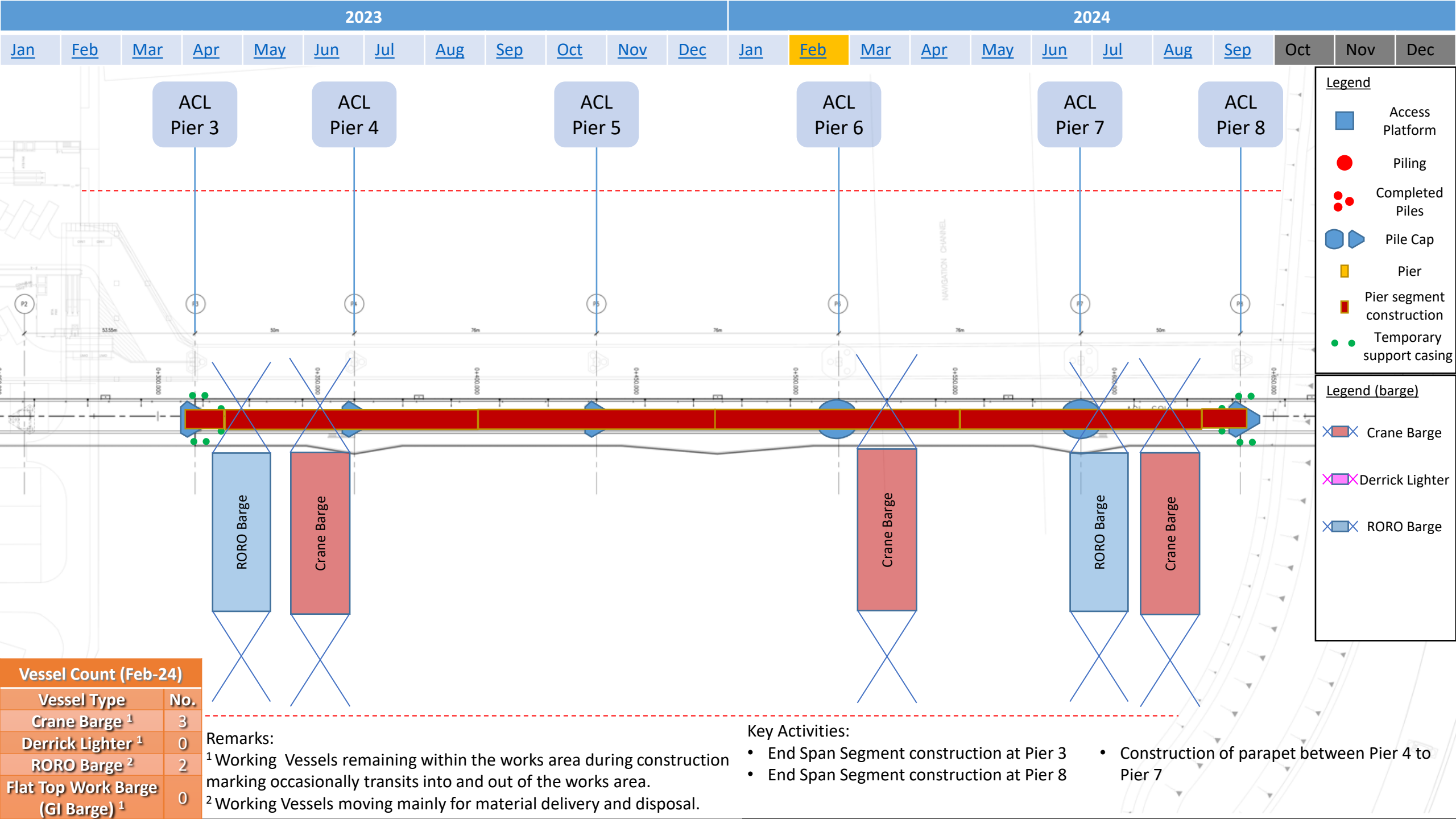
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Span segment and stitching construction at Pier 7
- End Span Segment construction at Pier 3
- Construction of parapet between Pier 4 to Pier 7
- Install Segment Construction Falsework at Pier 8



