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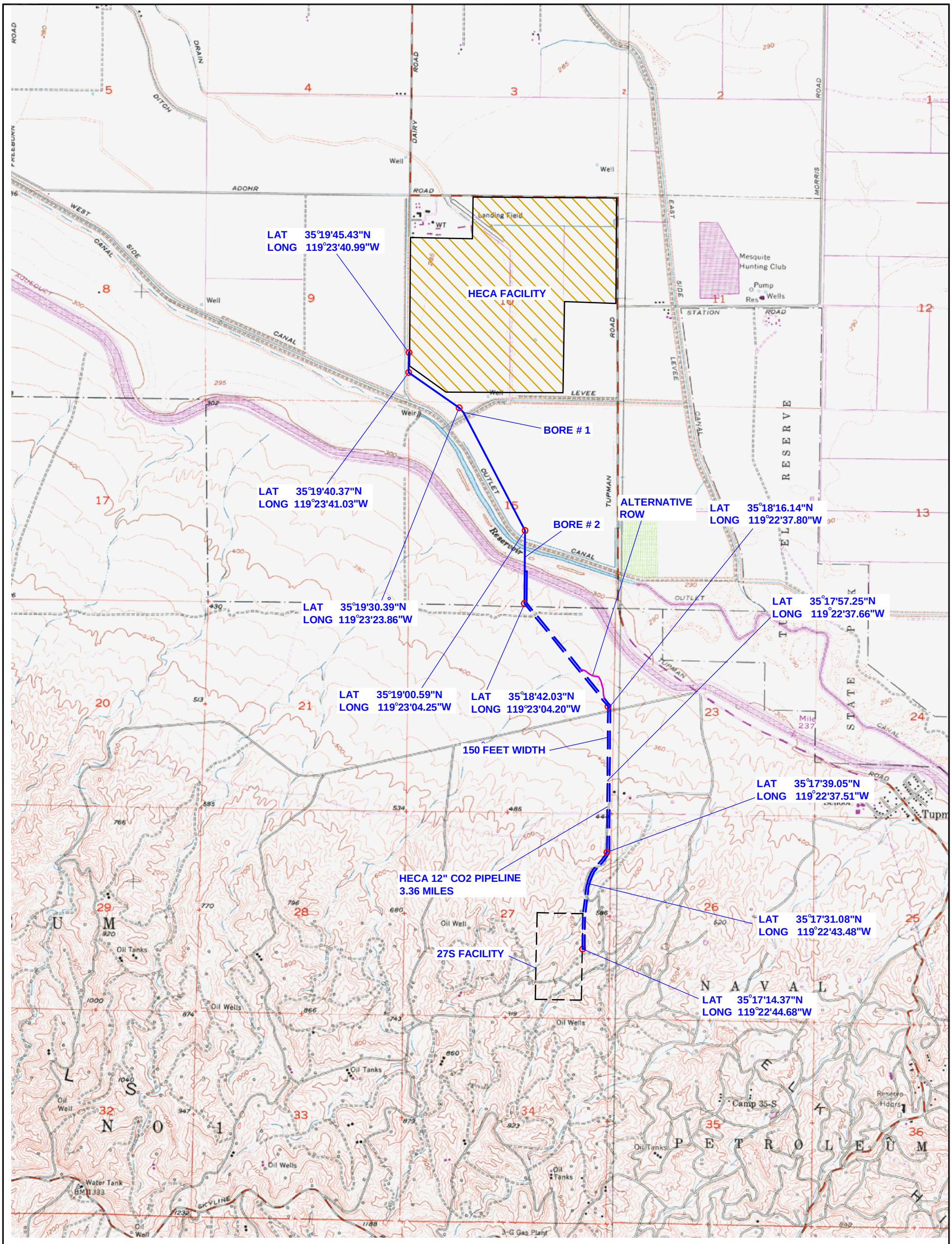

NOTES:

1. MAP COORDINATES SYSTEM;
   NAD 83 CALIFORNIA STATE PLANES,
   ZONE 5 (FT.)

2. USGS 7.5 MINUTE TOPOGRAPHIC MAPS;
   EAST ELKS HILLS QUADRANGLE 1954,
   PHOTOREVISED 1973,
   TUPMAN QUADRANGLE 1954,
   PHOTOREVISED 1973.

3. TOPOGRAPHIC CONTOUR INTERVALS;
   EAST ELKS HILLS= 20 FEET;
   TUPMAN 20 FEET.

N

0 2400 4800

APPROXIMATE SCALE (FEET)

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290 Conejo Ridge Avenue.
Thousand Oaks, CA 91361
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FOR:			FIGURE:
CO2 EOR PROJECT TUPMAN, KERN COUNTY, CALIFORNIA		**CO2 SUPPLY LINE ALIGNMENT**	**2B**
JOB NUMBER: 211302586	**DRAWN BY:** J.Barboza	**CHECKED BY:** J. May	**APPROVED BY:** M.Weber	**DATE:** 2/22/11

ATTACHMENT A

BIOLOGICAL RESOURCES STUDY FOR MODIFIED ALIGNMENT OF CO2 SUPPLY LINE

Biological Assessment for Modified Alignment of CO2 Supply Pipe Line

CO2 supply pipeline alignment from the HECA Facility to the OEHI CO2 EOR Processing Facility
Tupman, Kern County, CA

April 18, 2012

Executive Summary

Occidental of Elk Hills, Inc. (OEHI) retained Stantec Consulting Corporation (Stantec) to conduct a field survey on February 24th and February 25th, 2011 to study and evaluate the potential impacts to biological resources based on the new proposed alignment for the carbon dioxide (CO2) supply pipeline for the CO2 Enhanced oil Recovery (EOR) Project (Project).

Several comprehensive technical biological assessment studies have been conducted within the existing Elk Hills Oil Field (EHOF) boundaries and adjacent lands (Project area). The most recent and comprehensive resource document that describes impacts to sensitive biological resources by oil field related activities within the EHOF is the Habitat Conservation Plan (HCP) for the Elk Hills Oil Field (Live Oak Associates, 2006). This HCP was initially prepared to obtain incidental take authorization for State of California and federally listed species and provides a comprehensive review of the species and their habitats mitigation measures to reduce impacts by oilfield related activities.

Table of Contents

Figures

Tables

1.0 INTRODUCTION

Occidental of Elk Hills, Inc. (OEHI) retained Stantec Consulting Corporation (Stantec) to conduct a field survey on February 24th and February 25th, 2011 to study and evaluate the potential impacts to biological resources based on the new proposed alignment for the carbon dioxide (CO2) supply pipeline for the CO2 Enhanced Oil Recovery (EOR) Project (Project).

The purpose of this report is to summarize the biological resources encountered during the field survey and evaluate the baseline environmental characteristics of the OEHI carbon dioxide (CO2) Enhanced Oil Recovery (EOR) delivery CO2 supply pipeline from the Hydrogen Energy of California (HECA) plant to the OEHI CO2 Processing Facility (Project area), which is proposed to be constructed in Section 27S. In addition, current baseline conditions will be documented and analyzed along the proposed CO2 supply pipeline alignment and surrounding areas should any changes to alignment be required in the future. This report has been prepared in addition to the Supplemental Environmental Information (SEI) for the OEHI CO2 EOR project.

Such evaluations are required by California Environmental Quality Act (CEQA) to ensure that potentially significant environmental impacts are assessed, mitigated and the public has an opportunity to review and comment on the proposed mitigation measures (Bass 1999).

1.1 BACKGROUND

The OEHI operates a large, mature oil production field in the Elk Hills Oil Field (EHOF) located approximately 26 miles southwest of Bakersfield in western Kern County, California, and covers approximately 48,000 acres. OEHI is proposing to extend its existing EOR operations by utilizing CO2 from the proposed HECA project to facilitate oil production from its Elk Hills operations.

2.0 PROJECT DESCRIPTION

2.1 GENERAL DESCRIPTION

The HECA project, which will be located approximately 4-miles north of Section 27S will generate CO2 from an Integrated Gasification Combined Cycle (IGCC) power plant. A CO2 supply pipeline alignment was initially proposed in order to facilitate the transportation of CO2 from the HECA facility to the CO2 OEHI CO2 Processing Facility within the EHOF boundaries in Section 27S ***(Figure 1)***. The most recent proposed alignment would have the CO2 supply pipeline being routed from the HECA facility and trending south towards the OEHI CO2 Processing Facility in Section 27S ***(Figure 2)***. The compound CO2 will be compressed from a gaseous to semi-aqueous state at the HECA plant and be transported by a CO2 supply pipeline to the OEHI CO2 Processing Facility to distribute the CO2 for EOR and sequestration. The CO2 supply pipeline route would utilize Horizontal Directional Drilling (HDD) technology to pass beneath the West Side Canal, the Kern River Flood Control Canal, and the California Aqueduct. South of the California Aqueduct the route trends primarily south towards the OEHI CO2 EOR Processing Facility. The exact location of the main OEHI CO2 Processing Facility will be determined by OEHI but is currently proposed for southeastern quarter of Section 27S.

With the exception of these water crossings, the CO2 supply pipeline will be installed below ground using cut and fill techniques. Installation of the CO2 supply pipeline will involve typical construction activities, including trenching; hauling and stringing pipe along routes; welding; radiographic inspection and coating pipe welds; lowering welded pipe along routes; hydrostatic testing; and backfilling and restoring the approximate surface grade.

2.2 ENVIRONMENTAL SETTING

This section includes a description of the land and surrounding land uses in the vicinity of the proposed Project area. Conditions on the Project area to be addressed include: climate, drainages, soil, and vegetation communities. Anthropomorphic, or human land uses, on and off the proposed Project area are also described.

The modified CO2 supply pipeline alignment currently trends north-south approximately 3.4 miles from the Section 27S facility, towards the HECA facility. Within the EHOF, the proposed alignment trends north along established roads and a current pipeline right-of-way (ROW) for most of its length until it bends 45 degrees to the west for approximately 2/3 of a mile before bending back 45 degrees to the north and exiting the EHOF. The Project area north of the California Aqueduct consists primarily of agricultural development and does not support habitat suitable for the target species of this technical report and was not analyzed. Additionally, current construction plans call for HDD techniques to be used in order to drill under the California Aqueduct. South of the California Aqueduct the land is relatively undisturbed until the alignment reaches the borders of the active oil production area within the OEHI unit.

A 250 ft wide corridor was surveyed along the entire alignment length of the proposed CO2 supply pipeline in order to establish a buffer zone. For most of its length within the EHOF the proposed alignment follows roads and or current pipeline line ROW's. Outside those disturbed areas and along the alignment where it does not follow disturbed roads or ROW's consist of large swaths of habitat and localized areas of heavy disturbance.

There are several unpaved, dirt roads that occur throughout the Project area. Access to these roads is limited. Several boundary fences and gates are also present throughout various portions of the Project area. Such fences and an abandoned homestead suggest the land was historically used for grazing.

The nearest community is Tupman, which is located 0.45 miles east of the northeastern most point along the proposed alignment of the CO2 supply pipeline, and the nearest large city is Bakersfield, which is located approximately 26 miles northeast.

2.2.1 Climate

The San Joaquin Valley is classified as having a Mediterranean climate (Kottek et al. 2006). Areas of the Southern San Joaquin Valley are further classified as having a climate of a low-latitude desert. Summers are relatively hot and dry, and temperatures frequently reach 90˚F and can reach up to 104˚F. In contrast, winters are cold and wet, with the regular occurrence of fog in many areas. The rainy season typically occurs during mid-autumn to spring; however, thunderstorms may occur during the late summer months. With an average rainfall of only 5.75 inches per year, most precipitation falls during winter and spring. Typically, no rain falls from May through September (NOAA 2010).

2.2.2 Drainages

The Project area lies on a transition zone between valley floor and foothill terrain. Drainages in the foothill areas consisted of undeveloped washes approximately 3-10 feet wide with very little vertical erosion. Lowland area drainages consisted of low (sink) zones and developed washes with approximately 4 to 10 feet of vertical erosion. During periods of intense rainfall, these drainages can fill up and most of the erosion occurs during these brief intervals of rainfall.

2.2.3 Vegetation Communities

The proposed Project area is located in the western portion of the southern San Joaquin Valley. The majority of the proposed Project area is characterized as Upper Sonoran grassland (Twisselman 1967, Holland 1995), Valley Sink Scrub, and Valley Saltbush Scrub. Large expanses of non native grassland are interspersed with patches of valley saltbush scrub along the length of the survey area.

Valley Saltbush scrub habitat is characterized by blue-green, grayish chenopod shrubs and other subshrubs located on mostly alkaline soils. Valley Saltbush Scrub habitat at Elk Hills is

dominated by desert saltbush (*Atriplex polycarpa*), although spiny saltbush (*Atriplex spinifera*), cheesebush (*Hymenoclea salsola*), and matchweed (*Gutierrezia bracteata*) are often present in less abundance (Elk Hills HCP 2006). Traditionally, empty spaces within the canopy were sparsely populated by native grasses and forbs. With the introduction of non-native invasive grasses and forbs, areas of open canopy are typically dominated by grasses and forbs found in the non-native grassland described below.

Non-native grassland is typically comprised of introduced species of European origin. Previous site surveys of the EHOF and surround properties identify several dominant species including: red brome (*Bromus madritensis ssp. rubens*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), rattail fescue (*Vulpia myuros*), and wild oats (*Avena fatua*). The most dominant forbs found within non-native grasslands include red-stemmed Filaree (*Erodium cicutarium*), and ranchers fireweed (*Amsinckia intermedia*). Other commonly observed species include buckwheat (Eriogonum sp.), prickly lettuce (*Latuca serriola*), and lupines (*Lupinus sp.)* (Elk Hills HCP 2006).

Valley Sink Scrub is extremely limited in extent within the Project area. Where present, this habitat generally consists of low-lying arroyos or sandy washes surrounded by valley saltbush scrub habitat. Although rainwater may flow through these washes during storm events, sink scrub habitats are dry most of the year. Plants within this habitat are generally taller and denser than those of surrounding scrub-lands, but consist of the same species found in the valley saltbush scrub (Elk Hills HCP 2006).

2.2.4 Wildlife Communities

The proposed Project is located in the southwestern San Joaquin Valley, which historically, was composed of millions of acres of wetlands (CERES 2010), Valley Saltbush Scrub, Valley Sink Scrub, and native grasslands that supported diverse populations of wildlife. The proposed Project area is not expected to support any wetland or riparian habitats, though canals and other irrigations features on the northern portion of the proposed Project have often been used by wetland species. The Project is located in a transitional zone between valley and foothill ecological communities and resulting in a variety of plant and wildlife species occurring within the area.

3.0 METHODS

3.1 LITERATURE SEARCH

Prior to the field surveys conducted on February 24 and 25, a literature search and desktop analysis of the proposed Project area was conducted to gather any pertinent information for sensitive species that may occur in the area. Desktop analysis included the review of the California Natural Diversity Data Base (CNDDB)(2011), the California Native Plant Society (CNPS) Online Rare Plant Inventory (2011), CNPS's A Manual of California Vegetation (2000); the U.S. Fish and Wildlife Service Critical Habitat for Threatened and Endangered Species mapper (2011), U.S Fish and Wildlife Service species lists by quad search (2011), the Elk Hills Habitat Conservation Plan (2006), the Kern Valley Floor Habitat Conservation Plan (2006), and the 2001 Special status plant species survey results at Elk Hills Oil Field, Kern County, CA, and professional experience in the area. ***Table 1*** lists sensitive species with potential to occur in and around the proposed Project area, federal/state and other status, preferred habitat, and potential for occurring within the Project area.

Desktop analysis also included the review of topographical maps and aerials. A preliminary vegetation map was also produced to aid in the field and was finalized after field surveys to confirm the presence of the vegetation found on the Project area. The vegetation classification schemes used were based on the CNPS' A Manual of California Vegetation (2000) and Holland and Keil's California Vegetation (1995). Maps were constructed using aerial photographs and ground surveys.

A map was also produced that depicted the GPS locations of occurrences of sensitive species in the area from the CNDDB data obtained for the proposed Project area ***(Figure 3)***.

3.2 SURVEY TECHNIQUES

A terrestrial survey was conducted on February 24th and 25th, 2011. A qualified biologist conducted linear pedestrian transects along the most recent proposed alignment of the CO2 supply pipeline, provided prior to surveying. Figure 1 depicts a general vicinity map of the area, and Figure 2 shows the latest proposed alignment of the CO2 supply pipeline, which includes the area surveyed. Surveys were conducted along the proposed Project boundaries identifying vegetative and topographic conditions. Surveys to identify and/or observe wildlife and plants, confirmation of vegetation communities, and presence of sensitive habitats were concurrently conducted. Survey methods and results are described in greater detail below. Survey results were mapped in ***Figure 3***.

3.2.1 Vegetation

Botanical surveys following CDFG 2009 survey guidelines have not been conducted for the CO2 supply line alignment. However, terrestrial surveys were conducted on the proposed Project area to confirm the existence of the vegetation classes expected to occur on the Project area. Surveys were also performed to examine existing drainages on the Project area for any significant vegetation groups not anticipated on the Project area. Surveys concentrated on areas where construction was planned to occur according to proposed Project plans and descriptions provided by OEHI.

3.2.2 Wildlife

Wildlife surveys were conducted to determine if habitat existed for any sensitive wildlife species that may occur in the area. The survey was also conducted to determine the presence of all wildlife species and their signs. Identification of species and potential habitat was determined by searching for burrows, tracks, scat, nests, prey remains, hair, calls, other signs and direct observations. Linear pedestrian transects were conducted in areas that were accessible and where construction was to occur according to the Project plans and descriptions provided prior to the start of surveys. Areas that contained high burrowing activity were especially scrutinized. Global Positioning System (GPS) locations were taken for marking and mapping the location of notable findings.

Table 1: Regionally Present Sensitive Species and their Potential to Occur on the Project Area

Species	Listing Status	Habitat Association	Potential within Project area
BIRDS			
Tricolored blackbird (*Agelaius tricolor*)	CSC	Freshwater marsh, and other freshwater wetland habitats.	Suitable Habitat is not present within survey boundaries. **Low Potential**
Burrowing owl (*Athene cunicularia*)	MBTA, CSC	Inhabits open, dry annual or perennial grasslands, desert and scrublands characterized by low-growing vegetation.	Suitable habitat is present on site. Several CNDDB records near proposed project area. **High Potential**
Mountain plover (*Charadrius montanus*)	FC, CSC	Chenopod Scrub and Valley and foothill grasslands.	Suitable habitat exists within survey boundaries. **Moderate Potential**
Le Conte's thrasher (*Toxostoma lecontei*)	MBTA, CSC	Commonly nests in a dense, spiny shrub or densely branched cactus in desert wash habitat, usually 0.6-2.4m above the ground.	Marginal habitat is present within survey boundaries. **Low Potential**
Loggerhead shrike (*Lanius ludovicianus*)	MBTA, CSC	Inhabits broken woodlands, savannah, pinyon-juniper, Joshua tree and riparian woodlands,	Marginal habitat is present within survey boundaries. One individual was observed during surveys.

Table 1: Regionally Present Sensitive Species and their Potential to Occur on the Project Area			
Species	**Listing Status**	**Habitat Association**	**Potential within Project area**
		desert oases, scrub and washes.	**High Potential**
MAMMALS			
American badger (*Taxidea taxus*)	CSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	This species was not observed during surveys, however, burrows consistent with badger burrows were observed near within the survey boundaries. **High Potential**
Giant kangaroo rat (*Dipodomys ingens*)	FE, SE	Inhabits annual grasslands on the western side of the San Joaquin Valley, marginal habitat in alkali scrub.	Suitable habitat is present along the proposed CO2 supply pipeline alignment. CNDDB indicates several occurrences within or near survey boundaries. **High Potential**
San Joaquin antelope squirrel (*Ammospermophilus nelsoni*)	ST	Found on the western San Joaquin Valley from 50-350m elevation on dry, sparsely vegetated loam soils.	Suitable habitat is present along proposed alignment. Several occurrences in CNDDB near survey boundaries. **High Potential**
San Joaquin kit fox (*Vulpes macrotis mutica*)	FE, ST	Inhabits annual grasslands or grassy open stages with scattered shrubby vegetation.	Suitable habitat is present along proposed alignment, CNDDB occurrences in area and potential dens observed during surveys. **High Potential**
Short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*)	CSC	Found on the western side of San Joaquin Valley in grassland and desert scrub associations, especially *Atriplex*.	Potential habitat occurs within survey areas on the west side of the California Aqueduct. **High Potential**
Tipton kangaroo rat (Dipodomys nitratoides nitratoides)	FE, SE	Historically found in the saltbush scrub and sink communities of the southern san Joaquin Valley and Tulare lake basin. Now restricted to scattered isolated areas.	Several sightings recorded in the CNDDB near survey boundaries on the northeast side of the California Aqueduct. **Low Potential**
Tulare grasshopper mouse *(Onychomys torridus tularensis)*		Inhabits hot, arid valleys and scrub deserts in the Southern San Joaquin Valley.	Potential habitat occurs along proposed alignment. **Moderate Potential**
Buena Vista Lake Shrew (*Sorex ornatus relictus*)	FE, CSC	Marsh, swamp and riparian scrub.	No suitable habitat found within survey boundaries.

