MILLER PACIFIC ENGINEERING GROUP

FAULT TRENCH INVESTIGATION
PROCTOR TERRACE ELEMENTARY SCHOOL
1711 BRYDEN LANE
SANTA ROSA, CALIFORNIA

September 11, 2025

Project 1079.121

Prepared For:
Santa Rosa City Schools
211 Ridgway Avenue
Santa Rosa, California 95401

Attn: Mr. Erik Oden

CERTIFICATION

This document is an instrument of service, prepared by or under the direction of the undersigned professionals, in accordance with the current ordinary standard of care. The service specifically excludes the investigation of radon, asbestos, toxic mold and other biological pollutants, and other hazardous materials. The document is for the sole use of the client and consultants on this project. Use by third parties or others is expressly prohibited without written permission. If the project changes, or more than two years have passed since issuance of this report, the findings and recommendations contained herein must be reviewed by the undersigned.

MILLER PACIFIC ENGINEERING GROUP
(a California corporation)

Michael F. Jewett
Engineering Geologist No. 2610
(Expires 1/31/27)

MILLER PACIFIC ENGINEERING GROUP

FAULT TRENCH INVESTIGATION
PROCTOR TERRACE ELEMENTARY SCHOOL
1711 BRYDEN LANE
SANTA ROSA, CALIFORNIA

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.2 Project Background 1
1.3 Purpose and Scope 2

2.0 SITE SURFACE CONDITIONS 3

3.0 REGIONAL GEOLOGIC AND TECTONIC SETTING 4

3.1 Regional and Local Geologic Mapping 4
3.2 Regional Fault Mapping 4
3.3 Historic Seismicity 6
3.4 Expected Future Seismicity 7

4.0 INVESTIGATIVE METHODS 8

4.1 Review of Historic Aerial Photographs 8
4.2 Review of Topographic Data 9
4.3 Review of Previous Investigations by Others 9
4.4 Surface Reconnaissance 12
4.5 Fault Trenching 13
4.5 Radiocarbon Age-Dating 14
4.6 Seismic Refraction Surveys 14

5.0 SUBSURFACE CONDITIONS 15

5.1 Stratigraphy 15
5.2 Geologic Structures 15

6.0 CONCLUSIONS 17

7.0 RECOMMENDATIONS 17

8.0 SUPPLEMENTAL GEOTECHNICAL SERVICES 18

9.0 LIMITATIONS 18

10.0 LIST OF REFERENCES 19

MILLER PACIFIC
ENGINEERING GROUP

FIGURES

Site Location Map .... Figure 1
Site Plan 2
Regional Geologic Map 3
Local Fault Map and Previous Studies By Others 4
Site Reconnaissance Map 5
Seismic Refraction Profiles 6
Recommended "No-Build" Zone.. 7

APPENDIX A – HISTORIC AERIAL PHOTOGRAPHS

APPENDIX B - PREVIOUS SUBSURFACE EXPLORATION LOGS
Boring Logs.. B-1 through B-5

APPENDIX C – SUMMARY OF FAULT TRENCH FINDINGS
Soil Classification Chart .... Figure C-1
Exploratory Fault Trench Logs .... C-2 through C-14

APPENDIX D – LABORATORY RADIOCARBON AGE-DATING RESULTS

APPENDIX E – SEISMIC REFRACTION SURVEY REPORT

MILLER PACIFIC ENGINEERING GROUP

FAULT TRENCH INVESTIGATION
PROCTOR TERRACE ELEMENTARY SCHOOL
1711 BRYDEN LANE
SANTA ROSA, CALIFORNIA

1.0 INTRODUCTION

This report summarizes the results of Miller Pacific Engineering Group's (MPEG) Earthquake Fault Trench Investigation at Proctor Terrace Elementary School ("site") on behalf of Santa Rosa City Schools (SRCS). The site is located at 1711 Bryden Lane in Santa Rosa, California, as shown on Figure 1. Our services have been provided in accordance with our Agreement dated February April 9, 2025, and Purchase Order dated May 9, 2025 This report has been prepared for the exclusive use of SRCS and their assignees and design team for this project and site.

1.1 Regulatory Compliance

Our investigation has been performed for the purpose of satisfying the requirements of Title 24 of the California Code of Regulations (CCR) and Chapter 16 of the California Building Code (CBC, 2022). Our investigation has been performed in general accordance with the guidelines presented in California Geologic Survey (CGS) Special Publication 42, the most recent revision of which incorporates earlier CGS Notes 41 and 49 (CGS, 2018).

Per the provisions of the Field Act of 1933 and Title 24 of the California Code of Regulations, construction or rehabilitation of school structures is prohibited within 50 feet of active faults. Alquist-Priolo Earthquake Fault Zoning Act ("A-P" Act, 1972) and the Seismic Hazards Mapping Act (1990) direct the State Geologist to delineate regulatory "Earthquake Zones of Required Investigation", showing areas susceptible to surface fault rupture and seismic-induced landsliding, to reduce the threat to public health and safety and to minimize the loss of life and property posed by earthquake-triggered ground failures. These maps illustrate where geologic studies are required in order to evaluate the potential for fault surface rupture prior to development permitting and are prepared and periodically updated by CGS.

1.2 Project Background

We previously conducted a fault trench investigation for a new (now existing) restroom structure in the northern part of the site, as summarized in our report dated November 19, 2018. At the time, the campus was located outside of, but immediately adjacent to the eastern edge of the Alquist-Priolo Earthquake Fault Zone (APEFZ) associated with the active Rodgers Creek Fault. No faults were encountered during that study.

More recently, the California Geological Survey (CGS) published an updated APEFZ for the Santa Rosa Quadrangle (CGS, 2024), which now encompasses the entire school campus, as shown on Figure 2. Although no specific plans have been prepared, we understand that the results of our study will be used for evaluating rehabilitation/redevelopment options in the future.

1.3 Purpose and Scope

The purpose of our investigation is generally twofold; 1) to assess whether active fault traces exist within the site and 2) to provide recommended setbacks for new structures from any identified active fault traces. According to CGS Special Publication 42 – "For the purposes of the A-P Act, an active fault is defined as one which has "had surface displacement within Holocene time" (the last 11,700 years).

This definition does not mean that faults lacking evidence for surface displacement within Holocene time are necessarily inactive. A fault may only be presumed to be inactive based on satisfactory geologic evidence; however, the evidence necessary to prove inactivity sometimes is difficult to obtain and locally may not exist. Because fault investigations are required by the A-P Act to assess the recency of fault movement, faults within an APEFZ are presumed to be active until adequate evidence shows otherwise.

The scope of our investigation is outlined in our proposal letter dated April 8, 2025, and is intended to evaluate the entire 5-acre parcel. Our scope includes review of available, published geologic maps and reports, previous fault investigation reports by Miller Pacific and others, aerial photography, and other background information relevant to the project. Our scope also included subcontracting of excavation, site safety (fencing/shoring) and restoration services; excavation and logging of 4 trenches for observation of subsurface stratigraphy and geologic structure; coordination of field work and participation in field discussions and consultation with CGS/USGS personnel and the project's SRCS-appointed peer reviewer, Mr. Jared Pratt of RGH Consultants; and preparation of this report.

Our current study addresses only the potential for fault surface rupture and is intended to identify potential active faults exist within the campus. A more thorough geologic hazards investigation, including evaluation of seismic shaking, liquefaction and other hazards, should be performed as part of any future development at the site.

2.0 SITE SURFACE CONDITIONS

The Proctor Terrace Elementary School campus is located northeast of downtown Santa Rosa, just north of Fourth Street and about 200 feet north of Santa Rosa Creek, which flows east-to-west along the south side of Fourth Street. The site comprises an approximately 5-acre, rectangular parcel elongated in the northeast-southwest direction. Located in a residential neighborhood, the site is bordered by Bryden Lane to the southwest, Grosse Avenue to the southeast, and single-family homes to the northwest and northeast. The site is relatively level, with surface elevations of about +190 feet above sea level.

The campus was developed in 1949 with a main classroom building composed of four northwest-trending wings and a gymnasium in the southwestern and central parts of the site. Asphalt-paved play areas occupy the southeastern frontage along Grosse Avenue, and a grass playfield occupies the eastern portion of the site. Several more recent modular classroom buildings and the recently constructed restroom structure are located northwest of the gym and along the southwest side of the play field. A Site Plan is presented on Figure 2.

3.0 REGIONAL GEOLOGIC AND TECTONIC SETTING

Sonoma County lies within the Coast Ranges geomorphic province of California, a region characterized by active seismicity, steep, young topography, and abundant landsliding and erosion owing partly to its relatively high annual rainfall. The regional basement rock consists of sedimentary, igneous, and metamorphic rock of the Jurassic-Cretaceous age (65-190 million years ago) Franciscan Complex and marine sedimentary strata of the Great Valley Sequence, which is of similar age. Within central and northern California, the Franciscan and Great Valley rocks are locally overlain by a variety of late Cretaceous and Tertiary age sedimentary and volcanic rocks which have been deformed by episodes of folding and faulting. The youngest geologic units are Quaternary age (last 1.8 million years) sedimentary deposits. These unconsolidated deposits partially fill many of the valleys in the region.

3.1 Regional and Local Geologic Mapping

The project site is located just northeast of downtown Santa Rosa, where Santa Rosa creek emanates from the low foothills which divide the Santa Rosa floodplain to the west from Rincon Valley and Bennett Valley to the east. Regional geologic mapping (Fox et al, 1973; Huffman and Armstrong, 1980; McLaughlin et al, 2008) indicates upland areas east of the site and the Santa Rosa floodplain are underlain primarily by volcanic rocks of the Tertiary-age Sonoma Volcanics, with more local exposures of early Pleistocene and Pliocene fluvial (river) and lacustrine (lake) deposits (referred to on older maps as the Glen Ellen Formation), which overlies the volcanics and is derived primarily of weathered Sonoma Volcanics and Franciscan rocks.

The Santa Rosa floodplain, including the project site, is mapped as being underlain by alluvial fan deposits, with Fox indicating that the alluvium grades eastward into terrace deposits with increased gravel content. Both Fox and Armstrong plot a northeast-trending contact, nearly coincident with the northwestern property line, which separates younger fan and terrace deposits to the south from older fan deposits to the north. McLaughlin's map omits the contact and combines younger and older deposits separated by previous mappers into a single "Holocene alluvial fan" unit. A copy of the latest regional map by McLaughlin is shown in Figure 3.

3.2 Regional Fault Mapping

First recognized by Weaver (1949) and Gealey (1951), the Rodgers Creek Fault Zone has been recently mapped as exhibiting evidence of near-continuous Holocene displacement for at least 73 km, extending from the northern margin of San Pablo Bay, near Sears Point, to the foothills northwest of Healdsburg (Hecker and Randolph Loar, 2018). The project site lies near the eastern edge of the Santa Rosa floodplain, which serves as the boundary between the "northern" segment (also historically referred to as the Healdsburg Fault) and the "southern" segment of the Rodgers Creek Fault. South of the floodplain, the fault trends about N40ºW, extending across the northeast side of Taylor Mountain and beneath the floodplain alluvium just northeast of the County Fairgrounds (about 1.5 miles south of the site). North of the floodplain, the fault trends slightly more westerly, at about N50ºW, extending northward along the east edge of the floodplain through eastern Santa Rosa, Windsor, and Healdsburg.

In the immediate vicinity of the site, early mappers (Gealey, 1951; Fox et al, 1973; Huffman and Armstrong, 1980; Hart, 1982) projected a continuous fault trace from the southern segment that extends northward beneath the alluvium, passing about ¼-mile west of the site and connecting to the Healdsburg Fault north of the floodplain. Fox indicates faults are "recently active" based on topographic interpretation, and Huffman and Armstrong show the relevant fault traces as exhibiting evidence of Quaternary rupture. This alignment is also reflected by the older, (now superseded) Alquist-Priolo Special Studies Zone map (CDMG, 1983).

More recent mapping by McLaughlin et al (2008) does not show a continuous fault trace projecting beneath the alluvium but instead shows a pair of apparent left-stepping, en-echelon lineaments extending southeast from the northern segment/Healdsburg Fault along a trend of about N60ºW. These traces are apparently mapped based on photo interpretation of the alignment of tributary streams and bends in the Matanzas and Santa Rosa Creek channels. The southern of these traces projects across Santa Rosa Creek toward the southwestern corner of the site, terminating within Grosse Avenue just south of the main building

The 2010 Fault Activity Map of California (Jennings and Bryant, 2010) shows the Rodgers Creek Fault as being Holocene-active along most of its length and shows the same concealed alignment of a single fault trace passing about ¼ mile west of the site as shown on earlier maps.

More refined mapping of the Santa Rosa floodplain area encompassing the site was performed by Hecker et al (2016) and was based on review of LiDAR data, as well as previous regional gravity and aeromagnetic studies by others. Their work revealed the coincidence of gravity and magnetic boundaries with several topographic lineaments detected in the LiDAR data, which suggest a broad, westerly bend in the fault as it passes from south to north under the alluvial cover. While the main trace of the Rodgers Creek Fault beneath the floodplain alluvium is shown southwest of the site in approximately the same alignment as earlier maps, a pair of fault traces are also shown extending southeast from the foothills north of the site near the Rural Cemetery and Santa Rosa Memorial Park. The western of the two traces is shown trending about N55ºW a few hundred feet west of the site (on the opposite side of Bryden Lane), while the eastern trace shown extending into the western part of the site beneath the main building’s western wing along a trend of about N50ºW. These two traces are inferred by Hecker to mark the northeastern boundary of a small pull-apart basin between the site and the main fault trace to the west.

South of the site, the eastern margin of the basin is defined by a fault trace aligned about N25ºW which projects northwest across Santa Rosa creek toward the southern corner of the campus. This trace is shown southwest of the southern of the en-echelon faults mapped by McLaughlin but generally projecting toward the same area within Grosse Avenue near the south corner of the main school building.

Subsequently, Hecker (2018) performed more detailed and extensive analysis of the LiDAR data at greater resolution than previous efforts. This more recent mapping shows the same two fault traces as the 2016 map and identifies both as Holocene-active. The locations and interpreted ages of fault traces mapped near and within the site, are shown on Figure 4.

Most recently, CGS published an updated Fault Evaluation Report (FER) (Ladinsky and Zachariasen, 2024) which accompanies and serves as the basis for the updated Alquist Priolo Earthquake Fault Zone map released in February of 2024. This new map reflects near-identical fault traces and alignments to those shown by Hecker in the latest 2018 report and establishes a wider Zone of Required Investigation than the previous map. The revised map now places the entirety of the site within the APEFZ as shown in Figure 4.

3.3 Historic Seismicity

Several significant earthquakes have occurred in and around the Rodgers Creek Fault Zone in historical times, although no evidence appears in the written historical record of large earthquakes. Research by Hecker and others (2005) indicates that the most recent surface-rupturing event on the Rodgers Creek Fault occurred no earlier than 1690, and likely no earlier than 1715. They further concluded that the most recent large earthquake may have been time-correlative with the latest known pre-historic rupture on the Hayward Fault, sometime between 1640 and 1776.

Significant earthquakes known or suspected to have occurred along the Rodgers Creek Fault Zone include the March 31, 1898 "Mare Island" earthquake, centered beneath San Pablo Bay near the city of Vallejo. This earthquake has been estimated between Mw=6.2 and Mw=6.7, generating a Modified Mercalli intensity of VII or greater throughout portions of the North Bay area (Toppozada et al, 1992; CGS, 2025). The most significant damage was concentrated between Vallejo/Mare Island and the Sonoma and Petaluma Valleys to the northwest, and aftershock reports were also more abundant in those areas, suggesting a source near the southern end of the Rodgers Creek Fault (Toppozada, et al, 1992). Damage in Santa Rosa was more moderate, limited mainly to cracked windows, fallen plaster, and a few collapsed chimneys (CGS, 2018b).

On August 9, 1893, an Mw=5.6 earthquake occurred with an epicenter along the southwest side of Taylor Mountain, on an apparent concealed splay of the Rodgers Creek Fault beneath the east edge of the Santa Rosa floodplain. This earthquake generated a Modified Mercalli intensity of VII, toppling chimneys and plaster throughout Santa Rosa and causing moderate structural damage (CGS, 2025).

The largest earthquakes recorded in historic times on the Rodgers Creek Fault are the Mw=5.6 and Mw=5.7 Santa Rosa earthquakes of October 2, 1969 (Hecker, et al, 2005). These events occurred within about 90-minutes of one another and generated Modified Mercalli intensities of VII to VIII throughout Santa Rosa. Moderate damage, including fallen masonry and chimneys along with some structural damage, was observed to be concentrated within Santa Rosa (Wong and Bott, 1995). The earthquakes were generally thought to have been centered near the south end of the Healdsburg Fault, or on a blind, northeast-striking cross-fault within the right-stepover zone encompassing the project site (Wong and Bott, 1995). The CGS Historic Earthquake Database (CGS, 2025) shows these quakes to be centered several miles east and west of the site, west of 101 along Guerneville Road and in the area of Rincon Valley to the east.

Several smaller earthquakes have occurred near the site in historic times, the nearest of which are shown for reference on Figure 4 (USGS, 2025). The most significant of these was a 2003, Mw=4.1 earthquake centered near Montecito Avenue about 2,000 feet north of the site, while an Mw=2.6 event centered beneath Bryden Lane about 800 feet northwest of the site occurred that same day. Neither event apparently caused significant damage.

No documentation or evidence of fault surface rupture during any of these events is apparent in the literature.

3.4 Expected Future Seismicity

The historical records do not directly indicate either the maximum credible earthquake or the probability of such a future event. To evaluate earthquake probabilities in California, the USGS has assembled a group of researchers into the "Working Group on California Earthquake Probabilities" (USGS, 2003 and 2008; Field et al, 2015) to estimate the probabilities of earthquakes on active faults. These studies have been published cooperatively by the USGS, CGS, and Southern California Earthquake Center (SCEC) as the Uniform California Earthquake Rupture Forecast, Versions 1, 2, and 3 (aka UCERF, UCERF2, and UCERF3, respectively). In these studies, potential seismic sources were analyzed considering fault geometry, geologic slip rates, geodetic strain rates, historic activity, micro-seismicity, and other factors to arrive at estimates of earthquakes of various magnitudes on a variety of faults in California.

Conclusions from the 2015 UCERF3 indicate that the mean probability of an M>6.7 earthquake occurring on the Hayward-Rodgers Creek Fault by 2045 is about 32%. The highest probability of an M>6.7 earthquake occurring by 2045 on any of the active faults in the region is assigned to the San Andreas Fault, located approximately 33 kilometers southwest of the site, at 33%. It should be noted that these studies consider only the possibility that earthquakes of a given magnitude will occur, and do not consider surface rupture potential or the potential for other effects of such earthquakes.

As noted previously, research by Hecker et al (2005) suggests the most recent large, surface-rupturing earthquake on the Rodgers Creek Fault occurred sometime between about 1715 and 1776. Their research also indicates probable recurrence intervals of between 229 and 290 years ("certainly between 181 and 370 years") which suggests that a relatively large earthquake may statistically be expected in the near future.

4.0 INVESTIGATIVE METHODS

Investigative methods utilized for this project included a geologic reconnaissance of the project site and surrounding area; review of background information including regional geologic and fault mapping, historic aerial photographs, LiDAR-derived topographic mapping, and previous fault trench investigation reports in the site vicinity; subsurface exploration with four investigatory fault trenches totaling 597 linear feet; seismic refraction surveying; and radiocarbon dating of select recovered soil and charcoal samples. Our review of regional geologic mapping and regional fault mapping is discussed above in Sections 3.1 and 3.2. Our background material review, exploratory fault trenching, seismic surveying, and radiocarbon dating are summarized in the following sections.

4.1 Review of Historic Aerial Photographs

We reviewed several historic aerial photographs from Pacific Aerial Surveys of Novato, California that spanned the time period between 1942 and 1998. Little information was gleaned from photos post-dating the mid-1960's, by which time surrounding development obscures virtually all natural features. Brief descriptions of the relevant photographs we reviewed are presented in the following paragraphs, and those photographs are presented for reference in Appendix A.

- 1942 (Date Unknown, SON AG 1942, Scale Unknown) – This low-resolution image is the only photograph we were able to locate prior to development of the Proctor Terrace campus. Residential areas west of the site are largely developed, while recently constructed homes remain interspersed with larger orchards and other apparent agricultural properties to the south and east. Bryden Lane and Fourth Street have been paved, while Grosse Avenue appears to only to have been rough-graded northeast of the site and not yet connected to Bryden Lane.

  The Proctor Terrace site is partly occupied by an orchard, with mature trees occupying the northeastern half of the site. The southwestern part of the site appears undeveloped. A faint linear tonal contrast can be seen in the southwestern corner of the site (near the intersection of Bryden Lane and Grosse Avenue) which trends approximately coincident with the trace mapped within the northern part of the campus by Hecker (2018) and projects south toward the prominent southward bend in Santa Rosa Creek. The lineament may also faintly appear in open ground just north of the orchard on the south side of the creek but may also represent the edge of a graded driveway which is difficult to discern given the scale and quality of the photo.

- July 19, 1953 (CSH1953-7K-131; Scale Unknown) – Residential development east and west of the site has continued and now dominates the frame. The Proctor Terrace school has been constructed, and the existing main classroom buildings are visible in the southwest part of the site. The gymnasium building has not yet been built. The tonal lineament is no longer visible within the site but can still faintly be identified south of Santa Rosa Creek, north of the orchard. Tonal contrast across the school buildings is likely the result of recently installed landscaping along Bryden Lane in the southwest part of the site.

- June 20, 1965 (CAS65-130-47, Scale Unknown) – Campus development is largely complete excepting the newer portable buildings, as the gymnasium, asphalt play areas, and grass playfield are in place. The faint lineament south of the creek remains visible, although the better quality of this photo more convincingly suggests it may be the edge of an unpaved driveway area.

- April 14, 1966 (AV222-03-04, Scale 1:24,000) – Little change in site conditions or the surrounding area is apparent, although the tonal lineament south of the creek is more prominent than in previous images.

4.2 Review of Topographic Data

We reviewed digital topographic contours and bare earth hillshade data[1] obtained through Sonoma County's VegMap website (https://sonomavegmap.org/data-downloads/). We also reviewed hillshades from the same source which are derived from more recent 2022 LiDAR data, although updated topographic contours do not yet appear to be available. Topographic contours based on the 2013 LiDAR data are shown in Figure 2.

