

## STAFF REPORT

# 82

A Statewide

11/29/17

S Statewide

S. Pemberton

### **CONSIDER SPONSORING STATE LEGISLATION IN THE SECOND HALF OF THE 2017-18 LEGISLATIVE SESSION TO AMEND PUBLIC RESOURCES CODE SECTION 6217.8 TO REMOVE THE \$300 MILLION CAP IN THE OIL TRUST FUND SO THAT THE ABANDONMENT FUND FOR THE LONG BEACH OIL OPERATIONS IS MORE LIKELY TO BE SUFFICIENT TO COVER THE STATE'S ABANDONMENT LIABILITY**

#### **SUMMARY:**

This legislative proposal relates to the allocation of tidelands oil revenue for the future abandonment of the West Wilmington and Long Beach Unit oil operations in the city of Long Beach. Existing law establishes the Oil Trust Fund in the State Treasury to fund removal of oil and gas facilities, remediation, and plugging and abandonment of wells when the City of Long Beach oil operations cease. The Oil Trust Fund, financed by monthly contributions from revenue generated from the oil operations, is statutorily capped at \$300 million. The cap was reached in June 2014. Since then, the Fund has not grown and all interest earned, a total of \$4.4 million, has been transferred to the General Fund. According to the City of Long Beach Gas and Oil Department, the State's share of the abandonment liability is estimated to be approximately \$836 million, leaving a funding shortfall of \$536 million.

#### **BACKGROUND AND DISCUSSION:**

A large portion of the Wilmington Oil Field, one of the largest oil fields in the nation, is beneath the Long Beach tidelands. The Legislature granted these tide and submerged lands to the City in the early 1900s subject to the common law Public Trust Doctrine and the statutory trust grant. The grant included the mineral interests. The Wilmington Oil Field was discovered in 1937, and soon thereafter, the City began oil development and extraction operations in the tidelands. The oil operations include the Long Beach Unit and the West Wilmington Units established in the early and mid-1960s. The City is the unit operator and California Resources Corporation is the contractor responsible for day-to-day production and maintenance.

Even though the minerals are granted to the City, the State receives a share of the net profits that would otherwise go to the City as grantee. The State's share of revenue is deposited into the General Fund. Various unit and production agreements control the character of the oil operations, including the liability

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associated with abandoning oil and gas wells and facilities. The State's share of liability is apportioned based on its net profit interest, among other factors. The State retains a large majority of the total abandonment liability at the end of the oil operations. While oil and gas wells are abandoned as a normal course of oil field operations, those costs are deducted as unit expenses and are paid prior to net profits being calculated. Once operations cease and revenue is no longer generated, the Oil Trust Fund will be the primary source to fund the substantial abandonment and decommissioning work that will be required to remove oil and gas facilities related to the oil operations.

In 2005, the Legislature enacted SB 71 (Senate Committee on Budget), which created the Oil Trust Fund in Public Resources Code section 6217.8 to fund abandonment costs after unit operations have ceased, i.e., when oil revenue generation is insufficient to cover those costs. The purpose of the legislation was to create an abandonment fund for the Long Beach operations. Public Resources Code section 6217.8 requires monthly deposits (\$2 million or 50 percent of monthly revenue, whichever is less) from the State's share of tidelands oil revenues until the Oil Trust Fund reaches \$300 million. The Commission may spend money in the Oil Trust Fund for well abandonment, pipeline removal, facility removal, remediation and other costs associated with removal of oil and gas facilities from the Long Beach tidelands that are not the responsibility of other parties. Money in the Oil Trust Fund can be used only after the City determines that oil revenue is insufficient to cover abandonment and decommissioning work—an event likely associated with the end of the Wilmington Oil Field's productive life.

The projected abandonment costs for the Long Beach oil operations have increased considerably because of updated market costs for abandonment work and reduced production forecasts from low oil prices. In recent years, the City of Long Beach Gas and Oil Department has estimated the abandonment liability at several hundred million dollars more than previously thought. The City of Long Beach Gas and Oil Department requested that California Resources Corporation provide an updated estimate for abandoning and decommissioning the wells, pipelines, and facilities. The analysis, attached as Exhibits A and B, is consistent with the City of Long Beach Gas and Oil Department estimates showing that end of field life abandonment and decommissioning will be more expensive than previously estimated. In the last fiscal year, the total abandonment liabilities increased by \$34.8 million. Now, the City of Long Beach Gas and Oil Department estimates that the State's potential unfunded liability, subtracting the \$300 million in the Oil Trust Fund, is approximately \$536 million.

When the Long Beach oil operations cease, which is projected to be around the year 2036, it will pose a problem for the State because the Oil Trust Fund is

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inadequately funded to meet the State's liability obligations. The State can significantly reduce its unfunded liability by removing the \$300 million cap on the Oil Trust Fund and resume depositing a portion of the State's share of revenue from the Long Beach oil operations into the Oil Trust Fund.

**EXHIBITS:**

- A. California Resources Corporation: Full Field Abandonment; Opinion of Probable Cost, September 2017.
- B. Full Field Abandonment Cost Estimate, September 2017.
- C. 2018 Oil Field Abandonment Letter from the City of Long Beach Gas and Oil Department.

**STAFF RECOMMENATION:**

Staff believes that legislation is necessary to increase the \$300 million Oil Trust Fund cap. Staff recommends that the Commission sponsor legislation to remove the \$300 million cap in the Oil Trust Fund so that the abandonment fund for the Long Beach oil operations is more likely to be sufficient to cover the State's abandonment liability.

**RECOMMENDED ACTION:**

It is recommended that the Commission:

Sponsor legislation in the second half of the 2017-2018 legislative session to amend Public Resources Code section 6217.8 to remove the \$300 million cap in the Oil Trust Fund so that the Fund is more likely be sufficient to cover the State's potential abandonment liability.

EXHIBIT A



# Full Field Abandonment

## Opinion of Probable Cost

**Revision 1**  
**September 2017**

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## ATTACHMENTS:

ATTACHMENT A - Estimate Detail Example:	Pipelines and Facilities
ATTACHMENT A-1	X&Y Tank Farm Removal
ATTACHMENT A-2	West of Vopak Removal
ATTACHMENT A-3	Island White Removal Estimate
ATTACHMENT B – Estimate Detail Example:	Island White Mass Removal
ATTACHMENT C – Estimate Detail Example:	Island White Remediation

## REFERENCE DOCUMENTS

1. THUMS Drawing Exhibits, by SPEC Services, Inc., Revision A, dated 12-28-16 (3 sheets)
2. Tidelands Drawing Exhibits, by SPEC Services, Inc., Revision A, dated 12-21-16 (4 sheets)
3. Complete Cost Estimates (On File with CRC, Landmark Office):
  - a. 6747\_FullFieldAbandonment\_FacilitiesPipelines\_CostEstFINAL\_6 17 17.xlsx
  - b. 2017-05-23 CRC Final LBU Island Removal Estimate – Alternative 1.xlsx
  - c. 2017-05-23 CRC Final LBU Island Removal Estimate – Alternative 2.xlsx
  - d. 2017.05.25\_ATTACHMENT A\_CRC LBU THUMS End of Life Remediation Estimate.xlsx
  - e. 2017.05.25\_ATTACHMENT B\_CRC Tidelands End of Life Remediation Estimate.xlsx

## 1. EXECUTIVE SUMMARY

California Resources Corporation (CRC) is required to provide an abandonment cost estimate to the City of Long Beach on an annual basis for the Long Beach Unit (LBU, THUMS) and Tidelands. To support this effort, CRC engaged SPEC Services, Inc. (SPEC), Moffatt & Nichol (M&N) and Geosyntec Consultants (GEO) to collectively develop an opinion of probable cost (high level cost estimate) to remove all facilities and man-made oil production islands associated with LBU and Tidelands.

The cost estimate effort was divided up as follows:

- SPEC Services, Inc.      Pipelines and Facilities Removal
- Moffatt & Nichol      Island Land Mass Removal (THUMS only)
- Geosyntec              Remediation Costs
- CRC (In-house)      Well Abandonment

The approach for developing the removal cost estimates for Pipelines, Facilities and Two of the Island Land Masses included selecting representative facility sites to create the baseline for removal costs. Removal costs for the non-baseline sites were calculated by comparing their relative size and complexity to an appropriate baseline site. Unit costs were developed using historical data from relevant projects, budgetary information from local contractors and vendors, and recent project experience. The remediation costs were developed by calculating removal volumes at various depths, and estimating percentages of Total Petroleum Hydrocarbon (TPH)-impacted soils at each site by evaluating site use and history.

The opinion of probable cost for CRC End of Life Abandonment and Removal is summarized as follows:

<b>CRC Unit</b>	<b>Description</b>	<b>Opinion of Cost</b>	<b>Opinion of Cost (Escalated to year 2040)</b>
<b>THUMS</b>	Pipelines and Facilities	\$231,000,000	\$436,000,000
	Remediation	\$33,000,000	\$61,000,000
	Well Abandonment	\$369,000,000	\$697,000,000
	<b>Totals:</b>	<b>\$633,000,000</b>	<b>\$1,195,000,000</b>
	<b>Island Removal 2-Islands (Off-Shore Disposal)</b>	<b>\$83,000,000</b>	<b>156,000,000</b>
Not Expected	<b>Island Removal 2 Islands (On-Shore Disposal)</b>	<b>\$213,000,000</b>	<b>\$401,000,000</b>

<b>Tidelands</b>	Pipelines and Facilities	\$130,000,000	\$246,000,000
	Remediation	\$36,000,000	\$67,000,000
	Well Abandonment	\$231,000,000	\$435,000,000
	<b>Totals:</b>	<b>\$397,000,000</b>	<b>\$718,000,000</b>

## 2. BACKGROUND AND APPROACH

### 2.1. Project Background

The City of Long Beach Gas and Oil Department (LBGO) requested CRC to provide an updated cost estimate for the complete abandonment of all wells, pipelines and facilities for THUMS and Tidelands. LBGO is interested in improving the accuracy of its most recent estimate on file, which was derived by applying an escalation factor to the estimate from prior years.

