SECTION 4.4:
GEOLOGY, SOILS,
AND PALEONTOLOGICAL RESOURCES

THIS PAGE
INTENTIONALLY
LEFT BLANK

SECTION 4.4:
GEOLOGY, SOILS, AND PALEONTOLOGICAL RESOURCES

This section of the subsequent environmental impact report (SEIR) describes the local and regional geologic and paleontological conditions that occur in the vicinity of the project sites. These conditions are described and evaluated to ensure that project activities would not adversely affect significant paleontological resources.

The information in this section is based primarily on the following technical study prepared to support the 2019 SEIS:

- *Paleontological Technical Study United States Gypsum Company Expansion/Modernization Project,* Paleo Solutions, Inc., May 15, 2018 (see Appendix F, "Paleontological Technical Study")

4.4.1 Environmental Setting

4.4.1.1 Geology, Seismicity and Soils

The Quarry and site of proposed Well No. 3 and associated pipeline alignment are in western Imperial County within the Colorado Desert, which lies at relatively low elevations, in some places below sea level. This region is characterized by a series of low-lying mountains associated with the Peninsular Range, opening up to the Imperial Valley and Salton Trough to the east. The geology in the area of the Quarry consists primarily of nearly pure beds of Miocene-age gypsum. The gypsum beds are part of a conformable sequence consisting of Miocene non-marine Split Mountain Formation (also referred to as the Split Mountain Group), Fish Creek Gypsum, and Pliocene marine Imperial Formation (also referred to as the Imperial Group), which are unconformably underlain by Mesozoic intrusive igneous rocks.

There are three major fault zones in the vicinity of the Quarry and site of proposed Well No. 3 and associated pipeline: (1) the San Andreas fault zone to the northeast, which runs along the east side of the Salton Sea; (2) the San Jacinto fault zone which traverses western Imperial County through the Peninsular Ranges and into the Borrego Valley and West Mesa, and (3) the Elsinore fault zone to the southwest. The Coyote Creek fault, which runs through Ocotillo Wells and skirts the Fish Mountains east of the Quarry, is associated with the San Jacinto fault zone. The Quarry is located between the San Jacinto and Elsinore fault zones.

No significant changes in the regional or local geology of the project area have occurred since the 2008 EIR/EIS was prepared.

4.4.1.2 Paleontological Resources

Paleontological Sensitivity Rating

Paleontological sensitivity is a qualitative assessment based on the paleontological potential of the stratigraphic units present, the local geology and geomorphology, and other factors relevant to fossil preservation and potential yield.

The BLM assigns geologic units a Potential Fossil Yield Classification (PFYC) class based on the probability and abundance of known vertebrate fossils and scientifically significant invertebrate and plant fossils. The PFYC scheme ranges from very low (PFYC 1) to very high (PFYC 5) depending on the potential fossil yield:

- *PFYC Class 1:* Very Low. Geologic units that are not likely to contain recognizable fossil remains.
  - Units that are igneous or metamorphic, excluding reworked volcanic ash units.
  - Units that are Precambrian in age or older.
- *PFYC Class 2:* Low. Sedimentary geologic units that are not likely to contain vertebrate fossil remains or scientifically significant invertebrate fossils.
  - Vertebrate or significant invertebrate or plant fossils are not present or are very rare.
  - Units that are generally younger than 10,000 years before present.
  - Recent aeolian deposits.
  - Sediments that exhibit significant physical and chemical changes.
- *PFYC Class 3:* Moderate. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.
  - Often marine in origin with sporadic known occurrences of vertebrate fossils.
  - Vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently.
  - Predictability known to be low, but is somewhat higher for common fossils.
- *PFYC Class 4:* High. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources in many cases.
- *PFYC Class 5:* Very High. Highly fossiliferous geologic units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation.

Unknown fossil potential (PFYC U) is assigned to geologic units that do not have a clear PFYC assignment. Typically, paleontological resource compliance is required for earthwork occurring within PFYC classes 3, 4, 5, or U rock units.