4.3 Review of Previous Investigations by Others

We have reviewed the results of several previous subsurface fault investigation studies performed in the immediate vicinity of the project site, as well as the results of our geotechnical investigation performed for the restroom structure on the north side off the Proctor Terrace campus in 2018. The approximate area covered by each report is shown in Figure 4, and respective Alquist-Priolo (A-P) file numbers are cited below. Reports we reviewed included the following:

- Thomas D. Hays & Associates (1977, A-P #508) conducted a fault trench investigation for construction of new office buildings at the south corner of Fourth Street and Talbot Avenue, about 1,600 feet southwest of the site. Approximately 120 feet of trench was excavated to an average depth of about 12 feet which exposed interbedded, apparently young sediments, although no age constraints are noted in the report. No evidence of faulting was observed.

- Cooper-Clark & Associates (1978, A-P #799) conducted a fault trench investigation for a new medical office building at 510 Doyle Park Drive, just south of Memorial Hospital and about 3,000 feet southwest of the site. The study identified an apparent normal fault with a down-to-the-east sense of motion and postulated the feature to represent an en-echelon or branch fault. Apparent displacements of up to 10-inches were observed along the upper and lower contacts of a clean gravel horizon about 6- to 12 feet below the ground surface. Cooper-Clark recommended that no new construction across or east of the fault trace be planned and recommended 20-foot setbacks to the west (on the footwall side) of the fault trace or special structural design of new elements within the 20-foot setback zone. We note, as others have (including Herzog, 1989; Bace, 1992; and apparently Earl Hart, 1982 as noted by Herzog) that offsets do not affect deeper horizons, and the feature therefore may not be representative of a fault.

[1] LiDAR data and orthophotography were provided by the University of Maryland under NASA grant NNX13AP69G from NASA's Carbon Monitoring System (Dr. Ralph Dubayah and Dr. George Hurtt, Principal Investigators).

- Donald Herzog & Associates (1980, A-P #1231) conducted a fault trench investigation for a new office building at 1604 Fourth Street, about 1,300 feet southwest of the site and a few doors northeast of Hays' 1977 study. A pair of trenches were excavated across the north and south side of the relatively narrow parcel, encountering generally flat-lying alluvial deposits. No suspected faults were found.

- Burton H. Marliave (1981, A-P #1426) conducted a fault trench investigation for a new office building at 1635 Terrace Way, about 1,600-feet northwest of the site. The study identified a zone of sheared and slicken-sided claystone bedrock but did not document evidence of fault movement in overlying clayey alluvial/colluvial soils. Regardless, 20-foot setbacks from the bedrock shear zone were recommended.

- Herzog Associates (1989, A-P #2313) performed a fault trench investigation for new office development north of and adjacent to the Doyle Park Drive site investigated previously by Cooper-Clark in 1978. Herzog concluded that the feature interpreted previously by Cooper-Clark did not offset deeper horizons and is more likely evidence of previous creek scour or bank lurching. Herzog also concluded that no active faults cross the site and postulated that the main trace of the Rodgers Creek Fault is located east of the site, along Talbot Drive as shown on the Alquist-Priolo map (CDMG, 1983).

- Bace Geotechnical (1992, A-P #2933) performed a fault trench investigation at the Doyle Park Elementary School campus, located about 3,500-feet south of the site. Trenches were excavated across the south side of the campus and the adjacent property to the east up to depths of about 11 feet, and no faults were found. We note that more recent mapping (CGS, 2024; Hecker 2016, 2018) indicates the main trace of the Rodgers Creek Fault passes through the eastern edge of the campus, in the vicinity of Trench Station 370, where several apparently conformable depositional contacts are shown but no indication of faulting or related features.

- Fugro William Lettis & Associates (2011) performed a fault investigation for evaluation of the Santa Rosa aqueduct where it crosses the Rodgers Creek Fault along Sonoma Avenue. The study included collection and review of LiDAR imagery and 2-D seismic imagery, along with 12 Cone Penetration Tests (CPT) and 1 soil boring. No trenching was performed for the project.

  Analysis of subsurface data along the Sonoma Avenue transect revealed a total of 5 fault traces which merge at depth and together define a positive flower structure. The 2 western traces, each of which are interpreted as steeply east-dipping thrust faults, project to the surface beneath the Doyle Park School site previously explored and "cleared" by Bace Geotechnical but are not shown to offset contacts in the upper 50 feet of the subsurface. The main deformation zone is shown to be bounded on each side by a vertical strike-slip fault (Fault Traces D and E) and extending from Talbot Avenue on the east to Bishop Drive on the west. The east side of the flower structure is defined by a steep west-dipping thrust fault which projects to the surface just west of Alderbrook Drive (Fault Trace "E").

  This fault is noted to be aligned with a gravity density boundary identified by McLaughlin et al (2008), which trends northwest along Alderbrook at about N25°W toward Santa Rosa creek. North of the creek, the boundary bends slightly westward and passes through the campus along a similar alignment as shown by CGS and Hecker on their latest maps.

Fugro postulates that the fault trace marks the eastern boundary of the Rodgers Creek Fault Zone and notes that surface deformation, including a broad upwarping of the ground surface of about 18 inches, is apparent along Sonoma Avenue. They note that the fault may not be the result of discrete surface faulting, but rather the result of secondary rupture on the main fault strand at depth, where most of the offset is accommodated by the main strike-slip traces D and E. They estimate that dextral offsets may occur across a broad zone about 200 feet wide, but recommend, on a conservative basis, assuming that all of the surface offset during future rupture events could be centered within a narrow (<5 foot) zone along fault trace E.

- Miller Pacific Engineering Group (2018) performed a geotechnical investigation for a small new restroom structure in the northern part of the Proctor Terrace campus. The work included drilling 2 soil borings at the locations shown on Figure 2. Borings extended to depths of 30- and 50 feet below the ground surface. Both borings encountered medium- to high plasticity clay soils with variable sand content through the full depth of exploration. Blow counts are consistent with relatively unconsolidated alluvium, and the report concluded that soils were of Holocene and likely Pleistocene (at depth) age. Boring logs from this investigation are included for reference in Appendix B.

- Subsequent to the geotechnical investigation, Miller Pacific Engineering Group (2018) performed a fault investigation to clear the restroom structure site following CGS project review and commentary. Three trenches were excavated to depths approaching 12 feet along the northern property line, covering an approximately 130-foot zone perpendicular to the fault trace shown by Hecker and the most recent APEFZ map, which passes through the site about 70 feet southwest of the nearest trench. No fault-related features were observed in the excavations, and radiocarbon dating indicated that flat-lying alluvial soils at depths of about 8 to 12 feet are of Early to Middle Holocene age (about 4,500 to 8,000 years old). Although the study noted the presence of a low east-facing scarp at the location of the mapped fault, no other evidence of surface deformation was observed to corroborate the LiDAR-based fault mapping. Notably, the campus buildings had been recently repainted, potentially obscuring evidence of exterior cosmetic or structural distress.

- Miller Pacific (2020) also performed a fault investigation for a proposed medical building at 520 Doyle Park Drive. That study included performing 10 CPTs and excavating one 285-foot trench across the site to depths of about 9 feet. Trenches encountered flat-lying, Middle- to Late Holocene soils similar to those at Proctor Terrace. Two steeply east-dipping reverse faults exhibiting up to 9 inches of apparent vertical displacement were documented at the east end of the property, approximately where mapped by Hecker (2016, 2018) and along strike with the northward projection of the eastern fault interpreted by Fugro William Lettis along Sonoma Avenue just south of the site. The study recommended setbacks of about 70 feet from the fault, including areas not logged due to caving conditions and safety concerns. This study is cited in the 2024 FER as a partial basis for zoning that fault trace.

4.4 Surface Reconnaissance

We previously performed a reconnaissance of the project site and surrounding residential area on October 10, 2018, and performed supplemental reconnaissance of the area several times during the course of this study. Our 2018 reconnaissance was performed with the District-appointed peer-reviewer, Mr. Jared Pratt of RGH Consultants, as well as Mr. Gordon Seitz, Ms. Judy Zachariasen, and Mr. Tyler Ladinsky of the California Geological Survey and Ms. Suzanne Hecker of the United States Geological Survey.

Most existing campus improvements, including original buildings constructed in 1949 and surrounding asphalt-paved play areas, are in reasonably good condition considering their age. No evidence of apparent structural distress was observed in most areas aside from minor, localized differential heave and settlement of lightly loaded asphalt and concrete flatwork, likely due to expansive surface soils. Stucco facades and exposed foundation elements at the gymnasium and most of the main buildings are generally in good condition with no significant cracking or other apparent distress. The permanent restroom structure near the northern lot line that was constructed after our 2018 investigation is also performing well and in good condition.

Significant reconnaissance observations of unusual surface conditions along strike with the mapped fault alignments are described below, and an annotated map showing photographs and the locations of our observations is provided on Figure 5.

- A very faint linear break in topography, which rises about 1-foot from northeast to southwest, was noted at the approximate location of the scarp and fault trace described by Hecker (2018) and shown on their map trending toward northern corner of the main building's east-central wing (second wing from the east). See Location 1 on Figure 5. This feature also aligns with the gravity density boundary coincident with Fugro's Fault Trace E and the description of the subtle associated east-facing scarp noted in their report at Sonoma Avenue. The scarp is faintly visible northeast of the site at Geary Drive and Grace Drive but is not readily apparent northwest of Grace Drive.

  We did not observe any apparent damage to the building itself at this location during our 2018 visit, at which time the building had apparently been repainted in the recent past. During our most recent reconnaissance, we noted that the building's exterior wall shows significant cracking in the stucco façade and apparent foundation settlement at the scarp location.

- In the central part of the main building, at the intersection of the western wing's hallway and the main hall connecting the other 2 wings, we observed that the linoleum floor is damaged, with visible cracks extending from the northern and southern corners of the hallway intersection. The cracks in the floor exhibit patterns typically associated with shear failure, including en-echelon cracks and apparent pull-apart zones. See Location 2 on Figure 5.

- At the southern corner of the main building's west wing, we observed similar damage to the exterior stucco as noted at the northern corner, as shown on Figure 5 (Location 3). Aside from the aforementioned locations, no similar distress was noted in either the interior or exterior of the campus structures.

- Along the southeast side of Grosse Avenue, the three concrete driveways closest to Bryen Lane exhibit conspicuous and extensive cracking. See Location 4 on Figure 5. Although this may also be the result of older improvements, poor subgrade conditions, and/or root intrusion from mature trees, we did note that all other driveways and residential flatwork on the southeast side of Gross Avenue appear to be of similar age but in much better condition.

- Farther southeast, sidewalks along the north side of Fourth Street show several apparent right-lateral offsets at the curb/sidewalk control joints. We noted a four locations at which offsets are between about ½ and 1-inch as shown on Figure 5 (Location 5). Cumulatively, we measured a total of about 2 ¾ inches of right-lateral offset across an approximately 70-foot wide zone. The eastern two locations appear to coincide with the projection of the fault from the south as mapped by McLaughlin (2008).

4.5 Fault Trenching

Subsurface exploration performed for this study included excavation of four exploratory trenches, totaling approximately 597 linear feet, at the locations shown on Figure 2 between July 13 and August 5, 2025. The primary basis for trench locations and alignments are; 1) the location and trend of fault traces investigated/mapped by others as summarized on Figures 2 and 5, and 2) the locations of existing campus structures and other improvements.

Trenches were excavated by the excavation contractor to typical depths between about 8- and 10 feet below the ground surface using a 36-inch bucket. Following excavation, trenches were typically shored on 6-foot centers, and the north walls were cleaned with hand tools to expose soil and bedrock structure and stratigraphy. South walls were locally cleaned as needed to verify observations. Contacts between sedimentary units were marked with string lines nailed to the trench wall and 5-foot lateral intervals were marked with paint to ensure lateral positional accuracy. The trenches were carefully examined and logged at a scale of 1:60 (1-inch equals 5-feet), using the Unified Soil Classification System (USCS) nomenclature. Where encountered, significant features were logged at a more detailed scale of 1:12 (1 inch = 1 foot). A detailed summary of our cumulative fault trench findings and interpretations from both our 2018 study and this current study is provided in Appendix C. A stratigraphic column and explanation of the terms and methodology used for USCS classification is provided on Figure C-1. Combined exploratory trench logs from both studies are presented on Figures C-2 through C-14.

Prior to backfilling, we viewed and discussed the trench exposures with Mr. Jared Pratt of RGH Consultants (independent third-party reviewer) and Mr. Tyler Ladinsky of the California Geological Survey (author of the most recent 2024 APEFZ map). Upon completion, trenches were backfilled and compacted with native soil under the supervision of our Staff Engineer and existing improvements disturbed during our investigation were restored by the excavation contractor.

4.5 Radiocarbon Age-Dating

We collected samples of charcoal and organic sediments from various soil horizons in several trenches, as shown on the logs in Appendix B, for radiocarbon age-dating. Age dating of organic materials was performed via Acceleration Mass Spectroscopy (AMS) method. The results of our age-dating are shown on the relevant trench logs and indicate that soil horizons exposed in the lower sections of our trenches are of Early- to Middle-Holocene age (about 4,500 to 8,000 years old). The radiocarbon dating process and test results are discussed in greater detail in Appendix D.

4.6 Seismic Refraction Surveys

Field geophysical surveying was conducted by Terracon of Cotati, California on July 10, 2025, and included subsurface seismic refraction (SR) surveys along each of the two alignments shown on Figure 2. This work was performed for the purpose of evaluating conditions at depths exceeding the safe limits of excavation and identifying potential fault displacements via lateral variation in P-wave velocities. In general, SR surveying indicates that the upper 20 feet of the subsurface has P-wave velocities ranging from about 500 ft/sec (152 m/s) to 4,500 ft/sec (about 1,370 m/s), which is generally consistent with unconsolidated soils. Materials at depths between about 20 feet and the bottom of the profiles (ranging between about 40- and 80 feet below the subsurface) exhibit velocities between 4,500 ft/sec and about 7,500 ft/sec (about 2,300 m/s), which indicates denser materials, consisting either of consolidated or cemented (older) sediment and/or weathered bedrock. Terracon’s geophysical report and seismic profiles are provided in Appendix E.

5.0 SUBSURFACE CONDITIONS

The results of our subsurface exploration generally confirm the regionally mapped geology as discussed in Section 3.1 The project site is underlain by generally flat-lying alluvial soils of Holocene to Pleistocene age. These deposits primarily consist of moderately- to well-sorted, interbedded clay, silt, sand and gravels and are correlative to map unit "Qhf" as shown on Figure 3. However, we generally interpret them as dissected floodplain/overbank deposits as opposed to alluvial fan materials, as indicated by McLaughlin et al and as interpreted during our previous 2018 study. A site geologic map is shown on Figure 2.

5.1 Stratigraphy

Stratigraphy observed during our fault trench investigations included several distinct soil horizons that were encountered in each of our 2018 and 2025 trenches. Near-surface soils across the site typically consist of about 1- to 3 feet of moderately plastic silty clays and clayey silts with variable gravel content. This horizon locally has been disturbed and compacted in developed parts of the site. These soils are generally underlain by a series of laterally continuous and apparently conformable layers of silty to sandy clay and clayey sand. The oldest horizons consisted of blue-gray clays at typical depths of about 8 feet below the surface. Radiocarbon dating of organic sediments in these horizons during yielded ages between about 4,600 and 5,600 years. Overlying silty and sandy clay deposits (Unit 7) are approximately 2,500 years old based on samples collected from trenches T-2 and T-6. One sample, collected from the same Unit 7 in the upper 2 feet of Trench T-6, yielded an age of about 160 +/- 30 years. However, it is possible that the sample is contaminated with modern carbon, and as such the interpreted age is treated with a relatively low level of confidence.

In the eastern part of the site, these clays have locally been dissected by a series of younger cross cutting, apparently south- to southwest flowing channels that were encountered in Trench T-6. Channel deposits are typically composed of coarser sediments ranging from moderately sorted gravelly sands to well-sorted coarse gravels.

The stratigraphy exposed in our trenches generally correlates well with seismic refraction survey results, as shown on Figure 6. Each survey profile indicates materials in the upper +/- 20 feet of the subsurface have P-wave velocities below about 3,000 feet per second (fps). Velocities abruptly increase to between 5,000 and 7,000 (fps) below 20 feet, suggesting a higher degree of consolidation and/or cementation. This abrupt transition is interpreted as the probable base of the Holocene record.

5.2 Geologic Structures

A zone of deformed soil between Stations 0+0 and 0+36 is characterized by abrupt thickening/thinning and truncation of soil layers. No deformation was observed at Station 0+50, suggesting the edge of the deformation zone is somewhere between Stations 0+36 and 0+50, which was not excavated due to utility conflicts. A detailed log of the deformation zone is shown on Figure C-8. We also collected a 3-D scan of the deformation zone using the "3D Scanner" app available through the Apple store, and using the internal camera on an iPad Pro 13. A high-resolution color photomosaic derived from our scan is shown overlaid with the trench log on Figure C-9, and the unaltered image is shown on C-10.

Between Stations 0+10 and 0+22, several contacts between soil horizons are offset by a series of subvertical discontinuities expressed as seams of coarse rounded sand and gravelly sand. Some of these seams offset contacts in the base of the trench between the basal clayey soils (unit 11) and overlying silty to gravelly sands (units 9 and 10). Others project downward into open vertical cracks in the clayey soils, some filled with occasional rounded sands and pebbles, but do not appear to exhibit any vertical offset. We did not observe any consistent preferred gravel clast orientation along most of the seams that would provide better evidence of shear.

Most of the discontinuities are traceable to the base of the clayey surface soils, within about 2 or 3 feet of the ground surface and typically project to prominent open vertical cracks in those soils. Typically, vertical cracks in plastic clayey soils would be attributed to shrink/swell behavior in response to changing moisture content. However, the near-surface clayey soils within the deformation zone are laterally extensive across the entire site, and although all of the trenches were left open for several weeks (allowing ample opportunity for desiccation and cracking to occur), prominent cracks were only observed within the deformation zone in association with the vertical sandy seams in the deeper, coarser horizons.

Several roots and root casts were encountered along discontinuities in the sandy middle units of the trench, and it is possible these cracks simply represent areas where roots have been cut/destroyed by previous grading activity or otherwise decayed. No roots, krotovina (filled animal burrows), or other evidence of significant bioturbation were observed in the deeper clayey soils, and it appears unlikely that the cracks in those materials are related to root growth.

The location of deformation zone is generally on strike with regionally mapped fault traces, with our observations of potential ground deformation as discussed in Section 4.4, and with apparent offsets at the 1,000 and 6,000 fps contours on seismic plot SR-2.

Trenches T-1 through T-3, T-5 and T-6, located parallel to the northwestern property line in the northern part of the site, did not expose any potentially fault-related structures. Note that we were unable to dig across the mapped fault trace due to limited access. Seismic line SR-1 generally corroborates a lack of significant offsets in the near-subsurface. The boundary between interpreted Holocene (<3,000 feet per second P-wave velocity) and Pleistocene materials at a depth of about 30 feet below the ground surface appears to be uninterrupted and without apparent vertical offsets. Some variations at greater depth are evident, however. At the west side of the profile, successive vertical offsets of a couple feet are apparent in an interpreted channel deposit at depths of about 15-20 feet near Station 0+40, and in higher-velocity materials about 35 feet deep. At the location of the observed scarp, minor offsets in the 1,000 fps and 6,000 fps contacts are suggestive of a steeply southwest-dipping thrust fault, although offset in intermediate contours is not apparent.

6.0 CONCLUSIONS

We interpret that the features observed in the west end of Trench T-4, including local contact displacement and vertical sand seams and soil cracks are of tectonic origin, and that deformation occurred during late Holocene time. However, we are unable to conclude whether or not the features are representative of faults or are secondary features associated with nearby faulting. We judge that the following scenarios, or a combination of both, are plausible:

- Although vertical offsets are inconsistent and definitive evidence of shear was not observed, the features could represent active fault traces having a predominantly right-lateral strike-slip sense of motion. The conspicuous alignment of surface deformation observed during our reconnaissance with the exposure in our trench and the mapped fault trace/scarp suggests shallow creep may be occurring. It is possible that the vertical seams are poorly expressed faults associated with more significant aseismic creep at depth, and that the lack of significant offset or apparent shear is related to the very slow rate and magnitude of movement in the near surface.

- Another possible interpretation is that the vertical features observed are relic sand boils or water-escape structures associated with strong seismic shaking and liquefaction. The presence of rounded pebbles within soil cracks in the lower clayey unit of the trench and the lack of apparent offsets along seismic line SR-2 at the interpreted Holocene-Pleistocene boundary could also support this interpretation.

Based on the results of our radiocarbon dating discussed in Section 4.5, our trenches did not extend completely through the Holocene geologic record. Alluvium in the bottom of the trenches, including Units `13 and 14 at typical depths between about 8 and 12 feet below the ground surface, is interpreted to be about 8,000-years old at a minimum. Although they are subtle, minor offsets and irregularities in the seismic profiles are generally aligned on-strike with features exposed in our trenches and apparent deformation of cultural features at the ground surface. Additionally, deformation must have occurred within the last 2,500 years based on radiocarbon dating of charcoal samples collected from Unit 7 across the site. Therefore, we conclude that Holocene faulting has occurred, and that although indirect, the cumulative evidence supports the probability of active, ongoing creep along the possible fault trace plotted on Figure 7.

7.0 RECOMMENDATIONS

Since the aggregated evidence suggests likely Holocene fault activity, we recommend that minimum setbacks from the potential faults be imposed for new structures in accordance with the Field Act, as shown on Figure 7.

We recommend that setbacks of 50-feet be imposed, and a “no-build” zone established that extends east of the possible fault zone observed in Trench T-4, and as shown on Figure 7. Although we were unable to excavate areas between Stations 0+36 and 0+50, such a setback to the east from the possible fault at Station 0+22 would encompass the whole deformation zone, which we judge is adequate.

To the west, we recommend that that the “no-build” zone be extended to Bryden Lane. Although no evidence of faulting was observed in Trench T-3, apparent offsets at depth in seismic plot SR-1 suggests the potential for active faults at depth beneath our trench in that part of the site.

8.0 SUPPLEMENTAL GEOTECHNICAL SERVICES

Supplemental services could include consultation with the District to evaluate potential redevelopment options in consideration of the recommended no-build zone and probable site geotechnical considerations. Services could also include more comprehensive subsurface exploration, lab testing, and analysis as part of a design-level Geologic and Geotechnical Investigation, if new improvements are planned.

9.0 LIMITATIONS

It is our opinion that this report has been prepared in accordance with generally accepted geotechnical engineering practices in the San Francisco Bay Area at the time the report was prepared. This report has been prepared for the exclusive use of Santa Rosa City Schools and/or its assignees specifically for this project. No other warranty, expressed or implied, is made. Our evaluations and recommendations are based on the data obtained during our subsurface exploration program and our experience with soil and geologic conditions in this geographic area.

