CARMELITA PROJECT

GEOLOGY AND SOILS

ENVIRONMENTAL ASSESSMENT

JULY | 2010

Lead Agency
Fresno County, Public Works and Planning

Operator
Carmelita Resources, LLC

Applicant
Colony Land Company, L.P.

BENCHMARK RESOURCES

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Lead Agency
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GEOLOGY AND SOILS ENVIRONMENTAL ASSESSMENT

This Geology and Soils Environmental Assessment describes the local and regional geologic, soils, and seismic conditions that occur in the vicinity of the Project site. These conditions are described and evaluated to ensure that the Project facilities or personnel would not be significantly affected by seismic hazards such as ground rupture or ground shaking due to seismic activity; and that pit slopes would not be impacted by physical hazards such as ground shaking or landslides. Additionally, a discussion of the mineral resources to be extracted from the site is included in this section.

1.0 METHODOLOGY AND TERMINOLOGY

Preparation of this section was based on the review of various geologic reports, review of applicable laws and regulations, publications (including the Mineral Resource Classification report [CGS, 1999a]), and maps of eastern Fresno County region and the Project site. Additionally, the Applicant completed its own geologic drilling investigation and prepared a report for the slope design, entitled Reclamation Slope Stability Evaluation (Golder 2009). This report is attached to this Environmental Assessment as Appendix A.

2.0 EXISTING CONDITIONS

2.1 Regional Setting

California geology is separated into 11 general geomorphic provinces or regions. Fresno County is primarily located in the Great Valley and Sierra Nevada Geomorphic Provinces.

The Great Valley Province is a broad alluvial plan, extending from the northern part of the Sacramento Valley to the southern part of the San Joaquin Valley. This Province is approximately 50 miles wide and 400 miles in length. The County is located within the San Joaquin Valley section of this Province. The western portion of the County extends through this Province to the eastern section of the Ranges Geomorphic Province (CGS 2002a).

The Great Valley Province is a trough in which sedimentation has been occurring since the Jurassic Period (about 208 to 144 million years ago). However, most of the sedimentation in the Great Valley Province occurred in the Cenozoic Era (beginning 65 million years ago). Sediments in the San Joaquin Valley are generally of two types. The upper sediments range from the recent Holocene Epoch to Oligocene Epoch (37 to 24 million years ago). The lower sediments are composed of marine rocks of the Pliocene Epoch (5.3 to 1.6 million years ago) to Eocene Epoch (58 to 37 million years ago) (CGS 2002b). These sediments average approximately 2,400 feet in thickness in the Great Valley Province. However, the deepest deposits occurring in the San Joaquin Valley can be more than 9,000 feet thick in portions of the Tulare Basin, which is partly located in Fresno County (USGS 2005).

The Sierra Nevada Geomorphic Province parallels the western side of the Great Valley Geomorphic Province and is a tilted fault block formed by historical tectonic plate action. This province is also approximately 400 miles long. The eastern portion of the County extends into this Province.

The eastern side of the Sierra Nevada Province is characterized by high, rugged scarp, while the western side tends to have gentler slopes, averaging about two degrees. Deep river canyons along the western slope cut this Province. Many of these rivers have formed large alluvial fans as they leave the mountainous area of the Sierra Nevada Province and enter the flat, level terrain of the Great Valley Province. The most notable in the Fresno County region are the alluvial fans of the San Joaquin River and the Kings River.

The upper granites of the Sierra Nevada Mountains have been scoured by glacial activity. Most of the granitic rocks of this Province are Mesozoic Era (approximately 248 to 65 million years ago). These granitic rocks are partially caped by Cenozoic Era, Tertiary Period (between 65 to 1.6 million years ago) volcanic material (CGS 2002b).

2.2 Local Geology

The Project site is located approximately 2 miles southeast of the Kings River and encompasses an area of about 5 square miles at the base of the western side of the Sierra Nevada Mountain Range (see Figure 1, Regional Geology Map). The Sierra Nevada Mountain Range is a northwest/southeast-trending structural block that slopes gently to the west and dips steeply on its eastern flanks. Intrusive igneous rocks (i.e. granite, tonalite, monzonite, and granodiorite) are the dominant rock types that compose the range.

On the western margin of the Sierra Nevada foothills, the rock types differ. Extending east of the field area from Bear Mountain, Dalton Mountain, and Bald Mountain, northeastward through Hog Mountain to Owens Mountain, the rock types are metamorphic in origin. The mountains mentioned consist mainly of serpentine, metagabbro, and hornfels, which are metavolcanic and metasedimentary in origin (see Figure 1).

In the geologic past, the deposition environment in and around the field area was influenced by periods of glacial and interglacial episodes that occurred during the span of the Pleistocene Epoch (approximately 1.8 million years ago to 11,550 years ago). During periods of glaciation, high cycles of aggradation occurred, and interglacial periods produced cycles of erosion or low aggradation. Large accumulations of material formed a broad alluvial fan that opened westward and merged with other alluvial fans to form a part of the western portion of the Great Valley Sequence. The Great Valley Sequence includes stream channel deposits, fan deposits, and basin deposits.

The Project site is located in the eastern portion of Fresno County. This area is a general transition zone between the Great Valley Geologic Province and the Sierra Nevada Geologic Province (see Figure 1).

The Kings River flows from northeast to southwest, in relationship to the location of the Project site. Most of the Kings River area near the Project site is part of a large alluvial fan. The majority of the material in this alluvial fan was the result of Pleistocene Epoch glaciation cycling (1.6 million to 11,000 years ago) in the Sierra Nevada Mountain range.

As a result, most of the rock materials in the fan are composed of granitic materials, although finer sediments composed of various amounts of sands, silts, and clays are present in the alluvium.

The Kings River alluvial fan has a tear-drop shape and starts in the Avocado Lake and Holland Creek area, north of the Project site. The alluvial fan extends to an arc of the current Kings River, near Vino and Frantz Avenues. The fan is approximately 13 miles long and about 6 miles in breadth at its widest section. The City of Sanger, the Town of Centerville, Newmark Avenue, Flume Avenue, and Trimmer Springs Road border the alluvial fan on the western side of the fan. Frankwood Avenue, Campbell Mountain, Jesse Morrow Mountain and Tivy Valley border the eastern portion of the fan.

2.3 Asbestos

The name "asbestos" is a generic term given to a number of minerals used in commercial products. Minerals that generally contain asbestos-containing materials belong in two mineral groups – serpentine (chrysotile) and amphibole (crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos) (USGS 2001).

Asbestos has been identified in 20 states, including California. For California, the main asbestos mineral of concern is serpentine, an apple-green to black rock often with light and dark colored areas, but tremolite- and actinolite-bearing rocks have also been identified in several counties. Serpentine rocks have been found in 44 of the 58 California counties, extending from the southern to the northern Coastal Ranges, the Klamath Mountains, and in the Sierra Nevada foothills (CGS 2000). Of recent concern have been deposits of serpentine, tremolite, and actinolite rock in Plumas, El Dorado, and Sacramento counties. Not all serpentine rocks contain asbestos. However, because serpentine rocks often contain at least some asbestos, natural deposits of these rocks are of concern to public health agencies.

Possible asbestos-bearing rocks have been found in most counties along the coast and inland from Los Angeles County to the Oregon border, including Fresno County. The only identified rocks by the California Geological Survery (CGS) containing possible asbestos materials in Fresno County is a deposit north of the Pine Flat Dam in the Granite Ridge area. This location is approximately 13 miles northeast of the Project site. The CGS identified locations of possible asbestos-bearing rocks in California is provided in Figure 2, Areas More Likely to Contain Naturally Occurring Asbestos.

2.4 Seismic and Other Hazards

Geologic hazards include earthquake-induced hazards (e.g., ground shaking, surface fault ruptures, and soil liquefaction), slope instability, ground subsidence, soil erosion, and volcanic events.

2.4.1 Seismicity

The Project site is in a relatively earthquake-free zone. The area has not been identified as being within an Alquist-Priolo Earthquake Fault Zone. The Uniform Building Code (UBC) has designated this area as a Seismic Zone 3. Zone 3 areas can experience major damage from an earthquake. Due to the number of faults throughout California, almost all of the state falls within a Seismic Zone 3 or 4.

The only identified significant fault near the Project site is the Clovis Fault. This fault is approximately 5 to 6 miles east of the City of Clovis. The Clovis Fault is believed to have been active during the Quaternary Period (past 1.6 million years), but there is no historical evidence of recent age activity in this fault. Consequently, this fault is classified as “potentially active.” It is believed that this fault runs along the foothills of the Sierra Nevada Mountains from an area near the San Joaquin River to north of the Town of Centerville.

2.4.2 Surface Fault Rupture and Ground Shaking

In 1973, five counties (Fresno, Kings, Madera, Mariposa, and Tulare) undertook the preparation of the *Five County Seismic Safety Element* to assess seismic hazards in the region. This study concluded that if a Maximum Credible Earthquake (MCE) occurred along the San Andreas Fault, “relatively low levels of shaking should be expected in the eastern and central parts of the valley.” Additionally, this study concluded that a major seismic event on the Owens Valley Fault would have a low level surface amplification on the western side of the Sierra Nevada Mountains due to granitic rock structure of this mountain range (Tulare County 2004).

The Clovis Fault is located to the north of the Project site. Because this fault is considered “potentially active”, surface faulting is considered possible along the fault line. However, since the fault does not pass through the Project site and historical records of the fault’s activity are unknown, the risk of surface faulting and strong ground shaking at the Project site is considered to be minimal.

2.4.3 Liquefaction

Liquefaction is a phenomenon in which saturated soils lose strength and cohesion when subjected to dynamic forces, such as shaking during an earthquake. Liquefaction can also occur in unsaturated soils with low cohesion, such as sand. Ground failure resulting from liquefaction can include sand boils, ground settlement, ground cracking, lateral spreading, slope toe failure, and ground warping.

Geologic conditions at the site consisting of a mix of alluvial sources, gravels and cobbles, are not prone to liquefaction. This is principally due to the lack of a known seismically active area as well as the absence of unconsolidated, saturated, clay-free sands and silts at the site. Additionally, areas of liquefaction have not been identified on the Project site.

2.4.4 Tsunami and Seiche

A tsunami is an ocean water wave or series of waves generated by a sudden displacement of the ocean surface or other deep body of water. Given the proximity of the Project site to the nearest ocean, the Pacific Ocean, the risk of a tsunami affecting the site is remote.

A seiche is a periodic oscillation or "sloshing" of water in an enclosed basin (e.g., lake or reservoir) caused by an earthquake. This sloshing is similar to water movement in a bathtub (e.g., as you move, so does the water in the bathtub move). The period of oscillation is dependent upon the size and configuration of the water body and may range from minutes to hours. As a result, seiches have a potential to damage dams, levees, or shoreline structures such as residential dwellings, boat docks, or recreational facilities.

The nearest large enclosed water body to the Project site is Avocado Lake, approximately 7 miles northeast of the Project site. However, this lake is a small water body and would not be subject to strong oscillations during an earthquake event. Therefore, the risk of seiches affecting the Project site is insignificant.

2.4.5 Subsidence

Soil subsidence (the lowering of the ground surface caused by such factors as compaction or a decrease in groundwater) can result from both natural and man-made phenomena. Natural phenomena that may induce subsidence include seismically induced settlement (liquefaction); soil consolidation; oxidation or dewatering of organic-rich soils; and collapse of subsurface cavities. Man-made activities such as withdrawing subsurface fluids through the pumping of groundwater may help induce subsidence by decreasing pore pressure.

Geologic conditions at the site, consisting of a mix of alluvial sources, gravels and cobbles, are not prone to subsidence due to the lack of a seismically active area and the absence of unconsolidated, saturated, clay-free sands and silts.

2.4.6 Landslides

Landslides, rock falls, and debris flows are all forms of mass wasting, the movement of soils and rock under the influence of gravity. A landslide may occur if source material on a slope is triggered by some mechanism. Source materials include fractured and weathered bedrock and loose soils. Triggering mechanisms include earthquakes, saturation from rainfall, and erosion.

The *Five County Seismic Safety Element* identified four landslide risk categories. Areas of "no risk" were identified as flatlands, valley bottoms, and "areas of minimal topographic relief." Areas of "low risk" were identified as those along "hillside and mountains terrain of competent igneous and metamorphic rocks and sedimentary rocks with favorable bedding and composition." The "moderate risk" category includes "dip slopes (natural slopes parallel to bedding in sedimentary rocks), complexly folded metamorphic rocks, and zones of fractured rock." The "high risk" locations were those that consist of weak, landslide-prone rocks and existing or historical landslide locations. Therefore, landslide hazards within the County are locations along foothills and mountainous terrain, steep banks along rivers, and passes through valley floors (Tulare County 2004).

The Project site consists of lands with less than 0.3 percent slope grade, and is therefore not subject to landslides.

2.4.7 Erosion

Erosion is the wearing away and removal of soils and/or rocks by natural forces. The main natural erosion forces are rainfall, wind, percolation of water that slowly dissolves rock (water is known as the universal solvent; because given time, it will eventually dissolve or wear any rock or other surface materials), or landslides.

Erosion of the surface caused by rainwater is known as sheet-wash. Sheet-wash is described as water flowing across land picking up particles of soil or organic materials and carrying them away. Additionally, rainwater flows can cause rilling, which is when runoff water forms shallow broad channels across an area. Both sheet-wash and rilling leave patches of deposited soil material as a result of decreasing water velocity that can result from diminishing land gradient or from slackening rainwater. Wind erosion picks up small soil particles or bounces or rolls large particles along the land surface. Wind erosion is most serious when the soil is bare and exposed to strong wind.

Although all of these erosion processes are natural, human activity can often multiply the frequency and size of the erosion event. Human activities that can increase erosion include:

- Reducing the rate by which water can enter the soil (e.g., covering the land with impervious surfaces such as houses, roads, and shopping centers), and thereby, promote rapid runoff and greater erosive power of the water;
- Making drainage systems which concentrate runoff without controlling flow;
- Using poor agricultural practices such as overgrazing and cutting furrows down slope rather than with the natural contour of the land; and/or
- Excavating an area, which removes the vegetation and leaves the soil exposed to erosive factors.

While removal of soil for construction and mining operations could potentially cause increased erosion of topsoil at the site, the borders of the mineral area will remain vegetated, thus reducing the potential for erosion. Additionally, the Project site consists of lands with less than 0.3 percent slope grade, and is therefore not prone to erosion.

2.5 Soils

Soils in the eastern part of Fresno County consist of younger alluvium, consolidated older alluvium, and hard rock. Most of the younger alluvium soils in eastern Fresno County have been washed down from the Sierra Nevada Mountains by rivers, streams, and creeks. Consequently, most of these younger alluvium materials are of granitic base. The older alluviums are generally composed of sedimentary materials from historical lake beds.

The Carmelita site is encompassed largely by three major soil types: Hanford fine sandy loam, Grangeville fine sandy loam, and Tujunga sand. Soil series are described in Figure 3, Soils Map, and summarized below.

Soil Delineations and Map Unit Descriptions

Identified soil types are shown on Figure 3. Soil boundaries are approximate, based on the location and soils observed in the soil profiles described and field observations along the traverse lines. The following soil types are included within the boundaries of the Carmelita Project:

Map Unit – Hanford Series

These soils are very deep, well drained soils that formed in moderately coarse textured alluvium dominantly from granite. Hanford soils are on stream bottoms, floodplains and alluvial fans and have slopes of 0 to 15 percent.

Map Unit – He

This soil has gentle slopes ranging from 0 to 2 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are well drained with an available water holding capacity of approximately 2 to 6 inches/hour.

Map Unit – Hm

This soil has gentle slopes ranging from 0 to 2 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are well drained with an available water holding capacity of approximately 2 to 6 inches/hour.

Map Unit – Hn

This soil has gentle slopes ranging from 0 to 2 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are well drained with an available water holding capacity of approximately 2 to 6 inches/hour.

Map Unit – Grangeville Series

These soils are very deep, somewhat poorly drained soils that formed in moderate coarse textured alluvium dominantly from granitic rock sources. Grangeville soils are on alluvial fans and floodplains and have slopes ranging from 0 to 2 percent.

Map Unit – Gf

This soil has gentle slopes ranging from 0 to 2 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are poorly drained with an available water holding capacity of approximately 2 to 6 inches/hour.

Map Unit – Gl

This soil has gentle slopes ranging from 0 to 2 percent, and is more than 24 to 48 inches in depth to restrictive features (e.g., bedrock). These soils are poorly drained with an available water holding capacity of approximately 2 to 6 inches/hour.

Map Unit – Gp

This soil has gentle slopes ranging from 0 to 2 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are poorly drained with an available water holding capacity of approximately 2 to 6 inches/hour.

Map Unit – Tujunga Series

These soils are very deep, somewhat excessively drained soils formed in alluvium weathered mostly from granitic sources. Tujunga soils are on alluvial fans and flood plains and have slopes of 0 to 9 percent.

Map Unit – TzaA

This soil has gentle slopes ranging from 0 to 3 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are excessively drained with an available water holding capacity of approximately 6 to 20 inches/hour.

Map Unit – TzbA

This soil has gentle slopes ranging from 0 to 3 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are excessively drained with an available water holding capacity of approximately 6 to 20 inches/hour.

Map Unit – TzcA

This soil has gentle slopes ranging from 0 to 3 percent, and is more than 20 to 40 inches in depth to restrictive features (e.g., bedrock). These soils are excessively drained with an available water holding capacity of approximately 6 to 20 inches/hour.

Map Unit – TzdA

This soil has gentle slopes ranging from 0 to 3 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are excessively drained with an available water holding capacity of approximately 6 to 20 inches/hour.

Map Unit – TzeB

This soil has gentle slopes ranging from 0 to 9 percent, and is more than 80 inches of depth to restrictive features (e.g., bedrock). These soils are excessively drained with an available water holding capacity of approximately 6 to 20 inches/hour.

2.6 Mineral Resources

SMARA requires the State Geologist to classify land into Mineral Resource Zones (MRZs). These land classifications are based on the mineral potential of the area and do not consider the current or proposed land uses within the region.

Due to the concerns regarding the availability of aggregate resources in the Fresno County area to meet current and future demands, the CGS examined the availability of aggregate resources in the region. The CGS findings were presented in a report entitled, Update of Mineral Land Classification: Aggregate Materials in the Fresno Production-Consumption Region, California (CGS 1999a). The CGS report identified two main aggregate resource areas within the County: the San Joaquin River Resource Area and the Kings River Resource Area. The San Joaquin River Resource Area contains MRZ-1 and MRZ-2 deposits, while the Kings River Resource Area contains entirely MRZ-2 deposits. Although the CGS findings identified the western side of the County as being in a MRZ-1, further evaluation of this area was not presented in their assessment. Additionally, the CGS identified the remaining area surveyed as being in a MRZ-3 location. A description of these MRZ classifications is given as follows:

- **MRZ-1:** Areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence.
- **MRZ-2:** Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- **MRZ-3:** Areas containing mineral deposits, the significance of which cannot be evaluated from available data.

The San Joaquin River Resource Area is located along the northern county line of Fresno and Madera Counties. This resource area is part of the alluvial materials from the San Joaquin River and covers an estimated 4,271 acres (CGS 1999a). The CGS has identified aggregate resources in this area as being MRZ-1 and MRZ–2. This resource area extends from the Lost Lake Recreation Area to the Riverside Municipal Golf Course, a distance of approximately 15 miles. The San Joaquin River Resource Area averages about 0.5 miles along its width. This resource area generally follows the historical floodplain of the San Joaquin River.

The Kings River Resource Area is an alluvial fan that underlies the Project site. This resource area covers an estimated 16,380 acres (CGS 1999a), including the 1,500 acres of the Carmelita Project site. A map of the Kings River Resource Area alluvial fan is provided in Figure 4, Site and Kings River Mineral Resource Zone. The Kings River Resource Area is designated by the CGS as a MRZ-2.

In 2006, the CGS updated aggregate demand and supply calculations for the 31 aggregate study areas in the state and these calculations revealed that the Fresno Production-Consumption region had less than 10 years of permitted aggregate resources remaining (CGS 2006). A Production-Consumption (P-C) region is one or more aggregate production districts (a group of producing aggregate mines) and the market area they serve (CGS 2006). As of 2006, the Fresno P-C Region had 71 million tons of permitted aggregate resources, a 27 percent reduction in permitted aggregate resources from five years earlier. Additionally, with only enough permitted aggregate resources to meet 11 percent of the Fresno P-C Region's 50-year aggregate demand of 629 million tons, CGS estimated in 2006 that the Fresno P-C Region had less than 10 years of permitted aggregate resources remaining. In contrast to the 27 percent decrease in supply of permitted aggregate resources, the Fresno P-C Region's demand for aggregate resources increased 11 percent between 2001 and 2006 to 629 million tons. These aggregate shortages in the County have resulted in aggregate materials being imported from areas outside the County such as Coalinga, a 120-mile round-trip haul (CGS 2006).

Development of identified aggregate resources is dependent upon a number of considerations, including the distance to market (job site) locations as transportation is one of the primary costs associated with aggregates. The farther aggregate is transported, the higher the cost for driver wages and truck operation (e.g., fuel and maintenance). Consequently, as the distance increases, the cost of aggregate material increases. For example, in 2006, the Fresno P-C Region's shortage of aggregate resulted in aggregate prices ranging between $14 and $18 per ton (CGS 2006). In contrast, the price of high-grade aggregate was half as much in areas with abundant permitted supplies, such as the Yuba City-Marysville Region, where aggregate ranged between $7 and $8 per ton.

Because aggregates are used in public projects, and a local cost-effective supply of aggregate construction materials is important for economic well being, the State Mining and Geology Board encourages Lead Agencies to plan for a 50-year timeframe for aggregate supplies. With the ever-increasing population growth in the Fresno P-C Region, the CGS has predicted that a shortfall in the availability of aggregate products will occur in the area. While the CGS concluded in its 1999 report that the Fresno P-C Region would need an estimated 528 million tons of aggregate during the next 50 years (1998 to 2047), the 2006 report increased that estimate to 629 million tons.

3.0 REGULATORY SETTING

3.1 Federal

The 1997 Uniform Building Code (UBC) was developed by the International Conference of Building Officials (ICBO) and is used by most states, including California, as well as local jurisdictions to set basic standards for acceptable design of structures and facilities. The UBC provides information on criteria for seismic design, construction, and load-bearing capacity associated with various buildings and other structures and features. Additionally, the UBC identifies design and construction requirements for addressing and mitigating potential geologic hazards. New construction generally must meet the requirements of the most recent version of the UBC.

