5.4 Geology and Soils

This section addresses potential geology, soil and paleontological resource impacts that may result from construction, operation, closure and post-closure maintenance of the Desert Valley Company Monofill (DVCM) Expansion Project, Cell 4. The following discussion addresses the existing conditions on the Project site, identifies applicable regulations, identifies and analyzes environmental impacts, and recommends measures to reduce or avoid adverse impacts anticipated from implementation of the proposed Project, as applicable.

Information used in preparing this section and in the evaluation of potential impacts to geology, soils, and paleontological resources was derived from of the following sources,

- *Soils and Geology Report* prepared by Terraphase Engineering (Terraphase Engineering, 2019; Appendix I-1),
- *Calibration Boreholes Report* prepared by Fugro (Fugro, 2019a; Appendix I-2),
- *Fault Setbacks Map* prepared by Fugro (Fugro, 2019b; Appendix I-3);
- *Fault Trenching Report* prepared by Fugro (Fugro, 2019c; Appendix I-4);
- *Site Geologic Data Review and 3D Model Report*, prepared by Fugro (Fugro, 2018; Appendix I-5);
- *Geophysical Screening Report for Section 33* prepared by Fugro (Fugro, 2019d; Appendix I-6);
- *Geophysical Survey Report for Section 27* prepared by Fugro (Fugro, 2019e; Appendix I-7);
- *Phase I Environmental Site Assessment* prepared by Ninyo and Moore (Ninyo and Moore 2020; Appendix K); and,
- *Paleontological Report* prepared by Chambers Group (Chambers Group, 2019; Appendix J).

Scoping Issues Addressed

During the scoping period for the proposed Project, a public scoping meeting was conducted, and written comments were received from agencies. The following issue was raised by the California Department of Fish and Wildlife (CDFW) and are addressed in this section.

- Any changes from the elevations in the SWFP should be included in the project description and analyzed in the DEIR.

No comments related to paleontological resources were received.

Issues Scoped Out

The Imperial County Planning and Development Services Department (County) determined in the Initial Study/Notice of Preparation (IS/NOP), located in Appendix A-1, that the following environmental issue area resulted in no impact and was scoped out of requiring further review in this Draft EIR (DEIR). Please refer to Appendix A-1 of this DEIR for a copy of the NOP/IS and additional information regarding this issue.

- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater. Soils in the project area support the existing septic system and leach field at the Desert Valley Monofill. This same infrastructure would be used for the proposed Project.

5.4.1 Environmental Setting

Landfill History

As detailed in Section 3.2.1 of this EIR, the Desert Valley Company Monofill (DVCM or Monofill) began operations in May 1991 in an undeveloped area of western Imperial County. Cell 1 of the DVCM was built in 1990, and Cell 2 was built in 1999. Construction of Cell 3 began in the summer of 2004 and was completed in June 2005. Cell 3 is the only active cell currently receiving waste. Information regarding the existing regulatory permits and plans under which the DVCM currently operates is presented in **Table 3-2**.

Geologic Setting

Regional Geology

The Project site is located within the Salton Trough. The Salton Trough is a structural basin that comprises the northern extension of the Gulf of California Rift Zone. It consists of a depressed crustal block within a complex plate boundary zone. The primary structural features of the Gulf of California Rift Zone are a series of parallel transform faults which includes the San Andreas, San Jacinto, and the Elsinore fault zones. From a geomorphic perspective, the Salton Trough consists of a low-lying alluvial basin which is characterized by internal drainage and relatively low relief. Typical stratigraphy incorporates up to 21,000 feet of Late Cenozoic Era sediments and metasediments which are deposited primarily by the Colorado River. Other sources of sedimentation include wind and lake (lacustrine) deposition and the erosion of adjacent highlands (**Figure 5.4-1**). Regionally, the Quaternary Brawley Formation (Qb) attains a maximum thickness of approximately 2,000 feet and has been interpreted as Pliocene to mid-Pleistocene in age. Mollusks and diatoms are common and sparse remains of freshwater vertebrates and brackish water foraminifers have been observed (Terraphase, 2019; Appendix I-1).

Site-Specific Geology

The Project site is characterized by generally low-lying level topography. Surface elevations range from approximately 40 to 140 feet below mean sea level (MSL), with a slight southwest to northeast gradient across the Project site. Previous studies have determined that surface exposures within the

Project site consist of recent alluvial and eolian (wind derived) deposits, as well as ancient shoreline and lacustrine materials associated with Cahuilla Lake. These units overlie a generally unconformable sequence of Quaternary through Paleozoic strata and may extend locally to depths of up to several hundred feet (Terraphase, 2019; Appendix I-1). Specific soil types found in the vicinity of the Project site, as identified in the *Soils and Geology Report* are discussed below:

- Quaternary alluvium (Qal) is defined to include unconsolidated recent silt, sand, and gravel deposits associated with the larger ephemeral stream courses. These deposits are generally limited to several meandering washes which traverse the Project site from southwest to northeast.
- Quaternary Eolian Deposits (Qd) consist of significant accumulations of recent wind-blown sand and silt, typically in the form of dunes. Active dune structures incorporating unconsolidated and mobile sand and silt deposits are limited to the extreme southeast corner of the Project site.
- Quaternary Mixed Alluvium (Qa) includes unconsolidated recent silt, sand, and gravel deposits associated with minor washes and sheet flow areas, minor eolian deposits, and less extensive shoreline and lacustrine materials. These materials are widely exposed throughout the Project site.
- Quaternary Shoreline Deposits (Qs) consist of unconsolidated sand and gravel ridges associated with Pleistocene/Holocene Cahuilla Lake. Fine material is generally absent and mollusk and gastropod shell fragments are common. Shoreline deposits are present in the southern and east-central portions of the Project site in the form of low east-west trending ridges.
- Quaternary Brawley Formation (Qb) consists locally of interbedded massive silty clay, clayey silt, and sand units of lacustrine origin. Relatively small exposures of the Brawley Formation occur throughout much of the Project site, with these strata likely underlying the entire project site

The stratigraphic units of the Brawley Formation at the Project site include two thick clay layers, Qb2 and Qb5, which are interbedded with relatively coarser deposits comprising units Qb1, Qb3, Qb4, Qb6, and Qb7. These beds reflect alternating changes in depositional environments through time. Conditions have alternated between lacustrine, fluvial, and aeolian environments over time. The thick clay units indicate deposition in very still water of a lagoon or embayment isolated from significant coarse alluvial deposition. Unit Qb5 exhibits an important change in composition from clay to sand at the eastern edge of the Project site. The clay of Qb5 seen in boreholes taken underneath under Cell 3 transitions to sand in boreholes farther to the east. A body of eolian sand, likely a sand dune or ramp, apparently bounded the northeastern side of the lagoon or embayment (Fugro, 2018; Appendix I-5).

At the Project site, the beds of the Brawley Formation generally dip to the north with gentle undulations resulting from tectonic deformation. Unit Qb2 is the younger clay layer and underlies Cells 1 and 2. Unit Qb5 is a somewhat older clay unit and underlies Cell 3. Both outcrop to the west of the Project site where they were quarried for borrow to construct the clay liner of each cell.

Additional borrow was used for the cap of Cells 1 and 2. The disturbed area reflects the excavation, backfill and grading from these activities (**Figure 5.4-2**) (Fugro, 2018; Appendix I-5).

Two 150-foot-deep, continuous soil-core borings, B-401 and B-402, located in Sections 27 and 33 respectively (**Figure 5.4-3**) were drilled at the Project site to collect subsurface stratigraphic data and to conduct geophysical measurements used to calibrate previously obtained seismic reflection data. At B-401 the alluvium was lean clay at 10 feet changing to fat clay at 14.5 feet and back to lean clay at 45.5 feet. It changed to silty clay at 82 feet and back to fat clay at 95 feet. At B-402 the alluvium was silty clay to 26 feet changing to fat clay at 36 feet and staying as that until 110 feet when it changed back to silty clay (Fugro 2019a, Appendix I-2).

Seismic and Geologic Hazards

The Project site is within an active seismic region subject to regular earthquake events, resulting in potential seismic hazards as described below and as presented on **Table 5.4-1**.

TABLE 5.4-1: ACTIVE AND POTENTIALLY ACTIVE FAULTS IN PROJECT REGION

Fault Name or Seismic Zone	Approximate Distance to Project Site (miles)	Maximum Credible Earthquake Magnitude	Mercalli Intensity (*)	Peak Ground Acceleration (g)
Elmore Ranch	1.2	6.6	XI	0.80
Superstition Hills (San Jacinto).	5	6.6	X	0.52
Superstition Mountain (San Jacinto)	8.2	6.6	IX	0.37
San Jacinto Borrego Mtn.	9.9	6.6	IX	0.32
Brawley Seismic Zone	13.7	6.4	IX	0.24
Imperial	19.1	7.0	VIII	0.20
San Andreas-Coachella Valley	19.6	7.1	IX	0.21
San Jacinto - Anza	21	7.2	VIII	0.20
San Jacinto - Coyote Creek	22.6	6.8	VIII	0.17
Elsinore - Coyote Mountain	23.4	6.8	VIII	0.16
Laguna Salada	25	7.0	VIII	0.16

Source: Terraphase, 2019; Appendix I-1.

