APPENDIX L
DRAINAGE REPORT

DRAINAGE REPORT
FOR THE
STEVENS CREEK QUARRY
MINE AND RECLAMATION

(CA MINE ID 91-43-0007)

June 9, 2021

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FOR REVIEW ONLY

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INTRODUCTION

Stevens Creek Quarry (SCQ) is an existing mining and processing operation located in southwestern Santa Clara County (see Figure 1, "Regional Location," and Figure 2, "Site Location"). SCQ and its predecessors have continuously mined aggregates at the quarry for more than 70 years. A use permit is being processed for the entire site with a related amendment to the reclamation plan. The use permit will provide for a term of 30 years, amend SCQ's existing use permit issued for Parcel A and extend the use permit coverage to Parcel B (see Figure 3, "Existing Conditions Aerial Photograph" for Parcels A and B), allow import of recycle to Parcel B consistent with recycle activities on Parcel A, and allow the import of native greenstone from an adjacent vested and permitted mine site. The reclamation plan amendment includes a revised slope design to correct the potential slope instability identified in the western pit slope, updated plans for stormwater flow, and proposes a combination of backfilling the quarry using on-site materials and importing fill materials to meet the final reclaimed site elevations. Santa Clara County is the lead agency for the quarry under the California Surface Mining and Reclamation Act (SMARA) and California Environmental Quality Act (CEQA).

Th use permit includes a revised mine plan by Benchmark Resources that will continue mining operations within the central, southern, and eastern portions of Parcel B. Continued mining involves lowering the previously planned quarry floor an additional approximately 300 feet. Consistent with existing mining methods, the quarry will be developed by continuing to mine new benches to a bottom elevation between 550 and 600 feet mean sea level (msl) in the central, southern, and eastern portion of Parcel B. The highwall will be developed by stripping and transporting materials to the processing facilities for crushing and stockpiling. Cut slopes are planned to be 1.5H:1V. The quarry floor is planned to have an upper pad with a maximum elevation of 600 feet msl and a lower pad with a maximum elevation of 550 feet msl prior to final reclamation.

The quarry floor will be backfilled during reclamation to a maximum elevation between 1,100 and 1,200 feet msl with fill slopes not to exceed 2H:1V overall. SCQ proposes to continue to use a combination of on-site material and surplus clean soil available from regional construction projects. Two reclamation options (Option A and Option B) have been prepared by Benchmark Resources. Based on the revised reclamation design, a total volume of approximately 11.7 to 20.5 million cubic yards is required to fill the quarry floor to its final design elevation. Approximately 8 million cubic yards of backfill will be generated on-site from the proposed mining. It is anticipated that approximately 3.7 to 12.5 million cubic yards of backfill material will be imported fill generated from off-site sources.

This report contains drainage analyses for the mine plan and both reclamation plan options. The grading has been provided by Benchmark Resources and is based on their submitted Mine Plan, Reclamation Plan - Option A, and Reclamation Plan - Option B drawings. Santa Clara County's 2007 *Drainage Manual* indicates that new storm drain systems and channels shall be designed to convey the 10-year storm without surcharge, and a safe release shall be provided for the 100-year flow. Drainage systems and channels are not proposed. The 100-year flow will be conveyed over the ground surface.

Furthermore, the Surface Mining and Reclamation Act (SMARA) states that erosion control methods shall be designed for the 20-year storm, and shall control erosion and sedimentation during operations as well as after reclamation is complete (see *California Code of Regulations*, Title 14, Section 3706). The County *Drainage Manual* provides parameters for the 25-year storm event, but not the 20-year event. The 25-year event was analyzed in this report in order to satisfy the requirements for the 10- and 20-year events. Since the 25-year event is greater than these two events, the 25-year results will provide a greater factor-of-safety in the drainage design.

HYDROLOGIC ANALYSES

Hydrologic analyses were performed for the mining and both reclamation conditions. The Santa Clara County 2007 *Drainage Manual* allows the rational method for drainage areas smaller than 200 acres (with no detention, no substantial surface storage effect, and no large areas of pervious soils) and the unit hydrograph method for areas greater than 200 acres. The rational method was used since the overall drainage area is 119.46 acres.

Rational Method

The rational method input parameters are summarized below, and the supporting data is included in Appendix A:

- Rainfall Intensity: The 25-year intensity-duration-frequency curves were established using the Return Period-Duration-Specific (TDS) Regional Equation. The mean annual precipitation value used in the TDS equation is 25 inches.

- Drainage basins: The mining and reclamation drainage basins were delineated from the 2-foot contour interval topographic mapping as well as Benchmark Resources proposed grading for the Mine Plan and Reclamation Plan - Option A and B. The overall drainage basin tributary to the mining area on the Mine Plan was delineated first. The same overall drainage basin was used for Reclamation Plan Option - A and B to allow a comparison of results.

  Under the Mine Plan, the tributary storm runoff will be captured and stored at the bottom of the pit until it evaporates or infiltrates. Under Reclamation Plan - Option A, the storm runoff will surface flow towards the southeasterly corner of the drainage basin where it can ultimately be conveyed to Stevens Creek Reservoir just southeast of the site. Under Option B, the southerly portion of the storm runoff will flow to the southeasterly corner of the drainage basin and then to Stevens Creek Reservoir, while the northerly portion will be conveyed by natural drainages to Stevens Creek just downstream of the reservoir.

  The Rational Method Work Maps in the map pocket at the back of this report contain the existing topography, proposed grading, drainage basin boundaries, rational method node numbers, and drainage basin areas.

- Runoff coefficients: The existing and proposed areas within each drainage basin contain negligible impervious surfaces and a surface condition representative of the natural surrounding hillsides or of a mineral extraction site. The County *Drainage Manual* provides a table (Table 3-1) of runoff coefficients for various land uses ranging from natural cover (parks, agricultural, open space, and shrub land) to development types (residential, commercial, industrial, and paved/impervious surfaces). The mining and reclamation areas do not specifically fall within any of the *Drainage Manual's* land use categories. The undisturbed area contains hilly terrain with exposed rock/gravel surfaces, limited vegetal cover, and little surface storage. The post-project site will contain moderate to steeply sloping terrain, gravel/rock and revegetated surfaces, and little surface storage. Since the *Drainage Manual* does not specifically address the pre- and post-project conditions, Santa Clara County Land Development Engineering provided Table 4 from the County's previous drainage manual as a guideline to develop a runoff coefficient for mined areas.

For the Mine Plan, the selected values from Table 4 are a relief of 0.40, soil infiltration of 0.15, vegetal cover of 0.20, and surface storage of 0.20. This yields a runoff coefficient of 0.95. For Reclamation Plan - Option A, the selected values are a relief of 0.40, soil infiltration of 0.15, vegetal cover of 0.15, and surface storage of 0.20. This yields a runoff coefficient of 0.90. For Reclamation Plan Option - B, the selected values are a relief of 0.35, soil infiltration of 0.15, vegetal cover of 0.20, and surface storage of 0.20. This yields a runoff coefficient of 0.90. The soil infiltration and surface storage values are the same for all scenarios. The relief of Option B is lower than the Mine Plan and Option A because the reclamation grading will result in less overall ground slope. The vegetal cover of Option A is lower than the Mine Plan and Option B because the mining area will be partially vegetated.

It should be noted that the runoff coefficients from Table 4 can be higher than runoff coefficients based on the *Drainage Manual.*

- Flow lengths and elevations: The flow lengths and elevations were delineated and obtained from the topographic mapping and grading. The initial time of concentration for each initial subarea was calculated using a spreadsheet based on the Kirpich equation from the *Drainage Manual.*

  The flow lengths in an initial subarea start at the most hydraulically distant (or highest) point in a drainage basin in accordance with the typical rational method procedure (this is discussed on page 17 of the *Drainage Manual)*.