3.2 State

3.2.1 Alquist-Priolo Earthquake Fault Zone Act

The State Alquist-Priolo Earthquake Fault Zoning Act (A-P Act) of 1972 was passed to mitigate the hazards associated with surface faulting in California. Administered by the DOC, the A-P Act prevents construction of buildings used for human occupancy on the surface traces of active faults. Before a project can be permitted, cities and counties must require a geologic investigation to demonstrate that proposed buildings will not be constructed across active faults.

3.2.2 Seismic Hazards Mapping Act

The 1990 Seismic Hazards Mapping Act and related regulations established a statewide minimum public safety standard for mitigation of earthquake hazards. The purpose of this Act is to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure as well as other hazards caused by earthquakes. The Act provides the minimum level of mitigation needed to reduce the risk of a building collapse. Under this Act, the lead agency can withhold permits until geologic investigations are conducted and mitigation measures are incorporated into building plans. In addition, the Act addresses not only seismically induced hazards but also expansive soils, settlement, and slope stability. The program and actions mandated by this Act closely resemble those of the A-P Act by requiring:

- The State Geologist to delineate various “seismic hazard zones”; and
- Cities, counties, and/or other local permitting authorities to regulate certain development “projects” within these zones by withholding the development permits for a site until the geologic and soil conditions are investigated and appropriate mitigation measures (if required) are incorporated into development plans.

3.2.3 California Building Code

The California Building Code (CBC), known as Title 24, CCR, Part 2, specifies the acceptable design and construction requirements associated with various facilities or structures. These codes are administered and updated by the California Building Standards Commission. This Code specifies criteria for open excavation, seismic design, and load-bearing capacity directly related to construction in the State. The CBC augments the UBC and provides information for specific changes to various sections in it. The seismic building requirements under the CBC are more stringent than the federal UBC.

3.2.4 Surface Mining and Reclamation Act

Pursuant to the SMARA, local "lead agencies" are normally responsible for SMARA compliance in their jurisdiction. This is the case for Fresno County. SMARA requires mine owners to develop reclamation plans for use of the land after mining and to post Financial Assurances sufficient to perform the requirements specified in the site specific reclamation plan. SMARA also requires mine operators to obtain all necessary permits and approvals.

3.3 Local

The Fresno County General Plan outlines several goals and policies related to seismic and geologic hazards for projects within their jurisdictional area. These goals and policies are summarized as follows:

Goal HS-D: To minimize the loss of life, injury, and property damage due to seismic and geologic hazards.

> **Policy HS-D.2**: The County shall ensure that the General Plan and/or County Ordinance Code is revised, as necessary, to incorporate geologic hazards areas formally designated by the State Geologist.
>
> **Policy HS-D.3**: The County shall require that a soils engineering and geologic-seismic analysis be prepared by a California-registered engineer or engineering geologist prior to permitting development in areas prone to geologic or seismic hazards.
>
> **Policy HS-D.4**: The County shall require all proposed structures, additions to structures, or public facilities situated within areas subject to geologic-seismic hazards as identified in the soils engineering and geologic-seismic analysis to be sited, designed, and constructed in accordance with the applicable provision of the Uniform Building Code.
>
> **Policy HS-D.8**: The County shall require a soils report by a California-registered engineer or engineering geologist for any proposed development that requires a County permit and is located in an area containing soils with high "expansive" or "shrink-swell" properties.

4.0 THRESHOLDS OF SIGNIFICANCE

The criteria used to determine the significance of impacts on geology and soil resources are based on Appendix G of the CEQA Guidelines. Based on these guidelines, a project could have a significant impact to geology and soils if it would:

- Expose people or structures to 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 a known fault (Refer to Division of Mines and Geology Special Publication 42).
  - Strong seismic ground shaking.
  - Seismic-related ground failure, including liquefaction.
  - Landslides.
- Result in substantial soil erosion or the loss of topsoil;
- 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;
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to the life or property; or
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Impacts to mineral resources could be significant if they:

- Result in the loss of availability of a known mineral resource that would be of value to the regional and the residents of the state; or
- Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

5.0 ENVIRONMENTAL IMPACTS, MITIGATION MEASURES, AND SIGNIFICANCE DETERMINATIONS

Impact GEO-1: Seismic Hazards

The Project does not involve construction and occupation of structures that could expose people to potentially substantial adverse seismic hazards, involving the risk of loss, injury, or death.

Expected seismic activity within the Project vicinity could result in seismically induced ground shaking and potential damage to mine facilities or reclamation features. The Project would include the storage and use of petroleum products, explosives, and other potentially hazardous materials that could be released during a large seismic event.

Ground shaking intensity is largely a function of distance from the earthquake epicenter and underlying geology. Generally, western Fresno County, which is located on deep alluvial and unconsolidated sediments, could experience strong ground shaking during a large earthquake. Age and type of the construction are additional factors that affect the potential for damage to structures. Older unreinforced masonry buildings located on alluvial deposits are generally the most susceptible to damage. Wood or steel frame buildings, located on well-compacted soils or bedrock are the least susceptible to damage.

The most common impact associated with strong ground shaking is damage to structures. The UBC establishes minimum standards for buildings located in high ground shaking hazard areas.

Proposed new facilities include portable and stationary crushing and processing plant, truck scales, conveyors, administration complex including a maintenance shop, two above-ground diesel fuel storage tanks, and parking areas.

Potential ground shaking hazards associated with the Project site are relatively low by regional standards and building hazards related to ground shaking are addressed through CBC design and construction requirements. All of the above listed facilities would require the granting of Building Permits by Fresno County. Compliance with current seismic design and construction standards is a prerequisite for Building Permit issuances. Compliance with County Building Permits requirements would ensure that impacts to proposed structures, due to ground shaking, would be less than significant.

Level of Significance Before Mitigation: Less than Significant

Mitigation Measures: None Required

Impact GEO-2: Erosion

The Project would potentially result in increased erosion and the substantial loss of topsoil. This impact is less than significant.

The subject property is agricultural land that is continuously disturbed with minimum vegetation cover (tree crops). Thus the Project will not substantially change existing conditions in regard to topsoil disturbance. Moreover, as discussed in Section 2.4.7, the site topography consists of less than 0.3 percent slope grade and will remain bordered by active agricultural operations and orchards, and is therefore not prone to erosion. Mining would produce cell areas which only drain internally, surrounded by a perimeter berm.

The Project area is covered with a thin veneer of topsoil and in some areas topsoil is minimal. Prior to road construction and mining activity, what little topsoil exists will be removed and placed in designated topsoil storage areas. Any overburden will be stored separately from the topsoil. Road building and grading activities will require a Stormwater Water Pollution Prevention Plan and BMP erosion and sediment controls for roads and other improvements at the beginning of the Project. Reclamation activities include regrading the quarry site by redistributing residual overburden and topsoil and implementing interim BMP erosion control measures.

With implementation of permitting requirements and proposed mitigation measures, erosion and topsoil loss would be minimized.

Level of Significance Before Mitigation: Less than Significant

Mitigation Measures: None Required

Impact GEO-3: Slopes or Surface Instability

The proposed Project may result in active and reclaimed Quarry slopes that could fail in portions of the Quarry. This impact is potentially significant but reduced to a less than significant level with mitigation.

Slope stability analyses were completed for the operational and final reclaimed slopes. The details of the analyses are included in Appendix A, Reclamation Slope Stability Evaluation.

Static and seismic slope stability analyses were completed to evaluate stability of the proposed reclaimed quarry slopes. The computer program SLIDE 5.0 was used to calculate the factors-of-safety (FOS) against potential slope failures.

The following material properties were included in the stability modeling of the reclaimed slopes:

- Overburden;
- Alluvial Sands and Gravels; and
- Backfilled Fines

Water levels at depths of 15 feet and 30 feet bgs were considered in the analyses and represent the varying depths to groundwater for the majority of the site.

The results of the static and seismic analyses include:

- For the excavation slopes, a minimum *static* factor of safety of 1.14 was calculated for the 1.5H:1V slopes. If these slopes are flattened to 1.75H:1V, the minimum static factor of safety would be 1.3.
- For the excavation slopes, a *pseudo-static* factor of safety of 1.0 was calculated for a seismic coefficient of 0.043 applied to the 1.5H:1V slopes. A pseudo-static factor of safety of 1.1 was calculated for native slopes inclined at 1.75H:1V.
- For backfilled slopes with a relative compaction of 90 percent or greater, a minimum *static* factor of safety of 1.2 was calculated. A corresponding *pseudo-static* factor of safety of 1.0 was calculated.
- For backfilled slopes compacted to less than a 90 percent standard, a minimum *static* factor of safety of 1.2 was calculated for slopes flattened to 2.5H:1V. A corresponding *pseudo-static* factor of safety of 1.0 was calculated.

The slope stability evaluation indicates that the proposed mining plan results in stable slopes that will mitigate potential large-scale slope failures and associated impacts, and it complies with SMARA. Therefore, with the incorporation of the above recommendations into the Project, this impact is less than significant.

Level of Significance Before Mitigation: Less than Significant

Mitigation Measures: None Required

Impact GEO-4: Loss of Regional and Local Mineral Resources

Loss of mineral resources typically occurs due to urban development on or adjacent to such materials. The Project would not result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

The Project does not involve urban development. Conversely, the Project involves excavation and production of such mineral resources for use in public and private construction projects.

Level of Significance Before Mitigation: Less than Significant

Mitigation Measures: None Required

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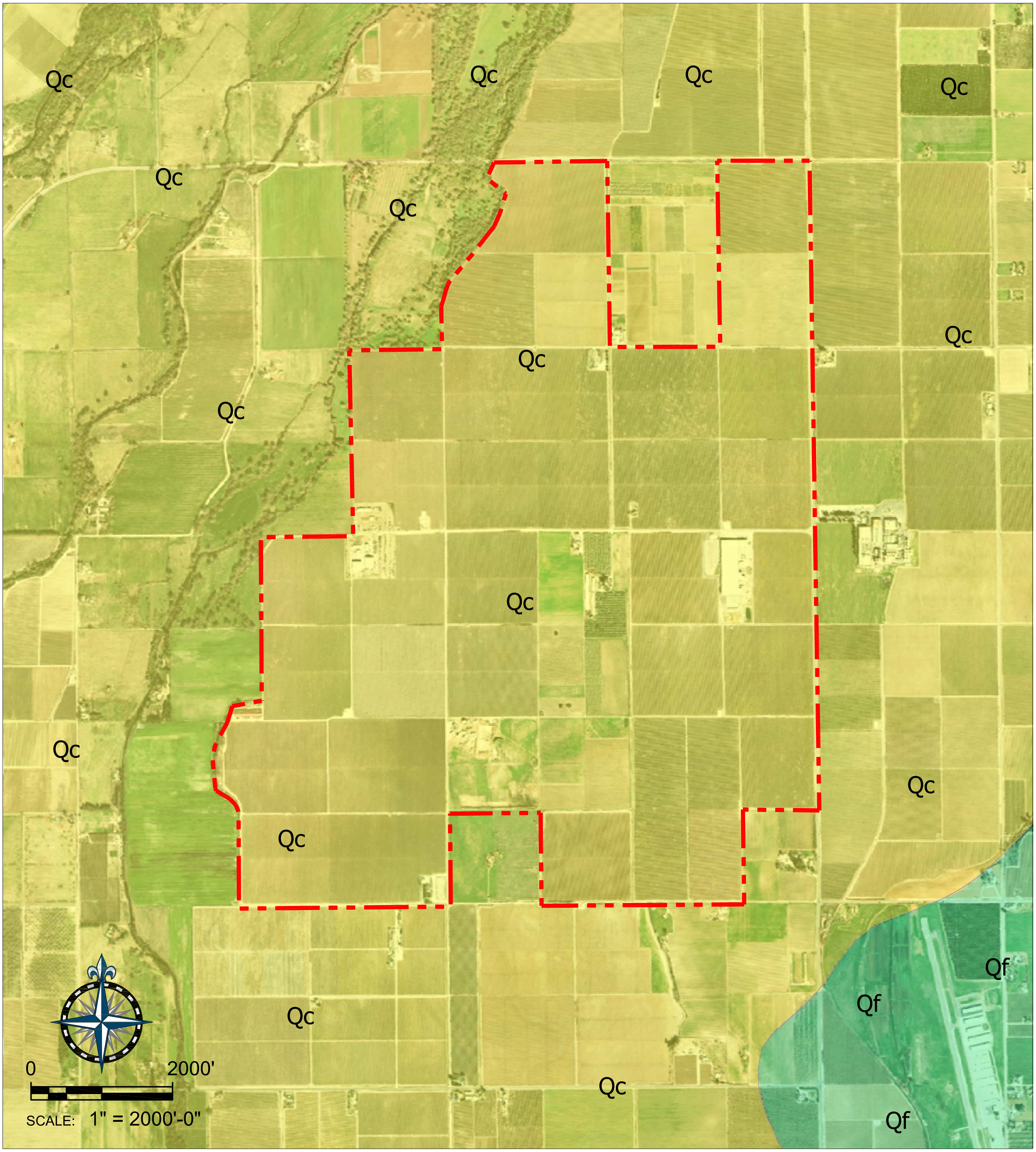


SOURCE: Department of Conservation, Division of Mines and Geology (1991)

Site Boundary

Qc pleistocene nonmarine

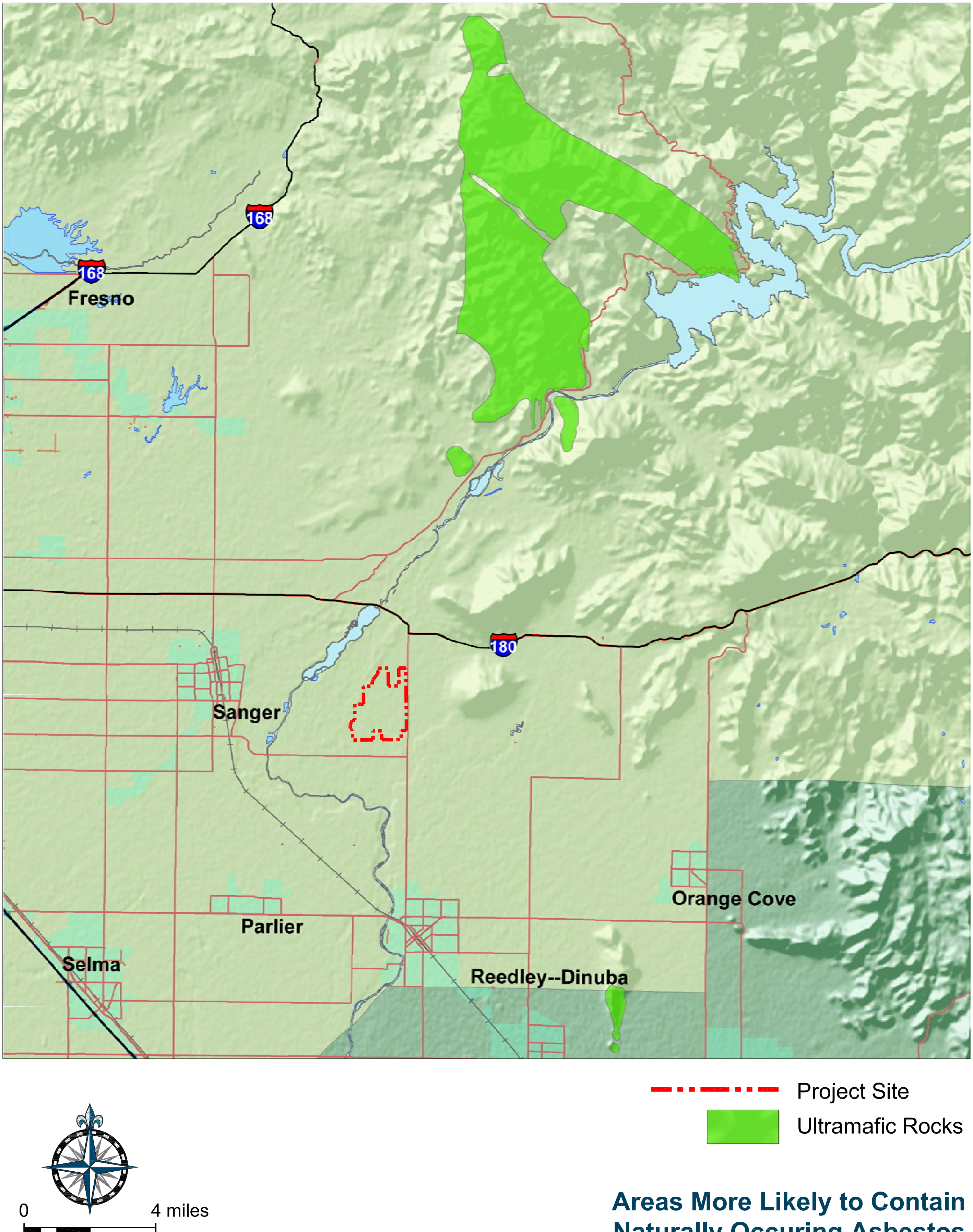
Qf fan deposits

Regional Geology Map

GEOLOGY AND SOILS
CARMELITA PROJECT

BENCHMARK RESOURCES

Figure 1

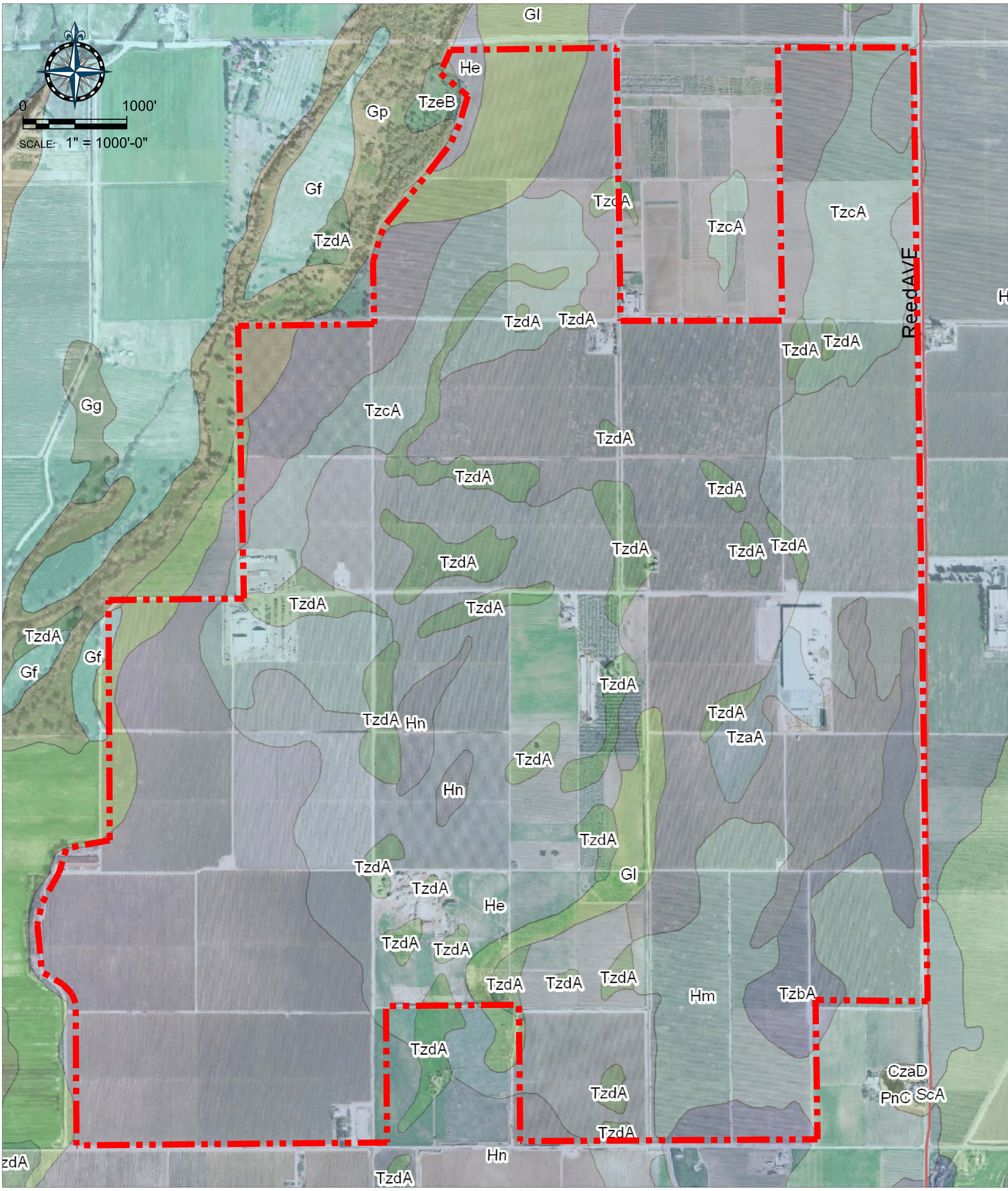


BENCHMARK RESOURCES

Areas More Likely to Contain Naturally Occuring Asbestos

GEOLOGY AND SOILS
CARMELITA PROJECT

Figure 2



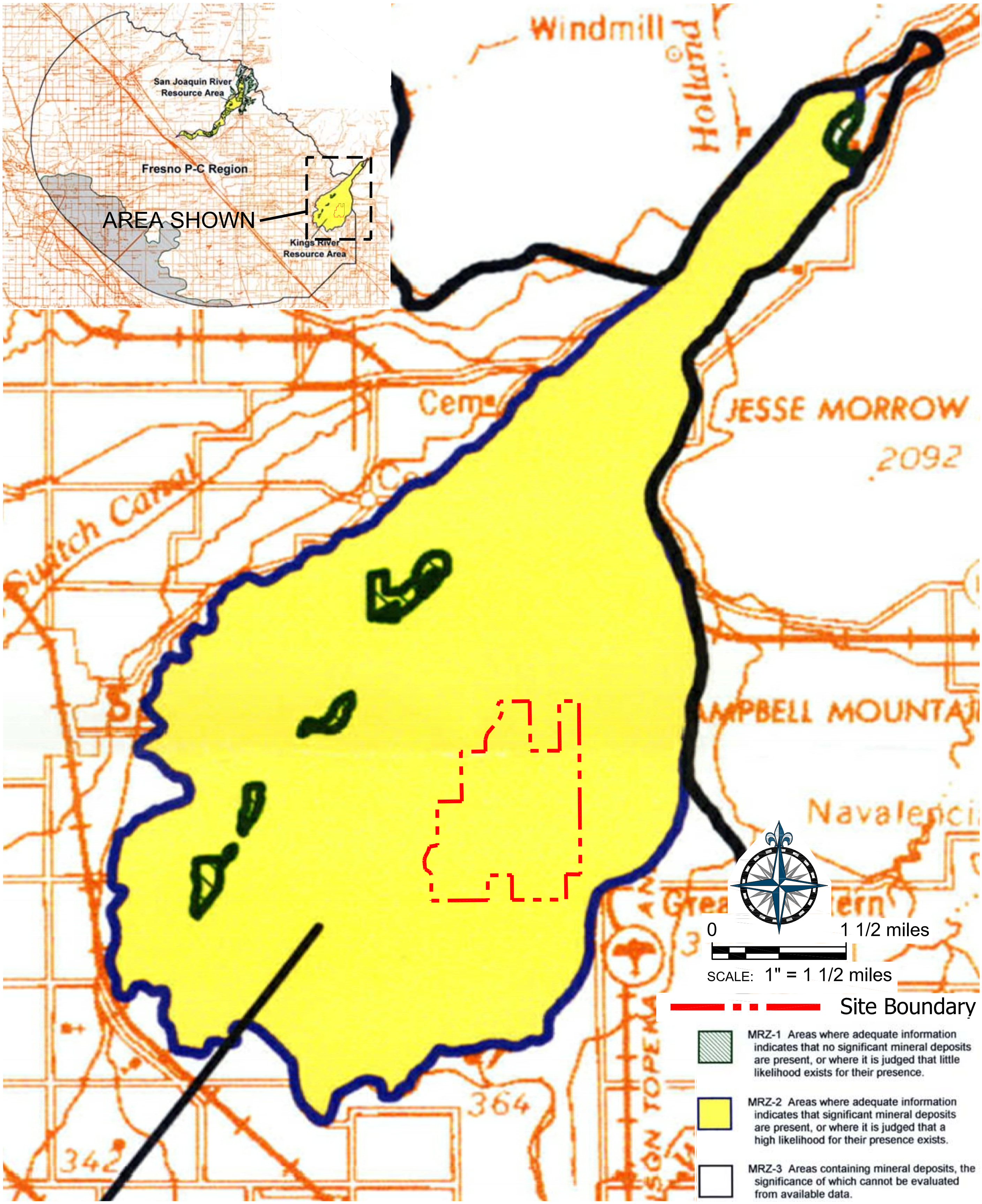
SOURCE: Department of Conservation, Division of Land Resource Protection

