LUMOS
& ASSOCIATES

9222 Prototype Drive
Reno, Nevada 89521
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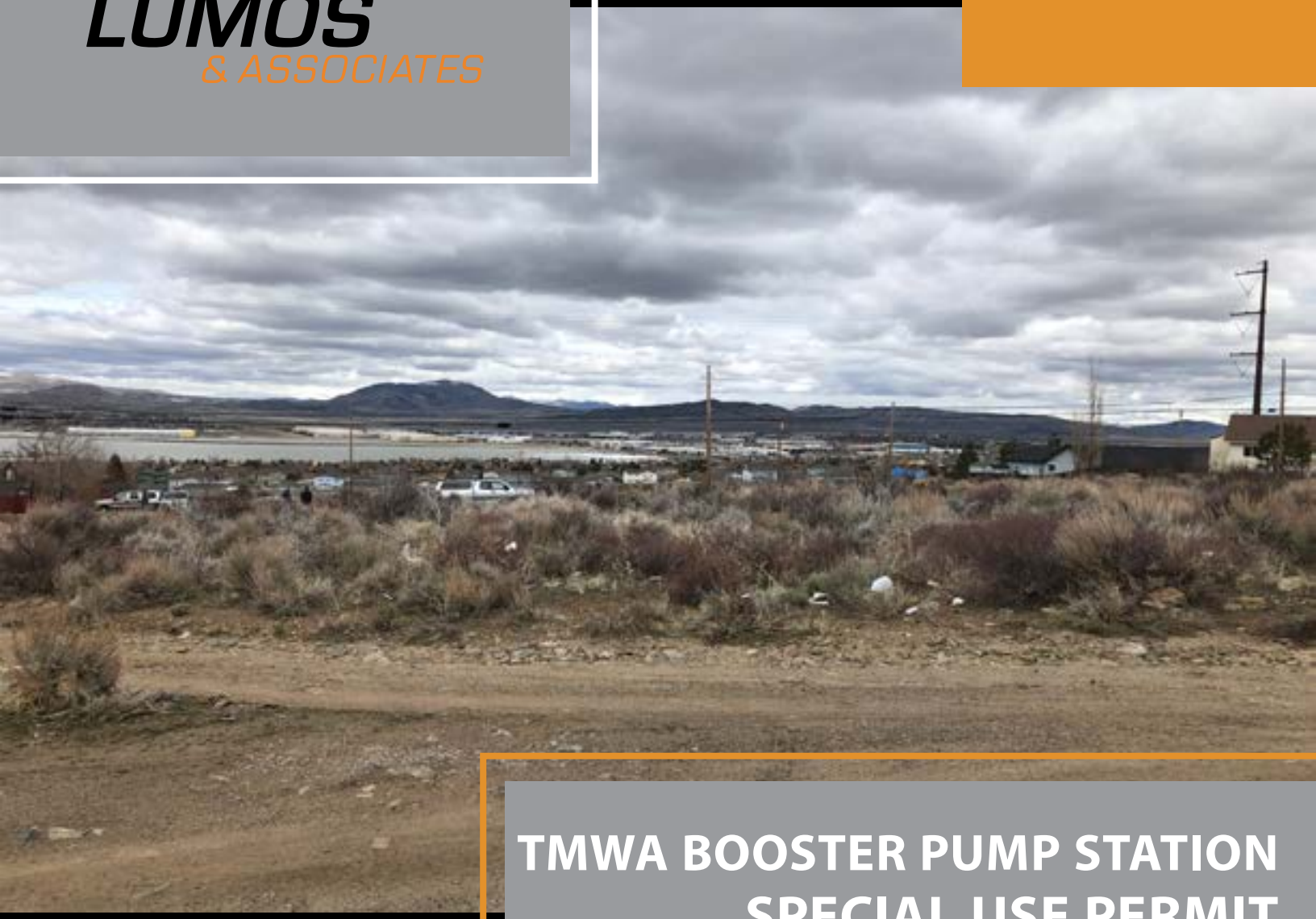
Fax 775.827.6122
www.LumosInc.com



TMWA BOOSTER PUMP STATION SPECIAL USE PERMIT

April 15, 2019

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Appendices

Maps

Project Description

Commissioner District:	5
Applicant:	Heinz Ranch Land Company LLC
APN Number:	081-031-13
Request:	This is a request for a Special Use Permit to allow a utility service (booster pump station) in the HDR zoning district per Washoe County Development Code Section 110.304.20.
Zoning:	High Density Rural (HDR)
Master Plan:	Reno-Stead Corridor Joint Plan
Planning Area:	North Valleys Area Plan

Project Request

The subject property (APN 081-031-13) encompasses a ±1.52-acre site located south of North Virginia Street at the northeast intersection of Common Road and Trail Drive. The property is currently zoned High Density Rural (HDR) and has a master plan designation of Medium Density Suburban/Suburban Residential (MDSSR) within the Reno-Stead Corridor Joint Plan. The parcel is currently vacant, and is surrounded by single family residences to the east and south, Sierra Safari Zoo to the west, and North Virginia Street to the north. The site is located within North Valleys Area Plan, and is a part of the Reno-Stead Corridor Joint Plan.

TMWA will be constructing a booster pump station, which will provide water service to development within the North Valley's area. The site plan has been designed with the building and above ground accessory buildings (i.e. generator and transformer) located on the northern end of the parcel, closest to N. Virginia Street. This was done to reduce any visual impacts on the adjacent neighbors located to the east and south. The site has also been designed with fencing and landscaping around the developed portion of the property. Solid view fencing, comprised of chain link with vinyl slats, will be located on the eastern property line, adjacent to residential development. Open chain link fencing will be located on the north, south and west side of the developed portion of the parcel.

The building measures approximately 2,335 square feet in size with a maximum height of 20'-6" to top of the pitched roof. The buildings materials and colors are designed to look and feel like a residential structure, and tie in with the surrounding development.

Access into the site will be located on the west side of the parcel from Common Road. The stretch of Common Road from N. Virginia Street to the driveway into the parcel will be constructed with AC pavement. This road improvement will also provide a safer access into the Sierra Safari Zoo parking lot to the west.

Landscaping

Development of the property is considered a civic use and requires 20 percent of the developed area to be landscaped. All yards adjoining a public street are required to be landscaped with at least one three for every 50 linear feet of street frontage. All yards adjoining a residential use are required to be landscaped and provide at least one tree for every 20 linear feet of property frontage. The proposed civic use is also required to install a solid fence or wall along the common property line, when adjoining a residential use.

The development provides for ±11,115 square feet of landscaping or 27 percent of the developed portion of property, including 25 trees. The landscape width on the south and west sides of the developed area have been reduced from 30 feet to 10 feet. There is an overhead power line that bisects the parcel and locating trees under or near the power point will create a conflict with the power line. The landscape area adjoining Common Road to the west, has been reduced from 30 feet to 10 feet. This was also done to accommodate site constraints related to the drainage. The intent of this section of the landscape code has been met by requiring both a fence and landscape strip with trees planted one tree every 50 feet of linear feet.