The rational method analyses were performed using the CivilDesign Universal Rational Method Hydrology Program. This program was customized to meet the Santa Clara County hydrologic criteria. The County's 25-year intensity-duration data was input into the program. The times of concentration for initial subareas were calculated using a spreadsheet of the Kirpich equation, which is included in Appendix A. The initial time of concentration values from the spreadsheet were entered as user-specified data in the program. After the initial subarea is modeled, the program can route the flow in channels, streets, pipes, etc. The analyses in this report modeled the overall drainage basins as initial subareas. The following Erosion and Sedimentation Control section discusses downstream routing of the calculated flows.

The CivilDesign program requires a land use to be entered (e.g., undeveloped dense cover, etc.). However, the runoff coefficients used by the program were based on user-defined values defined above, rather than the program specified land use and soil group. Therefore, while the land uses listed in the output provide a general description of the land use, they were not used for determination of the runoff coefficients.

The 25-year rational method results are included in Appendix A and summarized in Table 1. The overall flow rate under the Mine Plan, Option A, and Option B are similar.

Condition	**Area, acres**	**25-Year Flow, cfs[1]**
Mine Plan	119.46	213
Reclamation Plan - Option A	119.46	197
Reclamation Plan - Option B (northerly area)	54.36	93
Reclamation Plan - Option B (southerly area)	65.10	108
Reclamation Plan - Option B (total area)	119.46	201

[1]cubic feet per second

Table 1. Rational Method Results

EROSION AND SEDIMENTATION CONTROL

SMARA requires erosion and sedimentation to be controlled "during all phases of construction, operation, reclamation, and closure of a surface mining operation to minimize siltation of lakes and watercourses. . . ." Downstream sedimentation and erosion will not occur under the Mine Plan since the tributary stormwater will be entirely captured within the pit and not be discharged downstream.

On the other hand, stormwater will be conveyed downstream under Reclamation Plan - Option A and Reclamation Plan - Option B, so erosion and sedimentation control measures shall be implemented. Temporary best management practices (BMPs) as reclamation progresses can include berms, silt fences, hay bales, straw waddles, matting, or other erosion control measures. These BMPs shall be documented in the Industrial SWPPP and designed to handle runoff from not less than the 20-year, 1-hour intensity storm event. The final reclaimed surfaces will be revegetated for permanent erosion and sedimentation control. Revegetation is intended to not require maintenance following an establishment period.

Under Option A, all of the storm runoff from the reclamation area will be directed to the lower portion of the site and ultimately enter Stevens Creek Reservoir immediately east of the site. Under Option B, the southerly reclamation area will flow through the lower portion of the site to Stevens Creek Reservoir. Per Table 1, the 25-year flow rates under Option A and the southerly area of Option B are 197 and 108 cfs, respectively. Normal depth analyses were performed to estimate the pipe sizes needed to convey these flows from the respective reclamation areas to the reservoir. The average slope along the path is approximately 4 percent from the project's topographic mapping. The normal depth analyses are included in Appendix B and show that a

42-inch pipe is needed convey flow from Option A and a 36-inch pipe is needed to convey flow from the southerly area of Option B. Existing ponds are located between the reclamation areas and reservoir. The pipe sizes could be reduced if the ponds are used to detain flows or if overland flow is accepted. In addition, other options such as drainage swales or channels could be used in lieu of a pipe to convey flows.

Storm runoff from the northerly area of Option B will flow over 5,800 feet in a natural hillside ravine to Stevens Creek approximately 2,300 feet downstream of the reservoir. Drainage improvements are not proposed along the natural hillside ravine.

The proposed mining and reclamation will not create impervious surfaces and permanent revegetation will be installed on the final reclaimed surfaces. As a result, stormwater treatment measures from the Santa Clara Valley Urban Runoff Pollution Prevent Program's June 2016, *C.3. Stormwater Handbook*, are not required.

Temporary desiltation basins can be implemented during construction, if needed. The State Water Resources Control Board (SWRCB) Water Quality Order 99-08-DWQ (as amended by 2010-0014-DWQ and 2012-0006-DWQ) provides sediment basin sizing criteria. The SWRCB procedure is recommended for construction sites with exposed surfaces, which is appropriate for the project. Their procedure is based on the equation:

$A_S = 1.2Q / V_S$ where A_S is the minimum surface area for trapping soil particles of a certain size, sf
Q is the discharge, cfs
V_S is the settling velocity, fps

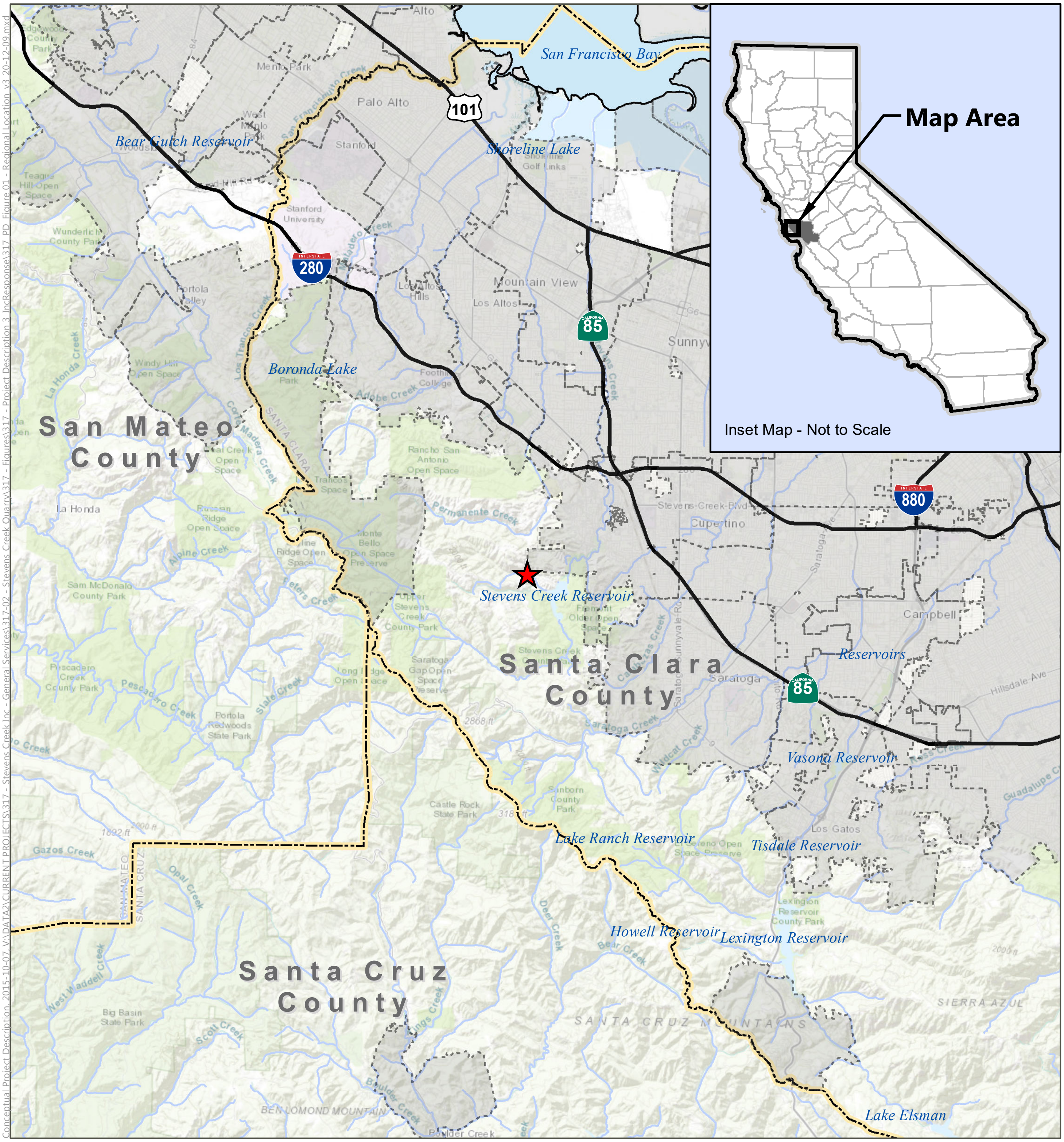
SWRCB recommends that Q be based on the 10-year event. However, the 25-year event can be used in order to meet the Surface Mining and Reclamation Act's 20-year event requirement for erosion control. The 25-year discharge will depend on the size of the drainage area. The results in Table 1 show an average discharge of 1.7 cfs per acre. A particle size distribution for the surrounding area is included in Appendix B and shows that nearly 93 percent of the material will be larger than 0.074 mm (No. 200 sieve size). Sediment smaller than the No. 200 sieve typically occur in suspension and are less prone to settling. The Regional Water Quality Control Board, San Francisco Bay Region's 1999, *Erosion and Sediment Control Field Manual,* provides settling velocities for several particle sizes. The settling velocity for a particle size of 0.05 mm (0.0062 feet per second) was selected because this size is smaller than 0.074 mm. Entering the settling velocity and 25-year discharge per acre value into the equation yields an estimated surface area of 329 square feet per acre of tributary drainage area. The SWRCB recommends that the basin length be twice the width, and the storage depth be between 3 to 5 feet with at least one-foot of freeboard. If temporary desiltation basins are implemented during construction, they shall be sized per the SWRCB procedure. More detailed 25-year hydrologic analyses can be performed for the sizing based on the actual tributary drainage area, as needed.

