Exhibit A - Planning Commission Staff Report

PLANNING COMMISSION
STAFF REPORT

Date: **March 6, 2024**

To: **Reno City Planning Commission**

Subject: **Staff Report (For Possible Action - Recommendation to City Council): Case No. LDC24-00031 (Bella Vista Ranch Phase II PUD Amendment) - A request has been made for an amendment to the Bella Vista Ranch Phase II Planned Unit Development (PUD) handbook to: a) reduce the amount of nonresidential from ±178,600 sq. ft. to ±117,612 square feet; b) increase the maximum dwelling units from ±575 units to ±609 units; and c) modify the allowed land uses, design standards, development standards, and street design standards. The ±77.37 acre site is located southeast of the eastern terminus of South Meadows Parkway, north of the northern terminus of Rio Wrangler Parkway. and east of Steamboat Creek within the Bella Vista Ranch Phase II PUD zoning district. The site is located within Bella Vista Ranch Phase II PUD zoning district and has a Master Plan land use designation of Special Planning Area (SPA).**

From: **Leah Piccotti, Associate Planner**

Ward #:	3
Case No.:	LDC24-00031 (Bella Vista Ranch Phase II PUD Amendment)
Applicant:	Sunny Hills Ranchos
APN:	165-011-37, 48, 49, 50, & 51
Request:	**PUD Amendment:** a) reduce the amount of nonresidential from ±178,600 square feet to ±117,612 square feet; b) increase the maximum dwelling units from ±575 units to ±609 units; and c) modify the allowed land uses, design standards, development standards, and street design standards.
Location:	See Case Maps (**Exhibit A**)

Proposed Motion: Based upon compliance with the applicable findings, I move to recommend that City Council approve the PUD amendment, subject to the condition listed in the staff report.

Recommended Condition of Approval:

1. Approval of the amendment to Bella Vista Ranch Phase II Planned Unit Development Design Guidelines is subject to the modifications to the Handbook as noted in **Exhibit B**, and any modifications made by the Planning Commission and City Council at their respective public hearings.

Summary: This request is a proposed amendment to the Bella Vista Ranch Phase II PUD Handbook. Amendments include allowing residential uses in the previously designated commercial area, decreasing the maximum square footage of allowed nonresidential, increasing the number of allowed residential units by 34, and eliminating outdated code and development standards that are no longer consistent with Reno Municipal Code (RMC). Key issues related to the request are: 1) compatibility of the proposed zoning and development standards with surrounding land uses; 2) conformance with current code; and 3) protection of natural resources. Staff can make all of the findings and recommends approval of the PUD amendment.

Background: The Bella Vista Ranch Phase II PUD (Case No. LDC10-00051) was approved by City Council on January 16, 2013 as an expansion of the original Bella Vista Ranch PUD located to the west of Bella Vista Ranch Phase II PUD (BVII).

Analysis:

Overview of the request: Requested modifications to the PUD Handbook include:

- Changes in land use for residential and nonresidential developments (Villages A, B, C)
- Reduce the maximum square footage of nonresidential development
- Increase the maximum residential units
- Update the permitted uses allowed in each land use category
- Update the development standards
- Change in design standards
- Update the street design standards
- Update the Feral Horse Protection Plan
- Replace the Master Traffic Study with updated study

Changes in Land Use: The current Bella Vista Ranch Phase II PUD (BVII) is divided into three "villages". Villages A and B allow only residential uses and Village C allows only commercial uses. The proposed amendments will remove the "village" designations. Villages B and C will be redesignated as Mixed Neighborhood (BVII MN), allowing only residential uses. Villages A will be redesignated as Suburban Mixed Use (BVII SMU) allowing for a mix of residential and commercial uses, with five of the ±10.8 acres designated for non-residential use only. These modifications will move the commercial uses away from existing residential and closer to the intersection of South Meadows Parkway and Rio Wrangler Parkway, which are identified as arterial and collector streets. Below is a comparison of the existing and proposed land uses.

Comparing Existing and Proposed Bella Vista II Land Use							
Existing PUD Land Use				**Proposed PUD Land Use**			
Village/Land Use	**Size (Acres)**	**Max Residential Density (du/ac)**	**Max Non-Residential Density (sq. ft.)**	**Area/Land Use**	**Size (Acres)**	**Max Residential Density (du/ac)**	**Max Non-Residential Density (sq. ft.)**
A	±12.7	30	-	SMU	**±10.8**	30	**117,612**
B	±22.9	30	-	MN	**±21.9**	30	-
C		-	178,600				
Public Park	±4.4	-	-	PGOS/Public Park	±4.4	-	-
Flood Storage	±3.8	-	-	PGOS/Flood Storage Basin	±3.8	-	-
Wetlands (WM-1)	±27.4	-	-	PGOS/Wetlands (WM-I)	±27.4	-	-
South Meadows Pkwy/ Rio Wrangler Pkwy	±6.3	-	-	South Meadows Pkwy/ Rio Wrangler Pkwy	**±9.0**	-	-
Total	**±77.37**	**575**	**178,600**	**Total**	**±77.37**	**609**	**117,612**

Reduce Commercial/Increase Residential: Proposed amendments include reducing the maximum square footage of nonresidential from ±178,600 square feet to ±117,612 square feet (34% reduction); and, increasing the maximum dwelling units from 575 units to 609 units (5.91% increase). The proposed modifications are supported by adjacent zoning along with existing and proposed land uses. Talus Valley (formerly Daybreak) has been approved for commercial development along the west side of Veterans Parkway and Single-Family residential adjacent to BVII SMU.

Updates to Permitted Uses: Table 2 (Bella Vista II Permitted Uses) has been updated to reflect uses defined in RMC. The updated land use table is shown on Page 14 of the amended Handbook **(Exhibit B)**. BVII SMU will have a base zoning district of Neighborhood Commercial (NC) and BVII MN will have a base zoning district of Multi-Family Residential – 30 units per acre (MF-30). Uses and standards not addressed in the Handbook shall default to these base zoning districts.

Updates to Development Standards: Proposed modifications to the residential development standards include a reduction of the maximum building height from forty-five feet (45 ft) to thirty-five feet (35 ft), and to allow for a three-foot garage setback. These modifications are consistent with the current residential standards in RMC.

Residential Existing and Proposed Lot/Parcel Standards				
	EXISTING		PROPOSED	
	Village A	Village B	SMU	MN
Density/Intensity Standards				
Dwelling Units per Acre Max.(du/ac)	30	30	30	30
Landscape Area (Multi-Family/Attached/Condos)	20%	20%	20%	20%
Max. Building Height (feet)	45	45	35	35
Minimum Yard & Setbacks (feet)				
Front Yards	10	10	10	10
Garage Setback (face of garage)	20	20	3 or 20	3 or 20
Side Yards	0 or 5	0 or 5	0 or 5	0 or 5
Rear Yards	10	10	10	10
Building Separation	20 (10 if less than 50 units)		20 (10 if less than 50 units)	
Accessory Structures (feet)				
Min. Driveways (feet long)	20	20	20	20
Min. usable open space (sf/unit)	100	100	100	100

The proposed amendments to nonresidential development standards include a reduction of the maximum building height from forty-five feet (45 ft) to thirty-five feet (35 ft), reductions to the to the front and rear minimum setbacks, eliminating the minimum lot standards, and eliminating the maximum floor area ratio (FAR). Other modified standards include the separation between buildings, minimum landscape area, and parking standards. It should also be noted that the total overall nonresidential development within the BVII PUD is limited to ±117,612 square feet, which would equate to a total FAR of 0.25 should the entire BVII SMU land use be developed as nonresidential.

Nonresidential Existing and Proposed Lot/Parcel Standards					
	EXISTING			PROPOSED	
	Village A	Village B	Village C	SMU	PGOS
Density/Intensity Standards					
Floor Area Ratio (FAR) Max.	0.50	0.50	0.50	None	N/A
Landscape Area	20%	20%	20%	20%	20%
Building Height (feet)	45	45	45	35	35
Lot Size					
Minimum Lot Width (feet)	30	30	30	None	
Minimum Lot Size				None	
Yard & Setback Dimension					
Front Yards (feet)	20	20	20	10	20
Side Yards (feet)	0 or 10	0 or 10	0 or 10	0 or 10	0 or 10
Rear Yards (feet)	20	20	20	10	15
Building Separation (feet)	20	20	20	20	20
Setbacks from Adjacent Residential Uses					
All Yards (feet)	20 or height of building, whichever is greater			20 or height of building, whichever is greater	

Change in Design Standards: Proposed amendments to the design standards include removing specific landscaping, signage, and architectural standards. These modifications will require all new buildings and signage to conform with standard RMC design requirements.

Update to Street Design Standards: The current street standards do not consider the new development projects that have been approved since the adoption of the current Handbook. The South Meadows Multimodal Transportation Study was completed by RTC in 2020 and concludes that the current standards for the extension of Rio Wrangler Parkway no longer require a center turn lane based on future traffic projections. The proposed amendments reflect the updated Rio Wrangler Parkway roadway section and include updates to the South Meadows Parkway Extension, including the crossing of Steamboat Creek. The newly proposed South Meadows Parkway standards are the same that were approved in the Talus Valley PUD and may be constructed with the development of this PUD or by others (Talus Valley).

Update the Feral Horse Protection Plan: Updates to the horse protection plan focus on fencing the property in accordance with Nevada State Law (NRS 569.431). A temporary fence shall be installed to fence off the entire property, with the exclusion of the Flood Storage Basin. New fencing will tie into the existing fencing on adjacent properties. A cattle (horse) guard crossing will not be required at Rio Wrangler or South Meadows Parkways. New language includes a reference to RMC 18.04.108, requiring mandatory monitoring and inspection of the fence to ensure any gaps are repaired in a timely manner. Repairs will be the responsibility of the Master Developer and/or a Homeowners Association (HOA) once construction is complete.

Temporary horse fencing will remain in place until the site is developed and permanent fencing is installed in accordance with the updated fencing plan. Once the permanent fencing is installed the temporary fence shall be removed. It should be noted that as part of the Wetland Mitigation Plan in Appendix C of the BVII PUD, the wetlands (WM-1) are required to be fenced off to ensure mitigation efforts are maintained.

Environmental Resources: The applicant will abide by all health and environmental requirements for future development and will continue to meet with and discuss all options and requirements for any necessary mercury testing or remediation required by Northern Nevada Public Health. A soil sample report **(Exhibit C)**, dated August 2020, has been provided by the applicant. All reported concentrations of mercury were below the Nevada reportable concentration for mercury in soil of 11 mg/kg, which is consistent with previous samples collected from the southern portion of the parcel.

Compatibility of the Proposed Zoning and Development Standards with Surrounding Land Uses: With the development of the Bella Vista Ranch PUD, also known as Cyan, significant changes have occurred within the property. The Bella Vista PUD was approved for 1,700 residential units and has seen the development of two major thoroughfares (Veterans and South Meadows Parkways), initial development of three single family residential villages, and the relocation and restoration of Steamboat Creek back to its original alignment on the eastern edge of the Bella Vista Ranch PUD. The table below outlines the predominately residential uses surrounding the Bella Vista Phase II PUD.

AREA DESCRIPTION			
	Land Use	**Master Plan Designation**	**Zoning**
North	Vacant (Former aggregate pit)	Single-Family Neighborhood Parks, Greenways and Open Space	PUD (Talus Valley Residential)
South	Residential	Parks, Greenways and Open Space Mixed Neighborhood	PUD (Damonte Ranch Residential)
East	Vacant (Former Gun Club)	Mixed Neighborhood Single-Family Neighborhood	PUD (Damonte Ranch Residential)

West	Open Space Residential	Parks, Greenways and Open Space Single-Family Neighborhood Public/Quasi-Public	PUD (Bella Vista Ranch)

Traffic Access and Circulation: An updated traffic impact analysis was provided in the application materials by Headway Transportation, dated December 22, 2023 **(Exhibit D)**. According to the analysis, after accounting for internal and pass-by trips, the amended PUD is expected to generate approximately 7,752 average daily trips, 545 AM net peak hour trips and 588 PM net peak hour trips. This is a small decrease in daily trips and a small increase in AM peak hour trips compared with the existing approved PUD. Essentially, the amended traffic intensity is approximately equal to the existing PUD. Levels of service of the intersections studied are expected to be within policy levels.

Access to the site will essentially remain the same as the existing PUD. The project will be accessed via an extension of South Meadows Parkway to the west of the site and extension of Rio Wrangler Parkway to the south. Final circulation plans through the development will be determined during the tentative map and final map phases.

With the removal of the center turn lane along Rio Wrangler Parkway, as approved with ADM22-00005, the applicant is proposing to provide dedicated southbound left-turn lanes at project accesses 4, 5, and 6 (three intersections). This is consistent with the amended PUD Handbook.

Major Drainageway: The area identified as a major drainageway in the BVII MN area meets the City of Reno definition as it drains over 100 acres. However, there is no distinct drainageway, identifiable ditch, evidence of water, or identified wetlands or riparian vegetation. It is not understood how grading activities to the east of the site impacted the flows onto the BVII properties. The drainage and grading for the BVII MN area will address the major drainageway prior to development. The location or relocation of the drainageway shall be determined through either the tentative map process or a major site plan review.

Drainage/Floodplain Management: The Bella Vista Ranch Phase II PUD villages are within the FEMA X zone, defined as an area outside the 0.2% annual chance of flooding. There should not be a need to elevate structures specifically from a floodplain management perspective.

Sewer Facilities: Public sanitary sewer infrastructure is currently in place to serve the Bella Vista Ranch Phase II site. There is a 24 inch sanitary sewer interceptor near the northwest corner of the proposed development which will be evaluated at the tentative map and final map phases of development to determine available capacity. The servicing treatment facility is the Southeast Truckee Meadows Water Reclamation Facility (STMWRF), which is owned and operated by

Washoe County. All proposed sanitary sewer infrastructure constructed as a part of the development is considered in the interlocal agreement between the City of Reno and Washoe County. This interlocal agreement addresses payment of connection and user fees for end users. The development is anticipated to generate approximately 707,450 gallons per day. It is anticipated that STMWRF will have the necessary capacity to serve the development.

Water Facilities: The project site is located within the Truckee Meadows Water Authority (TMWA) service territory. The developer(s) will need to dedicate sufficient water rights with each building permit or final map application. All water facilities for the project will be required to be designed and constructed to conform to TMWA standards and in conformance with Northern Nevada Public Health requirements.

Emergency Services: The Reno Fire Department noted that the closest fire station is Station 12, located at 1190 Steamboat Parkway, with a current response time of 13 minutes. The project location exceeds the required six-minute response time. As such, fire sprinklers shall be required in all single/multi-family occupancies. Additionally, two separate fire apparatus access roads shall be provided per the 2018 International Fire Code Appendix D requirements.

Master Plan Conformance: The subject site has a Master Plan land use designation of Special Planning Area (SPA) and is located within the Outer Neighborhoods per the Structure Plan Framework of the Reno Master Plan. The proposed amendments are consistent with the existing land use designations surrounding the site which include ±153 acres of the Suburban Mixed Use (SMU) land use to the northwest of the site and Single-Family (SF) land use east of BVII SMU. The proposed amendments will connect new and existing neighborhoods to open space, greenspace, and trails, promote the protection and conservation of significant wildlife habitats, and allow for flexibility based on market demand. The PUD amendments are in substantial conformance with the Master Plan land use designation and the following applicable Master Plan goals and policies:

- Guiding Principle 4.2E: Neighborhood Connections
- Guiding Principle 4.2C: Innovative Design
- Guiding Principle 4.5A: Connectivity and Access
- Guiding Principle 6.3E: Planned Unit Developments
- Guiding Principle 7.1D: Environmentally-Sensitive Areas

Public and Stakeholder Engagement: The project was reviewed by various City divisions and partner agencies. Courtesy notices were sent out to surrounding property owners. The applicant attended both the Ward 2 and Ward 3 Neighborhood Advisory Boards (NAB). Comments and concerns expressed at NAB include the potential for no commercial development, water and resources for feral horses, school capacity, and sewer capacity.

The BVII SMU allows for a mix of uses. If there is a demand for commercial uses, BVII SMU will allow it. The applicant has been working with local groups to mitigate the impact of development on the feral horses. Washoe County School District has provided comments and can accommodate the increase in residential units. Prior to approval of the first building permit for any project, final improvement plans shall demonstrate that the sanitary sewer system has capacity to serve the site. All necessary easements and bonding for the improvements will be included. Any future comments received will be forwarded to the Planning Commission.

Findings:

General Review Criteria**:** The decision-making body shall review all development applications for compliance with the applicable general review criteria stated below.

1) Consistency with the Reno Master Plan: The proposed development shall be consistent with the Reno Master Plan. The decision-making authority:
   a. Shall weigh competing plan goals, policies, and strategies; and
   b. May approve and application that provides a public benefit even if the development is contrary to some of the goals, policies, or strategies in the Reno Master Plan.
2) Compliance with Title 18: The proposed development shall comply with all applicable standards in this Title, unless the standard is lawfully modified or varied. Compliance with these standards is applied at the level of detail required for the subject submittal.
3) Mitigates Traffic Impacts: The project mitigates traffic impacts based on applicable standards of the City of Reno and the Regional Transportation Commission.
4) Provides Safe Environment: The project provides a safe environment for pedestrians and people on bicycles.
5) Rational Phasing Plan. If the application involves phases, each phase of the proposed development contains all of the required streets, utilities, landscaping, open space, and other improvements that are required to serve or otherwise accompany the completed phases of the project, and shall not depend on subsequent phases for those improvements.

***Zoning Map Amendment*:** All applications for zoning map amendments shall meet the approval criteria in Section 18.08.304(e), *Approved Criteria Applicable to all Applications*, and the following findings:

(1) The amendment, together with changed components of the Title, promotes, or does not conflict with the provisions of NRS 278.250(2) (outlined below);

    The zoning regulations must be adopted in accordance with the master plan for land use and be designed:

    a. To preserve the quality of air and water resources;

b. To promote the conservation of open space and the protection of other natural and scenic resources from unreasonable impairment;
c. To consider existing views and access to solar resources by studying the height of new buildings which will cast shadows on surrounding residential and commercial developments;
d. To reduce the consumption of energy by encouraging the use of products and materials which maximize energy efficiency in the construction of buildings;
e. To provide for recreational needs;
f. To protect life and property in areas subject to floods, landslides and other natural disasters;
g. To conform to the adopted population plan, if required by NRS 278.170;
h. To develop a timely, orderly and efficient arrangement of transportation and public facilities and services, including public access and sidewalks for pedestrians, and facilities and services for bicycles;
i. To ensure that the development on land is commensurate with the character of the physical limitations of the land;
j. To take into account the immediate and long-range financial impact of the application of particular land to particular kinds of development, and the relative suitability of the land for development;
k. To promote health and the general welfare;
l. To ensure the development of an adequate supply of housing for the community, including the development of affordable housing;
m. To ensure the protection of existing neighborhoods and communities, including the protection of rural preservation neighborhoods;
n. To promote systems which use solar or wind energy;
o. To foster the coordination and compatibility of land uses with any military installation in the city, county or region, taking into account the location, purpose and stated mission of the military installation.

(2) The amendment is in substantial conformance with the Master Plan.

Planned Unit Development: In addition to meeting the approval criteria in Section 18.08.304(e), *Approval Criteria Applicable to all Applications* and the findings for approval of zoning map amendments in Section 18.08.503(d), *Findings*, the Planning Commission and City Council shall find that the Tentative PUD Plan:

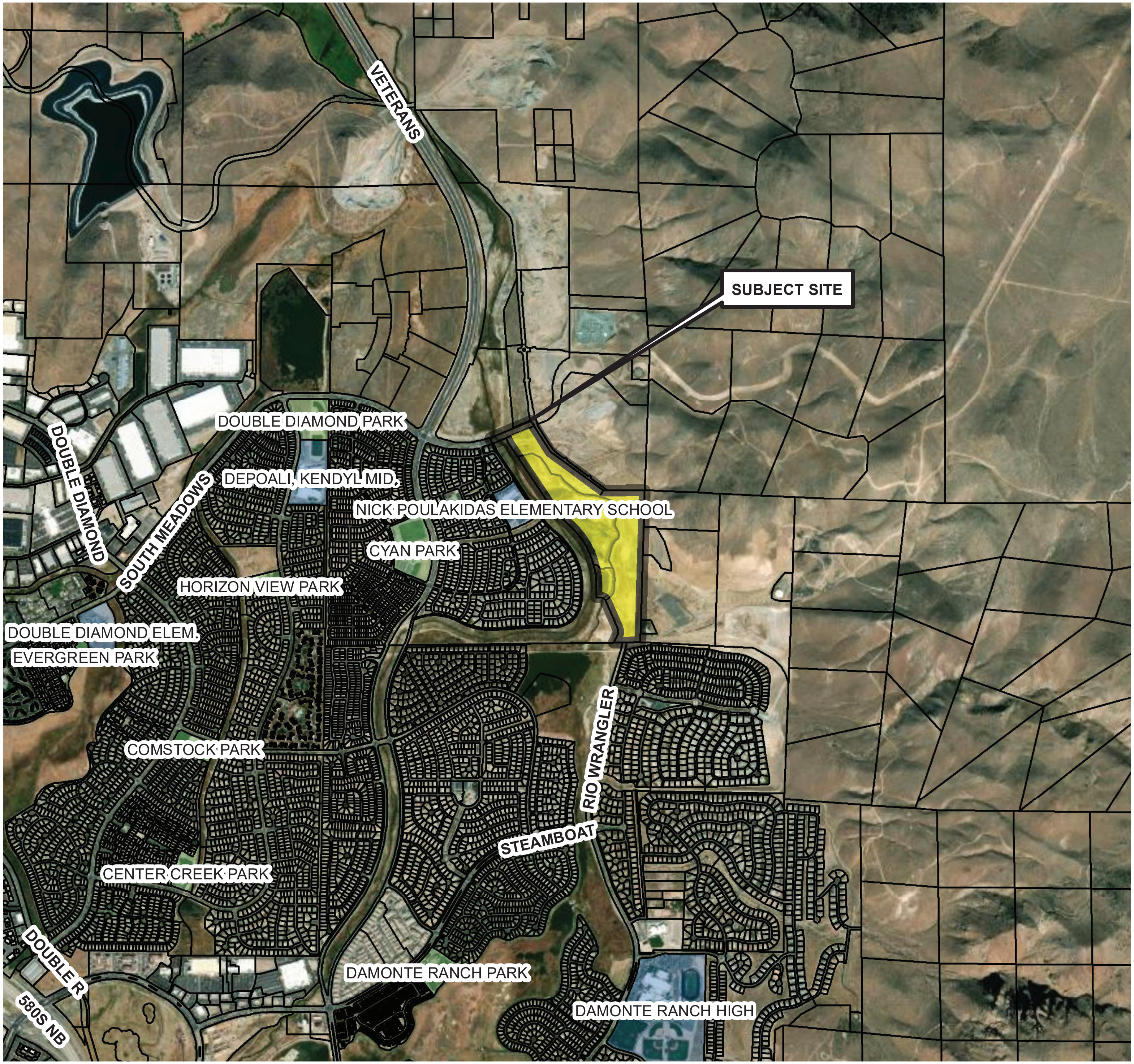
(1) Is consistent with the statement of objectives of a PUD.
(2) Ensures that any departures from standard zoning and subdivision regulations otherwise applicable to the property, including but not limited to density, bulk and use, are in the public interest.
(3) Has a ratio of residential to nonresidential use that is appropriate for the area and compatible with nearby land uses.

(4) Provides an appropriate location and amount of the common open space and provides for the maintenance and conservation of the common open space in relation to the proposed density and type of residential development.
(5) Includes an adequate provision for public services, adequate control over vehicular traffic, and furthers the amenities of light and air, recreation, and visual enjoyment.
(6) Is compatible with the neighborhood in which it is proposed to be established.
(7) For PUD Plans that propose phased development over a period of years, sufficient terms and conditions are included to protect the interests of the public, residents, and owners of the PUD in the integrity of the plan. Addresses a unique situation, provides substantial benefit to the City, or incorporates innovative design, layout, or configuration resulting in quality over what would typically be accomplished through strict application of a base zoning district or other standards of this Title;
(8) Is compatible with a Master Plan land use category or categories, including Master Plan guidance on the desired density, use, and characteristics of the land use category; and
(9) Demonstrates that there is a public benefit gained from approval of the PUD, such as but not limited to the following:
    a. Additional or better open spaces, or a design or development of open spaces that creates a desirable and useful environment;
    b. Additional public use facilities, such as but not limited to pedestrian and bicycle trails, parks, open spaces, streets improving local circulation, or public access to a lake or stream;
    c. Preservation or enhancement of natural and cultural assets, such as historic landmarks, migration routes, wetlands, fish or animal habitats, geographical features, specimen trees, or views;
    d. Other general public benefit features that contribute to improving the environment and ecology of the vicinity, such as incorporating green infrastructure improvements to enhance stormwater infiltration and/or provision of additional flood protection facilities; and/or
    e. A significantly higher quality development than following traditional development practices would allow, including more efficient use of land, energy, and resources, a more unified design concept, and a more carefully planned, considered, and livable community.

Attachments:

Exhibit A - Case Maps
Exhibit B - PUD Handbook (Clean version & Track Changes Version)
Exhibit C - Mercury Report
Exhibit D – Appendix

Exhibit A - Case Maps

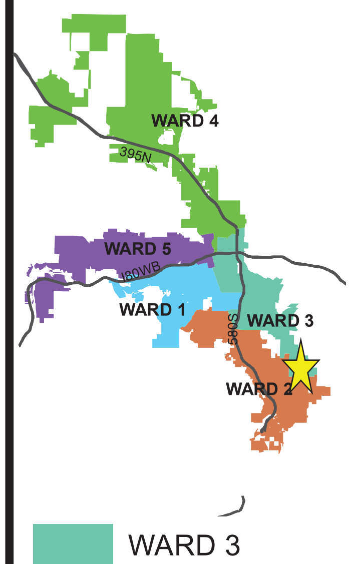


AREA MAP

LDC24-00031

(Bella Vista II Phase II PUD Amendment)

Subject Site ▶



WARD 3

Development Services Department

The information heron is approximate and is intended for display purposes only.

Date: January 2024

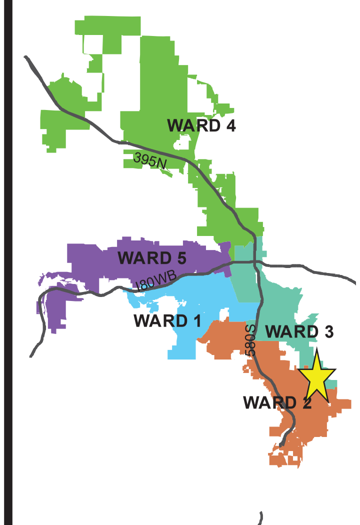
Scale: 1 inch = 2,400 feet

VICINITY MAP

LDC24-00031

(Bella Vista II Phase II PUD Amendment)

Subject Site ▶



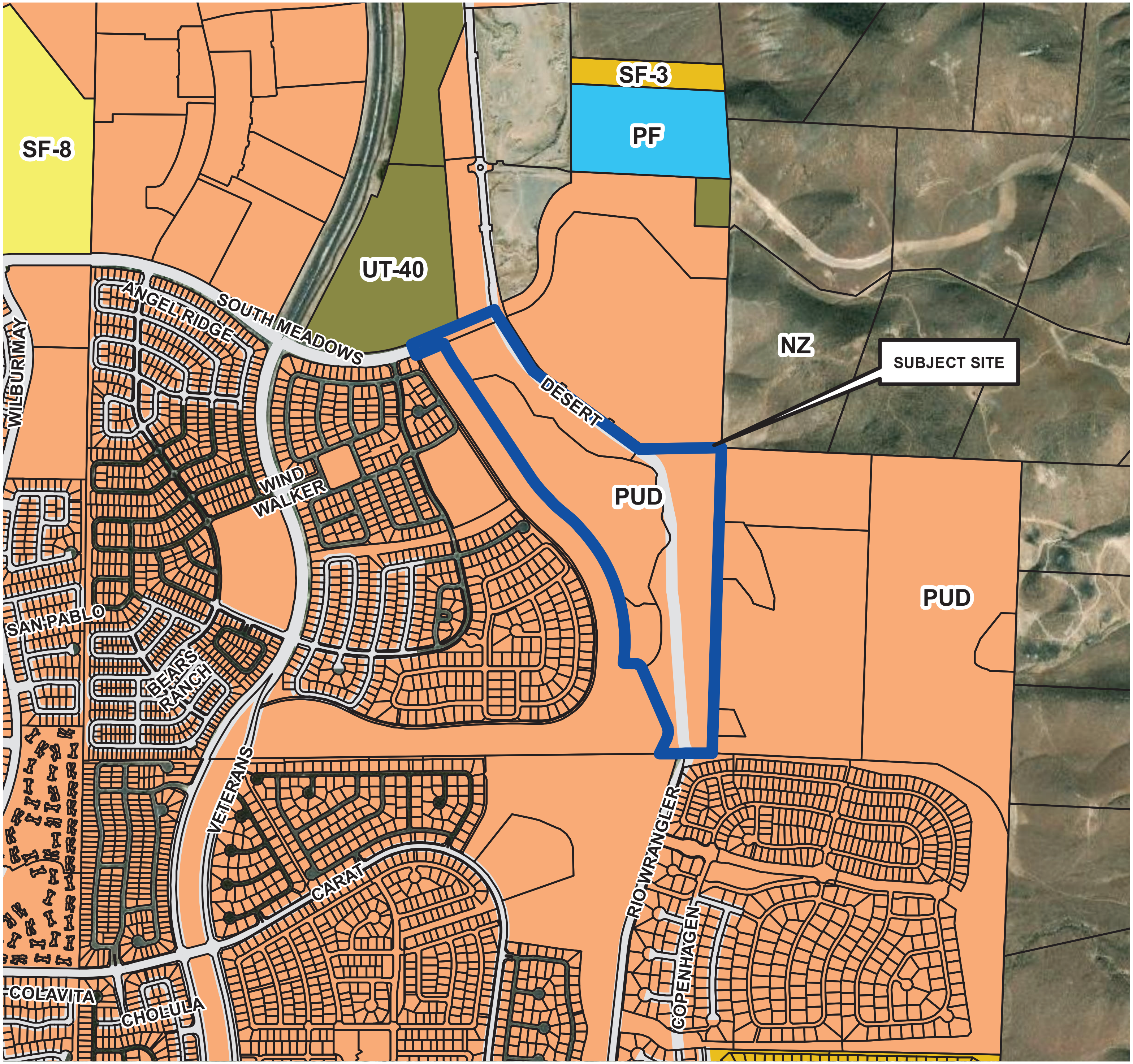
WARD 3

Development Services Department

The information heron is approximate and is intended for display purposes only.

Date: January 2024

Scale: 1 inch = 1,200 feet



ZONING MAP

LDC24-00031

(Bella Vista II Phase II PUD Amendment)

ZONING = PUD

Subject Site ▶

Zoning Designations

- PUD
- SF-3
- SF-8
- PF
- UT-40

Development Services Department

The information heron is approximate and is intended for display purposes only.

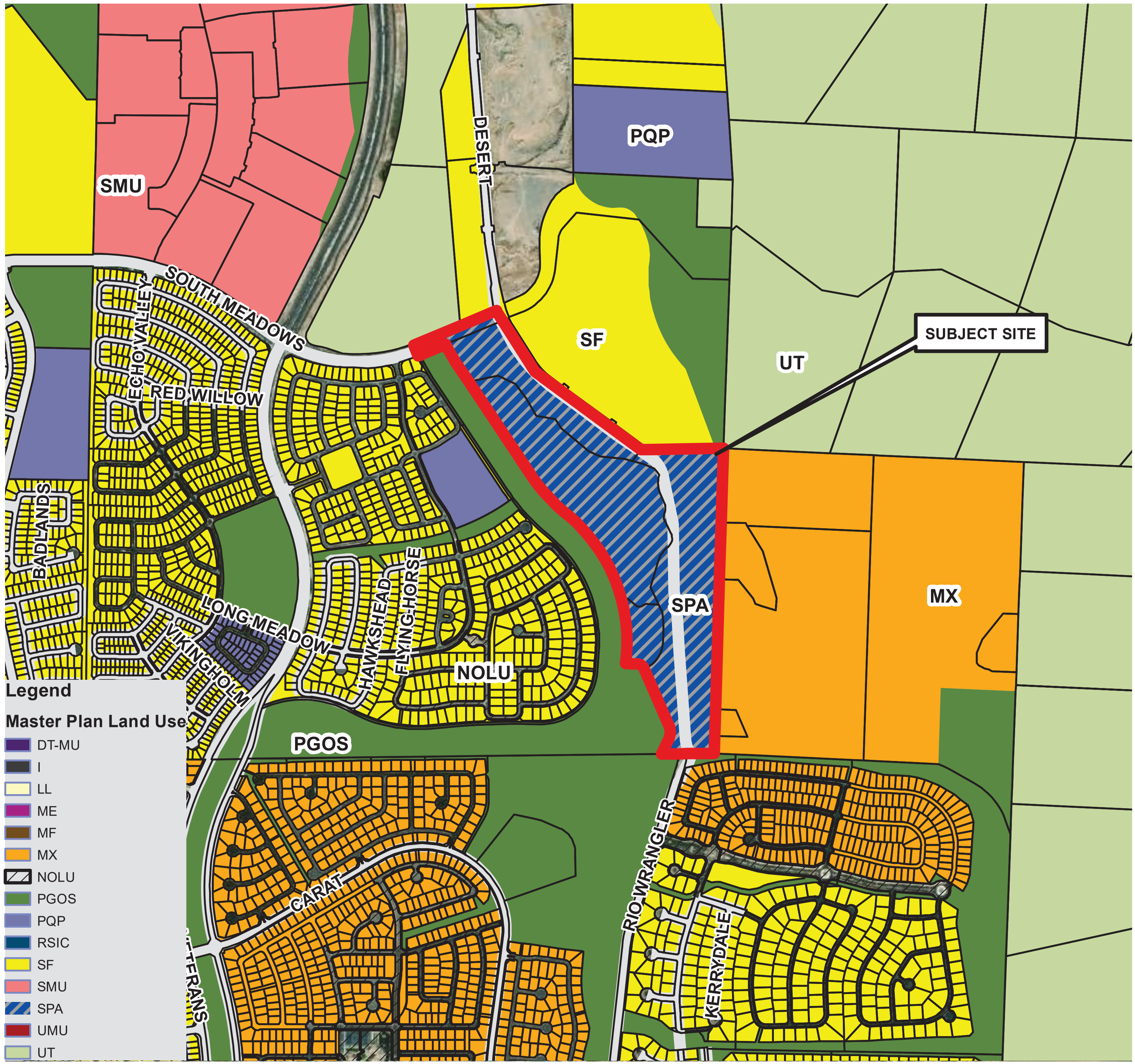
DATE: January 2024
SCALE: 1 inch = 1,200 feet

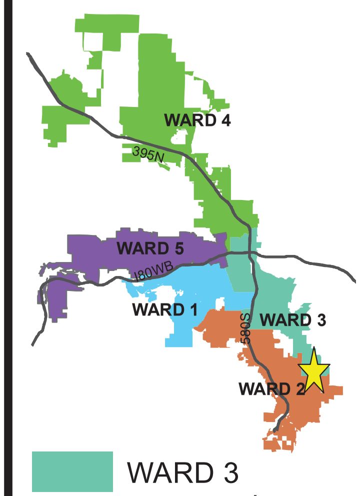
MASTER PLAN MAP

LDC24-00031

(Bella Vista II Phase II PUD Amendment)

Subject Site ▶





Development Services Department

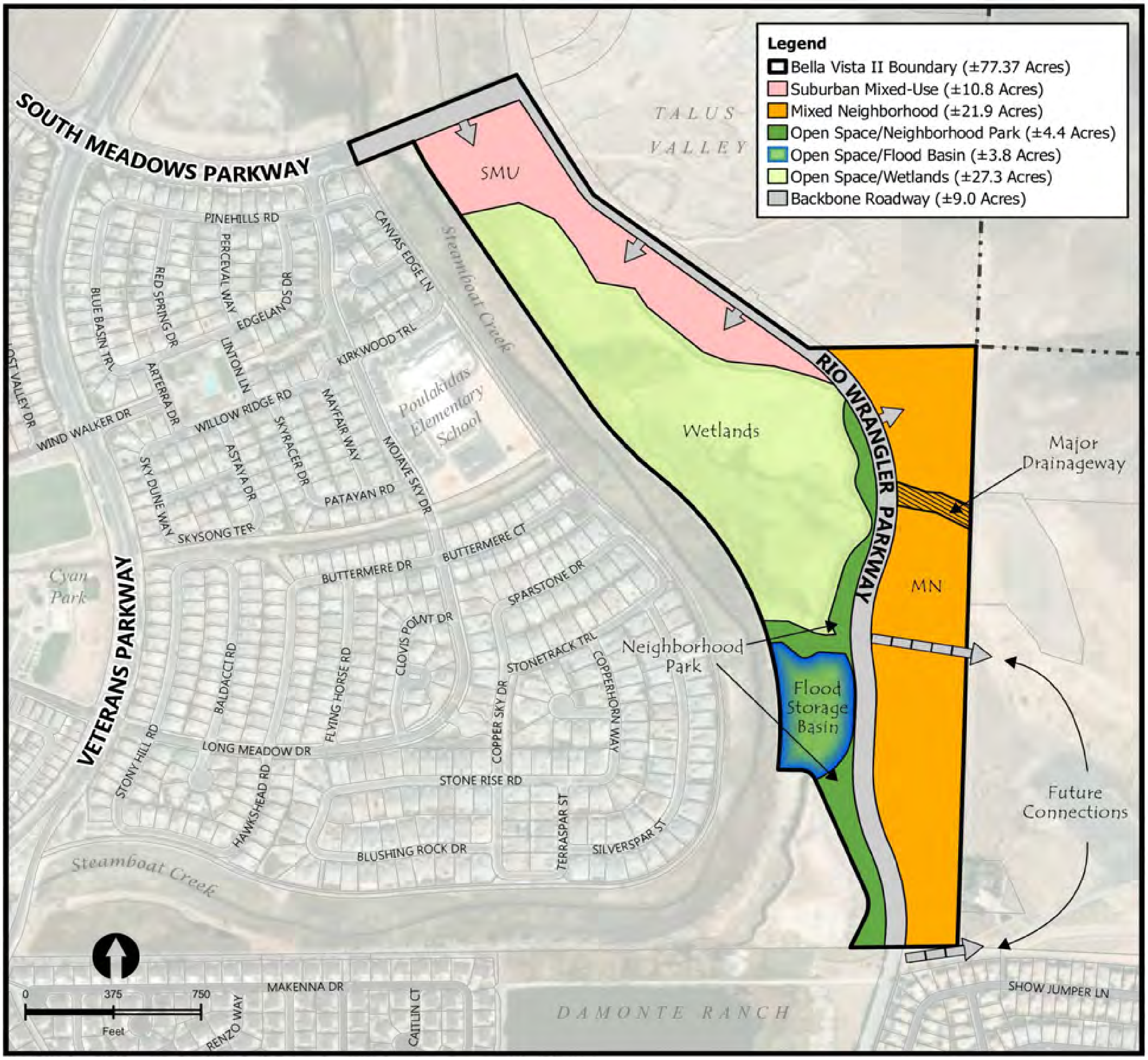
CITY OF RENO

The information heron is approximate and is intended for display purposes only.

Date: January 2024
Scale: 1 inch = 1,200 feet

Bella Vista Ranch Phase II

PUD Design Standards
Reno, Nevada



Certified by City Council:
January 16, 2013

Amended on:
March 9, 2022

Prepared for:
City of Reno

DRAFT AMENDMENT: DECEMBER 26, 2023

I. PROJECT DESCRIPTION

II. SERVICES & FACILITIES

III. DESIGN STANDARDS

FIGURES:

TABLES:

I. PROJECT DESCRIPTION

The ±77.37-acre Bella Vista Ranch Phase II Planned Unit Development (PUD) is located in the southeastern portion of the City of Reno (**Figure 1**). The PUD includes a mixture of residential, commercial, neighborhood park, and open space uses. The intent of the PUD is to preserve the proposed open space and wetlands, including the flood storage improvements, and create two (2) development areas which will be developed for subsequent subdivision into individual building lots, multi-family housing, and non-residential building sites. One development area will allow a mix of residential and non-residential uses that will support the future development, and the surrounding neighborhoods, while the other will be limited to only residential uses. This will allow for the development of a range of housing types and options.

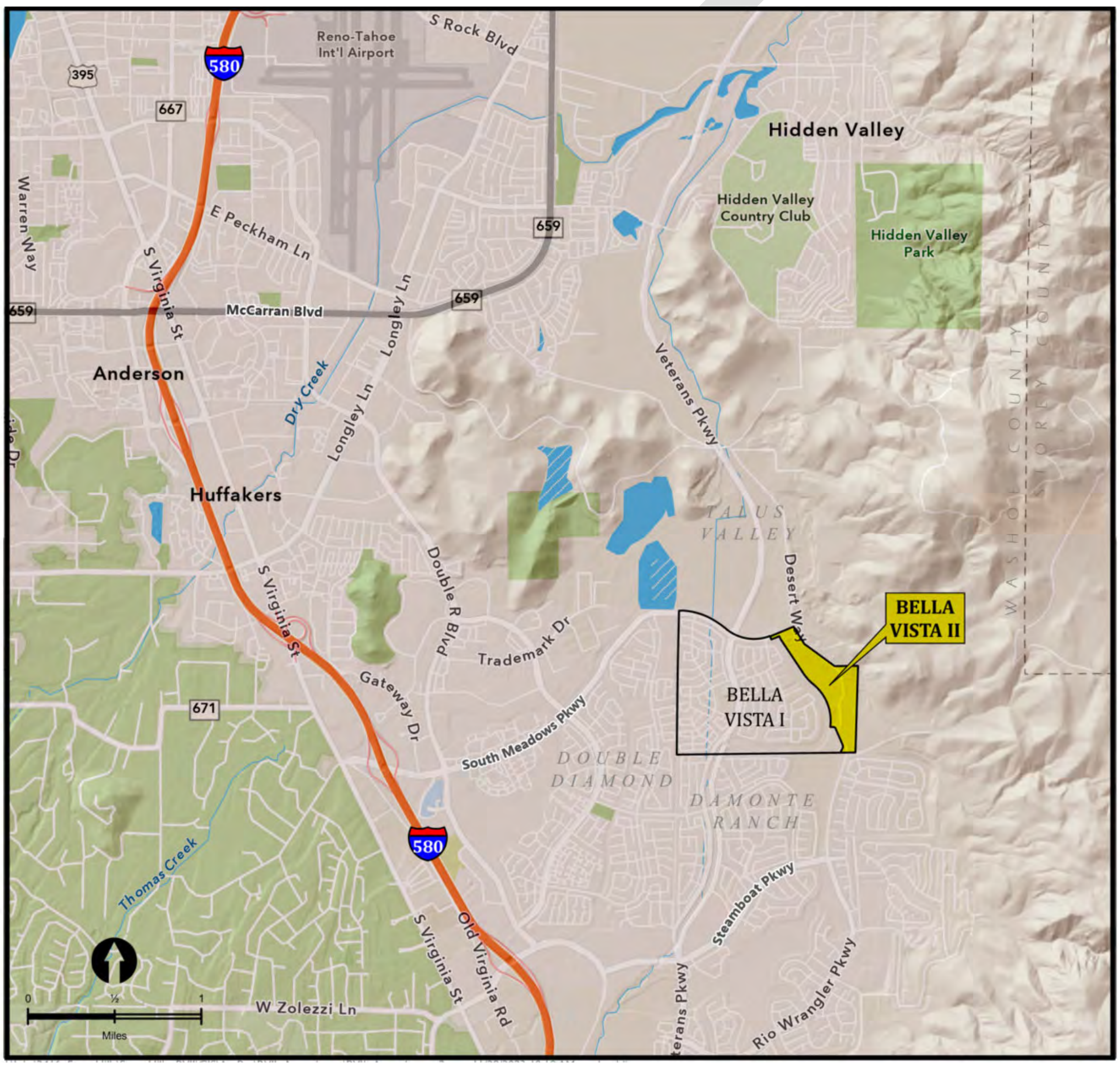


FIGURE 1
Location Map

A. Development Concept

The Bella Vista Ranch Phase II PUD consists of a mixture of residential, commercial, and open space/parks. Residential uses will be allowed within the Mixed-Neighborhood (MN) land use and will allow for single-family detached, single-family attached, and multi-family uses at densities ranging from 6 to 30 dwelling units per acre (du/ac). The Suburban Mixed-Use (SMU) land use will include a mix of residential and neighborhood commercial uses. Parks Greenways and Open Space (PGOS) land use provides a total of ±35.5 acres and will include a ±4.4 neighborhood park, ±3.8 acres of flood storage basin and ±27.3 acres of wetlands (WM-1), (as shown on ***Figure 2).***

The maximum density, total number of dwelling units and the maximum non-residential square footage for each village is shown on **Table 1**, page 14. The maximum number of dwelling units within the entire Bella Vista II PUD shall not exceed 609 dwelling units (residential) and the commercial square footage shall not exceed 117,612 square feet (non-residential).

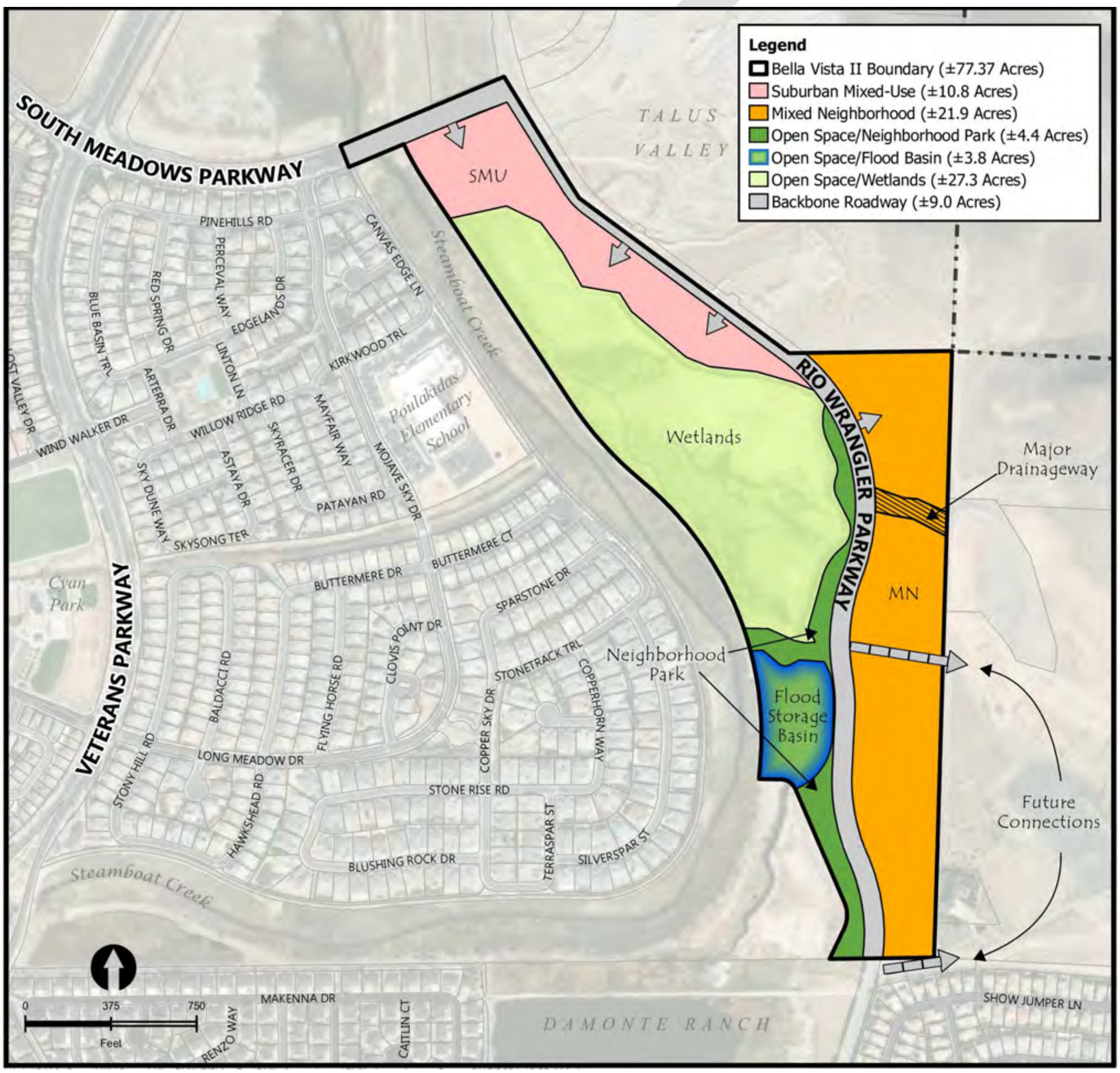


FIGURE 2
Land Use and Phasing Plan

B. Site Features Influencing Site Plan Design

Several onsite and offsite environmental constraints were considered when influencing site plan design. These are identified in **Figure 3**, Dominant Site Features.

Onsite Features
The entire site is virtually flat with a modest slope from south to north. Environmental onsite constraints include:

i. The jurisdictional wetland area (WM-1) that will be set-aside as permanent open space and enhanced as part of the Steamboat Creek Restoration program discussed in Appendix C are identified as "wetlands" in **Figure 3**. This area is proposed to be located within the ±27.3 acres of wetlands (WM-1), as shown on **Figure 2** and will not be developed.
ii. One major drainageway as identified to be within the MN land use in **Figure 2** is defined as a disturbed drainageway. It will be restored per City of Reno code 18.04.104 Drainage Way Protection, as amended and as further defined in the PUD. The final location of the major drainageway will be determined during the tentative map or major site plan review phase.
iii. The existing Irrigation Ditch will not be significantly impacted as part of this PUD and is proposed to be within the PGOS land use as identified in **Figure 2**.

Offsite Features
Environmental Constraints off site include:

iv. The Bella Vista I PUD re-aligned Steamboat Creek to the west. The current alignment of Steamboat Creek provides for one continuous and contiguous open space corridor linking all the wetlands and drainages on Damonte Ranch with the wetlands and drainages on the Bella Vista Ranch. The open space/neighborhood park buffer around the existing wetlands proposed in this development will enhance these features further and contribute to the contiguous open space corridor, (refer to "Steamboat Creek" in **Figure 3**).
v. Feral horses have migrated into this portion of the Bella Vista Ranch since the ranch fences were removed with construction of the Steamboat Creek restoration project. To address this issue, a Feral Horse Protection Plan has been developed for this PUD, (refer to **Figure 15**).

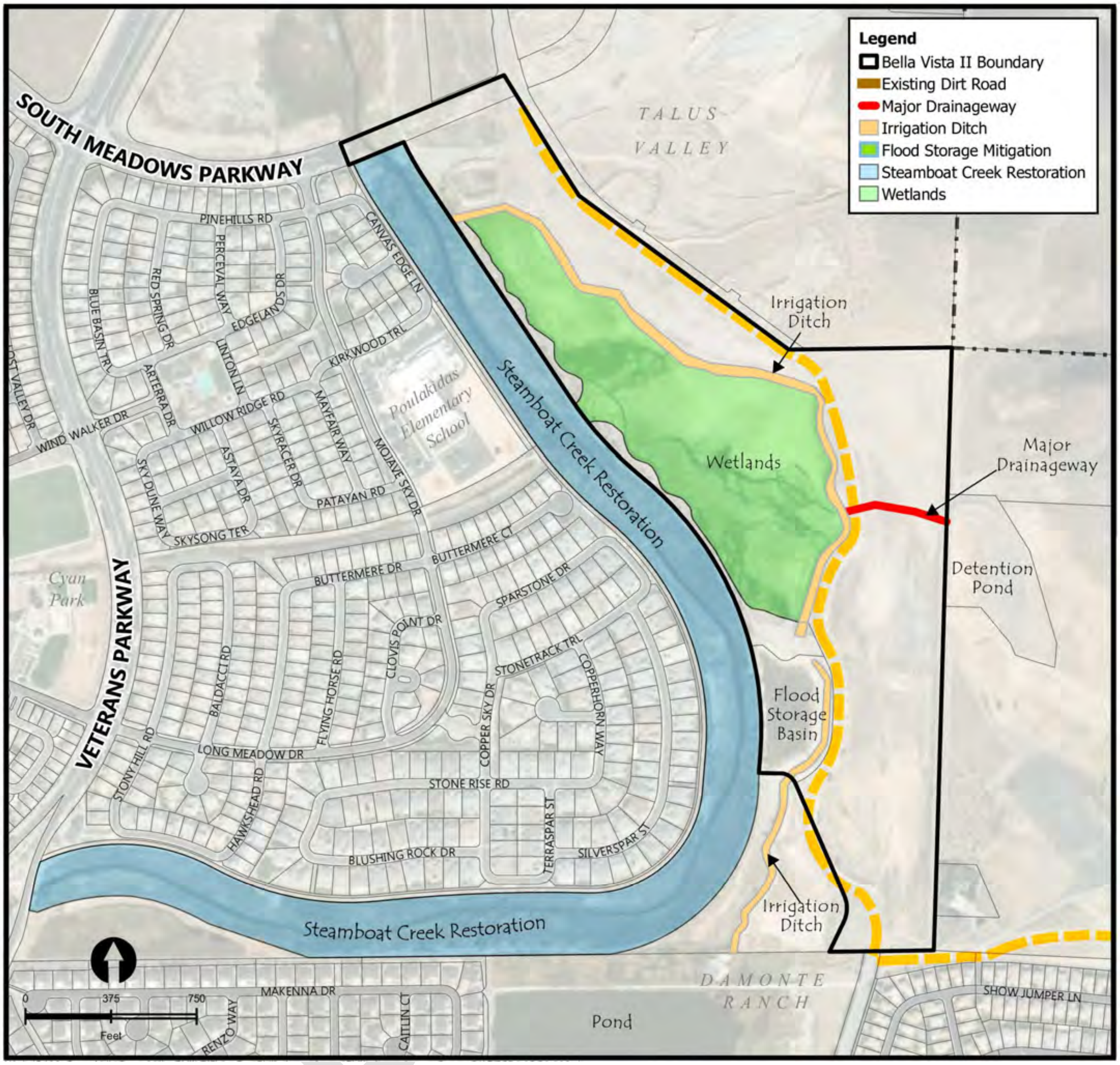


FIGURE 3
Dominant Site Features

C. Phasing

<u>Phasing Strategy</u>
The intent of the phasing strategy is to provide a balanced and effective approach to the buildout of the project. The phasing plan is a statement of the Master Developer's intentions related to the pattern and timing of construction. The phasing described presents a likely and logical sequence for development but may change due to factors including changes in market demands for the various types of land uses, the pace of individual developers and the availability of financing.

It is anticipated that the project will be developed in two (2) phases. The first phase includes the SMU Land Use, in the north half of the site. The second phase includes Mixed Neighborhood (MN) in the south half of the site and the neighborhood park.

<u>Major Infrastructure Phasing</u>
The following represents the Developer's anticipated timing for the construction of the major backbone infrastructure and how it will be phased. It is based on current market conditions and anticipated construction seasons, both of which could change over time. The trunk sanitary sewer, water trunk line, gas, electric, phone and cable distribution facilities will be constructed to serve each phase, (refer to **Figure 4**). On-site public improvements to service individual lots or projects such as, sanitary sewer, water, storm drain, gas, electric and phone shall be constructed with each residential subdivision, multi-family or non-residential building permit.

<u>Mass Grading</u>
Mass grading may occur prior to the design and approval of major infrastructure and/or at the same time as grading on adjacent parcels to allow for the mass grading associated with backbone infrastructure. This is anticipated to occur in Phase I in conjunction with the half street improvements on adjacent parcels. The grading of the Major Drainageway is anticipated to be within Phase 2 and will be completed with the development of the MN land use. During this phase the final location will be determined based on the type of development proposed and would need to be addressed through a site plan review or the tentative map process.

<u>Backbone Roadways</u>

Phase I:

The extension of South Meadows Parkway shall be constructed by the adjacent developer to the north (Talus Valley) or by the Bella Vista II Master Developer, whichever is first. This also may include half street improvements prior to development of the Bella Vista II PUD. The final improvement plans shall be submitted with final maps or with building permit submittal for the extension (refer to ***Figures 8A & 8B***). All necessary Right of Way dedication maps, easements, adjacent landscape corridor and sound wall/fencing improvement plans and bonding for the improvements shall be included with the submittal.

The northwest ±1,300 feet of Rio Wrangler half street improvements shall be constructed by the adjacent developer (Talus Valley). The northeast half of Rio Wrangler Parkway, including sidewalks, landscaping and fencing shall be constructed by the Bella Vista II Master Developer. The northwestern portion of Rio Wrangler Parkway within the SMU will be constructed prior to, or in coordination with, the development of the SMU Land Use.

Phase II:

Prior to approval of the first building permit submittal for any project in the MN Land Use, final improvement plans shall be submitted for review for the south ±2,700 feet of Rio Wrangler Parkway from the SMU Land Use in the north to the current terminus or Rio Wrangler Parkway to the south (refer to ***Figure 5***). All necessary R.O.W. dedication maps, easements, adjacent landscaping, and sound wall/fence improvements shall be included with the submittal.

Construction of Phase A and B of the Backbone Roadways will occur after approval of the plans. Bonding for the improvements shall be provided with the building permit.

Sanitary Sewer Trunk Lines
Prior to approval of the first building permit submittal for any project, final improvement plans shall be submitted for staff review of the sanitary sewer system to serve the site (refer to *Figure 4*). All necessary easements and bonding for the improvements will be included.

Water Main
Prior to approval of the first building permit for any project, final improvement plans shall be submitted for staff review of the water main construction to serve the site, (refer to ***Figure 4***). All necessary easements and bonding for the improvements will be included.

Public Amenities Phasing
A ±4.4 acre public neighborhood park, will be constructed prior to the buildout of the MN land use. The open space and 8-foot-wide asphalt trail associated with or adjacent to each phase will be constructed by the Master Developer prior to completion of each phase.

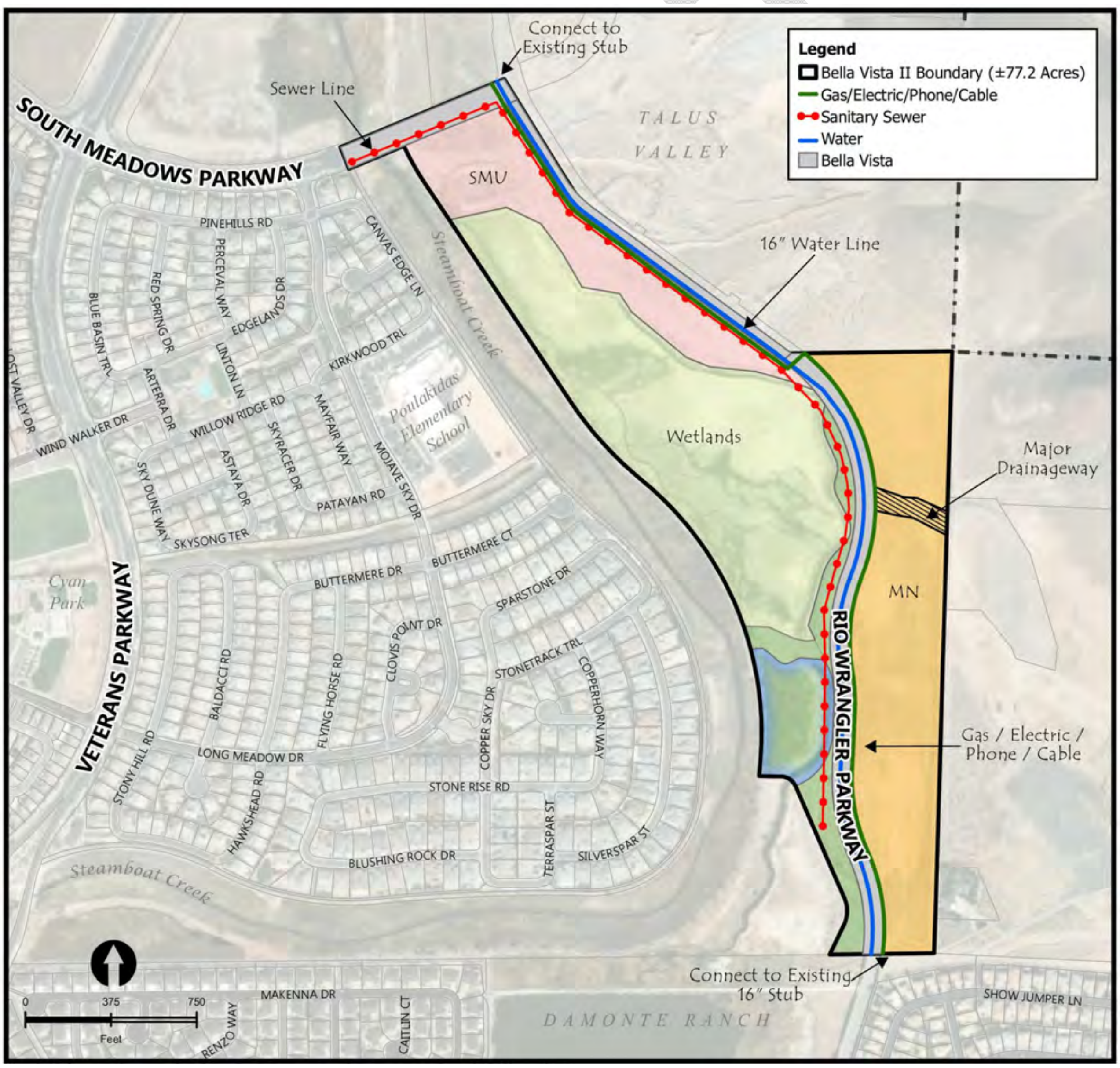


FIGURE 4
Major Infrastructure Phasing

II. SERVICES & FACILITIES

A. Traffic and Circulation Plan

Per the Traffic Study prepared by Headway Transportation on (December 22, 2023), the project is expected to generate 7,752 average daily trips with 545 trips occurring during the AM peak hour and 588 trips occurring during the PM peak hour. Traffic will have some impact on the adjacent street network. However, the proposed improvements will generally improve traffic for the surrounding area with the extension of South Meadows Parkway and Rio Wrangler Parkway. All tentative/final map applications and building permit submissions shall adhere to the recommendations in the Master Traffic Study and include an updated traffic letter with each tentative map/building permit, to show compliance with the Master Traffic Study, (refer to **Appendix A**), street types and design standards are outlined in detail in Section III**,** Design Standards, Section F.

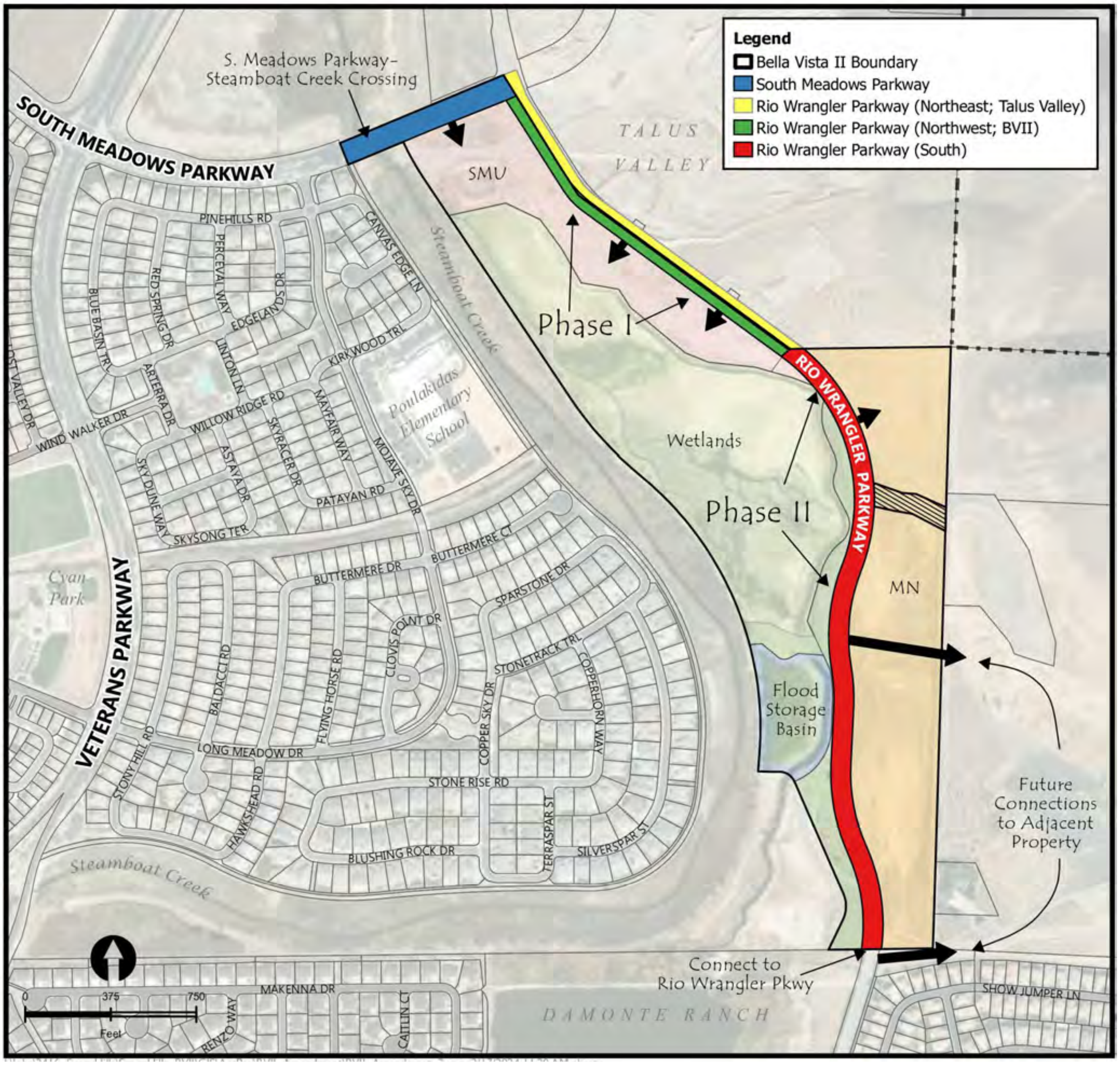


Figure 5
Major Roadways

B. Parks, Trails, and Open Space

A primary objective for this development is the inclusion of strategically located and accessible open space. To accomplish this objective, an interconnected system of sidewalks and trails is planned. The design standards for this pedestrian and bicycle circulation system are contained in Section II.

Parks
A ±4.4 acre neighborhood public park will be located in the south central portion of the project between the open space wetlands and Rio Wrangler Parkway, (refer to **Figure 2**). The park will be passive and will include a maximum one (1) acre of turf area for outdoor play. This park shall be connected to a sidewalk and trail system and provide access to other open space areas and developments throughout the PUD, (refer to **Figure 6**). The park will be constructed by the developer and maintained by the HOA as discussed in the Maintenance section of this PUD. The park will be designed to the approval of the City of Reno and constructed by the property developer.

The developer shall not receive credit towards the Residential Construction Tax (park fees) to construct the park. All Residential Construction Tax fees collected from this project shall be used to construct additional amenities within Cyan Park, located within the Bella Vista Ranch PUD to the west of this project which is within the same Park District. The proposed trail system within this PUD will connect to the adjacent trail networks and provide additional pedestrian connectivity.

The Residential Construction Tax Agreement for this project shall be completed and approved by the Reno City Council prior to or simultaneously with the certification of this PUD. The approved Agreement is attached as appendix H to this PUD. Refer to **Section III,** for additional design standards and implementation requirements.

Trails, Sidewalks, and Bike Lanes
Trails, sidewalks and bike lanes will be provided in accordance with **Figure 6**. Sidewalks and bike lanes will be provided on both sides of the arterial roadways. A pedestrian/bike multiuse trail will be provided along the east side of the wetland consolidation area and linear park. The arterial roadway sidewalks will connect to the trails in the Damonte Ranch area to the south. The arterial roadway sidewalks and pedestrian/bike trails will also connect to the Steamboat Creek Corridor and the parkway trails in the Bella Vista Ranch PUD to the west, (refer to **Figure 6**). The local pedestrian street sidewalks will provide internal connection from the developments to the trails and sidewalks and provide additional pedestrian access over South Meadows Parkway including safe pedestrian access to Nick Poulakidas Elementary School and Depoali Middle School to the west.

Open Space
Open space will be located within and adjacent to natural areas, such as the Steamboat Creek corridor, and manmade open space areas, such as the major drainageway. Trails and sidewalks will be located within the open space and provide connectivity throughout the PUD and connect to existing and proposed trail networks in the surrounding neighborhoods, (refer to ***Figure 6***).

C. Wetlands

The delineation of federally protected wetlands on this property was completed with approval of the individual Corps of Engineers permit number # 200400683, (refer to **Appendix C**). One of the two delineated wetlands covered by this permit (WM-1) exist within this PUD (refer to ***Figure 2*** and ***Figure 3***). Any enhancements within wetland area must be consistent with the Final Wetland Mitigation Plan approved by the Corps of Engineers through individual permit listed above under Section 404 of the Clean Water Act and the City of Reno Wetlands and Stream Environment Protection Standards, as amended. The wetland mitigation plan prepared by Gibson & Skordal, Wetlands Consultants dated February 2005, and the 404 permit dated October 2005 is located in Appendix C and includes additional details regarding the mitigation plan. All wetland improvements should also be in compliance with the City of Reno Wetlands and Stream Environment Ordinance, RMC 18.12.1801-1808, as amended.

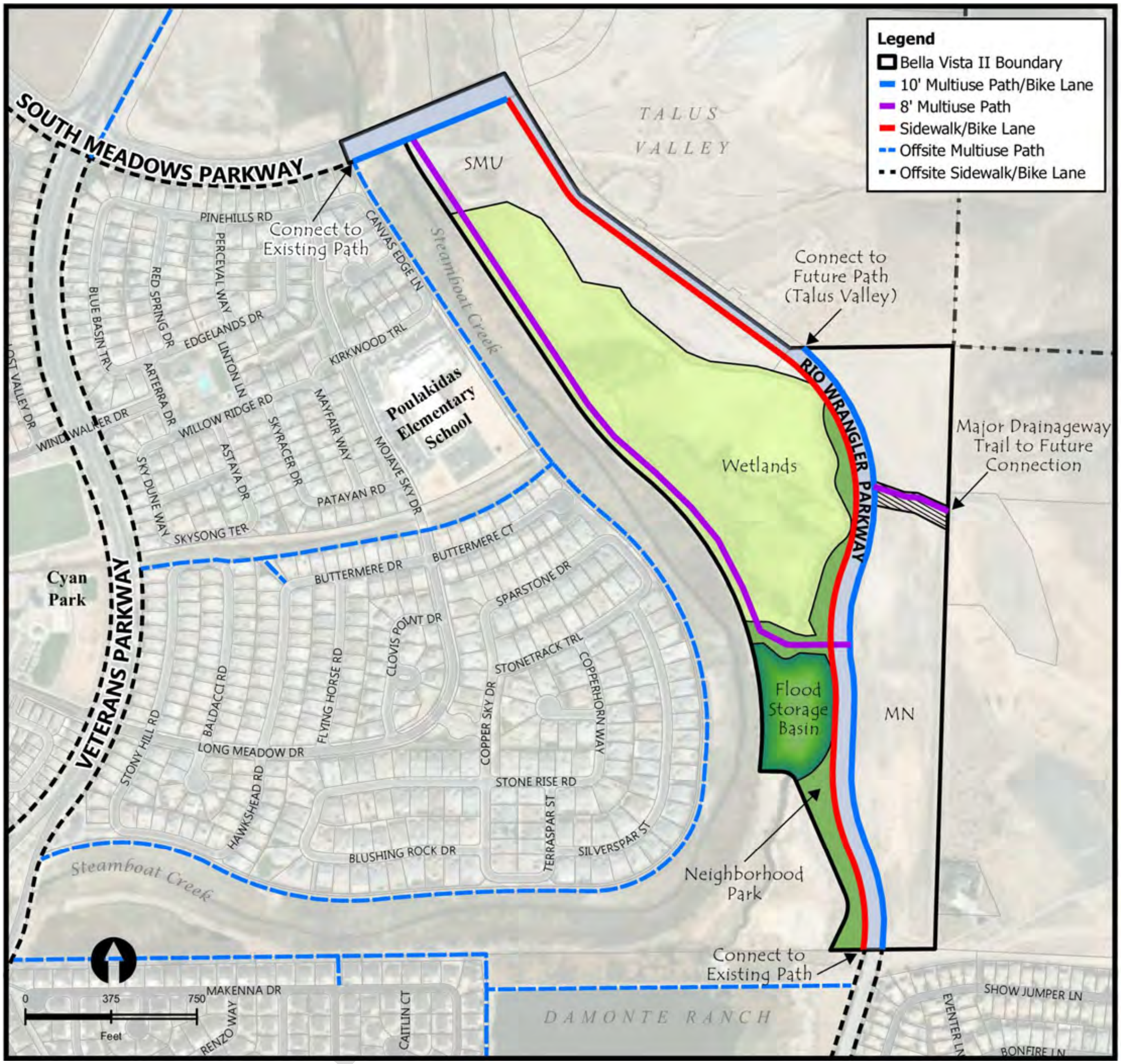


FIGURE 6
Open Space/Trail, Sidewalk and Bike Lane Plan

D. Stormwater Management

Site Drainage

The property slopes to the west/northwest very gradually at a typical gradient of less than half a foot per hundred feet (0.5%). The Steamboat Creek Restoration Project, adjacent to the west side of the site, was designed to provide 5 year and 100 year outfall drainage for the Phase II PUD. The City of Reno Public Works Design Manual and the standard details for Public Works shall be the design standards for on-site storm drainage system designs and construction. All on-site stormwater management and drainage improvements shall adhere to the Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006 and all updates or addenda thereto, (refer to **Appendix B**).

Flood Potential
The current Federal Emergency Management Agency (FEMA) DFIRM maps, dated March 2009, indicate that the site is not affected by the Zone A (100-year floodplain) from Steamboat Creek.

Floodplain Mitigation
The Flood Control Master Plan prepared by Quad Knopf Consulting, dated January 11, 2006 specifies how the 100-year floodplain was mitigated, (refer to appendix B). In summary, the approved flood control plan removed the developable portions of the site from the 100-year floodplain by constructing the Steamboat Creek Natural Corridor (SCNC). The current FEMA DFIRM maps dated March 2009 document that the site is not within the 100 year floodplain. Refer to appendix B-3 for a copy of the March 2009 DFIRM map. All floodplain mitigations shall adhere to the Flood Control master Plan and all updates or addenda thereto.

As noted in the QuadKnopf study, the following steps have been completed to remove the project from the 100-year floodplain:

- Approval from the Corps of Engineers of the 404 Individual Permit # 200400683. Permit received February 2005, copy in appendix C.
- Approval of the CLOMR for Phase II by FEMA received August 8, 2007, copy in appendix B.
- Approval of the LOMR for Phase II by FEMA received April 25, 2008, copy in appendix B.

Detention – Flood Storage
The Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006, specifies how the detention/flood storage issues are to be addressed for this PUD. (refer to appendix B). All flood storage and detention improvements shall adhere to the Flood Control Master Plan and all updates or addenda thereto.

Flood Mitigation Update
The Steamboat Creek channel work adjacent to the PUD area has been completed with the development of Bella Vista I and will not be changed with the development of this property. The adjacent property to the north (Talus Valley) has an approved CLOMR that addresses the existing and proposed conditions downstream of Bella Vista II. Additional work on the downstream improvements isn't warranted based on the proposed development in Bella Vista II. Therefore, onsite drainage will be addressed appropriately at the time of tentative maps or site plan review when details of the development are known and impacts can be further analyzed.

E. Major Drainageway

The existing drainageway noted in ***Figure 3*****,** is defined as a major drainageway because it drains more than 100 acres. It is also categorized as a "disturbed drainageway", as defined by Reno Municipal Code. The majority of this drainageway currently runs through the middle of the adjacent property to the east and is undistinguishable topographically. This drainageway terminates as it drains into the existing irrigation tail water ditch just west of the Desert Way (see Figure 3). The portion of the drainageway proposed for development shall be restored per City of Reno code 18.04.104. The Major Drainageway location will be finalized during the tentative map or through a Major Site Plan Review (MSRP).

F. Emergency Services

Police
A police impact fee will be collected for each residential unit and non-residential square foot constructed within the PUD in accordance with RMC Section 18.04.1206.

Fire
The Developer and the City previously executed a Fire Station Development Agreement. This revised agreement is called the First Amended Public Facility Site Agreement and includes development in this PUD as well as the Bella Vista Ranch PUD to the west. This revised First

Amended Public Facility Site Agreement outlines funding fee agreements to help the City provide fire service needs for the PUD. This funding is through a per-household and non-residential square foot fee to be collected at building permit. This revised First Amended Public Facility Agreement was completed and approved by the Reno City Council prior to certification of this PUD. The Agreement is appendix G of this PUD handbook.

The fee shall be paid into a dedicated account for this purpose prior to approval of any building permit for this PUD, as specified in the First Amended Public Facility Site Agreement.

G. Common Area Maintenance

General

This PUD will have Protective Covenants that address maintenance and enforcement of activities and will remain under the control of the Owners Association. These areas include parkways, open space areas and trails along drainage ways located outside of the public right-of-way. Project Protective Covenants (CC&R's) will clearly define maintenance responsibilities of the Owners Association versus the responsibility of individual property owners.

The City of Reno shall not be responsible for maintenance of any onsite private parks, common area improvements, private streets, storm drain channels, detention basins, other flood control facilities or the Steamboat Creek Restoration. The Owners Association or Drainage Maintenance District shall be responsible for maintenance of these facilities.

Drainage District

The Bella Vista Ranch (Phase I) PUD created and established a Drainage Maintenance District called the Cyan Drainage District (CDD), which has the powers and duties to contract for design, construction, and maintenance of drainage facilities throughout the Bella Vista Ranch PUD. This project shall incorporate into the existing CDD the areas identified as Wetlands and Flood Storage Basin in the Land Use Plan (**Figure 7**). It is intended that the project will be incorporated into the existing CDD via an annexation and/or supplemental declaration process.

The CDD shall be required to remove all vegetation from detention basins, flood storage areas, and low flow channels every two (2) years or as allowed by the Corps of Engineers permit. If the CDD fails to perform this periodic maintenance, then the City has the right to enter the property and perform said maintenance. If the City removes the vegetation from detention basins and low flow channels, then the City is entitled to receive reimbursement for these services from the CDD.

III. DESIGN STANDARDS

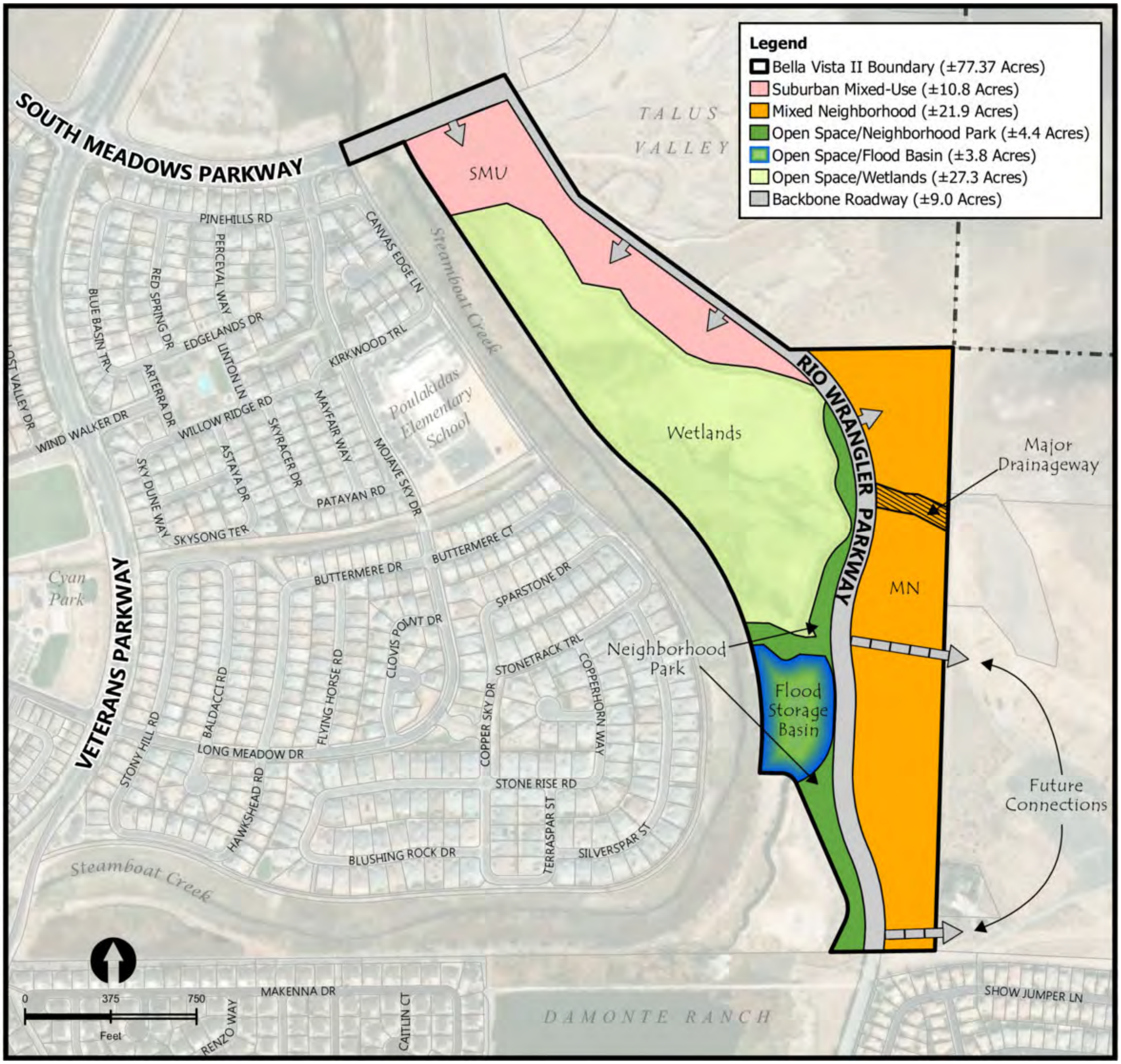


FIGURE 7
Land Use

A. Land Use Descriptions

Allowed uses include detached and attached single family residential, multi-family residential, lower intensity non-residential, parks, greenways/wetlands, and open space. The maximum density, total number of dwelling units and the maximum non-residential square footage for each village is shown on Table 1. The maximum number of dwelling units within the project shall not exceed 609 units (residential) and the non-residential square footage shall not exceed ±117,612 square feet (non-residential).

The Development Plan and Development Standards contained herein are intended to depict the general development vision for the PUD. Sufficient flexibility shall be allowed to permit detailed planning and design at the time of actual development. The acreage of each land use category may be increased by up to 10% if it is demonstrated that additional acreages are necessary due to constraints and/or design considerations to accommodate the project, to the satisfaction of the Administrator. This provision shall not exceed a cumulative total of 10% for each land use category. Changes in excess of 10% shall require an amendment to the Development Standards Handbook. Residential densities and residential dwelling unit allocation may be interchangeable between villages and will be defined fully with the tentative map for any given residential village.

TABLE 1
LAND USE BREAKDOWN

Village/Area[4]	Bella Vista II Land Use[5]	Size (Acres)	Min. Net Residential Density[3]	Max. Gross Residential Density[4]	Approx. Dwelling Units[1]	Min. Non-Residential Area	Max. Non-Res. Intensity (sq. ft.)[2]
SMU	SMU	±10.8	15 du/ac	30 du/ac	324	5 Acres	117,612
MN	MN	±22.0	6 du/ac	30 du/ac	285	N/A	N/A
Neighborhood Park	PGOS	±4.4	-	-	-	-	-
Flood Storage Basin	PGOS	±3.8	-	-	-	-	-
WM-I	PGOS	±27.4	-	-	-	-	-
South Meadows Pkwy/ Rio Wrangler Pkwy	*ROW*	±9.0	-	-	-	-	-
Total		**±77.4**			**609[1]**		**117,612[2]**

Notes:

1. The total amount of residential dwelling units by Village may vary but shall not exceed 609 units throughout the Bella Vista II PUD.
2. The total amount of non-residential may vary as long as the total floor area from non-residential development does not exceed 117,612 square feet throughout the SMU Land Use and a min of 5-acres is provided.
3. Minimum Net Density is calculated by dividing the total number of lots by the total acreage of lot area.
4. Max Gross Density is calculated by dividing the total number of lots by the total Village acreage.
5. All primary and accessory uses listed as permitted on **Table 2**, can be established by right, subject to compliance with the standards contained in this PUD. With the exception of tentative maps required to sell individual lots, no further discretionary review is required for each permitted unless otherwise stated in Table 2 below.

Suburban Mixed-Use

The Suburban Mixed-Use (SMU) land use category allows a mix of retail, commercial, employment, and high-density residential uses that are more appropriate near the two main arterials (South Meadows Parkway & Rio Wrangler Parkway). The mix of uses will serve the existing surrounding developments and the future developments and provide the area with additional residential opportunities. Trails within the SMU area will connect to the existing trail network to provide additional transportation opportunities.

Characteristics specific to the SMU area include:

- Buildings oriented along the main arterials.
- Bike and pedestrian connectivity is required throughout the site and connect to existing adjacent facilities.
- Signage will be limited to monument style only along Rio Wrangler Parkway.
- Design standards are outlined in Section D and E.

Mixed Neighborhood

The Mixed Neighborhood (MN) land use category includes a mix of housing types and can range from higher density housing including; multi-family, alley loaded town homes and condos, to lower density housing types including, triplex and duplex attached housing, zero lot single-family, and traditional single-family detached housing. These standards will allow for range of multi-generational housing, innovative designs, and community amenities that will provide a transition between commercial and lower intensity uses.

Characteristics specific to the MN area include:

- Provide a range of housing types
- Within walking distance to amenities such as retail, commercial centers, parks, and schools and connected with by trails and other bike and pedestrian facilities.
- Design Standards are outlined in Section D.

Parks, Greenways, and Open Space

The Parks, Greenways, and Open Space will protect the natural wetlands identified in WM-1 that connect with the floodways and Flood Storage Basin developed in the original Bella Vista PUD and take advantage of the close proximity to the Steamboat Creek. A ±4.4 acre Neighborhood Park will allow active and passive recreation and help to provide a transition with the natural elements of the property, with the development located in Villages 1 and 2. An extensive network of trails and bike and pedestrian paths will connect throughout the PGOS area and provide recreation opportunities to the surrounding and future developments.

B. Permitted Uses

TABLE 2
BELLA VISTA II PERMITTED USES

P = Permitted by Right
SPR = Site Plan Review Required
CUP = Conditional Use Permit Required
A = Permitted as Accessory Use

Use Category/Specific Use Type	BVII Land Use		
	SMU	MN	PGOS
Residential			
Dwelling, Single-Family Detached		P	
Dwelling, Duplex	P	P	
Dwelling, Triplex	P	P	
Dwelling, Fourplex	P	P	
Dwelling, Single-Family Attached	P	P	
Dwelling, Multi-Family	P	P	
Dwelling, Live/Work	P	P	
Manufactured Home	P	P	
Assisted Living Facility	P		
Group Home	P	P	
Commercial Sales and Services			
Animal Clinic, Hospital, or Training Facility (No Shelters, Commercial Boarding/Kennels)	P		
Bakery, Retail	P		
Bar, Lounge, or Tavern	CUP		
Carwash	P		
Child Care Center	P		
Cleaners, Commercial	P		
Convenience Store	P		
Financial Institution	P		
Automated Teller Machine, Freestanding	P		
Gas Station	CUP		
General Retail, less than 10,000 Square Feet	P		
Laboratory	CUP		
Medical Facility, Day Use Only	P		
Microbrewery, Distillery, or Winery	P		
Office, General	P		
Personal Service, General	P		
Plant Nursery or Garden Supply	P		
Restaurant	P		
Restaurant with Alcohol Service	P		
Recreation, Entertainment, and Amusement			
Amusement or Recreation, Inside	P		
Public Park or Recreation Area	P	P	P
Lodging			
Hotel	P		
Institutional, Public, and Community Service			
Communication Facility, Equipment Only	P	P	
Library, Art Gallery, or Museum	P		
Public Transit or School Bus Shelter	P	P	P
Religious Assembly	P	CUP	
School, Primary or Secondary (Public or Private)	SPR	SPR	
School, Vocational or Trade	SPR		
Utilities, Major	CUP	CUP	

TABLE 2 BELLA VISTA II PERMITTED USES			
P = Permitted by Right *SPR = Site Plan Review Required* *CUP = Conditional Use Permit Required* *A = Permitted as Accessory Use*			
Use Category/Specific Use Type	**BVII Land Use**		
	SMU	**MN**	**PGOS**
Utilities, Minor	P	P	P
Industrial, Manufacturing, Wholesale, Distribution and Transportation			
Custom and Craft Manufacturing	P		
Food Processing/Wholesale Bakery	P		
Mini-Warehouse	CUP		
Accessory Uses			
Accessory Dwelling Unit (ADU)		A - SPR	
Caretaker Quarters	A		
Child Care, In Home (1-6 Children)		A	
Child Care, In Home (7-12 Children)		A-SPR	
Community Center, Private	A	A	
Drive Through Facility (Food & Non-Food Service)	A		
Gaming Operation, Restricted	A		
Home Occupation	A	A	
Sidewalk Cafes	A		

Notes and Additional Use Requirements**:**

- Primary Uses not listed in Table 2 are not allowed, unless approved by the Master Developer and the City of Reno Zoning Administrator.
- Allowed Temporary Uses are as defined in RMC Section 18.08.201 Table 3-1, as amended, under the NC zoning districts for SMU, and Residential for the MN land use, and PGOS in the RMC.
- A CUP is required for uses that open before 6am or stay open past 11pm.
- A CUP is required for uses that require deliveries before 6am or past 11pm.

C. Residential Design Standards

Lot and parcel standards for all permitted residential uses are outlined in **Table 3** and are specific to the land use established in **Figure 7.** The land use establishes the base design standards for each village within this PUD. These standards shall apply to all residential development applications and building permit requests, except parcel maps establishing roadways. Each development application or building permit request shall comply with the design standards for residential in the SMU or MN land use categories. These standards determine the bulk, density, intensity, site and building design standards within the PUD.

Residential uses such as single-family attached/detached, condos, and multi-family dwelling units, and any accessory structures shall be sited on lots/parcels to conform to the minimum lot and parcel standards as outlined in **Table 3**. Standards not addressed on **Table 3** shall be consistent with the NC-Neighborhood Commercial zoning district for SMU (RMC 18.02.310, as amended) and the MF-30 Multi-Family Residential zoning district for MN (RMC 1802.210, as amended).

TABLE 3 RESIDENTIAL-LOT/PARCEL STANDARDS		
Density/Intensity Standards (a)	**SMU**	**MN**
Dwelling Units per Acre Max.(du/ac)	30	30
Landscape Area (Multi-Family/Attached/Condos) **(b)**	20%	20%
Max. Building Height (feet)	35	35
Minimum Yard & Setbacks (feet)		
Front Yards **(b)(c)**	10	10
Garage Setback (face of garage)	3 or 20	3 or 20
Side Yards	0 or 5	0 or 5
Rear Yards	10	10
Building Separation	20 (10 if less than 50 units)	
Accessory Structures (d)		
Driveways (feet long)	20	20
Min. usable open space (sf/unit)	100	100

Notes and Additional Requirements:

a. Setbacks for Suburban Mixed-Use and Mixed Neighborhood may be modified with a tentative map or a minor/major deviation to address unique housing products.
b. Single-family detached products will require the entire font yard to be landscaped. Front yard setbacks for residential projects shall apply to the front face of the house or garage. All garages shall be served by driveways not less than 3 or 20 feet in length. Side loaded garages may meet the same front yard setbacks as the house. Builders may provide for variations (but no less than the minimum setbacks) in front yard setbacks and/or building articulation to create an interesting streetscape.
c. Minimum front yard setback shall be 20 feet adjacent to arterial or collector streets.
d. Accessory building setbacks shall conform to Reno Municipal Code Title 18.08.203 Table 18.08.9B Bulk, Dimensional, Density and Intensity Standards for accessory structures and uses, as amended and based upon the land use for the project as described in the first paragraph of section III C of this PUD.

Residential Architectural Elements

Exterior Elements

Exterior materials shall include a combination of patterns and textures to provide a range of products with similar styles and architectural accents. Sample material boards shall be reviewed and approved by the BVROA. Siding materials shall be continued down to within 8 inches of finished grade on all elevations to eliminate large areas of exposed foundation. Building materials shall be compatible in scale with the design of the residences. Materials must also be compatible throughout each village.

Exterior Colors

All exterior color schemes as shown on sample color boards, shall be reviewed and approved by the BVROA. Exterior colors shall be in harmony with the natural setting. Color intensity shall be kept low for large surfaces.

Facades and Articulation

Architectural features such as: varying window sizes and shapes, shutters, broken planes and pitched roofs, covered entries and porches, porch rails, columns and trim detailing help to define the fronts of the homes and garages; and shall be incorporated into the design of the residences.

Large blank walls, roofs, non-articulated garage doors, are not permitted. Side entry garages are permitted.

Building materials and architectural features, compatible with the front of the houses shall be provided on all sides of the homes. Rear and side elevations adjacent to common open space areas shall be finished in a similar manner as the front elevations, subject to review and approval by the BVROA.

Roofs
Roof colors shall be consistent with the color scheme of the buildings. Varying pitched roofs are encouraged. A variety of pitched roofs may be provided. The BVROA shall review and approve the color palette of roofing within each village.

Roof materials shall be applied to comply with snow load and high wind standards. Materials may include:

1) Concrete or clay tile (flat or barrel),
2) Non-reflective architectural metal,
3) 40-year architectural grade composition shingles,
4) 40-year fiberglass composition shingles

Roof materials, however, must be consistent throughout each village.

House Plans
Each village shall have a minimum of four distinct house plans. House design shall vary throughout each village with no one elevation repeated for abutting homes, or mirrored across the street. Adjacent lots may share the same floor plan, but must have different elevations.

Exterior Lighting

Lighting shall be integrated with the architectural design of the individual residences. Lights shall be shielded to prevent light spillage onto adjacent properties or streets.

Flood lights are not permitted. Motion detector actuators are permitted with designer fixtures only and subject to approval by the BVROA.

Miscellaneous Design Elements

Awnings, Trellises, Patio Covers, Decks and Other Accessory or Ancillary Structures
Awnings, trellises, patio covers, second story decks and other accessory or ancillary structures including granny flats and casitas, provided by builders, shall be consistent in material, color and architectural character as the main structure and must be reviewed and approved by the BVROA. Protrusions into the setback will be allowed in accordance with RMC, as amended

Chimneys
Exterior materials of chimneys shall be compatible with the exterior materials and colors used on the house.

D. Non-Residential Design Standards

Lot and parcel standards for all permitted non-residential uses are outlined in **Table 4** and are specific to the land use established in **Figure 7.** The land use establishes the base design standards for each village within this PUD. These standards shall apply to all nonresidential development applications and building permit requests, except parcel maps establishing roadways. Each development application or building permit request shall comply with the design standards for nonresidential in the SMU or PGOS land use categories. These standards determine the bulk, density, intensity, site and building design standards within the PUD.

Non-residential structures and any accessory structures shall be sited to conform to the minimum lot and parcel standards as outlined in **Table 4** below or can be modified with a tentative map or a minor or major deviation to address unique products.

TABLE 4 NON-RESIDENTIAL – LOT DEVELOPMENT STANDARDS		
Density/Intensity Standards	**SMU**	**PGOS**
Floor Area Ratio (FAR) Max.	None	N/A
Landscape Area	20%	20%
Building Height (feet)	35	35
Lot Size		
Minimum Lot Width (feet)	None	
Minimum Lot Size	None	
Yard & Setback Dimension		
Front Yards (feet) **(c)**	10	20
Side Yards (feet)	0 or 10	0 or 10
Rear Yards (feet)	10	15
Building Separation (feet)	20	20
Setbacks from Adjacent Residential Uses		
All Yards (feet)	20 or height of building, whichever is greater	

Notes:

- All architectural design standards per Reno Municipal Code 18.08.301 (a) (10), and 18.12.305(b) as amended.
- Front yard setbacks adjacent to Rio Wrangler Parkway shall be 25 feet.

E. Street Design Standards

Streets within this PUD include arterials, collectors, and local streets as identified in **Figure 5,** Major Roadways. The Master Developer will be responsible for construction of the arterial and collector streets and associated improvements. Arterial/collector streets shall be improved with paving, curb, gutter, sidewalk, fencing and landscaping in accordance with **Figures 8A, 8B, 9A, 9B, 10A,** and **10B**. Local streets and associated improvements will be constructed by the developer. Local streets are defined as public or private streets within individual villages and will be identified during the tentative map or building permit process. Local Streets are not depicted in **Figure 5.**

<u>Intersection Spacing</u>
The on-site residential collector streets and local streets intersecting South Meadows Parkway and Rio Wrangler Parkway shall meet Regional Transportation Commission (RTC) spacing requirements for moderate access control arterials. An updated traffic letter supporting the Traffic Report shall be required to be submitted with each tentative map or building permit to determine intersection design. The intersection locations depicted in **Figure 5** are subject to change and will be finalized during the tentative map process.

Arterial Streets (South Meadows Parkway)
South Meadows Parkway extension will include the extension of South Meadows Parkway from the existing terminus in Bella Vista. This will include a culvert crossing over Steamboat Creek and eventually connect to Rio Wrangler Parkway. There are two cross sections proposed which will be designed to arterial street standards as outlined in **Figure 8A & 8B**.

Since this street is planned for in the adjacent property (Talus Valley), the Bella Vista II Master Developer shall only be responsible for half street improvements. Once complete, South Meadows Parkway shall be improved with paving, curb, gutter, sidewalk, fencing/sound walls (where applicable), and landscaping. The Master Developer South Meadows Parkway will construct two travel lanes, a bike lane, and a 10-foot wide shared use path for the South Meadows Parkway Steamboat Creek Crossing (**Figure 8B**), and the remaining portion of South Meadows Parkway will include the center 14 ft. landscaped median, south 2 lanes, and south 21-feet of landscape with a 10-foot wide shared use path (**Figure 8A**). The north half of South Meadows Parkway will be constructed by others (Talus Valley).

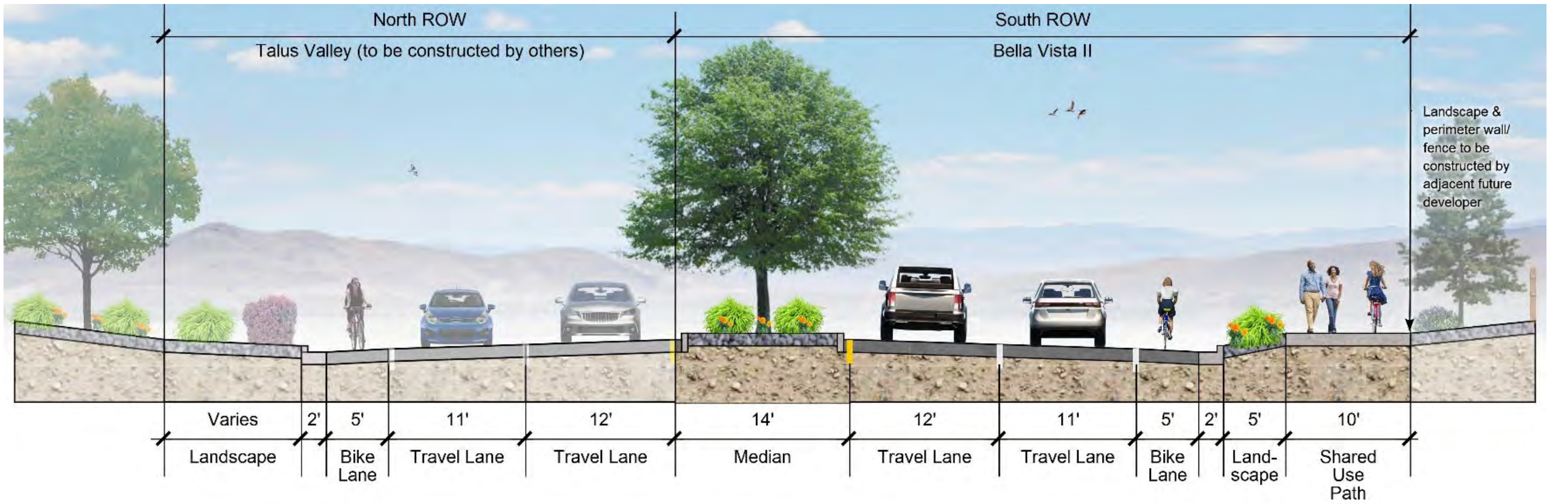


Figure 8A
South Meadows Parkway

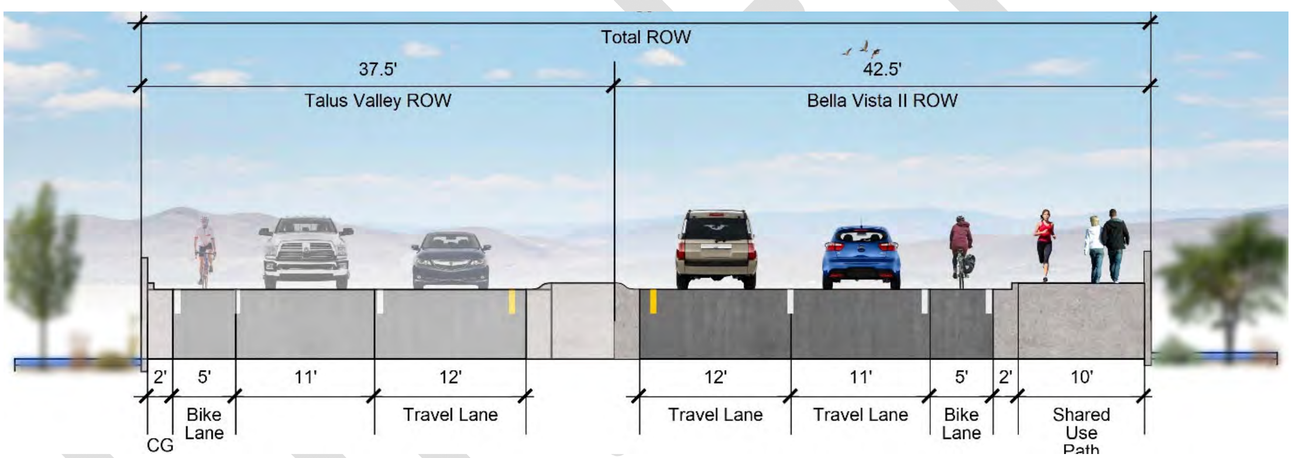


Figure 8B
South Meadows Parkway – Steamboat Creek Crossing

Arterial Street Parking and/or Direct Residential Access
On street parking and/or direct residential driveway access is not permitted on arterial streets.

Arterial Intersection Entry Treatment
Intersections of arterial with designated major or village entrances are encouraged to incorporate signage and enhanced landscape.

Arterial Street Fencing/Walls
Required fencing/wall design and materials shall be in accordance with ***Figure 12***. Required fencing design and materials, including alternative fencing design shall be in accordance with **Figure 11**.

Solid fencing, six (6) feet in height shall be consistent throughout the project in accordance with **Figure 11**. When changes in elevations occur, fences shall be stepped in equal intervals, rather than sloped. Fencing along arterial/collector streets shall include pilasters, spaced at least every 80 feet. Fencing along Arterials Streets adjacent to a non-residential use are not required.

Arterial Street Signs
All street signs, traffic signs and directional signs that control vehicular traffic along arterial streets shall

be standard city signs with standard posts.

Arterial Street Utility Standards
Above ground utility appurtenances shall be screened from public view from all streets. Screening shall be accomplished with the use of berms, walls, fences, blending colors and/or vegetation. If fences or walls are used, materials shall be consistent with arterial and collector walls or fencing and rock veneer walls.

Utility buildings and structures shall be designed to fit into the architectural character of the adjacent residential or non-residential community. Where feasible, utility appurtenances and buildings shall be located in planter areas and not in turf areas.

Arterial Street Horizontal, Vertical and Pavement Section Design
Design of arterial roadways shall be per the City of Reno Public Works Design Manual. The exception is intersection spacing, which shall be provided in accordance with RTC standards.

South Meadows Parkway Crossing of Steamboat Creek
The South Meadows Parkway crossing of the Steamboat Creek design details shall include exterior treatments and railings as approved by the Army Corps of Engineers through their individual permit and to the satisfaction of city staff. Design details for this crossing shall be submitted with improvement plans for the construction of the south half of South Meadows Parkway. This section maybe completed by the Master Developer or by others (Talus Valley).

Arterial Street Landscape/Streetscape
Landscape will be designed in accordance with Reno Municipal Code Sections 18.04.801 through 18.04.809, as amended.

Collector Streets (Rio Wrangler Parkway)
Rio Wrangler Parkway will be constructed to collector street standards as outlined in **Figure 9A and 9B**. Rio Wrangler Parkway will run north to south from the future extension of South Meadows Parkway to the current termination of Rio Wrangler Parkway in Damonte Ranch.

Rio Wrangler is proposed to be completed in two phases. Phase A will include the northwest ±1,300 foot section of Rio Wrangler Parkway and will be constructed with only half street improvements within the Bella Vista II PUD, (**Figure 9A**). This will include half of the center landscaped median, the west lane (southbound), west bike-lane, and the west 20 feet of landscape, sidewalk and fence improvements, (all landscaping, retaining and walls/fence shall be maintained by the project HOA). The eastern portion of half street improvements will be completed by others (Talus Valley).

The southern ±2,700 feet of Rio Wrangler Parkway will include full street improvements as identified in **Figure 9B**.

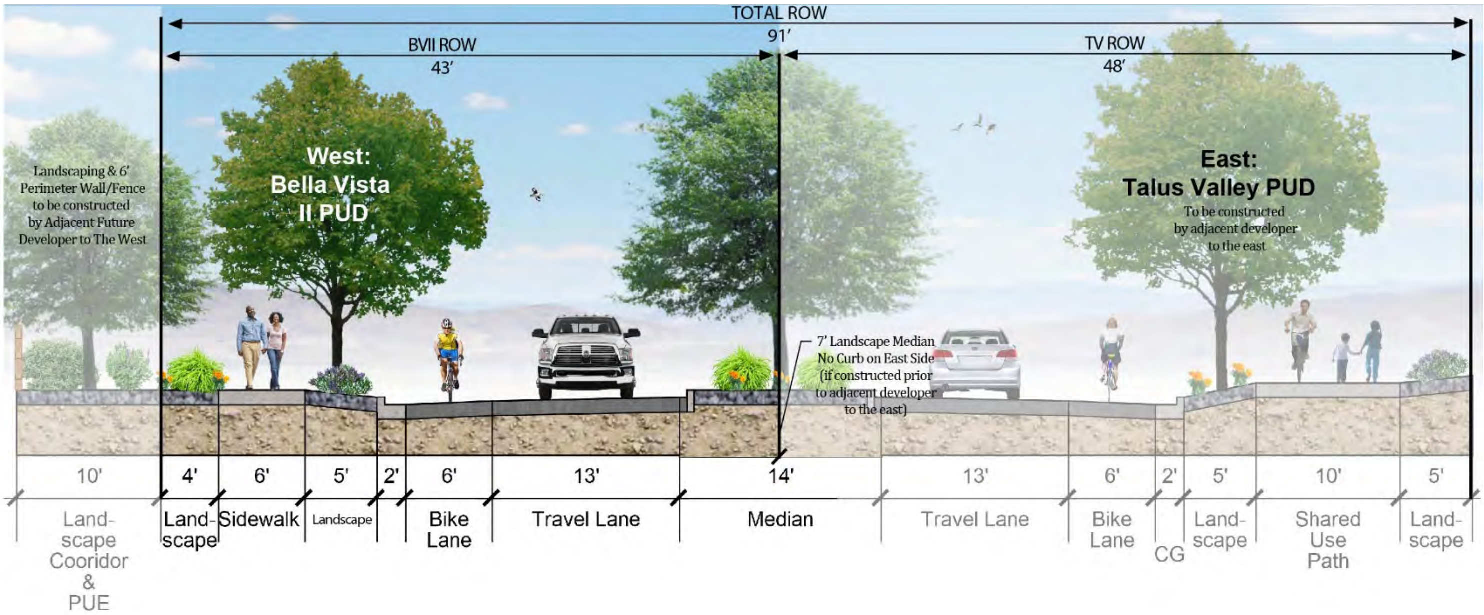


Figure 9A
Collector Street Section- Rio Wrangler Parkway (Phase A)

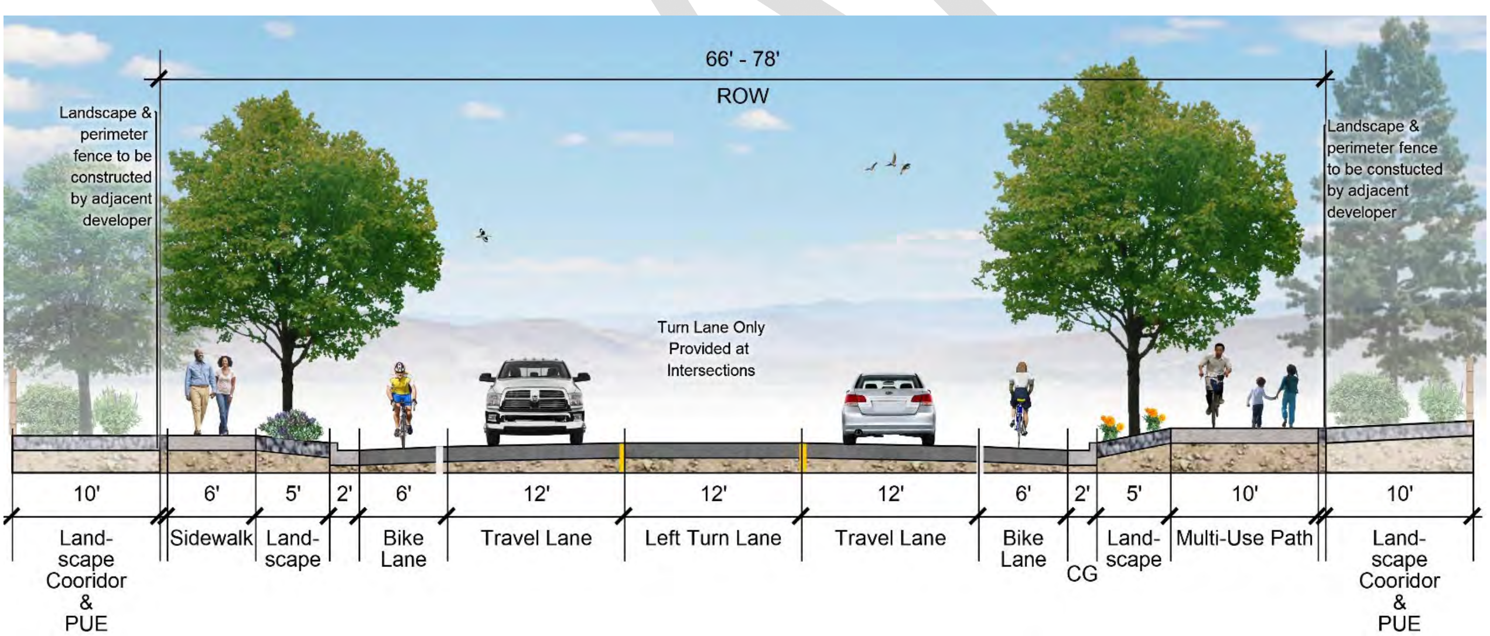


FIGURE 9B
Collector Street Section – Rio Wrangler Parkway (Phase B)

<u>Collector Street Parking and/or Direct Residential Access</u>
On street parking and /or direct residential parking access is not permitted on arterial streets.

