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5.15 GEOLOGICAL HAZARDS AND RESOURCES

Hydrogen Energy International LLC (HEI or Applicant) is jointly owned by BP Alternative Energy North America Inc., and Rio Tinto Hydrogen Energy LLC. HEI is proposing to build an Integrated Gasification Combined Cycle (IGCC) power generating facility called Hydrogen Energy California (HECA or the "Project") in Kern County, California. The Project will produce electricity while substantially reducing greenhouse gas emissions by capturing carbon dioxide (CO_2) and transporting it for enhanced oil recovery (EOR) and sequestration.

The 315-acre Project Site is located approximately 6.5 miles west of the outermost edge of the city of Bakersfield and 2 miles northwest of the unincorporated community of Tupman in western Kern County, California, as shown in Figure 2-1, Project Vicinity Map. The Project Site is adjacent to an oil producing area known as the Elk Hills Oil Field Unit. The Project Site is currently undeveloped. Existing surface elevations vary from about 445 feet above mean sea level (msl) in the southwest corner to about 310 feet above msl in the northeast corner.

The Project will gasify petroleum coke (or blends of petroleum coke and coal, as needed) to produce hydrogen to fuel a combustion turbine operating in combined cycle mode. The gasification component feeds a 390 gross megawatt (MW) combined cycle plant. The net electrical generation output from the Project will provide California with approximately 250 MW of low-carbon baseload power to the grid. The gasification component will also capture approximately 90 percent of the carbon dioxide from the syngas at steady-state operation, which will be transported and used for EOR and sequestration (storage) in the Elk Hills Oil Field Unit. In addition, approximately 100 MW of natural gas generated peaking power will be available from the Project.

The Project Site and linear facilities comprise the affected study area and are entirely located in Kern County, California. These Project components are described below.

Major on-site Project components will include, as shown on Figure 2-4, Plot Plan:

- Solids Handling, Gasification, and Gas Treatment
  - Feedstock delivery, handling and storage
  - Gasification
  - Sour shift/gas cooling
  - Mercury removal
  - Acid gas removal
- Power Generation
  - Combined-cycle power generation
  - Auxiliary combustion turbine generator
  - Electrical switching facilities
- Supporting Process Systems
  - Natural gas fuel systems

- Air separation unit (ASU)
- Sulfur recovery unit
- Zero liquid discharge
- Carbon dioxide compression
- Wastewater injection wells
- Raw water treatment plant
- Other plant systems

The Project also includes the following off-site facilities, as shown on Figure 2-5, Project Location Map:

- **Electrical Transmission Line** – An electrical transmission line will interconnect the Project to Pacific Gas & Electric's (PG&E) Midway Substation. The interconnection voltage is expected to be 230 kilovolts (kV). The Project is considering two alternative transmission routes, both of which extend from the western edge of the Project Site to the north, and west to the north side of the substation. Transmission Alternative 1 is approximately 9 miles long and Transmission Alternative 2 is approximately 9.5 miles long.
- **Natural Gas Supply** – A natural gas interconnection will be made with either PG&E or Southern California Gas Company natural gas pipelines, both of which are located southeast of the Project Site. The natural gas pipeline will be approximately 7 miles in length. The interconnect will consist of one tap off the existing natural gas line, one meter set, one service pipeline service connection, and a pressure limiting station located on the Project Site.
- **Water Supply Pipelines** – The Project will utilize brackish groundwater supplied from the Buena Vista Water Storage District (BVWSD) located to the northwest. The raw water supply pipeline will be approximately 18 miles in length. Potable water for drinking and sanitary use will be supplied by West Kern Water District located near the State Route 119 (SR 119)/Tupman Road intersection (southeast of the Project Site). The potable water supply pipeline will be approximately 5.5 miles in length.
- **Carbon Dioxide Pipeline** – The carbon dioxide pipeline will transfer the carbon dioxide captured during gasification from the Project Site southwest to the custody transfer point. The Project is considering two alternative pipeline routes. Alternative 1 is approximately 2 miles in length, while Alternative 2 is approximately 2.5 miles in length.

The Project components described above are shown on Figure 2-5, Project Location Map, which depicts the region, the vicinity, the Project Site and its immediate surroundings for Project components.

All temporary construction equipment laydown and parking, including construction parking, offices, and construction laydown areas, will be located on the Project Site.

This section presents information on the general geology of the region, subsurface conditions at the Project Site, geologic hazards affecting the Project Site and linear facilities (transmission lines and pipelines), and potential impacts of the Project on the geologic resources in the area.

Identification of geologic hazards and mineral resources is based on published literature and a Project Site investigation. Regarding geologic resources, evaluations of impact significance are based on the type and the proximity of the resource to the Project. Recommendations are provided for mitigation of geologic hazards and geotechnical issues at the Project. Figures are located at the end of this section.

The information provided in this section is based on a review of published geologic and mineral resource references.

5.15.1 Affected Environment

5.15.1.1 Tectonic Framework

The Project is located within the Great Valley Geomorphic Province of California (CGS 2002). The Great Valley is an alluvial plain about 50 miles wide and 400 miles long in the central part of California. Its northern part is the Sacramento Valley, drained by the Sacramento River and its southern part is the San Joaquin Valley drained by the San Joaquin River. The Great Valley is a trough in which sediments have been deposited almost continuously since the Jurassic period (about 160 million years ago).

