# ON-SITE PERCOLATION DESIGN CALCULATIONS

**FOR**

**AUSTIN ROAD MINI STORAGE**
**MANTECA, CALIFORNIA**

**SEPTEMBER 2021**

**PREPARED BY:**


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9/24/21

**RODRICK H. HAWKINS R.C.E. 50188**

**Project Description:**

The proposed development is at 183 South Austin Road. This parcel is currently undeveloped. The proposed development will consist of a Mini Storage facility on 2.77 acre site.

The site will connect to the City of Manteca's storm drain basin which is located on the Manteca RV site. As part of the consideration of installing the pipe-line to the Basin and draining to the basin through property owned by Manteca RV, we were requested, by Manteca RV, to determine the capacity of the existing basin and confirm that it will be able to handle our site as well as the remaining 8.85 acres of the Manteca RV property after it is fully developed. Our analysis concluded that the basin would only handle 92-percent of the required capacity of 24.75 ac-ft. at full development of both parcels. Therefore, in order to make up the 8-percent short-fall, we have converted 571 lineal feet of the currently proposed18-inch storm drain pipe to french drain.

Percolation tests were not done for this specific site, but we have worked on site just east of this site and given the uniform nature of the sandy soils in this area we believe the percolation rates from our records are sufficient for these calculations. These percolation test yield an infiltration rate of 3 cf/sf/day. Based on two 48 hour storms, or 4 days duration, the allowable infiltration rate over the 4 days is 12 cf/sf. The required percolation volume, based on the 2 10-year, 48-hour storms is 65,863 cf. Given the configuration of the proposed french drain (see detail attached), that will require 495 lineal feet of the 18-inch french drain. Given the 571 lineal feet being installed, there is a safety factor of 15-percent. Normally this would be considered too small a factor of safety, however, due to the fact that the system is still designed with a connection to storm drain basin, so if french drain system doesn't function at 100-percent capacity, it will simply build up within the underground system and discharge to the basin. This overflow also allows for drainage from the other properties connecting to our system to pass through.

Once this system is installed, the contribution from our site to the existing basin is effectively zero which allows the remaining tributary area, including the 8.85-acre future Manteca RV site to be 100-percent contained within the basin, while complying with the City of Manteca retention basin sizing criteria.

# AUSTIN ROAD MINI STORAGE
# STORM DRAINAGE PERCOLATION VOLUME CALCULATOR
# OVERALL SITE

**PERCOLATION VOLUME (2 - 10-YEAR, 48-HOUR STORMS** $\frac{\text{2CAR}}{12}$

RUNOFF COEFFICIENT (PER CITY OF MANTECA STANDARDS)

| | AREA S.F. | AREA COEFFICIENT | Σ =CA |
|---|---|---|---|
| LANDSCAPE AREA: | 3,828 | 0.15 | 574 |
| BUILDING AREA: | 48,290 | 0.95 | 45,876 |
| PAVING: | 67,953 | 0.95 | 64,555 |
| | | | |
| **TOTAL** | 120,071 | | 111,005 |

