West Trail Living Shoreline Project

San Mateo Harbor District
Board of Harbor Commissioners Meeting
April 17, 2019

West Trail - Previous Work

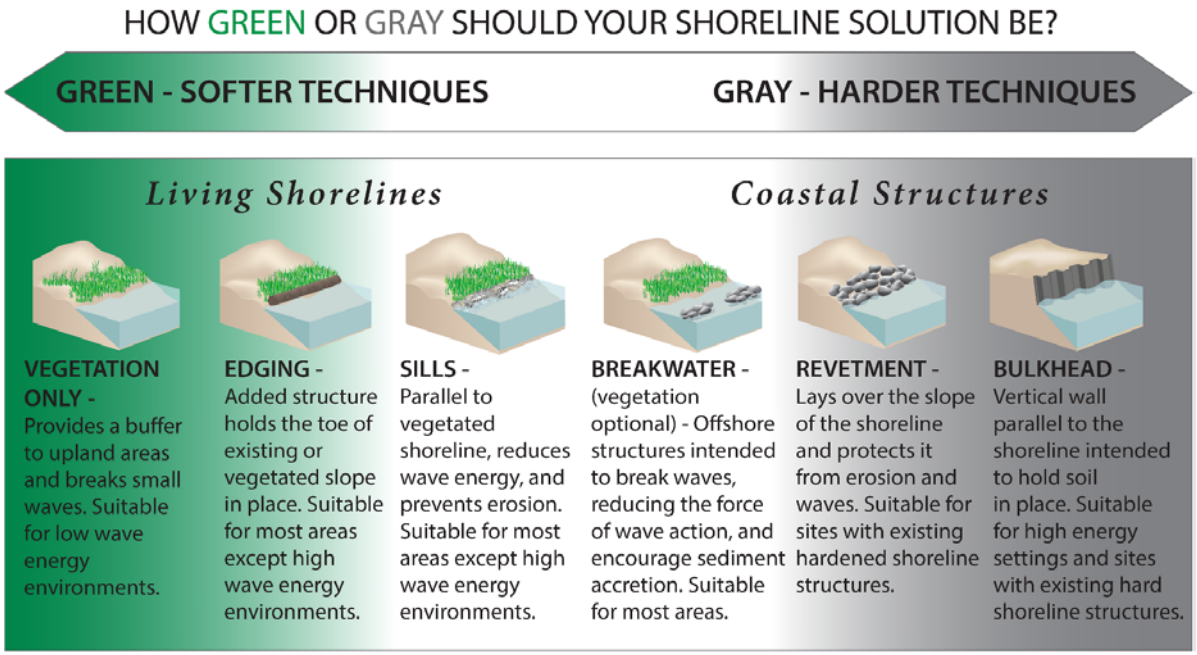
- 2012: West Trail Condition Survey and Alts Analysis
- 2016: Temp. emergency erosion repair of culvert
- 2016 - 2018: Design of Permanent Repair
- 2017 - 2018: Soil nail wall design
- **July 2018: Living Shoreline Redirection**

Culvert Repair

Living Shoreline Redirection - Scope of Work

Scope of Work:

- Evaluate the feasibility of living shoreline
- Minimize hard features
- Develop preferred living shoreline concept
- Coordinate with agencies