As with the rest of the San Joaquin Valley in Southern California, the Project is situated between two seismically active regions. Our review of geologic literature did not identify the presence of any known active or potentially active faults on the Project Site or crossing the Project linears. The Geologic Map, Figure 5.15-1, Regional Geologic Map, does not show any faults mapped within the Project.

The closest known faults classified as active by the State of California Geologic Survey (CGS) are the San Andreas Fault located, using Blake (1998), approximately 19 miles to the west, the White Wolf fault located approximately 22 miles to the southeast, and the Pleito Thrust located approximately 25 miles south of the Project Site. These faults are shown on Figure 5.15-2, Regional Fault Map.

5.15.1.2 Regional Stratigraphy

The southern portion of the Great Valley Province is characterized as being a nearly flat-surfaced north trending asymmetric trough bounded by the Coast Ranges Province to the west and Sierra Nevada Province to the east. Tertiary rocks, which were deposited nearly continuously from Cretaceous to Pleistocene time, are largely of marine origin and underlie a relatively thin cover of Quaternary alluvium. The Tertiary rocks overlie Jurassic-Cretaceous marine sedimentary rocks in the west side of the valley. Northwest-trending anticlines in the Tertiary strata are reflected by the gas and oil fields and by low hills in the valleys.

5.15.1.3 Local Geology

Geomorphically, the Project is on the northeastern face of the Elk Hills which is an anticlinal uplift along the western periphery of the San Joaquin Valley. The Elk Hills form the surface expression of an anticlinal fold composed of gravel and mudstone derived from the Coast Ranges to the west. The Elk Hills are being dissected by numerous streams that redeposit the material on

an apron of small coalescing fans along the northeast flank of the hills which abut the much larger Kern River fan to the north.

The Project surficial deposits, as shown on Figure 5.15-3, Project Site Geologic Map, are described as Quaternary age alluvial gravel and sand of valley areas (Q); and bedrock at the surface and underlying alluvium consisting of Pliocene- to Pleistocene-age Tulare Formation which consists of alternating beds of sand and mudstone. According to Dibblee (2005) these deposits are described as stream-laid, weakly indurated pebble gravels, sands, and clays; light gray in color; pebbles are composed chiefly of Monterey siliceous shale and debris from bedrock in adjacent Temblor Range.

The Project is located in the Kern County sub-basin of the San Joaquin Valley Groundwater Basin. Groundwater was not encountered in any of the borings drilled at the Project Site during the subsurface investigation (URS 2008) to the maximum elevation explored, approximately 275 feet above msl. A search of California Department of Water Resources groundwater well data identified Well No. 30S24E14Q001M to the northeast of the Project Site at a surface elevation of 291 feet above msl having historic high groundwater levels at about elevation 255 feet above msl (National Geodetic Vertical Datum [NGVD]), approximately 55 feet below the ground surface at the lowest portion of the Project Site (elevation 310 feet above msl).

The Project is in an area of relatively deep groundwater conditions. The groundwater surface was not encountered during the geotechnical exploration for the site. Groundwater is not expected to be within 55 feet of the ground surface based on Project Site geotechnical borings and historic data from Well No. 30S24E14Q001M.

The linear facilities (natural gas and water pipelines) will be underlain by similar earth materials as the Project Site.

5.15.1.4 Geologic Hazards

The primary geologic hazards at the Project (Project Site and linear facilities) include strong ground motion from a seismic event centered on one of several nearby active faults; and dry sand settlement or liquefaction of the sandy soils that underlie the Project given strong ground shaking as a result of a design level earthquake event. The general geologic hazards at the Project are discussed in detail below.

Seismicity

The Project is in one of the most seismically active areas in the U.S. and California. At least two-thirds of the relative motion between the North American and Pacific plates in California occurs in the San Andreas Fault system (Hutton et al. 1991; Sieh and Jahns 1984).

Historic Seismic Events

The major seismic events in terms of their magnitude and the extent of the damage caused are summarized in Table 15.5-1, Significant Seismic Events in Southern California.

Table 15.5-1
Significant Seismic Events in Southern California

Date	Location / Event	Moment Magnitude (M_w)	Latitude (degrees)	Longitude (degrees)
09 Jan 1857	Fort Tejon	7.9	36.20	-120.80
21 Jul 1952	Kern County	7.3	35.00	-119.02
28 Jun 1992	Landers	7.3	34.20	-116.44
16 Oct 1999	Hector Mine	7.1	34.59	-116.27
19 May 1940	Imperial County	7.0	32.73	-115.50
17 Jan 1994	Northridge	6.7	34.21	-118.54
09 Feb 1971	San Fernando	6.6	34.41	-118.40

Source: California Geological Survey, 2007
Note:
M_w = moment magnitude

The largest magnitude earthquake recorded was a magnitude 7.9 along the San Andreas Fault at Fort Tejon on 9 January 1857. The most damaging earthquakes in Southern California have been the San Fernando event on 9 February 1971 (Mw = 6.6) and the Northridge event on 17 January 1994 (Mw = 6.7). Figure 5.15-4, Epicentral Location of Major Earthquakes in Southern California, presents the location of the epicenters of all major recorded seismic events since 1735.