Ground Rupture: Seismically-induced ground rupture is defined as the physical displacement of surface deposits in response to earthquake-generated seismic waves. Recent ground rupture was not observed on the Project site during previous geotechnical investigations. The potential for seismic activity (and ground rupture) originating on faults within the Project site is considered low due to their small extent and is discussed in more detail below. Ground rupture may occur along faults in the project vicinity; however, this is usually in response to activity along larger regional structures. The earthquakes along the Superstition Hills and Elmore Ranch Faults in November 1987 produced surficial ground rupture along a number of nearby geologic structures, including the Elmore Desert Ranch Fault and several small unnamed faults west and south of the Project site (Terraphase, 2019; Appendix I-1).

Ground Acceleration: Ground acceleration is an estimation of the peak ground motion associated with a specific earthquake event. It is expressed in terms of accelerations as a fraction of the force of gravity at the earth's surface (g). Acceleration can be measured directly from seismic events or calculated from magnitude and fault distance data. Severe or extended ground accelerations can produce a variety of adverse structural effects. Potentially significant adverse effects from ground acceleration would be associated primarily with major earthquakes along regional faults. Large earthquakes along more extensive faults (e.g., the San Andreas Fault Zone) can produce ground accelerations with longer wavelengths and durations than smaller faults, even though the latter structures may be closer and thus generate greater peak acceleration values. Both the wavelength and duration of seismic waves can contribute to the destructive potential of individual earthquake events. The modified peak ground acceleration (PGA) on the Project site is projected as 0.905 g. As shown on **Table 5.4-1**, such an event would likely generate Modified Mercalli intensities of "**X**" or more, potentially resulting in a variety of adverse effects (Terraphase, 2019; Appendix I-1).

The effect of an earthquake on the earth's surface is called the "intensity", the scale of which consists of a series of responses such as people awakening, movement of furniture, damage to chimneys, and finally - total destruction. While numerous intensity scales have been used to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli (MM) Intensity Scale. The Modified Mercalli Intensity value is assigned to a specific site after an earthquake has occurred. As shown on **Table 5.4-2,** the lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of "VIII" or above.

TABLE 5.4-2: MODIFIED MERCALLI INTENSITY SCALE

Intensity	Shaking	Description/Damage
I	Not Felt	Not felt except by a very few under especially favorable conditions
II	Weak	Felt only by a few persons at rest especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of building. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.

TABLE 5.4-2: MODIFIED MERCALLI INTENSITY SCALE

Intensity	Shaking	Description/Damage
V	Moderate	Felt by nearly everyone; many awakened. Some dished, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frighted, Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage grate in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable n specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shipped off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: U.S. Geological Service, 2020.

Liquefaction and Dynamic Settlement: Liquefaction and dynamic settlement of unconsolidated materials can be caused by a strong vibratory motion resulting from seismic activity. Loose, granular soils are most susceptible to those effects, while the stability of silty clay and clay materials is generally not as affected by vibratory motion. Among granular materials, finer textured varieties are more susceptible to liquefaction and settlement than coarse-grained types, and sediments of uniform grain size are more likely to liquefy than well-graded materials. Additionally, liquefaction is generally restricted to saturated or near-saturated materials at depths of less than 50 feet. Although Trench T-401 in Section 27 did exhibit evidence for significant liquefaction and soft soil deformation (Fugro 2019c, Appendix I-4), in general, depth to groundwater o across the Project site is too deep to produce significant liquefaction settlements. The high seismicity of the area will have exposed any loose sand deposits to very many significant shaking events over the past few thousand years. Hence, seismic shakedown, settlements due to compaction of dry sands, is also unlikely.

Landsliding: Seismically-induced landsliding is not considered a significant hazard on the Project site due to the fact the topography is generally level.

Non-seismic geologic hazards include a number of potential physical and chemical effects such as compaction, expansion, erosion, and reactive soils.

Active Faults

A *Geological Data Review and 3D Model* was prepared to identify potentially active faults on the Project site (Fugro, 2018; Appendix I-5). The Project site is located in a tectonically active area, and a number of faults have been identified. Major active faults located to the northwest and southeast of Sections 27 and 33 experienced surficial ground rupture in the 1987 Superstition Hills earthquake. After 1987, no surface rupture was documented in either Sections 27 or 33. Faults discovered at the Project site were judged active on the basis of their displacement of Late Pleistocene to Holocene sediments. In general, faults documented in trenches and washes are considered to be minor faults with small displacements and do not constitute major tectonic elements of the Superstition Hills fault system (Fugro, 2018; Appendix I-5).

Figure 5.4-4 shows the location of all faults in Section 33 whose presence and extent were well supported by field observations of trenches or wash exposures.

Faults 1 through 5 were documented in Trench 1 and excavated for the initial site investigation for Cell 1. The faults were described as steeply dipping to vertical with displacement of bedding of less than two feet. Also present in Trench 1 were a number of fractures and disturbed zones that did not show displacement of beds consistent with faulting. These may have formed as a result of strong ground shaking. The presence of these faults and fractures led to the elimination of this area as a potential site for the DVCM.

Fault 6 was documented in Trench 2; it was also excavated for the initial site investigation. It was the only fault identified in this trench at the time. In 1989, additional trenches constrained the lateral extent of this fault and identified a second parallel fault, Fault 7. In accordance with the Alquist-Priolo Earthquake Fault Zoning Act of 1972 a 200-foot setback from Fault 7 established the western margin of Cells 1 and 2.

Faults 8 and 9 were identified during the fault trenching investigations conducted for the siting of Cell 3. The presence of Fault 9 constrained the western margin of Cell 3. The southern extent of Fault 8 was not investigated.

Fault 10 was identified in an incised wash draining northward along the east side of Section 33. It was not observed in Trench 219 which was located about 250 feet south of the wash exposure. Trenches on the east side of the DVCM did not encounter other faults.

Fault 11 was identified in an incised wash to the southwest of the DVCM, during the initial site selection. The northern and southern extensions of this fault were not visible due to soil cover.

Fault 12 was identified in an incised wash during Fugro's 2018 field mapping. This fault is a one-foot wide zone with several parallel traces, having a 1.4-foot cumulative displacement of the Lake Cahuilla beds. The fault could be traced a short distance across the surface to the south but could not be traced north of the wash due to soil cover.

All faults identified in Section 33 were documented in trench exposures or incised washes. They were recognized on the basis of vertically displaced bedding of generally less than one meter. Evidence to quantify lateral displacement was not present. Some faults could be traced across the ground surface for a limited distance, but generally faults could not be recognized across the surface in Section 33, possibly due to soil cover. In areas trenched extensively for the DVCM, individual faults were laterally discontinuous. There was not enough data exist to establish whether they may continue in an echelon pattern. The relatively small displacements and lack of surficial expression suggest the faults thus far identified are minor faults and do not constitute major tectonic elements of the larger fault system. None were observed to have ruptured in the 1987 Superstition Hills earthquake. Nonetheless, they should be presumed capable of future surface rupture (Fugro, 2018; Appendix I-5).

Geophysical surveys were conducted in January and April 2019 (Fugro 2019d and e, Appendices I-6 and I-7, respectively) and a fault trenching investigation was performed in June 2019 (Fugro 2019c, Appendix I-4) to supplement the 2018 *Geological Data Review and 3D Model*. The purpose of the January and April 2019 geophysical surveys was to scan for the presence of active faults capable of surface rupture within the proposed sites for DVMC Cell 4. The results of the geophysical surveys did not show strong evidence for lateral velocity boundaries indicative of shallow faulting; however, fault trenching was recommended (Fugro 2019d and e, Appendices I-6 and I-7, respectively). The purpose of the fault trenching investigation was to locate and delineate active faults that may constrain site boundaries for the proposed DVCM Cell 4 and to establish regulatory fault setbacks (Fugro, 2019c; Appendix I-4).Thirteen trenches were excavated to screen the Project site in Sections 27 and 33. The trenching targeted the extension of faults that had been identified in previous geologic investigations, were observed during field mapping, and were noted as anomalies in seismic reflection profiles prepared in 2018. No faults were found in the southwest quarter of Section 27. In Section 33, two zones of faulting were delineated. **Figure 5.4-5** shows faults in Section 33 as they are currently understood. A zone of faulting immediately west of Cells 1-3 consisting of multiple north trending fault segments and includes zones of potential faulting along geophysical lines GL-2 and GL-5. A second zone of northwest trending faulting lies to the west. Fault setbacks were delineated at a distance of 200 feet from identified faults (Fugro, 2019c; Appendix I-4).

<u>Seismicity</u>

The Salton Trough is one of the most seismically active regions in the world. Perceptible earthquakes (those registering on the Richter Scale as a magnitude of approximately 3.0 and above) are a regular occurrence and numerous microearthquakes (those registering on the Richter Scale as a magnitude of 2.9 or less) are recorded on a daily basis. The Southern California Earthquake Data Center reports there have been 1,992 perceptible earthquakes within 20 miles of the Project site since 1933, the last one on May 8, 2019 (magnitude 3.48) (Terraphase, 2019; Appendix I-1).

Seismicity in the Salton Trough is generally characterized by two types of activity: mainshock-aftershock sequences (i.e., large-scale seismic events) and earthquake swarms. Earthquake swarms typically consist of a few tens to a few hundred low magnitude events occurring very close together both temporally and geographically. Earthquake swarms are not associated with large seismic events, but often can be attributable to shear stress related to the emplacement of magnetic dikes in areas of crustal extension). There is current evidence to suggest that both large-scale and earthquake swarm activity can occur along the same structure (as demonstrated by events along the Imperial

Fault), although larger earthquakes are normally located on major faults and swarms tend to occur along parallel offset faults associated with inferred areas of crustal extension (Terraphase, 2019; Appendix I-1).

