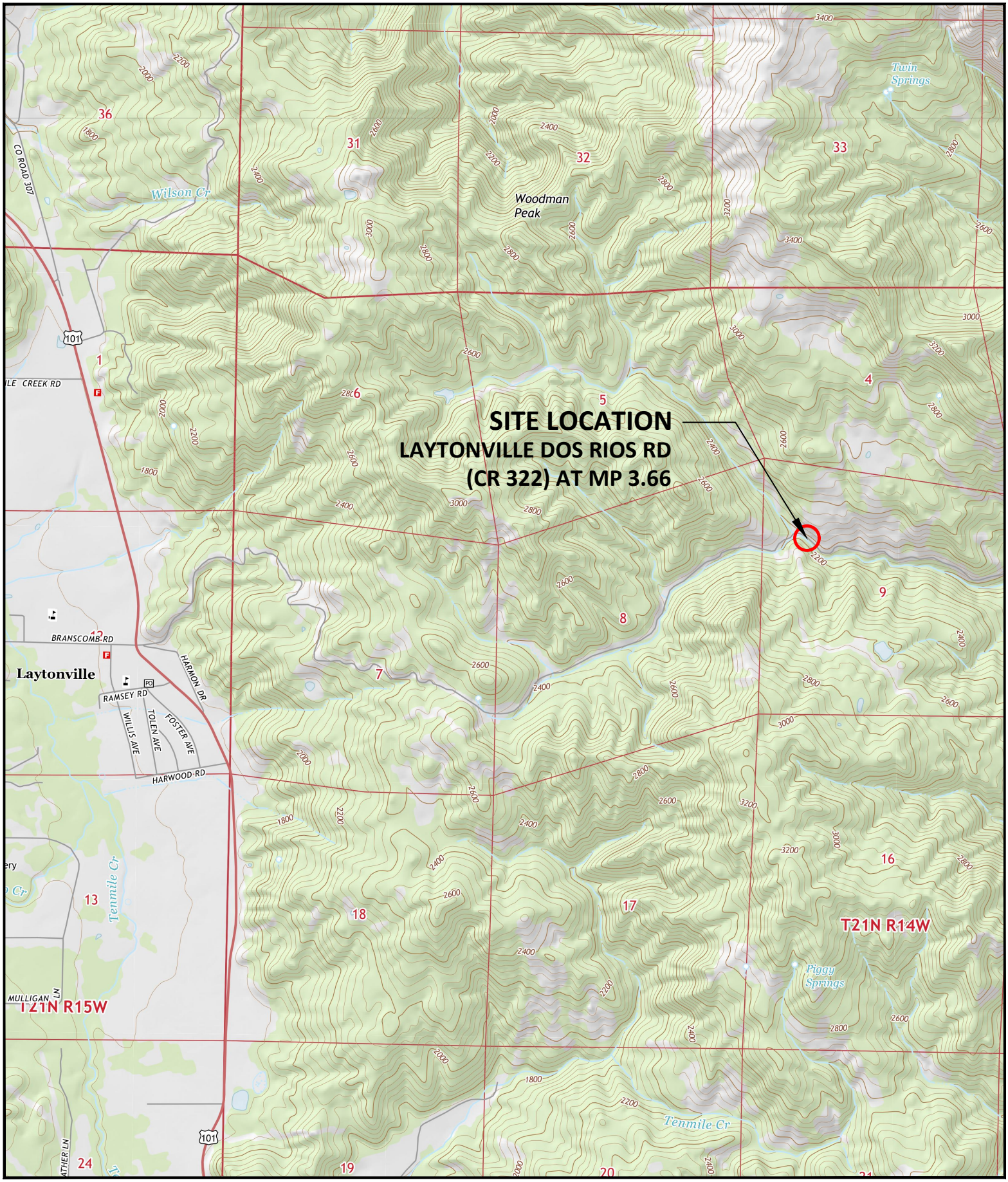

NORTH

Map Sources:
USGS 7.5' Topographic Maps 2015, Laytonville, Mendocino County, California, Scale 1:24000

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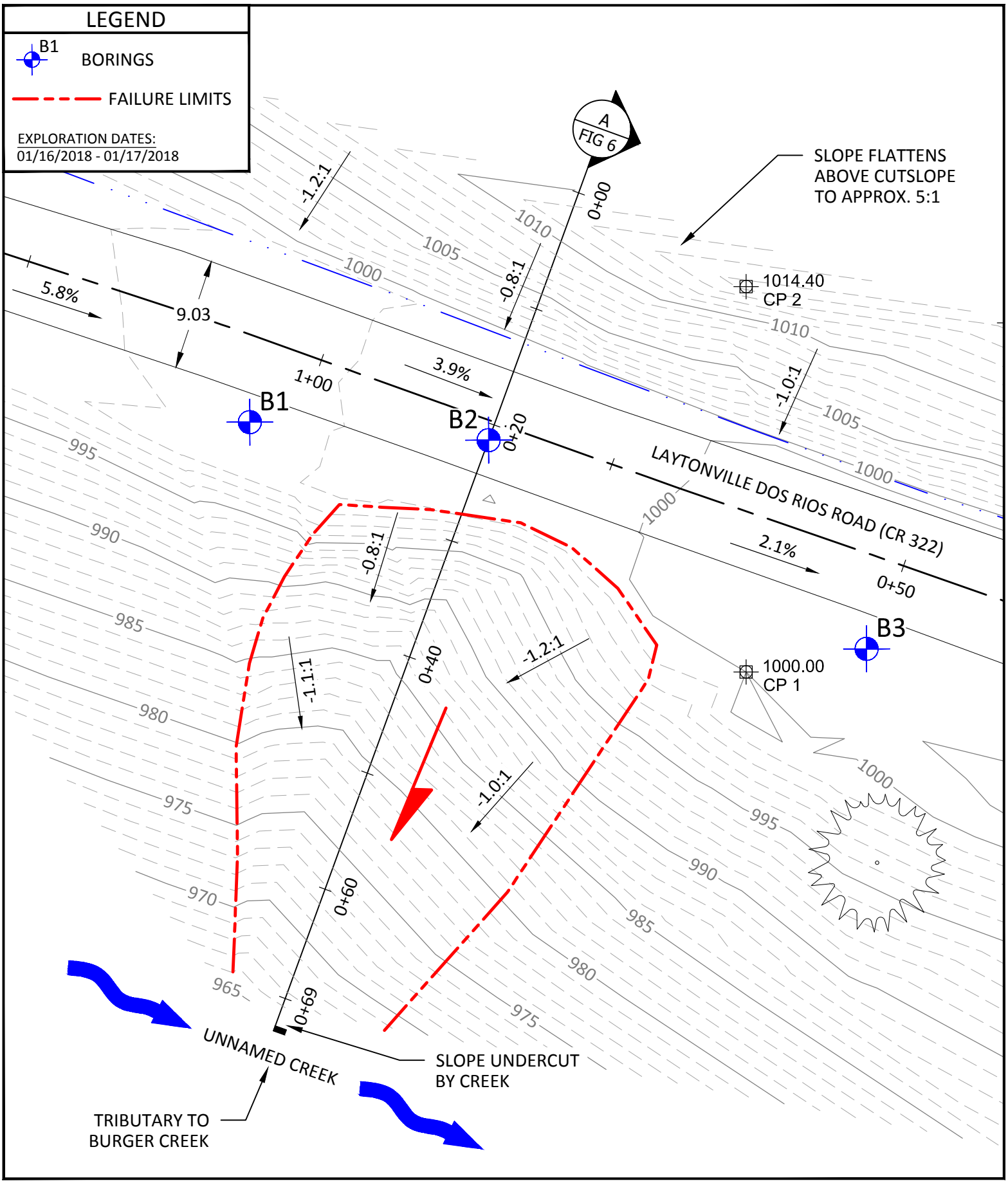
GEOTECHNICAL INVESTIGATION
LAYTONVILLE DOS RIOS ROAD
(CR 322) FAILURE AT MP 3.66

LAYTONVILLE, MENDOCINO CO., CA

Figure 1
Vicinity Map

Prj. No: 16-337.10
Scale: 1" = 2,500'
Date: 12/15/2017

Path: \\psf\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.10 Laytonville Dos Rios Road (CR 322) at MP 3.34, 3.66, and 4.19\CAD\16-337.10-Figures-MP 3.66.dwg Plot Date: Dec 20, 2017 at 2:26pm



Map and Data Source:
Basemap provided by MCDOT via electronic transfer on 10/31/2017. Survey completed by MCDOT.