Table 1: Regionally Present Sensitive Species and their Potential to Occur on the Project Area			
Species	**Listing Status**	**Habitat Association**	**Potential within Project area**
			Low Potential
REPTILES			
Blunt-nosed leopard lizard (*Gambelia sila*)	FE, SE, SP	Inhabits sparsely vegetated alkali and desert scrub habitats, in areas of low topographic relief.	Suitable habitat is present on the lowland portions of proposed alignment. CNDDB occurrences near area and prior protocol level surveys conducted near project showed presence of several individuals. **High Potential**
San Joaquin whipsnake (*Masticophis flagellum ruddocki*)	CSC	Found in the San Joaquin Valley in open, dry areas with little or no tree cover within grassland and saltbush scrub communities.	Suitable habitat found within survey boundaries. **High Potential**
Giant Garter snake (*Thamnophis gigas)*	FT, ST	Highly aquatic snake found in the San Joaquin valley riparian and wetland areas.	Suitable habitat is found near survey boundaries and a CNDDB search revealed an occurrence near Project area on the east/north side of the California Aqueduct. **Moderate Potential**
Western pond turtle (*Actinemys marmorata*)	CSC	Thoroughly aquatic turtle of ponds, marshes, streams, and canals with aquatic vegetation.	Suitable habitat is found within project area and occurrences near the project area are recorded in the CNDDB on the east/north side of the California Aqueduct. **Low Potential**
PLANTS			
California jewelflower (*Caulanthus californicus*)	FE, SE, CNPS 1B.1	Inhabits flats, gentle slopes generally in non-alkaline grassland. Also found in open juniper woodland from 70-1000 m. Found in southern San Joaquin Valley.	This species was not observed during botanical surveys And has never been recorded within the EHOF. **Low Potential**
Slough thistle (*Cirsium crassicaule*)	1B.1	Chenopod Scrub, Freshwater marsh and riparian scrub.	Potential habitat exists near Buena vista slough. **Low Potential**
Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*)	CNPS 1B.1	Inhabits saline places and vernal pools below 1000 m. Found in Tehachapi, southern	This species was not observed during botanical surveys And has never been recorded within the

Table 1: Regionally Present Sensitive Species and their Potential to Occur on the Project Area

Species	Listing Status	Habitat Association	Potential within Project area
		Outer South Coast Ranges, South Coast, Peninsular Ranges and western Mojave Desert.	EHOF. **Low Potential**
Heartscale (*Atriplex cordulata*)	CNPS 1B.2	Inhabits saline or alkaline soils below 200 m. Found in Sacramento and San Joaquin Valleys.	This species was not observed during botanical surveys And has never been recorded within the EHOF. **Low Potential**
Horn's milk vetch (*Astragalus hornii var. hornii*)	CNPS 1B.1	Inhabits salty flats and lakeshores from 60-150 m. Found in southern San Joaquin Valley, Western Transverse Range and the western edge of the Mojave Desert.	This species was not observed during botanical surveys and has never been recorded within the EHOF. **Low Potential**
Hoover's eriastrum (*Eriastrum hooveri*)	CNPS 4.2	Inhabits drying grassy areas below 170 m. Found in southern and eastern South Coast Range.	Suitable habitat exists within the survey area and surroundings. The species has been recorded in 66 sections throughout the EHOF. **High Potential**
Jared's pepper-grass (*Lepidium jaredii* ssp. *jaredii*)	CNPS 1B.2	Inhabits alkali bottoms, slopes and washes below 500 m. Found in South Coast Interior Range and San Joaquin Valley.	This species was not observed during botanical surveys and has never been recorded within the EHOF. **Low Potential**
Kern mallow (*Eremalche kernensis*)	FE, CNPS 1B.1	Found in Kern and San Luis Obispo Counties on eroded hillsides and alkali flats with shadscale from 100-1000 m.	Suitable habitat is present within the survey area; however the species has never been recorded within the EHOF. **Low Potential**
Lemmon's jewelflower (*Caulanthus coulteri* var. *lemmonii*)	CNPS 1B.2	Inhabits dry, exposed slopes from 80-2000 m. Found in San Joaquin Valley, San Francisco Bay, and South Coast Ranges.	This species was not observed during botanical surveys and the species has never been recorded within the EHOF. **Low Potential**
Lost Hills crownscale (*Atriplex vallicola*)	CNPS 1B.2	Inhabits dried ponds and alkaline soils below 200 m. Found in San Joaquin Valley.	This species was not observed during botanical surveys; however, habitat is suitable for the species to be present and it is known to occur within the EHOF. **Moderate Potential**

Table 1: Regionally Present Sensitive Species and their Potential to Occur on the Project Area			
Species	**Listing Status**	**Habitat Association**	**Potential within Project area**
Munz's tidy-tips (*Layia munzii*)	CNPS 1B.2	Inhabits alkaline clay soils below 700 m. Found in San Joaquin Valley.	This species was not observed during botanical surveys; however, habitat is suitable for the species to be present. **Low Potential**
Oil neststraw (*Stylocline citroleum*)	CNPS 1B.1	Inhabits flats and clay soils in oil-producing areas from 50-400 m. Found in southern San Joaquin Valley and San Diego county.	This species was not observed during botanical surveys; however, habitat is suitable for the species to be present and CNDDB records show multiple occurrences in the survey area. **High Potential**
Pale-yellow layia (*Layia heterotricha*)	CNPS 1B.1	Inhabits open, clay soils below 1600 m. Found in southern Tehachapi, western San Joaquin Valley, and South Coast and Western Transverse Ranges.	This species was not observed during botanical surveys; however, habitat is suitable for the species to be present. **Low Potential**
Recurved larkspur (*Delphinium recurvatum*)	CNPS 1B.2	Inhabits poorly drained, fine, alkaline soils in grassland and *Atriplex* scrub from 30-600 m. Found in Sacramento and San Joaquin Valleys.	This species was not observed during botanical surveys; however, habitat is suitable for the species to be present, and CNDDB records show multiple occurrences within the survey area and its surroundings. **Moderate Potential**
San Joaquin bluecurls (*Trichostema ovatum*)	CNPS 4.2	Inhabits valley and foothill grasslands from 65-300 m. Found in southwestern San Joaquin Valley.	Potential habitat exists within the survey area. **Low Potential**
San Joaquin woollythreads (Lembertia [*Monolopia*] *congdonii*)	FE, CNPS 1B.2	Inhabits sandy grasslands and alkali sink from 90-700 m. Found in southwestern San Joaquin Valley.	This species was not observed during botanical surveys; however, habitat is suitable for the species to be present. **Low Potential**
Tejon poppy (*Eschscholzia lemmonii* ssp. *kernensis*)	CNPS 1B.1	Inhabits grassy, open areas from 0-2000 m. Found in southwestern Tehachapi, and the northern portion of the Western Transverse Ranges.	This species was not observed during botanical surveys; however, habitat is suitable for the species to be present. CNDDB records and floristic survey data show

Table 1: Regionally Present Sensitive Species and their Potential to Occur on the Project Area

Species	Listing Status	Habitat Association	Potential within Project area
			occurrences near survey areas. **High Potential**
Temblor buckwheat (*Eriogonum temblorense*)	CNPS 1B.2	Inhabits barren clay in grassland and sandstone outcrops from 300–1000 m. Found in east Monterey, east San Luis Obispo and West Kern Counties.	This species was not observed during botanical surveys; however, habitat is marginally suitable for the species to be present. **Low Potential**

LISTING STATUS

FE = Federally listed Endangered FT = Federally listed Threatened FC = Federal Candidate FD = Federally de-listed CNPS 1B = Plants considered by CNPS to be rare, threatened, or endangered in California, and elsewhere CNPS 4= Plants considered by CNPS to have limited distribution. CNPS .1= seriously threatened in California. CNPS .2= fairly threatened in California.	SE = State listed Endangered ST = State Listed Threatened SP = State Protected Species CSC = California Species of Special Concern MBTA = Migratory Bird Treaty Act

4.0 RESULTS

The areas covered during the biological surveys conducted on February 24th and 25th, 2011 and the findings are discussed in the following sections.

4.1 VEGETATION

Vegetation observed during the biological survey was limited to common native and invasive plant species found in the EHOF and surrounding areas. These plant species are summarized in **Table 2**. No threatened, endangered, or any other sensitive plant species were observed during the biological survey period. The survey was not conducted during the optimal phenological period and the biologist used common identification methods in order to identify annual forbs and grasses. As such, Table 2 should only be used as a baseline for identifying community type and should not be treated as a comprehensive species list for the CO2 supply pipeline alignment. Additional general vegetation surveys and protocol level rare plant surveys should be conducted during optimal periods once the CO2 supply pipeline alignment is finalized.

The current iteration of the CO2 supply pipeline alignment places it directly through three plant communities and an agricultural zone along a transition from valley floor to foothill communities.

Generally, the project area is flat to gently sloping in the northern portion, moderately sloped in the central portion and steeply sloped in the southern portion. Non-native grassland dominates the steeper slopes of the southern-most portions of the project area. Vegetation associated with valley sink scrub is intermixed in the southern foothill regions in low lying washes and drainages. Vegetation in these areas is comprised of thick carpets of non-native invasive grasses and native grasses and forbs. Significant stands of fiddleneck (*Amsinckia sp.*) and (*Bromus sp.*) were the dominant plant species throughout much of the upland sloped terrain. An occasional saltbush (*Atriplex polycarpa*) stand was interspersed among the grasses and forbs. In general, shrub density increased as slope angle decreased along the foothill-valley transition. Vegetation density was highest in higher elevations and increased slope angles.

In more northerly, shallow sloped areas of the survey, vegetation consists almost entirely of non-native and native grasses and forbs. Very few shrubs were observed in these areas. Vegetation density in these areas was highest in low lying seeps and drainages.

Table 2: Botanical Survey Results for the OEHI CO2 EOR CO2 Supply Pipeline Alignment	
Plant Species Observed	
Scientific Name	**Common Name**
Amsinckia sp.	Fiddleneck
Astragalus lentiginosus	Speckled Milkvetch or Mottled Locoweed
Atriplex polycarpa	Valley/desert Saltbush
Atriplex spinifera	Spiny Saltbush
Avena fatua	Common wild oats
Brassica nigra	Black mustard
Bromus diandrus	Ripgut brome
Bromus madritensis spp. rubens	Red brome
Bromus hordeaceus	Soft chess
Camissonia californica	California Sun Cup
Centaurea melitensis	Tocalote
Eremocarpus setigerus	Turkey mullein
Erodium cicutarium	Red-stemmed filaree
Gutierrezia braceata	Matchweed
Helianthus annus	Annual sunflower
Hemizonia pungens	Common Spikeweed
Hordeum sp.	Barley
Hymenoclea salsola	Cheesebush
Layia glandulosa	White Tidy Tips
Lepidium dictyotum.	Peppergrass
Phacelia tanacetifolia	Tansy Leafed Phacelia
Plagiobothrys sp.	Popcorn flower
Poa sp.	Blue grass
Stephanomeria sp.	Wire Lettuce
Vulpia myuros	Rattail fescue

4.1.1 Listed and Sensitive Plant Species

No federal and/or state listed or otherwise sensitive plant species were observed on any portion of the proposed Project area during biological field surveys. Surveys were not conducted during the proper phenological blooming periods and thus detection is difficult if not impossible. Federally listed plants known to be found in similar habitat in surrounding areas include the federally endangered San Joaquin woollythreads (*Lembertia [Monolopia] congdonii*); Federally endangered Kern mallow (*Eremalche kernensis*); and federally and state endangered California jewelflower (*Caulanthus californicus*). Protocol level rare plant surveys should be conducted following finalization of CO2 supply pipeline alignment. A complete list of listed and sensitive plants, required habitat, and potential to occur within the Project area are located in Table 1.

4.2 WILDLIFE

Wildlife species and/or signs of presence observed during field surveys conducted on February 24th and February 25th, 2011 are presented in ***Table 3***. No visual observations of threatened,

endangered, or otherwise sensitive species were visually observed during the biological field survey. A lone Coyote (*Canis latrans*) was observed east of the survey area. Numerous small mammal and reptile burrows were found within the surveyed areas. Several large mammal dens (Coyote, San Joaquin Kit Fox, badger) were located within the survey area. The large mammal dens did not exhibit any signs of current occupancy and were partially backfilled and/or collapsed.

Small mammal and reptile burrows were most numerous on gently sloped or flat surfaces south of the California Aqueduct. Vegetation in these areas consisted of marginal native and non-native grasses and forbs. A high concentration of small mammal and reptile burrows was also located on the perimeter of the roads and current CO2 supply pipeline ROW's that the current alignment follows for most of its length within EHOF. While no definitive evidence was found, certain characteristics of Giant Kangaroo Rat habitation (vertical, appropriately sized burrows, elaborate burrow systems, and clear cutting) were observed in shallow sloped areas near previously identified CNDDB observations.

Large mammal burrows were most numerous on the steeper sloped terrain in the southern portion of the survey areas.

Focused surveys for Swainson's hawk nests, golden eagle nests, and burrowing owls have not been performed for the CO2 supply line. As required by the EHOF HCP, biological pre-activity surveys are conducted by qualified biologist's prior to ground disturbance activities. Biological data associated with these species are provided in the EHOF HCP semi-annual and annual reports provide to the wildlife agencies.

Table 3: Wildlife Species Observed Results for the OEHI CO2 EOR CO2 Supply Pipeline Alignment

Wildlife Species Observed		
Scientific Name	**Common Name**	**Occurrence**
Buteo jamaicensis	Red-tailed hawk	Visual
Canis latrans	Coyote	Visual, Appropriate dens (size, shape), scat
Cathartes aura	Turkey vulture	Visual
Corvus corax	Common raven	Visual
Circus cyaneus	Northern harrier	Visual
Falco sparverius	American Kestrel	Visual
Lanius ludovicianus	Loggerhead Shrike	Visual
Sturnella neglecta	Western Meadowlark	Visual, Audible Calls
Taxidea taxus	American badger	Appropriate den (indicative horizontal claw marks, size)
Uta stansburiana	Common side blotched lizard	Visual

Vulpes macrotis mutica	San Joaquin kit fox	Appropriate dens (size, shape, layout)

4.2.1 Listed and Sensitive Wildlife Species

With the exception of the Logger head shrike, no federal and/or state listed or otherwise sensitive wildlife species were observed on any portion of the proposed Project area during the initial biological field survey. However, the Project area is within the known range of multiple listed or sensitive species. Protocol levels surveys should be conducted for all federal and state threatened or endangered species in project areas with suitable habitat prior to construction.

Federal and State listed species with known ranges, suitable habitat, or have occurrences listed in the CNDDB near the Project area include: the federal and state endangered, and state fully protected blunt-nosed leopard lizard (*Gambelia sila*); federal and state threatened giant garter snake (*Thamnophis gigas*); federal and state endangered Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*); federal endangered and state threatened San Joaquin kit fox (Vulpes macrotis mutica); state threatened San Joaquin antelope squirrel (*Ammospermophilus nelson*) and the federal and state endangered giant kangaroo rat (*Dipodomys ingens*).

Other sensitive species with known ranges, suitable habitat, or have occurrences listed in the CNDDB near the Project area include: the California species of special concern (CSC) listed Western burrowing owl (*Athene cunicularia*), Le Conte's thrasher (*Toxostoma lecontei*), loggerhead shrike (*Lanius ludovicanius*), American badger (*Taxidea taxus*), short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*), Tulare grasshopper mouse (*Onychomys torridus tularensis*), San Joaquin whipsnake (*Masticophis flagellum ruddocki*), and western pond turtle (*Actinemys marmorata*).

5.0 CONCLUSIONS

The modified CO2 supply pipeline alignment follows previously disturbed roads and above ground CO2 supply pipelines for most of its length within the EHOF (***Figure 2***). Vegetation communities and habitat types within the survey area are similar to those in surrounding areas. The 250 foot wide survey area included the proposed CO2 supply pipeline alignment and 125 foot wide buffer on either side. In cases where the CO2 supply pipeline alignment followed roads and/or disturbed areas already containing above ground supply pipelines, the buffer areas were established outside the disturbed areas. Additional protocol level surveys should be conducted for all areas of the CO2 supply pipeline alignment within EHOF upon initiation of any trenching. Trenches left open during construction should have earthen wildlife escape ramps spaced no greater than 1,000 feet apart at a slope no greater than 2:1. Trenches should be monitored daily by a qualified biologist prior to beginning work each day. Special care should be taken in areas where the proposed alignment does not follow roads and or existing lines. In areas where the proposed CO2 supply pipeline follows roads and existing CO2 supply pipelines, construction should be confined to previously disturbed areas when possible in order to reduce impacts to surrounding undisturbed habitat.

One sensitive species; the CSC listed Loggerhead Shrike was observed during the survey. Potential habitat and signs of other listed species were observed within the survey area. Species specific surveys should be conducted prior to any disturbance.

It should also be noted that OEHI holds a 12 year site-wide streambed alternation maintenance permit as required by 14 CCR Sections 1601 and 1603 of the Fish and Game Code. The current permit for OEHI expires in the year 2020. If it is determined that the activity may substantially adversely affect fish and wildlife resources within state jurisdictional waters, a Lake or Streambed Alteration Agreement will be prepared.

Some activities proposed as part of the CO2 EOR Project could be covered by the Maintenance Streambed Alteration Agreement, could affect drainages not under the jurisdiction of the CDFG, or could necessitate issuance of a Standard Streambed Alteration Agreement. OEHI will comply with the requirements of the CDFG Code, including permitting and reporting. In addition, the EHOF contains no U.S. Army Corps of Engineers jurisdictional waters and installing the CO2 supply line under the California Aqueduct and nearby canal via HDD techniques is expected to avoid the need to obtain a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers.

6.0 ADDENDUM INTRODUCTION

As part of a comprehensive biological evaluation, Stantec conducted a second survey of the Modified CO2 supply pipeline alignment from the HECA Facility to the OEHI CO2 EOR Processing Facility on April 14, 2011. This survey was designed to evaluate botanical and wildlife resources located on or adjacent to the Modified Alignment. When taken in conjunction with the previous survey in March, the results of the April survey reflect a wide time period that corresponds with typical early and late blooming flora found on the EHOF and surrounding lands. By conducting surveys during both early and late spring, Stantec was able to ensure far greater accuracy regarding the presence or absence of sensitive plant species.

7.0 ADDENDUM METHODS

Prior to conducting the April 2011 survey, Stantec biologists thoroughly reviewed previous research referenced in the Biological Assessment for Modified Alignment of CO2 Supply Pipe Line. Special attention was given to plant species known to bloom in April and May.

The terrestrial survey was conducted on April 14, 2011. A qualified biologist conducted linear, 10 Meter wide, pedestrian transects along the most recent proposed alignment of the CO2 supply pipeline, provided prior to the initial March survey. Surveys were conducted along the proposed Project boundaries identifying vegetative and topographic conditions. Surveys to identify and/or observe wildlife and plants, confirmation of vegetation communities, and presence of sensitive habitats were concurrently conducted. Survey methods and results are described in greater detail below.

7.1 VEGETATION

Terrestrial surveys were conducted on the proposed Project area to confirm the presence or absence of sensitive plant species expected to occur on the Project area. Surveys concentrated on areas where construction was planned to occur according to proposed Project plans and descriptions provided by OEHI.

7.2 WILDLIFE

Wildlife surveys were conducted to determine if habitat existed for any sensitive wildlife species that may occur in the area. The survey was also conducted to determine the presence of all wildlife species and their signs. Identification of species and potential habitat was determined by searching for burrows, tracks, scat, nests, prey remains, hair, calls, other signs, and direct observations. Linear pedestrian transects were conducted in areas that were accessible and where construction was to occur according to the Project plans and descriptions provided prior to the start of surveys. Areas that contained high burrowing activity were especially scrutinized. Global Positioning System (GPS) locations were taken for marking and mapping the location of notable findings.

8.0 ADDENDUM RESULTS

The findings of the April 14, 2011 biological assessment survey are discussed in detail below.

8.1 VEGETATION

Vegetation observed during the terrestrial survey was typical of that found on the EHOF and surrounding lands. A complete list of common plants species observed during the April 2011 survey can be found in ***Table 4*** below.

Table 4: Botanical Survey Results for the OEHI CO2 EOR CO2 Supply Pipeline Alignment

Common Plant Species Observed April 14, 2011	
Scientific Name	**Common Name**
Achracheana mollis	Blow wives
Amsinckia sp.	Fiddleneck
Astragalus lentiginosus	Speckled Milkvetch or Mottled Locoweed
Atriplex polycarpa	Valley/desert Saltbush
Atriplex spinifera	Spiny Saltbush
Avena barbatus	Slender wild oats
Avena fatua	Common wild oats
Brassica nigra	Black mustard
Bromus diandrus	Ripgut brome
Bromus madritensis spp. rubens	Red brome
Bromus hordeaceus	Soft chess
Camissonia californica	California Sun Cup
Castilleja exserta ssp. exserta	Purple owl's clover
Centaurea melitensis	Tocalote
Chamomilla sauveolens	Pineapple weed
Cryptantha sp.	Cryptantha
Cucurbita palmate	Coyote melon
Dichelostemma capitatum	Blue dicks
Eremocarpus setigerus	Turkey mullein
Erodium cicutarium	Red-stemmed filaree
Eastwoodia elegans	Yellow mock aster
Gutierrezia braceata	Matchweed
Filago californica	Filago
Helianthus annus	Annual sunflower
Hemizonia pungens	Common Spikeweed
Hirshfeldia incana	Mustard
Hordeum sp.	Barley
Hymenoclea salsola	Cheesebush
Isomeris arborea	Bladderpod
Layia glandulosa	White Tidy Tips

Table 4: Botanical Survey Results for the OEHI CO2 EOR CO2 Supply Pipeline Alignment	
Common Plant Species Observed April 14, 2011	
Scientific Name	**Common Name**
Lepidium dictyotum.	Peppergrass
Linanthus liniflorous	Lewis' flax
Lupinus bicolor	Bi-colored lupine
Malocothrix californica	Wild marigold
Melilotus indica	Sour clover
Mentzelia affinis	Blazing star
Phacelia tanacetifolia	Tansy Leafed Phacelia
Plagiobothrys sp.	Popcorn flower
Poa secunda var. secunda	Blue grass
Salvia carduacea	Thistle sage
Schismus arabicus	Arabian grass
Stephanomeria pauciflora var. pauciflora	Wire Lettuce
Stylocline gnaphaloides	Everlasting nestraw
Vulpia myuros	Rattail fescue
Note: Table 4 only includes a list of common plants species observed. Listed and sensitive plant species observed are discussed in Section 8.1.1.	

8.1.1 Listed and Sensitive Plant Species

Two listed or sensitive plant species were observed during the survey: *Stylocline citroleum* (Oil nestraw) and *Eriastrum hooveri* (Hoover's eriastrum). Both species were found concurrently at 35° 17' 57.493"N, 119° 22' 35.844"W (Datum WGS 1984) along a roadside running north-south parallel to power lines. Hoover's eriastrum is listed as a CNPS 4.2, while Oil nestraw is listed as a CNPS 1B. No other listed or sensitive plant species were observed during the survey.

8.1.2 Wildlife Species Observed

Wildlife species and/or signs of presence observed during field surveys conducted during the April 14, 2011 survey are presented in ***Table 5***.

Numerous small mammal and reptile burrows were found within the surveyed areas. Several large mammal dens (*Canis latrans, Vulpes macrotis mutica, Taxidea taxus*) were located within the survey area. The large mammal dens did not exhibit any signs of current occupancy and were partially backfilled and/or collapsed. All dens corresponded with the March 2011 survey. No new signs of activity or new den locations were observed.

Multiple small mammal and reptile burrows were observed during the survey.

While no definitive evidence was found, certain characteristics of Giant Kangaroo Rat habitation (vertical, appropriately sized burrows, elaborate burrow systems, and clear cutting) were

observed in shallow sloped areas near previously identified CNDDB observations. These observations concur with the March 2011 survey.

