Sugarloaf Ranch Estates

Tentative Map
Application

Prepared For:

Sugarloaf Peak, LLC
2777 Northtowne Lane
Reno, NV 89512

Prepared By:

Axion Engineering
Civil Engineering • Land Development

681 Edison Way
Reno, NV 89502
775-771-5554

January, 2016

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Project Requests

This application is for a **Tentative Map Application** for:

A) 119 Single Family Residential lots on 39.84 acres.

Sugarloaf Ranch Estates is located ¼ mile east of the Pyramid Highway across the street from the Village Green business park. It will be accessed from Calle De La Plata which connects to the Pyramid Highway. The project site includes one parcel, APN 534-562-07 and consists of 39.84± acres, as shown in Figure 1 (below).

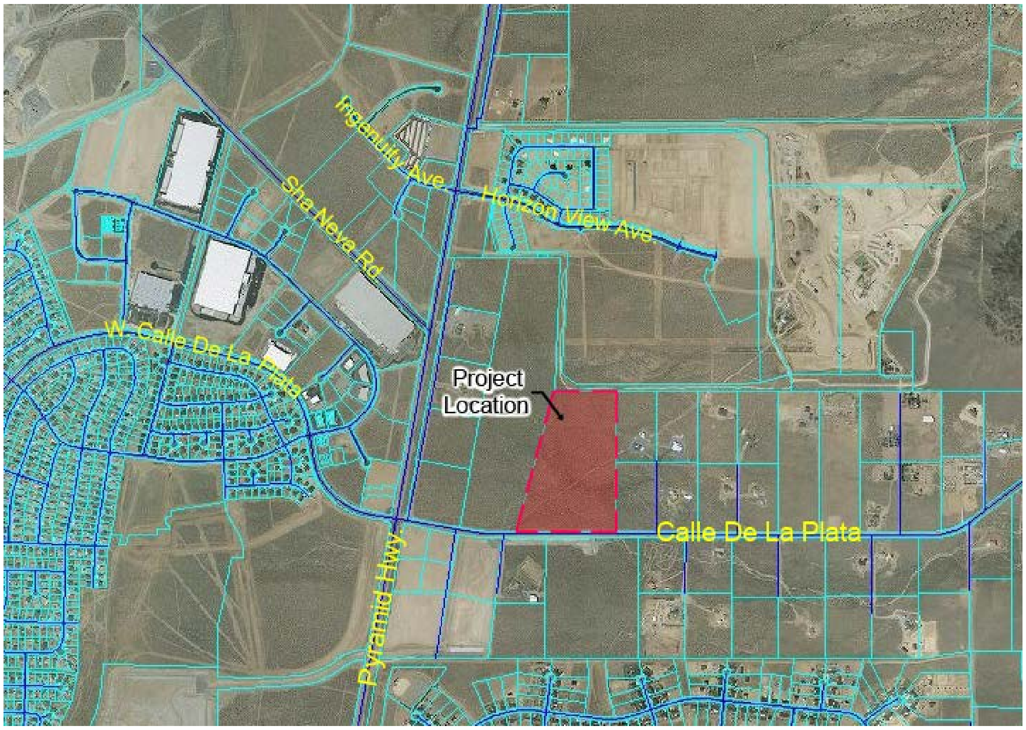


Figure 1 – Vicinity Map

Project History

The owner of the subject property requested a Master Plan Amendment, case number MPA12-001 to consider an amended to the Spanish Springs Area Plan, being a part of the Washoe County Master Plan. The amendment request involved the creation of a new character management area on the parcel and was called the Village Residential Character Management Area (VRCMA) requiring re-designation of the 39.84 acre parcel from a mix of Industrial (I), Commercial (C) and Open Space (OS) to Suburban Residential (SR) and to also required that the Character Management Plan map identify the new VRCMA. The amendment request also included a change to the Character Statement in the Spanish Springs Area Plan to identify the new VRCMA and to allow for multi-family uses within the VRCMA up to nine dwelling units per acre; to ultimately allow a

Master Plan Amendment and Regulatory Zone Amendment to obtain entitlements for construction of a 360 unit apartment complex in 2012. The request was denied by the Planning Commission and appealed to the Board of Commissioners where it was approved. Truckee Meadows Regional Planning Commission determined the amendment was not in conformance with the comprehensive Regional Plan leading to the applicant and staff to work on an amended application package.

The amended application was produced and heard by the Planning Commission on September 16, 2014 where it was denied. An appeal to the Board of Commissioners was made and approval from the Board was obtained on October 14, 2014. Subsequently the amended project was presented to the Truckee Meadows Regional Planning Commission and during a meeting on January 28, 2015 they again determined that the Master Plan Amendment was not in conformance with the comprehensive Regional Plan.

Seeing the need to still fill the growing demand for residential housing the owner submitted a Master Plan Amendment (MPA15-004) and Regulatory Zone Amendment (RZA15-006) requesting a change in the land use from a mix of Industrial, Commercial and Open Space to Suburban Residential in the Spanish Springs Area Plan and a change in the zoning from a mix of Industrial, Commercial, and Open Space to Medium Density Suburban. The request was presented to Planning Commission on December 1st, 2015 and they were unable to make the findings. The decision has been appealed and will be heard by the Regional Planning Commission during the January 26th meeting.

Project Description

The proposed project is for a 119 unit single family residential development with lot sizes ranging from 8,050 square feet to 17,261 square feet. The average lot size is 10,317 square feet. The project will include 5.66 acres of open space, 7.42 acres of public right of way, and 26.76 acres of residential lots.

Proposed net density is 4.45 dwelling units per acre and the proposed gross density is 2.99 dwelling units per acre. The proposed layout is shown on the following page.

Figure 2 - Site Plan

Tentative Map Findings

When considering a Tentative Subdivision Map the Washoe County development code requires that the Planning Commission determine if the proposal is in compliance with the required findings. The considered findings are as follows:

1) Plan Consistency – Determine that the proposed map is consistent with the Master Plan and any specific plan.

   Response: The proposed map is in conformance with all of the goals and policies of the Spanish Springs Area Plan. There are no specific plans associated with this request.

2) Design or Improvement – Determine that the design or improvement of the proposed subdivision is consistent with the Master Plan and any specific plan.

   Response: The subdivision design complies with the policies of the Spanish Springs Area Plan all the elements of the Washoe County Master Plan.

3) Type of Development – Determine that the project site is physically suited for the type of development proposed.

   Response: The proposed subdivision is located in an area with similar subdivisions to the north and west. Property to the south is vacant with Industrial, Commercial and Open Space zoning and the easterly property is Rural Residential. The proposed project is a suitable fit.

4) Availability of Service – That the subdivision will meet the requirements of article 702, Adequate Public Facilities Management System.

   Response: Adequate facilities exist to accommodate the proposed development. Any determined deficiencies and/or required infrastructure to connect to existing facilities will be borne by the developer.

5) Fish or Wildlife – Determine that neither the design of the subdivision nor any proposed improvements is likely to cause substantial environmental damage, or substantial and avoidable injury to any endangered plant, wildlife or their habitat.

   Response: There are no identified endangered plants or wildlife on the subject property.

6) Public Health – Determine that the design of the subdivision or type of improvement is not likely to cause significant public health problems.

   Response: The proposed subdivision is similar to other residential subdivisions in the surrounding area and the design is not likely to cause significant health problems.

7) Easements – Determine that the design of the subdivision or the type of improvements will not conflict with easements acquired by the public at large for access through, or use of property within, the proposed subdivision.

   Response: The design of the subdivision takes into account all existing easements and will provide access points at various locations to surrounding properties.

8) Access – Determine that the design of the subdivision provides any necessary access to surrounding, adjacent lands and provides appropriate secondary access for emergency vehicles.

   Response: The proposed subdivision provides necessary access to surrounding, adjacent lands. Multiple access points have been provided.

9) Dedications – Determine that any land or improvements to be dedicated to Washoe County is consistent with the Master Plan.

   Response: All lands to be dedicated to Washoe County are consistent with the Master Plan.

10) Energy – Determine that the design of the subdivision provides, to the extent feasible, for future passive or natural heating or cooling opportunities in the subdivision.

Response: Adequate opportunities shall be provided for future passive or natural heating or cooling to the extent feasible.

APPENDIX "A"

DEVELOPMENT APPLICATION

Axion ENGINEERING
Civil Engineering • Land Development

Washoe County Development Application

Your entire application is a public record. If you have a concern about releasing personal information, please contact Planning and Development staff at 775.328.3600.

Project Information

Staff Assigned Case No.: ______________

Project Name:	Sugarloaf Ranch Estates
Project Description:	119 lot single family residential subdivision
Project Address:	370 Calle De La Plata
Project Area (acres or square feet):	39.85 acres

Project Location (with point of reference to major cross streets **AND** area locator):
Spanish Springs Valley. The parcel is about ¼ miles east of of the intersection with Pyramid Highway

Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No(s):	Parcel Acreage:
534-562-07	39.85		

Section(s)/Township/Range: Portion of SE 1/4 Section 23, SW 1/4 Section 24, T. 21 N, R. 20 E.

Indicate any previous Washoe County approvals associated with this application:
Case No.(s).

Applicant Information (attach additional sheets if necessary)

Property Owner:		**Professional Consultant:**	
Name: Sugarloaf Peak, LLC		Name: Axion Engineering	
Address: 2777 Northtowne Lane		Address: 681 Edison Way	
Reno, NV	Zip: 89512	Reno, NV	Zip: 89503
Phone: 775-359-7245	Fax:	Phone: 775-771-5554	Fax: 775-856-3951
Email: jbhreno@aol.com		Email: gary@axionengineering.net	
Cell: 775-750-0426	Other:	Cell:	Other:
Contact Person: Jim House		Contact Person: Gary Guzelis	
Applicant/Developer:		**Other Persons to be Contacted:**	
Name: Same		Name:	
Address:		Address:	
	Zip:		Zip:
Phone:	Fax:	Phone:	Fax:
Email:		Email:	
Cell:	Other:	Cell:	Other:
Contact Person:		Contact Person:	

For Office Use Only

Date Received:	Initial:	Planning Area:
County Commission District:		Master Plan Designation(s):
CAB(s):		Regulatory Zoning(s):

Property Owner Affidavit

Applicant Name: Sugarloaf Peak LLC, Jim House

The receipt of this application at the time of submittal does not guarantee the application complies with all requirements of the Washoe County Development Code, the Washoe County Master Plan or the applicable area plan, the applicable regulatory zoning, or that the application is deemed complete and will be processed.

STATE OF NEVADA)
)
COUNTY OF WASHOE)

I, Jim House,
(please print name)

being duly sworn, depose and say that I am the owner* of the property or properties involved in this application as listed below and that the foregoing statements and answers herein contained and the information herewith submitted are in all respects complete, true and correct to the best of my knowledge and belief. I understand that no assurance or guarantee can be given by members of Planning and Development.

(A separate Affidavit must be provided by each property owner named in the title report.)

Assessor Parcel Number(s): 534-562-07

Printed Name Jim House

Signed

Address 2777 Northtowne Lane

Reno, NV 89512

Subscribed and sworn to before me this 14th day of January, 2016.

(Notary Stamp)

MYCOLE ENCISO
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 15-1630-2 - Expires May 18, 2019

Notary Public in and for said county and state

My commission expires: 05/18/2019

*Owner refers to the following: (Please mark appropriate box.)

- ☒ Owner
- ☐ Corporate Officer/Partner (Provide copy of recorded document indicating authority to sign.)
- ☐ Power of Attorney (Provide copy of Power of Attorney.)
- ☐ Owner Agent (Provide notarized letter from property owner giving legal authority to agent.)
- ☐ Property Agent (Provide copy of record document indicating authority to sign.)
- ☐ Letter from Government Agency with Stewardship

Tentative Subdivision Map Application
Supplemental Information

(All required information may be separately attached)

Chapter 110 of the Washoe County Code is commonly known as the Development Code. Specific references to tentative subdivision maps may be found in Article 608, Tentative Subdivision Maps.

1. What is the location (address or distance and direction from nearest intersection)?

The location is 370 Calle De La Plata in the Spanish Springs Valley. The parcel is about ¼ miles east of the intersection with the Pyramid Highway. It is APN 534-562-07. A legal description is attached in the Preliminary Title Report which is part of this application.

2. What is the subdivision name (proposed name must not duplicate the name of any existing subdivision)?

Sugarloaf Ranch Estates

3. Density and lot design:

a. Acreage of project site	39.85 acres
b. Total number of lots	119
c. Dwelling units per acre	2.986
d. Minimum and maximum area of proposed lots	8,050 sf min; 17,261 sf max.
e. Minimum width of proposed lots	70 feet
f. Average lot size	10,317 square feet

4. Utilities:

a. Sewer Service	Washoe County Utilities
b. Electrical Service	NV Energy
c. Telephone Service	AT&T
d. LPG or Natural Gas Service	NV Energy
e. Solid Waste Disposal Service	Waste Management of Nevada
f. Cable Television Service	Charter
g. Water Service	TMWA

5. For common open space subdivisions (Article 408), please answer the following:

   a. Acreage of common open space:

5.66 acres

   b. Development constraints within common open space (slope, wetlands, faults, springs, ridgelines):

None

   c. Range of lot sizes (include minimum and maximum lot size):

8,050 sf min; 17,261 sf max.

   d. Average lot size:

10,317 square feet

   e. Proposed yard setbacks if different from standard:

Front to structure 20' Front to garage 20' Sideyard 7' Backyard 20'

   f. Justification for setback reduction or increase, if requested:

Common open space development. Setbacks requested to match Washoe County MDS 4 zoning. The request for the 7' minimum sideyard setback is to provide a 10' to 12' setback on the opposing side of the lot for access to side and rear yard. Per the Tentative Map drawing approximately 75% of the lots will have this access.

   g. Identify all proposed non-residential uses:

None

h. Improvements proposed for the common open space:

Some of the common areas will incorporate walking trails that are proposed to tie into the existing trail system to the north of the project and connections will be offered to the west and east properties as well. Common area space will also be used as a buffer from the surrounding properties, contain drainage facilities and be landscaped as shown in the preliminary landscape plan.

i. Describe or show on the tentative map any public or private trail systems within common open space of the development:

Proposed trail improvements are shown on the tentative map drawings. Coordination with the surrounding property owners will be required for perpetuation.

j. Describe the connectivity of the proposed trail system with existing trails or open space adjacent to or near the property:

Currently the only trail system existing is on the property adjacent to Sugarloaf Ranch Estates to the north. Points of connection are shown on the plans. We propose to connect to the easterly property should they choose to have a trail system as well. The westerly property contains a singly family residence. No trail perpetuation is anticipated at this time however trail stubs can be provided.

k. If there are ridgelines on the property, how are they protected from development?

Not applicable.

l. Will fencing be allowed on lot lines or restricted? If so, how?

Fencing is anticipated to follow typical single family residential guidelines and Washoe County code.

m. Identify the party responsible for maintenance of the common open space:

A maintenance association will be created to take care of the common open space. Fees will be supported by homeowner dues.

6. Is the project adjacent to public lands or impacted by "Presumed Public Roads" as shown on the adopted April 27, 1999 Presumed Public Roads (see Washoe County Engineering website at http://www.washoecounty.us/pubworks/engineering.htm). If so, how is access to those features provided?

Not applicable.

7. Is the parcel within the Truckee Meadows Service Area?

☑ Yes	☐ No

8. Is the parcel within the Cooperative Planning Area as defined by the Regional Plan?

☐ Yes	☑ No	If yes, within what city?

9. Will a special use permit be required for utility improvement? If so, what special use permits are required and are they submitted with the application package?

Not applicable.

10. Has an archeological survey been reviewed and approved by SHPO on the property? If yes, what were the findings?

No

11. Indicate the type and quantity of water rights the application has or proposes to have available:

a. Permit #	71998	acre-feet per year	47.0
b. Certificate #		acre-feet per year	
c. Surface Claim #		acre-feet per year	
d. Other #		acre-feet per year	

e. Title of those rights (as filed with the State Engineer in the Division of Water Resources of the Department of Conservation and Natural Resources):

Water rights title attached.

12. Describe the aspects of the tentative subdivision that contribute to energy conservation:

Energy conservation is typically improved by use of energy efficient building materials including windows, doors, insulation and structure wraps per current ICC's IECC energy codes. Energy efficient appliances and water efficient faucets, shower heads and toilets will be used.

13. Is the subject property in an area identified by Planning and Development as potentially containing rare or endangered plants and/or animals, critical breeding habitat, migration routes or winter range? If so, please list the species and describe what mitigation measures will be taken to prevent adverse impacts to the species:

Bighorn Sheep-not an occupied area, Black Bear-not a habitat/range, Sage grouse-outside of brooding area, Pronghorn Antelope-year round habitat, Potential Golden Eagle in area, Wild Horse-outside heard management area, Mule Deer-limited habitat area. Vegetative Communities consist primarily of sagebrush with scattered basin & desert scrub. There are no topographic or scenic features & the site has a strong shaking seismic hazard. A portion of the site is within 1% FEMA flood area and is otherwise unconstrained per Washoe County development constraints/suitability

14. If private roads are proposed, will the community be gated? If so, is a public trail system easement provided through the subdivision?

Not applicable.

15. Is the subject property located adjacent to an existing residential subdivision? If so, describe how the tentative map complies with each additional adopted policy and code requirement of Article 434, Regional Development Standards within Cooperative Planning Areas and all of Washoe County, in particular, grading within 50 and 200 feet of the adjacent developed properties under 5 acres and parcel matching criteria:

Not applicable.

16. Are there any applicable policies of the adopted area plan in which the project is located that require compliance? If so, which policies and how does the project comply?

The project will comply with the applicable policies of the adopted Spanish Springs Area Plan.

17. Are there any applicable area plan modifiers in the Development Code in which the project is located that require compliance? If so, which modifiers and how does the project comply?

No, there are no plan modifiers for this area.

18. Will the project be completed in one phase or is phasing planned? If so, please provide that phasing plan:

At this time phasing is unknown and will depend on the developer. Phasing will be determined at the improvement plan preparation stage and discussed with Washoe County. It is anticipated that the phasing could be between one and three.

19. Is the project subject to Article 424, Hillside Development? If yes, please address all requirements of the Hillside Ordinance in a separate set of attachments and maps.

☐ Yes	☑ No	If yes, include a separate set of attachments and maps.

20. Is the project subject to Article 418, Significant Hydrologic Resources? If yes, please address Special Review Considerations within Section 110.418.30 in a separate attachment.

☐ Yes	☑ No	If yes, include separate attachments.

Grading

Please complete the following additional questions if the project anticipates grading that involves: (1) Disturbed area exceeding twenty-five thousand (25,000) square feet not covered by streets, buildings and landscaping; (2) More than one thousand (1,000) cubic yards of earth to be imported and placed as fill in a special flood hazard area; (3) More than five thousand (5,000) cubic yards of earth to be imported and placed as fill; (4) More than one thousand (1,000) cubic yards to be excavated, whether or not the earth will be exported from the property; or (5) If a permanent earthen structure will be established over four and one-half (4.5) feet high:

21. How many cubic yards of material are you proposing to excavate on site?

100,000 cy

22. How many cubic yards of material are you exporting or importing? If exporting of material is anticipated, where will the material be sent? If the disposal site is within unincorporated Washoe County, what measures will be taken for erosion control and revegetation at the site? If none, how are you balancing the work on-site?

Currently the project will require imported material to accomplish the required grading. This is a result of the project site having a natural low point ruining east to west in the center of the site and and due to having the drainage and sewer flow towards Calle De La Plata. With cooperation from the easterly property owner we will likely be able to achieve a balanced earthwork site by taking the sewer through their site to its point of connection east of Pyramid Highway.

23. Can the disturbed area be seen from off-site? If yes, from which directions, and which properties or roadways? What measures will be taken to mitigate their impacts?

Cut and fill slopes are minimal and occur within the project and around the perimeter of the project. The cut and fill slopes around the perimeter of the project are within the common open space and will be partially screened by the landscaping improvements.

24. What is the slope (Horizontal:Vertical) of the cut and fill areas proposed to be? What methods will be used to prevent erosion until the revegetation is established?

Cut and fill slopes will be either 2:1 or 3:1. A soil tackifier and biodegradable mulch will be applied as part of the hydroseed slurry mix.

25. Are you planning any berms and, if so, how tall is the berm at its highest? How will it be stabilized and/or revegetated?

No berms are planned at this time.

26. Are retaining walls going to be required? If so, how high will the walls be, will there be multiple walls with intervening terracing, and what is the wall construction (i.e. rockery, concrete, timber, manufactured block)? How will the visual impacts be mitigated?

No retaining walls are planned at this time however small landscape walls may be used upon final design.

27. Will the grading proposed require removal of any trees? If so, what species, how many, and of what size?

One isolated existing native juniper tree will be removed. It is approx. 12' to 15' tall and has a caliper of about 10 inches.

28. What type of revegetation seed mix are you planning to use and how many pounds per acre do you intend to broadcast? Will you use mulch and, if so, what type?

The revegetation seed blend will be a native/naturalized blend applied at rate of 31 pounds per acre. A wood fiber mulch will be included in the hydroseed slurry.

29. How are you providing temporary irrigation to the disturbed area?

Temporary irrigation will be provided through connection to installed water meters.

30. Have you reviewed the revegetation plan with the Washoe Storey Conservation District? If yes, have you incorporated their suggestions?

No

Request to Reserve New Street Name(s)

The Applicant is responsible for all sign costs.

Applicant Information

Name: Sugarloaf Peak, LLC

Address: 2777 Northtowne Lane

Reno, NV 89502

Phone : 775-771-5554 Fax: ____________

☐ Private Citizen ☑ Agency/Organization

Street Name Requests

(No more than 14 letters or 15 if there is an "i" in the name. Attach extra sheet if necessary.)

Seaberry	
Cloudberry	
Bayberry	
Pecan	
Chesnut Vine	
Malabar	
Pawpaw	
Hickory	

If final recordation has not occurred within one (1) year, it is necessary to submit a written request for extension to the coordinator prior to the expiration date of the original approval request.

Location

Project Name: Sugarloaf Ranch Estates

☐ Reno ☐ Sparks ☑ Washoe County

Parcel Numbers: 534-562-07

☑ Subdivision ☐ Parcelization ☐ Private Street

Please attach maps, petitions and supplementary information.

Approved: ______________________ Date: ____________

Regional Street Naming Coordinator

☐ Except where noted

Denied: ______________________ Date: ____________

Regional Street Naming Coordinator

Washoe County **CSD Engineering and Capital Projects Division**

Post Office Box 11130 - 1001 E. Ninth Street

Reno, NV 89520-0027

Phone: (775) 328-3667 - Fax: (775) 328-6133 Email: streetnames@washoecounty.us

PROPERTY TAX INFORMATION

Axion ENGINEERING
Civil Engineering • Land Development

Washoe County Treasurer
P.O. Box 30039, Reno, NV 89520-3039
ph: (775) 328-2510 fax: (775) 328-2500
Email: tax@washoecounty.us

Account Detail

Washoe County Parcel Information

Parcel ID	Status	Last Update
53456207	Active	1/22/2016 7:12:00 AM

Current Owner:
SUGARLOAF PEAK LLC

2777 NORTHTOWNE LN OFC
RENO, NV 89512

SITUS:
370 CALLE DE LA PLATA
WCTY NV

Taxing District
4000

Geo CD:

Legal Description

Section 23 Lot 24 1 0 1 Township 21 Range 20 SubdivisionName _UNSPECIFIED

Tax Bill (Click on desired tax year for due dates and further details)

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2015	$680.44	$680.44	$0.00	$0.00	$0.00
2014	$680.46	$680.46	$0.00	$0.00	$0.00
2013	$680.44	$680.44	$0.00	$0.00	$0.00
2012	$850.58	$850.59	$0.00	$0.00	$0.00
2011	$899.14	$899.14	$0.00	$0.00	$0.00
				Total	$0.00

Pay Online

No payment due for this account.

$0.00

Pay By Check

Please make checks payable to:
WASHOE COUNTY TREASURER

Mailing Address:
P.O. Box 30039
Reno, NV 89520-3039

Overnight Address:
1001 E. Ninth St., Ste D140
Reno, NV 89512-2845

Payment Information

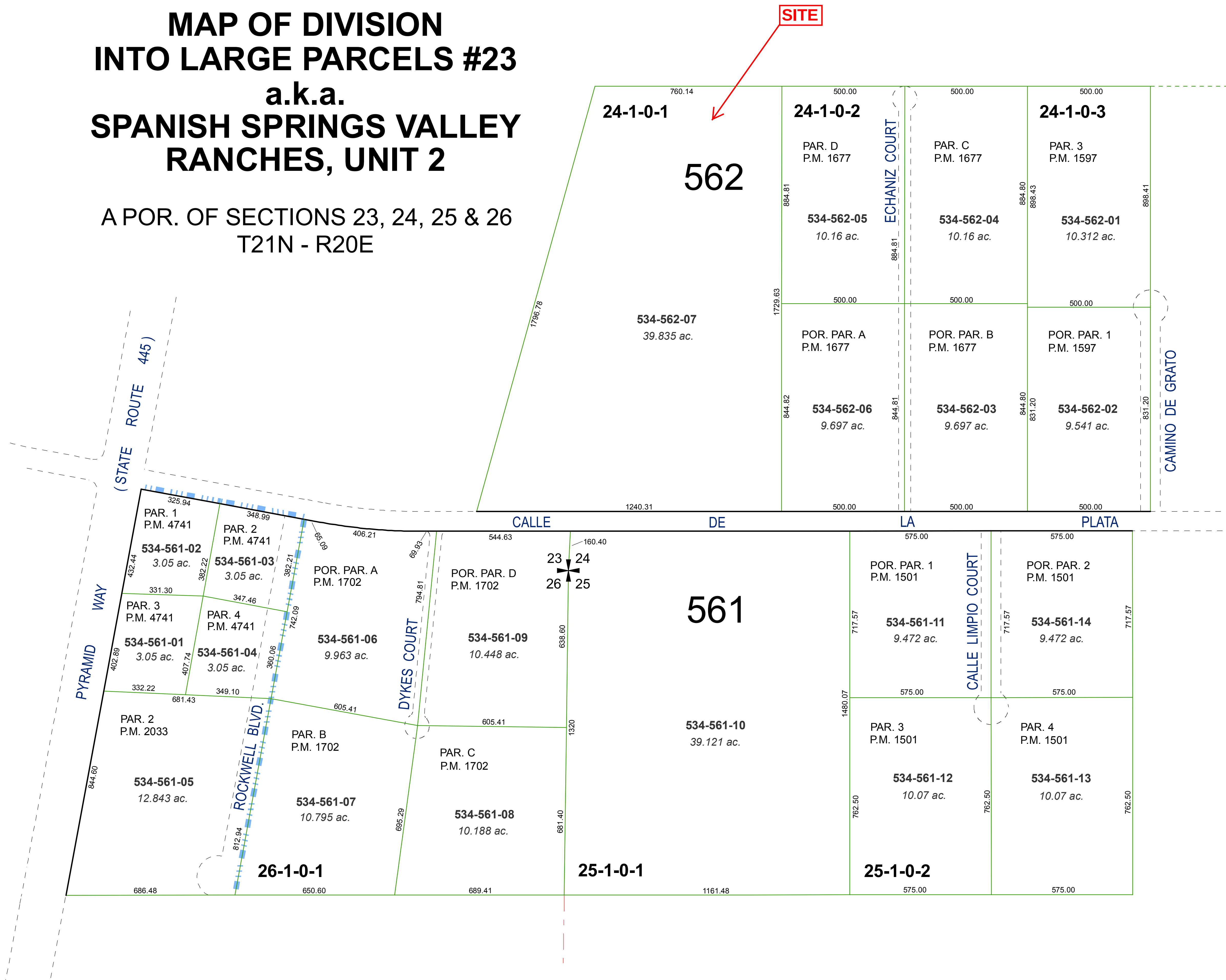
Special Assessment District

ASSESSOR'S MAP

Axion
ENGINEERING
Civil Engineering • Land Development

MAP OF DIVISION INTO LARGE PARCELS #23 a.k.a. SPANISH SPRINGS VALLEY RANCHES, UNIT 2

A POR. OF SECTIONS 23, 24, 25 & 26
T21N - R20E



Assessor's Map Number

534-56

STATE OF NEVADA

WASHOE COUNTY
ASSESSOR'S OFFICE
Joshua G. Wilson, Assessor

1001 East Ninth Street
Building D
Reno, Nevada 89512
(775) 328-2231

Feet
0 100 200 300 400

1 inch = 400 feet

created by: KSB 1/25/11

last updated:

area previously shown on map(s)
076-40

NOTE: This map was prepared for the use of the Washoe County Assessor for assessment and illustrative purposes only. It does not represent a survey of the premises. No liability is assumed as to the sufficiency or accuracy of the data delineated hereon.

WATER RIGHTS

Axion
ENGINEERING
Civil Engineering • Land Development

Balances for Permit Number: 71998

Status: Permitted

Will Serve # or Credit	Project Name	Project Types		Duty	Claim #	Date

House, James B., trustee of the James B. House Living Trust

CREDIT	Future Development			-10.575	88/88a	9/15/2009
Spanish Springs lot 534-562-07						
Assignment	South Reno Investors, LLC to James B. House Trustee of the James B. House, Living Trust			-36.425	88/88a	9/15/2009

Total uncomitted Af for House, James B., trustee of the J -47.0000

Housing Resources Company, L.C. 55%, Gateway Company, L.C. 45%

CREDIT	Mountaingate Ph. 2A-3 16 lots			-1.04		##########
2013-034	Mountaingate Ph. 2A-3 16 lots	TMWA 11%		0		##########
Interim Creek Exchange TMWA 11% - Meter Retrofit review fee of $17,375 deposited in separate account for future when WACO and TMWA combined						

Total uncomitted Af for Housing Resources Company, L. -1.0400

Ryder Homes of Nevada, Inc.

CREDIT	Future Development			-31.434	88/88a	7/20/2005
Assignment	Ryder Homes of Nevada, Inc to South Reno Investors, LLC			31.434	88/88a	7/20/2005
CREDIT	Future Deveoplement	Subdivision		-4.991	88/88a	2/21/2008
ASSIGNMENT	Ryder Homes of Nevada, Inc. to South Reno Investors, LLC	Subdivision		4.991	88/88a	2/21/2008

Total uncomitted Af for Ryder Homes of Nevada, Inc. 0.0000

South Reno Investors, LLC

Assignment	Ryder Homes of Nevada, Inc to South Reno Investors, LLC			-31.434	88/88a	7/20/2005
ASSIGNMENT	Ryder Homes of Nevada, Inc. to South Reno Investors, LLC	Subdivision		-4.991	88/88a	2/21/2008
Assignment	South Reno Investors, LLC to James B. House Trustee of the James B. House, Living Trust			36.425	88/88a	9/15/2009

Total uncomitted Af for South Reno Investors, LLC 0.0000

Village at ArrowCreek Parkway, LLC

2013-010	Village at Arrowcreek Apartments	Commercial	RF	9.79	88/88a	4/30/2013
208 apartments						
2013-010	Village at Arrowcreek Apartments	WC 58% Drought Yield		18.89	88/88a	4/30/2013
208 apartments						

Will Serve # or Credit	Project Name	Project Types	Duty	Claim #	Date
2013-010	Village at Arrowcreek Apartments	Commercial	26.09	88/88a	4/30/2013
208 apartments					
CREDIT	Future Development		-54.77	88/88a	##########

Total uncomitted Af for Village at ArrowCreek Parkway, L 0.0000

Total WC dedicated, uncomitted duty: 71998 -48.0400

NO. 71998

APPLICATION FOR PERMISSION TO CHANGE POINT OF DIVERSION, MANNER OF USE AND PLACE OF USE OF THE PUBLIC WATERS OF THE STATE OF NEVADA HERETOFORE APPROPRIATED

Date of filing in State Engineer's Office DEC 09 2004

Returned to applicant for correction

Corrected application filed

Map filed DEC 09 2004

****

The applicant **RYDER HOMES OF NEVADA, INC.** makeS application for permission to change the **POINT OF DIVERSION PLACE OF USE AND MANNER OF USE OF A PORTION** of water heretofore appropriated under **ClaimS #88 and 88a of the Truckee River Decree, said decree entered in the District Court of The United States for Nevada in that certain action entitled, "The United States of America, Plaintiff, vs. Orr Water Ditch Company, et al., Defendants," in Equity Docket No. A-3.**

****

1. The source of water is **TRUCKEE RIVER**

2. The amount of water to be changed **1.02 CFS NOT TO EXCEED 190.17 ACRE FEET ANNUALLY**

3. The water to be used for **MUNICIPAL**

4. The water heretofore permitted for **AS DECREED**

5. The water is to be diverted at the following point **SEE EXHIBIT "A" ATTACHED HERETO AND MAP SUPPORTING APPLICATION 71534 ON FILE WITH THE STATE ENGINEER.**

6. The existing permitted point of diversion is located within **NE¼ SW¼ OF SECTION 31, T.19N., R.18E., M.D.B.&M. OR AT A POINT FROM WHICH THE SOUTHEAST CORNER OF SAID SECTION 31 BEARS S. 62° 04' E. A DISTANCE OF 3195.00 FEET (STEAMBOAT CANAL).**

7. Proposed place of use **SEE EXHIBIT "B" ATTACHED HERETO AND MAP SUPPORTING APPLICATION 71534 ON FILE WITH THE NEVADA STATE ENGINEER.**

8. Existing place of use **SECTION 20, T.18N., R.20E., M.D.B.&M**
SW¼ SE¼ - 12.37 ACRES
NW¼ SE¼ - 0.06 SEE MAP TR-018
NE¼ SW¼ - 14.175
SE¼ SW¼ - 20.88 TOTAL: 47.485

9. Use will be from **JANUARY 1** to **DECEMBER 31** of each year.

10. Use was permitted from **AS DECREED**

11. Description of proposed works **WATER WILL BE DIVERTED BY EXISTING TMWA AND/OR WASHOE COUNTY FACILITIES, TREATED AND PLACED INTO EXISTING DISTRIBUTION SYSTEMS OF TMWA AND/OR WASHOE COUNTY.**

12. Estimated cost of works **EXISTING**

13. Estimated time required to construct works **EXISTING**

14. Estimated time required to complete the application of water to beneficial use **TEN YEARS**

15. Remarks:

By **ROBERT E. FIRTH**
s/ **Robert E. Firth**
360 E. RIVERVIEW CIRCLE
RENO, NV 89509

Compared **gkl/** sc lb/gkl

Protested

****

APPROVAL OF STATE ENGINEER

This is to certify that I have examined the foregoing application, and do hereby grant the same, subject to the following limitations and conditions:

This permit to change the point of diversion, manner of use and place of use of a portion of the waters of the Truckee River as heretofore granted under Claim 88/88a, Truckee River Final Decree is issued subject to the terms and conditions imposed in said decree and with the understanding that no other rights on the source will be affected by the change proposed herein. A suitable measuring device must be installed and accurate measurements of water placed to beneficial use must be kept.

This permit does not extend the permittee the right of ingress and egress on public, private or corporate lands.

The issuance of this permit does not waive the requirements that the permit holder obtain other permits from State, Federal and local agencies.

(CONTINUED ON PAGE 3)

 71998
(Permit Terms Continued)

The amount of water to be appropriated shall be limited to the amount which can be applied to beneficial use, and not to exceed **1.024** cubic feet per second, **but not to exceed 190.17 acre-feet as decreed**

Work must be prosecuted with reasonable diligence and be completed on or before:
N/A

Proof of completion of work shall be filed on or before:
N/A

Water must be placed to beneficial use on or before:
May 6, 2015

Proof of the application of water to beneficial use shall be filed on or before:
June 6, 2015

Map in support of proof of beneficial use shall be filed on or before:
N/A

IN TESTIMONY WHEREOF, I, HUGH RICCI, P.E.,

State Engineer of Nevada, have hereunto set

my hand and the seal of my office,

this **6th** day of **May** A.D. **2005**

H. Ricci, P.E.
State Engineer

Completion of work filed November 12, 2004 under 71420.

