SPECIAL USE PERMIT
APPLICATION FOR
MAJOR GRADING BROKEN HILLS TANK SITE

OWNER:

Barker Coleman Investments Broken Hills, LLC.
3675 Lakeside Drive
Reno, NV 89509
Phone: (775) 690-9925

PREPARED FOR:

Barker Coleman Investments Broken Hills, LLC.
3675 Lakeside Drive
Reno, NV 89509
Phone: (775) 690-9925

PREPARED BY:

Matzoll
Development Consultants, LLC.
3675 Lakeside Drive, Suite B
Reno, NV 89509
Cell: (775) 690-9925

DATE:

August 13, 2019

Table of Contents

Project Requests

This application is for a **Special Use Permit** for:

A) Major Grading for the Construction of a Tank, Access Road and related improvements

Broken Hills is located just north east of Eagle Canyon Unit II off Kinglet Drive. The proposed tank and access road is in located in the common are the of Broken Hills Subdivision (see below), APN 089-621-01

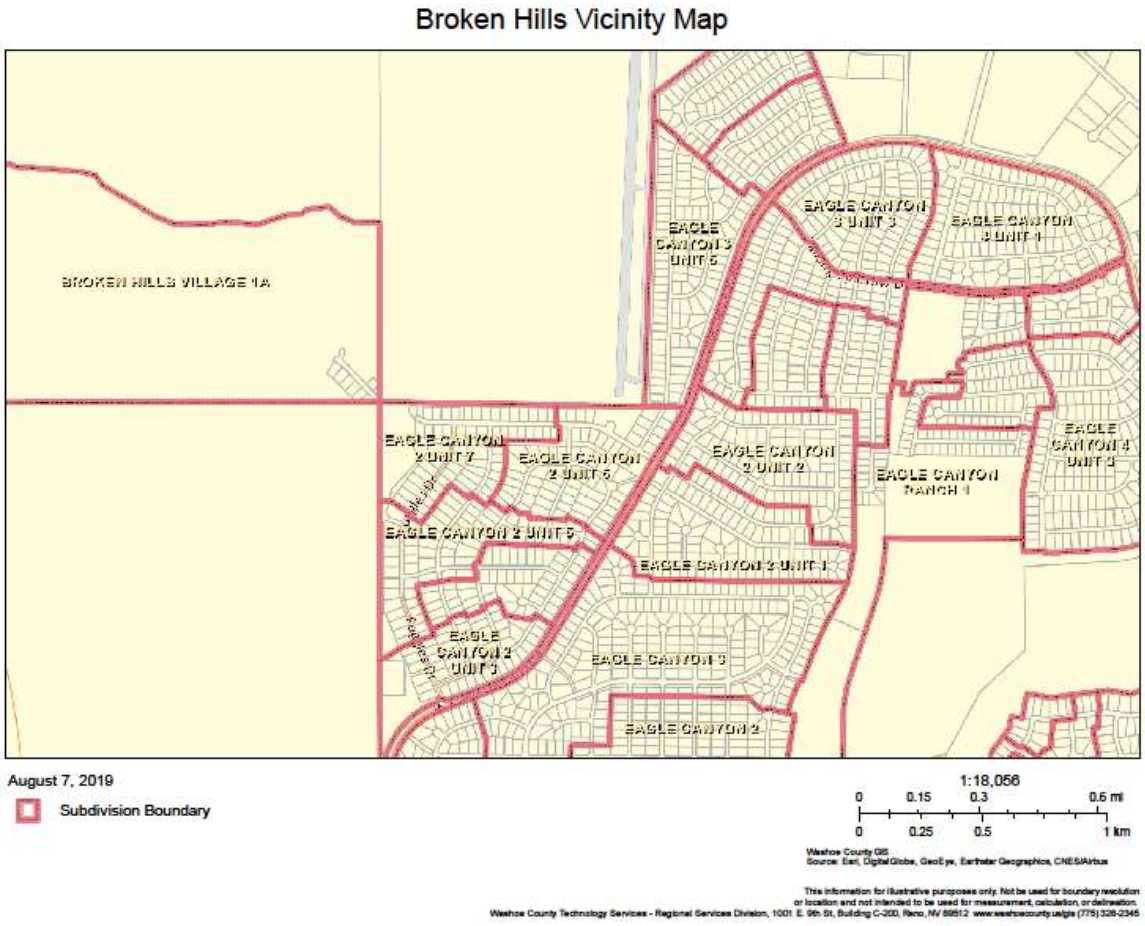


Figure 1 – Vicinity Map

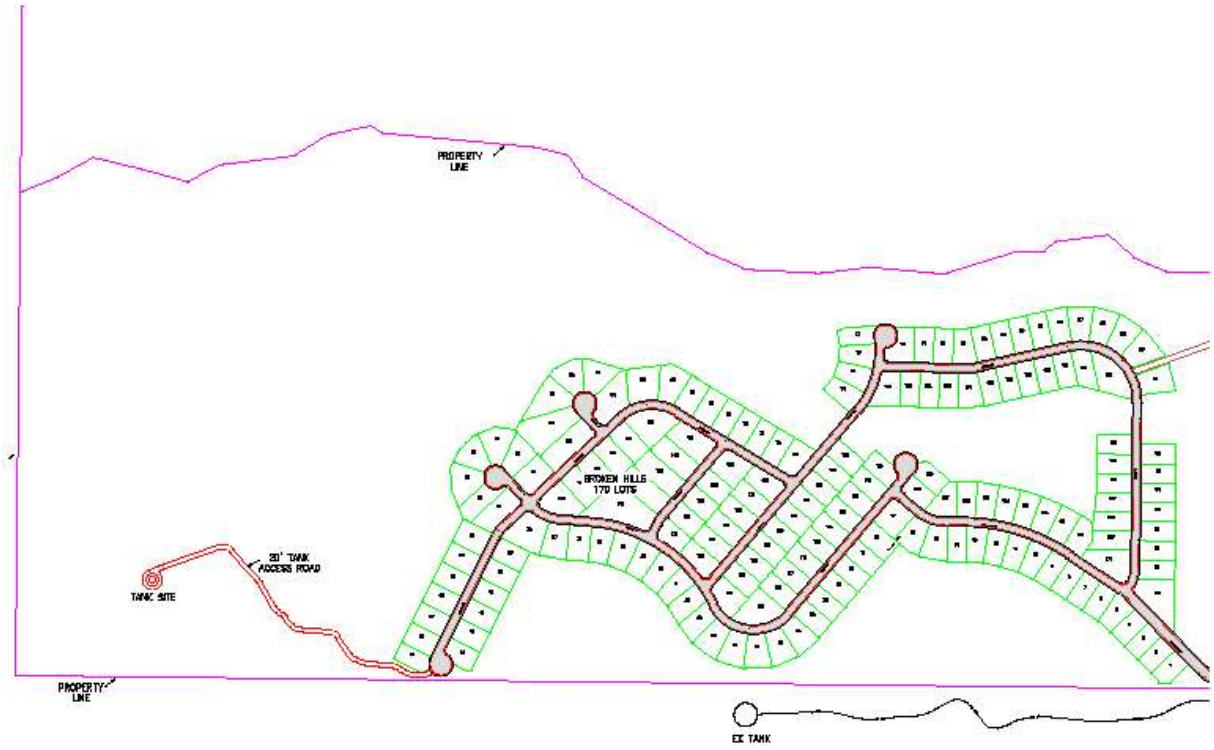


Figure 2 - Site Plan

Project History

Barker Coleman Development requested and obtained approval for a Tentative Map, case number TM05-012 to develop a 170-lot single family common open space development on 243 acres. (APN 089-621-01). Barker Coleman is currently in the design phases of 75 units and working with TMWA on the construction of a 325,000-gallon tank, access road, 12" waterline, booster pump station and related infrastructure to service the project.

Project Description

The proposed project is a 325,000-gal water tank with the associated infrastructure of an access road, transmission main and booster pumps station which will service the Broken Hills project (see attached preliminary design). The tank elevation is approximate 100' feet higher than the highest residential unit; this elevation will supply the require pressure to the units. Due to the lack of

pressure at the tank site and higher, irrigation cannot be provided. The disturbed areas around the tank and access road therefore will be re-vegetated in accordance with the Washoe County Codes (see attached preliminary landscape plans)

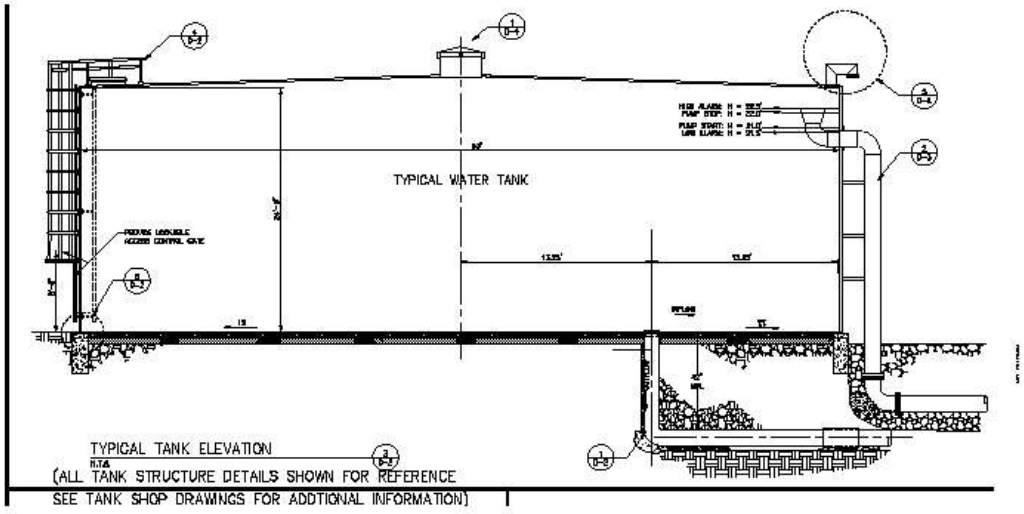
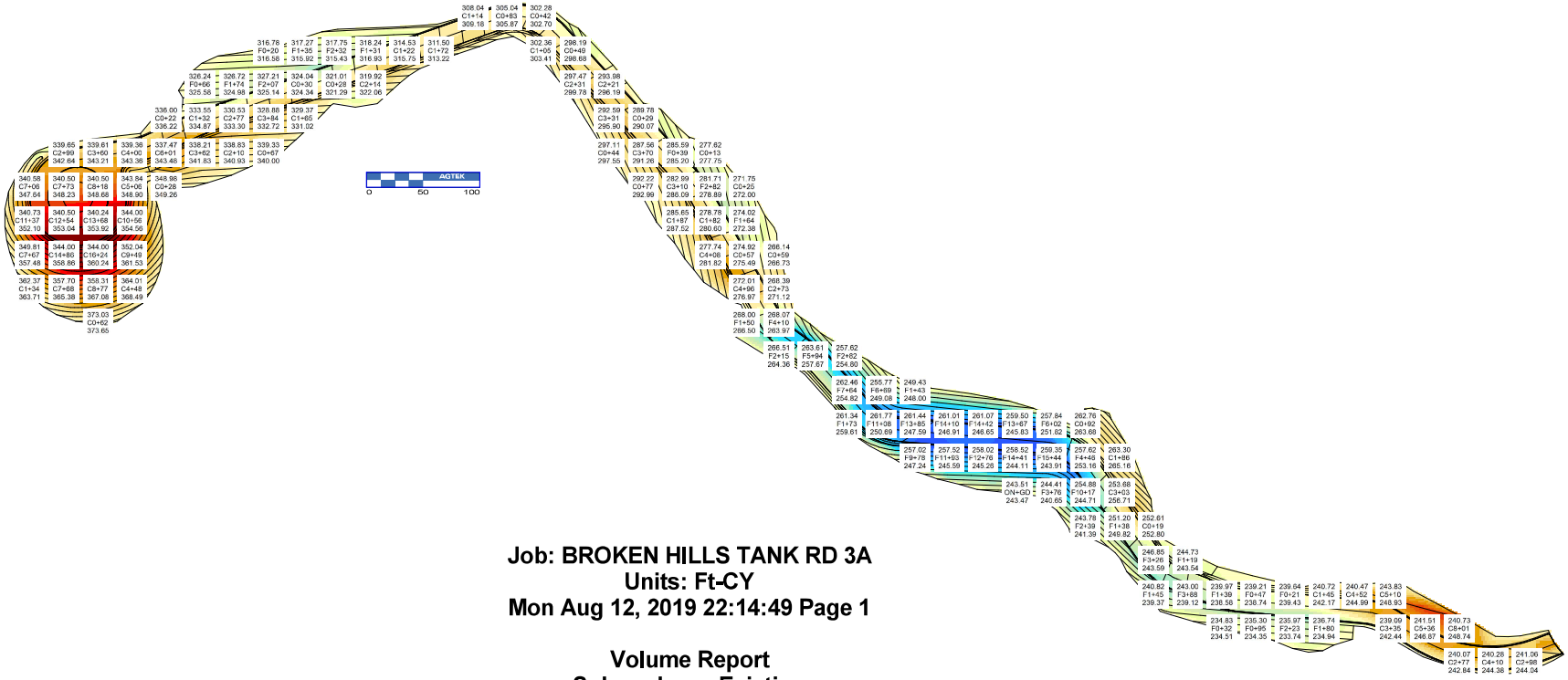


Figure 3 – Typical 325,000 Tank

LIST OF FIGURES

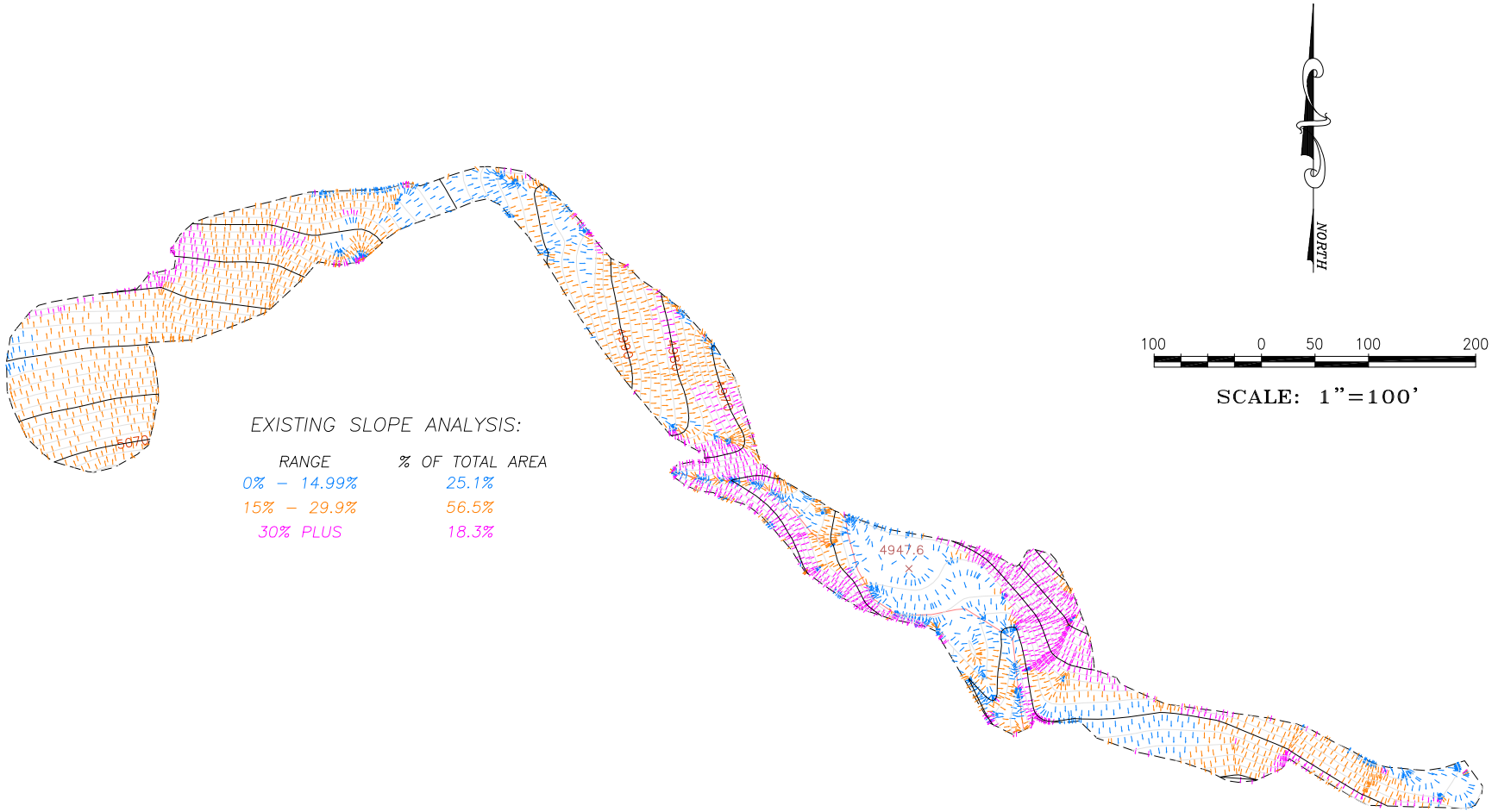


Job: BROKEN HILLS TANK RD 3A
Units: Ft-CY
Mon Aug 12, 2019 22:14:49 Page 1

Volume Report
Subgrade vs. Existing

	Total	Area Cut	Area Fill	OnGrade	Volume Cut	Volume Fill	Comp/Ratio Cut	Comp/Ratio Fill	Compact Cut	Compact Fill	Export -Import	Change Per .1 Ft
TANK ROAD 3	106,150	58,505	44,668	2,977	8,871	7,680	1.00	1.00	8,871	7,680	1,191	393

Sectional Qtys	Plane Area	Slope Area	Depth	Volume
TANK BASE	2,204	2,204	0.500	41
TANK ROAD	34,441	34,657	0.750	963
TANK Sub:	**36,645**	**36,861**		**1,004**
Sectional Total	**36,645**	**36,861**		**1,004**



BROKEN HILLS TANK SITE AND ACCESS ROAD

APPENDIX A
Development Application and Reports

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: Broken Hills Tank and Access Road	
Project Description: Construction of a 325,000 gal tank, access road, 12" transmission line and associated facilities	
Project Address: 0 Kinglet Road apn 089-621-01	
Project Area (acres or square feet): disturbance of ~2.5 acres	
Project Location (with point of reference to major cross streets **AND** area locator): Located just north east of Eagle Canyon Unit II off Kinglet Drive	

Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
089-621-01	249.81		

Indicate any previous Washoe County approvals associated with this application:
Case No.(s). Assoiciated with and Constructed for TM05-012

Applicant Information (attach additional sheets if necessary)

Property Owner:		**Professional Consultant:**	
Name: Barker Coleman Investments Broken Hills		Name: Matzoll Development Consultants	
Address: 3675 Lakeside Drive Suite B		Address: 3675 Lakeside Drive suite B	
Reno, Nevada	Zip: 89509	Reno, Nevada	Zip: 89509
Phone: 775-690-9925	Fax: none email	Phone: 775-690-9925	Fax:
Email: kmatzoll@mdc-krush.com		Email: kmatzoll@mdc-krush.com	
Cell: 775-690-9925	Other:	Cell: 775-690-9925	Other:
Contact Person: Karl Matzoll		Contact Person: Karl Matzoll	
Applicant/Developer:		**Other Persons to be Contacted:**	
Name: Same as above		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: Barker Coleman Investments Broken Hills 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,_____,
(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): 089-621-01

Printed Name_____

Signed_____

Address_____

_____

Subscribed and sworn to before me this _____ day of _____, _____.

(Notary Stamp)

_____
Notary Public in and for said county and state

My commission expires:_____

*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

Property Owner Affidavit

Applicant Name: Barker Coleman Investments, Broken Hill, 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, Keith E. Rush,
(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):_____

Printed Name Keith E. Rush

Signed _____

Address 3675 Lakeside Dr., Ste. B
Reno, NV. 89509

Subscribed and sworn to before me this 14th day of August, 2019.

Washoe, Nevada
Notary Public in and for said county and state

My commission expires: 3/15/2023

(Notary Stamp)

AGNES MARIANO
NOTARY PUBLIC
STATE OF NEVADA
My Commission Expires: 03/15/2023
Certificate No: 99-51887-2

*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?

Grading of ~9,000 cy of material for a tank and access road

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.)

see attached

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

anticipated construction start January 2019 completion in 6 to 12 months after construction start

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?

n/a; the elevation dictates the location of the tank (which is 100' above the highest house pad); and the tank is needed to service the Broken Hills subdivision

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

n/a public faculity

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

none

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.

9,000 cy cut to fill

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	
b. Electrical Service	
c. Telephone Service	
d. LPG or Natural Gas Service	
e. Solid Waste Disposal Service	
f. Cable Television Service	
g. Water Service	tank access road and water line 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 #	no water rights needed	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).

none

10. Community Services (provided and nearest facility):

a. Fire Station	n/a
b. Health Care Facility	n/a
c. Elementary School	n/a
d. Middle School	n/a
e. High School	n/a
f. Parks	n/a
g. Library	n/a
h. Citifare Bus Stop	n/a

Special Use Permit Application
for Grading
Supplemental Information

(All required information may be separately attached)

1. What is the purpose of the grading?

   the construction of a water tank is an acceptable use (in Spanish Springs) and does not need a SUP for construction; however the tank site and access road will generate ~9,000 cy of material which needs a SUP for major grading

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

   9,000 cy cut to fill

3. How many square feet of surface of the property are you disturbing?

   approximate ~2.5 acres

4. How many cubic yards of material are you exporting or importing? If none, how are you managing to balance the work on-site?

   the site will balance: if not the maximum amount of export is ~ 1,000 cy

5. Is it possible to develop your property without surpassing the grading thresholds requiring a Special Use Permit? (Explain fully your answer.)

   no - the elevation of the tank needs to be 100' above the highest house pad

6. Has any portion of the grading shown on the plan been done previously? (If yes, explain the circumstances, the year the work was done, and who completed the work.)

   no

7. Have you shown all areas on your site plan that are proposed to be disturbed by grading? (If no, explain your answer.)

   yes

8. Can the disturbed area be seen from off-site? If yes, from which directions and which properties or roadways?

no, the road and tank is placed behind a hill.

9. Could neighboring properties also be served by the proposed access/grading requested (i.e. if you are creating a driveway, would it be used for access to additional neighboring properties)?

no

10. 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?

maximum street grade is 10% maximum depth of cut and fill is ~17'. BMP's will be in place during and after construction until re-vegetation is completed

11. Are you planning any berms?

Yes	No no	If yes, how tall is the berm at its highest?

12. If your property slopes and you are leveling a pad for a building, are retaining walls going to be required? If so, how high will the walls be and what is their construction (i.e. rockery, concrete, timber, manufactured block)?

yes; the tank pad and yes; maximum stacked wall height 4' to 6' at the tank;

13. What are you proposing for visual mitigation of the work?

none

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

typical sage and desert brush

15. 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?

please see attached plans

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

see attached plans

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

no

18. Are there any restrictive covenants, recorded conditions, or deed restrictions (CC&Rs) that may prohibit the requested grading?

Yes	No no	If yes, please attach a copy.

APPENDIX B
Plan Sets

SPECIAL USE PERMIT APPLICATION
FOR
MAJOR GRADING BROKEN HILLS TANK SITE AND ACCESS ROAD

WASHOE COUNTY, NEVADA

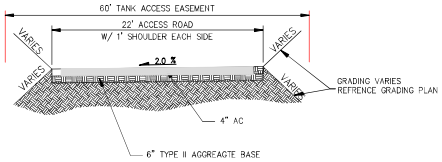
OWNER/DEVELOPER

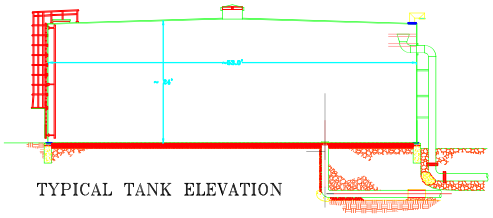
BARKER COLEMAN INVESTMENT BROKEN HILLS
3675 LAKESIDE DRIVE SUITE B
RENO, NEVADA 89509

ENGINEER

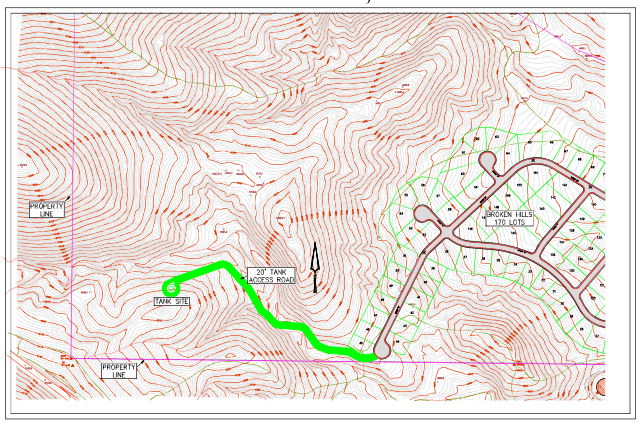
MATZOLL DEVELOPMENT CONSULTANTS
3675 LAKESIDE DRIVE SUITE B
RENO, NEVADA 89409

TANK ACCESS ROAD





TYPICAL TANK ELEVATION



SITE PLAN

VICINITY MAP

SHEET INDEX

SITE INFORMATION

DISTURBED AREA ~2.5 ACRES
CUBIC YARDS OF CUT = 8,871
CUBIC YARDS OF FILL = 7,680
CLOSEST SETBACK TO TOE OF SLOPE ~23'
HEIGHT OF FILL SLOPE AT CLOSEST SETBACK~9'
~ MAXIMUM CUT/FILL = 17'

ENGINEERS STATEMENT

I, KARL MATZOLL, DO HEREBY DECLARE THE THIS MAP HAS BE PREPARED BY ME OR UNDER MY SUPERVISION AND WAS COMPLETED ON THE 14 DAY OF AUGUST 2019. THIS GRADING PLAN WAS DESIGNED IN ACCORDANCE WITH THE WASHOE COUNTY DEVELOPMENT CODE WITH EXECPTIONS

_____
KARL A MATZOLL PE#9900

Matzoll Development Consultants, LLC
3675 LAKESIDE DRIVE SUITE B
RENO, NEVADA 89509
(775) 980-9965

PLANS ARE PRELIMINARY AND SUBJECT TO CHANGE UNTIL STAMPED, SIGNED AND APPROVED BY ALL APPROPRIATE GOVERNING AGENCIES.