Large-scale seismic events often occur in mainshock-aftershock sequences, with the second earthquake (aftershock event) averaging approximately one magnitude less than the first (mainshock event). From 1933 to 2019, at least 27 earthquakes with Richter magnitudes of 5.0 or greater have occurred within the Salton Trough. The most recent major earthquakes (6.0 or greater in magnitude) in the Salton Trough occurred in November 1987 along the Elmore Desert Ranch and Superstition Hills faults. These events generated magnitudes of 6.2 (11/24/87, Elmore Desert Ranch Fault) and 6.6 (11/24/87, Superstition Hills Fault), located approximately 2 and 5 miles south of the Project site, respectively. It is estimated that these events produced nearby peak ground accelerations of over 0.5 g, with associated Modified Mercalli intensities of VIII or IX. It is anticipated that similar earthquakes would be capable of producing significant effects on the Project site. Because of the proximity and earthquake potential of the Elmore Desert Ranch and Superstition Hills faults, they are considered the most likely source of maximum potential seismic impacts on the project site. A number of other major fault structures are located in the project vicinity and could generate significant seismic effects (Terraphase, 2019, Appendix I-1).

Non-Seismic Hazards

Non-seismic geologic hazards include a number of potential physical and chemical effects such as compaction, expansion, erosion, and reactive soils.

Compaction: Loose, well-graded soils (especially those containing oversize materials) can be subject to compaction and settlement hazards, including differential compaction (i.e., varying degrees of settlement over short distances). The Project site is not susceptible to damage due to differential settlements.

Expansive Soils: Expansive soils are fine-grained soils (generally high-plasticity clays) that can undergo a significant increase in volume with an increase in water content as well as a significant decrease in volume with a decrease in water content. Changes in the water content of highly expansive soils can result in severe distress for structures constructed on or against the soils. Sediments encountered during previous geotechnical investigations contain significant quantities of clay. These materials may exhibit expansive (shrink-swell) characteristics due to the water-holding capacity of clay minerals. Significant shrink-swell behavior can adversely affect the integrity of foundations, fill slopes, and associated structures.

Erosion: Erosional processes in the vicinity of the project site are related primarily to storm runoff and eolian activity. Runoff on the site is largely confined to a number of small ephemeral drainages trending generally northeast-southwest. Channel walls and banks in these washes are subject to erosional impacts during larger storm events due to their often, intensive nature. Some erosional effects may also occur outside of drainage channels as a result of sheet flow runoff. Such impacts would be expected to be minor, however, due to the presence of generally level topography and cohesive surface deposits.

Eolian-generated erosion is associated with the occurrence of seasonally high wind speeds in the project vicinity. Finer grained silt, sand, and clay materials are susceptible to transport and redeposition by high winds, especially if disturbed by grading, vehicular travel, etc.

Reactive Soils: Surficial deposits on the Project site are alkaline in nature and may contain soluble sulfates and chlorides and/or exhibit low resistivity. Soils with these characteristics can produce corrosive effects to subsurface facilities such as steel or concrete foundations and pipelines. No such effects are currently known in the vicinity of the Project site (Terraphase, 2019; Appendix I-1).

Paleontological Setting

Paleontological resources are the fossilized remains of prehistoric plants and animals and the mineralized impressions left as indirect evidence of the form and activity of such organisms. These resources are located within sedimentary rocks or alluvium and considered to be nonrenewable.

The Project site lies within the southern portion of the Salton Trough, a northwesterly-trending tectonic basin located between the Peninsular Ranges on the west and the Chocolate Mountains on the east. The geologic units that underly the Project site include quaternary alluvium (Qa), Lake Cahuilla Beds (Qlc), and Brawley Formation (Qbr). The paleontological sensitivity of the area is depicted on **Figure 5.4-6**, Paleontological Sensitivity, and is described below.

Quaternary Alluvium (Qa)

Much of the ground surface of the western portion of the Salton Trough in Imperial County is covered by a thin veneer of recent sediments of variable thickness (0-20 feet), including aeolian sand (in currently active sand dunes) and alluvial sand and gravel (in modern washes and alluvial fans). In general, these surficial deposits are undeformed by faulting and are probably entirely Holocene in age. Quaternary alluvium typically is not considered to yield significant fossils given the young age of the sediments. These deposits are therefore assigned a “No Potential” paleontological sensitivity rating.

Lake Cahuilla Beds (Qlc)

Lake Cahuilla was a former freshwater lake that periodically occupied a major portion of the Salton Trough during late Pleistocene to Holocene time (approximately 37,000 to 240 years ago), depositing sediments that underlie the entire Project site. Generally, Lake Cahuilla sediments consist of an interbedded sequence of both freshwater lacustrine (lake) and fluvial (river/stream) deposits. There are no SDNHM fossil collection localities from these deposits within a half-mile radius of the Project site. However, paleontological resources of the Lake Cahuilla Beds are considered significant because of the paleoclimatic and paleoecological information they can provide. These deposits are therefore assigned a "High" paleontological sensitivity rating.

Brawley Formation (Qbr)

The early to middle Pleistocene-age (approximately 1.1 to 0.5 million years old) Brawley Formation consists of sediments deposited in freshwater lacustrine, fluvial, and eolian settings, and underlies the southeastern portion of the Project site. While the SDNHM has no recorded fossil localities from the Brawley Formation within a half-mile radius of the Project site, this formation has produced well-preserved shells of freshwater mollusks and diatoms, freshwater vertebrates, and brackish water foraminifers in other locations. This formation is therefore assigned a "High" paleontological sensitivity rating.

5.4.2 Regulatory Setting

Geologic resources and geotechnical hazards are governed by local jurisdictions. The conservation elements and seismic safety elements of city and county general plans contain policies for the protection of geologic features and avoidance of hazards. The California Environmental Quality Act (CEQA) is the major environmental statue that guides the design and construction of projects on non-federal lands in California. This statute sets forth a specific process of environmental impact analysis and public review. In addition, the project proponent must comply with other applicable State and local statutes, regulations and policies. Relevant and potentially relevant statutes, regulations and policies are discussed below.

State

Geology

California Building Code

The California Building Code (CBC) (2019), as contained in Title 24 CCR Part 2, has been adopted by the California Building Standards Commission and other agencies within the State of California, including Imperial County. This Code implements the requirements contained in the 2018 International Building Code and consists of 12 parts that contain administrative regulations of the California Building Standards Commission. Local agencies must ensure that development in their jurisdictions complies with guidelines contained in the CBC. Cities and counties can, however, amend the CBC to adopt more stringent building standards beyond those provided because of unique climatic, geological, or topographical conditions.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 regulates development near active faults, with the specific intention of mitigating the hazard of surface fault rupture on buildings intended for human occupancy. In accordance with this law, the CGS maps active faults and designates

Earthquake Fault Zones along mapped faults. This Act groups faults into categories of active (historic or Holocene-age faults), potentially active (Quaternary-age faults), and inactive (pre-Quaternary age faults).

Local government agencies are mandated by this Act to require site-specific geologic investigations for proposed projects contained within a designated Alquist-Priolo Earthquake Fault Zone area. Such investigations typically include subsurface trenching to determine the presence, or lack of faulting.

Under this Act, the California State Geologist identifies areas in the state that are at risk from surface fault rupture. The main purpose of this Act is to prevent construction of buildings used for human occupancy where traces of active faults are evident on the earth's surface. Fault rupture generally occurs within 50 feet of an active fault line and is limited to the immediate area of the fault zone where the fault breaks along the surface. Such a rupture could potentially displace and/or deform the ground surface. Based on reviews of published maps, the Project site is located within a delineated Earthquake Fault Zone.

Seismic Hazards Mapping Act of 1990

In accordance with Public Resources Code, Chapter 7.8, Division 2, the California Department of Conservation, California Geological Survey (CGS), the State Geologist compiled maps identifying Seismic Hazard Zones. The Seismic Hazards Mapping Act of 1990 addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. The purpose of this Act is to reduce the threat to public health and safety and to minimize the loss of life and property by identifying and mitigating seismic hazards, such as those associated with strong ground shaking, liquefaction, landslides, other ground failures, or other hazards caused by earthquakes.

Cities, counties, and state agencies are directed to use and incorporate site-specific geotechnical hazard investigations and seismic hazard zone maps developed by CGS in their land use planning, as part of their permit approval process. This Act provides a mechanism to identify when provisions beyond standard building codes are necessary to ensure safe development and to reduce future losses.

California Code of Regulations, Title 27

Title 27 of the California Code of Regulations prohibits the construction of a Class II Waste Management Unit within 200 feet of the trace of an active ground-crossing fault. Section 20250 (d) of Title 27 requires that expansions of existing Class II waste management units have a 200-foot setback from any known Holocene fault. Section 20250 (d) of Title 27 also notes that "Other units (that are subject to this section) can be located within 200 feet of a known Holocene fault, provided the RWQCB finds that the Unit's containment structures are capable of withstanding ground accelerations associated with the maximum credible earthquake."

Section 20370 of Title 27 of the California Code of Regulations (Seismic Design) requires Class II Units to be designed to withstand the maximum credible earthquake without damage to the foundation or to the structures which control leachate, surface drainage, erosion, or gas.

Paleontology

California Code of Regulations, Title 14, Division 3, Chapter 1, Sections 4307-4309

These code sections prohibit the removal and destruction of geological features and any object of archaeological or historical interest or value. Section 4309 provides that the Department of Parks and Recreation may grant a permit to remove, treat, disturb, or destroy plants or animals or geological, historical, archaeological, or paleontological materials.

