



Baptiste Creek Bridge Landslide

Design and Construction of Remedial Measures

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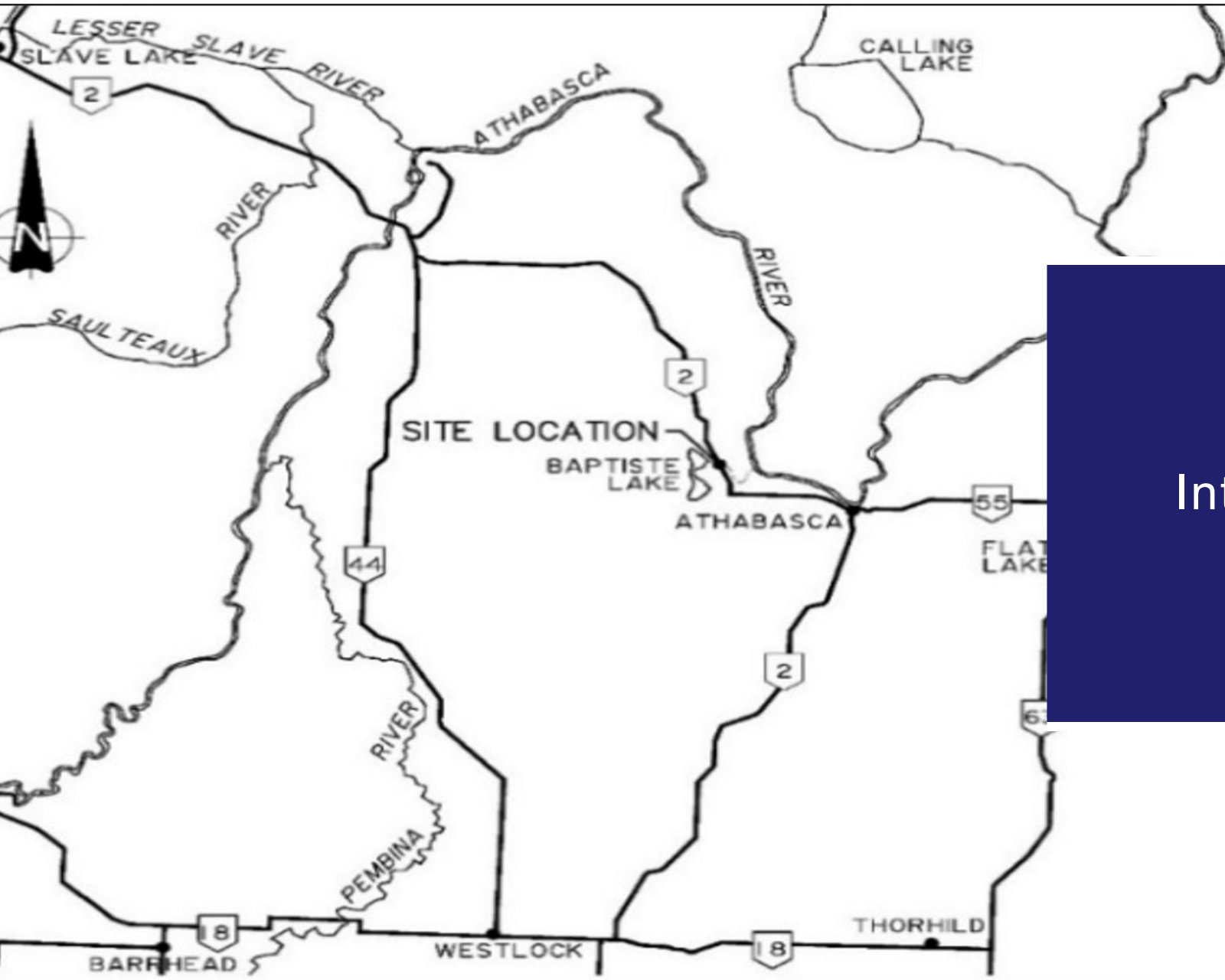


