3.6 Geology, Soils, and Mineral Resources

This section describes the environmental and regulatory settings and draft significance criteria with respect to geology, soils, and mineral resources.

3.6.1 Environmental Setting

This subsection describes the environmental setting for geology, soils, and mineral resources. In this section, the "study area" refers to the land beneath the proposed project components (i.e., temporary workspace, permanent right-of-way [ROW], and aboveground facilities).

3.6.1.1 Geology

Topography

Topography within the study area ranges from nearly flat to steeply sloping. Elevations in the study area range from approximately 100 meters (328 feet) to approximately 350 meters (1,255 feet) above mean sea level (USGS n.d.). Significant portions of the study area are located on slopes that exceed 25 percent (County of San Diego OES and San Diego County UDC 2010).

Geomorphic Setting

The study area is located in the western portion of the geomorphic province of California known as the Peninsular Ranges province. The Peninsular Ranges province is bounded on the east and north by the Colorado Desert and Transverse Ranges provinces, on the south by primarily intrusive rocks in Mexico, and on the west by the edge of the continental shelf (Ledesma-Vazquez et al. 2009). The Peninsular Ranges are separated by northwest-trending valleys, subparallel to faults branching from the San Andreas fault zone. Geology in the Peninsular Ranges province is similar to that of the Sierra Nevada of California, with granitic rocks intruding into older metamorphic rocks (CGS 2002).

Geologic Units

Surficial geology underlying the study area consists of alluvium, sedimentary rocks, intermediate volcanic rocks, and plutonic rocks. Alluvium underlies the study area primarily near watercourses and water bodies. Sedimentary rocks underlying the study area include argillite, mudstone, sandstone, and conglomerate. Plutonic rocks underlying the study area include tonalite, diorite, quartz diorite, and gabbro.

Surficial geology underlying Line 3602 and associated support facilities consists of alluvium, argillite, mudstone, sandstone, conglomerate, tonalite, diorite, quartz diorite, gabbro, and intermediate volcanic rocks. The regulator stations that would be removed along Line 1600 are underlain primarily by conglomerate and sandstone, with some specific stations or portions of them underlain by alluvium, intermediate volcanic rock, tonalite, and quartz diorite. The Mira Mesa Pipeline Extension and Line 49-31B Replacement are underlain by alluvium, conglomerate, and sandstone. The permanent patrol road is underlain by conglomerate and sandstone. Temporary access roads are underlain by tonalite, quartz diorite, gabbro, diorite, argillite, and greywacke. The staging areas/laydown yards are mostly underlain by tonalite and quartz diorite, with some yards or portions of them underlain by conglomerate, sandstone, gabbro, diorite, argillite, and greywacke. Geologic units associated with each proposed project component are listed in Table 3.6-1. Geology below and near each proposed project component is shown on Figure 3.6-1.

Table 3.6-1 Geology in the Study Area

Project Components	Map Symbol (Figure 3.6-1) and Geologic Unit Description	Formation Age
Line 3602 and Associated Support Facilities[(a)]	Q - Alluvium	Quaternary
	E – Mudstone and Sandstone	Paleocene to Oligocene
	Ec – Conglomerate and Sandstone	Middle to late Eocene
	Mzv – Intermediate Volcanic Rock	Late Jurassic to Early Cretaceous
	grMz – Tonalite and Quartz Diorite	Middle Jurassic to Late Cretaceous
	gb – Gabbro and Diorite	Triassic to Cretaceous
	J – Argillite and Graywacke	Paleozoic (?) to Late Jurassic
De-Rating Line 1600		
Removal of Regulator Station 982 on Line 1600	Q - Alluvium	Quaternary
Removal of Existing Regulator Stations 141, 1051, 1101, 1335, and 1494 on Line 1600	Ec – Conglomerate and Sandstone	Middle to late Eocene
Replacement of Regulator Stations 1500, and 1516 with check valves	Ec – Conglomerate and Sandstone	Middle to late Eocene
Removal of Regulator Station 1248 on Line 1600	Mzv – Intermediate Volcanic Rock	Late Jurassic to Early Cretaceous
Removal of Regulator Station 1316 on Line 3602	grMz – Tonalite and Quartz Diorite	Middle Jurassic to Late Cretaceous
Mira Mesa Pipeline Extension	Q - Alluvium	Quaternary
	Ec – Conglomerate and Sandstone	Middle to late Eocene
Line 49-31B Replacement	Ec – Conglomerate and Sandstone	Middle to late Eocene
Access and Patrol Roads		
Permanent Patrol Road between MPs 43.0 and 44.0	Ec – Conglomerate and Sandstone	Middle to late Eocene
Temporary Access Roads between MPs 12.0 and 13.0	grMz – Tonalite and Quartz Diorite	Middle Jurassic to Late Cretaceous
Temporary Access Roads between MPs 3.0 and 4.0	grMz – Tonalite and Quartz Diorite	Middle Jurassic to Late Cretaceous
	gb – Gabbro and Diorite	Triassic to Cretaceous
	J – Argillite and Graywacke	Paleozoic (?) to Late Jurassic
Staging Areas/Laydown Yards		
Staging Areas/Laydown Yard #6C	Ec – Conglomerate and Sandstone	Middle to late Eocene
Staging Areas/Laydown Yards #1, #1A, #3A, #4, #5, #5C, #6A, #6B, and #6D	grMz – Tonalite and Quartz Diorite	Middle Jurassic to Late Cretaceous
Staging Areas/Laydown Yards #3A and #6	gb – Gabbro and Diorite	Triassic to Cretaceous
Staging Areas/Laydown Yards #2 and #5A	J – Argillite and Graywacke	Paleozoic (?) to Late Jurassic

Source: USGS 2007

Note:

(a) Includes Rainbow Pressure-Limiting Station, existing Line 1600 cross-tie facility, existing Line 1601 cross-tie facility, existing Line 2010 cross-tie facility, 10 mainline valves, Line 49-31B Replacement, Line 49-31C Pre-lay Segment Replacement, three new regulator stations, removal and replacement of Regulator Station 939, pipeline inspection launching and receiving equipment, cathodic protection system, and intrusion and leak detection monitoring system.

Key:

MP = Milepost

Soils

The soils in the study area have been mapped by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). The NRCS maintains an online database of soil survey data for most United States counties through the Soil Survey Geographic database (NRCS 2017). The NRCS soil survey data describe the types of soils that exist in an area, their locations on the landscape, and their suitability for various uses. Soils of a similar type are grouped into soil map units. The major soil map units within the study area are presented in Table 3.6-2. The extent of the soil series underlying the study area is shown on Figure 3.6-2.

Table 3.6-2 Soils in the Study Area

Soil Map Unit (Map Symbol)	Project Component	USDA Description/ Soil Texture	Shrink-Swell Potential[(a)]	Erosion Hazard[(b)]	Wind Erodibility Group[(c)]	Drainage
Arlington Coarse Sandy Loam (AvC)	Line 3602, Staging Area/Laydown Yard #1A	Coarse sandy loam on alluvial fans and alluvial plains with 2 to 9 percent slopes.	Low	Moderate	3	Well
Bonsall Sandy Loam (BlC)	Line 3602	Sandy loam on concave hillslopes and uplands with 2 to 9 percent slopes.	High	Moderate	3	Moderately Well
Bonsall Sandy Loam, thick surface (BmC)	Line 3602	Sandy loam on concave hillslopes and uplands with 2 to 9 percent slopes.	Moderate	Moderate	3	Moderately Well
Bosanko Clay (BsD)	Line 3602	Clay on hills and uplands with 9 to 15 percent slopes.	High	Moderate	4	Well
Chino Silt Loam, Saline (CkA)	Line 3602, Staging Area/Laydown Yard #6A	Silt loam on alluvial fans and alluvial plains with 0 to 2 percent slopes.	Low	Slight	4	Moderately Well
Cieneba Coarse Sandy Loam (ClD2)	Line 3602, Staging Area/Laydown Yard #5A	Coarse sandy loam on hills and foothills with 5 to 15 percent slopes.	Low	Severe	3	Somewhat Excessive
Cieneba Coarse Sandy Loam (ClE2)	Line 3602, Access Roads between MPs 12.0 and 13.0	Coarse sandy loam on hills and foothills with 15 to 30 percent slopes.	Low	Severe	3	Somewhat Excessive
Cieneba Rocky Coarse Sandy Loam (CmE2)	Line 3602	Rocky coarse sandy loam on hills and foothills with 9 to 30 percent slopes.	Low	Severe	3	Somewhat Excessive
Cieneba Very Rocky Coarse Sandy Loam (CmrG)	Line 3602, Staging Area/ Laydown Yard #6A	Very rocky coarse sandy loam on hills and foothills with 30 to 75 percent slopes.	Low	Severe	3	Somewhat Excessive
Cieneba-Fallbrook Rocky Sandy Loams (CnE2)	Line 3602	Rocky sandy loam on hills and foothills with 9 to 30 percent slopes.	Low to Moderate	Severe	3	Well to Somewhat Excessive

Table 3.6-2 Soils in the Study Area

Soil Map Unit (Map Symbol)	Project Component	USDA Description/ Soil Texture	Shrink-Swell Potential[(a)]	Erosion Hazard[(b)]	Wind Erodibility Group[(c)]	Drainage
Cieneba-Fallbrook Rocky Sandy Loams (CnG2)	Line 3602	Rocky sandy loam on hills and foothills with 30 to 65 percent slopes.	Low to Moderate	Severe	3	Well to Somewhat Excessive
Diablo Clay (DaD)	Regulator Station 141 Removal	Clay on hill slopes and mountain slopes with 9 to 15 percent slopes.	Very High	Moderate	4	Well
Diablo Clay (DaE)	Regulator Station 1101, 1500, and 1516 Removal	Clay on hill slopes and uplands with 15 to 30 percent slopes.	High	Severe	4	Well
Diablo-Olivenhain Complex (DoE)	Line 3602	Cobbly loam and clay on hillslopes and uplands with 9 to 30 percent slopes.	Moderate to High	Moderate to Severe	4-7	Well
Escondido Very Fine Sandy Loam (EsD2)	Line 3602, Staging Area/ Laydown Yard #5A	Very fine sandy loam on hillslopes and uplands with 9 to 15 percent slopes.	Low	Severe	3	Well
Escondido Very Fine Sandy Loam (EsE2)	Line 3602	Very fine sandy loam on hillslopes and uplands with 15 to 30 percent slopes.	Low	Severe	3	Well
Fallbrook Sandy Loam (FaB)	Line 3602, Access Roads between MPs 12.0 and 13.0	Sandy loam on hills and foothills with 2 to 5 percent slopes.	Low	Moderate	3	Well
Fallbrook Sandy Loam (FaC)	Line 3602	Sandy loam on hills and foothills with 5 to 9 percent slopes.	Low	Moderate	3	Well
Fallbrook Sandy Loam (FaC2)	Line 3602, Access Roads between MPs 12.0 and 13.0	Sandy loam, eroded on hills and foothills with 5 to 9 percent slopes.	Low	Moderate	3	Well
Fallbrook Sandy Loam (FaD2)	Line 3602	Sandy loam, eroded on hills and foothills with 2 to 5 percent slopes.	Low	Severe	3	Well
Fallbrook Sandy Loam (FaE2)	Line 3602, Staging Area/ Laydown Yard #5C	Sandy loam, eroded on hills and foothills with 15 to 30 percent slopes.	Moderate	Severe	3	Well
Fallbrook Rocky Sandy Loam (FeC)	Line 3602	Rocky sandy loam on uplands and hillslopes with 5 to 9 percent slopes.	Moderate	Moderate	3	Well
Fallbrook-Vista Sandy Loam (FvD)	Line 3602, Staging Area/ Laydown Yard #5C	Sandy loam on hills and foothills with 9 to 15 percent slopes.	Low to Moderate	Severe	3	Well
Fallbrook-Vista Sandy Loam (FvE)	Line 3602, Regulator Station 1316 Removal	Sandy loam on hills and foothills with 15 to 30 percent slopes.	Low	Severe	3	Well

Table 3.6-2 Soils in the Study Area

Soil Map Unit (Map Symbol)	Project Component	USDA Description/ Soil Texture	Shrink-Swell Potential[a]	Erosion Hazard[b]	Wind Erodibility Group[c]	Drainage
Friant Fine Sandy Loam (FwF)	Line 3602	Fine sandy loam on mountains and mountain slopes with 30 to 50 percent slopes.	Low	Severe	3	Well
Grangeville Fine Sandy Loam (GoA)	Line 3602, Staging Area/Laydown Yard #1	Fine sandy loam on alluvial fans and alluvial plains with 0 to 2 percent slopes.	Low	Slight	3	Somewhat Poorly
Greenfield Sandy Loam (GrC)	Line 3602	Sandy loam on alluvial fans and alluvial plains with 5 to 9 percent slopes.	Low	Moderate	3	Well
Greenfield Sandy Loam (GrD)	Line 3602	Sandy loam on alluvial fans and alluvial plains with 9 to 15 percent slopes.	Low	Moderate	3	Well
Huerhuero Loam (HrC)	Line 3602, Staging Area/Laydown Yard #5A	Loam on valleys, hummocks, and marine terraces with 2 to 9 percent slopes.	High	Moderate	6	Moderately Well
Las Posas Fine Sandy Loam (LpC)	Line 3602	Fine sandy loam on hills and foothills with 5 to 9 percent slopes.	High	Severe	3	Well
Las Posas Fine Sandy Loam (LpD2)	Line 3602, Staging Area/Laydown Yard #2	Fine sandy loam on hills and foothills with 9 to 15 percent slopes.	High	Severe	3	Well
Las Posas Stony Fine Sandy Loam (LrG)	Line 3602, Existing Access Roads between MPs 3 and 4	Stony fine sandy loam on hills and foothills with 30 to 65 percent slopes.	High	Severe	5	Well
Olivenhain Cobbly Loam (OhC)	Line 3602, Staging Area/Laydown Yard #6B	Cobbly loam on coastal plains, hummocks, and marine terraces with 2 to 9 percent slopes.	Moderate	Slight	7	Well
Placentia Sandy Loam (PeA)	Staging Area/ Laydown Yard #1A	Sandy loam on alluvial fans and alluvial plains with 0 to 2 percent slopes.	Moderate	Slight	3	Well
Placentia Sandy Loam (PeC)	Line 3602	Sandy loam on alluvial fans and alluvial plains with 2 to 9 percent slopes.	Moderate	Moderate	3	Well
Placentia Sandy Loam (PeC2)	Line 3602	Sandy loam, eroded on alluvial fans and alluvial plains with 5 to 9 percent slopes.	Moderate	Moderate	3	Moderately Well

Table 3.6-2 Soils in the Study Area

Soil Map Unit (Map Symbol)	Project Component	USDA Description/ Soil Texture	Shrink-Swell Potential[a]	Erosion Hazard[b]	Wind Erodibility Group[c]	Drainage
Placentia Sandy Loam (PeD2)	Line 3602	Sandy loam, eroded on alluvial fans and alluvial plains with 9 to 15 percent slopes.	Moderate	Severe	3	Moderately Well
Placentia Sandy Loam (PfC)	Line 3602	Sandy loam, thick surface on alluvial fans and alluvial plains with 2 to 9 percent slopes.	High	Moderate	3	Well
Ramona Sandy Loam (RaB)	Line 3602	Sandy loam on alluvial fans and alluvial plains with 2 to 5 percent slopes.	Low	Moderate	3	Well
Ramona Sandy Loam (RaC)	Line 3602, Staging Area/Laydown Yard 6	Sandy loam on alluvial fans and alluvial plains with 5 to 9 percent slopes.	Low	Moderate	3	Well
Ramona Sandy Loam (RaC2)	Line 3602, Staging Area/ Laydown Yard 5	Sandy loam, eroded on alluvial fans and alluvial plains with 5 to 9 percent slopes.	Low	Moderate	3	Well
Ramona Sandy Loam (RaD2)	Line 3602	Sandy loam, eroded on alluvial fans and alluvial plains with 9 to 15 percent slopes.	Low	Severe	3	Well
Redding Gravelly Loam (RdC)	Line 3602; Staging Area/ Laydown Yard 6C; Regulator Station 982, 1051, 1335, and 1494 Removal; Mira Mesa Pipeline Extension and Line 49-31B Replacement; and Permanent Patrol Road	Gravelly loam on valleys, low hummocks, and terraces with 2 to 9 percent slopes.	Moderate	Moderate	6	Well
Redding Cobbly Loam (ReE)	Line 3602, Regulator Station 982, Line 49-31B Replacement, and Permanent Patrol Road	Cobbly loam on valleys and side slope terraces with 9 to 30 percent slopes.	High	Severe	6	Well
Redding Cobbly Loam (RfF)	Line 3602	Cobbly loam on valleys and side slope terraces with 15 to 50 percent slopes.	High	Severe	6	Well

Table 3.6-2 Soils in the Study Area

Soil Map Unit (Map Symbol)	Project Component	USDA Description/ Soil Texture	Shrink-Swell Potential[a]	Erosion Hazard[b]	Wind Erodibility Group[c]	Drainage
Riverwash (Rm)	Line 3602, Line 49-31B Replacement, and Permanent Patrol Road	Riverwash is considered a miscellaneous area by the NRCS; thus, they provide no unit description for it.	Not Available	Slight	1	Not Available
San Miguel Rocky Silt Loam (SmE)	Line 3602, Regulator Station 1248 Removal	Rocky silt loam on mountains and mountain slopes with 9 to 30 percent slopes.	High	Severe	5	Well
Terrace Escarpments (TeF)	Line 3602	Terrace escarpments are considered miscellaneous areas by the NRCS, thus they provide no unit description for them.	Not Available	Not Rated	Not Rated	Not Available
Tujunga Sand (TuB)	Line 3602	Sand on flood plains and alluvial plains with 0 to 5 percent slopes.	Low	Slight	1	Somewhat Excessive
Visalia Sandy Loam (VaA)	Line 3602, Staging Area/ Laydown Yard 3A	Sandy loam on alluvial fans and alluvial plains with 0 to 2 percent slopes.	Low	Slight	3	Well
Visalia Sandy Loam (VaB)	Line 3602, and Staging Area/Laydown Yards 1, 3A, and 4	Sandy loam on alluvial fans and alluvial plains with 2 to 5 percent slopes.	Low	Slight	3	Well
Vista Coarse Sandy Loam (VsC)	Staging Area/ Laydown Yard 5	Coarse sandy loam on hills and foothills with 5 to 9 percent slopes.	Low	Moderate	3	Well
Vista Coarse Sandy Loam (VsD)	Line 3602	Coarse sandy loam on hills and foothills with 9 to 15 percent slopes.	Low	Severe	3	Well
Vista Coarse Sandy Loam (VsD2)	Line 3602	Coarse sandy loam, eroded on hills and foothills with 9 to 15 percent slopes.	Low	Severe	3	Well
Vista Coarse Sandy Loam (VsE)	Line 3602	Coarse sandy loam on hills and foothills with 15 to 30 percent slopes.	Low	Severe	3	Well
Vista Coarse Sandy Loam (VsE2)	Line 3602	Coarse sandy loam, eroded on hills and foothills with 15 to 30 percent slopes.	Low	Severe	3	Well
Vista Coarse Sandy Loam (VsG)	Line 3602	Coarse sandy loam on hills and foothills with 30 to 65 percent slopes.	Low	Severe	3	Well

Table 3.6-2 Soils in the Study Area

Soil Map Unit (Map Symbol)	Project Component	USDA Description/ Soil Texture	Shrink-Swell Potential(a)	Erosion Hazard(b)	Wind Erodibility Group(c)	Drainage
Vista Rocky Coarse Sandy Loam (VvD)	Line 3602	Rocky coarse sandy loam on hills and foothills with 5 to 15 percent slopes.	Low	Severe	3	Well
Vista Rocky Coarse Sandy Loam (VvG)	Line 3602	Rocky coarse sandy loam on hills and foothills with 30 to 65 percent slopes.	Low	Severe	3	Well
Wyman Loam (WmC)	Line 3602	Loam on alluvial fans and alluvial plains with 5 to 9 percent slopes.	Moderate	Moderate	6	Well
Wyman Loam (WmD)	Line 3602, Staging Area/ Laydown Yard 2, and Existing Access Roads between MPs 3.0 and 4.0.	Loam on alluvial fans and alluvial plains with 9 to 15 percent slopes.	Moderate	Severe	6	Well

Source: NRCS 2017
Notes:
(a) Linear extensibility of less than 3 percent = low shrink-swell potential; 3 to 6 percent = moderate potential; 6 to 9 percent = high potential; greater than 9 percent = very high potential. The reported values were calculated by the NRCS as shrink swell potential posed to small commercial buildings.
(b) Erosion hazard interpreted by NRCS for unsurfaced roads and trails.
(c) Soils are assigned to wind erodibility groups based on their susceptibility to wind erosion. Soils assigned to Group 1 are the most susceptible; soils assigned to Group 8 are the least susceptible.
Key:
MP = Milepost
NRCS = Natural Resources Conservation Service
USDA = U.S. Department of Agriculture

Line 3602 and Associated Support Facilities

Soils underlying Line 3602 and associated support facilities, as defined above, consist primarily of sandy loams that are in some areas rocky, gravelly, or cobbly. Clay, silt, silt loam, gravelly or cobbly loam, and loam also underlie portions of Line 3602 and associated support facilities. Most of the soil series underlying Line 3602 and associated support facilities have low to moderate shrink-swell potential. Following are the series and map symbols for soils underlying Line 3602 with high or very high shrink-swell potential: Bonsall Sandy Loam (BIC), Bosanko Clay (BsD), Diablo-Olivenhain Complex (DoE), Huerhuero Loam (HrC), Las Posas Sandy Loams (LpC, LpD2, and LrG), Placentia Sandy Loam (PfC), Redding Cobbly Loams (ReE and RfF), and San Miguel Rocky Silt Loam (SmE).

A number of the soil series underlying Line 3602 and associated support facilities are ranked as posing a severe erosion hazard. The series names and map symbols for soils underlying Line 3602 and associated support facilities with a severe erosion hazard ranking are: Cieneba Sandy Loams (CID2, CIE2, CmE2, and CmrG), Cieneba-Fallbrook Rocky Sandy Loams (CnE2 and CnG2), Diablo Clay (DaE), Diablo-Olivenhain Complex (DoE), Escondido Very Fine Sandy Loams (EsD2 and EsE2), Fallbrook Sandy Loams (FaD2 and FaE2), Fallbrook-Vista Sandy Loams (FvD and FvE), Friant Fine Sandy Loam (FwF), Las Posas Sandy Loams (LpC, LpD2, and LrG), Placentia Sandy Loam (PeD2), Ramona Sandy Loam (RaD2), Redding Cobbly Loams (ReE and RfF), San Miguel Rocky Silt Loam (SmE), Vista Sandy Loams (VsD, VsD2, VsE, VsE2, VsG, VvD, and VvG), and Wyman Loam (WmD).

Line 1600 Regulator Station Removals and Replacements with Check Valves

Soils underlying the regulator stations along Line 1600 that would be removed (Regulator Stations 141, 982, 939, 1051, 1101, 1248, 1316, 1335, 1494, 1500, and 1516) consist of Diablo Clay (DaD and DaE), Fallbrook-Vista Sandy Loam (FvE), Redding Gravelly/Cobbly Loams (RdC and ReE), and San Miguel Rocky Silt Loam (SmE). Regulator Stations 1316, 1500, and 1516 would be replaced with check valves. Regulator Station 939 would be replaced with a new regulator station. Except for one of the Diablo Clay Units and the Redding Gravelly Loam, which pose a moderate erosion hazard, these soil series pose a severe erosion hazard. Except for the moderate shrink-swell potential of Redding Gravelly Loam, all of these soil series have high or very high shrink-swell potential.

Mira Mesa Pipeline Extension

The Mira Mesa Pipeline Extension is underlain by the Redding Gravelly Loam, which has a moderate shrink-swell potential and poses a moderate erosion hazard.

Line 49-31B Replacement

The Line 49-31B Replacement is underlain by the Redding Gravelly Loam, Redding Cobbly Loam, and Riverwash. The Redding Cobbly Loam has a high shrink-swell potential and poses a severe erosion hazard. Riverwash is considered by the NRCS as a miscellaneous area and not a soil series; therefore, they do not provide shrink-swell potential or erosion hazard rankings for it.

Access and Patrol Roads

Existing access roads located between Mileposts (MPs) 3.0 and 4.0 would be utilized to access a portion of the Line 3602 and associated support facilities construction area. The existing access roads are underlain by Las Posas Stony Fine Sandy Loam and Wyman Loam, which both pose severe erosion potential. Two new access roads would be constructed between MPs 12.0 and 13.0. These two roads are underlain by Cieneba Coarse Sandy Loam and Fallbrook Sandy Loams. The Cieneba soil poses a severe erosion hazard, while the Fallbrook soil poses a moderate erosion hazard. One new permanent patrol road would be constructed between MPs 43.0 and 44.0. The patrol road is underlain by Redding Gravelly Loam, Redding Cobbly Loam, and Riverwash. Redding Gravelly Loam poses a moderate erosion hazard, Redding Cobbly Loam poses a severe erosion hazard, and Riverwash is not ranked for erosion hazard.

Staging Areas/Laydown Yards

Soils underlying the staging areas/laydown yards consist mostly of sandy loam with areas of loam, silt loam, and gravelly or cobbly loam. Soils underlying Staging Areas/Laydown Yards #2, #5A, #5C, and #6A pose severe erosion potential. Soils underlying the remaining staging areas/laydown yards pose a slight to moderate erosion potential.

3.6.1.2 Geologic Hazards

Faulting and Seismicity

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Division 7, Chapter 2.5) requires the delineation of earthquake faults for the purpose of protecting public safety. Faults included in the Alquist-Priolo Earthquake Fault Zoning Program are classified by activity as follows (CGS 2007):

- Faults classified as “active” are those that have been determined to be “sufficiently active and well defined,” with evidence of movement within Holocene time (within the past 11,000 years).
- Faults classified as “potentially active” have shown geologic evidence of movement during Quaternary time (within the last 1.6 million years).
- Faults considered “inactive” have not moved in the last 1.6 million years.

Active and potentially active faults are present within 25 miles of the study area, as shown on Figure 3.6-3. Alquist-Priolo Earthquake Fault Zones (A-P fault zones) are designated areas within 500 feet of a known active fault trace. The proposed project components would not cross any active faults or potentially active faults; therefore, the proposed project components would cross no A-P fault zones. A number of active and potentially active faults are located near the study area (Jennings and Bryant 2010). These active and potentially active faults have the potential to cause strong ground shaking in the study area as a result of an earthquake. Information regarding active and potentially active faults within 25 miles of the study area is presented in Table 3.6-3. Active and potentially active faults within 25 miles of the study area are shown on Figure 3.6-3.

Table 3.6-3 Active and Potentially Active Faults Within 25 Miles of the Study Area

Fault Name	Approximate Location to Closest Proposed Project Component	Maximum Moment Magnitude Earthquake[(a)]
Agua Tibia Mountain Fault Zone	6.9 miles northeast of the Rainbow Pressure-Limiting Station.	NA
Chula Vista Fault	15.3 miles south of the southern terminus of Line 3602.	NA
Coronado Bank Fault Zone (Coronado Bank Section)	21.2 miles southwest of the southern terminus of Line 3602.	7.6
Elsinore Fault Zone (Glen Ivy Section) – Glen Ivy North Fault	16.7 miles northwest of the Rainbow Pressure-Limiting Station.	6.8
Elsinore Fault Zone (Julian Section) - Includes Earthquake Valley and Elsinore Faults	14.6 miles northeast of Line 3602 at MP 21.0.	7.1
Elsinore Fault Zone (Temecula Section) - Includes Wildomar, Willard, Wolf Valley, and Glen Ivy South Faults	2 miles northeast of the Rainbow Pressure-Limiting Station.	6.8
Florida Canyon Fault	6.4 miles southwest of the southern terminus of Line 3602.	NA
Mission Gorge Fault	2.8 miles south of the southern terminus of Line 3602.	NA
Murphy Canyon Fault	2.4 miles southwest of the southern terminus of Line 3602.	NA
Murietta Hot Springs Fault	8.9 miles north of the Rainbow Pressure-Limiting Station.	NA
Newport-Inglewood-Rose Canyon Fault Zone (Oceanside Section)	24.3 miles southwest of the Rainbow Pressure-Limiting Station.	7.1
Newport-Inglewood-Rose Canyon Fault Zone (San Diego Section) – Includes Mission Bay, Mount Soledad, Rose Canyon, and Old Town Faults	7.7 miles southwest of the southern terminus of Line 3602.	7.2
Newport-Inglewood-Rose Canyon Fault Zone (Silver Strand Section) – Includes Coronado, Silver Strand, and Spanish Bight Faults	11 miles south southwest of the southern terminus of Line 3602.	7.1
La Nacion Fault Zone – Includes La Nacion and Sweetwater Faults	4.8 miles south of the southern terminus of Line 3602.	NA
Point Loma Fault Zone	10.6 miles southwest of the southern terminus of Line 3602.	NA
San Felipe Fault Zone – Includes Agua Caliente, Hot Springs, and San Felipe Faults	18.6 miles northeast of Line 3602 at MP 21.0.	NA

Table 3.6-3 Active and Potentially Active Faults Within 25 Miles of the Study Area

Fault Name	Approximate Location to Closest Proposed Project Component	Maximum Moment Magnitude Earthquake[(a)]
San Ysidro Fault Zone	20.4 miles south of the southern terminus of Line 3602.	NA
Texas Street Fault	6.6 miles southwest of the southern terminus of Line 3602.	NA

Sources: Cao et al. 2003; Jennings and Bryant 2010
Note:
(a) Maximum moment magnitude (Cao et al. 2003). The moment magnitude is a measure of the size of an earthquake in terms of energy released.
Key:
MP = Milepost
NA = not applicable

Faults generally produce damage in two ways: ground shaking and surface rupture. Seismically induced ground shaking covers a wide area and is greatly influenced by the distance to the seismic source, soil conditions, and groundwater depth. Surface rupture is limited to the areas closest to the faults. Other potential hazards associated with seismically induced ground shaking include earthquake-triggered landslides, liquefaction, and tsunamis.

Only five historical earthquakes over moment magnitude 4 have occurred within approximately 25 miles of the study area (USGS 2017b). Magnitudes of historical earthquakes range up to moment magnitude 6.7. The locations of historical earthquakes and active or potentially active faults within 25 miles of the study area are shown on Figure 3.6-3.

Seismic hazards in a region are estimated by statistical analysis of earthquake occurrence to determine the level of potential ground motion. A common parameter used for estimating ground motion at a particular location is the peak ground acceleration (PGA). PGA is a measure of earthquake intensity; it indicates how hard the earth shakes at a given geographic location during the course of an earthquake. PGA values are typically expressed as a percentage of acceleration due to gravity: the higher the PGA value, the more intense the ground shaking.[1] PGA values were calculated by the California Geological Survey (CGS) based on historical earthquake occurrence, known damage from historic earthquakes, slip rates of major faults, and geologic materials. The PGA values described below were obtained through the CGS online ground motion interpolator (CGS 2008). The PGA values calculated by the CGS in the vicinity of the various proposed project components range from 0.417 to 0.668 times the force of gravity (g) with a 2 percent chance of being exceeded in 50 years (CGS 2008). The PGA values calculated by the CGS with a 10 percent chance of being exceeded in 50 years range from 0.241 to 0.378 g. The highest PGA values occur at the north end of the study area, and the lowest near the south end. PGA values vary throughout the study area and would be assessed as part of a site-specific geotechnical analysis. The assessed PGA values would be used to ensure that a proposed project is designed in compliance with applicable building codes.

Erosion

Water and wind are the processes responsible for most soil erosion within the study area. The NRCS assigns soils to Wind Erodibility Groups (WEGs). The susceptibility of the soils in the study area to wind erosion ranges from WEG 1 (highly susceptible) to WEG 7 (slightly susceptible), with most soils ranking moderately susceptible at WEG 3 to 4. The NRCS ranks the erosion hazard of soils for roads and trails at the site ranging from slight to severe. Soils that rank with a high or severe erosion hazard are present at

[1] The acceleration due to gravity is relatively constant at the earth's surface: 980 centimeters per second per second (cm/sec/sec). An acceleration of 16 feet per second is 16*12*2.54 = 487 cm/sec/sec. Therefore, an acceleration of 16 feet per second = 487/980 = 0.50 g.

various locations within the study area. Information regarding soil characteristics in the study area is presented in Table 3.6-2. The extent of soils described here is shown on Figure 3.6-2.

Landslides

Landslides may occur naturally or result from construction activities that remove stabilizing vegetation, create over-steepened slopes, or concentrate runoff onto existing landslides or areas susceptible to landslides. The San Diego County Multi-jurisdictional Hazard Mitigation Plan (Hazard Mitigation Plan) maps landslides, landslide susceptibility, and slide-prone formations in San Diego County (County of San Diego OES and San Diego County UDC 2010). Line 3602 would cross an area mapped as underlain by slide-prone formations and landslides from approximately 500 feet north of MP 46.0 through the terminus of Line 3602 at MP 47.3. Along Line 1600, Regulator Stations 141 and 1516 are underlain by slide-prone formations, and Regulator Station 1101 appears to be underlain by landslides. No other proposed project components would cross areas mapped as susceptible to landslides, known landslides, or slide-prone formations, according to the Hazard Mitigation Plan.

The U.S. Geological Survey (USGS) maps landslides on its Landslide Overview Map of the Conterminous United States and landslide susceptibility on its Landslide Susceptibility from the National Atlas of the United States (USGS 1982, 1997). The USGS maps the area around Line 1600, which includes Regulator Stations 1101, 1516, 141, 1500, and 1248, as having moderate landslide susceptibility and as a landslide occurrence area. The areas around all other proposed project components are mapped by the USGS as having a low susceptibility to landslides. Portions of the Line 3602 route from MP 0.0 to 18.5, and a small area around MP 40.0, are mapped as landslide occurrence areas. Proposed project components located in landslide occurrence areas are: portions of Line 3602; existing access roads between MPs 3.0 and 4.0; temporary access roads between MPs 12.0 and 13.0; and Staging Areas/ Laydown Yards #1, #2, and #4. Landslide susceptibility and occurrence areas are shown on Figure 3.6-4.

Liquefaction

Liquefaction can occur during an earthquake in areas where unconsolidated sediments and a shallow water table are present. Liquefaction occurs when seismic ground motion causes saturated sediments to flow like a fluid, resulting in sand boils or lateral spreading, both of which may cause a decrease in structural bearing capacity that can result in structural settlement or collapse. The Hazard Mitigation Plan maps liquefaction risk and liquefiable soils (labeled on the plan map as liquefaction layers) in San Diego County (County of San Diego OES and San Diego County UDC 2010). While the proposed project components would cross areas of liquefiable soil primarily at and near watercourse crossings, all but a small portion of the study area would be located in areas mapped as posing low liquefaction risk. Only the portion of the study area from approximately MP 4.5 to the northern terminus of Line 3602 would be located in an area mapped as having high liquefaction risk.

Subsidence/Collapsible Soil

Land subsidence can occur where large volumes of fluids are pumped from underground, such as near water wells or oil fields. Land subsidence occurs because the fluids present in subsurface pore spaces partially provide bearing capacity to support rock or sediments. When large volumes of fluids are pumped from the subsurface, land subsidence can result when rock or sediment partially collapses under its own weight into pore spaces that were previously full of fluids. Some soil may also collapse if it is irrigated after remaining dry for long periods of time. The County of San Diego General Plan does not discuss land subsidence or the presence of collapsible soil as hazards in the county (County of San Diego 2015). The Hazard Mitigation Plan does not consider land subsidence or collapsible soils as significant hazards in the county. Land subsidence was not considered in the risk assessment portion of the Hazard Mitigation Plan because there is no historical record of land subsidence in the county and because it presents only a minor threat to limited parts of the county. The hazards of collapsible soil are not discussed in the Hazard Mitigation Plan.

Expansive Soil

Some soils contain certain clay minerals that may cause them to swell when moist and shrink as the soil dries. These soils are known as expansive soils. Expansive soils have the potential to disturb building foundations, walls, roads, and pipeline components in areas underlain by expansive soils. Proposed project components that are at least partially underlain by soils with high to very high shrink-swell potential are: Line 3602 and associated support facilities; Line 1600 Regulator Stations 141, 982, 1101, 1248, 1500, and 1516; Line 49-31B Replacement; existing access roads between MPs 3.0 and 4.0; the permanent patrol road; and Staging Areas/Laydown Yards #2 and #5A. Table 3.6-2 lists the soil types and characteristics for the soils underlying the study area, including shrink-swell potential. The extent of the various soil series below the study area is shown on Figure 3.6-2.

3.6.1.3 Mineral Resources

According to the USGS, a mineral resource is defined as a concentration of naturally occurring solid, liquid, or gaseous material in or on the earth’s crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible (USGS 1980). Mineral resources include oil, natural gas, metallic deposits, and non-metallic deposits.

The study area is not located in a region of active oil exploration and production. No active oil or gas wells are located within the study area; however, there are a few idle, buried, plugged and abandoned, and unknown status wells within a few miles of some proposed project components. In addition, the study area is not located within the boundaries of an oil and gas field (DOC 2001). Figure 3.6-5 shows the locations of oil and gas wells near the study area (DOC 2017).

The Mineral Resource Data System of the USGS maps current and past producers of minerals, prospects, and occurrences of minerals. A small number of past producers and current producers of mineral resources are located within 0.25 mile of Line 3602, as discussed here (USGS 2003). Two past producers of sand and gravel for construction are located west of Line 3602 near MP 13.5; however, both appear to be within the Interstate (I-) 15 ROW such that future mining would be precluded by the presence of I-15. A former producer of perlite is located near I-15 and Centre City Parkway, such that the presence of the street and surrounding urban development would preclude mining. A gold prospect also is located near Regulator Station 1316; however, removal of the regulator station would not prevent mining at this location. East of Line 3602, near MP 31.3, is a stone producer; however, current aerial photography shows this area to be developed with residential housing such that it clearly is not a current producer. A past producer of crushed stone is located east of Line 3602 near MP 37.8; however, at this site, Line 3602 is located within the public ROW in Pomerado Road and mining would already be precluded by the presence of Pomerado Road. No active or inactive mines, no mineral occurrences, and no mineral prospects are known to exist within the study area (USGS 2003).

The California Department of Conservation, Division of Mines and Geology mapped mineral resource zones in the vicinity of the study area in its Special Report 153 (DOC 1982). The designated mineral resource zones (MRZ) in the study area are for aggregate resources and defined as follows:

> **MRZ-1**: Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that there is little likelihood for their presence. This zone shall be applied where well-developed lines of reasoning, based upon economic-geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is nil or slight.
>
> **MRZ-2**: Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that there is a high likelihood for their presence. This zone shall be applied to known mineral deposits or where well-developed lines of reasoning,

based on economic-geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high.

MRZ-3: Areas containing mineral deposits; the significance of which cannot be evaluated from available data.

MRZ-4: Areas where available information is inadequate for assignment to any other mineral resource zone (DOC 1982).

Areas designated as MRZ-2 (where mineral resources are present) are located within the floodplain of the San Luis Rey River, on the bed of Lake Hodges, and in the southern portions of the study area. MRZs in the study area are shown on Figure 3.6-6. The general plans for the cities of Escondido, Poway, and San Diego do not identify locally important mineral resources. The community plans for Bonsall, Fallbrook, and Rainbow; the regional plans prepared for the North County Sub-region and the San Diego Association of Governments; the Integrated Natural Resources Management Plan for Marine Corps Air Station Miramar; and the San Diego County General Plan also do not identify locally important mineral resources. The City of San Diego and the San Diego County General Plans identify only the MRZs shown on Figure 3.6-6.

3.6.2 Regulatory Setting

This subsection summarizes federal, state, and local laws; regulations; and standards that govern geology, soils, and mineral resources.

3.6.2.1 Federal

1997 Uniform Building Code

The 1997 Uniform Building Code (UBC) specifies acceptable design criteria for structures with respect to seismic design and load-bearing capacity. Seismic risk zones have been developed based on the known distribution of historic earthquake events and frequency of earthquakes in a given area. These zones are generally classified on a scale from I (least hazard) to IV (most hazard). These values are used to determine the strengths of various components of a building required to resist earthquake damage. Based on the UBC Seismic Zone Maps of the United States, and because of the number of active faults in southern California, the proposed project would be located in the highest seismic risk zone defined by the UBC standard: UBC Zone IV. The State of California has adopted the UBC seismic design and load-bearing capacity criteria in the California Building Code (CBC).

Clean Water Act

The Clean Water Act of 1972 (33 United States Code §1251 et seq.) requires states to set standards to protect water quality, including the regulation of stormwater and wastewater discharge during construction and operation of a facility. This includes the creation of the National Pollutant Discharge Elimination System (NPDES), a system that requires states to establish discharge standards specific to water bodies and which regulates stormwater discharge from construction sites through the implementation of a Stormwater Pollution Prevention Plan (SWPPP). Erosion and sedimentation control measures are fundamental components of SWPPPs. In California, the NPDES permit program is implemented and administered by Regional Water Quality Control Boards (RWQCBs). Refer to Section 4.9, Hydrology and Water Quality, for further information.

Title 49, Part 192 of the Code of Federal Regulations

Title 49, Part 192 of the Code of Federal Regulations outlines the minimum federal safety standards for the transportation of natural gas and other gas by pipeline, including pipeline facilities and the transportation of gas within the limits of the outer continental shelf. Subparts A through P summarize the minimum requirements for the selection and qualification of pipe components, corrosion control regulations, pipeline testing, pipeline integrity management, and additional pipeline design specifications. Section 192.917 (b) requires pipeline operators to incorporate topographic data, soil conditions, and earthquake fault data into evaluations regarding outside force threats. Specific data requirements are described in Appendix A of the American Society of Mechanical Engineers document B31.8S: Managing System Integrity of Gas Pipelines.

3.6.2.2 State

Alquist-Priolo Earthquake Fault Zoning Act

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act of 1972 is to regulate development near active faults to mitigate the hazard of surface fault rupture. The act requires disclosure to potential real estate buyers of the existence of faults nearby and a 50-foot setback from faults for new, occupied buildings. While the act does not specifically regulate natural gas pipelines, it does define areas where fault rupture is most likely to occur. Under the act, an active fault is defined as one that exhibits evidence that surface rupture has occurred within the last 11,000 years (i.e., Holocene activity). The State of California has identified active faults within California and has delineated “earthquake fault zones” along active faults.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 provides a statewide seismic hazard mapping and technical advisory program to assist cities and counties in fulfilling their responsibilities for protecting the public health and safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure and seismic hazards caused by earthquakes. Mapping and other information generated pursuant to the Seismic Hazards Mapping Act is to be made available to local governments for planning and development purposes. The state requires that (1) local governments incorporate site-specific geotechnical hazard investigations and associated hazard mitigation as part of the local construction permit approval process; and that (2) the agent for a property seller, or the seller if acting without an agent, must disclose to any prospective buyer if the property is located within a seismic hazard zone. The State Geologist is responsible for compiling seismic hazard zone maps.

California Government Code

California Government Code Sections 65302(f) and 65302 require cities to take seismic and other natural hazards into account in their planning programs and to outline them in their general plans.

California Building Standards Code

The 2016 CBC is based on the 2006 International Building Code, with the addition of more extensive structural seismic provisions. The CBC was published by the California Building Standards Commission on July 1, 2016, and became effective January 1, 2017. The CBC is contained in Title 24 of the California Code of Regulations, California Building Standards Code, and is a compilation of three types of building standards with three different origins:

- Building standards that have been adopted by state agencies without change from building standards contained in national model codes;
- Building standards that have been adopted and adapted from the national model code standards to meet California conditions; and
- Building standards authorized by the California legislature that constitute extensive additions not covered by the model codes that have been adopted to address particular California concerns.

Seismic sources and the procedures used to calculate seismic forces on structures are defined in Section 1613 of the CBC. The CBC requires that all structures and permanently attached nonstructural components be designed and built to resist the effects of earthquakes. The code also includes grading and other geotechnical issues, building specifications, and non-building structures.

3.6.2.3 Regional and Local

Regional Water Quality Control Board

The San Diego RWQCB manages water quality for the jurisdictions within the study area. If construction disturbs a surface area greater than 1 acre, coverage under the NPDES Construction General Permit from the RWQCB would be needed. To obtain coverage, a Notice of Intent would be filed with the RWQCB, and a SWPPP would be prepared that would include information about the proposed project; monitoring and reporting procedures; and best management practices, including those for erosion, sedimentation, and stormwater runoff control. The SWPPP would be based on final engineering design and would include all components of a proposed project.

County of San Diego General Plan

The following goals and policies from the San Diego County General Plan are relevant to development of a natural gas pipeline; these provide information as to what a development would need to comply with in order to be approved by the community (County of San Diego 2015):

> ***Goal S-7 Reduced Seismic Hazards****. Minimized personal injury and property damage resulting from seismic hazards.*
>
>> ***S-7.1 Development Location****. Locate development in areas where the risk to people or resources is minimized. In accordance with the California Department of Conservation Special Publication 42, require development be located a minimum of 50 feet from active or potentially active faults, unless an alternative setback distance is approved based on geologic analysis and feasible engineering design measures adequate to demonstrate that the fault rupture hazard would be avoided.*
>>
>> ***S-7.2 Engineering Measures to Reduce Risk****. Require all development to include engineering measures to reduce risk in accordance with the CBC, UBC, and other seismic and geologic hazard safety standards, including design and construction standards that regulate land use in areas known to have or potentially have significant seismic and/or other geologic hazards.*
>>
>> ***S-7.3 Land Use Location****. Prohibit high occupancy uses, essential public facilities, and uses that permit significant amounts of hazardous materials within Alquist-Priolo and County special study zones.*
>
> ***Goal S-8 Reduced Landslide, Mudslide, and Rock Fall Hazards.*** *Minimized personal injury and property damage caused by mudslides, landslides, or rock falls.*
>
>> ***S-8.1 Landslide Risks***. Direct development away from areas with high landslide, mudslide, or rock fall potential when engineering solutions have been determined by the County to be infeasible.
>>
>> ***S-8.2 Risk of Slope Instability***. Prohibit development from causing or contributing to slope instability.

Rainbow Community Plan

The Rainbow Community Plan Area (CPA), along with the entire Southern California region, lies within a zone of high earthquake activity. Although no known active faults are present within the CPA, three faults indirectly affect the CPA: the San Jacinto fault, the San Andreas system, and the Coronado Bank fault system. All of these faults have the ability to produce earthquakes above magnitude six, and the Rainbow CPA would be susceptible to earthquake shaking and possible damage.

The following goal and policy from the Rainbow Community Plan are relevant to a natural gas pipeline; the goal and policy provides information as to what a development would need to comply with in order to be approved by the community (County of San Diego 2014):

> ***Goal S1.1***. *The prevention of the loss of life and the destruction of property resulting from earthquakes.*
>
> > ***Policy S1.1.1***. *Require new development to comply with County seismic codes.*

City of Poway General Plan

The City of Poway General Plan establishes goals and policies to provide guidance in the growth of the city. The following geology and soils resources policies were identified under Goal VIII in the City of Poway General Plan. Goal VIII states that it is the goal of the City of Poway to minimize injuries, loss of life, and property damage resulting from natural and man-made hazards. These policies dictate strategies for the community to follow in reviewing applications for development; the strategies provide information as to what design elements and requirements would be needed for receiving approval for development.

