DOCKETED

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Project Title:	Huntington Beach Energy Project - Compliance
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Document Title:	Memo To: Joise McKinley From: Steve Tedesco P.E. Tetra Tech
Description:	Updated Sea Level Rise inundation and Tsunami Flood Hazards Technical Memorandum
Filer:	Cathy Hickman
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	3/11/2016 12:27:54 PM
Docketed Date:	3/11/2016

TETRA TECH

Memorandum

Date:	February 28, 2016
To:	Josie McKinley, Poseidon Water
From:	Steve Tedesco, P.E., Tetra Tech
Project:	Huntington Beach Desalination Project ***Project Number:*** 135-10908-12002
Subject:	Updated Sea Level Rise Inundation and Tsunami Flood Hazards Technical Memorandum

This Technical Memorandum provides an update to our January 22, 2016 *Sea Level Rise, Tsunami and Flood Hazards* memorandum and addresses the following two issues raised by Coastal Commission staff in its February 19, 2016 letter to Poseidon Resources:

(A) Analyze whether Poseidon's proposed Project site elevations and grading would direct water away from the Project site and onto nearby existing development and possibly cause offsite inundation and damage to those nearby properties.

(B) Analyze Poseidon facility's functionality should the area surrounding the site be inundated due to sea level rise.

In March, 2013, Tetra Tech completed a report entitled *Seismic, Tsunami and Flood Design Mitigation and Emergency Response Plan* ("Tetra Tech Hazard Mitigation Plan"). The Tetra Tech Hazard Mitigation Plan utilized site-specific hazard risk assessment information found in the March 2013 Geosyntec Consulting report ("2013 Geosyntec Report") entitled *Geotechnical Hazards Assessment for the Huntington Beach Seawater Desalination Project.*

In connection with pending Coastal Development Permit Application 9-15-1731 ("CDP"), Coastal Commission staff recently requested that Poseidon expand upon the Geosyntec Report's site hazard analysis to reflect a 50-year operating life (approximately 2020-2070) for the desalination facility that matches Poseidon's proposed water purchase agreement with the Orange County Water District. In response, Poseidon's September 2015 CDP application included an August 2015 technical memorandum from Geo-Logic Associates ("2015 Geo-Logic Report") that expands upon the 2013 Geosyntec Report and includes a 50-year site hazard analysis. In conducting its updated hazard assessment, the Geo-Logic Report utilized and relied upon the Coastal Commission's 2015 *Sea Level Rise Policy Guidance* document; the 2012 National Research Council's Report, *Sea-Level Rise for the Coasts of California, Oregon and Washington: Past, Present, and Future*; and the California Natural Resource Agency's 2014 *Safeguarding California* plan.

This technical memorandum is designed to update the Tetra Tech Hazard Mitigation Plan in response to Coastal Commission staff's February 19, 2016 letter. It provides updated proposed site hazard mitigation measures that Poseidon could take to address the worst-case sea level, tsunami and flood hazards of 14.5 feet of flooding hypothesized to affect the site under a scenario where the Project is impacted by an 11.0 ft. tsunami event on top of 3.5 ft. of sea level rise. Per Commission staff's request, this report includes updated tsunami flooding maps showing off-site flood levels (**Exhibits 3, 4 and 8**) and a revised grading plan (**Exhibit 2**).

17885 Von Karman Avenue, Suite 500, Irvine, CA 92614-6213
Tel 949.809.5000 **Fax** 949.809.8010 **tetratech.com**

SITE DESCRIPTION AND LAYOUT

The pending CDP proposes the construction and operation of a desalination plant with an output capacity of approximately 50 million gallons per day ("MGD"), or 56,000 acre feet per year ("Project"). The Project site is approximately 12 acres in size and is located at 21730 Newland Street in the City of Huntington Beach, a coastal city along the Pacific Ocean in northwestern Orange County. All components of the Project, including on and off-site Project elements, are proposed to be sized and built to accommodate and deliver approximately 50 MGD of product water. The Project would require the demolition of three fuel storage tanks and the remediation of any soil/groundwater that might be impacted by contamination associated with the Project site's prior use as a fuel storage facility. In addition, the existing interior berms that surround these fuel storage tanks would be demolished. On-site structures would consist of an administration building, a reverse osmosis facility building, pre-treatment filter structure, solids handling building, post-treatment structure, chemical storage structure, product water pump station and surge tank, flush tank, ammonia tank, fluoride tank, influent pump station, a 66 kV substation and associated connections to existing electrical transmission lines, electrical building, an aboveground product water tank, and appurtenant facilities (**See Exhibit 1**).

The Project's finished floor and grading elevations range from +9.0 feet MSL to approximately +14.0 feet MSL. The Site Grading Plan is attached as **Exhibit 2**.