Proof of beneficial use filed ______

Cultural map filed N/A

Certificate No. ______ Issued ______

71998

EXHIBIT "A"

The following describes the multiple points of diversion for Truckee Meadows Water Authority Water Treatment Plants and Washoe County Hidden Valley Induction Well #4, which are shown on the map accompanying Application No. 71534 on file with the State of Nevada, Division of Water Resources, more particularly described as follows:

STEAMBOAT CANAL (HUNTER CREEK RESERVOIR):

The existing point of diversion is situate within the Northeast one-quarter of the Southwest one-quarter (NE¼ SW¼) of Section 31, T.19N., R.18E., M.D.B.&M., Washoe County, Nevada, from said point of diversion, the Southeast corner of said Section 31 bears South 62°04' East, a distance of 3,195.00 feet.

HIGHLAND DITCH (HIGHLAND RESERVOIR):

The existing point of diversion is situate within the Southwest one-quarter of the Southeast one-quarter (SW¼ SE¼) of Section 9, T.19N., R.18E., M.D.B.&M., Washoe County, Nevada, from said point of diversion, the Southeast corner of said Section 9 bears South 75°16' East, a distance of 1,650.00 feet.

IDLEWILD TREATMENT PLANT:

The existing point of diversion is situate within the Southeast one-quarter of the Southeast one-quarter (SE¼ SE¼) of Section 10, T.19N., R.19E., M.D.B.&M., Washoe County, Nevada, from said point of diversion, the Southeast corner of said Section 10 bears South 69°57'58" East, a distance of 842.34 feet.

NORTH TRUCKEE DITCH (GLENDALE TREATMENT PLANT):

The existing point of diversion is situate within the Southwest one-quarter of the Northeast one-quarter (SW¼ NE¼) of Section 7, T.19N., R.20E., M.D.B.&M., Washoe County, Nevada, from said point of diversion, the Northeast corner of said Section 7 bears North 39°28' East, a distance of 3,015.00 feet.

ORR DITCH PUMP STATION (CHALK BLUFF TREATMENT PLANT):

The point of diversion is situate within the Northeast one-quarter of the Southeast one-quarter (NE¼ SE¼) of Section 17, T.19N., R.19E., M.D.B.&M., Washoe County, Nevada, from said point of diversion the Northeast corner of said Section 17 bears North 15°39'36" East, a distance of 3,264.77 feet.

ORR DITCH (CHALK BLUFF TREATMENT PLANT):

The point of diversion is situate within the Northeast one-quarter of the Southwest one-quarter (NE¼ SW¼) of Section 17, T.19N., R.19E., M.D.B.&M., Washoe County, Nevada, from said point of diversion the Southwest corner of said Section 17 bears South 44°40' West, a distance of 3,211.00 feet.

WASHOE COUNTY (HIDDEN VALLEY INDUCTION WELL #4)

The point of diversion is situate within the West one-half of the Northwest one-quarter (W½ NW¼) of Section 16 T.19N., R.20E., M.D.B.&M., Washoe County, Nevada from said point of diversion the West one-quarter corner of Section 21, T.19N., R.20E., M.D.B.&M. bears South 09°54'07"W a distance of 6929.94 feet.

"B"
EXHIBIT "~~A~~"
PROPOSED PLACE OF USE

DIVISION	SECTION	T-N	R-E	
ALL	1 – 5	18	18	M.D.B.& M.
E ½	6 & 7	18	18	M.D.B.& M.
ALL	8 – 17	18	18	M.D.B.& M.
E ½	18 & 19	18	18	M.D.B.& M.
ALL	20 – 29	18	18	M.D.B.& M.
E ½	30 & 31	18	18	M.D.B.& M.
ALL	32 – 36	18	18	M.D.B.& M.
ALL	1 – 5	19	18	M.D.B.& M.
E ½	6 & 7	19	18	M.D.B.& M.
ALL	8 – 17	19	18	M.D.B.& M.
E ½	18 & 19	19	18	M.D.B.& M.
ALL	20 – 29	19	18	M.D.B.& M.
E ½	30 & 31	19	18	M.D.B.& M.
ALL	32 – 36	19	18	M.D.B.& M.
ALL	1 – 5	20	18	M.D.B.& M.
E ½	6 & 7	20	18	M.D.B.& M.
ALL	8 – 17	20	18	M.D.B.& M.
E ½	18 & 19	20	18	M.D.B.& M.
ALL	20 – 29	20	18	M.D.B.& M.
E ½	30 & 31	20	18	M.D.B.& M.
ALL	32 – 36	20	18	M.D.B.& M.
ALL	1 – 5	21	18	M.D.B.& M.
E ½	6 & 7	21	18	M.D.B.& M.
ALL	8 – 17	21	18	M.D.B.& M.
E ½	18 & 19	21	18	M.D.B.& M.
ALL	20 – 29	21	18	M.D.B.& M.
E ½	30 & 31	21	18	M.D.B.& M.
ALL	32 – 36	21	18	M.D.B.& M.
ALL	1 – 36	17	19	M.D.B.& M.
ALL	1 – 36	18	19	M.D.B.& M.
ALL	1 – 36	19	19	M.D.B.& M.
ALL	1 – 36	20	19	M.D.B.& M.
ALL	1 – 36	21	19	M.D.B.& M.

DIVISION	SECTION	T-N	R-E	
ALL	5 & 6	16	20	M.D.B.& M.
ALL	1 – 36	17	20	M.D.B.& M.
ALL	2 – 35	18	20	M.D.B.& M.
W ½	36	18	20	M.D.B.& M.
ALL	1 – 12	19	20	M.D.B.& M.
ALL	14 – 23	19	20	M.D.B.& M.
ALL	26 – 35	19	20	M.D.B.& M.
ALL	1 – 36	20	20	M.D.B.& M.
ALL	1 – 36	21	20	M.D.B.& M.
ALL	1 – 36	20	21	M.D.B.& M.
ALL	1 – 36	21	21	M.D.B.& M.

See supporting map accompanying application 71534.

APPENDIX "B"

REPORTS and PLAN SETS

TMWA DISCOVERY
and
WATER SERVICE
ACKNOWLEDGEMENT

Axion
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December 5, 2015

To: Karen Meyer

Thru: Scott Estes

From: Holly Flores HMF

Re: 370 Calle De La Plata Discovery – Preliminary Water Facility Requirements

PURPOSE:
Determine the least cost facility plan to provide water service to the proposed 119 unit subdivision in the Spanish Springs Valley. The preliminary Tentative Map for the subdivision is attached.

CONCLUSIONS AND RECOMMENDATIONS:
The project will require annexation to TMWA's retail water service territory prior to service. Once successfully annexed, water service can be provided by the Desert Springs System by extending water main in Calle De La Plata to the property and constructing two new pressure regulating stations. The preliminary cost estimate for service to the 370 Calle De La Plata project is approximately $2,275,392. The included costs consist of Rate Schedule WSF charges for Area 12 and Supply and Treatment and major water facility improvements required for service.

DISCUSSION:
Location:
The 370 Calle De La Plata subdivision consists of 119 single-family residential units on APN 534-562-07 in Sections 23 and 24 in T21N, R20E, MDM in the Spanish Springs Valley. The project is located north of Calle De La Plata and east of Pyramid Way in Washoe County. Current development plans include 119 single-family residential units on 39.83 acres with average lot size of 8,000 square feet. The project is located outside the Truckee Meadows Water Authority's retail service territory and must be annexed prior to service. An exhibit is attached showing the project location in relation to existing water facilities and retail service boundary.

Estimated Demands:
The maximum day domestic demand for the project has been estimated at 96 gpm. No separate potable irrigation demand was included in this analysis as it is unknown at this time. In addition, fire requirements are unknown and must be set by the Fire Authority prior to service.

Water Facility Requirements and Cost Estimates:
The project can be served by extending water main in Calle De La Plata and constructing two new pressure regulating stations as shown on the attached exhibit. The proposed westerly point of connection will be to the existing 14-inch main near Isidor Court in Calle De La Plata.

Crossing Pyramid Highway in NDOT R-O-W will likely require jack and bore. The easterly point of connection will be to the existing 16-inch main at El Caballo Trail. TMWA may invest in oversizing the Calle De La Plata water main. Pressure regulating stations can be constructed at the two entrances to project just north of Calle De La Plata.

The preliminary water system facility requirements based on the estimated maximum day demand are summarized in the table below:

Table 1: Estimated Major Water Facility Costs

Facility Description	Quantity	Unit	Unit Cost	Total Cost	Comments
Area 12 Facility Charge	96	per gpm	$5,789	$555,744	Rate Schedule WSF
Supply and Treatment Facility Charge	96	per gpm	$4,163	$399,648	Rate Schedule WSF
Pressure Regulating Stations	2	each	$60,000	$120,000	
Offsite Main Extensions	8,000	feet	$150	$1,200,000	Calle De La Plata
Estimated Cost				**$2,275,392**	2015 planning level estimate only

ASSUMPTIONS:

1. The 370 Calle De La Plata subdivision will be annexed into the Truckee Meadows Water Authority's retail water service territory.
2. This preliminary study was based on information provided by Axion Engineering in late October 2015 including a preliminary Tentative Map and average lot sizes of 8,000 square feet.
3. The water facility plan shown on the included exhibit is preliminary and subject to change.
4. Potable irrigation demands are unknown at this time.
5. Privately owned individual pressure regulating valves will be installed by the builder per TMWA design standards.
6. The estimated maximum day domestic demand for the project is 96 gpm. Actual demands will be determined at the time of application for service.
7. The fire flow requirement and duration has not been set by the governing fire agency and must be set prior to finalizing the water facility plan.
8. All cost estimates are preliminary and subject to change. The costs represented are preliminary planning level cost estimates that are based on the best information available today. Actual costs will be determined at the time of application for service.
9. This estimate does not include the cost of onsite facilities, water rights for the project or contribution to the water meter retrofit fund.
10. Dead ends must be eliminated and a looped water system designed, to the extent possible, per NAC 445A requirements. The Health Authority may require changes to the ultimate water facility plan that may in turn affect the included cost estimates.
11. The water facility plan proposed by TMWA must be reviewed for compliance with state and local codes and regulations and approved by the local health authority prior to service.

SUMMARY AND CONCLUSIONS:

The proposed 370 Calle De La Plata subdivision can be served by the Truckee Meadows Water Authority within the Desert Springs System. The 2015 planning level estimated cost for service to this project for is $2,275,392. Annexation to the Truckee Meadows Water Authority's retail water service territory is required.

/hmf

Attachments: Preliminary Tentative Map by Axion Engineering – reduced
TMWA Retail Service Boundary Figure
Preliminary Water Service Plan

cc: Gary Guzelis, P.E., Axion Engineering
File 15-4682

Axion ENGINEERING

Civil Engineering • Land Development

681 EDISON WAY – RENO, NEVADA 89502
PH 775-771-5354 / FX 775-856-3951

PROFESSIONAL ENGINEER – STATE OF NEVADA
GARY K. GUZELIS
Exp. 6-30-17
CIVIL
No. 10372

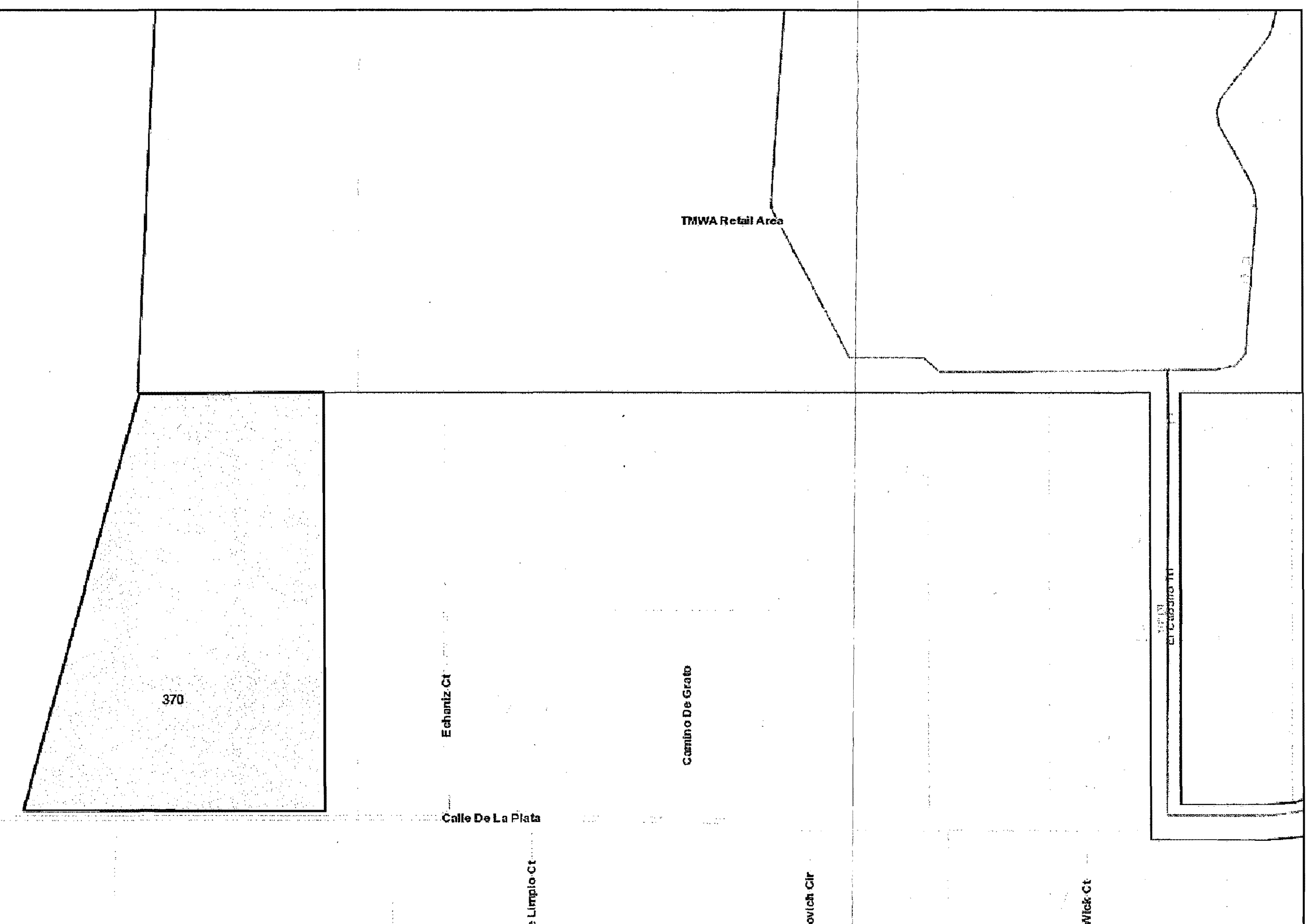
TENTATIVE MAP APPLICATION FOR
370 CALLE DE LA PLATA
LAYOUT 1
WASHOE COUNTY, NEVADA

revisions

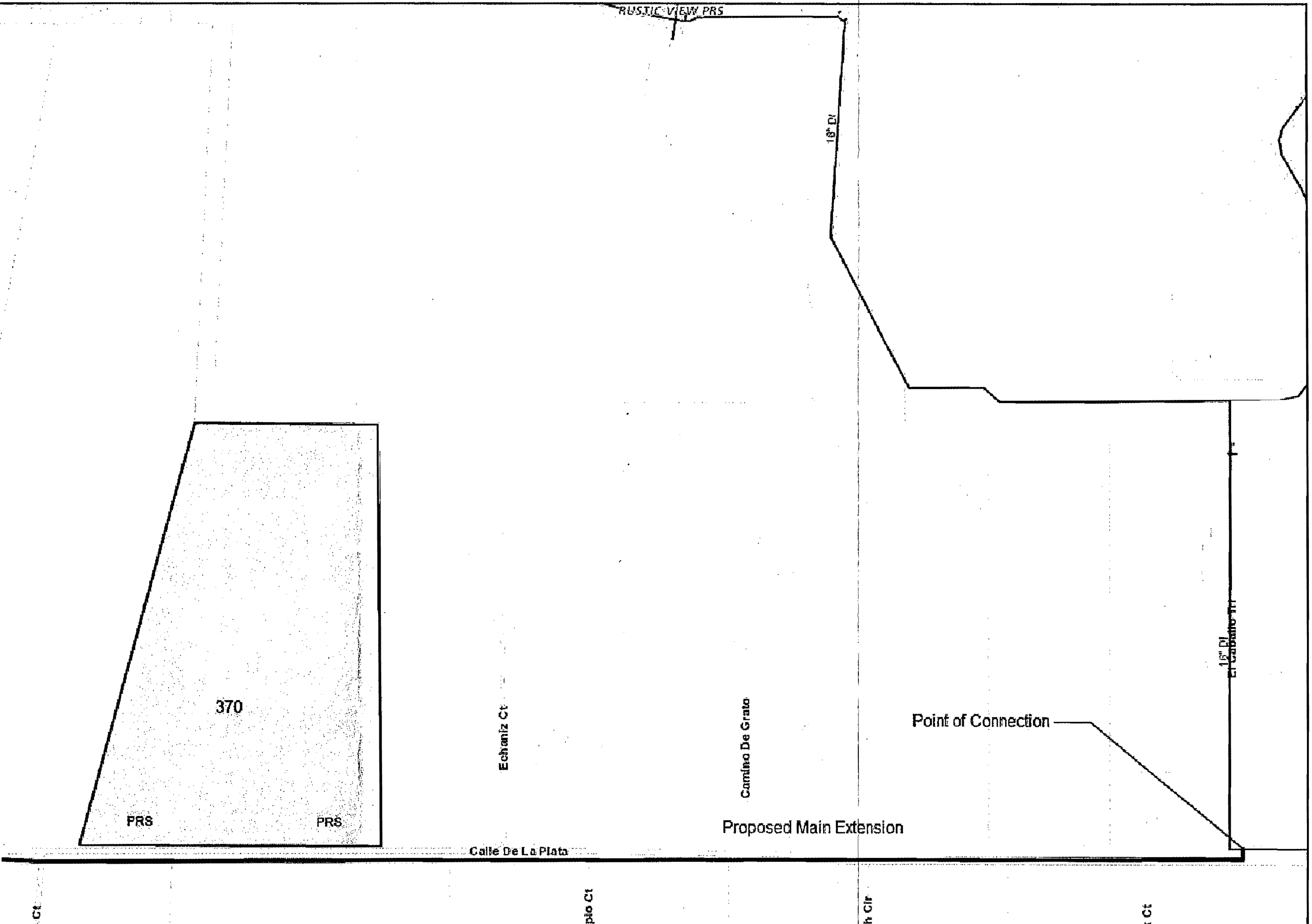
drawn:	GKG
checked:	GKG
date:	AUGUST 2015
scale:	1"=60'
project no:	15019

S-1

OF 1



TMWA Retail Area
370
Calle De La Plata
Echaniz Ct
Camino De Grato
e Limpio Ct
ovich Cir
Wick Ct


RUSTIC VIEW PRS
16" DI
370
PRS
PRS
Echaniz Ct
Camino De Grato
Point of Connection
Proposed Main Extension
Calle De La Plata
16" DI

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January 22, 2016

Gary Guzelis, P.E.
Axion Engineering
681 Edison Way
Reno, NV 89502

**RE: Sugarloaf Ranch Estates Tentative Map
Acknowledgement of Water Service**
(Tentative Map Review – 119 Units)

Dear Mr. Guzelis:

I have reviewed the plans for the above referenced development ("Project") and have determined the Project is outside the Truckee Meadows Water Authority's retail water service area. This letter constitutes an Acknowledgment of Water Service pursuant to NAC 445A.6666, and the Truckee Meadows Water Authority hereby acknowledges that Truckee Meadows Water Authority is agreeable to supplying water service to the Project subject to applicant satisfying certain conditions precedent, including, without limitation, annexation to the Truckee Meadows Water Authority's retail water service territory, the dedication of water resources, approval of the water supply plan by the local health authority, the execution of a Water Service Agreement, payment of fees, and the construction and dedication of infrastructure in accordance with our rules and tariffs. This Acknowledgement does not constitute a legal obligation by Truckee Meadows Water Authority to supply water service to the Project, and is made subject to all applicable Truckee Meadows Water Authority Rules.

Review of conceptual site plans or tentative maps by Truckee Meadows Water Authority does not constitute an application for service, nor implies a commitment by Truckee Meadows Water Authority for planning, design or construction of the water facilities necessary for service. The extent of required off-site and on-site water infrastructure improvements will be determined by Truckee Meadows Water Authority upon receiving a specific development proposal or complete application for service and upon review and approval of a water facilities plan by the local health authority. Because the NAC 445A Water System regulations are subject to interpretation, Truckee Meadows Water Authority cannot guarantee that a subsequent water facility plan will be approved by the health authority or that a timely review and approval of the Project will be made. The Applicant should carefully consider the financial risk associated with committing resources to their project prior to receiving all required approvals. After submittal of a complete Application for Service, the required facilities, the cost of these facilities, which could be significant, and associated fees will be estimated and will be included as part of the Water Service Agreement necessary for the Project. All fees must be paid to Truckee Meadows Water Authority prior to water being delivered to the Project.

Please call me at (775) 834-8026 at your convenience if you have any questions.

Sincerely,

Holly M Flores

Holly M. Flores, P.E.
Principal Engineer

cc: James English, Washoe County District Health Dept.
16-4799

TRAFFIC STUDY

Axion
ENGINEERING
Civil Engineering • Land Development

TRAFFIC IMPACT STUDY UPDATE

FOR

Sugarloaf Ranch Estates

September 15, 2015

PREPARED FOR:

Sugarloaf Peak LLC

PREPARED BY:

TRAFFIC WORKS LLC

PROFESSIONAL ENGINEER - STATE OF NEVADA
LOREN EDWARD CHILSON
Exp: 12-31-16
CIVIL
No. 15619

9-15-15

TRAFFIC WORKS, LLC
6170 Ridgeview Court, Suite B, Reno, NV 89519
775.322.4300
www.Traffic-Works.com

YOUR QUESTIONS ANSWERED QUICKLY

Why did you perform this study?

This report presents the findings of a Traffic Impact Study Update completed for the proposed land use change on an approximately 40 acre property known as Sugarloaf Ranch Estates, located in Spanish Springs, NV. This report is intended to update the previous *Village at the Peak Traffic Impact Study – Sugarloaf Peak Property, May 2012*.

What does the project consist of?

The land use and quantities are proposed to change from 360 multi-family units in the previous study to 119 single-family housing units.

How much traffic will the project generate?

The proposed project is anticipated to generate 1,139 total daily trips, 89 total AM peak hour trips (22 inbound and 67 outbound), and 120 total PM peak hour trips (72 inbound and 48 outbound). These trip generation estimates are approximately 45% to 50% lower than the traffic generation of the previously contemplated 360 unit multi-family project.

Are there any traffic impacts?

The Pyramid Highway/Calle de la Plata intersection operates at LOS "F" with or without the addition of the project traffic. The project adds traffic to this intersection and exacerbates the LOS "F" conditions.

With the RTP planned improvements, the intersection is anticipated to operate at acceptable LOS conditions in 2030.

What are the recommendations?

We recommend installing a traffic signal at the Pyramid Highway/Calle de la Plata intersection. The Spanish Springs Area Plan recognizes that a traffic signal is needed at this intersection to address the current situation.

The subject intersection operates at LOS "F" and meets MUTCD traffic signal warrants even without the addition of the project traffic. Hence, we recommend that the project apply for RRIF Waivers/Offset and construct the signal as an offset to its impact fees. Under the Existing Plus Project scenario, the existing lane configurations are shown to provide acceptable LOS with the traffic signal.

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

This report presents the findings of a Traffic Impact Study Update completed for the proposed land use change on an approximately 40 acre property known as Sugarloaf Ranch Estates, located in Spanish Springs, NV. This report is intended to update the previously approved *Village at the Peak Traffic Impact Study – Sugarloaf Peak Property, May 2012*. This study assesses the potential traffic impacts at the Pyramid Highway/Calle de la Plata intersection and at the access locations on Calle de la Plata associated with the proposed project. This traffic impact study has been prepared to document existing traffic conditions, quantify traffic volumes generated by the proposed project, identify potential impacts, document findings, and make recommendations to mitigate impacts, if any are found.

The updated land use consists of 119 single-family units (as opposed to 360 multi-family units in the previous traffic study).

Study Area and Evaluated Scenarios

The project location and the study intersections are shown in **Figure 1**. The following study intersections were analyzed:

- Pyramid Highway/Calle de la Plata
- Calle de la Plata/Driveway A
- Calle de la Plata/Driveway B

This study includes analysis of both the weekday AM and PM peak hours as these are the periods of time in which peak traffic conditions are anticipated to occur. The analysis scenarios include:

- Existing Conditions
- Existing Plus Project Conditions
- 2030 Background Conditions
- 2030 Plus Project Conditions

Analysis Methodology

This update utilizes the same analysis methodology used in the previous study. Please refer to *Village at the Peak Traffic Impact Study – Sugarloaf Peak Property, May 2012* (**Appendix E**).

Level of Service Policy

The 2035 Regional Transportation Plan (2035 RTP) establishes level of service criteria for regional roadway facilities in Washoe County, the City of Reno, and City of Sparks. The current Level of Service policy is:

- "All regional roadway facilities projected to carry less than 27,000 ADT at the latest RTP horizon – LOS D or better."
- "All regional roadway facilities projected to carry 27,000 ADT or more at the latest RTP horizon – LOS E or better."
- "All intersections shall be designed to provide a level of service consistent with maintaining the policy level of service of the intersecting roadways".

NDOT maintains a policy of LOS D or better on their facilities. Since Pyramid Highway is an NDOT facility and ADT on Calle de la Plata is anticipated to be less than 27,000 vehicles per day, LOS "D" is the LOS criteria for this study.

EXISTING TRANSPORTATION FACILITIES

Transportation facilities near the study area essentially remain unchanged compared to the previous approved study. Please refer to *Village at the Peak Traffic Impact Study – Sugarloaf Peak Property, May 2012* for a description of existing conditions.

EXISTING CONDITIONS

Existing Traffic Volumes

Existing traffic volumes at the study intersections were determined by new collecting turning movement counts during the AM and PM peak periods. The counts were conducted on September 10, 2015, an average mid-week day. The existing peak hour intersection traffic volumes and lane configurations are shown on **Figure 2** attached.

Existing Intersection Level of Service

Level of service calculations were performed using the existing traffic volumes, lane configurations, and traffic controls. The results are presented in **Table 1** and the calculation sheets are provided in **Appendix A**, attached.

Table 1: Existing Conditions Intersection Level of Service Summary

Intersection	Worst Approach	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
Pyramid Hwy/Calle de la Plata	Westbound	F	>100	F	53.6

As shown in **Table 1**, the Pyramid Highway/Calle de la Plata intersection (worst approach) currently operates at LOS "F" during both the AM and PM peak hour. The project driveway intersections do not exist at this time.

Existing Roadway Level of Service

Since the peak hour volumes at the study intersections were found to be consistent with the 2012 study, the prior road segment analysis is deemed valid. Please refer to *Village at the Peak Traffic Impact Study – Sugarloaf Peak Property, May 2012* for existing conditions road segment analysis. Based on the prior findings, the study roadway segments function at acceptable LOS.

Signal Warrant Analysis

A preliminary Signal Warrant Analysis was performed to determine whether or not a traffic signal would be warranted at the Pyramid Highway/Calle de la Plata intersection under existing conditions. The warrant analysis was completed based on nationally accepted standards outlined in the current edition of the Manual on Uniform Traffic Control Devices (MUTCD). The Warrant 2 – Four-Hour Vehicular Volume and Warrant 3 - Peak Hour signal warrants were analyzed based on the existing traffic volumes.

Warrant 2, Four-Hour Vehicular Volume

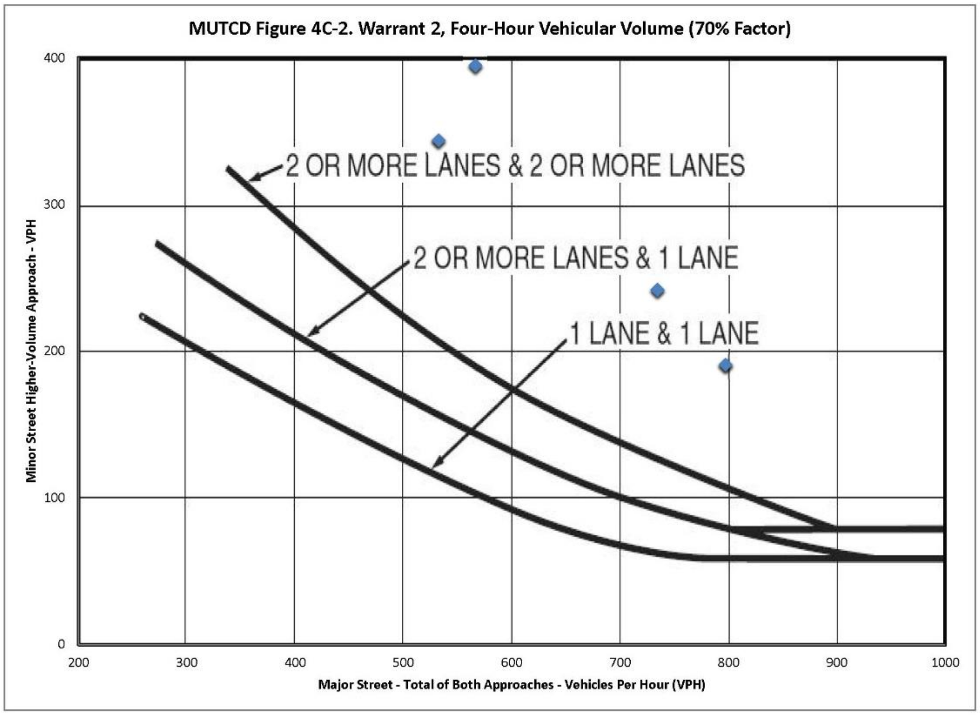


Exhibit 1. Warrant 2 Summary

This warrant requires that the traffic volumes for four hours of the day fall above the appropriate curve (2 or more lanes & 1 or more lanes) in **Exhibit 1**. Using Figure 4C-2 of the MUTCD, we plotted the points for major/minor street traffic. As shown in **Exhibit 1**, multiple hours fall above the curve (2 or more lanes & 1 or more lanes). Hence, Warrant 2 is met.

<u>Warrant 3, Peak Hour</u>

Warrant 3 has two criteria, Criteria A and Criteria B.

Criteria A has three parts. Part 1 requires stopped time delay on one leg of the minor street to be at least four (4) vehicle-hours. Using the traffic volumes and delay values calculated using the AM Peak, the average of 395.2 seconds per vehicle was multiplied by the 100 vehicles (worst approach) and divided by 3600 sec/hour to obtain the total delay which is 10.97 hours. Part 1 is met. The volume on minor street approach is more than 150 vehicles per hour. Part 2 is met. The total entering volume serviced during the same hour exceeds 800 vehicles per hour. Part 3 is met. Hence, Criteria A is met.

Criteria B was evaluated by plotting the points for major and minor street traffic using MUTCD Figure 4C-4. Since only one point would need to fall above the curve, Criteria B is met.

Since both Criteria A and Criteria B are met, Warrant 3 is met.

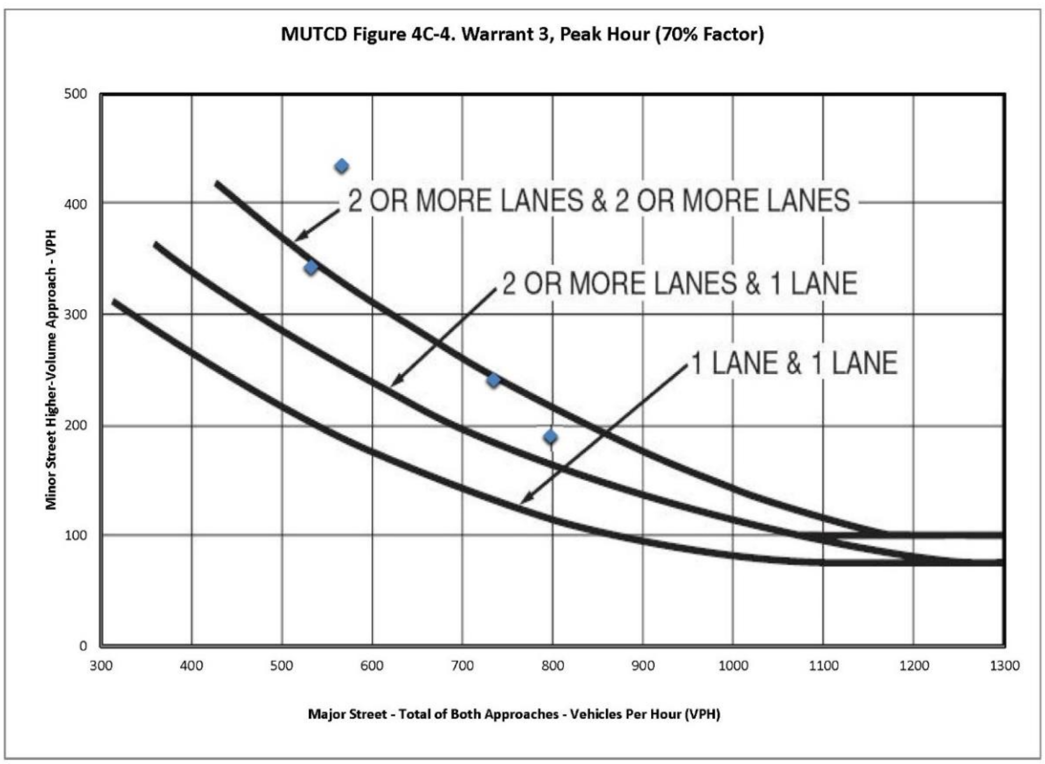


Exhibit 2. Warrant 3 Summary

Since the traffic volumes meet both Warrants 2 and 3, a traffic signal is warranted at the Pyramid Highway/Calle de la Plata intersection.

PROJECT GENERATED TRAFFIC

Project Description

The proposed project consists of 119 single-family units, as opposed to 360 multi-family units in the previous traffic study. The project location is shown in **Figure 1**.

Project Access

The project proposes two access driveways on Calle de la Plata. Both the driveways are proposed to be side-street STOP controlled with single-lane approaches.

Trip Generation

Trip generation rates for the proposed project were obtained using the *Trip Generation Manual, 8th Edition*, published by the Institute of Transportation Engineers.

Table 2 provides the Daily, AM Peak Hour, and PM Peak Hour trip generation calculations for the proposed project based on the ITE Trip Generation Manual. Detailed calculations of the trip generation estimates are provided in **Appendix B**.

Table 2: Trip Generation Estimates

ITE Land Use (#)	Size (units)	Daily	AM Peak Hour (Total Trips)			PM Peak Hour (Total Trips)		
			Total	In	Out	Total	In	Out
Single Family Housing (210)	119	1,139	89	22	67	120	72	48
TOTAL		1,139	89	22	67	120	72	48

As shown in **Table 2**, applying the ITE Trip Generation Manual trip rates, the proposed project is anticipated to generate 1,139 total daily trips, 89 total AM peak hour trips (22 inbound and 67 outbound), and 120 total PM peak hour trips (72 inbound and 48 outbound).

These trip generation estimates are approximately 45% to 50% lower than the previous 360 unit multi-family project.

Trip Distribution and Assignment

This analysis utilizes the same trip distribution and trip assignment developed in the previous study. Please refer to *Village at the Peak Traffic Impact Study – Sugarloaf Peak Property, May 2012.*

EXISTING PLUS PROJECT CONDITIONS

Traffic Volumes

Existing plus project traffic volumes were developed by adding the project generated trips (**Figure 3**) to the existing traffic volumes (**Figure 2**) and are shown on **Figure 4**, attached. The "Plus Project" condition Peak Hour Factors (PHF) and travel patterns were assumed to remain the same as existing conditions.

Intersection Level of Service Analysis

Table 3 presents the level of service analysis summary for "Plus Project" scenario. Detailed calculation sheets are provided in **Appendix C**, attached.