The following policies from the City of Poway General Plan are relevant to a natural gas pipeline: (City of Poway 1991)

> ***Policy B – Geologic Hazards***. *The community should be protected against the hazards associated with geologic formations, particularly landslides, through proper land use policies and mitigation. Strategies include:*
>
> - *Compare all development applications with the Geographic Information Management Systems (GIMS) mapping system to determine if significant geologic hazards exist.*
> - *Investigations performed by a qualified engineering geologist or soil engineer shall be required for all new development review applications.*
> - *Include, as a condition of approval, the recommendations of the engineering geologist for geologic hazard mitigation and the soils engineer for soils related issues.*
> - *Development within unstable slope and landslide areas will be prohibited unless adequate measures are taken to protect against slippage.*
> - *Establish and maintain proper soil management techniques to reduce the adverse effects of soil-related problems, such as shrink-swell behavior, erosion runoff, and potential septic tank failure.*
>
> ***Policy C – Seismic Safety***. *Seismic hazards should be controlled to a level of acceptable risk through the identification and recognition of potentially hazardous conditions and areas. Strategies include:*
>
> - *Take all appropriate actions to identify and mitigate seismic hazards such as ground shaking, ground rupture, landslides, liquefaction and structural hazards.*

- *The GIMS mapping system and the seismic matrix shall be used to determine if the probability of a seismic hazard exists.*
- *Where it has been determined that there is the probability of a seismic hazard, an investigation by a qualified engineering geologist shall be required.*

City of Escondido General Plan

The City of Escondido's Community Protection element of the General Plan addresses issues such as flood and fire hazards, geologic and seismic activity, and hazardous materials. Although the Alquist-Priolo Earthquake Fault Zoning Act identifies no active faults within Escondido, several faults are present in the vicinity. The City of Escondido regulates development in steep slope areas, which protects against floods, erosion, landslides, and fire hazards. (City of Escondido 2012)

City of San Diego General Plan

The City of San Diego General Plan's Public Facilities, Services, and Safety element contains policies related to geologic and seismic hazards. These policies dictate strategies for the community to follow in reviewing applications for development; the strategies provide information as to what design elements and requirements would be needed for receiving approval for development. The following policy is relevant to a natural gas pipeline within the city (City of San Diego 2015):

> ***PF-Q.1***. *Protect public health and safety through the application of effective seismic, geologic, and structural considerations.*
>
> - *Ensure that current and future community planning and other specific land use planning studies continue to include consideration of seismic and other geologic hazards. This information should be disclosed, when applicable, in the California Environmental Quality Act (CEQA) document accompanying a discretionary action.*
> - *Maintain updated citywide maps showing faults, geologic hazards, and land use capabilities, and related studies used to determine suitable land uses.*
> - *Require the submission of geologic and seismic reports, as well as soils engineering reports, in relation to applications for land development permits whenever seismic or geologic problems are suspected.*
> - *Coordinate with other jurisdictions to establish and maintain a geologic "data bank" for the San Diego area.*
> - *Regularly review local lifeline utility systems to ascertain their vulnerability to disruption caused by seismic or geologic hazards and implement measures to reduce any vulnerability.*
> - *Adhere to state laws pertaining to seismic and geologic hazards.*

3.6.3 Draft Significance Criteria

Had an impact analysis been completed for the proposed project, significance criteria would likely have been based on CEQA Guidelines Appendix G. An impact might have been considered significant if the project would:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

   i. Rupture of a known fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area, or based on other substantial evidence of a known fault. Refer to Division of Mines and Geology Special Publication 42

ii. Strong seismic ground shaking

iii. Seismic-related ground failure, including liquefaction

iv. Landslides

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

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;

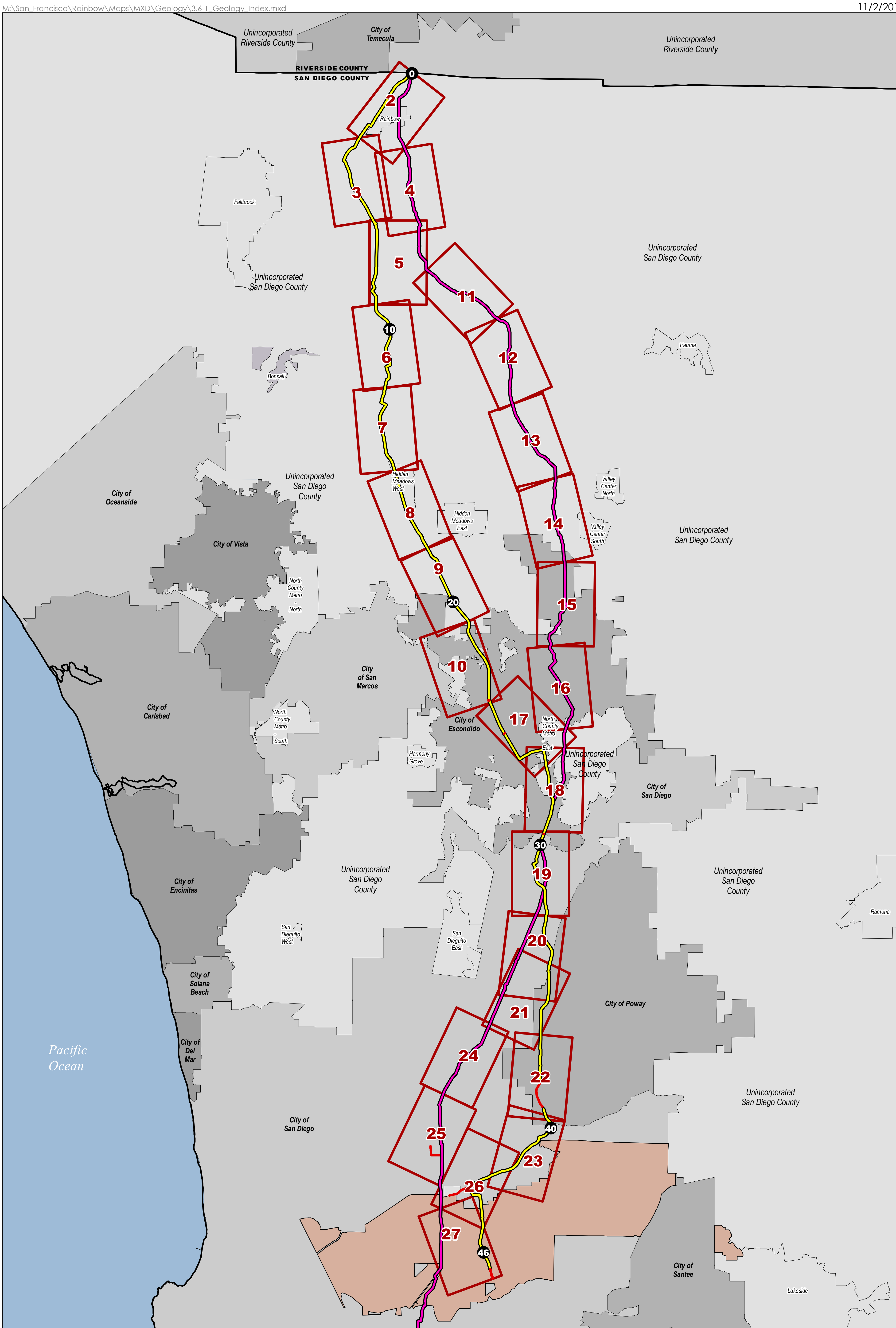
d) Be located on expansive soil, as defined in Table 18-1-B of the UBC (1994), creating substantial risks to life or property;

e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of waste water;

f) Result in the loss of availability of a known mineral resource that would be of value to the region and state residents; or

g) 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.

3.6.4 Draft Analytical Figures



Milepost

Line 3602

Tie-Ins & Extensions

Existing Line 1600

MCAS Miramar

Map Series Index

0 2.5 5

Miles

Figure 3.6-1

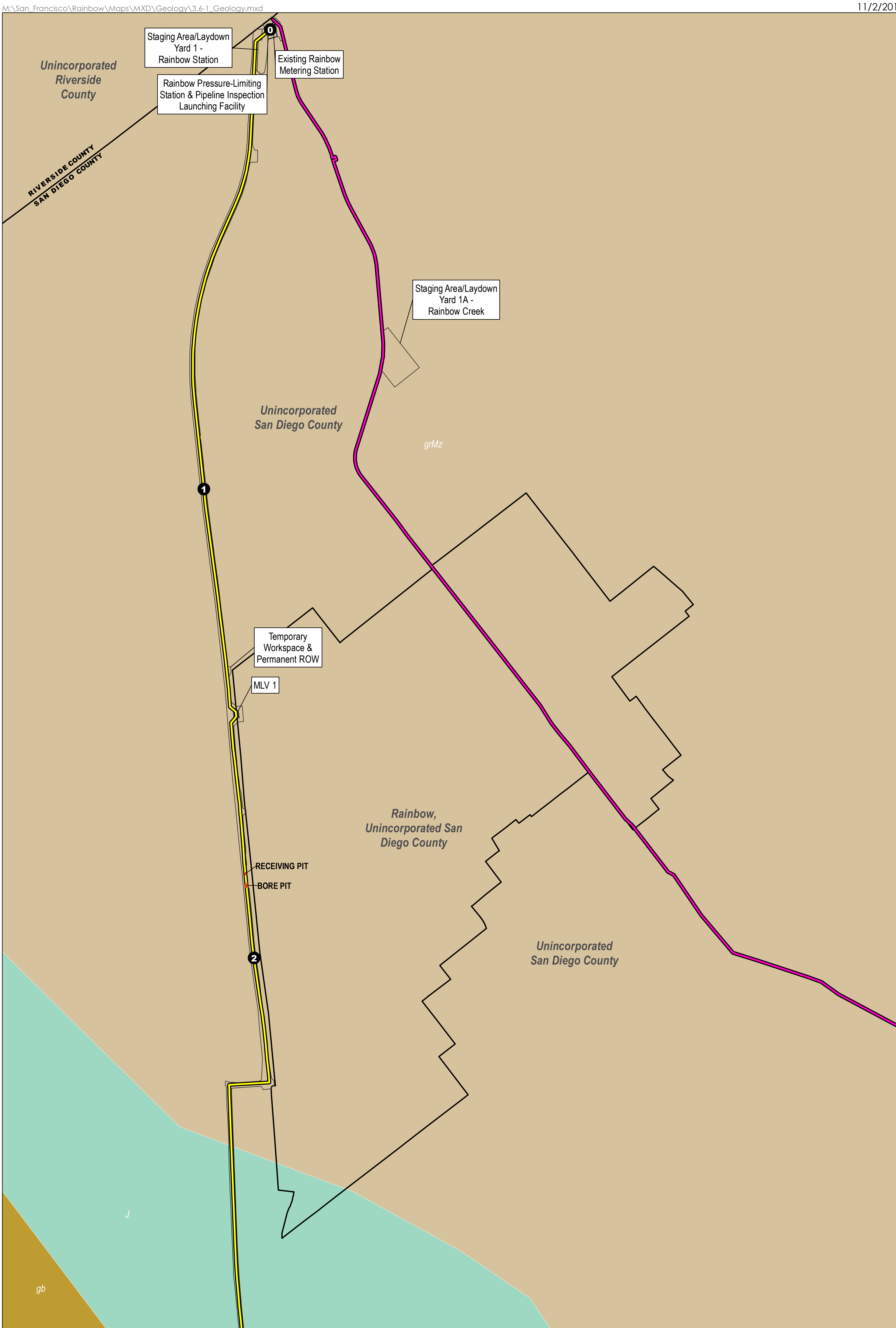
Geology in the Study Area

Page 1 of 27

Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600

San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Existing Line 1600
Bore Pits
Workspaces
Municipal Boundary

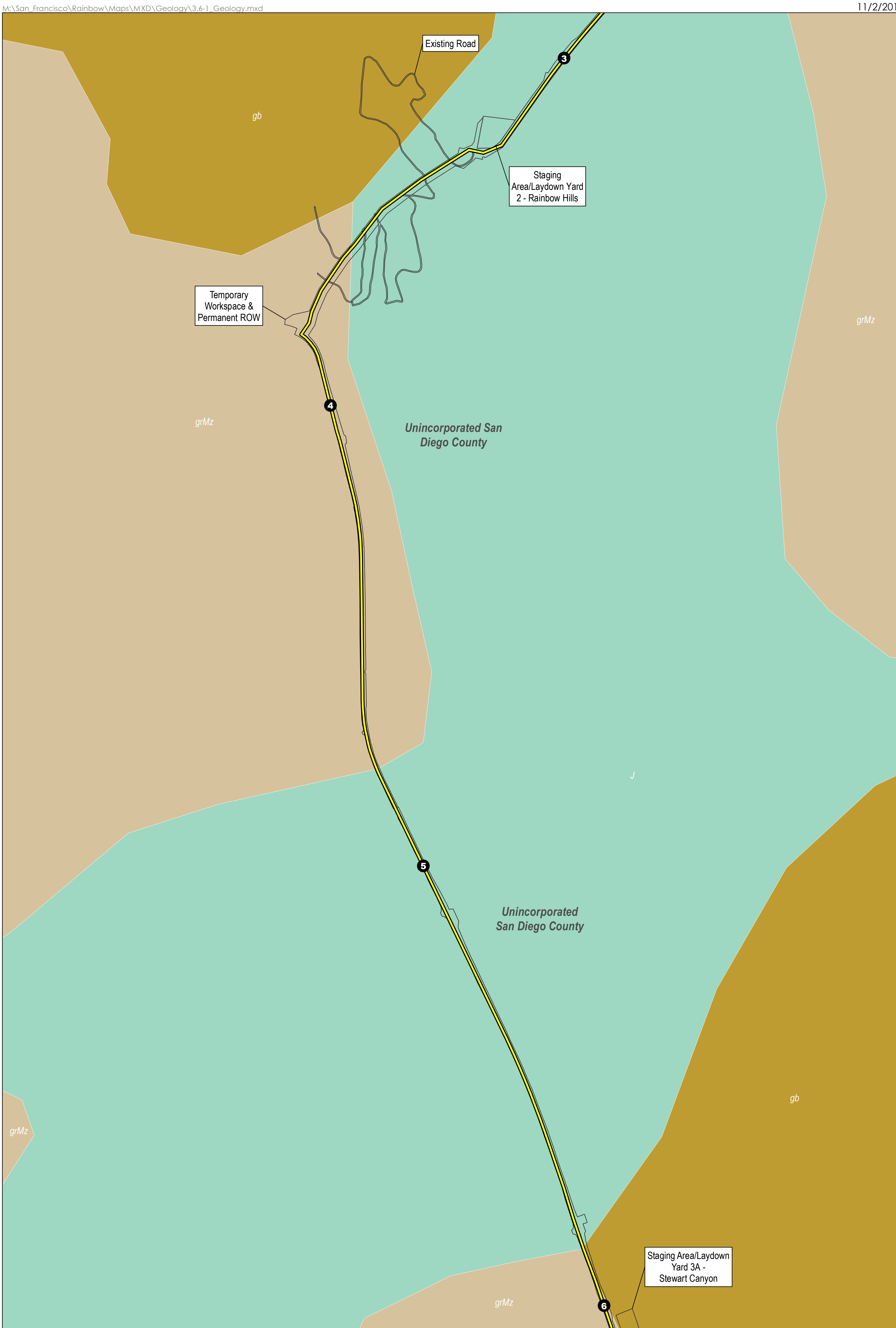
Units
J: Paleozoic(?) to Late Jurassic argillite and graywacke
gb: Triassic to Cretaceous gabbro and diorite
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 2 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



1 Milepost
Line 3602
Workspaces
Municipal Boundary

Units
J: Paleozoic(?) to Late Jurassic argillite and graywacke
gb: Triassic to Cretaceous gabbro and diorite
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 3 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

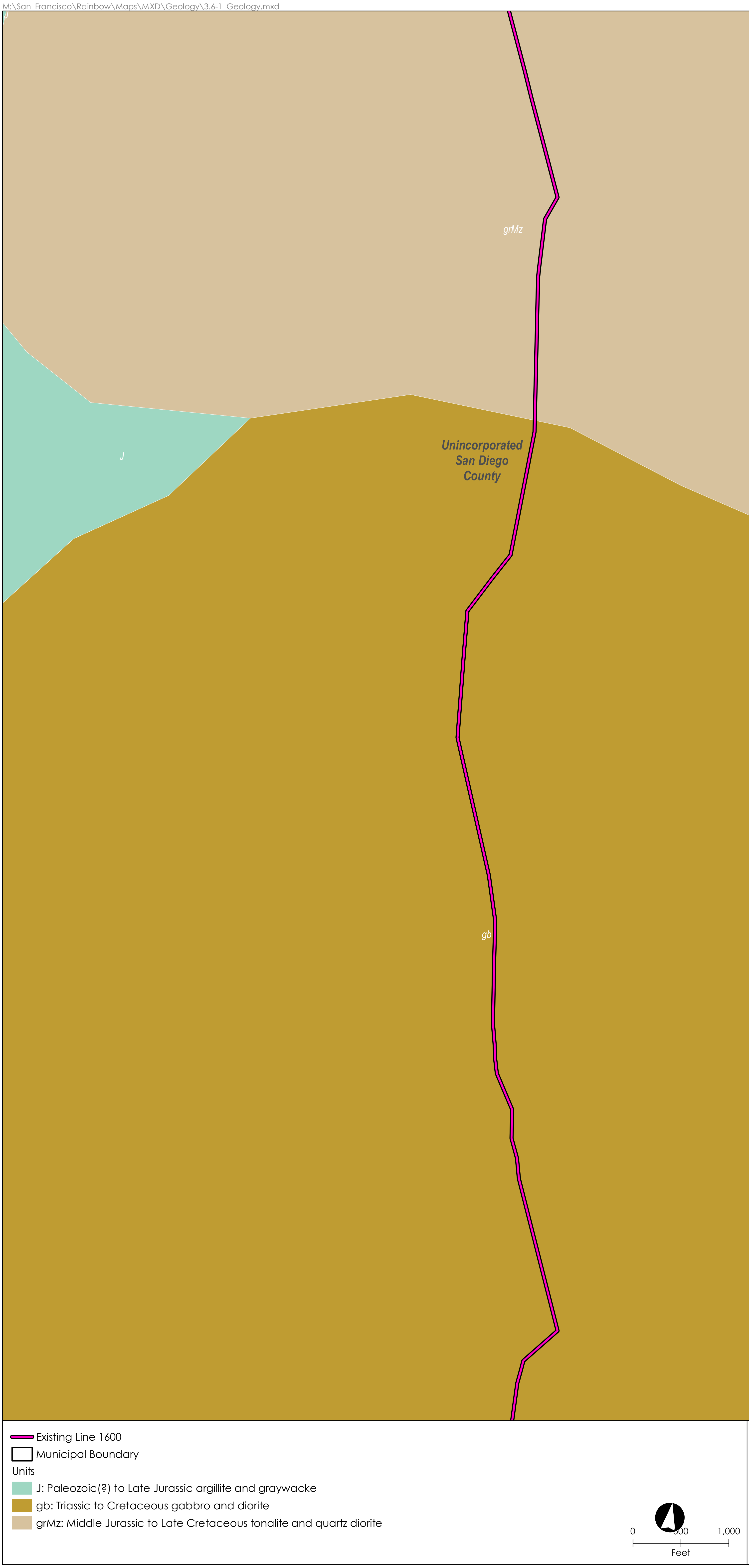


Figure 3.6-1
Geology in the Study Area
Page 4 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

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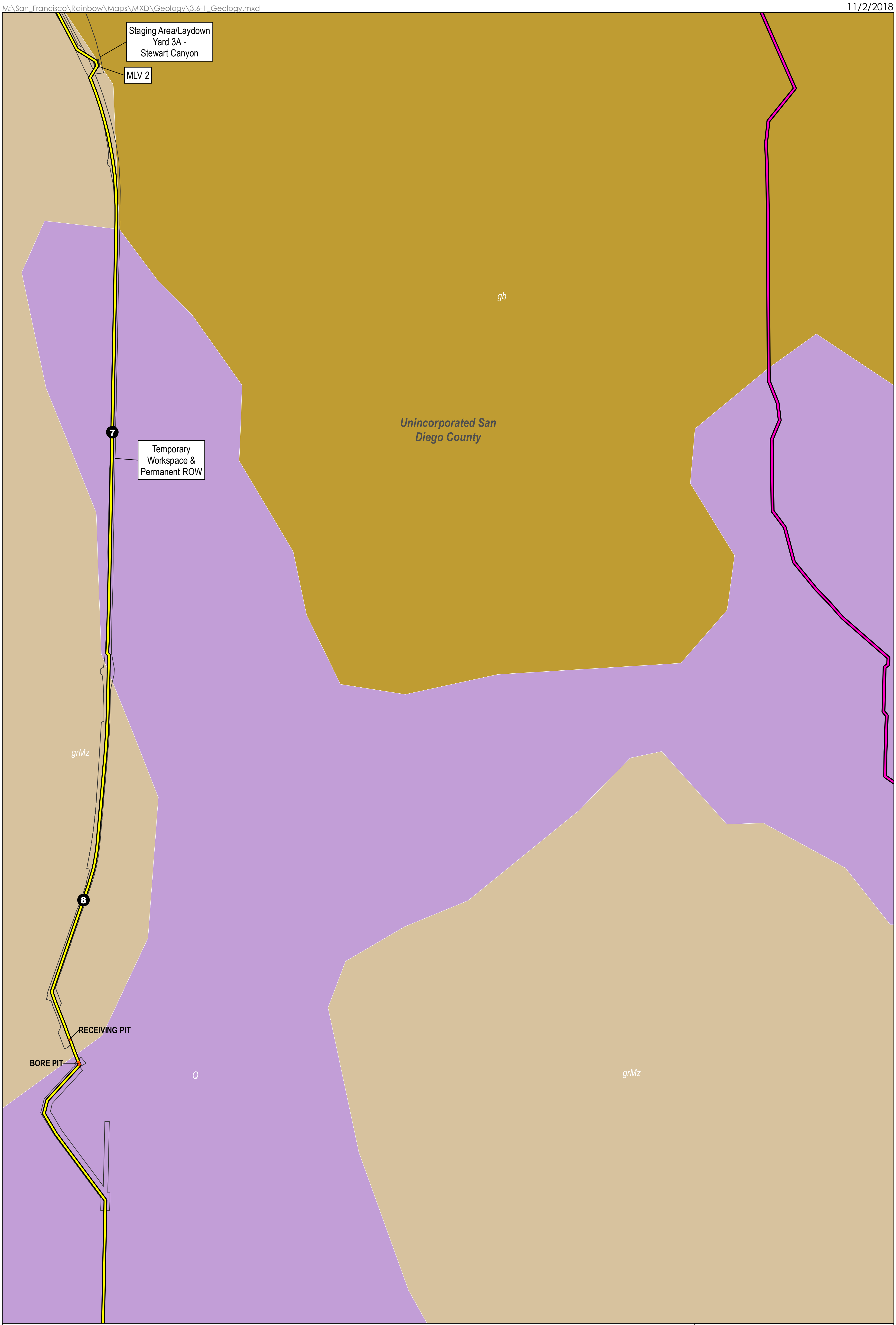
11/2/2018



Milepost
Line 3602
Existing Line 1600
Bore Pits
Workspaces
Municipal Boundary

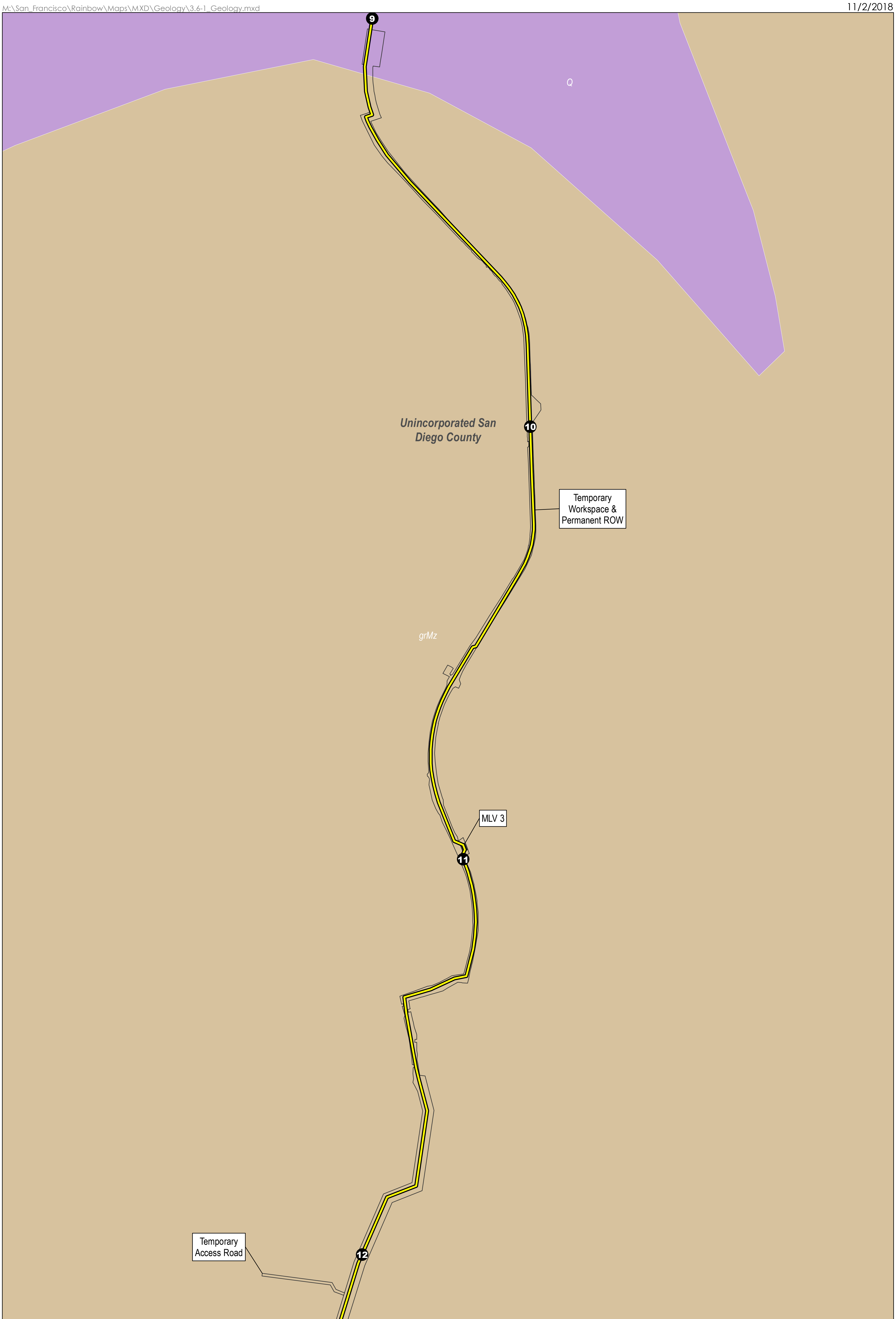
Units
Q: Pliocene to Holocene alluvium
gb: Triassic to Cretaceous gabbro and diorite
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 5 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



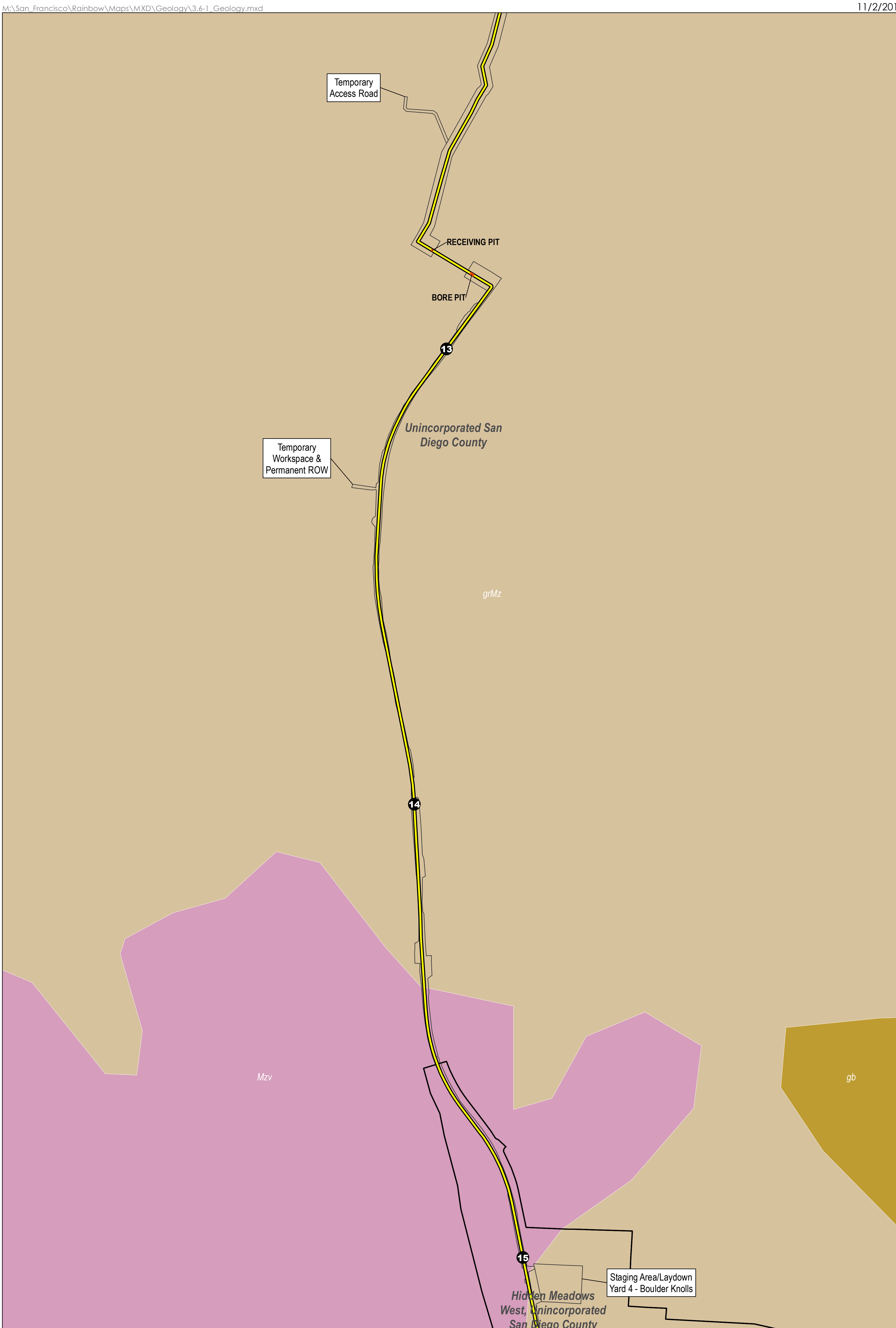
1 Milepost
Line 3602
Workspaces
Municipal Boundary
Units
Q: Pliocene to Holocene alluvium
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 6 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



Milepost
Line 3602
Bore Pits
Workspaces
Municipal Boundary

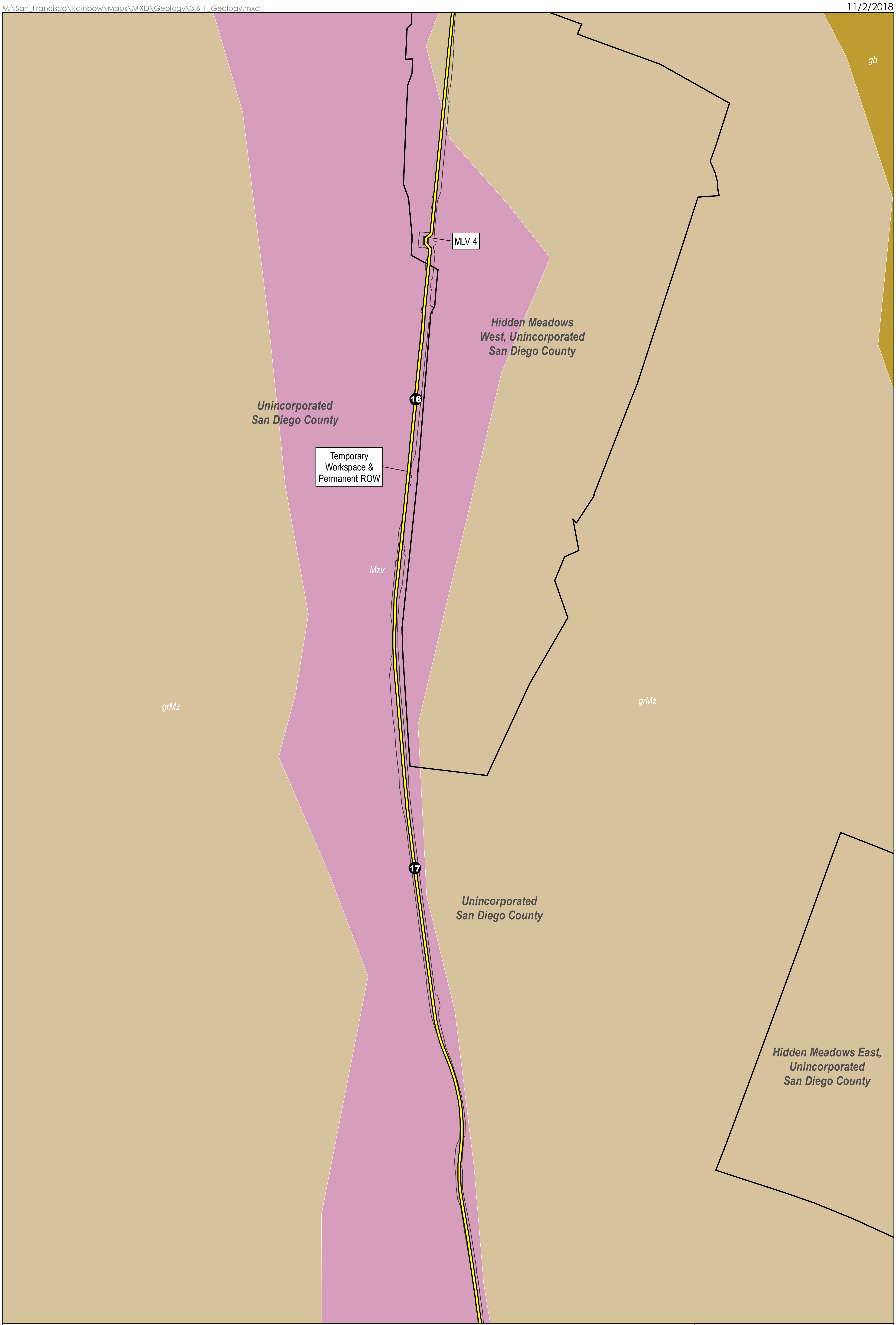
Units
Mzv: Late Jurassic to Early Cretaceous intermediate volcanic rock
gb: Triassic to Cretaceous gabbro and diorite
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 7 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



1 Milepost
Line 3602
Workspaces
Municipal Boundary

Units
Mzv: Late Jurassic to Early Cretaceous intermediate volcanic rock
gb: Triassic to Cretaceous gabbro and diorite
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 8 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

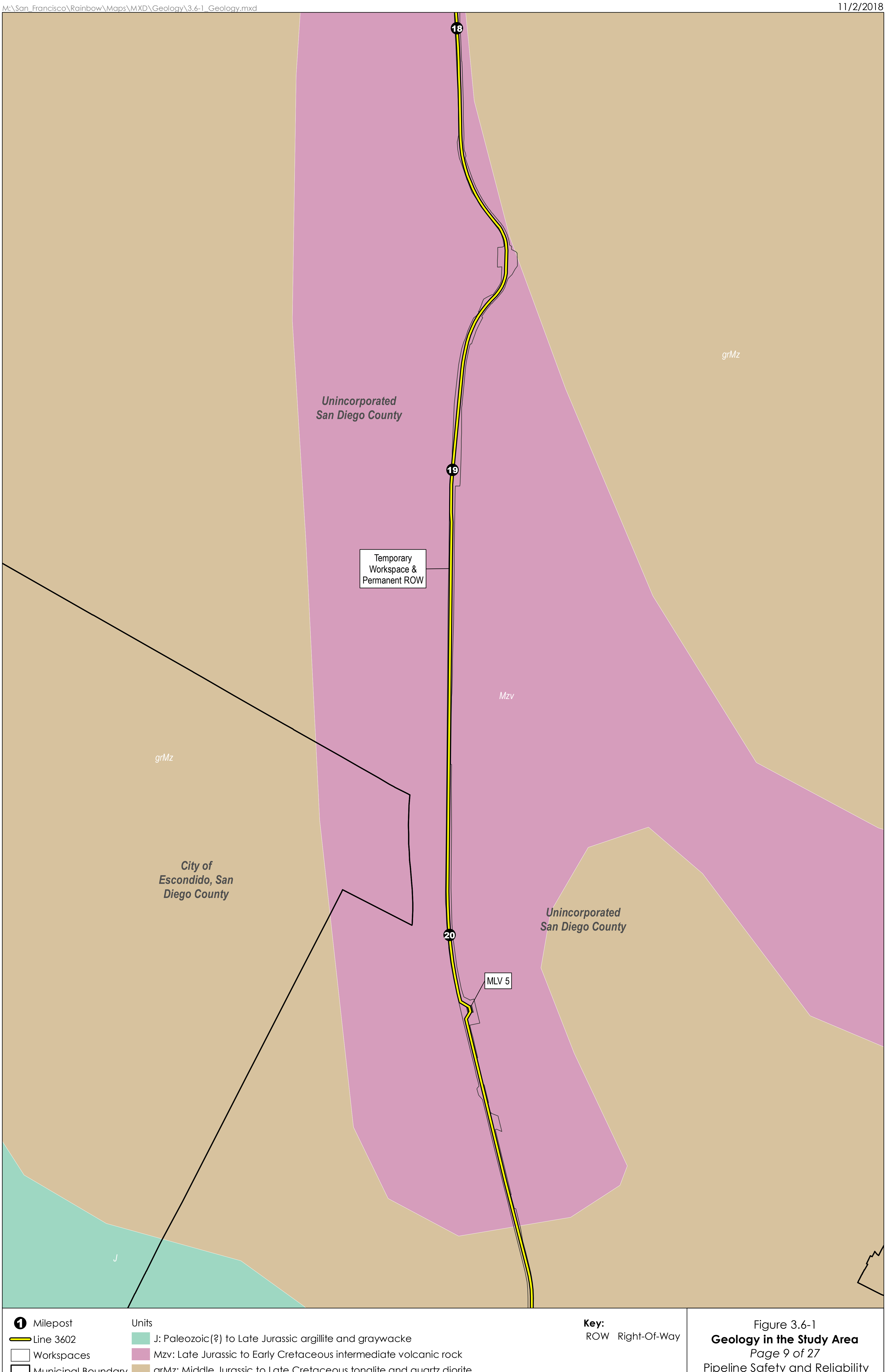
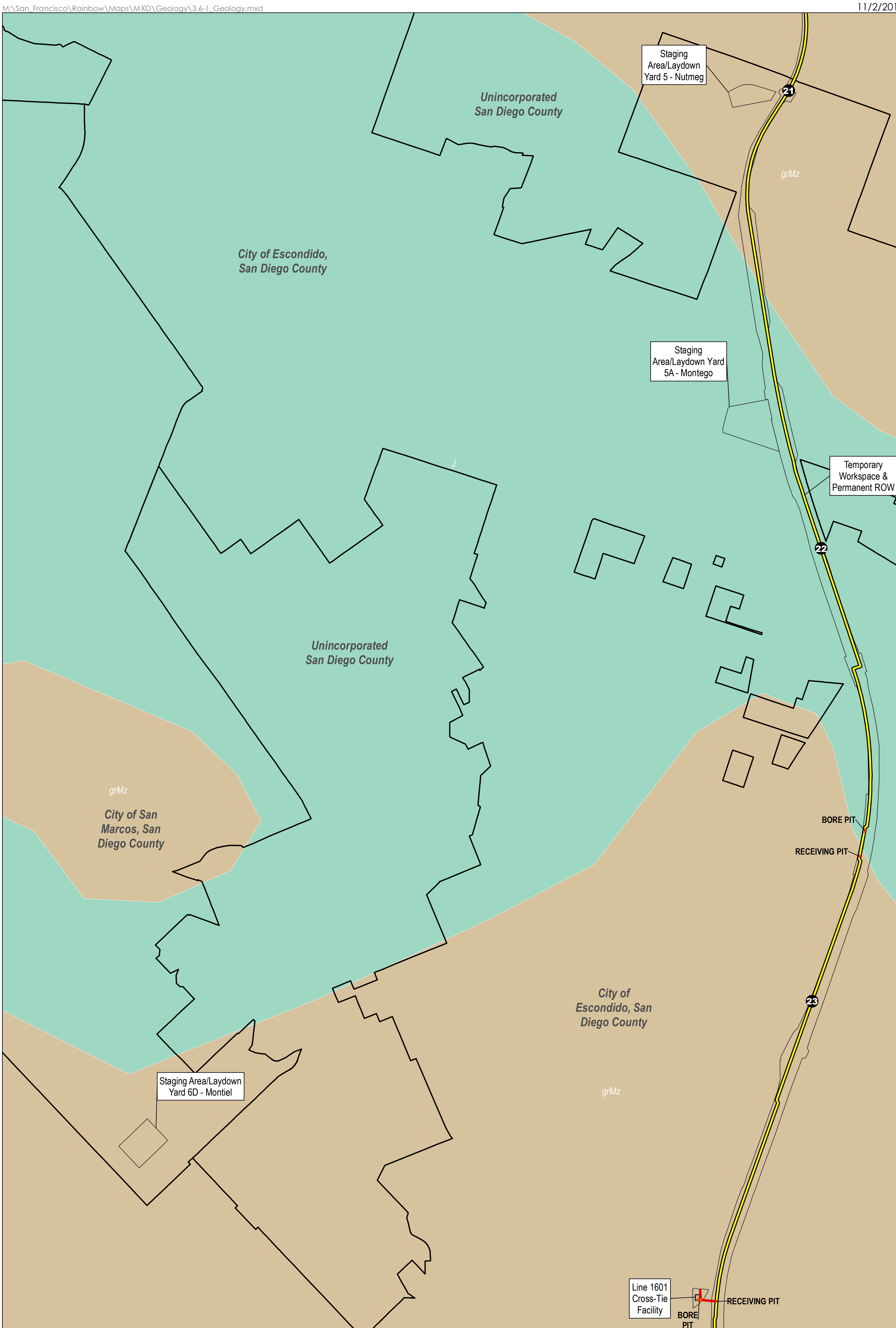


Figure 3.6-1
Geology in the Study Area
Page 9 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



1 Milepost
Line 3602
Tie-Ins & Extensions
Bore Pits
Workspaces
Municipal Boundary

Units
J: Paleozoic(?) to Late Jurassic argillite and graywacke
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 10 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

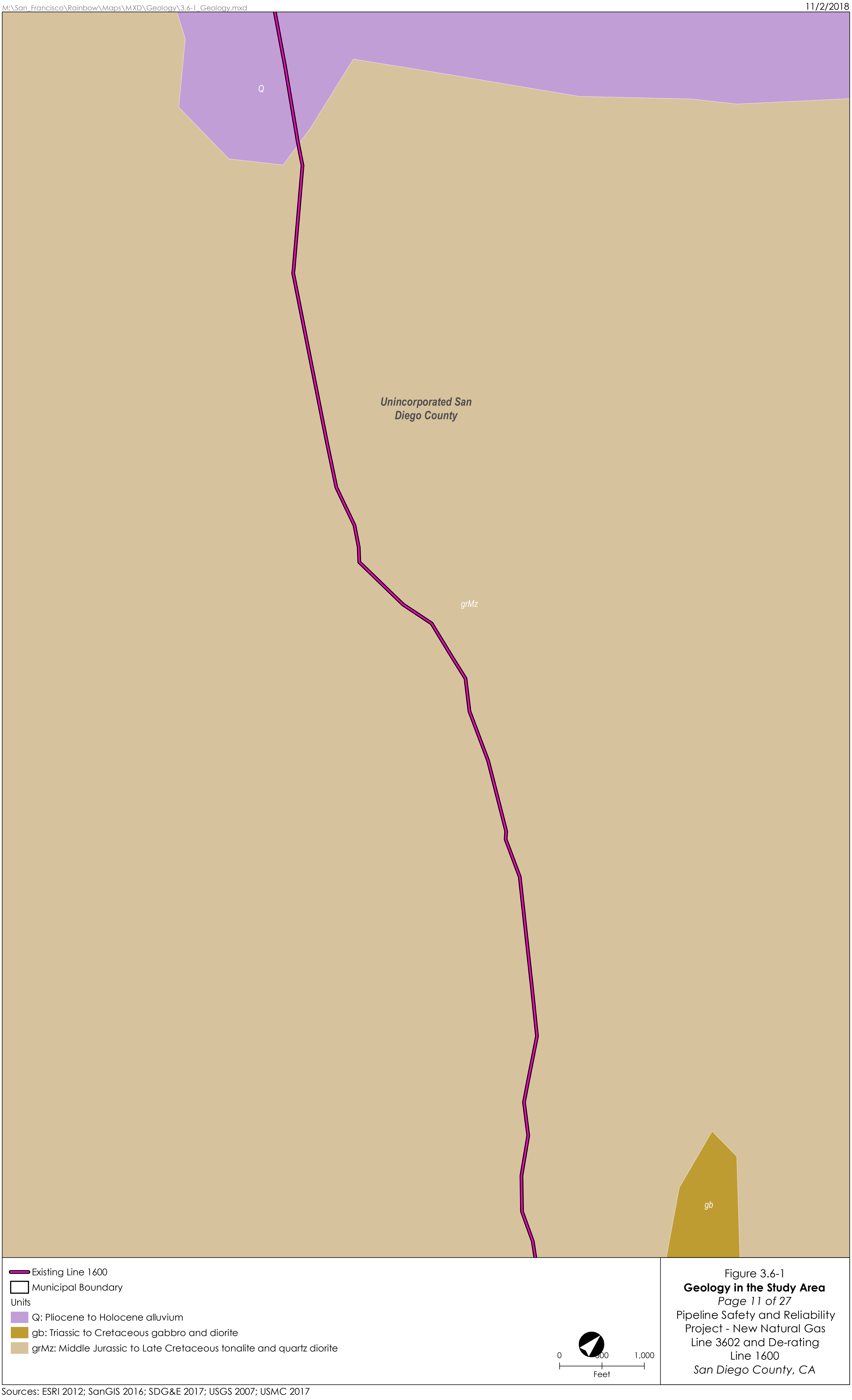


Figure 3.6-1
Geology in the Study Area
Page 11 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

Existing Line 1600
Municipal Boundary
Units
gb: Triassic to Cretaceous gabbro and diorite
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 12 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

Figure 3.6-1
Geology in the Study Area
Page 13 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

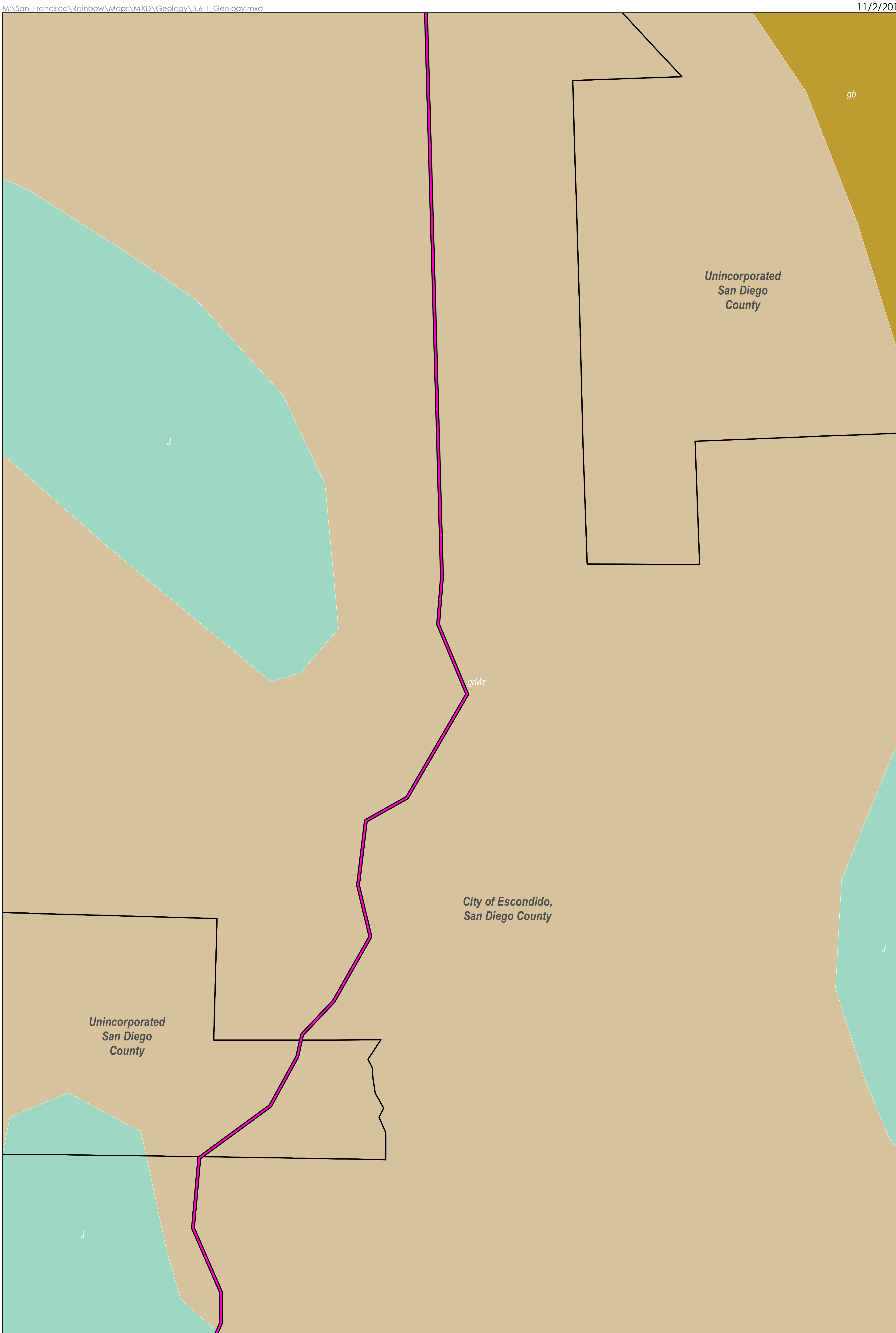
Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

