



CITY COUNCIL AGENDA REPORT

Meeting Date: September 3, 2020

From: Director of Public Works/City Engineer

Subject: 400 Kings Road Slope Stability Plans

Community Goal/Result: Safe Community

Purpose

To receive the Kings Road Roadway Protection Project plans prepared for the 400 block of Kings Road by Cotton, Shires and Associates.

Recommendation

Approve funding this project from the General Fund in the amount of \$250,000.

Background

The “background” section of the attached 3/5/20 staff report provides a summary of events up to that date.

At its 3/5/20 regularly scheduled meeting, Council directed staff to move forward with the design of an 8’ high soldier pile and wood lagging retaining wall. The exploratory drilling necessary to complete the project’s final design was delayed until 6/24/20 due to restrictions imposed on construction activities by the San Mateo County Health Officer’s Orders related to COVID-19.

Discussion: The completed design has been reviewed by staff, and is attached.

Fiscal Impact

The proposed budget of \$250,000 includes the engineer’s estimate of \$229,550, plus a small contingency.

Measure of Success: Protection of the public and public infrastructure.

Attachments

1. 3/5/20 Staff Report
2. Kings Road Roadway Protection Project plans

R.L. Breault

Randy Breault, Public Works Director

Clay Holstine, City Manager



CITY COUNCIL AGENDA REPORT

Meeting Date: March 5, 2020

From: Director of Public Works/city Engineer

Subject: 400 Kings Road Slope Stability Evaluation

Community Goal/Result

Safe Community

Purpose

To receive the Geologic and Geotechnical Evaluation of Slope Stability prepared for the 400 block of Kings Road by Cotton, Shires and Associates.

Recommendation

Provide direction to staff on next steps to be taken.

Background

Notice of the unravelling of the slope on the uphill side vicinity of 400 Kings block was brought to the city's attention in late September 2019. A preliminary geotechnical evaluation was completed the next week, and per the geotech's recommendation, parking was prohibited at the toe of this slope. In mid-November, k-rail was installed as an additional protective measure to prevent loose rocks from migrating out into the travelway.

Concerned citizens from the neighborhood appeared at several council and committee meetings in the following months, expressing their desire for the restoration of the lost parking spaces. At its 11/21/19 meeting, City council approved \$30k for the initial investigation and preliminary design efforts.

Discussion

The attached report incorporates three pages of geologic engineering review that may be best left for study by experts in that field. The salient notes for general consumption are: the minor likely failures that are anticipated will likely be constrained by the currently installed k-rails, and a major seismic event and/or intense rainfall event could result in earth material overflowing the k-rail and blocking the roadway (but would not impact the downhill residences).

The following table discusses options currently reviewed and estimated for the council's consideration:

Option	Cost	Notes
No changes to current condition (leave k-rail in place)	No additional cost. De minimis amounts spent to date – city owned the k-rail, only new purchases were signs and posts	Protects against likely events. Does not protect roadway against seismic events. Does not protect uphill property. Does not restore pre-existing substandard parking & travelway. Protects downhill residences.
Install rock bolt and drapery (leave k-rail in place)	\$80,000*	Protects against likely and seismic events. Does not restore pre-existing substandard parking & travelway. Protects downhill residences.
Install 8-foot high soldier pile and wood lagging wall (remove k-rail)	\$160,000*	Protects against all anticipated events. Without some excavation of existing slope, would only restore a portion of pre-existing substandard parking & travelway. Protects downhill residences.
Grade to a natural, stable slope. (remove k-rail)	\$210,000* (excludes cost of land purchase)	Protects against all anticipated events. Dependent upon quantity of land purchased from uphill properties, could create a wider travelway and parking area. Protects downhill residences.
Shotcrete and soil nail wall (remove k-rail)	\$250,000*	Protects against all anticipated events. Without significant unaccounted for off haul, would only restore pre-existing substandard parking & travelway. Protects downhill residences.

*Note that these costs are very preliminary, and final numbers could and likely will vary significantly. Also note that these numbers are pure construction only, and exclude items such as contractor’s mobilization and demobilization, traffic control, costs to acquire uphill property for the fourth option, etc.

Fiscal Impact


Staff assumes any new work at this point in time would come from the General Fund.

Measure of Success

Protection of the public and public infrastructure.

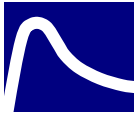
Attachments

1. Cotton, Shires and Associates letter report dated January 10, 2020



Randy Breault, Public Works Director

Clay Holstine, City Manager



January 10, 2020

E5669

By Email (rbreault@ci.brisbane.ca.us) and by Mail

Randy Breault, P.E.
Director of Public Works
City of Brisbane
50 Park Place
Brisbane, CA 94005

SUBJECT: Geologic and Geotechnical Evaluation of Slope Stability
RE: Kings Road Stability
City of Brisbane, California

Dear Mr. Breault:

Cotton, Shires and Associates, Inc. (CSA) is pleased to provide the City of Brisbane with the results of our evaluation of the slope stability conditions along a segment of Kings Road, east of Beatrice Road. The subject segment of Kings road is approximately 120 feet in length. We understand that Kings Road is a publicly maintained roadway that is approximately 16 to 18 feet wide. We also understand that no development is currently proposed upslope of the subject roadway (i.e., 462 Kings Road). We visited the site on several occasions in December 2019, performed a topographic survey, observed surface conditions, and mapped pertinent geologic features. No subsurface exploration, laboratory testing of samples or installation of monitoring devices was conducted as part of this evaluation.

In the following letter-report, we discuss the purpose and scope of our work, the observed site conditions, our preliminary conclusions, and general recommendations regarding potential slope stability hazards impacting the public roadway and adjacent properties, along with the limitations of our services.

PURPOSE AND SCOPE OF WORK

The purpose of our slope stability evaluation was to: 1) identify pertinent geologic features at the site; 2) formulate conclusions regarding the potential slope stability hazards that could impact the public roadway and residents; and 3) provide recommendations for future action to address identified hazards.

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Los Gatos, CA 95030-7218
(408) 354-5542 • Fax (408) 354-1852

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699 Hampshire Road, Suite 101
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(805) 370-8710

www.cottonshires.com

The specific scope of work performed for our investigation included the following tasks:

- 1) Review of technical documents and regional maps;
- 2) Conduct a ground-based topographic survey;
- 3) Geotechnical reconnaissance and geologic field mapping;
- 4) Geologic and geotechnical stability evaluations; and
- 5) Preparation of this letter-report.

OBSERVED SITE CONDITIONS

Regional geologic mapping of the site vicinity has identified sandstone and shale bedrock associated with the Franciscan Complex (Bonilla, M.G., 1998). This bedrock has been tectonically deformed, faulted and folded. An anticline fold is regionally aligned sub-parallel to the topographic ridge of San Bruno Mountain which trends approximately northwest-southeast. Reviewed regional maps do not identify landslide deposits in the site vicinity. Locally, the identified bedrock is mapped as dipping down to the northeast at approximately 35 to 50 degrees from horizontal. The subject site vicinity has not been included in state seismic hazard zone mapping efforts for earthquake induced landslides.

Based on the results of our topographic survey, the slope above Kings Road is up to 30 feet in height and is generally inclined at grades of 0.6H:1V to 1H:1V. We assume these precipitous slopes are cut slopes that were excavated during the original construction of Kings Road. Based on a review of historical aerial photographs construction of Kings Road occurred between 1930 and 1941. We observed sandstone and shale bedrock associated with the Franciscan Complex exposed in these cut slopes. The sandstone beds exposed are generally 1 to 2.5 feet thick and typically are bounded by laminated shale beds up to 1 inch thick. The in-place sandstone is moderately weathered and fractured and includes plagioclase feldspar. Roots were observed in open fractures and joints. The in-place shale was fissile, and hand samples easily crumbled. The results of our topographic surveying and geologic mapping are presented on Figure 1, Engineering Geologic Map and on Figure 2, Engineering Geologic Cross Section A-A'.