Paleontological Sensitivity of the Project Site

Geologic mapping indicates that the area of the Quarry, Well No. 3, and associated pipeline is underlain by Mesozoic-age or older, undivided intrusive igneous rocks (gr); Miocene-age Split Mountain Group Red Rock Formation (Tsr), and Elephant Trees Formation (Tse); Pliocene- to Miocene-age Fish Creek Gypsum (Tfc); Pliocene- to Miocene-age Imperial Group, Latrania Formation (Til), and undivided (Ti); Pleistocene- to Pliocene-age Palm Spring Group, undivided (QTp); Holocene-age Lake Cahuilla beds (Qlc); Holocene-age alluvial terrace deposits (Qt); and Holocene-age alluvium, undivided (Qa) (Paleo Solutions 2018).

According to the 2018 Paleontological Technical Study (Appendix F), the Miocene-age Split Mountain Group, Red Rock Formation (Tsr) and Elephant Trees Formation (Tse); Pliocene- to Miocene-age Imperial Group, Latrania Formation (Til) and undivided (Ti); Pleistocene- to Pliocene-age Palm Spring Group, undivided (QTp); and Holocene-age Lake Cahuilla beds (Qlc) have PFYC classes of 3, 4, and U indicating moderate to high or unknown potential to contain paleontological resources. The Fish Creek Gypsum (Tfc), alluvial terrace deposits (Qt), alluvium (undivided) (Qa), artificial fill, and previously disturbed sediments have lower PFYC classes and are unlikely to contain significant fossil vertebrate remains (Paleo Solutions 2018). Figures

4.4-1a and 4.4-1b, "Geologic Map with Paleontological Sensitivity," show the PFYC classes within and surrounding the project site.

4.4.2 Regulatory Setting

The following sections discuss federal, state, and local regulations pertaining to geology and soils.

4.4.2.1 Federal

Paleontological Resources Preservation Act

Paleontological Resources Preservation Act (PRPA) was signed into law on March 30, 2009 (Public Law 111-11, Title VI, Subtitle D; 16 U.S.C. §§ 470aaa—470aaa11). PRPA directs the Department of Agriculture (U.S. Forest Service) and the Department of the Interior (National Park Service, BLM, Bureau of Reclamation, and Fish and Wildlife Service) to implement comprehensive paleontological resource management programs. With passage of the PPRA, Congress officially recognizes the importance of paleontological resources on federal lands by declaring that fossils from federal lands are federal property that must be preserved and protected using scientific principles and expertise. The PRPA provides: 1) uniform definitions for "paleontological resources" and "casual collecting"; 2) uniform minimum requirements for paleontological resource use permit issuance; 3) uniform criminal and civil penalties for illegal sale and transport, and theft and vandalism of fossils from federal lands; and 4) uniform requirements for curation of federal fossils in approved repositories.

4.4.2.2 State

California Environmental Quality Act

Paleontological resources are afforded protection by environmental legislation set forth under CEQA. Appendix G (part V) of the CEQA Guidelines provides guidance relative to significant impacts on paleontological resources, indicating that a project will have a significant impact on paleontological resources if it will disturb or destroy a unique paleontological resource or site or unique geologic feature.

California Public Resources Code, Section 5097.5

This law protects historic, archaeological, and paleontological resources on public lands within California and establishes criminal and civil penalties for violations. Specifically, PRC Section 5097.5 states:

"(a) No person shall knowingly and willfully excavate upon, or remove, destroy, injure or deface any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands. Violation of this section is a misdemeanor. (b) As used in this section, "public lands" means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof."

California Penal Code, Section 622.5

California Penal Code, Section 622.5 sets the penalties for damage, destruction, or removal of paleontological resources on private and public land.

4.4.2.3 Local

Imperial County General Plan

The goals, objectives, and policies in the *Imperial County General Plan* are intended to inform decision makers, the general public, public agencies, and those doing business in the County of the County's position on land use-related issues and to provide guidance for day-to-day decision-making. The Conservation and Open Space Element does not provide any policies or requirements for paleontological resources. However, the following policy regarding unique geologic features is provided:

Conservation and Open Space Element

Goal 4: The County will identify and protect geologic, soil, aggregate, and mineral resources for extraction while minimizing the effect of mining on surrounding land uses and other environmental resources.

Objective 4.5: Preserve significant geologic features such as rock outcroppings, the Algodones Dunes, Imperial Sand Dunes, Salton Buttes, and Shell Beds in Yuha Basin.

