Coastal Hazards and Legacy Oil and Gas Well Removal and Remediation Program

Progress Report: 2021

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Introduction

Established in 1938, the California State Lands Commission (Commission) manages 4 million acres of tide and submerged lands and the beds of natural and navigable rivers, streams, lakes, bays, estuaries, inlets, and straits. These lands, often referred to as sovereign or Public Trust lands, stretch from the Klamath River and Goose Lake in the north to the Tijuana Estuary in the south, and the Colorado River in the southeast. They also encompass the Pacific Coast 3 miles offshore in the west to world-famous Lake Tahoe in the east, and include California's two longest rivers, the Sacramento and San Joaquin. The Commission protects and enhances these lands and natural resources by issuing leases for use or development, providing, and preserving public access, resolving boundaries between public and private lands, and implementing regulatory programs to protect state waters from oil spills and invasive species introductions. Through its actions, the Commission secures and safeguards the public's access rights to navigable waterways and the coastline and preserves irreplaceable natural habitats for wildlife, vegetation, and biological communities.

The Commission also oversees sovereign land granted in trust by the California Legislature to approximately 70 local jurisdictions that generally consist of prime waterfront lands and coastal waters.

The Summerland Oil Field at Summerland in Santa Barbara County was developed beginning in the late 1890s in an area of naturally occurring oil and gas seeps. Wells were first drilled on the beach and then later from piers that extended into the Pacific Ocean. The operators drilled, produced, and plugged and abandoned wells without regulation. Production ceased in the early 1900s. Virtually no contemporaneous records exist regarding the drilling or abandonment of the hundreds of wells in the Summerland Oil Field. Oil leaks and sheens are regularly observed on the beach and in the water near Summerland. Some oil leakage is from natural seeps, but some is from improperly plugged and abandoned legacy wells.

Legacy oil and gas wells are wells that were drilled before current abandonment standards, where there is little or no information on the well's abandonment procedure, and there is no viable company with the responsibility to re-abandon the well should it start leaking or pose a threat to the environment or public health and safety. Most legacy oil and gas wells were abandoned in the early 1900s and virtually no records exist regarding the drilling and abandonment of these wells. Based on the Commission's research, there are 200 high-priority legacy oil and gas wells that could, depending on their condition, leak oil into the marine environment, negatively impacting swimmers, surfers, recreational users, and marine and coastal wildlife and fish, as well as causing environmental degradation and public health and safety hazards.

SB 44 (Jackson) Chapter 645, Statutes of 2017, provides the Commission up to $2 million per year from fiscal years 2018-2019 to 2027-2028 to administer a Coastal Hazards and Legacy Oil and Gas Well Removal and Remediation Program. Chapter 645 requires the Commission to provide an annual report to the Legislature, until January 1, 2026, on the activities and accomplishments of the Program from the prior year and requires the Commission, on or before January 1, 2027, to submit a report to appropriate committees in the Legislature that covers the life of the Program and includes information necessary to aid the Legislature in determining the effectiveness of the program and the extent to which funding should be reauthorized. Chapter 645 becomes inoperative on July 1, 2028. The purpose of this report is to provide the Legislature with information on the Commission's activities from December 2020 through December 2021.