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Introduction

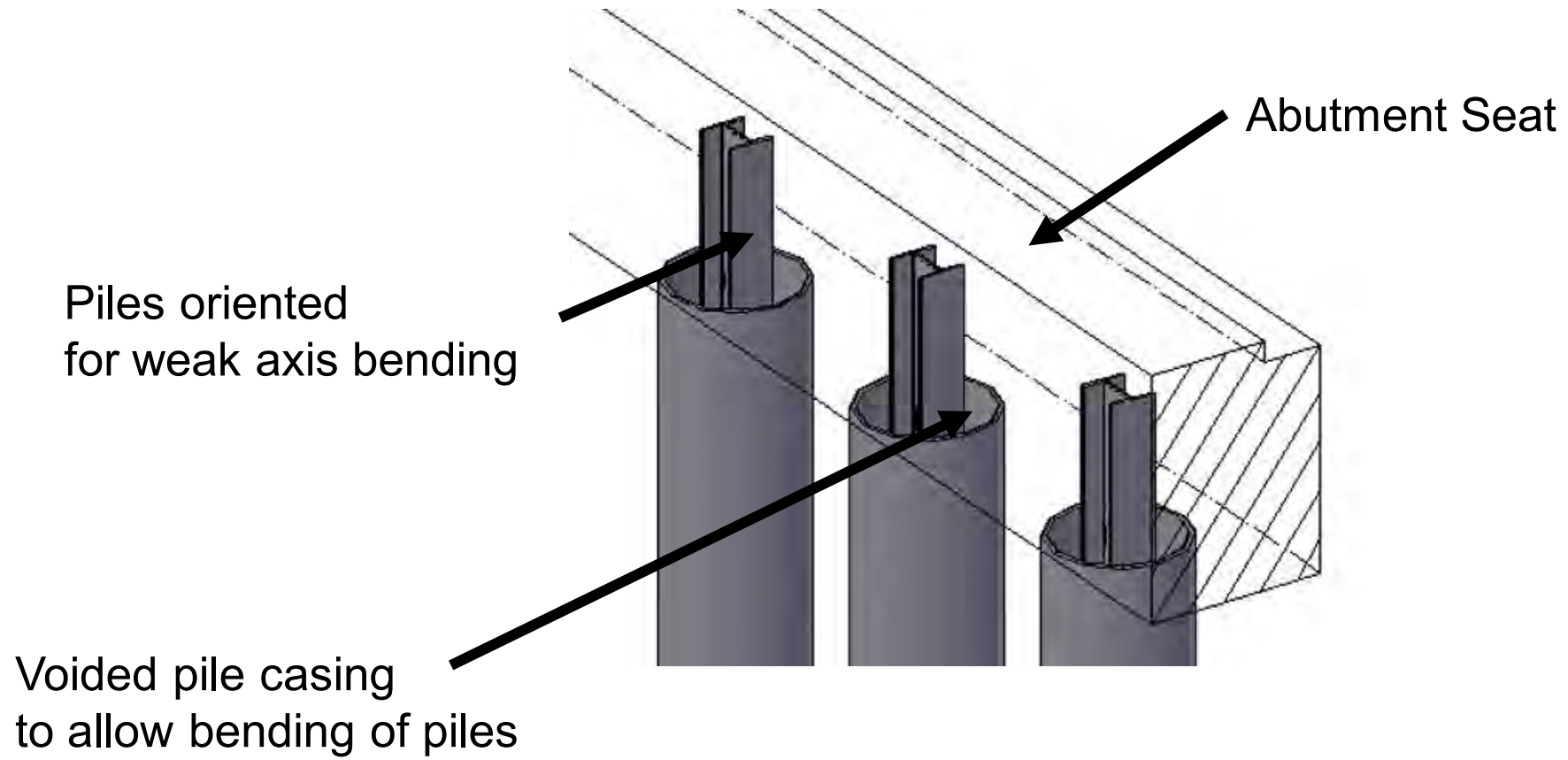
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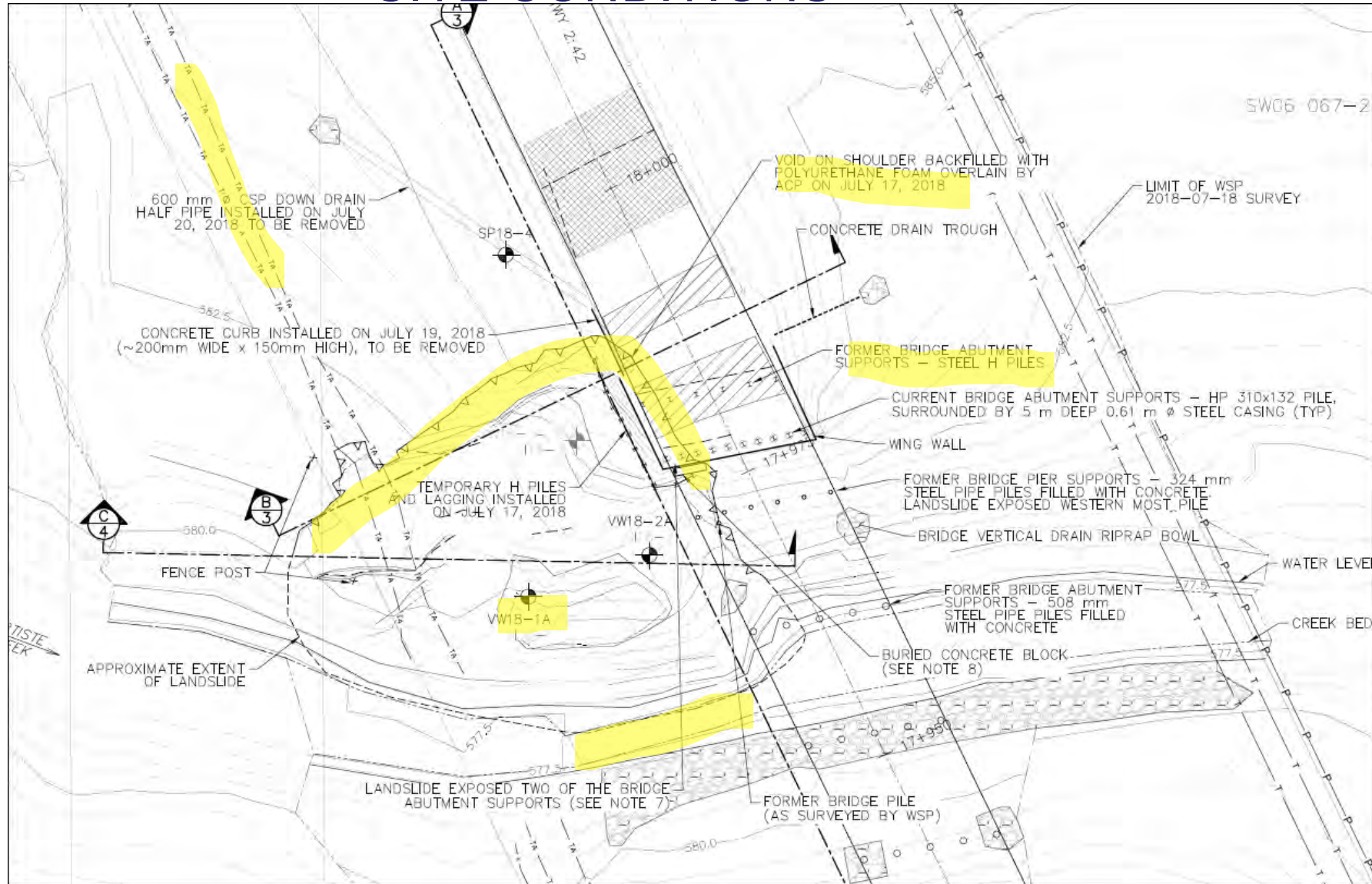
About the landslide