Vessel Count (Feb-24)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

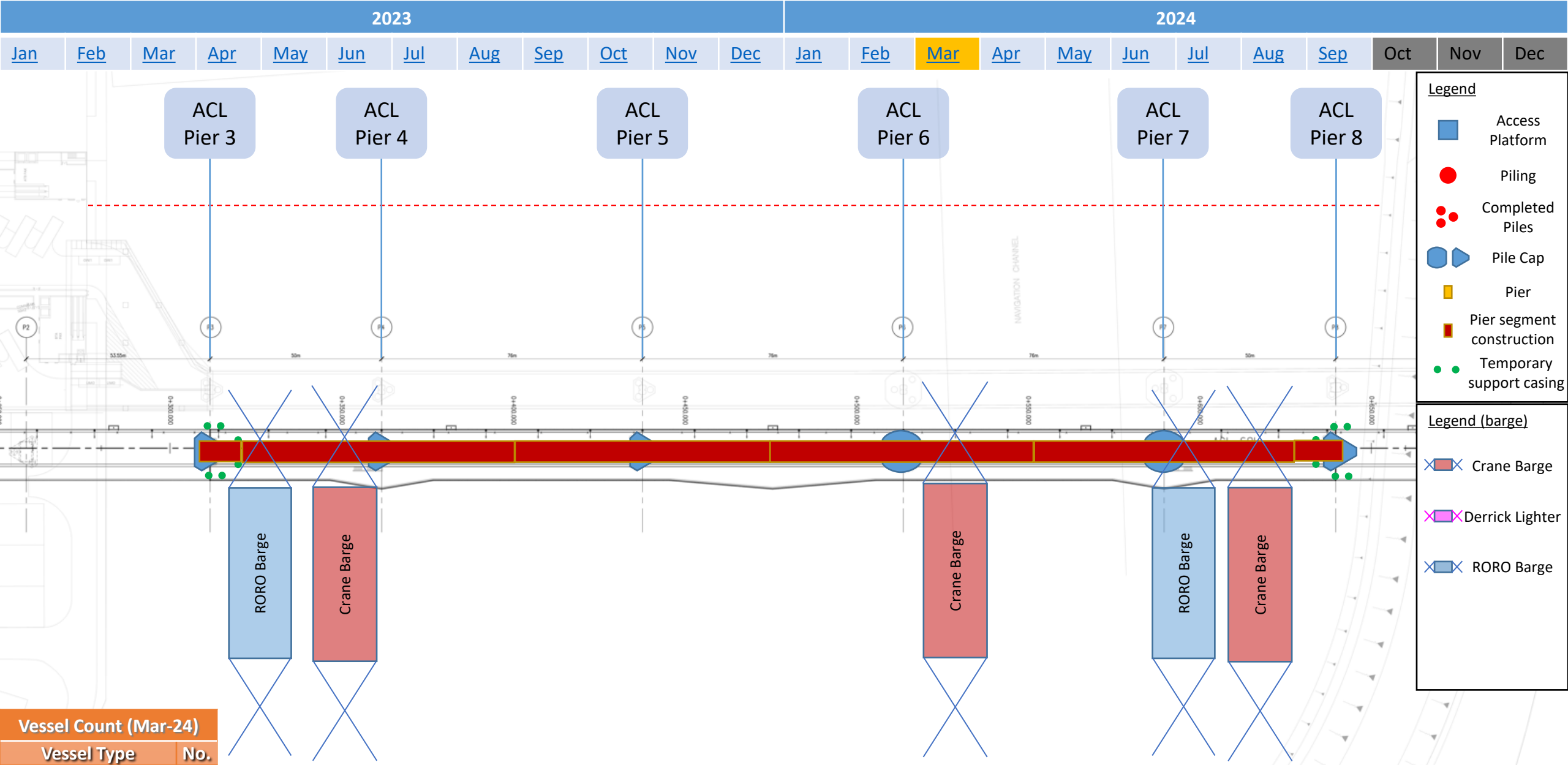
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- End Span Segment construction at Pier 3
- End Span Segment construction at Pier 8
- Construction of parapet between Pier 4 to Pier 7