Figure 1 - Vicinity Map

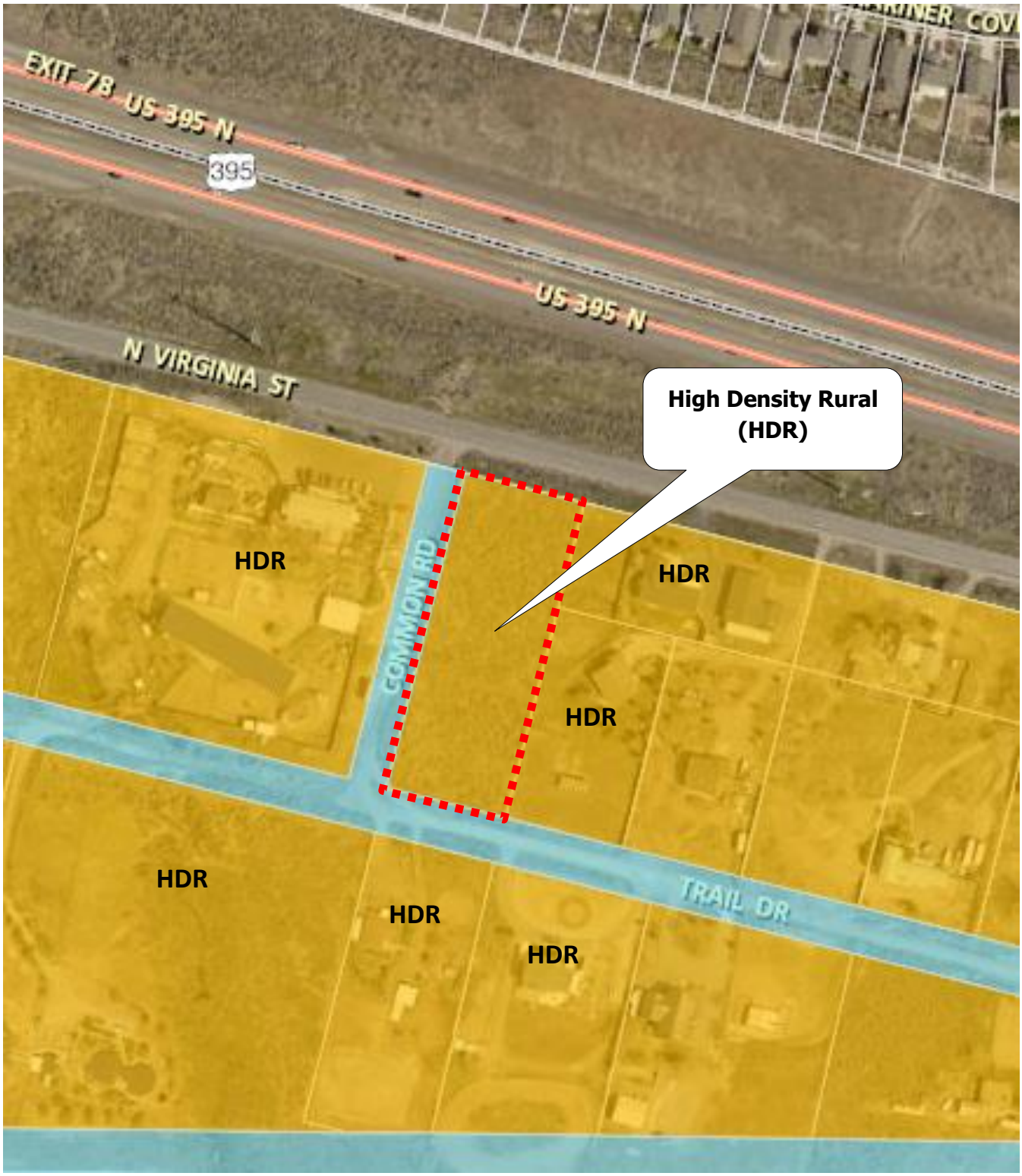


Figure 2 - Zoning Map

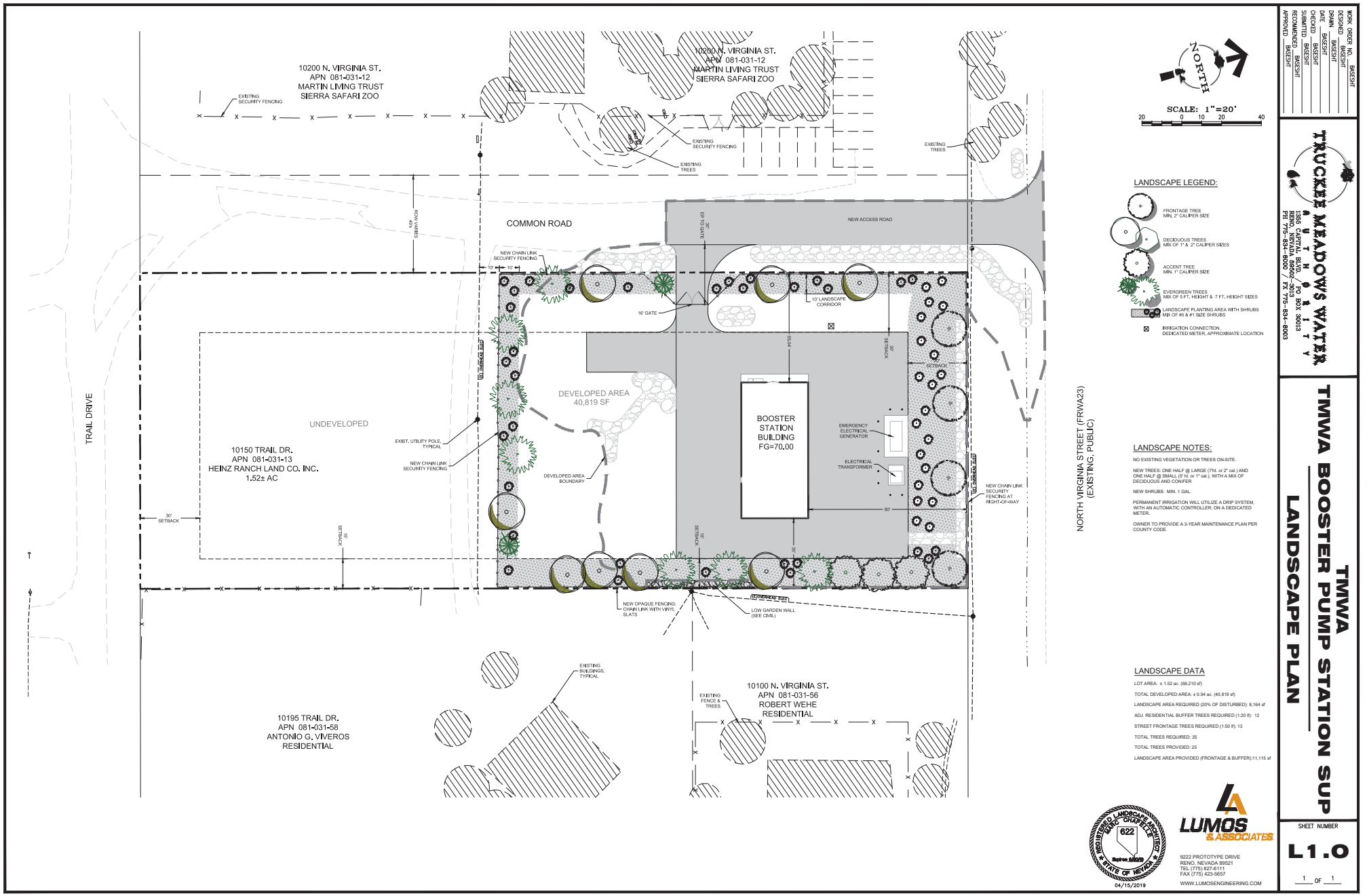


Figure 3 - Landscape Plan

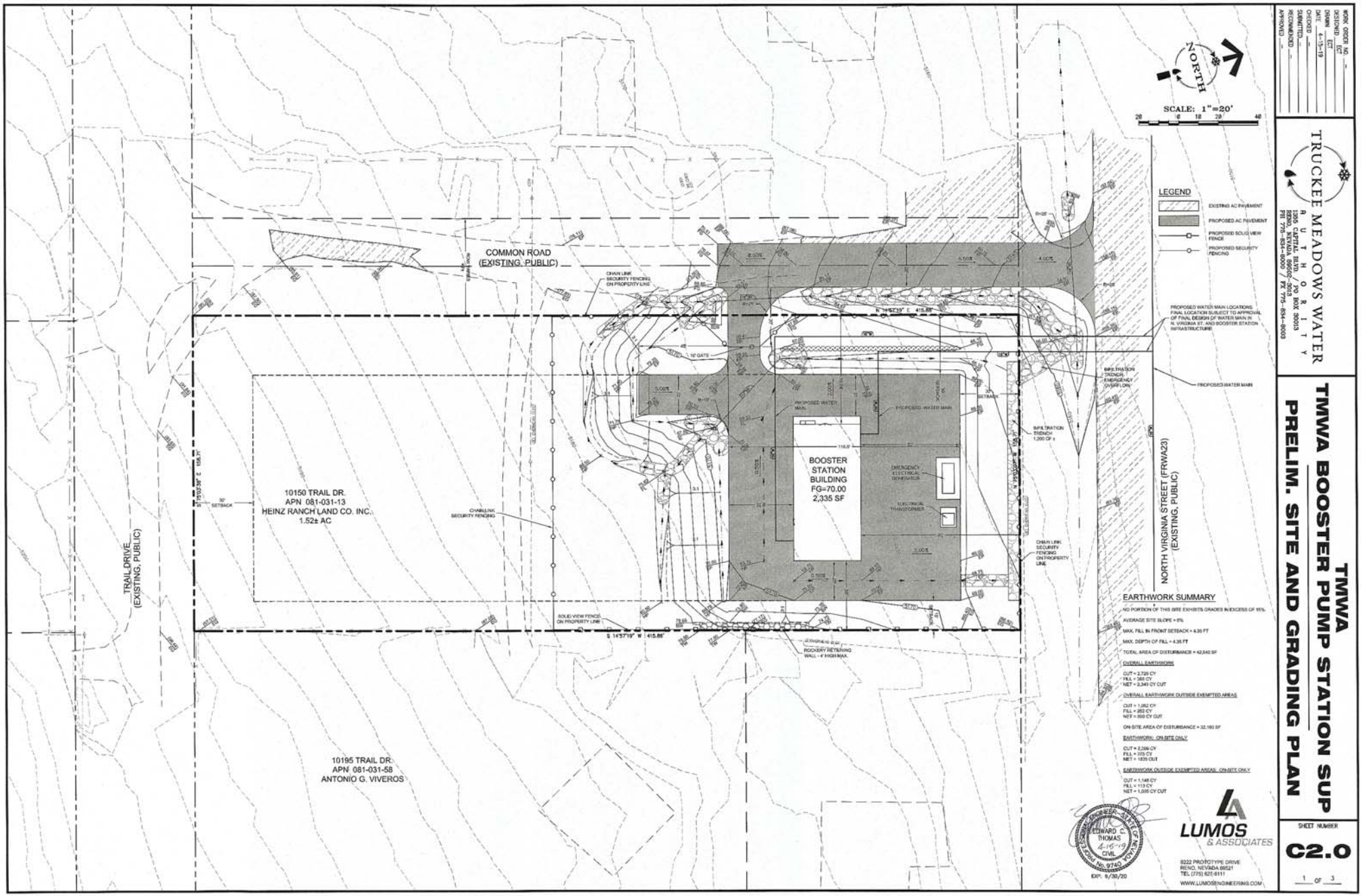
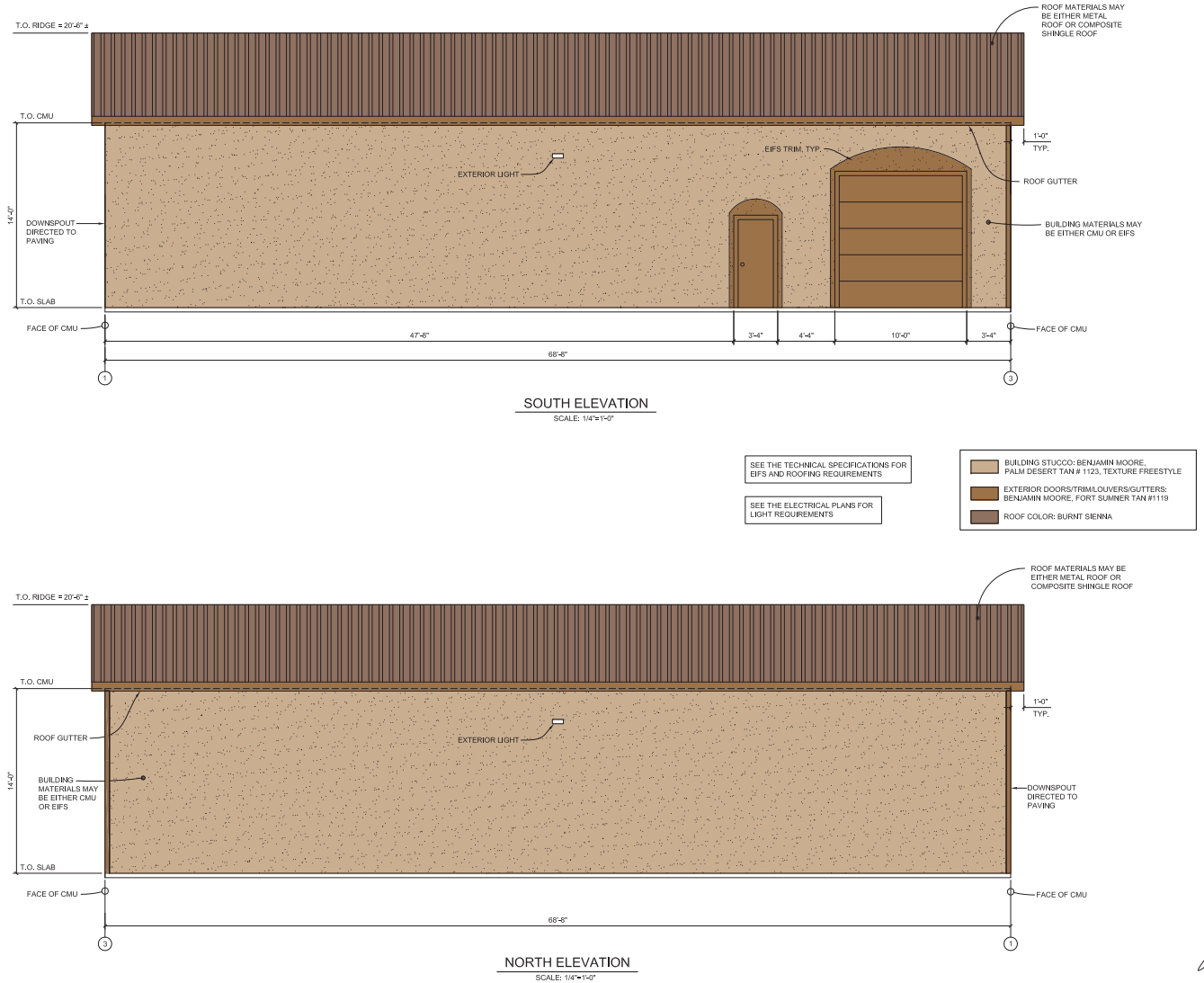


Figure 4 - Site Plan



WORK ORDER NO.
DESIGNED B.E.
DRAWN A.K.R.
DATE APRIL 15, 2019
CHECKED
SUBMITTED
RECOMMENDED
APPROVED

TRUCKEE MEADOWS WATER AUTHORITY
1355 CAPITAL BLVD. / PO BOX 30013
RENO, NEVADA 89502-3013
PH 775-834-8000 / FX 775-834-8003

TMWA BOOSTER PUMP STATION SUP
ELEVATIONS

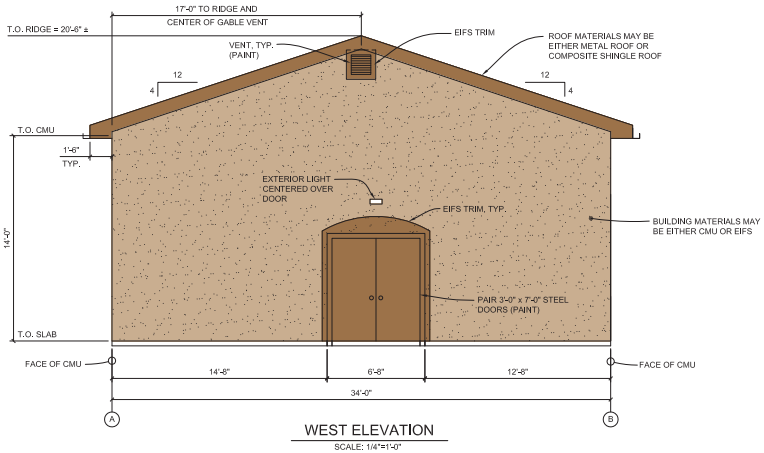
SHEET NUMBER
A1
XX OF XX

EXPIRES: DECEMBER 31, 2019
NOT FOR CONSTRUCTION

LUMOS & ASSOCIATES
9222 PROTOTYPE DRIVE
RENO, NV 89521
TEL 775.827.6111

JOB NO. 9740.000

Figure 5 - Building Elevation

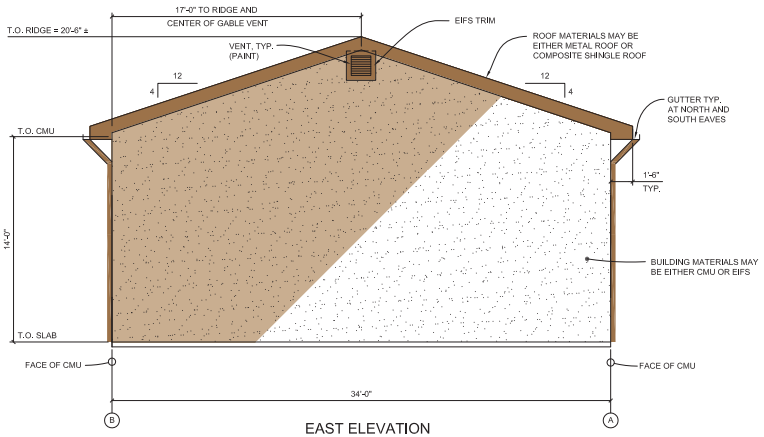


WEST ELEVATION
SCALE: 1/4"=1'-0"

SEE THE TECHNICAL SPECIFICATIONS FOR EIFS AND ROOFING REQUIREMENTS

SEE THE ELECTRICAL PLANS FOR LIGHT REQUIREMENTS

- BUILDING STUCCO: BENJAMIN MOORE, PALM DESERT TAN # 1123, TEXTURE FREESTYLE
- EXTERIOR DOORS/TRIM/LOUVERS/GUTTERS: BENJAMIN MOORE, FORT SUMNER TAN #1119
- ROOF COLOR: BURNT SIENNA



EAST ELEVATION
SCALE: 1/4"=1'-0"

EXPIRES: DECEMBER 31, 2019
NOT FOR CONSTRUCTION

LUMOS & ASSOCIATES
9222 PROTOTYPE DRIVE
RENO, NV 89521
TEL: 775.827.6111

JOB NO. 9740.000

WORK ORDER NO.
DESIGNED E.A.R.
DRAWN E.L.F.
DATE APRIL 15, 2019
CHECKED
SUBMITTED
RECOMMENDED
APPROVED

TRUCKEE MEADOWS WATER AUTHORITY
1355 CAPITAL BLVD. / PO BOX 30013
RENO, NEVADA 89502-3013
PH 775-834-8000 / FX 775-834-8003

TMWA BOOSTER PUMP STATION SUP

ELEVATIONS

SHEET NUMBER
A2
XX OF XX

Figure 6 - Building Elevation

View of the property facing east from Common Road.

View of the property facing northeast.

Figure 7 - Site Photographs

View of the southern end of property facing southeast.

View of the property facing northeast from Common Road & Trail Drive.

Figure 8 - Site Photographs

Special Use Permit Findings

Prior to approving an application for a special use permit, the Planning Commission, Board of Adjustment or a hearing examiner shall find that all of the following are true:

1. **Consistency – The proposed use is consistent with the action programs, policies, standards and maps of the Master Plan and the applicable area plan;**

The proposed project is in conformance with Washoe County Master Plan and the North Valleys Area Plan. The proposed project is consistent with the following Goals and Policies related to the North Valleys Area Plan:

Goal Two: Common Development Standards in all designated Character Management Areas. Establish development guidelines that will implement and preserve the community character commonly found within the North Valleys planning area.

NV 2.2 When feasible, given utility access constraints, grading in subdivisions established after the date of final adoption of this plan will:

a. Minimize disruption to natural topography.
b. Utilize natural contours and slopes.
c. Complement the natural characteristics of the landscape.
d. Preserve existing vegetation and ground coverage to minimize erosion.
e. Minimize cuts and fills.

Goal Three: North Valleys Rural Character Management Area. Establish a land use pattern, site development guidelines, and architectural guidelines that will implement and preserve the North Valleys Rural community character as described in the North Valleys Vision and Character Statement.

NV.3.3 Outdoor lighting must be consistent with best practice "dark-sky" standards.

NV.8.2 The Washoe County Departments of Community Development and Public Works will establish and oversee compliance with design standards for grading that minimize the visual impact of all residential and non-residential hillside development.

NV.8.3 The grading design standards referred to in Policy NV.8.2 will, at a minimum, ensure that disturbed areas shall be finished and fill slopes will not exceed a 3:1 slope, and that hillside grading will establish an undulating naturalistic appearance by creating varying curvilinear contours.

Goal Sixteen: Water resources will be supplied to land uses in the North Valleys planning area according to the best principles/practices of sustainable resource development.

NV.16.2 Development proposals must be consistent with Regional Water Plan Policies 1.3.d, "Water Resources and Land Use," and 1.3.e, "Water Resource Commitments."

NV.16.7 Unless approved by the Washoe County Board of Commissioners, water imported to the North Valleys planning area will not be diverted to supply land uses outside the North Valleys and Cold Springs planning areas.

2. Improvements – Adequate utilities, roadway improvements, sanitation, water supply, drainage, and other necessary facilities have been provided, the proposed improvements are properly related to existing and proposed roadways, and an adequate public facilities determination has been made in accordance with Division Seven;

The booster pump station development will provide water lines, drainage improvements, electrical lines and roadway improvements to Common Road. Access to the site will be from Common Road and the road will be improved from N. Virginia to the site entrance. The facility will provide future water service for future developments planned in the North Valley's area.

3. Site Suitability – The site is physically suitable for the type of development and for the intensity of development;

The site is physically suitable for this type of development. The booster pump station building measures 2,335 square feet in size and 20'-6" to the top peak of the roofline. The building has been designed to look like a single-family home and will blend in with the surrounding neighborhood, including the building materials and colors. The developed portion of the site will be fenced and landscaped on all four sides. The remaining undeveloped portion of the property will be left undisturbed. The site provides for over 20 percent landscaping, including 25 trees.