- Resulted in voids and a gap in the highway surface and exposed the underside of the wing wall and abutment seat
- Exposed two of the exterior pile casings
- Caused rotation of casings to jam against and restrain the piles movement during thermal expansion of the bridge structure
- Partially blocked the creeks channel

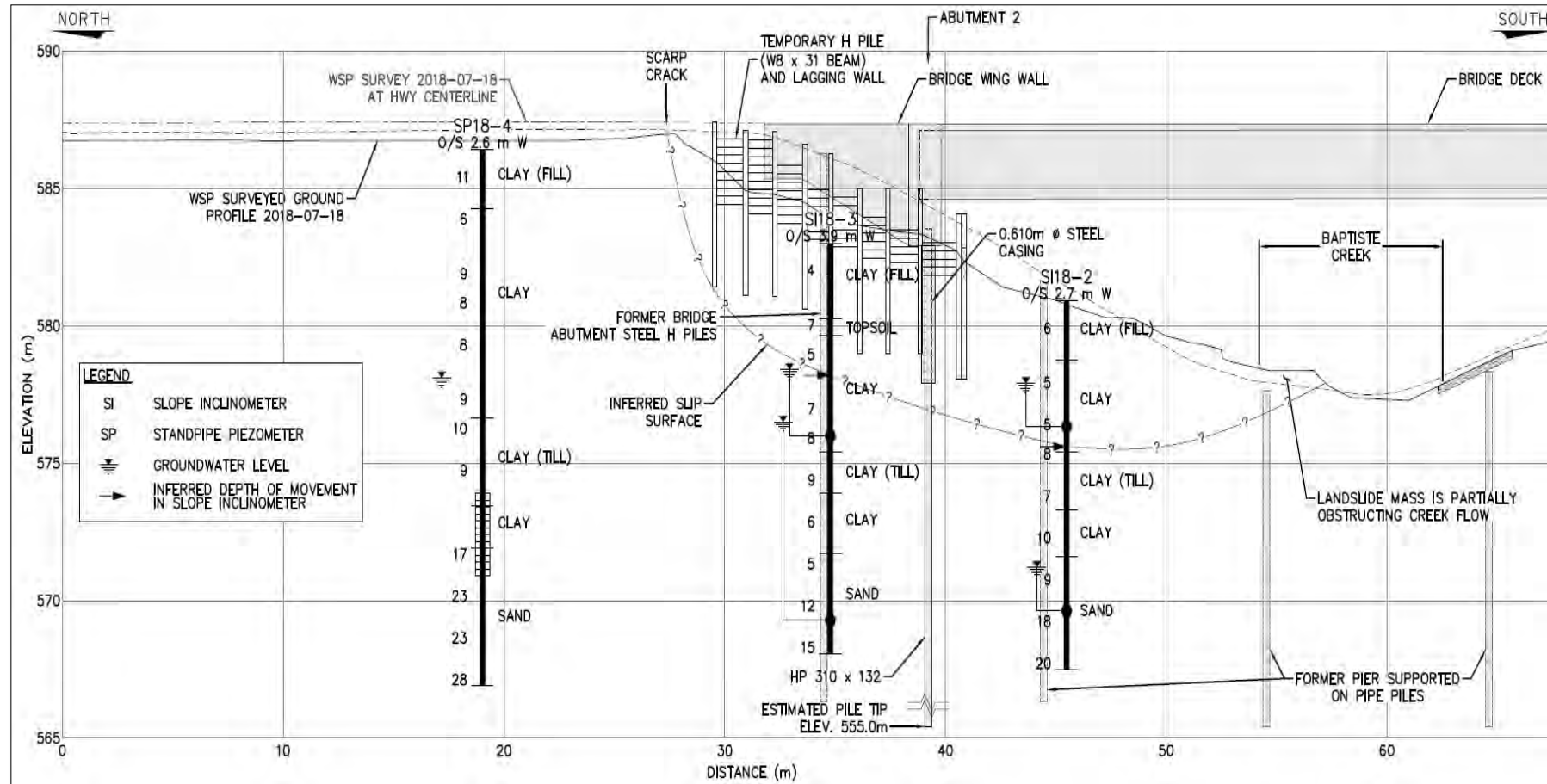




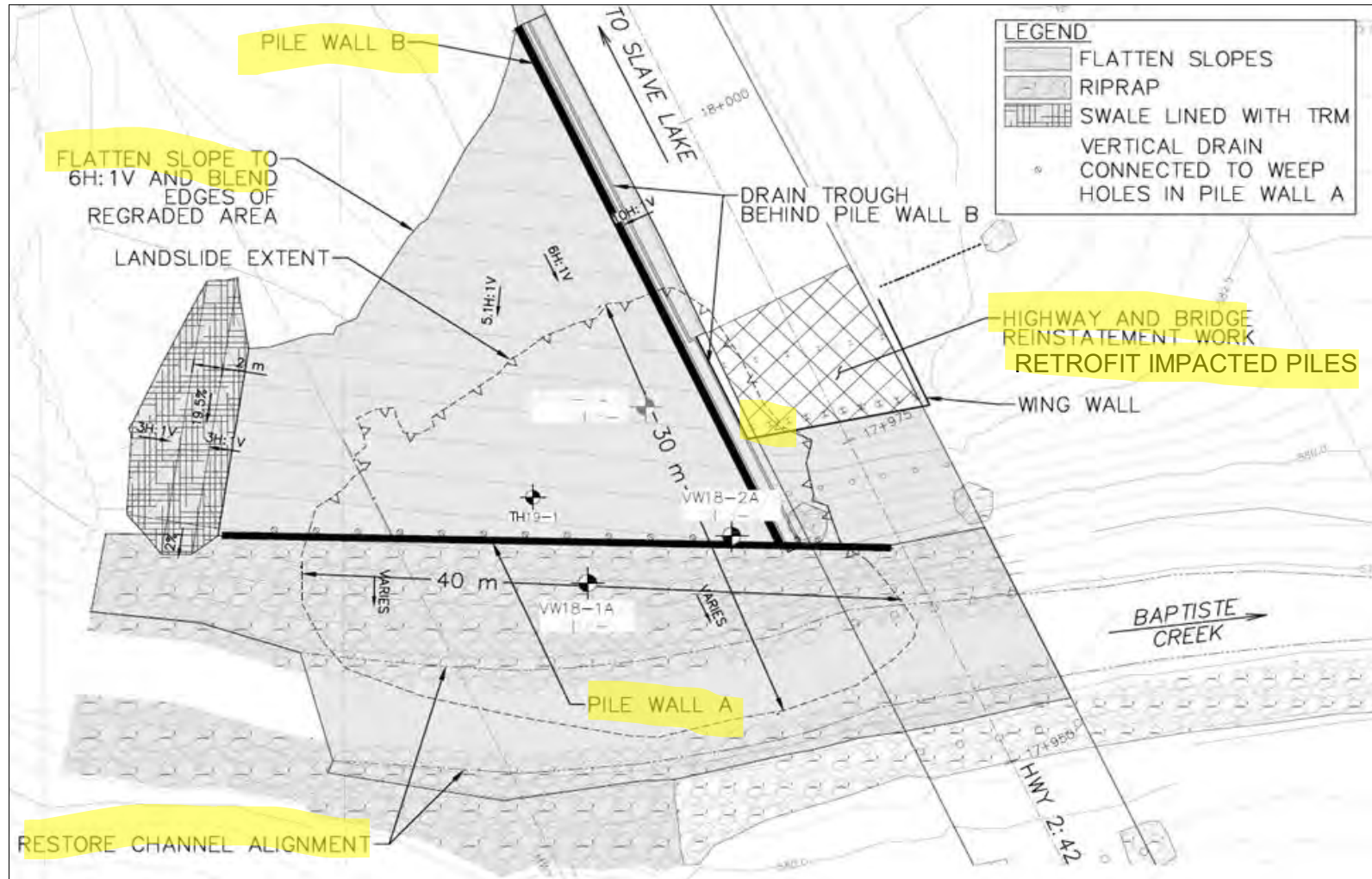
SITE CONDITIONS



Geotechnical Investigation and Instrument Monitoring



Remedial Measures







Installation of Pile wall A

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Construction of coffer dams upstream and downstream of site to isolate the working area to allow work under the bridge



Electro fishing within isolated area
as part of care of water



One fish was caught and quickly released downstream of coffer dam



Water works within isolated area. Note overflow pipes being installed as second line of defense



Total Suspended Solids (TSS) testing. Note boat upstream obtaining baseline readings



Flow is discharged to return turbidity to acceptable levels



Small hydraulic hammer
installing sheet piling under the
bridge



Splicing conducted under the bridge due to low head room. Third party inspector was retained to approve each weld section before driving subsequent section



Pile wall B resulted in a misalignment due to difficult driving conditions, sloping ground, installation technique

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The offset was up to 125 mm. Several options were considered to mitigate the out of tolerance. Ultimately, the as-built condition was deemed acceptable



The anchor loads were transferred to Sheet Pile Wall 'B' by three welded steel walers (C310x45 channel sections) affixed to the sheet piles.