Existing Line 1600
Municipal Boundary
Units
gb: Triassic to Cretaceous gabbro and diorite
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 14 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

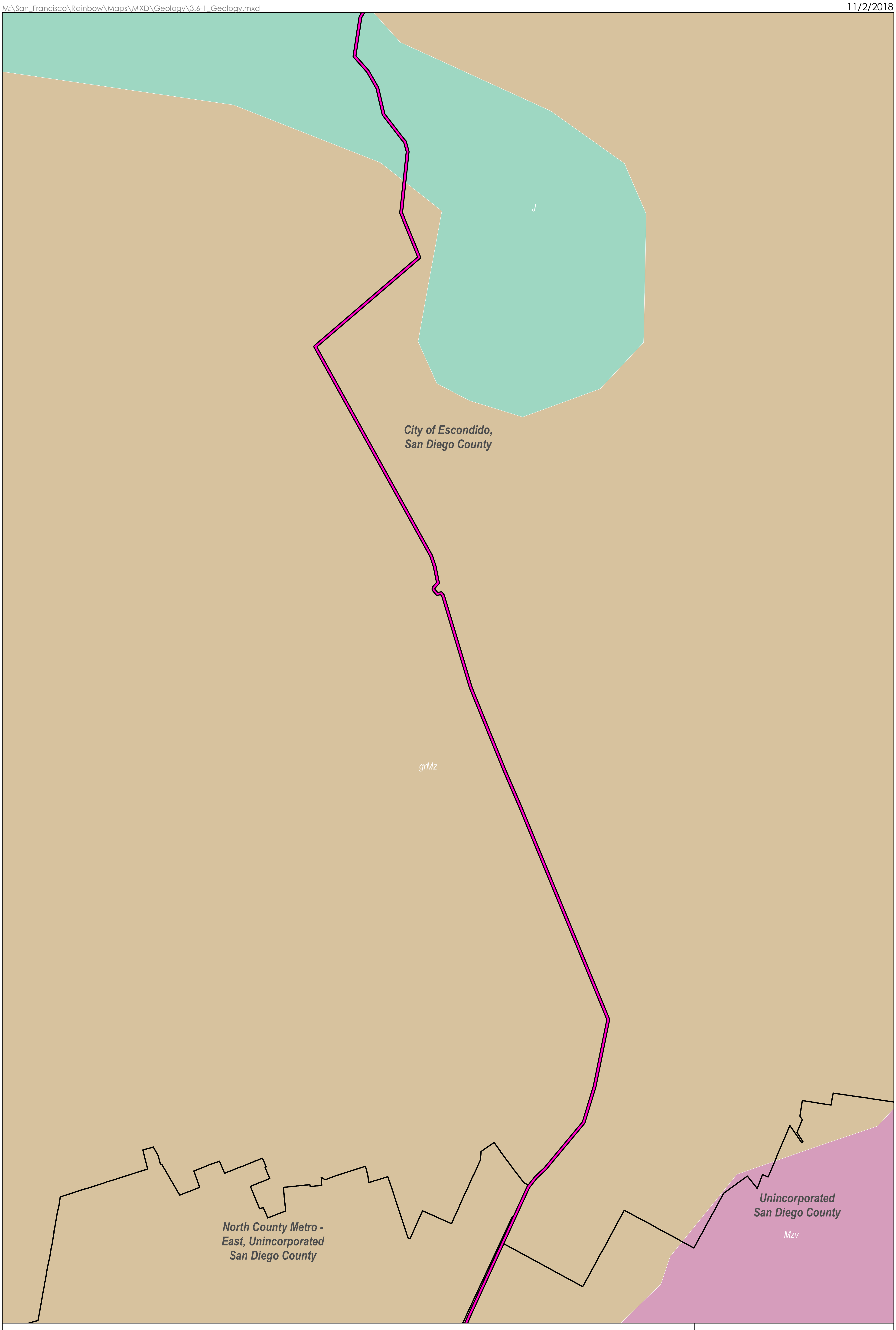


Existing Line 1600
Municipal Boundary
Units
J: Paleozoic(?) to Late Jurassic argillite and graywacke
gb: Triassic to Cretaceous gabbro and diorite
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 15 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



Existing Line 1600

Municipal Boundary

Units

J: Paleozoic(?) to Late Jurassic argillite and graywacke

Mzv: Late Jurassic to Early Cretaceous intermediate volcanic rock

grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

0 500 1,000

Feet

Figure 3.6-1

Geology in the Study Area

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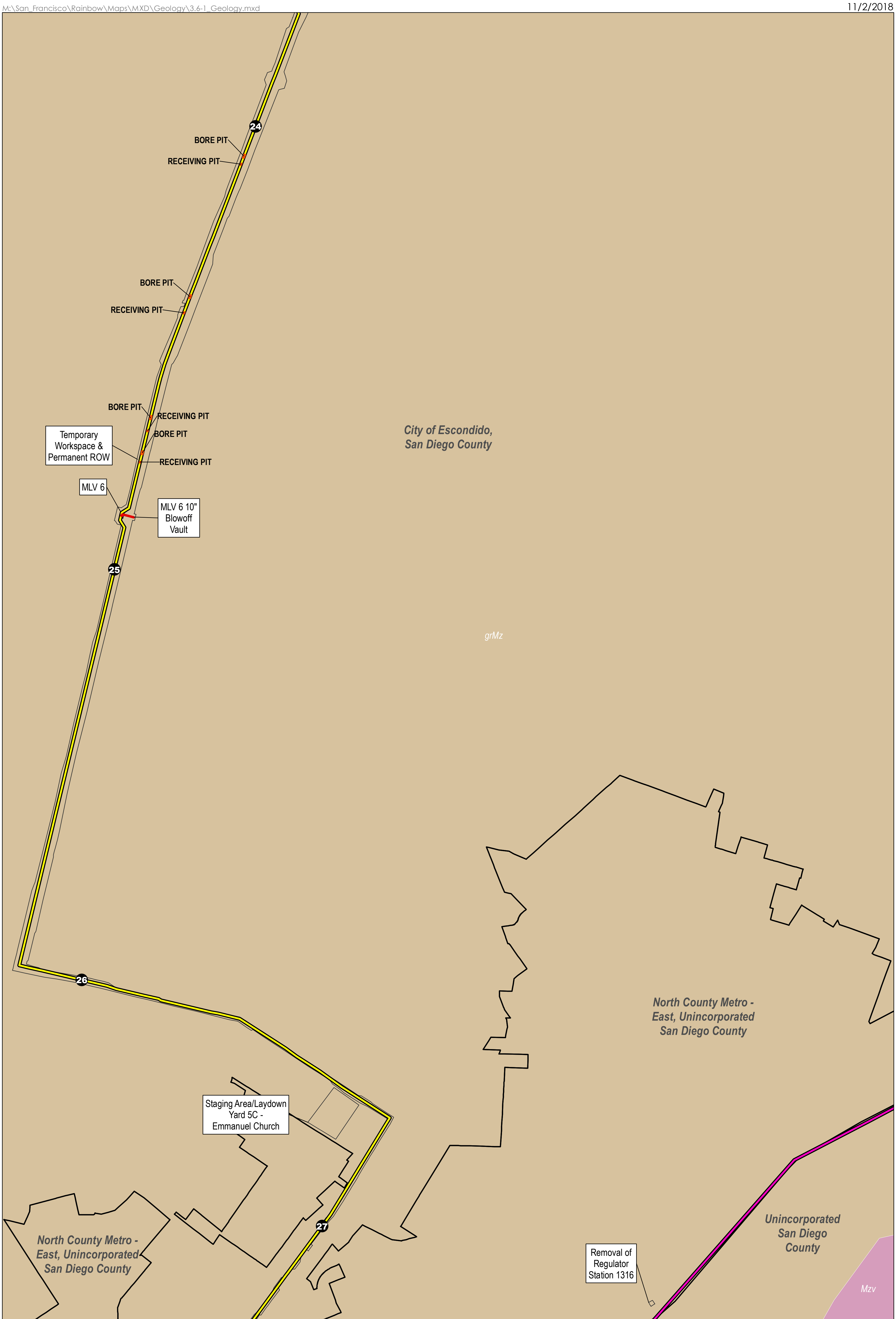
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600

San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



Milepost
Line 3602
Tie-Ins & Extensions
Existing Line 1600
Bore Pits
Workspaces

Municipal Boundary

Units

Mzv: Late Jurassic to Early Cretaceous intermediate volcanic rock

grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
MLV Mainline Valve
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 17 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

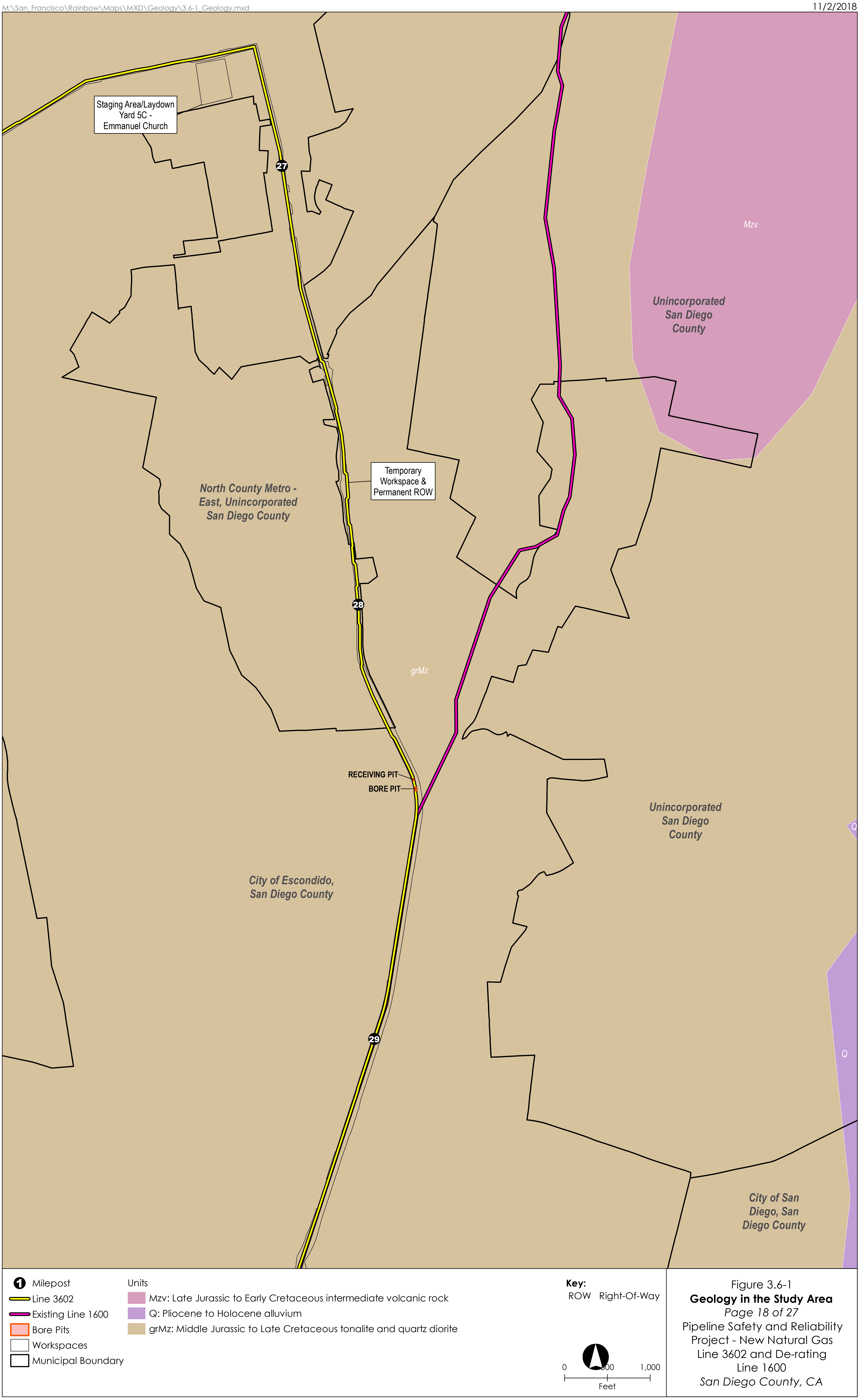


Figure 3.6-1
Geology in the Study Area
Page 18 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

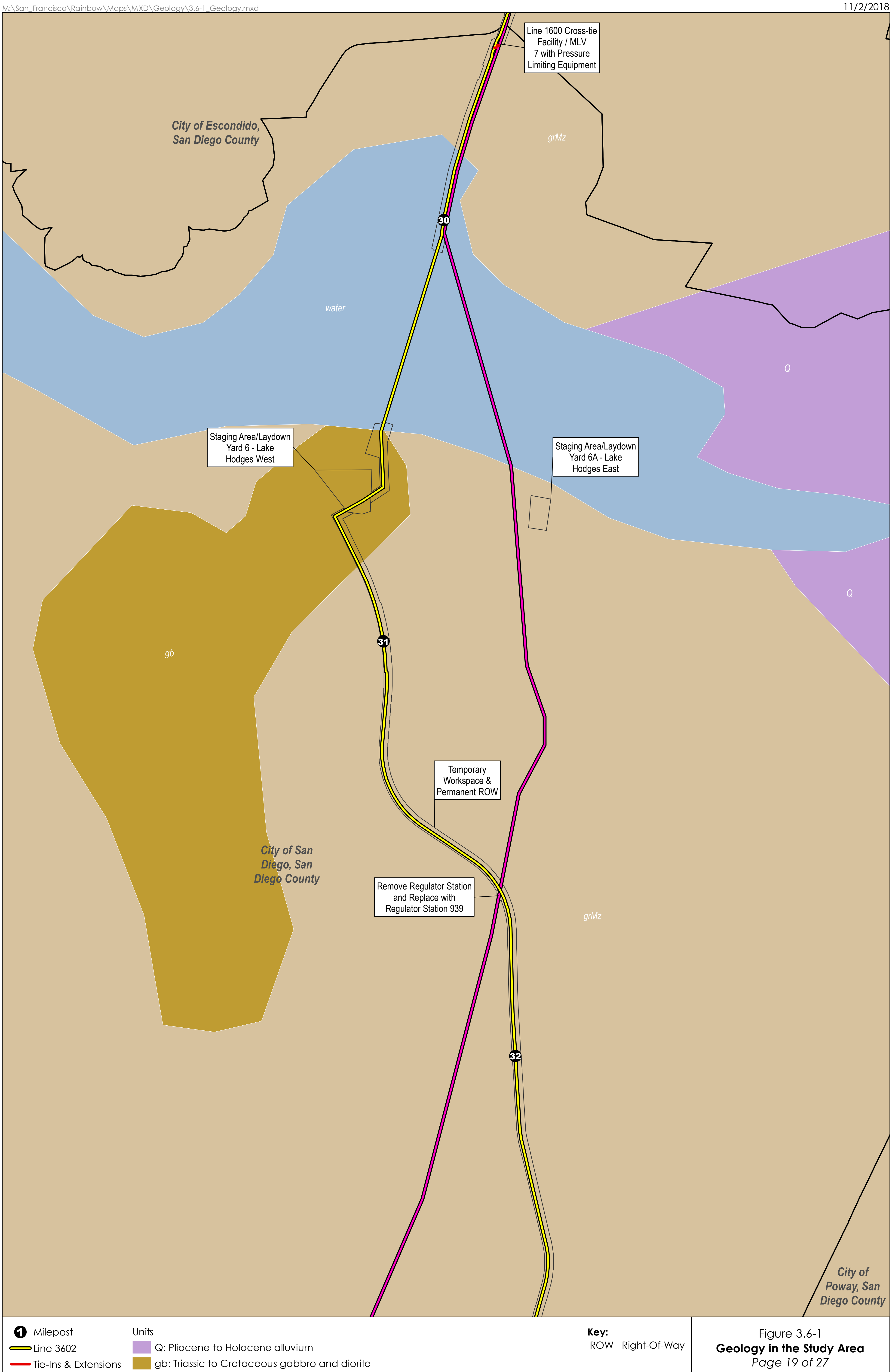
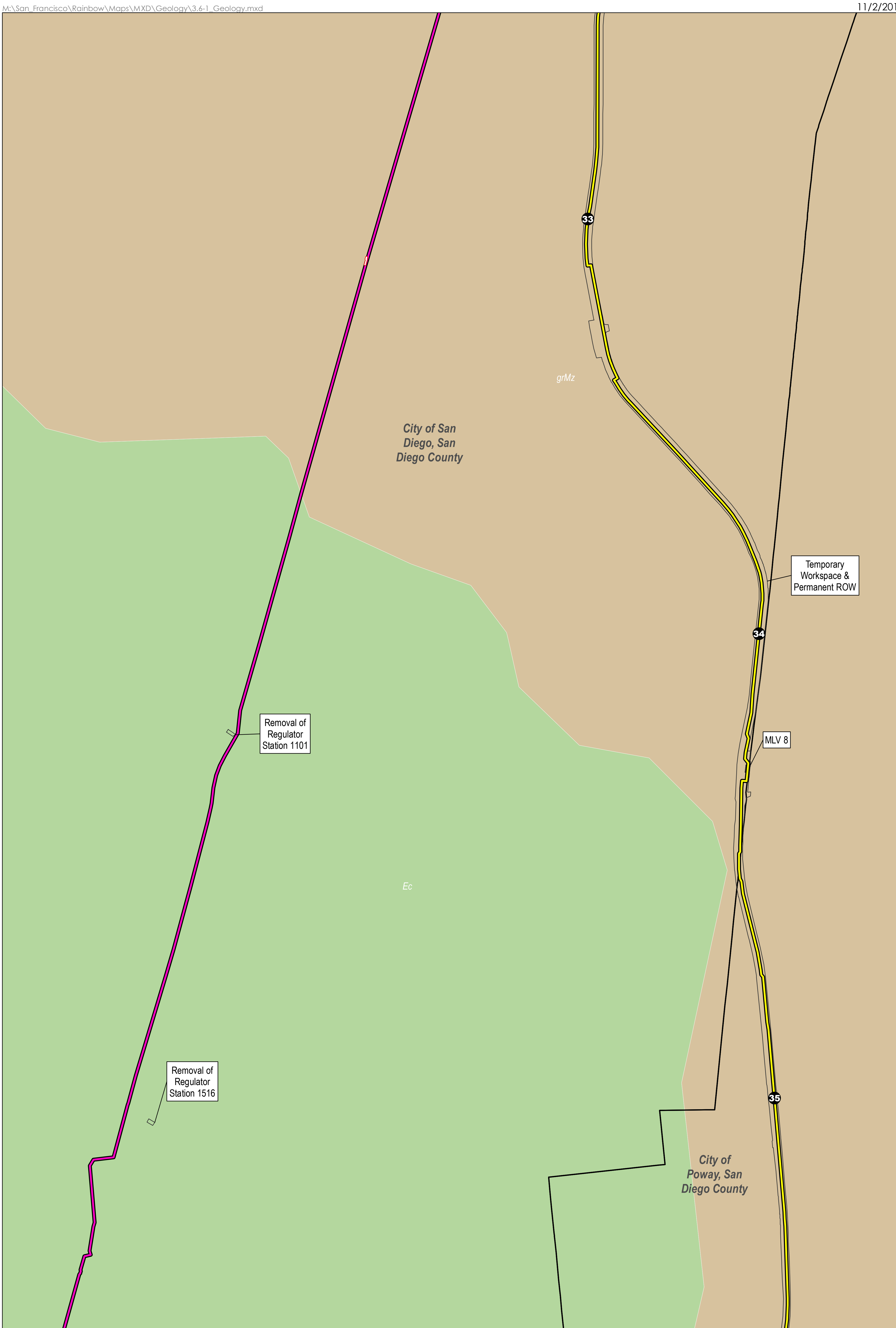


Figure 3.6-1
Geology in the Study Area
Page 19 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



- Milepost
- Line 3602
- Distribution System Modification
- Existing Line 1600
- Workspaces
- Municipal Boundary

Units

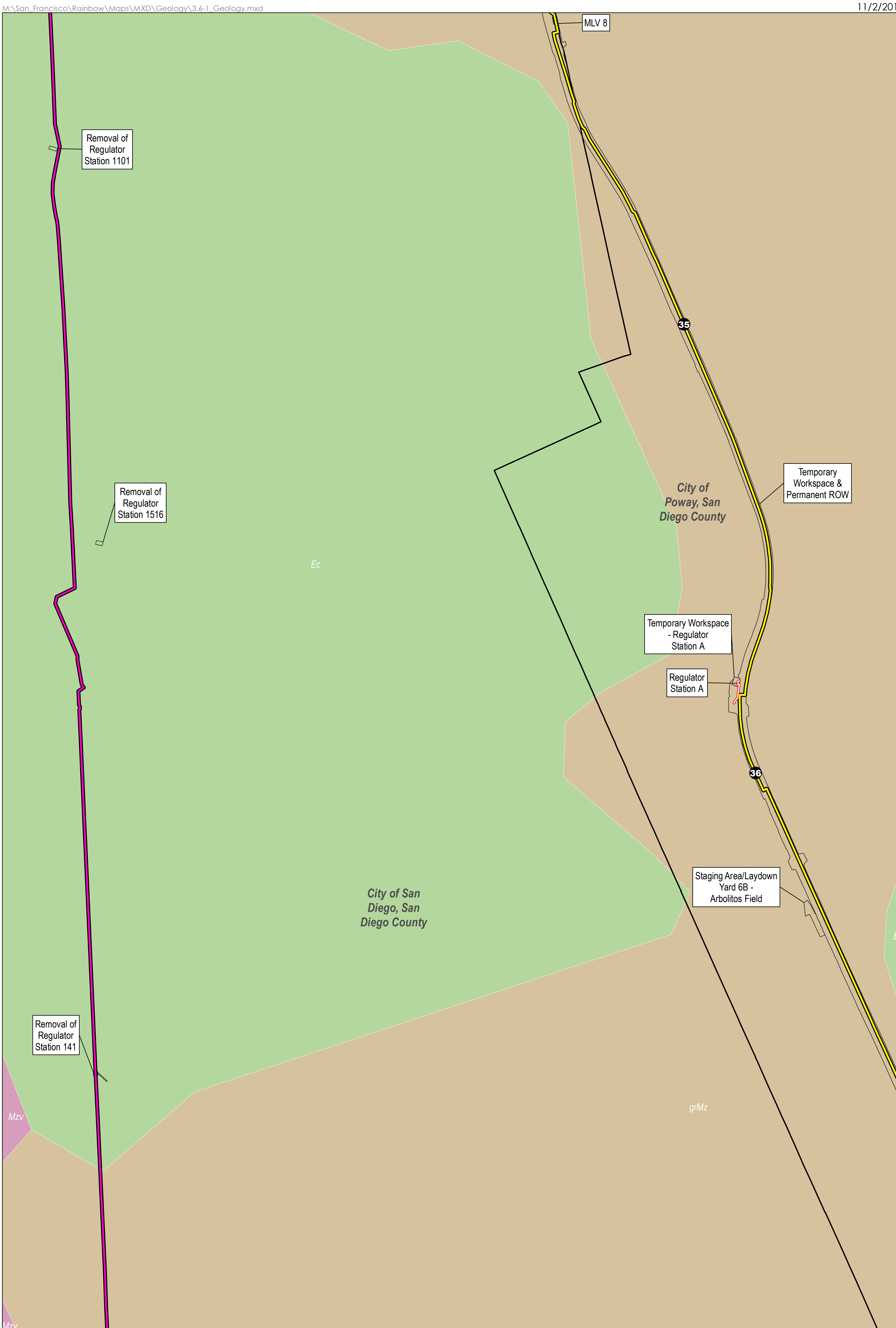
- Ec: middle to late Eocene conglomerate and sandstone
- grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 20 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



1 Milepost
Line 3602
Distribution System Modification
Existing Line 1600
Workspaces
Municipal Boundary

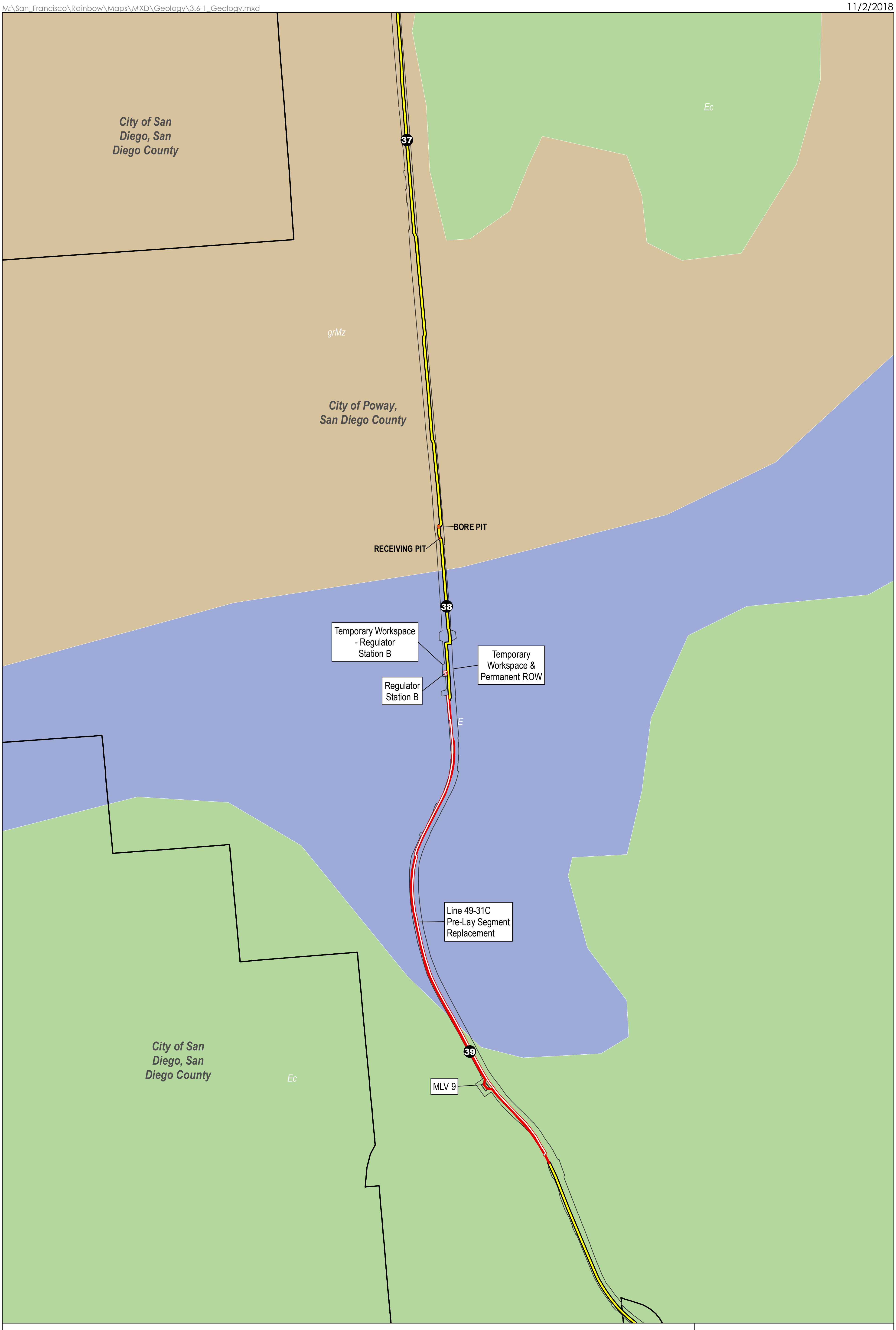
Units
Ec: middle to late Eocene conglomerate and sandstone
Mzv: Late Jurassic to Early Cretaceous intermediate volcanic rock
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 21 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



Milepost
Line 3602
Tie-Ins & Extensions
Distribution System Modification
Bore Pits
Workspaces

Municipal Boundary

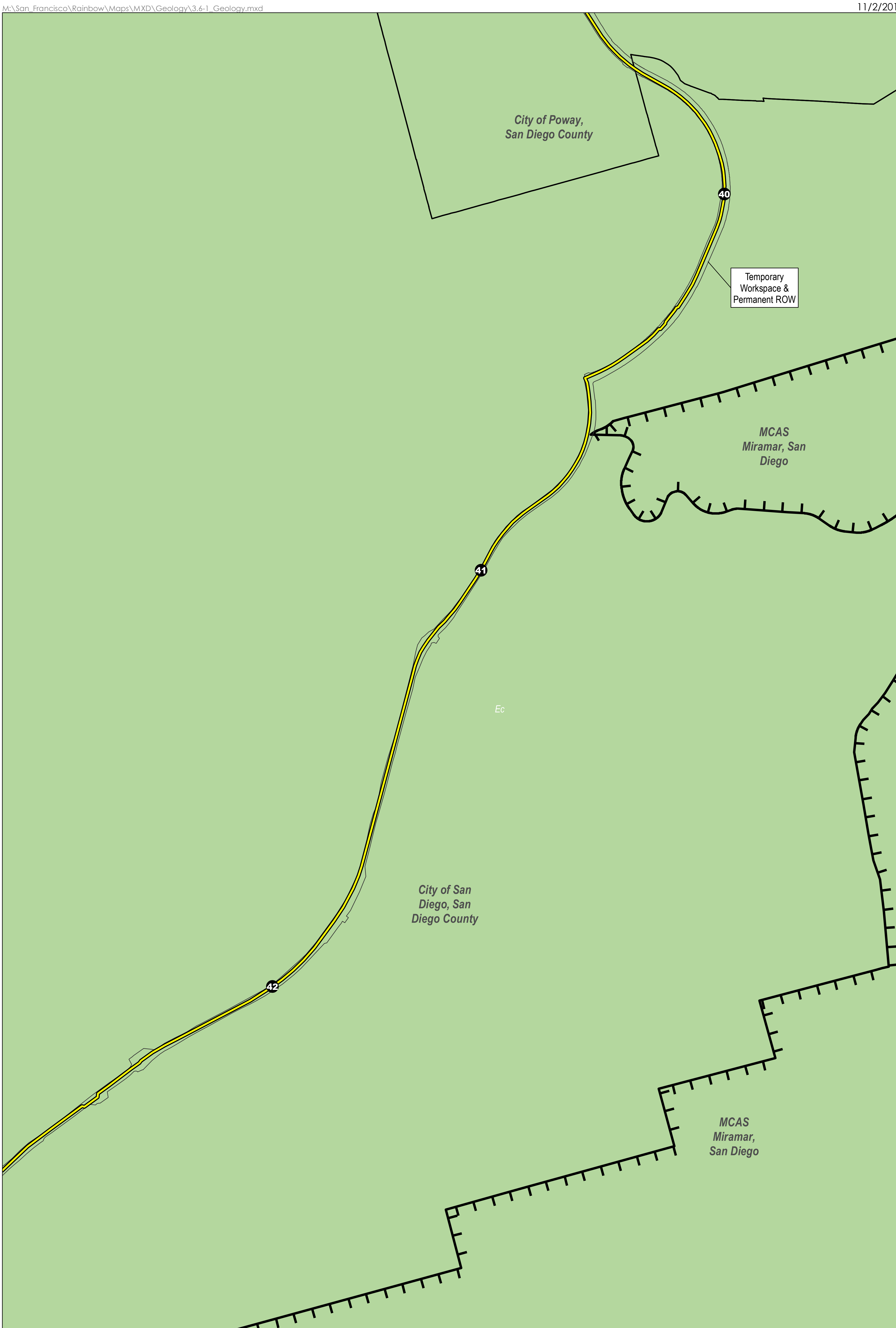
Units
E: Paleocene to Oligocene mudstone and sandstone
Ec: middle to late Eocene conglomerate and sandstone
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 22 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



1 Milepost
Line 3602
Workspaces
MCAS Miramar
Municipal Boundary

Units

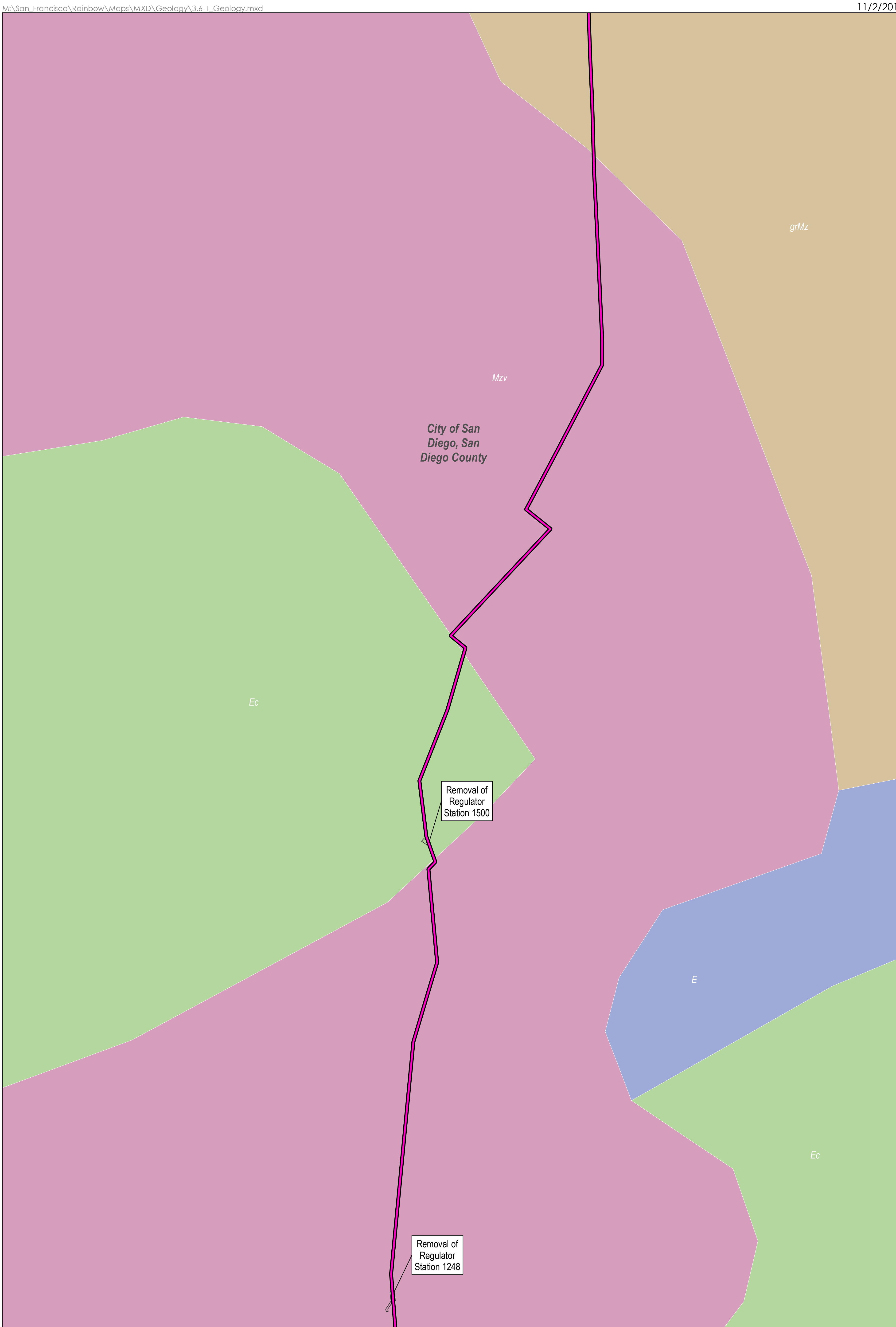
Ec: middle to late Eocene conglomerate and sandstone

Key:
ROW Right-Of-Way

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 23 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

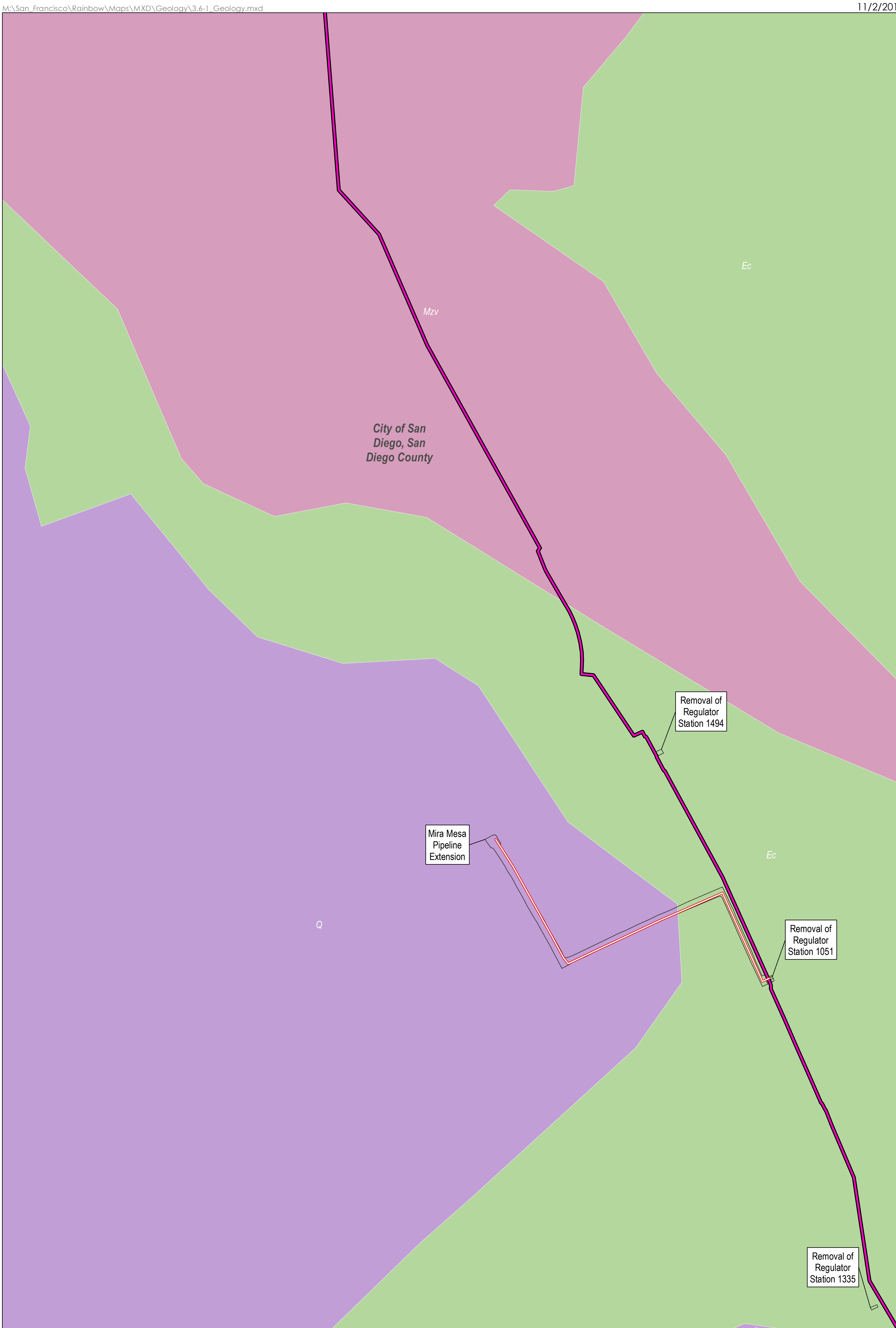


Existing Line 1600
Workspaces
Municipal Boundary
Units
E: Paleocene to Oligocene mudstone and sandstone
Ec: middle to late Eocene conglomerate and sandstone
Mzv: Late Jurassic to Early Cretaceous intermediate volcanic rock
grMz: Middle Jurassic to Late Cretaceous tonalite and quartz diorite

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 24 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



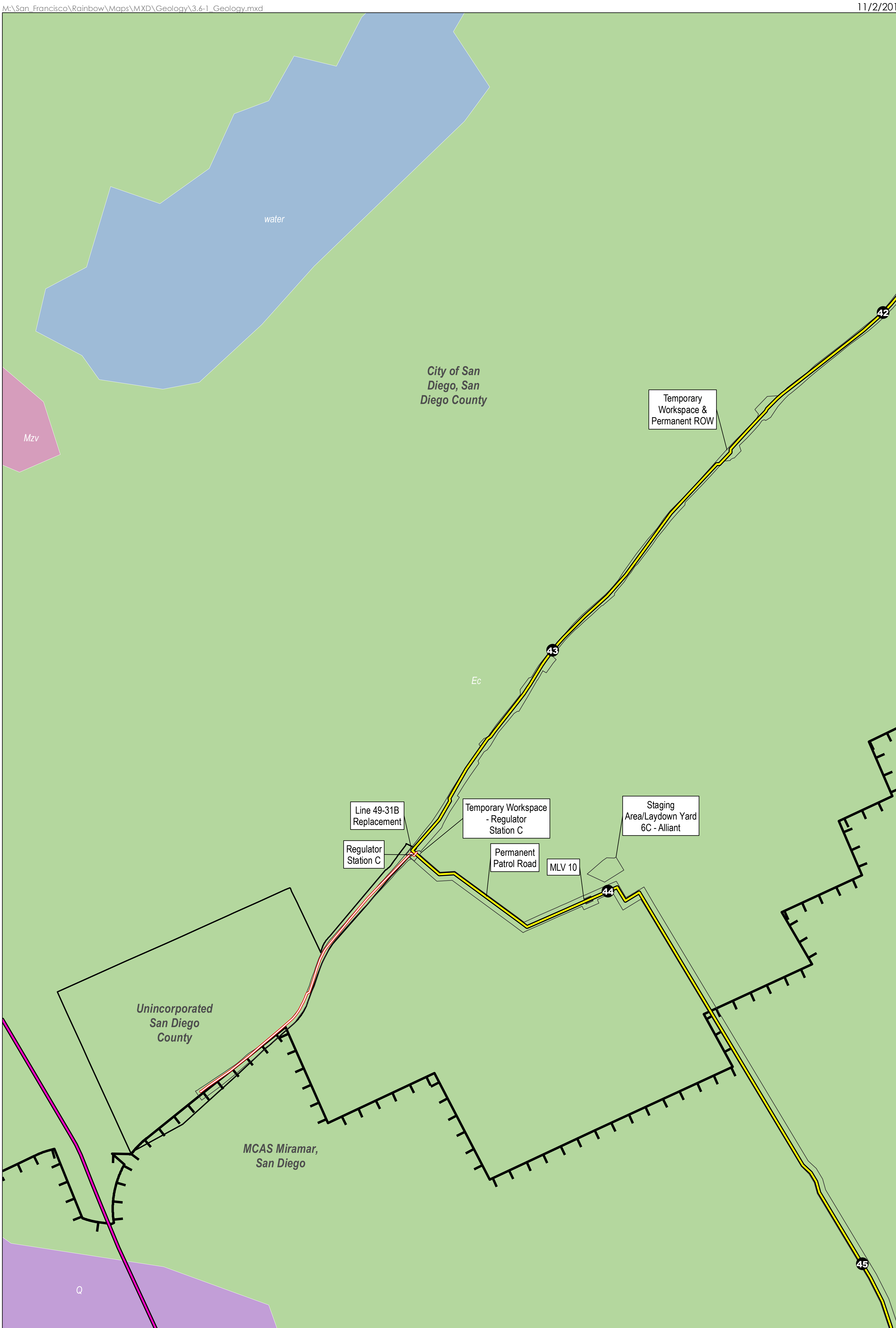
Distribution System Modification
Existing Line 1600
Workspaces
Municipal Boundary

Units
Ec: middle to late Eocene conglomerate and sandstone
Mzv: Late Jurassic to Early Cretaceous intermediate volcanic rock
Q: Pliocene to Holocene alluvium

0 500 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 25 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017



Milepost
Line 3602
Distribution System Modification
Existing Line 1600
Workspaces
MCAS Miramar

Municipal Boundary

Units

Ec: middle to late Eocene conglomerate and sandstone
Mzv: Late Jurassic to Early Cretaceous intermediate volcanic rock
Q: Pliocene to Holocene alluvium
Water: Holocene

Key:
ROW Right-Of-Way

0 1,000
Feet

Figure 3.6-1
Geology in the Study Area
Page 26 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