Seismic Sources

The state of California is located on the edge of the North American Plate where it is moving south relative to the Pacific Plate, which is moving north. This contact zone has given rise to prevalent faulting across the region, resulting in the high levels of seismic activity described above. These seismic events give rise to significant ground motions and displacements across the region.

Details of the seismic sources located by Blake (1998) within a 62-mile (100 kilometer) radius of the Project Site are provided in Table 5.15-2, Faults Within the Project Area.

Table 5.15-2
Faults Within the Project Area

Fault Name	Length Kilometer* (km)	Fault Type*	Slip Rate* (mm/yr)	Maximum Moment Magnitude* Mw
Big Pine	41	ll-ss	0.8	6.9
Garlock (West)	98	ll-ss	6	7.3
Great Valley 14	24	r, 15W	1.5	6.4
Los Alamos – W. Baseline	28	r, 30S	0.7	6.9
Los Osos	44	r, 45SW	0.5	7.0
Mission Ridge – Arroyo Parida – Santa Ana	69	r, 60N	0.4	7.2
North Channel Slope	68	r, 26N	2	7.4
Pleito Thrust	44	r, 45S	2	7.0

Table 5.15-2
Faults Within the Project Area

Fault Name	Length Kilometer* (km)	Fault Type*	Slip Rate* (mm/yr)	Maximum Moment Magnitude* Mw
Red Mountain	39	r, 60 N	2	7.0
San Andreas – 1857 Rupture				7.8
San Andreas - Carrizo	146	rl-ss	34	7.4
San Andreas - Cholame	63	rl-ss	34	7.3
San Andreas - Parkfield	36	rl-ss	34	6.5
San Cayetano	42	r, 60N	6	7.0
San Gabriel	72	rl-ss	1	7.2
San Luis Range (S. Margin)	64	r, 45N	0.2	7.2
San Juan	68	rl-ss	1	7.1
Santa Ynez (East)	68	ll-ss	2	7.1
Santa Ynez (West)	65	ll-ss	2	7.1
White Wolf	67	r-ll-o, 60S	2	7.3

Source: Blake (1998)
Note:
* = CGS, Appendix A, 2002 Fault Parameters
Fault types:- ss = strike slip, r = reverse, rl = right lateral, ll = left lateral, o = oblique

Surface Rupture

Primary ground rupture is defined as the surface displacement which occurs along the surface trace of the causative fault during an earthquake. Ground rupture can occur along known pre-existing faults, unknown pre-existing faults, or new faults that develop as a result of a seismic event. The state of California categorizes known faults as:

- Active – Faults where there is evidence of rupture in the last 11,000 years. These are considered capable of future movement.
- Potentially Active – Faults where there is evidence that movement occurred in the past 1.6 million years.
- Inactive – Faults that are older than 1.6 million years.

According to the California Geological Survey, the Project Site is not currently located within an Alquist-Priolo Earthquake Fault Zone. Based on our review of available geologic data, no surface traces of active faults pass through the Project; therefore, the potential for primary ground rupture within the Project during a seismic event is low. Impacts will be less than significant.

Seismic Ground Shaking

The Project is susceptible to strong ground shaking generated during earthquakes on nearby faults. The intensity of ground shaking, or strong ground motion, is dependent upon the distance of the fault to the Project Site, the magnitude of the earthquake, and the underlying soil conditions. This hazard is mitigated by designing and constructing improvements and buildings in conformance with current building codes and engineering practices. With the implementation of Geo-1 discussed in Section 5.14.4, impacts will be less than significant.

Liquefaction

Liquefaction is a process in which soil grains in a saturated sandy deposit lose contact because of earthquakes or other sources of ground shaking. The soil deposit temporarily behaves as a viscous fluid; pore pressures rise, and the strength of the deposit is greatly diminished. Liquefaction is often accompanied by sand boils, lateral spreading, and post-liquefaction settlement as the pore pressures dissipate. Liquefiable soils typically consist of cohesionless sands and silts that are loose to medium dense, and saturated.

Due to absence of shallow groundwater, the potential for liquefaction to occur and impact the Project Site is low to nil. As a result, impacts will be less than significant. The Project linears may require additional evaluation during detailed design.

Seismic-Induced Dry Sand Settlement

The presence of loose, unsaturated granular soil layers could result in some seismic-induced settlement that will need to be taken into account during foundation design. The potential for seismic-induced settlement for the Project Site was evaluated by URS (2008). In general, seismic-induced settlement could occur within the susceptible native, loose to medium dense sandy soils in the upper 50 feet; however, remedial grading and design can reduce the impact of seismically-induced dry sand settlement to less than significant. The Project linears may require additional evaluation during detailed design. With the implementation of Geo-2 discussed in Section 5.15.4, impacts will be less than significant.