California Environmental Quality Act (CEQA)

CEQA affords paleontological resources explicit protection, specifically in item V(c) of CEQA Guidelines Appendix G, the Environmental Checklist Form, which addresses the potential for adverse impacts to "unique paleontological resource[s] or site[s] or … unique geological feature[s]." This provision covers fossils of significant importance—remains of species or genera new to science, as well as localities that yield fossils significant in their abundance, diversity, preservation, and so forth.

In addition, CEQA provides that generally, a resource shall be considered "historically significant" if it has yielded or may be likely to yield information important in prehistory (PRC Section 15064.5[a][3][D]). Paleontological resources would fall within this category. Sections 5097.5 and 30244 of PRC Chapter 1.7 also define unauthorized removal of fossil resources as a misdemeanor and require mitigation of disturbed sites.

Paleontological resources are classified as nonrenewable scientific resources and are protected by state statute (PRC Section 5097.5). However, neither state nor local agencies have specific jurisdiction over paleontological resources, but all must evaluate potential impacts and provide applicable mitigation measures. State and local agencies do not require a paleontological collecting permit to allow for the recovery of fossil remains discovered as a result of construction-related earthmoving on state or private land in a project site.

Local

Imperial County General Plan Seismic and Public Safety Element

The Imperial County General Plan includes a "Seismic and Public Safety Element." The Seismic and Public Safety Element identifies potential natural and human-induced hazards and provides policy to avoid or minimize the risk associated with hazards. Potential hazards must be addressed in the land use planning process to avoid the unfolding of dangerous situations. The policies and implementation measures in the General Plan applicable to the Project are outlined below.

TABLE 5.4-3 CONSISTENCY WITH GEOLOGY, SOILS, AND SEISMICITY POLICIES OF THE GENERAL PLAN

General Plan Policies	Consistency	Analysis
Seismic and Public Safety Element (SPSE)		
SPSE Goal 1: Include public health and safety considerations in land use planning. • SPSE Objective 1.1: Ensure that data on geological hazards is incorporated into the land use review process, and future development process. • SPSE Objective 1.4: Require, where possessing the authority, that avoidable seismic risks be avoided; and that measures, commensurate with risks, be taken to reduce injury, loss of life, destruction of property, and disruption of service. • SPSE Objective 1.7: Require developers to provide information related to geologic and seismic hazards when siting a proposed project.	Yes	The Project is located in a rural area of Imperial County with very few residences nearby. Public health and safety from seismic considerations would not be affected by implementation of the proposed Project in this area based on its location away from population centers. The proposed Project has prepared a Soils and Geology Report identifying potential geologic hazards. All measures and design specifications identified in the Soils and Geology Report shall be incorporated into and reflected on the Project design and building plans. Therefore, the proposed Project is consistent with this goal.
SPSE Goal 2: Minimize potential hazards to public health, safety, and welfare and prevent the loss of life and damage to health and property resulting from both natural and human-related phenomena. • SPSE Objective 2.2: Reduce risk and damage due to seismic hazards by appropriate regulation. • SPSE Objective 2.5: Minimize injury, loss of life, and damage to property by implementing all state codes where applicable. • SPSE Objective 2.8: Prevent and reduce death, injuries, property damage, and economic and social dislocation resulting from natural hazards including flooding, land subsidence, earthquakes, other geologic phenomena, levee or dam failure, urban and wildland fires and building collapse by appropriate planning and emergency measures.	Yes	The Project will be required to incorporate design parameters and recommendations of the Soils and Geology Report into the final Project design to address seismic and soil conditions. The Soils and Geology Report prepared for the proposed Project utilized information provided by the State Geologist including Alquist-Priolo Earthquake Fault Zone maps and the 2010 Fault Activity Map of California. Therefore, the proposed Project is consistent with this goal.

Source: County of Imperial, nd.

While this Draft EIR analyzes the Project's consistency with the County of Imperial General Plan pursuant to California Environmental Quality Act (CEQA) Guidelines, Section 15125(d), the Imperial County Planning Commission ultimately determines consistency with the General Plan.

5.4.3 Analysis of Project Effects and Significance Determination

Methodology

Geology and Soils

The potential impacts associated with the proposed Project are evaluated on a qualitative and quantitative basis through a comparison of the anticipated Project effects on geologic resources. The technical reports prepared by Terraphase (2019) and Fugro (2018 and 2019a, b, c, d and e) present findings, conclusions, and recommendations concerning the development of the Project site based upon the engineering analysis of geotechnical properties of the site, as discussed above. The change in the land use to expand the monofill would be significant if the effects described below would occur. The evaluation of Project impacts is based on the significance criteria adopted by the Imperial County, which the County has determined to be appropriate criteria for this DEIR.

Paleontological Resources

To evaluate the proposed Project's potential impacts on significant paleontological resources, Chambers Group, Inc. conducted a paleontological literature review and museum records search along with an intensive pedestrian survey of the entire 320-acre area of Section 33. The study area included all of Section 33 plus a half-mile buffer. A detailed review of museum collections was performed by the Department of Paleontology and Paleo Services staff at the SDNHM on May 10, 2019 for the purposes of determining whether there are any known fossil localities in or near the project area, identifying the geologic units present in the project area, and determining the paleontological sensitivity ratings of those geologic units in order to assess potential impacts to nonrenewable paleontological resources. Museum records indicate that no vertebrate fossil localities have been documented within the study area. In addition to the records search, published and unpublished literature and geologic maps were reviewed. As shown on **Figure 5.4-6**, the Project site is underlain by the Brawley Formation (early to middle Pleistocene) and the Lake Cahuilla Beds (late Pleistocene to Holocene).

Guidelines for Determination of Significance

A project would be considered to have a significant impact if it would:

1. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the

area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?

2. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving strong seismic ground shaking?
3. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving seismic-related ground failure, including liquefaction?
4. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury or death involving landslides?
5. Result in substantial soil erosion or the loss of topsoil?
6. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?
7. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?
8. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Impact Analysis

Impact 5.4-1: Substantial adverse effects from the rupture of a known earthquake fault.

The Project site is located within an active seismic region subject to regular earthquake events. Geotechnical investigations of the Project site involved a number of subsurface excavations designed to identify and date potential fault structures on the project site. These investigations documented the presence of multiple active (Holocene) fault traces within Section 33, including several faults that was previously unmapped.

The fault systems are adjacent to the proposed location of the storage/disposal cells. Pursuant to California Code of Regulations requirements, proposed siting of these facilities has been set back 200 feet from the traces of observed faults. Additional subsurface exploration did not identify any evidence of faulting for a distance of over 1,000 feet to the east of the eastern fault system. Thus, no active fault traces are located within 200 feet of the Project site, and no significant effects associated with ground rupture are anticipated.

In addition, the DVC has elected to construct the liner system for the proposed expansion of the Class II Facility to Class I standards. Each cell would include a multi-layer leachate collection and liner system designed and constructed to the standard for Class I Units. The leachate liner and collection layer and a leak detection layer would be installed over a bottom geosynthetic clay liner and a 3-4 ft thick layer of compacted material with a permeability less than 1x10-7 cm/sec. The leachate collection and leak detection layers would slope to a 4-inch PVC collection pipe that would slope downward from the south to north end of the cell. The pipe would run up to the top of the north dike where a pump collection point would be installed to remove leachate if present. A similar leak detection pipe would be installed in the leak detection layer with a pump removal point adjacent to the leachate collection pipe on the north dike for each cell. The leachate or leakage fluid would be pumped to the leachate pond where it would be allowed to evaporate (CalEnergy, 2019, Appendix D). The proposed Project would neither negate nor supersede the requirements of the Alquist-Priolo Earthquake Fault Zoning Act, nor would the project expose people or structures to potentially substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the current Alquist-Priolo Earthquake Fault Zoning Map. In addition, all new development would have to comply with the requirements of the Alquist-Priolo Fault Zoning Act.

Impact 5.4-2: Substantial adverse effects from strong seismic ground shaking.

As discussed under Impact 5.4-1, Southern California has numerous active seismic faults potentially subjecting people to earthquake- and seismic-related hazards. Seismic activity poses two types of potential hazards for people and structures, categorized as either primary or secondary hazards. Primary hazards include ground rupture, ground shaking, ground displacement, subsidence, and uplift from earth movement. Secondary hazards include ground failure (lurch cracking, lateral spreading, and slope failure), liquefaction, water waves (seiches), movement on nearby faults (sympathetic fault movement), dam failure, and fires. These secondary hazards are discussed under Impact 5.4-3, below.

The maximum peak ground acceleration anticipated for the site is 0.905 g. Such an event would be expected to result in a Modified Mercalli intensities of approximately "**X" (See Table 5.4-1)**, which could result in significant damage to sloped embankments and subsurface drainage and liner facilities.

As required by **Mitigation Measure GEO-1** (Reduce Effects of Ground Shaking), the project design will incorporate peak ground acceleration loading values as recommended by the geotechnical consultant to reduce potentially significant impacts to less than significant impact.

Impact 5.4-3: Substantial adverse effects from seismic-related ground failure, including liquefaction.

No significant effects related to liquefaction and dynamic settlement are anticipated for the proposed project facilities due to the depth to groundwater and the seismicity of the Salton Trough. However, in the event that localized loose granular cohesionless materials (e.g., in alluvial washes) are encountered during final design, implementation of **MM GEO-1** will reduce impacts to below a level of significance.

Impact 5.4-4: Substantial adverse effects from landslides.

