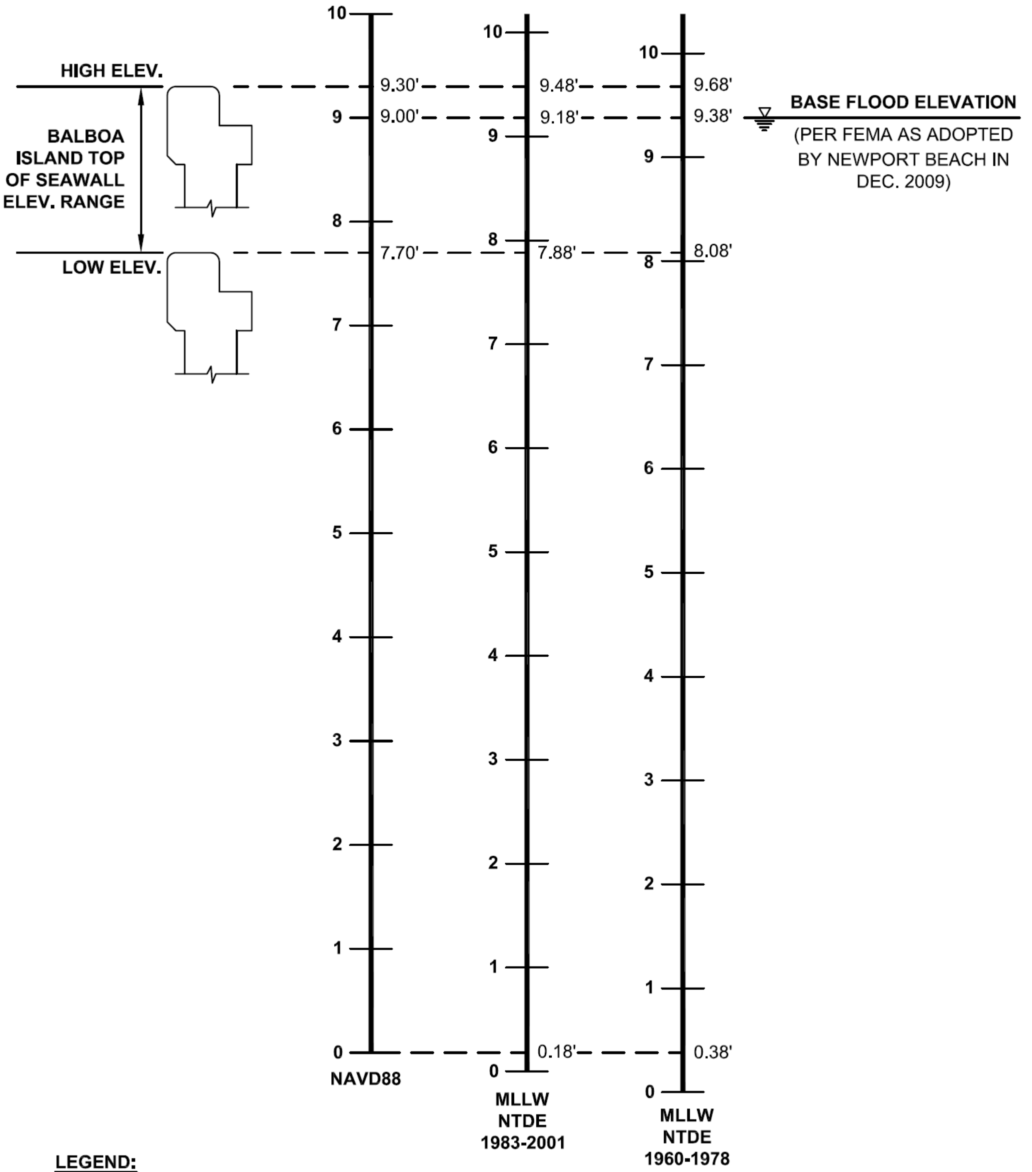
Balboa Island and Little Balboa Island Seawall Replacement

Tidelands Management Committee

July 17, 2012

Comparison of Different Tidal Datums



LEGEND:

NTDE = NATIONAL TIDAL DATUM EPOCH
(A 19 YEAR PERIOD OVER WHICH TIDAL DATA IS COLLECTED AND REDUCED TO OBTAIN MEAN (AVERAGE) VALUES FOR TIDAL DATUMS)

MLLW = MEAN LOWER LOW WATER
(RELATIVE DATUM BASED ON NTDE DATA)

NAVD88 = NORTH AMERICAN VERTICAL DATUM 1988
(GEODETIC VERTICAL DATUM USING A SINGLE FIXED REFERENCE POINT)

Waves Splashing over the Balboa Island Seawall at Turquoise Avenue and South Bay Front

(December 22, 2010)

City Personnel Pumping Flood Water Back into the Bay at Turquoise Ave and South Bay Front

(December 22, 2010)

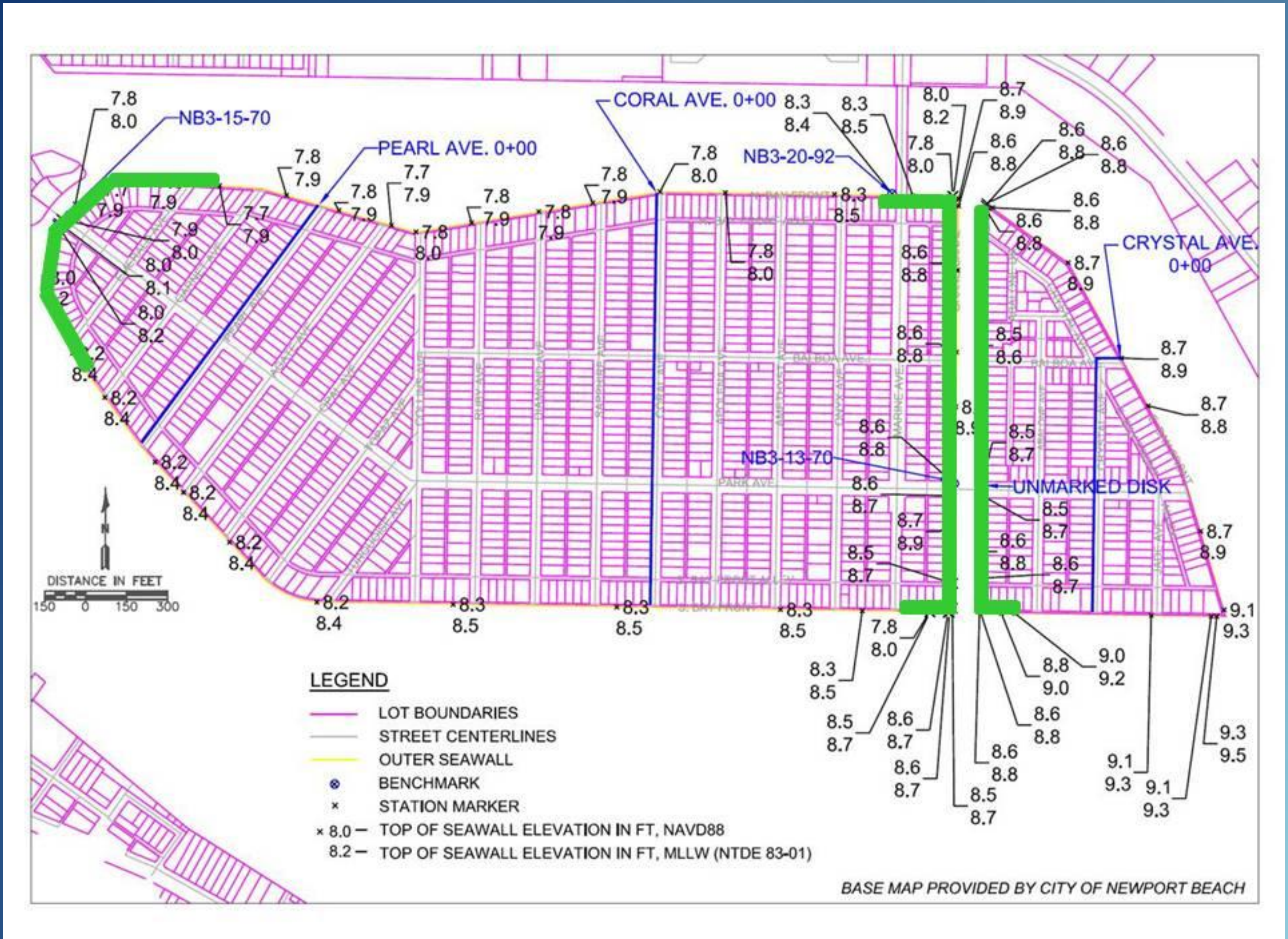
Projected Sea Level Rise

YEAR	MEAN SEA LEVEL (FT, NAVD88)	10% TIDE HEIGHT (FT, NAVD88)	1% TIDE HEIGHT (FT, NAVD88)	PROJECTED SEA LEVEL RISE (FT)*
2010	2.65	7.41	7.71	-
2025	3.05	7.81	8.11	0.40
2050	4.03	8.79	9.09	1.38
2100	7.25	12.01	12.31	4.60

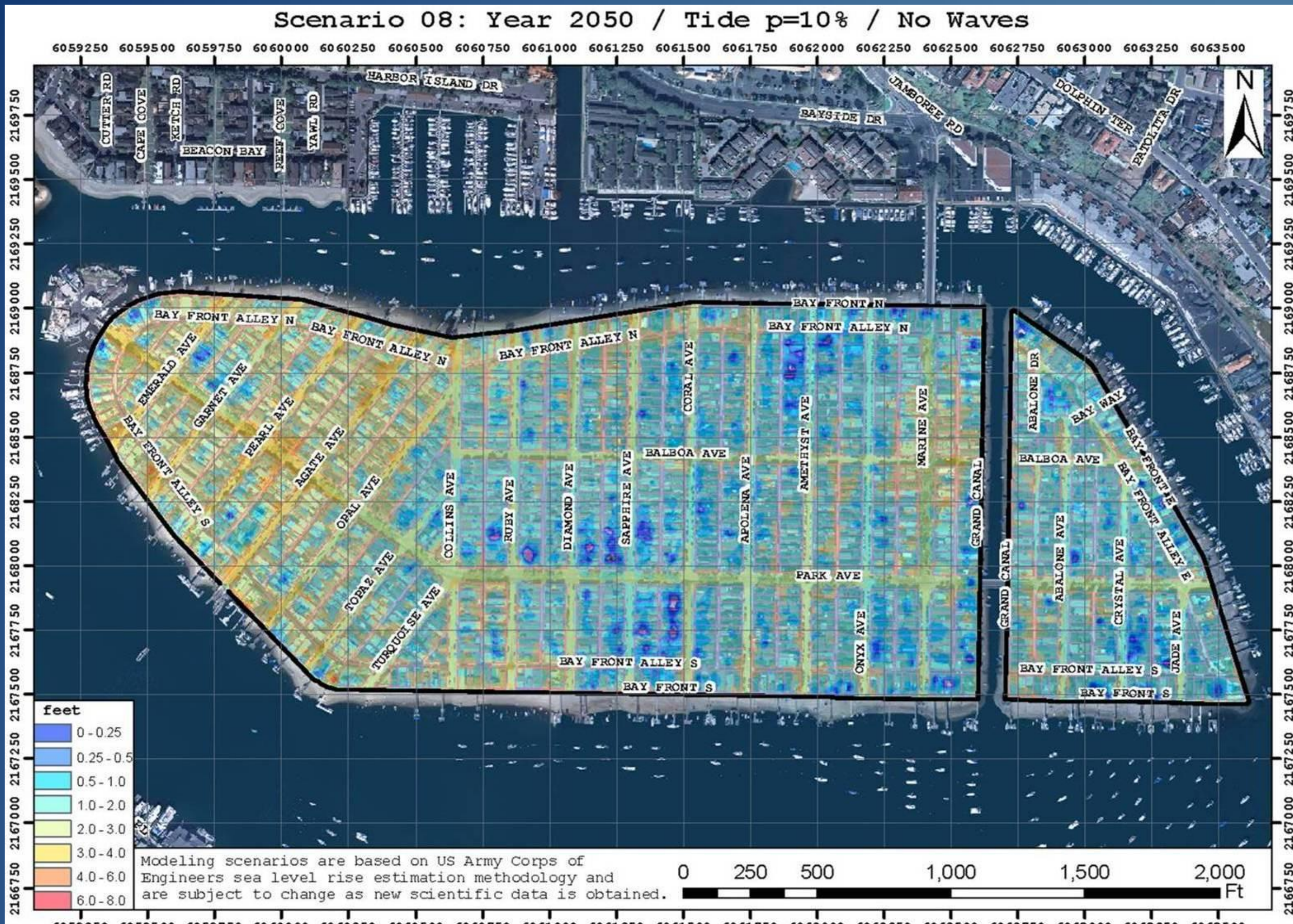
* equals change in mean sea level from Year 2010.