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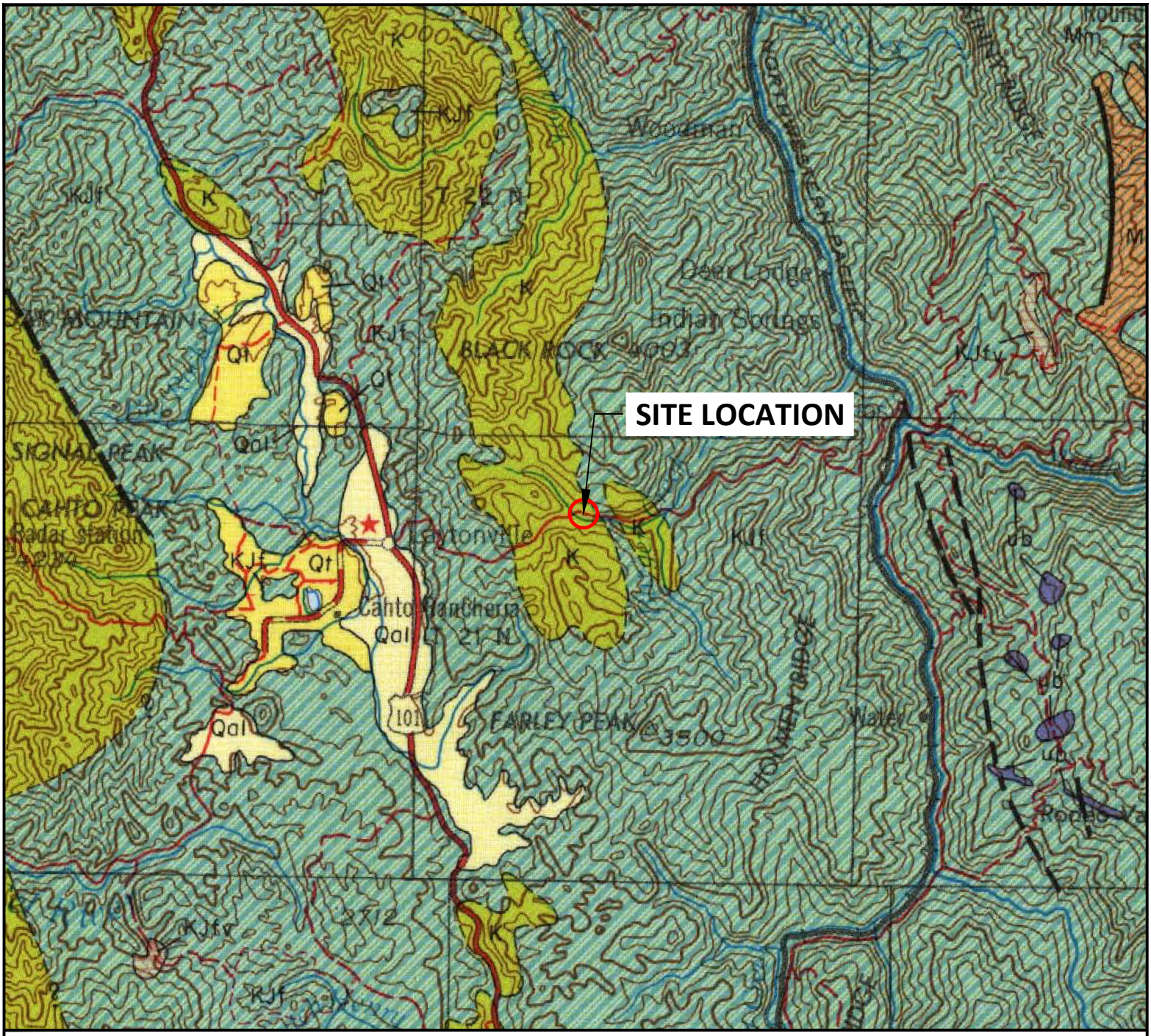
LAYTONVILLE DOS RIOS ROAD
(CR 322) FAILURE AT MP 3.66

LAYTONVILLE, MENDOCINO CO., CA

Figure 2
Exploration
Location Map

Prj. No:	16-337.10
Scale:	1" = 10'
Date:	12/15/2017

Path: \\psf\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.10 Laytonville Dos Rios Road (CR 322) at MP 3.34, 3.66, and 4.19\CAD\16-337.10-Figures-MP 3.66.dwg Plot Date: Mar 08, 2018 at 2:47pm



LEGEND

Geologic Formations

Qal — **Alluvium (Recent) -** *alluvial materials (sand, silt, clay); valley fill.*

K — **Undivided Marine Sedimentary Rocks (Cretaceous) -** *sandstone, shale, and conglomerate.*

KJf — **Franciscan Formation (Jurassic-Cretaceous) -** *sandstone, shale, chert, and conglomerate, with locally small areas of greenstone, limestone, basalt, schist, and related metamorphic rocks.*

CONTACT
(Dashed where approximately located, gradational or inferred)

FAULT
(Dashed where approximately located)

NORTH

Map Source:
Jennings, C.W. and Strand, R.G., 1960, Geologic Map of California, Ukiah Sheet, California Division of Mines and Geology, Scale 1:250,000

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GEOTECHNICAL INVESTIGATION
LAYTONVILLE DOS RIOS ROAD
(CR 322) FAILURE AT MP 3.66

LAYTONVILLE, MENDOCINO CO., CA

Figure 3
Regional Geologic Map

Prj. No:	16-337.10
Scale:	1" = 10,000'
Date:	12/15/2017

Path: \\psf\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.10 Laytonville Dos Rios Road (CR 322) at MP 3.34, 3.66, and 4.19\CAD\16-337.10-Figures-MP 3.66.dwg Plot Date: Mar 08, 2018 at 3:27pm

SEE FIGURE 4B FOR LEGEND

NORTH

Map Source:
Kilbourne, R.T., 1984, Geology and Geomorphic Features Related to Landsliding, Laytonville 7.5' Quadrangle, OFR 84-41, California Division of Mines and Geology, Scale 1:24,000

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GEOTECHNICAL INVESTIGATION
LAYTONVILLE DOS RIOS ROAD
(CR 322) FAILURE AT MP 3.66

LAYTONVILLE, MENDOCINO CO., CA

Figure 4A
Landslide and Geologic Map

Prj. No:	16-337.10
Scale:	1" = 2,000'
Date:	12/15/2017

Path: \\psf\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.10 Laytonville Dos Rios Road (CR 322) at MP 3.34, 3.66, and 4.19\CAD\16-337.10-Figures-MP 3.66.dwg Plot Date: Mar 08, 2018 at 3:38pm

TRANSLATIONAL/ROTATIONAL SLIDE: relatively cohesive slide mass with a failure plane that is deep-seated in comparison to that of a debris slide of similar areal extent; sense of motion along slide plane is linear in a translational slide and arcuate or "rotational" in a rotational slide; complex versions with rotational heads and translational movement or earthflows downslope are common; translational movement along a planar joint or bedding discontinuity may be referred to as a block glide; ↖ indicates scarp, ⟸ indicates direction of movement; dashed where dormant, queried where uncertain.

EARTHFLOW: mass movement resulting from slow to rapid flowage of saturated soil and debris in a semiviscous, highly plastic state; after initial failure, the flow may move, or creep, seasonally in response to destabilizing forces; ↖ indicates scarp, ⟵ indicates direction of movement; dashed where dormant, queried where uncertain.

DEBRIS SLIDE: unconsolidated rock, colluvium, and soil that has moved slowly to rapidly downslope along a relatively steep (generally greater than 65 percent), shallow translational failure plane; forms steep, unvegetated scars in the head region and irregular hummocky deposits (when present) in the toe region; scars likely to ravel and remain unvegetated for many years; revegetated scars recognized by steep, even-faceted slope and light-bulb shape; includes scarp and slide deposits; solid where active, dashed where dormant.

DEBRIS FLOW/TORRENT TRACK: long stretches of bare, generally unstable stream channel banks scoured and eroded by the extremely rapid movement of water-laden debris; commonly triggered by debris sliding in the upper part of the drainage during high intensity storms; scoured debris may be deposited downslope as a tangled mass of organic material in a matrix of rock and soil; debris may be reactivated or washed away during subsequent events; solid where active, dashed where dormant.

DEBRIS SLIDE SLOPE: geomorphic feature characterized by steep (generally greater then 65 percent), usually well vegetated slopes that have been sculpted by numerous debris slide events; vegetated soils and colluvium above shallow soil/bedrock interface may be disrupted by active debris slides or bedrock exposed by former debris sliding; slopes near angle repose may be relatively stable except where weak bedding planes and extensive bedrock joints and fractures parallel slope.

• ACTIVE SLIDE: too small to delineate at this scale.

DISRUPTED GROUND: irregular ground surface caused by complex landsliding processes resulting in features that are indistinquishable or too small to delineate individually at this scale; also may include areas affected by downslope creep, expansive soils, and/or gully erosion; boundaries usually are indistinct.

Q ALLUVIUM (Holocene): unconsolidated, fine-grained sand and silt along modern river flood plains; minor amounts of gravel in channel areas.