CONCLUSION

Drainage analyses have been performed for the Stevens Creek Quarry. The analyses were based on the County's 25-year storm, which will yield slightly conservative (higher) results than the SMARA 20-year event. The overall flow rates for the Mine Plan, Reclamation Plan - Option 1, and Reclamation Plan - Option 2 are similar because none of the scenarios propose impervious surfaces and the flow paths are relatively consistent. Following reclamation, storm runoff will be conveyed to Stevens Creek Reservoir and/or Stevens Creek.

Option A and Option B propose reclamation that will restore the hillside within and west of the mining area. The reclaimed slopes have been designed with proposed contours perpendicular to overland flow paths to create a uniformly sloping hillside. Storm runoff from the upstream watershed tributary to either the Option A or Option B reclamation areas primarily occurs as sheet flow over the existing natural hillside. The sheet flow enters ravines within the existing hillside and the ravines will direct concentrated flow towards the proposed reclaimed slopes. The operator shall collect and convey the concentrated flow during and post-reclamation to prevent erosion of the reclaimed slopes. During reclamation, the slopes will be continuously changing as grading proceeds. The operator shall implement measures to prevent erosion and convey the upper ravine flows within or around the active reclamation area throughout the rainy season. The measures can include erosion control blankets, mulch, soil binders, geotextiles, silt fencing, fiber rolls, gravel bags, berming, swales/ditches/channels, pipes, etc. The operator shall update the erosion controls and drainage conveyances, as needed, throughout the reclamation process. Following reclamation, drainage swales and/or channels shall be graded within the reclaimed slopes to convey storm flows from the ravines to the lower portion of the reclaimed slopes. Vegetation or other measures shall be installed to stabilize the drainage swales and/or channels in order to avoid erosion and sedimentation issues.

The project reclamation shall implement temporary and permanent erosion and sediment control measures. The temporary measures will be documented in the Stevens Creek Quarry's Industrial SWPPP. The Industrial SWPPP also addresses water quality and BMP requirements throughout the remainder of the operations area. Permanent revegetation will be selected to avoid long-term maintenance. These measures will satisfy the drainage, erosion, and sediment control requirements of Santa Clara County and SMARA.



SOURCE: ESRI World Shaded Relief accessed Sept. 2020, ESRI World Topographic Map accessed Sept. 2020; ESRI World Streetmap, 2009; compiled by Benchmark Resources in 2020

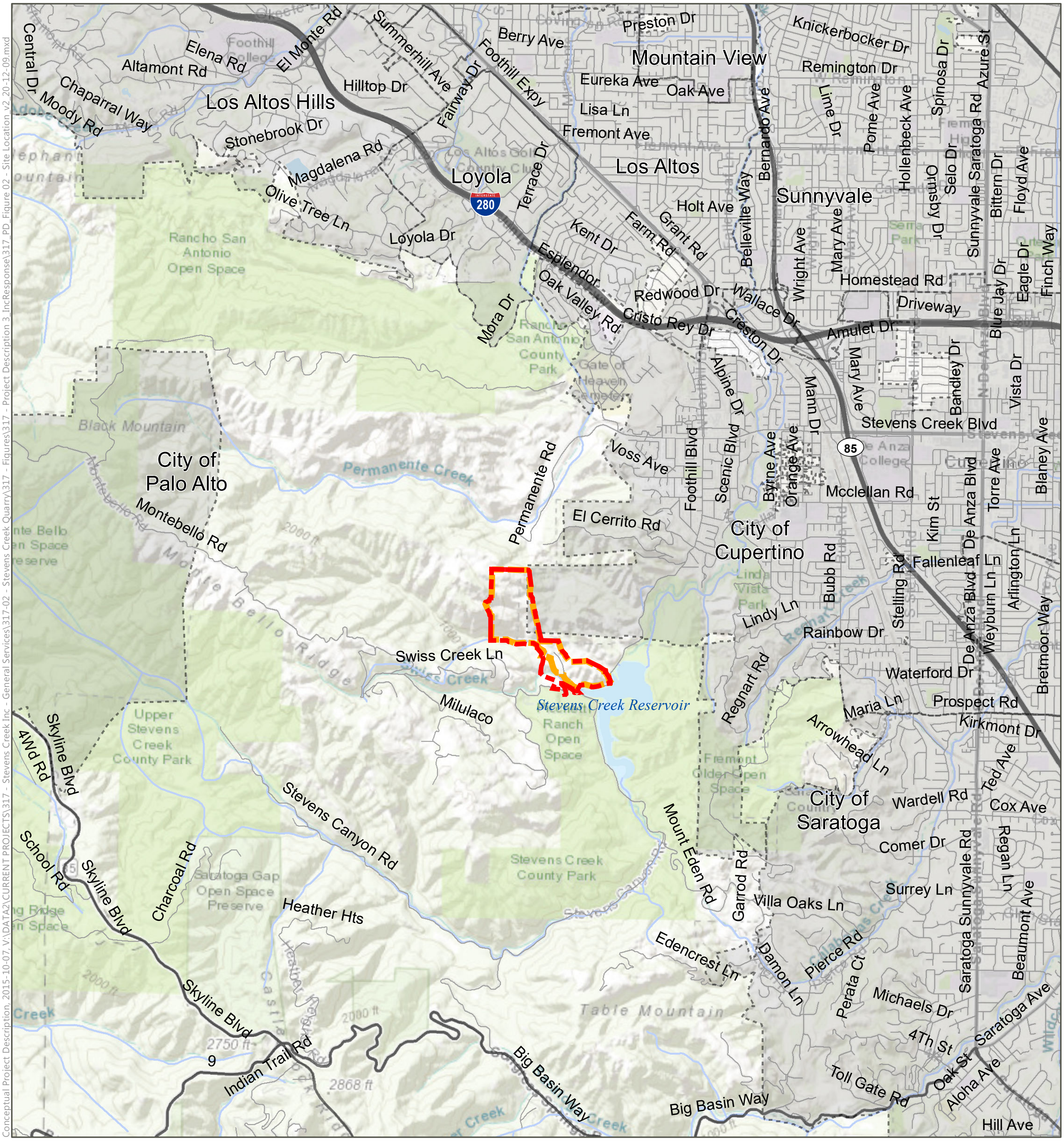
NOTES: This figure was prepared for land use planning and informational purposes only. The info shown and its accuracy are refelctive of the date the data was accessed or produced.