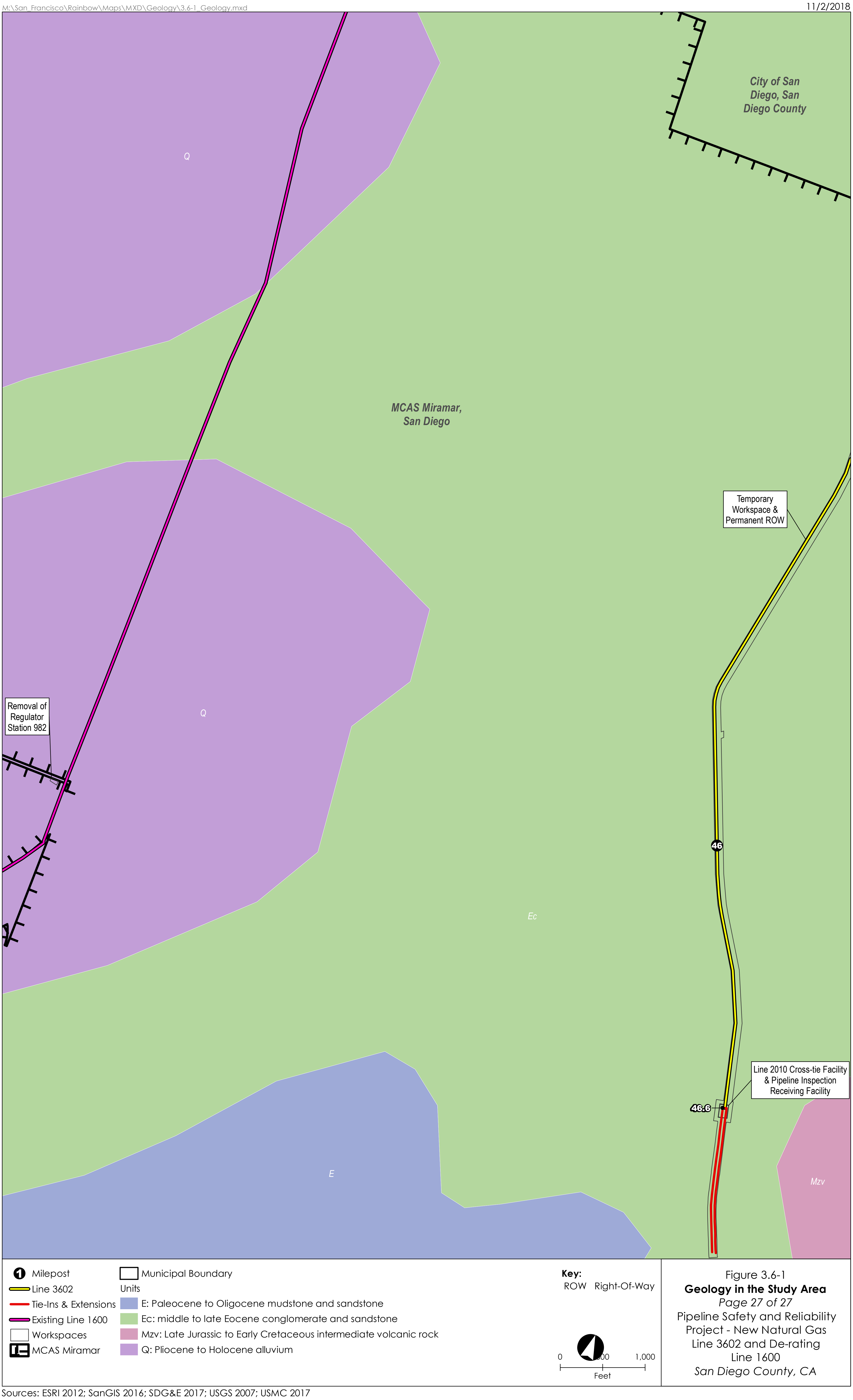
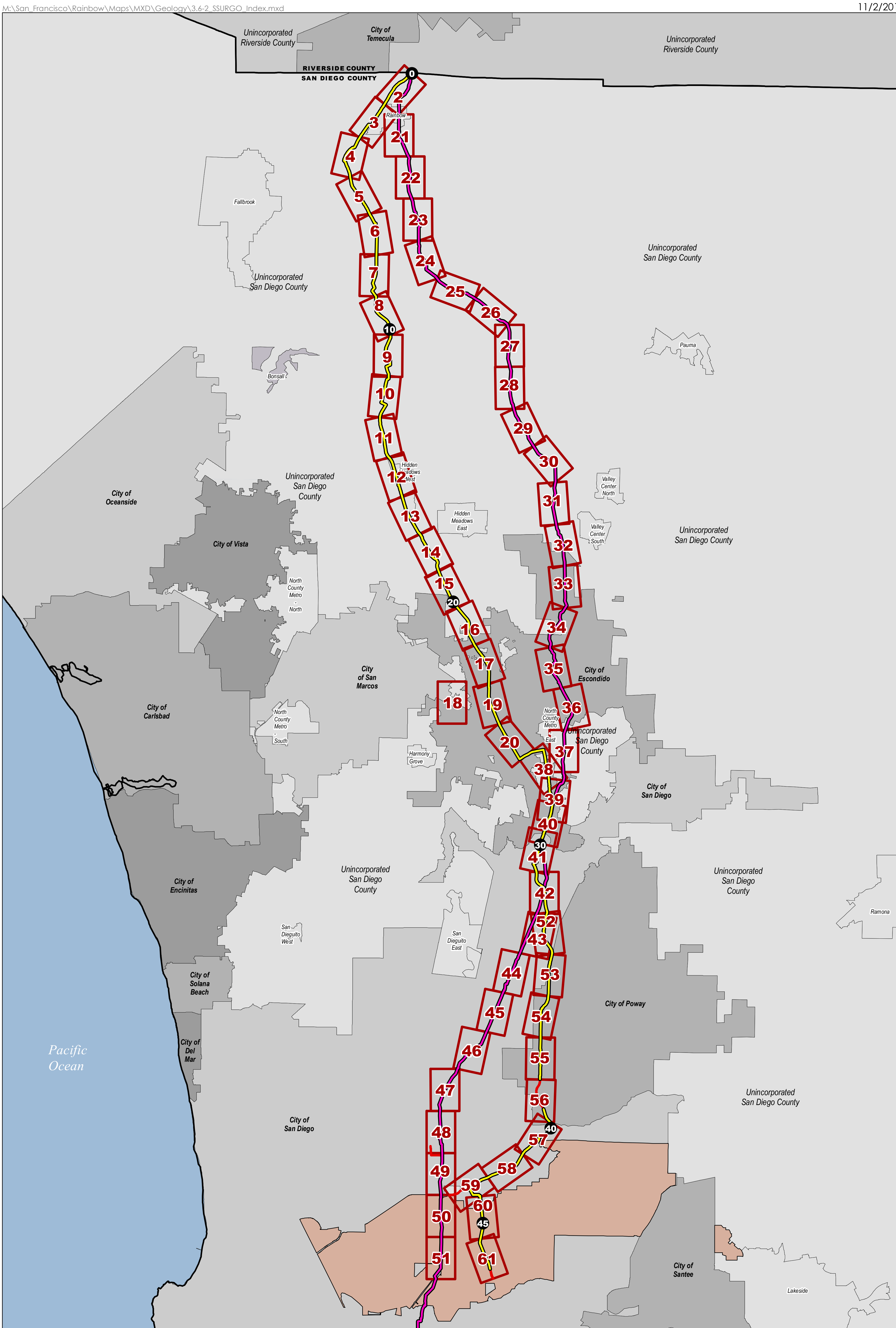


Figure 3.6-1
Geology in the Study Area
Page 27 of 27
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USGS 2007; USMC 2017

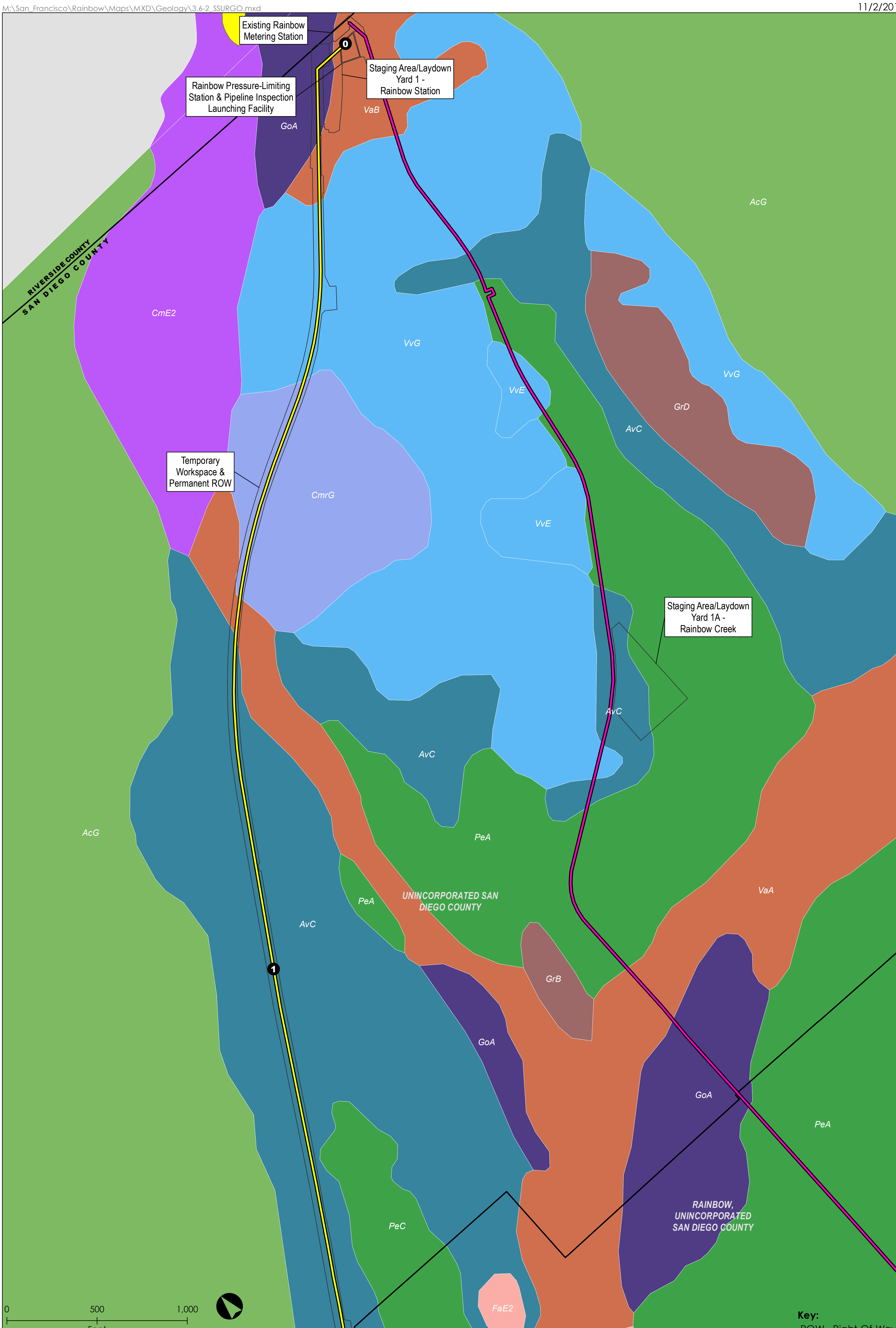


1 Milepost
Line 3602
Tie-Ins & Extensions
Existing Line 1600
MCAS Miramar
Map Series Index

0 2.5 5
Miles

Figure 3.6-2
Soils in the Study Area
Page 1 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

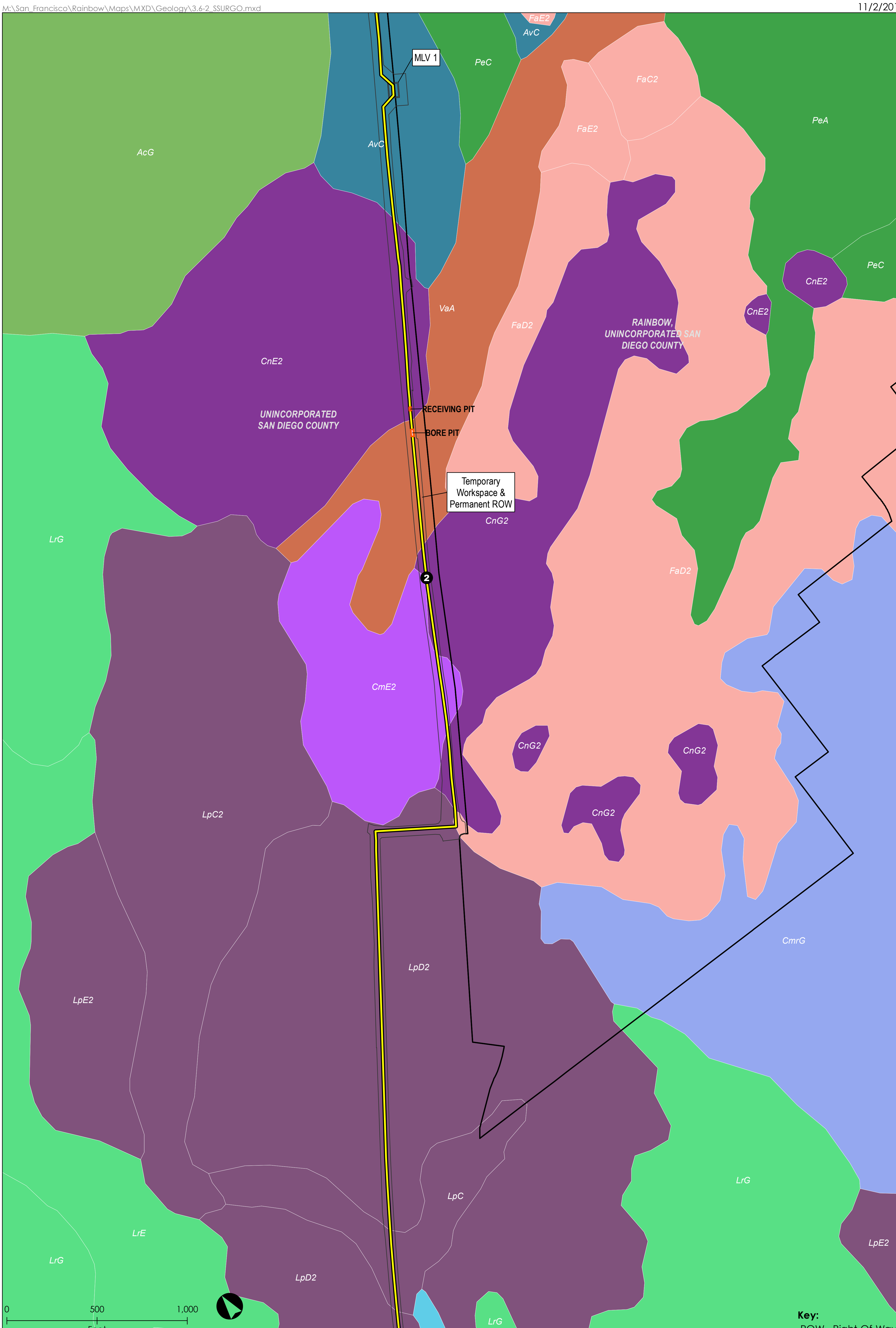
Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost	AvC: Arlington coarse sandy loam
Line 3602	CmE2: Cieneba rocky coarse sandy loam
Existing Line 1600	CmrG: Cieneba very rocky coarse sandy loam
Workspaces	FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
Municipal Boundary	GoA: Grangeville fine sandy loam
Soil Series	GrB, GrC, GrD: Greenfield sandy loam
AcG: Acid igneous rock land	PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
VaA, VaB, VaC: Visalia sandy loam	
VvD, VvE, VvG: Vista rocky coarse sandy loam	
HgA: Hanford coarse sandy loam	
RtF: Rockland	

Figure 3.6-2
Soils in the Study Area
Page 2 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



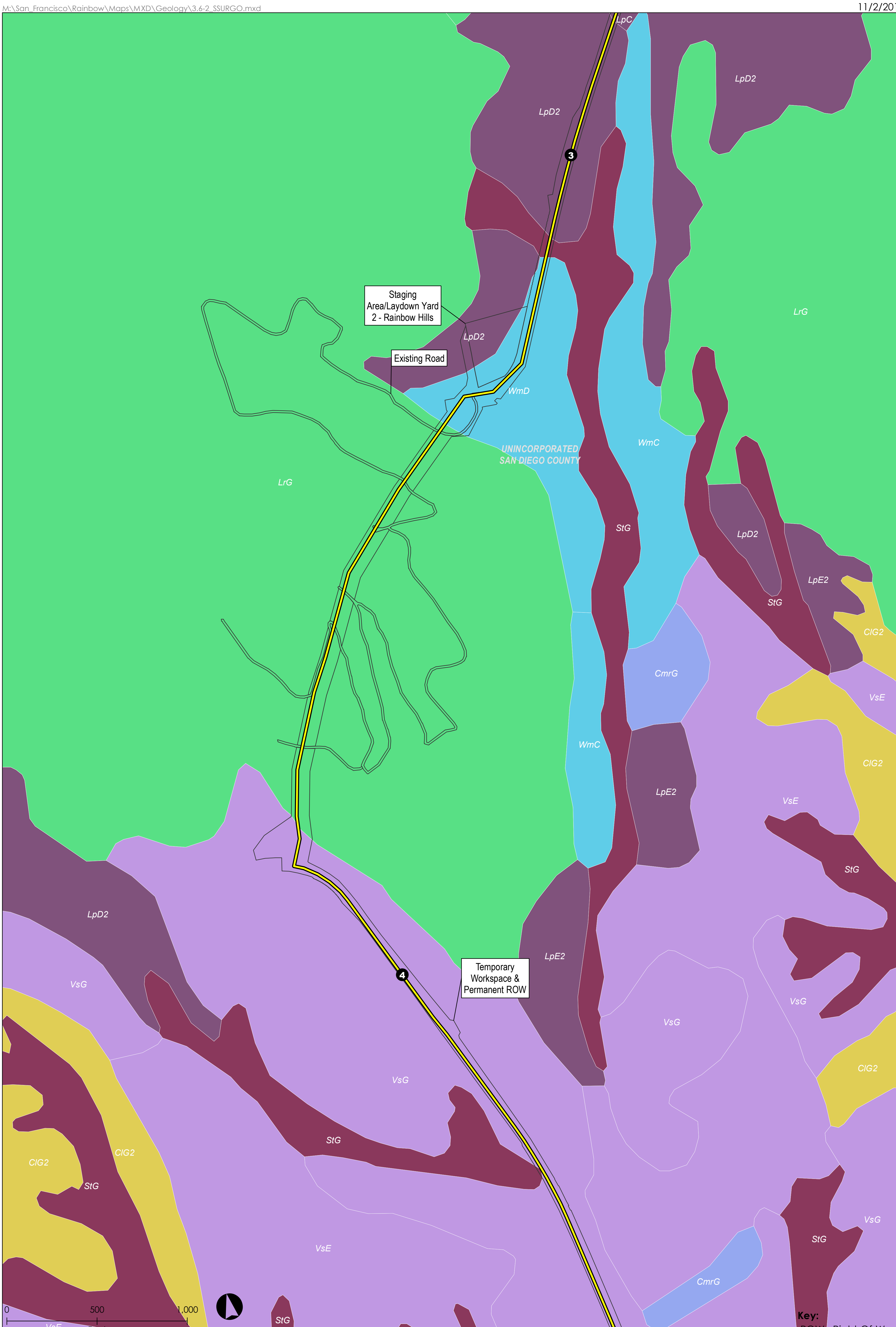
- Milepost
- Line 3602
- Bore Pits
- Workspaces
- Municipal Boundary

Soil Series

- AcG: Acid igneous rock land
- AvC: Arlington coarse sandy loam
- CmE2: Cieneba rocky coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- VaA, VaB, VaC: Visalia sandy loam
- WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
Page 3 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



1 Milepost
Line 3602
Workspaces
Municipal Boundary
Soil Series
CID2, CIE2, CIG2: Cineba coarse sandy loam
CmrG: Cieneba very rocky coarse sandy loam
LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
LrE, LrG, LrE2: Las Posas stony fine sandy loam
StG: Steep gullied land
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
Page 4 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

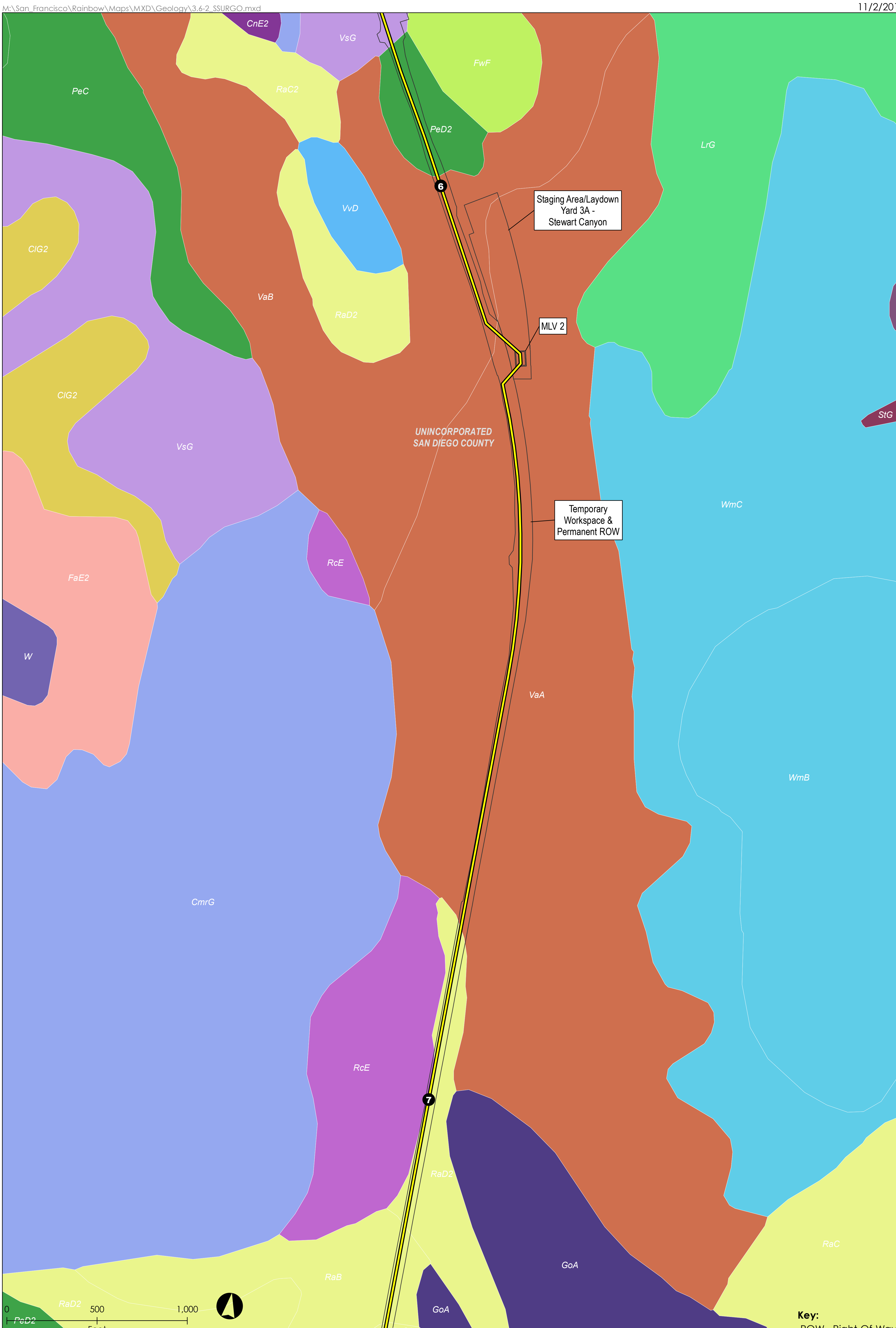
Milepost
Line 3602
Workspaces
Municipal Boundary

Soil Series

- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FwF: Friant fine sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- StG: Steep gullied land
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
Page 5 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

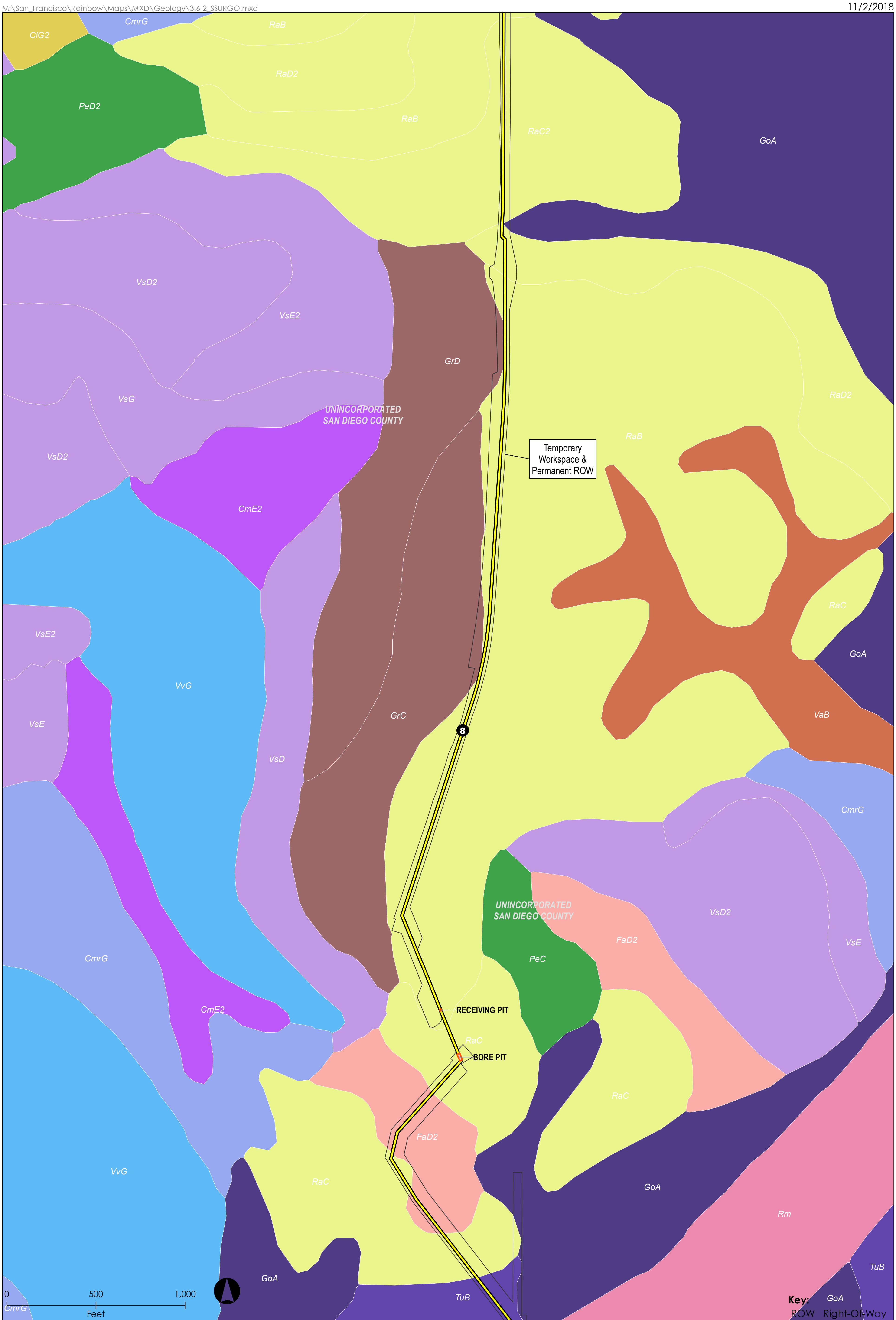


- Milepost
- Line 3602
- Workspaces
- Municipal Boundary

Soil Series
- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FwF: Friant fine sandy loam
- GoA: Grangeville fine sandy loam
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- RcE: Ramona gravelly sandy loam
- StG: Steep gullied land
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam
- W: Water
- WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
Page 6 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



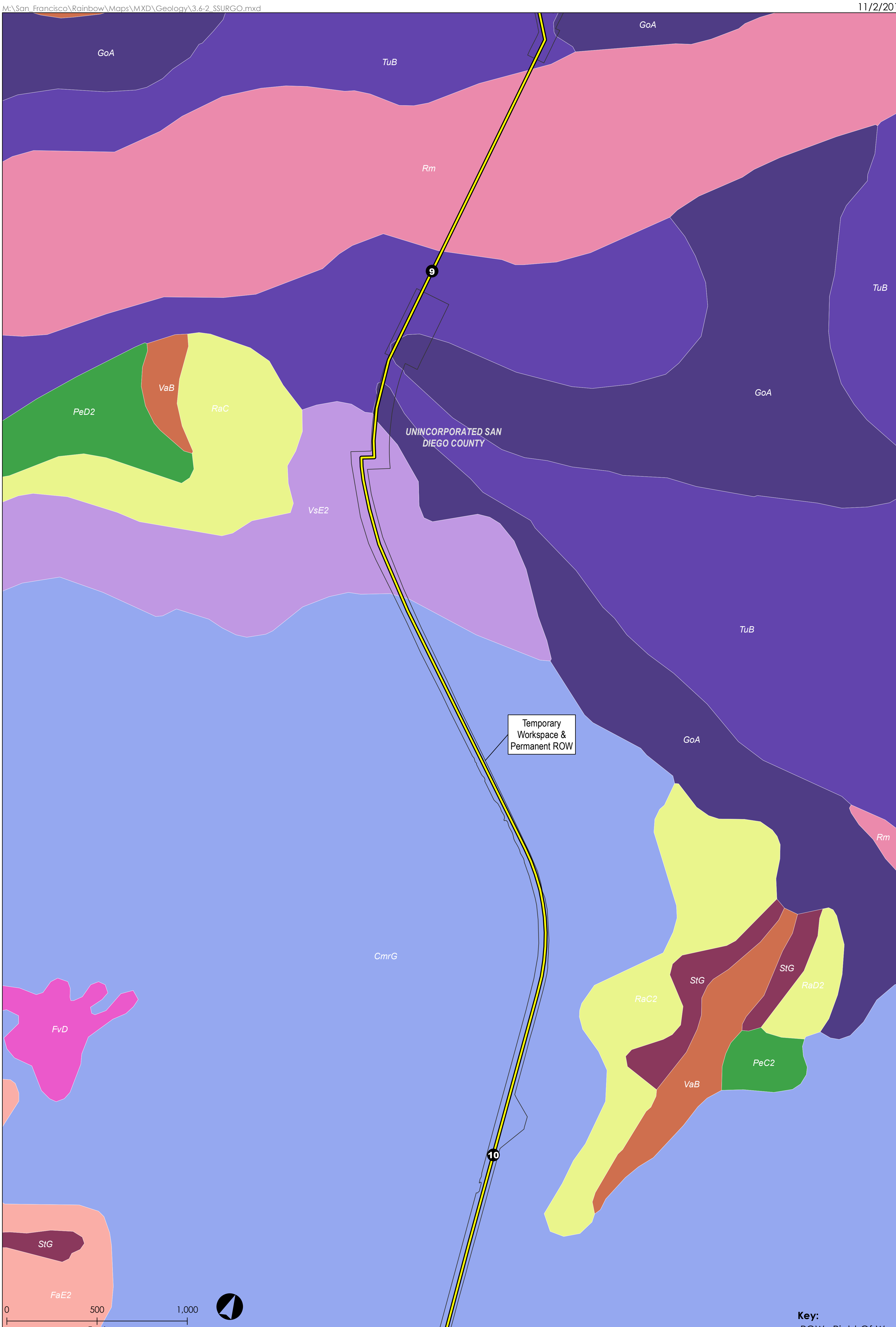
Milepost
Line 3602
Bore Pits
Workspaces
Municipal Boundary

Soil Series

ClD2, ClE2, ClG2: Cineba coarse sandy loam
CmE2: Cieneba rocky coarse sandy loam
CmrG: Cieneba very rocky coarse sandy loam
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
GoA: Grangeville fine sandy loam
GrB, GrC, GrD: Greenfield sandy loam
PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Rm: Riverwash
TuB: Tujunga sand
VaA, VaB, VaC: Visalia sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
Page 7 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Workspaces
Municipal Boundary
Soil Series
CmrG: Cieneba very rocky coarse sandy loam
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FvD, FvE: Fallbrook-Vista sandy loams
GoA: Grangeville fine sandy loam
PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Rm: Riverwash
StG: Steep gullied land
TuB: Tujunga sand
VaA, VaB, VaC: Visalia sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

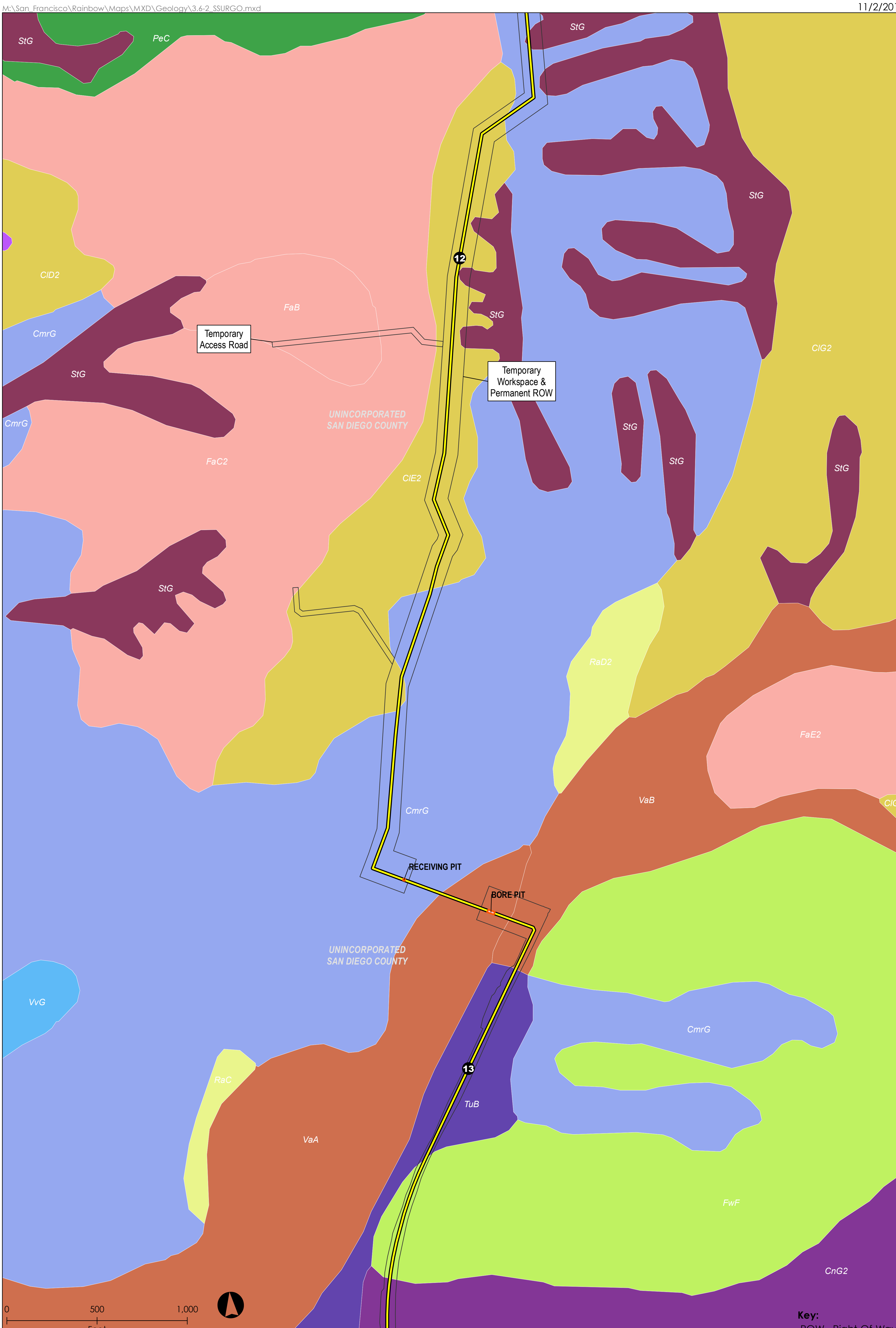
Figure 3.6-2
Soils in the Study Area
Page 8 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Milepost
Line 3602
Workspaces
Municipal Boundary
Soil Series
BIC2, BIC, BID2, BmC: Bonsall sandy loam
CID2, CIE2, CIG2: Cineba coarse sandy loam
CmE2: Cieneba rocky coarse sandy loam
CmrG: Cieneba very rocky coarse sandy loam
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FvD, FvE: Fallbrook-Vista sandy loams
PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
StG: Steep gullied land
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2
Soils in the Study Area
Page 9 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Bore Pits
Workspaces
Municipal Boundary

Soil Series

- CID2, CIE2, CIG2: Cineba coarse sandy loam
- CmE2: Cieneba rocky coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FwF: Friant fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- StG: Steep gullied land
- TuB: Tujunga sand
- VaA, VaB, VaC: Visalia sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

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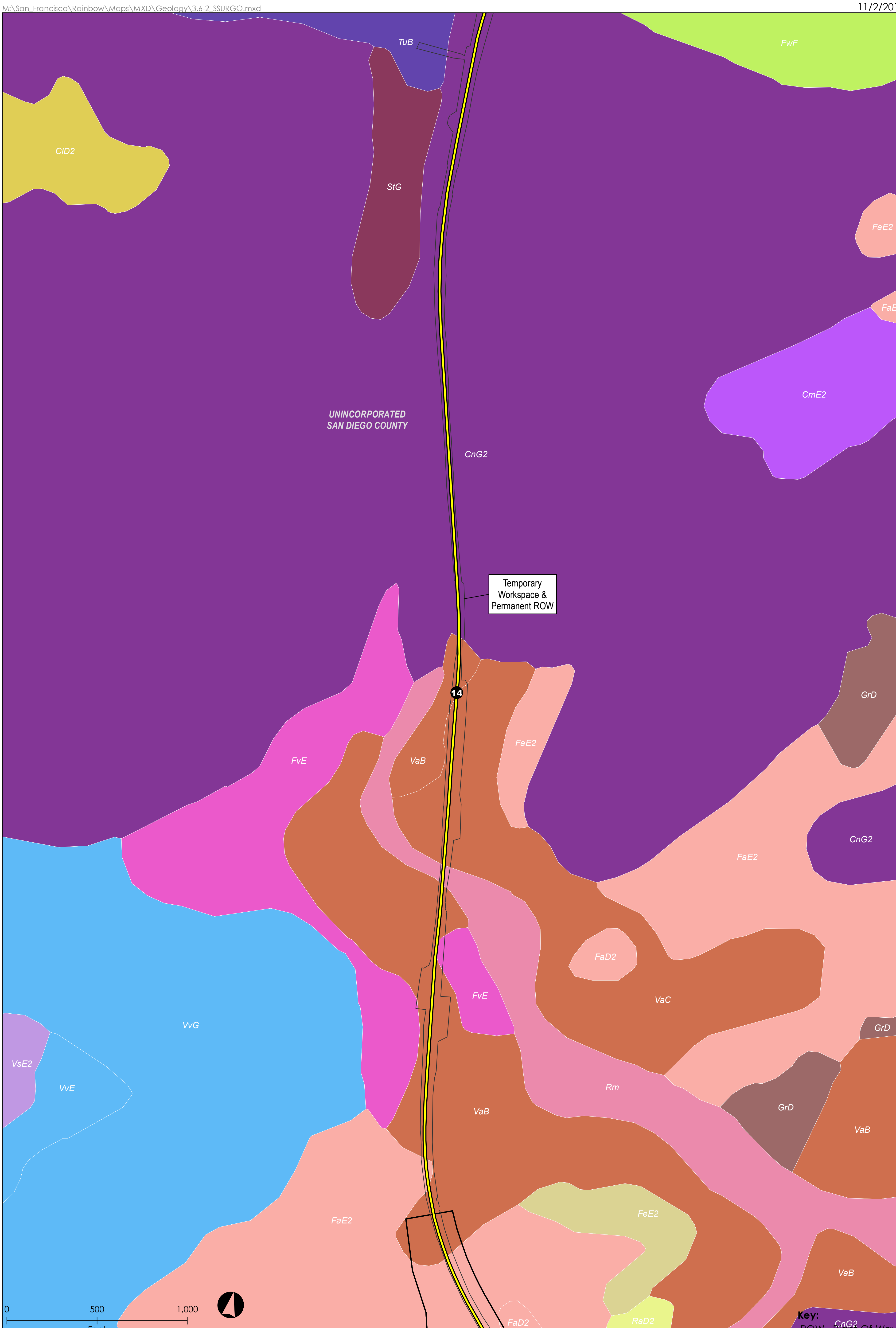
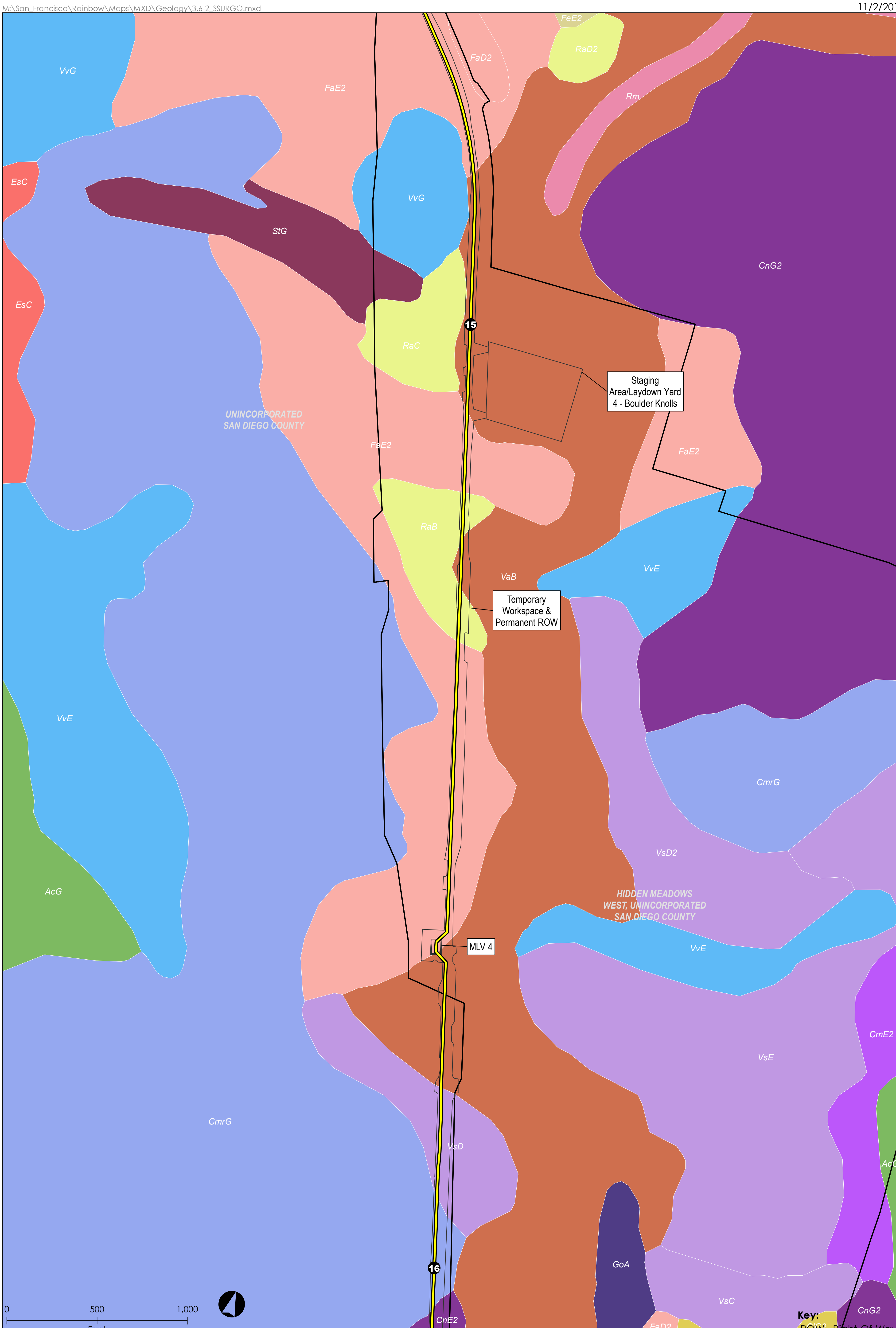


Milepost
Line 3602
Workspaces
Municipal Boundary
Soil Series
ClD2, ClE2, ClG2: Cineba coarse sandy loam
CmE2: Cieneba rocky coarse sandy loam
CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FeC. FeE2, FeE: Fallbrook rocky sandy loam
FvD, FvE: Fallbrook-Vista sandy loams
FwF: Friant fine sandy loam
GrB, GrC, GrD: Greenfield sandy loam
RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Rm: Riverwash
StG: Steep gullied land
TuB: Tujunga sand
VaA, VaB, VaC: Visalia sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
Page 11 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost	CmE2: Cieneba rocky coarse sandy loam	RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Line 3602	CmrG: Cieneba very rocky coarse sandy loam	Rm: Riverwash
Workspaces	CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams	StG: Steep gullied land
Municipal Boundary	EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam	VaA, VaB, VaC: Visalia sandy loam
Soil Series	FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam	VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
AcG: Acid igneous rock land	FeC. FeE2, FeE: Fallbrook rocky sandy loam	VvD, VvE, VvG: Vista rocky coarse sandy loam
CID2, CIE2, CIG2: Cineba coarse sandy loam	GoA: Grangeville fine sandy loam	

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

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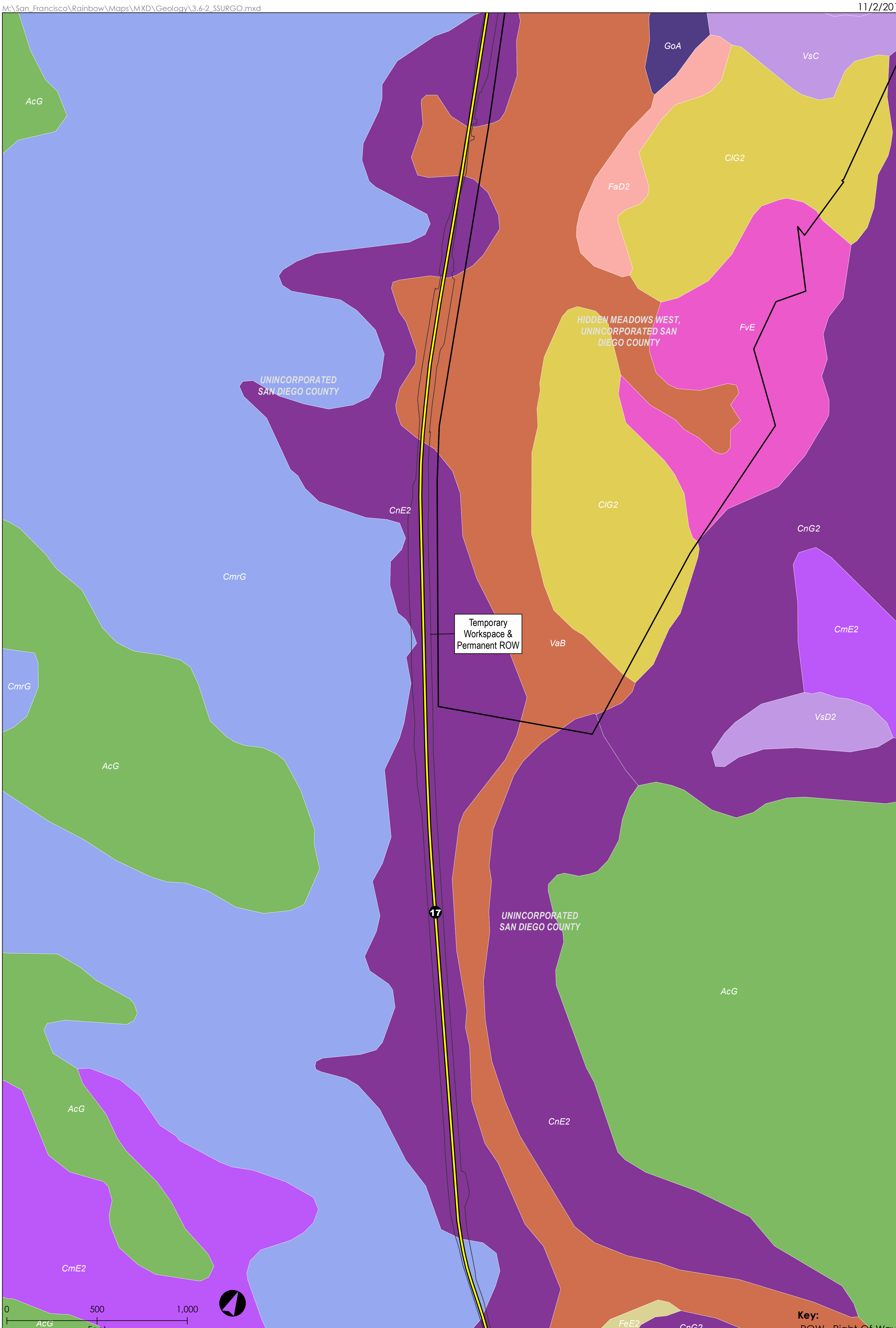

- Milepost
- Line 3602
- Workspaces
- Municipal Boundary

Soil Series

- AcG: Acid igneous rock land
- CID2, CIE2, CIG2: Cineba coarse sandy loam
- CmE2: Cieneba rocky coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FeC. FeE2, FeE: Fallbrook rocky sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- GoA: Grangeville fine sandy loam
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