Table 3: Existing Plus Project Intersection Level of Service Summary

Intersection	Worst Approach/ Control	Existing				Existing Plus Project			
		AM Peak		PM Peak		AM Peak		PM Peak	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Pyramid Hwy/Calle de la Plata	WB	F	>100	F	53.6	F	>100	F	96.5
Pyramid Hwy/Calle de la Plata	Signalized	NA	NA	NA	NA	B	15.2	A	9.2
Calle de la Plata/Dwy A	SB	NA	NA	NA	NA	A	9.2	A	8.7
Calle de la Plata/Dwy B	SB	NA	NA	NA	NA	A	9.0	A	8.8

As shown in **Table 3**, the Pyramid Hwy/Calle de la Plata intersection continues to operate at LOS "F" with the addition of the project traffic, during both the AM and PM peak hours. The project driveways would operate at LOS "A" during both the peak hours, with the addition of the project traffic.

With a traffic signal, the Pyramid Hwy/Calle de la Plata intersection would operate at LOS "A/B" with the existing lane configurations.

Roadway Level of Service Analysis

Table 4 shows the Existing Plus Project conditions roadway LOS.

Table 4: Existing Plus Project Roadway Level of Service Summary

Roadway Segment	Functional Classification	# Lanes	Existing		Existing Plus Project	
			ADT	LOS	ADT	LOS
Pyramid Hwy N/O Calle de la Plata	High Access Control Arterial	2	4,400	B	4,515	B
Pyramid Hwy S/O Calle de la Plata		2	10,000	C	10,918	C
Calle de la Plata E/O Pyramid Hwy	Low Access Control Collector	2	1,340	C	1,397	C
Calle de la Plata W/O Pyramid Hwy		4	5,480	C	5,538	C

As shown in **Table 4**, the study roadway segments are anticipated to operate at acceptable LOS conditions with the addition of the project traffic.

Signal Warrant Analysis

The Four-Hour Vehicular Volume and Peak Hour signal warrants are met under existing conditions at the Pyramid Highway/Calle de la Plata intersection. Therefore, with the addition of project traffic, these warrants are also satisfied under Existing Plus Project Conditions. A traffic signal is recommended at this location.

2030 BACKGROUND CONDITIONS

The 2030 Background Conditions remain unchanged from the prior study. Please refer to *Village at the Peak Traffic Impact Study – Sugarloaf Peak Property, May 2012.* The report is attached in **Appendix E**.

Note that a traffic signal is assumed in the 2030 Background Conditions scenario based on the improvements outlined in the 2035 RTP and the prior study. The 2030 background traffic volumes and long-term lane configurations are shown in **Figure 6**.

2030 PLUS PROJECT CONDITIONS

Traffic Volumes

Year 2030 plus project traffic volumes were developed by adding the project generated trips to the 2030 background traffic volumes. The 2030 plus project traffic volumes and long-term lane configurations are shown in **Figure 7**.

Intersection Level of Service Analysis

Table 5 presents the level of service analysis summary for "2030 Plus Project" scenario. Detailed calculation sheets are provided in **Appendix D**, attached.

Table 5: 2030 Plus Project Intersection Level of Service Summary

Intersection	Intersection Control	AM Peak		PM Peak	
		LOS	Delay	LOS	Delay
Pyramid Hwy/Calle de la Plata	Signal	C	28.4	D	46.1
Calle de la Plata/Dwy A	TWSC	B	10.7	C	15.1
Calle de la Plata/Dwy B	TWSC	B	11.9	C	15.8

As shown in **Table 5**, all the study intersections are anticipated to operate at acceptable LOS conditions under 2030 Plus Project conditions. This scenario includes a traffic signal at the Pyramid Highway/Calle de la Plata intersection and a variety of improvements outlined in the 2035 RTP.

Roadway Level of Service Analysis

Table 6 shows the 2030 Plus Project conditions roadway LOS. The planned roadway segments are anticipated to operate at LOS "C" with and without the addition of the project traffic.

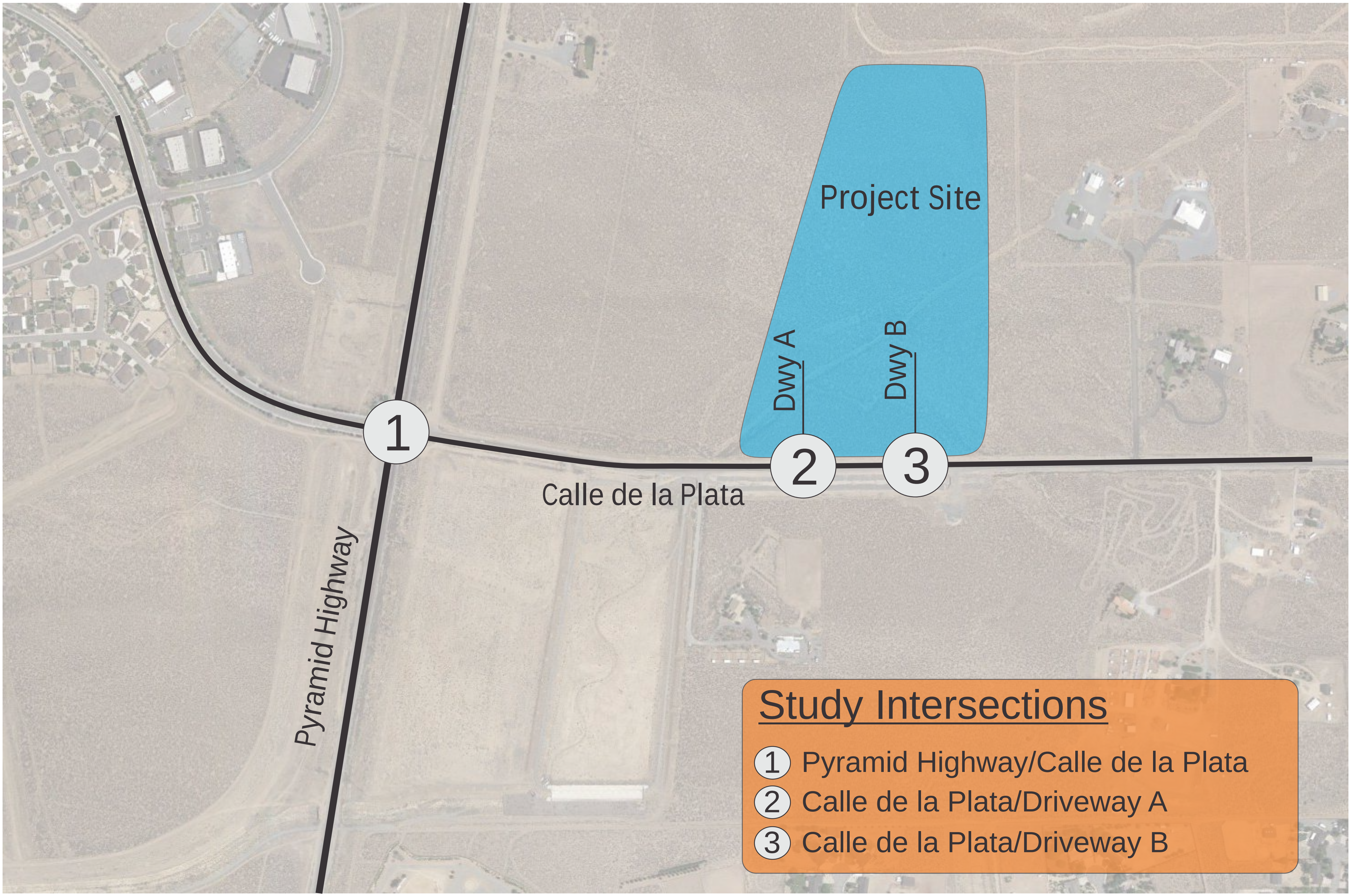
Table 6: 2030 Plus Project Roadway Level of Service Summary

Roadway Segment	Functional Classification	# Lanes	2030		2030 Plus Project	
			ADT	LOS	ADT	LOS
Pyramid Hwy N/O Calle de la Plata	High Access Control Arterial	4	26,010	C	26,240	C
Pyramid Hwy S/O Calle de la Plata		6	47,190	C	47,879	C
Calle de la Plata E/O Pyramid hwy	Low Access Control Collector	2	3,930	C	4,102	C
Calle de la Plata W/O Pyramid hwy		4	10,730	C	10,787	C

CONCLUSIONS & RECOMMENDATIONS

The following is a list of our key findings and recommendations:

- The land use density has been reduced from 360 multi-family units to 119 single family units.
- The new land use generates approximately 45% to 50% fewer trips compared to the previous project.
- The Pyramid Highway/Calle de la Plata intersection currently operates at LOS “F” during both the AM and PM peak hours.
- The Pyramid Highway/Calle de la Plata intersection will continue to operate at LOS “F” with the addition of the project traffic (with increased side street delays).
- Existing peak hour traffic volumes at the Pyramid Highway/Calle de la Plata intersection meet the Four-Hour Vehicular Volume and Peak Hour signal warrants per MUTCD guidelines. These warrants are met with or without the addition of the project traffic.
- We recommend installing a traffic signal at the Pyramid Highway/Calle de la Plata intersection to improve the LOS as it operates at LOS “F” and meets MUTCD signal warrants even without the addition of the project traffic. The Spanish Springs Area Plan recognizes that a traffic signal is needed at this intersection to address the current situation.
- Adequate roadway and intersection improvements are planned within the Regional Transportation Plan to accommodate the future regional growth in the project area.
- The study intersections and roadway segments are anticipated to operate at acceptable LOS conditions in the year 2030.
- We recommend the project enter into a Regional Road Impact Fee (RRIF) offset/waiver agreement with Washoe County and the Regional Transportation Commission for construction of a traffic signal at the Pyramid Highway/Calle de la Plata intersection. The existing lane configuration is shown to provide acceptable LOS conditions with a signal in place. If a signal is constructed prior to this project (by others) and an offset/waiver is not feasible, the applicant’s mitigation responsibility will be payment of the standard traffic impact fees.

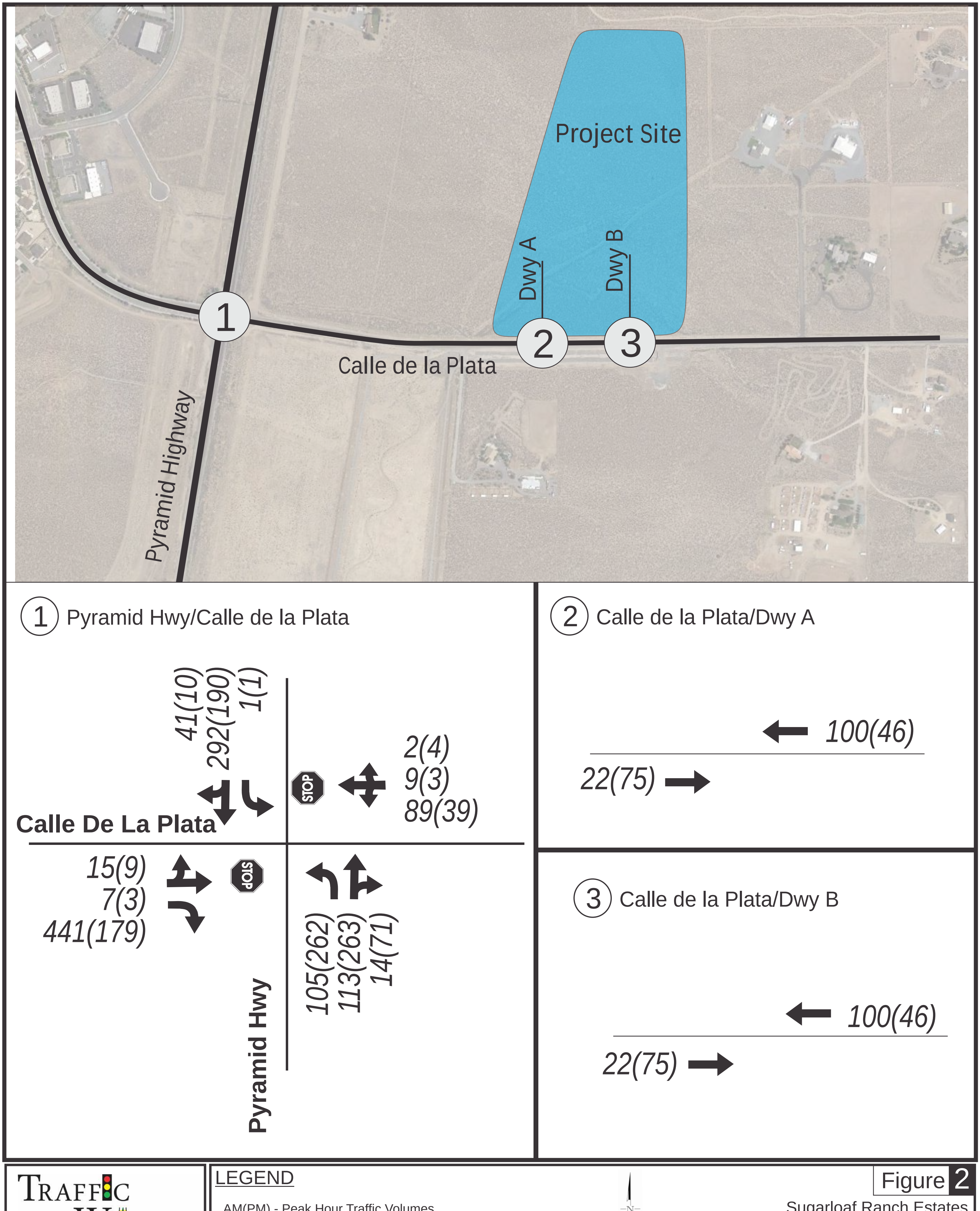


TRAFFIC WORKS LLC

N
NO SCALE

Figure 1

Sugarloaf Ranch Estates
Traffic Impact Study Update
Study Area



TRAFFIC WORKS LLC

LEGEND

AM(PM) - Peak Hour Traffic Volumes

← - Lane Configuration

STOP - STOP Sign

N

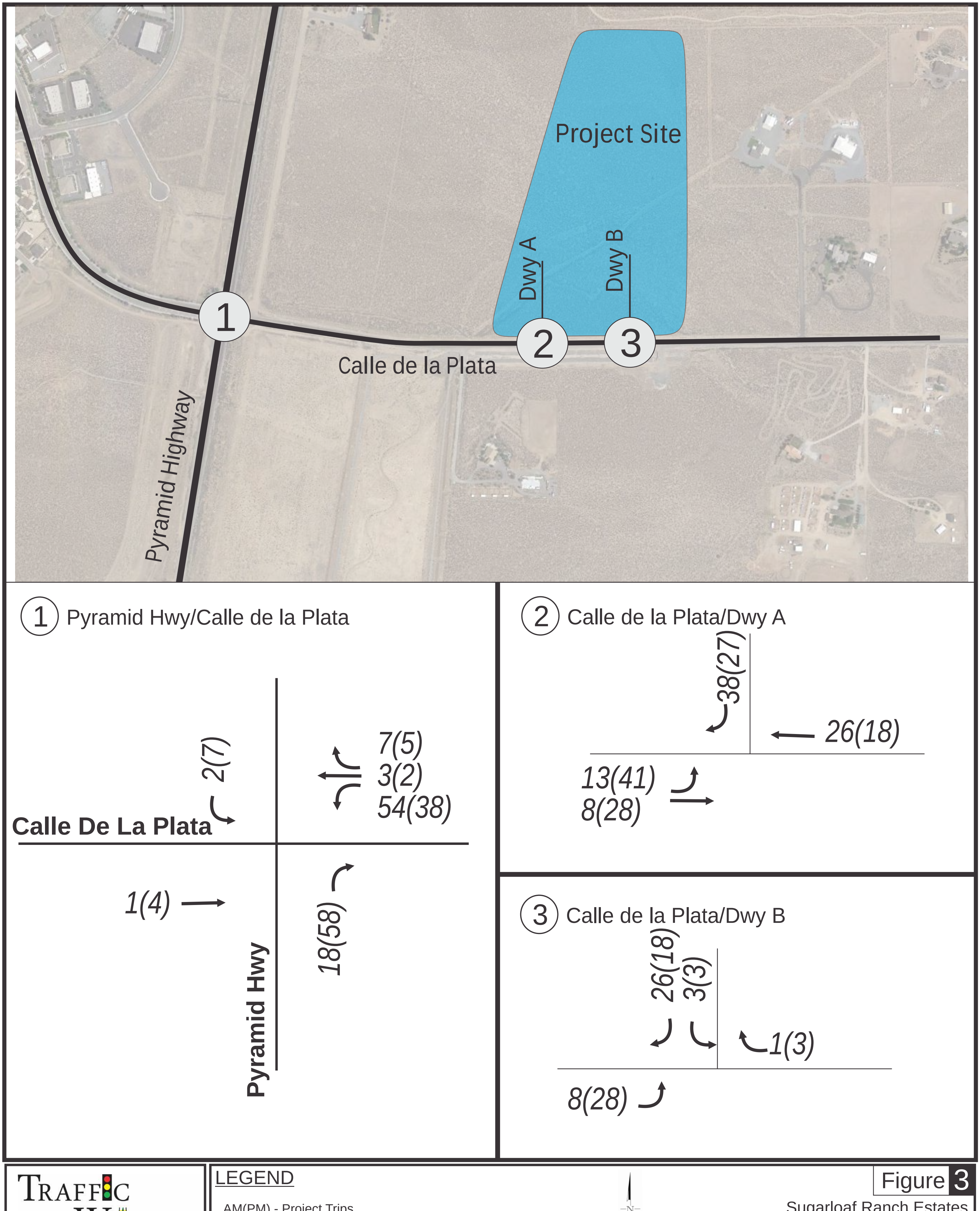
NO SCALE

Figure 2

Sugarloaf Ranch Estates

Traffic Impact Study Update

Existing Traffic Volumes



TRAFFIC WORKS LLC

LEGEND

AM(PM) - Project Trips

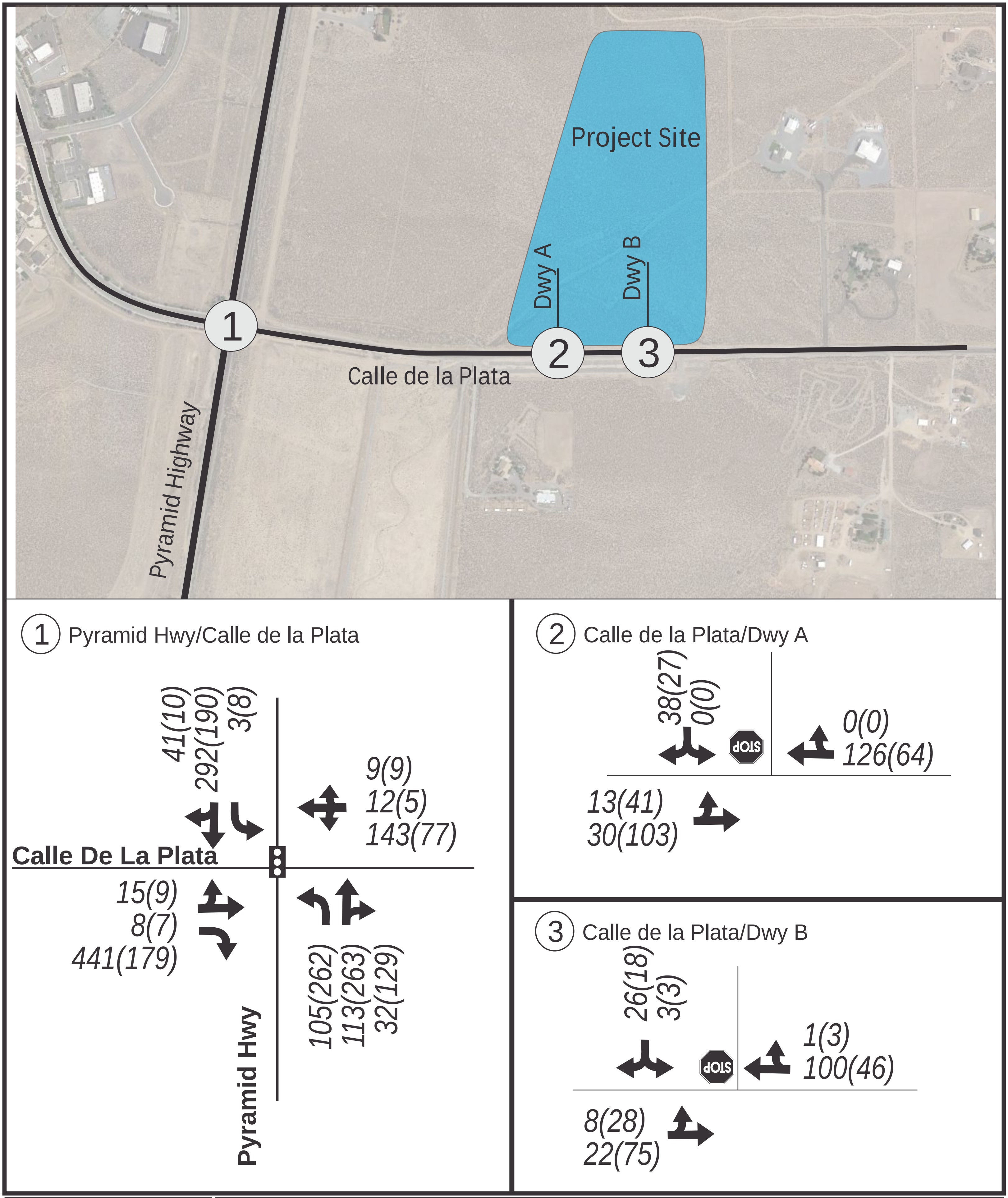
N

NO SCALE

Figure 3

Sugarloaf Ranch Estates
Traffic Impact Study Update

Trip Assignment



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LEGEND

AM(PM) - Peak Hour Traffic Volumes

- Traffic Signal

- Lane Configuration

STOP - STOP Sign

N

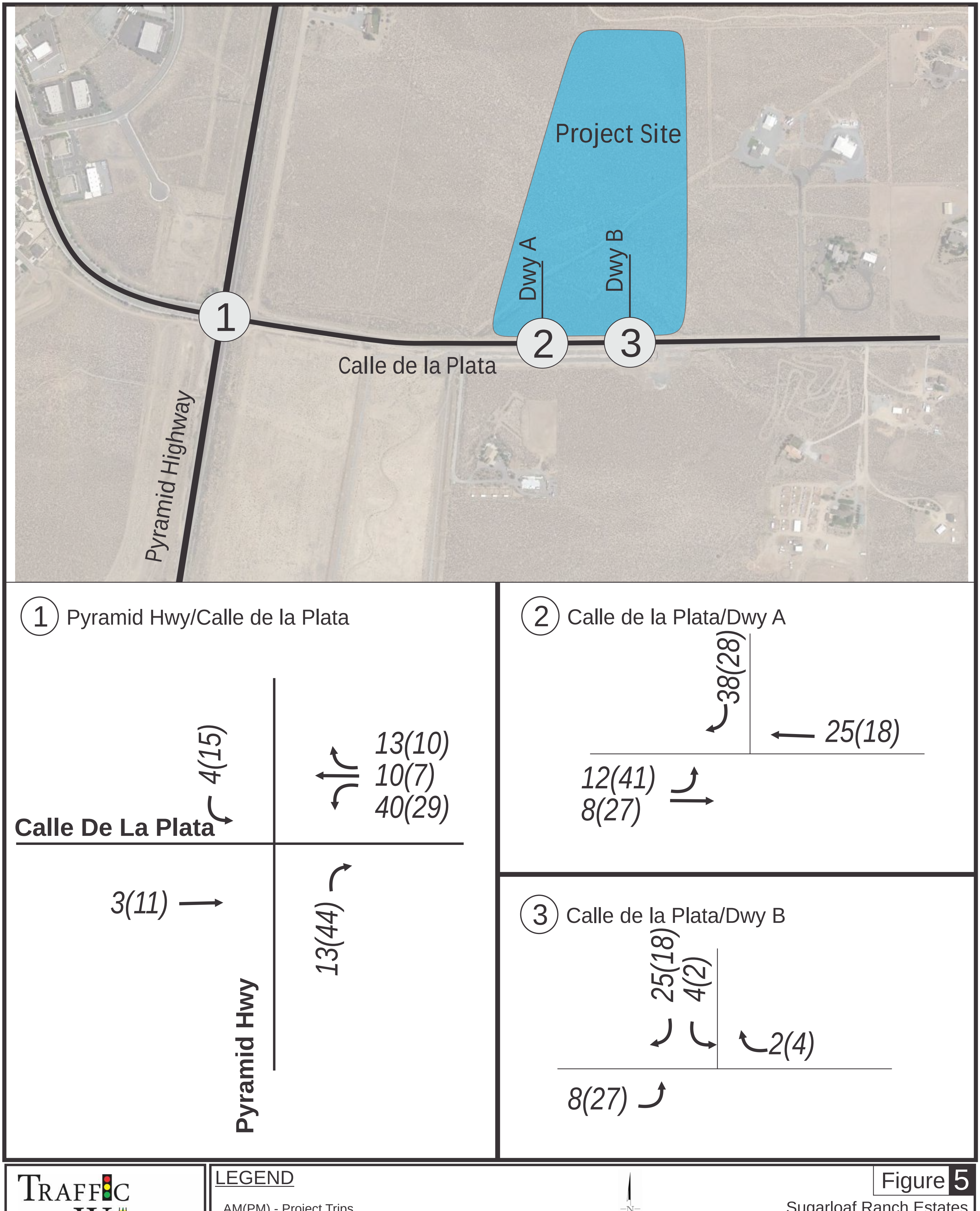
NO SCALE

Figure 4

Sugarloaf Ranch Estates

Traffic Impact Study Update

Existing Plus Project Traffic Volumes



TRAFFIC WORKS LLC

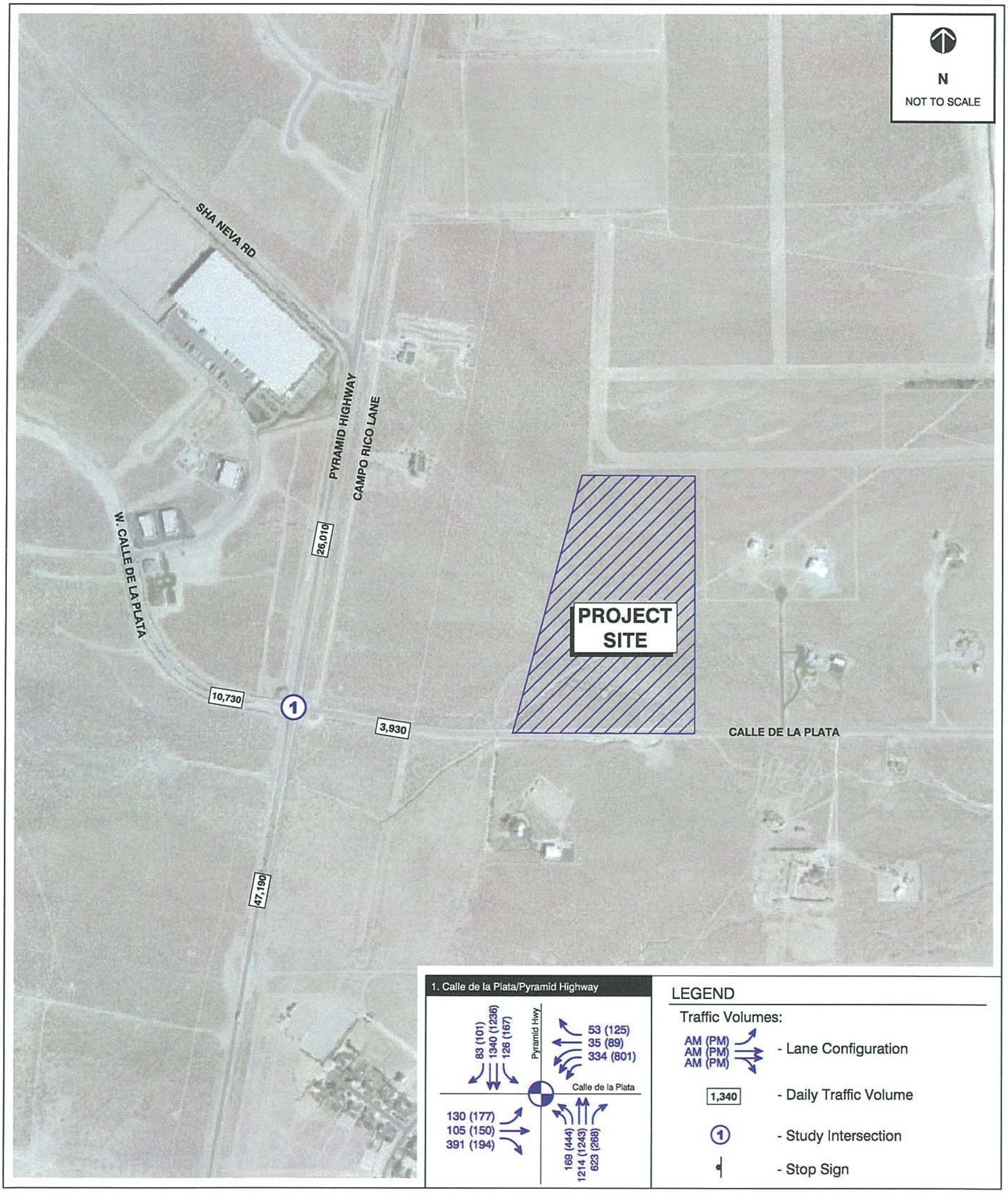
LEGEND

AM(PM) - Project Trips

NO SCALE

Figure 5

Sugarloaf Ranch Estates
Traffic Impact Study Update
2030 Trip Assignment



FEHR & PEERS
TRANSPORTATION CONSULTANTS

Village at the Peak TIS - Sugarloaf Peak Property
2030 Background Traffic Volumes,
Lane Configurations, and Traffic Control

TRAFFIC WORKS LLC

Figure 6

Sugarloaf Ranch Estates
Traffic Impact Study Update
2030 Background Traffic Volumes

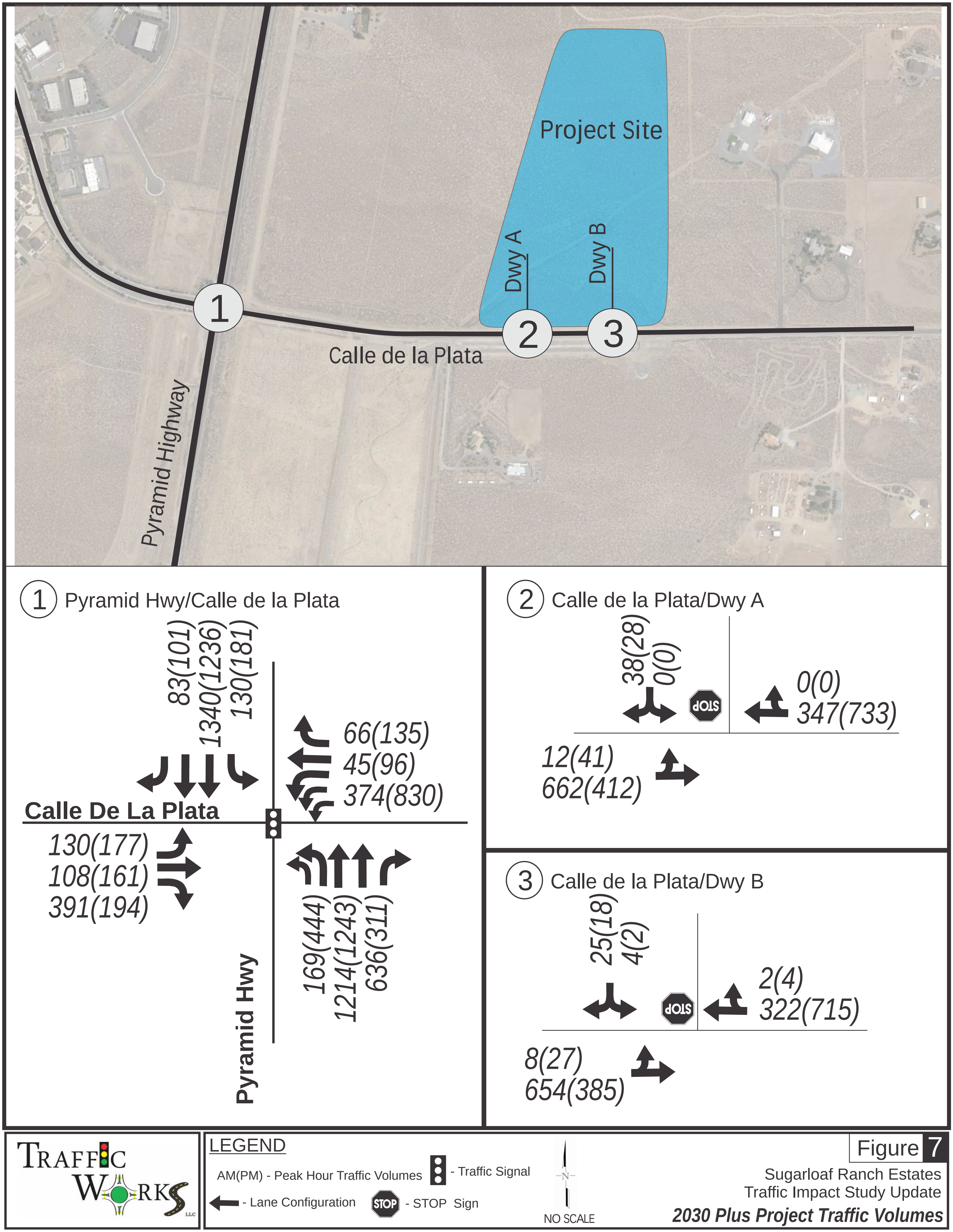


Figure 7
Sugarloaf Ranch Estates
Traffic Impact Study Update
2030 Plus Project Traffic Volumes

APPENDIX A

Existing Conditions LOS Calculations

Intersection	
Int Delay, s/veh	46

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	15	7	441	89	9	2	105	113	14	1	292	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	260	-	-	170	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	18	8	519	105	11	2	124	133	16	1	344	48

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	765	766	368	762	782	141	392	0	0	149	0	0
Stage 1	370	370	-	388	388	-	-	-	-	-	-	-
Stage 2	395	396	-	374	394	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	321	334	680	323	327	910	1172	-	-	1439	-	-
Stage 1	652	622	-	638	611	-	-	-	-	-	-	-
Stage 2	632	606	-	649	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	286	298	680	~ 69	292	910	1172	-	-	1439	-	-
Mov Cap-2 Maneuver	286	298	-	~ 69	292	-	-	-	-	-	-	-
Stage 1	583	622	-	570	546	-	-	-	-	-	-	-
Stage 2	553	542	-	152	607	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.9	$ 395.2	3.8	0
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1172	-	-	290	680	76	1439	-	-
HCM Lane V/C Ratio	0.105	-	-	0.089	0.763	1.548	0.001	-	-
HCM Control Delay (s)	8.4	-	-	18.6	25.2	$ 395.2	7.5	-	-
HCM Lane LOS	A	-	-	C	D	F	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	0.3	7.1	9.7	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	6.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	9	3	179	39	3	4	262	263	71	1	190	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	260	-	-	170	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	10	3	199	43	3	4	291	292	79	1	211	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1137	1172	217	1135	1138	332	222	0	0	371	0	0
Stage 1	219	219	-	914	914	-	-	-	-	-	-	-
Stage 2	918	953	-	221	224	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	180	193	825	180	202	712	1353	-	-	1193	-	-
Stage 1	786	724	-	329	353	-	-	-	-	-	-	-
Stage 2	327	339	-	784	720	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	147	151	825	112	158	712	1353	-	-	1193	-	-
Mov Cap-2 Maneuver	147	151	-	112	158	-	-	-	-	-	-	-
Stage 1	617	723	-	258	277	-	-	-	-	-	-	-
Stage 2	252	266	-	592	719	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12	53.6	3.7	0
HCM LOS	B	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1353	-	-	148	825	123	1193	-	-
HCM Lane V/C Ratio	0.215	-	-	0.09	0.241	0.416	0.001	-	-
HCM Control Delay (s)	8.4	-	-	31.7	10.7	53.6	8	-	-
HCM Lane LOS	A	-	-	D	B	F	A	-	-
HCM 95th %tile Q(veh)	0.8	-	-	0.3	0.9	1.8	0	-	-

APPENDIX B

Trip Generation Calculations

Weekday Average Daily Trip Generation Calculations

Land Use				Total Trips						Pass-By				Net New Trips		
Land Use	Variable		ITE LU Code	Trip Rate	% In	% Out	Total	In	Out	% of Ext.	Total	In	Out	Total	In	Out
Single Family Housing	119.00	Units	210	9.57	50%	50%	1139	570	569	0%	0	0	0	1139	570	569
Total							1139	570	569	0%	0	0	0	1139	570	569