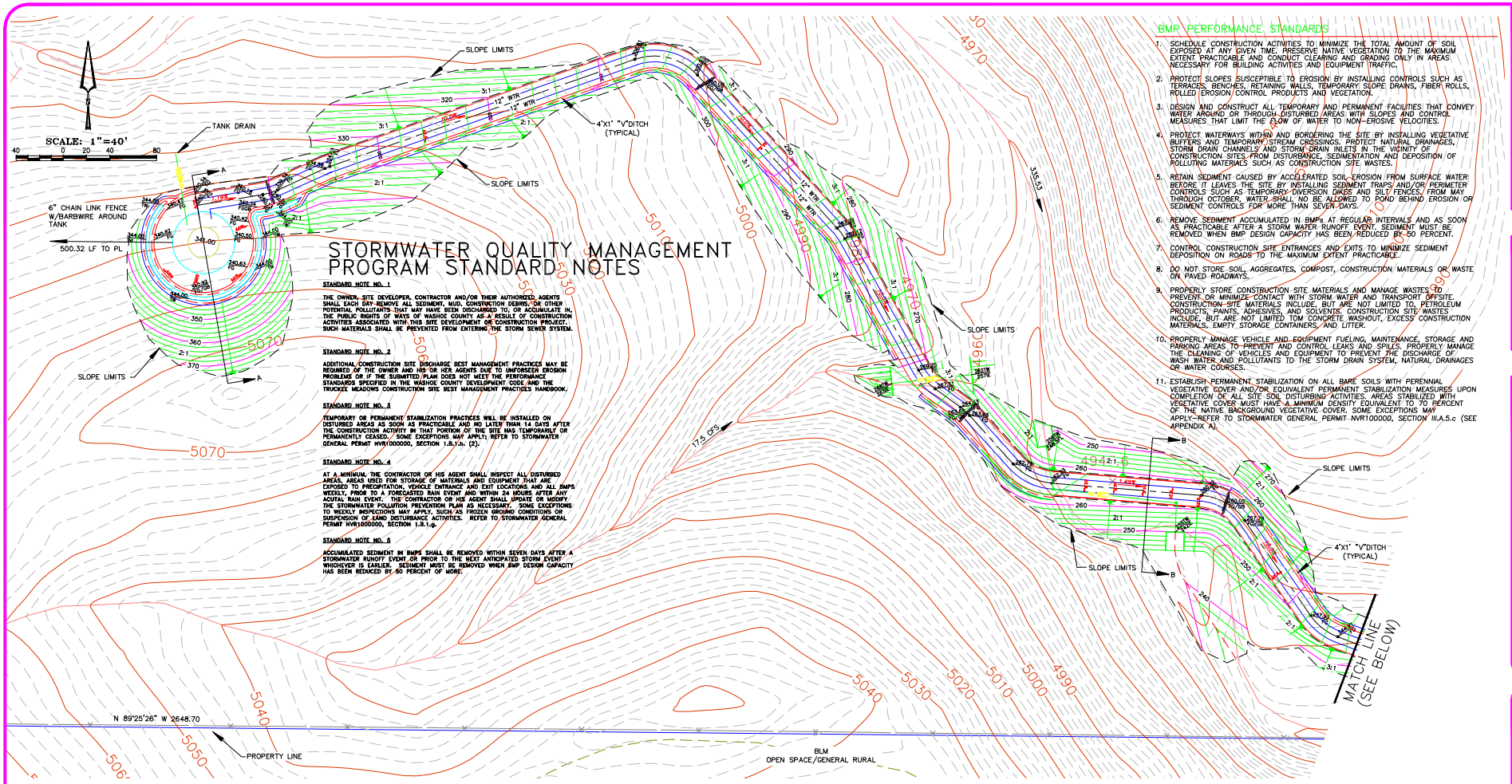
TITLE SHEET
SPECIFICATIONS
SPECIFICATIONS

BROKEN-HILLS-TANK-AND-ACCESS-ROAD
TITLE-SHEET
APN-089-621-01
-
WASHOE-COUNTY NEVADA
-

REV.	DATE	DESCRIPTION	BY	APP'D

SCALE
HORIZ. N/A
VERT. N/A
JOB# BHTANK

SHEET T-1 OF 4



Matzoll Development Consultants, LLC
3875 LAKESIDE DRIVE SUITE B
RENO, NEVADA 89509
(775) 980-9985

PLANS ARE PRELIMINARY AND SUBJECT TO CHANGE UNTIL STAMPED APPROVED BY ALL APPROPRIATE GOVERNING AGENCIES.

REVISIONS	DATE
1ST REVISION	
2ND REVISION	
3RD REVISION	

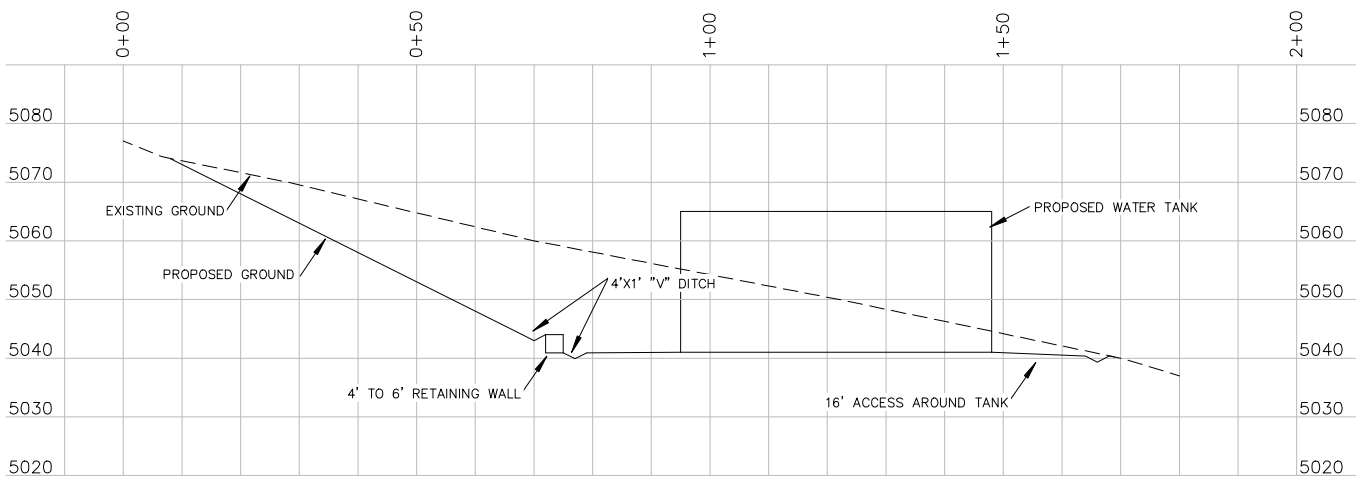
BROKEN-HILLS-TANK-AND-ACCESS-ROAD
GRADING-PLAN
APN-089-621-01
-
WASHOE-COUNTY NEVADA

REV.	DATE	DESCRIPTION	BY	APP'D

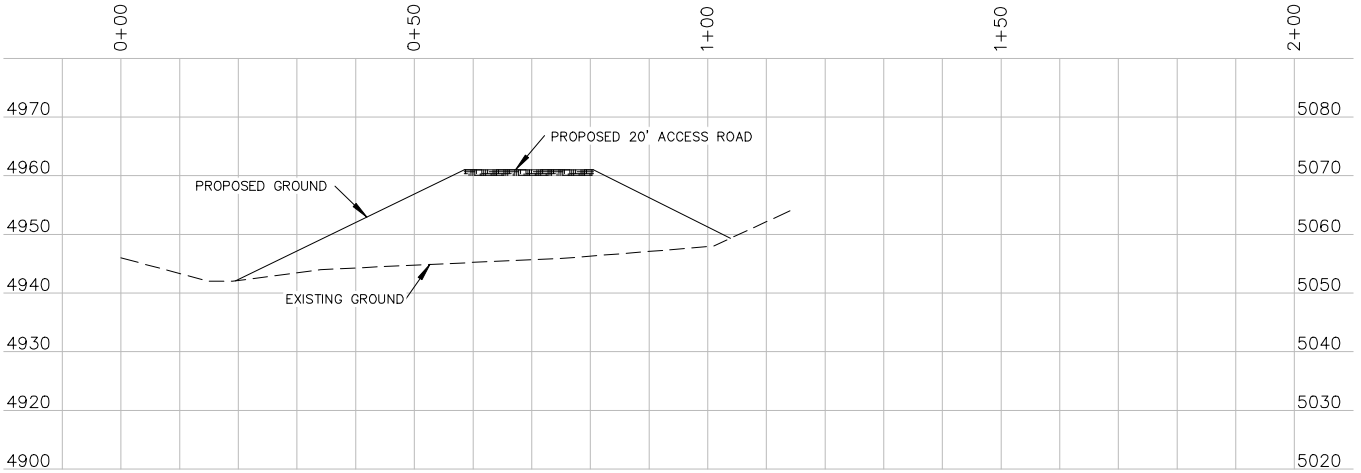
SCALE
HORIZ. 1"=40'
VERT. N/A
JOB# BHTANK

SHEET G-1 OF 4

SCALE: 1"=10'



CROSS SECTION A–A



CROSS SECTION B–B

Matzoll Development Consultants, LLC.
3875 LAKESIDE DRIVE SUITE B
RENO, NEVADA 89509
(775) 686-9985

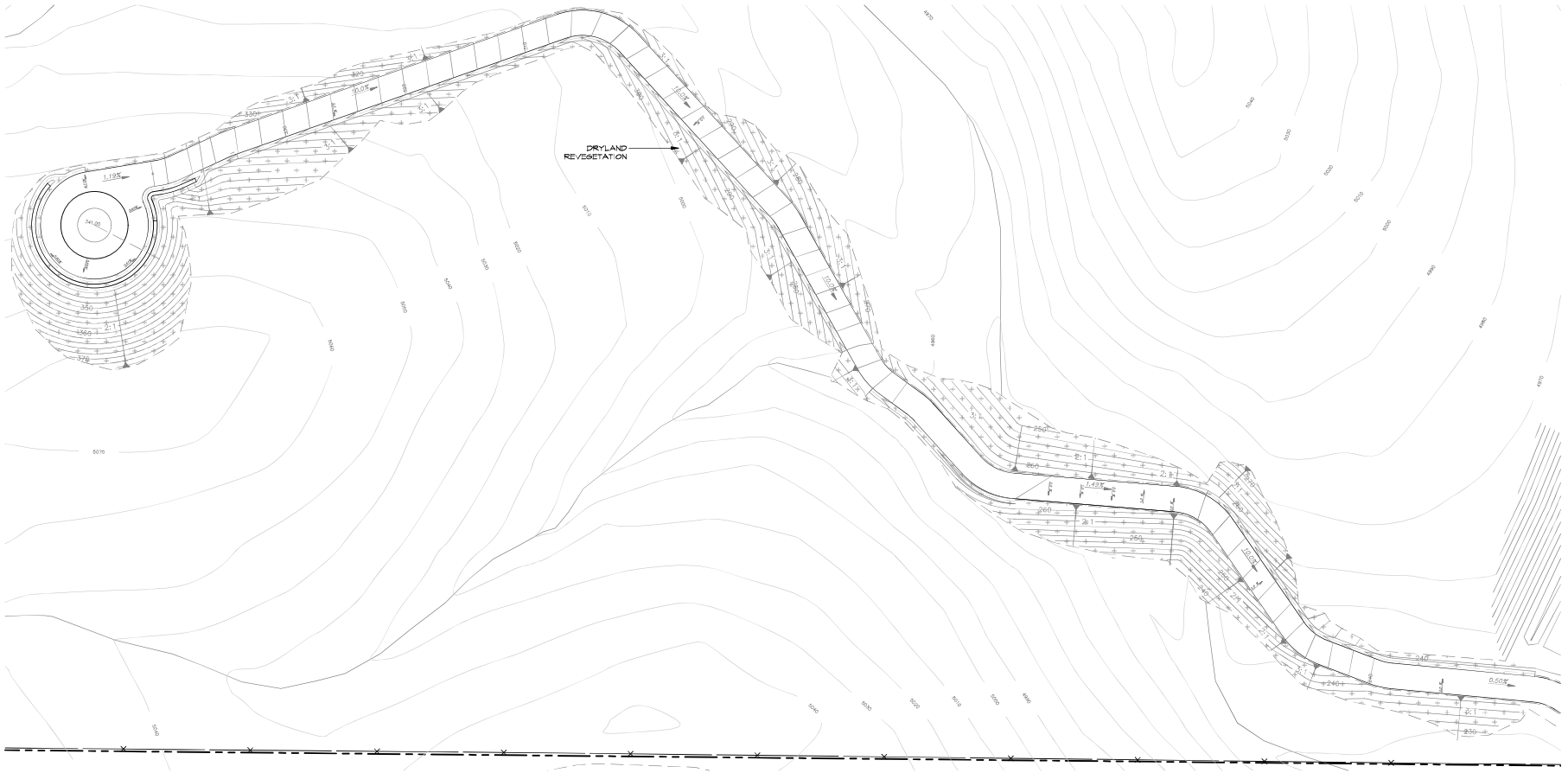
PLANS ARE PRELIMINARY AND SUBJECT TO CHANGE UNTIL STAMPED, SIGNED AND APPROVED BY ALL APPROPRIATE GOVERNING AGENCIES.

BROKEN–HILLS–TANK–AND–ACCESS–ROAD
CROSS–SECTIONS
APN–089–621–01
–
WASHOE–COUNTY NEVADA
–

REV.	DATE	DESCRIPTION	BY	APP'D

SCALE
HORIZ. 1"=10'
VERT. 1"=10'
JOB# BHTANK

SHEET C–1 OF 3



REVEGETATION SPECIFICATIONS

1. WHERE POSSIBLE, STRIP & STOCKPILE EXISTING 6" OF NATIVE SITE TOPSOIL. CONTRACTOR SHALL PROVIDE DUST CONTROL FOR STOCKPILED TOPSOIL AS REQUIRED BY REGULATORY AGENCIES.

2. FOLLOWING COMPLETION OF ROUGH GRADING RE-APPLY A MINIMUM OF 6" OF STOCKPILED TOPSOIL (IF AVAILABLE) TO REVEGETATION AREAS. TOPSOIL SHALL CONSIST OF NATURAL SURFACE SOIL, FRIABLE, AND LOAMY IN CHARACTER. TOPSOIL SHALL BE FREE OF LARGE BRUSH OR STUMPS, OBJECTIONABLE WEEDS, LARGE STONES OR ROCKS (EXCEPT AS DEPICTED ON PLANS) AND SUBSTANCES TOXIC TO PLANTS.

3. SCARIFY PLACED TOPSOIL TO CREATE FRIABLE CONDITIONS, EVENLY BLENDING PLACED TOPSOIL WITH TOP 6" OF SUBGRADE SOIL MATERIAL.

4. REVEGETATION SEEDING IS RECOMMENDED TO TAKE PLACE IN THE FALL TO ALLOW WINTER MOISTURE TO GERMINATE SEEDS. REVEGETATION SEED BLENDS MAY BE APPLIED IN HYDROSEED SLURRY. THE APPLICATION RATE (LBS PER ACRE) IN THE FALL SHALL BE APPLIED AT A MINIMUM RATE OF 32 PLS LBS/ACRE.

5. REVEGETATION SEEDING IN THE SUMMER SHALL BE APPLIED AT 25% OF THE FALL APPLICATION RATE, IMMEDIATELY FOLLOWED BY A TACKIFIER APPLICATION USING 150% OF THE MANUFACTURERS RECOMMENDED RATE

6. FOLLOWING SEEDING, APPLY HYDRO-SLURRY MIX OVER SEEDED SLOPE PER MFG'S SPECIFICATIONS. SLURRY SHALL CONSIST OF THE FOLLOWING:

   FERTILIZER, 0-10-10 @ 200 LBS/ACRE
   TACKIFIER, M-BINDER @ 60 LBS/ACRE
   MULCH: FIBER MULCH @ 1850 LBS/ACRE
   SEED: REVEGETATION SEED BLEND

7. CONTRACTOR SHALL MAINTAIN SEEDINGS UNTIL ESTABLISHED. REPAIR ANY SURFACE EROSION/RILLING UPON DISCOVERY.

8. COVERAGE REQUIREMENT: NON-IRRIGATED REVEG SEEDING RELIES ON NATURAL PRECIPITATION. ADDITIONAL ANNUAL SEEDING APPLICATIONS (INCLUDING APPROPRIATE TACKIFIER TREATMENTS) MAY BE REQUIRED TO INSURE SUCCESSFUL GERMINATION AND ESTABLISHMENT. FURTHER APPLICATIONS WILL BE REQUIRED UNTIL COVERAGE REQUIREMENTS (CONSISTENT WITH NON-DISTURBED NATURAL CONDITIONS) ARE ACHIEVED AND ACCEPTED BY THE REVIEW AGENCY.

DRYLAND (NON-IRRIGATED) SEED BLEND

SPECIES	PLS #/ACRE
GRASSES	
WHEATGRASS STREAMBANK	4.00
BLUEGRASS SANDBERG	5.00
WILDRYE GREAT BASIN	2.00
FESCUE SHEEP	3.00
INDIAN RICEGRASS	5.00
SHRUBS	
SAGEBRUSH WYOMING	.50
RABBITBRUSH RUBBER	.50
SALTBUSH FOURWING	2.00
MORMON TEA GREEN	.50
BITTERBRUSH	1.00
SPINY HOPSAGE	.50
DESERT PEACH	1.00
FLOWERS	
DRYLAND AGGRESSIVE BLEND	2.00
NURSE CROP	
RYEGRASS ANNUAL	6.00
TOTAL PLS #/ACRE:	31.00

SEED AVAILABLE FROM COMSTOCK SEED, MINDEN NV

0' 40' 80' 120'

Scale in Feet

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

Dryland Revegetation Plan
BROKEN HILLS TANK
Matzoll Development
Washoe Co. Nevada

No.	Revision Date

Reno

LA No.	821-504-08-M
Designed:	RMH
Drawn:	KMK
Checked:	RMH
Date:	8/12/14

Sheet
L1
of
1

PROPERTY TAX INFORMATION

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

Washoe County Treasurer
Tammi Davis

Account Detail

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

CollectionCart

Collection Cart	Items	Total	
	0	$0.00	Checkout View

Pay Online

Washoe County Parcel Information

Parcel ID	Status	Last Update
08962101	Active	8/7/2019 2:07:39 AM

Current Owner:
BARKER-COLEMAN INVESTMENTS
C/O KEITH RUSH MANAGER
3675 LAKESIDE DR STE B
RENO, NV 89509

SITUS:
0 KINGLET DR
WCTY NV

Taxing District
4000

Geo CD:

Legal Description

Range 20 Block Lot 2-A SubdivisionName BROKEN HILLS VILLAGE 1A Section Township 21

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

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2019	$11,333.60	$11,333.60	$0.00	$0.00	$0.00
2018	$11,333.61	$11,333.61	$0.00	$0.00	$0.00
2017	$11,333.77	$11,333.70	$0.00	$0.00	$0.00
2016	$12,491.89	$12,491.89	$0.00	$0.00	$0.00
2015	$12,466.80	$12,466.80	$0.00	$0.00	$0.00
				Total	$0.00

Disclaimer

- 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

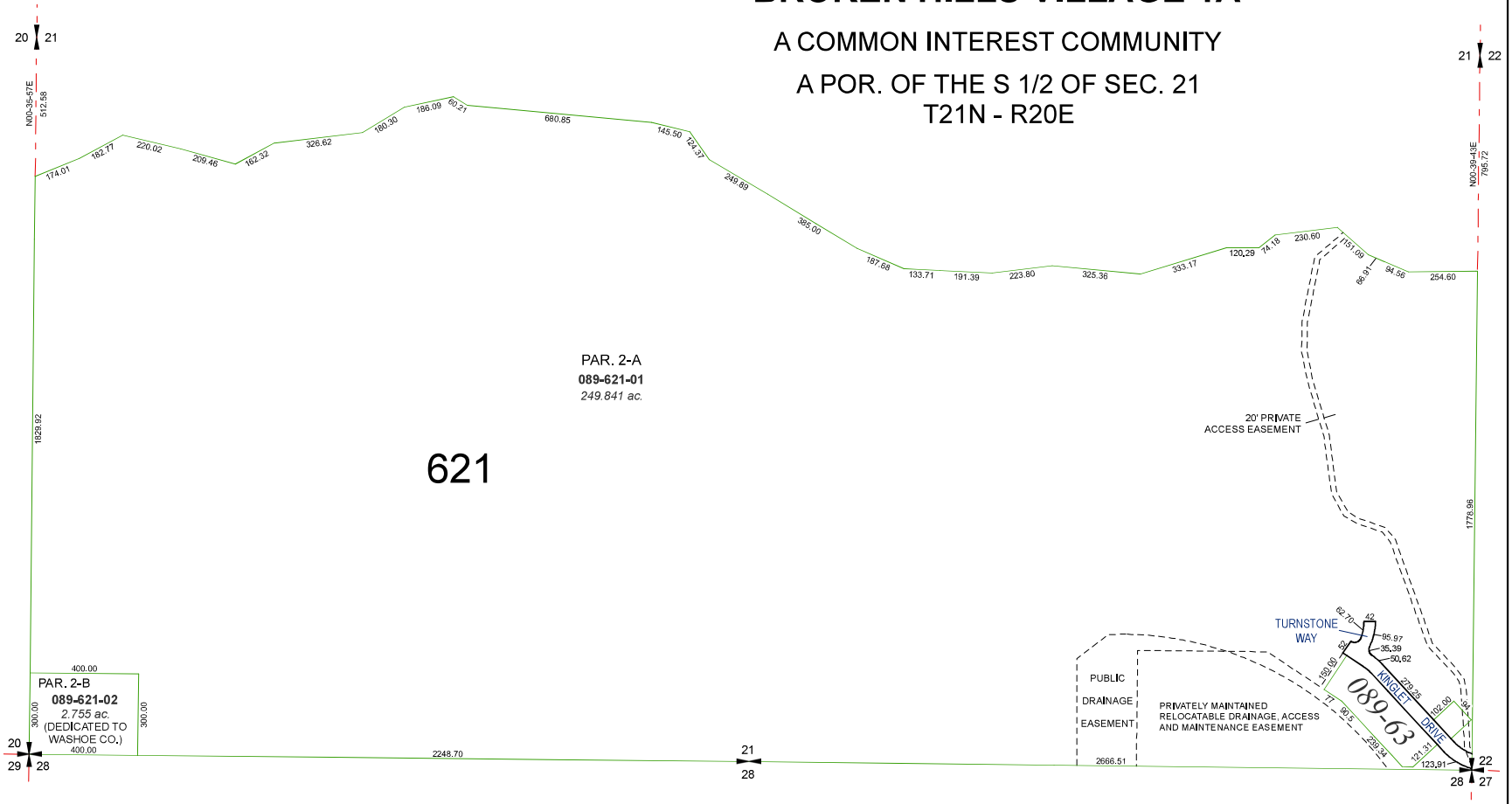
Assessment Information

ASSESSOR'S MAP

(#4821)
BROKEN HILLS VILLAGE 1A

A COMMON INTEREST COMMUNITY

A POR. OF THE S 1/2 OF SEC. 21
T21N - R20E



Assessor's Map Number

089-62

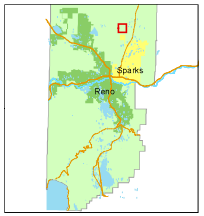
STATE OF NEVADA

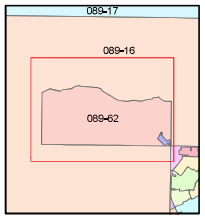
WASHOE COUNTY
ASSESSOR'S OFFICE
Joshua G. Wilson, Assessor

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

Feet
0 100 200 300 400

1 inch = 400 feet





created by: TWT 11/30/2011

last updated:

area previously shown on map(s)
089-16

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.