No significant effects related to seismically-induced landslides are expected from implementation of the proposed Project due to the nature of on-site topography (generally level). The proposed Project does, however, incorporate a number of sloped embankments which are potentially subject to seismically-induced failure. As required under **MM GEO-1**, additional analysis of the Project site will be conducted to evaluate potential impacts associated with repeatable high ground acceleration, localized liquefaction potential, expansive and reactive soils, and wind generated erosion. Project design features derived from these analyses, including, but not limited to incorporating into the Project the appropriate design of fill slopes associated with berms, storage/disposal facilities, building pads, etc., to minimize the potential for seismically-induced landslides will reduce potential impacts to below a level of significance.

Impact 5.4-5: Substantial soil erosion or the loss of topsoil.

The proposed Project may be subject to both fluid and wind erosion impacts. Specifically, the Project site and the associated access roads are crossed by minor drainage channels. Storm runoff in these channels could result in erosion of disturbed areas, road foundations, fill slopes, etc. The proposed project design will incorporate measures to mitigate these potential effects, which may include the use of a protective berm to divert runoff around storage/disposal facilities, excavation of a borrow ditch on the up-slope side of the access road, and/or construction of the road at channel bottom elevation (to avoid the use of culverts or bridges) within crossings. These are discussed in more detail below Further protection at road/drainage crossings will be provided by the use of concrete aprons at the crossing banks and channel bottoms. These measures will be incorporated into final project design. Disturbed areas of the project site may be susceptible to wind erosion impacts as described under existing conditions.

As required under **MM GEO-1,** final project design will incorporate all measures deemed appropriate by the geotechnical engineer on the basis of existing and future site-specific investigations. Additional analysis of the project site will be conducted to evaluate potential impacts associated with repeatable high ground acceleration, localized liquefaction potential, expansive and reactive soils, and wind generated erosion. Mitigation measures derived from these analyses may include the following types of requirements:

- Appropriate design, location, and construction of erosion control methods and devices
- Scarification and recompaction of the native soils in all fill areas to reduce erosion potential
- Identification of appropriate wind erosion mitigation measures (if necessary) such as the use of chemical or physical stabilizers, appropriate operating schedules, etc.

Potentially significant wind erosion impacts would be reduced below a level of significance with implementation **MM AIR-1** which requires the preparation and implementation of dust control plan. Additionally, the air quality control measures in the existing Solid Waste Facility Permit

(No. 13-AA-0022) and the Authority to Construct and Permit to Operate (2120 B-3) described in Section 3.4 of the EIR have been incorporated as a feature of the Project and shall also be implemented to minimize wind generated erosion.

Additionally, the proposed Project would be subject to compliance with the requirements set forth in the National Pollutant Discharge Elimination System (NPDES) Storm Water General Construction Permit (Order No. 2009-0009-DWQ) for construction activities and includes preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) and best management practices (BMPs). The SWPPP would be completed prior to project construction.

Impact 5.4-6: Landslides, lateral spreading, subsidence, liquefaction or collapse.

Potential effects from landslides and liquefaction, which can include excessive settlement, ground rupture and lateral spreading were discussed in Impact 5.4-3 and 5.4-4.

Impact 5.4-7: Substantial risks to life or property due to expansive soil.

The proposed Project may be subject to the effects of expansive soils due to the clayey nature of most surficial materials. However, the proposed Project, a landfill cell, would not be susceptible to differential movement caused by expansive clays. Final project design would incorporate all measures deemed appropriate by the geotechnical engineer on the basis of existing and future site-specific investigations. These could include:

- Use of moisture, chemical, engineering, and/or drainage methods to control expansive behavior of underlying clay soil, if appropriate.
- Use of non-steel or coated (usually polyethylene encasement) conduits, sulfate resistant cement, or other protective materials in areas of corrosive soils.

Impact 5.4-8: Direct or indirect destruction of a unique paleontological resource, site or unique geologic feature.

The Project site is underlain by the Brawley Formation (early to middle Pleistocene) and the Lake Cahuilla Beds (late Pleistocene to Holocene), both of which have a high paleontological sensitivity. The current project area contains an above average potential for paleontological resources. Therefore, any project-related ground disturbances within these formations from the construction of Cell 4A, Cell 4B and/or ancillary facilities could result in an adverse impact to non-renewable fossil resources and impacts are potentially significant. Mitigation Measures **MM PAL-1** through **MM PAL-4** would be required to mitigate impacts. With the implementation of **MM PAL-1** through **MM PAL-4**, impacts under this criterion would be reduced to less than significant.

The operation, closure and post-closure maintenance activities would not result in new ground disturbance and thus would not result in paleontological resource impacts.

5.4.4 Mitigation Measures

The following Mitigation Measures would reduce impacts to below a level of significance.

MM GEO-1: Reduce Effects of Groundshaking

Prior to issuance of construction permits, the design-level geotechnical investigations shall be conducted and shall include site-specific seismic analyses to evaluate ground accelerations for design of project components. Based on these findings, project structure designs shall be modified/strengthened to:

- Comply with all California Code of Regulations, Title 27, and the Regional Water Quality Control Board (RWQCB) and County of Imperial standards regarding the nature, location, and construction of proposed facilities, including, but not limited to Section 20370, which requires all Class II waste disposal facilities to be designed to withstand the maximum credible earthquake (MCE) without damage to the foundation or to the structures which control leachate, surface drainage, or erosion, or gas.
- Incorporate peak ground acceleration loading values of 0.905 g unless a site-specific seismic hazard analysis provides a different value of PGA or modified recommendations are provided by the geotechnical consultant.
- Incorporate all measures deemed appropriate by the geotechnical engineer. Prior to the issuance of building permits, additional analysis of the project site shall be conducted to evaluate potential impacts associated with repeatable high ground acceleration, localized liquefaction potential, expansive and reactive soils, and wind generated erosion. Mitigation measures derived from these analyses may include the following types of requirements:
    - Overexcavation of unsuitable base materials and replacement with approved and properly compacted structural fill;
    - Use of moisture, chemical, engineering, and/or drainage methods to control expansive behavior of underlying clay soil, if appropriate;
    - Use of non-steel or coated (usually polyethylene encasement) conduits, sulfate resistant cement, or other protective materials in areas of corrosive soils;
    - Appropriate design of fill slopes associated with berms, storage/disposal facilities, building pads, etc., to minimize the potential for seismically-induced landsliding. This may include measures such as establishing maximum slope grades and the use of stabilizing materials or buttressing;
    - Proper design of surface and subsurface drainage devices. Initiation of settlement monitoring if appropriate;
    - Appropriate design, location, and construction of erosion control methods and devices;

- Scarification and recompaction of the native soils in all fill areas to reduce erosion potential; and,
- Identification of appropriate wind erosion mitigation measures (if necessary) such as the use of chemical or physical stabilizers, appropriate operating schedules, etc.

Timing/Implementation:	*Prior to approval of final building plans/As part of Project design.*
Enforcement/Monitoring	*Imperial County Department of Planning and Development Service*

MM PAL-1: Retain Qualified Project Paleontologist

Prior to the start of ground disturbance for the construction of Cell 4A and prior to the start of ground disturbance for Cell 4B, a qualified paleontologist shall be retained by the Applicant to serve as Project Paleontologist. The qualifications of the Project Paleontologist shall be submitted to the Imperial County Planning and Development Services Department (ICPDSD) for approval. This individual shall have the following qualifications:

- Professional instruction in a field of paleontology relevant to the work proposed (vertebrate, invertebrate, trace, paleobotany, etc.), obtained through:
  - Formal education resulting in a graduate degree from an accredited institution in paleontology, or in geology, biology, botany, zoology or anthropology if the major emphasis is in paleontology; or
  - Equivalent paleontological training and experience including at least 24 months under the guidance of a professional paleontologist who meets qualification; and
- Demonstrated experience in collecting, analyzing, and reporting paleontological data;
- Demonstrated experience in planning, equipping, staffing, organizing, and supervising crews;
- Demonstrated experience in carrying paleontological projects to completion as evidenced by completion and/or publication of theses, research reports, scientific papers and similar documents.

The Project Paleontologist will serve as the Principal Investigator (PI) and is responsible for the performance of all other personnel. This person is also the contact person for the Applicant and the ICPDSD.

Additional Paleontological Staff – The Project Paleontologist may obtain the services of Paleontological Field Agents, Field Monitors, and Field Assistants, if needed, to assist in mitigation, monitoring, and curation activities.

Timing/Implementation:	*Pre-construction of Cell 4A and Pre-construction of Cell 4B*
Enforcement/Monitoring	*ICPDSD Monitor will verify compliance*

MM PAL-2: Provide Paleontological Environmental Awareness Training

The Applicant will provide worker's environmental awareness training on paleontological resources protection as part of its Worker Environmental Awareness Program (WEAP) required under **Mitigation Measure BIO-5 - Prepare and implement a Worker Environmental Awareness Program**. This training may be administered by the Project Paleontologist as a stand-alone training or included as part of the overall worker's environmental awareness training. At a minimum, the training shall include the following:

- Types of fossils that could occur at the project site;
- Types of lithologies in which the fossils could be preserved;
- Procedures that should be followed in the event of a fossil discovery; and
- Penalties for disturbing paleontological resources.