Qf ALLUVIAL FAN DEPOSITS (Holocene): fan-shaped deposits of unconsolidated, poorly sorted sand and gravel; found in lowlands at the mouths of steep drainage canyons; deposits may represent material transported by debris torrents.

Qo OLDER ALLUVIUM (Holocene-Pleistocene): flat-lying, compact but uncemented river and lake deposits ranging from boulder conglomerate and breccia to fine sand and silt; coarser facies more common at base along edge of deposit near contact with upland areas of Franciscan melange (fm).

mv VOLCANIC ROCKS: principally greenstone; includes altered diabase, pillow basalt, and volcanic breccia; chert is commonly mixed with the volcanics.

TKfs COASTAL BELT FRANCISCAN (Tertiary-Cretaceous): well consolidated, folded and fractured, clastic sedimentary rocks; includes arkosic sandstone, shale, and small amounts of pebble conglomerate; sandstones commonly are laumontized.

Kus WHITE ROCK SANDSTONE (Upper Cretaceous): deformed, but well consolidated; includes volcanic and quartz arenite, shale, and small amounts of pebble conglomerate; sandstones commonly are laumontized, massive units that develop steep slopes; boundaries slightly modified from White Rock unit of Gucwa (1974).

fm FRANCISCAN MELANGE (Tertiary-Cretaceous): pervasively sheared, argillaceous matrix surrounding pebble-size to individually mappable blocks of graywacke, greenstone, chert, conglomerate, serpentinite and serpentinized ultramafic rocks; the highly erodible, sheared shale matrix generally is very unstable in the Laytonville quadrangle and is prone to landsliding, even on gentle slopes; locally the melange is indistinquishable from fault gouge.

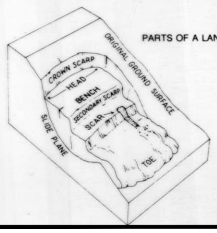
ls - limestone

um - serpentinite and ultramafic rocks

bs - glaucophane schist and blueschist

cg - conglomerate

sh - shale



KJfs FRANCISCAN CENTRAL BELT SEDIMENTARY ROCKS (Cretaceous-Jurassic): large, well consolidated blocks of graywacke, siltstone, mudstone, conglomerate, and small amounts of greenstone surrounded by a sheared clayey matrix; on the Laytonville and Iron Peak quadrangles this unit is lithologically the same as the Eel River melange of Gucwa (1974), but is considered to be gradational with, and less sheared than, typical melange.

LITHOLOGIC CONTACT: dashed where approximately located.

ROCK OUTCROP: too small to delineate boundaries at this scale.

FAULT: dashed where approximately located, dotted where concealed or inferred; letters (U=Up, D=Down) and arrows indicate sense of movement; usually associated with highly sheared, landslide-prone fault gouge.

SHEAR ZONE: fault zone without distinctive mappable fault trace; landslide prone.

LINEAMENT: linear feature of unknown origin observed on aerial photographs; usually associated with erodible rock units.

35 STRIKE AND DIP OF BEDDING

APPROXIMATE STRIKE AND DIP OF BEDDING: appears without numerical designation or dip angle.

STRIKE OF VERTICAL BEDDING

56 STRIKE AND DIP OF FAULT PLANE

14 STRIKE AND DIP OF FOLIATION

SPRING

MARSH OR SMALL POND

QUARRY OR BORROW PIT

REFERENCES

California Department of Forestry, 1981, Cal Aero Photos: Photos CDF-ALL-UK; Flight 6/30/81; Frames 20-9 to 20-14, 22-8 to 22-14, 24-9 to 24-15, and 26-10 to 26-16; black and white, scale 1:24,000.

California Division of Mines and Geology, 1983, Official Map of Special Studies Zones, Laytonville quadrangle: Scale 1:24,000.

California Division of Mines and Geology, 1976-1984, Geologic review of Timber Harvesting Plans: Unpublished field studies conducted for the California Department of Forestry.

Gucwa, P.R., 1974, Geology of the Covelo/Laytonville area, northern California: University of Texas at Austin, unpublished Ph.D. thesis, 82 pages, map scale 1:62,500.

Kilbourne, R.T., 1984, Geology and geomorphic features related to landsliding, Iron Peak 7.5' quadrangle, Mendocino County, California: California Department of Conservation, Division of Mines and Geology, Open File Report 84-40 PH, scale 1:24,000.

Kilbourne, R.T., 1983, Geology and geomorphic features related to landsliding, Cahto Peak 7.5' quadrangle, Mendocino County, California: California Division of Mines and Geology, Open File Report 83-39 SF, scale 1:24,000.

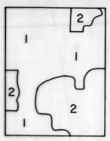
Kilbourne, R.T., 1984, Geology and geomorphic features related to landsliding, Longvale 7.5' quadrangle, Mendocino County, California: California Division of Mines and Geology, Open File Report 84-18 SF, scale 1:24,000.

SOURCES OF GEOLOGIC DATA

Geologic data were compiled from aerial photo interpretation, field reconnaissance, and the modification of unpublished geologic data from references listed above. The author was assisted in the field and office studies by Dan Trumbly and Lydia Lofgren.

1. Mapping from aerial photo interpretation, previously existing geologic data, and reconnaissance level field work.

2. Mapping from aerial photo interpretation and previously existing geologic data.



ACTIVITY OF LANDSLIDES

Active or probably active - presently moving or recently moved. Distinct topographic slide features present, i.e., sharp barren scarps, cracks, jackstrawed trees. Major revegetation has not occurred.

Dormant - little evidence of recent movement. Slide features modified by weathering and erosion. Vegetation generally well established. Some mass movements may have developed under climatic conditions different from today. Causes of failure may remain and movement could be renewed.

RATES OF LANDSLIDE MOVEMENT*

10 ft/sec or more	= extremely rapid
1 ft/min-10 ft/sec	= very rapid
5 ft/day-1 ft/mn	= rapid
5 ft/mo-5 ft/day	= moderate
5 ft/yr-5 ft/mo	= slow
1 ft/5yr-5 ft/yr	= very slow
1 ft/5yr or less	= extremely slow

*Modified from: Varnes, D.J., 1978, Slope movement types and processes. *in* Landslides: Analysis and Control, Transportation Research Board, National Academy of Sciences, Washington, D.C., Special Report 176, Figure 2.1.

SEE FIGURE 4A FOR MAP

NORTH

Map Source:
Kilbourne, R.T., 1984, Geology and Geomorphic Features Related to Landsliding, Laytonville 7.5' Quadrangle, OFR 84-41, California Division of Mines and Geology, Scale 1:24,000

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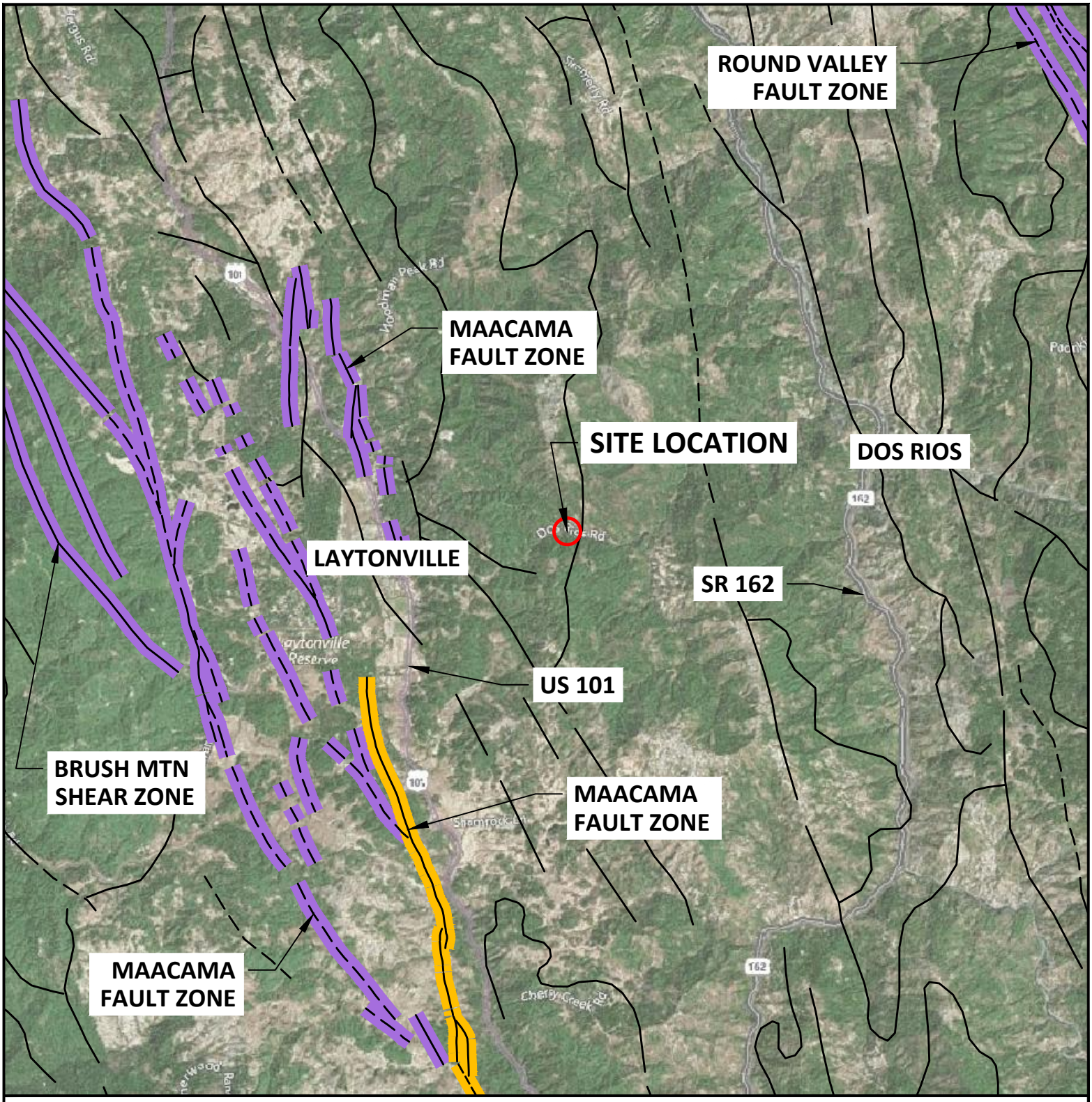
GEOTECHNICAL INVESTIGATION
LAYTONVILLE DOS RIOS ROAD
(CR 322) FAILURE AT MP 3.66