SOILS REPORT

GEOTECHNICAL INVESTIGATION
BROKEN HILLS – UNIT 1
WASHOE COUNTY, NEVADA

PREPARED FOR:

Mr. Karl Matzoll, PE
RIGHTWAY INVESTMENTS
5945 Los Altos Parkway, Suite 101
Sparks, Nevada 89436

March 2007

JAMES EDWARD ENGINEERING
INCORPORATED

March 10, 2007
Project No. 1422.01

Mr. Karl Matzoll, PE
RIGHTWAY INVESTMENTS
5945 Los Altos Parkway, Suite 101
Sparks, Nevada 89436

RE: GEOTECHNICAL ADDENDUM
BROKEN HILLS – PHASE 1

Dear Mr. Matzoll:

This letter presents our update to the Broken Hills geotechnical report originally prepared by our firm under the name of Matrix Construction Services in August, 2004. This addendum specifically addresses Phase 1. Unless specifically modified in this addendum, our opinions and recommendations stated in the original geotechnical report are applicable (Appendix B).

As indicated in Figure 1, the Phase 1 is situated in the southeast corner of the Broken Hills development area. The terrain surrounding this unit is relatively rugged with a substantial drainage forming the central open space area.

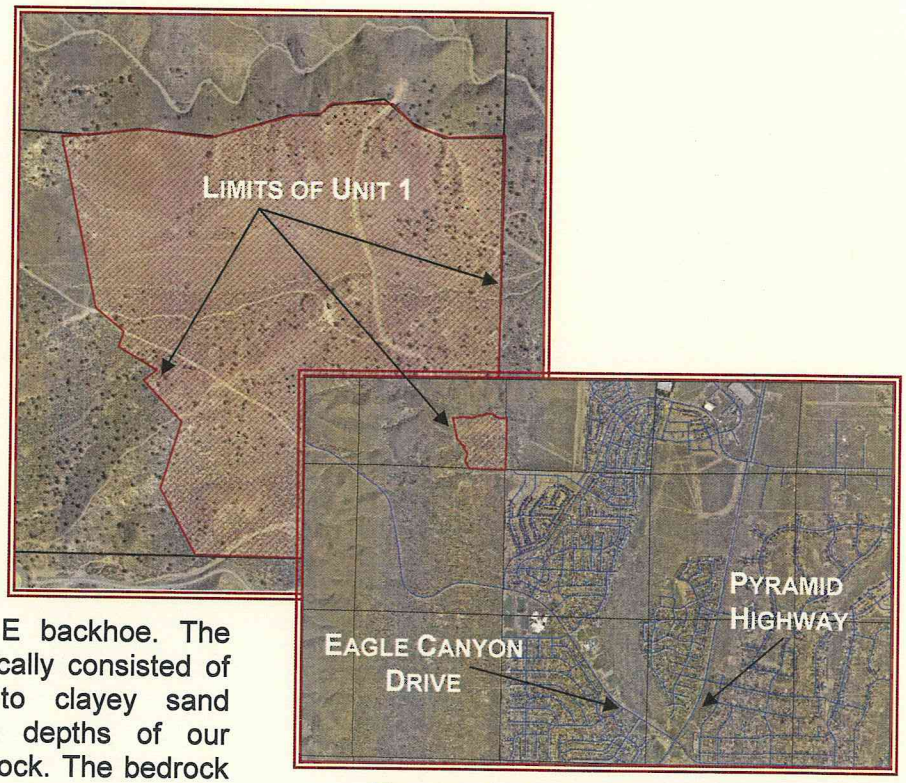


FIGURE 1 – Unit 1 and Vicinity Map

The site was explored by excavating five additional test pits along the proposed roadway alignments utilizing a Deere 410 E backhoe. The profile encountered typically consisted of poorly graded sand to clayey sand extending through the depths of our borings or capping bedrock. The bedrock encountered has typically been weathered and decomposed to excavate to a dense silty sandy consistency however along the southern ridge, the bedrock is more competent and less weathered. Soil profiles are presented a Plate A-2 in Appendix A of this report.

Based on the preliminary Griffith Canyon Quadrangle Geologic Map (USBM&G), Phase 1 overlies: Late Tertiary/early to mid-Pleistocene alluvial fan deposits and the Quaternary Alluvium associated with the drainages. One fault has been mapped in the immediate area, just northwest of the limits of Unit 1, trending north-northeast. This fault does not lie within the limits of Phases 1 or 2. The Quaternary Fault Map of Nevada, Reno Sheet (Bell 1984) was reviewed. This fault was not delineated on the Quaternary Fault map and no additional faults were mapped trending in the immediate vicinity of or through the site. The Spanish Springs Valley Fault Zone is located approximately 1 to 1 ½ miles east of the site.

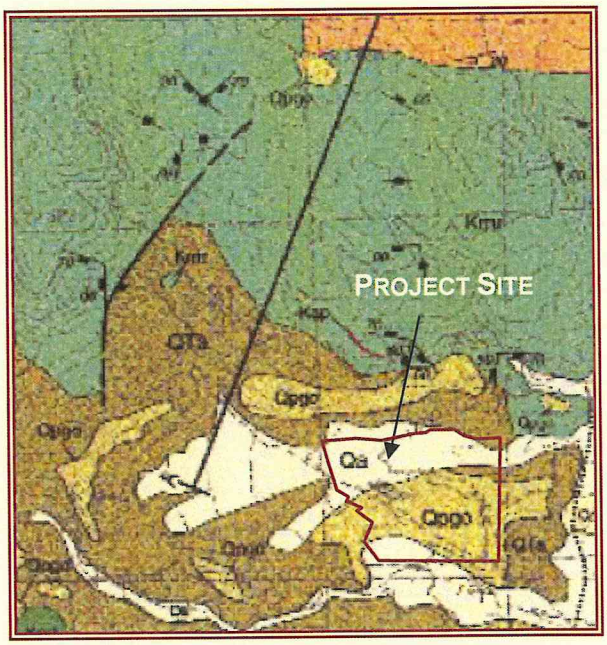


FIGURE 2 - Geologic Map of Project Area

Due to the presence of medium dense to dense granular soils, the site would be assigned Site Class D (stiff soil profile) listed in Table 1615.1 of the 2003 International Building Code. Based on the average latitude and longitude of the site (39.6677°N, 119.7393°W), the mapped spectral response accelerations for the 0.2 seconds (S_s) and 1 second (S_1) periods are 1.35 and 0.49, respectively (USGS Earthquake Hazards Program). Based on these mapped spectral response accelerations, the Site Coefficients F_a and F_v, as a function of site class, are 1.0 and 1.51, respectively.

Our original geotechnical report has been presented as Appendix B. The *Site Preparation*, *Grading and Filling*, *Trenching and Excavations*, *Foundations*, *Slope Stability and Erosion Control*, *Site Drainage*, *Concrete Slabs*, and *Asphaltic Concrete* sections of report are applicable to the grading and construction of the site. Based on our current understanding of the project development, no modifications are presented at this time. However, it should be noted that bedrock was encountered in Test Pits D and E and local difficulty in excavation should be anticipated.

R-Value testing on the native soils resulted in an R-Value of 69, indicating that the Washoe County minimum structural design section of 3-inches plantmix bituminous pavement capping 6-inches of Type 2 Class B aggregate base should perform satisfactorily. The structural section was evaluated in accordance with the AASHTO design procedure for low volume roads and a maximum residential service load of 150 residences. Structural pavement section evaluation is presented as Plate A-5 in Appendix A of this report. All public and private improvements should be constructed in accordance with the Standard Specifications for Public Works Construction and Washoe County Standards, whichever is more stringent.

Corrosive soil potential tests were performed on the near surface alluvium. Test results were in the negligible exposure range for sulfate as established in Table 1904.3 of the 2003 IBC and special concrete considerations to address sulfate attack would not be required. The test results as well as a summary of their applicability as per AWWA Standard C-105 are summarized below.

1 – Earth resistivity - 4100 Ω-cm (saturated paste – Method 2510B, 0 points)

Earth resistivity was determined on a remolded sample obtained from the near surface alluvium which extended from the ground surface to depths of 6 to 10 feet below existing grade which would be representative of most of the waterline embedment soils. Groundwater was not present at the time of our investigation and lies at a depth below the zone of influence with the piping associated with this tank. Therefore, the percentage of time the soil is likely to be water saturated is anticipated to be less than 5 percent. The soil sample was obtained on March 6, 2007. Due to the weather pattern and depth of sample, freezing soil conditions were not present at the time of sampling.

2 – pH – XX6.44X (saturated paste – Method 9045B, 0 points)

3 – Oxidation-reduction potential – (0 points)

Results of redox potential indicated a potential greater than +100 mV indicating that the soil is sufficiently aerated (+330 mV).

4 – Sulfides – (0 points)

No effervescence was noted from the soil sample upon being subjected to the 3-percent sodium azide in a 0.1N iodine solution indicating that the sulfide concentration is negative.

5 – Moisture Content – Good drainage, generally dry (0 points)

6.5 percent by dry weight of soil.

6 – Soil description

0 – 10' **Poorly Graded Sand (SC)** – medium dense to dense, slightly moist, orange brown

7 – Potential Stray Direct Current – Not applicable

Based on the soil characteristics the soil is not considered corrosive to ductile-iron pipe.

We appreciate the opportunity to provide these services for you. Please do not hesitate to contact our office should you have any related questions or comments.

Sincerely,

JAMES EDWARD ENGINEERING
I N C O R P O R A T E D

James G. Smith, PE
President

Mischelle J. Smith, PE
Engineering Manager
RE Number 6972
Expires 6/30/08

JGS:MJS:dh

CONSTRUCTION OBSERVATION AND TESTING SERVICES

The recommendations presented in this report are based on the assumption that the contractor performs his work as required by the project documents and that owner/project manager provides sufficient field-testing and construction review during all phases of construction. Prior to construction, the owner/project manager should schedule a pre-job conference including, but not limited to, the owner, architect, civil engineer, the general contractor, earthwork and materials subcontractors, building official, and geotechnical engineer. It is the owner's/project manager responsibility to set-up this meeting and contact all responsible parties. The conference will allow parties to review the project plans, specifications, and recommendations presented in this report, and discuss applicable material quality and mix design requirements. All quality control reports should be submitted to the owner/project manger for review and distributed to the appropriate parties.

During construction, James Edward Engineering, Inc. should have the opportunity to provide sufficient on-site observation of site preparation and grading, over-excavation, fill placement, foundation installation, and paving. These observations would allow us to document that the geotechnical conditions are as anticipated and that the contractor's work meets with the criteria in the approved plans and specifications. The site should be surveyed by a licensed professional surveyor for grade and location prior to placing structural fill over clay soils. Without this verification, JEE cannot provide verification that the work being completed is in accordance with the project's plans, specifications, or geotechnical report. If certification by a licensed surveyor is not provided, verification of horizontal and vertical control must be provided by whoever was responsible for establishing those boundaries.

STANDARD LIMITATION CLAUSE

This report has been prepared in accordance with generally accepted local geotechnical practices. The analyses and recommendations submitted are based upon field exploration performed at the locations shown on Plate A-2 of this report. This report does not reflect soils variations that may become evident during the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to document compliance with our recommendations. The owner/project manger is responsible for distribution of this geotechnical report to all designers and contractors whose work is related to geotechnical factors.

It is the contractor's responsibility for the grading and construction of the designed improvements. This responsibility includes the means, methods, techniques, sequence, and procedures of construction and safety of construction at the site. All construction shall conform to the requirements of the most recently adopted version of the Standard Specifications for Public Works Construction and the requirements of Washoe County, Nevada. Failure to inspect the work shall not relieve the contractor from his obligation to perform sound and reliable work as described herein and as described in the Standard Specifications for Public Works Construction.

All plans and specifications should be reviewed by the design engineer responsible for this geotechnical report, to determine if they have been completed in accordance with the recommendations contained in this report, prior to submitting to the building department for review. It is the owner's/project manager responsibility to provide the plans and specifications to the engineer.

Water level readings were made on the date shown on Plate A-2 of this report. Fluctuations in the water table may occur due to rainfall, temperature, seasonal runoff or adjacent irrigation practices. Construction planning should be based on assumptions of possible variations.

This report has been prepared to provide information allowing the architect and engineer to design the project. The owner/project manager is responsible for distribution of this report to all designers and contractors whose work is affected by geotechnical aspects. In the event of changes in the design, location, or ownership of the project after presentation of this report, our recommendations should be reviewed and possibly modified by the geotechnical engineer. If the geotechnical engineer is not accorded the privilege of making this recommended review, he can assume no responsibility for misinterpretation or misapplication of his recommendations or their validity in the event changes have been made in the original design concept without his prior review. The engineer makes no other warranties, either expressed or implied, as to the professional advice provided under the terms of this agreement and included in this report.

This report was prepared by James Edward Engineering, Inc. for the account of Rightway Investments, Inc. The material in it reflects James Edward Engineering Inc.'s best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. James Edward Engineering Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

March 10, 2007
Project No. 1422.01

Mr. Karl Matzoll, PE
RIGHTWAY INVESTMENTS
5945 Los Altos Parkway, Suite 101
Sparks, Nevada 89436

RE: GEOTECHNICAL ADDENDUM
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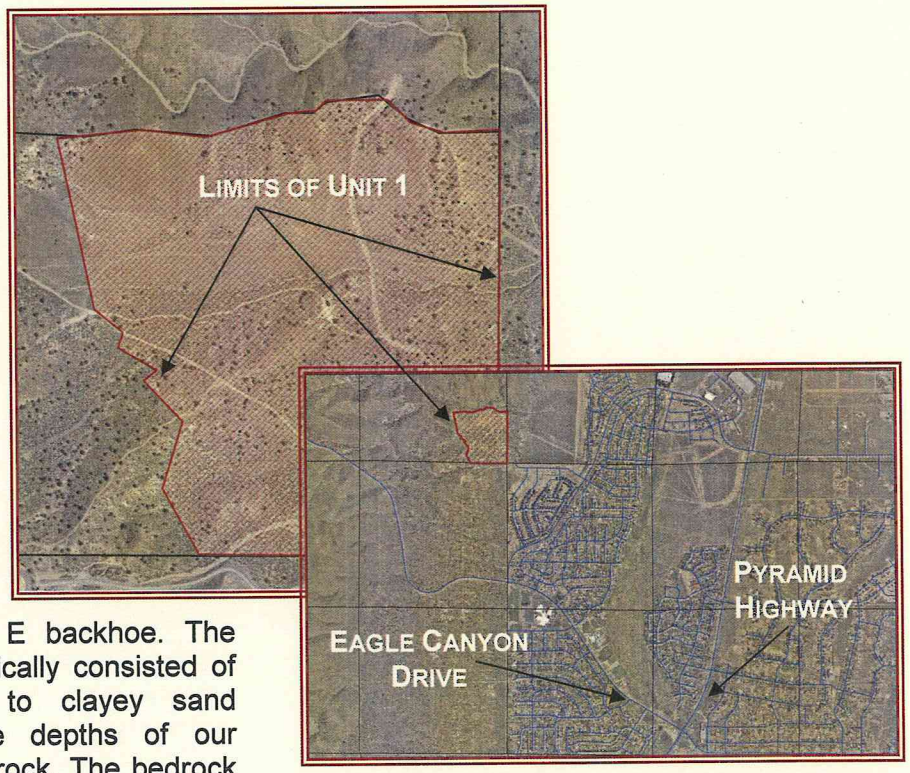

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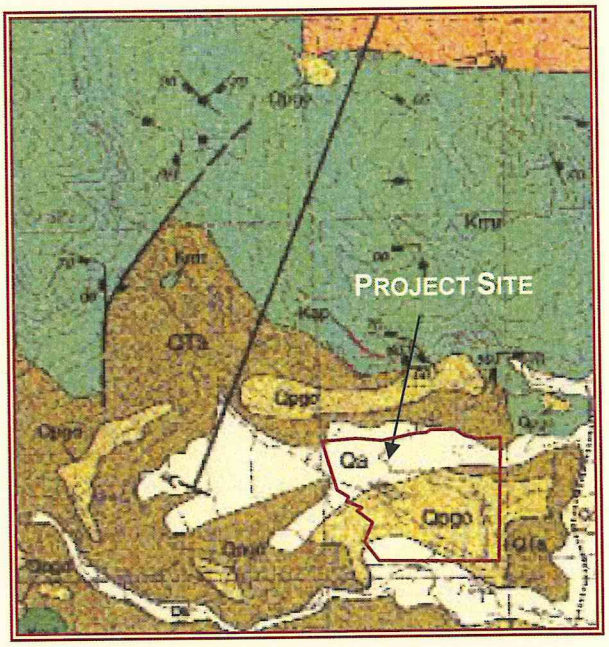

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We appreciate the opportunity to provide these services for you. Please do not hesitate to contact our office should you have any related questions or comments.

Sincerely,

JAMES EDWARD ENGINEERING
I N C O R P O R A T E D

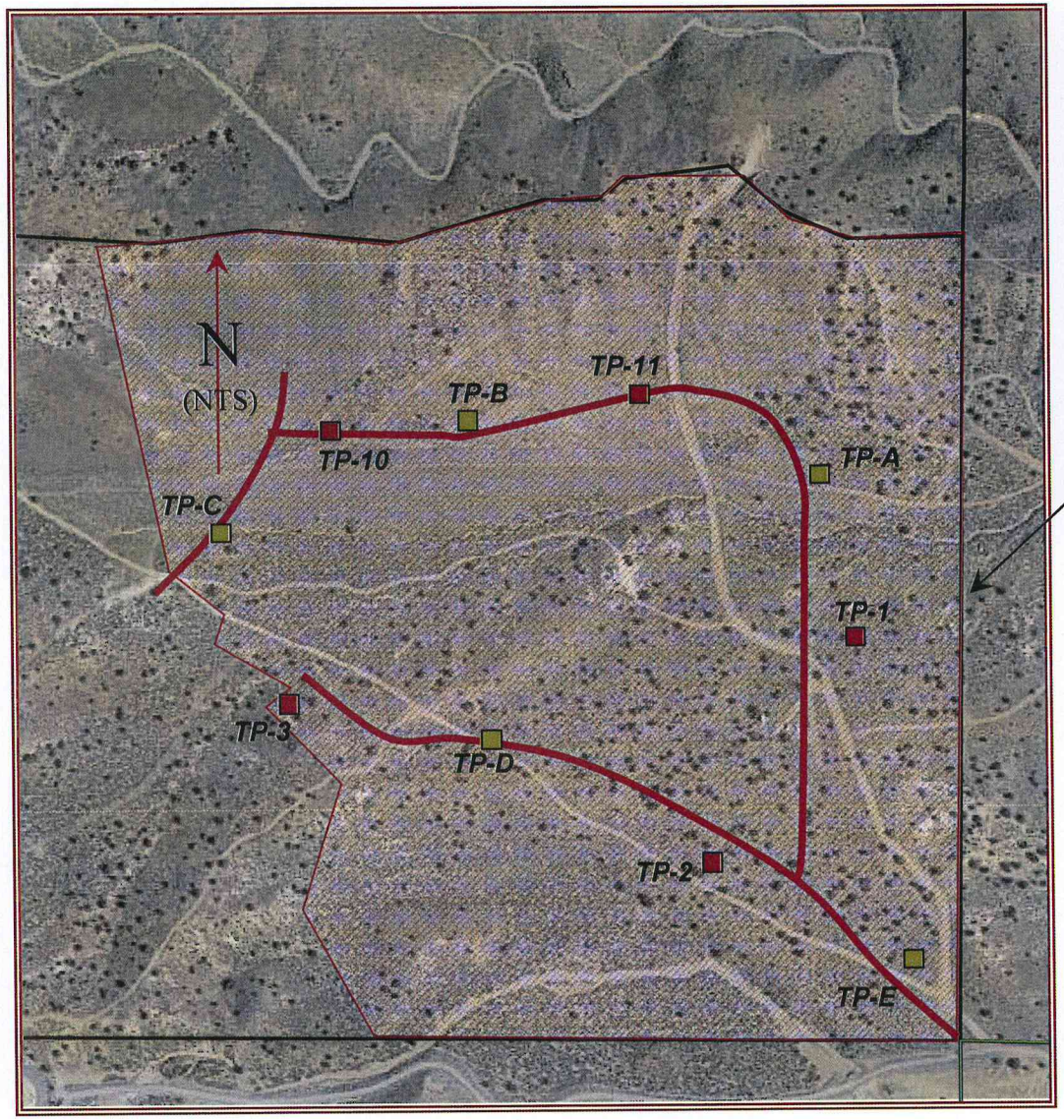
James G. Smith, PE
President

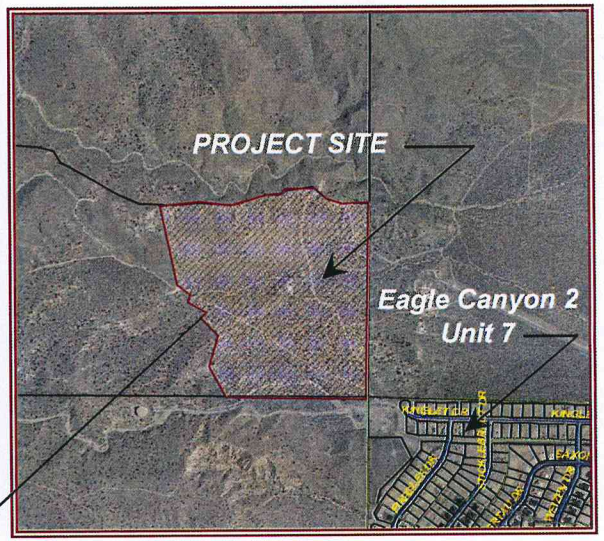
PROFESSIONAL ENGINEER-STATE OF NEVADA
MISCHELLE J. SMITH
3-12-7
Exp. 6-30-08
CIVIL
No. 6972

Mischelle J. Smith, RE
Engineering Manager
RE Number 6972
Expires 6/30/08

JGS:MJS:dh

APPENDIX A





VICINITY MAP (NTS)

LEGEND

TP-1 *2004 Explorations*

TP-A *2007 Explorations*

Approximate Roadway Alignment

JAMES EDWARD ENGINEERING
INCORPORATED
9475 Double R Boulevard, Reno, NV 89521
Phone 775.828.1866 Fax 775.828.1871

SITE PLAN AND APPROXIMATE EXPLORATION LOCATIONS

Geotechnical Investigation

BROKEN HILLS *PHASE I*

Project No.: 1422.01
Date: 03/10/07

PLATE A-1

LOG OF TEST PIT NO. A

PROJECT NAME:	BROKEN HILLS - PHASE 1
LOCATION:	SEE PLAN
DATE:	3/9/2007

PROJECT NUMBER:	1422.01
SURFACE ELEVATION:	SEE PLAN
EXPLORATION EQUIPMENT:	DEERE 410E

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SP					M	0 - 10' **Poorly Graded Sand (SP) with Some Silt** - medium dense, moist, brown (estimated <10% low plastic fines, >90% sand)			
2										
3										
4				B	A1					
5										
6										
7										
8										
9										
10	BEDROCK					S	10 - 13' Bedrock - Partially Decomposed State (PDS), Craters to Dents (C to D), Solid, Unit Weight <130 (estimated), excavates to a dense, poorly graded sand consistency			
11										
12										
13							Bottom of Test Pit @ 13 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		3/9/2007	S - SLIGHTLY MOIST
▼				M - MOIST
NE- No Free Water Encountered				V - VERY MOIST
				W - WET

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS
A- Atterberg Limits
B- Grain Size Distribution
C- Consolidation
MD- Moisture/Density
DS - Direct Shear

JAMES EDWARD ENGINEERING
INCORPORATED
9475 Double R Boulevard
Reno, Nevada 89521
Phone 775.828.1866 Fax 775.828.1871

Plate
A-2

LOG OF TEST PIT NO. B

PROJECT NAME:	BROKEN HILLS - PHASE 1
LOCATION:	SEE PLAN
DATE:	3/9/2007

PROJECT NUMBER:	1422.01
SURFACE ELEVATION:	SEE PLAN
EXPLORATION EQUIPMENT:	DEERE 410E

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SP			B	B1	S/M	0 - 10' **Poorly Graded Sand (SP) with Some Silt** - medium dense, slightly moist to moist, brown (estimated <10% low plastic fines, >90% sand)			
2										
3										
4										
5										
6										
7										
8										
9										
10							Bottom of Test Pit @ 10 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		3/9/2007	S - SLIGHTLY MOIST
▼				M - MOIST
NE- No Free Water Encountered				V - VERY MOIST
				W - WET

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS
A- Atterberg Limits
B- Grain Size Distribution
C- Consolidation
MD- Moisture/Density
DS - Direct Shear

JAMES EDWARD ENGINEERING
INCORPORATED
9475 Double R Boulevard
Reno, Nevada 89521
Phone 775.828.1866 Fax 775.828.1871

Plate
A-2

LOG OF TEST PIT NO. C

PROJECT NAME:	BROKEN HILLS - PHASE 1
LOCATION:	SEE PLAN
DATE:	3/9/2007

PROJECT NUMBER:	1422.01
SURFACE ELEVATION:	SEE PLAN
EXPLORATION EQUIPMENT:	DEERE 410E

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	BEDROCK						0 - 8' **Bedrock** - Partially Decomposed State (PDS), Craters to Dents (C to D), Solid, Unit Weight <130 (estimated), excavates to a dense, poorly graded **Silty Sand (SM)** consistency			
2										
3										
4				B	C1	S				
5										
6										
7										
8										

