Liftech
LIFTECH CONSULTANTS INC.

May 25, 2023

Tara McIntire
Marin County Parks
3501 Civic Center Drive #260
San Rafael, Ca 94903

SUBJECT: MCNEARS BEACH PIER – CURRENT DAMAGED CONDITION

Dear Tara:

During a storm in March 2023, a vessel collided into the north side of the pier causeway near the intersection with the pier head. For additional information, refer to Liftech's site visit reports dated March 28, 2023 and April 20, 2023.

Figures 1 and 2 present the location of the impact and two views of the damaged pile connection at Pile F14. See Figure 1 for pile bent numbers. The vertical and lateral support at this pile is significantly compromised. Currently, the pier deck dropped about 4 inches and is supported on a small area of remaining damaged pile concrete. Additionally, the damaged pile was pushed outward closer to the edge of the pile cap beam, as shown in Figure 3.

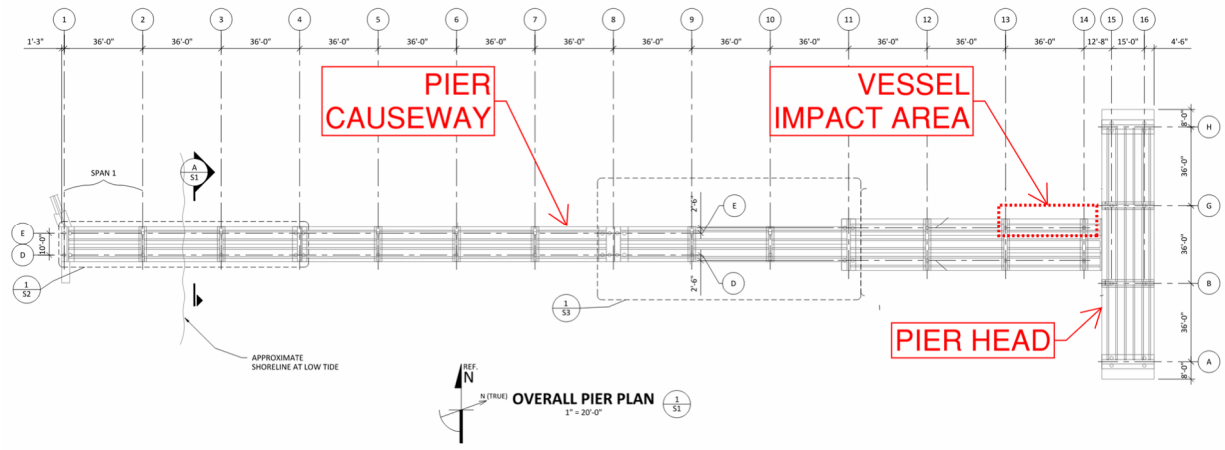

Figure 1: Overall pier plan with terms and impact area

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Figure 2: Damage at Pile F14, Bent 14 Northern Pile

The observed damage at Pile F14 compromises the lateral capacity of this pile bent and increases the possibility of losing vertical support of the northeast end of the pier causeway. The concrete at the top of the pile is cracked and being held together by the light pile spiral reinforcing.

A small lateral movement could cause the pile to slide off from the pile cap beam causing it to collapse. Even in a small earthquake, the pile bent structure will move several inches. For reference, Liftech's calculations for the 2008 McNears Pier Damage repair project estimated the lateral deflection at Pile Bent 14 for the design earthquake is approximately 10 inches.

Any lateral loads/movement from a small earthquake or additional deterioration at the top of damaged pile (i.e. reinforcing fracture or concrete crushing) could cause the pile to slip off the edge of the pile cap. If vertical support at Pile F14 is lost, this section of the pier could collapse.

Although we have not analyzed this condition, we expect that the torsional ("twisting") capacity of the pier deck is inadequate to prevent collapse. Figure 3 presents two possible collapse scenarios. In the partial collapse scenario, a portion of the pier deck would remain above water with the damaged portion possibly hanging from it down into the water. In the full collapse scenario, the entire causeway superstructure from the east edge of the pile cap at Bent 13 to the pier head would twist and fall destroying piles C14 and F14. It is possible that the collapsed portion may damage other piles such as piles B15 and G15.

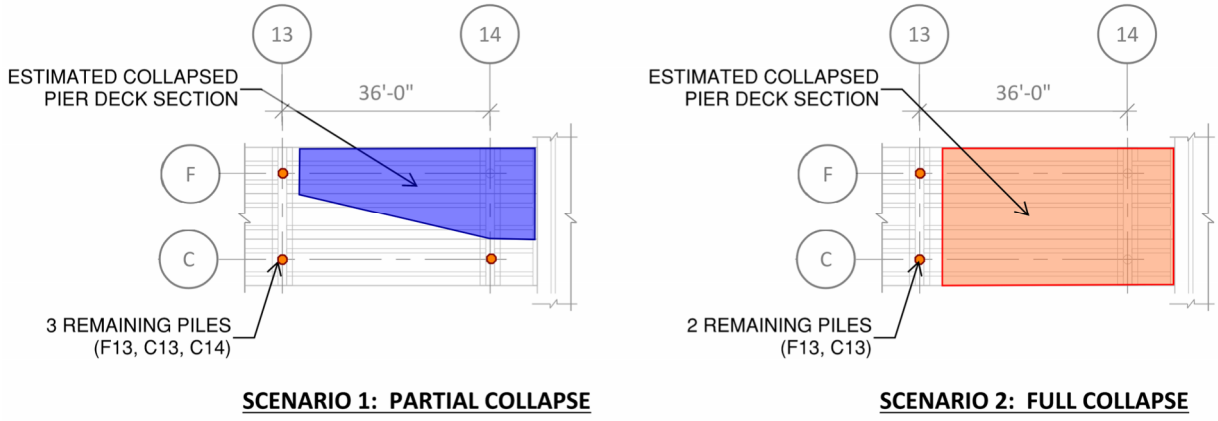

Figure 3: Possible pier collapse extent

The current condition of the support at Bent 14 poses an imminent risk to property, human life, and the environment.

We recommend immediately mitigating this risk by shoring and repairing the pile as soon as practical.

Sincerely,

REGISTERED PROFESSIONAL ENGINEER
DERRICK LIND
No. S4719
Exp. 12/31/24
STRUCTURAL
STATE OF CALIFORNIA

FOR LIFTECH CONSULTANTS INC
SIGNATURE DATE: 5/24/23

LIFTECH CONSULTANTS INC.

Derrick Lind
Principal