San Diego County General Plan

The goals and policies of the *San Diego County General Plan* provide direction to future growth and development in the county. The following goals and policies from the *San Diego County General Plan Conservation Element* relate to air quality and apply to proposed actions at the Viking Ranch Restoration Site and Old Kane Springs Road Preservation Site, located in unincorporated San Diego County.

Conservation and Open Space Element

Goal COS-9: Educational and Scientific Uses. Paleontological resources and unique geologic features conserved for educational and/or scientific purposes.

Policy COS-9.1: Preservation. Require the salvage and preservation of unique paleontological resources when exposed to the elements during excavation or grading activities or other development processes.

Policy COS-9.2: Impacts of Development. Require development to minimize impacts to unique geological features from human related destruction, damage, or loss.

4.4.3 Significance Thresholds and Analysis Methodology

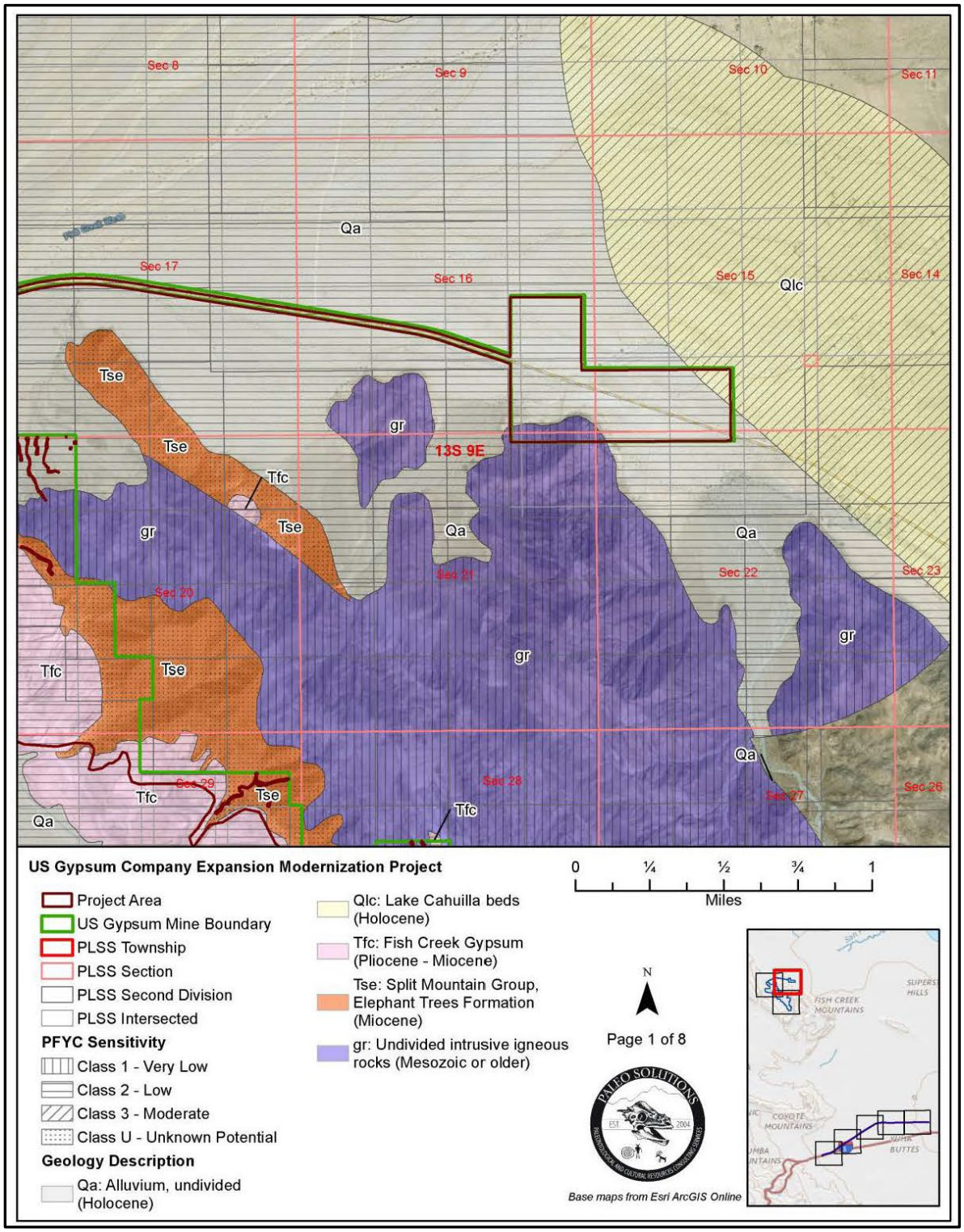
4.4.3.1 Significance Criteria

2008 EIR/EIS Significance Criteria

The 2008 EIR/EIS evaluated the project's air quality impacts using the following significance criteria:

The proposed project would have a significant geologic impact if it would result in the following:

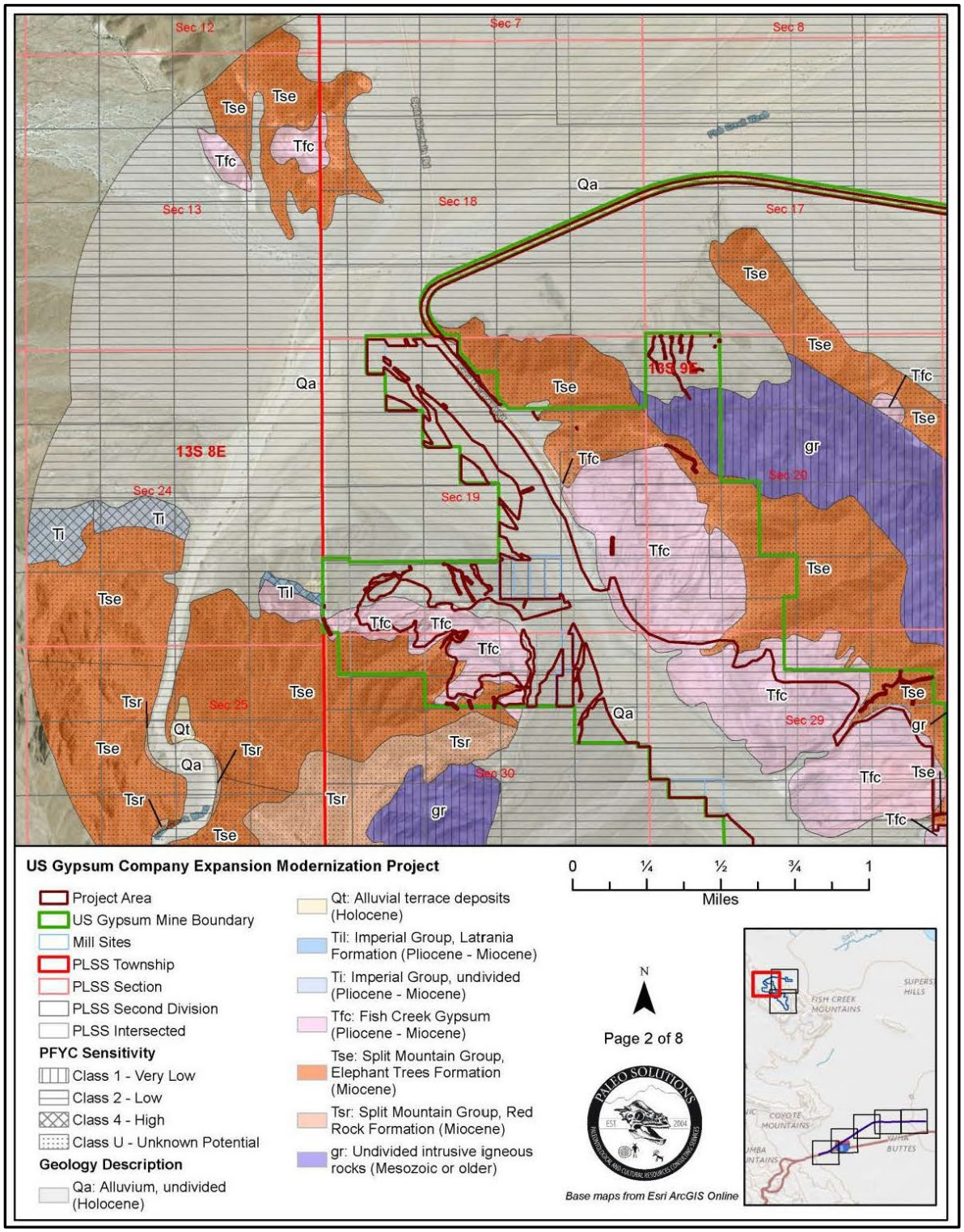
- Create a substantial geologic hazard, which could affect workers or other persons in the Project are or substantially damage structures; or
- Substantially restrict the future ability to utilize paleontological resources.