Table 5: Wildlife Species Observed Results for the OEHI CO2 EOR CO2 Supply Pipeline Alignment		
Wildlife Species Observed April 14, 2011		
Scientific Name	**Common Name**	**Occurrence**
Aspidoscelis tigris	Western whiptail	Visual
Canis latrans	Coyote	Appropriate dens (size, shape), scat
Corvus corax	Common raven	Visual
Lanius ludovicianus	Loggerhead Shrike	Visual
Sturnella neglecta	Western Meadowlark	Visual, Audible Calls
Taxidea taxus	American badger	Appropriate den (indicative horizontal claw marks, size)
Uta stansburiana	Common side blotched lizard	Visual
Vulpes macrotis mutica	San Joaquin kit fox	Appropriate dens (size, shape, layout)

8.1.3 Listed or Sensitive Wildlife Species

Only one listed or sensitive species was directly observed during surveys. One *Lanius ludovicianus* (Loggerhead Shrike) individual was observed perched on a power line near a tank farm. The Loggerhead shrike is listed as a CDFG Species of Special Concern. While some evidence of Dipodomys ingens (Giant kangaroo rat) activity was observed adjacent to the Project, trapping would be necessary to confirm presence.

9.0 ADDENDUM CONCLUSION

The April 2011 survey results allow for a more comprehensive and accurate biological analysis. The March and April surveys showed many of the same species to be present and no new large mammal dens or signs of activity were found during the April 2011 survey. No Blunt-nosed leopard lizards were observed. Certain characteristics of Giant kangaroo rat activity were observed but no conclusive determination of presence or absence can be made. Two sensitive plants species were observed: Oil nestraw, and Hoover's eriastrum. No other listed or otherwise sensitive flora or fauna were observed during the April 2011 survey.

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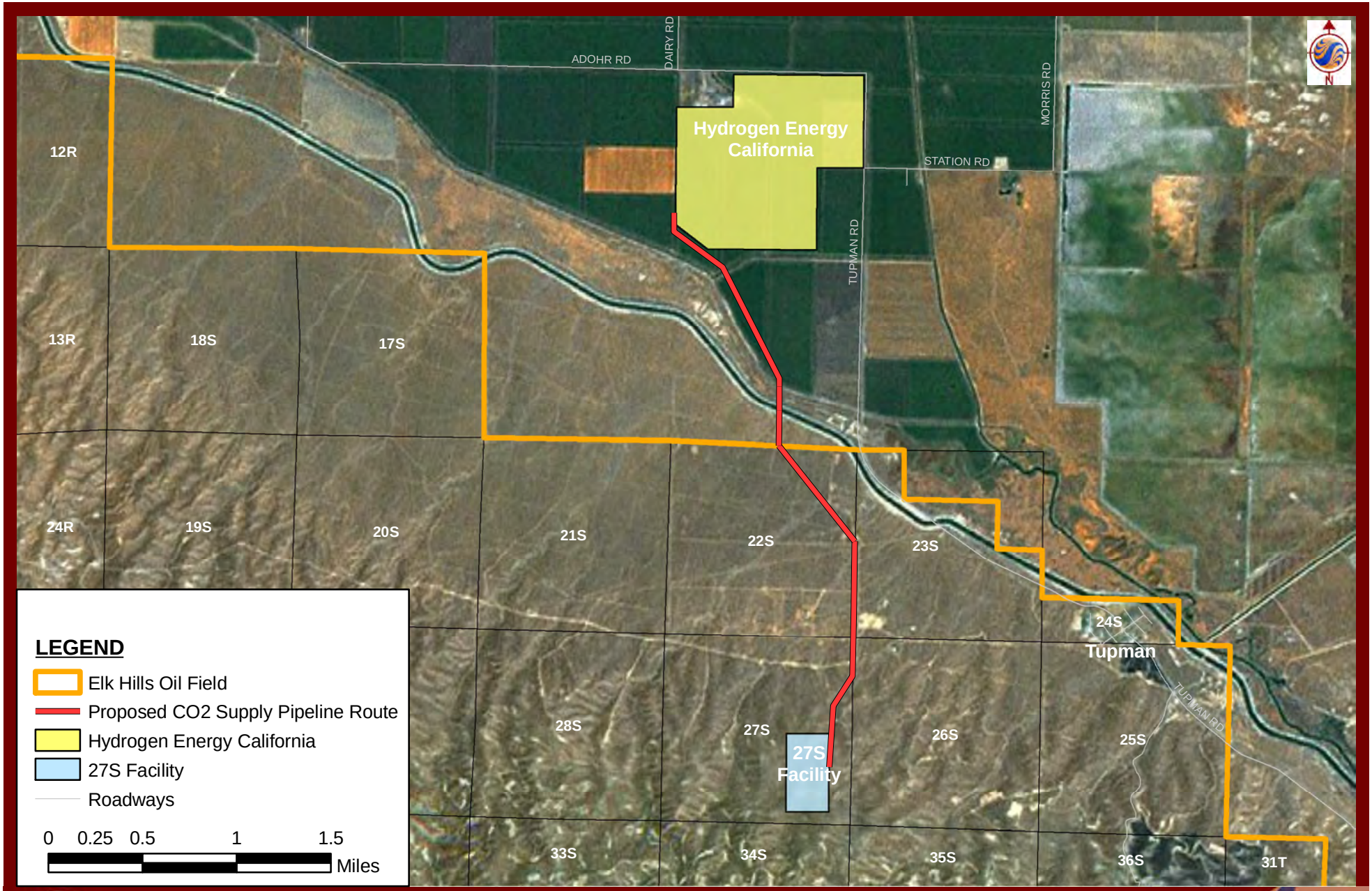
FIGURES



Cartographic Design By: C. Flinders | Environmental Remediation

Stantec does not certify the accuracy of the data. This map is for reference only and should not be used for construction.

Figure 1

Proposed Alignment of CO2 Supply Pipeline Route

Stantec
2590 Venture Oaks Way, Sacramento, CA 95833
Phone 916.569.2500 Fax 916.921.9274 www.stantec.com
Project # 185802314

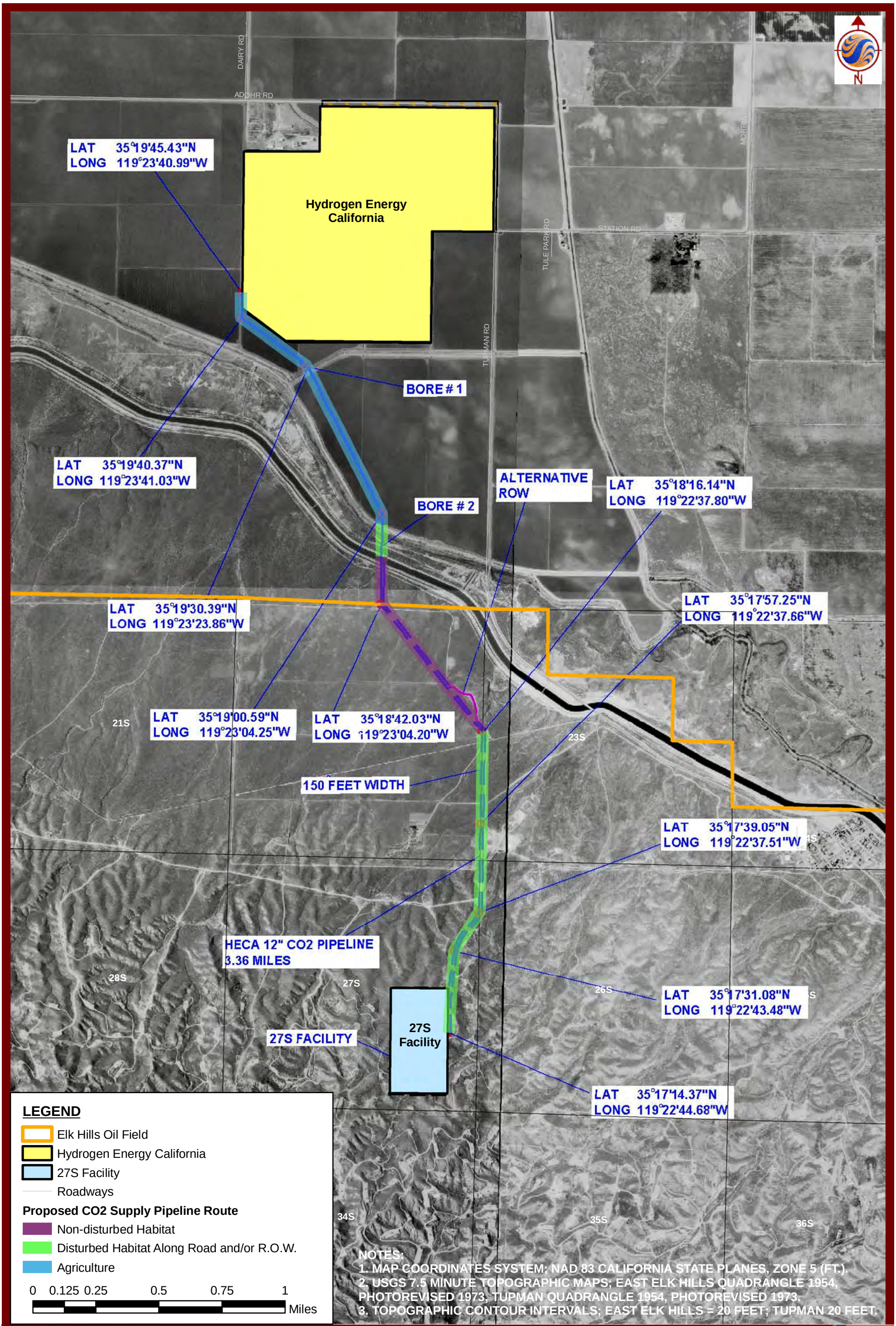


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Figure 2

CO2 Supply Pipeline Alignment and Survey Area Map

OEHI CO2 EOR Project - Supplemental Environmental Assessment

Hydrogen Energy California

27S Facility

LEGEND

- Proposed CO2 Supply Pipeline Route
- Elk Hills Oil Field
- Hydrogen Energy California
- 27S Facility

0 0.1 0.2 0.4 0.6 0.8 Miles

SOURCE: DELORME X-MAP

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Figure 3

California Natural Diversity Database Map

OEHI CO2 EOR Project - Supplemental Environmental Assessment

ATTACHMENT B

CULTURAL AND PALEONTOLOGICAL RESOURCES STUDY FOR MODIFIED ALIGNMENT OF CO2 SUPPLY LINE

Cultural and Paleontological Resources Survey for Modified Alignment of CO2 Supply Line

Cultural and Paleontological Resources Survey for modified CO2 Supply Line alignment from the HECA Facility to the OEHI CO2 EOR Processing Facility

April 2011

Table of Contents

Figures

Tables

Appendices

1.0 CULTURAL RESOURCES SURVEY

1.1 SUMMARY OF FINDINGS

No additional cultural resources were discovered during the survey. However, previously recorded site number PS-15-006776 is adjacent to, or within the proposed pipeline alignment. Additional survey and possibly testing is recommended to ensure significant cultural resources are not adversely impacted during pipeline construction. Site PS-15-000124 was recorded in 1963. It is depicted as being within the proposed alignment, but was probably destroyed during the construction of the California Aqueduct. No surface evidence of the site was detected. Two additional sites, PS-15-6734 and 6735, are located directly east of the proposed pipeline alignment, but are outside the Area of Potential Effect (APE).

1.2 PROPOSED UNDERTAKING

The proposed project is the construction of a main pipeline for the conveyance of CO2 from the HECA facility in Section 10, T30S, R24E, to the 27S facility in Section 27 of the same township in the Elk Hills Oil Field. The proposed alignment traverses Sections 10, 15, 22 and 27, T30S, R24E.

1.3 PURPOSE AND SCOPE OF THE SURVEY

A cultural resources survey was undertaken along the proposed alignment of the CO2 pipeline for a distance of 2.5 miles and a width of approximately 150 feet. The project includes a total of 3.36 miles of pipeline, most of which has been previously surveyed. The northern portion of the corridor was surveyed in 1999 by URS with negative results. The purpose of the current survey was to document any cultural resources within the corridor that could be adversely affected during construction of the pipeline.

1.4 CONSTRAINTS TO THE SURVEY EFFORT

Access to the entire area of potential effect was unconstrained. However, the survey was affected by lack of ground visibility. As a result of dense grasses and shrubs, the ground visibility was estimated to be 10 to 20% throughout the entire APE.

1.5 NUMBER AND TYPES OF IDENTIFIED ARCHAEOLOGICAL RESOURCES AND THEIR RELATION TO THE PROPOSED PROJECTS LIMITS

No newly discovered sites were found during the survey. Information from the Southern San Joaquin Valley Information Center indicated 22 previously recorded sites within a .5 mile radius

of the proposed alignment (see Section 1.6) Site PS-15-000124 was recorded in 1963 and the recorded site map indicates it being within the APE for the proposed pipeline. However, no evidence of the site was found during the current survey, and the site was probably destroyed during construction of the California Aqueduct. Additionally, there is no further surface disturbance planned in this area, as the pipeline construction will involve deep boring under both the California Aqueduct and an adjacent outlet canal. Site PS-15-006776 is a lithic/groundstone and shell midden site that was tested for eligibility (Jackson, Shapiro and King, 1999).

1.6 SOURCES CONSULTED

1.6.1 Summary of Methods and Results

The records search for this project was conducted on February 21, 2011 by Celeste Thomson of the Southern San Joaquin Valley Information Center (See Appendix B). The materials consulted during the background search included:

- Sites in or within a .5 mile radius of the project area
- Studies in or within .5 mile radius of the project area
- OHP Historic Properties Directory
- Historic Property Data File (10/5/10)
- California Inventory of Historical Resources
- California Register
- National Register
- Ethnographic information
- California Points of Historic Interest

The search was designed to include all known cultural resources recorded within .5 mile of the project area, and all survey project reports produced within .5 mile of the project area.

The background research indicated that one previously recorded site was located within the project area. There have been 22 recorded cultural resources within .5 mile of the project area. None of the known sites are listed in the National Register, California Register, California Inventory of Historic Resources, California Points of Historical Interest, or the California State Historic Landmarks.

Table 1. Previously Recorded Sites within .5-miles of the Project Area				
Site Number (PS15-00…)	**Site Type**	**Located within Area of Potential Effect?**	**Eligibility**	**Recommendation**
0124	Lithics/shell midden	Yes	Not Eligible	No Effect
0125	Lithics/shell midden	No	Not Eligible	No Effect
6776	Lithics/ground stone/shell midden	Yes	Potentially Eligible	Survey/Testing
3253	Historic trash scatter	No	Not Eligible	No Effect
3255	Badly disturbed small flake and shell scatter	No	Not Eligible	No Effect
6734	Shell scatter	No	Not Eligible	No Effect
6735	Shell midden	No	Not Eligible	No Effect
6771	Shell midden	No	Not Eligible	No Effect
6770	Lithics/shell midden	No	Not Eligible	No Effect
9319	Chert flake Isolate	No	Not Eligible	No Effect
9320	Chert biface fragment and flake	No	Not Eligible	No Effect
3254	Historic trash scatter	No	Not Eligible	No Effect
2329	Lithics/shell midden	No	Not Eligible	No Effect
3861	Lithics/shell midden	No	Not Eligible	No Effect
3213	Historic kiln	No	Not Eligible	No Effect
6774	Shell midden/historic debris	No	Not Eligible	No Effect
3252	Historic trash scatter	No	Not Eligible	No Effect
3248	Can scatter	No	Not Eligible	No Effect
3247	Historic kilns	No	Not Eligible	No Effect
3246	Historic household trash and well rig hardware	No	Not Eligible	No Effect
3241	Historic well complex	No	Not Eligible	No Effect
3140	Not available	No	Not Eligible	No Effect
3242	Historic well site	No	Not Eligible	No Effect

1.6.2 Previous Surveys Conducted within One Half Mile of the Project Area

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1.7 SUMMARY OF OTHERS WHO WERE CONSULTED

Section 5097.91 of the California PRC established the Native American Heritage Commission (NAHC), whose duties include the inventory of places of religious or social significance to Native Americans and the identification of known graves and cemeteries of Native Americans on private lands. Section 5097.98 of the PRC specifies a protocol to be followed when the NAHC receives notification of a discovery of Native American human remains from a county coroner.

Coordination with the NAHC is required for this project in order to determine if any areas of sacred significance are located near the project area. In addition, the NAHC provides an updated list of tribal contacts for each proposed project. Tribal consultation for this project is currently in progress.

1.8 ENVIRONMENT

The project is located in the southern San Joaquin Valley which is bounded by the Tehachapi Mountains to the east, the Sacramento-San Joaquin River Delta to the north, the Coast Range to the west and the Sierra Nevada Mountains to the east. Rivers and streams cross the valley from eastern slopes of the Sierras. The region is known for extensive, shallow inland lakes, as the rivers and streams had no historical natural outlet to the west. The climate is Mediterranean, with hot, dry summers and moist winters. Prior to historic times the area supported large woodlands, grasslands and marshes. The majority of the region in which the project is located is dominated by agricultural development.

1.9 ETHNOGRAPHY

The Yokuts were the Native American group that occupied the Southern San Joaquin Valley at the point of modern contact. A number of ethnographers have published descriptions of the Yokuts, including Kroeber (1925), Latta (1977) and Wallace (1978). There were over 40 different groups of the Yokuts, but the Southern Valley Yokuts were located in the region of the project area. The culture of the Southern Valley Yokuts included village life in which large groups were located in, or near a single, dominant village. Villages were inhabited on a permanent basis due to the ease of acquiring natural resources including roots, seeds, waterfowl, fish and shellfish.

Both villages and smaller settlements were located adjacent to, or within a short distance of permanent lakes and streams. Subsistence centered upon fishing, however, a mixed strategy of subsistence was employed. Fishing was accomplished by the use of nets. Mussels were also gathered, and hunting activities produced elk, pronghorn and rabbits.

Baskets were made with the tule grass that was very common near the water environments. The same resource was also employed in the construction of canoes utilized for fishing and travel, and in making mats for houses. Basket weaving was recognized as the primary technological skill of the Southern Valley Yokuts (Valdez 1993). Other material culture included knives, scraping tools and projectile points. Ground stone included mortars and pestles. Trade occurred for the acquisition of marine shells that were fashioned into pendants, disks, beads, etc. for use in both personal adornment and for money.

Two types of houses were constructed by the Yokuts. Smaller structures for single families were oval-shaped huts covered with tule grass mats. Communal dwellings were also constructed which were large enough to hold as many as ten families, with different areas separated for each family. Nuclear families were patrilineal and tribes were divided into moieties.

1.10 PRE-HISTORY SETTING

Archaeological research has been conducted for many years in the southern part of the San Joaquin Valley. Much of the research has been focused on the Buena Vista Lake and Elk Hills areas. One of the first publications regarding early archaeological research was published in 1926. Gifford and Schenk of the University of California documented approximately 40 sites, as well as their excavation of nine of them. They noted the appearance of very little change over extended periods of time.

Five sites were excavated by the Civil Works administration during the Depression in 1933 and 1934 on the shore of Buena Vista Lake. These were highly stratified midden sites exhibiting prehistoric, protohistoric and historic occupations. Between 1899 and 1925, data recovery at large village sites at Buena Vista Lake as well as other proximal locations were conducted, focusing on the recovery of burial sites and grave goods (Gifford and Schenk 1926; Hartzell 1992). Significant data recovery occurred in the 1930's when a Yokuts cemetery (KER-64) was excavated at Elk Hills in 1935 by Edwin Walker (Walker 1947:3). A number of burials were excavated, some of which included grave goods identified as aboriginal artifacts, while others contained both aboriginal and European artifacts.

Importantly, later excavations in the 1960s by Fredrickson and Grossman (1977) at one of the original sites near Buena Vista Lake indicated a deeply buried component that dated to ca. 6,250 BC (Moratto 1984). Subsequent work around Buena Vista Lake led to the discovery of a number of temporal components that have been used to describe the general prehistory of the region. A chronological framework was developed from the numerous testing and excavation projects around the lake. Refinement of the chronology by several researchers has led to three broad temporal periods in the Southern San Joaquin Valley area, including the Early Holocene, the Middle Holocene and the Late Holocene.

1.10.1 Early Holocene: 10,000 to 5,000 BC

This is the earliest known period of human existence in the San Joaquin Valley. People lived in small camps around lakes and relied on the lake environment for natural resources. Populations were small during this time period.

1.10.2 Middle Holocene: 5,000 to 2,000 BC

Very few preserved sites from this time period are known to exist in the region. Most were undoubtedly destroyed as a result of fluctuating lake levels. This time marks a change from primarily big game hunting to the increasing practice of gathering resources as evidenced by the increased number of milling stones. Extended burials were common, and evidence of trade items grew in type and number. During this time, the focus was still on the lake environments.

1.10.3 Late Holocene: 2,000 BC to A.D. 1,850

More evidence of lake fluctuations occurred during this period. Human inhabitants of the area were highly mobile, undoubtedly taking advantage of resources on a seasonal basis. Numerous different artifacts show up in the archaeological record, indicating a more refined means of hunting and gathering. Flexed and semi-flexed burials became the norm. During the late Holocene, or protohistoric period, the artifact assemblage became even more diverse, with more elaborate projectile points, specialized mortars, beads, etc. (Frederickson 1986).

From approximately 1,000 BC to the modern era, the archaeological evidence in the Elk Hills area indicates almost a continuous period of human occupation. The extensive marshlands around the region's lakes had interconnected sloughs that were fed by the seasonal flooding of the Kern River.

1.11 HISTORICAL SETTING

1.11.1 Spanish Period

The first record of contact with the Southern Valley Yokuts occurred in 1772 by a band of Spanish soldiers. In 1776, Francisco Garces arrived in the region. Attempts were made to establish missions in the region, but they were unsuccessful. When the U.S. annexed California, the Valley was inundated with settlers and the extant cultural practices began to wane. The remaining Southern Valley Yokuts were initially sent to the Tejon and Fresno Reservations, but were later moved to the Tule Reservation in 1859. Modern land use in the region is the result of both agricultural and oil field development.

1.11.2 Historic Period

The Elk Hills Oilfield itself has an extensive history. Established in 1912, it eventually produced a steady supply of petroleum products and stood out as one of the largest gas producers in the world. The management for the oilfield became the responsibility of the U.S. Department of Energy in 1977. By the late 1990’s, the majority of the oilfield was owned by the federal government, but Congress instructed the Department to relinquish ownership of the field.