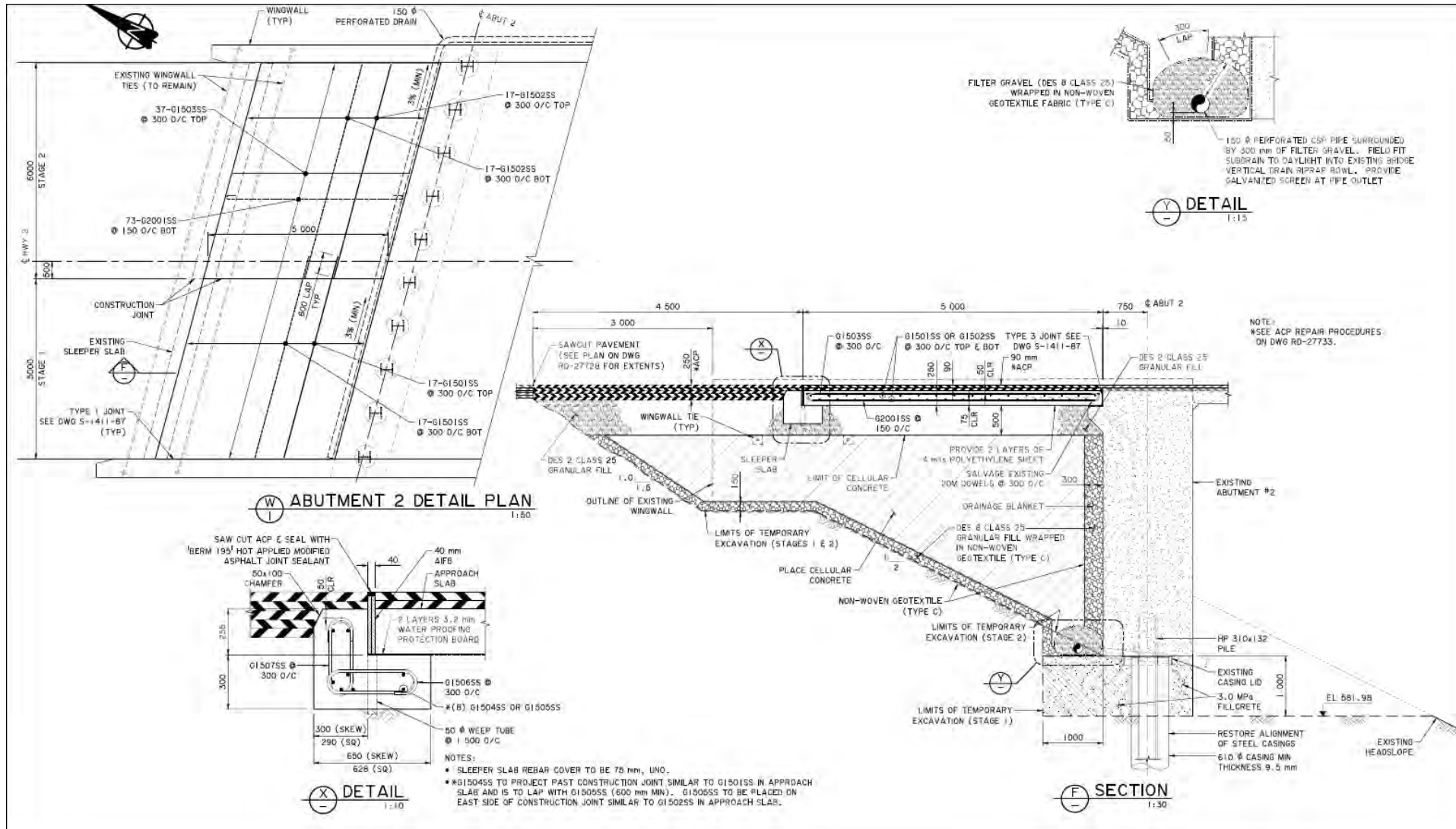


Each row of anchors was locked off prior to excavating to the next.

Note the larger spacing between anchors on the right due to drilling refusal on old bridge or shoring piles.



Integral Abutment Piles Retrofit





