Our mission is to provide a safe and reliable supply of high-quality water to the communities we serve.

West Basin’s
Ocean Water Desalination
Ocean Plan Compliance

CalDesal Annual Conference

February 2, 2017  San Diego, CA
Topics for Today’s Discussion

• West Basin Overview
• West Basin Project Overview
• Site
  – Previous and recent site evaluations
  – Subtidal Benthic Habitat Survey
• Intake
  – Subsurface
  – Wedge wire screening
• Discharge
  – Comingle with existing sources
  – Diffusers
• Schedule
• Questions
West Basin Overview
ELECTED BOARD OF DIRECTORS

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Vice President

Division II:
GLORIA D. GRAY
Immediate Past President

Division III:
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Division IV:
SCOTT HOUSTON
Treasurer

Division V:
DONALD L. DEAR
Secretary
WATER RELIABILITY THROUGH SUPPLY DIVERSIFICATION

2025

- Groundwater
- Imported Water
- Recycled Water
- Conservation
- Ocean Water Desal
West Basin’s Project Overview
Proposed Project

- Site
  - NRG power generating station site (El Segundo, CA)
  - Alternative site – AES power generating station (Redondo Beach, CA)
  - Additional sites evaluated

- Capacity
  - 20 MGD – Local Project (project level analysis)
  - 60 MGD – Regional Project (programmatic analysis)

- Intake
  - Subsurface
  - Wedge Wire Screens

- Treatment
  - Strainers, sand filters, ultrafiltration, reverse osmosis, ERD

- Discharge
  - Comingle with Hyperion
  - Diffusers, utilizing existing infrastructure

- Energy
  - Carbon neutral as compared to imported water
  - Pursuing renewable energy
  - SCE grid purchase
Site Selection

1. Evaluate a reasonable range of sites
2. Evaluate the placement of offshore facilities as to minimize habitat impacts
Site Selection

• Program Master Plan – 2013
  – Evaluated two sites
    • El Segundo (NRG)
    • Redondo Beach (AES)
  – Criteria
    • Available land
    • Access to distribution system
    • Existing onsite utilities
    • Existing offshore infrastructure
    • Overall permitability
    • Local planning and zoning compatibility
    • Known hazards remediation

• EIR
  – Evaluating five sites
    • Scattergood
    • Chevron
    • El Segundo ‘2’
Proposed Site
El Segundo Site Overview

- El Segundo Energy Center
- El Segundo 3 & 4 (and footprint for ESEC 2)
- Tank Farm Parcel
- Plains Cutter Tank (permanent easement)
- SCE Switchyard

- Tank Farm
- Metering Station
- Gas Compressors
- Water Treatment
TWO SITES TO BE EVALUATED

North Site

South Site
Subtidal Benthic Habitat Survey
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Intake

1. Evaluate feasibility of subsurface intakes
2. Evaluate hybrid subsurface intake with wedge wire screening
Subsurface Intake Study

- USBR grant funded study ($600,000+)
  - Technically feasible guidance manual
  - Apply West Basin site to the guidance manual
  - Perform in-situ and further testing for technically feasible options
  - 3 independent expert panel meetings facilitated by National Water Research Institute (NWRI)
  - 39 agencies contacted to participate

- Approach
  - Ocean Plan amendments state to evaluate sites “nearby”
    - West Basin determined an 8 mile stretch of the Santa Monica Bay would be most suitable
  - In situ testing
    - Testing at NRG
    - Offshore Seismic Reflection Survey (SRS)
    - Groundwater modeling
IDENTIFY SITE SPECIFICS

- Contamination
- Residential
- Habitats
- Seawater intrusion barrier
- De-designated aquifer
- Existing marine infrastructure
- Coastal erosion potential
- Tsunami potential
- Navigation regulations
SEISMIC REFLECTION SURVEY
SEISMIC REFLECTION SURVEY
Groundwater Modeling
GROUND WATER MODEL SET-UP
VERTICAL WELLS
Calculated Portions of Water Pumped Derived from Inland Injection Barrier and Ocean (10 Wells along coastal margin of NRG facility 20 mgd total)

- 58% from the ocean
- 36% from the injection barrier
- 4% from the north
- 1% areal recharge
CONCLUSIONS

1. **Technically infeasible**
   - Vertical, slant, HDD, Beach Gallery (BIG), Radial Collector, Deep Infiltration Gallery (DIG)

2. **Economically infeasible**
   - Seabed infiltration gallery (SIG)

3. **Outside of NRG site**
   - Site conditions apply across the 8 mile stretch of Santa Monica Bay