<u>Collector Street Sidewalk/Trail Connections</u>
Sidewalks/Trails along collectors for all projects shall be connected to sidewalks within residential and non-residential villages and arterial streets, collector streets and sidewalk trails within access easements to open space paths, as appropriate.

Collector Street Fence or Equivalent
Collector street fence design and materials shall be in accordance with **Figure 11**. As an alternative, a 4-foot or higher change in elevation from the roadway to adjacent lots, combined with a 4-foot fence, may be substituted to provide views of the wetland corridor and linear park. All fencing, landscaping, and sidewalks along arterial/collectors shall be maintained by the project Owners Association.

Solid fencing, six (6) feet in height shall be consistent throughout the project in accordance with **Figure 11**. When changes in elevations occur, fences shall be stepped in equal intervals, rather than sloped. Fencing along collector streets shall include pilasters, spaced at least every 80 feet. Fencing along Collector Streets adjacent to a non-residential uses are not required.

Collector Street Intersection Entry Treatment
Intersections of collectors are encouraged to include signage and enhanced landscape for village entrances.

Collector Street Signs
All street signs, traffic signs and directional signs that control vehicular traffic along collector streets shall be standard City signs with standard posts.

Collector Street Utility Standards
Above ground utility appurtenances shall be screened from public view from all streets. Screening shall be accomplished with the use of berms, walls, fences, blending colors and/or vegetation. If fences or walls are used, materials shall be consistent with arterial and collector fencing and rock veneer walls.

Utility buildings and structures shall be designed to fit into the architectural character of the adjacent residential community or non-residential development. Utility appurtenances and buildings shall be located in planter areas and not in turf areas, where feasible.

Collector Street Horizontal, Vertical and Pavement Section Design
Design of collector roadway shall be per the City of Reno Public Works Design Manual. The exception is intersection spacing, which may be provided at ¼ mile intervals.

Collector Street Landscape/Streetscape
Landscape will be designed in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended

Local Streets
Local streets are defined as any street including project entry streets, cul-de-sacs and loop streets within an individual residential village or non-residential project. Local Residential/Pedestrian and local streets may be public or private, to be determined at the time of Tentative Map or building permit submittal and approval. Local streets shall be constructed by the builders of each individual village. Village entrances will be constructed by the Master Developer or at the Master Developer's discretion, the builder of each individual village.

Alternative local street sections may be proposed during the tentative map process to accommodate unique housing types or to accommodate off street parking. Alley's may be designed in accordance with the City of Reno Public Works Design Manual.

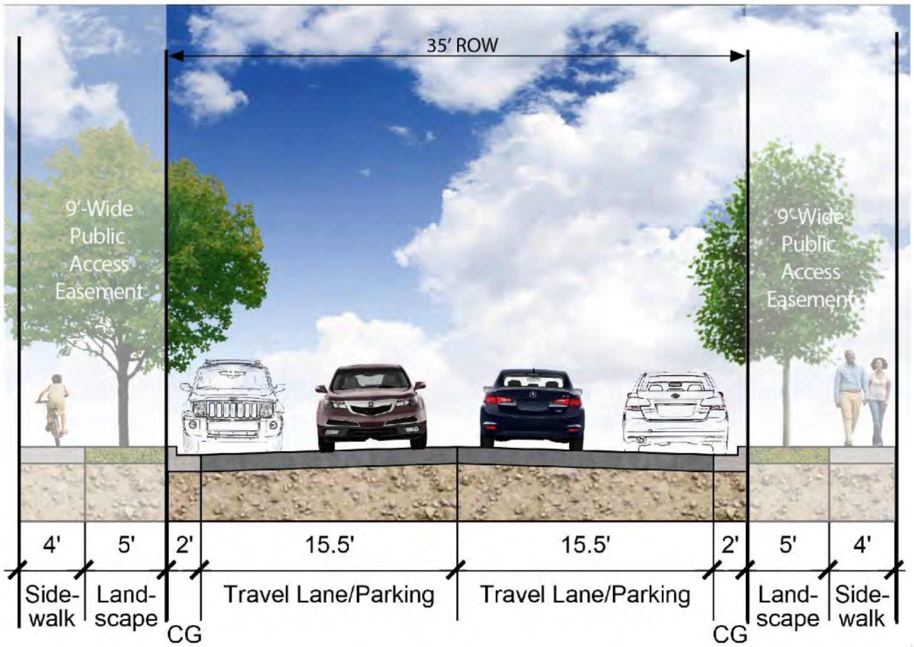


FIGURE 10A
Residential and Non-Residential Local Street (Pedestrian)

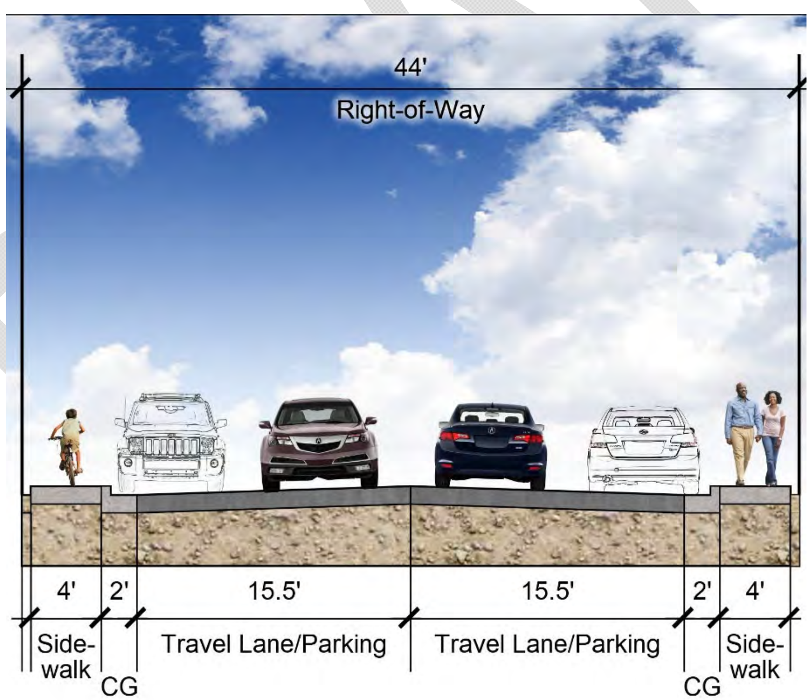


FIGURE 10B
Residential and Non-Residential Local Street

<u>Local Street Improvements</u>
Local public streets shall be improved with paving, curb, gutter landscaping and sidewalks as applicable in accordance with ***Figure 10A & 10B***.

Alternate street sections including private street or streets with landscaped parkways may be provided by the individual builder subject to approval by the Master Developer and the City of Reno at the time of tentative map or building permit review.

Local Streets Parking and/or Direct Access
On street parking and/or direct residential driveway access within villages is permitted.

Local Street Sidewalk Connections
Sidewalks within villages for all projects shall be connected to sidewalks along arterial streets, collector streets and sidewalk trails within access easements to open space paths, as appropriate. The City of Reno shall approve all connections with each tentative map or building permit submittal.

Local Street Fencing
Fencing adjacent to local residential/pedestrian and local streets shall comply with requirements outlined under Arterial/Collector street fencing as specified in **Figure 11** of this PUD.

Local Street Signs
All street signs, traffic signs and directional signs that control vehicular traffic along local streets shall be standard city signs with standard posts.

Local Street Landscape/Streetscape
Landscape will be designed in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended.

F. Major and Village Entrances

Entry monuments may be provided on arterials and collectors for each village or project entrance. The Developer will be responsible for construction of the major and village entrances. The BVROA will ultimately be responsible for the maintenance of the major and village entrances. The individual villages will utilize entrance concepts that include monumentation signs, lighting, fencing, and landscaping. If a private gated entrance is desired, builders must submit specific plans for median modifications and gates to the City of Reno for review and approval with each tentative map or building permit as applicable.

Additional details regarding signs, lighting, landscaping, and fencing are outlined below;

Signs
Each sign may include the name of the individual village and the master project name and logo. Builder names may not be listed on the signs. All signs shall meet the requirements of RMC Chapter 18.05 as amended.

Lighting
Entrance signs may be lighted with ground mounted direct lighting sources. No internal illumination of signs shall be permitted.

Landscaping
All major and village entrances shall be enhanced with irrigated landscaping in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended.

G. Open Space and Public Park Design Standards

Open Space
Open space includes the Wetlands Consolidation Corridor, major drainageway, parks, pathways, trail access parcels to open space and other open space land that is not developed with roadways, or located on individual lots within the residential or non- residential portion of this PUD. Common open space, including the park and trails, shall be open and available for use by the general public

(unless located in a private gated community). These facilities shall be maintained by an Association or the Cyan Drainage District (CDD).

Public Park
The public park will be designed to the approval of the City of Reno and constructed by the project Developer or the City of Reno. The Developer shall not receive credit towards the Residential Construction Tax (park fees) to construct the park. The park will not be dedicated to the City of Reno. The park will be approximately 4.4± acres in size and will be located in the south-central portion of the Bella Vista II PUD (refer to **Figure 7**).

All Residential Construction Tax fees collected from this project shall be used to improve the park in the Bella Vista Ranch PUD (Cyan Park) located to the west of this project, which is located within the same Park District.

I. Facilities

A minimum of three (3) of the following facilities will be constructed within approximately 3.0 acres of the park:

- Picnic Areas (to include tables and benches)
- Par Course (exercise equipment)
- Play Structure
- Horseshoes or similar amenities of scale (as approved by the administrator)
- Turf Open Play Areas (maximum of 1 acre in size)
- Trail Head/Parking Area along a public street

The following facilities will be constructed in the remaining portion of the park:

- Trails
- Native vegetation and existing un-disturbed vegetation
- Seating/viewing areas

II. Timing and Implementation

Provide plans for construction of the park to the City, including the above amenities, with application for the first residential building permit. Complete construction of the park improvements within one year of the date of City approval of the park construction plans. The applicant may request one, 1 year time extension (2 total years) to complete the park improvements without amending the PUD.

III. Fencing

Fencing associated with the park, may be provided adjacent to or within the park. The following area or activity delineation fencing shall be provided:

1) Split rail fencing as depicted in ***Figure 14A***.
2) Vinyl coated brown chain link fencing associated with sports fields or courts.
3) Rockery walls and/or rock veneer walls consistent with the streetscape walls.

IV. Landscape

The park will be landscaped and irrigated in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended. Evergreen massing is encouraged adjacent to residential lots.

V. Lighting

All lighting shall be approved by the City of Reno and shall utilize state of the art “dark sky lighting” techniques. Lighting in the park shall be minimized where possible but may include the following:

1) Parking Lot Lights – Fully shielded lighting including “shoebox” style lights shall be provided in parking lots and shall not exceed 20 feet in height.

VI. Pathways

Pathways within the park shall connect to sidewalks within the individual villages, sidewalks within trail access areas, open space trail pathways and sidewalks along arterial streets as appropriate. Pathways to and from individual lots are not permitted. A pathway/sidewalk circulation and connection plan to the park shall be reviewed and approved by the city with each tentative map or building permit.

VII. Utilities

Above ground utility appurtenances shall be screened from public view. Screening shall be accomplished with the use of berms, fences, walls, blending colors, and/or vegetation.

Utility buildings and structures shall be designed to fit into the architectural character of the adjacent development. Utility appurtenances and buildings shall be located in planter areas and not in turf areas. All utilities must meet the design standards outlined in **Table 4** of this PUD.

H. Fencing Plan/Design Standards

A combination of fencing types will be used throughout the Bella Vista Ranch II to provide consistency and to help protect the open space throughout the development. Furthermore, fencing/walls along the arterial and collector streets will help separate the villages and provide privacy and help to reduce traffic noise. Walls/fences along arterial/collector streets adjacent to non-residential development is not required.

The following types of fences are proposed throughout the development as depicted in **Figure 11** below:

- Masonry Sound Wall with Pilaster
- Arterial /Collector Street Fence
- Split Rail/Open Metal Fence
- Temporary Feral Horse Fence

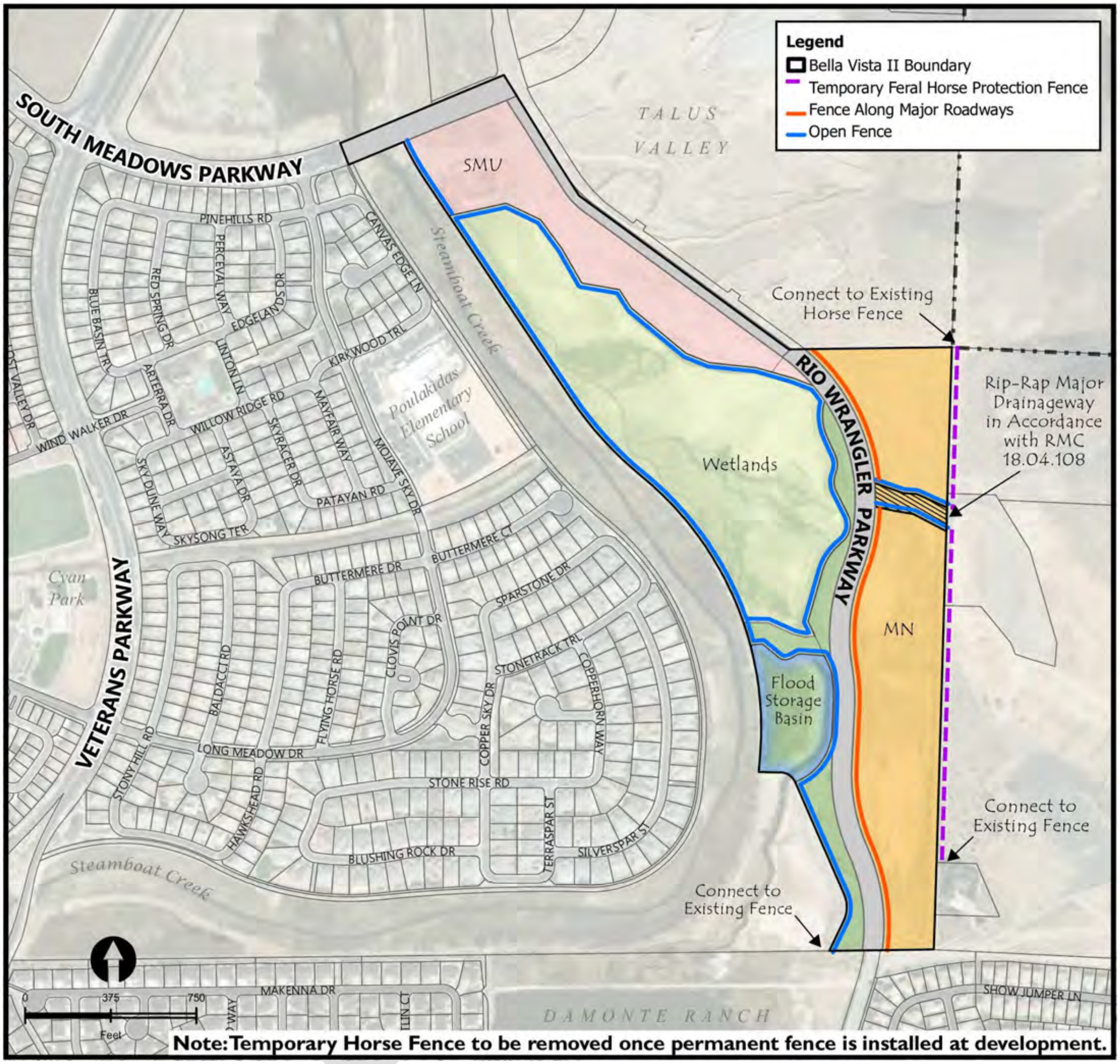


FIGURE 11
Fence Locations

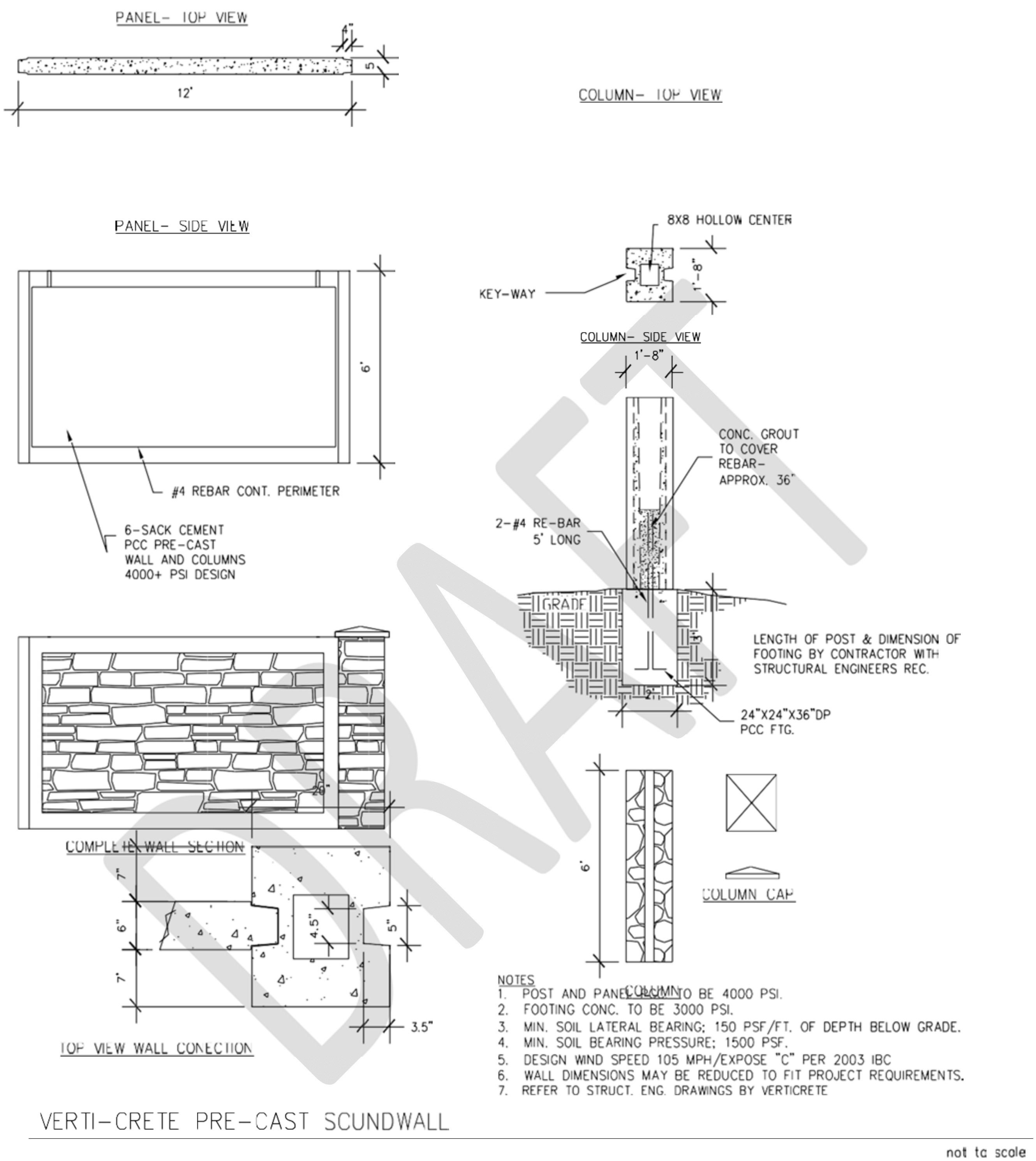
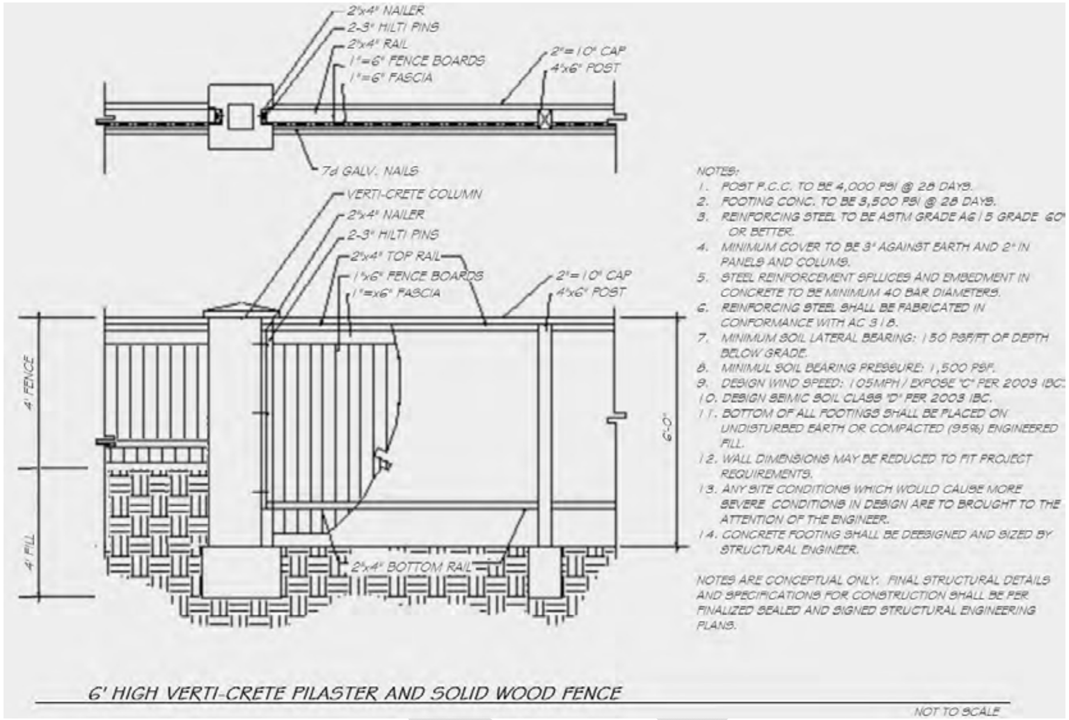


FIGURE 12
Masonry Sound Wall with Pilaster



NOTES:

1. See **Figure 11**, for Typical Locations.
2. The alternative 4 foot fence section and 4 feet of vertical grade change shall include the pilasters and all other details of the standard 6 ft. fence.

FIGURE 13
Arterial/Collector Street Fence

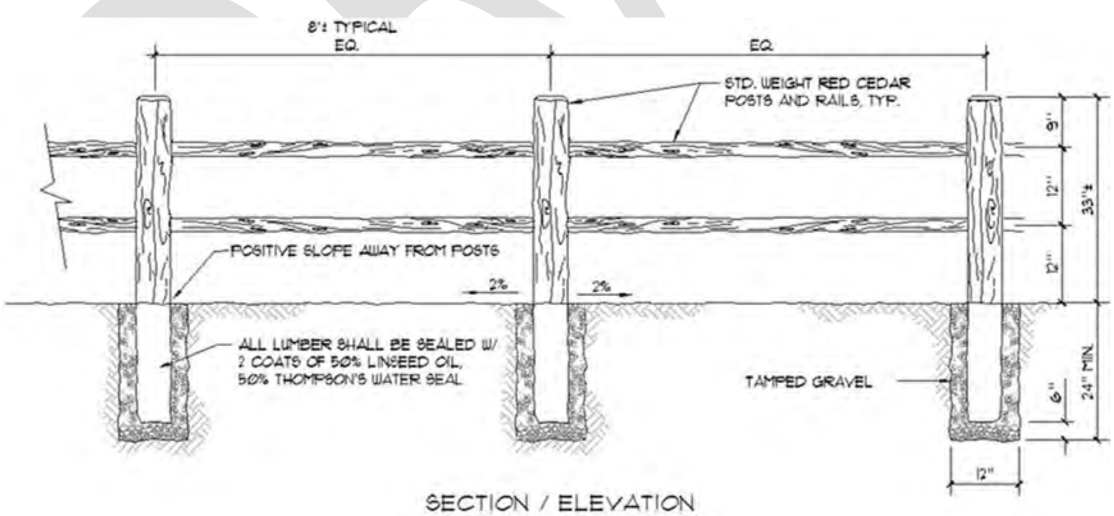


FIGURE 14A
Split Rail Fence

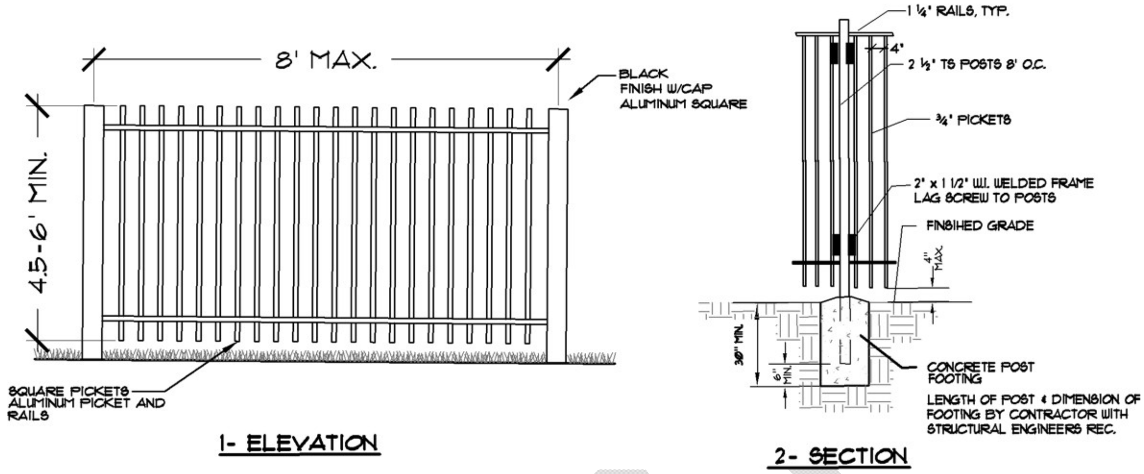


FIGURE 14B
Open Metal Fence

Open Fence types will be between the major drainageway and open space areas and residential lots shall be provided for delineation purposes throughout the project. Fencing shall consist of open metal and split rail fencing. (refer to **Figure 14A & 14B**). Open metal fencing shall be used at rear and side yards adjacent to the major drainageway and open space areas. Split rail fencing shall typically be used in front yard setbacks to delineate private lots vs. public open space areas. It will also be used along trails to provide separation from streets and wetland areas along the open space corridor, (refer to **Figure 11**).

Fencing of common open space will be associated with rear and side yards of individual lots located adjacent to open space, the major drainageway and streets. Additional fencing, may be provided by the builder of each village, if locations and fence types are approved by the City of Reno prior to the approval of the applicable tentative map or building permit.

I. Major Drainageway Design Standards

The major drainageway has been identified as a disturbed major drainageway and will be restored per City of Reno code 18.04.104 Drainage Way Protection, as amended. For any development proposed in the MN land use designation and within the area identified in **Figure 7** as 'Major Drainageway', improvement plans shall be submitted detailing the location/relocation plans for the entire major drainageway corridor. These shall either be submitted through the Tentative Map or Major Site Plan Review process.

Major Drainageway Edge Treatments
Transitional landscaping will be utilized to blend the ornamental landscape associated with residential lots or non-residential development and the natural revegetated drainageway area. This transition area will average ten (10) feet in width along edges without a trail and eighteen (18) feet in width with a trail (Refer to ***Figure 11***). All revegetation specifications shall be approved by the City of Reno with each adjacent Final Map or building permit.

Signage
Signage to discourage users from entering sensitive areas will be provided adjacent to Steamboat Creek and drainage way areas. Pedestrian oriented signs shall be compatible throughout the entire Bella Vista Ranch PUD. The signage plans shall be submitted for approval to City Parks staff, prior to approval of the first Final Subdivision Map or issuance of building permit.

Site Furnishings
Site furnishings such as benches and trash receptacles will be placed along the pathway areas

every 1,000 feet along channels, subject to approval by the City of Reno with each Final Map or non-residential building permit as applicable.

J. Common Open Space Design Standards

Common open space includes land located within the linear open space corridor and/or drainage way areas, and adjacent to residential lots or streets. An open space trail network is provided within the project and is shown on ***Figure 6***.

Landscaping

Landscaping and irrigation shall be provided on common open space that is located between residential lots and streets or adjacent to the major drainageway and other open space areas. Landscaping within these defined areas shall be provided by the builder of each village that abuts common open space in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended.

Pathways and Trails

Pathways adjacent to the major drainage way and along Steamboat Creek shall be asphalt, a minimum 8 feet in width (refer to **Figure 6**). Pathways will be constructed by the Master Developer or at the Master Developer's discretion, the builder of each abutting village. Village builders shall ensure that pathways connect to sidewalks within the individual villages; pathways within trail access areas; and sidewalks along arterials and residential collector streets, as appropriate. Construction plans for pathway connections to villages shall be provided with the adjacent Final Map or building permit as applicable.

K. Feral Horse Protection Plan/Design Standards

It is the intent of this PUD to keep the feral horses that roam this area safe and free. The plan calls for contiguous horse fencing along the east side of the MN land use with no gaps while connecting to adjacent fence to keep them along the eastern range in accordance with NRS 569.431 and RMC 18.04.108, as amended.

<u>Temporary Fencing</u>
The proposed temporary fencing will be installed prior to any development. This will keep the horses away from conflicts with other uses until development and permanent fencing is installed, (refer to **Figure 15**). Once permanent fencing is installed it will be monitored and maintained by the Master Developer or HOA in accordance with RMC 18.04.108, as amended.

Figure 15
Feral Horse Protection Plan

With development of each project, the individual village or project developer will be responsible for installation of permanent perimeter fencing per **Figures 12, 13, 14A, & 14B,** of this PUD, as applicable. Temporary fencing, along future development boundaries may be installed as specified on **Figure 15,** or an alternative design may be utilized subject to approval by the City of Reno. A fencing plan shall be required with each final map or building permit as applicable, to demonstrate compliance with the intent of this section. All temporary and permanent perimeter fencing shall be constructed in compliance with the requirements of NRS 569.431 thru .471.

The Corps of Engineers has required that the mitigated wetland area along the creek be fenced to keep the horses out of the jurisdictional wetlands south of South Meadows Parkway.

<u>Signage</u>
With construction of Rio Wrangler Pkwy., lighted horse hazard traffic signs shall be required to be installed within the PUD boundary located along Rio Wrangler Parkway to the satisfaction of the City of Reno Public Works staff.

L. Conflicts with Reno Zoning Code

In the event of a conflict between these design standards and City Code, these standards shall govern development of Bella Vista II. When a specific standard is not addressed by the PUD, then the applicable section of Reno Municipal Code, as amended, at the time of review shall prevail.

IV. IMPLEMENTATION

A. Design Review

These Design Standards will be used by the City of Reno and relevant government agencies to review each tentative map, multi-family, or non-residential site plan/building permit proposal for conformance with the overall design objectives and standards contained in this PUD.

It will be the responsibility of each Parcel Developer to comply with the Design Standards in preparation of landscape design plans.

B. Applicability of Land Use and Development Standards

Where there is a conflict between standards within this PUD and cited city code sections, the standards in this PUD shall prevail. Where the provisions of this PUD do not address a specific subject, the provisions of the Reno Municipal Code Title 18 or other ordinances governing the development of land, which are in effect at the time of application, shall apply. All other conflicts shall be resolved by the Administrator.

C. Administration

The Bella Vista Ranch Phase II PUD shall be administered by the Administrator, or their designee as defined by the City of Reno Annexation and Land Development Code. The Administrator shall have the authority to interpret and apply this PUD handbook.

There shall be a master developer in place from the first stage of development of the PUD. This master developer shall continue throughout the development of the PUD until and unless a master homeowners association or other entity is created to serve the role of the master developer. The role of the master developer, for the purposes of this PUD shall be:

a) To prescribe and administer methods and procedures to ensure and control the quality of development that occurs in this PUD.

b) Maintain all common area improvements, storm drain channels, detention basins and other flood control facilities.

c) Construct, or have constructed, all parks, pathways, trails and sidewalks.

D. Flexibility

The Development Plan and Development Standards contained herein are intended to depict the general development vision for the PUD. Sufficient flexibility shall be allowed to permit detailed planning and design at the time of actual development. The acreage of each land use category may be increased by up to 10% if it is demonstrated that additional acreages are necessary due to constraints and/or design considerations to accommodate the project, to the satisfaction of the Administrator. This provision shall not exceed a cumulative total of 10% for each land use category. Changes in excess of 10% shall require an amendment to the Development Standards Handbook. Residential densities and residential dwelling unit allocation may be interchangeable between villages and will be defined fully with the tentative map for any given residential village. With each tentative map application, the Master Developer and/or applicant shall provide an accounting of the overall residential unit allocations, and updated land use category acreages approved to date. The total number of residential units shall not exceed 609 units or 117,612 square feet of non-residential without an amendment to the Development Standards Handbook.

E. Modifications

The Administrator shall have the ability to administratively update the PUD to reflect RMC amendments that impact the PUD. The Master Developer shall be notified of any administrative changes by the Administrator prior to final approval of such changes. Minor deviations shall be subject to written approval from the Master Developer. The Administrator also shall have the ability to grant minor deviations as outlined in RMC 18.08.804 as amended. Deviations of 10% or more shall conform to the City of Reno Major Deviation process as outlined in RMC 18.08.802, as amended.

F. Green Development Practices

This PUD will include leading edge practices for the reuse of treated effluent. Low Impact Development (LID) best practices shall be utilized in the design and construction of all non-residential or residential developments to increase water infiltration and improve water quality. Any ordinances the city adopts that prescribe green building practices will be required in this PUD as they become effective. Plans demonstrating application of best practices or conformance with adopted green development standards shall be provided with each tentative map, conditional use permit, site plan review, and/or building permit.

To encourage the passive utilization of solar energy, this PUD will not restrict the reasonable use of solar facilities in the CC&R documents for the development. The PUD will not allow building heights in excess of those set forth in the **Tables 3 & 4** and will require the placement of houses or non-residential structures such that excessive shadows are not cast that restrict the use of solar facilities, both within and adjacent to the project.

G. Hours of Operation

Hours of operation for exterior construction activity or heavy equipment operation within the PUD shall be limited as follows:

a) Monday – Friday 7:00 a.m. to 6:00 p.m.;
b) Saturday – 8:00 a.m. to 6:00 p.m.;
c) There shall be no construction on Sundays.
d) A sign with the approved construction hours shall be posted on site for the full duration of construction activity.
e) Hours of Operation shall not apply to dust control or storm water management operations. A note to this effect shall be placed on the title sheet of all building permit plan sets.
f) Exceptions to construction hours for the pouring of concrete slabs, interior construction hours or other modifications (roadway paving, utility installation, etc.), a plan detailing the construction operations and provisions to minimize impacts on nearby residential areas shall be submitted and approved to the satisfaction of the Administrator.

H. Open Space Deed Restrictions

All designated open space and common areas intended for open space uses shall be deed restricted per Reno Municipal Code Section 18.09.208, as amended.

I. NV Energy Substation

The owner, his agent or designee shall notify and disclose to all potential buyers, renters and tenants within the project that there is an existing electrical power substation located approximately 1,450 feet northeast of the PUD which may be expanded in the future.

J. Health Department Wind Sensor Condition

Prior to issuance of each building permit, or approval of each final map, as applicable, the applicant shall have plans approved to install a wind sensor unit in all on-site areas containing turf.

K. Airport Avigation Condition

Prior to issuance of each building permit, or approval of each final map, as applicable, the property owner(s) shall grant an Avigation Easement to, and acceptable to, the Airport Authority of Washoe County over the entire ±77.3 acre property. The property owner(s) shall provide the Planning Department with appropriate documentation indicating the Avigation Easement has been granted and accepted by the Airport Authority of Washoe County.

L. Review Process

Prior to the submittal of a development application to the City, the proposed development shall be reviewed by the Master Developer at their sole discretion. Each development application submitted to the City shall include written documentation of approval from the Master Developer.

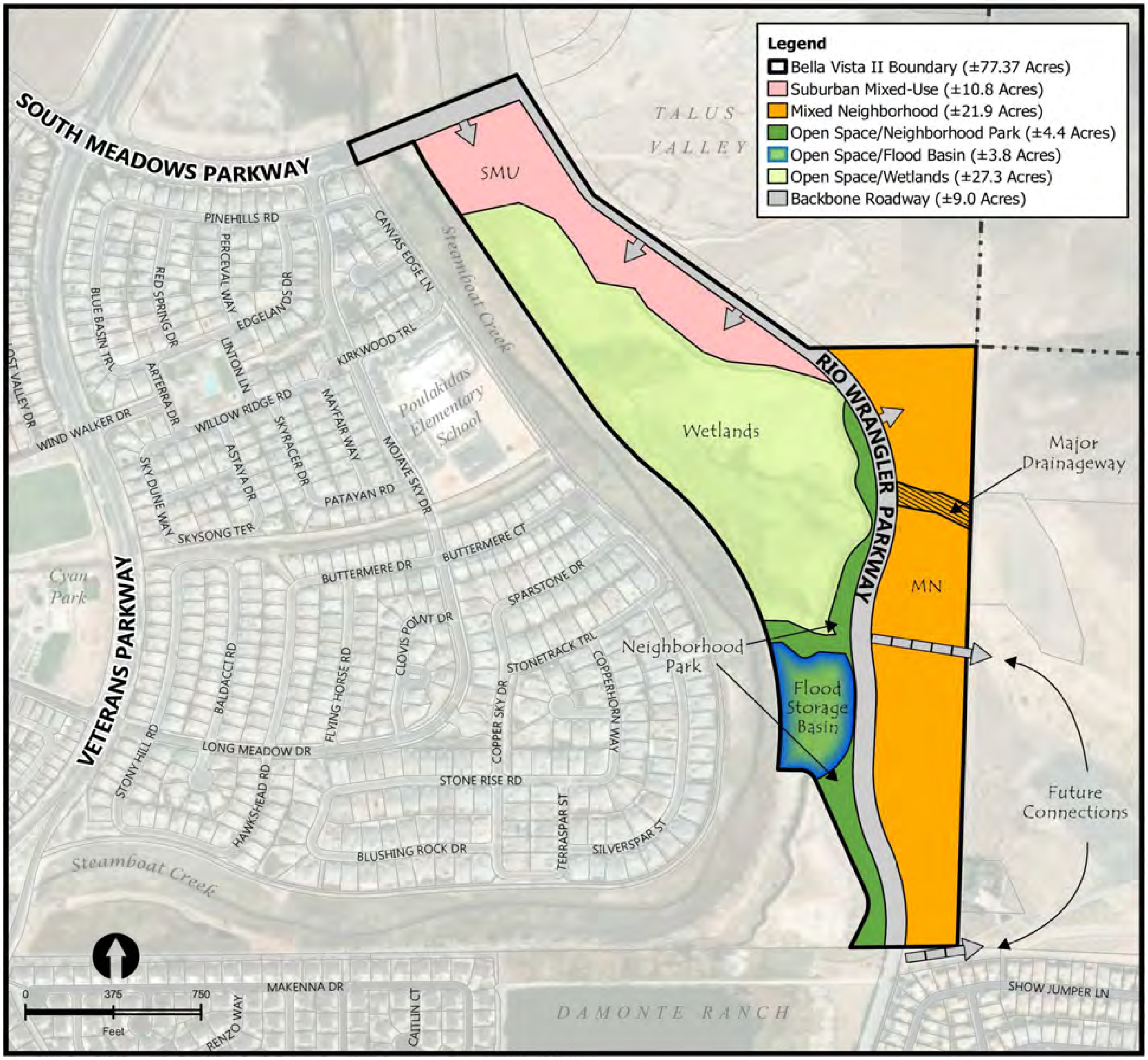
Written approval by the Master Developer does not constitute City approval of a development application. The construction of individual projects, including accessory structures shall follow the City of Reno building permit process. For some uses where a tentative map, conditional use permit, or site plan review is required, these processes shall precede the building permit process, as applicable.

Appeals:

The applicant or developer may appeal any decision, comments, or recommendations of the Administrator in accordance with RMC Section 18.08.307(J), as amended.

Bella Vista Ranch Phase II

PUD Design Standards
Reno, Nevada



Certified by City Council:
January 16, 2013

Amended on:
March 9, 2022

Prepared for:
City of Reno

DRAFT AMENDMENT: DECEMBER 26, 2023

***IV.* IMPLEMENTATION**

~~***III. DESIGN STANDARDS***~~

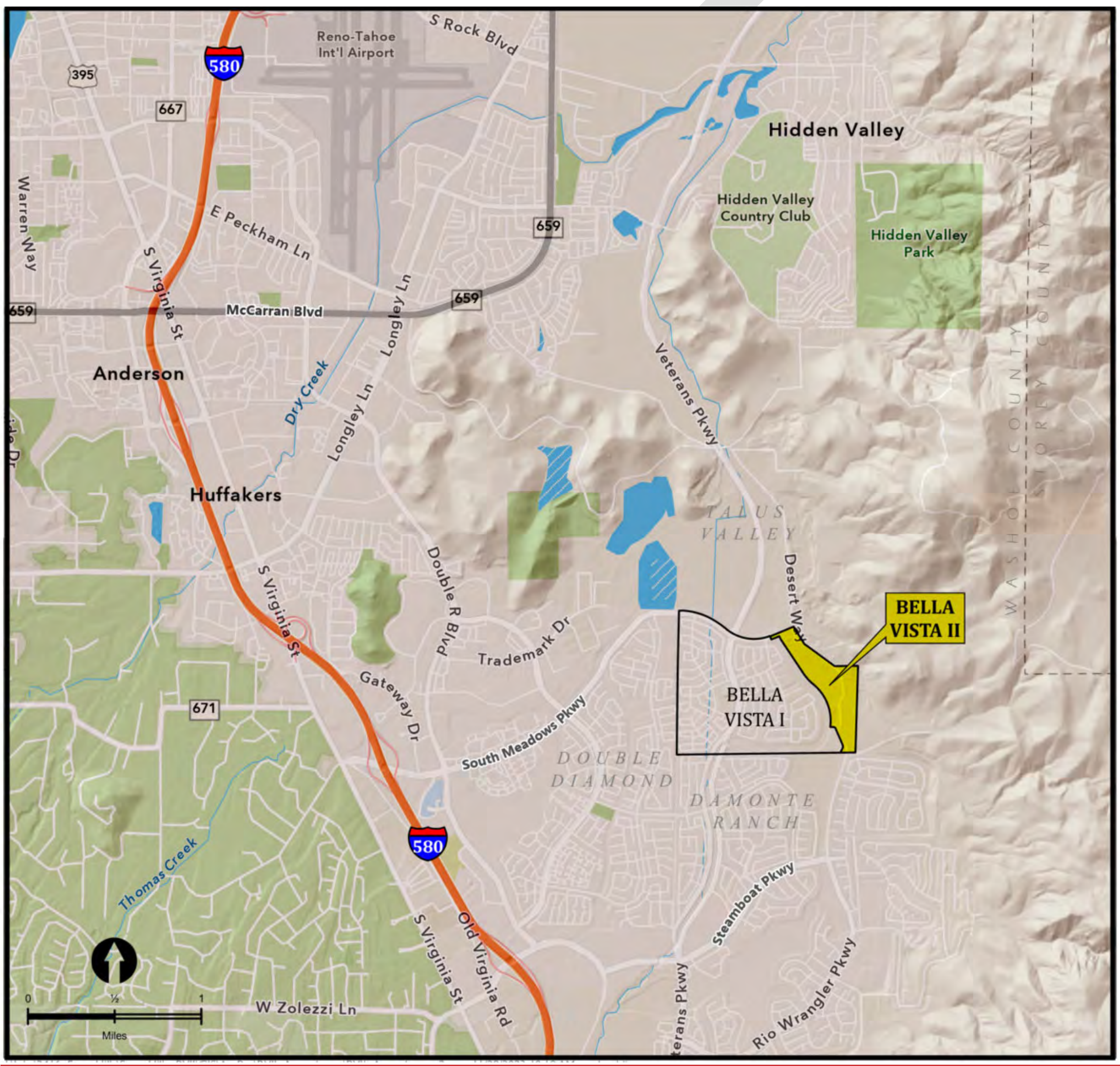
FIGURES:

TABLES:

~~***TABLES***~~

I. PROJECT DESCRIPTION

The ±77.37-acre Bella Vista Ranch Phase II Planned Unit Development (PUD) is located in the southeastern portion of the City of Reno (**Figure 1**). The PUD includes a mixture of residential, commercial, neighborhood park, and open space uses. The intent of the PUD is to preserve the proposed open space and wetlands, including the flood storage improvements, and create two (2) development areas which will be developed for subsequent subdivision into individual building lots, multi-family housing, and non-residential building sites. One development area will allow a mix of residential and non-residential uses that will support the future development, and the surrounding neighborhoods, while the other will be limited to only residential uses. This will allow for the development of a range of housing types and options.



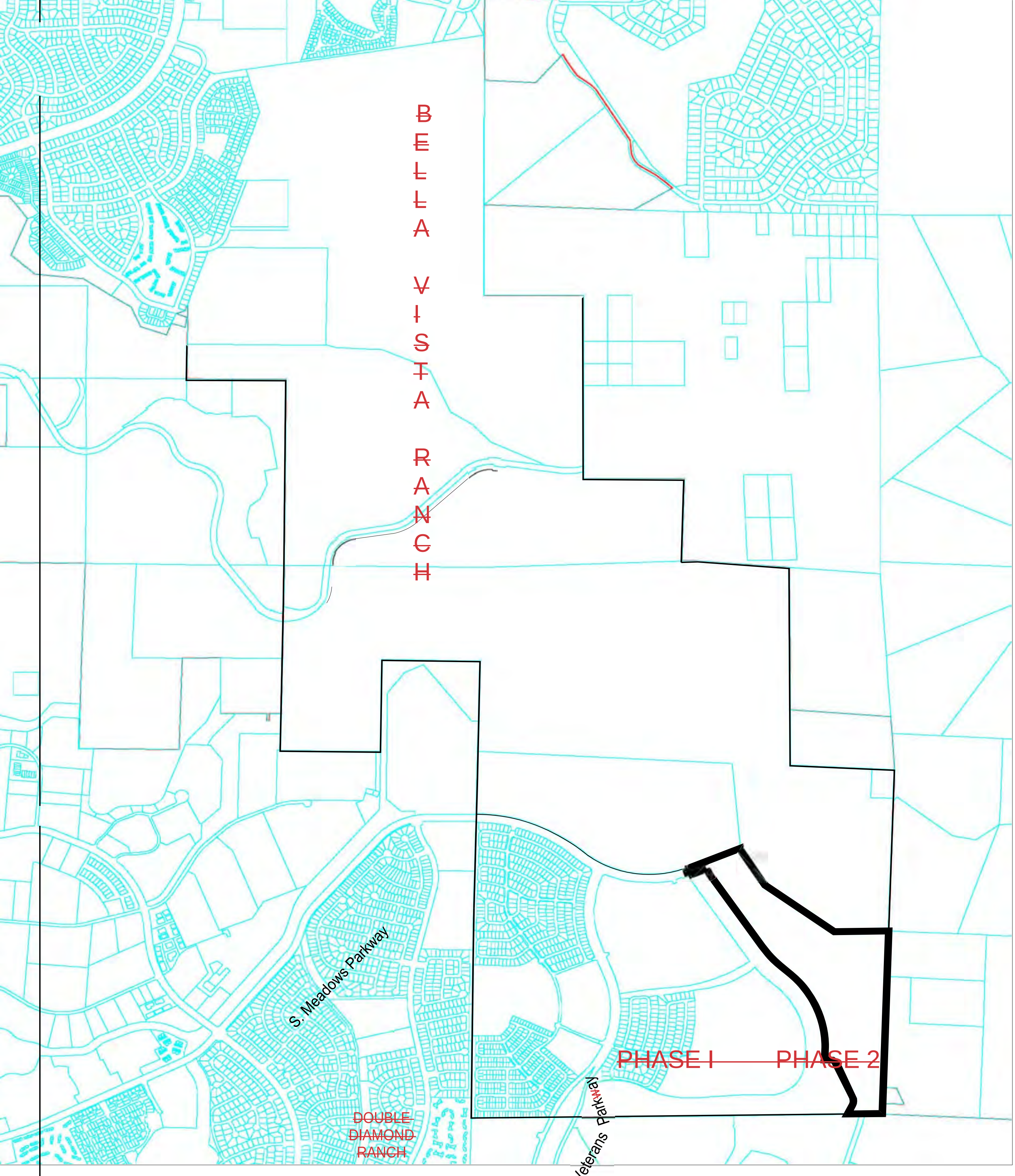


FIGURE 1
Location Map

A. ~~Land Use~~Development Concept

The Bella Vista Ranch Phase II PUD consists of a mixture of residential, commercial, and open space/parks. Residential uses will be allowed within the Mixed-Neighborhood (MN) land use and will allow for ~~high density~~ single-~~-~~family detached, ~~attached~~ single-~~-~~family attached, ~~residential,~~and multi-family uses at densities ranging from 6~~8~~ to 30 dwelling units per acre (du/ac).~~,~~ The Suburban Mixed-Use (SMU) land use will include a mix of residential and ~~non- residential uses,~~neighborhood commercial uses. Parks Greenways and Open Space (PGOS) land use ~~one neighborhood park, and open space areas as shown on **_Figure 2,_** page 2.~~provides a total of ±35.5 acres and will include a ±4.4 neighborhood park, ±3.8 acres of flood storage basin and ±27.3 acres of wetlands (WM-1), (as shown on **_Figure 2)._**

The maximum density, total number of dwelling units and the maximum non-residential square footage for each village is shown on **Table 1**, page 14. The maximum number of dwelling units within the entire Bella Vista II PUD shall not exceed 609 dwelling units (residential) and the commercial square footage shall not exceed 117,612 square feet (non-residential).

~~**Table 1** on page 9 shows the breakdown of the property amongst the various uses. The number of dwelling units listed in Table 1 for villages A and B is approximate. The final unit count, up to a maximum of 575 units, will depend upon the final configuration of each village as it is developed over time. Village C is limited to non-residential land uses, totaling approximately 178,600 square feet at a max. FAR of 0.25. The neighborhood park equals approximately 4.4 acres, and the open space is approximately 31.1 acres. (refer to Section II, A page 9 for details.)~~

~~South~~

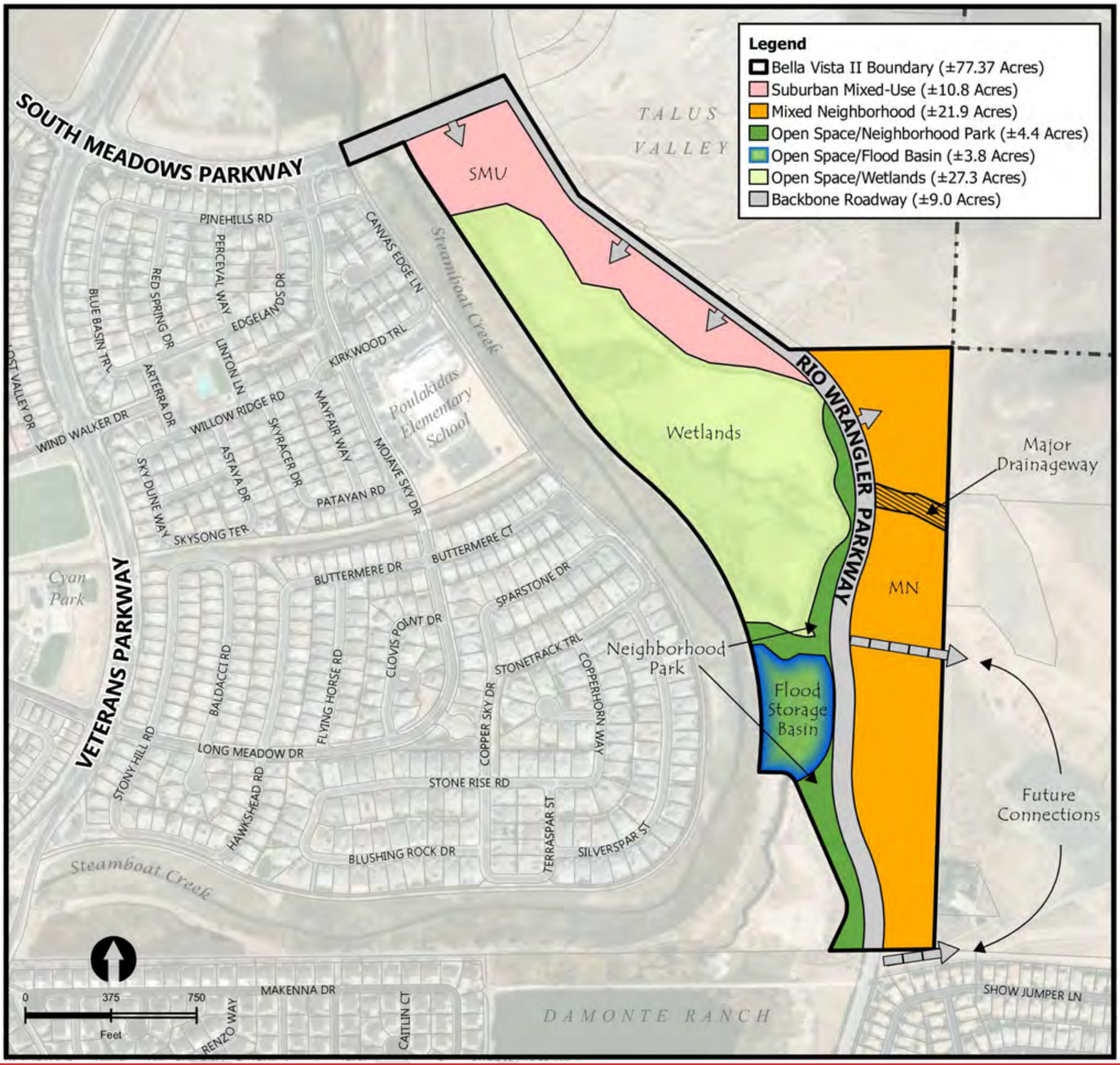


FIGURE 2
Land Use and Phasing Plan

~~A.~~B. Site Features Influencing Site Plan Design ~~(Refer to Figure 3, page 3)~~

Several onsite and offsite environmental constraints were considered when influencing site plan design. These are identified in **Figure 3**, Dominant Site Features.

On~~s-S~~site Features

The entire site is virtually flat~~-~~ with a modest slope from south to north. Environmental onsite constraints ~~on-site~~ include:

i. The jurisdictional wetland area (WM-1)~~s~~ that will be set-aside as permanent open space and enhanced as part of the Steamboat Creek Restoration program discussed in ~~Section I, G, page 7, of the PUD~~Appendix C are identified as "wetlands" in **Figure 3**. This area is proposed to be located within the ±27.3 acres of wetlands (WM-1), as shown on **Figure 2** and will not be developed.

ii. One major drainageway ~~between~~ as identified to be within the ~~Village B and CMN land~~

use ~~that~~ in **Figure 2** is defined as a disturbed drainageway. It will be restored per C~~c~~ity of Reno code 18.04.104 Drainage Way Protection~~8.12.1907(b)~~, as amended and as further defined in~~specified in section III B, 2 of~~ the PUD ~~(page 43).~~ ~~.~~The final location of the major drainageway will be determined during the tentative map or major site plan review phase.

iii. The existing Irrigation Ditch will not be significantly impacted as part of this PUD and is proposed to be within the PGOS land use as identified in **Figure 2**.

Off~~s-S~~site Features

Environmental Constraints off site include:

~~ii. The Butler Ranch Gravel pit adjacent to the north of Village A is currently being used as a stockpiling and sorting area. The mining in this area has been completed per the special Use Permit. The majority of the adjacent pit property is designated as a non-disturb buffer area per the existing permit.~~

~~iii. It is anticipated that the remaining pit materials will be used on this project and other projects in the vicinity. A disclosure statement is required to be provided to all potential buyers, renters and tenants within this project notifying them of the terms and conditions of the pit special use permit and its' operational characteristics per condition No. 3 as contained in Section IV Implementation of this PUD handbook. The existing topsoil berm located along the east side of Rio Wrangler Parkway will remain in place until the pit is depleted. The topsoil from the berm will then be used to help restore and revegetate the pit site.~~ The Bella Vista I ~~is~~ PUD ~~will create an open space/neighborhood park buffer around the existing wetlands and~~ re-aligned Steamboat Creek ~~constructed~~ to the west ~~as part of the Bella Vista Ranch PUD~~. The current alignment of Steamboat Creek provides for one continuous and contiguous open space corridor linking all the wetlands and drainages on Damonte Ranch with the wetlands and drainages on the Bella Vista Ranch. The open space/neighborhood park buffer around the existing wetlands proposed in this development will enhance these features further and contribute to the contiguous open space corridor, (refer to ~~Section II, E, page 15)~~"Steamboat Creek" in **Figure 3**).~~.~~

Meadows Parkway

South

iv.

DOUBLE DIAMOND RANCH

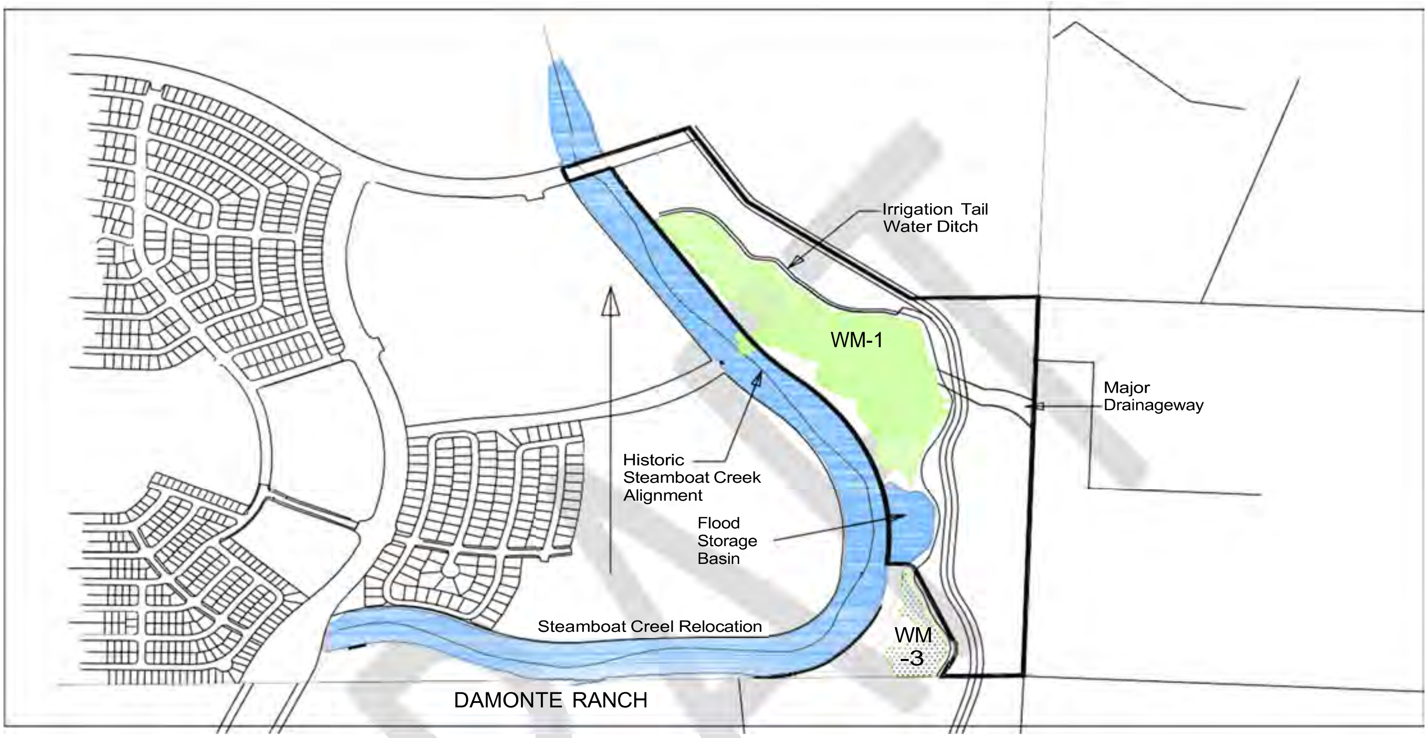
Veterans

Existing Drainage Pattern

~~v.~~iv.

~~*FIGURE 3*~~

~~Dominant Site Features~~



- ~~The existing gun club located to the east of Village C has a valid special use permit and may continue to operate indefinitely. A disclosure statement is required to be provided to all potential buyers, renters or tenants within the project notifying them of the terms and conditions of the gun club special use permit and its' operational characteristics per Exhibit B, Condition No. 3 amended clerks letter dated 3-12-13, contained in Section V Attachement 1of this PUD Handbook. Only non-residential land uses are allowed in Village C.~~

v. F~~The Hidden Valley wild ~~eral horses have migrated into this portion of the Bella Vista Ranch since the ranch fences were removed with construction of the Steamboat Creek restoration project. ~~In order to~~To address this issue, a Feral~~Wild~~ Horse Protection Plan has been developed for this PUD, (re~~. Re~~fer to ~~**Section III**~~**Figure 15** ~~B-4, page 46 for details~~).

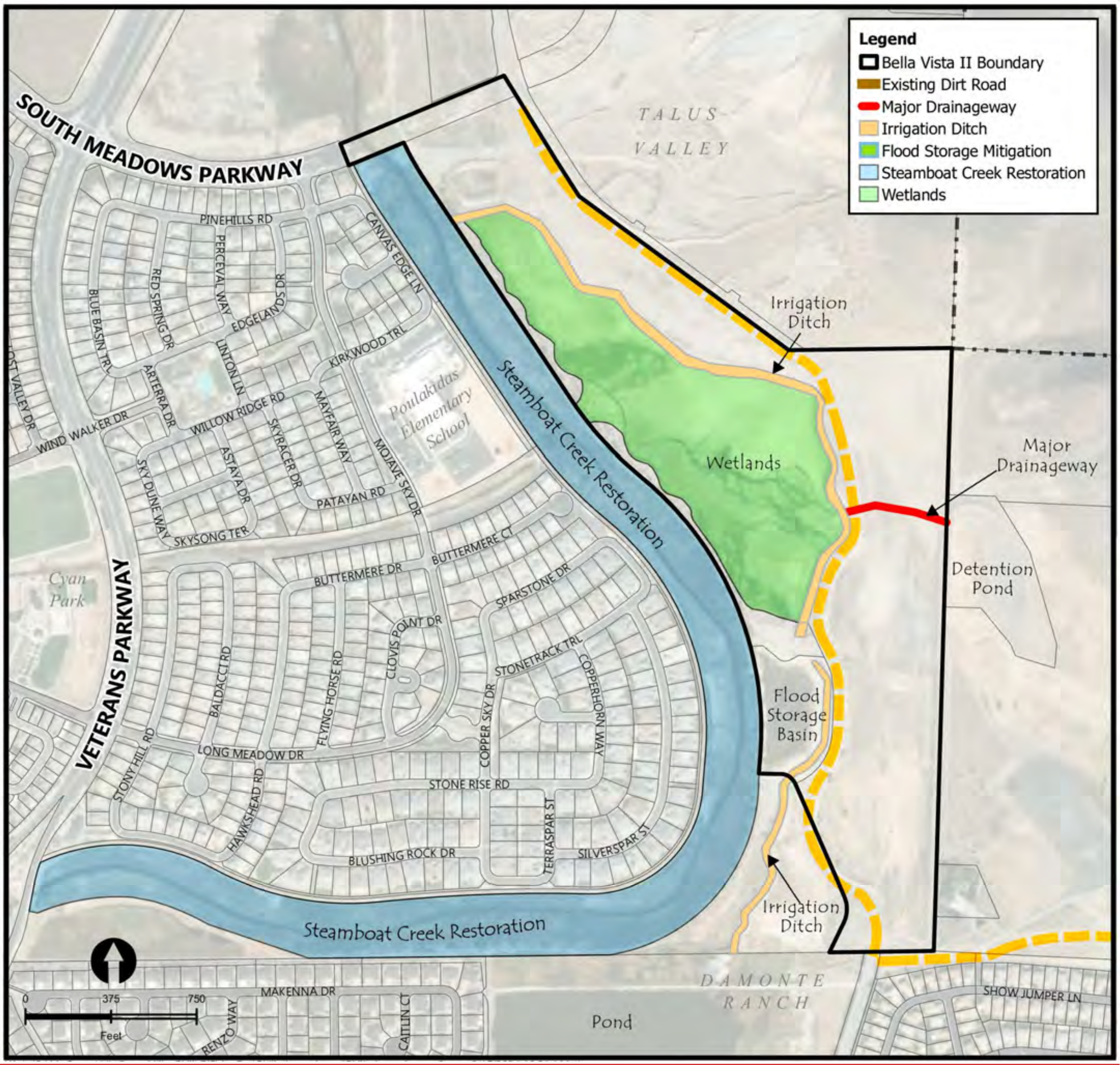


FIGURE 3
Dominant Site Features

~~B.~~C. Phasing ~~(Refer to Section II, F, page 15 for details)~~

~~2.~~ Phasing Strategy

The intent of the phasing strategy is to provide a balanced and effective approach to the build~~-~~out of the project. The phasing plan is a statement of the Master Developer's intentions related to the pattern and timing of construction. The phasing described ~~is not "cast in concrete." It~~ presents a likely and logical sequence for development but may change due to ~~. F~~factors ~~that will affect phasing~~ including~~e~~ changes in market demands for the various types of land uses, the pace of individual developers and the availability of financing.

~~**3. Mixed Residential/Non-Residential**~~

It is anticipated that the project will be developed in two (2) phases. The first phase ~~(refer to ***Figure 2,*** page 2). Phase IIA~~ includes the SMU Land Use~~Villages B and C~~, in the ~~south~~ north half of the site. ~~Phase IIB~~The second phase includes ~~Village A~~Mixed Neighborhood (MN) in the ~~north~~ south half of the site and the neighborhood park.

Major Infrastructure Phasing

~~The south ±1800 feet of Rio Wrangler will be constructed with Phase IIA. The extension of South Meadows Parkway to Rio Wrangler, and the north ±1300 feet of Rio Wrangler will be constructed with Phase IIB (refer to Section II, F, page 15).~~

~~The trunk sanitary sewer, water trunk line, gas, electric, phone and cable distribution facilities will be constructed to serve each phase. Sanitary sewer, storm drain and water systems to serve individual lots/parcels will be constructed with each residential subdivision, multi-family building permit or non-residential building permit.~~

~~**Infrastructure Phasing**~~

The following represents the Developer's anticipated timing for the construction of the major backbone infrastructure and how it will be phased. It is based on current market conditions and anticipated construction seasons, both of which could change over time. The trunk sanitary sewer, water trunk line, gas, electric, phone and cable distribution facilities will be constructed to serve each phase, (refer to **Figure 4**). On-site public improvements to service individual lots or projects such as, sanitary sewer, water, storm drain, gas, electric and phone shall be constructed with each residential subdivision, multi-family or non-residential building permit.

~~Phase IIA~~

Mass Grading

~~Prior to approval of the first building permit submittal for any project in Phase IIA, final improvement plans for any mass grading and or restoration of the Major Drainageway shall be submitted for staff review along with all necessary parcel maps and easements.~~Mass grading may occur prior to the design and approval of major infrastructure and/or at the same time as grading on adjacent parcels to allow for the mass grading associated with backbone infrastructure. This is anticipated to occur in Phase I in conjunction with the half street improvements on adjacent parcels. The grading of the Major Drainageway is anticipated to be within Phase 2 and will be completed with the development of the MN land use. During this phase the final location will be determined based on the type of development proposed and would need to be addressed through a site plan review or the tentative map process.

~~Arterial~~Backbone Roadways

Phase I:

The extension of South Meadows Parkway shall be constructed by the adjacent developer to the north (Talus Valley) or by the Bella Vista II Master Developer, whichever is first. This also may include half street improvements prior to development of the Bella Vista II PUD. The final improvement plans shall be submitted with final maps or with building permit submittal for the extension (refer to ***Figures 8A & 8B***). All necessary Right of Way dedication maps, easements, adjacent landscape corridor and sound wall/fencing improvement plans and bonding for the improvements shall be included with the submittal.

The northwest ±1,300 feet of Rio Wrangler half street improvements shall be constructed by the adjacent developer (Talus Valley). The northeast half of Rio Wrangler Parkway, including sidewalks, landscaping and fencing shall be constructed by the Bella Vista II Master Developer. The northwestern portion of Rio Wrangler Parkway within the SMU will be constructed prior to, or in coordination with, the development of the SMU Land Use.

~~Prior to approval of the first building permit submittal for any project in Phase IIA, final improvement plans shall be submitted for review for phase IIA of Rio Wrangler (refer to **Figure 14**, page 26). All necessary R.O.W. dedication maps, easements, adjacent landscaping and sound wall/fence improvements shall be included with the submittal.~~

~~Construction of Phase IIA of the Arterial Roadways will occur after approval of the plans. Bonding for the improvements shall be provided with the building permit.~~

Phase II:

Prior to approval of the first building permit submittal for any project in the MN Land Use, final improvement plans shall be submitted for review for the south ±2,700 feet of Rio Wrangler Parkway from the SMU Land Use in the north to the current terminus or Rio Wrangler Parkway to the south (refer to ***Figure 5***). All necessary R.O.W. dedication maps, easements, adjacent landscaping, and sound wall/fence improvements shall be included with the submittal.

Construction of Phase A and B of the Backbone Roadways will occur after approval of the plans. Bonding for the improvements shall be provided with the building permit.

Sanitary Sewer Trunk Lines

Prior to approval of the first building permit submittal for any project~~ in Phase IIA~~, final improvement plans shall be submitted for staff review ~~of Phase IIA~~ of the sanitary sewer system to serve the site (refer to *Figure 4*~~9, page 17~~). All necessary easements and bonding for the improvements will be included.

Water Main~~ - Washoe County Water Resources~~

Prior to approval of the first building permit for any project~~ in Phase IIA~~, final improvement plans shall be submitted for staff review of the ~~Phase IIA~~ water main construction to serve the site,~~.~~ (refer to ***Figure 4***~~***9***, page 17~~). All necessary easements and bonding for the improvements will be included.

~~**Phase IIB**~~

~~**Arterial Roadways**~~

~~Final improvement plans shall be submitted with adjacent subdivision final maps or with building permit submittal for half street improvements for Rio Wrangler and half street improvements for the extension of South Meadows Parkway. (refer to **Figures 10A & 10B**, pages 20 & 21). All necessary R.O.W. dedication maps, easements, adjacent landscape corridor and sound wall/fencing improvement plans and bonding for the improvements shall be included with the submittal.~~

~~The north half of South Meadows Parkway, including sidewalks, landscaping and sound walls shall be constructed with adjacent development to the north. The east half of Rio Wrangler Parkway, including sidewalks, landscaping and fencing shall be constructed with adjacent development to the east.~~

~~**On-site Improvements**~~

~~On-site public improvements to service individual lots or projects such as, sanitary sewer, water, storm drain, gas, electric and phone shall be constructed with each residential subdivision, multi-family or non-residential development.~~

Public Amenities Phasing

A~~A~~ ±4.4 acre public neighborhood park~~, located within Phase IIA~~, will be constructed ~~with Phase IIB to serve the majority of the projects residential units that are located in Phase IIB, Village~~ prior to the buildout of the MN land use~~A~~. The open space and 8-~~-~~foot-wide asphalt trail associated with or adjacent to each phase will be constructed by the Master Developer prior to completion of each phase.

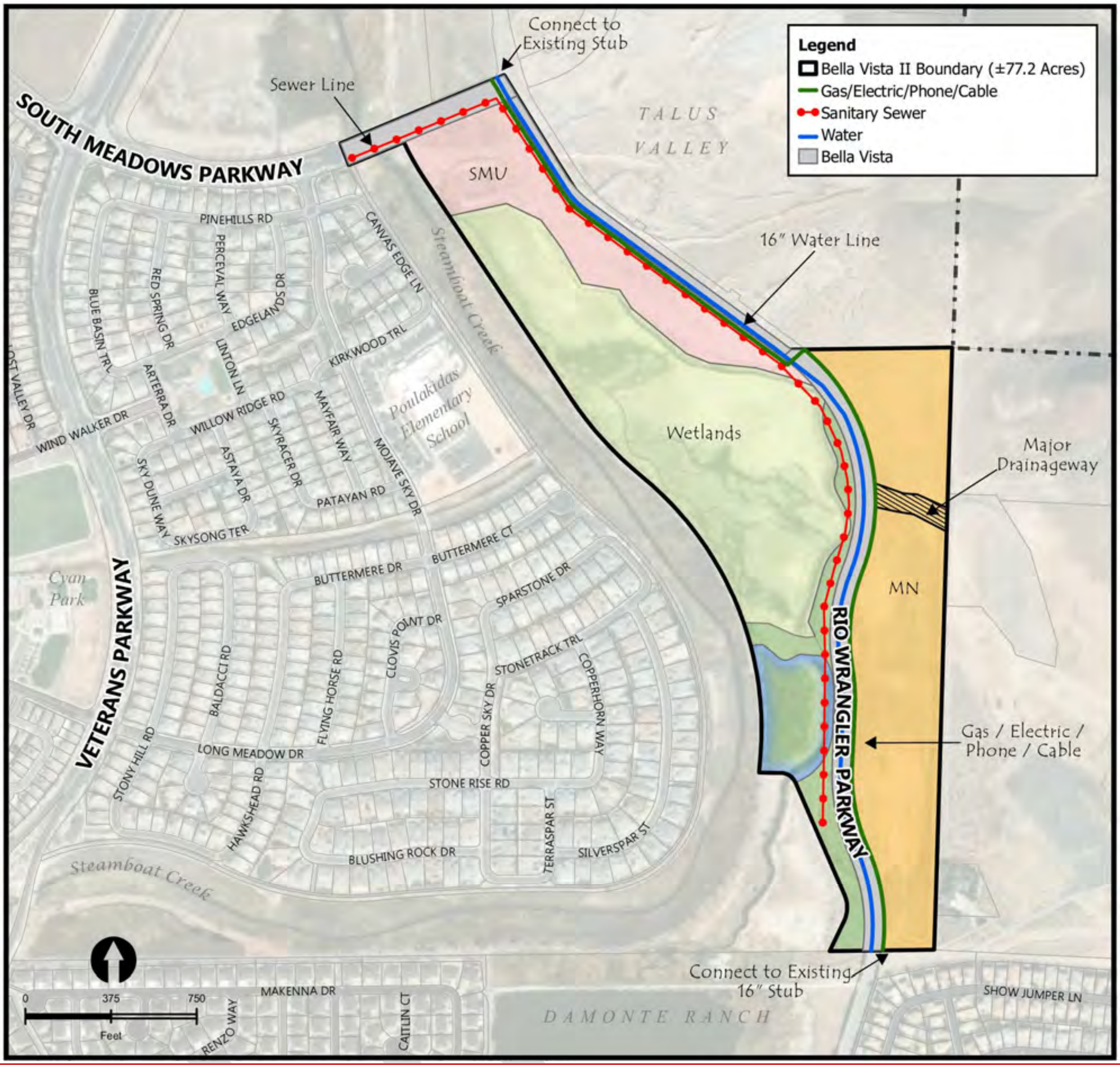

Legend
Bella Vista II Boundary (±77.2 Acres)
Gas/Electric/Phone/Cable
Sanitary Sewer
Water
Bella Vista
Connect to Existing Stub
Sewer Line
SOUTH MEADOWS PARKWAY
TALUS VALLEY
SMU
16" Water Line
Wetlands
Major Drainageway
MN
RIO WRANGLER PARKWAY
Gas / Electric / Phone / Cable
Connect to Existing 16" Stub
VETERANS PARKWAY
Steamboat Creek
Poulakidas Elementary School
Cyan Park
DAMONTE RANCH
PINEHILLS RD
CANVAS EDGE LN
PERCEVAL WAY
RED SPRING DR
BLUE BASIN TRL
EDGELANDS DR
LINTON LN
KIRKWOOD TRL
ARTERRA DR
WIND WALKER DR
WILLOW RIDGE RD
MAYFAIR WAY
SKYRACER DR
ASTAYA DR
SKY DUNE WAY
MOJAVE SKY DR
PATAYAN RD
SKYSONG TER
BUTTERMERE DR
BUTTERMERE CT
SPARSTONE DR
CLOVIS POINT DR
STONETRACK TRL
COPPERHORN WAY
BALDACCI RD
FLYING HORSE RD
COPPER SKY DR
LONG MEADOW DR
STONY HILL RD
HAWKSHEAD RD
STONE RISE RD
TERRASPAR ST
SILVERSPAR ST
BLUSHING ROCK DR
MAKENNA DR
CAITLIN CT
RENZO WAY
SHOW JUMPER LN
0
375
750
Feet

FIGURE 4~~9~~
Major Infrastructure Phasing

II. SERVICES & FACILITIES

A. Traffic and Circulation Plan

Per the Traffic Study prepared by Headway Transportation on (December 22, 2023), the project is expected to generate 7,752 average daily trips with 545 trips occurring during the AM peak hour and 588 trips occurring during the PM peak hour. Traffic will have some impact on the adjacent street network. However, the proposed improvements will generally improve traffic for the surrounding area with the extension of South Meadows Parkway and Rio Wrangler Parkway. All tentative/final map applications and building permit submissions shall adhere to the recommendations in the Master Traffic Study and include an updated traffic letter with each tentative map/building permit, to show compliance with the Master Traffic Study, (refer to **Appendix A**), street types and design standards are outlined in detail in Section III**,** Design Standards, Section F.

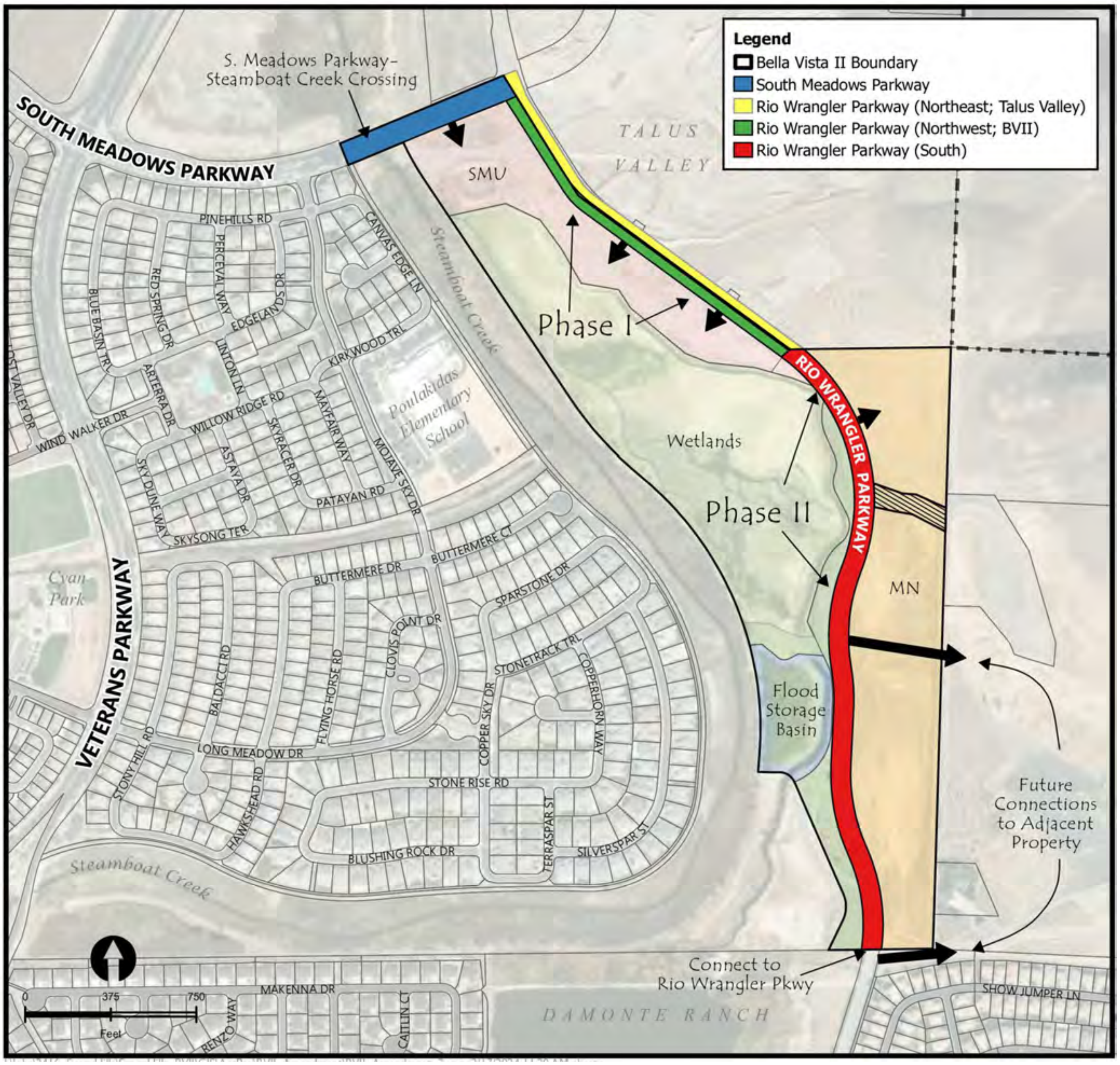
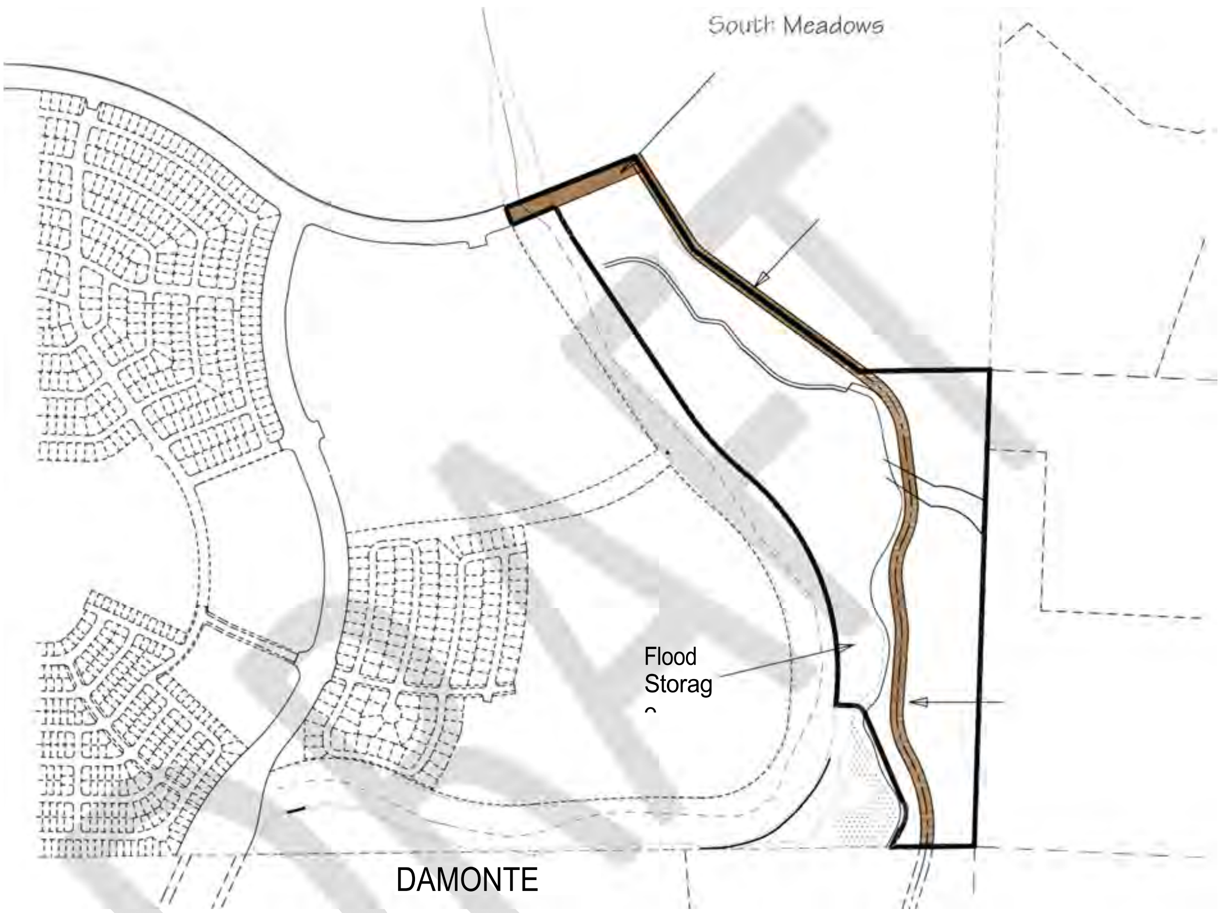
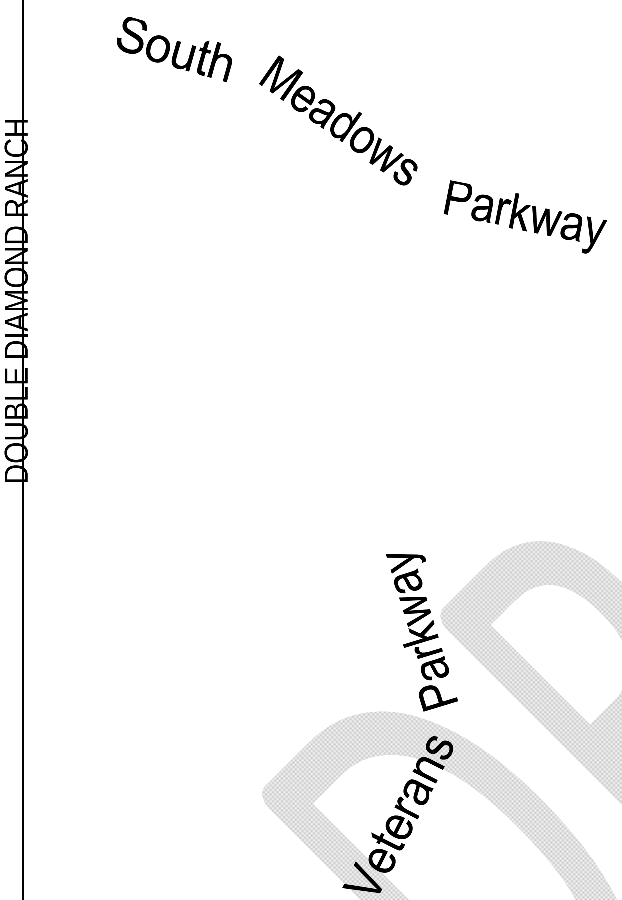


Figure 5
Major Roadways

~~7. Traffic and Circulation~~

~~The traffic study included in **appendix A** contains traffic projections for development of this property. South Meadows Parkway and Rio Wrangler Parkway are the main east-west and north-south arterial streets, respectively, to serve this project. The development of this project will extend South Meadows to the east to connect with Rio Wrangler; and extend Rio Wrangler to the south to connect to the existing northern terminus of Rio Wrangler in the Damonte Ranch (**refer to *Figure 4, page 5***). The street section standards are in **Section III, A, on pages 20, 21 and 26, Figures 10 A, 10 B and Figure 14.**~~





~~Figure 4~~
~~Major Roadways~~

~~A.~~B. Parks, Trails, and Open Space

A primary objective for this development ~~was~~ is the inclusion of strategically located and accessible open space. To accomplish this objective, an interconnected system of sidewalks and trails is planned. The design standards for this pedestrian and bicycle circulation system are contained in Section II~~, D, pages 13 & 14~~.

~~One neighborhood park will be constructed in the south half of the property. (refer to ***Figure 5***, page 6). This park will be connected via a trail system to other open space areas throughout the PUD (refer to Section II, D, page 13 and 14). Open space will be located within and adjacent to natural areas, such as the Steamboat Creek corridor, and manmade open space areas, such as the major drainageway. Trails and sidewalks will be located throughout the open space and along major roadways (refer to ***Figure 8,*** page 14). The park and open space will be accessible to the entire community via the project trails and sidewalks. (refer to Section III, B, page 38).~~

Parks

A ±4.4 acre neighborhood public park will be located in the south central portion of the project between the open space wetlands and Rio Wrangler Parkway, (refer to **Figure 2**). The park will be passive and will include a maximum one (1) acre of turf area for outdoor play. This park shall be connected to a sidewalk and trail system and provide access to other open space areas and developments throughout the PUD, (refer to **Figure 6**). The park will be constructed by the developer and maintained by the HOA as discussed in the Maintenance section of this PUD. The park will be designed to the approval of the City of Reno and constructed by the property developer.

The developer shall not receive credit towards the Residential Construction Tax (park fees) to construct the park. All Residential Construction Tax fees collected from this project shall be used to construct additional amenities within Cyan Park, located within the Bella Vista Ranch PUD to the west of this project which is within the same Park District. The proposed trail system within this PUD will connect to the adjacent trail networks and provide additional pedestrian connectivity.

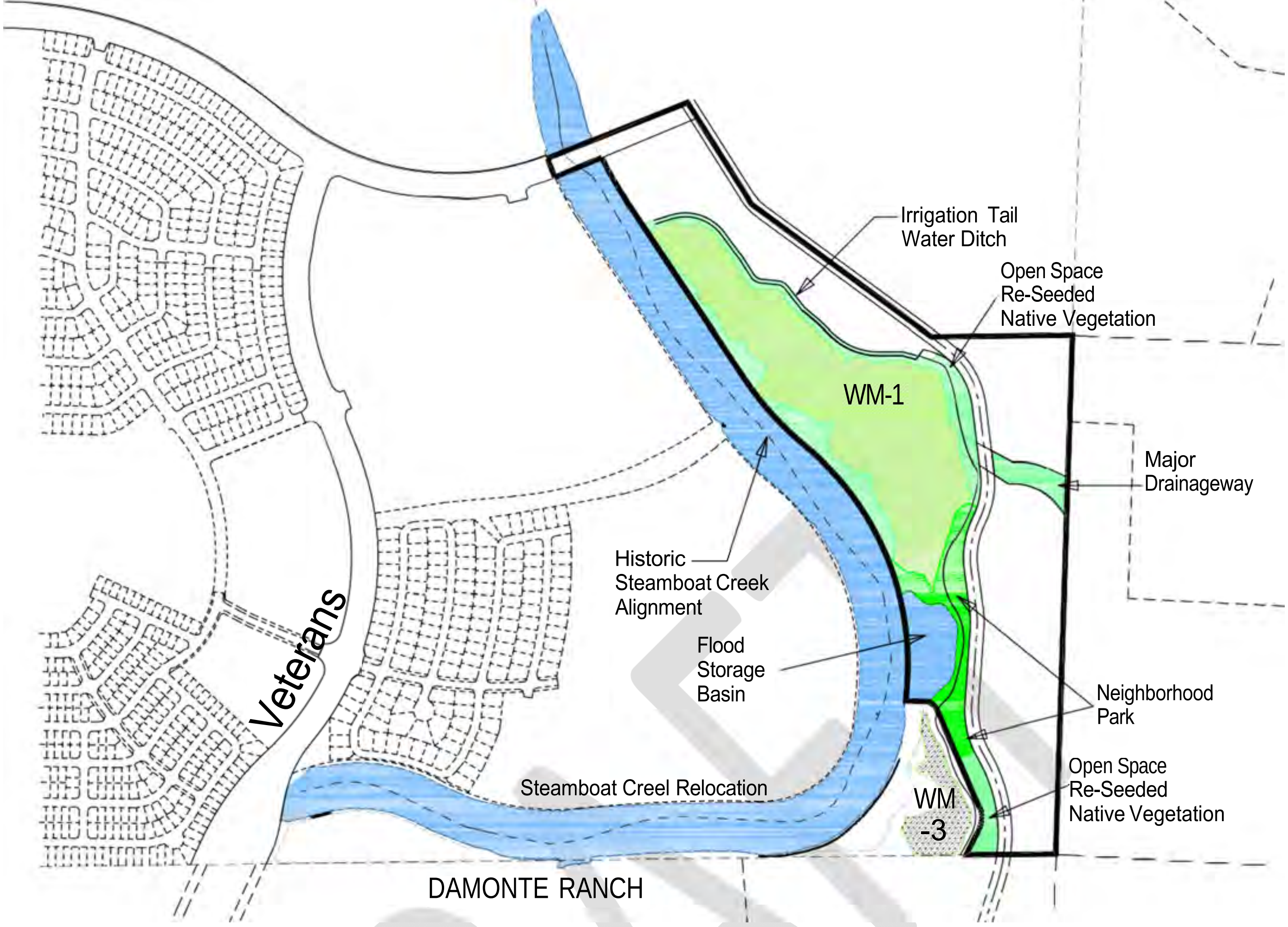
The Residential Construction Tax Agreement for this project shall be completed and approved by the Reno City Council prior to or simultaneously with the certification of this PUD. The approved Agreement is attached as appendix H to this PUD. Refer to **Section III,** for additional design standards and implementation requirements.

Trails, Sidewalks and Bike Lanes

Trails, sidewalks and bike lanes will be provided in accordance with **Figure 6**. Sidewalks and bike lanes will be provided on both sides of the arterial roadways. A pedestrian/bike multiuse trail will be provided along the east side of the wetland consolidation area and linear park. The arterial roadway sidewalks will connect to the trails in the Damonte Ranch area to the south. The arterial roadway sidewalks and pedestrian/bike trails will also connect to the Steamboat Creek Corridor and the parkway trails in the Bella Vista Ranch PUD to the west, (refer to **Figure 6**). The local pedestrian street sidewalks will provide internal connection from the developments to the trails and sidewalks and provide additional pedestrian access over South Meadows Parkway including safe pedestrian access to Nick Poulakidas Elementary School and Depoali Middle School to the west.

Open Space

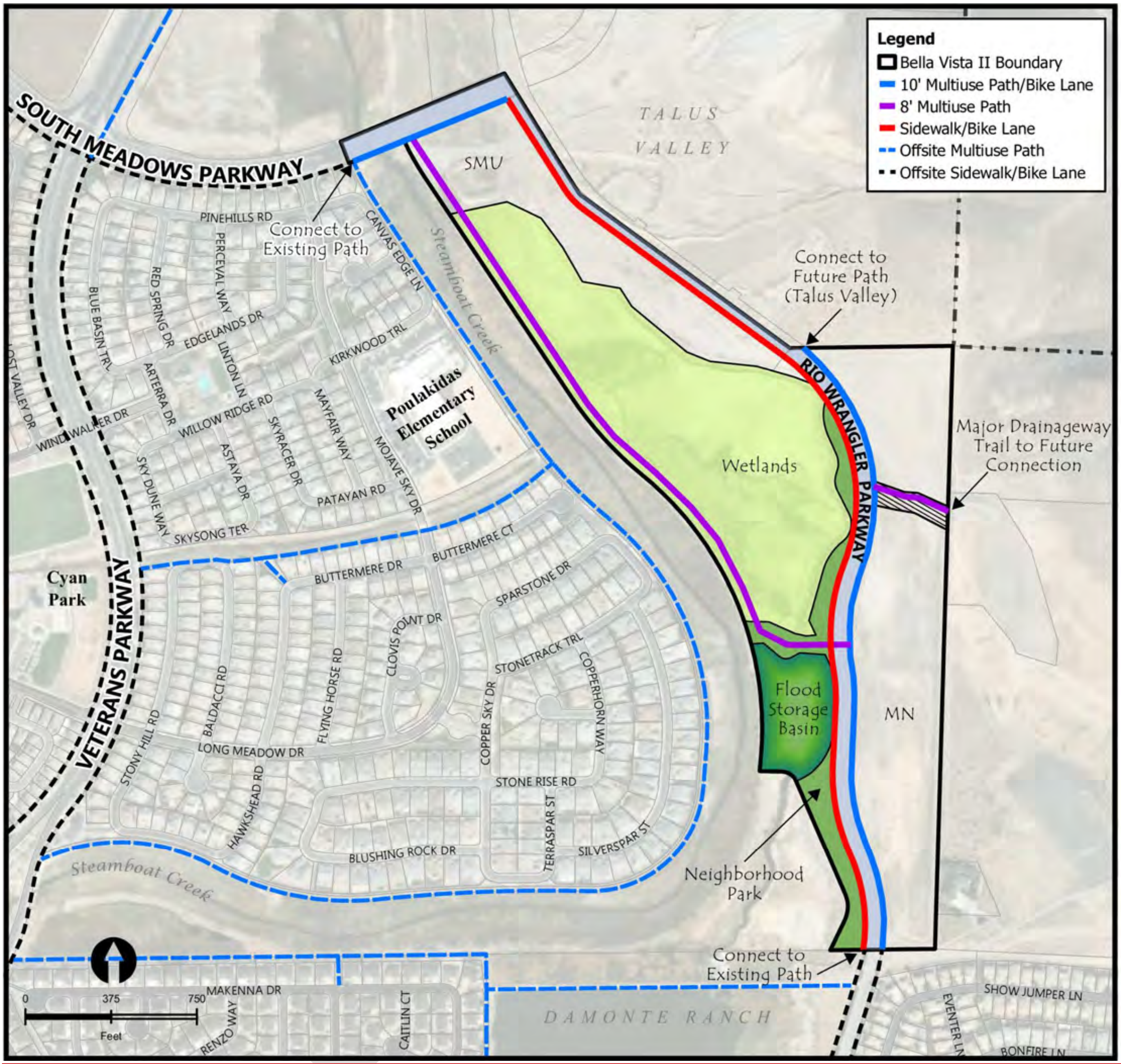
Open space will be located within and adjacent to natural areas, such as the Steamboat Creek corridor, and manmade open space areas, such as the major drainageway. Trails and sidewalks will be located within the open space and provide connectivity throughout the PUD and connect to existing and proposed trail networks in the surrounding neighborhoods, (refer to ***Figure 6***).



~~FIGURE 5~~
~~Open Space~~

~~B.~~C. Wetlands

The delineation of federally protected wetlands on this property was completed with approval of the individual Corps of Engineers permit number # 200400683,~~.~~ (r~~R~~efer to **Appendix C**~~-1~~). One of the two ~~Two~~ delineated wetlands covered by this permit (WM-1 ~~and WM3~~) exist within ~~and adjacent to~~ this PUD (refer to ***Figure*** ***2~~3,~~*** ~~page 3~~ and ***Figure*** ***3~~5~~***~~, page 6~~). Any enhancements within wetland area~~s~~ must be consistent with the Final Wetland Mitigation Plan approved by the Corps of Engineers through individual permit listed above under Section 404 of the Clean Water Act and the City of Reno Wetlands and Stream Environment Protection Standards, as amended. The wetland mitigation plan prepared by Gibson & Skordal, Wetlands Consultants dated February 2005, and the 404 permit dated October 2005 is located in Appendix C and includes additional details regarding the mitigation plan. All wetland improvements should also be ~~with the Final Wetland Mitigation Plan approved by the Corps of Engineers through the Individual Permit noted above and~~ in compliance with the City of Reno Wetlands and Stream Environment Ordinance, RMC 18.12.1801-1808, as amended.



~~FIGURE 6~~
~~Open Space/Trail, Sidewalk and Bike Lane Plan~~

~~8. Steamboat Creek~~

~~This PUD will create an open space/neighborhood park buffer around the existing wetlands and re-aligned Steamboat Creek constructed to the west as part of the Bella Vista Ranch PUD. The alignment of Steamboat Creek provides for one continuous and contiguous open space corridor linking all the wetlands and drainages on Damonte Ranch with the wetlands and drainages on the Bella Vista Ranch (refer to Section II, E, page 15).~~

~~C.~~D. Stormwater Management

~~1.~~ Site Drainage

The property slopes to the ~~north~~ west/northwest very gradually at a typical gradient of less than half a foot per hundred feet (0.5%). The Steamboat Creek Restoration Project, adjacent to the west side of the site, was designed to provide 5 year and 100 year outfall drainage for the Phase II PUD. The City of Reno Public Works Design Manual and the standard details for Public Works shall be the design standards for on-site storm drainage system designs and construction. All on-site stormwater management and drainage improvements shall adhere to the Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006 and all updates or addenda thereto, (refer to **Appendix B**).

~~2.~~ Flood Potential ~~**(Refer to Section II, C, page 13 for details)**~~

The current Federal Emergency Management Agency (FEMA) DFIRM maps, dated March 2009, indicate that the site is not affected by the Zone A (100-year floodplain) from Steamboat Creek.

Floodplain Mitigation
The Flood Control Master Plan prepared by Quad Knopf Consulting, dated January 11, 2006 specifies how the 100-year floodplain was mitigated, (refer to appendix B). In summary, the approved flood control plan removed the developable portions of the site from the 100-year floodplain by constructing the Steamboat Creek Natural Corridor (SCNC). The current FEMA DFIRM maps dated March 2009 document that the site is not within the 100 year floodplain. Refer to appendix B-3 for a copy of the March 2009 DFIRM map. All floodplain mitigations shall adhere to the Flood Control master Plan and all updates or addenda thereto.

As noted in the QuadKnopf study, the following steps have been completed to remove the project from the 100-year floodplain:

- Approval from the Corps of Engineers of the 404 Individual Permit # 200400683. Permit received February 2005, copy in appendix C.
- Approval of the CLOMR for Phase II by FEMA received August 8, 2007, copy in appendix B.
- Approval of the LOMR for Phase II by FEMA received April 25, 2008, copy in appendix B.

Detention – Flood Storage
The Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006, specifies how the detention/flood storage issues are to be addressed for this PUD. (refer to appendix B). All flood storage and detention improvements shall adhere to the Flood Control Master Plan and all updates or addenda thereto.

Flood Mitigation Update
The Steamboat Creek channel work adjacent to the PUD area has been completed with the development of Bella Vista I and will not be changed with the development of this property. The adjacent property to the north (Talus Valley) has an approved CLOMR that addresses the existing and proposed conditions downstream of Bella Vista II. Additional work on the downstream improvements isn't warranted based on the proposed development in Bella Vista II. Therefore, onsite drainage will be addressed appropriately at the time of tentative maps or site plan review when details of the development are known and impacts can be further analyzed.

E. Major Drainageway

The existing drainageway noted in ***Figure 3***, is defined as a major drainageway because it drains more than 100 acres. It is also categorized as a "disturbed drainageway", as defined by Reno Municipal Code. The majority of this drainageway currently runs through the middle of the adjacent property to the east and is undistinguishable topographically. This drainageway terminates as it drains into the existing irrigation tail water ditch just west of the Desert Way (see Figure 3). The portion of the drainageway proposed for development shall be restored per City of Reno code 18.04.104. The Major Drainageway location will be finalized during the tentative map or through a

Major Site Plan Review (MSRP).