We measured the orientations of bedrock discontinuities including bedding planes, joints, and fractures. Planar bedding orientations at the site generally paralleled the roadway (strike orientations between 311 and 335 degrees), and were dipping between 43 and 52 degrees to the northeast (towards the roadway). We note that these bedding orientations are inclined shallower than the topography of slope. This geometric configuration is commonly referred to as a "dip-slope condition" where relatively weaker geologic features (e.g., bedding planes) daylight from a slope. This dip-slope condition is illustrated on Figure 2, Engineering Geologic Cross Section A-A'. Conjugate joints were

noted with plane intersections that also trend and plunge out of the slope. It appears that recent minor wedge or slab failures along the slope resulted in blocks of friable/soft weathered bedrock accumulating at the toe of the slope. This slope debris was effectively restrained from entering the roadway by K-rails that we understand were recently installed.

In the vicinity of Beatrice Road, it appeared that a translational slab failure had previously evacuated from the slope along a shale bedding plane (Figure 3). Concrete and steel were observed on the exposed slope that we assume were intended to retain bedrock blocks upslope of the previous failure. This failure was located upslope of the intersection between Beatrice Road and Kings Road. Surficial colluvium and artificial fill earth materials were observed at the top of the cut slope (462 Kings Road) and on portions of the slope inclined approximately 1H:1V (100 percent). Existing foundations were observed at 462 Kings Road in proximity to the top of the cut slope, and we also observed a functioning water spigot located adjacent to an existing foundation footing (Figure 1). It is unclear if this spigot may be damaged and leaking water into the subsurface.

PRELIMINARY CONCLUSIONS AND GENERAL RECOMMENDATIONS

Based on our geotechnical and geologic evaluations it appears that the subject portion of Kings Road is primarily constrained by oversteepened slopes and dip-slope geologic conditions, along with anticipated strong seismic ground shaking. These constraints contribute to a relatively increased potential for future rock-slope failures to impact the roadway. **If no action is taken, the City of Brisbane should anticipate small rock-slope type failures to continue to impact the slope and roadway.** We find that these minor wedge failures resulting from adverse dip-slope conditions or joint orientations will likely be contained by the currently installed K-rails at the toe of the slope, assuming periodic clearing of slope debris if/when a shallow failure or continued raveling occurs. We note that we have not observed surficial geomorphic features or distress suggesting imminent instability beneath the subject portion of Kings Road.

Based on our visual observations and completed topographic survey we estimate that a significant slope failure could deposit up to 500 to 750 cubic yards of earth material on the roadway. Our estimate is based on a conceptual bedding plane (assumed failure surface) oriented at 45 degrees from horizontal that parallels the roadway and intersects the slope at the roadway elevation. A failure of this nature could 1) occur during a significant seismic event or following prolonged and/or intense rainfall; 2) would significantly impact the upslope property (462 Kings Road); and 3) would likely temporarily block the roadway, because the K-rail will not have the necessary storage capacity or lateral resistance to contain the failure.

It is our recommendation that no development (e.g., building permits or equivalent) should be permitted on the property directly upslope of the subject roadway without an adequate geotechnical investigation and implementation of mitigation measures reviewed and accepted by the City. We understand that the currently installed K-rails block portions of the roadway that were used for parking by neighboring residents. If the City determines that the current level of roadway protection (K-rails blocking portions of the roadway) is insufficient including likely temporary closure of the roadway following significant failures, then alternative mitigation measures should be considered.

In the following section we provide general recommendations and conceptual mitigation measures to improve the relative stability of the slope adjacent to the roadway and reduce the potential risk for adverse impacts from observed geotechnical and geologic conditions. The most significant geotechnical hazard to the roadway and adjacent properties is the dip-slope condition upslope of Kings Road. Our evaluation did not include quantitative slope stability analysis or geotechnical laboratory testing.

General Recommendations

The City of Brisbane should consider the following:

- 1) **Maintained and/or increased containment of anticipated minor slope failures.** This mitigation concept would include maintenance of the current K-rail installation to mitigate the potential for shallow failures or slope debris from entering the functioning roadway. This containment could be improved with further installation of mesh/drapery netting or equivalent on the slope. We find that this level of mitigation (K-rails and netting or equivalent) would appropriately mitigate the potential for minor wedge or block failures along the subject slope.
- 2) **Temporarily shutting off water service from 462 Kings Road** while it remains undeveloped (if possible). We note that water could remain servicing the unoccupied property if a qualified professional concludes that no water is leaking from existing site improvements into the subsurface.
- 3) **Additional mitigation measures (e.g., retaining wall or internal slope reinforcing)** if the potential for roadway closure, the potential for significant failures, or the current level of mitigation is found unacceptable by the City. Internal strengthening could be achieved with a combination of rock bolts and drapery, or rock bolts and shotcrete. Alternatively, the slope could be buttressed by an engineered retaining wall at the toe of the slope. Detailed mitigation concepts and designs would require additional geotechnical investigation and laboratory testing to derive appropriate

geotechnical design recommendations and criteria. This level of mitigation could be designed to resist the potential of larger rock-slope failure and probable seismic conditions.

- 4) **Alternatively**, the City could acquire a portion of the upslope property (462 Kings Road) and grade the slope to a more stable gradient considering the site's dip-slope geologic condition. This alternative may require an extended closure of the roadway to complete grading improvements, would require use of the public roadway to haul excess cut materials off-site, and would restrict the buildable area of 462 Kings Road.

We are available to discuss these general recommendations, and discuss potential further action as needed. Please let us know how we can best be of service moving forward.

LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted engineering geology and geotechnical engineering principles and practices. No warranty, expressed or implied, or merchantability of fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings.

This report is based solely on a reconnaissance-level evaluation without benefit of subsurface exploration and/or laboratory testing. Such additional work would be necessary to provide final design recommendations.

We trust that this provides you with the information that you need at this time. If you have any questions, or need additional information, please call.

Respectfully submitted,

COTTON, SHIRES AND ASSOCIATES, INC.