WHERE: **C**= RUN-OFF COEFFICIENT $\frac{111,005}{120,071}$ **0.92**

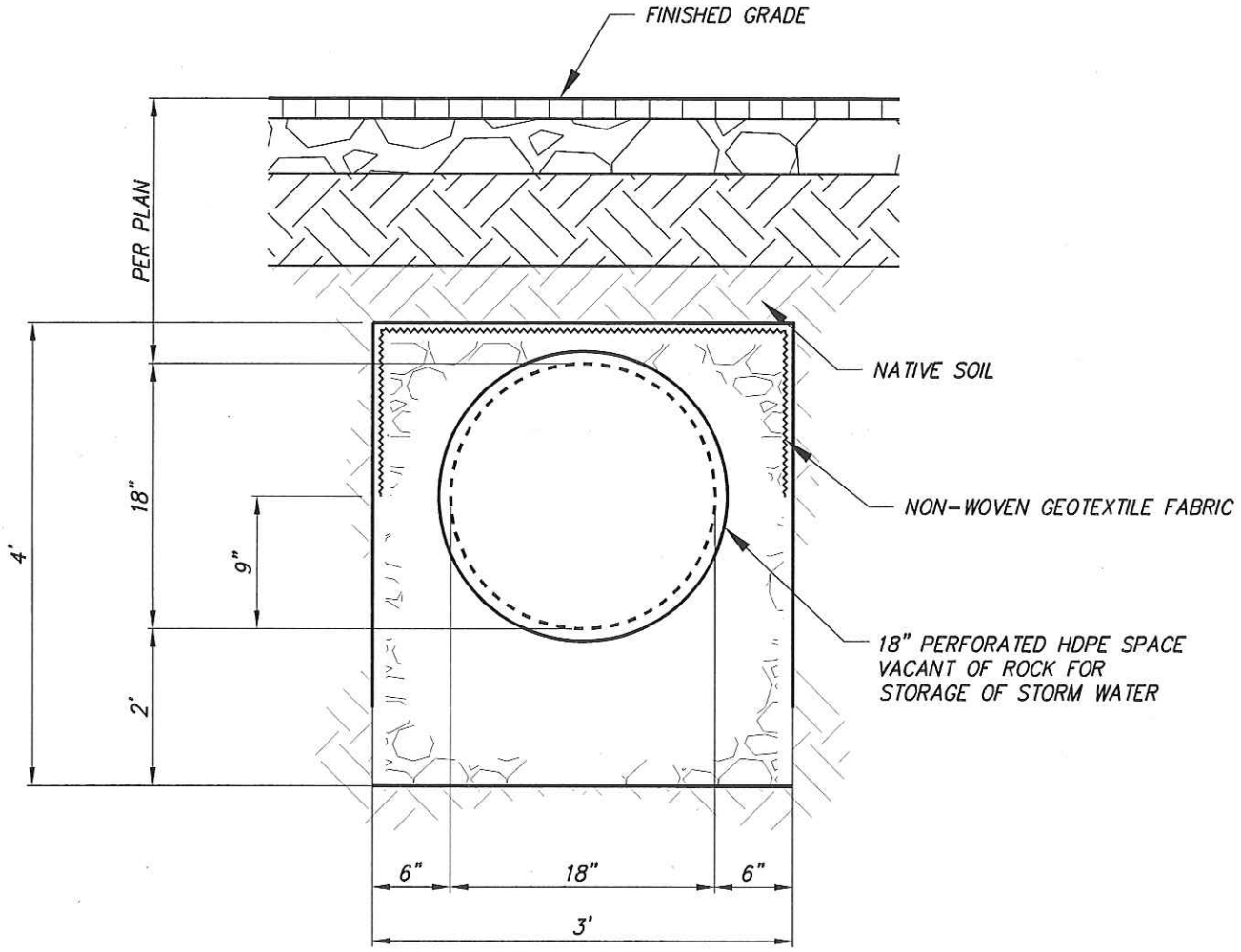
**A**= CONTRIBUTING AREA **120,071 S.F.**

R= RAINFALL IN INCHES (10-YEAR, 48-HOUR STORM)

| | | |
|---|---|---|
| RAINFALL INTENSITY PER HOUR | | 3.56 |
| SAFETY FACTOR FOR RENTION BASIN | | 2.00 |
| **R=** | (3.56) (2.00) | **7.12 IN.** |

$$V = \frac{CAR}{12} = \frac{(0.92)\ (120,071.00)\ (7.12)}{12}$$

**REQUIRED PERCOLATION VOLUME = 65,863 FT.$^3$**

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# 18" FRENCH DRAIN DETAIL

## AUSTIN ROAD MINI STORAGE

| | |
|---|---|
| BY: | JMI |
| CHK: | RHH |
| DATE: | 2021/09/21 |
| SCALE: | NTS |
| JOB #: | 3553.00 |
| FILE: | DETAIL |

# FRENCH DRAIN FOOTAGE CALCULATOR

ONSITE STORM WATER PERCOLATION VOLUME

1. TRENCH BELOW PIPE: 2.00 FT.
2. TRENCH WIDTH BEYOND PIPE: 0.75 FT.
3. TRENCH ABOVE PIPE: 0.50 FT.
4. VOID RATIO OF DRAIN ROCK: 0.40 %
5. AVERAGE PERC RATE (over 96 HR 12.11 $FT.^3/FT^2$/4-DAYS (96 HRS)
6. STORM DRAIN VOLUME TO BE PERCOLATED