Integral Abutment Piles Retrofit

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Placement of cellular concrete (Light Weight Fill)



Project at Construction Completion

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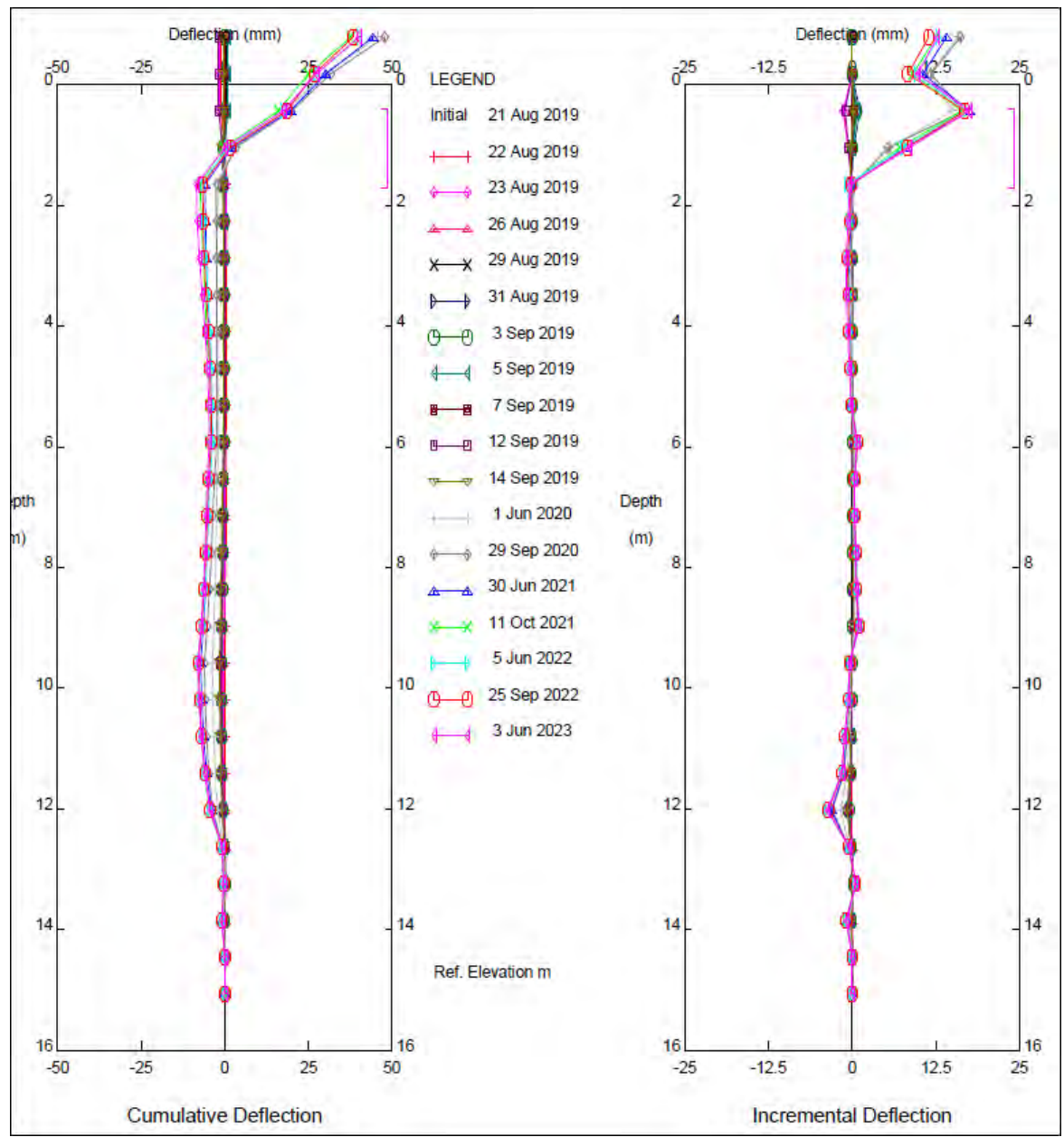