Weekday AM Peak Hour Trip Generation Calculations

Land Use				Total Trips						Pass-By				Net New		
Land Use	**Variable**		**ITE LU Code**	**Trip Rate**	**% In**	**% Out**	**Total**	**In**	**Out**	**% of Ext.**	**Total**	**In**	**Out**	**Total**	**In**	**Out**
Single Family Housing	119.00	Units	210	0.75	25%	75%	89	22	67	0%	0	0	0	89	22	67
Total							89	22	67	0%	0	0	0	89	22	67

Weekday PM Peak Hour Trip Generation Calculations

Land Use				Total Trips						Pass-By				Net New		
Land Use	Variable		ITE LU Code	Trip Rate	% In	% Out	Total	In	Out	% of Ext.	Total	In	Out	Total	In	Out
Single Family Housing	119.00	Units	210	1.01	60%	40%	120	72	48	0%	0	0	0	120	72	48
Total							120	72	48	0%	0	0	0	120	72	48

APPENDIX C

Existing Plus Project LOS Calculations

Intersection	
Int Delay, s/veh	122.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	15	8	441	143	12	9	105	113	32	3	292	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	260	-	-	170	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	18	9	519	168	14	11	124	133	38	4	344	48

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	786	793	368	778	798	152	392	0	0	171	0	0
Stage 1	375	375	-	399	399	-	-	-	-	-	-	-
Stage 2	411	418	-	379	399	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	311	322	680	315	320	897	1172	-	-	1412	-	-
Stage 1	648	619	-	629	604	-	-	-	-	-	-	-
Stage 2	620	592	-	645	604	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	271	287	680	~ 67	285	897	1172	-	-	1412	-	-
Mov Cap-2 Maneuver	271	287	-	~ 67	285	-	-	-	-	-	-	-
Stage 1	579	617	-	562	540	-	-	-	-	-	-	-
Stage 2	534	529	-	~ 150	602	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.9	$ 832	3.5	0.1
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1172	-	-	276	680	75	1412	-	-
HCM Lane V/C Ratio	0.105	-	-	0.098	0.763	2.573	0.002	-	-
HCM Control Delay (s)	8.4	-	-	19.5	25.2	$ 832	7.6	-	-
HCM Lane LOS	A	-	-	C	D	F	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	0.3	7.1	18.6	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	13	30	126	0	0	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	15	35	148	0	0	45

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	148	0	-	0	214	148
Stage 1	-	-	-	-	148	-
Stage 2	-	-	-	-	66	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1440	-	-	-	777	901
Stage 1	-	-	-	-	882	-
Stage 2	-	-	-	-	959	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1440	-	-	-	768	901
Mov Cap-2 Maneuver	-	-	-	-	768	-
Stage 1	-	-	-	-	882	-
Stage 2	-	-	-	-	948	-

Approach	EB	WB	SB
HCM Control Delay, s	2.3	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1440	-	-	-	901
HCM Lane V/C Ratio	0.011	-	-	-	0.05
HCM Control Delay (s)	7.5	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	8	22	100	1	3	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	9	26	118	1	4	31

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	119	0	-	0	163	118
Stage 1	-	-	-	-	118	-
Stage 2	-	-	-	-	45	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1475	-	-	-	830	937
Stage 1	-	-	-	-	910	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1475	-	-	-	825	937
Mov Cap-2 Maneuver	-	-	-	-	825	-
Stage 1	-	-	-	-	910	-
Stage 2	-	-	-	-	974	-

Approach	EB	WB	SB
HCM Control Delay, s	2	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1475	-	-	-	924
HCM Lane V/C Ratio	0.006	-	-	-	0.037
HCM Control Delay (s)	7.5	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	11.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	9	7	179	77	5	9	232	263	129	8	190	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	0	-	-	-	260	-	-	170	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	10	8	199	86	6	10	258	292	143	9	211	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1121	1185	217	1117	1119	364	222	0	0	436	0	0
Stage 1	234	234	-	879	879	-	-	-	-	-	-	-
Stage 2	887	951	-	238	240	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	184	190	825	185	208	683	1353	-	-	1129	-	-
Stage 1	771	713	-	344	367	-	-	-	-	-	-	-
Stage 2	340	340	-	768	709	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	150	153	825	115	167	683	1353	-	-	1129	-	-
Mov Cap-2 Maneuver	150	153	-	115	167	-	-	-	-	-	-	-
Stage 1	624	707	-	278	297	-	-	-	-	-	-	-
Stage 2	266	275	-	572	703	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.4	96.5	3.1	0.3
HCM LOS	B	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1353	-	-	151	825	128	1129	-	-
HCM Lane V/C Ratio	0.191	-	-	0.118	0.241	0.79	0.008	-	-
HCM Control Delay (s)	8.3	-	-	32	10.7	96.5	8.2	-	-
HCM Lane LOS	A	-	-	D	B	F	A	-	-
HCM 95th %tile Q(veh)	0.7	-	-	0.4	0.9	4.7	0	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	41	103	64	0	0	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	46	114	71	0	0	30

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	71	0	-	0	277	71
Stage 1	-	-	-	-	71	-
Stage 2	-	-	-	-	206	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1536	-	-	-	715	994
Stage 1	-	-	-	-	954	-
Stage 2	-	-	-	-	831	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1536	-	-	-	692	994
Mov Cap-2 Maneuver	-	-	-	-	692	-
Stage 1	-	-	-	-	954	-
Stage 2	-	-	-	-	804	-

Approach	EB	WB	SB
HCM Control Delay, s	2.1	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1536	-	-	-	994
HCM Lane V/C Ratio	0.03	-	-	-	0.03
HCM Control Delay (s)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	28	75	46	3	3	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	31	83	51	3	3	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	54	0	-	0	199	53
Stage 1	-	-	-	-	53	-
Stage 2	-	-	-	-	146	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1558	-	-	-	792	1017
Stage 1	-	-	-	-	972	-
Stage 2	-	-	-	-	884	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1558	-	-	-	775	1017
Mov Cap-2 Maneuver	-	-	-	-	775	-
Stage 1	-	-	-	-	972	-
Stage 2	-	-	-	-	865	-

Approach	EB	WB	SB
HCM Control Delay, s	2	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1558	-	-	-	974
HCM Lane V/C Ratio	0.02	-	-	-	0.024
HCM Control Delay (s)	7.4	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	8	441	143	12	9	105	113	32	3	292	41
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1881	1900	1881	1881	1900	1881	1881	1900
Adj Flow Rate, veh/h	18	9	519	168	14	11	124	133	38	4	344	48
Adj No. of Lanes	0	1	1	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	520	239	637	449	37	22	374	514	147	512	483	67
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.07	0.37	0.37	0.00	0.30	0.30
Sat Flow, veh/h	1014	598	1599	801	92	54	1792	1408	402	1792	1616	225
Grp Volume(v), veh/h	27	0	519	193	0	0	124	0	171	4	0	392
Grp Sat Flow(s),veh/h/ln	1613	0	1599	947	0	0	1792	0	1810	1792	0	1841
Q Serve(g_s), s	0.0	0.0	14.9	7.4	0.0	0.0	2.3	0.0	3.4	0.1	0.0	9.8
Cycle Q Clear(g_c), s	0.5	0.0	14.9	7.9	0.0	0.0	2.3	0.0	3.4	0.1	0.0	9.8
Prop In Lane	0.67		1.00	0.87		0.06	1.00		0.22	1.00		0.12
Lane Grp Cap(c), veh/h	759	0	637	508	0	0	374	0	661	512	0	551
V/C Ratio(X)	0.04	0.00	0.81	0.38	0.00	0.00	0.33	0.00	0.26	0.01	0.00	0.71
Avail Cap(c_a), veh/h	1184	0	1082	769	0	0	457	0	1365	643	0	1318
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.5	0.0	13.8	11.7	0.0	0.0	11.5	0.0	11.5	12.6	0.0	16.1
Incr Delay (d2), s/veh	0.0	0.0	2.6	0.5	0.0	0.0	0.5	0.0	0.2	0.0	0.0	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	7.0	2.1	0.0	0.0	1.2	0.0	1.7	0.0	0.0	5.2
LnGrp Delay(d),s/veh	9.5	0.0	16.4	12.1	0.0	0.0	12.0	0.0	11.7	12.6	0.0	17.9
LnGrp LOS	A		B	B			B		B	B		B
Approach Vol, veh/h		546			193			295			396	
Approach Delay, s/veh		16.1			12.1			11.8			17.8	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.2	22.9		24.6	7.6	19.5		24.6
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	4.0	39.0		35.0	6.0	37.0		35.0
Max Q Clear Time (g_c+I1), s	2.1	5.4		16.9	4.3	11.8		9.9
Green Ext Time (p_c), s	0.0	3.9		3.7	0.0	3.7		4.0

Intersection Summary			
HCM 2010 Ctrl Delay			15.2
HCM 2010 LOS			B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	7	179	77	5	9	232	263	129	8	190	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1881	1900	1881	1881	1900	1881	1881	1900
Adj Flow Rate, veh/h	10	8	199	86	6	10	258	292	143	9	211	11
Adj No. of Lanes	0	1	1	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	319	198	318	413	34	25	684	475	233	448	475	25
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.14	0.40	0.40	0.01	0.27	0.27
Sat Flow, veh/h	679	998	1599	982	171	125	1792	1194	585	1792	1772	92
Grp Volume(v), veh/h	18	0	199	102	0	0	258	0	435	9	0	222
Grp Sat Flow(s),veh/h/ln	1677	0	1599	1278	0	0	1792	0	1778	1792	0	1865
Q Serve(g_s), s	0.0	0.0	3.5	1.6	0.0	0.0	2.7	0.0	5.9	0.1	0.0	3.0
Cycle Q Clear(g_c), s	0.2	0.0	3.5	2.0	0.0	0.0	2.7	0.0	5.9	0.1	0.0	3.0
Prop In Lane	0.56		1.00	0.84		0.10	1.00		0.33	1.00		0.05
Lane Grp Cap(c), veh/h	517	0	318	471	0	0	684	0	708	448	0	500
V/C Ratio(X)	0.03	0.00	0.63	0.22	0.00	0.00	0.38	0.00	0.61	0.02	0.00	0.44
Avail Cap(c_a), veh/h	1033	0	839	876	0	0	785	0	1049	666	0	978
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.9	0.0	11.2	10.5	0.0	0.0	5.5	0.0	7.3	8.1	0.0	9.3
Incr Delay (d2), s/veh	0.0	0.0	2.0	0.2	0.0	0.0	0.3	0.0	0.9	0.0	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	1.7	0.8	0.0	0.0	1.3	0.0	3.1	0.1	0.0	1.6
LnGrp Delay(d),s/veh	9.9	0.0	13.2	10.8	0.0	0.0	5.8	0.0	8.2	8.1	0.0	9.9
LnGrp LOS	A		B	B			A		A	A		A
Approach Vol, veh/h		217			102			693			231	
Approach Delay, s/veh		12.9			10.8			7.3			9.8	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.3	16.1		10.1	8.3	12.2		10.1
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	4.0	18.0		16.0	6.0	16.0		16.0
Max Q Clear Time (g_c+I1), s	2.1	7.9		5.5	4.7	5.0		4.0
Green Ext Time (p_c), s	0.0	3.0		1.0	0.1	3.2		1.1

Intersection Summary			
HCM 2010 Ctrl Delay			9.0
HCM 2010 LOS			A

APPENDIX D

2030 Plus Project LOS Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	130	108	391	374	45	66	169	1214	637	131	1340	83
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881
Adj Flow Rate, veh/h	141	117	0	407	49	72	184	1320	692	142	1457	90
Adj No. of Lanes	1	1	1	3	1	1	2	2	1	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	181	190	161	505	187	159	231	1547	692	179	1666	745
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.10	0.07	0.43	0.43	0.10	0.47	0.47
Sat Flow, veh/h	1792	1881	1599	5052	1881	1599	3476	3574	1599	1792	3574	1599
Grp Volume(v), veh/h	141	117	0	407	49	72	184	1320	692	142	1457	90
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1684	1881	1599	1738	1787	1599	1792	1787	1599
Q Serve(g_s), s	4.6	3.6	0.0	4.7	1.4	2.5	3.1	19.9	26.0	4.7	22.1	1.9
Cycle Q Clear(g_c), s	4.6	3.6	0.0	4.7	1.4	2.5	3.1	19.9	26.0	4.7	22.1	1.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	181	190	161	505	187	159	231	1547	692	179	1666	745
V/C Ratio(X)	0.78	0.62	0.00	0.81	0.26	0.45	0.79	0.85	1.00	0.79	0.87	0.12
Avail Cap(c_a), veh/h	298	345	293	505	219	186	231	1547	692	179	1666	745
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.3	25.9	0.0	26.5	25.0	25.5	27.6	15.3	17.0	26.4	14.4	9.1
Incr Delay (d2), s/veh	7.0	3.2	0.0	9.3	0.7	2.0	17.2	4.8	34.1	21.2	5.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	2.0	0.0	2.6	0.8	1.2	2.1	10.8	17.9	3.3	12.0	0.8
LnGrp Delay(d),s/veh	33.4	29.1	0.0	35.8	25.7	27.5	44.9	20.2	51.2	47.7	19.9	9.1
LnGrp LOS	C	C		D	C	C	D	C	D	D	B	A
Approach Vol, veh/h		258			528			2196			1689	
Approach Delay, s/veh		31.4			33.7			32.0			21.7	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.0	30.0	10.0	10.1	8.0	32.0	10.1	10.0
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	6.0	26.0	6.0	11.0	4.0	28.0	10.0	7.0
Max Q Clear Time (g_c+I1), s	6.7	28.0	6.7	5.6	5.1	24.1	6.6	4.5
Green Ext Time (p_c), s	0.0	0.0	0.0	0.5	0.0	3.9	0.1	0.3

Intersection Summary			
HCM 2010 Ctrl Delay			28.4
HCM 2010 LOS			C

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	12	662	347	0	0	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	13	720	377	0	0	41

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	377	0	-	0	1123	377
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	746	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1187	-	-	-	229	672
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	471	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1187	-	-	-	225	672
Mov Cap-2 Maneuver	-	-	-	-	225	-
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	463	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1187	-	-	-	672
HCM Lane V/C Ratio	0.011	-	-	-	0.061
HCM Control Delay (s)	8.1	0	-	-	10.7
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	8	654	322	2	4	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	9	711	350	2	4	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	352	0	-	0	1079	351
Stage 1	-	-	-	-	351	-
Stage 2	-	-	-	-	728	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	1212	-	-	-	243	695
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	480	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1212	-	-	-	240	695
Mov Cap-2 Maneuver	-	-	-	-	240	-
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	474	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1212	-	-	-	551
HCM Lane V/C Ratio	0.007	-	-	-	0.057
HCM Control Delay (s)	8	0	-	-	11.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	177	161	194	830	96	135	444	1243	311	182	1236	101
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881	1881
Adj Flow Rate, veh/h	192	175	0	902	104	147	483	1351	338	198	1343	110
Adj No. of Lanes	1	1	1	3	1	1	2	2	1	1	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	227	188	160	954	305	259	502	1469	657	219	1390	622
Arrive On Green	0.13	0.10	0.00	0.19	0.16	0.16	0.14	0.41	0.41	0.12	0.39	0.39
Sat Flow, veh/h	1792	1881	1599	5052	1881	1599	3476	3574	1599	1792	3574	1599
Grp Volume(v), veh/h	192	175	0	902	104	147	483	1351	338	198	1343	110
Grp Sat Flow(s),veh/h/ln	1792	1881	1599	1684	1881	1599	1738	1787	1599	1792	1787	1599
Q Serve(g_s), s	9.4	8.3	0.0	15.9	4.4	7.6	12.4	32.2	14.2	9.8	33.1	4.1
Cycle Q Clear(g_c), s	9.4	8.3	0.0	15.9	4.4	7.6	12.4	32.2	14.2	9.8	33.1	4.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	227	188	160	954	305	259	502	1469	657	219	1390	622
V/C Ratio(X)	0.84	0.93	0.00	0.95	0.34	0.57	0.96	0.92	0.51	0.90	0.97	0.18
Avail Cap(c_a), veh/h	259	188	160	954	305	259	502	1469	657	219	1390	622
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.4	40.2	0.0	36.0	33.4	34.8	38.3	25.1	19.8	39.0	26.9	18.0
Incr Delay (d2), s/veh	19.9	46.1	0.0	17.4	0.7	2.9	30.6	9.6	0.7	36.0	16.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.9	6.7	0.0	8.9	2.3	3.6	8.1	17.7	6.3	7.0	19.5	1.8
LnGrp Delay(d),s/veh	58.4	86.3	0.0	53.5	34.1	37.7	68.9	34.7	20.5	74.9	43.6	18.2
LnGrp LOS	E	F		D	C	D	E	C	C	E	D	B
Approach Vol, veh/h		367			1153			2172			1651	
Approach Delay, s/veh		71.7			49.7			40.1			45.7	
Approach LOS		E			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.0	41.0	21.0	13.0	17.0	39.0	15.4	18.6
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	11.0	37.0	17.0	9.0	13.0	35.0	13.0	13.0
Max Q Clear Time (g_c+I1), s	11.8	34.2	17.9	10.3	14.4	35.1	11.4	9.6
Green Ext Time (p_c), s	0.0	2.7	0.0	0.0	0.0	0.0	0.1	0.7

Intersection Summary	
HCM 2010 Ctrl Delay	46.1
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	41	412	733	0	0	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	45	448	797	0	0	30

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	797	0	-	0	1334	797
Stage 1	-	-	-	-	797	-
Stage 2	-	-	-	-	537	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	829	-	-	-	171	388
Stage 1	-	-	-	-	445	-
Stage 2	-	-	-	-	588	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	829	-	-	-	159	388
Mov Cap-2 Maneuver	-	-	-	-	159	-
Stage 1	-	-	-	-	445	-
Stage 2	-	-	-	-	546	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	15.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	829	-	-	-	388
HCM Lane V/C Ratio	0.054	-	-	-	0.078
HCM Control Delay (s)	9.6	0	-	-	15.1
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	0.3

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	27	385	715	4	2	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	29	418	777	4	2	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	782	0	-	0	1256	779
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	477	-
Critical Hdwy	4.11	-	-	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	2.209	-	-	-	3.509	3.309
Pot Cap-1 Maneuver	840	-	-	-	190	397
Stage 1	-	-	-	-	454	-
Stage 2	-	-	-	-	626	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	840	-	-	-	181	397
Mov Cap-2 Maneuver	-	-	-	-	181	-
Stage 1	-	-	-	-	454	-
Stage 2	-	-	-	-	598	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	15.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	840	-	-	-	355
HCM Lane V/C Ratio	0.035	-	-	-	0.061
HCM Control Delay (s)	9.4	0	-	-	15.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2

APPENDIX E

2012 Traffic Study Report

FEHR & PEERS

MEMORANDUM

KATY SUE COLE
Exp. 12-31-12
CIVIL
No. 19078
PROFESSIONAL ENGINEER-STATE OF NEVADA
5.10.12

Date:	May 10, 2012
To:	Mr. Jim House, Sugarload Peak LLC
	Ms. Sandra Waltman, Sugarloaf Peak LLC
cc:	Mr. John Krmpotic, KLS Planning and Design Group
From:	Katy Cole, P.E., Fehr & Peers Marissa Harned, P.E., Fehr & Peers
Subject:	**Village at the Peak Traffic Impact Study – Sugarloaf Peak Property**

NV12-0499

This technical memorandum provides a summary of the data collection and traffic analysis performed for the Sugarloaf Peak property north of Calle de la Plata and east of Pyramid Highway (shown on attached **Figure 1**).

SUMMARY OF CONCLUSIONS

The following provides a summary of findings based on the analysis presented in this report:

- The proposed zoning (Specific Plan, conforming to High Density Suburban standards for up to 360 multi-family units) would generate significantly less traffic (more than 5,000 less daily trips) than the property built-out under the existing zoning.

- The Pyramid Highway/Calle de la Plata intersection currently operates at an unacceptable level of service F during the AM and PM peak hours. Based on existing traffic volumes, the intersection meets Peak Hour and Four-Hour Vehicle Volume traffic signal warrant criteria. The Spanish Springs Area Plan recognizes that a traffic signal is needed at the intersection to address the current situation.

- Build out of multi-family residential on the project site will increase delay at the Pyramid Highway/Calle de la Plata intersection. If a traffic signal is not installed at the Pyramid Highway/Calle de la Plata intersection prior to construction of the project, the project

Note that since the traffic signal is necessary to accommodate existing traffic volumes, the project should not be fully financially responsible for the improvements, and should only be responsible for a fair share based on the traffic volumes generated at the intersection by the project site.

- The Regional Transportation Commission's (RTC) *Regional Transportation Plan* (RTP) includes future regional roadway improvements to increase capacity on Pyramid Highway in the project vicinity. The *RTP* specifically indicates the following improvements:
    - Pyramid Highway – Widen from two lanes to four lanes, from Egyptian Drive to Calle de la Plata by 2018
    - Pyramid Highway – Widen from two lanes to four lanes, from Calle de la Plata to Winnemucca Ranch Road by 2030
    - Pyramid Highway – Widen from four lanes to six lanes, from Egyptian Drive to Calle de la Plata by 2030
- The 2030 analysis demonstrates adequate regional roadway improvements are planned to accommodate regional growth, approved but not yet constructed projects near the Pyramid Highway/Calle de la Plata intersection, and the proposed project

INTRODUCTION

PROJECT DESCRIPTION

The Sugarloaf Peak property is 39.8 acres and has the following zoning: 17.7 acres Neighborhood Commercial, 20 acres Industrial, and 2 acres Open Space. The proposed project would change the current zoning to Specific Plan, which would conform to High Density Suburban zoning standards. High Density Suburban would allow up to 9 multi-family units per acre for a total of 360 multi-family residential units.

STUDY INTERSECTIONS AND ROADWAY SEGMENTS

The following intersections were analyzed during the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak hours:

- Pyramid Highway/Calle de la Plata
- Calle de la Plata/Project Driveway 1
- Calle de la Plata/Project Driveway 2

Daily traffic volume data was analyzed for the following roadway segments:

- Pyramid Highway north of Calle de la Plata
- Pyramid Highway south of Calle de la Plata
- Calle de la Plata west of Pyramid Highway
- Calle de la Plata east of Pyramid Highway

ANALYSIS SCENARIOS

The following scenarios were analyzed with corresponding traffic volumes and roadway network configurations:

- Existing Conditions – Peak hour intersection and daily roadway segment level of service analysis was performed based on intersection turning movement volumes and roadway segment volumes collected in April 2012, and Nevada Department of Transportation (NDOT) traffic volume data collected in 2010.
- Existing Plus Project Conditions – Project generated traffic volumes (based on 360 multi-family units) were added to existing traffic volumes, and peak hour intersection and daily roadway segment level of service analysis was performed.
- 2030 Background Conditions - 2030 background conditions traffic volumes were developed based on the Regional Transportation Commission's (RTC) regional travel demand model and trip generation volumes from planned/approved projects in the area. Peak hour intersection and daily roadway segment level of service analysis was performed.

- 2030 Background Plus Project Conditions – Project generated traffic volumes were added to 2030 background traffic volumes, and peak hour intersection and daily roadway segment level of service analysis was performed.

ANALYSIS METHODOLOGY

Transportation engineers and planners commonly use the term level of service (LOS) to measure and describe the operational status of the local roadway network. An intersection or roadway segment's level of service can range from LOS A (indicating free-flow traffic conditions with little or no delay), to LOS F (representing oversaturated conditions where traffic flows exceed design capacity, resulting in long queues and delays).

The analysis methods presented in the Transportation Research Board's *Highway Capacity Manual 2000* (*HCM 2000*) were used to calculate level of service for signalized and unsignalized intersections.

Signalized Intersections

Signalized intersections were analyzed using the methodology contained in Chapter 16 of the *HCM 2000*. This methodology determines the level of service by comparing the average control delay for all vehicles approaching the intersection to the delay thresholds shown in **Table 1**.

Unsignalized Intersections

Unsignalized (side street stop controlled) intersection level of service calculations were conducted using the methods contained in Chapter 17 of the *HCM 2000*. The level of service rating is based on the average control delay expressed in seconds per vehicle. At side street stop controlled intersections, the control delay (and LOS) is calculated for each controlled movement, the left-turn movement from the major street, and for the entire intersection. For controlled approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. **Table 1** presents the thresholds for unsignalized intersections.

TABLE 1
INTERSECTION LEVEL OF SERVICE DEFINITIONS

Level of Service	Description	Signalized Intersections (Average Control Delay) [1]	Unsignalized Intersections (Average Control Delay) [2]
A	Represents free flow. Individual users are virtually unaffected by others in the traffic stream.	≤ 10	≤10
B	Stable flow, but the presence of other users in the traffic stream begins to be noticeable.	> 10 to 20	> 10 to 15
C	Stable flow, but the operation of individual users becomes significantly affected by interactions with others in the traffic stream.	> 20 to 35	> 15 to 25
D	Represents high-density, but stable flow.	> 35 to 55	> 25 to 35
E	Represents operating conditions at or near the capacity level.	> 55 to 80	> 35 to 50
F	Represents forced or breakdown flow.	> 80	> 50

Sources:
[1] *HCM 2000*, Chapter 16, Signalized Intersections. Values shown are in seconds/vehicle.
[2] *HCM 2000*, Chapter 17, Unsignalized Intersections. Values shown are in seconds/vehicle.

Roadway Segments

Table 2 provides roadway segment level of service standards as presented in the Regional Transportation Commission's (RTC) *Regional Transportation Plan (RTP)*. Roadway segment level of service is determined by comparing average daily traffic (ADT) volumes to the thresholds presented in the table.

TABLE 2
AVERAGE DAILY TRAFFIC LEVEL OF SERVICE THRESHOLDS BY FACILITY

Facility Type	Maximum Daily Service Flow Rate (For Given LOS)				
Number of Lanes	LOS A	LOS B	LOS C	LOS D	LOS E
Arterial - High Access Control (HAC)					
2	n/a	9,400	17,300	19,200	20,300
4	n/a	20,400	36,100	38,400	40,600
6	n/a	31,600	54,700	57,600	60,900
8	n/a	42,500	73,200	76,800	81,300
Arterial - Moderate Access Control (MAC)					
2	n/a	5,500	14,800	17,500	18,600
4	n/a	12,000	32,200	35,200	36,900
6	n/a	18,800	49,600	52,900	55,400
8	n/a	25,600	66,800	70,600	73,900
Arterial/Collector - Low Access Control (LAC)					
2	n/a	n/a	6,900	13,400	15,100
4	n/a	n/a	15,700	28,400	30,200
6	n/a	n/a	24,800	43,100	45,400
8	n/a	n/a	34,000	57,600	60,600

Source: Table 3-4 Average Daily Traffic Level of Service Thresholds By Facility Type for Roadway Planning, Washoe County *Regional Transportation Plan*, 2008

Level of Service Standards

The RTC has established level of service criteria for regionally significant roadways and intersections in the *RTP*. The *RTP* level of service standards for regional roadways and intersections are as follows:

- LOS D or better – All regional roadway facilities projected to carry less than 27,000 ADT at the latest RTP horizon
- LOS E or better – All regional roadway facilities projected to carry 27,000 or more ADT at the latest RTP horizon
- LOS F – Plumas Street from Plumb Lane to California Avenue
  Rock Boulevard from Glendale Avenue to Victorian Avenue
  South Virginia Street from Kietzke Lane to South McCarran Boulevard
  Sun Valley Boulevard from 2nd Avenue to 5th Avenue
  I-80 Ramps/North Virginia Street Intersection

All intersections shall be designed to provide a level of service consistent with maintaining the policy level of service of the intersecting corridors.

NDOT maintains a policy of LOS D or better on their facilities.

Since Pyramid Highway is an NDOT facility and is expected to carry less than 27,000 ADT, LOS D or better was used as the standard for this analysis (i.e. LOS A, B, C, or D are considered acceptable operations and LOS E or F are considered unacceptable operations).

EXISTING CONDITIONS

ROADWAY SYSTEM

Pyramid Highway is a north-south NDOT facility that runs from Interstate 80 (I-80) in the south to Pyramid Lake in the north. Pyramid Highway is a two-lane roadway with posted speed limits of 55-65 mph in the vicinity of the project. The *RTP* classifies Pyramid Highway as a High Access Control (HAC) Arterial south of Calle de la Plata and a Moderate Access Control (MAC) Arterial north of Calle de la Plata.

Calle de la Plata is a four-lane roadway west of Pyramid Highway and a two-lane roadway east of Pyramid Highway. The *RTP* classifies Calle de la Plata as a Low Access Control (LAC) Collector west of Pyramid Highway.

EXISTING TRAFFIC VOLUMES AND LEVEL OF SERVICE

Intersections

Intersection turning movement counts were collected at the Pyramid Highway/Calle de la Plata intersection during the weekday AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods in April 2012. The existing volumes are shown on **Figure 2** and the raw data is provided in **Attachment 1.** Synchro computer software, which utilizes *HCM 2000* methodology was used to analyze the level of service at the study intersection. **Table 3** shows the level of service results, and the detailed calculation worksheets are provided in the **Attachment 2**.

TABLE 3
EXISTING CONDITIONS INTERSECTION LEVEL OF SERVICE RESULTS

Intersection	Control Type[1]	AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS	Delay[2]	LOS
Pyramid Highway/Calle de la Plata	SSSC	17 **(>50)**	C **(F)**	7 **(>50)**	A **(F)**

Notes: [1] SSSC = Side Street Stop Control
[2] Delay is reported in seconds per vehicle for the overall intersection (worst movement) for unsignalized intersections.
Bold indicates unacceptable operations.
Source: Fehr & Peers, 2012

As shown in Table 3, the side street approach of the Pyramid Highway/Calle de la Plata intersection (westbound Calle de la Plata) operates at LOS F during the AM and PM peak hours. The overall intersection operates at LOS C during the AM peak hour and LOS A during the PM peak hour.

Roadway Segments

Daily roadway segment traffic volumes were collected on Calle de la Plata in April 2012 using machine counting equipment. Traffic volume data on Pyramid Highway was obtained from the NDOT *Annual Traffic Report* (2010). Daily traffic volumes were compared to the RTC's Average Daily Traffic Roadway Level of Service Thresholds (shown in Table 2 of this report) to determine existing roadway segment level of service. The results are shown in **Table 4**.

TABLE 4
EXISTING CONDITIONS ROADWAY SEGMENT CAPACITY RESULTS

Roadway	Location	Functional Classification[1]	Lanes	Daily Two-Way Traffic Volume	LOS
Pyramid Highway	South of Calle de la Plata	HAC Arterial	2	10,000	C
Pyramid Highway	North of Calle de la Plata	MAC Arterial	2	4,400	B
Calle de la Plata	West of Pyramid Highway	LAC Collector	4	5,480	C
Calle de la Plata	East of Pyramid Highway	LAC Collector	2	1,340	C

Notes: [1] LAC = Low Access Control, MAC = Moderate Access Control, HAC = High Access Control
Source: Fehr & Peers, 2012

As shown in Table 4, Pyramid Highway and Calle de la Plata currently operate at LOS C or better, which is considered acceptable operations based on Washoe County and NDOT standards.

HISTORICAL TRAFFIC VOLUMES

NDOT's Annual Traffic Report provides Annual Average Daily Traffic (AADT) volumes on Pyramid Highway north of Calle de la Plata from 2002 to 2010. This data was used to determine historical traffic volume growth in the project vicinity. Traffic volume data on Pyramid Highway south of Calle de la Plata has only been collected since 2008 and does not provide significant historical data. Table 5 shows the historical traffic volumes and associated annual growth rate on Pyramid Highway near the project site.

TABLE 5
HISTORICAL TRAFFIC VOLUMES – PYRAMID HIGHWAY

Roadway	Location	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Annual Growth Rate[1]
Pyramid Highway	North of Calle de la Plata	-	3,500	3,795	4,420	4,650	5,050	4,900	4,500	4,400	4,400	2.9%

Notes: [1] Exponential Annual Growth Rate shown.
Source: Fehr & Peers, 2012

Table 5 shows that traffic volumes on Pyramid Highway north of Calle de la Plata have fluctuated over the last eight years, peaking in 2006 and decreasing each year since. The overall annual growth rate from 2002 to 2010 is 2.9% per year.

TRAFFIC SIGNAL WARRANT ANALYSIS

The *Manual on Uniform Traffic Control Devices (MUTCD)* provides analysis criteria for determining if a traffic signal is warranted at an intersection. The Peak Hour Vehicle Volume and Four-Hour Vehicle Volume signal warrants were analyzed for the Pyramid Highway/Calle de la Plata intersection to determine if a traffic signal is warranted based on existing traffic volumes. **Exhibits 1A and 1B** show the Peak Hour Vehicle Volume signal warrant results.

Exhibit 1A: Peak Hour Vehicle Volume Signal Warrant

AM Peak Hour

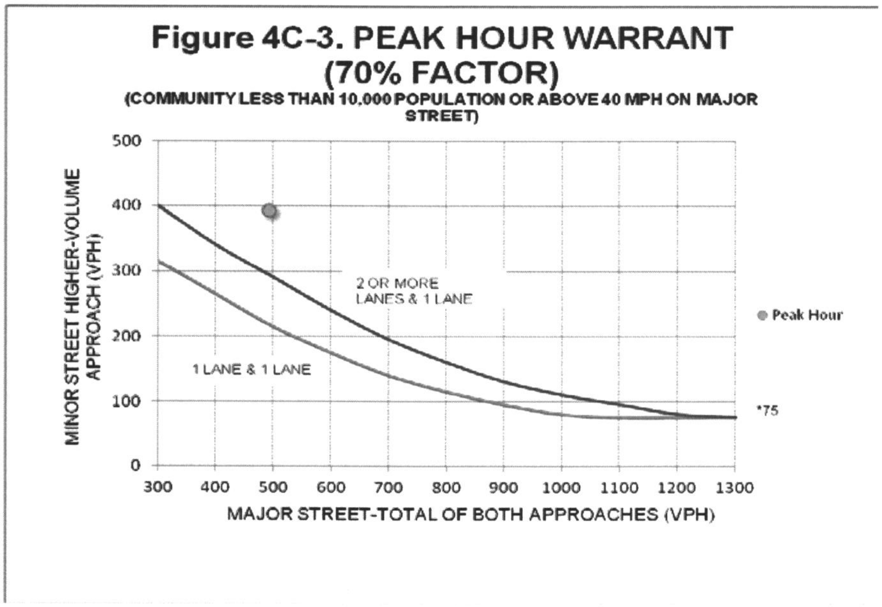
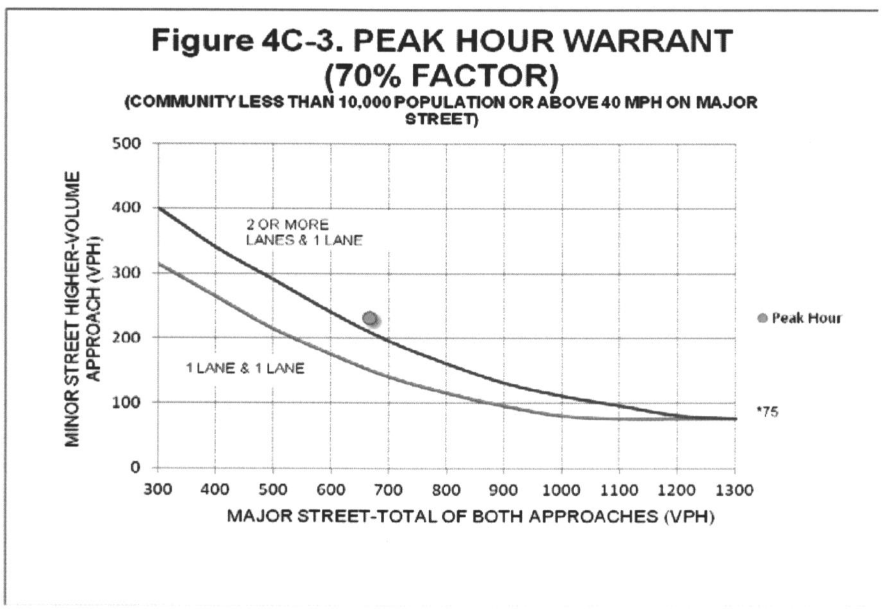


Exhibit 1B: Peak Hour Vehicle Volume Signal Warrant

PM Peak Hour

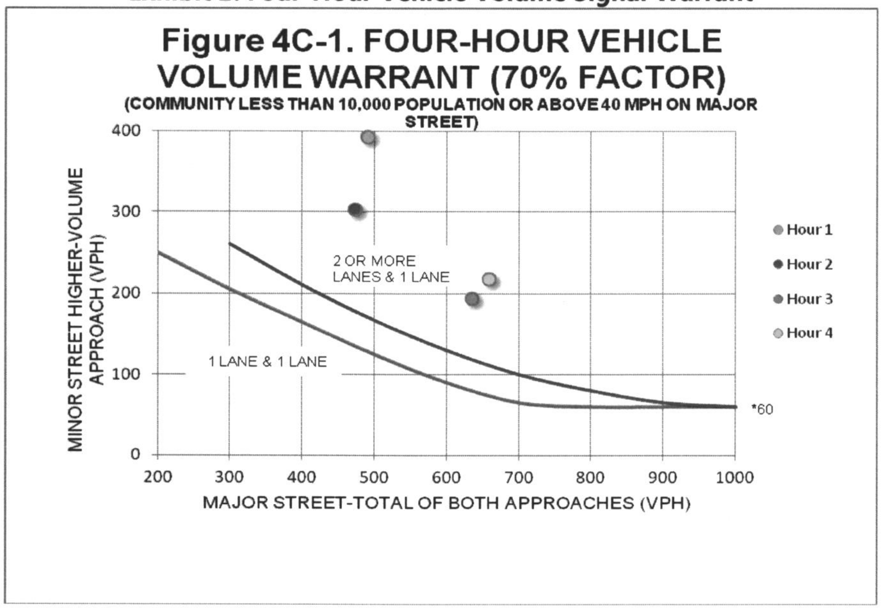


Source: MUTCD, Federal Highway Administration, 2009; Fehr & Peer, 2012

Based on the AM and PM peak hour traffic volumes at the Pyramid Highway/Calle de la Plata intersection, a traffic signal is warranted.