Site Boundary

Hn	Hanford fine sandy loam, gravelly substratum (80"+ to restrictive feature)
He	Hanford sandy loam, gravelly substratum (80"+ to restrictive feature)
Gl	Grangeville fine sandy loam, gravelly substratum (24" to 48" to restrictive feature)
Gf	Grangeville fine sandy loam (80"+ to restrictive feature)
Gp	Grangeville soils, channeled (80"+ to restrictive feature)
Gg	Grangeville fine sandy loam, saline akali (80"+ to restrictive feature)
TzaA	Tujunga sand (80"+ to restrictive feature)
TzbA	Tujunga loamy sand (80"+ to restrictive feature)
TzcA	Tujunga loamy sand, gravelly substratum (20" to 40" to restrictive feature)
TzdA	Tujunga cobbly loamy sand (80"+ to restrictive feature)
TzeB	Tujunga soils, channeled (80"+ to restrictive feature)

Soils Map

GEOLOGY AND SOILS
CARMELITA PROJECT



SOURCE: California Department of Conservation,
Division of Mines and Geology

Site and Kings River Mineral Resource Zone

GEOLOGY AND SOILS
CARMELITA PROJECT

RECLAMATION SLOPE
STABILITY REPORT

RECLAMATION SLOPE STABILITY EVALUATION

Proposed Carmelita Project

Submitted To: Michael Mallery, Esq.

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Date: January 11, 2010

Project No. 093-97527

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Golder Associates

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1.0 INTRODUCTION AND PROJECT DESCRIPTION

This report presents the results of our slope stability evaluation of the reclamation plan prepared for the proposed Carmelita Project located in Sanger, California (Figure 1). The proposed project includes the development of a 898-acre aggregate quarry within a 1,500-acre project boundary located south of East Annadale Avenue and west of South Reed Avenue. The Kings River, Byrd Slough, and several unlined sloughs are located northwest of the project site.

The project site is located on Colony Land Company, LLC and associated land owners' (Colony Land Company) property that is currently used for agricultural purposes, which primarily consists of growing fruit orchards. The Fink Ditch is an unlined water distribution canal that extends from the north and flows southward within the eastern one-third of the aggregate quarry footprint (Figure 2).

The topography is relatively flat with an average slope of approximately 0.3 percent to the south-southwest. The quarry development will include mining to depths of up to 50 feet below ground surface (bgs). Groundwater occurs at a depth of 20 to 30 feet bgs at the site. Mining below the current groundwater surface will be completed by either using dewatering wells or dredging the soils below the groundwater surface.

The quarry will be developed by excavating 22 "cells" in which each cell measures between 26 and 56 acres in area as shown on Figure 2. Mining will leave road access between the cells. In addition, the cell layout will leave the Fink Ditch in its current location. Mining will include minimum 100-foot horizontal offsets from property boundaries and the above agricultural water ditches.

The proposed operational excavation will be inclined at 1.5H:1V (horizontal to vertical). At reclamation, the mining spoils will be backfilled against the perimeter excavation slopes to flatten these slopes to 2H:1V. Portions of the interior slopes adjacent to access roads that separate individual cells will be reclaimed at the 1.5H:1V operational inclination or backfilled with mining spoils to a final inclination of 2H:1V.

Post-closure land use will be agricultural and the portions of the cells that are backfilled above the groundwater surface will be used for growing fruit trees. The reclamation plan estimates that approximately 40 percent of the project site will continue as fruit orchards. The portions of the cells that are not backfilled above the groundwater surface will be allowed to equilibrate with groundwater and become water basins available for irrigating the fruit orchards.

2.0 GEOLOGIC AND HYDROGEOLOGIC CHARACTERIZATION

2.1 Previous investigations

The site has been previously investigated to characterize the subsurface conditions with a focus on the quality and quantity of the aggregates that are suitable for mining. These investigations include the following:

- BSK completed an aggregate assessment and suitability study in 2008 by excavating 79 test pits up to 15 feet in depth and advancing 11 borings using sonic coring methods to depths of between 100 and 400 feet (2008 BSK Aggregate Assessment Report).
- BSK measured groundwater levels in eight on-site agricultural wells.
- BSK completed laboratory testing on selected soil samples to measure gradation and various aggregate quality parameters (LA Abrasion, etc.).

Figure 3 shows the approximate location of the BSK's test pits and borings.

The results of BSK's investigations indicate that the site is underlain by alluvial soils consisting of interbedded cobble and gravels, sands, silts, and clays. The 2008 BSK Aggregate Assessment Report indicates that the majority of the aggregate resource suitable for mining is located within the upper 50 feet of the native alluvial soils that underlie the site. The native alluvial soils include an upper "overburden" layer that consists of silt to silty sand with some organic material that is up to 0 to 13 feet thick within the mining area (i.e. quarry footprint).

Additional subsurface characteristics include the following:

- The alluvial soils in the upper 50 feet typically consist of 35 to 55 percent gravel cobbles and 35 to 45 percent sand. Silt and clay typically comprise 6 to 10 percent of the soil but may locally increase to 15 to 20 percent.
- The overburden soils were observed to be typically 5 to 10 feet thick at most exploration locations. The overburden soils thickness decreases locally to less than five feet in the west central portion of the mining area. The overburden soils increase up to 13 feet thick locally at the southeastern boundary of the proposed mining area (Figure 7 of 2008 BSK Aggregate Assessment Report).
- The alluvial soils appear to be more than several hundred feet thick. Bedrock was not encountered in BSK's borings.

BSK (2008) reported that measured groundwater levels ranged from 20 to 50 feet below ground surface. Groundwater flows to the south-southeast at a gradient of 0.002. Contours of the depth to groundwater (BSK, 2008) show that groundwater is deepest at 40 feet bgs at the southeast corner of the mining area. The shallowest groundwater occurrence appears to be at a depth of approximately 15 feet in the west-northwest portion of the site closest to Byrd Slough. Groundwater elevations appear to be influenced by infiltration from the Kings River and associated unlined sloughs northwest of the mining area.

Figure 4 shows a typical cross-section of the subsurface conditions in the proposed mining area.

2.2 Golder Site Reconnaissance

Golder completed a site reconnaissance on October 20, 2009 to review current site conditions. As part of the reconnaissance, Golder inspected existing slopes of an aggregate pit at the project site and observed the agricultural water canals.

Carmelita Resources, LLC (Carmelita Resources) operates a agricultural properties maintenance rock plant located near the southern boundary of the project site (Figure 2). The existing rock plant consists of a pit and a rock crushing and screening operation that generates aggregate for surfacing roads located on the Colony Land Company Property. At the time of our site visit, the rectangular-shaped quarry pit was excavated to a depth estimated to be between 12 and 15 feet. Excavatrion appeared to be progressing to west with the working face located on the west excavation slope. The remaining slopes had been regraded to 2H:1V or flatter.

Along the working face, the overburden soils were observed to be 6 to 8 feet thick and consisted of a brown, compact, fine to coarse sand with little to some silt, and occasional cobbles. The overburden soils were supporting temporary slopes as steep as 65 to 70 degrees, although the steepest slopes showed minor signs of sloughing and cracking. Figure 5 shows photographs of the excavation slope in the overburden soils.

The overburden soils were underlain by compact gravels and cobbles with some brown to light gray, medium to coarse sand. The gravels and cobbles were rounded to subrounded and appeared to comprise more than 50 percent of the soil. The gravels and cobbles exhibited abundant rock to rock contact with the sand filling the pore spaces between the rock particles. Figure 6 shows photographs of the gravel and cobble soils.

The agricultural ditches at the site are unlined. At one location where the Fink Ditch was inspected, the bank materials were observed to be comprised of a dark brown, compact, silty sand to sandy silt. The Fink Ditch was estimated to be approximately 4 to 5 feet wide.

2.3 Seismic Conditions

The Carmelita Project is located in an area with a relatively low seismic hazard potential in comparison to most other regions in California. Earthquake hazard maps provided by the California Geologic Society (CGS, April 2003) indicate the following:

- The design peak horizontal ground acceleration (PGA) in bedrock is estimated to be between 0.10g and 0.20g for an earthquake event associated with a 10 percent probability of exceedance (POE) in a 50-year period. Based on the location of the project within the mapping, Golder estimated that the design PGA is approximately 0.15g or less.

- The earthquake associated with the above design PGA is associated with a magnitude 7.0 to 7.5 event located at least 100 kilometers from the site.

For sites located on thick soil deposits, such as that for the Carmelita Project, it is common to apply a 10 percent reduction in the PGA estimated for PGA in bedrock. This potential reduction in design PGA was ignored in part due to the potential increases in the PGA that can occur with steep slopes (i.e. 1.5H:1V).

At the project site, groundwater occurs at depths of at least 15 feet or greater below the ground surface and within soils that are dominated by gravel and coarse sands. Based on these soil and groundwater conditions in conjunction with the relatively low seismic ground shaking potential, the potential for liquefaction in the native soils at the site is estimated to be low.

3.0 SLOPE STABILITY EVALUATION

3.1 Regulatory Requirements

The Surface Mining and Reclamation Act (SMARA), including the State Mining and Geology Board Reclamation Regulations, is flexible with respect to addressing geotechnical slope stability for both fill slopes and cut slopes. SMARA does not specify a minimum factor of safety for slope stability. However, Title 14, Chapter 8, CCR Section 3502(b)(3) indicates that final reclaimed slopes shall be flatter than the critical gradient, which implies that static factors of safety should be greater than 1.0. This section further states "Wherever final slopes approach the critical gradient for the type of material involved, regulatory agencies shall require an engineering analysis of slope stability. Special emphasis on slope stability and design shall be taken when public safety or adjacent property are affected."

For fill slopes, Section 3704 (d) states that fill slopes shall be 2H:1V or flatter. Fill slopes steeper than 2H:1V must be supported by site-specific geologic and engineering analyses to indicate that the minimum factor of safety is suitable for the proposed end use. For the Carmelita Project, the proposed end use is agricultural with fruit trees and water basins that are adaptable for irrigation use.

The Carmelita Project has established a minimum mining offset of 100 feet from the property boundaries and from the agricultural irrigation ditches. There are no dwellings located within 100 feet of the proposed mining limits. This minimum offset, in conjunction with mining depths limited to 50 feet, ensure that slope stability will not adversely impact adjacent property, irrigation ditches, or public safety.

In developing the slope stability criteria for the reclamation plan, the following issues were considered:

- The site soils are dominated by granular soils. The critical failure surfaces are expected to be relatively shallow, which limits the horizontal impact of any slope instability. Furthermore, the potential for loss of strength due with displacement is expected to be limited for granular soils.

- With the exception of the interior slopes adjacent to the irrigation ditches, the interior slopes are not critical with respect to slope stability. The interior slopes simply provide convenient access and could be removed by the mining operation. In the event of a slope failure, the material is fully contained within the mining cells and therefore pose no impact to off-site sediment transport. Furthermore, the occurrence of shallow slope failures are not expected to adversely impact the agricultural operations.

Based on the above considerations, Golder considers the following design criteria consistent with SMARA:

- **<u>Perimeter Slopes or Interior Slopes Adjacent to Irrigation Ditches Without Backfill</u>**: A minimum static factor of safety of 1.3 for perimeter slopes or interior slopes located adjacent to irrigation ditches. For these slopes, the maximum allowable permanent seismic displacements should be 12 inches or less.

- **Perimeter Slopes or Interior Slopes Adjacent to Irrigation Ditches With Backfill**: A minimum static factor of safety of 1.2 for the backfill placed against the perimeter slopes or interior slopes located adjacent to irrigation ditches. For this backfill, the maximum allowable permanent seismic displacements should be 24 inches or less. It should be noted that the critical failure mode is contained within the backfill and does not impact the native soils.

- **Non-Critical Interior Slopes**: Interior slopes that only serve to separate individual cells should have a minimum static factor of safety of 1.1 for either native materials or the backfill placed against these slopes. The maximum allowable permanent seismic displacements should be 24 inches or less.

In developing the above criteria, the following issues were considered:

- The site soils are dominated by granular soils. The critical failure surfaces are relatively shallow, which limits the horizontal impact of any slope instability. Furthermore, the potential for loss of strength due with displacement is expected to be limited for granular soils.

- With the exception of the interior slopes adjacent to the irrigation ditches, the interior slopes are not critical with respect to slope stability. The interior slopes simply provide convenient access and could be removed by the mining operation. In the event of a slope failure, the material is fully contained within the mining cells and therefore pose no impact to off-site sediment transport. Furthermore, the occurrence of shallow slope failures are not expected to adversely impact the agricultural operations.

3.2 Approach and Assumptions

Golder completed static and seismic slope stability analyses to evaluate stability of the proposed reclaimed quarry slopes for the Carmelita Project. The computer program SLIDE 5.0 (Rocscience, 2003) was used to calculate the factors-of-safety (FOS) against potential slope failures. This program uses two-dimensional, limit-equilibrium theory to calculate safety factors. This program allows both circular and noncircular sliding surfaces to be either defined or generated automatically. Janbu's Method was used for FOS calculations.

Pseudo-static analyses were performed to evaluate slope stability under earthquake loading. In a pseudo-static limit equilibrium analysis, a lateral force is added to a potential failure mass, with magnitude equal to some fraction of the weight of the slide mass. The fraction is defined in the form of a seismic coefficient, which is typically assumed to be less than the peak ground acceleration and is expressed as a percentage of gravity. Selection of a seismic coefficient and allowable factor of safety was based on the pseudo-static criteria established by Blake et. al (2002). This approach ties the selection of a seismic coefficient to the allowable permanent displacement (and other factors). Blake et al. (2002) developed charts for estimating the seismic coefficient for allowable displacements of 2 inches and 6 inches, which correspond to displacement sensitive applications. However, this methodology can be expanded to consider larger allowable displacements.

For the Carmelita Project, Golder calculated the following seismic coefficients (k) using the approach of Blake et.al (2002) for following allowable displacements:

- Allowable displacement of 12 inches: k = 0.06.
- Allowable displacement of 24 inches: k = 0.043.

The following material properties were included in the stability modeling of the reclaimed slopes:

- **Overburden Soils**: The shear strength of the compact overburden soils (primarily sand) is assumed to be characterized by a friction angle of 35 degrees with no cohesion. A moist unit weight of 120 pcf was assumed for stability calculations. Although the observed temporary slopes at the site suggest a much higher shear strength with friction angle greater than 50 degrees, this apparent high shear strength is due in part to partially saturated conditions that increase capillary tension. This condition can change with changing moisture contents. Therefore, Golder considers a friction angle of 35 degrees more consistent with that observed for compact sands.

- **Alluvial Sands and Gravels**: The shear strength of the alluvial sands and gravels is assumed to be characterized by a friction angle of 38 degrees with no cohesion (Bowles, 1988). A moist unit weight of 130 pcf was assumed for stability calculations.

- **Backfilled Mine Spoils**: Mine spoils will consist of the overburden soils, excess sand, and the fines (silt and clay) screened or washed from the mined aggregate. A shear strength characterized with an internal friction angle of 32 degrees with no cohesion was assumed for this material if it is compacted to a minimum relative compaction of 90 percent per ASTM D 1557. For material that is track-walked in place with compaction by dozers and hauling equipment, the assumed internal friction angle was reduced to 28 degrees. The moist unit weight of the compacted mine spoils was assumed to be 112 pcf.

If dredges are used to mine the alluvial soils below the water surface, then backfilling of mine spoils will likely involve dumping the soils in a loose condition below the water table. Under this type of backfill placement, the mine spoils are expected to be relatively loose with considerably lower shear strengths and unit weights.

Water levels at depths of 15 feet and 30 feet bgs were considered in the analyses and represent varying depths to groundwater for the majority of the site. Seepage induced stresses were considered to be negligible for reclamation conditions. In addition, infiltration impacts from the agricultural ditches were considered negligible based on their minimum distances from the excavation slopes.

Aggregate mining operations can generate “muds” as result of washing fines during the production of various aggregate products. For the purpose of this stability evaluation, the placement of saturated, soft muds within the backfill was not considered.

3.3 Slope Stability Results

The results the static and seismic analyses are summarized below. Calculations are included in Appendix A.

- For the native excavation slopes, a minimum static factor of safety of 1.14 was calculated for the 1.5H:1V slopes. If these slopes are flattened to 1.75H:1V, the minimum static factor of safety was calculated to be 1.3.

- For the native excavation slopes, a pseudo-static factor of safety of 1.0 was calculated for a seismic coefficient of 0.043 applied to the 1.5H:1V slopes. A pseudo-static factor of safety of 1.1 was calculated for native slopes inclined at 1.75H:1V for a seismic coefficient of 0.06. These calculations indicate that permanent displacements of 24 inches or less are expected for 1.5H:1V slopes, and permanent displacements of less than 12 inches are expected for 1.75H:1V slopes.

- For slopes backfilled with mine spoils compacted to a relative compaction of 90 percent or greater, a minimum static factor of safety of 1.2 was calculated. A corresponding pseudo-static factor of safety of 1.0 was calculated for a seismic coefficient of 0.043, indicating that permanent seismic displacements are estimated to be less than 24 inches.

- For slopes backfilled with mine spoils compacted by dozers and hauling equipment, a minimum static factor of safety of 1.2 was calculated for slopes flattened to 2.5H:1V. A corresponding pseudo-static factor of safety of 1.0 was calculated for a seismic coefficient of 0.043, indicating that permanent seismic displacements are estimated to be 24 inches or less.

For the backfilled mine spoils conditions, the above analyses assumed that height of the backfilled slopes was 50 feet. The slope heights will be considerably less for the cells that are backfilled above the groundwater surface.

The analyses indicated only minor differences in the computed factors of safety between assumed groundwater depths of 15 feet and 30 feet. In both cases, it was assumed that the water level in the pond was in equilibrium with the surrounding groundwater levels.

3.4 Conclusions and Recommendations

Based on the slope stability analyses summarized in Section 3.3 and slope stability criteria established in Section 3.1, Golder developed the following conclusions and recommendations:

- Perimeter slopes and interior slopes adjacent to the agricultural water ditches should be inclined at 1.75H:1V if they are not backfilled with mine spoils.

- Backfilled mine spoils that are compacted to a minimum relative compaction of 90 percent per ASTM D1557 may be inclined at 2H:1V. Achieving this specified density will likely require an appropriate compactor designed for soil compaction (i.e. heavy, smooth drum, vibratory compactor for granular soils).

- Backfilled mine spoils that are placed in controlled lifts of no more than 12-inches thick and compacted by track walking by dozers and hauling equipment Perimeter slopes and interior slopes adjacent to the agricultural water ditches should be inclined at 2.5H:1V.

Golder recommends that mining be initiated well away from the permanent excavation slopes so that the performance of the slopes can be monitored as the cells are developed. Generally, operational slopes should not exceed 1.5H:1V. In the event of excess sloughing of the operational slopes is observed, then the operational slopes should be flattened and the stability of the reclaimed slopes re-evaluated and flattened as appropriate.

Dredging may result in the need to backfill soils below the groundwater. For this scenario, the backfill will likely exhibit lower shear strengths than assumed in our stability analyses and will likely require substantially flatter slopes backfill slopes. Additional geotechnical studies should be completed to assess the shear strength of hydraulically placed soils and the required backfilled slope inclination. These studies can be completed following commencement of the mining operations after mine spoil properties can be better characterized, but should be completed prior to any dredging operations.

Although Golder did not evaluate the effectiveness of dewatering during operations, it is expected that the stability of the operational slopes could be significantly impacted by seepage stresses. Therefore, under a dewatering scenario, it will be important to ensure that the dewater wells lower the groundwater table sufficiently behind the slope face to maintain adequate stability of the operational slopes.

If the mining operations generate “muds,” the muds should be dried and compacted as backfilled mine spoils as discussed above. Alternatively, it may be possible to incorporate the muds into the mine spoils backfill. However, additional geotechnical studies are required to determine maximum mud lift thicknesses and minimum offsets from the final backfill slope face to ensure no adverse impact to the stability of the backfilled slopes.

4.0 USE OF THIS REPORT

This report has been prepared for the exclusive use of the Law Office of Michael P. Mallery and Carmelita Resources for specific application to the Carmelita Project quarry reclamation. Specifically, this report applies to the evaluation of the slope reclamation for compliance with SMARA. The findings, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted geotechnical engineering practice that exists within the area at the time of the work. No other warranty, expressed or implied, is made.