~~D.~~F. Emergency Services~~Fire/Police Protection/Parks~~

~~3. Fire~~

~~The Developer has previously entered into a Fire Station Development Agreement for the existing Bella Vista Ranch PUD. The Agreement is being revised to reflect current market conditions and fire service needs. It will be called a First Amended Public Facility Site Agreement and will include this project. It will. define the Developers obligation for the funding of a future Fire Station to serve this PUD. This Fire Station may be located on the public facility site created with the original Bella Vista Ranch PUD, or at some other location as provided for in the First Amended Public Facility Site Agreement.~~

~~A fee will be established in the First Amended Public Facility Site Agreement on a unit basis for single and multi-family development and on a per square foot basis for non-residential development.~~

~~If the City of Reno establishes an Impact Fee for Fire Service per NRS 278B, subsequent to approval of this project, then all per residential unit and non-residential square footage fire fees collected from this project shall be credited and applied on a per dollar basis for any fees contributed per the existing Bella Vista Ranch agreement noted above.~~

~~As noted above, the modification to the existing Bella Vista Ranch Fire Station Development Agreement to include this project shall be contained in the First Amended Public Facility SiteAgreement, shall be completed and approved by the Reno City Council prior to or simultaneously with the certification of this PUD and shall be added as an appendix to and recorded as part of this PUD Handbook.~~

~~4.~~ Police

~~A police station facility to serve this project could be located on the public facilities parcel of the Bella Vista Ranch PUD should the City of Reno determine it is appropriate. (refer to Section II, G, page 18 for details).~~

~~A police capital facilities fee shall be collected for each residential unit and non- residential square footage within the PUD. This fee shall be determined based on the requirements of NRS 278B. The fee shall be established for this PUD concurrent with adoption of a future citywide Police Department Facility Fee as allowed per NRS 278B.~~

~~5. Park~~

~~**A 4.4 acre public park will be located in the south central portion of the project (refer to Figure 2, page 2). The park will be passive and will include a maximum 1 acre of turf area for outdoor play. This park shall be connected to the project path and sidewalk system. The park will be constructed by the developer and maintained by the OA as discussed in the Maintenance section of this PUD on page 19. The park will be designed to the approval of the City of Reno and constructed by the property developer.**~~

~~**The developer shall not receive credit towards the Residential Construction Tax (park fees) to construct the park. All Residential Construction Tax fees collected from this project shall be used to construct the park located within the Bella Vista Ranch PUD located to the west of this project which is within the same Park District.**~~

~~**A.** The Residential Construction Tax Agreement for this project shall be completed and approved by the Reno City Council **prior to or simultaneously with the certification of this PUD. The approved Agreement is attached as appendix H to this PUD. Refer to Section III B, page 38 for additional design standards, timing and implementation requirements.**~~

~~III. DEVELOPMENT STANDARDS~~

~~A. Land Use~~

~~**Allowed uses include detached and attached single family residential, multi-family residential, lower intensity non-residential, park and open space. The maximum density, total number of dwelling units and the maximum non-residential square footage for each village is shown on table 1. The maximum number of dwelling units and the non-residential square footage within the project shall not exceed 575 units (residential) and 178,600 square feet (non-residential), respectively.**~~

~~TABLE 1~~
~~LAND USE BREAKDOWN~~

A police impact fee will be collected for each residential unit and non-residential square foot constructed within the PUD in accordance with RMC Section 18.04.1206.~~Total ± 77.4 100%~~

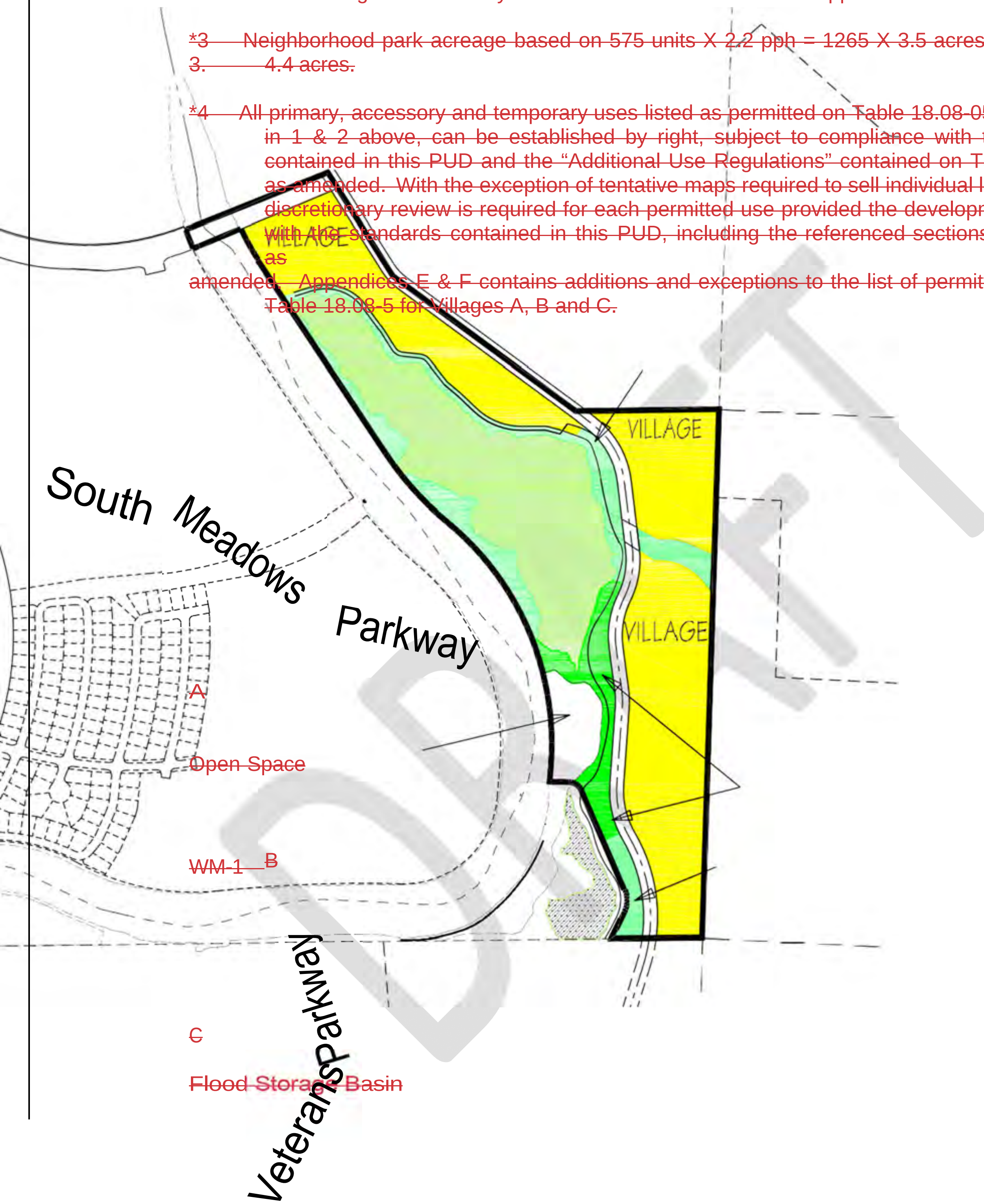
Fire

~~1. *1 Villages A and B will allow all residential and non-residential uses listed in the SF4, MF 14, MF 21, and MF 30 zones on Table 18.08-05 "Uses Permitted in the Residential Base Zoning Districts", Section 18.08.201 of the Reno Municipal Code (RMC), as amended; and as modified in Appendix E of this PUD.~~

~~2. *2 Village C allows only the non-residential uses listed in Appendix F of this PUD.~~

~~*3 Neighborhood park acreage based on 575 units X 2.2 pph = 1265 X 3.5 acres/1000 pop. = 3. 4.4 acres.~~

~~*4 All primary, accessory and temporary uses listed as permitted on Table 18.08-05, as modified in 1 & 2 above, can be established by right, subject to compliance with the standards contained in this PUD and the "Additional Use Regulations" contained on Table 18.08-05 as amended. With the exception of tentative maps required to sell individual lots, no further discretionary review is required for each permitted use provided the development complies with the standards contained in this PUD, including the referenced sections of the RMC, as amended. Appendices E & F contains additions and exceptions to the list of permitted uses from Table 18.08-5 for Villages A, B and C.~~



~~A~~

~~Open Space~~

~~WM-1~~ ~~B~~

~~C~~

~~Flood Storage Basin~~

~~Neighborhood Park~~

~~DAMONTE RANCH~~

~~Open Space~~
~~WM~~
~~-3~~

~~*FIGURE 6*~~
~~*Land Use*~~

~~B. Traffic and Circulation Plan~~

~~Per the Traffic Study prepared by Solaegui Engineers in June 2005 **and the addenda letter by Solaegui Engineers dated October 7, 2010 (appendix A-1),** the project is expected to generate **11,027average daily trips with 432 trips occurring during the AM peak hour and 967 trips occurring during the PM peak hour.** Traffic will have some impact on the adjacent street network. All tentative/final map applications and building permit submissions shall adhere to the recommendations in the Master Traffic Study and any updates or addenda thereto.~~

~~1. Intersection Spacing~~

~~a. South Meadows Parkway (refer to *Figure 7*, page 12).~~

~~The on-site residential collector streets and local streets intersecting South Meadows Parkway shall meet Regional Transportation Commission (RTC) spacing requirements for moderate access control arterials. An addendum to the Traffic Report shall be required to be submitted with each tentative map or building permit to determine intersection design.~~

~~b. Rio Wrangler Parkway (refer to *Figure 7*, page 12).~~

~~The on-site residential collector streets and local streets intersecting Rio Wrangler shall meet Regional Transportation Commission (RTC) spacing requirements for moderate access control arterials. An addendum Traffic Report shall be required to be submitted with each tentative map or building permit to determine intersection design.~~

~~2. Street Design Standards~~

~~Refer to Section III, A, beginning on page 20 for specific design standards for the above noted roadways.~~

DOUBLE DIAMOND RANCH

South Meadows Parkway

~~Pkwy. Extension~~
~~4 Lane Moderate Access Control Arterial~~

~~Rio Wrangler~~
~~2 Lane Moderate Access Control Arterial/Collector Northerly 1,300'~~

Veterans Parkway

~~Flood Storage Basin~~

~~Rio Wrangler~~
~~2 Lane Moderate Access Control Arterial/Collector~~

~~DAMONTE RANCH~~

~~FIGURE 7~~
~~*Circulation Plan*~~

~~C. Stormwater Management~~

~~1. Site Drainage~~

~~The City of Reno Public Works Design Manual and the standard details for Public Works shall be the design standards for on-site storm drainage system designs and construction. All on-site stormwater management and drainage improvements shall adhere to the Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006 and all updates or addenda thereto. (Refer to Appendix B)~~

~~2. Floodplain Mitigation~~

~~The Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006 specifies how the 100-year floodplain was mitigated. (refer to appendix B) In summary, the approved flood control plan removed the developable portions of the site from the 100-year floodplain by constructing the Steamboat Creek Natural Corridor (SCNC). The current FEMA DFIRM maps dated March 2009 document that the site is not within the 100 year floodplain. Refer to appendix B-3 for a copy of the March 2009 DFIRM map. All floodplain mitigations shall adhere to the Flood Control master Plan and all updates or addenda thereto.~~

~~a. Timing and Implementation~~

~~As noted in the QuadKnopf study, the following steps have been completed to remove the project from the 100-year floodplain.~~

~~Approval from the Corps of Engineers of the 404 Individual Permit # 200400683. Permit received February 2005, copy in appendix C-1~~

~~Approval of the CLOMR for Phase II by FEMA received August 8, 2007, copy in appendix B-1.~~

~~Approval of the LOMR for Phase II by FEMA received April 25, 2008, copy in appendix B-2~~

~~3. Detention – Flood Storage~~

~~The Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006, specifies how the detention/flood storage issues are to be addressed for this PUD. (refer to appendix B). All flood storage and detention improvements shall adhere to the Flood Control Master Plan and all updates or addenda thereto.~~

~~D. Trails, Sidewalks, and Bike Lanes~~

~~General~~

~~Trails, sidewalks and bike lanes will be provided in accordance with *Figure 8*, page 14. Sidewalks and bike lanes will be provided on both sides of the arterial roadways. A pedestrian/bike trail will be provided along the east side of the wetland consolidation area and linear park. The arterial roadway sidewalks will connect to the trails in the Damonte Ranch area to the south. The arterial roadway sidewalks and pedestrian/bike trails will also connect to the Steamboat Creek Corridor and the parkway trails in the Bella Vista Ranch PUD to the west. (refer to *Figure 8*, page 14). The local pedestrian street sidewalks will provide internal connection from villages to the trails and sidewalks noted above.~~

~~1. Design Standards/Timing and Implementation~~

~~**The pathway and trail standards are specified on page 45, Section III B 3 c of this PUD,**~~

South Meadows Parkway

~~**6' Sidewalk & Bike Lane**~~

~~**WM-1**~~

~~**6' Sidewalk & Bike Lane**~~

~~**8' Asphalt Trail**~~

Parkway

DOUBLE DIAMOND RANCH

~~**8' Asphalt Trail**~~

Veterans

~~**WM -3**~~
~~**DAMONTE RANCH**~~

~~FIGURE 8~~
~~***Trail, Sidewalk and Bike Lane Plan***~~

~~**E.** Wetlands & Major Drainageway~~

~~1. Wetlands~~

~~**Several areas of identified wetlands exist within and adjacent to the project. Any modifications or enhancements within wetland areas must be consistent with the Final Wetland Mitigation Plan approved by the Corps of Engineers through individual permit no. 200400683 under Section 404 of the Clean Water Act and the City of Reno Wetlands and Stream Environment Protection Standards, as amended. The wetland mitigation plan prepared by Gibson & Skordal, Wetlands Consultants dated February 2005, and the 404 permit dated October 2005 is located in appendix C and includes additional details regarding the mitigation plan.**~~

~~2. Major Drainageway~~

~~**The existing drainageway noted on *Figure 3*, page 3, is defined as a major drainageway because it drains more than 100 acres. It is also categorized as a "disturbed drainageway", as defined by Reno Municipal Code. The majority of this drainagway currently runs through the middle of the adjacent shooting range on the Damonte Ranch and is un-distinguishable topographically. This drainageway terminates as it drains into the existing irrigation tail water ditch just west of the future Rio Wrangler Parkway. This drainage will be piped from this point to the Steamboat Creek. The portion of the drainageway on this project is to be restored per City of Reno code 18.12.1907(b), and as specified in section III B. 2 of this PUD. (page 43)**~~

~~Stormwater Management~~

~~Site Drainage~~

~~**The City of Reno Public Works Design Manual and the standard details for Public Works shall be the design standards for on-site storm drainage system designs and construction. All on-site stormwater management and drainage improvements shall adhere to the Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006 and all updates or addenda thereto. (Refer to Appendix B)**~~

~~Floodplain Mitigation~~

~~**The Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006 specifies how the 100-year floodplain was mitigated. (refer to appendix B) In summary, the approved flood control plan removed the developable portions of the site from the 100-year floodplain by constructing the Steamboat Creek Natural Corridor (SCNC). The current FEMA DFIRM maps dated March 2009 document that the site is not within the 100 year floodplain. Refer to appendix B-3 for a copy of the March 2009 DFIRM map. All floodplain mitigations shall adhere to the Flood Control master Plan and all updates or addenda thereto.**~~

~~Timing and Implementation~~

~~**As noted in the QuadKnopf study, the following steps have been completed to remove the project from the 100-year floodplain.**~~

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~~Detention – Flood Storage~~

~~The Flood Control Master Plan prepared by QuadKnopf Consulting, dated January 11, 2006, specifies how the detention/flood storage issues are to be addressed for this PUD. (refer to appendix B). All flood storage and detention improvements shall adhere to the Flood Control Master Plan and all updates or addenda thereto.~~

~~F. Infrastructure Phasing~~

~~**The following represents the Developer's anticipated timing for the construction of the major backbone infrastructure and how it will be phased. It is based on current market conditions and anticipated construction seasons, both of which could change over time.**~~

~~1. Phase IIA~~

~~I. Mass Grading~~

~~**Prior to approval of the first building permit submittal for any project in Phase IIA, final improvement plans for any mass grading and or restoration of the Major Drainageway shall be submitted for staff review along with all necessary parcel maps and easements.**~~

~~II. Arterial Roadways~~

~~**Prior to approval of the first building permit submittal for any project in Phase IIA, final improvement plans shall be submitted for review for phase IIA of Rio Wrangler (refer to *Figure 14*, page 26). All necessary R.O.W. dedication maps, easements, adjacent landscaping and sound wall/fence improvements shall be included with the submittal.**~~

~~**Construction of Phase IIA of the Arterial Roadways will occur after approval of the plans. Bonding for the improvements shall be provided with the building permit.**~~

~~III. Sanitary Sewer Trunk Lines~~

~~**Prior to approval of the first building permit submittal for any project in Phase IIA, final improvement plans shall be submitted for staff review of Phase IIA of the sanitary sewer system (refer to *Figure 9*, page 17). All necessary easements and bonding for the improvements will be included.**~~

~~IV. Water Main - Washoe County Water Resources~~

~~**Prior to approval of the first building permit for any project in Phase IIA, final improvement plans shall be submitted for staff review of the Phase IIA water main construction. (refer to *Figure 9*, page 17). All necessary easements and bonding for the improvements will be included.**~~

~~2. Phase IIB~~

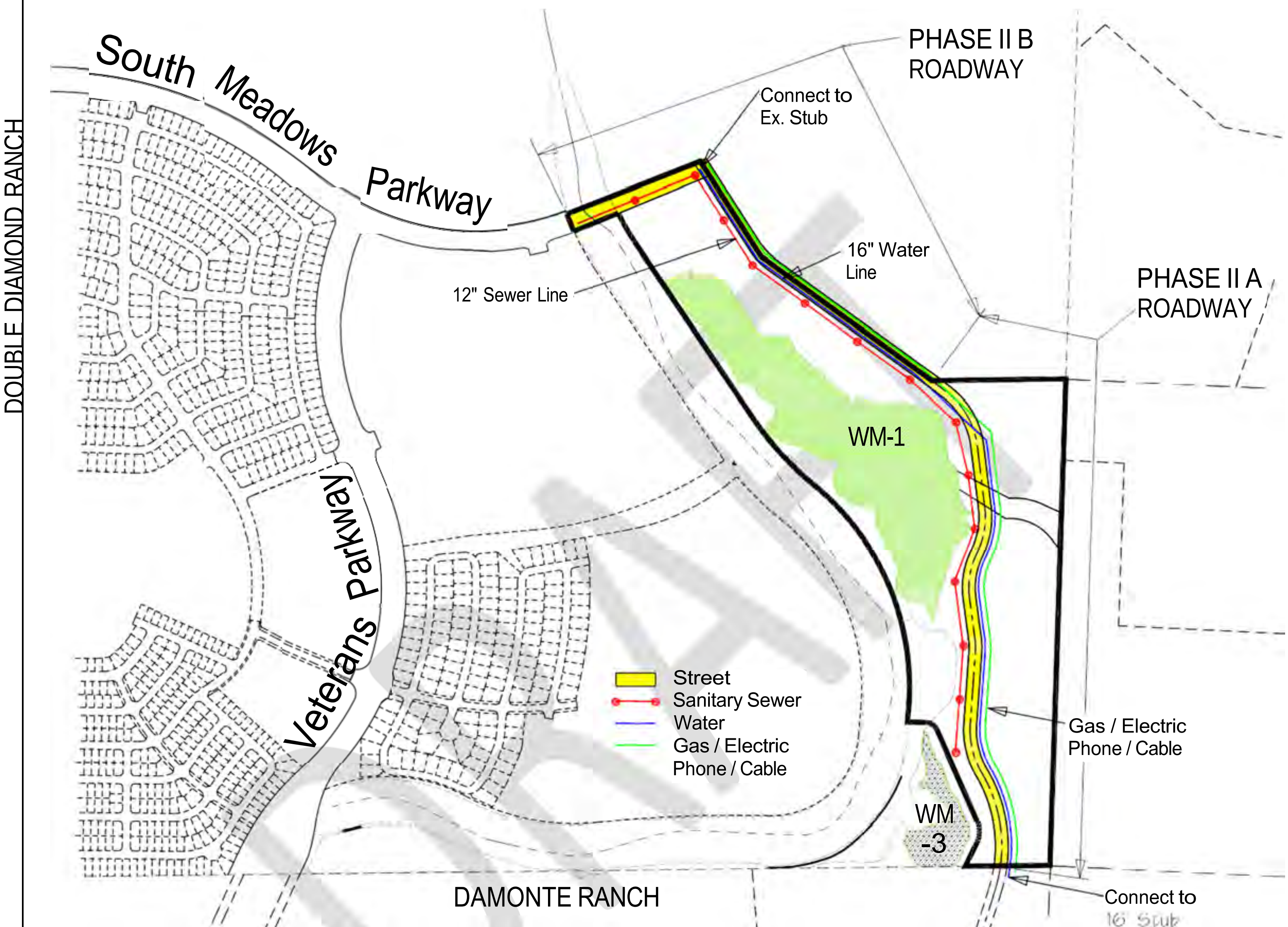
~~I. Arterial Roadways~~

~~**Final improvement plans shall be submitted with adjacent subdivision final maps or with building permit submittal for half street improvements for Rio Wrangler and half street improvements for the extension of South Meadows Parkway. (refer to *Figures 10A & 10B*, pages 20 & 21). All necessary R.O.W. dedication maps, easements, adjacent landscape corridor and sound wall/fencing improvement plans and bonding for the improvements shall be included with the submittal.**~~

~~**The north half of South Meadows Parkway, including sidewalks, landscaping and sound walls shall be constructed with adjacent development to the north. The east half of Rio Wrangler Parkway, including sidewalks, landscaping and fencing shall be constructed with adjacent development to the east.**~~

~~II. On-site Improvements~~

~~**On-site public improvements to service individual lots or projects such as, sanitary sewer, water, storm drain, gas, electric and phone shall be constructed with each residential subdivision, multi-family or non-residential development.**~~



~~FIGURE 9~~
~~Major Infrastructure Phasing~~

~~G. Public Safety~~

~~1. Police~~

~~**The 6-acre public facility parcel approved in the Bella Vista Ranch PUD to the west, may be the location for a future police sub-station.**~~

~~**If the City of Reno establishes an impact fee for police service per NRS 278B, subsequent to approval of this project, then the residential unit and non-residential square foot police fee shall be created for this PUD concurrent with adoption of the citywide Police Department Facility Fee as allowed per NRS 278B.**~~

~~Fire~~

The Developer and the City ~~have~~ previously executed a Fire Station Development Agreement ~~and have revised it to reflect current market conditions and the future needs of the fire department~~. This revised agreement is called the First Amended Public Facility Site Agreement and ~~will~~ includes development in this PUD as well as the Bella Vista Ranch PUD to the west. This revised First Amended Public Facility Site Agreement outlines funding fee ~~may identify an alternative site outside of the Bella Vista Ranch, which the Master Developer would~~ agreements to help the City provide fire service needs for the PUD. ~~to participate in funding.~~ This funding ~~would be~~is through a per-household and non-residential square foot fee to be collected at building permit. This revised First Amended Public Facility Agreement was completed and approved by the Reno City Council prior to certification of this PUD. The Agreement is appendix G of this PUD handbook.

~~**Fee Established for PUD**~~

The fee ~~noted above~~ shall be paid into a dedicated account for this purpose prior to approval of any building permit for this PUD, as specified in the First Amended Public Facility Site Agreement.

~~**b. Design Requirements**~~

~~The First Amended Public Facility Site Agreement shall determine the specific design requirements for the station if the subject Agreement calls for the Fire Station to be located in Bella Vista.~~

~~**c. Timing and Implementation**~~

~~Timing for the completion of the Fire Station shall be as specified in the First Amended Public Facility Site Agreement and with approval by the Reno City Council prior to or simultaneously with the certification of this PUD.~~

~~E.~~G. Common Area Maintenance

~~1.~~ General

This PUD will have Protective Covenants that address maintenance ~~issues. It is the owners' intent to annex this PUD into the Bella Vista Ranch PUD (Phase I) Owners Association and CC&R's.~~ and ~~The Bella Vista Ranch PUD to the west is currently being maintained by this Owners Association. E~~enforcement of activities and will remain under the control of the Owners Association. These areas include parkways, open space areas and trails along drainage ways located outside of the public right-of-way. Project Protective Covenants (CC&R's) will clearly define maintenance responsibilities of the Owners Association versus the responsibility of individual property owners. ~~Protective Covenants (CC&R's) have been recorded for Bella Vista Ranch PUD.~~

~~2. Owners Association~~

~~The Bella Vista Ranch Phase II PUD Owners Association (BVROA) will be overseen by a board of directors. The boards will ultimately hire full-time professional managers, or a Management Company, and associated staff to maintain, develop, and operate common areas, including on site parks, landscaped parkways and trails along drainage structures outside public rights-of-way. If the BVROA fails to perform this periodic maintenance, then the City has the right to enter the property and perform said maintenance. If the City performs said periodic maintenance, then the City can require reimbursement for these services from the BDROA.~~

~~Several other duties will be performed by the Associations. BVROA duties include, but are not limited to, enforcement of the Protective Covenants; architectural/site improvement review and approval, purchase and maintenance of equipment, materials and supplies for maintenance purposes. In addition, any land that is set aside for common open space within the PUD must be owned and maintained by the BVROA or BVRDD. These associations shall not be dissolved. Disposal of any such common open space by sale or otherwise, is not allowed without first amending this PUD. If an amendment is approved allowing disposal of common area, then the applicant/master developer may offer to dedicate this property to the city of Reno. The city of Reno shall have 120 days to accept of reject the offer to accept the property.~~

~~These requirements and duties are reflected in the master protective covenants recorded on the property for Bella Vista Ranch PUD (Phase I). This PUD will be incorporated into the Bella Vista Ranch PUD CC&R's via an annexation and/or supplemental declaration process.~~

The City of Reno shall not be responsible for maintenance of any on~~-~~site private parks, common area improvements, private streets, storm drain channels, detention basins, other flood control facilities or the Steamboat Creek Restoration. The Owners Association or Drainage Maintenance District shall be responsible for maintenance of these facilities.

~~3.~~ Drainage District

The Bella Vista Ranch (Phase I) PUD created and established a Drainage Maintenance District called the ~~Bella Vista Ranch~~Cyan Drainage District (~~BVRDD~~CDD), which has the powers and duties to contract for design, ~~construction~~construction, and maintenance of drainage facilities throughout the Bella Vista Ranch PUD. This project shall ~~be~~ incorporate~~d~~ ~~i~~onto the existing ~~Bella Vista Ranch~~CDD ~~district~~ the areas identified as Wetlands and Flood Storage Basin in the Land Use Plan (**Figure 7**). ~~or a separate district shall be organized and legally instituted prior to or concurrent with the first subdivision Final Map or building permit in Phase IIA or IIB proposing drainage or flood control improvements.~~ It is intended that the project will be incorporated into the existing ~~Phase I BVRDD~~ CDD via an annexation and/or supplemental declaration process.

The ~~BVRDD~~ CDD shall be required to remove all vegetation from detention basins, flood storage areas, and low flow channels every two (2) years or as allowed by the Corps of Engineers permit. If the ~~BVRDD~~ CDD fails to perform this periodic maintenance, then the City has the right to enter the property and perform said maintenance. If the City removes the vegetation from detention basins and low flow channels, then the City is entitled to receive reimbursement for these services from the ~~BDRDD~~CDD.

III. DESIGN STANDARDS

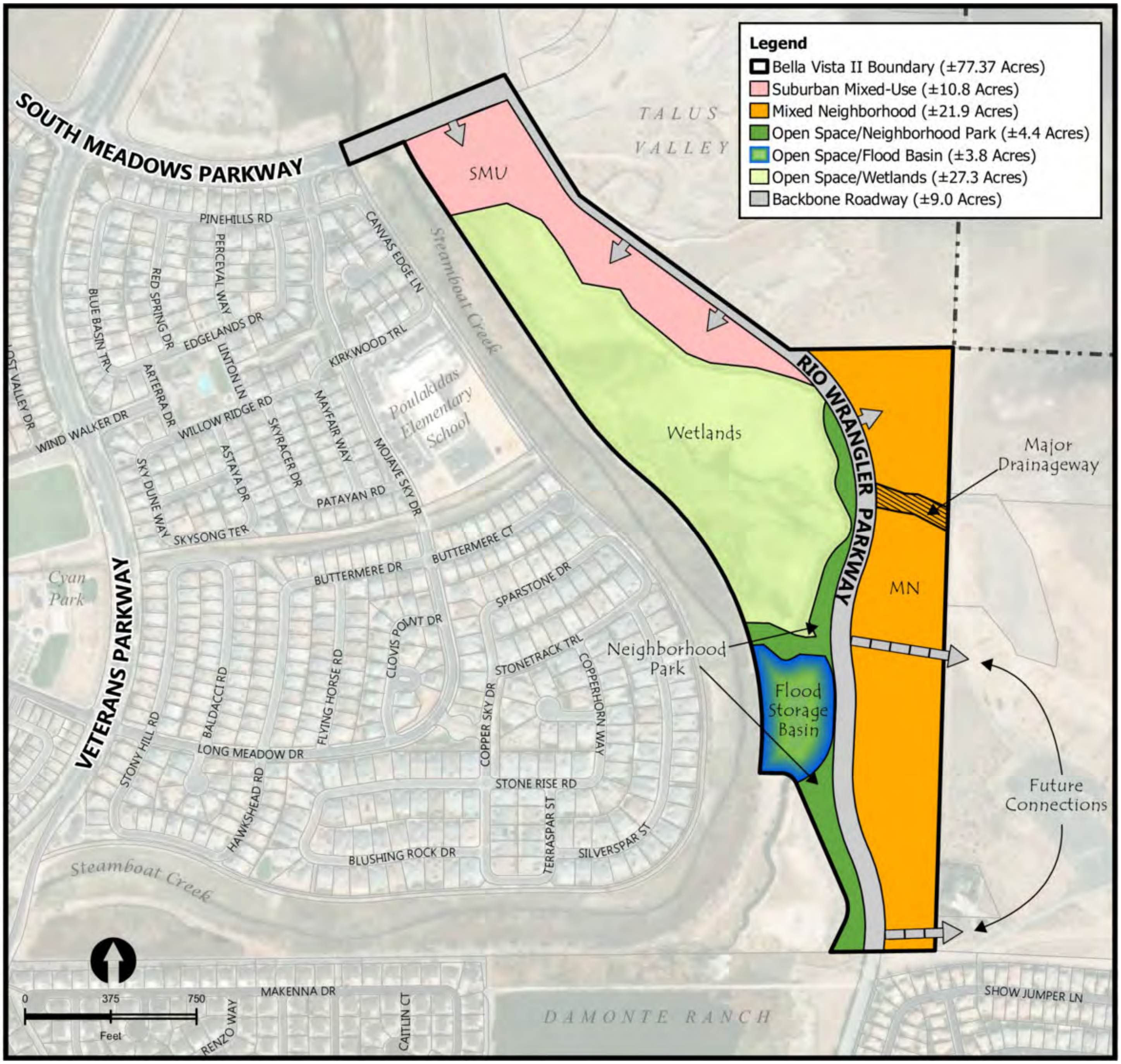


FIGURE 7
Land Use

A. Land Use Descriptions

Allowed uses include detached and attached single family residential, multi-family residential, lower intensity non-residential, parks, greenways/wetlands, and open space. The maximum density, total number of dwelling units and the maximum non-residential square footage for each village is shown on Table 1. The maximum number of dwelling units within the project shall not exceed 609 units (residential) and the non-residential square footage shall not exceed ±117,612 square feet (non-residential).

The Development Plan and Development Standards contained herein are intended to depict the general development vision for the PUD. Sufficient flexibility shall be allowed to permit detailed planning and design at the time of actual development. The acreage of each land use category may be increased by up to 10% if it is demonstrated that additional acreages are necessary due to constraints and/or design considerations to accommodate the project, to the satisfaction of the Administrator. This provision shall not exceed a cumulative total of 10% for each land use category. Changes in excess of 10% shall require an amendment to the Development Standards Handbook. Residential densities and residential dwelling unit allocation may be interchangeable between villages and will be defined fully with the tentative map for any given residential village.

TABLE 1
LAND USE BREAKDOWN

Village/Area[4]	Bella Vista II Land Use[5]	Size (Acres)	Min. Net Residential Density[3]	Max. Gross Residential Density[4]	Approx. Dwelling Units[1]	Min. Non-Residential Area	Max. Non-Res. Intensity (sq. ft.)[2]
SMU	SMU	±10.8	15 du/ac	30 du/ac	324	5 Acres	117,612
MN	MN	±22.0	6 du/ac	30 du/ac	285	N/A	N/A
Neighborhood Park	PGOS	±4.4	-	-	-	-	-
Flood Storage Basin	PGOS	±3.8	-	-	-	-	-
WM-I	PGOS	±27.4	-	-	-	-	-
South Meadows Pkwy/ Rio Wrangler Pkwy	*ROW*	±9.0	-	-	-	-	-
Total		**±77.4**			**609[1]**		**117,612[2]**

Notes:

1. The total amount of residential dwelling units by Village may vary but shall not exceed 609 units throughout the Bella Vista II PUD.
2. The total amount of non-residential may vary as long as the total floor area from non-residential development does not exceed 117,612 square feet throughout the SMU Land Use and a min of 5-acres is provided.
3. Minimum Net Density is calculated by dividing the total number of lots by the total acreage of lot area.
4. Max Gross Density is calculated by dividing the total number of lots by the total Village acreage.
5. All primary and accessory uses listed as permitted on **Table 2**, can be established by right, subject to compliance with the standards contained in this PUD. With the exception of tentative maps required to sell individual lots, no further discretionary review is required for each permitted unless otherwise stated in Table 2 below.

Suburban Mixed-Use

The Suburban Mixed-Use (SMU) land use category allows a mix of retail, commercial, employment, and high-density residential uses that are more appropriate near the two main arterials (South Meadows Parkway & Rio Wrangler Parkway). The mix of uses will serve the existing surrounding developments and the future developments and provide the area with additional residential opportunities. Trails within the SMU area will connect to the existing trail network to provide additional transportation opportunities.

Characteristics specific to the SMU area include:

- Buildings oriented along the main arterials.
- Bike and pedestrian connectivity is required throughout the site and connect to existing adjacent facilities.
- Signage will be limited to monument style only along Rio Wrangler Parkway.
- Design standards are outlined in Section D and E.

Mixed Neighborhood

The Mixed Neighborhood (MN) land use category includes a mix of housing types and can range from higher density housing including; multi-family, alley loaded town homes and condos, to lower density housing types including, triplex and duplex attached housing, zero lot single-family, and traditional single-family detached housing. These standards will allow for range of multi-generational housing, innovative designs, and community amenities that will provide a transition between commercial and lower intensity uses.

Characteristics specific to the MN area include:

- Provide a range of housing types
- Within walking distance to amenities such as retail, commercial centers, parks, and schools and connected with by trails and other bike and pedestrian facilities.
- Design Standards are outlined in Section D.

Parks, Greenways, and Open Space

The Parks, Greenways, and Open Space will protect the natural wetlands identified in WM-1 that connect with the floodways and Flood Storage Basin developed in the original Bella Vista PUD and take advantage of the close proximity to the Steamboat Creek. A ±4.4 acre Neighborhood Park will allow active and passive recreation and help to provide a transition with the natural elements of the property, with the development located in Villages 1 and 2. An extensive network of trails and bike and pedestrian paths will connect throughout the PGOS area and provide recreation opportunities to the surrounding and future developments.

B. Permitted Uses

TABLE 2 BELLA VISTA II PERMITTED USES			
P = Permitted by Right *SPR = Site Plan Review Required* *CUP = Conditional Use Permit Required* *A = Permitted as Accessory Use*			
Use Category/Specific Use Type	**BVII Land Use**		
	SMU	**MN**	**PGOS**
Residential			
Dwelling, Single-Family Detached		P	
Dwelling, Duplex	P	P	
Dwelling, Triplex	P	P	
Dwelling, Fourplex	P	P	
Dwelling, Single-Family Attached	P	P	
Dwelling, Multi-Family	P	P	
Dwelling, Live/Work	P	P	
Manufactured Home	P	P	
Assisted Living Facility	P		
Group Home	P	P	
Commercial Sales and Services			
Animal Clinic, Hospital, or Training Facility (No Shelters, Commercial Boarding/Kennels)	P		
Bakery, Retail	P		
Bar, Lounge, or Tavern	CUP		
Carwash	P		
Child Care Center	P		
Cleaners, Commercial	P		
Convenience Store	P		
Financial Institution	P		
Automated Teller Machine, Freestanding	P		
Gas Station	CUP		
General Retail, less than 10,000 Square Feet	P		
Laboratory	CUP		
Medical Facility, Day Use Only	P		
Microbrewery, Distillery, or Winery	P		
Office, General	P		
Personal Service, General	P		
Plant Nursery or Garden Supply	P		
Restaurant	P		
Restaurant with Alcohol Service	P		
Recreation, Entertainment, and Amusement			
Amusement or Recreation, Inside	P		
Public Park or Recreation Area	P	P	P
Lodging			
Hotel	P		
Institutional, Public, and Community Service			
Communication Facility, Equipment Only	P	P	
Library, Art Gallery, or Museum	P		
Public Transit or School Bus Shelter	P	P	P
Religious Assembly	P	CUP	
School, Primary or Secondary (Public or Private)	SPR	SPR	
School, Vocational or Trade	SPR		
Utilities, Major	CUP	CUP	
Utilities, Minor	P	P	P

TABLE 2 BELLA VISTA II PERMITTED USES			
P = Permitted by Right *SPR = Site Plan Review Required* *CUP = Conditional Use Permit Required* *A = Permitted as Accessory Use*			
Use Category/Specific Use Type	**BVII Land Use**		
	SMU	**MN**	**PGOS**
Industrial, Manufacturing, Wholesale, Distribution and Transportation			
Custom and Craft Manufacturing	P		
Food Processing/Wholesale Bakery	P		
Mini-Warehouse	CUP		
Accessory Uses			
Accessory Dwelling Unit (ADU)		A - SPR	
Caretaker Quarters	A		
Child Care, In Home (1-6 Children)		A	
Child Care, In Home (7-12 Children)		A-SPR	
Community Center, Private	A	A	
Drive Through Facility (Food & Non-Food Service)	A		
Gaming Operation, Restricted	A		
Home Occupation	A	A	
Sidewalk Cafes	A		

Notes and Additional Use Requirements**:**

- Primary Uses not listed in Table 2 are not allowed, unless approved by the Master Developer and the City of Reno Zoning Administrator.
- Allowed Temporary Uses are as defined in RMC Section 18.08.201 Table 3-1, as amended, under the NC zoning districts for SMU, and Residential for the MN land use, and PGOS in the RMC.
- A CUP is required for uses that open before 6am or stay open past 11pm.
- A CUP is required for uses that require deliveries before 6am or past 11pm.

C. Residential Design Standards

Lot and parcel standards for all permitted residential uses are outlined in **Table 3** and are specific to the land use established in **Figure 7.** The land use establishes the base design standards for each village within this PUD. These standards shall apply to all residential development applications and building permit requests, except parcel maps establishing roadways. Each development application or building permit request shall comply with the design standards for residential in the SMU or MN land use categories. These standards determine the bulk, density, intensity, site and building design standards within the PUD.

Residential uses such as single-family attached/detached, condos, and multi-family dwelling units, and any accessory structures shall be sited on lots/parcels to conform to the minimum lot and parcel standards as outlined in **Table 3**. Standards not addressed on **Table 3** shall be consistent with the NC-Neighborhood Commercial zoning district for SMU (RMC 18.02.310, as amended) and the MF-30 Multi-Family Residential zoning district for MN (RMC 1802.210, as amended).

TABLE 3

RESIDENTIAL-LOT/PARCEL STANDARDS		
Density/Intensity Standards (a)	**SMU**	**MN**
Dwelling Units per Acre Max.(du/ac)	30	30
Landscape Area (Multi-Family/Attached/Condos) **(b)**	20%	20%
Max. Building Height (feet)	35	35
Minimum Yard & Setbacks (feet)		
Front Yards **(b)(c)**	10	10
Garage Setback (face of garage)	3 or 20	3 or 20
Side Yards	0 or 5	0 or 5
Rear Yards	10	10
Building Separation	20 (10 if less than 50 units)	
Accessory Structures (d)		
Driveways (feet long)	20	20
Min. usable open space (sf/unit)	100	100

Notes and Additional Requirements:

a. Setbacks for Suburban Mixed-Use and Mixed Neighborhood may be modified with a tentative map or a minor/major deviation to address unique housing products.
b. Single-family detached products will require the entire font yard to be landscaped. Front yard setbacks for residential projects shall apply to the front face of the house or garage. All garages shall be served by driveways not less than 3 or 20 feet in length. Side loaded garages may meet the same front yard setbacks as the house. Builders may provide for variations (but no less than the minimum setbacks) in front yard setbacks and/or building articulation to create an interesting streetscape.
c. Minimum front yard setback shall be 20 feet adjacent to arterial or collector streets.
d. Accessory building setbacks shall conform to Reno Municipal Code Title 18.08.203 Table 18.08.9B Bulk, Dimensional, Density and Intensity Standards for accessory structures and uses, as amended and based upon the land use for the project as described in the first paragraph of section III C of this PUD.

Residential Architectural Elements

Exterior Elements

Exterior materials shall include a combination of patterns and textures to provide a range of products with similar styles and architectural accents. Sample material boards shall be reviewed and approved by the BVROA. Siding materials shall be continued down to within 8 inches of finished grade on all elevations to eliminate large areas of exposed foundation. Building materials shall be compatible in scale with the design of the residences. Materials must also be compatible throughout each village.

Exterior Colors

All exterior color schemes as shown on sample color boards, shall be reviewed and approved by the BVROA. Exterior colors shall be in harmony with the natural setting. Color intensity shall be kept low for large surfaces.

Facades and Articulation

Architectural features such as: varying window sizes and shapes, shutters, broken planes and pitched roofs, covered entries and porches, porch rails, columns and trim detailing help to define the fronts of the homes and garages; and shall be incorporated into the design of the residences.

Large blank walls, roofs, non-articulated garage doors, are not permitted. Side entry garages are permitted.

Building materials and architectural features, compatible with the front of the houses shall be provided on all sides of the homes. Rear and side elevations adjacent to common open space areas shall be finished in a similar manner as the front elevations, subject to review and approval by the BVROA.

Roofs

Roof colors shall be consistent with the color scheme of the buildings. Varying pitched roofs are encouraged. A variety of pitched roofs may be provided. The BVROA shall review and approve the color palette of roofing within each village.

Roof materials shall be applied to comply with snow load and high wind standards. Materials may include:

1) Concrete or clay tile (flat or barrel),
2) Non-reflective architectural metal,
3) 40-year architectural grade composition shingles,
4) 40-year fiberglass composition shingles

Roof materials, however, must be consistent throughout each village.

House Plans

Each village shall have a minimum of four distinct house plans. House design shall vary throughout each village with no one elevation repeated for abutting homes, or mirrored across the street. Adjacent lots may share the same floor plan, but must have different elevations.

Exterior Lighting

Lighting shall be integrated with the architectural design of the individual residences. Lights shall be shielded to prevent light spillage onto adjacent properties or streets.

Flood lights are not permitted. Motion detector actuators are permitted with designer fixtures only and subject to approval by the BVROA.

Miscellaneous Design Elements

Awnings, Trellises, Patio Covers, Decks and Other Accessory or Ancillary Structures

Awnings, trellises, patio covers, second story decks and other accessory or ancillary structures including granny flats and casitas, provided by builders, shall be consistent in material, color and architectural character as the main structure and must be reviewed and approved by the BVROA. Protrusions into the setback will be allowed in accordance with RMC, as amended

Chimneys

Exterior materials of chimneys shall be compatible with the exterior materials and colors used on the house.

D. Non-Residential Design Standards

Lot and parcel standards for all permitted non-residential uses are outlined in **Table 4** and are specific to the land use established in **Figure 7.** The land use establishes the base design standards for each village within this PUD. These standards shall apply to all nonresidential development applications and building permit requests, except parcel maps establishing roadways. Each development application or building permit request shall comply with the design standards for nonresidential in the SMU or PGOS land use categories. These standards determine the bulk, density, intensity, site and building design standards within the PUD.

Non-residential structures and any accessory structures shall be sited to conform to the minimum lot and parcel standards as outlined in **Table 4** below or can be modified with a tentative map or a minor or major deviation to address unique products.

TABLE 4

NON-RESIDENTIAL – LOT DEVELOPMENT STANDARDS		
Density/Intensity Standards	**SMU**	**PGOS**
Floor Area Ratio (FAR) Max.	None	N/A
Landscape Area	20%	20%
Building Height (feet)	35	35
Lot Size		
Minimum Lot Width (feet)	None	
Minimum Lot Size	None	
Yard & Setback Dimension		
Front Yards (feet) **(c)**	10	20
Side Yards (feet)	0 or 10	0 or 10
Rear Yards (feet)	10	15
Building Separation (feet)	20	20
Setbacks from Adjacent Residential Uses		
All Yards (feet)	20 or height of building, whichever is greater	

Notes:

- All architectural design standards per Reno Municipal Code 18.08.301 (a) (10), and 18.12.305(b) as amended.
- Front yard setbacks adjacent to Rio Wrangler Parkway shall be 25 feet.

~~A.~~E. Street Design Standards

Streets within this PUD include arterials, collectors, and local streets~~. Arterial and collector streets are identified on~~ as identified in ~~-~~**Figure** 5, Major Roadways~~-7, page 12~~. ~~-Local streets are defined as streets within individual villages and are not depicted on the Circulation Figure.~~The Master Developer will be responsible for construction of the arterial and collector streets and associated improvements. Arterial/collector streets shall be improved with paving, curb, gutter, sidewalk, fencing and landscaping in accordance with **Figures 8A, 8B, 9A, 9B, 10A,** and **10B**. Local streets and associated improvements will be constructed by the developer. Local streets are defined as public or private streets within individual villages and will be identified during the tentative map or building permit process. Local Streets are not depicted in **Figure 5.**

Intersection Spacing

The on-site residential collector streets and local streets intersecting South Meadows Parkway and Rio Wrangler Parkway shall meet Regional Transportation Commission (RTC) spacing requirements for moderate access control arterials. An updated traffic letter supporting the Traffic Report shall be required to be submitted with each tentative map or building permit to determine intersection design. The intersection locations depicted in **Figure 5** are subject to change and will be finalized during the tentative map process.

Arterial Streets (South Meadows Parkway)

South Meadows Parkway extension will include the extension of South Meadows Parkway from the existing terminus in Bella Vista. This will include a culvert crossing over Steamboat Creek and eventually connect to Rio Wrangler Parkway. There are two cross sections proposed which will be designed to arterial street standards as outlined in **Figure 8A & 8B**.

Since this street is planned for in the adjacent property (Talus Valley), the Bella Vista II Master Developer shall only be responsible for half street improvements. Once complete, South Meadows Parkway shall be improved with paving, curb, gutter, sidewalk, fencing/sound walls (where applicable), and landscaping. The Master Developer South Meadows Parkway will construct two travel lanes, a bike lane, and a 10-foot wide shared use path for the South Meadows Parkway Steamboat Creek Crossing (**Figure 8B**), and the remaining portion of South Meadows Parkway will include the center 14 ft. landscaped median, south 2 lanes, and south 21-feet of landscape with a 10-foot wide shared use path (**Figure 8A**). The north half of

South Meadows Parkway will be constructed by others (Talus Valley).

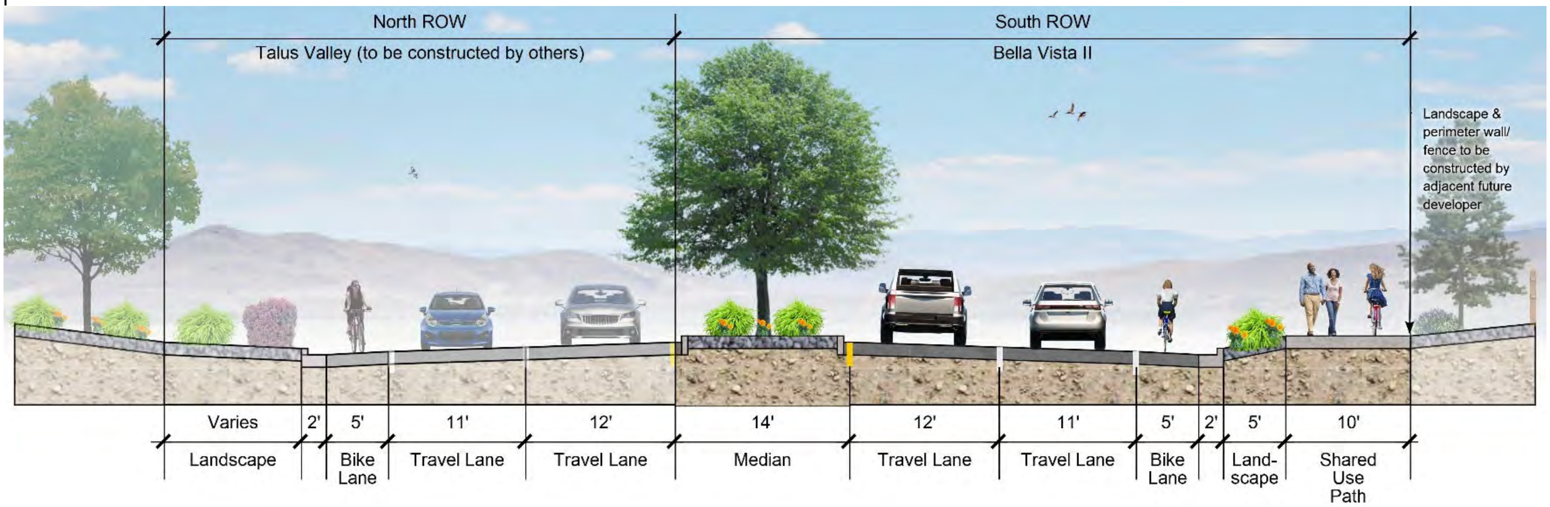


Figure 8A
South Meadows Parkway

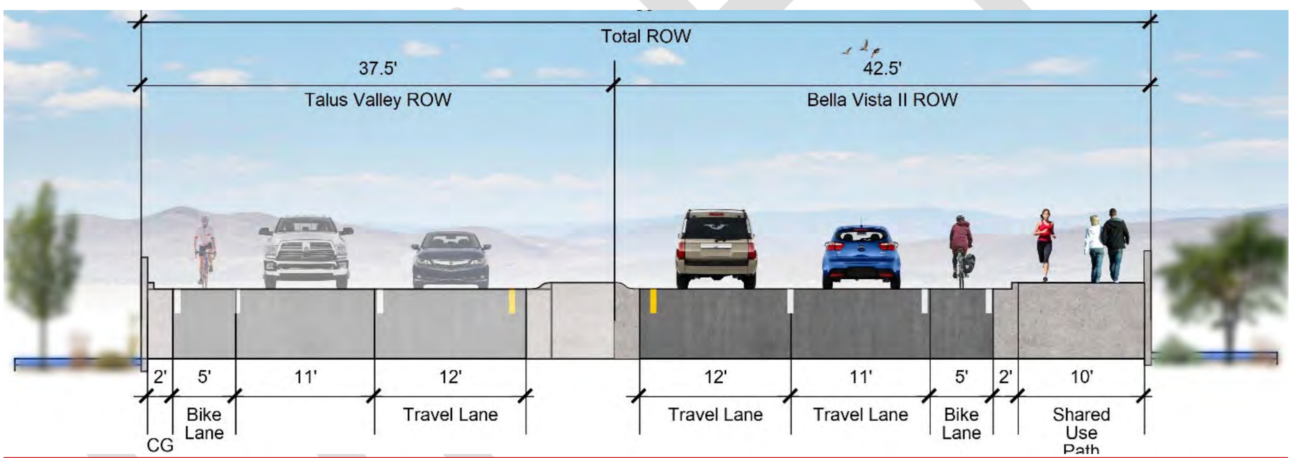


Figure 8B
South Meadows Parkway – Steamboat Creek Crossing

Arterial Street Parking and/or Direct Residential Access
On street parking and/or direct residential driveway access is not permitted on arterial streets.

Arterial Intersection Entry Treatment
Intersections of arterial with designated major or village entrances are encouraged to incorporate signage and enhanced landscape.

Arterial Street Fencing/Walls
Required fencing/wall design and materials shall be in accordance with ***Figure 12***. Required fencing design and materials, including alternative fencing design shall be in accordance with **Figure 11**.

Solid fencing, six (6) feet in height shall be consistent throughout the project in accordance with **Figure 11**. When changes in elevations occur, fences shall be stepped in equal intervals, rather than sloped. Fencing along arterial/collector streets shall include pilasters, spaced at least every 80 feet. Fencing along Arterials Streets adjacent to a non-residential use are not required.

Arterial Street Signs

All street signs, traffic signs and directional signs that control vehicular traffic along arterial streets shall be standard city signs with standard posts.

Arterial Street Utility Standards
Above ground utility appurtenances shall be screened from public view from all streets. Screening shall be accomplished with the use of berms, walls, fences, blending colors and/or vegetation. If fences or walls are used, materials shall be consistent with arterial and collector walls or fencing and rock veneer walls.

Utility buildings and structures shall be designed to fit into the architectural character of the adjacent residential or non-residential community. Where feasible, utility appurtenances and buildings shall be located in planter areas and not in turf areas.

Arterial Street Horizontal, Vertical and Pavement Section Design
Design of arterial roadways shall be per the City of Reno Public Works Design Manual. The exception is intersection spacing, which shall be provided in accordance with RTC standards.

South Meadows Parkway Crossing of Steamboat Creek
The South Meadows Parkway crossing of the Steamboat Creek design details shall include exterior treatments and railings as approved by the Army Corps of Engineers through their individual permit and to the satisfaction of city staff. Design details for this crossing shall be submitted with improvement plans for the construction of the south half of South Meadows Parkway. This section maybe completed by the Master Developer or by others (Talus Valley).

Arterial Street Landscape/Streetscape
Landscape will be designed in accordance with Reno Municipal Code Sections 18.04.801 through 18.04.809, as amended.

Collector Streets (Rio Wrangler Parkway)
Rio Wrangler Parkway will be constructed to collector street standards as outlined in **Figure 9A and 9B**. Rio Wrangler Parkway will run north to south from the future extension of South Meadows Parkway to the current termination of Rio Wrangler Parkway in Damonte Ranch.

Rio Wrangler is proposed to be completed in two phases. Phase A will include the northwest ±1,300 foot section of Rio Wrangler Parkway and will be constructed with only half street improvements within the Bella Vista II PUD, (**Figure 9A**). This will include half of the center landscaped median, the west lane (southbound), west bike-lane, and the west 20 feet of landscape, sidewalk and fence improvements, (all landscaping, retaining and walls/fence shall be maintained by the project HOA). The eastern portion of half street improvements will be completed by others (Talus Valley).

The southern ±2,700 feet of Rio Wrangler Parkway will include full street improvements as identified in **Figure 9B.**

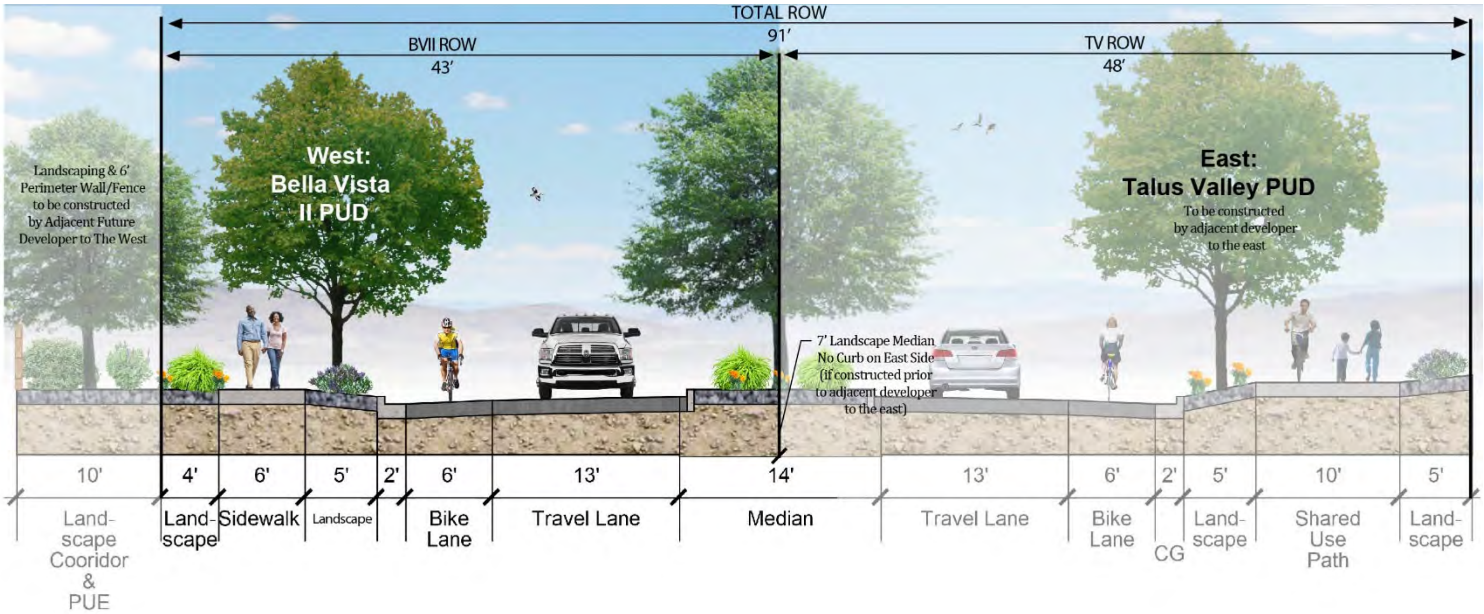


Figure 9A
Collector Street Section- Rio Wrangler Parkway (Phase A)

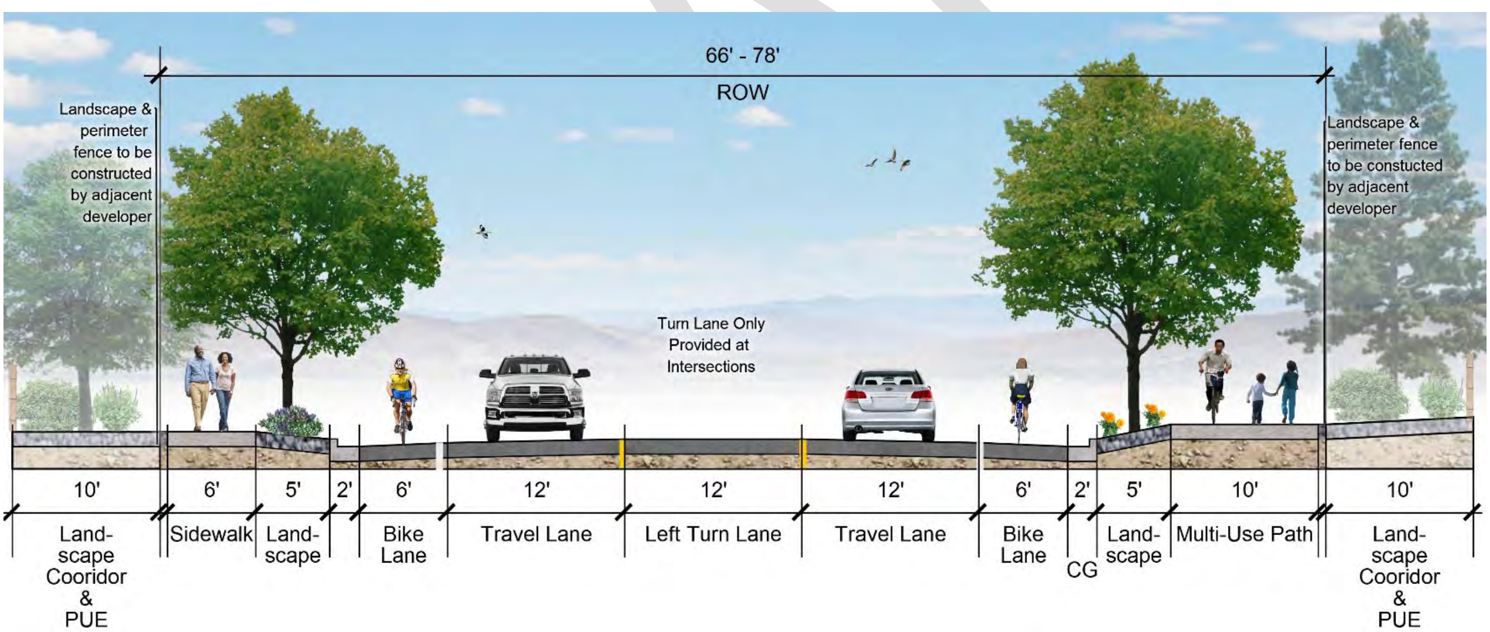


FIGURE 9B
Collector Street Section – Rio Wrangler Parkway (Phase B)

~~**1. Arterial Streets** – South Meadows Parkway and northern ±1,300 feet of Rio Wrangler~~

~~The Developer will be responsible for construction of arterial streets and associated improvements, as specified in Infrastructure Phasing Section II F, beginning on page 15 and illustrated in ***Figure 9,*** page 17.~~

~~a. Street Improvements~~

~~Arterial streets shall be improved with paving, curb, gutter, sidewalk, sound walls and landscaping in accordance with ***Figures 10*A & 10B** and ***Figure 11,*** page 22. The Phase IIB section of South Meadows Parkway will be constructed with only the center 14 ft. landscaped median, south 2 lanes and south 31' of landscape,~~

~~Figure 10A~~
~~Arterial Street Section – South Meadows Parkway~~

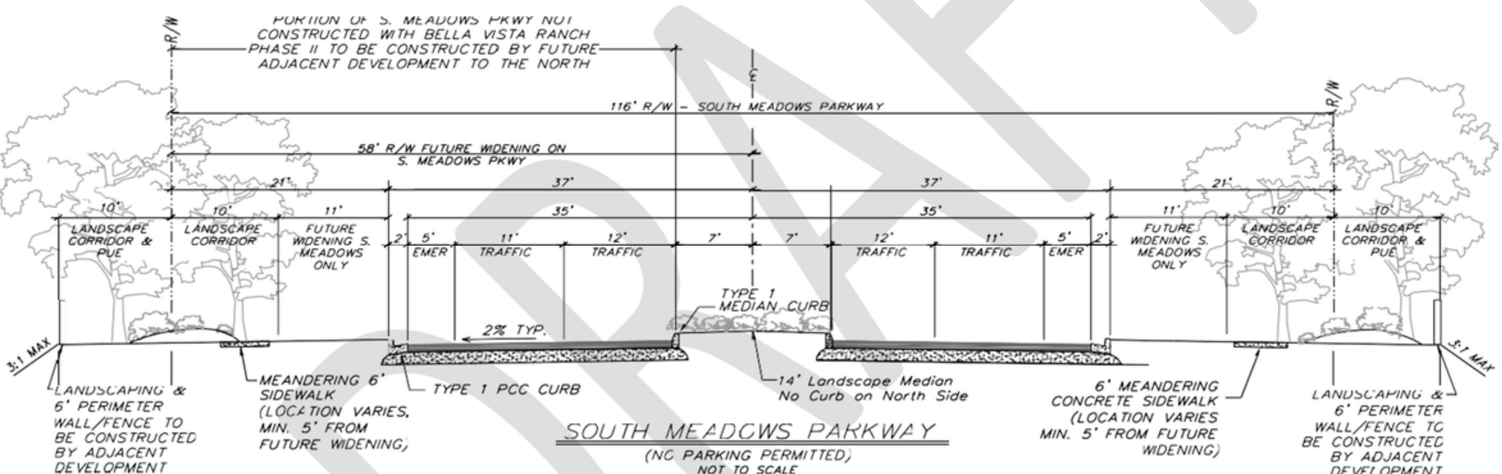
~~sidewalk and sound wall improvements. The Phase IIB section of Rio Wrangler will be constructed with only the center 10 ft. landscaped median, west lane and west 20' of landscape, sidewalk and fence improvements. (All landscaping, retaining and sound walls shall be maintained by the project HOA.)~~

~~b. Parking and/or Direct Residential Access~~

~~On street parking and/or direct residential driveway access is not permitted on arterial streets.~~

~~c. Sound Walls~~

~~Required sound wall design and materials shall be in accordance with ***Figure 12***, page 24. Required fencing~~



~~design and materials, including alternative fencing design shall be in accordance with **Figure 16**, page 29.~~~~Intersection Entry Treatment~~

~~Intersections of arterials with designated village entrances, ***(Figure 19,*** page 33) shall be accented with natural rock veneer walls at all corners, ground cover, perennials, and evergreen trees per ***Figure 22,*** page 36.~~

~~Street Signs~~

~~All street signs, traffic signs and directional signs that control vehicular traffic along arterial streets shall be standard City signs with standard posts~~

~~Utility Standards~~

~~Above ground utility appurtenances shall be screened from public view from all streets. Screening shall be accomplished with the use of berms, walls, fences, blending colors and/or vegetation. If fences or walls are used, materials shall be consistent with arterial and collector walls or fencing and rock veneer walls.~~

~~Utility buildings and structures shall be designed to fit into the architectural character of the adjacent residential or non-residential community. Where feasible, utility appurtenances and buildings shall be located in planter areas and not in turf areas.~~

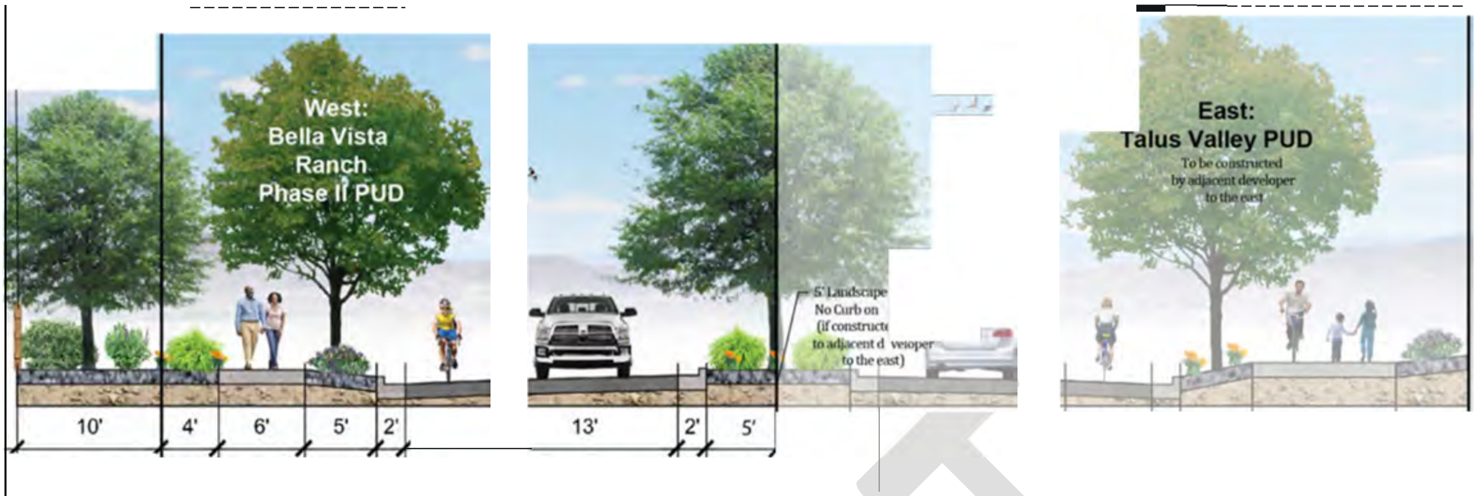
~~Horizontal, Vertical and Pavement Section Design~~

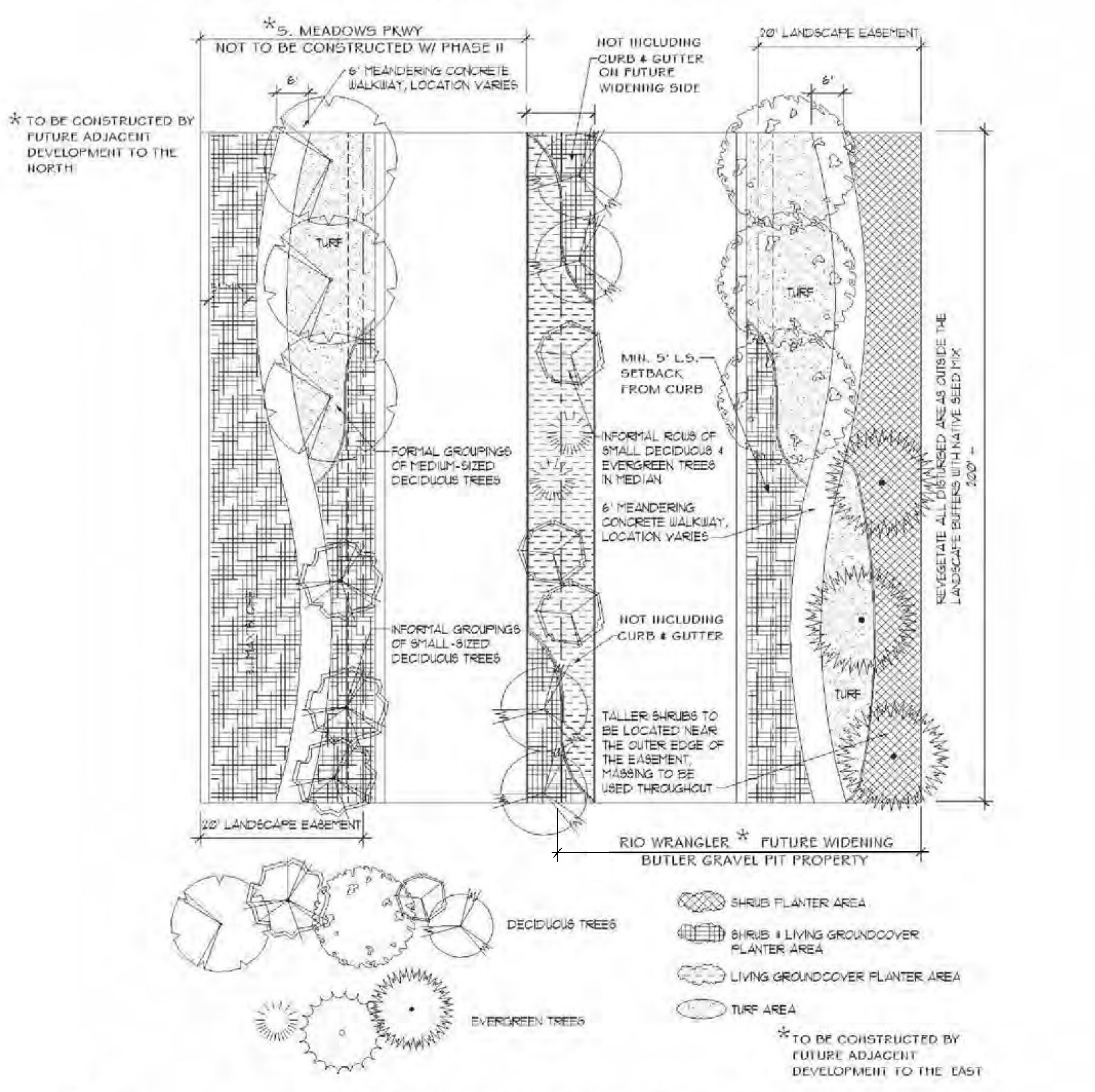
~~Design of arterial roadways shall be per the City of Reno Public Works Design Manual. The exception is intersection spacing, which shall be provided in accordance with RTC standards. (refer to Section 11, B, page 11)~~

~~South Meadows Parkway Crossing of Steamboat Creek~~

~~The South Meadows Parkway crossing of the Steamboat Creek shall be constructed with the same~~

~~bridge/structure design used for Veterans Parkway crossing of Steamboat Creek in the Bella Vista Ranch PUD to the west. Design details shall include exterior treatments and railings as approved by the Army Corps of Engineers through their individual permit and to the satisfaction of city staff. Design details for this crossing shall be submitted with improvement plans for the construction of the south half of South Meadows Parkway.~~


West:
Bella Vista
Ranch
Phase II PUD
5' Landscape
No Curb on
(if constructe
to adjacent d veloper
to the east)
East:
Talus Valley PUD
To be constructed
by adjacent developer
to the east
10'
4'
6'
5'
2'
13'
2'
5'



*S. MEADOWS PKWY
NOT TO BE CONSTRUCTED W/ PHASE II
6' MEANDERING CONCRETE WALKWAY, LOCATION VARIES
6'
* TO BE CONSTRUCTED BY FUTURE ADJACENT DEVELOPMENT TO THE NORTH
NOT INCLUDING CURB & GUTTER ON FUTURE WIDENING SIDE
20' LANDSCAPE EASEMENT
TURF
MIN. 5' L.S. SETBACK FROM CURB
FORMAL GROUPINGS OF MEDIUM-SIZED DECIDUOUS TREES
INFORMAL ROWS OF SMALL DECIDUOUS & EVERGREEN TREES IN MEDIAN
6' MEANDERING CONCRETE WALKWAY, LOCATION VARIES
REVEGETATE ALL DISTURBED AREAS OUTSIDE THE LANDSCAPE BUFFERS WITH NATIVE SEED MIX
200' ±
INFORMAL GROUPINGS OF SMALL-SIZED DECIDUOUS TREES
NOT INCLUDING CURB & GUTTER
TALLER SHRUBS TO BE LOCATED NEAR THE OUTER EDGE OF THE EASEMENT, MASSING TO BE USED THROUGHOUT
20' LANDSCAPE EASEMENT
RIO WRANGLER * FUTURE WIDENING
BUTLER GRAVEL PIT PROPERTY
DECIDUOUS TREES
EVERGREEN TREES
SHRUB PLANTER AREA
SHRUB & LIVING GROUNDCOVER PLANTER AREA
LIVING GROUNDCOVER PLANTER AREA
TURF AREA
*TO BE CONSTRUCTED BY FUTURE ADJACENT DEVELOPMENT TO THE EAST

~~91'ROW~~

Landscaping&6'

~~PerimeterWall/Fence~~

Phase 11B

~~to be constructed~~ ~~4 3~~ ~~4 8~~

~~by Adjacent Future Developer to The West~~

~~Median~~

~~EastS de e~~

~~6'~~ ~~S'~~ ~~2'~~ ~~13'~~ ~~6'~~ ~~2'~~ ~~5'~~ ~~10'~~ ~~5'~~

~~Landscape Corridor & PUE~~

~~land- Landscape scape~~

~~Meandering Bike Lane~~

~~Sidewalk (Location Varies, Min.S' From Back of Curb)~~

~~Travel Lane~~

~~CG~~

~~Landscape Median CG~~

~~Travel Lane~~

~~Bike Lane~~

~~Land- CG scape~~

~~Shared Use Path~~

~~Land- scape~~

~~Figure 10B~~

~~Arterial Street Section - Rio Wrangler Parkway~~

~~d. Intersection Entry Treatment~~

~~Intersections of arterials with designated village entrances, ***(Figure 19,*** page 33) shall be accented with natural rock veneer walls at all corners, ground cover, perennials, and evergreen trees per ***Figure 22,*** page 36.~~

~~e. Street Signs~~

~~All street signs, traffic signs and directional signs that control vehicular traffic along arterial streets shall be standard City signs with standard posts~~

~~f. Utility Standards~~

~~Above ground utility appurtenances shall be screened from public view from all streets. Screening shall be accomplished with the use of berms, walls, fences, blending colors and/or vegetation. If fences or walls are used, materials shall be consistent with arterial and collector walls or fencing and rock veneer walls.~~

~~Utility buildings and structures shall be designed to fit into the architectural character of the adjacent residential or non-residential community. Where feasible, utility appurtenances and buildings shall be located in planter areas and not in turf areas.~~

~~g. Horizontal, Vertical and Pavement Section Design~~

~~Design of arterial roadways shall be per the City of Reno Public Works Design Manual. The exception is intersection spacing, which shall be provided in accordance with RTC standards. (refer to Section 11, B, page 11)~~

~~h. South Meadows Parkway Crossing of Steamboat Creek~~

~~The South Meadows Parkway crossing of the Steamboat Creek shall be constructed with the same bridge/structure design used for Veterans Parkway crossing of Steamboat Creek in the Bella Vista Ranch PUD to the west. Design details shall include exterior treatments and railings as approved by the Army Corps of Engineers through their individual permit and to the satisfaction of city staff. Design details for this crossing shall be submitted with improvement plans for the construction of the south half of South Meadows Parkway.~~

~~10′~~

~~March 2022~~

~~TABLE 2~~

~~South Meadows Parkway / N. ±1300 ft of Rio Wrangler (± 4000 S.F. TOTAL~~
~~LANDSCAPE AREA PER 200 L.F.)*~~

~~**Plant Materials**~~	~~**Quantity**~~	~~**Plant Size**~~	~~**Min. Tree Size**~~	~~**O.C.****~~
~~Trees~~	~~**14**~~			
	~~7 Deciduous~~		~~2.5" Deciduous~~	
	~~4 Evergreen~~		~~6' Evergreen~~	
	~~3 Evergreen~~		~~10' Evergreen~~	
~~Shrubs~~	~~**40**~~	~~40 @ 5 gal~~		~~8'~~
	~~50% = 2000 s.f.~~			
~~Living Groundcover~~	~~**20**~~	~~10 @ 5 gal~~		~~8'~~
	~~25% = 1000 s.f.~~	~~10 @ 1 gal~~		~~6'~~
~~Turf~~	~~25% = 1000 s.f.~~			

~~* **NOTE:** Tree and plant quantities and spacing apply to each side of the street.~~

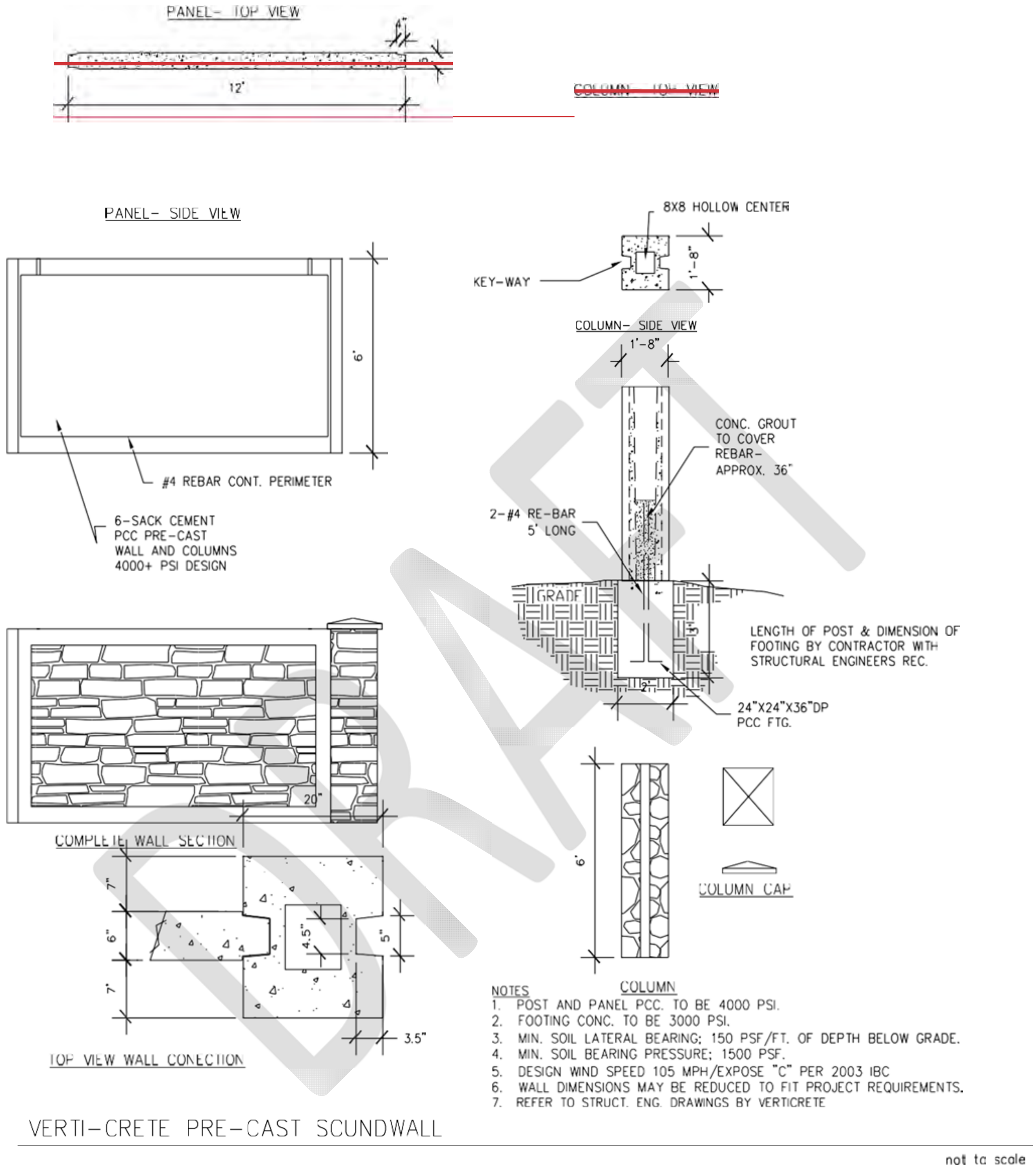
~~TABLE 3~~

~~South Meadows Parkway / N. ±1300 ft of Rio Wrangler~~
~~Median (included in half street improvements constructed with this PUD)~~
~~(± 2,800 S.F. TOTAL LANDSCAPE AREA PER 200 L.F.)~~

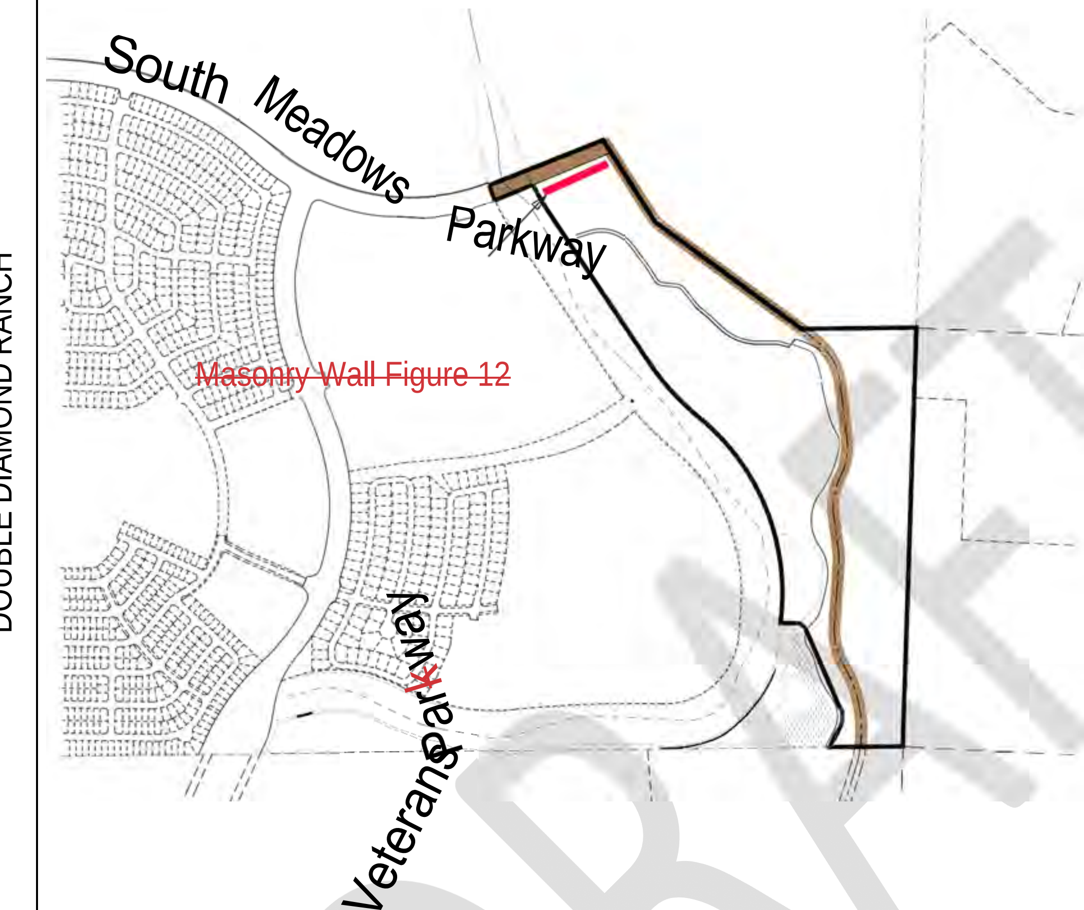
~~**Plant Materials**~~	~~**Quantity**~~	~~**Plant Size**~~	~~**Min. Tree Size**~~	~~**O.C.****~~
~~Trees~~	~~**9**~~			
	~~6 Deciduous~~		~~2.5 Deciduous~~	
	~~2 Evergreen~~		~~6' Evergreen~~	
	~~1 Evergreen~~		~~10" Evergreen~~	
~~Shrub~~	~~**20**~~	~~10 @ 5 gal~~		~~8'~~
	~~50% = 1,400 s.f.~~	~~10 @ 1 gal~~		~~6'~~
~~Living Groundcover~~	~~**40**~~	~~40 @ 1 gal~~		~~6'~~
	~~50% = 1,400 s.f.~~			

~~*NOTE: Tree and plant quantities and spacing apply to each side of the street.~~

~~**On center planting of shrubs and living ground covers is dependent on mature size of plant materials so that plants grow together and cover the ground area. These numbers represent an average and will be adjusted dependent on the species determined by Landscape Architect and Administrator~~



~~FIGURE 12~~
~~Masonry Sound Wall with Pilaster~~ *~~(Refer to **Figure 13**, page 25 for locations)~~*



~~DAMONTE RANCH~~

~~FIGURE 13~~
~~Masonry Sound Wall Locations~~

~~**Arterial/Collector Streets** – Rio Wrangler Parkway – Southern two (2) lane section (south ±1300 ft. to south property line)~~

~~The Developer will be responsible for construction of arterial/collector streets and associated improvements, as specified in Section II F, page 15 and illustrated in ***Figure 9,*** page 17.~~

~~i. Street Improvements~~

~~Arterial/collector streets shall be improved with paving, curb, gutter, sidewalk, fencing and landscaping in accordance with ***Figure 14***, page 26 and ***Figure 15***, page 27.~~

Collector Street Parking and/or Direct Residential Access

On street parking and /or direct residential parking access is not permitted on arterial streets.

Collector Street Sidewalk/Trail Connections

Sidewalks/Trails along collectors for all projects shall be connected to sidewalks within residential and non-residential villages and arterial streets, collector streets and sidewalk trails within access easements to open space paths, as appropriate.

~~Arterial/~~Collector Street Fence or Equivalent

C~~Arterial/c~~ollector street fence design and materials shall be in accordance with **Figure 11**~~6, page 29~~. As an alternative, a 4-foot~~'~~ or higher change in elevation from the roadway to adjacent lots, combined with a 4-foot~~'~~ fence, may be substituted to provide views of the wetland corridor and linear park. ~~(***Figure 16***, page 29).~~ All fencing, landscaping, and sidewalks along arterial/collectors shall be maintained by the project Owners Association~~(BVROA)~~.

Solid fencing, six (6) feet in height shall be consistent throughout the project in accordance with **Figure 11**. When changes in elevations occur, fences shall be stepped in equal intervals, rather than sloped. Fencing along collector streets shall include pilasters, spaced at least every 80 feet. Fencing along Collector Streets adjacent to a non-residential uses are not required.

Collector Street Intersection Entry Treatment

Intersections of ~~arterial/~~collectors are encouraged to include signage and enhanced landscape for ~~with designated major or~~ village entrances. ~~, (***Figure 20,*** page 34) shall be accented with natural rock veneer walls at all corners, ground cover, perennials, and evergreen trees per ***Figures 21 & 22,*** page 35 & 36.~~

Collector Street Signs

All street signs, traffic signs and directional signs that control vehicular traffic along collector streets shall be standard City signs with standard posts.

Collector Street Utility Standards

Above ground utility appurtenances shall be screened from public view from all streets. Screening shall be accomplished with the use of berms, walls, fences, blending colors and/or vegetation. If fences or walls are used, materials shall be consistent with arterial and collector fencing and rock veneer walls.

Utility buildings and structures shall be designed to fit into the architectural character of the adjacent residential community or non-residential development. Utility appurtenances and buildings shall be located in planter areas and not in turf areas, where feasible.

Collector Street Horizontal, Vertical and Pavement Section Design

Design of collector roadway shall be per the City of Reno Public Works Design Manual. The exception is intersection spacing, which may be provided at ¼ mile intervals.

Collector Street Landscape/Streetscape

Landscape will be designed in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended~~TABLE 4~~

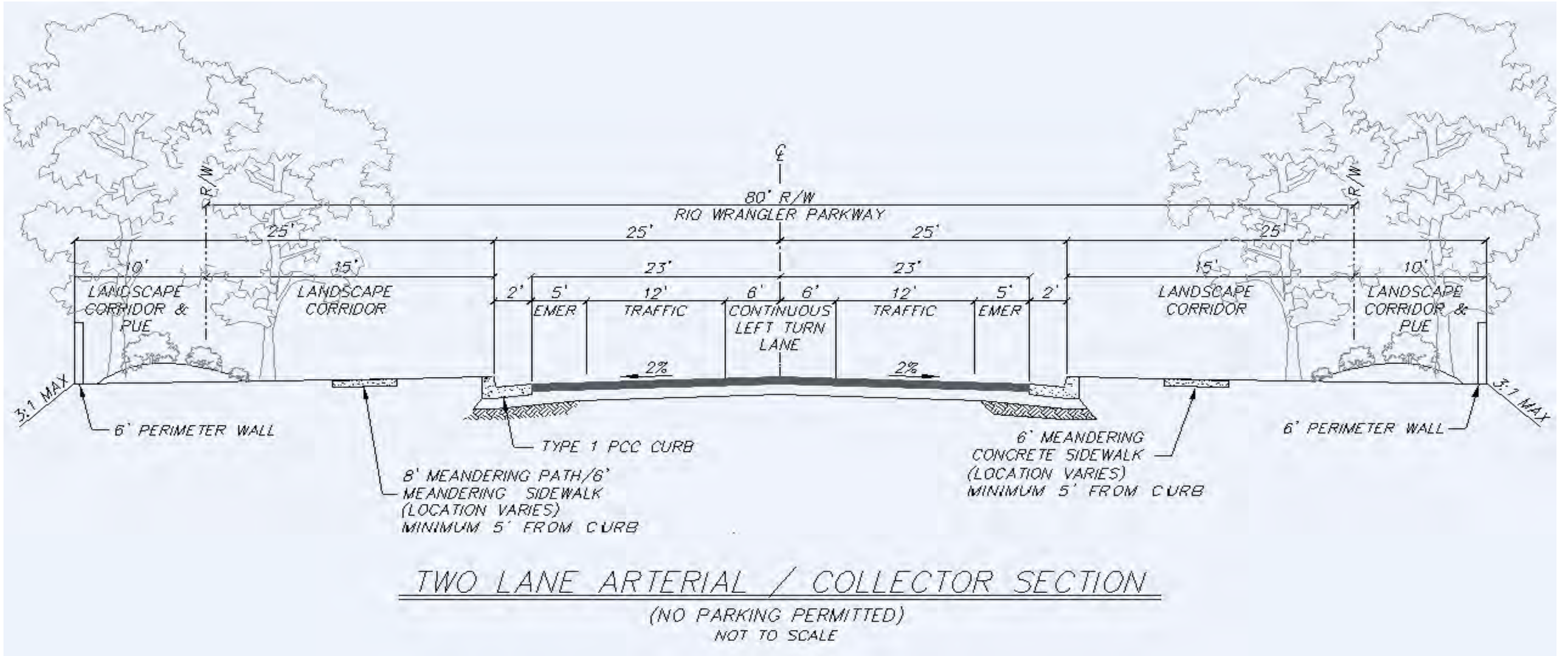
~~**Rio Wrangler Parkway (south ± 1300 ft to south project boundary)**~~
~~(± 4000 S.F. TOTAL LANDSCAPE AREA PER 200 L.F.)*~~

~~**Plant Materials**~~	~~**Quantity**~~
~~Trees~~	~~**14**~~ ~~7 Deciduous~~ ~~4 Evergreen~~ ~~3 Evergreen~~

~~Shrubs~~	~~**40**~~ ~~50% = 2000 s.f.~~
~~Living Groundcover~~	~~**20**~~ ~~25% = 1000 s.f.~~
~~Turf~~	~~25% = 1000 s.f.~~

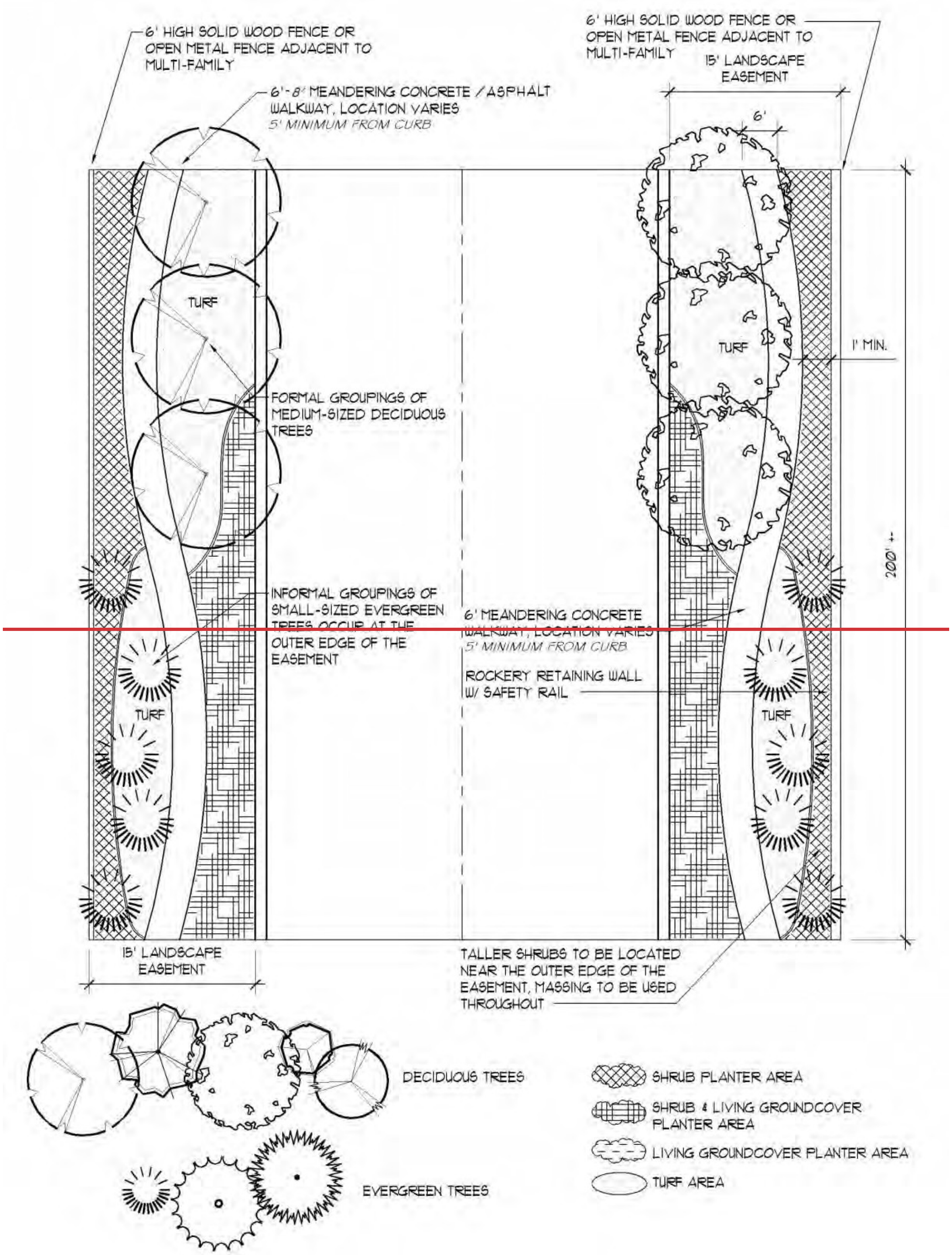
~~* **NOTE:** Tree and plant quantities and spacing apply to each side of the street.~~

~~**On center planting of shrubs and living ground covers is dependent on mature size of plant materials so that plants grow together and cover the ground area. These numbers represent an average and will be adjusted dependent on the species determined by Landscape Architect and Administrator~~



~~FIGURE 14~~

~~**Arterial/Collector Street Section – Southern +- 1300 feet of Rio Wrangler**~~



~~NOTE: See Table 4 on Page 28 for Standards~~

~~*FIGURE 15*~~
~~***Rio Wrangler Parkway Streetscape***~~
~~***(South ± 1300 ft to south project boundary)***~~

~~TABLE 4~~

~~**Rio Wrangler Parkway (south ± 1300 ft to south project boundary)**~~
~~(± 4000 S.F. TOTAL LANDSCAPE AREA PER 200 L.F.)*~~

~~**Plant Materials**~~	~~**Quantity**~~	~~**Min. Tree Size**~~
~~Trees~~	~~147 Deciduous 4 Evergreen 3 Evergreen~~	~~2.5" Deciduous 6' Evergreen 10' Ever~~

		~~green~~
~~Shrubs~~	~~4050% = 2000 s.f.~~	
~~Living Groundcover~~	~~2025% = 1000 s.f.~~	
~~Turf~~	~~25% = 1000 s.f.~~	

Local Streets

Local streets are defined as any street including project entry streets, cul-de-sacs and loop streets within an individual residential village or non-residential project. Local Residential/Pedestrian and local streets may be public or private, to be determined at the time of Tentative Map or building permit submittal and approval. Local streets shall be constructed by the builders of each individual village. Village entrances will be constructed by the Master Developer or at the Master Developer's discretion, the builder of each individual village.

Alternative local street sections may be proposed during the tentative map process to accommodate unique housing types or to accommodate off street parking. Alley's may be designed in accordance with the City of Reno Public Works Design Manual.

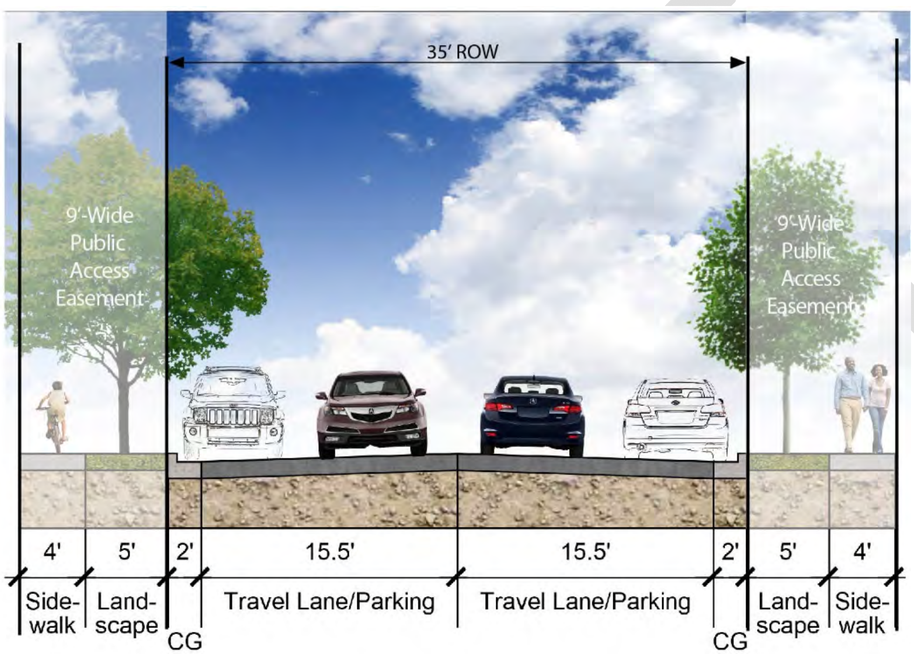


FIGURE 10A
Residential and Non-Residential Local Street (Pedestrian)

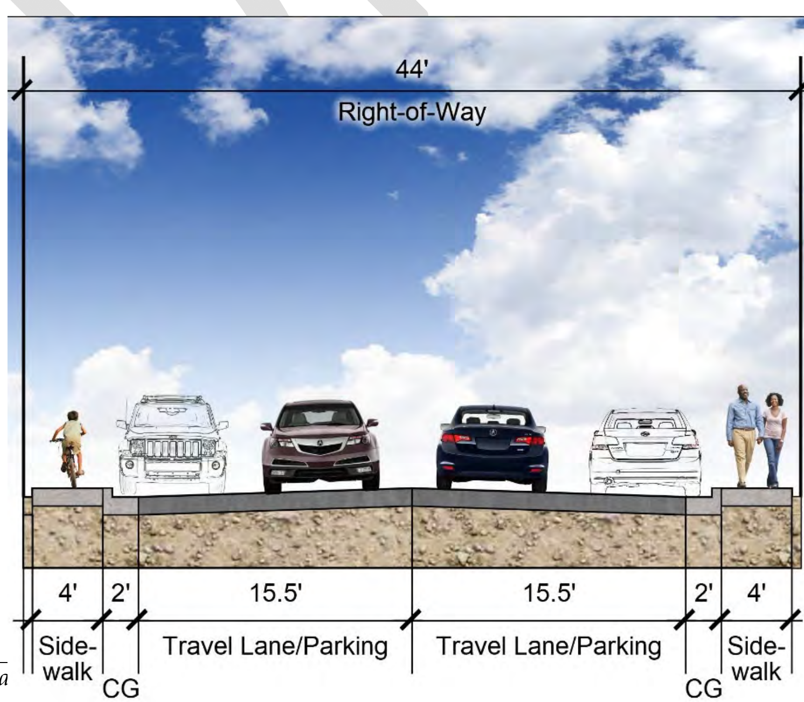


FIGURE 10B
Residential and Non-Residential Local Street

~~* **NOTE:** Tree and plant quantities and spacing apply to each side of the street.~~

~~**On center planting of shrubs and living ground covers is dependent on mature size of plant materials so that plants grow together and cover the ground area. These numbers represent an average and will be adjusted dependent on the species determined by Landscape Architect and Administrator~~

~~j. Street Signs~~

~~All street signs, traffic signs and directional signs that control vehicular traffic along collector streets shall be standard City signs with standard posts~~

~~k. Utility Standards~~

~~Above ground utility appurtenances shall be screened from public view from all streets. Screening shall be accomplished with the use of berms, walls, fences, blending colors and/or vegetation. If fences or walls are used, materials shall be consistent with arterial and collector fencing and rock veneer walls.~~

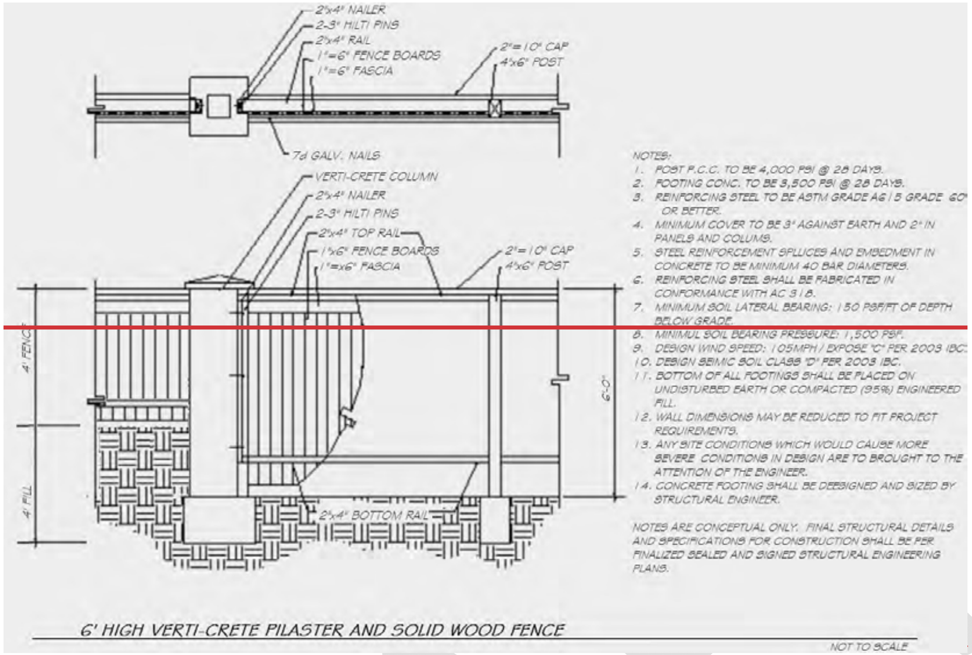
~~Utility buildings and structures shall be designed to fit into the architectural character of the adjacent residential community or non-residential development. Utility appurtenances and buildings shall be located in planter areas and not in turf areas, where feasible.~~

~~l. Horizontal, Vertical and Pavement Section Design~~

~~Design of arterial roadway shall be per the City of Reno Public Works Design Manual. The exception is intersection spacing, which shall be provided at ¼ mile intervals (refer to Section II, B, page 11).~~

~~m. Fencing~~

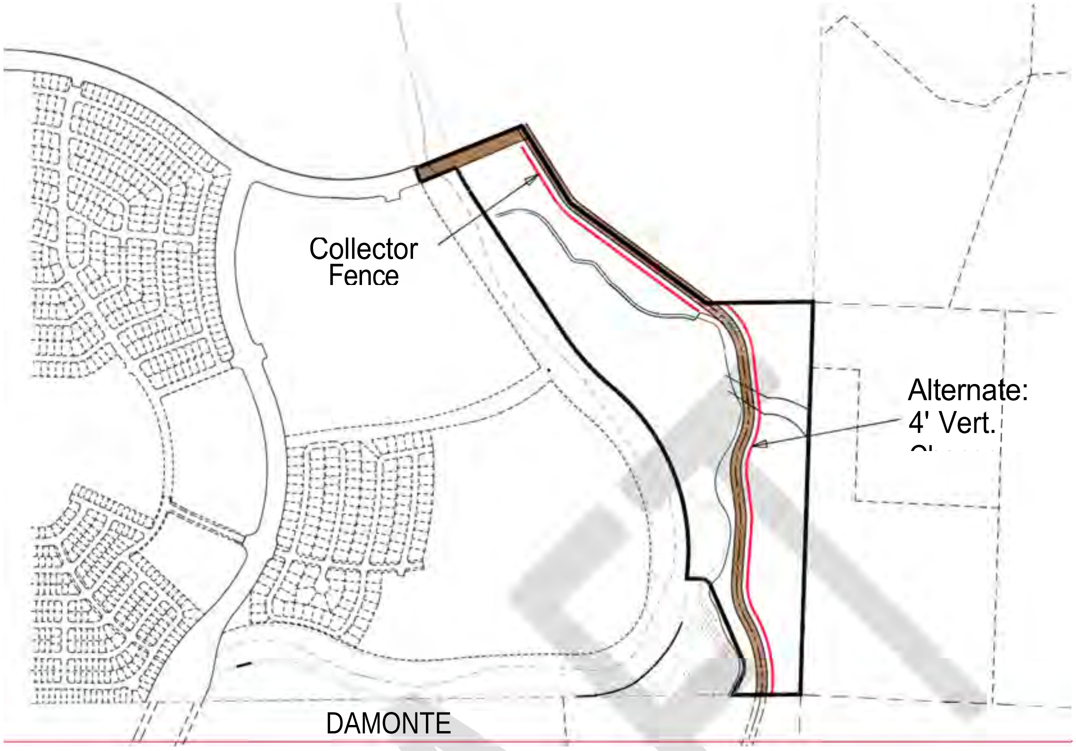
~~Solid fencing, six (6) feet in height shall be consistent throughout the project in accordance with ***Figure 16***, page29. When changes in elevations occur, fences shall be stepped in equal intervals, rather than sloped. Fencing along arterial/collector streets shall include pilasters, spaced at least every 80 feet.~~



~~**NOTES:** 1. See **Figure 17**, page 30, for Typical Locations. Refer to page 26, paragraph 2 c for details on location of 4 ft. height alternative.~~

~~2. The alternative 4 foot fence section and 4 feet of vertical grade change shall include the pilasters and all other details of the standard 6 ft. fence.~~

~~*FIGURE 16*~~
~~***Arterial/Collector Street Fence***~~


Collector Fence
Alternate: 4' Vert.
DAMONTE

South Meadows Parkway

Veterans Parkway

~~*FIGURE 17*~~
~~***Arterial/Collector Street Fence Locations***~~

~~3. Local Streets~~

~~Local streets are defined as any street including project entry streets, cul-de-sacs and loop streets within an individual residential village or non-residential project. Local Residential/Pedestrian and local streets may be public or private, to be determined at the time of Tentative Map or building permit submittal and approval. Local streets shall be constructed by the builders of each individual village. Village entrances will be constructed by the Master Developer or at the Master Developer's discretion, the builder of each individual village.~~

Local Street Improvements

Local public streets shall be improved with paving, curb, gutter landscaping and sidewalks as applicable in accordance with ***Figure 10A & 10B~~8~~***~~, page 32~~.

Alternate street sections including private street or streets with landscaped parkways may be provided by the individual builder subject to approval by the Master Developer and the City of Reno at the time of tentative map or building permit review.

Local Streets Parking and/or Direct Access

On street parking and/or direct residential driveway access within villages is permitted.

Local Street Sidewalk Connections

Sidewalks within villages for all projects shall be connected to sidewalks along arterial streets, collector streets and sidewalk trails within access easements to open space paths, as appropriate. ~~The major drainageway corridor trail will cross Rio Wrangler as noted in **Figure 26**, page 45.~~ The City of Reno shall approve all connections with each tentative map or building permit submittal. ~~A safe route to school for residential projects shall be approved by the City of Reno prior to approval of each final map or issuance of a building permit~~.

Local Street Fencing

Fencing adjacent to local residential/pedestrian and local streets shall comply with requirements outlined under Arterial/Collector street fencing as specified in ~~Section III A 2, h, page 29 (~~**Figure 11 ~~6~~**~~)~~ of this PUD.

Local Street Signs

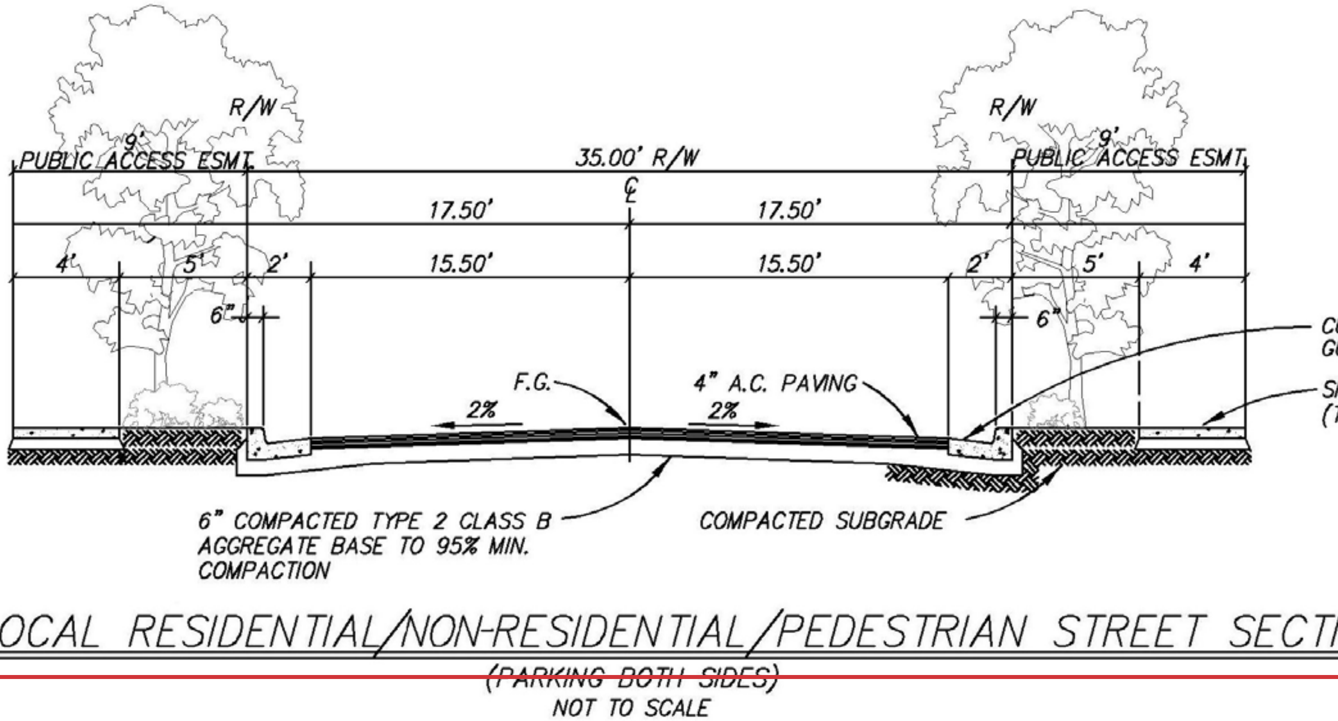
All street signs, traffic signs and directional signs that control vehicular traffic along local streets shall be standard c~~C~~ity signs with standard posts.

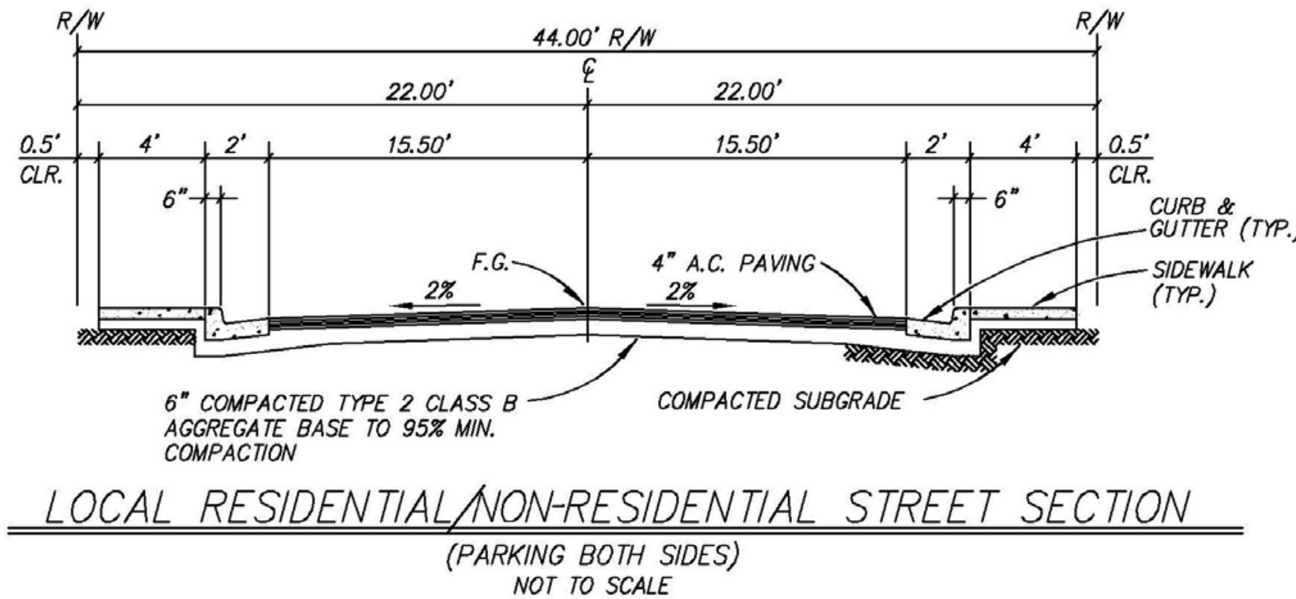
~~a. Intersection Treatment~~

~~Intersections of local streets shall not require special treatment. Only project entries illustrated in ***Figure 20**, Page 34* shall require special treatment.~~

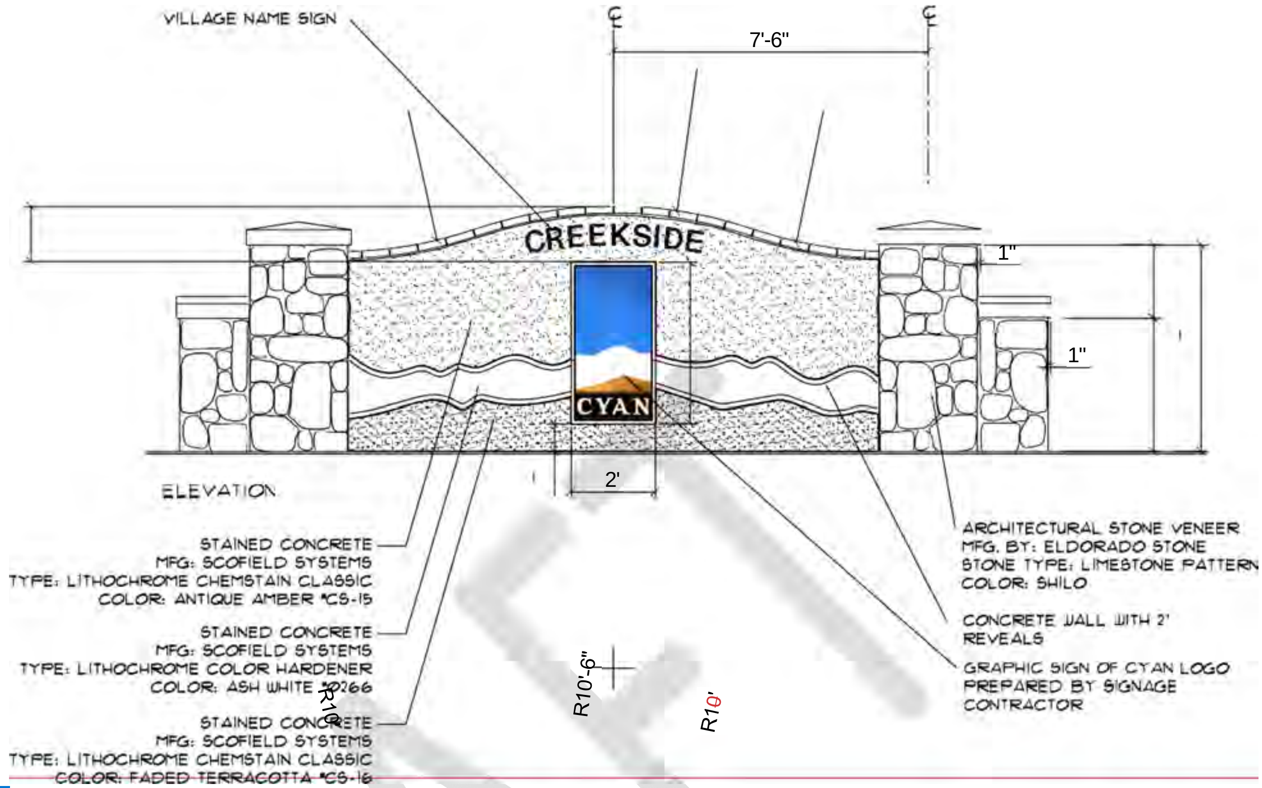
Local Street Landscape/Streetscape

~~5.~~ **Landscape will be designed in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended.**





~~**FIGURE 18**~~
~~**Residential and Non-Residential Local Street Sections**~~



~~B.~~F. Major and Village Entrances

Entry monuments ~~and sidewalks (refer to *Figure 19*, page 33) shall~~may be provided on ~~both sides of every~~arterials and collectors for each ~~major and~~ village or project entrance~~ street refer to *Figure 20*, page 34 for locations~~. ~~The size and configuration of the entrance area requirements are specified in **Figure 21**, page 35 and *Figure 22*, page 36. (refer to **Table 6**, page 37 for design standards)~~
The Developer will be responsible for construction of the major and village entrances. The BVROA will ultimately be responsible for the maintenance of the major and village entrances. The individual villages will utilize entrance concepts that include monumentation signs, lighting, fencing, and landscaping. If a private gated entrance is desired, builders must submit specific plans for median modifications and gates to the City of Reno for review and approval with each tentative map or building permit as applicable.