#### Tidelands Facilities:

Tidelands operates its oil field in 28 separate operating and set-aside areas under land lease agreements with the Port of Long Beach. Tidelands oil field includes approximately 932 active production and water injection wells, with well heads located in individual and common concrete well cellars. The field is supported by three water plants/pump stations and two tank farms that process production fluids. The system is interconnected by a network of pipelines that carry production fluids between operating areas, water plants and tank farms.

#### THUMS Facilities:

THUMS is engaged in the drilling and production operations of oil and gas from production and injection wells on four manmade islands in Long Beach Harbor. THUMS operates additional wells on-shore at set-aside areas leased from the Port of Long Beach. THUMS operations includes 1,492 active wells, both off-shore and on-shore. THUMS facilities on the islands include oil and gas processing equipment required to transport the oil and gas on shore. On-shore, THUMS facilities include two tank farms and the Broadway and Mitchell (B&M) Gas Plant. The THUMS Power Plant is not part of the removal estimate, as it is assumed the Plant will be sold or transferred and continue to operate.

### 2.2. Project Approach

The abandonment cost estimate (Opinion of Probable Cost) includes removal of all CRC facilities, including all oil production wells, injection wells, pipelines, and support facilities operated by THUMS and Tidelands business units, and removal of two (2) islands plus soils remediation.

### Pipelines and Facilities:

In the interest of controlling the cost of estimate development, the team identified representative facility sites to create the baseline for removal costs. Removal costs for the non-baseline sites were calculated by comparing their relative size and complexity to a comparable baseline site. Unit costs were developed using historical data from relevant projects, budgetary information from local contractors and vendors, and recent project experience.

The scope and cost of the removal was developed based on evaluating CRC facilities as they exist today. The cost estimate team realizes the oil field removal and abandonment would likely occur over several years. However, this cost estimate does not consider project schedule or phasing. Also, some wells and facilities in service today will be abandoned and/or removed before the major removal effort begins. The cost estimate is based on facilities in place at the time of publication.

The Opinion of Probable Cost was developed based on qualifications and exclusions considered reasonable and standard for this type of project. For example, removal of certain items are not included in the estimate because removal is considered not feasible. Examples include well casings below standard abandonment depth, horizontal directional drilled casings, railroad crossings, pipelines in active terminals and high traffic highways. For these items, the estimate includes procedures for abandoning in place. Refer to the Basis of Estimate section of this report for a complete listing of qualifications and exclusions.

### Island Removal:

Island White was selected as a representative island for the estimate. Using the estimate from Island White, minor adjustments were made to develop estimates for the other islands. The quantities for each island are based on the best publicly available ocean depth records at the islands.

It is expected offshore disposal sites will be available during construction that are in the Port of LA/Port of Long Beach area or other sites within 5 miles, and economically viable for disposal of armor stone, quarry run, clean fill and concrete. It is anticipated as long as the material is not contaminated, offshore disposal could be permitted as the operation will be similar to any dredge disposal project in the area. However, if an offshore disposal site is not available, then onshore disposal will be required. Therefore, per LBGO direction, two Alternatives were estimated for the island removal:

- **Off-Shore Disposal:** Assumes armor stone, quarry run, clean island fill and concrete are able to be disposed offshore.
- **On-Shore Disposal:** Assumes all island deconstruction material are required to be disposed onshore.

### Remediation:

Estimated volumes of Total Petroleum Hydrocarbon (TPH)-impacted soils were developed using GIS and CADD data-files provided by CRC for THUMS and Tidelands. The aerial footprint of each parcel



was used to calculate volumes of TPH-impacted soils assuming excavation extended across the parcel to one-foot below grade surface (bgs), two and one-half feet bgs, or five feet bgs. Based on the parcel location, use and history, and discussions with CRC, one of the calculated volumes was selected to estimate cost to remediate the parcel.

Once the calculated volume was selected, additional costs-per-ton for soil handling, waste disposal, permitting, storm water best management practices, etc., were incorporated into the estimates. The use of calculated volumes of TPH-impacted soil to develop these cost estimates was in lieu of conducting a remedial investigation, i.e., advancing soil borings to collect parcel-specific soil data. If remedial investigations are conducted in the future, that data may result in cost increases or decreases with respect to these estimates.

Well Abandonment:

CRC developed average costs for abandonment of production and injection wells at THUMS and Tidelands operating areas, based on abandonments performed for recent projects in the Port area, including the Gerald Desmond Bridge Replacement and Middle Harbor.

Disclaimer Statement:

This Opinion of Probable Cost was developed by quantifying the scope and costs for full field abandonment of CRC assets including pipelines, facilities, island removal, and remediation. Quantities were estimated from data/information provided by CRC; hence the estimate is believed to be comprehensive. However, it is possible that miscellaneous items may have been unknowingly omitted.

### **3. BASIS OF ESTIMATE**

#### **3.1. List of Facilities**

The assets to be considered in the abandonment cost estimate include all Tidelands and THUMS pipelines and facilities, specifically:

##### 3.1.1. General:

- Well cellars and support facilities for all production and injection wells.
- Underground and above ground pipelines, including supports.
- Electrical substations, load centers, MCCs, duct banks, above ground conduit, supports and related equipment.
- Production field equipment including AWTs, DVMs, valve stations, and similar components.
- Tanks/vessels, pumps, compressors, gas treatment equipment, support structures, foundations, piping, electrical equipment and buildings at the facility locations listed below.

3.1.2. Tidelands Facilities:

The following Tidelands facilities are included in the cost estimate. Baseline facilities are shown in **bold text**.

3.1.2.1. Oil Field Set-Aside Areas and Operating Areas:

- Pier A West
- NC Lease
- West of Carrack
- **West of Vopak**, and adjacent Tidelands Warehouse and Pipe Yard
- Pier S, Area 1 and Area 3
- W-Strip
- **Parcel A (A-7)**
- Pier A East New
- Ultramar Strip
- South of HCC
- TM-13
- TM-14
- South of Toyota
- Standard Lease
- A-4
- A-8 (North Flank)
- A-9 (Reef)
- Pier G
- B-1
- Pier C
- D-1, D-2, D-3 and D-4
- E-2, E-5 and E-13
- J-Leases
- Z1 Lease

3.1.2.2. **X&Y Tank Farm**

3.1.2.3. **Z Water Plant**

3.1.2.4. Z1-2 Tank Farm

3.1.2.5. Warehouse/South Maintenance Yard (A-6)

3.1.2.6. Slurry Process Facility, A-1 and A-1A

3.1.2.7. J Water Plant

3.1.2.8. F Water Plant (A-2)

3.1.3. THUMS Facilities:

The following THUMS facilities are included in the cost estimate. Baseline facilities are shown in **bold text**.

- 3.1.3.1. **B&M Gas Plant**
- 3.1.3.2. THUMS production islands: **Island White**, Island Freeman, Island Chaffee, Island Grissom.
- 3.1.3.3. J-1, J-3, J-4 and J-5
- 3.1.3.4. **J-2 Tank Farm**
- 3.1.3.5. J-6 Tank Farm
- 3.1.3.6. ANC-1 Maintenance Yard
- 3.1.3.7. THUMS Office Building, Warehouse and Docks
- 3.1.3.8. THUMS Drilling Yard

### 3.2. Common Assumptions

- 3.2.1. This cost estimate is an 'Opinion of Probable Construction Cost' made by consultants. In providing opinions of construction cost, it is recognized that neither the client nor the consultant has control over the cost of labor, equipment, materials, or the contractor's means and methods of determining constructability, pricing or schedule. This opinion of construction cost is based on the consultant's reasonable professional judgment and experience and does not constitute a warranty, expressed or implied, that contractor's bids or negotiated prices for the work will not vary from this opinion of cost.
- 3.2.2. A 30% contingency has been included to cover undefined items, due to the level of engineering carried out at this time. The contingency is not a reflection of the accuracy of the estimates but covers items of work which will have to be performed, and elements of costs which will be incurred, but which are not explicitly detailed or described due to the level of investigation, engineering and estimating completed today.
- 3.2.3. Owner overhead is included at 10% before contingency.
- 3.2.4. The estimate, including the contingency, is considered accurate to -30% to +50%.
- 3.2.5. For CRC accounting purposes, estimated costs have been allocated to each oil production fault block on a percentage basis.
- 3.2.6. Union wage rates were considered in the development of this estimate.
- 3.2.7. Separately, an escalation factor was applied to estimate totals using Engineering News Record (ENR) Construction Cost Index (CCI) average for the last 10 years in City of Los Angeles. The resulting 2.8% index was extrapolated to the year 2040.
- 3.2.8. Construction management cost was factored at 5%.
- 3.2.9. Assumes permits will be required from applicable local, state and federal jurisdictions, including but not limited to:
  - 3.2.9.1. South Coast Air Quality Management District (Rule 219 (n)) exempts Natural Gas and Crude Oil Production Equipment, however, permits are expected for abandonment, decommissioning and/or remediation activities.
  - 3.2.9.2. LA Regional Water Quality Control Board. Assumes LA RWQCB maintains role as lead agency. LA RWQCB is current lead agency for remediation at Parcel A-7. If additional contamination is found prior to, or during decommissioning activities, it

is possible for Cal DTSC and/or Cal EPA to become involved in oversight of environmental abandonment activities.