The analyses and recommendations contained in this report are based on data obtained from the results of previous subsurface explorations by others as well as the site reconnaissance conducted by Golder. The methods used generally indicate subsurface conditions at the time and locations explored and sampled. Boring logs may not reflect strata variations that may exist between all sampling locations. In addition, groundwater conditions can vary with time.

5.0 CLOSING

We appreciate the opportunity to assist the Law Offices of Michael P. Mallery on this project. Please call one of the undersigned if you have any questions or require clarification of our findings and recommendations.

GOLDER ASSOCIATES INC.

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Kenneth G. Haskell, P.E.
Principal

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Exp. 6/30/11
CIVIL
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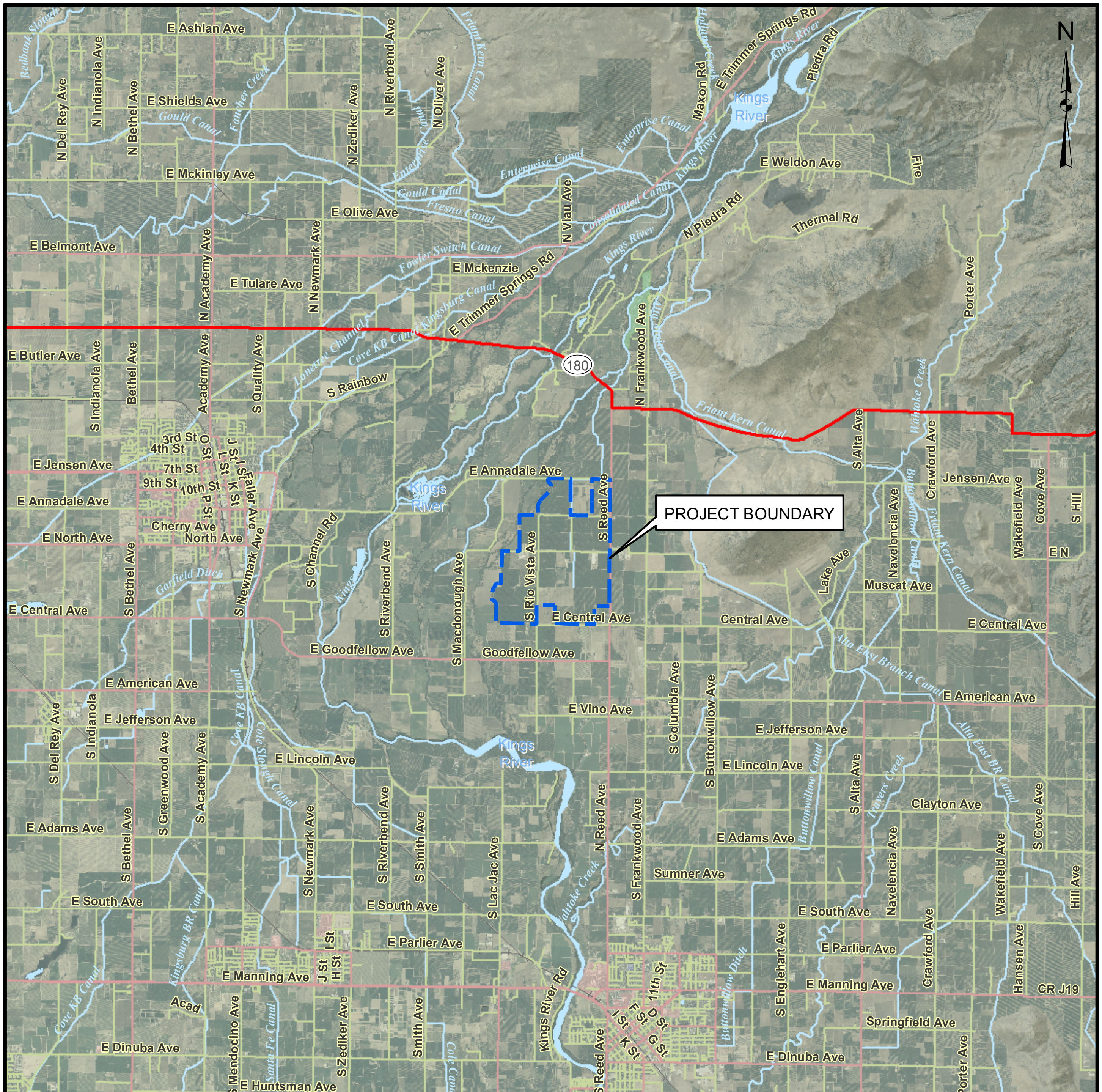
FIGURES



LEGEND

- Project Boundary
- State Highway
- Major Road
- Local Road

2 1 0 2 MILE

SCALE 1:126,720

REFERENCES

1. Road map obtained from ESRI StreetMap - North America. Date of map: 2008.

2. NED hillshade and NAIP aerial photography obtained from USGS Seamless website (http://seamless.usgs.gov).

PROJECT/REPORT

CARMELITA PROJECT
SANGER, CA

TITLE

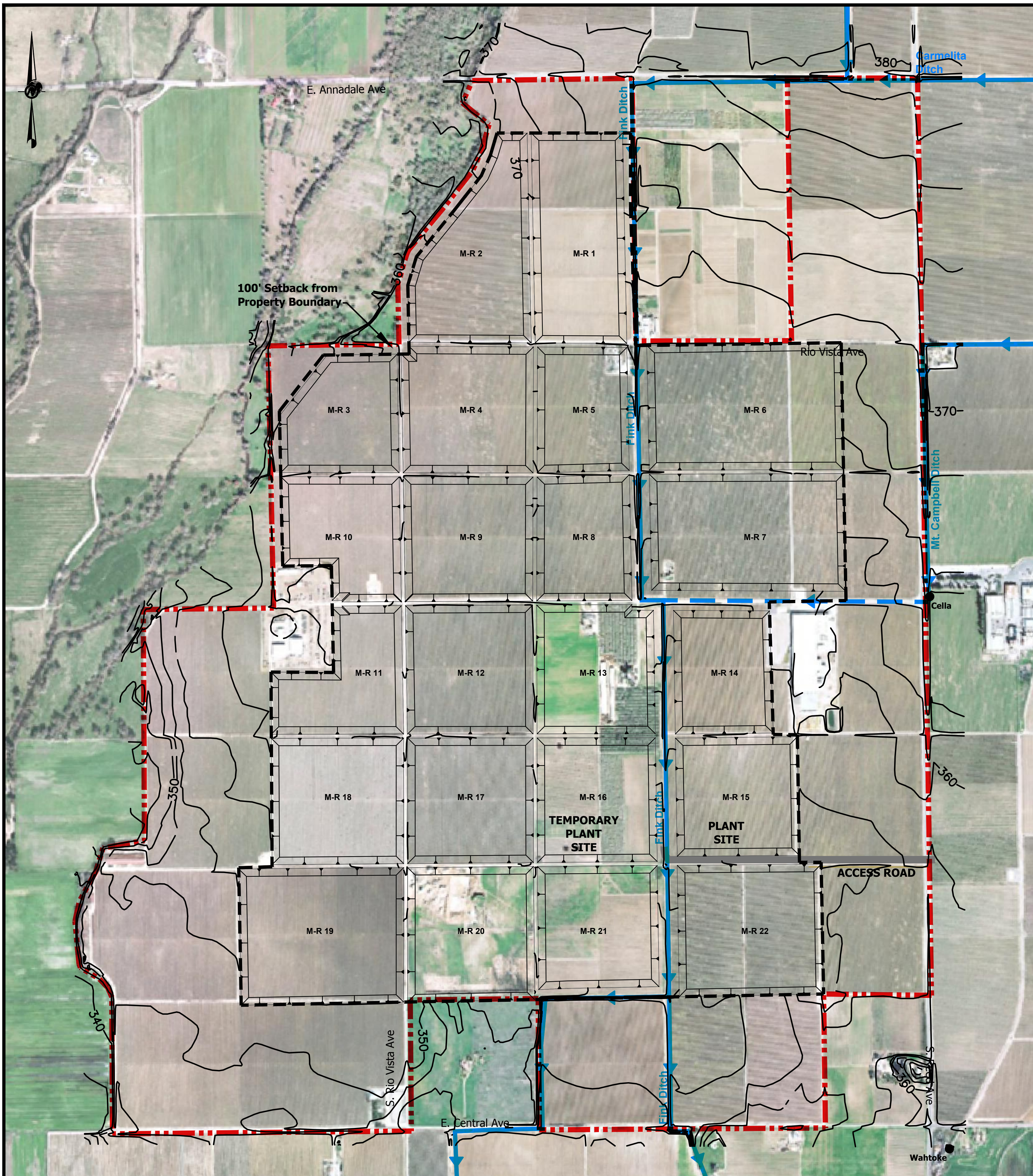
SITE LOCATION MAP

Golder Associates
Sacramento, CA

PROJECT No.
093-97527

FIGURE 1

Map Document: N:\GIS\PROJECT\093-97527\093975227-F1-LocMap.mxd / Modified 10/22/2009 9:53:36 AM / Plotted 10/22/2009 11:14:55 AM by JRaub



PHOTOGRAPH AND TOPOGRAPHY SOURCE: R.W. Greenwood and Associates (09/12/2008)
CONTOUR INTERVAL = 2'-0"

Project Boundary (1500 acres)
Mining Boundary (898 acres)
Agricultural Water Distribution Ditchs
Agriculture-Mining-Reclamation Cell

Notes:

- Side Slopes = 1.5:1
- Mining Property Boundary Setback = 100'
- Surface Water Ditch Setback = 100'
- Mining Cell Excavation Depth = ±-50' bgs in all cells
- Cell designations are consistent with agricultural ranch designations and do not reflect sequence of mining or reclamation.

Area Affected by Mining: 822 acres
Total Volume: 100,000,000 MT

1,000 0 1,000
SCALE FEET

NOTES

1. MAP BASED FROM BSK REPORT TITLED AGGREGATE ASSESSMENT AND SUITABILITY STUDY. DATE OF REPORT: JULY 21, 2008.

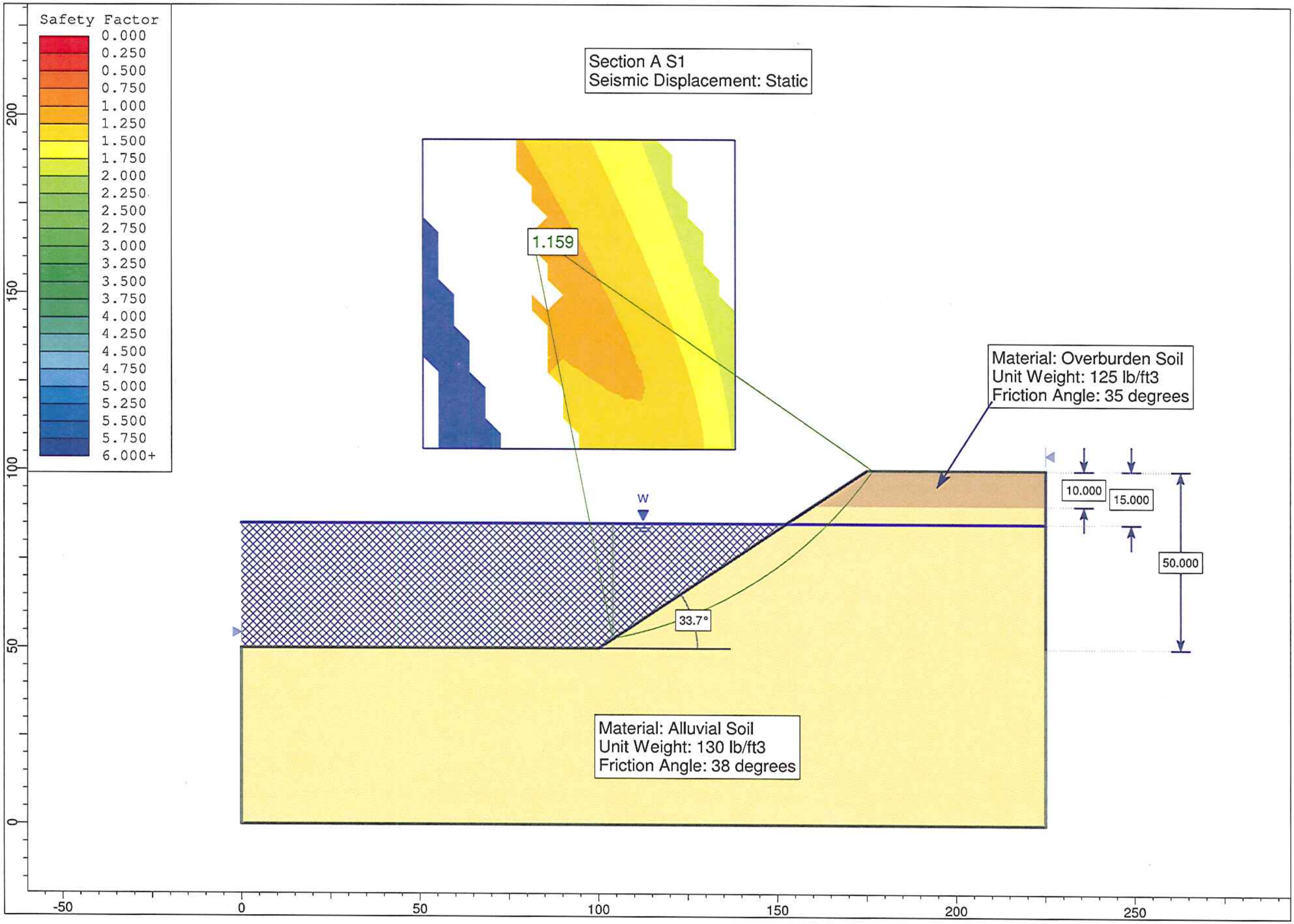
Golder Associates
Sacramento, CA

FIGURE 2
MINING PLAN
CARMELITA PROJECT

PROJECT No. 09397527 FILE No. F2-MINEPLAN CADD JDR DATE 10/26/09

APPENDIX A

SLOPE STABILITY CALCULATIONS



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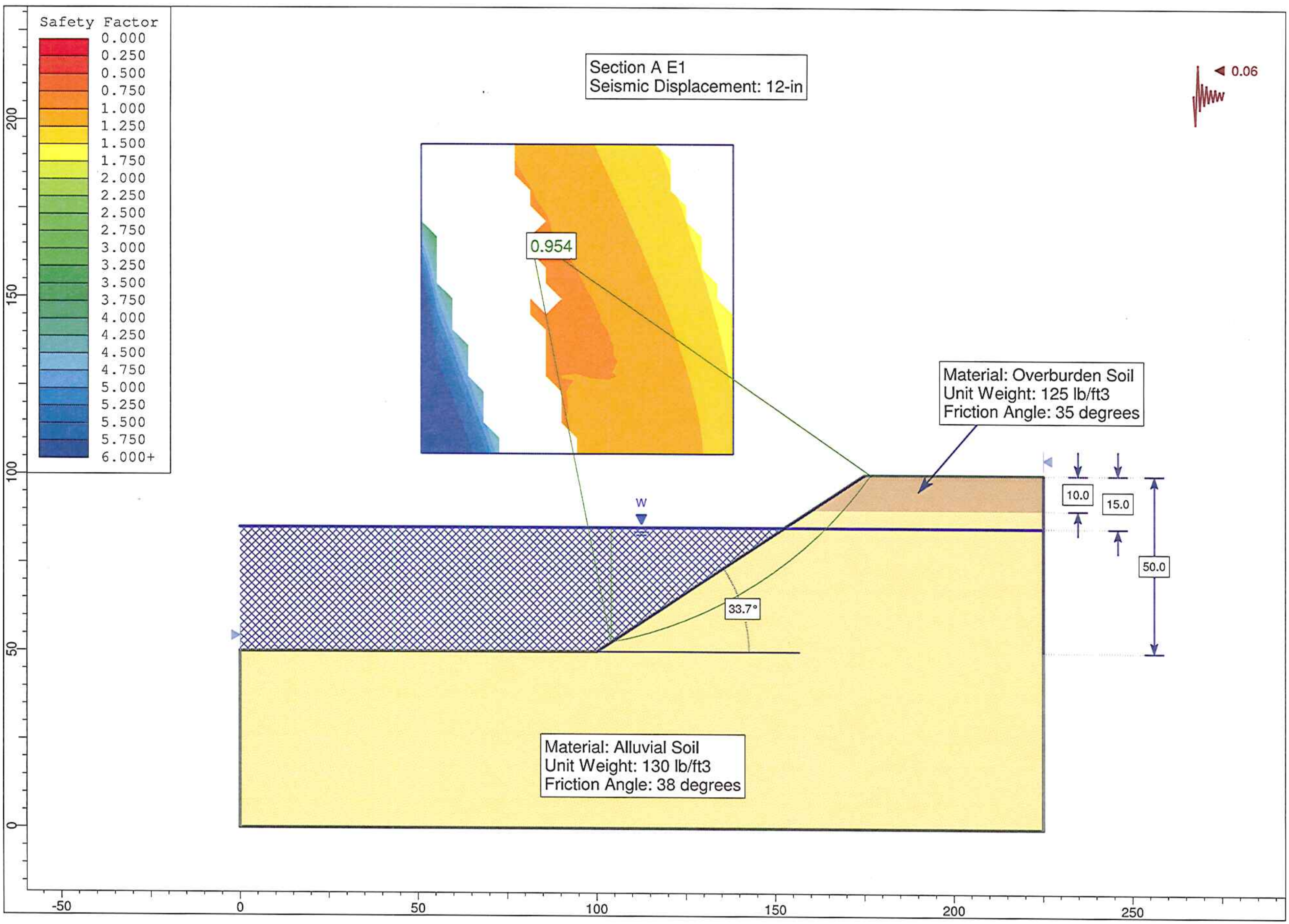
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section A S1
Seismic Displacement: Static
1.159
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
W
10.000
15.000
50.000
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
200
150
100
50
0
-50
0
50
100
150
200
250