4. Issuance Not Detrimental – Issuance of the permit will not be significantly detrimental to the public health, safety or welfare; injurious to the property or improvements of adjacent properties; or detrimental to the character of the surrounding area;

Issuance of the permit will not be significantly detrimental to the public health, safety or welfare of the surrounding area. Consideration has been given to the neighboring properties through the overall site design, including placement of the structure, fencing, landscaping and access. The proposed landscaped areas will provide a row of trees on all four sides of the building to help mitigate visual impacts and screen the development from public view.

5. Effect on a Military Installation – Issuance of the permit will not have a detrimental effect on the location, purpose or mission of the military installation.

The proposed project has no effect on the location, purpose or mission of military installation. There are no military installations in the area.

Appendix A

Washoe County Development Application

Your entire application is a public record. If you have a concern about releasing personal information, please contact Planning and Building staff at 775.328.6100.

Project Information	**Staff Assigned Case No.:**

Project Name: **Booster Pump Station Special Use Permit**

Project Description: Request for a Special Use Permit to allow a utility service (booster pump station) in the HDR zoning district per Washoe County Development Code Section 110.301.20.

Project Address: 10150 Trail Drive, Washoe County 89506

Project Area (acres or square feet): 1.52 acre

Project Location (with point of reference to major cross streets **AND** area locator):

The site is located on Trail Drive at the intersection of Common Road, south of N. Virginia Street

Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
081-031-13	1.52 acre		

Indicate any previous Washoe County approvals associated with this application:

Case No.(s). unknown

Applicant Information (attach additional sheets if necessary)

Property Owner:		**Professional Consultant:**	
Name: Heinz Ranch Land Co, LLC		Name: Lumos & Associates	
Address: 777 S Center Street #105		Address: 9222 Prototype Drive	
Reno, NV	Zip: 89501	Reno, NV	Zip: 89521
Phone: 775-557-7130	Fax:	Phone: 775-827-6111	Fax:
Email: dpattalock@stonegatereno.com		Email: afuss@lumosinc.com	
Cell: 775-846-1895	Other:	Cell: 775-771-6408	Other:
Contact Person: Don Pattalock		Contact Person: Angela Fuss	
Applicant/Developer:		**Other Persons to be Contacted:**	
Name: TMWA		Name:	
Address: 1255 Capital Blvd.		Address:	
Reno, NV	Zip: 89502		Zip:
Phone: 775-834-8286	Fax:	Phone:	Fax:
Email: jbarnes@tmwa.com		Email:	
Cell:	Other:	Cell:	Other:
Contact Person: Jason Barnes		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: Heinz Ranch Land Co, LLC

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, Michael R. Barnes,
(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 Building.

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

Assessor Parcel Number(s): 081-031-13

Printed Name Michael R. Barnes

Signed [signature]

Address 777 S. Center. #105

Reno, NV 89501

Subscribed and sworn to before me this 8th day of April, 2019 by Michael Barnes (Notary Stamp)

Lynell T. Higashi
Notary Public in and for said county and state

My commission expires: July 7, 2019

LYNELL T. HIGASHI
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 06-108071-2 - Expires July 7, 2019

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

- ☑ Owner
- ☐ Corporate Officer/Partner (Provide copy of record 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

Special Use Permit Application
Supplemental Information

(All required information may be separately attached)

1. What is the project being requested?

   Request for a Special Use Permit to allow a utility service (booster pump station) in the HDR zoning district per Washoe County Development Code Section 110.301.20.

2. Provide a site plan with all existing and proposed structures (e.g. new structures, roadway improvements, utilities, sanitation, water supply, drainage, parking, signs, etc.)

   A site plan has been included with the application package that includes roads, parcel lines, proposed grading and buildings, and landscaping.

3. What is the intended phasing schedule for the construction and completion of the project?

   The project will be constructed in one phase with construction anticipated in 2019.

4. What physical characteristics of your location and/or premises are especially suited to deal with the impacts and the intensity of your proposed use?

   The property is a vacant site located adjacent to North Virginia Street, where a new water main is being constructed. The booster pump station is needed to serve the water main.

5. What are the anticipated beneficial aspects or affects your project will have on adjacent properties and the community?

   Water utilities and infrastructure will provide a benefit to the North Valley's area because it provides a water service that is not yet constructed. The site has been designed with fencing and landscaping to protect the adjacent properties.

6. What are the anticipated negative impacts or affect your project will have on adjacent properties? How will you mitigate these impacts?

   Development of the booster pump station will occur on an existing vacant parcel. Negative impacts will be mitigated through fencing, landscaping, and providing an enclosed structure that is architecturally compatible with the surrounding homes.

7. Provide specific information on landscaping, parking, type of signs and lighting, and all other code requirements pertinent to the type of use being purposed. Show and indicate these requirements on submitted drawings with the application.

   A preliminary landscape plan is included with the application.

8. Are there any restrictive covenants, recorded conditions, or deed restrictions (CC&Rs) that apply to the area subject to the special use permit request? (If so, please attach a copy.)

❑ Yes	■ No

9. Utilities:

a. Sewer Service	Septic
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
f. Cable Television Service	Charter Communications
g. Water Service	TMWA

For most uses, Washoe County Code, Chapter 110, Article 422, Water and Sewer Resource Requirements, requires the dedication of water rights to Washoe County. Please indicate the type and quantity of water rights you have available should dedication be required.

h. Permit #		acre-feet per year	
i. Certificate #		acre-feet per year	
j. Surface Claim #		acre-feet per year	
k. Other #		acre-feet per year	

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

This will be a TMWA booster pump station and all water rights will be owned by TMWA.

10. Community Services (provided and nearest facility):

a. Fire Station	Truckee Meadows Fire Protection District, Station T44
b. Health Care Facility	REMSA
c. Elementary School	Silver Lake Elementary School
d. Middle School	Cold Springs Middle School
e. High School	North Valleys High School
f. Parks	North Valleys Park
g. Library	North Valleys Library
h. Citifare Bus Stop	NA

Washoe County Treasurer
Tammi Davis

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

Back to Account Detail | Change of Address | Print this Page

CollectionCart

	Items	Total	
Collection Cart	0	$0.00	Checkout View

Pay Online

No payment due for this account.

Washoe County Parcel Information

Parcel ID	Status	Last Update
08103113	Active	4/13/2019 2:07:12 AM

Current Owner:
HEINZ RANCH LAND COMPANY LLC

777 S CENTER ST 105
RENO, NV 89501

SITUS:
10150 TRAIL DR

Taxing District
4000

Geo CD:

Legal Description

SubdivisionName _UNSPECIFIED Range 18 Section 1 Township 20

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

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2018	$250.76	$250.76	$0.00	$0.00	$0.00
2017	$240.65	$240.65	$0.00	$0.00	$0.00
2016	$234.55	$234.55	$0.00	$0.00	$0.00
2015	$234.08	$234.08	$0.00	$0.00	$0.00
2014	$226.82	$226.82	$0.00	$0.00	$0.00
				Total	$0.00

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- ALERTS: If your real property taxes are delinquent, the search results displayed may not reflect the correct amount owing. Please contact our office for the current amount due.
- For your convenience, online payment is available on this site. E-check payments are accepted without a fee. However, a service fee does apply for online credit card payments. See Payment Information for details.

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

Installment Date Information

Assessment Information

Appendix B

LUMOS & ASSOCIATES

Carson City • Fallon • Lake Tahoe • Reno

www.LumosInc.com

Reno
9222 Prototype Drive
Reno, Nevada 89521
775.827.6111

Conceptual Drainage Report

for

TMWA Booster Pump Station
Special Use Permit Application

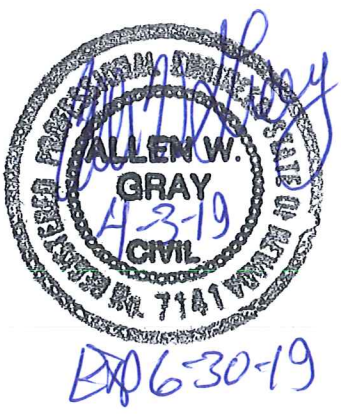
Washoe County, Nevada

Prepared for:

Truckee Meadows Water Authority
1355 Capital Blvd
Reno, NV 89502
(775) 834-8080

Prepared by:

Allen Gray, P.E.
Lumos & Associates
9222 Prototype Dr
Reno, NV 89521
(775) 827-6111



April 3, 2019

9740.000

LUMOS & ASSOCIATES

Carson City • Fallon • Lake Tahoe • Reno www.LumosInc.com

Reno
9222 Prototype Drive
Reno, Nevada 89521
775.827.6111

INTRODUCTION

This report presents hydrologic and hydraulic calculations for the Truckee Meadows Water Authority (TMWA) Booster Pump Station intended to serve the proposed North Virginia Street water main extension. The Booster Pump site is located in the southeastern 1/4 of Section 01, T.20N, R.18E, M.D.M. in Washoe County, Nevada. The property consists of a 1.52 acre parcel (APN 081-031-13 at 10150 Trail Drive). The purpose of this study is to compute the 5-year and 100-year peak runoff for the undeveloped and improved condition of the site and to provide supporting computations for the calculated peak runoff.

SITE DESCRIPTION

The Booster Pump site is located on an undeveloped parcel between Trail Drive, Common Road and North Virginia Street, (See Vicinity Map, Appendix A). The parcel is zoned High Density Residential (HDR) and bound on the west by the Sierra Safari Zoo, on the north by North Virginia Street frontage road (and US 395 further to the North), on the east by single family residential and on the south by Trail Road and additional single family homes. All of the surrounding parcels have been developed.

The parcel is currently accessed from Trail Drive and Common Road. Topography of the parcel is moderately sloping. The site drains generally to the north into an existing roadside drainage ditch in the North Virginia Street right-of-way. The roadside drainage then flows westerly and eventually through a culvert under US 395 toward Red Rock Road.

The subject parcel is 1.52 acres in area and is currently undeveloped. Groundcover consists of well-developed sage brush and low growing native desert shrubs and grasses. Trail Drive and Common Road are unpaved dirt roads, and the surrounding parcels have less native vegetation, but more grass and landscaping.

Slopes on the existing property are just under 8%. Consequently, the project is not categorized as a Hillside Development as defined by Development Code.

FLOOD ZONE

Based on a review of the Flood Insurance Rate Map Index, the site is in an un-mapped area of the Federal Emergency Management Agency (F.E.M.A.). The project site is, therefore identified as Flood Hazard Zone X (unshaded), which is defined as areas determined to be outside the 500-year floodplain.

PROJECT DESCRIPTION

The booster pump station will include the construction of a 2500 +/- square foot booster pump facility, a diesel generator pad, paved private access around the pump station facilities, landscaping and perimeter fencing. All development will occur on the northern portion of the site and occupy approximately 15,000 square feet (.35 Ac). The southern portion of the site will remain undeveloped and in native condition.

The site will be graded to accommodate an asphalt paved vehicle maintenance access route and will include fencing, landscaping and a stormwater infiltration basin. Public access and utility infrastructure exists adjacent to the site. The public rural road (Common Drive) will be improved from North Virginia Street to

provide access to the site. In a separate project, a water main will be routed along North Virginia Street. The pump station will be connected to the main to assist with water transport.

Runoff from the developed site will be split. All runoff from the southern, undeveloped portion of the site will be routed toward Common Road and bypass the developed norther portion of the site. All runoff originating on the developed northern portion of the project site will be routed to an infiltration basin located near the natural low point of the site near the northern boundary. Unpaved disturbed areas will be revegetated and stabilized with a dryland mix. Construction of the site, driveway, and utilities will disturb roughly 0.4 acres.

The proposed infiltration basin will be sized to accommodate runoff from both the 5-year and 100-year return frequency storms to reduce discharge from the developed portion of the site to pre-development levels.

METHODOLOGY

Peak rate of runoff and total runoff volumes have been computed using the Rational Method for peak flow calculation. Precipitation values were computed using National Oceanic and Atmospheric Administration's (NOAA's) Point Precipitation Frequency Estimates function available on the NOAA website, soil hydrologic characteristics were based upon the US Department of Agriculture Natural Resources Conservation Service (NRCS, formerly SCS) Soil Surveys, and concentration times were determined using the methods described in the Truckee Meadows Regional Drainage Manual (TMRDM).

According to TMRDM, the peak rate of runoff may not be increased as a result of development. In the TMWA Booster Pump project, runoff will be collected in swales and conveyed overland to an infiltration facility, resulting in no increase in stormwater discharge from the developed portion of the site.

Retention/detention facilities shall be additionally analyzed based on runoff volumes generated by the 10 day, 100 year storm as required in the North Valleys Silver Lake Playa drainage basin. Retention analysis for this project provides calculations addressing the capture of the 10 day, 100 year runoff volume as well as attenuation of the 100 year peak flows.

The infiltration basin will be designed to accommodate the runoff from the developed portion of the site. An emergency overflow swale will be constructed from the outlet to the existing North Virginia Street roadside ditch for storm events that exceed the infiltration capacity of the basin. This outlet will be armored to reduce the chance of erosion and siltation.

A volume based system (infiltration trench) is proposed to reduce pollutants from runoff. According to the Truckee Meadows Low Impact Development Manual, runoff for flow-based facilities must treat runoff from the 90^{th} percentile frequency storms to the public storm system. The manual defines the 90^{th} percentile storm as a storm that produces 0.60 inches of rainfall. Revegetation and rock treatment will be sized to remove pollutants from runoff prior to discharge from the project site. All on-site runoff originating on the paved surfaces will be routed to the infiltration basin where it will be retained and treated.

The result is that 100% of runoff originating on the developed portion of the project site will be reduced to less than pre-development peak flows and will be treated for pollutant removal.

EXISTING RUNOFF ANALYSIS

The existing site currently drains entirely onto the North Virginia Street right-of-way located to the north. It is assumed that Trail Road prevents off-site drainage from entering the site, and therefore, off-site runoff to the site is considered negligible. The runoff from the existing parcel drains to roadside ditches in both Common Road and North Virginia Street, eventually ending up in North Virginia Street with no single point of discharge attributable to the property.

The peak runoff rates calculated for the existing 1.52 acre site are based on Rational Method calculations as follows:

$Q_5 = (0.20)\left(1.31\frac{in}{hr}\right)(1.52ac)$=0.40cfs

$Q_{100} = (0.50)\left(3.23\frac{in}{hr}\right)(1.52ac)$=2.45cfs

Where: Q_5 = 5-year Peak Runoff Rate - computed
Q_{100} = 100-year Peak Runoff Rate – computed

Calculations can be found in Appendix C.