- Milepost
- Line 3602
- Workspaces
- Municipal Boundary

Soil Series

- AcG: Acid igneous rock land
- CmE2: Cieneba rocky coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FeC. FeE2, FeE: Fallbrook rocky sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- VaA, VaB, VaC: Visalia sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam
- WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
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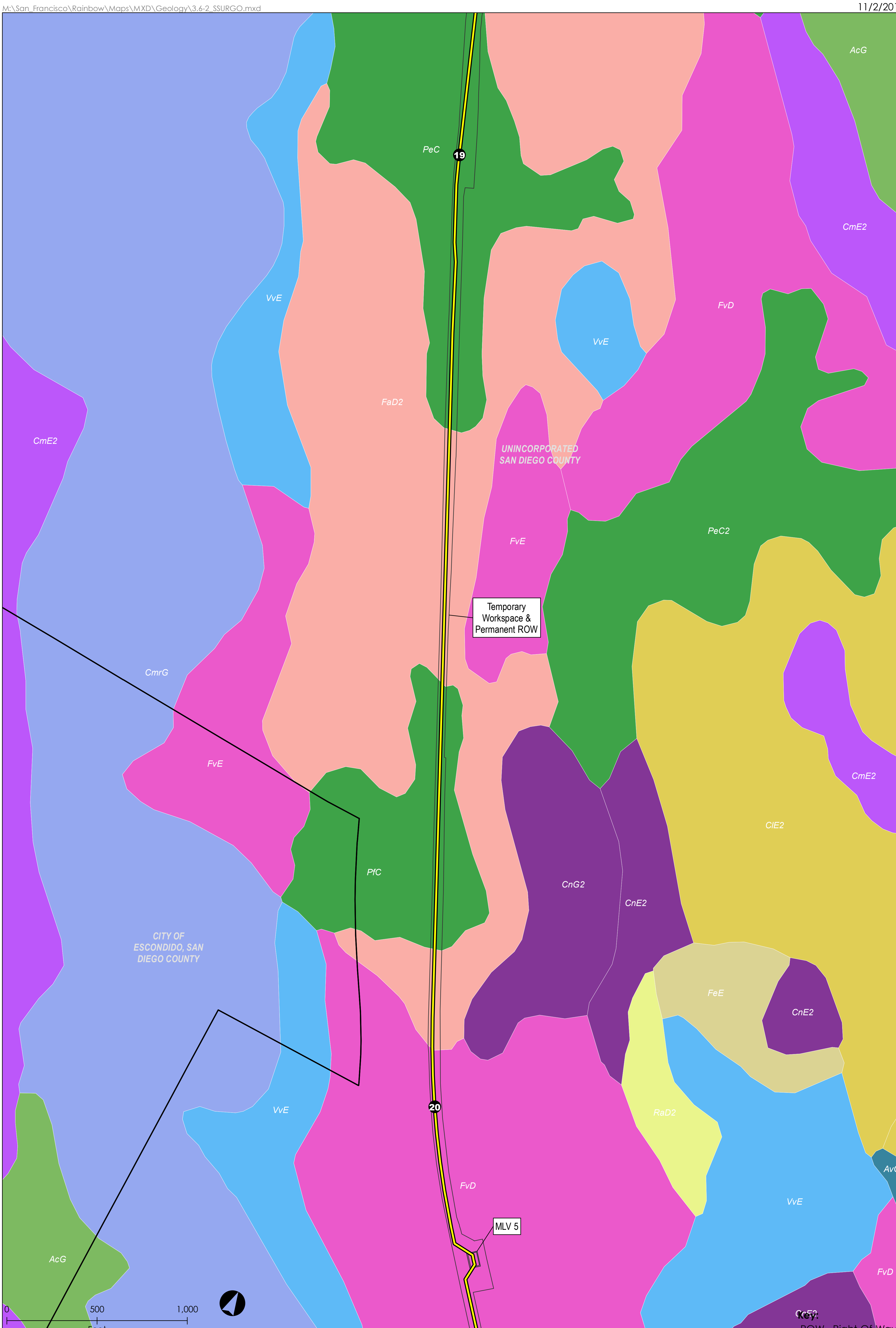
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost	ClD2, ClE2, ClG2: Cineba coarse sandy loam	PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
Line 3602	CmE2: Cieneba rocky coarse sandy loam	RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Workspaces	CmrG: Cieneba very rocky coarse sandy loam	VvD, VvE, VvG: Vista rocky coarse sandy loam
Municipal Boundary	CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams	
Soil Series	FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam	
AcG: Acid igneous rock land	FeC. FeE2, FeE: Fallbrook rocky sandy loam	
AvC: Arlington coarse sandy loam	FvD, FvE: Fallbrook-Vista sandy loams	

Figure 3.6-2
Soils in the Study Area
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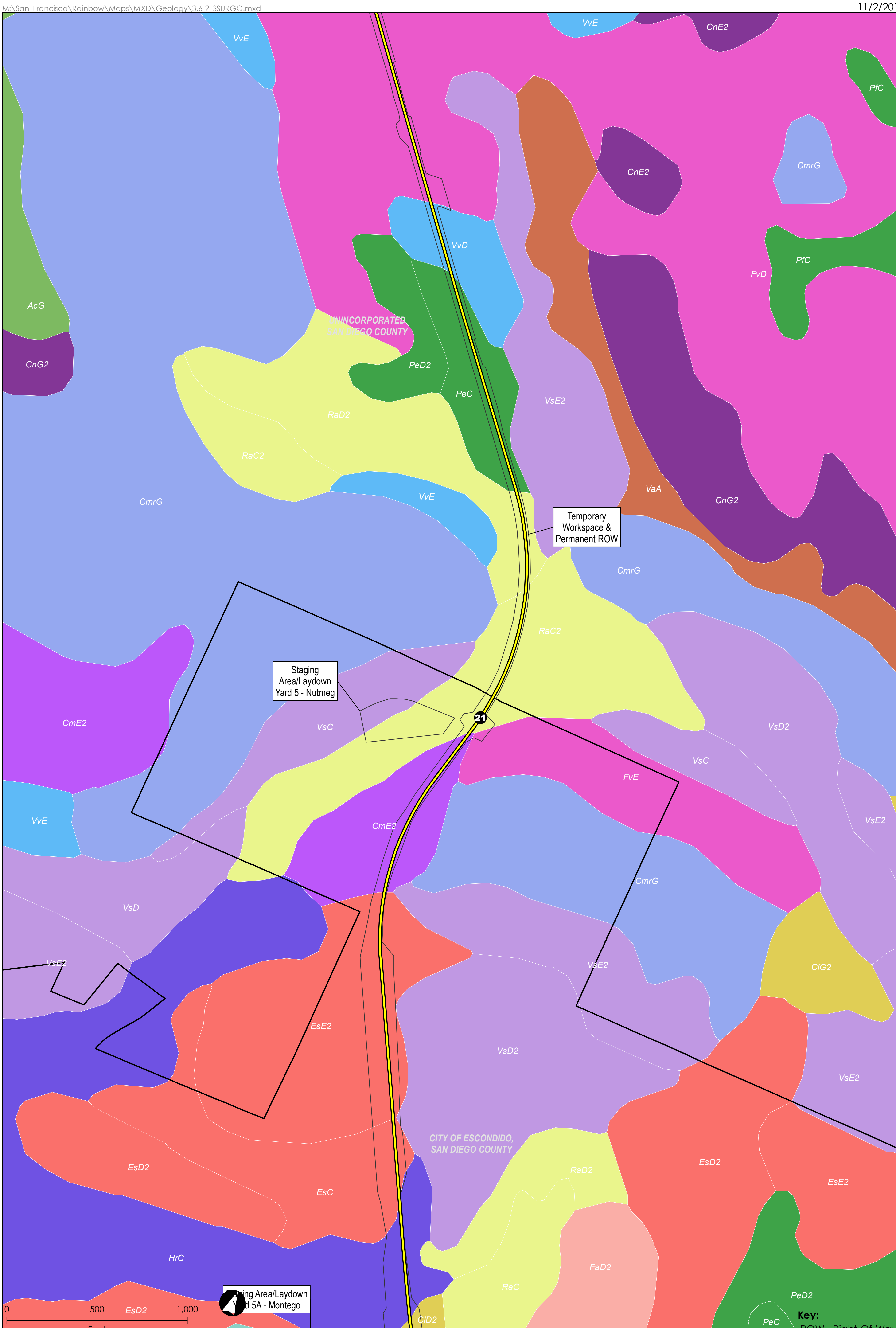
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Workspaces
Municipal Boundary

Soil Series
- AcG: Acid igneous rock land
- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CmE2: Cieneba rocky coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- HrC: Huerhuero loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- SmE: San Miguel rocky silt loam
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

- Milepost
- Line 3602
- Bore Pits
- Workspaces
- Municipal Boundary

Soil Series

- BlC2, BlC, BlD2, BmC: Bonsall sandy loam
- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- GoA: Grangeville fine sandy loam
- HrC: Huerhuero loam
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- SmE: San Miguel rocky silt loam
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

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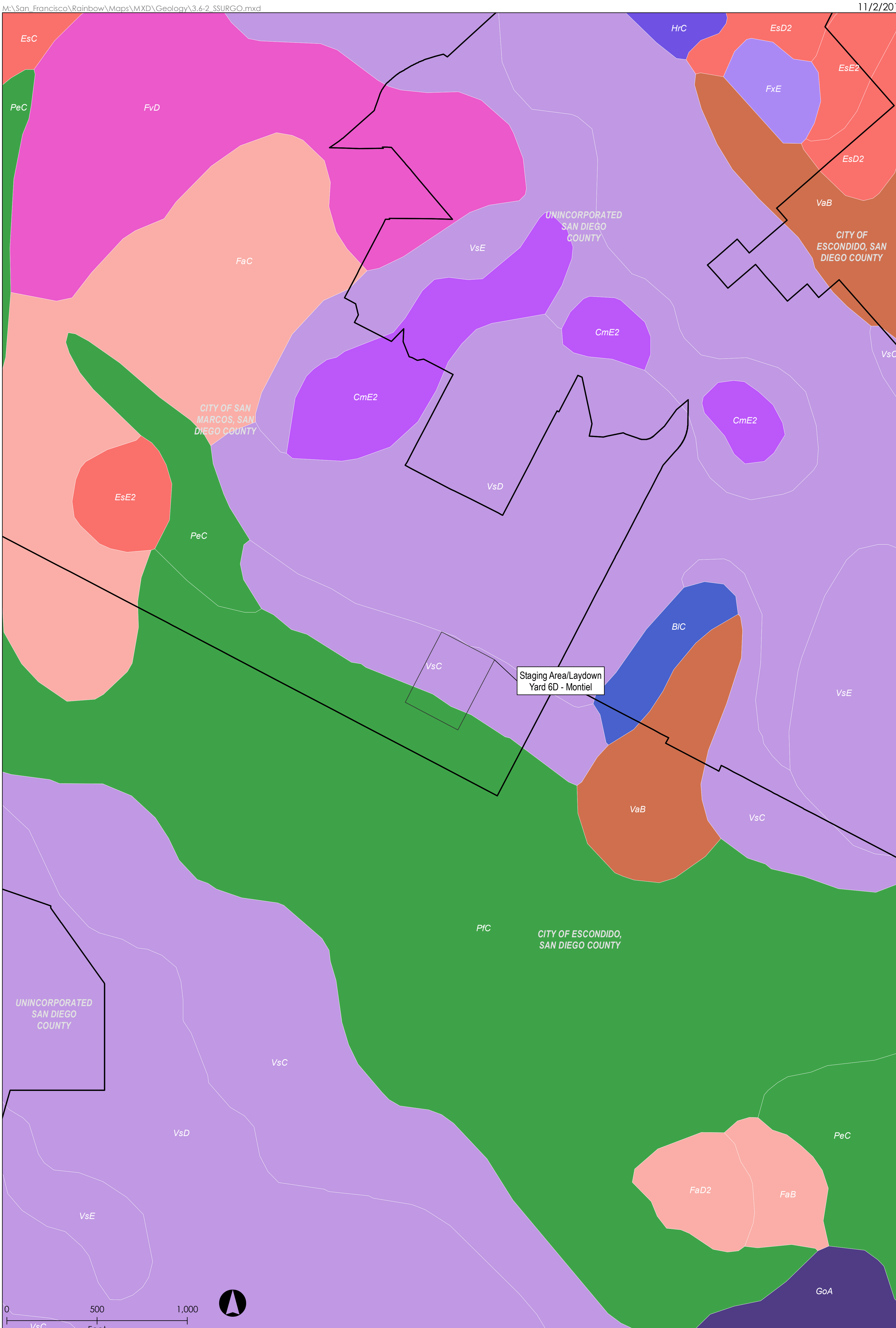

Workspaces

Municipal Boundary

Soil Series

- BIC2, BIC, BID2, BmC: Bonsall sandy loam
- CmE2: Cieneba rocky coarse sandy loam
- EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- FxE, FxG: Friant rocky fine sandy loam
- GoA: Grangeville fine sandy loam
- HrC: Huerhuero loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2

Soils in the Study Area

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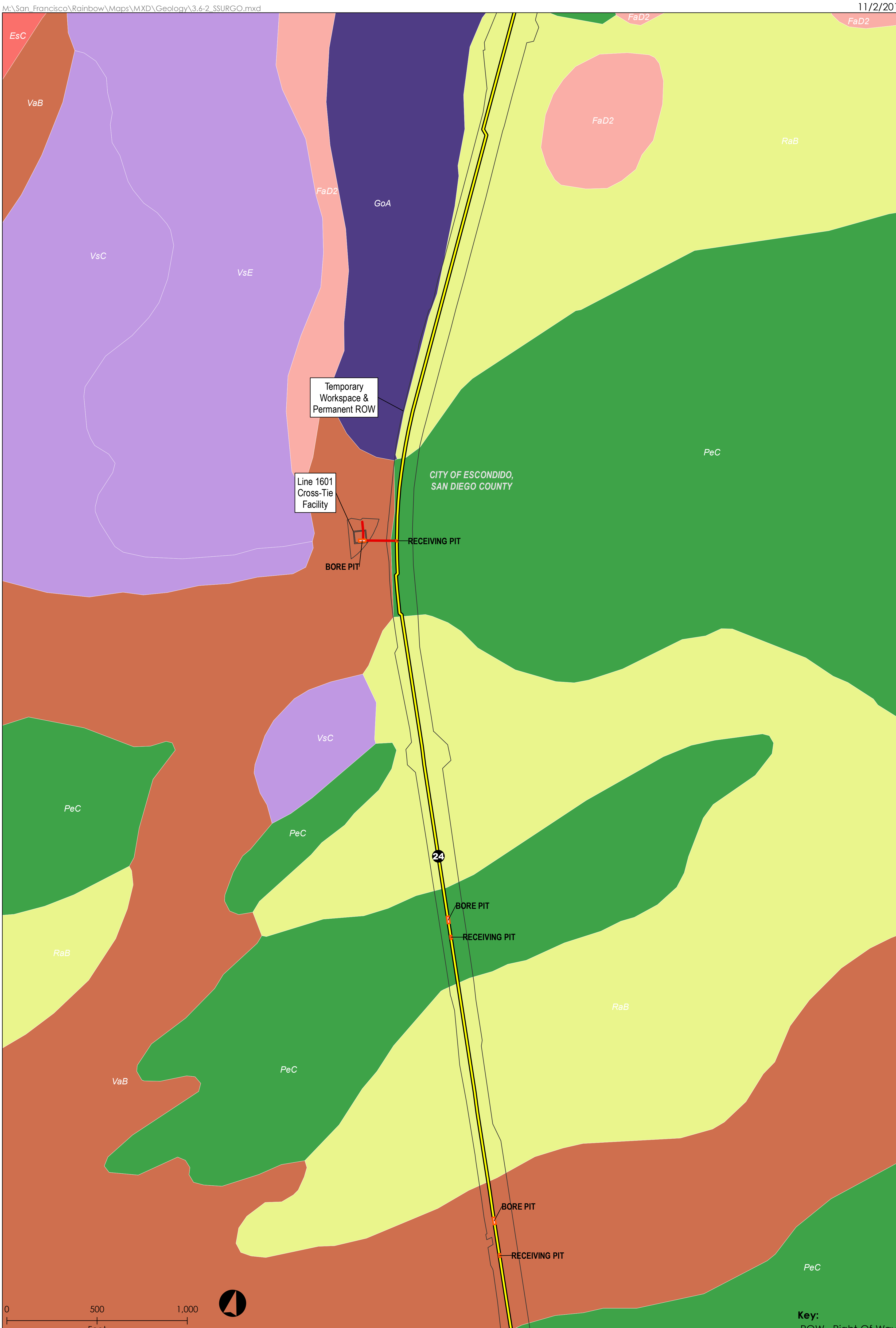
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600

San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Tie-Ins & Extensions
Bore Pits
Workspaces
Municipal Boundary

Soil Series
- EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- GoA: Grangeville fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Figure 3.6-2
Soils in the Study Area
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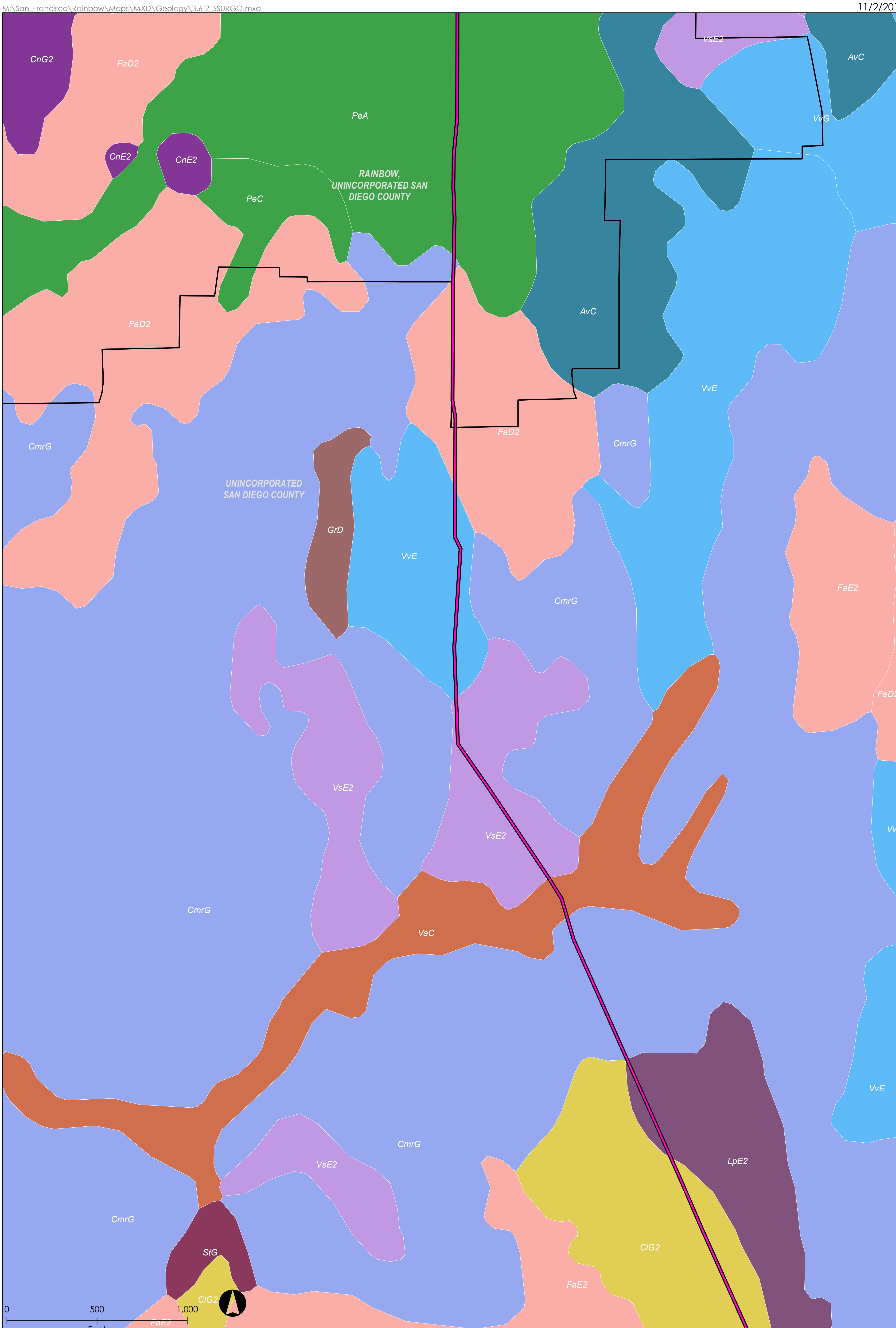
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Municipal Boundary

Soil Series

- AcG: Acid igneous rock land
- AvC: Arlington coarse sandy loam
- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- GrB, GrC, GrD: Greenfield sandy loam
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- StG: Steep gullied land
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Existing Line 1600
Municipal Boundary

Soil Series

AcG: Acid igneous rock land
ClD2, ClE2, ClG2: Cieneba coarse sandy loam
CmrG: Cieneba very rocky coarse sandy loam
CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FeC. FeE2, FeE: Fallbrook rocky sandy loam
GrB, GrC, GrD: Greenfield sandy loam
LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
LrE, LrG, LrE2: Las Posas stony fine sandy loam
StG: Steep gullied land
WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Existing Line 1600
Municipal Boundary

Soil Series

- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- Rm: Riverwash
- StG: Steep gullied land
- TeF: Terrace escarpments
- VaA, VaB, VaC: Visalia sandy loam
- VbB, VbC: Visalia gravelly sandy loam
- WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Existing Line 1600
Municipal Boundary

Soil Series

- AcG: Acid igneous rock land
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FeC. FeE2, FeE: Fallbrook rocky sandy loam
- GoA: Grangeville fine sandy loam
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- Rm: Riverwash
- TuB: Tujunga sand
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

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Existing Line 1600

Municipal Boundary

Soil Series

- AcG: Acid igneous rock land
- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FeC. FeE2, FeE: Fallbrook rocky sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- GrB, GrC, GrD: Greenfield sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- SvE: Stony land
- TeF: Terrace escarpments
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

- Existing Line 1600
- Municipal Boundary

Soil Series

- AvC: Arlington coarse sandy loam
- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- StG: Steep gullied land
- SvE: Stony land
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
Page 26 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Existing Line 1600
Municipal Boundary

Soil Series

- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- StG: Steep gullied land
- VaA, VaB, VaC: Visalia sandy loam

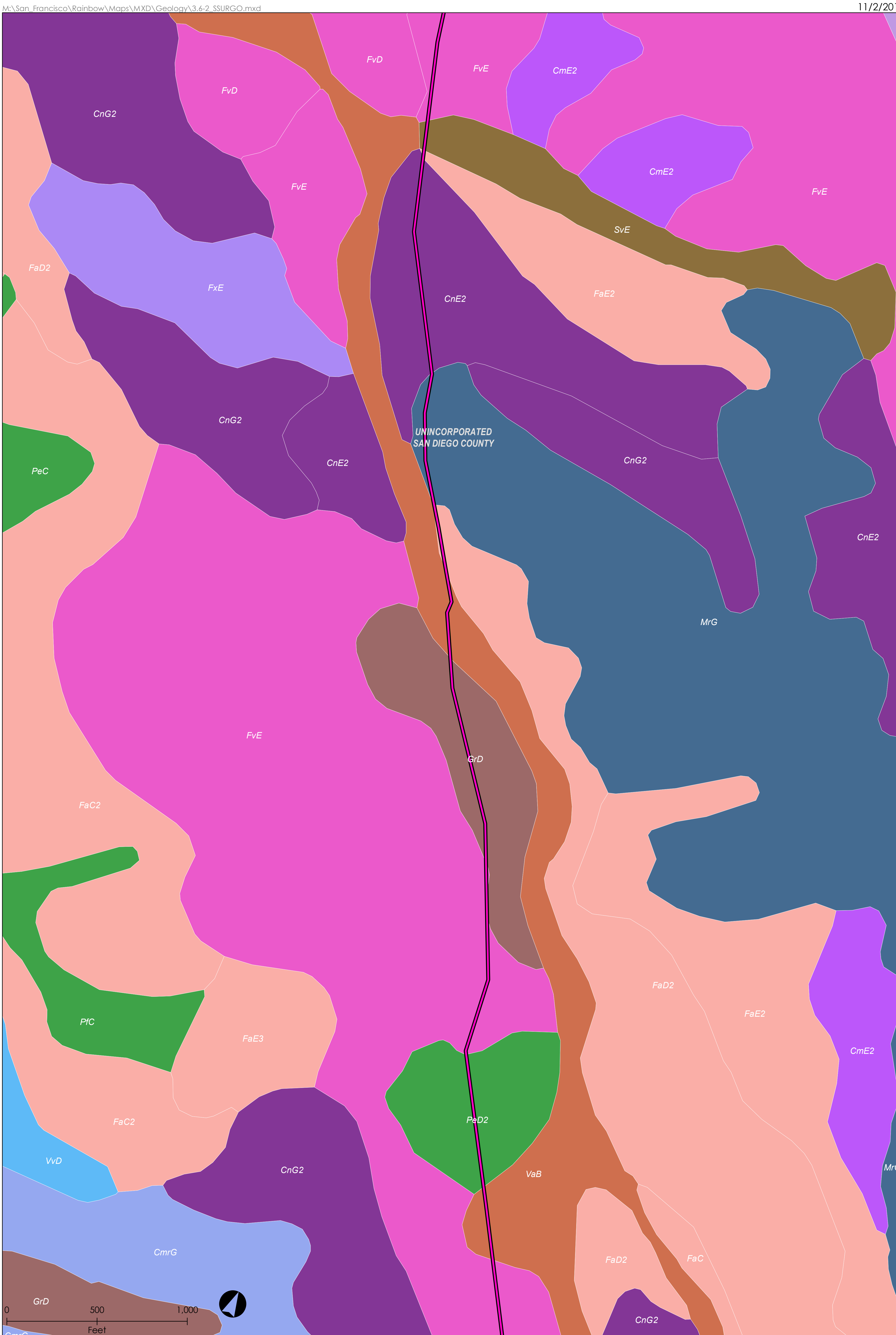
Figure 3.6-2
Soils in the Study Area
Page 27 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Existing Line 1600
Municipal Boundary
Soil Series
ClD2, ClE2, ClG2: Cineba coarse sandy loam
CmE2: Cieneba rocky coarse sandy loam
CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FvD, FvE: Fallbrook-Vista sandy loams
GrB, GrC, GrD: Greenfield sandy loam
RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
StG: Steep gullied land
TuB: Tujunga sand
VaA, VaB, VaC: Visalia sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2
Soils in the Study Area
Page 28 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Municipal Boundary

Soil Series

- CmE2: Cieneba rocky coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- FxE, FxG: Friant rocky fine sandy loam
- GrB, GrC, GrD: Greenfield sandy loam
- MrG: Metamorphic rock land
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- SvE: Stony land
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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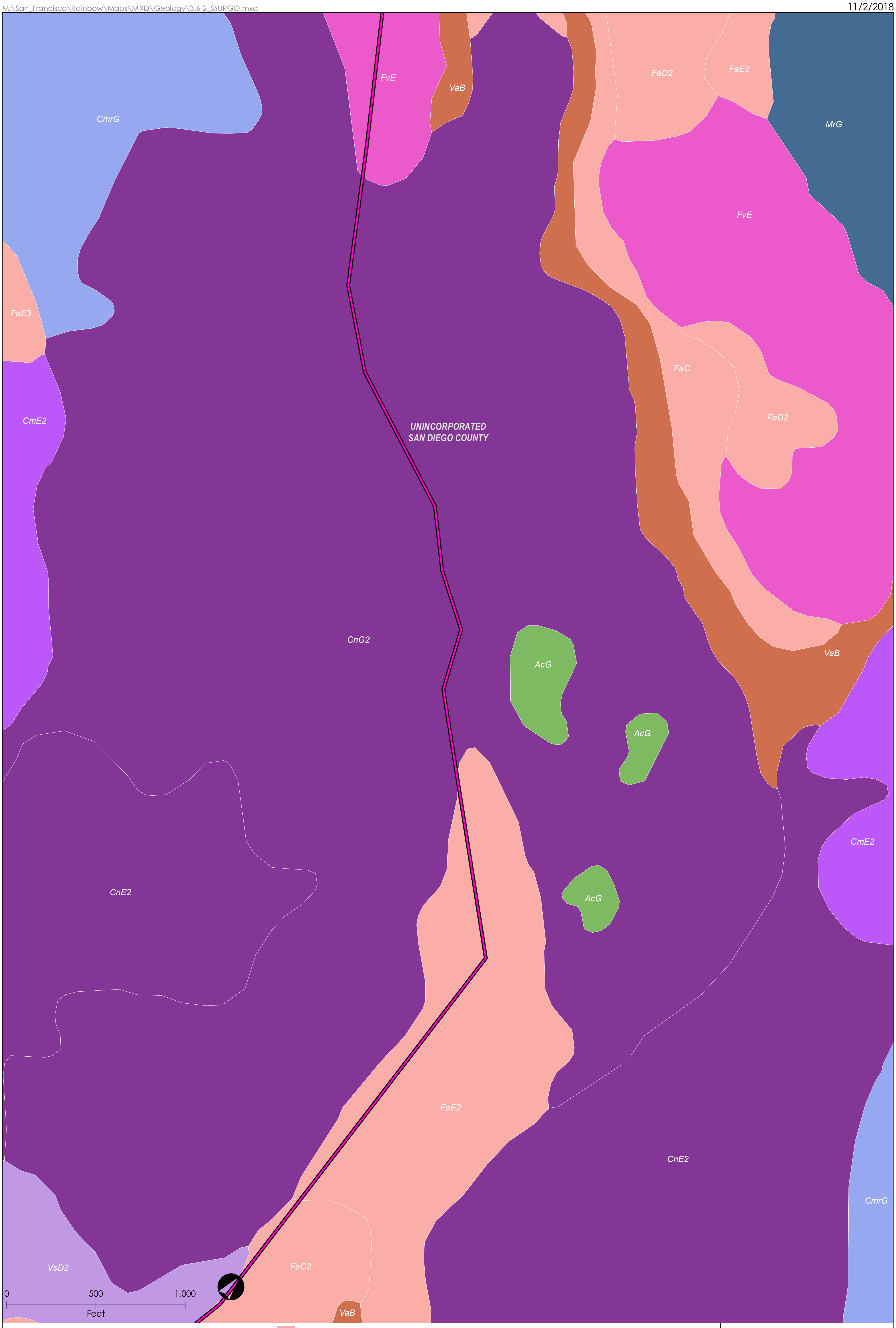
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Municipal Boundary

Soil Series

AcG: Acid igneous rock land
CmE2: Cieneba rocky coarse sandy loam
CmrG: Cieneba very rocky coarse sandy loam
CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FvD, FvE: Fallbrook-Vista sandy loams
MrG: Metamorphic rock land
VaA, VaB, VaC: Visalia sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

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Existing Line 1600

Municipal Boundary

Soil Series

- CmE2: Cieneba rocky coarse sandy loam
- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FeC. FeE2, FeE: Fallbrook rocky sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
- LrE, LrG, LrE2: Las Posas stony fine sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2

Soils in the Study Area

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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600

San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

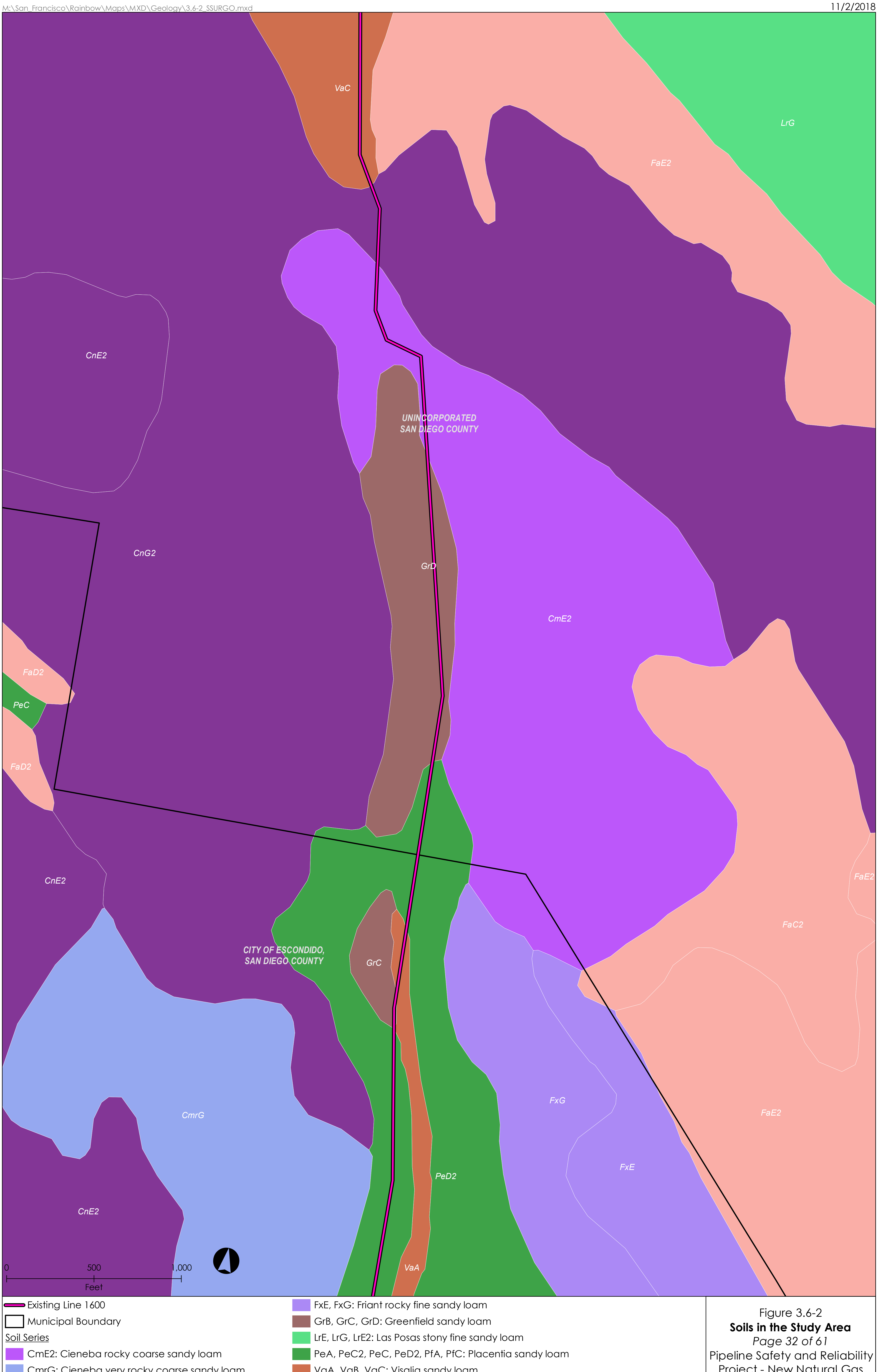

Figure 3.6-2
Soils in the Study Area
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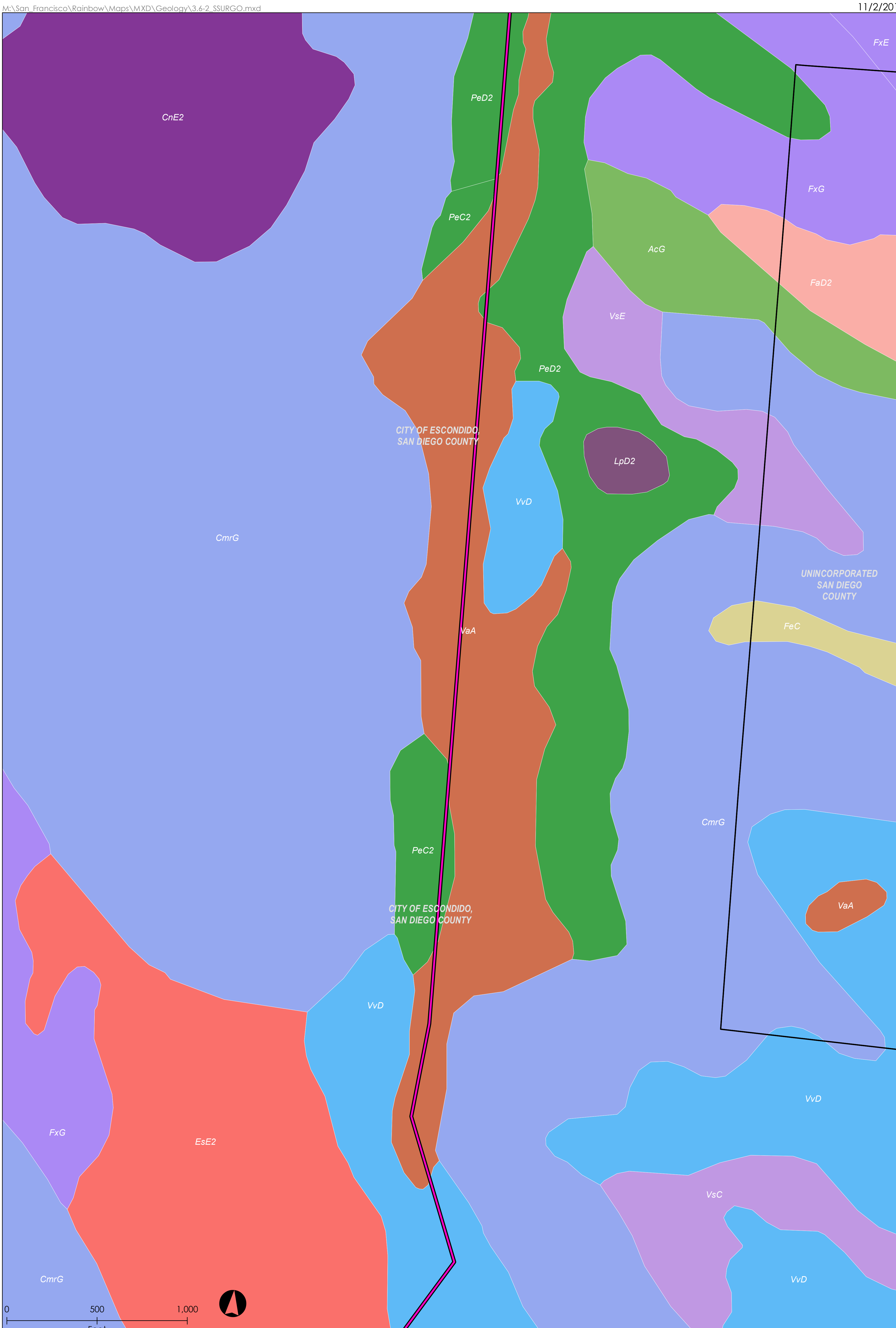
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Municipal Boundary

Soil Series

AcG: Acid igneous rock land
CmrG: Cieneba very rocky coarse sandy loam
CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FeC. FeE2, FeE: Fallbrook rocky sandy loam
FxE, FxG: Friant rocky fine sandy loam
LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
VaA, VaB, VaC: Visalia sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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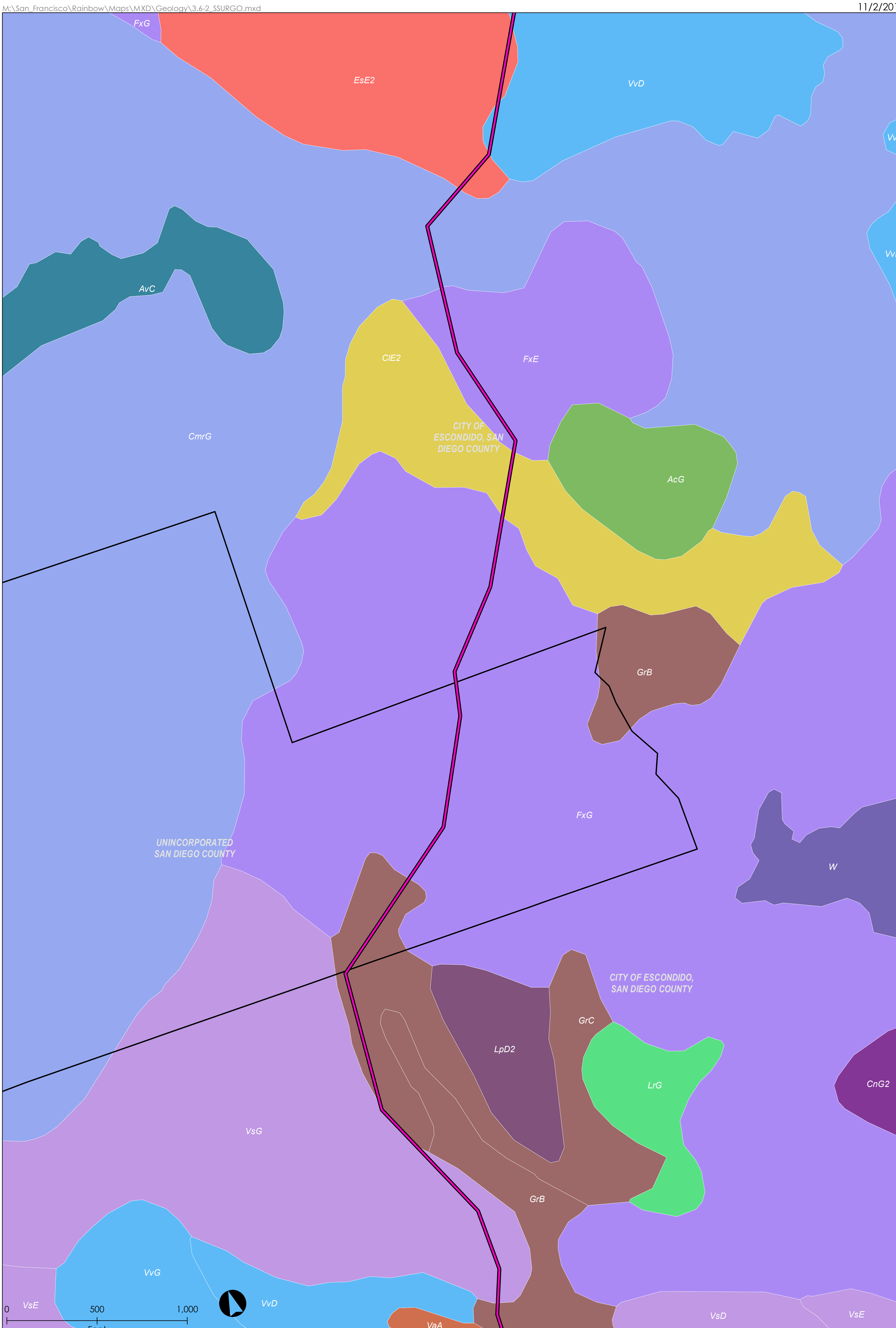
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Municipal Boundary
Soil Series
AcG: Acid igneous rock land
AvC: Arlington coarse sandy loam
ClD2, ClE2, ClG2: Cineba coarse sandy loam
CmrG: Cieneba very rocky coarse sandy loam
CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
FxE, FxG: Friant rocky fine sandy loam
GrB, GrC, GrD: Greenfield sandy loam
LpC2, LpC, LpD2, LpE2: Las Posas fine sandy loam
LrE, LrG, LrE2: Las Posas stony fine sandy loam
VaA, VaB, VaC: Visalia sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
VvD, VvE, VvG: Vista rocky coarse sandy loam
W: Water

Figure 3.6-2
Soils in the Study Area
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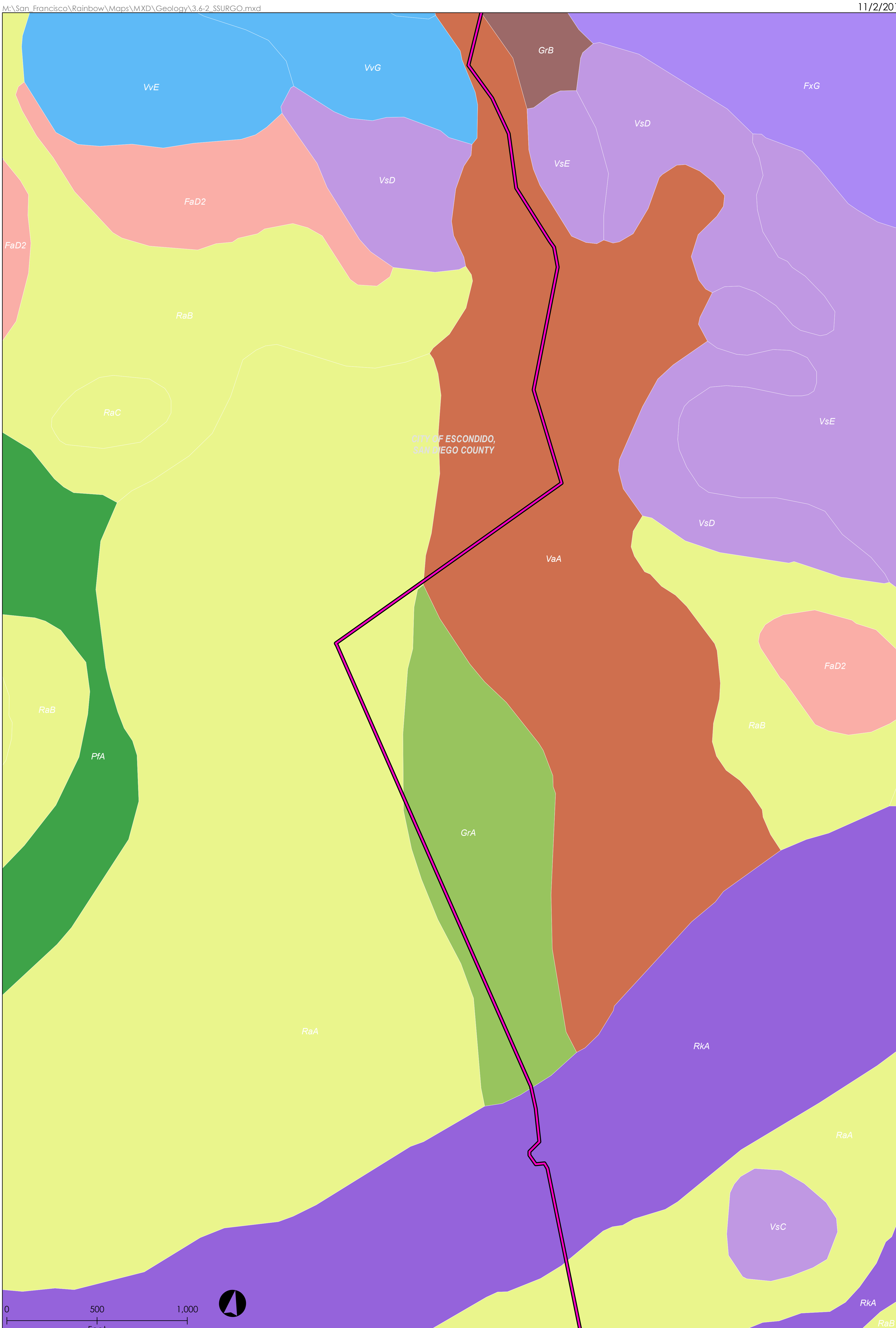
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Municipal Boundary

Soil Series

- CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FxE, FxG: Friant rocky fine sandy loam
- GrA: Greenfield sandy loam
- GrB, GrC, GrD: Greenfield sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- RkA: Reiff fine sandy loam
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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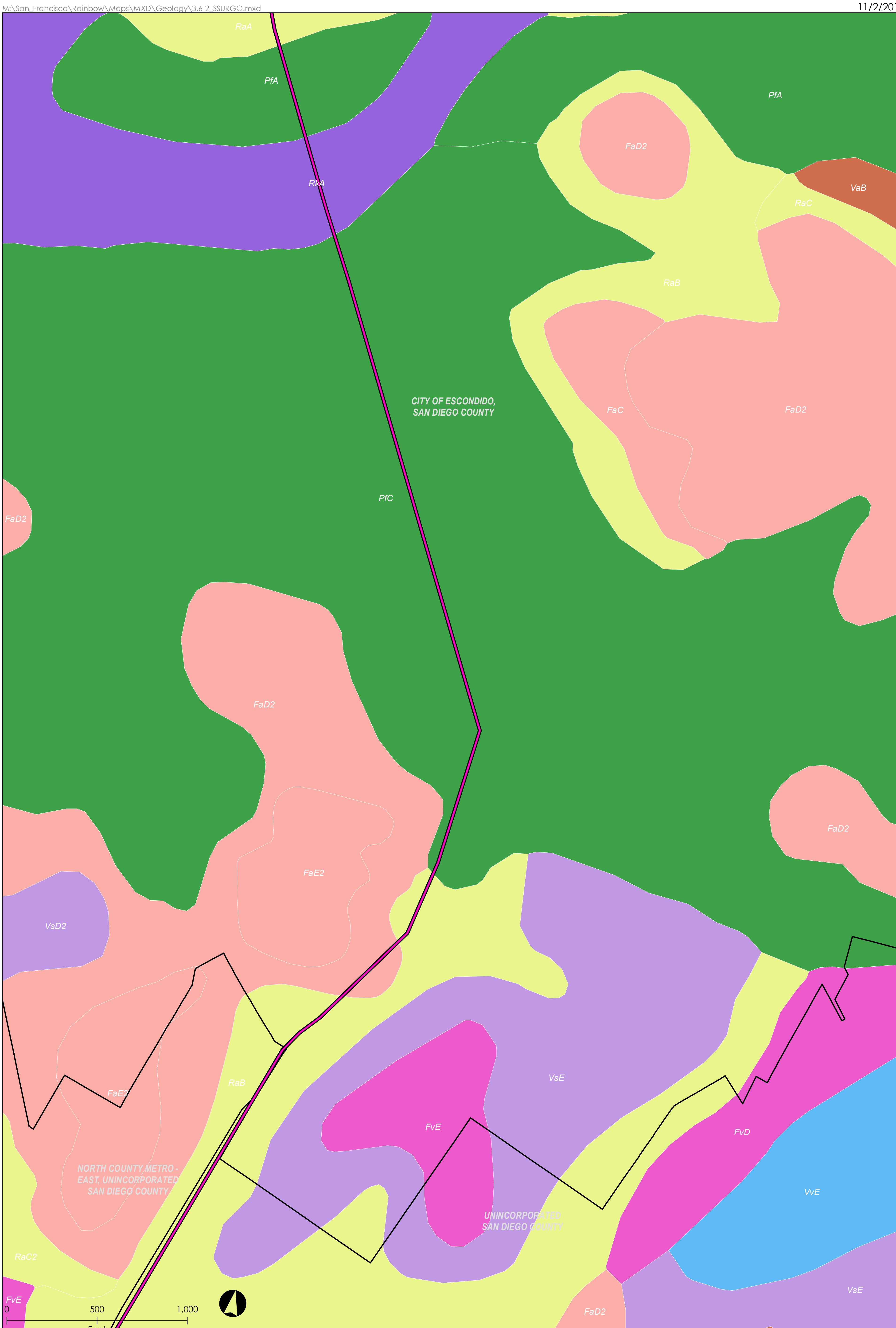
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600