Exhibit 2 shows the Four-Hour Vehicle Volume signal warrant results.

Exhibit 2: Four-Hour Vehicle Volume Signal Warrant



Source: MUTCD, Federal Highway Administration, 2009; Fehr & Peer, 2012

Based on the traffic volumes during four hours of an average day at the Pyramid Highway/Calle de la Plata intersection, a traffic signal is warranted.

PROJECT CONDITIONS

PROJECT DESCRIPTION

The proposed project would change the current Neighborhood Commercial, Industrial, and Open Space zoning to High Density Suburban zoning. High Density Suburban zoning allows up to 9 units per acre for a total 360 multi-family dwelling units. The project will have two access driveways on Calle de la Plata.

TRIP GENERATION

Trips were generated for the proposed project based on average trip generation rates in the Institute of Transportation Engineers' (ITE) *Trip Generation, 8th Edition.* The trip generation rates for ITE Code 220 – Apartment, were used to estimate the trip generation for site because they are the highest multi-family residential rates. Using the highest rates provides flexibility as the project moves forward. For example, a for-sale condo or townhouse would generate less traffic than an apartment; therefore, 360 condos or townhouses would have a lesser effect on transportation conditions than the apartments analyzed in this report. The estimated trip generation is summarized in **Table 6**. A detailed trip generation spreadsheet is provided in **Attachment 3**.

TABLE 6
TRIP GENERATION ESTIMATE

Land Use	ITE Code	Size[1]	Daily	AM Peak Hour			PM Peak Hour		
			Trips	In	Out	Total	In	Out	Total
Multi-Family Residential (Apartment)	220	360 du	**2,394**	37	147	**184**	145	78	**223**
		Total Trips	**2,394**	37	147	**184**	145	78	**223**

Notes: [1] du = dwelling units
Source: Fehr and Peers 2012

The project will generate approximately 2,400 daily trips, 185 AM peak hour trips, and 225 PM peak hour trips.

Existing Zoning

The Sugarloaf Peak property is currently zoned as approximately 20 acres of Industrial, 17 acres of Neighborhood Commercial, and 2 acres of Open Space. Trip generation estimates were calculated for these zoning designations assuming floor area ratios of approximately 20% and 30% for comparative purposes. This equates to approximately 175,000 – 260,000 square feet of Industrial and approximately 150,000 – 230,000 square feet of Neighborhood Commercial space. **Table 7** shows the trip generation estimates for the existing zoning, and compares it to the trip generation of the proposed project.

TABLE 7
EXISTING ZONING TRIP GENERATION ESTIMATE

Land Use	ITE Code	Size[1]	Daily	AM Peak Hour			PM Peak Hour		
			Trips	In	Out	Total	In	Out	Total
20% Floor Area Ratio									
NC (Shopping Center)	820	150 ksf	**6,441**	91	59	**150**	275	285	**560**
I (General Light Industrial)	110	175 ksf	**1,220**	142	19	**161**	20	150	**170**
Total Trips			**7,661**	233	78	**311**	295	435	**730**
Proposed Project Trips			**2,394**	37	147	**184**	145	78	**223**
Trip Difference			***5,267***	*196*	*(-69)*	***127***	*150*	*357*	***507***
30% Floor Area Ratio									
NC (Shopping Center)	820	230 ksf	**9,876**	140	90	**230**	420	438	**858**
I (General Light Industrial)	110	260 ksf	**1,812**	210	29	**239**	30	222	**252**
Total Trips			**11,688**	350	119	**469**	450	660	**1,110**
Proposed Project Trips			**2,394**	37	147	**184**	145	78	**223**
Trip Difference			***9,294***	*313*	*(-28)*	***285***	*305*	*582*	***887***

Notes: [1] ksf = 1,000 square feet
Source: Fehr and Peers 2012

As shown in Table 7, the proposed project (multi-family residential) will generate less traffic than the existing zoning land uses (Industrial and Neighborhood Commercial). If the existing zoning were constructed with a 20% floor area ratio, the property would generate approximately 5,300 more daily trips, 125 more AM peak hour trips, and 500 more PM peak hour trips than the proposed project.

TRIP DISTRIBUTION AND ASSIGNMENT

Existing Plus Project Trip Distribution

Project generated trips were distributed to the surrounding roadway network and study intersections based on existing travel patterns and the location of the project site relative to existing, complimentary land uses. The following trip distribution percentages were used in the existing plus project conditions analysis:

- 10% to/from the north on Pyramid Highway
- 80% to/from the south on Pyramid Highway

- 5% to/from the west on Calle de la Plata
- 5% to/from the east on Calle de la Plata

The project trip distribution and assignment for the existing plus project conditions analysis is shown on **Figure 3**.

2030 Plus Project Trip Distribution

There are a number of planned development projects in the study area that will include land uses that attract residential-based trips (i.e. commercial, industrial). These projects are expected to be constructed by 2030 and will therefore change the directional distribution of the project generated trips. The following trip distribution percentages were used in the 2030 plus project conditions analysis:

- 20% to/from the north on Pyramid Highway
- 60% to/from the south on Pyramid Highway
- 15% to/from the west on Calle de la Plata
- 5% to/from the east on Calle de la Plata

The project trip distribution and assignment for the existing plus project conditions analysis is shown on **Figure 6**.

EXISTING PLUS PROJECT CONDITIONS

EXISTING PLUS PROJECT TRAFFIC VOLUMES AND LEVEL OF SERVICE

Vehicle trips generated by the proposed project were distributed to the surrounding roadway network and added to the existing traffic volumes for existing plus project conditions analysis.

Intersections

Table 8 presents the existing plus project conditions intersection level of service results. The intersection level of service Synchro printouts are provided in **Attachment 2**. **Figure 4** shows the existing plus project traffic volumes and lane configurations at the study intersections.

TABLE 8
EXISTING PLUS PROJECT CONDITIONS INTERSECTION LEVEL OF SERVICE RESULTS

Intersection	Control Type[1]	Existing				Existing Plus Project			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
Pyramid Highway/ Calle de la Plata	SSSC	17 **(>50)**	C **(F)**	7 **(>50)**	A **(F)**	**>50 (>50)**	**F (F)**	30 **(>50)**	D **(F)**
Calle de la Plata/ Driveway A	SSSC	NA	NA	NA	NA	4 (10)	A (A)	4 (9)	A (A)
Calle de la Plata/ Driveway B	SSSC	NA	NA	NA	NA	3 (9)	A (A)	3 (9)	A (A)

Notes: [1] SSSC = Side Street Stop Control
[2] Delay is reported in seconds per vehicle for the overall intersection (worst movement) for unsignalized intersections.
Bold indicates unacceptable operations.
NA = Not Applicable
Source: Fehr & Peers, 2012

As shown in Table 6, the overall Pyramid Highway/Calle de la Plata intersection will degrade from LOS C to LOS F during AM peak hour with the project. During the PM peak hour, the side street approach (westbound Calle de la Plata) will operate at LOS F and the overall intersection will operate at LOS D. The project driveway intersections are expected to operate at LOS A during the AM and PM peak hours.

If a traffic signal is installed, the Pyramid Highway/Calle de la Plata intersection will operate at LOS C during the AM and PM peak hours.

Roadway Segments

Table 9 presents the existing plus project conditions daily roadway segment level of service results. **Figure 4** shows the existing plus project daily traffic volumes on the study roadway segments.

TABLE 9
EXISTING PLUS PROJECT CONDITIONS ROADWAY SEGMENT CAPACITY RESULTS

Roadway	Location	Functional Classification[1]	Lanes	Existing		Existing Plus Project	
				Daily Two-Way Traffic Volume	LOS	Daily Two-Way Traffic Volume	LOS
Pyramid Highway	South of Calle de la Plata	HAC Arterial	2	10,000	C	11.920	C
Pyramid Highway	North of Calle de la Plata	MAC Arterial	2	4,400	B	4,640	B
Calle de la Plata	West of Pyramid Highway	LAC Collector	4	5,480	C	5,600	C
Calle de la Plata	East of Pyramid Highway	LAC Collector	2	1,340	C	3,620	C

Notes: [1] LAC = Low Access Control, MAC = Moderate Access Control, HAC = High Access Control
Source: Fehr & Peers, 2012

As shown in Table 9, the study roadway segments will continue to operate at LOS C or better with the addition of project generated traffic.

TRAFFIC SIGNAL WARRANT ANALYSIS

Exhibits 1A, 1B, and 2 show the existing conditions Peak Hour Vehicle Volume and Four-Hour Vehicle Volume signal warrant analysis results for the Pyramid Highway/Calle de la Plata intersection. Both warrants are met based on existing traffic volumes; therefore, existing plus project conditions signal warrant analyses were not performed as the project will add more traffic to the intersection, and increase the need for a traffic signal at the intersection.

2030 BACKGROUND CONDITIONS

2030 background conditions analysis includes roadway network and intersection improvements listed in the *RTP*, as well as traffic volume increases from regional growth and planned/approved projects in the area.

2030 BACKGROUND TRAFFIC VOLUMES

Regional Travel Demand Model

The 2030 background traffic volumes were developed based on RTC's regional travel demand model. The model includes regional growth based on planned/approved project in the area.

Based on direction from Washoe County staff, the RTC's regional travel demand model was used to prepare 2030 traffic forecasts for Pyramid Highway and Calle de la Plata. The model includes regional growth based on planned/approved projects in the area. The available model years are the 2008 base year and the 2030 forecast year. The difference method was used to correct inconsistencies in the base year model outputs when compared to existing traffic volumes. This correction uses the existing count data as the basis for the forecast volumes by adding the incremental difference in the model volumes between the 2008 base year and 2030 forecast year to determine the adjusted 2030 background volumes.

It should be noted that the traffic volumes at the Pyramid Highway/Calle de la Plata intersection increase by approximately five percent per year based on the travel demand model. This is considered an aggressive growth rate; therefore, the 2030 analysis should be considered conservative. In addition, the RTC is currently in the process of updating the regional travel demand model. The general consensus on the current travel demand model is that it predicts very aggressive and potentially unachievable growth rates region wide. The updated model will take a new view at future growth and provide a more realistic picture of future traffic conditions.

The regional travel demand model output and difference method calculations are provided in **Attachment 4**.

Planned/Approved Projects

There are three planned/approved development projects in the study area that were not fully accounted for in the 2030 model volumes. Trip generation and traffic volume information from their corresponding traffic studies were used to develop the final 2030 background traffic volumes. These projects include:

- *Frear Comprehensive Plan Amendment Traffic Analysis (also known as Village Green Commercial Center)* (Solaegui Engineers, 2008)

  - Located at two sites south of Calle de la Plata and east of Pyramid Highway, this project includes commercial space, gas station with convenience market, drive-thru pharmacy, restaurant, car wash, and industrial space.
  - Net New Trip Generation: Daily – 15,889, AM Peak – 1,116, PM Peak - 1,502
- *Campo Rico Business Center Traffic Analysis* (Solaegui Engineers, 2008)
  - Located north of Calle de la Plata along Pyramid Highway, this project includes an industrial park, residential dwelling units, and commercial space.
  - Net New Trip Generation: Daily - 13,608, AM Peak - 1,088, PM Peak - 1,423
- *Calle de la Plata/Pyramid Highway Retail Project Traffic Impact Study* (Fehr & Peers, 2007)
  - Located on the northeast corner of the Pyramid Highway/Calle de la Plata intersection, this project includes a fitness center, restaurants, commercial space, and a gas station with convenience market and car wash.
  - Net New Trip Generation: Daily – 2,941, AM Peak - 150, PM Peak - 291

ROADWAY NETWORK AND INTERSECTION IMPROVEMENTS BY OTHERS

The *RTP* lists regional roadway improvements to be completed by 2018 and 2030 including:

- Widen Pyramid Highway from Egyptian Drive to Calle de la Plata from two lanes to four lanes by 2018
- Widen Pyramid Highway from Calle de la Plata to Winnemucca Ranch Road from two lanes to four lanes by 2030
- Widen Pyramid Highway from Egyptian Drive to Calle de la Plata from four lanes to six lanes by 2030

These improvements were included in the 2030 background conditions analysis.

The Pyramid Highway/Calle de la Plata intersection meets the Peak Hour and Four-Hour Vehicle Volumes signal warrants (MUTCD) based on existing traffic volumes. In addition, the traffic analyses for the three planned/approved projects listed above all discuss the need for a traffic signal at the Pyramid Highway/Calle de la Plata intersection, as well as the Spanish Springs Area Plan. Therefore, under 2030 conditions, the study intersection was analyzed with a traffic signal.

The necessary intersection lane configurations, including left and right-turn pockets, were determined based on the 2030 background conditions AM and PM peak hour analysis. It is reasonable to assume that these improvements would be constructed with the RTP planned widening of Pyramid Highway and Calle de la Plata.

Figure 5 shows the 2030 background traffic volumes and the assumed intersection lane configurations.

2030 LEVEL OF SERVICE

Intersections

Table 10 shows the 2030 background conditions intersection level of service results, and the detailed calculation worksheets are provided in **Attachment 2**.

TABLE 10
EXISTING CONDITIONS INTERSECTION LEVEL OF SERVICE RESULTS

Intersection	Control Type[1]	AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS	Delay[2]	LOS
Pyramid Highway/Calle de la Plata	Signal	26	C	43	D

Notes: [1] SSSC = Side Street Stop Control
[2] Delay is reported in seconds per vehicle for the overall intersection (worst movement) for unsignalized intersections.
Bold indicates unacceptable operations.
Source: Fehr & Peers, 2012

As shown in Table 10, the Pyramid Highway/Calle de la Plata will operate at LOS D or better during the AM and PM peak hours with the 2030 background traffic volumes and proposed intersection lane configurations.

Roadway Segments

The 2030 daily roadway segment level of service results are shown in **Table 11**.

TABLE 11 2030 BACKGROUND CONDITIONS ROADWAY SEGMENT CAPACITY RESULTS					
Roadway	**Location**	**Functional Classification[1]**	**Lanes**	**Daily Two-Way Traffic Volume**	**LOS**
Pyramid Highway	South of Calle de la Plata	HAC Arterial	6	47,190	C
Pyramid Highway	North of Calle de la Plata	MAC Arterial	4	26,010	C
Calle de la Plata	West of Pyramid Highway	LAC Collector	4	10,730	C
Calle de la Plata	East of Pyramid Highway	LAC Collector	2	3,930	C

Notes: [1] LAC = Low Access Control, MAC = Moderate Access Control, HAC = High Access Control
Source: Fehr & Peers, 2012

As shown in Table 11, Pyramid Highway and Calle de la Plata currently will operate at LOS C with 2030 traffic volumes and proposed roadway improvements.

2030 PLUS PROJECT CONDITIONS

2030 PLUS PROJECT TRAFFIC VOLUMES AND LEVEL OF SERVICE

Vehicle trips generated by the proposed project were distributed to the surrounding roadway network and added to the 2030 background traffic volumes for 2030 plus project conditions analysis.

Intersections

Table 12 presents the 2030 plus project conditions intersection level of service results, and the detailed calculation worksheets are provided in **Attachment 2**. **Figure 7** shows the 2030 plus project traffic volumes and lane configurations at the study intersections.

TABLE 12
2030 PLUS PROJECT CONDITIONS INTERSECTION LEVEL OF SERVICE RESULTS

Intersection	Control Type[1]	2030 Background				2030 Plus Project			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS	Delay[2]	LOS
Pyramid Highway/ Calle de la Plata	Signal	26	C	43	D	27	C	48	D
Calle de la Plata/ Driveway 1	SSSC	NA	NA	NA	NA	2 (11)	A (B)	2 (13)	A (B)
Calle de la Plata/ Driveway 2	SSSC	NA	NA	NA	NA	1 (10)	A (B)	1 (12)	A (B)

Notes: [1] SSSC = Side Street Stop Control
[2] Delay is reported in seconds per vehicle for the overall intersection (worst movement) for unsignalized intersections.
Bold indicates unacceptable operations.
NA = Not Applicable
Source: Fehr & Peers, 2012

As shown in Table 12, the Pyramid Highway/Calle de la Plata will operate at LOS D during the AM and PM peak hours with the 2030 plus project traffic volumes and proposed intersection lane configurations. The project driveway intersections are expected to operate at acceptable levels of service during the AM and PM peak hours.

Roadway Segments

Table 13 presents the 2030 plus project conditions daily roadway segment level of service results. **Figure 7** shows the 2030 plus project daily traffic volumes on the study roadway segments.

TABLE 13
2030 PLUS PROJECT CONDITIONS ROADWAY SEGMENT CAPACITY RESULTS

Roadway	Location	Functional Classification[1]	Lanes	2030 Background		2030 Plus Project	
				Daily Two-Way Traffic Volume	LOS	Daily Two-Way Traffic Volume	LOS
Pyramid Highway	South of Calle de la Plata	HAC Arterial	6	47,190	C	48,630	C
Pyramid Highway	North of Calle de la Plata	MAC Arterial	4	26,010	C	26,490	C
Calle de la Plata	West of Pyramid Highway	LAC Collector	4	10,730	C	11,090	C
Calle de la Plata	East of Pyramid Highway	LAC Collector	2	3,930	C	6,200	C

Notes: [1] LAC = Low Access Control, MAC = Moderate Access Control, HAC = High Access Control
Source: Fehr & Peers, 2012

As shown in Table 13, the study roadway segments will operate at LOS C with and without the addition of project generated traffic.

CONCLUSIONS AND RECOMMENDATIONS

The Pyramid Highway/Calle de la Plata intersection currently operates at LOS F during the AM and PM peak hours. Based on existing traffic volumes, the intersection meets Peak Hour and Four-Hour Vehicle Volume signal warrant criteria. The Spanish Springs Area Plan recognizes that a traffic signal is needed at the intersection to address the current situation.

The proposed project will increase delay at the Pyramid Highway/Calle de la Plata intersection, and degrade the overall intersection level of service from LOS C to LOS F during the AM peak hour. If a traffic signal is not installed at the Pyramid Highway/Calle de la Plata intersection prior to construction of the project, the project should construct the traffic signal to accommodate project generated traffic volumes. Note that since the traffic signal is necessary to accommodate existing traffic volumes, the project should not be fully financially responsible for the improvements, and should only be responsible for a fair share based on the traffic volumes generated at the intersection by the project site.

The *RTP* includes future regional roadway improvements to increase capacity on Pyramid Highway in the project vicinity. The *RTP* specifically indicates the following improvements:

- Pyramid Highway – Widen from two lanes to four lanes, from Egyptian Drive to Calle de la Plata by 2018
- Pyramid Highway – Widen from two lanes to four lanes, from Calle de la Plata to Winnemucca Ranch Road by 2030
- Pyramid Highway – Widen from four lanes to six lanes, from Egyptian Drive to Calle de la Plata by 2030

The *RTP* does not include recommendations for specific intersection improvements, recognizing that the specific intersection configurations should be determined at the time when the corridor is improved and actual turning movements are known. The *RTP* projects listed above assume that intersection upgrades will be accomplished with the widenings.

It is important to note that this analysis is conservative and comprehensive with regard to 2030 future traffic volumes because it assumes that, in addition to high background traffic growth (up to 5% per year at the Pyramid Highway/Calle de la Plata intersection), the following projects will be built out:

- Village Green Commercial Center (southeast corner of Pyramid Highway/Calle de la Plata intersection)
- Campo Rico Business Center (north of Calle de la Plata along Pyramid Highway)
- Calle de la Plata Retail Project (northwest corner of Pyramid Highway/Calle de la Plata intersection)

In addition, the proposed project would generate significantly less traffic than the property built-out under the existing zoning.

The 2030 analysis demonstrates adequate regional roadway improvements are planned to accommodate regional growth, approved but not yet constructed projects near the Pyramid Highway/Calle de la Plata intersection, and the proposed project.

PRELIMINARY HYDROLOGY REPORT

Axion ENGINEERING
Civil Engineering • Land Development

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APPENDICES

General Figures and Tables

Hydrologic Design Reference Materials

1. INTRODUCTION

This report represents the preliminary hydrology report for Surgarloaf Ranch Estates Tentative Subdivision. This report was prepared in accordance with the Washoe County Tentative Subdivision Map requirements and the Washoe County Hydrologic Criteria and Drainage Design Manual, hereinafter referred to as the WCDDM.

1.1 PROJECT DESCRIPTION/LOCATION

Sugarloaf Ranch Estates is a proposed 119 unit single family residential subdivision located in Spanish Springs approximately ¼ mile east of Pyramid Highway adjacent to Calle De La Plata on the north side. (Reference Figure 1 Vicinity Map). The property is approximately 39.85 acres in size and lies in a portion of Section 24, Township 21 North, Range 20 East. (APN is 534-562-07). The site is bounded by Calle De La Plata on the south, a single family residential lot on the east, undeveloped land to the west and the Donovan Ranch Development to the north. The portion of the Donovan Ranch project adjacent to the subject property is currently undeveloped. The site slopes down from the east to the west toward Pyramid Lake Highway with an approximate gradient of 1.3% with a low point existing towards the middle of the property.

1.2 PREVIOUS DRAINAGE STUDIES

The following drainage reports were used for reference materials in the analysis of the Sugarloaf Ranch Hydrology. 1. "Master Drainage Study for Donovan Ranch" prepared by Matrix Engineering & Consulting, Inc., dated September 2004. (Matrix) 2. "Draft Final Drainage Report for North Spanish Springs Flood Detention Facilities" prepared by AMEC Infrastructure dated May 2006 (AMEC). 3. "Application for Conditional Letter of Map Revision (CLOMR)" prepared by Quad Knopt dated October 2006 (Quad Knopt) and 4. "Application for Letter of Map Amendment (LOMR)" prepared by Aqua Hydrologic Consulting LLC dated October 2008 (Aqua).

1.3 FEMA FLOOD HAZARD INFORMATION

A portion of the site lies within a designated flood hazard area (Zone AO with depths of 1 foot) as outlined on the Flood Insurance Rate Map 32031C2865G (revised March 2009) which is included in the back of this report. This flood zone was established from the offsite flows associated with Griffith Canyon which historically overtopped Calle De La Plata and flowed through the site. The Griffith Canyon flows have since been diverted to the North Spanish Springs Detention Facility by means of the Calle Channel as outlined in the AMEC report [1]. Subsequent to the AMEC analysis, a CLOMR and final LOMR were obtained from FEMA for the areas removed from the flood hazard area by the detention facility (Quad Knopt [3], Aqua [4]). The results of all studies concluded that a portion of the 100-year flow calculated to be 104 cfs would still overtopped Calle De La Plata upstream of the project site and therefore a small portion of the south west corner remains in the flood zone AO as shown on the FIRM map. The tentative map application for Sugarloaf Estates was preceded by a Master Plan Amendment (MPA) application. Within the MPA staff report, Washoe County Engineering staff indicated that more recent improvements to drainage facilities in the general vicinity of the project have likely removed the Zone AO constraint from the subject property. A detailed analysis of those improvements would be required however to support a new LOMR application to FEMA in order to officially remove the property from the flood hazard area. In the absence of said LOMR, the final elevations of the proposed homes on the affected lots within the flood hazard area must be elevated to the depths associated with the AO zone and the Washoe County Flood Ordinance. Flood Insurance requirements would also be required to obtain mortgages on those homes.

1.4 REQUIRED DETENTION

A detention basin is proposed within the subdivision to reduce developed peak discharges from the proposed development to at or below existing runoff rates.

2. HYDROLOGIC ANALYSIS

The hydrologic analysis included in this report consists of peak runoff flow computations for the existing and proposed conditions for the 5 and 100-year design storms.

2.1 DESIGN RAINFALL

Precipitation intensity values were obtained from the NOAA Atlas 14 website. The rainfall data is specific to the latitude and longitude of the project site. A copy of the values obtained are included in this report. The NOAA Atlas 14 values are somewhat higher than the regional rainfall values for the Spanish Springs Valley outlined in the WCDDM which are the values used in the previous drainage studies referenced herein. For the purposes of the subdivision design, the higher NOAA 14 values are therefore conservative in terms of pipe and channel designs. Final design of the subdivision drainage facilities could possibly be based on the lower regional rainfall values if acceptable to the designer and if approved by the Washoe County engineering department.

2.2 METHODOLOGY

The SCS TR-55 unit hydrograph methodology was used to determine peak flows for the large off-site drainage are tributary to the project. The off-site area is greater than 100 acres in size and therefore the SCS method was a more appropriate method over the Rational Method. The SCS method uses the Drainage Area, Curve Number, Time of Concentration and a Unit Hydrograph to compute peak flows. A computer program version of TR55 is currently available and was used in the analysis. It is important to note that the new version of TR55 uses time of concentration and not lag time which was part of the older version and as outlined in the WCDDD. Runoff Curve numbers were determined using Table 702 in the WCDDM and soil types obtained from the SCS soil conservation service web-site. A map of the existing soil types are included in the back of this report.

The Rational Method was used to compute the peak runoff for the remaining drainage areas in the existing condition and also for the developed condition project runoff. The Rational Method uses the formula Q=C*I*A where; (Q) is the peak flow in cfs, (C) is the runoff coefficient, (I) is the rainfall intensity in inches per hour and (A) is the drainage area in acres. The drainage areas for both methods were measured in AutoCad. Time of Concentrations were calculated using the drainage flow paths measured in autocad along with Figure 701 from the WCDDM . Runoff coefficients (C) were obtained from table 701 of the WCDDM. The values for the average of 1/8 and 1/4 acre lots were used and are equal to 0.55 for the 5-year storm and 0.72 for the 100-year storm. C values for "Forest" were used for the existing condition drainage areas due to the high infiltration rates of the underlying A soil group. This is line with a CN value of 40 used for soil group A in TR55.

2.3 EXISTING RUNOFF

The first source looked at to determine existing runoff was the USGS quadrangle map for Griffith Canyon which was obtained in pdf format from the USGS website (2011). Figure DR-1 is a copy of the quadrangle map which shows the subject site in relation to the off-site tributary drainage areas A, B, C, D and E. Areas A and D together encompasses a substantial off-site drainage area was historically tributary to the project site. The upper portion defined by Area A has since been diverted into the existing gravel pit as outlined in the Matrix report for the Donovan Ranch Subdivision stating that the pit captured and retained all of the flows from this drainage area upstream of that subdivision. As part of this analysis for Sugarloaf Estates, an examination of google earth images did conclude that the upper portion of the watershed defined by Area A is being diverted into the pit with Area D still tributary to the project site. Area B on the quad map is shown to flow across Calle De La Plata in a defined drainage path to combine with the Griffith Canyons flows on the south side of the road. This area is also part of the previous drainage studies and is included in the total Griffith Canyon flows diverted to the Calle Channel, Refer to Basin 3 as shown on Plate 1 from the Quad Knopt report. In an examination of current Google street view images however, a culvert at the location of the drainage crossing over Calle De La Plata is not evident therefore it is not certain what storm duration actually overtops Calle De La Plata. There is also an existing roadside ditch on the north side of the road that appears to have capacity for the minor storm flows from Area B. Although the flow from this area would likely not impact the project site itself, it would have an impact on the existing roadside ditch that exists along the project frontage of Calle De La Plata. A more detailed study of upstream flows tributary to the roadside ditch is recommended with final design of the Sugarloaf subdivision to determine if the 100-year flow from Area B must be accounted for in the roadside ditch on the north side of Calle De La Plata. Continuing with review of the quadrangle map, Area C is shown as sheet flow directed south westerly toward both Calle De La Plata and the project site. Area E is an area of sheet flow toward to the project site.

The quad map represents an overall view of the off-site watersheds but was not used for any calculations. For hydrologic calculations, areas C, D and E were further analyzed using the Washoe County CSD system which includes 2’ CI contours and parcel lines. Figure DR-2 is the drainage map created using an image file generated from CSD and best-fit into AutoCad. The drainage areas were then drawn and measured in Autocad. The area designations on the CSD map relative to the quad map are as follows: Area E was split into two drainage areas and labeled as E1A and E2A and Areas C and D were combined into one area labeled E3A. These areas represent the off-site tributary drainage areas to the project which must be perpetuated through the subdivision. The continuation of these drainage areas through the project site were given the designations E1B, E2B and E3B, respectively, which represent the existing condition of the project site, and when combined with the off-site areas represent the total tributary area and flow at the downstream end of the project. The locations of existing flow outlets from the property are also shown on the map.

Figure DR-2 shows the location near the southeast corner of the gravel pit where google earth images showed an opening in the existing berm exists to allow flows to enter the pit. South of this area flows would continue to the project site. It is important that the design engineer who prepares the final plans for Sugarloaf Estates verifies that this opening still exists at that time and that it is a permanent opening otherwise a significant amount of flow from area A could end up in the project site should the opening ever be closed. Figure DR-2 also shows that although the off-site flow pattern within each area is primarily sheet flow perpendicular to the existing contours, somewhat defined drainage paths were evident and were drawn and used to calculate the time of concentrations for each drainage area. An important consideration regarding areas E3A and E3B are that historically these areas drained through the middle of the site to Outlet 2. This is verified by both the drainage line on the quadrangle map and from the existing contour lines. Sometime in the recent past however a dirt road was constructed diagonally across the drainage areas which over time has become a diversion channel for this flow and is directing it to Outlet 3 at Calle De La Plata. As will be discussed in the proposed condition section of this report, the proposed design is to route the off-site flow from Area E3A to Outlet 3. Table 1 summarizes the existing runoff calculations.

3. PROPOSED DRAINAGE FACILITIES

3.1 ON-SITE STORM DRAINAGE SYSTEM

Figure DR-3 represents the proposed drainage system including all catch basin locations and their respective drainage areas and flows. Table 2 summarizes all flow information. The system is described as follows: the offsite upstream flows north of Chestnut Vine Drive (Area E3A from DR-2) will be picked up via a cut-off channel and routed between lots 6 and 7 to an inlet structure in Seaberry way, south in Seaberry in 42” pipe to new trapezoidal channel running parallel to Calle de la Plata and flowing west meeting the existing drainage path at the south west side of the site (Outlet 3). Alternatively, this newly installed 42” pipe could exit into the existing drainage channel south of Calle De La Plata, directing the flows to the regional detention/sedimentation facility. There are three catch basin areas that combine with this off-site flow, A, B and L. The SCS TR-55 model was used to route area E3A through the pipe and open channel and combine with these three areas at outlet 3. The total flows to outlet 3 are Q (5) = 2.62 cfs and Q (100) = 45.62 cfs which represents a slight increase from existing flows at this location of Q (5)=1.70 cfs and Q (100) =41.03 cfs. This increase can be mitigated with final design by reducing discharges from the proposed detention basin.

The existing roadside channel on the north side of Calle De La Plata is not planned to be modified nor are flows planned to be changed. This could change with final design however depending on verification of off-site flows from Area B from DR-1, and the 104 cfs of overflow from Griffith Canyon as outlined previously in this report.

Off-site flows north of Chestnut Vine Drive (Areas E1A and E1B from DR-2) will be intercepted via a cut-off channel along the east boundary of lots 14-20 and routed to the north side of the project and then west back into the original flow path of E1A within the existing adjacent open space and County park area (Outlet 1). The plan will add existing off-site area E2A to the outlet 1 flows but subtracts the on-site area flows from E1B and E2B. The total proposed flows at outlet 1 are Q (5)= 0.53 cfs and Q (100) = 7.99 cfs which represent slight increases from the existing flows of Q (5) = 0.42 cfs and Q (100) = 6.28 cfs. As with outlet 3, this slight increase in flow can be mitigated by detaining more of the developed area flows in the detention pond.

On site flows will be collected via catch basins and conveyed to a proposed detention pond located on the west side of the project between lots 33 and 34. The pond will be sized to mitigate increased storm flows due to development and release storm flows in the current low-point of the property. The current estimated volume of storage required for the pond is 1.02 acre-feet. The available storage is 4.82 acre-feet. It is suggested that the property adjacent to Sugarloaf Ranch Estates to the west coordinate their detention facilities with this project so that one pond, rather than two be built in this area.

3.2 STREET CAPACITY CALCULATIONS

Street drainage capacities will be verified with final design to capture the 5-year flow in ½ a travel lane and the 100-year flow to top of curb.