PROPOSED RUNOFF ANALYSIS

Development of the project will involve the construction of paved access and maintenance areas, drainage swales, a stormwater infiltration facility, landscaping and public utilities on the northern portion of the site. The runoff from the southern portion of the site (which will remain undeveloped) will bypass the developed areas and be routed into the Common Road roadside ditch which will drain to North Virginia Street as currently occurs in the existing condition. The drainage from the northerly portion of the site, where all the development will take place, will be routed entirely to an infiltration basin. The construction of the improvements will alter the runoff originating on the site by providing swales through which the drainage will be routed into the proposed stormwater infiltration basin. The sizing of the infiltration basin will be based upon post development runoff discharging to that point. The basin is sized to capture and infiltrate the volume increase in runoff due to development based upon the 10 day, 100 year storm. It is also sized to contain on-site peak runoff reaching it with no increased rate of discharge leaving the site.

The peak runoff rates calculated for the developed 1.52 acre site are based on Rational Method calculations as follows:

$Q_5 = (0.35)\left(1.42\frac{in}{hr}\right)(1.52ac)$=0.76cfs

$Q_{100} = (0.59)\left(3.49\frac{in}{hr}\right)(1.52ac)$=3.13cfs

Where: Q_5 = 5-year Peak Runoff Rate - computed

Q_{100} = 100-year Peak Runoff Rate – computed

The 10-day, 100-year volume generated on the site based on NOAA Atlas 14 precipitation is 5909 cubic feet over 10 days, for an average of 591 cubic feet per day. The infiltration basin, using assumed infiltration rates, is sized to infiltrate the increase in runoff volume from the 10-day 100-year storm due to development. The increase in runoff from the 10-day, 100-year storm volume is retained on site, and the cumulative post development discharge from the site will match the computed existing discharge from the site during the 100 year event while the five-year discharge will be reduced as a result of the improvements.
The total proposed runoff from the developed site is calculated as follows:

$Q_5 = 0.20cfs$
$Q_{100} = 2.45cfs$

Where: Q_5 = 5-year Peak Runoff Rate - computed
Q_{100} = 100-year Peak Runoff Rate - computed

All calculations were performed by hand and can be found in Appendix C.

As can be seen by comparing existing and developed peak onsite runoff reaching the infiltration basin, initial peak runoff increases as a result of development. This is entirely due to an increase in the amount of impervious ground cover in the form of driveways, maintenance areas and roofs. The infiltration basin is designed to attenuate and treat the increase in peak flow, which will result in a net decrease in runoff from the site.

The infiltration basin will be designed with an outlet structure to accommodate flows in excess of the designed infiltration capacity of the basin. The outlet structure will discharge runoff from the basin into existing North Virginia Street roadside drainage ditch and culvert located under Common Road on the north side of the project. The outlet structure will be armored to reduce the chance of erosion and siltation in the event that a storm that is greater than the expected 100-year storm should reach the basin.

Water Quality

Methods of treating runoff will be employed to address storm water quality. In addition to attenuating the peak storm runoff, the infiltration basin will serve to provide water quality treatment of the runoff. The volume of the proposed basin as designed to accommodate the runoff generated by the 90th percentile frequency storm designated for LID volume-based treatment. Therefore, water quality will be controlled by retaining the volume of stormwater generated by the 90th percentile storm entirely within the infiltration basin.

CONCLUSION

The TMWA Booster Pump Station project will result in the development of a portion of a 1.52 acre undeveloped site into a partially paved and developed site, including private driveway, maintenance access, pump building and utility infrastructure. Development of the project will result in an increase in impervious ground cover. The increase in impervious ground cover will result in an increased rate of runoff generated by the project. Water quality of the runoff as well as the volume and rate of runoff will all be controlled by an

infiltration basin at the north end of the project. The proposed infiltration basin will be designed and sized to store the 10 day, 100 year storm volume, provide required LID water quality treatment and reduce peak runoff from the site to pre-development flow rates.

All disturbed ground surfaces which are not paved will be re-vegetated using a dry land native seed mix. By re-vegetating disturbed slopes and by lining cutoff ditches with rip-rap, erosion and sedimentation can be minimized.

Code requires that the 5-year and 100-year peak runoff leaving a developed site not exceed the peak runoff leaving the site in its undeveloped state. Washoe County policy strongly recommends that runoff be treated to remove pollutants prior to discharge from the site. The nature of the closed North Valleys basin requires that the runoff volume from the 10-day, 100-year storm be retained on site. The proposed improvements are expected to meet all of these standards.

APPENDIX A

VICINITY MAP


Subject Property
APN 081-031-13
CRYSTAL SHORES DR
MOYA BLVD
SHIFTING SANDS DR
ANCHOR POINT DR
BIG RIVER DR
WHITE FALLS DR
MOSS CREEK DR
MALIBU DR
RED ROCK RD
BEECHCRAFT DR
SOPWITH BLVD
PIPER PL
CORRIGAN WAY
MOTH CIR
BAGPIPE CIR
SUNSET BREEZE DR
Silver Lake Park
Sierra Sage Golf Course
SAND PEBBLE DR
MONTEREY SHORES DR
KEY LARGO DR
SPEY DR
DEVERON DR
ENTRANCE 78
EXIT 78
EXIT 79
ENTRANCE 78
Reno
395
LOTUS ST
FLOWER ST
FERN ST
PEPPERMINT DR
STEAD BLVD
SUSAN CT
LENCO AVE
TRAIL DR
MERMAC ST
COPPERFIELD DR
LONGVIEW LN
DUFFNEY LN
ENTRANCE 76
EXIT 76
N VIRGINIA
N VIRGINIA ST
PEAVINE PEAK RD

Appendix A

APPENDIX B

PRECIPITATION CURVES

NOAA Atlas 14, Volume 1, Version 5
Location name: Reno, Nevada, USA*
Latitude: 39.6231°, Longitude: -119.9076°
Elevation: 5185.2 ft**
* source: ESRI Maps
** source: USGS

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

Precipitation Depth

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	**0.112** (0.094-0.128)	**0.139** (0.117-0.161)	**0.184** (0.156-0.217)	**0.229** (0.193-0.270)	**0.302** (0.251-0.364)	**0.372** (0.301-0.455)	**0.456** (0.359-0.567)	**0.560** (0.425-0.710)	**0.731** (0.526-0.958)	**0.892** (0.616-1.20)
10-min	**0.169** (0.143-0.195)	**0.211** (0.178-0.246)	**0.281** (0.238-0.330)	**0.348** (0.294-0.411)	**0.460** (0.382-0.554)	**0.566** (0.459-0.692)	**0.694** (0.547-0.864)	**0.852** (0.647-1.08)	**1.11** (0.801-1.46)	**1.36** (0.937-1.82)
15-min	**0.210** (0.177-0.242)	**0.262** (0.220-0.304)	**0.348** (0.294-0.410)	**0.431** (0.364-0.510)	**0.570** (0.474-0.686)	**0.702** (0.568-0.858)	**0.861** (0.678-1.07)	**1.06** (0.803-1.34)	**1.38** (0.993-1.81)	**1.68** (1.16-2.26)
30-min	**0.283** (0.239-0.326)	**0.352** (0.296-0.410)	**0.469** (0.396-0.552)	**0.581** (0.490-0.687)	**0.768** (0.638-0.924)	**0.945** (0.766-1.16)	**1.16** (0.913-1.44)	**1.42** (1.08-1.81)	**1.86** (1.34-2.44)	**2.27** (1.57-3.04)
60-min	**0.351** (0.295-0.404)	**0.436** (0.367-0.508)	**0.580** (0.491-0.683)	**0.719** (0.607-0.850)	**0.951** (0.789-1.14)	**1.17** (0.948-1.43)	**1.43** (1.13-1.78)	**1.76** (1.34-2.23)	**2.30** (1.66-3.01)	**2.81** (1.94-3.76)
2-hr	**0.473** (0.419-0.541)	**0.587** (0.522-0.673)	**0.749** (0.659-0.860)	**0.892** (0.775-1.02)	**1.11** (0.946-1.29)	**1.32** (1.09-1.54)	**1.55** (1.26-1.83)	**1.87** (1.47-2.24)	**2.44** (1.84-3.04)	**2.98** (2.17-3.80)
3-hr	**0.582** (0.523-0.655)	**0.722** (0.653-0.817)	**0.897** (0.805-1.01)	**1.04** (0.929-1.18)	**1.25** (1.10-1.43)	**1.44** (1.24-1.65)	**1.66** (1.41-1.93)	**1.98** (1.64-2.34)	**2.53** (2.04-3.07)	**3.06** (2.41-3.84)
6-hr	**0.878** (0.794-0.977)	**1.09** (0.988-1.22)	**1.34** (1.20-1.49)	**1.53** (1.37-1.71)	**1.78** (1.57-2.00)	**1.96** (1.72-2.22)	**2.15** (1.86-2.45)	**2.39** (2.04-2.75)	**2.87** (2.41-3.35)	**3.35** (2.78-3.96)
12-hr	**1.25** (1.12-1.39)	**1.56** (1.40-1.74)	**1.94** (1.74-2.17)	**2.25** (2.01-2.51)	**2.66** (2.35-2.99)	**2.97** (2.60-3.36)	**3.29** (2.84-3.77)	**3.61** (3.07-4.17)	**4.03** (3.36-4.75)	**4.39** (3.59-5.24)
24-hr	**1.68** (1.51-1.89)	**2.11** (1.90-2.37)	**2.69** (2.40-3.00)	**3.15** (2.82-3.53)	**3.81** (3.38-4.27)	**4.34** (3.81-4.87)	**4.89** (4.26-5.53)	**5.47** (4.71-6.22)	**6.27** (5.31-7.22)	**6.92** (5.76-8.04)
2-day	**2.11** (1.88-2.41)	**2.67** (2.37-3.05)	**3.47** (3.06-3.95)	**4.12** (3.63-4.70)	**5.06** (4.41-5.79)	**5.82** (5.03-6.69)	**6.63** (5.66-7.69)	**7.51** (6.32-8.79)	**8.75** (7.21-10.4)	**9.76** (7.90-11.8)
3-day	**2.36** (2.08-2.69)	**3.00** (2.65-3.43)	**3.95** (3.47-4.51)	**4.73** (4.15-5.42)	**5.87** (5.09-6.74)	**6.81** (5.84-7.85)	**7.82** (6.62-9.09)	**8.91** (7.44-10.4)	**10.5** (8.55-12.5)	**11.8** (9.43-14.2)
4-day	**2.60** (2.29-2.98)	**3.32** (2.92-3.81)	**4.43** (3.88-5.07)	**5.35** (4.67-6.13)	**6.68** (5.78-7.70)	**7.79** (6.66-9.01)	**9.00** (7.58-10.5)	**10.3** (8.55-12.1)	**12.2** (9.88-14.5)	**13.8** (11.0-16.6)
7-day	**3.11** (2.70-3.62)	**4.01** (3.48-4.67)	**5.41** (4.68-6.30)	**6.56** (5.66-7.65)	**8.20** (7.01-9.60)	**9.56** (8.07-11.2)	**11.0** (9.21-13.1)	**12.6** (10.4-15.1)	**14.9** (12.0-18.0)	**16.7** (13.2-20.5)
10-day	**3.57** (3.11-4.14)	**4.62** (4.02-5.36)	**6.25** (5.42-7.25)	**7.55** (6.53-8.76)	**9.39** (8.04-10.9)	**10.9** (9.23-12.7)	**12.5** (10.5-14.6)	**14.1** (11.7-16.8)	**16.5** (13.4-19.8)	**18.4** (14.7-22.4)
20-day	**4.68** (4.10-5.41)	**6.06** (5.30-7.00)	**8.16** (7.12-9.40)	**9.78** (8.51-11.3)	**12.0** (10.4-13.8)	**13.7** (11.8-15.9)	**15.5** (13.2-18.1)	**17.4** (14.6-20.5)	**20.1** (16.5-24.0)	**22.2** (18.0-26.8)
30-day	**5.63** (4.93-6.51)	**7.30** (6.39-8.43)	**9.80** (8.57-11.3)	**11.7** (10.2-13.5)	**14.3** (12.4-16.6)	**16.4** (14.1-19.0)	**18.5** (15.7-21.5)	**20.6** (17.4-24.2)	**23.7** (19.7-28.2)	**26.2** (21.4-31.4)
45-day	**6.87** (6.02-7.78)	**8.90** (7.81-10.1)	**11.9** (10.4-13.5)	**14.2** (12.4-16.1)	**17.1** (14.9-19.5)	**19.4** (16.8-22.2)	**21.8** (18.6-25.0)	**24.1** (20.5-27.8)	**27.4** (23.0-32.0)	**30.0** (24.8-35.3)
60-day	**7.89** (6.88-8.98)	**10.3** (8.98-11.7)	**13.8** (12.0-15.7)	**16.3** (14.1-18.5)	**19.4** (16.9-22.1)	**21.8** (18.8-24.9)	**24.1** (20.6-27.7)	**26.4** (22.4-30.5)	**29.6** (24.8-34.4)	**31.9** (26.5-37.4)

[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

NOAA Atlas 14, Volume 1, Version 5
Location name: Reno, Nevada, USA*
Latitude: 39.6231°, Longitude: -119.9076°
Elevation: 5185.2 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

