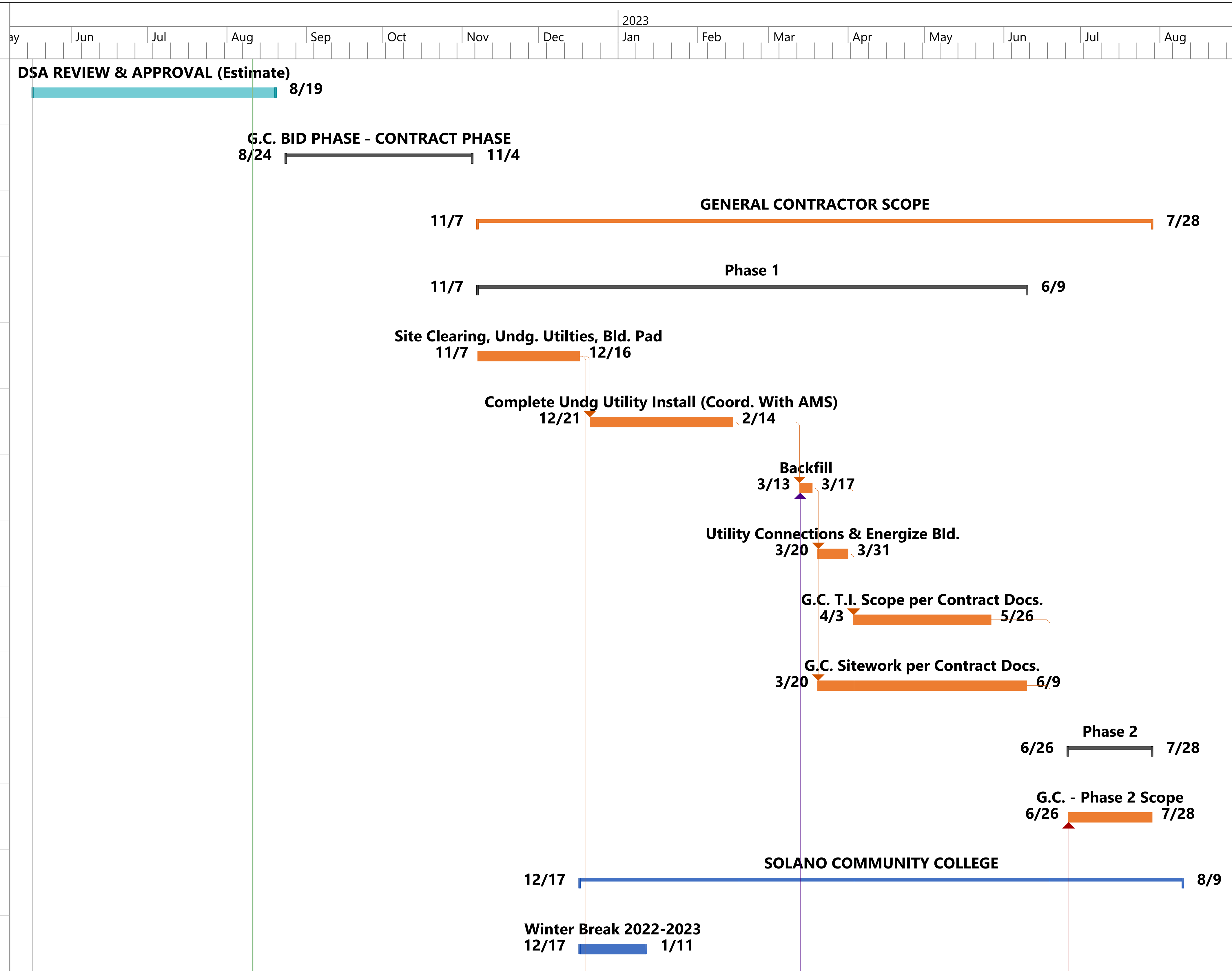
FAIRFIELD CAMPUS

EARLY LEARNING CENTER PROJECT

REFERENCE DOCUMENTS

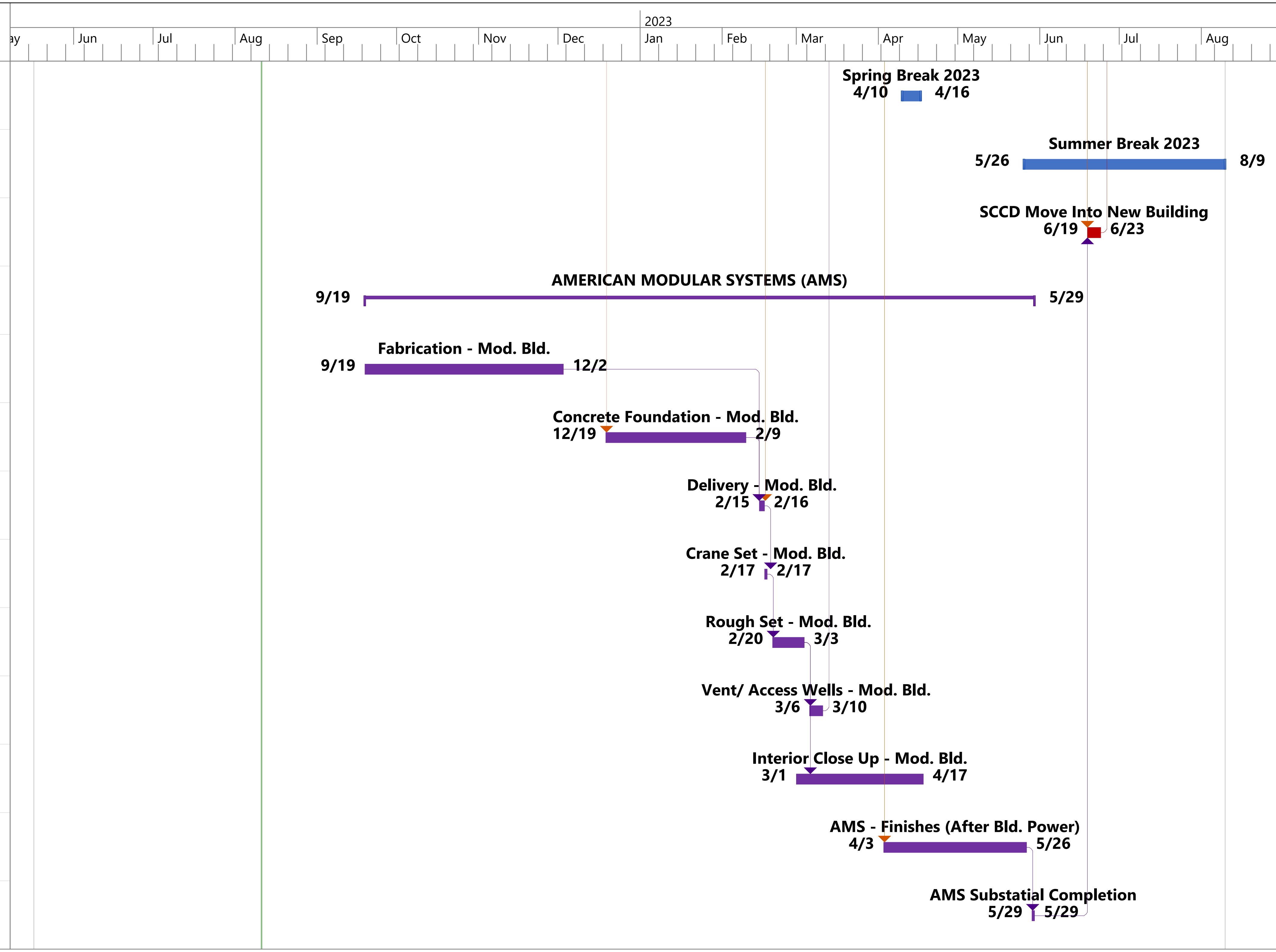
TABLE OF CONTENTS

ID	Task Name	Start
1	DSA REVIEW & APPROVAL (Estimate)	Tue 5/17/22
2	**G.C. BID PHASE - CONTRACT PHASE**	**Wed 8/24/22**
11	**GENERAL CONTRACTOR SCOPE**	**Mon 11/7/22**
12	**Phase 1**	**Mon 11/7/22**
13	Site Clearing, Undg. Utilties, Bld. Pad	Mon 11/7/22
14	Complete Undg Utility Install (Coord. With AMS)	Wed 12/21/22
15	Backfill	Mon 3/13/23
16	Utility Connections & Energize Bld.	Mon 3/20/23
17	G.C. T.I. Scope per Contract Docs.	Mon 4/3/23
18	G.C. Sitework per Contract Docs.	Mon 3/20/23
19	**Phase 2**	**Mon 6/26/23**
20	G.C. - Phase 2 Scope	Mon 6/26/23
21	**SOLANO COMMUNITY COLLEGE**	**Sat 12/17/22**
22	Winter Break 2022-2023	Sat 12/17/22



REFERENCE DOCUMENT

ID	Task Name	Start
23	Spring Break 2023	Mon 4/10/23
24	Summer Break 2023	Fri 5/26/23
25	SCCD Move Into New Building	Mon 6/19/23
26	**AMERICAN MODULAR SYSTEMS (AMS)**	**Mon 9/19/22**
27	Fabrication - Mod. Bld.	Mon 9/19/22
28	Concrete Foundation - Mod. Bld.	Mon 12/19/22
29	Delivery - Mod. Bld.	Wed 2/15/23
30	Crane Set - Mod. Bld.	Fri 2/17/23
31	Rough Set - Mod. Bld.	Mon 2/20/23
32	Vent/ Access Wells - Mod. Bld.	Mon 3/6/23
33	Interior Close Up - Mod. Bld.	Wed 3/1/23
34	AMS - Finishes (After Bld. Power)	Mon 4/3/23
35	AMS Substatial Completion	Mon 5/29/23



REFERENCE DOCUMENT

Schedule is provided as a reference document in order to show possible sequence of work / coordination needed between Modular Building Manufacturer (AMS) and General Contractor. General Contractor is responsible for producing actual schedule and coordinating with Modular Building Manufacturer (AMS).

Solano Community College District

Early Learning Center

RESPONSIBILITY MATRIX

8-Aug-22

ACTIVITY DESCRIPTION	PRIME CONTRACTOR	MODULAR CONTRACTOR	DISTRICT/ OTHERS	COMMENTS
DIVISION 01 - GENERAL REQUIREMENTS				
Temporary facilities/toilets	X			
Temporary site fencing/dumpsters	X			
Temporary field office trailers	X			If needed
Temporary electrical power	X			
All city permits, fees, water, electrical etc.	X		X	Division of State Architect Permit by District
Temporary phone & internet	X			If needed
Staging area for modules on site	X		X	
Site security	X			Provide perimeter fencing for modulars if needed.
DIVISION 02 - EXISTING CONDITIONS				
Subsurface investigation			X	Underground As-Builts Provided by District
Demolition & removals	X			
DIVISION 03 - CONCRETE				
Mow strips	X			
Site flatwork & accessories	X			
Curb & gutter	X			
Modular building foundations		X		
Non-modular site foundations	X			
Foundation staking	X			
Mechanical & utility foundations	X			
Haul-off of all foundation/form spoils from site	X			If spoils cannot be utilized with site earthwork
Haul-off or fill any all soil not from foundation	X			
All modular building footings & stem walls		X		
Crawl space slurry		X		
Install foundation vents and grates		X		Formed and poured after buildings craned and set and structurally connected
Supply metal grates and frames material		X		
Modular foundation - dig footings		X		
Provide/install light weight concrete subfloors within building		X		
DIVISION 04 - MASONRY - Not Applicable				
DIVISION 05 - METALS				
Building foundation flashings and weep screeds		X		
Building foundation & access vent grates		X		Verify T.O. grate is at finish floor height
ADA building handrails				Not applicable
ADA building guardrails				Not applicable
ADA site handrails	X			If applicable
ADA site guardrails	X			If applicable
ADA Drinking Fountain Handrails	X			
Provide/install building downspout conductor heads		X		If applicable
DI grates	X			
DIVISION 07 - THERMAL & MOISTURE PROTECTION				
Building dampproofing & waterproofing		X		Above grade conditions only
DIVISION 08 - OPENINGS				
Doors & frames		X		
Windows & frames		X		
Door hardware	X	X		Exterior Door Hardware by GC / Interior Hardware by AMS
Glazing		X		
Louvers & vents		X		
Skylights		X		
DIVISION 09 - FINISHES				
Plaster & gypsum board		X		
Tackable wall panels		X		
Epoxy		X		
Ceilings		X		
Floorings & base		X		
Wall finishes		X		
Door frames & doors		X		
Exterior caulking		X		Modular buildings only
Interior window sills		X		
Paintings & coatings		X		Modular buildings only

Solano Community College District

Early Learning Center

RESPONSIBILITY MATRIX

8-Aug-22

ACTIVITY DESCRIPTION	PRIME CONTRACTOR	MODULAR CONTRACTOR	DISTRICT/ OTHERS	COMMENTS
DIVISION 10 - SPECIALTIES				
Building & site ADA signage	X			All required signage
Site Installed Canopies/Walkway Structure(s)	X			To be installed after modular buildings are craned in placed
DIVISION 11 - EQUPMENT				
Security equipment	X			If applicable
Educational equipment (smart TVs, WAPs, smartboards, etc.)	X			
Appliances (ovens, Refridgerators, washer/dryer)			X	Purchased and installed by District
DIVISION 12 - FURNISHINGS				
Casework, cabinets, & countertops		X		Per AMS DSA approved drawings
Classroom furniture			X	
DIVISION 13 - Special Construction				
Engineering & DSA approval		X		In collaboration with project AOR
Manufacture buildings		X		
Transport cost to site		X		Special fees, Permits, & CHP escort not included
DSA fees			X	
Inplant inspection fees			X	
Interior finish		X		
DIVISION 14 - CONVEYING EQUIPMENT - Not Applicable				
DIVISION 21 - FIRE SUPPRESSION				
DIVISION 22 - PLUMBING				
Site/under building foundation area drains	X			
All Cleanouts below finished Floor and at POC	X			
Pressure testing of all UG lines	X			
Storm drain lines & catch basins	X			
Provide & install building downspouts		X		Connection to site storm and clean-out by GC per AMS POC drawing
Site sewer line - within 2' of new building	X			Connect to modular building per POC drawing
Site water service - within 2' of new building	X			Connect to modular building per POC drawing
Crawlspace waste manifold		X		Stub 2' past foundation stem wall, Per AMS POC drawing
Building shut off valves (water, gas, FW, etc.)	X			At or below grade conditions
Site shut off valves (water, gas, FW, etc.)	X			
Shut off valves & pressure reducing valves in building & HVAC units		X		
Building water service in building		X		
Plumbing fixtures		X		
Chlorination - all lines	X			Including modular buildings
Downspout cleanouts	X			Install after downspouts installed
Connect Downspouts to storm drain	X			
Irrigation	X			
Planting	X			
Fencing, fencing footings & columns	X			
Site accessories & planters	X			
DIVISION 23 - HVAC				
HVAC piping & pumps within the building		X		
HVAC supply & return ducts & grills		X		
Run condensate drains stub below FF		X		Per AMS POC drawing
Condensate drain below floor piping and drywells	X			Connect to modular building per POC drawing
HVAC exhaust fans		X		
HVAC air cleaning devices		X		Air filter provided at start-up
Thermostats		X		
EMS System	X			If applicable
EMS wiring, testing, labeling, devices, etc. to ensure EMS is compatible with new HVAC units	X			If applicable
Power for EMS		X		Location provided by project AOR
Backboxes/J-boxes and conduits within wall cavity and overhead		X		Per design provided by project AOR
EMS sensors/thermostats conductors	X			Connect to HVAC units, if applicable
DIVISION 26 - ELECTRICAL				
Site electrical service - to new building	X			Including energizing modular subpanels, per AMS POC drawing
Site light fixtures & foundations	X			
Site UG trenching, backfill, & compaction	X			

Solano Community College District

Early Learning Center

RESPONSIBILITY MATRIX

8-Aug-22

ACTIVITY DESCRIPTION	PRIME CONTRACTOR	MODULAR CONTRACTOR	DISTRICT/ OTHERS	COMMENTS
Main switch boards	X			
Conductors to meters	X			
Transformers & installation of transformers	X			
Conduit pathway and conductors to transformers and from transformers to MSB	X			
Distribution switch boards	X			
Energizing of new building & all site/building electrical components	X			
Building electrical sub panels		X		Per AMS drawings
Ground rods, testing, & reports	X			
Power for low voltage components		X		Per layout provided by project AOR
Conductors from main switch board to modular subpanels	X			Per AMS POC Drawing
Electrical conduit from MSB to crawl space subpanel stub out	X			Per AMS POC Drawing
Circuit monitoring	X			
Panel ID/circuit ID labeling		X		
Site lighting	X			
All building exterior lighting		X		
EMS controls panel	X			If applicable
Interior light programming		X		AMS systems only, excludes programming/intetgration to campus network (if required)
Exterior light programing	X			
Conduits connectiong building wings	X			
2x4 Interior dimmable LED lights		X		
Exterior LED lights		X		
Interior occupancy sensors/photo sensors		X		
All electrical (power) within new building		X		Per layout provided by project AOR. See subsequent items in Division 21, 23, 26 and 27 for scope limitations
DIVISION 27 - LOW VOLTAGE				
All new to existing low voltage tie-ins (to be coordinated through the school)	X			
Testing of all low voltage lines	X			
Training of district employees for all new devices & equipment	X		X	
Telephone system & devices at new building	X			
Network infrastructure	X			
Fiber optic network system	X			
Audio-video systems	X			
Data communications	X			
Security wiring, cabling, devices, programing and integration	X			
Cable trays (if applicable)	X			
Data/EMS system - install, equipment, cabling, testing, labeling, etc.	X			
All fire alarm communications & panels	X			Power by AMS per location(s) provided by project AOR
Fire alarm system - install, equipment, cabling, testing, labeling, etc.	X			
Low voltage backboxes/ J-boxes		X		Stubbed 6" above T-bar
Conduit pathway to IDF room to buildings underground	X			
Pathway to IDF room in buildings in wall & ceiling	X			Per layout provided by project AOR.
Conduit pathway/tie in to all low voltage panels/devices (FA, EMS, IDF, lighting contrls,etc.)	X			
Hardware at each exterior door	X			All electronic hardware, pushbars, locksets by GC
Access Control panel, networking, and final programming	X			
IDF cabinets		X		
Signal termination cabinets	X			If applicable
DIVISION 28 - ELECTRONIC SAFETY & SECURITY				
New building security system	X			