The Kern River Oilfield was discovered in 1899, which started a different type of “gold rush” in the area. Within five years after this date, most of the land in the Elk Hills Oilfield had been claimed. In the early 1900’s, the federal government became concerned about ensuring continued supplies of petroleum, and took control of the Elk Hills in 1909. Prior to the government claiming compete control, wildcatters began drilling throughout the field. A great deal of activity occurred, as small and large companies operated lease camps throughout the area. Standard Oil drilled a very successful well in 1919, thereby increasing the interest in the area. Camps continued to be set up, and a great deal of development occurred. The camps included barracks, dining halls, residences, etc.

Most of the early historic equipment is long gone, but of the known historic archaeological sites in the area, at least 175 of them have been recorded within the oilfield itself. The initial cultural resources work conducted in the area classified these historic sites into five property types: domestic occupation, transportation, military, industrial manufacturing and technology, and oil exploration and production.

Since the oilfield was somewhat isolated, a surprising amount of domestic life occurred there. Evidence of women and children is very clear in the archaeological record.

There are still a number of historic components representing the early oil industry on the property. The old road network still exists, along with a pipeline system and foundations and many of the early structures and equipment.

1.12 FIELD METHODS

Major portions of the APE for this project were surveyed previously by consulting firms in the 1990's for the privatization of the Elk Hills Oil Field. For this project, the pipeline APE was surveyed in 15 m transects and covered a corridor width of approximately 150 feet and length of approximately 2.5 miles. On Wednesday, February 23, 2011, two surveyors covered the southern half of the pipeline route. The remaining portion of the APE was surveyed on Thursday, February 24th.

1.13 STUDY FINDINGS AND CONCLUSIONS

Previously recorded sites were relocated if they were originally recorded as being within close proximity to the proposed pipeline corridor. During the survey, no new sites were discovered, but site number PS-15-006776, located in the northeast quarter of Section 22 does extend beyond the previously determined site boundaries. One isolated chert biface was located during the current survey. Previous researchers did not locate the western boundary of the site, as it extended into areas disturbed by agriculture. In addition, the current project APE extends both west and north of the original efforts at PS-15-006776. The fieldwork conducted for this project verified that the site does extend westerly and northerly beyond its current boundary description, and possibly into the APE. Testing conducted at PS-15-006776 produced data that indicated the site was not eligible for listing on the National Register of Historic Places. We agree with that assessment. However, the current survey indicates the site is larger, and possibly substantially larger, than originally thought. Due to current issues regarding land ownership, as well as limited ground surface visibility, we did not establish a revised site boundary. It is recommended that further survey, and possibly additional testing be conducted in the area of site number PS-15-006776 when the exact pipeline corridor is established and ground visibility has improved. It is also recommended that a Native American monitor be present during any future testing activities. One or more specific Native American monitors are very knowledgeable of archaeological investigations in the project area.

Previously recorded site PS-15-000124, originally recorded as including a sparse shell scatter in 1963, appears to have been destroyed by the construction of the California Aqueduct, as no surface manifestations of the site remain. Additionally, the portion of the pipeline in this area will be deeply buried by horizontal directional drilling.

Two other previously recorded sites, PS-15-6734 and 6735 were relocated, as they appeared to be in proximity to the APE. These two sparse shell scatters are located directly east of the pipeline corridor, but outside the APE.

In conclusion, one isolated artifact was discovered during this survey, and additional shell deposition west and north of site PS-15-006776 were identified. Neither the newly discovered isolated artifact, nor any of the other previously discovered sites are currently considered eligible for listing on the national register. However, additional survey and or testing should be conducted on the western and northern borders of site PS-15-006776. At the current time, the site should therefore be considered potentially eligible under the California and/or the federal criterion that it has yielded, or may be likely to yield, information important in history or prehistory.

2.0 PALEONTOLOGICAL RESOURCES

2.0 BACKGROUND

Elk Hills Oilfield has been the subject of a number of paleontological investigations. As a result of the planned Hydrogen Energy International Plant located directly north of the oilfield, background investigations, as well as field research has been conducted in and surrounding the current project area.

Much of the recent summary information regarding the paleontology of the oilfield was prepared by Lanny Fisk, PhD, and Stephen Blakely, both paleontologists with Paleo Resource Consultants. These investigators looked at the background of the entire oilfield, but primarily, the proposed location of the hydrogen facility just north of the oilfield, as well as the ancillary pipelines and other facilities that would extend southward into the oilfield.

Extensive information is available regarding the geology of the San Joaquin Valley. See Mendenhall 1908, Mendenhall et al., 1916, Hoots et al. 1954, Davis et al., 1957, 1959, 1964, Davis and Hall 1959. Hoffman 1964, Croft and Wahrhaftig 1965, Hackel 1966, Croft and Gordon 1968, Bull 1973, Page 1986, Marchand 1977, Bartow and Marchand 1979, Marchand and Allwardt 1981, Lettis 1988, Bartow 1987 and 1991, Beyer and Barto 1988, as well as others.

2.1 THE PROJECT AREA

As indicated by the geologic map of the region, the project area for the proposed pipeline is located in two of the major regional area divisions described by geologists and paleontologists. The northern portion of the pipeline corridor is located in Quaternary alluvium, while the southern portion (beginning at the southeast corner of Section 22, and continuing south) is the beginning of the Tulare Formation. The Tulare Formation is well known as a fossil bearing marine and non-marine sediment.

The majority of the information gathered for this report was obtained from the section on paleontological resources prepared by URS in the HECA final report (see Fisk and Blakely 2009). The authors of the 2009 report gathered information at the University Of California Museum Of Paleontology at Berkeley, the Los Angeles County Natural History Museum and the San Bernardino County Museum of Natural History. After their background research, the paleontologists from URS conducted extensive field surveys through the numerous sections that would be affected by the construction of the HECA facility. While no digging was undertaken and no samples were taken, the field inspection occurred during numerous site visits and focused upon areas of visible stratigraphy including hill slopes, cut slopes, road cuts, etc.

An important point should be made related to the difference between archaeological site significance and paleontological site significance. Archaeological sites are recorded as point data, as their surface expressions can be observed and site form and size can be easily recorded. Fossil strata, on the other hand, extend over large expanses of geographic area and are not point specific. It is therefore very difficult for a paleontologist to predict the potential impact on subsurface fossil beds, and monitoring is usually recommended when projects are proposed in known fossil localities.

Several organizations have established categories of sensitivity for paleontological resources. Of primary relevance are those developed by the Society of Vertebrate Paleontology (SVP) in 1995. Based upon the criteria advanced by the SVP, the entire length of the proposed pipeline is considered of high sensitivity.

While fossils are well known to exist in the Tulare Formation in the southern portion of the pipeline corridor, it is also known that the Quaternary alluvium in Sections 15 and 22 covers additional areas of the Tulare Formation to a depth of approximately 5 -10 feet. In addition, the Quaternary alluvium itself also has known fossil locations in other parts of Kern County.

2.2 KNOWN FIOSSIL INVENTORY

2.2.1 Tulare Formation

The formation is known to include algal stromatolites, shells of snails and clams, diatoms, petrified wood, bones and teeth of bony fishes, lizards, snakes, turtles, amphibians, birds, and a diversity of extinct land mammals, including gophers, pocket mice, squirrels, rabbits, ground sloths, kangaroo rats, pack rats, dogs, saber tooth cats, peccaries, camels, horses, tapirs and deer. The location of the proposed pipeline corridor extends through the Tulare Formation in Section 27. The formation is considered to have high sensitivity for fossil locations.

2.2.2 Quaternary Alluvium

There have been no reports of fossil localities in the Quaternary alluvium along the actual proposed pipeline corridor for this project. However, a number of vertebrate fossils have been discovered in Holocene and Pleistocene deposits elsewhere in Kern County. Fossils located in Quaternary alluvium can offer valuable data for reconstruction of paleoenvironments. The proposed pipeline corridor extends through Quaternary alluvium in Sections 15 and 22. The Quaternary alluvium is considered to have high sensitivity for fossil locations.

2.3 FIELD REVIEW RESULTS

A pedestrian survey of the proposed pipeline corridor was conducted on February 23 and 24. The survey width for the area of potential effect was 150 feet. Several locations of freshwater mussel shells were seen either directly on the surface or in the back dirt from animal burrowing. The locations of the freshwater shells were in previously recorded archaeological sites and have

been described previously as shell middens. The individual pieces of shell were soft and pliable. No excavations were made and no deep existing excavations were seen along the pipeline route.

2.4 POTENTIAL IMPACTS

As a result of the high potential for fossil locations in both the Quaternary alluvium and the Tulare formation, the construction of the proposed pipeline could cause significant damage to the existing fossil strata. It is unlikely that activities conducted after the construction phase would further impact the fossil bearing sediments.

2.5 SUMMARY / RECOMMENDATIONS

It is recommended that paleontological monitoring be conducted by a qualified paleontologist during construction of the pipeline. A monitoring and mitigation program should be developed in order to define activities and emergency measures before, during and after construction. The monitoring plan should be consistent with SVP guidelines (1995), and specify how fossil specimens can be collected, reported and curated. The plan should contain a section on education of construction personnel in the event of fossil discoveries.

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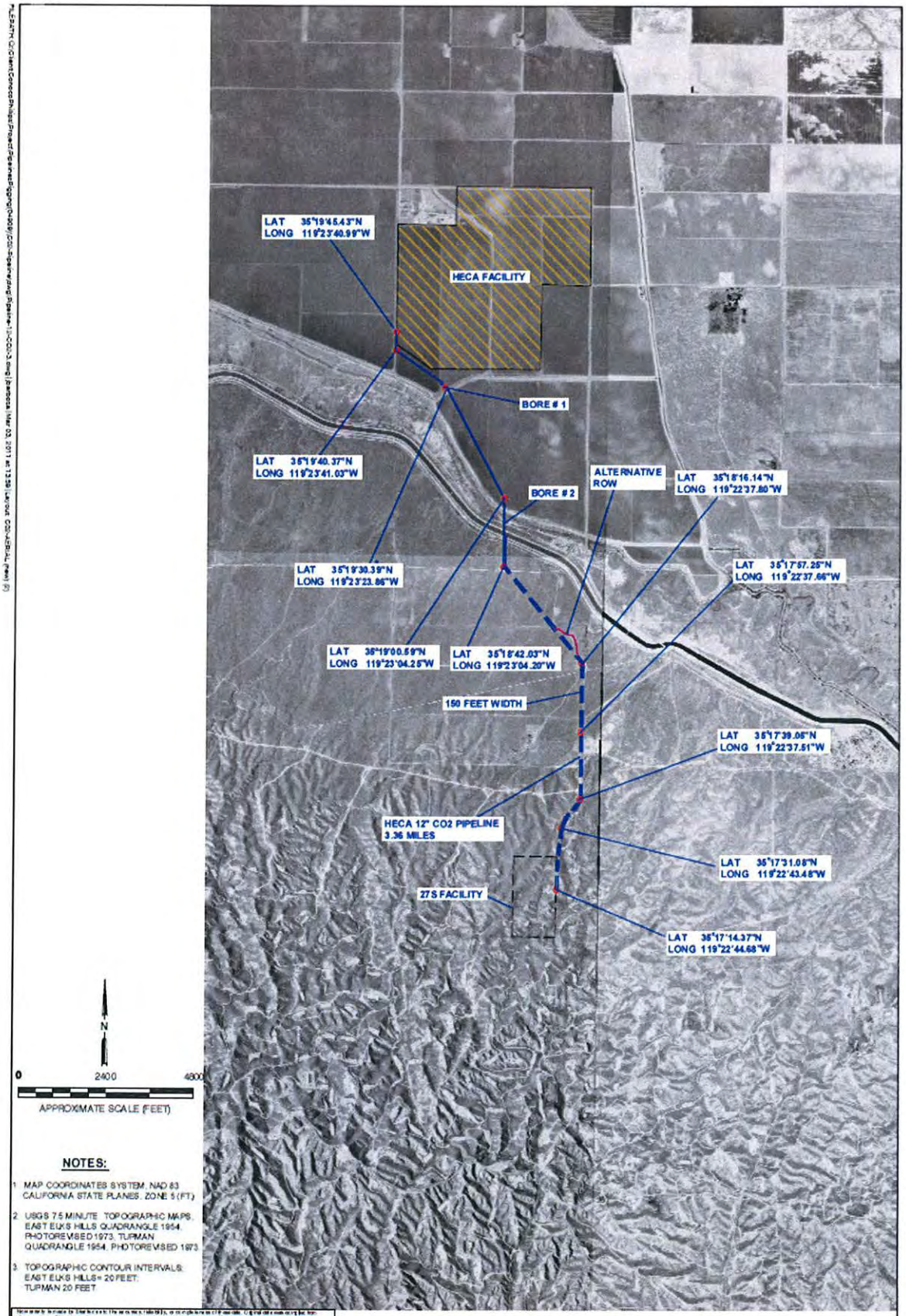
FIGURES



NOTES:

1. MAP COORDINATES SYSTEM, NAD 83 CALIFORNIA STATE PLANES, ZONE 5 (FT.)
2. USGS 7.5 MINUTE TOPOGRAPHIC MAPS, EAST ELKS HILLS QUADRANGLE 1954, PHOTOREVISED 1973, TUPMAN QUADRANGLE 1954, PHOTOREVISED 1973.
3. TOPOGRAPHIC CONTOUR INTERVALS, EAST ELKS HILLS= 20 FEET, TUPMAN 20 FEET.

Figure 1 Project Area

Stantec
290 Conejo Ridge Avenue
Thousand Oaks, CA 91361

FOR:				FIGURE
CO2 EOR PROJECT TUPMAN, KERN COUNTY, CALIFORNIA		CO2 SUPPLY LINE ALIGNMENT		1
JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:

Figure 2 – Cultural Resource Site Locations Adjacent to Proposed Pipeline

CONFIDENTIAL – NOT INCLUDED IN PUBLIC VERSION

APPENDIX A

SITE RECORDS

CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

FRESNO KERN KINGS MADERA TULARE

Southern San Joaquin Valley Information Center
California State University, Bakersfield
9001 Stockdale Highway
31 MW
Bakersfield, California 93311-1022
(661) 654-2289 FAX (661) 654-2415
E-mail: ssjvic@csub.edu

TO: Robert Larkin **(RS# 11-057)**
Stantec Consulting Services, Inc.
8211 South 48th Street
Phoenix, AZ 85044-5355

DATE: February 21, 2011

RE: Proposed Pipeline, Elk Hills Oilfield

Counties: Kern

Map(s): East Elk Hills & Tupman 7.5's

The Southern San Joaquin Valley Information Center is under contract to the State Office of Historic Preservation and is responsible for the local management of the California Historical Resources Inventories. The Center is funded by research fees and a grant from the State Office of Historic Preservation. The Information Center does not conduct fieldwork and is not affiliated with any archaeological consultants who conduct fieldwork.

CULTURAL RESOURCES RECORDS SEARCH

The following are the results of a search of the cultural resources files at the Southern San Joaquin Valley Information Center. These files include known and recorded archaeological and historic sites, inventory and excavation reports filed with this office, and properties listed on the National Register of Historic Places, the Historic Property Data File (10/5/10), the California State Historical Landmarks, the California Register, the California Inventory of Historic Resources, and the California Points of Historical Interest.

PRIOR CULTURAL RESOURCE INVENTORIES WITHIN THE PROJECT AREA AND A ONE-HALF MILE RADIUS

According to the information in our files, there have been seven (7) previous cultural resource studies conducted within the project study area, KE-00924, 02268, 02269, 02375, 03503, 03508, and 03509. There have been no additional studies conducted within a one-half mile radius. See the enclosed map for study locations and report designations.

(RS# 11-057)

KNOWN/RECORDED CULTURAL RESOURCES WITHIN THE PROJECT AREA AND A ONE-HALF MILE RADIUS

There is one (1) recorded cultural resource within the project area, P-15-000124. There are twenty-two (22) recorded cultural resources within a one-half mile radius, P-15-000125, 002329, 003140, 003213, 003241, 003242, 003246, 003247, 003248, 003252, 003253, 003254, 003255, 003861, 006734, 006735, 006770, 006771, 006774, 006776, 009319, and 009320. See the enclosed project map for resource locations.

There are no known cultural resources within the project area or radius that are listed in the National Register of Historic Places, California Register, California Inventory of Historic Resources, California Points of Historical Interest, or the California State Historic Landmarks.

COMMENTS

Requested copies are enclosed. If you have any questions, comments, or need additional information, please don't hesitate to contact our office at (661) 654-2289.

By Michael A. Thomas
for

Brian E. Hemphill, Ph.D.
Coordinator

Date: February 21, 2011

Fee: $225.00/hr. (Priority Service)

Please note that invoices for Information Center services will be sent under separate cover from the California State University, Bakersfield Accounting Office.

APPENDIX B

TRIBAL CONSULTATION

Tribal consultations have not yet been completed

ATTACHMENT C

AN ANALYSIS OF NOISE IMPACTS FOR MODIFIED ALIGNMENT OF CO2 SUPPLY LINE

An Analysis of Noise Impacts for Modified Alignment of CO2 Supply Line

CO2 supply line alignment from the HECA Facility to the OEHI CO2 EOR Processing Facility
Tupman, Kern County, CA

March 1, 2011

Table of Contents

Tables

Appendices

1.0 INTRODUCTION

Potential noise impacts from installation of the CO2 supply line in HECA's 2009 CEC AFC filing, focused on the distance away from sensitive receptors. HECA specifically evaluated construction noise impacts from construction of the main HECA Facility. As the main HECA Facility was located closer to sensitive receptors than the CO2 supply line and potential noise impacts from construction were determined to not be significant, construction impacts resulting from pipeline installation were also determined not to be significant. However, the modification of the CO2 supply pipeline alignment results in the pipeline being located closer to the (sensitive receptors) Tule Elk Reserve State Park and the community of Tupman. As a result of the decrease in distance, a substantial noise data gap has been identified and this noise analysis re-evaluates potential noise impacts from the alignment modification.

Installation of the CO2 supply line will be performed by utilizing a combination of horizontal direction drilling (HDD) and conventional trenching techniques. Specifically, the CO2 supply line will be installed under the farm irrigation canal (Bore #1), located immediately south of the HECA Project, and the West Side Canal and California Aqueduct (Bore #2) using HDD techniques and conventional trenching for the remainder of the alignment. As a result of the proposed installation methods, Stantec has evaluated the construction noise anticipated to result in the community of Tupman from pipeline construction at their closest point to Tule Elk Reserve State Park and the community of Tupman. These points equate to a distance of 2,400 feet to Tule Elk Reserve State Park from trenching and HDD operations as well as 6,774 feet to Tupman from trenching operations and 10,500 feet to Tupman from HDD operations. This assumption further assumes that the closest HDD point to Tule Elk Reserve State Park and Tupman (south of the California Aqueduct) will be utilized as a HDD entry point which provides the most conservative approach for equipment usage and noise impacts compared to more limited equipment used in support of a HDD exit point.

2.0 TERMINOLOGY

The measurement of any sound level requires language used specifically for the measurement of acoustical conditions. Definitions of acoustical l terms used in this noise evaluation are included in ***Table 1.***

TABLE 1: DEFINITION OF ACOUSTICAL TERMS

Term	Definition
dB, Decibel	Unit of measurement of sound level
dBA, decibel A-Weighted	A unit of measurement of sound level corrected to the A–weighted scale, as defined in ANSI S1.4–1971 (R1976), using a reference level of 20 micropascals (0.00002 Newtons per square meter).
A – Weighted Scale	A sound measurement scale, which corrects the pressures of individual frequencies according to human sensitivities. The scale is based upon the fact that the region of highest sensitivity for the average ear is between 2,000 and 4,000 Hz. Sound levels are measured on a logarithmic scale in decibels, dB. The universal measure for environmental sound is the A–weighted sound level, dBA.
Leq, Equivalent Noise Level	Also called the equivalent continuous noise level. It is the continuous sound level that is equivalent, in terms of noise energy content, to the actual fluctuating noise existing at the location over a given period, usually one hour. Leq is usually measured in hourly intervals over long periods in order to develop 24–hour noise levels.
CNEL, Community Noise Equivalent Level	The CNEL is a measure of the cumulative noise exposure in the community, with greater weights applied to evening and night time periods. This noise descriptor is the equivalent noise level over a 24–hour period mathematically weighted during the evening and night when residents are more sensitive to intrusive noise. The daytime period is from 7:00 a.m. to 7:00 p.m.; evening from 7:00 p.m. to 10:00 p.m.; and nighttime from 10:00 p.m. to 7:00 a.m. A weighting factor of 1 dB is added to the measured day levels defined as 7 a.m. to 7 p.m., evening levels (7 p.m. to 10 p.m.) have a weighting factor of three and 10 dB to the night time levels (10 p.m. to 7 a.m.). The weighted levels over a 24–hour period are then averaged to produce the single number CNEL rating.
Ldn, Day/Night Noise Level	The same as CNEL except that the evening time period is not considered separately, but instead it is included as part of the daytime period. Measurements of both CNEL and Ldn in the same residential environments reveal that CNEL is usually slightly higher (by less than 1 dB) than Ldn due to the evening factor weighting.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

The decibel (dB) is the preferred unit to measure sound levels utilizing a logarithmic scale to account for large a large range in audible sound intensities. A general rule for the decibel scale is that a 10 dB increase in sound is perceived as a doubling of loudness by the human ear.

3.0 ENVIRONMENTAL SETTING

3.1 AFFECTED NOISE ENVIRONMENT

The proposed alignment of the CO2 supply line is located primarily within an area used for agriculture north of the California Aqueduct and West Side Canal and petroleum extraction within the EHOF to the south. The nearest sensitive receptors to the CO2 supply line are the Tule Elk Reserve State Park located approximately 0.45 miles to the east of the HDD entry point, and the community of Tupman, which is located approximately 1.25 miles east of the eastern most point located along the CO2 supply line.

3.2 PROJECT VICINITY NOISE SETTING

Existing sources of noise in the Project vicinity include agricultural activities to the north of the California Aqueduct, vehicular traffic on Tupman Road to the east, and oilfield activities to the south of the proposed CO2 supply line alignment.

3.3 SENSITIVE RECEPTORS AND AMBIENT NOISE LEVELS

The nearest sensitive receptor to the proposed pipeline alignment is the Tule Elk Reserve State Park located approximately 0.45 miles to the east of the HDD entry point. The next closest sensitive receptor is the community of Tupman (Elk Hills Elementary School), which is located approximately 1.25 miles east of the eastern most point located along the alignment of the CO2 supply line. The sensitive receptors, proximity to the pipeline alignment, and the ambient noise levels are presented in ***Table 2***.