Subsidence

Subsidence ground failure can be aggravated by several causes including ground shaking, withdrawal of large volumes of fluids from underground reservoirs, and also by the addition of surface water to certain types of soils (hydro-compaction). Subsidence from any of the above causes accelerates maintenance problems on roads, lined and unlined canals, and underground utilities. According to the Kern County General Plan Safety Element, the Project Site is not located within an area mapped as having measured land subsidence between 1926 and 1965 or hydro-compaction; therefore, it is unlikely that subsidence will occur at the site. As a result, impacts will be less than significant.

Flooding

According to Figure 14 of the Kern County General Plan Safety Element, the Project Site is not located within an area identified as having flood hazards or shallow groundwater. The Project linears to the east of the Project Site will cross a flood hazard zone located on the east side of the California State Water Project where the linears are adjacent to State Route 119 (SR 119).

The Project is located within an active alluvial floodplain. Gullies and channels are present across the Project and throughout the Project area. Surface water flow across the Project Site is likely to occur during periods of intense rainfall.

Provided proper drainage design, the Project Site is not likely to experience flooding. As a result, impacts will be less than significant.

Tsunamis

A tsunami is a great sea wave (commonly called a tidal wave) produced by a significant undersea disturbance such as tectonic displacement of the sea floor associated with large, shallow earthquakes. The Project is situated greater than 200 feet above sea level. The potential for tsunamis at the Project is nil to low due to the absence of oceans, lakes, or large bodies of water in the immediate area. As a result, impacts will be less than significant.

Seiches

A wave created by an earthquake shaking in an enclosed body of water is called a seiche. The potential for a seiche to occur is related to the natural frequency of vibration of the body of water, as well as the predominate frequencies of vibration in the seismic event. The potential for seiches at the Project is nil to low due to the absence of oceans, lakes, or large bodies of water in the immediate area. As a result, impacts will be less than significant.

Landslides and Lateral Spreading

Landsliding and lateral spreading usually occur in areas of relief, weak soil strength, and high groundwater. They are often triggered by earthquakes. The Project Site is in an area of low relief. The potential for localized landsliding or lateral spreading to occur within the Project Site is very low. The carbon dioxide pipelines that extend east and south of the Project Site will traverse areas of medium relief. The Project carbon dioxide pipelines will require slope stability evaluation during a design level geotechnical exploration. With the Project design, impacts will be less than significant.

Volcanic Hazards

No centers of potential volcanic activity occur within hundreds of miles of the Project. Volcanic hazards, such as lava flows and ash falls, are therefore not anticipated to present a hazard. As a result, impacts will be less than significant.

Expansive Soils

The subsurface investigation (URS 2008) indicates that the surficial soils at the Project Site are composed of silty sands. Silty sands are not considered to be expansive. As a result, impacts will be less than significant.

5.15.1.5 Geologic Resources

Geologic resources of recreational, commercial, or scientific value in the Project vicinity that could be affected include oil and gas reserves. The Project is not located over mines, aggregate deposits or mineral deposits; and no known scientific or recreational geologic resources were identified in the vicinity of the Project based on published information (CDMG 1962, Mines and Mineral Resources of Kern County California, Figure 1). Department of Conservation, Division of Oil, Gas, & Geothermal Resources (DOGGR) Map 421 does not identify any oil or gas wells drilled at the Project Site. Wells drilled on the southern half of Section 22 (the Project Site is located on the northern half of Section 22) were dry wells that didn't encounter petroleum; therefore, the likelihood of petroleum reserves being located below the Project Site is unlikely.

The Project linears pass through the Elk Hills, North Coles Levee and South Coles Levee petroleum fields. Construction of the Project linears through these petroleum fields is not likely to prevent recovery of the resources and injection of carbon dioxide into the Elk Hills Petroleum Field is designed to enhance recovery of those deposits.

As a result, the impacts to geologic resources will be less than significant.

5.15.2 Environmental Consequences

Potential impacts of the Project on the geologic or mineral resources and potential impacts of geologic hazards can be divided into those related to construction activities and those related to power plant operation.

5.15.2.1 Construction-Related Impacts

Construction-related impacts to the geologic or mineral resources primarily involve grading operations and operations for foundation support. The Project Site slopes and temporary construction slopes and excavations should be properly designed to be stable. Project development is not anticipated to result in significant adverse impacts to geologic or mineral resources. Potentially, significant impacts by geologic conditions on construction are not anticipated. With implementation of the mitigation measures outlined in Section 5.15.4, Mitigation Measures, impacts to power plant construction by the geologic environment will be reduced to less than significant levels.

5.15.2.2 Operation-Related Impacts

No significant adverse impacts to geologic resources have been identified as a result of operation. Positive impacts to geologic resources (enhanced oil recovery) have been identified as a result of operation. Potential impacts of geologic hazards on the Project and ancillary facility operations include seismic shaking. With implementation of the measures outlined in

Section 5.15.4, Mitigation Measures, impacts to power plant operations from geologic hazards will be reduced to a less than a significant level.

There will be no significant impacts to the geologic environment resulting from construction or operation of the Project linears.

5.15.3 Cumulative Impacts Analyses

Cumulative impacts to the geologic resources at the Project are considered to be negligible.

5.15.4 Mitigation Measures

5.15.4.1 Seismic Shaking

The potential exists for strong ground shaking from a variety of nearby sources, including the San Andreas Fault.