Note: Tide heights assume no wind waves or ocean swell.

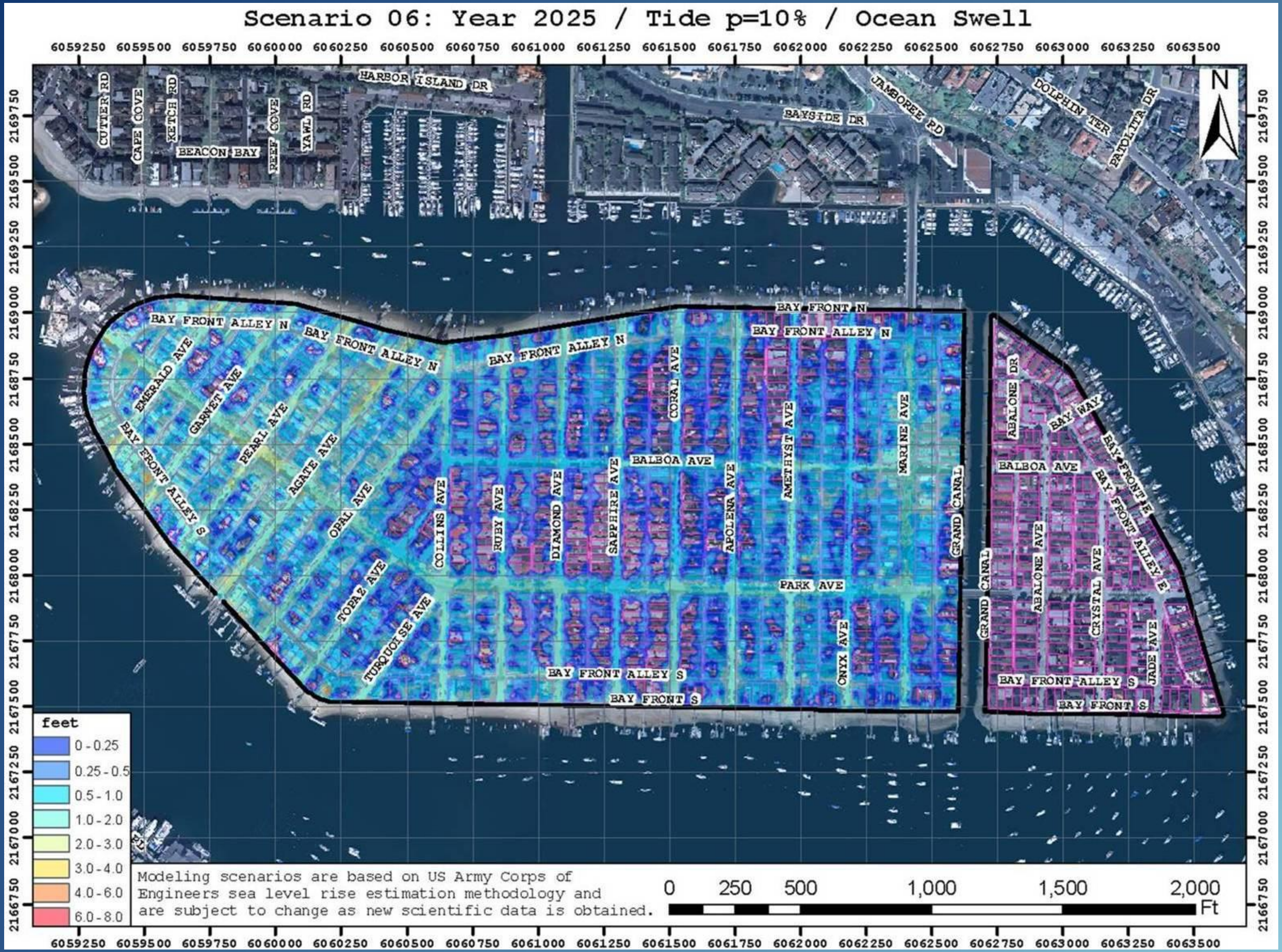
Top of Seawall Elevation [ft]



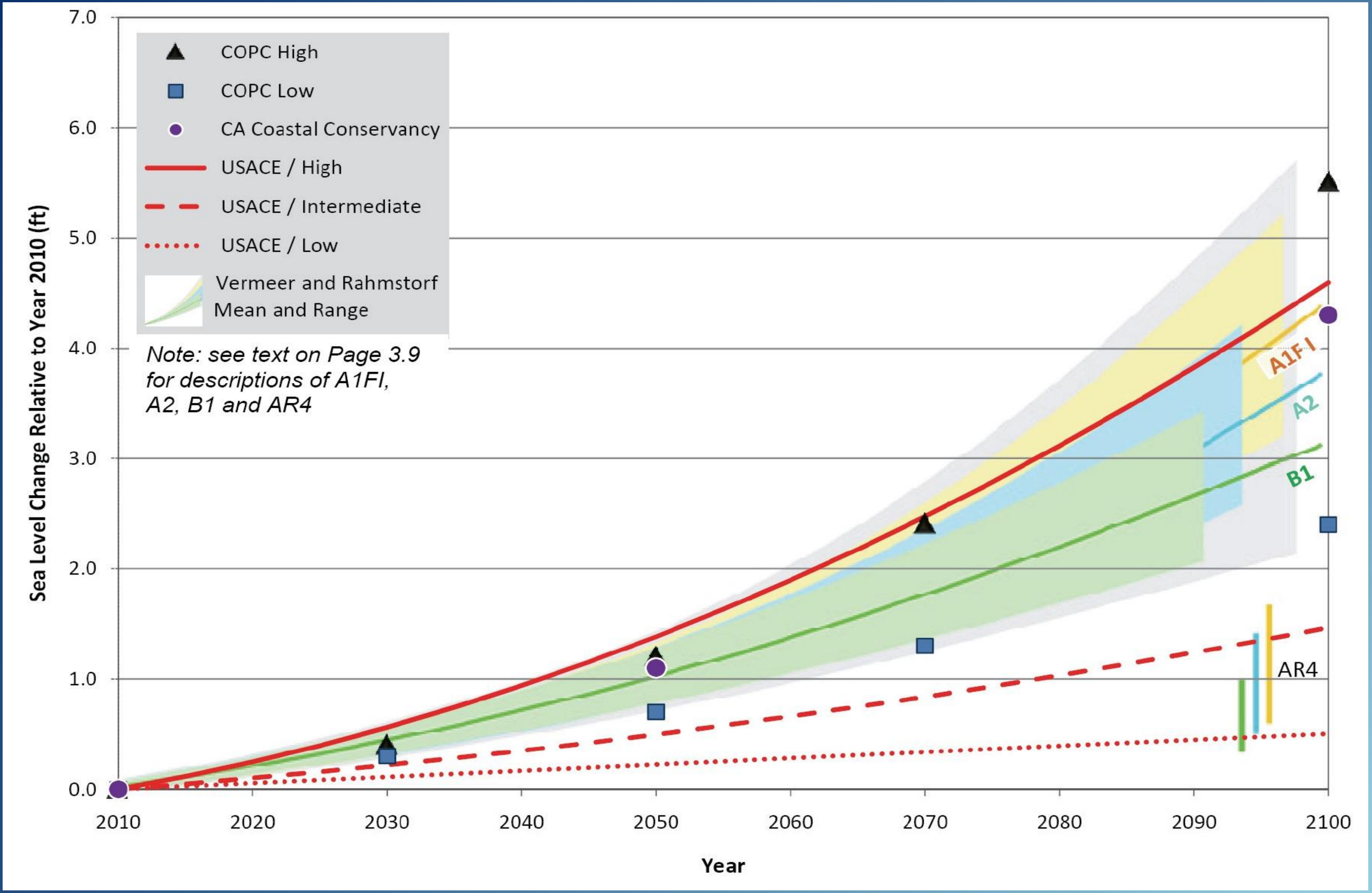
2050 Flood Scenario 8: w/o additional protection



2025 Flood Scenario 6



Sea Level Rise Projections



New Seawall – Option 1
H-piles and Concrete Wall (Lag) Panels
(No tiebacks)

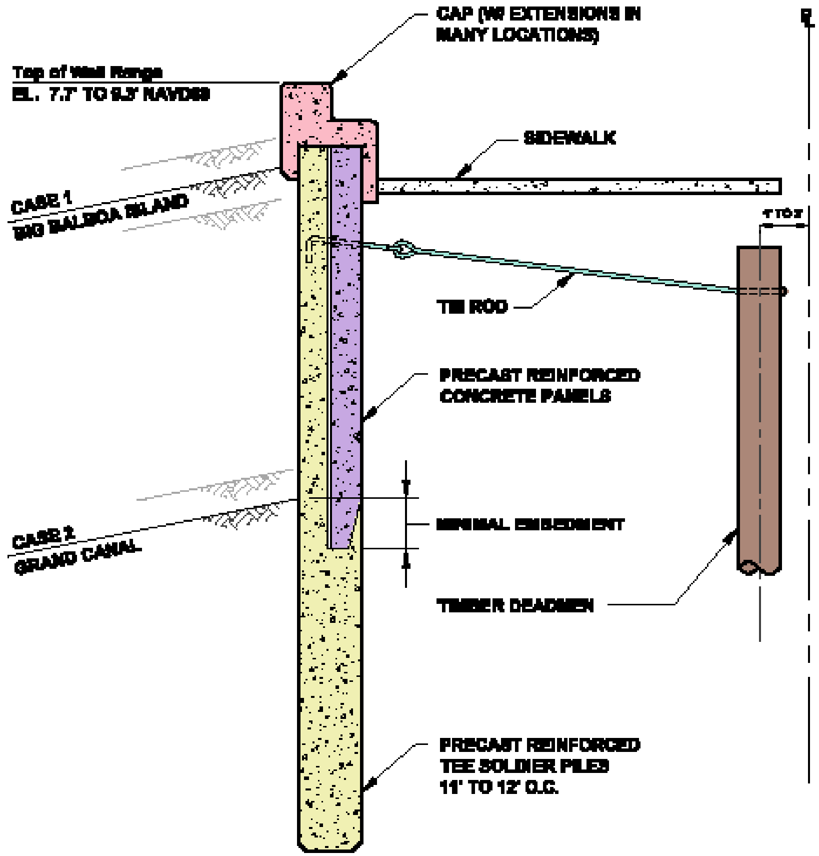
New Seawall – Option 2
Steel Sheet Pile Bulkhead
(No tiebacks)

Seawall Condition

- Seawall Age: 73-82 years
- Overall Condition: FAIR. Widespread cracking, some concrete spalling and rebar corrosion.
- Seismic concerns
- Estimated Useful Life: 10-25 years

Distresses in Bulkhead Cap

Crack Repairs with Corroding Rebar



TYPICAL WALL CASES[1]

[1] OTHER NON-TYPICAL CONDITIONS EXIST

SK-1

DATE: 5/4/11

URS

CITY OF NEWPORT BEACH

Key Recommendations

1. Construct new seawalls at 9.8 feet [NAVD88]. (2020-2030)
2. If needed, construct 6-inch cap on existing seawalls as an interim measure.
3. Extend new seawalls up to 14 feet [NAVD88] if necessary. (2050-2060)
4. Construct dewatering system to address groundwater .