David T. Schrier
Principal Geotechnical Engineer
GE 2334



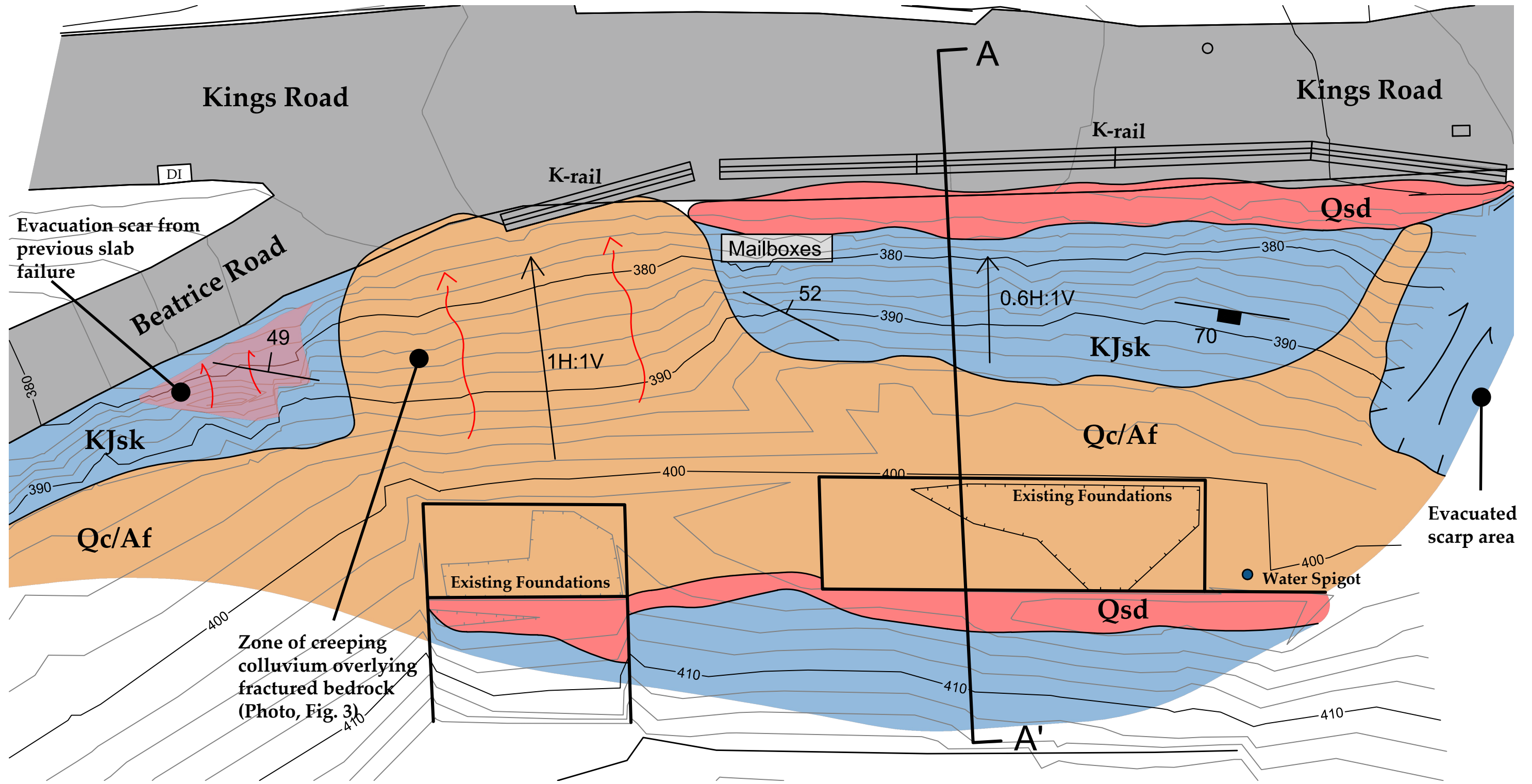
Craig Stewart
Senior Geologist

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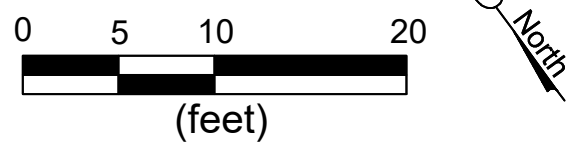
Attachments:

- 1) Figure 1, *Engineering Geologic Map*
- 2) Figure 2, *Engineering Geologic Cross Section A-A'*
- 3) Figure 3, *Annotated Photograph*

COTTON, SHIRES AND ASSOCIATES, INC.



Explanation:



- Qsd** Slope debris, including soft blocks of KJsk (up to 1' diameter) and soil
- Qc/Af** Colluvium and undocumented fill, soil materials
- KJsk** SANDSTONE AND SHALE: See Cross- Section. (Fig. 2)

Bedding Attitudes	Joint Orientations
*319, 49 NE	*139, 70 SW
313, 43 NE	209, 64 NW
311, 52 NE	113, 58 SW
*330, 52 NE	226, 54 NW
335, 51 NE	198, 80 W

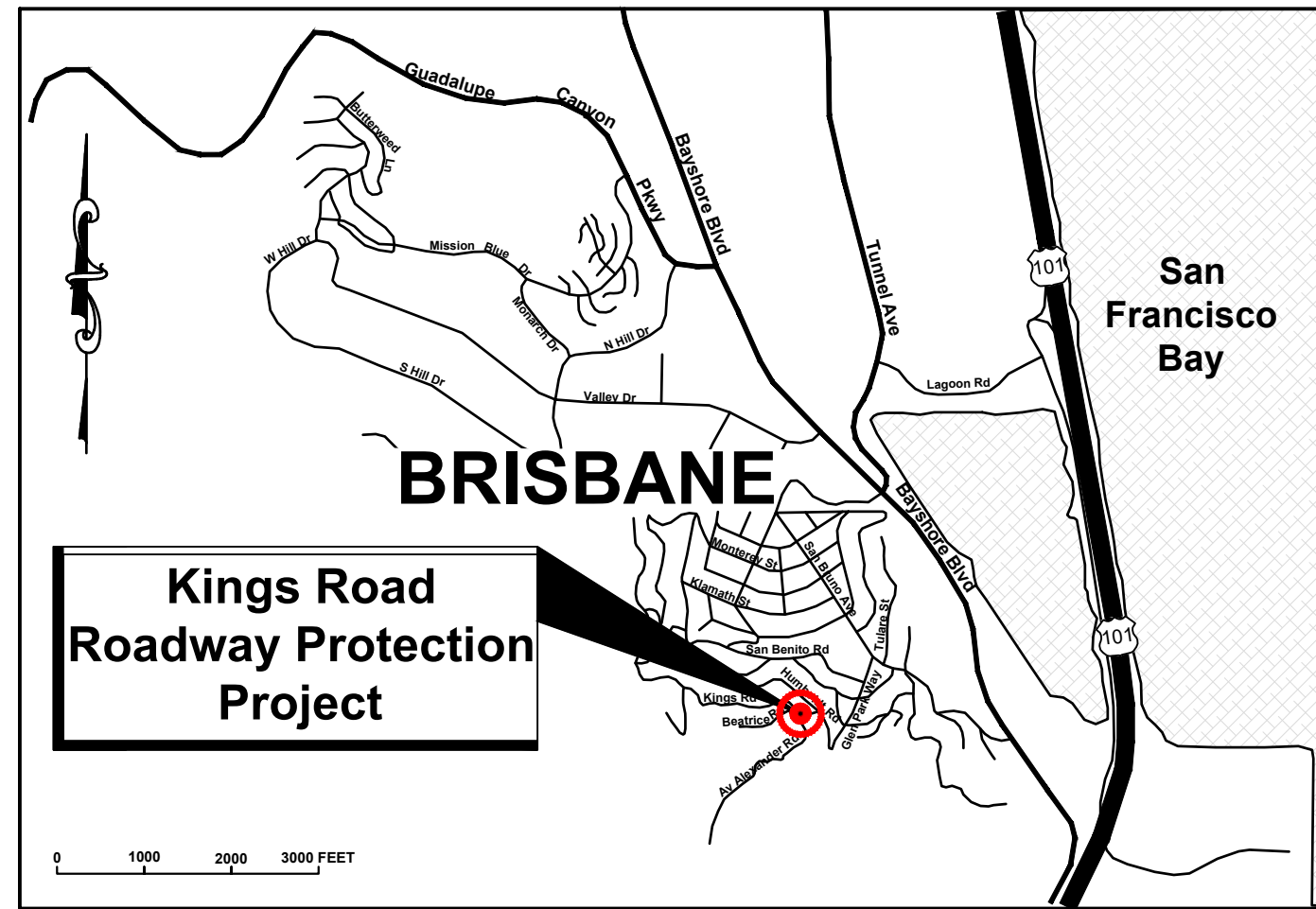
* measurements plotted on map

Topographic contours were derived from a ground-based topographic survey performed by CSA on 12/17/2019

COTTON, SHIRES AND ASSOCIATES, INC. CONSULTING ENGINEERS AND GEOLOGISTS		
ENGINEERING GEOLOGIC MAP KINGS ROAD BRISBANE, CALIFORNIA		
GEO/ENG BY CS/TRH	SCALE 1"=10'	PROJECT NO. E5669
APPROVED BY DTS	DATE January 2020	FIGURE NO. 1



Figure 3: Photograph taken from Beatrice Road facing southeast towards Kings Road. In the fore-ground, fractured sandstone and shale bedrock of the Franciscan Complex is exposed on the slope. It appears that a previous rock-slope failure along a bedding plane (orientation annotated in purple) may have exposed this bedrock outcrop. Colluvial slopes are inclined at grades of approximately 100 percent (1H:1V Slope Gradient).



SITE LOCATION MAP

PROJECT DESCRIPTION NOTE

The Kings Road Roadway Protection Project consists of constructing a new soldier pile and wood lagging retaining wall located along the inboard side of the roadway. The intent of the wall is to protect the roadway from rocks and other slope debris falling off the adjacent slope.

LIMITATIONS NOTES

- The Kings Road Roadway Protection Project has been designed to protect the roadway for only that portion of the roadway improved with a wall, as shown on these drawings.
- Our services consist of professional designs, opinions and recommendations made in accordance with generally accepted engineering geology, geotechnical engineering and civil engineering principles and practices. No warranty, expressed or implied, or merchantability of fitness, is made or intended in connection with our work, by the proposal for consulting or other services, or by the furnishing of oral or written reports or findings.
- Any engineered design notes, drawings and specifications presented in this plan set are contingent upon Cotton, Shires and Associates, Inc. being consulted when any questions arise with regard to the notes and specifications contained herein, and to provide observation and testing services for construction operations. Unanticipated soil and geologic conditions are commonly encountered during construction which cannot be fully determined from existing exposures or by limited subsurface investigation. Such conditions may require additional expenditures during construction to obtain a properly constructed project. Some contingency fund is recommended to accommodate these possible extra costs.