Precipitation Intensity

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.34** (1.13-1.54)	**1.67** (1.40-1.93)	**2.21** (1.87-2.60)	**2.75** (2.32-3.24)	**3.62** (3.01-4.37)	**4.46** (3.61-5.46)	**5.47** (4.31-6.80)	**6.72** (5.10-8.52)	**8.77** (6.31-11.5)	**10.7** (7.39-14.4)
10-min	**1.01** (0.858-1.17)	**1.27** (1.07-1.48)	**1.69** (1.43-1.98)	**2.09** (1.76-2.47)	**2.76** (2.29-3.32)	**3.40** (2.75-4.15)	**4.16** (3.28-5.18)	**5.11** (3.88-6.49)	**6.67** (4.81-8.75)	**8.14** (5.62-10.9)
15-min	**0.840** (0.708-0.968)	**1.05** (0.880-1.22)	**1.39** (1.18-1.64)	**1.72** (1.46-2.04)	**2.28** (1.90-2.74)	**2.81** (2.27-3.43)	**3.44** (2.71-4.28)	**4.22** (3.21-5.36)	**5.52** (3.97-7.23)	**6.73** (4.65-9.03)
30-min	**0.566** (0.478-0.652)	**0.704** (0.592-0.820)	**0.938** (0.792-1.10)	**1.16** (0.980-1.37)	**1.54** (1.28-1.85)	**1.89** (1.53-2.31)	**2.32** (1.83-2.88)	**2.84** (2.16-3.61)	**3.71** (2.67-4.87)	**4.53** (3.13-6.08)
60-min	**0.351** (0.295-0.404)	**0.436** (0.367-0.508)	**0.580** (0.491-0.683)	**0.719** (0.607-0.850)	**0.951** (0.789-1.14)	**1.17** (0.948-1.43)	**1.43** (1.13-1.78)	**1.76** (1.34-2.23)	**2.30** (1.66-3.01)	**2.81** (1.94-3.76)
2-hr	**0.236** (0.210-0.270)	**0.294** (0.261-0.336)	**0.374** (0.330-0.430)	**0.446** (0.388-0.512)	**0.556** (0.473-0.643)	**0.658** (0.546-0.768)	**0.776** (0.630-0.916)	**0.934** (0.734-1.12)	**1.22** (0.919-1.52)	**1.49** (1.09-1.90)
3-hr	**0.194** (0.174-0.218)	**0.240** (0.217-0.272)	**0.299** (0.268-0.338)	**0.347** (0.309-0.394)	**0.417** (0.366-0.475)	**0.479** (0.414-0.551)	**0.553** (0.470-0.643)	**0.660** (0.547-0.778)	**0.844** (0.681-1.02)	**1.02** (0.803-1.28)
6-hr	**0.147** (0.133-0.163)	**0.182** (0.165-0.204)	**0.223** (0.201-0.249)	**0.255** (0.228-0.285)	**0.297** (0.263-0.334)	**0.327** (0.287-0.370)	**0.359** (0.311-0.410)	**0.398** (0.341-0.460)	**0.479** (0.402-0.560)	**0.560** (0.464-0.662)
12-hr	**0.103** (0.093-0.115)	**0.129** (0.116-0.144)	**0.161** (0.145-0.180)	**0.187** (0.167-0.208)	**0.220** (0.195-0.248)	**0.247** (0.216-0.279)	**0.273** (0.236-0.312)	**0.300** (0.255-0.346)	**0.335** (0.278-0.394)	**0.364** (0.298-0.435)
24-hr	**0.070** (0.063-0.079)	**0.088** (0.079-0.099)	**0.112** (0.100-0.125)	**0.131** (0.117-0.147)	**0.159** (0.141-0.178)	**0.181** (0.159-0.203)	**0.204** (0.177-0.230)	**0.228** (0.196-0.259)	**0.261** (0.221-0.301)	**0.288** (0.240-0.335)
2-day	**0.044** (0.039-0.050)	**0.056** (0.049-0.063)	**0.072** (0.064-0.082)	**0.086** (0.076-0.098)	**0.105** (0.092-0.121)	**0.121** (0.105-0.139)	**0.138** (0.118-0.160)	**0.156** (0.132-0.183)	**0.182** (0.150-0.217)	**0.203** (0.165-0.246)
3-day	**0.033** (0.029-0.037)	**0.042** (0.037-0.048)	**0.055** (0.048-0.063)	**0.066** (0.058-0.075)	**0.082** (0.071-0.094)	**0.095** (0.081-0.109)	**0.109** (0.092-0.126)	**0.124** (0.103-0.145)	**0.146** (0.119-0.173)	**0.164** (0.131-0.197)
4-day	**0.027** (0.024-0.031)	**0.035** (0.030-0.040)	**0.046** (0.040-0.053)	**0.056** (0.049-0.064)	**0.070** (0.060-0.080)	**0.081** (0.069-0.094)	**0.094** (0.079-0.109)	**0.107** (0.089-0.126)	**0.127** (0.103-0.152)	**0.144** (0.114-0.173)
7-day	**0.019** (0.016-0.022)	**0.024** (0.021-0.028)	**0.032** (0.028-0.038)	**0.039** (0.034-0.046)	**0.049** (0.042-0.057)	**0.057** (0.048-0.067)	**0.066** (0.055-0.078)	**0.075** (0.062-0.090)	**0.088** (0.071-0.107)	**0.100** (0.079-0.122)
10-day	**0.015** (0.013-0.017)	**0.019** (0.017-0.022)	**0.026** (0.023-0.030)	**0.031** (0.027-0.036)	**0.039** (0.034-0.046)	**0.045** (0.038-0.053)	**0.052** (0.044-0.061)	**0.059** (0.049-0.070)	**0.069** (0.056-0.083)	**0.077** (0.061-0.093)
20-day	**0.010** (0.009-0.011)	**0.013** (0.011-0.015)	**0.017** (0.015-0.020)	**0.020** (0.018-0.023)	**0.025** (0.022-0.029)	**0.029** (0.024-0.033)	**0.032** (0.027-0.038)	**0.036** (0.030-0.043)	**0.042** (0.034-0.050)	**0.046** (0.037-0.056)
30-day	**0.008** (0.007-0.009)	**0.010** (0.009-0.012)	**0.014** (0.012-0.016)	**0.016** (0.014-0.019)	**0.020** (0.017-0.023)	**0.023** (0.020-0.026)	**0.026** (0.022-0.030)	**0.029** (0.024-0.034)	**0.033** (0.027-0.039)	**0.036** (0.030-0.044)
45-day	**0.006** (0.006-0.007)	**0.008** (0.007-0.009)	**0.011** (0.010-0.012)	**0.013** (0.011-0.015)	**0.016** (0.014-0.018)	**0.018** (0.016-0.021)	**0.020** (0.017-0.023)	**0.022** (0.019-0.026)	**0.025** (0.021-0.030)	**0.028** (0.023-0.033)
60-day	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.010** (0.008-0.011)	**0.011** (0.010-0.013)	**0.014** (0.012-0.015)	**0.015** (0.013-0.017)	**0.017** (0.014-0.019)	**0.018** (0.016-0.021)	**0.021** (0.017-0.024)	**0.022** (0.018-0.026)

[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

APPENDIX C

SUPPORTING CALCULATIONS

LUMOS & ASSOCIATES

9222 Prototype Drive
Reno, NV 89521
(775) 827.6111

178 South Maine Street
Fallon, NV 89406
(775) 423.2188

308 N. Curry Street, Ste. 200
Carson City, NV 89703
(775) 883.7077

PO Box 3570
225 Kingsbury Grade, Ste. A
Stateline, NV 89449
(775) 588.6490

Client: TMWA Sheet 1 of 12

Description: PRELIM. HYDRO BOOSTER STATION Job No. 9740

By: ELT Date: 3-31-19

Checked By: _____ Date: _____

PRELIMINARY HYDROLOGY CALCULATIONS

A = 1.52 ac

FROM TMRDM TABLE 701:

FOR RANGELAND $C_5 = 0.20$
$C_{100} = 0.50$

FROM TMRDM EQ 702

$$t_i = \frac{1.8(1.1-R)(L_o^{1/2})}{S^{1/3}}$$

WHERE t_i = OVERLAND FLOW TIME (MIN)
R = 5-YEAR RUNOFF COEFFICIENT
L_o = INITIAL FLOW DISTANCE (FT) — 500 FT MAX
S = BASIN SLOPE (%)

L_o = 445 FT

$S = (97-61)/455\ (100) = 7.91\%$

$$t_i = \frac{(1.8)(1.1-0.20)(454)^{1/2}}{(7.91)^{1/3}}$$

t_i = 17.32 MIN

STATE OF NEVADA
PROFESSIONAL ENGINEER
EDWARD C. THOMAS
4-8-19
CIVIL
No. 9740

EXP 6-30-20

2/12

NOAA Atlas 14, Volume 1, Version 5
Location name: Reno, Nevada, USA*
Latitude: 39.6186°, Longitude: -119.8902°
Elevation: 5244.04 ft**
* source: ESRI Maps
** source: USGS

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

PRECIPITATION DEPTH

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	0.110 (0.093-0.127)	0.137 (0.115-0.160)	0.183 (0.155-0.215)	0.226 (0.191-0.268)	0.299 (0.248-0.360)	0.368 (0.298-0.450)	0.451 (0.355-0.561)	0.552 (0.419-0.702)	0.721 (0.518-0.946)	0.879 (0.605-1.18)
10-min	0.168 (0.141-0.193)	0.209 (0.176-0.244)	0.278 (0.236-0.328)	0.344 (0.291-0.408)	0.455 (0.378-0.548)	0.560 (0.454-0.685)	0.686 (0.540-0.854)	0.841 (0.638-1.07)	1.10 (0.789-1.44)	1.34 (0.921-1.80)
15-min	0.208 (0.175-0.240)	0.259 (0.218-0.302)	0.344 (0.292-0.406)	0.427 (0.361-0.506)	0.564 (0.469-0.679)	0.694 (0.562-0.849)	0.850 (0.669-1.06)	1.04 (0.791-1.33)	1.36 (0.977-1.79)	1.66 (1.14-2.23)
30-min	0.280 (0.236-0.323)	0.349 (0.293-0.407)	0.464 (0.393-0.547)	0.575 (0.486-0.681)	0.760 (0.631-0.915)	0.935 (0.757-1.14)	1.15 (0.901-1.43)	1.40 (1.07-1.78)	1.83 (1.32-2.40)	2.23 (1.54-3.00)
60-min	0.347 (0.292-0.400)	0.432 (0.363-0.503)	0.574 (0.487-0.677)	0.711 (0.601-0.842)	0.941 (0.781-1.13)	1.16 (0.937-1.42)	1.42 (1.12-1.76)	1.74 (1.32-2.21)	2.27 (1.63-2.98)	2.76 (1.90-3.71)
2-hr	0.466 (0.413-0.533)	0.578 (0.515-0.664)	0.737 (0.649-0.848)	0.878 (0.763-1.01)	1.10 (0.930-1.27)	1.30 (1.07-1.51)	1.53 (1.24-1.81)	1.83 (1.44-2.23)	2.39 (1.80-3.01)	2.92 (2.13-3.75)
3-hr	0.573 (0.514-0.645)	0.710 (0.643-0.805)	0.882 (0.793-0.999)	1.03 (0.914-1.16)	1.23 (1.08-1.40)	1.41 (1.22-1.63)	1.63 (1.39-1.90)	1.94 (1.61-2.30)	2.48 (2.00-3.04)	3.00 (2.36-3.79)
6-hr	0.859 (0.777-0.957)	1.07 (0.966-1.19)	1.31 (1.18-1.46)	1.50 (1.34-1.68)	1.74 (1.54-1.96)	1.92 (1.68-2.17)	2.11 (1.82-2.41)	2.34 (1.99-2.70)	2.80 (2.35-3.28)	3.27 (2.70-3.87)
12-hr	1.21 (1.09-1.35)	1.52 (1.37-1.69)	1.89 (1.70-2.12)	2.19 (1.96-2.45)	2.59 (2.29-2.91)	2.90 (2.53-3.28)	3.21 (2.77-3.67)	3.52 (2.99-4.07)	3.93 (3.26-4.63)	4.28 (3.49-5.11)
24-hr	1.64 (1.48-1.84)	2.06 (1.85-2.30)	2.61 (2.34-2.92)	3.06 (2.74-3.42)	3.70 (3.28-4.14)	4.20 (3.70-4.71)	4.74 (4.14-5.34)	5.29 (4.57-6.01)	6.07 (5.16-6.95)	6.69 (5.60-7.73)
2-day	2.05 (1.83-2.34)	2.60 (2.31-2.96)	3.36 (2.98-3.82)	3.99 (3.52-4.53)	4.89 (4.27-5.57)	5.62 (4.87-6.43)	6.40 (5.48-7.38)	7.23 (6.12-8.42)	8.42 (6.98-9.95)	9.39 (7.64-11.3)
3-day	2.29 (2.03-2.61)	2.91 (2.57-3.32)	3.82 (3.37-4.35)	4.57 (4.02-5.22)	5.66 (4.92-6.48)	6.55 (5.64-7.53)	7.52 (6.39-8.70)	8.56 (7.17-9.98)	10.1 (8.24-11.9)	11.3 (9.09-13.5)
4-day	2.52 (2.22-2.88)	3.22 (2.84-3.68)	4.27 (3.76-4.89)	5.15 (4.51-5.90)	6.43 (5.57-7.38)	7.48 (6.42-8.63)	8.64 (7.31-10.0)	9.88 (8.23-11.5)	11.7 (9.51-13.9)	13.2 (10.5-15.8)
7-day	3.02 (2.62-3.51)	3.88 (3.37-4.51)	5.21 (4.52-6.07)	6.31 (5.45-7.35)	7.88 (6.74-9.20)	9.16 (7.76-10.8)	10.6 (8.84-12.5)	12.0 (9.96-14.3)	14.2 (11.5-17.1)	16.0 (12.7-19.5)
10-day	3.46 (3.02-4.01)	4.47 (3.90-5.17)	6.02 (5.23-6.97)	7.25 (6.29-8.41)	9.00 (7.73-10.5)	10.4 (8.86-12.2)	11.9 (10.0-14.0)	13.5 (11.2-16.0)	15.7 (12.8-18.8)	17.5 (14.1-21.3)
20-day	4.53 (3.97-5.22)	5.85 (5.13-6.75)	7.83 (6.85-9.03)	9.37 (8.17-10.8)	11.5 (9.94-13.2)	13.1 (11.3-15.2)	14.8 (12.6-17.3)	16.7 (14.0-19.6)	19.2 (15.8-22.9)	21.2 (17.2-25.5)
30-day	5.44 (4.77-6.29)	7.04 (6.17-8.13)	9.41 (8.23-10.9)	11.2 (9.80-13.0)	13.7 (11.9-15.9)	15.7 (13.5-18.2)	17.7 (15.1-20.6)	19.8 (16.7-23.2)	22.7 (18.9-26.9)	25.0 (20.5-29.9)
45-day	6.62 (5.81-7.50)	8.57 (7.53-9.71)	11.4 (10.0-12.9)	13.6 (11.9-15.4)	16.4 (14.3-18.7)	18.6 (16.1-21.3)	20.9 (17.9-23.9)	23.1 (19.7-26.7)	26.3 (22.0-30.6)	28.7 (23.8-33.8)
60-day	7.61 (6.65-8.66)	9.91 (8.66-11.3)	13.2 (11.5-15.0)	15.6 (13.6-17.7)	18.6 (16.1-21.2)	20.9 (18.0-23.9)	23.1 (19.8-26.5)	25.4 (21.5-29.2)	28.3 (23.8-32.9)	30.5 (25.4-35.7)

[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.