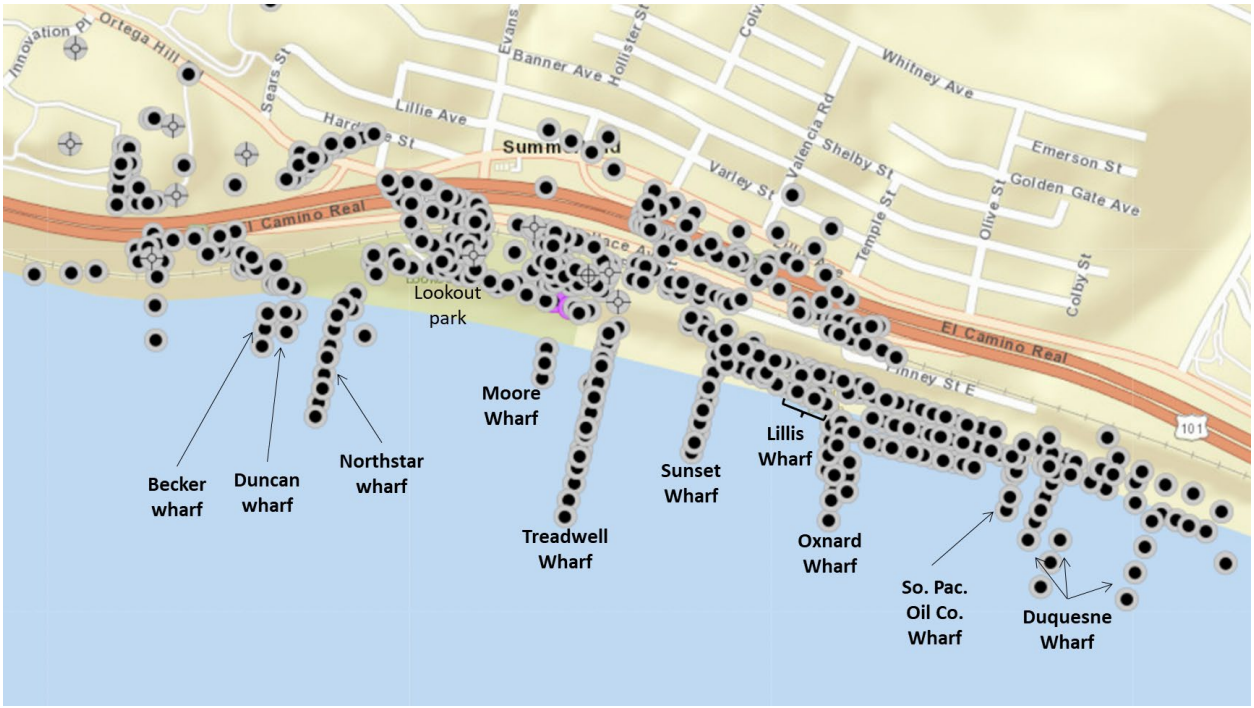

Figure 1. Summerland Legacy Wells in Santa Barbara County.

Figure 2. Exposed railroad irons near Goleta Beach (photo by Padre Associates).

Program Accomplishments

Legacy Oil and Gas Wells

Following the successful re-abandonment of two Legacy Wells in November 2020, the Commission abandoned two additional Legacy Wells in Summerland in 2021. The Olsson-805 well was re-abandoned in July and the Duquesne-910 well was re-abandoned in December. In addition, in April, divers investigated a sheen along the site of the Treadwell pier that was identified during aerial drone surveys. The dive survey found one additional well leaking a minor volume of hydrocarbons (i.e., droplets and/or bubbles) along the former Treadwell pier and another well that had heavy asphaltenes around it. Further investigation will determine if the second well is also leaking. These wells will be scheduled for future re-abandonment.

Aerial drone surveys

The Commission and its contractor, InterAct PMTI (InterAct), conducted several aerial drone surveys to monitor the Treadwell-10 and Northstar-815 well re-abandonments that occurred in November 2020 and assess the success of the re-abandonment activities. The purpose of these surveys was to monitor the wells and ensure hydrocarbons were no longer seeping from them, post re-abandonment. The Commission and its contractor also conducted land-based monitoring which consists of weekly site visits by Commission inspectors to look for tar balls and record seep activity, if any.

In late December 2020, aerial surveys noticed a sheen drifting toward and over the former Treadwell pier as it approached the shoreline. There were no sheens, or any trace of hydrocarbons observed in and around the NorthStar-815 well location, however, during most of the surveys, the Treadwell-10 location continued to have a sheen around the re-abandoned wellhead, breaking up on the surface.

The presence of sheens in the surrounding area confirmed what was seen in a multibeam scan survey that took place in May 2019. Multiple seep sources were observed in proximity of the Treadwell-10 well.

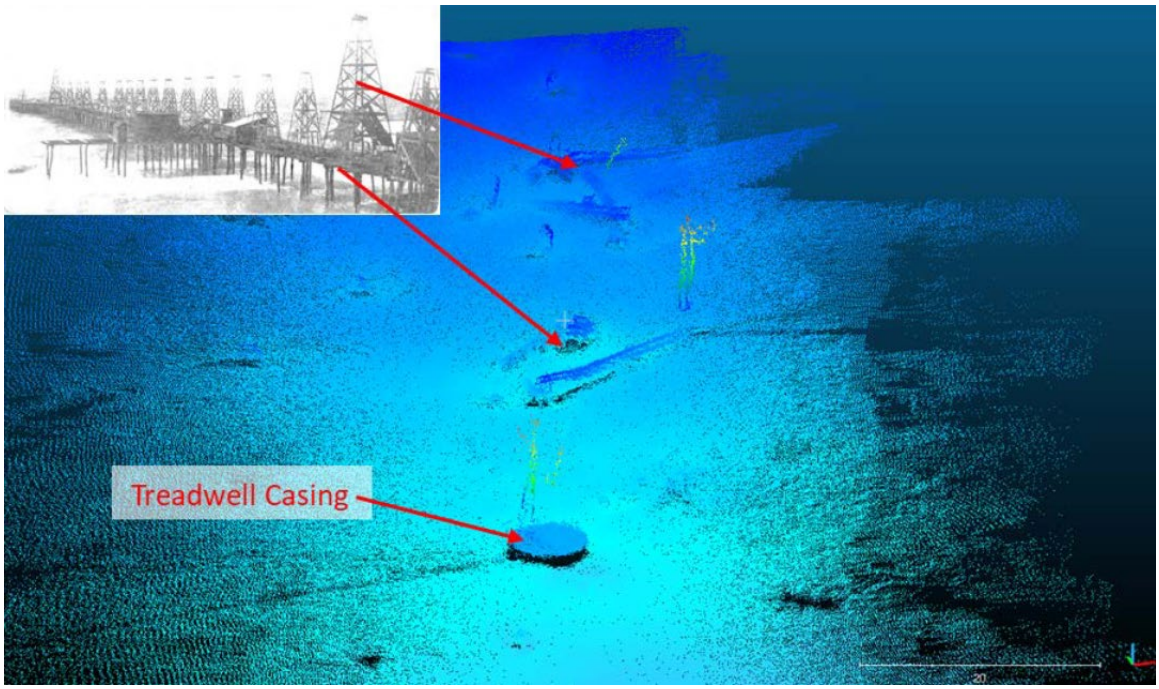

Figure 3. Seeps and linear debris from the 2019 multibeam survey exposed on the seafloor at the Treadwell casing location before the re-abandonments. (Photo by UTEC).