Bottom of Test Pit @ 8 Feet
No Free Water Encountered

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		3/9/2007	S - SLIGHTLY MOIST
▼				M - MOIST
NE- No Free Water Encountered				V - VERY MOIST
				W - WET

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS
A- Atterberg Limits
B- Grain Size Distribution
C- Consolidation
MD- Moisture/Density
DS - Direct Shear

JAMES EDWARD ENGINEERING
INCORPORATED
9475 Double R Boulevard
Reno, Nevada 89521
Phone 775.828.1866 Fax 775.828.1871

Plate
A-2

LOG OF TEST PIT NO. D

PROJECT NAME:	BROKEN HILLS - PHASE 1
LOCATION:	SEE PLAN
DATE:	3/9/2007

PROJECT NUMBER:	1422.01
SURFACE ELEVATION:	SEE PLAN
EXPLORATION EQUIPMENT:	DEERE 410E

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC					M	0 - 1' **Clayey Sand (SC)** - loose, moist, dark brown (estimated 25% medium plastic fines, 75% sand)			
	SC					M	1 - 2' **Clayey Sand (SC)** - medium dense, moist, brown (estimated 20% low plastic fines, 80% sand)			
2	BEDROCK					S	2 - 7' **Bedrock** - Stained State (STS), Compression (DQ), Intersecting Open Planes (3-D), Unit Weight estimated 130-140 pcf, excavates to a dense **Sandy Gravel (GP)** consistency, with $CaCO_3$ staining			
3										
4										
5										
6										
7							Bottom of Test Pit @ 7 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		3/9/2007	S - SLIGHTLY MOIST
▼				M - MOIST
NE- No Free Water Encountered				V - VERY MOIST
				W - WET

SAMPLE TYPE	
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C - CME Sample	R - Rotary Cuttings
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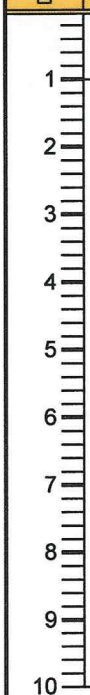
Plate
A-2

LOG OF TEST PIT NO. E

PROJECT NAME:	BROKEN HILLS - PHASE 1	PROJECT NUMBER:	1422.01
LOCATION:	SEE PLAN	SURFACE ELEVATION:	SEE PLAN
DATE:	3/9/2007	EXPLORATION EQUIPMENT:	DEERE 410E



Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
0 - 1	SC					S	0 - 1' Clayey Sand (SC) - loose, slightly moist, brown (estimated 25% low plastic fines, 75% sand)			
1 - 10	BEDROCK			B	E1	S	1 - 10' **Bedrock** - Stained State (STS), Compression (DQ), Intersecting Open Planes (3-D), Unit Weight estimated 130-140 pcf, excavates to a dense **Sandy Gravel with Clay (GC)** consistency, with CaCO3 staining			
10							Bottom of Test Pit @ 10 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE					SAMPLE TYPE		LABORATORY TESTS
	Depth	Hour	Date	D - DRY	A - Drill Cuttings	B - Bulk Sample	A- Atterberg Limits
▽	NE		3/9/2007	S - SLIGHTLY MOIST	C - CME Sample	R - Rotary Cuttings	B- Grain Size Distribution
▼				M - MOIST	S- 2" O.D. 1.38" I.D. Tube Sample		C- Consolidation
NE- No Free Water Encountered				V - VERY MOIST	U- 3" O.D. 2.42 " I.D. Tube Sample		MD- Moisture/Density
				W - WET	T- 3" O.D. Thin-Walled Shelby Tube		DS - Direct Shear

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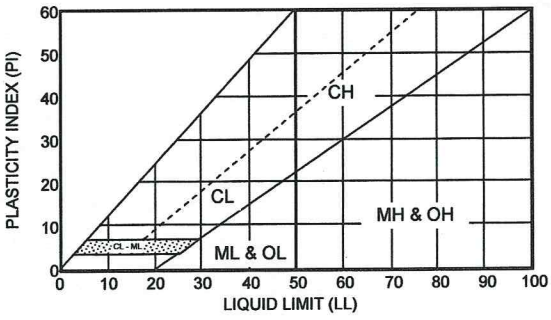
Plate
A-2

MAJOR DIVISION					TYPICAL NAMES
COARSED-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVEL MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES		GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
				GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES		GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
				GC	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SAND MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES		SW	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
				SP	POORLY GRADED SAND WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES		SM	SILTY SANDS WITH OR WITHOUT GRAVEL
				SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILT AND CLAY LIQUID LIMIT 50% OR LESS			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
				OL	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILT AND CLAY LIQUID LIMIT GREATER THAN 50%			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOLID, ELASTIC SILTS
				CH	INORGANIC CLAYS OR HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC SILTS OR CLAYS MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS



CONSISTENCY		RELATIVE DENSITY	
SILTS & CLAYS	SPT BLOW* COUNTS (N)	SANDS & GRAVELS	SPT BLOW* COUNTS (N)
VERY SOFT	0 - 2	VERY LOOSE	0 - 4
SOFT	3 - 4	LOOSE	5 - 10
MEDIUM STIFF	5 - 8	MEDIUM DENSE	11 - 30
STIFF	9 - 15	DENSE	31 - 50
VERY STIFF	16 - 30	VERY DENSE	50 +
HARD	30 +		

* The Standard Penetration Resistance (N) In blows per foot is obtained by the ASTM D1585 procedure using 2" O.D., 1 3/8" I.D. samplers.

DESCRIPTION OF ESTIMATED PERCENTAGES OF GRAVEL, SAND, AND FINES	
TRACE	Particles are present but est. < 5%
FEW	5% - 10%
LITTLE	15% - 20%
SOME	30% - 45%
MOSTLY	50% - 100%

NOTE: Percentages are presented within soil description for soil horizon with laboratory tested soil samples.

DEFINITIONS OF SOIL FRACTIONS	
SOIL COMPONENT	PARTICLE SIZE RANGE
COBBLES	ABOVE 3 INCHES
GRAVEL	3 IN. TO NO. 4 SIEVE
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 SIEVE
SAND	NO. 4 TO NO. 200
COARSE SAND	NO. 4 TO NO. 10
MEDIUM SAND	NO. 10 TO NO. 40
FINE SAND	NO. 40 TO NO. 200
FINES (SILT OR CLAY)	MINUS NO. 200 SIEVE

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UNIFIED SOIL CLASSIFICATION AND KEY TO SOIL DESCRIPTIONS

Geotechnical Investigation

BROKEN HILLS *PHASE 1*

Project No.: 1422.01
Date: 03/10/07

PLATE A-3

UNIFIED ROCK CLASSIFICATION SYSTEM (URCS)

DEGREE OF WEATHERING						
REPRESENTATIVE		ALTERED	WEATHERED			
			>GRAVEL SIZE		<SAND SIZE	
Micro Fresh State (MFS)	Visually Fresh State (VFS)	Stained State (STS)	Partially Decomposed State (PDS)		Completely Decomposed State (CDS)	
A	B	C	D		E	
Unit Weight Relative Absorption		Compare to Fresh State	Non-Plastic	Plastic	Non-Plastic	Plastic

ESTIMATED STRENGTH				
REACTION TO IMPACT OF 1LB BALL PEEN HAMMER				REMOLDING[1]
"Rebounds" (RQ)	"Pits" (Tensional) (PQ)	"Dents" (Compression) (DQ)	"Craters" (Shears) (CQ)	Moldable (Friable) (MQ)
A	B	C	D	E
>15,000 psi[2]	8,000-15,000 psi[2]	3,000-8,000 psi[2]	1,000-3,000 psi[2]	<1,000 psi[2]

[1] Strength estimated by soil mechanics techniques
[2] Approximate unconfined compressive strength

DISCONTINUITIES				
VERY LOW PERMEABILITY			MAY TRANSMIT WATER	
Solid (Random Breakage) (SRB)	Solid (Preferred Breakage) (SPB)	Solid (Latent Planes of Separation) (LPS)	Nonintersecting Open Planes (2-D)	Intersecting Open Planes (3-D)
A	B	C	D	E

UNIT WEIGHT				
> 160 pcf	150-160 pcf	140-150 pcf	130-140 pcf	<130 pcf
A	B	C	D	E

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SUMMARY OF TEST RESULTS

Geotechnical Investigation
BROKEN HILLS PHASE 1
Project No.: 1422.01
Date: 03/10/07

PLATE A-4

ESAL RANGE	
High	700,000 - 1,000,000
Medium	400,000 - 600,000
Low (125 - 750 Residences)	50,000 - 300,000

ESAL DETERMINATION		
Design Life (yrs)	L	20
Number of Lots	N	150
Average Daily Two Way Trips per Lot	T_d	10
Percent Heavy Trucks	T	2
Average Truck Factor	T_f	0.52
Construction Traffic (Trips per Lot)	T_c	20
Construction Truck Factor	T_{cf}	1.0
$ESAL_{20}$	5.99E+04	

STRUCTURAL NUMBER (CLIMATE ZONE V)			
Relative Quality of Roadbed Soil	Traffic Level	Reliability	
		50% SN	75% SN
Very Good (R>35)	High	2.4 - 2.6	2.7 - 2.8
	Medium	2.2 - 2.4	2.4 - 2.6
	Low	1.6 - 2.1	1.7 - 2.2
Good (R>15)	High	2.7 - 2.9	3.0 - 3.1
	Medium	2.5 - 2.7	2.6 - 2.9
	Low	1.8 - 2.4	2.0 - 2.5
Fair (R>10)	High	2.9 - 3.1	3.2 - 3.3
	Medium	2.6 - 2.8	2.8 - 3.1
	Low	1.9 - 2.5	2.1 - 2.7
Poor (R>7)	High	3.2 - 3.4	3.5 - 3.6
	Medium	2.9 - 3.2	3.1 - 3.4
	Low	2.2 - 2.8	2.3 - 2.9
Very Poor (R>5)	High	3.4 - 3.6	3.7 - 3.8
	Medium	3.1 - 3.3	3.3 - 3.6
	Low	2.3 - 3.0	2.5 - 3.1

Material Type	Reference	Structural Coefficient	Thickness (in) - Wa. Co.	Thickness (in)	Thickness (in)	Thickness (in)
Plantmix Surface	AC	0.35	3	4	4	0
Plantmix Base	PB	0.32	0	0	0	0
Cement Treated	CTB	0.2	0	0	0	0
Type 2 Class B	AB	0.1	6	6	8	0
Structural Fill (R-45)	SF	0.07	0	0	0	0
Structural Number for Section			1.7	2.0	2.2	0.0

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STRUCTURAL PAVEMENT SECTION DESIGN (Low Volume Roads)

Geotechnical Investigation
BROKEN HILLS *PHASE 1*
Project No.: 1422.01
Date: 03/10/07

PLATE A-5

APPENDIX B

PRELIMINARY GEOTECHNICAL INVESTIGATION
EAGLE CANYON - BROKEN HILLS
WASHOE COUNTY, NEVADA

PREPARED FOR:

BARKER COLEMAN CONSTRUCTION
Mr. Karl Matzoll, PE
Matrix Engineering and Consulting, Inc.
4741 Caughlin Parkway, Suite 1B
Reno, Nevada 89509

August 2004

MATRIX CONSTRUCTION SERVICES
INCORPORATED

MATRIX CONSTRUCTION SERVICES
INCORPORATED

August 12, 2004
Project Number: 1083.01

BARKER COLEMAN CONSTRUCTION
c/o Mr. Karl Matzoll, P.E.
MATRIX ENGINEERING & CONSULTING INC.
4741 Caughlin Parkway, Suite 1B
Reno, Nevada 89509

RE: PRELIMINARY GEOTECHNICAL INVESTIGATION
EAGLE CANYON – BROKEN HILLS
RENO, NEVADA

Dear Mr. Matzoll:

Matrix Construction Services, Inc. is pleased to present the results of our preliminary geotechnical investigation for the referenced residential subdivision to be constructed in Washoe County, Nevada. The site encompasses an area of approximately 253 acres, with 100 acres to be developed into an estimated 170 residential lots. Eagle Canyon Drive passes near the southwest corner of the parcel and provides access. Numerous dirt roads also provide access to the development area.

In general, the geotechnical profile consists of silty to clayey sand with gravel capping weathered bedrock. The weathered bedrock typically excavated as silty sandy gravel with limited plasticity. The deepest test pit was advanced to 18 feet and refusal was not met. Cuts and fills are anticipated to be less than 10 feet. The material generated during grading should provide adequate subgrade support for foundations and roadways.

The following report presents our findings, discusses our methods, and provides preliminary geotechnical recommendations for design and construction of the project as currently planned. The recommendations presented herein are intended to reduce the risk of structural distress due to expansion and/or consolidation of the native soils and structural fill.

We wish to thank you for the opportunity to provide you with our services, and look forward to working with you during construction.

Sincerely,

MATRIX CONSTRUCTION SERVICES
INCORPORATED

James G. Smith, PE
Principal
R.E. Number 10101
Expires 6-30-06

PROFESSIONAL ENGINEER-STATE OF NEVADA
JAMES G. SMITH
Exp. 06-30-06
8/12/04
GEOLOGICAL
No. 10101

Mischelle J. Smith, PE
Project Engineer

JGS:MJS:er

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FIGURES

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PRELIMINARY GEOTECHNICAL INVESTIGATION

EAGLE CANYON – BROKEN HILLS

Washoe County, Nevada

INTRODUCTION

Presented herein are the results of Matrix Construction Services' geotechnical exploration, laboratory testing, and associated geotechnical design recommendations for the proposed residential development, Eagle Canyon – Broken Hills, to be located in Washoe County, Nevada. These recommendations are based on surface and subsurface conditions encountered in our explorations, and on details of the proposed project as described in this report. The objectives of this study were to:

1. Determine general soil and ground water conditions pertaining to design and construction of the proposed subdivision.

2. Provide recommendations for design and construction of the project, as related to these geotechnical conditions.

The area covered by this report is shown in Figure 1 and on Plate A-1 (Site Plan & Approximate Test Pit Locations) in Appendix A. Our study included field exploration, laboratory testing, and engineering analyses to identify the physical and mechanical properties of the various on-site materials. Results of our field exploration and testing programs are included in this report and form the basis for all conclusions and recommendations.

PROJECT DESCRIPTION

The overall site, located in Washoe County, Nevada, encompasses an area of approximately 253 acres, with approximately 100 acres to be developed. The development is contained in Section 21, Township 21N, Range 20E, M.D.M. As shown in Figure 1, undeveloped land surrounds the immediate parcel perimeter. Eagle Canyon Drive passes near the southwest corner of the parcel.

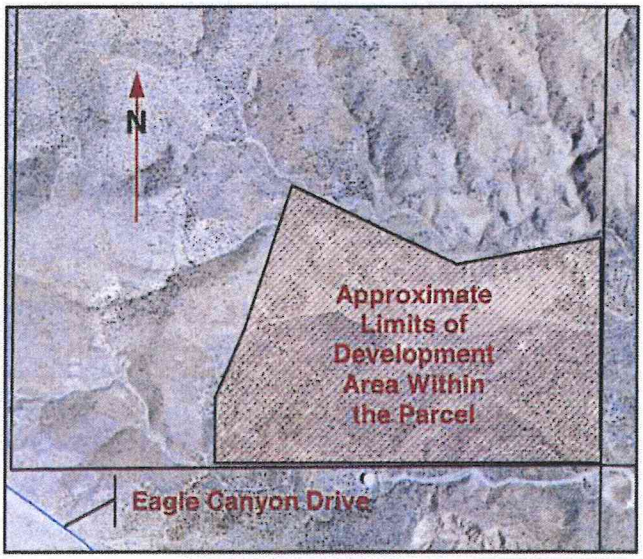


Figure 1 – Project Site

The project consists of developing a single-family residential subdivision. Homes will be one to two-story, wood-framed, with raised floor construction. Foundation loads are anticipated to be light.

All street improvements will be dedicated to Washoe County. Underground utilities will be provided by a variety of public and private companies.

The development will be phased for a balance of cut and fills with little or no required import. Cuts and fills are anticipated to be less than 10 feet.

SITE CONDITIONS

The site is situated at the base of the eastern flank of Hungry Mountain, along a ridgeline separating Hungry and Spanish Springs Valleys. Slopes vary from slight (~5%) to steep. Vegetation is light to moderat and typically consists of grasses, brush, and trees. Several dirt roads cross the property.

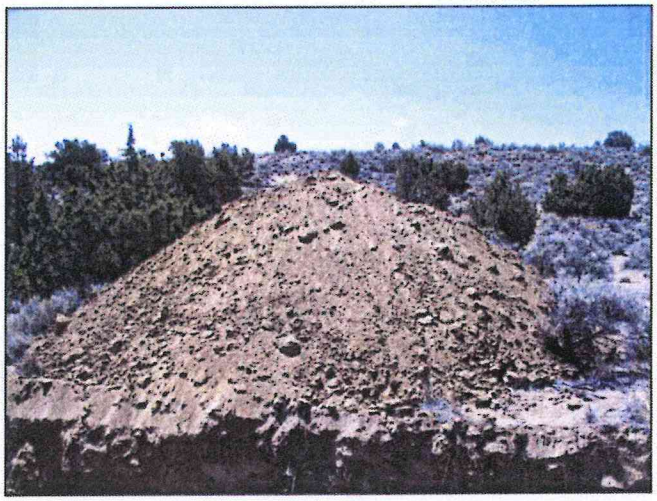


Figure 2 – Site and soil conditions associated with Test Pit 3 (TP-3).

EXPLORATION

The project was explored in June 2004 by excavating a series of 11 test pits using a Cat EL300B trackhoe. The approximate locations of the test pits are shown on Plate A-1 – Site Map and Approximate Test Pit Locations. The maximum depth of test pit advance was 18 feet below the existing ground surface. Bulk samples for index testing were collected from the trench walls at specific depths in each soil horizon.

Matrix Construction Services' personnel examined and classified all soils in the field in general accordance with ASTM D 2488 (Description and Identification of Soils). During exploration, representative bulk samples were placed in sealed plastic bags and returned to our Reno, Nevada laboratory for testing. Additional soil classifications, as well as verification of the field classifications, were subsequently performed in accordance with ASTM 2487 (Unified Soil Classification System [USCS]) upon completion of laboratory testing as described below in the **Laboratory Testing**

section. Logs of the test boring and test pits are presented as Plate A-2. A USCS chart has been included as Plate A-3 - Graphic Soils Classification Chart.

LABORATORY TESTING

All soil testing performed in the Matrix Construction Services' laboratory is conducted in accordance with the standards and methods described in Volume 4.08 (Soil and Rock; Dimension Stone; Geosynthetics) of the ASTM Standards.

Samples of significant soil types were analyzed to determine their in-situ moisture contents (ASTM D 2216), grain size distributions (ASTM D 422), and plasticity indices (ASTM D 4318). Results of these tests are shown on Plate B-1 - Index Test Results. The test results were used to classify the soils according the USCS (ASTM D 2487) and to verify the field logs, which were then updated.

GEOLOGIC AND GENERAL SOIL AND GROUNDWATER CONDITIONS

Based on the Geologic Map of Washoe and Storey Counties, Nevada (1969), the site is mapped in an area of Pliocene sedimentary units capping undifferentiated plutonic rocks, most commonly granodiorite. The soils/bedrock units encountered in our explorations typically consisted of clayey sand and silty sand locally capping granodiorite bedrock.

Groundwater was not encountered in any of our explorations.

SEISMIC HAZARDS

The Spanish Springs Valley area lies sandwiched between the Pah Rah Range to the east and Hungry Mountain to the west, within the Western extreme of the Basin and Range physiographic province. The Basin and Range is bounded by the seismically active zones of the Wasatch Front and the eastern front of the Sierra Nevada Mountains to the east and west, respectively.

The criteria for Quaternary earthquake fault evaluation has been formulated by a professional committee for the State of Nevada Seismic Safety Council, but has not yet been adopted by the State or Counties. These guidelines define active faults as those with evidence of displacement within the past 11,000 years (Holocene time). Those faults with evidence of displacement during Pleistocene time (11,000 to 2,000,000 years before present) are generally considered potentially active. Several north-south trending faults transect the older plutonic units but are

obscured by the younger Pliocene deposits and would therefore be considered inactive. No mapped faults transect the site.

Liquefaction is a loss of soil shear strength that can occur during a seismic event, as excessive pore water pressure, between the soil grains, is induced by cyclic shear stresses. This phenomenon is limited to unconsolidated, clean to silty sand (up to 35 percent non-plastic fines) lying below the ground water table (typically less than 40 feet deep). Based on the information obtained during our exploration and research programs, no liquefaction potential exists at the site due to the competent nature of the subgrade soil and bedrock and depth to groundwater.

DISCUSSION AND RECOMMENDATIONS

General Information

The following definitions characterize terms utilized in this report:

- Fine-grained soil possesses more than 40 percent by weight passing the number 200 sieve and exhibits a plasticity index lower than 15.
- Clay soil possesses more than 30 percent passing the number 200 sieve and exhibits a plasticity index greater than 15.
- Granular soil does not meeting the above criteria and has a maximum particle size less than 6-inches.

The recommendations provided herein, particularly under **Site Preparation, Grading and Filling, Foundation Design, Site Drainage** and **Quality Control** are intended to reduce risks of structural distress related to consolidation or expansion of native soils and/or structural fills. These recommendations, along with proper design and construction of the planned structure(s) and associated improvements, work together as a system to improve overall performance. If any aspect of this system is ignored or poorly implemented, the performance of the project will suffer. Barker Coleman has Matrix Construction Services, Inc., under contract to provide construction testing and observation services. Any evaluation of the site for the presence of surface or subsurface hazardous substances is beyond the scope of this study. When suspected hazardous substances are encountered during routine geotechnical investigations,

they are noted in the exploration logs and reported to the client. No such substances were identified during our exploration.

The test pits were excavated by backhoe at the approximate locations shown on the site plan. All test pits were backfilled upon completion of the field portion of our study. The backfill was compacted to the extent possible with the equipment on hand. However, the backfill was not compacted to the requirements presented herein under Grading and Filling. If structures, concrete flatwork, pavement, utilities or other improvements are to be located in the vicinity of any of the test pits, the backfill should be removed and re-compacted in accordance with the requirements contained in the soils report. Failure to properly compact backfill could result in excessive settlement of improvements located over test pits.

Structural areas referred to in this report include all areas of buildings, concrete slabs, asphalt pavements, as well as pads for any minor structures. All compaction requirements presented in this report are relative to ASTM D 1557[1].

Soil Profile Type Amplification Factors

The project is located within Seismic Zone 3, an area with a strong potential for ground shaking. In accordance with 1997 UBC guidelines, there are 6 different soil profile type amplification factors ranging from S_a to S_f. The recommended soil profile type amplification factor is based on two criteria: density (for soils based on SPT blow count data) or hardness (for bedrock sites), and soil and/or bedrock classification for sites with soil profiles that have been determined to a depth of 100-feet. However, if the soil profile has not been characterized to a depth of 100-feet, the UBC allows the use of a default soil type of S_d.

Site Preparation

All vegetation and topsoil is to be stripped and grubbed from structural areas. A minimum stripping depth of 0.3 to 0.5 feet is anticipated. Localized deeper areas may be required in areas of large brush and tress. Some vegetation could be placed in backyard non-structural fill areas at least 5 feet away from the structure footprint. Concentration of the vegetation must be avoided, since placing large concentrated layers of vegetation could lead to excessive settlement and subsequent surface depressions.

[1] • Relative compaction refers to the ratio (percentage of the in-place density of a soil divided by the same soil's maximum dry density) as determined by the ASTM D 1557 laboratory test procedure. Optimum moisture content is the corresponding moisture content of the same soil at its maximum dry density.

All areas to receive structural fill or structural loading should be densified to a minimum depth of 8-inches to at least 90 percent relative compaction in accordance with ASTM D 1557. It is recommended that soils have moisture contents of plus or minus 3 percent of optimum moisture (ASTM D1557) prior to densification. Higher moisture contents will be acceptable if the soil horizon is stable and density can be achieved in subsequent structural fill lifts. Scarification and moisture conditioning may be required to achieve the required soil moisture content recommendations.

Grading and Filling

Structural fill is defined as any material placed below structural elements, including; foundations, concrete slabs-on-grade, pavements, or any structure that derives support from the underlying soil. Granular and fine-grained soil generated on-site and free of vegetation, organic matter, and other deleterious material can be used as structural fill. If imported structural fill is required, it should be free of vegetation, organic matter, and other deleterious material and meet the requirements of Table 1.

TABLE 1 - GUIDELINE SPECIFICATION FOR IMPORTED STRUCTURAL FILL

Sieve Size	Percent by Weight Passing	
6 Inch	100	
¾ Inch	70 – 100	
No. 40	15 – 70	
No. 200	10 – 40	
Percent Passing No. 200 Sieve	**MAXIMUM LIQUID LIMIT**	**Maximum Plastic Index**
10 – 20	40	15
21 – 40	35	10

Adjustments to the recommended limits presented in Table 1 can be provided to allow the use of other granular, non-expansive material, including rock fills. Any such adjustments must be made and approved by the geological engineer, in writing, prior to importing fill to the site. Rock fills must consist of a 12-inch-minus, well-graded soil, placed and compacted in maximum 15-inch thick lifts. A soil fill or 3-inch minus rock fill is normally used for the final 12 inches of pad fills to facilitate fine grading and utility trenching.