Site Location
City Boundary
County Boundary
Major Highway
Waterway
Water Body

BENCHMARK RESOURCES

0 1.5 3 6 Miles

Regional Location
STEVENS CREEK QUARRY
PROJECT DESCRIPTION
Figure 1



SOURCE: ESRI World Shaded Relief accessed Sept. 2020, ESRI World Topographic Map accessed Sept. 2020; ESRI World Streetmap, 2009; adapted by Benchmark Resources in 2020

NOTES:

1. Property boundary for illustrative purposes only.
2. This figure was prepared for land use planning and informational purposes only. The information shown and its accuracy are refelctive of the date the data was accessed or produced.

Site Boundary
Reclamation Plan Boundary
City Boundary
Water Body
Major Highway
Street
Waterway

0 0.5 1 2 Mile

N

BENCHMARK RESOURCES

Site Location

STEVENS CREEK QUARRY
PROJECT DESCRIPTION

Figure 2

SOURCE: Aerial & Site Parcel Lines–Muir Consulting Inc, flown and surveyed 8-13-2020; Other Parcel Lines–Parcel Quest, accessed December 2020 & Santa Clara Interactive Map, accessed December 2020; compiled by Benchmark Resources in 2020

NOTES:
1. Material reviewed and utilized to prepare reclamation plan boundary was informed by orthophotography and sruvey data prepared by Muir Consulting, Inc., flown on 6-18-2020.
2. See Appendix # and # forstampedand signed Professional Surveyor boundaryand topography.

Site Boundary ±156 acres
Reclamation Plan Boundary ±147 acres
APN: 351-18-048 Parcel Line & Assessor's Parcel Number
100-foot Power Line Easement
1 Existing Building/Mining Equipment/Other Facilities (See list below for for callouts shown)

1. Top Soil Plan
2. Main Office
3. Lower Scale House
4. Recycle Plant
5. Tractor Shop
6. Tractor Shop Office
7. Truck Shop
8. Maintenance Shop
9. Upper Scale
10. Maintenance Shop Office
11. Rock Plant
12. Wash Plant (Press)
13. Radio Tower
14. Equipment Storage

Porta Potty Location
D Diesel Fuel Storage
H Hazardess Material Storage
806 Distance from Loading Point to nearest Parcel Line
Dirt Road
Asphalt Road
Access Road
Water Border
Swiss Creek
A A' Cross Section