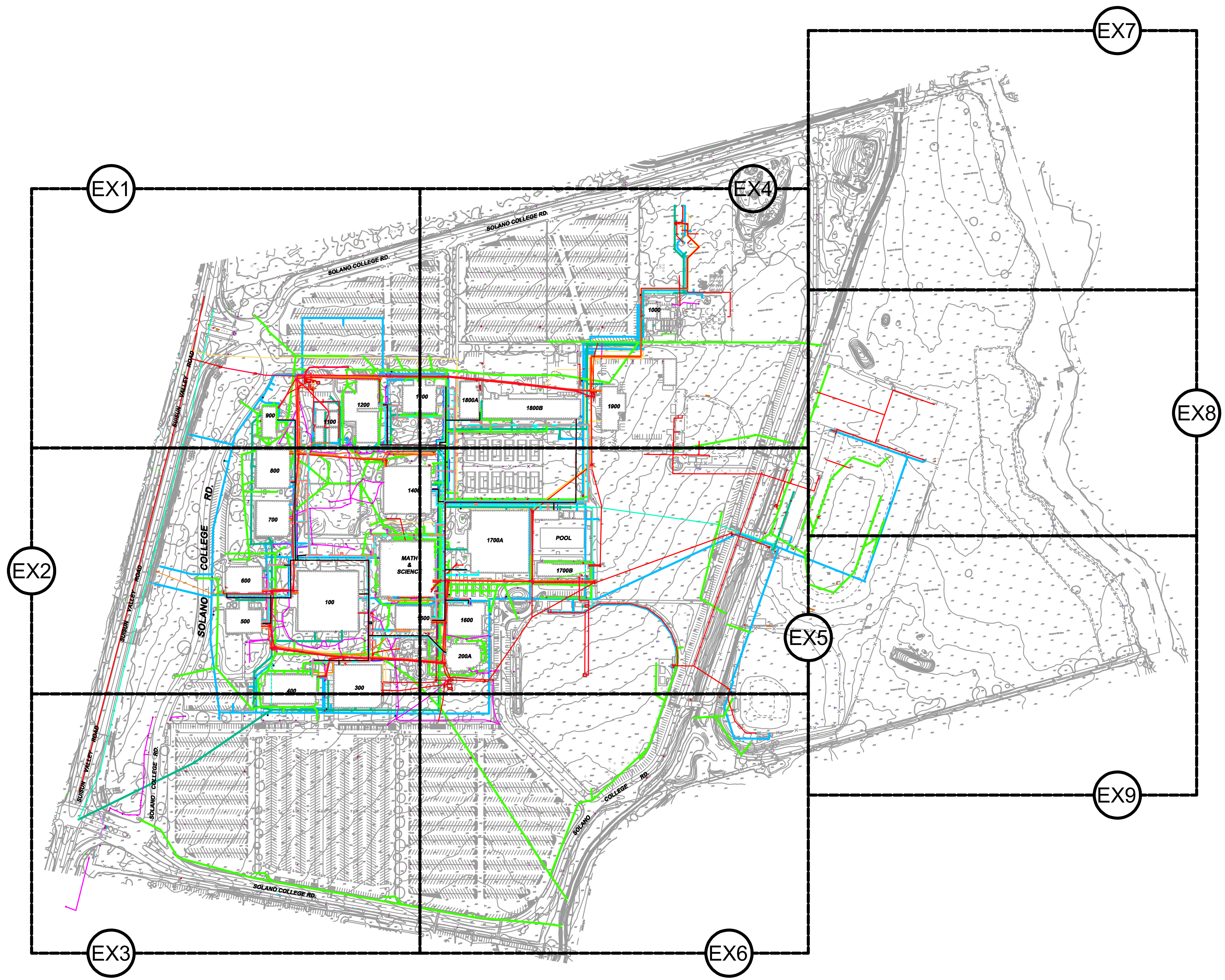
Solano Community College District

Early Learning Center

RESPONSIBILITY MATRIX

8-Aug-22

ACTIVITY DESCRIPTION	PRIME CONTRACTOR	MODULAR CONTRACTOR	DISTRICT/ OTHERS	COMMENTS
All new to existing security tie-ins (to be coordinated through the school)	X			
Testing of all security lines	X			
Security wiring, cabling, devices, programing and integration	X			If aplicable
Hardware at each door & Wire for door locks	X			
Training of district employees for all new devices & equipment	X		X	
DIVISION 31 - EARTHWORK				
Site & building excavation, backfill, compaction, import, export, etc.	X			Backfill along building perimeter within 3 weeks after buildling crane set
Import/export fill to include engineered fill if applicable per soils report	X			
Rough grading (including building perimeter)	X			
Finish grading, including slopes to drain to drain within building pad area	X			
Surveying, staking (site & building footprint), etc.	X			
Finish grade, including slopes to drain (if applicable) within the building pad area, & re-grading after all removed form work.	X			
Excavate modular building foundation pads to +/- .1' for 18" crawl space height.	X			Excavate 5' minimum horizontally beyond building perimeter. Coordinate subgrade elevation with AMS
Excavate building/foundation footings		X		
DIVISION 32 - ASPHALT CONCRETE PAVING				
Asphalt concrete paving & slurry seal (power wash prior to seal)	X			If applicable
Driveways, parking stalls & accessories, wheel stops, speed bumps, etc.	X			If applicable
Walkways	X			If applicable
Striping	X			If applicable
Protection bollards	X			
Gates & fencing - including footings, soil export, etc.	X			
Landscape planting	X			
Landscape irrigation systems	X			
OTHER(S)				
Restroom accessories (mirror, grab bars, ADA TP)		X		
Restroom accessories (soap/paper towel dispenser, sanitary dispenser, etc.)	X			
Classroom accessories (soap/towel dispenser)	X			
Window Coverings		X		
Site SWPPP & monitoring	X			
Temporary construction keys & cores		X		Where applicable - Some door locksets not in AMS scope per approved hardware submittal
Permanent building master keys & cores	X		X	
Provide unobstructed truck/crane routes & access to building foundation pads	X		X	District, school, & contractors to ensure no material, equipment, stockpiles, etc. is in the way.
Building mounted exterior hose bibbs		X		Per locations provided by project AOR
Building mounted exterior power outlets		X		Per locations provided by project AOR
Classroom markerboards		X		If applicable.
Walk-off floor mats at classroom entry		X		
Site security	X			
Dust control	X			
Utility POC coordination	X	X		Per locations and scope as defined in AMS POC shop drawing
Ceiling Access panels		X		
Modular building delivery, craning, rigging, & erecting		X		
Hot Water Heaters		X		
A/V systems	X		X	
Final cleaning	X		X	



LEGEND

- ABANDONED HYDRONIC
- AIR
- CHILLED WATER SUPPLY/RETURN
- COMMUNICATION
- HOT WATER RETURN
- HOT WATER SUPPLY/RETURN
- ELECTRICAL LINE
- FIRE WATER
- GAS LINE
- JOINT TRENCH
- LIGHTING
- SANITARY SEWER
- STORM DRAIN
- WATER

Date: 01/26/2020
Scale: 1" = 400'
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EX0

SHEET INDEX

FAIRFIELD CALIFORNIA

SOLANO COMMUNITY COLLEGE DISTRICT MASTER PLAN

SOLANO COMMUNITY COLLEGE

CSW | ST2 ENGINEERING GROUP

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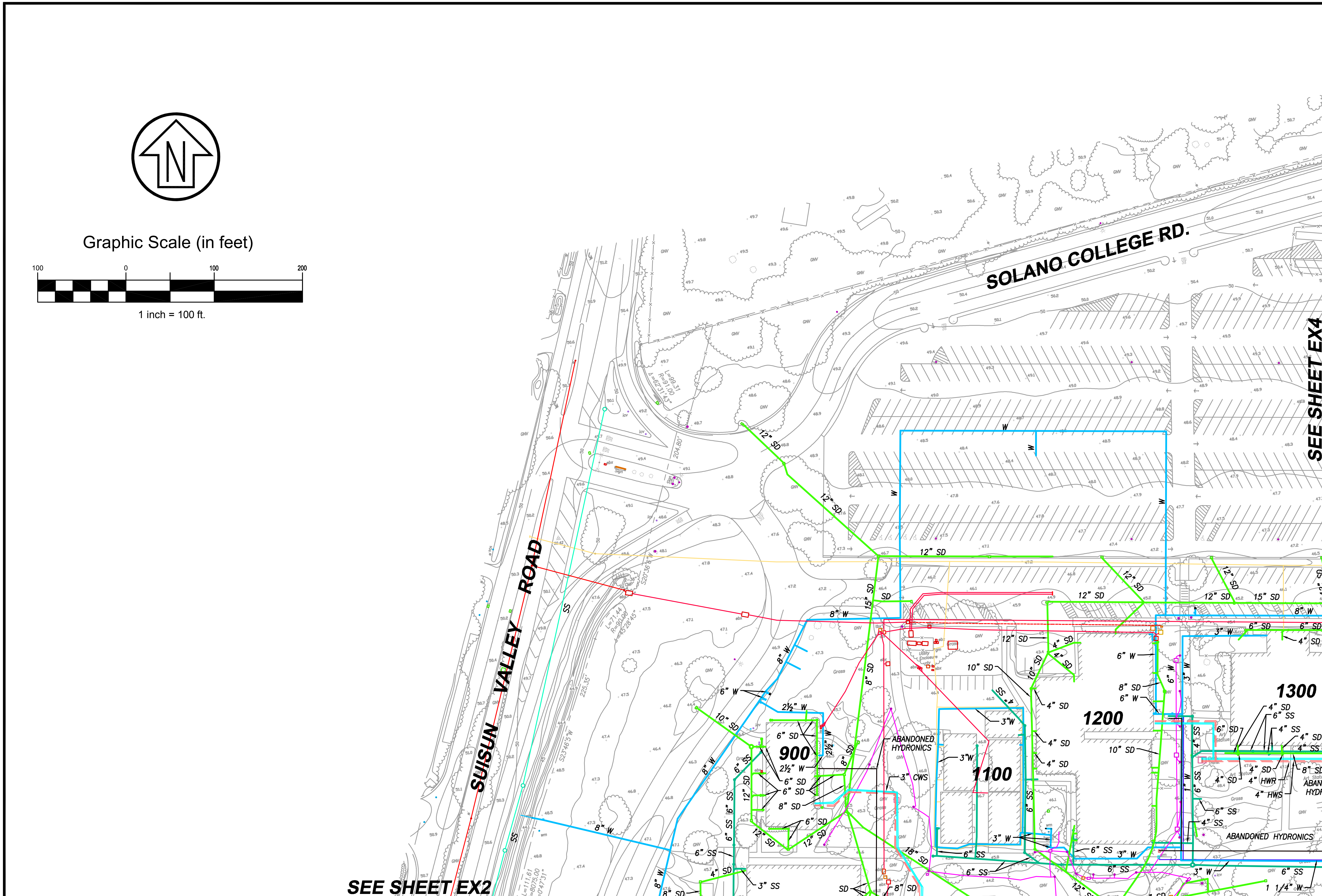

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EX1

EXISTING UTILITIES

FAIRFIELD CALIFORNIA

SOLANO COMMUNITY COLLEGE DISTRICT MASTER PLAN

SOLANO COMMUNITY COLLEGE

CSW | ST2
ENGINEERING GROUP

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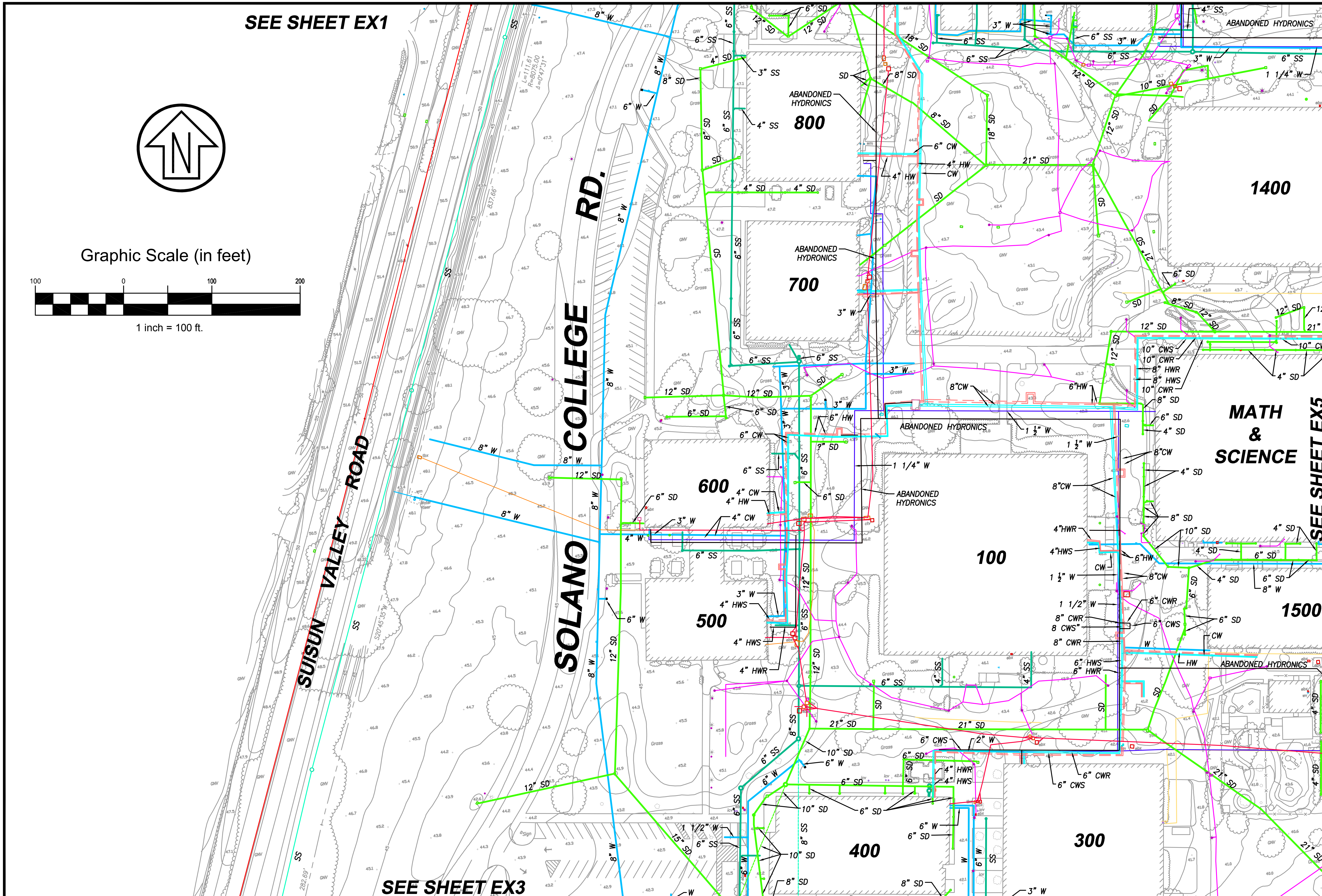

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EX2

EXISTING UTILITIES

FAIRFIELD CALIFORNIA

SOLANO COMMUNITY COLLEGE DISTRICT MASTER PLAN

SOLANO COMMUNITY COLLEGE

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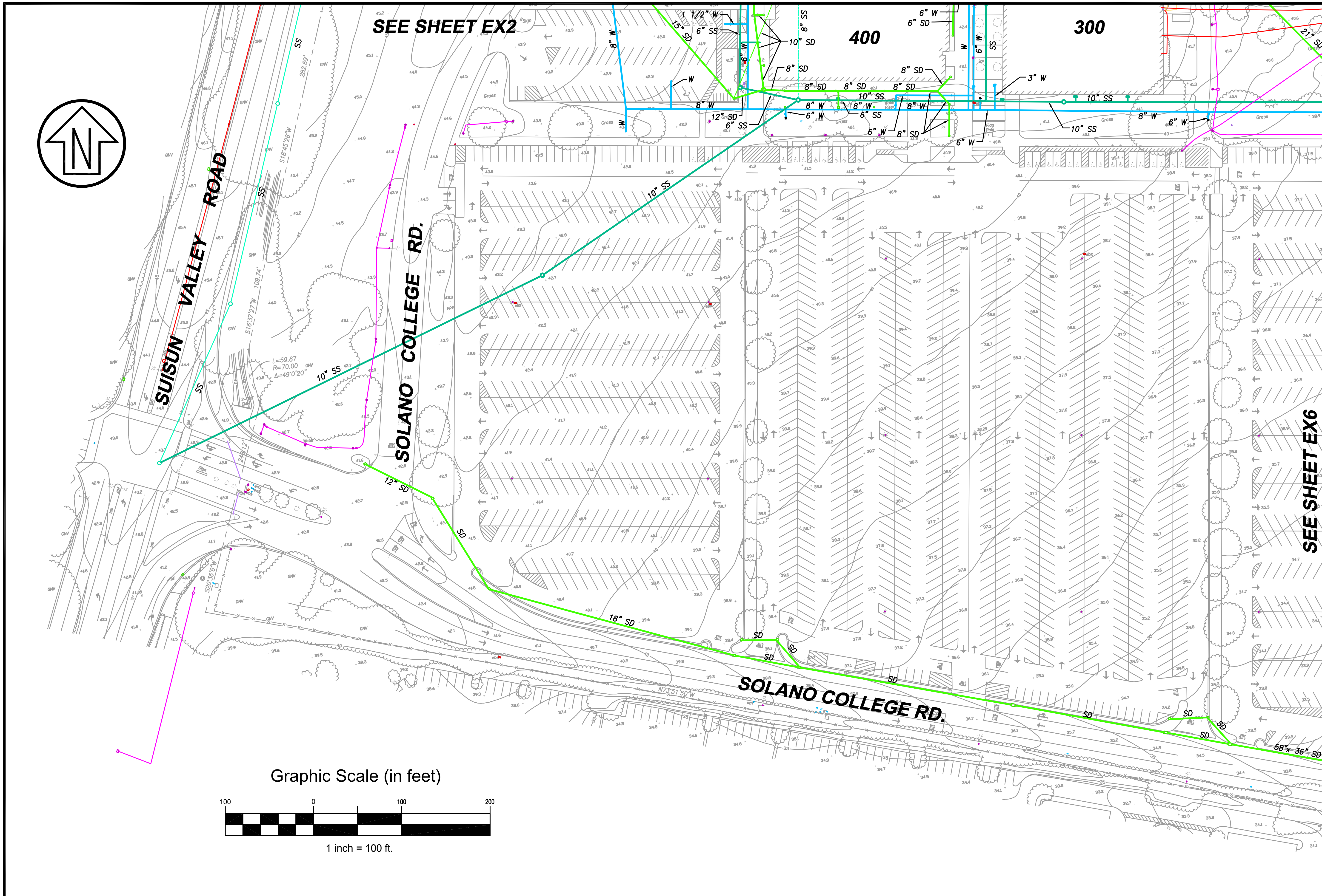