LAYTONVILLE, MENDOCINO CO., CA

Figure 4B
Landslide and Geologic Map

Prj. No: 16-337.10
Scale: N/A
Date: 12/15/2017

Path: \\psf\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.10 Laytonville Dos Rios Road (CR 322) at MP 3.34, 3.66, and 4.19\CAD\16-337.10-Figures-MP 3.66.dwg Plot Date: Mar 08, 2018 at 6:06pm



LEGEND

CGS Faults (Last Activity Age)

- <200 years (Historic)
- <11,700 years (Holocene)
- <700,000 years (Late Quaternary)

CGS Faults (Last Activity Age)

- <1.6 million years (Quaternary)
- >1.6 million years (Pre-Quaternary)

Fault Location

- Certain
- Approx. or Inferred
- Concealed

NORTH

Map and Data Sources:

1. Basemap via AutoCAD Civil 3D geolocation tool

2. Fault data via CGS Fault Activity Map of California 2010 GIS data

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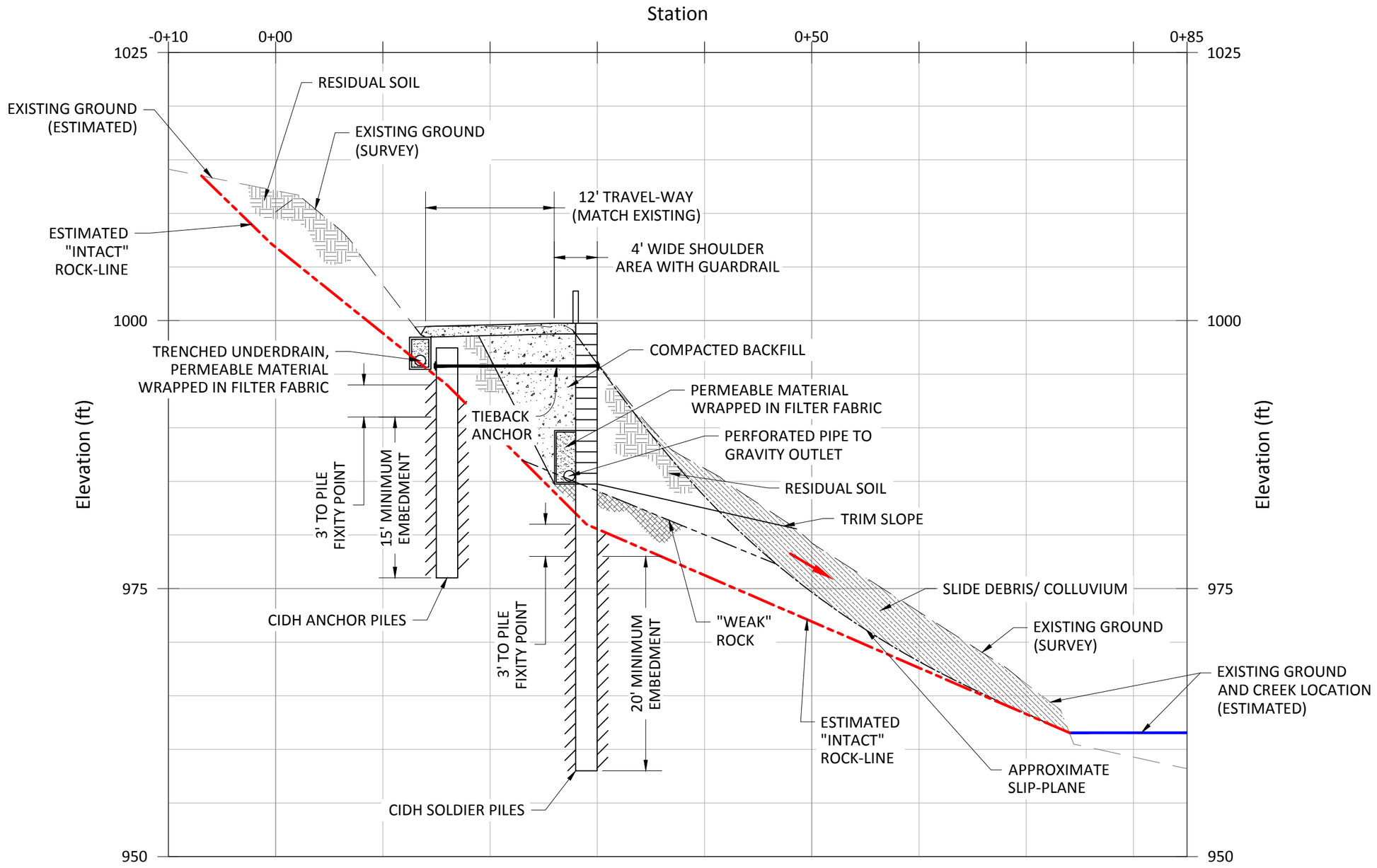
GEOTECHNICAL INVESTIGATION
LAYTONVILLE DOS RIOS ROAD
(CR 322) FAILURE AT MP 3.66

LAYTONVILLE, MENDOCINO CO., CA

Figure 5
Fault Activity Map

Prj. No: 16-337.10
Scale: 1" = 10,000'
Date: 12/15/2017

Path: \\psf\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.10 Laytonville Dos Rios Road (CR 322) at MP 3.34, 3.66, and 4.19\CAD\16-337.10-Figures-MP 3.66.dwg Plot Date: Mar 13, 2018 at 5:41pm



Profile of Section A

NORTH

Data Source:
Existing Topography provided by MCDOT via electronic transfer on 10/31/2017. Survey completed by MCDOT.

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GEOTECHNICAL INVESTIGATION
LAYTONVILLE DOS RIOS ROAD
(CR 322) FAILURE AT MP 3.66

LAYTONVILLE, MENDOCINO CO., CA

Figure 6
Typical Section of Soldier Pile Tieback Wall

Prj. No: 16-337.10
Scale: 1" = 10'
Date: 03/08/2018

Path: \\psf\Home\Box\Projects\16-337.X Mendocino 2016 Quadrennial Support Project\16-337.10 Laytonville Dos Rios Road (CR 322) at MP 3.34, 3.66, and 4.19\CAD\16-337.10-Figures-MP 3.66.dwg Plot Date: Mar 13, 2018 at 2:09pm

APPENDIX A

BORING LOG LEGEND
BORING LOGS

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435)
CL	Collapse Potential (ASTM D 4546)
CP	Compaction Curve (CTM 216)
CR	Corrosion, Sulfates, Chlorides (CTM 643, CTM 417, CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
DR	Drained Residual Shear Strength (ASTM D 6467)
DS	Direct Shear (ASTM D 3080)
EI	Expansion Index (ASTM D 4829)
M	Moisture Content (ASTM D 2216)
OC	Organic Content (ASTM D 2974)
P	Permeability (CTM 220)
PA	Particle Size Analysis (ASTM D 422)
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89, AASHTO T 90)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T 100)
SW	Swell Potential (ASTM D 4546)
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 7012-C)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 7263)

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler (ID 2.5 in.)
- Modified California Sampler (ID 2.0 in.)
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010) with Errata Sheet (2015).