West Trail Living Shoreline Team

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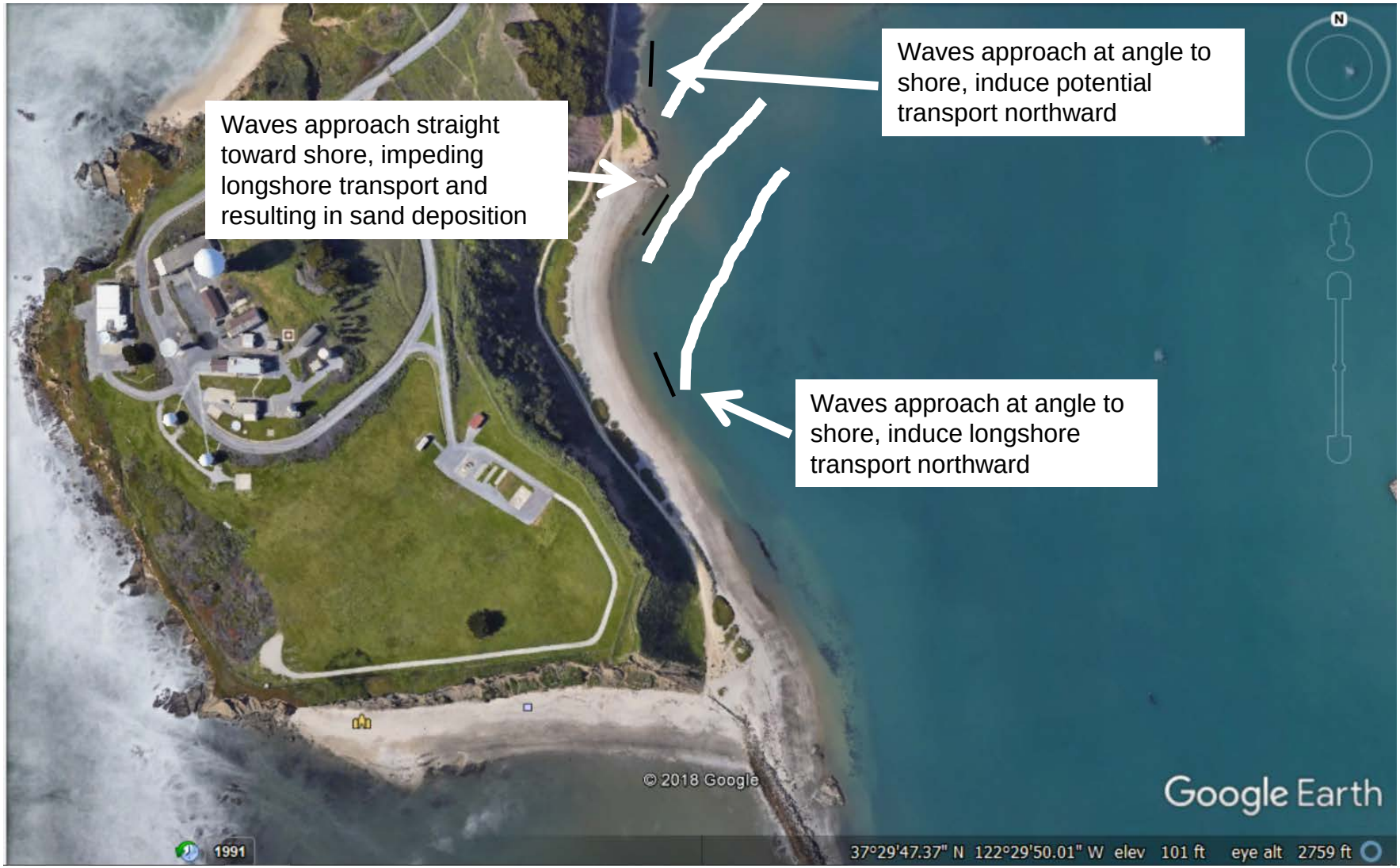
Basis of Design - Shore Geomorphology


Waves approach straight toward shore, impeding longshore transport and resulting in sand deposition
Waves approach at angle to shore, induce potential transport northward
Waves approach at angle to shore, induce longshore transport northward
N
© 2018 Google
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1991
37°29'47.37" N 122°29'50.01" W elev 101 ft eye alt 2759 ft

Basis of Design - Sea Level Rise Considerations

- Assume 50 yr design life
- Low Risk Aversion with Adaptation

Year	Low Risk Aversion	Medium-High Risk Aversion	Extreme Risk Aversion
	Limit of "likely range"	1-in-200 chance	Single scenario
	(~17% probability SLR exceeds...)	(0.5% probability SLR exceeds…)	(no associated probability)
2000	0.0	0.0	0.0
2030	0.6	0.9	1.1
2040	0.9	1.3	1.8
2050	1.2	2.0	2.8
2060	1.6	2.7	3.9
2070	2.0	3.6	5.2
2080	2.5	4.6	6.7
2090	3.0	5.7	8.3
2100	3.6	7.1	10.2

CA Ocean Protection Council Science Advisory Team Working Group (OPC-SAT) 2018

Other Design Considerations

- 18’ wide trail (vehicle and ped. access)
- 12” asbestos pipeline burial
- Cobble and sand source(s)
- Storm Water
  - 36” storm drain outfall
  - Concrete swale

Design to Include Drainage Improvement

Problem:

- Concrete swale is cracking
- Debris management

Existing system designed to manage runoff from 25-year event (GHD 2016)