Timing/Implementation:	*WEAP training shall be provided prior to, and during construction.*
Enforcement/Monitoring	*ICPDSD Monitor will verify compliance*

MM PAL-3: Prepare and Implement a Paleontological Resource Mitigation and Monitoring Plan (PRMMP)

Prior to the start of construction of Cell 4A and 4B, the Applicant shall submit a Paleontological Mitigation and Monitoring Plan (PRMMP) for the Project to the ICPDSD for review and approval. The PRMMP shall be prepared and implemented during the construction of Cell 4A and Cell 4B under the direction of the Project Paleontologist and shall address and incorporate mitigation measures **PAL-1**, **PAL-3** and **PAL-4**. The PRMMP shall be based on Society of Vertebrate Paleontology (SVP) assessment and mitigation guidelines and meet all regulatory requirements. A monitoring plan indicates the avoidance or treatments recommended for the area of the proposed disturbance and must at a minimum address the following:

- Identification and mapping of impact areas of high paleontological sensitivity that will be monitored during construction;
- A coordination strategy to ensure that a qualified paleontologist will conduct monitoring at the appropriate locations at the appropriate intensity;
- The significance criteria to be used to determine which resources will be avoided or recovered for their data potential;
- Procedures for the discovery, recovery, preparation, and analysis of paleontological resources encountered during construction, in accordance with standards for recovery established by the SVP;
- Provisions for verification that the Applicant has an agreement with a recognized museum repository for the disposition of any recovered fossils
- Specifications that all paleontological work undertaken shall be carried out by qualified paleontologists;
- Description of monitoring reports that will be prepared which shall include daily logs, monthly reports, and a final monitoring report with an itemized list of specimens found to be submitted to the ICPDSD, the Applicant and the designated repository within 90 days of the completion of monitoring;
- The implementation sequence and the estimated time frames needed to accomplish all project-related tasks during the ground-disturbance phases; and
- Person(s) expected to perform each of the tasks, and their responsibilities, shall be identified.
- All impact-avoidance measures (such as flagging or fencing) to prohibit or otherwise restrict access to sensitive resource areas that are to be avoided (if any) during ground disturbance/ construction shall be described. Any areas where these measures are to be implemented shall be identified. The description shall address how these measures would be implemented prior to the start of ground disturbance and how long they would be needed to protect the resources from project-related impacts.

Timing/Implementation:	*Pre-construction and Construction Phases*
Reporting Requirements	*Prior to the start of construction of Cell 4A and Cell 4B, the Applicant shall submit a PRMMP to the ICPDSD for review and approval*
Enforcement/Monitoring	*ICPDSD Monitor will verify compliance*

MM PAL-4: Paleontological Monitoring

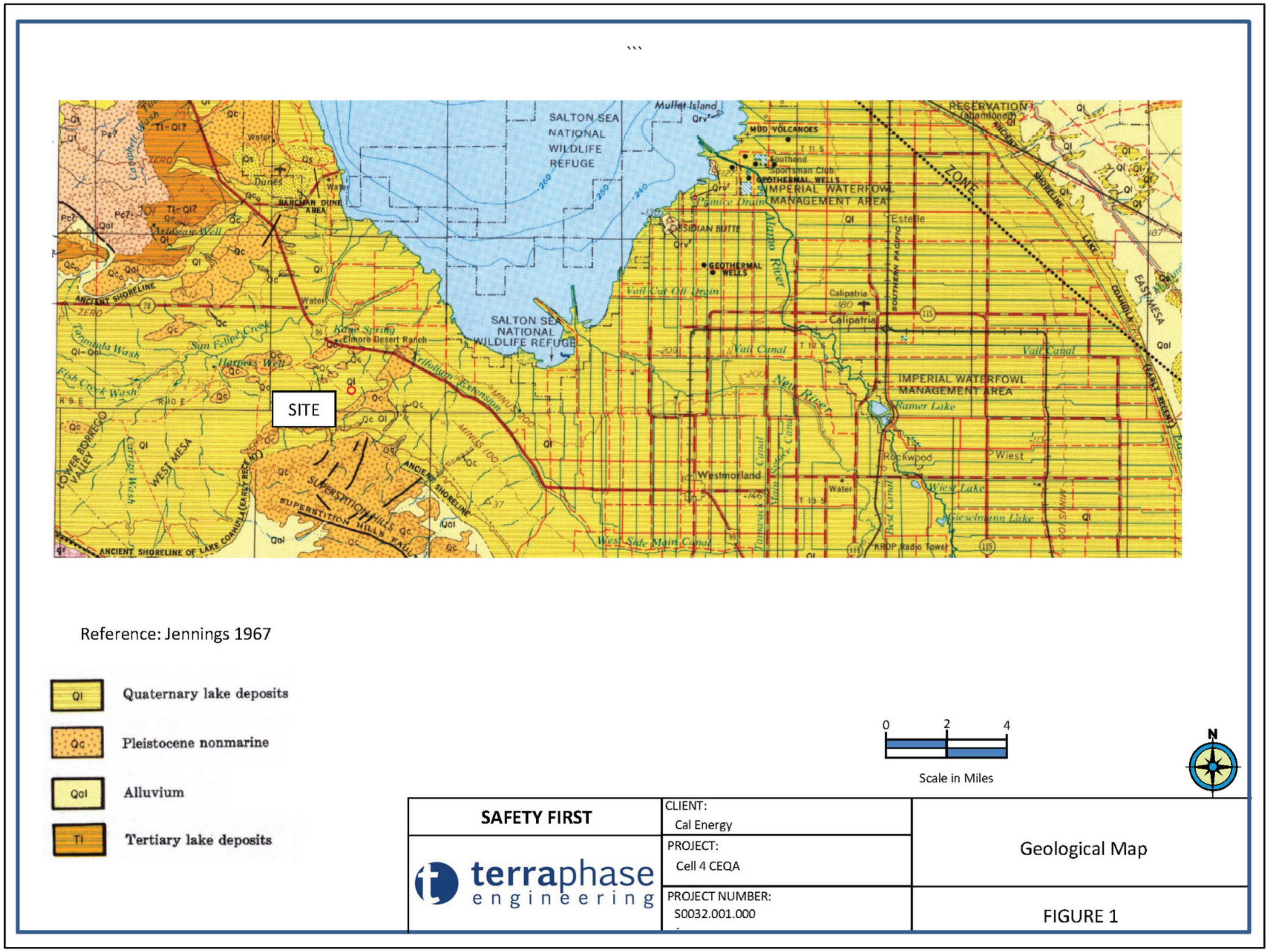
The Applicant shall continuously comply with the following during all ground disturbing activities during the project:

- Areas within the Project work areas with high paleontological sensitivity shall be plotted on the main project map and all ground disturbing activity in these areas shall be monitored on a full-time basis by an ICPDSD approved Paleontological Field Agent who will work under the supervision of the paleontologist and principal investigator.
- The level of effort and intensity for monitoring shall be modified as needed by the Project Paleontologist, based on the sediment types, depths, and distributions observed.
- Project activities shall be diverted when data recovery of significant fossils is warranted, as determined by the Project Paleontologist. Monitoring shall be conducted as follows:
  - Monitoring of ground disturbance shall consist of the surface collection of visible vertebrate and significant invertebrate fossils within the project site. Upon discovery of paleontological resources by paleontologists or construction personnel, work in the immediate area of the find shall be halted and diverted and the Project Paleontologist shall be notified. Once the find has been inspected and a preliminary assessment has been made, the Project Paleontologist will notify the Applicant. The Applicant will notify the ICPDSD of the discovery within 24 hours.
  - Recovered specimens shall be prepared to a point of identification and curated into a repository with retrievable storage.
- All significant fossil specimens recovered from the Project site shall be treated (prepared, identified, curated, and catalogued) in accordance with the designated repository requirements.
  - Samples shall be submitted to a laboratory, acceptable to the designated repository, for identification, dating, and microfossil and pollen analysis.
  - Upon completion of the monitoring efforts,
- Within 90 days of the completion of monitoring effort(s), monitoring reports will be prepared and submitted to the ICPDSD, the Applicant and the designated repository.

Timing/Implementation:	*Construction Phases*
Enforcement/Monitoring	*ICPDSD Monitor will verify compliance*

Level of Significance After Mitigation

Implementation of **MM GEO-1** and **MMs PAL-1** through **PAL-4** would reduce the geological and paleontological resource impacts to a level that is less than significant by ensuring appropriate measures are incorporated into the project design; that resource awareness training is provided to all construction personnel; that proper resource monitoring is conducted; and, that the proper assessment, documentation, and recovery and curation of unique fossils occurs.



SOURCE: Terraphase Engineering, 2019.