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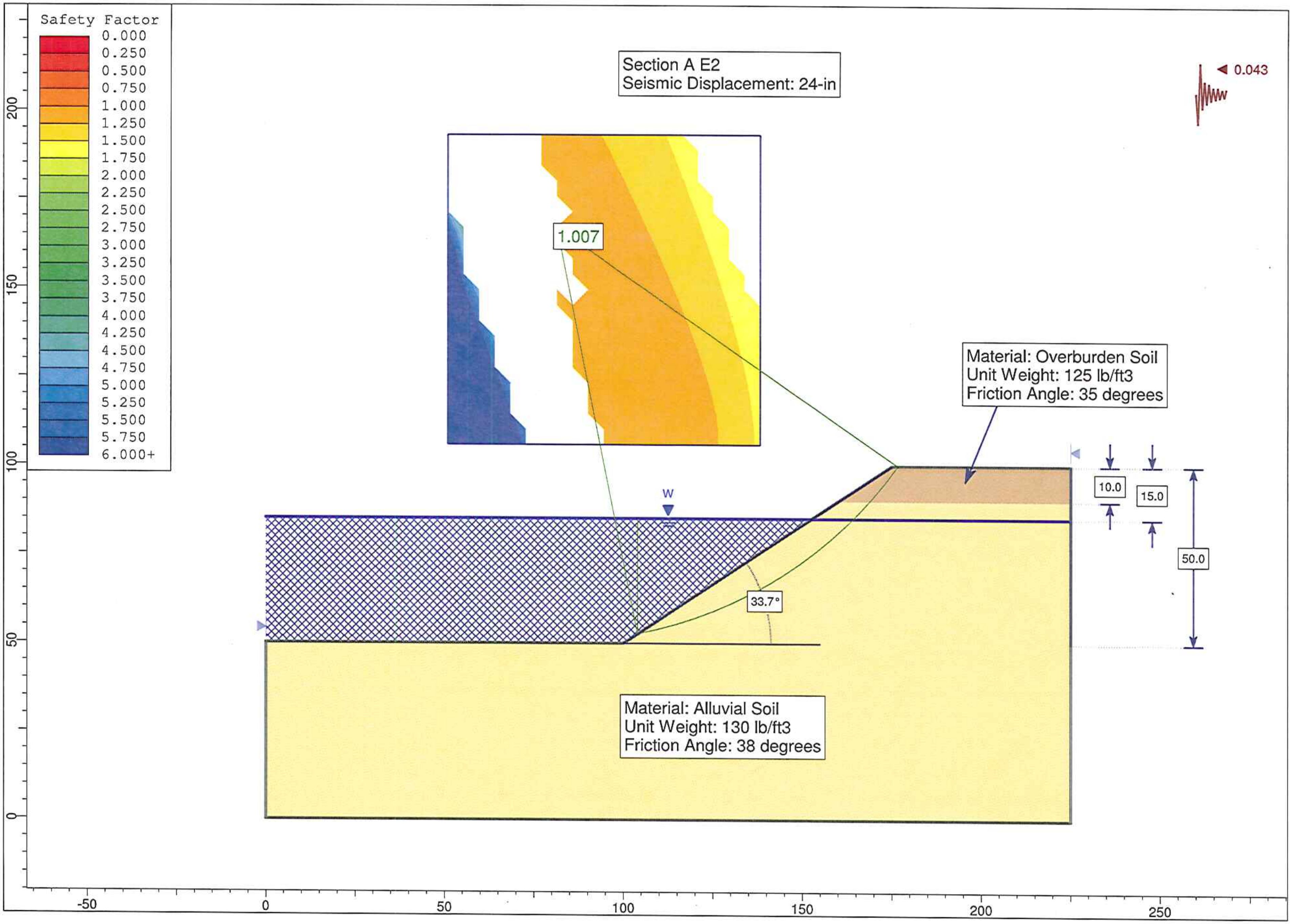
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section A E1
Seismic Displacement: 12-in
0.06
0.954
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
W
10.0
15.0
50.0
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250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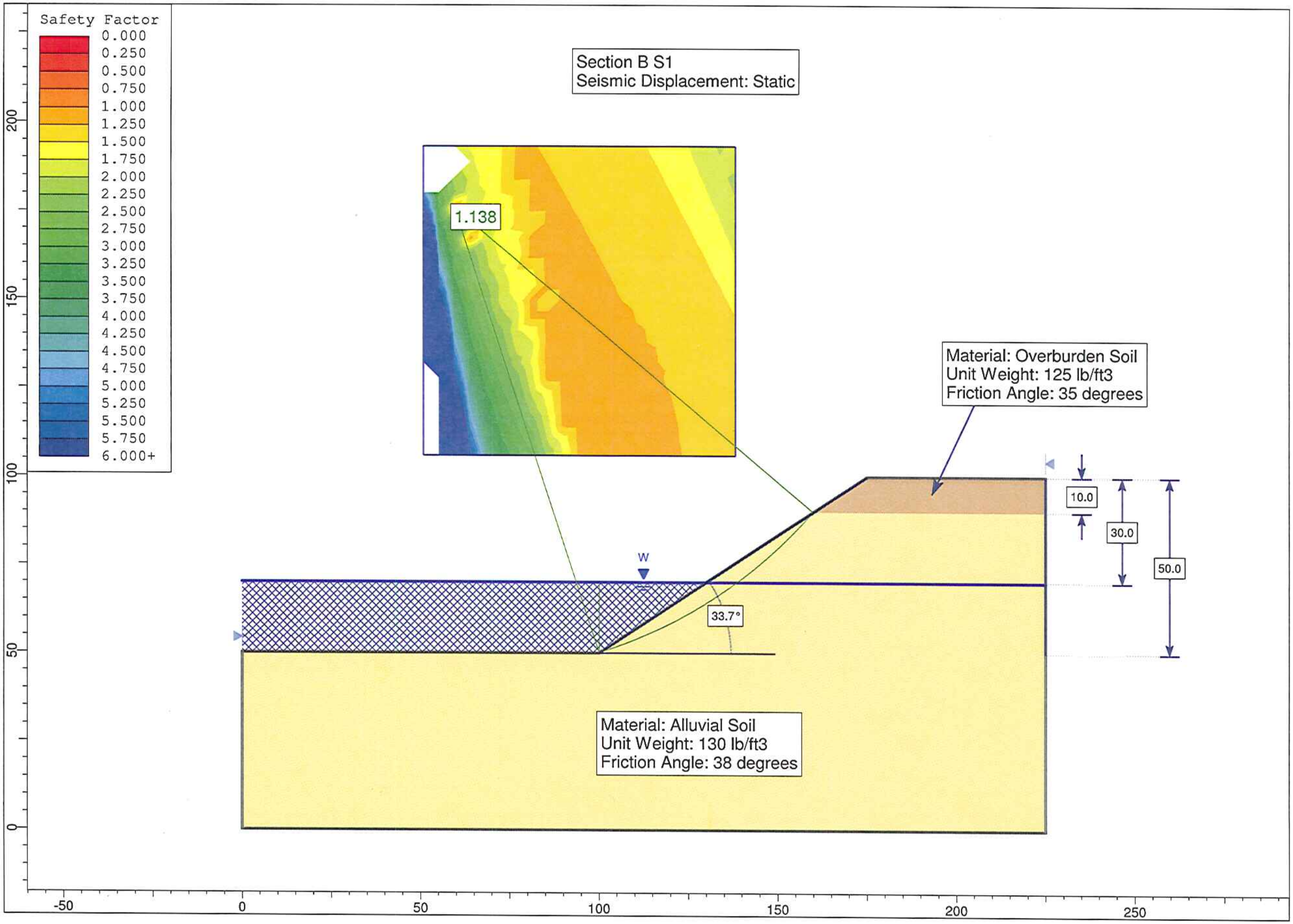
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section A E2
Seismic Displacement: 24-in
0.043
1.007
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
15.0
50.0
W
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
200
150
100
50
0
-50
0
50
100
150
200
250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3.750
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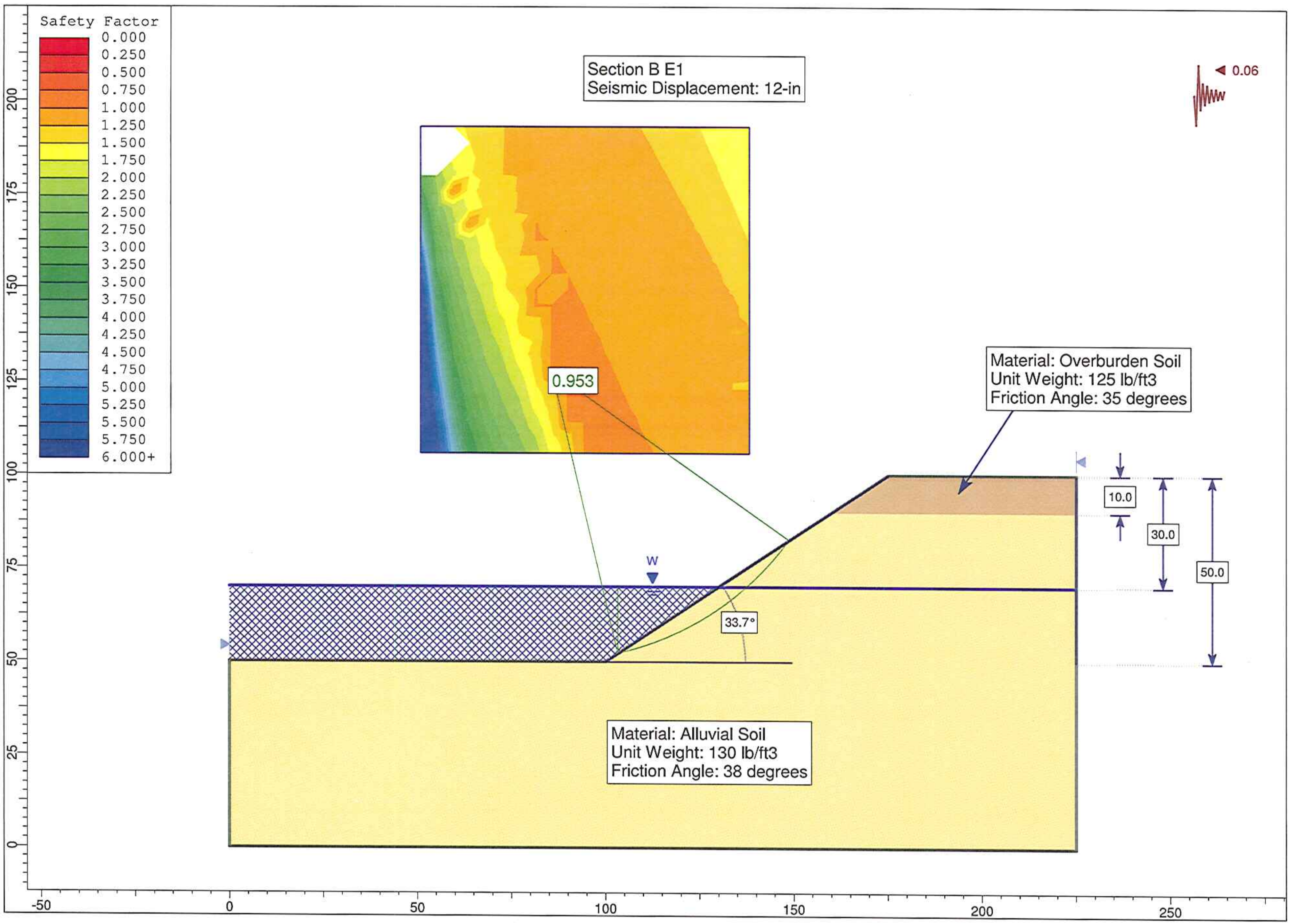
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section B S1
Seismic Displacement: Static
1.138
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250



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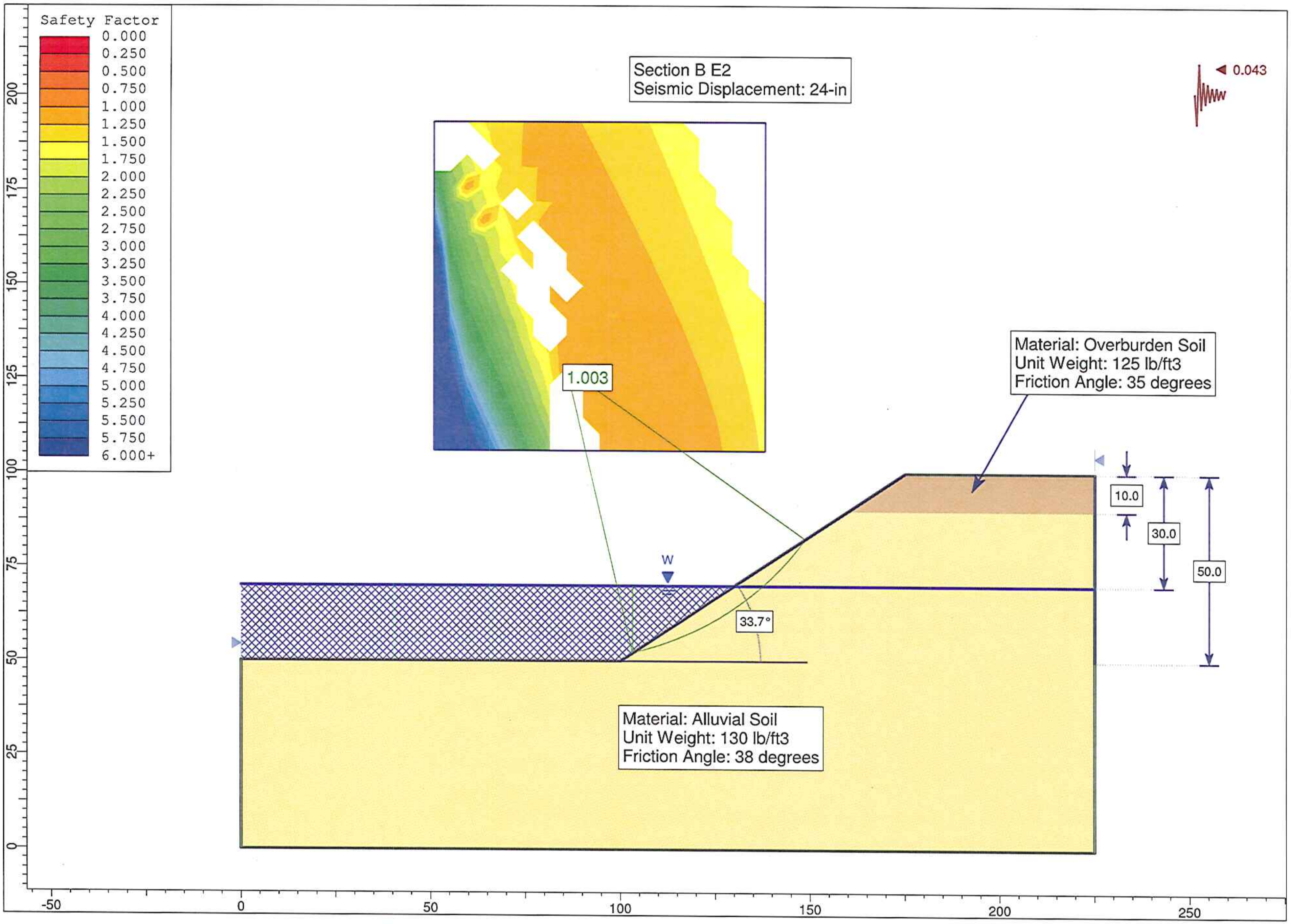
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section B E1
Seismic Displacement: 12-in
0.06
0.953
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees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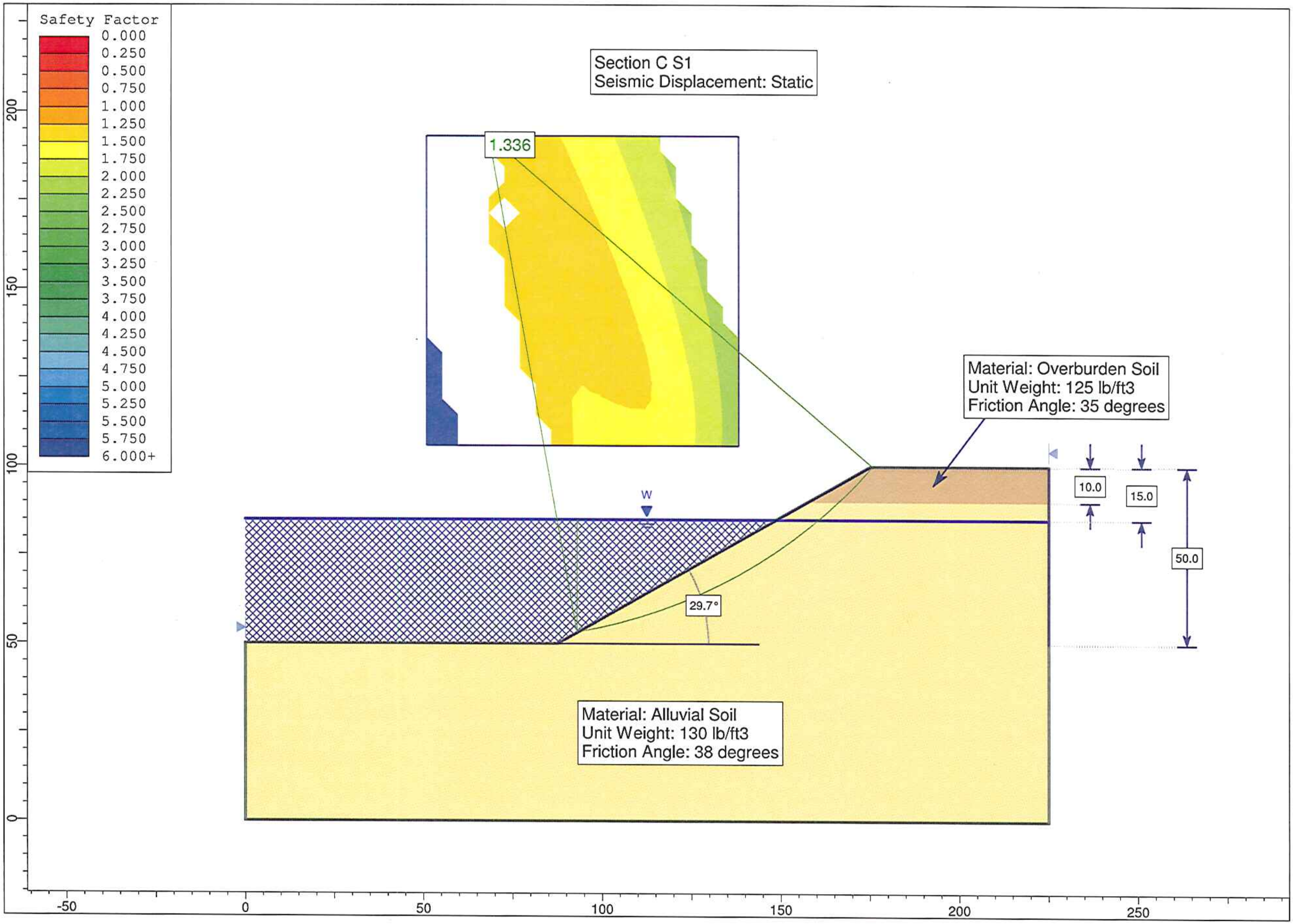
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section B E2
Seismic Displacement: 24-in
0.043
1.003
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250
25
75
125
175



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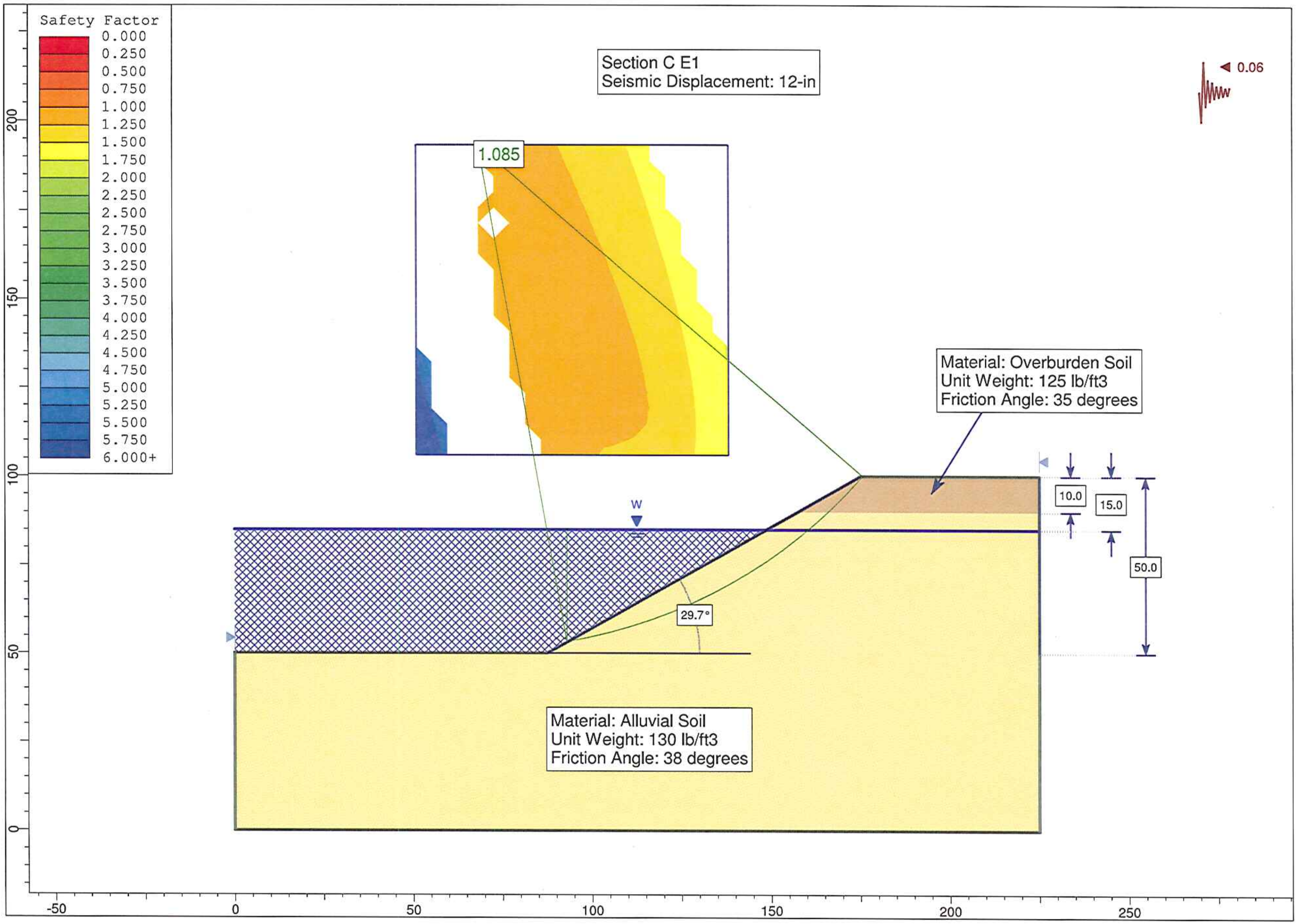
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section C S1
Seismic Displacement: Static
1.336
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
W
10.0
15.0
50.0
29.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
200
150
100
50
0
-50
0
50
100
150
200
250



