Assembly Bill 691

- Trustees of granted public trust lands
  - Assess of the impacts of Sea Level Rise
  - Conduct financial impact analysis
  - Submit a description of how trustee proposes to address sea level rise
2018 SLR Ad Hoc Committee Meeting Summary

- **September 18, 2018**: Review results of the Port’s sea level rise vulnerability assessment
- **November 13, 2018**: Receive feedback on a sea level rise adaptation framework
- **December 6, 2018**: Help to inform options for a monitoring strategy
2018 Sea Level Rise Ad-Hoc Committee

EAC Members
- Department of Navy
- Center for Sustainable Energy
- Port Tenants Association
- Shelter Island Marina
- US Fish and Wildlife
- Southwest Wetlands Interpretive Association

Regional Agencies
- City of San Diego
- City of National City
- City of Chula Vista
- City of Imperial Beach
- City of Coronado
- SANDAG
- Airport Authority
- Coastal Commission

Advisors & Presenters
- Scripps Institution of Oceanography—Center for Climate Change Impacts and Adaptation
- Army Corps of Engineers
- United States Geologic Survey
- Tijuana River National Estuarine Research Reserve
Meeting 1:
Review results of the vulnerability assessment
# Sea Level Rise Projections for San Diego Bay

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Feet</td>
<td>Meters</td>
<td>Feet</td>
<td>Meters</td>
<td>Feet</td>
<td>Meters</td>
</tr>
<tr>
<td>2030</td>
<td>0.5</td>
<td>0.15</td>
<td>0.4—0.6</td>
<td>0.12—0.18</td>
<td>0.7</td>
<td>0.21</td>
</tr>
<tr>
<td>2050</td>
<td>0.9</td>
<td>0.27</td>
<td>0.7—1.2</td>
<td>0.21—0.37</td>
<td>1.4</td>
<td>0.43</td>
</tr>
<tr>
<td>2100 (RCP 8.5)</td>
<td>2.6</td>
<td>0.79</td>
<td>1.8—3.6</td>
<td>0.55—1.10</td>
<td>4.5</td>
<td>1.4</td>
</tr>
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</tbody>
</table>
Include cross walk to COSMOS intervals
Philip Gibbons, 2/28/2019

Provide background on why we chose these? Not only time we will utilize projections
Philip Gibbons, 3/1/2019
## Vulnerability Results

<table>
<thead>
<tr>
<th>Asset</th>
<th>Total Quantity</th>
<th>Exposed to Daily Inundation</th>
<th>Exposed to 100-Year Storm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.25 m</td>
<td>0.50 m</td>
</tr>
<tr>
<td>Transport Facilities (linear feet)</td>
<td>350,390</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>Roads (linear feet)</td>
<td>233,891</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Rail (linear feet)</td>
<td>85,203</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Bikeways (linear feet)</td>
<td>31,297</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Marine Terminals (acres)</td>
<td>233</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Building Stock (count)</td>
<td>590</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Stormwater Management (count)</td>
<td>458</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Wastewater Management (count)</td>
<td>24</td>
<td>67%</td>
<td>67%</td>
</tr>
<tr>
<td>Sewer Lifts (count)</td>
<td>10</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Sanitary Pump Outs (count)</td>
<td>14</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Contaminated Sites (count)</td>
<td>15</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Park &amp; Beach Areas (acres)</td>
<td>155</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Beach Accessible Areas (acres)</td>
<td>11</td>
<td>71%</td>
<td>75%</td>
</tr>
<tr>
<td>Parks (acres)</td>
<td>144</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Boating facilities (count)</td>
<td>6</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Fuel Docks (count)</td>
<td>3</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Boat Launch Ramps (count)</td>
<td>3</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Ecosystems &amp; Critical Species</td>
<td>54</td>
<td>6%</td>
<td>11%</td>
</tr>
<tr>
<td>Least Tern Habitat (acres)</td>
<td>54</td>
<td>6%</td>
<td>11%</td>
</tr>
</tbody>
</table>
Salt Marsh—Current

Current Elevation 0.25—11.5 Feet ~496 acres

Preferred 3.3—6.5 Feet ~115 acres
Salt Marsh—2030 High (0.8 Feet)