Drainage Component	Hydraulic Capacity (cfs)
Gunite swale	8.1
24" CMP Pipe	87.9

Concept Bookends

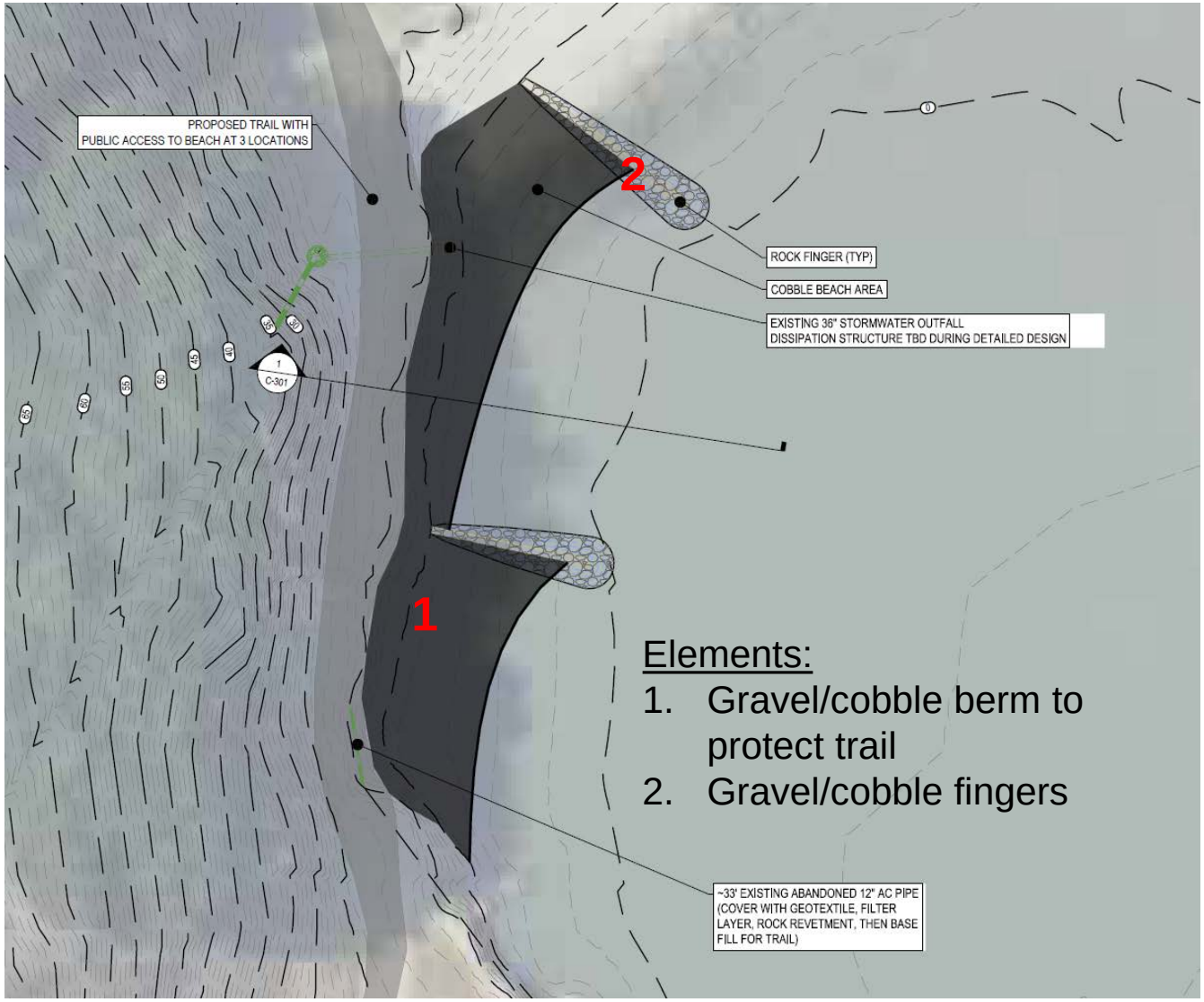
- Eroded Case – Cobble / Gravel Beach with Rock Finger
- Nourished Case – Beach and Vegetated Dune