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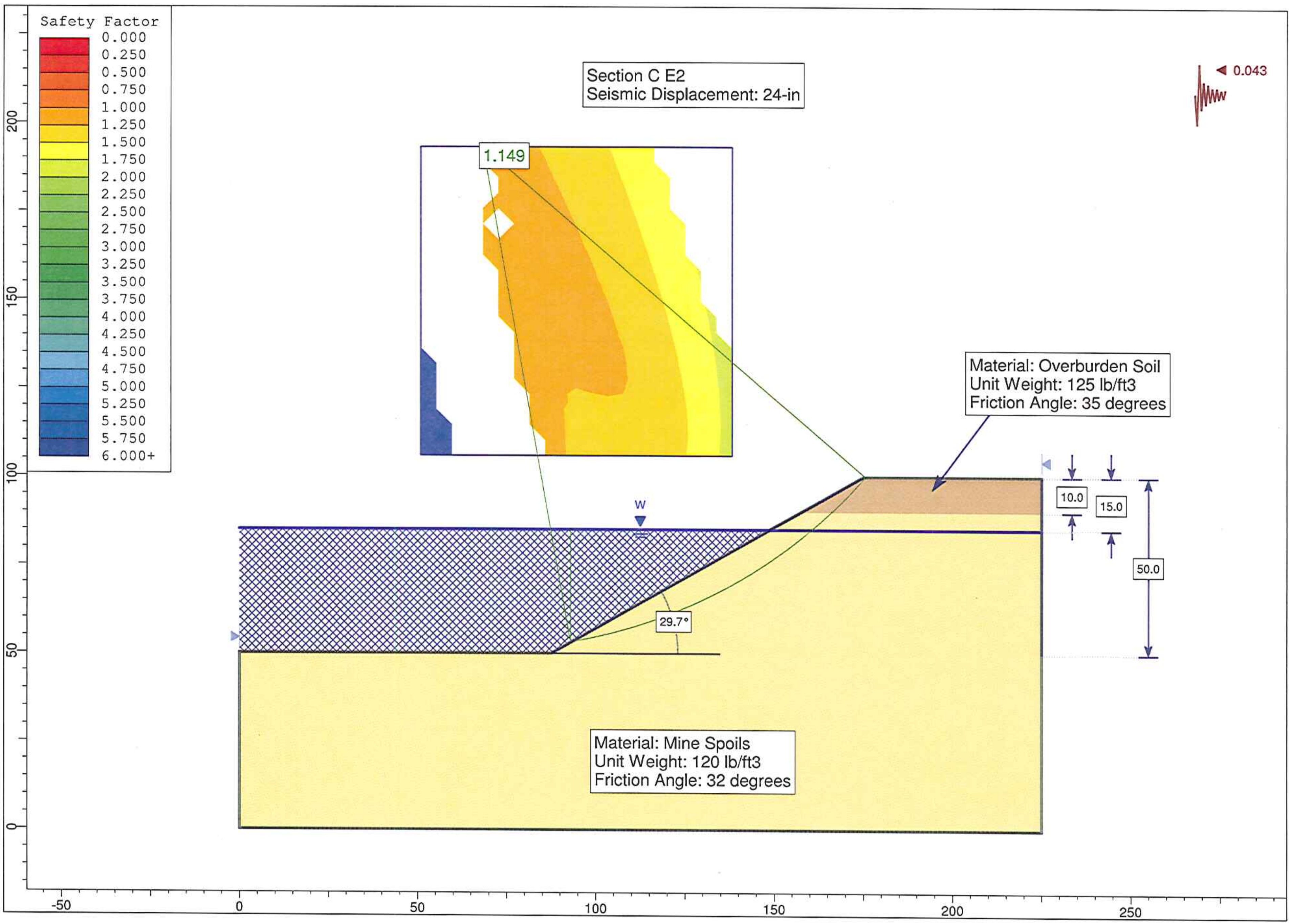
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section C E1
Seismic Displacement: 12-in
0.06
1.085
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
15.0
50.0
W
29.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250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5.000
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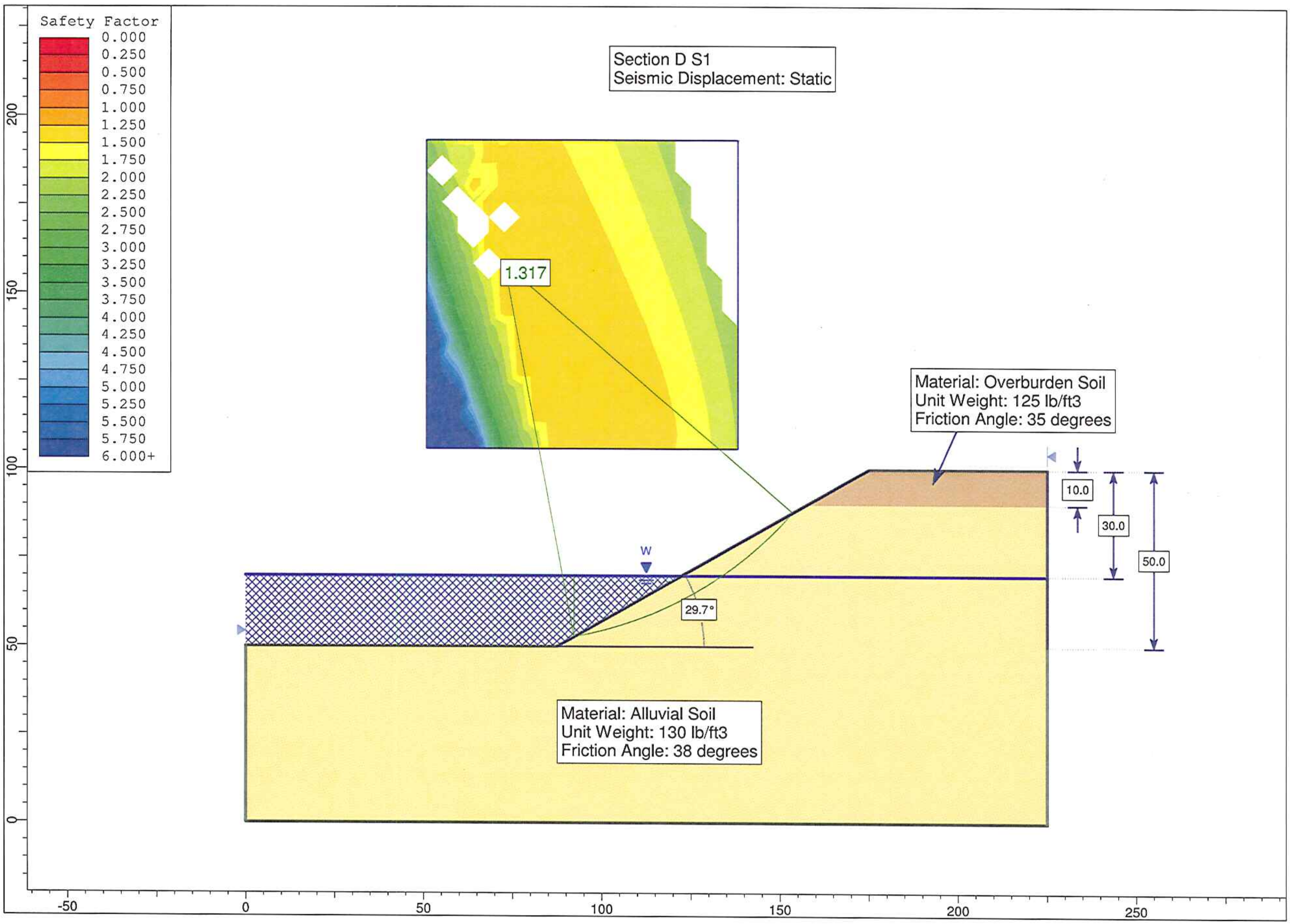
5.500
5.750
6.000+
Section C E2
Seismic Displacement: 24-in
0.043
1.149
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
15.0
50.0
W
29.7°
Material: Mine Spoils
Unit Weight: 120 lb/ft3
Friction Angle: 32 degrees
-50
0
50
100
150
200
250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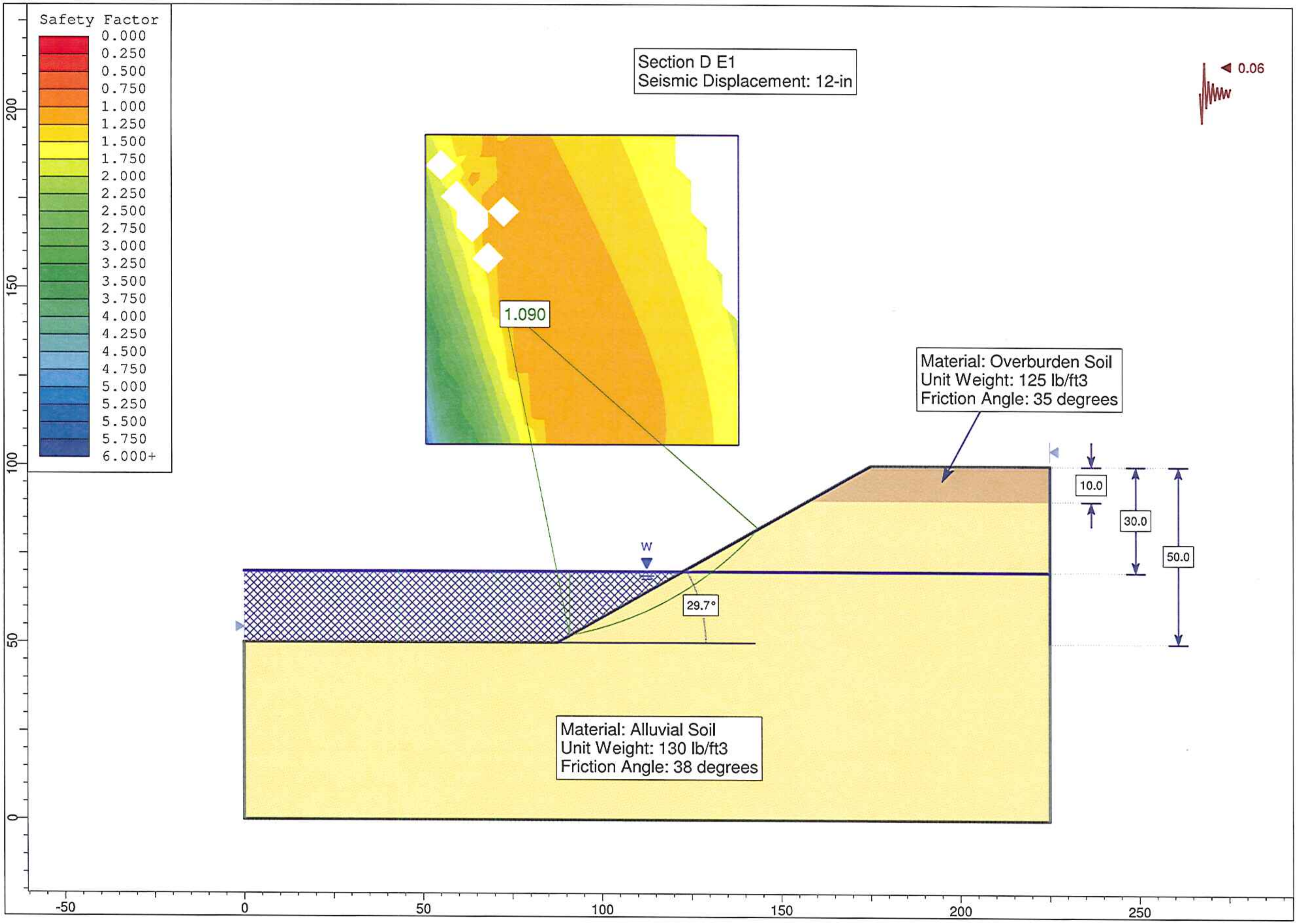
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section D S1
Seismic Displacement: Static
1.317
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
29.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
200
150
100
50
0
-50
0
50
100
150
200
250



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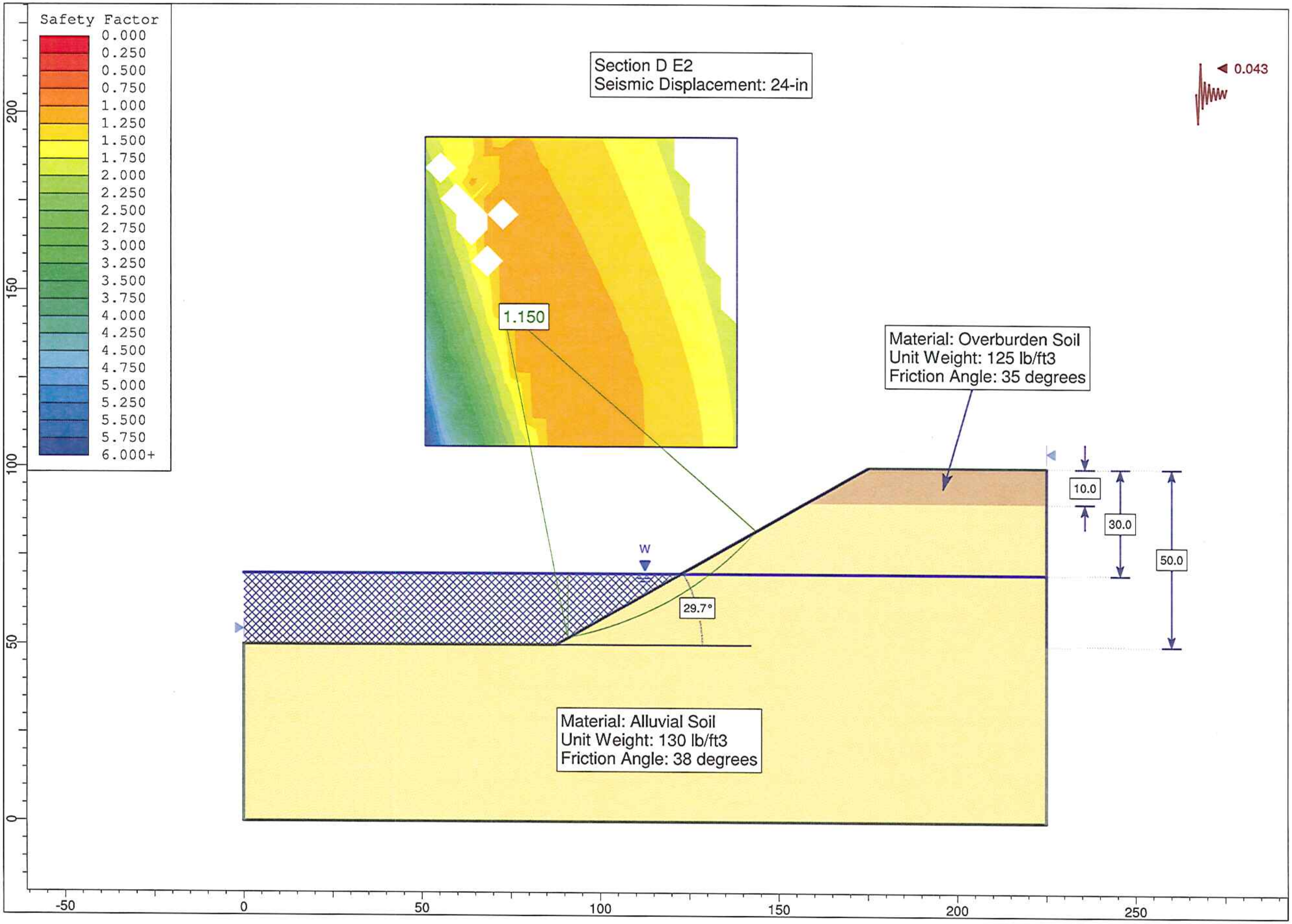
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section D E1
Seismic Displacement: 12-in
0.06
1.090
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
29.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250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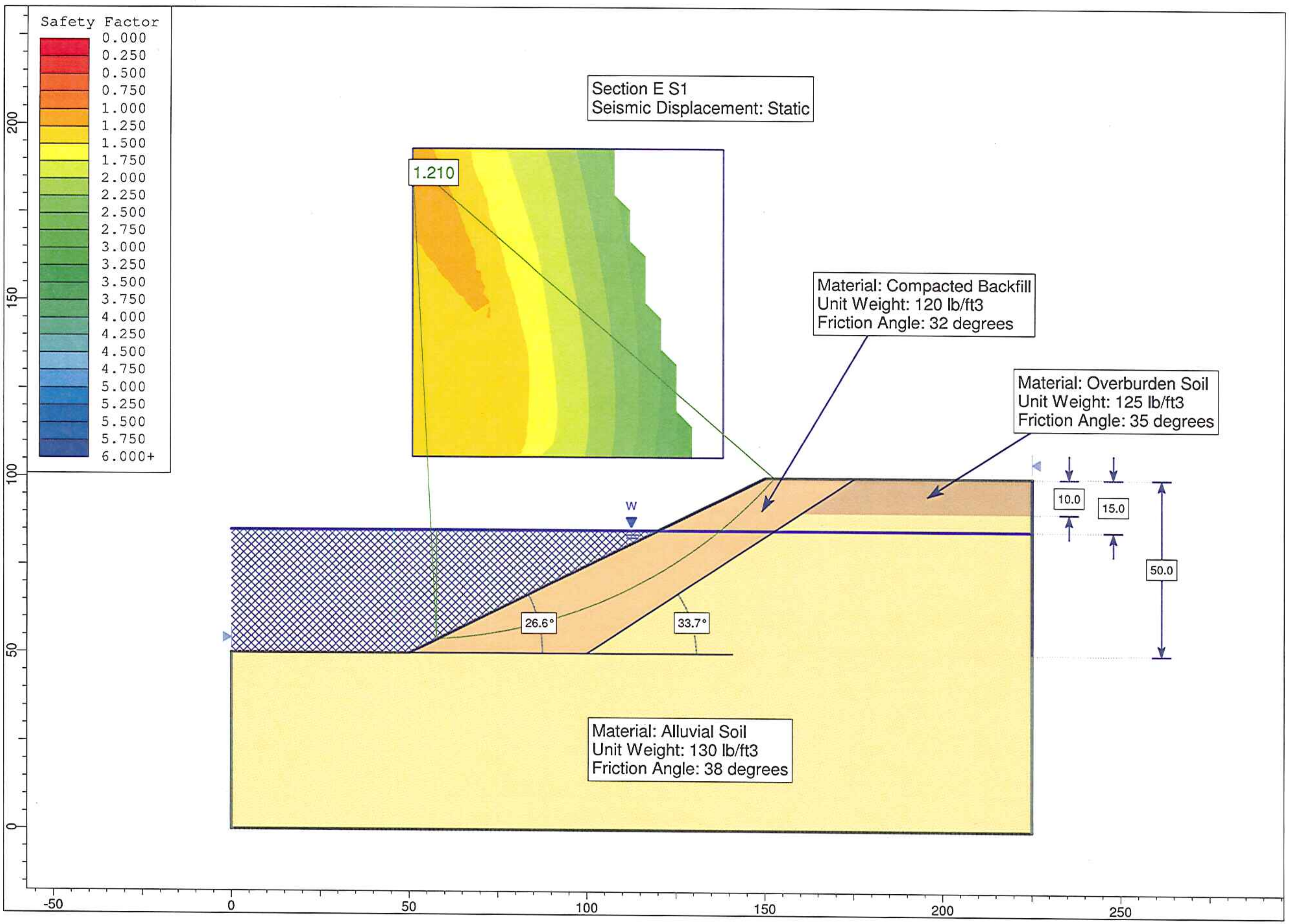
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section D E2
Seismic Displacement: 24-in
0.043
1.150
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
29.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250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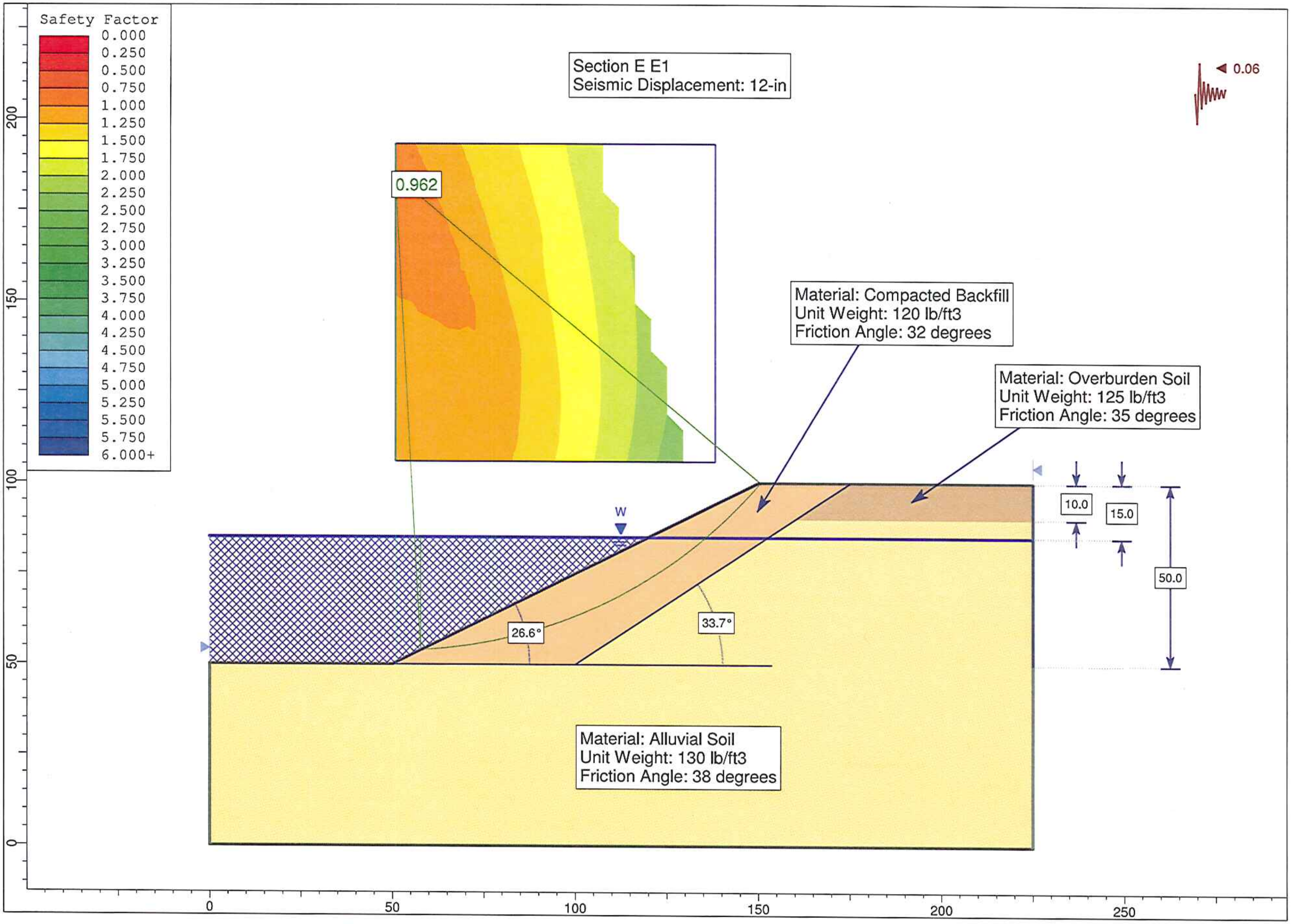
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section E S1
Seismic Displacement: Static
1.210
Material: Compacted Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 32 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
W
10.0
15.0
50.0
26.6°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250