The aerial drone survey showed a minor sheen in March 2021 around what once was the Treadwell pier, south of Treadwell-10 well (re-abandoned in November of 2020), which prompted staff to schedule a dive survey in April 2021 to determine the source of the sheen and determine if it was related to one or more Legacy wells or a natural seep.

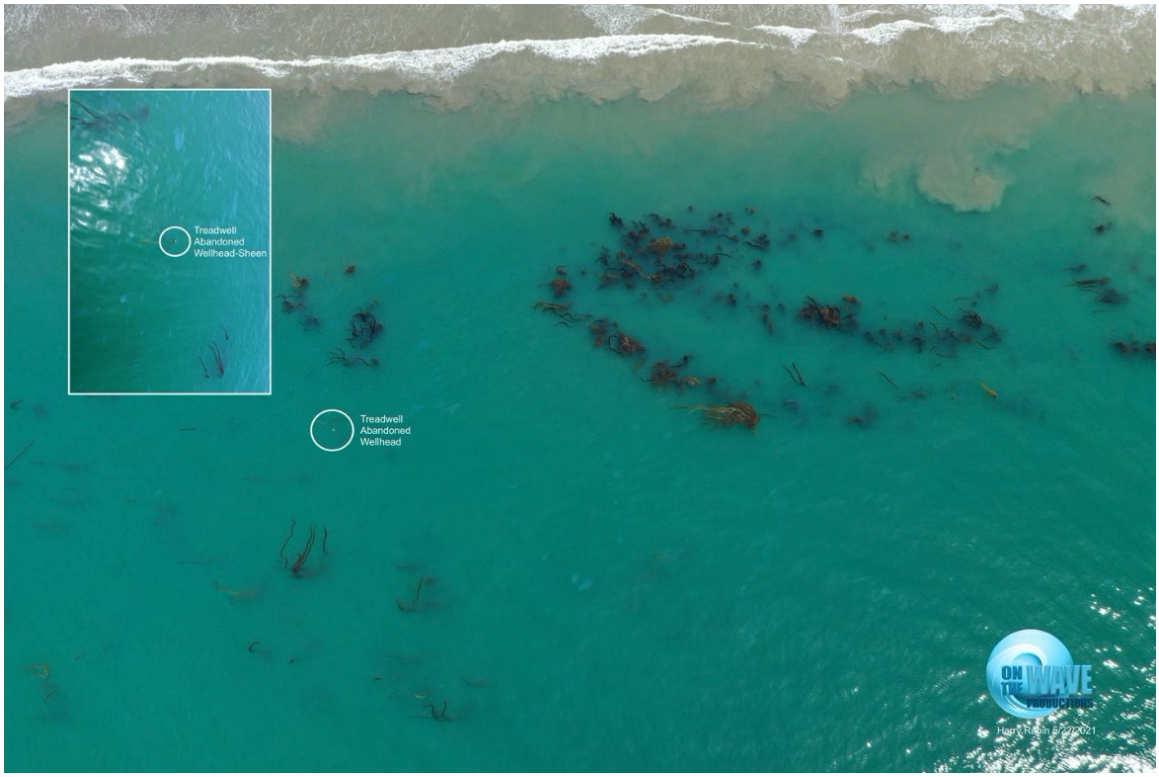

Figure 4. Sheen observed south of Treadwell-10 (photo by On the Wave Productions).

Diver survey in April 2021

Commission staff authorized investigative dive work on April 5 and 6 to determine if any of the oil was associated with another legacy well and to verify that Treadwell-10 was still not leaking any oil or gas into the ocean. Staff prioritized observed sheens near the former Treadwell pier and adjacent area, which historically was a site of active oil production.