1. Sea Level Rise Hazards and Risks

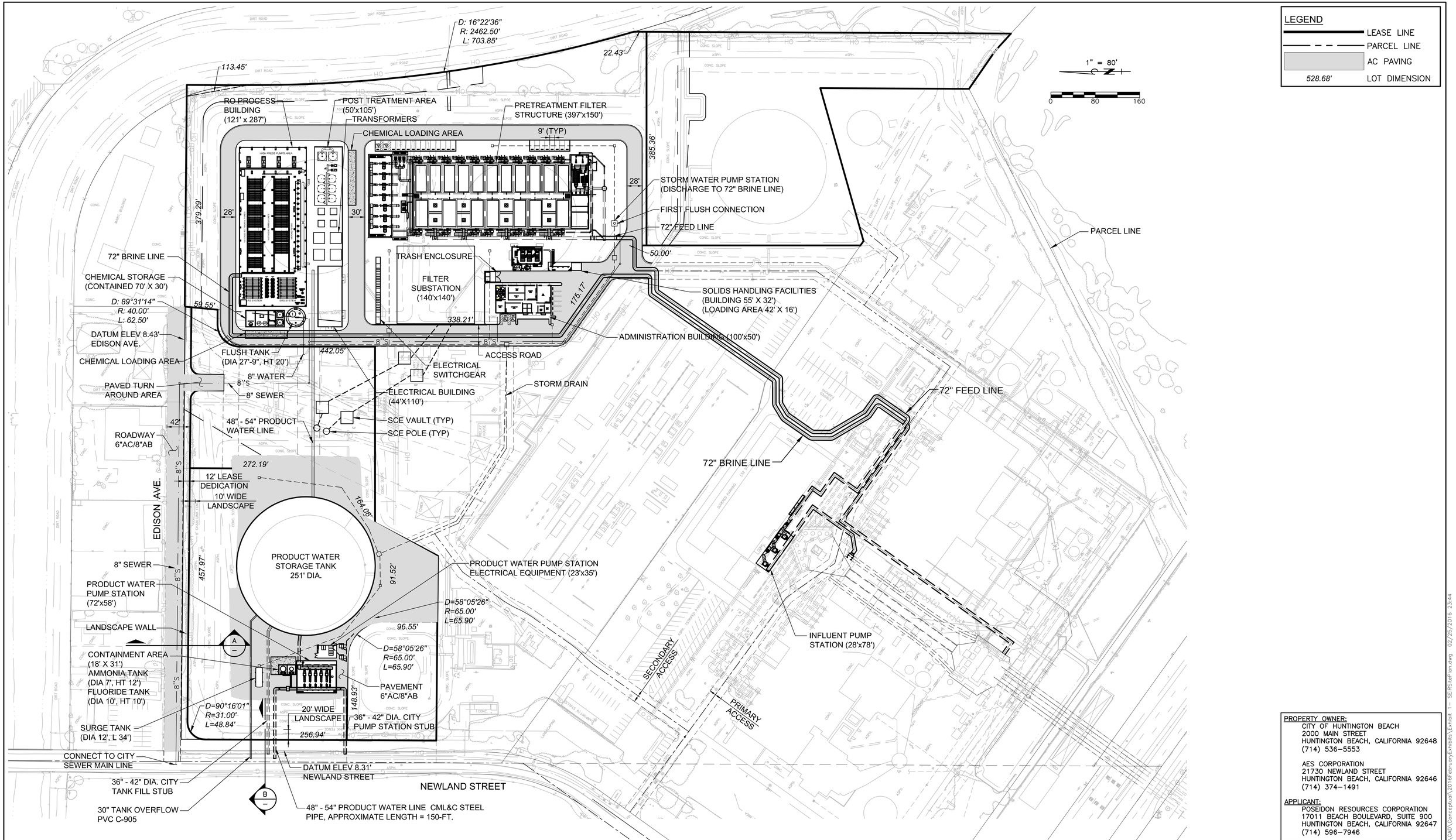
In the year 2070, at the end of the Project's anticipated 50-year operating life, the estimated projection for sea level rise according to National Research Council's 2012 report (*Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*) range from 0.8 to 3.5 ft. above MSL, with a mean value of 1.8 ft. The Coastal Commission's 2015 Sea Level Rise Policy Guidance document relied upon the National Research Council's 2012 report, which it calls the "the best available science on sea level rise for California."

The 2015 Geo-Logic Report assumes a worst-case 2070 sea level rise estimate of 3.5 feet of elevation and concludes that the Project's sea level rise risk profile does not materially change as a result of the planned 50-year operating life of the proposed Project. The 2013 Geosyntec Report and the 2015 Geo-logic Report consider 3.5 ft. MSL sea level rise to be conservative. The selected value of 3.5 ft. represents one "extreme" in that it corresponds to the last year (i.e., the highest projected sea level rise) of the planned 50-year operating life of the proposed Project. Concurrently, the selected value represents another "extreme" in that it corresponds to the upper bound of the projections presented in the NRC 2012 report.

Sea Level Rise Conclusion: The worst-case projected sea level rise of 3.5 ft. above MSL does not pose a hazard risk to the proposed Project as defined by the Coastal Act as it doesn't pose a risk to life and property[1]. The Project's current, finished floor and grading elevations range from approximately +9.0 feet MSL to approximately +14.0 feet MSL, well above the worst-case projected sea level rise of 3.5 ft. above MSL. Consequently the Project site would not be at risk of inundation or sea level rise impact.[2] Therefore, no mitigation measures are required for sea level rise.

[1] The Coastal Act (Pub. Res. Code Section 30253) requires that "*new development shall (a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard; and (b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.*"

[2] Sea Level Rise Impact is defined as "An effect of sea level rise on the structure or function of a system"; 2015 Final California Coastal Commission Sea Level Rise Policy Guidance, Page 185.



PROPERTY OWNER:
CITY OF HUNTINGTON BEACH
2000 MAIN STREET
HUNTINGTON BEACH, CALIFORNIA 92648
(714) 536-5553

AES CORPORATION
21730 NEWLAND STREET
HUNTINGTON BEACH, CALIFORNIA 92646
(714) 374-1491

APPLICANT:
POSEIDON RESOURCES CORPORATION
17011 BEACH BOULEVARD, SUITE 900
HUNTINGTON BEACH, CALIFORNIA 92647
(714) 596-7946

DRAWINGS PREPARED BY:
TETRA TECH
17885 Von Karman Ave, Suite 500
Irvine, California 92614
(949) 809-5000
(949) 809-5010 FAX

DRAWINGS PREPARED FOR:
POSEIDON RESOURCES
Poseidon Resources Corporation
17011 Beach Boulevard, Suite 900, Huntington Beach, California 92647
(714) 596-7946

PROJECT:
SEAWATER DESALINATION PROJECT
Huntington Beach, California

SITE PLAN
EXHIBIT 1

LEGEND

10.00 PROPOSED FINISHED GRADE/FLOOR

528.68' LOT DIMENSION

1" = 80'

0 80 160

D: 16°22'36"
R: 2462.50'
L: 703.85'

113.45'

22.43'

POST TREATMENT

TRANSFORMERS

12.06

12.66

12.35

CB 13.33

CB 12.20

385.36'

PRE TREATMENT PLANT 13.50

ACCESS ROAD

379.29'

RO PROCESS 14.00

11.45

CB 11.25

CB 12.40

12.00

50.00'

PARCEL LINE

TRASH ENCLOSURE

CHEMICAL STORAGE (CONTAINED)

FILTER SUBSTATION 12.00

11.25

175.17'

SOLIDS HANDLING FACILITIES

D: 89°31'14"
R: 40.00'
L: 62.50'

59.55'

12.15

338.21'

12.06

ADMINISTRATION BUILDING

8"S

8"S

CB 11.30

CB 10.33

442.05'

ACCESS ROAD

STORM WATER PUMP STATION

ELECTRICAL SWITCHGEAR

FLUSH TANK

PAVED TURN AROUND AREA

ELECTRICAL BUILDING

STORM DRAIN

72" FEED LINE

48"-54" PRODUCT WATER LINE

ROADWAY 6"AC/8"AB

42'

8"S

272.19'

72" BRINE LINE

12' LEASE DEDICATION

10.80

CB 9.00

164.06'

EDISON AVE.