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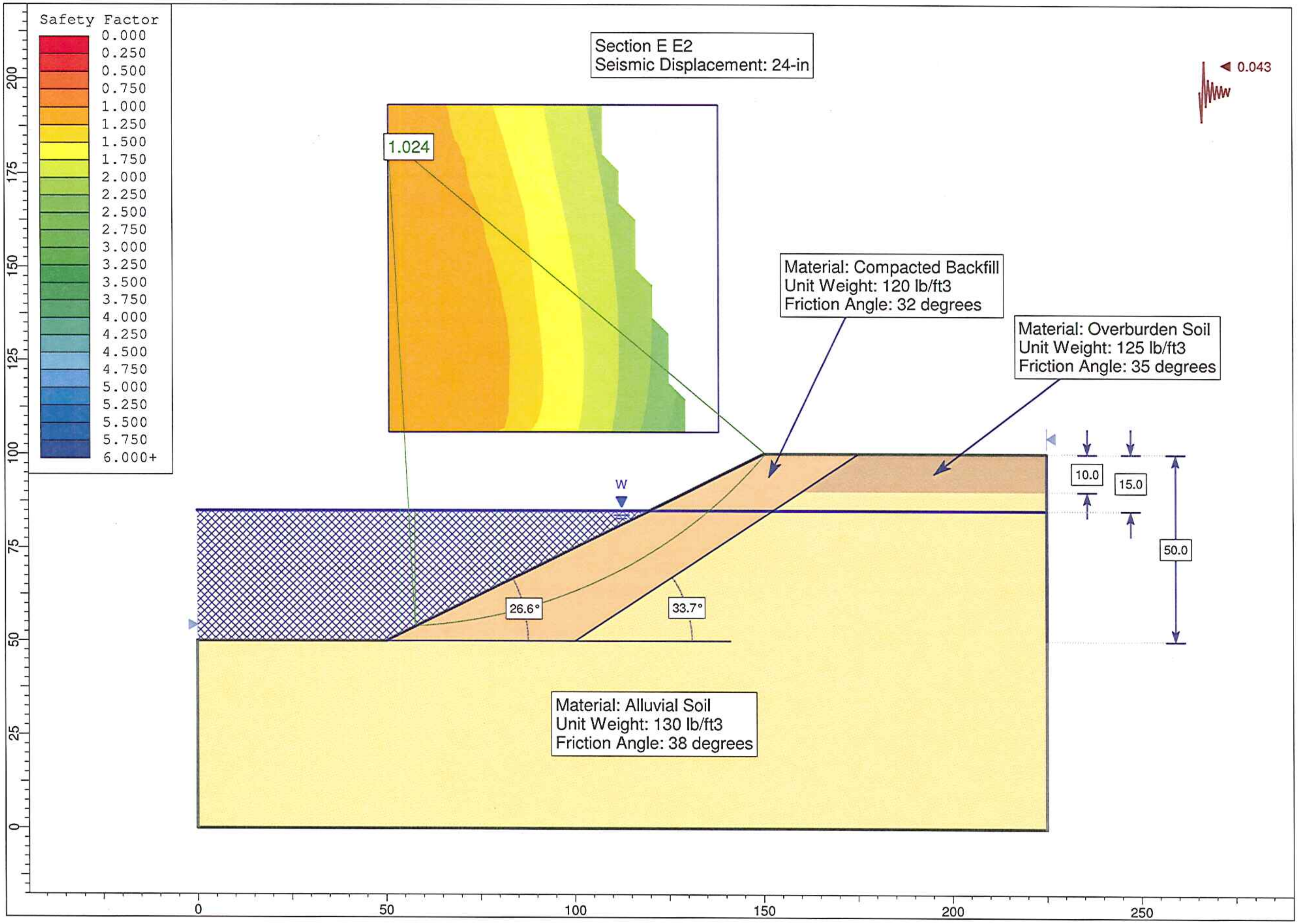
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section E E1
Seismic Displacement: 12-in
0.06
0.962
Material: Compacted Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 32 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
15.0
50.0
W
26.6°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
0
50
100
150
200
250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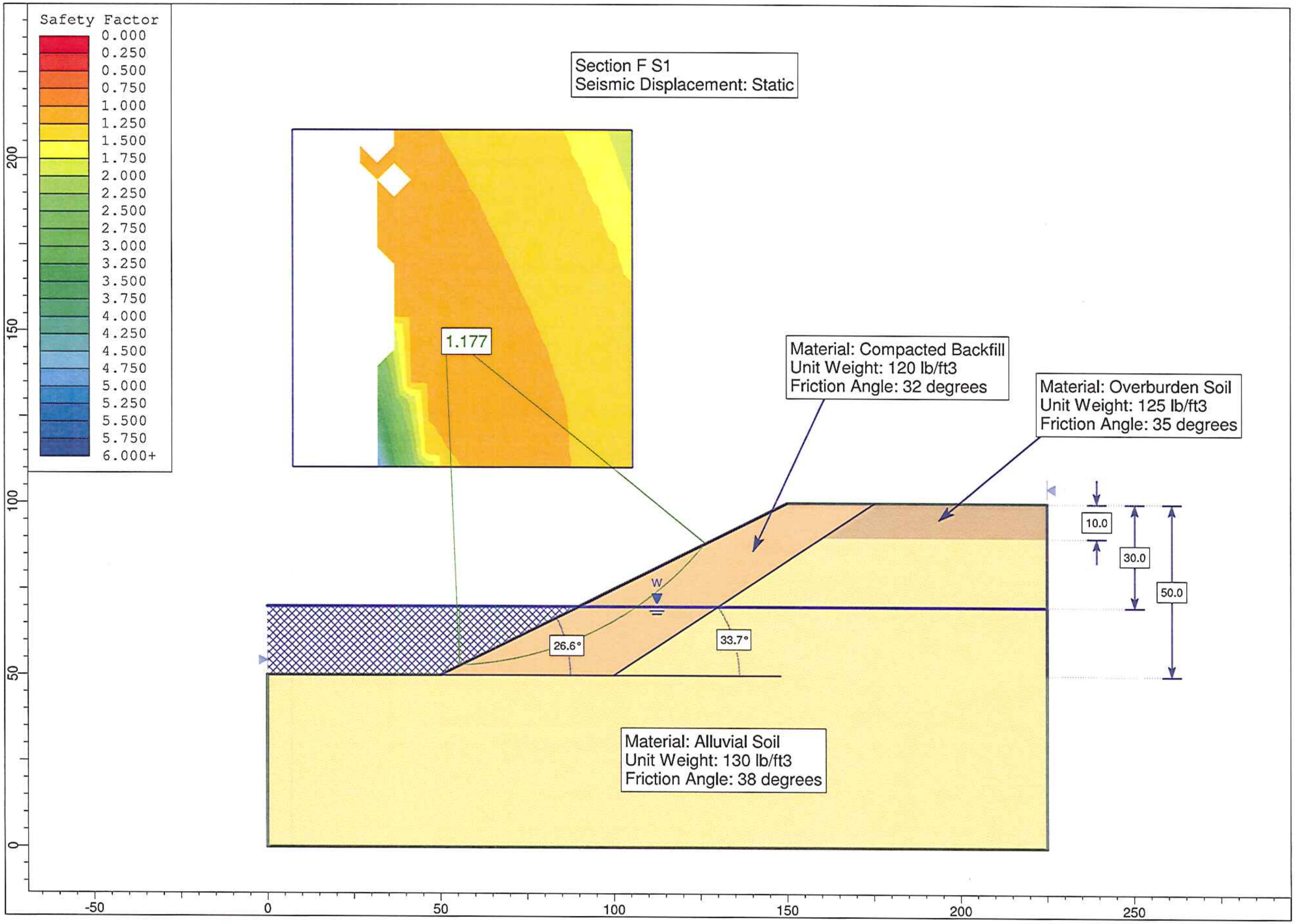
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section E E2
Seismic Displacement: 24-in
0.043
1.024
Material: Compacted Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 32 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
W
10.0
15.0
50.0
26.6°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
0
25
50
75
100
125
150
175
200
250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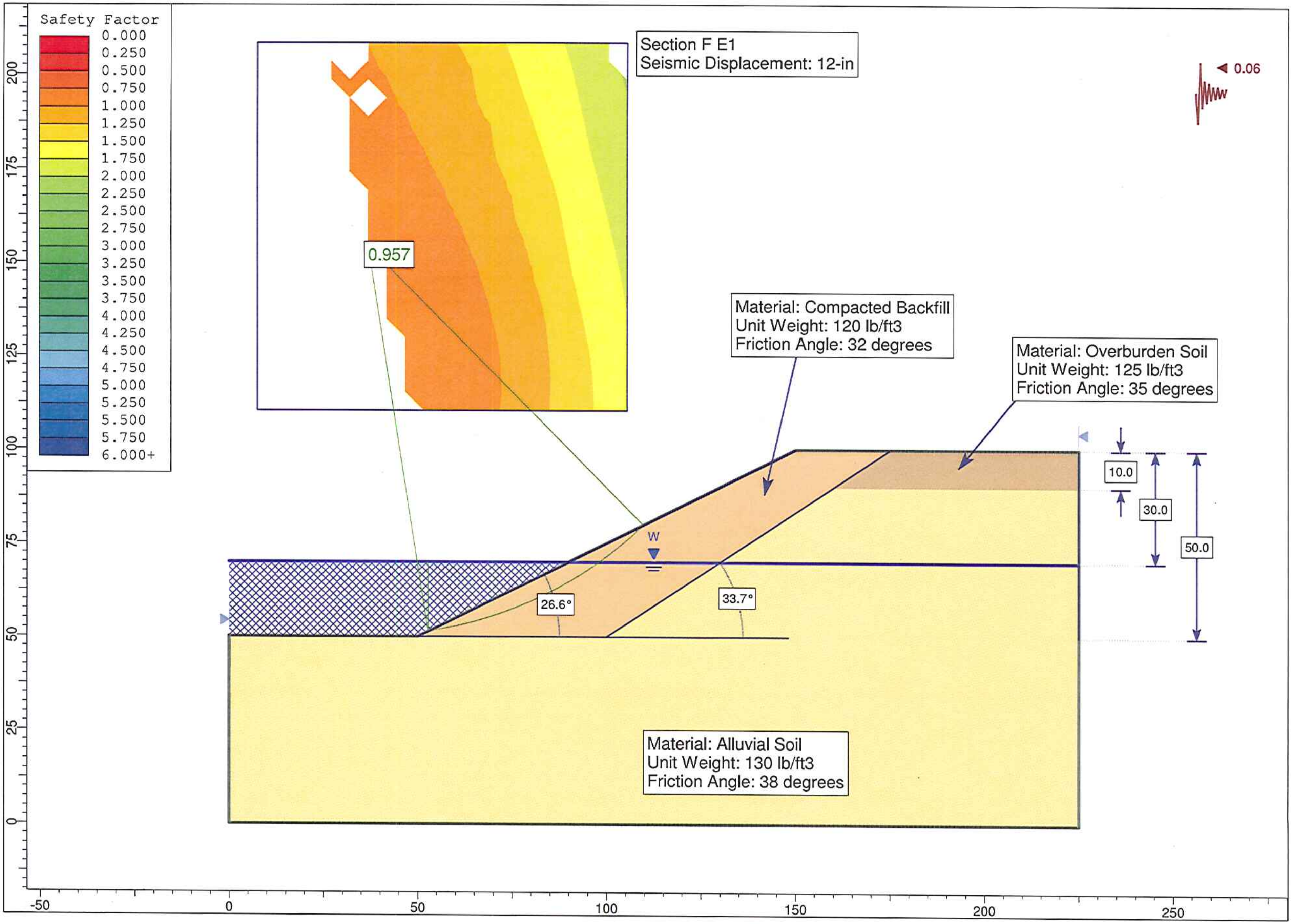
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section F S1
Seismic Displacement: Static
1.177
Material: Compacted Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 32 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
26.6°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees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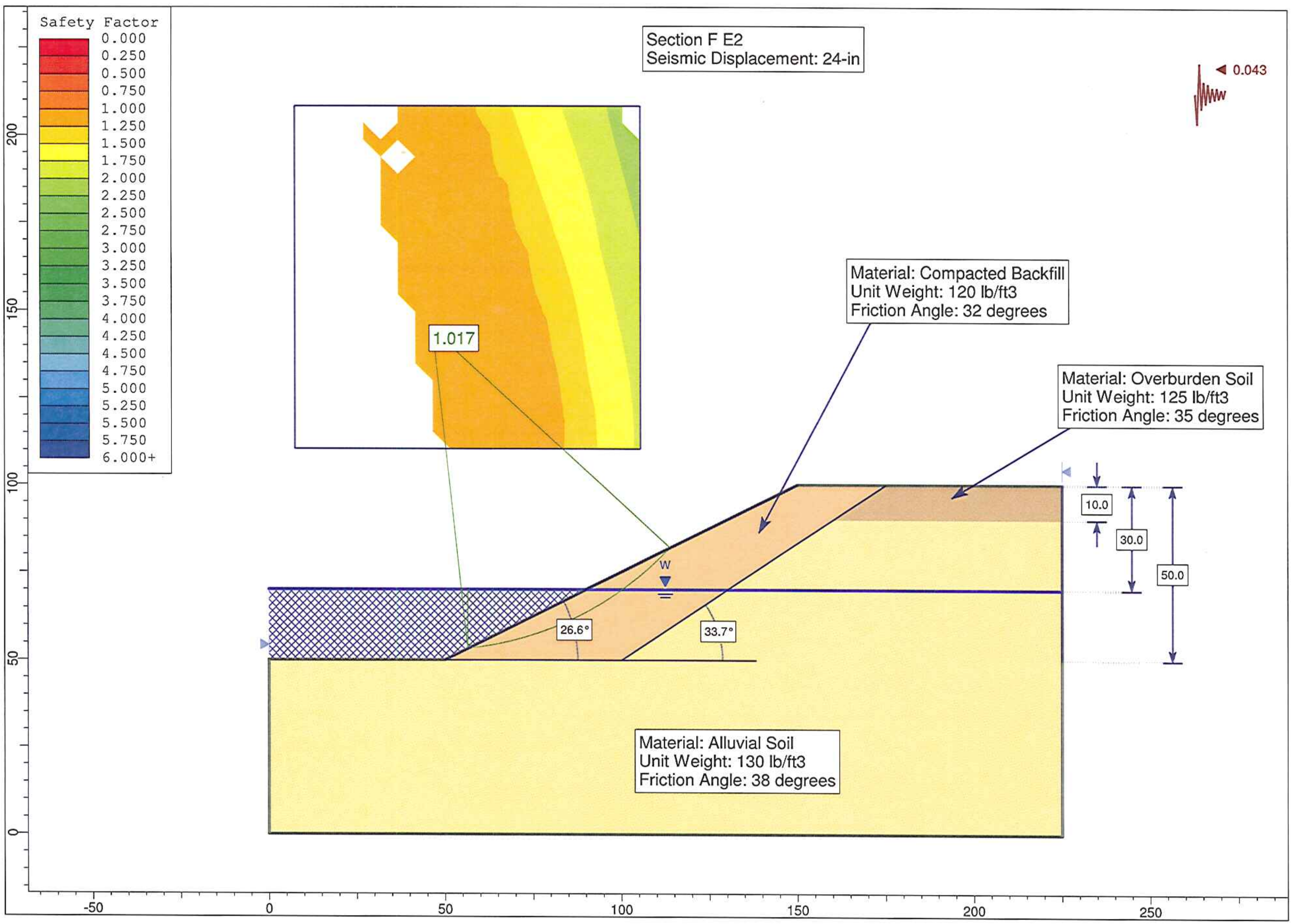
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section F E1
Seismic Displacement: 12-in
0.06
0.957
Material: Compacted Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 32 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
26.6°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees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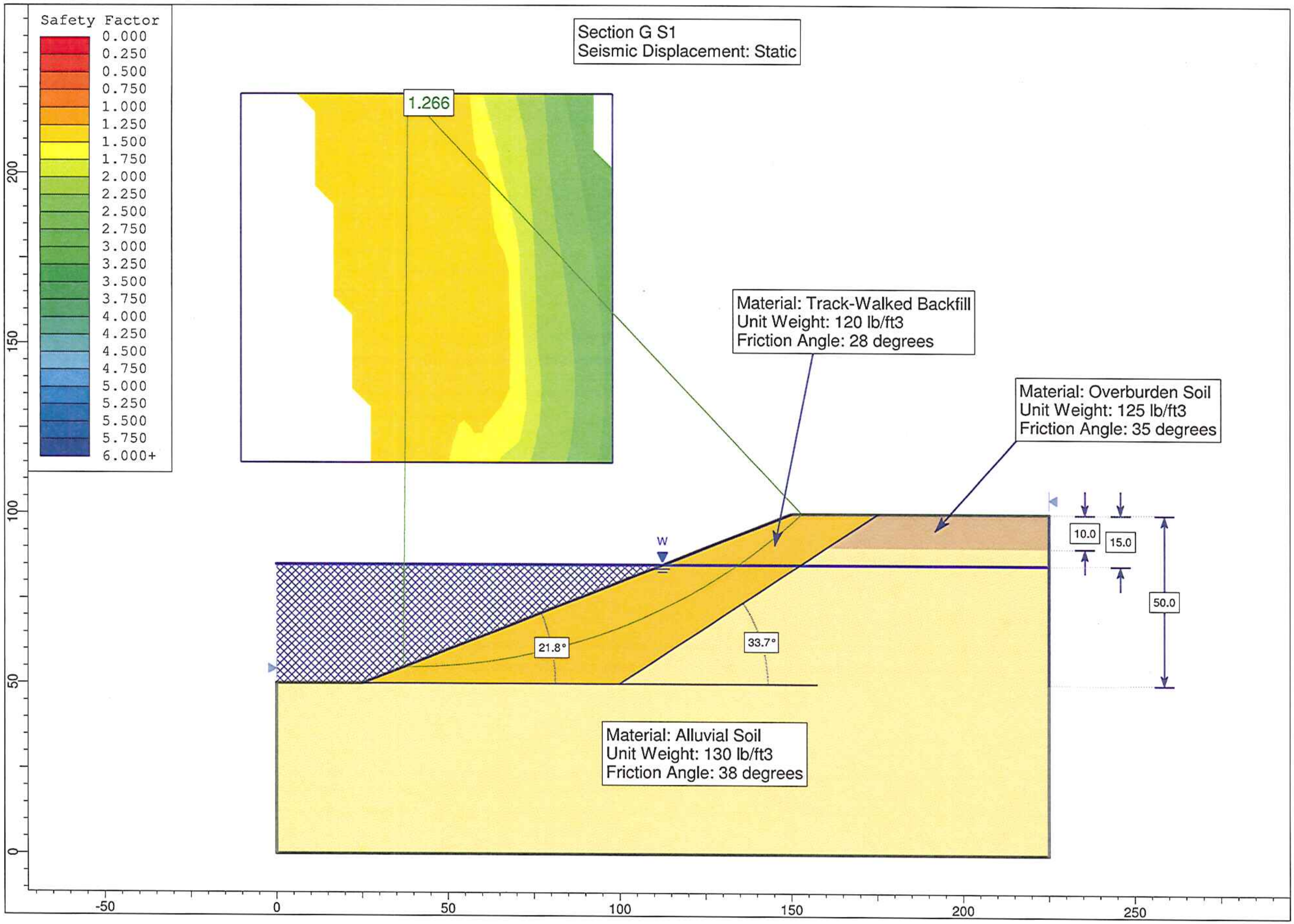
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section F E2
Seismic Displacement: 24-in
0.043
1.017
Material: Compacted Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 32 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
26.6°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250



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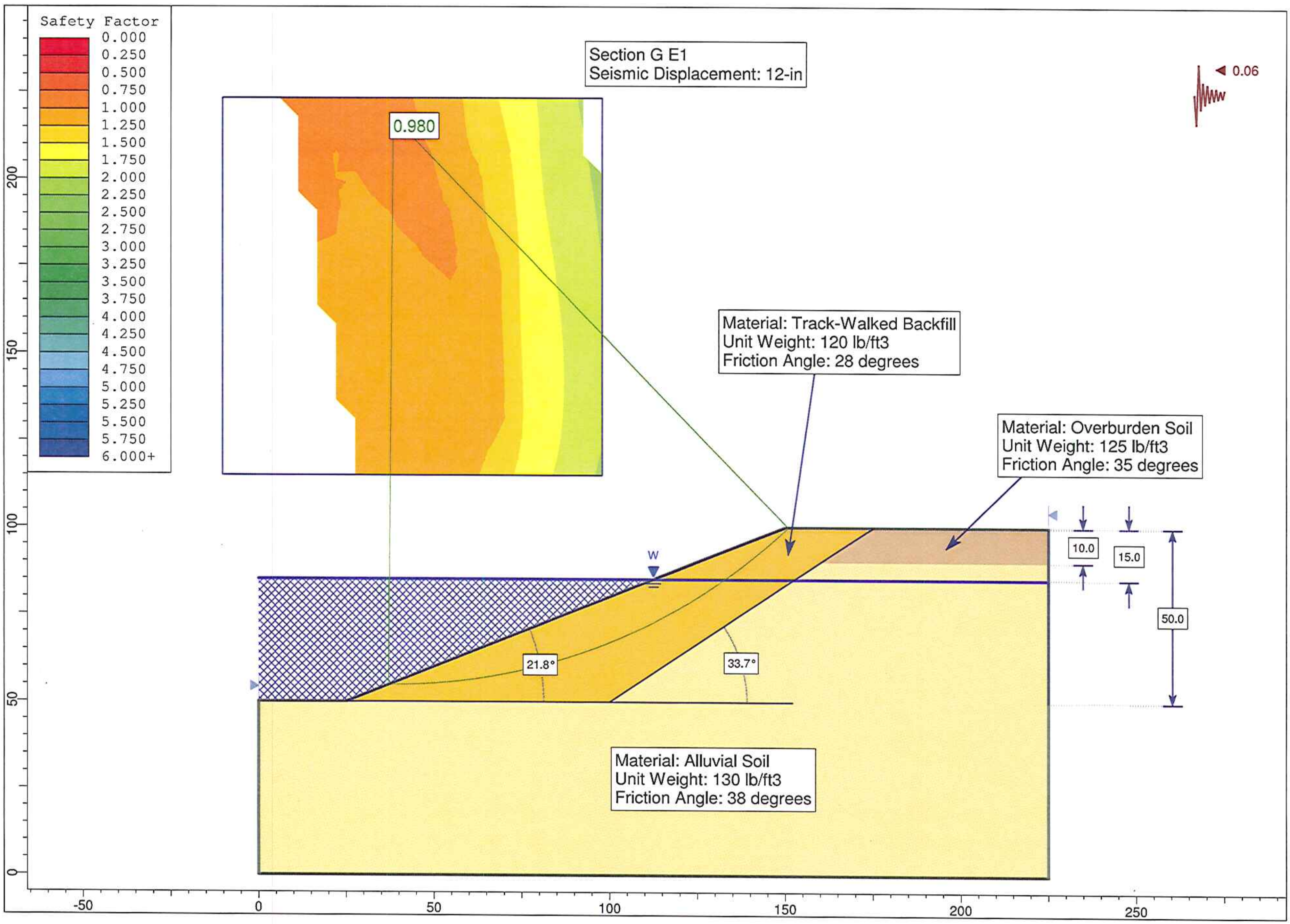
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section G S1
Seismic Displacement: Static
1.266
Material: Track-Walked Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 28 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
W
10.0
15.0
50.0
21.8°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250