Soil Formations
Desert Valley Company Monofill Expansion Project, Cell 4
Figure 5.4-1

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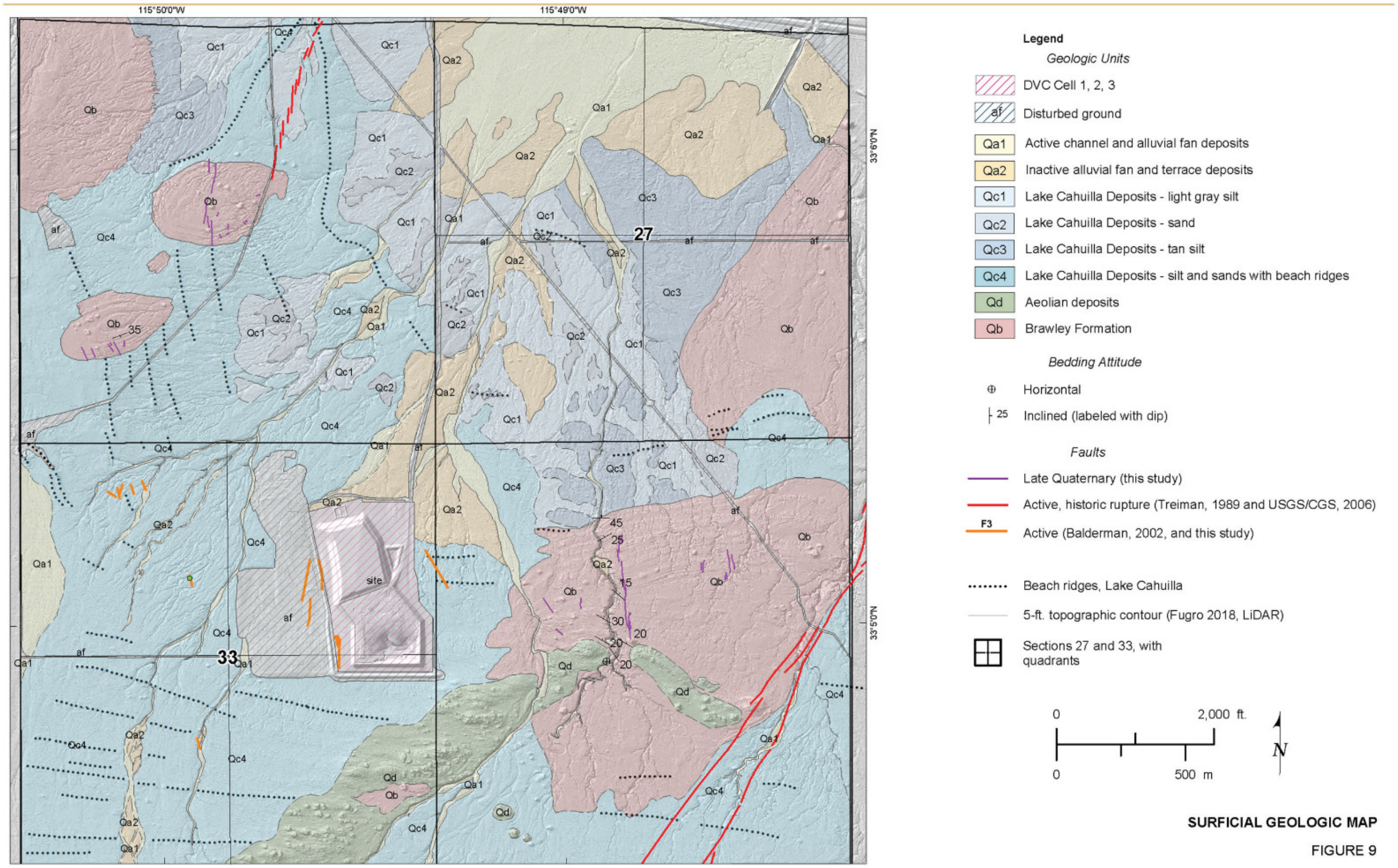

SOURCE: Fugro, 2018.

Brawley Soil Formations

Desert Valley Company Monofill Expansion Project, Cell 4

Figure 5.4-2

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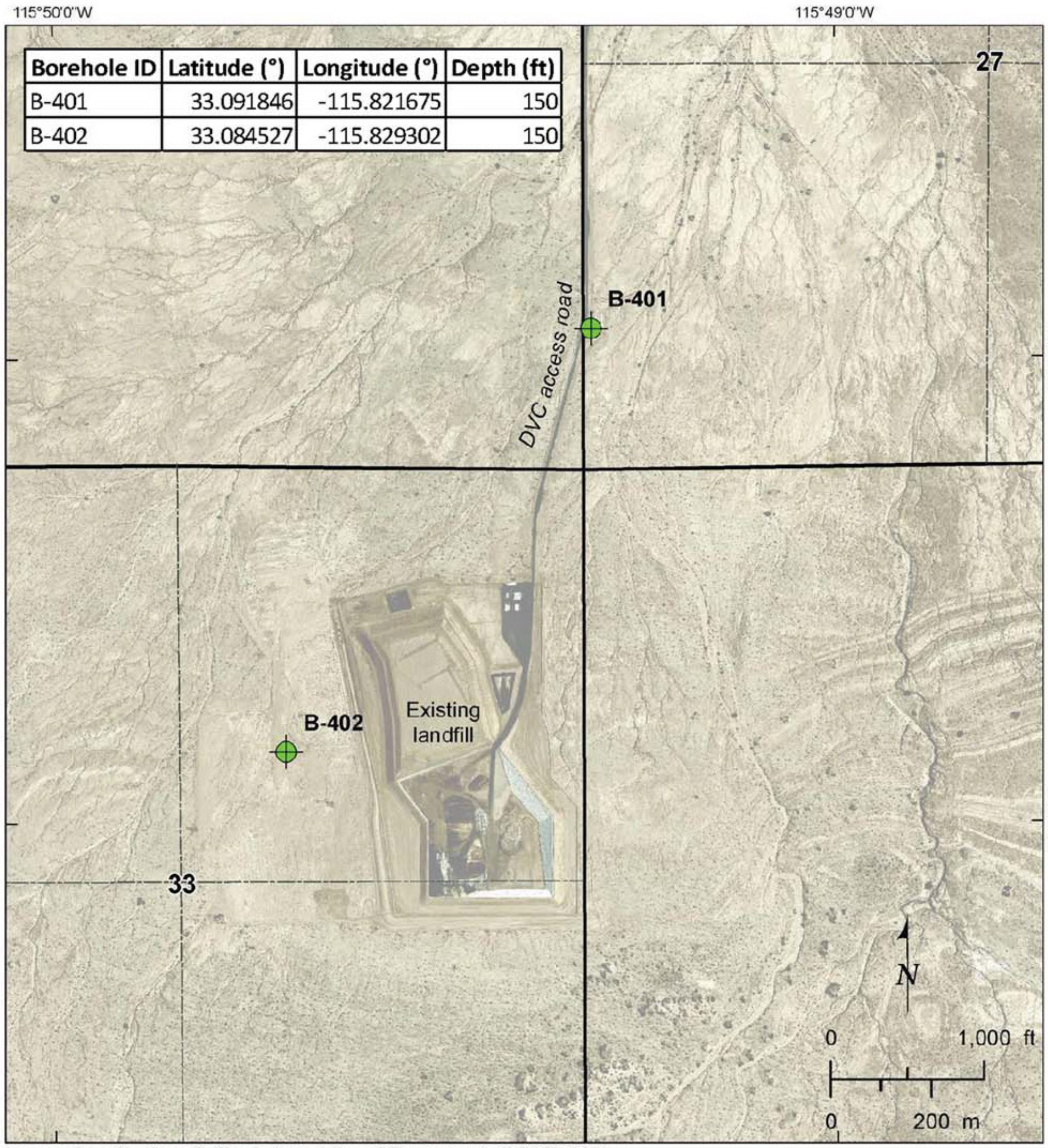

Borehole ID	Latitude (°)	Longitude (°)	Depth (ft)
B-401	33.091846	-115.821675	150
B-402	33.084527	-115.829302	150

Imagery from Southern California Association of Governments (SCAG), 2011.

Legend

Calibration borehole

Sections 27 and 33, with quadrants

Figure 1. Location of Calibration Boreholes

SOURCE: Fugro 2019a.

BRG CONSULTING, INC.

Calibration Soil Boring Locations

Desert Valley Company Monofill Expansion Project, Cell 4

Figure 5.4-3

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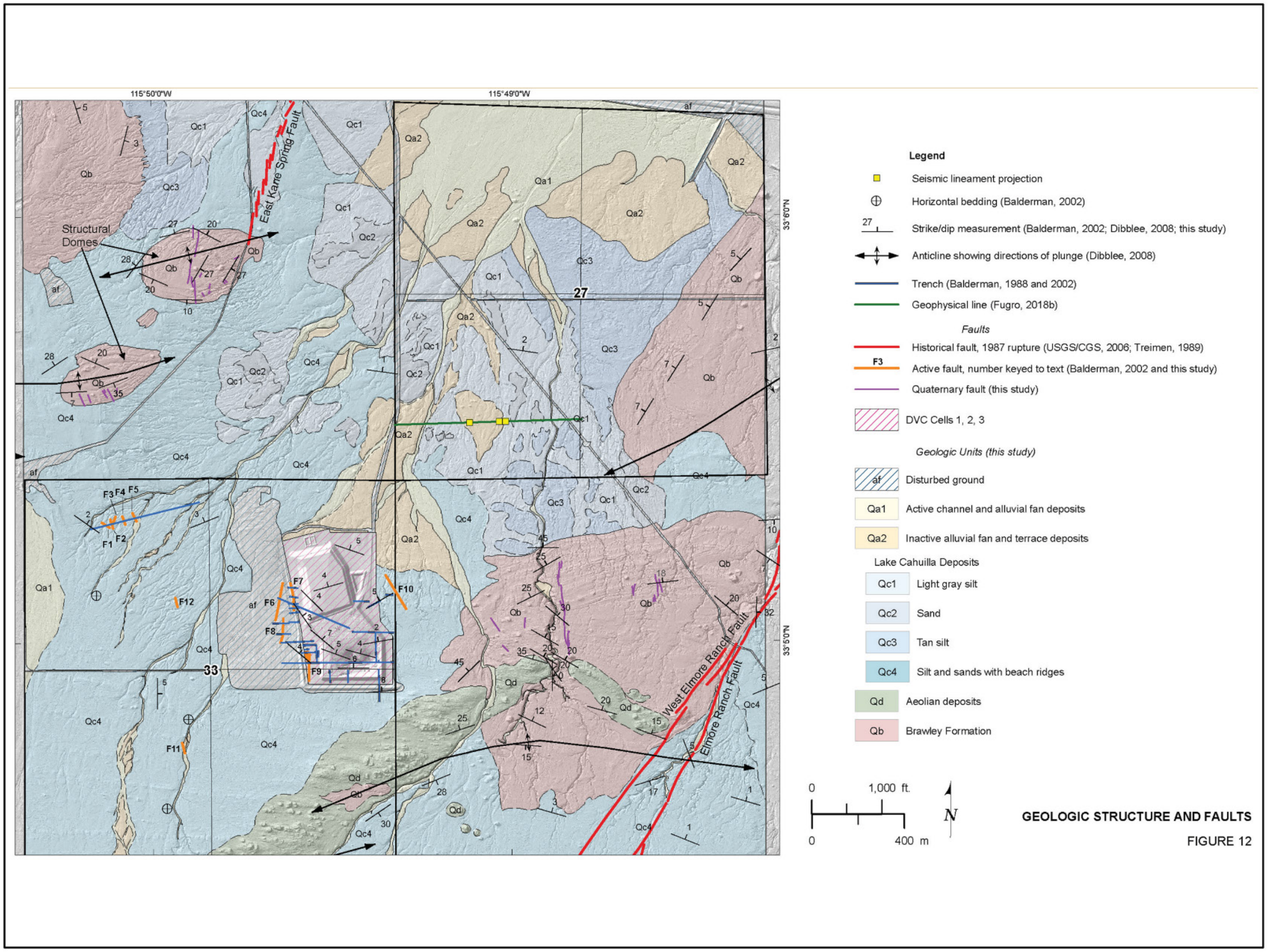