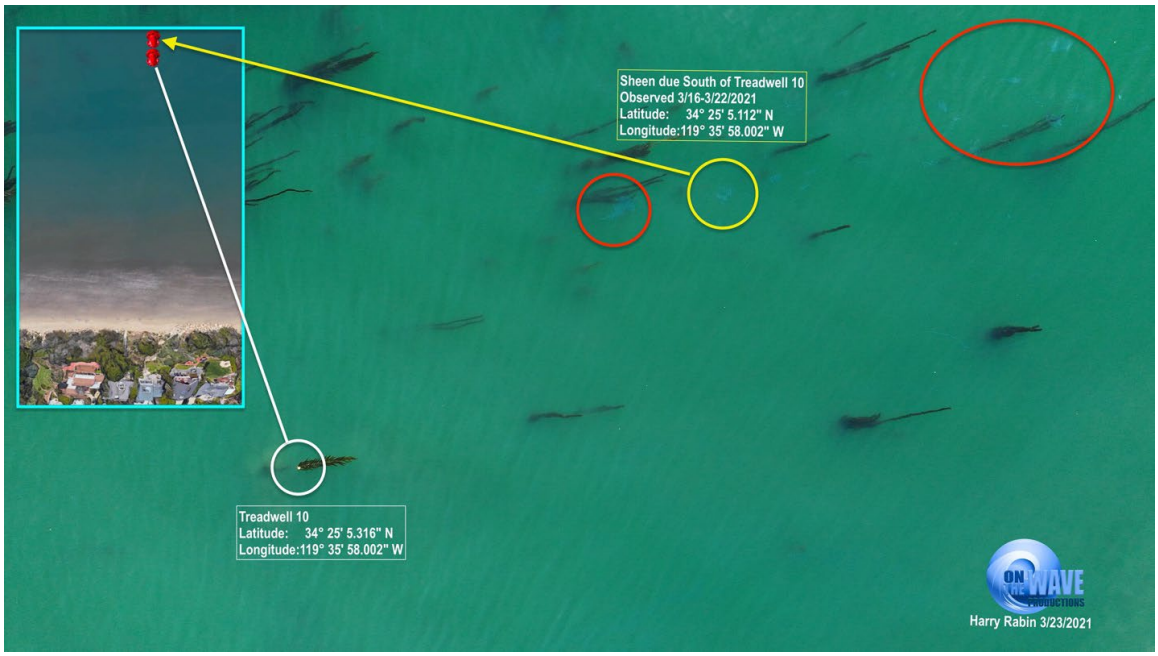

Figure 5. Sheens observed along the Treadwell pier (photo by On the Wave Productions).

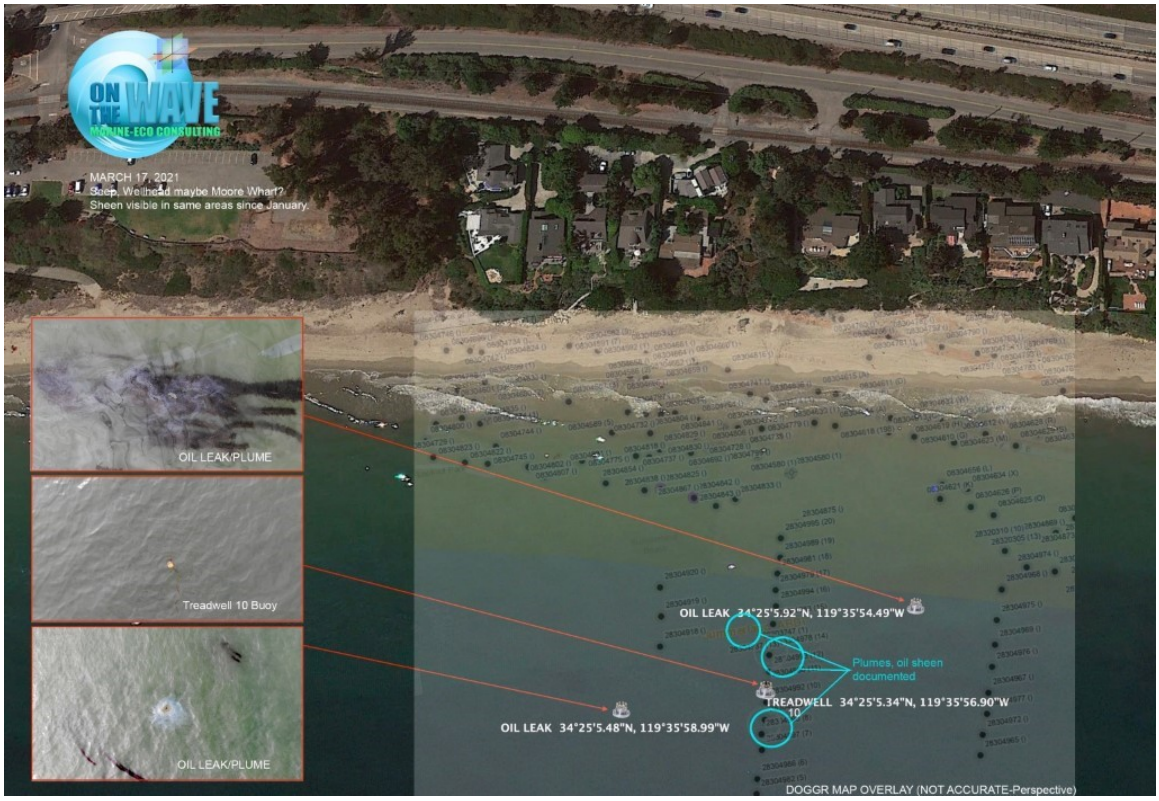

Figure 6. Dive survey target area (photo by On the Wave Productions).