March 2016

November 2017

Mixed Cobble / Sand Beach at Surfer's Point, Ventura, CA

Eroded Bookend – Gravel / Cobble Beach with Rock Fingers

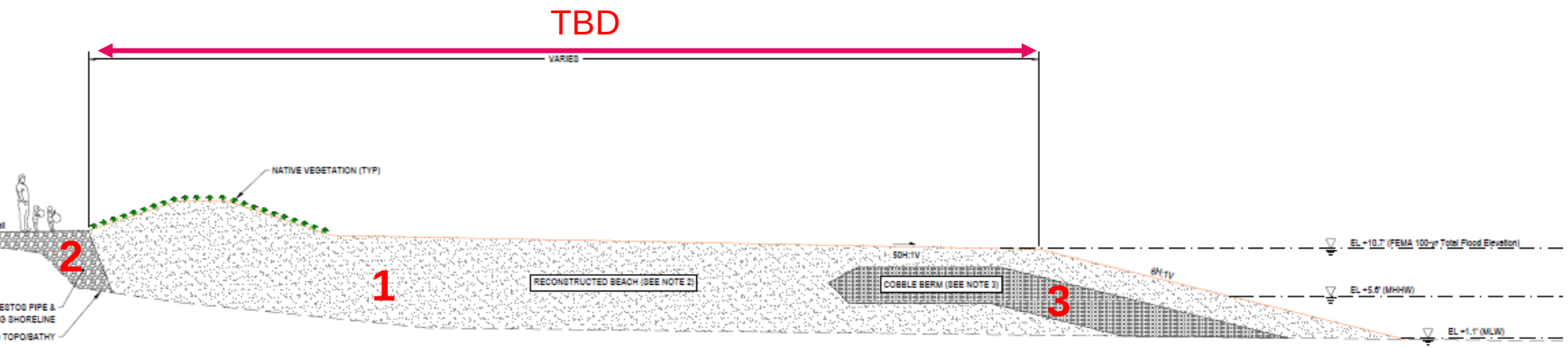


Design Inspiration

Nourished Bookend – Beach and Dune with Buried Rock Fingers

Design Inspiration

Proposed Living Shoreline Concept



Elements:

1. Sand import to create:
   - Beach
   - Vegetated dune
2. Use of native gravel/cobble berm to protect trail
3. Gravel/cobble retain sand

Numerical modeling – Cross shore analysis

CSHORE model used to assess erosional impacts of waves and elevated water levels at the project site

24 separate model scenarios for storm waves:

- Three sediment sizes (fine, medium and coarse sand)
- Two wave cases (100 yr swell, 100 yr wind)
- Four water levels (present day, storm surge, sea level rise x 2)

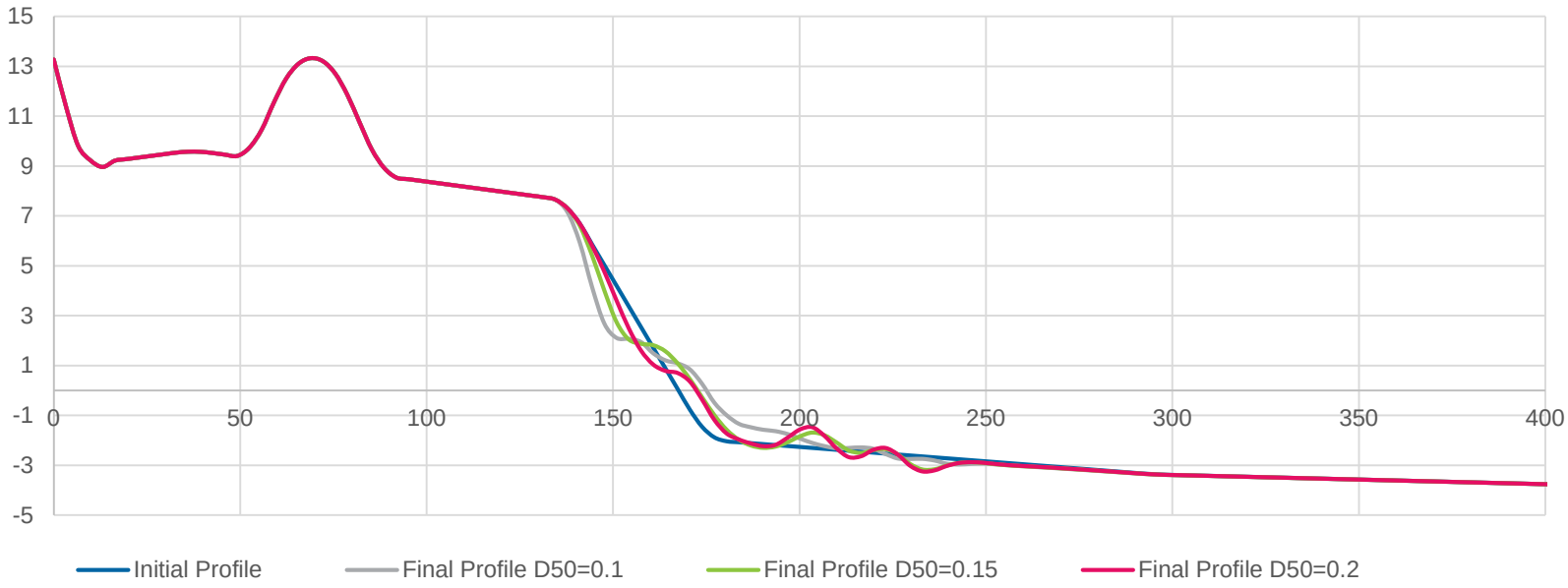
3 separate model scenarios for operational waves:

- Three sediment sizes (fine, medium and coarse sand)
- One wave case (operational)
- One water level (present day)

Total of 27 simulations

Numerical modeling – Cross shore analysis

Model results, operational wave case

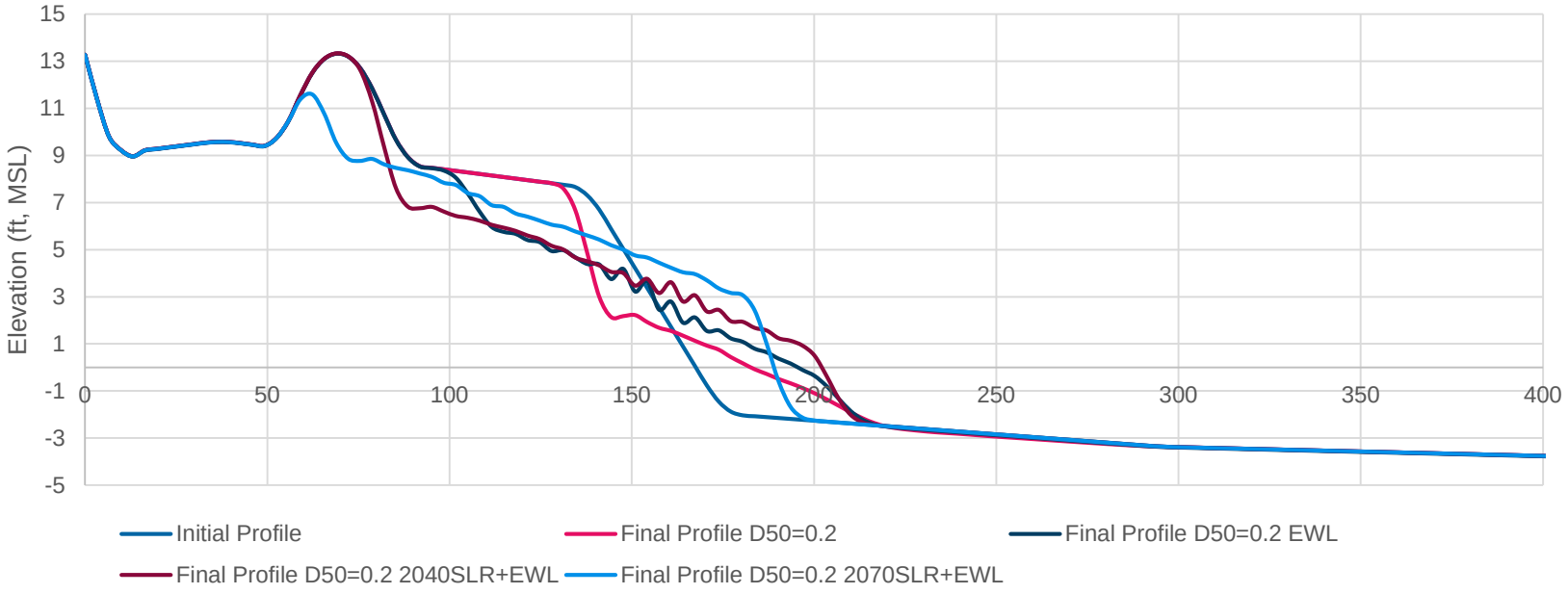


Numerical modeling – Cross shore analysis

Outcomes:

- Swell is the most erosive wave case
- Elevated water levels (surge, SLR) result in greater erosion of the nourished profile
- Erosion reduced as the sand fill grain size increased

Model results, swell wave case, D50=0.2mm (coarse sand)



Numerical modeling – Long shore analysis

LITDRIFT model used to assess longshore erosional impacts

6 separate model scenarios for storm waves:

- One sediment size (medium sand)
- Two wave cases (100 yr swell, 100 yr wind)
- Three wave obliquity angles (15, 30 and 45 degrees)
- One water level (present day)

Numerical Modeling - Long Shore

Outcomes:

- Short period most erosive case
- Erosion increased as wave angle increased
- Further investigation needed
  - Confirm occurrence of oblique waves
  - Model effects of cobble vs coarse sand

Next Steps – Final Design & Environmental

- Final Design
- Permitting
- CEQA
- Construction
- Monitoring & Adaptation

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