GENERAL NOTES

- For reference in these documents, the "Owner" is the City of Brisbane, the "Engineer" is Cotton, Shires and Associates, Inc. (CSA), and the "Contractor" is a separate entity retained by the Owner to accomplish the work described herein. The construction work of the Contractor shall be observed by the Engineer, who is a separate entity retained by the Owner to design and observe the project.
- The Contractor shall verify all site conditions and grades prior to commencing work. Any conflicts or discrepancies shall be brought to the attention of the Engineer and be resolved prior to the commencement of work.
- The Contractor shall coordinate the work of all trades.
- The Contractor shall exercise particular care to preserve existing trees not identified for removal, their root structures, and other natural landscaping. The Contractor shall require the approval from the Owner to remove any tree or branch prior to the removal.
- The Contractor shall exercise particular care to protect the roadways, driveways, curbs, gutters, and adjacent structures from damage.
- In the event that any unusual conditions not covered by the drawings or specifications are encountered during construction operations, the Engineer shall be immediately contacted for recommendations.
- All work to be in accordance with the Standard Provisions of the City of Brisbane and the latest edition of the State of California Standard Specifications.
- Any distress or damage, caused by the Contractor's actions, to existing structures not identified for construction, including, without limitation, existing structures, fences, AC pavement, utilities, landscaping, etc. shall be repaired or replaced at the Contractor's expense. The Contractor shall document existing conditions of the site and adjacent structures prior to commencement of construction.
- The Contractor shall notify the City and the Engineer at least two (2) working days prior to commencing work or if work has been suspended for a period of more than twenty-four (24) hours.

KINGS ROAD ROADWAY PROTECTION PROJECT

400 Block of Kings Road Brisbane, California

- The Contractor shall provide the Owner and Engineer with the names and telephone numbers of the responsible persons to contact, with regard to this project, 24 hours a day.
- The Contractor shall call U.S.A. (Underground Service Alert) at (800) 642-2444, forty-eight (48) hours prior to beginning any underground work to verify the location of existing underground utilities. Possible conflicts with underground utilities should be brought to the Engineer's attention.
- The Contractor shall notify all public and private utility owners two (2) working days prior to commencement of work adjacent to the utilities unless the permit specifies otherwise.
- The Contractor shall conform to the rules and regulations of the State Construction Safety Orders pertaining to excavations and trenches.
- The Construction work shall occur only between the hours of 9:00 A.M. and 5:00 P.M., Monday through Friday, unless an exception is granted by the City of Brisbane.
- The Contractor shall provide adequate dust control at all times. Any operation that creates excessive dust shall cease immediately until sufficient measures satisfactory to the Owner have been taken to insure compliance with dust control requirements.
- The Contractor shall furnish and install all signs, lights, barricades, and other traffic control or warning devices, including flagpersons, as required by the City of Brisbane. The work area can be closed to traffic during construction hours.
- All materials and methods of construction shall comply with the provisions of the California Building Code (most recent release).
- All work shall be subject to inspection and approval by the Owner and Engineer.
- Contractor shall comply with all Federal, California, City of Brisbane and/or other applicable laws and regulations and shall bear the cost of any violations by Contractor thereof.
- Any uncertainties, and need for clarifications, shall be addressed to the Engineer in writing in the form of Requests For Information (RFI's). The RFI forms shall include the date submitted, a reference to the sheet number, and a sketch if appropriate. The Contractor shall submit an RFI as soon as a question arises and understand that, depending on the complexity of the question, the answer may take time to be resolved.
- The Contractor shall provide submittals as may be required for the prosecution of the work and approval of materials and/or equipment. Submittals may include calculations, specifications, product data, samples, manuals, spare parts, photographs, schedules, or similar items required to be submitted to the Engineer. These submittals shall be approved by the Engineer before any work involving these submittals is performed. No change shall be made by the Contractor to any submittal after it has been approved by the Engineer. Submittals shall contain all required detailed information at a reasonable scale with enough views to clearly show the work to be done or the item to be furnished, and shall be properly checked. It is expressly understood, however, that approval of the Contractor's submittals shall not relieve the Contractor of any responsibility for accuracy of dimensions and details, or for mutual agreement of dimensions and details. The Contractor shall be solely responsible for agreement and conformity of submittals with the Contract Drawings and Specifications. The submittals shall be returned to the Contractor marked, "No Exceptions Noted," "Make Corrections Noted and Resubmit Final File Copy," "Rejected," "Revise and Resubmit," or "Submit Specified Items," within 10 days after receipt. The Contractor shall make any necessary corrections and revisions to returned submittals and shall resubmit the submittals within 10 days after receipt. The Contractor shall be responsible for furnishing submittals in sufficient time for approval action, including resubmittal, without delaying construction.
- Submittals shall be required for the following items: 1) Construction Schedule; 2) Permits and Licenses; 3) Construction Area Traffic Plan; 4) Public Notification; 5) Steel Mill Certifications 6) Concrete Mix Designs; 7) Pressure Treated Wood Lagging; 8) Visqueen; 9) Asphalt Concrete Pavement; and 10) Corrosion Protection (galvanized, Ameron Dimetocote 21-5, epoxy paint, ZRC Galvanizing Touchup Paint, etc.). Submittals may also be required for other items as they come up during the course of construction.
- All Substitutions shall be approved by the Engineer prior to incorporation in the project.
- The Engineer's field personnel shall verify geotechnical conditions during construction. If field conditions are different, the Engineer shall revise the design layout to suit.
- The Contractor shall be responsible for site cleanup to the satisfaction of the Owner.
- The Contractor is responsible for legally disposing of slope debris, drill spoils, construction debris, and excavated AC Pavement. The Contractor is responsible for coordinating and costs associated with testing the off-haul material for contamination.
- The Contractor should visit the site to evaluate access and site conditions, and is responsible for determining how to access the site for equipment and supplies.
- The Contractor can temporarily stockpile material (beams and lagging only) at 1050 Tunnel Avenue in Brisbane.

REQUIRED SPECIAL INSPECTION NOTES

In addition to regular inspections, the following numbered items shall also require Special Inspection in accordance with Sec. 1701 of the California Building Code:
 SITE PREPARATION INSPECTION, PIER DRILLING, AND EXCAVATIONS: Cotton, Shires and Assoc. Inc.
 STRUCTURAL CONCRETE where F'c > 2,500 psi: Not Anticipated, but City to coordinate, if required.