Figure 7. Sheen on surface south of Treadwell-10.

Divers used surface buoys as reference and secured sub-surface travel and search lines between the well casings as they were located. The well casings appeared to maintain a uniform distance of approximately 40 feet from each other. Several casings stuck out above the sea floor in approximately 17 feet of water. The possibility exists that any vessel anchoring in this area may foul their anchor gear on, or cause damage to, the well casings. It is possible that a couple of well casings in the vicinity may have been damaged previously and bent over in this way as both are bent at a 90-degree angle to the seafloor.

Throughout three days of diving, eight new well casings were observed. Two appeared to be leaking small amounts of gas and oil into the ocean, along the Treadwell pier. All eight well casings followed a straight line perpendicular to the beach, except one that is about 25 feet east of the old Treadwell pier alignment. Diving operations also revealed old timber piles that are believed to be remnants from the Treadwell pier.

Figure 8. Damaged casing with hydrocarbons leaking out intermittently.

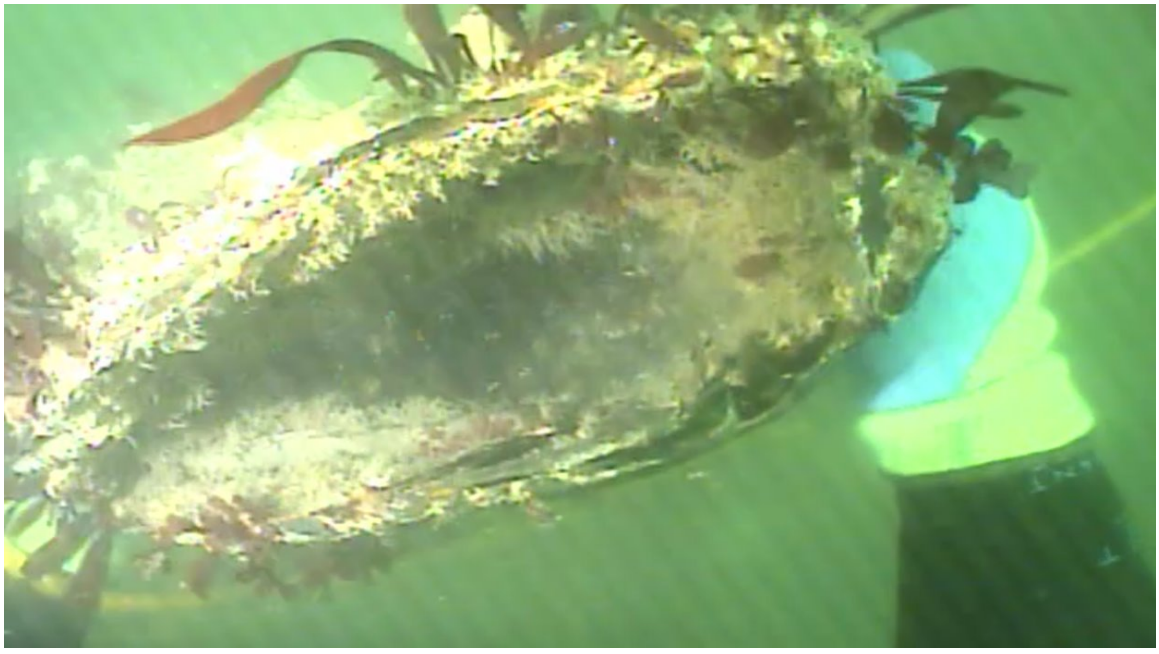

Figure 9. Damaged casing found during the April dive survey.

As part of the survey, divers located and observed the Treadwell-10 well that was re-abandoned in 2020 and determined that it was not leaking any oil or gas into the ocean.

Figure 10. Legacy Wells in Summerland and the new discovered leaking wells.

Commission staff believes that further exploratory diving operations over the leaking wells along the Treadwell pier are necessary prior to any re-abandonment effort. These operations would be needed to clear timber piles and debris so that tooling, such as shoring rings and cut off saws, could be installed prior to pipe-pile encapsulation.

Below are the key findings from the dive survey:

- Casing #1, probably well Treadwell #2, consists of a 12-inch outer caisson with 9-inch inner string, sticking up 7 feet above the mud line, the annulus and 9-inch string are grouted with cement but visibly leaking oil from a split in the 12-inch caisson. A buoy was tied off to a clump weight marking the location.
- Casing #5, probably well Treadwell #2, consists of a 9-inch casing buried about 2 feet below the mud line, 25 feet east of the general pier alignment, heavy asphaltene is present, bubbles noted at surface, but no leaking visible during excavation. Pier timbers uncovered. Buoy tied off to a clump weight marking the location. More dive work will be scheduled for further investigation to determine if the well is actively leaking.