- 3.2.9.3. City of Long Beach, specifically, Title 12 Long Beach Oil Code. Sections 12.08 Tidelands Areas, 12.12 Permits, 12.20 Derricks, and 12.36 Abandonment. This code section is detailed for oil and gas production with little focus on abandonment. This code may be updated with additional abandonment and restoration requirements as the timeline for abandonment activities narrows.
- 3.2.9.4. CA Division of Oil, Gas, and Geothermal Resources.
- 3.2.9.5. State Lands Commission.
- 3.2.9.6. Harbor Development (POLB).
- 3.2.9.7. Environmental Impact Report (EIR). Due to uncertainty, the cost of an EIR is not included.
- 3.2.9.8. Army Corp of Engineers
- 3.2.9.9. California Coastal Commission

### **3.3. Pipelines and Facilities – Assumptions**

- 3.3.1. Removal costs for non-baseline facilities were estimated by reviewing site locations and applying a percentage to removal cost for a comparable baseline facility.
- 3.3.2. For set-aside and operating areas, removal costs were estimated from detailed take-offs performed for two (2) areas: West of Vopak and Parcel A. The two estimates resulted in an average cost per well which was used to estimate removal costs of the remaining areas.
- 3.3.3. The estimate is based on the following backfill assumptions:
  - 3.3.3.1. 10% slurry backfill
  - 3.3.3.2. 90% native soil backfill.
  - 3.3.3.3. 0% import soil backfill (included in remediation costs).
- 3.3.4. Site grade elevations will be returned to match existing to the extent possible.
- 3.3.5. Estimate includes a salvage value for material removed from tank farms and process facilities, calculated at 2% of removal cost.
- 3.3.6. Estimate does not include removal of old, previously abandoned lines, inclusive of Lomita, UPRC, Mobil Lease lines or regulated pipelines north of B&M Gas Plant.
- 3.3.7. Removal scope under the Pier B On-Dock Rail Yard project is not included. The estimate does include removal of pipelines “proposed” under the Pier B On-Dock Rail Yard project.
- 3.3.8. Estimate assumes major permits for the work will include Harbor Development Permits only.
- 3.3.9. Wells:
  - 3.3.9.1. CRC well work group will disconnect wells and remove well heads during well abandonment.
  - 3.3.9.2. Removal of common well cellar structures is included in the facilities portion of the estimate. Individual well cellars will be removed during well abandonment.
- 3.3.10. Estimate includes product removal, cleaning and pigging of pipelines.

- 3.3.11. Where existing lines are under public streets, 40% will be removed and 60% will be abandoned in place.
- 3.3.12. 75% of pipelines in terminals will be abandoned in place.
- 3.3.13. Sub-sea electrical lines: conductors and dielectric oil will be removed. Conduits and casings will be capped at each end and abandoned in place.
- 3.3.14. Sub-sea pipelines will be drained, pigged and cleaned and mud-jacked in place.
- 3.3.15. Inaccessible pipelines will be cut, mud-jacked, capped and abandoned in place.
- 3.3.16. Inaccessible casings will be mud-jacked and abandoned in place, such as casings in HDDs and at railroad crossings.
- 3.3.17. Duct banks:
  - 3.3.17.1. THUMS/Tidelands: In operating areas, duct banks will be completely removed. Duct banks in public streets and Terminals: conductors will be removed, and conduits/concrete will not be removed.
- 3.3.18. Removal of CRC idle pipelines is included, with percentages as described herein.
- 3.3.19. Estimate includes cleaning of tanks and vessels.
- 3.3.20. Civil and Structural:
  - 3.3.20.1. Foundations, spread footings and mat slabs are estimated using an average depth of 3 feet.
  - 3.3.20.2. Non-foundation slab-on-grade concrete is estimated using an average depth of 1 foot.
  - 3.3.20.3. Concrete piles and drilled piers will be abandoned in place 5 feet below grade.
  - 3.3.20.4. Storm water systems at Pier A West and S-1 will remain; includes retention basins and pump station.
- 3.3.21. THUMS Islands:
  - 3.3.21.1. Steel and other construction materials will be barged from island to mainland for disposal.
  - 3.3.21.2. Concrete will be cleaned and disposed off shore.
- 3.3.22. Estimate includes removal of cathodic protection equipment.

#### **3.4. Island Removal Assumptions**

- 3.4.1. Contaminated soil (hydrocarbons) disposal assumes 2% of the soil is contaminated with hydrocarbons, is Class II and can be transported and disposed of at a facility (e.g., McKittrick Waste Treatment Site) within a 3-4 hour drive from Long Beach at a rate of \$70/ton. Additional costs to excavate, transport, and offload the material at the Port of Long Beach are estimated to be \$23/ton.
- 3.4.2. Contaminated soil (hazardous) disposal assumes 0.1% of the soil is contaminated with PCBs, metals and/or solvents, is Class I RCRA waste and can be transported and disposed of at a facility (e.g. Kettleman Hills Chemical Waste Management Site) within a 4-5 hour drive from Long Beach at a rate of \$120/ton plus an additional hazardous waste disposal fee of \$55/ton. Additional costs to excavate, transport, and offload the material at the Port of Long Beach are estimated to be \$45/ton.

- 3.4.3. **Off-Shore disposal** - assumes offshore disposal location is available for armor stone, quarry run, and clean island fill in close proximity to Long Beach Harbor or within 5 miles.
- 3.4.4. **Onshore disposal option** - costs for Armor Stone, Quarry Run, Clean Island Fill assume waste is transported and disposed of at a facility 2 hours away from the Port of Long Beach. Concrete Retaining Wall, Deadman, and Concrete Decorative Walls is assumed to be trucked 30 minutes to Hanson Aggregates, a disposal site in Long Beach.
- 3.4.5. Mobilization / demobilization costs based on a US-based west-coast contractor.

### 3.5. Remediation Assumptions

- 3.5.1. Oversight and management costs are provided as a percent of the remediation estimate prepared for each parcel.
- 3.5.2. In general, the remediation estimates include costs for oversight and management, excavation of TPH-impacted soils to a maximum depth of five (5) feet below grade, backfill of excavation areas, off-site transportation and disposal of TPH-impacted soils, laboratory analytical costs for waste profiling, laboratory analytical costs to confirm excavation limits, dust monitoring, SWPPP BMPs, select permit application fees and agency coordination. Constituents of Concern (COCs) addressed in the remediation estimate are limited to Total Petroleum Hydrocarbons (C4 – C44). Other COCs are not considered in the development of this estimate. Inclusion of additional COCs will require these estimates to be updated.
- 3.5.3. A level of effort lump sum of \$5,000 is included for each parcel to prepare a final letter-report for submittal to an oversight agency to document completion of remediation activities.
- 3.5.4. NORM is known to be present in isolated facilities within the LBU and the cost associated with NORM is included in the Pipelines and Facilities portion of the estimate.
- 3.5.5. Potential sediment accumulation in the Port from THUMS and/or Tidelands operations are not evaluated or included in these estimates.
- 3.5.6. Remediation equipment utilized will be standard in nature (i.e. excavator, front-end loader, backhoe, compaction wheel, water truck, etc.) and will need to meet South Coast Air Quality Monitoring District Tier 3 or Tier 4 requirements.
- 3.5.7. GIS files provided by CRC for THUMS and Tidelands used to generate square footage of each parcel. The square footage of each parcel was then used to calculate estimated volumes of TPH-impacted soils at the parcel. Tables showing GIS area (square footage) and estimated volumes of TPH-impacted soils for each parcel to one-foot bgs, two and one-half feet bgs, and five feet bgs are included in the estimate prepared for each parcel.
- 3.5.8. On-site soil handling includes soil excavation, handling and stockpiling, environmental sampling, backfill and compaction.
- 3.5.9. Maximum excavation depths of five (5) feet below grade at are assumed at the THUMS and Tidelands sites, unless otherwise specified. Select parcels assume excavation depths greater than five (5) feet below grade based on available data.

- 3.5.10. TPH-impacted soil excavation extent will be limited to THUMS and Tidelands parcel boundaries.
- 3.5.11. Excavated TPH-impacted soils will be hauled off-site for disposal.
- 3.5.12. Excavated clean overburden will be stockpiled on-site and re-used as backfill as appropriate.
- 3.5.13. Confirmation environmental soil samples will be collected from excavation limits and regulatory requirements.
- 3.5.14. Environmental soil samples will be submitted to an appropriate environmental laboratory for analysis.
- 3.5.15. Off-site transportation and disposal will utilize standard 18-ton capacity end-dump trucks.
- 3.5.16. Off-site soil handling includes trucking and disposal TPH-impacted soils classified as non-hazardous or hazardous waste streams.
- 3.5.17. TPH-impacted soils with concentrations less than 1,000 mg/kg can be reused within the Port and do not require off-site transportation or disposal.
- 3.5.18. Non-hazardous TPH-impacted soil disposal costs developed for Clean Harbors facility located in Buttonwillow, CA.
- 3.5.19. Hazardous TPH-impacted soil disposal costs developed for Kettleman City facility located in Kettleman City, CA.
- 3.5.20. Waste disposal fees and taxes applicable for January 2017.
- 3.5.21. Costs for demolition of all on-shore, at-grade and below-grade oil and gas related facilities for THUMS and Tidelands are included in Pipelines and Facilities.
- 3.5.22. Costs for on-shore demolition are included in Pipelines and Facilities.
- 3.5.23. Assumes groundwater is not impacted and/or will not require remediation.
- 3.5.24. Groundwater is tidally influenced and may fluctuate in depth, affecting excavation depths and access.
- 3.5.25. Costs for clean soil import are included.
- 3.5.26. Access to the site is assumed to be unimpeded by demolition of existing facilities or structures, Port facilities, Port activities, etc.
- 3.5.27. Assumes LARWQCB will be the regulatory oversight agency during remediation activities.
- 3.5.28. Completion of initial remedial investigation activities to determine spatial distribution, depth, and concentration of TPH-impacted soils may affect the estimates provided.