ABBREVIATIONS

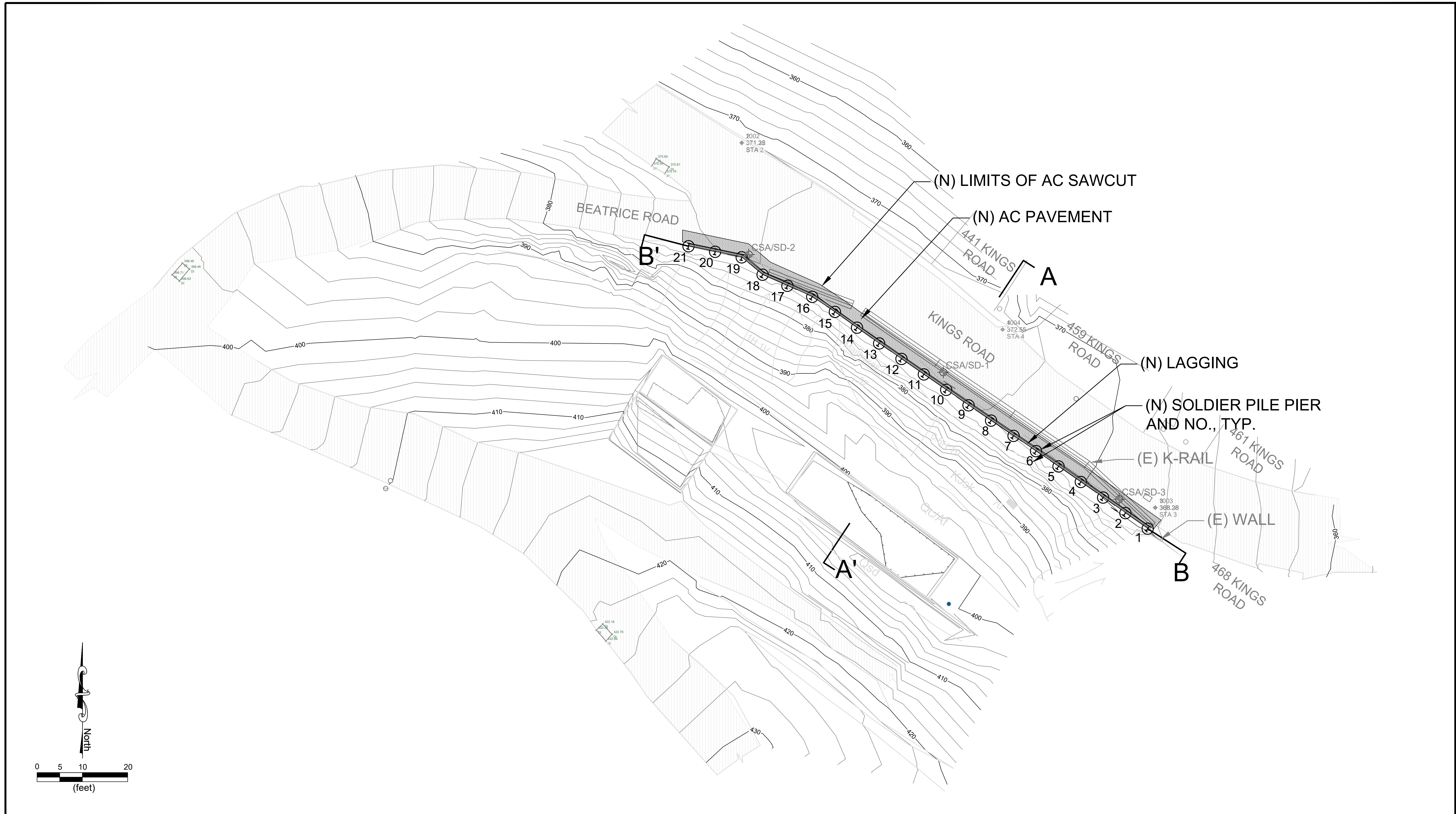
(E)	Existing	Elev. El.	
(N)	New	or EL	Elevations
CMP	Corrugated Metal Pipe	Max.	Maximum
# or No.	Number	Min.	Minimum
AC	Asphaltic Concrete	O.C.	On Center
PVC	Polyvinylchloride	Af	Artificial Fill
Type V	Portland Cement	Col	Colluvium
' or ft.	Feet	psi	Pounds per square inch
in. or "	Inches	AB	Aggregate Base
@	At	St. or STA	Survey Station
typ. or TYP.	Typical	C.I.D.H.	Cast In Drilled Hole
Ø	Diameter	W/	With
%	Percent	C.C.	Center to Center
H = V	Horizontal equals Vertical	Als	Active Landslide
TD	Termination Depth	Dls	Dormant Landslide
DI	Drop Inlet	CSA	Cotton Shires and Associates, Inc.
Inv.	Invert	Sch.	Schedule
T.G.	Top of Grate	lb.	Pounds
UP	Utility Pole	kg	Kilograms
Lt.	Left	ID	Inner Diameter
Rt.	Right	OD	Outer Diameter
C	Centerline	N/A	Not Applicable
<	Angle	C/O	Clean-Out
x	By	R.C.	Relative Compaction
N	North	HDPE	High Density Polyethylene
E	East	HP	High Point
W	West	G.S.	Ground Surface
S	South	EQ.	Equal
mil. or mm	Millimeters	VERT.	Vertical
RCJ	Rough Construction Joint	CNTR.	Center
cu. yds.	Cubic Yards	REINF.	Reinforcement
STD	Standard	STL.	Steel
EA	Each	T&B	Top and Bottom
SQ.	Square	f	Fahrenheit
fc	Unconfined Compressive Strength	STD.	Standard
FS	Factor of Safety	DIA.	Diameter
QC	Quality Control	GR	Grade
TOW	Top of Wall	U.O.N.	Unless Otherwise Noted
BOW	Bottom of Wall	ga	Gauge
CONC.	Concrete	MB	Machine Bolt
PT	Pressure Treated	MI	Malleable Iron

LIST OF SHEETS

Sheet No.	Drawing Title
1 of 10	Site Location Map, Notes, List of Sheets and Abbreviations
2 of 10	Notes and Technical Specifications (Parts 1, 2, 3 and 4)
3 of 10	Technical Specifications (Parts 5, 6, and 7)
4 of 10	Retaining Wall Plan
5 of 10	Cross Section A-A'
6 of 10	Elevation B-B'
7 of 10	Detail 1
8 of 10	Detail 2
9 of 10	Erosion Control Plan
10 of 10	Boring Logs

Grading Quantity Estimates (all volumes are in-place volumes. Contractor shall estimate bulking (swelling) and shrinking)		
Export:	155	cubic yards (Drill Spoils and Debris)
Import:	0	cubic yards
Cut:	100	cubic yards (Debris Removal Base of Slope)
	55	cubic yards (Drill Spoils)
Fill:	0	cubic yards

	COTTON, SHIRES & ASSOCIATES, INC. CONSULTING ENGINEERS AND GEOLOGISTS 330 Village Lane Los Gatos, California 95030 (408) 354-5542 Fax: (408) 354-1852	FOR: Mr. Randy Breault Director of Public Works City Engineer CITY OF BRISBANE 50 Park Place Brisbane, California 94005-1310	Approvals (If Applicable) Reviewed By: _____ Date: _____ Reviewed By: _____ Date: _____ Reviewed By: _____ Date: _____ Reviewed By: _____ Date: _____	DRAWING TITLE: SITE LOCATION MAP, NOTES, LIST OF SHEETS AND ABBREVIATIONS ROADWAY PROTECTION Kings Road Brisbane, California	DRAWING NO. 1 SHEET NO. 1 OF 10 CSA PROJECT NO. E5669A
	DESIGNED: David T. Schrier P.E. 8/13/20 DATE: _____ DRAWN: Sam W. Nolan, P.E. 8/13/20 DATE: _____ CHECKED: _____ DATE: _____				



NO.	REVISIONS	BY	DATE	APP'D

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

330 Village Lane
Los Gatos, California 95030
(408) 354-5542 Fax: (408) 354-1852

DESIGNED: David T. Schrier P.E. 8/13/20
DATE: 8/13/20
DRAWN: Sam W. Nolan, P.E. 8/13/20
DATE: 8/13/20

SUBMITTED: *David T. Schrier*

FOR: Mr. Randy Breault
Director of Public Works
City Engineer
CITY OF BRISBANE
50 Park Place
Brisbane, California 94005-1310

Approvals (If Applicable)	
Reviewed By: _____	Reviewed By: _____
Date: _____	Date: _____
Reviewed By: _____	Reviewed By: _____
Date: _____	Date: _____
Reviewed By: _____	Reviewed By: _____
Date: _____	Date: _____