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Boring Record Legend

Soil Legend

CONSISTENCY OF COHESIVE SOILS				
Descriptor	**Unconfined Compressive Strength (tsf)**	**Pocket Penetrometer (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS	
Descriptor	**SPT N_{60} (blows / 12 inches)**
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

MOISTURE	
Descriptor	**Criteria**
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS	
Descriptor	**Criteria**
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE		
Descriptor		**Size**
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS	
Descriptor	**Criteria**
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION	
Descriptor	**Criteria**
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

ROCK GRAPHIC SYMBOLS


IGNEOUS ROCK


SEDIMENTARY ROCK


METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 ft - 10 ft
Thickly bedded	1 ft - 3 ft
Moderately bedded	4 in - 1 ft
Thinly bedded	1 in - 4 in
Very thinly bedded	1/4 in - 1 in
Laminated	< 1/4 in

WEATHERING DESCRIPTORS FOR INTACT ROCK

	Diagnostic Features					
	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		
Descriptor	Body of Rock	Fracture Surfaces		Texture	Solutioning	General Characteristics
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull	Minor to complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened.
Decomposed	Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregated)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

Note: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

PERCENT CORE RECOVERY (REC)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

ROCK QUALITY DESIGNATION (RQD)

$$\frac{\Sigma \text{ Length of intact core pieces} > 4 \text{ in.}}{\text{Total length of core run (in.)}} \times 100$$

Note: RQD* indicates soundness criteria not met

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/16 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light manual pressure.

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Core lengths greater than 3 ft.
Slightly Fractured	Core lengths mostly from 1 ft. to 3 ft.
Moderately Fractured	Core lengths mostly from 4 in. to 1 ft.
Intensely Fractured	Core lengths mostly from 1 in. to 4 in.
Very Intensely Fractured	Mostly chips and fragments.

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).

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Boring Record Legend

Rock Legend

LOG OF BORING B1

PROJECT NO: 16-337.10
PROJECT: Laytonville Dos Rios Rd. MP 3.66
LOCATION: L.D.R. Rd. (CR 322), Laytonville
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: EET
DEPTH OF BORING: 38.04 (ft)

BEGIN DATE: 1/17/18
COMPLETION DATE: 1/17/18
SURFACE ELEVATION: 998.6 (ft)*
SURFACE CONDITION: Dirt/Gravel
WATER DEPTH: 26.5 (ft)
READING TAKEN: 1/17/18
HAMMER EFFICIENCY: 80 (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
DRILLING METHOD: Hollow-Stem Auger (6" OD, 2.25" ID)
DRILL RIG: Deeprock - DR5K (Truck)
HAMMER TYPE: Automatic, 140 lbs, 30" drop
SAMPLER TYPE & SIZE: SPT (ID 1.4")
BOREHOLE DIAMETER: 6"
BACKFILL METHOD: Type II-V Portland Cement

ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: LIQUID LIMIT	LABORATORY: PLASTIC LIMIT	LABORATORY: MOISTURE (%)	LABORATORY: D. DENSITY (PCF)	LABORATORY: % PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
998	1							CLAYEY SAND (SC); brown; moist; trace GRAVEL; coarse to fine SAND; medium plasticity fines [FILL].										
	2		0						100		38	21			29			
996	3																	
	4																	
994	5		1	8 5 3	8	1.75 3.50		Loose to medium dense.	64				7.6	104				
	6																	
992	7																	
	8							CLAYEY SAND (SC); medium dense; grayish brown; moist; with fragments of intensely weathered rock [RESIDUAL SOIL].										
990	9																	
	10		2	6 6 8	14	2.00			89				15.8	110.9	43			
988	11																	
	12																	
986	13							SANDY lean CLAY (CL); very stiff; brown with orange; moist; trace GRAVEL; about 40 to 50% medium to fine SAND.										
	14																	
984	15		3	6 5 23	28	2.50			89				15.4 14.6	115.9 111.8				
	16							SEDIMENTARY ROCK (SANDSTONE), gray, decomposed, moist, clayey gravel matrix [UNDIVIDED MARINE FORMATION].										
982	17																	
	18																	
980	19																	
	20		4	58/6"	REF	4.00		Brownish gray, very intensely weathered.	100				7.6	124.7				
978	21																	
	22																	
976	23																	

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ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD / CASING DEPTH	REMARKS
								SEDIMENTARY ROCK (Sandstone) *(continued)*.									
974	25		5	50/6"	REF	>4.50		Dark gray and white, intensely to moderately weathered, interbedded with decomposed rock.	100				3.6	115.6			
972	26																
	27																
	28							SEDIMENTARY ROCK (SHALE), black, intensely weathered, dry to moist.									
970	29																
	30		6	50/1"	REF				50								
968	31																
	32																
966	33																
	34																
964	35		7	50/1"	REF				0								Initial groundwater at 35' Drill rig "chatter", slow drilling at 35.5'
	36																
962	37							SEDIMENTARY ROCK (GRAYWACKE), dark gray, intensely to moderately weathered, wet.									
	38		8	50/0.5"	REF			Bottom of borehole at 38.0 ft bgs	100								Auger refusal at 38', 1/2 of auger bit completely worn down
960	39							Backfilled with 94lbs bags of portland cement grout (mix 6 bags/60 gal. water)									
	40							*Elevation Reference: CP 1, Elev. 1000.00 feet per MCDOT topographic survey									
958	41																
	42																
956	43																
	44																
954	45																
	46																
952	47																
	48																
950	49																
	50																
948	51																
	52																
946	53																

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PROJECT NUMBER: 16-337.10
PROJECT: Laytonville Dos Rios Rd. MP 3.66
BORING: B1
ENTRY BY: RRH
CHECKED BY: RDS

LOG OF BORING B2

PROJECT NO: 16-337.10
PROJECT: Laytonville Dos Rios Rd. MP 3.66
LOCATION: L.D.R. Rd. (CR 322), Laytonville
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: EET
DEPTH OF BORING: 40.17 (ft)

BEGIN DATE: 1/16/18
COMPLETION DATE: 1/16/18
SURFACE ELEVATION: 999.5 (ft)*
SURFACE CONDITION: Dirt/Gravel
WATER DEPTH: 40 (ft)
READING TAKEN: 1/16/18
HAMMER EFFICIENCY: 80 (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
DRILLING METHOD: Hollow-Stem Auger (6" OD, 2.25" ID)
DRILL RIG: Deeprock - DR5K (Truck)
HAMMER TYPE: Automatic, 140 lbs, 30" drop
SAMPLER TYPE & SIZE: SPT (ID 1.4")
BOREHOLE DIAMETER: 6"
BACKFILL METHOD: Type II-V Portland Cement

ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: LIQUID LIMIT	LABORATORY: PLASTIC LIMIT	LABORATORY: MOISTURE (%)	LABORATORY: D. DENSITY (PCF)	LABORATORY: % PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
			0					Lean CLAY (CL); dark gray; moist; trace GRAVEL; about 10% SAND; medium plasticity fines [FILL].	100		29	14						Chemical Analysis pH = 6.14 Min. Res. = 1370 ohm-cm Chloride = 30.5 ppm Sulfate = 42.0 ppm
998	1																	
	2																	
	3																	
996	4							Brown.										
	5							SEDIMENTARY ROCK (SANDSTONE), light brown, very intensely weathered, dry, 70% clay [UNDIVIDED MARINE FORMATION].										
994	6		1	36 54/6"	54/6	2.75			83				2.6	88.7				Drill rig "chatter" at 6'
	7																	
992	8																	
	9																	
990	10		2	14 11 11	22	0.75 >4.50		Reddish brown, moist. Light gray, intensely weathered, dry to moist.	39				7.9					
	11																	
988	12																	
	13																	
986	14																	
	15		3	13 27 50	77	>4.50		Reddish brown, decomposed, moist, 30% clay. Brown and gray, intensely weathered, moist.	89				6.6	126				Unconfined Comp. Test UC = 1483 psf
984	16																	
	17																	
982	18																	
	19																	
980	20		4	50/2"	REF			Dry to moist.	50									
	21																	
978	22																	
	23																	
976																		

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ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
								SEDIMENTARY ROCK (Sandstone) *(continued)*.										
974	25		5	50/2"	REF				0									Drill rig "chatter" at 25'
972	27																	
970	29																	
	30		6	50/1"	REF				0									
968	31																	
966	33																	
964	35																	
962	37																	
960	39																	
	40		7	50/2"	REF			Bottom of borehole at 40.2 ft bgs	0									Auger refusal at 40', initial groundwater at sampler tip
958	41																	
956	43																	
954	45																	
952	47																	
950	49																	
948	51																	
	53																	

Backfilled with 94lbs bags of portland cement grout (mix 5 bags/50 gal. water)

*Elevation Reference: CP 1, Elev. 1000.00 feet per MCDOT topographic survey

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PROJECT NUMBER: 16-337.10
PROJECT: Laytonville Dos Rios Rd. MP 3.66
BORING: B2
ENTRY BY: RRH
CHECKED BY: RDS