Structural fill should be placed in maximum 12-inch thick (loose) level lifts or layers and densified to at least 90 percent relative compaction. The required moisture content of the soils prior to densification depends on the soil type and the moisture-density relationship test results (ASTM D1557). However, soils should have moisture contents of at least plus or minus 3 percent of optimum moisture (ASTM D1557). Higher moisture contents are acceptable if the soil lifts are stable and required relative compaction can be attained in the soil lift and subsequent soil lifts. Where structural fills exceed 5 feet in thickness the minimum compaction requirement shall be increased to 95 percent.

The maximum fill differential beneath a single structure shall be limited to 5 feet. As shown in Figure 3, overexcavation and replacement of insitu soils or extending foundations may be necessary to meet this requirement.

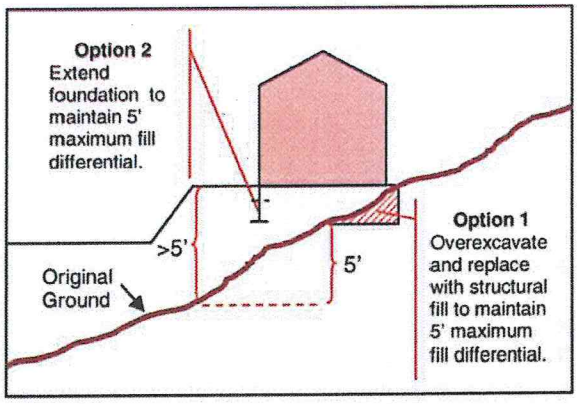


Figure 3 – Options for maintaining maximum fill differential beneath residences.

The exterior face of any embankment should be constructed with an inclination of no steeper than 2H:1V. The surface of the slope should be compacted to the same percent compaction as the body of the fill. This may be accomplished by compacting the surface of the embankment as it is constructed or by overbuilding the fill and cutting back to its compacted core. However, the cut away material should be placed and compacted as outlined above rather than left at the base of the slope.

Trenching and Excavation

Regulations amended in Part 1926, Volume 54, Number 209 of the Federal Register (Table B-1, October 31, 1989) require that the temporary sidewall slopes be no greater than those presented in Table 2. Temporary trenches with near vertical sidewalls should be relatively stable to a depth of approximately five feet. Excavations to greater depths will require shoring or laying back of sidewalls to maintain adequate stability.

TABLE 2 - MAXIMUM ALLOWABLE TEMPORARY SLOPES

Soil or Rock Type	Maximum Allowable Slopes[1] For Deep Excavations Less Than 20 Feet Deep[2]	
Stable Rock	Vertical	(90 degrees)
Type A[3] - cohesive, non-fissured soils, with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater	3H:4V	(53 degrees)
Type B - cohesive soils with an unconfined compressive strength between 0.5 and 1.5 tsf	1H:1V	(45 degrees)
Type C - unconfined compressive strength below 0.5 tsf	3H:2V	(34 degrees)

NOTES:

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off. Numerous additional factors and exclusions are included in the formal definitions.
2. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.
3. A short-term (open 24 hours or less) maximum allowable slope of 1H:2V (63 degrees) is allowed in excavations in Type A soil that are 12 feet or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet in depth shall be 3H:4V (53 degrees).

Based on the results of our exploration, it is our opinion that the bulk of the site soils appear to be predominately Type B, although variations exist. Areas with poorly graded sands with silt were encountered and these soils are classified as a Type C soil. All trenching should be performed and stabilized in accordance with local, state, and OSHA standards. Bank stability is the responsibility of the contractor, who is present at the site, able to observe changes in ground conditions, and has control over personnel and equipment.

Foundations

It is our understanding that spread footings will be utilized for this project. Provided the foundation soils have been prepared in accordance with the recommendations of this report, the bearing pressures presented in Table 3 can be utilized for design.

TABLE 3 – FOUNDATION ALLOWABLE BEARING PRESSURES

Loading Conditions	Maximum Soil Net Allowable Bearing Pressures[1] (pounds per square foot)
Dead Loads plus full time live loads	2,000
Dead Loads plus live loads, plus transient wind, or seismic loads.	2,700

NOTES:

1. The net allowable bearing pressure is that pressure at the base of the footing in excess of the adjacent overburden pressure.

For frost protection, footings should all be set at least two feet below adjacent outside or unheated interior finish grades. Footings not located within frost prone areas should be placed at least 12 inches below surrounding ground or slab level for confinement. Regardless of loading, individual pad foundations and continuous spread foundations should be at least 18 and 12 inches wide, respectively, or as required by code.

Lateral loads, such as wind or seismic, may be resisted by passive soil pressure and friction on the bottom of the footing. The recommended coefficient of base friction is 0.38, and has been reduced by a factor of 1.5 on the ultimate soil strength. Design values for active and passive equivalent fluid pressures are 33 and 300 pounds per square foot per foot of depth, respectively. In designing for passive pressure, the upper one-foot of the soil profile should not be included unless confined by a concrete slab, or pavement. These design values are based on spread footings bearing on native granular soils, native fine-grained soils, or structural fill and backfilled with structural fill.

If loose, soft, wet, or disturbed soils are encountered at the foundation subgrade, these soils should be removed to expose suitable foundation soils, and the resulting over-excavation backfilled with compacted structural fill. The base of all excavations should be dry and free of loose materials at the time of concrete placement.

Total settlement for the structures is anticipated to be on the order of 1 inch, or less. Differential settlement between foundations with similar loads and sizes is anticipated to be ½ of the total settlement.

Slope Stability and Erosion Control

Stability of cut and filled surfaces involves two separate aspects. The first concerns true slope stability related to mass wasting, landslides or the enmasse downward movement of soil or rock. Cut and fill slopes, with gradients of 2H:1V (horizontal to vertical) or flatter, are suitable for the project soils.

The second aspect of stability involves erosion potential and is dependent on numerous factors involving grain size distribution, cohesion, moisture content, slope angle and the velocity of the water or wind on the ground surface. Erosion protection should be in accordance with the City of Reno *Public Works Design Manual.*

Temporary (during construction) and permanent (after construction) erosion control will be required for all disturbed areas. The contractor shall prevent dust from being generated during construction in compliance with all applicable city, county, state and federal regulations, and shall submit an acceptable dust control plan to the Washoe County District Health Department prior to starting site preparation or earthwork. The project specifications should include an indemnification by the contractor of the owner and engineer for any dust generation during the construction period. The owner will be responsible for mitigation of dust after his acceptance of the project.

Site Drainage

Adequate surface drainage must be constructed and maintained away from the structures. The permanent finish slopes away from the structure should be sufficient to allow water to drain away quickly from and prevent any ponding of water adjacent to the structure. All runoff should be collected within permanent drainage paths that can convey water off the property. A system of roof gutters and downspouts is recommended to collect roof drainage and direct it away from the foundations.

Crawl space moisture is commonly associated with raised floor construction. Introduction of this moisture is due to several sources including, but not limited to: excessive landscape irrigation, poor site drainage, excessive precipitation, or leakage pools, ponds, irrigation lines, etc. In addition, it is common for water to seep into fill material, perch on the native or compacted soils, travel along the surface of the native or compacted soils, and daylight where the cut/fill line is exposed. This perched water can daylight in any number of locations such as slope faces, roadway subgrade, and crawl spaces.

Foundation and stem wall backfill should be densified to at least 90 percent relative compaction in accordance with the requirements given in Section 9.4 – Grading and Filling. Compacting the backfill material decreases permeability and reduces the amount of irrigation and storm water available to enter under floor areas.

We recommend the developer collect the moisture via drainage swales excavated along the interior of the perimeter footing and sloped the water to the sewer lateral and gravel bed the lateral from the crawl space to the sewer main. The trench should start out a minimum depth of 3 inches below footing grade and slope to the sewer lateral at approximately 1 percent, and

should be backfilled with drain rock. Once the swales are constructed, the entire crawl space should be covered with a moisture barrier (visqueen sheeting). Refer to Appendix D for a construction detail of the proposed drainage swale alternative.

Crawl space drainage systems are not a guarantee against sporadic wetting caused by large storms, unusually large and/or rapid snowmelt or plumbing leaks. The purpose of a crawl space drainage system is to reduce the amount of moisture that accumulates in the crawl space under normal conditions and to drain the moisture caused by an unusual condition within a few days or possibly weeks. Positive crawl space drainage does not insure that soils are dry, only that ponding water is not normally present. As with other design features of the residence, maintenance is required.

Moist to wet soils are normal in crawl spaces, particularly in the vicinity of the perimeter footings. Any perceived harmful effects from this moisture are usually alleviated by the proper installation of a visqueen vapor retarder placed over the crawl space surface. Crawl space vents should be open all year to help facilitate the evaporation and reduction of moisture.

Concrete Slabs

A compacted base with a minimum R-value of 60 shall underlie private concrete slabs-on-grade. Type 2, Class B aggregate base is the preferred alternative. However, other material types such as decomposed granite, or native poorly graded sand with silt meeting the R-value requirement is acceptable within private improvements such as patios, private walks, and driveways. The base material should be 6 inches beneath driveways and 4 inches beneath private flatwork. All dedicated and public easement improvements shall be constructed in accordance with the Standard Specifications for Public Works Construction.

We recommend that all concrete placement and curing be performed in accordance with procedures outlined by the American Concrete Institute. Special considerations should be given to concrete placed and cured during hot or cold weather conditions. Proper control joints and reinforcing should be provided to minimize any damage resulting from shrinkage.

Asphaltic Concrete

The minimum structural section for roadways within Washoe County is 3 inches of asphaltic concrete and 6 inches of base material with a Type II Slurry Seal. Based on our analyses, the minimum structural section can be used for the streets within the subdivision.

All roadway construction shall be in accordance with the approved plans and the Standard Specifications for Public Works Construction. Roadway subgrade shall be prepared in accordance with the requirements of this report. The Contractor should submit a pavement mix design to the Owner, for approval, at least 5 working days prior to paving. When pavement is placed directly adjacent to concrete flatwork, the finish compacted grade of the pavement be at least ½ of an inch higher than the edge of adjacent concrete surface to allow adequate compaction of the pavement without damaging the concrete.

Asphalt Design Life

Maintenance is **mandatory** to long-term pavement performance. Maintenance refers to any activity performed on the pavement that is intended to preserve its original service life or load-carrying capacity. Examples of maintenance activities include patching, crack or joint sealing, and seal coats. If these maintenance activities are ignored or deferred, premature failure of the pavement **will occur**.

The cost associated with proper maintenance is generally much less than the cost for reconstruction due to the premature failure of the pavement. Therefore, since pavement quality is an integral consideration in the formulation of our design recommendations, we strongly recommend the owner/project manager implement a pavement management program.

Premature failure of asphaltic concrete frequently occurs adjacent to poorly graded ponding areas and/or landscape areas. Failures may occur due to excessive precipitation, irrigation and landscaping water infiltrating into the subgrade soils causing subgrade failure. As such, in areas where saturation of the subgrade soils beneath asphaltic pavement may occur, we strongly recommend the owner/project manager install a subdrain system to eliminate the potential for saturation of subgrade soils. The subdrain system should discharge into a permanent drainage area that will not impede drainage flow to cause the system to back-up and/or clog. Appropriate maintenance procedures should be implemented to ensure the subdrain system does not plug and allow for proper drainage of surface and subsurface water beneath paved areas. Subdrain

location and configuration should be evaluated once final grading and landscaping plans have been prepared. If the ultimate traffic exceeds the anticipated levels, it may be necessary to reevaluate and overlay the pavement at some time in the future.

CONSTRUCTION OBSERVATION AND TESTING SERVICES

Matrix Construction Services is currently under contract to provide testing and observation services during site preparation, grading, over-excavation, fill placement, and paving. These observations would allow us to document that the geotechnical conditions are as anticipated and that the contractor's work meets with the criteria in the approved plans and specifications.

STANDARD LIMITATION CLAUSE

This report has been prepared in accordance with generally accepted local geotechnical practices. The analyses and recommendations submitted are based upon field exploration performed at the locations shown on Plate A-1 – Site Plan of this report. This report does not reflect soils variations that may become evident during the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to document compliance with our recommendations. The owner/project manger is responsible for distribution of this geotechnical report to all designers and contractors whose work is related to geotechnical factors.

All plans and specifications should be reviewed by the design engineer responsible for this geotechnical report, to determine if they have been completed in accordance with the recommendations contained in this report, prior to submitting to the building department for review. It is the owner's/project manager responsibility to provide the plans and specifications to the engineer.

This report has been prepared to provide information allowing the architect and engineer to design the project. The owner/project manager is responsible for distribution of this report to all designers and contractors whose work is affected by geotechnical aspects. In the event of changes in the design, location, or ownership of the project after presentation of this report, our recommendations should be reviewed and possibly modified by the geotechnical engineer. If the geotechnical engineer is not accorded the privilege of making this recommended review, he can assume no responsibility for misinterpretation or misapplication of his recommendations or their validity in the event changes have been made in the original design concept without his

prior review. The engineer makes no other warranties, either expressed or implied, as to the professional advice provided under the terms of this agreement and included in this report.

REFERENCES

American Society for Testing and Materials (ASTM), 1993, *Soil and Rock; Dimension Stone; Geosynthetics,* Volume 4.08.

The Asphalt Institute, 1991, *Thickness Design - Asphalt Pavements for Highways and Streets,* Manual Series No. 1 (MS-1).

Bonham, Harold F., *Geology and Mineral Deposits of Washoe and Storey Counties,* Nevada (1969), Nevada Bureau of Mines and Geology, Bulletin 70

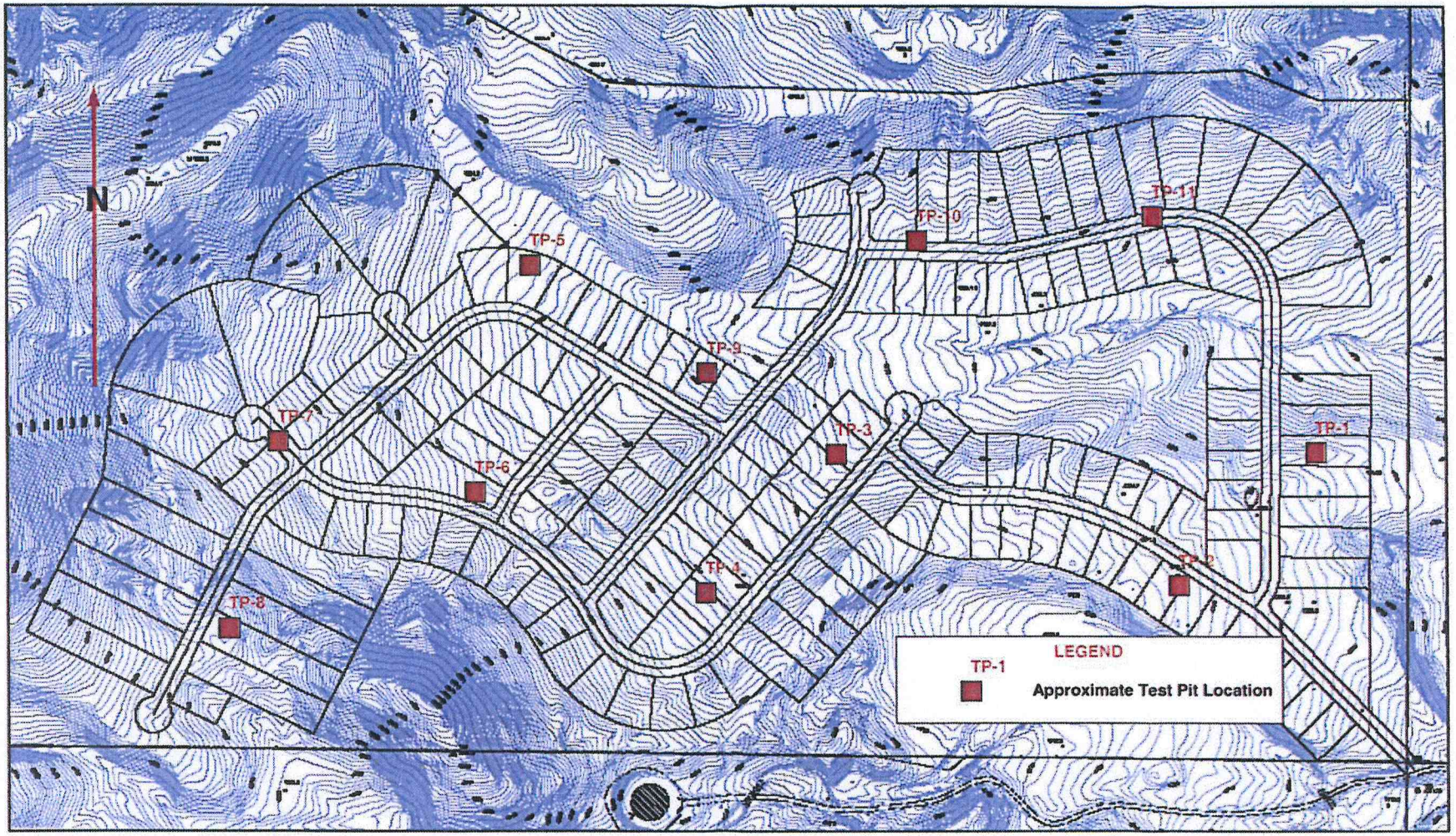
Bowles, J. E., 1996, *Foundation Analysis and Design,* McGraw Hill.

Sowers, George, F., 1979, *Introductory Soil Mechanics and Foundations: Geotechnical Engineering*

Standard Specifications for Public Works Construction, 1996 (Washoe County, Sparks-Reno, Carson City, Yerington, Nevada).

Uniform Building Code, 1997.; *International Conference of Building Officials.*

APPENDIX A



SITE PLAN AND APPROXIMATE TEST PIT LOCATIONS
(nts)

Matrix Construction Services, Inc.
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BROKEN HILLS
Site Plan
Plate A-1

LOG OF TEST PIT NO. 1

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4750'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC			B	1	D/M	0 – 4 ½' Clayey Sand with occasional Gravel (SC) – dense, dry to moist, brown, moderate vegetation	> 4.5		13.5%-200 NP
2										
3										
4				B						
5	Kgd					D/M	4 ½ - 10' Granodiorite (Kgd) – hard, strong, moderately weathered, little fracturing			
6										
7										
8										
9										
10							Bottom of Test Pit @ 10 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		6/29/2004	M - MOIST
▼				W - WET
NE- No Free Water Encountered				V-VERY MOIST
				S- SLIGHTLY MOIST

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS
A- Atterberg Limits
B- Grain Size Distribution
C- Consolidation
MD- Moisture/Density
DS - Direct Shear

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Plate
A-2

LOG OF TEST PIT NO. 2

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4775'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC			B		D/M	0 – 2' Clayey Sand with occasional Gravel (SC) – very dense, dry to moist, brown	> 4.5		
2 – 10	Kgd					D	2 – 10' Granodiorite (Kgd) – hard, strong, deeply weathered at surface			

Bottom of Test @ 10 Feet
No Free Water Encountered

GROUNDWATER & SOIL MOISTURE					SAMPLE TYPE		LABORATORY TESTS
	Depth	Hour	Date	D - DRY	A - Drill Cuttings	B - Bulk Sample	A- Atterberg Limits
▽	NE		6/29/2004	M - MOIST	C - CME Sample	R - Rotary Cuttings	B- Grain Size Distribution
▼				W - WET	S- 2" O.D. 1.38" I.D. Tube Sample		C- Consolidation
NE- No Free Water Encountered				V-VERY MOIST	U- 3" O.D. 2.42 " I.D. Tube Sample		MD- Moisture/Density
				S- SLIGHTLY MOIST	T- 3" O.D. Thin-Walled Shelby Tube		DS - Direct Shear

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Plate
A-2

LOG OF TEST PIT NO. 3

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4779'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC					M	0 – 6 ½' Clayey Sand with Gravel (SC) – very dense, moist, brown	> 4.5		
2										
3										
4				B						
5										
6										
7	SP/SM					M	6 ½ - 12' Poorly Graded Sand with Silt (SP/SM) – dense, moist, brown			
8										
9										
10										
11										
12							Bottom of Test Pit @ 12 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	
▽	NE		6/29/2004	
▼				
NE- No Free Water Encountered				

GROUNDWATER & SOIL MOISTURE	SAMPLE TYPE	LABORATORY TESTS
D - DRY	A - Drill Cuttings / B - Bulk Sample	A- Atterberg Limits
M - MOIST	C - CME Sample / R - Rotary Cuttings	B- Grain Size Distribution
W - WET	S- 2" O.D. 1.38" I.D. Tube Sample	C- Consolidation
V-VERY MOIST	U- 3" O.D. 2.42 " I.D. Tube Sample	MD- Moisture/Density
S- SLIGHTLY MOIST	T- 3" O.D. Thin-Walled Shelby Tube	DS - Direct Shear

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Plate
A-2

LOG OF TEST PIT NO. 4

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4814'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC					D/M	0 – 5' Clayey Sand with occasional Gravel (SC) – very dense, dry to moist, brown			
2										
3				B	2					2.1%-200 NP
4										
5	SM					D/M	5 – 14' Silty Sand with occasional Gravel (SM) – dense, dry to moist, brown			
6										
7										
8										
9										
10										
11										
12										
13										
14							Bottom of Test Pit @ 14 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		6/29/2004	M - MOIST
▼				W - WET
NE- No Free Water Encountered				V-VERY MOIST
				S- SLIGHTLY MOIST

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS	
A-	Atterberg Limits
B-	Grain Size Distribution
C-	Consolidation
MD-	Moisture/Density
DS -	Direct Shear

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Plate
A-2

LOG OF TEST PIT NO. 5

PROJECT NAME:	Broken Hills
LOCATION:	See Site Plan - Finishing Area
DATE:	6/29/2004

PROJECT NUMBER:	1083.01
SURFACE ELEVATION:	4824'
EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC						0 – 10' Clayey Sand with occasional Gravel (SC) – very dense, moist, brown			
2										
3										
4										
5							Excavation difficult from 5 feet	> 4.5		
6										
7										
8										
9										
10							Bottom of Test Pit @ 10 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		6/29/2004	M - MOIST
▼				W - WET
NE- No Free Water Encountered				V-VERY MOIST
				S- SLIGHTLY MOIST

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS	
A-	Atterberg Limits
B-	Grain Size Distribution
C-	Consolidation
MD-	Moisture/Density
DS -	Direct Shear

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Plate
A-2

LOG OF TEST PIT NO. 6

PROJECT NAME:	Broken Hills
LOCATION:	See Site Plan - Finishing Area
DATE:	6/29/2004

PROJECT NUMBER:	1083.01
SURFACE ELEVATION:	4841'
EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC					D/M	0 – 7' Clayey Sand with occasional Gravel (SC) – very dense, dry to moist, brown			
2										
3										
4										
5				B						
6										
7										

Refusal @ 7 Feet
No Free Water Encountered

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		6/29/2004	M - MOIST
▼				W - WET
NE- No Free Water Encountered				V-VERY MOIST
				S- SLIGHTLY MOIST

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS	
A-	Atterberg Limits
B-	Grain Size Distribution
C-	Consolidation
MD-	Moisture/Density
DS -	Direct Shear

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Plate
A-2

LOG OF TEST PIT NO. 7

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4881'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1–7	SC			B			0 – 8' Clayey Sand with occasional Gravel (SC) – very dense, dry, brown			
8–9	SM						8 – 10' Silty Sand with occasional Gravel (SM) – dense, moist, brown			
10–11	Kgd						10 – 12' Granodiorite (Kgd) – very little fracturing, moderately hard, weak, deeply weathered			
12							Bottom of Test Pit @ 12 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		6/29/2004	M - MOIST
▼				W - WET
NE- No Free Water Encountered				V-VERY MOIST
				S- SLIGHTLY MOIST

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS
A- Atterberg Limits
B- Grain Size Distribution
C- Consolidation
MD- Moisture/Density
DS - Direct Shear