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NOAA Atlas 14, Volume 1, Version 5
Location name: Reno, Nevada, USA*
Latitude: 39.6186°, Longitude: -119.8902°
Elevation: 5244.04 ft**
* source: ESRI Maps
** source: USGS

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

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PRECIPITATION INTENSITY

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.32 (1.12-1.52)	1.64 (1.38-1.92)	2.20 (1.86-2.58)	2.71 (2.29-3.22)	3.59 (2.98-4.32)	4.42 (3.58-5.40)	5.41 (4.26-6.73)	6.62 (5.03-8.42)	8.65 (6.22-11.4)	10.5 (7.26-14.2)
10-min	1.01 (0.846-1.16)	1.25 (1.06-1.46)	1.67 (1.42-1.97)	2.06 (1.75-2.45)	2.73 (2.27-3.29)	3.36 (2.72-4.11)	4.12 (3.24-5.12)	5.05 (3.83-6.41)	6.58 (4.73-8.65)	8.02 (5.53-10.8)
15-min	0.832 (0.700-0.960)	1.04 (0.872-1.21)	1.38 (1.17-1.62)	1.71 (1.44-2.02)	2.26 (1.88-2.72)	2.78 (2.25-3.40)	3.40 (2.68-4.24)	4.17 (3.16-5.30)	5.44 (3.91-7.14)	6.63 (4.57-8.91)
30-min	0.560 (0.472-0.646)	0.698 (0.586-0.814)	0.928 (0.786-1.09)	1.15 (0.972-1.36)	1.52 (1.26-1.83)	1.87 (1.51-2.29)	2.29 (1.80-2.85)	2.81 (2.13-3.57)	3.66 (2.63-4.81)	4.47 (3.08-6.00)
60-min	0.347 (0.292-0.400)	0.432 (0.363-0.503)	0.574 (0.487-0.677)	0.711 (0.601-0.842)	0.941 (0.781-1.13)	1.16 (0.937-1.42)	1.42 (1.12-1.76)	1.74 (1.32-2.21)	2.27 (1.63-2.98)	2.76 (1.90-3.71)
2-hr	0.233 (0.206-0.266)	0.289 (0.258-0.332)	0.368 (0.324-0.424)	0.439 (0.382-0.504)	0.548 (0.465-0.634)	0.648 (0.537-0.756)	0.763 (0.618-0.903)	0.916 (0.720-1.11)	1.19 (0.900-1.50)	1.46 (1.06-1.88)
3-hr	0.191 (0.171-0.215)	0.236 (0.214-0.268)	0.294 (0.264-0.333)	0.342 (0.304-0.388)	0.410 (0.360-0.468)	0.471 (0.407-0.542)	0.543 (0.462-0.633)	0.647 (0.537-0.764)	0.827 (0.667-1.01)	0.998 (0.786-1.26)
6-hr	0.143 (0.130-0.160)	0.179 (0.161-0.199)	0.218 (0.197-0.244)	0.250 (0.223-0.280)	0.291 (0.257-0.327)	0.320 (0.281-0.363)	0.352 (0.304-0.402)	0.390 (0.333-0.451)	0.468 (0.392-0.548)	0.546 (0.451-0.647)
12-hr	0.101 (0.091-0.112)	0.126 (0.113-0.141)	0.157 (0.141-0.176)	0.182 (0.163-0.203)	0.215 (0.190-0.242)	0.240 (0.210-0.272)	0.266 (0.230-0.305)	0.292 (0.248-0.338)	0.326 (0.271-0.385)	0.355 (0.289-0.424)
24-hr	0.068 (0.061-0.077)	0.086 (0.077-0.096)	0.109 (0.098-0.122)	0.128 (0.114-0.143)	0.154 (0.137-0.172)	0.175 (0.154-0.196)	0.197 (0.172-0.223)	0.221 (0.191-0.250)	0.253 (0.215-0.290)	0.279 (0.233-0.322)
2-day	0.043 (0.038-0.049)	0.054 (0.048-0.062)	0.070 (0.062-0.080)	0.083 (0.073-0.094)	0.102 (0.089-0.116)	0.117 (0.101-0.134)	0.133 (0.114-0.154)	0.151 (0.127-0.175)	0.175 (0.145-0.207)	0.196 (0.159-0.234)
3-day	0.032 (0.028-0.036)	0.040 (0.036-0.046)	0.053 (0.047-0.060)	0.063 (0.056-0.072)	0.079 (0.068-0.090)	0.091 (0.078-0.105)	0.104 (0.089-0.121)	0.119 (0.100-0.139)	0.140 (0.114-0.165)	0.157 (0.126-0.188)
4-day	0.026 (0.023-0.030)	0.034 (0.030-0.038)	0.045 (0.039-0.051)	0.054 (0.047-0.061)	0.067 (0.058-0.077)	0.078 (0.067-0.090)	0.090 (0.076-0.104)	0.103 (0.086-0.120)	0.122 (0.099-0.144)	0.137 (0.110-0.165)
7-day	0.018 (0.016-0.021)	0.023 (0.020-0.027)	0.031 (0.027-0.036)	0.038 (0.032-0.044)	0.047 (0.040-0.055)	0.055 (0.046-0.064)	0.063 (0.053-0.074)	0.072 (0.059-0.085)	0.084 (0.068-0.102)	0.095 (0.076-0.116)
10-day	0.014 (0.013-0.017)	0.019 (0.016-0.022)	0.025 (0.022-0.029)	0.030 (0.026-0.035)	0.038 (0.032-0.044)	0.043 (0.037-0.051)	0.050 (0.042-0.058)	0.056 (0.047-0.067)	0.066 (0.053-0.079)	0.073 (0.059-0.089)
20-day	0.009 (0.008-0.011)	0.012 (0.011-0.014)	0.016 (0.014-0.019)	0.020 (0.017-0.023)	0.024 (0.021-0.028)	0.027 (0.023-0.032)	0.031 (0.026-0.036)	0.035 (0.029-0.041)	0.040 (0.033-0.048)	0.044 (0.036-0.053)
30-day	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.013 (0.011-0.015)	0.016 (0.014-0.018)	0.019 (0.017-0.022)	0.022 (0.019-0.025)	0.025 (0.021-0.029)	0.027 (0.023-0.032)	0.032 (0.026-0.037)	0.035 (0.028-0.042)
45-day	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.011 (0.009-0.012)	0.013 (0.011-0.014)	0.015 (0.013-0.017)	0.017 (0.015-0.020)	0.019 (0.017-0.022)	0.021 (0.018-0.025)	0.024 (0.020-0.028)	0.027 (0.022-0.031)
60-day	0.005 (0.005-0.006)	0.007 (0.006-0.008)	0.009 (0.008-0.010)	0.011 (0.009-0.012)	0.013 (0.011-0.015)	0.015 (0.012-0.017)	0.016 (0.014-0.018)	0.018 (0.015-0.020)	0.020 (0.017-0.023)	0.021 (0.018-0.025)

[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

LUMOS & ASSOCIATES

9222 Prototype Drive
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178 South Maine Street
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308 N. Curry Street, Ste. 200
Carson City, NV 89703
(775) 883.7077

PO Box 3570
225 Kingsbury Grade, Ste. A
Stateline, NV 89449
(775) 588.6490

Client: TMWA Sheet 4 of 12

Description: PRELIM HYDRO BOOSTER STATION Job No. 9740

By: ECT Date: 3-31-19

Checked By: _____ Date: _____

FROM NOAA ATLAS 14

FOR T_c = 17.32 min: i_5 = 1.31 IN/HR

i_{100} = 3.23 IN/HR

EXISTING CONDITIONS:

$Q_5 = (0.20)(1.31\ IN/HR)(1.52ac) = 0.40cfs$

$Q_{100} = (0.50)(3.23\ IN/HR)(1.52ac) = 2.45cfs$

PAVEMENT AREA = 12,230.61 SF = 0.28ac

ROOF AREA = 2,471 SF = 0.06ac

FROM TMRDM TABLE 701

PAVEMENT C_5 = 0.88

C_{100} = 0.93

ROOF C_5 = 0.85

C_{100} = 0.87

$$C_5 = \frac{(0.20)(1.18ac) + (0.88)(0.28ac) + (0.85)(0.06ac)}{1.52ac}$$

C_5 = 0.35

LUMOS & ASSOCIATES

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Client: TMWA Sheet 5 of 12
Description: PRELIM HYDRO
BOOSTER STATION Job No. 9740
By: ECT Date: 5-31-19
Checked By: Date:

$$C_{100} = \frac{(0.50)(1.18ac) + (0.93)(0.28ac) + (0.87)(0.06ac)}{(1.52ac)}$$

$C_{100} = 0.59$

$L_o = 260 FT$

$S = \frac{97-76}{260}(100)$

$S = 8.08\%$

$t_i = \frac{(1.8)(1.1-0.20)(260)^{1/2}}{(8.08)^{1/3}}$

$t_i = 13.02 min$

RIPRAP V-DITCH, 3:1 SIDES, 1% SLOPE, L=105FT

$n = 0.035$

CFT $Q = 0.4 cfs$

$V_s = 1.30 fps$

$t_t = \frac{L}{V(60)} = \frac{105 FT}{(1.30)(60)} = 1.35 min$

$t_c = 13.02 min + 1.35 min = 14.37 min$

$\Rightarrow i_5 = 1.42 IN/HR$

$i_{100} = 3.49 IN/HR$

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Client: TMWA Sheet 6 of 12
Description: PRELIM HYDRO
BOOSTER STATION Job No. 9740
By: BLT Date: 3-31-19
Checked By: Date:

DEVELOPED CONDITION:

$Q_5 = (0.35)(1.42\text{"/HR})(1.52\text{ac}) = 0.76\text{ cfs}$

$Q_{100} = (0.59)(3.49\text{"/HR})(1.52\text{ac}) = 3.13\text{ cfs}$

COMPUTE REQUIRED STORAGE VOLUME

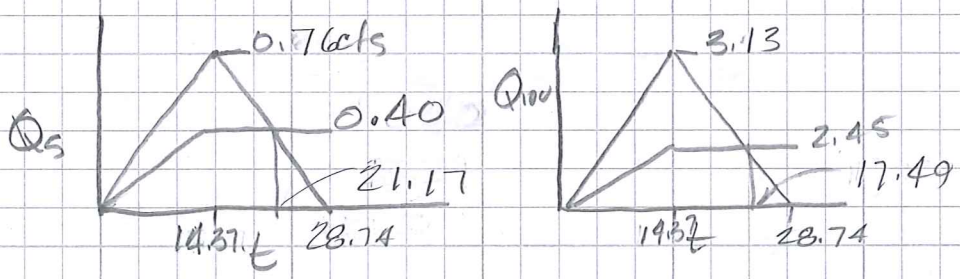
EXISTING $\forall_5 = (0.40\text{cfs})(17.32\text{min})(60\text{s/min}) = 416\text{cf}$

$\forall_{100} = (2.45\text{cfs})(17.32\text{min})(60\text{s/min}) = 2,546\text{cf}$

PROPOSED $\forall_5 = (0.76\text{cfs})(14.37\text{min})(60\text{s/min}) = 655\text{ cf}$

$\forall_{100} = (3.13\text{ cfs})(14.37\text{min})(60\text{s/min}) = 2,699\text{cf}$

REQUIRED STORAGE VOLUME:



$$\forall_5 = 655\text{ cf} - \left[(1/2)(14.37)(0.40)(60) + (0.40)(21.17-14.37)(60) + (0.4)(7.57)(1/2)(60)\right]$$

$\forall_5 = 229\text{ cf}$

$$\forall_{100} = 2699\text{ cf} - 60\left[1/2(14.37)(2.45) + (17.49-14.37)(2.45) + (2.45)(11.25)(1/2)\right]$$

$\forall_{100} = 857\text{cf}$

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(775) 883.7077

PO Box 3570
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Stateline, NV 89449
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Client: TMWA Sheet 7 of 12
Description: PRELIM. HYDRO
BOOSTER STATION Job No. 9740
By: DCT Date: 3-31-19
Checked By: Date:

10-DAY, 100-YEAR STORM

FROM NOAA ATLAS 14, $P = 11.9$ IN

LET RUNOFF VOLUME = $C_{100} P A$

$$\text{STORAGE} = (0.59 - 0.50)(11.9\text{ IN})\left(\frac{1\text{ FT}}{12\text{ IN}}\right)(1.52\text{ ac})\left(43{,}560\frac{\text{SF}}{\text{ac}}\right) = 5909\text{ CF}$$

DAILY INFILTRATION REQUIREMENT = 5909 CF / 10 = 590.9 CF

REQUIRED INFILTRATION RATE (ASSUME 6'X6'X110' TRENCH) $= \left[\frac{590.9\text{ CF}}{660\text{ SF}}\left(\frac{12\text{ IN}}{\text{FT}}\right)\right] / (24\text{ HR}) = 0.45\text{ IN/HR}$

LID

SINCE TRENCH WILL BE A RETENTION BASIN FOR 10-DAY, 100-YEAR, USE THAT BASIN FOR LID

⟹ VOLUME BASED SYSTEM

UNDEVELOPED AREAS WILL BE ROUTED OFF SITE AND BYPASS INFILTRATION.

FROM TRUCKEE MEADOWS LID MANUAL

$$WQV = P R_V A / 12$$

WHERE: WQV = WATER QUALITY VOLUME

P = PRECIPITATION = 0.6 IN
R_V = WATERSHED RUNOFF COEFFICIENT
A = DRAINAGE AREA (FT²)

$$R_V = 0.05 + (0.009 I)$$

WHERE I = % IMPERVIOUS

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Client: TMWA Sheet 8 of 12

Description: PRELIM HYDRO BOOSTER STATION Job No. 9740

By: ECT Date: 3-31-19

Checked By: _____ Date: _____

$I = 100\%$

$R_v = (0.05) + (0.009)(100) = 0.95$

$WQv = [(0.6\,in)(0.95)(14701\,sf)]/12 = 698\,cf$

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Client: TMWA Sheet 9 of 12

Description: PRELIM HYDRO
BOOSTER STATION Job No. 9740

By: ECT Date: 4-1-19

Checked By: _____ Date: _____

ACTUAL GRADING CONDITIONS:

A PORTION OF THE SITE WILL DRAIN TO N. VIRGINIA WITHOUT BEING DETAINED.

THE REMAINDER WILL DRAIN INTO THE INFILTRATION BASIN.

BYPASS AREA: 0.67ac

$L_o = 240'$

$$S = \frac{95 - 76}{240}(100) = 7.9\%$$

$$t_i = \frac{1.8(1.1 - 0.2)(240)^{1/2}}{(7.9)^{1/3}} = 12.60 \text{ min}$$

$\Rightarrow i_5 = 1.52$ IN/HR

$i_{100} = 3.75$ IN/HR

$Q_5 = (0.2)(1.52 \text{ IN/HR})(0.67ac) = 0.20 \text{ cfs}$

$Q_{100} = (0.5)(3.75 \text{ IN/HR})(0.67ac) = 1.26 \text{ cfs}$

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Client: TMWA Sheet 10 of 12

Description: PRELIM HYDRO BOOSTER STATION Job No. 9746

By: ECT Date: 4-1-19

Checked By: _____ Date: _____

PORTION OF SITE DRAINING TO INFILTRATION BASIN

OPEN SPACE A = 0.51 ac

PAVEMENT A = 0.28 ac

ROOF A = 0.06 ac

$$C_5 = \frac{(0.2)(0.51) + (0.88)(0.28) + (0.85)(0.06)}{0.85 ac}$$

$C_5 = 0.47$

$$C_{100} = \frac{(0.5)(0.51) + (0.93)(0.28) + (0.87)(0.06)}{(0.85)}$$

$C_{100} = 0.67$

$L_o = 190$ FT

$S = 92 - 79/190\,(100) = 6.84\%$

$$t_i = \frac{1.8\,(1.1 - 0.2)\,(190)^{1/2}}{(6.84)^{1/3}} = 11.76 \text{ min}$$

FROM PREVIOUS CALCULATIONS, $T_t = 1.35$ min

$T_c = 11.76 \text{ min} + 1.35 \text{ min} = 13.11 \text{ min}$

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Client: TMWA Sheet 11 of 12

Description: PRELIM HYDRO
BOOSTER STATION Job No. 9740

By: ELT Date: 4-1-19

Checked By: _____ Date: _____

$i_5 = 1.49$ IN/HR

$i_{100} = 3.67$ IN/HR

$Q_5 = (0.47)(1.49\ \text{IN/HR})(0.85\text{ac}) = 0.60\text{cfs}$

$Q_{100} = (0.67)(3.67\ \text{IN/HR})(0.85\text{ac}) = 2.09\text{cfs}$

RUNOFF FROM THE DEVELOPED PORTION OF THE SITE WILL BE ROUTED TO AN INFILTRATION BASIN TO MEET THE ON-SITE RETENTION REQUIREMENTS FOR THE 100-YEAR, 10-DAY STORM.