SOURCE: PaleoSolutions 2018; Figure A-1
NOTE: Image has been altered by Benchmark Resources and is not printed to scale.

Figure 4.4-1a
Geologic Map with Paleontological Sensitivity

THIS PAGE
INTENTIONALLY
LEFT BLANK



SOURCE: PaleoSolutions 2018; Figure A-2
NOTE: Image has been altered by Benchmark Resources and is not printed to scale.

Figure 4.4-1b
Geologic Map with Paleontological Sensitivity

THIS PAGE
INTENTIONALLY
LEFT BLANK

CEQA Appendix G Significance Criteria

Based on Appendix G of the CEQA Guidelines, the proposed project would have a significant impact to geology and soils if it would:

a) directly or indirectly cause potential substantial adverse effects, involving the risk of loss, injury, or death involving;
   - rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zone Map issued by the State Geologist for the area or based on other substantial evidence of known fault (Refer to Division of Mines and Geology Special Publication 42),
   - strong seismic ground shaking,
   - seismic-related ground failure, including liquefaction, or
   - landslides;

b) result in substantial soil erosion or the loss of topsoil;

c) 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;

d) 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 the life or property;

e) 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; or

f) directly or indirectly destroy a unique paleontological resource or site or unique geological feature.

As discussed in Section 4.4.4.1, "2008 EIR/EIS Impacts Analysis," below, under "Significance Determination," the Initial Study (Appendix A-1) determined that the project would not result in any potentially significant impacts for checklist items a through e for both the project site and the off-site mitigation sites. Therefore, these topics are not evaluated further in this SEIR.

4.4.3.2 Analysis Methodology

The 2008 EIR/EIS concluded that Quarry expansion and development of Well No. 3 would have no potential to encounter or destroy paleontological resources. However, the proposed water pipeline alignment was not evaluated for the presence of paleontological resources at that time. A Paleontological Technical Study prepared by Paleo Solutions dated May 15, 2018, updated the previous work with current data reviews, and included more areas including the pipeline alignment. The report is included as Appendix F to this SEIR and is summarized herein.

Because the report was prepared to support the SEIS, it was prepared according to BLM standards using the BLM system for rating the potential for presence of paleontological resources. As described previously, the BLM system assigns geologic units a Potential Fossil Yield Classification (PFYC) class based on the probability and abundance of fossils ranging from very low (PFYC 1) to very high (PFYC 5). Typically, paleontological resource compliance is required for earthwork occurring within PFYC classes 3, 4, 5, or U rock units. The BLM identified that portions of the project area are underlain by geologic formations assigned to a class of PFYC 3, 4, and U.

4.4.4 Project Impacts and Mitigation Measures

4.4.4.1 2008 EIR/EIS Impact Analysis

The 2008 EIR/EIS concluded that the expanded Quarry would not be subject to substantial risk of deep-seated landslides, rockfalls, or surficial instability based on the characteristics of the gypsum deposit, which is nearly pure, with no weak clay or silt intercalations observed in natural or mined exposures. However, the 2008 EIR/EIS did indicate that reclaimed slopes could be subject to significant slope instability due to the proximity of the Coyote Creek branch of the San Jacinto fault and the relatively long period of exposure expected for reclaimed quarry slopes. To ensure long-term slope stability within the Quarry, the following mitigation measures were included:

> ***Mitigation Measure 3.2-1a****: Reclaimed cut slopes in the alluvial materials (map units Qya and Qoa) should be constructed no steeper than 1.75H:1V up to a maximum height of 100 feet.*
>
> ***Mitigation Measure 3.2-1b****: Reclaimed cut slopes in the gypsum (map unit Tfc) should be no steeper than 1H:1V up to a maximum height of approximately 225 feet.*
>
> ***Mitigation Measure 3.2-1c****: Any large, unstable, rounded boulders on reclaimed slopes steeper than approximately 2H:1V should be removed or stabilized prior to the end of reclamation.*

The 2008 EIR/IES did not identify any potentially significant geologic, soil, or seismic impacts that would result from development of proposed Well No. 3 and associated pipeline.