Our approved scope of work did not include an environmental assessment of the site. Consequently, this report does not contain information regarding the presence or absence of toxic or hazardous wastes.

The evaluations and recommendations do not reflect variations in subsurface conditions that may exist between exploration locations or in unexplored portions of the site. Should such variations become apparent during construction, the general recommendations contained within this report will not be considered valid unless MPEG is given the opportunity to review such variations and revise or modify our recommendations accordingly. No changes may be made to the general recommendations contained herein without the written consent of MPEG.

We recommend that this report, in its entirety, be made available to project team members, contractors, and subcontractors for informational purposes and discussion. We intend that the information presented within this report be interpreted only within the context of the report as a whole. No portion of this report should be separated from the rest of the information presented herein. No single portion of this report shall be considered valid unless it is presented with and as an integral part of the entire report.

10.0 LIST OF REFERENCES

Bace Geotechnical (1992), "Fault Hazard Investigation, Doyle Park Elementary School, 1350 Sonoma Avenue, Santa Rosa, California", Job No. 10590.1, dated September 21, 1992.

Borchardt, G. (2010), "Soil Stratigraphy for Trench Logging, Third Edition", A Continuing Education Short Course presented by Soil Tectonics Inc. and sponsored by AEG (Short Course Textbook).

Burton H. Marliave (1981), "Geologic Hazards Study for Zada Project, 1625 Terrace Way, Santa Rosa, California", dated July 10, 1981 (A-P #1426)

California Public Resources Code, Chapter 7.8, "Seismic Hazard Mapping Act", 1990.

California Public Resources Code, Division 2, Section 7.5, "Earthquake Fault Zoning Act, 1972 (Amended 2024).

California Division of Mines and Geology (CDMG)(1983), "Revised Official Map of Earthquake Fault Hazard Zones, Santa Rosa Quadrangle", effective July 1, 1983.

California Geological Survey (CGS)(2018), "Earthquake Fault Zones – A Guide for Government Agencies, Property Owners/Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California", Special Publication 42, Revised 2018.

California Geological Survey (CGS)(2024), "Earthquake Zones of Required Investigation, Santa Rosa Quadrangle, Revised Official Map, Released February 22, 2024.

California Geological Survey (CGS)(2025), "Historic Earthquake Online Database", http://maps.conservation.ca.gov/cgs/historicearthquakes/, accessed September 3, 2025

Cooper-Clark & Associates (1978), "Report, Fault Hazard Investigation, Proposed Medical Center, Santa Rosa, California", Job No. 2048-A, dated June 5, 1978 (A-P #799).

Donald Herzog & Associates (1980), "Report, Soil and Geologic Investigation, Proposed Office Building, 1604 Fourth Street, Santa Rosa, California", Job No. 5074.1, dated September 30, 1980 (A-P #1231).

Field, E.H. et al (2015), "Long-Term Time-Dependent Probabilities for the Third Uniform California Earthquake Rupture Forecast (UCERF3)", Bulletin of the Seismological Society of America, Volume 105, No. 2A, 33pp., April 2015, doi: 10.1785/0120140093

Fox, K.F. et al (1973), "Preliminary Geologic Map of Eastern Sonoma County and Western Napa County, California" Untied States Geological Survey Miscellaneous Field Studies Map MF-483, Sheet 2 of 4, Map Scale 1:62,500.

Fugro William Lettis & Associates (2011), "Draft Report, Geologic and Geotechnical Evaluation of The Santa Rosa Aqueduct Crossing of the Rodgers Creek Fault, Santa Rosa, California", Project No. 04.79218600, dated September 2011.

Gealey, W.K. (1951), "Geology of the Healdsburg Quadrangle, California", California Department of Natural Resources, Division of Mines Bulletin 161.

Hart, E.W. (1982), "Fault Evaluation Report FER-141", California Department of Conservation, Division of Mines and Geology, dated July 27, 1982.

Hecker, S. et al (2005), "The Most Recent Large Earthquake on the Rodgers Creek Fault, San Francisco Bay Area" in Bulletin of the Seismological Society of America, Vol. 95, No. 3, pp. 844-860, June 2005, doi: 10.1785/0120040134

Hecker, S. et al (2016), "Detailed Mapping and Rupture Implications of the 1-km Releasing Bend in the Rodgers Creek Fault at Santa Rosa, California", Bulletin of the Seismological Society of America, Vol. 106, No. 2, pp. 575-594, April 2016, doi: 10.1785/0120150152

Hecker, S. and Randolph Loar, C.E. (2018), "Map of Recently Active Traces of the Rodgers Creek Fault, Sonoma County, California", United States Geological Survey Scientific Investigations Map 3410, Sheet 1, https://doi.org/10.3133/sim3410.

Huffman, M.E. and Armstrong, C.F. (1980), "Geologic Map Exclusive of Landslides, Southern Sonoma County, California" *in* Geology for Planning in Sonoma County, California Department of Conservation, Division of Mines and Geology Special Report 120, Plate 3A, Map Scale 1:62,500.

Jennings, C.W. and Bryant, W.A. (2010), "2010 Fault Activity Map of California", California Department of Conservation, California Geological Survey Geologic Data Map No. 6, http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html#, accessed November 1, 2018.

Ladinsky, T. and Zachariasen, J. (2024), "The Southern Rodgers Creek Fault Zone in the Sears Point, Petaluma River, Glen Ellen, Cotati and Santa Rosa Quadrangles, Sonoma County, California", California Geological Survey Fault Evaluation Report 270, dated February 22, 2024.

McLaughlin, R.J., et al (2008), "Geologic and Geophysical Framework of the Santa Rosa 7.5-Minute Quadrangle, Sonoma County, California", United States Geological Survey Open-File Report 2008-1009, Sheet 1 of 3, Map Scale 1:24,000.

Miller Pacific Engineering Group (2015), "Geotechnical Investigation, Proposed Modular Restroom, Proctor Terrace Elementary School, 1711 Bryden Lane, Santa Rosa, California", Project No. 1079.113, dated May 25, 2018.

Seitz, G.G. and Rosinski, A. (2018), "Engineering Geology and Seismology Review, Proctor Terrace Elementary School – Modular Restroom, 1711 Bryden Lane, Santa Rosa, CA, CGS Application No. 01-CGS3482", dated July 24, 2018

Thomas D. Hays & Associates (1977), "Preliminary Geologic Investigation, Proposed Site for Office Buildings, South Corner of 4th and Talbot, Santa Rosa, California", Job No. 77-380, dated June 14, 1977 (A-P #508)

Toppozada, T. R et al. (1992), "1898 "Mare Island" earthquake at the southern end of the Rodgers Creek Fault" *in* Conference on Earthquake Hazards in Eastern San Francisco Bay Area, 2nd, Hayward, Calif., Proceedings, Borchardt, G., and others, eds.: California Department of Conservation, Division of Mines and Geology Special Publication 113, p. 385-392.

United States Geological Survey (USGS)(2003), "Earthquake Probabilities in the San Francisco Bay Region, 2002 to 2031 – A Summary of Finding," The Working Group on California Earthquake Probabilities, Open File Report 99-517.

United States Geological Survey (USGS)(2008), "The Uniform California Earthquake Rupture Forecast, Version 2 (UCERF 2), 2007 Working Group on California Earthquake Probabilities, USGS Open File Report 2007-1437, CGS Special Report 203, SCEC Contribution #1138.

United States Geological Survey (USGS)(2025), "Historic Earthquake Catalogue Search", https://earthquake.usgs.gov/earthquakes/search/, accessed August 27, 2025.

Weaver, C.E. (1949), "Geology of the Coast Ranges immediately north of the San Francisco Bay region, California:, Geological Society of America, Memoir 35, Map Scale 1:62,500.

Wong, I.G. and Bott, J.D.J (1995), "A New Look Back at the 1969 Santa Rosa, California Earthquakes" in Bulletin of the Seismological Society of America, Vol. 85, No. 1, pp. 334-341, February 1995.

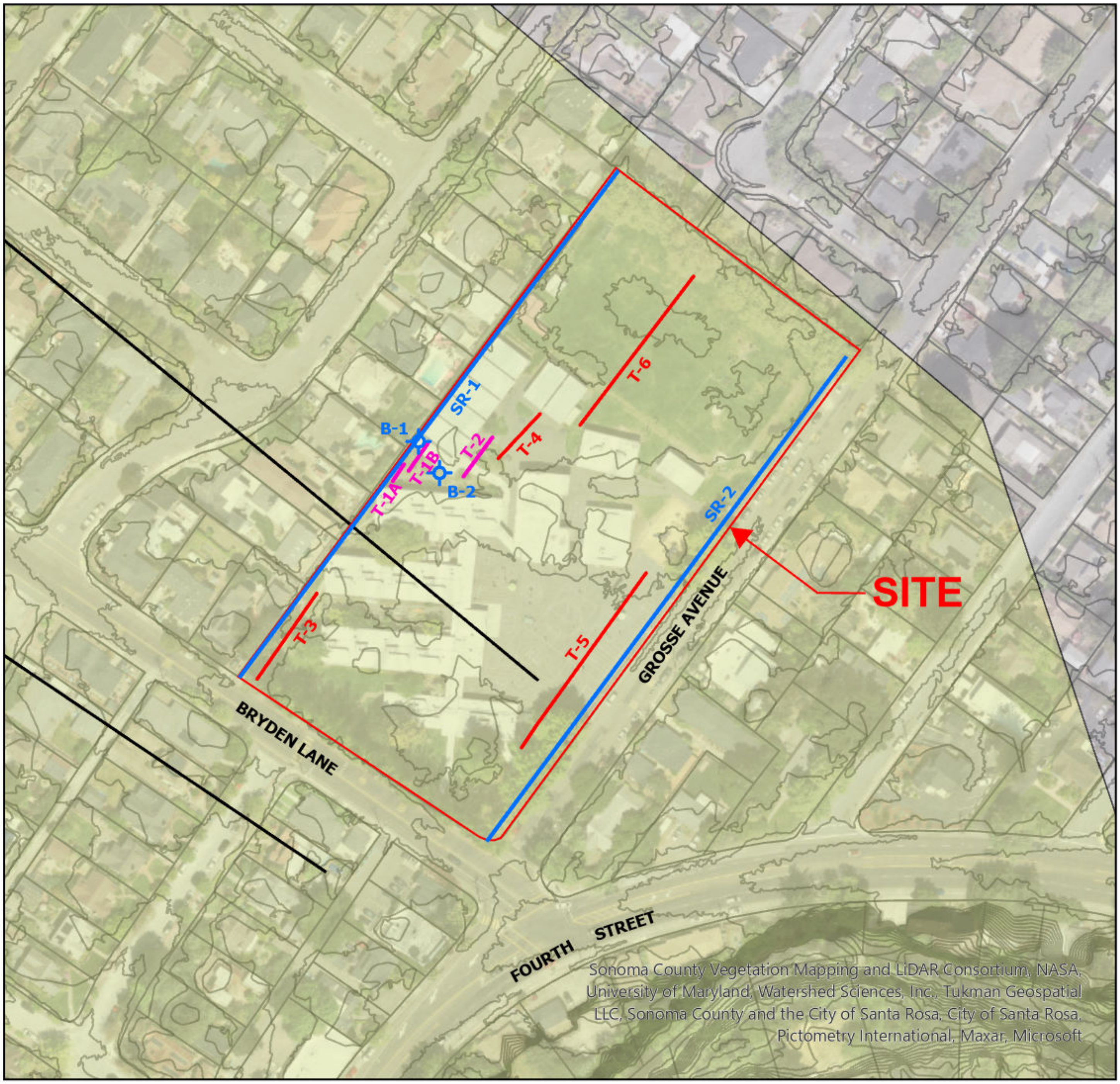
SITE COORDINATES
38.4518°N
122.6974°W

MAP SCALE 1:24,000

0 500 1,000 2,000 3,000 4,000 Feet

N W E S

MILLER PACIFIC ENGINEERING GROUP	NOVATO 415-382-3444	**SITE LOCATION MAP**	**FIGURE** 1
	PETALUMA 707-765-6140	Proctor Terrace Elementary School 1711 Bryden Lane Santa Rosa, California	
	NAPA 707-265-7982		
A CALIFORNIA CORPORATION © 2025, ALL RIGHTS RESERVED	www.millerpac.com	Project No. 1079.121 Date: 9/3/2025 6:01 PM	



SITE COORDINATES
38.4518°N
122.6974°W

MAP SCALE 1:2,400

0 100 200 400 Feet

N W E S

Legend and Key to Map Symbols

- Parcel Boundary
- CGS Alquist-Priolo Earthquake Fault Zone
- CGS Alquist-Priolo Fault Trace
- Topographic Contour (1-foot)
- Fault Trench (2025)
- Fault Trench (2018)
- Seismic Refraction Line
- Boring by Miller Pacific (2018)

MPEG MILLER PACIFIC ENGINEERING GROUP

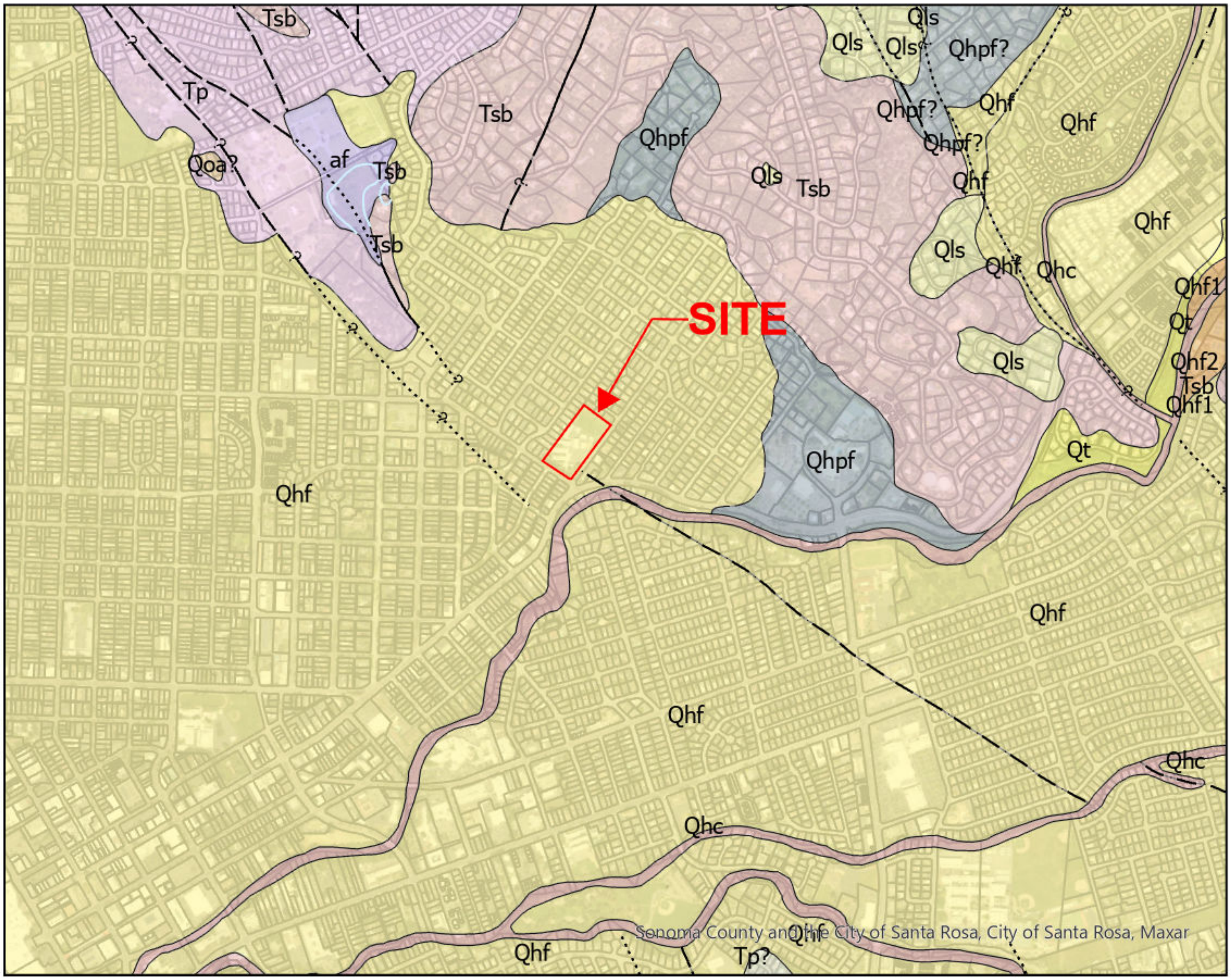
NOVATO 415-382-3444
PETALUMA 707-765-6140
NAPA 707-265-7982
www.millerpac.com

SITE PLAN

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 9/15/2025 12:49 PM

FIGURE
2



SITE COORDINATES
38.4518°N
122.6974°W

MAP SCALE 1:24,000

0 500 1,000 2,000 3,000 4,000 Feet

N W E S

Geologic Map Units

af	Artificial fill
Qhc	Channels (Holocene) - Incise older deposits.
Qhf	Alluvial fan and fluvial terrace deposits, undivided (Holocene)
Qhf1	Young Holocene alluvial fan and fluvial terrace deposits
Qhf2	Older Holocene alluvial fan and fluvial terrace deposits.
Qhpf	Alluvial fan and terrace deposits (Holocene? and/or Pleistocene)
Qls	Landslide Deposits (Holocene and Pleistocene)
Qoa?	Older alluvium, undivided (Pleistocene)
Qt	Alluvial terrace deposits (Holocene - Pleistocene)
Tp	Petaluma Formation (Pliocene - Miocene)
Tsb	Andesite, basaltic andesite, and basalt (Tertiary)

Map Symbols

- contact, approx. located
- contact, certain
- fault, approx. loc., queried
- fault, approx. located
- fault, certain
- fault, concealed
- fault, concealed, queried
- lineaments
- sag pond

REFERENCE: McLaughlin, R.J., et al (2008), "Geologic and Geophysical Framework of the Santa Rosa 7.5-Minute Quadrangle, Sonoma County, California", United States Geological Survey Open-File Report 2008-1009, Sheet 1 of 3, Map Scale 1:24,000.

MPEG MILLER PACIFIC ENGINEERING GROUP

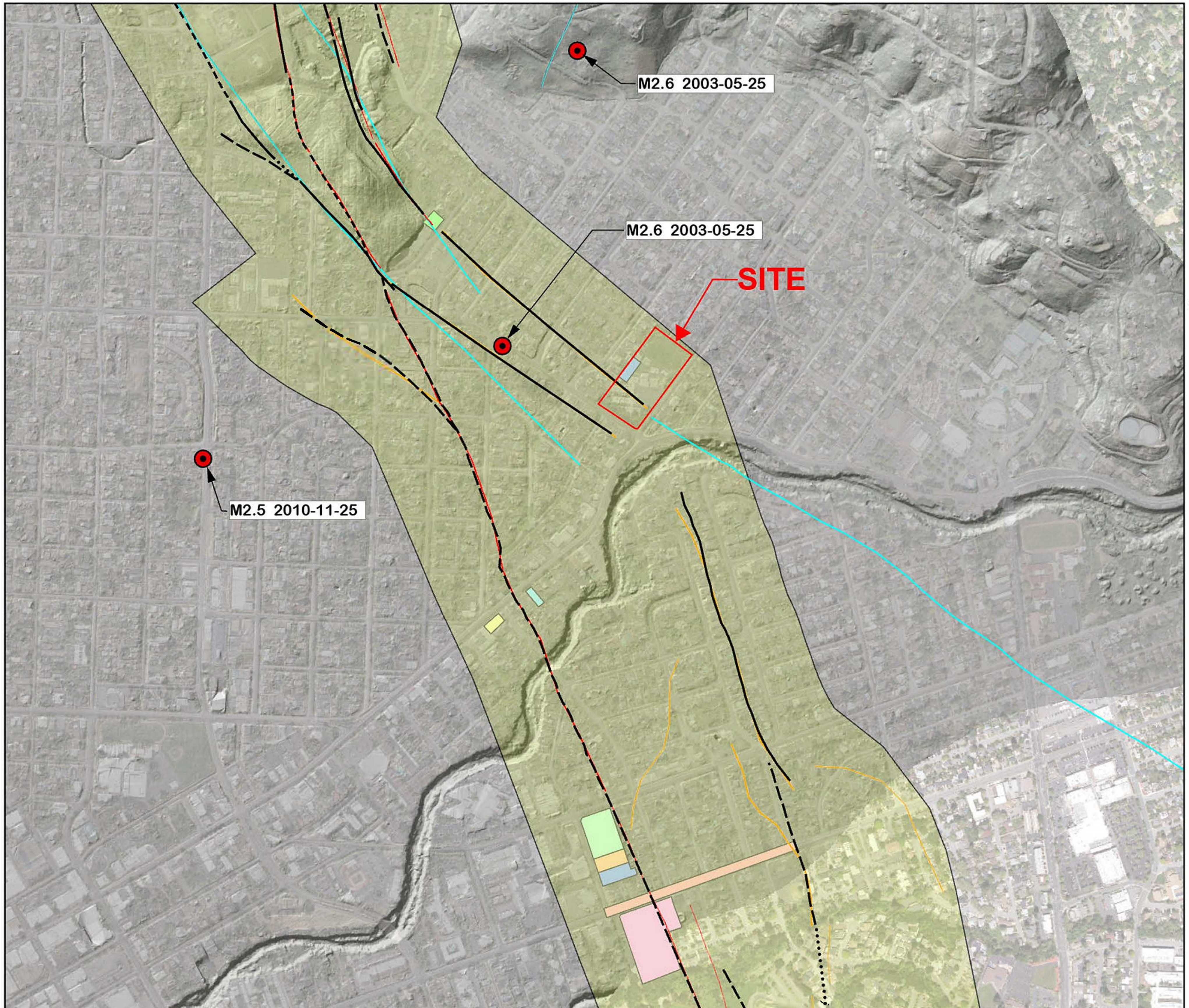
NOVATO 415-382-3444
PETALUMA 707-765-6140
NAPA 707-265-7982
www.millerpac.com

REGIONAL GEOLOGIC MAP

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 9/3/2025 6:01 PM

FIGURE
3



Legend and Key to Map Symbols

- Historic Earthquake Epicenter
- CGS Alquist-Priolo Earthquake Fault Zone

Alquist-Priolo Faults (Holocene)

- Accurately Located
- Approximately Located
- Inferred
- Concealed

Faults Mapped by Hecker (2018)

- Part of Principal Displacement Zone (Holocene)
- Part of Distributed Displacement Zone (Holocene)

Faults Mapped by McLaughlin et al. (2008)