Rising Groundwater

- Existing 1st Floor Elevations: 6.2 to 11.6 feet [NAVD88]
- 2050 high groundwater elevation: 6.1’
- 2100 high groundwater elevation: 9.3’

➢ Recommendation: Establish new lowest floor elevation

Design Costs

1. CONCEPT DEVELOPMENT ($317,000)

2. SEAWALL STUDIES AND REPORTS ($245,000)

3. CEQA AND PERMITS ($315,000)

4. CONSTRUCTION DOCUMENTS ($449,000)
   (Total Tasks 1-4: $1.3 million over 3 years)

Construction Costs (2020-2030)

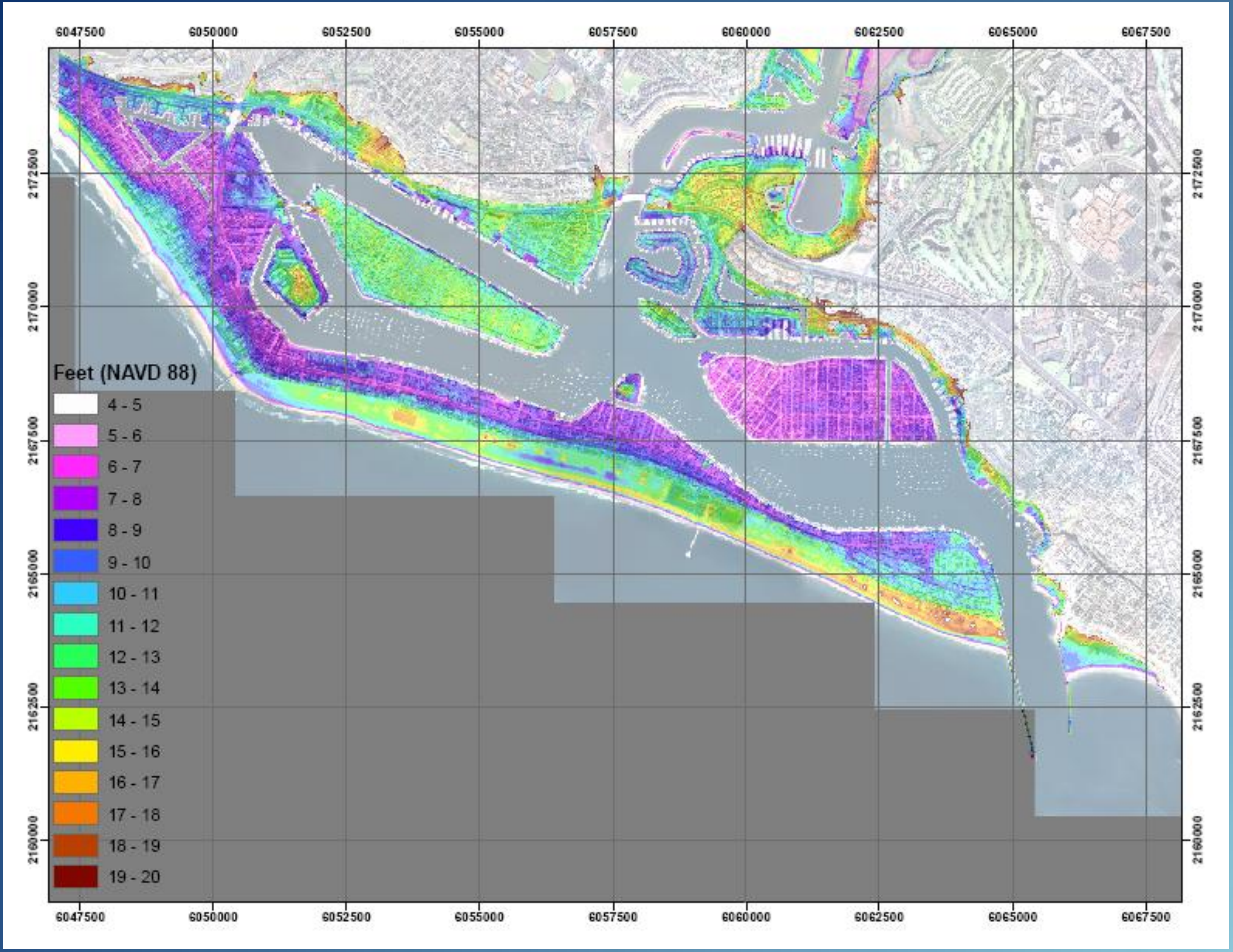
1st PHASE: Grand Canal and West End
(~ $20 million)

2nd PHASE: Bridges and Ferry
(~ $5 million)

3rd PHASE: Remaining Walls
(~ $40 million)

Task 1: Concept Development

a. Wall Requirements and Impacts
b. Raise Boardwalk
c. Frontage Property Drainage
d. Dock and Pier Access & Connections
e. Beach Access
f. Street End Modifications
g. Storm Drain and Tide Gates
h. Above/Below Ground Utility Impacts
i. Bridge Access
j. Ferry Impacts



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19 - 20

Task 2: Seawall Studies and Reports

1. Topographic and Hydrographic Surveys
2. Hydrodynamic Evaluation (Wave and Current Loading on Seawalls)
3. Geotechnical Investigation
4. Marine Biology Surveys
5. (Beach Sand Replenishment)

Task 3: CEQA and Permits

1. Mitigated Negative Declaration
2. Coastal Development Permit
   - CCC
3. Surface Lease Agreement
   - State Lands Commission
4. 401 Water Quality Certification
   - RWQCB
5. 404 Standard Individual Permit
   - Corps of Engineers

Task 4: Construction Documents

1. Seawall Structural Design
2. Boardwalk and Drainage Design
3. Street-End Modifications
4. Utility Relocation
5. Drawing Package – 1st Phase (55 Sheets)
6. Specifications and Cost Estimate

Funding Summary

1. Concept Development, Special Studies, Permitting, Entitlement and Construction Documents by Consultant
   ($1.3 million)
2. Seawall Construction – 1st Phase
   (~$20 million)
3. Seawall Construction – 2nd and 3rd Phases
   (~$46 million + detailed design costs)

End Slide

Supplementary slides follow

Little Balboa Seawall Cap Extension

Earth Anchors at Balboa Island Ferry Landing

Sidewalk Separation from Seawall

Street Flooding Overtopping Curb

(December 22, 2010)

Flood Inundation Modeling

Seawall overtopping depends on:

1. Seawall elevation
   a. Existing
   b. w/ 6-inch cap
   c. w/ new of seawall at Elev. 10.0’ MLLW
2. Predicted Future Seawater level

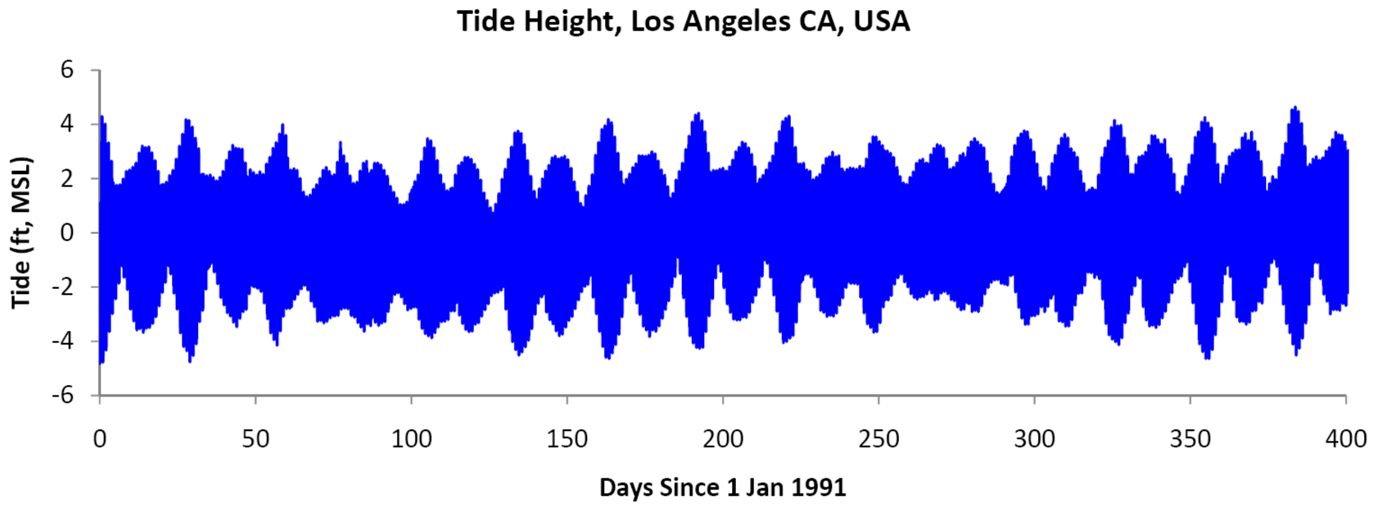
Predicting Seawater Level

Model uses:

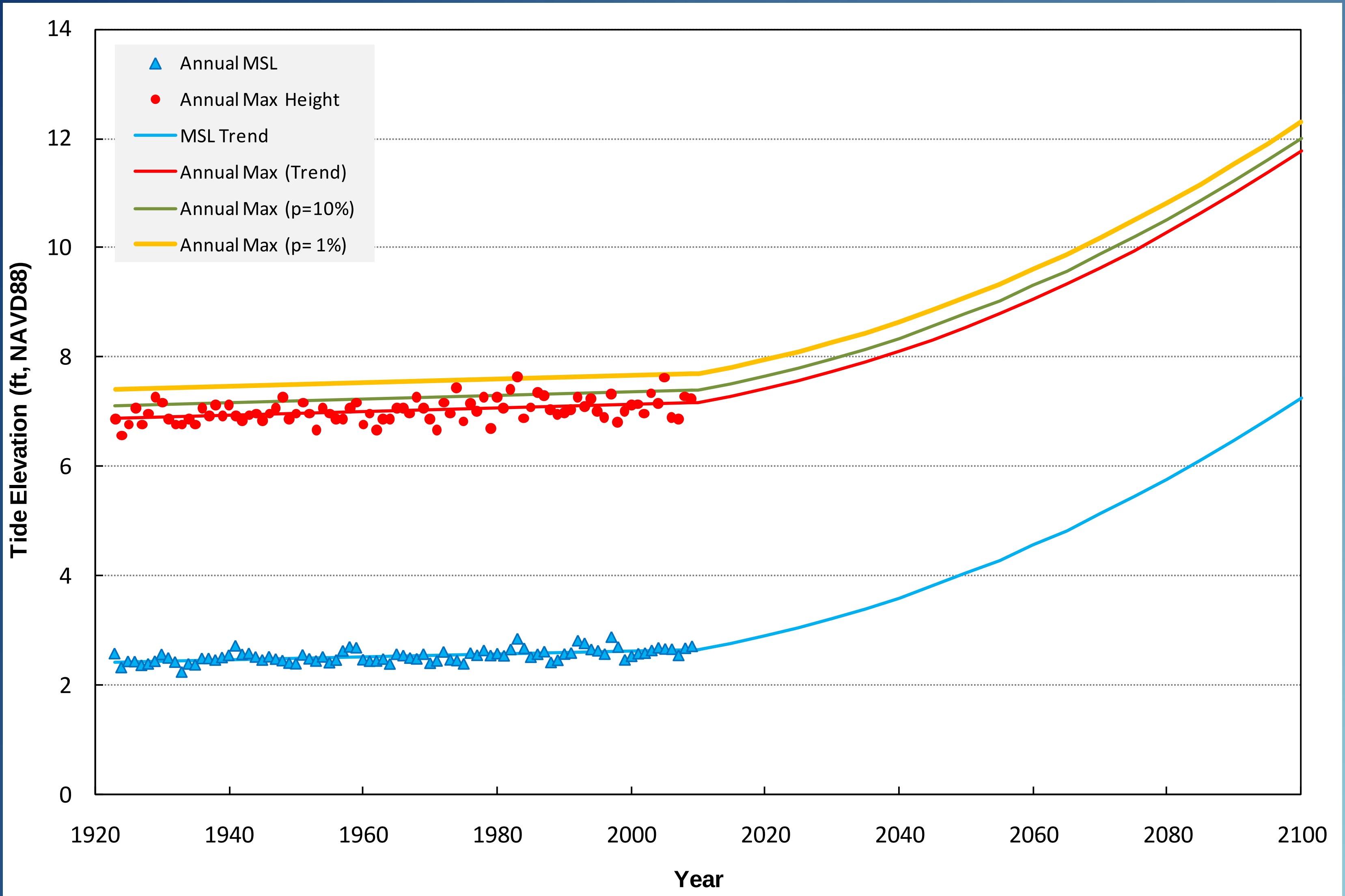
1. Extreme high tide
2. Accounts for expected rise is mean sea level
3. Adds ocean swell or wind waves