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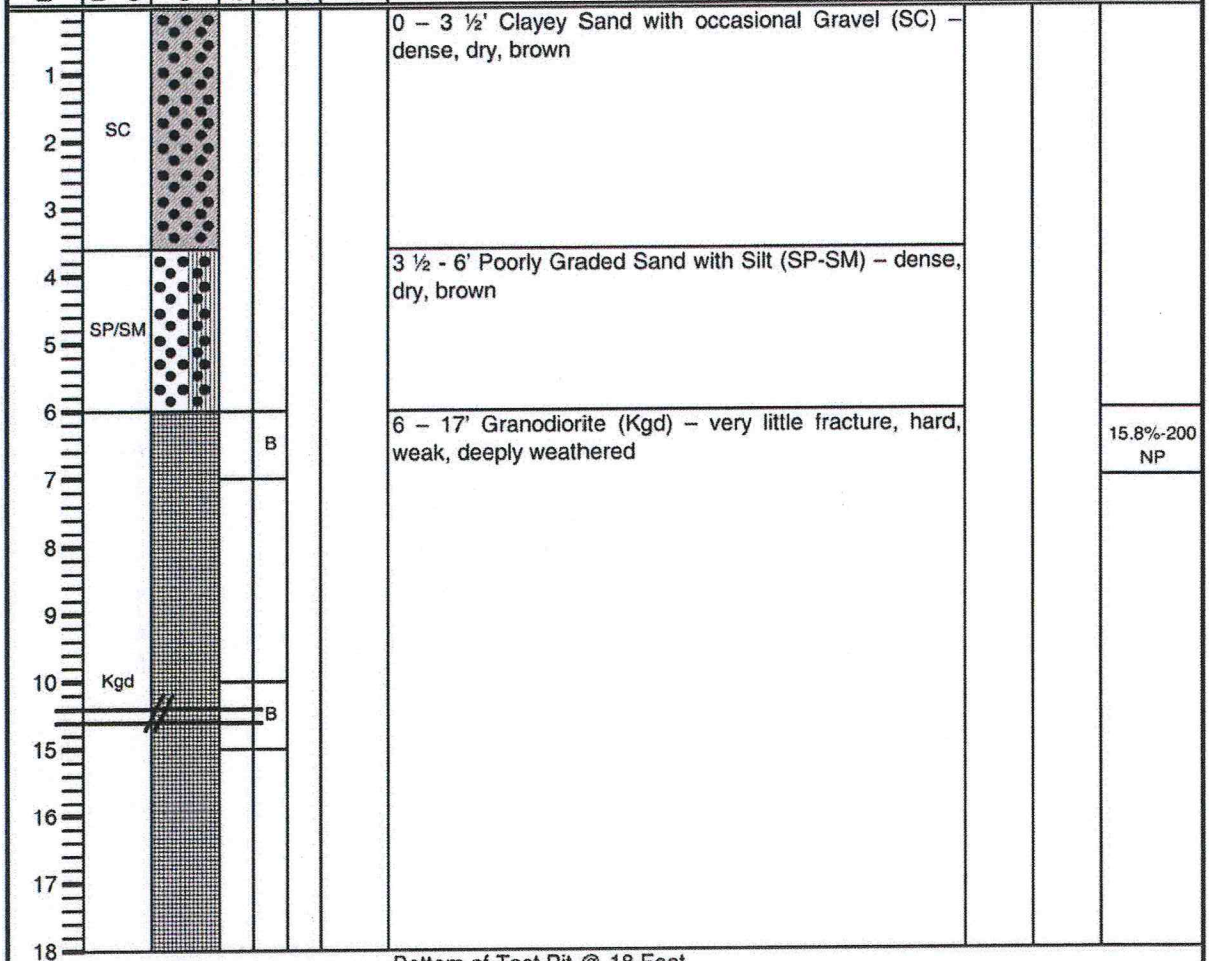
Plate
A-2

LOG OF TEST PIT NO. 8

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4938'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B



GROUNDWATER & SOIL MOISTURE					SAMPLE TYPE		LABORATORY TESTS
	Depth	Hour	Date	D - DRY	A - Drill Cuttings	B - Bulk Sample	A- Atterberg Limits
▽	NE		6/29/2004	M - MOIST	C - CME Sample	R - Rotary Cuttings	B- Grain Size Distribution
▼				W - WET	S- 2" O.D. 1.38" I.D. Tube Sample		C- Consolidation
NE- No Free Water Encountered				V-VERY MOIST	U- 3" O.D. 2.42 " I.D. Tube Sample		MD- Moisture/Density
				S- SLIGHTLY MOIST	T- 3" O.D. Thin-Walled Shelby Tube		DS - Direct Shear

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Plate
A-2

LOG OF TEST PIT NO. 9

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4897'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC			B			0 – 10 ½' Clayey Sand with occasional Gravel (SC) – dense, moist, brown			
2										
3										
4										
5										
6										
7										
8							cobbles at 8 feet			
9										
10										

Bottom of Test Pit @ 10 ½ Feet
No Free Water Encountered

GROUNDWATER & SOIL MOISTURE				
	Depth	Hour	Date	D - DRY
▽	NE		6/29/2004	M - MOIST
▼				W - WET
NE- No Free Water Encountered				V-VERY MOIST
				S- SLIGHTLY MOIST

SAMPLE TYPE	
A - Drill Cuttings	B - Bulk Sample
C - CME Sample	R - Rotary Cuttings
S- 2" O.D. 1.38" I.D. Tube Sample	
U- 3" O.D. 2.42 " I.D. Tube Sample	
T- 3" O.D. Thin-Walled Shelby Tube	

LABORATORY TESTS
A- Atterberg Limits
B- Grain Size Distribution
C- Consolidation
MD- Moisture/Density
DS - Direct Shear

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Plate
A-2

LOG OF TEST PIT NO. 10

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4771'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC						0 – 13' Clayey Sand with occasional Gravel (SC) – very dense, dry to moist, brown			
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13							Bottom of Test Pit @ 13 Feet No Free Water Encountered			

GROUNDWATER & SOIL MOISTURE					SAMPLE TYPE		LABORATORY TESTS
	Depth	Hour	Date	D - DRY	A - Drill Cuttings	B - Bulk Sample	A- Atterberg Limits
▽	NE		6/29/2004	M - MOIST	C - CME Sample	R - Rotary Cuttings	B- Grain Size Distribution
▼				W - WET	S- 2" O.D. 1.38" I.D. Tube Sample		C- Consolidation
NE- No Free Water Encountered				V-VERY MOIST	U- 3" O.D. 2.42 " I.D. Tube Sample		MD- Moisture/Density
				S- SLIGHTLY MOIST	T- 3" O.D. Thin-Walled Shelby Tube		DS - Direct Shear

MATRIX CONSTRUCTION SERVICES
INCORPORATED
4741 Caughlin Parkway, Suite 1-B
Reno, Nevada 89509
Phone 775.828.1866 Fax 775.828.1871

Plate
A-2

LOG OF TEST PIT NO. 11

PROJECT NAME:	Broken Hills	PROJECT NUMBER:	1083.01
LOCATION:	See Site Plan - Finishing Area	SURFACE ELEVATION:	4747'
DATE:	6/29/2004	EXPLORATION EQUIPMENT:	EL 300B

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1 – 5	SC						0 – 5' Clayey Sand with occasional Gravel (SC) – dense, dry to moist, brown			
5 – 11	SM			B			5 – 11 ½' Silty Sand with occasional Gravel (SM) – dense, moist, brown			

Bottom of Test Pit @ 11 ½ Feet
No Free Water Encountered

GROUNDWATER & SOIL MOISTURE					SAMPLE TYPE		LABORATORY TESTS	
	Depth	Hour	Date	D - DRY	A - Drill Cuttings	B - Bulk Sample	A- Atterberg Limits	
▽	NE		6/29/2004	M - MOIST	C - CME Sample	R - Rotary Cuttings	B- Grain Size Distribution	
▼				W - WET	S- 2" O.D. 1.38" I.D. Tube Sample		C- Consolidation	
NE- No Free Water Encountered				V-VERY MOIST	U- 3" O.D. 2.42 " I.D. Tube Sample		MD- Moisture/Density	
				S- SLIGHTLY MOIST	T- 3" O.D. Thin-Walled Shelby Tube		DS - Direct Shear	

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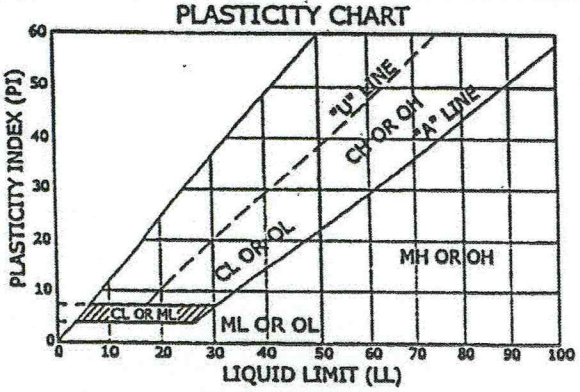
Plate
A-2

MAJOR DIVISION				TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC	CLAYEY GRAVELS, CLAYEY GRAVLS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP	POORLY GRADED SAND WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS WITH OR WITHOUT GRAVEL
			SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SANDS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILT AND CLAYS LIQUID LIMIT 50% OR LESS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILT AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH	INORGANIC SILTS, MICACEOUS OR DIATAMACEOUS FINE SANDY OR SILTY SOLID, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC SILTS OR CLAYS MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

PLASTICITY CHART



CONSISTENCY		RELATIVE DENSITY	
SILTS & CLAYS	SPT BLOW* COUNTS (N)	SANDS & GRAVELS	SPT BLOW* COUNTS (N)
VERY SOFT	0-2	VERY LOOSE	0-4
SOFT	3-4	LOOSE	5-10
MEDIUM STIFF	5-8	MEDIUM DENSE	11-30
STIFF	9-15	DENSE	31-50
VERY STIFF	16-30	VERY DENSE	50+
HARD	30+		

* The Standard Penetration Resistence (N) in blows per foot is obtained by the ASTM D1586 procedure using 2" O.D., 1 3/8" I.D. samplers.

DESCRIPTION OF ESTIMATED PERCENTAGES OF GRAVEL, SAND, AND FINES	
TRACE	Particles are present but est. < 5%
FEW	5%-10%
LITTLE	15%-20%
SOME	30%-45%
MOSTLY	50%-100%

NOTE: Percentages are presented within soil description for soil horizon with laboratory tested soil samples.

DEFINITIONS OF SOIL FRACTIONS	
SOIL COMPONENT	PARTICLE SIZE RANGE
COBBLES	ABOVE 3 INCHES
GRAVEL	3 IN. TO NO. 4 SIEVE
COARSE GRAVEL	3 IN. TO 3/4 IN.
FINE GRAVEL	3/4 IN. TO NO. 4 SIEVE
SAND	NO. 4 TO NO. 200
COARSE SAND	NO. 4 TO NO. 10
MEDIUM SAND	NO. 10 TO NO. 40
FINE SAND	NO. 40 TO NO. 200
FINES (SILTS OR CLAYS)	BELOW NO. 200 SIEVE

MATRIX CONSTRUCTION SERVICES, INC.
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UNIFIED SOIL CLASSIFICATION SYSTEM AND KEY TO SOIL DESCRIPTION

Scale:	NTS
Date:	DEC 2003
Sheet No:	A-3

SUMMARY OF TEST RESULTS

EAGLE CANYON - BROKEN HILLS

Sample	TP-1	TP-4	TP-8
Depth (ft)	1 - 3'	3 - 5'	6 - 7'
Sample No.	1	2	3
Sieve Size	Pecent Passing by Weight		
2"			
1 1/2"			
1"	100	100	
3/4"	99	98	100
1/2"	98	95	99
3/8"	97	93	90
# 4	94	85	80
# 10	75	68	58
# 40	31	37	18
# 100	19	23	5
# 200	13.5	15.8	2.1
% Moisture	4.1	2.9	2.1
Liquid Limit	-	-	-
Plasticity Index	NP	NP	NP
Classification	SM	SM	SP

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LABORATORY TEST RESULTS

Project No.:	1083.01
Date:	8/4/2004
Plate No:	A-4

June 6, 2007
Project No. 1422.01

Mr. Karl Matzoll, PE
RIGHTWAY INVESTMENTS
5945 Los Altos Parkway, Suite 101
Sparks, Nevada 89436

RE: GEOTECHNICAL ADDENDUM
BROKEN HILLS – PHASE 1

Dear Mr. Matzoll:

This letter presents our update to the Broken Hills geotechnical report originally prepared by our firm under the name of Matrix Construction Services in August, 2004 and subsequently updated by James Edward Engineering in March, 2007. Two retention basins, associated with the natural drainage that runs through the development area, are planned. This addendum specifically addresses percolation tests performed for use in the evaluation and design of those retention basins. Unless specifically modified in this addendum, our opinions and recommendations stated in the original geotechnical report are applicable (Appendix B).

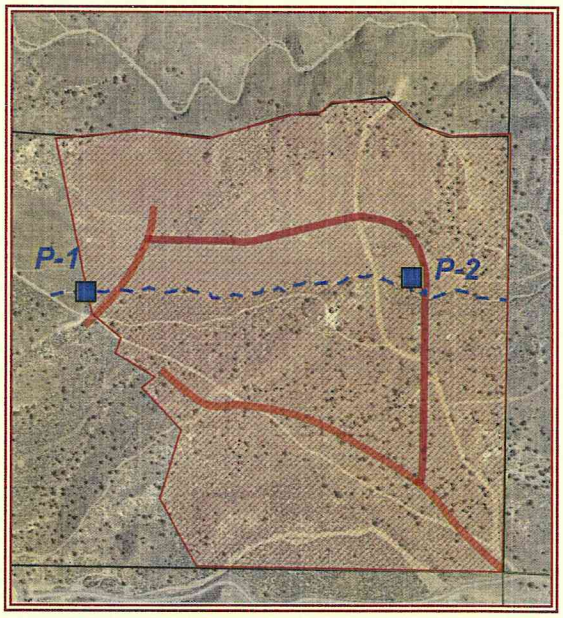

FIGURE 1 – Site Plan and Approximate Exploration Locations

The site was explored by excavating two additional test pits near or within the limits of the proposed retention basins utilizing a Deere 410 E backhoe. In P-1, the profile encountered typically consisted of sandy clay capping weathered bedrock. The bedrock has typically been weathered and decomposed to excavate to as dense, clayey sand to sandy clay. The fines associated with the weathered bedrock are medium to highly plastic. In P-2 the soils consisted of silty sand. The soil profiles are presented on Plates A-1a and b of this update letter.

Percolation testing was performed in accordance with the standards established by Washoe County. Two tests were performed in each test pit at depths of 1 and 3 feet. Individual percolation test results are presented on Plates A-1a and b. On average however, the percolation rate associated with P-1 could be considered 60 minutes per inch, and the percolation rate associated with P-2 could be considered 3 minutes per inch.

The soils generated during grading of the retention ponds can be used to construct any berms and embankments associated with the ponds. The soils associated with P-1 will be clayey and once compacted relatively impermeable. The soils associated with P-2 will be granular, and although compact will readily allow seepage into the embankment. Prior to constructing any berms or embankments the subgrade shall be cleared, grubbed, and compacted as prescribed in the geotechnical report prepared for the project. The embankment fills are considered structural and should be compacted to not less than 90 percent of the soils maximum dry density in accordance with ASTM D 1557. Due to the presence of clay soils, the embankment fills associated with P-1 shall be moisture conditioned to at least optimum prior to compacting.

We appreciate the opportunity to provide these services for you. Please do not hesitate to contact our office should you have any related questions or comments.

Sincerely,

JAMES EDWARD ENGINEERING
I N C O R P O R A T E D

James G. Smith, PE
President

PROFESSIONAL ENGINEER-STATE OF NEVADA
MISCHELLE J. SMITH
Exp. 6-30-08
CIVIL
No. 6972

Mischelle J. Smith, PE
Engineering Manager
RE Number 6972
Expires 6/30/08

Cc: Mr. Todd Gammill – Wood Rodgers Consulting

JGS:MJS:jm

LOG OF TEST PIT NO. P-1

PROJECT NAME:	BROKEN HILLS - PONDS	PROJECT NUMBER:	1422.01
LOCATION:	SEE PLAN	SURFACE ELEVATION:	SEE PLAN
DATE:	5-22-07 & 5-23-07	EXPLORATION EQUIPMENT:	DEERE 410E

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SC					D	0 - 1' **Clayey Sand (SC)** - loose, dry, brown			
2	CL					S	1 - 2 ½' **Sandy Clay (CL)** - stiff to hard, slightly moist, red brown (medium to highly plastic fines)			55 min/in
3	BEDROCK					S	2 ½ - 6' **BEDROCK** - Intensely weathered and decomposed to excavate as dense to very dense **Clayey Sand (SC)** (estimated 35% medium plastic fines, 65% sand)			60 min/in
4										
5										
6										

Bottom of Test Pit @ 6 Feet
No Free Water Encountered

Test @ 12"					
Time	Drop	Min/In	Time	Drop	Min/In
9:43	15/16	32	12:22	8/16	60
10:13			12:52		
10:15	6/16	80	12:54	9/16	53
10:45			1:24		
10:47	7/16	69	1:25	9/16	53
11:17			1:55		
11:19	9/16	53			
11:49					
11:50	10/16	48			
12:20					

Test @ 36"					
Time	Drop	Min/In	Time	Drop	Min/In
9:47	1 10/16	18	12:25	9/16	53
10:17			12:55		
10:19	10/16	48	12:57	9/16	53
10:49			1:27		
10:50	10/16	48	1:30	8/16	60
11:20			2:00		
11:21	9/16	53			
11:51					
11:53	10/16	48			
12:23					

GROUNDWATER & SOIL MOISTURE				SAMPLE TYPE		LABORATORY TESTS
	Depth	Hour	Date	**D** - DRY	**A** - Drill Cuttings / **B** - Bulk Sample	**A**- Atterberg Limits
▽	NE		5/22/2007	**S** - SLIGHTLY MOIST	**C** - CME Sample / **R** - Rotary Cuttings	**B**- Grain Size Distribution
▼				**M** - MOIST	**S**- 2" O.D. 1.38" I.D. Tube Sample	**C**- Consolidation
NE- No Free Water Encountered				**V** - VERY MOIST	**U**- 3" O.D. 2.42 " I.D. Tube Sample	**MD**- Moisture/Density
				W - WET	**T**- 3" O.D. Thin-Walled Shelby Tube	**DS** - Direct Shear

JAMES EDWARD ENGINEERING
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Phone 775.828.1866 Fax 775.828.1871

Plate
A-2

LOG OF TEST PIT NO. P-2

PROJECT NAME:	BROKEN HILLS - PONDS	PROJECT NUMBER:	1422.01
LOCATION:	SEE PLAN	SURFACE ELEVATION:	SEE PLAN
DATE:	5/22/2007	EXPLORATION EQUIPMENT:	DEERE 410E

Depth in Feet	Unified Soil Classification	Graphical Log	Sample	Sample Type	Sample No.	Moisture	Visual Description	Pocket Penetrometer (tsf)	Moisture Content (% of Dry Weight)	Laboratory Tests
1	SM					D	0 - 1 ½' **Silty Sand (SM)** - loose, dry, brown			
2	SC					D	1 ½ - 2 ½' **Clayey Sand (SC)** - medium dense, dry, brown			2 min/in
3	SP					S	2 ½ - 6' **Poorly Graded Sand (SP) with some Gravel** - dense, slightly moist, brown			3 min/in
4										
5										
6										

Bottom of Test Pit @ 6 Feet
No Free Water Encountered

Test @ 12"					
Time	Drop	Min/In	Time	Drop	Min/In
11:19	4 2/16	1	11:50	4 10/16	1
11:23			11:55		
11:25	4 13/16	1	11:56	4	2
11:29			12:03		
11:31	4 9/16	1	12:03	4 2/16	2
11:35			12:10		
11:39	3 15/16	1	12:11	4 8/16	2
11:43			12:19		
11:43	5 4/16	1	12:19	3 2/16	2
11:49			12:25		

Test @ 36"					
Time	Drop	Min/In	Time	Drop	Min/In
11:17	4 8/16	2	12:13	3 3/16	3
11:27			12:23		
11:28	4 7/16	2			
11:36					
11:37	3 15/16	3			
11:47					
11:48	2 11/16	4			
11:58					
12:02	3	3			
12:12					

GROUNDWATER & SOIL MOISTURE				SAMPLE TYPE		LABORATORY TESTS
	Depth	Hour	Date	D - DRY	A - Drill Cuttings / B - Bulk Sample	A- Atterberg Limits
▽	NE		5/22/2007	S - SLIGHTLY MOIST	C - CME Sample / R - Rotary Cuttings	B- Grain Size Distribution
▼				M - MOIST	S- 2" O.D. 1.38" I.D. Tube Sample	C- Consolidation
NE- No Free Water Encountered				V - VERY MOIST	U- 3" O.D. 2.42 " I.D. Tube Sample	MD- Moisture/Density
				W - WET	T- 3" O.D. Thin-Walled Shelby Tube	DS - Direct Shear

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Plate
A-2

PRELIMINARY DRAINAGE REPORT

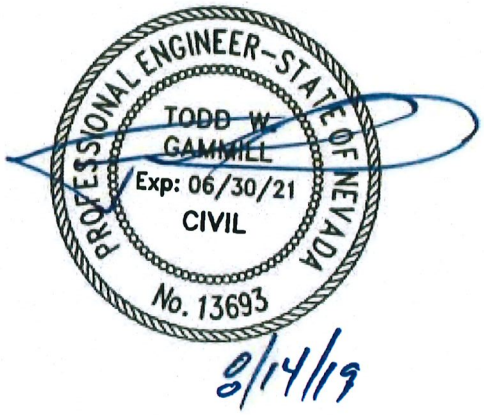
FOR

BROKEN HILLS WATER TANK SPECIAL USE PERMIT

Prepared for:

Barker Coleman Investments Broken Hills, LLC
539 Riverside Drive
Reno NV 89502

August 14, 2019



Prepared by:
Wood Rodgers Inc.
1361 Corporate Boulevard
Reno, Nevada 89502
(775) 823-4068
Todd Gammill, PE – Associate

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
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TABLE OF CONTENTS

APPENDIX

1 INTRODUCTION

This report shall serve as the preliminary drainage report for the Broken Hills Water Tank Special Use Permit (SUP), a domestic water tank and access road project. The site is located approximately 1.5 miles northwest of the intersection of Eagle Canyon Road and Calle de la Plata. Access to the project site is currently provided via jeep roads, which can be accessed off of Kinglet Drive through Eagle Canyon II, Unit 7. The project site is identified by the Washoe County Assessor's Office as APN 089-621-01.

A Vicinity Map is included in the **Appendix** of this report for reference. As this report is preliminary in nature, a more detailed study will need to be conducted and a final drainage report will need to be submitted with the final improvement plans for the project.

1.1 HISTORIC DRAINAGE

The existing site is undeveloped with terrain sloping for west to east. Storm runoff leaving the site flows south and east through Sparks and eventually to the Truckee River.

1.2 REGULATORY PERSPECTIVE

The Broken Hills Water Tank SUP site is located within Washoe County jurisdiction and therefore falls under its jurisdiction. Hydrologic and hydraulic calculations were completed per the standards contained within the Truckee Meadows Regional Drainage Manual (TMRDM) and Washoe County Development Code. The drainage facilities will be private and maintained by TMWA.

1.3 FEMA FLOOD HAZARD INFORMATION

The Broken Hills Water Tank SUP site is located within FEMA Flood Zone 'X', areas of minimal flood hazard outside the 0.2% (500-year) annual chance floodplain.

2 PRELIMINARY DESIGN

The proposed project consists of a TMWA water tank and associated access road grading. The alignment of the access road requires crossing of two drainage ways, and culverts will be placed at existing drainage way flowlines to convey storm flows underneath the access road.

The preliminary grading for the site is depicted on Sheet G-1 of 4, Grading Plan, of the "Broken Hills Tank and Access Road" plans by Matzoll Development Consultants. A reduced copy of the grading plan is included in the **Appendix**, but full size copies are included with the SUP package, which this report is intended to supplement. The grading as shown is intended to keep proposed drainage consistent with the existing drainage, and to allow the site to drain to an existing detention basin to the east, just south and west of the terminus of Kinglet Drive.

3 HYDROLOGIC ANALYSIS

The Army Corps of Engineers HEC-HMS software was used to determine storm flow magnitude in the 100-year, 24 hour storm using precipitation data from NOAA Atlas 14. Existing drainage basins were identified using USGS data and two separate basins affect the alignment of the access road, depicted as basins E-1 and E-2 in the associated figures in the **Appendix**. It is not anticipated that detention will be required, as the ratio of developed area to existing area is extremely small. Relatively small drainage areas will need to be analyzed for areas around the tank and access that may require small drainage ditches. Those basins were not analyzed with this preliminary study and will need to be analyzed during final design. The intent of this report is to analyze the large scale drainage basins and drainage way crossings.

4 HYDRAULIC ANALYSIS

Where the existing drainages cross the access road alignment, culverts are proposed. Basin E-2 is proposed to be conveyed under the access road via a 24" culvert, and the combination of Basins E-1 and E-2 will be conveyed under the access road via either a 4' high by 8' wide concrete box culvert or dual 48" CMP pipes. Preliminary culvert calculations are provided in the **Appendix** for the three scenarios. Headwall configuration and erosion control protection for the inlet and outlet conditions will need to be provided with final design and are not contemplated with this preliminary report.