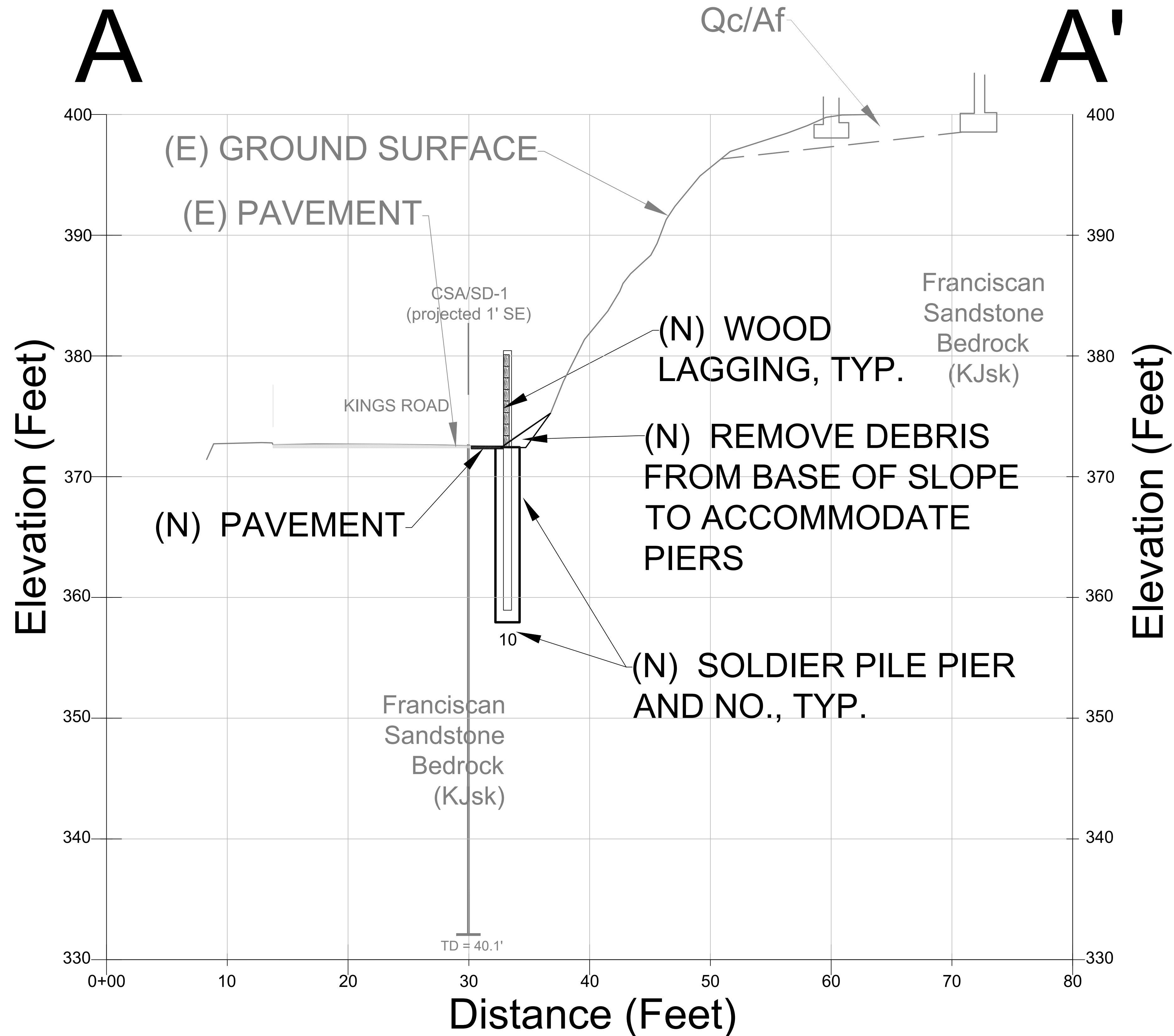
DRAWING TITLE: **RETAINING WALL PLAN**

ROADWAY PROTECTION
Kings Road
Brisbane, California

DRAWING NO. **4**

SHEET NO. **4** OF **10**

CSA PROJECT NO. **E5669A**



NO.	REVISIONS	BY	DATE	APP'D

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

330 Village Lane
Los Gatos, California 95030
(408) 354-5542 Fax: (408) 354-1852

DESIGNED: David T. Schrier P.E. 8/13/20 DATE: 8/13/20
DRAWN: Sam W. Nolan, P.E. 8/13/20 DATE: 8/13/20
CHECKED: DATE: DATE:

SUBMITTED: *David T. Schrier*

FOR: Mr. Randy Breault
Director of Public Works
City Engineer
CITY OF BRISBANE
50 Park Place
Brisbane, California 94005-1310

Approvals (If Applicable)	
Reviewed By: _____ Date: _____	Reviewed By: _____ Date: _____
Reviewed By: _____ Date: _____	Reviewed By: _____ Date: _____
Reviewed By: _____ Date: _____	Reviewed By: _____ Date: _____

DRAWING TITLE: **CROSS SECTION A-A'**

ROADWAY PROTECTION
Kings Road
Brisbane, California

DRAWING NO. **5**

SHEET NO. **5** OF **10**

CSA PROJECT NO. **E5669A**

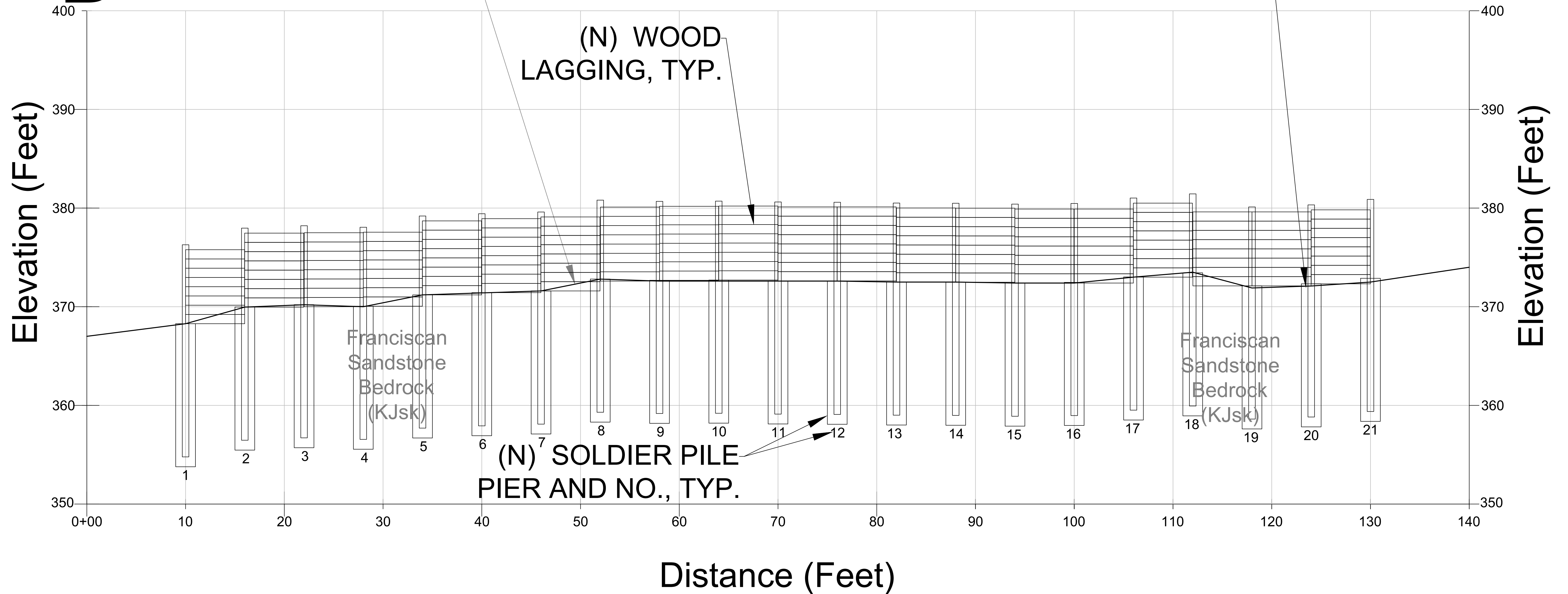
SECTION A-A'

(N) WET-SET LAGGING AS NECESSARY INTO PIER CONCRETE TO CREATE UNIFORM HORIZONTAL SURFACE OR PLACE LEAN CONCRETE LEVELING PADS, TYP.