BENCHMARK RESOURCES

N 0 150 300 600 1,200

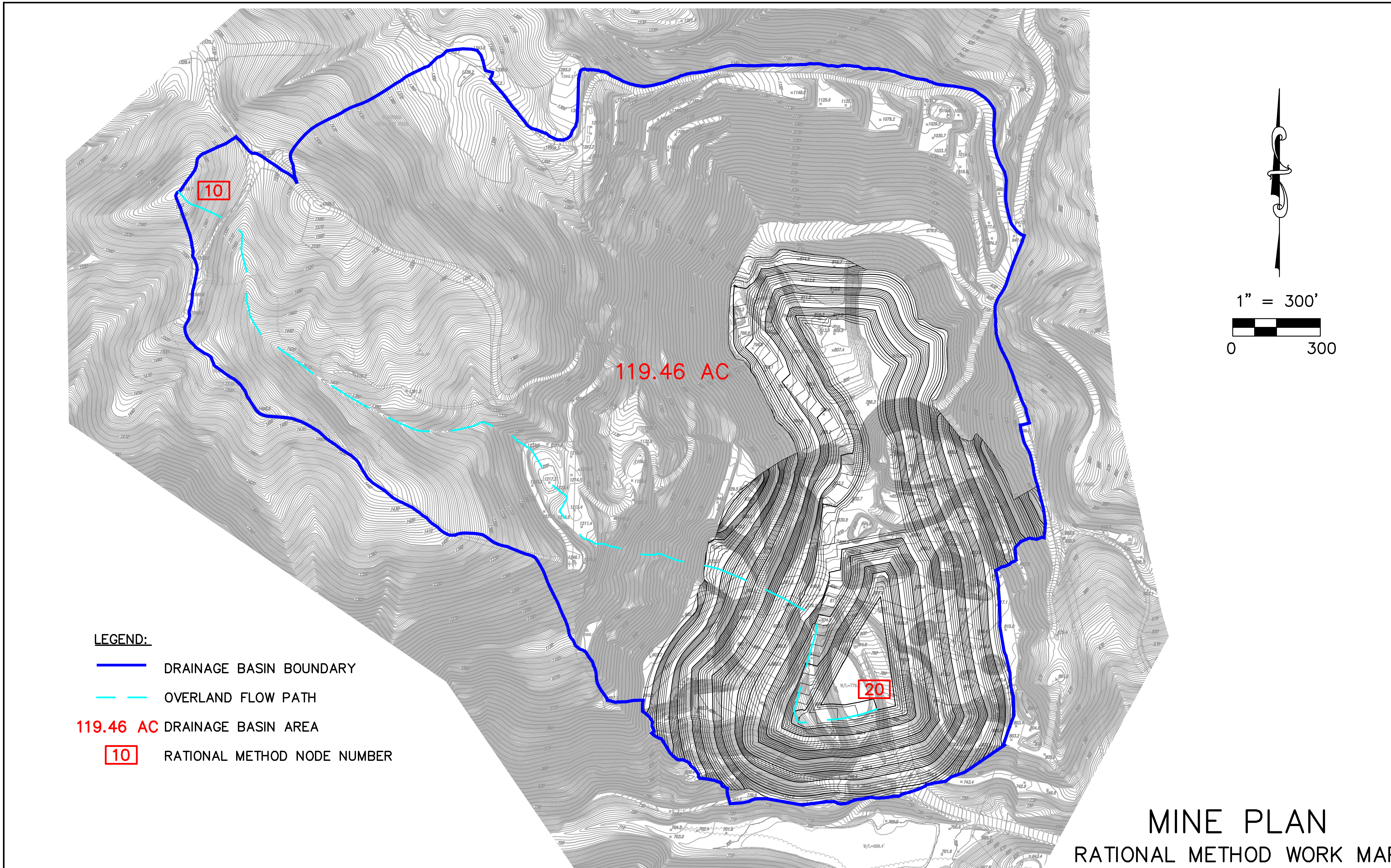
Figure 3

Existing Conditions Aerial Photograph

STEVENS CREEK QUARRY
USE PERMIT & RECLAMATION PLAN AMENDMENT

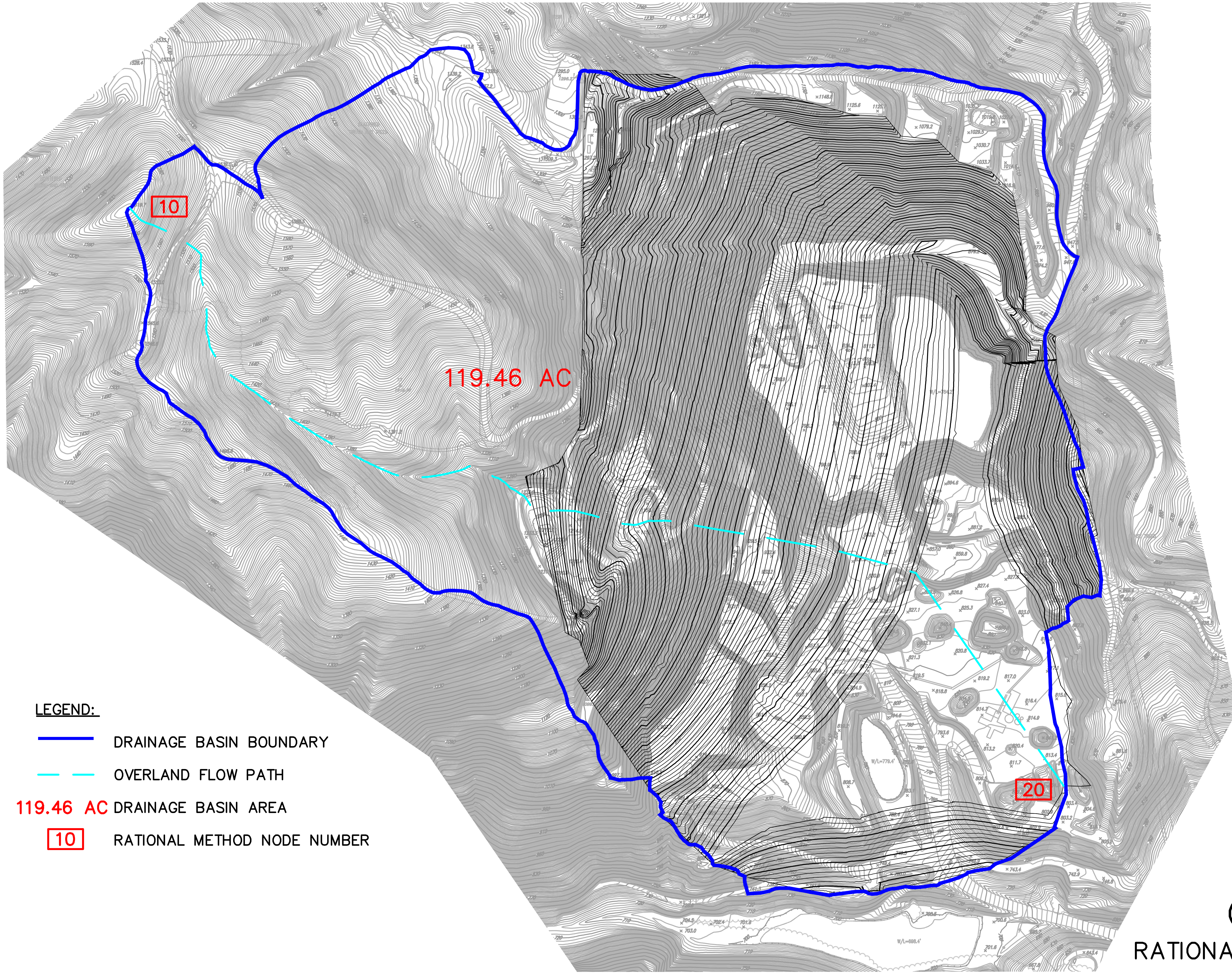
APPENDIX A

HYDROLOGIC INPUT DATA
AND ANALYSES



MINE PLAN

RATIONAL METHOD WORK MAP



1" = 300'

0 300

LEGEND:

DRAINAGE BASIN BOUNDARY

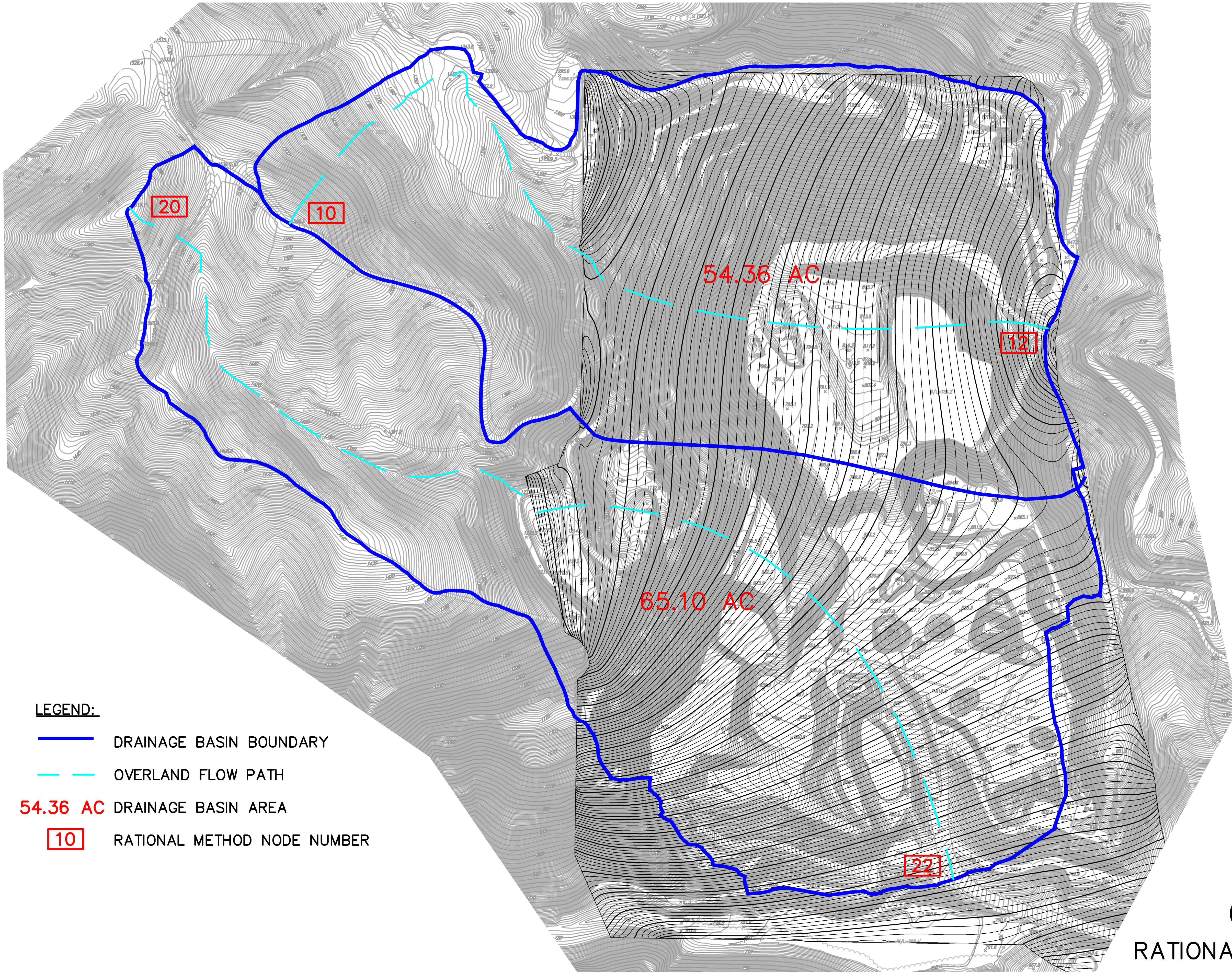
OVERLAND FLOW PATH

119.46 AC DRAINAGE BASIN AREA

10 RATIONAL METHOD NODE NUMBER

OPTION A

RATIONAL METHOD WORK MAP



OPTION B

RATIONAL METHOD WORK MAP

RATIONAL METHOD INPUT DATA

25-Year Return Period

Duration	A	B	MAP, in	x, in	I, in/hr
5	0.230641	0.002691	25	0.2979	3.575
10	0.287566	0.004930	25	0.4108	2.465
15	0.348021	0.005594	25	0.4879	1.951
30	0.443761	0.008719	25	0.6617	1.323
60	0.508791	0.016680	25	0.9258	0.926
120	0.612629	0.031025	25	1.3883	0.694
180	0.689252	0.044264	25	1.7959	0.599
360	0.693566	0.083195	25	2.7734	0.462