Well casing data:

Well casing #	Feet above natural bottom	Leaking (Y/N)
1	7	Y
2	5	N
3	3	N
4	1	N
5	-2	N*
6	1	N
7	0	N
8	1	N

*Bubbles noted at surface and heavy asphaltenes were present on stie

Mobilization and Plugging of Legacy well Olsson-805

On July 23, 2021, the Commission and InterAct successfully re-abandoned the Olsson-805 well using heavy equipment on the beach.

In 2020, InterAct prepared abandonment plans for the Olsson-805 well (tidal zone), as well as the Treadwell-10 well (subtidal zone), the NorthStar-815 well (subtidal zone), and the Duquesne-910 well (tidal zone). The abandonment plans were developed as a blueprint for all legacy wells in the tidal and subtidal zones, including future wells under consideration for re-abandonment.

The Commission coordinated with numerous agencies and either consulted or obtained necessary permits for the four well abandonments. Consulting and permitting agencies include:

- California Geologic Energy Management Division (CalGEM): permit to conduct well operations.
- Santa Barbara County Air Pollution Control District: written determination of permit exemption.
- California Coastal Commission: coastal development permit.
- U.S. Army Corps of Engineers: nationwide permit verification.
- Central Coast Regional Water Quality Control Board: water quality certification.
- Santa Barbara County Planning and Development: equipment staging permit.
- U.S. Coast Guard: pre-work notification.
- California Department of Fish and Wildlife Office of Spill Prevention and Response: pre-work notification.

- Santa Barbara County Parks: pre-work notification.
- Joint Oil Fisheries Liaison Office: pre-work notification.

The Olsson-805 well re-abandonment work began on July 20, 2021 and concluded on July 24, 2021. The first step was mobilizing track carriers with a vibro-hammer and power unit, pipe pile, excavator, loader, and crane to Lookout Park in the city of Summerland. A surveyor marked the well location to identify the site for excavation activities necessary to uncover the well.

Figure 11. Equipment at Lookout Park.

Figure 12. Well location identified by WM Surveys.

Shortly after marking the location and waiting for ideal tide conditions, a front loader and an excavator entered the beach and exposed the well. A pipe pile was then placed over the wellhead and driven approximately 14 feet below the beach floor to a point of refusal, encapsulating the wellhead. The pipe pile was cut 1 foot above the wellhead and cleaned out of sand approximately 5 feet below the top of the pipe pile. Then the cementers rigged-up their equipment and pumped the pipe pile full of cement to act as a barrier against hydrocarbons migrating to the surface. The final step was to weld a steel plate on to the top of the pipe pile to act as a secondary barrier to hydrocarbon migration. Commission and CalGEM staff were present to witness the operations.

Figure 13. Excavation operations to expose the Olsson-805 well.

Figure 14. Olsson-805 well exposed.

Figure 15. Pile driving operations using the crane and excavator.

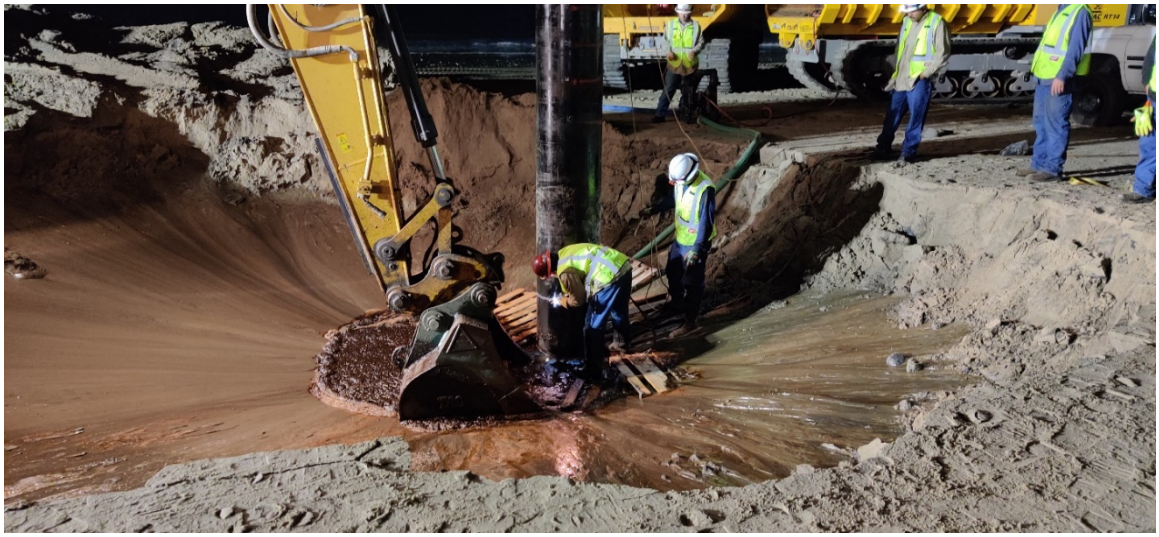

Figure 16. Pipe pile torch-cutting operations.

Figure 17. Cleaning out the inside of the casing in preparation for cementing operations.

Figure 18. The pipe pile was filled with approximately 12 cubic feet of cement.