2030 Elevation
1.6—12.3 Feet
~458 acres

Preferred
4.1—7.4 Feet
~110 acres

Salt Marsh: Area of Elevation Range

Salt Marsh: Area of Preferred Elevation Range

Acres

Current

2030
Salt Marsh—2050 (1.6 feet)

2050 Elevation
2.4—13.1 Feet
~438 acres

Preferred
4.9—8.2 Feet
~111 acres

Salt Marsh: Area of Elevation Range

Salt Marsh: Area of Preferred Elevation Range

Current 2030 2050

400 410 420 430 440 450 460 470 480 490 500 510

Acres

Current 2030 2050

107 108 109 110 111 112 113 114 115 116

Acres
Salt Marsh—2100 Low (2.5 feet)

2100 (LOW) Elevation
3.3—13.9 Feet
~430 acres

Preferred
4.9—8.2 Feet
~111 acres

Salt Marsh: Area of Elevation Range

Current 2030 2050 2100 (LOW)

Salt Marsh: Area of Preferred Elevation Range

Current 2030 2050 2100 (LOW)
Salt Marsh—2100 High (4.9 feet)

2100 (HIGH) Elevation
5.7—16.4 Feet
~370 acres

Preferred
8.2—11.5 Feet
~143 acres

Salt Marsh: Available Habitat Extent

Salt Marsh: Area of Preferred Elevation Range
Habitat Analysis

**Acres of Available Habitat Elevation in District**

- **Eelgrass**
  - No SLR: 1,500 acres
  - 2030 0.8 feet SLR: 1,200 acres
  - 2050 1.6 feet SLR: 1,000 acres
  - 2100 2.5 feet SLR: 800 acres
  - 2100 4.9 feet SLR: 600 acres

- **Salt Marsh**
  - No SLR: 1,000 acres
  - 2030 0.8 feet SLR: 1,200 acres
  - 2050 1.6 feet SLR: 1,000 acres
  - 2100 2.5 feet SLR: 800 acres
  - 2100 4.9 feet SLR: 600 acres

**Acres of Available Beach Dune Habitat Elevation in District**

- **No SLR**
  - 2030 0.80 feet SLR: 10 acres
  - 2050 1.6 feet SLR: 10 acres
  - 2100 2.5 feet SLR: 10 acres
  - 2100 4.9 feet SLR: 10 acres

**Acres of Available Preferred Habitat Elevation in District**

- **Eelgrass**
  - No SLR: 1,200 acres
  - 2030 0.8 feet SLR: 1,200 acres
  - 2050 1.6 feet SLR: 1,200 acres
  - 2100 2.5 feet SLR: 1,200 acres
  - 2100 4.9 feet SLR: 1,200 acres

- **Salt Marsh**
  - No SLR: 1,000 acres
  - 2030 0.8 feet SLR: 1,200 acres
  - 2050 1.6 feet SLR: 1,200 acres
  - 2100 2.5 feet SLR: 1,200 acres
  - 2100 4.9 feet SLR: 1,200 acres

**Acres of Available Uplands Habitat Elevation in District**

- **Eelgrass**
  - No SLR: 1,400 acres
  - 2030 0.8 feet SLR: 1,400 acres
  - 2050 1.6 feet SLR: 1,400 acres
  - 2100 2.5 feet SLR: 1,400 acres
  - 2100 4.9 feet SLR: 1,400 acres

- **Salt Marsh**
  - No SLR: 1,200 acres
  - 2030 0.8 feet SLR: 1,200 acres
  - 2050 1.6 feet SLR: 1,200 acres
  - 2100 2.5 feet SLR: 1,200 acres
  - 2100 4.9 feet SLR: 1,200 acres

**Habitat Analysis**

- **Habitat Type**
  - Eelgrass
  - Salt Marsh

- **Elevation in District**
  - 0 feet SLR
  - 2030 0.8 feet SLR
  - 2050 1.6 feet SLR
  - 2100 2.5 feet SLR
  - 2100 4.9 feet SLR

- **Sea Level Rise Scenarios**
  - No SLR
  - 2030 0.80 feet SLR
  - 2050 1.6 feet SLR
  - 2100 2.5 feet SLR
  - 2100 4.9 feet SLR
Meeting 2: Receive Feedback on Sea Level Rise Framework
Sea Level Rise Planning Framework

- **Vulnerability Assessment**
  - Select Sea Level Rise Projections
  - Identify Assets
  - Evaluate Risk

- **Evaluate**
  - Strategy Implementation

- **Inform**
  - Adaptation Planning
  - Identify adaptation strategies
  - Create decision making process
  - Develop Monitoring Program with Indicators