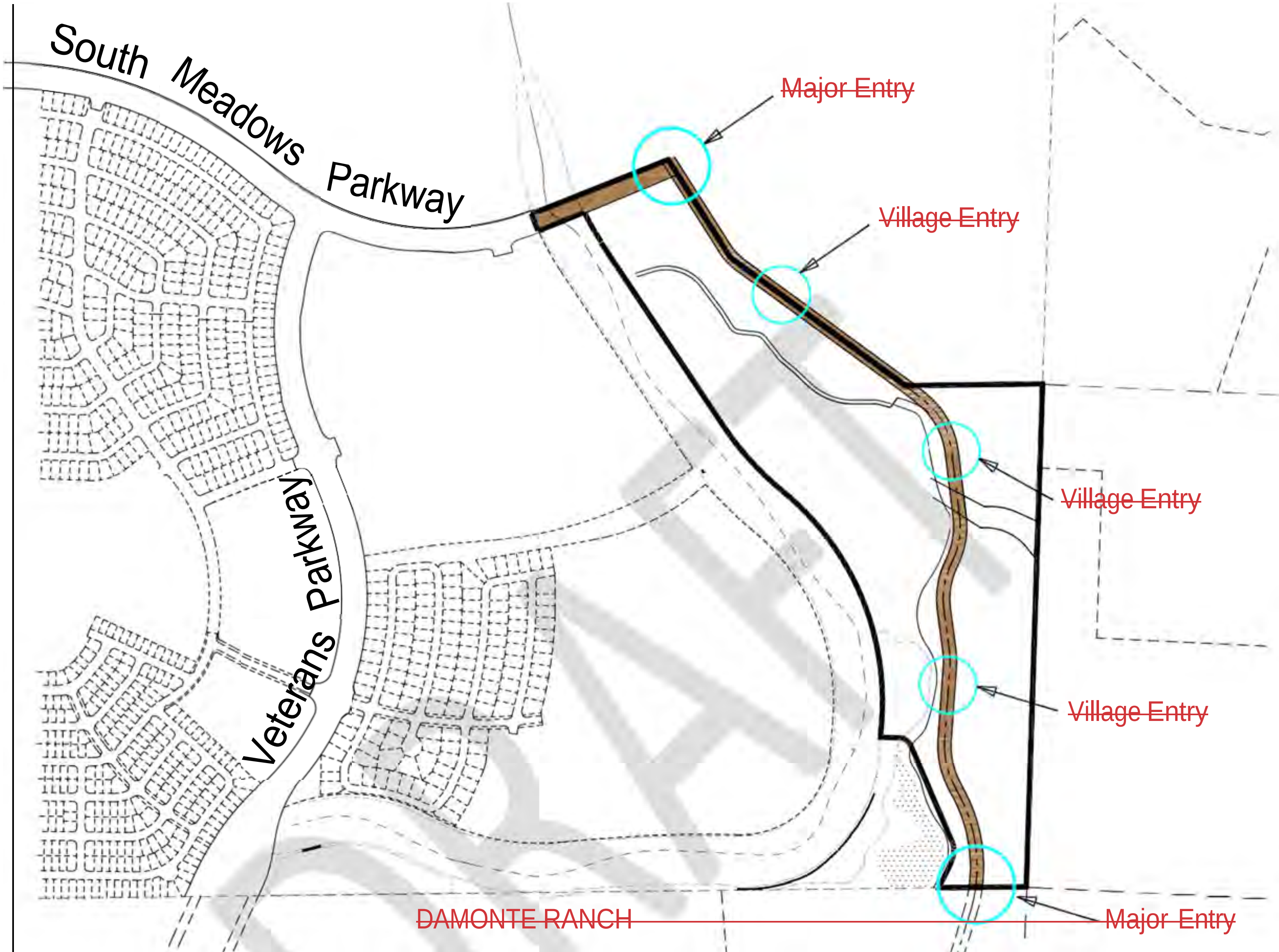
Additional details regarding signs, lighting, landscaping, and fencing are outlined below;

Signs
Each sign may include the name of the individual village and the master project name and logo. Builder names may not be listed on the signs. All signs shall meet the requirements of RMC Chapter 18.05 as amended.

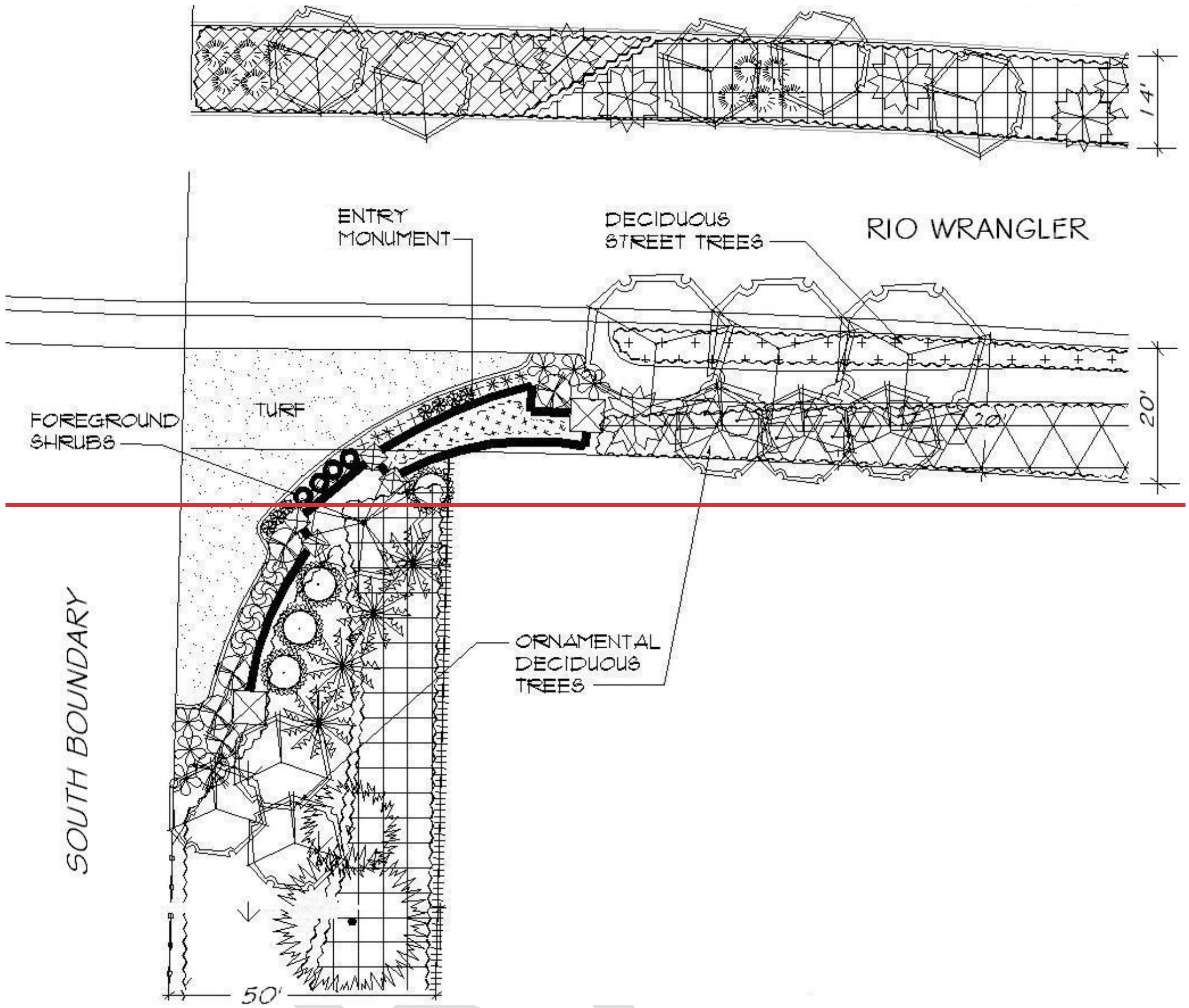
Lighting
Entrance signs may be lighted with ground mounted direct lighting sources. No internal illumination of signs shall be permitted.

Landscaping
All major and village entrances shall be enhanced with irrigated landscaping in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended.

~~***FIGURE 19***~~
~~***Major and Village Entry Monument Concept***~~

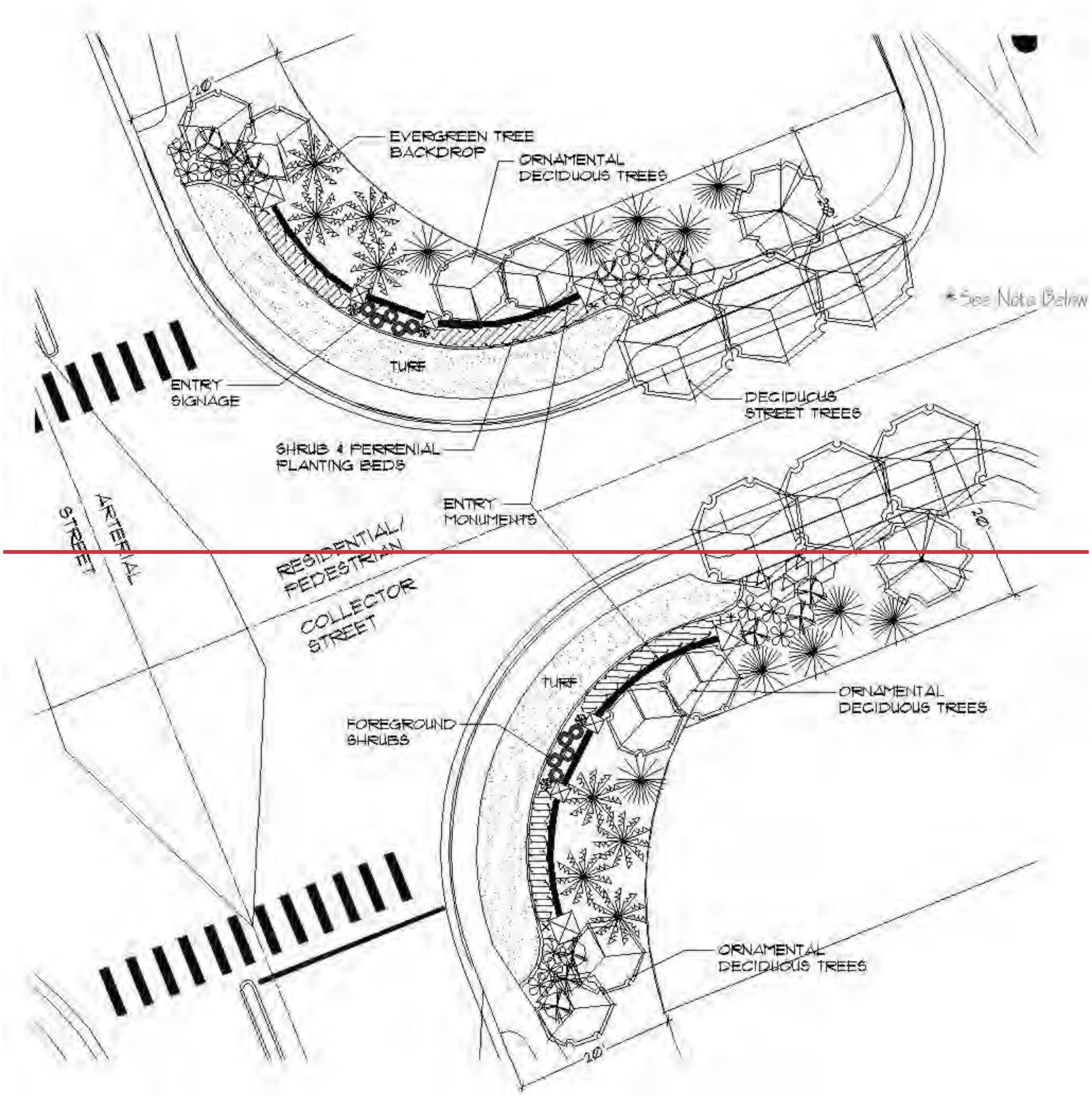


~~FIGURE 20~~
~~Major and Village Project Entry Locations~~



~~***FIGURE 21***~~
~~***Major Entry Monument Detail***~~

~~See **Tables 2 & 3** on page 23, for landscape requirements and **Figure 11** on page 22 and **Table 5** on page 37 for landscape easement widths and requirements for materials.~~



~~**NOTE:** After first intersection landscape corridor is reduced to 15'. Refer to **Figures 11** and **15** on pages 22 and 27 for easement widths on Rio Wrangler and refer to **Table 5** on page 37 for landscaping requirements~~

~~*FIGURE 22*~~
~~***Village Entry Monument Detail***~~

~~The Developer will be responsible for construction of the major and village entrances. The BVROA will ultimately be responsible for the maintenance of the major and village entrances. The individual villages will utilize entrance concepts that include monumentation signs, lighting, fencing and landscaping. If a private gated entrance is desired, builders must submit specific plans for median modifications and gates to the City of Reno for review and approval with each tentative map, or building permit as applicable.~~

~~The types, sizes and minimum number of trees and shrubs required, as well as sign dimensions are shown in the project entry monument details illustrated on ***Figures 21* and *22***, pages 35 and 36. The entry monument concept is illustrated on **Figure 19**, page 33 and **Table 5** below provides minimum landscape requirements. Additional details regarding signs, lighting, landscaping and fencing are outlined below;~~

~~b. Signs~~

~~Each sign may include the name of the individual village and shall include the master project name and logo. Refer to ***Figure 19***, page 33. Builder names may not be listed on the signs.~~

~~c. Lighting~~

~~Entrance signs may be lighted with ground mounted direct lighting sources. No internal illumination of signs shall be permitted.~~

~~d. Landscaping~~

~~All major and village entrances shall be enhanced with irrigated landscaping in accordance with the entry monument details illustrated on ***Figures 21 & 22***, pages 35 & 36. Plant materials, quantities and minimum sizes at the time of installation shall be per ***Table 5***.~~

~~TABLE 5~~
~~Major and Village Entry Monument Area~~
~~MINIMUM LANDSCAPING REQUIREMENTS PER 1,000 SQ> FT. of AREA~~

~~Plant Materials~~	~~Quantity *~~	~~Plant Size~~	~~Caliper Size (min.)~~
~~Turf~~	~~50% max cover~~	~~Sod~~	~~N/A~~
~~Shrubs~~	~~10~~	~~5 gallon~~	~~N/A~~
~~Living Groundcover or Additional shrubs~~	~~50% min. cover~~	~~1 gallon~~	~~N/A~~
~~Deciduous Trees~~	~~2~~	~~B&B or Box~~	~~2 ½"~~
~~Evergreen Trees~~	~~2~~	~~6-10 ft height~~	~~1 at 6'~~ ~~1 at 10'~~

~~* NOTE: Tree and plant quantities and spacing apply to each side of the street.~~

~~C. Fencing~~

~~Solid fencing, six (6) feet in height located along entrance streets shall be consistent throughout the entire Bella Vista Ranch Phase II PUD in accordance with ***Figure 16***, page 29. When changes in elevations occur, fences shall be stepped in equal intervals, rather than sloped.~~

~~D. Street Signs~~

~~All street signs, traffic signs and directional signs that control vehicular traffic within villages shall be standard City signs with standard posts. Alternative posts, if used, must be consistent throughout each village, approved by the city and shall be maintained by the Owner's Association.~~

~~E.~~G. Open Space and Public Park Design Standards

Open Space

Open space includes the Wetlands Consolidation Corridor, major drainageway, parks, pathways, trail access parcels to open space and other open space land that is not developed with roadways, or located on individual lots within the residential or non- residential portion of this PUD. Common open space, including the park and trails, shall be open and available for use by the general public (unless located in a private gated community). These facilities shall be maintained by ~~the Bella Vista Ranch Owner~~an Association ~~(BVROA)~~ or the ~~Bella Vista Ranch~~Cyan Drainage District (C~~(BVR~~DD).

~~1.~~ Public Park

The public park will be designed to the approval of the City of Reno and constructed by the project Developer or the City of Reno. The Developer shall not receive credit towards the Residential Construction Tax (park fees) to construct the park. The park will not be dedicated to the City of Reno. The park will be approximately 4.4± acres in size and will be located in the south-central portion of the Bella Vista II PUD (refer to **Figure 7**).

All Residential Construction Tax fees collected from this project shall be used to ~~construct~~ improve the park in the Bella Vista Ranch PUD (Cyan Park) located to the west of this project, which is located within the same Park District. ~~The park will be approximately 4.4± acres in size and will be located in the south central portion of the site (refer to *Figure 2*, page 2).~~

~~I.~~ I. Facilities

A minimum of three (3) of t~~T~~**he following facilities will be constructed within approximately 3.0 acres of the park:**

- Picnic Areas (to include tables and benches)
- Par Course (exercise equipment)
- Play Structure
- Horseshoes or similar amenities of scale (as approved by the administrator)
- Turf Open Play Areas~~.~~ (maximum of 1 acre in size)
- Trail Head/Parking Area along a public street

The following facilities will be constructed in the remaining portion of the park:

- Trails
- Native vegetation and existing un-disturbed vegetation
- Seating/viewing areas

II. Timing and Implementation

Provide plans for construction of the park to the City, including the above amenities, with application for the first residential building permit. Complete construction of the park improvements within one year of the date of City approval of the park construction plans. The applicant may request one, 1 year time extension (2 total years) to complete the park improvements without amending the PUD.

~~III.~~ III. Fencing

Fencing associated with the park, may be provided adjacent to or within the park. The following area or activity delineation fencing shall be provided:

1) Split rail fencing as depicted in ***Figure 1~~2~~4A***~~, page 41~~.
~~2)~~ Vinyl coated brown chain link fencing associated with sports fields or courts.

2)

3) Rockery walls and/or rock veneer walls consistent with the streetscape walls. ~~as depicted in ***Figure 23***, page 40.~~

~~**IV. Landscaping**~~

~~V.~~

IV. Landscape

The park will be landscaped and irrigated in accordance with Reno Municipal Code Sections 18.04.801 through 809, as amended.~~as appropriate for the planned uses as approved by the City of Reno and as determined with review of the construction plans.~~ Evergreen massing is encouraged adjacent to residential lots.

~~VI.~~

~~VII.~~ Lighting

~~**VIII.**~~V.

All lighting shall be approved by the City of Reno and shall utilize state of the art “dark sky lighting” techniques. Lighting in the park shall be minimized where possible but may include the following:

1) Parking Lot Lights – Fully shielded lighting including “shoebox” style lights shall be provided in parking lots and shall not exceed 20 feet in height.

~~IX. All lighting shall be approved by the City of Reno and shall utilize state of the art “dark sky lighting” techniques.~~

~~X.~~

~~XI.~~ Pathways

~~**XII.**~~VI.

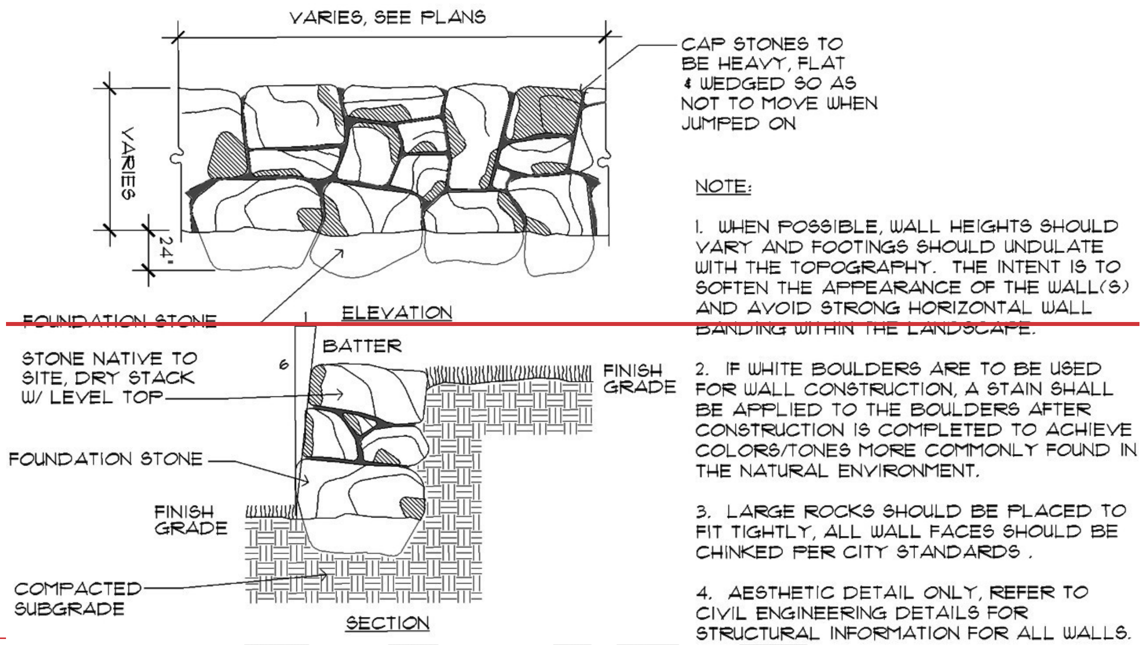
Pathways within the park shall connect to sidewalks within the individual villages, sidewalks within trail access areas, open space trail pathways and sidewalks along arterial streets as appropriate. Pathways to and from individual lots are not permitted. A pathway/sidewalk circulation and connection plan to the park shall be reviewed and approved by the city with each tentative map or building permit ~~located adjacent to the park~~.

~~XIII.~~ Utili~~tiesty Standards~~

~~**XIV.**~~VII.

Above ground utility appurtenances shall be screened from public viewe~~e~~. Screening shall be accomplished with the use of berms, fences, walls, blending colors, and/or vegetation.

Utility buildings and structures shall be designed to fit into the architectural character of the adjacent development. Utility appurtenances and buildings shall be located in planter areas and not in turf areas. All utilities must meet the design standards outlined in **Table 4** of this PUD.

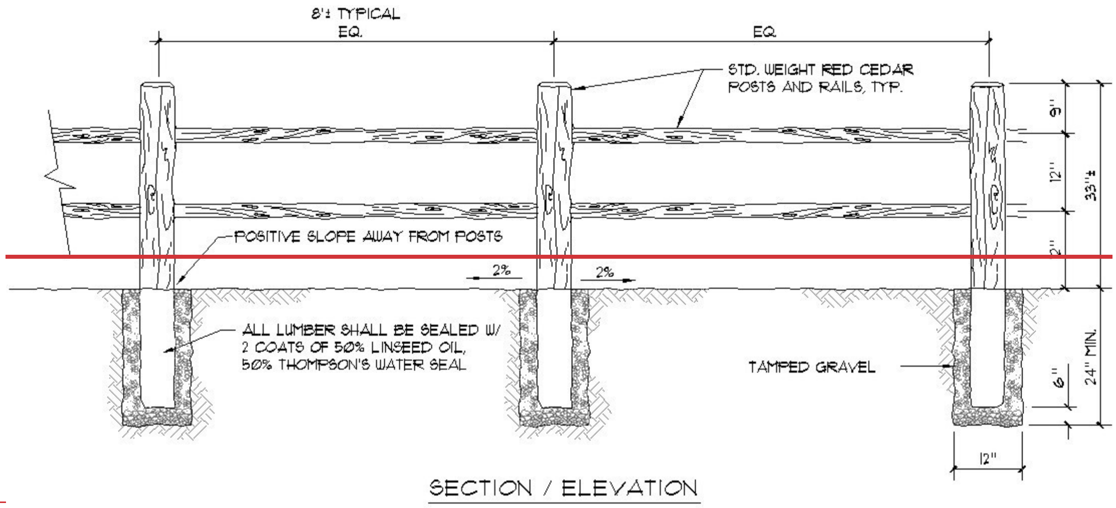


~~**Note:**~~

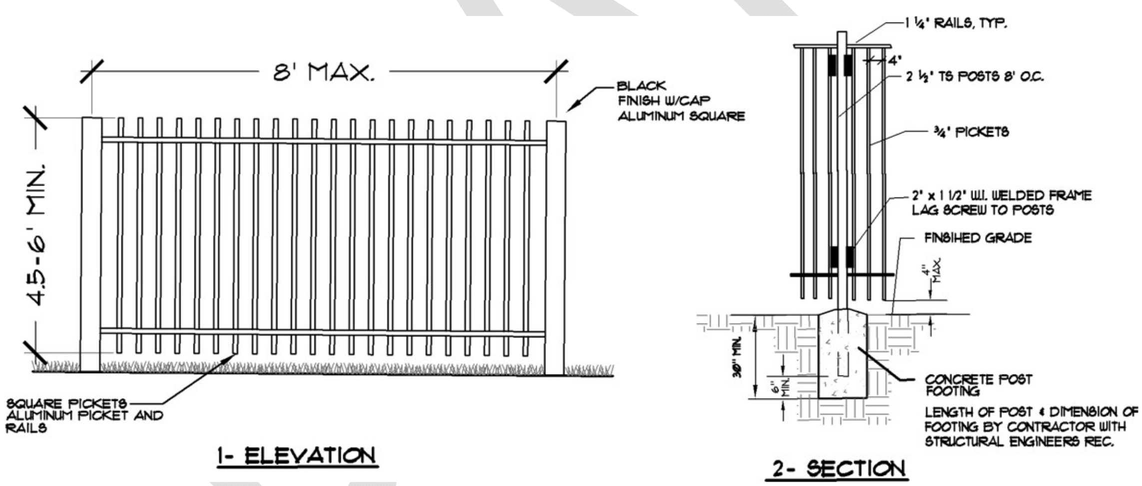
~~Walls in excess of 30 inches shall require a minimum 4½ foot tall open metal fence at the top of the wall (refer to *Figure 24B*, page 41 for open metal fence detail).~~

~~All rockery walls shall be designed and constructed in accordance with the City of Reno Rockery Wall Design and Construction Standards.~~

~~***FIGURE 23***~~
~~***Rockery Walls***~~

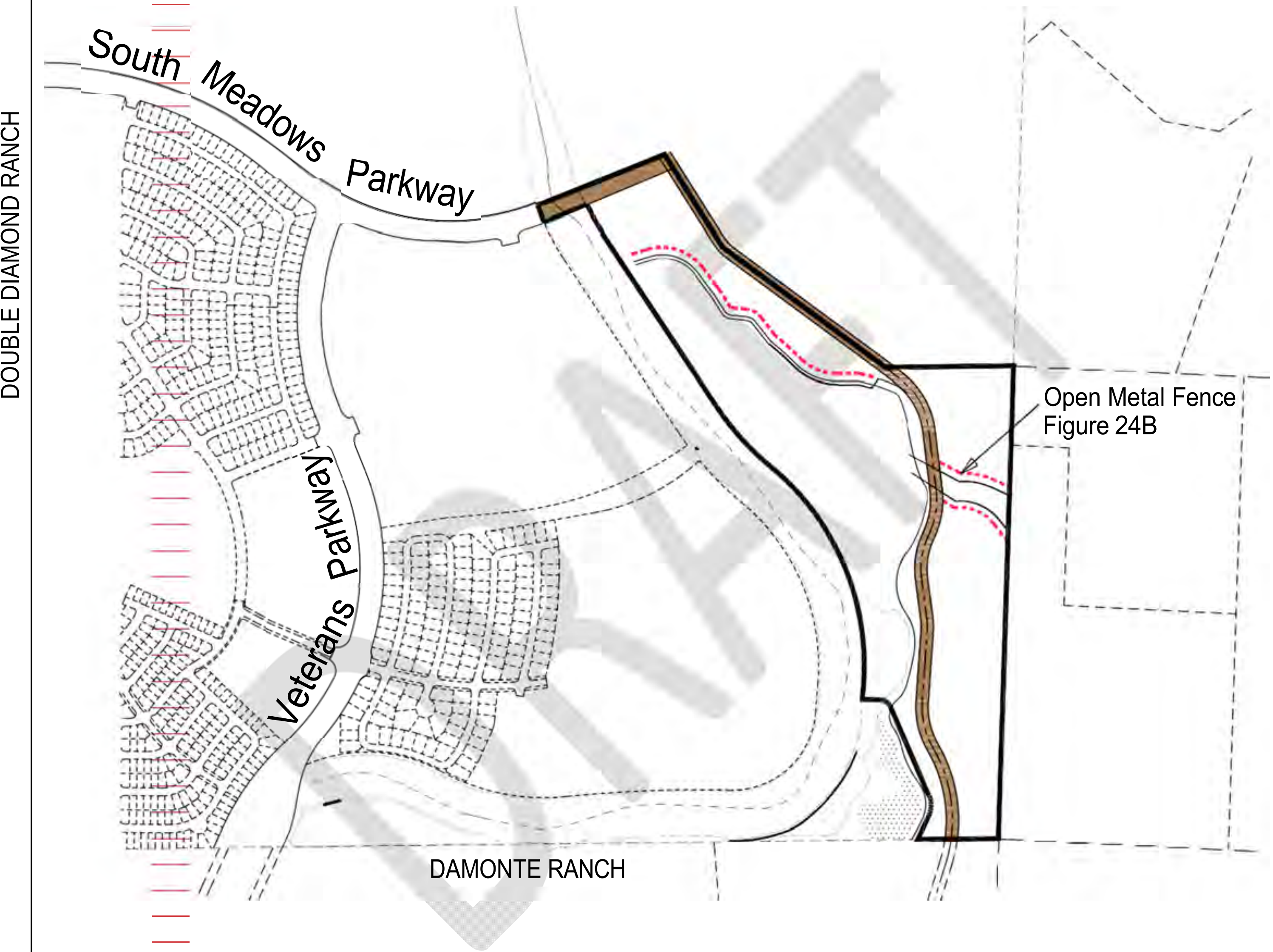


~~A. FIGURE 24A~~
~~A. Split Rail Fence~~



~~A. FIGURE 24B~~
~~A. Open Metal Fence~~

~~A. See Figure 25 page 42 for location~~



~~***FIGURE 25***~~

~~***Open Metal Fencing Locations***~~

H. Fencing Plan/Design Standards

A combination of fencing types will be used throughout the Bella Vista Ranch II to provide consistency and to help protect the open space throughout the development. Furthermore, fencing/walls along the arterial and collector streets will help separate the villages and provide privacy and help to reduce traffic noise. Walls/fences along arterial/collector streets adjacent to non-residential development is not required.

The following types of fences are proposed throughout the development as depicted in **Figure 11** below:

- Masonry Sound Wall with Pilaster
- Arterial /Collector Street Fence
- Split Rail/Open Metal Fence
- Temporary Feral Horse Fence

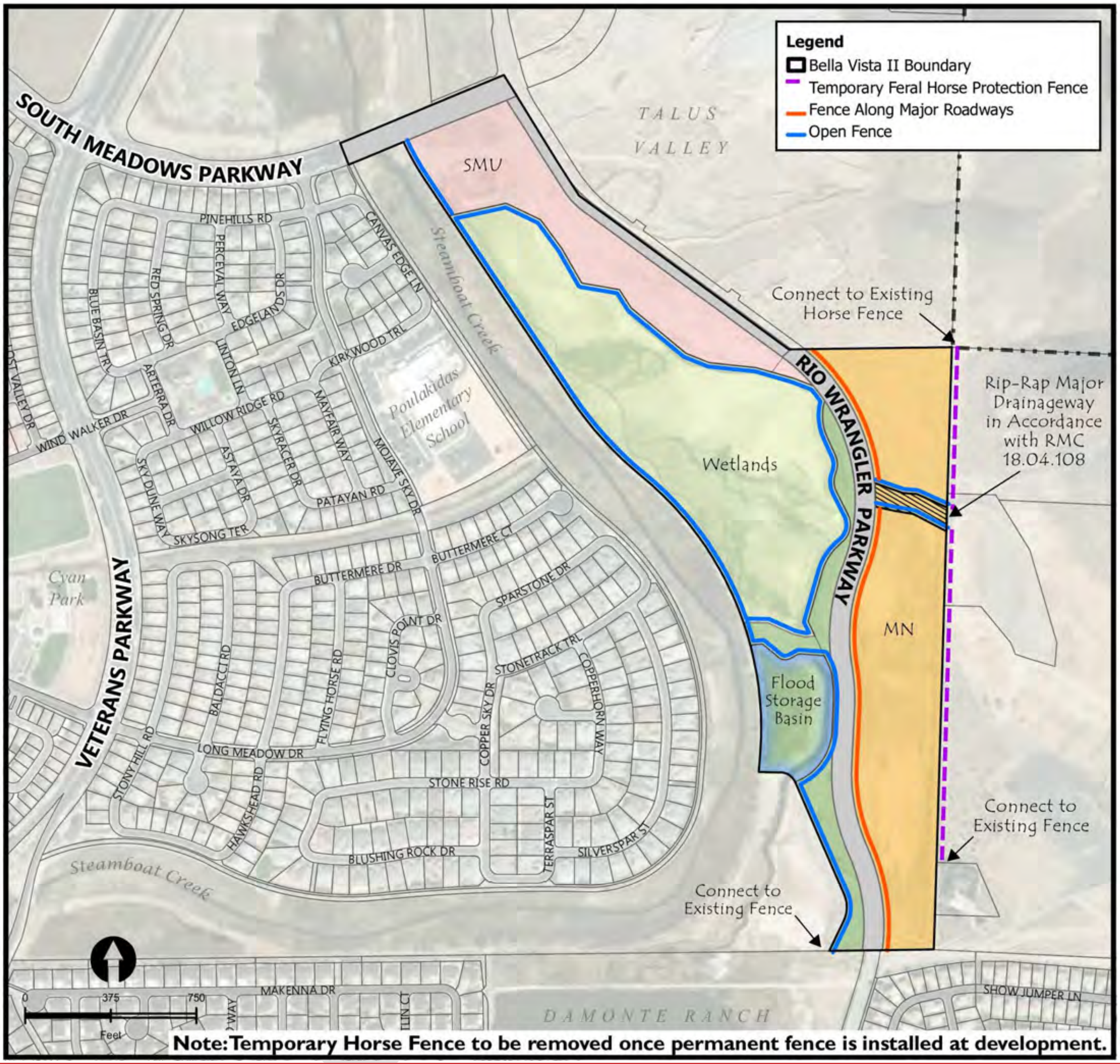


FIGURE 11
Fence Locations

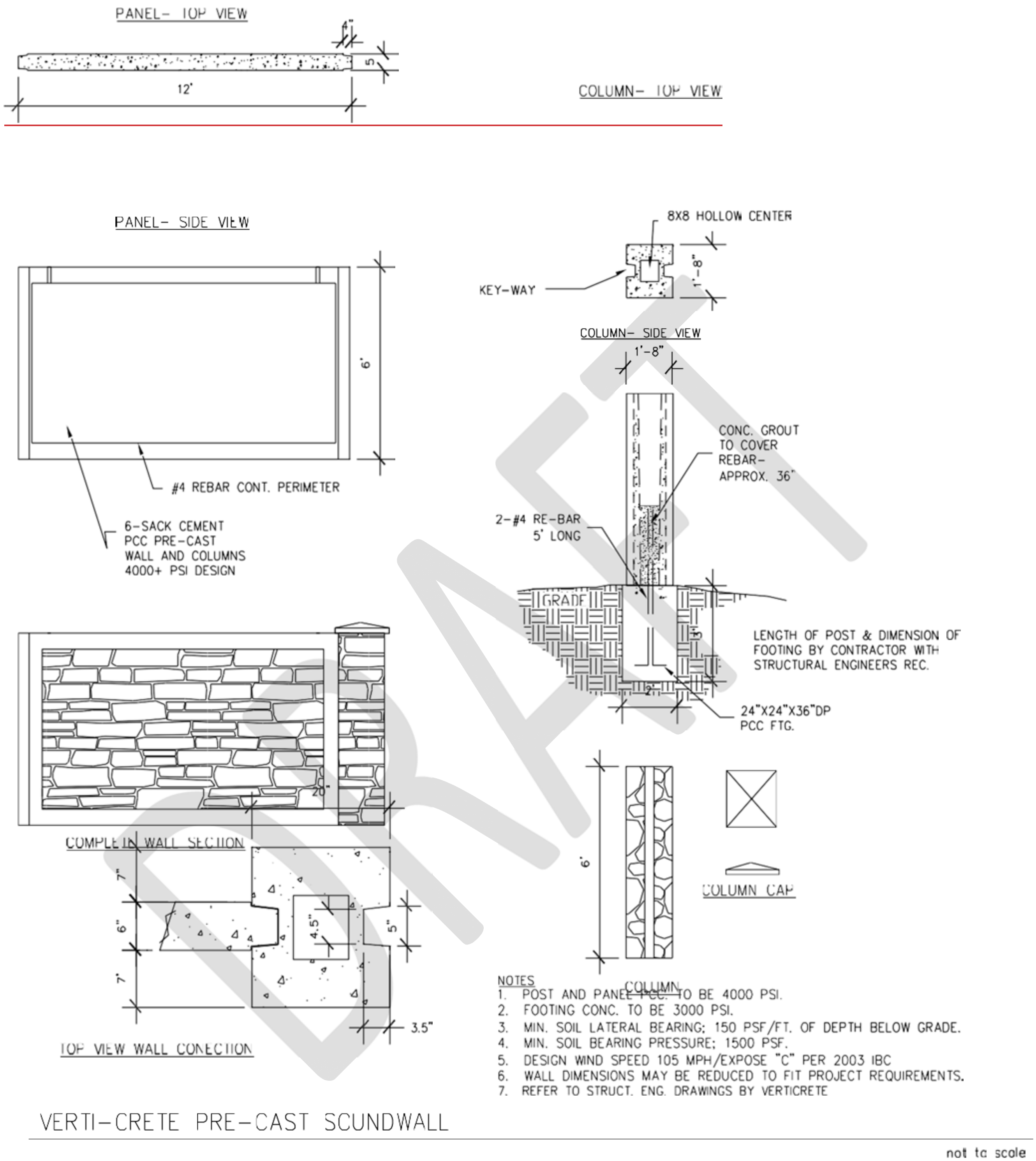
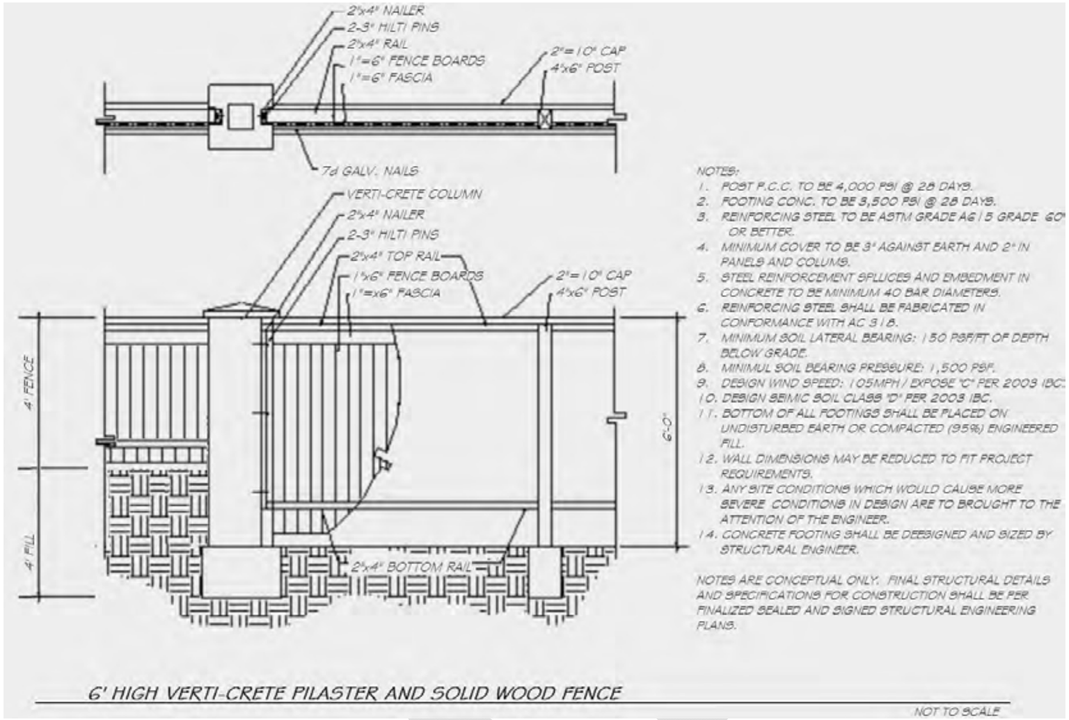


FIGURE 12

Masonry Sound Wall with Pilaster



NOTES:

1. See **Figure 11**, for Typical Locations.
2. The alternative 4 foot fence section and 4 feet of vertical grade change shall include the pilasters and all other details of the standard 6 ft. fence.

FIGURE 13
Arterial/Collector Street Fence

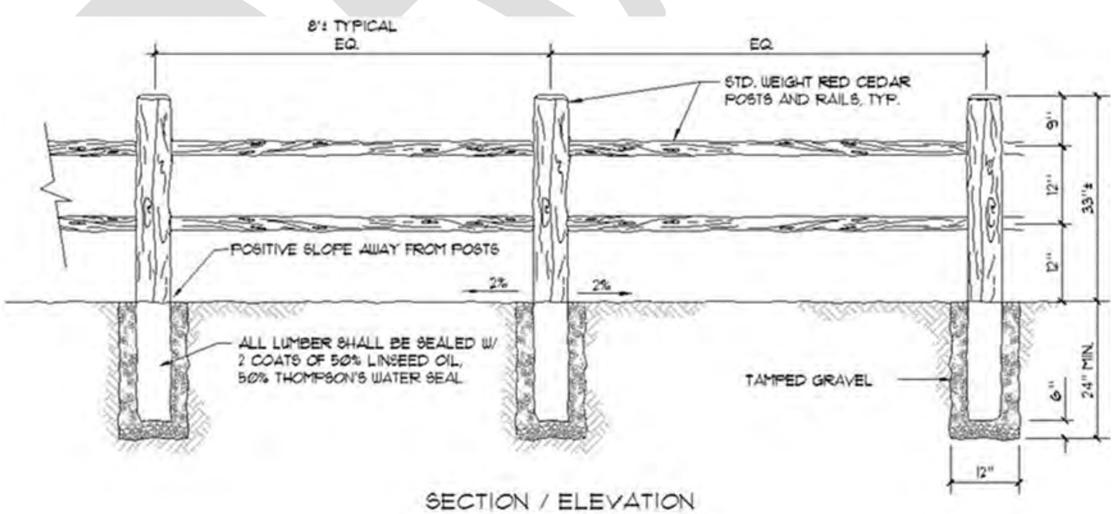


FIGURE ~~1~~24A
Split Rail Fence

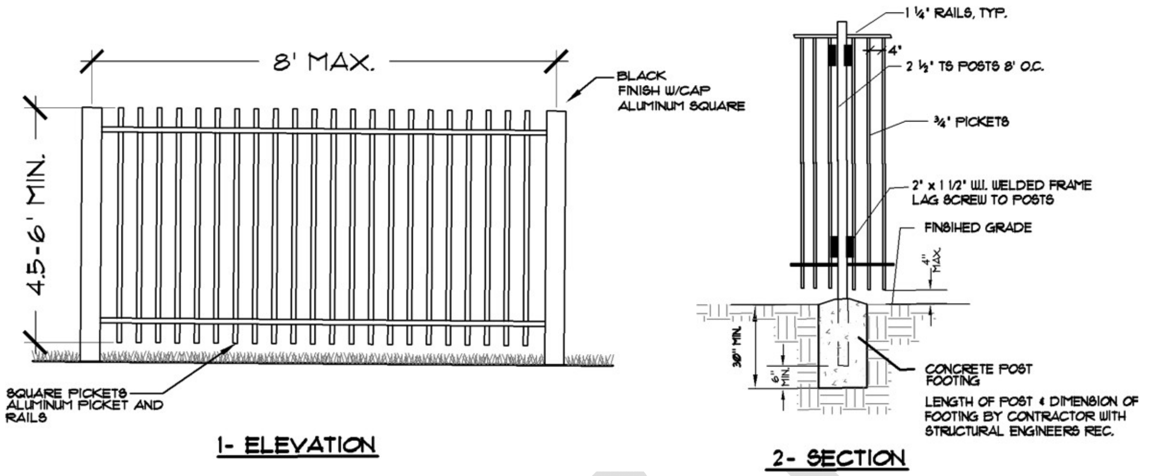


FIGURE 1~~2~~4B
Open Metal Fence

Open Fence types will be between the major drainageway and open space areas and residential lots shall be provided for delineation purposes throughout the project. Fencing shall consist of open metal and split rail fencing. (refer to **Figure 14A & 14B**). Open metal fencing shall be used at rear and side yards adjacent to the major drainageway and open space areas. Split rail fencing shall typically be used in front yard setbacks to delineate private lots vs. public open space areas. It will also be used along trails to provide separation from streets and wetland areas along the open space corridor, (refer to **Figure 11**).

Fencing of common open space will be associated with rear and side yards of individual lots located adjacent to open space, the major drainageway and streets. Additional fencing, may be provided by the builder of each village, if locations and fence types are approved by the City of Reno prior to the approval of the applicable tentative map or building permit.

~~***See Figure 25 page 42 for location***~~

~~F.~~ Major Drainageway Design Standards/~~Open Space (Refer to Figure 5, page 6)~~

I.

~~XV.~~ The major drainageway has been identified as a disturbed major drainageway and will be restored per City of Reno code 18.04.104 Drainage Way Protection, as amended. For any development proposed in the MN land use designation and within the area identified in **Figure 7** as 'Major Drainageway', ~~Fencing~~

~~Fencing located between the major drainageway and open space areas and residential lots shall be provided for delineation purposes throughout the project. Fencing shall consist of open metal and split rail fencing. (refer to *Figure 24A & 24B*, page 41). Open metal fencing shall be used at rear and side yards adjacent to the major drainageway and open space areas. Split rail fencing shall typically be used in front yard setbacks to delineate private lots vs. public open space areas. It will also be used along trails to provide separation from streets and wetland areas along the open space corridor. (refer to *Figure 26*, page 45)~~

~~**XVI.** Landscaping~~

~~Steamboat Creek Corridor wetland areas shall remain undisturbed with no landscaping provided. The Major drainageway shall be enhanced with landscaping and irrigation. Refer to Section III, B, & **Table 6**, page 44. Landscape~~ improvement plans shall be submitted detailing the location/relocation plans ~~for~~ for the entire major drainageway corridor. These shall either be submitted ~~with the major drainage way corridor improvement plans with the first~~through the ~~adjacent~~ Tentative Map or ~~or~~ Major Site Plan Review process~~non-residential building permit site improvement plans~~.

Major Drainageway Edge Treatments

Transitional landscaping will be utilized to blend the ornamental landscape associated with residential lots or non-residential development and the natural revegetated drainageway area. This transition area will average ten (10) feet in width along edges without a trail and eighteen (18) feet in width with a trail (Refer to ***Figure 11***). All revegetation specifications shall be approved by the City of Reno with each adjacent Final Map or building permit.

Signage

Signage to discourage users from entering sensitive areas will be provided adjacent to Steamboat Creek and drainage way areas. Pedestrian oriented signs shall be compatible throughout the entire Bella Vista Ranch PUD. The signage plans shall be submitted for approval to City Parks staff, prior to approval of the first Final Subdivision Map or issuance of building permit.

~~**Major Drainageway Edge Treatments**~~

~~Transitional landscaping will be utilized to blend the ornamental landscape associated with residential lots or non-residential development and the natural re- vegetated drainageway area. This transition area will average ten (10) feet in width along edges without a trail and eighteen (18) feet in width with a trail (Refer to ***Figure 26***, page 45). ***Table 6*** page 44 sets the standards for these areas and all re-vegetation specifications shall be approved by the City of Reno with each adjacent Final Map or building permit.~~

~~XVII. **Utility Standards**~~

~~Above ground utility appurtenances shall be screened from public view. Screening shall be accomplished with the use of berms, fences, walls, blending colors, and/or vegetation. If fences or walls are used, materials shall be consistent with nearby fences and rockery walls.~~

~~Utility buildings and structures shall be designed to fit into the architectural character of the adjacent residential or non-residential development as applicable. Utility appurtenances and buildings shall be located in planter areas and not in turf areas, where feasible.~~

Site Furnishings

Site furnishings such as benches and trash receptacles will be placed along the pathway areas every 1,000 feet along channels, subject to approval by the City of Reno with each Final Map or non-residential building permit as applicable.

~~G.~~J. Common Open Space Design Standards

Common open space includes land located within the linear open space corridor and/or drainage way areas, and adjacent to residential lots or streets. An open space trail network is provided within the project and is shown on ***Figure*** ***~~6~~8***~~, page 14~~.

~~XVIII.Fencing~~

~~Fencing of common open space will be associated with rear and side yards of individual lots located adjacent to open space, the major drainageway and streets. Additional fencing, may be provided by the builder of each village, if locations and fence types are approved by the City of Reno prior to the approval of the applicable tentative map or building permit.~~

Landscaping

Landscaping and irrigation shall be provided on common open space that is located between residential lots and streets or adjacent to the major drainageway and other open space areas. Landscaping within these defined areas shall be provided by the builder of each village that abuts common open space in accordance ~~with~~with Reno Municipal Code Sections 18.04.801 through 809, as amended~~ *Figure 26*, page 45. *Table 6* below specifies the minimum landscape requirements for common open space areas~~.

~~TABLE 6~~

~~Common Area Ornamental Landscape Development Minimum Landscaping Requirements per 1,000 sq. ft. of Area~~

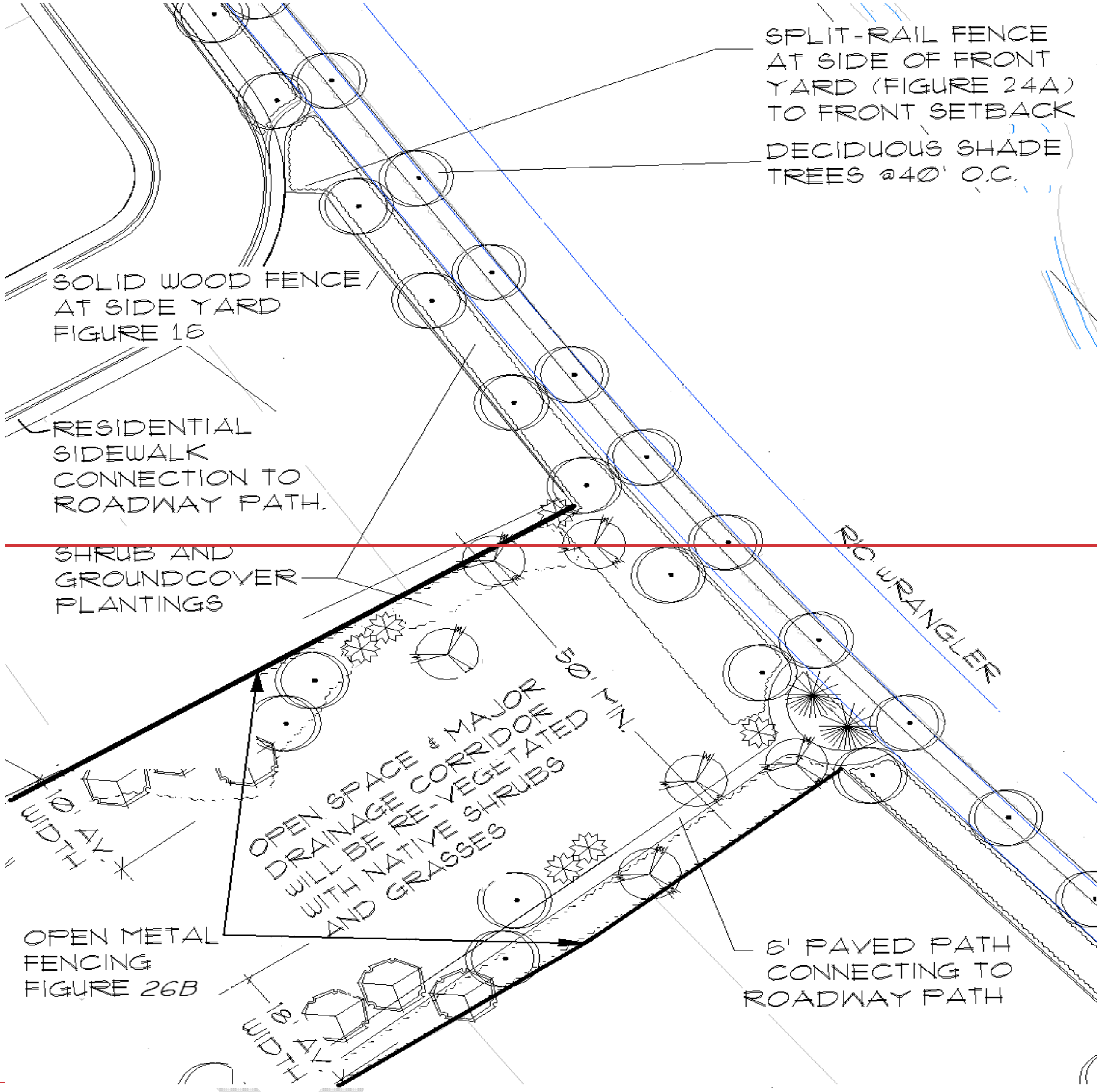
~~Plant Materials~~	~~Quantity~~	~~Plant Size~~	~~Caliper Size Height (~~

			~~min.)~~
~~Turf~~	~~50% max. cover~~	~~Sod~~	~~N/A~~
~~Shrubs~~	~~10~~	~~5 gallon~~	~~N/A~~
~~Living ground cover or additio~~	~~50% min. cover~~	~~5 gallon~~	~~N/A~~
	~~2~~	~~B&B or~~	~~2 ½"~~

~~nal shrubs~~		~~Box~~	
~~Deciduous Trees~~	~~1~~	~~6 ft height~~	~~6 ft~~
~~Evergreen Trees~~	~~1~~	~~10 ft height~~	~~10 ft~~

Pathways and Trails

Pathways adjacent to the major drainage way and along Steamboat Creek shall be asphalt, a minimum 8 feet in width (refer to **Figure 6~~8~~**~~, page 14~~). Pathways will be constructed by the Master Developer or at the Master Developer's discretion, the builder of each abutting village. Village builders shall ensure that pathways connect to sidewalks within the individual villages; pathways within trail access areas; and sidewalks along arterials and residential collector streets, as appropriate. Construction plans for pathway connections to villages shall be provided with the adjacent Final Map or building permit as applicable.



~~NOTE: Refer to Table 6, Page 44 for Standards~~

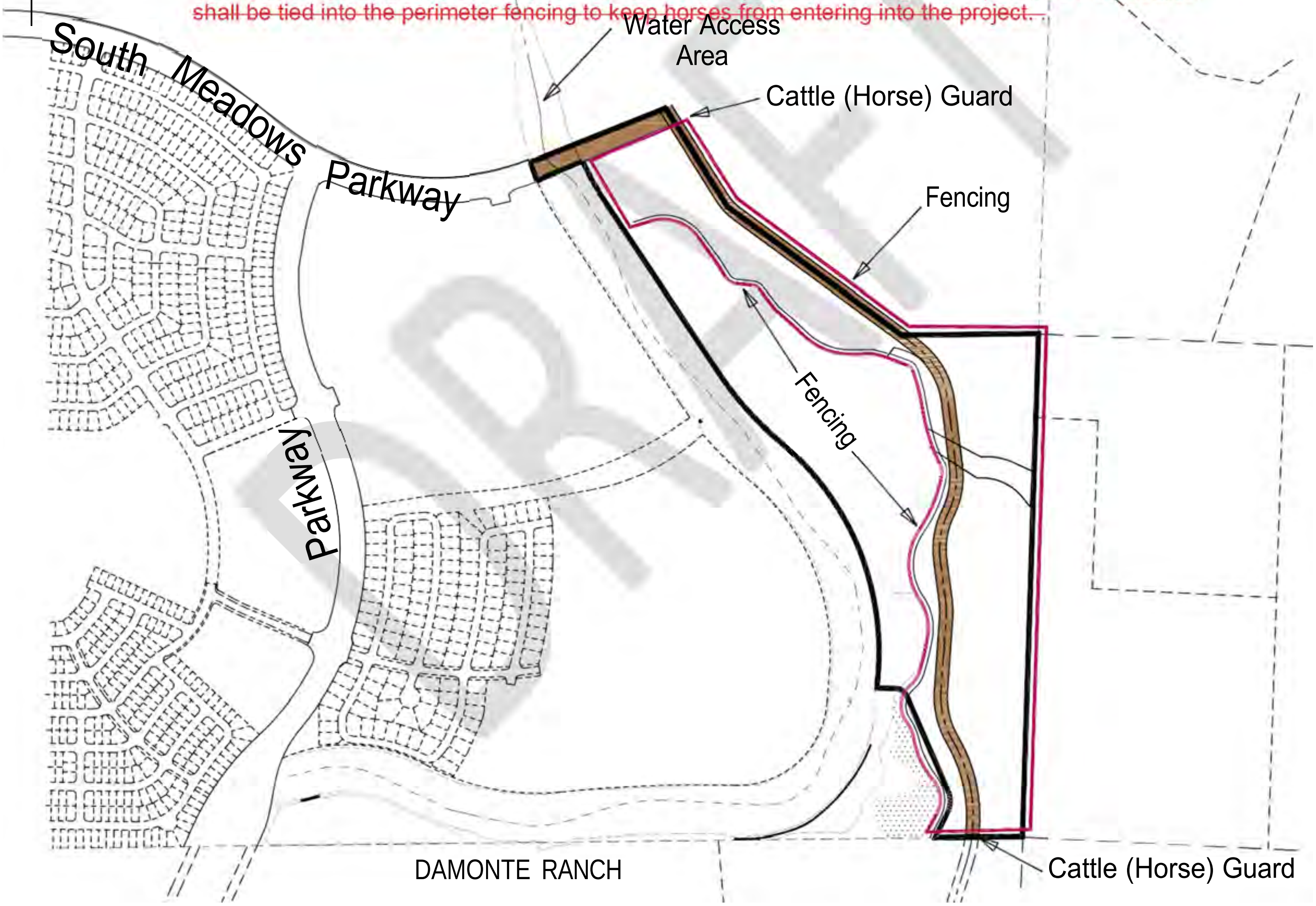
~~***FIGURE 26***~~
~~***Open Space & Major Drainageway Landscape Edge Treatment***~~

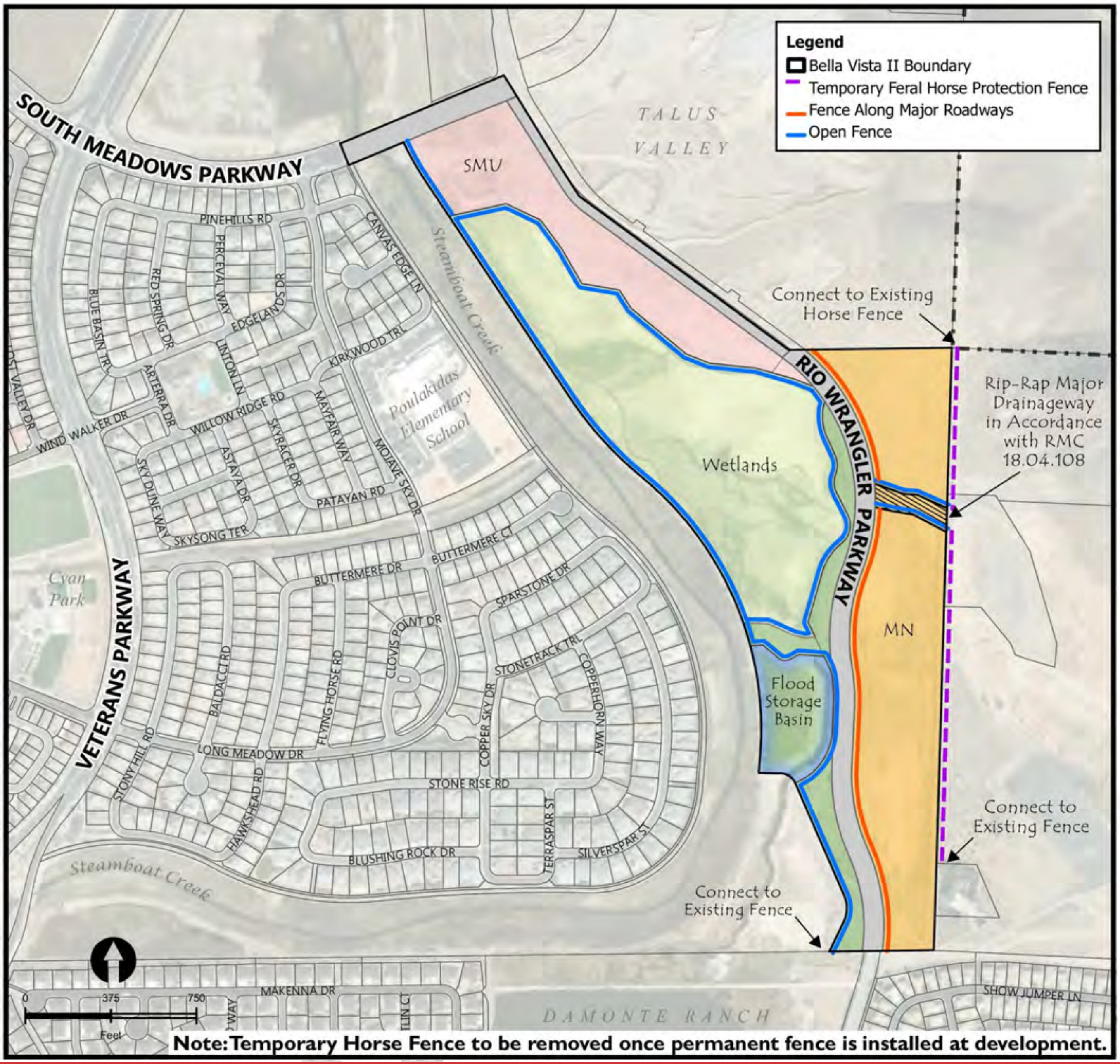
~~H.~~K. ~~Wild~~Feral Horse Protection Plan/Design Standards

It is the intent of this PUD to keep the ~~wild~~ feral horses that roam this area safe~~, wild~~ and free. The plan calls for contiguous horse fencing ~~around~~ along the east side of the ~~villages~~ MN land use with no gaps while connecting to adjacent fence to keep them along the eastern range ~~as they are developed, while at the same time, allowing access to water in Steamboat Creek~~in accordance with NRS 569.431 and RMC 18.04.108, as amended. ~~.~~

Temporary Fencing

The proposed temporary fencing will be installed prior to any development. This w~~, as noted below, w~~ill keep the horses away from conflicts with other uses until development and permanent fencing is installed,~~.~~ (refer to **Figure 15~~27~~**~~, below~~). Once permanent fencing is installed it will be monitored and maintained by the Master Developer or HOA in accordance with RMC 18.04.108, as amended. ~~. In addition to fencing, cattle guards (horse guards) shall be included in the construction of Rio Wrangler Parkway at the north and south ends of the project. These guards, per NDOT standards, shall be tied into the perimeter fencing to keep horses from entering into the project.~~




Legend
Bella Vista II Boundary
Temporary Feral Horse Protection Fence
Fence Along Major Roadways
Open Fence
SOUTH MEADOWS PARKWAY
TALUS VALLEY
SMU
Wetlands
RIO WRANGLER PARKWAY
Connect to Existing Horse Fence
Rip-Rap Major Drainageway in Accordance with RMC 18.04.108
MN
Flood Storage Basin
Connect to Existing Fence
Connect to Existing Fence
Steamboat Creek
Poulakidas Elementary School
VETERANS PARKWAY
Cyan Park
DAMONTE RANCH
0 375 750
Feet
Note: Temporary Horse Fence to be removed once permanent fence is installed at development.

Veterans

Figure 15~~27~~
Feral ~~Wild~~ Horse Protection Plan

With development of each project, the individual village or project developer will be responsible for installation of ~~permenant~~permanent perimeter fencing per **Figures 12, 13, 14A, & 14B~~6, page 29,~~,~~or Figures 24A and 24B~~**~~, page 41~~ of this PUD, as applicable. Temporary fencing, along future development boundaries may be installed as specified on **Figure 15~~24A~~,** or an alternative design may be utilized subject to approval by the City of Reno. A fencing plan shall be required with each final map or building permit as ~~appiicable~~applicable, to demonstrate compliance with the intent of this section. All temporary and permanent perimeter fencing shall be constructed in ~~copliance~~compliance with the requirements of NRS 569.431 thru .471.

~~IX.~~Water

~~Access to water in Steamboat Creek will be maintatained to the north of the project. (refer to **Figure 27**, page 46)~~ The Corps of Engineers has required that the mitigated wetland area along the creek be fenced to keep the horses out of the jurisdictional wetlands south of South Meadows Parkway.

~~The area north of the extension of South Meadows Parkway along the flood control easement (approx. 100 feet) will be fenced to provide a corridor for the horses to access Steamboat Creek. An additional 300 feet may be obtained from the Butler Ranch to the north as a temporary easement. The master developer shall be responsible for providing this fenced area at such time as the cattle guard is required to be installed at the north end of Rio Wrangler Parkway. This access easement shall remain in place until development north of South Meadows Parkway occcurs and an alternative access easement to replace the existing easement is put in place. Alternative locations to replace this water access will be reviewed with future development approvals for this property.~~

Signage

With construction of Rio Wrangler Pkwy., lighted horse hazard traffic signs shall be required to be installed within the PUD boundary located along Rio Wrangler Parkway to the satisfaction of the City of Reno Public Works staff.

L. Conflicts with Reno Zoning Code

In the event of a conflict between these design standards and City Code, these standards shall govern development of Bella Vista II. When a specific standard is not addressed by the PUD, then the applicable section of Reno Municipal Code, as amended, at the time of review shall prevail.

~~H. Residential/Non Residential Design Standards~~

~~**Tables 7 and 8** contain the base design standard for each Village within this PUD. These standards shall apply to all development applications and building permit requests, except parcel maps establishing roadways. Each development application or building permit request shall select one of the base zoning categories listed within subsections 3a, 4a and 5a below (design standards for Single Family (SF4), Multi-Family (MF), and non-residential uses), which will be used for the particular piece of property included in the request. The selected base zoning category shall be in writing, approved by the Master Developer or the individual parcel developer if they are the owner of record. Once this base zone is selected for a particular parcel, it shall be used throughout the development process. It shall be used for determining signage and accessory building standards. It shall also be used to determine bulk, density, intensity, site and building design standards not specifically included in Tables 7 and 8 or the design standards text of this PUD.~~

~~1. Lot/ Parcel Standards - Residential~~

~~Single-family and Multi-family dwelling units, and any accessory structures shall be sited on lots/parcels to conform to the minimum lot and parcel standards as outlined in Table 7. Standards not addressed on Table 7 shall be consistent with the selected base zoning category as noted above in the previous paragraph.~~

~~TABLE 7~~
~~LOT/ PARCEL STANDARDS - RESIDENTIAL~~

~~**Density/Intensity Standards**~~	~~**Village A (a)**~~	~~**Village B (a)**~~
~~Dwelling Units per Acre Max. (du/ac)~~	~~30~~	~~30~~
~~Landscape Area (percent)~~	~~20~~	~~20~~
~~Building Height (feet)~~	~~45(e)~~	~~45(e)~~
~~**Lot Size**~~		
~~Minimum Lot Area (1000's sq. ft)~~	~~1~~	~~1~~
~~Minimum Lot Width (feet)~~	~~20~~	~~20~~
~~**Yard & Setback Dimension**~~		
~~Front Yards (feet) **(b)(d)**~~	~~10~~	~~10~~
~~Side Yards (feet)~~	~~5 or 0~~	~~5 or 0~~
~~Rear Yards (feet)~~	~~10~~	~~10~~
~~**Accessory Structures (c)**~~		
~~Driveways~~	~~20~~	~~20~~
~~Min. usable open space~~	~~100 sf/unit~~	~~100 sf/unit~~

~~a. Small lot provisions as outlined in Reno Municipal Code, Title 18.12.102, Table 18.12.1 Residential Zones, bulk, dimensions and density standards as amended may be used in village A and B as outlined in Table 7.~~

~~b. Front yard setbacks for residential projects shall apply to the front face of the house or garage. All garages shall be served by driveways not less than 20 feet in length. Side loaded garages may meet the same front yard setbacks as the house.~~

~~Builders may provide for variations (but no less than the minimum setbacks) in front yard setbacks and/or building articulation to create an interesting streetscape.~~

~~c. Accessory building setbacks shall conform to Reno Municipal Code Title 18.08.203 Table 18.08.9B Bulk, Dimensional, Density and Intensity Standards for accessory structures and uses, as amended and based upon the base zone chosen for the project as described in the first paragraph of section III C of this PUD.~~

~~d. Minimum front yard setback shall be 20 feet adjacent to arterial or collector streets.~~

~~e. Single Family uses limited to 35' overall building height per section 3 (b) 6.~~

~~2. Lot/Parcel Standards – Non-Residential~~

~~Non-residential structures and any accessory structures shall be sited to conform to the minimum lot and parcel standards as outlined in Table 8 below and in conjunction with the selected base zoning category as noted above in the first paragraph of Section III C, if the particular design requirement is not specified in Table 8.~~

~~TABLE 8~~
~~LOT/ PARCEL STANDARDS –~~
~~NON-RESIDENTIAL~~

~~Density/Intensity Standards~~	**~~Village A (a)~~**	**~~Village B (a)~~**
~~Floor Area Ratio~~		
~~(FAR) Max.~~	~~0.50~~	~~0.50~~
~~Landscape Area (percent)~~	~~20~~	~~20~~
~~Building Height (feet)~~	~~45~~	~~45~~
~~Lot Size~~		
~~Minimum Lot Width (feet)~~	~~30~~	~~30~~
~~Yard & Setback Dimension~~		
~~Front Yards (feet)~~ **~~(b)~~**	~~20~~	~~20~~
~~Side Yards (feet)~~	~~10 or 0~~	~~10 or 0~~
~~Rear Yards (feet)~~	~~20~~	~~20~~
~~Setbacks from Adjacent Residential Uses~~		
	~~20' or~~	~~20' or~~
	~~height of~~	~~height of~~
~~All Yards~~	~~building,~~	~~building~~
~~Building Separation~~	~~20 feet~~	~~20 feet~~

~~a. All architectural design standards per Reno Municipal Code 18.08.301 (a) (10), 18.12.304 and 18.12.305(b) as amended~~

~~b. Front yard setbacks adjacent to Rio Wrangler Parkway shall be 25 feet.~~

~~3. Design Standards – Single Family Residential (SF-4 zoning district requirements)~~

~~(Refer to Section IV B, Page 54 of this PUD for design standard conflict resolution)~~

~~a. Reno Zoning Code~~

~~The following City of Reno Code Sections apply to the Single Family uses.~~

1) ~~Bulk Dimensional, Density and Intensity Standards for SF-4 projects shall follow City of Reno Development Code Section 18.12.101 and 102, as amended.~~

2) ~~Residential Site and Building Design Standards for SF-4 projects shall follow City of Reno Development Code Section 18.12.302, as amended.~~

3) ~~Off Street Parking and Loading Standards shall follow City of Reno Development Code Section 18.12.1101 through 1107, as amended.~~

4) ~~Landscaping and Screening Standards for SF-4 projects shall follow City of Reno Development Code Section 18.12.1201 through 1213, as amended.~~

5) ~~Exterior Lighting Standards shall follow City of Reno Development Code Section 18.12.1301 through 1304, as amended.~~

6) ~~Fences and Walls Standards shall follow City of Reno Development Code Section 18.12.1405, as amended.~~

7) ~~General Environmental Standards shall follow City of Reno Development Code Section 18.12.1501 through 1509, as amended.~~

8) ~~Signage Standards for SF-4 projects shall follow City of Reno development Code Section 18.16.101 through 18.16.804, as amended. Off premises advertising displays are prohibited.~~

9) ~~Accessory Buildings Standards for SF-4 projects shall follow City of Reno Development Code Section 18.08.205, as amended.~~

~~b. Architectural Elements~~

~~(Refer to Section IV B, Page 54 of this PUD for design standard conflict resolution)~~

~~1. Exterior Elements~~

~~Exterior materials shall include one or a combination of the following: stucco, Exterior Insulation and Finish System (EIFS), concrete fiberboard, wood or composite wood siding products with stone and masonry accents. Other materials may be submitted to the BVROA for consideration. Sample material boards shall be reviewed and approved by the BVROA. Siding materials shall be continued down to within 8 inches of finished grade on all elevations to eliminate large areas of exposed foundation. Building materials shall be compatible in scale with the design of the residences. Materials must also be compatible throughout each village.~~

~~2. Exterior Colors~~

~~All exterior color schemes as shown on sample color boards, shall be reviewed and approved by the BVROA. Exterior colors shall be in harmony with the natural~~

~~setting. Color intensity shall be kept low for large surfaces. Exterior palette materials shall not have high gloss or reflective/glare finishes. Bright primary colors are not permitted.~~

~~3. Facades and Articulation~~

~~Architectural features such as: varying window sizes and shapes, shutters, broken planes and pitched roofs, covered entries and porches, porch rails, columns and trim detailing help to define the fronts of the homes and garages; and shall be incorporated into the design of the residences. Doors and windows shall be compatible throughout each house design.~~

~~Large blank walls, roofs, non-articulated garage doors, and three (or more) car garages, with garage doors in the same plane, are not permitted. Side entry garages are permitted.~~

~~Building materials and architectural features, compatible with the front of the houses shall be provided on all sides of the homes. Rear and side elevations adjacent to arterials and collector streets, as well as common open space areas shall be finished in a similar manner as the front elevations, subject to review and approval by the BVROA.~~

~~4. Roofs~~

~~Roof colors shall be rich, medium to dark tones such as slate, dark brown and dark gray. Light colors are not permitted. The BVROA shall review and approve the color palette of roofing within each village.~~

~~Varying pitched roofs are encouraged. A variety of pitched roofs may be provided. Roof pitches under 5/12 including flat roofs are subject to specific review and approval by the BVROA.~~

~~Roof materials shall be applied to comply with snow load and high wind standards. Materials may include:~~

~~1) Concrete or clay tile (flat or barrel),~~
~~2) Non-reflective architectural metal,~~
~~3) 40-year architectural grade composition shingles,~~
~~4) 40-year fiberglass composition shingles~~

~~Roof materials, however, must be consistent throughout each village.~~

~~5. House Plans~~

~~Each village shall have a minimum of four distinct house plans. House design shall vary throughout each village with no one elevation repeated for abutting homes, or mirrored across the street. Adjacent lots may share the same floor plan, but must have different elevations. Garage forward plans shall be limited to 2 of the 4. Side loaded garages shall not be considered garage forward plans if elevations are architecturally consistent.~~

~~6. Height and Size Restrictions~~

~~The maximum allowable height of all structures shall be thirty-five (35) feet as measured from finished floor to the highest ridge of the structure.~~

~~7. Exterior Lighting~~

~~Lighting shall be integrated with the architectural design of the individual residences. Exterior lighting fixtures mounted on the homes shall be no higher than the line of the first story eave or, where no eave exists, no higher than 12 feet above finished grade. Lights shall be shielded to prevent light spillage onto adjacent properties or streets.~~

~~Flood lights are not permitted. Motion detector actuators are permitted with designer fixtures only and subject to approval by the BVROA.~~

~~c. Miscellaneous Design Elements~~

~~1. Awnings, Trellises, Patio Covers, Decks and Other Accessory or Ancillary Structures~~

~~Awnings, trellises, patio covers, second story decks and other accessory or ancillary structures including granny flats and casitas, provided by builders, shall be consistent in material, color and architectural character as the main structure and must be reviewed and approved by the BVROA. At a minimum, the setback requirements of such structure shall conform to this PUD and Reno Municipal Code 18.08.203(c) as amended.~~

~~2. Chimneys~~

~~Exterior materials of chimneys shall be compatible with the exterior materials and colors used on the house.~~

~~3. Driveways, Parking Areas and Walkways~~

~~Driveways shall be a minimum of 20 feet in length as measured from the outside edge of sidewalk to allow for off-street parking. Driveways shall be Portland Cement Concrete or traffic rated concrete decorative pavers and shall be consistent on a village wide basis. Asphalt or decomposed granite is not allowed.~~

~~4. Design Standards - Multi-Family Residential~~

~~(Refer to Section IV B, Page 54 of this PUD for design standard conflict resolution)~~

~~a. The following City of Reno Code Sections apply to the Multi-family uses.~~

~~1) Bulk Dimensional, Density and Intensity Standards for MF-14, MF-21 and MF-30 projects shall follow City of Reno Development Code Section 18.12.101 and 103, as amended.~~

~~2) Site and Building Design Standards for MF-14, MF-21 and MF-30 projects shall follow City of Reno Development Code Section 18.12.301, as amended.~~

~~3) Off Street Parking and Loading Standards shall follow City of Reno Development Code Section 18.12.1101 through 1107 as amended.~~

~~4) Landscaping and Screening Standards for MF-14, MF-21 and MF-30 projects shall follow City of Reno Development Code Section 18.12.1201 through 1213, as amended.~~

~~5) Exterior Lighting Standards shall follow City of Reno Development Code Section 18.12.1301 through 1304, as amended.~~

~~6) Fences and Walls Standards shall follow City of Reno Development Code Section 18.12.1405, as amended.~~

7) ~~General Environmental Standards shall follow City of Reno Development Code Section 18.12.1501 through 1509, as amended.~~

8) ~~Signage Standards for MF-14, MF-21 and MF-30 projects shall follow City of Reno development Code Section 18.16.101 through 18.16.804, as amended. Off premises advertising displays are prohibited.~~

9) ~~Accessory Buildings Standards for MF-14, MF-21 and MF-30 projects shall follow City of Reno development Code Section 18.08.203, as amended~~

5. ~~Design Standards - Non-Residential (NC, Neighborhood Commercial and PO, Professional Office)~~

~~(Refer to Section IV B, Page 54 of this PUD for design standard conflict resolution)~~

a. ~~The following City of Reno Code Sections apply to the non residential land uses:~~

1) ~~Bulk Dimensional, Density and Intensity Standards for NC and PO projects shall follow City of Reno Development Code Section 18.12.101 to 18.12.104, as amended.~~

2) ~~Non-Residential Site and Building Design Standards for NC and PO projects shall follow City of Reno Development Code Section 18.12.301 and 18.12.305, as amended.~~

3) ~~Off Street Parking and Loading Standards shall follow City of Reno Development Code Section 18.12.1101 through 1108, as amended.~~

4) ~~Landscaping and Screening Standards for NC and PO projects shall follow City of Reno Development Code Section 18.12.1201 through 1213, as amended.~~

5) ~~Exterior Lighting Standards shall follow City of Reno Development Code Section 18.12.1301 through 1304, as amended.~~

6) ~~Fences and Walls Standards shall follow City of Reno Development Code Section 18.12.1401, as amended.~~

7) ~~General Environmental Standards shall follow City of Reno Development Code Section 18.12.1501 through 1509, as amended.~~

8) ~~Signage Standards for NC and PO projects shall follow City of Reno development Code Section 18.16.101 through 18.16.804, as amended. Off premises advertising displays are prohibited.~~

9) ~~Residential Adjacency Standards for NC and PO projects shall follow City of Reno development Code Section 18.12.304, as amended. These standards shall apply to any adjacent selected single family base zones as specified in Section III C, page 48 of this PUD.~~

IV. IMPLEMENTATION

A. Design Review

These Design Standards will be used by the City of Reno and relevant government agencies to review each ~~single family~~ tentative map, multi-family, or non-residential site plan/building permit proposal for conformance with the overall design objectives and standards contained in this PUD.

It will be the responsibility of each Parcel Developer to comply with the Design Standards in preparation of landscape design plans.

~~I.~~ B. Applicability of Land Use and Development Standards

Where there is a conflict between standards within this PUD and cited city code sections, ~~(Sections III C 3 -5),~~ the standards in this PUD shall prevail. Where the provisions of this PUD do not address a specific subject, the provisions of the Reno Municipal Code Title 18 ~~Zoning Ordinance (Chapter 18)~~ or other ordinances governing the development of land, which are in effect at the time of application, shall apply. All other conflicts shall be resolved by the ~~City Zoning~~ Administrator.

C. Administration

The Bella Vista Ranch Phase II PUD shall be administered by the Administrator, or their designee as defined by the City of Reno Annexation and Land Development Code. The Administrator shall have the authority to interpret and apply this PUD handbook.

There shall be a master developer in place from the first stage of development of the PUD. This master developer shall continue throughout the development of the PUD until and unless a master homeowners association or other entity is created to serve the role of the master developer. The role of the master developer, for the purposes of this PUD shall be:

a) To prescribe and administer methods and procedures to ensure and control the quality of development that occurs in this PUD.

b) Maintain all common area improvements, storm drain channels, detention basins and other flood control facilities.

c) Construct, or have constructed, all parks, pathways, trails and sidewalks.

D. Flexibility

The Development Plan and Development Standards contained herein are intended to depict the general development vision for the PUD. Sufficient flexibility shall be allowed to permit detailed planning and design at the time of actual development. The acreage of each land use category may be increased by up to 10% if it is demonstrated that additional acreages are necessary due to constraints and/or design considerations to accommodate the project, to the satisfaction of the Administrator. This provision shall not exceed a cumulative total of 10% for each land use category. Changes in excess of 10% shall require an amendment to the Development Standards Handbook. Residential densities and residential dwelling unit allocation may be interchangeable between villages and will be defined fully with the tentative map for any given residential village. With each tentative map application, the Master Developer and/or applicant shall provide an accounting of the overall residential unit allocations, and updated land use category acreages approved to date. The total number of residential units shall not exceed 609 units or 117,612 square feet of non-residential without an amendment to the Development Standards Handbook.

E. Modifications

The Administrator shall have the ability to administratively update the PUD to reflect RMC amendments that impact the PUD. The Master Developer shall be notified of any administrative changes by the Administrator prior to final approval of such changes. Minor deviations shall be subject to written approval from the Master Developer. The Administrator also shall have the ability to grant minor deviations as outlined in RMC 18.08.804 as amended. Deviations of 10% or more shall conform to the City of Reno Major Deviation process as outlined in RMC 18.08.802, as amended.

~~J. Administration~~

~~The Bella Vista Ranch Phase II PUD shall be administered by the Zoning Administrator or his/her designee as defined by the City of Reno Annexation and Land Development Code. The administer shall have the authority to interpret and apply this PUD handbook.~~

~~There shall be a master developer in place from the first stage of development of the PUD. This master developer shall continue throughout the development of the PUD until and unless a master homeowners association or other entity is created to serve the role of the master developer. The role of the master developer, for the purposes of this PUD shall be:~~

~~a) To prescribe and administer methods and procedures to ensure and control the quality of development that occurs in this PUD.~~

~~b) Maintain all common area improvements, storm drain channels, detention basins and other flood control facilities.~~

~~c) Construct, or have constructed, all parks, pathways, trails and sidewalks.~~

~~Only the master developer or its authorized designee may initiate an amendment to the PUD. Each development application submitted to the city shall include documentation that the master developer has reviewed the application.~~

~~**K. Affordable Housing**~~

~~**In recognition of the importance of expanding homeownership opportunities to all members of the City and region, this PUD shall participate in any future citywide inclusionary zoning or other affordable housing program established and approved by the city council**~~

.

~~C.~~F. Green Development Practices

This PUD will include leading edge practices for the reuse of treated effluent. Low Impact Development (LID) best practices shall be utilized in the design and construction of all non-residential or residential developments to increase water infiltration and improve water quality. Any ordinances the city adopts that prescribe green building practices will be required in this PUD as they become effective. Plans demonstrating application of best practices or conformance with adopted green development standards shall be provided with each tentative map, ~~special~~ conditional use permit, site plan review, and/or building permit.

To encourage the passive utilization of solar energy, this PUD will not restrict the reasonable use of solar facilities in the CC&R documents for the development. The PUD will not allow building heights in excess of those set forth in the **Tables 3 & 4** ~~City of Reno development code~~ and will require the placement of houses or non-residential structures such that excessive shadows are not cast that restrict the use of solar facilities, both within and adjacent to the project.

~~D.~~G. Hours of Operation

Hours of operation for exterior construction activity or heavy equipment operation within the PUD shall be limited as follows:

a) Monday – Friday 7~~6~~:00 a.m. to 6~~8~~:00 p.m.;

b) Saturday – 8~~9~~:00 a.m. to 6:00 p.m.;

c) ~~No heavy equipment operations on Sundays or holidays (New Years Day, Thanksgiving Day and Christmas Day);~~There shall be no construction on Sundays.

d) A sign with the approved construction hours shall be posted on site for the full duration of construction activity.

~~c)~~e) Hours of Operation shall not apply to dust control or storm water management operations. A note to this effect shall be placed on the title sheet of all building permit plan sets.

~~d)~~f) Exceptions to ~~these hours of operation may be granted by the Administrator for construction activities that are of limited scope or unique and necessary based on weather, time of season, or nature of the particular activity. (e.g. concrete pours, roadway paving, utility installation, etc.)~~construction hours for the pouring of concrete slabs, interior construction hours or other modifications (roadway paving, utility installation, etc.), a plan detailing the construction operations and provisions to minimize impacts on nearby residential areas shall be submitted and approved to the satisfaction of the Administrator.

~~E.~~H. Open Space Deed Restrictions

All designated open space and common areas intended for open space uses shall be deed restricted per Reno Municipal Code Section 18.~~12.101(f)~~09.208, as amended.

~~F. Fire, Police and Parks Fees~~

~~**Refer to Sections I-I, and II-G and III-B for details on implementation of certain fees for and construction of these public facilities.**~~

~~G.~~I. NV Energy Substation

The owner, his agent or designee shall notify and disclose to all potential buyers, renters and tenants within the project that there is an existing electrical power substation located approximately 1,450 feet northeast of the PUD which may be expanded in the future.

~~H.~~J. Health Department Wind Sensor Condition

Prior to issuance of each building permit, or approval of each final map, as applicable, the applicant shall have plans approved to install a wind sensor unit in all on-site areas containing turf.

~~I.~~K. Airport Avigation Condition

Prior to issuance of each building permit, or approval of each final map, as applicable, the property owner(s) shall grant an Avigation Easement to, and acceptable to, the Airport Authority of Washoe County over the entire ±~~+-~~77.3 acre property. The property owner(s) shall provide the Planning Department with appropriate documentation indicating the Avigation Easement has been granted and accepted by the Airport Authority of Washoe County.

L. Review Process

Prior to the submittal of a development application to the City, the proposed development shall be reviewed by the Master Developer at their sole discretion. Each development application submitted to the City shall include written documentation of approval from the Master Developer.

Written approval by the Master Developer does not constitute City approval of a development application. The construction of individual projects, including accessory structures shall follow the City of Reno building permit process. For some uses where a tentative map, conditional use permit, or site plan review is required, these processes shall precede the building permit process, as applicable.

Appeals:

The applicant or developer may appeal any decision, comments, or recommendations of the Administrator in accordance with RMC Section 18.08.307(J), as amended.

~~L. Gravel Pit~~

~~Refer to Page 3, paragraph B.2, of this PUD Handbooks~~

~~M. Shooting Range~~

~~Refer to Page 4, paragraph B.2, of this PUD Handbook~~

~~V. Zoning Ordinance, Certifications, Clerks Letter, Regional Planning Letter~~

~~Attachment 1~~

~~Zoning Ordinance & City Council Certification Letter~~

~~chment 2~~

~~s Letter, Regional Planning Letter~~

~~Attachment 3~~

~~Development Services Amendment Decision Letter~~

~~/. APPENDIX~~

~~A. Traffic Study – Solaegui Engineering, June 2005~~

~~-1 Update/Addendum Letter – Solaegui Engineering, April 2010~~

~~**B. Flood Control Master Plan** – QuadKnopf Consulting, December 2005 B-1 CLOMR approval letter from FEMA, dated August 8, 2007 B-2 LOMR approval letter from FEMA, dated April 25, 2008~~

~~B-3 Bella Vista Ranch Drainage District – Recorded as document Number 3522200~~

~~**C. Wetland Mitigation Plan** – Gibson & Skordal, Wetlands Consultants, February 2005~~

~~-1 404 Individual Permit # 200400683, dated February~~

~~**D. Geotechnical Report** – Black Eagle Consulting, Inc., August 23, 2004~~

~~**E.** List of Uses in the SF4, MF14, MF 21 and MF30 zones not allowed in the Bella Vista Ranch Phase II PUD~~

~~Manufactured Homes Mobile Home Subdivision Electric Generating Plant Electric Utility Substation Utilities Major~~

~~Boarding and rooming houses Fraternity or Sorority~~

~~Hospice~~

~~Private Dorm~~

~~**F.** List of non-residential uses that will be allowed in this PUD General Personal Service~~

~~Child Care Facility (Village C only) Cluster Development Convenience store~~

~~Car wash~~

~~Financial Institution (Village C Only) Laboratory~~

~~Medical facility, day use only~~

~~General Retail Store or Commercial Use other than listed~~

~~Office other than listed Pet store~~

~~Restaurant, with or without alcohol service Showroom~~

~~Hotel without gaming Post office~~

~~Custom & craft work~~

~~List of non-residential uses strictly prohibited~~

~~LRE (Large Retail Establishments) Gas station~~

~~**G. First Amended Public Facility Site Agreement**~~

~~**H. Residential Construction Tax Agreement**~~

McGinley & Associates
Environmental Engineering and Science

Reno Office
5410 Longley Lane
Reno, Nevada 89511

775.829.2245

Las Vegas Office
1915 N. Green Valley Pkwy, Suite 200
Henderson, Nevada 89074

702.260.4961

www.mcgin.com

August 14, 2020
Project #LRRC011

Unitex Management Corporation
c/o Lewis Roca Rothergerber Christie LLP
One East Liberty Street, Suite 300
Reno, NV 89501

ATTN: Mr. Casey Stiteler

RE: **RESULTS OF LIMITED NEAR SURFACE SOIL SAMPLING, APN 165-011-38, RENO, WASHOE COUNTY, NV (SITE)**

Mr. Stiteler:

McGinley and Associates, Inc. (McGinley) has prepared this report describing the limited near surface soil sampling activities conducted at the Site. The location of the Site is indicated in Figure 1.

1. OBJECTIVES

The objective of the limited near surface soil sampling activities was to determine if the developable portion of the above-referenced Site (i.e. outside of wetlands) has been impacted by mercury from Comstock Era mining activities.

2. SCOPE OF WORK

The sampling activities included the following:

- Collecting five soil samples from approximately eight inches below ground surface (bgs);
- analytical testing of the collected samples; and
- preparing this report of findings.

3. LIMITED SURFACE SOIL SAMPLING ACTIVITIES

3.1 Soil Sample Collection

On August 7, 2020, a McGinley representative collected five soil samples from the northern portion of APN 165-011-37 at the locations indicated in Figure 2. The locations of soil samples previously collected at the Site, under a different contract, are also included in Figure 2 for reference. Soil samples were collected from approximately eight inches bgs using hand tools. Sampling tools were decontaminated with a mixture of deionized water and Alconox between each sample. The soil samples were placed in laboratory provided glass sample containers with Teflon lids, sealed, labeled, and preserved on ice in a cooler pending delivery to the laboratory for analysis.

3.2 Analytical Testing

The soil samples were shipped under chain of custody protocol to Pace Analytical in Mount Juliet, TN and were analyzed for mercury using EPA Method SW7471. The chain-of custody record and laboratory reports for all soil samples are provided in Attachment A.

3.3 Analytical Results

Analytical results for the soil samples are summarized in Table 1. Detectable concentrations of mercury were reported in four of the five collected samples and ranged from 0.066 mg/kg (S2) to 0.768 mg/kg (S4).

4. CONCLUSIONS AND RECOMMENDATIONS

All reported concentrations of mercury were below the Nevada reportable concentration for mercury in soil of 11 mg/kg, which is consistent with previous samples collected from the southern portion of the parcel. As such, McGinley is of the opinion that no further assessments are warranted at this time.

5. LIMITATIONS

The conclusions presented herein are partially based on information compiled by McGinley and others. McGinley makes no warranties or guarantees as to the accuracy or completeness of information provided or compiled by others. The results reported herein are applicable to the time the sampling occurred. Changes in site hydrogeology may occur as a result of rainfall, snowmelt, water usage, or other factors.

It should be recognized that definition and evaluation of environmental conditions is a difficult and inexact science. Judgments and opinions leading to conclusions and recommendations are generally made with an incomplete knowledge of the conditions present. More extensive studies, including additional environmental investigations, can tend to reduce the inherent uncertainties associated with such studies. Additional information not found or available to McGinley at the time of writing this report may result in a modification to the conclusions and recommendations contained herein.

The presentation of data presented herein is intended for the purpose of the visualization of environmental conditions. A greater degree of spatial and temporal data density may result in a more accurate representation of environmental conditions. Although such data visualization techniques may aid in providing a conceptual understanding of environmental conditions, such presentations are not intended to completely depict environmental conditions.

This report is not a legal opinion. The services performed by McGinley have been conducted in a manner consistent with the level of care ordinarily exercised by members of our profession currently practicing under similar conditions. No other warranty, expressed or implied, is made.

The use of the word "certify" in this document constitutes an expression of professional opinion regarding those facts or findings which are the subject of the certification and does not constitute a warranty or guarantee, either express or implied.

6. CLOSING

Should you have any questions regarding this report please contact Caitlin Jelle at 775.829.2245
Respectfully submitted,

McGinley and Associates, Inc.

Anna Henry, E.I.
Staff Engineer

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations, and ordinances.

Caitlin Jelle

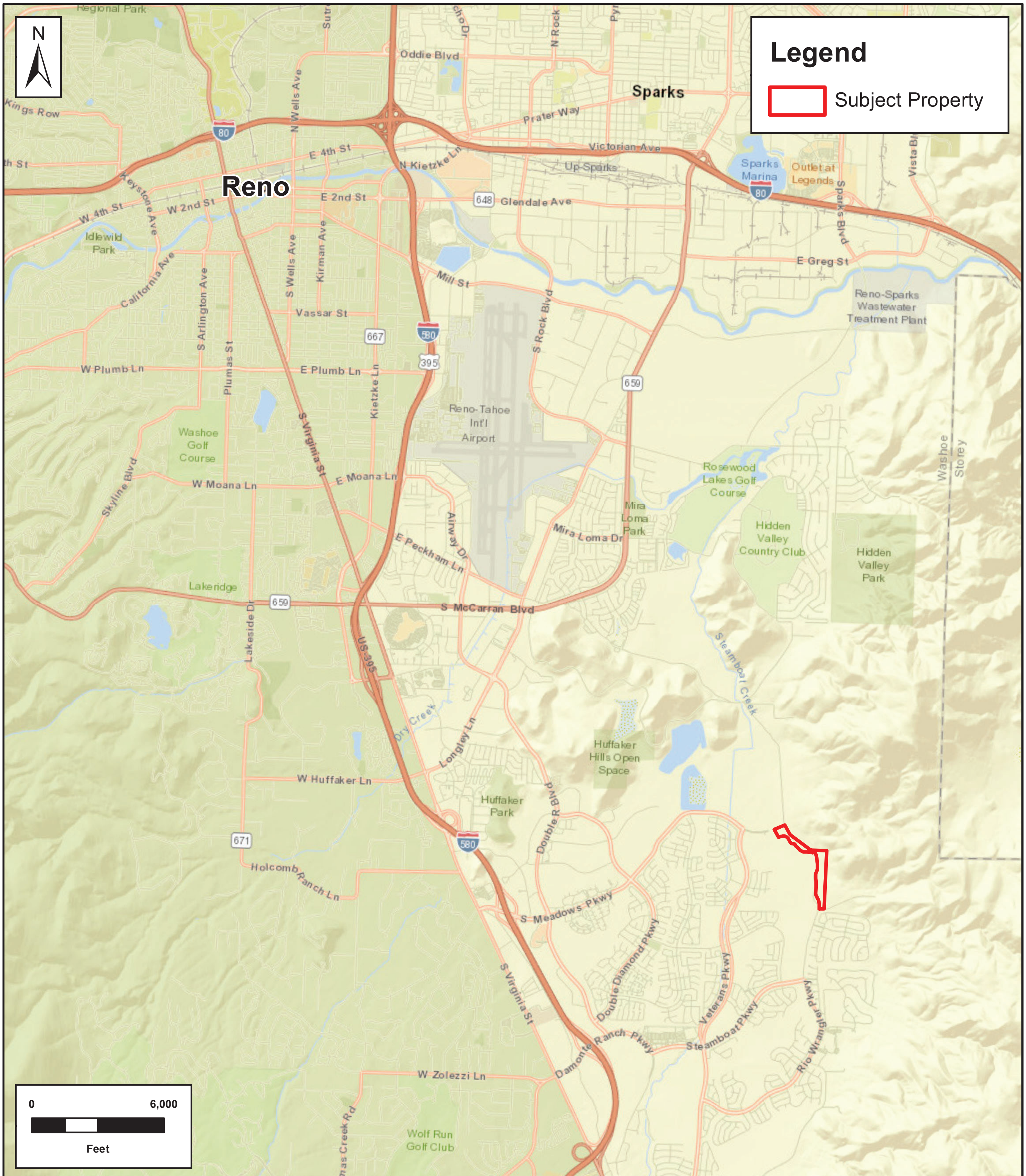
Caitlin Jelle, P.E., CEM #2454 (Exp. 3/22)
Project Manager

TABLE

Table 1. Summary of Analytical Results for Soil Samples			
Sample Location	**Sample ID**	**Date**	**Mercury (mg/kg)**
SS1	PLA001-SS1	28-Aug-19	0.263
SS2	PLA001-SS2	28-Aug-19	0.059
SS3	PLA001-SS3	28-Aug-19	<0.0028
SS4	PLA001-SS4	28-Aug-19	0.384
SS5	PLA001-SS5	28-Aug-19	<0.0028
SS6	PLA001-SS6	28-Aug-19	0.032
SS7	PLA001-SS7	28-Aug-19	0.153
SS8	PLA001-SS8	28-Aug-19	0.079
SS9	PLA001-SS9	28-Aug-19	0.022
SS10	PLA001-SS10	28-Aug-19	0.225
SS11	PLA001-SS11	28-Aug-19	0.998
SS12	PLA001-SS12	28-Aug-19	0.757
SS13	PLA001-SS13	28-Aug-19	1.600
SS14	PLA001-SS14	28-Aug-19	0.6910
SS15	PLA001-SS15	28-Aug-19	0.011
SS16	PLA001-SS16	28-Aug-19	0.106
SS17	PLA001-SS17	28-Aug-19	2.880
SS18	PLA001-SS18	28-Aug-19	1.740
SS19	PLA001-SS19	28-Aug-19	0.243
SS20	PLA001-SS20	28-Aug-19	0.666
S1	LRRC011-S1@8"	7-Aug-20	0.562
S2	LRRC011-S2@8"	7-Aug-20	0.066
S3	LRRC011-S3@8"	7-Aug-20	0.103
S4	LRRC011-S4@8"	7-Aug-20	0.768
S5	LRRC011-S5@8"	7-Aug-20	<0.0202
Nevada Reportable Concentration for Mercury in Soil			**11**

mg/Kg milligrams per kilograms

FIGURES



REVISIONS NO.		BY	DATE

A	
DESIGNED	BP
DRAWN	BP
CHECKED	BP
APPROVED	BP

JOB NO.:
PLA001

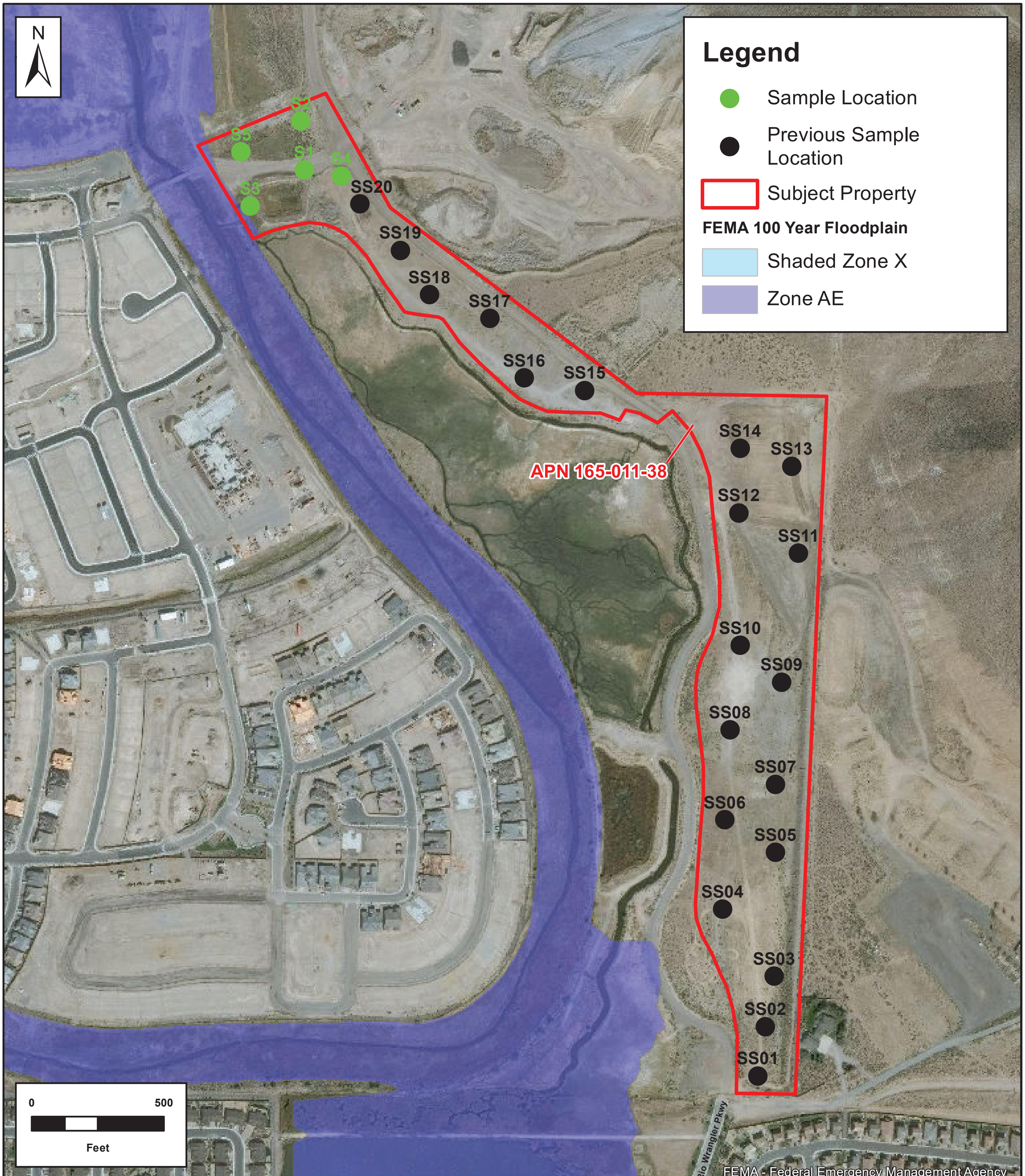
FIGURE 1

PROJECT LOCATION MAP
-SHOWING-
PROPOSED BELLA VISTA RANCH PHASE II DEVELOPMENT PROJECT
RENO, NEVADA

McGinley & Associates
Environmental Engineering and Science
RENO | LAS VEGAS | www.mcgin.com

COORDINATE SYSTEM:
NAD 1983 UTM Zone 11N

PLA001 - Figure 1
9/24/2019



REVISIONS NO.		BY	DATE

A		
	DESIGNED	BP
	DRAWN	BP
JOB NO.:	CHECKED	BP
PLA001	APPROVED	BP

FIGURE 2

SITE MAP
-SHOWING-
DISCRETE SOIL SAMPLE LOCATIONS AND 100 YEAR FLOODPLAIN
PROPOSED BELLA VISTA RANCH PHASE II DEVELOPMENT PROJECT
RENO, NEVADA

McGinley & Associates
Environmental Engineering and Science
RENO | LAS VEGAS | www.mcgin.com

COORDINATE SYSTEM:
NAD 1983 UTM Zone 11N

LRRC011 - Figure 2
8/13/2020

ATTACHMENT A

Chain-of-Custody Records and Analytical Reports for Soil Samples

Pace Analytical®
National Center for Testing & Innovation

ANALYTICAL REPORT

August 13, 2020

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

McGinley & Assoc. - Reno, NV

Sample Delivery Group:	L1249109
Samples Received:	08/11/2020
Project Number:	LRRC011
Description:	Bella Vista
Report To:	Caitlin Jelle 5410 Longley Lane Reno, NV 89511

Entire Report Reviewed By: Chris Ward

Chris Ward
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.

LRRC011-S1@8" L1249109-01 Solid

Collected by	Collected date/time	Received date/time
Curtis Marcille	08/07/20 10:55	08/11/20 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1525253	1	08/13/20 09:26	08/13/20 09:35	KBC	Mt. Juliet, TN
Mercury by Method 7471A	WG1525284	1	08/13/20 09:55	08/13/20 11:15	ABL	Mt. Juliet, TN

LRRC011-S2@8" L1249109-02 Solid

Collected by	Collected date/time	Received date/time
Curtis Marcille	08/07/20 11:15	08/11/20 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1525253	1	08/13/20 09:26	08/13/20 09:35	KBC	Mt. Juliet, TN
Mercury by Method 7471A	WG1525284	1	08/13/20 09:55	08/13/20 11:22	ABL	Mt. Juliet, TN

LRRC011-S3@8" L1249109-03 Solid

Collected by	Collected date/time	Received date/time
Curtis Marcille	08/07/20 11:30	08/11/20 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1525253	1	08/13/20 09:26	08/13/20 09:35	KBC	Mt. Juliet, TN
Mercury by Method 7471A	WG1525284	1	08/13/20 09:55	08/13/20 11:25	ABL	Mt. Juliet, TN

LRRC011-S4@8" L1249109-04 Solid

Collected by	Collected date/time	Received date/time
Curtis Marcille	08/07/20 11:45	08/11/20 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1525253	1	08/13/20 09:26	08/13/20 09:35	KBC	Mt. Juliet, TN
Mercury by Method 7471A	WG1525284	1	08/13/20 09:55	08/13/20 11:27	ABL	Mt. Juliet, TN

LRRC011-S5@8" L1249109-05 Solid

Collected by	Collected date/time	Received date/time
Curtis Marcille	08/07/20 12:05	08/11/20 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Total Solids by Method 2540 G-2011	WG1525253	1	08/13/20 09:26	08/13/20 09:35	KBC	Mt. Juliet, TN
Mercury by Method 7471A	WG1525284	1	08/13/20 09:55	08/13/20 11:30	ABL	Mt. Juliet, TN

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Chris Ward

Chris Ward
Project Manager

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	93.9		1	08/13/2020 09:35	WG1525253

Mercury by Method 7471A

Analyte	Result (dry) mg/kg	Qualifier	MDL (dry) mg/kg	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.562		0.0192	0.0426	1	08/13/2020 11:15	WG1525284

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	96.8		1	08/13/2020 09:35	WG1525253

Mercury by Method 7471A

Analyte	Result (dry) mg/kg	Qualifier	MDL (dry) mg/kg	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.0660		0.0186	0.0413	1	08/13/2020 11:22	WG1525284

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	96.8		1	08/13/2020 09:35	WG1525253

Mercury by Method 7471A

Analyte	Result (dry) mg/kg	Qualifier	MDL (dry) mg/kg	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.103		0.0186	0.0413	1	08/13/2020 11:25	WG1525284

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	90.0		1	08/13/2020 09:35	WG1525253

Mercury by Method 7471A

Analyte	Result (dry) mg/kg	Qualifier	MDL (dry) mg/kg	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.768		0.0200	0.0445	1	08/13/2020 11:27	WG1525284

Total Solids by Method 2540 G-2011

Analyte	Result %	Qualifier	Dilution	Analysis date / time	Batch
Total Solids	89.2		1	08/13/2020 09:35	WG1525253

Mercury by Method 7471A

Analyte	Result (dry) mg/kg	Qualifier	MDL (dry) mg/kg	RDL (dry) mg/kg	Dilution	Analysis date / time	Batch
Mercury	0.0362	J	0.0202	0.0448	1	08/13/2020 11:30	WG1525284

Method Blank (MB)

(MB) R3559510-1 08/13/20 09:35

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
	%		%	%
Total Solids	0.000			

L1249109-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1249109-02 08/13/20 09:35 • (DUP) R3559510-3 08/13/20 09:35

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	%	%		%		%
Total Solids	96.8	96.8	1	0.0102		10

Laboratory Control Sample (LCS)

(LCS) R3559510-2 08/13/20 09:35

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	%	%	%	%	
Total Solids	50.0	50.0	100	85.0-115	

Method Blank (MB)

(MB) R3559373-1 08/13/20 11:10

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
Mercury	U		0.0180	0.0400

Laboratory Control Sample (LCS)

(LCS) R3559373-2 08/13/20 11:12

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Mercury	0.500	0.520	104	80.0-120	

L1249109-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1249109-01 08/13/20 11:15 • (MS) R3559373-3 08/13/20 11:17 • (MSD) R3559373-4 08/13/20 11:20

Analyte	Spike Amount (dry) mg/kg	Original Result (dry) mg/kg	MS Result (dry) mg/kg	MSD Result (dry)	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Mercury	0.532	0.562	0.982	0.958	78.9	86.2	1	75.0-125			3.85	20

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
MDL	Method Detection Limit.
MDL (dry)	Method Detection Limit.
RDL	Reported Detection Limit.
RDL (dry)	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J	The identification of the analyte is acceptable; the reported value is an estimate.

Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.
* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LAO00356
Kentucky [1 6]	90010	South Carolina	84004
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana [1]	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

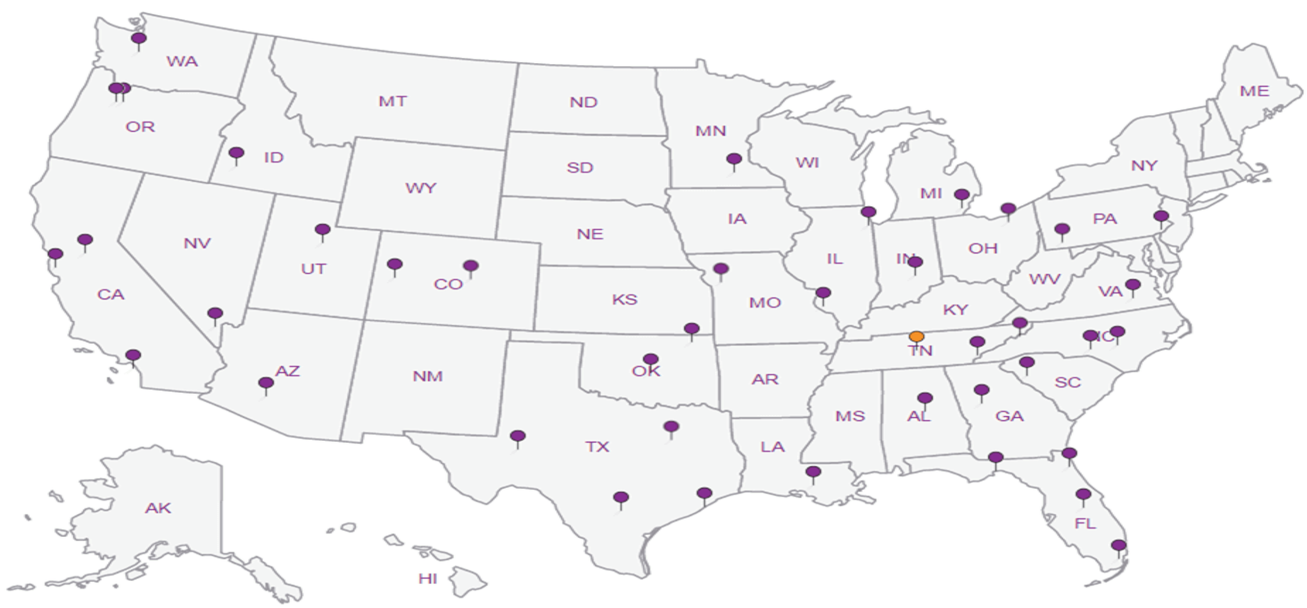
Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



Chain of Custody Page 1 of 1

Pace Analytical®
National Center for Testing & Innovation

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McGinley & Assoc. - Reno, NV

5410 Longley Lane
Reno, NV 89511

Billing Information:
Accounts Payable
5410 Longley Lane
Reno, NV 89511

Pres Chk

Report to: Caitlin Jelle

Email To: cjelle@mcgin.com;ahenry@mcgin.com

Project Description: Bella Vista

City/State Collected: Reno, Nevada

Please Circle: PT MT CT ET

Phone: 775-829-2245

Client Project # LRRC011

Lab Project # MCGINRNV-LRRC011

Collected by (print): Curtis Marcille

Site/Facility ID #

P.O. #

Collected by (signature): [signature]

Rush? (Lab MUST Be Notified)
___ Same Day X Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed

Immediately Packed on Ice N___ Y___

SDG # 1249109

J118

Acctnum: MCGINRNV
Template: T172417
Prelogin: P790601
PM: 824 - Chris Ward
PB:
Shipped Via: FedEX Ground

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	HG 2ozClr-NoPres	Remarks	Sample # (lab only)
LRRC011- S1@8"	Grab	SS	8" Bgs	8/7/20	1055	1	X		-01
- S2@8"	|	SS	|	|	1115	1	X		-02
- S3@8"	|	SS	|	|	1130	1	X		-03
- S4@8"	|	SS	|	|	1145	1	X		-04
- S5@8"	|	SS	|	|	1205	1	X		-05

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other______

Remarks:

pH ______ Temp ______
Flow ______ Other ______

Samples returned via:
__ UPS __ FedEx __ Courier ______

Tracking # 3956 6754 7804

Sample Receipt Checklist
COC Seal Present/Intact: NP __Y __N
COC Signed/Accurate: ✓Y __N
Bottles arrive intact: ✓Y __N
Correct bottles used: ✓Y __N
Sufficient volume sent: ✓Y __N
If Applicable
VOA Zero Headspace: __Y __N
Preservation Correct/Checked: __Y __N
RAD Screen <0.5 mR/hr: ✓Y __N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Trip Blank Received: Yes / No HCL / MeoH TBR	
[signature]	8/10/20	10:00		0	
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)	Temp: 2.8-.1=2.7 °C	Bottles Received: 5
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature) [signature]	Date: 08/11/2020	Time: 8:45

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK

Exhibit D - Appendix

TRAFFIC IMPACT STUDY

FOR

BELLA VISTA II PUD AMENDMENT

December 22, 2023

PREPARED FOR:

Wood Rodgers, Inc

PREPARED BY:

HEADWAY TRANSPORTATION

PROFESSIONAL ENGINEER - STATE OF NEVADA
M. SCOTT HENRY
Exp. 06/30/25
CIVIL
No. 12539

Headway Transportation, LLC
5482 Longley Lane, Suite B, Reno, Nevada 89511
775.322.4300
www.HeadwayTransportation.com

YOUR QUESTIONS ANSWERED QUICKLY

Why did you perform this study?