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1.500
1.750
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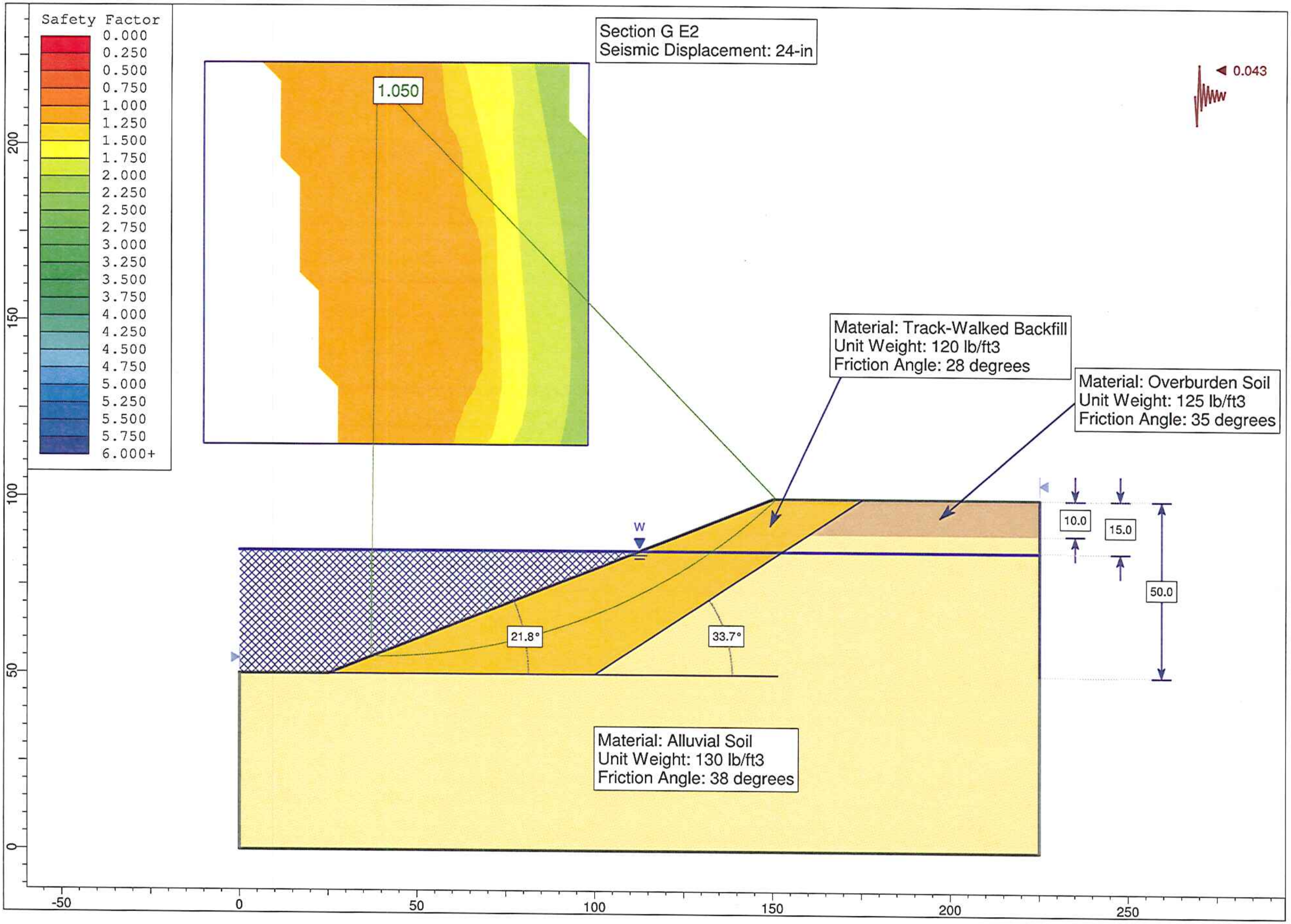
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section G E1
Seismic Displacement: 12-in
0.06
0.980
Material: Track-Walked Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 28 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
W
10.0
15.0
50.0
21.8°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
0
50
100
150
200
-50
0
50
100
150
200
250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1.500
1.750
2.000
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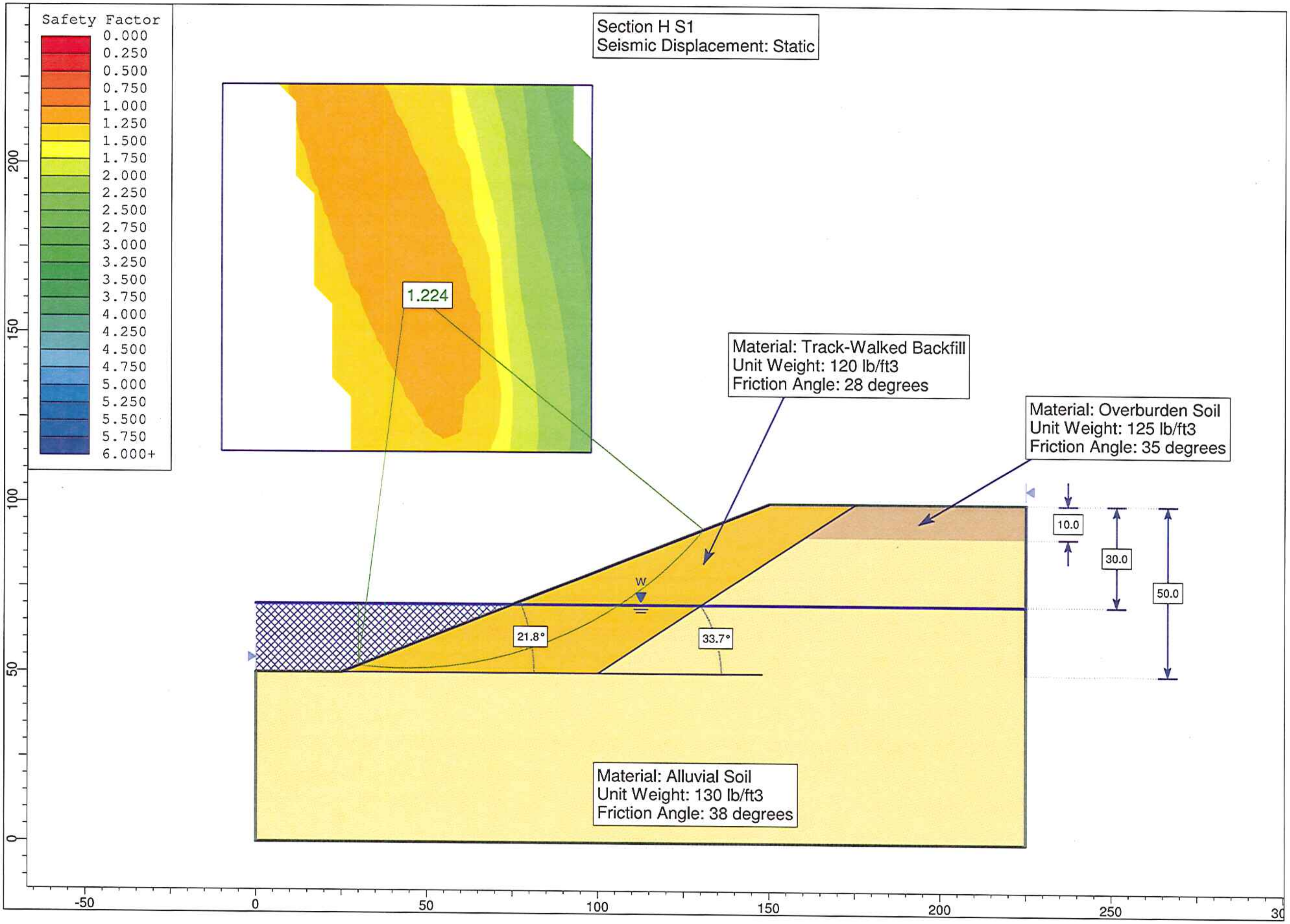
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section G E2
Seismic Displacement: 24-in
0.043
1.050
Material: Track-Walked Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 28 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
W
10.0
15.0
50.0
21.8°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250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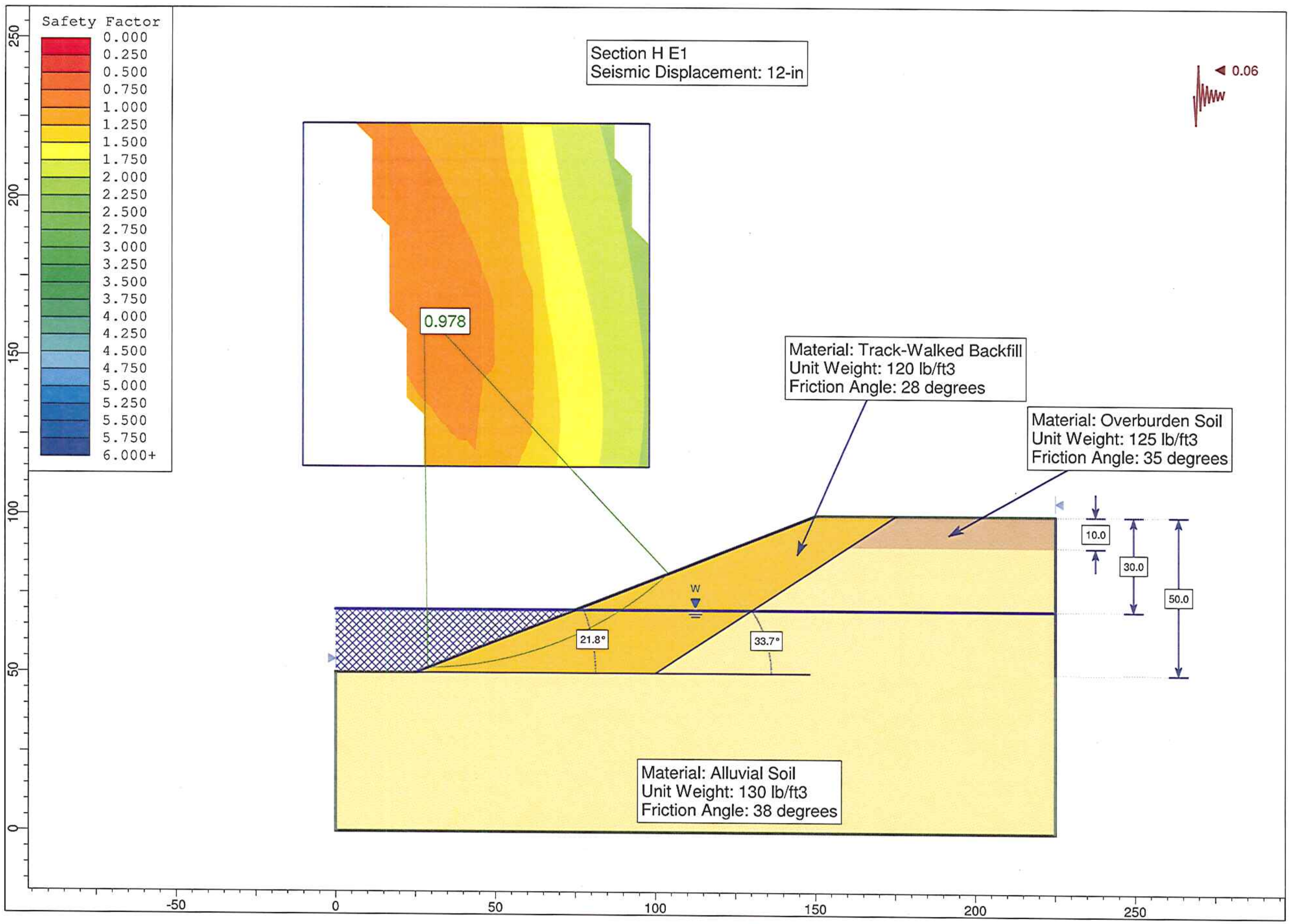
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section H S1
Seismic Displacement: Static
1.224
Material: Track-Walked Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 28 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
21.8°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250
300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0.750
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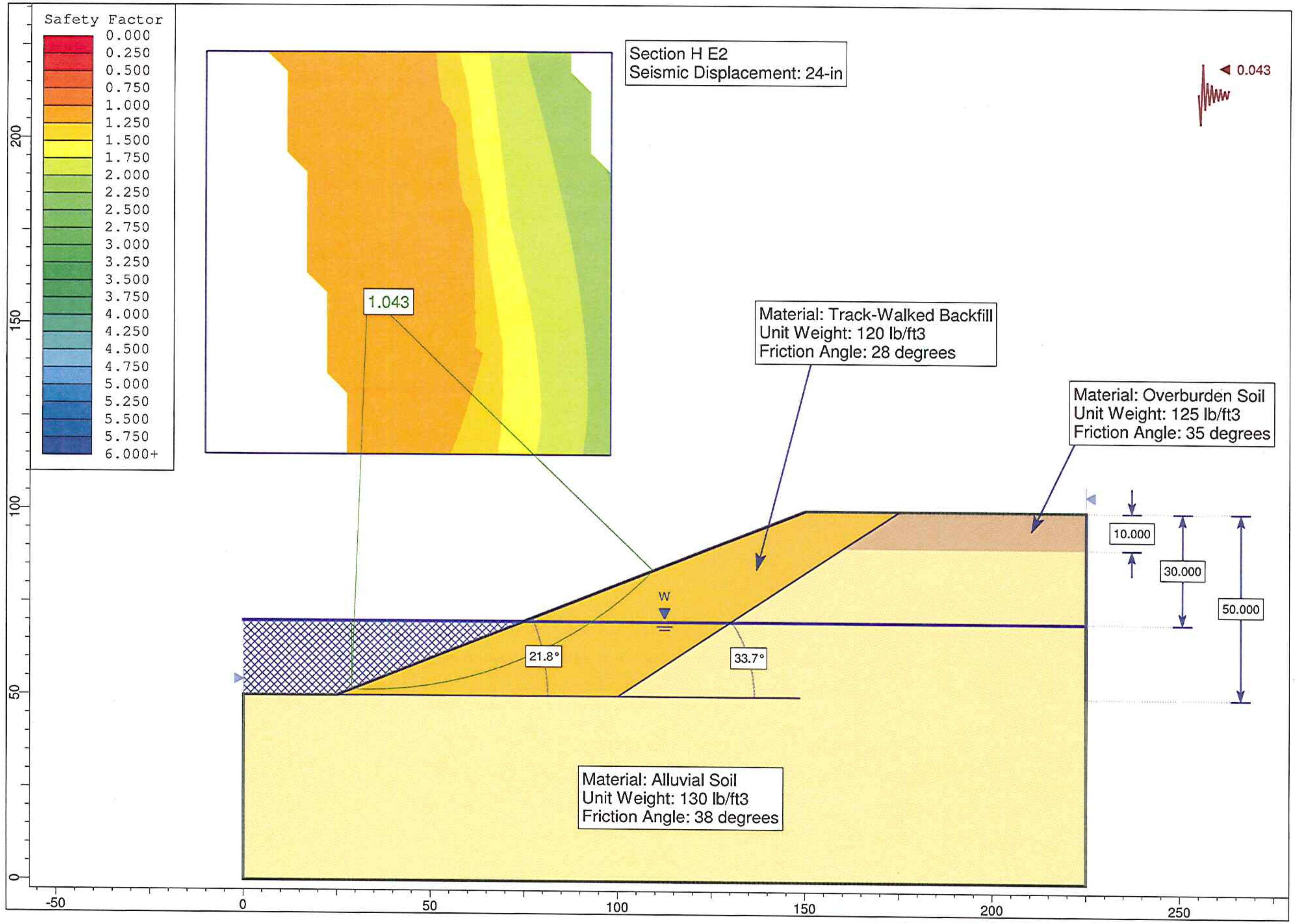
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section H E1
Seismic Displacement: 12-in
0.06
0.978
Material: Track-Walked Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 28 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.0
30.0
50.0
W
21.8°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
250
200
150
100
50
0
-50
0
50
100
150
200
250



Safety Factor
0.000
0.250
0.500
0.750
1.000
1.250
1.500
1.750
2.000
2.250
2.500
2.750
3.000
3.250
3.500
3.750
4.000
4.250
4.500
4.750
5.000
5.250
5.500
5.750
6.000+
Section H E2
Seismic Displacement: 24-in
0.043
1.043
Material: Track-Walked Backfill
Unit Weight: 120 lb/ft3
Friction Angle: 28 degrees
Material: Overburden Soil
Unit Weight: 125 lb/ft3
Friction Angle: 35 degrees
10.000
30.000
50.000
W
21.8°
33.7°
Material: Alluvial Soil
Unit Weight: 130 lb/ft3
Friction Angle: 38 degrees
-50
0
50
100
150
200
250

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Carmelita Project EIR
Technical Report Review

SUBJECT/RESOURCE AREA:	**Reclamation Plan, Slope Stability Analysis, Geology & Soils Environmental Assessment**
REPORTS PREPARED BY:	**Benchmark Resources, June 2010 Golder Associates, January 2010, Benchmark Resources, July 2010**
REVIEWED BY:	**Todd Parkington, URS Corporation**
DATE OF REVIEW:	**August 20, 2010, September 2, 2010, and December 14, 2010**

Introduction/Overview:

This review addresses three reports: Carmelita Project Reclamation Plan, June 2010, prepared by Benchmark Resources, the Reclamation Slope Stability Evaluation, January 2010, prepared by Golder Associates, and Carmelita Project Geology & Soils Environmental Assessment, July 2010.

It should also be noted that much of the basis of Slope Stability Evaluation report is derived from antoher report: Aggregate Assessment, 2008, prepared by BSK, which was not made available for this review.

Technical Report Summary:

Summary of Slope Stability Evaluation associated with aspects of the Carmelita Project

The slope stability evaluation report provides information on the stability of slopes that are planned to be left after mining and when the property is reclaimed. The evaluation used the results

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of an aggregate assessment report which included a geotechnical investigation that consisted of the following field exploration and laboratory testing programs:

- Excavation of 79 test pits up to 15 feet deep
- Drilling of 11 borings to depths of 100 to 400 feet using sonic coring methods
- Groundwater measurements in eight on-site agricultural wells
- Laboratory tests to measure gradations and aggregate quality on selected soil samples

The aggregate assessment report was not made available for this review, but reportedly indicated that "*the site is underlain by alluvial soils consisting of interbedded cobble and gravels, sands, silts and clays*", and "*the majority of the aggregate resource suitable for mining is located within the upper 50 feet of the native alluvial soils*". The slope stability report states "*The native alluvial soils include an upper "overburden" layer that consists of silt to silty sand with some organic material that is up to 0 to 13 feet thick*".

Static and seismic slope stability analyses are presented on the basis of aggregate assessment and suitability study findings that the soils are dominantly granular with limited horizontal impacts of any slope instability, and interior slopes are not critical with respect to stability except when next to irrigation ditches. The slope stability report provides factors of safety for three slope types:

- Perimeter slopes or interior slopes adjacent to irrigation ditches without backfill
- Perimeter slopes or interior slopes adjacent to irrigation ditches with backfill
- Non-critical interior slopes.

The slope stability report concludes that operational slopes should not exceed inclinations of 1.5 horizontal to 1.0 vertical (1.5H:1V) and that reclamation slopes can be inclined as follows:

- Perimeter slopes and interior slopes adjacent to irrigation ditches not backfilled with mine spoils - 1.75H:1V
- Mine spoil backfill compacted to a prescribed degree by heavy compactors designed for soil compaction - 2H:1V
- Mine spoil backfill placed in controlled lifts and compacted by earth moving equipment – 2.5H:1V.

Summary of Reclamation Plan associated with aspects of the Carmelita Project

The reclamation plan provides information on the proposed reclamation for the mine including:

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- post mining topography,
- post mining land use,
- regional geology,
- regional hydrology,
- regional vegetation and wildlife,
- general mining procedures including maximum pit depth and initiation and termination dates for mining,
- effect of reclamation on future mining,
- and financial assurance.

The report indicates that mining will occur across the site to a maximum depth of 50 feet below the existing ground surface in a series of cells with access roads left at the original grade between the cells. Post mining land use is to be 25 percent agricultural and 75 percent water recharge.

The reclamation plan indicates that cut slopes will be left at inclinations of 1.5H:1V while fill slopes will be constructed to inclinations of 2H:1V. These slope inclinations are inconsistent with the slopes recommended in the slope stability report. For example, the slope stability report allows for operational slopes to be as steep as 1.5H:1V, but recommends flatter reclamation slopes of 1.75H:1V for perimeter slopes and slopes adjacent to irrigation ditches.

Summary of Geology & Soils Environmental Assessment associated with aspects of the Carmelita Project

The Geology & Soils Assessment provides information on the local geology, potential seismic and geologic hazards, their level of significance with respect to the project and proposed mitigation, if required.

The proposed operational and reclamation slope angles are provided with the associated factors of safety for both static and seismic conditions.

Conclusions/Areas of Concern:

Regional geology is provided in all of the reports but site specific geology is provided only in the form of Soil Conservation Service (SCS) soil types. SCS soil types provide information only for the upper three to six feet of soil. There is also no reference to the geotechnical characteristics of the soils in commonly accepted geotechnical soil classifications such as the Unified Soil Classification System (USCS). The slope stability report indicates that up to 13 feet of overburden is present at the site. However, the reclamation plan indicates that up to 20 feet of overburden is present at the site. There are also no subsurface profiles showing the soils types in accordance with the USCS and suitability for mining versus stockpiling. Therefore, little or no information was provided regarding the majority of the soils to be mined and their engineering characteristics. Data on the site soils sufficient to establish the critical gradient and stable post mining slope angles will need to be developed. This information is also needed for mine planning.

Information is provided on what geotechnical parameters were used to develop and design the slopes, what groundwater levels and earthquake criteria were assumed in the analyses, and what slope stability methods were used to confirm that the slopes have acceptable factors of safety with respect to static and seismic stability. However, the soil parameters were developed based on the aggregate assessment report which was not available for this review. Hence the appropriateness of the parameters cannot be verified. The critical gradient for the site soils needs to be established.

Final angles for mine pit cut and fill slopes are specified in both the reclamation plan and the slope stability analysis, but the conclusions are inconsistent. For example, the reclamation plan indicates that cut slopes will be left at inclinations of 1.5H:1V while fill slopes will be constructed to inclinations of 2H:1V. Conversely, the slope stability report allows for operational slopes to be as steep as 1.5H:1V, but recommends flatter reclamation slopes. The Geology & Soils Assessment provides slope angles with associated factors of safety but no information on which angles will be used for operations versus reclamation.

Backfilling of slopes in standing water was not assessed (indicated in the Golder report as to be completed later, if backfilling under water is to be performed) and seepage effects on slopes were not evaluated. These are alluded to as deficiencies in the slope stability report.

The reclamation plan indicates that 75 percent of the cells will be left open with bottom depths lower than the ground water level and allowed to fill with water. The plan further indicates that the water may be used for agriculture. The plan does not indicate if cells will ever be emptied or drawn down significantly in a short period of time (i.e. “rapid drawdown”). This has slope stability implications as the case of rapid drawdown tends to be the most critical for inundated slopes.

Recommended Revisions:

The aggregate assessment report or at least those portions that were used to develop the slope stability evaluation need to be presented. Specifically, test pit and boring logs, laboratory test results and groundwater level measurements need to be made available to assess the suitability of the soil parameters chosen by Golder for the stability analyses.

The reclamation plan needs to be revised to reflect the results of the slope stability evaluations. Specifically, cut slope angles for perimeter slopes and slopes adjacent to irrigation channels need to be 1.75H:1V instead of 1.5H:1V. Proposed methods for placing backfill need to be specified in the reclamation plan so that the appropriate slope angle from the stability evaluation can be selected. Further, an indication of whether or not backfill will be placed beneath water needs to be given and, if subaqueous placement will be used, additional slope stability analyses will need to be performed to establish an appropriate slope angle for subaqueous slopes.

A discussion regarding the probability of rapid drawdown conditions developing in the cells needs to be provided in the reclamation plan. If the discussion indicates that rapid drawdown conditions are likely, additional slope stability analyses need to be performed to evaluate the stability of the post mining slopes under those conditions.

As the slope angles recommended in the slope stability report were not incorporated into the reclamation plan, the reclamation plan is not in conformance with the Surface Mining and Reclamation Act (SMARA), Section 3704, paragraphs (d) and (f).

Certification:

Todd Parkington

Signature

I, Todd Parkington, have reviewed the three reports referenced herein. I find that the slope stability report used information from an aggregate assessment report which was not available for review, hence the accuracy of the slope stability findings cannot be verified. I find that the reclamation plan is partly inconsistent with the slope stability report, and that the reclamation plan has not been prepared in accordance with the standards and practices of the industry. Additional data may be requested following preparation of the Administrative Draft of the EIR. I further certify that I have no present or contemplated future interest in the project nor am I associated with the project applicant in any manner.