Extreme High Tide

Extreme High Tide



Projections of Mean Sea Level and Extreme Tide Heights Through Year 2100



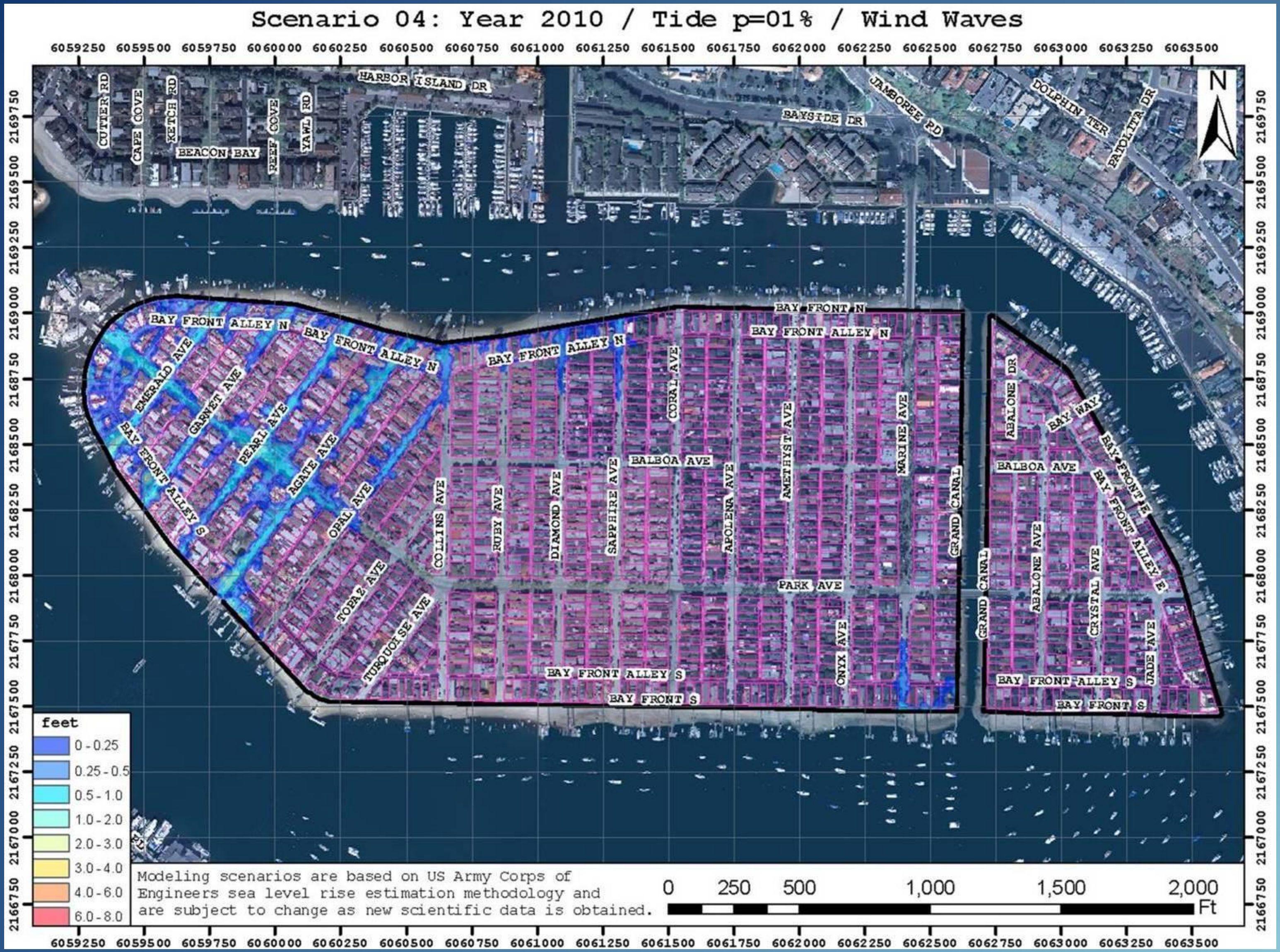
Flood Inundation Modeling Scenarios

Scenario	Seawall Condition	Year	Sea Level Rise From 2010	Tide Height (Annual Exceedance Probability)	Wave Scenario
1	Existing Conditions	2010	NA	10%	No Waves
2	Existing Conditions	2010	NA	10%	Wind Waves
3	Existing Conditions	2010	NA	10%	Ocean Swell
4	Existing Conditions	2010	NA	1%	Wind Waves
5	Existing Conditions	2025	0.40 ft	10%	Wind Waves
6	Existing Conditions	2025	0.40 ft	10%	Ocean Swell
7	Existing Conditions	2025	0.40 ft	1%	Wind Waves
8	Existing Conditions	2050	1.38 ft	10%	No Waves
9	Existing Conditions	2050	1.38 ft	1%	No Waves
10	Existing Conditions	2100	4.60 ft	10%	No Waves
11	6-inch extension	2010	NA	1%	Wind Waves
12	6-inch extension	2025	0.40 ft	1%	Wind Waves
13	10 ft (MLLW) seawall	2010	NA	1%	Wind Waves
14	10 ft (MLLW) seawall	2025	0.40 ft	1%	Wind Waves
15	10 ft (MLLW) seawall	2050	1.38 ft	1%	Wind Waves
16	10 ft (MLLW) seawall	2050	1.38 ft	10%	Wind Waves
17	10 ft (MLLW) seawall	2100	4.60 ft	1%	Wind Waves

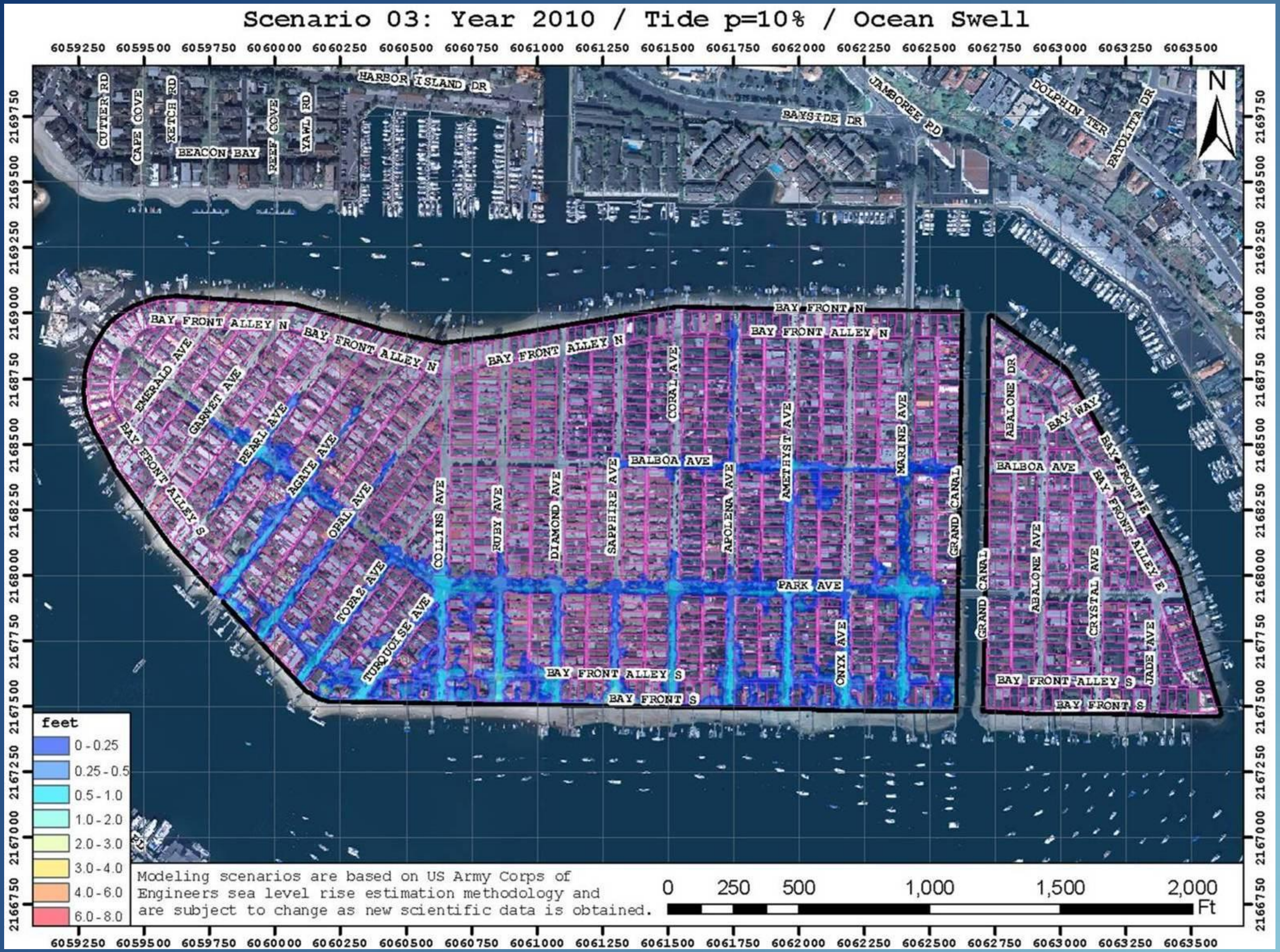
Average Flood Depth, Parcel and Building Impacts Associated with Each Model Scenario

Scenario	Year	Tide Height (Annual Exceedance Probability)	Wave Scenario	Average * Flood Depth (ft)	Impacted** Parcels (number)	Parcels Impacted (%)	Impacted*** Buildings (number)	Impacted Buildings (%)	Flood Extent Figure Number
Existing Condition Scenarios									
1	2010	10%	No Waves	0.26	61	4.0	3 ± 2	0.2	Figure 3.5
2	2010	10%	Wind Waves	0.26	61	4.3	3 ± 2	0.2	Figure 3.6
3	2010	10%	Ocean Swell	0.29	514	36.5	24 ± 5	1.7	Figure 3.7
4	2010	1%	Wind Waves	0.36	324	23.0	22 ± 4	1.5	Figure 3.8
5	2025	10%	Wind Waves	0.48	681	48.3	66 ± 7	4.7	Figure 3.9
6	2025	10%	Ocean Swell	0.79	1,176	83.4	235 ± 13	16.6	Figure 3.10
7	2025	1%	Wind Waves	1.16	1,179	83.6	420 ± 14	29.8	Figure 3.11
8	2050	10%	No Waves	1.84	1,410	100.0	894 ± 17	63.4	Figure 3.12
9	2050	1%	No Waves	2.15	1,410	100.0	1047 ± 15	74.3	Figure 3.13
10	2100	10%	No Waves	5.02	1,410	100.0	1410 ± 1	100.0	Figure 3.14
6-inch Extension Scenarios									
11	2010	1%	Wind Waves	0.03	0	0.0	0	0.0	Figure 3.15
12	2025	1%	Wind Waves	0.12	12	0.9	0-1	<0.1	Figure 3.16
10-foot Seawall Scenarios									
13	2010	1%	Wind Waves	0	0	0.0	0	0.0	Figure 3.17
14	2025	1%	Wind Waves	0	0	0.0	0	0.0	Figure 3.18
15	2050	1%	Wind Waves	0	0	0.0	0	0.0	Figure 3.19
16	2050	10%	Wind Waves	0	0	0.0	0	0.0	Figure 3.20
17	2100	1%	Wind Waves	5.30	1,410	100.0	1410 ± 1	100.0	Figure 3.21