PRODUCT WATER STORAGE TANK 251' DIA.

91.52'

CB 9.00

ELECTRICAL EQUIPMENT

457.97'

8"S

PRODUCT WATER PUMP STATION

D=58°05'26"
R=65.00'
L=65.90'

10.40

LANDSCAPE WALL

AMMONIA AND FLUORIDE STORAGE AREA

10.20

D=58°05'26"
R=65.00'
L=65.90'

CB 9.00

10.00

SURGE TANK 9.50

PAVEMENT 6"AC/8"AB

148.93'

D=90°16'01"
R=31.00'
L=48.84'

36" - 42" DIA. CITY PUMP STATION STUB

256.94'

INFLUENT PUMP STATION

SECONDARY ACCESS

PRIMARY ACCESS

CONNECT TO CITY SEWER MAIN LINE

36" - 42" DIA. CITY TANK FILL STUB

NEWLAND STREET

30" TANK OVERFLOW PVC C-905

48" - 54" PRODUCT WATER LINE CML&C STEEL PIPE, APPROXIMATE LENGTH = 150-FT.

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Irvine, California 92614
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DRAWINGS PREPARED FOR:

POSEIDON RESOURCES

Poseidon Resources Corporation
17011 Beach Boulevard, Suite 900, Huntington Beach, California 92647
(714) 596-7946

PROJECT:

SEAWATER DESALINATION PROJECT
Huntington Beach, California

ORIGINAL SITE GRADING PLAN EXHIBIT 2

The Project site is not located within the 100 year flood zone. Even the extreme worst case projection of sea level rise (i.e., 3.5 ft. above MSL in the year 2070) would not result in inundation impacts to the Project site, which has finished floor and grading elevations of 9 to 14 ft. above MSL. In response to Coastal Commission staff's February 19, 2016 letter, because the extreme worst case projection of sea level rise would not affect the Project site, the Project would not – and could not – direct water onto nearby existing offsite development causing property damage and risk to life as a result of sea level rise inundation alone.

Coastal Commission staff's February 19, 2016 letter also asked whether the Project's functionality would be compromised should the area surrounding the site be inundated due to sea level rise. It would not. For the vast majority of the desalination facility's operating life, sea level rise is projected to be lower than the 3.5 ft. above MSL that the Project's hazards evaluation is based on. All of the facility's landward components are located at elevations above 3.5 ft. MSL, which again is an extreme as it corresponds to the upper bound projection in the last year of the Project's 50 year operating life. The Project's one offsite, seaward component – the seawater intake – is submerged below the surface of the ocean and its operation would also not be affected by sea level rise. Finally, while a 3.5 foot sea level rise could affect site access from Pacific Coast Highway, access from the north using Newland Street would not be impacted. The elevation at Newland Street is currently at approximately 7.1 feet. This elevation rises as Newland continues to the North toward and eventually to the 405 Freeway.

2. Tsunami Hazards and Risks

The City of Huntington Beach's Local Hazard Mitigation Plan states "…the probability of a tsunami in the City of Huntington Beach is extremely low." The 2013 Geosyntec Report first performed a review of the technical literature regarding tsunami hazard in Southern California and conducted a site-specific tsunami hazard evaluation. Based on its research and site-specific evaluation, Geosyntec concluded that an extreme worst-case tsunami run-up height of 10 feet is appropriate for the site's tsunami hazard assessment. As indicated in the Cal EMA [2009] map, this value is already "…adjusted to 'Mean High Water' sea-level conditions, representing a conservative sea level…" The 2015 Geo-Logic Report similarly found that, based on the best available science, tsunami inundation depth at the site could range between 4.0 and 10.0 ft. for the range of tsunami hazard assessments considered.

Notwithstanding the conclusions in the 2013 Geosyntec Report and the 2015 Geo-Logic Report, the Coastal Commission staff has requested that Poseidon use a conservative approach and apply an extreme worst-case tsunami run-up elevation of 11.0 ft. to the Project. This technical memorandum therefore evaluates the potential impact upon the Project of a tsunami that inundates the Project at depths up to elevation 11.0 ft.

Tsunami Conclusion: The 2013 Geosyntec Report and 2015 Geo-Logic Report both concluded that tsunami hazard is not anticipated to present a significant risk to public health and safety at the Project site. According to the Project's SEIR, there will be approximately twenty personnel on site during desalination plant operations. The Orange County Grand Jury report on Tsunami Hazards [2008] found that the City of Huntington Beach has one of the most advanced tsunami early-warning systems in the County. The City of Huntington Beach and AES Huntington Beach have hazard mitigation plans that address tsunami risk to public health and safety

Possible tsunami impacts at the site related to a maximum flooding include seepage, soil erosion, and loading on proposed structures. The impact of seepage is anticipated to be small, as flooding will be temporary. The soil erosion impact also is likely to be small as much of the Site is anticipated to be covered with concrete or asphalt pavement.

Due to the Project site's finished floor and grading elevations of 9 to 14 ft. above MSL and the anticipated additional elevated rise around the structures methodology as identified in the 2013 Tetra Tech Hazard Mitigation Plan, 11.0 ft. tsunami inundation is not anticipated to pose a hazard risk at the Project site. Further, based on Geosyntec's and Geo-Logic's site specific analysis and recommended design measures, we conclude that the impacts of tsunami at elevation up to 11.0 ft. on the Project site can be mitigated using standard design and construction techniques as described below.