- **Geo-1:** Project facilities will be designed in accordance with applicable building codes' seismic design criteria. Seismic design criteria will be provided either by codes or a design level geotechnical investigation.

5.15.4.2 Liquefaction

No liquefaction hazard exists at the Project Site and no mitigations are suggested. In general, mitigation of liquefaction on Project linears will be accomplished in the design of the specific structures.

5.15.4.3 Seismic-Induced Dry Sand Settlement

- **Geo-2:** To reduce the potential for adverse differential settlement beneath heavily loaded settlement-sensitive structures, removal of the susceptible soils and replacement with engineered fill have been recommended for structures to be founded on shallow foundations. Alternatively, deep foundations (driven piles) have been recommended. Settlement design criteria can be provided by a design level geotechnical investigation.

5.15.4.4 Subsidence

Subsidence at the Project Site is not considered to be a significant hazard and no mitigations are suggested.

5.15.4.5 Flooding

Flooding at the Project Site is not considered to be a significant hazard and no mitigations are suggested.

5.15.4.6 Tsunamis, Seiches, Landslides, Lateral Spreading, and Volcanic Hazards

Tsunami, seich, landslide, lateral spreading, and volcanic hazards are not present in the Project area.

5.15.4.7 Expansive Soils

Expansive soils are not likely to be present in the Project area.

5.15.4.8 Geologic Resources

There are no significant adverse impacts to geologic resources; therefore, no mitigation is recommended.

5.15.5 Laws, Ordinances, Regulations, and Standards

The Project will be constructed and operated in accordance with all laws, ordinances, regulations, and standards (LORS) applicable to geologic hazards and resources discussed below and summarized in Table 5.15-3, Summary of LORS – Geological Hazards.

Table 5.15-3
Summary of LORS – Geological Hazards

LORS	Requirements	Conformance Section	Administering Agency
Federal Jurisdiction			
No federal LORS are applicable			
State Jurisdiction			
Cal PRC 25523(a), Alquist-Priolo Earthquake Fault Zone	Not Applicable	Section 5.15.5.2, State	California Energy Commission Facilities Siting Division Siting Office, California Energy Commission Facilities Siting Division Engineering Office, and Kern County Building Inspection Division
Local Jurisdiction			
Kern County General Plan/Safety Element	Minimize injuries and loss of life and reduce property damage. Reduce economic and social disruption resulting from earthquakes, fire, flooding, and other geologic hazards by assuring the continuity of vital emergency public services and functions.	Section 5.15.5.3, Local	Kern County Planning Department
California Building Code, Chapters 16, 18, and 33	Codes address excavation, grading and earthwork construction, including construction applicable to earthquake safety and seismic activity.	Section 5.15.5.3, Local	Kern County Planning Department

5.15.5.1 Federal

There are no federal LORS for geological hazards and resources, or grading and erosion control.

5.15.5.2 State

California Public Resources Code 25523(a): 20 CCR § 1252 (b) and (c)

None of the Project components are located within or cross an Alquist–Priolo earthquake zone, therefore, the Project will not be subject to requirements for construction within an earthquake fault zone.

California Building Code

The 2007 edition of the California Building Code (CBC) is based on the International Building Code (IBC) 2006 edition with revisions specifically tailored to geologic hazards in California.

Chapter 16: Structural Design Requirements, Division IV Earthquake Design. This section requires structural designs to be based on geologic information for seismic parameters, soil characteristics, and site geology.

Chapter 18: Foundations and Retaining Walls, Division I. This section sets requirements for excavations and fills, foundations, and retaining structures, with regard to expansive soils, subgrade bearing capacity, seismic parameters, and also addresses waterproofing and damp-proofing foundations. In Seismic Zones 3 and 4, as defined by the Uniform Building Code (UBC), liquefaction potential at the site should be evaluated. Division III contains requirements for mitigating effects of expansive soils for slab-on-grade foundations.

Chapter 33: Site Work, Demolition and Construction, and Appendix Chapter 33. These sections establish rules and regulations for construction of cut-and-fill slopes, fill placement for structural support, and slope setbacks for foundations.

California Environmental Quality Act of 1970

The CEC will be the lead agency for rules and regulations to implement the California Environmental Quality Act (CEQA). Appendix G, Section VI of the CEQA guidelines contains the geologic hazards and resources related to the Project.

5.15.5.3 Local

Kern County General Plan, Chapter 4, Safety Element

The Safety Element of the Kern County General Plan provides an implementation program to reduce the threat of seismic and public safety hazards within unincorporated areas of Kern County.

The Project will comply with all of the Seismic/Geologic Hazard Elements of the Kern County General Plan. No active faults will be crossed by the transmission lines.

The county will review the geologic information and geotechnical recommendations presented in design level geotechnical reports.

5.15.6 Involved Agencies and Agency Contacts

Agencies with jurisdiction to enforce LORS related to geologic hazards and resources, and the appropriate contact person are summarized in Table 15.5-4, Involved Agencies and Agency Contacts.