(BASED ON 2 -10 YEAR 48-hour Storms 65,863 $FT.^3$

| NUMBER OF PIPE | DIAMETER OF PIPE (INCHES) | PIPE VOLUME ($FT^3$) | ROCK VOLUME ($FT^3$) | TOTAL VOLUME ($FT^3$)/FT | TRENCH SURFACE (L.F.) | PERC RATE PER L.F. OF TRENCH (96 HOURS) | LENGTH OF TRENCH BASED ON PERC |
|---|---|---|---|---|---|---|---|
| 1 | 18 | 1.77 | 4.09 | 5.86 | 11.00 | 133.21 | 494.43 |

# MINUTES/INCH TO C.F./S.F./DAY CONVERSION

| | | |
|---|---|---|
| 1. PERCOLATION RATE: | P= | 7.61 MIN./IN. |
| 2. PIPE DIAMETER: | d= | 0.50 FT. |
| 3. DEPTH : | h= | 0.50 FT. |
| 4. FACTOR OF SAFETY : | Fs= | 1.00 FT. |

**SURFACE AREA:**

| | | |
|---|---|---|
| **Side Wall Area** | $[(d)\pi]*h =$ | 0.7854 $FT^2$ |
| **Bottom Area** | $[(d)^2\pi/4]$ | 0.1963 $FT^2$ |
| | **Total Area T(a)** | 0.9817 $FT^2$ |

**VOLUME** (PER INCH OF HEIGHT): v(i)= $[(d)^2\pi/4]*0.08 =$ 0.0157 $FT.^3$

**INFILTRATION RATE PER MIN:** I= v(i) / T(a) / P 0.002 $FT.^3$ / $FT.^2$ / MIN.

**INFILTRATION RATE PER DAY:** I*(1440 MIN/DAY)

**3.0 $FT.^3$ / $FT.^2$ / DAY**

**INFILTRATION RATE OVER 4 DAYS:** **12.11 $FT.^3$ / $FT.^2$ / 4 DAYS**

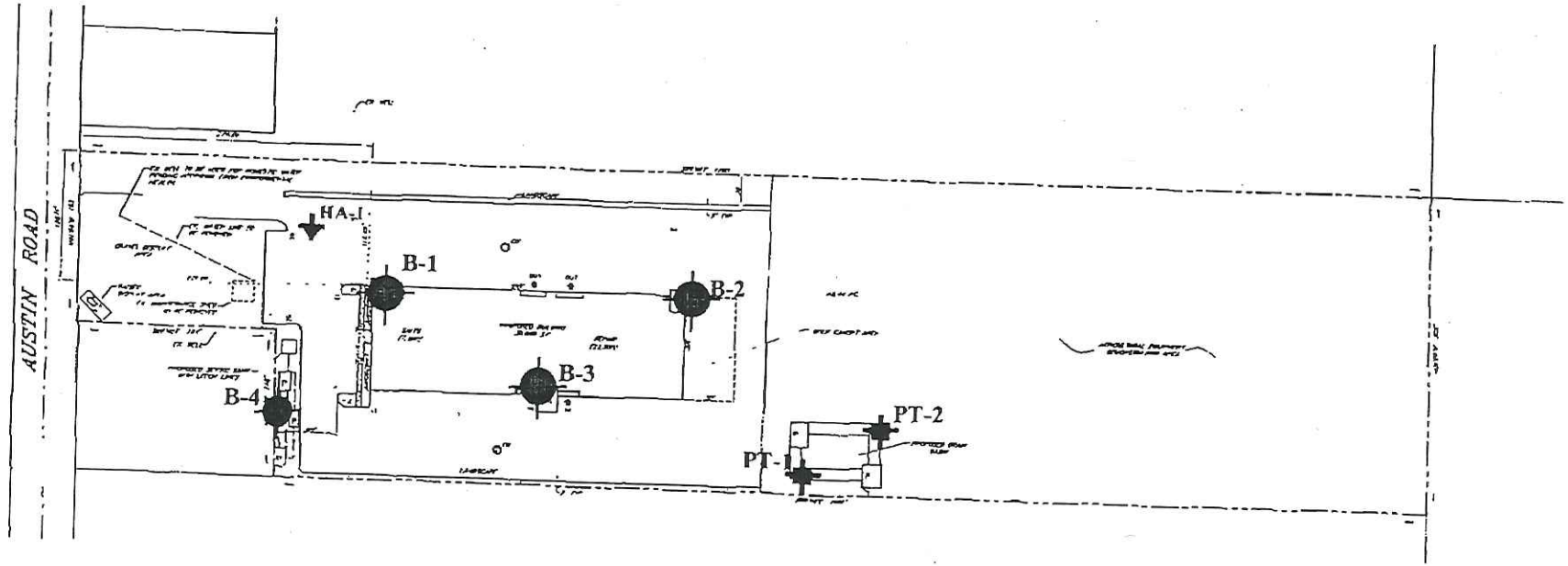
improvements. Positive drainage should be directed away from improvements at a minimum gradient of two percent for a distance of at least five feet. On-site control of storm water by infiltration devices should be underlain by a permanent impervious barrier, and collected water discharged off site. Storm water control devices that discharge water on site should generally be avoided due to adverse impacts to foundations, pavements and slopes. Additionally, storm water detention basins should not be positioned at the top of slopes, over deep fills and/or subdrains. Proposed storm water collection systems should be reviewed by the project geotechnical consultant.