The 2008 EIR/EIS also determined that impacts to paleontological resources from the USG Expansion/Modernization Project would be less than significant and no mitigation was required. This determination was supported by the fact that the formations with higher likelihood of the presence of fossils are located below the formation that is being mined at the Quarry. Thus, proposed activities would not extend into fossil-bearing formations.

4.4.4.2 2019 SEIS Impact Analysis

The 2019 SEIS further evaluated the proposed project under the National Environmental Policy Act (NEPA) based on an updated paleontological technical study and provided the following additional mitigation measure to address potential impacts to paleontological resources at the site of proposed Well No. 3 and along the associated pipeline alignment.

> ***Mitigation Measure 3.2-3:*** *Once the pipeline alignment is located and staked, a pre-construction pedestrian field survey is recommended in order to locate any surficial fossil localities and verify the geologic units underlying the area associated with the Proposed Action. For any areas where potential resources cannot be avoided by the pipeline construction, a Paleontological Resources Monitoring and Mitigation Plan (PRMMP) should be prepared and implemented by a BLM-permitted paleontologist and approved by the BLM and Imperial County.*

4.4.4.3 Substantial Project Changes

Project Revisions

The proposed Quarry expansion, and the proposed Well No. 3 and associated pipeline, are substantially in the same location and same configuration as the features that were evaluated in the 2008 EIR/EIS. Therefore, any minor revisions would not create a new or increase a significant impact related to geology, soils, or paleontological resources. However, the restoration of the Viking Ranch site and preservation of the Old Kane Springs Road site are proposed in response to mitigation required by the 2019 SEIS, and these are new actions under the proposed project.

Changed Circumstances

The primary change in circumstance related to geology, soils, and paleontological resources was that the Paleontological Resources Preservation Act (PRPA) was signed into law on March 30, 2009 (Public Law 111-11, Title VI, Subtitle D; 16 U.S.C. §§ 470aaa—470aaa11). The PRPA provides: 1) uniform definitions for "paleontological resources" and "casual collecting"; 2) uniform minimum requirements for paleontological resource use permit issuance; 3) uniform criminal and civil penalties for illegal sale and transport, and theft and vandalism of fossils from federal lands; and 4) uniform requirements for curation of federal fossils in approved repositories.

New Information

There is no new information related to the potential for unstable geologic or soils conditions to occur at the Quarry. The Quarry is inspected and monitored annually in accordance with Imperial County and Division of Mine Reclamation requirements. Slopes are evaluated for gross and surficial stability under both static and seismic conditions. In addition to conducting quantitative analyses, the slopes are visually evaluated by a qualified geologist for erosion, over-excavation, and signs of adverse geologic conditions. The annual inspection reports were reviewed as part of the 2019 SEIS. No change in conditions that could alter the findings of the 2008 EIR/EIS were noted.

As described previously, a Paleontological Technical Study (Appendix F) was completed as part of the 2019 SEIS (Paleo Solutions, Inc. 2018) which identifies geologic formations underlying the Quarry, well site, and associated pipeline alignment which have high potential for containing paleontological resources. Based on the results of the Paleontological Technical Study, the 2019 SEIS recommended implementation of Mitigation Measure 3.2-3 to address potential impacts to paleontological resources at Well No. 3 and the associated pipeline alignment.

Significance Determination

The Initial Study prepared for the project (Appendix A-1) determined that with respect to the Quarry expansion and development of Well No. 3 and associated pipeline, each of the geology, soils, and seismic impacts (checklist questions [a] through [e]) would be below the applicable significance thresholds and that no additional analysis of this portion of the proposed project is required. This was based on the finding that the proposed project would not result in a new significant geology or soils impact or a substantial increase in the severity of a previously identified significant impact caused by substantial changes proposed in the project, substantial changes with respect to project circumstances, or new information of substantial importance that was not known and could not have been known with the exercise of reasonable diligence at the time the 2008 EIR/EIS was adopted.