This Traffic Impact Study evaluates the potential traffic impacts associated with the proposed Bella Vista II PUD Amendment in Reno, Nevada. This study of potential transportation impacts was undertaken for planning purposes and to assist in determining what traffic controls or mitigations may be needed to reduce potential impacts, if any are found.

What does the project consist of?

The Bella Vista II PUD Amendment consists of 25.9 acres of residential land use (approximately 602 multifamily units) and 6.8 acres of commercial land use (approximately 74,050 square feet of building floor area). For the purposes of this study, the commercial land uses consist of a pharmacy/drugstore with drive-through window, drive-in bank, sit-down restaurant, coffee/donut shop with drive-through window, automatic car wash, and general retail. The previously approved PUD land uses for the project consisted of 19.2 acres of residential land (575 multifamily units) and 16.4 acres of commercial land (178,600 square feet of building floor area).

How much traffic will the project generate?

The proposed amendment will generate essentially the same amount of traffic as the currently approved PUD. The amended project is anticipated to generate 7,752 net new Daily, 545 net new AM peak hour, and 588 net new PM peak hour trips. The land uses and quantities are preliminary and subject to change as the project develops. Any similar project land use mix generating equal or fewer trips is deemed to have similar or less impact and is addressed by this study.

How will project traffic affect the roadway network?

Under Baseline Plus Project conditions, the study intersections are anticipated to operate within overall policy level of service thresholds during the AM and PM peak hours except for the all-way stop controlled Steamboat Parkway/Rio Wrangler Parkway intersection which is anticipated to operate at LOS F during the AM peak hour with or without the project. A roundabout, which is anticipated to operate at overall LOS A during the AM and PM peak hours for Baseline Plus Project conditions, is planned to be installed at this intersection by the RTC as a regional improvement and is identified in the *Intersection Control Evaluation Steamboat Parkway/Rio Wrangler Parkway* study dated September 28, 2022. That improvement is anticipated in the 2025 – 2030 timeframe, likely ahead of buildout of the project.

Under Future Year Plus Project conditions, the study intersections are anticipated to operate within overall policy level of service thresholds during the AM and PM peak hours. The northbound left turn movement at the S. Meadows Parkway/Project Access 1 intersection (the project approach) is anticipated to operate at LOS F during the AM and PM peak hours. LOS F conditions for a side-street approach, during the peak hour(s), does not necessarily indicate an intersection failure or the need for mitigation. This condition (LOS F for a minor side-street approach) commonly exists throughout urban and suburban areas and is manageable in this case since there would be other project departure options. The poor peak hour operations would not affect operations on S. Meadows Parkway. Queuing would be internal to the project. This intersection should be revisited with formal site plan review.

Are any improvements recommended?

Project Access 1 on S. Meadows Parkway should contain side-street stop sign control and operate with right-in, right-out, and left-out movements only (left-in movement prohibited). This access should contain an eastbound right-turn deceleration lane, 230 feet in total length with 50 feet of full lane width and 180 feet of taper. A traffic study update should be prepared for Project Access 1 when a site plan is developed.

Project Accesses 2 and 3 on Rio Wrangler Parkway should be located so that they align with the proposed Talus Valley accesses (labeled Daybreak North Access and Daybreak South Access) on the east side of Rio Wrangler Parkway. Both intersections should contain side-street stop sign control with northbound and southbound left turn lanes, 200 feet in total length with 150 feet of full lane width and 50 feet of taper. Project Access 2 should contain a southbound right-turn deceleration lane, 230 feet in total length with 50 feet of full lane width and 180 feet of taper.

Project Accesses 4, 5, and 6 on Rio Wrangler Parkway should contain side-street stop sign control with southbound left turn lanes, 200 feet in total length with 150 feet of full lane width and 50 feet of taper.

A formal site plan has not yet been prepared for the project showing the exact location of the project accesses. It is recommended that when a formal site plan is prepared, the project accesses meet RTC's access management standards for spacing and left turn movements.

The project will pay Regional Road Impact Fees (RRIF) as mitigation for its minor impacts on the regional roadway network. The amount due will be the standard fee based on the actual amount of commercial/retail floor area and the actual number of multi-family dwelling units. Depending on timing relative to the Talus Valley (Daybreak) project, this project may construct portions of S. Meadows Parkway and may be eligible for an RRIF Offset agreement for improvements and/or right-of-way dedication deemed "regional improvements."

The S. Meadows Parkway/Rio Wrangler Parkway intersection should initially be all-way stop controlled in anticipation of future signalization when signal warrants are met. Since the relative timing of the Talus Valley (Daybreak) project, this project, and the potential extension of S. Meadows Parkway further east towards Sunny Hills and USA Parkway are undefined, this project should pay regional road impact fees toward future improvements at the intersection.

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

This report presents the findings of a Traffic Impact Study completed to assess the potential traffic impacts on local intersections associated with the Bella Vista II PUD Amendment in Reno, Nevada. This study was undertaken as part of a PUD Handbook Amendment. This traffic impact study has been prepared to document existing traffic conditions, quantify traffic volumes generated by the proposed project, compare the traffic generation to the previous approved PUD, identify potential impacts, document findings, and make recommendations to mitigate impacts, if any are found. The location of the project is shown on **Figure 1** and the preliminary land use plan is shown on **Figure 2**.

The previously approved land uses for the existing Bella Vista II PUD consist of 19.2 acres of residential land (575 total multifamily units) and 16.4 acres of commercial land (178,600 square feet of building floor area).

The Bella Vista II PUD Amendment proposes 25.9 acres of residential land use (approximately 602 multifamily units) and 6.8 acres of commercial land use (approximately 74,050 square feet of building floor area). For the purposes of this study, the commercial land uses are assumed to consist of a pharmacy/drugstore with drive-through window, drive-in bank, sit-down restaurant, coffee/donut shop with drive-through window, automatic car wash, and general retail.

The study intersections were identified as those most likely to be impacted by project and are shown on **Figure 1**. The following intersections are included in this study:

- S. Meadows Parkway / Veterans Parkway
- S. Meadows Parkway / Project Access 1
- S. Meadows Parkway / Rio Wrangler Parkway
- Rio Wrangler Parkway / Project Access 2 / Talus Valley (Daybreak) North Access
- Rio Wrangler Parkway / Project Access 3 / Talus Valley (Daybreak) South Access
- Rio Wrangler Parkway / Project Access 4
- Rio Wrangler Parkway / Project Access 5
- Rio Wrangler Parkway / Project Access 6
- Steamboat Parkway / Rio Wrangler Parkway

This study includes analysis of both the weekday AM and PM peak hours as these are the periods of time in which peak traffic is understood to occur. The evaluated development scenarios are:

- Baseline Conditions
- Baseline Plus Project Conditions
- Future Year Conditions (20-year Horizon)
- Future Year Plus Project Conditions

ANALYSIS METHODOLOGY

Level of service (LOS) is a term commonly used by transportation practitioners to measure and describe the operational characteristics of intersections, roadway segments, and other facilities. This term equates seconds of delay per vehicle at intersections to letter grades "A" through "F" with "A" representing optimum conditions and "F" representing breakdown or over capacity flows.

Intersections

The complete methodology for intersection level of service analysis is established in *the Highway Capacity Manual (HCM), 6th Edition* published by the Transportation Research Board (TRB). **Table 1** presents the delay thresholds for each level of service grade at signalized and unsignalized intersections.

Table 1: Level of Service Definition for Intersections

Level of Service	Brief Description	Average Delay (seconds per vehicle)	
		Signalized Intersections	Unsignalized Intersections
A	Free flow conditions.	< 10	< 10
B	Stable conditions with some affect from other vehicles.	10 to 20	10 to 15
C	Stable conditions with significant affect from other vehicles.	20 to 35	15 to 25
D	High density traffic conditions still with stable flow.	35 to 55	25 to 35
E	At or near capacity flows.	55 to 80	35 to 50
F	Over capacity conditions.	> 80	> 50

Source: *Highway Capacity Manual, 6^{th} Edition*

Level of service calculations were performed for the study intersections using the Synchro 11 software package with analysis and results reported in accordance with *HCM, 6^{th} Edition* methodology.

Level of Service Policy

The Regional Transportation Commission's (RTC) *2050 Regional Transportation Plan (RTP)* establishes level of service criteria for regional roadway facilities in the City of Reno. The current Level of Service policy is:

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

Veterans Parkway is projected to carry more than 27,000 ADT north and south of S. Meadows Parkway and S. Meadows Parkway, Steamboat Parkway, and Rio Wrangler Parkway within the project vicinity are projected to carry less than 27,000 ADT in the 2050 horizon year. Therefore, LOS E was used as the threshold criteria for the S. Meadows Parkway/Veterans Parkway intersection and LOS D was used as the threshold criteria for the other study intersections. The policy applies to overall intersection operations, not individual movements.

If an intersection operates at unacceptable conditions without the project, then the project impacts should be mitigated to pre-project conditions.

It should be noted that traffic engineering practitioners recognize that LOS E/F conditions for the side street approach, during the peak hour(s), does not necessarily indicate an intersection failure or the need for mitigation. This condition (LOS E/F for a minor side-street approach) commonly exists throughout urban and suburban areas and is manageable in most cases.

EXISTING TRANSPORTATION FACILITIES

Major Roadways

A brief description of the key roadways in the study area is provided below.

S. Meadows Parkway is generally an east-west, four-lane roadway with two through lanes in each direction near the Veterans Parkway study intersection. S. Meadows Parkway ends approximately 1,000 east of Veterans Parkway, just west of Steamboat Creek. The speed limit is posted at 35 mph. S. Meadows Parkway is classified as an Arterial with Moderate Access Control in RTC's *2050 Regional Transportation Plan*.

Veterans Parkway is a north-south, six-lane roadway with three through lanes in each direction north of S. Meadows Parkway and a four-lane roadway with two through lanes in each direction south of S. Meadows Parkway. The speed limit is posted at 55 mph on the six-lane segment and 45 mph on the four-lane segment. Veterans Parkway is classified as an Arterial with High Access Control in RTC's *2050 Regional Transportation Plan*.

Steamboat Parkway is generally an east-west, four-lane roadway with two through lanes in each direction west of Rio Wrangler Parkway and a two-lane local roadway with one through lane in each direction east of Rio Wrangler Parkway. The speed limit is posted at 35 mph. Steamboat Parkway is classified as an Arterial with Moderate Access Control in RTC's *2050 Regional Transportation Plan*.

Rio Wrangler Parkway is generally a north-south, two-lane roadway with one through lane in each direction near the Steamboat Parkway study intersection. Rio Wrangler Parkway ends approximately 3,000 feet north of Steamboat Parkway. The speed limit is posted at 35 mph. Rio Wrangler Parkway is classified as an Arterial with Moderate Access Control in RTC's *2050 Regional Transportation Plan*.

Bicycle, Pedestrian, and Transit Facilities

Striped bicycle lanes exist in both directions on Veterans Parkway, S. Meadows Parkway, Steamboat Parkway, and Rio Wrangler Parkway in the project vicinity. Sidewalks exist along both sides of Steamboat Parkway and Rio Wrangler Parkway, on the south side of S. Meadows Parkway, and on both sides of Veterans Parkway south of S. Meadows Parkway. A paved multi-use path exists on the east side of Veterans Parkway north of S. Meadows Parkway. Currently there are no public transit routes that operate within the project area.

Crash History

Vehicle crash data was obtained from NDOT for the study intersections for the latest five-year period from January 1, 2016 to January 1, 2021 (the most recent 5-year data).

A total of 4 crashes were reported at the S. Meadows Parkway/Veterans Parkway intersection with 2 crashes causing property damage only (PDO) and 2 crashes causing injury. A total of 2 people were injured in the 2 crashes, however, there were no fatalities. The crash types were 2 angle crashes, 1 sideswipe meeting crash, and 1 single-vehicle crash.

A total of 4 crashes were reported at the Steamboat Parkway/Rio Wrangler Parkway intersection with 3 crashes causing property damage only (PDO) and 1 crash causing injury. A total of 2 people were injured in the injury crash, however, there were no fatalities. The crash types were 2 angle crashes, 1 rear-end crash, and 1 single-vehicle crash.

It does not appear that there are any significant safety issues or trends at the existing intersections based on recent crash history. It is not anticipated that this project would cause a significant impact on the safety of the local roadway network. The complete NDOT crash data is provided in **Appendix A**.

BASELINE CONDITIONS

The Baseline conditions assume planned roadway improvements and the approved Talus Valley (Daybreak) Planned Unit Development will be in place/constructed prior to this project.

Roadway Improvements

The following roadway improvements are included in the Baseline Conditions analysis:

- S. Meadows Parkway extension from its current terminus east to Rio Wrangler Parkway. This improvement is identified in RTC's *2050 RTP Complete Street Project Listing* for the 2021 - 2025 time period and is consistent with the Talus Valley project and current Bella Vista II PUD Handbook.
- Rio Wrangler Parkway extension from its current terminus north to S. Meadows Parkway. This improvement is identified in RTC's *2050 RTP Complete Street Project Listing* for the 2021 - 2025 time period and will be completed by the project if not completed by others.
- Rio Wrangler Parkway extension north of S. Meadows Parkway within Talus Valley. This improvement is identified in RTC's *2050 RTP Complete Street Project Listing* for the 2021 - 2025 time period and will be constructed by the Talus Valley project.

With the above improvements the S. Meadows Parkway/Rio Wrangler Parkway intersection will be a three-leg intersection with stop sign control at the northbound, southbound, and eastbound approaches. In addition, the Talus Valley project plans to construct two accesses on Rio Wrangler Parkway south of S. Meadows Parkway. Both of those access intersections (labeled Daybreak North Access and Daybreak South Access) would be three-leg intersections with stop sign control at the westbound approaches.

Traffic Volumes

Existing AM and PM peak hour traffic volumes were collected on Tuesday, November 28, 2023 at the S. Meadows Parkway/Veterans Parkway intersection and on Thursday, December 7, 2023 at the Steamboat Parkway/Rio Wrangler Parkway intersection. The Washoe County School District was in session during the count periods. The traffic counts include pedestrian and bicycle movements, truck percentages, and peak hour factors. Traffic signal phasing/timing were also observed at the S. Meadows Parkway/Veterans Parkway intersection during the peak hours and used in the baseline level of service analysis.

Baseline traffic volumes were developed based on the programmed roadway improvements discussed above. The S. Meadows Parkway extension to Rio Wrangler Parkway and the Rio Wrangler Parkway extension north to S. Meadows Parkway would provide a shorter connection to/from north Veterans Parkway and west S. Meadows Parkway for some existing drivers with destination/origins south of the project along Rio Wrangler Parkway. Baseline traffic volumes were therefore developed by rerouting a portion of existing traffic volumes at the S. Meadows Parkway/Veterans Parkway and Steamboat Parkway/Rio Wrangler Parkway intersections to the S. Meadows Parkway and Rio Wrangler Parkway extensions, through the new S. Meadows Parkway/Rio Wrangler Parkway intersection, and then adding traffic generated by the Talus Valley (Daybreak) project. **Figure 3** shows the Baseline peak hour traffic volumes, lane configurations, and controls at the study intersections.

Intersection Level of Service Analysis

AM and PM peak hour intersection level of service analysis was performed for the study intersections based on the Baseline traffic volumes, the existing peak hour factors from the counts, and the lane configurations and controls shown on **Figure 3. Table 2** shows the Baseline conditions level of service results and the technical calculations are provided in **Appendix B**.

Table 2: Baseline Intersection Level of Service

Int. ID	Intersection	Control	AM		PM	
			Delay[1]	LOS	Delay[1]	LOS
1	S. Meadows Pkwy / Veterans Pkwy	Signal				
	Overall		23.7	C	40.1	D
3	S. Meadows Pkwy / Rio Wrangler Pkwy	All-Way Stop				
	Overall		10.3	B	11.1	B
4	Rio Wrangler Pkwy / Talus Valley (Daybreak) North Access	Side-Street Stop				
	Overall		1.8	A	2.1	A
	Southbound Left		7.6	A	7.5	A
	Westbound Approach		9.9	A	9.4	A
5	Rio Wrangler Pkwy / Talus Valley (Daybreak) South Access	Side-Street Stop				
	Overall		1.1	A	1.3	A
	Southbound Left		7.6	A	7.5	A
	Westbound Approach		9.8	A	9.3	A
9	Steamboat Pkwy / Rio Wrangler Pkwy	All-Way Stop				
	Overall		95.6	F	13.8	B
9	Steamboat Pkwy / Rio Wrangler Pkwy	Round-About				
	Overall		5.8	A	4.0	A

Notes: 1. Delay is reported in seconds/vehicle for the overall intersections and the worst approach/movement for side street stop controlled intersections.
Source: Headway Transportation, 2023

As shown in **Table 2**, the study intersections are anticipated to operate at overall LOS D or better during the AM and PM peak hours except for the Steamboat Parkway/Rio Wrangler Parkway intersection which operates at LOS F during the AM peak hour. This intersection also operates at LOS F during the AM peak hour for existing conditions. A roundabout is planned to be installed at this intersection (likely in the 2025 - 2030 timeframe) as identified in the *Intersection Control Evaluation Steamboat Parkway/Rio Wrangler Parkway* study dated September 28, 2022. The roundabout is anticipated to operate at overall LOS A operation during the AM and PM peak hours.

PROJECT CONDITIONS

Trip Generation

Trip generation rates from the *Trip Generation Manual, 11th Edition* published by the Institute of Transportation Engineers (ITE) were used to develop trip generation estimates for the project based on the anticipated Multifamily Housing (220), Shopping Plaza (821), Pharmacy/Drugstore with Drive-Through Window (881), Drive-In Bank (912), High-Turnover (Sit-Down) Restaurant (932), Coffee/Donut Shop with Drive-Through Window (937), and Automatic Car Wash (948) land uses. The specific uses are speculation at this time, and subject to change, but used to develop a trip generation threshold for this study and PUD Handbook Amendment.

The trip generation accounts for internal trips and pass-by trips consistent with the *Trip Generation Handbook, 3rd Edition*. Internal trips are trips made between land uses within a mixed-use development and are not new trips on the external road network. Pass-by trips generated by the shopping plaza, pharmacy/drugstore, drive-in bank, sit-down restaurant, and coffee/donut shop land uses are made by drivers already on the external roadway network that divert to the project site on their way to another destination. **Table 3** shows the Daily, AM peak hour, and PM peak hour trip generation estimates for the Bella Vista II PUD Amendment.

Table 3: Trip Generation Estimates (Bella Vista II PUD Amendment)

Land Use (ITE Code)	Size[1]	Trips				
		Daily	AM	AM In/Out	PM	PM In/Out
Multifamily Housing (220)	602 du	4,058	241	58/183	307	193/114
Shopping Plaza (821)	49.05 ksf	3,312	85	53/32	255	125/130
Pharmacy w/Drive-Thru (881)	10 ksf	1,084	37	19/18	102	51/51
Drive-In Bank (912)	6 ksf	602	60	35/25	126	63/63
Sit-Down Restaurant (932)	5 ksf	536	48	26/22	46	28/18
Coffee Shop w/Drive Thru (937)	2 ksf	1,068	172	88/84	78	39/39
Automatic Car Wash (948)	2 ksf	280	14	7/7	28	14/14
Total Trip Generation		**10,940**	**657**	**286/371**	**942**	**513/429**
Internal Trips		-1,149	-32	-16/-16	-136	-68/-68
Pass-By Trips		-2,039	-80	-40/-40	-218	-109/-109
New Trips		**7,752**	**545**	**230/315**	**588**	**336/252**

Notes: 1. du = dwelling unit and ksf = 1,000 square feet
Source: Headway Transportation, 2023

The project is expected to generate approximately 10,940 total Daily, 657 total AM peak hour, and 942 total PM peak hour trips. After accounting for internal and pass-by trips, the project is anticipated to generate 7,752 net new Daily, 545 net new AM peak hour trips, and 588 net new PM peak hour trips.

It is important to note that the land uses and quantities are preliminary and subject to change as the project develops. Any similar project land use mix generating equal or fewer trips is deemed to have similar or less impact and is addressed by this study.

Trip generation for the existing Bella Vista II PUD was also reviewed in order to provide a comparison with the amended PUD trip generation discussed above. The current approved PUD land uses consist of 575 multifamily units and approximately 179,000 square feet of commercial building floor area. Trip generation estimates for the existing Bella Vista II PUD were obtained from the traffic analysis letter for Bella Vista II dated October 7, 2010. **Table 4** shows the total Daily, AM peak hour, and PM peak hour trip generation estimates for the existing Bella Vista II PUD.

Table 4: Trip Generation Estimates (Existing Bella Vista II PUD)

Land Use (ITE Code)	Size[1]	Trips				
		Daily	AM	AM In/Out	PM	PM In/Out
Multifamily Housing	575 du	3,341	253	40/213	299	201/98
Shopping Center	179 ksf	7,686	179	109/70	668	328/340
Total Trip Generation		**11,027**	**432**	**149/283**	**967**	**529/438**

Notes: 1. du = dwelling unit and ksf = 1,000 square feet
Source: Bella Vista II Traffic Analysis Letter dated October 7, 2010

Trip generation estimates for the proposed Bella Vista II PUD Amendment (**Table 3**) were compared with trip generation estimates for the existing Bella Vista II PUD (**Table 4**). **Table 5** shows the trip generation comparison.

Table 5: Trip Generation Comparison

Bella Vista II	Trips				
	Daily	AM	AM In/Out	PM	PM In/Out
Existing PUD (Table 4)	11,027	432	149/283	967	529/438
Amended PUD (Table 3)	10,940	657	286/371	942	513/429
Difference	**-87**	**+225**	**+137/+88**	**-25**	**-16/-9**

As shown in **Table 5**, the proposed Bella Vista II PUD Amendment is anticipated to generate 87 less daily, 225 more AM peak hour, and 25 less PM peak hour trips than the existing PUD land uses. The proposed amendment is essentially equal in traffic intensity to the existing PUD. The AM peak hour is not the critical peak hour, therefore an increase in AM peak hour trips is not a notable change.

Trip Distribution

New project trips were distributed to the adjacent roadway network based on existing traffic volumes, the locations of complimentary land uses, and anticipated travel patterns. New project trips were distributed based on the following:

- 35% to/from the west on S. Meadows Parkway
- 25% to/from the north on Veterans Parkway
- 14% to/from the west on Steamboat Parkway
- 10% to/from the south on Veterans Parkway
- 10% to/from the south on Rio Wrangler Parkway
- 5% to/from the north on Rio Wrangler Parkway
- 1% to/from the east on Steamboat Parkway

Figure 4 shows the project trip distribution and assignment.

Project Access

The preliminary land use plan shown on **Figure 2** indicates six total access points, one on S. Meadows Parkway and five on Rio Wrangler Parkway. S. Meadows Parkway and Rio Wrangler Parkway are regional roadways within the City of Reno so RTC access management standards apply. S. Meadows Parkway and Rio Wrangler Parkway are both classified as arterials with moderate access control so the following access management criteria apply:

- Left turns from the major roadway are permitted if the access is located a minimum of 500 feet from a signalized intersection.
- Left turns from the minor roadway are permitted on roadways with less than six lanes.
- Right turn deceleration lanes are required if there are more than 60 inbound right turn movements in the peak hour.
- Driveway spacing should be at least 200 feet from signalized intersections and 300 feet from other driveways.

The project access on S. Meadows Parkway (Project Access 1) would be located approximately midpoint along the project frontage per the preliminary land use plan which meets the driveway spacing requirements. However, the access would not meet the minimum 500 feet spacing requirement for left-in movements based on the limited amount of project frontage as well as the anticipated future traffic signal at the adjacent S. Meadows Parkway/Rio Wrangler Parkway intersection. The left-out movement is permitted since S. Meadows would be constructed as a four-lane roadway. The project is expected to generate more than 60 right turn-in vehicles during the AM and PM peak hours at Project Access 1 so an exclusive right turn deceleration lane is required.

The right-turn deceleration lane should be 230 feet in total with 50 feet of full lane width and 180 feet of taper length based on the 35 mph speed limit on S. Meadows Parkway. The S. Meadows Parkway/Project Access 1 intersection was therefore analyzed with right-in, right-out, and left-out movements and side-street stop control. This access will require further evaluation when a formal site plan is prepared and the land uses are known.

The project accesses on Rio Wrangler Parkway (Project Accesses 2 through 6) would meet the driveway spacing and left turn requirements based on the locations shown on the preliminary land use plan. The project is expected to generate more than 60 right turn-in vehicles during the AM and PM peak hours at Project Access 2 so an exclusive right turn deceleration lane is required at this location. The right-turn deceleration lane should be 230 feet in total with 50 feet of full lane width and 180 feet of taper length based on an anticipated 35 mph speed limit on Rio Wrangler Parkway. It is important to note that Project Accesses 2 and 3 are anticipated to align with the Talus Valley accesses on the east side of Rio Wrangler Parkway (labeled Daybreak North Access and Daybreak South Access) and therefore were analyzed as full movement, four-leg intersections with side-street stop control. Project Accesses 4, 5, and 6 were analyzed as full movement, three-leg intersections with side-street stop control.

The preliminary land use plan indicates that Project Accesses 5 and 6 will provide future connections to the property located directly east of the project. The *South Meadows Multimodal Transportation Study* dated April 17, 2020 identifies that property as the Damonte PUD project. It is important to note that the Damonte PUD project will need to evaluate these intersections when additional information is known and a formal proposal is made.

BASELINE PLUS PROJECT CONDITIONS

Traffic Volumes

Project trips (**Figure 4**) were added to the Baseline traffic volumes (**Figure 3**) to develop the Baseline Plus Project traffic volumes, shown on **Figure 5**.

Intersection Level of Service

AM and PM peak hour intersection level of service analysis was performed for the study intersections based on the Baseline Plus Project traffic volumes, the existing peak hour factors from the counts, and the lane configurations and controls shown on **Figure 5. Table 6** shows the Baseline Plus Project level of service results and the technical calculations are provided in **Appendix C**.

Table 6: Baseline Plus Project Intersection Level of Service

Int. ID	Intersection	Control	Baseline				Baseline Plus Project			
			AM		PM		AM		PM	
			Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
1	S. Meadows Pkwy / Veterans Pkwy	Signal								
	Overall		23.7	C	40.1	D	25.7	C	44.9	D
2	S. Meadows Pkwy / Project Access 1	Side-Street Stop								
	Overall		N/A	N/A	N/A	N/A	1.5	A	2.5	A
	Northbound Approach		N/A	N/A	N/A	N/A	14.8	B	18.3	C
3	S. Meadows Pkwy / Rio Wrangler Pkwy	All-Way Stop								
	Overall		10.3	B	11.1	B	14.2	B	13.6	B
4	Rio Wrangler Pkwy / North Daybreak / Project Access 2	Side-Street Stop								
	Overall		1.8	A	2.1	A	3.0	A	3.6	A
	Northbound Left		N/A	N/A	N/A	N/A	7.8	A	8.1	A
	Southbound Left		7.6	A	7.5	A	7.9	A	7.6	A
	Eastbound Approach		N/A	N/A	N/A	N/A	12.4	B	13.4	B
	Westbound Approach		9.9	A	9.4	A	12.6	B	11.7	B
5	Rio Wrangler Pkwy / South Daybreak / Project Access 3	Side-Street Stop								
	Overall		1.1	A	1.3	A	1.6	A	1.4	A
	Northbound Left		N/A	N/A	N/A	N/A	7.6	A	7.9	A
	Southbound Left		7.6	A	7.5	A	8.0	A	7.7	A
	Eastbound Approach		N/A	N/A	N/A	N/A	12.9	B	13.1	B
	Westbound Approach		9.8	A	9.3	A	11.8	B	11.1	B
6	Rio Wrangler Pkwy / Project Access 4	Side-Street Stop								
	Overall		N/A	N/A	N/A	N/A	1.0	A	1.0	A
	Southbound Left		N/A	N/A	N/A	N/A	7.9	A	7.7	A
	Westbound Approach		N/A	N/A	N/A	N/A	10.6	B	10.1	B
7	Rio Wrangler Pkwy / Project Access 5	Side-Street Stop								
	Overall		N/A	N/A	N/A	N/A	1.8	A	1.7	A
	Southbound Left		N/A	N/A	N/A	N/A	7.8	A	7.7	A
	Westbound Approach		N/A	N/A	N/A	N/A	10.7	B	10.1	B
8	Rio Wrangler Pkwy / Project Access 6	Side-Street Stop								
	Overall		N/A	N/A	N/A	N/A	0.9	A	0.8	A
	Southbound Left		N/A	N/A	N/A	N/A	7.7	A	7.7	A
	Westbound Approach		N/A	N/A	N/A	N/A	10.3	B	9.9	A

Table 6: Baseline Plus Project Intersection Level of Service

Int. ID	Intersection	Control	Baseline				Baseline Plus Project			
			AM		PM		AM		PM	
			Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
9	Steamboat Pkwy / Rio Wrangler Pkwy	All-Way Stop								
	Overall		95.6	F	13.8	B	109.8	F	15.6	C
9	Steamboat Pkwy / Rio Wrangler Pkwy	Round-About								
	Overall		5.8	A	4.0	A	6.5	A	4.5	A

Notes: 1. Delay is reported in seconds per vehicle for the overall intersections and for the worst approach/movement for side street stop controlled intersections.
Source: Headway Transportation, 2023

As shown in **Table 4**, the study intersections are anticipated to operate at overall LOS D or better during the AM and PM peak hours except for the Steamboat Parkway/Rio Wrangler Parkway intersection which is anticipated to operate at LOS F during the AM peak hour. This intersection is also anticipated to operate at LOS F during the AM peak hour for pre-project Baseline conditions. Again, a roundabout is planned to be installed by the RTC in the 2025 – 2030 timeframe at this intersection as identified in the *Intersection Control Evaluation Steamboat Parkway/Rio Wrangler Parkway* study dated September 28, 2022. The roundabout is anticipated to provide overall LOS A operation during the AM and PM peak hours.

FUTURE YEAR CONDITIONS

The Future Year analysis estimates operating conditions for the 20-year horizon (Year 2044).

Planned Roadway Improvements

The RTC's *2050 Regional Transportation Plan (RTP)* outlines programmed roadway projects of regional significance. The project list is split into three time periods: 2021 - 2025 (first five years of the plan), 2026 - 2030 (second five years of the plan), and 2031 - 2050 (remaining years of the plan).

The S. Meadows Parkway and Rio Wrangler Parkway extensions discussed under the Baseline Conditions section of this report are programmed improvements identified in the *RTP Complete Street Project Listing* for the 2021 - 2025 time period. The only other improvement in the project vicinity identified in the *RTP Complete Street Project Listing* is the Tahoe-Regional Industrial Center (TRIC) Southern Connection from the eastern Talus Valley (Daybreak) boundary to the Washoe County line, which is the extension of S. Meadows Parkway east of Rio Wrangler Parkway. This roadway improvement is programmed in the 2031 - 2050 time period.

With the above planned improvements, the S. Meadows Parkway/Rio Wrangler Parkway intersection will be a four-leg signalized intersection as identified in the *Long Range Planning For Rio Wrangler Parkway* analysis letter dated May 13, 2021. In addition, the Steamboat Parkway/Rio Wrangler Parkway intersection is analyzed as a roundabout as identified in the *Intersection Control Evaluation Steamboat Parkway/Rio Wrangler Parkway* dated September 28, 2022.

Traffic Volume Forecasts

The *South Meadows Multimodal Transportation Study* dated April 17, 2020, the *Long Range Planning For Rio Wrangler Parkway* traffic analysis letter dated May 13, 2021, and the *Intersection Control Evaluation Steamboat Parkway/Rio Wrangler Parkway* study dated September 28, 2022 were used as the basis for developing Future Year background traffic volumes unrelated to this project. These studies estimated 2040 AM and PM peak hour traffic volumes on area roadways and intersections based on RTC's travel demand model runs conducted for the *South Meadows Multimodal Transportation Study*.

The Future Year (2040) traffic volumes from these studies were used as a starting point to develop Future Year (2044) forecasts for this report. The following steps were taken to develop Future Year (without project) traffic volumes at the study intersections:

1. The above studies specifically state that the Bella Vista II project was included in RTC's travel demand model that was used to predict 2040 traffic volumes. The project trips were therefore removed from the 2040 background traffic volumes in order to isolate and evaluate this project.
2. The traffic volume forecasts in these studies represent the year 2040, so a one-percent per year growth rate (1.04 factor) was applied to the 2040 adjusted traffic volumes for 4 years to develop Future Year (20 year horizon, Year 2044) traffic volumes. The growth rate was derived from 2040 and 2050 model outputs on Veterans Parkway, S. Meadows Parkway, and Steamboat Parkway in the vicinity of the study intersections.

Intersection Level of Service

AM and PM peak hour intersection level of service analysis was performed for the study intersections based on the Future Year (without project) traffic volumes, lane configurations, and controls shown on **Figure 6. Table 7** shows the Future Year conditions level of service results and the technical calculations are provided in **Appendix D**.

Table 7: Future Year Intersection Level of Service

Int. ID	Intersection	Control	AM Delay[1]	AM LOS	PM Delay[1]	PM LOS
1	S. Meadows Pkwy / Veterans Pkwy	Signal				
	Overall		57.6	E	59.9	E
3	S. Meadows Pkwy / Rio Wrangler Pkwy	Signal				
	Overall		36.3	D	28.9	C
4	Rio Wrangler Pkwy / Talus Valley (Daybreak) North Access	Side-Street Stop				
	Overall		0.9	A	0.9	A
	Southbound Left		8.8	A	8.2	A
	Westbound Approach		17.0	C	13.3	B
5	Rio Wrangler Pkwy / Talus Valley (Daybreak) South Access	Side-Street Stop				
	Overall		0.5	A	0.5	A
	Southbound Left		8.8	A	8.1	A
	Westbound Approach		16.5	C	13.2	B
9	Steamboat Pkwy / Rio Wrangler Pkwy	Round-about				
	Overall		9.3	A	8.9	A

Notes: 1. Delay is reported in seconds/vehicle for the overall intersections and the worst approach/movement for side street stop controlled intersections.
Source: Headway Transportation, 2023

As shown in **Table 7**, the Veterans Parkway/S. Meadows Parkway intersections is anticipated to operate at overall LOS E during the AM and PM peak hours which is within level of service policy thresholds. The other study intersections are anticipated to operate at overall LOS D or better during the AM and PM peak hours which is within level of service policy thresholds.

FUTURE YEAR PLUS PROJECT CONDITIONS

Traffic Volumes

Project trips (**Figure 4**) were added to the Future Year traffic volumes (**Figure 6**) to develop the Future Year Plus Project conditions traffic volumes, shown on **Figure 7**. Slight adjustments were made to the trip assignment in future conditions to account for the extension of S. Meadows Parkway east of Rio Wrangler Parkway. For Future Year Plus Project conditions half of the trip assignment on Rio Wrangler Parkway north of S. Meadows Parkway, as shown on Figure 4, was assigned to S. Meadows Parkway east of Rio Wrangler Parkway (2.5%).

Intersection Level of Service

AM and PM peak hour intersection level of service analysis was performed for the study intersections based on the Future Year Plus Project traffic volumes, lane configurations, and controls shown on **Figure 7**. **Table 8** shows the level of service results and the technical calculations are provided in **Appendix E**.

Table 8: Future Year Plus Project Intersection Level of Service

Int. ID	Intersection	Control	Future Year				Future Year Plus Project			
			AM		PM		AM		PM	
			Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
1	S. Meadows Pkwy / Veterans Pkwy	Signal								
	Overall		57.6	E	59.9	E	66.5	E	66.6	E
2	S. Meadows Pkwy / Project Access 1	Side-Street Stop								
	Overall		N/A	N/A	N/A	N/A	10.7	B	24.9	C
	Northbound Approach		N/A	N/A	N/A	N/A	>120.0	F	>120.0	F
3	S. Meadows Pkwy / Rio Wrangler Pkwy	Signal								
	Overall		36.3	D	28.9	C	42.6	D	33.0	C
4	Rio Wrangler Pkwy / North Daybreak / Project Access 2	Side-Street Stop								
	Overall		0.9	A	0.9	A	3.3	A	4.0	A
	Northbound Left		N/A	N/A	N/A	N/A	8.7	A	9.2	A
	Southbound Left		8.8	A	8.2	A	9.3	A	8.4	A
	Eastbound Approach		N/A	N/A	N/A	N/A	34.4	D	34.2	D
	Westbound Approach		17.0	C	13.3	B	30.4	D	21.3	C
5	Rio Wrangler Pkwy / South Daybreak / Project Access 3	Side-Street Stop								
	Overall		0.5	A	0.5	A	1.6	A	1.1	A
	Northbound Left		N/A	N/A	N/A	N/A	8.5	A	8.9	A
	Southbound Left		8.8	A	8.1	A	9.3	A	8.5	A
	Eastbound Approach		N/A	N/A	N/A	N/A	34.6	D	27.7	D
	Westbound Approach		16.5	C	13.2	B	24.7	C	18.6	C
6	Rio Wrangler Pkwy / Project Access 4	Side-Street Stop								
	Overall		N/A	N/A	N/A	N/A	0.6	A	0.5	A
	Southbound Left		N/A	N/A	N/A	N/A	9.3	A	8.5	A
	Westbound Approach		N/A	N/A	N/A	N/A	17.4	C	14.2	B
7	Rio Wrangler Pkwy / Project Access 5	Side-Street Stop								
	Overall		N/A	N/A	N/A	N/A	1.2	A	1.0	A
	Southbound Left		N/A	N/A	N/A	N/A	9.1	A	8.5	A
	Westbound Approach		N/A	N/A	N/A	N/A	19.0	C	14.6	B

Table 8: Future Year Plus Project Intersection Level of Service

Int. ID	Intersection	Control	Future Year				Future Year Plus Project			
			AM		PM		AM		PM	
			Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
8	Rio Wrangler Pkwy / Project Access 6	Side-Street Stop								
	Overall		N/A	N/A	N/A	N/A	0.5	A	0.4	A
	Southbound Left		N/A	N/A	N/A	N/A	9.0	A	8.4	A
	Westbound Approach		N/A	N/A	N/A	N/A	17.5	C	14.1	B
9	Steamboat Pkwy / Rio Wrangler Pkwy	Round-About								
	Overall		9.3	A	8.9	A	11.4	B	11.9	B

Notes: 1. Delay is reported in seconds per vehicle for the overall intersections and for the worst approach/movement for side street stop controlled intersections.
Source: Headway Transportation, 2023

As shown in **Table 8**, the Veterans Parkway/S. Meadows Parkway intersection is anticipated to operate at overall LOS E during the AM and PM peak hours which is within level of service policy thresholds. The other study intersections are anticipated to operate at overall LOS D or better during the AM and PM peak hours which is within level of service policy thresholds.

The northbound left turn movement at the S. Meadows Parkway/Project Access 1 intersection is anticipated to operate at LOS F during the AM and PM peak hours under the preliminary land use and access assumptions. This condition (LOS F for a minor side-street approach) commonly exists throughout urban and suburban areas and does not necessarily constitute an exceedance of the level of service policy.

In this case, drivers have the option of turning right from Project Access 1 onto eastbound S. Meadows Parkway and then performing a U-turn at the S. Meadows Parkway/Rio Wrangler Parkway signalized intersection if they deem the left turn delay excessive. Drivers departing the project to the west also have the option of using Project Access 2 on Rio Wrangler Parkway.

Project Access 1 should be re-evaluated through a traffic study update when a formal project is presented.

CONCLUSIONS

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

- The Bella Vista II PUD Amendment consists of 25.9 acres of residential land use (602 multifamily units) and 6.8 acres of commercial land use (74,050 square feet of building floor area). For the purposes of this study, the commercial land uses consist of a pharmacy/ drugstore with drive-through window, drive-in bank, sit-down restaurant, coffee/donut shop with drive-through window, automatic car wash, and general retail.

- The project is expected to generate approximately 7,752 net new Daily, 545 net new AM peak hour, and 588 net new PM peak hour trips.
- The land uses and quantities are preliminary and subject to change as the project develops. Any similar project land use mix generating equal or fewer trips is deemed to have similar or less impact and is addressed by this study.
- The project is anticipated to generate 87 less daily, 225 more AM peak hour, and 25 less PM peak hour trips than the previous approved PUD. The proposed amendment has essentially the same traffic intensity as the existing PUD.
- Under Baseline and Baseline Plus Project conditions, the study intersections are anticipated to operate within overall policy level of service thresholds during the AM and PM peak hours except for the Steamboat Parkway/Rio Wrangler Parkway intersection which is anticipated to operate at LOS F during the AM peak hour. A roundabout, which is anticipated to operate at LOS A operation during the AM and PM peak hours, is planned to be installed at this intersection as identified in the *Intersection Control Evaluation Steamboat Parkway/Rio Wrangler Parkway* study dated September 28, 2022. The roundabout installation is anticipated in the 2025 – 2030 timeframe based on discussion with RTC staff.
- Under Future Year (without project) conditions, the study intersections are anticipated to operate within overall policy level of service thresholds during the AM and PM peak hours.
- Under Future Year Plus Project conditions, the study intersections are anticipated to operate within overall policy level of service thresholds during the AM and PM peak hours. The northbound left turn movement at the S. Meadows Parkway/Project Access 1 intersection is anticipated to operate at LOS F during the AM and PM peak hours under the preliminary land use and access assumptions. LOS F conditions for a side-street approach, during the peak hour(s), does not necessarily indicate an intersection failure or the need for mitigation. This condition (LOS F for a minor side-street approach) commonly exists throughout urban and suburban areas and is manageable since there would be other project departure options.
- Project Access 1 on S. Meadows Parkway should contain side-street stop sign control and operate with right-in, right-out, and left-out movements only (left-in movement prohibited). This access should contain an eastbound right-turn deceleration lane, 230 feet in total length with 50 feet of full lane width and 180 feet of taper.
- Project Access 1 should be re-evaluated through a traffic study update when a formal project is proposed and the land use and access plan are better defined.
- Project Accesses 2 and 3 on Rio Wrangler Parkway should be located so that they align with the proposed Talus Valley accesses (labeled Daybreak North Access and Daybreak South Access) on the east side of Rio Wrangler Parkway. Both intersections should contain side-street stop sign control with northbound and southbound left turn lanes, 200 feet in total length with 150 feet of full lane width and 50 feet of taper. Project Access 2 should contain a

southbound right-turn deceleration lane, 230 feet in total length with 50 feet of full lane width and 180 feet of taper.

- Project Accesses 4, 5, and 6 on Rio Wrangler Parkway should contain side-street stop sign control with southbound left turn lanes, 200 feet in total length with 150 feet of full lane width and 50 feet of taper.
- A formal site plan has not yet been prepared for the project showing the exact location of the project accesses. It is recommended that when a formal site plan is prepared, the project accesses meet RTC's access management standards for spacing and left turn movements.
- The project will pay Regional Road Impact Fees (RRIF) as mitigation for its minor impacts on the regional roadway network. The amount due will be the standard fee based on the actual amount of commercial/retail floor area and the actual number of multi-family dwelling units.
- Depending on timing relative to the Talus Valley (Daybreak) project, this project may construct portions of S. Meadows Parkway and may be eligible for an RRIF Offset agreement for improvements and/or right-of-way dedication deemed "regional improvements."
- The S. Meadows Parkway/Rio Wrangler Parkway intersection should initially be all-way stop controlled in anticipation of future signalization when signal warrants are met. Since the relative timing of the Talus Valley (Daybreak) project, this project, and the potential extension of S. Meadows Parkway further east towards Sunny Hills and USA Parkway are undefined, this project should pay regional road impact fees toward future improvements at the intersection.

HEADWAY TRANSPORTATION

NO SCALE

- Study Intersection

- Other Development

- Project Site

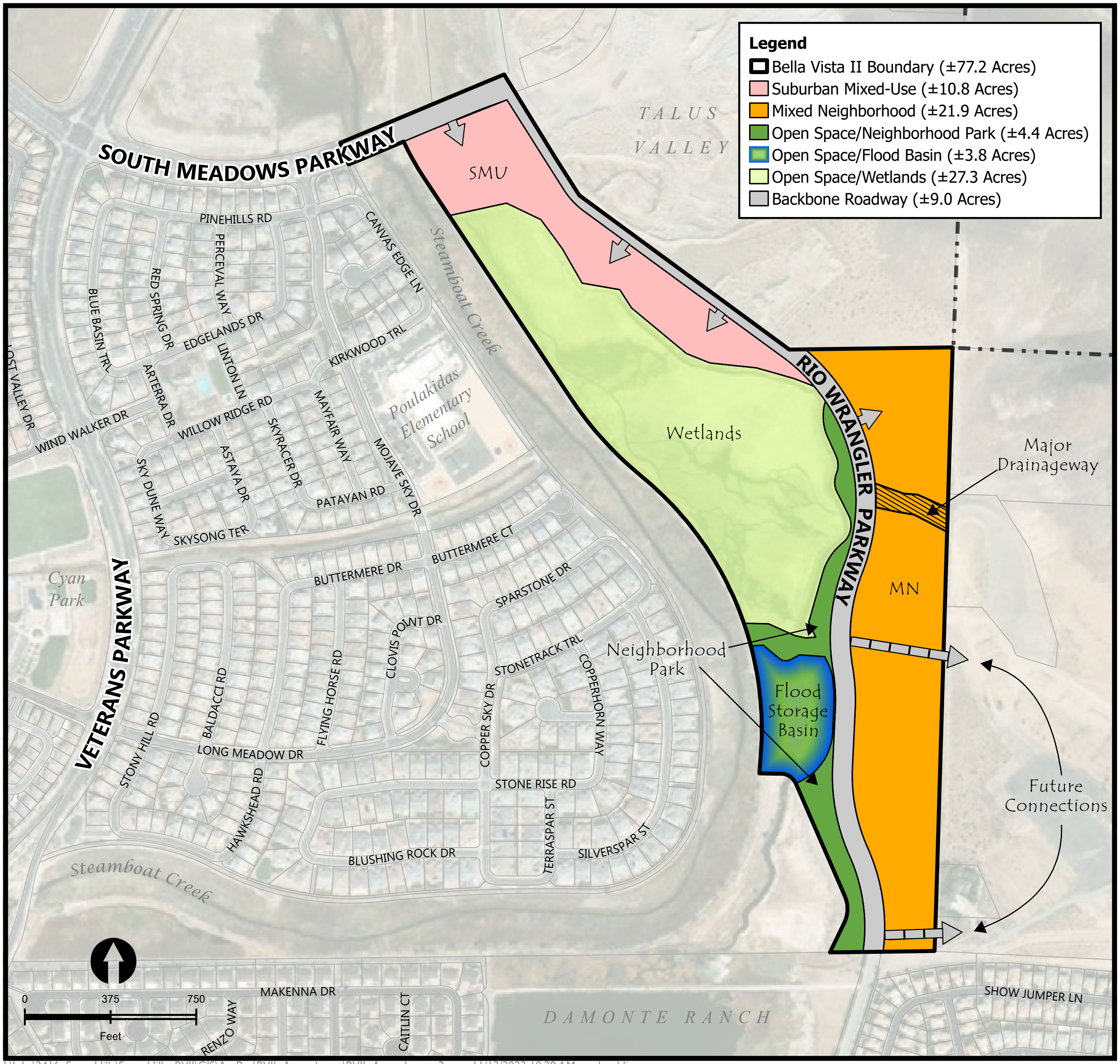
- Future Connections

Figure 1

Bella Vista II PUD Amendment

Traffic Impact Study

Project Location and Study Intersections



J:\Jobs\2416_SunnyHills\SunnyHills_BVII\GIS\ArcPro\BVII_Amendment\BVII_Amendment_2.aprx 11/13/2023 10:29 AM amclaughlin

Bella Vista II Land Use

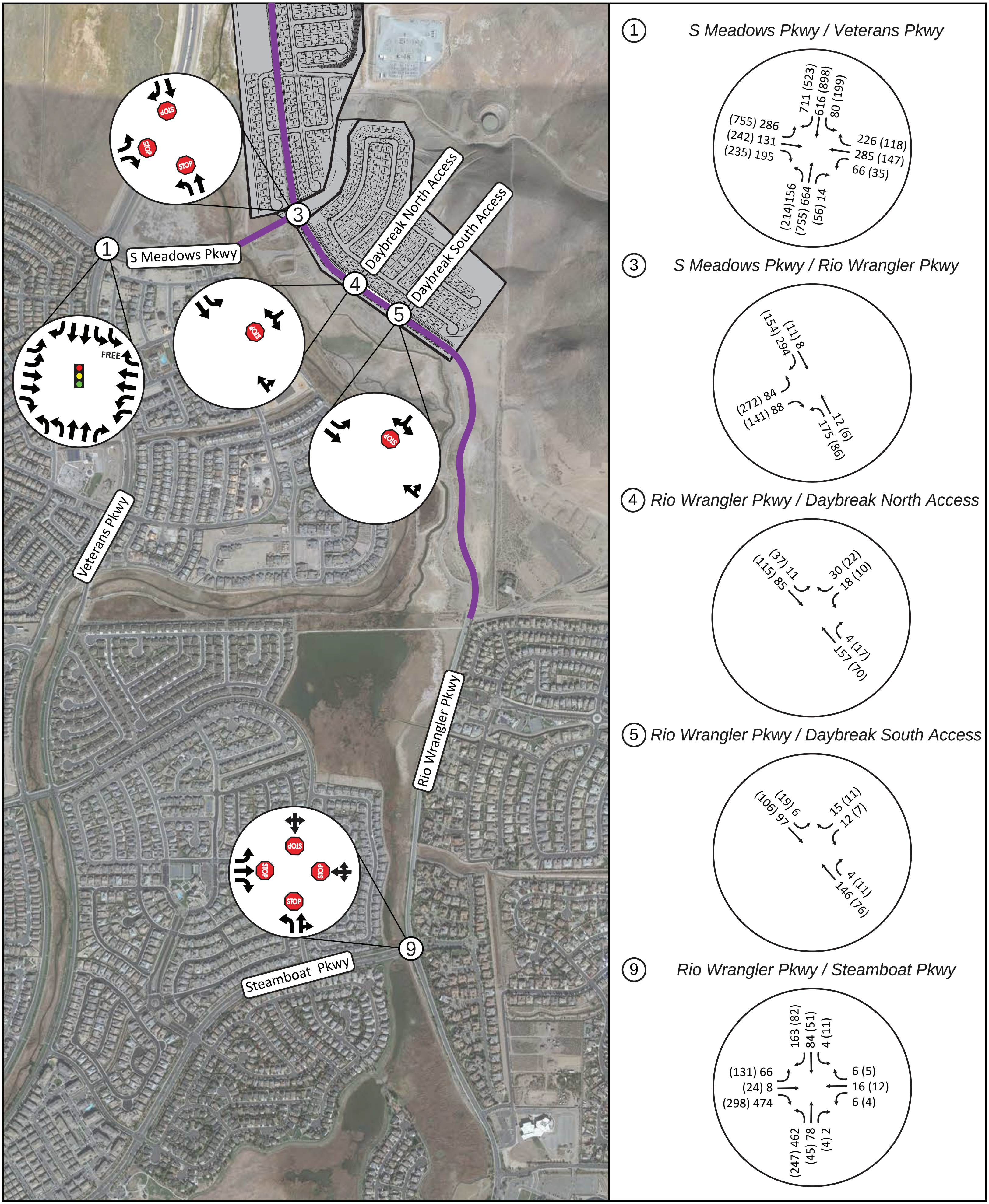
Handbook Amendment

November 2023

NO SCALE

Figure 2

Bella Vista II PUD Amendment
Traffic Impact Study
Preliminary Land Use Plan



HEADWAY TRANSPORTATION

NO SCALE

AM Peak Hour Volume (PM Peak Hour Volume)

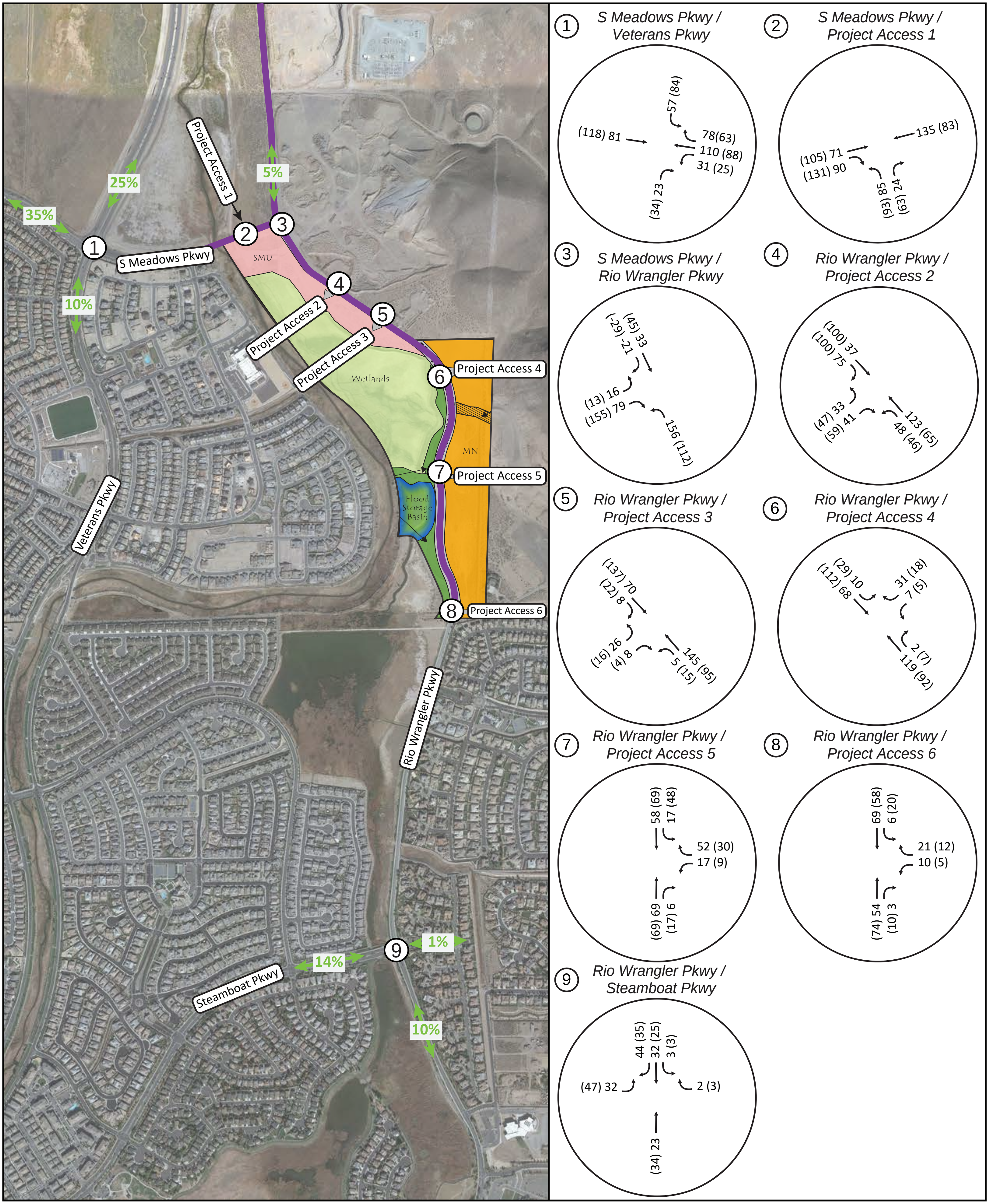
- Study Intersection   STOP - Stop   - Signal   - Future Connections

- Other Development

Figure 3

Bella Vista II PUD Amendment
Traffic Impact Study

Baseline Traffic Volumes, Lane Configurations, and Controls



HEADWAY TRANSPORTATION

NO SCALE

AM Peak Hour Volume (PM Peak Hour Volume)

\# - Study Intersection

- Project Site

- Future Connections

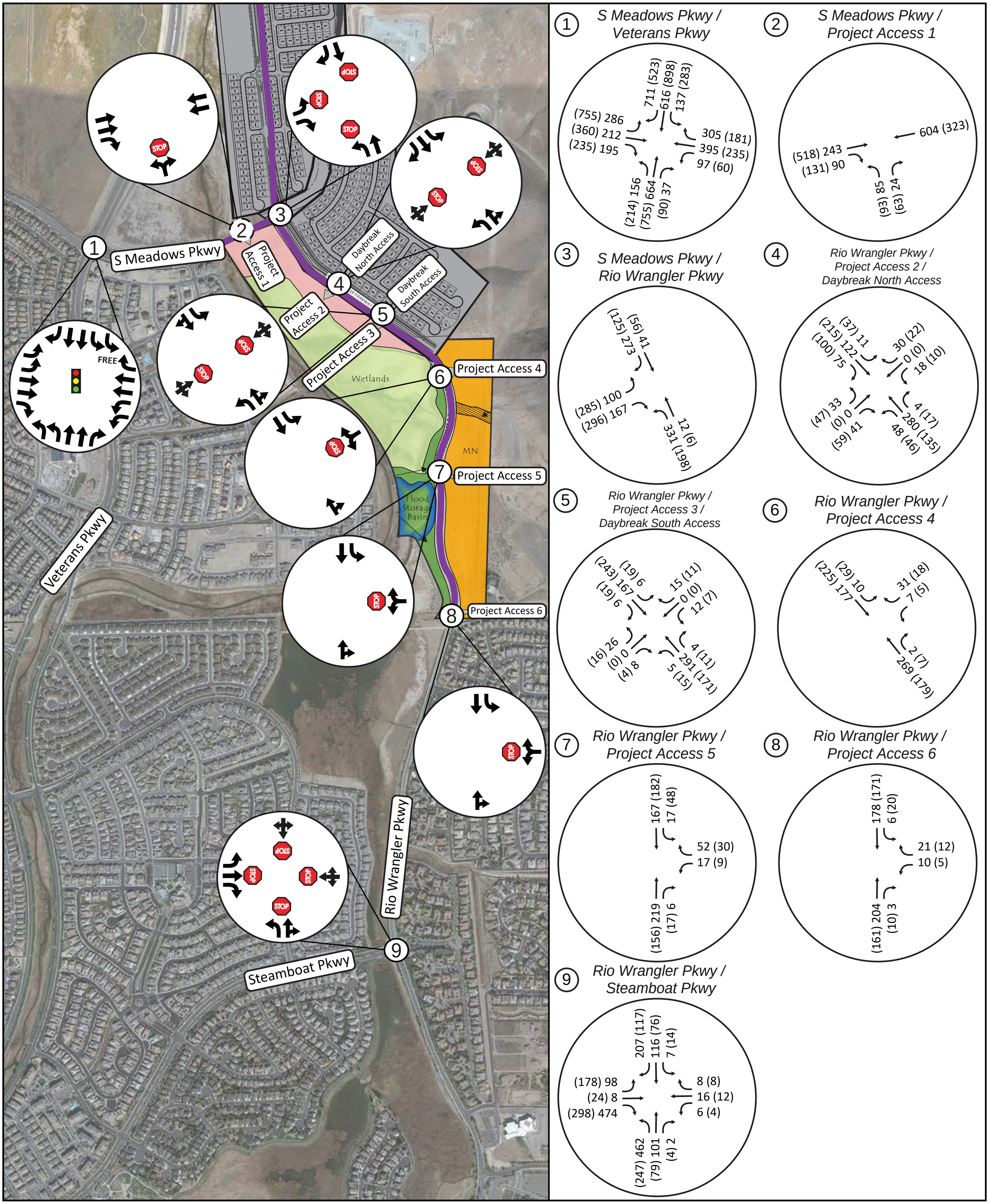
XX% - Trip Distribution

Figure 4

Bella Vista II PUD Amendment

Traffic Impact Study

Project Trip Distribution and Assignment



HEADWAY TRANSPORTATION

- Study Intersection STOP - Stop - Signal - Future Connections

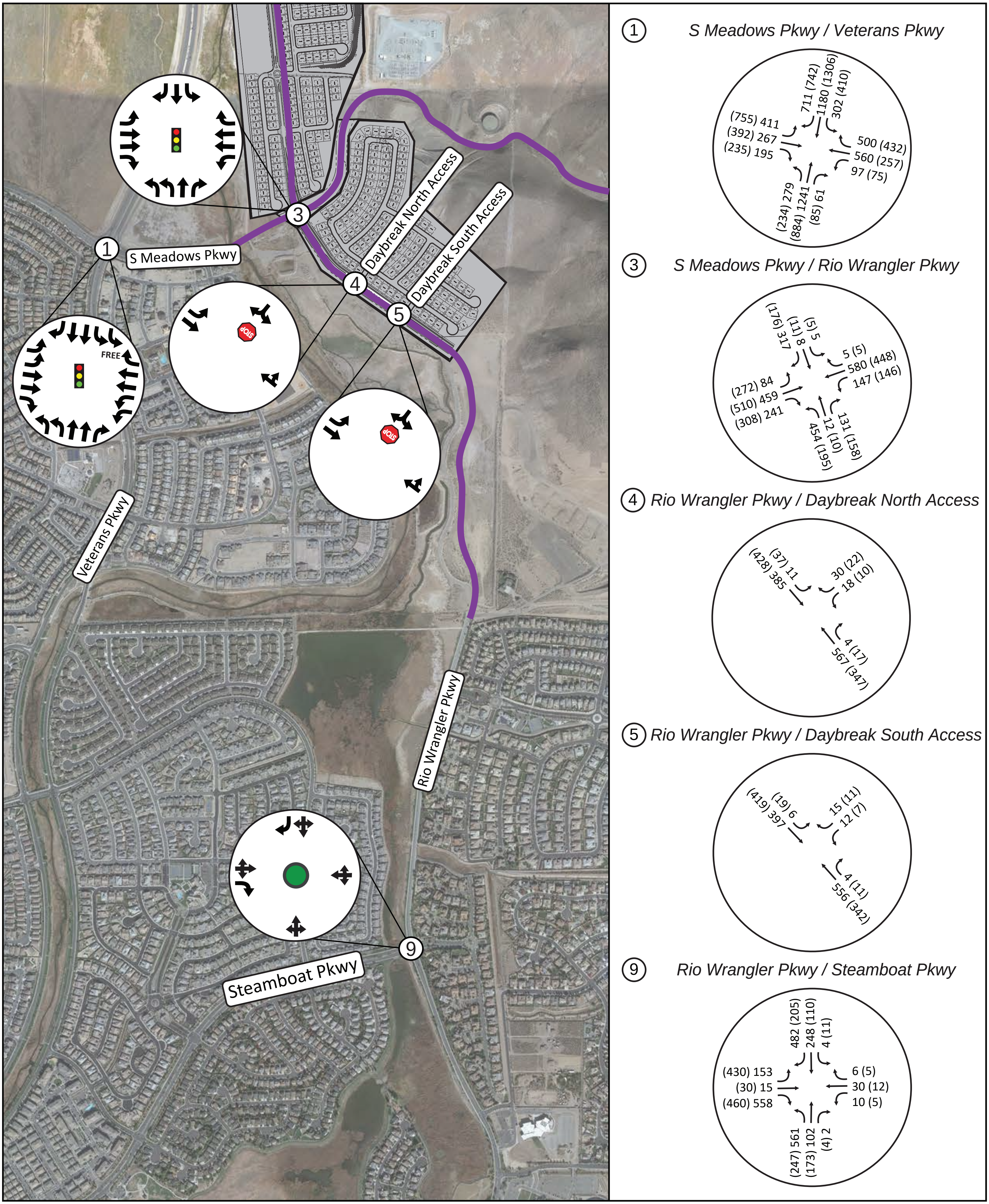
- Project Site - Other Development

NO SCALE AM Peak Hour Volume (PM Peak Hour Volume)

Figure 5

Bella Vista II PUD Amendment
Traffic Impact Study

Baseline Plus Project Traffic Volumes, Lane Configurations, and Controls



HEADWAY TRANSPORTATION

NO SCALE

AM Peak Hour Volume (PM Peak Hour Volume)

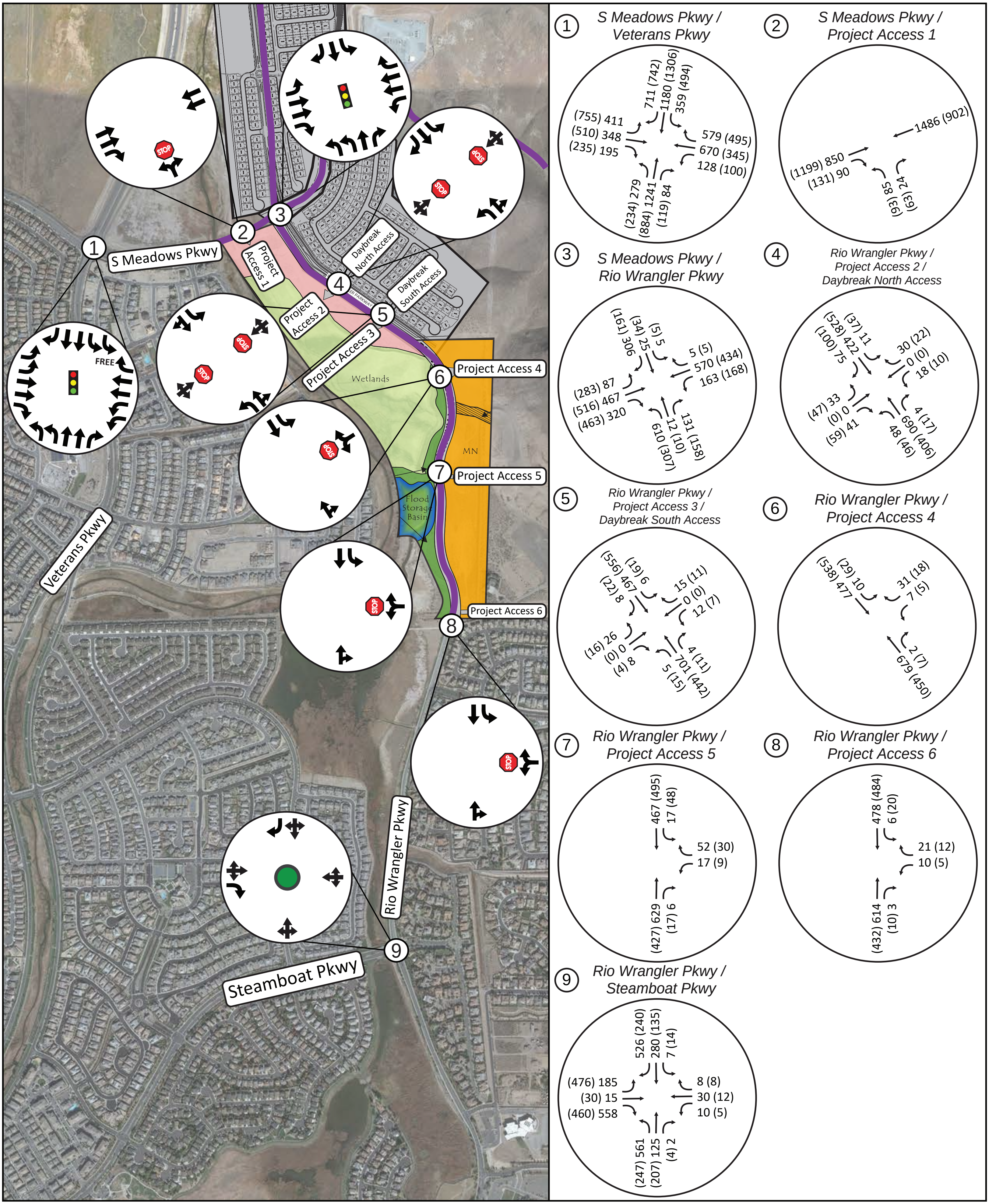
(#) - Study Intersection STOP - Stop - Signal - Future Connections

- Other Development - Roundabout

Figure 6

Bella Vista II PUD Amendment
Traffic Impact Study

Future Year Traffic Volumes, Lane Configurations, and Controls



HEADWAY TRANSPORTATION

- Study Intersection
STOP - Stop
- Signal
- Roundabout
- Future Connections
- Project Site
- Other Development
NO SCALE
AM Peak Hour Volume (PM Peak Hour Volume)

Figure 7

Bella Vista II PUD Amendment
Traffic Impact Study

Future Year Plus Project Traffic Volumes, Lane Configurations, and Controls

Appendix A
NDOT Crash Data

OBJECTID	Crash Seve	County	Crash Date	Crash Year	Crash Time	Primary Str	Distance	Dir	Secondary	Weather
1720229	INJURY CR/	WASHOE	2/7/2017, 1	2,017	########	VETERANS	No Data	AT INT	SOUTH ME/	CLEAR
1811636	PROPERTY	WASHOE	12/3/2018,	2,018	########	VETERANS	No Data	AT INT	SOUTH ME/	No Data
1811985	PROPERTY	WASHOE	12/6/2018,	2,018	########	SOUTH ME/	No Data	AT INT	VETERANS	CLOUDY
1846963	INJURY CR/	WASHOE	8/26/2019,	2,019	########	VETERANS	No Data	AT INT	SOUTH ME/	CLEAR

S. Meadows Parkway & Veterans Parkway

Fatalities	Injured	Property Da	Injury Type	Crash Type	Total Vehicl	V1 Type	V1 Dir	V1 Driver A	V1 Lane Nu	V1 Action
No Data	1	No Data	C	NON-COLL	1	HATCHBAC	N	16	No Data	TURNING L
No Data	No Data	PDO	No Data	ANGLE	2	SEDAN, 4 D	No Data	20	L1	TURNING L
No Data	No Data	PDO	No Data	SIDESWIPE	2	BUS	No Data	No Data	1	CHANGING
No Data	1	No Data	B	ANGLE	2	CARRY-ALL	S	36	1	GOING STR

V1 Driver Fa	V1 Driver D	V1 Vehicle	V1 Most Ha	V1 All Event	V2 Type	V2 Dir	V2 Driver Ag	V2 Lane Nu	V2 Action	V2 Driver Fa
APPARENTI	No Data	MADE AN IN	No Data	RAN OFF RO	No Data	No Data	No Data	No Data	No Data	No Data
APPARENTI	No Data	DISREGARD	MOTOR VEH	No Data	CARRY-ALL	S	30	1	No Data	APPARENTI
No Data	No Data	No Data	No Data	No Data	CARRY-ALL	No Data	No Data	1	GOING STR	No Data
APPARENTI	No Data	DISREGARD	MOTOR VEH	No Data	PICKUP	E	47	L2	TURNING L	APPARENTI

V2 Driver D	V2 Vehicle	V2 Most Ha	V2 All Event	First Harmf	Nonmotoris	Factors Roa	Lighting	HWY Facto	Agency
No Data	No Data	No Data	No Data	No Data	No Data	DRY	DARK - SPC	NONE	RPD
No Data	No Data	MOTOR VEI	No Data	MOTOR VEI	No Data	DRY	DARK - SPC	NONE	RPD
No Data	No Data	No Data	No Data	No Data	No Data	DRY	DAYLIGHT	NONE	WASD
No Data	No Data	MOTOR VEI	No Data	MOTOR VEI	No Data	DRY	DAYLIGHT	NONE	RPD

OBJECTID	Crash Seve	County	Crash Date	Crash Year	Crash Time	Primary Str	Distance	Dir
1666480	PROPERTY	WASHOE	1/15/2016,	2,016	########	RIO WRAN(	1	N
1751877	PROPERTY	WASHOE	9/21/2017,	2,017	########	RIO WRAN(	No Data	AT INT
1763483	INJURY CR/	WASHOE	12/9/2017,	2,017	########	STEAMBOA	No Data	AT INT
1806426	PROPERTY	WASHOE	10/25/201{	2,018	########	RIO WRAN(	No Data	AT INT

Steamboat Parkway & Rio Wrangler Parkway

Secondary	Weather	Fatalities	Injured	Property Da	Injury Type	Crash Type	Total Vehicl	V1 Type
STEAMBOA	CLEAR	No Data	No Data	PDO	No Data	NON-COLL	1	CARRY-ALL
STEAMBOA	CLOUDY	No Data	No Data	PDO	No Data	ANGLE	2	HARDTOP,
RIO WRAN(	CLEAR	No Data	2	No Data	B	ANGLE	2	CARRY-ALL
STEAMBOA	CLEAR	No Data	No Data	PDO	No Data	REAR-END	2	SEDAN, 4 D

V1 Dir	V1 Driver Ag	V1 Lane Nu	V1 Action	V1 Driver Fa	V1 Driver D	V1 Vehicle	V1 Most Ha	V1 All Event
N	55	1	NOT REPOF	ILLNESS	No Data	FAILURE TC	No Data	RAN OFF RO
S	16	No Data	TURNING L	APPARENTI	No Data	DRIVING TC	No Data	SLOW/STO
E	74	No Data	GOING STR	APPARENTI	No Data	DISREGARD	No Data	No Data
No Data	18	1	GOING STR	UNKNOWN	No Data	UNKNOWN	MOTOR VEH	No Data

V2 Type	V2 Dir	V2 Driver Ag	V2 Lane Nu	V2 Action	V2 Driver Fa	V2 Driver D	V2 Vehicle	V2 Most Ha
No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
HATCHBAC	N	18	No Data	STOPPED	APPARENTI	No Data	UNKNOWN	No Data
CARRY-ALL	N	37	No Data	TURNING L	APPARENTI	No Data	No Data	No Data
VAN	N	41	1	STOPPED	UNKNOWN	No Data	UNKNOWN	MOTOR VEI

V2 All Event	First Harmf	Nonmotoris	Factors Roa	Lighting	HWY Facto	Agency
No Data	MOTOR VEH	No Data	ICE	DAYLIGHT	NONE	RPD
No Data	No Data	No Data	DRY	DAYLIGHT	NONE	RPD
No Data	No Data	No Data	DRY	DARK - SPC	NONE	RPD
No Data	MOTOR VEH	No Data	UNKNOWN	DARK - UNK	UNKNOWN	RPD

Appendix B

Baseline LOS Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	286	131	195	66	285	226	156	664	14	80	616	711
Future Volume (veh/h)	286	131	195	66	285	226	156	664	14	80	616	711
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1841	1870
Adj Flow Rate, veh/h	304	139	0	70	303	0	166	706	15	85	655	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	4	2
Cap, veh/h	417	747		199	522		271	949	414	219	881	
Arrive On Green	0.12	0.21	0.00	0.06	0.15	0.00	0.08	0.27	0.27	0.06	0.25	0.00
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	3456	3554	1551	3456	3497	1585
Grp Volume(v), veh/h	304	139	0	70	303	0	166	706	15	85	655	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1777	1551	1728	1749	1585
Q Serve(g_s), s	5.1	1.9	0.0	1.2	4.7	0.0	2.8	10.8	0.4	1.4	10.3	0.0
Cycle Q Clear(g_c), s	5.1	1.9	0.0	1.2	4.7	0.0	2.8	10.8	0.4	1.4	10.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	417	747		199	522		271	949	414	219	881	
V/C Ratio(X)	0.73	0.19		0.35	0.58		0.61	0.74	0.04	0.39	0.74	
Avail Cap(c_a), veh/h	509	1536		289	1310		289	1798	784	289	1769	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	25.3	19.4	0.0	27.1	23.7	0.0	26.6	20.0	16.2	26.9	20.6	0.0
Incr Delay (d2), s/veh	4.1	0.1	0.0	1.1	1.0	0.0	3.4	1.2	0.0	1.1	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.7	0.0	0.5	1.9	0.0	1.1	3.9	0.1	0.6	3.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.4	19.5	0.0	28.1	24.8	0.0	30.0	21.2	16.2	28.0	21.8	0.0
LnGrp LOS	C	B		C	C		C	C	B	C	C	
Approach Vol, veh/h		443			373			887			740	
Approach Delay, s/veh		26.3			25.4			22.8			22.5	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.8	21.9	9.4	18.5	10.7	21.0	13.2	14.8
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	30.2	5.0	25.8	5.0	30.2	8.8	22.0
Max Q Clear Time (g_c+I1), s	3.4	12.8	3.2	3.9	4.8	12.3	7.1	6.7
Green Ext Time (p_c), s	0.0	2.4	0.0	0.4	0.0	2.1	0.2	0.9

Intersection Summary			
HCM 6th Ctrl Delay			23.7
HCM 6th LOS			C

Notes

Unsignalized Delay for [EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	755	242	235	35	147	118	214	755	56	199	898	523
Future Volume (veh/h)	755	242	235	35	147	118	214	755	56	199	898	523
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1841	1870
Adj Flow Rate, veh/h	803	257	0	37	156	0	228	803	60	212	955	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	4	2
Cap, veh/h	875	1102		118	324		284	1036	452	284	1020	
Arrive On Green	0.25	0.31	0.00	0.03	0.09	0.00	0.08	0.29	0.29	0.08	0.29	0.00
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	3456	3554	1552	3456	3497	1585
Grp Volume(v), veh/h	803	257	0	37	156	0	228	803	60	212	955	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1777	1552	1728	1749	1585
Q Serve(g_s), s	19.2	4.6	0.0	0.9	3.6	0.0	5.5	17.6	2.4	5.1	22.7	0.0
Cycle Q Clear(g_c), s	19.2	4.6	0.0	0.9	3.6	0.0	5.5	17.6	2.4	5.1	22.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	875	1102		118	324		284	1036	452	284	1020	
V/C Ratio(X)	0.92	0.23		0.31	0.48		0.80	0.78	0.13	0.75	0.94	
Avail Cap(c_a), veh/h	893	1628		203	918		284	1044	456	284	1027	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	30.9	21.8	0.0	40.1	36.8	0.0	38.4	27.6	22.2	38.2	29.4	0.0
Incr Delay (d2), s/veh	14.1	0.1	0.0	1.5	1.1	0.0	15.2	3.7	0.1	10.3	15.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.3	1.8	0.0	0.4	1.5	0.0	2.8	7.4	0.9	2.5	10.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.0	21.9	0.0	41.6	37.9	0.0	53.6	31.3	22.4	48.5	44.6	0.0
LnGrp LOS	D	C		D	D		D	C	C	D	D	
Approach Vol, veh/h		1060			193			1091			1167	
Approach Delay, s/veh		39.4			38.6			35.5			45.3	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	13.0	30.8	8.9	32.4	13.0	30.8	27.5	13.8
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	7.0	25.0	5.0	39.0	7.0	25.0	22.0	22.0
Max Q Clear Time (g_c+I1), s	7.1	19.6	2.9	6.6	7.5	24.7	21.2	5.6
Green Ext Time (p_c), s	0.0	1.6	0.0	0.8	0.0	0.2	0.3	0.4

Intersection Summary	
HCM 6th Ctrl Delay	40.1
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Intersection Delay, s/veh	10.3
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	84	88	175	12	8	294
Future Vol, veh/h	84	88	175	12	8	294
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	91	96	190	13	9	320
Number of Lanes	1	1	1	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	2	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	2
HCM Control Delay	9.5	11	10.3
HCM LOS	A	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	0%	0%
Vol Thru, %	0%	100%	0%	0%	100%	0%
Vol Right, %	0%	0%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	175	12	84	88	8	294
LT Vol	175	0	84	0	0	0
Through Vol	0	12	0	0	8	0
RT Vol	0	0	0	88	0	294
Lane Flow Rate	190	13	91	96	9	320
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.308	0.019	0.16	0.135	0.013	0.406
Departure Headway (Hd)	5.837	5.333	6.294	5.086	5.276	4.571
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	613	668	567	699	676	783
Service Time	3.598	3.093	4.068	2.859	3.027	2.322
HCM Lane V/C Ratio	0.31	0.019	0.16	0.137	0.013	0.409
HCM Control Delay	11.2	8.2	10.3	8.7	8.1	10.4
HCM Lane LOS	B	A	B	A	A	B
HCM 95th-tile Q	1.3	0.1	0.6	0.5	0	2

Intersection	
Intersection Delay, s/veh	11.1
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	272	141	86	6	11	154
Future Vol, veh/h	272	141	86	6	11	154
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	296	153	93	7	12	167
Number of Lanes	1	1	1	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	2	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	2
HCM Control Delay	11.9	10.4	9.4
HCM LOS	B	B	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	0%	0%
Vol Thru, %	0%	100%	0%	0%	100%	0%
Vol Right, %	0%	0%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	86	6	272	141	11	154
LT Vol	86	0	272	0	0	0
Through Vol	0	6	0	0	11	0
RT Vol	0	0	0	141	0	154
Lane Flow Rate	93	7	296	153	12	167
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.166	0.011	0.473	0.194	0.019	0.238
Departure Headway (Hd)	6.405	5.899	5.764	4.56	5.835	5.127
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	557	603	621	780	610	696
Service Time	4.182	3.675	3.529	2.325	3.602	2.894
HCM Lane V/C Ratio	0.167	0.012	0.477	0.196	0.02	0.24
HCM Control Delay	10.5	8.7	13.7	8.4	8.7	9.5
HCM Lane LOS	B	A	B	A	A	A
HCM 95th-tile Q	0.6	0	2.5	0.7	0.1	0.9

Intersection						
Int Delay, s/veh	1.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	30	157	4	11	85
Future Vol, veh/h	18	30	157	4	11	85
Conflicting Peds, #/hr	0	0	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	33	171	4	12	92

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	294	178	0	0	180	0
Stage 1	178	-	-	-	-	-
Stage 2	116	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	697	865	-	-	1396	-
Stage 1	853	-	-	-	-	-
Stage 2	909	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	687	861	-	-	1389	-
Mov Cap-2 Maneuver	687	-	-	-	-	-
Stage 1	849	-	-	-	-	-
Stage 2	901	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.9	0	0.9
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	786	1389	-
HCM Lane V/C Ratio	-	-	0.066	0.009	-
HCM Control Delay (s)	-	-	9.9	7.6	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	22	70	17	37	115
Future Vol, veh/h	10	22	70	17	37	115
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	24	76	18	40	125

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	295	90	0	0	99	0
Stage 1	90	-	-	-	-	-
Stage 2	205	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	696	968	-	-	1494	-
Stage 1	934	-	-	-	-	-
Stage 2	829	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	674	963	-	-	1487	-
Mov Cap-2 Maneuver	674	-	-	-	-	-
Stage 1	929	-	-	-	-	-
Stage 2	807	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	1.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	849	1487	-
HCM Lane V/C Ratio	-	-	0.041	0.027	-
HCM Control Delay (s)	-	-	9.4	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	15	146	4	6	97
Future Vol, veh/h	12	15	146	4	6	97
Conflicting Peds, #/hr	0	0	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	16	159	4	7	105

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	285	166	0	0	168	0
Stage 1	166	-	-	-	-	-
Stage 2	119	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	705	878	-	-	1410	-
Stage 1	863	-	-	-	-	-
Stage 2	906	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	698	874	-	-	1403	-
Mov Cap-2 Maneuver	698	-	-	-	-	-
Stage 1	859	-	-	-	-	-
Stage 2	901	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	786	1403	-
HCM Lane V/C Ratio	-	-	0.037	0.005	-
HCM Control Delay (s)	-	-	9.8	7.6	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	11	76	11	19	106
Future Vol, veh/h	7	11	76	11	19	106
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	12	83	12	21	115

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	251	94	0	0	100	0
Stage 1	94	-	-	-	-	-
Stage 2	157	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	738	963	-	-	1493	-
Stage 1	930	-	-	-	-	-
Stage 2	871	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	724	958	-	-	1486	-
Mov Cap-2 Maneuver	724	-	-	-	-	-
Stage 1	925	-	-	-	-	-
Stage 2	859	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	1.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	851	1486	-
HCM Lane V/C Ratio	-	-	0.023	0.014	-
HCM Control Delay (s)	-	-	9.3	7.5	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Intersection Delay, s/veh	95.6
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	66	8	474	6	16	6	462	78	2	4	84	163
Future Vol, veh/h	66	8	474	6	16	6	462	78	2	4	84	163
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	80	10	571	7	19	7	557	94	2	5	101	196
Number of Lanes	1	1	1	0	1	0	1	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	3
HCM Control Delay	76.5	14.5	150.4	28.2
HCM LOS	F	B	F	D

Lane	NBLn1	NBLn2	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1
Vol Left, %	100%	0%	100%	0%	0%	21%	2%
Vol Thru, %	0%	97%	0%	100%	0%	57%	33%
Vol Right, %	0%	3%	0%	0%	100%	21%	65%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	462	80	66	8	474	28	251
LT Vol	462	0	66	0	0	6	4
Through Vol	0	78	0	8	0	16	84
RT Vol	0	2	0	0	474	6	163
Lane Flow Rate	557	96	80	10	571	34	302
Geometry Grp	8	8	7	7	7	8	8
Degree of Util (X)	1.293	0.21	0.175	0.02	1.068	0.09	0.679
Departure Headway (Hd)	8.682	8.151	8.515	7.999	7.277	10.739	8.8
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	423	443	424	450	503	336	414
Service Time	6.382	5.851	6.215	5.699	4.977	8.439	6.5
HCM Lane V/C Ratio	1.317	0.217	0.189	0.022	1.135	0.101	0.729
HCM Control Delay	174.2	13	13	10.9	86.4	14.5	28.2
HCM Lane LOS	F	B	B	B	F	B	D
HCM 95th-tile Q	23.7	0.8	0.6	0.1	16.3	0.3	4.9

Intersection	
Intersection Delay, s/veh	13.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	131	24	298	4	12	5	247	45	4	11	51	82
Future Vol, veh/h	131	24	298	4	12	5	247	45	4	11	51	82
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	146	27	331	4	13	6	274	50	4	12	57	91
Number of Lanes	1	1	1	0	1	0	1	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	3
HCM Control Delay	12.9	10.6	16.3	12.2
HCM LOS	B	B	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1
Vol Left, %	100%	0%	100%	0%	0%	19%	8%
Vol Thru, %	0%	92%	0%	100%	0%	57%	35%
Vol Right, %	0%	8%	0%	0%	100%	24%	57%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	247	49	131	24	298	21	144
LT Vol	247	0	131	0	0	4	11
Through Vol	0	45	0	24	0	12	51
RT Vol	0	4	0	0	298	5	82
Lane Flow Rate	274	54	146	27	331	23	160
Geometry Grp	8	8	7	7	7	8	8
Degree of Util (X)	0.535	0.098	0.27	0.046	0.502	0.048	0.295
Departure Headway (Hd)	7.017	6.454	6.669	6.162	5.453	7.415	6.628
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	513	554	537	580	659	480	539
Service Time	4.776	4.213	4.422	3.915	3.206	5.209	4.4
HCM Lane V/C Ratio	0.534	0.097	0.272	0.047	0.502	0.048	0.297
HCM Control Delay	17.6	9.9	11.9	9.2	13.6	10.6	12.2
HCM Lane LOS	C	A	B	A	B	B	B
HCM 95th-tile Q	3.1	0.3	1.1	0.1	2.8	0.2	1.2

MOVEMENT SUMMARY

Site: 1 [Steamboat & Rio Wrangler AM Baseline (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Practical Capacity): Results for 20 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Rio Wrangler															
3	L2	All MCs	513	2.0	513	2.0	0.590	10.8	LOS B	4.2	107.7	0.40	0.18	0.40	28.8
8	T1	All MCs	87	2.0	87	2.0	0.590	10.8	LOS B	4.2	107.7	0.40	0.18	0.40	29.2
18	R2	All MCs	2	2.0	2	2.0	0.590	10.8	LOS B	4.2	107.7	0.40	0.18	0.40	29.0
Approach			602	2.0	602	2.0	0.590	10.8	LOS B	4.2	107.7	0.40	0.18	0.40	28.8
East: Steamboat															
1	L2	All MCs	7	2.0	7	2.0	0.056	7.1	LOS A	0.2	4.5	0.54	0.51	0.54	31.3
6	T1	All MCs	18	2.0	18	2.0	0.056	7.1	LOS A	0.2	4.5	0.54	0.51	0.54	31.8
16	R2	All MCs	7	2.0	7	2.0	0.056	7.1	LOS A	0.2	4.5	0.54	0.51	0.54	31.6
Approach			31	2.0	31	2.0	0.056	7.1	LOS A	0.2	4.5	0.54	0.51	0.54	31.7
North: Rio Wrangler															
7	L2	All MCs	4	2.0	4	2.0	0.153	7.4	LOS A	0.5	13.5	0.53	0.46	0.53	31.5
4	T1	All MCs	93	2.0	93	2.0	0.153	7.4	LOS A	0.5	13.5	0.53	0.46	0.53	32.0
14	R2	All MCs	181	2.0	181	2.0	0.110	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	36.1
Approach			279	2.0	279	2.0	0.153	2.6	LOS A	0.5	13.5	0.18	0.16	0.18	34.5
West: Steamboat															
5	L2	All MCs	73	2.0	73	2.0	0.230	5.7	LOS A	1.0	24.4	0.26	0.13	0.26	31.8
2	T1	All MCs	9	2.0	9	2.0	0.230	5.7	LOS A	1.0	24.4	0.26	0.13	0.26	32.4
12	R2	All MCs	527	2.0	527	2.0	0.230	1.7	LOS A	1.0	24.4	0.07	0.04	0.07	34.9
Approach			609	2.0	609	2.0	0.230	2.2	LOS A	1.0	24.4	0.10	0.05	0.10	34.4
All Vehicles			1521	2.0	1521	2.0	0.590	5.8	LOS A	4.2	107.7	0.24	0.13	0.24	31.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 2010 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 1 [Steamboat & Rio Wrangler PM Baseline (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Practical Capacity): Results for 20 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Rio Wrangler															
3	L2	All MCs	274	2.0	274	2.0	0.356	7.7	LOS A	1.7	42.1	0.40	0.24	0.40	30.0
8	T1	All MCs	50	2.0	50	2.0	0.356	7.7	LOS A	1.7	42.1	0.40	0.24	0.40	30.5
18	R2	All MCs	4	2.0	4	2.0	0.356	7.7	LOS A	1.7	42.1	0.40	0.24	0.40	30.3
Approach			329	2.0	329	2.0	0.356	7.7	LOS A	1.7	42.1	0.40	0.24	0.40	30.1
East: Steamboat															
1	L2	All MCs	4	2.0	4	2.0	0.034	5.6	LOS A	0.1	2.8	0.46	0.37	0.46	32.0
6	T1	All MCs	13	2.0	13	2.0	0.034	5.6	LOS A	0.1	2.8	0.46	0.37	0.46	32.6
16	R2	All MCs	6	2.0	6	2.0	0.034	5.6	LOS A	0.1	2.8	0.46	0.37	0.46	32.3
Approach			23	2.0	23	2.0	0.034	5.6	LOS A	0.1	2.8	0.46	0.37	0.46	32.4
North: Rio Wrangler															
7	L2	All MCs	12	2.0	12	2.0	0.084	5.2	LOS A	0.3	7.3	0.38	0.27	0.38	32.2
4	T1	All MCs	57	2.0	57	2.0	0.084	5.2	LOS A	0.3	7.3	0.38	0.27	0.38	32.8
14	R2	All MCs	91	2.0	91	2.0	0.055	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	36.1
Approach			160	2.0	160	2.0	0.084	2.2	LOS A	0.3	7.3	0.17	0.12	0.17	34.5
West: Steamboat															
5	L2	All MCs	146	2.0	146	2.0	0.188	5.1	LOS A	0.8	19.2	0.20	0.09	0.20	31.2
2	T1	All MCs	27	2.0	27	2.0	0.188	5.1	LOS A	0.8	19.2	0.20	0.09	0.20	31.7
12	R2	All MCs	331	2.0	331	2.0	0.188	0.4	LOS A	0.8	19.2	0.01	0.01	0.01	35.7
Approach			503	2.0	503	2.0	0.188	2.0	LOS A	0.8	19.2	0.08	0.03	0.08	34.0
All Vehicles			1016	2.0	1016	2.0	0.356	4.0	LOS A	1.7	42.1	0.21	0.12	0.21	32.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 2010 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix C
Baseline Plus Project
LOS Calculations

HEADWAY
TRANSPORTATION

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	286	212	195	97	395	305	156	664	37	137	616	711
Future Volume (veh/h)	286	212	195	97	395	305	156	664	37	137	616	711
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1841	1870
Adj Flow Rate, veh/h	304	226	0	103	420	0	166	706	39	146	655	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	4	2
Cap, veh/h	404	808		227	626		256	921	402	250	900	
Arrive On Green	0.12	0.23	0.00	0.07	0.18	0.00	0.07	0.26	0.26	0.07	0.26	0.00
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	3456	3554	1550	3456	3497	1585
Grp Volume(v), veh/h	304	226	0	103	420	0	166	706	39	146	655	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1777	1550	1728	1749	1585
Q Serve(g_s), s	5.4	3.4	0.0	1.8	7.1	0.0	3.0	11.7	1.2	2.6	10.9	0.0
Cycle Q Clear(g_c), s	5.4	3.4	0.0	1.8	7.1	0.0	3.0	11.7	1.2	2.6	10.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	404	808		227	626		256	921	402	250	900	
V/C Ratio(X)	0.75	0.28		0.45	0.67		0.65	0.77	0.10	0.58	0.73	
Avail Cap(c_a), veh/h	432	1334		324	1223		270	1557	679	432	1696	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	27.3	20.4	0.0	28.8	24.6	0.0	28.8	21.9	18.0	28.7	21.7	0.0
Incr Delay (d2), s/veh	6.8	0.2	0.0	1.4	1.3	0.0	5.0	1.4	0.1	2.2	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	1.3	0.0	0.8	2.9	0.0	1.3	4.4	0.4	1.1	4.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.1	20.6	0.0	30.2	25.9	0.0	33.7	23.3	18.1	30.9	22.8	0.0
LnGrp LOS	C	C		C	C		C	C	B	C	C	
Approach Vol, veh/h		530			523			911			801	
Approach Delay, s/veh		28.3			26.7			25.0			24.3	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	10.6	22.6	10.2	20.5	10.7	22.4	13.5	17.3				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	8.0	28.0	6.0	24.0	5.0	31.0	8.0	22.0				
Max Q Clear Time (g_c+I1), s	4.6	13.7	3.8	5.4	5.0	12.9	7.4	9.1				
Green Ext Time (p_c), s	0.1	2.3	0.0	0.6	0.0	2.1	0.1	1.2				
Intersection Summary												
HCM 6th Ctrl Delay			25.7									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	755	360	235	60	235	181	214	755	90	283	898	523
Future Volume (veh/h)	755	360	235	60	235	181	214	755	90	283	898	523
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1841	1870
Adj Flow Rate, veh/h	803	383	0	64	250	0	228	803	96	301	955	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	4	2
Cap, veh/h	863	1136		155	409		274	927	405	353	992	
Arrive On Green	0.25	0.32	0.00	0.04	0.12	0.00	0.08	0.26	0.26	0.10	0.28	0.00
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	3456	3554	1550	3456	3497	1585
Grp Volume(v), veh/h	803	383	0	64	250	0	228	803	96	301	955	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1777	1550	1728	1749	1585
Q Serve(g_s), s	20.0	7.2	0.0	1.6	5.9	0.0	5.7	19.0	4.3	7.6	23.7	0.0
Cycle Q Clear(g_c), s	20.0	7.2	0.0	1.6	5.9	0.0	5.7	19.0	4.3	7.6	23.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	863	1136		155	409		274	927	405	353	992	
V/C Ratio(X)	0.93	0.34		0.41	0.61		0.83	0.87	0.24	0.85	0.96	
Avail Cap(c_a), veh/h	863	1572		196	887		274	927	405	353	992	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	32.3	22.9	0.0	41.0	37.1	0.0	40.0	31.1	25.7	38.9	31.1	0.0
Incr Delay (d2), s/veh	16.4	0.2	0.0	1.7	1.5	0.0	18.9	8.7	0.3	17.9	20.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.0	2.9	0.0	0.7	2.6	0.0	3.0	8.6	1.6	3.9	11.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.7	23.0	0.0	42.7	38.6	0.0	58.9	39.8	26.0	56.8	51.2	0.0
LnGrp LOS	D	C		D	D		E	D	C	E	D	
Approach Vol, veh/h		1186			314			1127			1256	
Approach Delay, s/veh		40.4			39.4			42.5			52.5	
Approach LOS		D			D			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.0	29.0	10.0	34.2	13.0	31.0	28.0	16.1
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	9.0	23.0	5.0	39.0	7.0	25.0	22.0	22.0
Max Q Clear Time (g_c+I1), s	9.6	21.0	3.6	9.2	7.7	25.7	22.0	7.9
Green Ext Time (p_c), s	0.0	0.8	0.0	1.3	0.0	0.0	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	44.9
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	1.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	243	90	0	604	85	24
Future Vol, veh/h	243	90	0	604	85	24
Conflicting Peds, #/hr	0	5	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	200	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	264	98	0	657	92	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	598	137
Stage 1	-	-	-	-	269	-
Stage 2	-	-	-	-	329	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	0	-	434	886
Stage 1	-	-	0	-	752	-
Stage 2	-	-	0	-	701	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	432	882
Mov Cap-2 Maneuver	-	-	-	-	432	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	701	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	14.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	487	-	-	-
HCM Lane V/C Ratio	0.243	-	-	-
HCM Control Delay (s)	14.8	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.9	-	-	-

Intersection						
Int Delay, s/veh	2.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	518	131	0	323	93	63
Future Vol, veh/h	518	131	0	323	93	63
Conflicting Peds, #/hr	0	5	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	200	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	563	142	0	351	101	68

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	744	287
Stage 1	-	-	-	-	568	-
Stage 2	-	-	-	-	176	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	0	-	350	710
Stage 1	-	-	0	-	530	-
Stage 2	-	-	0	-	837	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	348	707
Mov Cap-2 Maneuver	-	-	-	-	348	-
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	837	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	18.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	438	-	-	-
HCM Lane V/C Ratio	0.387	-	-	-
HCM Control Delay (s)	18.3	-	-	-
HCM Lane LOS	C	-	-	-
HCM 95th %tile Q(veh)	1.8	-	-	-

Intersection	
Intersection Delay, s/veh	14.2
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	100	167	331	12	41	273
Future Vol, veh/h	100	167	331	12	41	273
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	109	182	360	13	45	297
Number of Lanes	1	1	1	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	2	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	2
HCM Control Delay	11.1	19.1	11.5
HCM LOS	B	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	0%	0%
Vol Thru, %	0%	100%	0%	0%	100%	0%
Vol Right, %	0%	0%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	331	12	100	167	41	273
LT Vol	331	0	100	0	0	0
Through Vol	0	12	0	0	41	0
RT Vol	0	0	0	167	0	273
Lane Flow Rate	360	13	109	182	45	297
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.634	0.021	0.21	0.29	0.074	0.432
Departure Headway (Hd)	6.341	5.834	6.969	5.754	5.955	5.245
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	572	614	515	624	602	685
Service Time	4.073	3.566	4.712	3.496	3.689	2.978
HCM Lane V/C Ratio	0.629	0.021	0.212	0.292	0.075	0.434
HCM Control Delay	19.5	8.7	11.6	10.8	9.2	11.9
HCM Lane LOS	C	A	B	B	A	B
HCM 95th-tile Q	4.4	0.1	0.8	1.2	0.2	2.2

Intersection	
Intersection Delay, s/veh	13.6
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	285	296	198	6	56	125
Future Vol, veh/h	285	296	198	6	56	125
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	310	322	215	7	61	136
Number of Lanes	1	1	1	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	2
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	2	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	2	0	2
HCM Control Delay	14.3	14.5	10.3
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	0%	0%
Vol Thru, %	0%	100%	0%	0%	100%	0%
Vol Right, %	0%	0%	0%	100%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	198	6	285	296	56	125
LT Vol	198	0	285	0	0	0
Through Vol	0	6	0	0	56	0
RT Vol	0	0	0	296	0	125
Lane Flow Rate	215	7	310	322	61	136
Geometry Grp	7	7	7	7	7	7
Degree of Util (X)	0.419	0.012	0.546	0.459	0.111	0.222
Departure Headway (Hd)	7.004	6.495	6.347	5.139	6.59	5.877
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	514	551	570	701	544	610
Service Time	4.743	4.233	4.078	2.869	4.332	3.618
HCM Lane V/C Ratio	0.418	0.013	0.544	0.459	0.112	0.223
HCM Control Delay	14.7	9.3	16.5	12.2	10.2	10.3
HCM Lane LOS	B	A	C	B	B	B
HCM 95th-tile Q	2.1	0	3.3	2.4	0.4	0.8

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	33	0	41	18	0	30	48	280	4	11	122	75
Future Vol, veh/h	33	0	41	18	0	30	48	280	4	11	122	75
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	0	45	20	0	33	52	304	4	12	133	82

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	589	579	138	636	659	311	220	0	0	313	0	0
Stage 1	162	162	-	415	415	-	-	-	-	-	-	-
Stage 2	427	417	-	221	244	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	420	426	910	391	384	729	1349	-	-	1247	-	-
Stage 1	840	764	-	615	592	-	-	-	-	-	-	-
Stage 2	606	591	-	781	704	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	385	401	906	357	362	726	1343	-	-	1241	-	-
Mov Cap-2 Maneuver	385	401	-	357	362	-	-	-	-	-	-	-
Stage 1	804	753	-	589	566	-	-	-	-	-	-	-
Stage 2	556	565	-	735	693	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.4	12.6	1.1	0.4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1343	-	-	565	523	1241	-	-
HCM Lane V/C Ratio	0.039	-	-	0.142	0.1	0.01	-	-
HCM Control Delay (s)	7.8	-	-	12.4	12.6	7.9	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.3	0	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	47	0	59	10	0	22	46	135	17	37	215	100
Future Vol, veh/h	47	0	59	10	0	22	46	135	17	37	215	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	51	0	64	11	0	24	50	147	18	40	234	109

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	587	589	239	662	689	161	348	0	0	170	0	0
Stage 1	319	319	-	261	261	-	-	-	-	-	-	-
Stage 2	268	270	-	401	428	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	421	421	800	375	369	884	1211	-	-	1407	-	-
Stage 1	693	653	-	744	692	-	-	-	-	-	-	-
Stage 2	738	686	-	626	585	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	386	388	796	325	340	880	1205	-	-	1400	-	-
Mov Cap-2 Maneuver	386	388	-	325	340	-	-	-	-	-	-	-
Stage 1	661	631	-	710	660	-	-	-	-	-	-	-
Stage 2	688	654	-	559	565	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.4	11.7	1.9	0.8
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1205	-	-	541	574	1400	-	-
HCM Lane V/C Ratio	0.041	-	-	0.213	0.061	0.029	-	-
HCM Control Delay (s)	8.1	-	-	13.4	11.7	7.6	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.8	0.2	0.1	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	0	8	12	0	15	5	291	4	6	167	8
Future Vol, veh/h	26	0	8	12	0	15	5	291	4	6	167	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	0	9	13	0	16	5	316	4	7	182	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	542	541	192	538	543	323	196	0	0	325	0	0
Stage 1	206	206	-	333	333	-	-	-	-	-	-	-
Stage 2	336	335	-	205	210	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	451	448	850	454	447	718	1377	-	-	1235	-	-
Stage 1	796	731	-	681	644	-	-	-	-	-	-	-
Stage 2	678	643	-	797	728	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	436	439	846	444	438	715	1370	-	-	1229	-	-
Mov Cap-2 Maneuver	436	439	-	444	438	-	-	-	-	-	-	-
Stage 1	790	723	-	676	638	-	-	-	-	-	-	-
Stage 2	660	637	-	784	720	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.9	11.8	0.1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1370	-	-	492	562	1229	-	-
HCM Lane V/C Ratio	0.004	-	-	0.075	0.052	0.005	-	-
HCM Control Delay (s)	7.6	-	-	12.9	11.8	7.9	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.2	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	0	4	7	0	11	15	171	11	19	243	22
Future Vol, veh/h	16	0	4	7	0	11	15	171	11	19	243	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	5	5	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	0	4	8	0	12	16	186	12	21	264	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	553	558	281	549	564	197	293	0	0	203	0	0
Stage 1	323	323	-	229	229	-	-	-	-	-	-	-
Stage 2	230	235	-	320	335	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	444	438	758	446	435	844	1269	-	-	1369	-	-
Stage 1	689	650	-	774	715	-	-	-	-	-	-	-
Stage 2	773	710	-	692	643	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	426	421	754	432	418	840	1263	-	-	1362	-	-
Mov Cap-2 Maneuver	426	421	-	432	418	-	-	-	-	-	-	-
Stage 1	677	637	-	761	702	-	-	-	-	-	-	-
Stage 2	752	697	-	677	630	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.1	11.1	0.6	0.5
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1263	-	-	467	614	1362	-	-
HCM Lane V/C Ratio	0.013	-	-	0.047	0.032	0.015	-	-
HCM Control Delay (s)	7.9	-	-	13.1	11.1	7.7	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection						
Int Delay, s/veh	1					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	31	269	2	10	177
Future Vol, veh/h	7	31	269	2	10	177
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	34	292	2	11	192

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	512	298	0	0	299	0
Stage 1	298	-	-	-	-	-
Stage 2	214	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	522	741	-	-	1262	-
Stage 1	753	-	-	-	-	-
Stage 2	822	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	515	737	-	-	1256	-
Mov Cap-2 Maneuver	515	-	-	-	-	-
Stage 1	749	-	-	-	-	-
Stage 2	815	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	683	1256	-
HCM Lane V/C Ratio	-	-	0.06	0.009	-
HCM Control Delay (s)	-	-	10.6	7.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	18	179	7	29	225
Future Vol, veh/h	5	18	179	7	29	225
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	20	195	8	32	245

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	513	204	0	0	208	0
Stage 1	204	-	-	-	-	-
Stage 2	309	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	521	837	-	-	1363	-
Stage 1	830	-	-	-	-	-
Stage 2	745	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	506	833	-	-	1357	-
Mov Cap-2 Maneuver	506	-	-	-	-	-
Stage 1	826	-	-	-	-	-
Stage 2	727	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	730	1357	-
HCM Lane V/C Ratio	-	-	0.034	0.023	-
HCM Control Delay (s)	-	-	10.1	7.7	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Intersection						
Int Delay, s/veh	1.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	52	219	6	17	167
Future Vol, veh/h	17	52	219	6	17	167
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	57	238	7	18	182

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	465	247	0	0	250	0
Stage 1	247	-	-	-	-	-
Stage 2	218	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	556	792	-	-	1316	-
Stage 1	794	-	-	-	-	-
Stage 2	818	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	545	788	-	-	1310	-
Mov Cap-2 Maneuver	545	-	-	-	-	-
Stage 1	790	-	-	-	-	-
Stage 2	807	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	10.7		0		0.7	
HCM LOS	B					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	710	1310	-
HCM Lane V/C Ratio	-	-	0.106	0.014	-
HCM Control Delay (s)	-	-	10.7	7.8	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	30	156	17	48	182
Future Vol, veh/h	9	30	156	17	48	182
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	33	170	18	52	198

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	486	184	0	0	193	0
Stage 1	184	-	-	-	-	-
Stage 2	302	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	540	858	-	-	1380	-
Stage 1	848	-	-	-	-	-
Stage 2	750	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	517	854	-	-	1373	-
Mov Cap-2 Maneuver	517	-	-	-	-	-
Stage 1	844	-	-	-	-	-
Stage 2	722	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.1	0	1.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	742	1373	-
HCM Lane V/C Ratio	-	-	0.057	0.038	-
HCM Control Delay (s)	-	-	10.1	7.7	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection						
Int Delay, s/veh	0.9					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	21	204	3	6	178
Future Vol, veh/h	10	21	204	3	6	178
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	23	222	3	7	193

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	436	229	0	0	230	0
Stage 1	229	-	-	-	-	-
Stage 2	207	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	578	810	-	-	1338	-
Stage 1	809	-	-	-	-	-
Stage 2	828	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	572	806	-	-	1332	-
Mov Cap-2 Maneuver	572	-	-	-	-	-
Stage 1	805	-	-	-	-	-
Stage 2	824	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	712	1332	-
HCM Lane V/C Ratio	-	-	0.047	0.005	-
HCM Control Delay (s)	-	-	10.3	7.7	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection						
Int Delay, s/veh	0.8					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	12	161	10	20	171
Future Vol, veh/h	5	12	161	10	20	171
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	13	175	11	22	186

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	416	186	0	0	191	0
Stage 1	186	-	-	-	-	-
Stage 2	230	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	593	856	-	-	1383	-
Stage 1	846	-	-	-	-	-
Stage 2	808	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	581	852	-	-	1376	-
Mov Cap-2 Maneuver	581	-	-	-	-	-
Stage 1	842	-	-	-	-	-
Stage 2	795	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.9	0	0.8
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	749	1376	-
HCM Lane V/C Ratio	-	-	0.025	0.016	-
HCM Control Delay (s)	-	-	9.9	7.7	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Intersection Delay, s/veh	109.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	98	8	474	6	16	8	462	101	2	7	116	207
Future Vol, veh/h	98	8	474	6	16	8	462	101	2	7	116	207
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	118	10	571	7	19	10	557	122	2	8	140	249
Number of Lanes	1	1	1	0	1	0	1	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	3
HCM Control Delay	87.6	15.6	169.1	55.8
HCM LOS	F	C	F	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1
Vol Left, %	100%	0%	100%	0%	0%	20%	2%
Vol Thru, %	0%	98%	0%	100%	0%	53%	35%
Vol Right, %	0%	2%	0%	0%	100%	27%	63%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	462	103	98	8	474	30	330
LT Vol	462	0	98	0	0	6	7
Through Vol	0	101	0	8	0	16	116
RT Vol	0	2	0	0	474	8	207
Lane Flow Rate	557	124	118	10	571	36	398
Geometry Grp	8	8	7	7	7	8	8
Degree of Util (X)	1.36	0.286	0.27	0.021	1.117	0.103	0.909
Departure Headway (Hd)	9.242	8.711	8.862	8.343	7.617	11.557	9.121
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	395	416	409	432	480	312	402
Service Time	6.942	6.411	6.562	6.043	5.317	9.257	6.821
HCM Lane V/C Ratio	1.41	0.298	0.289	0.023	1.19	0.115	0.99
HCM Control Delay	203.5	14.9	14.8	11.2	103.9	15.6	55.8
HCM Lane LOS	F	B	B	B	F	C	F
HCM 95th-tile Q	25.4	1.2	1.1	0.1	17.9	0.3	9.6

Intersection	
Intersection Delay, s/veh	15.6
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	178	24	298	4	12	8	247	79	4	14	76	117
Future Vol, veh/h	178	24	298	4	12	8	247	79	4	14	76	117
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	198	27	331	4	13	9	274	88	4	16	84	130
Number of Lanes	1	1	1	0	1	0	1	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	3	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	3	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	3
HCM Control Delay	14.6	11.3	17.6	15.3
HCM LOS	B	B	C	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	EBLn3	WBLn1	SBLn1
Vol Left, %	100%	0%	100%	0%	0%	17%	7%
Vol Thru, %	0%	95%	0%	100%	0%	50%	37%
Vol Right, %	0%	5%	0%	0%	100%	33%	57%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	247	83	178	24	298	24	207
LT Vol	247	0	178	0	0	4	14
Through Vol	0	79	0	24	0	12	76
RT Vol	0	4	0	0	298	8	117
Lane Flow Rate	274	92	198	27	331	27	230
Geometry Grp	8	8	7	7	7	8	8
Degree of Util (X)	0.569	0.177	0.386	0.048	0.535	0.06	0.446
Departure Headway (Hd)	7.466	6.925	7.035	6.527	5.816	8.105	6.974
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	480	515	508	545	616	445	513
Service Time	5.256	4.715	4.814	4.305	3.593	5.805	4.773
HCM Lane V/C Ratio	0.571	0.179	0.39	0.05	0.537	0.061	0.448
HCM Control Delay	19.8	11.2	14.2	9.6	15.2	11.3	15.3
HCM Lane LOS	C	B	B	A	C	B	C
HCM 95th-tile Q	3.5	0.6	1.8	0.2	3.2	0.2	2.3