2010 Flood Scenario 4: Wind Waves



2010 Flood Scenario 3: Ocean Swell

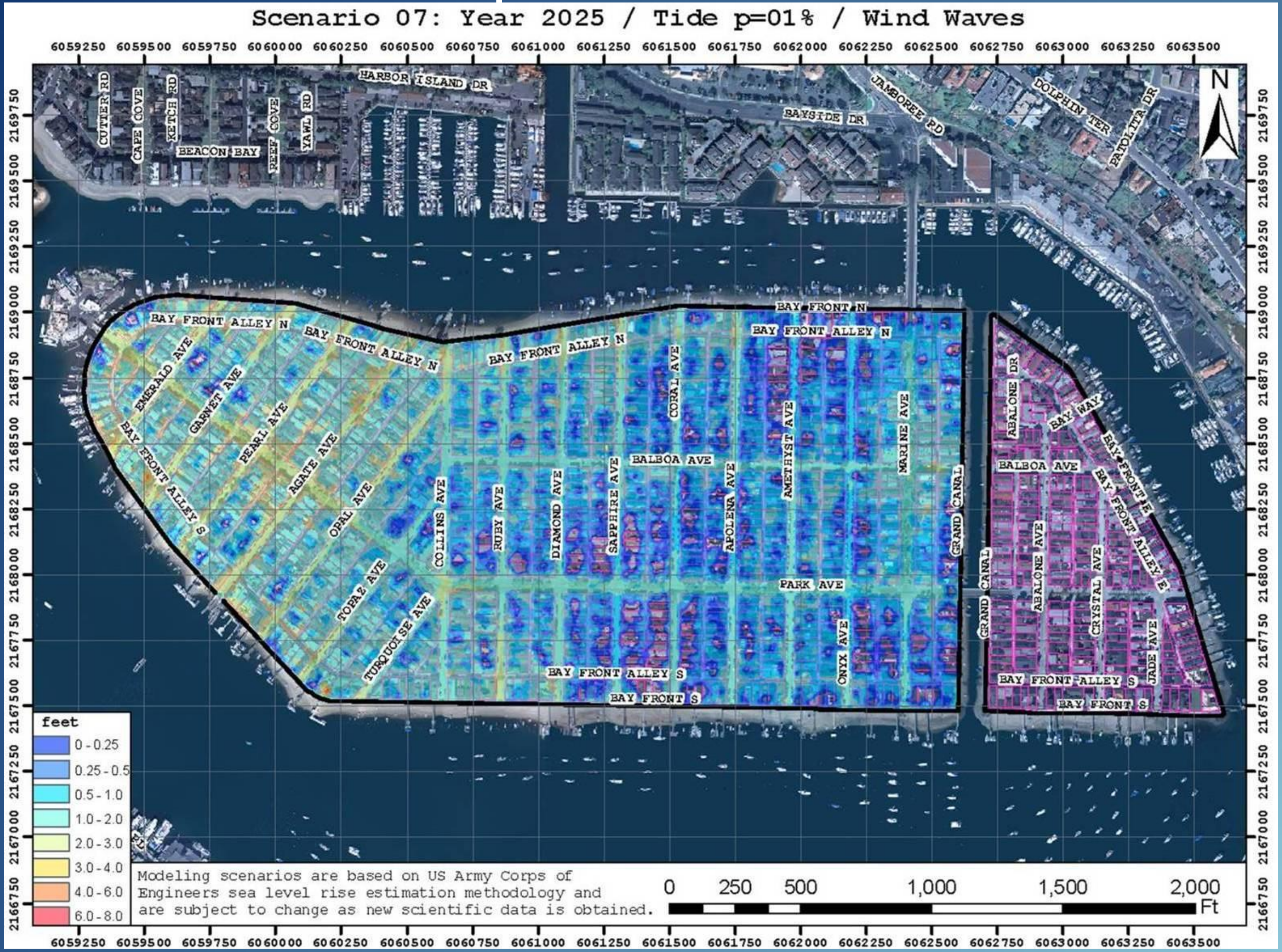


December 2010 Flooding on Turquoise
Extreme Tide p=40% w/ Ocean Swell

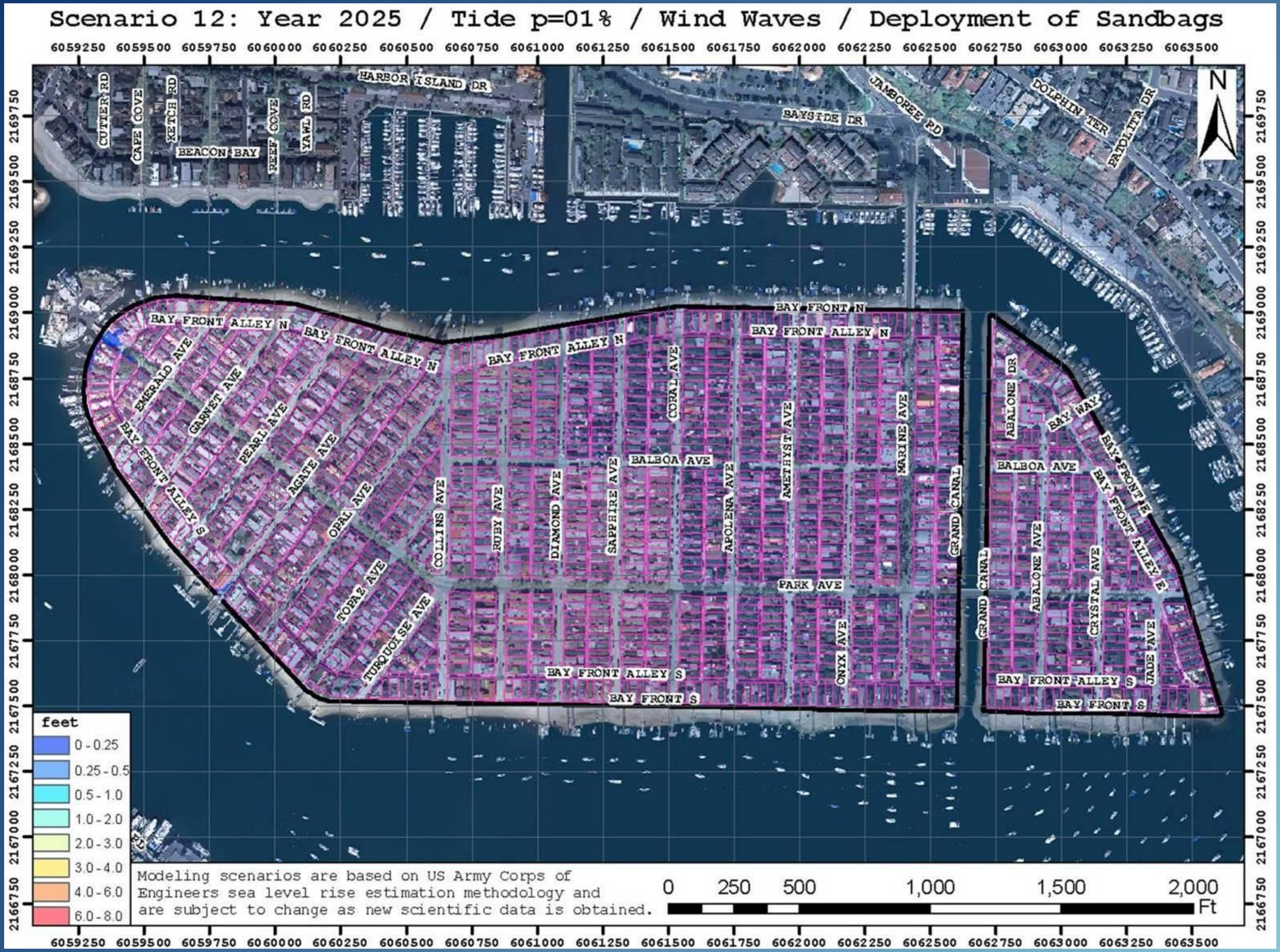
Flooding at Balboa Island Ferry Landing

(2005 Flood Event)

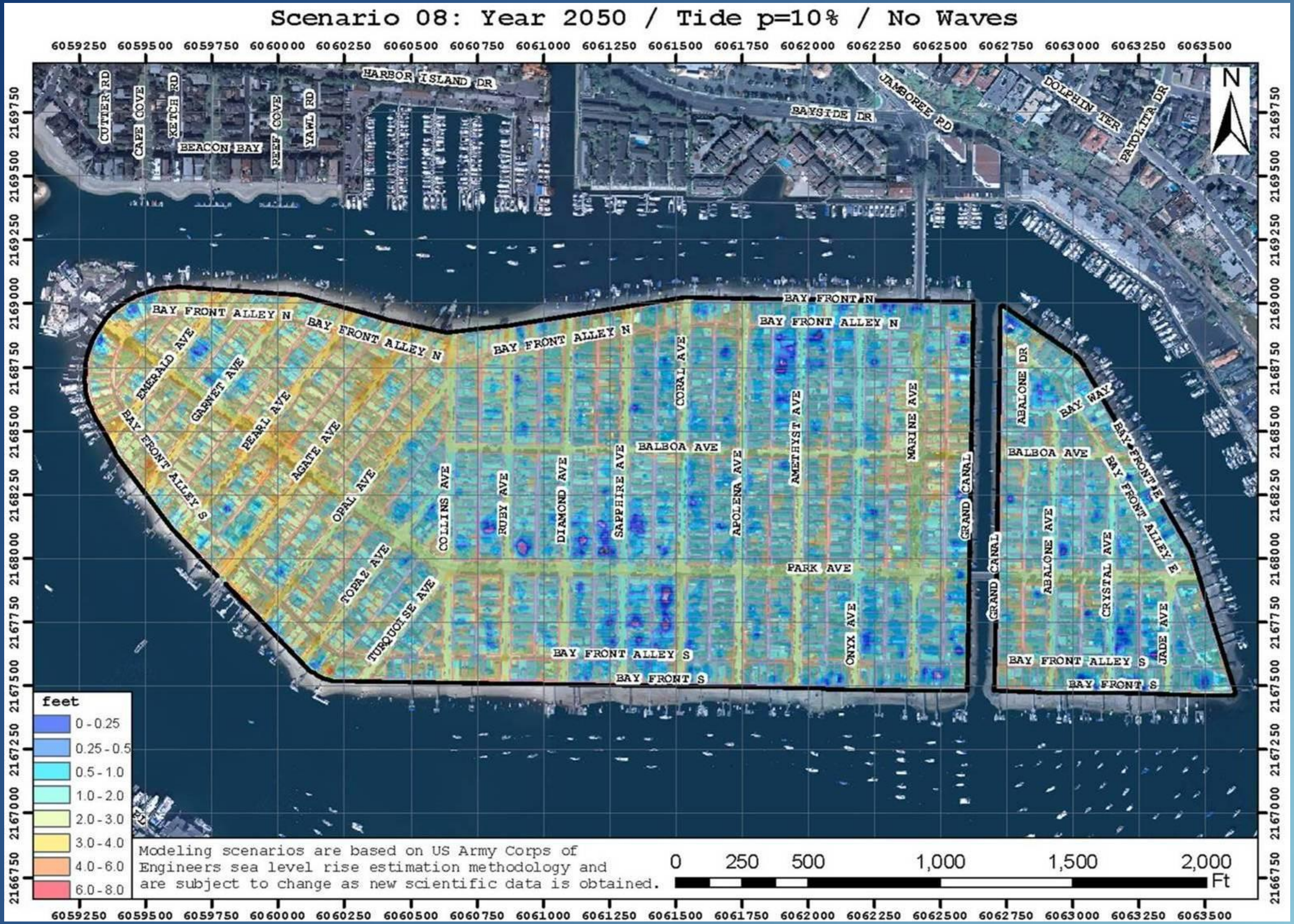
2025 Flood Scenario 7: w/o additional protection