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EX3

EXISTING UTILITIES

FAIRFIELD CALIFORNIA

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SOLANO COMMUNITY COLLEGE

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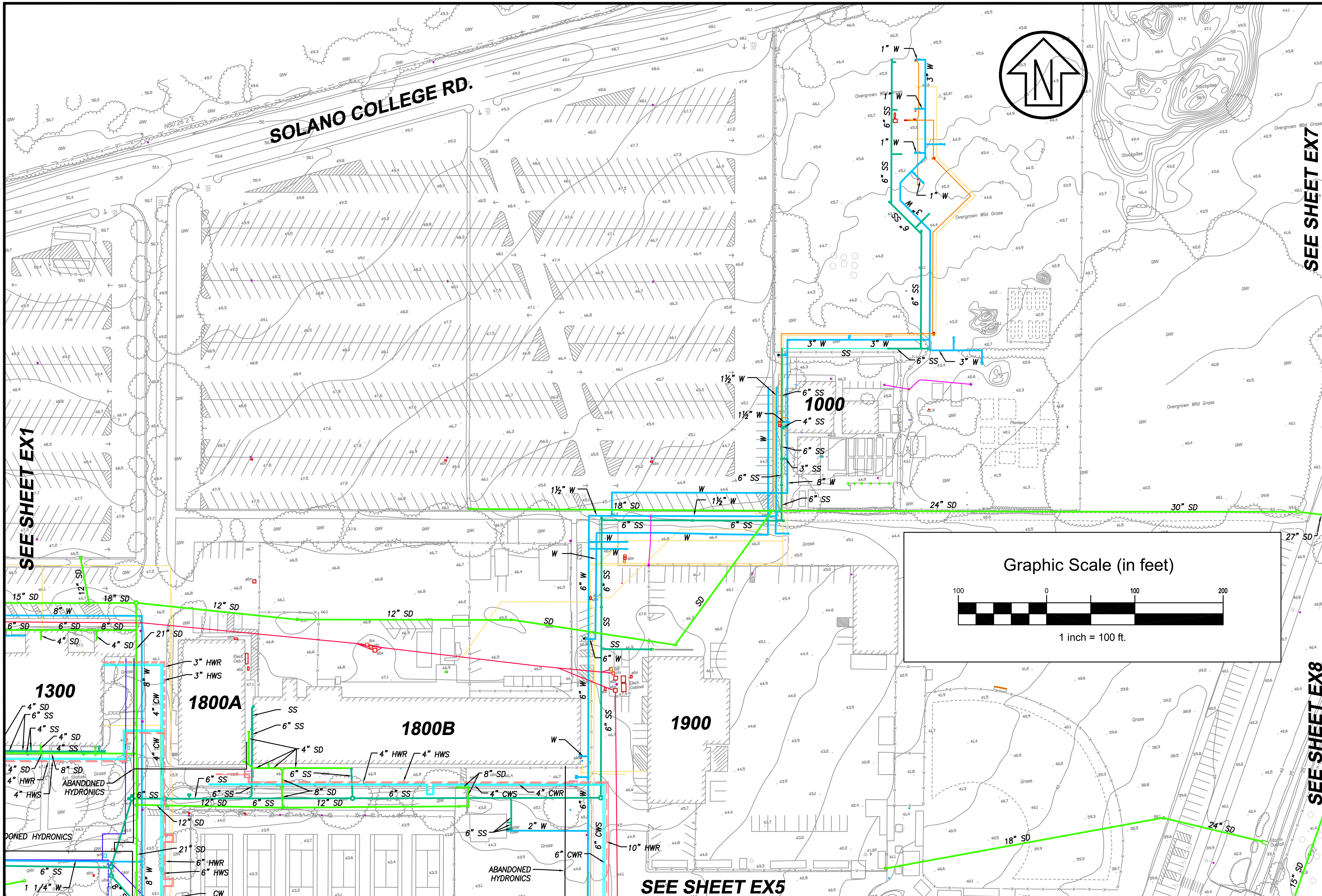

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EX4

EXISTING UTILITIES

FAIRFIELD CALIFORNIA

SOLANO COMMUNITY COLLEGE DISTRICT MASTER PLAN

SOLANO COMMUNITY COLLEGE

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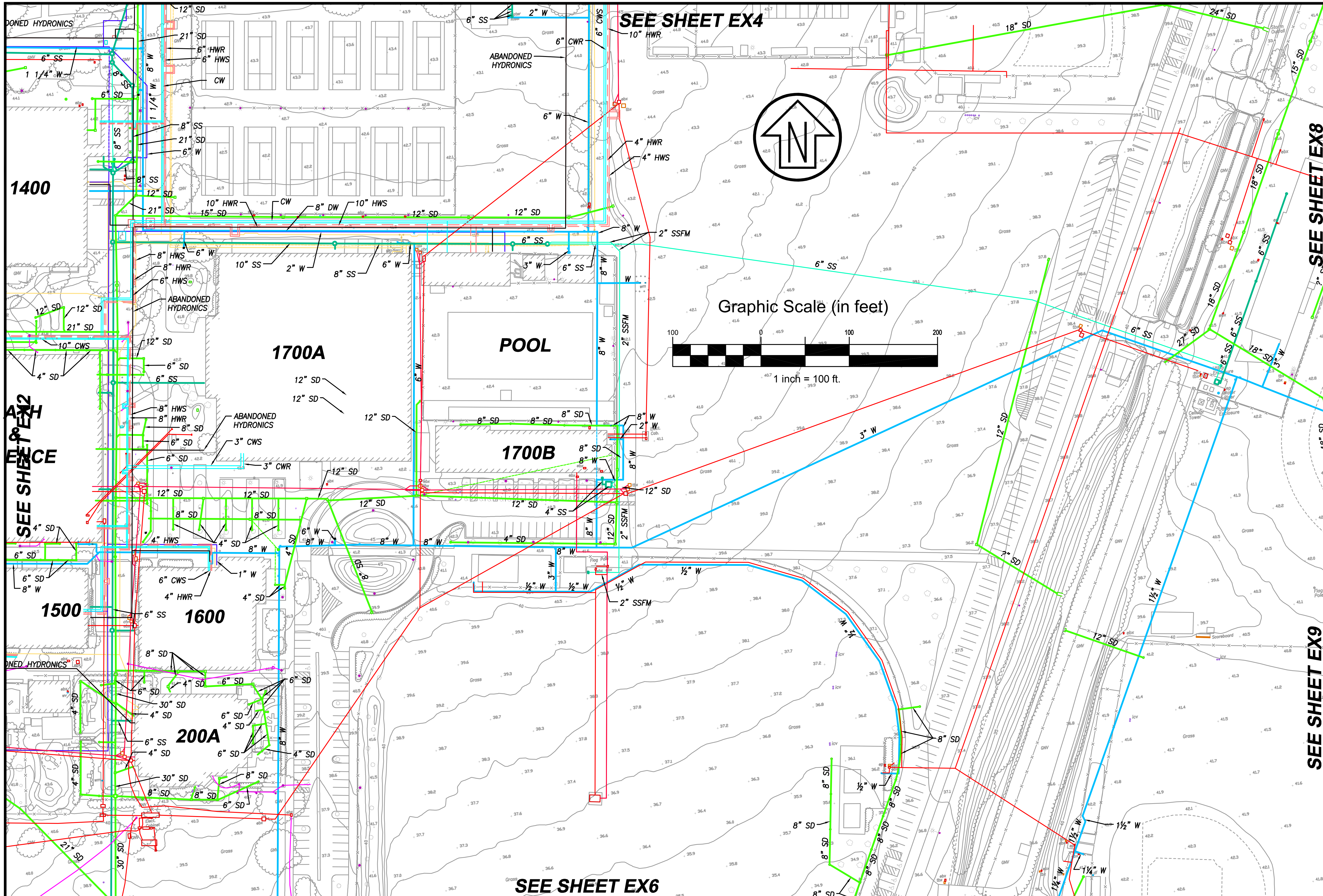

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EX5

EXISTING UTILITIES

FAIRFIELD
CALIFORNIA

SOLANO COMMUNITY COLLEGE DISTRICT MASTER PLAN

SOLANO COMMUNITY COLLEGE

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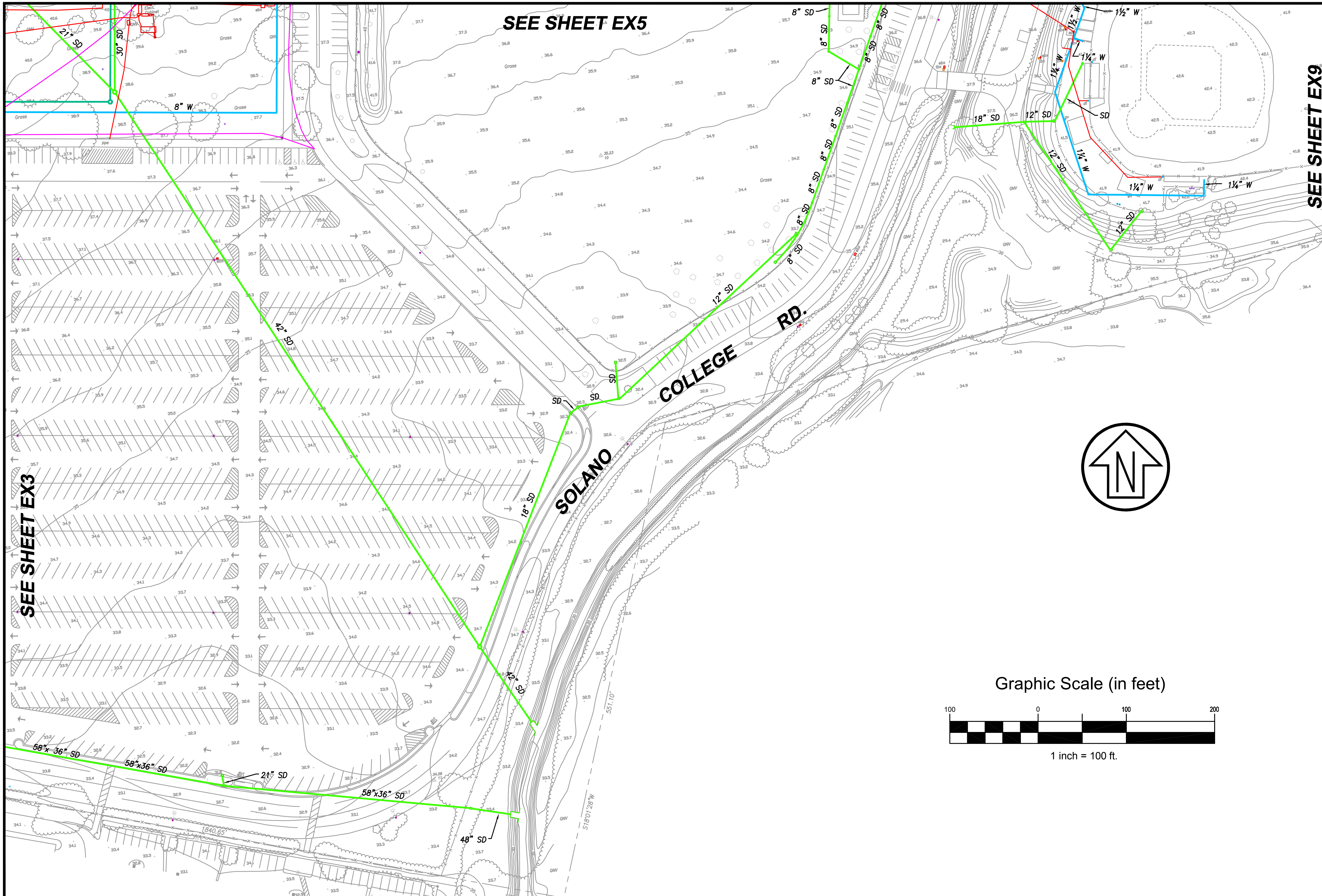

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EX6

EXISTING UTILITIES

FAIRFIELD CALIFORNIA

SOLANO COMMUNITY COLLEGE DISTRICT MASTER PLAN

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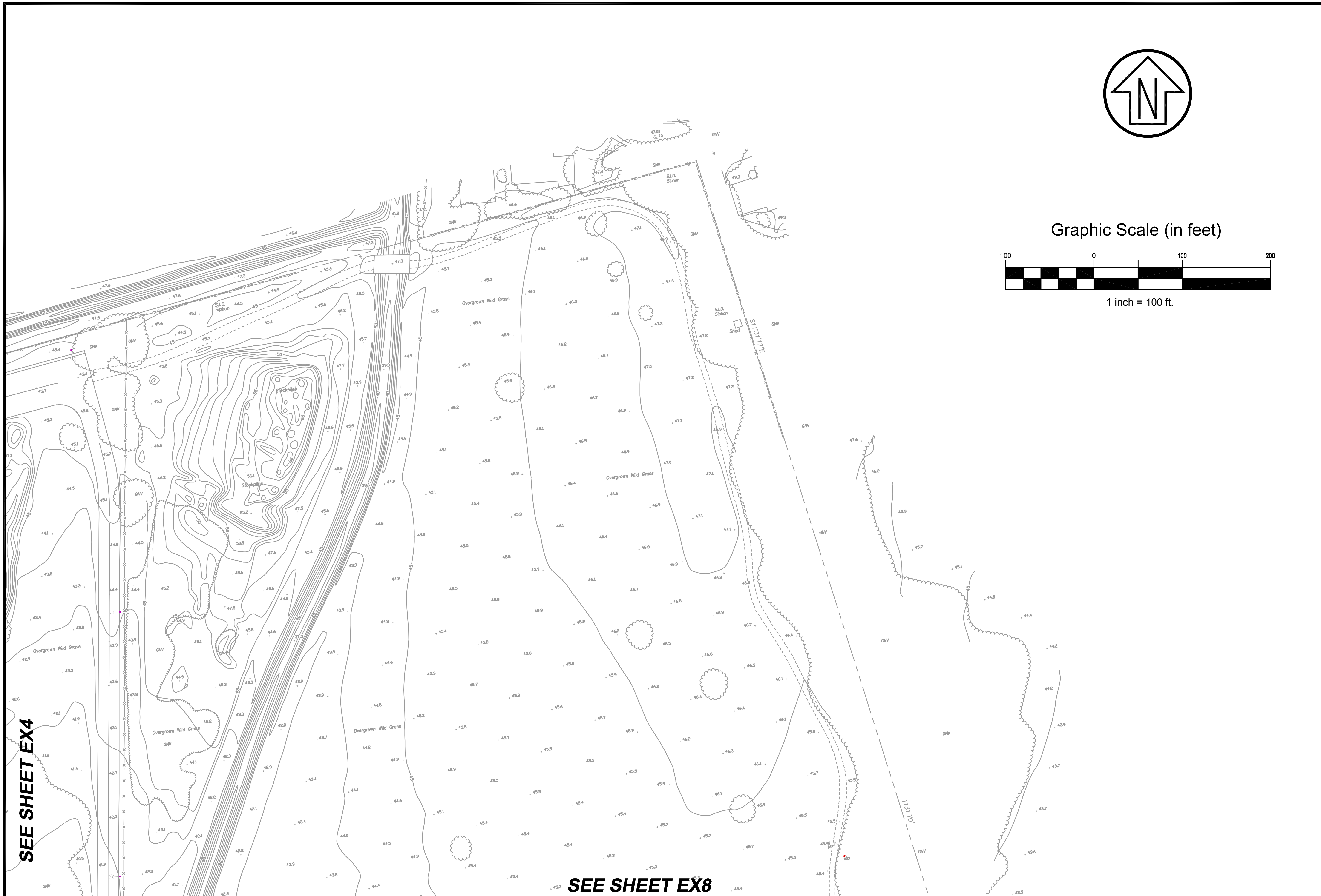

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EX7

EXISTING UTILITIES

FAIRFIELD CALIFORNIA

SOLANO COMMUNITY COLLEGE DISTRICT MASTER PLAN

SOLANO COMMUNITY COLLEGE

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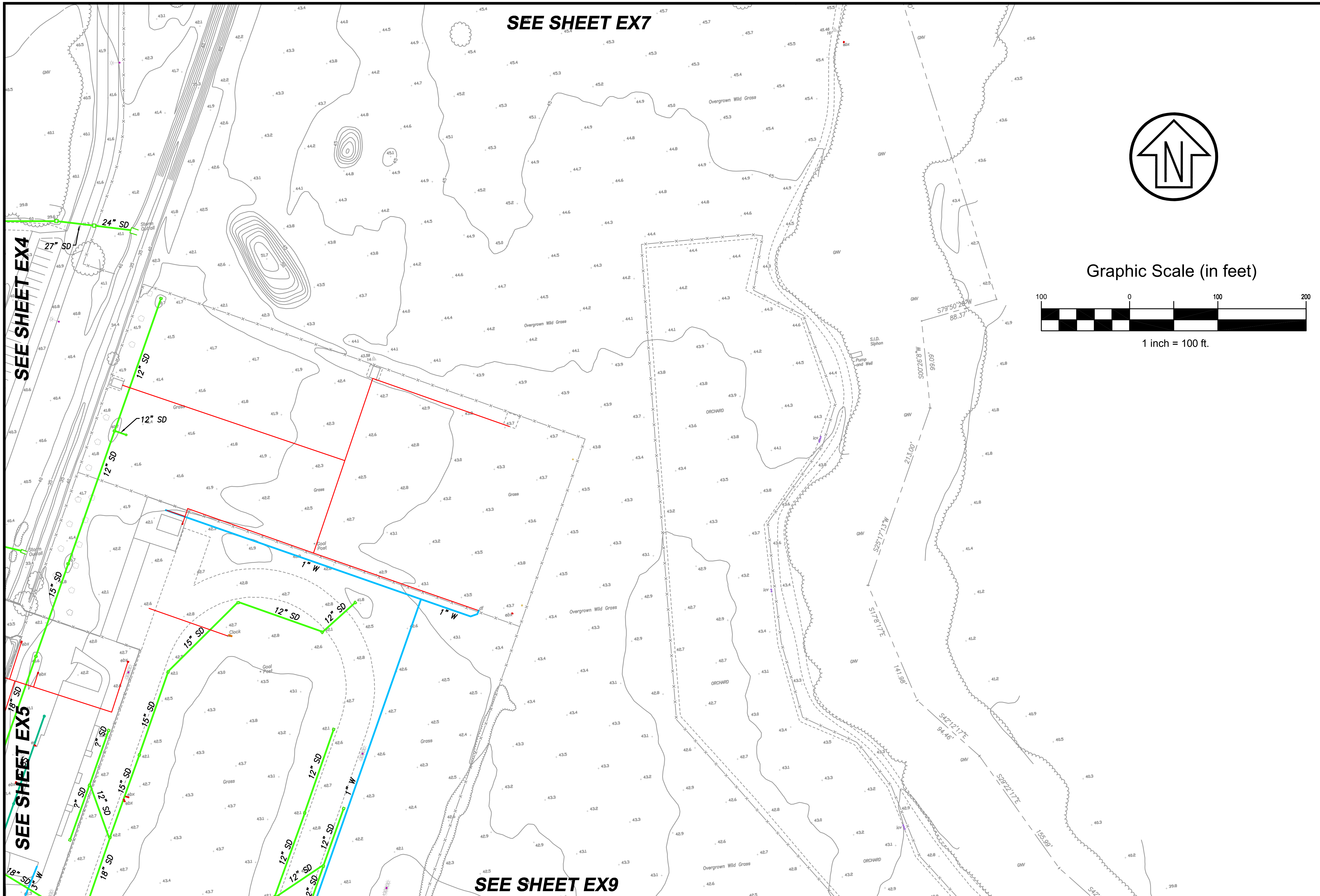