COMPUTE THE STORAGE REQUIREMENT TO REDUCE 100-YEAR PEAK RUNOFF FROM THE ENTIRE DEVELOPED SITE TO THE PEAK RATE OF RUNOFF FROM THE UNDEVELOPED SITE.

$Q_{100\ EXISTING} = 2.45\text{cfs}$

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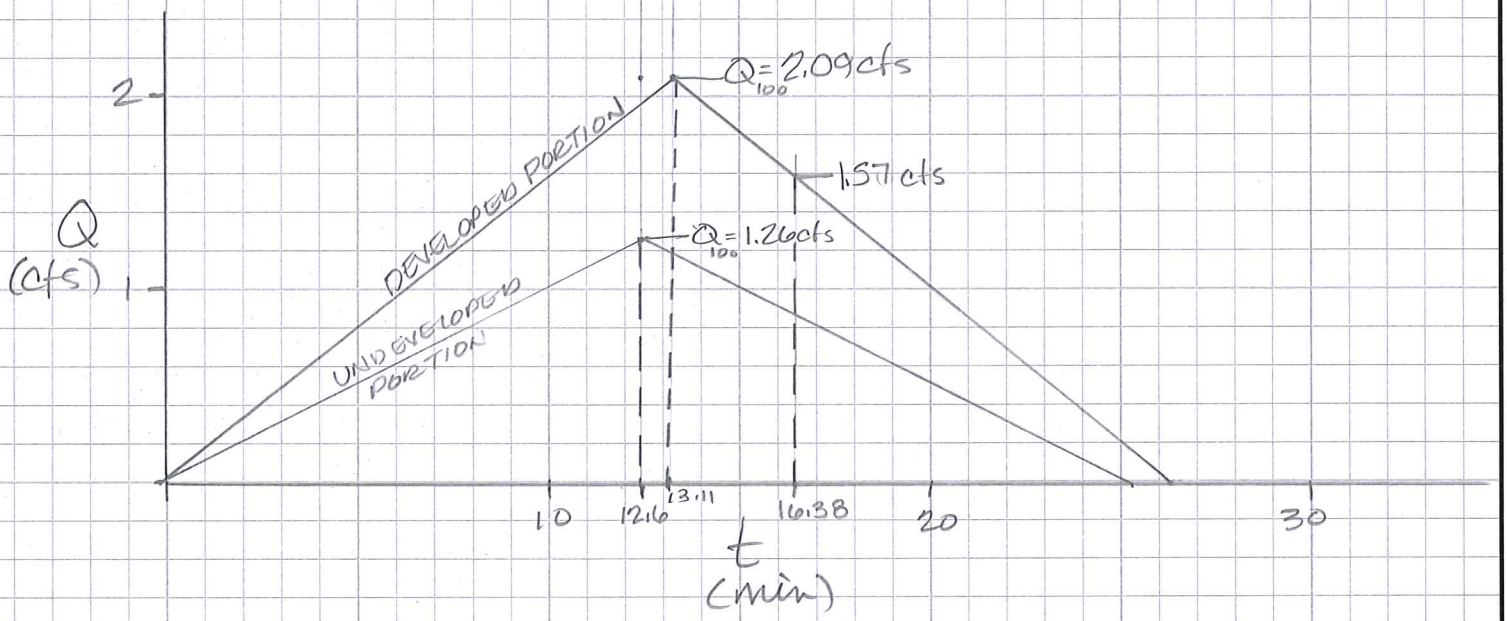
Client: TMWA Sheet 12 of 12

Description: PRELIM HYDRO BOOSTER STATION Job No. 9740

By: BCT Date: 4-1-19

Checked By: _____ Date: _____



$$\left(\frac{-2.09}{13.11}x + 4.18\right) + \left(\frac{-1.26}{12.16}x + 2.52\right) = 2.45\text{cfs}$$

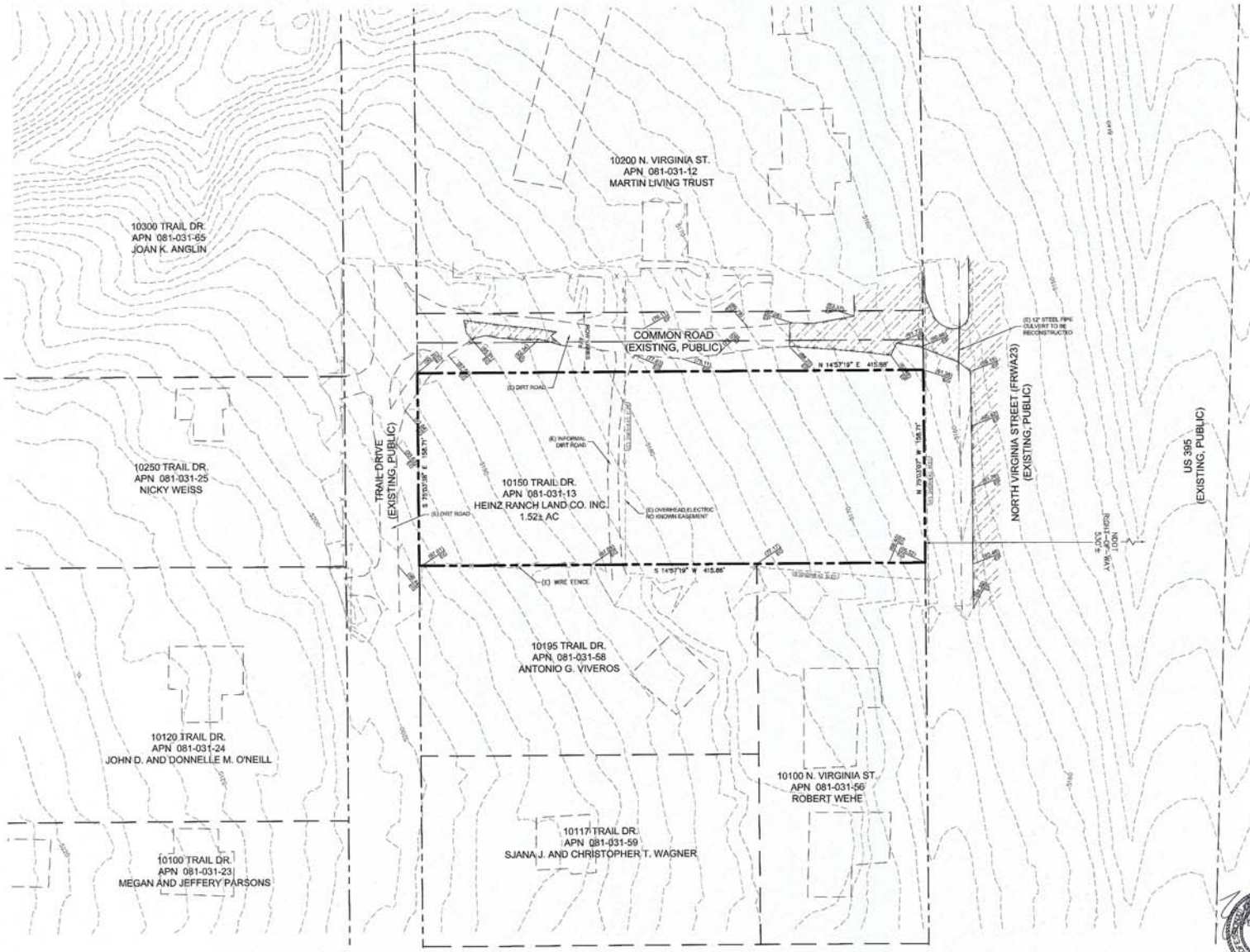
$x = 16.38\text{ min}$

$$\text{Required Storage Volume} = (60\text{ s/min})\left\{\left[\tfrac{1}{2}(2.09\text{cfs})(13.11\text{min})\right] + \left[\frac{(2.09\text{cfs} + 1.57\text{cfs})}{2}(16.38\text{min} - 13.11\text{min})\right]\right\}$$

$$= 1181\text{ cf}$$

THIS WILL BE THE TOTAL STORAGE VOLUME SINCE IT IS THE GREATEST OF STORM RUNOFF, LID, AND ON-SITE STORAGE

Maps



NORTH

SCALE: 1"=40'

40 0 20 40 80

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS NEVADA STATE PLANE COORDINATE SYSTEM, WEST ZONE NAD(2034) BASED UPON REAL TIME KINEMATIC GPS OBSERVATIONS, OBSERVED JANUARY 23, 2018 USING A SURVEY GRADE DUAL FREQUENCY GPS RECEIVER. MODIFIED BY A COMBINED FACTOR OF 1.000197894, SCALED FROM G-NSN 2.008 AND CONVERTED TO U.S. SURVEY FEET. ALL DIMENSIONS ON THIS MAP ARE GROUND DISTANCES.

BASIS OF ELEVATIONS

DATUM: NAVD 88
PROJECT BENCHMARK = NEVADA DEPARTMENT OF TRANSPORTATION FENO MONUMENT DESIGNATED AS #660331M HAVING AN ELEVATION OF 5356.19'

TOPOGRAPHY NOTES

NO PORTION OF THIS SITE EXHIBITS GRADES IN EXCESS OF 15%.

LEGEND

EXISTING AC PAVEMENT

WORK ORDER NO. —
DESIGNED ECT
DRAWN ECT
DATE 4-15-19
CHECKED —
SUBMITTED —
RECOMMENDED —
APPROVED —

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RENO, NV 89520-3013
PH 775-834-8000 / FX 775-834-8003

TMWA BOOSTER PUMP STATION SUP

EXISTING SITE PLAN

SHEET NUMBER
C1.0
1 OF 3

EDWARD C. THOMAS 4-15-19 CIVIL No. 9740 STATE OF NEVADA REGISTERED PROFESSIONAL ENGINEER
EXP. 8/30/20

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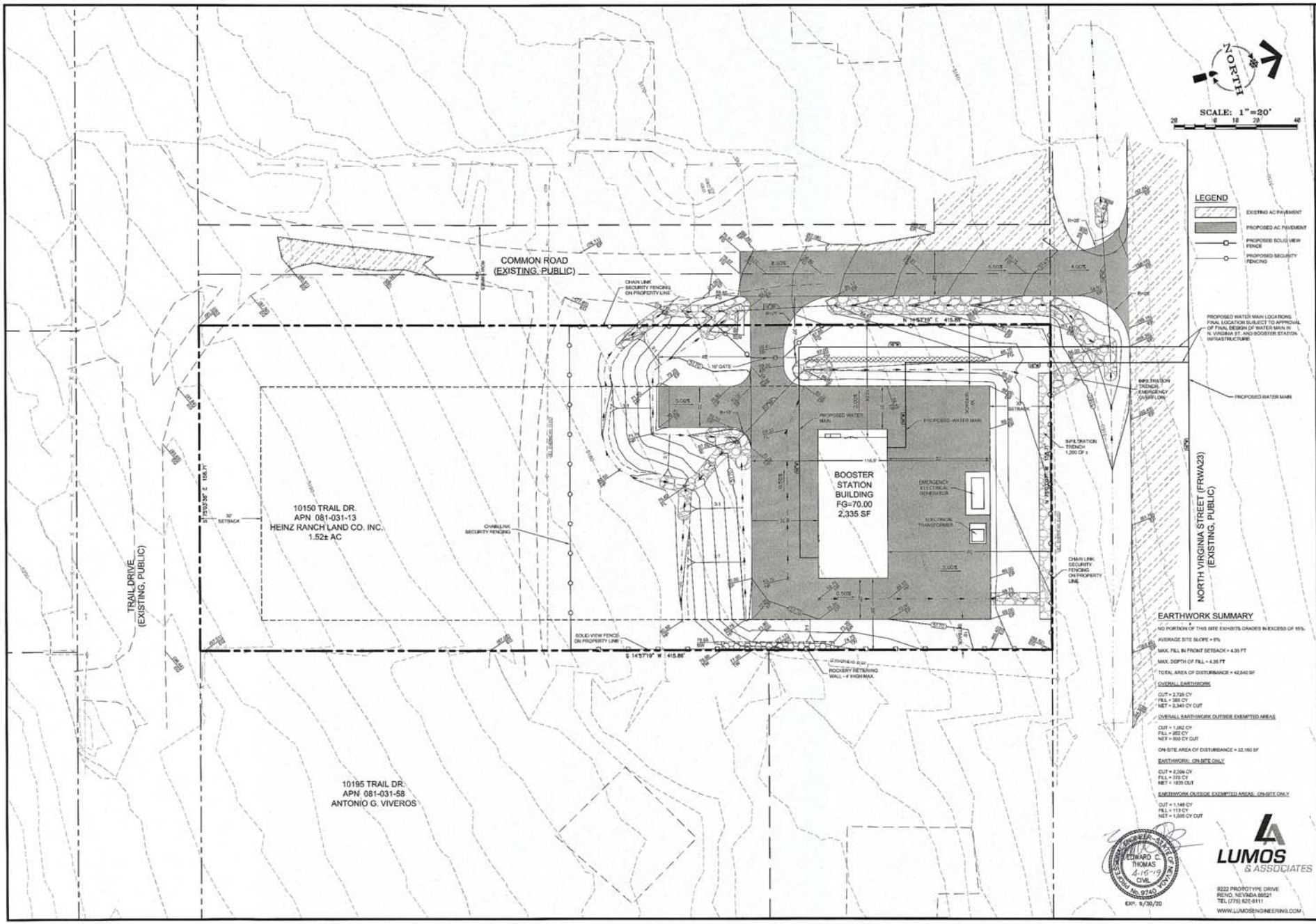

EARTHWORK SUMMARY

NO PORTION OF THIS SITE EXHIBITS GRADES IN EXCESS OF 15%.