(E) GROUND/ROADWAY SURFACE AT FACE PF WALL

B

B'



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Brisbane, California 94005-1310

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DRAWN: Sam W. Nolan, P.E. 8/13/20
CHECKED: [Signature] DATE: 8/13/20

REGISTERED PROFESSIONAL ENGINEER
DAVID T. SCHRIER
NO. 47816
CIVIL
STATE OF CALIFORNIA

Approvals (If Applicable)			
Reviewed By:	_____	Date:	_____
Reviewed By:	_____	Date:	_____
Reviewed By:	_____	Date:	_____
Reviewed By:	_____	Date:	_____

DRAWING TITLE: **ELEVATION B-B'**

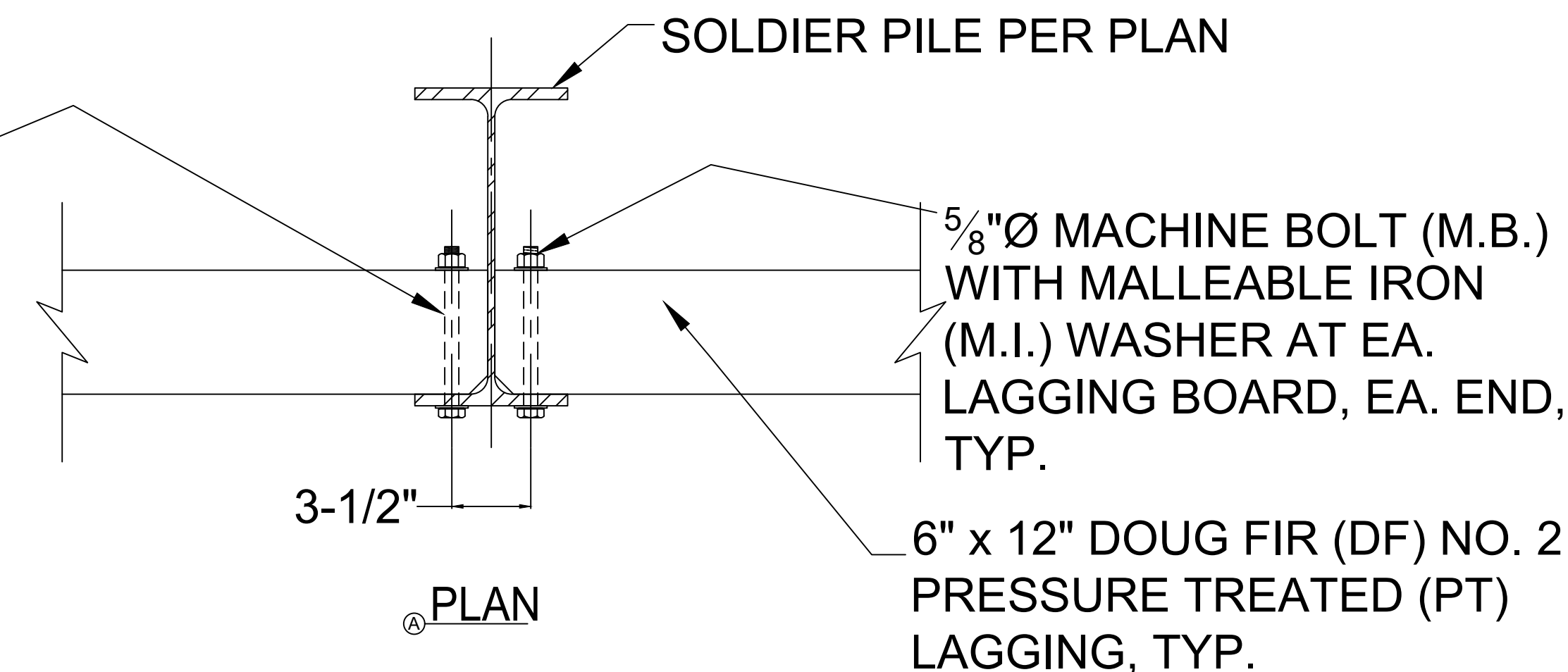
ROADWAY PROTECTION
Kings Road
Brisbane, California

DRAWING NO. **6**

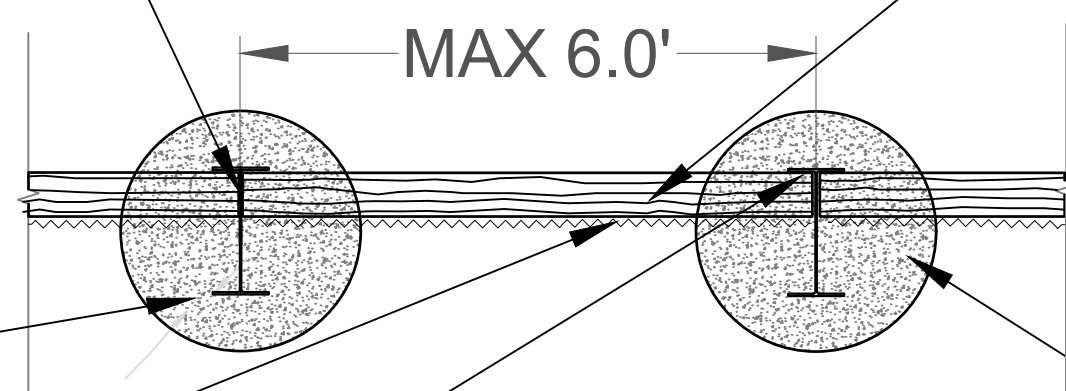
SHEET NO. **6** OF **10**

CSA PROJECT NO. **E5669A**

FILL BOLT HOLES WITH GREASE BEFORE INSERTING BOLTS. USE NYLON SPACER, POLYETHLENE TAPE OR OTHER CORROSION-RESISTANT BARRIR ON SURFACES OF HARDWARE THAT WILL BE IN CONTACT WITH TREATED WOOD PER CALTRANS SECTION 57-2.01C



(N) A572 GRADE 50 KSI W16X36 STEEL BEAM TREATED WITH GALVANIZATION, AMERON DIMETCOTE 21-5 WATER BASED INORGANIC-ZINC, OR AMERLOCK 400 EPOXY COATING, AND EXPOSED PORTIONS PAINTED TO MATCH TANK COLOR



(N) 6" X 12" PRESSURE TREATED DOUGLAS FIR #2 LAGGING (COAT ALL SAW CUTS WITH PRESERVATIVES)

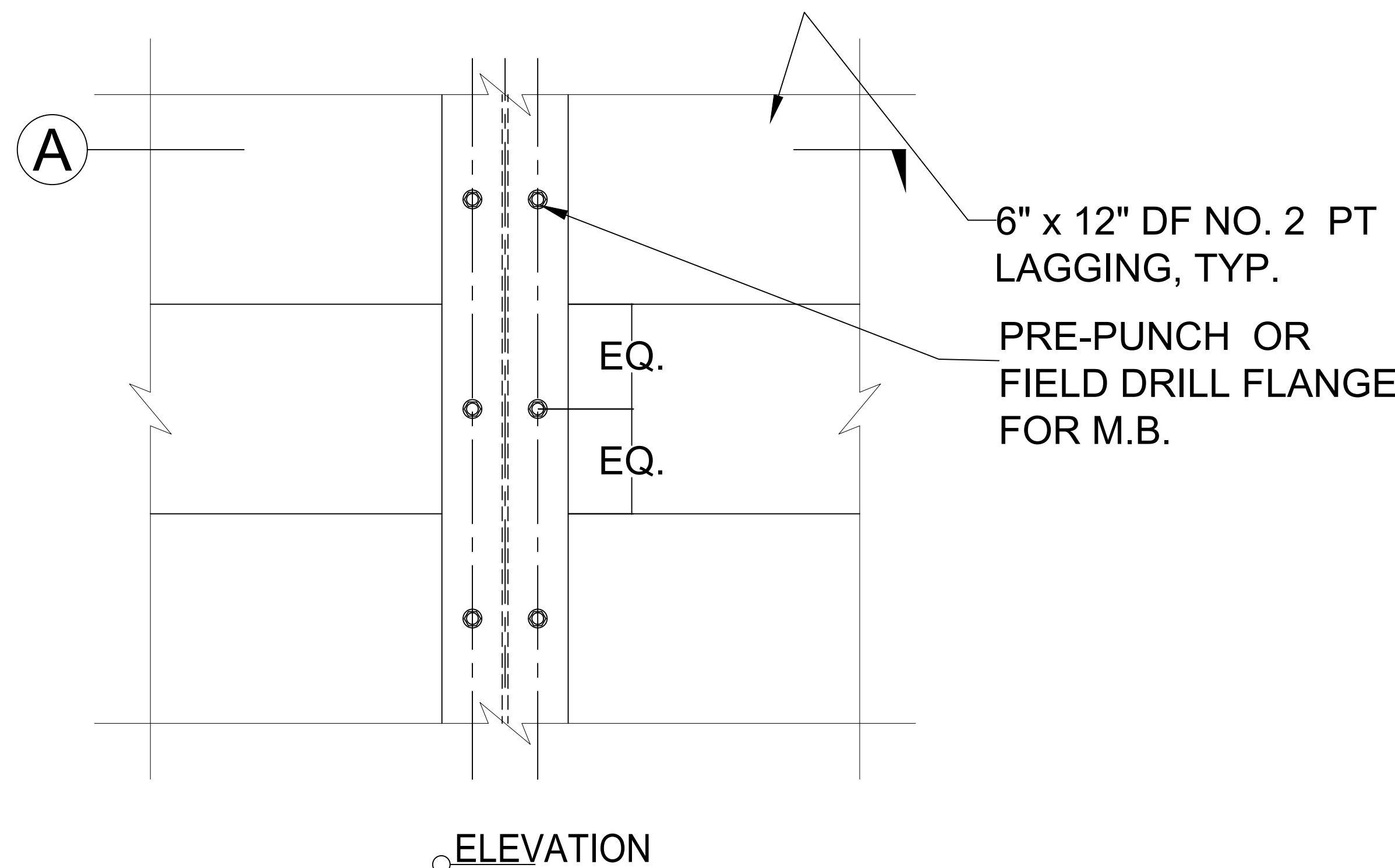
(N) 30-INCH Ø SOLDIER PILE PIER WITH 2,500 PSI CONCRETE