Municipal Boundary

Soil Series

FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam

FvD, FvE: Fallbrook-Vista sandy loams

PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam

RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam

RkA: Reiff fine sandy loam

VaA, VaB, VaC: Visalia sandy loam

VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2

Soils in the Study Area

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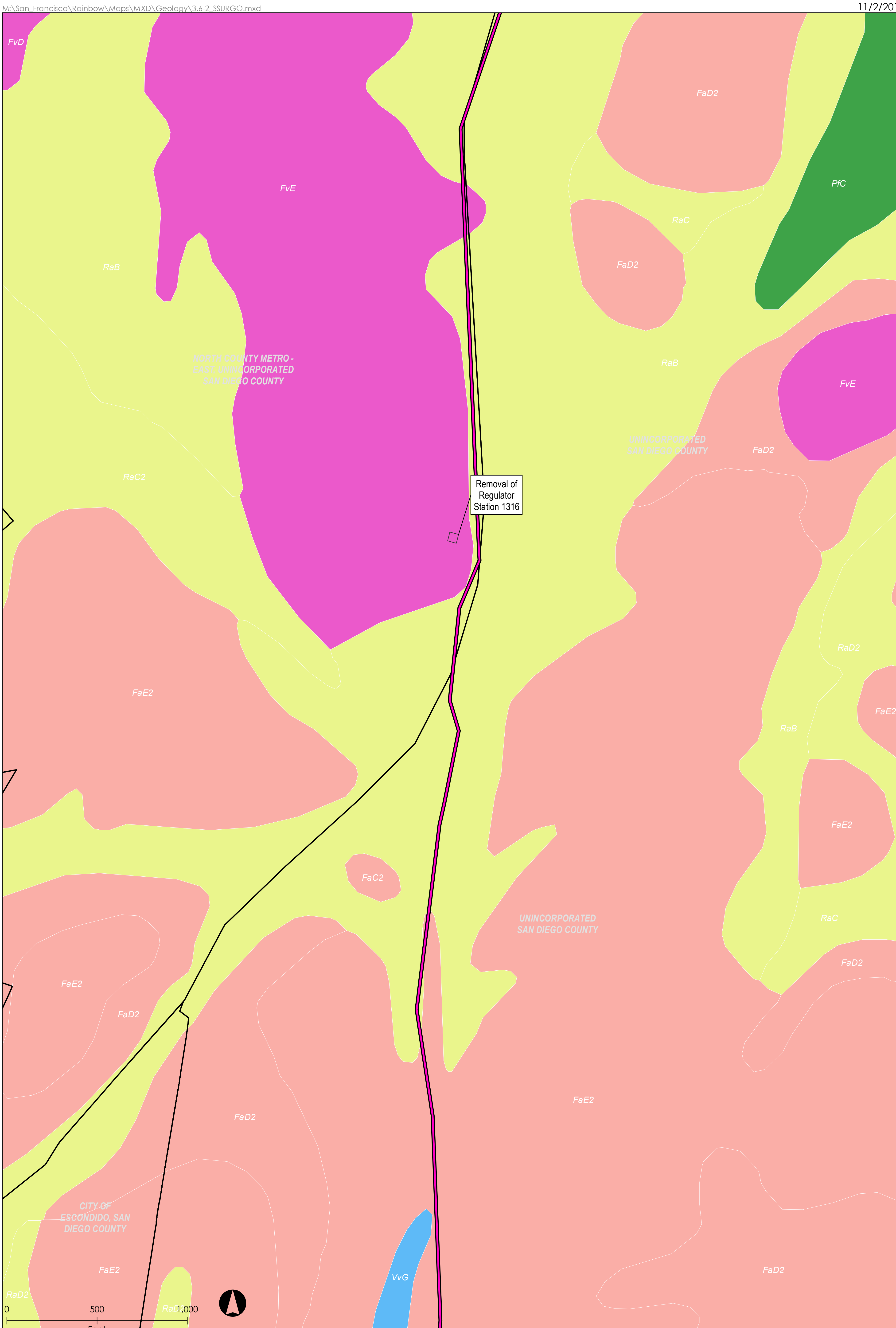
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600

San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Workspaces
Municipal Boundary

Soil Series
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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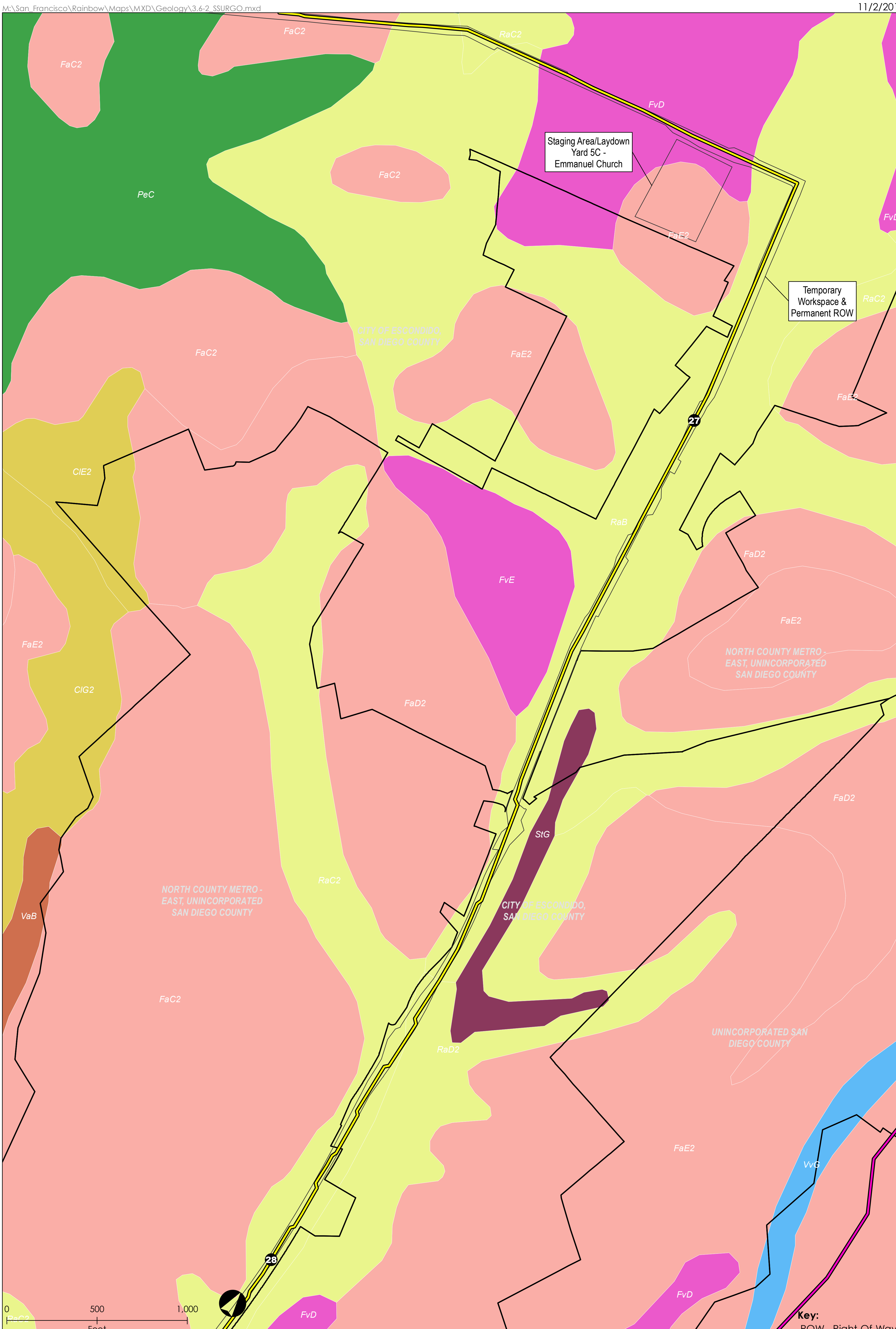
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



- Milepost
- Line 3602
- Existing Line 1600
- Workspaces
- Municipal Boundary

Soil Series

- CID2, CIE2, CIG2: Cineba coarse sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- StG: Steep gullied land
- VaA, VaB, VaC: Visalia sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2

Soils in the Study Area

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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600

San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

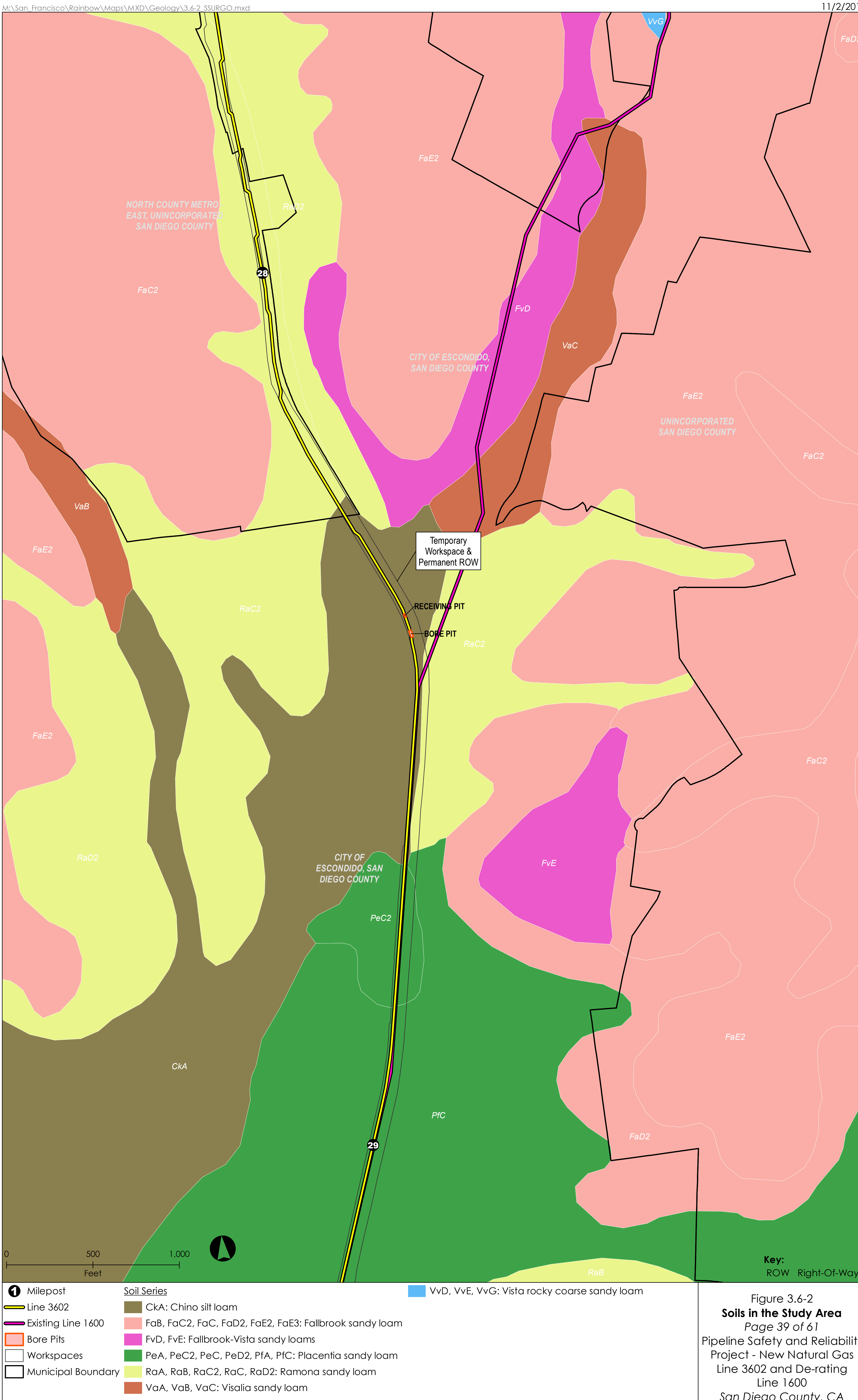

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

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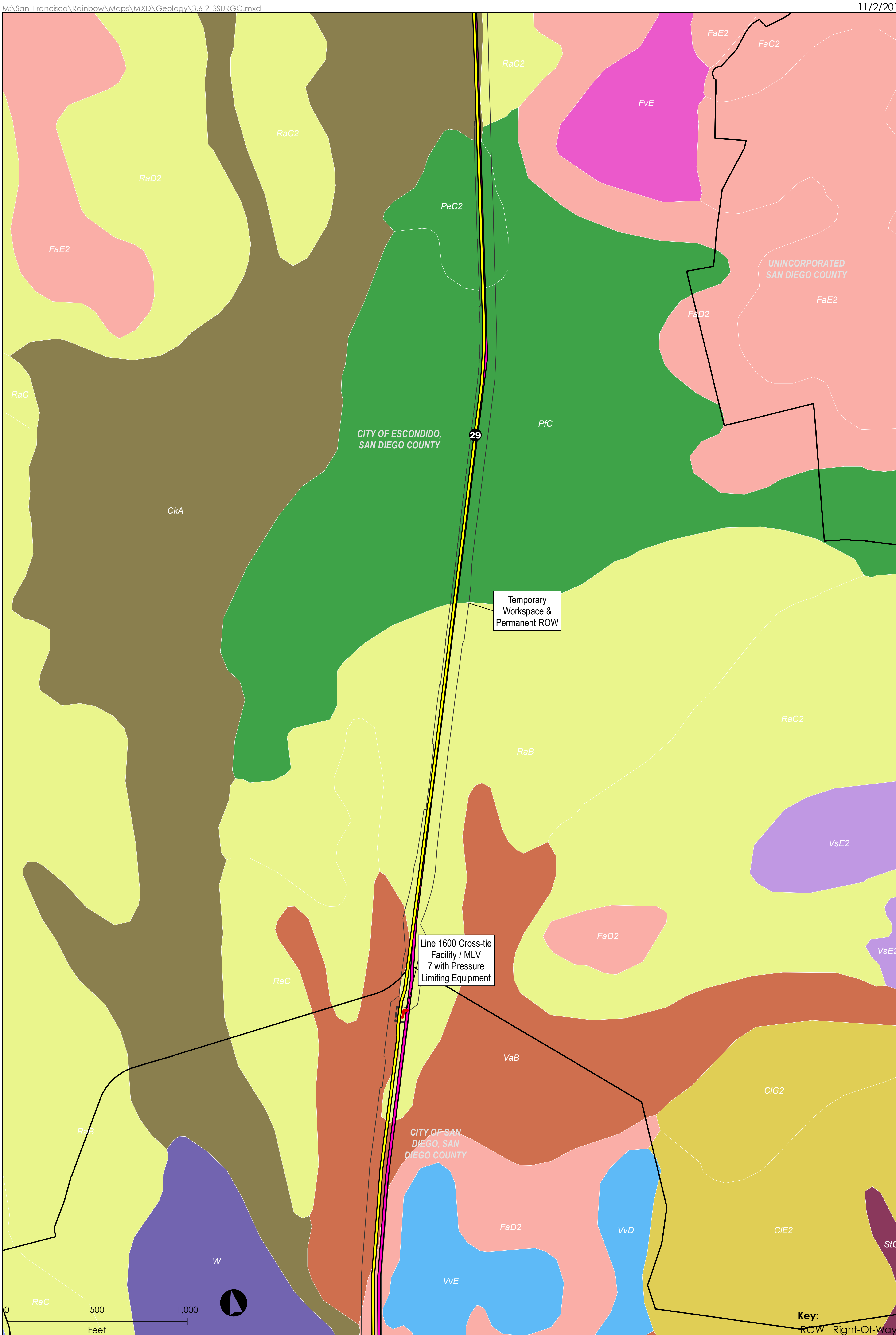

- Milepost
- Line 3602
- Tie-Ins & Extensions
- Existing Line 1600
- Workspaces
- Municipal Boundary

Soil Series

- CkA: Chino silt loam
- ClD2, ClE2, ClG2: Cineba coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FvD, FvE: Fallbrook-Vista sandy loams
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- StG: Steep gullied land
- VaA, VaB, VaC: Visalia sandy loam
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam
- W: Water

Figure 3.6-2
Soils in the Study Area
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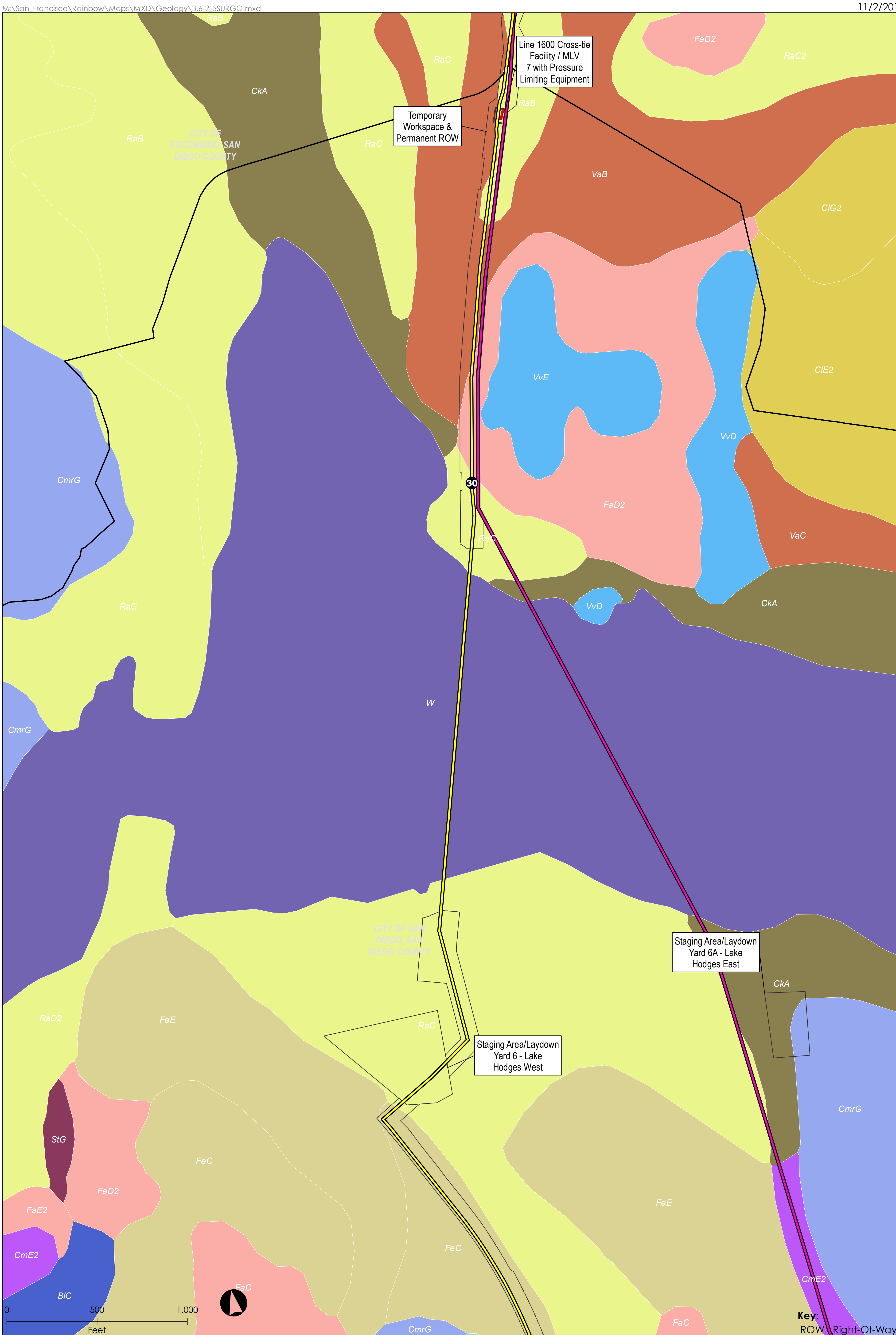
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost	**Soil Series**		FeC. FeE2, FeE: Fallbrook rocky sandy loam
Line 3602		BlC2, BlC, BlD2, BmC: Bonsall sandy loam	RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Tie-Ins & Extensions		CkA: Chino silt loam	SnG: San Miguel-Exchequer rocky silt loams
Existing Line 1600		ClD2, ClE2, ClG2: Cineba coarse sandy loam	StG: Steep gullied land
Workspaces		CmE2: Cieneba rocky coarse sandy loam	VaA, VaB, VaC: Visalia sandy loam
Municipal Boundary		CmrG: Cieneba very rocky coarse sandy loam	VvD, VvE, VvG: Vista rocky coarse sandy loam
		FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam	W: Water

Figure 3.6-2
Soils in the Study Area
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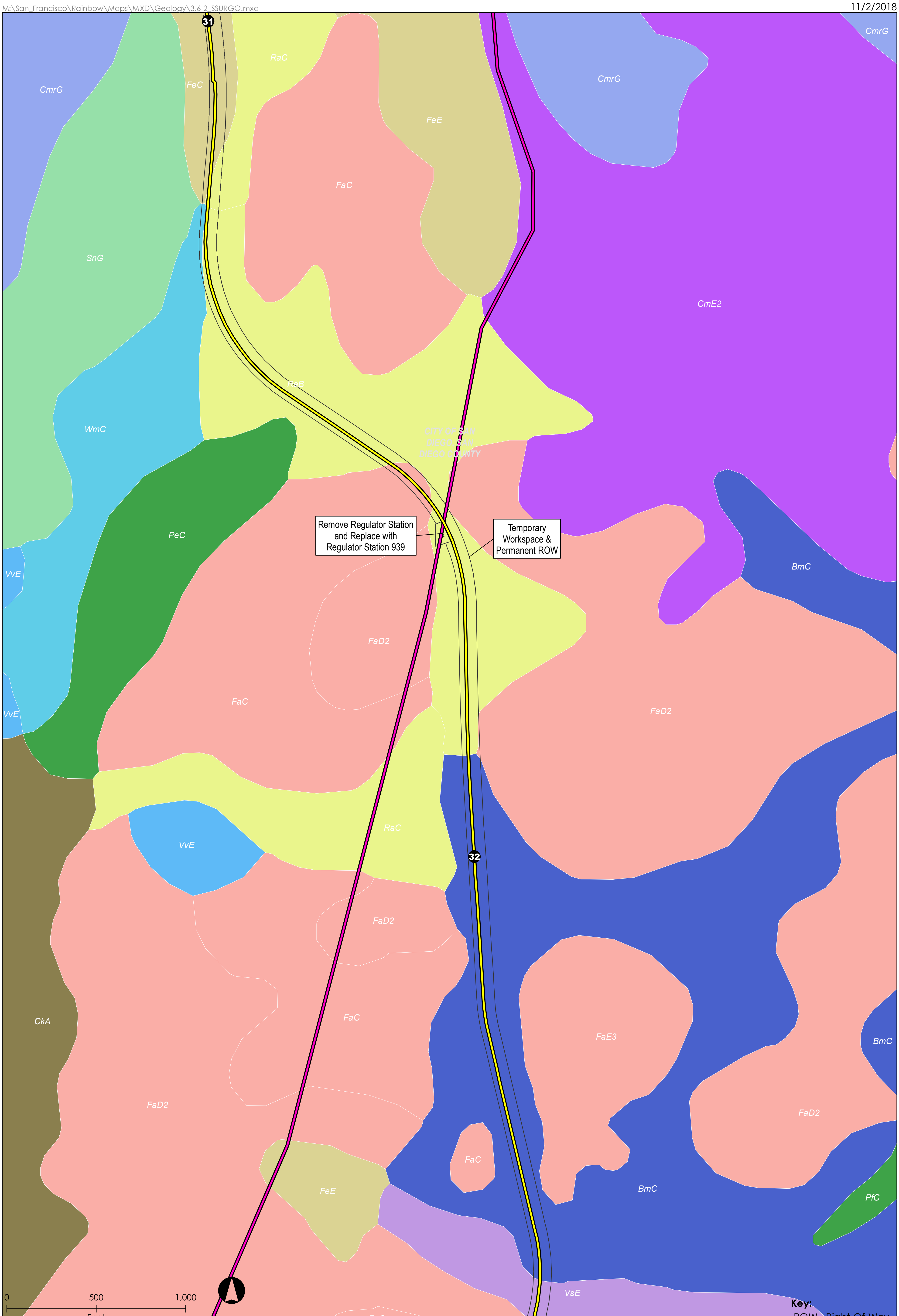
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



- Milepost
- Line 3602
- Existing Line 1600
- Workspaces
- Municipal Boundary

Soil Series

- BIC2, BIC, BID2, BmC: Bonsall sandy loam
- CkA: Chino silt loam
- CmE2: Cieneba rocky coarse sandy loam
- CmrG: Cieneba very rocky coarse sandy loam
- FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
- FeC. FeE2, FeE: Fallbrook rocky sandy loam
- PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- SnG: San Miguel-Exchequer rocky silt loams
- VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
- VvD, VvE, VvG: Vista rocky coarse sandy loam
- WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Milepost	BsC, BsD: Bonsanko clay	FvD, FvE: Fallbrook-Vista sandy loams
Line 3602	CkA: Chino silt loam	GoA: Grangeville fine sandy loam
Distribution System Modification	CmE2: Cieneba rocky coarse sandy loam	OhC, OhE: Olivenhain cobbly loam
Existing Line 1600	DaC, DaD, DaE2, DaE, DaF: Diablo Clay	PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
Workspaces	DcD, DcF: Diablo-Urban land complex	RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Municipal Boundary	DoE: Diablo-Olivenhain complex	VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
Soil Series	FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam	VvD, VvE, VvG: Vista rocky coarse sandy loam
BlC2, BlC, BlD2, BmC: Bonsall sandy loam	FeC. FeE2, FeE: Fallbrook rocky sandy loam	

Figure 3.6-2
Soils in the Study Area
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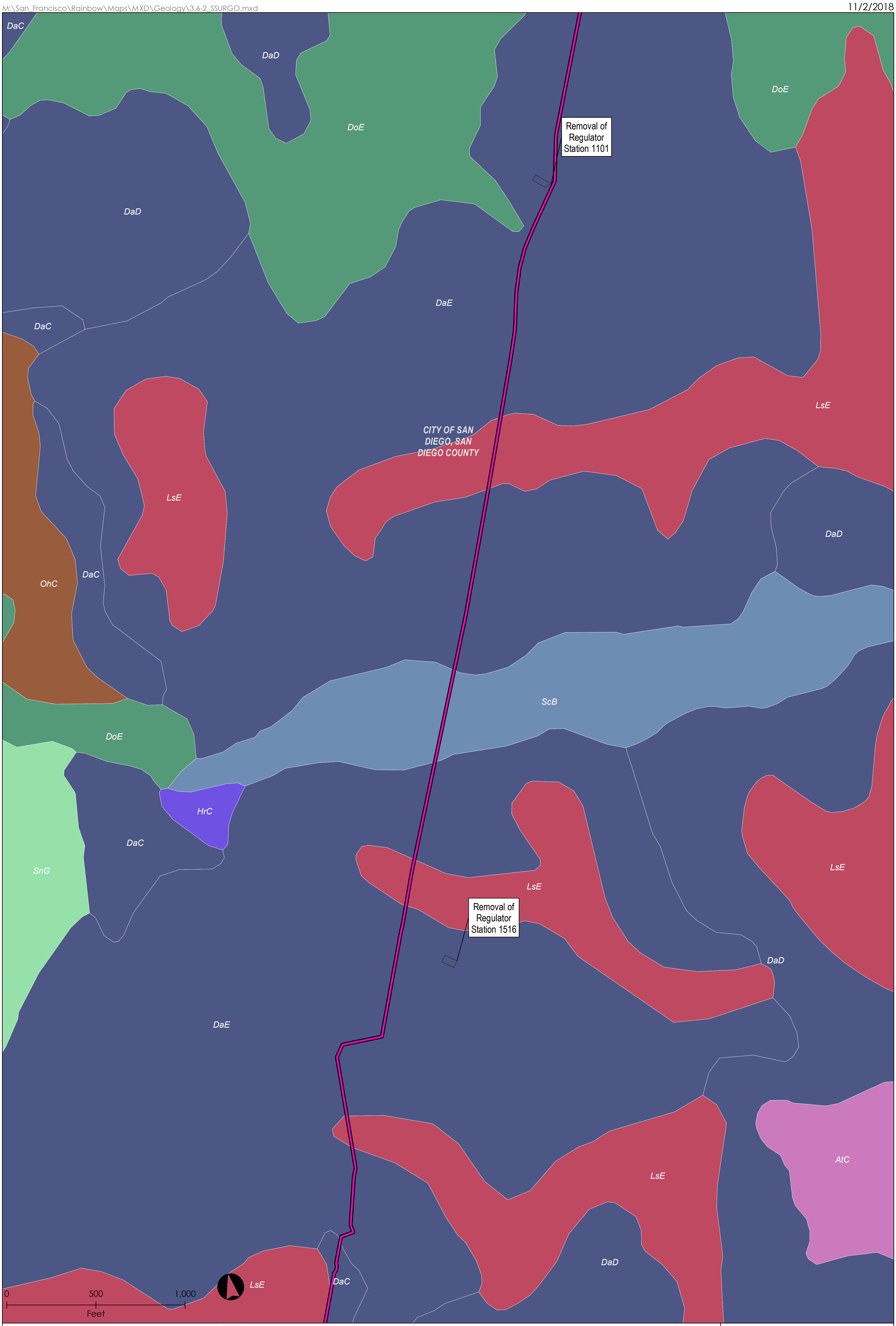
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Workspaces
Municipal Boundary

Soil Series

- AtC, AtE: Altamont clay
- DaC, DaD, DaE2, DaE, DaF: Diablo Clay
- DoE: Diablo-Olivenhain complex
- HrC: Huerhuero loam
- LsE: Linne clay loam
- OhC, OhE: Olivenhain cobbly loam
- ScB: Salinas clay
- SnG: San Miguel-Exchequer rocky silt loams

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Existing Line 1600
Workspaces
Municipal Boundary

Soil Series

- AtC, AtE: Altamont clay
- CmE2: Cieneba rocky coarse sandy loam
- DaC, DaD, DaE2, DaE, DaF: Diablo Clay
- DoE: Diablo-Olivenhain complex
- EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
- ExE: Exchequer rocky silt loam
- LsE: Linne clay loam
- RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
- SbC: Salinas clay loam
- SnG: San Miguel-Exchequer rocky silt loams
- WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

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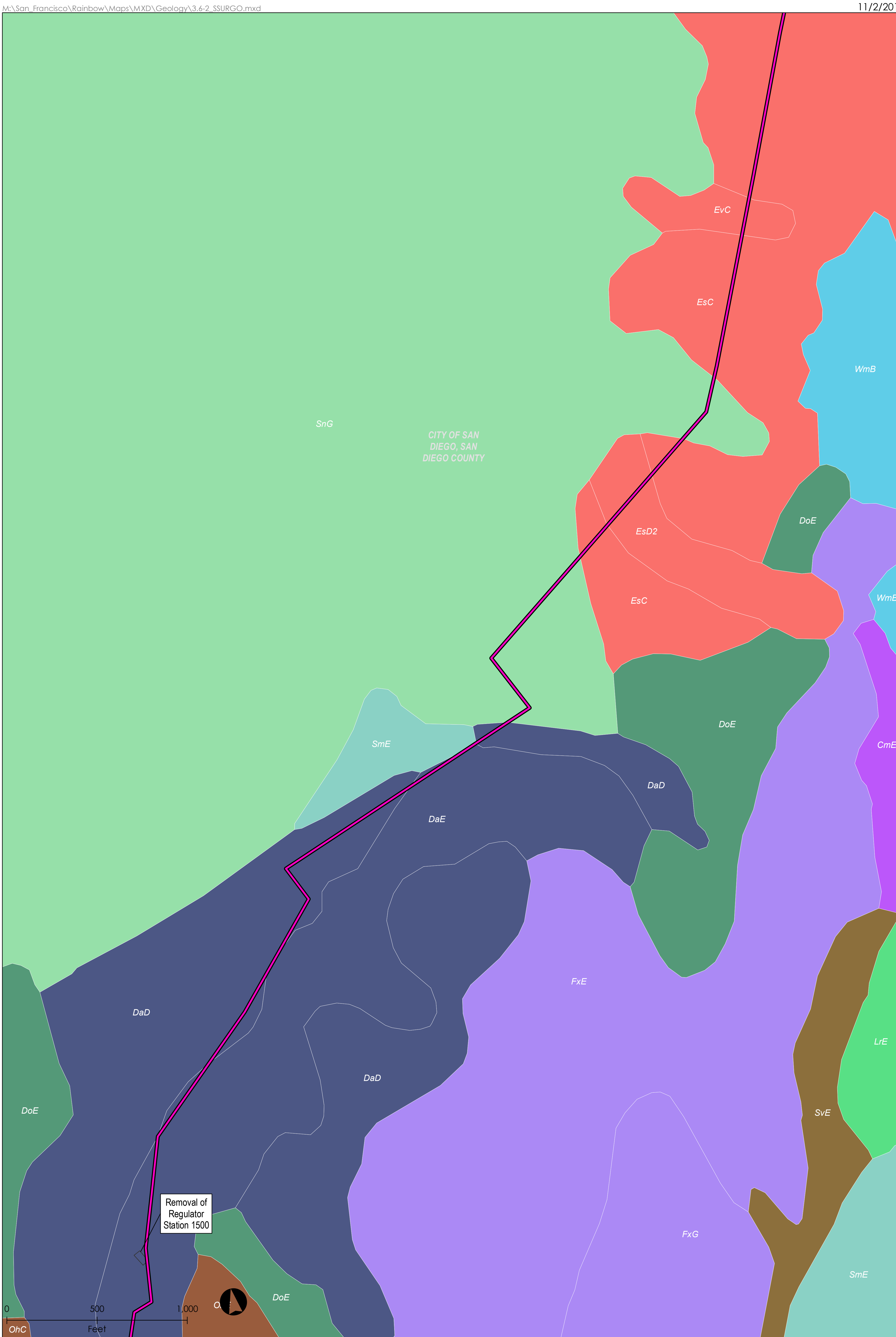

Existing Line 1600
Workspaces
Municipal Boundary

Soil Series

CmE2: Cieneba rocky coarse sandy loam
DaC, DaD, DaE2, DaE, DaF: Diablo Clay
DoE: Diablo-Olivenhain complex
EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam
FxE, FxG: Friant rocky fine sandy loam
LrE, LrG, LrE2: Las Posas stony fine sandy loam
OhC, OhE: Olivenhain cobbly loam
RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
SmE: San Miguel rocky silt loam
SnG: San Miguel-Exchequer rocky silt loams
SvE: Stony land
WmB, WmC, WmD: Wyman loam

Figure 3.6-2
Soils in the Study Area
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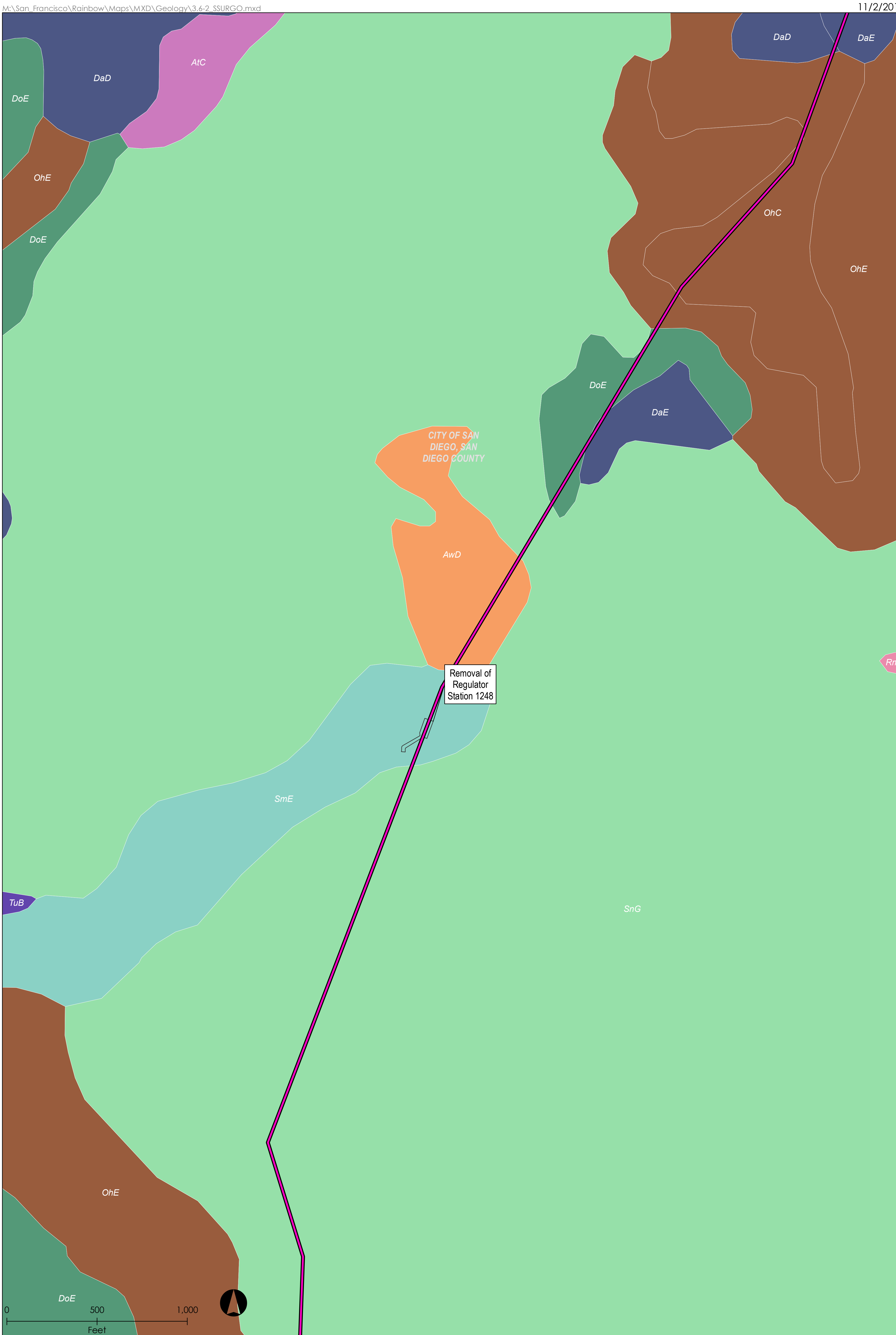
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Existing Line 1600
Workspaces
Municipal Boundary

Soil Series

AtC, AtE: Altamont clay
AwD: Auld clay
DaC, DaD, DaE2, DaE, DaF: Diablo Clay
DoE: Diablo-Olivenhain complex
OhC, OhE: Olivenhain cobbly loam
Rm: Riverwash
SmE: San Miguel rocky silt loam
SnG: San Miguel-Exchequer rocky silt loams
TuB: Tujunga sand

Figure 3.6-2
Soils in the Study Area
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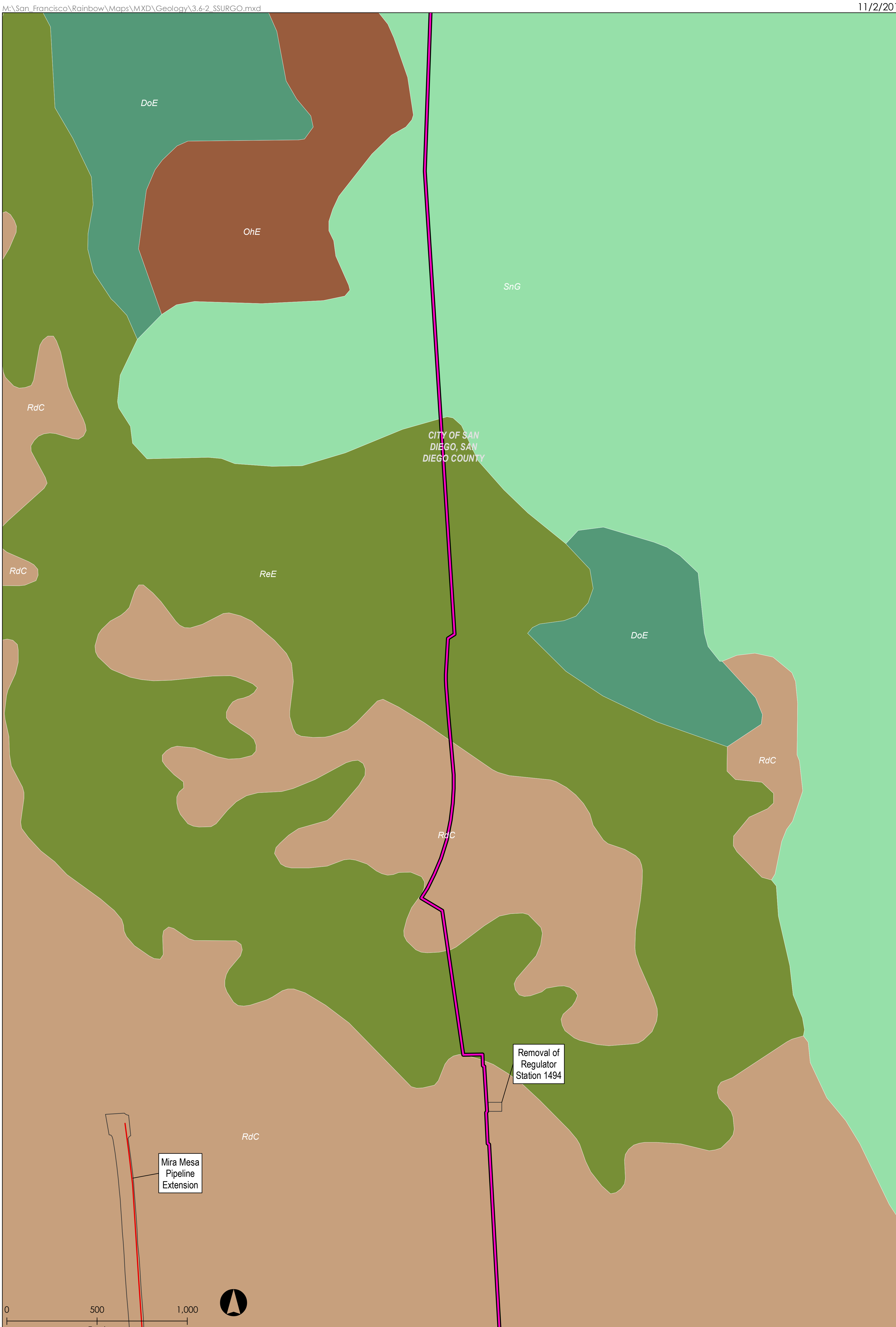
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Distribution System Modification
Existing Line 1600
Workspaces
Municipal Boundary
Soil Series
DoE: Diablo-Olivenhain complex
OhC, OhE: Olivenhain cobbly loam
RdC: Redding gravelly loam
ReE, RfF: Redding cobbly loam
SnG: San Miguel-Exchequer rocky silt loams

Figure 3.6-2
Soils in the Study Area
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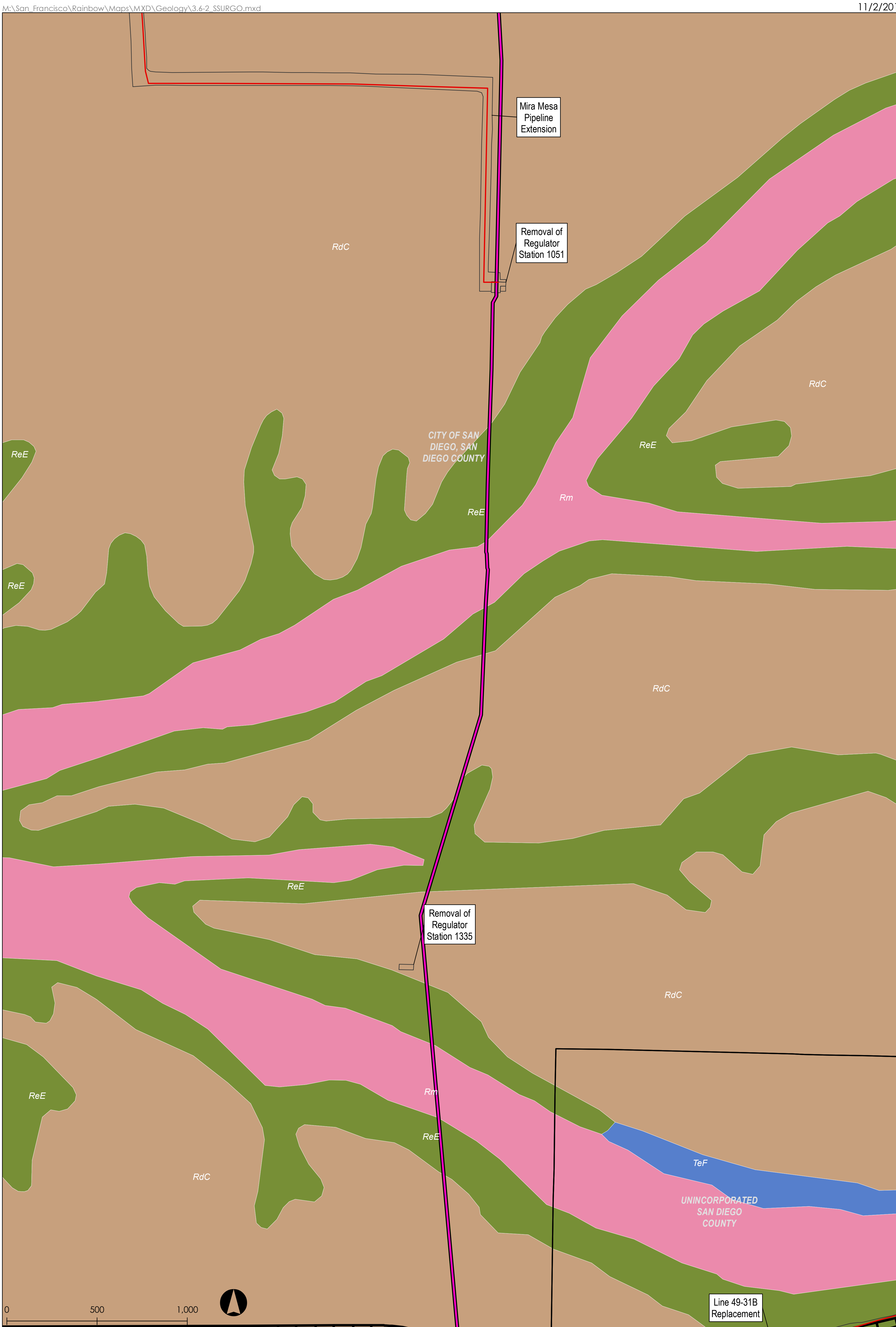
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



- Distribution System Modification
- Existing Line 1600
- Workspaces
- MCAS Miramar
- Municipal Boundary

Soil Series

- RdC: Redding gravelly loam
- ReE, RfF: Redding cobbly loam
- Rm: Riverwash
- TeF: Terrace escarpments