- **Monitor**
## Adaptation Strategies

<table>
<thead>
<tr>
<th>Protect</th>
<th>Nature-Based</th>
<th>Shoreline Infrastructure</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cluster New</td>
<td>• Build dikes with habitat value</td>
<td>• Bulkheads</td>
<td>• Floodwalls</td>
</tr>
<tr>
<td>Development</td>
<td>• Living shorelines</td>
<td>• Embankments/Levees</td>
<td>• Flood proofing</td>
</tr>
<tr>
<td>• Encourage Natural Solutions</td>
<td></td>
<td>• Floodwalls</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Build dikes with habitat value</td>
<td>• Revetments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Living shorelines</td>
<td>• Groins</td>
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</tr>
<tr>
<td></td>
<td>• Build dikes with habitat value</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Living shorelines</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accommodate</strong></td>
<td><strong>• Beach and sediment</strong></td>
<td><strong>• Internal Drainage</strong></td>
<td><strong>Permeable Pavers</strong></td>
</tr>
<tr>
<td>• Allow Temporary</td>
<td><strong>• Habitat Restoration</strong></td>
<td><strong>• Floodable Open</strong></td>
<td><strong>• Elevate</strong></td>
</tr>
<tr>
<td>and Occasional</td>
<td><strong>• Living Breakwater</strong></td>
<td><strong>• Spaces</strong></td>
<td><strong>Structures and</strong></td>
</tr>
<tr>
<td>Flooding in Open</td>
<td></td>
<td></td>
<td><strong>infrastructure</strong></td>
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<tr>
<td>Space</td>
<td></td>
<td></td>
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<tr>
<td>• Design Flood</td>
<td></td>
<td></td>
<td><strong>• Floodable</strong></td>
</tr>
<tr>
<td>Elevations</td>
<td></td>
<td></td>
<td><strong>Parking</strong></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Structures</strong></td>
</tr>
<tr>
<td><strong>Adjust</strong></td>
<td>• Setbacks</td>
<td>• Allow habitat migration</td>
<td>• Relocate Critical</td>
</tr>
<tr>
<td>• Setbacks</td>
<td>• Modify</td>
<td>• Beach Nourishment</td>
<td>Facilities</td>
</tr>
<tr>
<td>• Modify</td>
<td>• Redevelopment in At-Risk</td>
<td></td>
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<tr>
<td></td>
<td>Locations</td>
<td></td>
<td></td>
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<tr>
<td>• Setbacks</td>
<td>• Modify</td>
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<td></td>
</tr>
<tr>
<td>• Modify</td>
<td>• Redevelopment in At-Risk</td>
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</tr>
<tr>
<td></td>
<td>• Redevelopment in At-Risk</td>
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<tr>
<td></td>
<td>Locations</td>
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<td></td>
</tr>
</tbody>
</table>
Visualizing Sea Level Rise Adaptation Strategies

- Elevate Building Infrastructure
- Design Flood Elevations
- Setback
- Bulkhead
- Revetment
- Living Breakwater
- Elevation
- Terraced Wetland
Decision-Making Process

Step 1.
Identify Suitable Adaptation Strategies
Which strategies address the impacts of concern?

Step 2.
Identify Benefits and Limitations
Qualitative/Quantitative Description

Step 3.
Evaluate Feasibility
Can the strategies technically, financially, and legally be implemented?

Step 4.
Evaluate Appropriateness
Are the strategies consistent with policy and plans? Politically appropriate? Proportional to impacts?

Suitable Adaptation Strategies
Sea Level Rise Planning Framework

- Perform site-specific analysis
- Apply Decision Making Framework
- Institute an implementation plan

Evaluate

Vulnerability Assessment

Inform

- Communicate with regional partners
- Select Sea Level Rise Projections
- Identify Assets
- Evaluate Risk

- Identify adaptation strategies
- Create decision making process
- Develop Monitoring Program with Indicators

Monitor

Threshold

Strategy Implementation

Adaptation Planning
Sea Level Rise Approach

Strengths

Areas of Improvement

Actions
Meeting 3: Receive Feedback on the Sea Level Rise Framework
Monitoring Indicators

**WATER**
- Mean Sea Level
- Waves
- Tide Levels
- Frequency of Storms

**NATURAL**
- Habitat
  - Types
  - Health
  - Extent
  - Migration
- Topography
- Water depth

**BUILT**
- Flooding Frequency
- Cost of Response
- Performance of Flood Defense Infrastructure
Next Steps
Next Steps

- Financial impacts analysis
- Work with Scripps Institution of Oceanography to deploy wave sensors in San Diego Bay
- Identify near-term and long-term actions
- Finalize draft report
- Presentation to the Board of Port Commissioners
Discussion