- Accurately Located (Age Undetermined)

Previous Studies by Others

- Bace Geotechnical (1992)
- Burton H. Marliave (1981)
- Cooper Clark & Associates (1978)
- Donald Herzog & Associates (1980)
- Fugro William Lettis & Associates (2011)
- Herzog Associates (1989)
- Miller Pacific Engineering Group (2018, 2020)
- Thomas D. Hays & Associates (1977)

SITE COORDINATES
38.4518°N
122.6974°W

MAP SCALE 1:12,000

0 500 1,000 2,000 3,000 4,000 Feet

N W E S

MILLER PACIFIC ENGINEERING GROUP

A CALIFORNIA CORPORATION

NOVATO 415-382-3444
PETALUMA 707-765-6140
NAPA 707-265-7982
www.millerpac.com

LOCAL FAULT MAP AND STUDIES BY OTHERS

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

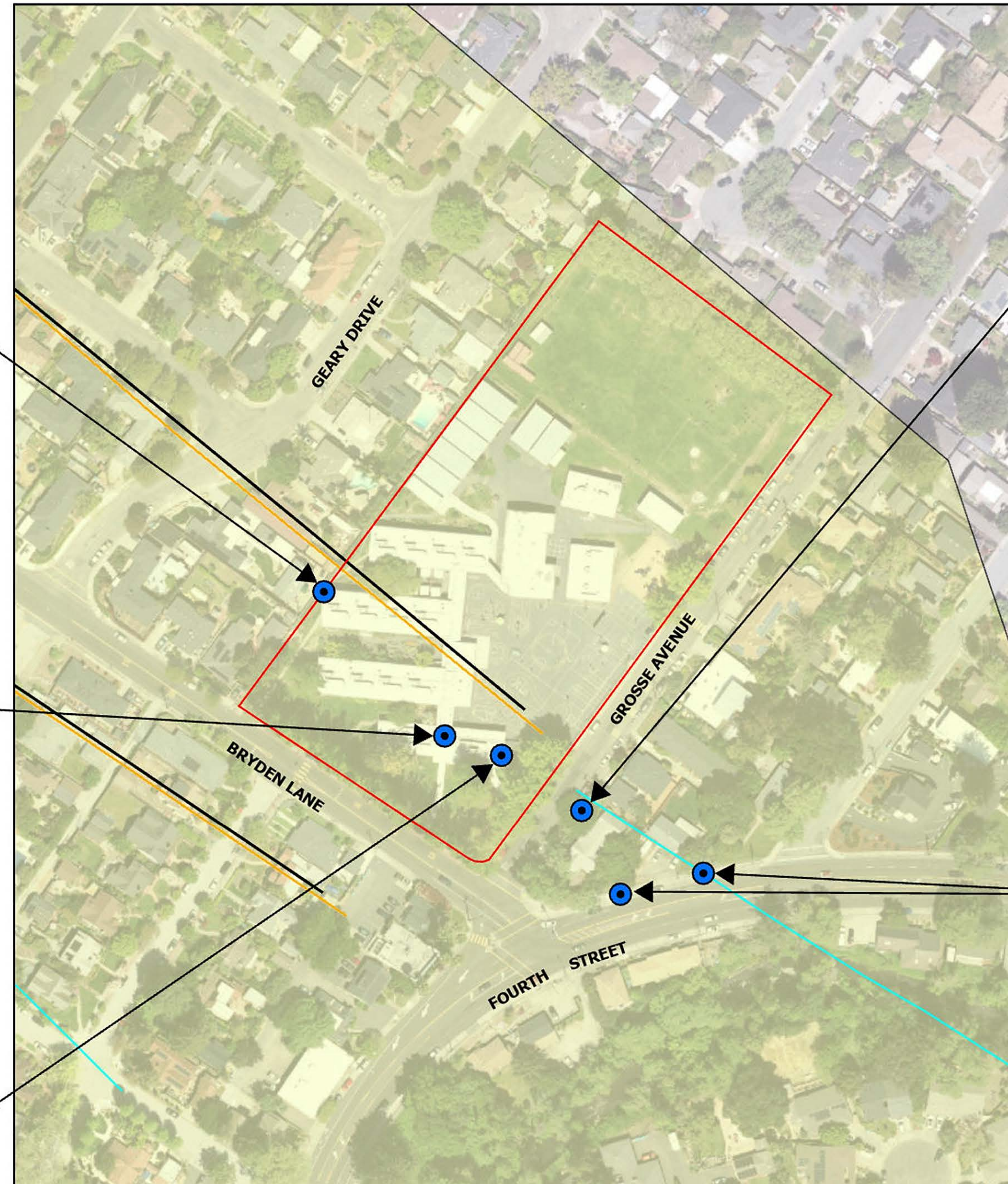
Project No. 1079.121 Date: 9/8/2025 9:57 AM

FIGURE 4

Location 1 - View to northeast of low northeast-facing scarp at northern corner of main building, approximately coincident with fault trace mapped by Hecker (2016, 2018) and CGS (2024). Note approximate 1-foot rise in ground surface against block wall and prominent cracks in stucco facade.

Location 2 - Cracked linoleum floor in main building hallway exhibiting en echelon fractures. Cracks extend across entire hallway along northwest trend.

Location 3 - View to north of damaged stucco at south corner of main building at location of deformation zone observed in Trench T-4 and approximately on strike with mapped fault and locations 1 and 2.



SITE COORDINATES
38.4518°N
122.6974°W

MAP SCALE 1:2,400

0 50 100 200 300 400 Feet

N W E S

Legend and Key to Map Symbols

- CGS Alquist-Priolo Earthquake Fault Zone
- Alquist-Priolo Faults (Holocene)
- Faults Mapped by Hecker (2018)
- Faults Mapped by McLaughlin et al. (2008)

Location 4 - View to south of severely damaged concrete driveways. Most of the concrete flatwork in the surrounding area is older, but in reasonably good condition without similarly prominent or extensive damage.

Photo 5 - View to northeast of right-lateral offsets between sidewalk panels along Fourth Street. Total of 4 locations noted with apparent cumulative offset just under 3 inches.

MPEG MILLER PACIFIC ENGINEERING GROUP

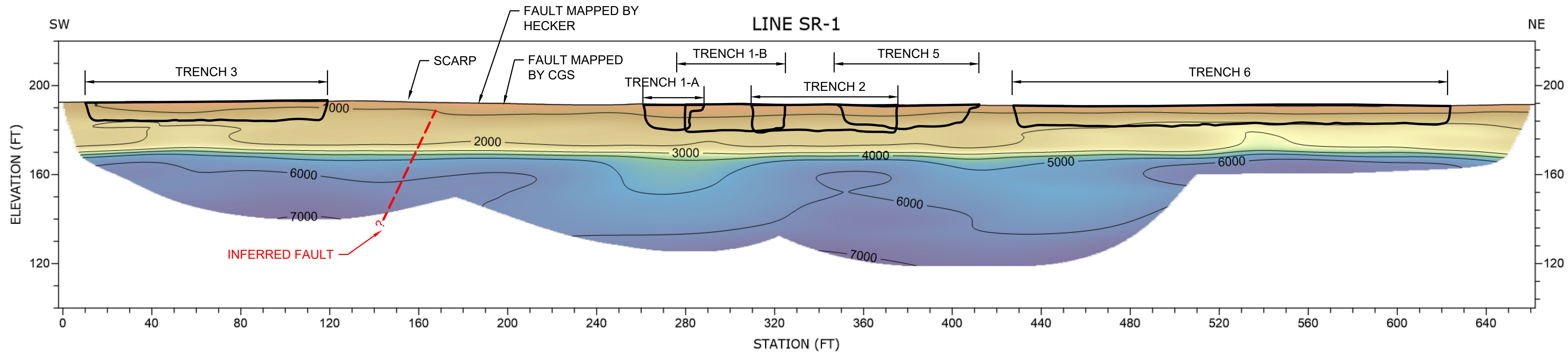
NOVATO 415-382-3444
PETALUMA 707-765-6140
NAPA 707-265-7982
www.millerpac.com

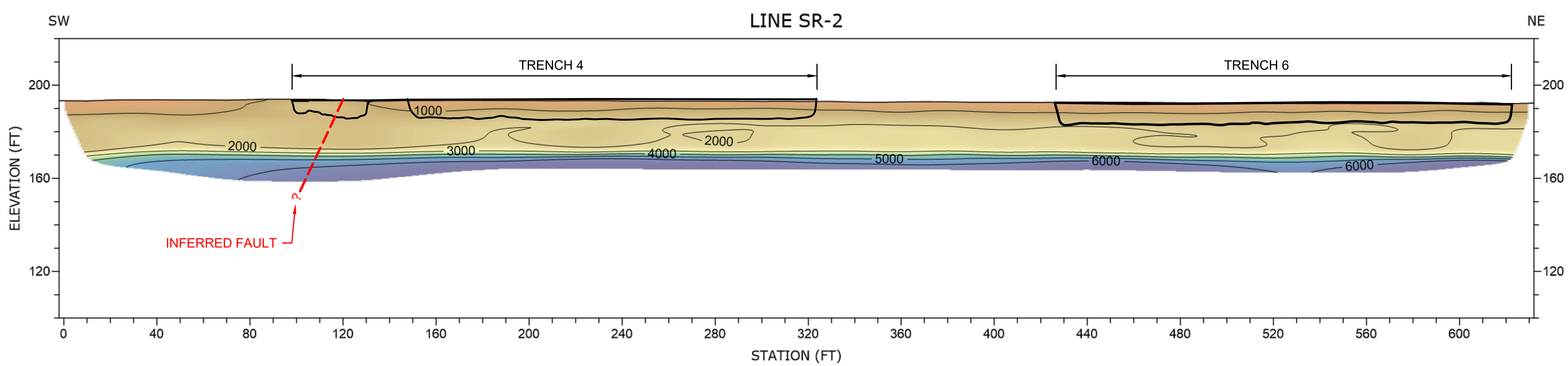
SITE RECONNAISSANCE MAP

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 9/8/2025 9:57 AM

FIGURE 5





MPEG MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121 Figures.dwg

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

SEISMIC PLOTS WITH TRENCH ALIGNMENTS

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/8/2025

Designed ZMS
Drawn ZMS
Checked ZMS

6
FIGURE

SITE COORDINATES
38.4518°N
122.6974°W

MAP SCALE 1:2,400

0 100 200 400 Feet

N W E S

Legend and Key to Map Symbols

- - - - Inferred Fault (this study)

Recommended "No Build" Zone

MPEG MILLER PACIFIC ENGINEERING GROUP

NOVATO 415-382-3444
PETALUMA 707-765-6140
NAPA 707-265-7982
www.millerpac.com

RECOMMENDED "NO BUILD" ZONE

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 9/8/2025 9:57 AM

FIGURE 7

APPENDIX A
HISTORIC AERIAL PHOTOGRAPHS

(NOT TO SCALE)

MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121AppendixA.pdf

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

HISTORIC AERIAL PHOTOGRAPH (1942)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 9/4/2025

Drawn MFJ
Checked

A-1
FIGURE

(NOT TO SCALE)

MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121AppendixA.pdf

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

HISTORIC AERIAL PHOTOGRAPH (1953)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 9/4/2025

Drawn MFJ
Checked

A-2
FIGURE

(NOT TO SCALE)

MPEG MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121AppendixA.pdf

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

HISTORIC AERIAL PHOTOGRAPH (1965)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 9/4/2025

Drawn MFJ
Checked

A-3
FIGURE

(NOT TO SCALE)

MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121AppendixA.pdf

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

HISTORIC AERIAL PHOTOGRAPH (1966)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 9/4/2025

Drawn MFJ
Checked

A-4
FIGURE

APPENDIX B

PREVIOUS SUBSURFACE EXPLORATION LOGS

MAJOR DIVISIONS		SYMBOL	DESCRIPTION
COARSE GRAINED SOILS over 50% sand and gravel	CLEAN GRAVEL	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
	GRAVEL with fines	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	CLEAN SAND	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
	SAND with fines	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS over 50% silt and clay	SILT AND CLAY liquid limit <50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	SILT AND CLAY liquid limit >50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS		PT	Peat, muck, and other highly organic soils
ROCK			Undifferentiated as to type or composition

KEY TO BORING AND TEST PIT SYMBOLS

CLASSIFICATION TESTS

PI	PLASTICITY INDEX
LL	LIQUID LIMIT
SA	SIEVE ANALYSIS
HYD	HYDROMETER ANALYSIS
P200	PERCENT PASSING NO. 200 SIEVE
P4	PERCENT PASSING NO. 4 SIEVE

SAMPLER TYPE

- MODIFIED CALIFORNIA
- HAND SAMPLER
- STANDARD PENETRATION TEST
- ROCK CORE
- THIN-WALLED / FIXED PISTON
- X DISTURBED OR BULK SAMPLE

NOTE: Test boring and test pit logs are an interpretation of conditions encountered at the excavation location during the time of exploration. Subsurface rock, soil or water conditions may vary in different locations within the project site and with the passage of time. Boundaries between differing soil or rock descriptions are approximate and may indicate a gradual transition.

STRENGTH TESTS

TV	FIELD TORVANE (UNDRAINED SHEAR)
UC	LABORATORY UNCONFINED COMPRESSION
TXCU	CONSOLIDATED UNDRAINED TRIAXIAL
TXUU	UNCONSOLIDATED UNDRAINED TRIAXIAL
	UC, CU, UU = 1/2 Deviator Stress

SAMPLER DRIVING RESISTANCE

Modified California and Standard Penetration Test samplers are driven 18 inches with a 140-pound hammer falling 30 inches per blow. Blows for the initial 6-inch drive seat the sampler. Blows for the final 12-inch drive are recorded onto the logs. Sampler refusal is defined as 50 blows during a 6-inch drive. Examples of blow records are as follows:

25	sampler driven 12 inches with 25 blows after initial 6-inch drive
85/7"	sampler driven 7 inches with 85 blows after initial 6-inch drive
50/3"	sampler driven 3 inches with 50 blows during initial 6-inch drive or beginning of final 12-inch drive

MPEG MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILENAME: 1079.113 BL.dwg

SOIL CLASSIFICATION CHART

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 5/14/2018

Drawn MMT
Checked

B-1
FIGURE

BORING 1

EQUIPMENT: Truck-Mounted Mobile B53 with 6.0-Inch Hollow Stem Augers
DATE: 4/13/18
ELEVATION: 192 - feet*
*REFERENCE: Google Earth, 2018

DEPTH meters	DEPTH feet	SAMPLE	SYMBOL (4)	DESCRIPTION	BLOWS / FOOT (1)	DRY UNIT WEIGHT pcf (2)	MOISTURE CONTENT (%)	SHEAR STRENGTH psf (3)	OTHER TEST DATA	OTHER TEST DATA
0	0			GRAVEL						
				CLAY with Sand (CL) Dark brown, moist, medium stiff, medium plasticity clay, ~15-20% fine grained sand. [Alluvium]						
1		■			11	97	22.5	UC 950		
	5	■			8	98	24.6	UC 500		
2										
3	10	■			9	92	30.1			
4				Sandy CLAY (CL) Dark gray, saturated, soft, low to medium plasticity clay, ~30-35% fine grained sand. [Alluvium]						
	15	■			4	107	23.9			
5				Clayey SAND (SC) Dark gray, saturated, very loose, fine grained sand, ~40-45% medium plasticity clay. [Alluvium]						
6	20	■			6	87	30.1		P200 40.8%	LL:37 PI:19

▽ Water level encountered during drilling
▼ Water level measured after drilling

NOTES:
(1) UNCORRECTED FIELD BLOW COUNTS
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m^3 = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(4) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

MPEG MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILENAME: 1079.113 BL.dwg

BORING LOG

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 5/14/2018

Drawn MMT
Checked

B-2
FIGURE

BORING 1 (CONTINUED)

DEPTH meters	DEPTH feet	SAMPLE	SYMBOL (4)	DESCRIPTION	BLOWS / FOOT (1)	DRY UNIT WEIGHT pcf (2)	MOISTURE CONTENT (%)	SHEAR STRENGTH psf (3)	OTHER TEST DATA	OTHER TEST DATA
	20			**Clayey SAND (SC)** Dark gray, saturated, very loose, fine grained sand, ~40-50% medium plasticity clay. [Alluvium]	6	87	30.1		P200 40.8%	LL:37 PI:19
7					3		31.3		P200 46.0%	
	25			**CLAY with Sand (CH)** Dark gray, saturated, soft, high plasticity clay, ~10-15% fine grained sand. [Alluvium]	6		21.0			
8										
9	30			**Sandy CLAY (CL-CH)** Dark gray black, saturated, soft, medium to high plasticity clay, ~25-30% fine grained sand. [Alluvium]	5		34.3		P200 65.3%	
10										
	35				4		39.3			
11										
12	40				5		35.7			

▽ Water level encountered during drilling

▼ Water level measured after drilling

NOTES:
(1) UNCORRECTED FIELD BLOW COUNTS
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m^3 = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(4) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

MPEG MILLER PACIFIC ENGINEERING GROUP

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILENAME: 1079.113 BL.dwg

BORING LOG

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 5/14/2018

Drawn MMT
Checked

B-3
FIGURE

BORING 1 (CONTINUED)

DEPTH meters	DEPTH feet	SAMPLE	SYMBOL (4)	DESCRIPTION	BLOWS / FOOT (1)	DRY UNIT WEIGHT pcf (2)	MOISTURE CONTENT (%)	SHEAR STRENGTH psf (3)	OTHER TEST DATA	OTHER TEST DATA
	40			Sandy CLAY (CL-CH) Dark gray black, saturated, soft, medium to high plasticity clay, ~25-30% fine grained sand. [Alluvium]						
13				Grades with trace gravel.						
	45				7		28.2			
14										
15	50				10		27.7			
				Boring terminated at 50.0 feet. Groundwater measured at 10.0 feet upon completion of exploration.						
16										
	55									
17										
18	60									

▽ Water level encountered during drilling

▼ Water level measured after drilling

NOTES: (1) UNCORRECTED FIELD BLOW COUNTS
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m^3 = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(4) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

MPEG MILLER PACIFIC ENGINEERING GROUP

FILENAME: 1079.113 BL.dwg

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

BORING LOG

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 5/14/2018

Drawn MMT
Checked

B-4
FIGURE

BORING 2

EQUIPMENT: Truck-Mounted Mobile B53 with 6.0-Inch Hollow Stem Augers
DATE: 4/13/18
ELEVATION: 192 - feet*
*REFERENCE: Google Earth, 2018

DEPTH meters	DEPTH feet	SAMPLE	SYMBOL (4)	DESCRIPTION	BLOWS / FOOT (1)	DRY UNIT WEIGHT pcf (2)	MOISTURE CONTENT (%)	SHEAR STRENGTH psf (3)	OTHER TEST DATA	OTHER TEST DATA
0	0			GRAVEL						
				CLAY with Sand (CL) Dark brown, moist, medium stiff, medium plasticity clay, ~15-20% fine grained sand. [Alluvium]	12	98	23.3	UC 800		LL:40 PI:25
1				Grades dark red brown, ~20-25% fine grained sand.	8	96	24.5	UC 400		
	5				10	96	27.5	UC 550		
2										
3	10			Grades medium gray, stiff.	16	98	26.1			
4										
	15									
5				Grades soft, ~15-20% fine grained sand.	4	86	37.6		P200 82.7%	
					4		28.9			
6	20									

Water level encountered during drilling
Water level measured after drilling

NOTES: (1) UNCORRECTED FIELD BLOW COUNTS
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m^3 = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(4) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

MPEG MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILENAME: 1079.113 BL.dwg

BORING LOG

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California
Project No. 1079.121 Date: 5/14/2018

Drawn MMT
Checked

B-5
FIGURE

BORING 2 (CONTINUED)

DEPTH meters	DEPTH feet	SAMPLE	SYMBOL (4)	DESCRIPTION	BLOWS / FOOT (1)	DRY UNIT WEIGHT pcf (2)	MOISTURE CONTENT (%)	SHEAR STRENGTH psf (3)	OTHER TEST DATA	OTHER TEST DATA
	20			CLAY with Sand (CL-CH) Dark gray, saturated, soft, medium to high plasticity clay, ~15-20% fine grained sand. [Alluvium]						
7					3		38.9			
	25									
8										
				Sandy CLAY (CL-CH) Dark gray, saturated, medium stiff, medium to high plasticity clay, ~30-35% fine grained sand. [Alluvium]	10	87	34.8			
9	30			Boring terminated at 30.0 feet. Groundwater measured at 10.0 feet upon completion of exploration.						
10										
	35									
11										
12	40									

∇ Water level encountered during drilling
▼ Water level measured after drilling

NOTES: (1) UNCORRECTED FIELD BLOW COUNTS
(2) METRIC EQUIVALENT DRY UNIT WEIGHT kN/m^3 = 0.1571 x DRY UNIT WEIGHT (pcf)
(3) METRIC EQUIVALENT STRENGTH (kPa) = 0.0479 x STRENGTH (psf)
(4) GRAPHIC SYMBOLS ARE ILLUSTRATIVE ONLY

MPEG MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILENAME: 1079.113 BL.dwg

BORING LOG

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

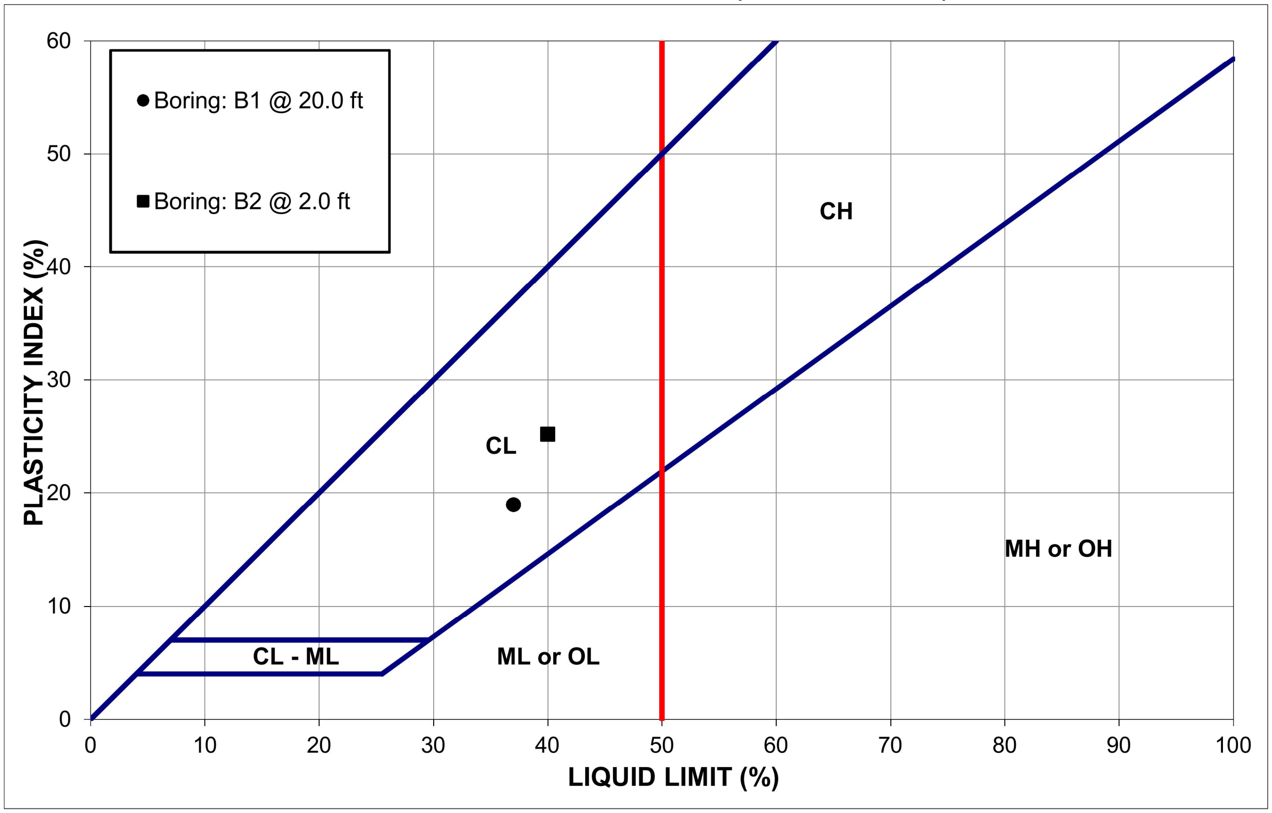
Project No. 1079.121 Date: 5/14/2018

Drawn MMT
Checked

B-6
FIGURE

MILLER PACIFIC ENGINEERING GROUP

ATTERBERG LIMITS TEST (ASTM D 4318)



Sample	Classification	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
Boring: B1 @ 20.0 ft	Clayey SAND (SC) medium gray brown	37	18	19
Boring: B2 @ 2.0 ft	Sandy CLAY (CL) dark brown	40	15	25

PI = 0-3: Non-Plastic
PI = 3-15: Slightly Plastic
PI = 15-30: Medium Plasticity
PI = >30: High Plasticity

MPEG MILLER PACIFIC ENGINEERING GROUP

FILENAME: 1079.113 BL.dwg

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

PLASTICITY INDEX RESULTS

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 5/14/2018

Drawn MMT
Checked

B-7
FIGURE

E T S

Environmental Technical Services

- Soil, Water & Air Testing & Monitoring
- Analytical Labs
- Technical Support

975 Transport Way, Suite 2
Petaluma, CA 94954
(707) 778-9605/FAX 778-9612
e-mail: *entech@pacbell.net*

Serving people and the environment so that both benefit.