5 CONCLUSIONS

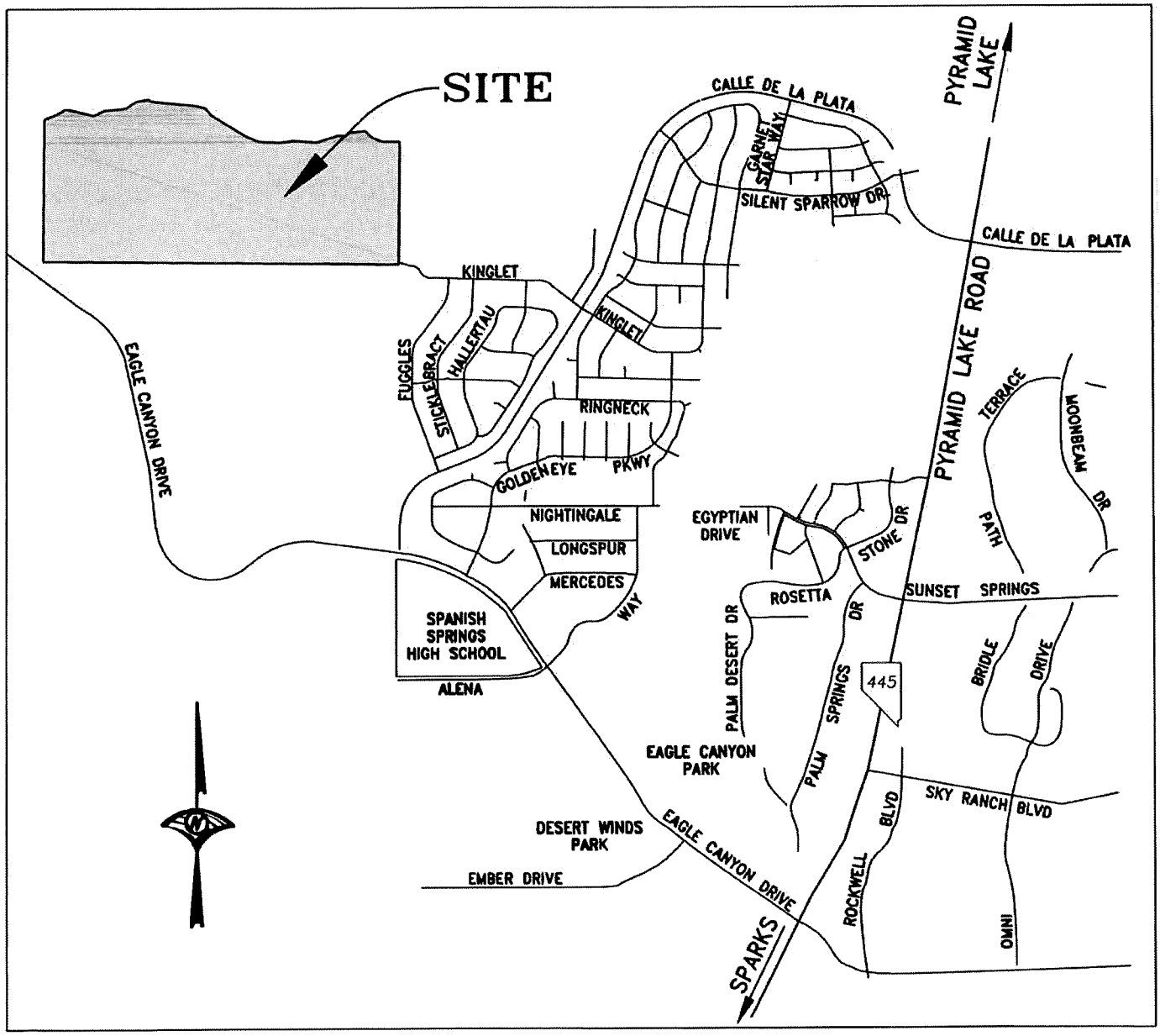
The drainage facilities that will be constructed with the Broken Hills Water Tank SUP have been designed to capture and perpetuate the design storm event flows for the culvert crossings. The conveyance of flows is in conformance with the Washoe County Code and the TMRDM. There will be no negative impacts to any adjacent or downstream properties as a result of development of the access road and tank, as the existing storm flows will be conveyed via appropriately sized culverts and it is not anticipated that detention will be required, as the ratio of developed area to existing area is extremely small. As previously stated, this report is preliminary in nature and a more detailed study will need to be conducted and a final technical drainage report will need to be submitted with the final improvement plans for the project.

6 REFERENCES

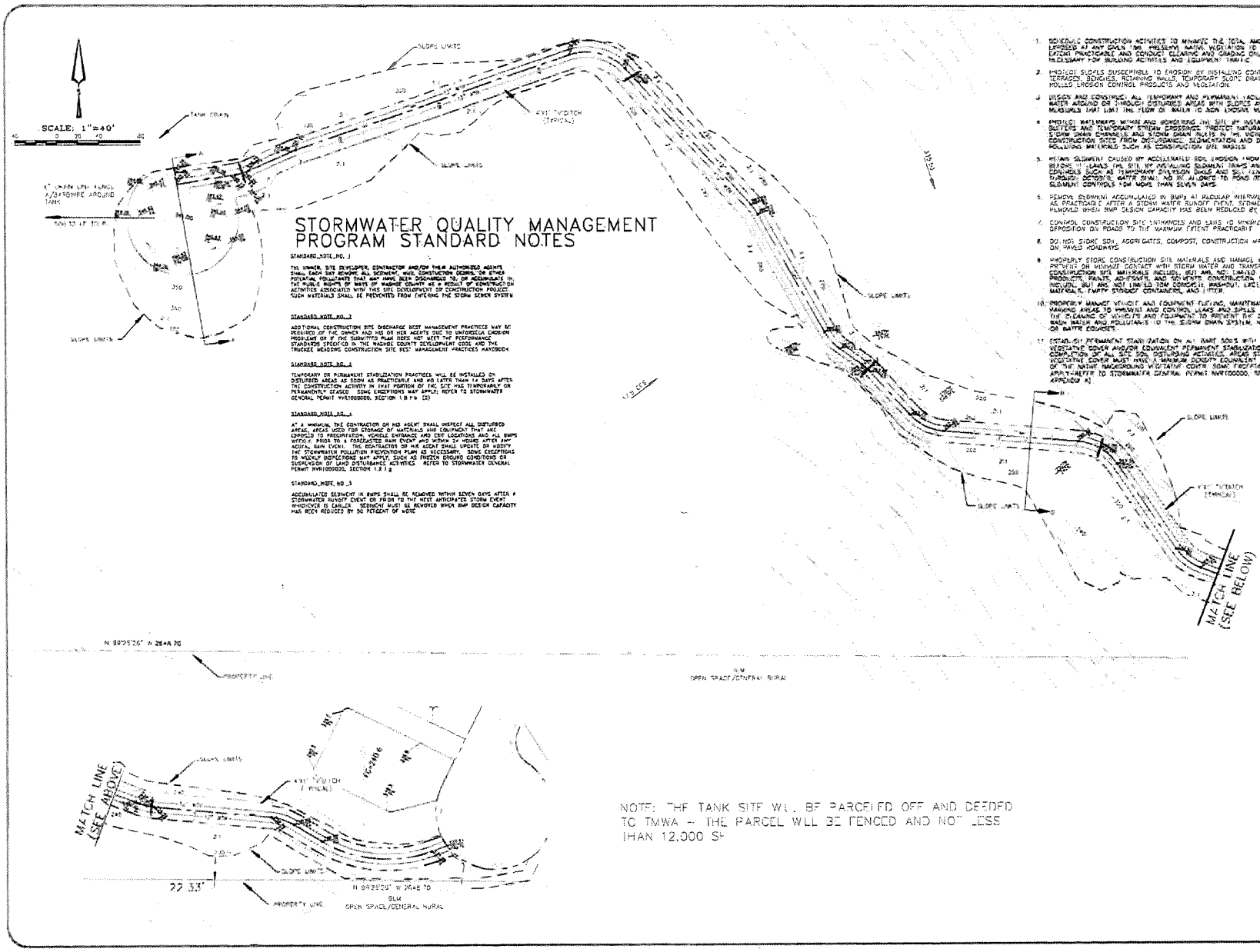
Truckee Meadows Regional Drainage Manual, April 30, 2009.

Washoe County Development Code, Latest Edition.

APPENDIX



VICINITY MAP
NOT TO SCALE



STORMWATER QUALITY MANAGEMENT PROGRAM STANDARD NOTES

STANDARD_NOTE_NO_1

THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL EACH BMP REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO OR ACCUMULATED IN THE PUBLIC RIGHTS OF WAY OR WASHOE COUNTY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM

STANDARD_NOTE_NO_2

ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE WASHOE COUNTY DEVELOPMENT CODE AND THE TRUCKEE MEADOWS CONSTRUCTION SITE BEST MANAGEMENT PRACTICES HANDBOOK

STANDARD_NOTE_NO_3

TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO STORMWATER GENERAL PERMIT NVR100000, SECTION I.B.7.b (2)

STANDARD_NOTE_NO_4

AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS AND ALL BMPS WEEKLY, PRIOR TO A FORECASTED RAIN EVENT AND WITHIN 24 HOURS AFTER ANY ACTUAL RAIN EVENT. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS FROZEN GROUND CONDITIONS OR SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO STORMWATER GENERAL PERMIT NVR100000, SECTION I.B.7.g

STANDARD_NOTE_NO_5

ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE

1. SCHEDULE CONSTRUCTION ACTIVITIES TO MINIMIZE THE TOTAL AMOUNT OF SOIL EXPOSED AT ANY GIVEN TIME, PRESERVE NATIVE VEGETATION TO THE MAXIMUM EXTENT PRACTICABLE AND CONFINE CLEARING AND GRADING ONLY IN AREAS IMMEDIATELY FOR BUILDING ACTIVITIES AND EQUIPMENT TRAFFIC.
2. PROTECT SLOPES SUSCEPTIBLE TO EROSION BY INSTALLING CONTROLS SUCH AS TERRACES, BENCHES, RETAINING WALLS, TEMPORARY SLOPE DRAINS, FIBER ROLLS, ROLLED EROSION CONTROL PRODUCTS AND VEGETATION.
3. DIVERT AND CONVEY ALL TEMPORARY AND PERMANENT CHANNELS THAT CONVEY WATER AROUND OR THROUGH DISTURBED AREAS WITH SLOPES AND CONTROL MEASURES THAT LIMIT THE FLOW OF WATER TO NON EROSIVE VELOCITIES.
4. PROTECT WATERWAYS WITHIN AND BORDERING THE SITE BY INSTALLING VEGETATIVE BUFFERS AND TEMPORARY SCREEN ENCLOSURES. PROTECT NATURAL DRAINAGE, STORM DRAIN CHANNELS AND STORM DRAIN INLETS IN THE VICINITY OF CONSTRUCTION SITES FROM DISTURBANCE, SEDIMENTATION AND DEPOSITION OF POLLUTING MATERIALS SUCH AS CONSTRUCTION BMP BARRIERS.
5. RETAIN SEDIMENT CAUSED BY ACCELERATED SOIL EROSION FROM SURFACE WATER RUNOFF. REPAIR ALL RILLS AND GULLIES BY INSTALLING SEDIMENT TRAPS AND/OR PERIMETER CONTROLS SUCH AS TEMPORARY DIVERSION BERMS AND SILT FENCES. KNOW WHAT TURBIDITY DICTATES. WATER DRAIN. NO BY ALLOWED TO POND BEYOND EROSION OR SEDIMENT CONTROLS FOR MORE THAN SEVEN DAYS.
6. REMOVE SEDIMENT ACCUMULATED IN BMPS AT REGULAR INTERVALS AND AS SOON AS PRACTICABLE AFTER A STORM WATER RUNOFF EVENT. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT.
7. CONTROL CONSTRUCTION SITE ENTRANCES AND EXITS TO MINIMIZE SEDIMENT DEPOSITION ON ROADS TO THE MAXIMUM EXTENT PRACTICABLE.
8. DO NOT STORE SOIL, AGGREGATES, COMPOST, CONSTRUCTION MATERIALS OR WASTE ON PAVED ROADWAYS.
9. PROPERLY STORE CONSTRUCTION SITE MATERIALS AND MANAGE WASTES TO PREVENT ON MINIMIZE CONTACT WITH STORM WATER AND TRANSPORT OFFSITE. CONSTRUCTION SITE MATERIALS INCLUDE, BUT ARE NOT LIMITED TO: PETROLEUM PRODUCTS, PAINTS, ADHESIVES, AND SEPTAGE. CONSTRUCTION SITE WASTES INCLUDE, BUT ARE NOT LIMITED TO: CONCRETE, MASONRY, EXCESS CONSTRUCTION MATERIALS, TRAFFIC STORAGE CONTAINERS, AND LITTER.
10. PROPERLY MANAGE VEHICLE AND EQUIPMENT FUELING, MAINTENANCE, STORAGE, AND WASHING AREAS TO PREVENT AND CONTROL LEAKS AND SPILLS. PROPERLY MANAGE THE CLEANING OF VEHICLES AND EQUIPMENT TO PREVENT OR DISCHARGE OF WASH WATER AND POLLUTANTS TO THE STORM DRAIN SYSTEM, NATURAL DRAINAGES OR WATER SOURCES.
11. ESTABLISH PERMANENT STABILIZATION ON ALL INERT SOILS WITH INTENSIVE, VEGETATIVE COVER AND/OR EQUIVALENT PERMANENT STABILIZATION MEASURES. UPON COMPLETION OF ALL SITE SOIL DISTURBING ACTIVITIES, AREAS STABILIZED WITH VEGETATIVE COVER MUST HAVE A MINIMUM DENSITY EQUIVALENT TO 70 PERCENT OF THE NATIVE BACKGROUND VEGETATIVE COVER. SOME EXCEPTIONS MAY APPLY; REFER TO STORMWATER GENERAL PERMIT NVR100000, SECTION I.A.5.b (SEE APPENDIX A)

NOTE: THE TANK SITE WILL BE PARCELED OFF AND DEEDED TO TMWA - THE PARCEL WILL BE FENCED AND NOT LESS THAN 12,000 SF

Matzoll Development Consulting, LLC
3575 LAKESIDE DRIVE, SUITE B
RENO, NEVADA 89509
(775) 850-8605

PLANS ARE PRELIMINARY AND NOT TO BE CONSTRUCTED, STARTED, SCARED, AND APPROVED BY ALL APPLICABLE GOVERNING AGENCIES.

BROKEN-HILLS-TANK-AND-ACCESS-ROAD
GRADING-PLAN
APN-089-621-01
-
WASHOE COUNTY NEVADA

REV.	DATE	DESCRIPTION	BY	APP'D

SCALE
HORIZ. 1"=40'
VERT. N/A
JOB# 8H1A1K

SHEET
G-1
4

NOAA Atlas 14, Volume 1, Version 5
Location name: Sparks, Nevada, USA*
Latitude: 39.66°, Longitude: -119.76°
Elevation: 5287.81 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

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 (0.105-0.145)	0.167 (0.142-0.197)	0.208 (0.176-0.246)	0.277 (0.229-0.333)	0.342 (0.275-0.417)	0.419 (0.328-0.521)	0.514 (0.387-0.655)	0.670 (0.478-0.885)	0.815 (0.558-1.10)
10-min	0.152 (0.128-0.175)	0.190 (0.159-0.221)	0.255 (0.215-0.299)	0.317 (0.268-0.375)	0.421 (0.348-0.507)	0.520 (0.418-0.636)	0.638 (0.499-0.794)	0.783 (0.590-0.997)	1.02 (0.728-1.35)	1.24 (0.848-1.68)
15-min	0.189 (0.159-0.217)	0.235 (0.198-0.274)	0.315 (0.267-0.371)	0.392 (0.332-0.464)	0.522 (0.432-0.629)	0.644 (0.518-0.788)	0.791 (0.618-0.984)	0.970 (0.731-1.24)	1.26 (0.903-1.67)	1.54 (1.05-2.08)
30-min	0.255 (0.214-0.292)	0.317 (0.266-0.369)	0.425 (0.359-0.499)	0.528 (0.447-0.625)	0.703 (0.582-0.847)	0.868 (0.698-1.06)	1.07 (0.833-1.33)	1.31 (0.984-1.67)	1.70 (1.22-2.25)	2.07 (1.42-2.80)
60-min	0.315 (0.264-0.362)	0.392 (0.329-0.457)	0.526 (0.445-0.618)	0.654 (0.553-0.774)	0.870 (0.720-1.05)	1.07 (0.864-1.31)	1.32 (1.03-1.64)	1.62 (1.22-2.06)	2.11 (1.51-2.78)	2.56 (1.75-3.47)
2-hr	0.415 (0.367-0.477)	0.516 (0.457-0.594)	0.662 (0.581-0.764)	0.792 (0.686-0.913)	0.993 (0.839-1.15)	1.18 (0.969-1.38)	1.39 (1.12-1.66)	1.67 (1.30-2.08)	2.21 (1.63-2.81)	2.71 (1.92-3.50)
3-hr	0.503 (0.450-0.570)	0.625 (0.564-0.712)	0.784 (0.700-0.889)	0.913 (0.809-1.04)	1.10 (0.958-1.26)	1.26 (1.08-1.46)	1.46 (1.23-1.71)	1.75 (1.44-2.10)	2.24 (1.79-2.84)	2.73 (2.10-3.54)
6-hr	0.729 (0.657-0.819)	0.911 (0.819-1.02)	1.13 (1.01-1.27)	1.29 (1.15-1.46)	1.51 (1.32-1.71)	1.67 (1.45-1.90)	1.83 (1.57-2.11)	2.04 (1.72-2.38)	2.46 (2.03-2.92)	2.88 (2.34-3.57)
12-hr	0.988 (0.887-1.11)	1.24 (1.11-1.39)	1.56 (1.39-1.75)	1.81 (1.61-2.03)	2.14 (1.88-2.41)	2.39 (2.08-2.72)	2.65 (2.27-3.05)	2.91 (2.45-3.39)	3.25 (2.67-3.87)	3.56 (2.87-4.29)
24-hr	1.27 (1.13-1.43)	1.60 (1.43-1.80)	2.06 (1.83-2.32)	2.43 (2.16-2.74)	2.96 (2.60-3.34)	3.38 (2.94-3.83)	3.82 (3.29-4.37)	4.29 (3.65-4.93)	4.94 (4.12-5.74)	5.46 (4.48-6.42)
2-day	1.54 (1.36-1.75)	1.96 (1.73-2.23)	2.56 (2.25-2.92)	3.05 (2.67-3.48)	3.76 (3.25-4.30)	4.33 (3.71-4.98)	4.94 (4.18-5.73)	5.59 (4.66-6.54)	6.51 (5.31-7.73)	7.26 (5.81-8.75)
3-day	1.68 (1.49-1.92)	2.15 (1.90-2.45)	2.84 (2.50-3.24)	3.41 (2.99-3.90)	4.24 (3.66-4.85)	4.91 (4.20-5.65)	5.63 (4.75-6.53)	6.41 (5.33-7.50)	7.52 (6.10-8.94)	8.43 (6.72-10.2)
4-day	1.83 (1.61-2.09)	2.34 (2.06-2.67)	3.13 (2.75-3.57)	3.78 (3.30-4.32)	4.72 (4.08-5.41)	5.48 (4.68-6.32)	6.32 (5.33-7.34)	7.22 (5.99-8.45)	8.53 (6.90-10.1)	9.60 (7.63-11.6)
7-day	2.17 (1.89-2.50)	2.78 (2.42-3.22)	3.75 (3.26-4.34)	4.55 (3.93-5.27)	5.69 (4.86-6.62)	6.64 (5.60-7.76)	7.66 (6.39-9.03)	8.76 (7.19-10.4)	10.3 (8.30-12.5)	11.6 (9.19-14.2)
10-day	2.45 (2.13-2.83)	3.16 (2.76-3.66)	4.27 (3.70-4.94)	5.15 (4.45-5.97)	6.40 (5.48-7.45)	7.42 (6.28-8.67)	8.50 (7.12-10.0)	9.65 (7.96-11.5)	11.3 (9.11-13.6)	12.6 (10.0-15.4)
20-day	3.12 (2.72-3.59)	4.03 (3.52-4.65)	5.42 (4.72-6.24)	6.49 (5.63-7.48)	7.94 (6.84-9.16)	9.06 (7.76-10.5)	10.2 (8.66-12.0)	11.5 (9.62-13.5)	13.3 (10.9-15.9)	14.7 (11.9-17.7)
30-day	3.69 (3.22-4.27)	4.78 (4.18-5.53)	6.42 (5.58-7.43)	7.67 (6.66-8.87)	9.38 (8.07-10.8)	10.7 (9.14-12.4)	12.1 (10.2-14.1)	13.5 (11.3-15.8)	15.5 (12.8-18.4)	17.1 (13.9-20.5)
45-day	4.45 (3.88-5.07)	5.77 (5.03-6.57)	7.71 (6.70-8.78)	9.16 (7.94-10.4)	11.1 (9.57-12.7)	12.6 (10.8-14.4)	14.1 (12.0-16.3)	15.7 (13.2-18.2)	17.9 (14.8-21.0)	19.7 (16.1-23.4)
60-day	5.12 (4.45-5.84)	6.67 (5.80-7.61)	8.91 (7.74-10.2)	10.5 (9.11-12.0)	12.5 (10.8-14.3)	14.1 (12.1-16.1)	15.6 (13.2-17.9)	17.0 (14.4-19.7)	19.1 (15.9-22.4)	20.7 (17.1-24.4)

[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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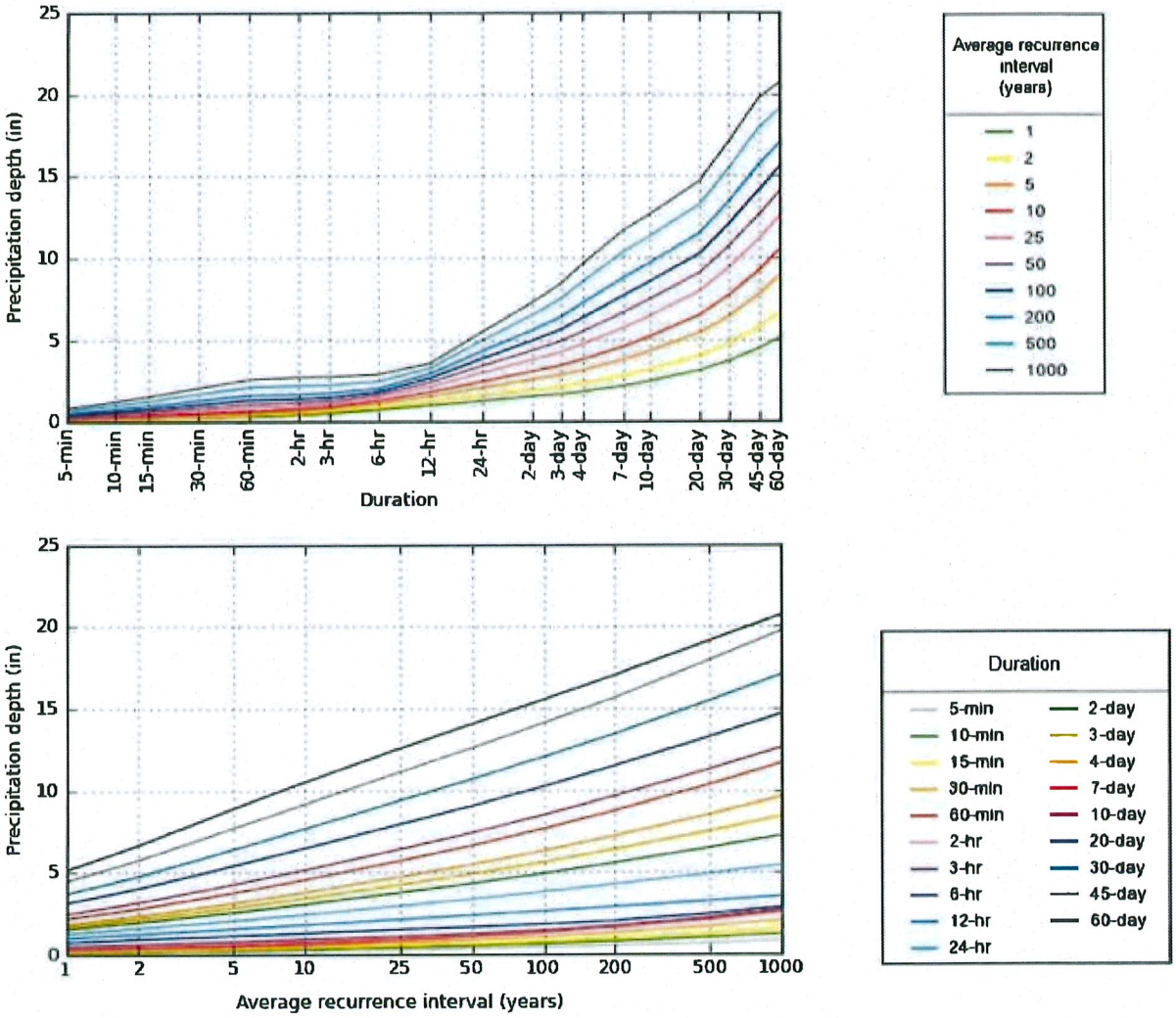
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 39.6600°, Longitude: -119.7600°



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Wed Aug 7 16:22:48 2019

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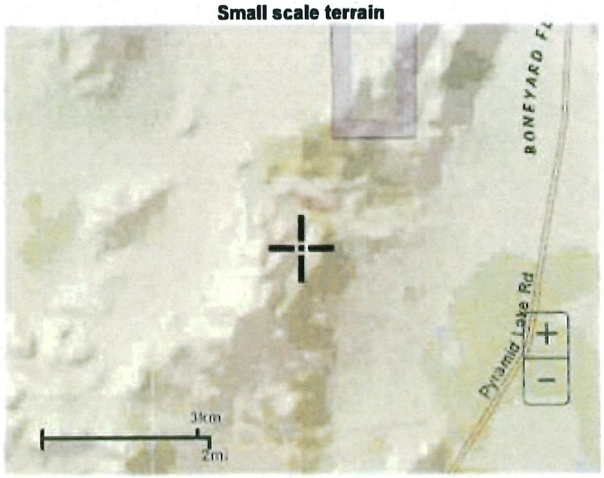
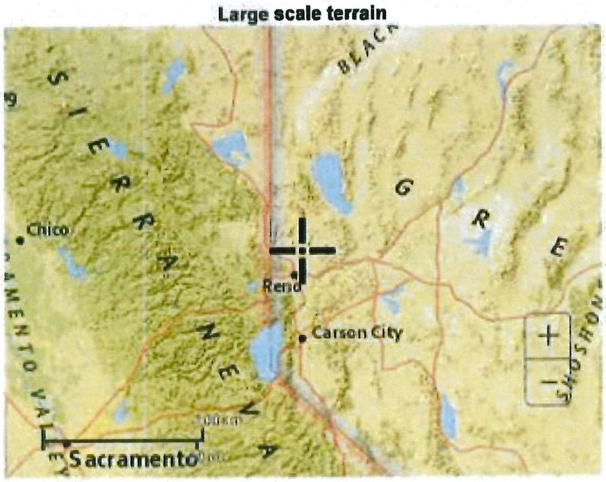
Maps & aerials