Table 15.5-4
Involved Agencies and Agency Contacts

Number	Agency	Contact/Title	Telephone
1	California Energy Commission Facilities Siting Division Siting Office	Eileen Allen/ Facilities Siting Program Manager	916-654-4082
2	California Energy Commission Facilities Siting Division Engineering Office	Rick Tyler/ Senior Mechanical Engineer	916-653-1646
3	Kern County Planning Department 2700 “M” Street, Suite 100 Bakersfield, CA 93301	Cheryl Casdorph/ Supervising Planner	661-862-8600
4	Kern County Building Inspection Division 2700 “M” Street, Suite 100 Bakersfield, CA 93301	Charles Lackey/ Director	661-862-8650

5.15.7 Permits Required and Permit Schedule

There are no applicable permits required for geologic hazards.

5.15.8 References

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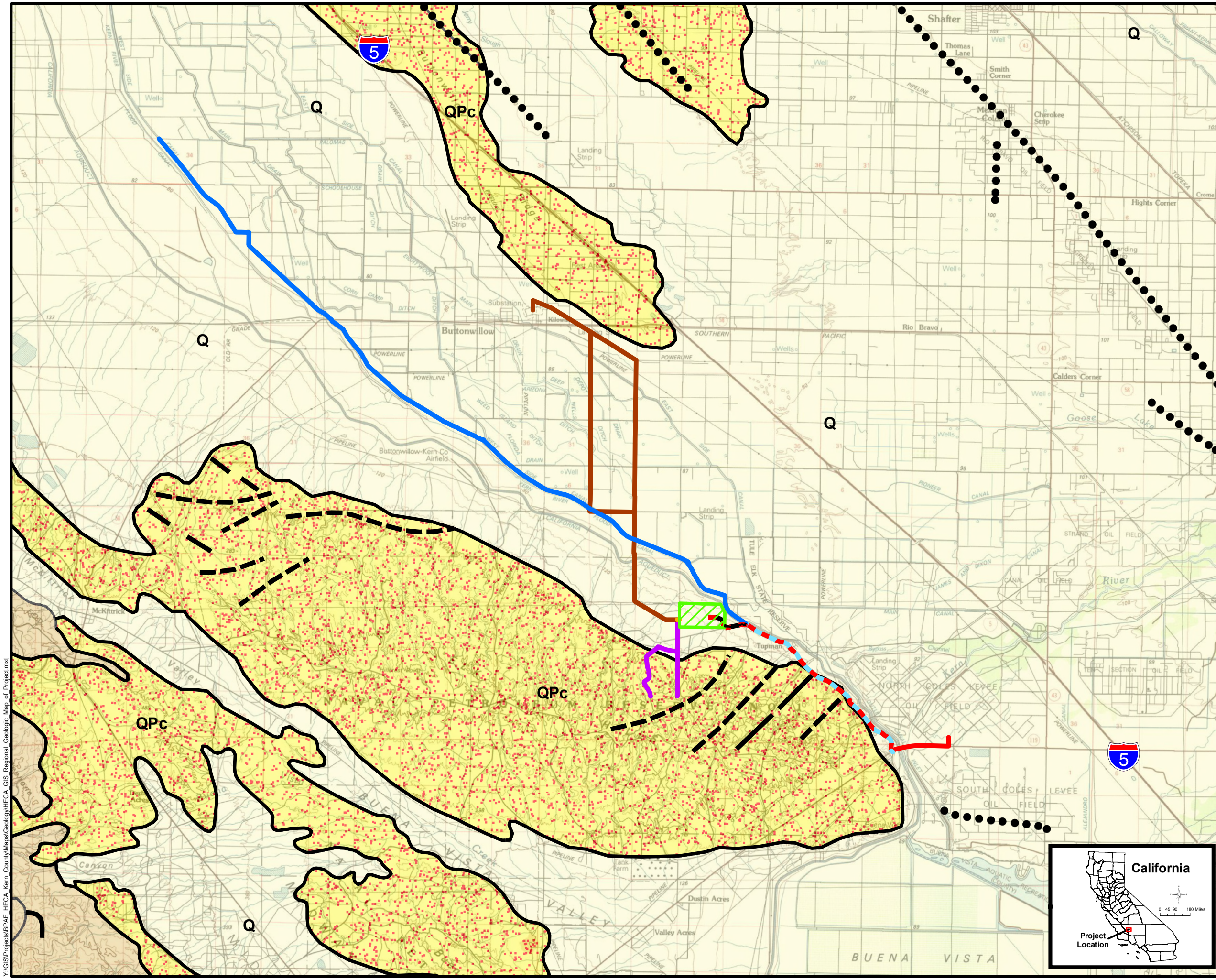

Project Site
Site Access Road
CO2
Natural Gas (NG)
Potable Water
Process Water
Potable Water/NG
Process & Potable Water/NG
Transmission
Transmission/CO2
Fault, Certain
Fault, Approximately Located
Fault, Concealed
Contact, Certain

Q — Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-unconsolidated. Mostly nonmarine, but includes marine deposits near the coast.

QPc — Pliocene and/or Pleistocene sandstone, shale, and gravel deposits; mostly loosely consolidated.

M — Sandstone, shale, siltstone, conglomerate, and breccia; moderately to well consolidated.