AVERAGE SITE SLOPE = 6%

MAX. FILL IN FRONT SETBACK = 4.35 FT

MAX. DEPTH OF FILL = 4.35 FT

TOTAL AREA OF DISTURBANCE = 42,640 SF

OVERALL EARTHWORK

CUT = 2,725 CY
FILL = 385 CY
NET = 2,340 CY CUT

OVERALL EARTHWORK OUTSIDE EXEMPTED AREAS

CUT = 1,062 CY
FILL = 262 CY
NET = 800 CY CUT

ON-SITE AREA OF DISTURBANCE = 32,160 SF

EARTHWORK: ON-SITE ONLY

CUT = 2,206 CY
FILL = 375 CY
NET = 1835 CUT

EARTHWORK OUTSIDE EXEMPTED AREAS: ON-SITE ONLY

CUT = 1,148 CY
FILL = 113 CY
NET = 1,035 CY CUT

EDWARD C. THOMAS 4-15-19 CIVIL No. 9740 STATE OF NEVADA REGISTERED PROFESSIONAL ENGINEER
EXP. 9/30/20

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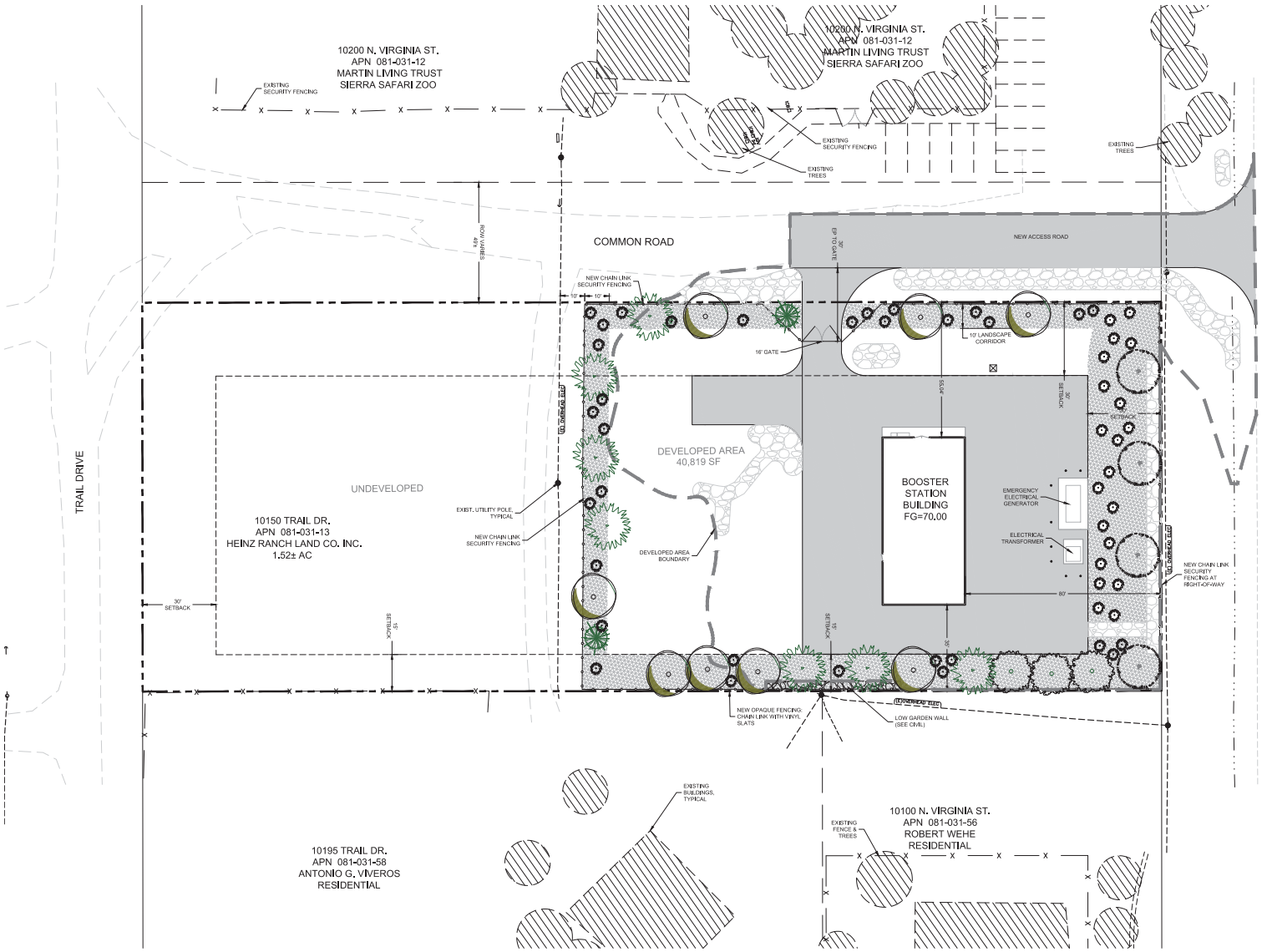
WORK ORDER NO. –
DESIGNED ECT
DRAWN ECT
DATE 4-15-19
CHECKED –
SUBMITTED –
RECOMMENDED –
APPROVED –

TMWA BOOSTER PUMP STATION SUP
PRELIM. SITE AND GRADING PLAN

SHEET NUMBER
C2.0
1 OF 3



NORTH

SCALE: 1"=20'

20 0 10 20 40

LANDSCAPE LEGEND:

- FRONTAGE TREE MIN. 2" CALIPER SIZE
- DECIDUOUS TREES MIX OF 1" & 2" CALIPER SIZES
- ACCENT TREE MIN. 1" CALIPER SIZE
- EVERGREEN TREES MIX OF 5 FT, HEIGHT & 7 FT, HEIGHT SIZES
- LANDSCAPE PLANTING AREA WITH SHRUBS MIX OF #5 & #1 SIZE SHRUBS
- IRRIGATION CONNECTION, DEDICATED METER, APPROXIMATE LOCATION

LANDSCAPE NOTES:

NO EXISTING VEGETATION OR TREES ON-SITE.

NEW TREES: ONE HALF @ LARGE (7ht. or 2" cal.) AND ONE HALF @ SMALL (5' ht. or 1" cal.), WITH A MIX OF DECIDUOUS AND CONIFER.

NEW SHRUBS: MIN. 1 GAL.

PERMANENT IRRIGATION WILL UTILIZE A DRIP SYSTEM, WITH AN AUTOMATIC CONTROLLER, ON A DEDICATED METER.

OWNER TO PROVIDE A 3-YEAR MAINTENANCE PLAN PER COUNTY CODE.

LANDSCAPE DATA

LOT AREA: ± 1.52 ac. (66,210 sf)

TOTAL DEVELOPED AREA: ± 0.94 ac. (40,819 sf)

LANDSCAPE AREA REQUIRED (20% OF DISTURBED): 8,164 sf

ADJ. RESIDENTIAL BUFFER TREES REQUIRED (1:20 lf): 12

STREET FRONTAGE TREES REQUIRED (1:50 lf): 13

TOTAL TREES REQUIRED: 25

TOTAL TREES PROVIDED: 25

LANDSCAPE AREA PROVIDED (FRONTAGE & BUFFER):11,115 sf

REGISTERED LANDSCAPE ARCHITECT MARC CHAFFEE 622 Expires 6/30/20 STATE OF NEVADA

04/15/2019

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DESIGNED	BASESHT
DRAWN	BASESHT
DATE	BASESHT
CHECKED	BASESHT
SUBMITTED	BASESHT
RECOMMENDED	BASESHT
APPROVED	BASESHT

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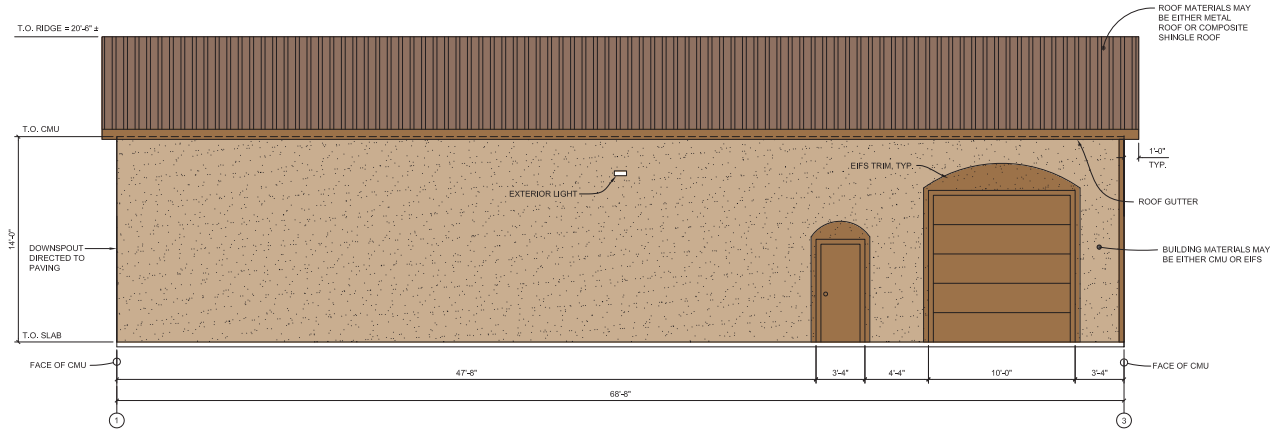
TMWA BOOSTER PUMP STATION SUP

LANDSCAPE PLAN

SHEET NUMBER

L1.0

1 OF 1



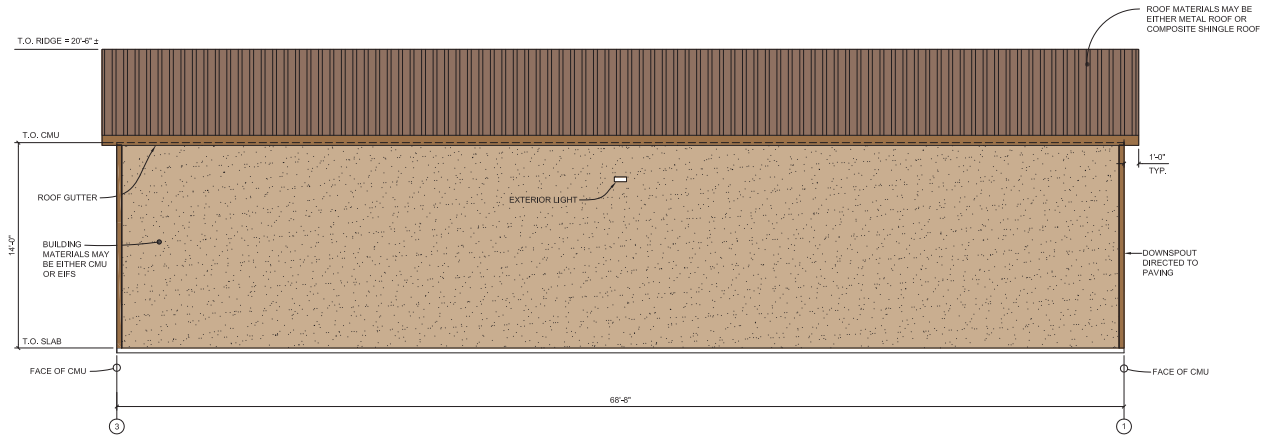
SOUTH ELEVATION

SCALE: 1/4"=1'-0"

SEE THE TECHNICAL SPECIFICATIONS FOR EIFS AND ROOFING REQUIREMENTS

SEE THE ELECTRICAL PLANS FOR LIGHT REQUIREMENTS

- BUILDING STUCCO: BENJAMIN MOORE, PALM DESERT TAN # 1123, TEXTURE FREESTYLE
- EXTERIOR DOORS/TRIM/LOUVERS/GUTTERS: BENJAMIN MOORE, FORT SUMNER TAN #1119
- ROOF COLOR: BURNT SIENNA



NORTH ELEVATION

SCALE: 1/4"=1'-0"

EXPIRES: DECEMBER 31, 2019

NOT FOR CONSTRUCTION

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TEL 775.827.6111

JOB NO. 9740.000

WORK ORDER NO.
DESIGNED A.R.
DRAWN B.E.
DATE APRIL 15, 2019
CHECKED
SUBMITTED
RECOMMENDED
APPROVED

TRUCKEE MEADOWS WATER AUTHORITY

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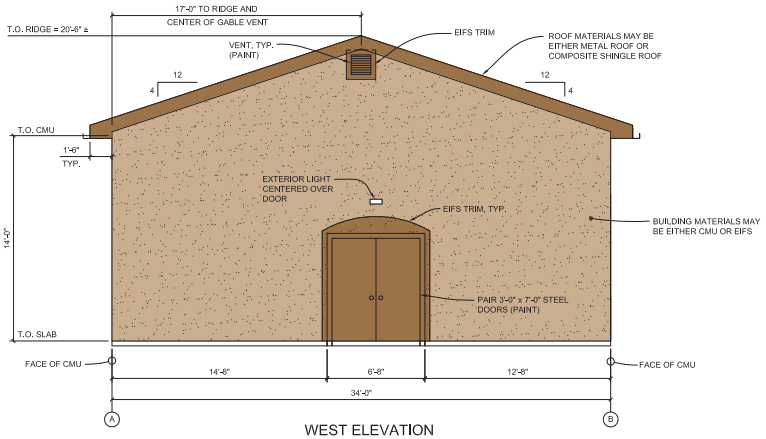
TMWA BOOSTER PUMP STATION SUP

ELEVATIONS

SHEET NUMBER

A1

XX OF XX



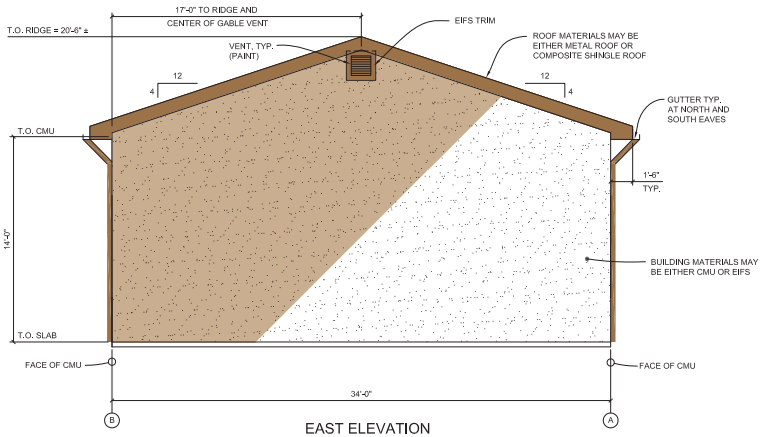
WEST ELEVATION

SCALE: 1/4"=1'-0"

SEE THE TECHNICAL SPECIFICATIONS FOR EIFS AND ROOFING REQUIREMENTS

SEE THE ELECTRICAL PLANS FOR LIGHT REQUIREMENTS

- BUILDING STUCCO: BENJAMIN MOORE, PALM DESERT TAN # 1123, TEXTURE FREESTYLE
- EXTERIOR DOORS/TRIM/LOUVERS/GUTTERS: BENJAMIN MOORE, FORT SUMNER TAN #1119
- ROOF COLOR: BURNT SIENNA



EAST ELEVATION

SCALE: 1/4"=1'-0"

EXPIRES: DECEMBER 31, 2019
NOT FOR CONSTRUCTION

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TEL: 775.827.6111

JOB NO. 9740.000

WORK ORDER NO.
DESIGNED A.A.R.
DRAWN E.E.
DATE APRIL 15, 2019
CHECKED
SUBMITTED
RECOMMENDED
APPROVED

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TMWA BOOSTER PUMP STATION SUP

ELEVATIONS

SHEET NUMBER
A2
XX OF XX