Small scale terrain

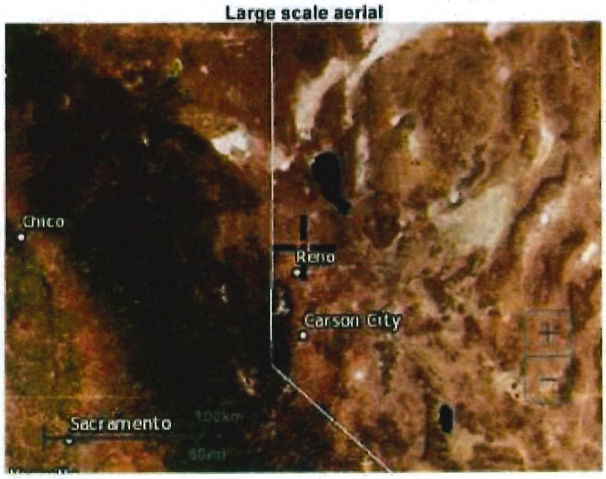


Large scale terrain



Large scale map

Large scale aerial



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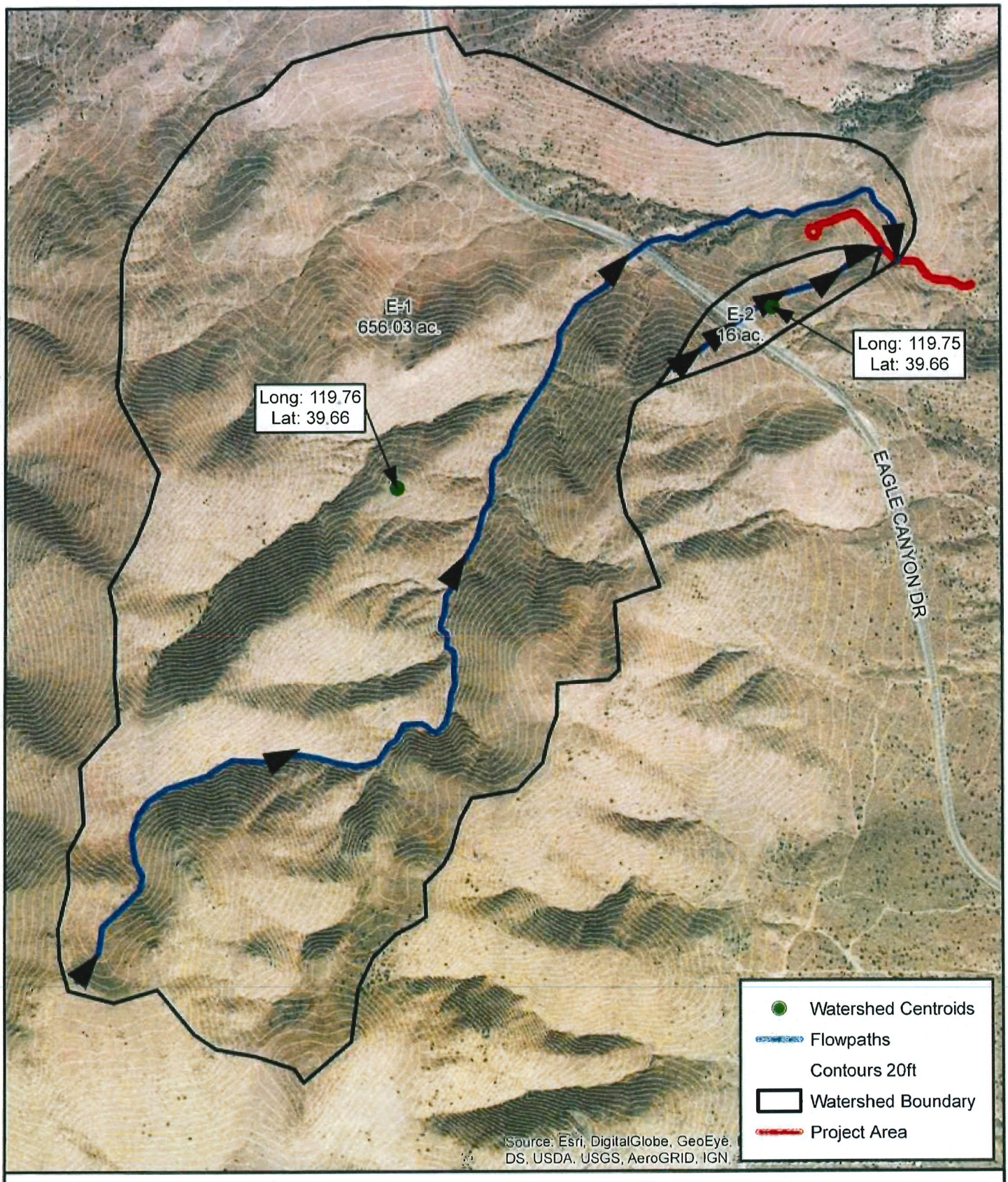
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov



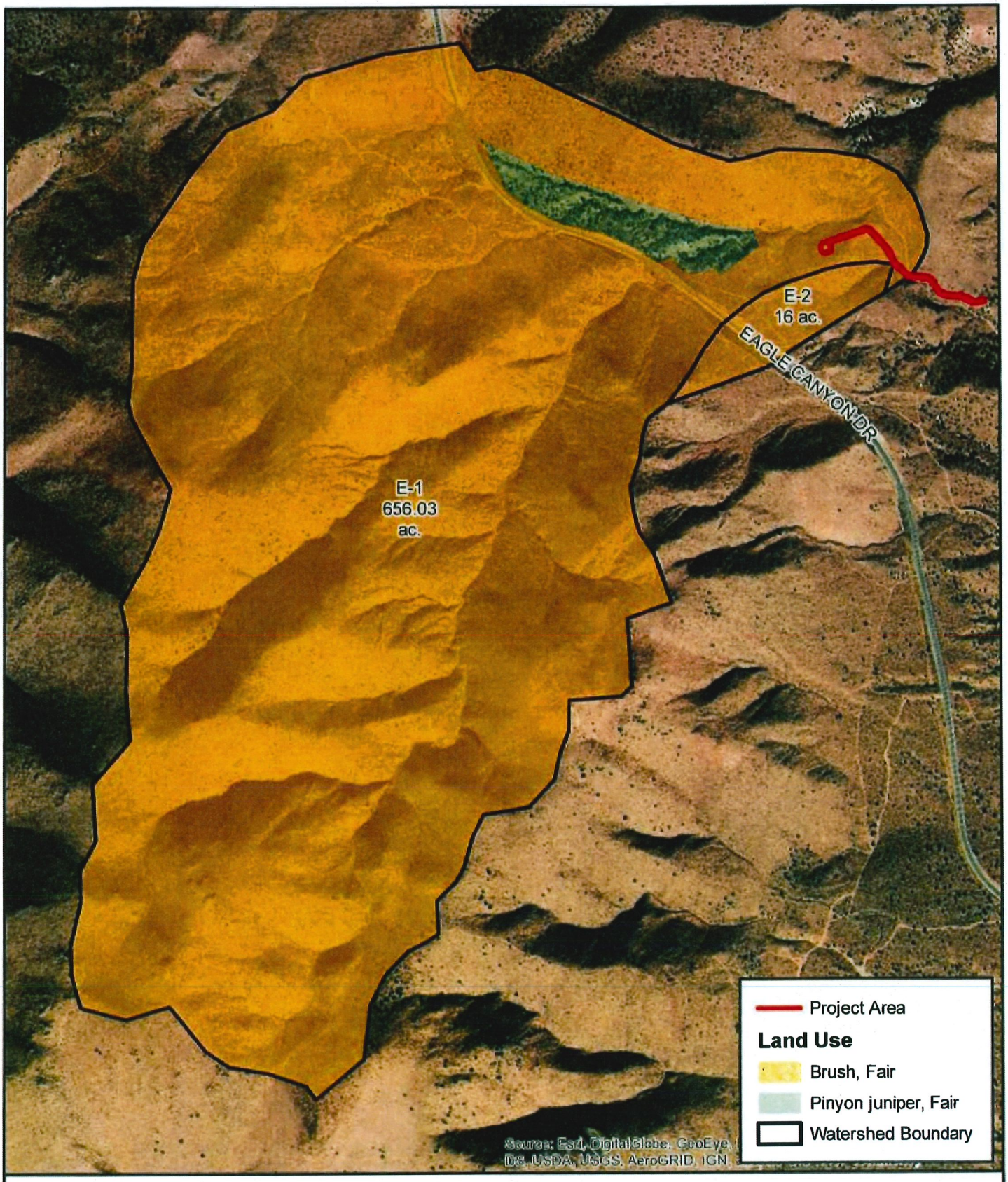
FLOWPATHS

BROKEN HILL
WASHOE COUNTY, NV
AUGUST, 2019
NOTES

NORTH

0 500 1,000
FEET

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
1361 Corporate Boulevard
Reno, NV 89502
Tel: 775.823.4068
Fax: 775.823.4066



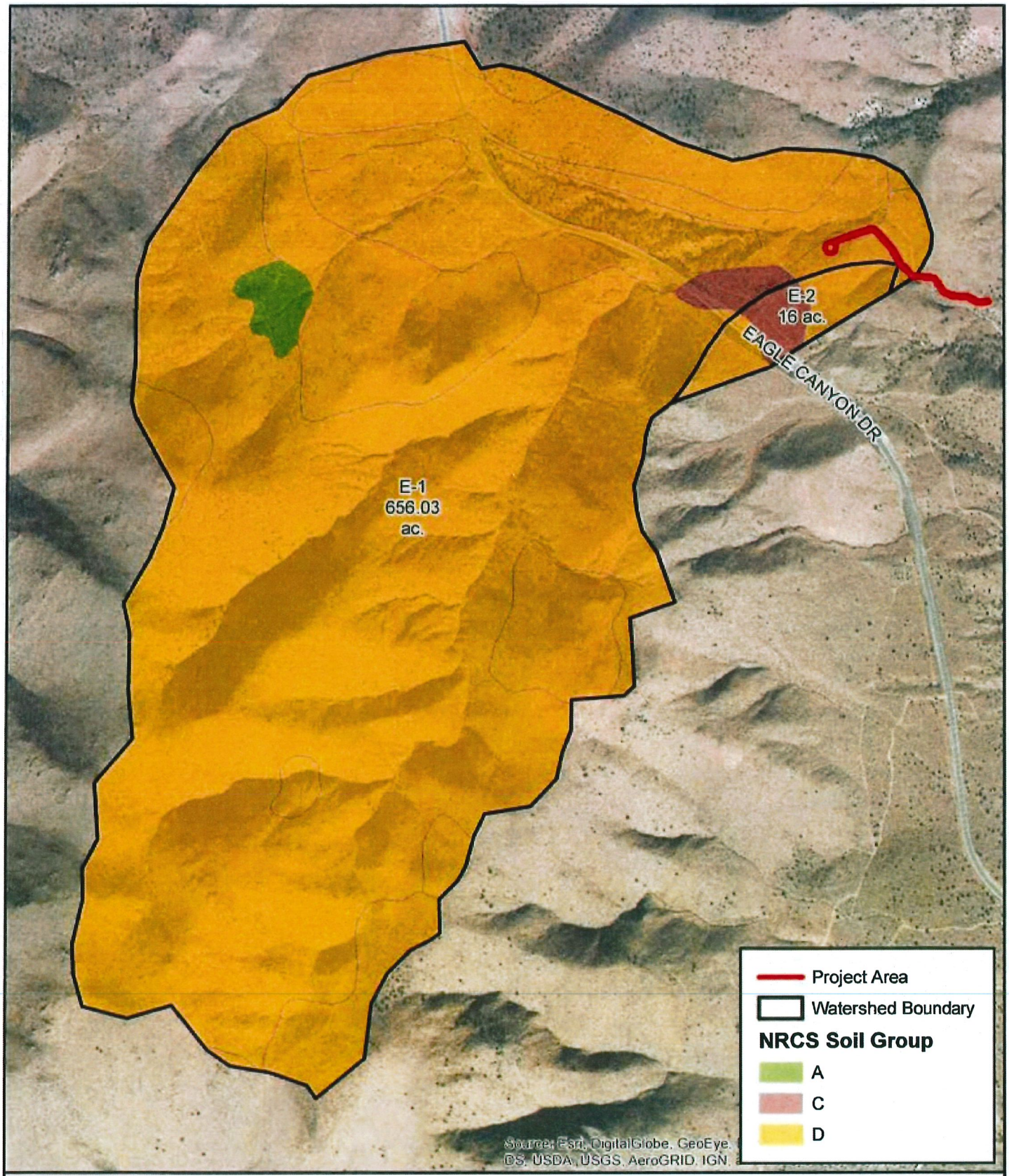
LAND USE
BROKEN HILL
WASHOE COUNTY, NV
AUGUST, 2019
NOTES

NORTH

0 500 1,000
FEET

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
1361 Corporate Boulevard
Reno, NV 89502
Tel: 775.823.4066
Fax: 775.823.4066

J:\Jobs\1657_BrokenHill\Broken Hill_DWG\57\tasks\Hydrology_20190805_V1.mxd 8/12/2019 11:32:45 AM sbarros



SOIL GROUPS
BROKEN HILL
WASHOE COUNTY, NV
AUGUST, 2019
NOTES

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME
1361 Corporate Boulevard
Reno, NV 89502
Tel: 775.823.4068
Fax: 775.823.4066

Truckee Meadows Regional Drainage Manual

April 30, 2009

Reno

Sparks

Washoe County

RUNOFF CURVE NUMBERS FOR ARID AND SEMIARID RANGELANDS[1]

Cover Description	Hydrologic Condition[2]	Runoff Curve Numbers Soil Comp A[3]	Soil Comp B	Soil Comp C	Soil Comp D
Herbaceous – mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen – mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper – pinyon, juniper, or both; grass understory	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub – major plants include saltbrush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use Table 702 - 3 of 4.

[2]*Poor*: < 30% ground cover (litter, grass, and brush overstory)
Fair: 30 to 70% ground cover
Good: > 70% ground cover

[3]Curve numbers for group A have been developed only for desert shrub.

RUNOFF CURVE NUMBERS FOR OTHER AGRICULTURAL LANDS[1]

Cover Type	Hydrologic Condition	Runoff Curve Numbers: Soil Comp A	Soil Comp B	Soil Comp C	Soil Comp D
Pasture, grassland, or range – continuous forage for grazing[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow – continuous grass, protected from grazing and generally mowed for hay	-	30	58	71	78
Brush – brush-weed-grass mixture with brush the major element[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30[4]	48	65	73
Woods – grass combination (orchard or tree farm)[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30[4]	55	70	77
Farmsteads – buildings, lanes, driveways, and surrounding lots	-	59	74	82	86

[1]Average runoff condition, and $I_a = 0.2S$

[2]*Poor*: < 50% ground cover or heavily grazed with no mulch
Fair: 50 to 75% ground cover and not heavily grazed
Good: > 75% ground cover and lightly or only occasionally grazed

[3]*Poor*: < 50% ground cover
Fair: 50 to 75% ground cover
Good: >75% ground cover

[4]Actual curve number is less than 30; use CN = 30 for runoff computations.

[5]CNs shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CNs for woods and pasture.

[6]*Poor*: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

E-1			
Land Use	**Soil**	**Area**	**Curve Number**
Brush, Fair	A	6.4	35
Brush, Fair	C	5.0	70
Brush, Fair	D	627.9	77
Pinyon juniper, Fair	C	0.1	73
Pinyon juniper, Fair	D	16.7	80
Total Area		656.0	
Final Curve Number			77

E-2			
Land Use	**Soil**	**Area**	**Curve Number**
Brush, Fair	C	4.8	70
Brush, Fair	D	11.2	77
Total Area		16.0	
Final Curve Number			75

Time of Concentration
Existing Onsite Basins

	Drainage Area (AC)	Kn	L	Lc	S (ft/mi)	TLAG(hours)	TLAG(min)
E-1	656.03	0.09	2.09	1.14	569.84	0.93	55.78
E-2	16.00	0.09	0.36	0.19	1087.28	0.26	15.54

Project: BrokenHills Simulation Run: 100yr_24hour

Start of Run: 01Jan2019, 00:00 Basin Model: ExistingBasin
End of Run: 02Jan2019, 00:00 Meteorologic Model: Met 1
Compute Time: 12Aug2019, 13:10:28 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
E-1	1.025	335.53	01Jan2019, 12:58	1.56
E-2	0.025	17.57	01Jan2019, 12:18	1.50
Junction-1	1.050	337.39	01Jan2019, 12:58	1.56

Culvert Calculator Report
24" Culvert -Basin E-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	268.00	ft	Headwater Depth/Height	1.31	
Computed Headwater Elev	265.62	ft	Discharge	17.60	cfs
Inlet Control HW Elev.	265.50	ft	Tailwater Elevation	260.00	ft
Outlet Control HW Elev.	265.62	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	263.00	ft	Downstream Invert	257.00	ft
Length	68.00	ft	Constructed Slope	0.088235	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	3.00	ft
Slope Type	N/A		Normal Depth	0.70	ft
Flow Regime	N/A		Critical Depth	1.51	ft
Velocity Downstream	5.60	ft/s	Critical Slope	0.007147	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	265.62	ft	Upstream Velocity Head	0.74	ft
Ke	0.50		Entrance Loss	0.37	ft

Inlet Control Properties					
Inlet Control HW Elev.	265.50	ft	Flow Control	Transition	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
4'x8' Box Culvert - Basin E-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	256.00	ft	Headwater Depth/Height	1.67	
Computed Headwater Elev	255.19	ft	Discharge	337.00	cfs
Inlet Control HW Elev.	255.19	ft	Tailwater Elevation	248.00	ft
Outlet Control HW Elev.	254.59	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	248.50	ft	Downstream Invert	242.00	ft
Length	168.00	ft	Constructed Slope	0.038690	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	1.93	ft
Slope Type	N/A		Normal Depth	1.68	ft
Flow Regime	N/A		Critical Depth	3.81	ft
Velocity Downstream	21.87	ft/s	Critical Slope	0.003847	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	8.00	ft
Section Size	8 x 4 ft		Rise	4.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	254.59	ft	Upstream Velocity Head	1.90	ft
Ke	0.20		Entrance Loss	0.38	ft

Inlet Control Properties					
Inlet Control HW Elev.	255.19	ft	Flow Control	Submerged	
Inlet Type	90° headwall w 45° bevels		Area Full	32.0	ft²
K	0.49500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	2	
C	0.03140		Equation Form	2	
Y	0.82000				

Culvert Calculator Report
Dual 48" Culverts - Basin E-1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	256.00	ft	Headwater Depth/Height	2.10	
Computed Headwater Elev	256.88	ft	Discharge	337.00	cfs
Inlet Control HW Elev.	256.88	ft	Tailwater Elevation	248.00	ft
Outlet Control HW Elev.	255.79	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	248.50	ft	Downstream Invert	242.00	ft
Length	168.00	ft	Constructed Slope	0.038690	ft/ft

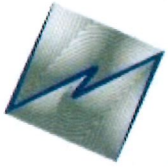
Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	2.42	ft
Slope Type	N/A		Normal Depth	2.22	ft
Flow Regime	N/A		Critical Depth	3.72	ft
Velocity Downstream	21.21	ft/s	Critical Slope	0.011905	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	4.00	ft
Section Size	48 inch		Rise	4.00	ft
Number Sections	2				

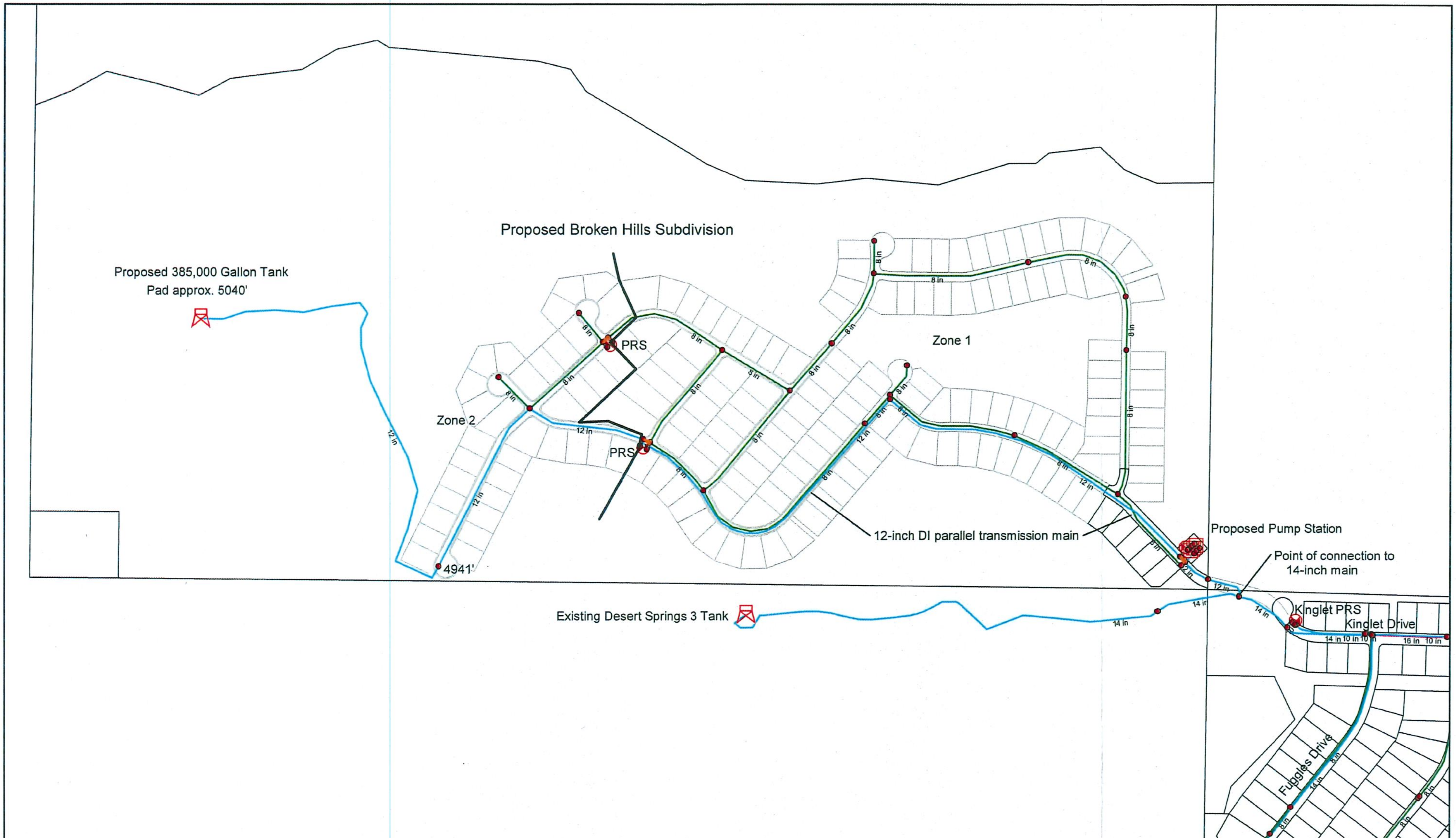
Outlet Control Properties					
Outlet Control HW Elev.	255.79	ft	Upstream Velocity Head	2.98	ft
Ke	0.20		Entrance Loss	0.60	ft

Inlet Control Properties					
Inlet Control HW Elev.	256.88	ft	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	25.1	ft²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

TMWA DESIGN REPORT



Matzoll
Development Consultants, LLC.



TRUCKEE MEADOWS WATER AUTHORITY

Quality. Delivered.

Broken Hills Annexation Conceptual Water Service Plan

Preliminary and Subject to Change

Desert Springs System Expansion

19-6844

DATE: 6/20/2019

MAP BY: hmf

REQUESTED BY: pa

SCALE: 1 inch = 411 fee

NORTH

NAD 83 NEVADA STATE PLANE WEST FEET

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TMWA DESIGN REPORT

Proposed Broken Hills Subdivision

Proposed 385,000 Gallon Tank
Pad approx. 5040'

4941'

Zone 2

Zone 1

PRS

PRS

12-inch DI parallel transmission main

Proposed Pump Station

Point of connection to
14-inch main

Existing Desert Springs 3 Tank

Kinglet PRS

Kinglet Drive

Fuggles Drive

12 in
8 in
14 in
16 in
10 in

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