LOG OF BORING B3

PROJECT NO: 16-337.10
PROJECT: Laytonville Dos Rios Rd. MP 3.66
LOCATION: L.D.R. Rd. (CR 322), Laytonville
CITY/COUNTY: Mendocino
CLIENT: MCDOT
LOGGED BY: EET
DEPTH OF BORING: 50.21 (ft)

BEGIN DATE: 1/16/18
COMPLETION DATE: 1/16/18
SURFACE ELEVATION: 1000.3 (ft)*
SURFACE CONDITION: Dirt/Gravel
WATER DEPTH: Not Encountered (ft)
READING TAKEN: 1/16/18
HAMMER EFFICIENCY: 80 (%)

DRILLING CONTRACTOR: Clear Heart Drilling, Inc.
DRILLING METHOD: Hollow-Stem Auger (6" OD, 2.25" ID)
DRILL RIG: Deeprock - DR5K (Truck)
HAMMER TYPE: Automatic, 140 lbs, 30" drop
SAMPLER TYPE & SIZE: SPT (ID 1.4")
BOREHOLE DIAMETER: 6"
BACKFILL METHOD: Type II-V Portland Cement

ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LABORATORY: LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
1000	0		0					CLAYEY GRAVEL (GC); brown; fine GRAVEL; about 5% fine SAND; medium plasticity fines [FILL].	100						41			
998	2																	
996	4							Lean CLAY (CL); hard; variegated brown, light brown, reddish brown; dry to moist; about 10% fine SAND; medium plasticity fines [RESIDUAL SOIL].										
994	6		1	8 7 9	16	>4.50			39				13.2	96.4				
992	8																	
990	10		2	8 19 36	55	>4.50		Trace GRAVEL.	89				11.1	95.3				
988	12					4.00		SEDIMENTARY ROCK (SANDSTONE), brown, decomposed, dry to moist, fractured rock fragments in clay matrix [UNDIVIDED MARINE FORMATION].										
986	14																	
984	16		3	10 8 8	16	>4.50		Tan with orange.	72				9.5	105.8				
982	18																	
980	20		4	44 28 37	65	>4.50 4.50 >4.50		SEDIMENTARY ROCK (SANDSTONE), light gray with dark gray and pale pink, intensely weathered, dry. Brown, decomposed, moist. Dark gray, intensely weathered, dry.	89				6	112.1				Driller reports "intact" rock at 19'
978	22																	
	23							SEDIMENTARY ROCK (SHALE), black, intensely weathered, dry to moist.										

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PROJECT NUMBER: 16-337.10
PROJECT: Laytonville Dos Rios Rd. MP 3.66
BORING: B3
ENTRY BY: RRH
CHECKED BY: RDS

ELEV (ft)	DEPTH (ft)	SAMPLE	SAMPLE NO	BLOWS PER 6 INCH	BLOWS PER FOOT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	RECOVERY(%)	RQD (%)	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE (%)	D. DENSITY (PCF)	% PASSING 200 SIEVE	DRILL METHOD	CASING DEPTH	REMARKS
				FIELD							LABORATORY							
976								SEDIMENTARY ROCK (Shale) *(continued)*.										
	25	X	5	50/5"	REF	4.00			100				2.7	115.7				
974	26																	
	27																	
972	28							SEDIMENTARY ROCK (GRAYWACKE), gray, intensely weathered, dry to moist.										
	29																	
970	30	X	6	50/5.5"	REF	>4.50		SEDIMENTARY ROCK (SHALE), black, intensely weathered, dry.	100				2.7	122.6				
	31																	
968	32																	
	33																	
966	34																	
	35	X	7	8	66/9			Very intensely weathered, moist.	100									
	36			16 50/3"		2.5 >4.50		SEDIMENTARY ROCK (GRAYWACKE), dark gray, intensely to moderately weathered, dry to moist.					3.1	126.8				Unconfined Comp. Test UC = 2506 psf Driller reports hard rock starting at 36'
964	37																	
	38																	
962	39																	
	40		8	50/0.5"	REF				0									Drill rig "chatter" at 40'
960	41																	
	42																	
958	43																	
	44																	
956	45																	
	46																	
954	47																	
	48																	
952	49																	
	50	X	9	50/2.5"	REF			Intensely weathered.	100									
950	51							Bottom of borehole at 50.2 ft bgs										
	52							Backfilled with 94lbs bags of portland cement grout (mix 7 bags/70 gal. water)										
948	53							*Elevation Reference: CP 1, Elev. 1000.00 feet per MCDOT topographic survey										

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PROJECT NUMBER: 16-337.10
PROJECT: Laytonville Dos Rios Rd. MP 3.66
BORING: B3
ENTRY BY: RRH
CHECKED BY: RDS SHEET 2 of 2

APPENDIX B

LABORATORY AND FIELD TEST RESULTS SUMMARY

Job: **Laytonville Dos Rios Road (CR 322) MP 3.66**
Job No: **16-337.10**
Date: **3/1/18**

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Laboratory and Field Test Summary

	Boring I.D.	Sample I.D.	Sample Depth (ft)	USCS Class.	Field Blows N (bpf)	SPT Blows N_{60} (bpf)	Moisture/Density			Classification						Strength		Chemical Analysis			
							Dry Density (pcf)	Moist. Content (%)	In-Situ Density (pcf)	Atterberg Limits			Gravel (%)	Sand (%)	Fines (%)	Pocket Pent. (tsf)	Uncon. Comp. (psf)	pH	Minimum Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
										Liquid Limit	Plastic Limit	Plasticity Index									
Road-level Borings	B1	BULK	2.0	SC	N/A	N/A				38	21	17			29						
	B1	1	5.5	SC	8	11	104.0	7.6	111.9							1.75 - 3.50					
	B1	2	10.8	SC	14	19	110.9	15.8	128.4						43	2.00					
	B1	3B	15.3	CL	28	37	115.9	15.4	133.7												
	B1	3A	15.8	ROCK			111.8	14.6	128.1							2.50					
	B1	4	20.0	ROCK	REF	REF	124.7	7.6	134.2							4.00					
	B1	5	25.0	ROCK	REF	REF	115.6	3.6	119.8							+4.50					
	B1	6	30.0	ROCK	REF	REF															
	B1	7	35.0	ROCK	REF	REF															
	B1	8	38.0	ROCK	REF	REF															
	B2	BULK	0.0	CL	N/A	N/A				29	14	15						6.14	1,370	30.5	42.0
	B2	1	5.4	ROCK	54/6"	54/6"	88.7	2.6	91.0							2.75					
	B2	2	10.0	ROCK	22	29		7.9								0.75 - +4.50					
	B2	3	15.0	ROCK	77	103	126.0	6.6	134.3							+4.50	1,483				
	B2	4	20.0	ROCK	REF	REF															
	B2	5	25.0	ROCK	REF	REF															
	B2	6	30.0	ROCK	REF	REF															
	B2	7	40.0	ROCK	REF	REF															
	B3	BULK	0.0	GC	N/A	N/A									41						
	B3	1	5.0	CL	16	21	96.4	13.2	109.1							+4.50					
	B3	2	10.0	CL	55	73	95.3	11.1	105.9							4.00 - +4.50					
	B3	3	15.5	ROCK	16	21	105.8	9.5	115.9							+4.50					
	B3	4	20.8	ROCK	65	87	112.1	6.0	118.8							+4.50					
	B3	5	25.0	ROCK	REF	REF	115.7	2.7	118.8							4.00					
	B3	6	30.0	ROCK	REF	REF	122.6	2.7	125.9							+4.50					
	B3	7	35.8	ROCK	66/9"	66/9"	126.8	3.1	130.7							2.50 - +4.50	2,506				
	B3	8	40.0	ROCK	REF	REF															
	B3	9	50.0	ROCK	REF	REF															

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Project Name: Laytonville Dos Rios Road at MP 3.66
CAInc File No: 16-337.10
Date: 2/25/18
Technician: CAP/KE/AS/ETT

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B1-1	B1-2	B1-3B	B1-3A	B1-4
USCS Symbol	SC	SC	SC	SC	Rock
Depth (ft.)	5.5	10.8	15.3	15.8	20
Sample Length (in.)	4.864	5.961	5.277	5.276	3.483
Diameter (in.)	1.415	1.413	1.412	1.404	1.416
Sample Volume (ft^3)	0.00443	0.00541	0.00478	0.00473	0.00317
Total Mass Soil+Tube (g)	350.2	439.5	413.8	396.3	318.0
Mass of Tube (g)	125.6	124.4	123.8	121.5	124.8
Tare No.	B8	P2	E4	C5	G3
Tare (g)	14.0	126.9	13.7	13.9	20.6
Wet Soil + Tare (g)	66.6	336.6	68.9	75.8	79.2
Dry Soil + Tare (g)	62.9	308.0	61.5	67.9	75.0
Dry Soil (g)	48.9	181.1	47.8	54.0	54.4
Water (g)	3.7	28.6	7.4	7.9	4.1
Moisture (%)	**7.6**	**15.8**	**15.4**	**14.6**	**7.6**
Dry Density (pcf)	**104.0**	**110.9**	**115.9**	**111.8**	**124.7**