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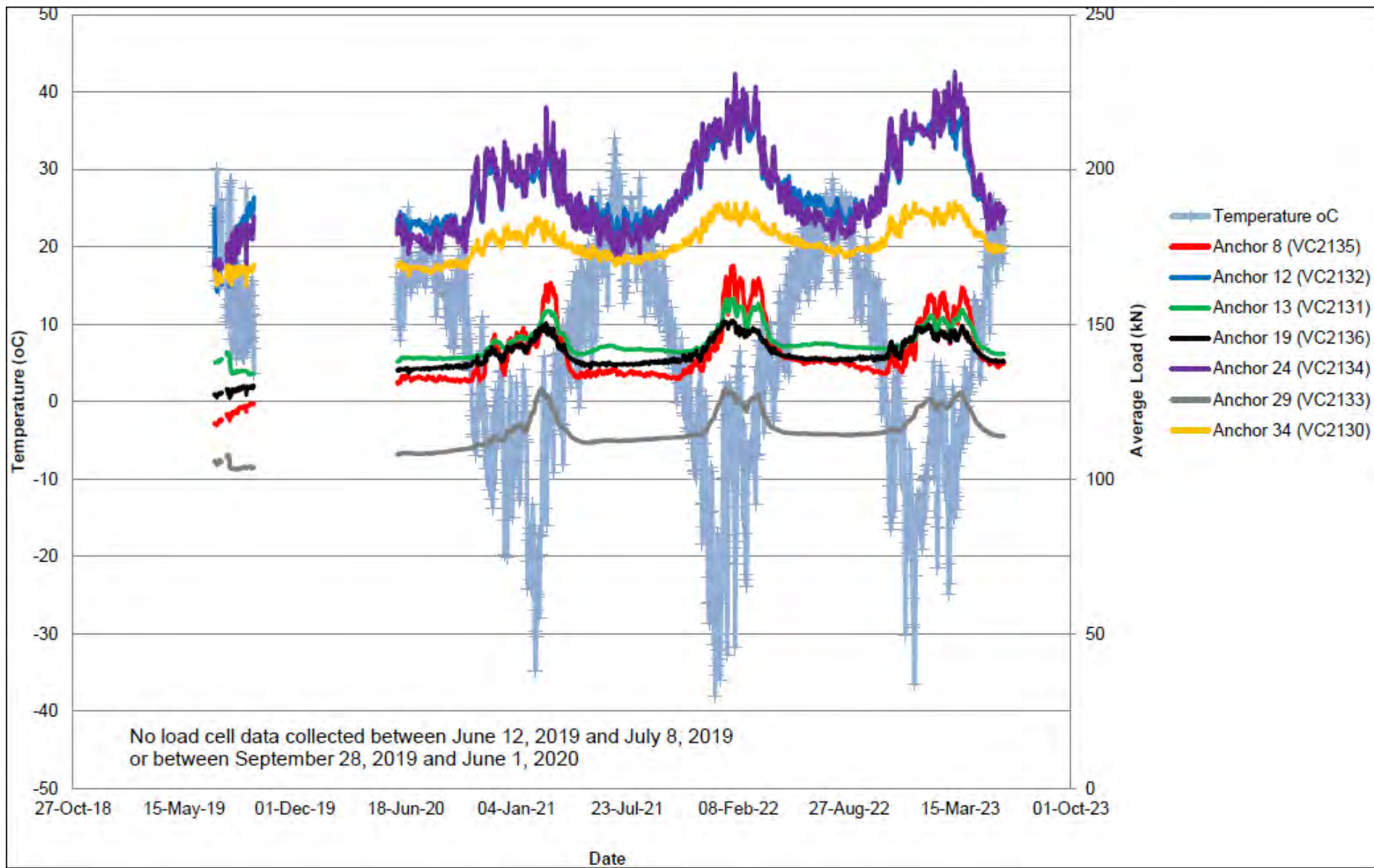