6.9 Percolation Testing for Drainage Basin

CTE performed testing for percolation rates in the area of the proposed drainage basin. Results from percolation tests PT-1 and PT-2 were 4.13 and 11.08 minutes per inch (min./in), respectively. This averages to be 7.61 min./in. for the proposed drainage basin. Percolation test data is attached in Appendix B.

6.10 Slopes

Proposed slopes are anticipated to be minor, but should be constructed at 2:1 (horizontal: vertical) or flatter. Proposed fill slopes shall generally be constructed with internal drains as indicated in the attached Appendix D. Although graded slopes on this site shall be grossly stable (i.e., factor of safety greater than 1.5), the soils will be somewhat erodible. Therefore, runoff water should not be permitted to drain over the edges of slopes unless that water is confined to properly designed and constructed drainage facilities. Erosion resistant vegetation should be maintained on the face of all slopes. As previously stated, all slopes should be properly keyed and benched.

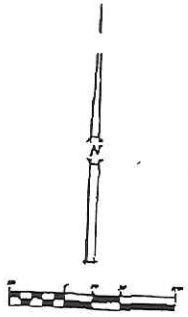



## LEGEND

B-1 APPROXIMATE BORING LOCATION

PT-1 APPROXIMATE PERCOLATION TEST LOCATION

HA-1 APPROXIMATE LOCATION OF HAND EXCAVATED BULK SAMPLE



PHE EAST OF AUSTIN MINI

**18400 South Austin Road, Manteca, CA**

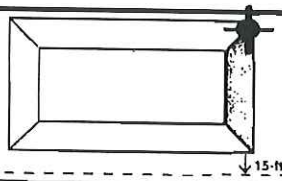


# PERCOLATION TEST DATA

Test Date: 10/20/2008 Job # 20-2003

PERC. TEST # PT-2

TEST LOCATION:




TEST DETAILS:

| Test Hole Diam / Depth | Casing Diam. | Casing Depth | Slotted Test Interval |
|---|---|---|---|
| 6.0" / 5.0-ft | 4.0" | 5.0' | No Slots/Tested thru Open Bottom |

Pre-saturation: 11:45am- 12:15pm (30+/- min)

Additional Notes:

## MEASUREMENTS

| TIME (T) (min) | * WATER LEVEL (D) (Inches above base of hole) | | Δ TIME (min) | Δ DEPTH (inches) | Δ Time / Δ Depth = PERCOLATION RATE (Min/Inch) |
|---|---|---|---|---|---|
| Start Test 0:00 | Refill 12.00 | Water Level | Start Test | N.A. | |
| 0:00 8.420 | | 11.00 | 8.42 | 1.00 | 8.42 |
| 0:00 9.080 | 12.00 | 11.00 | 9.08 | 1.00 | 9.08 |
| 0:00 10.420 | 12.00 | 11.00 | 10.42 | 1.00 | 10.42 |
| 0:00 10.580 | 12.00 | 11.00 | 10.58 | 1.00 | 10.58 |
| 0:00 11.080 | 12.00 | 11.00 | 11.08 | 1.00 | 11.08 |
| 0:00 11.080 | 12.00 | 11.00 | 11.08 | 1.00 | 11.08 |

AVERAGE STEADY PERCOLATION RATE = 11.08 Min/Inch

## TEST HOLE SOIL LOG

| Depth (ft) | Soil Description | USC Classification |
|---|---|---|
| 0.0-3.5. | Loose, Dry, Brown, Silty Fine SAND | SM |
| 3.5-5.0 | Dense, Dry, Brown Silty Fine Sand | SM |

DUE EAST OF AUSTIN RD

# 18400 South Austin Road, Manteca, CA



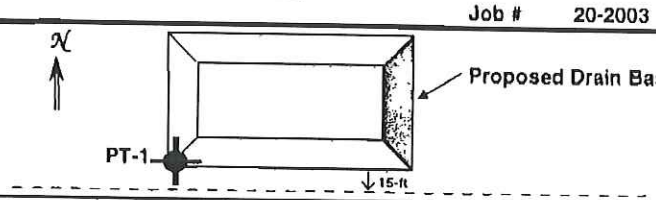
## PERCOLATION TEST DATA

Test Date: 10/20/2008

Job # 20-2003

PERC. TEST # PT-1

TEST LOCATION:




TEST DETAILS:

| Test Hole Diam / Depth | Casing Diam. | Casing Depth | Slotted Test Interval |
|---|---|---|---|
| 6.0" / 5.0-ft | 4.0" | 5.0' | No Slots/Tested thru Open Bottom |

Pre-saturation: 10:30am- 11:30am (60+/- min)

Additional Notes:

### MEASUREMENTS

| TIME (T) (min) | * WATER LEVEL (D) (Inches above base of hole) | | Δ TIME (min) | Δ DEPTH (inches) | Δ Time / Δ Depth = PERCOLATION RATE (Min/Inch) |
|---|---|---|---|---|---|
| Start Test 0:00 | Refill 12.00 | Water Level | Start Test | N.A. | |
| 0:00 12.500 | | 8.00 | 12.50 | 4.00 | 3.13 |
| 0:00 14.083 | 12.00 | 8.00 | 14.08 | 4.00 | 3.52 |
| 0:00 4.170 | 12.00 | 11.00 | 4.17 | 1.00 | 4.17 |
| 0:00 4.030 | 12.00 | 11.00 | 4.03 | 1.00 | 4.03 |
| 0:00 4.000 | 12.00 | 11.00 | 4.00 | 1.00 | 4.00 |
| 0:00 4.370 | 12.00 | 11.00 | 4.37 | 1.00 | 4.37 |

AVERAGE STEADY PERCOLATION RATE = 4.13 Min/Inch

### TEST HOLE SOIL LOG

| Depth (ft) | Soil Description | USC Classification |
|---|---|---|
| 0.0-5.0 | Loose, Dry, Brown, Silty Fine SAND | SM |

Surrounding area land use consists generally of agricultural, light commercial, and residential properties. The site is at an approximate elevation ranging from 55 ft. above mean sea level (msl) in the northeast corner of the property to 45 ft. msl in the southwest corner.

### 3.2 Proposed Improvements

We understand that the proposed project will consist of construction of a new 30,000 square-foot equipment sales and repair facility. Ancillary construction includes drive areas/parking lots, utilities, landscaping, and a drainage basin. Figure 2 shows the approximate location of the proposed improvements.