Figure 3.6-2
Soils in the Study Area
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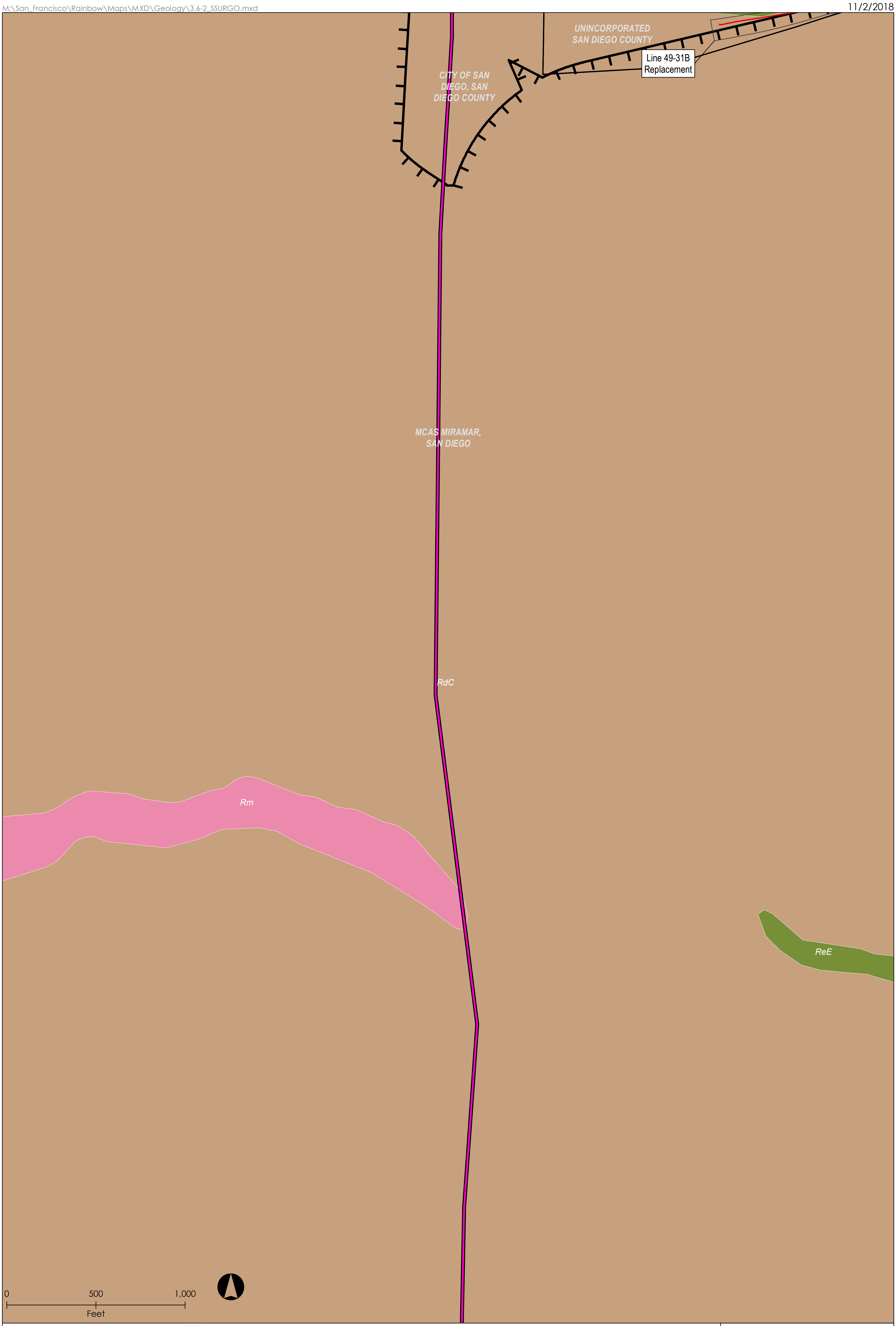
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



- Distribution System Modification
- Existing Line 1600
- Workspaces
- MCAS Miramar
- Municipal Boundary

Soil Series

- RdC: Redding gravelly loam
- ReE, RfF: Redding cobbly loam
- Rm: Riverwash

Figure 3.6-2
Soils in the Study Area
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Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

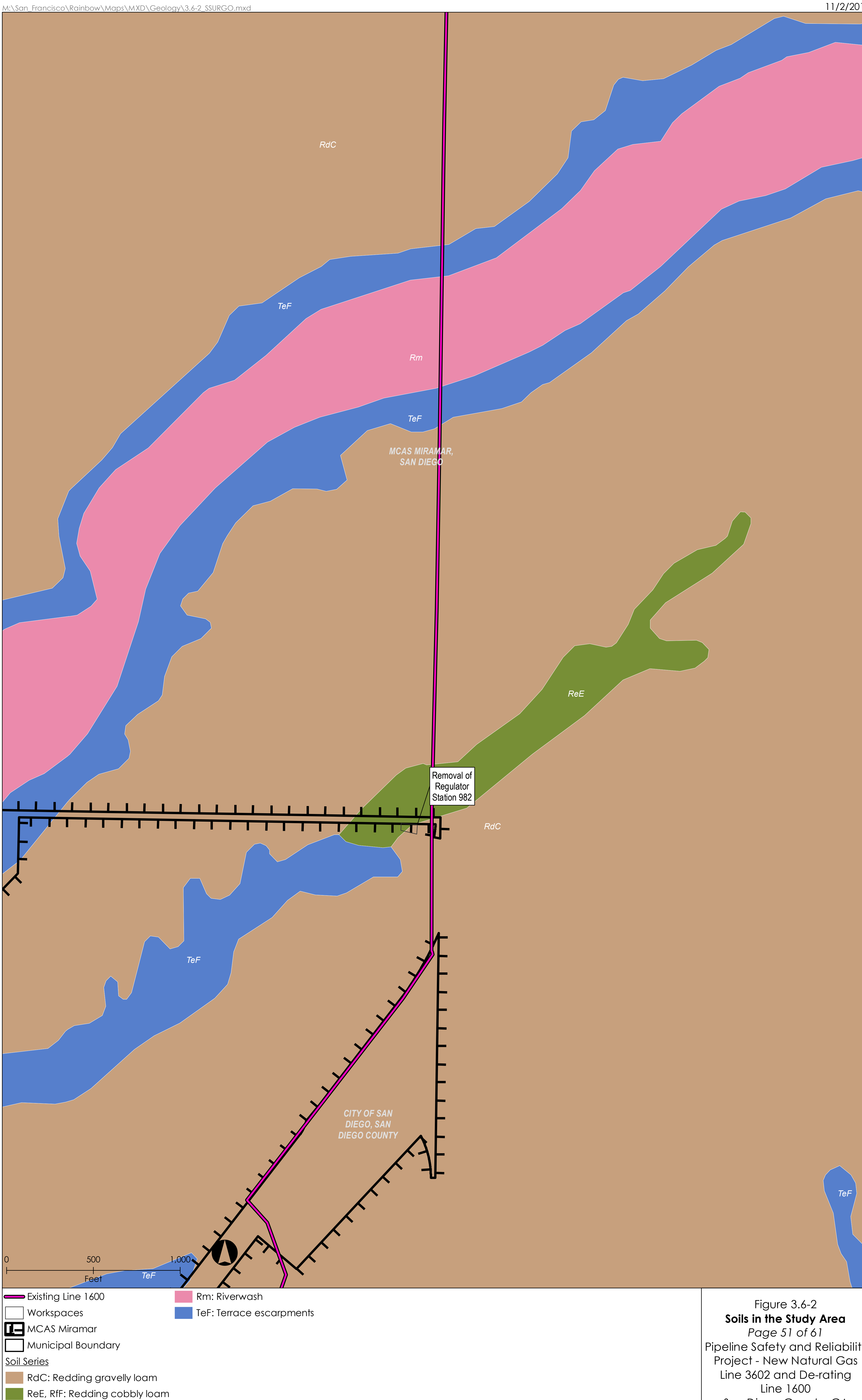

Figure 3.6-2
Soils in the Study Area
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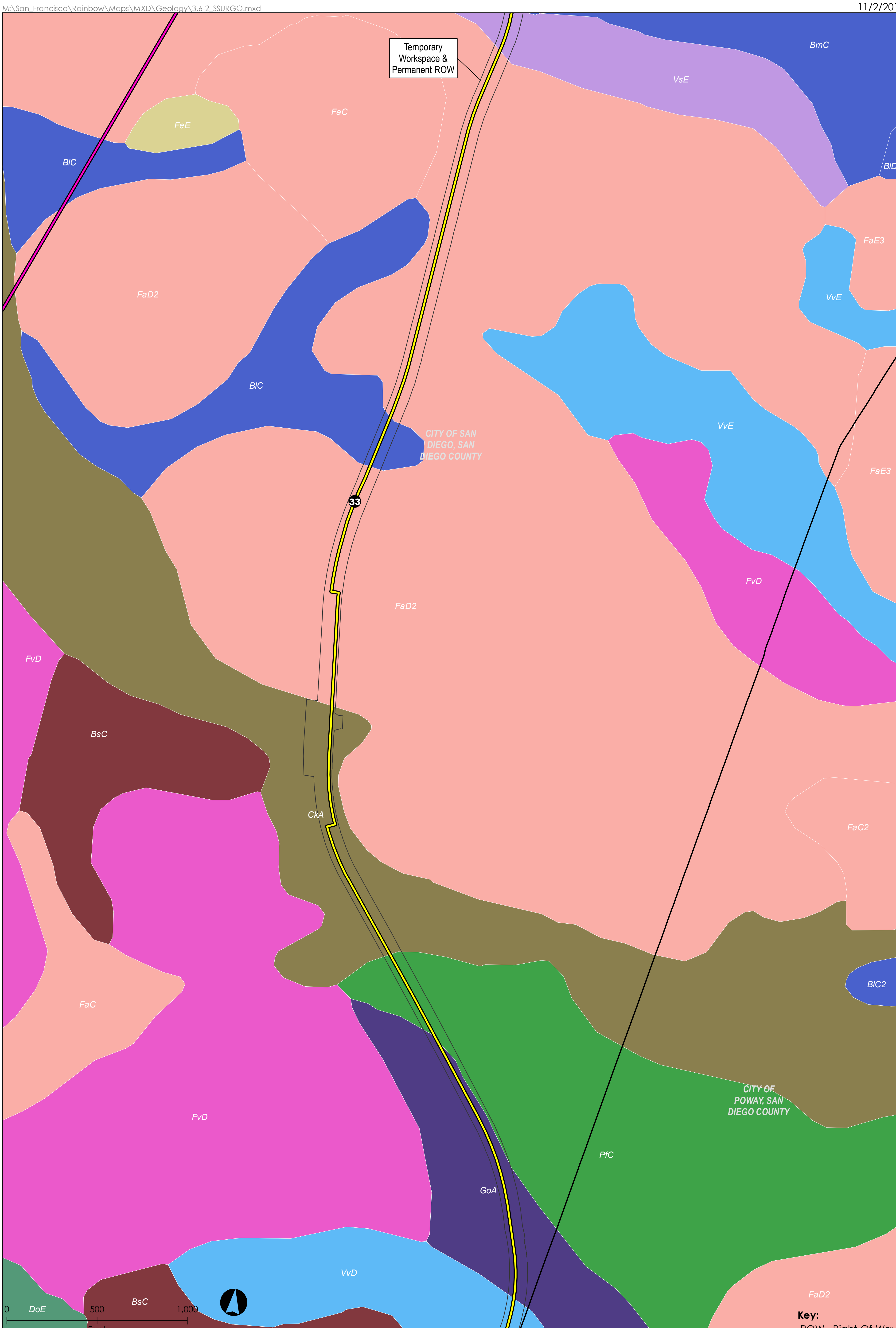
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Existing Line 1600
Workspaces
Municipal Boundary
Soil Series
BlC2, BlC, BlD2, BmC: Bonsall sandy loam
BsC, BsD: Bonsanko clay
CkA: Chino silt loam
DoE: Diablo-Olivenhain complex
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FeC. FeE2, FeE: Fallbrook rocky sandy loam
FvD, FvE: Fallbrook-Vista sandy loams
GoA: Grangeville fine sandy loam
PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
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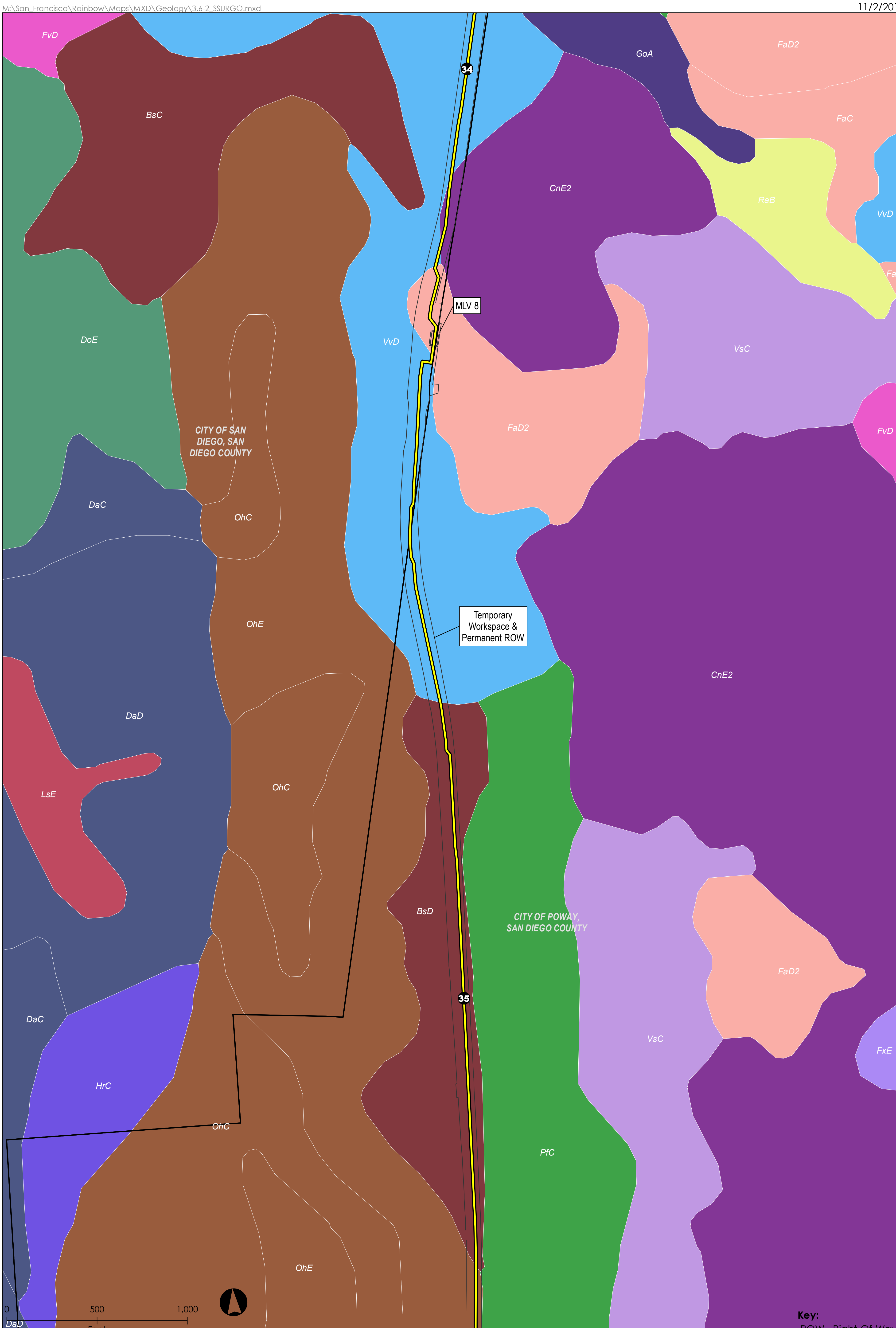
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

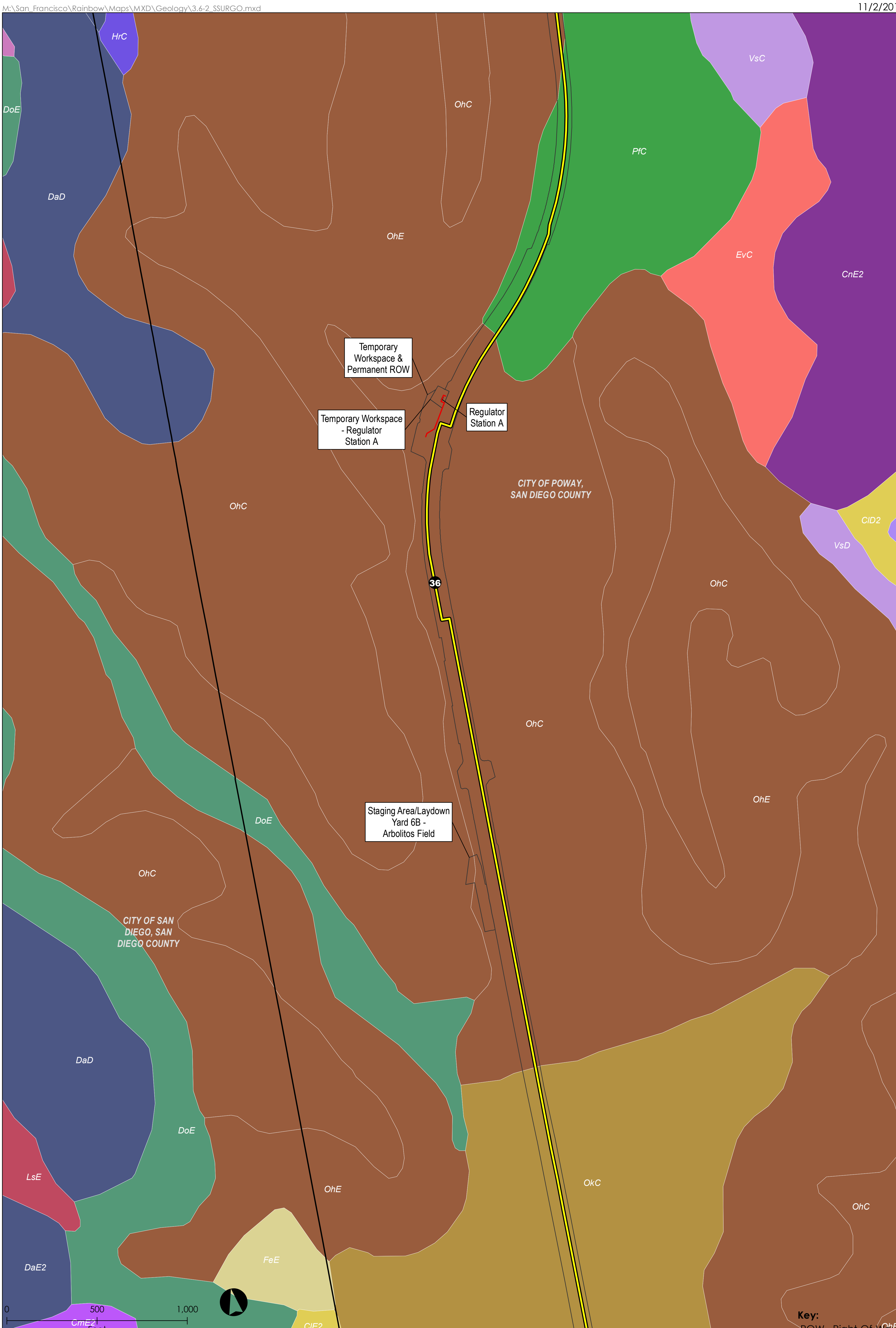
Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Workspaces
Municipal Boundary
Soil Series
BsC, BsD: Bonsanko clay
CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams
DaC, DaD, DaE2, DaE, DaF: Diablo Clay
DoE: Diablo-Olivenhain complex
FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam
FvD, FvE: Fallbrook-Vista sandy loams
FxE, FxG: Friant rocky fine sandy loam
GoA: Grangeville fine sandy loam
HrC: Huerhuero loam
LsE: Linne clay loam
OhC, OhE: Olivenhain cobbly loam
PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam
VvD, VvE, VvG: Vista rocky coarse sandy loam

Figure 3.6-2
Soils in the Study Area
Page 53 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

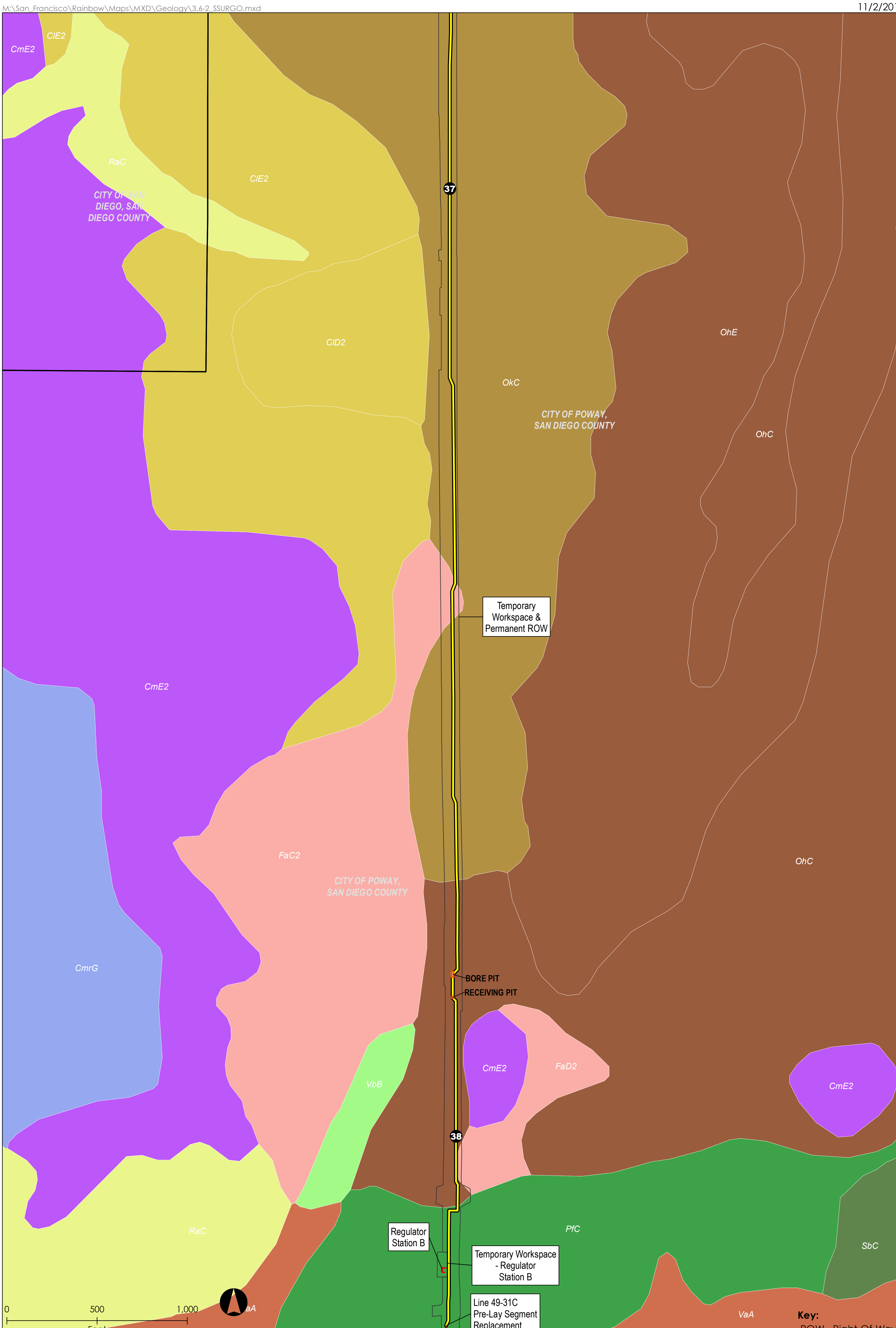
Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost	CID2, CIE2, CIG2: Cineba coarse sandy loam	FxE, FxG: Friant rocky fine sandy loam
Line 3602	CmE2: Cieneba rocky coarse sandy loam	HrC: Huerhuero loam
Distribution System Modification	CnE2, CnG2: Cieneba-Fallbrook rocky sandy loams	LsE: Linne clay loam
Workspaces	DaC, DaD, DaE2, DaE, DaF: Diablo Clay	OhC, OhE: Olivenhain cobbly loam
Municipal Boundary	DoE: Diablo-Olivenhain complex	OkC: Olivenhain-Urban land complex
Soil Series	EsC, EsD2, EsE2, EvC: Escondido very fine sandy loam	PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
AtC, AtE: Altamont clay	FeC. FeE2, FeE: Fallbrook rocky sandy loam	VsC, VsD2, VsD, VsE2, VsE, VsG: Vista coarse sandy loam

Figure 3.6-2
Soils in the Study Area
Page 54 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

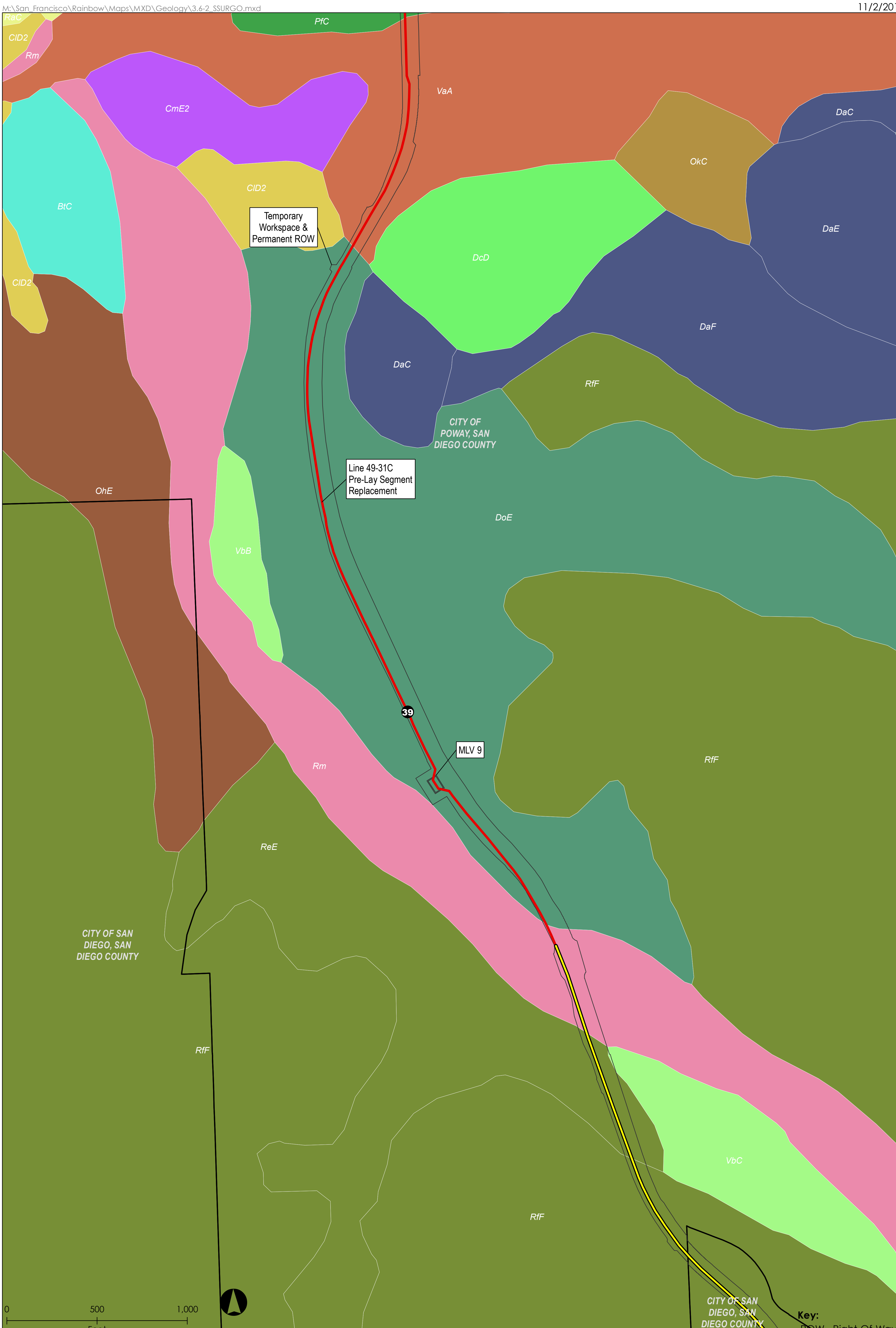
Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



	Soil Series	
Milepost	CID2, CIE2, CIG2: Cineba coarse sandy loam	PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
Line 3602	CmE2: Cieneba rocky coarse sandy loam	RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Tie-Ins & Extensions	CmrG: Cieneba very rocky coarse sandy loam	Rm: Riverwash
Distribution System Modification	FaB, FaC2, FaC, FaD2, FaE2, FaE3: Fallbrook sandy loam	SbC: Salinas clay loam
Bore Pits	OhC, OhE: Olivenhain cobbly loam	VaA, VaB, VaC: Visalia sandy loam
Workspaces	OkC: Olivenhain-Urban land complex	VbB, VbC: Visalia gravelly sandy loam
Municipal Boundary		

Figure 3.6-2
Soils in the Study Area
Page 55 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost	ClD2, ClE2, ClG2: Cineba coarse sandy loam	PeA, PeC2, PeC, PeD2, PfA, PfC: Placentia sandy loam
Line 3602	CmE2: Cieneba rocky coarse sandy loam	RaA, RaB, RaC2, RaC, RaD2: Ramona sandy loam
Tie-Ins & Extensions	DaC, DaD, DaE2, DaE, DaF: Diablo Clay	ReE, RfF: Redding cobbly loam
Workspaces	DcD, DcF: Diablo-Urban land complex	Rm: Riverwash
Municipal Boundary	DoE: Diablo-Olivenhain complex	VaA, VaB, VaC: Visalia sandy loam
Soil Series	OhC, OhE: Olivenhain cobbly loam	VbB, VbC: Visalia gravelly sandy loam
BtC: Bosanko stony clay	OkC: Olivenhain-Urban land complex	

Figure 3.6-2
Soils in the Study Area
Page 56 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

- Milepost
- Line 3602
- Workspaces
- MCAS Miramar
- Municipal Boundary

Soil Series

- RdC: Redding gravelly loam
- ReE, RfF: Redding cobbly loam
- Rm: Riverwash

Figure 3.6-2
Soils in the Study Area
Page 57 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Milepost
Line 3602
Workspaces
Municipal Boundary
Soil Series
RdC: Redding gravelly loam
ReE, RfF: Redding cobbly loam
Rm: Riverwash

Figure 3.6-2
Soils in the Study Area
Page 58 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

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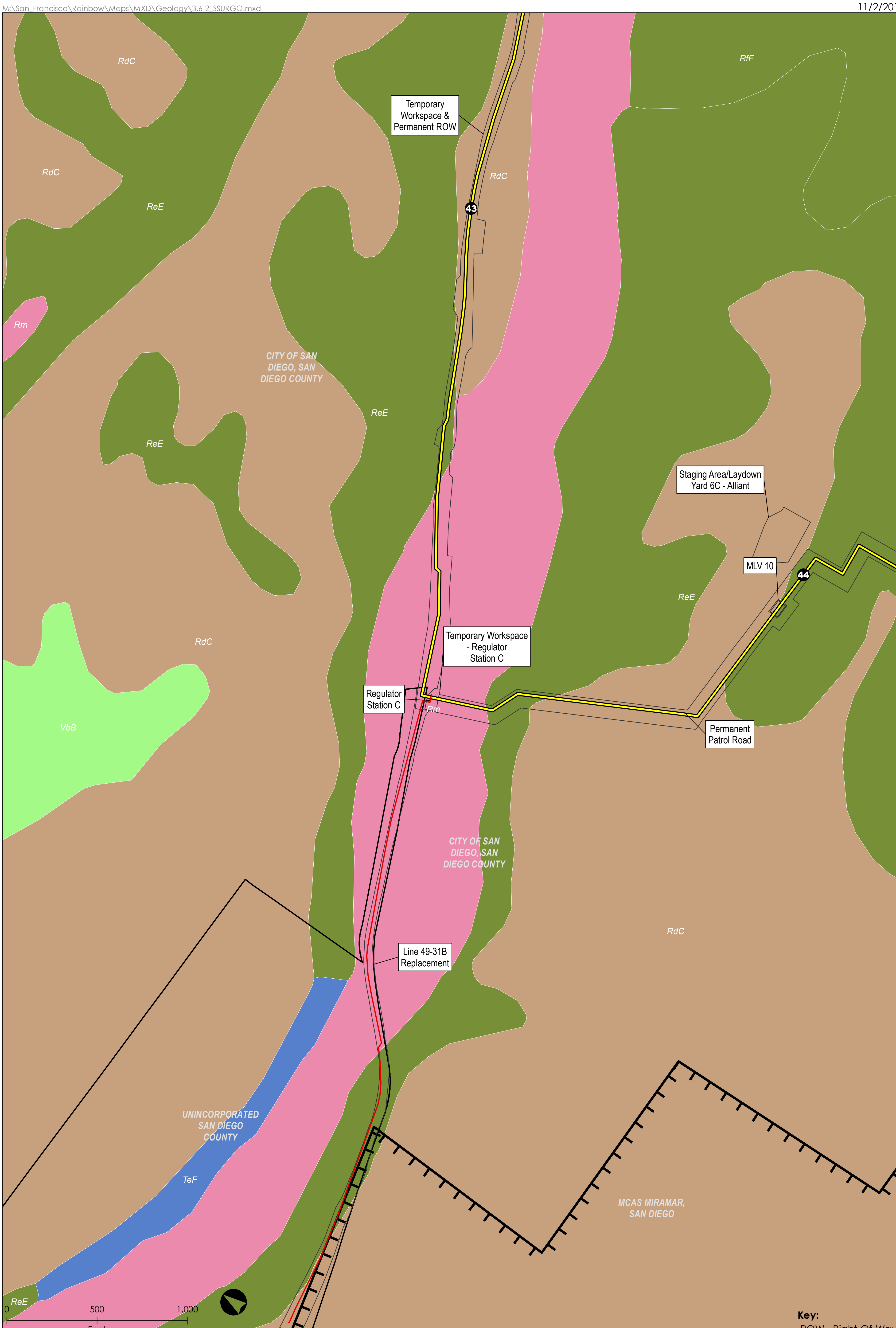
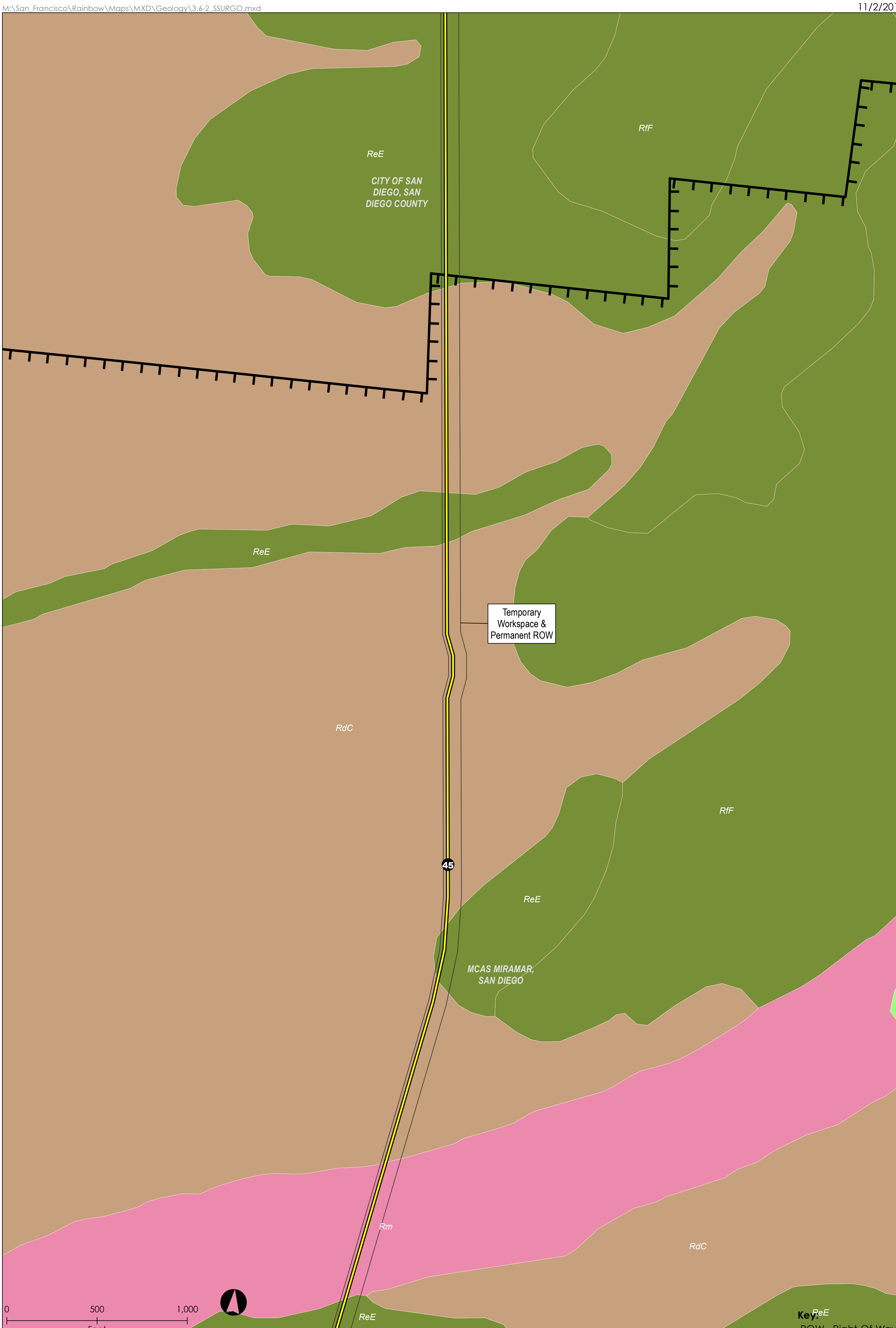


Milepost
Line 3602
Distribution System Modification
Workspaces
MCAS Miramar
Municipal Boundary

Soil Series
RdC: Redding gravelly loam
ReE, RfF: Redding cobbly loam
Rm: Riverwash
TeF: Terrace escarpments
VbB, VbC: Visalia gravelly sandy loam

Figure 3.6-2
Soils in the Study Area
Page 59 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Workspaces
MCAS Miramar
Municipal Boundary
Soil Series
RdC: Redding gravelly loam
ReE, RfF: Redding cobbly loam
Rm: Riverwash
VbB, VbC: Visalia gravelly sandy loam

Figure 3.6-2
Soils in the Study Area
Page 60 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

Figure 3.6-2
Soils in the Study Area
Page 61 of 61
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; NRCS 2017; SanGIS 2016; SDG&E 2017; USMC 2017

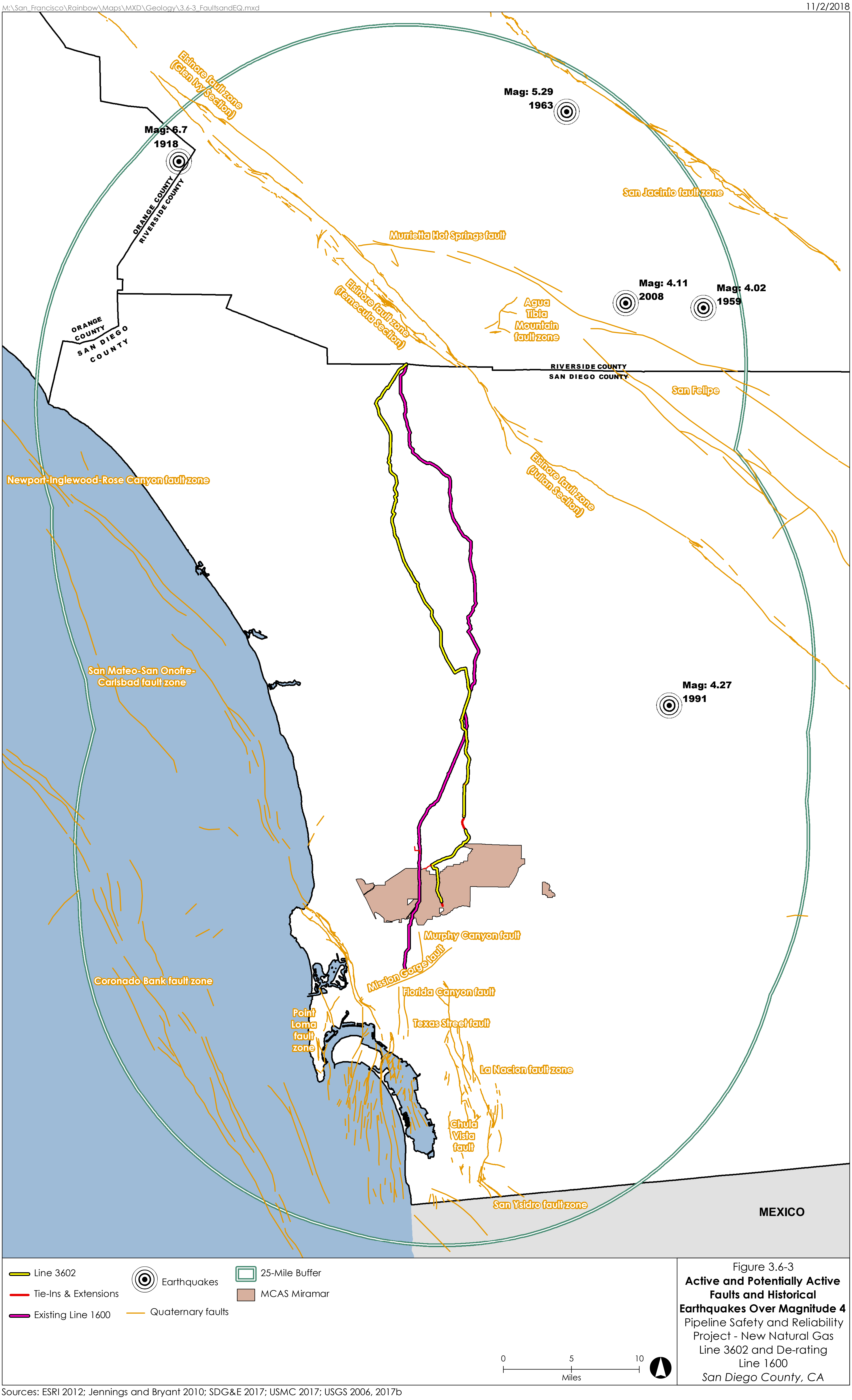


Figure 3.6-3
Active and Potentially Active Faults and Historical Earthquakes Over Magnitude 4
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; Jennings and Bryant 2010; SDG&E 2017; USMC 2017; USGS 2006, 2017b

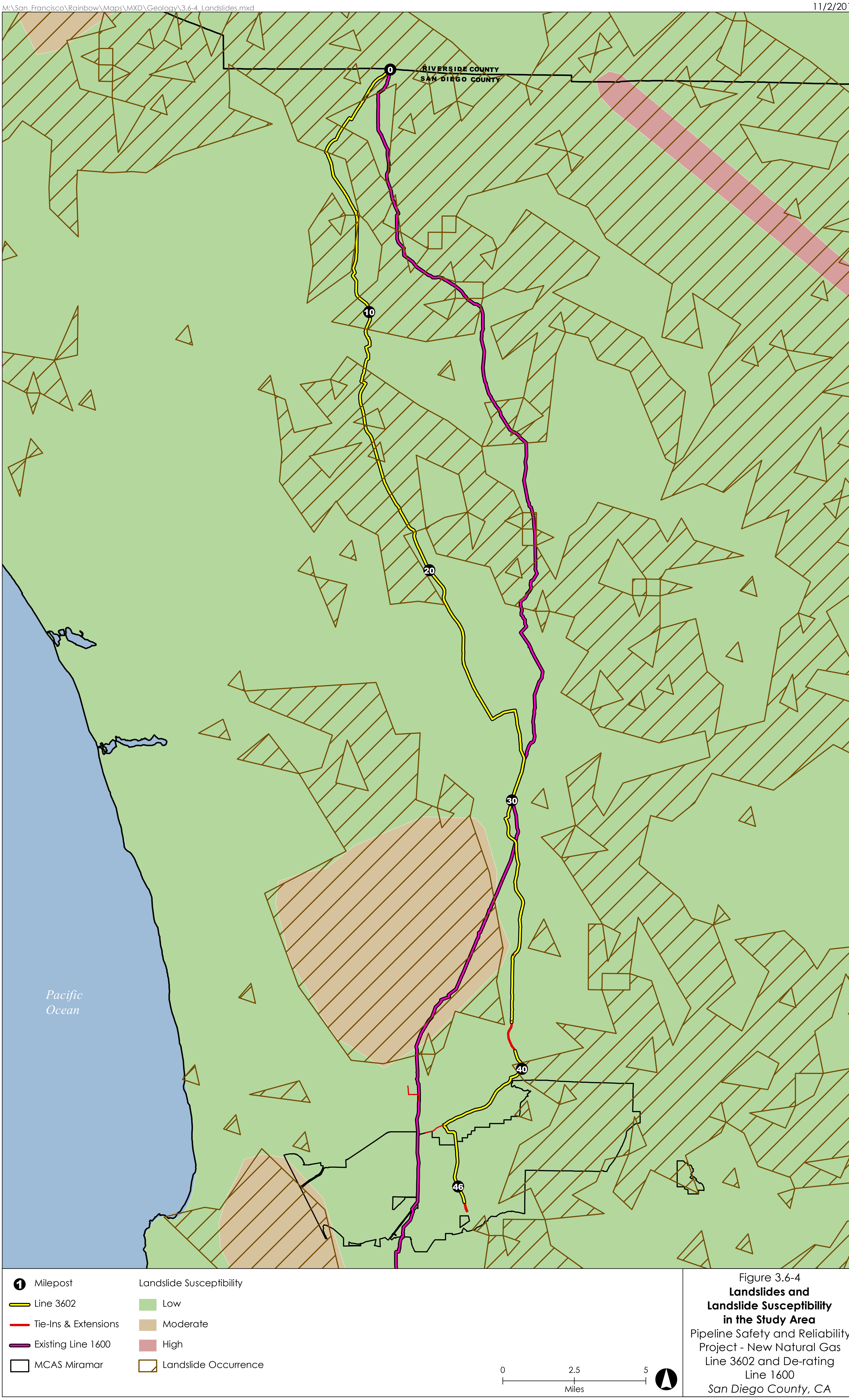


Figure 3.6-4
Landslides and Landslide Susceptibility in the Study Area
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SDG&E 2017; USMC 2017; USGS 1982, 1997