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EX8

EXISTING UTILITIES

FAIRFIELD CALIFORNIA

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SOLANO COMMUNITY COLLEGE

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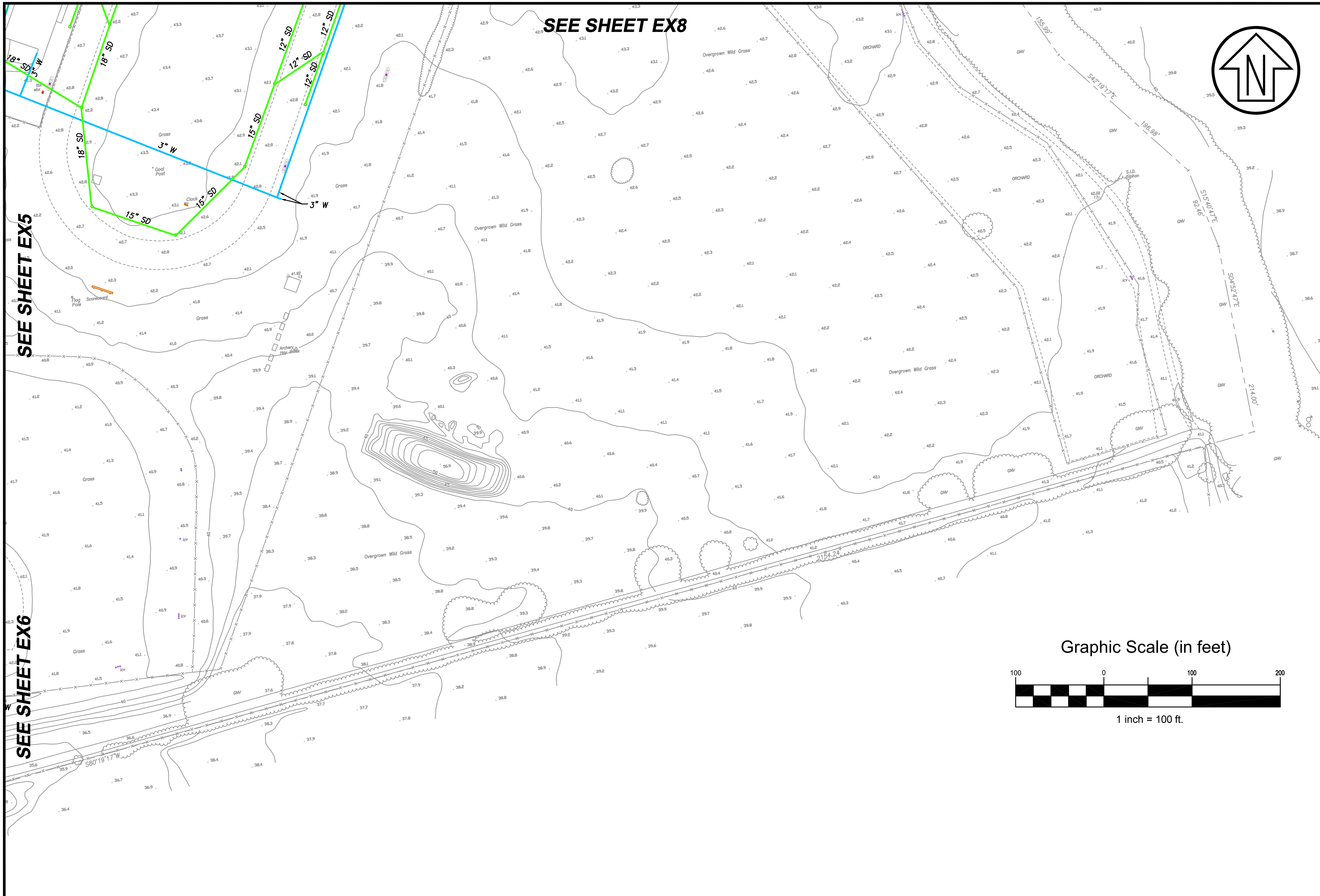

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EX9

EXISTING UTILITIES

FAIRFIELD CALIFORNIA

SOLANO COMMUNITY COLLEGE DISTRICT
MASTER PLAN

SOLANO COMMUNITY COLLEGE

CSW | ST2
ENGINEERING GROUP

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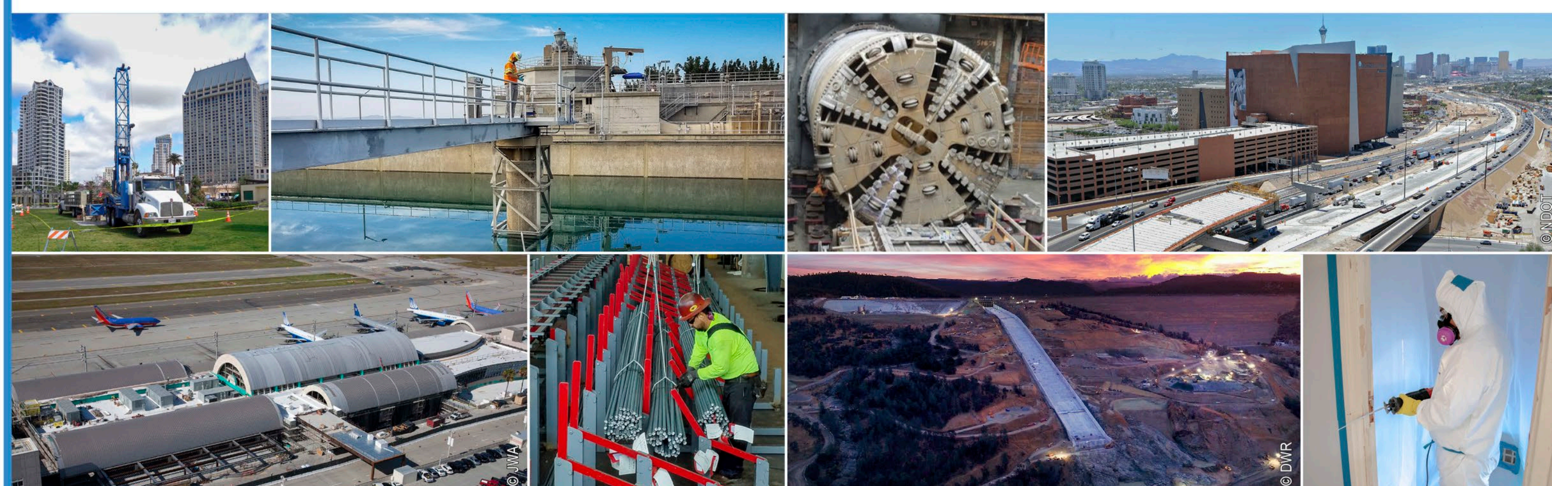
Geotechnical Evaluation and Geologic Hazards Assessment

New Modular Building
Solano Community College – Fairfield Campus
4000 Suisun Valley Road
Fairfield, California

Solano Community College District
4000 Suisun Valley Road | Fairfield, California 94534

February 7, 2022 | Project No. 404147001



Geotechnical | Environmental | Construction Inspection & Testing | Forensic Engineering & Expert Witness

Geophysics | Engineering Geology | Laboratory Testing | Industrial Hygiene | Occupational Safety | Air Quality | GIS

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

CELEBRATING 35 YEARS

Geotechnical Evaluation and Geologic Hazards Assessment

New Modular Building

Solano Community College – Fairfield Campus
4000 Suisun Valley Road
Fairfield, California

Mr. Noe Ramos (Kitchell CEM)
Solano Community College District
4000 Suisun Valley Road | Fairfield, California 94534

February 7, 2022 | Project No. 404147001

REGISTERED PROFESSIONAL ENGINEER
RANSOM H. HENNEFER
GE 3152
GEOTECHNICAL
STATE OF CALIFORNIA
February 7, 2022

PROFESSIONAL GEOLOGIST
CHAD STELLERN
No. 9946
STATE OF CALIFORNIA
February 7, 2022

Chad Stellern, PG
Senior Staff Geologist

Ransom H. Hennefer, PE, GE
Principal Engineer

PROFESSIONAL GEOLOGIST
DAVID C. SEYMOUR
NO. 1574
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA
February 7, 2022

David C. Seymour, PG, CEG
Principal Engineering Geologist

CDS/RH/DCS/gvr

CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

In accordance with your authorization, we have performed a geotechnical evaluation and geologic hazards assessment for the new modular building at the Solano Community College District Fairfield Campus at 4000 Suisun Valley Road in Fairfield, California (Figure 1). The new modular building is part of the Measure Q Early Learning Center Expansion project. This report presents the findings and conclusions from our geotechnical and geologic hazards evaluation, and our geotechnical recommendations for the proposed improvements at the site.

2 SCOPE OF SERVICES

Our scope of services included the following:

- Review of readily available background materials, including geologic maps, aerial photographs, topographic data, and hazard maps.
- Review of Ninyo and Moore's previous geotechnical evaluation for the Solano Community College Library Learning Resource Center completed in 2018, and other geotechnical evaluations performed in 2013 and 2014.
- Site reconnaissance to observe the general site conditions and to mark the locations for our subsurface exploration.
- Procurement of a boring permit from the Solano County Department of Resource Management, Environmental Health Services division.
- Review of existing utility plans provided by the owner, and coordination with Underground Service Alert (USA) to locate underground utilities in the vicinity of our subsurface exploration.
- Subsurface exploration consisting of one (1) cone penetration test (CPT) sounding and two (2) hand auger exploratory borings. Hand auger borings were advanced to 5 feet below the existing ground surface. The CPT sounding was advanced to a depth of 50 feet. A representative of Ninyo & Moore logged the subsurface conditions exposed in the borings and collected bulk and relatively undisturbed soil samples for laboratory tests. The sounding was backfilled with cement grout in compliance with the Solano County permit.
- Laboratory testing of selected soil samples was performed to evaluate the geotechnical properties of the subsurface materials including in-situ soil moisture content and density, Atterberg limits, expansion index, and soil corrosivity, as appropriate for the subsurface materials encountered.
- Data compilation and engineering analysis of the information obtained from our background review, subsurface evaluation, and laboratory testing.
- Preparation of this geologic hazards assessment and geotechnical evaluation report presenting our findings and conclusions regarding the potential geologic hazards and geotechnical conditions at the project site, and our geotechnical recommendations for the proposed improvements.

3 SITE DESCRIPTION

The campus is located at 4000 Suisun Valley Road in Fairfield, California (Figure 1). The campus is located south of Rockville Road between Suisun Valley Road to the west and Suisun Creek to the east (Figure 1). Existing campus improvements are generally encircled by Solano College Road (a loop road).

The subject site is located in the south central portion of the campus at approximately 38.2339 degrees north latitude and 122.1224 degrees west longitude, and is shown on the USGS Fairfield South, California 7.5-minute quadrangle. The project area is part of a courtyard area surrounded by existing buildings, including the Science Building to the west, Building 200B to the north, a modular building and parking lot to the south, and open space to the east. The project area is relatively flat with elevations of about 45 to 47 feet above mean sea level (Google, 2022).

Historical topographic maps and aerial photographs that we reviewed indicate that the site was used for agricultural/rangeland purposes prior to development of the community college in the early 1970's. We did not observe any tonal lineaments or other features suggestive of active faulting on the historical aerial photographs that we reviewed on Google Earth and the USGS historical aerial photograph website (https://earthexplorer.usgs.gov).

4 PROJECT DESCRIPTION

Based on the information provided, we understand that the proposed improvements will consist of the construction of a new modular building in the south central portion of the campus. The modular building is expected to be one-story in height with a building footprint of approximately 40 feet by 96 feet. Other associated improvements are anticipated to include site work improvements, pedestrian walkways, and utility installations.

5 BACKGROUND REVIEW

As part of our evaluation we reviewed in-house reports prepared for other projects located at the campus, including the New Library and Learning Resource Center Building project (Ninyo & Moore, 2018); the solar photovoltaic arrays project (Ninyo & Moore, 2013a); the expansion of Building 600 project (Ninyo & Moore, 2013b); and the Building P2 and Building 1200 Theater Renovation project (Ninyo & Moore, 2014).

6 FIELD EXPLORATION AND LABORATORY TESTING

Our subsurface exploration at the site was performed on December 17, 2021 and January 12, 2022. The subsurface exploration consisted of two (2) small diameter, hand auger borings advanced up to 5 feet below existing ground surface. Additionally, we performed one (1) CPT sounding advanced to a depth of approximately 50 feet below the existing ground surface. The approximate locations of the borings and sounding are presented on Figure 2.

A representative of Ninyo & Moore logged the subsurface conditions exposed in the borings and collected bulk soil samples from the borings. The samples were then transported to our geotechnical laboratory for testing. The CPT sounding was backfilled with cement grout in compliance with the Solano County drilling permit. Detailed logs of the borings are presented in Appendix A.

The CPT soundings were performed using a truck-mounted rig with a 25-ton reaction capacity. Cone tip resistance, sleeve friction, and pore pressure were electronically measured and recorded at vertical intervals of approximately 2 inches while the cone was advanced. The soil behavior type index (I_c) and corresponding soil behavior for the subsurface materials encountered was assessed using correlations (Robertson & Campanella, 1986) based on the cone penetration data and sleeve friction. The CPT sounding log is presented in Appendix B.

Laboratory testing of soil samples recovered from the borings included tests to evaluate in-situ soil moisture content, Atterberg limits, expansion index, and soil corrosivity. The results of the in-place soil moisture and density are shown at the corresponding sample depths on the boring logs in Appendix A. The results of the other laboratory tests, except corrosivity testing, are presented in Appendix C. The results of the corrosivity tests are presented in Appendix D.

7 GEOLOGIC AND SUBSURFACE CONDITIONS

Our findings regarding regional geologic setting, site geology, subsurface stratigraphy, and groundwater conditions at the subject site are provided in the following sections.

7.1 Regional Geologic Setting

The campus is located north of Suisun Bay in the Coast Ranges geomorphic province of California. The Coast Ranges are comprised of several mountain ranges and structural valleys formed by tectonic processes commonly found around the Circum-Pacific belt. Basement rocks have been sheared, faulted, metamorphosed, and uplifted, and are separated by thick blankets of Cretaceous and Cenozoic sediments that fill structural valleys and line continental margins.

The San Francisco Bay Area has several ranges that trend northwest, parallel to major strike-slip faults such as the San Andreas, Hayward, and Calaveras (Figure 3). Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement.

7.2 Site Geology

Review of available geologic maps and reports indicates that the project area is underlain by Holocene age alluvial fan deposits (Figure 4). According to regional geologic studies by Bezore et al. (1998a and 1998b) and Graymer et al. (2002), the Holocene age alluvial fan deposits typically consist of silt and clay interbedded with layers of sand and gravel. The alluvial deposits are derived from the bedrock formations exposed in the nearby foothills and local mountains. The local bedrock formations are part of the Pliocene age Sonoma Volcanics and consist of layers of ash flow tuff, andesite, and basalt.

7.3 Subsurface Conditions

The following sections provide a generalized description of the geologic units encountered during our subsurface evaluation. More detailed descriptions are presented on the logs in Appendix A.

7.3.1 Alluvium

Alluvium was encountered in the borings and CPTs from the ground surface to depths of up to about 50 feet. The fill encountered generally consisted of brown, moist to wet, firm to stiff lean clay with thin layers of sand and silty sand..

7.4 Groundwater

During our visit on December 17, 2021 to perform hand augers, we found surface water ponding on the ground surface and saturated soil conditions. Seepage was encountered in borings HA-1 and HA-2 at 4.5 and 4.0 feet BPG, respectively, during auguring. For planning purposes, we recommend assuming a design groundwater depth of about 6 feet below the ground surface based on previous site evaluations.

Fluctuations in the groundwater level across the site and over time may occur due to seasonal precipitation, variations in topography or subsurface hydrogeologic conditions, or as a result of changes to nearby irrigation practices or groundwater pumping. In addition, seeps may be encountered at elevations above the observed groundwater levels due to perched groundwater conditions, leaking pipes, preferential drainage, or other factors not evident at the time of our exploration.

8 GEOLOGIC HAZARDS AND CONSIDERATIONS

This study considered a number of issues relevant to the proposed construction, including seismic hazards, flood hazards, landsliding and slope stability, naturally occurring asbestos, settlement of compressible soil layers from static loading, unsuitable materials, excavation characteristics, soil corrosivity, and expansive soils. These issues are discussed in the following subsections.

8.1 Seismic Hazards

The seismic hazards considered in this study include the potential for ground rupture due to faulting, seismic ground shaking, liquefaction, dynamic settlement, seismic slope stability, and tsunamis and seiches. These potential hazards are discussed in the following subsections.

8.1.1 Historical Seismicity

The site is located in a seismically active region. Figure 3 presents the location of the site relative to the epicenters of historic earthquakes with magnitudes of 5.5 or more from 1800 to 2022. Records of historic ground effects related to seismic activity (e.g. liquefaction, sand boils, lateral spreading, ground cracking) compiled by Knudsen et al. (2000), indicate that no ground effects related to historic seismic activity have been reported for the site vicinity. In addition, no ground effects were reported at the site after the August 24, 2014 Mw 6.0 South Napa Earthquake as compiled by Ponti et al. (2019).

8.1.2 Faulting and Ground Surface Rupture

The site is not located within an Alquist-Priolo Fault Rupture Hazard Zone (AP Zone) established by the State Geologist (CGS, 2018) to delineate regions of potential ground surface rupture adjacent to active faults. As defined by the California Geological Survey (CGS), active faults are faults that have caused surface displacement within Holocene time, or within approximately the last 11,700 years (CGS, 2018). The closest fault rupture hazard zone is the one associated with the Cordelia Fault, which is located approximately ½ mile west of the site (CDMG, 1993a and b).

8.1.3 Strong Ground Motion

Based on historic activity, the potential for future strong ground motion at the site is considered significant. Seismic design criteria to address ground shaking are provided in Section 10.2. The peak ground acceleration (PGA) associated with the Maximum Considered Earthquake Geometric Mean (MCE_G) was calculated in accordance with the American Society of Civil Engineers (ASCE) 7-16 Standard and the 2019 California Building Code (CBC). The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.719g using the USGS seismic design maps (SEAOC/OSHPD, 2021) that yielded a mapped MCE_G peak ground acceleration of 0.599g for the site and a site coefficient (F_{PGA}) of 1.2 for Site Class D - default.

8.1.4 Liquefaction and Strain Softening

Liquefaction is a phenomenon in which soil loses its shear strength for short periods of time during an earthquake. The strong vibratory motions generated by earthquakes can trigger a rapid loss of shear strength in saturated, loose, granular soils of low plasticity (liquefaction) or in wet, sensitive, cohesive soils (strain softening). Ground shaking of sufficient duration results in the loss of grain-to-grain contact, due to a rapid increase in pore water pressure, causing the soil to behave as a fluid for short periods of time. The potential damaging effects of liquefaction include differential settlement, loss of foundation bearing capacity, ground cracking, heaving and cracking of structure slabs due to sand boiling, and buckling of deep foundations due to liquefaction-induced ground settlement. Subsidence from liquefaction at the ground surface and densification of sands may result in free-field (large area) site settlement. Liquefaction (or strain softening) is generally not a concern at depths more than 50 feet below ground surface.