Vessel Count (Mar-24)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

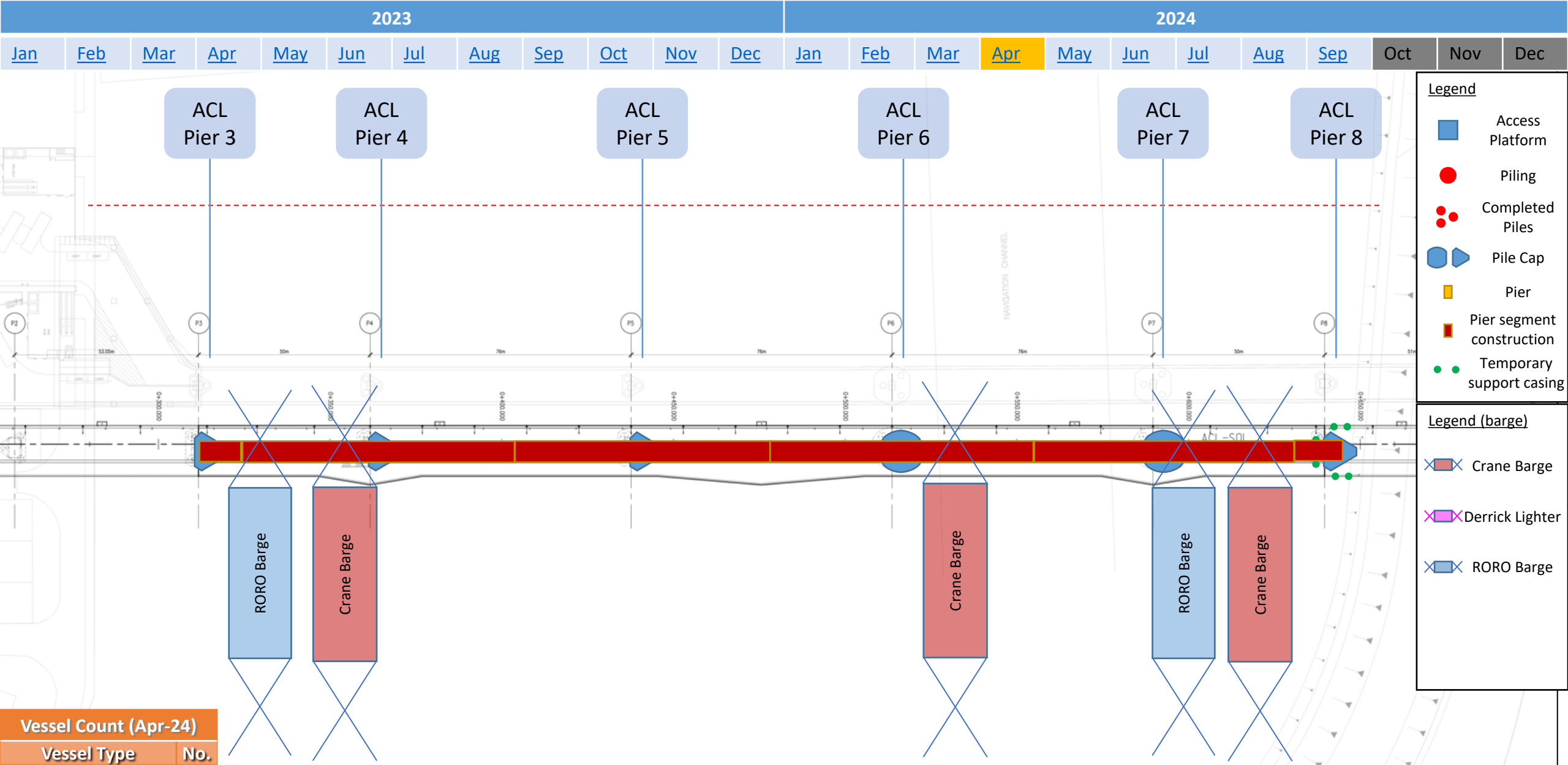
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- End Span Segment construction at Pier 3
- End Span Segment construction at Pier 8
- Remove temporary supporting casing at Pier 3
- Construction of parapet between Pier 4 to Pier 7