3. Combined Tsunami and Sea Level Rise Hazards and Risks

At the request of Coastal Commission staff, Tetra-Tech has evaluated the extreme worst-case sea level rise hazard conditions (i.e., inundation of 3.5 ft. above MSL in 2070 per the National Research Council's 2012 report) combined with the extreme worst-case sea tsunami conditions (i.e., flooding of 11.0 ft. above MSL per Coastal Commission staff), for a total site inundation flooding of 14.5 ft. above MSL in 2070. Geo-Logic concludes that the probability that this hazard scenario could occur during the 50-year design life of the desalination Project is one-tenth of one percent (0.1%).[3]

A tsunami that occurred in Huntington Beach, California would cover a large area of the coastline. The City of Huntington Beach's Flood Hazard Map actually indicates that a large portion of the City could experience flooding in an extreme tsunami. The Project site area represents less than one-half percent (1/2%) of the total area at risk to flooding during a tsunami, so any increase in flooding possibly caused by project site development would be so small it would not be measurable. As can be seen from a comparison of the two flooding maps, the Desalination Project would not result in any change to off-site flooding levels, even for those nearby properties that are significantly lower in elevation than the Poseidon property. The Project actually spreads the flooding out rather than concentrating it. This is due to the removal of the interior containment berms.

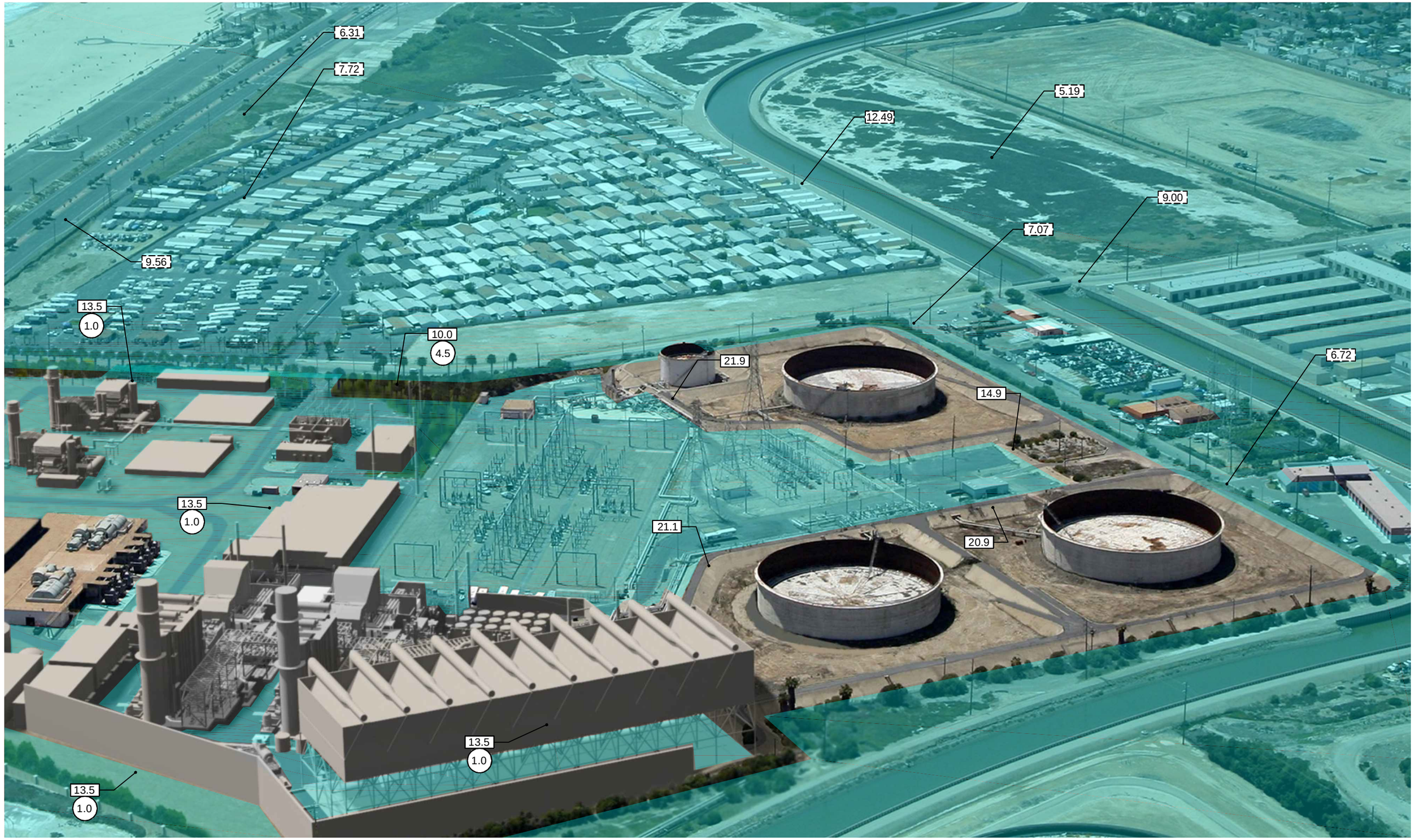
The site is also located at an elevation that is high enough that the following hazards will not affect the project:

- Storm Surge
- Wave Energy
- Beach Erosion

The attached exhibits depict the area that would be subject to flooding if there were a tsunami event under three development scenarios. Exhibit 3 shows the extent of flooding affecting the current existing site and surrounding development with the permitted AES Huntington Beach Energy Project built. Exhibit 4 depicts the site and surrounding development with both the AES Huntington Beach Energy Project and the proposed desalination Project with grading and structural stability measures and 8 depicts the site and surrounding development with both the AES Huntington Beach Energy Project and the proposed desalination Project with Project roads elevated to 14.5 feet above MSL. All three exhibits illustrate that if there were a tsunami event, the construction of the Poseidon project would not cause any additional flooding impacts or property damage or increase the risk to life on the existing surrounding area beyond that which would occur under existing conditions.

Coastal Commission staff's February 19, 2016 letter requested analysis showing how sea level rise and tsunami induced flooding could affect existing development in the area surrounding the Project site. Staff's stated concern was that the Project's grading plan could "re-direct water onto nearby existing development and possibly cause additional inundation and damage to those properties." As previously stated, flooding during a tsunami event would occur over a large area of the Huntington Beach coastline. The project area is less than one-half percent (1/2%) of the total area potentially affected and therefore would not pose any added flood depth to the surrounding area.