COMPANY: Miller Pacific Engineering Group, 504 Redwood Blvd, Suite 220, Novato, CA 94947			ANALYST(S)	SUPERVISOR
ATTN: Dan Caldwell		DATE of	S. Santos	D. Jacobson
JOB NAME: Proctor Terrace Elem Sch, 1711 Bryden Lane	DATE RECEIVED	COMPLETION	L. Quijano	LAB DIRECTOR
JOB #: 1079.113 Santa Rosa, California	5/2/2018	5/10/2018		G.S. Conrad PhD

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SOIL pH -log[H+]	NOMINAL MIN RESISTIVITY ohm-cm	ELECTRICAL CONDUCTIVITY µmhos/cm	SULFATE SO4 ppm	CHLORIDE Cl ppm
07770-1	PTES1-BL/SR	Native Soil (B1+B2 @ 0.0-3.0')	**6.59**	**876**	**[1142]**	**171**	**120.0**
Method	Detection	Limits --->	---	1	0.1	1	1

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SALINITY ECe mmhos/cm	SOLUBLE SULFIDES (S=) ppm	SOLUBLE CYANIDES (CN=) ppm	REDOX mV	PERCENT MOISTURE %
Method	Detection	Limits --->	---	0.1	0.1	1	0.1

*** COMMENTS ***

Resistivity is at <1,000 ohm-cm, i.e., poor, and soil reaction (i.e., pH) is mildly acidic; sulfate is low enough (i.e., @ <200 ppm), but chloride is very mildly elevated (i.e., @ >100 ppm) [see table below on right for the assigned point values and ranges]. The CalTrans (CT) times to perforation of galvanized steel and full depth pitting times (following Uhlig) for this soil are detrermined based on pertinent parameters [see table at left below]. Sulfate should not have any measureable adverse impact on concrete, cement, mortar or grout; but chloride could have a very mild adverse impact on steel rebar or buried steel, In principle, lime or mild cement (@ 1%-2%) treatment to raise soil pH to the 7.5-8.5 range could be of some potential benefit. Otherwise, to increase the longevity of metals any more in this soil would require steel upgrading or other actions. At times, structural strength considerations may require heavier gauge steel than is used in the presented examples such that the perf and pitting to depth times can be beyond the specified life span. Where this is not the case, cathodic protection along with the coating or wrapping steel assets is one potential solution. Other options can include increased/specialized engineering fill, use of polymer coating, or the use of plastic, fiberglass or concrete assets. Based on these results, standard concrete mixes and rebar should be acceptable in this soil in the most commonly encountered projects, although other testing could be needed to verify this.

SAMPLE ID	CT 18 ga	CT 12 ga	2 mm (Uhlig)	PARAMETER/ID	MSES1-BD/SR
MSES1-BR/SR	*<12 yrs*	*~26 yrs*	*>11 yrs*	*pH*	*Ø*
Treated	<24 yrs	~52 yrs	>15 yrs	Rs	8-10
				SO4	Ø
				Cl	Ø-3
				Redox	-
				TOTALS	8-13

\\\\NOTES: Methods are from following sources: extractions by Cal Trans protocols as per Cal Test 417 (SO4), 422 (Cl), and 532/643 (pH & resistivity); &/or by ASTM Vol. 4.08 & ASTM Vol. 11.01 (=EPA Methods of Chemical Analysis, or Standard Methods); pH - ASTM G 51; Spec. Cond. - ASTM D 1125; resistivity - ASTM G 57; redox - Pt probe/ISE; sulfate - extraction Title 22, detection ASTM D 516 (=EPA 375.4); chloride - extraction Title 22, detection ASTM D 512 (=EPA 325.3); sulfides - extraction by Title 22, and detection EPA 376.2 (= SMEWW 4500-S D); cyanides - extraction by Title 22, and detection by ASTM D 4374 (=EPA 335.2).

MPEG MILLER PACIFIC ENGINEERING GROUP

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILENAME: 1079.113 BL.dwg

CORROSION TEST RESULTS

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.121 Date: 5/14/2018

Drawn MMT
Checked

B-8
FIGURE

APPENDIX C
SUMMARY OF FAULT TRENCH FINDINGS

Fault trenching for our previous study at the site was performed in early October of 2018. Excavation, shoring, and trench backfill were performed by Robison Construction of Petaluma, California. Trenching for this 2025 study, including Trenches 3 through 6, was performed in July and August of 2025. Excavation, shoring, and trench backfill were performed by Maggiora & Ghilotti of San Rafael, California.

Trenches were excavated at the locations shown on Figure 2 by use of a hydraulic excavator equipped with a 36-inch bucket. Trenches were excavated to typical depths of around 8 to 12 feet below existing grade, and aluminum “speed-shores” were installed on maximum 6-foot centers as excavation progressed.

Following trench excavation and shoring, the north walls were thoroughly and carefully cleaned with hand tools to expose natural soil structure and stratigraphy. The south walls were locally cleaned as needed to obtain better exposures or confirm features and contacts observed on the north wall during initial cleaning. Surface topography along the north side of each trench was surveyed using a hand-level, and contacts were marked with string line for accurate depth measurements from the top of trench. Positional/lateral accuracy was achieved by marking stations with paint 5-foot horizontal intervals. Each trench was logged at a scale of 1:60 (1 inch = 5-feet) using the Unified Soil Classification System (USCS). Brief explanations of the terms and methodology used in classifying earth materials are provided along with a stratigraphic column on Figure C-1.

Trench T-1 (2018) – Figures C-2 and C-3

Trench T-1 was excavated to a total length of about 65-feet within the previously open area between the northeast corner of the main classroom building and the western portable classroom building. Due to conflicts with a 2-inch water service (playfield irrigation supply line) and unknown ½-inch electrical conduit, Trench T-1 was split into a western (T-1A) and eastern (T-1B) section as shown on Figure 2. Both sections were excavated to depths of about 12 feet below the ground surface.

Trench T-1 exposed flat-lying, apparently conformable alluvial soils of Early to Late Holocene age. Beneath a thin layer of surface fill and aggregate baserock, silty and sandy, moderately to highly plastic clay dominates the profile, as is typical of the Santa Rosa floodplain. Soils in the upper 6 to 8 feet typically consist of medium to dark gray plastic clay and clayey to silty sand. Deeper soils are composed of lighter gray to blue-gray clays with variable sand content which are laterally extensive across the site and were encountered in the base of all 6 trenches. Aside from an interpreted, approximately south-flowing channel exposed in cross-section near the east end of Trench T-1B, no significant structures, disruption, or deformation of the soil profile were observed.

Trench T-2 (2018) – Figure C-4

This trench was excavated within the asphalt courtyard south of the existing portables as shown on Figure 2. Trench T-2 was excavated to a total length of 65-feet, and to typical depths of 12 feet. Stratigraphy was noted to be very similar to Trench T-1, and no significant structures or other disruption or deformation of the soil profile was observed.

Trench T-3 – Figure C-5

Trench T-3 was excavated to a total length of about 109 feet along the sidewalk which runs parallel to the northwest property line, extending from Bryden Lane to the rear entrance door of the main building's westernmost wing. covered open area between the northeast corner of the main classroom building and the western portable building.

Trench T-3 exposed the same general stratigraphy as Trenches T-1 and T-2, consisting of sandy clay and silty sand over the basal clayey horizons. of Early to Late Holocene age. Aside from a few lenses of coarser sand and gravel, no structures or potential fault-related features were observed.

Trench T-4 – Figures C-6 through C-10

This trench was 226 feet long and excavated in the main asphalt play area in the southern part of the site, parallel to the southeastern parcel boundary. Due to conflicts with several existing utility installations, including the main electrical feed to the campus, a 14-foot section between Stations 0+36 and 0+50 were not excavated. At the west end of the trench, excavation depth was limited to about 5 feet between Stations 0+07 and 0+15 due to an unknown sewer line that crosses the trench obliquely at a depth of about 6 feet.

Trench T-4 generally exposed the same stratigraphy as observed in the rest of the site, particularly east of Station 0+125. Between Stations 0+00 and 0+125, several flat-lying horizons of slightly coarser composition were observed between the upper, darker gray expansive clays and the basal blue-gray clays. The east end of this zone at Station 0+125 is marked by a roughly south-flowing cross cutting channel about 5 feet deep. These intermediate soil layers are laterally continuous through the west end of the trench, and interpreted as having been deposited in a shallow basin incised into the basal clays east of Station 0+125.

As shown on Figure C-6, a zone of deformed soil between Stations 0+00 and 0+36 is characterized by abrupt thickening/thinning and truncation of soil layers. Excavation within the deformation zone was impeded by an obliquely-crossing, apparently abandoned sewer line. The sewer line obstructed excavation below about 5 feet west of Station 0+10, and trench backfill obscured the northern trench wall exposure between Stations 0+07 and 0+10.

Between Stations 0+10 and 0+22, several contacts between soil horizons are offset by a series of subvertical seams of coarse rounded sand and gravelly sand. Detailed logs and a photomosaic of this zone are shown on Figures C-8 through C-10. Some of these seams offset contacts in the base of the trench between the basal clayey soils (Unit 11) and overlying silty to gravelly sands (Units 9 and 10). Others project downward into open vertical cracks in the clayey soils, but do not appear to exhibit any vertical offset. We did not observe any consistent preferred gravel clast orientation along most of the seams that would provide better evidence of shear, although oblong gravels were occasionally oriented near-parallel with the seams.

Most of the seams are traceable to the base of the clayey surface soils, within about 2 or 3 feet of the ground surface and project to prominent open vertical cracks in those soils. Typically, vertical cracks in plastic clayey soils would be attributed to shrink/swell behavior in response to changing moisture content. However, the near-surface clayey soils within the deformation zone are laterally extensive across the entire site, and although all of the trenches were left open for several weeks (allowing ample opportunity for desiccation and cracking to occur), prominent cracks were only observed within the deformation zone in association with the vertical sandy seams in the deeper, coarser horizons.

Several roots and root casts were encountered along seams in the sandy middle units of the trench, and it is possible these cracks represent areas where roots have been cut/destroyed by previous grading activity or otherwise decayed. No roots, krotovina, or other evidence of significant bioturbation were observed in the deeper clayey soils, and it appears unlikely that the cracks in those materials are related to root growth.

Trench T-5 – Figure C-11

Trench T-5 was 64 feet long and excavated in the asphalt courtyard northeast of the gym and immediately southeast of our 2018 trenches. The west end of the trench exposed the same stratigraphy as observed in Trench T-2. At the east end, a series of cross cutting channels deepens to the east. No other significant or fault-related structures were observed.

Trench T-6 – Figures C-12 through C-14

Trench T-6 was 197 feet long and excavated across the playfield between the portable buildings and the northeast property line. The trench was not extended west to overlap with Trench T-5 due to utility conflicts between the existing portable structures. The east end of the trench exposed the same basic stratigraphy as noted in the west end of Trench T-5, suggesting that the channels observed in T-5 pinch out laterally west of T-6.

Significant features in Trench T-6 were generally limited to a broad zone of cross cutting, typically sandy to gravelly channel fills roughly between Stations 0+80 and 0+150. Imbrication was typically weak but, where observed in coarse gravelly horizons, tended to suggest south to southeast flow. No other significant structures or apparent fault-related features were observed in Trench T-6.

STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

2 SAND (SP)
Light gray, very fine grained, well rounded, common charcoal, few rootlets. Locally includes lenses with medium plasticity clay. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

3 SILT with Sand (ML) to Silty CLAY (CH)
Medium gray brown, faint orange mottling, moist, medium stiff, medium to high plasticity, very fine to fine grained sand, weak to medium prismatic structure to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

4 SAND (SP)
Light gray, very fine grained, well rounded, rare charcoal. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

5 Gravelly SAND (SW/SG)
Multicolored, loose, moist, varying percentages of medium to coarse grained sand with fine to coarse sunrounded to rounded gravel, occasional lenses of well sorted rounded pebbles, chert gravel present, maxium diameter up to 3.0 inches, mottled black and orange at lower portion of unit, seam of black gravel present. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

6 Silty SAND (SM) to Sandy SILT (ML)
Medium to dark gray, moist, medium stiff/dense, moderate plasticity silt, very fine to fine grained sand, occasional lenses of coarse, rounded sand with fine to medium rounded gravel, faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

8 SAND (SP) to Silty SAND with Gravel (SM)
Light to dark gray brown with orange mottling, moist, medium dense, very fine to fine grained sand, locally silty, massive structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

9 Silty SAND (SM)
Medium gray brown with orange mottling, local stripes of blueish gray and black mottling, medium dense, very fine to fine grained sand, low plasticity silt, massive to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

10 SAND (SP) to Silty SAND with Gravel (SM)
Dark gray with orange mottling, moist, medium dense, very fine to fine grained sand, low plasticity silt, fine granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

12 CLAY (CL) to Silty CLAY with Sand (CL)
Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets
[MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

13 CLAY (CL)
Dark blue-gray, moist, medium stiff, faint fine blocky texture, some fine tubular vertical pores/root casts, fine sub-rounded sand, few very thin clay films, thin local manganese oxide coatings on ped faces and pores
[MIDDLE TO LATE HOLOCENE MARSH DEPOSITS?]

14 CLAY WITH SAND (CL)
Light gray, moist, medium stiff, low to medium plasticity, fine to coarse sand, rare fine to medium gravels, some clay films, few random fine tubular pores, abundant local iron and manganese oxide on ped faces and pores
[EARLY TO MIDDLE HOLOCENE FLOODPLAIN DEPOSITS]

——— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

x ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

UNITED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		ABBR.	DESCRIPTION
COARSE GRAINED SOILS over 50% sand and gravel	CLEAN GRAVEL	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
	GRAVEL with fines	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	CLEAN SAND	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
	SAND with fines	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS over 50% silt and clay	SILT AND CLAY liquid limit <50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	SILT AND CLAY liquid limit >50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS		PT	Peat, muck, and other highly organic soils
ROCK			Undifferentiated as to type or composition

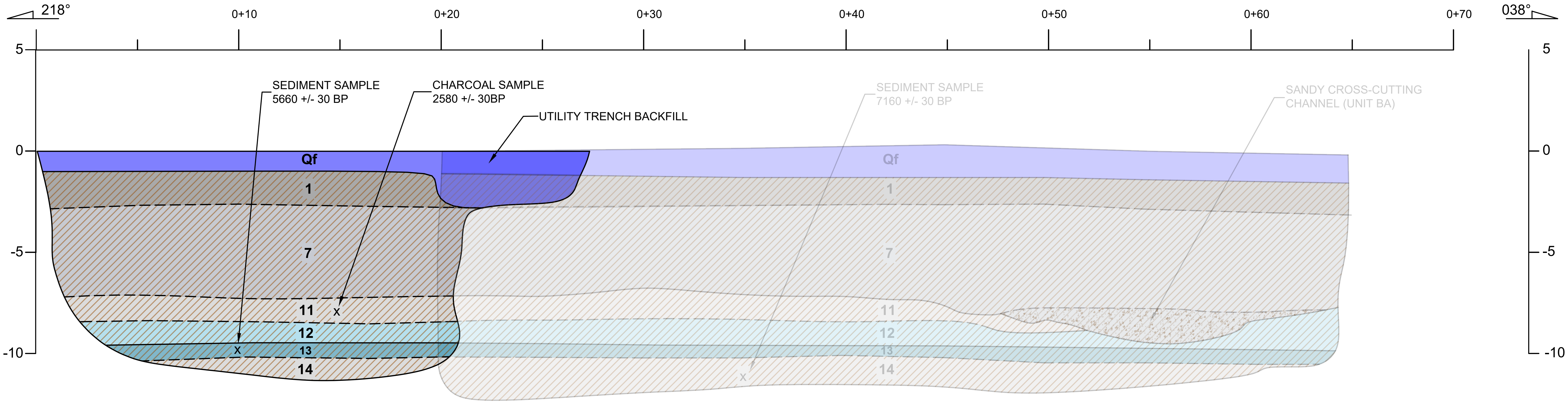
MPEG MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILE: 1079.121 Figures.dwg

STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS
Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California
Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-1
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf — FILL (GW/GC)
Mixed Class II baserock and native soil.

1 — Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 — Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 — Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

12 — CLAY (CL) to Silty CLAY with Sand (CL)
Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets
[MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

13 — CLAY (CL)
Dark blue-gray, moist, medium stiff, faint fine blocky texture, some fine tubular vertical pores/root casts, fine sub-rounded sand, few very thin clay films, thin local manganese oxide coatings on ped faces and pores
[MIDDLE TO LATE HOLOCENE MARSH DEPOSITS?]

14 — CLAY WITH SAND (CL)
Light gray, moist, medium stiff, low to medium plasticity, fine to coarse sand, rare fine to medium gravels, some clay films, few random fine tubular pores, abundant local iron and manganese oxide on ped faces and pores
[EARLY TO MIDDLE HOLOCENE FLOODPLAIN DEPOSITS]

——— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

X — ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

SCALE
0 2.5 5 10 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILE: 1079.121 Figures.dwg

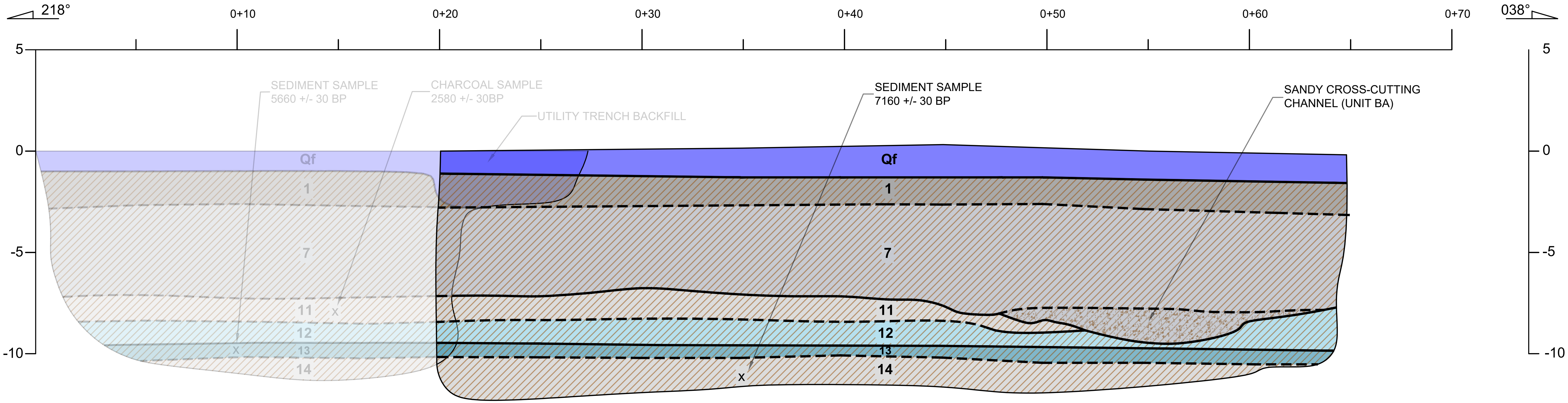
TRENCH LOG (T-1A, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-2
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

12 CLAY (CL) to Silty CLAY with Sand (CL)
Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets
[MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

13 CLAY (CL)
Dark blue-gray, moist, medium stiff, faint fine blocky texture, some fine tubular vertical pores/root casts, fine sub-rounded sand, few very thin clay films, thin local manganese oxide coatings on ped faces and pores
[MIDDLE TO LATE HOLOCENE MARSH DEPOSITS?]