TABLE 2: SENSITIVE RECEPTORS IN CLOSE PROXIMITY TO PIPELINE ALIGNMENT AND AMBIENT NOISE LEVEL

Receptor Identification	Receptor Description	Receptor Location	Daytime Ambient Noise Level (Leq)
Tule Elk Reserve State Park	North of California Aqueduct and east-northeast of Tupman Road	0.45 miles east of pipeline alignment	Assumed 65 dBA
Community of Tupman	Intersection of Grace Avenue and Kern Street	1.25 miles east of pipeline alignment	62.2 dBA*

*Data collected by Stantec Personnel on September 21, 2010 during daytime hours. However, a daytime ambient noise level of 65 dBA was used in this evaluation to provide a conservative approach.

4.0 REGULATORY SETTING

Following are local, state, and federal regulations and standards pertaining to noise that apply to installation of the CO2 supply line.

4.1 LOCAL

4.1.1 Kern County General Plan

The goals and policies set forth by the Kern County General Plan Noise Element have been established in order to protect the acoustical environment for Kern County and to assure a comfortable and calming quality of life for residents. The Kern County General Plan Noise Element requires indoor noise levels in habitable rooms be limited to 45 dBA day/night noise level (Ldn). The typical attenuation factor for structures with closable windows is 20 dBA. The maximum noise level in outside living areas, such as yards, is required to be less than 65 dBA Ldn. A noise level of 65 dBA Ldn is considered the upper limit for noise-sensitive land uses such as residential areas, schools, convalescent and acute care hospitals, parks and recreation areas and churches.

4.1.2 Kern County Code (Chapter 8.36.020)

The Kern County Code prohibits noise from construction, between the hours of nine (9:00) p.m. and six (6:00) a.m. on weekdays and nine (9:00) p.m. and eight (8:00) a.m. on weekends, which is audible to a person with average hearing faculties or capacity at a distance of one hundred fifty (150) feet from the construction site, if the construction site is within one thousand (1,000) feet of an occupied residential dwelling.

4.2 STATE

Two state laws address occupational noise exposure for construction workers and vehicle noise. The Cal-Occupational Safety & Health Administration (OSHA) regulations, which are the same as the federal OSHA regulations, are described below under the Federal subheading. The regulations are contained in Section 8 of the California Code of Regulations (CCR), General Industrial Safety Orders, Article 105, Control of Noise Exposure, Sections 5095, et seq. Noise limits for highway vehicles are regulated under the California Vehicle Code, Sections 23130 and 23130.5. The limits are enforceable on the highways by the California Highway Patrol (CHP) and the Kern County Sheriff's Office. The California State Government Code, Section 65302, requires local governments (Counties and Cities) to prepare plans that contain noise provisions and standards. Kern County conforms to the Government Code requirements with the Kern County General Plan Noise Element outlined above.

4.2.1 California Energy Commission (CEC)

The CEC guidelines state that the area of impact to be studied should include areas where the noise of the project plus the background exceeds the existing background levels by 5 dBA or more at the sensitive receptor, including those receptors that are considered a minority population. The CEC has considered it reasonable to assume that an increase in background noise levels up to 5 dBA in a residential setting is considered insignificant, while an increase of more than 10 dBA in a residential setting is considered significant. For projects where the increase is between 5 and 10 dBA, the level of an impact depends on the particular circumstances of a case. Factors to be considered in determining the significance of an impact for this plus 5 to plus10 dB situation include:

- Resulting noise level;
- Duration and frequency of the noise;
- Number of people affected;
- Land use designation of the affected receptor sites; and
- Public concern or controversy as demonstrated at workshops or hearings, or by correspondence.

4.3 FEDERAL

The federal government has no standards or regulations applicable to off-site noise levels from the Project. However, guidelines are available from the United States Environmental Protection Agency (EPA; 1974) to assist state and local government entities in development of state and local laws, ordinances regulations, and standards (LORS) for noise.

On-site noise levels are regulated, in a sense, through the Occupational Safety and Health Act of 1970 and through the OSHA. The noise exposure level of workers is regulated at 90 dBA over an eight (8)-hour work shift to protect hearing (29 CFR 1910.95).

5.0 IMPACT EVALUATION

The only sensitive receptors that could be adversely impacted by installation of the CO2 supply line are the Tule Elk Reserve State Park and the community of Tupman. Projected sound levels from construction equipment anticipated to be used for trenching and HDD installation methods were estimated using a point source attenuation model. Noise from the source was assumed to attenuate at a rate of 6 dB for each doubling of distance. To determine potential noise impacts, the noise levels of these activities were estimated at the distance to the sensitive receptors and compared to the Kern County exterior standard noise level of 65 dBA Ldn and the CEC threshold of a 5 dBA noise level increase. The point source attenuation models for each of the following modeled scenarios are attached as ***Appendix A***.

- HDD operations (entry point) within 2,400 feet of Tule Elk Reserve State Park;
- Trenching operations within 2,400 feet of Tule Elk Reserve State Park;
- HDD operations (entry point) within 10,500 feet of Elk Hills Elementary School; and,
- Trenching operations within 6,774 feet of Elk Hills Elementary School.

The noise model assumed eight of hours of construction during daytime hours and no construction activities during nighttime hours for the trenching installation scenario. The model assumed continuous 24 hours of construction per day for the HDD installation scenario (12 hours daytime, 3 hours evening, and 9 hours nighttime). The model further assumes that all equipment would operate at the same time within the same closest distance to the sensitive receptor, which although unlikely to occur, provides a conservative estimate of resulting sound levels for purposes of this analysis. Ambient noise levels of 65 dBA daytime and 50 dBA nighttime were also used to predict the dBA Ldn at sensitive receptors with construction noise. Table 3 provides a summary of the modeling results for each of the above-identified scenarios.

TABLE 3: ESTIMATED SOUND LEVELS FROM CO2 SUPPLY LINE INSTALLATION AT SENSITIVE RECEPTORS				
Installation Scenario	Receptor Modeled	Distance to Receptor (feet)	Estimated Resulting Noise Level (dBA Ldn)	Resulting Increase Over Ambient (dBA Ldn)
HDD	Tule Elk Reserve State Park	2,400	65.4	1.7 dBA
Trenching	Tule Elk Reserve State Park	2,400	63.8	0.1 dBA
HDD	Elk Hills Elementary School	10,500	63.8	0.1 dBA
Trenching	Elk Hills Elementary School	6,774	63.7	No increase

NOTE: Resulting increase over ambient noise levels based on assumed 65 dBA daytime and 50 dBA nighttime ambient noise levels.

As shown in ***Table 3***, the results of the noise model indicates that noise levels are predicted to be below the exterior 65 dBA Ldn Kern County standard for trenching and HDD methods measured at Elk Hills Elementary School (Community of Tupman), as well as for trenching installation methods measured at Tule Elk Reserve State Park. The noise level for HDD methods predicted at Tule Elk Reserve State Park was estimated to exceed the exterior 65 dBA Ldn Kern County standard by 0.4 dBA. However, the Kern County standard is typically applied to outside living areas. It should also be noted that the HDD noise level model assumed all equipment typically required for HDD installation will all operate at the same time, continuous 24 hours a day operation, and at the same distance to the Tule Elk Reserve State Park. As such, it is likely that the estimated noise levels from HDD operations at the Tule Elk Reserve State Park have been overestimated. Furthermore, the HDD installation activities at this location will be limited to a short-term duration and will not result in a permanent noise level increase at this sensitive receptor. In addition, there is not an occupied residential dwelling located within 1,000 feet of the HDD location (or any other proposed CO2 supply line installation location). Therefore, construction activities are not expected to violate the Kern County Code or Noise Ordinance.

As shown in ***Table 3***, the predicted increase in ambient noise levels at sensitive receptors will be below the 5 dBA threshold considered by the CEC for noise level increases for residential settings. Even when applied to all potentially affected sensitive receptors (school and park), no increases in ambient levels will approach the 5 dBA CEC threshold. Considering the above, noise impacts from installation of the modified CO2 supply line alignment will not result in a significant noise impact or violate any applicable standard.

Operation of the CO2 supply line is not expected to generate substantial noise. Some noise may occur during operation of the CO2 supply line as a result of vehicles and other equipment used in support of routine right-of-way (ROW) inspections, response to underground service alert requests, and other supply line maintenance activities. However, the level of activity and

noise sources associated with operational activities are expected to be below noise levels associated with installation of the CO2 supply line. As noise levels form pipeline installation have been shown not to be significant or violate any applicable standard through this evaluation, operational noise sources are also not expected be significant or violate any applicable standard.

APPENDIX A

CONSTRUCTION NOISE MODELS

CONSTRUCTION NOISE ANALYSIS
MODIFIED CO2 SUPPLY LINE ALIGNMENT

Noise Scenario: Pipeline Installation via Conventional Trenching Techniques
Receptor: Tupman (Elk Hills Elementary School)

Construction Noise Source (Point Source)	Number of Units	Assumed Equipment Use Factor	Maximum Sound Pressure @50 feet (dBA)	Distance to Receptor (Feet)	Point Source Noise Level Attenuation with Distance (dBA)	Ground Attenuation with Distance (dBA)	Total Noise Level Attenuation (dBA)	Noise Level Below Loudest	Additive Noise Level (dBA)
Crane	1	0.16	83	6774	37.8	4.8	33.1	3.7	1.5
Backhoe or Excavator	1	0.73	85	6774	41.6	4.8	36.8	0.0	3
Welding Machine	1	0.73	73	6774	29.6	4.8	24.8	12.0	0.26
Supply Truck	1	0.73	82	6774	38.6	4.8	33.8	3.0	1.68
Water Truck	1	0.73	83	6774	39.6	4.8	34.8	2.0	2.12

Total Leq (dBA) at Receptors During Scenario	**42.3**
Assumed Daytime Ambient Noise Level:	65.0
Assumed Nighttime Ambient Noise Level:	50.0
Number of Daytime Hours Operating	8.0
Number of Evening Hours Operating	0.0
Number of Nighttime Hours Operating	0.0
Assumed Ambient Ldn	63.7
Estimated Ldn	**63.7**

Ground attenuation estimates assume soft sites, average transmission path of 2 meters above the ground
Data Source: EPA (1971), Noise From Construction Equipment and Operations

CONSTRUCTION NOISE ANALYSIS
MODIFIED CO2 SUPPLY LINE ALIGNMENT

Noise Scenario: Pipeline Installation via Horizontal Directional Drilling (Bore 2 - entry south of California Aqueduct)
Receptor: Tupman (Elk Hills Elementary School)

Construction Noise Source (Point Source)	Number of Units	Assumed Equipment Use Factor	Maximum Sound Pressure @50 feet (dBA)	Distance to Receptor (Feet)	Point Source Noise Level Attenuation with Distance (dBA)	Ground Attenuation with Distance (dBA)	Total Noise Level Attenuation (dBA)	Noise Level Below Loudest	Additive Noise Level (dBA)
Crane	1	0.16	83	10500	34.0	4.8	29.3	3.7	1.5
Backhoe or Excavator	1	0.73	85	10500	37.7	4.8	33.0	0.0	3
Drill Rig	1	0.73	85	10500	37.7	4.8	33.0	0.0	3
Generator	1	0.73	78	10500	30.7	4.8	26.0	7.0	0.79
Supply Truck	1	0.73	82	10500	34.7	4.8	30.0	3.0	1.68
Pump	3	0.73	76	10500	33.1	4.8	28.3	4.6	1.23

Total Leq (dBA) at Receptors During Scenario	**41.2**
Assumed Daytime Ambient Noise Level:	65.0
Assumed Nighttime Ambient Noise Level:	50.0
Number of Daytime Hours Operating	12.0
Number of Evening Hours Operating	3.0
Number of Nighttime Hours Operating	9.0
Assumed Ambient Ldn	63.7
Estimated Ldn	**63.8**

Ground attenuation estimates assume soft sites, average transmission path of 2 meters above the ground
Data Source: EPA (1971), Noise From Construction Equipment and Operations

CONSTRUCTION NOISE ANALYSIS
MODIFIED CO2 SUPPLY LINE ALIGNMENT

Noise Scenario: Pipeline Installation via Conventional Trenching Techniques

Receptor: Tule Elk Reserve State Park

Construction Noise Source (Point Source)	Number of Units	Assumed Equipment Use Factor	Maximum Sound Pressure @50 feet (dBA)	Distance to Receptor (Feet)	Point Source Noise Level Attenuation with Distance (dBA)	Ground Attenuation with Distance (dBA)	Total Noise Level Attenuation (dBA)	Noise Level Below Loudest	Additive Noise Level (dBA)
Crane	1	0.16	83	2400	46.9	4.7	42.2	3.7	1.5
Backhoe or Excavator	1	0.73	85	2400	50.6	4.7	45.9	0.0	3
Welding Machine	1	0.73	73	2400	38.6	4.7	33.9	12.0	0.26
Supply Truck	1	0.73	82	2400	47.6	4.7	42.9	3.0	1.68
Water Truck	1	0.73	83	2400	48.6	4.7	43.9	2.0	2.12

Total Leq (dBA) at Receptors During Scenario	**51.4**
Assumed Daytime Ambient Noise Level:	65.0
Assumed Nighttime Ambient Noise Level:	50.0
Number of Daytime Hours Operating	8.0
Number of Evening Hours Operating	0.0
Number of Nighttime Hours Operating	0.0
Assumed Ambient Ldn	63.7
Estimated Ldn	**63.8**

Ground attenuation estimates assume soft sites, average transmission path of 2 meters above the ground

Data Source: EPA (1971), Noise From Construction Equipment and Operations

CONSTRUCTION NOISE ANALYSIS
MODIFIED CO2 SUPPLY LINE ALIGNMENT

Noise Scenario: Pipeline Installation via Horizontal Directional Drilling (Bore 2 - entry south of California Aqueduct)

Receptor: Tule Elk Reserve State Park

Construction Noise Source (Point Source)	Number of Units	Assumed Equipment Use Factor	Maximum Sound Pressure @50 feet (dBA)	Distance to Receptor (Feet)	Point Source Noise Level Attenuation with Distance (dBA)	Ground Attenuation with Distance (dBA)	Total Noise Level Attenuation (dBA)	Noise Level Below Loudest	Additive Noise Level (dBA)
Crane	1	0.16	83	2400	46.9	4.7	42.2	3.7	1.5
Backhoe or Excavator	1	0.73	85	2400	50.6	4.7	45.9	0.0	3
Drill Rig	1	0.73	85	2400	50.6	4.7	45.9	0.0	3
Generator	1	0.73	78	2400	43.6	4.7	38.9	7.0	0.79
Supply Truck	1	0.73	82	2400	47.6	4.7	42.9	3.0	1.68
Pump	3	0.73	76	2400	45.9	4.7	41.2	4.6	1.23

Total Leq (dBA) at Receptors During Scenario	**54.1**
Assumed Daytime Ambient Noise Level:	65.0
Assumed Nighttime Ambient Noise Level:	50.0
Number of Daytime Hours Operating	12.0
Number of Evening Hours Operating	3.0
Number of Nighttime Hours Operating	9.0
Assumed Ambient Ldn	63.7
Estimated Ldn	**65.4**

Ground attenuation estimates assume soft sites, average transmission path of 2 meters above the ground

Data Source: EPA (1971), Noise From Construction Equipment and Operations

ATTACHMENT D

HAZARDS ASSESSMENT FOR MODIFIED ALIGNMENT OF CO2 SUPPLY LINE

Hazards Assessment for Modified Alignment of CO2 Supply Line

CO2 supply line alignment from the HECA Facility to the OEHI CO2 EOR Processing Facility
Tupman, Kern County, CA

April 12, 2011

Table of Contents

Tables

1.0 RISK ASSESSMENT

This Risk Assessment was conducted as an update for the accidental worst-case release scenario from the carbon dioxide (CO2) Supply Line from the Hydrogen Energy California (HECA) Facility to the Occidental of Elk Hills, Inc (OEHI) CO2 Enhanced Oil Recovery (EOR) Processing Facility located in Section 27S. This Risk Assessment addresses the worst-case release scenario of a modified alignment of the CO2 supply line from what was originally considered in HECA's 2009 Application for Certification (AFC) with the California Energy Commission (CEC). This risk assessment specifically addresses a worst-case scenario by dispersion of CO2 and hydrogen sulfide (H2S). The risk assessment methodology for CO2 is based on the evaluation performed on the original pipeline alignment contained in HECA's 2009 CEC AFC filing (URS, 2009, Appendix E).

The chemical compound CO2 does not manifest hazardous properties (i.e., toxicity, reactivity, flammability, or explosivity) that would result in regulatory classification as a hazardous material. However, the current U.S. Department of Transportation (DOT) requirement for pipelines transporting CO2 (49 Code of Federal Regulations [CFR] 195) directs the operator to perform a risk assessment.

Hydrogen sulfide (H2S) does manifest hazardous properties (i.e., primarily toxicity and flammability). By relative volume compared to the quantity of CO2, the H2S volume is much lower, but National Institute for Occupational Safety and Health (NIOSH) regulated permissible exposure limits (PELs) are also much lower.

The CO2 captured in the gasification processes at the HECA Facility will be compressed and transported in a semi-aqueous state to the custody transfer point and ultimately injected into the Stevens reservoirs for CO2 EOR and sequestration. The 12-inch diameter CO2 supply line will convey the CO2 from the HECA Facility to the OEHI CO2 EOR Processing Facility. It is anticipated that the pressure of the CO2 from the compressor will be approximately 2,500 pound-force per square inch gauge *(psig)*. The modified alignment of the CO2 supply line is 3.36 miles (see Figure 2 of the Data Gap Analysis).

For the majority of the modified alignment, the CO2 supply line will be buried approximately 5 feet below grade in a trench. The CO2 supply line will be buried as deep as 50 to 100 feet below grade using horizontal directional drilling (HDD) methodology when crossing the California Aqueduct and the Buena Vista Slough. The length of the surface pipeline which connects the compressor and underground pipeline will be approximately 200 feet long and entirely within the HECA Facility.

The CO2 supply line will be equipped with four emergency block valves that will isolate various segments of the supply line. The first block valve will be located at the end of the 200-foot aboveground supply line segment from the HECA compressor discharge, before the pipeline transitions below ground. There will be additional block valves placed along the CO2 supply line on the north side of the aqueduct and on the south side of the aqueduct. The last block valve will be placed at the pipeline terminus at OEHI's CO2 EOR Processing Facility. Although the block valves located near the boundary of the HECA facility and the pipeline termination at the EOR Processing Facility will be automated emergency block valves, the block valves located adjacent to the north and south sides of the California Aqueduct will be manual block

valves. As such, the evaluation of the potential consequences associated with a worst-case release from the CO2 supply line includes a release from the entire 3.36 mile-long pipeline rather than individual pipeline segments located between block valves.

.

2.0 QUANTITATIVE FAILURE ANALYSIS

The HECA project analyzed the risk of upset assessment for the proposed CO2 supply line and estimated the probability of failure and adverse consequences based on historical accident records of CO2 pipelines.

Accident/spill records of CO2 pipelines were obtained from the data provided by the Office of Pipeline Safety at the DOT. Incident failure rate was also obtained from the European Gas Pipeline Incident Data Group and analysis in the Oil and Gas Journal. Based on these data, the failure and accident frequency of CO2 pipelines could be calculated.

A total of 13 accidents regarding CO2 pipelines occurred in the United States between 1986 and 2008. Of these 13 accidents, none had reported human injuries or fatalities, compared to the more than 5,000 accidents and 107 fatalities in the same period caused by natural gas and hazardous liquid pipelines. This information on CO2 pipeline incidents was used to estimate the failure rate (i.e., 13 accidents in 22 years in 3,500 miles of pipelines).

The HECA project evaluation concluded that 46 percent of the accidents were caused by equipment failure. Close examination of these accidents revealed that the majority were caused by failure of a subcomponent (such as valve or gasket). The second most common cause was “Unknown,” accounting for approximately 23 percent of all accidents. The average failure rate for this period of time was 0.000169 failure per mile of CO2 pipeline per year.

Based on these data, the upper bound of the projected failure rate for the approximately 3.36 miles of CO2 supply line is 0.0006 failure per year.

Due to the adverse consequences that may occur from a possible CO2 pipeline failure, the industry has developed standard means to control the integrity and safe operation of pipelines. These practices include routine inspections of the pipeline rights-of-way (ROWs) for third party actions, internal pipe inspections performed by in-line inspection tools (e.g., pigs), and cathodic protection programs.

3.0 POTENTIAL HAZARD IMPACTS AND CONSEQUENCE MODELING

This section presents an evaluation of a hypothetical worst-case release scenario to assess the maximum potential consequence from the CO2 supply line.

Dispersion modeling provides an examination of the dispersion of CO2 in the form of a vapor cloud. The modeling assumptions for a worst-case release scenario are that the total contents from the largest inventory are accidentally released into the atmosphere. The extent of potential impact from the hypothetical accidental release was computed by using the Areal Locations of Hazardous Atmospheres (ALOHA) 5.4.1 air dispersion modeling program. ALOHA is a Gaussian plume model that incorporates continuous source and meteorological parameters.

The ALOHA model was selected to model the release, as it is suitable for modeling the release of a heavy gas (i.e., gas that is heavier than air) such as CO2. This model also takes into consideration the specific atmospheric conditions that may affect a potential release.

The modeling assumed worst-case atmospheric conditions during such a release. These conditions provide conservative results because these extreme and unlikely climatic conditions maximize the vaporization to create the vapor cloud and minimize its dispersion. For purposes of this analysis, the worst-case climate condition consists of:

- an ambient temperature of 115 degrees Fahrenheit (ºF) (the highest average temperature in the Project area),
- 50 percent average humidity,
- wind speed of 1.5 meters per second, and
- level F atmospheric stability.

Level F atmospheric stability provides the most stable atmospheric environment where the tendency of the atmosphere is to resist or enhance vertical motion and/or turbulence—this also contributes to minimum dissipation of the vapor cloud.

3.1 CARBON DIOXIDE EXPOSURE LIMITS

The modeling conducted to evaluate the potential impact area associated from a worst-case CO2 supply line release used exposure limit concentrations levels of CO2 as established by the U.S. Occupational Safety & Health Administration (OSHA), the American Conference of Governmental Industrial Hygienists (ACGIH), and NIOSH. The concentrations were examined to determine which concentration levels would present the greatest hazard during a worst-case release scenario.

