

# Ocean Blvd. (Bluff) Erosion and Enhancement Project, Phase 2

December 16, 2014

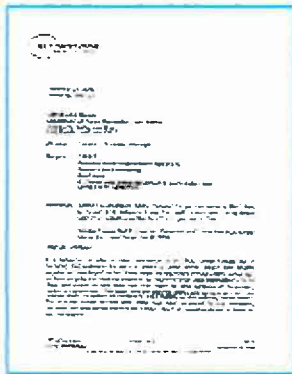
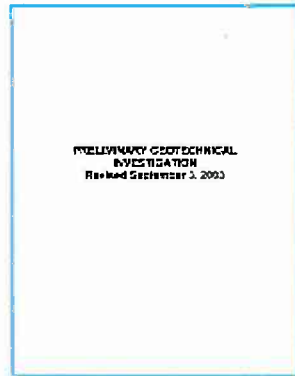




# Project Background

- In November 2000, Tetra Tech completed a Master Plan of Development for the overall Bluff Erosion & Enhancement Project, which included two rounds of community meetings and targeted outreach for specific projects.
- The purpose of the Master Plan is to address:
  - Bluff failure
  - Erosion causing severe undermining of sidewalks impacting public access
  - Public safety hazard from potential collapse above and below bluff
  - Dying and sparse vegetation, and
  - Future seismic activity that may hasten slumping and bluff recession.

# Geotechnical Studies



- 2000 Final – Plan of Development Bluff Erosion & Enhancement Project
- 2000 and Revised 2003 Preliminary Geotechnical Investigation Proposed Belmont Shore Bluff Restoration
- 2009 Draft Possible Slope Improvement Options for Project Cost Estimating
- 2010 Geotechnical Study Proposed Slope Improvements



# Project Background

- Projects that were recommended in the Master Plan by Tetra Tech that have been implemented to date include:
  1. 12<sup>th</sup> Place Erosion Improvements (2007 – 2008)
  2. 5<sup>th</sup> Place and 7<sup>th</sup> Place Erosion Improvements (2010 – 2011)
  3. Redondo Ave to 36<sup>th</sup> Place (Phase 1) Soil Nails and Stained and Sculpted Shotcrete without Planter Pockets (2010 – 2011)
  4. 20<sup>th</sup> Place to Redondo Ave (Phase 2) Soil Nails and Stained and Sculpted Shotcrete with Planter Pockets (2013 – 2014)
  5. Bixby Park Bluff Improvements and ADA Beach Access (2013 – 2014)

# Phase 1 and 2 Project Description

- Phase 1 was approved by the City Council on November 16, 2010 and included soil nailing and shotcrete without planter pockets.
  - Completed in 2011
- The current Ocean Blvd. (Bluff) Erosion and Enhancement Phase 2 Project was approved for construction by the City Council on July 9, 2013
  - Plans and Specifications No. R-6959 adopted and a construction contract awarded to Drill Tech Drilling & Shoring Inc.
- For the areas most prone to severe erosion, the City's engineers recommended the soil nailing technology and a tan-stained sculpted shotcrete facing that contains planter pockets.
- The project included the replacement of the sidewalk, railing, major landscaping, and the full replacement of the irrigation system.

# Site Map



Phase 1 completed in  
2011



## Project Pause

- On April 29, 2014 the City Council voted to pause the Project and directed staff to conduct an engineering analysis (Peer Review) of the Project.
  - The peer review concluded that the soil nail system and shotcrete are an appropriate solution for the project; however, there are feasible biotechnical alternatives for the soil nailed areas that have not received shotcrete.
- On July 1, 2014, the City Council directed staff to review and evaluate biotechnical options for unfinished areas of the Bluff (Area 1 and a portion of Area 2) and continue with Bluff Park construction.

# Construction Progress

- 3700 feet of new sidewalk and historical railing have been fully installed in Bluff Park.
- The railing is made of galvanized steel and is guaranteed to last at least 25 years.