4. **Smaller capacity/hybrid intake**
   - Feasibility Study for SIG ONLY
     - ‘Subsurface-Wedge Wire’
     - 30-10, 20-20, 10-30, 5-35, 2.5-37.5
SIG Hybrid Cost Estimate

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<th>SIG Intake Rate</th>
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<td>Capital Cost of the Facility (W/O Intake)</td>
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<td>TOTAL CAPITAL COST</td>
<td>$430,881,000</td>
<td>$440,974,000</td>
<td>$507,675,000</td>
<td>$553,570,000</td>
<td>$642,177,000</td>
<td>$686,802,000</td>
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</table>

- 50’ deep, 6,500 feet off shore
- 1.5 - 14.5 acres
- Cost estimate assumes WWS as the redundancy – most economically conservative case
- Program Master Plan Cost Estimate
  - Intake ~$8M
- EIR Analysis
  - Environmental and social factors to be addressed
Discharge

1. Evaluate feasibility of comingling brine with existing discharges
2. Evaluate brine diffuser impacts – Shearing and Salinity
Comingling Feasibility Study

• Require a partnership with the City of LA Hyperion WWTP
  – Hyperion is ~1 mile North of the proposed desal site
• Feasibility Criteria
  – Connection points at the facility
  – Pipeline alignments
  – Regulatory requirements for Hyperion (NPDES) and desal (OPA)
  – Future plans by the City of LA for their wastewater
• 7 connection points
• 3 pipeline alignments
• Hydrodynamic modeling
• Feasibility determination
  – Pipeline + connection points
  – Not technically feasible with planned low flow conditions at the wastewater treatment plant
  – Did not assess social, economic, environmental factors in this analysis (to be done in the EIR)
Diffuser Discharge Considerations

• Salinity Impacts
  – Salinity impacts from the brine
    • Brine mixing zone (BMZ)
      – 100m radially from the diffuser
      – Mitigate for all salinity impacts in the BMZ
      – Higher velocity = smaller BMZ

• Shearing/Entrainment Impacts
  – Velocity impacts from the diffuser
    • Higher the velocity = more shearing
      – Calculated value
Proposed Diffuser Design
# BRINE DISCHARGE

## Preliminary Findings

<table>
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<tr>
<th>Distance to Compliance Point Where $S_b&lt;2$ ppt above Natural Background (m)</th>
<th>Maximum Discharge Velocity m/sec</th>
<th>Area of Production Foregone (Acres) due to shearing</th>
<th>Acres of mitigation for salinity impacts (BMZ)</th>
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<td>99.9</td>
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PROPOSED PROJECT TIMELINE

1. EIR 2015-2017
2. PERMITS 2018-2020
3. DESIGN 2019-2021
4. BUILD 2021-2024
5. WATER DELIVERY 2024
Questions

Diane Gatza
DianeG@westbasin.org
Intake

- West Basin has performed and participated in 5 intake studies
  - Over $2,700,000 spent researching intake impacts and minimizing impacts
    - Intake Effects Assessment Study
    - Harmful Algal Bloom and Marine Biotoxin Study (Dept. of Water Resources)
    - Intake Biofouling and Corrosion Study (Metropolitan Water District)
    - IM&E Mitigation Development (Water Reuse)
    - Subsurface Intake Study (US Bureau of Reclamation)

- Wedge Wire Screens
  - First to test 3 screen sizes
    - 0.5, 1.0 and 2.0 mm
    - First ever to test 0.5mm in the ocean
  - Identified no Impingement
    - Low slot velocities below 0.5ft/sec
  - Identified and quantified Entrainment
    - Protection of most if not all mature larvae, all juvenile and adult fish from entrainment
    - Only organisms impacted by entrainment
      - Juvenile larvae
      - Microscopic organisms
SAFE INTAKE OF OCEAN WATER

Current passive wedge wire screens proven to protect 100% of adult and juvenile marine life and most, if not all, mature larvae.
1. Pilot Testing

- Demonstrated performance through seasonal variations of water quality
- Determined MF/UF is a viable pretreatment to RO
- No process challenges due to
  - Hyperion Effluent
  - Storm water
  - Red Tide
- Identified environmental impacts needed to be included in future research
- Developed design criteria for Demonstration Facility and future full scale implementation
2. Demonstration Testing

• Certify Processes at Full-Scale Level
  • Quantify Potential Intake Impacts
    • Wedge wire intake screens
    • Subsurface intake study
  • Quantify Potential Discharge Impacts
    • Impacts on marine life
• Process Optimization
  • New technologies
• Energy Minimization
  • Energy Recovery Devices
• Regulatory Compliance
  • Permitted facility, but not for drinking water
  • Simulated drinking water permit requirements
• Cost Options
  • Determined the true cost of desalination
• Distribution Integration
  • Assessed blending impacts for desalination