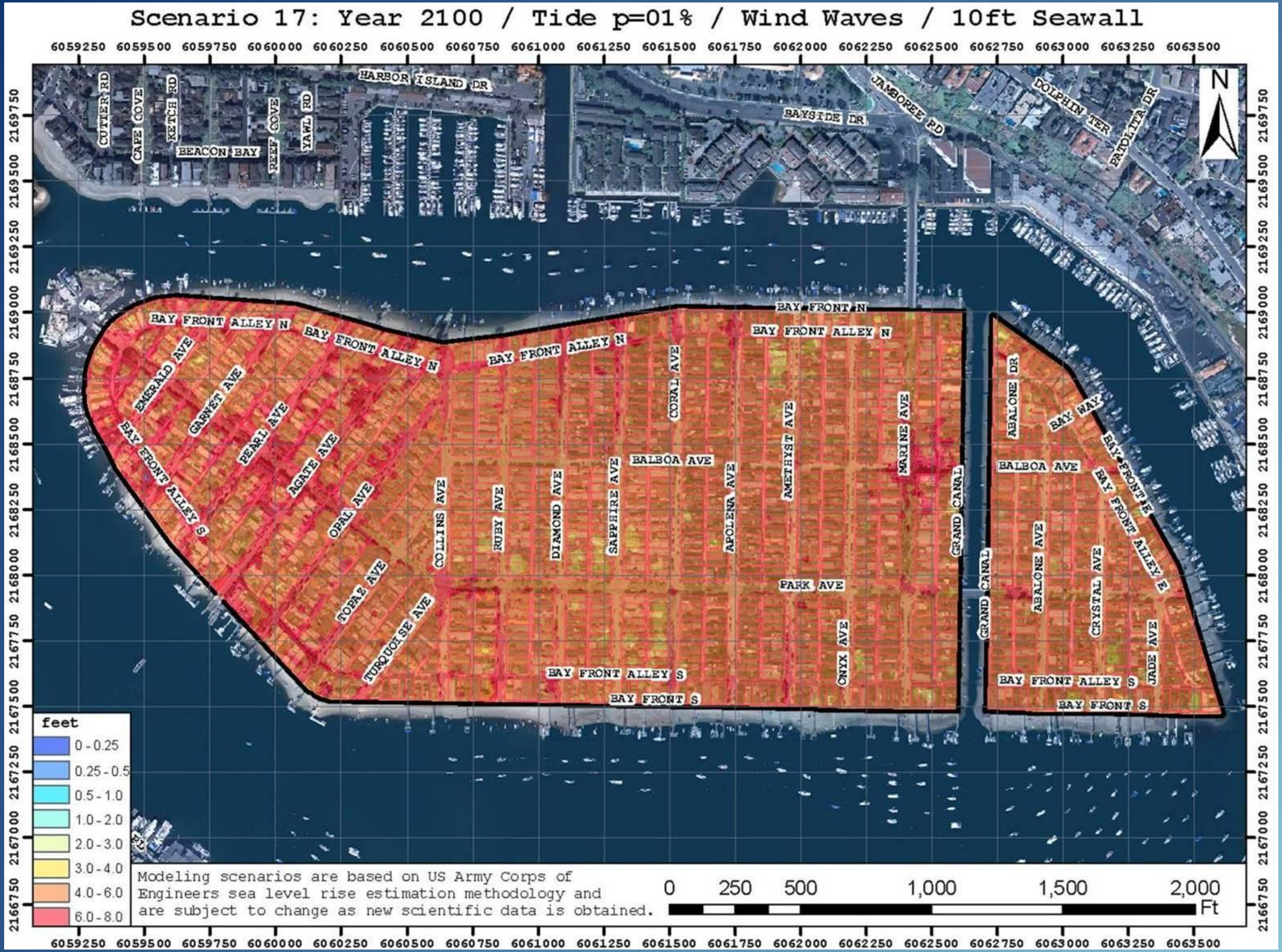
2025 Flood Scenario 12: w/ 6-inch cap



2050 Flood Scenario 8: w/o additional protection



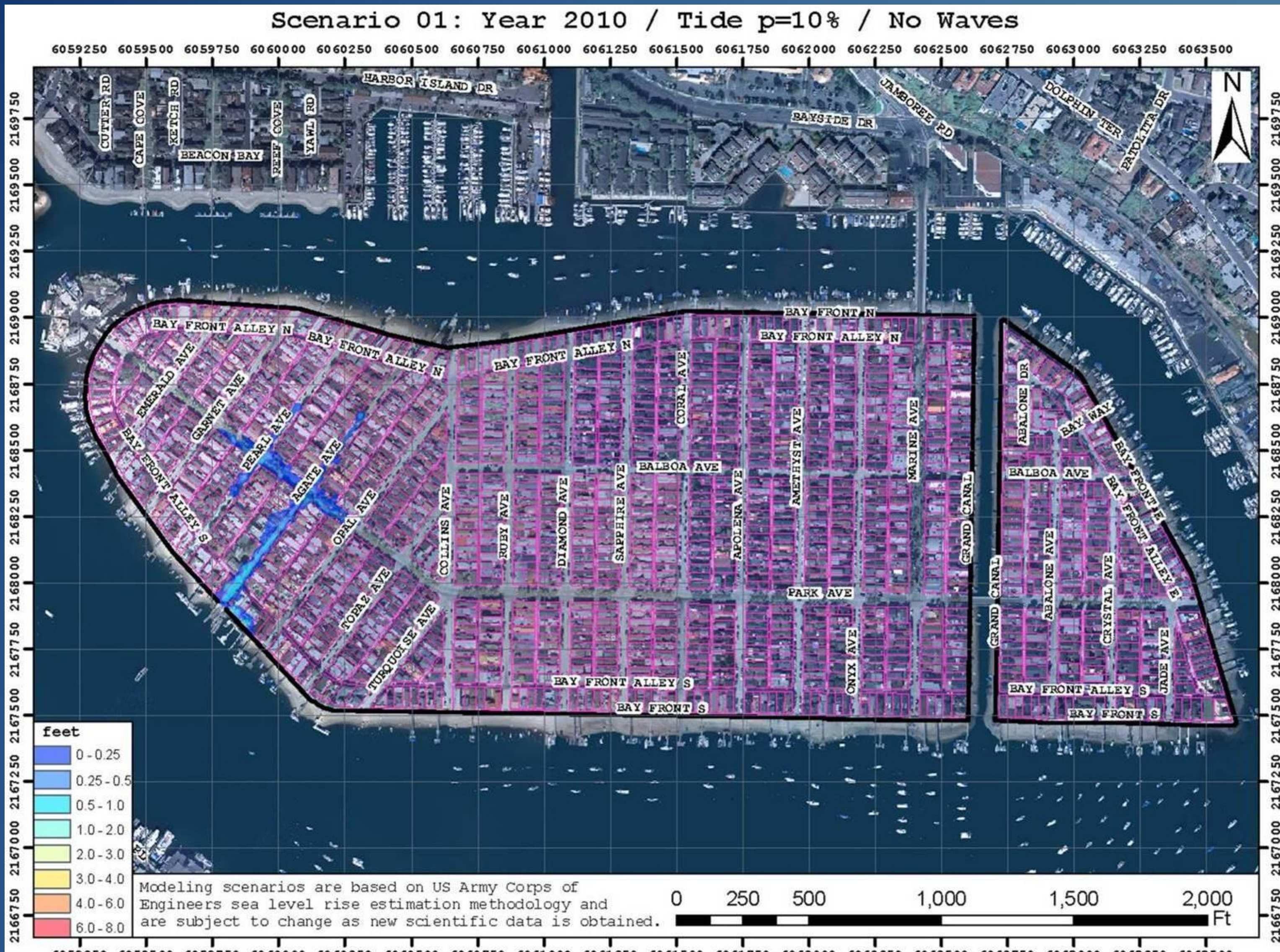
2100 Flood Scenario 17: w/o Seawall Extensions



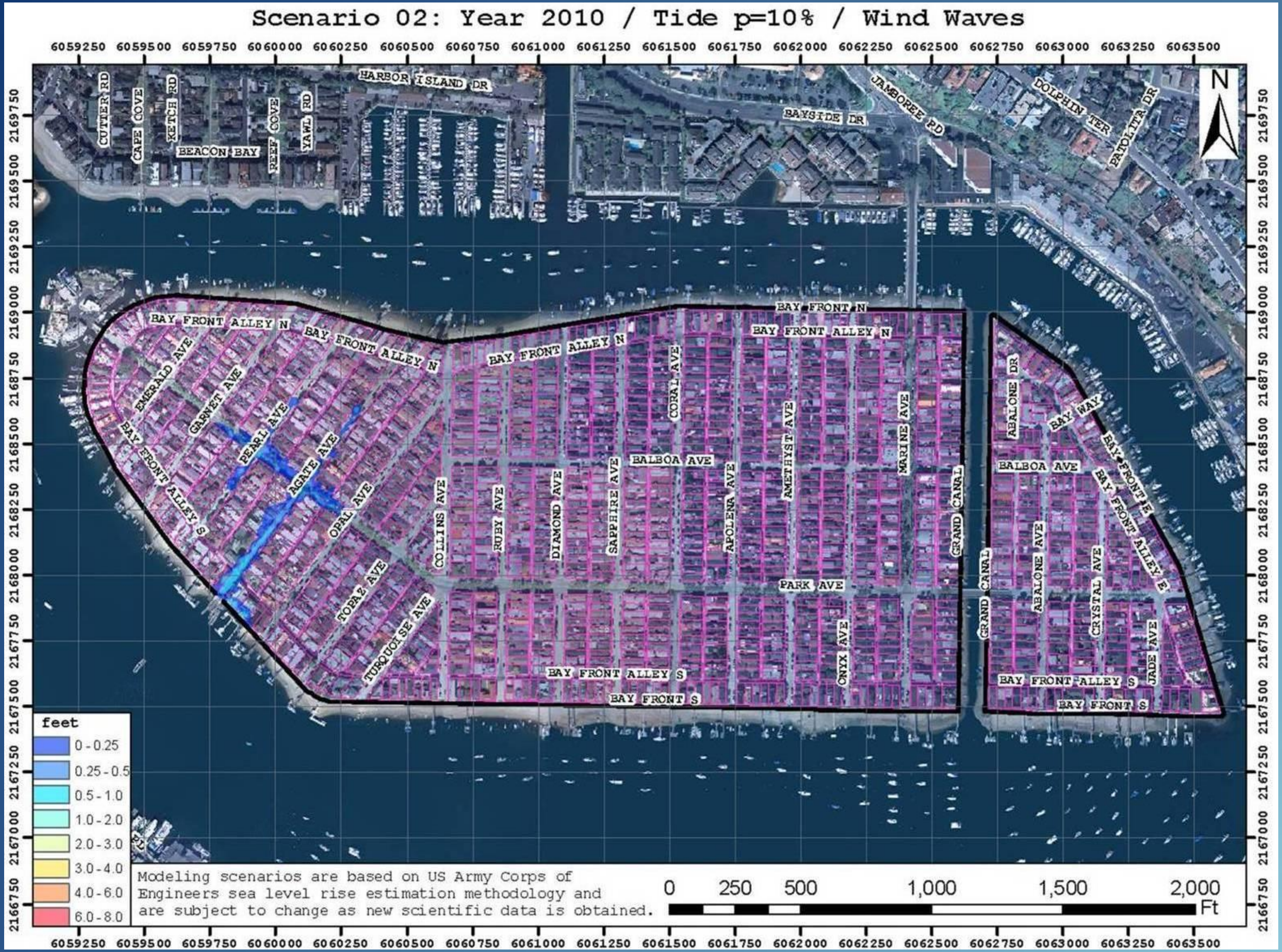
Protection Option: Seawall Extension

1. Extend existing cap 6 inches
2. Remove existing cap and replace with 6-inch taller cap
3. Lower cost option: Use sandbags or geotextile bags