The site is in an area where the California Geological Survey has not yet evaluated or established seismic hazard zones for liquefaction. The Association of Bay Area Governments (ABAG, 2021) notes that the campus is in area considered to have a moderate susceptibility to liquefaction based on regional studies by Knudsen et al., (2000) and Witter et al. (2006).

We encountered deposits of sand and fine-grained soil of low plasticity below the groundwater level during our subsurface exploration. We evaluated the potential for liquefaction in accordance with the methods presented by Boulanger and Idriss (2014) using the CPT data collected during our subsurface exploration and the computer program CLiq (GeoLogismiki, 2018). Our analysis assumed a design groundwater level of 8 feet below the ground surface, and considered a seismic event producing a PGA of 0.72g resulting from a Magnitude 6.7 earthquake.

The results of our analysis, presented in Appendix E indicate that relatively thin layers of sandy and silty soil below the assumed design groundwater level will liquefy under the considered ground motion based on a factor of safety against liquefaction of less than one. Due to the depth and relative thickness of the liquefiable layers, we do not regard the potential for liquefaction-induced reduction in the bearing capacity of shallow foundations to be a design concern or considerations for the project. Sand-boil-induced ground subsidence and lateral spreading are not design concerns or considerations for the project. Although reduction or loss of bearing capacity for shallow foundations, subsidence associated with ground rupture and lateral spreading are not concerns, strong shaking of the site and the occurrence of liquefaction can result in settlement as discussed in Section 8.1.5.

The moisture content of the clay encountered during our subsurface exploration, when compared to the liquid limit and plastic limit from the results of our laboratory testing, is not consistent with a soil that is particularly sensitive. Estimates of undrained and remolded shear strength based on CPT tip resistance and sleeve friction indicate that the cohesive soils during our subsurface exploration are not particularly sensitive. As such, we do not regard seismically induced strain-softening behavior to be a design consideration or concern for this project.

8.1.5 Dynamic Settlement

The strong vibratory motion associated with earthquakes can dynamically compact or densify loose granular soil, leading to surficial settlements. Dynamic settlement may occur in both dry and saturated sand and silt. Cohesive soil is not typically susceptible to dynamic settlement.

We evaluated the potential for dynamic settlement using the computer program CLiq (GeoLogismiki, 2018) to evaluate the CPT data collected during our field investigation. CPT data was analyzed based on the methodology of Boulanger and Idriss (2014). Our analysis considered a Magnitude 6.7 earthquake producing a PGA of 0.72g and a design groundwater elevation of 8 feet below the ground surface. The results of our analyses indicate that the total dynamic settlement at the site following the considered seismic event will be up to approximately ¾ inch. Differential dynamic settlement is estimated to be about ½ inch over a horizontal distance of approximately 40 feet.

8.1.6 Lateral Spreading

In addition to vertical displacements, seismic ground shaking can induce horizontal displacements as surficial deposits spread laterally by floating atop liquefied subsurface layers. Lateral spreading can occur on sloping ground or on flat ground adjacent to an exposed face. Lateral spreading will not occur unless a liquefiable layer of sufficient lateral continuity is present. There are no significant slopes or free face conditions at the site. As such, we do not regard lateral spreading as a design consideration for this project

8.1.7 Seismic Slope Stability

No significant slopes are present on the site, as such, we do not regard seismic slope stability as a design consideration for this project.

8.1.8 Tsunamis and Seiches

Tsunamis are long wavelength seismic sea waves (long compared to ocean depth) generated by the sudden movements of the ocean floor during submarine earthquakes, landslides, or volcanic activity. The project is not located within a tsunami evacuation area as shown on the tsunami evacuation planning maps for California.

Seiches are waves generated in a large enclosed body of water. Based on the inland location and the lack of large enclosed bodies of water near the site, the potential for damage due to tsunamis or seiches is not a design consideration.

8.2 Flood Hazards

Our review of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FEMA, 2009) found that the community college lies, in part, within a 0.2% annual chance flood plain (500-year flood zone) for Suisun Creek. However, proposed development is outside of the flood zone.

8.3 Landsliding and Slope Stability

The site and surrounding area are relatively flat and the proposed improvements do not include construction of significant slopes. As such, we do not regard landsliding or slope stability a design consideration.

8.4 Naturally Occurring Asbestos

According to State of California guidelines established by the California Department of Toxic Substances and Control (2004 and 2005), a Preliminary Environmental Assessment (PEA) is recommended for school sites that are located within a 10-mile radius of any rock formation that may contain naturally occurring asbestos (NOA). The nearest mapped location of ultramafic rock from which NOA may be found is over 10 miles from the campus (Churchill and Hill, 2000; and Brabb et al., 1998). Based on these conditions, NOA is not a design consideration for this project.

8.5 Static Settlement

The proposed improvements will be relatively light and we anticipate that the grading operations will not increase site grades by more than a couple of feet. We estimate that the static settlement of the modular building, will be approximately 1 inch or less presuming that the foundations and earthwork conform with the recommendations in this report.

8.6 Unsuitable Materials

Fill materials that were not placed and compacted under the observation of a geotechnical engineer, or fill materials lacking documentation of such observation, are considered undocumented fill. Undocumented fill is unsuitable as a bearing material below foundations due to the potential for differential settlement resulting from variable support characteristics or the potential inclusion of deleterious materials. Recommendations for subgrade preparation and foundation embedment recommendations are provided to mitigate the undocumented fill concerns if encountered during construction.

Soil containing roots or other organic matter are not suitable as fill or subgrade material below foundations, pavements, or engineered fill. Recommendations for clearing and grubbing to remove vegetative matter in soil during site preparation are provided.

8.7 Excavation Characteristics

We anticipate that the project will involve excavations of depths up to 5 feet for foundations and utility trenches. We anticipate that heavy earthmoving equipment in good working condition should be able to make the proposed excavations.

Excavations in fill may encounter obstructions consisting of debris, rubble, abandoned structures, or over-sized materials that may require special handling or demolition equipment for removal.

Near-vertical temporary cuts in the near surface deposits up to 4 feet in depth should remain stable for a limited period of time. However, sloughing of the materials exposed on the excavation sidewall may occur, particularly if the excavation extends near the groundwater level, encounters granular soil, is exposed to water, or if the sidewall is disturbed during construction operations. Excavation subgrade may become unstable if exposed to wet conditions. Recommendations for excavation stabilization are presented. Excavated materials may also be wet and need to be dried out before reuse as fill.

8.8 Corrosive/Deleterious Soil

Corrosivity analysis was performed by CERCO Analytical, Inc. of Concord, California on samples of the near-surface soil. As reported by CERCO Analytical, the samples were determined to be "corrosive" based on resistivity test results. CERCO Analytical' s report (see Appendix C) included the following recommendation: "All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion." Please refer to the CERCO Analytical report included in Appendix D for more information regarding their test results and brief evaluation.

8.9 Expansive Soils

Some clay minerals undergo volume changes upon wetting or drying. Unsaturated soils containing those minerals will shrink/swell with the removal/addition of water. The heaving pressures associated with this expansion can damage structures and flatwork. Laboratory testing was performed on a select sample of the near-surface soil to evaluate the expansion index. The test was performed in accordance with the American Society of Testing and Materials (ASTM) Standard D 4829 (Expansion Index). The results of our laboratory testing indicate that the expansion index of the near-surface soil is 38 which is consistent with a low expansion characteristic.

9 CONCLUSIONS

Based on our review of the referenced background data, our site field reconnaissance, subsurface evaluation, and laboratory testing, it is our opinion that proposed construction is feasible from a geotechnical standpoint. Geotechnical considerations include the following:

- Our subsurface exploration encountered alluvium. Alluvium was encountered to depths of up to about 50 feet. The alluvium generally consisted of dark brown, moist to saturated, firm to stiff, lean clay with trace sand and layers of sand and silty sand. We found heavy organic material within the upper 2 feet and deeper adjacent to the tree onsite.

- Undocumented fill and soil containing roots, including root balls, or other organic matter are not suitable as subgrade below foundations. Recommendations for subgrade preparation and foundation embedment depth are provided.

- Near surface ground water was encountered in HA-1 and HA-2 at depths of 4.5 and 4.0 feet BPG, respectively. Ninyo & Moore (2018) reported groundwater at depths ranging from 7 and 16½ feet below the existing ground surface. Variation and fluctuation in groundwater levels should be anticipated as discussed in Section 7.4. For planning purposes, we recommend assuming a design groundwater depth of about 6 feet below the ground surface. To further evaluate variations in groundwater levels over time with respect to the site, piezometers can be installed and monitored.

- The site could experience a relatively large degree of ground shaking during a significant earthquake on a nearby fault. Seismic design criteria are presented in Section 10.2.

- The results of our liquefaction evaluation, presented in Appendix D, indicate that relatively thin layers of sandy soil will liquefy under the considered ground motion. However due to the depth and relative thickness of the liquefiable layers, we do not regard the potential for liquefaction-induced reduction in the bearing capacity of shallow foundations as a design consideration for the project.

- The results of our dynamic settlement analysis, presented in Appendix D, indicate that a total dynamic settlement of approximately ¾ inches will occur due to the assumed ground motion. For design purposes, we recommend using a total dynamic settlement of ¾ inch with a differential settlement of ½ inch over a horizontal distance of 40 feet.

- Tsunamis, seiches, ground surface rupture due to faulting, landslides, and slope stability are not design considerations based on the location, geologic, and surface conditions at the site.

- Excavations that remain unsupported and exposed to water, or encounter seepage, or granular soil may be unstable and prone to sloughing. Recommendations for excavation stabilization are provided.

- Excavations in fill may encounter debris, rubble, oversize material, buried objects, or other potential obstructions.

- The site is not in a flood hazard zone.

- High concentrations of naturally occurring asbestos (NOA) in the natural soils at the site are unlikely based on the nearest mapped location of ultramafic rock from which NOA may be found is over 10 miles from the school campus. NOA is not a design consideration for this project.
- Based on assumed light loads, static settlement is anticipated to be under 1 inch total and ½ inch differential over 40 feet.
- Based on the results of our limited soil corrosivity tests during this study and Caltrans corrosion guidelines (2021), the site meets the definition of a corrosive environment.
- Expansion index testing indicates that the near-surface soil on site has a low expansion characteristic.

10 RECOMMENDATIONS

The following sections present our geotechnical recommendations for the design and construction of the proposed improvements. The project improvements should be designed and constructed in accordance with these recommendations, applicable codes, and appropriate construction practices.

10.1 Earthwork

The site of the proposed improvements should be prepared by clearing and grubbing to remove debris, rubble, and vegetation, from excavation and fill areas. The debris generated from clearing and grubbing operations should be hauled off site to a legal dump site.

After clearing, grubbing, and excavation to rough grade, where needed, the geotechnical engineer should check the exposed subgrade for unsuitable materials including debris, organic matter, deleterious fill, or dry, loose, soft, or wet soil and evaluate if additional excavation is needed. The exposed subgrade should then be scarified to a depth of 12 inches in areas to receive fill, or at the proposed location for the modular building and adjacent flatwork. Scarified subgrade should be moisture conditioned, as-needed, to achieve a moisture content about 2 percentage points above the optimum, before compaction, by mechanical means, to 90 percent, or more, of the reference density as evaluated by ASTM D1557. Utility trench subgrade that is loose or soft should be removed or compacted to achieve a firm condition.

Excavations, including trench excavations, should be stabilized in accordance with the Excavation Rules and Regulations (29 Code of Federal Regulations, Part 1926) stipulated by the Occupational Safety and Health Administration (OSHA). Stabilization may consist of shoring sidewalls or laying slopes back. Dewatering should be performed as needed to depress groundwater levels below the bottom of excavations. Site soil above groundwater may be considered an OSHA Type C material with an allowable temporary slope gradient of 1½:1 (horizontal to vertical). Alternatively, an internally-braced shoring system or trench shield conforming to the OSHA Excavation Rules and Regulations (29 CFR Part 1926) may be used to stabilize excavation sidewalls during construction.

Construction should be performed during the period between approximately April 15 and October 15 to avoid the rainy season. In the event that grading is performed during the rainy season, the plans for the project should be supplemented to include a stormwater management plan prepared in accordance with the requirements of the relevant agency having jurisdiction. Rainy weather may impact the stability of excavation subgrade and exposed ground.

The on-site soil is generally suitable for reuse as general fill provided that it is processed, as-needed, to remove rocks or lumps in excess of 3-inches in median dimension, hazardous materials, trash, debris, and vegetation or other deleterious material, and moisture conditioned to near-optimum conditions.

Subgrade, if exposed to wet conditions, may be subject to pumping under load. The contractor should be prepared to stabilize subgrade. In general, unstable subgrade conditions may be mitigated by scarification and aeration to dry the soil to the optimum moisture content or treating the soil with quicklime. Alternatively, unstable subgrade may be removed and replaced with aggregate base. Construction of a bridging layer consisting of geotextile or geogrid may be needed to support the aggregate base so that the specified compaction can be achieved. Appropriate mitigation measures will be influenced by the conditions encountered. The geotechnical consultant should be consulted for recommendations to stabilize the site as-needed.

In general, fill should not consist of pea gravel and should be free of rocks or lumps in excess of 3-inches in median dimension, hazardous materials, trash, debris, and vegetation or other deleterious material. In addition, import fill should be close graded with 35 percent or more by dry weight passing the No. 4 sieve and either: an expansion index of 50 or less, a plasticity index of 12 or less, or less than 10 percent by dry weight passing the No. 200 sieve.

Fill should be placed and compacted by hand tampers or mechanical means in lifts to 90 percent of the reference density as evaluated by American Society for Testing and Materials (ASTM) standard D1557. Fill should be moisture conditioned as needed to achieve a moisture content approximately 2 percentage points above the optimum before compaction. The allowable lift thickness is influenced by the type of compaction equipment utilized but generally should not exceed 8 inches in loose thickness. Finish subgrade under the building or pedestrian flatwork should be compacted to 90 percent of ASTM D1557. The aggregate base section below flatwork or mat foundations should be compacted to 95 percent of ASTM D1557.

The earthwork should be conducted in accordance with the relevant grading ordinances having jurisdiction and the following recommendations. The geotechnical engineer should observe earthwork operations. Evaluations performed by the geotechnical engineer during the course of field operations may result in new recommendations, which could supersede the recommendations in this section.

10.2 Seismic Design Criteria

Design of the proposed improvements should be performed in accordance with the requirements of governing jurisdictions and applicable building codes. Table 1 presents the Risk-Targeted, Maximum Considered Earthquake (MCER) spectral response accelerations consistent with the 2019 California Building Code and corresponding site-adjusted and design level spectral response accelerations based on the USGS seismic design maps (SEAOC/OSHPD, 2021).

Table 1 – 2019 California Building Code Seismic Design Criteria

Seismic Design Parameter Evaluated for 38.2339° North Latitude, 122.1224°West Longitude	Value
Site Class	D - Default
Site Coefficient, Fa	1.2
Site Coefficient, Fv	null
Mapped Spectral Acceleration at 0.2-second period, S_S	1.509
Mapped Spectral Acceleration at 1.0-second period, S_1	0.6
Spectral Acceleration at 0.2-second Period Adjusted for Site Class, S_{MS}	1.811
Spectral Acceleration at 1.0-second Period Adjusted for Site Class, S_{M1}	null
Design Spectral Response Acceleration at 0.2-second Period, S_{DS}	1.207
Design Spectral Response Acceleration at 1.0-second Period, S_{D1}	null
Seismic Design Category for Risk Category I, II, or III	III

10.3 Foundation Recommendations

The new building may be supported on spread footings with slab on-grade floors. Foundations should be designed in accordance with structural considerations and the following recommendation. In addition, requirements of the appropriate governing jurisdictions and applicable building codes should be considered in design of the structures.

10.3.1 Spread Footings

Footings bearing on alluvium or new engineered fill with subgrade prepared in accordance with the recommendations in Section 10.2 may be designed using the criteria listed in Table 2. The geotechnical engineer should observe the footing excavations to evaluate bearing materials and subgrade condition before the exposed subgrade is covered.

Table 2 – Recommended Bearing Design Parameters for Footings

Footing	Sustained Loads	Footing Widths[1]	Bearing Depth[2]	Allowable Bearing Capacity[3]	Static Settlement[4]
Wall Footing	6 kips/foot or less	1½ feet or more	2 feet or more	1,500 psf	1 inch total ½ inch differential over 40 feet
Column Footing	20 kips or less	2 feet or more	2 feet or more	2,200 psf	1 inch total ½ inch differential over 40 feet

Notes:
1 Assumes square footing shape.
2 Below the adjacent finish grade and the existing grade.
3 Net allowable bearing capacity in pounds per square foot. Listed value includes a Factor of Safety of 3 or more. Allowable bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic loads.
4 Based on sustained long-term loading conditions. Assumes that if footing width is increased from that shown in table, sustained load remains fixed.

Structures supported on footings consistent with these recommendations should be designed for the total and differential settlements listed in Table 2 for sustained loads plus an additional ¾ inches of total seismic settlement with a differential seismic settlement of about ½ inch over a lateral span of 40 feet.

The spread footings should be reinforced with deformed steel bars as detailed by the project structural engineer. Where footings are located adjacent to utility trenches or other excavations, the footing bearing surfaces should bear below an imaginary plane extending upward from the bottom edge of the adjacent trench/excavation at 2H:1V angle above the bottom edge of the footing. Footings should be deepened or excavation depths reduced as needed.

The weight of the material above a plane rising up and away from the bottom edges of the footings at 20 degrees off plumb may be considered, along with the weight of the footing and the material over the footing, when evaluating footing resistance to uplift. A unit weight of 115 pounds per cubic foot (pcf) for soil or aggregate and 150 pcf for normal weight concrete may be assumed for this evaluation.

10.3.2 Slabs–on-Grade

Building floor slabs should be designed by the project structural engineer based on the anticipated loading conditions. The slab should be reinforced with deformed steel bars. We recommend that masonry briquettes or plastic chairs be used to aid in the correct placement of slab reinforcement in the upper half of the slab. Refer to Section 10.6 for the recommended in areas where moisture-sensitive floor coverings or conditioned environments are anticipated. Joints consistent with ACI guidelines (ACI, 2021) maybe constructed at periodic intervals to reduce the potential for random cracking of the slab.

10.4 Moisture Vapor Retarder

A moisture vapor retarding system, consisting of a Class A plastic membrane conforming to ASTM E1745 on a 4-inch thick capillary break layer of ¾-inch crushed rock, should be provided under slabs overlain by moisture sensitive floor coverings or underlying conditioned spaces. Where a moisture vapor retarding system is not needed, mat slabs should be constructed over 4 inches of aggregate base that conforms to the criteria for Class 2 aggregate base in Section 26-1.02 of the California Standard Specifications (Caltrans 2018) and is compacted to 95 percent of the reference density as evaluated by ASTM D1557. A layer of coarse sand, up to 2 inches thick, may be placed over the aggregate base or moisture vapor retarder to provide a level surface for precast mat foundations.