Min. 3" CLEAR ON ALL SIDES

(N) 10 MIL POLYETHYLENE SHEETING PLACED AGAINST LAGGING

(N) LAGGING TO FIT TIGHT TO BEAM WEB, MIN 3" OVERLAP W/ FLANGE

PIER AND LAGGING DETAIL 2
SCALE: NTS



LAGGING ANCHOR DETAIL 3
SCALE: NTS

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CHECKED: *David T. Schrier*

REGISTERED PROFESSIONAL ENGINEER
DAVID T. SCHRIER
NO. 47816
CIVIL
STATE OF CALIFORNIA

Approvals (If Applicable)			
Reviewed By:	_____	Reviewed By:	_____
Reviewed By:	_____	Reviewed By:	_____
Reviewed By:	_____	Reviewed By:	_____
Reviewed By:	_____	Reviewed By:	_____

DRAWING TITLE:

DETAIL 2

ROADWAY PROTECTION
Kings Road
Brisbane, California

DRAWING NO. 8

SHEET NO. 8 OF 10

CSA PROJECT NO. E5669A



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SUBMITTED: _____

David T. Schrier

FOR: Mr. Randy Breault
Director of Public Works
City Engineer
CITY OF BRISBANE
50 Park Place
Brisbane, California 94005-1310

Approvals (If Applicable)

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Reviewed By: _____	Date: _____	Reviewed By: _____	Date: _____
Reviewed By: _____	Date: _____	Reviewed By: _____	Date: _____

DRAWING TITLE: **EROSION CONTROL PLAN**

ROADWAY PROTECTION
Kings Road
Brisbane, California

DRAWING NO. **9**

SHEET NO. **9** OF **10**

CSA PROJECT NO. **E5669A**

COTTON, SHIRES AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project Kings Rd. Boring CSA/SD-1
 Location Brisbane, CA - Center Project No. E5669A
 Drilling Contractor/Rig Britton Exploration/ CME 55 Date of Drilling 6/24/2020
 Ground Surface Elev. 372.5' Logged By CS Hole Diameter 6" Solid Stem Augers
 Surface Pavement Weather Sunny

Depth (feet)	Graphic Log	USCS Class	Geotechnical Description	Sample Design.	Dry Unit Wt. (pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recovery (%)	Remarks
0-2	AC		0' - 0.5' AC PAVEMENT							10:15 Start Drilling
2-3			0.5' - BOH: FRANCISCAN FORMATION							
3-4			0.5' - 42.2' Sandstone with shale - tan, moderately weathered, oxidized	S-1			50/1"	MC 0		10:30
4-6			Orange brown	S-2			50/1"	SPT		
6-10			Fissile/frable, shale fragments recovered, dry	S-3			50/1.5"	SPT		10:43 AM
10-16			Sandstone				50/0"	SPT 0		10:51 AM
16-20							50/0"	SPT 0		11:02 AM driller adds water
20-24										Rig Chatter, driller adds water
24-26							50/0"	SPT 0		11:15 AM, driller adds water
26-28										Steady drilling
28										11:27 AM, driller adds water

Sheet 1 of 2

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project Kings Rd. E5669A Date 6/24/20 Boring CSA/SD-1

Depth (feet)	Graphic Log	USCS Class	Geotechnical Description	Sample Design.	Dry Unit Wt. (pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recovery (%)	Remarks
32-34			Less oxidized, gray	S-4			50/1"	SPT		11:37 AM
34-36			Sandstone							Steady Drilling
36-38										11:50 AM
38-40										Rig Chatter
40-42			Dry				50/2"	SPT		Cuttings bagged
42-44			Total Depth = 40.2 Feet No Groundwater Encountered							12:05 PM

Sheet 2 of 2

COTTON, SHIRES AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project Kings Rd. Boring CSA/SD-2
 Location Brisbane, CA - near Beatrice Road Project No. E5669A
 Drilling Contractor/Rig Britton Exploration/ CME 55 Date of Drilling 6/24/2020
 Ground Surface Elev. 372' Logged By CS Hole Diameter 6" Solid Stem Augers
 Surface Pavement Weather Sunny

Depth (feet)	Graphic Log	USCS Class	Geotechnical Description	Sample Design.	Dry Unit Wt. (pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recovery (%)	Remarks
0-2			0' - 0.5' AC PAVEMENT							Start Drilling: 12:21 AM
2-4			0.5' - BOH: FRANCISCAN FORMATION							
4-6			0.5' - 15.1' Sandstone with shale - orange brown to tan, moderately weathered and fractured sandstone, dry, oxidized	MC-1			50/5"	MC		12:25 PM - shoe sample bagged
6-8			less oxidized	S-1			26 27 40	SPT		12:35 PM, driller added water
8-10							50/1"	MC 0		shoe sample bagged
10-12										12:46 PM, driller added water
12-14							50/1"	SPT 0		12:50 PM
14-16										Hard drilling, driller added water
16-18							50/1"	SPT 0		Hard drilling
18-20										1:05 PM
20-28			Total Depth = 15.1 Feet No Groundwater Encountered							

Sheet 1 of 1

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COTTON, SHIRES AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project Kings Rd. Boring CSA/SD-3
 Location Brisbane, CA - East Project No. E5669A
 Drilling Contractor/Rig Britton Exploration/ CME 55 Date of Drilling 6/24/20
 Ground Surface Elev. 370' Logged By CS Hole Diameter 6" Solid Stem Augers
 Surface Pavement Weather Sunny

Depth (feet)	Graphic Log	USCS Class	Geotechnical Description	Sample Design.	Dry Unit Wt. (pcf)	Moisture Content (%)	SPT Blows/ft	Sample Type	Recovery (%)	Remarks
0-2			0' - 0.5' AC PAVEMENT							Start Drilling: 1:20 PM
2-4			0.5' - BOH: FRANCISCAN FORMATION							
4-6			0.5' - 15' Sandstone with shale - orange brown, moderately weathered and fractured, dry, oxidized	MC-1	126	8.0	38	MC		
6-8				MC-2	102	9.0	50	MC		1:32 PM MD
8-10				MC-3	102	9.0	50	MC		1:38 PM MD
10-12			Slightly less oxidized				50/2"	SPT		driller added water
12-14				S-1			50/5"	SPT		1:50 PM
14-16							50/0"	SPT		2:07 PM
16-28			Total Depth: 15 Feet No Groundwater Encountered							

Sheet 1 of 1

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SUBMITTED: _____

David T. Schrier

Approvals (If Applicable)

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Reviewed By: _____	Reviewed By: _____
Date: _____	Date: _____
Reviewed By: _____	Reviewed By: _____
Date: _____	Date: _____

DRAWING TITLE: BORING LOGS

ROADWAY PROTECTION
Kings Road
Brisbane, California

DRAWING NO. 10

SHEET NO. 10 OF 10

CSA PROJECT NO. E5669A