[3] $r = 1-(1-1/T)^N = 1-(1-1/10{,}000)^{10} = 0.1\%$, where: r = the probability that the event will occur at least once in N years, T = the return period (e.g., a 10,000-year event), N = the expected operating life of the facility (i.e., 10 years [between 2060 and 2070] when a 3.5-ft sea level rise may occur; note: 10,000-year tsunami may occur at any moment).



LEGEND

(1.75) WATER DEPTH AROUND STRUCTURES

[11.25] PROPOSED FINISHED GRADE

[7.72] EXISTING GRADE

TETRA TECH

TSUNAMI FLOODING MAP
EXISTING SITE WITH AES PLANT ADDED

EXHIBIT
3

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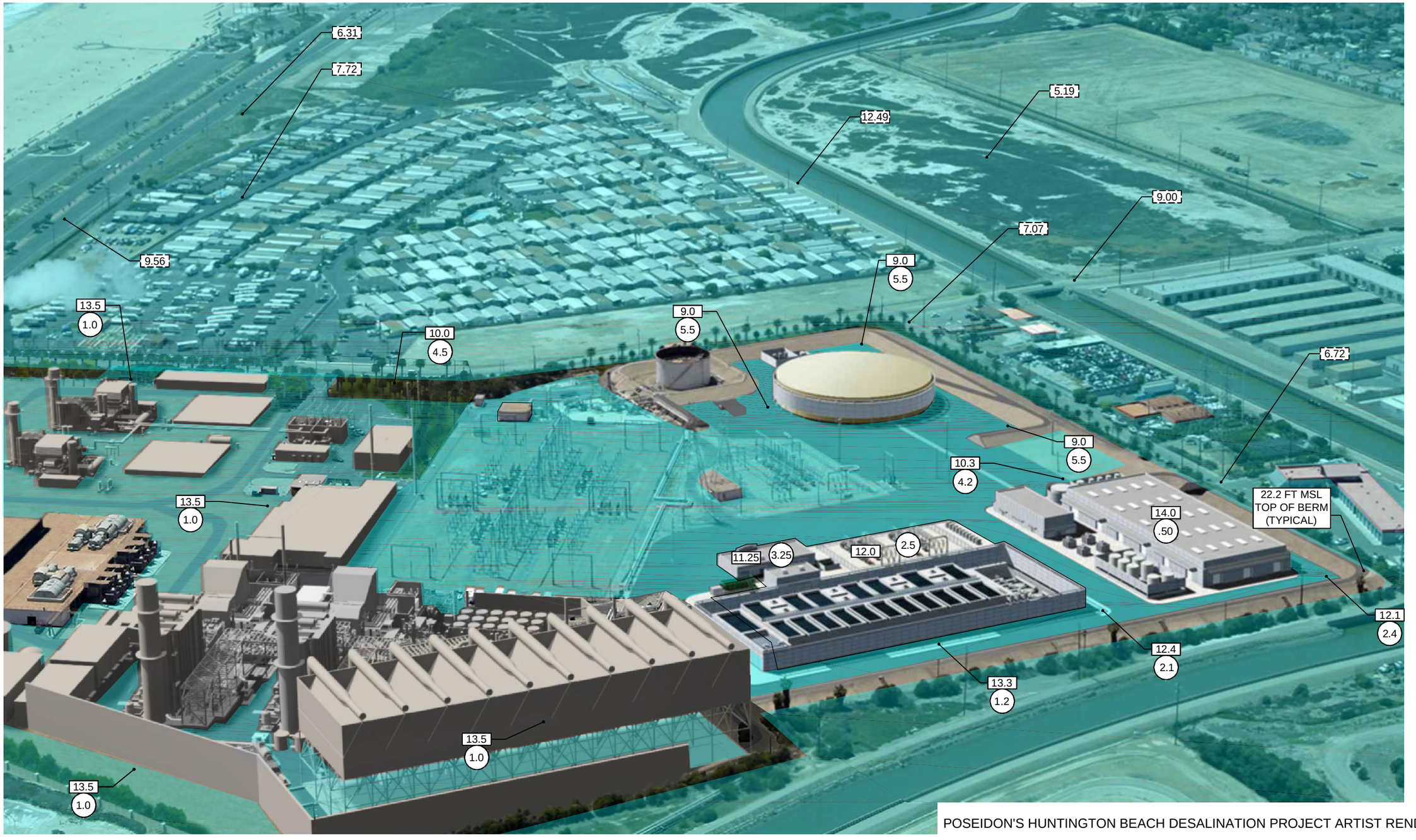

POSEIDON'S HUNTINGTON BEACH DESALINATION PROJECT ARTIST RENDERING

LEGEND

(1.75) WATER DEPTH AROUND STRUCTURES

[11.25] PROPOSED FINISHED GRADE

[7.72] EXISTING GRADE

TETRA TECH

TSUNAMI FLOODING MAP
EXISTING SITE WITH AES & DESALINATION PLANT ADDED

EXHIBIT 4

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In response to this concern, Tetra Tech has modeled an extreme worst-case 14.5 feet of inundation and flooding (i.e., 11.0 feet of tsunami flooding combined with 3.5 feet of sea level rise) in the with- and without-Project condition for the Project site and surrounding area. As shown in Exhibits 3, 4, and 8, the Project would not increase sea level rise and tsunami induced inundation depths in the area surrounding the Project site beyond what would occur without the Project.

Combined Tsunami and Sea Level Rise Conclusion: Based on Geosyntec's and Geo-Logic's site specific analysis and recommended design measures, we conclude that the combined extreme worst-case impacts of sea level rise and tsunami of 14.5 ft. above MSL in 2070 can be mitigated using the standard design and construction techniques as described below.