## 4.0 FIELD AND LABORATORY INVESTIGATION

### 4.1 Field Investigations

Field investigations at this site were performed on October 20, 2008. The investigation included site reconnaissance and the excavation of four geotechnical exploratory borings to a maximum depth of 20 fbg. Two percolation tests were also conducted in the proposed drainage basin location.

Soils were logged and visually classified in the field by a geologist in accordance with the Unified Soil Classification System. The field descriptions have been modified, where appropriate, to reflect laboratory test results. Boring excavation logs including descriptions of the soil, *in situ* field-testing data, and supplementary laboratory data are included in Appendix B. The results of the percolation tests performed are also presented in Appendix B. Figure 2 is a map showing the approximate locations of the explorations conducted by this firm.

4.2 Laboratory Investigation

Specific laboratory tests conducted for this investigation included in-place moisture and density, "R"-Value, 200 wash, and Atterberg limits. Test method descriptions and laboratory results are presented in Appendix C.

## 5.0 GEOLOGY

5.1 General Physiographic Setting

The project site is located within the San Joaquin Valley which is considered a part of the Great Valley Geomorphic Province. The Great Valley Geomorphic Province is an approximately 400-mile-long northwest-southeast trending deep structural basin that extends along the center of California from the Tehachapi Mountains on the south to the Klamath Mountains on the north. The Sierra Nevada Mountain Range lies to the east and the Coast Ranges to the west. The structural trough between the mountain ranges was filled with alluvial, lacustrine, and marine deposits of the Cretaceous, Tertiary, and Quaternary geologic ages. Deposits up to 30,000 feet are present near the western edge of the valley and incline down relatively uniformly from each side of the valley toward the control axis. The site is located within the City of Manteca approximately 12 miles north/northwest of the Stanislaus River (San Joaquin -Stanislaus County line) in the San Joaquin Valley, The San Joaquin Valley is relatively flat and locally incised by numerous creeks, streams and rivers with a surface elevation that generally rises westward to the Sierra Nevada Mountain Range.

5.2 Geologic Conditions

Published mapping indicates the site to be underlain by Pleistoeene Modesto Formation sediments consisting of arkosic alluvium (Geologic Map of San Francisco-San Jose Regional Geologic Map, 1990). Recent alluvium in the vicinity is interpreted to consist of young locally derived over-bank river deposits typically placed during floods along the river systems within the valley. Recent sediments typically consist of sand, silt, and minor quantities of clay.

5.2.1 Alluvium

Alluvium materials were encountered to the maximum explored depth of 20 fbg. These materials were generally encountered as a loose to dense, dry, silty sand to very stiff sandy silt. Shallow alluvial materials are recommended to be overexcavated and compacted, as detailed herein.

5.3 Groundwater Conditions

Groundwater was not encountered during our explorations at the site. Although groundwater levels may fluctuate, groundwater is not expected to adversely affect the proposed improvements if proper drainage is maintained. However, seasonal fluctuations in groundwater depth and flow direction could occur at thc subject site and local saturated areas could affect construction activity, particularly if performed during the rainy season(s). Proper sitc surface drainage should be as per the project civil engineer of record.

5.4 Geologic Hazards

From our investigation it appears that geologic hazards at the site are primarily limited to those caused by shaking from earthquake generated ground motion waves. The site is not within a State of

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | 18400 AUSTIN ROAD, MANTECA | DRILLER: | ALL STAR DRILLING | SHEET: | 1 of 1 |
| CTE JOB NO | 20-2003 | DRILL METHOD: | 4" AUGER | DRILLING DATE: | 10/1/2008 |
| LOGGED BY | TAK | SAMPLE METHOD: | SPT | ELEVATION: | EGS |

# BORING: B-4

| Depth (Feet) | Bulk Sample | Driven Type | Blows/Foot | Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | ■ | 2<br>2<br>3 | | | SM | | Loose, damp, brown, silty fine SAND. | |
| 5 | | | | | | | | | |
| | | ■ | 3<br>3<br>4 | | | SP | | Loose, dry, light brown, fine SAND with silt. | |
| 10 | | | | | | | | | |
| 15 | | | | | | SP-SW | | Medium dense, light brown, silty fine coarse SAND to silty fine sand. | |
| 20 | | | | | | | | Total Depth 20'<br>No Free Groundwater Encountered<br>Installed 9' of 4" Drain Pipe and Capped Hole 10/20/2008 | |
| 25 | | | | | | | | | |

| | | | |
|---|---|---|---|
| PROJECT: | 18400 AUSTIN ROAD, MANTECA | DRILLER: | ALL STAR DRILLING |
| CTE JOB NO: | 20-2003 | DRILL METHOD: | 4" AUGER |
| LOGGED BY: | TAK | SAMPLE METHOD: | SPT |