10.5 Exterior Flatwork

Concrete walkways and other exterior flatwork not subject to vehicular loading should be 4 inches thick (or more) over 6 inches of aggregate base. The concrete thickness should be increased to 6 inches at driveways. Appropriate jointing of concrete flatwork can encourage cracks to form at joints, reducing the potential for crack development between joints. Joints should be laid out in a square pattern at consistent intervals. Contraction and construction should be detailed and constructed in accordance with the guidelines of ACI Committee 302 (ACI, 2015). The lateral spacing between contraction joints should be 8 feet or less for a 4-inch thick slab.

Distributed reinforcing steel may be utilized to reduce the potential for differential slab movement, should cracking occur between joints. The distributed reinforcing steel should be terminated about 6 inches from contraction joints and should consist of No. 3 deformed bars at 18 inches on center, both ways. Slabs reinforced with distributed steel should be 5 inches thick (or more). To reduce the potential for differential slab movement across joints, the distributed steel may be extended through the joints. This improvement will be balanced by a reduction in the functionality of the contraction joint to encourage crack formation at joints. Masonry briquettes or plastic chairs should be used to maintain the position of the reinforcement in the upper half of the slab with 1½ inches of cover over the steel.

10.6 Concrete

Laboratory testing indicated that the concentration of sulfate and corresponding potential for sulfate attack on concrete is negligible for the soil tested. However, due to the variability in the on-site soil and the potential future use of reclaimed water at the site, we recommend that Type II/V or Type V cement be used for concrete structures in contact with soil. In addition, we recommend a water-to-cement ratio of no more than 0.45. A 3-inch thick, or thicker, concrete cover should be maintained over reinforcing steel where concrete is in contact with soil in accordance with recommendations of ACI Committee 318 (ACI, 2015).

In order to reduce the potential for shrinkage cracks in the concrete during curing, we recommend that the concrete for slabs and flatwork should not contain large quantities of water or accelerating admixtures containing calcium chloride. Higher compressive strengths may be achieved by using larger aggregates in lieu of increasing the cement content and corresponding water demand. Additional workability, if desired, may be obtained by including water-reducing or air-entraining admixtures. Concrete should be placed in accordance with the appropriate guidance in the ACI Manual of Concrete Practice (MCP) and project specifications. Particular attention should be given to curing techniques and curing duration. Slabs that do not receive adequate curing have a more pronounced tendency to develop random shrinkage cracks and other defects.

10.7 Surface Drainage and Site Maintenance

Surface drainage on the site should generally be provided so that water is diverted away from structures and is not permitted to pond. Positive drainage should be established adjacent to structures to divert surface water to an appropriate collector (graded swale, v-ditch, or area drain) with a suitable outlet. Drainage gradients should be 2 percent or more a distance of 5 feet or more from the structure for impervious surfaces and 5 percent or more a distance of 10 feet or more from the structure for pervious surfaces. Slopes may be reduced where required by ADA (Americans with Disabilities Act) standards. Slope, pad, and roof drainage (from adjacent structures) should be collected and diverted to suitable discharge areas away from structures or other slopes by non-erodible devices (e.g., gutters, downspouts, concrete swales, etc.). Graded swales, v-ditches, or curb and gutter should be provided at the site perimeter to restrict flow of surface water onto and off of the site. Slopes should be vegetated or otherwise armored to reduce potential for erosion of soil. Drainage structures should be periodically cleaned out and repaired, as-needed, to maintain appropriate site drainage patterns.

Landscaping adjacent to foundations should include vegetation with low-water demands and irrigation should limited to that which is needed to sustain the plants. Trees should be restricted from the areas adjacent to foundations a distance equivalent to the canopy radius of the mature tree. Bioretention areas should not be located within a distance of 20 feet from structure foundations.

Care should be taken by the contractor during grading to preserve any berms, drainage terraces, interceptor swales or other drainage devices on or adjacent to the project area. Drainage patterns established at the time of grading should be maintained for the life of the project. The property owner and maintenance personnel should be made aware that altering drainage patterns might be detrimental to wall performance.

10.8 Review of Construction Plans

The recommendations provided in this report are based on preliminary design information for the proposed construction. We recommend that a copy of the plans be provided to Ninyo & Moore for review before bidding to check the interpretation of our recommendations and that the designed improvements are consistent with our assumptions. It should be noted that, upon review of these documents, some recommendations presented in this report might be revised or modified to meet the project requirements.

10.9 Construction Observation and Testing

The recommendations provided in this report are based on subsurface conditions encountered in relatively widely spaced exploratory borings. During construction, the geotechnical engineer or his representative in the field should be allowed to check the exposed subsurface conditions. During construction, the geotechnical engineer or his representative should be allowed to:

- Observe preparation and compaction of subgrade.
- Observe mitigation of unsuitable materials by excavation.
- Check and test imported materials prior to use as fill.
- Observe placement and compaction of fill.
- Perform field density tests to evaluate fill and subgrade compaction.

- Observe foundation excavations for bearing materials and cleaning prior to placement of reinforcing steel and concrete.

The recommendations provided in this report assume that Ninyo & Moore will be retained as the geotechnical consultant during the construction phase of the project. If another geotechnical consultant is selected, we request that the selected consultant provide a letter to the architect and the owner (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the recommendations contained in this report.

11 LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

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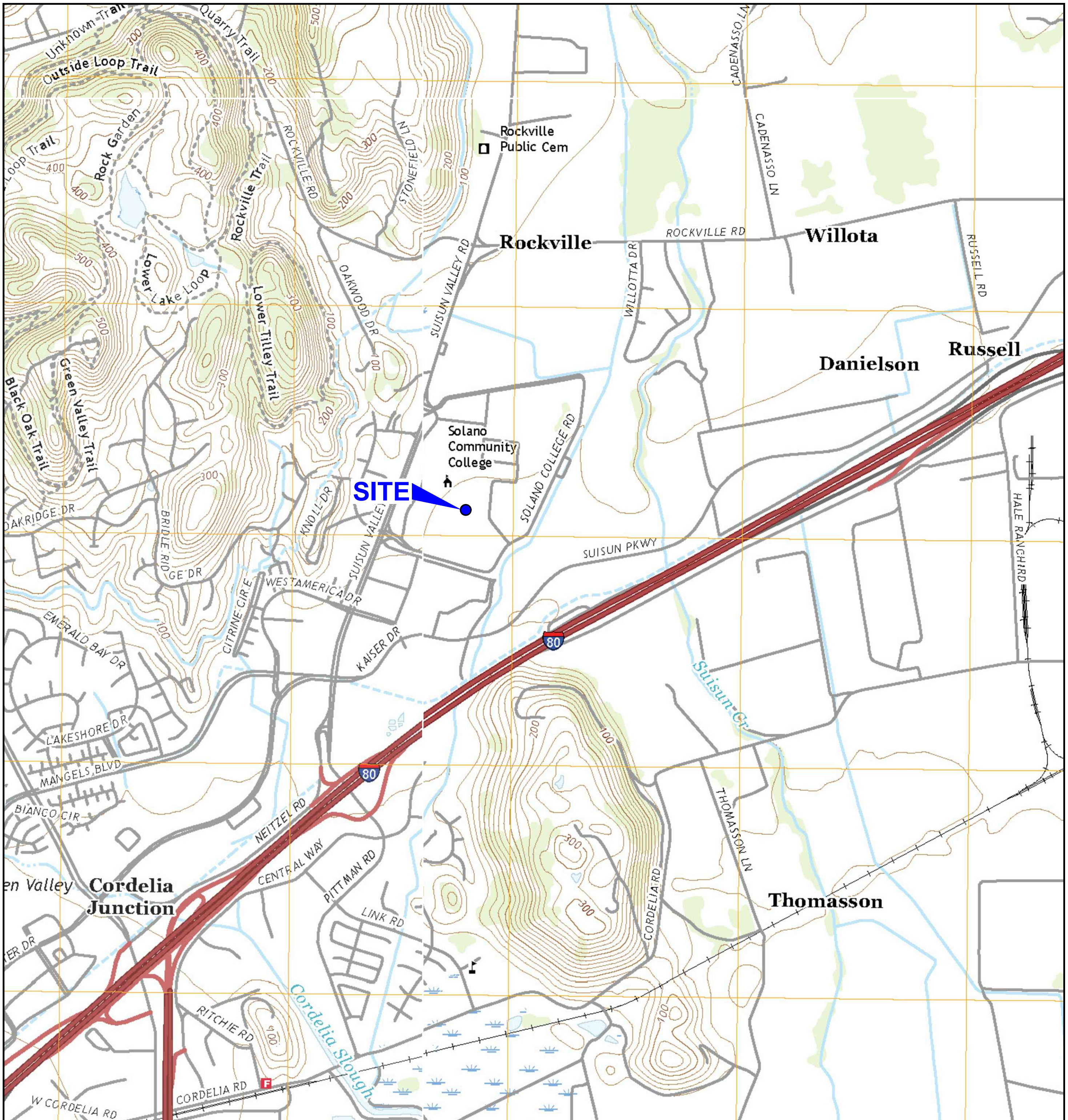
FIGURES



NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE I REFERENCE: USGS, 2018

N

SCALE (FEET)
0 2,000 4,000

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FIGURE 1

SITE LOCATION

SOLANO COMMUNITY COLLEGE - NEW MODULAR BUILDING
4000 SUISUN VALLEY ROAD
FAIRFIELD, CALIFORNIA

404147001 I 02/22

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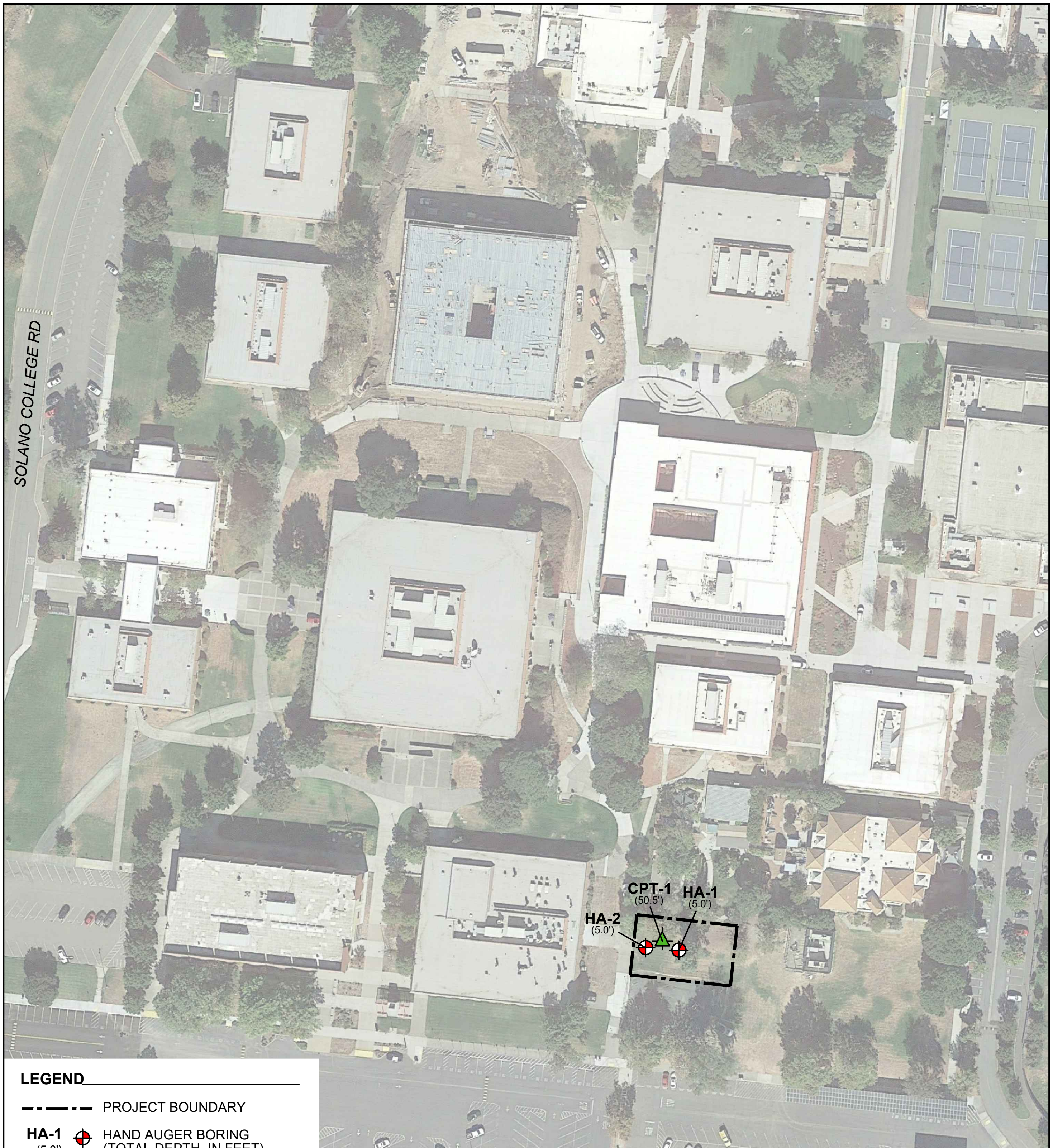

LEGEND

- PROJECT BOUNDARY
- **HA-1** (5.0') HAND AUGER BORING (TOTAL DEPTH, IN FEET)
- **CPT-1** (50.5') CONE PENETRATION TEST (TOTAL DEPTH, IN FEET)

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE | REFERENCE: GOOGLE EARTH, 2022

N

SCALE (FEET)

0 150 300

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FIGURE 2

EXPLORATION LOCATIONS

SOLANO COMMUNITY COLLEGE - NEW MODULAR BUILDING
4000 SUISUN VALLEY ROAD
FAIRFIELD, CALIFORNIA

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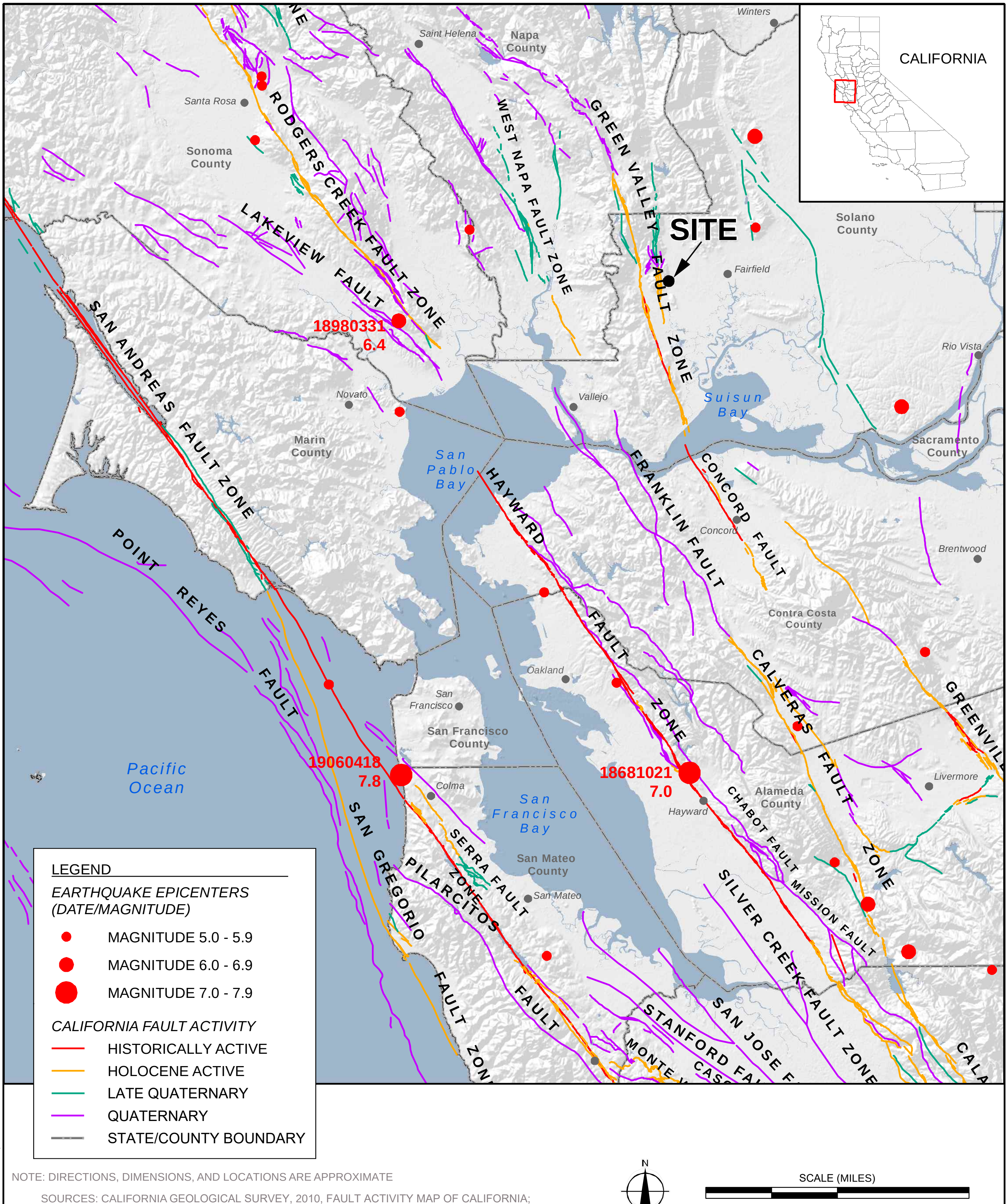

NOTE: DIRECTIONS, DIMENSIONS, AND LOCATIONS ARE APPROXIMATE

SOURCES: CALIFORNIA GEOLOGICAL SURVEY, 2010, FAULT ACTIVITY MAP OF CALIFORNIA; CALIFORNIA GEOLOGICAL SURVEY, 2000, MAP SHEET MS 49