MOVEMENT SUMMARY

Site: 1 [Steamboat & Rio Wrangler AM Baseline Plus Project (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Practical Capacity): Results for 20 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Rio Wrangler															
3	L2	All MCs	513	2.0	513	2.0	0.640	12.6	LOS B	4.8	122.7	0.52	0.28	0.52	28.2
8	T1	All MCs	112	2.0	112	2.0	0.640	12.6	LOS B	4.8	122.7	0.52	0.28	0.52	28.6
18	R2	All MCs	2	2.0	2	2.0	0.640	12.6	LOS B	4.8	122.7	0.52	0.28	0.52	28.4
Approach			628	2.0	628	2.0	0.640	12.6	LOS B	4.8	122.7	0.52	0.28	0.52	28.3
East: Steamboat															
1	L2	All MCs	7	2.0	7	2.0	0.064	7.7	LOS A	0.2	5.2	0.56	0.54	0.56	31.1
6	T1	All MCs	18	2.0	18	2.0	0.064	7.7	LOS A	0.2	5.2	0.56	0.54	0.56	31.6
16	R2	All MCs	9	2.0	9	2.0	0.064	7.7	LOS A	0.2	5.2	0.56	0.54	0.56	31.4
Approach			33	2.0	33	2.0	0.064	7.7	LOS A	0.2	5.2	0.56	0.54	0.56	31.4
North: Rio Wrangler															
7	L2	All MCs	8	2.0	8	2.0	0.214	8.2	LOS A	0.8	19.6	0.55	0.48	0.55	31.1
4	T1	All MCs	129	2.0	129	2.0	0.214	8.2	LOS A	0.8	19.6	0.55	0.48	0.55	31.6
14	R2	All MCs	230	2.0	230	2.0	0.140	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	36.1
Approach			367	2.0	367	2.0	0.214	3.1	LOS A	0.8	19.6	0.20	0.18	0.20	34.2
West: Steamboat															
5	L2	All MCs	109	2.0	109	2.0	0.247	6.1	LOS A	1.0	26.3	0.31	0.17	0.31	31.4
2	T1	All MCs	9	2.0	9	2.0	0.247	6.1	LOS A	1.0	26.3	0.31	0.17	0.31	31.9
12	R2	All MCs	527	2.0	527	2.0	0.247	1.5	LOS A	1.0	26.3	0.07	0.04	0.07	35.0
Approach			644	2.0	644	2.0	0.247	2.3	LOS A	1.0	26.3	0.12	0.06	0.12	34.2
All Vehicles			1672	2.0	1672	2.0	0.640	6.5	LOS A	4.8	122.7	0.30	0.18	0.30	31.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 2010 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 1 [Steamboat & Rio Wrangler PM Baseline Plus Project (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Practical Capacity): Results for 20 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Rio Wrangler															
3	L2	All MCs	274	2.0	274	2.0	0.421	9.1	LOS A	2.1	52.1	0.49	0.33	0.49	29.6
8	T1	All MCs	88	2.0	88	2.0	0.421	9.1	LOS A	2.1	52.1	0.49	0.33	0.49	30.0
18	R2	All MCs	4	2.0	4	2.0	0.421	9.1	LOS A	2.1	52.1	0.49	0.33	0.49	29.8
Approach			367	2.0	367	2.0	0.421	9.1	LOS A	2.1	52.1	0.49	0.33	0.49	29.7
East: Steamboat															
1	L2	All MCs	4	2.0	4	2.0	0.043	6.2	LOS A	0.1	3.5	0.50	0.44	0.50	31.8
6	T1	All MCs	13	2.0	13	2.0	0.043	6.2	LOS A	0.1	3.5	0.50	0.44	0.50	32.3
16	R2	All MCs	9	2.0	9	2.0	0.043	6.2	LOS A	0.1	3.5	0.50	0.44	0.50	32.1
Approach			27	2.0	27	2.0	0.043	6.2	LOS A	0.1	3.5	0.50	0.44	0.50	32.2
North: Rio Wrangler															
7	L2	All MCs	16	2.0	16	2.0	0.121	5.6	LOS A	0.4	11.0	0.40	0.28	0.40	32.1
4	T1	All MCs	84	2.0	84	2.0	0.121	5.6	LOS A	0.4	11.0	0.40	0.28	0.40	32.7
14	R2	All MCs	130	2.0	130	2.0	0.079	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	36.1
Approach			230	2.0	230	2.0	0.121	2.4	LOS A	0.4	11.0	0.17	0.12	0.17	34.4
West: Steamboat															
5	L2	All MCs	199	2.0	199	2.0	0.225	5.7	LOS A	0.9	23.7	0.26	0.13	0.26	30.7
2	T1	All MCs	27	2.0	27	2.0	0.225	5.7	LOS A	0.9	23.7	0.26	0.13	0.26	31.2
12	R2	All MCs	331	2.0	331	2.0	0.202	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	36.0
Approach			557	2.0	557	2.0	0.225	2.3	LOS A	0.9	23.7	0.10	0.05	0.10	33.7
All Vehicles			1180	2.0	1180	2.0	0.421	4.5	LOS A	2.1	52.1	0.25	0.16	0.25	32.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 2010 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix D

Future Year LOS Calculations

HEADWAY
TRANSPORTATION

HCM 6th Signalized Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	411	267	195	97	560	500	279	1241	61	302	1180	711
Future Volume (veh/h)	411	267	195	97	560	500	279	1241	61	302	1180	711
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1841	1870
Adj Flow Rate, veh/h	437	284	0	103	596	0	297	1320	65	321	1255	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	4	2
Cap, veh/h	483	986		151	644		333	1412	618	359	1415	
Arrive On Green	0.14	0.28	0.00	0.04	0.18	0.00	0.10	0.40	0.40	0.10	0.40	0.00
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	3456	3554	1556	3456	3497	1585
Grp Volume(v), veh/h	437	284	0	103	596	0	297	1320	65	321	1255	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1777	1556	1728	1749	1585
Q Serve(g_s), s	16.8	8.5	0.0	4.0	22.3	0.0	11.5	48.0	3.5	12.4	44.9	0.0
Cycle Q Clear(g_c), s	16.8	8.5	0.0	4.0	22.3	0.0	11.5	48.0	3.5	12.4	44.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	483	986		151	644		333	1412	618	359	1415	
V/C Ratio(X)	0.91	0.29		0.68	0.92		0.89	0.93	0.11	0.90	0.89	
Avail Cap(c_a), veh/h	487	986		205	659		333	1528	669	359	1530	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	57.2	38.3	0.0	63.6	54.3	0.0	60.3	39.0	25.6	59.7	37.3	0.0
Incr Delay (d2), s/veh	20.3	0.2	0.0	5.5	18.8	0.0	24.6	10.6	0.1	23.8	6.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	13.5	6.7	0.0	3.3	17.1	0.0	10.1	29.8	2.4	10.7	26.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.4	38.4	0.0	69.1	73.1	0.0	84.8	49.6	25.6	83.5	43.6	0.0
LnGrp LOS	E	D		E	E		F	D	C	F	D	
Approach Vol, veh/h		721			699			1682			1576	
Approach Delay, s/veh		62.1			72.5			54.9			51.8	
Approach LOS		E			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.0	59.6	11.9	43.4	19.0	60.6	24.8	30.5
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	14.0	58.0	8.0	36.0	13.0	59.0	19.0	25.0
Max Q Clear Time (g_c+I1), s	14.4	50.0	6.0	10.5	13.5	46.9	18.8	24.3
Green Ext Time (p_c), s	0.0	3.6	0.0	0.9	0.0	4.1	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	57.6
HCM 6th LOS	E

Notes

Unsignalized Delay for [EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	755	392	235	75	257	432	234	884	85	410	1306	742
Future Volume (veh/h)	755	392	235	75	257	432	234	884	85	410	1306	742
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	803	417	0	80	273	0	249	940	90	436	1389	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	831	1099		123	371		269	1223	535	488	1448	
Arrive On Green	0.24	0.31	0.00	0.04	0.10	0.00	0.08	0.34	0.34	0.14	0.41	0.00
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	3456	3554	1554	3456	3554	1585
Grp Volume(v), veh/h	803	417	0	80	273	0	249	940	90	436	1389	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1777	1554	1728	1777	1585
Q Serve(g_s), s	32.5	13.0	0.0	3.2	10.5	0.0	10.1	33.3	5.7	17.5	53.7	0.0
Cycle Q Clear(g_c), s	32.5	13.0	0.0	3.2	10.5	0.0	10.1	33.3	5.7	17.5	53.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	831	1099		123	371		269	1223	535	488	1448	
V/C Ratio(X)	0.97	0.38		0.65	0.74		0.93	0.77	0.17	0.89	0.96	
Avail Cap(c_a), veh/h	831	1232		171	553		269	1223	535	538	1484	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	53.1	38.2	0.0	67.3	61.4	0.0	64.8	41.3	32.3	59.7	40.7	0.0
Incr Delay (d2), s/veh	23.1	0.2	0.0	5.7	2.9	0.0	35.7	3.0	0.1	16.3	14.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	23.3	9.6	0.0	2.7	8.5	0.0	9.6	21.0	3.9	13.4	33.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	76.2	38.4	0.0	73.0	64.3	0.0	100.4	44.4	32.4	76.0	55.4	0.0
LnGrp LOS	E	D		E	E		F	D	C	E	E	
Approach Vol, veh/h		1220			353			1279			1825	
Approach Delay, s/veh		63.3			66.2			54.4			60.3	
Approach LOS		E			E			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	25.9	54.6	11.0	49.7	17.0	63.6	40.0	20.7				
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0				
Max Green Setting (Gmax), s	22.0	48.0	7.0	49.0	11.0	59.0	34.0	22.0				
Max Q Clear Time (g_c+I1), s	19.5	35.3	5.2	15.0	12.1	55.7	34.5	12.5				
Green Ext Time (p_c), s	0.4	3.2	0.0	1.4	0.0	1.8	0.0	0.6				
Intersection Summary												
HCM 6th Ctrl Delay			59.9									
HCM 6th LOS			E									

Notes

Unsignalized Delay for [EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	84	459	241	147	580	5	454	12	131	5	8	317
Future Volume (veh/h)	84	459	241	147	580	5	454	12	131	5	8	317
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.96	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	91	499	0	160	630	5	493	13	142	5	9	345
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	118	648		199	810	347	611	784	652	12	465	385
Arrive On Green	0.07	0.18	0.00	0.11	0.23	0.23	0.18	0.42	0.42	0.01	0.25	0.25
Sat Flow, veh/h	1781	3554	1585	1781	3554	1524	3456	1870	1556	1781	1870	1550
Grp Volume(v), veh/h	91	499	0	160	630	5	493	13	142	5	9	345
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1524	1728	1870	1556	1781	1870	1550
Q Serve(g_s), s	4.3	11.4	0.0	7.5	14.2	0.2	11.7	0.3	5.0	0.2	0.3	18.4
Cycle Q Clear(g_c), s	4.3	11.4	0.0	7.5	14.2	0.2	11.7	0.3	5.0	0.2	0.3	18.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	118	648		199	810	347	611	784	652	12	465	385
V/C Ratio(X)	0.77	0.77		0.80	0.78	0.01	0.81	0.02	0.22	0.43	0.02	0.90
Avail Cap(c_a), veh/h	250	997		396	1288	552	1010	1049	873	104	612	507
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.3	33.3	0.0	37.1	31.0	25.6	33.8	14.5	15.9	42.3	24.3	31.1
Incr Delay (d2), s/veh	10.3	2.0	0.0	7.4	1.7	0.0	2.6	0.0	0.2	23.0	0.0	15.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.9	8.6	0.0	6.4	10.0	0.1	8.6	0.3	3.1	0.3	0.2	12.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	49.6	35.3	0.0	44.5	32.7	25.6	36.4	14.5	16.0	65.3	24.3	46.1
LnGrp LOS	D	D		D	C	C	D	B	B	E	C	D
Approach Vol, veh/h		590			795			648			359	
Approach Delay, s/veh		37.5			35.0			31.5			45.8	
Approach LOS		D			D			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.6	41.8	15.5	21.6	21.1	27.3	11.6	25.5
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	48.0	19.0	24.0	25.0	28.0	12.0	31.0
Max Q Clear Time (g_c+I1), s	2.2	7.0	9.5	13.4	13.7	20.4	6.3	16.2
Green Ext Time (p_c), s	0.0	0.5	0.3	1.3	1.4	0.8	0.1	2.0

Intersection Summary	
HCM 6th Ctrl Delay	36.3
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	272	510	308	146	448	5	195	10	158	5	11	176
Future Volume (veh/h)	272	510	308	146	448	5	195	10	158	5	11	176
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.96	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	296	554	0	159	487	5	212	11	172	5	12	191
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	345	966		203	681	291	303	469	389	12	318	262
Arrive On Green	0.19	0.27	0.00	0.11	0.19	0.19	0.09	0.25	0.25	0.01	0.17	0.17
Sat Flow, veh/h	1781	3554	1585	1781	3554	1518	3456	1870	1550	1781	1870	1542
Grp Volume(v), veh/h	296	554	0	159	487	5	212	11	172	5	12	191
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1518	1728	1870	1550	1781	1870	1542
Q Serve(g_s), s	10.8	9.0	0.0	5.8	8.6	0.2	4.0	0.3	6.3	0.2	0.4	7.9
Cycle Q Clear(g_c), s	10.8	9.0	0.0	5.8	8.6	0.2	4.0	0.3	6.3	0.2	0.4	7.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	345	966		203	681	291	303	469	389	12	318	262
V/C Ratio(X)	0.86	0.57		0.79	0.71	0.02	0.70	0.02	0.44	0.42	0.04	0.73
Avail Cap(c_a), veh/h	424	1215		397	1162	497	308	640	530	132	612	504
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.2	21.1	0.0	29.0	25.5	22.0	29.8	19.0	21.2	33.3	23.3	26.4
Incr Delay (d2), s/veh	13.6	0.5	0.0	6.6	1.4	0.0	6.7	0.0	0.8	22.3	0.0	3.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.4	6.3	0.0	4.9	6.3	0.1	3.3	0.2	3.9	0.3	0.3	5.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.8	21.7	0.0	35.6	26.9	22.1	36.6	19.0	22.0	55.5	23.4	30.3
LnGrp LOS	D	C		D	C	C	D	B	C	E	C	C
Approach Vol, veh/h		850			651			395			208	
Approach Delay, s/veh		28.0			29.0			29.7			30.5	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.4	22.9	13.6	24.3	11.9	17.4	19.0	18.9
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	23.0	15.0	23.0	6.0	22.0	16.0	22.0
Max Q Clear Time (g_c+I1), s	2.2	8.3	7.8	11.0	6.0	9.9	12.8	10.6
Green Ext Time (p_c), s	0.0	0.5	0.2	1.6	0.0	0.5	0.3	1.4

Intersection Summary	
HCM 6th Ctrl Delay	28.9
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	18	30	567	4	11	385
Future Vol, veh/h	18	30	567	4	11	385
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	33	616	4	12	418

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1065	623	0	0	625	0
Stage 1	623	-	-	-	-	-
Stage 2	442	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	246	486	-	-	956	-
Stage 1	535	-	-	-	-	-
Stage 2	648	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	242	484	-	-	951	-
Mov Cap-2 Maneuver	242	-	-	-	-	-
Stage 1	532	-	-	-	-	-
Stage 2	640	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	352	951	-
HCM Lane V/C Ratio	-	-	0.148	0.013	-
HCM Control Delay (s)	-	-	17	8.8	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	22	341	17	37	428
Future Vol, veh/h	10	22	341	17	37	428
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	24	371	18	40	465

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	930	385	0	0	394	0
Stage 1	385	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	297	663	-	-	1165	-
Stage 1	688	-	-	-	-	-
Stage 2	581	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	285	660	-	-	1159	-
Mov Cap-2 Maneuver	285	-	-	-	-	-
Stage 1	685	-	-	-	-	-
Stage 2	561	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.3	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	468	1159	-
HCM Lane V/C Ratio	-	-	0.074	0.035	-
HCM Control Delay (s)	-	-	13.3	8.2	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	15	556	4	6	397
Future Vol, veh/h	12	15	556	4	6	397
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	16	604	4	7	432

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1057	611	0	0	613	0
Stage 1	611	-	-	-	-	-
Stage 2	446	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	249	494	-	-	966	-
Stage 1	542	-	-	-	-	-
Stage 2	645	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	246	492	-	-	961	-
Mov Cap-2 Maneuver	246	-	-	-	-	-
Stage 1	539	-	-	-	-	-
Stage 2	640	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.5	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	341	961	-
HCM Lane V/C Ratio	-	-	0.086	0.007	-
HCM Control Delay (s)	-	-	16.5	8.8	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	11	342	11	19	419
Future Vol, veh/h	7	11	342	11	19	419
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	12	372	12	21	455

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	880	383	0	0	389	0
Stage 1	383	-	-	-	-	-
Stage 2	497	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	318	664	-	-	1170	-
Stage 1	689	-	-	-	-	-
Stage 2	611	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	311	661	-	-	1164	-
Mov Cap-2 Maneuver	311	-	-	-	-	-
Stage 1	686	-	-	-	-	-
Stage 2	600	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.2	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	460	1164	-
HCM Lane V/C Ratio	-	-	0.043	0.018	-
HCM Control Delay (s)	-	-	13.2	8.1	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

MOVEMENT SUMMARY

Site: 1 [Steamboat & Rio Wrangler AM Future Year (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Practical Capacity): Results for 20 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Rio Wrangler															
3	L2	All MCs	623	2.0	623	2.0	0.806	20.9	LOS C	18.5	469.0	0.86	0.82	1.54	25.5
8	T1	All MCs	113	2.0	113	2.0	0.806	20.9	LOS C	18.5	469.0	0.86	0.82	1.54	25.9
18	R2	All MCs	2	2.0	2	2.0	0.806	20.9	LOS C	18.5	469.0	0.86	0.82	1.54	25.7
Approach			739	2.0	739	2.0	0.806	20.9	LOS C	18.5	469.0	0.86	0.82	1.54	25.6
East: Steamboat															
1	L2	All MCs	11	2.0	11	2.0	0.118	9.9	LOS A	0.4	9.4	0.63	0.63	0.63	30.1
6	T1	All MCs	33	2.0	33	2.0	0.118	9.9	LOS A	0.4	9.4	0.63	0.63	0.63	30.6
16	R2	All MCs	7	2.0	7	2.0	0.118	9.9	LOS A	0.4	9.4	0.63	0.63	0.63	30.4
Approach			51	2.0	51	2.0	0.118	9.9	LOS A	0.4	9.4	0.63	0.63	0.63	30.5
North: Rio Wrangler															
7	L2	All MCs	4	2.0	4	2.0	0.502	15.2	LOS C	2.7	67.8	0.70	0.76	1.02	28.4
4	T1	All MCs	276	2.0	276	2.0	0.502	15.2	LOS C	2.7	67.8	0.70	0.76	1.02	28.9
14	R2	All MCs	536	2.0	536	2.0	0.326	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	36.0
Approach			816	2.0	816	2.0	0.502	5.3	LOS A	2.7	67.8	0.24	0.26	0.35	33.2
West: Steamboat															
5	L2	All MCs	170	2.0	170	2.0	0.327	8.0	LOS A	1.4	35.6	0.47	0.34	0.47	30.2
2	T1	All MCs	17	2.0	17	2.0	0.327	8.0	LOS A	1.4	35.6	0.47	0.34	0.47	30.7
12	R2	All MCs	620	2.0	620	2.0	0.327	1.2	LOS A	1.4	35.6	0.06	0.05	0.06	35.2
Approach			807	2.0	807	2.0	0.327	2.8	LOS A	1.4	35.6	0.16	0.11	0.16	33.9
All Vehicles			2412	2.0	2412	2.0	0.806	9.3	LOS A	18.5	469.0	0.41	0.39	0.66	30.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 2010 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 1 [Steamboat & Rio Wrangler PM Future Year (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Practical Capacity): Results for 20 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Rio Wrangler															
3	L2	All MCs	274	2.0	274	2.0	0.726	22.1	LOS C	7.3	186.4	0.83	0.99	1.62	25.5
8	T1	All MCs	192	2.0	192	2.0	0.726	22.1	LOS C	7.3	186.4	0.83	0.99	1.62	25.9
18	R2	All MCs	4	2.0	4	2.0	0.726	22.1	LOS C	7.3	186.4	0.83	0.99	1.62	25.7
Approach			471	2.0	471	2.0	0.726	22.1	LOS C	7.3	186.4	0.83	0.99	1.62	25.7
East: Steamboat															
1	L2	All MCs	6	2.0	6	2.0	0.059	9.4	LOS A	0.2	4.5	0.63	0.63	0.63	30.3
6	T1	All MCs	13	2.0	13	2.0	0.059	9.4	LOS A	0.2	4.5	0.63	0.63	0.63	30.8
16	R2	All MCs	6	2.0	6	2.0	0.059	9.4	LOS A	0.2	4.5	0.63	0.63	0.63	30.6
Approach			24	2.0	24	2.0	0.059	9.4	LOS A	0.2	4.5	0.63	0.63	0.63	30.6
North: Rio Wrangler															
7	L2	All MCs	12	2.0	12	2.0	0.163	6.0	LOS A	0.6	15.3	0.41	0.29	0.41	32.0
4	T1	All MCs	122	2.0	122	2.0	0.163	6.0	LOS A	0.6	15.3	0.41	0.29	0.41	32.6
14	R2	All MCs	228	2.0	228	2.0	0.139	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	36.1
Approach			362	2.0	362	2.0	0.163	2.3	LOS A	0.6	15.3	0.15	0.11	0.15	34.6
West: Steamboat															
5	L2	All MCs	478	2.0	478	2.0	0.529	10.2	LOS B	3.2	81.7	0.45	0.25	0.45	28.9
2	T1	All MCs	33	2.0	33	2.0	0.529	10.2	LOS B	3.2	81.7	0.45	0.25	0.45	29.3
12	R2	All MCs	511	2.0	511	2.0	0.311	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	36.0
Approach			1022	2.0	1022	2.0	0.529	5.2	LOS A	3.2	81.7	0.22	0.12	0.22	32.0
All Vehicles			1880	2.0	1880	2.0	0.726	8.9	LOS A	7.3	186.4	0.37	0.34	0.57	30.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 2010 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix E
Future Year Plus Project
LOS Calculations

HEADWAY
TRANSPORTATION

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	411	348	195	128	670	579	279	1241	84	359	1180	711
Future Volume (veh/h)	411	348	195	128	670	579	279	1241	84	359	1180	711
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	437	370	0	136	713	0	297	1320	89	382	1255	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	448	961		185	691		319	1378	603	398	1460	
Arrive On Green	0.13	0.27	0.00	0.05	0.19	0.00	0.09	0.39	0.39	0.12	0.41	0.00
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	3456	3554	1556	3456	3554	1585
Grp Volume(v), veh/h	437	370	0	136	713	0	297	1320	89	382	1255	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1777	1556	1728	1777	1585
Q Serve(g_s), s	17.5	11.8	0.0	5.4	27.0	0.0	11.9	50.2	5.2	15.3	44.7	0.0
Cycle Q Clear(g_c), s	17.5	11.8	0.0	5.4	27.0	0.0	11.9	50.2	5.2	15.3	44.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	448	961		185	691		319	1378	603	398	1460	
V/C Ratio(X)	0.98	0.38		0.73	1.03		0.93	0.96	0.15	0.96	0.86	
Avail Cap(c_a), veh/h	448	961		256	691		319	1408	616	398	1490	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	60.2	41.2	0.0	64.7	55.9	0.0	62.6	41.4	27.6	61.1	37.3	0.0
Incr Delay (d2), s/veh	36.0	0.3	0.0	6.7	42.6	0.0	33.2	15.0	0.1	34.5	5.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.9	5.2	0.0	2.5	16.1	0.0	6.6	23.9	1.9	8.5	19.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	96.2	41.5	0.0	71.4	98.5	0.0	95.8	56.4	27.7	95.6	42.5	0.0
LnGrp LOS	F	D		E	F		F	E	C	F	D	
Approach Vol, veh/h		807			849			1706			1637	
Approach Delay, s/veh		71.1			94.2			61.7			54.9	
Approach LOS		E			F			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.0	59.8	13.4	43.6	18.8	63.0	24.0	33.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	16.0	55.0	10.3	34.7	12.8	58.2	18.0	27.0
Max Q Clear Time (g_c+I1), s	17.3	52.2	7.4	13.8	13.9	46.7	19.5	29.0
Green Ext Time (p_c), s	0.0	1.6	0.1	1.2	0.0	4.0	0.0	0.0

Intersection Summary	
HCM 6th Ctrl Delay	66.5
HCM 6th LOS	E

Notes

Unsignalized Delay for [EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	755	510	235	100	345	495	234	884	119	494	1306	742
Future Volume (veh/h)	755	510	235	100	345	495	234	884	119	494	1306	742
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	803	543	0	106	367	0	249	940	127	526	1389	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	827	1138		151	443		267	1095	478	566	1402	
Arrive On Green	0.24	0.32	0.00	0.04	0.12	0.00	0.08	0.31	0.31	0.16	0.39	0.00
Sat Flow, veh/h	3456	3554	1585	3456	3554	1585	3456	3554	1553	3456	3554	1585
Grp Volume(v), veh/h	803	543	0	106	367	0	249	940	127	526	1389	0
Grp Sat Flow(s),veh/h/ln	1728	1777	1585	1728	1777	1585	1728	1777	1553	1728	1777	1585
Q Serve(g_s), s	33.7	17.9	0.0	4.4	14.7	0.0	10.5	36.4	9.0	21.9	56.8	0.0
Cycle Q Clear(g_c), s	33.7	17.9	0.0	4.4	14.7	0.0	10.5	36.4	9.0	21.9	56.8	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	827	1138		151	443		267	1095	478	566	1402	
V/C Ratio(X)	0.97	0.48		0.70	0.83		0.93	0.86	0.27	0.93	0.99	
Avail Cap(c_a), veh/h	827	1167		213	535		267	1095	478	567	1402	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	55.1	39.9	0.0	69.0	62.5	0.0	67.1	47.6	38.1	60.3	44.0	0.0
Incr Delay (d2), s/veh	24.2	0.3	0.0	5.8	9.0	0.0	37.3	7.0	0.3	21.8	21.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	17.3	7.9	0.0	2.1	7.2	0.0	5.9	16.7	3.5	11.1	28.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	79.3	40.2	0.0	74.8	71.5	0.0	104.4	54.6	38.4	82.1	65.7	0.0
LnGrp LOS	E	D		E	E		F	D	D	F	E	
Approach Vol, veh/h		1346			473			1316			1915	
Approach Delay, s/veh		63.5			72.2			62.5			70.2	
Approach LOS		E			E			E			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	30.0	51.0	12.4	52.8	17.3	63.7	41.0	24.2
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	24.0	45.0	9.0	48.0	11.3	57.7	35.0	22.0
Max Q Clear Time (g_c+I1), s	23.9	38.4	6.4	19.9	12.5	58.8	35.7	16.7
Green Ext Time (p_c), s	0.0	2.4	0.1	1.9	0.0	0.0	0.0	0.6

Intersection Summary	
HCM 6th Ctrl Delay	66.6
HCM 6th LOS	E

Notes

Unsignalized Delay for [EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	10.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	850	90	0	1489	85	24
Future Vol, veh/h	850	90	0	1489	85	24
Conflicting Peds, #/hr	0	5	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	200	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	924	98	0	1618	92	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	1738	467
Stage 1	-	-	-	-	929	-
Stage 2	-	-	-	-	809	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	0	-	~ 78	542
Stage 1	-	-	0	-	345	-
Stage 2	-	-	0	-	398	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	~ 78	539
Mov Cap-2 Maneuver	-	-	-	-	~ 78	-
Stage 1	-	-	-	-	343	-
Stage 2	-	-	-	-	398	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	248.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	96	-	-	-
HCM Lane V/C Ratio	1.234	-	-	-
HCM Control Delay (s)	248.8	-	-	-
HCM Lane LOS	F	-	-	-
HCM 95th %tile Q(veh)	8.2	-	-	-

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

Intersection	
Int Delay, s/veh	24.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1199	131	0	902	93	63
Future Vol, veh/h	1199	131	0	902	93	63
Conflicting Peds, #/hr	0	5	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	200	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1303	142	0	980	101	68

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	1798	657
Stage 1	-	-	-	-	1308	-
Stage 2	-	-	-	-	490	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	0	-	~ 71	407
Stage 1	-	-	0	-	217	-
Stage 2	-	-	0	-	581	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	~ 71	405
Mov Cap-2 Maneuver	-	-	-	-	~ 71	-
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	581	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	$ 380.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	106	-	-	-
HCM Lane V/C Ratio	1.6	-	-	-
HCM Control Delay (s)	$ 380.4	-	-	-
HCM Lane LOS	F	-	-	-
HCM 95th %tile Q(veh)	12.9	-	-	-

Notes

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	467	320	163	570	5	610	12	131	5	25	306
Future Volume (veh/h)	87	467	320	163	570	5	610	12	131	5	25	306
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.97	1.00		0.99	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	95	508	0	177	620	5	663	13	142	5	27	333
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	122	617		213	799	346	777	844	705	12	436	363
Arrive On Green	0.07	0.17	0.00	0.12	0.22	0.22	0.22	0.45	0.45	0.01	0.23	0.23
Sat Flow, veh/h	1781	3554	1585	1781	3554	1541	3456	1870	1562	1781	1870	1559
Grp Volume(v), veh/h	95	508	0	177	620	5	663	13	142	5	27	333
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1541	1728	1870	1562	1781	1870	1559
Q Serve(g_s), s	5.1	13.3	0.0	9.4	15.8	0.2	17.7	0.4	5.3	0.3	1.1	20.1
Cycle Q Clear(g_c), s	5.1	13.3	0.0	9.4	15.8	0.2	17.7	0.4	5.3	0.3	1.1	20.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	122	617		213	799	346	777	844	705	12	436	363
V/C Ratio(X)	0.78	0.82		0.83	0.78	0.01	0.85	0.02	0.20	0.43	0.06	0.92
Avail Cap(c_a), veh/h	222	849		333	1070	464	1076	971	811	92	485	405
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.2	38.4	0.0	41.5	35.1	29.0	35.8	14.6	15.9	47.7	28.7	36.0
Incr Delay (d2), s/veh	10.4	4.8	0.0	9.9	2.6	0.0	5.0	0.0	0.1	23.4	0.1	24.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	6.0	0.0	4.6	6.9	0.1	7.8	0.2	1.8	0.2	0.5	9.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.5	43.1	0.0	51.4	37.7	29.1	40.8	14.6	16.1	71.1	28.8	60.0
LnGrp LOS	D	D		D	D	C	D	B	B	E	C	E
Approach Vol, veh/h		603			802			818			365	
Approach Delay, s/veh		44.9			40.6			36.1			57.8	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.6	49.5	17.5	22.7	27.6	28.5	12.6	27.7
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	50.0	18.0	23.0	30.0	25.0	12.0	29.0
Max Q Clear Time (g_c+I1), s	2.3	7.3	11.4	15.3	19.7	22.1	7.1	17.8
Green Ext Time (p_c), s	0.0	0.5	0.2	1.2	1.9	0.4	0.1	1.8

Intersection Summary	
HCM 6th Ctrl Delay	42.6
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	283	516	463	168	434	5	307	10	158	5	34	161
Future Volume (veh/h)	283	516	463	168	434	5	307	10	158	5	34	161
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.96	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	308	561	0	183	472	5	334	11	172	5	37	175
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	350	905		227	659	281	396	501	415	12	299	246
Arrive On Green	0.20	0.25	0.00	0.13	0.19	0.19	0.11	0.27	0.27	0.01	0.16	0.16
Sat Flow, veh/h	1781	3554	1585	1781	3554	1517	3456	1870	1551	1781	1870	1541
Grp Volume(v), veh/h	308	561	0	183	472	5	334	11	172	5	37	175
Grp Sat Flow(s),veh/h/ln	1781	1777	1585	1781	1777	1517	1728	1870	1551	1781	1870	1541
Q Serve(g_s), s	11.7	9.8	0.0	7.0	8.7	0.2	6.6	0.3	6.4	0.2	1.2	7.5
Cycle Q Clear(g_c), s	11.7	9.8	0.0	7.0	8.7	0.2	6.6	0.3	6.4	0.2	1.2	7.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	350	905		227	659	281	396	501	415	12	299	246
V/C Ratio(X)	0.88	0.62		0.81	0.72	0.02	0.84	0.02	0.41	0.42	0.12	0.71
Avail Cap(c_a), veh/h	357	1171		332	1120	478	396	670	555	128	589	485
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.3	23.0	0.0	29.6	26.7	23.2	30.3	18.8	21.1	34.6	25.2	27.8
Incr Delay (d2), s/veh	21.2	0.7	0.0	9.0	1.5	0.0	15.2	0.0	0.7	22.4	0.2	3.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	3.9	0.0	3.4	3.6	0.1	3.4	0.1	2.2	0.2	0.5	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	48.4	23.7	0.0	38.6	28.2	23.3	45.5	18.9	21.7	56.9	25.3	31.6
LnGrp LOS	D	C		D	C	C	D	B	C	E	C	C
Approach Vol, veh/h		869			660			517			217	
Approach Delay, s/veh		32.5			31.0			37.0			31.1	
Approach LOS		C			C			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	6.5	24.7	14.9	23.8	14.0	17.2	19.7	19.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	25.0	13.0	23.0	8.0	22.0	14.0	22.0
Max Q Clear Time (g_c+I1), s	2.2	8.4	9.0	11.8	8.6	9.5	13.7	10.7
Green Ext Time (p_c), s	0.0	0.5	0.2	1.6	0.0	0.5	0.0	1.3

Intersection Summary	
HCM 6th Ctrl Delay	33.0
HCM 6th LOS	C

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	33	0	41	18	0	30	48	690	4	11	422	75
Future Vol, veh/h	33	0	41	18	0	30	48	690	4	11	422	75
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	2	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	36	0	45	20	0	33	52	750	4	12	459	82

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1358	1345	461	1405	1425	754	543	0	0	756	0	0
Stage 1	485	485	-	858	858	-	-	-	-	-	-	-
Stage 2	873	860	-	547	567	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	126	151	600	117	136	409	1026	-	-	855	-	-
Stage 1	563	552	-	352	374	-	-	-	-	-	-	-
Stage 2	345	373	-	521	507	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	110	141	599	103	127	408	1024	-	-	853	-	-
Mov Cap-2 Maneuver	110	141	-	103	127	-	-	-	-	-	-	-
Stage 1	533	543	-	333	354	-	-	-	-	-	-	-
Stage 2	301	353	-	475	499	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	34.4	30.4	0.6	0.2
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1024	-	-	201	193	853	-	-
HCM Lane V/C Ratio	0.051	-	-	0.4	0.27	0.014	-	-
HCM Control Delay (s)	8.7	-	-	34.4	30.4	9.3	-	-
HCM Lane LOS	A	-	-	D	D	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	1.8	1	0	-	-

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	47	0	59	10	0	22	46	406	17	37	528	100
Future Vol, veh/h	47	0	59	10	0	22	46	406	17	37	528	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	5	0	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	51	0	64	11	0	24	50	441	18	40	574	109

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1221	1223	579	1296	1323	455	688	0	0	464	0	0
Stage 1	659	659	-	555	555	-	-	-	-	-	-	-
Stage 2	562	564	-	741	768	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	157	179	515	139	156	605	906	-	-	1097	-	-
Stage 1	453	461	-	516	513	-	-	-	-	-	-	-
Stage 2	512	508	-	408	411	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	140	161	513	113	141	602	902	-	-	1092	-	-
Mov Cap-2 Maneuver	140	161	-	113	141	-	-	-	-	-	-	-
Stage 1	426	442	-	485	482	-	-	-	-	-	-	-
Stage 2	464	478	-	344	394	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	34.2	21.3	0.9	0.5
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	902	-	-	235	256	1092	-	-
HCM Lane V/C Ratio	0.055	-	-	0.49	0.136	0.037	-	-
HCM Control Delay (s)	9.2	-	-	34.2	21.3	8.4	-	-
HCM Lane LOS	A	-	-	D	C	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	2.5	0.5	0.1	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	0	8	12	0	15	5	701	4	6	467	8
Future Vol, veh/h	26	0	8	12	0	15	5	701	4	6	467	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	2	0	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	0	9	13	0	16	5	762	4	7	508	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1311	1307	515	1307	1309	766	519	0	0	768	0	0
Stage 1	529	529	-	776	776	-	-	-	-	-	-	-
Stage 2	782	778	-	531	533	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	136	160	560	137	159	403	1047	-	-	846	-	-
Stage 1	533	527	-	390	407	-	-	-	-	-	-	-
Stage 2	387	407	-	532	525	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	129	157	559	133	156	402	1045	-	-	844	-	-
Mov Cap-2 Maneuver	129	157	-	133	156	-	-	-	-	-	-	-
Stage 1	529	522	-	387	404	-	-	-	-	-	-	-
Stage 2	370	404	-	519	520	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	34.6	24.7	0.1	0.1
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1045	-	-	158	212	844	-	-
HCM Lane V/C Ratio	0.005	-	-	0.234	0.138	0.008	-	-
HCM Control Delay (s)	8.5	-	-	34.6	24.7	9.3	-	-
HCM Lane LOS	A	-	-	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.5	0	-	-

Intersection												
Int Delay, s/veh	1.1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	0	4	7	0	11	15	442	11	19	556	22
Future Vol, veh/h	16	0	4	7	0	11	15	442	11	19	556	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	5	5	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	0	4	8	0	12	16	480	12	21	604	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1187	1192	621	1183	1198	491	633	0	0	497	0	0
Stage 1	663	663	-	523	523	-	-	-	-	-	-	-
Stage 2	524	529	-	660	675	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	165	187	487	166	186	578	950	-	-	1067	-	-
Stage 1	450	459	-	537	530	-	-	-	-	-	-	-
Stage 2	537	527	-	452	453	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	156	178	485	159	177	575	945	-	-	1062	-	-
Mov Cap-2 Maneuver	156	178	-	159	177	-	-	-	-	-	-	-
Stage 1	440	448	-	525	518	-	-	-	-	-	-	-
Stage 2	517	515	-	439	442	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	27.7	18.6	0.3	0.3
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	945	-	-	180	285	1062	-	-
HCM Lane V/C Ratio	0.017	-	-	0.121	0.069	0.019	-	-
HCM Control Delay (s)	8.9	-	-	27.7	18.6	8.5	-	-
HCM Lane LOS	A	-	-	D	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.2	0.1	-	-

Intersection						
Int Delay, s/veh	0.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	31	679	6	10	477
Future Vol, veh/h	7	31	679	6	10	477
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	34	738	7	11	518

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1287	747	0	0	750	0
Stage 1	747	-	-	-	-	-
Stage 2	540	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	181	413	-	-	859	-
Stage 1	468	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	178	411	-	-	855	-
Mov Cap-2 Maneuver	178	-	-	-	-	-
Stage 1	466	-	-	-	-	-
Stage 2	576	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.4	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	331	855	-
HCM Lane V/C Ratio	-	-	0.125	0.013	-
HCM Control Delay (s)	-	-	17.4	9.3	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection						
Int Delay, s/veh	0.5					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	18	450	7	29	538
Future Vol, veh/h	5	18	450	7	29	538
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	20	489	8	32	585

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1147	498	0	0	502	0
Stage 1	498	-	-	-	-	-
Stage 2	649	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	220	572	-	-	1062	-
Stage 1	611	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	212	569	-	-	1057	-
Mov Cap-2 Maneuver	212	-	-	-	-	-
Stage 1	608	-	-	-	-	-
Stage 2	504	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.2	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	417	1057	-
HCM Lane V/C Ratio	-	-	0.06	0.03	-
HCM Control Delay (s)	-	-	14.2	8.5	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection						
Int Delay, s/veh	1.2					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	52	629	6	17	467
Future Vol, veh/h	17	52	629	6	17	467
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	57	684	7	18	508

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1237	693	0	0	696	0
Stage 1	693	-	-	-	-	-
Stage 2	544	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	194	443	-	-	900	-
Stage 1	496	-	-	-	-	-
Stage 2	582	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	189	441	-	-	896	-
Mov Cap-2 Maneuver	189	-	-	-	-	-
Stage 1	494	-	-	-	-	-
Stage 2	570	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	332	896	-
HCM Lane V/C Ratio	-	-	0.226	0.021	-
HCM Control Delay (s)	-	-	19	9.1	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0.1	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	9	30	427	17	48	495
Future Vol, veh/h	9	30	427	17	48	495
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	33	464	18	52	538

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1120	478	0	0	487	0
Stage 1	478	-	-	-	-	-
Stage 2	642	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	228	587	-	-	1076	-
Stage 1	624	-	-	-	-	-
Stage 2	524	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	216	584	-	-	1071	-
Mov Cap-2 Maneuver	216	-	-	-	-	-
Stage 1	621	-	-	-	-	-
Stage 2	498	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	14.6		0		0.8	
HCM LOS	B					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	419	1071	-
HCM Lane V/C Ratio	-	-	0.101	0.049	-
HCM Control Delay (s)	-	-	14.6	8.5	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	21	614	3	6	478
Future Vol, veh/h	10	21	614	3	6	478
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	23	667	3	7	520

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1208	674	0	0	675	0
Stage 1	674	-	-	-	-	-
Stage 2	534	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	202	455	-	-	916	-
Stage 1	506	-	-	-	-	-
Stage 2	588	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	199	453	-	-	912	-
Mov Cap-2 Maneuver	199	-	-	-	-	-
Stage 1	503	-	-	-	-	-
Stage 2	583	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.5	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	321	912	-
HCM Lane V/C Ratio	-	-	0.105	0.007	-
HCM Control Delay (s)	-	-	17.5	9	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

Intersection						
Int Delay, s/veh	0.4					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	12	432	10	20	484
Future Vol, veh/h	5	12	432	10	20	484
Conflicting Peds, #/hr	0	0	0	5	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	13	470	11	22	526

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1051	481	0	0	486	0
Stage 1	481	-	-	-	-	-
Stage 2	570	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	251	585	-	-	1077	-
Stage 1	622	-	-	-	-	-
Stage 2	566	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	244	582	-	-	1072	-
Mov Cap-2 Maneuver	244	-	-	-	-	-
Stage 1	619	-	-	-	-	-
Stage 2	554	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	14.1		0		0.3	
HCM LOS	B					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	414	1072	-
HCM Lane V/C Ratio	-	-	0.045	0.02	-
HCM Control Delay (s)	-	-	14.1	8.4	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

MOVEMENT SUMMARY

Site: 1 [Steamboat & Rio Wrangler AM Future Year Plus Project (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Practical Capacity): Results for 0 years

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Rio Wrangler															
3	L2	All MCs	623	2.0	623	2.0	0.869	27.1	LOS D	23.9	608.3	1.00	1.15	2.09	23.9
8	T1	All MCs	139	2.0	139	2.0	0.869	27.1	LOS D	23.9	608.3	1.00	1.15	2.09	24.2
18	R2	All MCs	2	2.0	2	2.0	0.869	27.1	LOS D	23.9	608.3	1.00	1.15	2.09	24.1
Approach			764	2.0	764	2.0	0.869	27.1	LOS D	23.9	608.3	1.00	1.15	2.09	24.0
East: Steamboat															
1	L2	All MCs	11	2.0	11	2.0	0.131	10.8	LOS B	0.4	10.4	0.66	0.66	0.66	29.8
6	T1	All MCs	33	2.0	33	2.0	0.131	10.8	LOS B	0.4	10.4	0.66	0.66	0.66	30.3
16	R2	All MCs	9	2.0	9	2.0	0.131	10.8	LOS B	0.4	10.4	0.66	0.66	0.66	30.1
Approach			53	2.0	53	2.0	0.131	10.8	LOS B	0.4	10.4	0.66	0.66	0.66	30.1
North: Rio Wrangler															
7	L2	All MCs	8	2.0	8	2.0	0.572	17.4	LOS C	3.4	86.3	0.74	0.82	1.14	27.7
4	T1	All MCs	311	2.0	311	2.0	0.572	17.4	LOS C	3.4	86.3	0.74	0.82	1.14	28.1
14	R2	All MCs	584	2.0	584	2.0	0.356	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	36.0
Approach			903	2.0	903	2.0	0.572	6.2	LOS A	3.4	86.3	0.26	0.29	0.40	32.7
West: Steamboat															
5	L2	All MCs	206	2.0	206	2.0	0.346	8.6	LOS A	1.5	37.7	0.51	0.38	0.51	29.8
2	T1	All MCs	17	2.0	17	2.0	0.346	8.6	LOS A	1.5	37.7	0.51	0.38	0.51	30.3
12	R2	All MCs	620	2.0	620	2.0	0.346	0.8	LOS A	1.5	37.7	0.04	0.03	0.04	35.4
Approach			842	2.0	842	2.0	0.346	2.9	LOS A	1.5	37.7	0.17	0.12	0.17	33.7
All Vehicles			2563	2.0	2563	2.0	0.869	11.4	LOS B	23.9	608.3	0.46	0.50	0.83	29.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 2010 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 1 [Steamboat & Rio Wrangler PM Future Year Plus Project (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout
Design Life Analysis (Practical Capacity): Results for 20 years

Vehicle Movement Performance

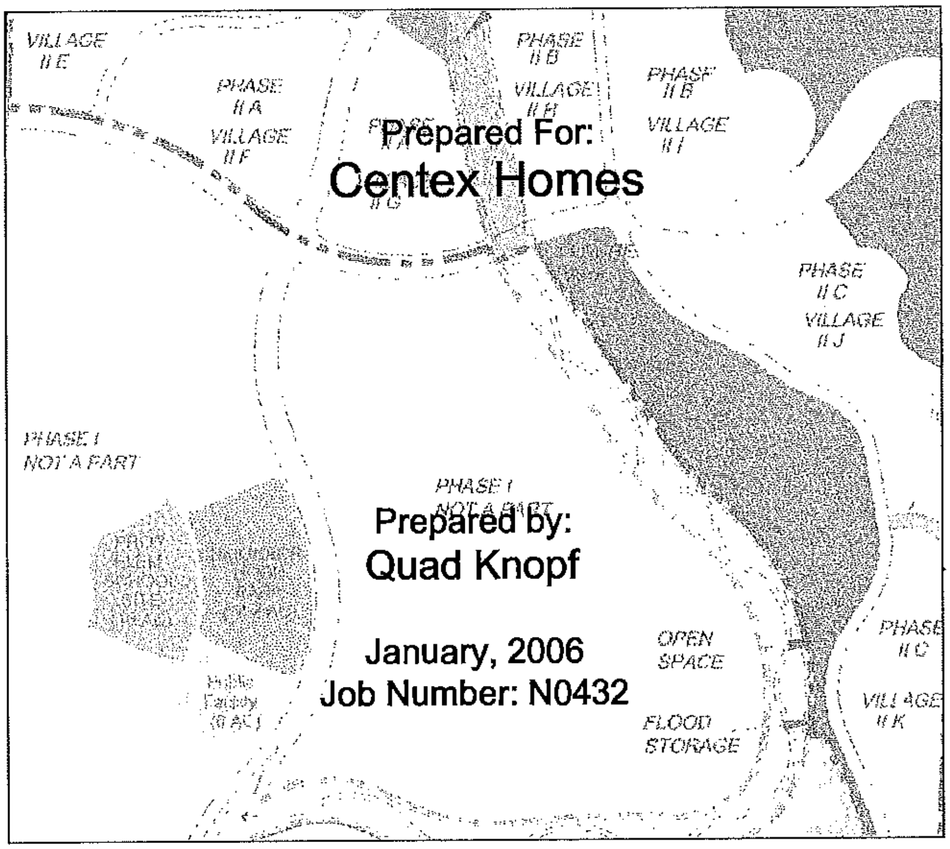
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Rio Wrangler															
3	L2	All MCs	274	2.0	274	2.0	0.830	31.5	LOS D	10.4	263.7	0.92	1.23	2.15	23.1
8	T1	All MCs	230	2.0	230	2.0	0.830	31.5	LOS D	10.4	263.7	0.92	1.23	2.15	23.4
18	R2	All MCs	4	2.0	4	2.0	0.830	31.5	LOS D	10.4	263.7	0.92	1.23	2.15	23.3
Approach			509	2.0	509	2.0	0.830	31.5	LOS D	10.4	263.7	0.92	1.23	2.15	23.2
East: Steamboat															
1	L2	All MCs	6	2.0	6	2.0	0.073	10.5	LOS B	0.2	5.6	0.67	0.67	0.67	29.9
6	T1	All MCs	13	2.0	13	2.0	0.073	10.5	LOS B	0.2	5.6	0.67	0.67	0.67	30.4
16	R2	All MCs	9	2.0	9	2.0	0.073	10.5	LOS B	0.2	5.6	0.67	0.67	0.67	30.2
Approach			28	2.0	28	2.0	0.073	10.5	LOS B	0.2	5.6	0.67	0.67	0.67	30.2
North: Rio Wrangler															
7	L2	All MCs	16	2.0	16	2.0	0.201	6.4	LOS A	0.8	19.5	0.42	0.30	0.42	31.8
4	T1	All MCs	150	2.0	150	2.0	0.201	6.4	LOS A	0.8	19.5	0.42	0.30	0.42	32.4
14	R2	All MCs	267	2.0	267	2.0	0.162	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	36.1
Approach			432	2.0	432	2.0	0.201	2.5	LOS A	0.8	19.5	0.16	0.12	0.16	34.5
West: Steamboat															
5	L2	All MCs	529	2.0	529	2.0	0.601	12.1	LOS B	4.7	119.5	0.55	0.35	0.61	28.2
2	T1	All MCs	33	2.0	33	2.0	0.601	12.1	LOS B	4.7	119.5	0.55	0.35	0.61	28.6
12	R2	All MCs	511	2.0	511	2.0	0.311	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	36.0
Approach			1073	2.0	1073	2.0	0.601	6.4	LOS A	4.7	119.5	0.29	0.18	0.32	31.4
All Vehicles			2042	2.0	2042	2.0	0.830	11.9	LOS B	10.4	263.7	0.42	0.44	0.75	29.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 2010 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix B
Flood Control Master Plan – Quadknopf Consulting

FLOOD CONTROL MASTER PLAN
BELLA VISTA RANCH
PHASE II

City of Reno, Nevada



Prepared For:
Centex Homes

Prepared by:
Quad Knopf

January, 2006
Job Number: N0432

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RALPH M. HOGOBOOM
Exp. 6/30/07
CIVIL
No. 11813

1/13/06

TABLE OF CONTENTS

PHASE 2

FLOOD CONTROL MASTER PLAN

SOUTHERN PORTION OF THE BELLA VISTA RANCH

1.0 INTRODUCTION

The original Master Plan Document was prepared for Phase 1 and Phase 2 of Bella Vista Ranch Subdivision. However the two phases were separated for submittal at different times. The original document " FLOOD CONTROL MASTER PLAN, BELLA VISTA RANCH, City of Reno, Nevada" dated June 3, 2005 prepared by Quad Knopf was submitted with Phase 1.

Phase 1 plans are currently in the review process in the City of Reno. They include the majority of the Relocated Steamboat Creek, all of the east-west channel and the westerly channel. Phase 2 includes the construction of the northerly 1500 feet of Relocated Steamboat Creek and the construction of a multi-barrel box culvert at the proposed South Meadows Parkway crossing. Existing drainage courses from the lower portions of the Virginia Range foothills have been delineated.

1.1 Background

The majority of the Bella Vista Ranch lies within a broad alluvial valley in the southern portion of the Truckee Meadows. A small portion of the property on the easterly boundary is situated on the lower portion of the Virginia Range. Properties to the south, the Damonte Ranch, and the west, the Double Diamond Ranch, are undergoing intensive master planned development. The drainage and flood control infrastructure which has been constructed with these two large developments was master planned with area wide considerations. See Figure 1.

1.2 Damonte Ranch Facilities

The facilities constructed on the Damonte Ranch have the largest impact upon the planning for drainage and flood prevention for the Bella Vista. Steamboat Creek, Whites Creek Branches 3 and 4 and the Eastside Tributaries (flows from the Virginia Range) have been (or will at ultimate build out be) collected in a series of natural and engineered channels which were designed to maintain the drainage patterns which existed prior to development.

The Steamboat Creek channel loses capacity at a point north of the Whites Creek Branch 3 channel and a diversion structure has been built to allow the lower flows to continue north in the current channel and to capture the higher flows and to direct them over a side weir and into a series of large regional detention facilities. The large detention facilities also serve as wetlands mitigation areas. Those excess flows, along with the onsite flows and flows entering from the eastern boundary are directed toward the Steamboat Creek historic channel on the eastern portion of the project. They sheet flow through regulatory wetlands areas and areas set aside for future wetlands mitigation.

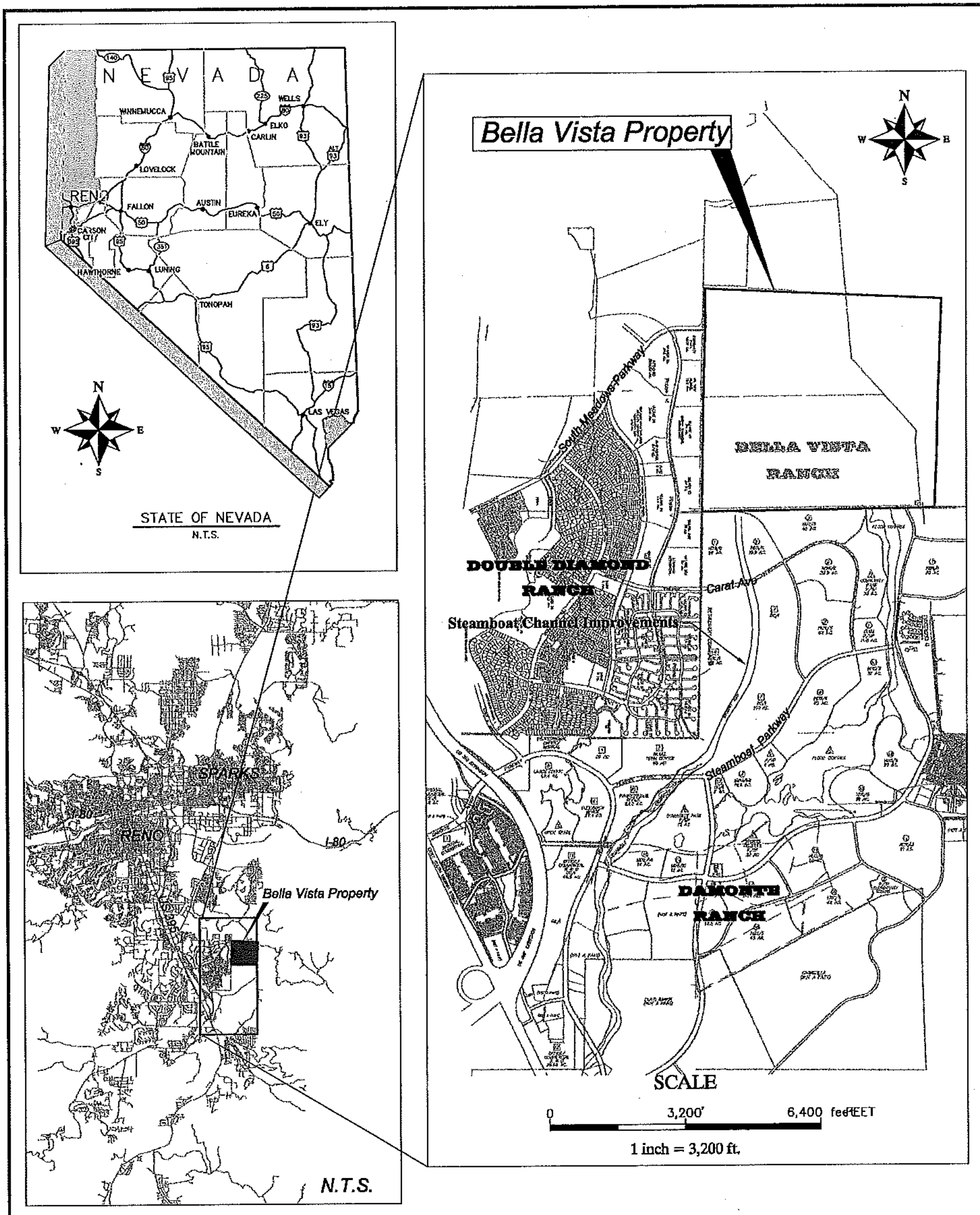

Figure 1

Vicinity Map

Bella Vista Ranch

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File:\0432_area_phaseII.dwg

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Phased construction of the Damonte Ranch has begun on the central and southern portion of the property. Construction of the Relocated Steamboat Creek is nearing completion through the northerly portion of the property. The channel has been excavated and the majority of the rockery walls have been constructed. The major construction remaining is the construction of two multi-barrel reinforced concrete box culverts. The Steamboat Creek flows are returned to sheet flow and combine near the northern boundary of the ranch. When the final phases of the project are built and agreements are reached with the Bella Vista development, the flows will be confined to the restored Steamboat Creek channel, a channel on the west side of the project and to the wetlands mitigation site on the east.

1.3 Double Diamond Ranch

Flood control facilities on the Double Diamond Ranch include the confinement of Thomas Creek to wetland areas and designed channels. These channels deliver the 100 year flows to the Double Diamond regional detention basin on the northern portion of the east boundary of the project. Whites Creek Branches 1 and 2 are also conveyed through the Double Diamond project in a series of channels and wetlands and combine with the Thomas Creek flows to be conveyed to the regional detention basin. On site flows are collected primarily in the Central Channel and in a channel on the eastern boundary of Double Diamond. The Central Channel combines with the Thomas and Whites Creek and flows into the detention basin. The flows in the channel on the eastern boundary are also conveyed to the regional detention basin. This channel was also sized for flows which were displaced by the placement of fill on the eastern edge of the Double Diamond ranch.

2.0 BELLA VISTA PROJECT SITE

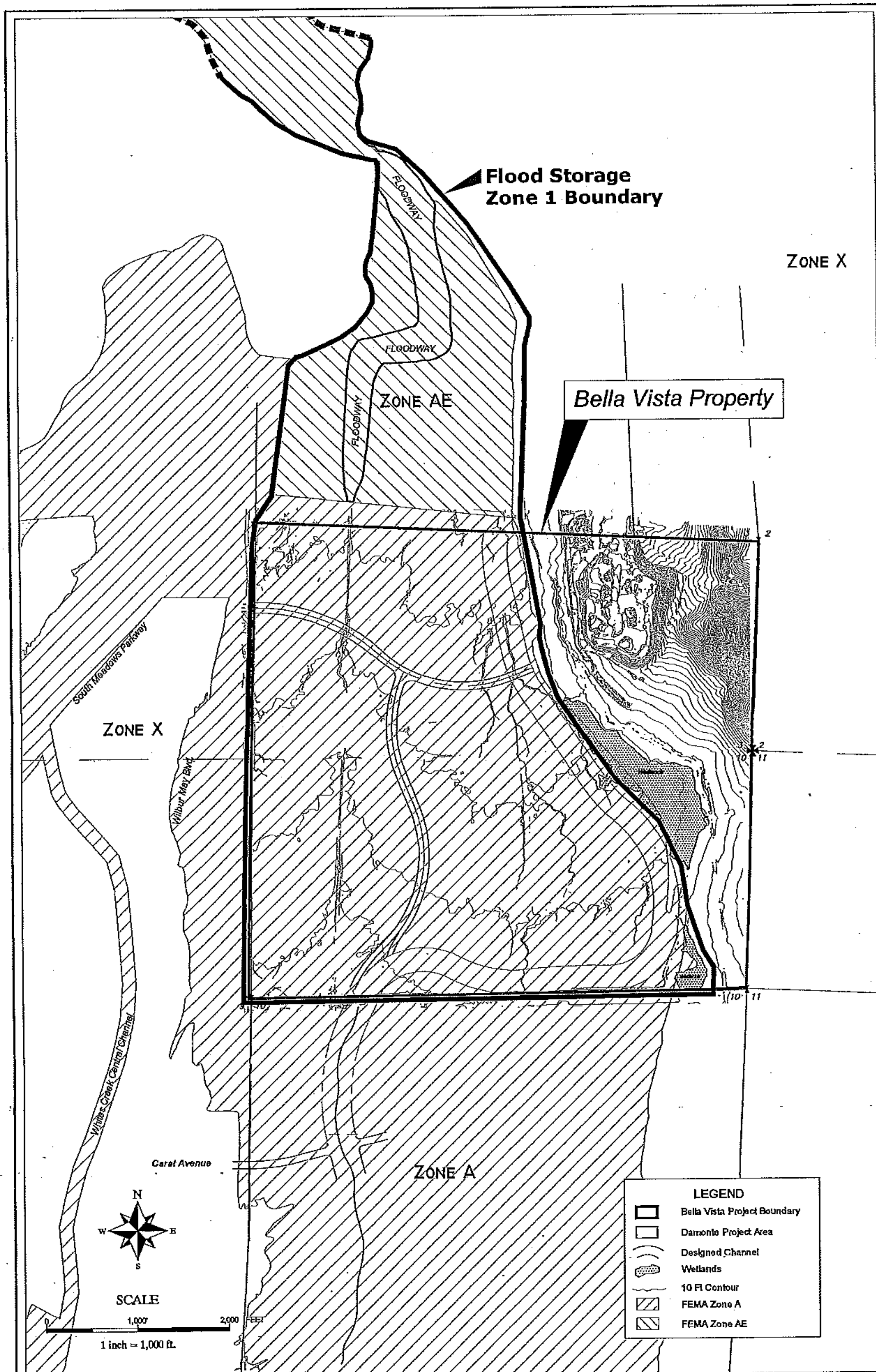
The Bella Vista Ranch has been determined to be subject to flooding in a 100 year or 1% chance flood. It is within an unnumbered Zone A and Zone AE on Panel 3178 of the Flood Insurance Rate Map for Washoe County and Incorporated Areas, effective date of September 30, 1994. It is affected by two sources of flooding as described in the following sections. The flood zones are shown on Figure 2.

2.1 Steamboat Creek

Steamboat Creek is the major source of flooding on the Bella Vista parcel. The creek was diverted from its natural channel more than a century ago with the advent of ranching and farming in the Truckee Meadows area. The low flows were diverted to a perched channel which was constructed in a north south alignment. This alteration allowed for flood irrigation of the Bella Vista. In larger events, the flows which exceed the channel capacity break out of the manmade channel and flow primarily eastward to the historic channel. Most of the ranch is covered with sheet flow during a major event, with the manmade and historic channels having the deepest flows.

2.2 East Side – Virginia Range Tributaries

No significantly large basins affect the parcel from the eastern boundary but there are three basins whose 100 year discharges range from 38 to 135 cfs. Flows from these basins are most likely to be more hazardous during localized thunderstorm events rather than during a general rain event.



Sheet 1 of 1	FIGURE 2	Scale: 1" = 1,000'	Revisions:	Quad Knopf
Quad Knopf Job # N0432	Existing Conditions FEMA Zone Map	CI: detailed contours = 10 Feet		9600 Prototype Ct. Reno, Nevada 89521 TEL: (775) 324-1212 FAX: (775) 324-2311 WEB: www.quadknopf.com
	Centex Homes	File Name: 0432_Figs2,3,9.dwg		N0432
Date: Jan 2006	Washoe County Nevada	Drawn By: GH		
		Designed By: PB		

3.0 FLOOD CONTROL MASTER PLAN GOALS AND INTENT

The Flood Control Master Plan for the Bella Vista Ranch has as one of its primary goals to provide flood protection for the proposed project and to adhere to the floodplain management ordinances of the City of Reno and the Interim Policies adopted by the Regional Water Planning Commission. Channel and storm drain design will be in accordance with the *City of Reno Design Standards* and the *Draft Hydrologic Criteria and Drainage Design Manual.*

The improved Steamboat Creek which is being restored with this project close to its historic alignment, as preferred by the *Steamboat Creek Restoration Plan*, will provide the central feature of the plan. The current channel has basically been used as an irrigation canal and does little to further the goals proposed by the restoration plan, especially the reduction of the total dissolved solids in the flow. A low flow channel as described above is incorporated into the design as recommended in the *Steamboat Creek Restoration Plan.* The main channel is proposed with a sinuous channel to avoid decreasing the time of the peak flow through the project and to prevent increasing its quantity.

The major wetlands adjacent to the channel will provide overflow capacity for extreme events and flood storage capacity for the project. The project lies within zone 1 of the critical flood storage zones for the Truckee River Watershed, however it is not within the backwater pool caused by the Huffaker Narrows and its culvert structure, nor the proposed flood pool of the conceptual detention dam proposed by the Corps of Engineers Truckee Meadows Flood Management Project.

3.1 Purpose of Master Plan

This Master Plan was developed in order to provide a framework for final design of the drainage and flood control features of the Bella Vista Ranch development The framework will

- Quantify flows originating off site and on site
- Provide conceptual or preliminary design for channels and other hydraulic structures
- Propose mitigation for any impacts to adjacent property owners
- Provide sufficient analyses to support the facilities proposed.

Further, more detailed analyses and studies are planned during various stages of the project design. Specifically:

- Hydraulic evaluation of the proposed Steamboat Creek restoration channel and certification that the Master Grading and Major Infrastructure Plan for Phase I is in conformance with this Master Flood Control Plan. This evaluation will be submitted with the construction drawings for the channel and will present any analyses needed for proposed variations. This report will also include the final Flood Storage Plan.

- Application for Conditional Letter of Map Revision to FEMA for confirmation that the facilities proposed are in conformance with FEMA policies and that the project will be removed from 100 year floodplain when built as designed
- Hydrology Reports for each tentative map
- Hydrologic and Hydraulic Evaluation for Phase II Grading and Drainage Plan

3.2 Flood Storage Zone 1

The Bella Vista Ranch lies within critical zone one as delineated by the Regional Water Planning Commission and adopted by the City of Reno. The purpose of the zone 1 designation was to assure that properties that are developed do not affect the proposed Truckee Meadows Flood Management Plan as developed by the Community Coalition. This plan relies upon the preservation of the volume of flood ponding currently available in the eastern Truckee Meadows. Projects must mitigate development within the ponding areas by providing storage in a hydraulically connected area or by participating in a regional project.

The southern portion of the Bella Vista does not contain ponding areas, only shallow sheet flow, so it is difficult to offer mitigation in the spirit of the current ordinance, that is, no ponding areas are proposed to be eliminated. Critical areas on the Bella Vista Ranch are those north of the project which lie within the proposed flood pool of the Huffaker Hills Detention Basin, a part of the flood management plan. The extent of this proposed detention structure's flood pool is shown on figure 3. The flood pool is based upon the current elevation of the spillway at 4428.

A second alternative to the Huffaker Hills Detention Basin is under study by the Corps of Engineers and the local project sponsors. This alternative has a spillway design of 4448 and would inundate the entire project. This concept would require levees of more than 20 feet adjacent to the South Meadows Business Park, render the Double Diamond Detention Basin useless and require large pumping stations to remove drainage and flood waters from both the Double Diamond Ranch and the South Meadows Business Park. It is highly unlikely that this alternative will be pursued due to serious objections from the City of Reno and affected residents and the extraordinary cost of such an undertaking.

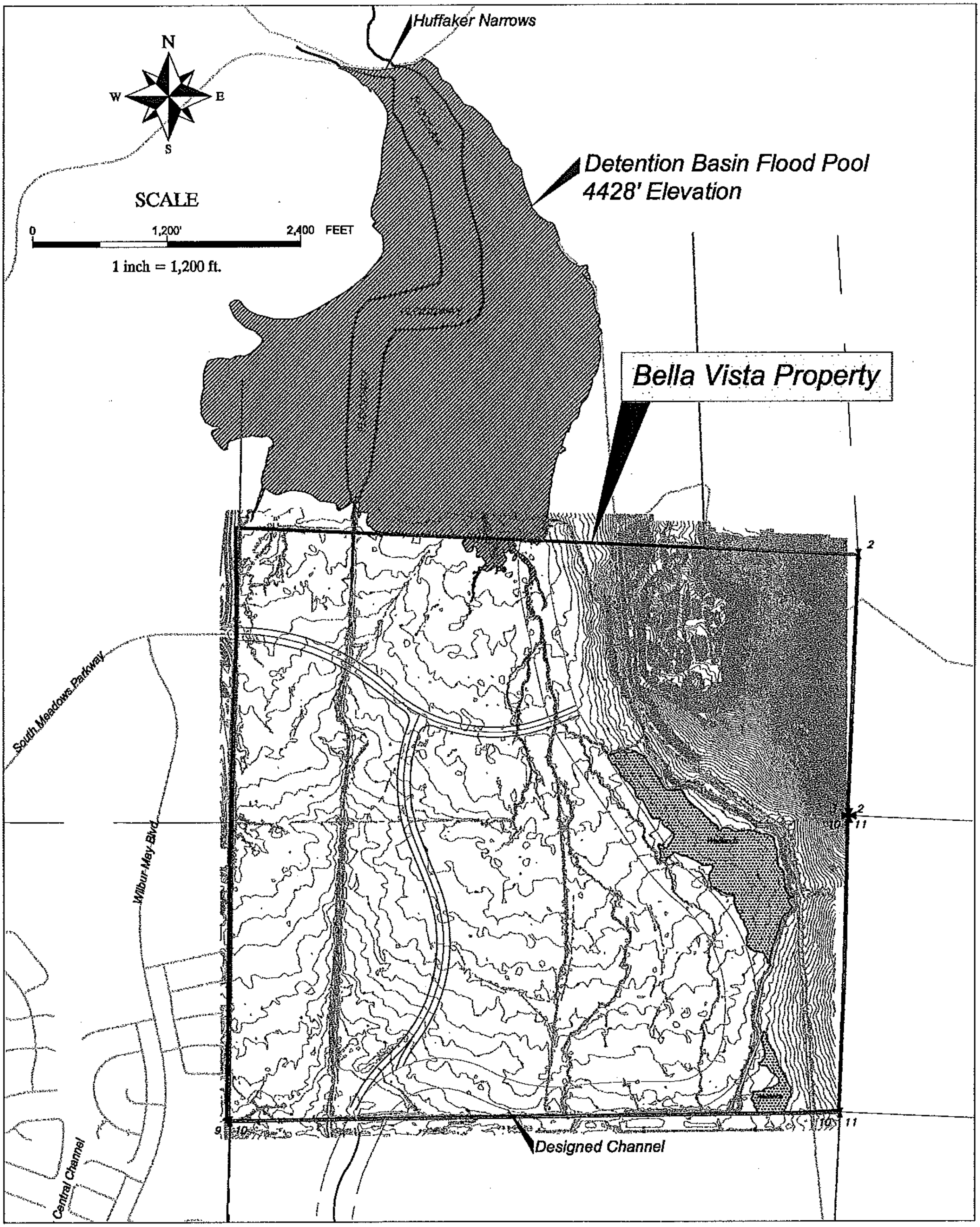


Figure 3

Detention Basin Flood Pool

Bella Vista Ranch

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N0432

Care has been taken in the concept development of flood control and drainage features to avoid adverse impacts on the flood storage capacity downstream of the project. The relocated Steamboat Creek channel is designed for minimal velocities and a longer travel time in order to minimize or negate any impacts to the hydrograph (especially the timing of flows) at the Huffaker Narrows.

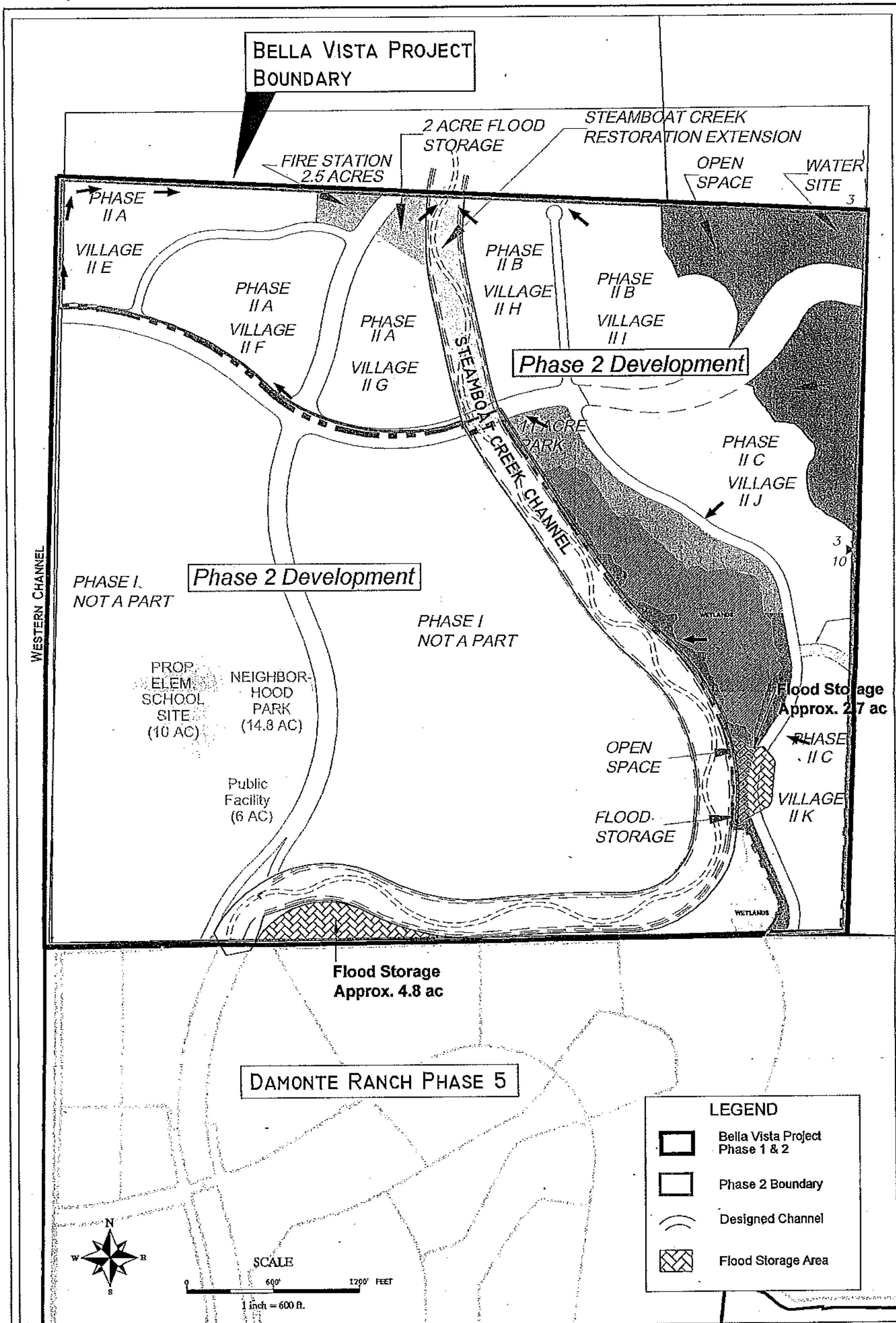
The construction of impervious surfaces within the development will increase the *volume* of runoff. The mitigation of this increase in runoff is to take place in the following way:

> On site mitigation both phases can be achieved by retention in the two parcels shown on Figure 4 and the volume of stormwater which leaves the property will remain at pre-development levels during the 100 year design event (as determined by the Truckee Meadows Flood Management Project). This mitigation includes full retention until the peak volumes of flood flows have receded in the Vista area. The release from the oversized basins will be designed to retain the required volume for a 72-hour period following the peak of the storm. The suggested design of the outlet structures is included in the Plans for Phase 1 currently being reviewed by the City of Reno. Our calculations based upon the conceptual land plan show that about 20 acre-feet of storage for Phase 1 and 4 acre-feet of storage for Phase 2 will be needed for mitigation of the project at its currently proposed density. Full retention areas of the property have been set aside to contain the estimated volume and are shown on figure 3.

The drainages from the east side tributaries will be intercepted in their current configurations by the improved Steamboat Channel. Onsite flow which is generated on Phase 2 is confined to areas north of South Meadows Parkway and east of the improved Steamboat Channel. The concentrated flows from the improved Steamboat Channel will also enter the property to the north in a manner to be determined by agreement between the project developer and the land owner. These concepts are being reviewed and analyzed and will be finalized in detail in the Hydraulic Report which will be prepared for the channel design and the Master Grading and Major Infrastructure Plan discussed earlier in this report.

3.3 Development Phasing Plan

Phase 2 of the project is shown on Figure 4. The northerly 1500 feet of Steamboat Channel will be constructed and the South Meadows Parkway crossing are to be completed as part of the Phase 2. The required flood storage for Phase 2 will be near the northerly boundary line.



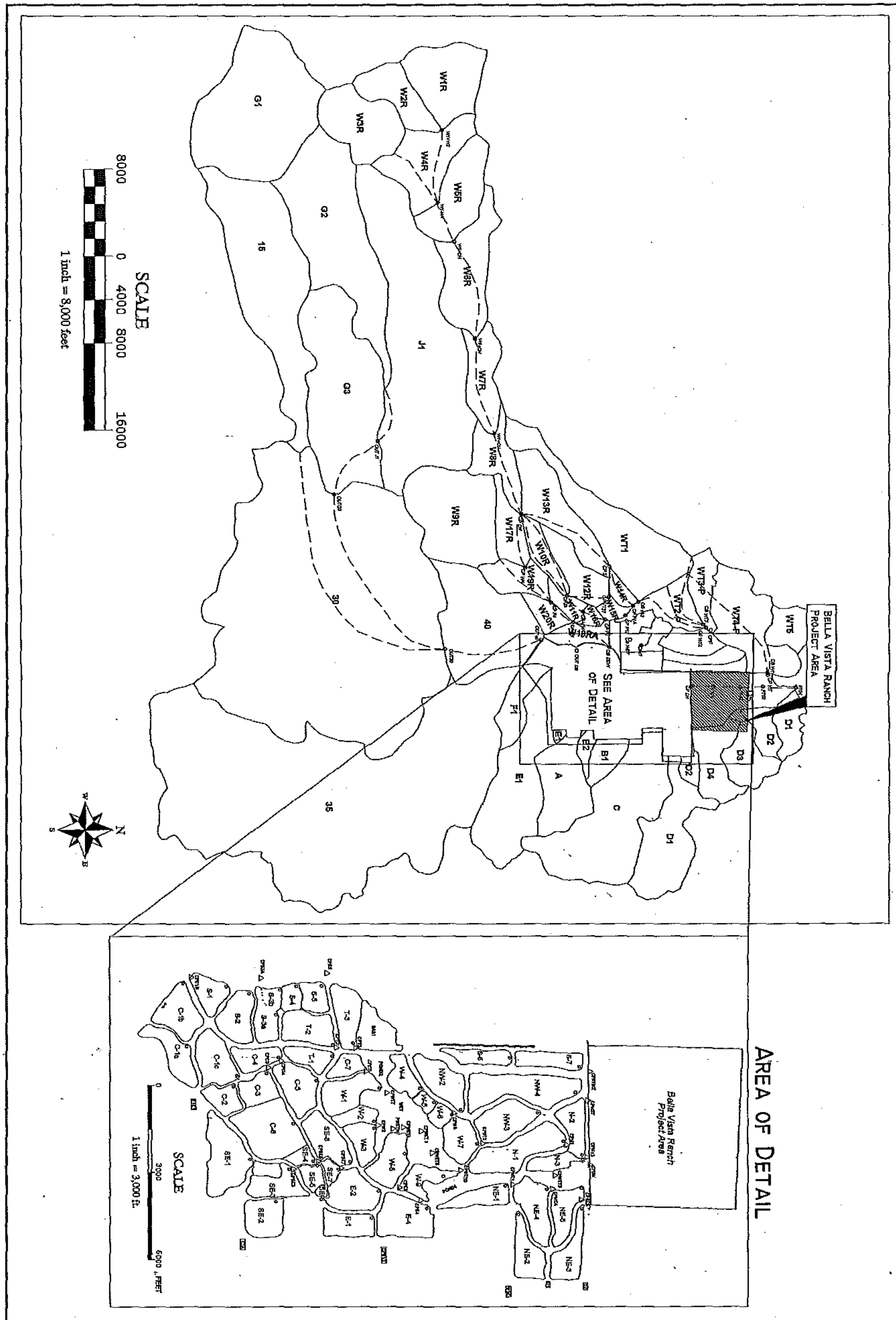
Sheet 1 of 1	FIGURE 4	Scale: 1" = 600'	Revisions:	Quad Knopf
Quad Knopf Job: N0432	Phasing and Flood Storage Areas	CI: NA		9600 Prototype Ct. Reno, Nevada 89521 TEL: (775) 324-1212 FAX: (775) 324-2311 WEB: www.quadknopf.com
Date: May, 2005	Centex Homes, Inc.	File Name: 0432_Figs-Cov,4,6,8.dwg		N0432
	Reno Nevada	Drawn By: GH		
		Designed By: DW		

4.0 HYDROLOGIC ANALYSES

Hydrologic analyses for the flood control concept development for the Bella Vista Ranch Project were performed using the Army Corps of Engineers HEC 1 program and the approved master plans for the Damonte and Double Diamond Projects. The hydrologic models for these projects were developed by Nimbus Engineers using locally accepted parameters and are the basis of the flood control infrastructure which has been constructed upstream of the project and for the future improvements which are planned. These models are the current effective FEMA models, which were approved by the City of Reno and Washoe County and submitted to and approved by FEMA, with a number of CLOMRs and LOMRs for the two developments. The results of the models prepared for the preliminary designs are included on a CD in Appendix A of this report. Figure 5 is the hydrologic work map which displays the regional basin configuration used in the model.

Steamboat Creek entering the Bella Vista site from the south currently sheet flows from the south to the north contributing 5972 cfs. North of the property line, after combining with the flows from the Double Diamond Regional Detention Basin and the east side tributaries the flow is 6362 cfs. Upon the completion of the Damonte Ranch improvements at the south property line 4213cfs will enter through the channel on the western side of the property and 2836cfs will enter through the confined wetlands flow on the eastern portion of the project. For further discussion of the improvements which have been constructed to date on the Damonte Ranch the reader is referred to *Application for Letter of Map Revision for the Double Diamond and Damonte Ranch Regional Flood Control Improvements,* Nimbus Engineers, 2004. For further discussion of the future conditions the reader is referred to *Application for Conditional Letter of Map Revision Damonte/Double Diamond Ranch for Regional Flood Control Improvements,* Nimbus Engineers, 2001.

The Bella Vista Ranch on site flows will increase with the type of development planned. The impact of the increased on-site flows has been assessed using street patterns and site grading plans developed by Places Consulting. Most of those on-site flows will be directed to the restored Steamboat Channel, with lesser amounts being directed to the westerly boundary to the West Side channel. In the central portion of the project, the East West channel will collect flows and direct them to the Steamboat Creek channel. The Steamboat Channel is proposed as a restoration channel and will include features for wetland enhancement and mitigation, as well as water quality improvement, which have been designed in consultation with the Corps of Engineers.



Sheet 1 of 1	FIGURE 5 REGIONAL WATERSHED MAP Bella Vista Ranch *Centex Homes*	Scale: 1" = 8000' & 1" = 3000' (inset)	References:	Quad Knopf	9600 Prototype Court Reno, Nevada 89521 TEL: (775) 324-1212 FAX: (775) 324-2311 WEB: www.quadknopf.com
Quad Knopf Job # N0432		Contour Interval: NA			
		File: 0432_Fig5_Reg-Sheds.dwg			
		Drawn By: GH			
January, 2006	Reno Nevada	Designed By: PB			

The hydrologic analyses for the Bella Vista Ranch, as noted earlier, have been performed using the Corps of Engineers HEC 1 computer program and current effective models accepted by FEMA. The analyses enclosed are as it is on the ground today, sheetflooding from the south. Also included is an analysis which assumes that the Damonte Ranch Phase V improvements have been approved and built and that Steamboat Creek is contained when it enters the site and the Phase 1 improvements for Bella Vista have been approved and built.

The following table includes descriptions of the models and their file names. These models are included in electronic form on a CD in Appendix A .

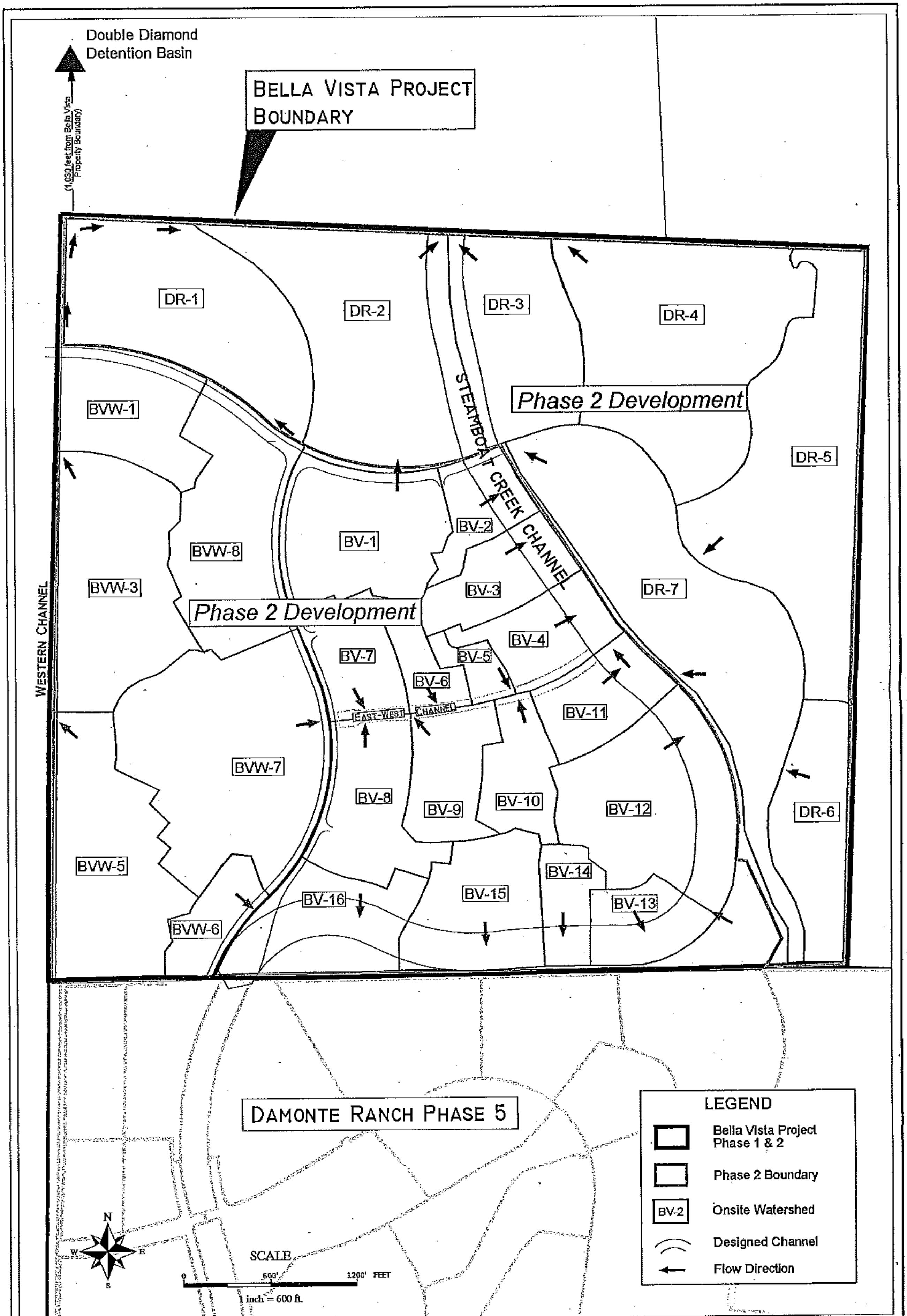
Table 1

Regional Models		Peak flow
0243AB.dat	-Existing Conditions	6362
DRph5.dat	- Existing conditions w/ Damonte V	7165
DRph5+BV1.dat	-Post-development (through Phase 1)	7022
DRph5+BV2.dat	-Post-development (through Phase 2)	7057

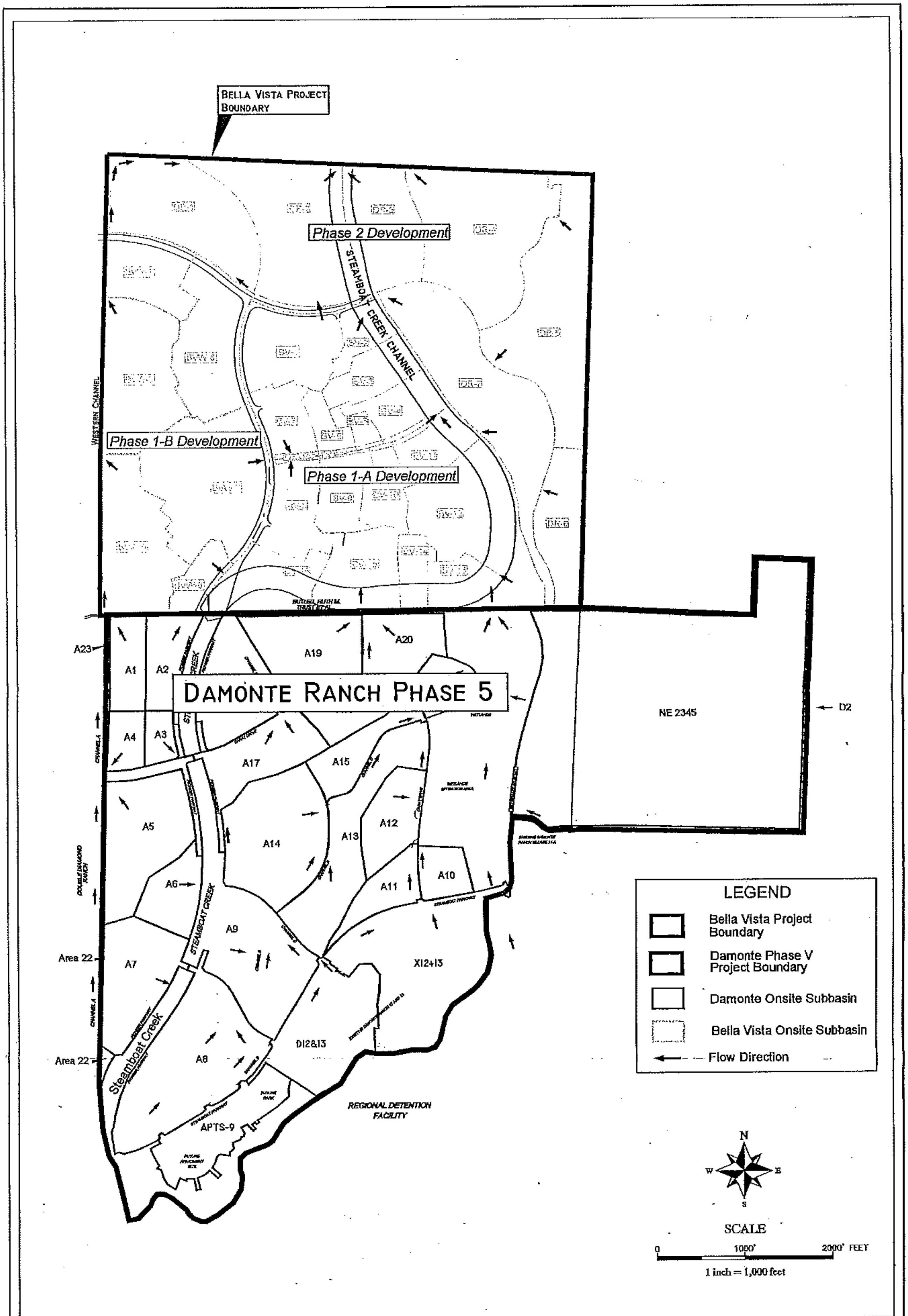
Onsite Volume Models:		Volume
BV72UND.dat	-Existing conditions	101 ac-ft
BV72DEV1.dat	-Post-development (through Phase1)	121 ac-ft
BV72DEV2.dat	-Post-development (through Phase 2)	125 ac-ft

4.1 On-site Hydrologic Analysis

Earlier discussion in this document focused on the overall development. Figures 6,7, and 8 show the project layout and the sub-watersheds used in the on-site analysis, the configuration of the Damonte V project used in this analysis and the soils map used to develop the curve numbers for the analysis. The on site hydrologic analysis was performed using the Corps of Engineers HEC-1 computer program. On-site basins generally drain to the relocated Steamboat channel. Table 2 sets forth the parameters which were used in the HEC-1 model; times of concentration were determined to be the minimum (10 minutes) based upon the formulas in the *Hydrologic Criteria and Drainage Design Manual*, therefore they are not listed.



Sheet 1 of 1	FIGURE 6	Scale: 1" = 600'	Revisions:	Quad Knopf
Quad Knopf Job: N0432	Onsite Hydrologic Workmap	CI: NA		9600 Prototype Ct. Reno, Nevada 89521 TEL: (775) 324-1212 FAX: (775) 324-2311 WEB: www.quadknopf.com
	Centex Homes, Inc.	File Name: 0432_Figs-Cov,4,6,8.dwg		N0432
		Drawn By: GH		
Date: Jan. 2006	Reno Nevada	Designed By: RH/YT		



Sheet 1 of 1	FIGURE 7	Scale: 1" = 1,000'	Revisions:
Quad Knopf Job: N0432	Damonte Onsite Subbasin Map	Ct: NA	
	Bella Vista Ranch	File Name: 0432_Fig7_Damon-Onsite.dwg	
Date: Jan. 2006	Centex Homes	Drawn By: GH	
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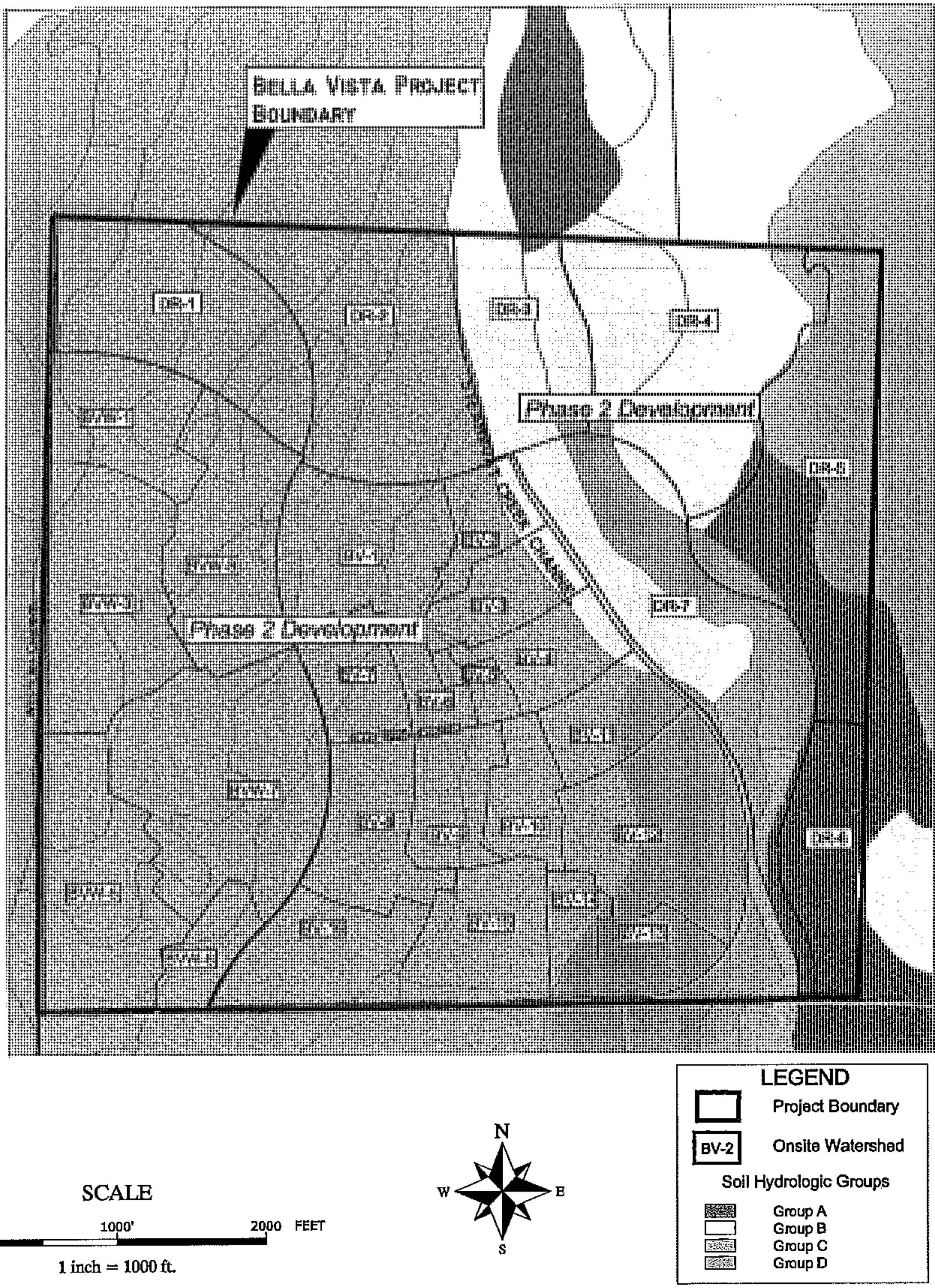

Figure 8
Soils Map
Bella Vista Phase 1 & 2

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File: 0432_Figs-Cov,4,6,8.dwg

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Table 2 On-site Watershed Parameters

Sub-basin ID	Area (acres)	Area (mi^2)	CN Pre-Development	CN Post-Development
DR-1	33.92	0.053	74	86
DR-2	26.24	0.041	74	90
DR-3	18.56	0.029	74	90
DR-4	44.80	0.070	74	75
DR-5	65.92	0.103	74	78
DR-6	18.56	0.029	74	87
DR-7	61.44	0.096	74	49

Modeling for existing conditions, as presented in the effective FEMA models, produces a flow of 6362 cfs at the north end of the Bella Vista Ranch Project when the onsite flows are combined with the 5972 cfs sheet flow coming from the Damonte Ranch Project. Damonte Ranch V is proposed to channelize Steamboat Creek and the Westside Channel to the Bella Vista Ranch south property line. With that development the flows entering Bella Vista will be 4213cfs in the channel and 2836cfs from the confined wetland flow on the eastern side of the property.

This modeling is presented to demonstrate the impacts of the development which will need to be mitigated, either because of increase in peak flows which would require detention, or increase in the volume of runoff which will require flood storage to be developed. An area within the development have been reserved for flood storage and/or peak flow detention. The increase in peak flows from the on-site development are approximately 44 cfs, considering only Phase 1 and 2 developments. The increase in on site peak flows however does not increase the overall peak flow leaving the project. If the increase in on site peak flow is detained, it will add to the off site peak flows which enter and leave the site after the runoff from the on site basins and the peak at the Huffaker Narrows will be increased. Increase in the volume of flow will be mitigated and this volume mitigation will also serve as detention. The final design of the flood storage will be incorporated into the channel design and be submitted in conjunction with the Master Grading and Major Infrastructure Plan.

5.0 HYDRAULIC ANALYSES

A HEC RAS model has been developed of the proposed relocation of Steamboat Creek in order to demonstrate that the channel is physically feasible and that the velocities will remain low enough to achieve the goals of improved riparian vegetation and wetlands enhancement. The model will be refined and updated as final design plans are developed to incorporate freeboard requirements and to include storm drainage inlets and confluence configurations for the east side tributaries and flows entering in the southwest corner from the Damonte wetlands flows. Figure 9 shows the channel alignment and cross section location for the RAS analysis. HEC-RAS analysis for the existing natural channels in the East side is included. Preliminary designs of these channels for developed conditions are also provided.

5.1 Hydraulic Analysis of the Steamboat Creek channel

The channel that is proposed for Steamboat Creek is compatible with the goals of the Steamboat Creek restoration plan and has been developed in consultation with the U.S. Army Corps of Engineers and the wetland scientists for the project. The channel will convey the western flows to the east to combine with the flows from the Damonte wetlands and then continue to the north in the alignment of the historic Steamboat Creek channel. The Phase 1 portion of the channel slope varies from 0.0016 to 0.0018 ft/ft. Phase 2 will continue downstream with a channel slope of .0016 ft/ft and have a water surface top width of approximately 240 ft. All velocities calculated are non-erosive.

A low flow channel is incorporated into the preliminary design. See typical section on Figure 9. The channel has a capacity of approximately 25 to 30 cfs. This low flow channel has been sized and configured as requested by the Corps of Engineers during review of the 404 Permit application for channel relocation. The final low flow design will incorporate point bars which are periodically flooded to enhance the wetland mitigation. These enhancements to the low flow channel do not affect the performance of the larger channel and are not analyzed herein. The Corps of Engineers preferred depth for the channel will make it extremely likely that the channel will be constructed in some portions of the ground water. Consultation with the Nevada Department of Environmental Protection has been done. The department has no current objection to the channel intercepting groundwater flow. It is felt that any effects to the water table will be localized and will be similar to the effect of the current Steamboat channel. Soil testing within the proposed alignment of the channel is currently underway and soil and water samples will be tested.

The restored Steamboat Channel has been designed to connect to the channel proposed for the Damonte V development. As noted earlier, the preliminary design has been developed in consultation with the project's wetlands consultant and the Corps of Engineers Reno Office. The alignment and cross sections of the channel are in conformance with the Steamboat Creek Restoration Plan which is the locally accepted and preferred standard for improvements to the Creek and its associated floodplains. The preliminary design presented here has been submitted to the Corps of Engineers as the basis of a request for a 404 Permit from the Corps which is required under the Clean Water Act.

A Corps of Engineers HEC RAS model was prepared for the channel design and is included in Appendix A. The model was developed with generally accepted parameters for an earthen channel. The designed channel will not have velocities which exceed 5 feet per second and the curvature of the channel conforms to standards set forth in the

Hydrologic Criteria and Drainage Design Manual. The final design of the channel will be developed in conjunction with the Master Grading Plan in order to assure that the channel has proper freeboard.

The preliminary design of the channel shown in this report, presumes that the Damonte V channel Bella Vista Phase 2 portion of the channel will be built prior to the Bella Vista Phase 2 portion of the channel. If the Damonte channel is not built in a timely manner, the design of the Bella Vista channel will be modified to include the capture of the sheet flow which exists in that area presently. Site specific surveying is being obtained in order to develop the spreading structure which will be needed at the channel outlet. The design for that structure will be included in the Hydraulic Analysis report for the channel.

5.2 East Side Channels

HEC-RAS analysis for the existing natural channels in the East side is included (see Appendix B). Preliminary designs of these channels for developed conditions have been developed based upon analysis of channel size and velocity using the Manning Equation (see Table 3). Loose rip-rap lined channel is used. Location and cross section of these channels are given in Figure 10.

Table 3 Preliminary Design of East Side Channels (Developed Conditions)

Channel Name	Discharge	Manning's n	Longitudinal Slope	Side slope	Bottom Width	Flow Depth
	(cfs)		(ft/ft)		(ft)	(ft)
South Channel	91	0.04	0.03	2H:1V	6	1.51
Mid Channel	10	0.04	0.03	2H:1V	2	0.73
Far North Channel	138	0.04	0.05	2H:1V	10	1.29

6.0 CONCLUSIONS AND RECOMMENDATIONS

The Bella Vista Ranch project will create a project which is compatible with surrounding developments and will meet all requirements for the safe handling of drainage and flood flows as set forth in City ordinance and standards. The analyses which are provided herein have been developed to provide a framework for orderly development of the project and for the design of the needed drainage and flood control features. The submittal of an Application for a Conditional Letter of Map Revision (CLOMR) will be prepared after approval of the Master Plan. The approval of the CLOMR by FEMA will assure that the project will be removed from the 100 year floodplain

Final design of each tentative map and its associated infrastructure, ie storm drains, channels, culverts and flood storage facilities should be evaluated to determine that the projects and facilities will not alter the overall framework for the project. If it is found necessary to deviate from this Master Plan, a revised Master Plan should be developed for review and approval by the City of Reno.

The Flood Storage Ordinance is a new concept within the Truckee Meadows and prior to the final design of the Flood Mitigation features, the City and the project developer should agree upon the responsibilities for maintenance and operation of the facilities. It is our recommendation that the city give serious consideration to Alternative 2 in Section 3.2. This alternative will allow the project to proceed while providing time for the City and the other governments in the region to determine the best way to achieve their goals of maintaining the flood storage and safeguarding the flood control project.

Appendix B-1
CLOMR Letter from FEMA

Federal Emergency Management Agency

Washington, D.C. 20472

AUG 0 8 2007

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 07-09-1007R

The Honorable Robert Cashell
Mayor, City of Reno
P.O. Box 1900
Reno, NV 89505

Community: City of Reno, NV
Community No.: 320020

104

Dear Mayor Cashell:

This responds to a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) comment on the effects that a proposed project would have on the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Washoe County, Nevada and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated March 13, 2007, Mr. Ralph M. Hogoboom, P.E., Senior Engineer, Quad Knopf, requested that FEMA evaluate the effects along Steamboat Creek that updated topographic information; proposed grading; a proposed channel from approximately 6,800 feet upstream of Short Lane to approximately 2,400 feet downstream of the confluence with Whites Creek Branch 3 (confluence); seven proposed 12-foot by 8-foot box culverts and one proposed 12-foot by 10-foot box culvert to be located approximately 3,200 feet downstream of the confluence; eight proposed 12-foot by 8-foot box culverts and one proposed 12-foot by 10-foot box culvert under Carat Drive, approximately 7,800 feet downstream of the confluence; and two proposed storage basins, Basin 1 and Basin 3, to be located approximately 9,500 feet downstream of the confluence and approximately 9,200 feet upstream of Short Lane, respectively, would have on the flood hazard information shown on the effective FIRM and FIS report. The proposed project reach will extend along Steamboat Creek from approximately 5,700 feet upstream of Short Lane to approximately 2,400 feet downstream of the confluence. Although the proposed area of revision is shown on the effective FIRM and FIS report as in the unincorporated areas of Washoe County, this entire area has been annexed by the City of Reno.

All data required to complete our review of this request for a Conditional Letter of Map Revision (CLOMR) were submitted with letters from Mr. Hogoboom.

We reviewed the submitted data and the data used to prepare the effective FIRM for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. We believe that, if the proposed project is constructed as shown on the plans entitled "Steamboat Creek Restoration Grading Plans," prepared by Odyssey Engineering, Inc., dated October 13, 2007, and "Steamboat Channel Bella Vista Ranch," prepared by Quad Knopf, dated March 12, 2007, and as described in the submitted report entitled "Application for Conditional Letter of Map Revision (CLOMR), Damonte Ranch Phase V and Bella Vista Ranch Phase I," prepared by Quad Knopf, dated March 13, 2007, and the data listed below are received, a revision to the FIRM would be warranted.

As a result of the proposed project and updated topographic information, the width of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base (1-percent-annual-chance) flood, will increase in some areas and decrease in other areas compared to the effective SFHA width along Steamboat Creek from approximately 5,700 feet upstream of Short Lane to approximately 2,400 feet downstream of the confluence. The maximum increase in SFHA width, approximately 300 feet, will occur approximately 9,400 feet upstream of Short Lane. The maximum decrease in SFHA width, approximately 4,500 feet, will occur approximately 7,700 feet upstream of Short Lane. In addition, an SFHA designated Zone A, with no Base Flood Elevations (BFEs) determined, along Steamboat Creek will be redesignated Zone AE, with BFEs determined, from approximately 6,800 feet upstream of Short Lane to approximately 2,400 feet downstream of the confluence. The entire base flood along Steamboat Creek will be contained in the proposed channel and culverts from approximately 6,800 feet upstream of Short Lane to approximately 2,400 feet downstream of the confluence..

Upon completion of the project, your community may submit the data listed below and request that we make a final determination on revising the effective FIRM and FIS report.

- Detailed application and certification forms must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview & Concurrence Form," must be included. (A copy of this form is enclosed.)

- The detailed application and certification forms listed below may be required if as-built conditions differ from the conceptual plans. If required, please submit new forms (copies of which are enclosed) or annotated copies of the previously submitted forms showing the revised information.

  Form 2, entitled "Riverine Hydrology & Hydraulics Form"

  Form 3, entitled "Riverine Structures Form"

  Hydraulic analyses, for as-built conditions, of the base flood, together with a topographic work map showing the revised floodplain boundaries, must be submitted with Form 2.

- Effective October 30, 2005, FEMA revised the fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps. In accordance with this schedule, the current fee for this map revision request is $4,000 and must be received before we can begin processing the request. Please note, however, that the fee schedule is subject to change, and requesters are required to submit the fee in effect at the time of the submittal. Payment of this fee shall be made in the form of a check or money order, made payable in

U.S. funds to the National Flood Insurance Program, or by credit card (Visa or MasterCard only). The payment, along with the revision application, must be forwarded to the following address:

FEMA National Service Provider
3601 Eisenhower Avenue
Alexandria, VA 22304-6425

- As-built plans, certified by a registered professional engineer, of all proposed project elements
- As-built plans, certified by a registered professional engineer, and hydraulic analyses for all proposed channels located within the Damonte Ranch and Bella Vista Ranch developments
- Community acknowledgment of the map revision request
- An officially adopted maintenance and operation plan for the onsite storage Basins 1 and 3. This plan, which may be in the form of a written statement from the community Chief Executive Officer, an ordinance, or other legislation, must describe the nature of the maintenance activities, the frequency with which they will be performed, and the title of the local community official who will be responsible for ensuring that the maintenance activities are accomplished.

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM and FIS report. Because BFEs would be established as a result of the project, a 90-day appeal period would be initiated, during which community officials and interested persons may appeal the BFEs based on scientific or technical data.

The basis of this CLOMR is, in whole or in part, a channel-modification/culvert project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the modified channel and culverts rests with your community.

This CLOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the Consultation Coordination Officer (CCO) for your community. Information on the CCO for your community may be obtained by calling the Director, Federal Insurance and Mitigation

Division of FEMA in Oakland, California, at (510) 627-7175. If you have any questions regarding this CLOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Engineering Management Section
Mitigation Division

For: William R. Blanton Jr., CFM, Chief
Engineering Management Section
Mitigation Division

Enclosures

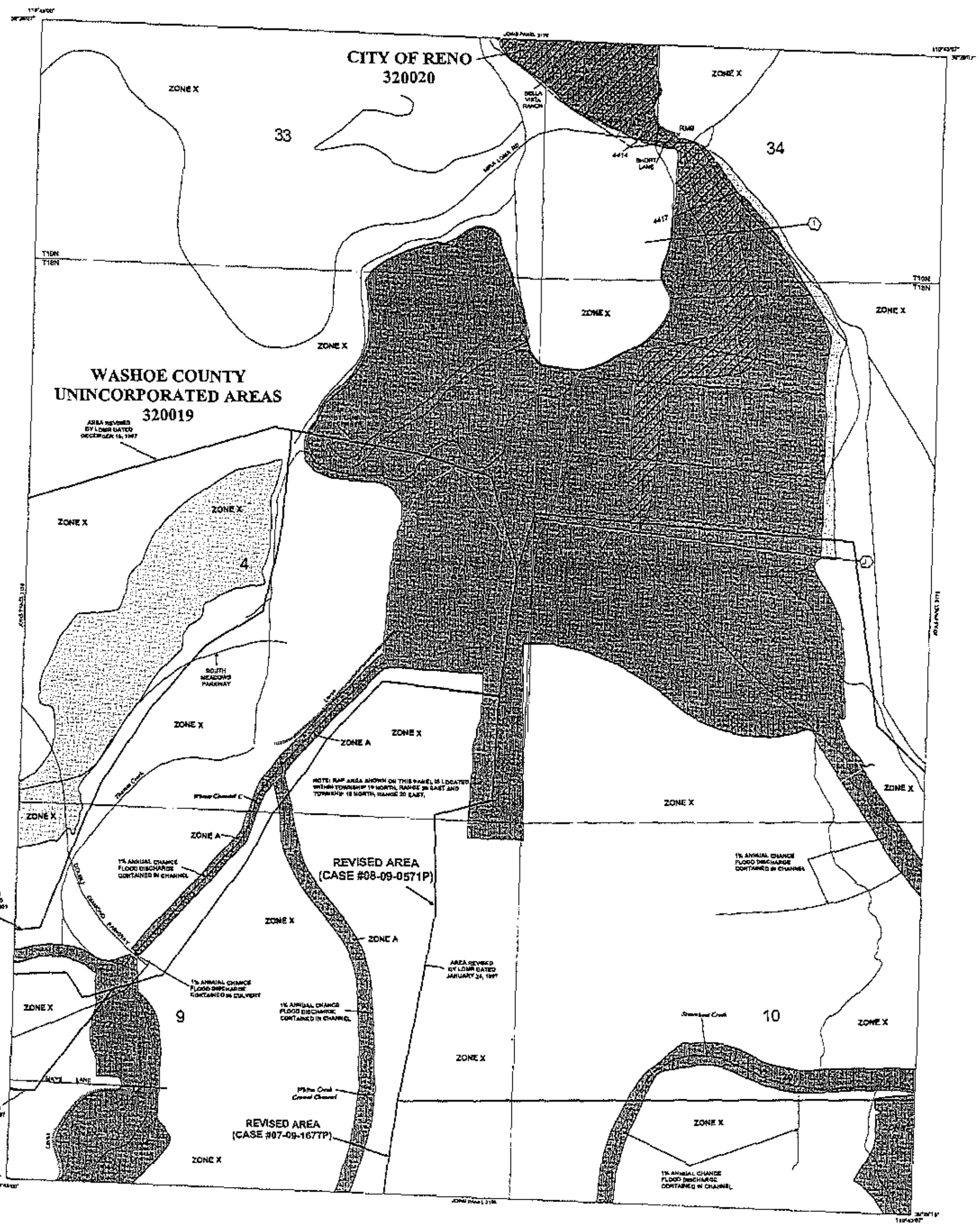
cc: Ms. Kerri Williams-Lanza, P.E., CFM
Senior Civil Engineer
City of Reno

Mr. Neil Mann
Public Works Director
City of Reno

Mr. Kimball Corbridge, P.E., CFM
Washoe County

Mr. Ralph M. Hogoboom, P.E.
Senior Engineer
Quad Knopf

Mr. Ronald C. Hoops, P.L.S.
Odyssey Engineering Inc.



SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

UNDEVELOPED COASTAL BARRIERS

NOTES

APPROXIMATE SCALE IN FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

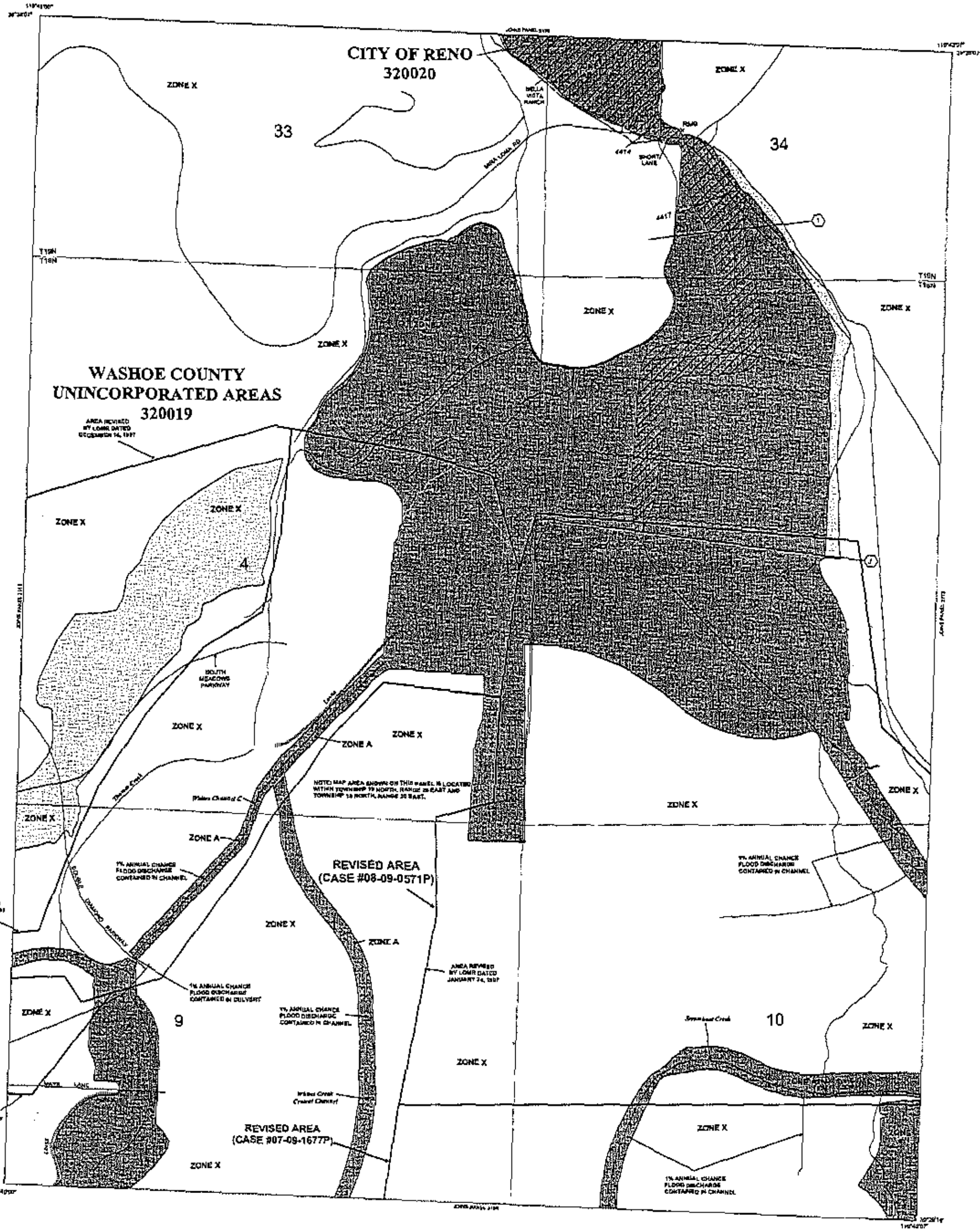
WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS

PANEL 3178 OF 3350

REVISED TO
REFLECT LOMR
EFFECTIVE APR 25 2008

MAP NUMBER

EFFECTIVE DATE:
SEPTEMBER 30, 1994



ELEVATION REFERENCE MARKS

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

UNDEVELOPED COASTAL BARRIERS

NOTES

MAP REPOSITORY

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

APPROXIMATE SCALE IN FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

WASHOE COUNTY,
NEVADA
AND INCORPORATED AREAS

PANEL 3178 OF 3350

(SEE MAP INDEX FOR PANELS NOT PRINTED)

REVISED TO
REFLECT LOMR
EFFECTIVE APR 25 2008

MAP NUMBER
32031C3178 E

EFFECTIVE DATE:
SEPTEMBER 30, 1994

Appendix B-2
LOMR Letter from FEMA

Federal Emergency Management Agency
Washington, D.C. 20472

APR 2 5 2008

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Robert Cashell
Mayor, City of Reno
P.O. Box 1900
Reno, NV 89505

IN REPLY REFER TO:
Case No.: 08-09-0571P
Follows Conditional
Case No.: 07-09-1007R
Community Name: City of Reno, NV
Community No.: 320020
Effective Date of
This Revision: APR 2 5 2008

Dear Mayor Cashell:

The Flood Insurance Rate Map for your community has been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Craig S. Kennedy, CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

For: William R. Blanton Jr., CFM, Chief
Engineering Management Branch
Mitigation Directorate

List of Enclosures:

Letter of Map Revision Determination Document
Annotated Flood Insurance Rate Map

cc: Ms. Kerri Williams-Lanza, P.E., CFM
Senior Civil Engineer
City of Reno

Mr. Neil Mann
Director
Public Works
City of Reno

Mr. Kimball Corbridge, P.E., CFM
Washoe County

Mr. Hoss Khatami
Branch Manager
Quad Knopf

Page 1 of 4	Issue Date: APR 2 5 2008	Effective Date: APR 2 5 2008	Case No.: 08-09-0571P	LOMR-APP

Follows Conditional Case No.: 07-09-1007R

Federal Emergency Management Agency
Washington, D.C. 20472

RECEIVED
APR 2 9 2008
CITY OF RENO
Public Works Department

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Reno Washoe County Nevada COMMUNITY NO.: 320020	CHANNELIZATION GRADING	HYDRAULIC ANALYSIS HYDROLOGIC ANALYSIS NEW TOPOGRAPHIC DATA
IDENTIFIER	Bella Vista Ranch Phase I	APPROXIMATE LATITUDE & LONGITUDE: 39.447, -119.719 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 32031C3178 E DATE: September 30, 1994 TYPE: FIRM* NO.: 32031C3179 E DATE: September 30, 1994	NO REVISION TO THE FLOOD INSURANCE STUDY REPORT

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Steamboat Creek - from approximately 6,800 feet upstream of Short Lane to approximately 8,900 feet downstream of the confluence with Whites Creek Branch 3

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Steamboat Creek	Zone A	Zone A	YES	YES
	Zone A	Zone A (contained)	NONE	YES
	Zone A	Contained	NONE	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Craig S. Kennedy

Craig S. Kennedy, CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

112553 10.3.1.08090571 102-I-C

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance discharges computed in the submitted hydrologic model. Future development of projects upstream could cause increased discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on discharges and could, therefore, indicate that greater flood hazards exist in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Craig S. Kennedy, CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We are processing a revised countywide FIRM and FIS report for Washoe County; therefore, we will not physically revise and republish the FIRM and FIS report for your community to incorporate the modifications made by this LOMR at this time. Preliminary copies of the revised countywide FIRM and FIS report were submitted to your community for review on September 28, 2007. We will incorporate the modifications made by this LOMR into the revised FIRM and FIS report before they become effective.

Although the area of revision is shown on the effective FIRM as within the unincorporated areas of Washoe County, the City of Reno has annexed the entire area of revision.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Craig S. Kennedy

Craig S. Kennedy, CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

Federal Emergency Management Agency
Washington, D.C. 20472

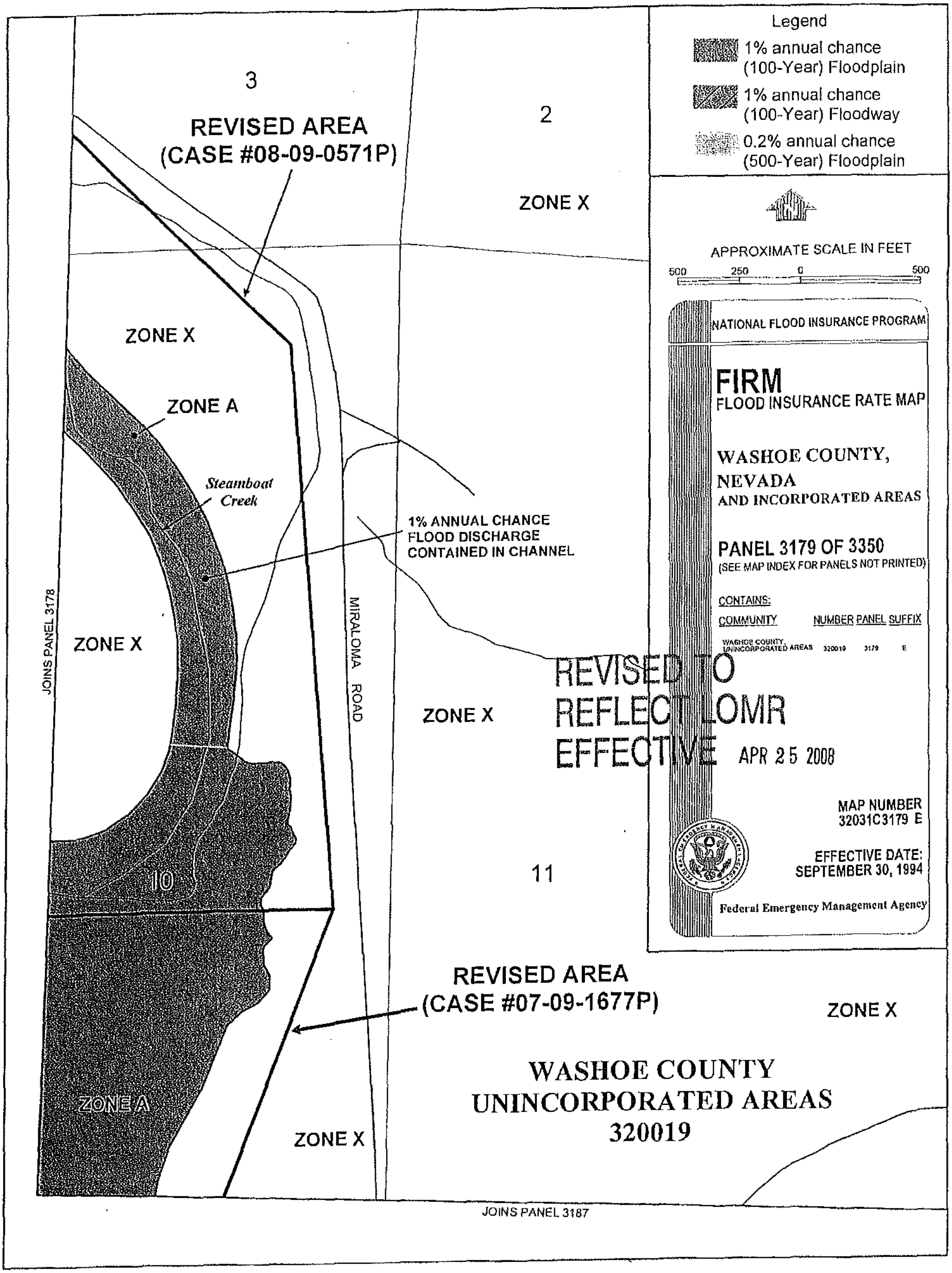
LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

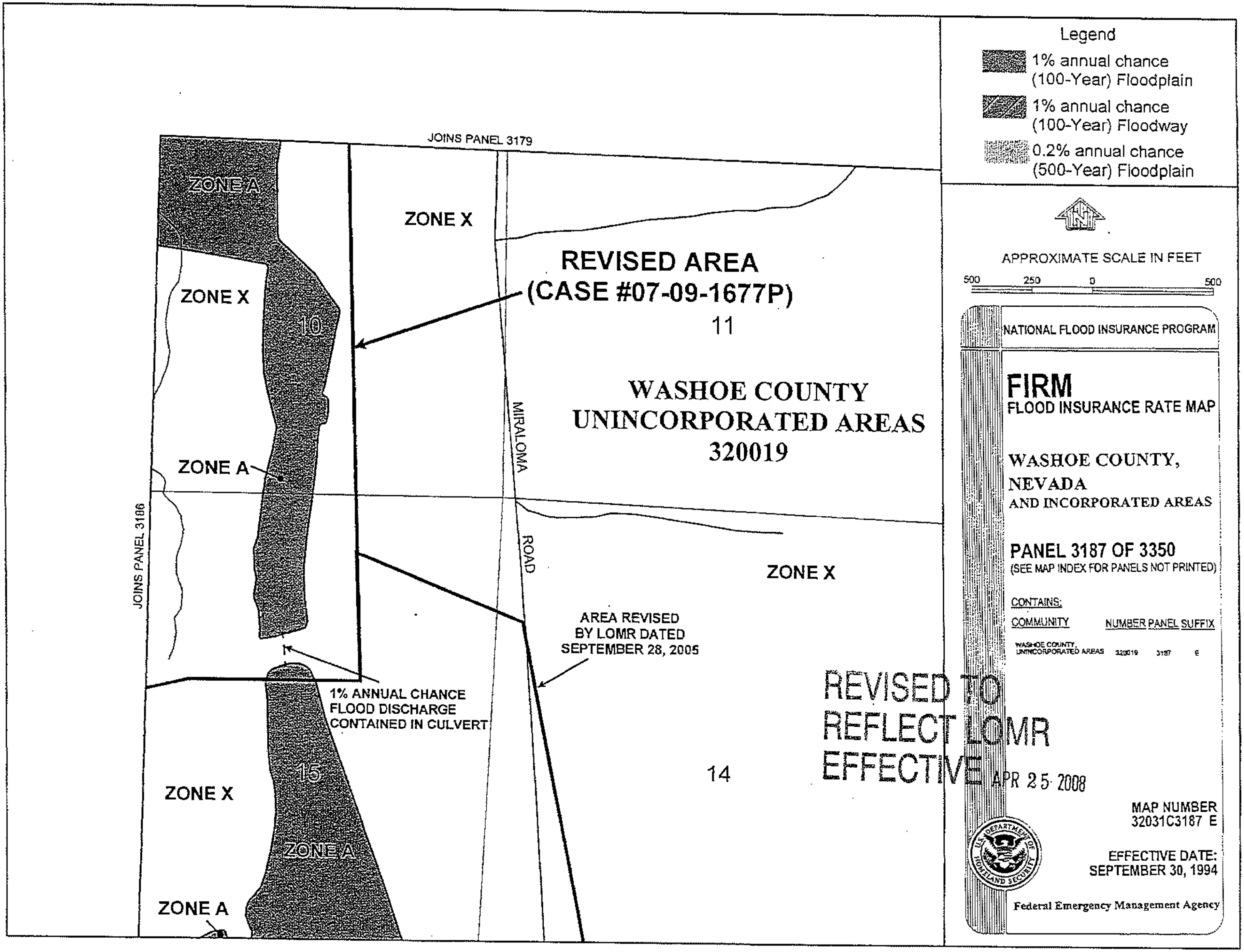
This revision is effective as of the date of this letter. Any requests to review or alter this determination should be made within 30 days and must be based on scientific or technical data.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Craig S. Kennedy
Craig S. Kennedy, CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate



Legend
1% annual chance (100-Year) Floodplain
1% annual chance (100-Year) Floodway
0.2% annual chance (500-Year) Floodplain
APPROXIMATE SCALE IN FEET
500 250 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS
PANEL 3179 OF 3350
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
WASHOE COUNTY, UNINCORPORATED AREAS 320019 3179 E
REVISED TO REFLECT LOMR EFFECTIVE APR 25 2008
MAP NUMBER 32031C3179 E
EFFECTIVE DATE: SEPTEMBER 30, 1994
Federal Emergency Management Agency
3
2
10
11
REVISED AREA (CASE #08-09-0571P)
REVISED AREA (CASE #07-09-1677P)
ZONE X
ZONE A
Steamboat Creek
1% ANNUAL CHANCE FLOOD DISCHARGE CONTAINED IN CHANNEL
MIRALOMA ROAD
JOINS PANEL 3178
JOINS PANEL 3187
WASHOE COUNTY UNINCORPORATED AREAS 320019



Legend
1% annual chance (100-Year) Floodplain
1% annual chance (100-Year) Floodway
0.2% annual chance (500-Year) Floodplain
APPROXIMATE SCALE IN FEET
500 250 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS
PANEL 3187 OF 3350
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
WASHOE COUNTY, UNINCORPORATED AREAS 320019 3187 E
MAP NUMBER
32031C3187 E
EFFECTIVE DATE:
SEPTEMBER 30, 1994
Federal Emergency Management Agency
JOINS PANEL 3179
JOINS PANEL 3186
ZONE A
ZONE X
REVISED AREA
(CASE #07-09-1677P)
11
10
WASHOE COUNTY
UNINCORPORATED AREAS
320019
MIRALOMA
ROAD
ZONE A
ZONE X
AREA REVISED
BY LOMR DATED
SEPTEMBER 28, 2005
1% ANNUAL CHANCE
FLOOD DISCHARGE
CONTAINED IN CULVERT
15
14
ZONE X
ZONE A
ZONE A
REVISED TO
REFLECT LOMR
EFFECTIVE APR 25 2008

Appendix C
Wetland Mitigation Plan – Gibson & Skordal

BELLA VISTA RANCH - CENTEX HOMES

WETLAND MITIGATION AND MONITORING PLAN

Reno, Nevada

February 2005
Revised August 2005

8/23/05

Prepared For:

CENTEX HOMES
10509 Professional Circle, Suite 200
Reno, Nevada 89521

Prepared By:

GIBSON & SKORDAL, LLC
Wetland Consultants
2277 Fair Oaks Blvd., Suite 105
Sacramento, California 95825

Contents

Tables

Figures

Appendices

Chapter 1
Summary

The purpose of this document is to describe the mitigation measures proposed as compensation for the potential impacts to wetlands and other waters of the United States that would result from construction of the proposed Bella Vista Ranch-Centex Homes project. This plan was prepared with the objective of complying with the Corps of Engineers' and Environmental Protection Agency's guidance on compensatory mitigation projects for aquatic resource impacts under the Corps Regulatory program pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act as set forth in Regulatory Guidance letter No. 02-2. It is also intended to conform with the overall goals and recommendations set forth in Washoe-Storey Conservation District's Steamboat Creek Restoration Plan.

The overall format of this plan follows the Sacramento District Corps of Engineers' Habitat Mitigation and Monitoring Proposal Guidelines dated October 25, 1996.

The proposed project is a 364-acre mixed use residential development. The development would result in the loss of 4.623 acres of waters of the United States comprised of 3.060 acres of perennial creek channel (Steamboat Creek) and 1.562 acres of ephemeral to intermittent creek channels. To mitigate for these impacts, Steamboat Creek would be restored to its approximate original alignment. The restored stream corridor would consist of a meandering low flow channel with adjacent wetlands located on point bars occurring on the inside of meanders. The restored

Steamboat Creek natural corridor will be approximately 55.6 acres comprised of 5.3 acres of low flow channel, four acres of adjacent wetlands and 46.3 acres of uplands.

Chapter 2
Project Description

Responsible Parties

This mitigation plan is being proposed by Centex Homes as part of their Department of the Army Permit Application for a Section 404 permit to authorize fill in waters of the United States associated with the Bella Vista Ranch project described below. As the permittee, Centex Homes will be responsible for implementing the provisions of this mitigation plan.

Location of Project

The project area is approximately 364 acres is size. It is located east of the Double Diamond Ranch development and north of the Damonte Ranch development in Reno, Nevada. It is within Sections 21 and 28, Township 20 North and Range 20 East. The coordinates for the center of the property are latitude North 39°, 34', 44" and longitude West 119°, 44' 16". Sheet 1 of 9 of the project plans attached as Appendix A is a vicinity map showing major roads and surrounding developments.

Description of the Proposed Project

The proposed project is a 364- acre mixed use residential development. Approximately 275.5 acres will consist of four residential neighborhoods with attendant, roads, sidewalks, landscaping and other attendant features. Five acres are proposed for commercial uses. Eleven acres are proposed for public facilities including neighborhood parks, smaller parks and a police sub-station. A total of 17.2 acres are proposed for major roadways (Pioneer Parkway). The remainder (55.6 acres) would be the proposed Steamboat Creek Natural Corridor. Table 1 is a summary of the various proposed uses and their respective areas.

Table 1. Proposed Land Use

Proposed Use		*Area (acres)*	*Density (du/acre)*	*% of Total*
Residential	Neighborhood A	60.9	4.1 - 4.9	-
	Neighborhood B	77.0	7.8 – 8.4	-
	Neighborhood C	55.7	3.6 – 5.0	-
	Neighborhood D	81.9	4.9 – 6.1	-
	Subtotal Residential	275.5	-	75.8
Commercial		5.0	-	1.4
Public Facilities	Neighborhood Parks	5.0	-	-
	Small Parks	5.0	-	-
	Police Station	1.0	-	-
	Subtotal Public Facilities	11.0	-	3.0
Major Roadways	Pioneer Parkway	17.2	-	4.6
Steamboat Creek Natural Corridor		55.6	-	15.2
	Grand Total	±364.3	-	100

Chapter 3

Description of Impacts to Aquatic Resources

Existing Resources

General Site Characteristics

The project area consists of the southern 364 acres of the 1,700-acre Bella Vista Ranch. The topography of the project area is primarily flat to gently sloping terrain except the extreme eastern portion which is steeper terrain. The elevations within the study area range from 4,420' to 4,595' feet and 4,420' to 4,445' on the valley floor.

Historically, the hydrology of the project has been extensively modified to facilitate flood irrigation for grazing. Many years ago, Steamboat Creek was channelized and relocated to the west. Based on topography and soils, it appears that Steamboat Creek originally flowed south to north along the eastern one-third of the valley. The current alignment of Steamboat Creek is along a low topographic ridge that forms an east-west drainage divide. The ground elevation along the current alignment of Steamboat is four to five feet higher than its original alignment.

A second irrigation canal was constructed along the eastern side of the valley. This ditch was constructed to transport irrigation water north from Damonte Ranch. This ditch was also connected to Steamboat by a ditch aligned along the southern boundary of Bella Vista Ranch. The irrigation ditch along the eastern side of the valley was historically constructed at an elevation several feet above the toe of the eastern slope. This irrigation ditch may have intercepted groundwater flow contributing to saline seep wetlands that occur along the eastern edge of the valley. Countering this effect somewhat, are several small breaches in this ditch that allow irrigation waters to escape from the ditch.

A total of 15 soil mapping units occur within the study area for the jurisdictional delineation. Table 2 provides a list of these soil mapping units along with their status as hydric soils. Figure 1 is a map showing the location of soil mapping units. Two of the soils (Cradlebaugh loam and Voltaire loam, strongly alkaline) are listed as hydric soils. Six of the soil mapping units that are not listed as hydric commonly have inclusions of hydric soils within the mapping unit.

Table 2. Soil Mapping Units Within the Study Area*

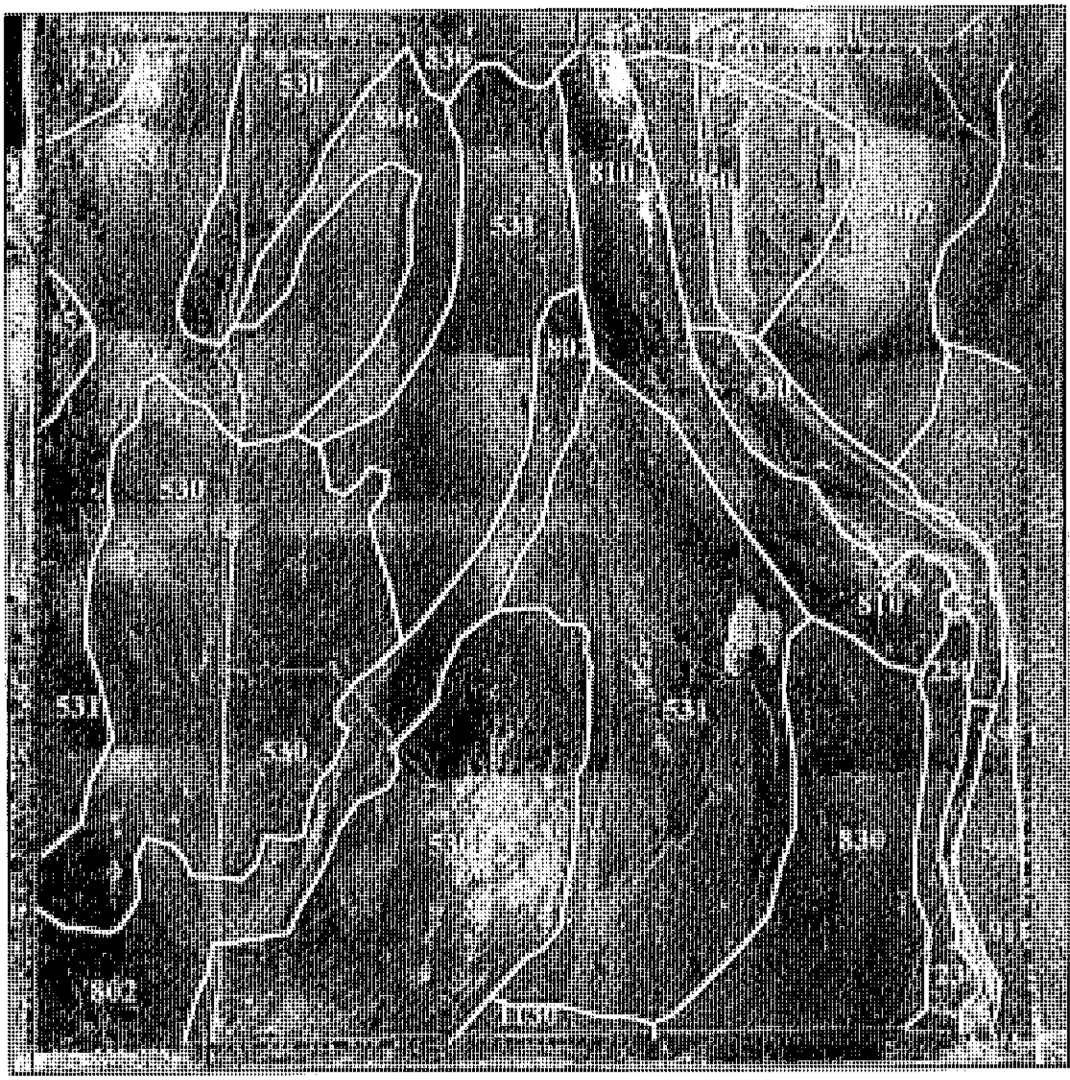
Map Ref. No.	*Soil Name*	*Hydric?***	*Hydric Inclusions?*
230	Cradlebaugh loam	Yes	Yes
420	Godecke loamy sand	No	Yes
430	Sagouspe variant loamy very fine sand	No	Yes
452	Voltaire loam, strongly saline	Yes	Yes
500	Mottsville sand	No	No
530	Sagouspe sand	No	Yes
531	Sagouspe fine sandy loam	No	No
802	Truckee silt loam, strongly saline	No	Yes
806	Truckee sandy loam, sandy substratum	No	No
810	Rose Creek fine sandy loam, drained	No	No
830	Fettic silty clay loam	No	Yes
911	Vamp silt loam, strongly alkaline	No	Yes
960	Kayo stony sandy loam	No	No
962	Kayo very stony sandy loam	No	No
1130	Dithod sandy loam	No	No

*Soil Conservation Service 1983
**Soil Conservation Service 1991.

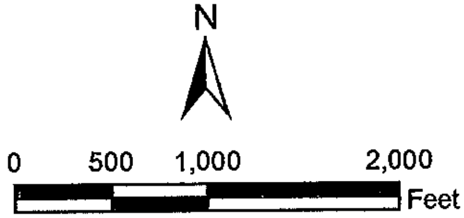
A preliminary geotechnical investigation of the study area for the jurisdictional delineation was completed by Black Eagle

FIGURE 1

SOIL MAPPING UNITS



SOURCE: Adapted from Soil Survey of Washoe County, Nevada, South Part



Legend

Study Area Boundary

Soil Unit Mapping Boundary

Consulting, Inc. The report for this investigation provides detailed descriptions of soil profiles, depth to groundwater and soil chemistry for selected locations (Black Eagle Consulting, Inc. 2004).

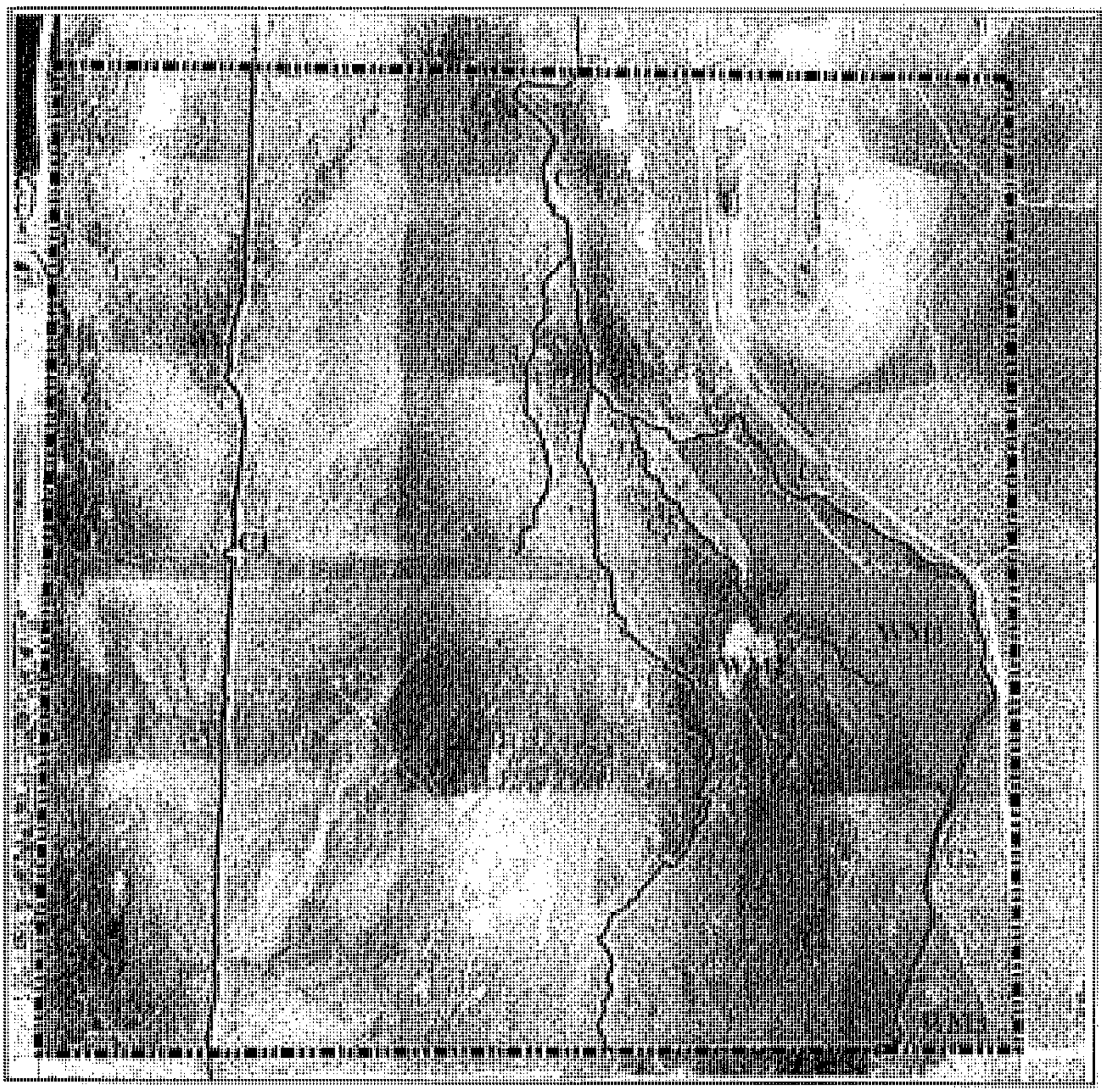
The dominant plant community occurring within the project area is characteristic of upland rangeland. Since cessation of irrigation, whitetop (*Lepidium latifolium*) has established itself as the dominant species. Other common plants within the study area include rabbitbrush (*Chrysothamnus nauseosus*), big sagebrush (*Artemesia tridentata*), greasewood (*Sarcobatus vermiculatus*) cheatgrass (*Bromus tectorum*), saltgrass (*Distichlis spicata*), and flixweed (*Descurainia sophia*).

Aquatic Resources

A delineation of jurisdictional waters of the United States was completed by Gibson & Skordal, LLC in 2004. This delineation encompassed a larger area than what is now the project area. The delineation encompassed a 642-acre area whereas the project area is approximately 364 acres. Figure 2 is a delineation map depicting the location and extent of waters of the United States within the original study area as delineated by Gibson & Skordal, LLC. Table 3 lists each of the delineated waters/wetlands, by type, and their areas for the original delineation and Table 4 lists the areas of delineated waters and wetlands within the project area.

FIGURE 2

EXISTING WATERS OF THE UNITED STATES



Legend

Wet Meadow (WM)

Channel (C)

Delineation Study Area Boundary

N

GIBSON & SKORDAL, LLC
WETLANDS CONSULTANTS
2277 Fair Oaks Blvd., Suite 395
Sacramento, CA 95825
(916) 569-1830

0 450 900 1,800 Feet

Table 3. Summary of Delineated Areas

Reference Number	*Wetland/Waters Type*	*Area (Acres)*
WM1	Wet Meadow	20.274
WM2	Wet Meadow	0.273
WM3	Wet Meadow	2.387
C1	Channel, Steamboat Creek	3.061
C2	Channel	1.082
C3	Channel	0.334
C4	Channel	0.816
C5	Channel	0.412
	Total	**28.639**

Table 4. Summary of Waters/Wetlands within the Project Area

Reference Number	*Wetland/Waters Type*	*Area (Acres)*
C1	Channel, Steamboat Creek	3.061
C2	Channel	0.541
C3	Channel	0.334
C4	Channel	0.816
C5	Channel	0.412
	Total	**5.164**

The following is a description of the wetlands and other waters of the United States existing within the project area as well as those within the study area of the wetland delineation.

The waters of the United States within the project area consist of perennial and intermittent to ephemeral channels. Wetlands within the project area are limited to relatively small areas within these channels. Steamboat Creek (C1) and C2 are perennial creeks while C3, C4 and C5 are intermittent to ephemeral drainage courses. Both Steamboat Creek and C2 are channelized watercourses that were constructed to act as conduits for irrigation water. Both lack meanders and are deeply incised with steep banks. Because of these steep banks, wetland vegetation is sparse and limited in extent. There is no woody riparian vegetation associated with either of these water courses.

Both Steamboat Creek and C2 are located at elevated topographic positions to facilitate the distribution of irrigation water. While both of these water courses carry water from naturally occurring sources including runoff and groundwater in the spring and early summer, their hydrology is dominated by irrigation water during the summer and early fall.

C3, C4, and C5 are intermittent to ephemeral channels that experience flows only in the spring during periods of precipitation and/or groundwater levels are high. Wetland vegetation is generally lacking in these channels. No woody riparian vegetation is associated with these channels. Prior to the cessation of flood irrigation practices, these channels transported irrigation return flows and would have experienced intermittent flow through much of the irrigation season (± March – October). The jurisdictional width of C3, C4 and C5 average approximately eight feet.

WM1, WM2 and WM3 are alkaline wet meadows. These wetlands occur on convex sloping topography along the eastern edge of the valley bottom immediately east of the eastern project area boundary. The hydrology of these wetlands is dependent on naturally occurring groundwater seepage supplemented by infiltration and some minor overland flow from irrigation water derived from C2. The naturally occurring groundwater is alkaline. This alkaline groundwater is diluted somewhat by the infiltration and overland flow from C2.

There are two distinct plant communities comprising these wet meadows. The predominant plant community in the eastern portions of WM1 and WM3 is dominated by halophytes. The dominant species is saltgrass. Other common species include pickleweed (*Salicornia* sp.), saltmarsh bird's-beak (*Cordylanthus maritimus*) and seaside arrow-grass (*Triglochin maritima*). The plant community in the western portions of WM1, WM2, and all of WM3 is more typical of fresh to slightly brackish environments with Baltic rush (*Juncus balticus*) being the dominant species. Cattails (*Typha* sp.) are common in those areas directly influenced by overland flow escaping from C2.

Impacts

The proposed project will result in the elimination of all existing waters of the United States within the project boundaries (except for C2 and restoration of Steamboat Creek to its approximate original alignment. The restored Steamboat Creek will include both a low-water channel as well as adjacent wetlands. The restored Steamboat Creek Natural Corridor will also include an upland floodplain and buffer.

The proposed project will result in the loss of approximately 4.623 acres of waters of the United States. This total is entirely comprised of channels. No wetlands will be directly impacted by the proposed project. Approximately 3.061 acres of perennial creek channel and 1.562 acres of intermittent to ephemeral drainages channels will be relocated. The restored Steamboat Creek will have six acres of low water channel habitat and three acres of adjacent wetlands.

A detailed description of the restored Steamboat Creek Corridor is provided in Chapter 4 – Proposed Mitigation Measures.

Chapter 4
Proposed Mitigation Measures

Goals and Objectives

Given the highly modified and degraded nature of the waterways and wetlands within the project area, several opportunities to restore functions and values to wetlands and other waters of the United States were identified during project planning. Based on these opportunities, the following planning objectives and mitigation objectives were established.

- Restore Steamboat Creek consistent with the Steamboat Creek Restoration Plan. To the extent possible, the alignment of the restored channel of Steamboat Creek should approximate its approximate original alignment.

- To the maximum extent possible, all preserved and restored wetlands and other waters of the United States should be located within contiguous open space corridors with upland buffers of at least 50 feet in width. The restored channel of Steamboat Creek should be aligned adjacent to existing wetlands along the eastern side of the valley.

- The number of road crossings over the preserved and restored wetlands and other waters of the United States should be minimized to the maximum extent practicable.

- To the extent practicable, locate public use areas such as schools and parks adjacent to the preserved and restored wetlands and other waters of the United States.

There are several logistical constraints that limit the extent to which the above design objectives can be satisfied. The following is a discussion of these constraints

- The transportation system for the project must tie into existing transportation infrastructure. There are two regional arterials that the project will need to be designed to connect with. They are Pioneer Parkway and South Meadows Parkway. Pioneer Parkway is a north-south arterial that currently is planned to connect from Damonte on the south at the approximate point where the current alignment of Steamboat Creek enters the project area. South Meadows Parkway connects with the project area in its northwest corner.

- The project design must accommodate all flows entering from the south (Damonte Ranch). Currently, flows enter the property in the southwest in Steamboat Creek and in the southeast from a wetland mitigation area located in the northeast corner of Damonte Ranch, flowing into C2. The design will need to accommodate both low and flood flows. At the current time, irrigation water from C2 is released through several small breaches into WM1 and subsurface seepage from C2 contributes groundwater to WM1. The current areal extent of WM1 is maintained, at least in part, by this water. The project should be designed to maintain this hydrologic input to maintain the existing hydrology of WM1.

Steamboat Creek Restoration Plan

The Steamboat Creek Restoration Plan (SCRP) is a community-wide, cooperative plan prepared for the Washoe-Storey Conservation District to restore, enhance and preserve the

Steamboat Creek Watershed (Codega 2000). The stated goals of this plan are as follows.

- Improve the water quality of Steamboat Creek.
- Restore Steamboat Creek to a sustainable condition.
- Re-establish wildlife habitat appropriate for individual reaches.
- Re-establish vegetation appropriate for individual stream reaches.
- Combine stream restoration with recreation in areas designated for public access.

The SCRP provides specific design recommendations for the restoration of various reaches of Steamboat Creek. It also prioritizes the need for restoring these various reaches. The project area lies within the middle of the Bella Vista reach. This reach is assigned a moderate to high restoration priority based on particulate pollution and chemical constituents.

The SCRP classifies the existing channels according to the Rosgen Classification System (RCS) and makes recommendations for restored channels within various reaches. The RCS classifies channels according to their channel morphology and by bed material types. Based on morphology, the channel is assigned a letter designation A through G. The channel is then assigned a number 1 through 6 based on the bed material type (e.g. bedrock, sand, gravel, etc.).

Within the Bella Vista reach, F and G type channels are predominant. F and G type channels are deeply incised, low gradient channels with steep banks located in highly weathered, alluvial or colluvial soils. They are unstable and subject to bank and/or bed erosion. The SCRP acknowledges that these channel types have little meaning since the entire reach is artificial. The recommended restored channel is a C5 type. C type channels are slightly entrenched within broad valleys associated with floodplains. The bed material is sand. C type channels have well defined meanders and are considerably more stable than F and G type channels.

The SCRP recommends two alternatives for restoring this reach of Steamboat Creek. The first alternative would involve attempting to restore the creek within its current alignment. The second alternative would involve relocating Steamboat east to approximate its original alignment.

Since the first alternative would use the current alignment of Steamboat Creek, it would not result in true restoration. This alignment will always be perched above the valley floor and will require more intensive long-term maintenance.

Because of the above and following coordination with the Corps of Engineers, the second alternative (restore Steamboat Creek to its approximate original alignment) was selected as the preferred restoration alternative.

Description of Proposed Mitigation Measures

Design

For the reasons stated above, the SCRP restoration alternative selected for this project is to relocate Steamboat Creek to approximately its original alignment using a C5 type channel as the model for the restored channel.

In order to return Steamboat Creek to its approximate original alignment, the channel will have to connect the current alignment of Steamboat Creek with the original alignment. Based on the topography of the project area as well as the soils, it appears that the original channel was located approximately 2,000 to 3,000 feet east of its current alignment. The point at which Steamboat Creek enters the property from the south cannot be moved more than about 350 feet to the east because the alignment south of the project area is dictated by the Damonte Ranch project which is currently under construction. Therefore, in order to relocate the channel to its original alignment at the southern border of the project area, the channel must first be aligned parallel to the southern border of the property boundary to a point where it approximates the original alignment, whereupon it can then turn north.

The project plans in Appendix A include drawings showing the proposed restored channel of Steamboat Creek in plan and cross-section views.

The Steamboat Creek Natural Corridor (SCNC) will begin at a point approximately 313 feet east of the point where Steamboat Creek currently enters the project area. The SCNC will follow the southern boundary of the project area to a point due west of WM1. The SCNC will then turn north and parallel the eastern project boundary to the northern boundary of the project area. The SCNC will average 240 feet in width. The total area of the SCNC will be 55.6 acres. The SCNC has been designed to accommodate the estimated post-project 100-year storm event.

The restored channel of Steamboat Creek will be a C5 type channel that will meander within the SCNC. The low water channel has been designed to carry the estimated average summer flow of Steamboat Creek. This is the estimated amount of water that normally flows in Steamboat Creek during the summer irrigation season. The total length of the low flow channel will be approximately 7,700 feet. It will have an average bottom width of 9 feet, an average top width of 21 feet and an average depth of 2 feet. The total area of low flow channel will be approximately 5.3 acres.

Significant portions of the low flow channel are expected to be open water but emergent marsh vegetation is also expected to establish along its edges and in backwater areas. Plant species expected to establish within the low flow channel include hardstem bulrush (*Scirpus acutus*) and cattails.

The restored channel of Steamboat Creek has been designed so that there will be wetlands located on the point bars occurring at the inside of meanders. The wetlands will be located on low terraces that are slightly higher than the bed of the low flow channel. The point bar wetlands are designed so that they are at or above the summer low flow elevation but below the estimated average annual high water elevation. Approximately four acres of wetlands will be constructed.

The point bar wetlands have been designed to have the hydrologic characteristics of herbaceous and/or woody riparian wetlands existing at other locations along Steamboat Creek. They have been designed so that they will flood only during higher spring flows. While they will be inundated for a month or less under normal conditions, their elevation is such that they should experience saturated soils within the upper root zone for a significant portion of the growing season during normal runoff years.

This hydrology regime is more conducive to the establishment of vegetation typically found in wet meadows and riparian meadows as opposed to the emergent marsh vegetation that is expected to establish within the low flow channel. Plant species expected to establish within this zone include Baltic rush, fox-tail barley, (*Hordeum jubatum*), meadow barley (*Hordeum brachyantherum*), tufted hairgrass (*Deschampsia cespitosa*) and various bluegrasses (P*oa juncifolia, P. palustris*).

In addition to hydrology, the plant communities that establish within the low water channel and point bar wetlands will be significantly influenced by soil and groundwater chemistry. The soils and associated groundwater of the Truckee meadows are high in certain naturally occurring salts. Both boron and arsenic are present in concentrations that can influence the type of plant communities that can be successfully established. Chemical testing within the project area revealed soil boron concentrations ranging from 5.3 to 81 mg/l (ppm) in groundwater and 25 to 140 mg/l (ppm) in the soil (Black Eagle Consulting, Inc. 2004). These levels of boron are similar to levels that have been observed on adjacent developments (Double Diamond and Damonte Ranches).

The effect of high salt levels has been and will continue to be moderated by irrigation waters which dilute and/or reduce the concentrations near the surface. Where concentrations are relatively high, the plant communities that establish will be more typical of alkaline wetlands. Species such as salt grass, Mediterranean barley (*Hordeum hystrix*), pickleweed, salt marsh birds-beak and seaside arrow-grass are likely to become dominant in these areas over time. Also, the high boron levels are expected to preclude successful establishment of woody riparian vegetation.

Implementation

The SCNC will be constructed "in the dry" to minimize temporary degradation of water quality from construction activities. Construction of the entire SCNC including the restored stream channel with its adjacent wetlands will be completed prior to routing the water of Steamboat Creek into the restored channel.

All of the topsoil within the alignment of the SCNC will be excavated to an approximate depth of 0.75 foot. The salvaged topsoil will be stockpiled separately from other excavated material. The corridor will then be excavated to its approximate finish contours minus ± 0.75 foot. The salvaged topsoil will then be applied evenly across the corridor and finish graded.

The salvaged and reapplied topsoil will be the primary source of inoculum for revegetation of the creek, adjacent wetlands and floodplain. The area from which the soil is being salvaged was flood irrigated for many years and contains the seeds, roots and rhizomes of many hydrophytes. Normally use of this topsoil would be the most efficient method of revegetating the restored channel and disturbed uplands. However, a combination of seeding and plugging will also be used to promote a more rapid establishment of desired species and discourage the establishment of undesirable species such as tall whitetop (see Appendix B – Revegetation Plan).

Construction of the SCNC will take place during the fall and winter low flow period. Prior to rerouting water from the existing channel of Steamboat Creek into the restored channel, a series of temporary sediment traps will be constructed within the restored channel. The sediment traps will be constructed of 3/4–inch drain rock spaced 750 feet apart in the low flow channel of relocated Steamboat Creek. The drain rock plug will allow the flow to pass through at slower velocities that the first flow channel by itself thereby creating a pool upstream of the plug in which the sediments will drop out.

The plugs will remain in place after stabilization has taken place. The first major flow will remove them and redistribute the rock downstream. The flowline of the realigned channel varies from 0.0016 ft/ft to 0.0018 ft/ft. The first flow channel meanders from side to side across the 200 wide main channel bottom, therefore its slope will be less that the main channel. Drawings of the sediment filters and placement are shown schematically in Appendix C. As stated previously, the construction of the restored channel will be conducted "in the dry". An earth plug will be maintained between the upstream beginning of the restored channel and the existing channel of Steamboat Creek until construction of the restored channel is completed. Prior to releasing water into the restored channel, a sandbag plug will be constructed in the earth plug. The sandbag plug will have V-shaped opening in the center for the diverted flow to pass through (see Appendix C).

After completion of the sandbag plug the earthen plug will be incrementally removed allowing gradually increased flow into the restored channel. At the point when removing sandbags does not increase the flow, a sandbag plug will placed in the existing channel Steamboat Creek immediately downstream of the diversion. The construction of the plug will continue by adding sandbags until the entire flow is diverted to the new channel. After the entire flow has been diverted, the existing channel will be filled in downstream of the diversion.

Once the relocated channel has been completed on the Damonte Development to the south and the flow diverted to the realigned channel, the plugs in the existing and temporary channel on Bella Vista Development will be removed and the old channel filled. A noxious weed control program will be implemented during the mitigation monitoring period. The purpose of this program will be to limit the establishment of noxious weeds within the SCNC. Appendix B contains a copy of the Revegetation Plan which outlines measures to control noxious weeds. The intent of this program will be to reduce the presence of certain non-native weed species that can retard the development of desired plant communities and reduce wetland function or value. It is not intended to limit all non-native species. Examples of species of concern are white-top pepper-grass (*Lepidium latifolium*), purple loosestrife (*Lythrum salicaria*), several species of nightshade (*Solanum* sp.) and salt cedar (*Tamarix ramosissima*). Weed control measures will include hand removal and application of herbicides. Where herbicides are used, they will be limited to those that have been approved for use in or near water (see Appendix B).

Implementation Schedule

The construction of the SCNC will be initiated prior to or concurrent with initiation of construction activities for the project. It will be completed no later than December 31 of that same year.

Responsibilities for Implementing Plan

The permittee (Centex Homes) will be responsible for constructing the proposed mitigation.

Chapter 5
Monitoring

Performance Standards

The following performance standards will be used to assess the relative success of the constructed wetlands.

The restored Steamboat Creek shall be approximately 7,700 feet in length. It shall contain approximately 5.3 acres of summer low flow channel, four acres of wetlands, and 46.3 acres of upland floodplain buffer.

A minimum of 3.2 acres of the total four acres of wetlands constructed must meet or exceed the following criteria for three consecutive years without human intervention.

- The constructed wetlands will exhibit a minimum of one primary or two secondary indicators of wetland hydrology (Environmental Laboratory 1987).
- The plant communities in the constructed wetlands will be dominated by species with a wetland indicator status of facultative, facultative wetland or obligate (Reed 1988).
- The plant communities in the constructed wetlands (other than areas of open water) will be dominated by species commonly found in wetlands adjacent to Steamboat Creek both upstream and downstream of the mitigation area.

- The total vegetative cover in the constructed wetlands (other than areas of open water) will be equal to or greater than 70 percent.

Restrictions and Conditions

In addition to the above performance standards, the Corps of Engineers has required that the following restrictions be complied with as conditions of the permit. Where there are perceived conflicts between the restrictions listed below and other provisions of this plan, these conditions will be overriding.

1. The permittee must obtain written approval from this office prior to making any change or modification to any general or special permit condition.

2. The permittee shall take the actions required to record this permit with the Registrar of Deeds or other appropriate official charged with the responsibility for maintaining records of title to or interest in real property. Proof of this recordation shall be submitted to this office before February 28, 2006. The deed restriction must include a condition that the deed restriction may not be removed without prior written approval from the Corps.

3. The permittee must protect the constructed Steamboat Creek natural corridor (and mitigation site) from human encroachment and disturbance that would environmentally degrade the corridor for at least 30 years from the date of this permit.

4. The permittee must treat all water from stormwater outfalls draining to the Steamboat Creek natural corridor using appropriate Best Management Practices (BMPs) prior to discharging to the low flow channel of Steamboat Creek. Appropriate BMPs include oil and grease separators, trash racks, grassy swales and/or detention basins.

5. The permittee must establish staging areas in an upland area at least 150 feet from the newly constructed Steamboat Creek corridor after corridor construction is completed.

6. The permittee must complete all land clearing and other surface disturbances associated with this permitted activity outside the avian breeding season (from 15 April to 31 July) to avoid destruction of active bird nests (nests with eggs or fledglings) that breed in the area unless a qualified biologist surveys the area prior to construction and verifies that no active nests would be impacted. If the biologist locates active nests at or immediately adjacent to the project site, or if other evidence of nesting is observed, a protective buffer shall be marked with flagging so the nesting area will be avoided to prevent the destruction or disturbance to nests until they are no longer active.

7. The permittee must allow unimpeded passage of a 100-year storm event for all bridge and culverted tributary crossings. Energy dissipaters and / or rip rap aprons must be installed at the downstream end of culverts to prevent increased velocities from causing erosion.

8. This permit authorizes filling approximately 3928 feet of creek segment C2; 1819 feet of creek segment C3; 4445 feet of creek segment C4; and 2243 feet of creek segment C5; it is noted that impacts to C2 and C5 are considered temporary because they line in the constructed creek corridor. The permittee must mitigate for these creek impacts by constructing a new creek corridor as shown on the attached drawings. The corridor must include side slopes (from the top of bank / original ground level to the base of the corridor that do not slope less than 1 horizontal to 3 vertical. The base of the corridor (flood storage area) shall be slightly sloped toward the low flow channel. The low flow channel must be 9-21 feet wide and 2-3 feet deep, sufficient to be near bank-full during normal low flows. The permittee must construct point-bar wetlands adjacent to the low flow channel; the total wetland acreage shall be at least 3.5

acres.

9. The permittee must complete all Steamboat Creek natural corridor construction and initial revegetation within the constructed Steamboat Creek corridor by February 28, 2006.

10. The permittee must assure compliance with the commitments made in mitigation goals. The mitigation goals are described and referenced in Chapter 4 of Mitigation and Monitoring Plan.

11. The permittee must revegetate all disturbed areas within the newly constructed Steamboat Creek corridor per the Wetland Mitigation Design Report prepared by Western Botanical Services, Inc., located in Appendix B of the referenced Mitigation and Monitoring Report.

12. The permittee must assure that low flow channel head cutting does not exceed more than 6 inches deeper than the design grade and that the base of the corridor the bank side slopes are sufficiently stabilized to preclude erosion and sediment deposition in the low flow channel.

13. The permittee must maintain a minimum 50 foot buffer between the wetland adjacent to the newly constructed Steamboat Creek corridor and any development. This buffer zone must be at least 50 feet wide measured from the outer edge of the wetland. The permittee must not construct any permanent structure within this buffer, except pedestrian walkways, bike paths, or fencing. The preferred design is a vegetated buffer zone. A vegetated buffer zone shall be established and maintained.

14. The permittee must stockpile topsoil from within the new Steamboat Creek alignment, particularly from creek segments C2 and C5. At least 6-8 inches of this material must be the top grade at the base of the corridor, excluding the low flow channel, to provide the finished grade.

15. The permittee must monitor the mitigation site for success for

at least five years to begin after the first growing season after fully implementing the mitigation plan. One measure of mitigation success shall be desirable vegetation survival and percent cover for herbaceous plants and at least three consecutive years of growth without artificial manipulation such as irrigation. Desirable plants are native, hydrophytic plants, listed in Appendix B of the referenced Mitigation and Monitoring Plan. In general, the cover of herbaceous species should be at least 40% for the first growing season and shall be at least 60% after the second growing season in all areas within the Steamboat Creek natural corridor, disturbed by construction or planted with native plantings. For herbaceous species, the cover rate shall be more than 70% for three consecutive growing seasons after the second growing season in all disturbed areas to be considered successful. If necessary, additional plantings or on-site modifications may be needed to attain a successful survival rate and plant cover.

16. The permittee must pursue all reasonable efforts for at least ten years (from the date of mitigation planting or project completion or a date) to control non-native invasive species within the newly constructed Steamboat Creek corridor below one plant per any square yard (averaged), except for purple loosestrife *(Lythrum salicaria)*, saltcedar/tamarisk *(Tamarix ramosissima)*, and Canada thistle *(Cirsium arvense)*; there is zero tolerance for these four species. Reasonable efforts include physically pulling the plant, including the complete root mass; cutting of the flowering parts before seeds are produced; applying herbicides to early spring rosettes (young plants); and drying and, if possible, burning plants.

17. The permittee must implement the perennial pepperweed/tall white top *(Lepidium latifolium)*, control plan, located in Appendix B of the referenced Mitigation and Monitoring Plan.

18. The annual mitigation monitoring report shall include information on mitigation successes and actions needed to correct deficiencies; compliance with mitigation goals; photographs of representative areas along the newly

constructed Steamboat Creek corridor; a map showing all photo locations and directions the camera was pointing; and vegetative sampling data, including species composition and density within the corridor.

19. The permittee must submit a mitigation monitoring report annually until the mitigation efforts are successful, or annually, thereafter, if mitigation is not successful after five years, until mitigation is certified as successful.

20. The first report must be submitted after the end of the first growing season and contain baseline data and as-built drawings if the project was constructed differently from the drawings included with the authorization. Submit the report and other required documents by December 31 of each year to:

    US Army Corps of Engineers
    Reno Regulatory Office
    300 Booth Street, Room 2103
    Reno, Nevada 89509-1361

21. Unless extended by non-compliance, the term for submitting monitoring reports is at least five years after completion of mitigation construction to ensure these areas revegetate as described. The Reno Regulatory Office, Corps of Engineers, Sacramento District, will determine if the mitigation effort was successful; if further actions are needed to bring the project in compliance; and the need for a monitoring report if the reporting term exceeds five years. Monitoring is no longer required when mitigation is certified by this office as successful.

22. Once the compensatory mitigation has been approved as complete and successful, you must not allow further development or human encroachment in the mitigation or buffer area for at least 30 years, except for Corps of Engineers mandated or maintenance activities or low density recreation use or seasonal restrictions if approved by this office. The permittee or a subsequent owner may maintain the site, if

consistent with the (compensatory) mitigation goals, by such activities as control of nuisance mammals, removal of exotic (non-native) or pest plant species, and controlled burning if consistent with the compensatory mitigation goals. The permittee or subsequent owner may not engage in activities in the mitigation area or buffer zone that are considered inconsistent with compensatory mitigation goals, such as removal of vegetation (although minor cosmetic manipulation, such as minor pruning, is acceptable) or alteration of hydrology, or any filling with debris or fill material, except as provided in the referenced Mitigation and Monitoring Plan. Exceptions may be obtained by written approval from the Reno Regulatory Office, Corps of Engineers, Sacramento District.

Monitoring Protocol

The constructed wetlands will be monitored for a period of five years or until all performance criteria have been met for three successive years without human intervention, whichever is longer. The purpose of the monitoring is to assess the relative success of the mitigation as compared to performance criteria and to determine whether remedial actions are necessary to assure the performance criteria are met.

Monitoring of Steamboat Creek and the constructed wetlands will include obtaining quantitative data on their hydrology and plant communities. Photo points will be established to qualitatively monitor trends in the developing plant communities. The areal extent of constructed wetlands will be surveyed annually using GPS technology and/or GIS technology with georeferenced aerial photography.

The monitoring of the hydrology of Steamboat Creek and the constructed wetlands will be emphasized primarily in the first growing season following construction. Staff gages will be installed at selected locations in the restored channel of Steamboat Creek and the constructed wetlands. Sampling will be conducted at a frequency sufficient to document the depth and duration of inundation within the constructed wetlands. Once the hydrology of the constructed wetlands has been adequately characterized, additional detailed hydrology monitoring will not be conducted over subsequent growing seasons unless specific problems are identified that warrant further monitoring.

Vegetation monitoring will be conducted during each growing season throughout the monitoring period. The plant community in the constructed wetlands will be characterized. Each plant observed will be identified and its relative cover will be recorded. The total cover of all species will also be estimated.

Reporting

The results of each year's monitoring will be compiled into an annual monitoring report. The annual monitoring reports will present all monitoring data, assess the implications of that data, and make recommendations for remedial actions, where warranted. The annual reports will be submitted to the Corps of Engineers not later than December 31st each year.

Responsibilities

The permittee (Centex Homes) will be responsible for implementing all aspects of the monitoring of the constructed mitigation.

Chapter 6
Long-term Maintenance and Management

The mitigation area will be owned and managed by a Home Owners Association (HOA). Prior to deeding the land to the HOA, deed restrictions will be established over the restored Steamboat Creek, the constructed wetlands and their upland buffer. These deed restrictions will limit activities within the mitigation area to those activities beneficial to the restoration, creation and preservation of Steamboat Creek, the constructed wetlands and their adjacent upland buffer.

Once the restored Steamboat Creek and the constructed wetlands have been monitored for the required period and they have met or exceeded all performance criteria for a period of three consecutive years without human intervention, these responsibilities will have been satisfied and the HOA will be responsible for the long-term maintenance of the mitigation area. Long-term maintenance includes those activities necessary to protect the mitigation area from incidental damage and, if such damage does occur, undertake appropriate remedial measures. Normal long-term maintenance activities include maintenance of the trail system and garbage removal. The HOA will fund any and all efforts required under this plan.

Appendix C-1
404 Individual Permit # 200400683

24015-00

DEPARTMENT OF THE ARMY PERMIT

Permittee: Centex Homes

Permit Number: 200400683

Issuing Office: US Army Engineer District, Sacramento

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

TO place fill material in Steamboat Creek to divert all of its flows into a newly constructed, restored Steamboat Creek corridor. All work is to be completed in accordance with the attached plan, entitled, "Wetland Mitigation and Monitoring Plan."

Project Location:

The project is located in southeast Reno in Sections 3 and 10, Township 18 North, Range 20 East, Washoe County, Nevada on the Steamboat USGS topographic quadrangle.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on September 30, 2008. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

The document entitled "Wetland Mitigation and Monitoring Plan," dated Revised August 2005, is incorporated by reference as a condition of this authorization. This plan includes mitigation location and design drawings, vegetation plans, including target species to be planted, and final success criteria, presented in the format of the Sacramento District's Habitat Mitigation and Monitoring Proposal Guidelines, dated December 30, 2004. You must comply with the overall goals and designs of the referenced mitigation plan.

You must comply with the restrictions and conditions section listed in the referenced mitigation plan that start on page 21.

You must implement the cultural resources treatment plan, entitled "An Historic Preservation Treatment Plan for Three Prehistoric Sites (26Wa2054, 26Wa6651, and 26Wa7478), Located in the Truckee Meadows, Washoe County, Nevada" by December 31, 2006.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal projects.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant.

Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Permittee

10/7/05
Date

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

for Michael S. Jewell, Chief,
Central California/Nevada Section
(For the District Engineer)

7 OCT 05
Date

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

Transferee

Date

LEO DROZDOFF, *Administrator*

(775) 687-4670
Administration
Facsimile 687-5856

Water Quality Planning
Water Pollution Control
Facsimile 687-4684

Mining Regulation & Reclamation
Facsimile 684-5259

State of Nevada
KENNY C. GUINN
Governor

ALLEN BIAGGI, *Director*

Air Pollution Control
Air Quality Planning
Facsimile 687-6396

Waste Management
Federal Facilities

Corrective Actions
Facsimile 687-8335

email ndep.nv.gov

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
901 South Stewart Street, Suite 4001
Carson City, Nevada 89701-5249

March 30, 2005

Mr. Richard Gebhart
U.S. Army Corps of Engineers
Nevada/Sierra Regulatory Office
300 Booth Street Rm 2103
Reno, NV 89509

Nevada Division of Environmental Protection (NDEP) grants 401 Certification for the Centex Homes Project (PN 200400683) in south Reno, Washoe County, Nevada. BMPs must be properly installed and maintained throughout the project construction period until all disturbed areas are stabilized. Photographs of BMPs must be submitted to this office within two weeks of their installation. If straw bales are selected as BMPs they should be certified as weed free.

Any modifications to original project submittal must be reviewed and approved by this office prior to implementation.

All conditions of NDEPs Temporary Authorization To Discharge Permit (Construction / Dewatering Permit) or any other permit issued by NDEP for the project must be followed.

This Section 401 Water Quality Certification is subject to the acquisition of all necessary local, regional, state and federal permits and approvals as required by law. Failure to meet any conditions of this 401 Water Quality Certification or the Temporary Authorization Permit (Construction/Dewatering Permit) or any other permit issued by NDEP for this project or any violation of NAC 445A may result in the revocation of this 401 Water Quality Certification.

If you have any question please give me a call.

Sincerely yours,

Glen Gentry

Glen Gentry
Monitoring Branch Supervisor
Bureau Water Quality Planning

cc: Kyle Collinsworth, Centex Homes
Icyl Mulligan, NDEP

Appendix D
Geotechnical Report – Black Eagle Consulting

PRELIMINARY GEOTECHNICAL INVESTIGATION

THE SOUTHERN PORTION OF THE BELLA VISTA RANCH

A Portion of Sections 3 and 10, Township 18N, Range 20E, M.D.M.

WASHOE COUNTY, NEVADA

AUGUST 2004

Prepared for:

Centex Homes

Black Eagle Consulting, Inc. - Geotechnical & Construction Services

Black Eagle Consulting, Inc.
Geotechnical & Construction Services
1345 Capital Boulevard, Suite A
Reno, Nevada 89502-7140
Telephone: 775/359-6600
Facsimile: 775/359-7766
Email: mail@blackeagleconsulting.com

Mr. Merlin Waite
Centex Homes
9600 Prototype Drive
Reno, NV 89511

August 23, 2004
Project No.: 0199-08-1

Re: Preliminary Geotechnical Investigation
The Southern Portion of Bella Vista Ranch

Dear Mr. Waite:

Black Eagle Consulting, Inc. is transmitting herewith our preliminary geotechnical investigation of the southern portion of the Bella Vista Ranch in Washoe County, Nevada. A wide variety of materials are present, ranging from bedrock to coarse granular alluvial fan deposits, and complexly interbedded fine sand, silt, and clay flood plain deposits. Bedrock is present in limited areas in the higher elevations along the northeastern boundary. Coarse granular alluvial fan deposits are present east of Mira Loma Road. The remainder of the site west of Mira Loma Road in low-lying flood plain deposits is typified by complexly gradational and interbedded layers of fine sands, silts, and clays. The ground water table lies at shallow depths in several areas throughout the low-lying flood plain.

The enclosed report presents conclusions and recommendations for the planning and preliminary design of the project. If you require any clarification of our findings, please contact us. We look forward to being of continued service to Centex Homes on this project.

Sincerely,

Black Eagle Consulting, Inc.

PROFESSIONAL ENGINEER - STATE OF NEVADA
ROBERT D. HUNTER
8-23-04
GEOLOGICAL
No. 9343
EXP. 6-30-05

Larry J. Johnson
President

Dal Hunter, Ph.D., P.E.
Vice President

Copies to: Addressee (5 copies)

cc: Mr. Randy Walters, MacKay & Somps
Ms. Peggy Bowker, P.E., Nimbus Engineers

LJJ:DH:mk

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APPENDIX

PRELIMINARY GEOTECHNICAL INVESTIGATION

THE SOUTHERN PORTION OF THE BELLA VISTA RANCH

(A Portion of Sections 3 and 10, Township 18N, Range 20E, M.D.M.)

WASHOE COUNTY, NEVADA

INTRODUCTION

Presented herein are the results of the Black Eagle Consulting, Inc. preliminary geotechnical investigation and associated geotechnical recommendations for the southern portion of the Bella Vista Ranch, Washoe County, Nevada. These conclusions and recommendations are based on surface and subsurface conditions encountered in our research and exploration of the property. The objectives of this study were to:

1. Determine general soil, bedrock, and ground water conditions pertaining to planning, design, and construction of the proposed residential development.

2. Provide recommendations for due diligence, planning and preliminary design of the project, as related to these geotechnical conditions.

The area covered by this report is shown on Plate 1 - Plot Plan. Our investigation included field exploration, laboratory testing, and engineering analysis to determine 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.

The services described above were conducted in accordance with the Black Eagle Consulting, Inc. proposal dated June 4, and revised July 6, 2004.

PROJECT DESCRIPTION

Project details are not available at this time, but planning studies are in progress. We anticipate that the site will be developed as residential housing projects with associated streets, utilities, and neighborhood parks.

SITE CONDITIONS

Access

This initial geotechnical investigation of the Bella Vista Ranch site covers approximately 585 acres in Sections 3 and 10, Township 18 North, 20 East, M.D.M. and includes most of the area south of the A & K conveyor belt, east of Alexander Lake and Steamboat Creek, and west of the Power substation and Mira Loma Road (refer to Plate 1a). The Bella Vista Ranch site is accessed by turning south along Alexander Lane, locally known as the Mira Loma Access Road, off of South McCarran Boulevard. A locked gate on the south side of Alexander Lane that accesses the north-central part of the site is present approximately 3.2 miles from McCarran Boulevard.

Topography and Vegetation

Topography ranges from a low of 4,425 feet in elevation near the valley floor to a maximum of 4,960 feet in the northwestern corner and 4,820 feet in elevation in the southeastern corner of the site. The majority of the site lies at or near valley floor elevations. Gradients across the valley floor are typically in the range of 0.5 to 1.0 percent.

Vegetation in the valley floor is dominated by green and brown grass that ranges from 6 inches to 5 feet in height. The hills and alluvial fans show sparse to moderate amounts of small sagebrush up to 3 feet tall. Wetland areas consist of abundant native green plants and weeds. Vegetation is larger and more abundant in areas adjacent to Steamboat Creek, Alexander Lake, and the other local irrigation ditches.

Lakes, Wetlands, and Irrigation Ditches

The majority of the property is flat and undeveloped and has been used previously for cattle ranching. Steamboat Creek crosses the western part of the site and is oriented in a north-south direction. Limited access across the area is provided by a small number of unimproved roads that traverse the ranch, with the primary road running north-south and directly east of Steamboat Creek. Areas of the eastern side of the ranch are inaccessible without a 2- to 3-foot deep water crossing. A number of east-west barbed-wire fences also cross the site. Alexander Lake covers approximately 41 acres and lies just outside of the area of study, near the northwestern corner of the property. Several wetlands are present on the southern part of the site. The largest wetland is located in the southeastern corner of the parcel and covers approximately 20 acres.

Throughout the ranch are several irrigation ditches that connect to Steamboat Creek, Alexander Lake, or several of the wetland areas. These ditches also serve as the local drainage features on the site. Sheet flow is also an important drainage pattern that is related to the topographic variation due to localized rises and depressions.

Gravel Operations

The most prominent activity on the Bella Vista Ranch site is the active mining of aggregate and gravel along the northeastern margin by A&K Earthmovers. Several other previously mined quarries are present outside the boundaries. The Alexander Lane roadway is heavily used by trucks hauling aggregate and gravel from the main Bella Vista Pit located on the northeast corner of the site and from Pit #2, located on the northwest corner of the site (see Plate 1). A conveyor belt crosses the northern boundary of the Bella Vista Ranch site (see Plate 1) connecting the mining operations between the two pits. The northeastern quarry has been partially backfilled with considerable depths of construction debris and uncontrolled fill.

Utilities and Other Development

An overhead power line is present on the northern and eastern boundaries of the Bella Vista Ranch site. The power line approaches a large power substation that lies just outside the eastern-central boundary of the site (see Plate 1).

Sewage treatment ponds lie approximately 1.4 miles to the south of the southern boundary of the Bella Vista Ranch site. The Sage Hills Gun Club and Shooting Range lies near the southeast corner of the site.

Sewer lines are currently being constructed directly south of the wetlands at the southern border of the parcel in the developing Damonte Ranch area.

EXPLORATION

Exploration of the Bella Vista site was conducted from June 11 to 16, 2004, and included both test pits and borings. Twenty-one test pits were excavated with Case 580 Super L and Case 580K rubber-tired backhoes. The maximum depth of excavation was 14.3 feet in Test Pit # 6. Test pit locations are shown on Plate 1a.

Deeper soils were explored on June 15 and 16, 2004, with three test borings. Two borings were advanced using 6-inch-outside-diameter (O.D.), 3-¼-inch-inside-diameter (I.D.), hollow stem augers and a truck-mounted CME 55 soils sampling drill rig. All three borings were for liquefaction analysis and utilized rotary mud drilling techniques. The maximum depth of exploration was 41-½ feet below the existing ground surface in B-1. Several attempts were made to advance borings B-2 and B3 below 36.3 feet and 33.0 feet, respectively, but caving conditions prevented further progress. The locations of the test borings are shown on Plate 1a.

The native soils were sampled in-place every 2 to 5 feet by use of a standard, 2-inch O.D., split-spoon sampler driven by a standard 140-pound drive hammer with a 30-inch stroke. The number of blows to drive the sampler the final 12 inches of an 18-inch penetration (Standard Penetration Test - ASTM D 1586) into undisturbed soil is an indication of the density and consistency of the material. Pocket penetrometer testing was performed on various samples of fine-grained soils in order to evaluate unconfined compressive strength.

Due to the relatively small diameter of the samplers, the maximum particle size that could be obtained was approximately 1-¼ inches. The final logs may not, therefore, adequately represent the actual quantity or presence of cobbles or boulders.

Test pit numbers TP-1, TP-2, TP-3, TP-5, and TP-6, along with Boring #B-01, are located north of the site boundary for this initial geotechnical investigation. Geotechnical information from these test pits and one boring are included in this report.

Ground water observation wells were installed in ten of the test pits (TP-2, 6, 9, 10, 14, 16, 17, 18, 19, and 20) and in two borings (B-2 and B-3). The observation wells consist either of 10-foot long and 3-inch-diameter or 2-⅜-inch-diameter polyvinyl chloride (PVC) pipe with slotted intervals or drilled holes throughout the length of the pipe. A 20-foot long PVC pipe was installed in boring

B-3. The ground water observation wells at boring sites B-2 and B-3 were installed in hollow-stem auger borings that were drilled 5 feet away from the respective mud-rotary boring. The depth to the ground water table from the existing surface was measured in all 12 monitoring wells on June 17, 2004 and varied from a low of 2.7 feet at TP-2 and TP-16, to a high of 9.2 feet in TP-6 and greater than 10 feet in TP-10 (Table 1). A map showing ground water depth zones is included as Plate 1c.

One trench (TP-7) was excavated 60 linear feet across the trace of a mapped earthquake fault (Bonham and Bell, 1993) in order to verify the precise location of the fault trace on the surface. The fault was not observed in the trench; however, previous disturbance from the active mining operations may have covered exposures of this fault. The maximum depth of the fault trench at TP-7 was 4.1 feet. A prominent northwest-trending fault zone was previously mapped by the Nevada Bureau of Mines and Geology (Bonham and Bell, 1993) in the northeastern corner of the site directly within the main operating Bella Vista open pit. However, this prominent fault zone was not trenched during this phase of exploration due to previous mining operations that have disturbed the native surface, including over 20 feet of mine fill cover.

TABLE 1. DEPTH TO THE GROUND WATER TABLE FROM THE EXISTING SURFACE WITHIN TEST PITS AND BORINGS AS MEASURED FROM INSTALLED SLOTTED PVC PIPES ON JUNE 17, 2004.

TEST PIT NUMBER	Depth to GWT from surface (ft.)
TP-02	2.7
TP-06	9.2
TP-09	4.0
TP-10	Greater than 10.0
TP-14	6.5
TP-16	2.7
TP-17	5.1
TP-18	4.2
TP-19	3.0
TP-20	6.2
B-02	6.9
B-03	4.6

GWT = Ground Water Table

Material Classification

Two members of the geotechnical staff examined and classified all soils in the field in accordance with ASTM D 2488. During test pitting, representative bulk samples were placed in sealed plastic bags and returned to our Reno, Nevada, laboratory for testing. Additional soil classification was 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 pits are presented as Plate 2 – Boring/Test Pit Logs, and a USCS chart has been included as Plate 3 - Graphic Soils Classification Chart.

LABORATORY TESTING

All soils testing performed in the Black Eagle Consulting, Inc. soils laboratory is conducted in accordance with the standards and methodologies described in Volume 4.08 of the ASTM Standards.

Index Testing

Samples of significant soil types were analyzed to determine their in situ moisture content (ASTM D 2216), grain size distribution (ASTM D 422), and plasticity index (ASTM D 4318), and the results of these tests are shown on Plate 4 - Index Test Results. Results of these tests were used to classify the soils according to ASTM D 2487 and to verify the field logs, which were then updated as appropriate. Classification in this manner provides an indication of the soil's mechanical properties and can be correlated with published charts (Bowles, 1996; NAVFAC, 1982a and b) to evaluate bearing capacity, lateral earth pressures, and settlement potential.

Chemical Tests

Chemical testing was performed on five ground water samples obtained from the ground water observation wells installed at the site (TP-2, TP-16, TP-19, TP-20, and B-02). The samples were tested for total boron content in order to evaluate the potential to discharge site ground water into the nearby Steamboat Creek. Total boron in the five water samples range from 5.3 to 81 mg/l (ppm) with the highest boron present in TP-16 (81 ppm) located in the southeast corner of the site near an existing wet lands area.

Chemical testing was also performed on five soil samples from 0 to 5 feet below the surface (in test pits 3, 5, 9, 14, and 17). The soil samples were tested for soluble sulfate, soluble chloride, pH, resistivity, and total boron which will help for future planning of landscape constraints. Total boron in the five soil samples range from 25 to 140 mg/kg (ppm) with the highest boron present in TP-5 located near the northwest corner of the site.

All chemical testing was performed by Western Environmental Testing Laboratory (WET Lab) of Sparks, Nevada. The results of the chemical tests are shown on Plate 5.

GENERAL GEOLOGY AND SOIL CONDITIONS

The Bella Vista Ranch lies immediately west of the Virginia Range, which has been previously mapped by the Nevada Bureau of Mines and Geology (Bonham and Bell, 1993) as consisting of three main rock and soil units: (1) volcanic rocks of the Kate Peak Formation, (2) alluvial fan deposits of the Virginia Range, and (3) flood plain deposits of the Truckee River and Steamboat Creek.

The western part of the Virginia Range is dominated by volcanic and volcaniclastic rocks from the Kate Peak Formation which consists of *flows, domes, lahars, pyroclastic flows, plugs and dikes with ages ranging from 12.4 to 16.9 Ma* (Bonham and Bell, 1993). Exposures of the Kate Peak Formation are locally present on the northwest and eastern boundaries of the Bella Vista Ranch site. No test pits or borings were completed in this bedrock unit.

Alluvial fan deposits of the Virginia Range lie on the western flank of the Virginia Range in the Bella Vista Ranch site and consist of *subangular to subrounded clasts of gray to dark gray andesite with varying proportions of white to red altered andesite clasts; poorly to moderately stratified; poorly to very poorly sorted.* Subunits of the alluvial fan deposits include: *(1) light brown to brown, muddy, sandy, pebble gravel; locally with cobble to boulder gravel; pebbly sand derived from reworking of older eolian sand deposits; (2) light brown to brown, muddy, sandy, cobble to boulder gravel; maximum boulder diameter > 1m; soils contain a well-developed argillic (Bt) horizon ranging from ½ to 1 m thick, locally underlain by a carbonate- silica-cemented duripan as much as 1 m thick; this unit forms a prominent terrace east of Steamboat Creek.* The alluvial fan deposits at the Bella Vista Ranch site are generally exposed east of the Mira Loma Access road but locally cross over the road in the south-central part of the site. Three test pits tested the alluvial fan deposits: TP-7, TP-12, and TP-21.

The flood plain deposits of the Truckee River and Steamboat Creek generally lie west of the Mira Loma Access road. The floodplain deposits consist of *gray, dark gray-brown, and light brown sand, and sandy mud; locally may contain interbeds of pebble-cobble fluvial gravel and peat.* A C^{14} date of 2130±165 years was obtained on a peat bed directly north of the Steamboat quadrangle (Bell and Bonham, 1987). The majority of the test pits and all three of the borings were located in the floodplain deposits.

Soils encountered during our exploration generally agree with the previous mapping by the Nevada Bureau of Mines and Geology. All of the test pits and borings completed by Black Eagle Consulting except for TP-07, TP-12, and TP-21 were located in the flood plain. The flood plain deposits in the valley floor or the main ranching area consist of a thinly interbedded sequence of silty sand, lean clay, and lean clay with sand with lesser fat clay, silty clay, poorly graded sand, and poorly graded sand with clay. The fine-grained soils are described as slightly moist to wet, brown to dark brown to dark brownish black, soft to very hard, and have 50 to 84 percent low to high plastic fines. Granular soils are dominated by silty sand, clayey sand, and silt, clayey sand with lesser poorly graded sand, poorly graded sand with clay, and poorly graded sand with silt. These soils are described as light brown to brown to dark grayish green, slightly moist to wet, and loose to medium dense. The plasticity indices of granular and fine-grained soils, verified in our laboratory, range from non-plastic to 36.

Coarse-grained granular soils are also encountered within the flood plain deposits at depths greater than 28.0 feet in B-1, 23.5 feet in B-2, and 27.5 feet in B-3. These soils consist of poorly graded gravel with sand, poorly graded gravel, poorly graded sand with silt and gravel, and poorly graded gravel with silt and sand. The coarse-grained granular soils in the deeper parts of borings B-1, B-2, and B-3 are described as dark gray to dark greenish gray, wet, dense to very dense, locally unconsolidated, with less than 5 to 15 percent non-plastic fines. Subrounded to subangular gravel makes up 15 to 80 percent of the total soil mass.

Test pits TP-7, TP-12, and TP-21 encountered alluvial fan granular soil deposits located to the east of the flood plain deposits. These granular soil deposits consist of a near-surface unit one foot thick of dry to slightly moist silty sand with estimated 15-20 percent non-plastic fines. Gravel-bearing material is common at depth within test pits TP-7 and TP-12 which consists of poorly graded gravel with clay, poorly graded gravel with sand, poorly graded gravel with silt and sand, poorly graded sand with gravel, and poorly graded gravel (duripan). Gravel content varies from 15 to 85 percent of the total soil mass. This material is typically a very dense duripan with slight to strong calcium carbonate cement. The back hoe was unable to excavate the gravel-bearing material at depths greater than 4.1 feet in test-pit TP-7 and at depths greater than 6.5 feet in test pit TP-12.

The alluvial fan deposits encountered in Test Pit TP-21 were all granular with trace to minor gravel. Soils encountered in TP-21 consist of an interbedded sequence of silty sand, poorly graded sand with silt and gravel, poorly graded sand with silt, poorly graded sand, and poorly graded sand with gravel. This material is described as grayish brown to brown, dry to very moist, and loose to very dense with a non-plastic fines content ranging from less than 5 percent to 20 percent.

Flood Plains

The majority of the Bella Vista Ranch site that is located to the west of the Mira Loma Road has been identified by the Federal Emergency Management Agency (FEMA) as lying in a shaded Zone A, or within the limits of a 100-year flood with no associated base flood elevation determinations (FEMA, 1994). The northern part of Steamboat Creek, within the northern half of Section 3 T18N, R 20E, has been identified by FEMA as lying in a shaded Zone AE, or within the limits of a 100-year flood also with no associated base flood elevation determinations (FEMA, 1994).

The area lying primarily to the east of the Mira Loma Road has been identified by FEMA as lying in unshaded Zone X, which is outside the 500-year flood plain. A small sliver zone near the northern part of Mira Loma Road in the northeast part of Section 3, T18N, R20E has been identified by FEMA as lying within shaded Zone X, or within the area of a 500-year flood and within an area of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 100-year flood (FEMA, 1994).

GEOLOGIC HAZARDS

Seismicity

Much of the Western United States is a region of moderate to intense seismicity related to movement of the crustal masses (plate tectonics). By far, the most active regions, outside of Alaska, center around the San Andreas fault system of western California. Other seismically active areas include the Wasatch Front in Salt Lake City, Utah, which forms the eastern boundary of the Basin and Range physiographic province, and the eastern front of the Sierra Nevada Mountains, which is the western margin of the province. The Reno-Sparks area lies along the eastern base of the Sierra Nevada, within the western extreme of the Basin and Range. It must be recognized that there are probably few regions in the United States not underlain at some depth by older bedrock faults. Even areas within the interior of North America have a history of strong seismic activity.

The Truckee Meadows lies within Seismic Zone 3, an area with a potential for earthquake damage. Seismicity within the Reno-Sparks area is considered about average for the western Basin and Range Province (Ryall and Douglas, 1976). It is generally accepted that the maximum credible earthquake in this area would be in the range of magnitude 7 to 7.5 along the frontal fault system of the Eastern Sierra Nevada. The most active segment of this fault system in the Reno area is located at the base of the mountains near Thomas Creek, Whites Creek, and Mt. Rose Highway, some 5 miles west of the project.

Faults

No earthquake hazards map is available for the project area. The published geologic map (Bonham and Bell, 1993) shows several faults in the northeastern portion of the site in areas of the aggregate quarry. These faults are also shown on the Quaternary Fault Map of Nevada (Bell, 1984) as being Pleistocene in age. The criteria for evaluation of Quaternary earthquake faults have been developed and adopted by the State of Nevada Seismic Safety Council. These standards 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. Based on the geologic map, the faults on the project are considered potentially active. Potentially active is a rather alarming and unfortunate term in that it suggests a higher degree of risk than is justified in most cases. Recurrence intervals for Nevada earthquakes along faults that have been studied are estimated to be in the range of 6,000 to 18,000 years in western Nevada (Bell, 1984). The very active eastern boundary faults of the Sierra Nevada Mountains may have a shorter recurrence interval of 1,000 to 2,000 years. Many of the smaller faults may be the result of one-time events in response to movement along a better developed and more active fault system a considerable distance away.

One trench TP-7 was excavated 60 linear feet across a fault mapped by the Nevada Bureau of Mines and Geology (NMBG; Bonham and Bell, 1993). The trench was examined for evidence of faulting; however, no fault was observed. Soil profiles are included as Plate 2. Most of the surface expression of fault traces mapped by the NBMG has been destroyed by aggregate mining operations. Additional fault trenching should be performed during design-level investigations.

Ground Motion and Liquefaction

Because the eastern portion of site area is underlain by dense granular soils and bedrock, liquefaction potential is minimal due to the types of materials present. Only localized amplification of ground motion would be expected during an earthquake in these areas. Mapping by the U. S. Geological Survey (1996) indicates that there is a 10 percent probability that a *bedrock* ground acceleration of 0.3 to 0.4 will be exceeded in 50 years. Including the effects of any potential soil amplification, the peak ground acceleration expected for the design earthquake will be approximately 0.384g using methods recommended in the 2003 *International Building Code* (International Codes Council, 2003).

Liquefaction is a nearly complete loss of soil shear strength that can occur during a seismic event in saturated, loose to medium dense, poorly graded sands, cohesionless silts, and gravels. Liquefaction results from cyclic shear strains causing partial collapse of the soil matrix and development of excessive pore water pressure between the soil grains. Liquefaction will result in settlements shortly after the earthquake. Water and sand may be expelled to the surface, referred to as sand boils; these may cause minimal damage, except if building footings are located directly over a major sand boil. For sites with gentle or minimal slopes or with an adjacent slope, significant damage may potentially result from ground oscillation or lateral spreading. These horizontal deformations occur due to either the earthquake motions imparted to the surface soils or the driving force of the existing ground surface slope, which cause the surface soils to move with relatively little resistance from the underlying liquefied soils.

The area has some limited areas of liquefiable soils, based on the presence of relatively young, loose to medium dense, sandy soils with a very high water table. Field exploration performed as a part of this investigation involved two rotary mud borings to a depth of 40 feet (Borings B-02 and B-03). Exploration, laboratory testing, and analysis were performed in accordance with the *Guidelines for Evaluating Liquefaction Hazards in Nevada* (Truckee Meadows Geohazards Committee, 2003), ASTM D 6066, and Youd et al. (2001). The variation of soil consistency, penetration resistance, and liquefaction threshold with depth are shown on Plate 6 - Liquefaction Potential Versus Depth. The figure shows the corrected penetration resistance in blows per foot versus depth, versus the predicted liquefaction threshold for the design earthquake. The threshold shown on the figure is the penetration resistance below which liquefaction will occur; penetration values plotting to the left of the threshold lines indicate liquefaction. The results of the liquefaction analyses indicate that the majority of the site soils are too cohesive or sufficiently dense to be considered liquefiable; however, there are two layers (one between 15 feet and 17½ feet in Boring B-02, and the other between 25 and 27½ feet in Boring B-03) that could liquefy during the design ground motion. The calculated total settlement for each of these layers is only about ½ inch. It is unlikely that this minimal amount of settlement would ever reflect to the surface. Supporting calculations are contained in Appendix A - Liquefaction Analyses.

In Nevada, there is no specific policy which requires structures to be designed to resist liquefaction. Such designs tend to be very costly and are usually limited to those structures with a public safety function, such as fire and police facilities and hospitals or buildings with high occupancy, such as large commercial, retail, office and manufacturing facilities, schools, municipal or major governmental buildings. These types of structures present a significant potential for loss of life and/or are important enough, from a public safety standpoint, such that a design to minimize liquefaction may be warranted. The decision to mitigate or accept liquefaction risk is a business decision that can only be made by the owner/developer. The decision requires analysis of up-front mitigation costs as compared to the potential for longer range repair costs and liability.

We recommend that, as the area is developed and uses of the area with specific structures are formulated, a geotechnical investigation be completed for each of these specific projects. These specific geotechnical investigations can then address the potential for liquefaction at that location and the need, if necessary, for a liquefaction analysis and design for liquefaction effects.

Flood Plains

The majority of the Bella Vista Ranch site that is located to the west of the Mira Loma Road has been identified by the Federal Emergency Management Agency (FEMA) as lying in a shaded Zone A, or within the limits of a 100-year flood with no associated base flood elevation determinations (FEMA, 1994). The northern part of Steamboat Creek within the northern half of Section 3, T18N, R 20E, has been identified by FEMA as lying in a shaded Zone AE, or within the limits of a 100-year flood also with no associated base flood elevation determinations (FEMA, 1994).

The area lying primarily to the east of the Mira Loma Road has been identified by FEMA as lying in unshaded Zone X, which is outside the 500-year flood plain. A small sliver zone near the northern part of Mira Loma Road in the northeast part of Section 3, T18N, R20E has been identified by FEMA as lying within shaded Zone X, or within the area of a 500-year flood and within an area of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 100-year flood (FEMA, 1994).

Other Geologic Hazards

A high potential for dust generation is present if grading is performed in dry weather. No other geologic hazards were identified.

DISCUSSION AND RECOMMENDATIONS

General Information

A wide variety of materials are present, ranging from:

- Volcanic bedrock along the eastern margin

- Coarse granular alluvial fan deposits lying predominately east of Mira Loma Road

- Complexly interbedded fine grain silts, clays, and sands in the lowlands west of Mira Loma Road.

The area east of Mira Loma road will serve as a good source of structural fill throughout the project. The existing borrow pit in the northeast corner contains significant quantities of construction debris and uncontrolled fill. Structural improvements should be separated from the fine grain and clay soils by structural fill. Ground water is shallow in portions of the low-lying areas, as shown on Plate 1c.

The recommendations provided herein, and particularly under **Site Preparation, Grading and Filling, Foundation Design, Site Drainage** and **Quality Control**, are intended to minimize 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 structure 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. Sufficient quality control should be performed to verify that the recommendations presented in this report are followed.

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. For the purposes of this project:

- Fine-grained soils are defined as those with more than 40 percent by weight passing the number 200 sieve, and a plastic index lower than 15.

- Clay soils are defined as those with more than 30 percent passing the number 200 sieve, and a plastic index greater than 15.

- Granular soils are those not defined by the above criteria.

Any evaluation of the site for the presence of surface or subsurface hazardous substances is beyond the scope of this investigation. When suspected hazardous substances are encountered during routine geotechnical investigations, they are noted in the exploration logs and immediately reported to the client. No such substances were revealed during our exploration. A Phase I

Environmental Assessment was performed on this site by Black Eagle Consulting, Inc. in August 2004.

The test pits were excavated by backhoe at the approximate locations shown on the site plan. Locations were determined in the field by approximate means. 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 recompacted 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.

It is common practice in Northern Nevada to place unsuitable soils, including expansive clays and oversize rock, in back, front, and side yard areas. If the developer elects this alternate, as opposed to exporting such materials and importing/placing structural fills in yard areas, we recommend disclosure be included in the sales agreement. The buyer should be made aware that homeowner-added improvements, such as patios or swimming pools, will require geotechnical analysis.

Seismic Design Criteria

All structures at Bella Vista should be designed for Seismic Zone 3. The City of Reno has adopted the 1997 *Uniform Building Code* (ICBO), but is planning to change to the 2003 *International Building Code* (ICC, 2003) in late 2004. The ICC requires a detailed soils evaluation to a depth of 100 feet to develop the appropriate soils criteria. However, the code states that a Type S_D soil profile may be used as a default value when the soil properties are not known in sufficient detail to determine the soil profile type. The Type S_D soil profile is for stiff soils with a shear velocity between 600 and 1,200 feet per second, or with an N (SPT) value between 15 and 50 or an undrained shear strength between 1,000 and 2,000 pounds per square foot (psf). Based on our experience and the geology at the area, it is our opinion that the default soils profile Type S_D is appropriate for alluvial fan materials and S_c for flood plain areas. With that assumption, the recommended seismic design criteria are as follow:

TABLE 2 – *IBC* 2003 SEISMIC DESIGN CRITERIA	
Spectral Response at Short Periods, S_s, percent of gravity (*IBC* Figure 1615)	144
Spectral Response at 1-Second Period, S_1, percent of gravity (*IBC* Figure 1615)	49
Site Class (*IBC* Table 1615.1.1)	S_D
Site Coefficient F_a, decimal	1.0
Site Coefficient F_v,decimal	1.51
Site Adjusted Spectral Response at Short Periods, S_{MS} (*IBC* Eqn 16-16)	144
Site Adjusted Spectral Response at Short Periods, S_{M1} (*IBC* Eqn 16-17)	74

These parameters were derived for an earthquake with a magnitude of 7 to 7.5 occurring on the eastern Sierra frontal fault system, 8 kilometers west of the site.

Site Preparation

All vegetation should be stripped and grubbed from structural areas and removed from the site. A stripping depth of 0.2 to 0.3 feet is anticipated.

Clay and fine grain soils were found to exist in various locations in various depths and thicknesses in the low-lying portions of the site. Laboratory testing performed on these materials indicates the clay soils exhibit plasticity indices on the order of 16 to 26, indicative of moderately expansive soils (Nelson and Miller, 1992).

Surficial clay soils on this site will exhibit considerable shrink-swell with changes in moisture content. Such soils are common, but sporadically distributed and must be identified during grading. Failure to recognize and properly mitigate expansive clays will result in damage to improvements. Clay soils should be separated from improvements by structural fill in order to decrease potential shrink-swell movements. The minimum separation is presented in Table 3.

TABLE 3 - REQUIRED THICKNESS OF STRUCTURAL FILL BETWEEN CLAY SOILS AND IMPROVEMENTS	
Improvement	**Minimum Separation**
Footings	2 feet
Floor Slabs, Living Space	2 feet
Floor Slab, Garage	2 feet
Exterior Concrete Slabs, including curbs, gutters, sidewalk*	1.5 feet
Asphalt Pavements	1.5 feet
* Includes aggregate base section.	

The required separation may be achieved by any combination of site filling or overexcavation and replacement. Depending on final design elevations, considerable overexcavation could be required.

Clays to be left in place and covered with fill should be moisture conditioned to 2 to 4 percent over optimum for a minimum depth of 12 inches. This moisture level will significantly decrease the magnitude of shrink-swell movements in the upper foot of clay. The high moisture content must be maintained by periodic surface wetting, or other methods, until the surface is covered by at least one lift of fill.

All areas to receive structural fill or structural loading should be densified to, at least, 90 percent relative compaction. Where less than 70 percent passes the ¾-inch sieve, as in alluvial fan areas, soils are too coarse for standard density testing techniques. In this case, as will occasionally occur here, a proof rolling of a minimum five single passes with a minimum 10-ton roller in mass grading, or five complete passes with hand compactors in footing trenches is recommended. This alternate has proved to provide adequate project performance, as long as all other geotechnical recommendations are closely followed. In all cases, the final surface should be smooth, firm, and exhibit no signs of deflection.

Existing ditches which are to be abandoned and are located in structural areas will require overexcavation to remove organic material and soft, wet, fine-grained soils. The overexcavation should extend to a depth of at least one to three feet below the ditch bottom, unless granular soils are encountered at shallower depth. The width of overexcavation will be dependent upon the extent of soft, wet soils that cannot be compacted. Ditch bottoms may require stabilization in accordance with later recommendations. Where irrigation ditches are to be perpetuated, it will be necessary to either re-route them around structural areas or replace the ditches with gasketed pipes. No piped ditches should underlie a house or its garage.

In areas of shallow ground water, or if wet weather construction is anticipated, soils may be well above optimum moisture and impossible to compact. In some situations, moisture conditioning may be possible by scarifying the top 12 inches of subgrade and allowing it to air dry to near-optimum moisture, prior to compaction. Where this procedure is ineffective or where construction schedules preclude delays, mechanical stabilization will be necessary. Mechanical stabilization may be achieved by overexcavations and/or placement of an initial 12- to 18-inch-thick lift of 12-inch-minus, 3-inch-plus, well graded, angular rock fill. The more angular and well graded the rock is, the more effective it will be. This fill should be densified with large equipment, such as a self-propelled sheeps-foot or a large loader, until no further deflection is noted. Additional lifts of rock may be necessary to achieve adequate stability. The use of a geotextile (Table 4) will prevent mud from "pumping" up between the rocks, thereby increasing rock-to-rock contact and decreasing the thickness of stabilizing fill.

As an alternate, overexcavation and a geotextile/gravel system may be used for stabilization. The geotextile should meet or exceed the following minimum properties:

TABLE 4 - MINIMUM AVERAGE ROLL STRENGTH PROPERTIES FOR GEOTEXTILE	
Trapezoid Strength (ASTM D 4533)	80 lbs.
Puncture Strength (ASTM D 4833)	120 lbs.
Grab Tensile/Elongation (ASTM D 4632)	245 @ 50 %

A minimum of 18 inches of imported, coarse, stabilizing fill should be placed above the geotextile. Additional lifts of stabilizing fill may be necessary. The stabilizing can be obtained from the eastern alluvial fan deposits.

Regardless of which alternate is selected, a test section is recommended to determine the required thickness of stabilization.

Trenching and Excavation

Temporary trenches with near-vertical sidewalls should be stable to a depth of approximately 5 feet. Temporary trenches are defined as those that will be open for less than 24 hours. Excavations to greater depths will require shoring or laying back of sidewalls to maintain adequate stability. 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 5.

TABLE 5 - 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]	3H:4V (53 degrees)
Type B	1H:1V (45 degrees)
Type C	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.	
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 excavation in Type A soils 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).	

These regulations, including the classification system and the maximum slopes, have been adopted and are strictly enforced by the State of Nevada, Department of Industrial Relations, Division of Occupational Safety and Health. In general, Type A soils are cohesive, non-fissured soils, with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Type B are cohesive soils with an unconfined compressive strength between 0.5 and 1.5 tsf, while those designated as Type C have an unconfined compressive strength below 0.5 tsf. Numerous additional factors and exclusions are included in the formal definitions. The client, owner, design engineer, and contractor shall refer to Appendix A and B of Subpart P of the previously referenced Federal Register for complete definitions and requirements on sloping and benching of trench sidewalls. Appendices C through F of Subpart P apply to requirements and methodologies for shoring.

On the basis of our exploration, the flood plain soils are predominately Type B, and the alluvial fan soils are Type C. Any area in question should be considered Type C, unless specifically examined by the geological engineer during construction. All trenching should be performed and stabilized in accordance with local, state, and OSHA standards.

Maximum particle size in the backfill should be 4 inches. In general, bedding and initial backfill 12 inches over the pipe will require import, but native granular soil will provide adequate final backfill as long as oversized particles from alluvial fan soils are excluded. Drain rock and backfill can be manufactured from the eastern alluvial fan soils. Bedding and initial backfill should conform to the requirements of the utility having jurisdiction, but should be densified to at least 90 percent relative compaction. Excavations below the ground water table will likely require dewatering. Below the waterline, bedding and backfill should consist of compacted drain rock graded in accordance with the requirements for Class C drain backfill presented in the City of Reno *Standard Specifications for Public Works Construction*. Above the waterline, trenches should be backfilled in maximum eight-inch-thick (loose) lifts in all structural areas. Each lift should be densified to a minimum of 90 percent relative compaction (ASTM D 1557). When drain rock is used as trench backfill, it shall be considered a rock backfill (greater than 30 percent retained on the ¾-inch sieve) and should be placed in maximum 12-inch-thick loose lifts, with each lift densified by at least five complete passes with approved compaction equipment and until no deflection is observed. A separator geotextile such as Synthetic Industries Geotex 401 should be placed between the drain rock and any native soil backfill.

Grading and Filling

Native clay and fine-grained soils should be placed as fill only in nonstructural areas. Native granular soils will be suitable for structural fill provided particles larger than 8 inches are removed. The minimum R-value for street subgrade will need to be 30. High-strength structural fill (subbase, R $\geq$45) will be required in areas of weak, native soil in order to provide a weighted average R-value of 30. Oversized rock can be stockpiled for later use as erosion protection or placed in the bottom of deep nonstructural fills. In deep fills, oversized rocks must be scattered in such a manner as to preclude development of voids between the particles (nesting).

All fill and utility trench backfill in structural areas should be densified to a minimum 90 percent relative compaction. Nonstructural fill should be densified to, at least, 85 percent relative compaction to minimize consolidation and erosion. If the native granular soils have greater than 30 percent retained on the ¾-inch sieve, standard density testing is not valid. A proof rolling program of at least five single passes of a minimum 10-ton roller in mass grading or at least five complete passes with hand compactors in footing trenches is recommended. Compaction must continue to the satisfaction of the geotechnical engineer. Acceptance of this rock fill is based upon observation of maximum particle size, lift thickness, moisture content, and applied compactive effort. In all cases, the finished surface should be smooth, firm, and show no signs of deflection. Grading should not be performed with or on frozen soils.

Subsidence and Shrinkage

In low-lying flood plain areas, subsidence of about 0.1 to 0.2 feet should be anticipated from construction traffic. Subsidence of granular alluvial fan soils exposed in cut should be negligible. Granular alluvial soils excavated and recompacted in structural fills should experience quantity shrinkage of approximately 10 to 15 percent, including removal of oversize particles. In other words, one cubic yard of excavated granular alluvium will generate about 0.85 to 0.90 cubic yards of structural fill at 90 percent relative compaction.

Foundation Design

The near-surface clays are poor foundation soils such that footings should not bear directly in these materials. The most economical method of foundation support lies in spread footings bearing on structural fill.

Individual column footings and continuous wall footings underlain by a minimum of 2 feet of structural fill or granular native soil fill can be designed for a net maximum allowable bearing pressure of 2,000 psf, and should have minimum footings widths of 16 and 12 inches, respectively. The net allowable bearing pressure is that pressure at the base of the footing in excess of the adjacent overburden pressure. This allowable bearing value should be used for dead plus ordinary live loads. Ordinary live loads are defined as being that portion of the design live load which will be present during the majority of the life of the structure. Design live loads are those loads which are produced by the use and occupancy of the building, such as by moveable objects, including people or equipment, as well as snow loads. This bearing value may be increased by one-third for total loads. Total loads are defined as the maximum load imposed by the required combinations of dead load, design live loads, snow loads, and wind or seismic loads.

With this allowable bearing pressure, total settlements of approximately ¾-inch should be anticipated. Differential settlements between footings with similar loads, dimensions, and base elevations should not exceed two-thirds of the values provided above for total settlements. The majority of the anticipated settlement will occur during the construction period as the loads are applied.

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 0.4 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 37 and 370 pounds per square foot per foot of depth, respectively. These design values are based on spread footings bearing on and backfilled with structural fill. All exterior footings should be placed a minimum two feet below adjacent finish grade for frost protection.

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

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 en masse downward movement of soil or rock. Stability of cut and fill slopes is dependent upon shear strength, unit weight, moisture content, and slope angle. The *Uniform Building Code* (ICBO, 1997), currently adopted by the City of Reno, allows cut and fill slopes up to 2H:1V in the type of soils present at this site. The exploration and testing program conducted during this investigation confirms 2H:1V slopes will be stable.

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. The City of Reno municipal code requires erosion control of cut and fill slopes 5H:1V or steeper. Slopes between 3H:1V and 5H:1V can be stabilized by hydroseeding. Slopes steeper than 3H:1V require mechanical stabilization. The City of Reno may accept other methods of stabilization on slopes steeper than 3H:1V if it can be demonstrated to be as effective as mechanical stabilization. Details of the required erosion control are presented in the City of Reno *Public Works Design Manual* (2004). Protection could be provided by a variety of methods such as rip-rap or "geo-cell" systems. Rock rip rap can be obtained by screening the eastern alluvial fan deposits.

Dust potential at this site will be moderate during dry periods. 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.

In order to minimize erosion and downstream impacts to sedimentation from this site, best management practices with respect to storm water discharge should be implemented at this site.

Site Drainage

Adequate surface drainage should be provided away from the structure. A system of roof gutters and downspouts is recommended to collect roof drainage and direct it away from the foundations unless pavement extends to the walls. Stemwall backfill should be thoroughly compacted to decrease permeability and reduce the potential for irrigation and storm water to enter the crawlspace or seep beneath the floor slab. A perimeter foundation drain should be included on each house, particularly if raised floor construction is used. Positive crawlspace drainage should also be provided by grading the crawlspace to drain to one or more localized areas and providing 3-inch diameter pipes to daylight beneath the footings. Often, design grades preclude adequate drainage by daylighting a direct drain. A less preferable alternate is to grade the crawlspace to drain to the sewer lateral and gravel packing the lateral from the crawlspace to the sewer main in the street. Ponding of water on finish grade or at the edge of pavements should be prevented by proper grading.

Concrete Slabs

All concrete slabs should be directly underlain by imported, granular material with a minimum R-value of 60. Type 2, Class B, aggregate base is the preferred alternate, although other materials may be acceptable. The thickness of base material shall be 6 inches beneath curb and gutters, 4 inches beneath sidewalks and 4 inches beneath private flatwork. Aggregate base courses should be densified to at least 95 percent relative compaction. Base materials can be manufactured from the eastern alluvial fan deposits.

The soils in the low-lying flood plain area are low-energy deposits, and, as such, include localized areas with high levels of sodium and calcium sulfate. Deposits of the white alkali salts can be seen in the area as they begin to dry out, and visible gypsum was seen in some of the test pits. Soluble sulfate minerals, particularly sodium sulfate, aggressively attack the surface of low strength porous concrete. Standard 4,000 pounds per square in (psi) concrete with Type II cement, such as required for dedicated improvements, is normally adequately resistant to sulfate attack, especially when separated from native soil by several feet of imported fill. Footing and stemwall concrete is often of much lower strength and is poured very wet so that it becomes relatively porous. If native clay soils are used as stemwall backfill in yard areas, the sulfate will attack and severely spall the concrete, just above the ground line. This spalling occurs as the very soluble salts "wick" up the surface of the porous stemwall concrete and then precipitate as the moisture evaporates. This problem can be prevented in three ways, listed in order of preference:

- Use 4,000 psi ("City Mix") concrete for stemwalls, garage floors, and driveways.
- Use imported backfill within 3 feet of the stemwall and private flatwork.
- Coat the stemwalls with a suitable concrete sealer.

Each phase of the development should be checked for sulfate levels to determine the need for these measures.

Type II cement should be used for all concrete work. The Reno area is a region with exceptionally low relative humidity. As a consequence, concrete flatwork is prone to excessive shrinking and curling. Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of the concrete and result in cracking, curling, and spalling of slabs. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute (1999). 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. Concrete should not be placed on frozen in-place soils.

Any interior concrete slab floors with moisture-sensitive flooring will require a moisture barrier system. Installation should conform to the specifications provided for a Class B vapor restraint (ASTM E 1745-97). A 4-inch-thick layer of clean sand or aggregate base should be placed over the vapor barrier and be compacted with a vibratory plate. The base layer should remain compacted and a uniform thickness maintained during the concrete pour, as its intended purpose is to facilitate even curing of the concrete and minimize curling of the slab. Care should be taken during construction to ensure that rebar reinforcement, forming stakes, and equipment do not damage the integrity of the vapor barrier.

Asphalt Concrete

The project is in preliminary stages so that street layout and traffic volumes are unavailable at this time. Structural section design of pavement is therefore preliminary as well. The City of Reno requires that all roadway subgrade exhibit an R-value of at least 30 (City of Reno, 2004). The City does not specify how that requirement will be achieved, but it typically involves removal of low-strength soil and replacement with imported fill (subbase) with an R-value of at least 45 to provide a weighted average 30.

The subgrade strength in eastern alluvial fan areas is high, so that City of Reno minimum structural sections (4 inches of asphalt concrete and 6 inches of Type 2, Class B aggregate base) are appropriate for residential streets. The low-lying flood plain soils often have weak subgrade strengths that will require the addition of 12-inch granular subbase with a minimum R-value of 45 beneath these minimum structural sections to meet City standards. Collector streets would typically have the sections increased to 5 inches of asphalt concrete over 8 inches of base. Arterials will require special analysis and design.

Pavement Drainage

Pavement design is mostly a function of heavy truck traffic and subgrade strength. Inherent in the selection of design subgrade strength is the assumption that the subgrade will not become saturated. Subgrade strength drops dramatically with even a slight moisture increase above that selected for the design value. This is essentially true for any material other than clean sands and gravels and is more critical in fine-grained and clay soils than in granular soils. Soils in the low-lying flood plain area are considered to be of high moisture sensitivity. Where irrigated landscaping is to be placed adjacent to the pavement section, we recommend that edge drains be constructed directly behind the curb, or along the edge of the asphalt where curbs and gutters are not used. This recommendation includes both center median and edge or back face of curb/sidewalk areas with irrigated landscaping and is particularly important where irrigated landscape mounds slope toward the street section. If proper drainage is not provided, increased maintenance costs and premature pavement (subgrade) failure will result.

The edge drain should extend at least 12 inches below the street subgrade and can consist of either a narrow trench backfilled with Class B or C drain rock or a synthetic edge drain product. Drain rock should be separated from native soil backfill by a geotextile such as Geotex 311 or equal. In cohesionless soils the fabric should also be placed on the upslope side, between the native soils and the drain rock/backfill. The edge drain should be tied into the storm drain or drain rock backfill around the storm drain. In some cases utility trenches located behind the street could be utilized as edge drains, if designed and constructed with that intent.