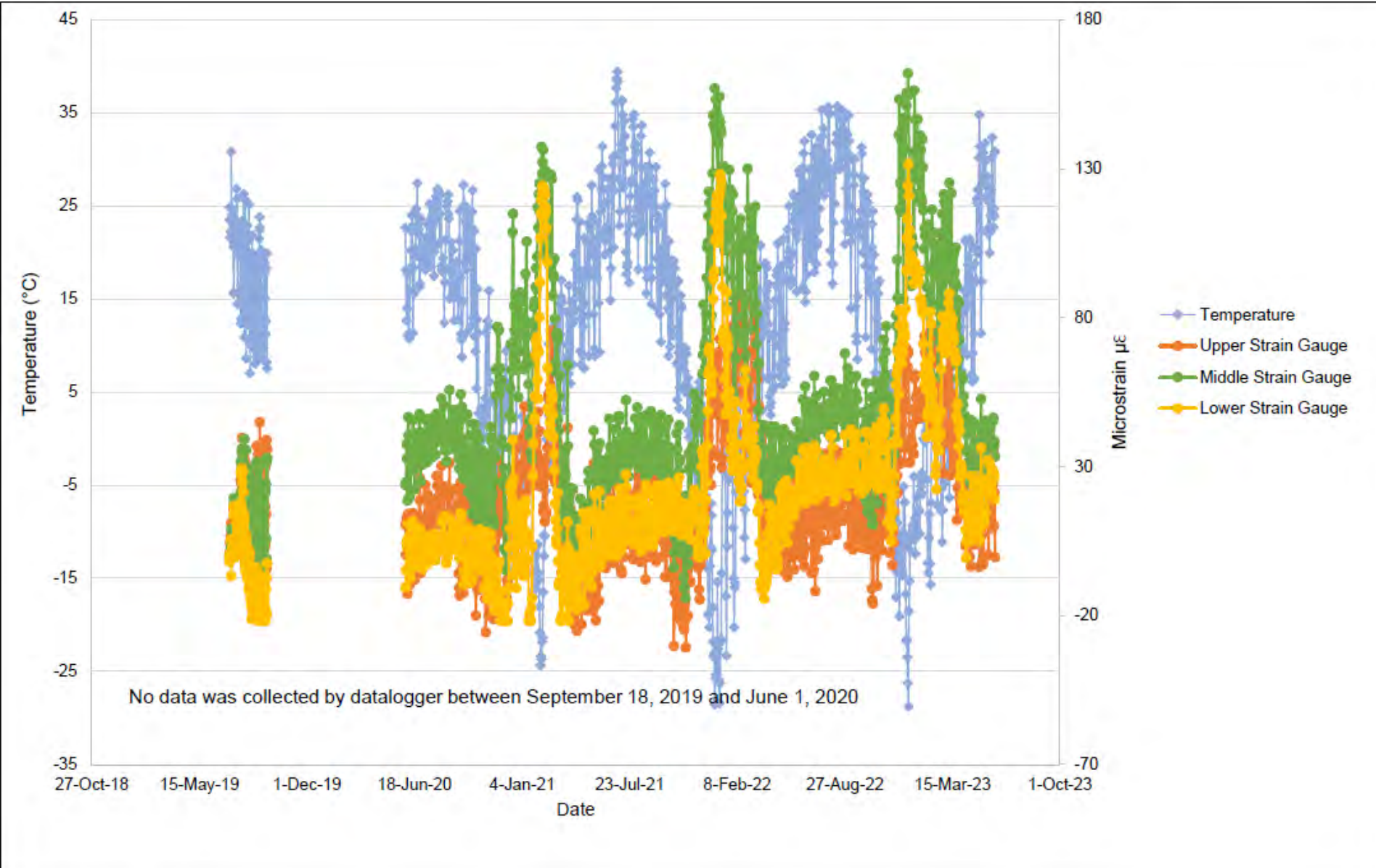
One year after construction

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Conclusions

- Landslide movement caused by steep slopes and weak soil conditions
- Avoid integral abutment bridges in areas prone to soil instability. Consider additional stabilization measures during head slope design.
- The permanent repair measures have stabilized the landslide movement.
- Instrumentation monitoring has assessed the performance of the cantilever and tied-back sheet pile walls.
- Effective communication is key to project success.

Acknowledgements

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Any questions?