# Construction Progress

- The Bluff Park irrigation system has been completely replaced and reseeding to fully restore Bluff Park is scheduled to begin shortly.
  - The former irrigation system required constant repairs due to line failures.
  - The new irrigation system required the installation of more than 4000 feet of a 4" mainline and more than 8000 feet of ¾" to 3" lateral lines.
  - Bluff Park uses only recycled water for irrigation purposes.

# Construction Progress



# Construction Progress





# Construction Progress

- The City is expecting up to 75% plant coverage with the current native plants design, however using non-natives may increase coverage amount, but would not add any ecological value.
  - Public input on the enhanced landscaping design was sought at an August 27, 2014 community meeting.
  - Attendees responded positively to the enhanced design but concerns about plant survival were raised.
  - Adaptive Management will be used to maximize plant success.
- The majority of the planting on the Bluff has been completed and the plants are thriving.
- The landscape designs were revised and enhanced during construction to include more drought tolerant and colorful plants and increase the plant coverage area.

# Plant Selection – Native Plants



# Ocean Blvd. Planter Design



# Planter Pockets Design



**Showy Island Snapdragon**  
*Galvezia speciosa*



**Island morning Glory**  
*Calystegia macrostegia ssp macrostegia*



**St. Catherine's Lace**  
*Eriogonum giganteum*



**Bladderpod**  
*Cleome isomeris*

# Planter Pocket Plants



**Island morning Glory**  
*Calystegia macrostegia ssp macrostegia*



# Toe Slope Design



**Lemonade Berry**  
*Rhus integrifolia*



**Holly-leaf Cherry**  
*Prunus illicifolia*



**Catalina Island Mallow**  
*Lavatera assurgentiflora*

# Examples of Shotcrete

**During construction**



**After construction**

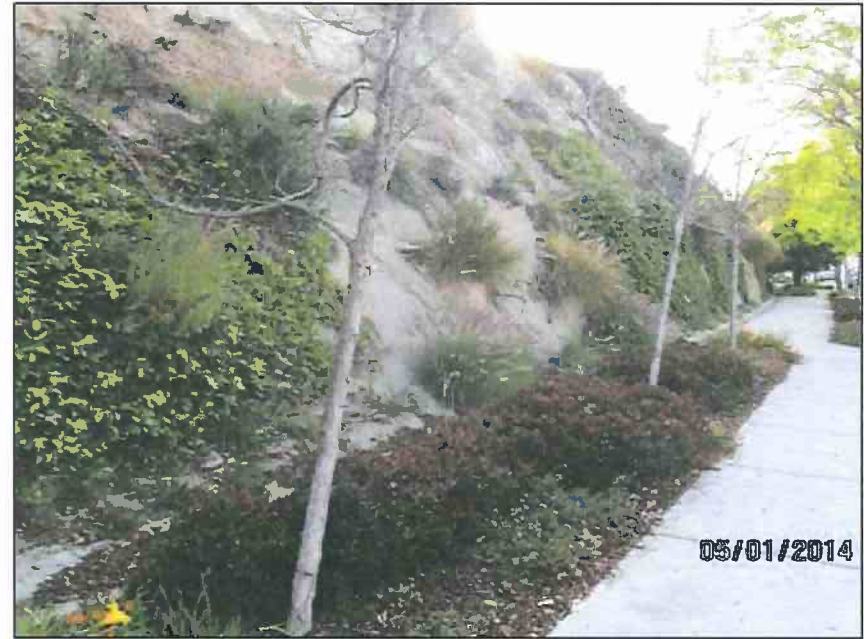


# Examples of Shotcrete

**During construction**



**After construction**



# Examples of Shotcrete

During construction



After construction



# Current conditions



# Areas to be Completed





# Direction Needed

- Staff is seeking direction to allow project completion.
- Options before the Council include:
  1. Complete the original project
  2. Biotechnical option 1: steel mesh
  3. Biotechnical option 2: cellular confinement
  4. Major regrading alternative



## Option 1: Complete the Original Project

- Three independent geotechnical engineers confirmed that soil nails and shotcrete are an appropriate solution for the Project (June 23, 2014 Peer Review)
- Most cost effective option with at least 75 year effective lifespan requiring minimal annual maintenance
- Vegetation will cover shotcrete as it grows and fully establishes itself and is expected to achieve greater Bluff coverage than in similar natural urban coastal bluffs



# Option 1 After Construction





# Biotechnical Options

- The June 23rd Peer Review Report indicated that in recent years, biotechnical techniques have been used to improve slope faces instead of using shotcrete and may be more aesthetically pleasing than shotcrete.
- The Report noted that some biotechnical techniques could be applicable to the site, especially in areas that are 1:1 or flatter.