Vessel Count (Apr-24)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

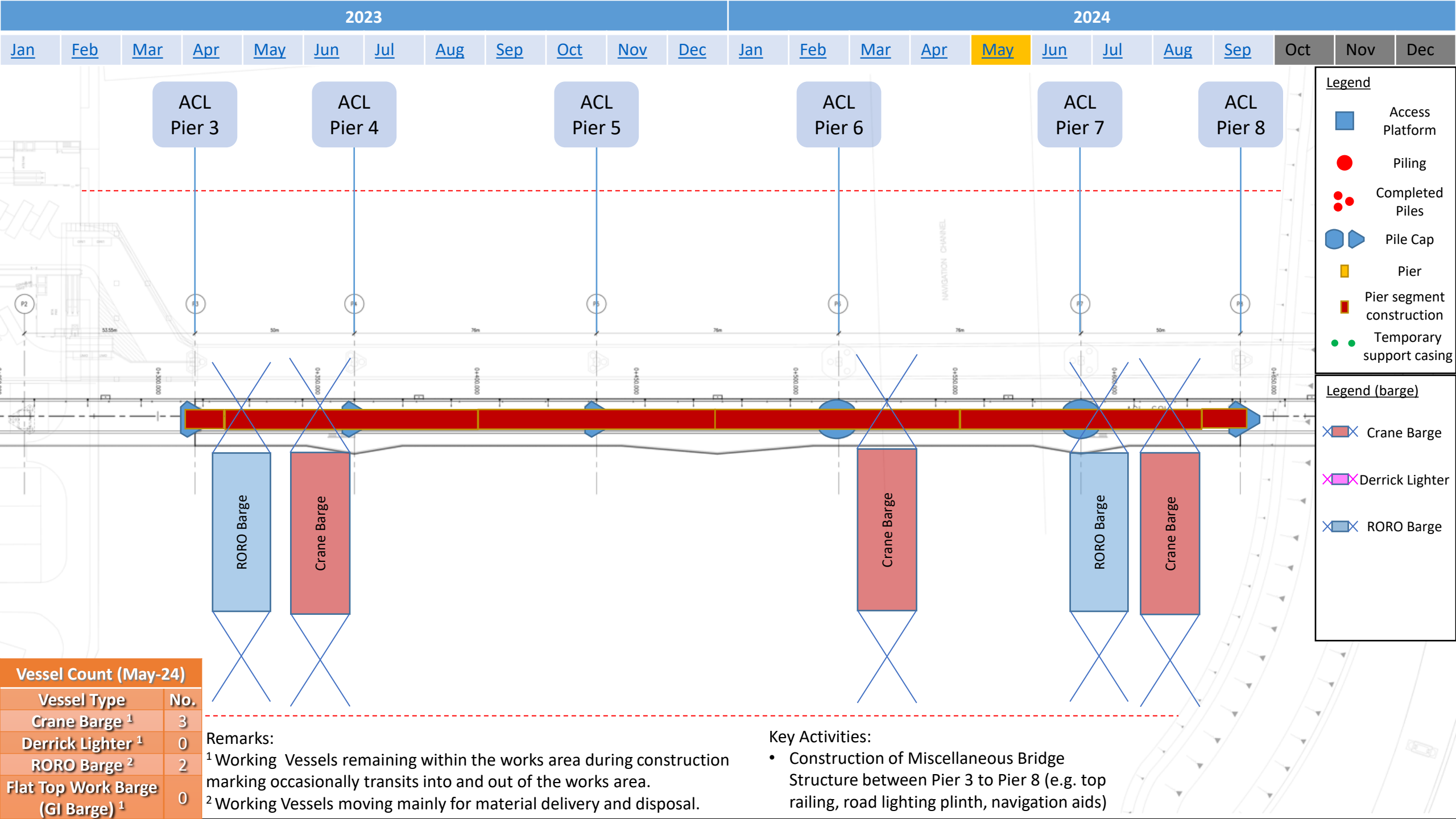
Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Construction of parapet from Pier 3 to Pier 8
- Remove temporary supporting casing at Pier 8
- Construction of Miscellaneous Bridge Structure from Pier 3 to Pier 8 (e.g. top railing, road lighting plinth, navigation aids)



Vessel Count (May-24)	
Vessel Type	No.
Crane Barge [1]	3
Derrick Lighter [1]	0
RORO Barge [2]	2
Flat Top Work Barge (GI Barge) [1]	0

Remarks:

[1] Working Vessels remaining within the works area during construction marking occasionally transits into and out of the works area.

[2] Working Vessels moving mainly for material delivery and disposal.

Key Activities:

- Construction of Miscellaneous Bridge Structure between Pier 3 to Pier 8 (e.g. top railing, road lighting plinth, navigation aids)