These concentrations are stated in terms of:

(1) Permissible Exposure Limit PEL;

(2) Threshold Limit Value (TLV);

(3) Short Term Exposure Limit (STEL); and

(4) Immediately Dangerous to Life or Health (IDLH).

Both the PEL and TLV specify airborne concentration levels under which nearly all workers may be repeatedly exposed without potential adverse effects. The STEL represents the concentration to which workers can be exposed continuously for a short period of time without suffering from irritation, chronic or irreversible tissue damage, or narcosis of sufficient degree to increase the likelihood of accidental injury, impaired judgment, or materially reduction in work efficiency.

TABLE 1: Concentrations of Concern for Carbon Dioxide

Exposure Limit for Carbon Dioxide	Concentration	Exposure Period
OSHA PEL	5,000 ppm	Time weighted average concentration for 8-hour work day
ACGIH TLV	5,000 ppm	Time weighted average concentration for normal 8-hour work day or 40-hour work week
OSHA STEL	30,000 ppm	Maximum concentration for 15-minute period (maximum of 4 periods per day with at least 60 minutes between exposure periods)
NIOSH IDLH	40,000 ppm	The maximum level to which a healthy individual can be exposed to a chemical for 30 minutes and escape without suffering irreversible health effects or impairing symptoms

Notes:

ACGIH = American Conference of Governmental Industrial Hygienists
IDLH = Immediately Dangerous to Life or Health
NIOSH = National Institute for Occupational Safety and Health
OSHA = Occupational Safety & Health Administration
PEL = Permissible Exposure Limit
ppm = parts per million
STEL = Short Term Exposure Limit
TLV = Threshold Limit Value

3.2 HYDROGEN SULFIDE EXPOSURE LIMITS

The CO2 contained in the CO2 supply pipeline is expected to have a relatively small percentage of H2S in the stream. A peak concentration of 100 ppm with an average of 20 ppm is anticipated, so exposure limit concentrations were also reviewed the worst-case release scenario.

These concentrations are stated in terms of:

(1) PEL;

(2) TLV;

(3) STEL; and

(4) IDLH.

TABLE 2: Concentrations of Concern for Hydrogen Sulfide		
Exposure Limit for Carbon Dioxide	**Concentration**	**Exposure Period**
OSHA PEL	20 ppm	Time weighted average concentration for 8-hour work day
ACGIH TLV	10 ppm	Time weighted average concentration for normal 8-hour work day or 40-hour work week
OSHA STEL	50 ppm (10-minute max peak)	Maximum concentration for 10-minute period (maximum of one time per day)
NIOSH IDLH	100 ppm	The maximum level to which a healthy individual can be exposed to a chemical for 30 minutes and escape without suffering irreversible health effects or impairing symptoms

Notes:

ACGIH = American Conference of Governmental Industrial Hygienists
IDLH = Immediately Dangerous to Life or Health
NIOSH = National Institute for Occupational Safety and Health
OSHA = Occupational Safety & Health Administration
PEL = Permissible Exposure Limit
ppm = parts per million
STEL = Short Term Exposure Limit
TLV = Threshold Limit Value

3.3 CONSEQUENCE MODEL AND METHODOLOGY

Carbon Dioxide Worst-Case Release Scenario

In order to provide conservative results as to the extent of impact of a CO2 release from the CO2 supply line, the worst-case scenario modeling examined an instantaneous release from a complete lateral shear and de-pressurization of the CO2 supply line sections isolated by automated emergency block valves (assumed to be the entire 3.36 mile-long pipeline for purposes of this evaluation).

This Risk Assessment uses the same following assumptions for a CO2 release as those considered in HECA's 2009 CEC AFC filing (URS 2009, Appendix E):

> The CO2 will be transported as a supercritical fluid under highly pressurized conditions. Due to the highly pressurized conditions, a complete shear or rupture of the pipeline may displace the soil above the pipeline. Upon release and adiabatic expansion, it is estimated that approximately 75 percent of the CO2 volume within the affected pipeline segment will be discharged as a gas. The remaining 25 percent of the CO2 volume will solidify and then vaporize slowly, resulting in a gaseous release into the atmosphere.
>
> Since the weight of the soil above the pipeline would decrease the release rate, the worst-case scenario of CO2 release at each pipeline section was assumed to occur at the piping connecting to the valve boxes, which are located near the ground surface level, resulting in a release to the atmosphere.
>
> The evaluation of the worst-case release scenario focused on the estimated gas volume of the supercritical CO2 released, because the CO2 gas volume presents the greatest

potential for dispersion upon release into the atmosphere. Based on these assumptions, this assessment analyzed the potential impacts of the CO2 within the affected pipeline segment being modeled at a ground-level elevation, which is the worst-case scenario.

For the worst-case release scenario, the rupturing of the CO2 supply line was assumed to produce an 0.8-square-foot aperture (meaning a complete severing of the 12-inch-diameter pipeline) at the connection to the valve box through which CO2 would escape. The worst-case scenario assumes that the total CO2 volume of each section will release through the rupture within 1 minute (the minimum duration used by the ALOHA model for immediate releases). The atmospheric conditions modeled represent the least favorable conditions for the normal dissipation of a concentrated CO2 release.

In addition to the gas volume released from each isolated pipeline segment, the analysis also accounted for the additional CO2 that would be released during the reaction time for activation of the automated emergency block valves. It would take approximately 20 seconds for the CO2 supply line emergency block valves to activate based on pressure loss conditions identified for the pipeline.

Based on the foregoing, a total of 273,423 pounds of CO2 would be released during the worst-case release scenario

3.4 MODELING RESULTS CARBON DIOXIDE

The modeling of the worst-case scenarios demonstrated the following concentrations may be reached at the following approximate distances during the hypothetical release. This information was used for the risk analysis.

TABLE 3: Approximate Distances to Carbon Dioxide Concentrations of Concern

Length of CO2 Pipeline (feet)	CO2 Released (Pounds)	Concentration of Concern (PPM)	Approximate Distance to Concentration of Concern (feet)
17,741	273,423	30,000(STEL)	1,767
		40,000 (IDLH)	1,476

The area surrounding the CO2 supply line route is mainly composed of oil field, native terrain, and agriculturally developed lands in areas that would potentially be impacted from the hypothetical worst-case scenario release. The community of Tupman is approximately 6,804 feet from the closest point along the pipeline alignment. Other individuals who may be present in potential areas of impacts include occasional agricultural workers and oil production workers and potential future workers at the projects.

3.5 MODELING RESULTS HYDROGEN SULFIDE

The CO2 provided to the Project from HECA is expected to contain H2S with an anticipated peak concentration of 100 parts per million (ppm) and an average concentration of 20 ppm. H2S is considered a toxic gas, so a release could create a hazard to the public. As a worst-case release scenario, the radius of H2S exposure at the IDLH was modeled using the Pasquill-Gifford equation. Specifically, the radius of H2S exposure was estimated using the following equation:

Radius of H2S Exposure (feet) = [(1.589) (mole fraction H2S)(Q)]^0.6258

The above equation estimates the radius of exposure in feet, where: Q = maximum volume determined to be available for escape in cubic feet, and mole fraction H2S = mole fraction of hydrogen sulfide in the gaseous mixture available for escape. At 100 ppm H2S, the H2S mole fraction is 0.0001. Q is the worst-case release mass of 273,423 pounds (lbs) of CO2 which is equivalent to 2,389,990 standard cubic feet of gaseous mixture available for escape. Using the above assumptions, the IDLH for H2S (100 ppm) is estimated to extend approximately 41 feet from the release point.

4.0 CONCLUSION

The modification to the alignment of the CO2 supply line and resulting dispersion modeling of the worst-case release scenario does not substantially change the risk probability or evaluation contained in HECA's 2009 CEC AFC filing. As calculated in Section 20, the historical failure rate for the 3.36-mile CO2 supply line is estimated to be approximately 0.0006 failures per year, which will not present a significant likelihood of occurrence. The ranges of risk values previously evaluated by HECA remain unchanged as a result of the alignment modification and are acceptable based upon standard risk methodology. This demonstrates that the CO2 supply line will have a less-than significant risk.

Appendix A-3

OEHI Responses to CEC August 5, 2011 Outstanding Items Letter

OCCIDENTAL OF ELK HILLS, INC.
10800 Stockdale Highway, Bakersfield, CA 93311
Telephone 661 412-5000

April 27, 2012

Robert Worl, Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

RE: HYDROGEN ENERGY CALIFORNIA PROJECT (08-AFC-8)
CALIFORNIA ENERGY COMMISSION DATA REQUEST, AUGUST 5, 2011(#s 13-36)

Dear Mr Worl:

Below are responses to the certain questions from the California Energy Commission data request regarding the Hydrogen Energy California Project which pertain to Oxy's CO2 EOR Project.

13. **Applicant to provide Oxy's historical wildlife data from long-term monitoring of NPR-1 and NPR-2 (several decades of data was collected during Naval Petroleum Reserve monitoring). Resource agencies have a good handle on which wildlife are present on Elk Hills. San Joaquin kit fox, San Joaquin antelope ground squirrel, giant kangaroo rat, blunt-noise leopard lizard are all threatened and endangered species and assumed present.**

Section 4.4 of the SEI includes a discussion of existing biological resources and impact analysis for the CO2 EOR Project. OEHI is providing the Annual Reports from 1995 to 2011 which contains historic long-term monitoring data for NPR-1 (EHOF).

14. **Applicant to map giant kangaroo rat precincts (individual territories) on direct impact areas of Elk Hills. Giant kangaroo rat are assumed present by resource agencies, but a current mapping would be useful. The resource agencies asked for current giant kangaroo rat precinct data for the carbon dioxide pipeline so the same request would likely be made here.**

Section 4.4 of the SEI includes a discussion of existing biological resources and impact analysis for the CO2 EOR Project.

15. **Applicant to perform focused surveys for Swainson's hawk nests. General survey timing: March-August.**

As required by the EHOF HCP, biological pre-activity surveys are conducted by qualified biologist's prior to ground disturbance activities. Biological data associated with Swainson's hawk and nests are provided in the EHOF HCP semi-annual and annual reports provided to the wildlife agencies.

16. **Applicant to provide golden eagle nest data for Elk Hills and surrounding areas. Provide the results of a literature review, museum records search, database search, and check with local raptor groups for golden eagle nests and territories. Depending on this data, USFWS's Migratory Bird Office may request more detailed field surveys and/or helicopter surveys.**

Biological pre-activity surveys are conducted by qualified biologist's prior to ground disturbance activities. Biological data associated with golden eagle and nests are provided, if observed in the annual reports provided to the wildlife agencies; and included herewith.

17. **Applicant to conduct focused burrowing owl surveys (Phase I habitat assessment, Phase II burrow surveys, Phase III owl surveys) on Oxy's direct impact areas. Timing: Phase I and II can be conducted any time of the year, Phase III peak nesting season April 15 to July 15.**

Biological pre-activity surveys are conducted by qualified biologist's prior to ground disturbance activities. Biological data associated with burrowing owl and nests are provided, if observed in the annual reports provided to the wildlife agencies; and included herewith.

18. **Applicant to conduct focused botanical surveys following CDFG 2009 survey guidelines over the direct impact area of Elk Hills. Staff is not sure how current the plant survey data is for Elk Hills although rare plants have been long-studied here. Survey timing is species-specific in the southern San Joaquin Valley, but generally, surveys should be spaced out between February through March/April for annuals. Perennials can be surveyed for later in the season. Consult with DFG on species-specific survey timing.**

Plant species are listed in the Data Gap Analysis Biological Assessment (Feb 2011), and survey data are included herewith.

19. **Applicant to provide mapping of potentially state jurisdictional waters following Section 1600 Fish and Game Codes on Elk Hills direct impact area.**

OEHI holds a 12 year site-wide streambed alteration maintenance permit as required by 14 CCR Sections 1601 and 1603 of the Fish and Game Code. The current permit for OEHI expires in the year 2020. If it is determined that the activity may substantially adversely affect fish and wildlife resources within state jurisdictional waters, a Lake or Streambed Alteration Agreement will be prepared.

20. **Applicant to add Elk Hills direct impact area to Section 404 Waters of the U.S. study area map and re-submit to Corps for verification.**

EHOF contains no U.S. Army Corps of Engineers jurisdictional waters.

21. Applicant to assess whether Elk Hills direct impact area overlaps with any existing or proposed conservation lands owned by CDFG per the draft Occidental of Elk Hills Habitat Conservation Plan (HCP).

The Elk Hills direct impact area does not overlap with any existing or proposed conservation lands owned by CDFG.

22. Determine the nature of impacts to ethnographic resources through with local Native American groups. Staff has found that letters and emails to be ineffective in determining ethnographic impacts. Therefore, face to face consultation and site tours are strongly recommended.

Face to face consultation with Native American groups has not been conducted for the CO2 EOR Project. Impacts to ethnographic resources have been addressed in the SEI and C02 EOR Supply Line Data Gap Analysis.

23. Provide copies of formal government-to-government Section 106 consultation letters written by the DOE to local Native American groups.

A copy of the consultation letter has been provided to HECA.

24. Revisit site CA-Ker-5392, identify and map its full extent, and submit either a detailed site specific avoidance plan or data recovery plan to address impacts of the proposed CO2 line.

Site CA-Ker-5392 is approximately a mile away from the OEHI proposed CO2 line route. No further survey, mapping, avoidance plan, or data recovery plan is needed since it will not be impacted by this project.

25. Revisit historic archaeological sites P-15-9738 and HECA 2010-2, update the site maps and site forms to include all of the structures and features shown on aerial photographs or described in previous site forms. Conduct archival research equivalent to that conducted for the build-environment resources by JRP.

OEHI is not familiar with these historic archaeological sites. Please provide further details.

26. Complete the pedestrian survey for all of the HECA linear alignments.

A pedestrian survey was conducted for the OEHI preferred CO2 supply line alignment (see Data Gap Analysis). Remaining HECA linear alignments are the responsibility of HECA.

27. Conduct test excavations and evaluations of CRHR eligibility for all archaeological sites which staff has identified as having the potential to be directly impacted by HECA.

OEHI will evaluate the sites within the CO2 supply pipeline ROW alignment. Remaining sites with the HECA linear alignments are the responsibility of HECA.

28. Conduct geoarchaeological field sampling as requested in Data Requests 78-79, 143 and 172-173 (CEC 2009o, CEC 2010b, 2010w). Staff requests that the sampling be conducted prior to the completion of the FSA, otherwise staff may not be able to complete their analysis.

This DR is the responsibility of HECA.

29. Provide a discussion of the existing site conditions, the expected direct, indirect and cumulative impacts due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental impacts of the project, the effectiveness of the proposed measures, and any monitoring plan proposed to verify the effectiveness of the mitigation.

See section 4.5 (Cultural Resources) of the SEI and Data Gap Analysis.

30. A summary of the ethnology, prehistory, and history of the region with emphasis on the area within no more than a 5-mile radius of the project location.

See section 4.5 (Cultural Resources) of the SEI and Data Gap Analysis.

31. The results of a literature search to identify cultural resources within an area not less than a 1-mile radius around the project site and not less that than one-quarter (0.25) mile on each side of the linear facilities.

See section 4.5 (Cultural Resources) of the SEI and Data Gap Analysis.

32. Conduct all required pedestrian surveys of the CO2 linear route and any proposed facilities, staging areas or injection points and provide the results in a technical report.

See section 4.5 (Cultural Resources) of the SEI and Data Gap Analysis.

33. Copies of all technical reports whose survey coverage is wholly or partly within .25 mile of the area surveyed for the project.

See section 4.5 (Cultural Resources) of the SEI and Data Gap Analysis.

34. Copies of California Department of Parks and Recreation (DPR) 523 forms for all cultural resources identified in the literature search as being 45 years or older or of exceptional importance.

OEHI is not familiar with these forms. Please provide further details.

35. A copy of the USGS 7.5' quadrangle map of the literature search area delineating the areas of all past surveys.

See section 4.5 (Cultural Resources) of the SEI and Data Gap Analysis.

36. A map at a scale of 1:24,000 U.S. Geological Survey quadrangle depicting the locations of all previously known and newly identified cultural resources compiled through the research required by Appendix B.

See section 4.5 (Cultural Resources) of the SEI and Data Gap Analysis.

Sincerely,

William H. Barrett
EOR Business Manager
Occidental of Elk Hills, Inc.

Appendix B

NEPA

1.1 INTRODUCTION

The U.S. Department of Energy (DOE) is proposing to provide financial assistance to Hydrogen Energy California LLC (HECA) for project definition; design and construction; and demonstration of the HECA Project (Project). This provision of financial assistance is herein referred to as the Proposed Action. DOE has selected the Project through a competitive process under the Clean Coal Power Initiative Round 3 (CCPI) program. The National Environmental Policy Act (NEPA) process is initiated when a need to take a federal action has been identified. Because the Project is receiving funding from a federal agency, it is subject to the NEPA. The NEPA process consists of an evaluation of relevant environmental effects of a federal project or action undertaking, including reasonable alternatives.

This Application for Certification (AFC) Amendment is intended to provide information to the California Energy Commission (CEC) and DOE for their use in preparing a joint California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA) document.

Appendix B provides the NEPA-required information that may not typically be addressed under CEQA for a CEC project, including the following:

- Purpose and Need
- Irreversible or Irretrievable Commitments of Resources
- The Relationship between Short-term Uses of the Environment and Long-term Productivity

The Environmental Justice evaluation required for NEPA compliance is provided in the AFC Amendment Section 5.8, Socioeconomics. The Alternatives Analysis for NEPA compliance is provided in AFC Amendment Section 6.0, Alternatives.

1.2 PURPOSE AND NEED

This section introduces the Proposed Action and describes the purpose and need for agency actions. This section also summarizes the NEPA process, the scope of the Environmental Impact Statement (EIS), and the public scoping process for the EIS. The complete description of the HECA Project is provided in the AFC Amendment Section 2.0, Project Description.

The purpose and need for DOE action—providing limited financial assistance to HECA's project—are to advance the CCPI program by funding projects that have the best chance of achieving the program's objectives as established by Congress: The commercialization of clean coal technologies that advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies that are currently in commercial service. DOE's purpose and need, as well as the range of reasonable alternatives, may differ from those of the CEC.

As detailed in the Project Description, the HECA Project would gasify a 75 percent coal and 25 percent petroleum coke (petcoke) fuel blend to produce synthesis gas (syngas). Syngas produced via gasification would be purified to hydrogen-rich gas and used to generate low-carbon electricity in a Combined Cycle Power Block, and to produce low-carbon nitrogen-based

products in an integrated Manufacturing Complex. The products and power produced by the Project are expected to have a lower carbon footprint than similar products produced from conventional fossil-fuel based technology. The low-carbon footprint is accomplished by capturing more than 90 percent of the carbon dioxide (CO_2) in the syngas and transporting it for use in enhanced oil recovery (EOR), which results in permanent sequestration (storage) of the CO_2. The high purity CO_2 would be compressed and transported approximately 3 miles by pipeline to the adjacent Elk Hills Oil Field (EHOF), owned and operated by Occidental of Elk Hills, Inc. (OEHI), for injection into deep underground hydrocarbon reservoirs for CO_2 EOR.

This joint document will inform DOE's decision on whether to provide financial assistance to partially fund the approximately $4.0 billion (estimated total cost) Project under DOE's CCPI program. DOE's financial assistance (or "cost share") would be limited to $408 million, which is approximately 10 percent of the HECA Project's total cost.

Under NEPA, a federal, state, tribal, or local agency having special expertise with respect to an environmental issue or jurisdiction by law may be a cooperating agency in the NEPA process. For this Project, CEC is a cooperating agency because of its responsibility in fulfilling the requirements of the CEQA. The CEC and DOE will prepare a joint document that complies with CEQA as well as the NEPA as amended (42 United States Code [USC] 4321 *et seq*.), the Council on Environmental Quality's (CEQ) NEPA regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), and the DOE's NEPA regulations (10 CFR Part 1021) to assess the potential environmental impacts of providing financial assistance for the construction and operation of the Project. The joint documents will be referred to as a Preliminary Staff Assessment/Draft EIS and Final Staff Assessment/Final EIS.

Clean Coal Power Initiative Program

Public Law (PL) 107-63, enacted in November 2001, initiated and funded the initial phases of the CCPI, as a government and private-sector partnership to increase investment in clean coal technology. Through cooperative agreements with private sector partners, the program advances clean coal technologies to commercialization; these technologies often involve combustion improvements, control systems advances, gasifier design, pollution reduction (including greenhouse gas [GHG] reduction), sequestration or beneficial use of CO_2, efficiency increases, fuel processing, and others.

Congress established criteria for projects receiving financial assistance under this program in Title IV of the Energy Policy Act of 2005 (EPAct, 2005: PL 109-58). Under this statute, CCPI projects must "advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies that are in commercial service." (PL 109-58, Section [§] 402(a). In February 2009, the American Recovery and Reinvestment Act of 2009 (PL 111-5, 123 Statute 115 [February 17, 2009]) appropriated $3.4 billion to DOE for "Fossil Energy Research and Development." DOE intends to use a significant portion of these funds to provide financial assistance to CCPI projects.

The CCPI program selects projects for its government-private sector partnerships through an open and competitive process. Potential private sector partners may include developers of technologies, utilities and other energy producers, service corporations, research and

development firms, software developers, academia, and others. DOE issues funding opportunity announcements that specify the types of projects it is seeking and invites submission of applications. Applications are reviewed according to the criteria specified in each funding opportunity announcement; these criteria include technical, financial, environmental, and other programmatic considerations. DOE selects the projects that demonstrate the most promise when evaluated against these criteria and enters into a cooperative agreement with the applicant. These agreements set out the project's objectives, the obligations of the parties, and other features of the partnership. Applicants must agree to provide at least 50 percent of their project cost. For most CCPI projects, the applicant's cost share is much greater than 50 percent.

To date, the CCPI has conducted three rounds of solicitations and project selections. Round 1 sought projects that would demonstrate advanced technologies for power generation and improvements in plant efficiency, economics, and environmental performance. Round 2 requested applications for projects that would demonstrate improved mercury controls and gasification technology. Round 3 (which DOE conducted in two phases) sought projects that would demonstrate advanced coal-based electricity-generating technologies that capture and sequester (or put to beneficial use) CO_2 emissions. DOE's overarching goal for Round 3 projects was to demonstrate commercial-scale technologies that would (1) operate at more than 90 percent capture efficiency for CO_2; (2) make progress towards capture and sequestration at less than a 10 percent increase in the cost of electricity for gasification systems and a less than 35 percent increase for combustion and oxy-combustion systems; and (3) make progress toward capture and sequestration of 50 percent of the facility-generated CO_2 at a scale sufficient to evaluate the full impacts of carbon capture technology on operations, economics, and performance of a generating facility. This Project was one of two selected in the first phase of Round 3. DOE entered into a Cooperative Agreement with HECA on September 30, 2009. On September 2, 2011, SCS Energy California LLC (SCS Energy) acquired 100 percent ownership of Hydrogen Energy California LLC, from BP Alternative Energy North America Inc., and Rio Tinto Hydrogen Energy LLC. SCS Energy is a private power plant development company headquartered in Concord, Massachusetts.