# Biotechnical Review Process

- Researched biotechnical erosion control methods applied throughout California
- Interviewed numerous experts with knowledge of biotechnical methods and experience in implementing them
  - Experts also provided information on the feasibility of implementing biotechnical methods on the Long Beach Bluffs



# Biotechnical Review Process

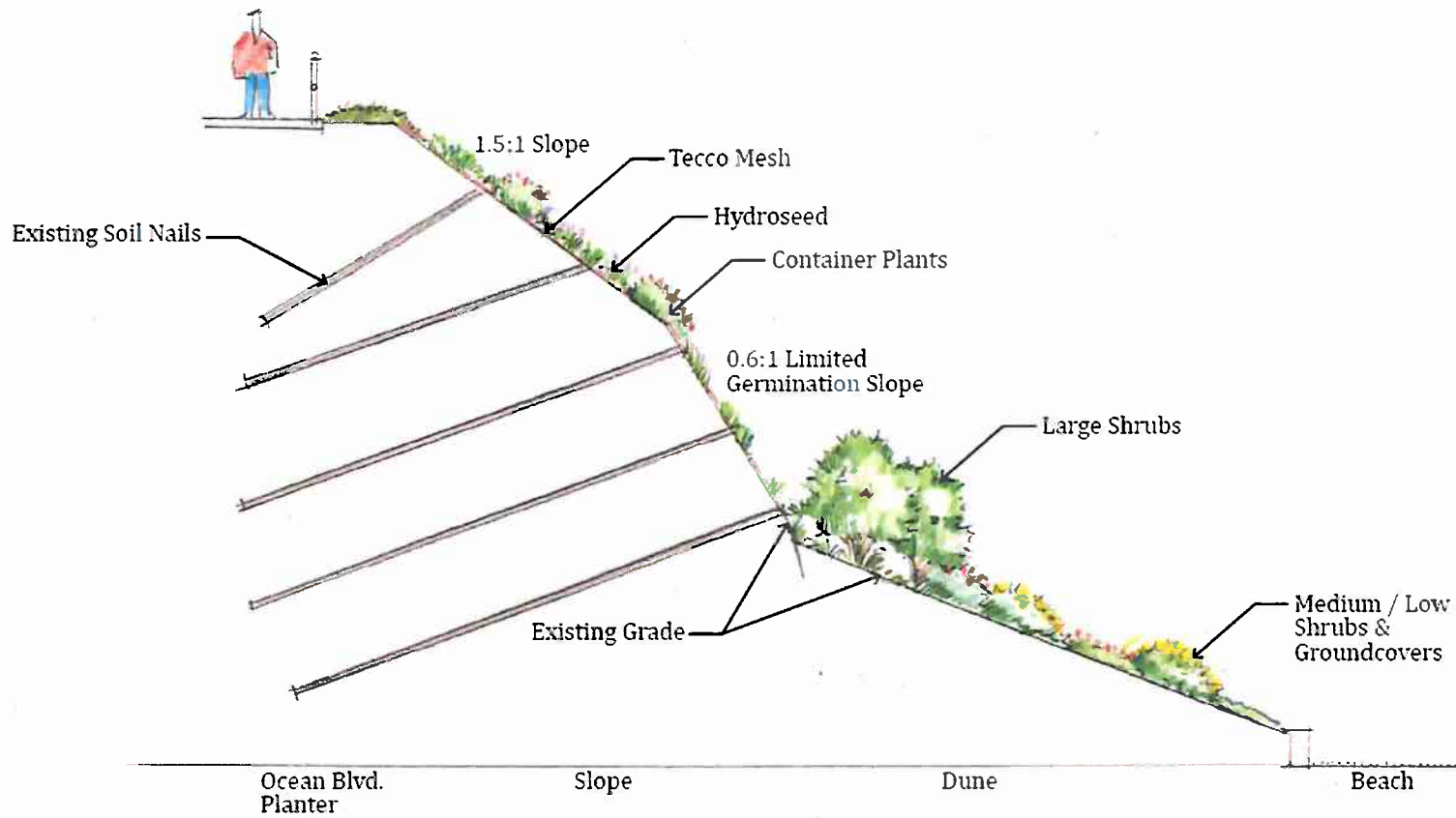
- We have developed biotechnical concepts and evaluated them according to their:
  - durability and seismic stability
  - erosion control
  - vegetation/planting quality (including irrigation)
  - construction and maintenance costs
  - implementation time
  - regulatory permitting requirements
- Several biotechnical methods were rejected due to ineffective erosion control and sustainability issues on steep coastal bluffs