### **3.6. Well Abandonment Assumptions**

- 3.6.1. Well abandonment costs are included as an average cost per well based on recent historical data for well abandonment work.
- 3.6.2. Well count includes active and idle wells in the oil field as of the date of the estimate.
- 3.6.3. The cost estimate does not include a future projection for added or removed wells.
- 3.6.4. Wells will be abandoned to surface.
- 3.6.5. Removal of conductor and casing for island wells will be to 5 feet below mud line.
- 3.6.6. Estimate includes water source well abandonment.

### 3.7. Specific Exclusions

- 3.7.1. Removal and reassignment of the THUMS Power Plant at Pier D.
- 3.7.2. HDD removal, except as described herein.
- 3.7.3. Re-abandonment of existing abandoned wells.
- 3.7.4. Inaccessible duct banks or casings.
- 3.7.5. Groundwater characterization, sampling and remediation.
- 3.7.6. Lead paint, asbestos or other hazardous materials abatement or removal. Estimate includes testing costs.
- 3.7.7. Permanent fencing or other permanent improvements.
- 3.7.8. Agency oversight costs.
- 3.7.9. Coastal Commission approval or interface.
- 3.7.10. Estimate excludes business disruption cost for terminals, tenants, adjacent businesses, etc.
- 3.7.11. Maintenance costs – operations revenue will cover maintenance costs until the field is uneconomic, and no maintenance is expected after cessation of operations.

## 4. COST ESTIMATE SUMMARY

### 4.1. Overall Cost Summaries

#### OPINION OF PROBABLE COST THUMS OVERALL SUMMARY

	Total Removal Cost 2017	Escalation to Year 2040	Total Including Escalation
Pipelines and Facilities	\$ 231,000,000	\$ 205,000,000	\$ 436,000,000
Remediation Estimate	\$ 33,000,000	\$ 28,000,000	\$ 61,000,000
Well abandonment	\$ 369,000,000	\$ 328,000,000	\$ 697,000,000
<b>Totals:</b>	<b>\$ 633,000,000</b>	<b>\$ 562,000,000</b>	<b>\$ 1,195,000,000</b>

Total Number of Active & Idle  
 Wells: 1,492

Island Removal 2 Islands (Off-Shore Disposal)	\$ 83,000,000	\$ 73,000,000	\$ 156,000,000
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Island Removal 2 Islands (On-Shore Disposal)	\$ 213,000,000	\$ 188,000,000	\$ 401,000,000
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**OPINION OF PROBABLE COST  
Tidelands OVERALL SUMMARY**

	<b>Total Removal Cost 2017</b>	<b>Escalation to Year 2040</b>	<b>Total Including Escalation</b>
<b>Pipelines and Facilities</b>	<b>\$ 130,000,000</b>	<b>\$ 116,000,000</b>	<b>\$ 246,000,000</b>
<b>Remediation Estimate</b>	<b>\$ 36,000,000</b>	<b>\$ 31,000,000</b>	<b>\$ 67,000,000</b>
<b>Well abandonment</b>	<b>\$ 231,000,000</b>	<b>\$ 204,000,000</b>	<b>\$ 435,000,000</b>
<b>Grand Total:</b>	<b>\$ 397,000,000</b>	<b>\$ 321,000,000</b>	<b>\$ 718,000,000</b>

**Total Number of Active & Idle Wells: 932**

**4.2. THUMS Pipelines and Facilities - Cost Summary**

<b>THUMS PIPELINES AND FACILITIES</b>							
	<b>Construction</b>	<b>Engineering</b>	<b>Construction Management</b>	<b>CRC/State/City Overhead</b>	<b>Contingency</b>	<b>Total</b>	
<b>Island White</b>	\$ 27,600,000	\$ 2,760,000	\$ 1,380,000	\$ 2,760,000	\$ 9,500,000	<b>\$ 44,000,000</b>	
<b>B&amp;M Gas Plant</b>	\$ 4,220,000	\$ 420,000	\$ 211,000	\$ 420,000	\$ 1,500,000	<b>\$ 6,800,000</b>	
<b>Power Generation Plant</b>							
<b>Island Freeman</b>	\$ 26,270,000	\$ 2,630,000	\$ 1,313,500	\$ 2,630,000	\$ 9,100,000	<b>\$ 41,900,000</b>	
<b>Island Chaffee</b>	\$ 31,420,000	\$ 3,140,000	\$ 1,571,000	\$ 3,140,000	\$ 10,800,000	<b>\$ 50,100,000</b>	
<b>Island Grissom</b>	\$ 25,270,000	\$ 2,530,000	\$ 1,263,500	\$ 2,530,000	\$ 8,700,000	<b>\$ 40,300,000</b>	
<b>Thums Pier J Storage</b>	\$ 60,000	\$ 10,000	\$ 3,000	\$ 10,000	\$ 20,000	<b>\$ 100,000</b>	
<b>J-1, J-3, J-4, J-5 (SAAs)</b>	\$ 5,240,000	\$ 520,000	\$ 262,000	\$ 520,000	\$ 1,800,000	<b>\$ 8,300,000</b>	
<b>Thums J-2 Tank Farm</b>	\$ 5,960,000	\$ 600,000	\$ 298,000	\$ 600,000	\$ 2,100,000	<b>\$ 9,600,000</b>	
<b>Thums J-6 Tank Farm</b>	\$ 5,040,000	\$ 500,000	\$ 252,000	\$ 500,000	\$ 1,700,000	<b>\$ 8,000,000</b>	
<b>ANC-1 Maintenance Yard</b>	\$ 60,000	\$ 10,000	\$ 3,000	\$ 10,000	\$ 20,000	<b>\$ 100,000</b>	
<b>THUMS Office Bldg., Warehouse &amp; Dock</b>	\$ 300,000	\$ 30,000	\$ 15,000	\$ 30,000	\$ 100,000	<b>\$ 500,000</b>	
<b>THUMS Systems</b>	\$ 11,220,000	\$ 1,120,000	\$ 561,000	\$ 1,120,000	\$ 3,900,000	<b>\$ 17,900,000</b>	
<b>THUMS Active &amp; Idle Wells</b>	\$ 2,430,000	\$ -	\$ 121,500	\$ 240,000	\$ 800,000	<b>\$ 3,600,000</b>	
<b>Subtotals - THUMS</b>	<b>\$ 145,090,000</b>	<b>\$ 14,270,000</b>	<b>\$ 7,254,500</b>	<b>\$ 14,510,000</b>	<b>\$ 50,040,000</b>	<b>\$ 231,200,000</b>	

### 4.3. Tidelands Pipelines and Facilities - Cost Summary

TIDELANDS PIPELINES AND FACILITIES						
	Construction	Engineering	Construction Management	CRC/State/City Overhead	Contingency	Total
X & Y Tank Farm	\$ 9,170,000	\$ 920,000	\$ 458,500	\$ 920,000	\$ 3,200,000	\$ 14,700,000
Z Water Plant	\$ 1,980,000	\$ 200,000	\$ 99,000	\$ 200,000	\$ 700,000	\$ 3,200,000
West of Vopak	\$ 970,000	\$ 100,000	\$ 48,500	\$ 100,000	\$ 300,000	\$ 1,500,000
Parcel A (A-7)	\$ 1,840,000	\$ 180,000	\$ 92,000	\$ 180,000	\$ 600,000	\$ 2,900,000
Warehouse / Pipe Yard (West of Vopak)	\$ 400,000	\$ 40,000	\$ 20,000	\$ 40,000	\$ 100,000	\$ 600,000
Other Tidelands SAAs	\$ 21,400,000	\$ 2,140,000	\$ 1,070,000	\$ 2,140,000	\$ 7,400,000	\$ 34,200,000
W-Strip						Included
Pier S, Area 1 and Area 3						Included
Pier A West						Included
Pier A East New						Included
NC Lease						Included
Ultramar Strip						Included
South of HCC						Included
West of Carrack						Included
TM-13, TM-14						Included
South of Toyota						Included
Standard Lease						Included
A-4, A-8 (North Flank), A-9 (Reef)						Included
B-1 NEW						Included
Pier C						Included
D-1, D-2, D-3, D-4						Included
E-2, E-5, E-13						Included
J-Leases						Included
Z1 Lease						Included
Warehouse / Pipe Yard (West of Vopak)	\$ 100,000	\$ 10,000	\$ 5,000	\$ 10,000	\$ 30,000	\$ 200,000
Warehouse/South Maintenance Yard (A-6)	\$ 400,000	\$ 40,000	\$ 20,000	\$ 40,000	\$ 100,000	\$ 600,000
Slurry Proc Facility, A-1 and A-1A	\$ 600,000	\$ 60,000	\$ 30,000	\$ 60,000	\$ 200,000	\$ 1,000,000
J Water Plant (J-7)	\$ 590,000	\$ 60,000	\$ 29,500	\$ 60,000	\$ 200,000	\$ 900,000
F Water Plant (A-2)	\$ 400,000	\$ 40,000	\$ 20,000	\$ 40,000	\$ 100,000	\$ 600,000
Z1-2 Tank Farm	\$ 5,500,000	\$ 550,000	\$ 275,000	\$ 550,000	\$ 1,900,000	\$ 8,800,000
Tidelands Systems	\$ 24,280,000	\$ 2,430,000	\$ 1,214,000	\$ 2,430,000	\$ 8,400,000	\$ 38,800,000
Tidelands Active & Idle Wells	\$ 13,980,000	\$ 1,400,000	\$ 699,000	\$ 1,400,000	\$ 4,800,000	\$ 22,300,000
<b>Subtotals - TIDELANDS</b>	<b>\$ 81,610,000</b>	<b>\$ 8,170,000</b>	<b>\$ 4,080,500</b>	<b>\$ 8,170,000</b>	<b>\$ 28,030,000</b>	<b>\$130,300,000</b>

