THE USE OF HYDRAULIC MODELING TO PREDICT FLOODING IMPACTS TO INFRASTRUCTURE FROM SEA LEVEL RISE ALONG A RIVERINE SYSTEM IN THE SOUTHERN CALIFORNIA COASTAL MARGIN

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### OVERVIEW

- Project Location
- Model Description
- Project Purpose
- Sea Level Rise Estimates & Guidelines
- Model Results
- Secondary Impacts
- Recommendations

<table>
<thead>
<tr>
<th>Station ID: 9410580</th>
<th>Publication Date: 04/21/2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: NEWPORT BEACH, NEWPORT BAY ENTRANCE CALIFORNIA</td>
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<tr>
<td>NOAA Chart: 18754</td>
<td>Latitude: 33° 36.2’ N</td>
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<tr>
<td>USGS Quad: NEWPORT BEACH</td>
<td>Longitude: 117° 53.0’ W</td>
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</table>

#### TIDAL DATUMS

Tidal datums at NEWPORT BEACH, NEWPORT BAY ENTRANCE based on:

- **LENGTH OF SERIES:** 14 Years
- **TIME PERIOD:** January 1980 - December 1993
- **TIDAL EPOCH:** 1983-2001
- **CONTROL TIDE STATION:** 0418060 LOS ANGELES, OUTER HARBOR

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

- **HIGHEST OBSERVED WATER LEVEL (01/28/1988):** 2.337
- **MEAN HIGHER HIGH WATER:** 2.186
- **MEAN HIGH WATER:** 1.424
- **MEAN TIDE LEVEL:** 0.852
- **MEAN SEA LEVEL:** 0.845
- **MEAN LOW WATER:** 0.279
- **North American Vertical Datum (NAVD88):** 0.000
- **LOWEST OBSERVED WATER LEVEL (01/28/1988):** -0.717

North American Vertical Datum (NAVD88)
Upper Newport Back Bay, Orange County, CA

Study area includes the terminus of San Diego Creek

Study reach from the Back Bay to SR73

Significant infrastructure includes SR73 and Jamboree Road Bridges, MWD pipeline, lower San Diego Creek weir
Sections from bathymetry/topography between Highway 73 bridge to NBB @ \( \Delta x = 100 \) ft

Bank, ineffective flow and levee markers based on aerial photography and site visits

Jamboree Road Bridge entered into the model based on site visits and topographic data

Manning’s from FEMA FIRM 06059C0288K and site visits

\( Q_{100} \) from FIS

Upstream BC is normal depth

\( MHHW = 4.67 \) feet; \( WSE_{100} = 8.0 \) feet - \( WSE_{100} > \) highest observed

\( WSE_{100} \) used as the baseline

SLR = 5.5 feet from CCC
PROJECT PURPOSE

- Analyze SLR impacts on infrastructure in lower San Diego Creek
- Comply with CCC SLR requirements
<table>
<thead>
<tr>
<th>AGENCY/GUIDANCE</th>
<th>USACE</th>
<th>CCC</th>
<th>CALTRANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUIDE DOCUMENT</td>
<td>ETL 1100-2-1; SEA LEVEL CHANGE CURVE CALCULATOR</td>
<td>CALIFORNIA COASTAL COMMISSION SEA LEVEL RISE POLICY GUIDANCE; SEA-LEVEL RISE FOR THE COASTS OF CALIFORNIA, OREGON AND WASHINGTON: PAST, PRESENT AND FUTURE</td>
<td>GUIDANCE ON INCORPORATING SEA LEVEL RISE; ADDRESSING CLIMATE CHANGE ADAPTATION IN REGIONAL TRANSPORTATION PLANS</td>
</tr>
<tr>
<td>SLR RANGE</td>
<td>VARIES BY LOCATION (NOAA AND NON-NOAA GAGE BASED)</td>
<td>17-66 INCHES*</td>
<td>17-66 INCHES (PREVIOUSLY 55 INCHES AVERAGE)*</td>
</tr>
<tr>
<td>SLR TIME FRAME</td>
<td>100 YEARS*</td>
<td>100 YEARS*</td>
<td>100 YEARS*</td>
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<td>ADDITIONAL CRITERIA</td>
<td>SMART (SPECIFIC, MEASURABLE, ATTAINABLE, RISK INFORMED, TIMELY); FOUR PROJECT TYPES (PROTECT, ACCOMMODATE, RETREAT)</td>
<td>20 PRINCIPLES, PHYSICAL EFFECTS (FLOODING, WAVES, EROSION, SEDIMENT SUPPLY, SALTWATER INTRUSION)</td>
<td>EIGHT RECOMMENDATIONS. PREVIOUSLY 10 FACTORS OF CONSIDERATION; EIGHT ELEMENTS OF IMPLEMENTATION (INCLUDING BENCHMARK, GEOTEchnICAL)</td>
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MODEL RESULTS

- Backwater only extends to MWD pipeline, $\Delta z=0.1$ feet
- Velocity change at MWD pipeline is negligible, $\Delta v=0.1$ fps
- No impacts to Jamboree Bridge soffit
- San Diego Creek Weir becomes permanently submerged
- Channel banks too elevated to impact overbank flooding
SECONDARY IMPACTS

- Sediment Transport – Possible increased bed aggradation from reduced velocity, but only at weir and Jamboree
- Waves – No exposure from open-ocean waves
- Structures – Weir submerged permanently, bridges not impacted (increased z, decreased v)
RECOMMENDATIONS

- Additional studies with revised hydrology and stream yield based on future conditions
- Develop existing infrastructure deficiencies
- Time-augmented TBL analysis of impacts to property and infrastructure where deficiencies exist
- Continued review and understanding of conflicting and complimentary regulatory requirements
- Habitat Impacts
- See Jaffe (2014)