3.3 CONCLUSIONS

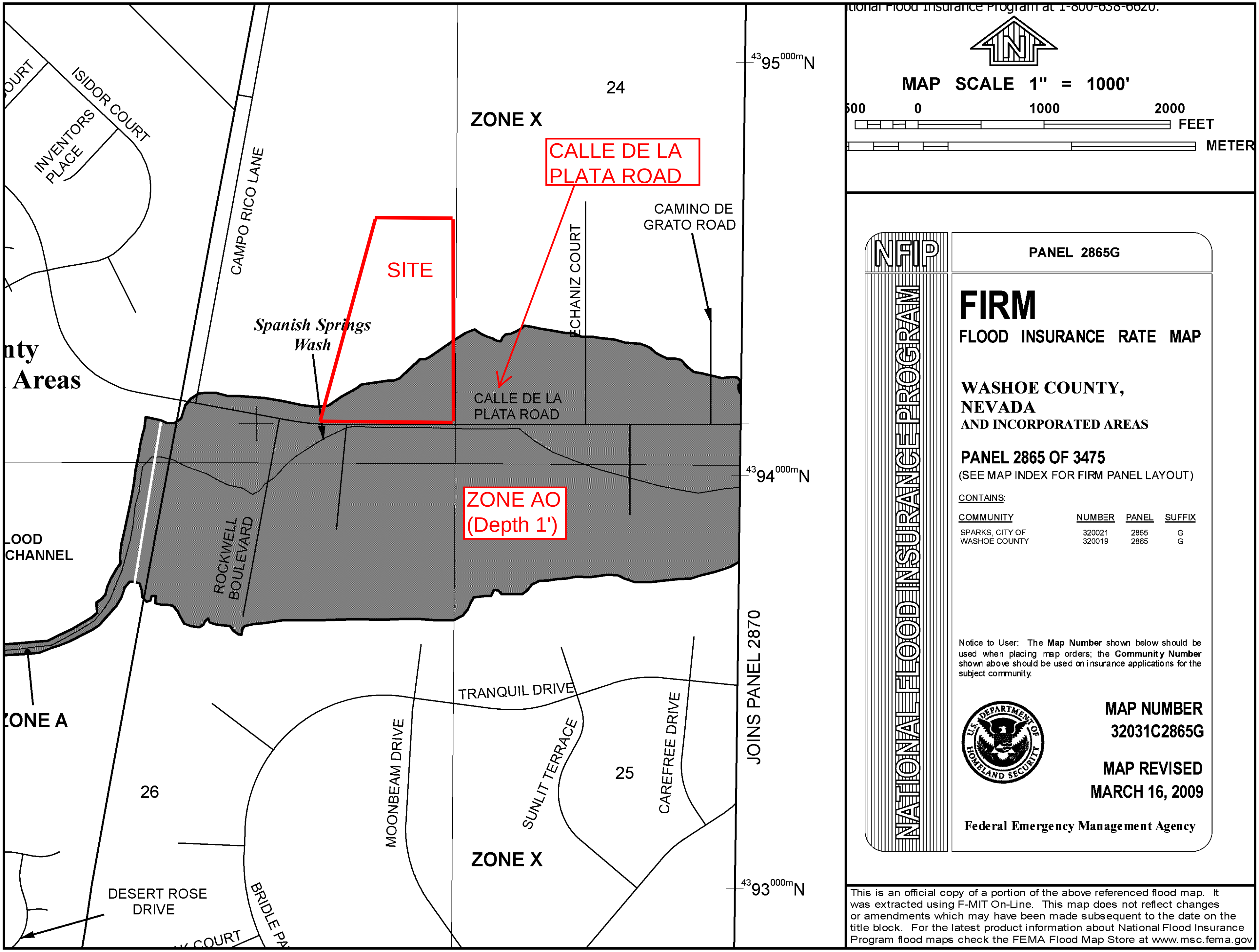
In conclusion, the Sugarloaf Ranch Estates Tentative Map has been designed to meet the Washoe County Drainage Code and will result in slight to no increase in downstream flows. Recommendations are contained herein for further analysis on upstream watershed flow paths and drainage improvements as part of the final design of the subdivision. All exhibits and supporting calculations are included in the Appendix of this report.

4. REFERENCES

Washoe County Hydrologic Criteria and Drainage Design Manual, December 2, 1996

N.T.S.

FIGURE 1 - VICINITY MAP



tional Flood Insurance Program at 1-800-638-6620.
N
MAP SCALE 1" = 1000'
500 0 1000 2000
FEET
METER
NFIP
PANEL 2865G
FIRM
FLOOD INSURANCE RATE MAP
WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS
PANEL 2865 OF 3475
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
SPARKS, CITY OF 320021 2865 G
WASHOE COUNTY 320019 2865 G
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
32031C2865G
MAP REVISED
MARCH 16, 2009
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
U.S. DEPARTMENT OF HOMELAND SECURITY
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov
4395000mN
4394000mN
4393000mN
24
25
26
ZONE X
ZONE X
ZONE A
ZONE AO
(Depth 1')
SITE
CALLE DE LA PLATA ROAD
CALLE DE LA PLATA ROAD
CAMINO DE GRATO ROAD
ECHANIZ COURT
CAMPO RICO LANE
ISIDOR COURT
INVENTORS PLACE
COURT
Spanish Springs Wash
nty Areas
LOOD CHANNEL
ROCKWELL BOULEVARD
TRANQUIL DRIVE
MOONBEAM DRIVE
SUNLIT TERRACE
CAREFREE DRIVE
JOINS PANEL 2870
DESERT ROSE DRIVE
BRIDLE PA
COURT

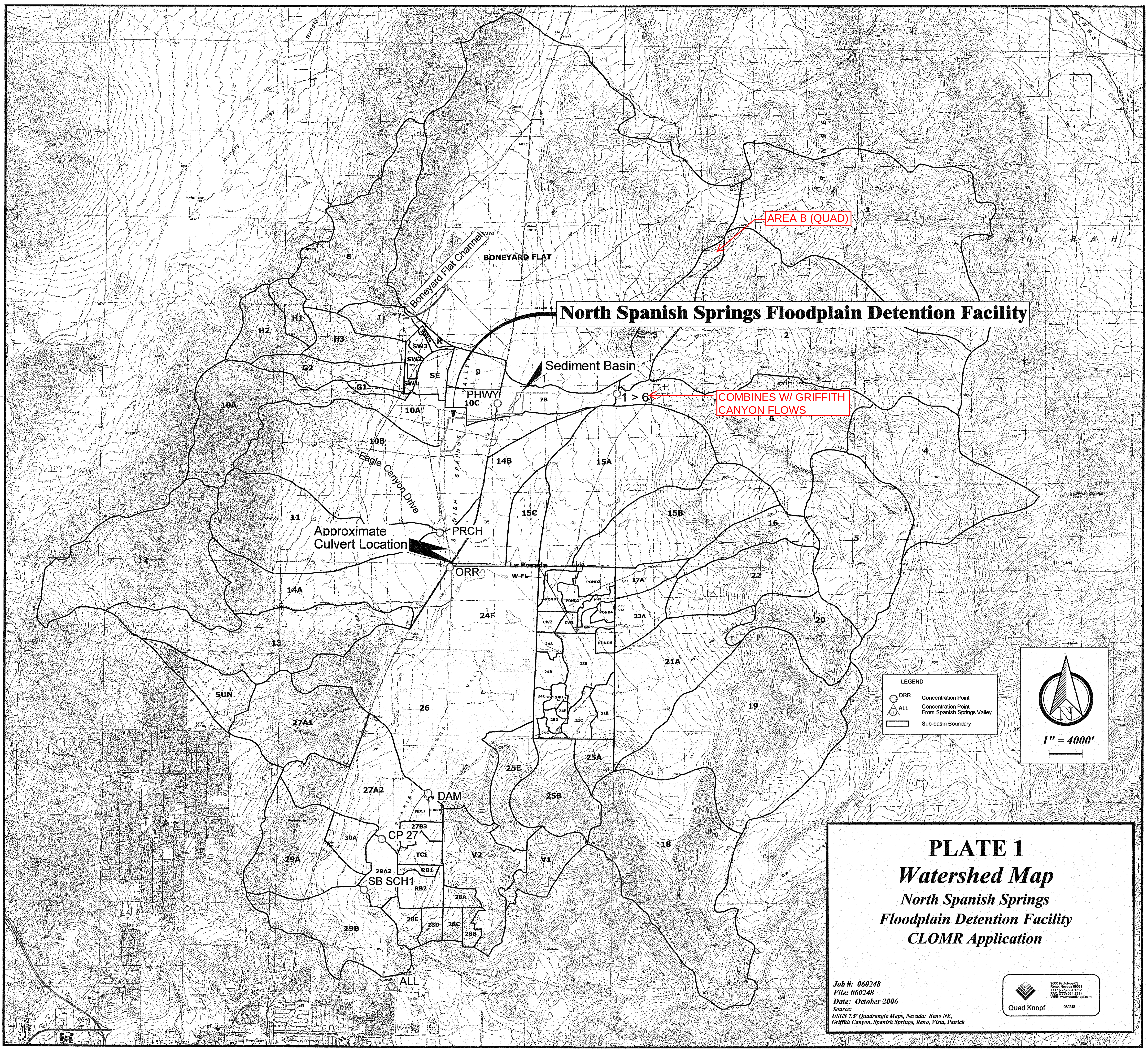

North Spanish Springs Floodplain Detention Facility
AREA B (QUAD)
COMBINES W/ GRIFFITH CANYON FLOWS
Boneyard Flat Channel
BONEYARD FLAT
Sediment Basin
PHWY
1 > 6
Eagle Canyon Drive
Approximate Culvert Location
PRCH
ORR
La Posada
W-FL
DAM
CP 27
SB SCH1
ALL
LEGEND
ORR Concentration Point
ALL Concentration Point From Spanish Springs Valley
Sub-basin Boundary
1" = 4000'
PLATE 1
Watershed Map
North Spanish Springs
Floodplain Detention Facility
CLOMR Application
Job #: 060248
File: 060248
Date: October 2006
Source:
USGS 7.5' Quadrangle Maps, Nevada: Reno NE, Griffith Canyon, Spanish Springs, Reno, Vista, Patrick
Quad Knopf

TABLE 1 - EXISTING DEVELOPED SUB-BASIN SUMMARY

BASIN NO.	AREA (acres)	Tc (min)	C5	C100	i5	i100	Q_5 (cfs)	Q_{100} (cfs)	Destination
E1A	9.94	50.3	0.05	0.3	0.58	1.47	0.29	4.38	
E1B	5.81	8.5	0.05	0.3	1.6	4	0.46	6.97	
E1	**15.75**	**58.8**	**0.05**	**0.3**	**0.53**	**1.33**	**0.42**	**6.28**	**Outlet 1**
E2A	8.96	46.5	0.05	0.3	0.61	1.55	0.27	4.17	
E2B	7.63	16.5	0.05	0.3	1.17	2.95	0.45	6.75	
E2	**16.59**	**63**	**0.05**	**0.3**	**0.51**	**1.27**	**0.42**	**6.32**	**Outlet 2**
E3A	244.94	85.3	CN=61		TR55 METHOD		1.61	45.03	
E3B	26.4	27.7	0.05	0.3	0.87	2.2	1.15	17.42	
E3	**271.34**	**113**	**CN=61**		**TR55 METHOD**		**1.70**	**41.03**	**Outlet 3**

TABLE 2 - DEVELOPED SUB-BASIN SUMMARY

BASIN NO.	AREA (acres)	Tc (min)	C5	C100	i5	i100	Q_5 (cfs)	Q_{100} (cfs)	DESTINATION
E1A	9.94	50.3	0.05	0.3	0.58	1.47	0.29	4.38	
E2A	8.96	46.5	0.05	0.3	0.61	1.55	0.27	4.17	
Combined	**18.9**	**53.6**	**0.05**	**0.3**	**0.56**	**1.41**	**0.53**	**7.99**	**Outlet 1**
A	1.51	10.00	0.55	0.72	1.89	3.49	1.57	3.79	CB #1
B	1.01	10.00	0.55	0.72	1.89	3.49	1.05	2.54	CB #1
L	1.41	10.00	0.55	0.72	1.89	3.49	1.47	3.54	CB #7
ABL	3.93				Rational		4.09	9.88	Outlet 3
ABL	3.93	10.00	CN=79		TR55		**2.62**	**9.68**	Outlet 3
E3A	244.94	85.3	CN=61		TR55		1.61	45.03	Open Channel
Routed					TR55		1.61	45.00	Open Channel
Combined	**248.87**				TR55		**2.62**	**45.62**	**Outlet 3**

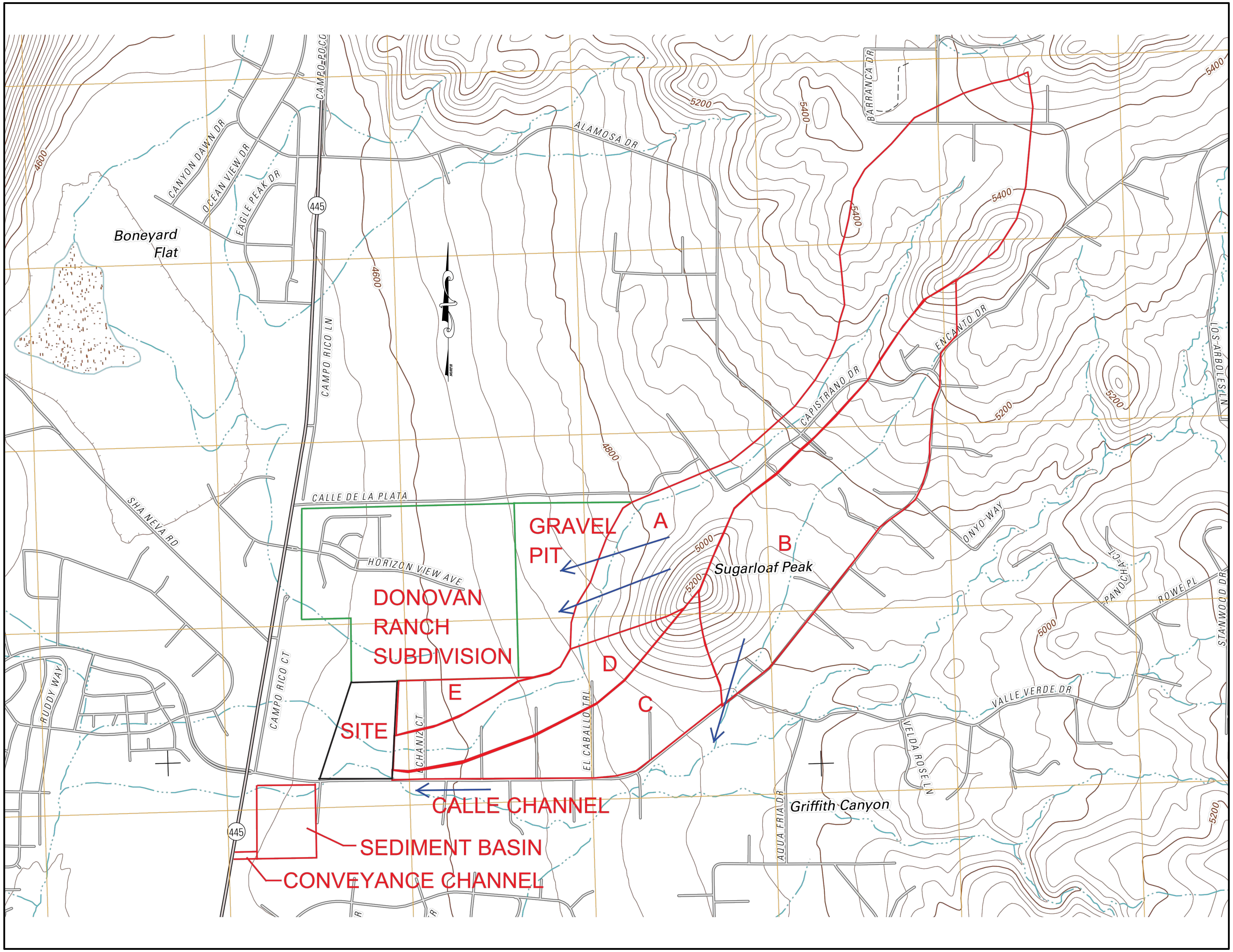
TABLE 2 - DEVELOPED SUB-BASIN SUMMARY (continued)									
BASIN NO.	**AREA (acres)**	**Tc (min)**	**C5**	**C100**	**i5**	**i100**	**Q_5 (cfs)**	**Q_{100} (cfs)**	**DESTINATION**
C	2.39	10.00	0.55	0.72	1.89	3.49	2.48	6.01	CB #2
D	1.51	10.00	0.55	0.72	1.89	3.49	1.57	3.79	CB #3
E	1.42	10.00	0.55	0.72	1.89	3.49	1.48	3.57	CB #3
F	1.29	10.00	0.55	0.72	1.89	3.49	1.34	3.24	CB #4
G	2.06	10.00	0.55	0.72	1.89	3.49	2.14	5.18	CB #4
H	1.35	10.00	0.55	0.72	1.89	3.49	1.40	3.39	CB #5
I	2.98	10.00	0.55	0.72	1.89	3.49	3.10	7.49	CB #5
J	1.63	10.00	0.55	0.72	1.89	3.49	1.69	4.10	CB #6
K	1.19	10.00	0.55	0.72	1.89	3.49	1.24	2.99	CB #6
L	1.41	10.00	0.55	0.72	1.89	3.49	1.47	3.54	CB #7
M	1.46	10.00	0.55	0.72	1.89	3.49	1.52	3.67	CB #7
N	0.74	10.00	0.55	0.72	1.89	3.49	0.77	1.86	CB #8
O	0.46	10.00	0.55	0.72	1.89	3.49	0.48	1.16	CB #8
P	2.08	10.00	0.55	0.72	1.89	3.49	2.16	5.23	CB #9
Q	3.37	10.00	0.55	0.72	1.89	3.49	3.50	8.47	CB #9
R	1.25	10.00	0.55	0.72	1.89	3.49	1.30	3.14	CB #10
S	3.21	10.00	0.55	0.72	1.89	3.49	3.34	8.07	CB #10
T	1.75	10.00	0.55	0.72	1.89	3.49	1.82	4.40	CB #11
U	0.49	10.00	0.55	0.72	1.89	3.49	0.51	1.23	CB #12
V	1.22	10.00	0.05	0.30	1.89	3.49	0.12	1.28	Det Pond
Combined	**33.26**						**33.31**	**81.79**	**Det Pond**
						Discharge	**0.42**	**6.32**	**Outlet 2**
						Storage	**32.88**	**75.47**	**cfs**
						Volume	**0.45**	**1.04**	**ac-feet**

SugarLoaf Estates
Off Site Area E3A
Reno-W County, Nevada

Hydrograph Peak/Peak Time Table

Peak Flow and Peak Time (hr) by Rainfall Return Period

Sub-Area or Reach Identifier	5-Yr (cfs) (hr)	100-Yr (cfs) (hr)
SUBAREAS		
E3A	1.61	45.03
	14.35	12.96
ABL	0.64	5.13
	12.06	12.02
REACHES		
channel	1.61	45.03
	14.35	12.96
Down	1.61	45.00
	14.53	13.05
OUTLET	1.67	45.45



QUAD MAP

N.T.S.

Axion ENGINEERING
Civil Engineering • Land Development
681 EDISON WAY – RENO, NEVADA 89502
PH 775-771-5554 / FX 775-856-3951

TENTATIVE MAP APPLICATION FOR

SUGARLOAF RANCH ESTATES

EXISTING CONDITION DRAINAGE MAP

WASHOE COUNTY, NEVADA

revisions

drawn:	GKG
checked:	GKG
date:	FEBRUARY 2016
scale:	N.T.S.
project no:	15021

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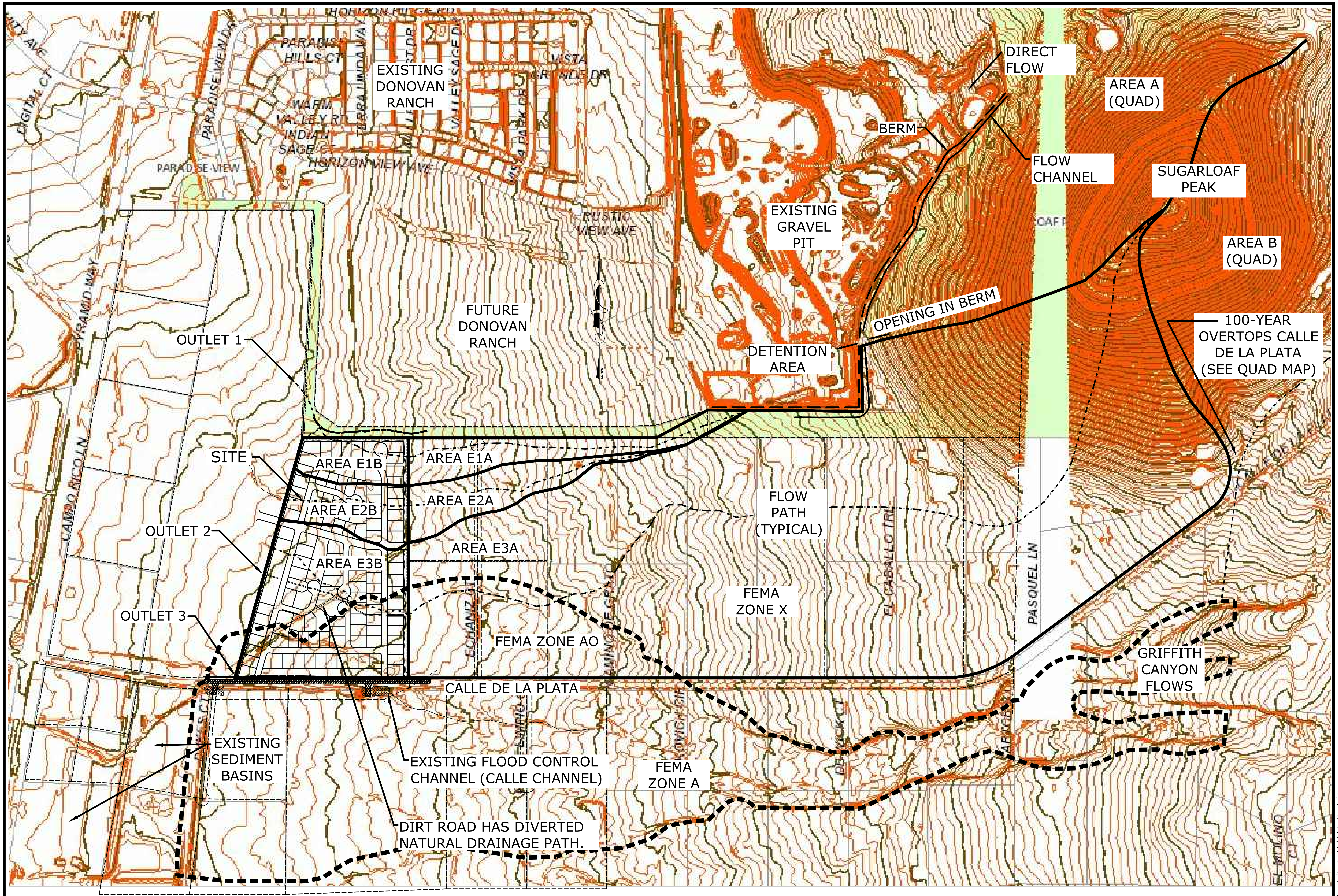
DR-1



300' 0 150' 300' 600'

SCALE: 1"=300'

CSD MAP

Axion ENGINEERING
Civil Engineering • Land Development
681 EDISON WAY – RENO, NEVADA 89502
PH 775-771-5554 / FX 775-856-3951

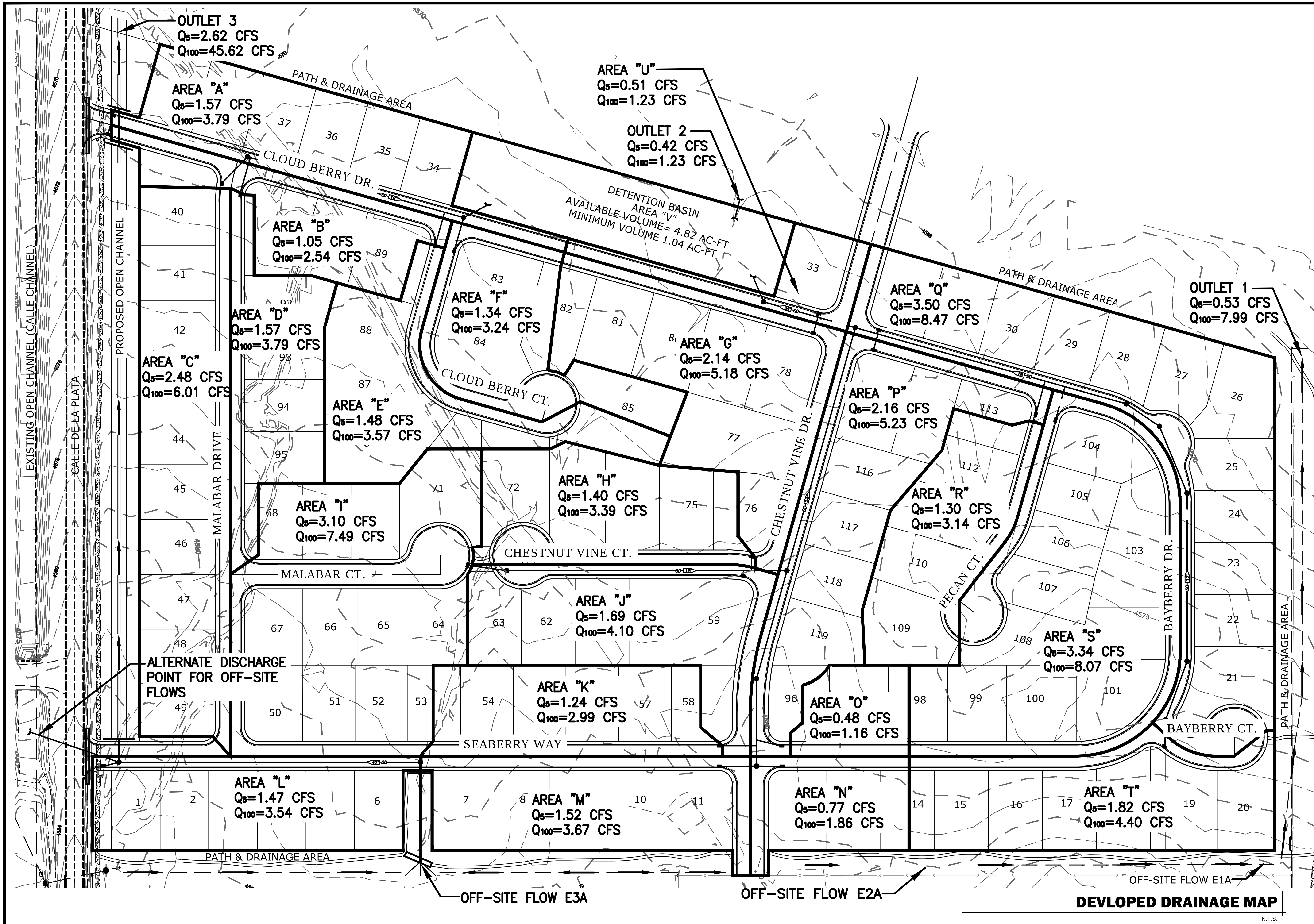
TENTATIVE MAP APPLICATION FOR
SUGARLOAD RANCH ESTATES
EXISTING CONDITION DRAINAGE MAP
WASHOE COUNTY, NEVADA

revisions

drawn:	JNM
checked:	GKG
date:	FEBRUARY 2016
scale:	1"=300'
project no:	15021

DR-2

OF 4



Axion ENGINEERING
Civil Engineering · Land Development
681 EDISON WAY – RENO, NEVADA 89502
PH 775–771–5554 / FX 775–856–3961

TENTATIVE MAP APPLICATION FOR
SUGARLOAF RANCH ESTATES
DEVELOPED CONDITION DRAINAGE MAP
WASHOE COUNTY, NEVADA

revisions

drawn:	GKG
checked:	GKG
date:	FEBRUARY 2016
scale:	N.T.S.
project no:	15021

DR-3

OF 4

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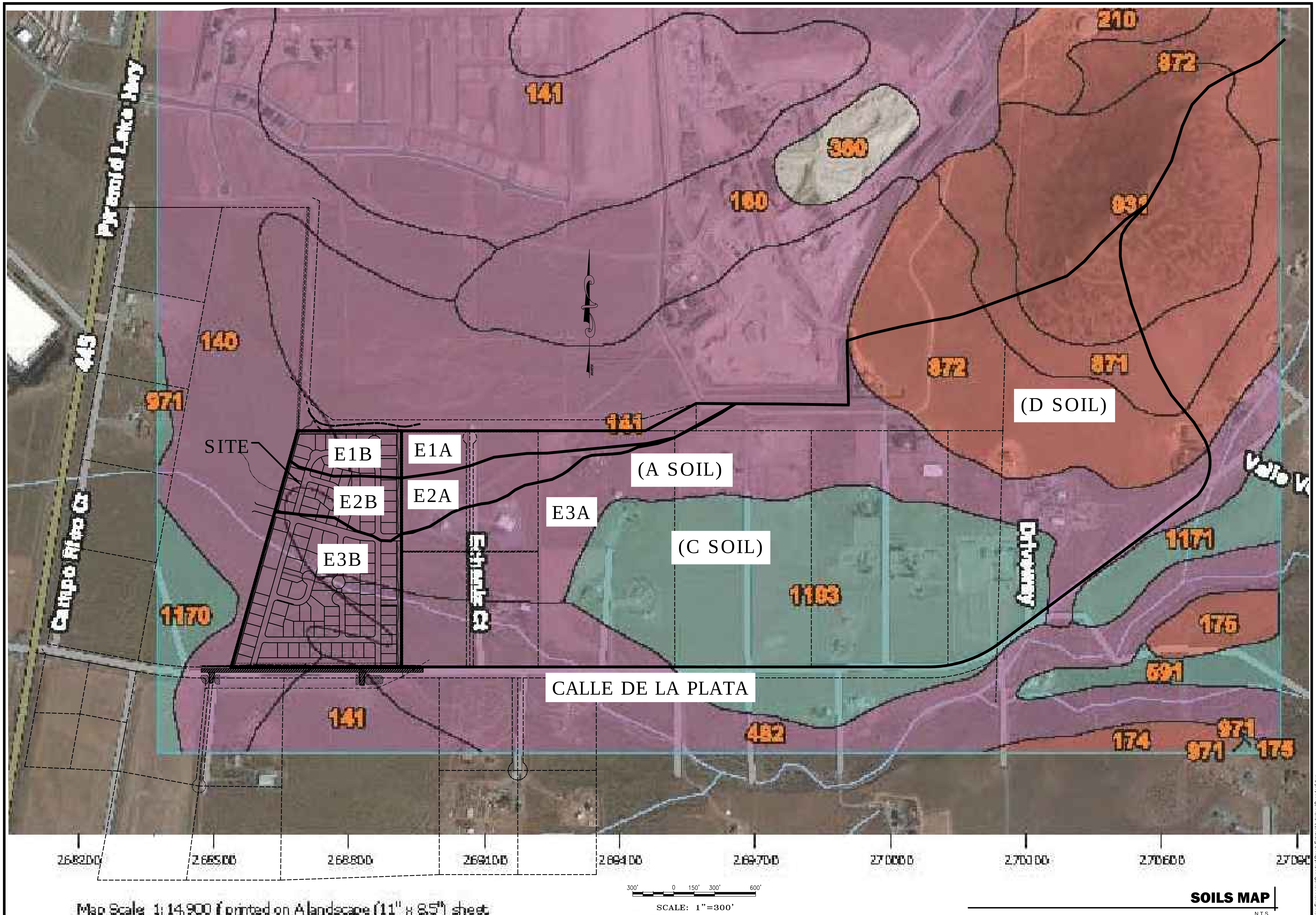

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PH 775-771-5554 / FX 775-856-3951

TENTATIVE MAP APPLICATION FOR

SUGARLOAF RANCH ESTATES

HYDROLOGIC SOILS MAP
WASHOE COUNTY, NEVADA

revisions

drawn:	JNM
checked:	GKG
date:	FEBRUARY 2016
scale:	N.T.S.
project no:	15021

DR-4

OF 4

SOILS MAP
N.T.S.

NOAA Atlas 14, Volume 1, Version 5
Location name: Sparks, Nevada, US*
Latitude: 39.6698°, Longitude: -119.6877°
Elevation: 4621 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.100 (0.084-0.115)	0.125 (0.104-0.146)	0.168 (0.141-0.198)	0.208 (0.175-0.248)	0.277 (0.227-0.335)	0.341 (0.272-0.418)	0.418 (0.325-0.521)	0.513 (0.383-0.653)	0.667 (0.471-0.880)	0.810 (0.548-1.10)
10-min	0.152 (0.128-0.176)	0.190 (0.159-0.222)	0.255 (0.214-0.301)	0.317 (0.266-0.377)	0.421 (0.346-0.509)	0.519 (0.414-0.636)	0.637 (0.494-0.793)	0.780 (0.582-0.994)	1.01 (0.717-1.34)	1.23 (0.834-1.67)
15-min	0.189 (0.158-0.218)	0.236 (0.197-0.275)	0.316 (0.266-0.373)	0.393 (0.330-0.468)	0.522 (0.429-0.631)	0.643 (0.514-0.788)	0.789 (0.612-0.982)	0.967 (0.722-1.23)	1.26 (0.889-1.66)	1.53 (1.03-2.07)
30-min	0.254 (0.213-0.293)	0.317 (0.265-0.370)	0.425 (0.358-0.503)	0.529 (0.444-0.629)	0.703 (0.578-0.850)	0.867 (0.692-1.06)	1.06 (0.825-1.32)	1.30 (0.972-1.66)	1.70 (1.20-2.24)	2.06 (1.39-2.78)
60-min	0.315 (0.263-0.363)	0.392 (0.328-0.458)	0.526 (0.443-0.622)	0.655 (0.550-0.779)	0.870 (0.715-1.05)	1.07 (0.857-1.31)	1.31 (1.02-1.64)	1.61 (1.20-2.05)	2.10 (1.48-2.77)	2.55 (1.72-3.44)
2-hr	0.415 (0.365-0.481)	0.516 (0.455-0.600)	0.665 (0.580-0.774)	0.796 (0.684-0.924)	0.998 (0.836-1.17)	1.18 (0.966-1.40)	1.40 (1.11-1.67)	1.68 (1.30-2.08)	2.19 (1.62-2.80)	2.66 (1.90-3.48)
3-hr	0.500 (0.443-0.569)	0.621 (0.556-0.712)	0.781 (0.692-0.892)	0.911 (0.801-1.04)	1.10 (0.950-1.26)	1.26 (1.07-1.47)	1.46 (1.22-1.72)	1.75 (1.42-2.09)	2.24 (1.77-2.82)	2.70 (2.08-3.51)
6-hr	0.707 (0.632-0.801)	0.884 (0.789-1.00)	1.10 (0.972-1.25)	1.26 (1.11-1.43)	1.48 (1.29-1.69)	1.64 (1.41-1.88)	1.80 (1.53-2.10)	2.01 (1.68-2.37)	2.43 (1.99-2.90)	2.84 (2.29-3.55)
12-hr	0.943 (0.841-1.06)	1.19 (1.06-1.33)	1.50 (1.33-1.69)	1.74 (1.53-1.96)	2.06 (1.80-2.34)	2.31 (1.99-2.64)	2.56 (2.18-2.96)	2.81 (2.36-3.30)	3.15 (2.58-3.77)	3.46 (2.77-4.19)
24-hr	1.18 (1.06-1.33)	1.49 (1.33-1.68)	1.92 (1.71-2.16)	2.26 (2.01-2.55)	2.75 (2.42-3.10)	3.14 (2.73-3.56)	3.55 (3.06-4.05)	3.98 (3.39-4.57)	4.58 (3.82-5.31)	5.05 (4.15-5.93)
2-day	1.42 (1.25-1.61)	1.80 (1.59-2.05)	2.35 (2.07-2.67)	2.79 (2.45-3.18)	3.43 (2.97-3.92)	3.94 (3.39-4.53)	4.49 (3.81-5.20)	5.07 (4.25-5.93)	5.89 (4.82-6.99)	6.56 (5.27-7.89)
3-day	1.55 (1.37-1.76)	1.97 (1.74-2.25)	2.60 (2.29-2.97)	3.12 (2.73-3.56)	3.86 (3.35-4.42)	4.46 (3.83-5.14)	5.12 (4.33-5.94)	5.81 (4.84-6.80)	6.80 (5.53-8.08)	7.61 (6.08-9.17)
4-day	1.68 (1.48-1.91)	2.14 (1.90-2.45)	2.86 (2.52-3.26)	3.45 (3.02-3.94)	4.29 (3.72-4.93)	4.99 (4.26-5.75)	5.74 (4.84-6.67)	6.55 (5.43-7.67)	7.71 (6.24-9.18)	8.67 (6.89-10.5)
7-day	1.98 (1.73-2.28)	2.54 (2.21-2.92)	3.40 (2.96-3.93)	4.12 (3.56-4.76)	5.15 (4.40-5.98)	5.99 (5.06-7.00)	6.90 (5.76-8.13)	7.88 (6.47-9.36)	9.28 (7.45-11.2)	10.4 (8.24-12.8)
10-day	2.23 (1.94-2.57)	2.88 (2.51-3.32)	3.86 (3.36-4.46)	4.66 (4.03-5.38)	5.78 (4.95-6.71)	6.68 (5.67-7.80)	7.65 (6.41-8.99)	8.67 (7.16-10.3)	10.1 (8.17-12.2)	11.3 (8.97-13.8)
20-day	2.78 (2.43-3.20)	3.59 (3.14-4.13)	4.82 (4.20-5.54)	5.76 (5.00-6.62)	7.02 (6.06-8.09)	8.00 (6.85-9.26)	9.02 (7.63-10.5)	10.1 (8.46-11.9)	11.6 (9.55-13.9)	12.9 (10.4-15.5)
30-day	3.27 (2.86-3.77)	4.23 (3.70-4.88)	5.66 (4.93-6.53)	6.76 (5.87-7.78)	8.23 (7.09-9.49)	9.36 (8.01-10.8)	10.5 (8.92-12.3)	11.7 (9.82-13.8)	13.4 (11.1-16.0)	14.8 (12.1-17.8)
45-day	3.92 (3.42-4.46)	5.07 (4.43-5.77)	6.76 (5.89-7.69)	8.02 (6.97-9.12)	9.68 (8.36-11.0)	10.9 (9.40-12.5)	12.2 (10.4-14.1)	13.5 (11.4-15.7)	15.4 (12.8-18.1)	16.9 (13.9-20.0)
60-day	4.51 (3.92-5.14)	5.86 (5.11-6.67)	7.81 (6.79-8.88)	9.19 (7.98-10.4)	10.9 (9.46-12.5)	12.2 (10.5-14.0)	13.5 (11.5-15.5)	14.7 (12.5-17.0)	16.5 (13.8-19.2)	17.8 (14.7-21.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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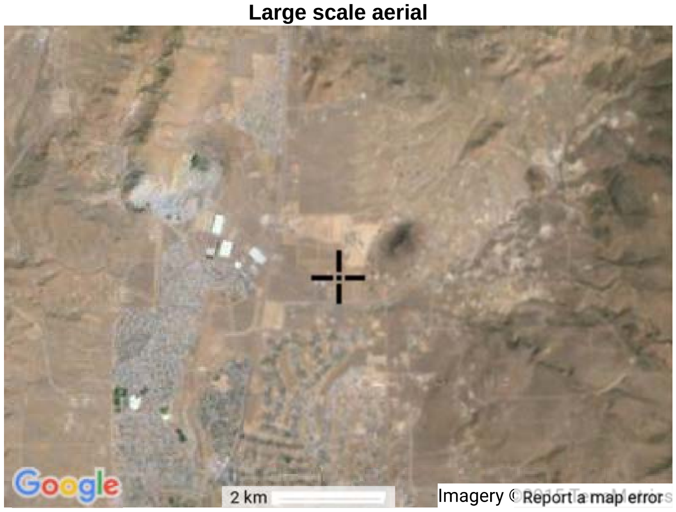
PF graphical

Large scale terrain

Large scale map

Large scale aerial



RATIONAL FORMULA METHOD
RUNOFF COEFFICIENTS

Land Use or Surface Characteristics	Aver. % Impervious Area	Runoff Coefficients 5-Year (C_5)	100-Year (C_{100})
Business/Commercial:			
Downtown Areas	85	.82	.85
Neighborhood Areas	70	.65	.80
Residential:			
(Average Lot Size)			
⅛ Acre or Less (Multi-Unit)	65	.60	.78
¼ Acre	38	.50	.65
⅓ Acre	30	.45	.60
½ Acre	25	.40	.55
1 Acre	20	.35	.50
Industrial:	72	.68	.82
Open Space:			
(Lawns, Parks, Golf Courses)	5	.05	.30
Undeveloped Areas:			
Range	0	.20	.50
Forest	0	.05	.30
Streets/Roads:			
Paved	100	.88	.93
Gravel	20	.25	.50
Drives/Walks:	95	.87	.90
Roofs:	90	.85	.87

Notes:

1. Composite runoff coefficients shown for Residential, Industrial, and Business/Commercial Areas assume irrigated grass landscaping for all previous areas. For development with landscaping other than irrigated grass, the designer must develop project specific composite runoff coefficients from the surface characteristics presented in this table.