# Biotechnical Option 1

- A high-tensile steel wire mesh would be laid down and anchored to the soil nails.
- The slope would be hydroseeded with grasses and flowers, and cutouts would be made in the mesh to allow for small shrubs to be planted.
- At least 15 year effective lifespan with intensive annual maintenance, including repeated hydroseeding and top soil replacement.
- Plant failure anticipated to be high and will require significant maintenance to replace.

# Cross Section of Biotechnical Option 1



# Example of Biotechnical Option 1



# Biotechnical Option 1 During Construction





# Biotechnical Option 1 After Construction and Plant Establishment



# Example of Biotechnical Option 1

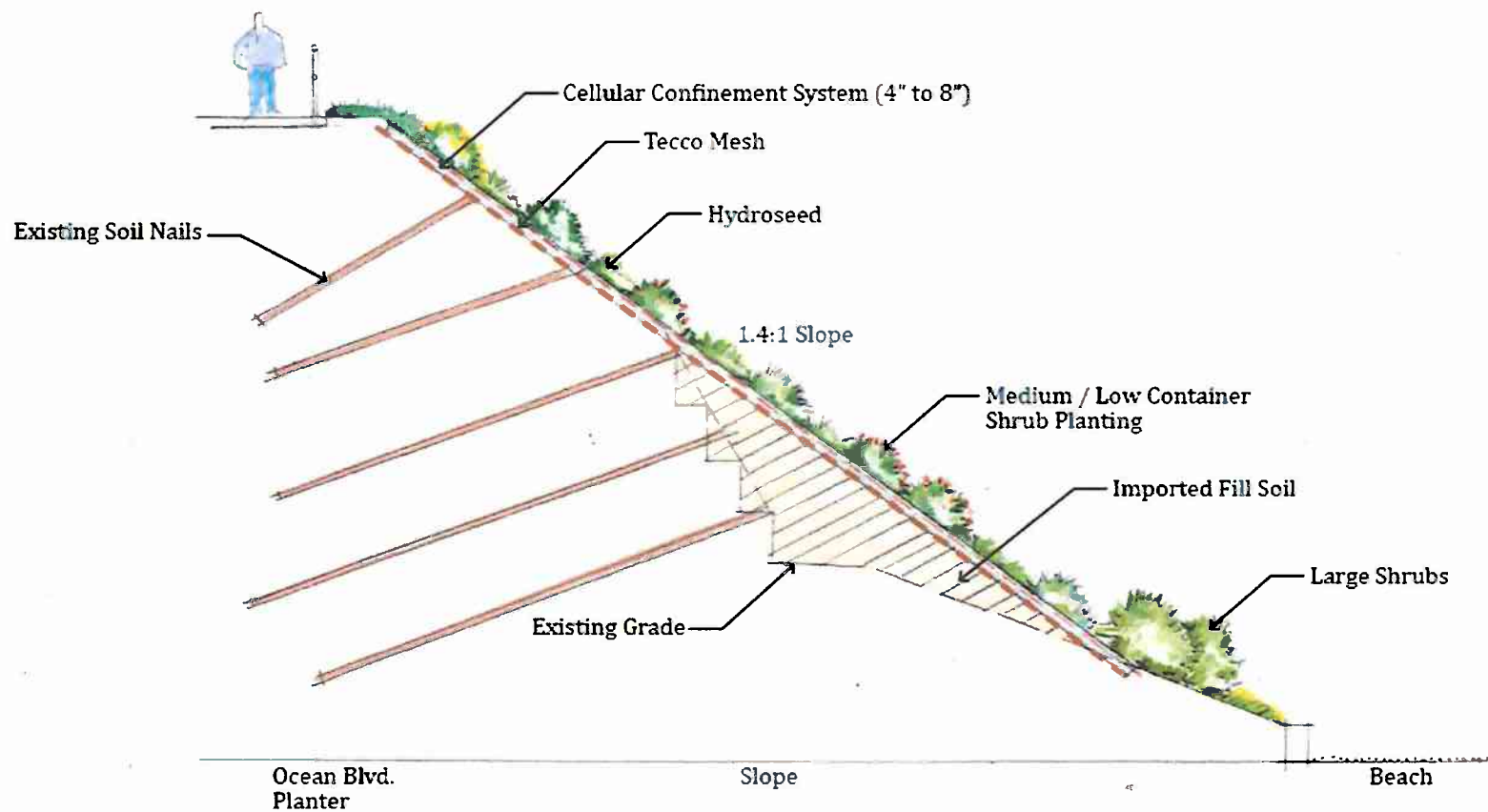