1.2.1 Proposed Action

1.2.1.1 DOE Proposed Action

The DOE Proposed Action is to provide limited financial assistance for the development, construction and demonstration of the HECA Project. Provision of financial assistance is considered a major federal action; therefore, the DOE will coordinate with the CEC to prepare the joint CEQA/NEPA document to evaluate the potential impacts of DOE's Proposed Action, the proposed Project, and reasonable alternatives to DOE's Proposed Action. The DOE and CEC will consider information prepared by HECA and OEHI, as well as additional sources available from government agencies and other entities.

The objective of the Project is to produce hydrogen for low-carbon power generation and low-carbon nitrogen-based products. The Project would demonstrate carbon capture and sequestration on a commercial scale.

Under the cooperative agreement between DOE and HECA LLC, DOE would share the costs of the gasifier, syngas cleanup systems, a combustion turbine, a heat recovery steam generator, a

steam turbine, supporting facilities and infrastructure, and a demonstration phase in which the HECA Project would use at least 75 percent coal (calculated on a fuel thermal input basis) to generate low-carbon electricity and low-carbon nitrogen-based products and would capture CO_2 for EOR and sequestration.[1] The Proposed Action applies to the following components of the HECA Project:

- HECA Project Site (including the integrated gasification combined-cycle electrical generation facilities, low-carbon nitrogen-based products Manufacturing Complex, and associated equipment and processes, except for the air separation unit which is a Connected Action)
- Potable water linear
- Transmission linear
- Process water linear
- Natural gas linear
- Railroad spur

1.2.1.2 DOE Connected Action

DOE would not share in the cost of the air separation unit, OEHI CO_2 pipeline, OEHI CO_2 EOR and sequestration facilities, or certain other facilities. These components that will not be part of the cost-sharing effort are referred to as Connected Actions. However, the potential impacts of Connected Actions would be evaluated in addition to those of the Proposed Action.

1.2.1.3 CEC Process

As discussed in AFC Amendment Section 2.0, Project Description, the CEC is responsible for reviewing and approving the Project under the Warren-Alquist Act, Cal. Pub. Res. Code § 25500 *et seq*., and has the role of lead agency under the CEQA for the environmental review of the whole of the Project, including the OEHI CO_2 EOR, and facilities related thereto. The CEC conducts this review in accordance with the administrative adjudication provisions of the Administrative Procedure Act, Cal. Gov't Code § 11400 *et seq*. and with its own regulations governing site certification proceedings, 20 Cal. Code Regs. § 1701, *et seq*. These provisions require the CEC staff to conduct an independent analysis of applications for certification, and to prepare an independent assessment of a project's potential environmental impacts, feasible mitigation measures, and alternatives as part of this process. In preparing this analysis, the staff consults with interested local, regional, state, and federal agencies, and Native American tribes.

In addition to the CEC power plant licensing process and DOE federal funding, Project permitting will also involve the Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR).

[1] The HECA Project would continue sequestering carbon dioxide (CO_2) throughout the operational life of the facility.

1.2.2 Purpose and Need Statement

The Purpose and Need for DOE's Proposed Action are to advance the CCPI program by funding projects that have the best chance of achieving the program's objective as established by Congress—the commercialization of clean coal technologies that advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies that are currently in commercial service. The proposed HECA Project was selected under the CCPI program as one in a portfolio of projects that would represent the most appropriate mix to achieve programmatic objectives and meet legislative requirements.

1.2.3 National Environmental Policy Act of 1969

DOE does not have regulatory jurisdiction over the Project. Its decisions are limited to whether and under what circumstances it would provide limited financial assistance to the Project. There are a number of federal and state agencies that do have regulatory authority over the Project, as described below.

In compliance with the NEPA, the EIS will inform DOE's decision on whether to provide financial assistance under its CCPI program. The document will evaluate the potential impacts of the DOE Proposed Action (provision of financial assistance), the Project proposed by HECA and any Connected Actions, and reasonable alternatives to the DOE Proposed Action. The extent of actions taken by DOE with regard to any proposal, including project selection or award, is limited prior to completion of the NEPA process.

DOE is coordinating this joint NEPA/CEQA review of the Proposed Action with the environmental review of the Project conducted by the CEC as lead state agency under the CEQA. DOE is working closely with the CEC throughout its regulatory processes in order to integrate the NEPA and CEQA processes in an efficient and expeditious manner. This AFC Amendment is intended to provide information to CEC and DOE for their use in preparing a joint CEQA/NEPA document.

DOE understands that, pursuant to California law and a grant of primacy from the U.S. Environmental Protection Agency (USEPA) regarding Class II wells under Section 1425 of the Safe Drinking Water Act, the DOGGR would have responsibility for permitting EOR injection and extraction wells, and would impose permit conditions on these aspects of the Project.[2]

1.2.4 Scope of the Environmental Impact Statement

This section of the EIS contains descriptions of the NEPA scoping process and coordination with federal and state agencies.

[2] The DOE anticipates that, pursuant to California Public Resources Code (PRC) Section (§) 21000 *et seq.*, California agencies will impose mitigation measures to address potential impacts and project design elements to verify the sequestration of CO_2 injected for EOR.

1.2.4.1 Federal NEPA Scoping Process

Notice of Intent

A Notice of Intent (NOI) to prepare an EIS and hold a public scoping meeting was published by DOE in the *Federal Register* (FR) on April 6, 2010 (75 FR, No. 65, Page 17397). Publication of the NOI initiated the 30-day public scoping period. The NOI invited comments and suggestions on the proposed scope of the EIS, including environmental issues and alternatives, and invited participation in the NEPA process. Display advertisements were placed in the *Bakersfield Californian* newspaper on March 31, 2010 and April 3, 2010. The advertisements briefly described the Project and the need for the open house/public meeting. They provided the meeting time and place, and also stated that the scoping period end date was May 24, 2010. Publication of the NOI initiated the EIS process with a public scoping period for soliciting public input to ensure that (1) significant issues are identified early and appropriately addressed, (2) issues of little significance do not consume time and effort, and (3) delays occasioned by an inadequate EIS are avoided (40 CFR Part 1501.7).

In accordance with Section 216 of the DOE NEPA regulations, DOE prepared an "environmental critique" that assessed the environmental impacts and issues relating to each of the proposals that the DOE selecting official considered for selection in this round of the CCPI program.

DOE will publish an amended NOI after the filing of the AFC Amendment to reflect Project changes subsequent to the April 2010 publication.

List of Issues to be Analyzed

The following environmental issues were tentatively identified for analysis in the EIS. This list (which was developed from the DOE environmental critique of the Project, from permit applications that HECA filed and comments by regulatory agencies on those applications, and from information from similar projects) is neither an inclusive nor a predetermined set of potential impacts. This preliminary list is presented to facilitate public comment on the planned scope of the EIS. The preliminary list of potential environmental issues includes:

1. **Atmospheric Resources**: Potential air quality impacts resulting from emissions during construction and operation of the Project and Connected Actions (e.g., effects of ground-level concentrations of criteria pollutants and trace metals—including mercury—on surrounding areas, including those of special concern, such as Prevention of Significant Deterioration Class I areas). Potential cumulative effects of GHG emissions.
2. **Water Resources**: Potential effects of groundwater withdrawals and water use by the Project, including potential impacts resulting from construction and operation of the Project, such as linear facilities and any Connected Actions.
3. **Infrastructure and Land Use**: Potential effects on existing infrastructure and land uses resulting from the construction and operation of the Project. For example, potential traffic effects resulting from the Project and potential land use impacts of committing farm land to the Project.
4. **Solid Waste**: Pollution prevention and waste management issues, including potential impacts from the generation, treatment, transport, storage, and management of wastes.

5. **Visual**: Potential aesthetic impacts of new stacks, mechanical-draft cooling towers, flares, and other structures of the Project; linear facilities; and Connected Actions.
6. **Floodplain**: Potential impacts (e.g., impeding floodwaters, redirecting floodwaters, possible property damage) of siting structures on a floodplain.
7. **Wetlands**: Potential effects on wetlands due to construction and operation of the Project (including the Manufacturing Complex), linear facilities, and Connected Actions.
8. **Ecological**: Potential on-site and off-site impacts to vegetation, terrestrial and aquatic wildlife, threatened and endangered species, and ecologically sensitive habitats due to the construction and operation of the Project (including the Manufacturing Complex), linear facilities, and Connected Actions.
9. **Safety and Health**: Construction and operation-related safety, process safety, and management of process chemicals and materials.
10. **Construction**: Potential impacts associated with noise, traffic patterns, and construction-related emissions.
11. **Community Impacts**: Potential congestion and other impacts on local traffic patterns, socioeconomic impacts on public services and infrastructure (e.g., police protection, schools, and utilities), noise associated with Project operation, and environmental justice issues with respect to nearby communities.
12. **Cultural and Archaeological Resources**: Potential impacts on such resources from construction of the Project.
13. **Cumulative Effects**: Incremental impacts of the Project (e.g., incremental air emissions affecting ambient air quality) that, when added to other past, present, and reasonably foreseeable future actions, including Connected Actions, may have potentially significant impacts on the environment. This analysis would include potential impacts on climate.

The level of analysis of issues in the EIS is in accordance with their level of importance. The most detailed analyses focus on potential impacts on air, water, and ecological resources.

As discussed above, the list of issues presented in the NOI was not intended to be all-inclusive nor was it intended to imply a predetermined set of potential environmental issues. During scoping, focus was drawn to certain specific issues of concern (see the subsection entitled Comments Received During the Scoping Process, below).

NEPA Public Scoping Meeting

A NEPA public scoping meeting was held at the Bakersfield Marriott at the Convention Center on Wednesday, April 14, 2010, from 5:00 PM to 9:00 PM. The format of the meeting was set up as a combination informal poster session and presentation. There were informational boards and maps explaining the NEPA and CEC processes and showing the Project Site and linear facilities. There were 14 attendees who signed in; 8 of them provided oral comments during the public comment session.

DOE received five sets of written comments during the scoping meeting and four sets of written comments and questions after the meeting. The responses assisted in establishing additional

issues to be analyzed in the EIS. Issues raised during public scoping are identified in the subsection entitled Comments Received During the Scoping Process.

DOE plans to hold a second scoping meeting for the Project in Spring/Summer 2012 after publication of the Amended NOI in the Federal Register.

Comments Received During the Scoping Process

During the scoping process, comments that were received from the public included those requesting that the EIS include a discussion of the positive benefits of the Project and those requesting further analysis of potential impacts and consideration of additional mitigation measures.

The potential effects and issues that the public commented on included the following:

1. Socioeconomic effects and environmental justice issues, both positive and negative, including an increased tax base, jobs, and domestic energy security.
2. Air quality and mitigation measures.
3. GHG emissions and climate change.
4. Benefits of CO_2 sequestration and concerns about its effectiveness, safety, monitoring, enforcement, and potential impacts.
5. Water use and impacts on local water quality.
6. Impacts on farmland and suggested mitigation measures.
7. Biological impacts and suggested mitigation measures.
8. Cumulative impacts.

DOE considered input obtained during the scoping process for addition to the list of issues to be analyzed and to provide additional focus to the analysis of previously identified issues (presented above under List of Issues to be analyzed). There were no resources identified that were not included in the NOI. Issues are analyzed and discussed in this document in accordance with their level of importance, and based on the expressed concerns of the public.

1.2.4.2 Coordination with Federal and State Agencies

In compliance with CEQ and DOE regulations for implementing the NEPA, DOE contacted appropriate federal and state (California) resource agencies with special expertise or jurisdiction in the Project area to participate in the NEPA Process. Contacts were made with USEPA, the U.S. Fish and Wildlife Service, the CEC, the State Historic Preservation Officer, and DOGGR**.** On June 3, 2010, the CEC accepted the DOE's invitation to become a cooperating agency for the EIS. Subsequently, the CEC and DOE agreed to produce a joint CEQA/NEPA document for the Project. This AFC Amendment is intended to provide information to the CEC and DOE for their use in preparing the joint document.

1.2.4.3 Coordination with Native American Tribes

DOE will consult with Native American Tribes with historic interests in Kern County on DOE's proposed action and the proposed Project, and will continue consultation through the NEPA process.

1.3 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

For the purposes of this document, a commitment of resources is irreversible when the primary (direct) or secondary (indirect) impacts from the use limit the future options for that resource. Irreversible commitments of resources refer to the use or consumption of a resource that cannot be reversed except over a very long time period (e.g., minerals). An irretrievable commitment of resources refers to the use or consumption of resources that is neither renewable nor recoverable for use by future generations and that cannot be restored. This commitment can refer to the use of non-renewable resources such as cultural resources, and the expenditure of labor or funds that, when used, would not be available for future use.

The No Action Alternative would not directly require the commitment of human or fiscal resources. However, this alternative fails to achieve all of the Project objectives related to production of energy, advancement of technology, and enhancement of energy security. In the long run, this alternative would not provide environmental benefits with regard to greenhouse gases, and would not help California meet its obligations under AB 32, SB 1368, and AB 1925.

The Action Alternatives would each involve irreversible or irretrievable commitment of resources, including the materials, energy, labor, and funds required during construction and operation. Implementation of mitigation measures, as identified in Section 5.0, Environmental Information, of the AFC Amendment, will minimize these commitments.

Non-renewable and irretrievable fossil fuels and construction materials (e.g., petroleum) would be required for both construction and operation. Use of raw building materials would be an irretrievable commitment of resources from which these materials were produced. Consumption or use of widely available materials such as gasoline and cement would not be anticipated to result in shortages.

Resources that would be irreversibly used during the construction of the Project include land and raw materials. Areas needed for construction of the Project and the associated linear facilities would be modified (e.g., cleared, graded, filled) to meet Project design requirements. The land resources needed would be physically altered, and the alteration of these land resources would constitute a permanent commitment of land for the life of the Project to a developed use and would decrease the amount of open/agricultural land available for other uses. Access to lands in the Project Site would also be limited to authorized personnel, thus limiting the use of those lands for other uses.

Construction would also result in an irreversible loss of biological resources, including loss of individual plants and animals. Individuals could be destroyed or displaced during construction and operation activities. Cultural and paleontological resources are non-renewable, and any disturbance of these resources from the action alternatives would constitute and irreversible and irretrievable commitment.

Construction and operation of the Project would result in an irretrievable commitment of resources such as non-renewable fuels to generate power and operate equipment and vehicles. Resources consumed during operation would include diesel oil, fuel oil, and gasoline.

An irretrievable expenditure of labor would occur during both construction and operation for all action alternatives. Funding would also be committed as part of any of the action alternatives, would not be available for other uses, and would therefore be irretrievable. Labor would also irreversibly and irretrievably be committed during preparation and creation of the construction materials.

Although the implementation of the action alternatives would result in the commitment of resources as described above, the alternatives would allow for the addition of a nominal 300 megawatts of baseload low-carbon power to the grid, provide environmental benefits with regard to greenhouse gases (among others), and help California meet its obligations under AB 32, SB 1368, and AB 1925.

1.4 THE RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

This section addresses the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

The No Action Alternative would not result in short-term uses of the environment. However, this alternative fails to achieve all of the Project objectives related to production of energy, advancement of technology, and enhancement of energy security. In the long run, this alternative would not provide environmental benefits with regard to greenhouse gases, nor help California meet its obligations under AB 32, SB 1368, and AB 1925.

Regardless of the Action Alternative, short-term uses of the environment would occur as a result of construction activities, as described in Section 5.0, Environmental Information, of the AFC Amendment. These uses include impacts on air, noise, soils, water, and transportation resources. These short-term impacts would be minimized through the use of Best Management Practices and through the implementation of mitigation measures described in Section 5.0, Environmental Information, of the AFC Amendment. In addition, these short-term uses would allow for long-term productivity of several resources, as discussed below.

Some greenhouse gases would be emitted during construction and operation of the Project. However, as discussed in Section 5.1, Air Quality, of the AFC Amendment, implementation of the Project would result in long-term greenhouse gas benefits by dramatically reducing average annual greenhouse gas emissions relative to those emitted from a conventional power plant nitrogen-based-product manufacturing facility by capturing and sequestering CO_2 emissions.

Short-term use of the construction labor force would result in substantial long-term productivity in the economic environment, given the short- and long-term benefits to local and regional employment and tax revenue, which are discussed in Section 5.8, Socioeconomics, of the AFC Amendment.

Short-term commitment of non-renewable and irretrievable fossil fuels and energy would be required for both construction and operation, as discussed above. However, implementation of the Project would conserve domestic energy supplies and enhance energy security by using coal and a byproduct from the oil-refining process (petcoke) to generate electricity and by enhancing production of domestic petroleum reserves that are otherwise unrecoverable.

In the long term, implementation would support the Project's objective to produce hydrogen for low-carbon baseload power generation and nitrogen-based products, and demonstrate carbon capture and sequestration on a commercial scale. The Project would support the DOE's Clean Coal Power Initiative, to further the commercialization of clean coal technologies that advance efficiency, environmental performance, and cost competitiveness well beyond the level of technologies that are currently in commercial service. The proposed Project would contribute an approximately 300-megawatt output of low-carbon baseload electricity to the grid during operations, and thus feed major load sources while providing environmental benefits regarding greenhouse gases (among others) and helping California to meet its obligations under California AB-32 and AB-1925, California SB-1368, and California Executive Orders S-7-04 and S-3-05. If other older coal-fueled power plants were replaced with newer plants similar to the Project's, the total domestic and international emissions of pollutants could be reduced, and there will be an increase in the efficient use of non-renewable resources.

If implemented, the Project would contribute to long-term positive impacts through the reduction of CO_2 emissions per megawatt generation. In addition, the integrated production of nitrogen-based products would enhance the production and availability of nitrogen-based products by producing approximately 1 million tons per year of low-carbon nitrogen-based products (including Urea, Urea Ammonium Nitrate, and anhydrous ammonia) for regional markets, which will result in long-term productivity increases.

ENVIRONMENTAL SYNOPSIS
CCPI Round 3
DE-PS26-08NT43181
DE-FOA-0000042

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National Energy Technology Laboratory
U.S. Department of Energy

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CONTENTS

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INTRODUCTION

The U.S. Department of Energy (DOE or the Department) prepared this Environmental Synopsis pursuant to the Department's responsibilities under section 1021.216 of DOE's National Environmental Policy Act (NEPA) Implementing Procedures set forth in 10 CFR Part 1021. This synopsis summarizes the consideration given to environmental factors and records that the relevant environmental consequences of reasonable alternatives were evaluated in the process of selecting projects seeking financial assistance under Round 3 of the Clean Coal Power Initiative (CCPI). DOE selected five applicants seeking financial assistance under CCPI Round 3 during its merit review process. In addition to financial and technical elements, DOE considered relevant environmental factors and consequences of the projects proposed to DOE in response to the funding opportunity announcements. As required by section 1021.216, this synopsis does not contain business, confidential, trade secret or other information that statutes or regulations would prohibit DOE from disclosing. It also does not contain data or other information that may in any way reveal the identity of the offerors.[1]

BACKGROUND

Coal is an abundant and indigenous energy resource and supplies almost 50 percent of the United States' electric power. Demand for electricity is projected to increase by more than 30 percent by 2030. Based on analyses conducted by the EIA, it is projected that this power increase can only be achieved if coal use is also increased. Furthermore, nearly half of the nation's electric power generating infrastructure is more than 30 years old, with a significant portion in service for twice as long. These aging facilities are - or soon will be - in need of substantial refurbishment or replacement. Additional capacity must also be put in service to keep pace with the nation's ever-growing demand for electricity. Therefore, DOE expects that nearly half of the nation's electricity needs will continue to be served by coal for at least the next several decades. Given heightened awareness of environmental stewardship, while at the same time meeting the demand for a reliable and cost-effective electric power supply, it is clearly in the public interest for the nation's energy infrastructure to be upgraded with the latest and most advanced commercially viable technologies to achieve greater efficiencies, environmental performance, and cost-competitiveness. However, to realize acceptance and replication of these advanced technologies into the electric power generation sector, the technologies must first be demonstrated (i.e., designed and constructed to industrial standards and operated at significant scale under industrial conditions).

Public Law 107-63, enacted in November 2001, first provided funding for the Clean Coal Power Initiative, or CCPI. The CCPI is a multi-year federal program tasked with accelerating the commercial readiness of advanced multi-pollutant emissions control, combustion, gasification, and efficiency improvement technologies to retrofit or repower existing coal-based power plants and for deployment in new coal-based generating facilities. The CCPI encompasses a broad spectrum of commercial-scale demonstrations that target environmental challenges, including reducing greenhouse gas (GHG) emissions, by boosting the efficiency at which coal is converted to electricity or other energy forms. The CCPI is closely linked with DOE's research and development activities directed toward creating ultra-clean, fossil fuel-based energy complexes in the 21st century. When integrated with other DOE initiatives, the CCPI will help the nation successfully commercialize advanced power systems that will produce electricity at greater efficiencies, produce almost no emissions, and create clean fuels. Improving power plant efficiency is a potentially significant way to reduce carbon dioxide (CO_2) emissions in the near- and midterm. In the longer term, the most recent future funding opportunity announcements targeted CCPI technologies employing CO_2 capture and storage, or beneficial reuse. Accelerating

[1] The five projects selected for awards are identified in this synopsis and information on these projects is available on the DOE National Energy Technology Laboratory web site at http://www.netl.doe.gov/technologies/coalpower/cctc/ccpi/index.html.

commercialization of clean coal technologies also positions the United States to supply these technologies to a rapidly expanding world market.

Congress provided for competitively awarded federal cost-shared funding for CCPI demonstration projects. In contrast to other federally funded activities, CCPI projects are not federal projects seeking private investment; instead, they are private projects seeking federal financial assistance. Under the CCPI funding opportunities, industry proposes projects that meet its needs and those of its customers while furthering the national goals and objectives of DOE's CCPI. Demonstration projects selected by the CCPI program become private-public partnerships that satisfy a wide set of industry and government needs. Through the CCPI program, industry may satisfy its short-term need to retrofit or repower a facility, develop new power generating capacity, or obtain critical economic or technical evaluation of emerging commercial-scale technologies, all for the benefit of its customers. By providing financial incentives to the energy sector that reduce risks associated with project financing and technical challenges for emerging clean coal technologies, the government: (a) supports the verification of commercial readiness leading toward the long-term objective of transitioning the nation's existing fleet of electric power plants to more efficient, environmentally sound, and cost-competitive facilities; and (b) facilitates the adoption of technologies that can meet more stringent environmental regulation through more efficient power generation, advanced environmental controls, and production of environmentally attractive energy carriers and byproduct utilization.