**4.4. Island Removal Cost Summary**

<b>Island White Removal Estimate</b>			
Item			Total Cost
Remove Rock Perimeter and Quarry Run			\$5,085,000
Remove Sand Fill (Clean Only, Contaminated is by Others)			\$15,103,000
Remove Sea Wall, Sheetpile Walls, and Asphalt Topping			\$2,198,000
Remove Barge Ramp			\$56,000
Remove Landscape and Replant Trees			\$269,000
Remove Decorative Concrete Walls			\$423,000
Remove Boat Landing and Timber Piles			\$200,000
Remove Well Conductors/Casings (cost provided by Others)			\$7,445,000
<b>Island White Removal Total</b>			<b>\$30,779,000</b>
<b>TOTAL PROJECT REMOVAL COSTS</b>			
ITEM			COST
<b>ISLAND WHITE REMOVAL TOTAL</b>			\$30,800,000
<b>ISLAND GRISSOM REMOVAL TOTAL</b>			\$36,500,000
<b>ISLAND CHAFFEE REMOVAL TOTAL</b>			\$34,000,000
<b>ISLAND FREEMAN REMOVAL TOTAL</b>			\$48,600,000
<b>THUMS ISLAND REMOVAL TOTAL</b>			<b>\$ 149,900,000</b>

4.5. Remediation Cost Summary

<b>HIGH-LEVEL REMEDIATION COST ESTIMATE FOR CRC THUMS SET-ASIDE AREAS AND ISLANDS</b>	
<b>Off-Shore Islands:</b>	
<b>Island Name</b>	<b>SUBTOTAL ESTIMATE</b>
Island White	\$ 3,423,000
Island Grissom	\$ 4,605,000
Island Chaffee	\$ 3,997,000
Island Freeman	\$ 6,692,000
<b>SUBTOTAL FOR OFF-SHORE ISLANDS: \$ 18,717,000</b>	
<b>Pier D THUMS Set-Aside Areas:</b>	
<b>Set-Aside Area Name</b>	<b>SUBTOTAL ESTIMATE</b>
B&M (Parcels A&B Combined)	\$ 761,000
Power Plant	\$ -
<b>SUBTOTAL FOR PIER D: \$ 761,000</b>	
<b>Piers E, F, G and H THUMS Set-Aside Areas:</b>	
<b>Set-Aside Area Name</b>	<b>SUBTOTAL ESTIMATE</b>
Harbor Plaza	\$ 12,000
A-7A	\$ 8,000
Pier G	\$ 508,000
Barge Ramp [Pier G (Parcels C, D, E combined)]	\$ 319,000
<b>SUBTOTAL FOR PIERS E, F, G &amp; H: \$ 847,000</b>	
<b>Pier J THUMS Set-Aside Areas:</b>	
<b>Set-Aside Area Name</b>	<b>SUBTOTAL ESTIMATE</b>
Pier J Facilities A	\$ 208,000
Pier J Facilities B	\$ 44,000
Pier J Facilities (D, E, and F Combined)	\$ 7,170,000
J-4	\$ 73,000
J6	\$ 4,652,000
<b>SUBTOTAL FOR PIER J: \$ 12,147,000</b>	
<b>Other THUMS Set-Aside Area:</b>	
<b>Set-Aside Area Name</b>	<b>SUBTOTAL ESTIMATE</b>
Pico Road Electrical Substation	\$ 84,000
<b>SUBTOTAL FOR OTHER THUMS AREAS: \$ 84,000</b>	
<b>REMEDICATION ESTIMATE SUBTOTAL FOR THUMS SET-ASIDE AREAS AND OFF-SHORE</b>	<b>SUBTOTAL ESTIMATE</b>
	<b>\$ 32,556,000</b>

## HIGH-LEVEL REMEDIATION COST ESTIMATE FOR CRC TIDELANDS SET-ASIDE AREAS

### North Tidelands, Pier A, A west, and Pier B Set-Aside Areas:

Set-Aside Area Name	SUBTOTAL ESTIMATE
Standard Injection Plant	\$ 550,000
Boneyard	\$ 29,000
Edison Hole (South of Toyota Yard)	\$ 1,027,000
West of Carrack	\$ 1,063,000
South of HCC (A and B)	\$ 534,000
Ultramar Strip	\$ 427,000
Pier A West Area 4	\$ 1,168,000
NC Lease	\$ 1,528,000
<b>SUBTOTALS FOR NORTH TIDELANDS, PIER A, A WEST, AND PIER B:</b>	<b>\$ 6,326,000</b>

### North Tidelands, Pier S and Pier T Set-Aside Areas:

Set-Aside Area Name	SUBTOTAL ESTIMATE
Warehouse Pipe Yard	\$ 21,000
West of Vopak	\$ 1,168,000
W Strip (W-6A, W-5, W-4)	\$ 1,060,000
Pier S Area 3	\$ 588,000
Pier S Area 1	\$ 866,000
E-2	\$ 643,000
E-13	\$ 49,000
E-5	\$ 704,000
<b>SUBTOTALS FOR NORTH TIDELANDS AND PIER S &amp; T:</b>	<b>\$ 5,099,000</b>

### Pier C Set-Aside Areas:

Set-Aside Area Name	SUBTOTAL ESTIMATE
TM-13	\$ 88,000
TM-14	\$ 163,000
TM-15	\$ 74,000
<b>SUBTOTAL FOR PIER C:</b>	<b>\$ 325,000</b>

### Pier D Tidelands Set-Aside Areas:

Set-Aside Area Name	SUBTOTAL ESTIMATE
X&Y Tank Farm	\$ 6,581,000
D-1	\$ 271,000
D-2	\$ 801,000
D-3	\$ 235,000
D-4	\$ 391,000
<b>SUBTOTAL FOR PIER D:</b>	<b>\$ 8,279,000</b>

<b>Piers E, F, G and H Tidelands Set-Aside Areas:</b>	
<b>Set-Aside Area Name</b>	<b>SUBTOTAL ESTIMATE</b>
B-1	\$ 608,000
A-10	\$ 981,000
A-8	\$ 372,000
A-6 (Warehouse/ S Maintenance Yard)	\$ 906,000
A-5A, Z-1 Lease	\$ 1,140,000
A-7, Parcel "A" and Steam Plant	\$ 5,070,000
A-9	\$ 346,000
A-4	\$ 473,000
A-3, Z-12 Tank Farm	\$ 3,844,000
A-2, "F" Water Injectin Plan	\$ 350,000
A-1, Slurry Processing Facility	\$ 514,000
G-1	\$ 250,000
<b>SUBTOTAL FOR PIER G &amp; H:</b>	<b>\$ 14,854,000</b>
<b>Pier J Tidelands Set-Aside Areas:</b>	
<b>Set-Aside Area Name</b>	<b>SUBTOTAL ESTIMATE</b>
Pier J Facilities C	\$ 115,000
J-1	\$ 113,000
J-3	\$ 134,000
J-5	\$ 117,000
J7	\$ 165,000
<b>SUBTOTAL FOR PIER J:</b>	<b>\$ 644,000</b>
<b>SUBTOTAL ESTIMATE</b>	
<b>REMEDATION ESTIMATE SUBTOTAL FOR TIDELANDS SET-ASIDE AREAS:</b>	<b>\$ 35,527,000</b>

# EXHIBIT B

## Full Field Abandonment Opinion of Probable Cost

September 2017



# Summary

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- Cost Summary
- Qualifications
- Scope
- Basis of Estimate
- Facility & Pipeline Location Maps
  - THUMS
  - Tidelands



# Cost Summary – LBU

Category	2016 Estimate	Updated Estimate	Updated Estimate (Escalated to 2040)
Pipelines and Facilities	\$140MM	\$230MM	\$410MM
Remediation	\$50MM	\$30MM	\$70MM
Well Abandonment	\$280MM	\$370MM	\$630MM
<b>Total</b>	<b>\$470MM</b>	<b>\$630MM</b>	<b>\$1,480MM</b>

Island Removal 2-Islands (Option 1 - Off-Shore Disposal)	\$260MM	\$80MM	160MM
Island Removal (Option 2 - On-Shore Disposal)		\$210MM	\$400MM

# Cost Summary – Tidelands

---

Category	2016 Estimate	Updated Estimate	Updated Estimate (Escalated to 2040)
Pipelines and Facilities	\$50MM	\$130MM	\$250MM
Remediation	\$10MM	\$40MM	\$70MM
Well Abandonment	\$220MM	\$230MM	\$400MM
<b>Total</b>	<b>\$280MM</b>	<b>\$400MM</b>	<b>\$750MM</b>

# Qualifications

---

## Cost estimate excludes:

- Removal of existing Pier D THUMS Power Plant
- Re-abandonment of abandoned wells
- Business disruption cost for terminals, tenants, adjacent businesses, etc.
- Accessibility due to future development
- Accelerated schedules
- Facility expansion or contraction

# Qualifications

---

## Cost estimate excludes:

- Coastal Commission approval or interface
- Future regulatory or environmental changes
- Maintenance costs
  - Operations revenue will cover maintenance costs until the field is uneconomic
  - After cessation of operations, no further maintenance is expected

# Cost Estimate Team

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- SPEC Services, Inc. Pipelines and Facilities Removal
- Moffatt & Nichol Island Land Mass Removal
- Geosyntec Remediation
- CRC (In-House) Well Abandonment

# Scope of Cost Estimate

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- Abandonment of active & idle wells (over 2,400)
- Removal of THUMS and Tidelands facilities:
  - (30) Tidelands set-aside and operating areas
  - (9) THUMS off-shore and on-shore operating areas
  - (3) Water pumping plants
  - (4) Tank Farms
  - (1) Gas processing plant
  - Maintenance yards, slurry plant
  - Removal or abandon-in-place of pipeline network
- Removal of two (2) THUMS island land masses.
- Soil remediation included.