## Biotechnical Option 2

- Soil would be imported to create a uniform slope of 1.4:1, but not impact the Park or beach
- The steel mesh would be laid down and biodegradable or synthetic vegetative cells would be anchored to the mesh and filled with 4-8" of soil.
- Wide variety and larger plants could be planted on the slope due to additional soil.
- At least 25 year effective lifespan with moderate annual maintenance including top soil replacement.

# Cross Section of Biotechnical Option 2



# Biotechnical Option 2 During Construction



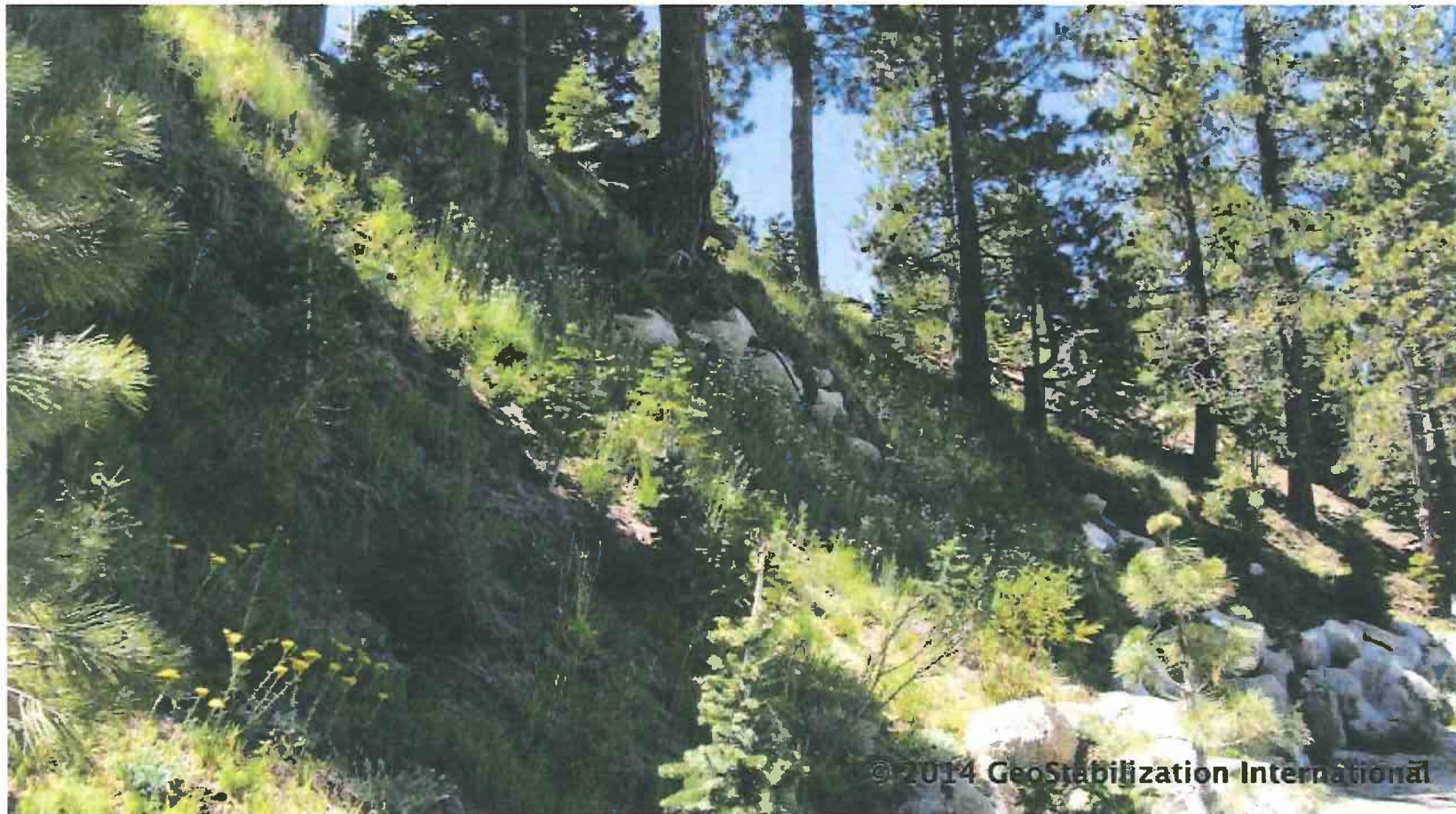
# Biotechnical Option 2 After Construction