DOE selects projects for CCPI funding in a series of rounds, each of which starts with a Funding Opportunity Announcement (FOA) that asks project proponents to submit applications for federal cost-sharing for their demonstration projects. DOE issued the first CCPI FOA (Round 1) in March 2002 and a second FOA (Round 2) in February 2004. These funding opportunities focused on projects involving advanced coal-based power generation, including gasification, efficiency improvements, optimization through neural networking, environmental and economic improvements, and mercury control. For Round 3, DOE issued a Financial Assistance FOA on August 11, 2008 (DE-PS26-08NT43181) to solicit applications and subsequently issued Amendment 005 (as DE-FOA-0000042) on June 9, 2009, to reopen the FOA and provide a second closing date (August 24, 2009) for additional applications. Projects receiving awards under the amended FOA could be funded, in whole or in part, with funds appropriated by the American Recovery and Reinvestment Act of 2009, Public Law 111-5.

Applications for demonstrations under CCPI Round 3 were evaluated against specific programmatic criteria:

- Technology merit, technical plan, and site suitability;
- Project organization and project management plan;
- Commercialization potential;
- Funding plan;
- Financial business plan.

Evaluations against these criteria represented the total evaluation scoring. However, the selection official also considered the results of the environmental evaluation and the applicant's budget information and financial management system, as well as program policy factors, in making final selections.

As a Federal agency, DOE must comply with NEPA (42 U.S.C. §§ 4321 et seq.) by considering potential environmental issues associated with its actions prior to deciding whether to undertake these actions. The environmental review of applications received in response to the CCPI Round 3 FOA was conducted pursuant to Council on Environmental Quality Regulations (40 Code of Federal Regulations (CFR) Parts 1500 - 1508) and DOE's NEPA Implementing Procedures (10 CFR Part 1021), which provide directions specific to procurement actions that DOE may undertake or fund before completing the NEPA process.

PURPOSE AND NEED

The purpose and need for DOE's selections of projects under the CCPI Program are to satisfy the responsibility Congress imposed on the Department to demonstrate advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States.

The specific objectives of the Round 3 FOAs were:

- The CO_2 capture process must operate at a CO_2 capture efficiency of at least 90 percent;
- Progress is made toward carbon capture and sequestration (CCS) at less than a 10 percent increase in the cost of electricity for gasification systems and less than 35 percent increase for combustion and oxy-combustion systems;
- Progress is made toward CCS of 50 percent of plant CO_2 output at a scale sufficient to evaluate the full impact of the carbon capture technology on plant operations, economics, and performance; and
- At least 300,000 tons per year of CO_2 emissions from the demonstration plant must be captured and sequestered or put to beneficial use.

ALTERNATIVES

DOE received eleven (11) applications in response to the initial FOA (issued August 11, 2008) for CCPI-3, all of which were determined to have met the mandatory eligibility requirements listed in the FOA. The applications covered a wide geographic range, including sites in fourteen different states representing nearly every region of the country. In response to the reopened FOA (issued June 9, 2009), DOE received thirty eight (38) applications, of which twenty five (25) were determined to have met the mandatory eligibility requirements listed in the FOA. The requirements for the reopened FOA were the same as for the initial. The twenty five applications offered projects involving sites in nineteen different states representing nearly all geographic regions of the country. Several applicants in the initial FOA also resubmitted modified applications in response to the reopened FOA. The applications were evaluated against technical, financial and environmental factors. The criteria for evaluating applications received under CCPI-3 were published in the FOA. The technical and financial evaluations resulted in separate numerical scores; the environmental evaluation, while not scored, was considered in making selections. Each applicant was required to complete and submit a standard environmental questionnaire for each site proposed in its application.

The evaluations focused on the technical description of the proposed project, financial plans and budgets, potential environmental impacts, and other information that the applicants submitted. Following reviews by technical, environmental and financial panels and a comprehensive assessment by a merit review board, a DOE official selected those projects that best met the CCPI program's purpose and need. By broadly soliciting proposals to meet the programmatic purpose and need for DOE action and by evaluating the potential environmental impacts associated with each proposal before selecting projects, DOE considered a reasonable range of alternatives for meeting the purpose and need of the CCPI Round 3 solicitation.

For the initial FOA, applications were divided into three broad categories:

- Retrofit of CCS to an existing integrated gasification combined cycle (IGCC) facility or to an IGCC facility under construction;
- Retrofit of CCS to an existing pulverized coal (PC)-fired facility; and
- Construction and operation of new IGCC or Fluidized Bed Combustion (FBC) facilities with integrated CCS.

DOE received no less than two applications in each of the above groupings, which provided DOE with a range of reasonable alternatives for meetings the Department's need to demonstrate, at a commercial scale, new technologies that capture CO_2 emissions from coal-based power plants and either sequester the CO_2 or put it to beneficial reuse. The applications included demonstration of CCS integrated into new facilities using advanced technologies for power generation, as well as retrofits of CCS to existing facilities or ones already under construction, including both advanced and conventional technologies for power generation.

For the reopened FOA, DOE divided the applications into four groups, because of the larger number of submissions received:

- Retrofit of CCS to an existing plant (already permitted and operating);
- Retrofit of CCS to a planned or authorized power plant (but not yet constructed or operating);
- Construction and operation of a new power plant with CCS on an existing industrial site; and
- Construction and operation of a new power plant with CCS on an undeveloped site.

DOE received no less than four applications in each of the above groupings.

ENVIRONMENTAL REVIEW

DOE assembled environmental review teams to assess all applications that met the mandatory requirements. The review teams considered twenty (20) resource areas that could potentially be impacted by the projects proposed under CCPI-3. These resource areas consisted of:

Aesthetics	Floodplains	Soils
Air Quality	Geology	Surface Water
Biological Resources	Ground Water	Transportation and Traffic
Climate	Human Health and Safety	Utilities
Community Services	Land Use	Wastes and Materials
Cultural Resources	Noise	Wetlands
Environmental Justice	Socioeconomics	

The review teams were composed of environmental professionals with experience evaluating the impacts of power plants and energy-related projects, and with expertise in the resource areas considered by DOE. The review teams considered the information provided as part of each application, which included narrative text, worksheets, and the environmental questionnaire(s) for the site(s) proposed by the applicant. In addition, reviewers independently verified the information provided to the extent practicable using available sources commonly consulted in the preparation of NEPA documents, and conducted preliminary analyses to identify the potential range of impacts associated with each application. Reviewers identified both direct and indirect, as well as short-term impacts, which might occur during construction and start-up, and long-term impacts, which might occur over the expected operational life of the proposed project and beyond. The reviewers also considered any mitigation measures proposed by the applicant and any reasonably available mitigation measures that may not have been proposed.

Reviewers assessed the potential for environmental issues and impacts using the following characterizations:

- **Beneficial** – Expected to have a net beneficial effect on the resource in comparison to baseline conditions.

- **None (negligible)** – Immeasurable or negligible in consequence (not expected to change baseline conditions).
- **Low** – Measurable or noticeable but of minimal consequence (barely discernable change in baseline conditions).
- **Moderate** – Adverse and considerable in consequence but moderate and not expected to reach a level of significance (discernable, but not drastic, alteration of baseline conditions).
- **High** – Adverse and potentially significant in severity (anticipated substantial changes or effects on baseline conditions that might not be mitigable).

Applications in Response to the Initial FOA

Based on the technologies and sites proposed, none of the applications for the initial FOA were deemed to have a high potential for adverse impacts in nineteen of the twenty resource areas. However, four applications could have a potential for high adverse impacts to biological resources. The following impacts by resource area were considered in the selection of candidates for award:

Aesthetics – No impacts would be expected for one project at an existing power plant. Low to moderate impacts would be expected for other existing facilities or facilities to be constructed. Impacts ranged from temporary impacts during construction to new construction within the line-of-sight of public property, including nearby roads and highways.

Air Quality – Low to moderate impacts would be expected from emissions of criteria pollutants from new sources and fugitive emissions of dust. Compliance with Prevention of Significant Deterioration increments would be required for three projects; and new source reviews would be required for four projects. Increased emissions of volatile organic compounds (VOCs) and ammonia would be expected for more than half of the projects. Some increase in cooling tower drift could be expected for two projects.

Biological Resources – Four applications could potentially impact threatened or endangered species or their critical habitat, waterfowl and other migratory bird flyways or their crucial habitat, or wildlife refuges either because of new plant construction or installation of pipelines for CO_2 transport. No impacts were expected for two projects at existing plants. Low to moderate potential impacts would be expected for five applications.

Climate – No impacts would be expected for four projects at existing power plants. Low to moderate impacts would be expected for other existing facilities or facilities to be constructed. Impacts ranged from potential operational impacts from severe weather to localized increases in fogging or icing. Successful demonstration of CCS could contribute to reduced carbon footprints of fossil-fuel power plants.

Community Services – No impacts would be expected at the sites of two existing plants. Low to moderate impacts would be expected for the remaining applications. Generally, projects anticipating a larger temporary workforce during construction would be expected to place a higher demand on community services – particularly in smaller, more rural communities where currently existing community services are more limited.

Cultural Resources – No impacts would be expected at three existing facilities. Low to moderate impacts would be expected for the remaining applications. Potential impacts include tribal concerns over pipeline routes. Impacts would vary with the extent of known tribal claims and their proximity to the proposed project or pipeline route.

Environmental Justice – No impacts would be expected for five applications with no environmental justice populations present. There is a moderate potential for environmental justice issues at all but one of the remaining sites either because of environmental justice populations near the proposed site or along a

proposed pipeline route. Potential impacts at the remaining site are expected to be low because of more limited environmental justice populations in the project area.

Floodplains – No impacts would be expected for two proposed projects. Low to moderate potential impacts during construction or pipeline routing would be expected for the remaining proposed projects.

Geology – The potential for low to moderate impacts exists for all applications either from CO_2 injection into saline aquifers or use for enhanced oil recovery. Some impacts could be expected from increased demand for coal if such demand contributes to opening new coal mines or expanding existing mines.

Ground Water – No impacts would be expected for one application involving an existing facility. Low to moderate impacts could be expected for the other applications. Impacts could include displacement of saline waters in reservoirs targeted for CO_2 injection or loss of CO_2 containment should injection pressures be too high.

Human Health and Safety – Potential impacts would be low to moderate and consist mainly of hazards associated with construction. The level of risk is generally related to the size and complexity of the planned construction. There could also be risk to human health and safety from loss of containment of CO_2 during transport and injection. This risk is present for all applications and generally varies from low to moderate with distance and population density along the CO_2 transport route where shorter routes through sparsely populated areas would have a lower risk than longer routes through regions of higher population.

Land Use – No impacts were identified for applications at existing facilities where the proposed project would not increase the footprint of the existing plant. Low to moderate impacts would be expected for applications proposing new construction. The level of potential impacts would generally be higher for new facilities on land currently used for other than industrial purposes. The assessment of impacts included both the plant site, sequestration site, and required pipeline routes for CO_2 transport.

Noise – No impacts would be expected for one project at an existing power plant. Low to moderate impacts could result from increases to ambient noise during construction and operation. Impacts would generally vary with distance and population density.

Socioeconomics – Expected impacts would be low for all applications. All applications would provide some additional employment during construction and operations. Most employment opportunities would be in the local area.

Soils – No impacts would be expected for one project at an existing power plant. Low impacts related to increased erosion during construction would be expected for other existing facilities requiring new pipelines or new facilities to be constructed.

Surface Water – Low to moderate impacts, including increased demand for cooling water and discharges to surface waters, would be expected for most of the applications. Some applications offered plans to maximize on-site reuse of water. Sediment control during construction was also considered.

Transportation and Traffic – Low to moderate impacts to traffic flow would be expected for all applications. Impacts would generally be higher during construction. Impacts expected during operations vary depending on increased rail or truck traffic. Projects in more rural areas would generally have lower impacts than new or existing facilities in more urban areas, where some increases in travel time could be expected during periods of peak construction.

Utilities – Low to moderate impacts would be expected for all applications. These would include an energy penalty for CCS retrofitted to existing power plants and increased demand for natural gas, potable water and wastewater treatment and disposal. Expected impacts would be higher for new plants proposed at sites not previously serviced by public utilities.

Wastes and Materials – Low to moderate impacts would be expected for all applications. Applications for projects that would include associated construction and operation of a new power plant would generally involve more material and waste impacts than would retrofits to existing plants.

Wetlands – No wetlands are located on the preferred site for one application. The potential for low to moderate impacts could be expected to small jurisdictional wetlands located on the proposed site or near proposed pipeline routes.

Applications in Response to the Reopened FOA

Based on the technologies and sites proposed, none of the applications for the reopened FOA were deemed to have a high potential for adverse impacts in sixteen of the twenty resource areas. All applications that would involve construction and operation of a new power plant were considered to have potentially high air quality impacts based on the need for new source permitting. Four applications were determined to have high potential for adverse impacts on biological resources; three applications were determined to have high potential for adverse impacts on surface waters; and one was determined to have high potential for adverse impacts on floodplains. The following impacts by resource area were considered in the selection of candidates for award:

Aesthetics – Impacts would be negligible for six projects that would involve retrofit or new construction at existing power plants or industrial sites. Low to moderate impacts would be expected for other retrofits to existing facilities or new facilities to be constructed. Moderate adverse impacts would result in the case of four applications involving construction of new power plants that would introduce line-of-sight impacts from superstructure and exhaust stacks where similar structures do not exist.

Air Quality – Impacts would result from emissions of criteria pollutants from new sources and fugitive emissions of dust. Twelve projects would have potentially high adverse impacts relating to emissions from proposed new plants. Lowest potential impacts would result from retrofits to existing or already-planned power plants.

Biological Resources – Four applications could potentially impact threatened or endangered species or their critical habitat, waterfowl and other migratory bird flyways, crucial habitat, or wildlife refuges either because of new plant construction or installation of pipelines for CO_2 transport. Moderate potential impacts would be expected for seven applications based on the locations of pipelines and other features. Low potential impacts would be expected for fourteen applications.

Climate – All applications were considered to present net beneficial effects on climate, because successful demonstration of CCS could contribute to reduced carbon footprints for fossil-fuel power plants. Potential adverse climate effects on plant operations were considered more from the perspective of engineering and design challenges to plant construction and maintenance.

Community Services – Negligible to low impacts would be expected for twenty applications. Five applications were determined to have potential for moderate impacts based on the size of the proposed projects to be located in smaller, more rural communities where existing community services are more limited.

Cultural Resources – Low potential for impacts would be expected for seventeen applications, including most retrofit projects. Moderate impacts would be expected for eight applications that could involve construction of structures or pipelines in proximity to tribal areas or historic sites.

Environmental Justice – Negligible to low potential for impacts would be expected for twenty three applications involving locations where environmental justice populations are not present. There is a moderate potential for environmental justice issues relating to the two remaining applications because of low-income or minority populations near the proposed site or along a proposed pipeline route.

Floodplains – One application would involve construction of structures within a 100-year floodplain with high potential for adverse impacts. Four applications were determined to have moderate potential impacts

during construction of structures or pipelines. Negligible to low potential for impacts would be expected for twenty applications that do not directly involve actions in floodplains.

Geology – Negligible to low potential for impacts would be expected for twenty two applications based on CO_2 injection into saline aquifers or use for enhanced oil recovery. Three applications would have potential for moderate impacts based on limited information and uncertainties relating to target formations for proposed CO_2 injection.

Ground Water – Negligible to low potential for impacts would be expected for eighteen applications. Moderate impacts could be expected for the seven other applications relating to limited information about groundwater capacity to supply plant operations or the potential effects on groundwater sources from required dewatering operations.

Human Health and Safety – Moderate potential for impacts would be expected for seventeen applications; low potential would be expected for eight. The level of risk is generally related to the size and complexity of the planned construction. There could also be risk to human health and safety from loss of containment of CO_2 during transport and injection. This risk is present for all applications and generally varies from low to moderate with distance and population density along the CO_2 transport route.

Land Use – Negligible to low potential for impacts would be expected for twenty applications, mainly including projects involving retrofit at existing facilities or new construction on industrial sites. Moderate potential for impacts would be expected for five applications particularly requiring new construction on land currently used for other than industrial purposes.

Noise – Negligible to low potential for impacts from increases to ambient noise during construction and operation for all applications. Moderate potential for impacts could occur in the cases of five applications if coal would be transported by truck instead of by rail.

Socioeconomics – All applications were determined to provide beneficial impacts to the respective host areas based on economic multipliers associated with project spending as well as additional employment during construction and operations.

Soils – Low potential for impacts would be expected for twenty applications, mainly including projects involving retrofit at existing facilities or new construction on industrial sites. Moderate potential for impacts would relate to increased erosion during construction of structures or pipelines for five applications.

Surface Water – Three applications could have high potential for impacts attributable to substantial planned withdrawals from surface waters for plant operations, construction of pipelines along impaired surface waters, or planned discharges to surface waters. Moderate potential for impacts would be expected for eight applications; low potential would be expected for fourteen, including most retrofit projects.

Transportation and Traffic – Negligible to low potential for impacts could result from increases in traffic during construction and operation for all applications. Moderate potential for impacts could occur in the cases of five applications if coal would be transported by truck instead of by rail.

Utilities – Low potential for impacts would be expected for twelve applications that would not require extensive new pipelines and transmission lines. Thirteen applications would have potential for moderate impacts based on the need for longer pipeline and/or transmission line construction.

Wastes and Materials – Low potential for impacts would be expected for nine applications, including most projects proposing retrofits. Sixteen applications would have potential for moderate impacts based on the development of new facilities or new processes at existing facilities that would increase demands for management of materials and wastes.

Wetlands – The potential for negligible to low impacts could be expected for nineteen applications. Six applications would have potential for moderate impacts based on the lengths and routing of utility features and the potential for encountering wetlands along corridors.

CONCLUSION

The applications received in response to the CCPI-3 FOAs provided reasonable alternatives for accomplishing the Department's purpose and need to satisfy the responsibility Congress imposed on DOE to demonstrate advanced coal-based technologies that can generate clean, reliable and affordable electricity in the United States. The alternatives available to DOE would also meet the Department's goal of accelerating the deployment of carbon capture and storage. An environmental review was part of the evaluation process of these applications. DOE prepared a critique containing information from this environmental review. That critique, summarized here, contained summary as well as project-specific environmental information. The critique was made available to, and considered by, the selection official before selections for financial assistance were made.

DOE determined that selecting two applications in response to the initial FOA, and three applications in response to the reopened FOA, would meet its purpose and need. The following provides a list of the projects selected, their locations, brief descriptions of the projects, and the anticipated level of NEPA review:

CCPI-3 initial FOA:

- Hydrogen Energy California Project (Kern County, CA). Hydrogen Energy International LLC, a joint venture owned by BP Alternative Energy and Rio Tinto, would design, construct, and operate an IGCC power plant that would take blends of coal and petroleum coke, combined with non-potable water, and convert them into hydrogen and CO_2. The CO_2 would be separated from the hydrogen using the methanol-based Rectisol process. The hydrogen gas would be used to fuel a power station, and the CO_2 would be transported by pipeline to nearby oil reservoirs where it would be injected for storage and used for enhanced oil recovery. The project, which would be located in Kern County, California, would capture more than 2,000,000 tons per year of CO_2. The anticipated level of NEPA review for this project is an EIS.
- Basin Electric Power Cooperative - Post Combustion CO_2 Capture Project - Basin Electric Power Cooperative proposed to add CO_2 capture and sequestration (CCS) to Basin Electric's existing Antelope Valley Station, located near Beulah, N.D. Negotiations are still ongoing to define the project scope and schedule.

CCPI-3 reopened FOA:

- Mountaineer Carbon Dioxide Capture and Storage Demonstration (New Haven, WV). American Electric Power (AEP) would design, construct, and operate a chilled ammonia process that is expected to effectively capture at least 90 percent of the CO_2 (1.5 million metric tons per year) in a 235 megawatt (MW) flue gas stream at the existing 1,300 MW Appalachian Power Company (APCo) Mountaineer Power Plant near New Haven, WV. The captured CO_2 would be treated, compressed, and then transported by pipeline to proposed injection sites located near the capture facility. During the operation phase, AEP proposed to permanently store the entire amount of captured CO_2 in two separate saline formations located approximately 1.5 miles below the surface. The project team includes AEP, APCo, Schlumberger Carbon Services, Battelle Memorial Institute, CONSOL Energy, Alstom, and an advisory team of geologic experts. The anticipated level of NEPA review for this project is an EIS.
- The Texas Clean Energy Project. Summit Texas Clean Energy, LLC (Bainbridge Island, WA) would integrate Siemens gasification and power generating technology with carbon capture technologies to effectively capture 90% of the carbon dioxide (2.7 million metric tons per year) at a 400 MW plant to

be built near Midland-Odessa, TX. The captured CO_2 would be treated, compressed and then transported by CO_2 pipeline to oilfields in the Permian Basin of West Texas, for use in enhanced oil recovery (EOR) operations. The Bureau of Economic Geology (BEG) at the University of Texas would design and assure compliance with a state-of-the-art CO_2 sequestration monitoring, verification, and accounting program. The anticipated level of NEPA review for this project is an EIS.

- The Parish Post-Combustion CO_2 Capture and Sequestration Project (Thompsons, Texas). NRG Energy, Inc. (NRG) would design, construct, and operate a system that would capture and store approximately 400,000 tons of carbon CO_2 per year. The system would employ Fluor's Econamine FG Plus technology to capture at least 90 percent of the CO_2 from a 60 MW flue gas stream of the 617-MW Unit 7 at the W.A. Parish Generating Station located in Thompsons, Texas. Fluor's Econamine FG Plus CO_2 capture system features advanced process design and techniques, which lower the energy consumption of existing amine-based CO_2 capture processes by more than 20 percent. The captured CO_2 would be compressed and transported by pipeline to a mature oil field for injection into geologic formations for permanent storage through an enhanced oil recovery operation. The site would be monitored to track the migration of the CO_2 underground and to establish the permanence of sequestration. DOE is in the process of evaluating the appropriate level of NEPA documentation for this project.