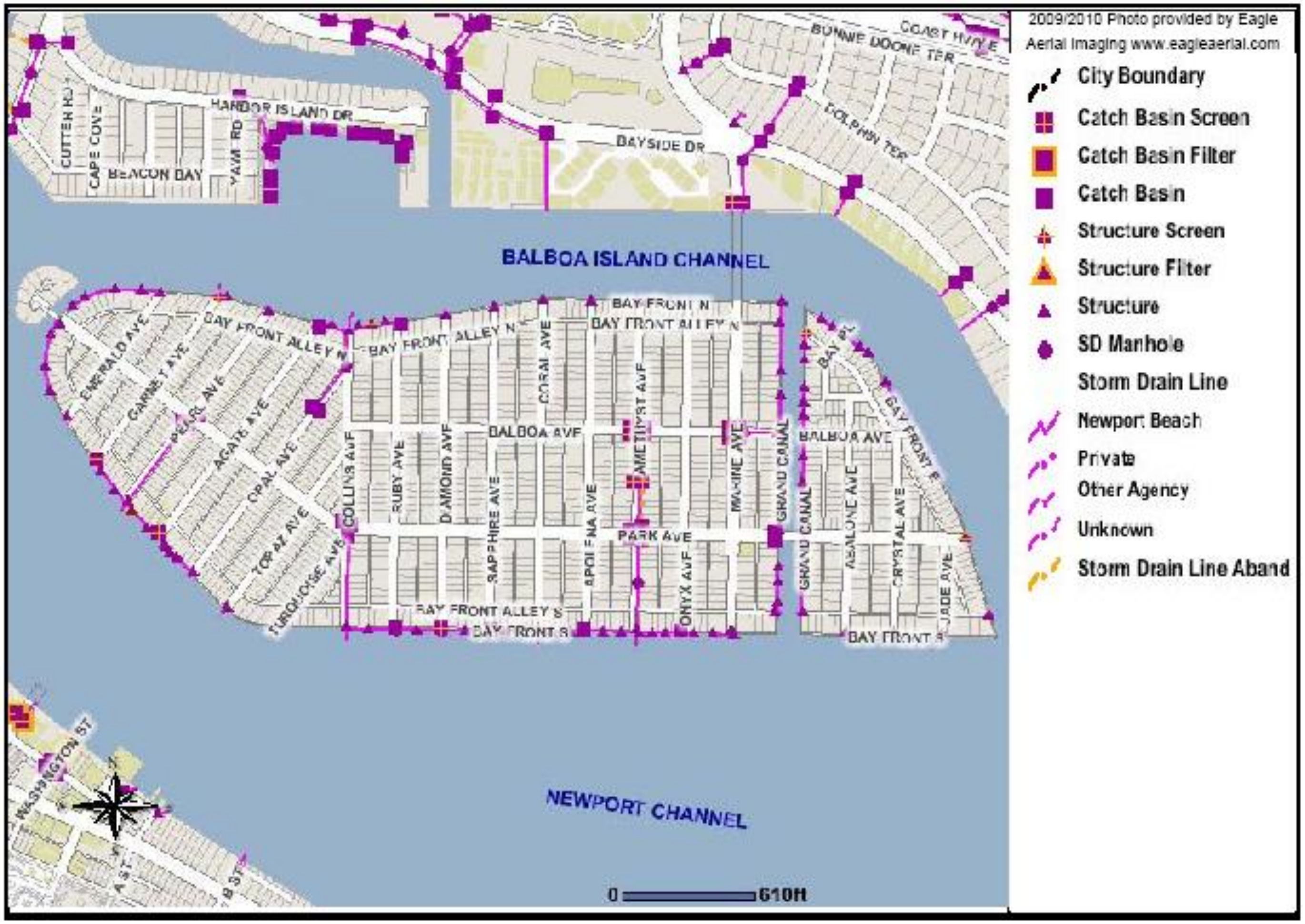
Flood Scenario 1



Flood Scenario 2



2035 Flood Scenario 12: w/ 6-inch cap



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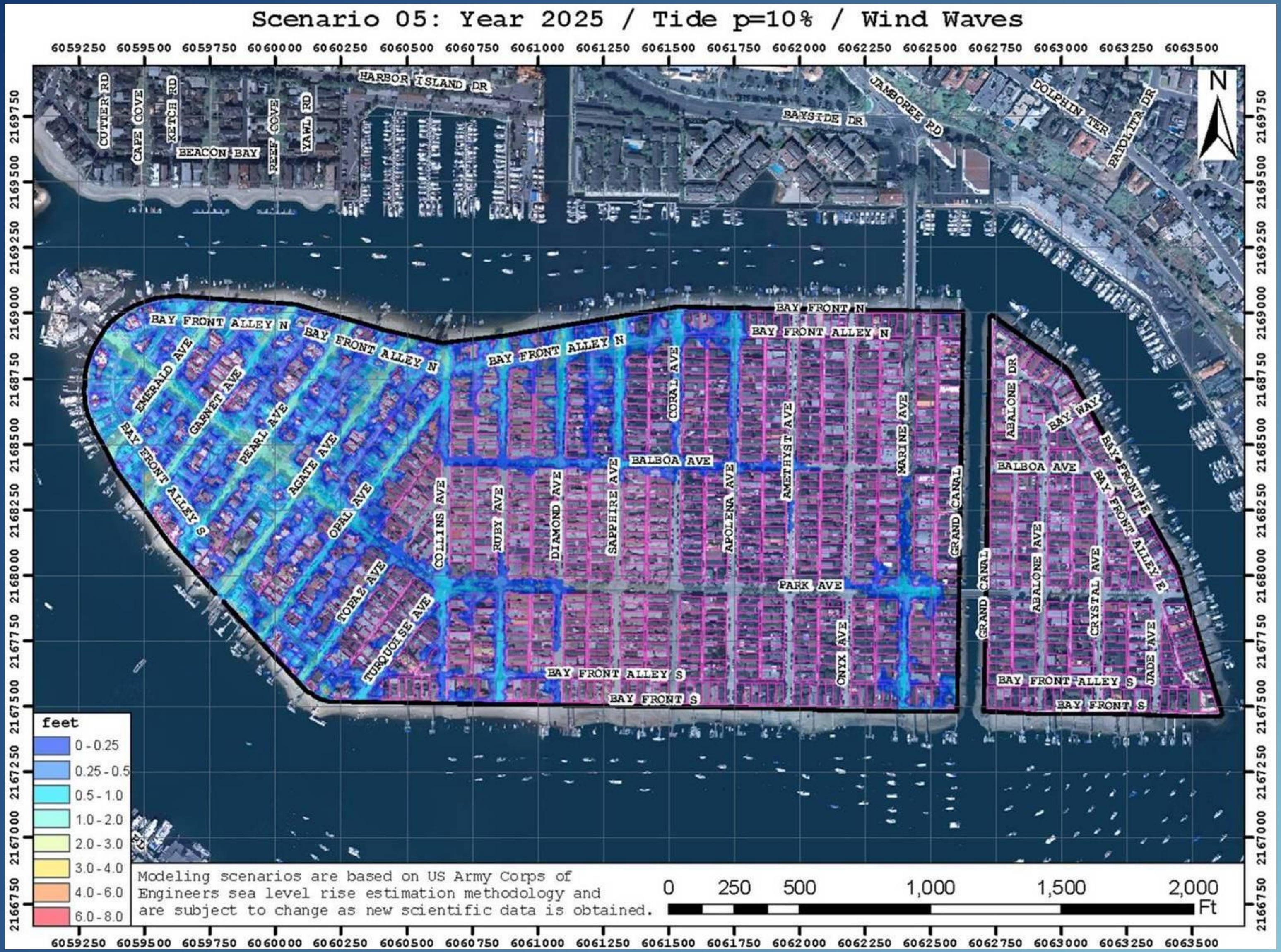
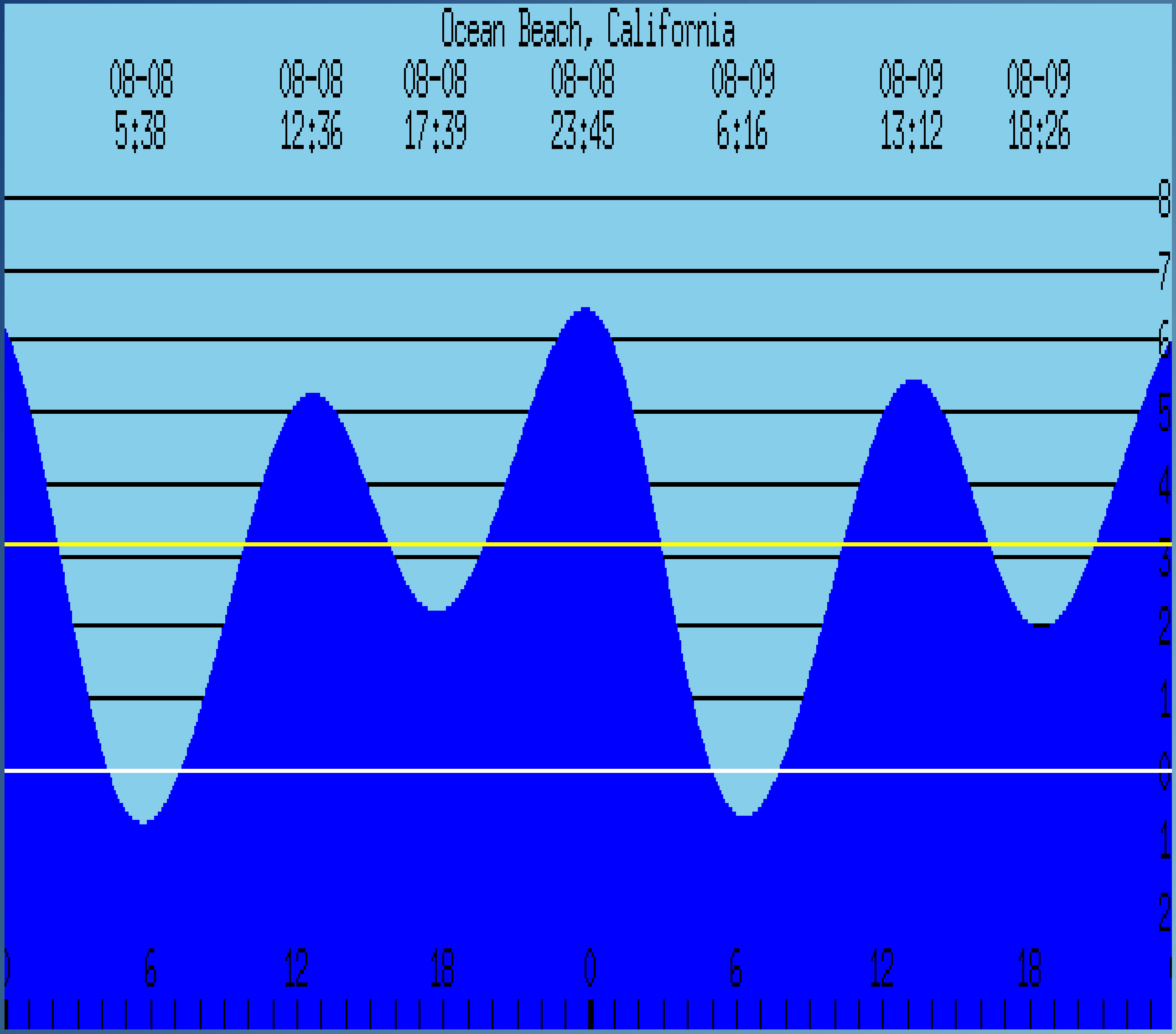
Flood Scenario 5