# Example of Biotechnical Option 2 During Construction



# Example of Biotechnical Option 2 After Construction & Plant Establishment







# Regrading Alternative

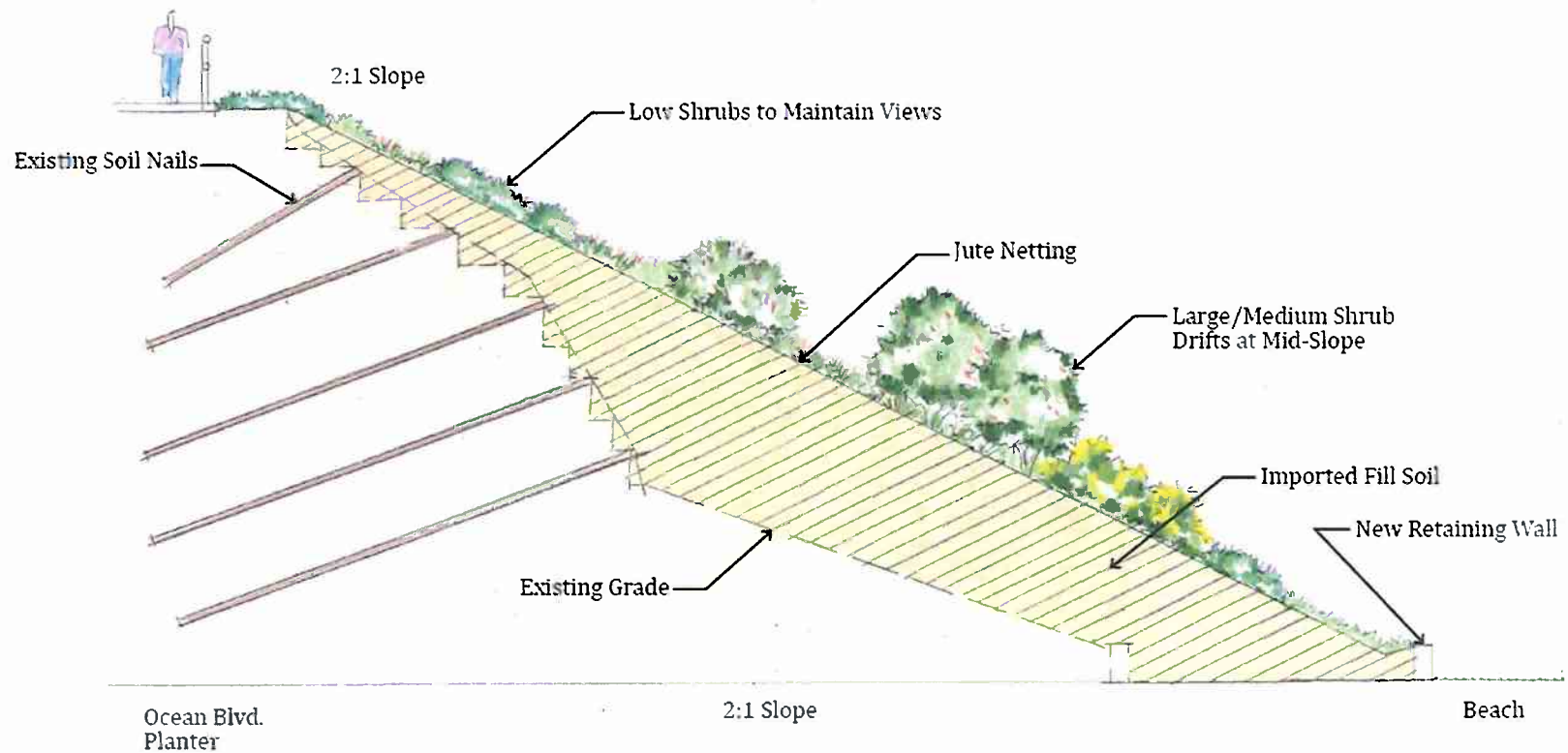
- Current slope conditions are too steep for erosion control and vegetation establishment.
  - Nearby beach bluffs, such as those in Redondo Beach, are more gradual (2.5:1 vs. 0.6:1 in Long Beach) and allow for replanting without engineering solution.
- Additional soil would be imported and compacted to create a uniform 2:1 slope that would encroach 20 feet onto the beach, onto Bluff Park, or a combination thereof.
  - Slopes steeper than 1.5:1 are recommended to have an engineered stabilization solution.