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Laytonville Dos Rios Road at MP 3.66
CAInc File No: 16-337.10
Date: 2/25/18
Technician: CAP/KE/AS/ETT

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B1-5	B2-1	B2-2	B2-3	B3-1
USCS Symbol	Rock	Rock	Rock	Rock	Rock
Depth (ft.)	25	5.4	10	15	5
Sample Length (in.)	5.474	5.273		3.238	5.445
Diameter (in.)	1.410	1.445		1.381	1.392
Sample Volume (ft^3)	0.00495	0.00500		0.00281	0.00480
Total Mass Soil+Tube (g)	389.3	343.1		171.0	367.3
Mass of Tube (g)	120.6	136.5		0.0	129.9
Tare No.	A3	A1	E8	H13	G19
Tare (g)	13.7	13.7	20.9	13.4	13.7
Wet Soil + Tare (g)	73.7	74.5	83.7	70.7	53.8
Dry Soil + Tare (g)	71.6	72.9	79.1	67.1	49.1
Dry Soil (g)	58.0	59.2	58.2	53.7	35.5
Water (g)	2.1	1.5	4.6	3.5	4.7
Moisture (%)	**3.6**	**2.6**	**7.9**	**6.6**	**13.2**
Dry Density (pcf)	**115.6**	**88.7**	**NA**	**126.0**	**96.4**

Notes:

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MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B3-2	B3-3	B3-4	B3-5	B3-6
USCS Symbol	Rock	Rock	Rock	Rock	Rock
Depth (ft.)	10	15.5	20.8	25.5	30
Sample Length (in.)	5.410	4.717	4.935	5.399	5.799
Diameter (in.)	1.410	1.424	1.413	1.399	1.388
Sample Volume (ft^3)	0.00489	0.00435	0.00448	0.00480	0.00508
Total Mass Soil+Tube (g)	371.4	354.8	375.4	386.4	425.2
Mass of Tube (g)	136.6	126.4	133.9	127.6	135.2
Tare No.	H1	C15	A14	D12	A2
Tare (g)	13.5	13.7	13.7	13.7	13.7
Wet Soil + Tare (g)	62.2	50.5	76.9	80.3	94.6
Dry Soil + Tare (g)	57.3	47.3	73.3	78.6	92.5
Dry Soil (g)	43.8	33.6	59.6	64.9	78.8
Water (g)	4.8	3.2	3.6	1.8	2.1
Moisture (%)	**11.1**	**9.5**	**6.0**	**2.7**	**2.7**
Dry Density (pcf)	**95.3**	**105.8**	**112.1**	**115.7**	**122.6**

Notes:

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Date: 2/25/18
Technician: CAP/KE/AS/ETT

MOISTURE-DENSITY TESTS - D2216

	1	2	3	4	5
Sample No.	B3-7				
USCS Symbol	Rock				
Depth (ft.)	35.75				
Sample Length (in.)	3.313				
Diameter (in.)	1.430				
Sample Volume (ft^3)	0.00308				
Total Mass Soil+Tube (g)	182.6				
Mass of Tube (g)	0.0				
Tare No.	D16				
Tare (g)	13.8				
Wet Soil + Tare (g)	78.7				
Dry Soil + Tare (g)	76.7				
Dry Soil (g)	62.9				
Water (g)	2.0				
Moisture (%)	**3.1**				
Dry Density (pcf)	**126.8**				

Notes:

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Laytonville Dos Rios Road at MP 3.66
CAInc File No: 16-337.10
Date: 2/22/18
Technician: ETT

200 Wash - ASTM D1140
Method A

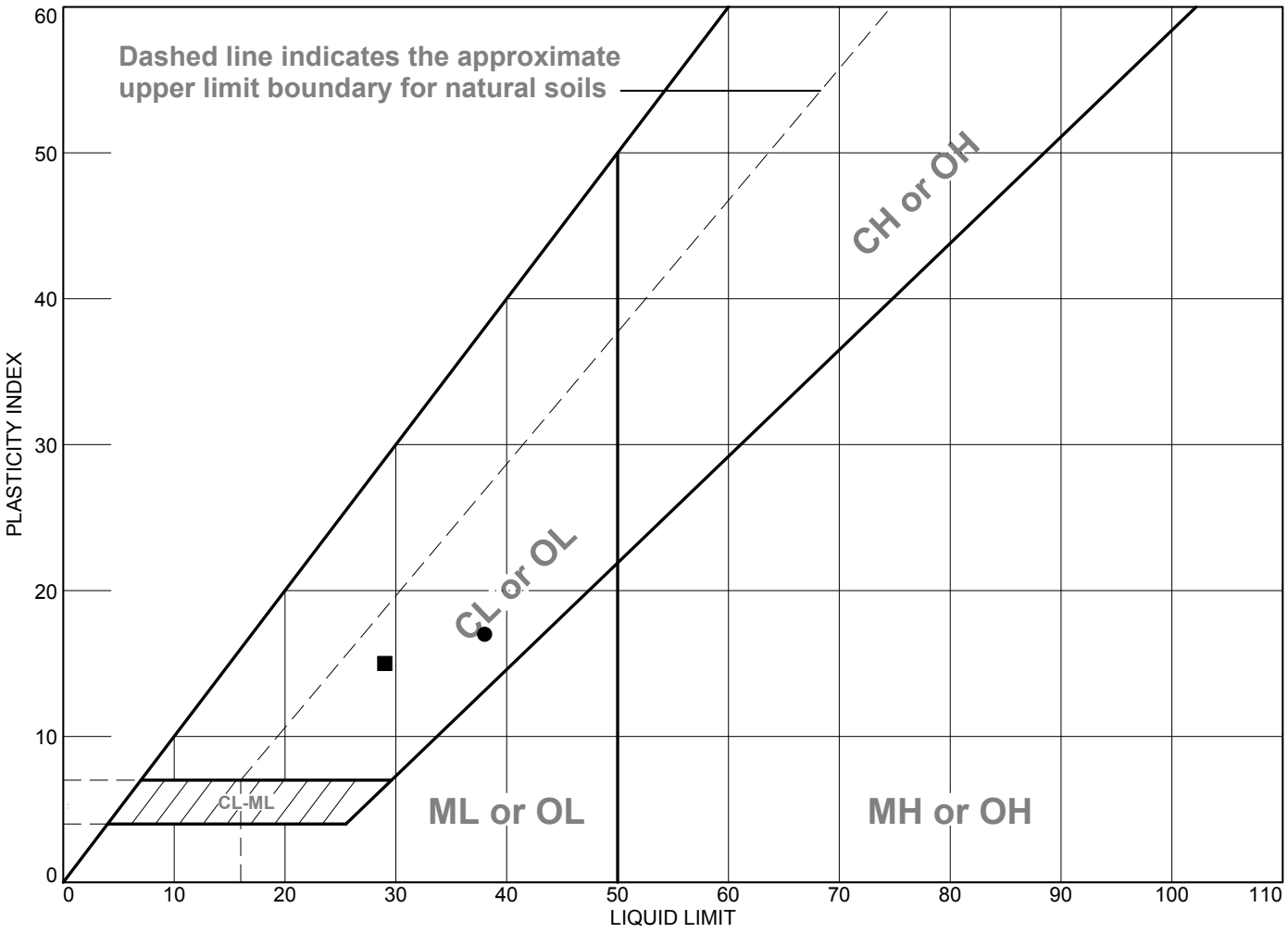
Max Particle Size (100% Passing)	Standard Sieve Size	Recommended Min Mass of Test Specimens
2 mm or less	No. 10	20 g
4.75 mm	No. 4	100 g
9.5 mm	3/8 "	500 g
19.0 mm	3/4 "	2.5 kg
37.5 mm	1 1/2 "	10 kg
75.0 mm	3 "	50 kg

Table from 6.2 of ASTM D1140

Sample No.	B1 Bulk	B1-2	B3 Bulk		
USCS Symbol	SC	SC	SC		
Depth (ft.)	2-4	10.8	0-2		
Tare No.	P18	P2	R13		
Tare (g)	128.8	126.9	129.8		
Dry Soil + Tare (g)	313.3	308	304.7		
Dry Mass before (g)	184.5	181.1	174.9		
Dry Mass after (g)	131.8	102.6	102.9		
Percent Fines (%)	29	43	41		

Notes:

LIQUID AND PLASTIC LIMITS TEST REPORT



	Material Description	Sampled	Tested	Technician	LL	PL	PI	%<#40	USCS
○			2/21/18	AST	38	21	17		
□			2/21/18	AST	29	14	15		

Project No. S9763-05-112 **Client:** Crawford and Associates

Project: Crawford 16-337.10

○ **Location:** Dos Rios Road MP 3.66 **Sample Number:** B1-Bulk

□ **Location:** Dos Rios Road MP 3.66 **Sample Number:** B2-Bulk

GEOCON CONSULTANTS, INC.