As preservation of the Old Kane Springs Road site and restoration of the Viking Ranch site are newly proposed actions, the Initial Study (Appendix A-1) provided further evaluation of the potential geologic, seismic, and soils impacts (checklist questions [a] through [e]) at these sites and determined each to be below the applicable significance threshold. This was based on the fact that no ground disturbing activities are proposed at the Old Kane Springs Road site and proposed activities at the Viking Ranch site would be limited to grading, would be subject to existing regulations ensuring worker safety and minimizing soil erosion, and would not expose anyone to geologic or seismic hazards as no development is proposed. These issues are not evaluated further in this SEIR.

Regarding paleontological resources (checklist question [f]), new information available in the 2019 SEIS indicates the potential for paleontological resources to be encountered at the Well No. 3 site and along the associated pipeline alignment. In addition, potential disturbance of paleontological resources at the Viking Ranch site has not previously been evaluated. No ground disturbing activities are proposed at the Old Kane Springs Road Preservation Site and there would be no potential to destroy paleontological resources or unique geologic features at that site.

Based on project revisions, changed circumstances, and new information that may create a new or increased significant impact, the County has amplified and augmented the analysis contained in the 2008 EIR/EIS pertaining to paleontological resources. This evaluation is provided in the following impact analysis.

4.4.4.4 Subsequent Environmental Analysis

Impact 4.4-1: Directly or Indirectly Destroy a Unique Paleontological Resource or Site or Unique Geological Feature

According to the 2008 EIR/EIS, the geologic units at the Quarry are not expected to contain significant paleontological resources due to their nature and origin. Paleontological surveys were recommended in the areas of the proposed Well No. 3 and associated pipeline alignment, but these surveys were not performed prior to certification of the 2008 EIR/EIS.

The Paleontological Technical Study (Paleo Solutions 2018; Appendix F) prepared for the 2019 SEIS determined that the Quarry, well site, and proposed pipeline alignment are mostly underlain by geologic units with very low or low paleontological potential (PFYC classes 1 and 2). Areas of high paleontological potential (PFYC classes 3 and 4) lie within a mile of the west and southwest portions of the Quarry boundary. However, project ground disturbing activities at the Quarry operation would only be associated with the mining of gypsum and would not extend into the boulder conglomeration formation. Therefore, the proposed project would not be expected to affect any significant paleontological resources within the Quarry.

One segment of the proposed pipeline alignment intersects with mapped higher-potential deposits. Excavations, grading, and other earthmoving activities can result in significant adverse effects to paleontological resources in geologic units determined to have a moderate to high potential for fossil yield. Consistent with the recommendations of the 2018 technical study, Mitigation Measure 4.4-1 would minimize this potential impact by requiring completion of pre-construction paleontological surveys, by requiring preparation of a plan for monitoring and worker training, and in the event of a discovery, for the implementation of recovery, analysis, curation, and notification protocols.

The Viking Ranch Restoration Site has not been evaluated for paleontological resources sensitivity. The site has been subject to extensive ground disturbance through its use as an orchard resulting in a low potential for presence of significant undiscovered paleontological resources. Regardless, implementation of Mitigation Measure 4.4-1 requiring a pre-construction paleontological survey and resource management plan would reduce this potential impact to a less than significant level.

No ground disturbing activities are proposed at the Old Kane Springs Road Preservation Site and there would be no potential to destroy paleontological resources at that site.

Level of Significance Before Mitigation: Potentially significant.

Mitigation Measures: *Implement the following newly proposed mitigation measure:*

Mitigation Measure 4.4-1: *Pre-construction pedestrian field surveys shall be conducted throughout the proposed areas of disturbance for the Well No. 3 site, the final pipeline alignment, and the Viking Ranch site to locate any surficial fossil localities and verify the underlying geologic units. For any areas where potential resources cannot be avoided by proposed construction activities, a Paleontological Resources Monitoring and Mitigation Plan (PRMMP) shall be prepared and implemented by a BLM-permitted paleontologist and approved by the BLM and Imperial County.*

Level of Significance After Mitigation: Less than significant.

THIS PAGE
INTENTIONALLY
LEFT BLANK