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FIGURE 3

FAULT LOCATIONS AND EARTHQUAKE EPICENTERS

SOLANO COMMUNITY COLLEGE - NEW MODULAR BUILDING
4000 SUISUN VALLEY ROAD, FAIRFIELD, CALIFORNIA

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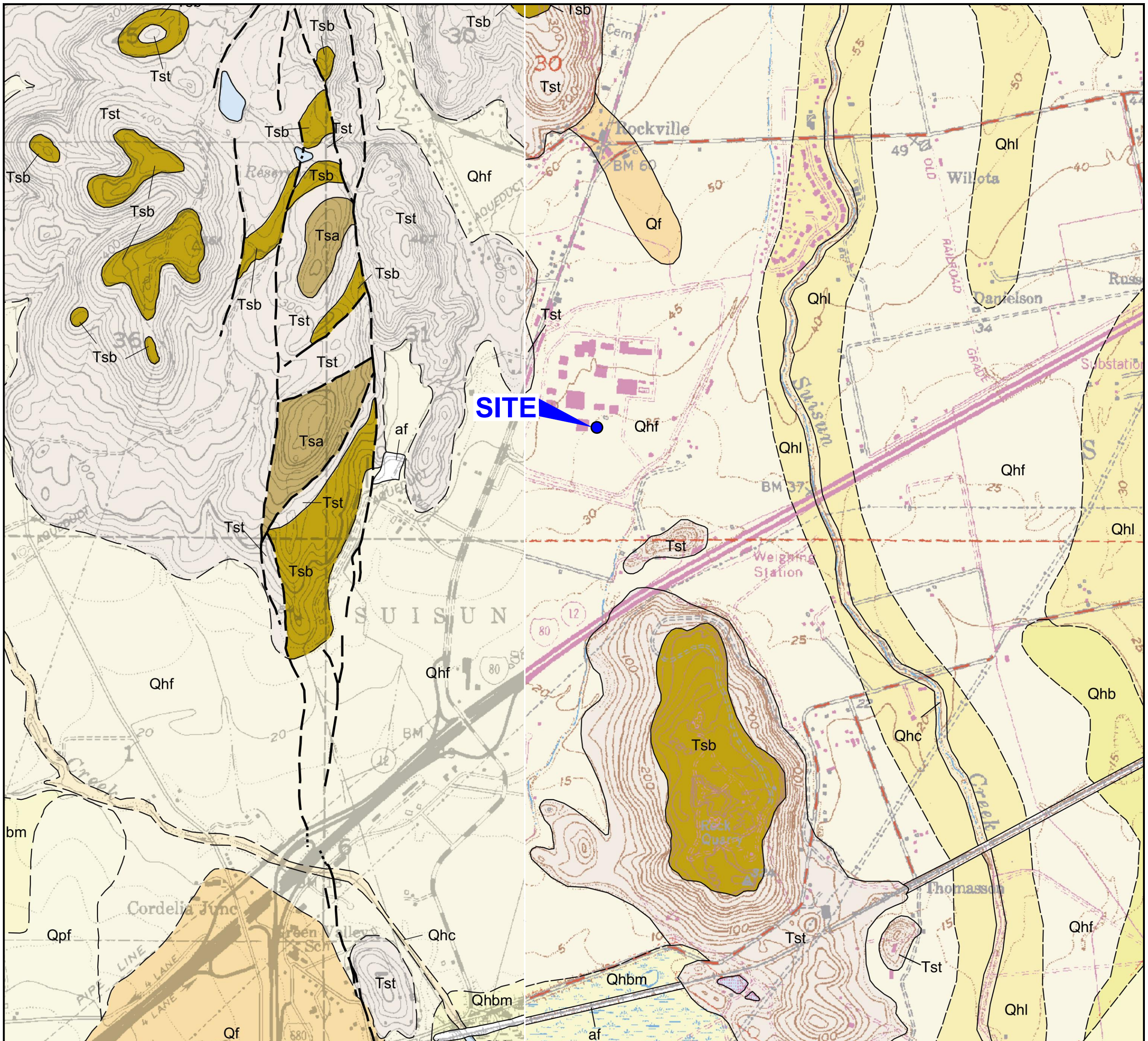
404147001 | 02/22



LEGEND

af	ARTIFICIAL FILL (HOLOCENE)	Qhf	ALLUVIAL FAN DEPOSITS (HOLOCENE)	Tst	ASH-FLOW TUFF (PLIOCENE)
Qhbm	BAY MUD (HOLOCENE)	Qhl	FAN LEVEE DEPOSITS (HOLOCENE)	Tsa	ANDESITE (PLIOCENE)
Qhb	BASIN DEPOSITS (HOLOCENE)	Qf	ALLUVIAL FAN DEPOSITS (HOLOCENE/PLEISTOCENE)	Tsb	BASALT (PLIOCENE)
Qhc	MODERN STREAM CHANNEL DEPOSITS (HOLOCENE)	Qpf	ALLUVIAL FAN DEPOSITS (PLEISTOCENE)		

GEOLOGIC CONTACT

STRIKE AND DIP OF BEDDING

THRUST FAULT

FAULT

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE
REFERENCE: BEZORE, ET AL, CGS, 1998

N

SCALE (FEET)
0 2,000 4,000

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FIGURE 4

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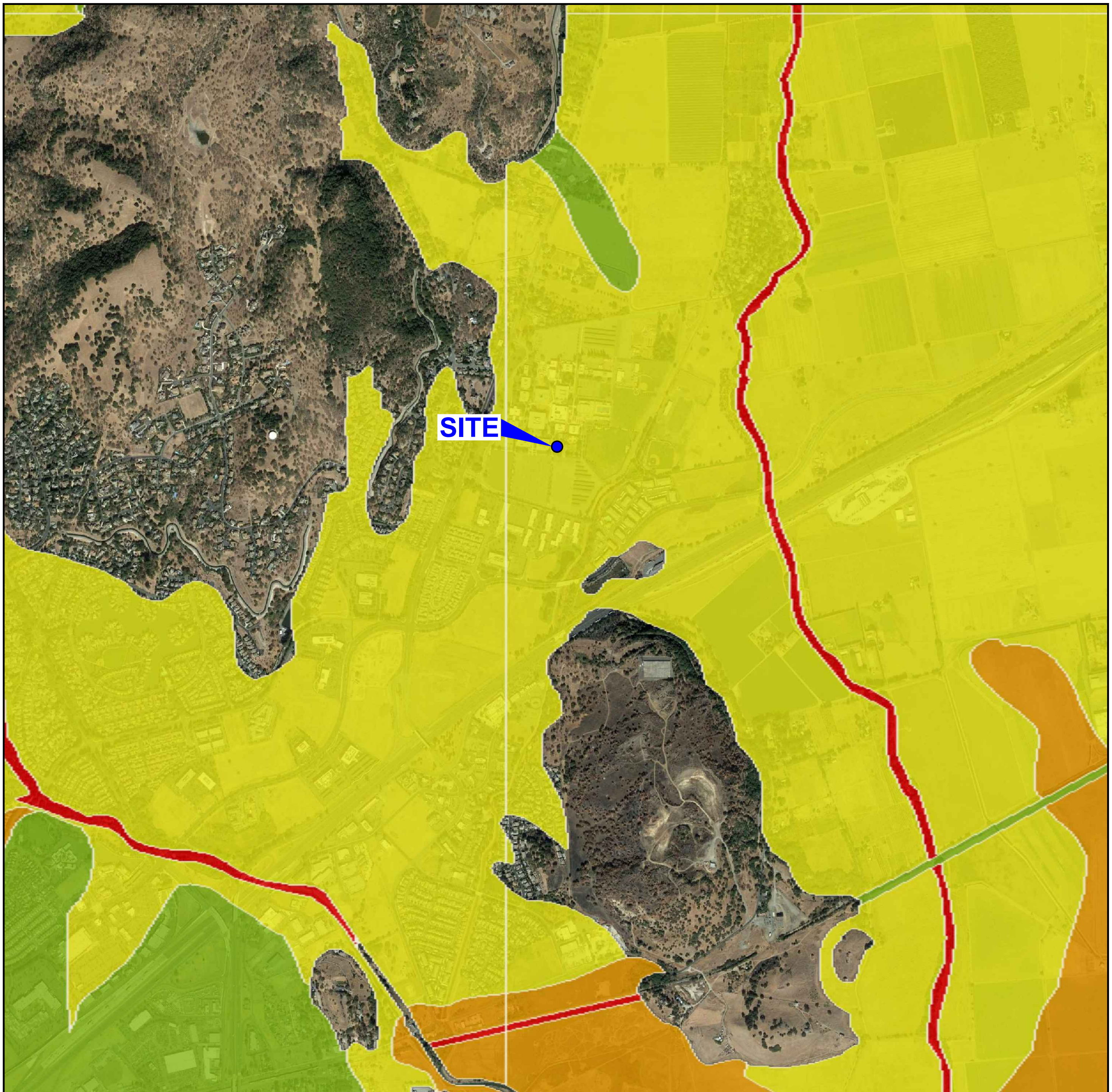
REGIONAL GEOLOGY

SOLANO COMMUNITY COLLEGE - NEW MODULAR BUILDING
4000 SUISUN VALLEY ROAD
FAIRFIELD, CALIFORNIA

404147001 I 02/22



LEGEND

LIQUEFACTION SUSCEPTIBILITY :

VERY HIGH
HIGH
MODERATE
LOW
VERY LOW

NOTE: DIMENSIONS, DIRECTIONS, AND LOCATIONS ARE APPROXIMATE
REFERENCE: WITTER ET AL, 2006; GOOGLE EARTH, 2022

N

SCALE (FEET)
0 2,000 4,000

404147001.dwg 02/02/2022 AEK

FIGURE 5

LIQUEFACTION SUSCEPTIBILITY

SOLANO COMMUNITY COLLEGE - NEW MODULAR BUILDING
4000 SUISUN VALLEY ROAD
FAIRFIELD, CALIFORNIA

404147001 I 02/22

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APPENDIX A

Boring Logs

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples
Disturbed soil samples were obtained in the field using the following method.

Bulk Samples
Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0								Bulk sample.
								Modified split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler.
								Sample retained by others.
								Standard Penetration Test (SPT).
5								No recovery with a SPT.
			XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
								Continuous Push Sample.
								Seepage.
10								Groundwater encountered during drilling.
								Groundwater measured after drilling.
							SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
							CL	Dashed line denotes material change. Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
15								
20								The total depth line is a solid line that is drawn at the bottom of the boring.

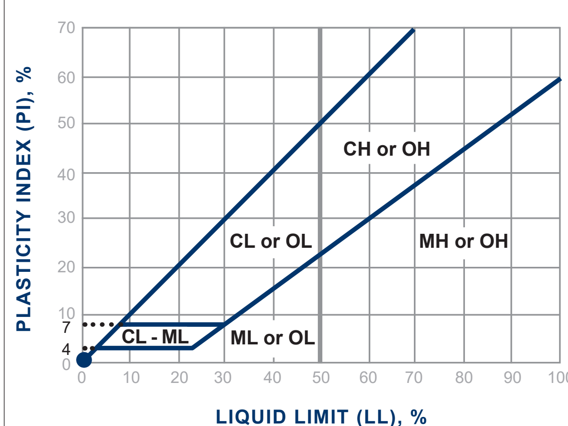
Soil Classification Chart Per ASTM D 2488

Primary Divisions			Secondary Divisions: Group Symbol	Secondary Divisions: Group Name
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	**GRAVEL** more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	**SILT and CLAY** liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

Grain Size

Description		Sieve Size	Grain Size	Approximate Size
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

Plasticity Chart



Apparent Density - Coarse-Grained Soil

Apparent Density	Spooling Cable or Cathead: SPT (blows/foot)	Spooling Cable or Cathead: Modified Split Barrel (blows/foot)	Automatic Trip Hammer: SPT (blows/foot)	Automatic Trip Hammer: Modified Split Barrel (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

Consistency - Fine-Grained Soil

Consistency	Spooling Cable or Cathead: SPT (blows/foot)	Spooling Cable or Cathead: Modified Split Barrel (blows/foot)	Automatic Trip Hammer: SPT (blows/foot)	Automatic Trip Hammer: Modified Split Barrel (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

DATE DRILLED	12/17/21	BORING NO.	HA-1
GROUND ELEVATION	45 feet ± (MSL)	SHEET 1 OF 1	
METHOD OF DRILLING	Hand Auger		
DRIVE WEIGHT		DROP	
SAMPLED BY	CDS	LOGGED BY CDS	REVIEWED BY RH

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▨	CL	Dark brown, moist, firm to stiff, lean CLAY with some fine-grained sand. Organics (grass roots and mulch).
	■			23.2		▨		Decreasing organic content.
	■					▨		Shallow groundwater / seepage.
5								Total depth = 5 feet. Backfilled with soil. Shallow groundwater was encountered at 4.5 feet during our investigation. However that water may not be apart of the watertable. Seepage obsevered was likely due to recent heavy rains and low infiltration rates of surficial soils and may not be reflective of regional groundwater level as discussed in the report. Please refer to the report for groundwater monitoring recommendations. The ground elevation shown above is an estimation only (Google, 2022). It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
10								
15								
20								

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION

DATE DRILLED 12/17/21 BORING NO. HA-2

GROUND ELEVATION 45 feet ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING Hand Auger

DRIVE WEIGHT ______ DROP ______

SAMPLED BY CDS LOGGED BY CDS REVIEWED BY RH

DESCRIPTION/INTERPRETATION

Depth (feet)	Classification U.S.C.S.	Description/Interpretation
0	CL	Dark Brown, moist, firm to stiff, CLAY with trace, fine-gained sand. Organics (grass roots and mulch). Decreasing organic content. Decrasing density to soft. Increasing water content and seepage.
5		Total depth = 5 feet. Backfilled with soil. Shallow groundwater was encountered at 4.0 feet during our investigation. However that water may not be apart of the watertable. Seepage obsevered was likely due to recent heavy rains and low infiltration rates of surficial soils and may not be reflective of regional groundwater level as discussed in the report. Please refer to the report for groundwater monitoring recommendations. The ground elevation shown above is an estimation only (Google, 2022). It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
10		
15		
20		

APPENDIX B

Cone Penetration Testing

APPENDIX B

CONE PENETRATION TESTING

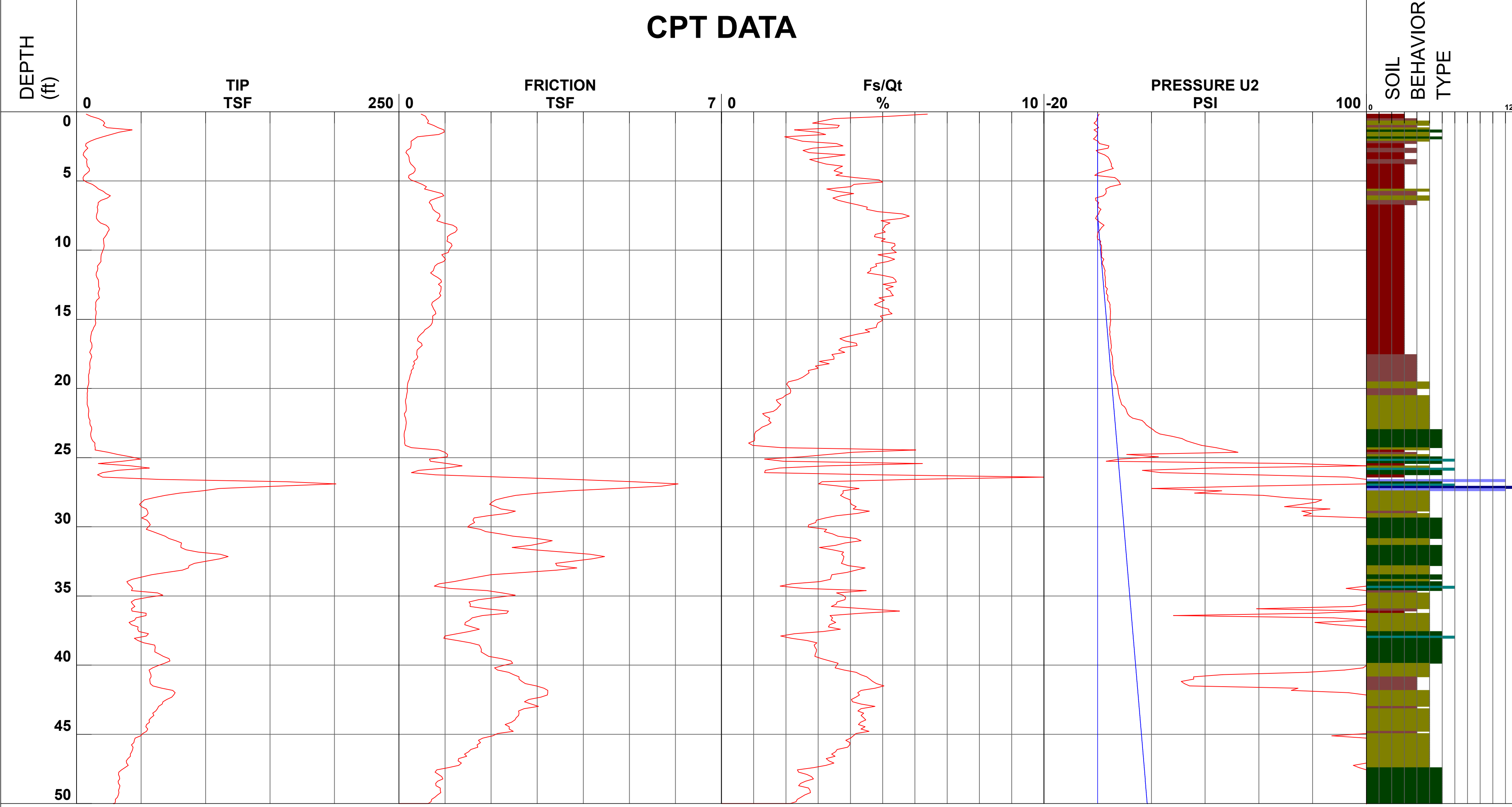
Field Procedure for Cone Penetration Testing

A penetrometer with a conical tip having an apex angle of 60 degrees and a cone base area of 10 square centimeters was hydraulically pushed through the soil using the reaction mass of a 20-ton rig at a constant rate of about 20 millimeter per second in accordance with ASTM D 5778. The penetrometer was instrumented to measure, by electronic methods, the force on the conical point required to penetrate the soil, the force on a friction sleeve behind the cone tip as the penetrometer was advanced, and the pore pressure (Pw) on a transducer behind the cone tip. Penetration data was collected and recorded electronically at intervals of about 2-inches. Cone resistance (Q_c) was calculated by dividing the measured force of penetration by the cone base area. Friction sleeve resistance (F_s) was calculated by dividing the measured force on the friction sleeve by the surface area of the sleeve. The friction ratio (Fs/Qc) was calculated as the ratio of the tip resistance to the sleeve friction. A graph of the computed values of cone resistance (tip) and friction ratio are presented on the logs in the following pages. The tip resistance and friction ratio were used to classify the soil type encountered using the method by Robertson & Campanella (1986). Equivalent SPT blowcounts at a 60 percent energy ratio (N_{60}-values) were calculated from the tip resistance and friction ratio using the method by Jeffries and Davies (1993). A graph of the equivalent N_{60} values (SPT N_{eq}) and the encountered soil types are also presented on the logs in the following pages.