KIRPICH EQUATION FOR INITIAL SUBAREAS

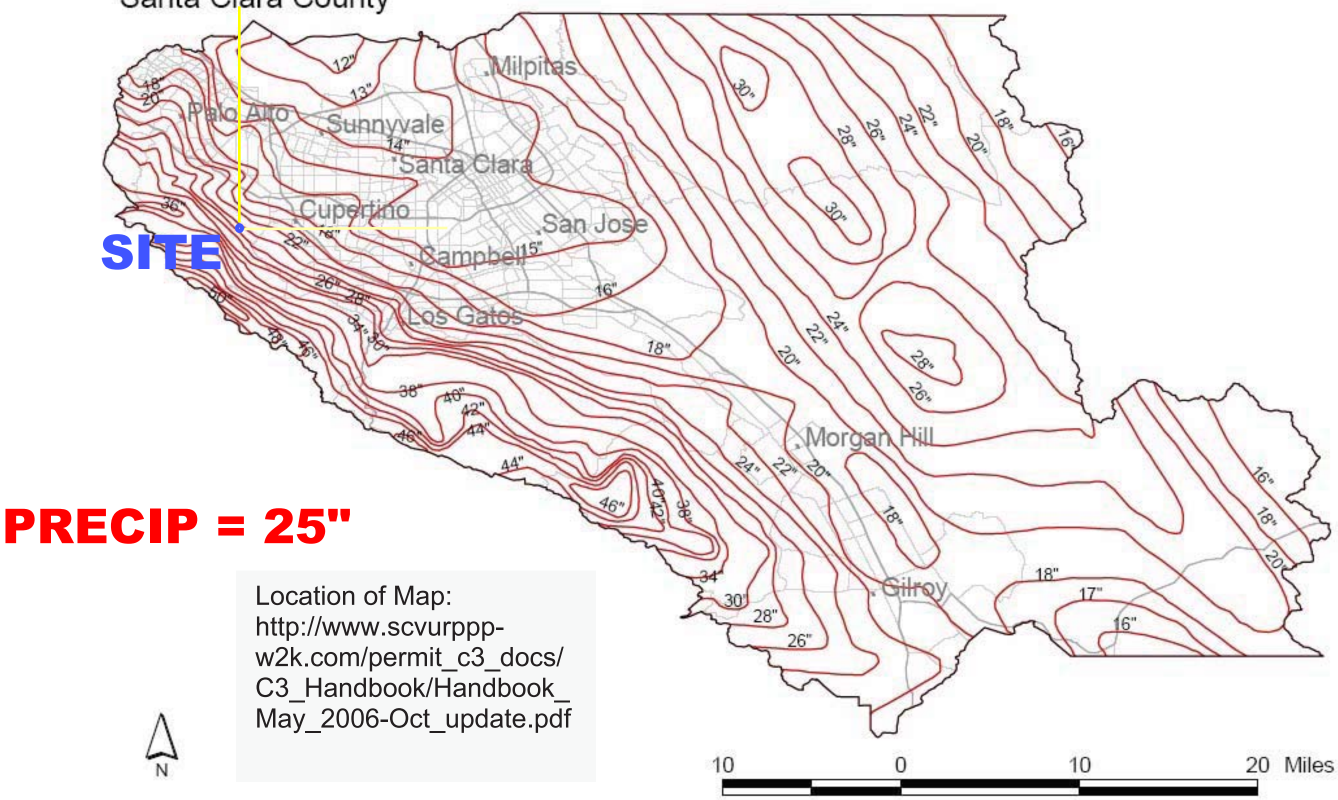
Proposed Conditions

Drainage Basin	Nodes	Up Elev., ft	Down Elev., ft	L, feet	S, ft/ft	Tc, min
Mine Plan	10-12	1,619.7	550.0	3,572	0.30	16.8
Option A	10-12	1,619.7	820.0	3,717	0.22	17.9
Option B - North	10-12	1,588.5	898.0	2,912	0.24	16.3
Option B - South	20-22	1,619.7	735.0	3,636	0.24	17.4

Table B-2: Parameters $A_{T,D}$ and $B_{T,D}$ for TDS Equation

Return Period/Duration	$A_{T,D}$	$B_{T,D}$
25-YR RETURN PERIOD		
5-min	0.230641	0.002691
10-min	0.287566	0.004930
15-min	0.348021	0.005594
30-min	0.443761	0.008719
1-hr	0.508791	0.016680
2-hr	0.612629	0.031025
3-hr	0.689252	0.044264
6-hr	0.693566	0.083195
12-hr	0.725892	0.132326
24-hr	0.675008	0.195496
48-hr	0.989588	0.264703
72-hr	0.967854	0.316424
50-YR RETURN PERIOD		
5-min	0.249324	0.003241
10-min	0.300971	0.006161
15-min	0.384016	0.006315
30-min	0.496301	0.009417
1-hr	0.568345	0.017953
2-hr	0.672662	0.033694
3-hr	0.754661	0.048157
6-hr	0.740666	0.092105
12-hr	0.779967	0.147303
24-hr	0.747121	0.219673
48-hr	1.108358	0.295510
72-hr	1.075643	0.353143
100-YR RETURN PERIOD		
5-min	0.269993	0.003580
10-min	0.315263	0.007312
15-min	0.421360	0.006957
30-min	0.553934	0.009857
1-hr	0.626608	0.019201
2-hr	0.732944	0.036193
3-hr	0.816471	0.051981
6-hr	0.776677	0.101053
12-hr	0.821859	0.162184
24-hr	0.814046	0.243391
48-hr	1.210895	0.325943
72-hr	1.175000	0.389038

Figure A-2
Mean Annual Precipitation Map
Santa Clara County



SOURCE: Santa Clara Valley Water District, Mean Annual Precipitation Map, San Francisco & Monterey Bay Region, 1998

Figure A-2: Mean Annual Precipitation, Santa Clara County

Table 4

Runoff Coefficients for Agricultural and Open Areas *

RUNOFF PRODUCING CHARACTERISTICS	WATERSHED CHARACTERISTICS A RELIEF	B SOIL INFILTRATION	C VEGETAL COVER	D SURFACE STORAGE
EXTREME	0.40 Steep rugged terrain average slopes greater than 30%	0.20 No effective soil cover; either rock or thin soil mantle negligible infiltration capacity	0.20 No effective plant cover; bare or very sparse soil cover	0.20 Negligible; surface depression few and shallow; drainage ways steep and small, no ponds or marshes
HIGH	0.30 Hilly with average slopes of 10 to 30%	0.15 Slow to take up water; clay or other soil of low infiltration capacity such as heavy gumbo	0.15 Poor to fair; clean cultivated crops or poor natural cover; less than 10% of area under good cover	0.15 Low; well defined system of small drainage ways; no ponds or marshes
NORMAL	0.20 Rolling with average slopes of 5 to 10%	0.10 Normal, deep loam	0.10 Fair to good; about 50% of area in good grass land, woodland or equivalent cover	0.10 Normal; considerable surface depression storage; typical of prairie lands; lakes, ponds and marshes less than 20% of area
LOW	0.10 Relatively flat land average slopes 0 to 5%	0.05 High; deep sand or other soil that takes up water readily and rapidly	0.05 Good to excellent; about 90% of area in good grass land, woodland or equivalent cover	0.05 High; surface depression storage high; drainage system not sharply defined, Lg. flood plain storage; large number of ponds and marshes

NOTE: Runoff coefficient is equal to sum of coefficients from the appropriate block in Rows A, B, C and D.

* After H. L. Cook, as published in Engineering for Agricultural Drainage, by Harry B. Roe and Quincy C. Ayres, McGraw-Hill Book Co., Inc., New York, 1954, p. 105.

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 12/16/20

Stevens Creek Quarry
Mine Plan
25-Year Flow Rate
County of Santa Clara Rational Method

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time	-	Intensity
1	5.000		3.575(In.)
2	10.000		2.465(In.)
3	15.000		1.951(In.)
4	30.000		1.323(In.)
5	60.000		0.926(In.)
6	120.000		0.694(In.)
7	180.000		0.599(In.)
8	360.000		0.462(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows

Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ... qn
TC = t of stream with largest q

++

Process from Point/Station 10.000 to Point/Station 12.000

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance = 3572.000(Ft.)
Top (of initial area) elevation = 1619.700(Ft.)
Bottom (of initial area) elevation = 550.000(Ft.)
Difference in elevation = 1069.700(Ft.)
Slope = 0.29947 s(%)= 29.95
Manual entry of initial area time of concentration, TC
Initial area time of concentration = 16.800 min.
Rainfall intensity = 1.876(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 212.861(CFS)
Total initial stream area = 119.460(Ac.)
End of computations, total study area = 119.460 (Ac.)