2100
2050
2025

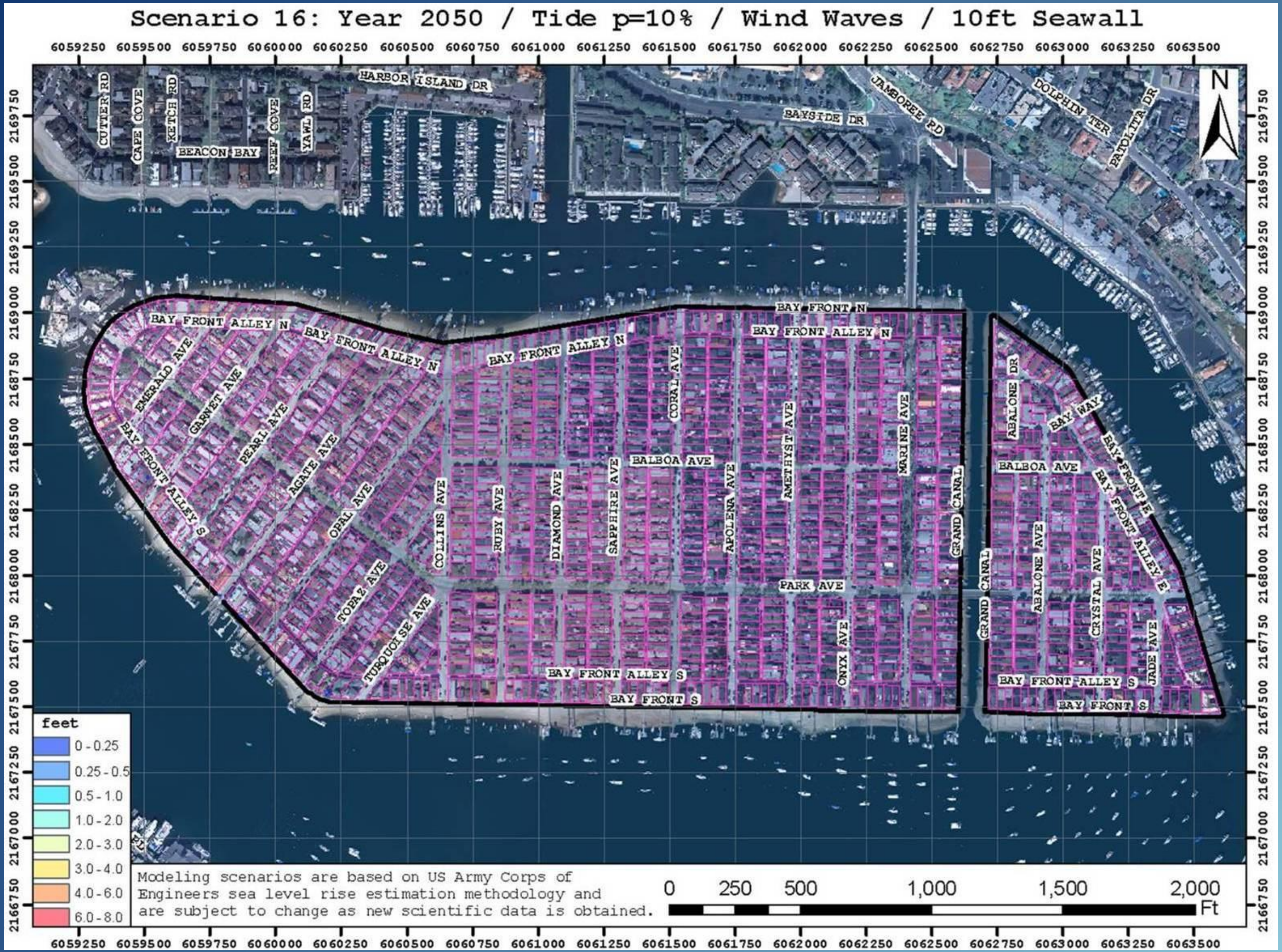
Rising High Tide



Harbor Protection

1. Private and Public Seawalls ($500 million +)
2. Storm Drain and Tide Gate Modifications
3. Groundwater Protection
4. Street End Modifications
5. Utilities Protection
6. Pier and Dock Access
7. Beach Access
8. Beach Sand Replenishment

2050 Flood Scenario 16 w/ New Seawall at 9.8 feet
(NAVD88)



Summary & Recommendations

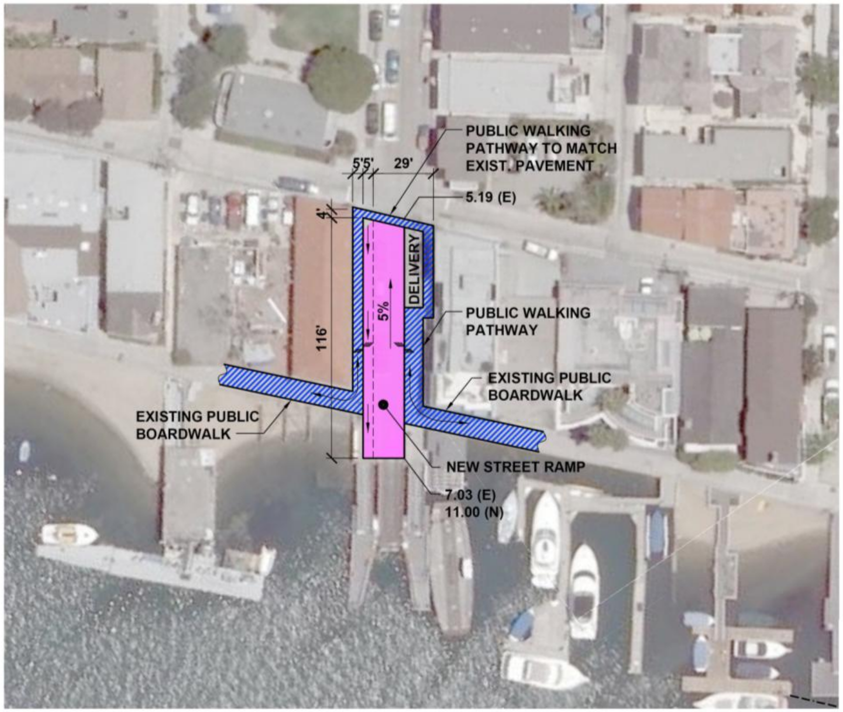
1. 2011-2020
   a. Review of codes, standards & policies
   b. Implement a community awareness program
   c. Establish new lowest floor elevation
   d. Harbor-wide planning for new seawalls at minimum 10 feet MLLW
   e. Balboa Islands seawall and bridge retrofit design and permitting
   f. Design for new ferry boat landing
   g. Identify funding sources

Summary & Recommendations

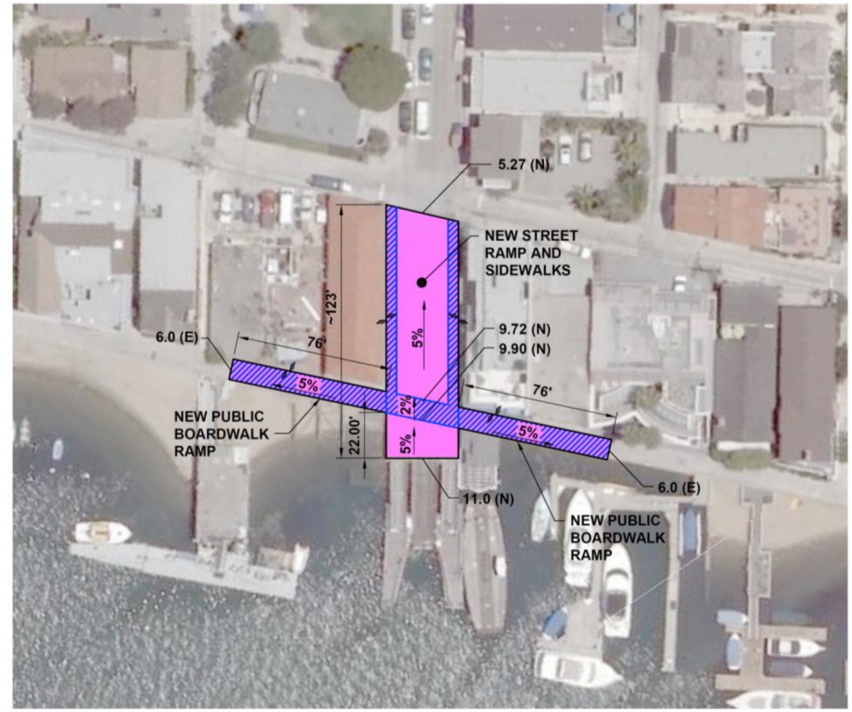
2. 2021-2035
   a. Construct new seawalls at 10’ MLLW.
   b. If needed, construct 6-inch cap on existing seawalls as an interim measure.

3. 2050-2060
   a. Extend new seawalls if necessary to 13 or 14 feet MLLW.
   b. Implement dewatering system or other means to address groundwater

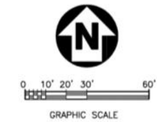
Two Options to Raise the Launch Ramp at Balboa Island Ferry Landing



Option 1
Street Approach Ramp with Diverted Walking Path
@ 8% : ELEV. 14.0



Option 2
Street Approach & Boardwalk Ramps
@ 8% : ELEV. 12.5



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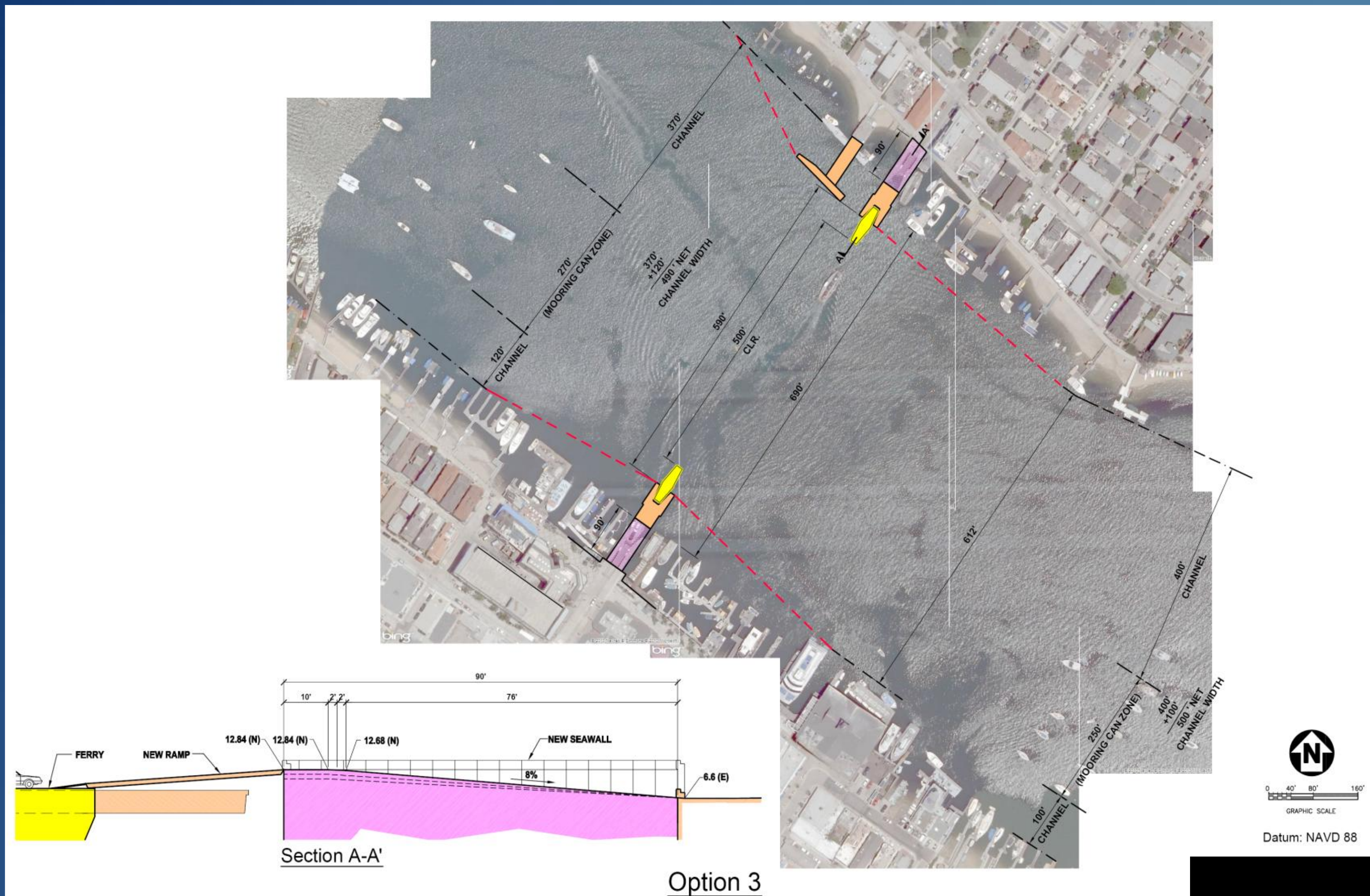
Balboa Island Ferry Modification Option



Seawall Construction Cost Estimates (Concept-Level)

Mitigation Component	Unit Price ($/LF) [1]	Conceptual Cost [2]
Interim Seawall Height Extension		
Alt. 1: New Seawall Cap	$625 - $725	$8.25 - $9.57 million
Alt. 2: Existing Seawall Cap Extension		
Option 1: Mechanical Extension	$250 - $300	$3.30 - $3.63 million
Option 2: Polypropylene Sandbags	$170 - $190	$2.26 - $2.52 million
Option 3: Geotextile Bags/Tubes	$130 - $160	$1.72 - $2.12 million
New Seawall		
Option 1: Steel H-Piles w/ Conc. Panels	$3,800 - $4,000	$50.20 - $52.80 million
Option 2: Steel Sheet Piles	$4,100 - $4,300	$54.10 - $56.80 million
Subsequent Seawall Extension: 3 – 4 feet (When/If Required)	$400 - $500	$5.30 - $6.60 million
Ferry Landing and Bridges		
Ferry Boat Landing and Fuel Dock Retrofit (All 3 Options)		$3.50 -$5.00 million
Bridge Retrofit (3 bridges)	$250,000 - $350,000 per bridge	$0.75 - $1.05 million
Total Estimated Program Cost [3]		**$61.47 - $79.02 million**