Ninyo & Moore

Project	Solano Community College	Operator	AJ-OO	Filename	SDF(346).cpt
Job Number	404147001	Cone Number	DDG1587	GPS	
Hole Number	CPT-01	Date and Time	1/12/2022 1:04:40 PM	Maximum Depth	50.52 ft
EST GW Depth During Test			7.50 ft		

Net Area Ratio .8



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

APPENDIX C

Laboratory Testing

APPENDIX C

LABORATORY TESTING

Classification
Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

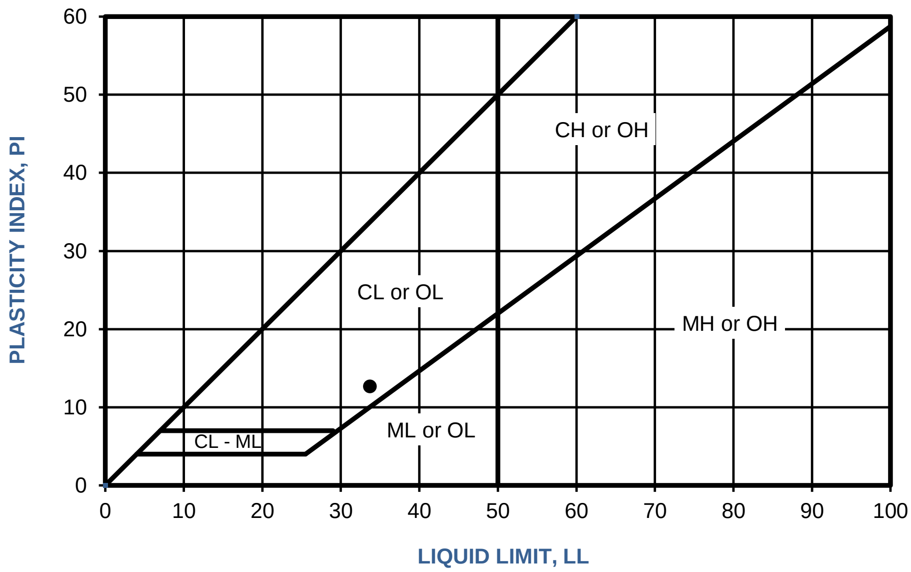
Moisture Content
The moisture content of samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory borings in Appendix A.

Atterberg Limits
Tests were performed on a selected representative fine-grained soil sample to evaluate the liquid limit, plastic limit, and plasticity index in accordance with ASTM D 4318. These test results were utilized to evaluate the soil classification in accordance with the USCS. The test results and classifications are shown on Figure C-1.

Expansion Index Test
The expansion index of a selected material was evaluated in accordance with ASTM D 4829. The specimen was molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1 inch thick by 4 inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The test results are presented on Figure C-2.

SYMBOL	LOCATION	DEPTH (ft)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	USCS
●	HA-2	0.0-5.0	34	21	13	CL	

NP - INDICATES NON-PLASTIC



PERFORMED IN ACCORDANCE WITH ASTM D 4318

FIGURE C-1

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

ATTERBERG LIMITS TEST RESULTS
SOLANO COMMUNITY COLLEGE - NEW MODULAR BUILDING
4000 SUISUN VALLEY ROAD, FAIRFIELD, CALIFORNIA
404147001 | 02/2022

SAMPLE LOCATION	SAMPLE DEPTH (ft)	INITIAL MOISTURE (percent)	COMPACTED DRY DENSITY (pcf)	FINAL MOISTURE (percent)	VOLUMETRIC SWELL (in)	EXPANSION INDEX	POTENTIAL EXPANSION
HA-1	0.0-5.0	13.6	98.0	26.1	0.0380	38	Low

PERFORMED IN ACCORDANCE WITH ASTM D 4829

FIGURE C-2

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

EXPANSION INDEX TEST RESULTS
SOLANO COMMUNITY COLLEGE - NEW MODULAR BUILDING
4000 SUISUN VALLEY ROAD, FAIRFIELD, CALIFORNIA
404147001 | 02/2022

APPENDIX D

Corrosivity Testing
(CERCO Analytical)

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

7 January, 2022

Job No. 2112050
Cust. No.13270

Mr. Ransom Hennefer
Ninyo & Moore
2149 O'Toole Avenue, Suite 30
San Jose, CA 95131

Subject: Project No.: 404147001
Project Name: Solano Community College – New Modular
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Hennefer:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on December 29 21, 2021. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, the sample is classified as "corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration is none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentration is 15 mg/kg and is determined to be insufficient to damage reinforced concrete structures and cement mortar-coated steel at this location.

The pH of the soil is 6.93 which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 340-mV which is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

Sherri Moore
for J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: Ninyo & Moore
Client's Project No.: 404147001
Client's Project Name: Solano Community College - New Modular
Date Sampled: 17-Dec-21
Date Received: 29-Dec-21
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 7-Jan-2022

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
2112050-001	HA-2/0.0-5.0'	340	6.93	-	1,700	-	N.D.	15

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	6-Jan-2022	6-Jan-2022	-	7-Jan-2022	-	6-Jan-2022	6-Jan-2022

Shaun Moore for
Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis
N.D. - None Detected
(1) Detection limit is elevated to 75 mg/kg due to dilution

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

Chain of Custody 2112050

Page 1 of 1

Concord, CA 94520-1006
925 462 2771
Fax: 925 462 2775

CERCO analytical

Job No.	CU#	Client Project I.D.	Schedule	Analyte	Date Sampled	Date Due
404147001	13270				12/17/21	

Full Name Ransom Hennefer

Phone 4084359000 **X** 15304

Fax

Company and/or Mailing Address Ninyo & Moore 2149 O'Toole Avenue Suite 30 San Jose CA

Cell ☒

Sample Source Solano Community College-New Modular

Lab No.	Sample I.D.	Date	Time	Matrix	Contain.	Size	Preserv.	Qty.	Redox Potential	pH	Sulfate	Chloride	Resistivity-100% Saturated			Brief Evaluation						
	HA-2/0.0-5.0'	12/17/21		S					X	X	X	X	X			X						

ANALYSIS — ASTM

MATRIX
DW - Drinking Water
GW - Ground Water
SW - Surface Water
WW - Waste Water
Water
SL - Sludge
S - Soil
Product

ABBREVIATIONS
HB - Hosebib
PV - Petcock Valve
PT - Pressure Tank
PH - Pump House
RR - Restroom
GL - Glass
PL - Plastic
ST - Sterile

SAMPLE RECEIPT
Total No. of Containers
Rec'd Good Cond/Cold
Conforms to Record
Temp. a t Lab -°C
Sampler

Relinquished By: [signature]	Date 12/28/21	Time 10:00am
Received By: Sherrie Moore	Date 12/29/21	Time 1130
Relinquished By:	Date	Time
Received By:	Date	Time
Relinquished By:	Date	Time
Received By:	Date	Time

Comments:

THERE IS AN ADDITIONAL CHARGE FOR EXTRUDING SOIL FROM METAL TUBES

Email Address: rhennefer@ninyoandmoore.com

APPENDIX E

CPT Calculations

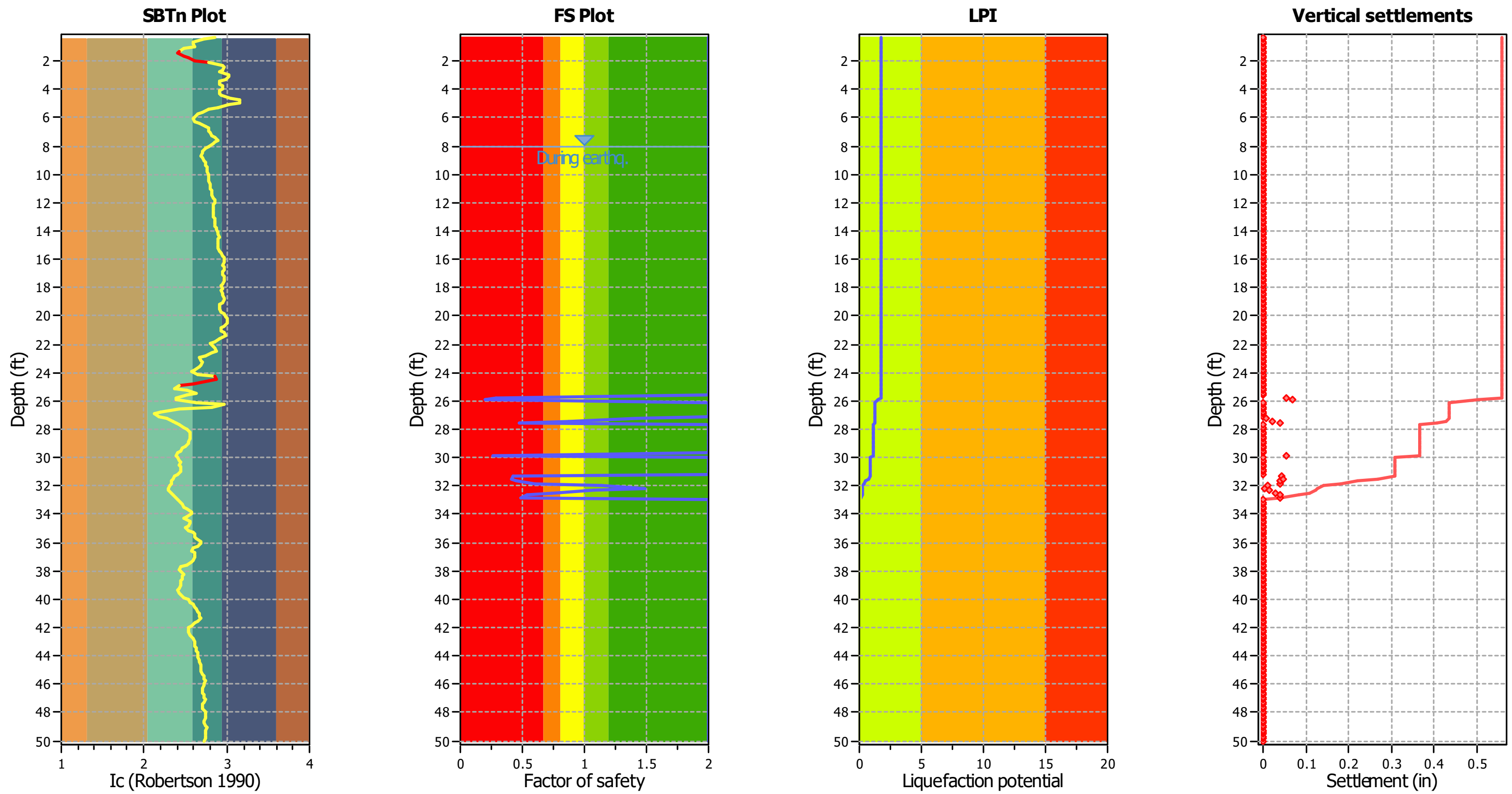
Ninyo & Moore
2149 O'Toole Avenue, Suite 30
San Jose, CA 95131
https://ninyoandmoore.com

Project: **404147001 - Solano Community College**

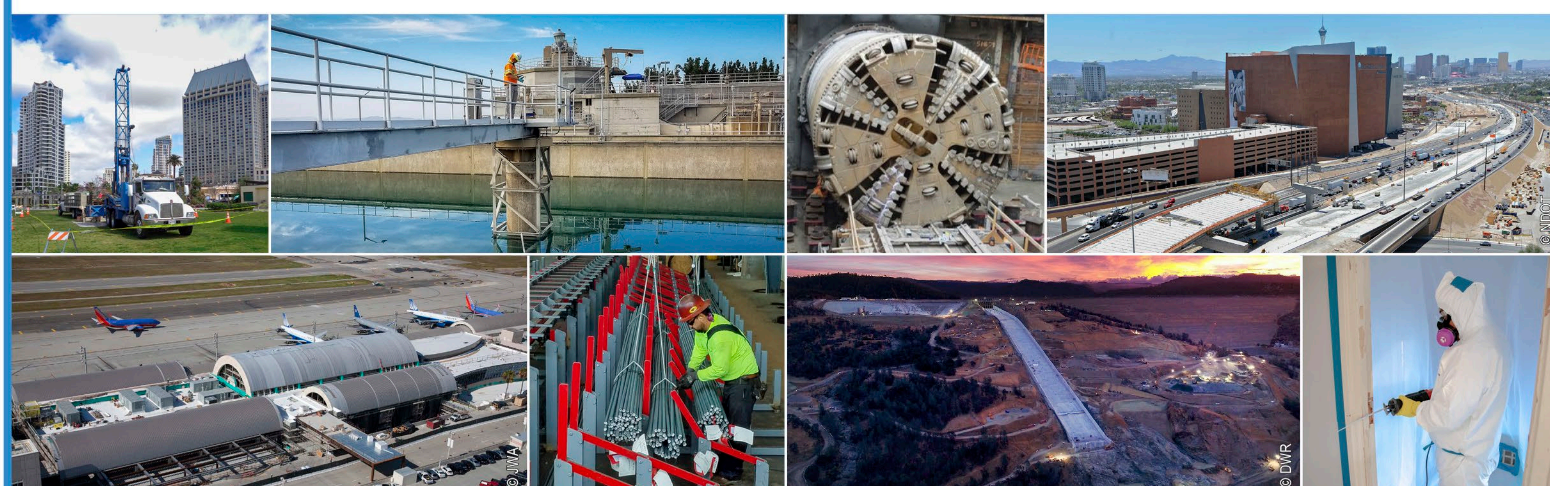
Location: **4000 Suisun Valley Road, Fairfield, California**

CPT: CPT-01

Total depth: 50.04 ft



Analysis method:	B&I (2014)	G.W.T. (in-situ):	9.60 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	8.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.71	Ic cut-off value:	2.40	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.72	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



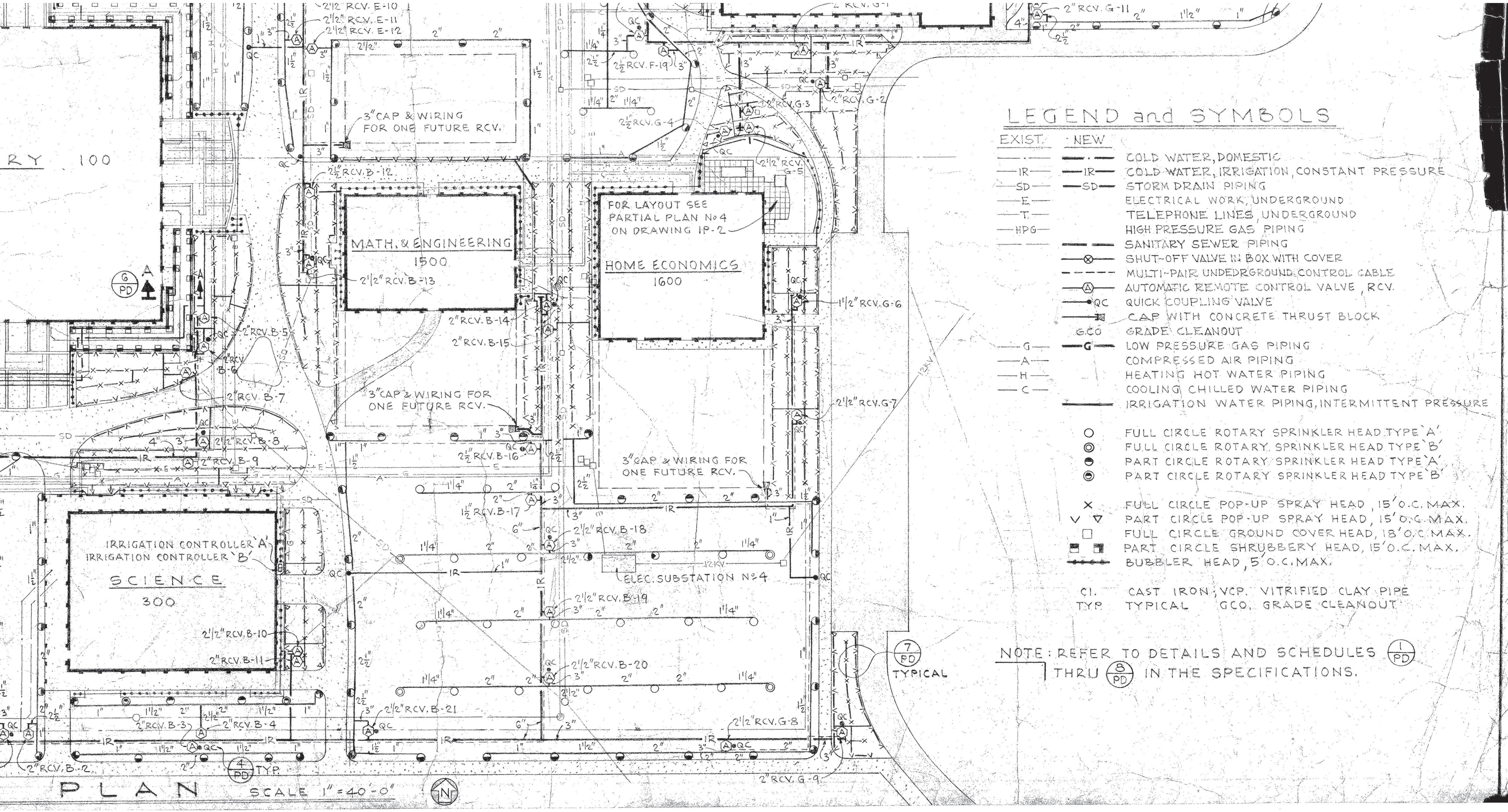
2149 O'Toole Ave, Suite 30 | San Jose, California 95131 | p. 408.435.9000

ARIZONA | CALIFORNIA | COLORADO | NEVADA | TEXAS | UTAH

ninyoandmoore.com

Ninyo & Moore

Geotechnical & Environmental Sciences Consultants



MATH. & ENGINEERING
1500
HOME ECONOMICS
1600
SCIENCE
300
RY 100
FOR LAYOUT SEE PARTIAL PLAN No 4 ON DRAWING IP-2
3" CAP & WIRING FOR ONE FUTURE RCV.
IRRIGATION CONTROLLER 'A'
IRRIGATION CONTROLLER 'B'
ELEC. SUBSTATION No 4
LEGEND and SYMBOLS
EXIST. NEW
COLD WATER, DOMESTIC
COLD WATER, IRRIGATION, CONSTANT PRESSURE
STORM DRAIN PIPING
ELECTRICAL WORK, UNDERGROUND
TELEPHONE LINES, UNDERGROUND
HIGH PRESSURE GAS PIPING
SANITARY SEWER PIPING
SHUT-OFF VALVE IN BOX WITH COVER
MULTI-PAIR UNDERGROUND CONTROL CABLE
AUTOMATIC REMOTE CONTROL VALVE, RCV.
QUICK COUPLING VALVE
CAP WITH CONCRETE THRUST BLOCK
GRADE CLEANOUT
LOW PRESSURE GAS PIPING
COMPRESSED AIR PIPING
HEATING HOT WATER PIPING
COOLING CHILLED WATER PIPING
IRRIGATION WATER PIPING, INTERMITTENT PRESSURE
FULL CIRCLE ROTARY SPRINKLER HEAD TYPE 'A'
FULL CIRCLE ROTARY SPRINKLER HEAD TYPE 'B'
PART CIRCLE ROTARY SPRINKLER HEAD TYPE 'A'
PART CIRCLE ROTARY SPRINKLER HEAD TYPE 'B'
FULL CIRCLE POP-UP SPRAY HEAD, 15' O.C. MAX.
PART CIRCLE POP-UP SPRAY HEAD, 15' O.C. MAX.
FULL CIRCLE GROUND COVER HEAD, 18' O.C. MAX.
PART CIRCLE SHRUBBERY HEAD, 15' O.C. MAX.
BUBBLER HEAD, 5' O.C. MAX.
C.I. CAST IRON; VCP. VITRIFIED CLAY PIPE
TYP. TYPICAL GCO. GRADE CLEANOUT
NOTE: REFER TO DETAILS AND SCHEDULES 1/PD THRU 8/PD IN THE SPECIFICATIONS.
7/PD TYPICAL
PLAN SCALE 1" = 40'-0"