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 12/16/20

Stevens Creek Quarry
Reclamation Plan - Option A
25-Year Flow Rate
County of Santa Clara Rational Method

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2	10.000		2.465(In.)
3	15.000		1.951(In.)
4	30.000		1.323(In.)
5	60.000		0.926(In.)
6	120.000		0.694(In.)
7	180.000		0.599(In.)
8	360.000		0.462(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows

```
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ..... qn
TC = t of stream with largest q


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station      12.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =  3717.000(Ft.)
Top (of initial area) elevation =  1619.700(Ft.)
Bottom (of initial area) elevation =   820.000(Ft.)
Difference in elevation =   799.700(Ft.)
Slope =    0.21515  s(%)=     21.51
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   17.900 min.
Rainfall intensity =      1.830(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
Subarea runoff =    196.706(CFS)
Total initial stream area =      119.460(Ac.)
End of computations, total study area =        119.460 (Ac.)
```

UNIVERSAL RATIONAL METHOD HYDROLOGY PROGRAM

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989- 2005 Version 7.1
Rational Hydrology Study Date: 12/16/20

Stevens Creek Quarry
Reclamation Plan - Option B
25-Year Flow Rate
County of Santa Clara Rational Method

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 25.0
Number of [time,intensity] data pairs = 8

No.	Time -	Intensity
1	5.000	3.575(In.)
2	10.000	2.465(In.)
3	15.000	1.951(In.)
4	30.000	1.323(In.)
5	60.000	0.926(In.)
6	120.000	0.694(In.)
7	180.000	0.599(In.)
8	360.000	0.462(In.)

English Input Units Used
English Output Units Used:
Area = acres, Distance = feet, Flow q = ft^3/s, Pipe diam. = inches
Runoff coefficient method used:
Runoff coefficient 'C' value calculated for the
equation Q=KCIA [K=unit constant(1 if English Units, 1/360 if SI Units),
I=rainfall intensity, A=area];
by the following method:
Manual entry of 'C' values

Rational Hydrology Method used:

The rational hydrology method is used where the area
of each subarea in a stream, subarea 'C' value, and rain-
fall intensity for each subarea is used to determine the
subarea flow rate q, of which values are summed for total Q

Stream flow confluence option used:

Stream flow confluence method of 2 - 5 streams:
Note: in all cases, if the time of concentration
or TC of all streams are identical, then q = sum of stream flows

```
Variables p=peak; i=intensity; Fm=loss rate; a=area; 1...n flows
q = flow rate, t = time in minutes
Stream flows summed; qp = q1 + q2 + ..... qn
TC = t of stream with largest q


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      10.000 to Point/Station      12.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =  2912.000(Ft.)
Top (of initial area) elevation =  1588.500(Ft.)
Bottom (of initial area) elevation =   898.000(Ft.)
Difference in elevation =   690.500(Ft.)
Slope =    0.23712  s(%)=      23.71
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   16.300 min.
Rainfall intensity =      1.897(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
Subarea runoff =     92.788(CFS)
Total initial stream area =       54.360(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      20.000 to Point/Station      22.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (average cover) subarea
Initial subarea data:
Equations shown use english units, converted if necessary to (SI)
Initial area flow distance =  3636.000(Ft.)
Top (of initial area) elevation =  1619.700(Ft.)
Bottom (of initial area) elevation =   735.000(Ft.)
Difference in elevation =   884.700(Ft.)
Slope =    0.24332  s(%)=      24.33
Manual entry of initial area time of concentration, TC
Initial area time of concentration =   17.400 min.
Rainfall intensity =      1.851(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.900
Subarea runoff =    108.422(CFS)
Total initial stream area =       65.100(Ac.)
End of computations, total study area =         119.460 (Ac.)
```

APPENDIX B

NORMAL DEPTH ANALYSES
AND
PARTICLE SIZE DISTRIBUTION

Worksheet for Circular Pipe - Option A

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.04000	ft/ft
Normal Depth	3.47	ft
Diameter	3.47	ft
Discharge	197.00	ft³/s

Results

Diameter	3.47	ft
Normal Depth	3.47	ft
Flow Area	9.47	ft²
Wetted Perimeter	10.91	ft
Hydraulic Radius	0.87	ft
Top Width	0.00	ft
Critical Depth	3.44	ft
Percent Full	100.0	%
Critical Slope	0.03680	ft/ft
Velocity	20.80	ft/s
Velocity Head	6.73	ft
Specific Energy	10.20	ft
Froude Number	0.00	
Maximum Discharge	211.92	ft³/s
Discharge Full	197.00	ft³/s
Slope Full	0.04000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Worksheet for Circular Pipe - Option B (southerly area)

Project Description

Friction Method	Manning Formula
Solve For	Full Flow Diameter

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.04000	ft/ft
Normal Depth	2.77	ft
Diameter	2.77	ft
Discharge	108.00	ft³/s

Results

Diameter	2.77	ft
Normal Depth	2.77	ft
Flow Area	6.03	ft²
Wetted Perimeter	8.71	ft
Hydraulic Radius	0.69	ft
Top Width	0.00	ft
Critical Depth	2.74	ft
Percent Full	100.0	%
Critical Slope	0.03659	ft/ft
Velocity	17.90	ft/s
Velocity Head	4.98	ft
Specific Energy	7.75	ft
Froude Number	0.00	
Maximum Discharge	116.18	ft³/s
Discharge Full	108.00	ft³/s
Slope Full	0.04000	ft/ft
Flow Type	SubCritical	

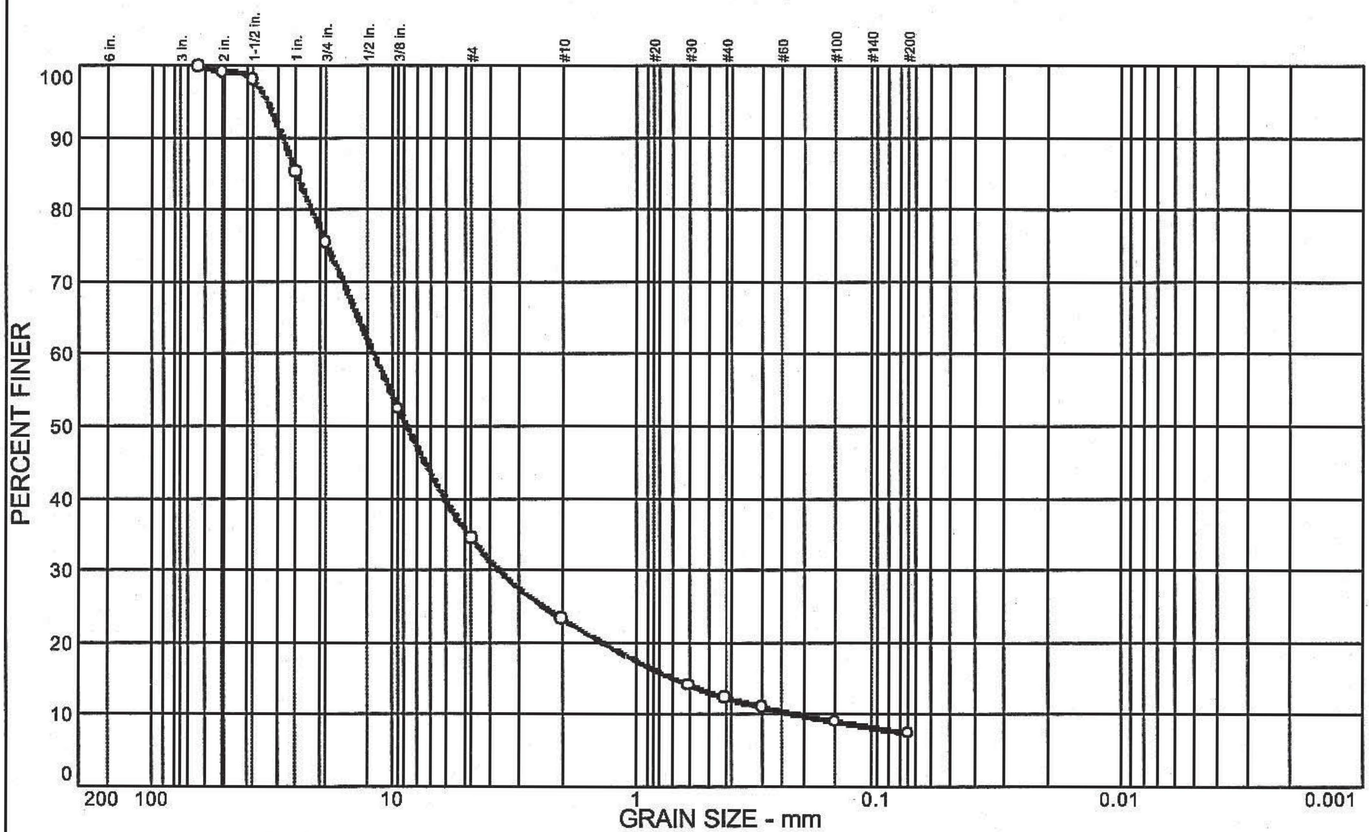
GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
o		65.6	27.0	7.4					