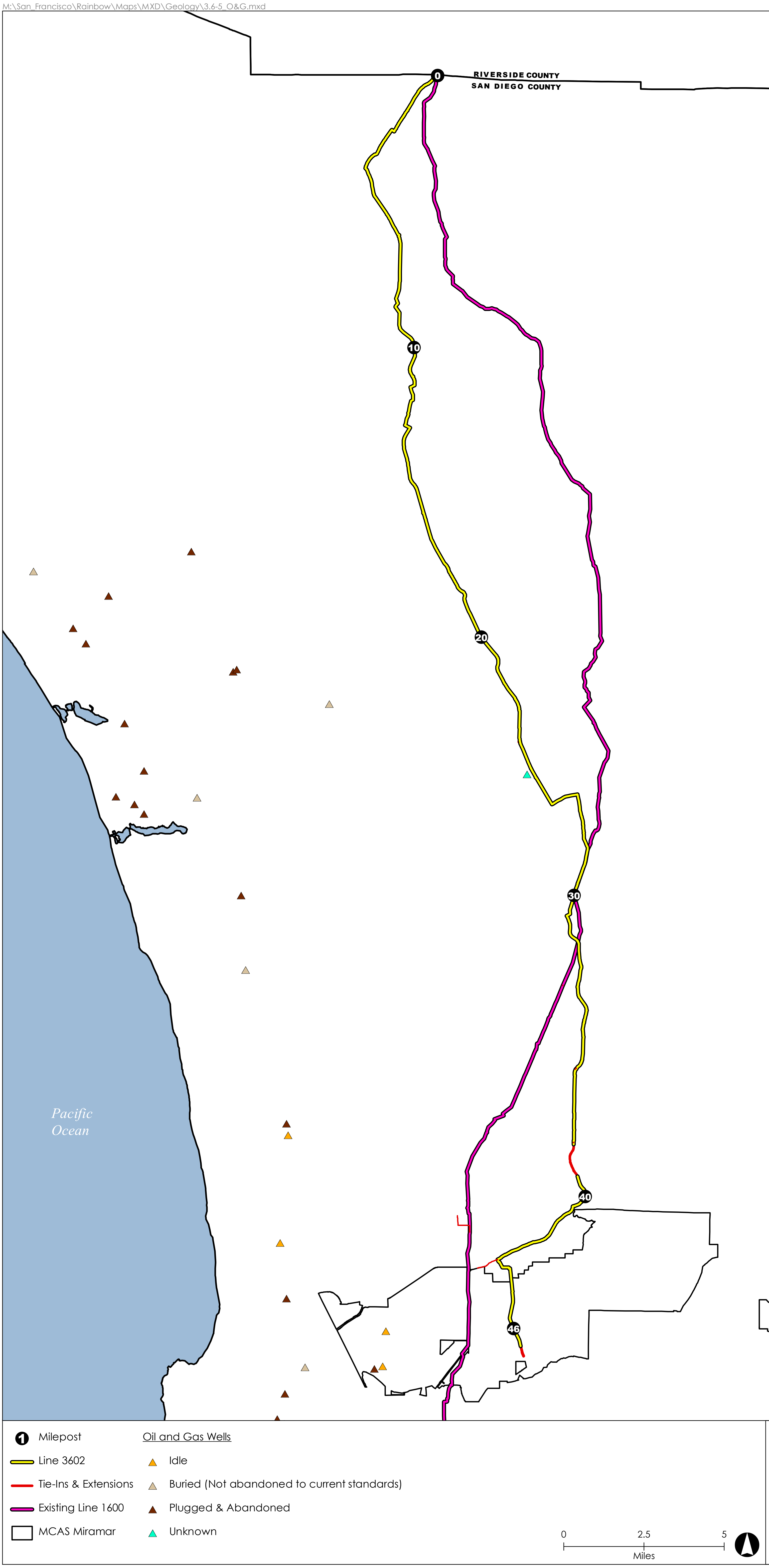
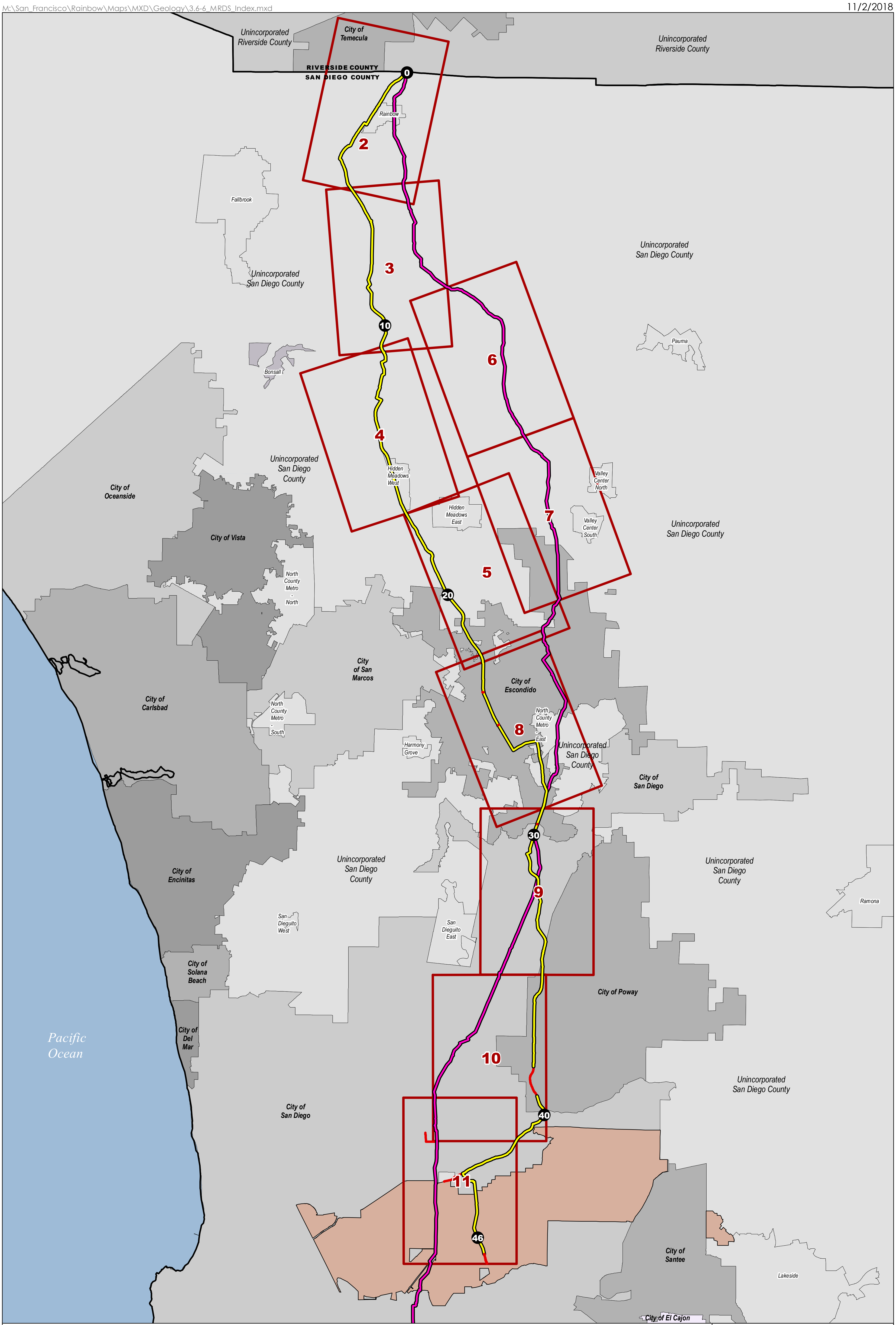


Figure 3.6-5
Oil and Gas Wells in the Study Area
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

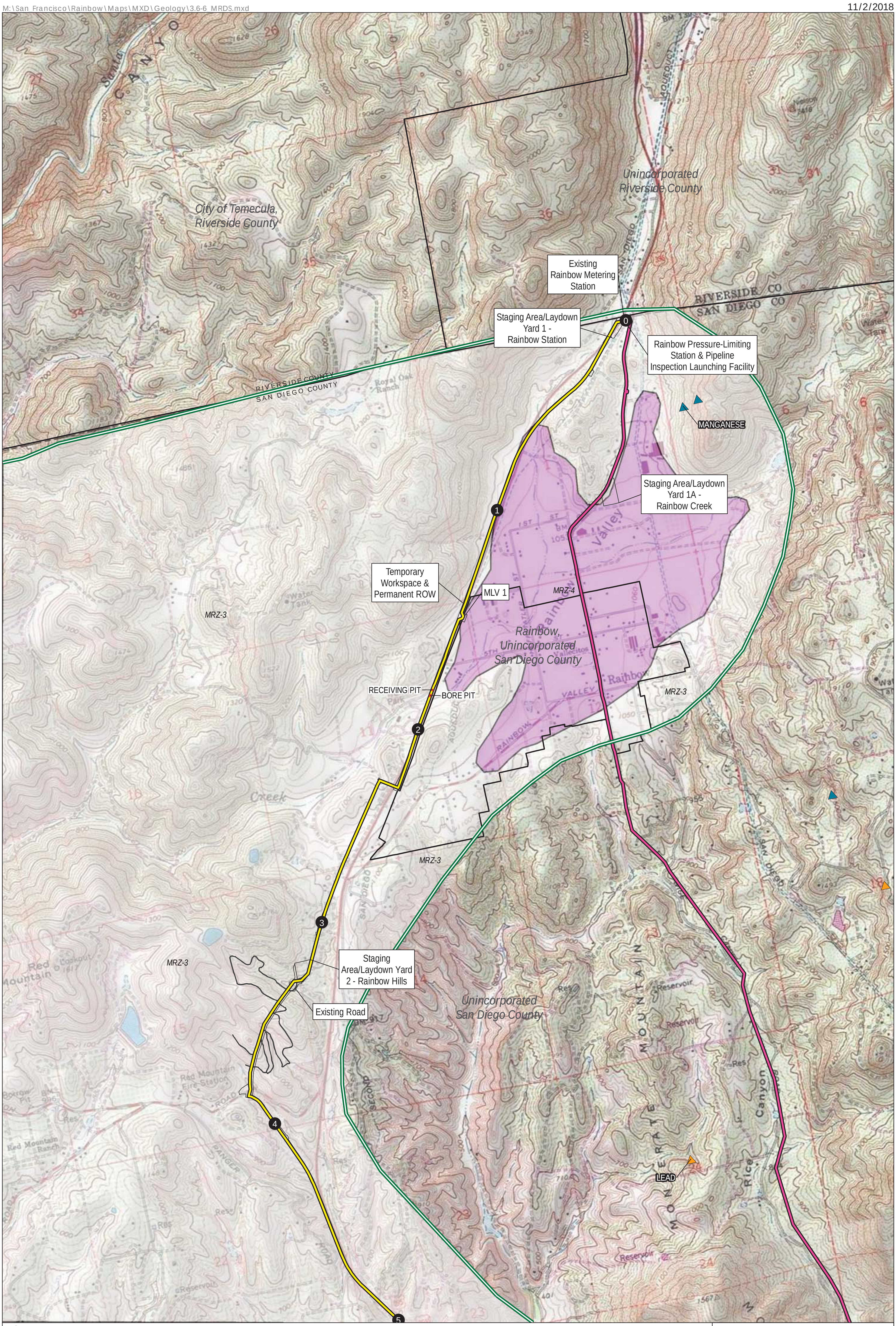
Sources: CA DOC 2017; ESRI 2012; SDG&E 2017; USMC 2017



Milepost
Line 3602
Tie-Ins & Extensions
Existing Line 1600
MCAS Miramar
Map Series Index

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 1 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: ESRI 2012; SanGIS 2016; SDG&E 2017; USMC 2017



Milepost
Line 3602
Existing Line 1600
Bore Pits
Workspaces

Mineral Resource Data System
Occurrence, Metallic
Prospect, Metallic
Production-Consumption Region Boundary
Municipal Boundary

Mineral Resource Zone Classification

MRZ-3 *Areas containing mineral deposits, the significance of which cannot be evaluated from available data.*

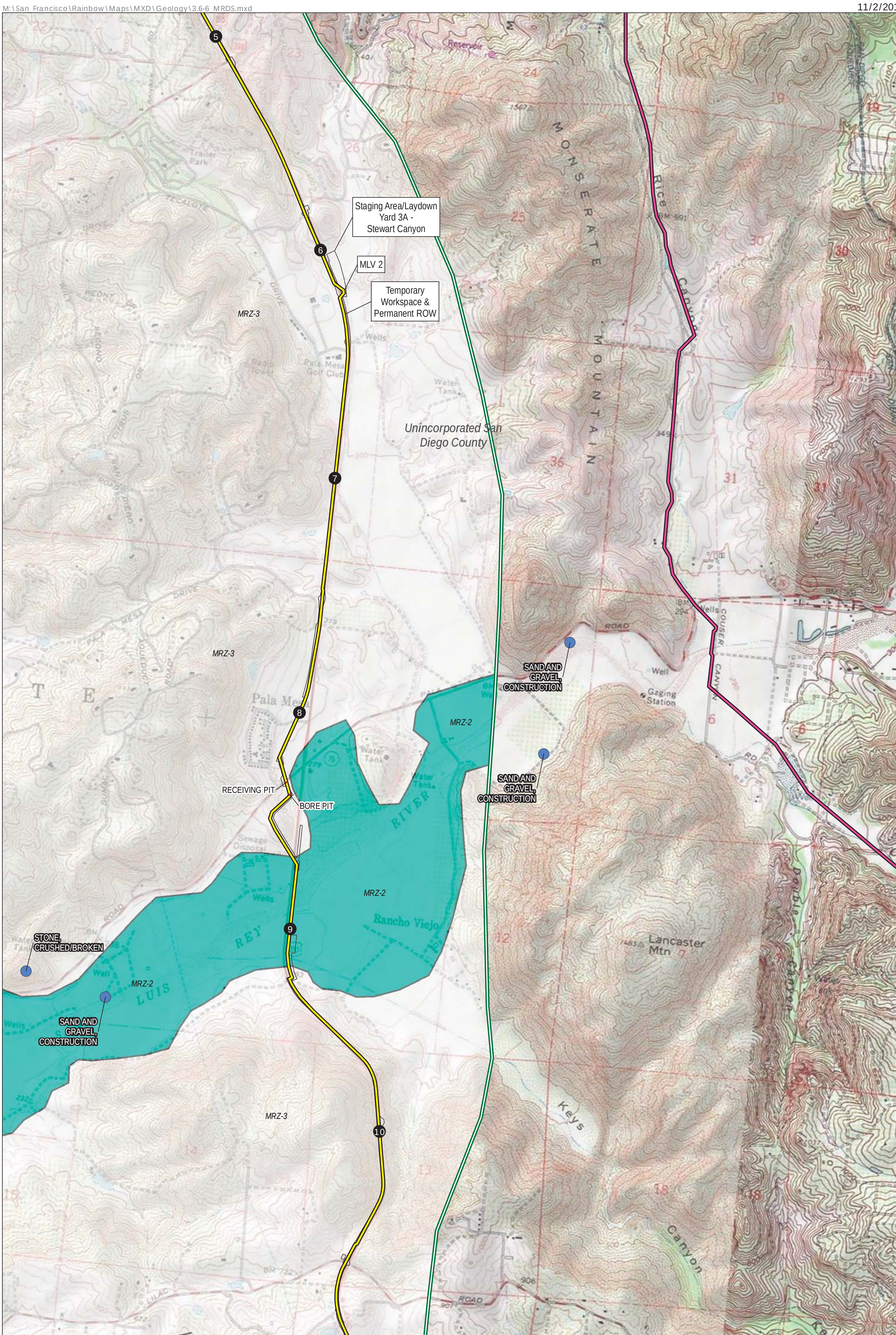
MRZ-4 *Areas where available information is inadequate for assignment to any other mineral resource zone.*

Key:
ROW Right-Of-Way

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 2 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a



Milepost
Line 3602
Existing Line 1600
Bore Pits
Workspaces

Mineral Resource Data System
Past Producer, Non-Metallic
Production-Consumption Region Boundary
Municipal Boundary

Mineral Resource Zone Classification

MRZ-2 *Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that there is a high likelihood for their presence.*

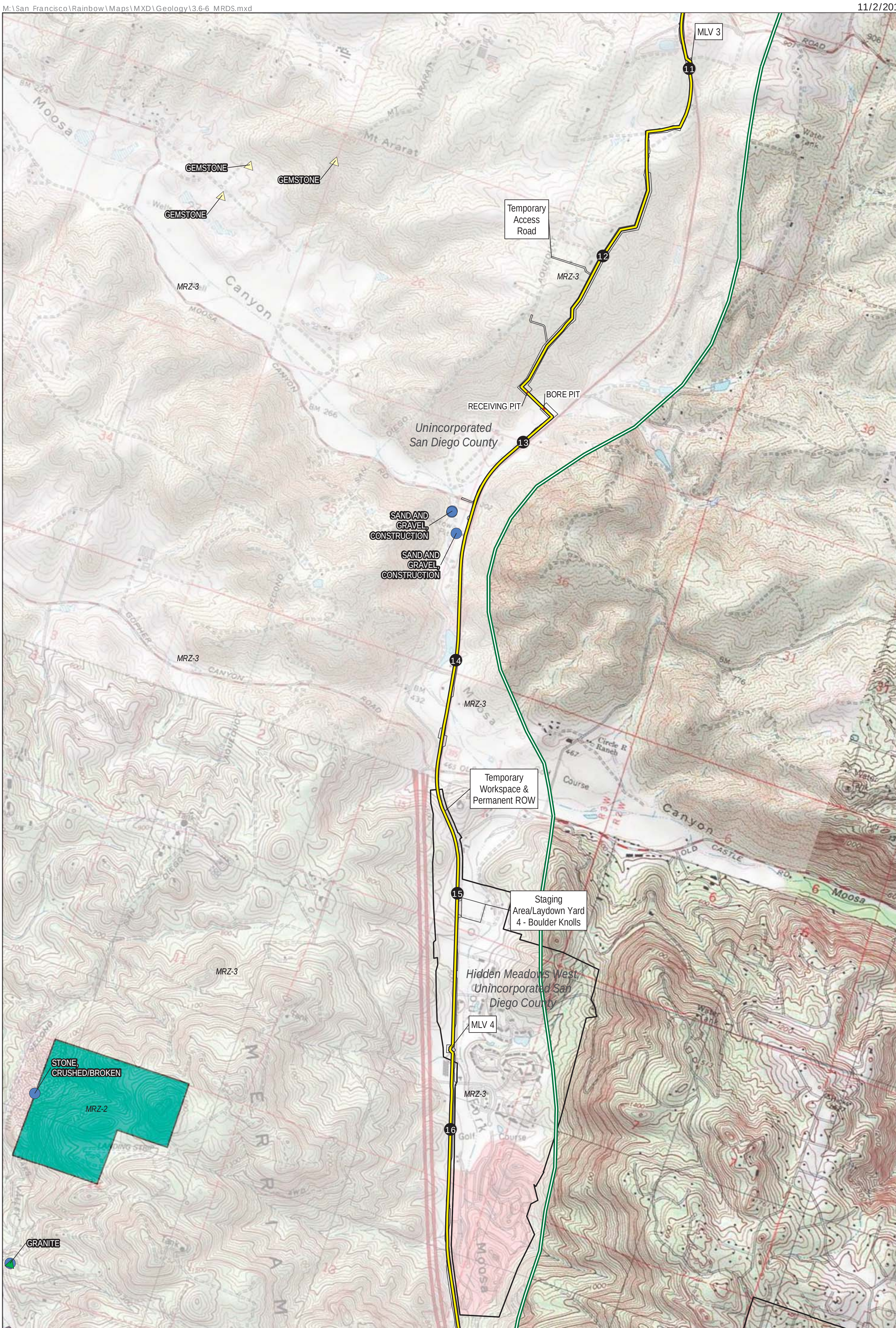
MRZ-3 *Areas containing mineral deposits, the significance of which cannot be evaluated from available data.*

Key:
ROW Right-Of-Way

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 3 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a



Milepost
Line 3602
Bore Pits
Workspaces

Mineral Resource Data System
Occurrence, Non-Metallic
Producer, Non-Metallic
Past Producer, Non-Metallic
Production-Consumption Region Boundary
Municipal Boundary

Mineral Resource Zone Classification

MRZ-2 *Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that there is a high likelihood for their presence.*

MRZ-3 *Areas containing mineral deposits, the significance of which cannot be evaluated from available data.*

MRZ-4 *Areas where available information is inadequate for assignment to any other mineral resource zone.*

Key:
ROW Right-Of-Way

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 4 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a

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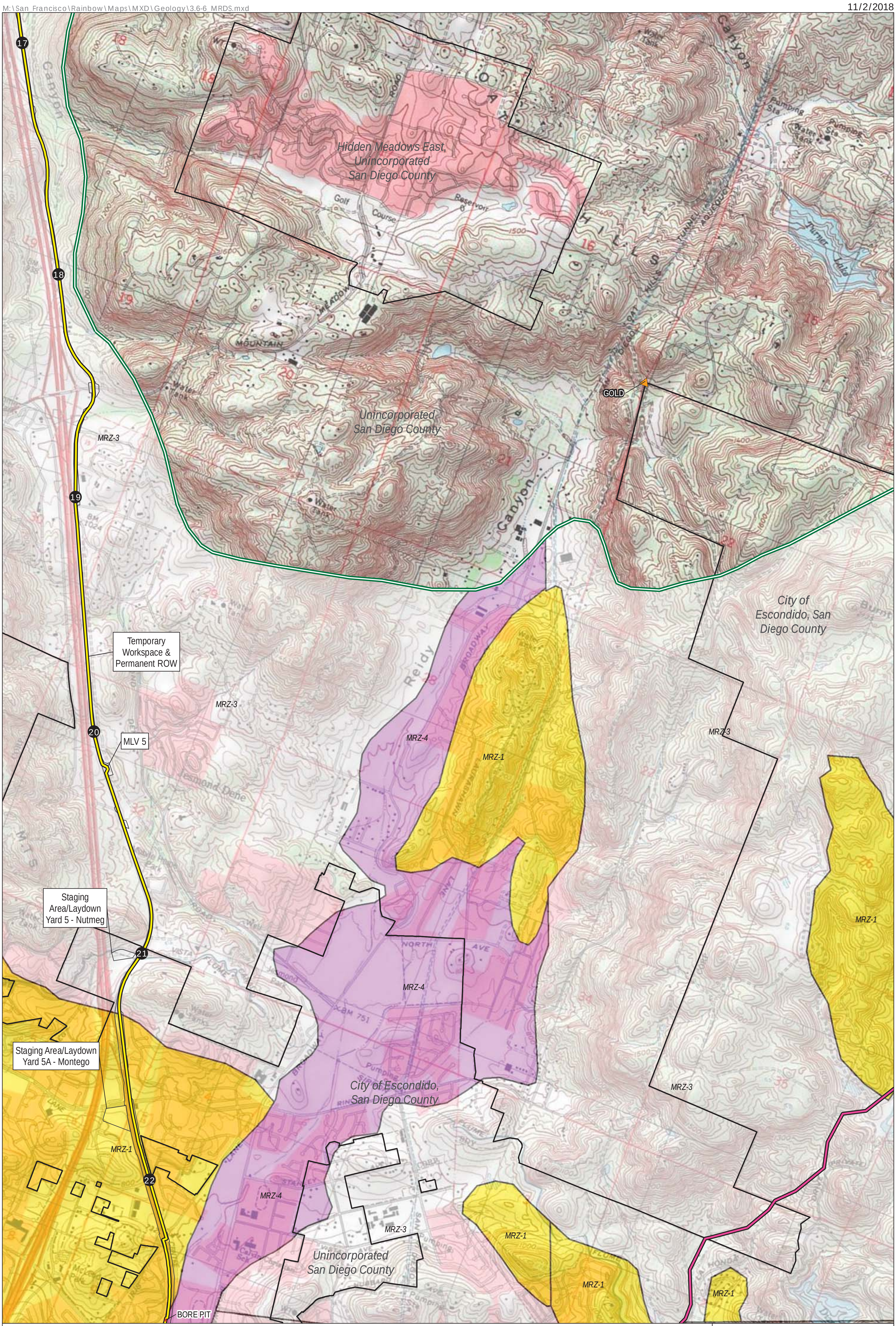


Milepost	Mineral Resource Data System	Mineral Resource Zone Classification
Line 3602	Prospect, Metallic	MRZ-1 Areas where adequate information indicates that no significant mineral deposits area present, or where it is judged there is little likelihood for their presence.
Existing Line 1600	Production-Consumption Region Boundary	MRZ-3 Areas containing mineral deposits, the significance of which cannot be evaluated from available data.
Bore Pits	Municipal Boundary	MRZ-4 Areas where available information is inadequate for assignment to any other mineral resource zone.
Workspaces		

Key:
ROW Right-Of-Way

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 5 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a

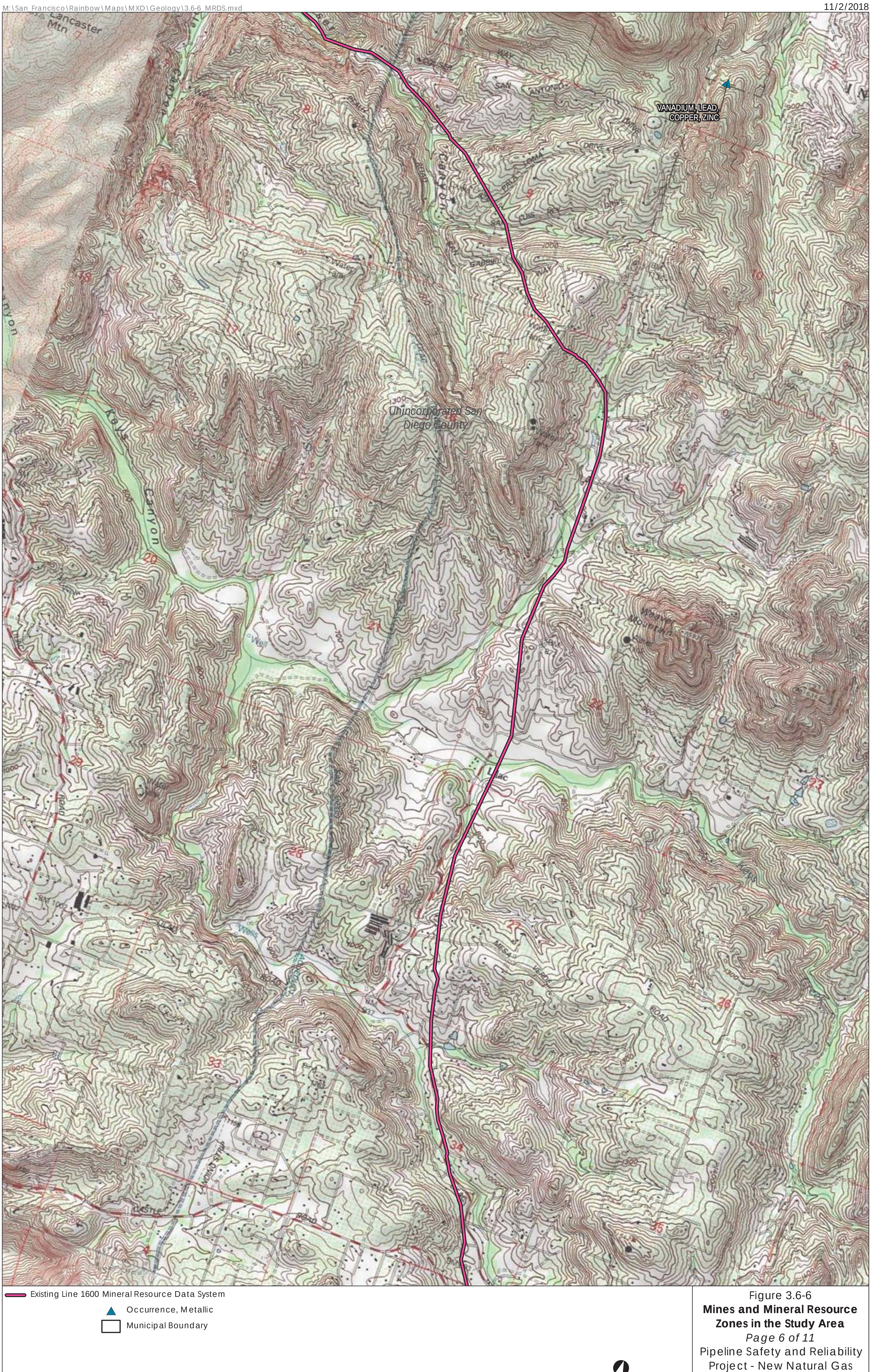
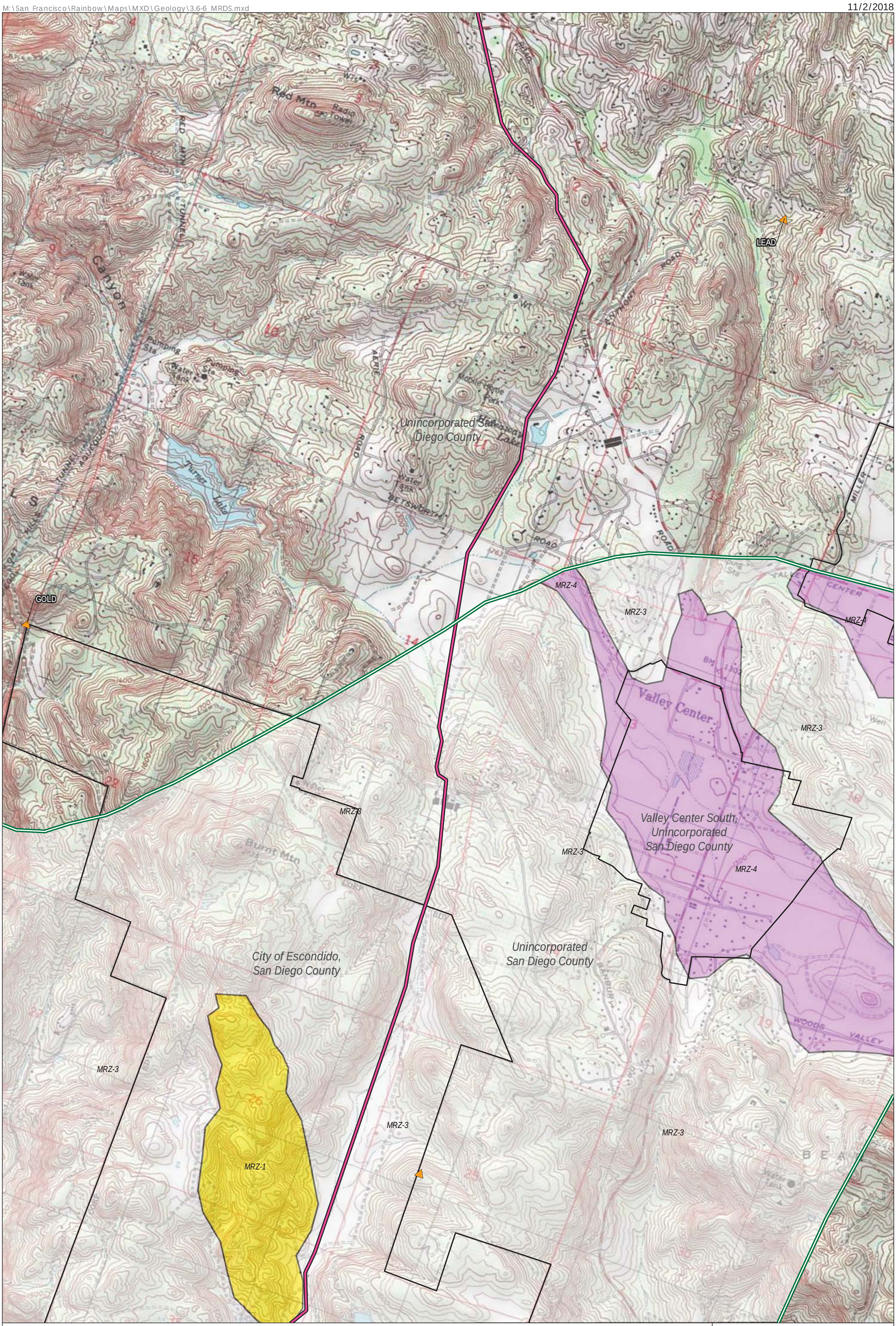


Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 6 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a



Existing Line 1600
Mineral Resource Data System
Prospect, Metallic
Production-Consumption Region Boundary
Municipal Boundary

Mineral Resource Zone Classification

MRZ-1 *Areas where adequate information indicates that no significant mineral deposits area present, or where it is judged there is little likelihood for their presence.*

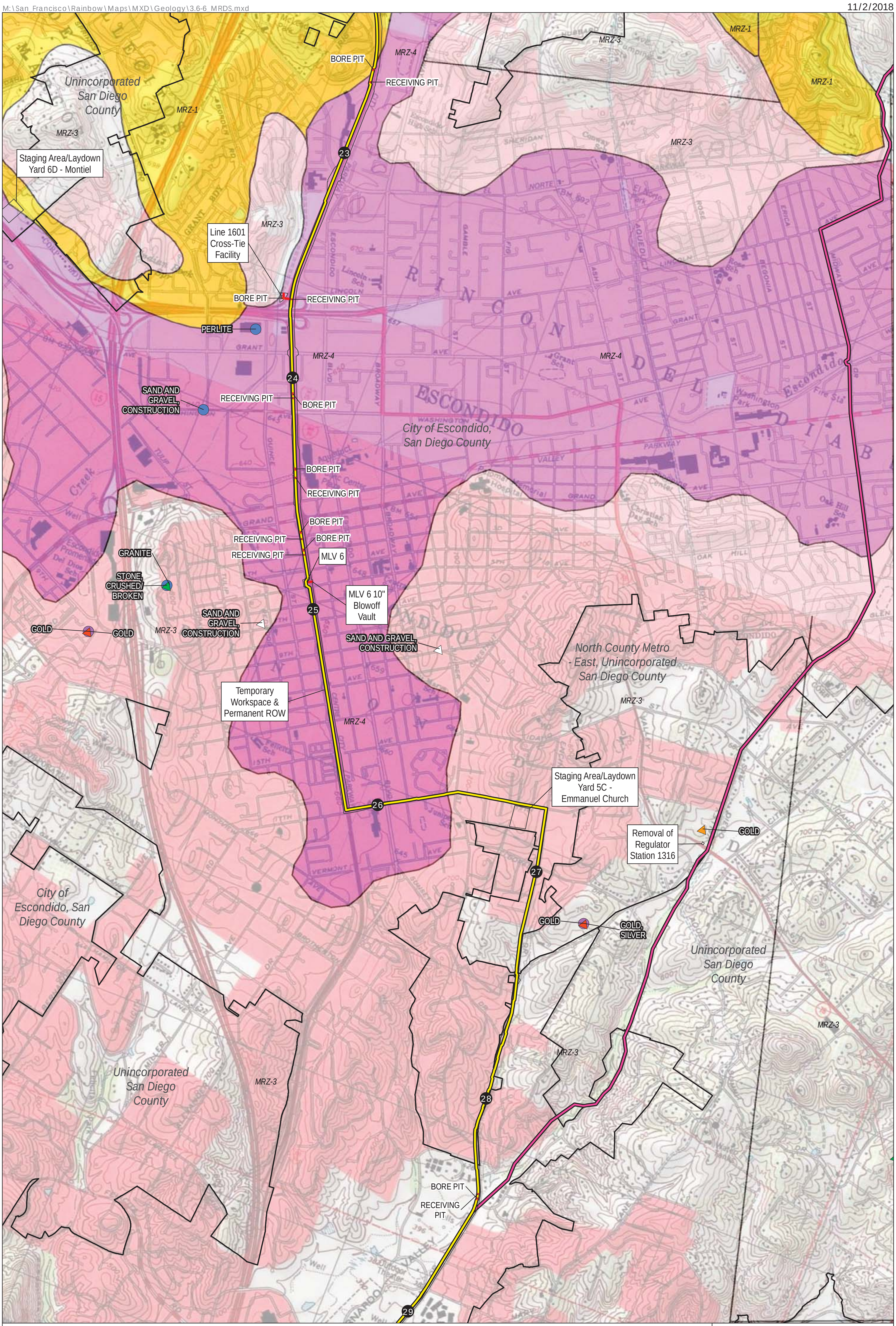
MRZ-3 *Areas containing mineral deposits, the significance of which cannot be evaluated from available data.*

MRZ-4 *Areas where available information is inadequate for assignment to any other mineral resource zone.*

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 7 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a



Milepost
Line 3602
Tie-Ins & Extensions
Existing Line 1600
Bore Pits
Workspaces

Mineral Resource Data System
Producer, Metallic
Producer, Non-Metallic
Prospect, Metallic
Unknown Status, Non-Metallic
Past Producer, Metallic
Past Producer, Non-Metallic
Municipal Boundary

Mineral Resource Zone Classification

MRZ-1 *Areas where adequate information indicates that no significant mineral deposits area present, or where it is judged there is little likelihood for their presence.*

MRZ-3 *Areas containing mineral deposits, the significance of which cannot be evaluated from available data.*

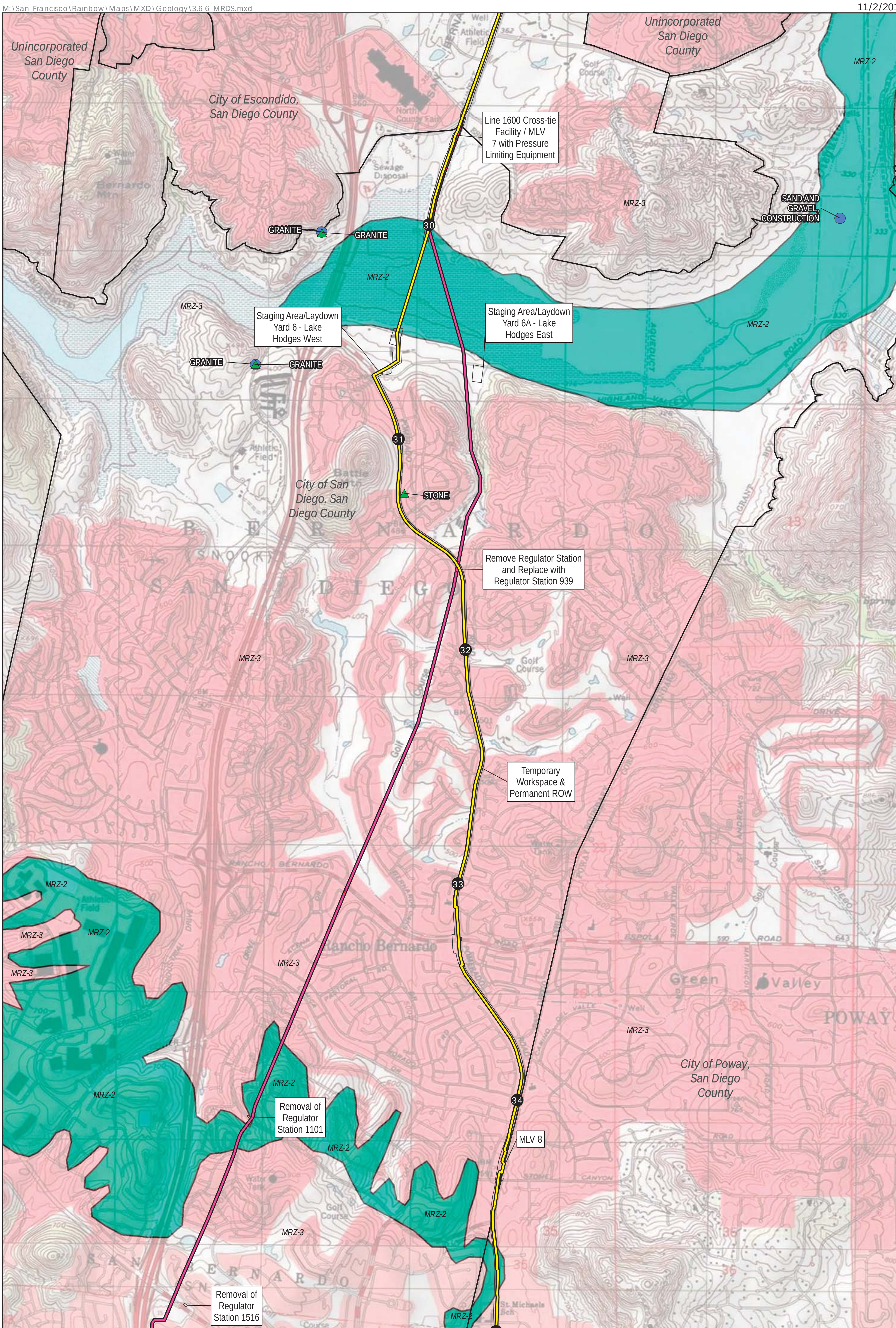
MRZ-4 *Areas where available information is inadequate for assignment to any other mineral resource zone.*

Key:
MLV Mainline Valve
ROW Right-Of-Way

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 8 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a



1 Milepost
Line 3602
Tie-Ins & Extensions
Existing Line 1600
Workspaces

Mineral Resource Data System
Producer, Non-Metallic
Past Producer, Non-Metallic
Municipal Boundary

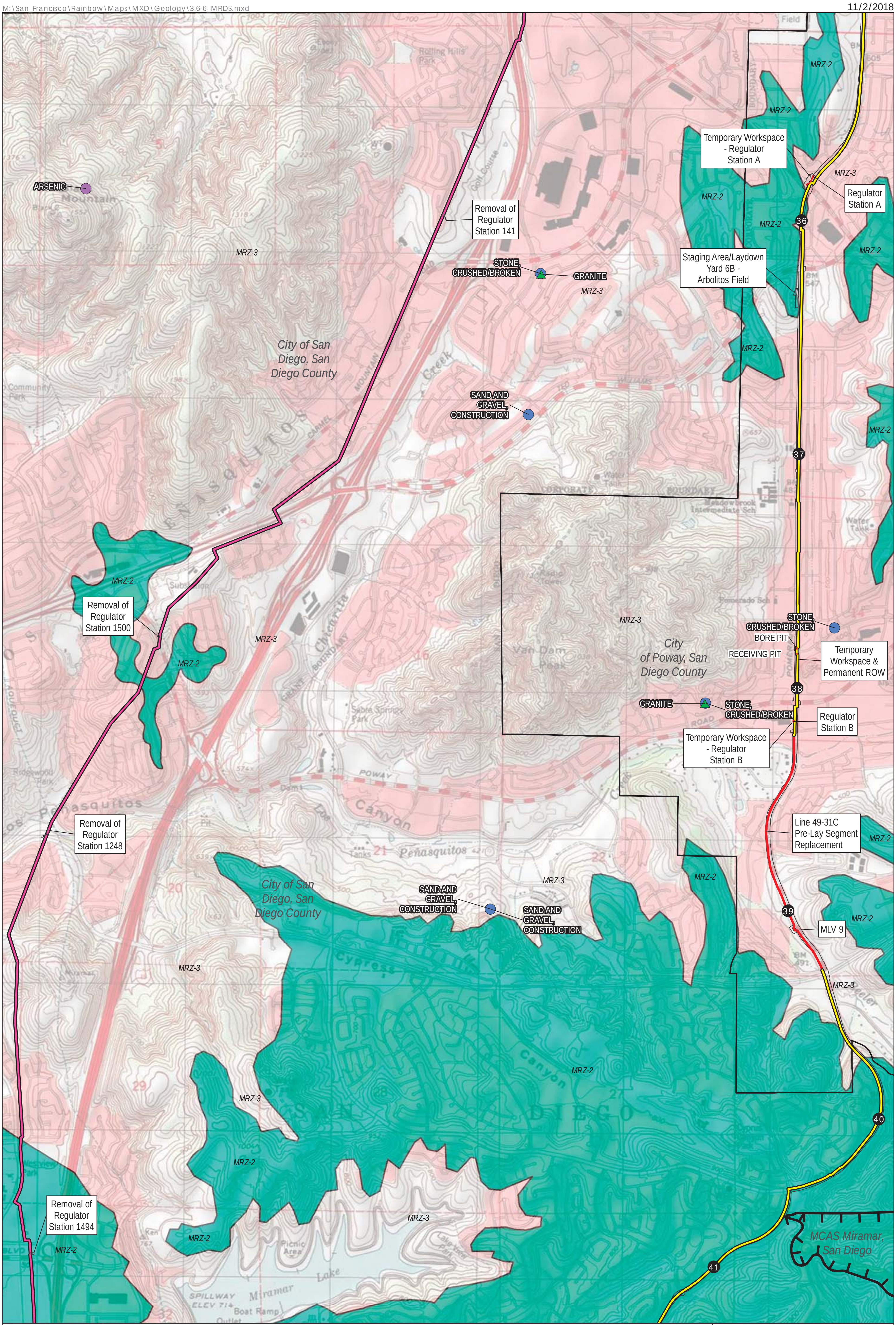
Mineral Resource Zone Classification
MRZ-2 *Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that there is a high likelihood for their presence.*
MRZ-3 *Areas containing mineral deposits, the significance of which cannot be evaluated from available data.*

Key:
ROW Right-Of-Way

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 9 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a



1 Milepost
Line 3602
Tie-Ins & Extensions
Existing Line 1600
Bore Pits
Workspaces

Mineral Resource Data System
Producer, Non-Metallic
Past Producer, Metallic
Past Producer, Non-Metallic
MCAS Miramar
Municipal Boundary

Mineral Resource Zone Classification

MRZ-2 *Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that there is a high likelihood for their presence.*

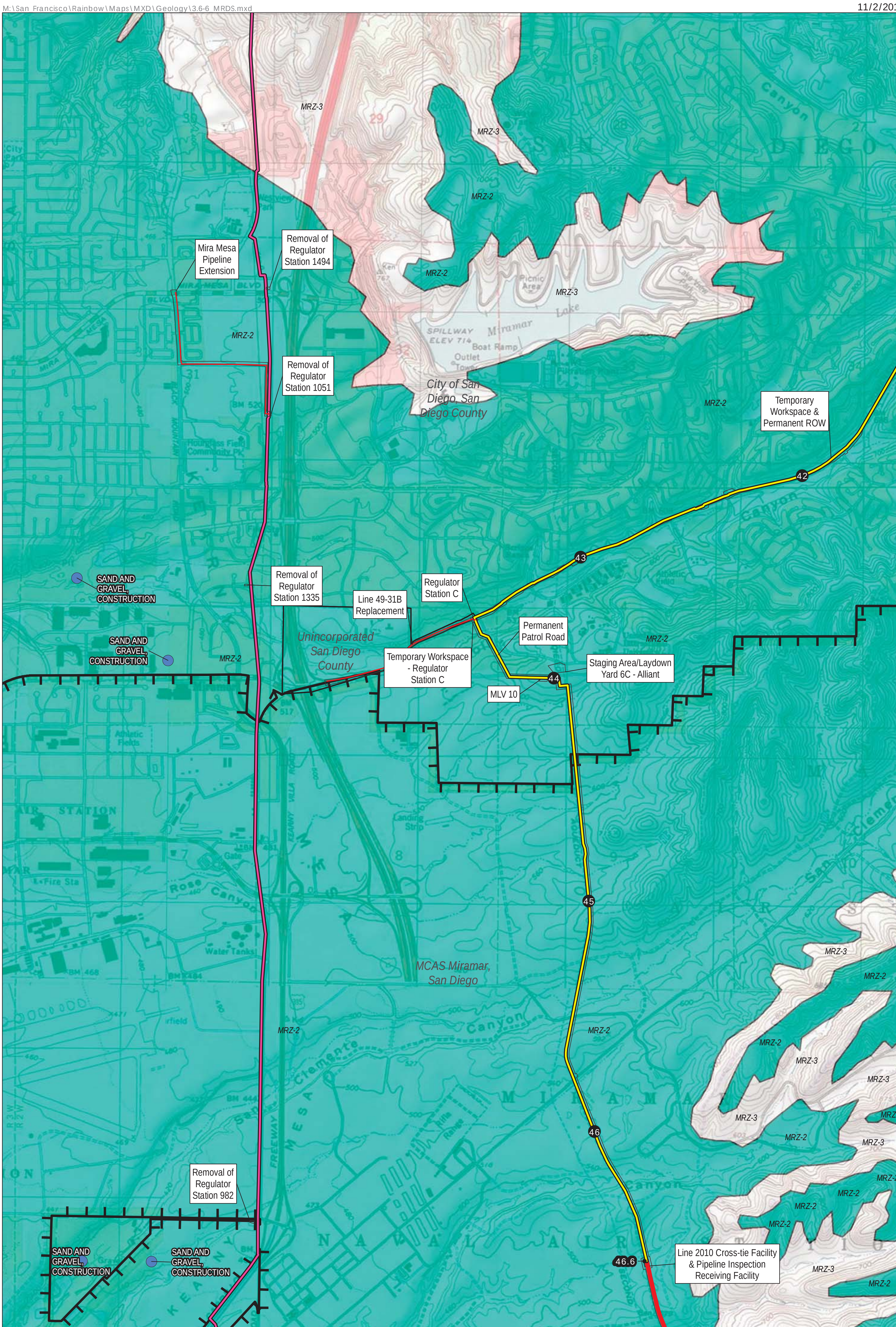
MRZ-3 *Areas containing mineral deposits, the significance of which cannot be evaluated from available data.*

Key:
ROW Right-Of-Way

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 10 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a



1 Milepost
Line 3602
Tie-Ins & Extensions
Existing Line 1600
Workspaces

Mineral Resource Data System
Past Producer, Non-Metallic
MCAS Miramar
Municipal Boundary

Mineral Resource Zone Classification

MRZ-2	*Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that there is a high likelihood for their presence.*
MRZ-3	*Areas containing mineral deposits, the significance of which cannot be evaluated from available data.*

Key:
ROW Right-Of-Way

0 0.25 0.5
Miles

Figure 3.6-6
Mines and Mineral Resource Zones in the Study Area
Page 11 of 11
Pipeline Safety and Reliability Project - New Natural Gas Line 3602 and De-rating Line 1600
San Diego County, CA

Sources: CA DOC 1982; ESRI 2012, 2018; SanGIS 2016; SDG&E 2017; USMC 2017; USGS 2017a

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