N W E S

0 1 2 4 Miles

Sources:
USGS (30'x60' quads: Taft 1982, Delano 1982). Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved.
Jennings, C. W., 1977, Geologic Map of California, 1:750,000-Scale (Geology).

Regional Geologic Map of Project

Hydrogen Energy California (HECA)

FIGURE 5.15-1

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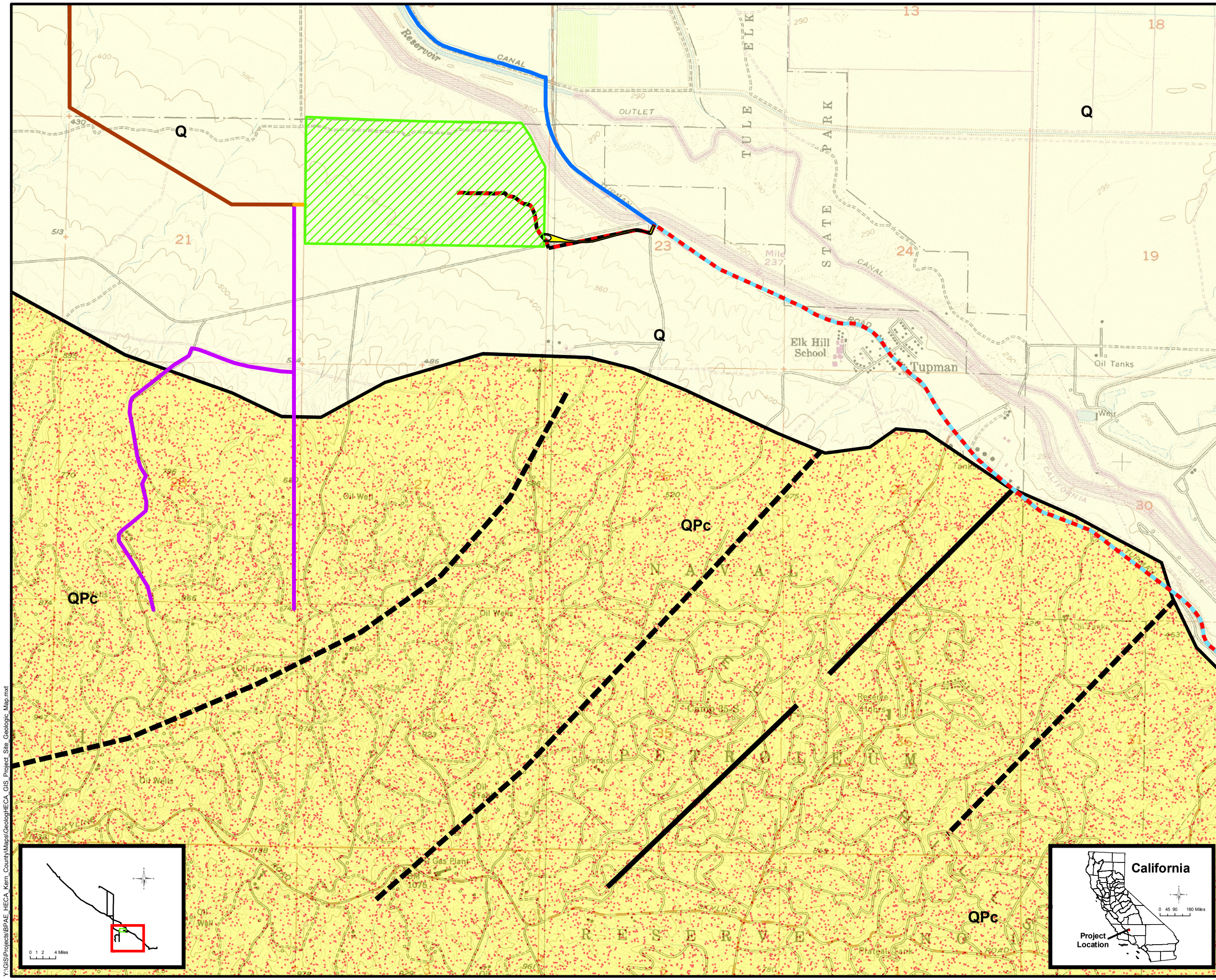
Major faults of southern California (from United Stated Geological Survey http://earthquake.usgs.gov)

Regional Fault Map

Figure 5.15-2



Sources:
USGS (7.5' quads: East Elk Hills 1977, Tupman 1977).
Created using TOPO!, ©2006 National Geographic Maps, All Rights Reserved.
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Project Site Geologic Map

Hydrogen Energy California (HECA)