TSUNAMI AND SEA LEVEL RISE DESIGN MITIGATION MEASURES

This section of the report provides proposed mitigation measures to address the extreme combined tsunami and sea level rise hazard that results in site flood level of 14.5 feet MSL. This calculation includes a tsunami run-up of 11 feet, plus sea level rise of 3.5 feet that hypothetically could occur in 2070. Therefore, this memo takes an extremely conservative approach and implements design and mitigation measures capable of minimizing the effects of tsunami on structural integrity and health and human safety. Under the extreme design scenario tsunami-related loading and flooding of facilities would range from 0.5 feet at the high elevations of the Project site to 4.5 feet at the lower elevations.

Structural design of tsunami-resistant mitigation would include components for hydrostatic, buoyant, hydrodynamic, impulsive, and debris impact forces, not all of which would occur simultaneously. Partially buried and above-grade structures will be designed with reinforced concrete walls to resist the various combinations of tsunami force components. Similarly, the substation may be enclosed within reinforced concrete walls to resist tsunami forces. All structures will be designed with an adequate factor of safety against uplift due to tsunami buoyant forces based upon design run-up water elevations.

Exhibit 3 is a depiction of the on- and off-site tsunami flood levels after the proposed AES plant has been constructed. **Exhibit 4** shows the on- and off-site tsunami flood levels with the proposed Desalination Project constructed.

The following mitigation measures are proposed in order to mitigate the effects of tsunami flooding[4]:

Design Measure C: Poseidon shall implement SEIR mitigation measure HWQ-3: *Prior to issuance of grading permits, the applicant shall submit to the City for approval a plan outlining the specific planning measures to be taken to minimize or reduce risks to property and human safety from tsunami during operation. Planning measures could include but would not be limited to the following: (a) Provision of tsunami safety information to all facility personnel, in addition to posting signage on site; (b) identification of the method for transmission of tsunami watch and warnings to facility personnel and persons on the site in the event a watch or warning is issued; and (c) identification of an evacuation site for persons on site in the event of a tsunami warning*.

Design Measure D: Poseidon shall develop a Hazard Emergency Response Plan with AES HBGS prior to the commencement of Project operations. A Draft Hazard Emergency Response Plan tailored after the current AES plan but specifically for a non-essential water treatment plant, was attached as Appendix B to the 2013 Tetra Tech Hazard Mitigation Plan.

[4] Design Measures A and B are required for Seismic mitigation and are included in the Tetra Tech *Seismic, Tsunami and Flood Design Mitigation and Emergency Response Plan, March 2013.*

Design Measure E: Poseidon shall incorporate tsunami-resistant design features into the design of proposed structures that are sufficient to accommodate maximum potential flooding of between approximately 0.5 feet and approximately 4.5 feet of water. Guidance on tsunami-resistant design that can sufficiently accommodate these flooding levels and provide for vertical evacuations if necessary is available in the Applied Technology Council report titled *Guidelines for Design of Structures for Vertical Evacuation from Tsunamis* [ATC, 2008]. Such tsunami-related design features may include either of the following:

(1) Raising the grade around individual buildings that are currently below the 14.5 feet MSL run-up elevation and ensuring that buildings potentially subject to flooding have a minimum concrete wall thickness of 1.25 feet; **Exhibit 5** graphically shows the mitigation measures for each project facility. Our calculations indicate that approximately 4,000 cubic yards (CY) would be required for the areas around these structures to be raised. Small ramps and/or garden walls could also be used instead of raising the grading. **Exhibit 6** is a revised grading plan showing the proposed new elevations required.

or

(2) Raising/leveling the surrounding road grades to an elevation 14.5 feet or higher. Our calculations indicate that approximately 6,400 cubic yards (CY) would be required. Exhibit 7 is a revised grading plan showing the proposed new road elevations required. Exhibit 8 shows the flooding that results from raising the roads to 14.5 feet elevation.

In conclusion, implementation of structural design measures with flood panels for openings where appropriate and raising of the Project site around the structures or raising the roads around the Project facility to 14.5 ft., will sufficiently mitigate flooding hazards including:

- Protection of human health and safety;
- Prevent mobilization of building materials and major detritus from buildings, and;
- Prevent release of hazardous chemicals.

Appendix A provides the estimated costs for the tsunami and flooding structural design mitigation measure

TSUNAMI MITIGATION BY ELEVATION RISE

	STRUCTURE	RAISE ELEVATION (FT) AROUND STRUCTURES
1	PRETREATMENT FILTER STRUCTURE	1.5
2	POST TREATMENT AREA	0.5
3	TRANSFORMERS	0.5
4	RO PROCESS BUILDING	0.5
5	CHEMICAL STORAGE	0
6	FLUSH TANK	0
7	ELECTRICAL BUILDING	0
8	PRODUCT WATER PUMP STATION	0
9	PRODUCT WATER PUMP STATION ELEC. EQUIP.	0
10	AMMONIA AND FLUORIDE STORAGE AREA	0
11	SURGE TANK	0
12	SOLIDS HANDLING FACILITIES (BUILDING)	0
13	SOLIDS HANDLING FACILITIES (LOADING AREA)	0
14	ADMINISTRATION BUILDING	0
15	FILTER SUBSTATION	2.5
16	INFLUENT PUMP STATION	NA

TSUNAMI MITIGATION BY STRUCTURAL DESIGN

	STRUCTURE	RUNUP AT STRUCTURE	Δ WALL THICKNESS (FT)
A	PRETREATMENT FILTER STRUCTURE	1.5	0
B	POST TREATMENT AREA	0.5	0
C	RO PROCESS BUILDING	0.5	0
D	ELECTRICAL BUILDING/ CHEMICAL STORAGE	0.5	0
E	ELECTRICAL EQUIPMENT AND SURGE TANK	4.3	1.25
F	SOLIDS HANDLING FACILITIES (BUILDING)	2.1	1.25
G	ADMINISTRATION BUILDING	3.2	1.25
H	AMONIA AND FLOURIDE STORAGE AREA	4.3	1.25

POSEIDON'S HUNTINGTON BEACH DESALINATION PROJECT
ARTIST RENDERING

TETRA TECH

TSUNAMI DESIGN MITIGATION MEASURES

EXHIBIT 5

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LEGEND

10.00 PROPOSED FINISHED GRADE/FLOOR

528.68' LOT DIMENSION

1" = 80'

0 80 160

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PARCEL LINE

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184.06'

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LANDSCAPE WALL

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9.50

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PAVEMENT 6"AC/8"AB

148.93'

D=90°16'01"
R=31.00'
L=48.84'

36" - 42" DIA. CITY PUMP STATION STUB

256.94'

INFLUENT PUMP STATION

SECONDARY ACCESS

PRIMARY ACCESS

CONNECT TO CITY SEWER MAIN LINE

36" - 42" DIA. CITY TANK FILL STUB

30" TANK OVERFLOW PVC C-905

NEWLAND STREET

48" - 54" PRODUCT WATER LINE CML&C STEEL PIPE, APPROXIMATE LENGTH = 150-FT.