SHEET: 1 of 1
DRILLING DATE: 10/1/2008
ELEVATION: EGS

# BORING: B-1

| Depth (Feet) | Bulk Sample | Driven Type | Blows/Foot | Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | ■ | 2<br>3<br>4 | 108.0 | 2.6 | SM | | Loose, dry, brown, silty fine SAND. | MD, WA |
| 5 | | ■ | 2<br>4<br>5 | 109.0 | 2.8 | SM | | Loose, dry, brown, silty fine SAND. | MD, WA |
| 10 | | ■ | 3<br>4<br>4 | | 2.6 | SM | | Loose, dry, brown, silty fine SAND. | M |
| | | | | | | SW | | (Loose), dry, brown, fine coarse SAND with silt. | |
| 15 | | ■ | 3<br>4<br>9 | | 6.3 | | | | M |
| | | | | | | ML | | Very stiff, light gray, SILT, low plasticity . | |
| | | | | | | | | Total Depth 16.5'<br>No Groundwater Encountered<br>Boring Backfilled 10/20/2008 | |
| 20 | | | | | | | | | |
| 25 | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| PROJECT: | 18400 AUSTIN ROAD, MANTECA | DRILLER: | ALL STAR DRILLING | SHEET: | 1 of 1 |
| CTE JOB NO | 20-2003 | DRILL METHOD: | 4" AUGER | DRILLING DATE | 10/1/2008 |
| LOGGED BY: | TAK | SAMPLE METHOD: | SPT | ELEVATION | EGS |

# BORING: B-2

| Depth (Feet) | Bulk Sample | Driven Type | Blows/Foot | Dry Density (pcf) | Moisture (%) | U.S.C.S Symbol | Graphic Log | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | 4<br>6<br>7 | | | SM | | Medium dense, dry, light brown, silty fine SAND. | WA |
| 5 | | | 4<br>5<br>8 | | | | | | |
| | | | | | | ML | | Loose, dry, light brown, very fine sandy SILT, non plastic. | AL |
| 10 | | | 2<br>3<br>3 | | | | | | |
| | | | | | | SW | | Dense, dry, light brown, slightly silty fine to coarse SAND. | |
| 15 | | | 6<br>15<br>18 | | | | | | |
| | | | | | | | | Total Depth 16.5'<br>No Free Groundwater Encountered<br>Boring Backfilled 10/20/2008 | |
| 20 | | | | | | | | | |
| 25 | | | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT: | 18400 AUSTIN ROAD, MANTECA | DRILLER: | ALL STAR DRILLING | SHEET: | 1 | of | 1 |
| CTE JOB NO | 20-2003 | DRILL METHOD: | 4" AUGER | DRILLING DATE | | | 10/1/2008 |
| LOGGED BY: | TAK | SAMPLE METHOD: | SPT | ELEVATION: | | | EGS |

# BORING: B-3

| Depth (Feet) | Bulk Sample | Driven Type | Blows/Foot | Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | DESCRIPTION | Laboratory Tests |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| | | | 2<br>3<br>5 | | | SM | | Loose, dry, brown, silty fine SAND. | |
| 5 | | | 4<br>4<br>5 | | | | | | WA |
| 10 | | | 3<br>4<br>4 | | | | | | |
| | | | | | | | | | |
| 15 | | | 5<br>6<br>8 | | | SM/ML | | Medium dense, light brown to gray, silty very fine sandy SILT. | |
| | | | | | | | | Total Depth 16.5<br>No Free Groundwater Encountered<br>Boring Backfilled 10/20/2008 | |
| 20 | | | | | | | | | |
| 25 | | | | | | | | | |