14 CLAY WITH SAND (CL)
Light gray, moist, medium stiff, low to medium plasticity, fine to coarse sand, rare fine to medium gravels, some clay films, few random fine tubular pores, abundant local iron and manganese oxide on ped faces and pores
[EARLY TO MIDDLE HOLOCENE FLOODPLAIN DEPOSITS]

GEOLOGIC CONTACT, SHARP

GEOLOGIC CONTACT, GRADATIONAL

X ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

SCALE
0 2.5 5 10 FEET

MILLER PACIFIC ENGINEERING GROUP

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

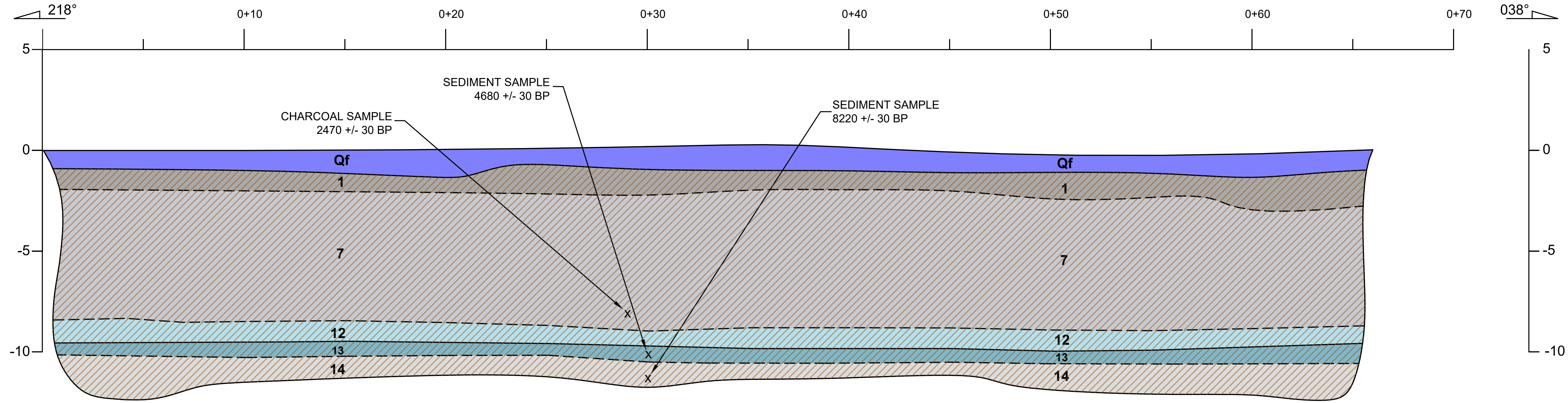
FILE: 1079.121 Figures.dwg

TRENCH LOG (T-1B, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California
Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-3
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf — FILL (GW/GC)
Mixed Class II baserock and native soil.

1 — Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 — Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

12 — CLAY (CL) to Silty CLAY with Sand (CL)
Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets
[MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

13 — CLAY (CL)
Dark blue-gray, moist, medium stiff, faint fine blocky texture, some fine tubular vertical pores/root casts, fine sub-rounded sand, few very thin clay films, thin local manganese oxide coatings on ped faces and pores
[MIDDLE TO LATE HOLOCENE MARSH DEPOSITS?]

14 — CLAY WITH SAND (CL)
Light gray, moist, medium stiff, low to medium plasticity, fine to coarse sand, rare fine to medium gravels, some clay films, few random fine tubular pores, abundant local iron and manganese oxide on ped faces and pores
[EARLY TO MIDDLE HOLOCENE FLOODPLAIN DEPOSITS]

——— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

X — ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

SCALE

0 2.5 5 10 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILE: 1079.121 Figures.dwg

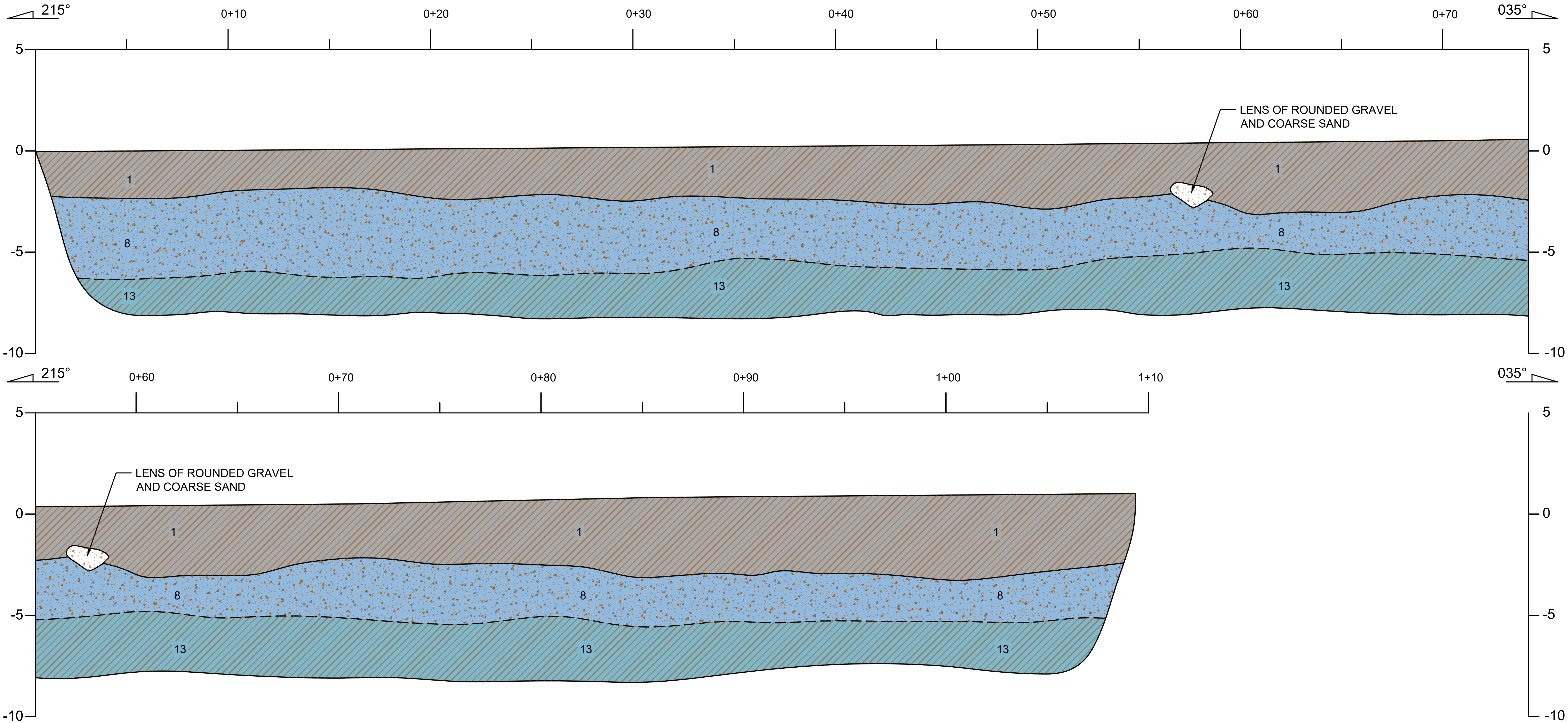
TRENCH LOG (T-2, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-4
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

1 — Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

8 — SAND (SP) to Silty SAND with Gravel (SM)
Light to dark gray brown with orange mottling, moist, medium dense, very fine to fine grained sand, locally silty, massive structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

13 — CLAY (CL)
Dark blue-gray, moist, medium stiff, faint fine blocky texture, some fine tubular vertical pores/root casts, fine sub-rounded sand, few very thin clay films, thin local manganese oxide coatings on ped faces and pores
[MIDDLE TO LATE HOLOCENE MARSH DEPOSITS?]

——— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

X ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

SCALE
0 2.5 5 10 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

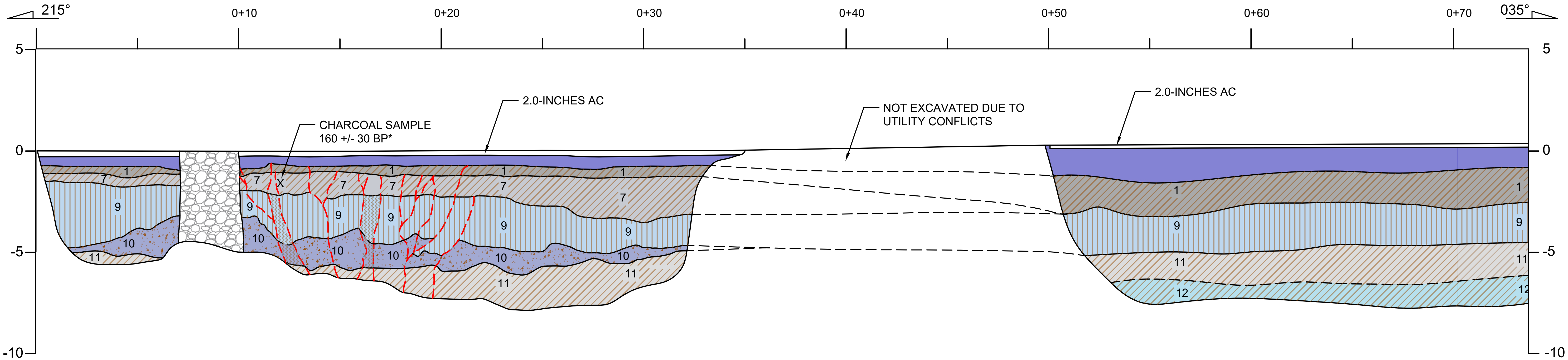
FILE: 1079.121 Figures.dwg

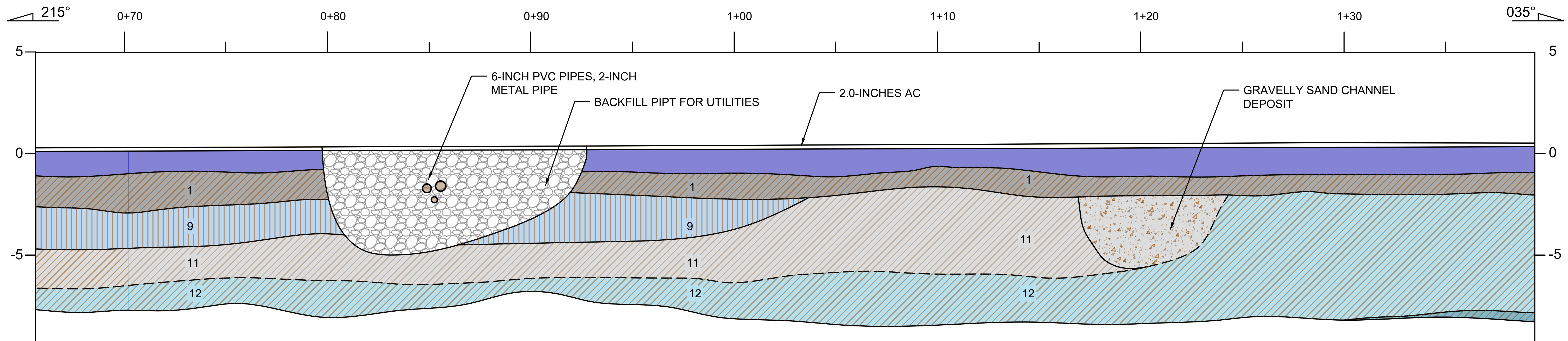
TRENCH LOG (T-3, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California
Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-5
FIGURE





STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

9 Silty SAND (SM)
Medium gray brown with orange mottling, local stripes of blueish gray and black mottling, medium dense, very fine to fine grained sand, low plasticity silt, massive to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

10 SAND (SP) to Silty SAND with Gravel (SM)
Dark gray with orange mottling, moist, medium dense, very fine to fine grained sand, low plasticity silt, fine granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

12 CLAY (CL) to Silty CLAY with Sand (CL)
Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets [MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

——— GEOLOGIC CONTACT, SHARP
- - - - GEOLOGIC CONTACT, GRADATIONAL

X ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED
* LIKELY INACCURATE, SEE APP. D

SCALE
0 2.5 5 10 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121 Figures.dwg

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

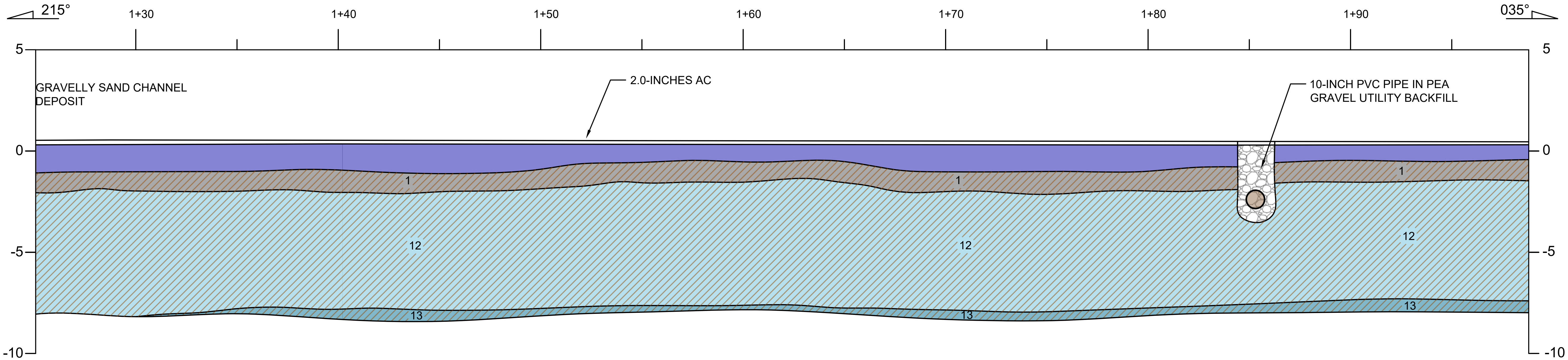
TRENCH LOG (T-4, LOG OF NORTH WALL)

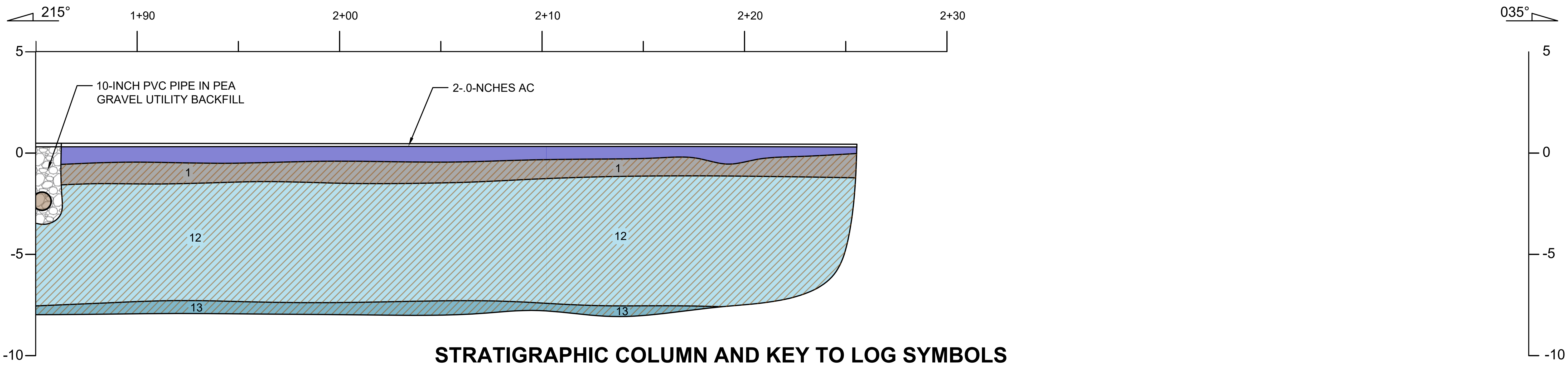
Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-6
FIGURE





STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

9 Silty SAND (SM)
Medium gray brown with orange mottling, local stripes of blueish gray and black mottling, medium dense, very fine to fine grained sand, low plasticity silt, massive to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

10 SAND (SP) to Silty SAND with Gravel (SM)
Dark gray with orange mottling, moist, medium dense, very fine to fine grained sand, low plasticity silt, fine granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

12 CLAY (CL) to Silty CLAY with Sand (CL)
Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets [MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

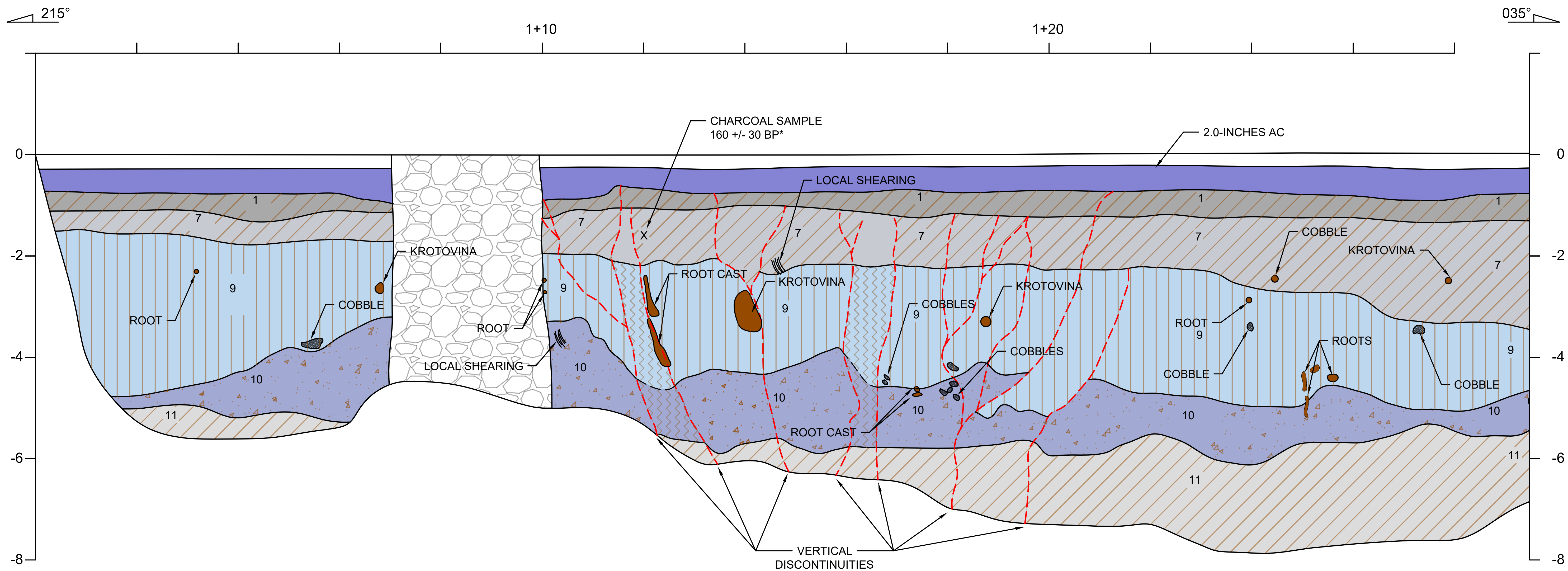
—— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

X ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

SCALE
0 2.5 5 10 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP	504 Redwood Blvd. Suite 220 Novato, CA 94947 T 415 / 382-3444 F 415 / 382-3450 www.millerpac.com	TRENCH LOG (T-4, LOG OF NORTH WALL)
A CALIFORNIA CORPORATION, © 2024, ALL RIGHTS RESERVED FILE: 1079.121 Figures.dwg		Proctor Terrace Elementary School 1711 Bryden Lane Santa Rosa, California Project No. 1079.120 Date: 9/11/2025
Designed ZMS	Drawn ZMS	Checked ZMS
C-7 FIGURE		



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

9 Silty SAND (SM)
Medium gray brown with orange mottling, local stripes of blueish gray and black mottling, medium dense, very fine to fine grained sand, low plasticity silt, massive to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

10 SAND (SP) to Silty SAND with Gravel (SM)
Dark gray with orange mottling, moist, medium dense, very fine to fine grained sand, low plasticity silt, fine granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

12 CLAY (CL) to Silty CLAY with Sand (CL)
Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets [MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

—— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

X ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

* LIKELY INACCURATE, SEE APP. D

SCALE
0 1 2 4 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121 Figures.dwg

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

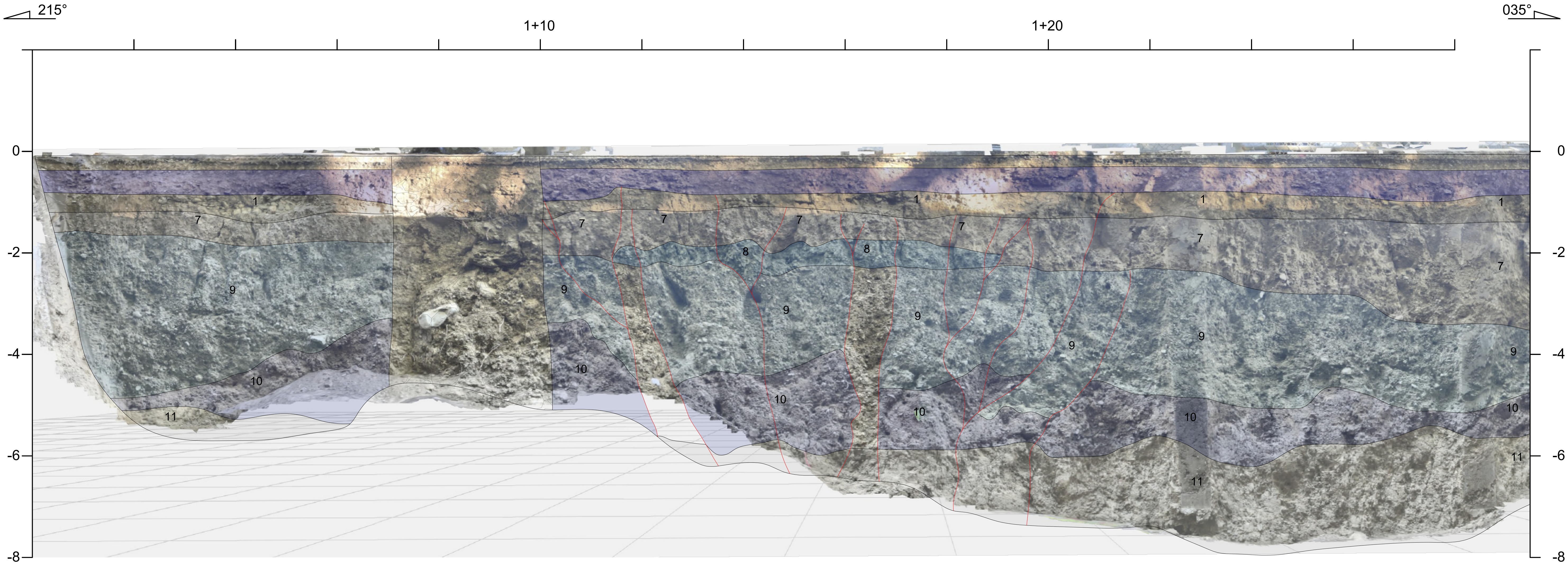
TRENCH LOG (T-4, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-8
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf	FILL (GW/GC) Mixed Class II baserock and native soil.
1	Silty SAND (SM) to Sandy CLAY (CL/CH) Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]
7	Silty CLAY (CH) to Sandy CLAY (CH) Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]
9	Silty SAND (SM) Medium gray brown with orange mottling, local stripes of blueish gray and black mottling, medium dense, very fine to fine grained sand, low plasticity silt, massive to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]
10	SAND (SP) to Silty SAND with Gravel (SM) Dark gray with orange mottling, moist, medium dense, very fine to fine grained sand, low plasticity silt, fine granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]
11	Silty CLAY with Sand (CL/CH) to CLAY (CL) Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]
12	CLAY (CL) to Silty CLAY with Sand (CL) Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets [MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

——— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

X ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

SCALE

0 1 2 4 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121 Figures.dwg

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

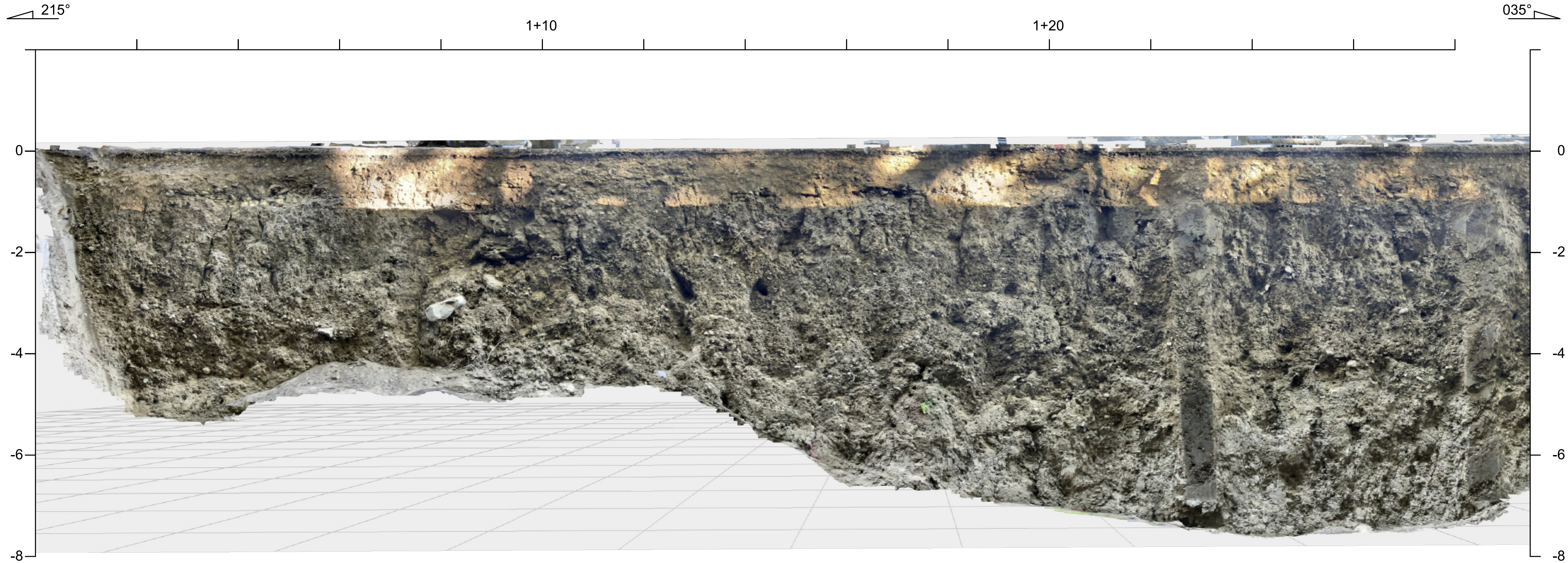
TRENCH LOG (T-4, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-9
FIGURE



SCALE

0 1 2 4 FEET

MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILE: 1079.121 Figures.dwg

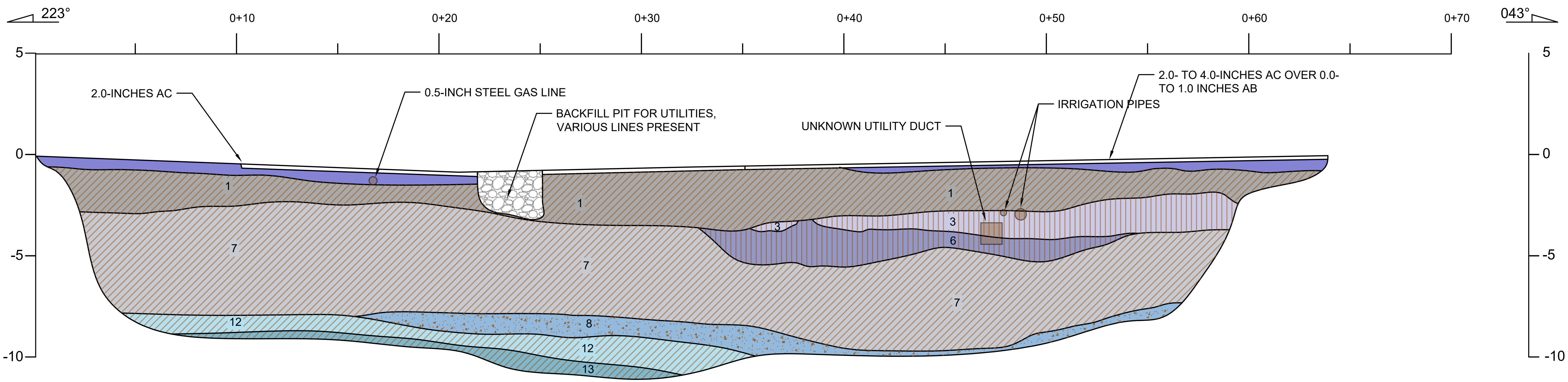
TRENCH LOG (T-4, SCANNED IMAGE OF WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-10
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

3 SILT with Sand (ML) to Silty CLAY (CH)
Medium gray brown, faint orange mottling, moist, medium stiff, medium to high plasticity, very fine to fine grained sand, weak to medium prismatic structure to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

6 Silty SAND (SM) to Sandy SILT (ML)
Medium to dark gray, moist, medium stiff/dense, moderate plasticity silt, very fine to fine grained sand, occasional lenses of coarse, rounded sand with fine to medium rounded gravel, faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

8 SAND (SP) to Silty SAND with Gravel (SM)
Light to dark gray brown with orange mottling, moist, medium dense, very fine to fine grained sand, locally silty, massive structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

12 CLAY (CL) to Silty CLAY with Sand (CL)
Medium blue-gray, moist, medium stiff, few pores, rare fine to medium subrounded volcanic sand, rare rootlets
[MIDDLE TO LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

13 CLAY (CL)
Dark blue-gray, moist, medium stiff, faint fine blocky texture, some fine tubular vertical pores/root casts, fine sub-rounded sand, few very thin clay films, thin local manganese oxide coatings on ped faces and pores
[MIDDLE TO LATE HOLOCENE MARSH DEPOSITS?]

GEOLOGIC CONTACT, SHARP

GEOLOGIC CONTACT, GRADATIONAL

x ORGANIC MATERIAL SAMPLE;
RADIOCARBON DATE AS INDICATED

SCALE
0 2.5 5 10 FEET

MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILE: 1079.121 Figures.dwg

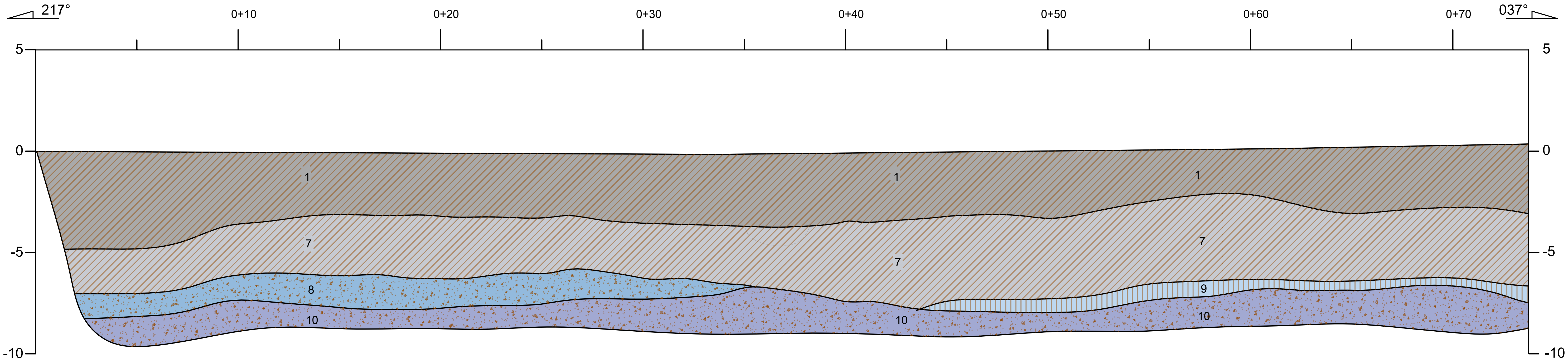
TRENCH LOG (T-5, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-11
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

2 SAND (SP)
Light gray, very fine grained, well rounded, common charcoal, few rootlets. Locally includes lenses with medium plasticity clay. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

3 SILT with Sand (ML) to Silty CLAY (CH)
Medium gray brown, faint orange mottling, moist, medium stiff, medium to high plasticity, very fine to fine grained sand, weak to medium prismatic structure to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

4 SAND (SP)
Light gray, very fine grained, well rounded, rare charcoal. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

5 Gravelly SAND (SW/SG)
Multicolored, loose, moist, varying percentages of medium to coarse grained sand with fine to coarse sunrounded to rounded gravel, occasional lenses of well sorted rounded pebbles, chert gravel present, maxium diameter up to 3.0 inches, mottled black and orange at lower portion of unit, seam of black gravel present. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

6 Silty SAND (SM) to Sandy SILT (ML)
Medium to dark gray, moist, medium stiff/dense, moderate plasticity silt, very fine to fine grained sand, occasional lenses of coarse, rounded sand with fine to medium rounded gravel, faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

8 SAND (SP) to Silty SAND with Gravel (SM)
Light to dark gray brown with orange mottling, moist, medium dense, very fine to fine grained sand, locally silty, massive structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

9 Silty SAND (SM)
Medium gray brown with orange mottling, local stripes of blueish gray and black mottling, medium dense, very fine to fine grained sand, low plasticity silt, massive to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

10 SAND (SP) to Silty SAND with Gravel (SM)
Dark gray with orange mottling, moist, medium dense, very fine to fine grained sand, low plasticity silt, fine granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

GEOLOGIC CONTACT, SHARP

GEOLOGIC CONTACT, GRADATIONAL

x ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

SCALE

0 2.5 5 10 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121 Figures.dwg

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

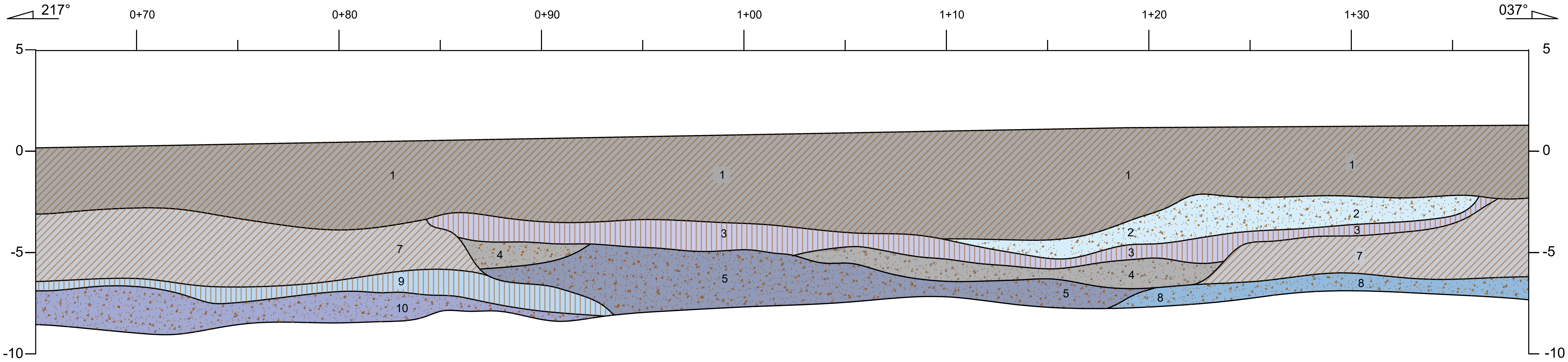
TRENCH LOG (T-6, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-12
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

2 SAND (SP)
Light gray, very fine grained, well rounded, common charcoal, few rootlets. Locally includes lenses with medium plasticity clay. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

3 SILT with Sand (ML) to Silty CLAY (CH)
Medium gray brown, faint orange mottling, moist, medium stiff, medium to high plasticity, very fine to fine grained sand, weak to medium prismatic structure to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

4 SAND (SP)
Light gray, very fine grained, well rounded, rare charcoal. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

5 Gravelly SAND (SW/SG)
Multicolored, loose, moist, varying percentages of medium to coarse grained sand with fine to coarse sunrounded to rounded gravel, occasional lenses of well sorted rounded pebbles, chert gravel present, maxium diameter up to 3.0 inches, mottled black and orange at lower portion of unit, seam of black gravel present. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

6 Silty SAND (SM) to Sandy SILT (ML)
Medium to dark gray, moist, medium stiff/dense, moderate plasticity silt, very fine to fine grained sand, occasional lenses of coarse, rounded sand with fine to medium rounded gravel, faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

8 SAND (SP) to Silty SAND with Gravel (SM)
Light to dark gray brown with orange mottling, moist, medium dense, very fine to fine grained sand, locally silty, massive structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

9 Silty SAND (SM)
Medium gray brown with orange mottling, local stripes of blueish gray and black mottling, medium dense, very fine to fine grained sand, low plasticity silt, massive to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

10 SAND (SP) to Silty SAND with Gravel (SM)
Dark gray with orange mottling, moist, medium dense, very fine to fine grained sand, low plasticity silt, fine granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

——— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

x ORGANIC MATERIAL SAMPLE; RADIOCARBON DATE AS INDICATED

SCALE
0 2.5 5 10 FEET

MPEG MILLER PACIFIC ENGINEERING GROUP
504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

FILE: 1079.121 Figures.dwg

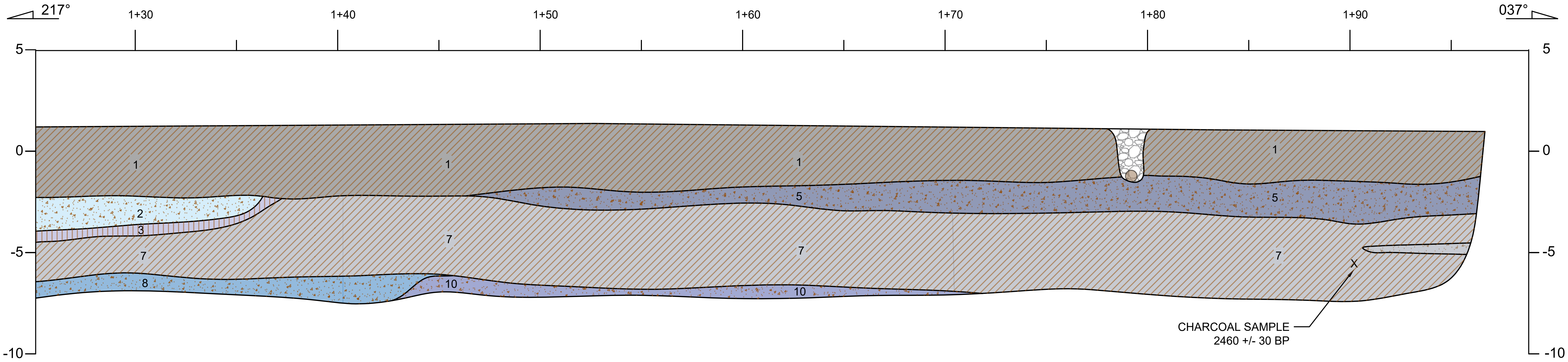
TRENCH LOG (T-6, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-13
FIGURE



STRATIGRAPHIC COLUMN AND KEY TO LOG SYMBOLS

Qf FILL (GW/GC)
Mixed Class II baserock and native soil.

1 Silty SAND (SM) to Sandy CLAY (CL/CH)
Dark to light gray brown, moist, medium dense/stiff, fine to coarse grained, low plasticity silt and clay, occasional sub-angular to sub-rounded pebbles and fine to medium gravel, faint granular to massive structure. Includes local channel deposit of (1A) Silty SAND with Gravel (SM) - gray brown, moist, medium dense, approximately 25% fine to coarse gravel [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

2 SAND (SP)
Light gray, very fine grained, well rounded, common charcoal, few rootlets. Locally includes lenses with medium plasticity clay. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

3 SILT with Sand (ML) to Silty CLAY (CH)
Medium gray brown, faint orange mottling, moist, medium stiff, medium to high plasticity, very fine to fine grained sand, weak to medium prismatic structure to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

4 SAND (SP)
Light gray, very fine grained, well rounded, rare charcoal. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

5 Gravelly SAND (SW/SG)
Multicolored, loose, moist, varying percentages of medium to coarse grained sand with fine to coarse sunrounded to rounded gravel, occasional lenses of well sorted rounded pebbles, chert gravel present, maxium diameter up to 3.0 inches, mottled black and orange at lower portion of unit, seam of black gravel present. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

6 Silty SAND (SM) to Sandy SILT (ML)
Medium to dark gray, moist, medium stiff/dense, moderate plasticity silt, very fine to fine grained sand, occasional lenses of coarse, rounded sand with fine to medium rounded gravel, faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

7 Silty CLAY (CH) to Sandy CLAY (CH)
Light to dark gray brown with local orange mottling, moist, soft to medium stiff, high plasticity, silt and fine grained sand, rare rounded pebbles, medium granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

8 SAND (SP) to Silty SAND with Gravel (SM)
Light to dark gray brown with orange mottling, moist, medium dense, very fine to fine grained sand, locally silty, massive structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

9 Silty SAND (SM)
Medium gray brown with orange mottling, local stripes of blueish gray and black mottling, medium dense, very fine to fine grained sand, low plasticity silt, massive to faint medium blocky structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

10 SAND (SP) to Silty SAND with Gravel (SM)
Dark gray with orange mottling, moist, medium dense, very fine to fine grained sand, low plasticity silt, fine granular structure. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

11 Silty CLAY with Sand (CL/CH) to CLAY (CL)
Light to dark gray, moist, medium stiff, high plasticity, low plasticity silt, very fine sand, massive structure. Local lenses of increased sand content and grain size. [LATE HOLOCENE FLOODPLAIN/OVERBANK DEPOSITS]

—— GEOLOGIC CONTACT, SHARP

- - - - GEOLOGIC CONTACT, GRADATIONAL

x ORGANIC MATERIAL SAMPLE;
RADIOCARBON DATE AS INDICATED

SCALE
0 2.5 5 10 FEET

MILLER PACIFIC ENGINEERING GROUP

FILE: 1079.121 Figures.dwg

504 Redwood Blvd.
Suite 220
Novato, CA 94947
T 415 / 382-3444
F 415 / 382-3450
www.millerpac.com

TRENCH LOG (T-6, LOG OF NORTH WALL)

Proctor Terrace Elementary School
1711 Bryden Lane
Santa Rosa, California

Project No. 1079.120 Date: 9/11/2025

Designed ZMS
Drawn ZMS
Checked ZMS

C-14
FIGURE

APPENDIX D
LABORATORY RADIOCARBON AGE-DATING RESULTS

Radiocarbon dating is a process by which the quantity of radioactive carbon in a sample of organic matter or sediment is used to determine the approximate age of the sample. The process is based on the known half-life, or decay rate, of a radioactive carbon isotope, ^{14}C. Radioactive carbon originates by interaction of cosmic rays with naturally occurring carbon in the Earth's atmosphere, which is rapidly oxidized to form radioactive carbon dioxide. This carbon dioxide enters the food chain via photosynthesis in plants and may be transferred to other organisms if the plant is eaten. When plants or animals die, they stop exchanging carbon with the environment, and their ^{14}C content is essentially fixed. Thus, the ^{14}C content (or ratio of ^{14}C to non-radioactive ^{12}C) of a given sample may be measured and compared with its known half-life in order to arrive at the amount of time which has passed since the plant or animal became deceased. The carbon ratio may be measured indirectly by "Beta-counting" (a process by which beta particles emitted from ^{14}C are counted in order to estimate the ^{14}C content of a sample) or, more commonly, may be measured directly by physically counting the number of isotopes in a sample using a mass spectrometer (acceleration mass spectrometry, "AMS"). Today, most samples are commonly pre-treated to remove any potential contamination and then converted to graphite for direct measurement of the $^{14}C/^{12}C$ ratio by the AMS method.

During our 2018 study, samples of charcoal were collected from soil Units 7 and 11 exposed in Trenches T-1A and T-2, and samples of organic sediment were collected from Units 13 and 14 for radiocarbon dating content by Beta Analytic of Miami, Florida. For this study, we collected and submitted samples collected from Unit 7 in Trench 4, and from Unit 7 in Trench 6. Sample locations are shown on the trench logs in Appendix C. Samples were carefully removed from the trench walls using gloves and hand tools to avoid contamination and sealed in plastic storage bags for transport. The plastic bags were then placed in a box for transport to the laboratory for dating by the AMS method. Samples were sieved to 180-microns to remove any roots or macrofossils and acid-washed to remove carbonates which may introduce "modern" carbon into the sample and associated error into the measurement. Testing was performed via the AMS method to determine the bulk carbon content of the charcoal and sediment samples. As shown on the attached lab reports, charcoal samples from Unit 7 in Trenches T-2 and T-6 were dated between about approximately 2460 to 2470 years old. A sample from the same unit, taken from within the deformation zone in Trench T-4, was dated at about 160 years old; however, we judge that result is an erroneous outlier, most likely resulting from contamination with modern carbon in the near-surface. Samples from Unit 11 were dated at about 2580 years old. Sediment samples from Unit 13 were dated at approximately 4680 and 5660 years old, while sediment from Unit 14 (the oldest unit encountered in our trenches) was dated at approximately 7160 and 8220 years old. All dates include a +/- 30-year margin of error due to the AMS method.