RUNOFF CURVE NUMBERS

Land Use or Surface Characteristics	Aver. % Impervious Area	Runoff Curve Numbers Soil Comp A	Soil Comp B	Soil Comp C	Soil Comp D
Business/Commercial:					
Downtown Areas	85	89	92	94	95
Neighborhood Areas	70	80	87	91	93
Residential:					
(Average Lot Size)					
1/8 Acre or Less (Multi-Unit)	65	77	85	90	92
1/4 Acre	38	61	75	83	87
1/3 Acre	30	57	72	81	86
1/2 Acre	25	54	70	80	85
1 Acre	20	51	68	79	84
Industrial:	72	81	88	91	93
Irrigated Areas:					
Lawns, Parks, Golf Courses/	5	41	62	75	81
Agriculture	0	39	61	74	80
Undeveloped Areas (Open Space):					
Herbaceous (grasses)	0	40	62	74	85
Mixed Grass and Shrub	0	39	61	73	82
Shrub/Brush	0	35	56	70	77
Forest (Evergreen)	0	30	54	66	75
Outcrops	70	77	86	91	94
Street/Roads:					
Paved	100	98	98	98	98
Gravel	20	76	85	89	91
Drives/Walks:	95	97	97	97	97
Roofs:	90	95	95	95	95

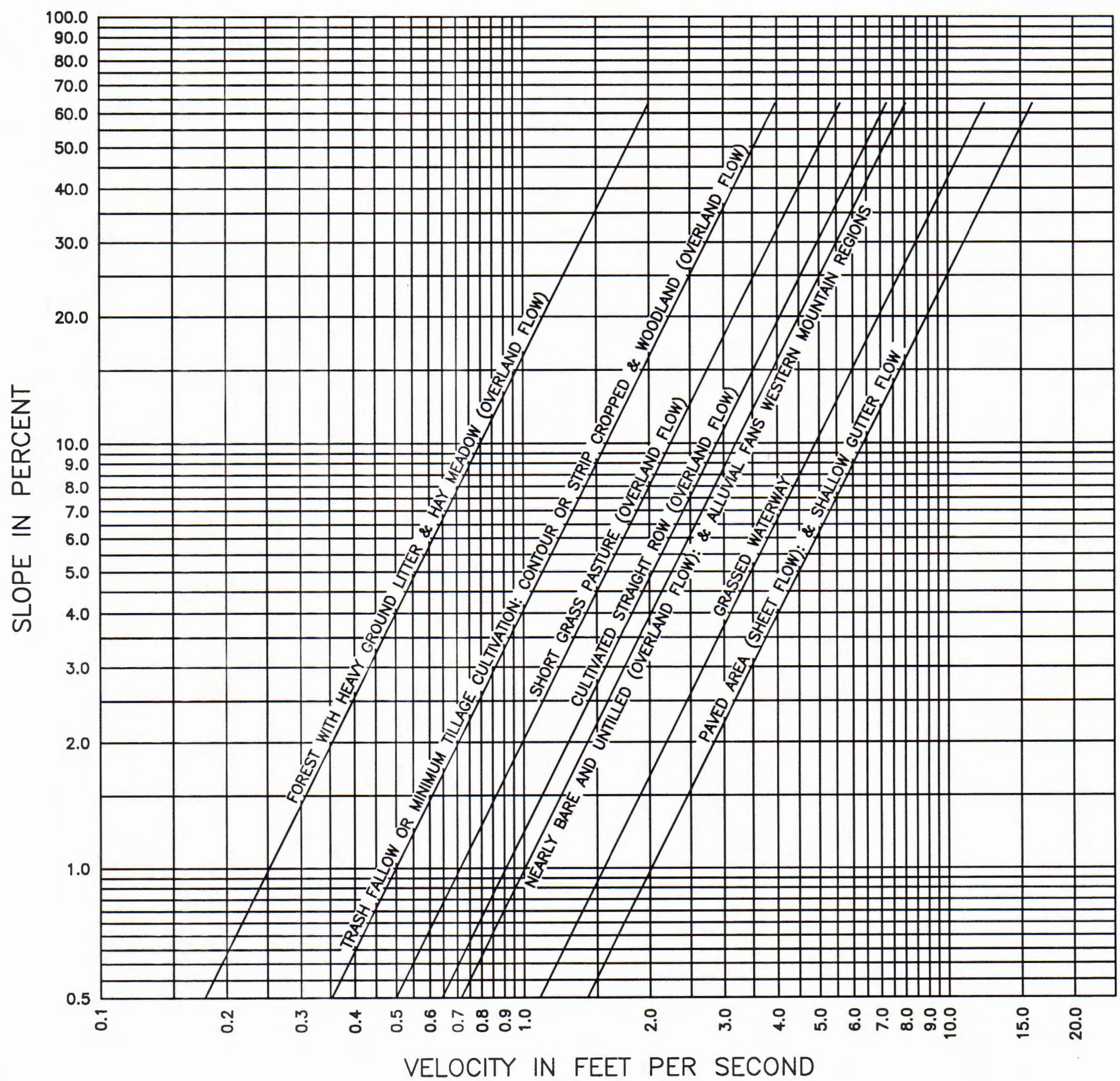
Notes:

1. Grass - Grassed Landscaping or Irrigated Vegetation

WASHOE COUNTY

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TRAVEL TIME VELOCITY



VERSION: December 2, 1996	REFERENCE: Soil Conservation Service, 1985 (Modified)	FIGURE 701
WRC ENGINEERING, INC		

1878, 1878-701.DWG 01-13-97 1:1MS WRC.PCP EJM

PRELIMINARY SEWER REPORT

Axion ENGINEERING
Civil Engineering • Land Development

SUGARLOAF RANCH ESTATES
PRELIMINARY SEWERAGE REPORT

INTRODUCTION

Sugarloaf Ranch Estates is a proposed 119 unit single family residential subdivision located in Spanish Springs approximately ¼ mile east of Pyramid Highway adjacent to Calle De La Plata on the north side. (Reference Figure 1 Vicinity Map). The proposed development is surrounded by undeveloped land with the exception of a single family residence towards the northeasterly side of the site. This report will address the project at full build-out and possibilities for connecting to the existing Washoe County sewer system.

Sugarloaf Ranch Estates is bounded by Calle De La Plata on the south, a single family residential lot on the east, undeveloped land to the west and the Donovan Ranch Development to the north. The portion of the Donovan Ranch project adjacent to the subject property is currently undeveloped. The property is approximately 39.85 acres in size and lies in a portion of the SE 1/4 section 23 and a portion of the SW 1/4 of section 24, T. 21 N, R. 20 E., M.D.B. & M. (APN is 534-562-07).

The site slopes down from the east to the west toward Pyramid Lake Highway with an approximate gradient of 1.3% with a low point existing towards the middle of the property. No existing sewer facilities are immediately available adjacent to the proposed development at this time and two options exist to obtain sewer service. They are discussed below:

OPTIONS

1) The first option would be to construct offsite sewer improvements from the proposed project west down Calle De La Plata, across Pyramid Highway, and further down Calle De La Plata on the east side of Pyramid Highway. This option would require approximately 2,500 liner feet of sewer main, associated manholes, road repair, and jack and bore under Pyramid Highway. With this option the sewer system would be constructed in public right of way and not require obtaining any easements. An NDOT encroachment permit would be required however.

2) The second option would be to connect to the Donavan Ranch project to the north. This would require crossing the County owned property adjacent to the project's north boundary, constructing approximately 2,400 linear feet of sewer main and associated manholes, and necessary easements to connect to the existing sewer main in the Donavan Ranch development. Sewage flows from the Donavan Ranch development ultimately flow to the Pebble Creek Lift Station. A capacity analysis of the existing lift station and the corresponding force main would need to be performed to determine the impacts connecting to this system would have on the existing infrastructure.

Both options are graphically shown in Figure 2 – Site Plan.

DESIGN REQUIREMENTS

Average peak flows were determined to be 96,390 gallons per day based on the following Washoe County Department of Water Resources (WCDWR) design requirements:

Average Flow = 270 gallons/day

Peaking Factor = 3.0

Zoning = Single Family Residential

Minimum Velocity = 2.5 feet/second

Peak Flow Calculation:

Q_P = (avg flow) (peaking factor) (# of dwelling units)

Q_P = (270) (3.0) (119) = 96,390 gpd

It is anticipated that the minimum pipe slope on the proposed sewer mains will be 0.5% which yields a half full velocity of 2.65 fps meeting the County minimum half full velocity of 2.5 fps.

CONCLUSION

It is our understanding that the WCDWR has commissioned a sewer study for the area that Sugarloaf Ranch Estates will contribute sewer flows to. Once completed any downstream inadequacies beyond the points of connection shown in Figure 2 will be identified and the impact of the proposed development on the downstream system can be determined. The information shown above should be included in the model and at final design an agreement can be worked out for any cost sharing should that be the route the County chooses.

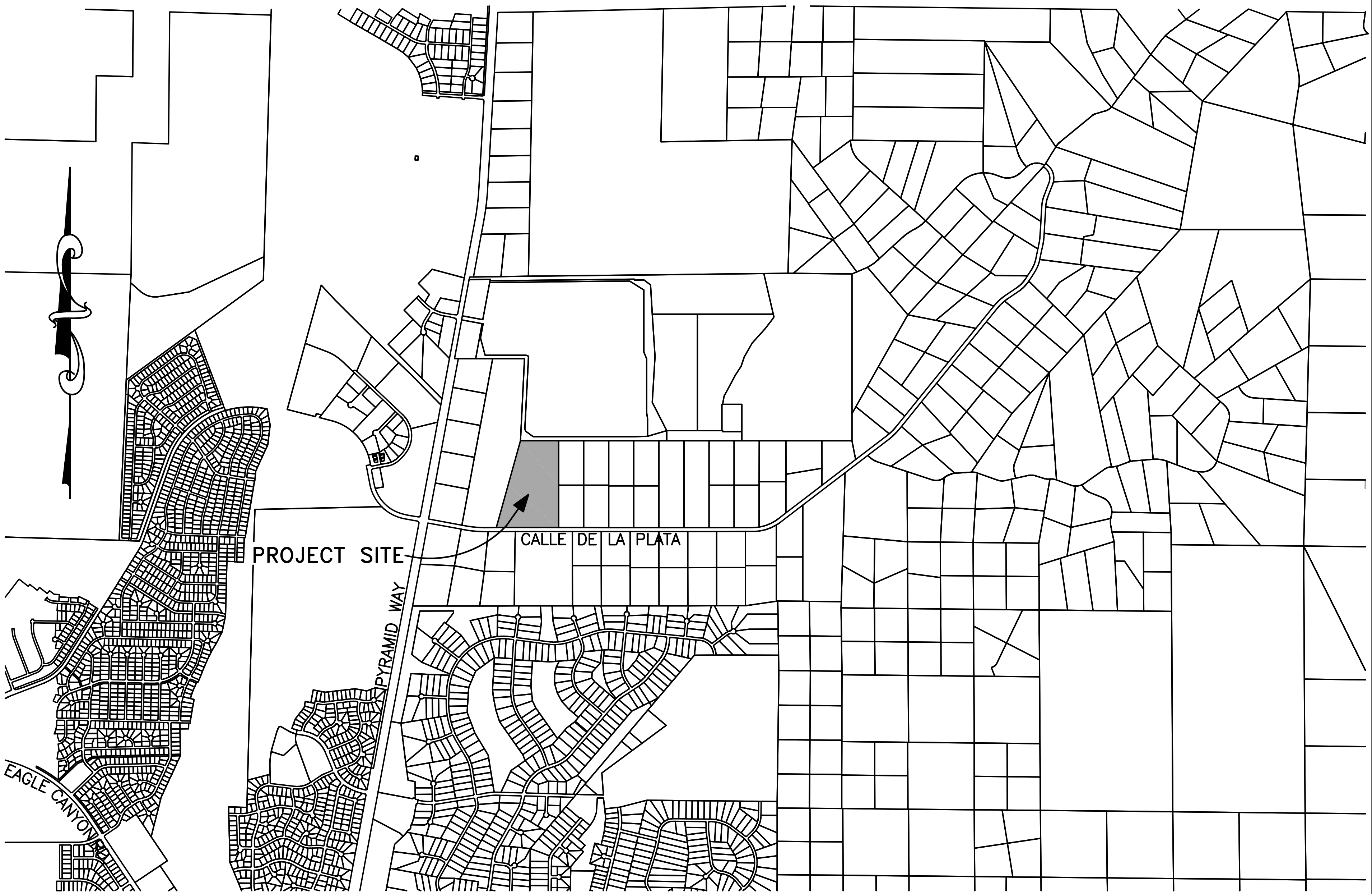


FIGURE 1 - VICINITY MAP

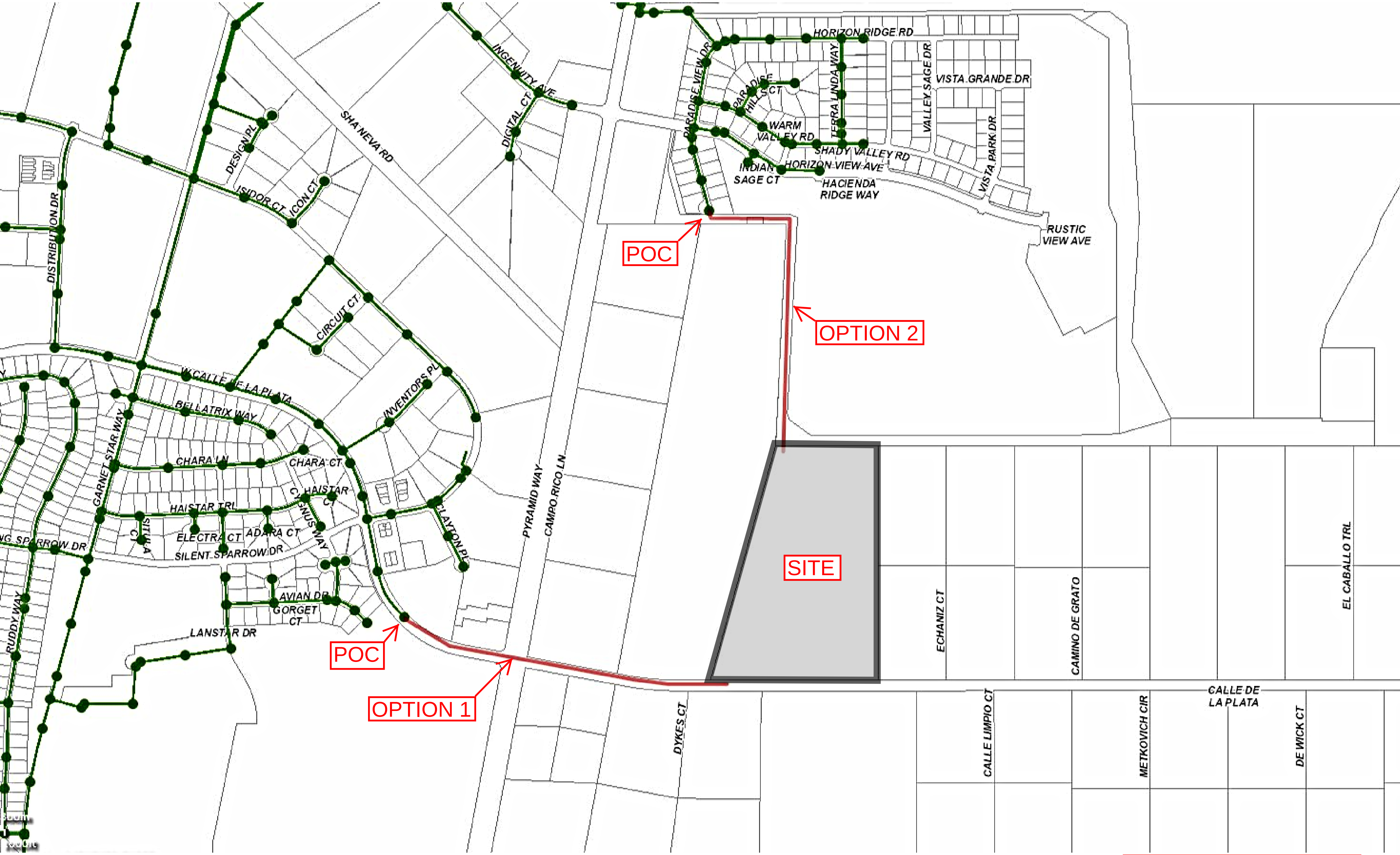


FIGURE 2 - SITE PLAN

U.S. FISH & WILDLIFE
iPac REPORT

Axion
ENGINEERING
Civil Engineering • Land Development

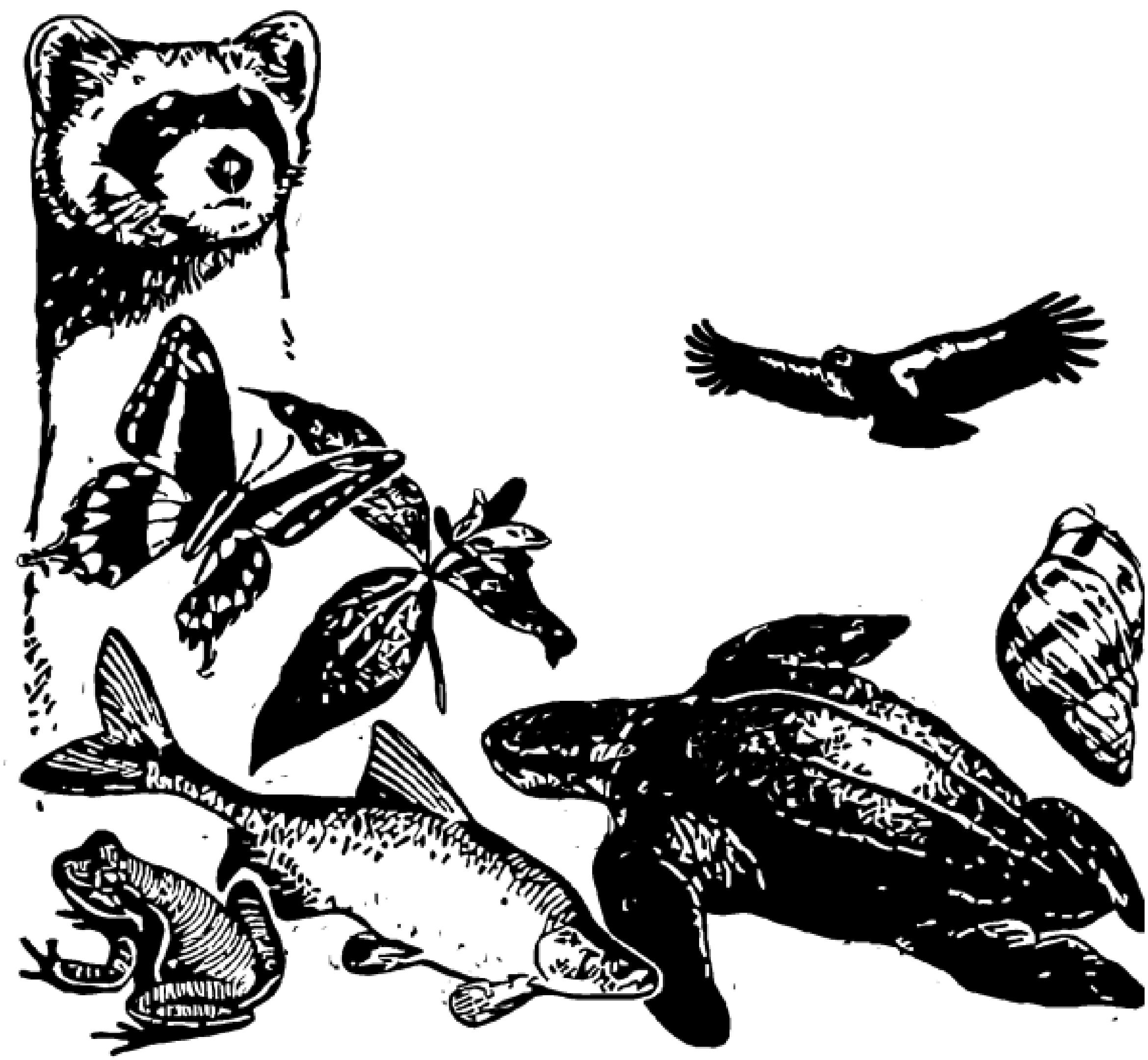
U.S. Fish & Wildlife Service

Sugarloaf Ranch Estates

IPaC Trust Resource Report

Generated January 21, 2016 02:56 PM MST, IPaC v2.3.2

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.



IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

US Fish & Wildlife Service

IPaC Trust Resource Report

NAME

Sugarloaf Ranch Estates

LOCATION

Washoe County, Nevada

DESCRIPTION

39.85 acre, 119 unit single family residential subdivision

IPAC LINK

https://ecos.fws.gov/ipac/project/4EW5H-WAUTN-BHXMR-SYOHV-QLZEYE

U.S. Fish & Wildlife Contact Information

Trust resources in this location are managed by:

Nevada Fish And Wildlife Office
1340 Financial Boulevard, Suite 234
Reno, NV 89502-7147
(775) 861-6300

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require FWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list from the Regulatory Documents section in IPaC.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Fishes

Cui-ui Chasmistes cujus — Endangered

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E001

Lahontan Cutthroat Trout Oncorhynchus clarkii henshawi — Threatened

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E00Y

Critical Habitats

There are no critical habitats in this location

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/akn-histogram-tools.php

The following species of migratory birds could potentially be affected by activities in this location:

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Black Rosy-finch Leucosticte atrata — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0J4

Brewer's Sparrow Spizella breweri — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HA

Burrowing Owl Athene cunicularia — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0NC

Calliope Hummingbird Stellula calliope — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0K3

Eared Grebe Podiceps nigricollis — Bird of conservation concern
Season: Breeding

Fox Sparrow Passerella iliaca — Bird of conservation concern
Year-round

Greater Sage-grouse Centrocercus urophasianus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06W

Green-tailed Towhee Pipilo chlorurus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0IO

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY

Long-billed Curlew Numenius americanus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06S

Olive-sided Flycatcher Contopus cooperi — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0AN

Peregrine Falcon Falco peregrinus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FU

Pinyon Jay Gymnorhinus cyanocephalus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0I0

Sage Thrasher Oreoscoptes montanus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0ID

Short-eared Owl Asio flammeus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

Snowy Plover Charadrius alexandrinus — Bird of conservation concern
Season: Breeding

Swainson's Hawk Buteo swainsoni — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B070

Tricolored Blackbird Agelaius tricolor — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06P

Western Grebe aechmophorus occidentalis — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0EA

White Headed Woodpecker Picoides albolarvatus — Bird of conservation concern
Year-round
https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HU

Williamson's Sapsucker Sphyrapicus thyroideus Bird of conservation concern

Year-round

https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FX

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuges in this location

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

There are no wetlands in this location

Axion
GEOTECHNICAL
681 Edison Way, Reno, NV 89502 ting Services

GEOTECHNICAL FEASIBILITY STUDY

PROPOSED

SUGARLOAF RANCH ESTATES

Washoe County Assessor's Parcel Number 534-562-07

Spanish Springs Valley Area

WASHOE COUNTY, NEVADA

Prepared for:

Sugarloaf Peak, LLC
2777 Northtowne Lane
Reno, Nevada 89512

Attention: Jim House

September 11, 2015

Project No. 15.131.01-G

Axion
GEOTECHNICAL
Geotechnical Engineering & Construction Testing Services
681 Edison Way, Reno, NV 89502

September 11, 2015
Project No. 15.131.01-G

Sugarloaf Peak, LLC
2777 Northtowne Lane
Reno, Nevada 89512

Attn: Jim House

Re: Geotechnical Feasibility Report, Proposed Sugarloaf Estates, Washoe County Assessor's Office Parcel Number 534-562-07, Spanish Springs Valley area of Washoe County, Nevada

Dear Mr. House:

Axion Geotechnical is pleased to present results of the geotechnical feasibility study our firm conducted at the above-referenced property. Based on the results of our study, experience in the area, and understanding of proposed development, we conclude that, from a preliminary geotechnical standpoint, the Property is suitable for single-family residential development. The primary geotechnical concerns are the potential presence of **clay soils**, and location of the **floodplain**.

We appreciate having been selected to perform this study and trust results fulfill your needs. If you or your design consultants have questions, please do not hesitate to contact us.

Respectfully,

AXION GEOTECHNICAL, LLC

PROFESSIONAL ENGINEER STATE OF NEVADA
CHRISTOPHER D. BETTS
Exp: 12-31-16
CIVIL
No. 21633

9-11-15

Chris D. Betts, P.E.
President

TABLE OF CONTENTS

I INTRODUCTION

Axion Geotechnical is pleased to present results of a geotechnical feasibility study our firm conducted for Washoe County Assessor's Office Parcel Number 534-562-07 (Property). The 39.835-acre parcel is on the north side of Calle de la Plata, and approximately one quarter mile east of Pyramid Lake Road. Conceptual plans are not available at this time; however, we anticipate development will include construction of isolated pads for single-family residences serviced community water, sewer and storm drain systems. The structures will have one to two levels, will be wood-framed, and will be supported with shallow conventional spread foundations. Dedicated service streets will be surfaced with asphaltic concrete.

We have not received information concerning anticipated foundation loads; however, we anticipate that maximum wall loads are on the order of one kip per foot (dead plus live plus snow load), and that maximum column loads are from five to 5 kips (dead plus live plus snow load). For frost protection, perimeter foundations will bottom at least 24 inches below lowest adjacent exterior ground surface. Structural design will follow criteria outlined in the 2012 *International Building Code*.

We have not received civil design plans; however, we anticipate earthwork necessary to create proposed grades and for proper site drainage will result in cuts and fills from two to four feet. New slopes will be constructed at final inclinations of two horizontal to one vertical (2H:1V) or flatter. Site retaining walls are not anticipated. Depth of utility trenches should be on the order of eight feet. We assume underground utilities in proposed structural areas will be abandoned or relocated. Earthwork will be performed in accordance with the 2012 *International Building Code,* and the 2012 *Standard Specifications for Public Works Construction* (Regional Transportation Commission).

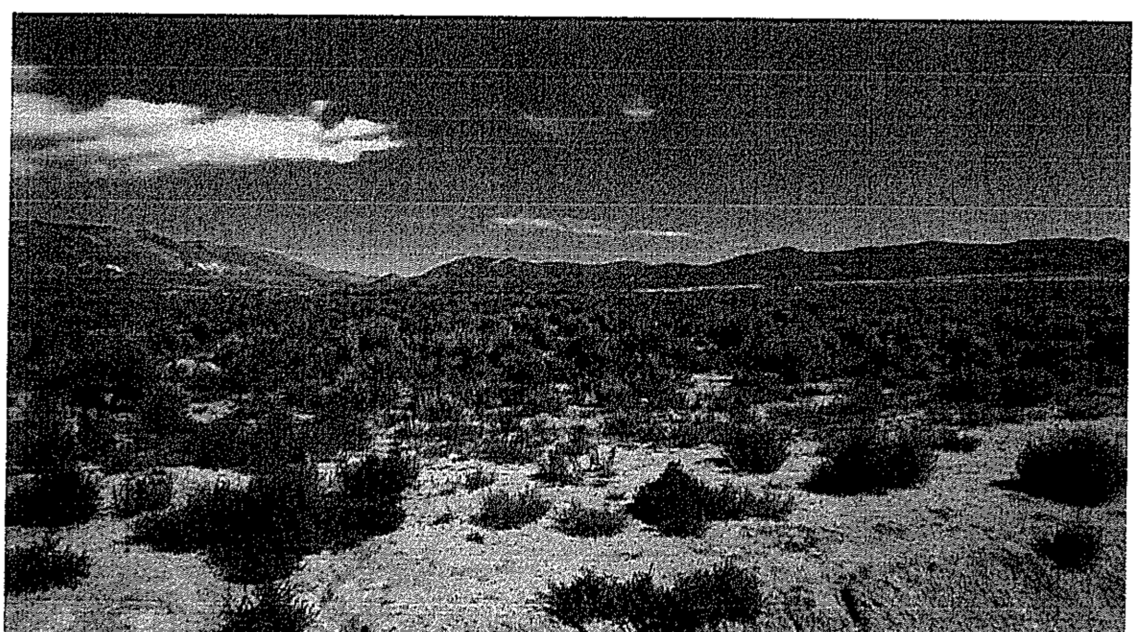
The purpose of our work was to perform a site reconnaissance and review available literature and maps to provide opinions and discussions concerning geotechnical suitability of the Property for its intended use. Once design parameters, such as building locations, finish floor elevations, foundation loads and proposed grading are known; a design-level geotechnical investigation report with detailed information of the subsurface soil conditions and recommendations for design and construction must be prepared.

This report is preliminary and geotechnical in nature and not intended to identify other site constraints such as environmental hazards, wetlands determinations or the potential presence of buried utilities. Opinions and discussions included in this report are specific to development at the Property and are not intended for off-site development.

II SITE AND SOIL CONDITIONS

The Property is undeveloped and vacant. Review of Google Earth images reveals the Property has been undeveloped and vacant dating back to 1994, the oldest image available. The Property is bordered by undeveloped land to the north, undeveloped land and sparse single-family residences to the east, Calle De La Plata (paved roadway) to the south, and undeveloped land to the west. The Property is relatively level, and essentially match's elevations of Calle De La Plata. The surface of the Property is covered by medium dense to dense sagebrush and weeds. Shallow drainages and a jeep trail cross the Property.

Site and Vicinity Plan


View of Property from south to north at Calle de la Plata

Axion Geotechnical, LLC
681 Edison Way
Reno, Nevada 89502

Based on the United States Geological Survey 7.5-Minute topographic map of the Griffith Canyon Quadrangle, the site is in proximity to the SE quarter of Section 23 and the SW quarter of Section 24, Township 21 North, Range 20 East, and elevation is between about 4,570 and 4,590 feet relative to mean sea level.

According to geologic mapping by H. F. Bonham, materials underlying the site consist of Quaternary-age stream deposits, talus, slope wash, alluvial fan and eolian deposits (Qal).

According to sheet 17 of the *Soil Survey of Washoe County, Nevada, South Part*, the Property is underlain by the following units:

Soil Map

<u>Haybourne loamy sand, 2 to 4 percent slopes (# 140):</u> This very deep, well-drained soil on alluvial fans. It formed in alluvium derived dominantly from granitic rocks. Elevation is 4,500 to 5,900 feet. Typically, the surface layer is pale brown loamy sand about 10 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum to a depth of 63 inches or more is brown, stratified fine sandy loam through coarse sand. Permeability is moderately rapid in the subsoil and moderately rapid to rapid in the substratum. Effective rooting depth is 60 inches or more. Runoff is slow, the hazard of water erosion is slight. The hazard for soil blowing is moderate. The soil is subject to flash flooding during storms of unusually high intensity and channeling. Deposition are common along streambanks. Limitations for shallow excavations are severe due to cutbanks caving. Limitations for dwellings with or without basements,

small commercial buildings are severe due to flooding. Limitations for local roads and streets are severe due to flooding. Limitations for septic tank absorption fields are severe due to poor filter. The shrink-swell potential is low. The frequency of flooding is rare. Depth to high water table is greater than 6.0 feet. Depth to bedrock is greater than 60 inches. The potential frost action is moderate. The risk of corrosion to uncoated steel is moderate, and to concrete it is low. Limitations associated with the use of this unit for urban development, as defined by the soil survey, are flooding, rapid permeability and the susceptibility to frost heaving.

<u>Haybourne loamy sand, 4 to 8 percent slopes (# 141):</u> Similar characteristics as #140; however, the substratum to a depth of 60 inches or more is brown, stratified fine sandy loam, loamy sand, and coarse sand.

<u>Holbrook cobbly loamy sand, 2 to 8 percent slopes (# 482):</u> This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Elevation is 4,400 to 5,400 feet. Typically, 25 to 35 percent of the surface is covered with cobbles. The surface layer is brown cobbly loamy sand about 10 inches thick. The underlying material to a depth of 60 inches is stratified stony sand through very gravelly loam. Permeability is moderately rapid. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of soil blowing is slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks. Limitations for shallow excavations are severe due to caving. Limitations for dwellings with or without basements are severe due to caving cutbanks and flooding. Limitations for roadways are moderate due to frost action. Limitations for septic tank absorption fields are moderate due to flooding. The shrink-swell potential is low. The frequency of flooding is rare. Depth to high water table is greater than 6 feet. Depth to bedrock is greater than 60 inches. The potential frost action is moderate. The risk of corrosion to steel is high, and to concrete it is low. Limitations associated with the use of this soil for urban development, as described by the soil survey, are the potential for flooding and the susceptibility of the soil to frost heave.

Based on geologic mapping completed by Harold F. Bonham (*Geology and Mineral Deposits of Washoe and Storey Counties, Nevada*, Nevada Bureau of Mines and Geology, Bulletin 70, dated 1969), the materials underlying the site consist of Quaternary-age stream deposits, talus, slope wash, alluvial fan and eolian deposits (Qal).