Checked by: MR

Title: Lab Manager

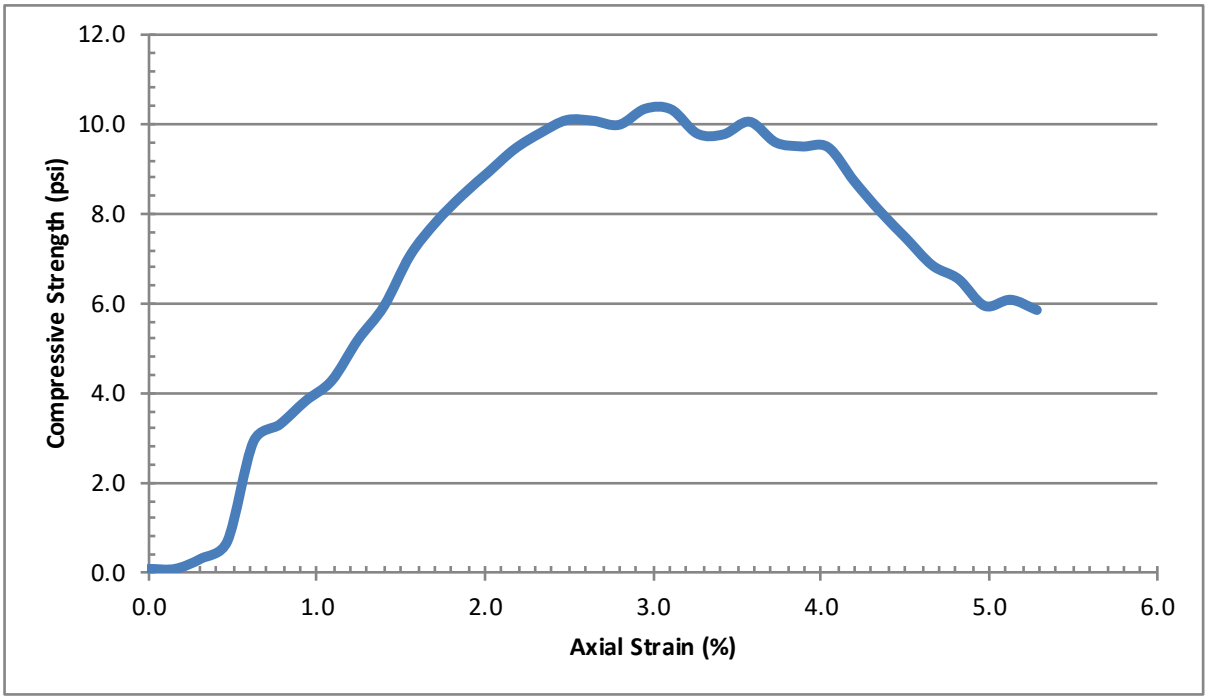
Figure

Tested By: AST **Checked By:** MR

Crawford & Associates, Inc.
Geotechnical Engineering, Design and Construction Services

Project Name: Laytonville Dos Rios Road at MP 3.66
CAInc File No: 16-337.10
Date: 2/20/18
Technician: MEA
Sample ID: B2-3 Depth (ft): 15.0
USCS Classification: Rock

UNCONFINED COMPRESSION TEST - D2166



Dry Density (pcf)	**126.0**
Water Content (%)	**6.6**
Unconfined Compressive Strength (psi)	**10.3**
Unconfined Compressive Strength (psf)	**1483**
Shear Strength (psf)	**741.6**
Average Height (in)	3.238
Average Diameter (in)	1.381
Rate of strain (%)	1.0
Strain at Failure (%)	3.0

Notes:

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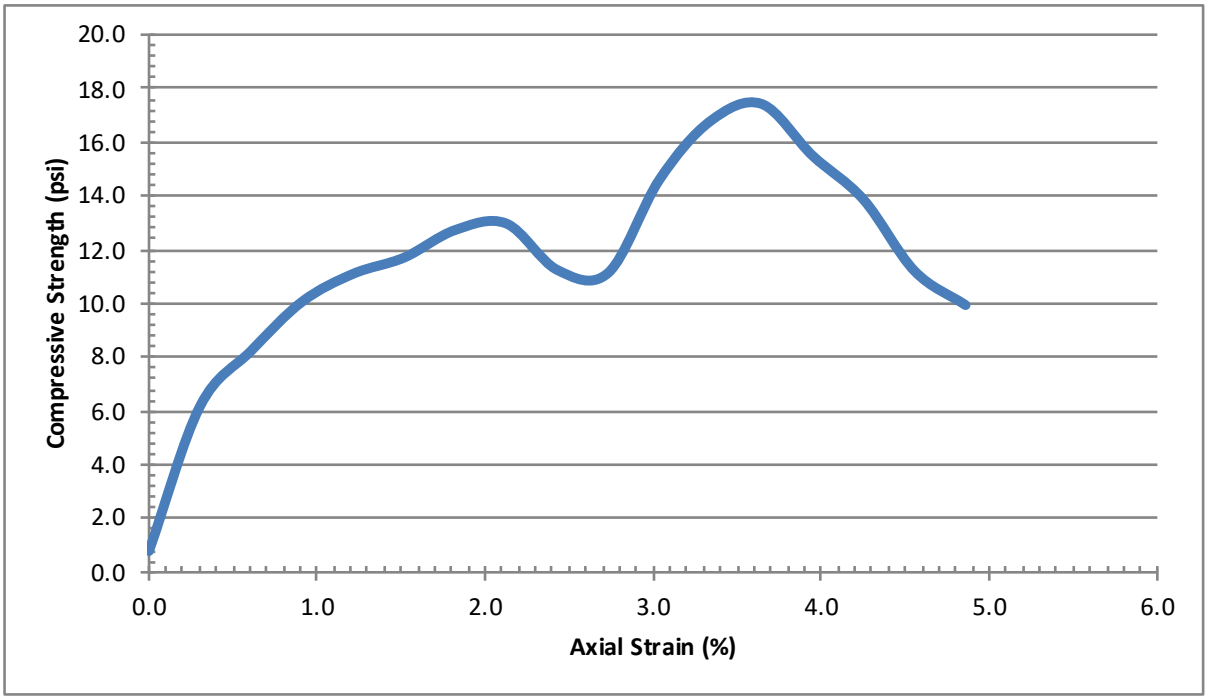
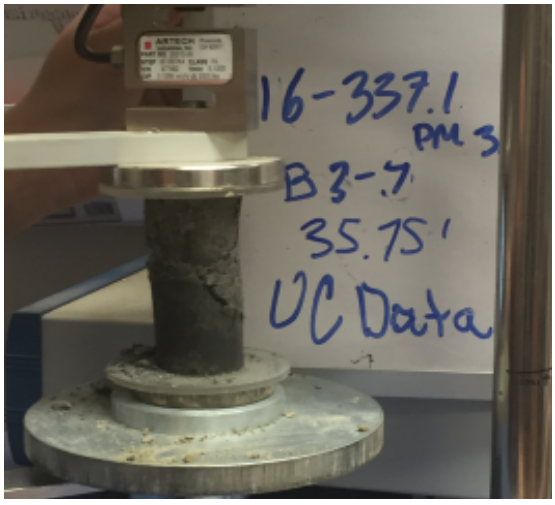
Project Name: Laytonville Dos Rios Road at MP 3.66
CAInc File No: 16-337.10
Date: 2/21/18
Technician: CAP
Sample ID: B3-7 Depth (ft): 35.8
USCS Classification: Rock

UNCONFINED COMPRESSION TEST - D2166



Dry Density (pcf)	**126.8**
Water Content (%)	**3.1**
Unconfined Compressive Strength (psi)	**17.4**
Unconfined Compressive Strength (psf)	**2506**
Shear Strength (psf)	**1252.8**
Average Height (in)	3.313
Average Diameter (in)	1.430
Rate of strain (%)	1.0
Strain at Failure (%)	3.6

Notes:



Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 02/16/2018
Date Submitted 02/12/2018

To: Ellen Tiedemann
Crawford & Associates, Inc.
1100 Corporate Way Suite 230
Sacramento, CA 95831

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 16-337.10 - 3.66 Site ID : B2.
Thank you for your business.

* For future reference to this analysis please use SUN # 76177-158869.

EVALUATION FOR SOIL CORROSION

Soil pH	6.14	
Minimum Resistivity	1.37 ohm-cm (x1000)	
Chloride	30.5 ppm	00.00305 %
Sulfate	42.0 ppm	00.00420 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422