For dates derived from the bulk carbon content of sediment samples, some consideration of potential (additional) systematic error must be given. Humic acids, which result from decay of plants, can often migrate downward and introduce modern carbon into older sediment; this phenomenon is most prevalent in soils that are either high in organic content (typically dark in color) or poorly drained, or both. In this case, Unit 13 was noted to be a poorly, draining, dark-colored clay of relatively high organic content, while Unit 14 was observed to be slightly-better draining with apparently few organics. Therefore, while we judge that some potential for error exists, we note that incorporation of modern carbon would skew the dates toward the younger end of the range and thus, the reported dates may generally be considered "minimum" ages.

Beta Analytic
RADIOCARBON DATING

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 2005:17025-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Michael Jewett	Report Date: October 29, 2018
Miller Pacific Engineering Group	Material Received: October 19, 2018

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 507365	**T-1A STA 10 Unit 13**	**5660 +/- 30 BP**	IRMS δ13C: -25.2 o/oo

(92.1%)	**4554 - 4445 cal BC**	**(6503 - 6394 cal BP)**
(2.9%)	**4421 - 4397 cal BC**	**(6370 - 6346 cal BP)**
(0.4%)	**4381 - 4375 cal BC**	**(6330 - 6324 cal BP)**

Submitter Material: Organic Sediment/Gyttja
Pretreatment: (organic sediment) acid washes
Analyzed Material: Organic sediment
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 49.43 +/- 0.18 pMC
Fraction Modern Carbon: 0.4943 +/- 0.0018
D14C: -505.69 +/- 1.85 o/oo
Δ14C: -509.74 +/- 1.85 o/oo(1950:2,018.00)
Measured Radiocarbon Age: (without d13C correction): 5660 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

Beta Analytic
RADIOCARBON DATING

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 2005:17025-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Michael Jewett — Report Date: November 07, 2018

Miller Pacific Engineering Group — Material Received: October 19, 2018

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 507362	**T-1A STA 10 Unit 13**	**2580 +/- 30 BP**	IRMS δ13C: -23.2 o/oo

(87.0%)	**814 - 750 cal BC**	**(2763 - 2699 cal BP)**
(3.9%)	**616 - 590 cal BC**	**(2565 - 2539 cal BP)**
(3.1%)	**684 - 668 cal BC**	**(2633 - 2617 cal BP)**
(1.4%)	**637 - 622 cal BC**	**(2586 - 2571 cal BP)**

Submitter Material: Charcoal
Pretreatment: (charred material) acid/alkali/acid
Analyzed Material: Charred material
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 72.53 +/- 0.27 pMC
Fraction Modern Carbon: 0.7253 +/- 0.0027
D14C: -274.71 +/- 2.71 o/oo
Δ14C: -280.65 +/- 2.71 o/oo(1950:2,018.00)
Measured Radiocarbon Age: (without d13C correction): 2550 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

Beta Analytic
RADIOCARBON DATING

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 2005:17025-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Michael Jewett	Report Date: October 29, 2018
Miller Pacific Engineering Group	Material Received: October 19, 2018

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 507366	**T-1B STA 35 Unit 14**	**7160 +/- 30 BP**	IRMS δ13C: -25.0 o/oo

(95.4%) **6070 - 5990 cal BC** **(8019 - 7939 cal BP)**

Submitter Material: Organic Sediment/Gyttja
Pretreatment: (organic sediment) acid washes
Analyzed Material: Organic sediment
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 41.01 +/- 0.15 pMC
Fraction Modern Carbon: 0.4101 +/- 0.0015
D14C: -589.89 +/- 1.53 o/oo
Δ14C: -593.25 +/- 1.53 o/oo(1950:2,018.00)
Measured Radiocarbon Age: (without d13C correction): 7160 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 2005:17025-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Michael Jewett
Miller Pacific Engineering Group

Report Date: November 07, 2018
Material Received: October 19, 2018

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 507364	**T-2 STA 29 Unit 7**	**2470 +/- 30 BP**	IRMS δ13C: -23.5 o/oo

(92.4%)	**768 - 476 cal BC**	**(2717 - 2425 cal BP)**
(1.8%)	**445 - 431 cal BC**	**(2394 - 2380 cal BP)**
(1.2%)	**464 - 453 cal BC**	**(2413 - 2402 cal BP)**

Submitter Material: Charcoal
Pretreatment: (charred material) acid/alkali/acid
Analyzed Material: Charred material
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 73.53 +/- 0.27 pMC
Fraction Modern Carbon: 0.7353 +/- 0.0027
D14C: -264.71 +/- 2.75 o/oo
Δ14C: -270.73 +/- 2.75 o/oo(1950:2,018.00)
Measured Radiocarbon Age: (without d13C correction): 2450 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

BETA Beta Analytic RADIOCARBON DATING

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 2005:17025-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Michael Jewett	Report Date: October 29, 2018
Miller Pacific Engineering Group	Material Received: October 19, 2018

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 507367	**T-2 STA 30 Unit 13**	**4680 +/- 30 BP**	IRMS δ13C: -25.6 o/oo

(90.8%)	**3523 - 3370 cal BC**	**(5472 - 5319 cal BP)**
(4.6%)	**3623 - 3605 cal BC**	**(5572 - 5554 cal BP)**

Submitter Material: Organic Sediment/Gyttja
Pretreatment: (organic sediment) acid washes
Analyzed Material: Organic sediment
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 55.84 +/- 0.21 pMC
Fraction Modern Carbon: 0.5584 +/- 0.0021
D14C: -441.56 +/- 2.09 o/oo
Δ14C: -446.13 +/- 2.09 o/oo(1950:2,018.00)
Measured Radiocarbon Age: (without d13C correction): 4690 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

Beta Analytic RADIOCARBON DATING

Beta Analytic Inc
4985 SW 74 Court
Miami, Florida 33155
Tel: 305-667-5167
Fax: 305-663-0964
beta@radiocarbon.com

Mr. Darden Hood
President

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

ISO/IEC 2005:17025-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Michael Jewett — Report Date: October 29, 2018

Miller Pacific Engineering Group — Material Received: October 19, 2018

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes Calendar Calibrated Results: 95.4 % Probability High Probability Density Range Method (HPD)	
Beta - 507368	**T-2 STA 30 Layer 4Btb1**	**8220 +/- 30 BP**	IRMS δ13C: -25.0 o/oo

(92.4%)	**7342 - 7133 cal BC**	**(9291 - 9082 cal BP)**
(3.0%)	**7104 - 7084 cal BC**	**(9053 - 9033 cal BP)**

Submitter Material: Organic Sediment/Gyttja
Pretreatment: (organic sediment) acid washes
Analyzed Material: Organic sediment
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 35.94 +/- 0.13 pMC
Fraction Modern Carbon: 0.3594 +/- 0.0013
D14C: -640.59 +/- 1.34 o/oo
Δ14C: -643.53 +/- 1.34 o/oo(1950:2,018.00)
Measured Radiocarbon Age: (without d13C correction): 8220 +/- 30 BP
Calibration: BetaCal3.21: HPD method: INTCAL13

Results are ISO/IEC-17025:2005 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), "present" = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

APPENDIX E

SEISMIC REFRACTION SURVEY REPORT

Proctor Terrace Seismic Refraction Survey

Geophysical Exploration Report

Santa Rosa, CA

Prepared for:

Miller Pacific Engineering Group
504 Redwood Blvd., Suite 220
Novato, CA 94947

Explore with us

Nationwide
Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials

321A Blodgett Street
Cotati, CA 94931
P (707) 796-7170
Terracon.com

July 3, 2025
Miller Pacific Engineering Group
504 Redwood Blvd., Suite 220
Novato, CA 94947

Attn: Ms. Zoe Stephens
P: (415) 382-3444
E: zstephens@millerpac.com

RE: Proctor Terrace Seismic Refraction Survey
1711 Bryden Lane
Santa Rosa, CA
Terracon Report No. NS255109

Dear Ms. Stephens,

We have completed the scope of services for the above referenced project in general accordance with the Terracon agreement dated May 27, 2025. This report presents the findings and interpretations of the geophysical exploration for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Max Sperry
Field Geophysicist

David T. Hagin, Reviewer
Senior Geophysicist

PROFESSIONAL GEOPHYSICIST • DAVID T HAGIN No. 1033 • STATE OF CALIFORNIA

7-3-2025

Table of Contents

Introduction 1
Site Conditions 1
Project Description 2
Geophysical Exploration Methodology 2
Geophysical Results 2
SR Profiles 2
Observations 3
General Comments 3
Exploration and Testing Procedures 5
Seismic Refraction (SR) Profiling Survey (ASTM D5777) 5

Attachments

Plate 1 – Site Map
Plate 2 – Seismic Refraction Profiles 1 & 2

Introduction

This report presents the results of our geophysical exploration investigation for the SRCS Proctor Terrace project located at 1711 Bryden Lane in Santa Rosa, CA. The purpose of these services was to provide geophysical information regarding lateral variations in p-wave velocity with the goal of locating the Rodgers Creek Fault, which is mapped traversing the site (USGS, 2010).

The geophysical exploration Scope of Services for this project included seismic refraction, geophysical interpretation, and preparation of this report.

Graphical plates are attached at the end of this report that present the Site Location and SR Profiles. More in-depth information on the methods used can be found in the Exploration and Testing Procedures.

Site Conditions

The following description of site conditions is derived from our site visit in association with the geophysical exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	This project is located at Proctor Terrace Elementary School in Santa Rosa, CA. It lies on the path of the Rodgers Creek Fault See Plate 1 – Site Map.
Current Ground Cover	The northeast portion of the site is a grassy field. In the middle is an asphalt playground, and at the southwest end is another grassy area – the front lawn of the school. The seismic lines covered all these areas.
Existing Topography	The site is very flat with elevations ranging from 191- to 194-ft.
Geology	The site is less than 0.25 miles from Santa Rosa Creek, on the river terrace. The surficial geologic material is Quaternary alluvium. The hills to the East and North are composed of material from the Pliocene-age Sonoma Volcanics. The mapped trace of the right-lateral Rodgers Creek Fault is mapped traversing the site (USGS, 2010).

Project Description

Miller Pacific aims to locate and characterize the Rodgers Creek Fault as it occurs within the site. The goal of the geophysical survey is to detect lateral variations in p-wave velocities (Vp) that may indicate geologic offset due to fault motion.

Geophysical Exploration Methodology

The surface geophysics consisted of 2 lines of 2D seismic refraction (compression wave) data designated as SR-1 and SR-2. The lines are parallel – running southeast to northwest.

2D Seismic Refraction data were collected along relatively straight lines in general accordance with ASTM D5777 *Standard Guide for Using the Seismic Refraction Method for Subsurface Investigation* using a 24-channel Geometrics seismograph with 4.5 Hz geophones. The lines each consisted of four spreads. A seismic source consisting of a 16-pound sledgehammer impacting a metal plate in contact with the ground was used to generate seismic waves at five or more points along each spread. Data were processed using SeisImager and Rayfract software to yield 2D contoured profiles depicting p-wave velocity versus depth under the line.

Array Locations	Line Length	Spreads	Ground Cover
SR-1	360 ft	4	Grass & Dirt
SR-2	330 ft	4	Grass & Asphalt (Playground)

The geophysical data quality was good in some areas and poor in others due to noise generated by nearby road traffic. To mitigate this, we collected data for two extra shot points along most spreads.

Geophysical Results

SR Profiles

The results of the SR survey are illustrated by the cross-sections (profiles) shown on Plate 2 – Seismic Refraction Profiles. On each profile, the vertical axis represents elevation (NAVD88), and the horizontal axis represents the survey stationing established for each SR line with the zero-value at the westernmost end of each line. The unit of measure for all axes is the US Survey Foot. The solid black line along the top of the contoured portion of the profiles represents the ground surface.

The Vp measured by the seismic refraction survey range from below 1,000 ft/sec near the surface to greater than 7,000 ft/sec at depth.

Vp Range (ft/sec)	Color Shading	Assumed Lithology
500 – 4,500	Tan-yellow-green	Soils and unconsolidated, unsaturated sedimentary deposits
4,500 – 7,500	Blue-purple	Consolidated, cemented and/or saturated sediments or weathered and/or fractured rock

Observations

The two SR profiles share similar Vp values which we group into two Vp ranges. The lower range (tan to green coloration) is considered low Vp and is interpreted to correspond to soils and unconsolidated, unsaturated sedimentary deposits. The higher range (blue to purple coloration) is considered moderate/high Vp and may indicate either consolidated, cemented and/or saturated sediments or weathered and/or fractured rock. On both profiles we observe a low Vp layer to a depth of about 20-ft, which quickly transitions to moderate and high Vp (blue to purple) extending to the bottom of the profile.

Neither profile exhibits the kind of lateral Vp variations that are typically associated with faulting. It is possible that the fault is present but does not create a contrast in p-wave velocities and is therefore undetectable to our survey.

General Comments

As with any geophysical method, the processes rely on measured responses to provide indications of physical conditions in the field. Responses can be affected by on-site conditions beyond the control of the operator, such as, but not limited to, cultural features (e.g., utilities, buried metallic objects, etc.), soil/material types, soil/material moisture, and/or groundwater table depth. Interpretation is based on known factors combined with the experience of the operator and the geophysicist evaluating the results. Detailed descriptions of the limitations specific to each geophysical method are provided in the Exploration and Testing Procedures.

Sampling and testing of select areas using subsurface exploration methods is recommended to correlate the results from the geophysical surveys. As with all geophysical methods, the geophysical results provide information regarding subsurface conditions at the site but should not be considered absolute. We cannot be responsible for the interpretation of geophysical results by others.

Our analysis and opinions are based upon our understanding of the project, the geophysical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration locations or due to the modifying effects of construction (if applicable) or weather. If variations appear, we can provide further evaluation and supplemental recommendations via change order.

Our Scope of Services does not include either specifically or by implication any geotechnical, environmental, or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the client is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geophysical practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, cost estimating, including excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we are retained to review the changes and either verify or modify our conclusions in writing.

Exploration and Testing Procedures

Terracon utilized the following test methods in our investigation.

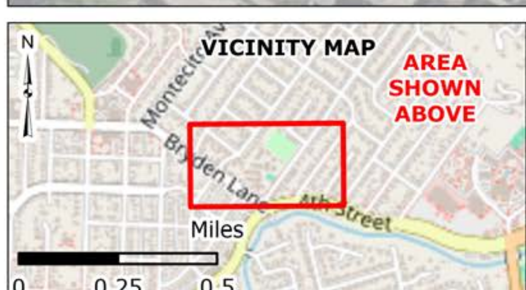
Seismic Refraction (SR) Profiling Survey (ASTM D5777)

The seismic refraction (SR) method provides information regarding the seismic velocity structure of the subsurface. An impulsive (mechanical or explosive) source is used to produce compressional (P) wave seismic energy. The P-waves propagate into the earth and are refracted along interfaces caused by an increase in velocity. A portion of the P-wave energy is refracted back to the surface where it is detected by sensors (geophones) that are coupled to the ground surface in a collinear array (spread). The detected signals are recorded on a multichannel seismograph and are analyzed to determine the shot point-to-geophone travel times. These data can be used along with the corresponding shot point-to-geophone distances to determine the depth, thickness, and velocity of subsurface seismic layers.

Limitations: The seismic refraction method provides a 2-D cross-section (profile) depicting the distribution of compressional (P) wave velocities versus distance and depth beneath a seismic line. These variations in velocity can be related to lithologic variations by correlating the seismic data with other subsurface information such as borehole geological and/or geophysical logs. In the absence of ground truth, certain assumptions can be made according to the interpreter's knowledge of the local geology and experience in similar surveys. In either case, the resulting seismic velocity profile represents a model of the subsurface, not an exact depiction.

SR data quality can be reduced by extraneous seismic energy sources such as wind, traffic or nearby machinery. It is also subject to induced noise by power lines or other field-generating sources. To overcome these issues, the SR energy source can be "stacked" (multiple shots) to achieve an acceptable signal-to-noise ratio. However, in extremely noisy conditions it may not be possible to achieve an acceptable signal-to-noise ratio for the greatest shot-to-receiver distance, possibly reducing the maximum depth of investigation.

Furthermore, SR data quality can be reduced when surveys are conducted on asphalt or concrete surfaces. This situation poses the unique problem of placing a thin layer of higher velocity material (the asphalt or concrete) over the target of the survey (the underlying geology). This typically causes noise in the geophone traces nearest the source where the seismic energy traveling through the asphalt masks the information from the shallow geology. This may result in a loss of shallow data for the modelling process.



LEGEND

— 2D SEISMIC REFRACTION PROFILE

HORIZONTAL SCALE

0 50 100 150 200

(1 inch = 100 feet)

DATA SOURCES:
ESRI - Basemaps

Terracon
Geophysical Services

321A BLODGETT STREET
COTATI, CA 94931

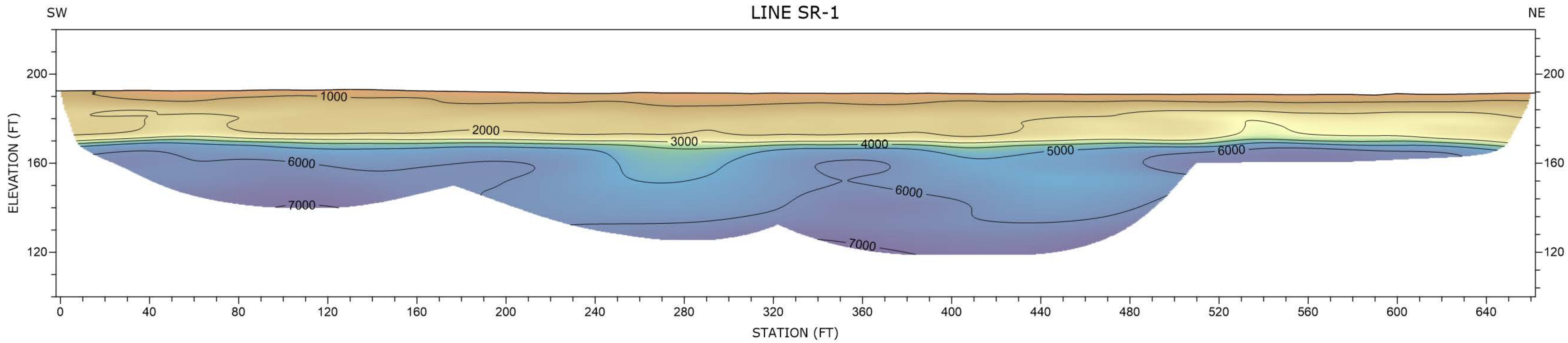
(707) 796-7170
www.terracon.com

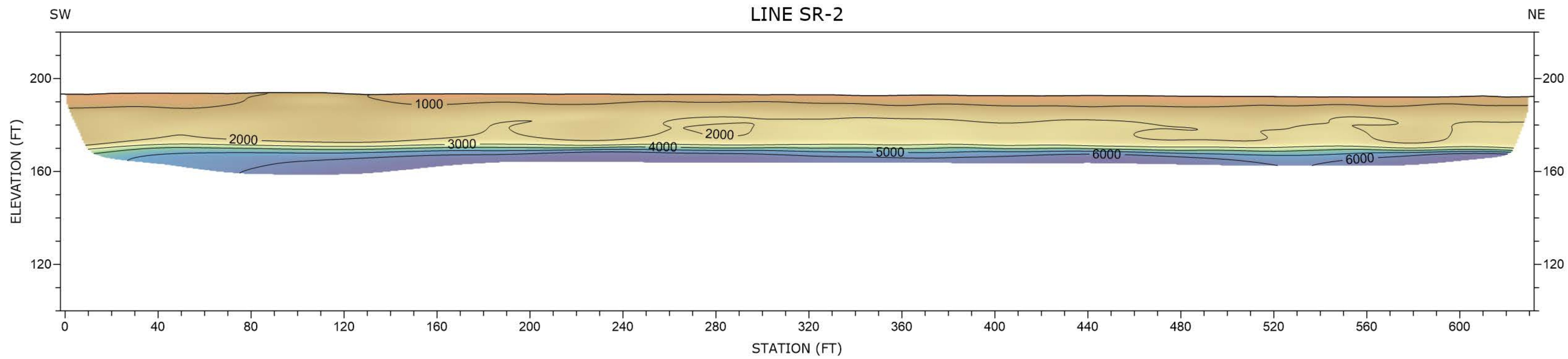
PROFESSIONAL GEOPHYSICIST
JAMES EARNEST SAGE WAGNER III
No. 1109
STATE OF CALIFORNIA

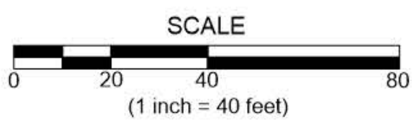
SITE LOCATION MAP
PROCTOR TERRACE ELEMENTARY
1711 BRYDEN LANE

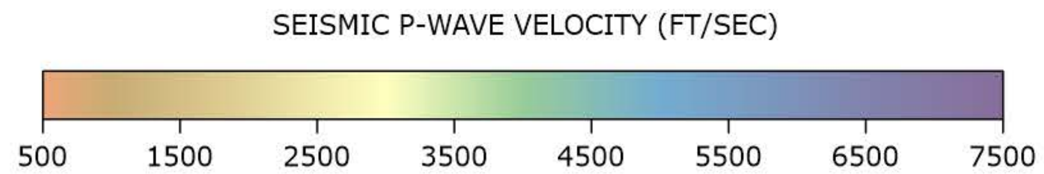
LOCATION: SANTA ROSA, CALIFORNIA	
CLIENT: MILLER PACIFIC ENGINEERING GROUP	
PROJ #: NS255108	DATE: JUL 2025
DRAWN BY: M. ELSHALKANY	APPROVED BY: JSW
J. Sage Wagner	7/3/2025

PLATE
1









Terracon
Geophysical Services

321A BLODGETT STREET
COTATI, CA 94931
(707) 796-7170
www.terracon.com

PROFESSIONAL GEOPHYSICIST
JAMES EARNEST SAGE WAGNER III
No. 1109
STATE OF CALIFORNIA

SEISMIC REFRACTION PROFILES
SR LINES 1 & 2
1711 BRYDEN LANE

LOCATION: SANTA ROSA, CALIFORNIA		
CLIENT: MILLER PACIFIC		
JOB #: NS255108	DATE: JULY 2025	PLATE
DRAWN BY: M. SPERRY	APPROVED BY: JSW	2
J Sage Wagner	7/7/2025	