# Basis of Estimate - General

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- Contingency is included at 30%
- Union wage rates considered in the estimate
- Construction management factored at 5%
- Owner overhead included at 10% before contingency
- Escalation at 2.8% extrapolated to year 2040

# Basis of Estimate – Pipelines and Facilities

---

- Detailed estimates developed for representative sites
- Estimates extrapolated for similar facilities based on site area, well count and facility type.
- Based on pipeline locations and accessibility, a portion of the lines will be removed with the remainder abandoned in place.



# Basis of Estimate – Island Removal

---

- Estimate includes only removal of two (2) islands.
- Detailed estimate developed for removal of one island
- Estimate extrapolated for 2<sup>nd</sup> island based on area.
- Two disposal options are presented: off-shore or on-shore
- Estimate assumes 2% of soil is contaminated

# Basis of Estimate – Remediation

---

- Volumes were determined by a high-level review of site history.
- Soil removal depth is limited to a maximum of five (5) feet
- No remediation investigation/testing was conducted.

## Basis of Estimate – Wells

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- Well abandonment costs are based on recent historical data.
- Well count includes current active and idle wells.
- Wells will be abandoned to current DOGGR requirements.
- Removal of conductor and casing for island wells to 5 feet below mud line is only included in island removal case

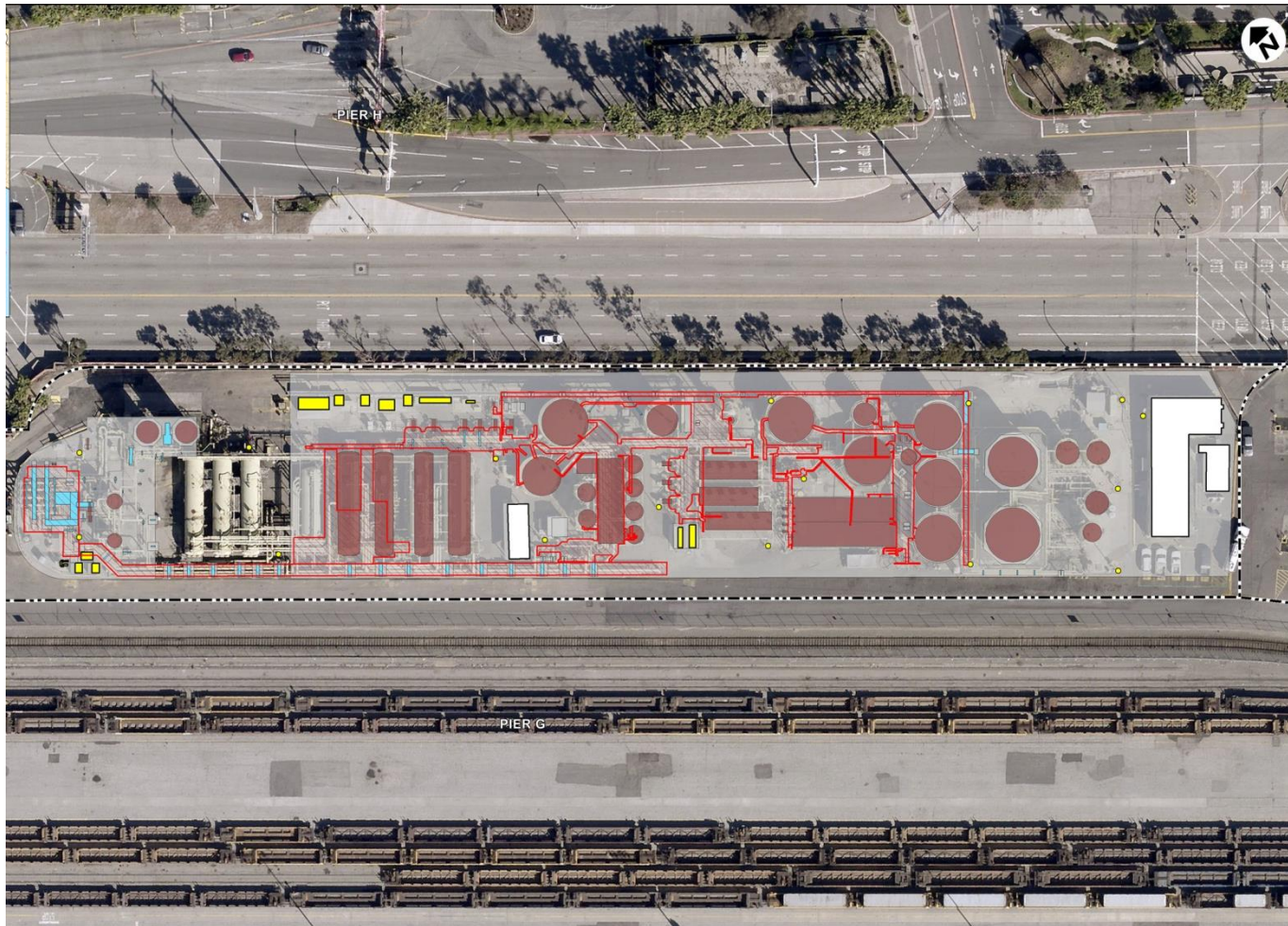
# THUMS Facilities & Pipelines

## B&M Gas Plant



# THUMS Facilities & Pipelines

## Pier J On-Shore Facility (Estimate Base Line)



# THUMS Facilities & Pipelines

Island White (Estimate Base Line) (one of four off-shore operating areas)