Figure 19. Welding a steel plate on Olsson-805.

Figure 20. The site of the Olsson-805 well was restored.

Mobilization and Plugging of Legacy well Duquesne-910

In early December, the Commission and InterAct successfully re-abandoned the Duquesne-910 well using heavy equipment on the beach. InterAct remains under contract with the Commission for purposes of developing engineering plans for additional wells, as needed, until January 15, 2023.

The Duquesne-910 well re-abandonment work began on December 2, 2021 and concluded on December 7, 2021. The first step was mobilizing track carriers with a vibro-hammer and power unit, pipe pile, excavator, loader, and crane to Lookout Park in the City of Summerland. A surveyor marked the well location to identify the site for excavation activities necessary to uncover the well.

Shortly after marking the location and waiting for ideal tide conditions, a front loader and an excavator entered the beach and exposed the well. A pipe pile was then placed over the wellhead and driven approximately 29 feet below the beach floor to a point of refusal, encapsulating the wellhead. The pipe pile was cut 18 inches above the wellhead and cleaned out of sand and debris below top of the pipe pile. Then the cementers rigged-up their equipment and pumped the pipe pile full of cement to act as a barrier against hydrocarbons migrating to the surface. The final step was to weld a steel plate on top of the pipe pile to act as a secondary barrier to hydrocarbon migration. Commission and CalGEM staff were present to witness the operations.

Figure 21. Equipment at Lookout Park.

Figure 22. Spill control equipment at Lookout Park.

Figure 23. Pipe pile and crane on beach access ramp.

Figure 24. Well location identified by WM Surveys.

Figure 25. Excavation operations to expose the Duquesne-910 well.

Figure 26. Duquesne-910 exposed.

Figure 27. Pile driving operations using the crane and the excavator.

Figure 28. Pipe pile torch-cutting operations.

Figure 29. Cleaning out the inside of the casing in preparation for cementing operations.

Figure 30. The pipe pile was filled with approximately 19 cubic feet of cement.

Figure 31. Welding a steel plate on Duquesne-910.

Figure 32. The site of the Duquesne-910 well was restored.

The re-abandonment work for wells Olsson-805 and Duquesne-910 is an essential part of the Commission's efforts to permanently stop the hydrocarbon source from leaking into surrounding waters and onto the beach. The work was conducted on Summerland beach with heavy equipment stationed in the parking lot of Lookout Park moving back and forth using the access off Finney Street.

No spill response was activated during the re-abandonment operations, although as a precautionary measure spill response equipment and trained personnel were staged in the Lookout Park parking lot in case it was needed.

InterAct remains under contract with the Commission for purposes of developing engineering plans for additional wells, as needed, until January 15, 2023.

Coastal Hazards (legacy infrastructure, not including wells)

Coastal hazards are the remnants of artificial coastal structures that have been abandoned and orphaned (i.e., there is no known responsible party). These hazards are typically buried in the coastal surf zone and include wood or steel pilings, H piles and H beams, railroad irons, cables, angle bars, ties, pipes, pipelines, seep tent related structural remnants of rip rap structures, wood structures, groins, jetties, piers, and oil and gas-related infrastructure located along the California coastline. Hazard exposure depends on tide and beach erosion. Many hazards are only exposed during the high tidal erosion that occurs during winter. The Commission can respond to and remove hazards subject to permit conditions.

In 2018, the Commission hired Cushman Contracting Corporation to remove coastal hazards as they are identified. This contractor is on call and retained through June 30, 2022. Hazards are usually removed by using small excavators or loaders. No coastal hazard removal work was conducted during 2021 winter exposure season due to lower-than-expected coastal erosion at suspected hazard sites. The Commission's contractor remains on call to remove hazards as they appear during the 2021/2022 winter exposure season.

Figure 33. H Beam being extracted near Bacara Resort in 2018.

Figure 34. H Beam being extracted near Bacara Resort in 2018.

An additional component is the ongoing hazards inventory conducted on behalf of the Commission by Padre Associates. Padre Associates conducts surveys annually using handheld GIS data collection units as beach exposure occurs. Once the sand moves away from the beaches (typically starting in November) the Commission will resume documenting remaining features. At this point in time, approximately 70 percent of the inventory of documented hazard sites has been completed.

Program Plans 2022

The Commission intends to continue performing investigatory work on seep sites for association with legacy wells and plans to execute future re-abandonments as funding allows. The Commission will also continue its coastal hazard removal program.

Additional Detail About 2022 Plans:

Execute the plug and abandonment plans for up to two Summerland Beach legacy wells

With CEQA analysis complete and when the field investigations are finished and the engineering plans developed, the Commission anticipates plugging and abandoning two additional offshore wells along the Treadwell pier, in 2022 and 2023. Staff will attempt to re-abandon both wells concurrently if funding allows. The plugging and abandonment approach will be comparable to the approach used in the Treadwell-10 and NorthStar abandonments performed in 2020, with some improvements or modifications based on lessons learned from previous operations since these wells are fully submerged and currently leaking minor amounts of hydrocarbons. This work will occur, depending on fund availability, in the second half of 2022 and second half of 2023 if needed.