FIGURE 5.15-3

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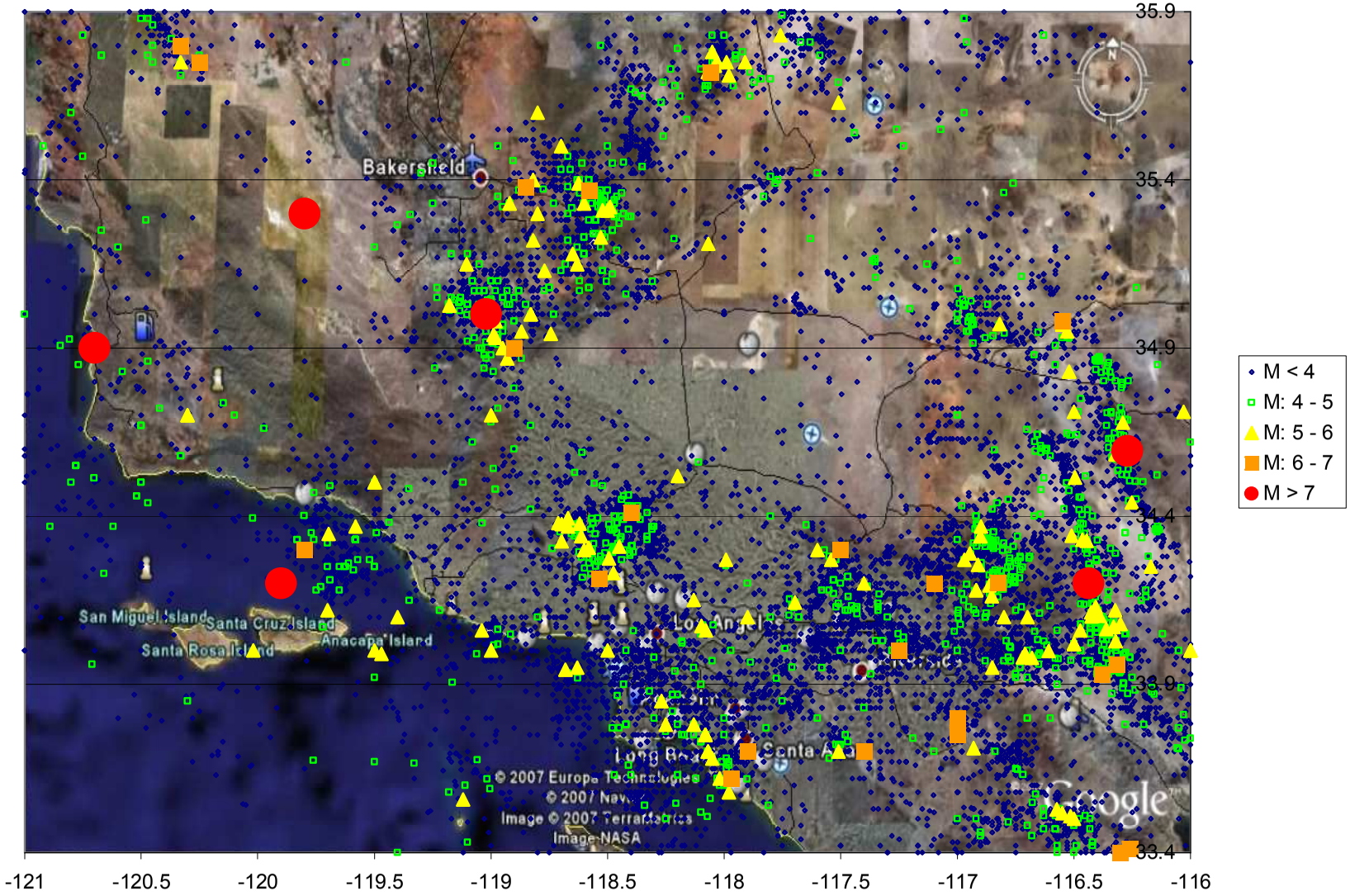

Epicentral Location of Major Earthquakes in Southern California
Figure 5.15-4

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Geological Hazards**

Project: ____

Technical Staff: ____

Project Manager: ____

Docket: ____

Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (1)	...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 plans proposed to verify the effectiveness of the mitigation.	Pages 5.15-1 to 5.15-10 Section 5.15		
Appendix B (g) (17) (A)	A summary of the geology, seismicity, and geologic resources of the project site and related facilities, including linear facilities.	Pages 5.15-1 to 5.15-7 Section 5.15.1		
Appendix B (g) (17) (B)	A map at a scale of 1:24,000 and description of all recognized stratigraphic units, geologic structures, and geomorphic features within two (2) miles of the project site and along proposed facilities. Include an analysis of the likelihood of ground rupture, seismic shaking, mass wasting and slope stability, liquefaction, subsidence, tsunami runup, and expansion or collapse of soil structures at the plant site. Describe known geologic hazards along or crossing linear facilities.	Figures 5.15-1 and 5.15-3 Pages 5.15-3 to 5.15-6 Section 5.15.1.4		
Appendix B (g) (17) (C)	A map and description of geologic resources of recreational, commercial, or scientific value which may be affected by the project. Include a discussion of the techniques used to identify and evaluate these resources.	Figure 5.15-3 Pages 5.15-6 to 5.15-7 Section 5.15.1.5		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Geological Hazards**

Project: ____

Technical Staff: ____

Project Manager: ____

Docket: ____

Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (i) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed; and	Table 5.15-3 Pages 5.15-9 to 5.15-11 Section 5.15.5		
Appendix B (i) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	Table 5.15-3 Pages 5.15-9 to 5.15-11 Section 5.15.5		
Appendix B (i) (2)	The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.	Table 15.5-4 Page 5.15-11 Section 5.15.6		
Appendix B (i) (3)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.	Page 5.15-11 Section 5.15.7		