SOURCE: Fugro, 2018.

Previously Identified Faults

Desert Valley Company Monofill Expansion Project, Cell 4

Figure 5.4-4

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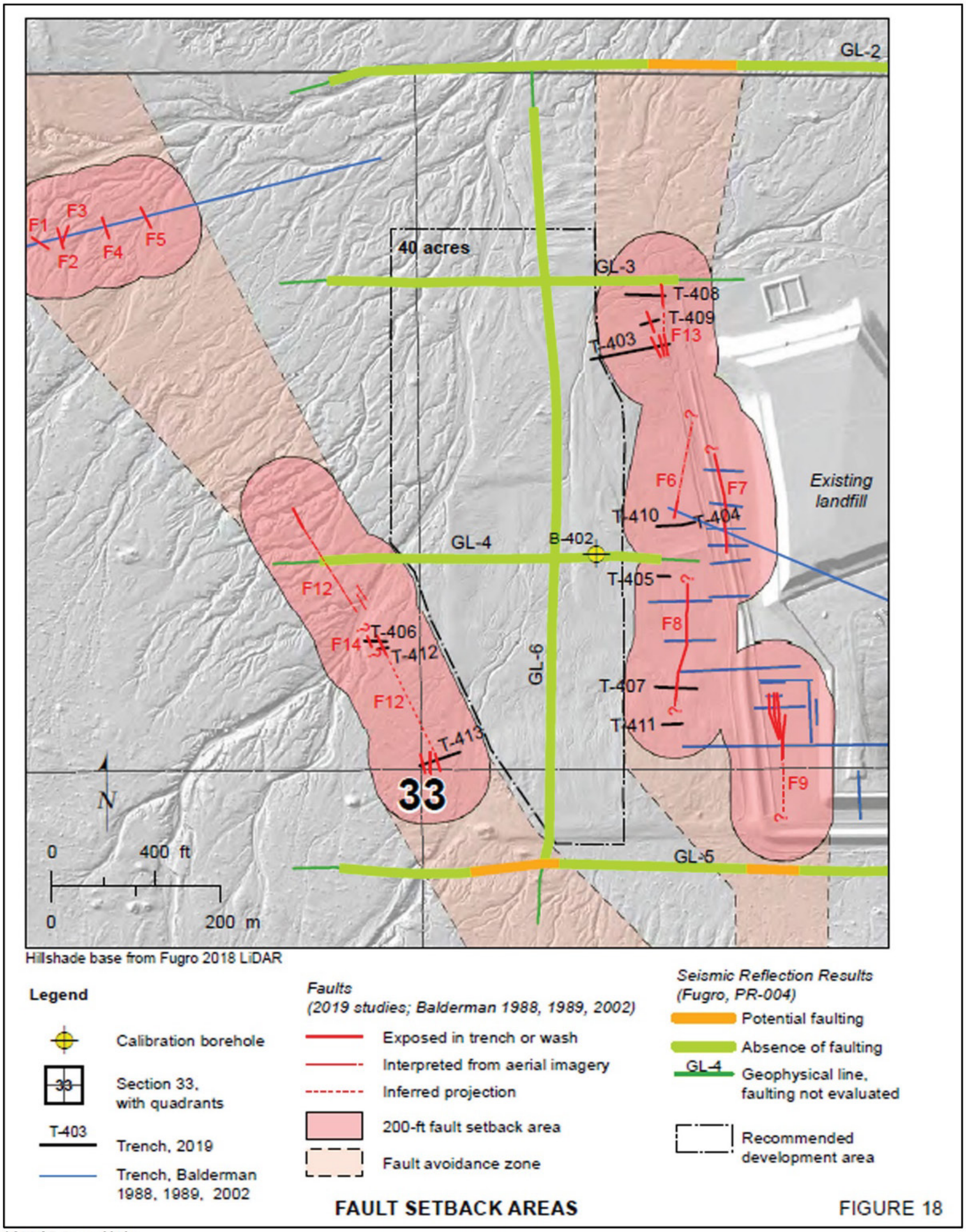

SOURCE: Fugro 2019c.

Faults and Fault Setback Areas

Desert Valley Company Monofill Expansion Project, Cell 4

Figure 5.4-5

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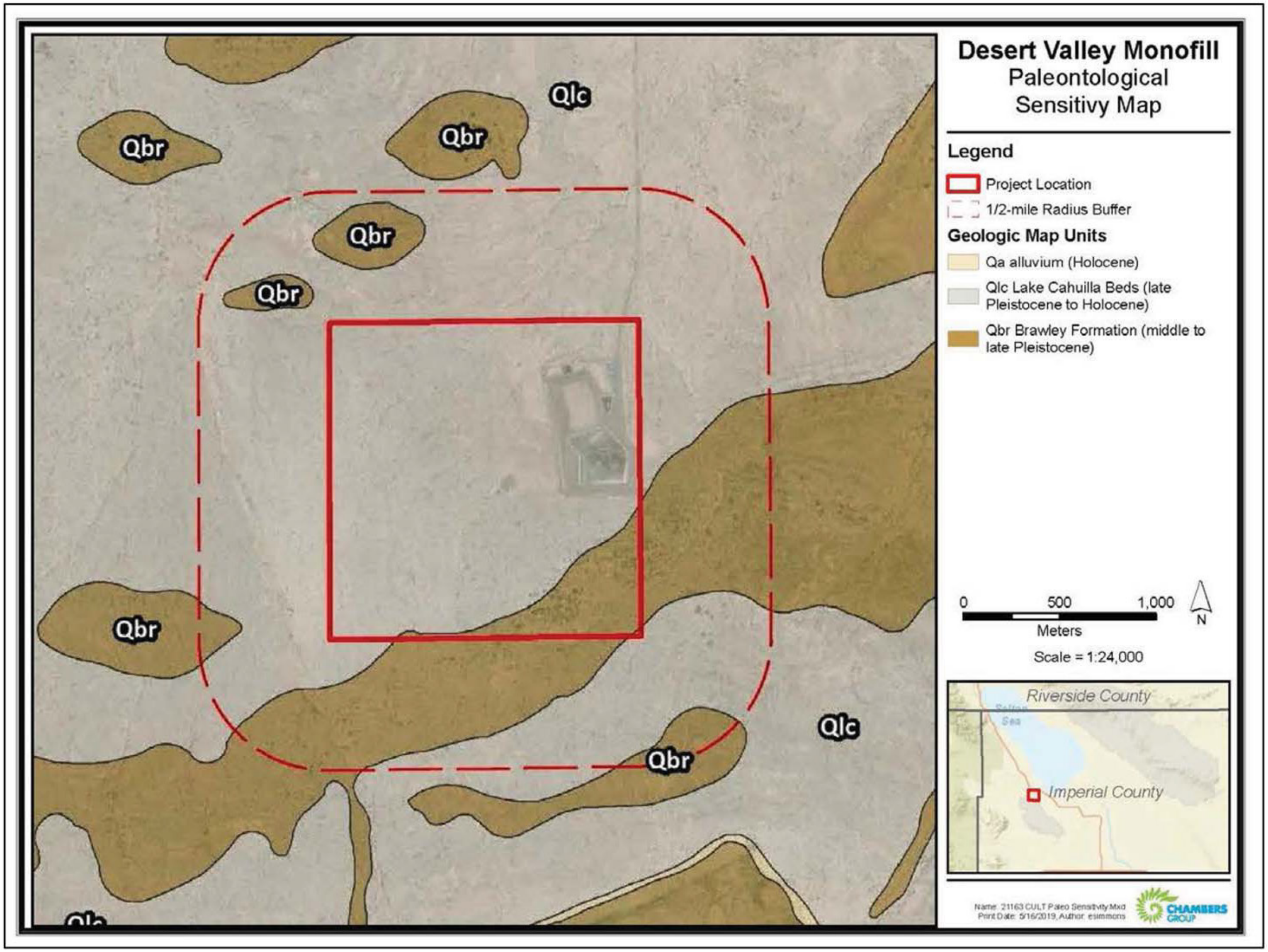

SOURCE: Chambers, 2019.

Paleontological Sensitivity

Desert Valley Company Monofill Expansion Project, Cell 4

Figure 5.4-6

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