SIEVE inches size	PERCENT FINER o		
2.5	100.0		
2	99.2		
1.5	98.0		
1	85.3		
3/4	75.5		
3/8	52.4		
	GRAIN SIZE		
D_{60}	12.0		
D_{30}	3.65		
D_{10}	0.220		
	COEFFICIENTS		
C_c	5.05		
C_u	54.84		

o Source: TC-1

SIEVE number size	PERCENT FINER o		
#4	34.4		
#10	23.3		
#30	14.1		
#40	12.4		
#50	11.0		
#100	9.0		
#200	7.4		

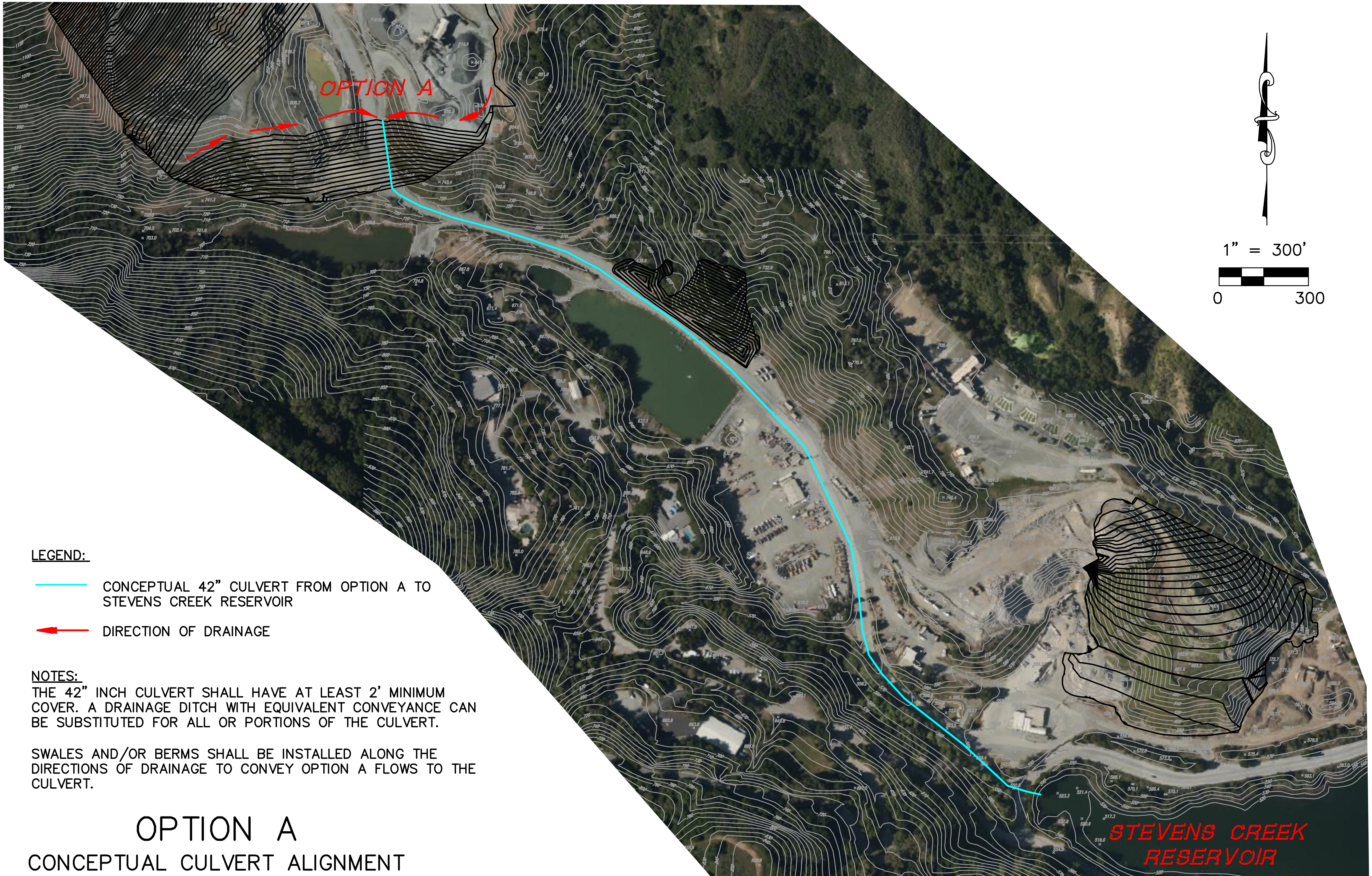
SOIL DESCRIPTION

o Gray Poorly Graded GRAVEL w/ Silt & Sand

REMARKS:

o

COOPER TESTING LABORATORY



LEGEND:

CONCEPTUAL 42" CULVERT FROM OPTION A TO STEVENS CREEK RESERVOIR

DIRECTION OF DRAINAGE

NOTES:

THE 42" INCH CULVERT SHALL HAVE AT LEAST 2' MINIMUM COVER. A DRAINAGE DITCH WITH EQUIVALENT CONVEYANCE CAN BE SUBSTITUTED FOR ALL OR PORTIONS OF THE CULVERT.

SWALES AND/OR BERMS SHALL BE INSTALLED ALONG THE DIRECTIONS OF DRAINAGE TO CONVEY OPTION A FLOWS TO THE CULVERT.

OPTION A

CONCEPTUAL CULVERT ALIGNMENT

LEGEND:

CONCEPTUAL 36" CULVERT FROM OPTION B TO STEVENS CREEK RESERVOIR

DIRECTION OF DRAINAGE

NOTES:

THE 36" INCH CULVERT SHALL HAVE AT LEAST 2' MINIMUM COVER. A DRAINAGE DITCH WITH EQUIVALENT CONVEYANCE CAN BE SUBSTITUTED FOR ALL OR PORTIONS OF THE CULVERT.

SWALES AND/OR BERMS SHALL BE INSTALLED ALONG THE DIRECTIONS OF DRAINAGE TO CONVEY OPTION B FLOWS TO THE CULVERT.

THE NORTHERLY DRAINAGE AREA WITHIN OPTION B FLOWS TO A NATURAL RAVINE, SO NO DRAINAGE FACILITIES ARE PROPOSED.

OPTION B

CONCEPTUAL CULVERT ALIGNMENT