* DISCLAIMER: GENERAL ARRANGEMENT ONLY, DOESN'T REPRESENT FINAL DESIGN DRAWINGS

PROPERTY OWNER:
CITY OF HUNTINGTON BEACH
2000 MAIN STREET
HUNTINGTON BEACH, CALIFORNIA 92648
(714) 536-5553

AES CORPORATION
21730 NEWLAND STREET
HUNTINGTON BEACH, CALIFORNIA 92646
(714) 374-1491

APPLICANT:
POSEIDON RESOURCES CORPORATION
17011 BEACH BOULEVARD, SUITE 900
HUNTINGTON BEACH, CALIFORNIA 92647
(714) 596-7946

DRAWINGS PREPARED BY:

TETRA TECH

17885 Von Karman Ave, Suite 500
Irvine, California 92614
(949) 809-5000
(949) 809-5010 FAX

DRAWINGS PREPARED FOR:

POSEIDON RESOURCES

Poseidon Resources Corporation
17011 Beach Boulevard, Suite 900, Huntington Beach, California 92647
(714) 596-7946

PROJECT:

SEAWATER DESALINATION PROJECT

Huntington Beach, California

REVISED MITIGATION SITE GRADING PLAN EXHIBIT 6

LEGEND

10.00 PROPOSED FINISHED GRADE/FLOOR

528.68' LOT DIMENSION

1" = 80'

0 80 160

D: 16°22'36"
R: 2462.50'
L: 703.85'

22.43'

113.45'

POST TREATMENT

TRANSFORMERS

385.36'

ACCESS ROAD

PRE TREATMENT PLANT
13.50

RO PROCESS
14.00

379.29'

50.00'

PARCEL LINE

TRASH ENCLOSURE

CHEMICAL STORAGE
(CONTAINED)

FILTER
SUBSTATION
12.0

D: 89°31'14"
R: 40.00'
L: 62.50'

59.55'

175.17'

SOLIDS HANDLING
FACILITIES

ADMINISTRATION BUILDING

338.21'

442.05'

8"S

ACCESS ROAD

CB 11.30

STORM WATER PUMP STATION

ELECTRICAL SWITCHGEAR

STORM DRAIN

CB 10.33

FLUSH TANK

PAVED TURN
AROUND AREA

ELECTRICAL BUILDING

48"-54" PRODUCT
WATER LINE

ROADWAY
6"AC/8"AB

42"

272.19'

12' LEASE
DEDICATION

CB 9.00

10.86

164.06'

EDISON AVE.

457.97'

PRODUCT WATER
STORAGE TANK
251' DIA.

91.52'

CB 9.00

ELECTRICAL
EQUIPMENT

PRODUCT WATER
PUMP STATION

D=58°05'26"
R=65.00'
L=65.90'

LANDSCAPE WALL

10.40

AMMONIA AND
FLUORIDE
STORAGE AREA

10.20

D=58°05'26"
R=65.00'
L=65.90'

CB 9.00

10.00

SURGE TANK
9.50

PAVEMENT
6"AC/8"AB

148.93'

D=90°16'01"
R=31.00'
L=48.84'

36" - 42" DIA. CITY
PUMP STATION STUB

256.94'

CONNECT TO CITY
SEWER MAIN LINE

36" - 42" DIA. CITY
TANK FILL STUB

NEWLAND STREET

30" TANK OVERFLOW
PVC C-905

48" - 54" PRODUCT WATER LINE CML&C STEEL
PIPE, APPROXIMATE LENGTH = 150-FT.

72" BRINE LINE

72" FEED LINE

AES AMENDED
HUNTINGTON BEACH
ENERGY PROJECT *

INFLUENT
PUMP STATION

SECONDARY
ACCESS

PRIMARY
ACCESS

* DISCLAIMER: GENERAL ARRANGEMENT ONLY, DOESN'T REPRESENT FINAL DESIGN DRAWINGS

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17011 BEACH BOULEVARD, SUITE 900
HUNTINGTON BEACH, CALIFORNIA 92647
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TETRA TECH
17885 Von Karman Ave, Suite 500
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(714) 596-7946

PROJECT:

SEAWATER DESALINATION PROJECT
Huntington Beach, California

REVISED - RAISED ROADWAY SITE GRADING PLAN EXHIBIT 7

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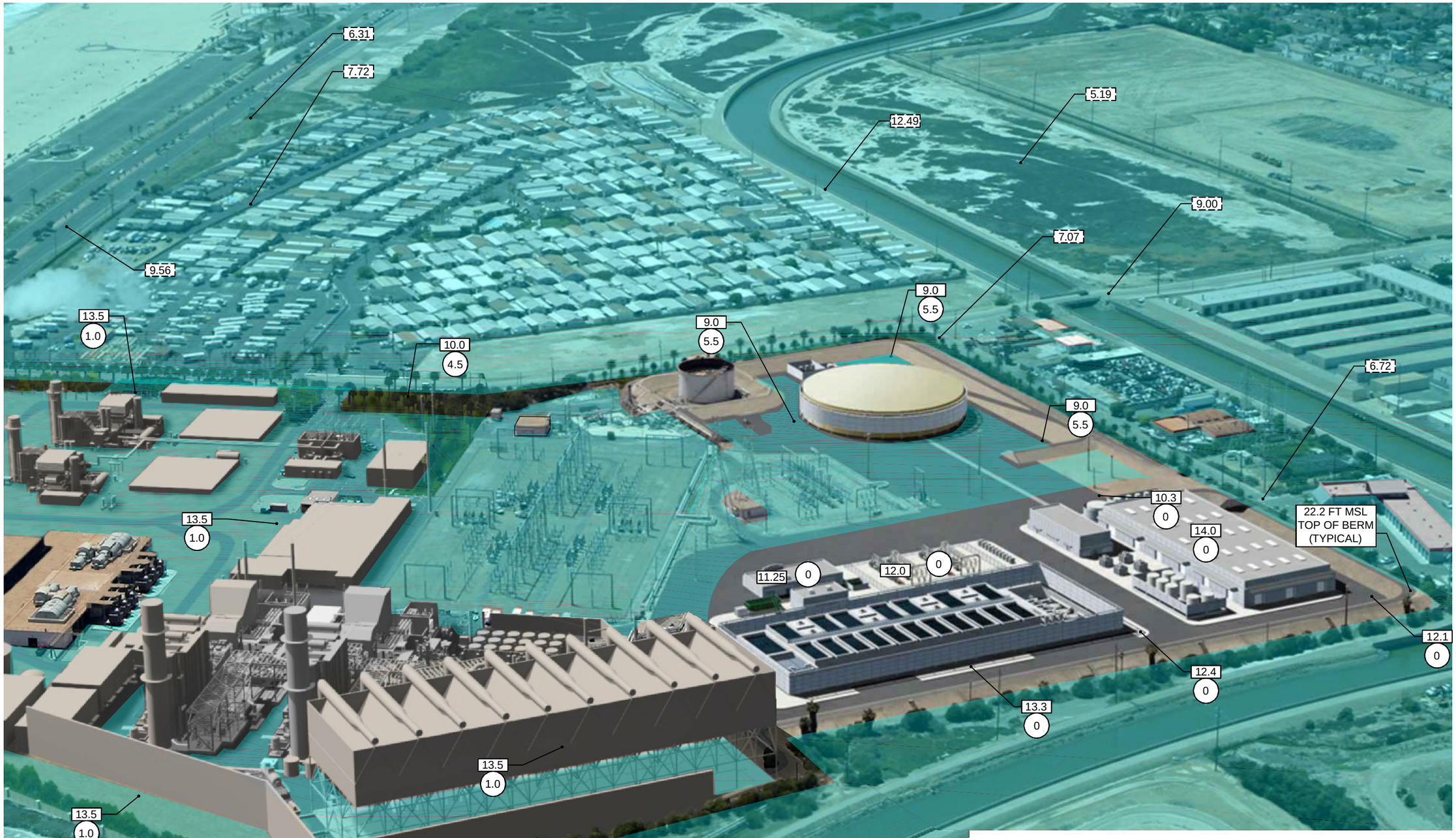

POSEIDON'S HUNTINGTON BEACH DESALINATION PROJECT ARTIST RENDERING

LEGEND

(1.75) WATER DEPTH AROUND STRUCTURES

[11.25] PROPOSED FINISHED GRADE

[7.72] EXISTING GRADE

TETRA TECH

TSUNAMI FLOODING MAP
WITH PROJECT ROADS RAISED
TO ELEVATION 14.5 FEET

EXHIBIT
8

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APPENDIX A

Estimated Costs for Tsunami Flood Design Mitigation Measures

Tsunami Mitigation by Strengthening Individual Structure and Raising the Grade Around the Structures to 14.5 ft. Estimate

Design Run-up 14.5 ft

Structure	Length/ Diameter (ft)	Width (ft)	FF Elevation (ft)	Above Grade or Below Grade	Run-up At Structure	Conc. Wall Thickness req'd to resist tsunami bore (ft)	Conc. Wall Thickness in the original design	Conc. Wall Height (ft)	Δ Wall Thickness (ft)	Δ Conc Vol (CY)	Unit Price ($/CY)	Δ Cost
Pretreatment Filter Structure	397	150	13	Above/ Below	0.5	N/A	N/A	N/A	N/A	N/A	1500	$0
Post Treatment Area	105	50	14	Above	0.5	N/A	N/A	N/A	N/A	N/A	1500	$0
Transformers	100	60	14	Above	0.5	N/A	N/A	N/A	N/A	N/A	1500	$0
RO Process Building	287	121	14	Above	0.5	N/A	N/A	N/A	N/A	N/A	1500	$0
Chemical Storage	70	30	14	Above	0.5	N/A	N/A	N/A	N/A	N/A	1500	$0
Flush Tank	27.75		14	Above	0.5	N/A	N/A	N/A	N/A	N/A	1500	$0
Electrical Building	110	44	14	Above	0.5	N/A	N/A	N/A	N/A	N/A	1500	$0
Product Water Pump Station	72	58	10	Below	4.5	N/A	N/A	N/A	N/A	N/A	1500	$0
Product Water Pump Station Elec. Equip.	35	23	10.2	Above	4.3	1.25	0	5	1.25	26	1500	$39,000
Ammonia and Fluoride Storage Area	31	18	10.2	Above	4.3	1.25	0	5	1.25	22	1500	$33,000
Surge Tank	44	22	10.2	Above	4.3	1.25	0	5	1.25	27	1500	$40,500
Solids Handling Facilities (Building)	55	32	12.4	Above	2.1	1.25	0	2	1.25	15	1500	$22,500
Solids Handling Facilities (Loading Area)	42	16	12.4	Above	2.1	N/A	N/A	N/A	N/A	N/A	1500	$0
Administration Building	100	50	11.25	Above	3.2	1.25	0	4	1.25	48	1500	$72,000
Filter Substation	140	140	12	Above	0	N/A	N/A	N/A	N/A	N/A	N/A	$0
Influent Pump Station	78	28	8	Below	6.5	N/A	N/A	N/A	N/A	N/A	1500	$0
Product Water Tank	251		10	Above	4.5	1.50	1.5	3	N/A	N/A	1500	$0
Fill Around the Structures										4,000 (Fill)	12	$48,000
										Total Δ Cost		$255,000

Estimate to Raise Road Grade to Elevation 14.5 Feet

Item	Quantity	Unit Price	Δ Cost
Fill	6,400 CY	$12	$76,800
Garden Wall	1,100 LF	$70	$77,000
Miscellaneous Stairs, Ramps, etc.	LS	LS	$50,000
		Total Δ Cost	203,800