# Regrading Alternative

- Staircase at 20<sup>th</sup> place may need to be reconstructed.
- A retaining wall, additional concrete, and/or drainage trench would be required.
- Wider variety and larger plants could be planted on the slope due to additional soil.
- High risk of trespassing without an additional fence (such as the one in Redondo Beach)

# Cross section of Regrading Alternative



## Example of Planted, Gradual Slopes



# Example of Planted, Gradual Slopes





# Impacts of Regrading

- Importing soil to regrade the Bluff would require approximately 2,150 truck trips.
- Additional construction of a wall or a trench would be required to mitigate horizontal erosion.
- Depending on the exact solution, the project could require an amendment to the Local Coastal Program and/or a new Coastal Development Permit.

# Cost Estimates

Option #	Option	Area 1	Area 2	Total
1	Completion of Original Project	\$794,000	\$529,000	\$1,323,000
2	Biotechnical Option 1	\$1,650,000	\$2,700,000	\$4,350,000
	Biotechnical Option 2	\$3,800,000	\$3,950,000	\$7,750,000
3	Regrading	\$3,000,000	\$2,450,000	\$5,450,000



# Annual Maintenance Cost Estimates

1. Complete the original project: \$11,000
2. Biotechnical option 1: steel mesh: \$26,000
3. Biotechnical option 2: cellular confinement: \$19,000
4. Regrading alternative: \$19,000





# Fiscal Impact

- Oil futures are currently trading at \$50 per barrel and projections show that prices may remain low for the next year.
- Due to anticipated funding shortfall, funds will need to be appropriated from existing Tidelands projects or the general fund.
- The project would take priority over other projects as it is an unfinished construction project.
- We request that the City Council consider these constraints when evaluating potential options.



# Timing Considerations

- Area 1 has already experienced noticeable erosion after recent storms
- Completion time estimates:
  1. Complete the original project: 2015
  2. Biotechnical option 1: steel mesh: 2016
  3. Biotechnical option 2: cellular confinement: 2016
  4. Regrading alternative: 2018



## Options Council may Consider

1. Complete the original project
2. Biotechnical option 1: steel mesh
3. Biotechnical option 2: cellular confinement
4. Regrading alternative

Staff recommends completing original project.

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