Our experience in the area confirms, in general, with the soils and geologic mapping and indicates that the underlying materials consist of alternating layers of medium dense to very dense silty sand (SM), clayey sand (SC) and clean sand (SP) that contain varying amounts of gravel, and medium stiff to hard clay (CL) and silt (ML) that contain varying amounts of sand and gravel. Review of *Well Driller's Report* Log No. 83355 on-file with the State of Nevada Division of Water Resources and for parcel # 076-401-17 which is immediately east of the Property, indicates that the static ground water level was 150 at the time of drilling (February, 2001).

III GEOLOGIC AND SEISMIC CONSIDERATIONS

To evaluate potential geological hazards at the Property, our study included a site reconnaissance and review of available literature and maps.

A. Geology and Faulting

The Property is in the northern portion of the Spanish Springs Valley, a complex basin bordered to the east by the Pah Rah Range which is composed of granite and gabbro intrusions, ash flow tuffs, and andesitic and basaltic flows and to the west by primarily granitic rock. The entire valley and accompanying ridges drain to the south. The southern 1/3 of the valley is poorly-drained and numerous small ponds have formed, in part, from the termination of the Orr Ditch. The North Truckee Drain which exits the valley partially drains the area.

Review of the referenced geologic map indicates faults do not cross the Property. The *Quaternary Fault and Fold Database of the United States* (http://earthquake.usgs.gov) indicates that Holocene-age or late-Quaternary-age faults do not cross the Property. Holocene and Late-Quaternary age faults are those that have experienced movement within the last 15,000 and 130,000 years, respectively. The database also indicates that the nearest Holocene to latest Pleistocene fault is the Spanish Springs Valley fault zone located approximately 1.8 miles west of the Property.

Based on the Nevada Seismological Laboratory website (http://www.seismo.unr.edu), the nearest principal Quaternary-age fault is the East Reno Basin fault zone located about 1.8 miles west of the Property. The Nevada Seismological Laboratory indicates an earthquake of magnitude 6.9 is possible along this fault zone (*Reno/Carson Fault Information*, updated January 31, 2003).

Interpolated probabilistic ground motion values were obtained from the USGS Seismic Design Center web site using 2012 International Building Code data, Site Class of D, and Risk Category of I, II or II. From the web site, the S_S value is 1.388g and the S_1 value is 0.468g (GPS: lat. 39.66785° N and long. 119.67879722° W).

B. Liquefaction

Liquefaction, a loss of soil shear strength, is a phenomenon associated with loose saturated granular deposits subjected to strong earthquake shaking. Liquefaction can result in unacceptable movement of foundations. Although a detailed assessment should be considered during a design-level geotechnical investigation, the anticipated deep-depth to ground water suggests the Property is not susceptible to liquefaction.

C. Slope Stability

Based on the relatively level nature of the Property and our anticipation that slopes will be shallow and constructed at final inclinations of two horizontal to one vertical (2H:1V) or flatter, we do not believe rock falls or landslides will impact the Property.

D. Radon

Radon, a colorless, odorless, radioactive gas derived from the natural decay of uranium, is found in nearly all rocks and soils. The Environmental Protection Agency (EPA) suggests that remedial action be taken to reduce radon in any structure with average indoor radon of 4.0 picocuries per liter (pCi/L) or more. Based on our review of *Radon in Nevada*, the Property, as well as much of northern Nevada, is in an area where average indoor radon concentrations could exceed 4.0 pCi/L.

E. Flooding

The Federal Emergency Management Agency flood map (FEMA-Map 32031C2865G, revise date of March 16, 2009) shows the majority of the Property in Flood Hazard Zones X unshaded, and the southernmost portion of the Property in Special Flood Hazard Zone AO (1'). According to FEMA, these zones are defined as follows:

> <u>Flood Hazard Zone X unshaded</u>: Areas determined to be outside the 0.2% annual chance floodplain.
>
> <u>Special Flood Hazard Zone AO (1'):</u> Areas subject to inundation by the 1% annual chance flood. The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Area of Special Flood Hazard include Zones A, AE, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood. Zone AO (1') has a flood depth of 1 foot (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities are also determined.

IV OPINIONS AND DISCUSSIONS

Based on the results of our study, experience in the area, and understanding of proposed development, we conclude that, from a preliminary geotechnical standpoint, the Property is suitable for single-family residential development. The primary geotechnical concerns are the potential presence of **clay soils**, and location of the **floodplain**.

Although not indicated on the soil and geologic maps, our experience in the area suggests clays soils may be present. Clay soils exhibit a potential for expansion. Expansive soils are subject to substantial volume changes (shrink and swell) with changes in moisture content. Changes in moisture content can occur as a result of seasonal variations in precipitation, landscape irrigation, broken or leaking water pipes and sewer lines, and/or poor site drainage. These volume changes can cause differential movements (settlement or heave) of foundations, interior slabs-on-grade, exterior flatwork (i.e. walkways, stoops and patios) and pavement sections.

One method to reduce the potential for movement is to remove (over-excavate) the expansive material to a sufficient depth and replace it with approved compacted fill, thereby reducing the thickness of the expansive layer, providing surcharge, and maintaining moisture at a suitable and near constant level. In conjunction with over-excavation and filling, moisture conditioning of the exposed materials to a slightly over optimum moisture content will be needed during construction.

In addition to their expansive characteristics, expansive materials also exhibit a lower Resistance Value and Modulus of Subgrade Reaction (k) than granular material. To reduce the thickness of aggregate base and to minimize future maintenance in slab-on-grade, exterior flatwork and pavement areas, portions of these soils would require removal and replacement with approved compacted fill subbase.

Clay soils also inhibit achieving uniform moisture content and impede compaction efforts. Consideration should be given to time constraints associated with scarification, moisture conditioning, drying and compacting clay soils. During periods of inclement weather, water may also become perched above the clay soil, resulting in a saturated condition for prolonged periods and creating additional limitations on equipment mobility. Consideration should be given to the necessity for maintaining moisture content to prevent wind erosion and for controlling dust during earthwork operations.

According to FEMA, a portion of the Property is in an area of potential flooding. Consideration should be given to local and federal regulations which may impose construction constraints, such as requiring minimum finish floor elevations, or ordinances banning basements. Due to constant revisions associated with flood zoning, site delineation with respect to flood zoning should be verified with the most current map at the time of design.

Studies regarding the presence of radon gas suggest the Property, as well as much of northern Nevada, is in an area which could exceed the action levels established by the Environmental Protection Agency. Determinations regarding the potential presence of radon gas should be considered prior to site development.

The soil survey suggests that rapid permeability, susceptibility to frost heaving, and corrosion potential for uncoated steel or metal may be an additional constraints associated with the native soils. Based on our understanding that the Property will be serviced by community water, sewer and storm drain systems, we do not believe rapid permeability rates will impact the site. Consideration, however, should be given to performing infiltration tests if retention/detention basins are proposed. Based on our anticipation that footings, exterior flatwork and pavement sections will be supported on approved compact granular material; that foundations will bottom below the design frost depth; and that proper site drainage will be provided, we do not believe frost heave will adversely impact site development. Based on our experience in the area, we believe that adequate corrosion mitigation can be attained through use of properly prepared and placed Type II portland cement concrete, and by maintaining a minimum 3-inch concrete cover where reinforcing steel or other metal is in close proximity to native soils.

Moderate vegetation is present across the Property. Roots and organic laden soils can result in unacceptable movement of site improvement supported by these materials. Consideration should be given to the increased cost of construction associated with clearing and stripping of these materials, and associated material volume loss.

V REFERENCES

Bonham, H. F. *Geology and Mineral Deposits of Washoe and Storey Counties, Nevada.* Reno: Nevada Bureau of Mines & Geology, Bulletin 70, University of Nevada, Reno, 1969.

Federal Emergency Management Agency, U.S> Department of Homeland Security, *FEMA's Flood Map Service Center* (https://msc.fema.gov/portal).

International Code Council *2012 International Building Code,* Whittier: International Code Council, Inc., 2012.

Regional Transportation Commission of Washoe County. *Standard Specification for Public Works Construction.* Reno: Regional Transportation Commission of Washoe County, 2012.

Rigby, James G., Jonathan G. Price, Lindsay G. Christensen, Daphne D. La Pointe, Alan R. Ramelli, Mario O. Desilets, Ronald H. Hess, and Stanley R. Marshall. *Radon in Nevada.* Reno: Nevada Bureau of Mines & Geology, Bulletin 108, University of Nevada, Reno, 1994.

United States Department of Agriculture, Soil Conservation Service. *Soil Survey of Washoe County, Nevada, South Part.* Washington: U.S. Government Printing Office, 1980.

United States Department of the Interior Geological Survey. *Griffith Canyon Quadrangle, Nevada.* 7.5-minute series map (topographic). 1:24,000. Denver: USGS, 1980.

VI DISTRIBUTION

Unbound original, one bound copy and a.pdf copy to:

Sugarloaf Peak, LLC
2777 Northtowne Lane
Reno, Nevada 89512

TENTATIVE MAP APPLICATION

SUGARLOAF RANCH ESTATES

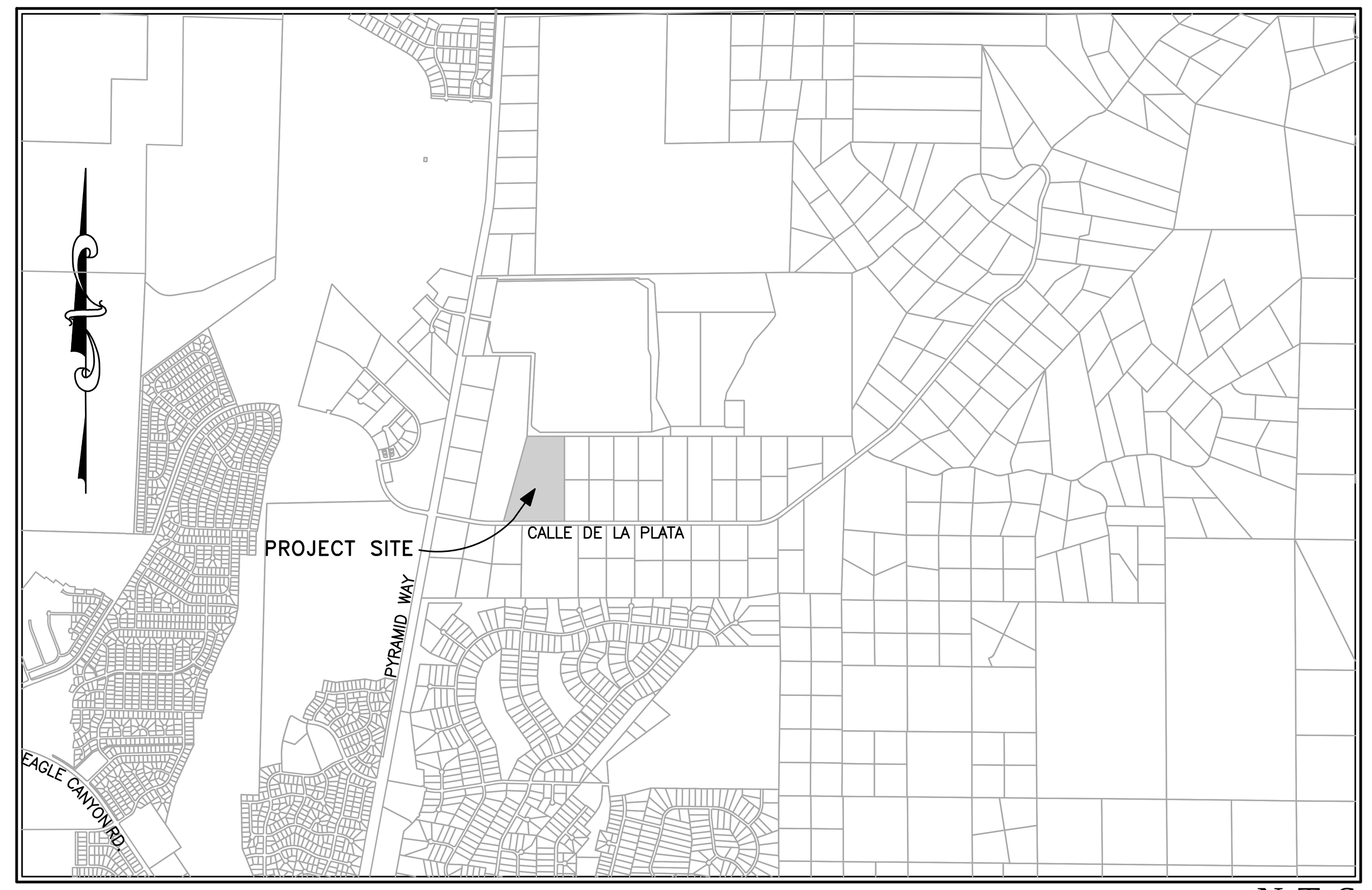
WASHOE COUNTY, NEVADA

OWNER/DEVELOPER

SUGARLOAF PEAK, LLC
2777 NORTHTOWNE LANE
RENO, NV 89512
ATTN: JIM HOUSE

PUBLIC SERVICES

GAS & ELECTRICAL SERVICE: NV ENERGY
WATER SERVICE: TRUCKEE MEADOWS WATER AUTHORITY
SEWER SERVICE: WASHOE COUNTY
TELEPHONE: AT&T
CABLE TV: CHARTER COMMUNICATIONS
FIRE PROTECTION: TRUCKEE MEADOWS FIRE DEPARTMENT
POLICE PROTECTION: WASHOE COUNTY SHERIFF DEPARTMENT



N.T.S.

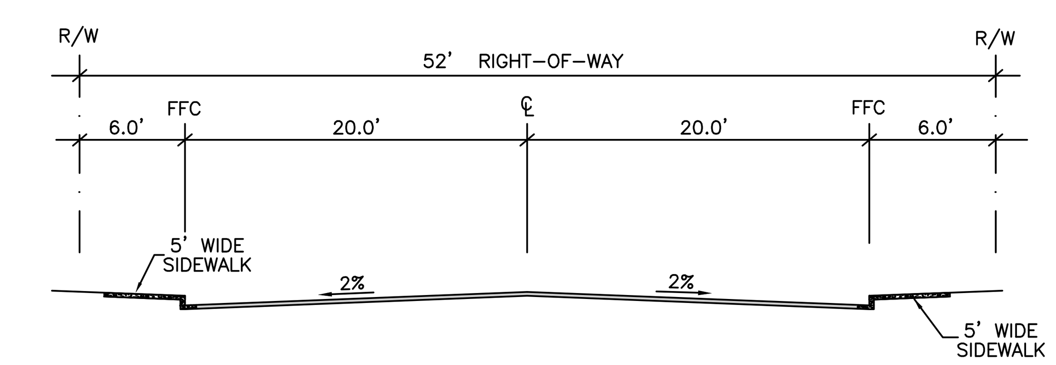
VICINITY MAP

ENGINEER

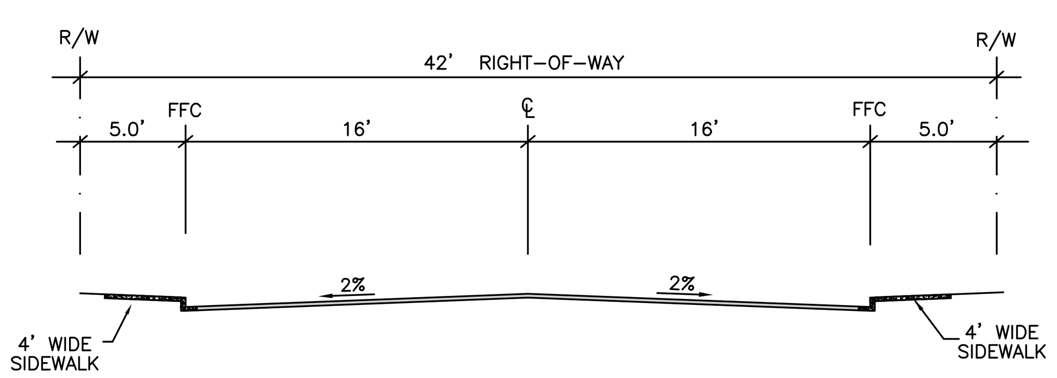
Axion ENGINEERING
Civil Engineering • Land Development

681 EDISON WAY – RENO, NEVADA 89502
PH 775-771-5554 / FX 775-856-3951

SHEET INDEX

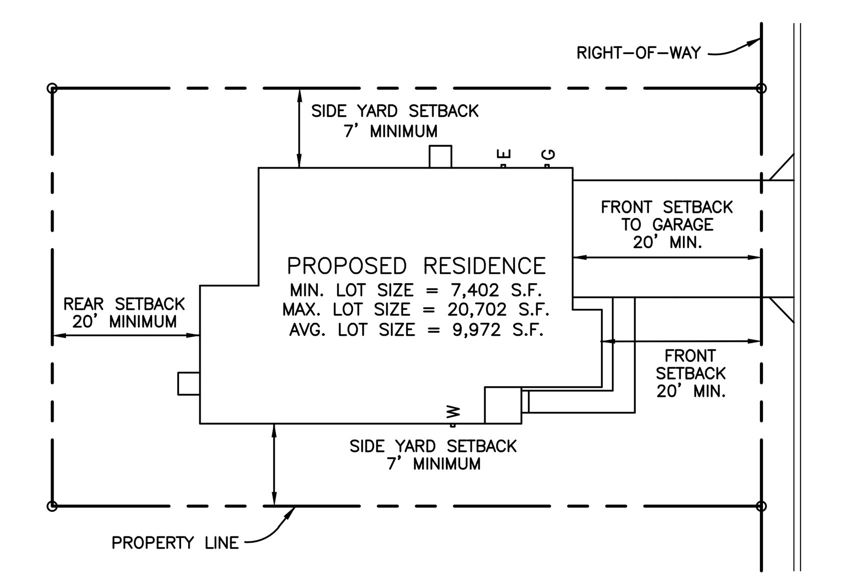


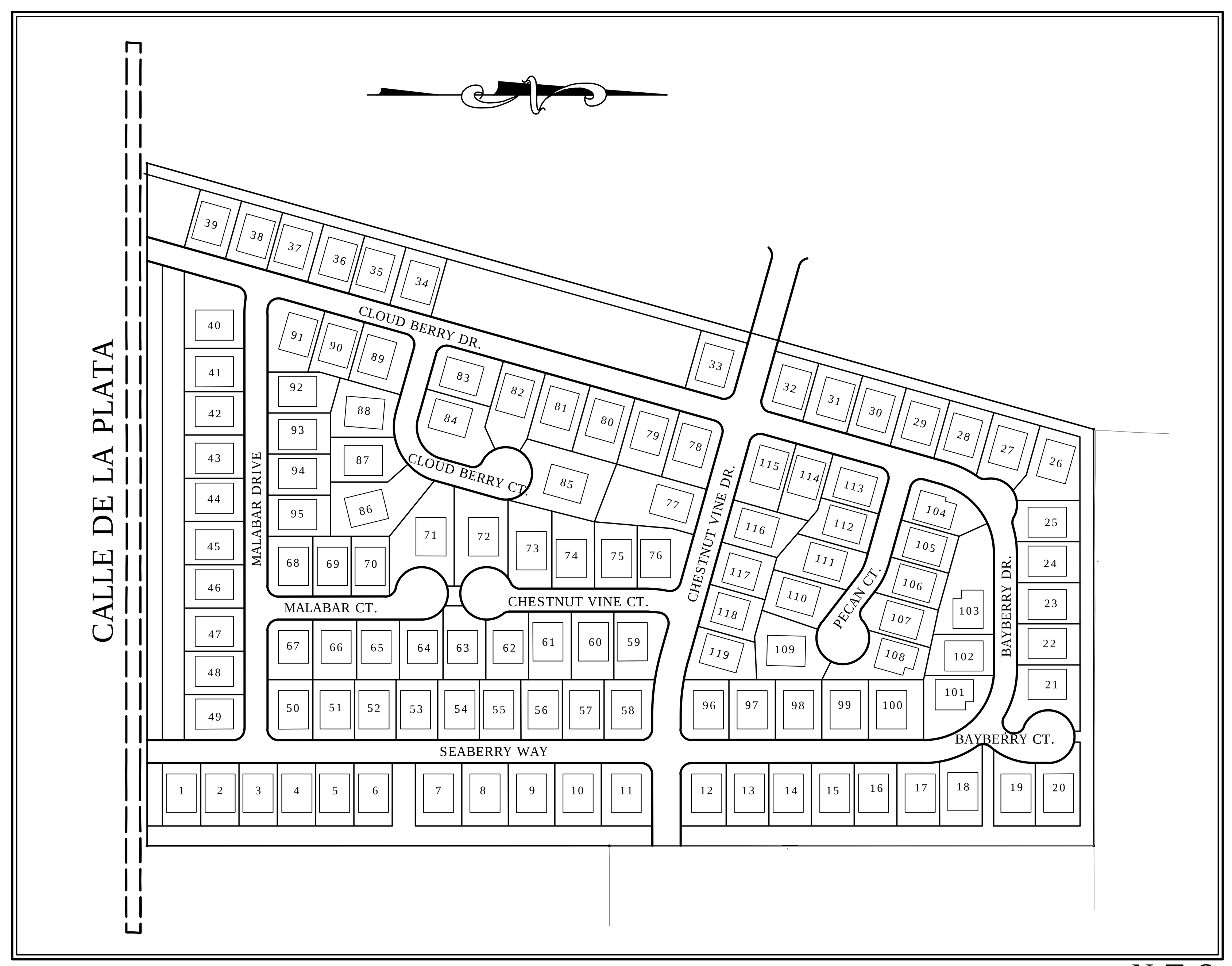
RESIDENTIAL COLLECTOR STREET SECTION



RESIDENTIAL STREET SECTION

MINIMUM SETBACKS





SITE

N.T.S.

ENGINEERS STATEMENT

I, GARY K. GUZELIS, DO HEREBY CERTIFY THAT THIS MAP HAS BEEN PREPARED BY ME, OR UNDER MY SUPERVISION AND WAS COMPLETED ON THIS 16th DAY OF FEBRUARY, 2016.

GARY K. GUZELIS P.E. #10372

SUGARLOAF RANCH ESTATES TITLE SHEET

C1


LEGEND
64 LOT NUMBER
OHP OVER HEAD POWER
(E) EXISTING
AP ANGLE POINT
RP RADIUS POINT
SS SNOW STORAGE
PP POWER POLE
Axion ENGINEERING
Civil Engineering • Land Development
SCALE: 1"=100'
200 0 100 200 400
UNSHADED X
FEMA 100 YEAR FLOOD LIMIT
ZONE AO (1' DEPTH)
EXISTING BOX CULVERT
28' NV ENERGY EASEMENT
PROJECT BOUNDARY
APN: 534-571-01 JACIE LLC
APN: 534-561-09STN 375 THOMAS
10' PUBLIC UTILITY EASEMENT
POTENTIAL ROAD CONNECTION TO WESTERLY PROPERTY
NV ENERGY MANHOLES
DETENTION BASIN
CLOUD BERRY DR.
CLOUD BERRY CT.
28' NV ENERGY UNDERGROUND ELECTRIC TRANSMISSION LINE PER DOC. NO. 477225
APN: 534-450-05 WASHOE COUNTY
CONNECT TO SHADOW RIDGE TRAIL
APN: 534-561-10 STN 375 CALLE GROUP LLC
CALLE DE LA PLATA
MALABAR DRIVE
CHESTNUT VINE DR.
PECAN CT.
BAYBERRY DR.
EXISTING TRAIL
10' PUBLIC UTILITY EASEMENT
MALABAR CT.
CHESTNUT VINE CT.
PROPOSED CHANNEL
APN: 534-450-13 RYDER SHADOW LLC
BAYBERRY CT.
SEABERRY WAY
PROJECT BOUNDARY
10' PUBLIC UTILITY EASEMENT
PROJECT BOUNDARY
ROAD CONNECTION TO EASTERLY PROPERTY (OPTIONAL BASED ON NEIGHBOR'S DESIRE)
CONNECT TO SHADOW RIDGE TRAIL
APN: 534-562-06 ECHAINZ
APN: 534-562-05 THEISS
FEMA 100 YEAR FLOOD LIMITS
APN: 534-56-11 VOLTL 1994 TRUST
ZONE AO (1' DEPTH)
UNSHADED X
ECHAINZ CT.
OVERALL MAP
1'=100'
C2

COMMON OPEN SPACE DEVELOPMENT

1.	TOTAL PROJECT SITE	39.84 ACRES
2.	LOT AREA	26.76 ACRES
3.	RIGHT OF WAY	7.42 ACRES
4.	COMMON AREA	5.66 ACRES
5.	GROSS DENSITY	2.99 DU/ACRE
6.	NET DENSITY	4.45 DU/ACRE
7.	AVERAGE LOT SIZE	10,317 SF
8.	MAXIMUM LOT SIZE	17,261 SF
9.	MINIMUM LOT SIZE	8,050 SF
10.	DWELLING UNITS	119 EA

SITE PLAN

1"=60'


EARTHWORK ESTIMATE
100,000 CY IMPORT.
LEGEND
GRADE BREAK
64 LOT NUMBER
4462 EXISTING CONTOUR LINE
OHP OVER HEAD POWER POLE
70.00 FG FINISHED GRADE ELEVATION
72.57 TC TOP OF CURB ELEVATION
99.20 FL FLOW LINE ELEVATION
89.18 LP LOW POINT ELEVATION
5% SLOPE IN PERCENT
(E) EXISTING
2:1 SLOPE RATIO (VERT:HORIZ)
AP ANGLE POINT
RP RADIUS POINT
PP POWER POLE
Axion
ENGINEERING
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DETENTION BASIN
TRAIL CONNECTION TO
ADJACENT PROPERTY
CLOUD BERRY DR.
CLOUD BERRY CT.
CHESTNUT VINE DR.
CHESTNUT VINE CT.
MALABAR DRIVE
MALABAR CT.
SEABERRY WAY
BAYBERRY DR.
BAYBERRY CT.
PECAN CT.
EXISTING CHANNEL
CALLE DE LA PLATA
CONNECT TO SHADOW RIDGE TRAIL
PROPOSED TRAIL
CONNECT TO SHADOW RIDGE TRAIL
SCALE: 1"=60'
GRADING PLAN
C4

NOTES:
① ±3400 LF TO WATER MAIN POINT OF CONNECTION @ SILENT SPARROW DRIVE.
② ±3700 LF TO WATER MAIN POINT OF CONNECTION @ EL CABALLO TRAIL
③ SEE TMWA DISCOVERY INCLUDED IN TENTATIVE MAP APPLICATION
④ ±2500 LF TO SEWER POINT OF CONNECTION CALLE DE LA PLATA ±900' WEST OF PYRAMID INTERSECTION
LEGEND:
MANHOLE
CATCH BASIN
SD 18" STORM DRAIN MAIN (DASHED IF EXISTING)
SS 8" SANITARY SEWER MAIN (DASHED IF EXISTING)
8"W WATER MAIN
WATER VALVE
ELBOW FITTINGS (w/THRUST BLOCKS)
FLUSH VALVE ASSEMBLY
Axion ENGINEERING
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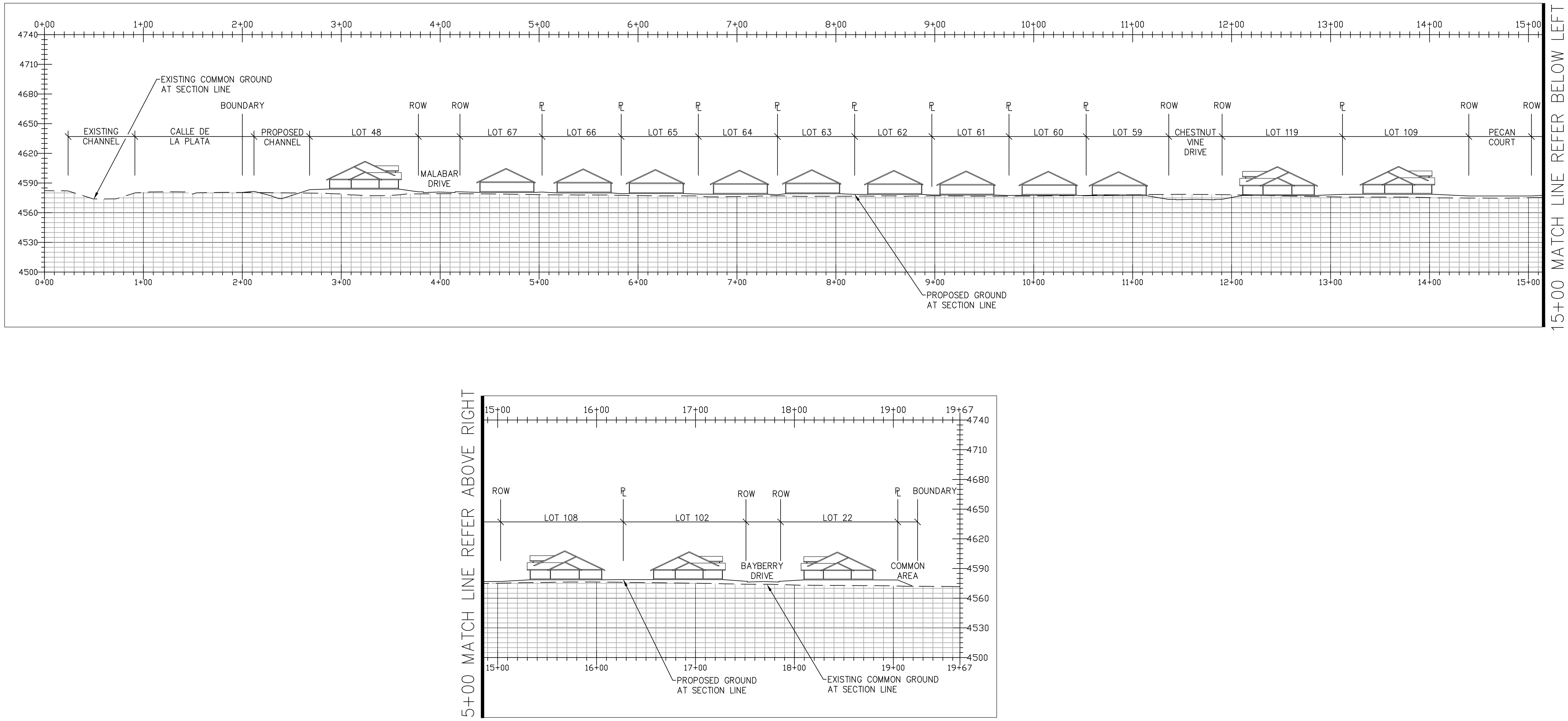
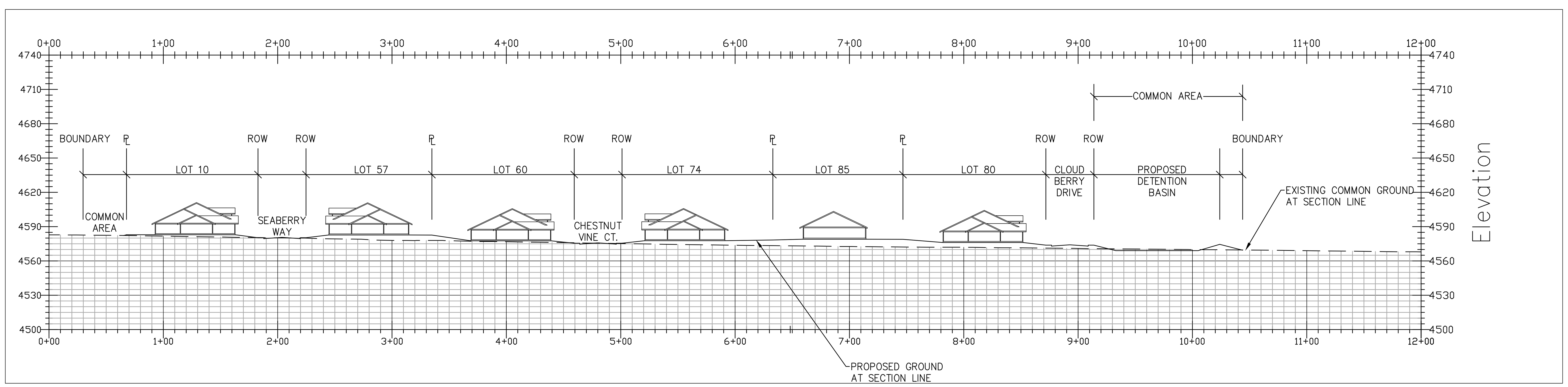
EXISTING DRAINAGE CHANNEL
NOTE ④
NOTE ①
NOTE ②
EXISTING CHANNEL
CALLE DE LA PLATA
POWER COMPANY ACCESS ROAD
PROPOSED TRAPEZOIDAL DRAINAGE CHANNEL
MALABAR DRIVE
MALABAR CT.
CLOUD BERRY DR.
CLOUD BERRY CT.
CHESTNUT VINE DR.
CHESTNUT VINE CT.
PECAN CT.
BAYBERRY DR.
BAYBERRY CT.
SEABERRY WAY
DETENTION BASIN
DETENTION POND RELEASE @ EXISTING NATURAL DRAINAGE COURSE
WATER STUB FOR FUTURE CONNECTION
EXISTING OVERHEAD POWER
OFFSITE DRAINAGE
WATER STUB FOR FUTURE CONNECTION
SCALE: 1"=60'
UTILITY PLAN
C5



SECTION A-A



SECTION B-B

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60 0 30 60 120
SCALE: 1"=60'

CROSS SECTION PLAN
1'=60'

C6

GENERAL NOTES

1) ALL PLANTING AND IRRIGATION SHALL BE INSTALLED PER LOCAL GOVERNING CODES.

2) FINAL PLANT SELECTION AND LAYOUT WILL BE BASED ON SOUND HORTICULTURAL PRACTICES RELATING TO MICRO-CLIMATE, SOIL, AND WATER REGIMES. ALL TREES WILL BE STAKED SO AS TO REMAIN UPRIGHT AND PLUMB FOLLOWING INSTALLATION. PLANT SIZE AND QUALITY AT TIME OF PLANTING WILL BE PER CURRENT EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z60.1).

3) ALL PLANTER BEDS WILL RECEIVE 4" DEPTH OF MULCH WITH WEED CONTROL.

4) ALL LANDSCAPING WILL BE AUTOMATICALLY IRRIGATED UNLESS NOTED OTHERWISE ON THE PLAN. CONTAINER PLANTINGS WILL BE DRIP IRRIGATED. A REDUCED-PRESSURE-TYPE BACKFLOW PREVENTOR WILL BE PROVIDED ON THE IRRIGATION SYSTEM AS REQUIRED PER CODE.

LANDSCAPE DATA

SITE AREA: 39.83 ACRES (1,735,212 SQ FT)
ZONING: MDS: MEDIUM DENSITY SUBURBAN
REQUIRED LANDSCAPE AREA: N/A

PROVIDED LANDSCAPE AREA: 119,925 SQ FT (7% TOTAL SITE AREA).

TREES REQUIRED: 274 TREES

- 1 TREE PER 50 LINEAR FEET OF FRONT YARD STREET FRONTAGE: 12,430 LF MINUS AVERAGE (120) 28' WIDE DRIVEWAYS = 249 TREES
- 1 TREE PER 50 LF OF SUBDIVISION PERIMETER FRONTAGE ADJOINING AN ARTERIAL STREET: CALLE DE LA PLATA 1,247 LF = 25 TREES

TREES PROVIDED: 274 TREES

SHRUBS REQUIRED: 1,644 SHRUBS (6 SHRUBS PER TREE)

SHRUBS PROVIDED: 1,644 MINIMUM

L.A. StudioNevada
the landscape architecture studio
1552 C Street Sparks, NV 89431 (775) 323-2223 NV RLA #440
www.lastudionevada.com

Preliminary Landscape Plan
SUGARLOAF RANCH ESTATES
Axion Engineering
Spanish Springs Washoe Co. Nevada

No.	Revision Date

LA No: 532-508-08-15
Designed: GSS
Drawn: GSS
Checked: RWH
CAD File: L1-532-508-Prel
Date: 1/29/16

Sheet
L1
of
1