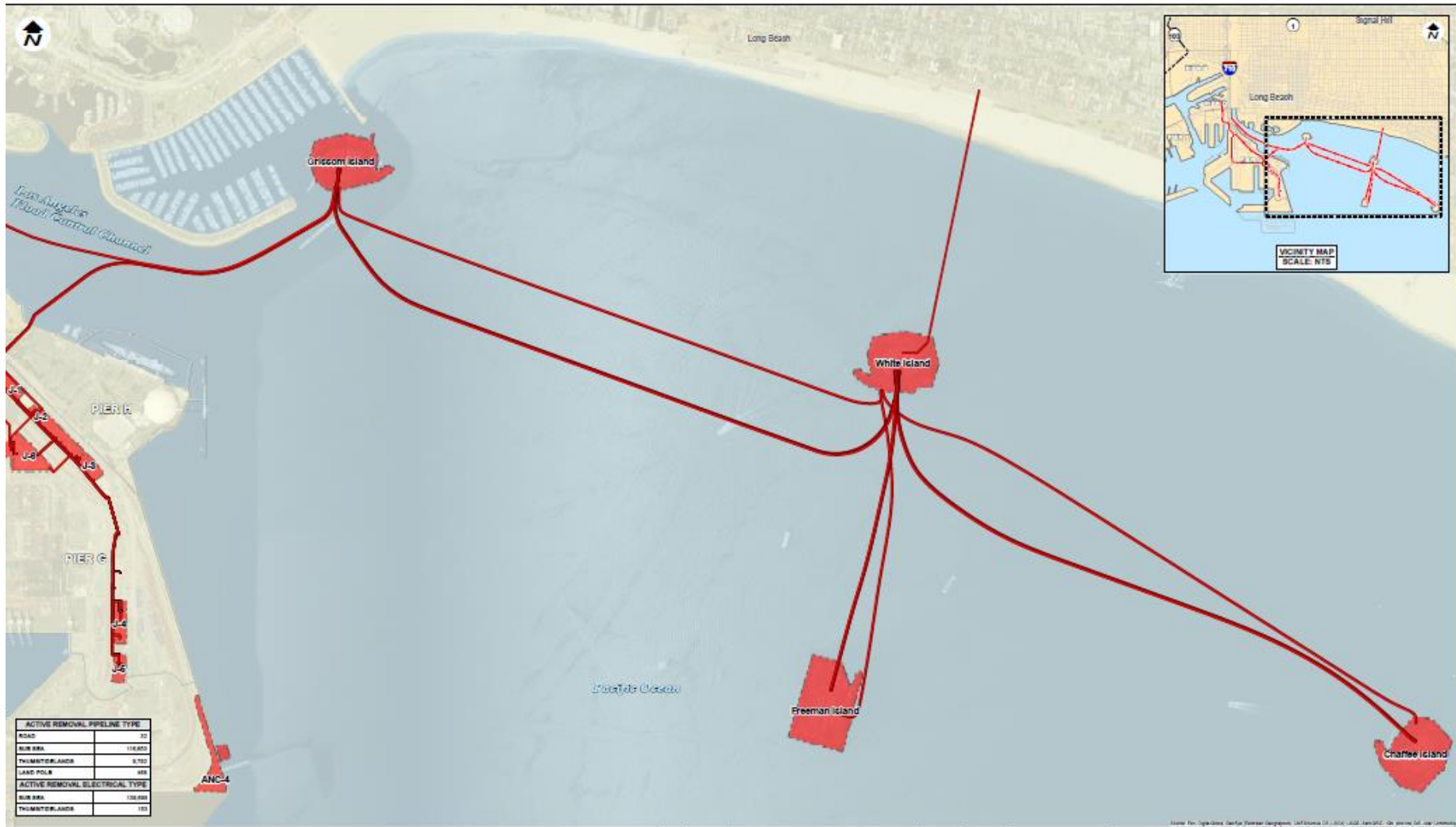
# THUMS Facilities & Pipelines

## THUMS Pipelines (1 of 2)



# THUMS Facilities & Pipelines

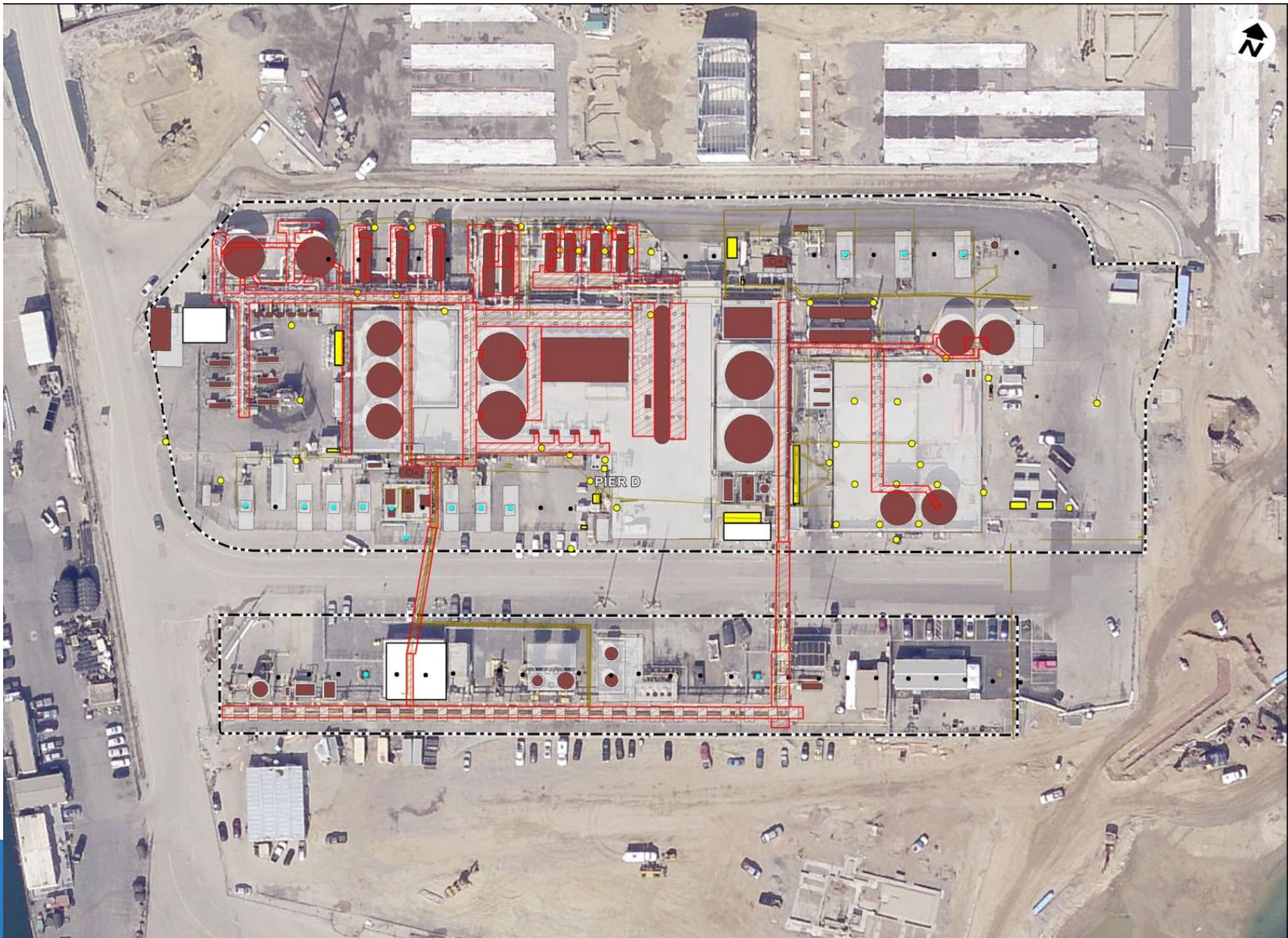
## THUMS Pipelines (2 of 2)