Develop an inventory and study of offshore seep activity

The Commission anticipates contracting with a university, nonprofit organization, or private entity to develop a comprehensive study of natural seeps. This will likely require historical research and an inventory of offshore natural tar, oil, and gas seeps; the survey, study, and monitoring of tar, oil, and gas seepage (seep studies) in state waters to determine locations, rates, and fingerprinting techniques to characterize tar, oil, and gas samples originating from natural seeps, geologic framework and other conditions controlling seeps, as well as their environmental impacts. The Commission expects to solicit statements of qualifications for a consultant to perform this work in the second half of 2022, depending on funding availability.

Fund Allocation

Contract No.	Contractor	Start	End	Contract Value
C2017041	Cushman Contracting Corporation	9/1/2018	6/30/2022	$1,000,000.00
C2017043	Padre Associates	2/1/2018	12/31/2022	$1,500,000.00
C2018031 (Engineering Plans, EIR Addendum & Permitting)	InterAct	1/15/2019	1/15/2023	$3,000,000.00
C2019060 (Plug & Abandonment work)	InterAct	06/30/2020	06/29/2023	$6,500,000.00

Looking Ahead

The following table shows ongoing and anticipated projects:

#	Project Description	Timeframe
1	Execute the plug and abandonment of up to two legacy wells at Summerland Beach	3rd Qtr. 2022
2	Issue an RFQ to retain a consultant or firm to perform a seep inventory and study.	4th Qtr. 2022
3	Continue researching leaks that may be associated with legacy wells or natural seeps.	Ongoing
4	Continue coastal hazard inventory and removal as hazards become exposed.	Ongoing

Supplemental Background:

In the late 1800s, the area offshore of Summerland Beach in Santa Barbara County contained hundreds of oil wells and related drilling infrastructure. Today,

the coastline area retains the vestiges of that extensive and largely unregulated offshore oil production. These are the unfortunate legacy of the rapid and intensive offshore oil development along the coastline thatbegan just before the turn of the twentieth century, primarily at Summerland Beach.

Most legacy oil and gas wells were abandoned in the early 1900s when regulatory oversight was nonexistent. Virtually no records exist regarding the drilling and abandonment of these wells. Removal, if any, varied from well to well and involved rudimentary procedures that fell well short of current health, safety, and environmental protection requirements. Based on the Commission's research, there are approximately 200 high priority legacy oil and gas wells (identified as Category 1 wells), that could, depending on their condition, leak oil into the marine environment, negatively impacting swimmers, surfers, recreational users, and marine and coastal wildlife and fish and their habitats, as well as causing environmental degradation and public health and safety hazards. Legacy oil and gas wells are wells drilled before current abandonment standards. There is little or no information on the well's abandonment procedure and no viable company with the responsibility to re-abandon the well should it start leaking or pose a threat to the environment or to public health and safety. Other wells are categorized as medium (Category 2) to low (Category 3) priority wells because more information is available about the integrity and abandonment of these wells or because a responsible party is or may be available to address any leak that may occur.

The Legislature, when it passed SB 44, found that there is a critical need for funding to removecoastal hazards, to identify exact locations of legacy oil and gas wells that may be leaking, and to prioritize remediating wells with the highest risk. The funding enables the Commission to gather data to address the presence of oil along the coastline, determine where legacy wells are located and whether they are leaking oil, and prioritize remediation to address the highestrisk wells first. The funding also enables the Commission to survey and monitor offshore oil seeps in state waters, to contract for studies to determine oil seepage locations, rates, and environmental impacts, and pursue innovative solutions to address natural seeps.

SB 44 added section 6212 to the Public Resources Code, which states that when the Legislatureappropriates revenue the Commission shall, within two years, administer a coastal hazard and legacy oil and gas well removal and remediation program to do the following:

1. Complete an assessment of legacy oil and gas wells and other coastal hazards along theCalifornia coastline, including conducting aerial surveys and dives, and determine high- priority hazards and legacy oil and gas wells to remediate.
2. Survey, study, and monitor oil seepage in state waters and tidelands under the Commission's jurisdiction to determine oil seepage locations, rates, and environmentalimpacts; and partner with experts to facilitate innovative solutions.
3. In cooperation with the Division of Oil, Gas, and Geothermal Resources (now the California Geologic Energy Management Division [CalGEM]), begin the process of remediating improperly abandoned legacy oil and gas wells that have a highrisk of leaking oil and are hazardous to public health and safety and the environment.

SB 44 authorizes up to $2 million annually from the state's General Fund to the Commission's Kapiloff Land Bank Fund (https://www.slc.ca.gov/kapiloff) beginning in 2018-19 andthrough 2027-28, to administer the program. In July 2018, the Commission received the first $2 million appropriation. SB 44 authorizes the transfer of an amount sufficient to bring the unencumbered balance of the program funds back up to $2 million annually through 2027-28.