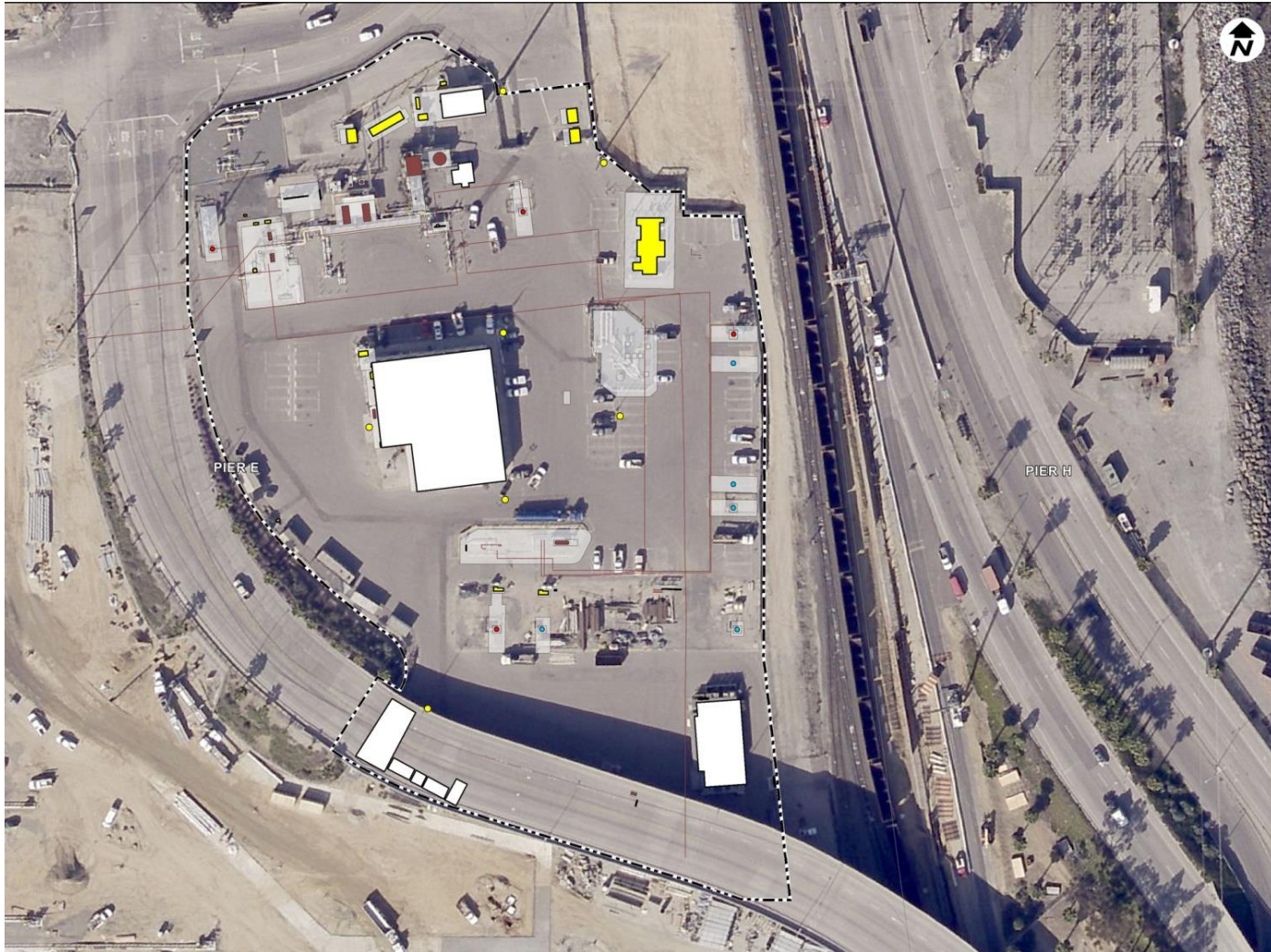
# Tidelands Facilities & Pipelines

## X & Y Tank Farm (Estimate Base Line) (Similar to other 3 tank farms)



# Tidelands Facilities & Pipelines

## Z Water Plant (Pumping) / Walker Center (Est. Base Line) (Office, Whse.)



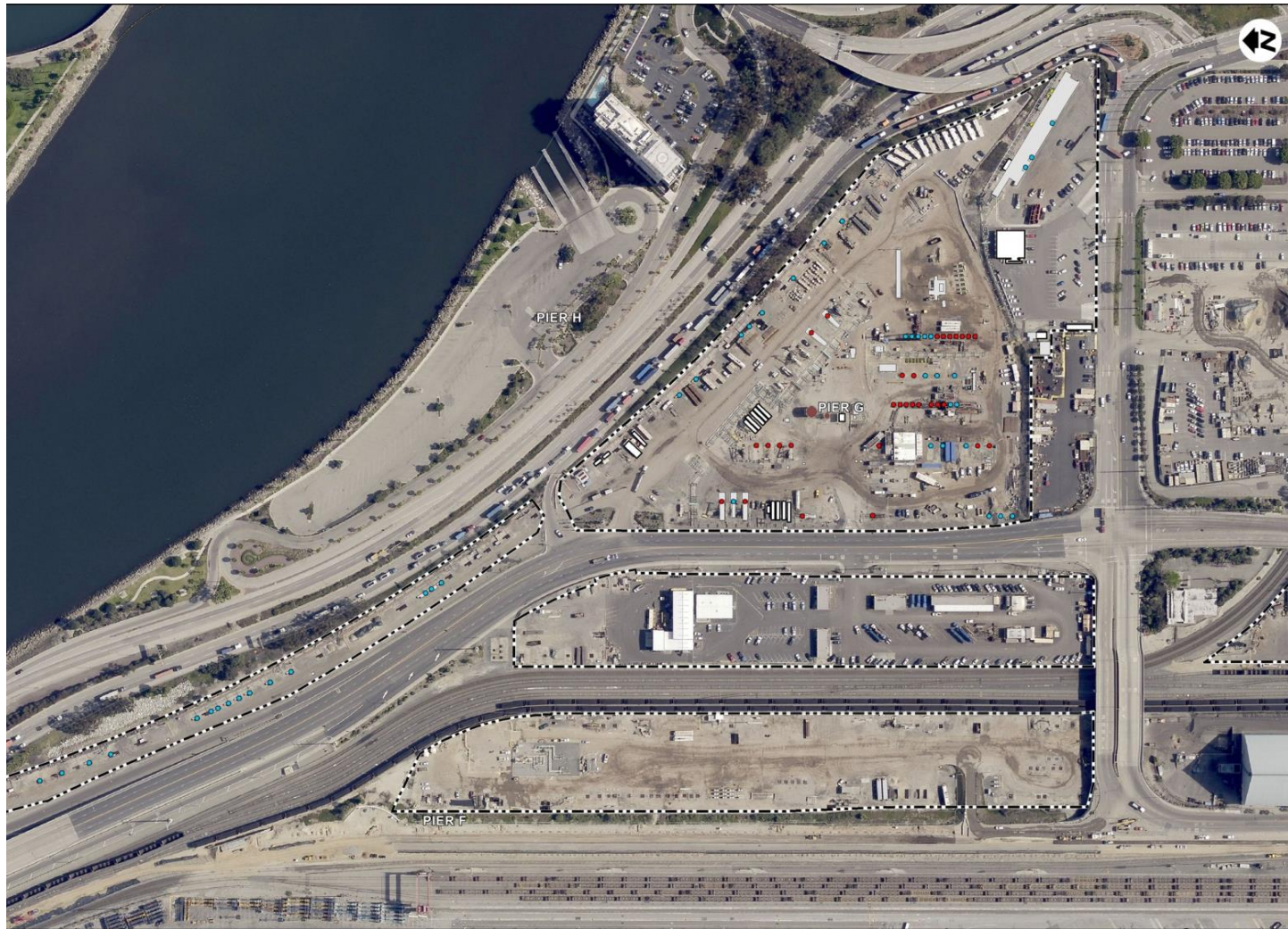
# Tidelands Facilities & Pipelines

## West of Vopak (Estimate Base Line) (Typical Small Operating Area)



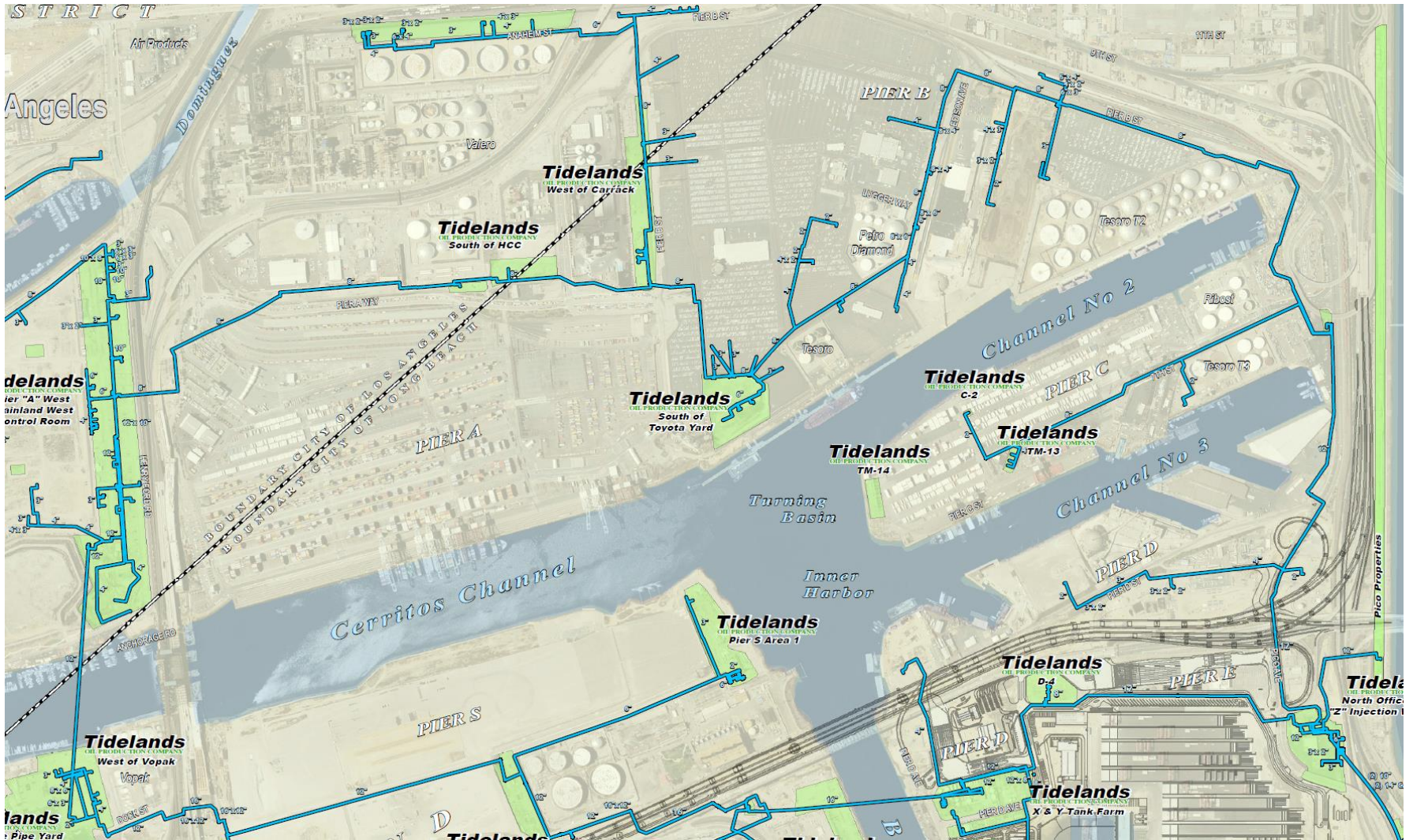
# Tidelands Facilities & Pipelines

## Parcel A (Estimate Base Line) (Typical Large Operating Area)



# Tidelands Facilities & Pipelines

## Injection Pipeline System (Example network for one system)





## EXHIBIT C

M E M O R A N D U M

Working Together To Serve

Date: October 26, 2017

To: John Gross, Director, Financial Management

From: Bob Dowell, Director, Long Beach Gas and Oil *Bob Dowell*

Subject: **Fiscal Year 2018 Oil Field Abandonment Liability – No Removal of Islands and Powerplant**

The revenues and liabilities from oil operations are accumulated and disbursed among three City funds as shown in the attached table: The Tidelands Oil Revenue Fund, the Tidelands Operating Fund, and the Upland Oil Fund. For Fiscal Year 2018, the total abandonment liabilities are estimated to be \$836 million for the Tidelands Trust (State), \$113 million for the Tidelands Operating Fund, and \$21.0 million for the City's proprietary interest (Uplands). Total abandonment liabilities increased by \$34.8 million over last fiscal year as determined by a recent abandonment liability analysis.

As of July 1st, 2017, the remaining unfunded liability for the Tidelands Trust (State) is estimated at \$536 million, \$90.2 million for the Tidelands Operating Fund, and \$14.0 million for the City's proprietary interest based on the respective balances in each reserve for abandonment.

The unfunded liability per barrel has significantly increased for the Tidelands Operating Fund and the City's proprietary interest primarily due to the following reasons:

- i. CRC was tasked by the City to conduct a study to provide a best estimate for facilities abandonment costs. The analysis indicated that the Tidelands operating area would require additional costs to abandon than previously estimated.
- ii. The production forecast has continued to decline due to very few new wells drilled over the last fiscal year as a result of the low oil price environment.

The decrease in drilling investment was made in an effort to maximize oil profits in a continuing low oil price environment. For the City's proprietary interest, the unfunded liability is \$8.78 per barrel of oil forecast to be produced through Fiscal Year 2035. While the oil price determines the ultimate field life, currently the field contractor has reported end of field life of 2041 and 2030 for Long Beach Unit and Tidelands, respectively, for Year End 2016 SEC filing. In this analysis, end of field life of 2035 was used for each abandonment fund.

The base goal for abandonment reserve in FY 18 is \$5 million for Tidelands Operating Fund and \$660,000 for Uplands. The City will consider increasing its savings for abandonment this fiscal year if oil prices allow for profits more than the current budget forecast.

If you have questions or require additional information, please contact Kevin Tougas at 562-570-3963.

## Attachment

cc: David Nakamoto, Financial Management  
Marina Voskanian, State Lands Commission  
Cameron Smith, Long Beach Gas & Oil

ABANDONMENT LIABILITY CALCULATION	Well ABD	Facilities and	Total ABD	Current	Unfunded	Production	Unfunded
	Liability (x \$1,000)	Soil ABD Liability (x \$1,000)	Liability (x \$1,000)	Reserve for ABDs (x \$1,000)	Liability (x \$1,000)	Forecast thru FY2035 (x 1,000 BBLs)	Liability per BBL (\$/BBL)
<b>Tidelands Oil Revenue Fund (NX420)<sup>a</sup></b>							
<b>("CITY TIDELANDS TRUST")</b>							
October 1, 2017	502,300	333,900	836,200	300,000	536,200	97,840	5.480
October 1, 2016	373,000	464,500	837,500	300,000	537,500	109,220	4.921
Change from 2016	129,300	-130,600	-1,300	0	-1,300	-11,380	0.559
<b>Tidelands Operating Fund (TF 401)</b>							
October 1, 2017	73,900	38,800	112,700	22,463	90,237	8,300	10.872
October 1, 2016	64,200	19,400	83,600	17,438	66,162	8,590	7.702
Change from 2016	9,700	19,400	29,100	5,025	24,075	-290	3.170
<b>Upland Oil Fund (SR134)</b>							
<b>("CITY PROPRIETARY")</b>							
October 1, 2017	12,130	8,850	20,980	7,012	13,968	1,590	8.785
October 1, 2016	10,220	3,780	14,000	6,199	7,801	1,730	4.509
Change from 2016	1,910	5,070	6,980	813	6,167	-140	4.276
<b>TOTAL</b>							
October 1, 2017	588,330	381,550	969,880	329,475	640,405	107,730	5.945
October 1, 2016	447,420	487,680	935,100	323,637	611,463	119,540	5.115
Change from 2016	140,910	-106,130	34,780	5,838	28,942	-11,810	0.829

<sup>a</sup>Excludes Long Beach Unit Tract 2