Pavement Maintenance

Asphalt concrete pavements have been designed for a standard 20-year life expectancy with the design assumptions presented under **Pavement Design**. Due to the local climate and available construction aggregates, a full 20 years of performance life are seldom achieved. Between 15 and 20 years from initial construction (average 17 years), major rehabilitation (structural overlay or reconstruction) is generally required. To achieve even this performance life, periodic maintenance is required. Such maintenance includes regular crack sealing, seal coats, and patching as necessary. Failure to provide the required maintenance will significantly reduce pavement design life and performance.

Corrosion Potential

Soluble sulfate content has been determined for representative samples of the site foundation soils, and the results of the testing indicate that concrete in contact with the site foundation soils should experience moderate degradation due to reaction with soil sulfate. Therefore, Type II cement should be used for all concrete work.

Laboratory testing on representative samples of site foundation soils was also performed to evaluate the corrosion potential of the soils with respect to buried steel structures. The results of the laboratory testing indicate that the site foundation soils exhibit a high degree of corrosivity.

ANTICIPATED CONSTRUCTION PROBLEMS

Soft, wet, surface soils may make for difficult travel by construction equipment. Trenching below the water table will require dewatering. Some difficulty will also be encountered in trenching due to the presence of boulders in areas of granular alluvial fan soil.

QUALITY CONTROL

All plans and specifications should be reviewed for conformance with this geotechnical report and approved by the geotechnical engineer prior to submitting to the building department for review.

The recommendations presented in this report are based on the assumption that sufficient field testing and construction review will be provided during all phases of construction. We should review the final plans and specifications for conformance with the intent of our recommendations. Prior to construction, a pre-job conference should be scheduled to include, but not be limited to, the owner, architect, civil engineer, the general contractor, earthwork and materials subcontractors, building official, and geotechnical engineer. 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 and reviewed by the geotechnical engineer.

During construction, we should have the opportunity to provide sufficient on-site observation of preparation and grading, overexcavation, fill placement, foundation installation, and paving. These observations would allow us to verify that the geotechnical conditions are as anticipated and that the contractor's work is in conformance with the approved plans and specifications.

STANDARD LIMITATIONS CLAUSE

This report has been prepared in accordance with generally accepted geotechnical practices. The analyses and recommendations submitted are based on field exploration performed at the locations shown on Plate 1 - Plot 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 ensure compliance with our recommendations. The owner shall be responsible for distribution of this geotechnical investigation to all designers and contractors whose work is related to geotechnical factors.

Equilibrium water level readings were made on the date shown on Plate 2 –Boring/Test Pit Logs 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 or engineer to design the project. The owner 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 from the time of this report, 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 geotechnical 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.

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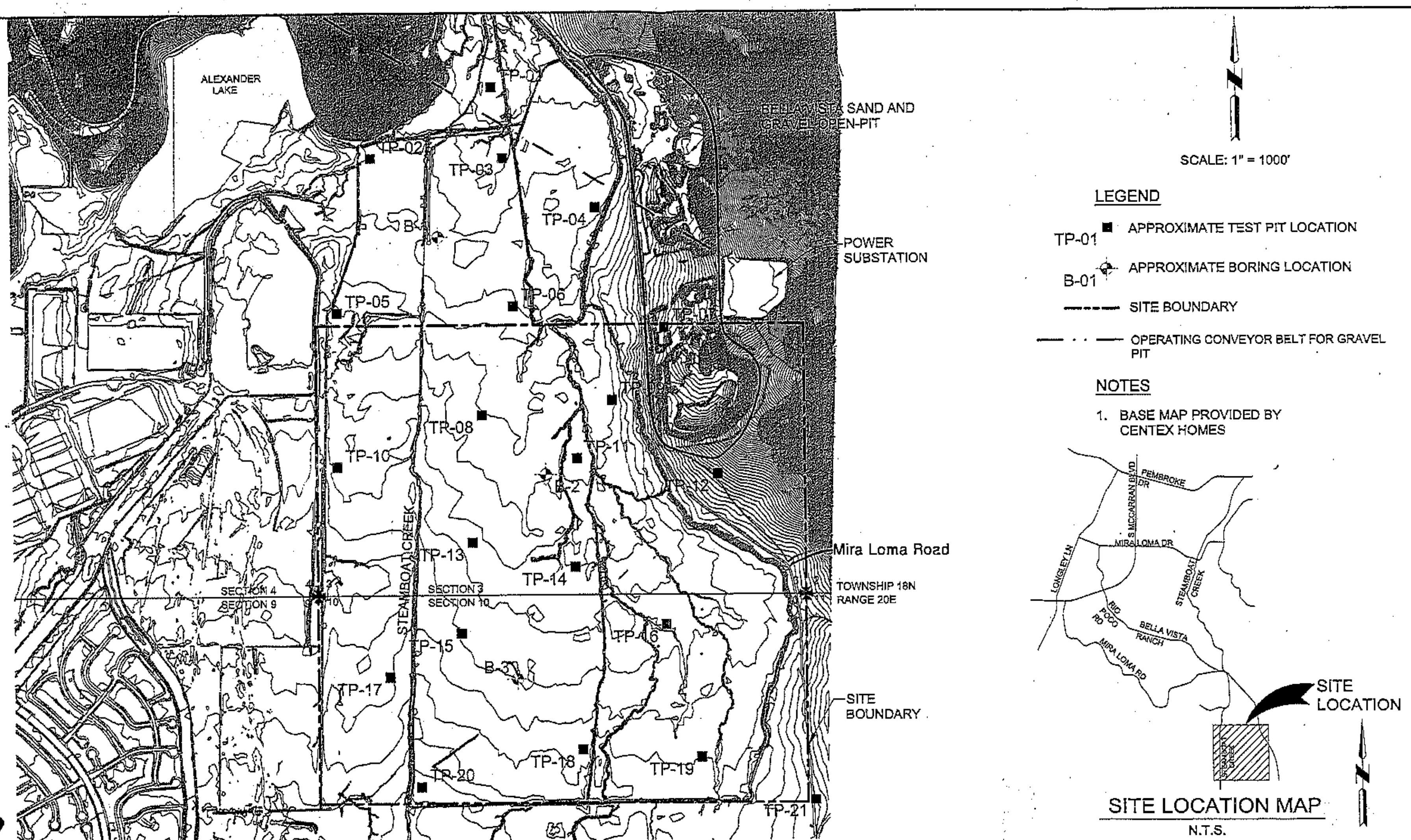
PLATES



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CENTEX HOMES
PLOT PLAN
BELLA VISTA RANCH
RENO, NEVADA

Project No. 0199-08-1

Plate 1a

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SCALE: 1" = 1000'

LEGEND

TP-01 ■ APPROXIMATE TEST PIT LOCATION

B-01 ⌖ APPROXIMATE BORING LOCATION

SOIL CONTACT BOUNDARY
FLOOD PLAIN DEPOSITS TO THE WEST,
ALLUVIAL FAN DEPOSITS TO THE EAST

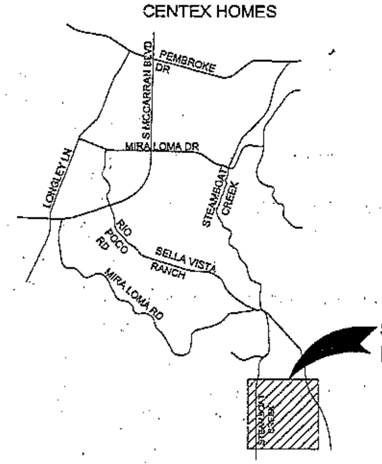
UPPER COLORED BLOCK REPRESENTS DOMINANT SOIL TYPE IN UPPER HALF OF TEST PIT OR BORING WHEREAS LOWER COLORED BLOCK REPRESENTS DOMINANT SOIL TYPE IN LOWER HALF OF TEST PIT OR BORING

PREDOMINATLY FINE GRAINED SOILS IN 5' INTERVAL (< 0.075 MILLIMETERS)

PREDOMINATLY GRANULAR SOILS IN 5' INTERVAL (> 0.075 MILLIMETERS)

NOTES

1. BASE MAP PROVIDED BY CENTEX HOMES



SITE LOCATION MAP

N.T.S.

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CENTEX HOMES

SOILS MAP

BELLA VISTA RANCH

RENO, NEVADA

Project No.
0199-08-1

Plate 1b

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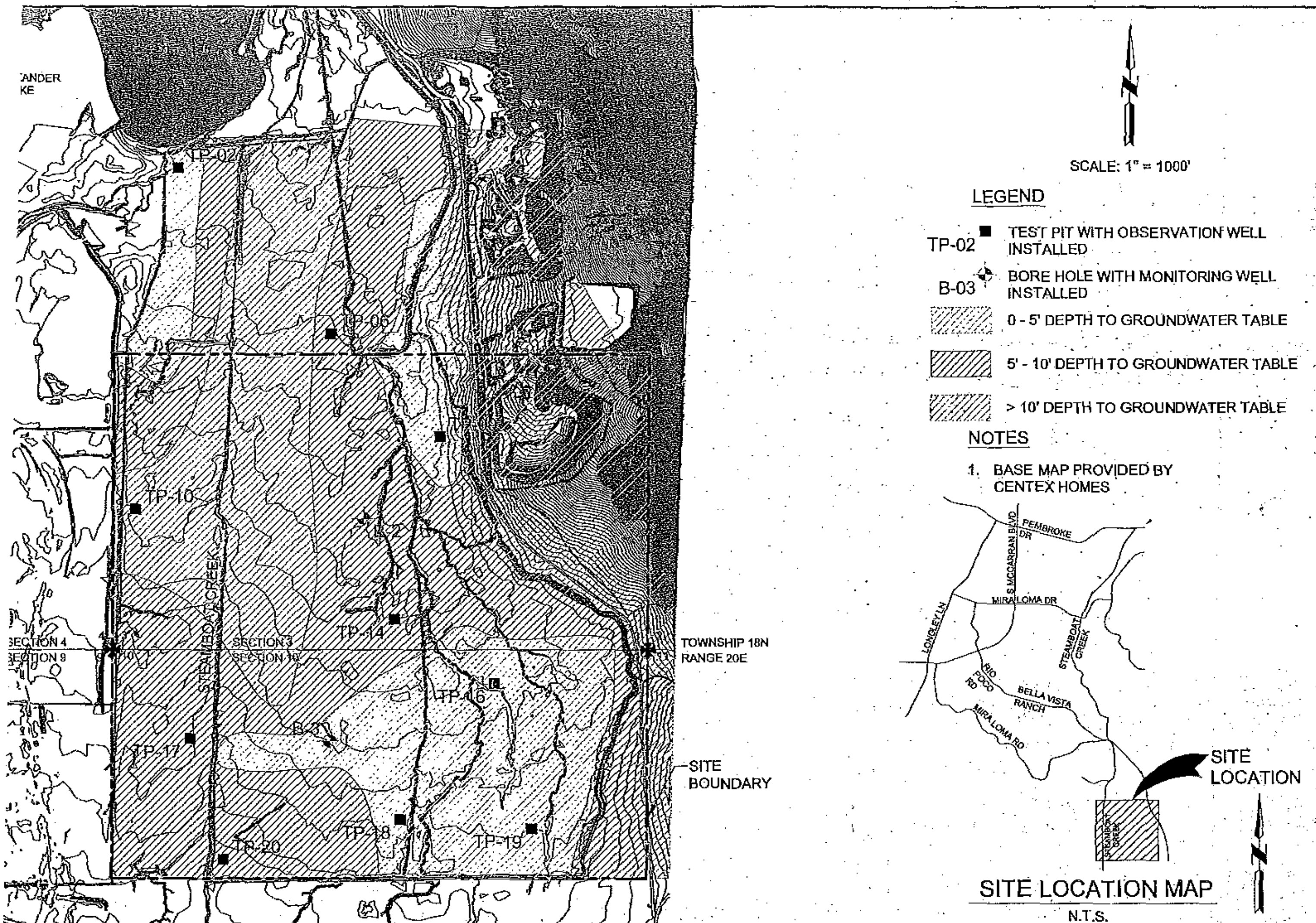

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CENTEX HOMES

GROUND WATER TABLE

BELLA VISTA RANCH
RENO, NEVADA

Project No.
0199-08-1

Plate 1c

BORING LOG

BORING NO.: B-01 | DATE: 6/15/2004

TYPE OF BORING: CME 55 | DEPTH TO GROUND WATER (ft): 21.0

LOGGED BY: TWJ | GROUND ELEVATION (ft): 4437 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	SPT	13				SM		0.0' - 2.0': **Silty Sand** light brown, slightly moist, loose from 0-0.1' and medium dense from 0.1-1.5', with estimated 20% non-plastic fines and 80% fine to coarse sand. With moderate roots to 1/4" in diameter.
B/B1	SPT	8				SM		2.0' - 3.4': **Silty Sand** brown, slightly moist, loose, with estimated <5% non-plastic fines and 95% fine to coarse sand. Fines have low plasticity in last 2" of the interval.
						CL		3.4' - 4.5': **Lean Clay** dark brownish black, moist, firm, with estimated 100% medium plastic fines.
C	SPT	13	24.7	26	5	CL		4.5' - 7.0': **Lean Clay with Sand** dark brown, moist, stiff, with 76% medium plastic fines, 23% fine to coarse sand, and 1% fine gravel. Material breaks at 4.0 tsf using the pocket penetrometer. Switch to mud rotary drilling after 6.5 feet.
D/D1	SPT	25				CH		7.0' - 8.5': **Fat Clay** dark brown, moist, very stiff, with estimated 95% high plastic fines and 5% fine to medium sand.
						SM		8.5' - 9.5': **Silty Sand** brown, moist, medium dense, with estimated 15% non-plastic fines, 80% fine to coarse sand, and 5% subrounded gravel to 1/4".
E	SPT	8			10	CH		9.5' - 12.0': **Fat Clay** dark grayish brown, moist, firm, with estimated 95% high plastic fines and 5% fine sand.
						SM		12.0' - 12.9': **Silty Sand** brown, moist, loose, with estimated 15% non-plastic fines and 85% fine to medium sand. Pocket penetrometer = 0 tsf.
F/F1	SPT	5				CL-ML		12.9' - 14.5': **Silty Clay with Sand** mottled from brown to dark green, very moist, firm, with estimated 85% low plastic fines and 15% fine to medium sand,
								14.5' - 18.0': **Interbedded Lean Clay and Silty Sand** dark

Located 130 feet east of ranch road.

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Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2a

BORING LOG

BORING NO.: B-01

DATE: 6/15/2004

TYPE OF BORING: CME 55

DEPTH TO GROUND WATER (ft): 21.0

LOGGED BY: TWJ

GROUND ELEVATION (ft): 4437 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G	SPT	5				CL		greenish black, very moist silty sand with estimated 20% non-plastic fines and 80% fine to medium sand. Interbedded with dark black lean clay with estimated 90% medium plastic fines and 20% fine sand. Pocket penetrometer = 0.5-0.65 tsf.
						CL		18.0' - 23.0': **Lean Clay** dark greenish black, very moist to wet, soft, with estimated 90% medium plastic fines and 10% fine sand.
H	SPT	2			20			
						SC		23.0' - 28.0': **Interbedded Silty Sand, Clayey Sand, and Sandy Lean Clay** dark greenish black, wet, loose. Material from 25.0-25.25' consists of Silty Sand with estimated 15% non-plastic fines and 85% fine to medium sand. The remaining material from 25.25-26.5' consists of interbedded Clayey Sand with estimated 20% low plastic fines and 80% fine to medium sand, and Sandy Lean Clay with estimated 65% low plastic fines and 35% fine to medium sand. Pocket penetrometer = 1.75-2.25 tsf.
I	SPT	10			25			
								28.0' - 33.0': **Poorly Graded Gravel with Sand** dark gray, wet, dense, with estimated <5% non-plastic fines, 40% fine to coarse sand, and 55% rounded to subrounded gravel to 1/2". Pocket penetrometer = 1.5-2.0 (material breaks).

Located 130 feet east of ranch road.

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Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2b

BORING LOG

BORING NO.: B-01

DATE: 6/15/2004

TYPE OF BORING: CME 55

DEPTH TO GROUND WATER (ft): 21.0

LOGGED BY: TWJ

GROUND ELEVATION (ft): 4437 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
J	SPT	37				GP		
						SP-SM		33.0' - 38.0': **Poorly Graded Sand with Silt and Gravel** dark gray, wet, medium dense, with estimated 5% non-plastic to low plastic fines, 80% fine to coarse sand, and 15% rounded to subrounded gravel to 3/8". Very low recovery from 35.0-36.5 feet.
K	SPT	17			35			
						GP		38.0' - 41.0': **Poorly Graded Gravel** gray, wet, dense, with estimated <5% non-plastic fines, <5% fine to coarse sand, and 90% subrounded gravel to 1/2".
L/L1	SPT	37			40			
						GPS		41.0' - 41.4': **Poorly Graded Gravel with Sand** gray, wet, dense, with estimated <5% non-plastic fines, 35% fine to coarse sand, and 60% subrounded gravel to 1/2".
						SM		41.4' - 41.5': **Silty Sand** olive gray, wet, dense, with estimated 15% non-plastic fines and 85% fine to coarse sand.
								-- back fill mud-rotary hole with bentonite. Drill twin auger hole 10 feet east of mud-rotary hole in order to measure ground water table elevation at 21.0 feet below the surface.

Located 130 feet east of ranch road.

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Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2c

BORING LOG

BORING NO.: B-02 | DATE: 6/16/2004

TYPE OF BORING: CME 55 | DEPTH TO GROUND WATER (ft): 6.9

LOGGED BY: TWJ | GROUND ELEVATION (ft): 4431 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	DESCRIPTION
A	SPT	4				CH	0.0' - 0.2': **Fat Clay** dark brown, moist, soft, with estimated 90% high plastic fines and 10% fine sand. With strong roots.
						SM	0.2' - 0.8': **Silty Sand** brown, slightly moist, very loose, with estimated 15% non-plastic fines and 85% fine to coarse sand.
						CL	0.8' - 2.0': **Lean Clay** dark brownish black, moist, very hard, with estimated 95% medium plastic fines and 5% fine sand. Pocket penetrometer = 4.0 tsf (material breaks).
B/B1	SPT	11				CL	2.0' - 3.0': **Lean Clay** brown, moist, stiff, with estimated 80% low plastic fines and 20% fine to medium sand. Pocket penetrometer = 2.75 tsf.
						SP-SM	3.0' - 4.5': **Poorly Graded Sand with Silt** brown, moist, medium dense, with estimated 10% non-plastic fines and 90% fine to coarse sand. Fines in last 1.5" of interval are low plastic. With trace rootlets.
C/C1	SPT	13			5	CL	4.5' - 5.5': **Lean Clay with Sand** brown, moist, stiff, with estimated 80% low plastic fines and 20% fine to medium sand.
					▼	SP	5.5' - 7.0': **Sandy Lean Clay** brown, very moist to wet, stiff, with estimated <5% non-plastic fines and 95% fine to coarse sand. Last 1" of interval consists of dark brown and slightly moist Sandy Lean Clay (not sampled). With trace rootlets. Switch to mud-rotary drilling greater than 6.5 feet. Water sample collected on 6/17/04 and submitted for chemical analysis.
D/D1	SPT	15				CL	7.0' - 8.0': **Lean Clay with Sand** dark greenish gray, wet, stiff, with estimated 75% medium plastic fines and 25% fine to medium sand. Pocket penetrometer = 2.25 tsf.
						SM	8.0' - 9.5': **Silty Sand** dark greenish gray, wet, medium dense, with estimated 20% non-plastic fines and 80% fine to medium sand.
E	SPT	8			10	CL	9.5' - 12.0': **Lean Clay with Sand** from 10.0-10.1' is dark greenish gray, wet Clayey Sand (not sampled) with estimated 15% medium plastic fines and 85% fine to medium sand and trace gravel to 1/4". Most material from 10.1-11.5' consists of dark gray and wet Lean Clay with Sand with estimated 85% medium plastic fines and 15% fine sand. Pocket penetrometer = 1.5 tsf.
F	SPT	15				CL	12.0' - 14.5': **Lean Clay** dark greenish gray, wet, stiff, with estimated 95% medium plastic fines and 5% fine sand. Pocket penetrometer = 3.0-3.5 tsf from 12.5-13.5' and 2.75 tsf from 13.5-14.0'.
							14.5' - 16.0': **Silty Sand** dark greenish gray, wet, loose, with

Located 540 feet north of fence line and 880 feet southeast of TP-8.

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Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2b

BORING LOG

BORING NO.: B-02

DATE: 6/16/2004

TYPE OF BORING: CME 55

DEPTH TO GROUND WATER (ft): 6.9

LOGGED BY: TWJ

GROUND ELEVATION (ft): 4431 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G/G1	SPT	10				SM		estimated 15% non-plastic fines, 73% fine to coarse sand, and 12% subrounded gravel to 3/8". Pocket penetrometer = 2.5 tsf (material breaks).
						SC-SM		16.0' - 18.0': **Silty, Clayey Sand** dark grayish green, wet, loose, with estimated 25% non-plastic to low plastic fines and 75% fine to coarse sand. Pocket penetrometer = 0.5 tsf.
								18.0' - 23.5': **Clayey Sand** dark grayish green, wet, loose, with estimated 40% low plastic fines and 60% fine to medium sand. More fines in upper half of interval. Pocket penetrometer = 1.0-1.5 tsf.
					20			
H	SPT	7				SC		
								23.5' - 28.0': **Poorly Graded Gravel with Silt and Sand** dark greenish black, wet, very dense, with estimated 5% non-plastic fines, 25% fine to coarse sand, and 70% subrounded gravel to 1-1/2".
I	SPT	50 in 5"			25			
						GP-GM		
								28.0' - 33.0': **Poorly Graded Gravel** dark greenish gray, wet, very dense. Only trace recovery due to two pieces of subrounded gravel to 1-1/2" in diameter jammed in shoe. Very difficult drilling with tricone bit.

Located 540 feet north of fence line and 880 feet southeast of TP-8.

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Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2c

BORING LOG

BORING NO.: B-02 DATE: 6/16/2004

TYPE OF BORING: CME 55 DEPTH TO GROUND WATER (ft): 6.9

LOGGED BY: TWJ GROUND ELEVATION (ft): 4431 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
J	SPT	50 in 6"				GP		
						GP		33.0' - 35.7': **Poorly Graded Gravel** dark gray, wet, very dense, unconsolidated material, with estimated <5% non-plastic fines, 20% fine to coarse sand, and 75% subrounded to subangular gravel to 3/4".
					35			
K/K1	SPT	82				GP-GM		35.7' - 36.3': **Poorly Graded Gravel with Silt and Sand** dark greenish gray, wet, very dense, with estimated 7% non-plastic fines, 73% fine to coarse sand, and 20% subrounded to subangular gravel to 3/4".
								-- used tricone bit to 40'; hole keeps caving in after reaming hole out twice. Stop hole at 40' at 10:35 a.m.
								-- Drill a twin hollow-stem auger boring 5 feet east of mud-rotary hole and set 2-6/16" (O.D) PVC pipe in hole to observe ground water table elevation. Ground water table measured at 6.9 feet below surface on 6-17-04 at 12:10 p.m.
					40			

Located 540 feet north of fence line and 880 feet southeast of TP-8.

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Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2d

BORING LOG

BORING NO.: B-03

DATE: 6/16/2004

TYPE OF BORING: CME 55

DEPTH TO GROUND WATER (ft): 4.6

LOGGED BY: TWJ

GROUND ELEVATION (ft): 4441 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX
A/A1	SPT	6		
B	SPT	8		
C/C1	SPT	5		
D	SPT	11		
E/E1	SPT	18		
F	SPT	28		

USCS SYMBOL	DESCRIPTION
SP-SM	0.0' - 0.4': **Poorly Graded Sand with Silt** brown, dry, loose, with estimated 5% non-plastic fines and 95% fine to coarse sand. With moderate roots.
CL	0.4' - 0.7': **Lean Clay** brown, moist, firm, with estimated 95% low plastic fines and 5% fine sand.
SP	0.7' - 1.0': **Poorly Graded Sand** brown, slightly moist, loose, with estimated <5% non-plastic fines and 95% fine to coarse sand.
ML	1.0' - 2.0': **Silt with Sand** brown, moist, firm, with estimated 85% non-plastic fines and 15% fine sand.
SC-SM	2.0' - 4.5': **Silty, Clayey Sand** brown, moist, loose, interbedded Silty Sand and Clayey Sand, with estimated 20% non-plastic to low plastic fines, 80% fine to medium sand, and trace subangular gravel to 3/4" in last 2-1/2". With trace rootlets. Pocket penetrometer = 2.0 tsf (material breaks) from 2.5-3.0'; 0 tsf from 3.0-4.0'.
SM	4.5' - 5.3': **Silty Sand** brown, moist to wet, loose, with estimated 25% non-plastic fines and 75% fine to medium sand. With trace rootlets. Pocket penetrometer = 0 tsf.
SC	5.3' - 5.5': **Clayey Sand** brown, wet, loose, with estimated 30% low plastic fines and 70% fine to medium sand.
CH	5.5' - 7.0': **Fat Clay** dark brownish black, wet, firm, with estimated 95% medium to high plastic fines and 5% fine sand. Pocket penetrometer = 1.0-1.25 tsf. Switch to mud-rotary drilling greater than 6.5 feet.
SM	7.0' - 7.9': **Silty Sand** dark greenish black, wet, medium dense, with estimated 20% non-plastic fines, 70% fine to coarse sand, and 10% subrounded gravel to 1/4". Pocket penetrometer = 0 tsf.
CL	7.9' - 9.5': **Sandy Lean Clay** dark greenish black, wet, stiff, with estimated 60% medium plastic fines and 40% fine to medium sand. Pocket penetrometer = 2.25 tsf.
CL	9.5' - 10.7': **Lean Clay** dark greenish gray, wet, very stiff, with estimated 90% medium plastic fines and 10% fine sand. Pocket penetrometer = 1.0-1.75 tsf.
SP-SM	10.7' - 12.0': **Poorly Graded Sand with Silt** dark gray, wet, medium dense, with estimated 5% non-plastic fines and 95% fine to coarse sand.
SM	12.0' - 14.5': **Silty Sand** dark greenish black, wet, medium dense, with estimated 30% non-plastic fines and 70% fine to coarse sand. Pocket penetrometer = 0-0.5 tsf (material breaks).
	14.5' - 15.5': **Silty, Clayey Sand** dark gray, wet, medium dense,

Located in middle of meadow.

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PROJECT NO.: 0199-08-1

PLATE: 2c

BORING LOG

BORING NO.: B-03 | DATE: 6/16/2004

TYPE OF BORING: CME 55 | DEPTH TO GROUND WATER (ft): 4.6

LOGGED BY: TWJ | GROUND ELEVATION (ft): 4441 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G/G1	SPT	13				SC-SM		with estimated 20% medium plastic fines and 80% fine sand. Pocket penetrometer = 1.25 tsf.
						CL		15.5' - 18.0': **Lean Clay** dark gray, wet, stiff, with estimated 90% medium plastic fines and 10% fine sand. Pocket penetrometer = 2.5-2.75 tsf.
					20	SC		18.0' - 20.6': **Clayey Sand** dark greenish gray, wet, medium dense, with estimated 30% low plastic fines and 70% fine to medium sand. Pocket penetrometer = 0.5-1.25 tsf.
H	SPT	22				SP-SM		20.6' - 21.3': **Poorly Graded Sand with Silt** dark gray, wet, medium dense, with estimated 10% non-plastic fines and 90% fine to coarse sand. Pocket penetrometer = 0 tsf.
						CL		21.3' - 23.0': **Lean Clay with Sand** dark greenish black, wet, very stiff, with estimated 80% medium plastic fines and 20% fine to medium sand. Material not sampled.
I/I1	SPT	18			25	SC-SM		23.0' - 26.3': **Silty, Clayey Sand** dark greenish gray, wet, medium dense, with estimated 25% low plastic fines and 75% fine to medium sand. Pocket penetrometer = 0.5 tsf.
						SM		26.3' - 27.5': **Silty Sand** dark greenish gray, wet, medium dense, with estimated 20% non-plastic fines and 80% fine to medium sand. Pocket penetrometer = 2.25 tsf.
								27.5' - 33.0': **Poorly Graded Gravel** dark gray, wet, dense, unconsolidated, with estimated <5% non-plastic fines, 13% fine to coarse sand, and 82% subrounded to subangular gravel to 1-1/2". Difficult auger drilling from 27.5 to 33.0 feet. Hole keeps caving at 33.0 feet. Stop hole at 33.0 feet at 1:55 p.m.

Located in middle of meadow.

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PLATE: 2d

BORING LOG

BORING NO.: B-03

DATE: 6/16/2004

TYPE OF BORING: CME 55

DEPTH TO GROUND WATER (ft): 4.6

LOGGED BY: TWJ

GROUND ELEVATION (ft): 4441 (Topo)

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
J	SPT	32				GP		
					35			-- Drill hollow-stem auger hole 7 feet north of mud-rotary hole and install 2-6/16" (O.D.) PVC pipe 20 feet long to observe the ground water table elevation. Measured ground water table on 6-17-04 is 4.6 feet below the surface.
					40			

Located in middle of meadow.

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PROJECT NO.: 0199-08-1

PLATE: 2e

TEST PIT LOG

TEST PIT NO.: TP-01 DATE: 6/16/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe DEPTH TO GROUND WATER (ft): 11

LOGGED BY: DPM GROUND ELEVATION (ft): 4444 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		0.0' - 0.5': **CLAYEY SAND** brown, dry, loose, with estimated 35-40% medium plasticity fines and 60-65% fine to coarse sand. Very abundant organic material and roots present.
						SP		0.5' - 1.0': **POORLY GRADED SAND** brown, slightly moist, loose, with estimated trace non-plastic fines and 100% fine to medium sand.
B	GRAB					CL		1.0' - 1.9': **SANDY LEAN CLAY** brown, slightly moist, medium dense, with estimated 45-50% medium plasticity fines and 50-55% fine sand. Roots and oxidation encountered.
C	GRAB					SM		1.9' - 2.5': **SILTY SAND** white and light grey, slightly moist, medium dense, with estimated 40-45% low plasticity fines and 55-60% fine sand. Roots and oxidation encountered.
D	GRAB					SM		2.5' - 3.5': **SILTY SAND** grey, slightly moist, medium dense, with estimated 15-20% low plasticity fines and 80-85% fine sand. Roots and oxidation encountered.
E	GRAB					SC		3.5' - 4.0': **CLAYEY SAND** dark brown, slightly moist, medium dense, with estimated 45% medium plasticity fines and 55% fine to coarse sand. Abundant roots encountered.
F	GRAB				5	CL		4.0' - 8.0': **LEAN CLAY with SAND** black and dark brown, slightly moist, firm to stiff, with estimated 80-90% medium plasticity fines and 10-20% fine sand. Grades to higher percentage sand, estimated from tailings. Hole caving occurs at 7 feet below grade.
					10			8.0' - 13.0': **LEAN CLAY with SAND** black and dark grey, moist to wet, firm, with estimated 80-90% medium plasticity fines and 10-20% fine sand.

Located south of Alexander Lake access road.

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PROJECT NO.: 0199-08-1

PLATE: 2d

SHEET 1 OF 1

BORING_LOG 0199081.GPJ BLKEAGLE.GDT 8/17/2004

TEST PIT LOG

TEST PIT NO.: TP-02
DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe
DEPTH TO GROUND WATER (ft): 2.7

LOGGED BY: DPM
GROUND ELEVATION (ft): 4438 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								0.0' - 0.4': **TOPSOIL**
						SM		0.4' - 1.0': **SILTY SAND** grey and brown, moist, medium dense, with estimated 20% low plasticity fines and 80% fine to coarse sand with roots.
						SM		1.0' - 1.5': **SILTY SAND** grey, wet, loose to medium dense, with estimated 35% low plasticity fines and 65% fine sand.
						SP-SM		1.5' - 2.0': **POORLY GRADED SAND with SILT** grayish-brown, wet, loose, with estimated 5-10% non-plastic fines and 90-95% fine to coarse sand.
A	GRAB	<.5				CL		2.0' - 5.0': **LEAN CLAY** black, wet, soft, with estimated 85-90% low to medium plasticity fines and 10-15% fine sand. Water Sample collected on 6/17/04 and submitted for chemical analysis. Hole caving and water pumping at 2.7 feet below grade.
B	GRAB				5	SM		5.0' - 8.0': **SILTY SAND** dark grey, wet, loose, with estimated 30% low plasticity fines, 60% fine to coarse sand, and 10% fine subrounded gravel. Estimated from tailings.
						ML		8.0' - 9.5': **SANDY SILT** blue-green and grey, wet, soft, with estimated 55% low plasticity fines and 45% fine to coarse sand. Estimated from tailings.
					10			-- Install slotted PVC pipe to observe ground water table elevation. Measured ground water table on 6/17/04 is 2.7 feet below the ground surface.

Located 50 feet southeast of Steamboat Creek. PVC pipe installed to monitor ground water.

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PLATE: 2e

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-03

DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DPM

GROUND ELEVATION (ft): 4440 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								0.0' - 0.5': **TOPSOIL** brown, slightly moist, medium dense, with abundant organic material.
						SP		0.5' - 1.5': **POORLY GRADED SAND** brown, slightly moist, medium dense, with estimated trace non-plastic fines, 100% fine to coarse sand, and trace fine subrounded gravel.
A	GRAB	4.5				ML		1.5' - 2.0': **SILT with SAND** light grey to black, dry, very stiff, with estimated 75-85% non-plastic to low plasticity fines and 15-25% fine sand. Thin black sandy silt seam at bottom.
B	GRAB					SP		2.0' - 5.0': **POORLY GRADED SAND** brown, slightly moist, loose to medium dense, with estimated trace non-plastic fines, 90% fine to coarse sand, and 10% fine subrounded gravel. Soil sample submitted for chemical analysis.
					5	SM		5.0' - 5.5': **SILTY SAND** black and brown, slightly moist, medium dense, with estimated 35% low plasticity fines and 65% fine sand.
						ML		5.5' - 8.0': **SANDY SILT** black and brown, slightly moist, stiff, with estimated 60-70% low plasticity fines and 30-40% fine to medium sand. Interbedded layers with weak to moderate cementation encountered. Estimated from tailings.
C	GRAB	2.5 - >5.0				CL		8.0' - 10.0': **LEAN CLAY with SAND** black, slightly moist to moist, stiff, with estimated 80% medium plasticity fines and 20% fine sand. Estimated from tailings.
					10			

Located in abandoned pasture approximately 30 feet west of dry irrigation ditch and 188 feet south of fence line.

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PROJECT NO.: 0199-08-1

PLATE: 2f

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-04 DATE: 6/16/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe DEPTH TO GROUND WATER (ft): 5

LOGGED BY: DPM GROUND ELEVATION (ft): 4420 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SC		0.0' - 0.5': **CLAYEY SAND** reddish-brown, slightly moist, loose, with estimated 35% medium plasticity fines and 65% fine sand. Soil consists of predominantly organic material.
A	GRAB					CL		0.5' - 1.2': **SANDY LEAN CLAY** dark brown, slightly moist, firm, with estimated 55-60% medium plasticity fines and 40-45% fine sand. Abundant roots encountered.
B	GRAB					CL		1.2' - 2.5': **SANDY LEAN CLAY** light brown and grayish-brown, slightly moist, stiff, with estimated 60-65% medium plasticity fines and 35-40% fine to medium sand. Color darkens with depth from grade.
C	GRAB					CL		2.5' - 3.0': **GRAVELLY LEAN CLAY with SAND** grey, moist, very stiff, with estimated 55% medium plasticity fines, 15% fine to medium sand, and 30% fine to coarse subangular gravel. Rare small subangular cobbles up to 4-inches encountered.
D	GRAB				5	CL		3.0' - 5.5': **SANDY LEAN CLAY** grey, moist to wet, soft, with, estimated 65% medium plasticity fines, 35% fine sand, and trace fine subangular gravel.
						SC		5.5' - 7.0': **CLAYEY SAND** grey, wet, dense, with estimated 35-40% medium plasticity fines and 60-65% fine to coarse sand. Hole caving at 6.5 feet below grade.
					10			

BORING_LOG 0199081.GPJ BLKEAGLE.GDT 8/17/2004

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PROJECT NO.: 0199-08-1

PLATE: 2g

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-05 DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe DEPTH TO GROUND WATER (ft): 4.5

LOGGED BY: DPM GROUND ELEVATION (ft): 4429 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SM		0.0' - 1.0': **SILTY SAND** brown, slightly moist, medium dense, with estimated 15% non-plastic fines and 85% fine to coarse sand with abundant roots.
A	GRAB	>5.0				SC-SM		1.0' - 2.5': **SILTY, CLAYEY SAND** brown, slightly moist, medium dense, with estimated 30-35% medium plasticity fines and 65-70% fine to coarse sand. Soil sample submitted for chemical analysis.
						SM		2.5' - 3.5': **SILTY SAND** brown, moist, medium dense, with estimated 15% non-plastic fines and 85% fine to corse sand.
						ML		3.5' - 3.9': **SANDY SILT** light brown, moist, hard, with estimated 65% low plasticity fines and 35% fine to coarse sand. Stong cementation.
					▼	SP		3.9' - 4.5': **POORLY GRADED SAND** brown, very moist, loose, with estimated trace non-plastic fines, 100% fine to coarse sand, and trace fine subrounded gravel.
					5	SP-SM		4.5' - 6.5': **POORLY GRADED SAND with SILT** grey-green, wet, loose, with estimated 10% non-plastic fines and 90% fine to coarse sand.
						ML		6.5' - 7.5': **SANDY SILT** grey, wet, hard, with estimated 60% low plasticity fines and 40% fine sand. Layer is strongly cemented and estimated from tailings..
						SP		7.5' - 9.0': **POORLY GRADED SAND** grey, wet, loose, with estimated trace non-plastic fines and 100% fine to coarse sand. Estimated from tailings.
					10			

Located in abandoned pasture.

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PROJECT NO.: 0199-08-1

PLATE: 2h

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-06

DATE: 6/15/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 9.2

LOGGED BY: DPM

GROUND ELEVATION (ft): 4430 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SP-SM		0.0' - 0.7': **POORLY GRADED SAND with SILT** brown, dry, loose, with estimated 10-12% non-plastic fines, 88-90% fine to coarse sand, and trace fine subrounded gravel. Abundant roots encountered.
A	GRAB					SP		0.7' - 2.3': **POORLY GRADED SAND** brown, slightly moist, loose, with estimated trace non-plastic fines, 100% fine to coarse sand, and trace fine subrounded gravel.
B	GRAB					CL		2.3' - 3.7': **SANDY LEAN CLAY** black and dark brown, slightly moist, medium stiff, with estimated 70% medium plasticity fines and 30% fine sand. Interbedded thin seams of silty soils near 3.5 feet below grade.
C	GRAB					ML		3.7' - 4.0': **SANDY SILT** reddish-brown, slightly moist, stiff, with estimated 50% low plasticity fines and 50% fine sand. Weakly cemented, with friable texture.
D	GRAB					SM		4.0' - 4.7': **SILTY SAND** light brown, slightly moist, medium dense, with estimated 30-40% low plasticity fines and 60-70% fine to medium sand. Fines decrease with depth from grade.
E	GRAB				5	SP-SM		4.7' - 6.0': **POORLY GRADED SAND with SILT** light brown, slightly moist, medium dense, with estimated 10% non-plastic to low plasticity fines, 90% fine to coarse sand, and trace fine sub-rounded gravel.
						CL		6.0' - 7.0': **SANDY LEAN CLAY** dark brown and grey, slightly moist, medium stiff, with estimated 50% low to medium plasticity fines and 50% fine sand. Estimated from tailings.
					10	SM		7.0' - 14.6': **SILTY SAND** brown and grey-green, moist to wet, medium dense, with 20-40% low plasticity fines and 60-80% fine to coarse sand. Layer is interbedded and estimated from tailings.

Located 146 feet north of fence line.

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PROJECT NO.: 0199-08-1

PLATE: 2i

TEST PIT LOG

TEST PIT NO.: TP-06

DATE: 6/15/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 9.2

LOGGED BY: DPM

GROUND ELEVATION (ft): 4430 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								-- Install slotted PVC pipe to observe the ground water table elevation. Measured ground water table on 6/17/04 is 9.2 feet below the ground surface.
					20			
					25			

Located 146 feet north of fence line.

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PLATE: 2j

TEST PIT LOG

TEST PIT NO.:	TP-07	DATE:	6/14/2004
TYPE OF HOE:	Case 580 Super L Rubber tire back hoe	DEPTH TO GROUND WATER (ft):	NE
LOGGED BY:	TWJ	GROUND ELEVATION (ft):	4448 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		0.0' - 1.0': **SILTY SAND** grayish brown, dry to slightly moist, loose from 0-0.15' and dense from 0.15-1.0', with estimated 15% non-plastic fines and 85% fine to medium sand. With trace roots to 0.3" in diameter.
B	GRAB					GP-GC		1.0' - 3.0': **POORLY GRADED GRAVEL WITH CLAY AND SAND** dark brown, moist, very dense, with estimated 10% low to medium plastic fines, 30% fine to coarse sand, and 60% subrounded to subangular gravel to 2-1/2". With subrounded to subangular cobbles to 1' that make up to 40% of the total soil mass. With subrounded boulders to 3' that make up to 10% of the total soil mass. With trace rootlets. Moderately difficult to excavate.
C	GRAB					GP		3.0' - 3.4': **POORLY GRADED GRAVEL WITH SAND** brown, slightly moist, dense, with estimated 5% non-plastic fines, 15% fine to coarse sand, and 80% subrounded gravel to 2-1/2".
D	GRAB					GP		3.4' - 4.1': **POORLY GRADED GRAVEL-Hardpan** light whitish gray, slightly moist, dry, with estimated <5% non-plastic fines, 10% fine to coarse sand, and 85% angular to subangular gravel to 3". With angular cobbles to 6" that make up to 5% of the total soil mass. With strong calcium carbonate cement. Material is very difficult to excavate. Refusal at 4.1 feet. Trench excavation is 60 feet long. No fault observed.
					5			
					10			

Located on native soil window within Bella Vista Pit at 50 feet north of mine road.

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PROJECT NO.: 0199-08-1

PLATE: 2j

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.:	TP-08	DATE:	6/10/2004
TYPE OF HOE:	Case 580 Super L Rubber tire back hoe	DEPTH TO GROUND WATER (ft):	NE
LOGGED BY:	DPM	GROUND ELEVATION (ft):	4432 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								0.0' - 0.5': **TOPSOIL** brown, dry, loose, with abundant organic material.
						SC		0.5' - 1.0': **CLAYEY SAND** black, slightly moist, coarse, with estimated 20% medium plasticity fines and 80% fine to coarse sand.
A	GRAB					SP-SM		1.0' - 3.0': **POORLY GRADED SAND with SILT** brown, slightly moist, loose, with estimated trace non-plastic fines, 95% fine to coarse sand, and 5% fine rounded gravel.
						SP-SM		3.0' - 5.0': **POORLY GRADED SAND with SILT** light brown and brown, slightly moist, medium dense, with estimated 5% non-plastic fines, 95% fine to coarse sand, and trace fine rounded gravel. Thin seam of silty sand encountered at top of layer.
B	GRAB	3.5			5	SC		5.0' - 6.5': **CLAYEY SAND** black, moist, medium dense, with estimated 45% medium plasticity fines and 55% fine sand.
					10	SC		6.5' - 11.0': **CLAYEY SAND** black and brown, moist, medium dense, with estimated 25-35% low to medium plasticity fines and 65-75% fine to coarse sand. Alternating interbedded layers of silty sand and clayey sand estimated from tailings.

Abandoned pasture with brush to 1 foot in height.

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PLATE: 2k

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.:	TP-09	DATE:	6/15/2004
TYPE OF HOE:	Case 580 Super L Rubber tire back hoe	DEPTH TO GROUND WATER (ft):	4.0
LOGGED BY:	DPM	GROUND ELEVATION (ft):	4430.9 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SC		0.0' - 0.7': **CLAYEY SAND** brown, dry to slightly moist, loose to medium dense, with estimated 40% medium plasticity fines and 60% fine sand. Very abundant organic material and roots present in soil.
A	GRAB					CL		0.7' - 1.2': **SANDY LEAN CLAY** light brown, slightly moist, firm, with estimated 55-60% medium plasticity fines and 40-45% fine sand. Very abundant organic material in soil. Soil sample submitted for chemical analysis.
B	GRAB		19.1	7		SC-SM		1.2' - 2.2': **SILTY, CLAYEY SAND** brown, moist, loose, with 21% low to medium plasticity fines and 80% fine to coarse sand.
C	GRAB					SP-SM		2.2' - 3.0': **POORLY GRADED SAND with SILT** brown, moist, loose, with estimated 5% non-plastic fines and
D	GRAB					SC		3.0' - 4.0': **CLAYEY SAND** brown, very moist, loose to medium dense, with estimated 20% medium plasticity fines, 75% fine to coarse sand, and 5% fine subrounded gravel.
E	GRAB				5	SC		4.0' - 5.5': **CLAYEY SAND** light brown, wet, medium dense, with estimated 45% medium plasticity fines and 55% fine sand.
F	GRAB				10	SM		5.5' - 10.0': **SILTY SAND** grey, wet, loose, with estimated 15% low plasticity fines, 85% fine to coarse sand, and trace fine subrounded gravel.

-- Install slotted PVC pipe to observe the ground water table elevation. Measured ground water table on 6/17/04 is 4.0 feet below the ground surface.

Located 165 feet east of active irrigation ditch.

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SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-10 | DATE: 6/14/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe | DEPTH TO GROUND WATER (ft): >10

LOGGED BY: TWJ | GROUND ELEVATION (ft): 4433.5 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					CL-ML		0.0' - 0.6': **SILTY CLAY** grayish brown, dry to slightly moist, firm, with estimated 90% low plastic fines and 10% fine sand. With strong roots.
B	GRAB	>4.5				CL		0.6' - 2.2': **SANDY LEAN CLAY** dark brown, moist, very hard, with estimated 70% low plastic fines and 30% fine to medium sand. With trace rootlets. Pocket penetrometer is >4.5 tsf.
C	GRAB	4.0-4.5				CL		2.2' - 3.7': **LEAN CLAY WITH SAND** light brown, moist, hard, with estimated 85% low plastic fines and 15% fine to medium sand. With trace rootlets.
D	GRAB				5	SP		3.7' - 7.1': **POORLY GRADED SAND** brown, very moist, dense, with estimated <5% non-plastic fines and 95% fine to coarse sand. Interbedded with Clayey Sand with estimated 15% low plastic fines and 85% fine to coarse sand. With trace rootlets.
E	GRAB	>=4.5				CL		7.1' - 9.5': **LEAN CLAY** dark brown to brown, very moist, very hard, with estimated 90% medium plastic fines and 10% fine sand. Pocket penetrometer = >4.5 tsf.
F	GRAB					SP		9.5' - 10.0': **POORLY GRADED SAND** brown, very moist, medium dense, with estimated <5% non-plastic fines and 95% fine to coarse sand. No seeping water.
G	GRAB				10	CL		10.0' - 11.5': **LEAN CLAY** dark grayish green, very moist, very hard, with estimated 95% medium plastic fines and 5% fine sand.
								-- Install 3" diameter PVC pipe to observe the ground water table elevation. Ground water table measured at deeper than 10.0 feet below the ground surface on 6/17/04.

Located 65 feet east of fence line.

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SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-11 | DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe | DEPTH TO GROUND WATER (ft): 9.5

LOGGED BY: DPM | GROUND ELEVATION (ft): 4431.5 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SC		0.0' - 1.5': **CLAYEY SAND** black and dark brown, slightly moist, loose, with estimated 40-45% medium plasticity fines and 55-60% fine sand. Dense rootlets encountered.
A	GRAB					SM		1.5' - 2.7': **SILTY SAND** brown, moist, medium dense, with estimated 12-15% low plasticity fines and 85-88% fine to coarse sand with roots.
						SC		2.7' - 3.0': **CLAYEY SAND** dark brown, moist, medium dense, with estimated 35% medium plasticity fines and 65% fine to coarse sand.
						SP		3.0' - 3.5': **POORLY GRADED SAND** brown, moist, medium dense, with estimated trace non-plastic fines and 100% fine to coarse sand.
B	GRAB					SC-SM		3.5' - 4.5': **SILTY, CLAYEY SAND** brown, moist, medium dense, with estimated 35-45% low to medium plasticity fines and 55-65% fine to coarse sand.
C	GRAB	3.0			5	CL		4.5' - 6.5': **SANDY LEAN CLAY** dark brown, moist, firm to stiff, with estimated 50% medium plasticity fines and 50% fine sand.
					10	SC		6.5' - 10.0': **CLAYEY SAND** brown and dark brown, moist to wet, medium dense, with estimated 20-35% medium plasticity fines and 65-80% fine to coarse sands in interbedded layers. Estimated from tailings.

Abandoned pasture with sage to 3 foot in height.

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PLATE: 2n

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-12

DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): >6.5

LOGGED BY: TWJ

GROUND ELEVATION (ft): 4455 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		0.0' - 0.9': **SILTY SAND** grayish brown, dry from 0-0.1' and slightly moist from 0.1-0.9', dense, with estimated 20% non-plastic fines, 68% fine to medium sand, and 12% subrounded gravel to 2". With trace roots to 1/2".
B	GRAB					GP-GC		0.9' - 1.7': **POORLY GRADED GRAVEL WITH CLAY AND SAND** dark brown, moist, very dense, with estimated 5% medium plastic fines, 40% fine to coarse sand, and 55% subangular gravel to 3". With subangular cobbles to 1'. With trace roots.
C	GRAB					GP		1.7' - 2.7': **POORLY GRADED GRAVEL** light whitish gray, dry to slightly moist, very dense, with estimated <5% non-plastic fines, 10% fine to coarse sand, and 85% subangular to subrounded gravel to 3". With trace subangular cobbles to 7". With strong calcium carbonate cement. Gravel and cobbles consist of black basalt porphyry.
D	GRAB					GP-GM		2.7' - 4.6': **POORLY GRADED GRAVEL WITH SILT AND SAND** light brown, slightly moist, very dense, with estimated 5% non-plastic fines, 30% fine to coarse sand, and 65% subangular to subrounded gravel to 3". With subrounded to subangular cobbles to 8" that make up to 15% of the total soil mass. With trace calcium carbonate filaments and coatings to gravel and cobbles.
E	GRAB				5	SP		4.6' - 6.5': **POORLY GRADED SAND WITH GRAVEL** light brown, slightly moist, very dense, with estimated <5% non-plastic fines, 80% fine to coarse sand, and 15% subrounded to subangular gravel to 3". With subrounded cobbles to 6" that make up to 5% of the total soil mass. Refusal at 6.5 feet.
					10			

Located 150 feet south of open pit boundary and 280 feet northeast of dirt road.

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SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-13

DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DPM

GROUND ELEVATION (ft): 4441.5 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								0.0' - 0.4': **TOPSOIL**
						SP		0.4' - 1.0': **POORLY GRADED SAND** light brown, dry, dense, with estimated trace non-plastic fines and 100% fine to coarse sand with abundant roots.
						SM		1.0' - 1.5': **SILTY SAND** light brown, dry, dense, with estimated 30% non-plastic fines and 70% fine sand with roots.
A	GRAB	>5.0 tsf				SP		1.5' - 2.3': **POORLY GRADED SAND** reddish-brown and brown, dry, loose, with estimated trace non-plastic fines and 100% fine to coarse sand with abundant roots.
						ML		2.3' - 3.0': **SANDY SILT** light brown and black, dry , very stiff, with estimated 55-60% low plasticity fines and 40-45% fine sand.
						SP		3.0' - 3.5': **POORLY GRADED SAND** brown, dry, dense, with estimated 5% non-plastic fines and 95% fine to coarse sand with mica.
B	GRAB		10.9	11		CL		3.5' - 5.0': **SANDY LEAN CLAY** light brown, dry, very stiff with 59% low plastic fines and 41% fine to medium sand.
					5	SP		5.0' - 6.0': **POORLY GRADED SAND** brown, dry to slightly moist, loose, with estimated trace non-plastic fines and 100% fine to coarse sand with mica.
						ML		6.0' - 7.0': **SANDY SILT** brown, moist , stiff, with estimated 55% low plasticity fines and 45% fine sand.
					10	SC		7.0' - 12.0': **CLAYEY SAND** brown and grey, moist, medium dense, with estimated 35-45% medium plasticity fines and 55-65% fine to coarse sand. Estimated from tailings.

Abandoned pasture with dense brush to 3 foot in height.

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PLATE: 2p

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-14

DATE: 6/15/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 6.5

LOGGED BY: DPM

GROUND ELEVATION (ft): 4432 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						CL		0.0' - 1.0': **SANDY LEAN CLAY**
A	GRAB					SC		1.0' - 2.0': **CLAYEY SAND** black and brown, slightly moist, medium dense, with estimated 40% medium plasticity fines and 60% fine sand. Abundant organics and interbedded clean sand and silty sand seams encountered.
B	GRAB		6.1	NP		SM		2.0' - 2.7': **SILTY SAND** brown, slightly moist, medium dense, with 13% non-plastic fines and 87% fine to medium sand with mica. Fines percentage decreases with depth from grade. Soil sample submitted for chemical analysis.
						SC		2.7' - 3.0': **CLAYEY SAND** black, slightly moist, medium dense, with estimated 45% medium plasticity fines and 55% fine sand.
C	GRAB					SC		3.0' - 3.5': **CLAYEY SAND** light brown, slightly moist, medium dense, with estimated 35% medium plasticity fines and 65% fine to coarse sand.
						SC		3.5' - 3.7': **CLAYEY SAND** light brown, slightly moist, medium dense, with estimated 25% medium plasticity fines and 75% fine to coarse sand.
D	GRAB				5	CL		3.7' - 6.0': **SANDY LEAN CLAY** dark brown, moist, stiff, with estimated 65% low to medium plasticity fines and 35% fine sand.
					▼	SM		6.0' - 6.7': **SILTY SAND** brown, moist, medium dense, with estimated 15% low plasticity fines and 85% fine to coarse sand.
						CL		6.7' - 8.0': **SANDY LEAN CLAY** brown, moist, firm, with estimated 75% medium plasticity fines and 25% fine sand.
					10	SC-SM		8.0' - 13.0': **SILTY, CLAYEY SAND** brown, grey, and bluish-green, moist, medium dense, with estimated 25-40% low to medium plasticity fines and 60-75% fine to coarse sand. Interbedded layers of silty sands and clayey sands estimated from tailings.
								-- Install slotted PVC pipe to observe the ground water table elevation. Measured ground water table on 6/17/04 is 6.5 feet below the ground surface.

Located 50 feet south of fence line.

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PLATE: 2q

TEST PIT LOG

TEST PIT NO.: TP-15

DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 11

LOGGED BY: DPM

GROUND ELEVATION (ft): 4441 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SC		0.0' - 0.5': **CLAYEY SAND** brown, dry, dense, with estimated 35-40% medium plasticity fines and 60-65% fine to coarse sand. Very abundant roots and organics encountered.
						SP		0.5' - 1.5': **POORLY GRADED SAND** brown, slighty moist, loose, with estimated trace non-plastic fines and 100% fine to coarse sand.
A	GRAB					SC-SM		1.5' - 3.0': **SILTY, CLAYEY SAND** dark brown, slightly moist, medium dense, with estimated 35-40% low to medium plasticity fines and 60-65% fine to coarse sand.
B	GRAB	4.5				ML		3.0' - 3.5': **SANDY SILT** brown, moist, stiff, with estimated 55% low plasticity fines and 45% fine sand.
						SP		3.5' - 4.0': **POORLY GRADED SAND** brown, moist, medium dense, with estimated trace non-plastic fines and 100% fine to coarse sand.
						ML		4.0' - 4.5': **SANDY SILT** brown, moist, stiff, with estimated 55% low plasticity fines and 45% fine sand.
					5	SP		4.5' - 5.0': **POORLY GRADED SAND** brown, moist, medium dense, with estimated trace non-plastic fines and 100% fine to coarse sand.
						SP-SM		5.0' - 6.0': **POORLY GRADED SAND with SILT** brown, moist, medium dense, with estimated 5-10% non-plastic fines and 90-95% fine to coarse sand.
						CH		6.0' - 7.0': **SANDY FAT CLAY** black, moist, stiff, with estimated 70% medium to high plasticity fines and 30% fine sand. Estimated from tailings.
						SC		7.0' - 9.0': **CLAYEY SAND** brown, moist, medium dense, with estimated 30% medium plasticity fines and 70% fine to coarse sand. Estimated from tailings.
						CH		9.0' - 9.5': **SANDY FAT CLAY** black, moist, stiff, with estimated 70% medium to high plasticity fines and 30% fine sand. Estimated from tailings.
					10	SP-SM		9.5' - 12.0': **POORLY GRADED SAND with SILT** brown, moist to wet, medium dense, with estimated 5-10% low plasticity fines and 90-95% fine to coarse sand. Estimated from tailings.

Located 500 feet east of Steamboat ditch with 1 foot high dense brush.

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TEST PIT LOG

TEST PIT NO.: TP-16 DATE: 6/10/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe DEPTH TO GROUND WATER (ft): 2.7

LOGGED BY: DPM GROUND ELEVATION (ft): 4434 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								0.0' - 0.5': **TOPSOIL**
A	GRAB					CL		0.5' - 1.0': **SANDY LEAN CLAY** light brown, moist, firm, with estimated 60-70% medium plasticity fines and 30-40% fine sand.
B	GRAB					CL		1.0' - 2.2': **SANDY LEAN CLAY** light brown, moist, soft, with estimated 60% low to medium plasticity fines and 40% fine sand.
C	GRAB				▼	CL		2.2' - 2.8': **SANDY LEAN CLAY** brown, moist to wet, soft, with estimated 50% medium plasticity fines and 50% fine sand.
D	GRAB					CL		2.8' - 4.0': **SANDY LEAN CLAY** light brown and brown, wet, soft, with estimated 50% medium plasticity fines, 40% fine to coarse sand, and 10% fine to coarse round gravel. With trace rounded cobbles to 8". Water sample collected on 6/17/04 and submitted for chemical analysis.
						SC		4.0' - 4.5': **CLAYEY SAND** brown, wet, soft, with estimated 35-45% medium plasticity fines, 55-65% fine to coarse sand, and trace fine to coarse rounded gravel. Estimated from tailings.
E	GRAB				5	SM		4.5' - 7.0': **SILTY SAND** grey-brown, wet, loose to very loose, with estimated 25% low plasticity fines, 70% fine to coarse sand, and 5% rounded fine to coarse gravel. Occasional rounded cobbles up to 8-inches in diameter comprise 5% total soil mass.
								-- Install slotted PVC pipe to observe the ground water table elevation. The measured ground water table on 6/17/04 is 2.7 feet below the ground surface.
					10			

Located west of Mira Loma Road and gun club.

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BORING_LOG 0199081.GPJ BLKEAGLE.GDT 8/17/2004

TEST PIT LOG

TEST PIT NO.: TP-17 | DATE: 6/14/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe | DEPTH TO GROUND WATER (ft): 5.1

LOGGED BY: TWJ | GROUND ELEVATION (ft): 4444 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A/B	GRAB					CL		0.0' - 0.6': **LEAN CLAY** brown, slightly moist, firm, with estimated 90% low plastic fines and 10% fine sand. With strong roots and grass.
						CL		0.6' - 1.3': **LEAN CLAY WITH SAND** brown, slightly moist, very stiff, with estimated 85% low plastic fines and 15% fine sand. With weak roots. Pocket penetrometer = 3.0-3.5 tsf.
						SM		1.3' - 3.1': **SILTY SAND** grayish brown to brown, moist, dense, with estimated 20% non-plastic fines and 80% fine to medium sand. With trace rootlets. A one-inch thick layer of dark brown Clayey Sand occurs at 2.0 feet with 15% medium plastic fines and 85% fine to medium sand.
						SP		3.1' - 4.7': **POORLY GRADED SAND** brown, moist, dense, with estimated <5% non-plastic fines and 95% fine to coarse sand. With trace rootlets. One 0.5" thick Clayey Sand layer at 3.4 feet with 15% medium plastic fines and 85% fine to medium sand.
					5	SM		4.7' - 5.9': **SILTY SAND** dark brown, very moist to wet, dense, with estimated 15% non-plastic fines and 85% fine to medium sand. With trace rootlets.
						SC-SM		5.9' - 7.8': **SILTY, CLAYEY SAND** mottled from dark brown to dark green, wet, dense, with estimated 25% non-plastic to low plastic fines and 75% fine to medium sand. Water is minorly seeping at 7.8 feet at approximately 1 gallon per minute.
					10	SP		7.8' - 10.4': **POORLY GRADED SAND** grayish brown, wet, dense, with estimated <5% non-plastic fines, 85% fine to coarse sand, and 10% rounded gravel to 1-1/2".

-- Soil sample from 0-1.3 feet submitted for chemical analysis.

-- Install 3" diameter PVC pipe to observe the ground water table elevation. Ground water table measured at 5.1 feet below the ground surface on 6/17/04.

Located 200 feet west of Steamboat Creek, dense grass to 3 feet tall.

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SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-18 | DATE: 6/15/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe | DEPTH TO GROUND WATER (ft): 4.2

LOGGED BY: DPM | GROUND ELEVATION (ft): 4441 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								0.0' - 0.5': **TOPSOIL**
A	GRAB					SP		0.5' - 1.0': **POORLY GRADED SAND** brown, slighty moist, loose, with estimated trace non-plastic fines and 100% medium to coarse sand with roots.
B	GRAB		30.1	16		CL		1.0' - 3.0': **SANDY LEAN CLAY** brown, moist, medium dense, with 59% medium plasticity fines and 41% fine sand.
C	GRAB					CL		3.0' - 4.0': **SANDY LEAN CLAY** light brown, moist, stiff, with estimated 65% low to medium plasticity fines and 35% fine sand.
					5	SC-SM		4.0' - 7.0': **SILTY, CLAYEY SAND** brown, very moist to wet, loose, with estimated 35% low to medium plasticity fines and 65% fine to medium sand.
						SM		7.0' - 10.0': **SILTY SAND** grey-green-blue, wet, loose to medium dense, with estimated 30% low plasticity fines and 70% fine to coarse sand.
					10			-- Install slotted PVC pipe to observe the ground water table elevation. The measured ground water table on 6/17/04 is 4.2 feet below the ground surface.

Located 150 feet east of flowing creek in southeast corner of parcel.

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SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-19

DATE: 6/15/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 3.0

LOGGED BY: DPM

GROUND ELEVATION (ft): 4441.5 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SC		0.0' - 0.7': **CLAYEY SAND** dark brown, slightly moist, loose, with estimated 45% low to medium plasticity fines and 55% fine sand.
A	GRAB					CL		0.7' - 1.1': **SANDY LEAN CLAY** grey and black, moist, soft, with estimated 60-70% medium plasticity fines and 30-40% fine sand. Layer is interbedded with alternating colors.
B	GRAB		42.2	12	▼	ML		1.1' - 3.5': **SANDY SILT** light brown, moist to wet, soft, with 66% low plasticity fines, 30% fine to coarse sand, and 4% fine gravel.
C	GRAB					SC		3.5' - 4.0': **CLAYEY SAND with GRAVEL** brown, wet, loose, with estimated 40% low to medium plasticity fines, 45% fine to coarse sand, and 15% fine to coarse angular gravel. Subangular fine to coarse cobbles up to 8" comprise 5% of the total soil mass. A water sample was collected on 6/17/04 and submitted for chemical analysis.
D	GRAB					SM		4.0' - 5.0': **SANDY SILT** brown, wet, soft, with estimated 60% low plasticity fines, 40% fine sand , and trace fine subangular gravel. Hole caving at 5 feet below grade.
					5	SM		5.0' - 7.0': **SILTY SAND** grey, wet, loose, with estimated 15-20% low plasticity fines, 70-75% fine to coarse sand, and 10% fine subrounded gravel.
					10			

-- Install a slotted PVC pipe to observe the ground water table elevation. The measured ground water table on 6/17/04 is 3.0 feet below the ground surface.

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PROJECT NO.: 0199-08-1

PLATE: 2v

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-20

DATE: 6/14/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): 6.2

LOGGED BY: TWJ

GROUND ELEVATION (ft): 4442.5 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						SM		0.0' - 1.2': **Silty Sand** grayish brown, dry to slightly moist, loose, with estimated 15% non-plastic fines and 85% fine to medium sand. With strong roots to 1/2" in diameter.
						GP		1.2' - 2.1': **Poorly Graded Gravel with Sand** grayish brown, slightly moist, dense, with estimated <5% non-plastic fines, 25% fine to coarse sand, and 70% rounded to subangular gravel to 2-1/2". With some rootlets in upper 5" of interval.
						SP-SM		2.1' - 3.4': **Poorly Graded Sand with Silt** light brown to brown, moist, dense, with estimated 10% non-plastic fines and 90% fine to coarse sand. A Silt layer 5" thick (not sampled) occurs from 2.1-2.45 feet with estimated 90% non-plastic fines and 10% fine-grained sand. Pocket penetrometer = 2.5 tsf. With some rootlets.
						SC		3.4' - 4.7': **Clayey Sand** grayish brown, moist, dense, with estimated 25% low to medium plastic fines and 75% fine to coarse sand. With trace rootlets.
					5	CL		4.7' - 5.0': **Lean Clay with Sand** dark grayish brown, moist, hard, with estimated 85% low to medium plastic fines and 15% fine sand.
						SP-SM		5.0' - 6.1': **Poorly Graded Sand with Silt** brown, very moist, dense, with estimated 10% non-plastic fines and 90% fine to coarse sand. With trace iron-oxide staining.
					▼	SC		6.1' - 6.4': **Clayey Sand** dark brown, very moist, dense, with estimated 15% low plastic fines and 85% fine to coarse sand. Water sample collected on 6/17/04 and submitted for chemical analysis.
						SP		6.4' - 8.0': **Poorly Graded Sand** grayish brown, very moist to wet, medium dense, with estimated <5% non-plastic fines and 95% fine to coarse sand. Moderate water seeping at 7.2 feet at approximately 1 gallon per minute.
					10	CL		8.0' - 11.0': **Sandy Lean Clay** mottled from dark brown to dark green, wet, firm, with estimated 70% medium plastic fines and 30% fine to medium sand. Pocket penetrometer = 1.25-1.5 tsf.

- Install 3" diameter PVC pipe to observe the ground water table elevation. Ground water table elevation measured at 6.2 feet below the surface on 6/17/04.

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Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2w

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-21

DATE: 6/14/2004

TYPE OF HOE: Case 580 Super L Rubber tire back hoe

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: TWJ

GROUND ELEVATION (ft): 4450 (Topo)

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		0.0' - 1.0': **Silty Sand** grayish brown, dry, loose, with estimated 20% non-plastic fines, 75% fine to coarse sand, and 5% subangular to subrounded gravel to 1/4". With moderate rootlets.
B	GRAB					SP-SM		1.0' - 3.7': **Poorly Graded Sand with Silt and Gravel** brown, slightly moist, dense, with estimated 10% non-plastic fines, 65% fine to coarse sand, and 25%subrounded gravel to 1-1/4". With trace white clay filaments.
C	GRAB				5	SP-SM		3.7' - 5.3': **Poorly Graded Sand with Silt** brown, moist, very dense, with estimated 8% non-plastic fines and 92% fine to medium sand.
D	GRAB					SP-SM		5.3' - 7.0': **Poorly Graded Sand with Silt and Gravel** brown, moist, dense, with estimated 10% non-plastic fines, 65% fine to coarse sand, and 25% subrounded gravel to 1-1/2".
E	GRAB					SP		7.0' - 9.5': **Poorly Graded Sand** grayish brown, moist, dense, with estimated <5% non-plastic fines, 90% fine to coarse sand, and 5% subrounded gravel to 1".
F	GRAB				10	SP		9.5' - 11.0': **Poorly Graded Sand with Gravel** brownish gray, very moist, very dense, with estimated <5% non-plastic fines, 65% fine to coarse sand, and 30% subrounded gravel to 2".

Located 50 feet north of SE parcel corner. Test pit excavated on eastern side of barbed-wire fence.

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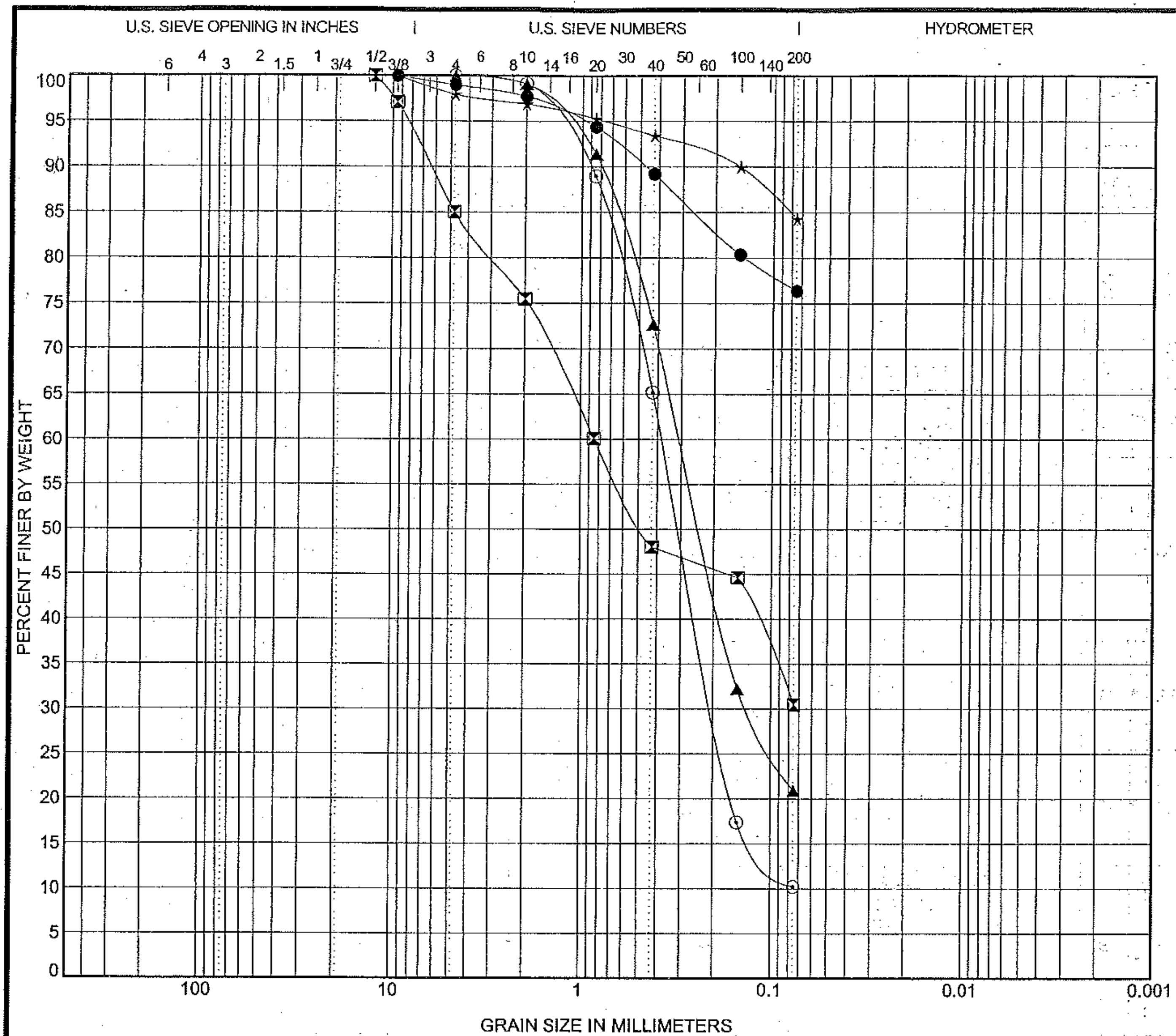
Centex Homes
Bella Vista Ranch
Reno, Nevada

PROJECT NO.: 0199-08-1

PLATE: 2x



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
●	B-01	5.0'	**LEAN CLAY with SAND (CL)**	**48**	**22**	**26**		
⊠	TP-02	2.0'	**SILTY SAND (SM)**	**77**	**41**	**36**		
▲	TP-09	1.2'	**SILTY, CLAYEY SAND (SC-SM)**	**29**	**22**	**7**		
★	TP-10	2.2'	**LEAN CLAY with SAND (CL)**	**49**	**23**	**26**		
⊙	TP-11	1.5'	**POORLY GRADED SAND with SILT (SP-SM)**	**NP**	**NP**	**NP**	**1.40**	**5.17**

	Specimen Identification		D100	D60	D30	D10	MC %	%Gravel	%Sand	%Silt	%Clay
●	B-01	5.0'	9.5				24.7	1.0	22.6	76.4	
⊠	TP-02	2.0'	12.5	0.846			81.6	15.0	54.6	30.5	
▲	TP-09	1.2'	4.75	0.307	0.131		19.1	0.0	79.1	20.9	
★	TP-10	2.2'	9.5				33.3	2.1	13.6	84.3	
⊙	TP-11	1.5'	4.75	0.38	0.197		15.0	0.0	89.8	10.2	

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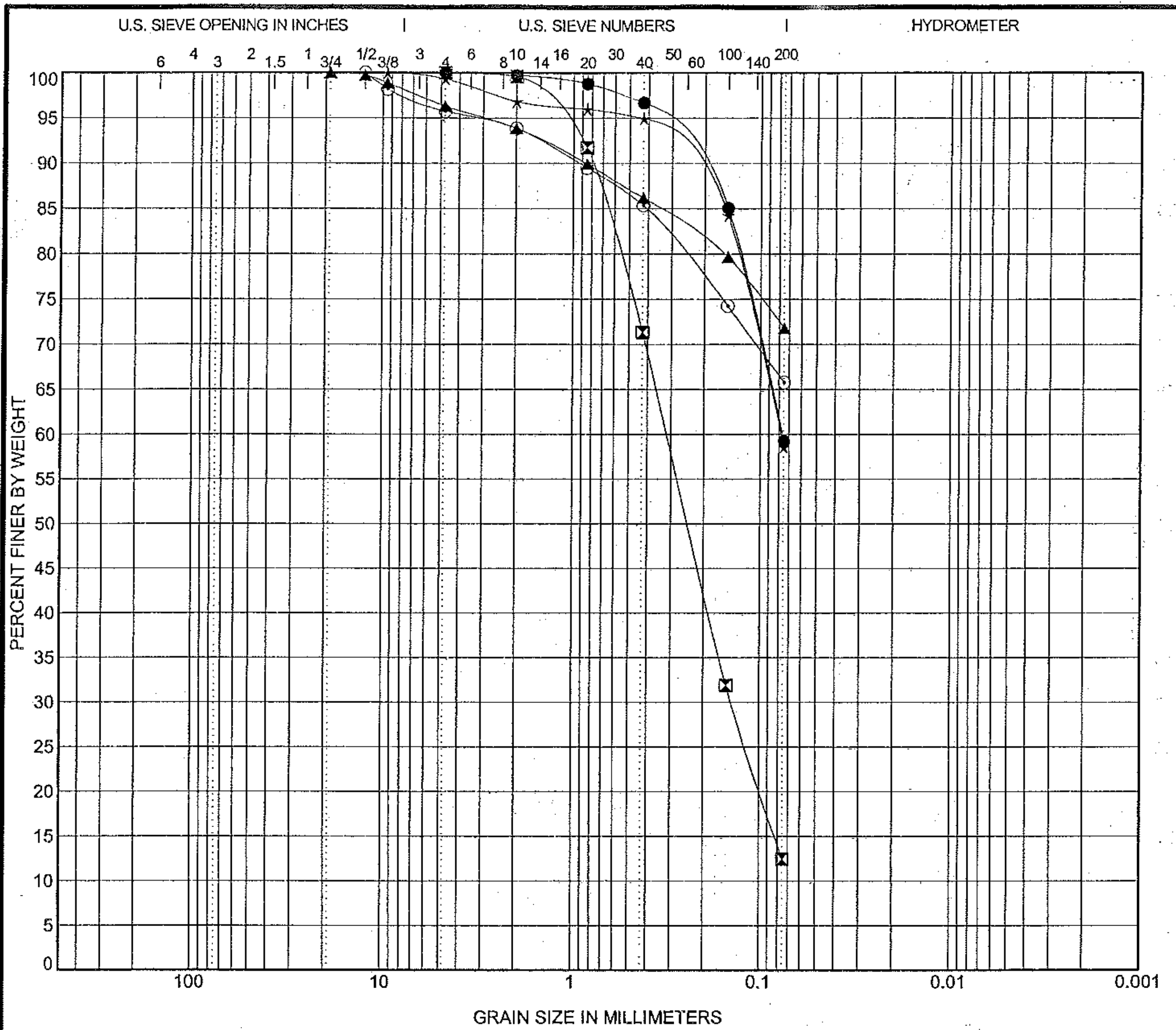
GRAIN SIZE DISTRIBUTION

Project: Bella Vista Ranch

Location: Reno, Nevada

Project Number: 0199-08-1 Plate Number: 4a



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			USCS Classification	LL	PL	PI	Cc	Cu
●	TP-13	3.5'	SANDY LEAN CLAY (CL)	35	24	11		
⊠	TP-14	2.0'	SILTY SAND (SM)	NP	NP	NP	0.91	4.59
▲	TP-17	0.0'	SILT with SAND (ML)	48	28	20		
★	TP-18	1.0'	SANDY LEAN CLAY (CL)	35	19	16		
⊙	TP-19	1.1'	SANDY SILT (ML)	41	29	12		

Specimen Identification			D100	D60	D30	D10	MC %	%Gravel	%Sand	%Silt	%Clay
●	TP-13	3.5'	4.75	0.077			10.9	0.0	40.7	59.3	
⊠	TP-14	2.0'	4.75	0.315	0.14		6.1	0.0	87.5	12.5	
▲	TP-17	0.0'	19				22.0	3.7	24.5	71.8	
★	TP-18	1.0'	9.5	0.078			30.1	0.7	40.8	58.6	
⊙	TP-19	1.1'	12.5				42.2	4.2	30.0	65.8	

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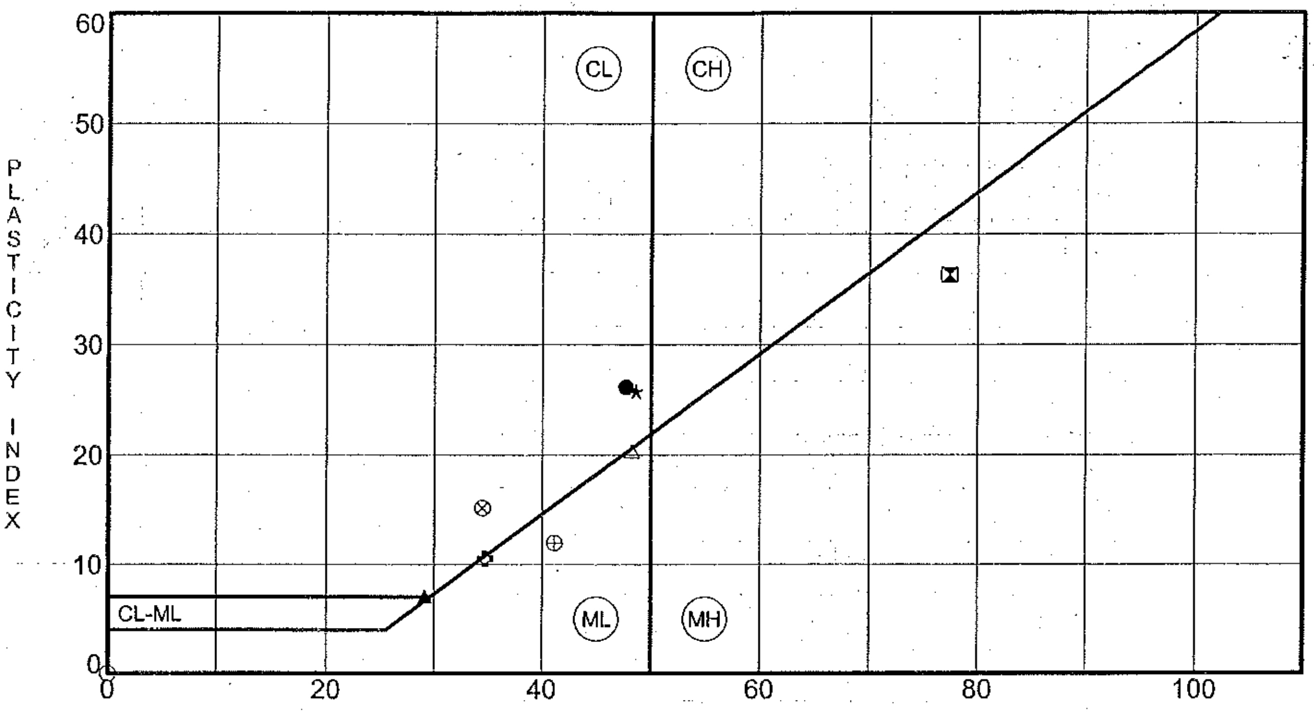
GRAIN SIZE DISTRIBUTION

Project: Bella Vista Ranch

Location: Reno, Nevada

Project Number: 0199-08-1 Plate Number: 4b

US GRAIN SIZE2 0199081.GPJ US LAB.GDT 8/2/2004



Specimen Depth in Feet.

	Specimen Identification		LL	PL	PI	Fines	USCS Classification
●	**B-01**	**5.0**	**48**	**22**	**26**	**76**	**LEAN CLAY with SAND (CL)**
⊠	**TP-02**	**2.0**	**77**	**41**	**36**	**30**	**SILTY SAND (SM)**
▲	**TP-09**	**1.2**	**29**	**22**	**7**	**21**	**SILTY, CLAYEY SAND (SC-SM)**
★	**TP-10**	**2.2**	**49**	**23**	**26**	**84**	**LEAN CLAY with SAND (CL)**
⊙	**TP-11**	**1.5**	**NP**	**NP**	**NP**	**10**	**POORLY GRADED SAND with SILT (SP-SM)**
✿	**TP-13**	**3.5**	**35**	**24**	**11**	**59**	**SANDY LEAN CLAY (CL)**
○	**TP-14**	**2.0**	**NP**	**NP**	**NP**	**12**	**SILTY SAND (SM)**
△	**TP-17**	**0.0**	**48**	**28**	**20**	**72**	**SILT with SAND (ML)**
⊗	**TP-18**	**1.0**	**35**	**19**	**16**	**59**	**SANDY LEAN CLAY (CL)**
⊕	**TP-19**	**1.1**	**41**	**29**	**12**	**66**	**SANDY SILT (ML)**

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ATTERBERG LIMITS RESULTS

Project: Bella Vista Ranch

Location: Reno, Nevada

Project Number: 0199-08-1 Plate Number: 4c

Western Environmental Testing Laboratory
Analytical Report

Black Eagle Consulting, Inc.		EPA Lab ID:	NV004
1345 Capital Blvd, Suite A		Received:	06/17/04
Reno, NV 89502		Lab Sample ID:	406-120-1/3
Attn:	Ron Weber	Reported:	06/25/04

Phone: 359-6600 Fax: 359-7766

Project Name/Number:	Bella Vista Ranch / 199-08-1
Sample ID:	See Below
Date/Time Collected:	See Below
Sampled By:	Client

Parameter	Method	Results	Units	Analyzed
TP 17 A+B 0-1.3 6/15/04 @ 0400				
Chloride	300.0	310	mg/kg	06/24/04
pH	9045B	8.44	SU	06/21/04
Resistivity	2510B	530	Ω.cm	06/21/04
Sulfate	300.0	76	mg/kg	06/24/04
Boron	200.7	92	mg/kg	06/22/04
TP 14 B 2-2.7' 6/16/04 @ 0400				
Chloride	300.0	520	mg/kg	06/24/04
pH	9045B	7.64	SU	06/21/04
Resistivity	2510B	540	Ω.cm	06/21/04
Sulfate	300.0	51	mg/kg	06/24/04
Boron	200.7	29	mg/kg	06/22/04
TP 9 B 1.2-2.2 6/16/04 @ 0400				
Chloride	300.0	950	mg/kg	06/24/04
pH	9045B	8.24	SU	06/21/04
Resistivity	2510B	270	Ω.cm	06/21/04
Sulfate	300.0	200	mg/kg	06/24/04
Boron	200.7	94	mg/kg	06/22/04

Comments: The pH and Resistivity analyses were performed on a paste extract.

Plate 5a
Project No.: 0199-08-1

ASmith

Andy Smith, Lab Manager

Western Environmental Testing Laboratory
Analytical Report

Black Eagle Consulting, Inc.
1345 Capital Blvd, Suite A
Reno, NV 89502
Attn: Ron Weber

Phone: 359-6600 Fax: 359-7766

EPA Lab ID: NV004
Received: 06/17/04
Lab Sample ID: 406-120-4/5
Reported: 06/25/04

Project Name/Number: Bella Vista Ranch / 199-08-1
Sample ID: See Below
Date/Time Collected: See Below
Sampled By: Client

Parameter	Method	Results	Units	Analyzed
TP-3 B 2-5 6/17/04 @ 0400				
Chloride	300.0	49	mg/kg	06/24/04
pH	9045B	9.04	SU	06/21/04
Resistivity	2510B	1400	Ω.cm	06/21/04
Sulfate	300.0	25	mg/kg	06/24/04
Boron	200.7	25	mg/kg	06/22/04
TP-5 A 1-2.5 6/17/04 @ 0400				
Chloride	300.0	900	mg/kg	06/25/04
pH	9045B	9.02	SU	06/21/04
Resistivity	2510B	160	Ω.cm	06/21/04
Sulfate	300.0	490	mg/kg	06/24/04
Boron	200.7	140	mg/kg	06/22/04

Comments: The pH and Resistivity analyses were performed on a paste extract.

Plate 5b
Project No.: 0199-08-1

Andy Smith, Lab Manager

Western Environmental Testing Laboratory
Analytical Report

Black Eagle Consulting, Inc.		EPA Lab ID:	NV004
1345 Capital Blvd, Suite A		Received:	06/17/04
Reno, NV 89502		Lab Sample ID:	406-121-1/5
Attn:	Ron Weber	Reported:	07/01/04

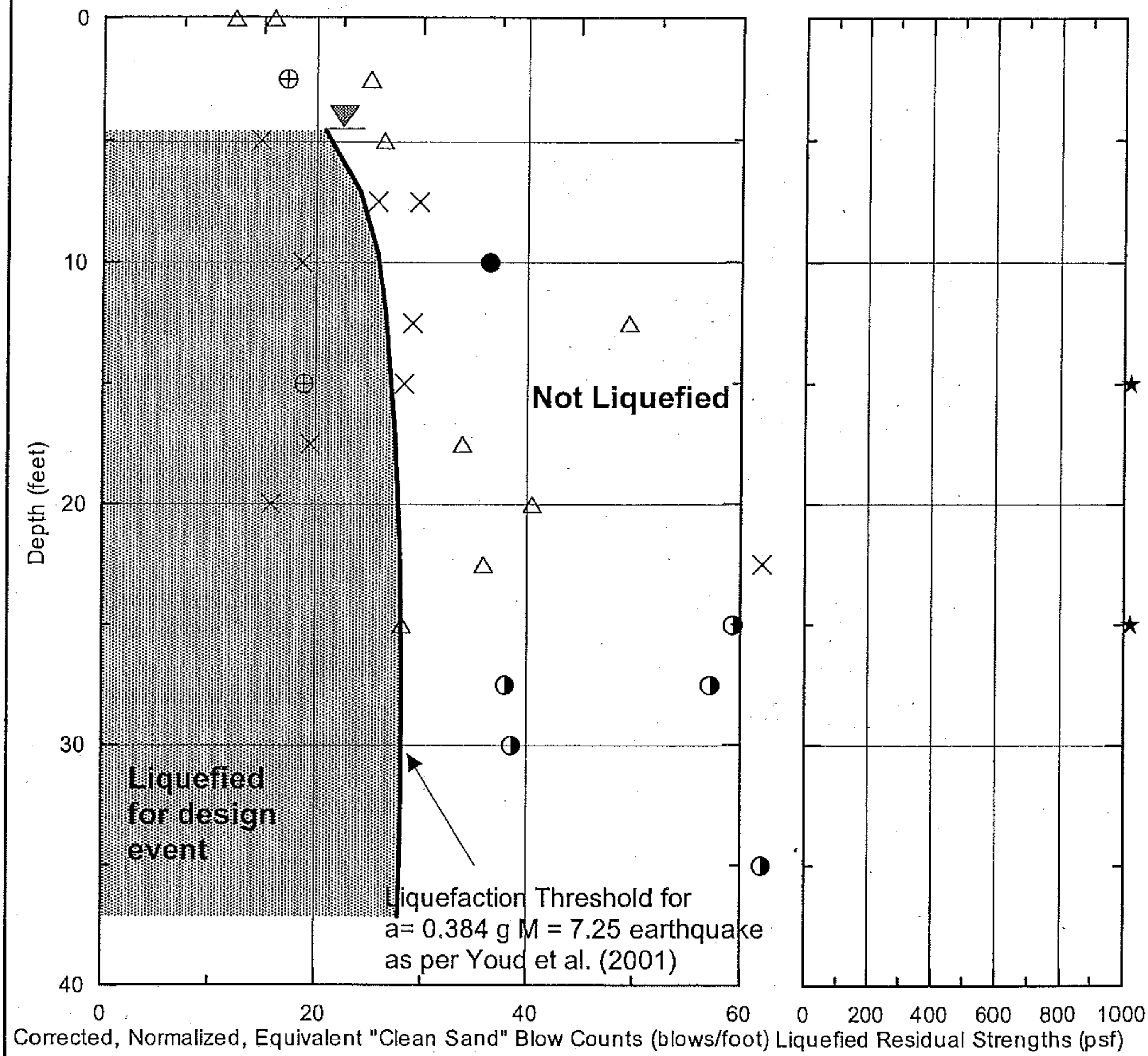
Phone: 359-6600 Fax: 359-7766

Project Name/Number: Bella Vista Ranch / 0199-08-1
Sample ID: See Below
Date/Time Collected: See Below
Sampled By: Client

Parameter	Method	Results	Units	Analyzed
B-2 6.9'				
Boron	200.7	30	ppm	06/23/04
TP-2 2.7'				
Boron	200.7	5.3	ppm	06/23/04
TP-16 4.0'				
Boron	200.7	81	ppm	06/30/04
TP-19 4.0'				
Boron	200.7	32	ppm	06/23/04
TP-20 6.2'				
Boron	201	11	ppm	06/23/04

Plate 5c
Project No.: 0199-08-1

Andy Smith, Lab Manager



● ● ●	Clean sands or gravels (SP,GP)
◑ ◑ ◑	Sand with Silt (SP-SM)
⊕ ⊕ ⊕	Silty Sand (SM)
△ △ △	Clayey Sand (SC) questionable liquefaction potential
× × ×	Cohesive Soils - Non-liquefiable
———	Liquefaction Threshold

SPT data from Borings B-02 and B-03.
Liquefied strength estimated using Seed and Harder (1991); points to right of graph indicate values above correlated range.

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CENTEX HOMES
LIQUEFACTION POTENTIAL VERSUS DEPTH, BORING B-02 AND B-03
BELLA VISTA RANCH
RENO, NEVADA

Project No:
0185-07-2

Plate 6

APPENDIX A

Liquefaction Analyses

BLACK EAGLE CONSULTING INC.
Geotechnical and Construction Services

Date: 8/19/2004
Revision No: jwp0311 el
Developed by: JWP
Calculated by: JP/TJ
Checked by: JP

Project Name: Bella Vista Ranch
Project Number: 0199-08-1 other comments

STANDARD PENETRATION TEST (SPT) CORRECTION FOR LIQUEFACTION ANALYSIS FOR BORINGS BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS

Only cells with blue background and blue text should be modified This version (030905) conforms more closely with MathCAD sheet (version jwp0309)

Location: meadow Boring ID: B-03 Borehole Diameter (in): 6
Elevation: 4441 Depth to GW Exploration (ft): 4.6 Length of Drill Rod above GS
Depth to groundwater during Earthquake (ft): 4.6 to Hammer (ft): 5
Sampler Type(standard 1-3/8" ID=1, Sampler without Liners 1-1/2" ID = 2): 1
Hammer Type (Cathead=1, Trip Hammer=2, Correction Data=3): 3
Corrected Hammer Efficiency as % of Theoretical Energy (if 3 above): 68%
Soil Unit Weight Above WT (pcf): 120

Elimination Codes:
MC Modified Cal or other sampler
SA clean sand (or blank)
SS Sand with 5 - 15% silt
SM Sand with >15% silt
SC Sand with >15% clay
EL Layer elimination
X non-liquefiable consistency

Clean sand correction: If FC >35%, computed as for FC = 35%
Normalize to 1 atm

Boring ID	Top Depth ft	Description	N_{field} Blowcount	Sample Plastic-ity %	(Lab/Est)	Fines Content %	(Lab/Est)	Gravel Content%	(Lab/Est)	Elimin-ation Code	Soil Total Unit Wt (pcf)	During Exploration: σ_{vo} at Mid Depth of Sample psf	During Exploration: σ'_{vo} at Mid-Depth of Sample psf	Design EQ: σ_{vo} at Mid Depth of Sample psf	Design EQ: σ'_{vo} at Mid-Depth of Sample psf	Normalization to 65% energy: Normize to 1 atm C_n	Ham-mer Cer	Brg Diam Cb	Sam-pler ID Cs	Rod Length Cr	$(N1)_{60}$	Clean Sand Correction: α	β	$(N1)_{60}CS$
B-03	4.6	:Depth to Water Table						Soil Unit Wt Above Wt:		A	120	672		672	=Overstated by 1 ft x wt below water table for sample middepth									
B-03	0	SP-SM; SF; ML; CL	6	5%	est	35%	est	0%	est	SC	120	120	120	120	120	1.70	1.13	1.05	1	0.75	9.1	NA	1.20	15.9
B-03	2.5	SC-SM; SM PP=0-2.0	8	0%	est	22%	est	1%	est	SM	120	420	420	420	420	1.70	1.13	1.05	1	0.75	12.1	3.93	1.09	17.2
B-03	5	SM; CH; SM PP=0-1.2	5	22%	est	55%	est	3%	est	X	120	720	632.64	720	632.64	1.70	1.13	1.05	1	0.8	8.1	NA	1.20	14.7
B-03	7.5	CL(S); SM PP=0-2.3	11	20%	est	60%	est	2%	est	X	120	1020	776.64	1020	776.64	1.65	1.13	1.05	1	0.8	17.3	NA	1.20	25.7
B-03	10	CL; SP-SM PP = 0-0.5	22	0%	est	12%	est	0%	est	SA	120	1320	920.64	1320	920.64	1.52	1.13	1.05	1	0.85	33.7	1.55	1.03	36.4
B-03	12.5	SM;SC-SM PP=0.5-1.3	28	5%	est	27%	est	0%	est	SC	120	1620	1064.64	1620	1064.64	1.41	1.13	1.05	1	0.85	39.9	4.46	1.13	49.6
B-03	15	CL;SC-SM PP=1.3-2.8	13	20%	est	80%	est	0%	est	X	120	1920	1208.64	1920	1208.64	1.32	1.13	1.05	1	0.95	19.4	NA	1.20	28.3
B-03	17.5	SC PP = 0.5-1.3	17	12%	est	37%	est	0%	est	SC	120	2220	1352.64	2220	1352.64	1.25	1.13	1.05	1	0.95	24.0	NA	1.20	33.8
B-03	20	SC;SP-SM;CL PP=0-1.3	22	10%	est	40%	est	0%	est	SC	120	2520	1496.64	2520	1496.64	1.19	1.13	1.05	1	0.95	29.6	NA	1.20	40.5
B-03	22.5	SC-SM; CL PP=0.5	20	13%	est	35%	est	0%	est	SC	120	2820	1640.64	2820	1640.64	1.14	1.13	1.05	1	0.95	25.7	NA	1.20	35.8
B-03	25	SC-SM;SM PP=0.5-2.3	18.00	5%	est	22%	est	0%	est	SC	120	3120	1784.64	3120	1784.64	1.09	1.13	1.05	1	0.95	22.2	3.93	1.09	28.1
B-03	27.5	GP	32	0%	est	5%	est	82%	est	SS	120	3420	1928.64	3420	1928.64	1.05	1.13	1.05	1	0.95	37.9	0.00	1.00	37.9
B-03	30	GP	32.00	0%	est	5%	est	82%	est	SS	120	3720	2072.64	3720	2072.64	1.01	1.13	1.05	1	1	38.5	0.00	1.00	38.5
B-03	35	NO RETURN	0.0	0%	est	0%	est	0%	est		120	4320	2360.64	4320	2360.64	0.95	1.13	1.05	1	1	0.0	0.00	1.00	0.0
B-03												4320	4320	4320	4320	0.70	1.13	1.05	1	0.75	0.0	0.00	1.00	0.0
B-03												4320	4320	4320	4320	0.70	1.13	1.05	1	0.75	0.0	0.00	1.00	0.0
B-03												4320	4320	4320	4320	0.70	1.13	1.05	1	0.75	0.0	0.00	1.00	0.0
B-03												4320	4320	4320	4320	0.70	1.13	1.05	1	0.75	0.0	0.00	1.00	0.0
Averages	16.4		16.7	8%		31%		12%													17.6			22.4
St Devs	10.8		10.1	8%		23%		30%													14.6			16.8

"NL" indicates sample is outside of range of liquefiable soil types

Depth compared to MathCAD evalation: Are results comparable?

Copy row:	27.5	GP	32	0	est	0.05	est	0.82	est	SS	120	3420	1928.64	3420	1928.64	1.047	1.13	1.05	1	0.95	37.89	0	1	37.940094
Check:																								

Comparison OK? y
All SPT locations are driven 1.5 feet y

Energy Ratio correction relative to 60% theoretical hammer energy
Cer = 90% if safety hammer
75% if donut hammer
130% if automatic hammer
This means that actual hammer energy for safety hammer is 90%x65% = 58%
if hammer calibration value is available, it will be used in same manner

Borehole Diameter
Cb = 1 if 2.5 to 4.5 inches 1.3
1.05 if 6 inches
1.15 if 8 inches

Rod Length - assume rod is probably at least 5 feet longer than the hole is deep
Cr = 1 if > 30 feet
0.95 if 20 to 30 feet
0.85 if 13 to 20 feet
0.75 if 10 to 13 feet

Sampling Method
Cs = 1 1-3/8" ID sampler (with liner or no liner space)
1.2 1-1/2" ID sampler (space for liners, liners not used)

BLACK EAGLE CONSULTING INC.
Geotechnical and Construction Services

Date: 8/19/2004
Revision No: v0311
Developed by: JWP
Calculated by: JWP/TI
Checked by:

Project Name: Bella Vista Ranch
Project Number: 0199-03-1

COMPUTE LIQUEFACTION CYCLIC STRESS AND REDUCTION RATIOS
Only cells with blue background and red text should be modified

Boring or Zone of Interest: B-03

	Curve1	Curve2
Moment Magnitude of EQ (Mw):	7.5	7.5
Horizontal Peak Ground Accel (g):	0.384	0.384
Depth to Groundwater (ft):	4.6	5
Magnitude Scaling Factor:	1.00	1.00

where N160cs is greater than 33.5, max value of CRR of 2.24 is used

COPIED CELLS:

Boring	Depth	Elevation	(N1)60	(N1)60CS	Description	Sample Plasticity	Sample Gravel Content	Elimin-ation Code	σvo at Mid Depth of Sample at EQ psf	σ'vo at Mid-Depth of Sample at EQ psf	Use Curve 1, 2, or both 0
meadow		EQ Water Level:			4.6	ft depth					
B-03	0	4441	9.1	15.9	SM; SP; ML;	5%	0%	SC	120	120	1
B-03	2.5	4438.5	12.1	17.2	M; SM PP=	0%	1%	SM	420	420	1
B-03	5	4436	8.1	14.7	CH; SM PP=	22%	3%	X	720	632.64	1
B-03	7.5	4433.5	17.3	25.7	S); SM PP=	20%	2%	X	1020	776.64	1
B-03	10	4431	33.7	36.4	PP = 0-0.5	0%	0%	SA	1320	920.64	1
B-03	12.5	4428.5	39.9	49.6	C-SM PP=(	5%	0%	SC	1620	1064.64	1
B-03	15	4426	19.4	28.3	C-SM PP=1	20%	0%	X	1920	1208.64	1
B-03	17.5	4423.5	24.0	33.8	PP = 0.5-	12%	0%	SC	2220	1352.64	1
B-03	20	4421	29.8	40.5	-SM;CL PP	10%	0%	SC	2520	1496.64	1
B-03	22.5	4418.5	25.7	35.8	SM; CL PP	13%	0%	SC	2820	1640.64	1
B-03	25	4416	22.2	28.1	M;SM PP=(	5%	0%	SC	3120	1784.64	1
B-03	27.5	4413.5	37.9	37.9	GP	0%	82%	SS	3420	1928.64	1
B-03	30	4411	38.5	38.5	GP	0%	82%	SS	3720	2072.64	1
B-03	35	4406	0.0	0.0	NO RETURI	0%	0%		4320	2360.64	1
Averages	16.4		22.7	28.8							
St Devs	10.8		12.5	13.1							

Boring	Depth	CRR for Mw7.5, clean non-plastic sand	Stress Reduction Rd	Curve 1 Cyclic Stress Ratio1	Gravel Scaling Factor GCSF	Plastic Index Scaling factor PISF	CSR1	Curve 2 Cyclic Stress Ratio2	Gravel Scaling Factor GCSF	Plastic Index Scaling factor PISF	CSR2	Factor of Safety Curve 1	Description	Factor of Safety Curve 2	Description	Seed and Harder su psf	
meadow			1.00			NA				NA							
B-03	0	0.169	1.00	0.25	1.00	1.00	0.250	0.25	1.00	1.00	0.250	0.88	Hazard	na	na	HALF	
B-03	2.5	0.183	0.99	0.25	1.01	1.00	0.250	0.25	1.01	1.00	0.250	0.73	Hazard	na	na	HALF	
B-03	5	0.157	0.99	0.28	1.02	1.26	0.228	0.28	1.02	1.26	0.228	0.69	Hazard	na	na		X
B-03	7.5	0.307	0.96	0.32	1.02	1.22	0.268	0.32	1.02	1.22	0.285	1.14	Negligible	na	na		X
B-03	10	2.243	0.98	0.35	1.00	1.00	0.350	0.35	1.00	1.00	0.350	6.42	Negligible	na	na		
B-03	12.5	2.243	0.97	0.37	1.00	1.00	0.369	0.37	1.00	1.00	0.389	6.08	Negligible	na	na		
B-03	15	0.382	0.97	0.38	1.00	1.22	0.314	0.38	1.00	1.22	0.314	1.22	Negligible	na	na		X
B-03	17.5	2.243	0.96	0.39	1.00	1.04	0.377	0.39	1.00	1.04	0.377	5.96	Negligible	na	na		
B-03	20	2.243	0.95	0.40	1.00	1.00	0.401	0.40	1.00	1.00	0.401	5.60	Negligible	na	na		
B-03	22.5	2.243	0.95	0.41	1.00	1.07	0.381	0.41	1.00	1.07	0.381	5.88	Negligible	na	na		
B-03	25	0.375	0.94	0.41	1.00	1.00	0.411	0.41	1.00	1.00	0.411	0.91	Hazard	na	na	HALF	
B-03	27.5	2.243	0.94	0.41	1.91	1.00	0.791	0.41	1.91	1.00	0.791	2.84	Negligible	na	na		
B-03	30	2.243	0.93	0.42	1.91	1.00	0.793	0.42	1.91	1.00	0.793	2.83	Negligible	na	na		
B-03	35	0.049	0.89		1.00	1.00			1.00	1.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	
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St Devs												#VALUE!		#VALUE!			

Depth compared to MathCAD evalation: Are results comparable?

Copy row:	0	9.1	########	SM; SP; ML; CL	120	120	1	0.25	1	1	0.24969	1	1	0.24969	0.679	Hazard	na	na	
Check:																			
Comparison OK?	Nearly																		

Rd — Linear fit of average smear of stress reduction curves with depth
If(Depth<30 ft, Rd = 1-0.00233*Depth
If(Depth<75 ft, Rd = 1.174-0.00822*Depth;
otherwise Rd is 0.56

Seed and Harder Strength Lookup

0	0	6	0
5	0	10	100
10	100	13	270

BLACK EAGLE CONSULTING INC.
Geotechnical and Construction Services

Date:	7/15/2004
Revision No:	v0311
Developed by:	JWP
Calculated by:	TJJ
Checked by:	

Project Name: Bella Vista Ranch
Project Number: 0199-08-1

NCRR CURVE FOR LIQUEFACTION GRAPHICS FOR BORINGS BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS

Only cells with blue background and blue text should be modified

Location: **Boring ID:** B-03
Surf Elev ft: 4441 epth to Groundwater (ft): 4.6
Soil Unit Weight Above Groundwater (pcf): 120

	Curve1
Moment Magnitude of EQ (Mw):	7.25
Horizontal Peak Ground Accel (g):	0.384
Depth to Groundwater (ft):	4.6
Magnitude Scaling Factor:	1.09

Boring ID	Top Depth ft	Soil Total Unit Wt (pcf)	σ_{vo} at Mid-Depth of Sample psf	σ'_{vo} at Mid-Depth of Sample psf	Stress Reduction Rd	CSR with depth for M and clean sand	Ncrr corresponding to CSR
B-03	4.6	120	552	552	0.99	0.226	20.832
B-03	7.1	120	852	696	0.98	0.276	24.112
B-03	9.6	120	1152	840	0.98	0.307	25.689
B-03	12.1	120	1452	984	0.97	0.328	26.538
B-03	17.1	120	2052	1272	0.96	0.355	27.470
B-03	22.1	120	2652	1560	0.95	0.369	27.986
B-03	27.1	120	3252	1848	0.94	0.377	28.161
B-03	32.1	120	3852	2136	0.91	0.376	28.127
B-03	37.1	120	4452	2424	0.87	0.365	27.853
B-03	42.1	120	5052	2712	0.83	0.353	27.416
B-03	47.1	120	5652	3000	0.79	0.339	26.930
B-03	52.1	120	6252	3288	0.75	0.325	26.408
B-03	57.1	120	6852	3576	0.70	0.309	25.797

Boring ID:	B-03
Location:	0
Depth to Groundwater (ft):	4.6
Moment Magnitude of EQ (Mw):	7.25
Horizontal Peak Ground Accel (g):	0.384
Depth to Groundwater (ft):	4.6
Summary of Resul Elevation:	4441

Top Depth ft	Elevation	Ncrr NP CS corresponding to CSR value
4.6	4436.4	20.832
7.1	4433.9	24.112
9.6	4431.4	25.689
12.1	4428.9	26.538
17.1	4423.9	27.470
22.1	4418.9	27.986
27.1	4413.9	28.161
32.1	4408.9	28.127
37.1	4403.9	27.853
42.1	4398.9	27.416
47.1	4393.9	26.930
52.1	4388.9	26.408
57.1	4383.9	25.797

This analysis assumes there are no significant adjustments to CSR for plasticity or gravel content
These adjustments should modify the CSR value of the data, not the CSR for the clean sand, no fines, no gravel curve.
Because magnitude factors are made to adjust the N160 values, curve is made for M= 7.5
CRR vs N curve (from Raush Formula) for interpolation **Resulting curve:**

BLACK EAGLE CONSULTING INC.
Geotechnical and Construction Services

Date: 7/14/2004
Revision No: jwp0311 el
Developed by: JWP
Calculated by: JP/TJ
Checked by:

Project Name: Bella Vista Ranch
Project Number: 0199-08-1 other comments

STANDARD PENETRATION TEST (SPT) CORRECTION FOR LIQUEFACTION ANALYSIS FOR BORINGS BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS

Only cells with blue background and blue text should be modified

This version (030905) conforms more closely with MathCAD sheet (version jwp0309)

Location: 880 ft. SE Boring ID: B-02 Borehole Diameter (in): 6
Elevation: 4431 Depth to GW Exploration (ft): 6.9 Length of Drill Rod above GS
Depth to groundwater during Earthquake (ft): 6.9 to Hammer (ft): 5
Sampler Type(standard 1-3/8" ID=1, Sampler without Liners 1-1/2" ID = 2): 1
Hammer Type (Cathead=1, Trip Hammer=2, Correction Data=3): 3
Corrected Hammer Efficiency as % of Theoretical Energy (if 3 above): 68%
Soil Unit Weight Above WT (pcf): 120

Elimination Codes:

MC	Modified Cal or other sampler	EL	Layer elimination
SA	clean sand (or blank)	X	non-liquefiable consistency
SS	Sand with 5 - 15% silt		
SM	Sand with >15% silt		
SC	Sand with >15% clay		

Clean sand correction: If FC >35%, computed as for FC = 35%

Normalize to 1 atm

Boring ID	Top Depth ft	Description	N_{field} Blowcount	Sample Plastic-ity %	(Lab/Est)	Fines Content %	(Lab/Est)	Gravel Content%	(Lab/Est)	Elimin-ation Code	Soil Total Unit Wt (pcf)	During Exploration: σ_{vo} at Mid Depth of Sample psf	During Exploration: σ'_{vo} at Mid-Depth of Sample psf	Design EQ: σ_{vo} at Mid Depth of Sample psf	Design EQ: σ'_{vo} at Mid-Depth of Sample psf	Normalization to 65% energy: Normlze to 1 atm C_n	Ham-mer Cer	Brg Diam Cb	Sam-pler ID Cs	Rod Length Cr	$(N1)_{60}$	Clean Sand Correction: α	β	$(N1)_{60}CS$
B-02	6.9	:Depth to Water Table						Soil Unit Wt Above Wt:		A	120	948		948	=Overstated by 1 ft x wt below water table for sample middepth									
B-02	0	SM; CL PP=4.0	4	20%	est	60%	est	0%	est	SC	120	120	120	120	120	1.70	1.13	1.05	1	0.75	6.1	NA	1.20	12.3
B-02	2.5	CL, SP-SM PP=0-2.8	11	10%	est	50%	est	0%	est	SC	120	420	420	420	420	1.70	1.13	1.05	1	0.75	16.7	NA	1.20	25.0
B-02	5	CL; SP PP=0.8-1.8	13	10%	est	20%	est	0%	est	SC	120	720	720	720	720	1.70	1.13	1.05	1	0.8	21.0	3.61	1.08	26.3
B-02	7.5	CL(S); SM PP=1.5-2.3	15	12%	est	30%	est	1%	est	X	120	1020	920.16	1020	920.16	1.52	1.13	1.05	1	0.8	21.7	4.71	1.15	29.7
B-02	10	CL PP = 1.5	8	17%	est	75%	est	1%	est	X	120	1320	1064.16	1320	1064.16	1.41	1.13	1.05	1	0.85	11.4	NA	1.20	18.7
B-02	12.5	CL; SM PP=2.8-3.5	15	15%	est	75%	est	5%	est	X	120	1620	1208.16	1620	1208.16	1.32	1.13	1.05	1	0.85	20.1	NA	1.20	29.1
B-02	15	SM;SC-SM PP=0.5-2.5	10	0%	est	20%	est	6%	est	SM	120	1920	1352.16	1920	1352.16	1.25	1.13	1.05	1	0.95	14.1	3.61	1.08	18.9
B-02	17.5	SC;SC-SM PP=1-1.5	9	5%	est	35%	est	0%	est	X	120	2220	1496.16	2220	1496.16	1.19	1.13	1.05	1	0.95	12.1	NA	1.20	19.5
B-02	20	SC PP=1-1.5	7	5%	est	40%	est	0%	est	X	120	2520	1640.16	2520	1640.16	1.14	1.13	1.05	1	0.95	8.0	NA	1.20	15.8
B-02	22.5	SC; GP-GM PP=1-1.5	50	2%	est	10%	est	35%	est	X	120	2820	1784.16	2820	1784.16	1.09	1.13	1.05	1	0.95	61.6	0.87	1.02	63.8
B-02	25	GP-GM	50.00	0%	est	5%	est	70%	est	SS	120	3120	1928.16	3120	1928.16	1.05	1.13	1.05	1	0.95	59.2	0.00	1.00	59.3
B-02	27.5	GP	50	0%	est	5%	est	75%	est	SS	120	3420	2072.16	3420	2072.16	1.01	1.13	1.05	1	0.95	57.1	0.00	1.00	57.2
B-02	35	GP	82.00	0%	est	7%	est	30%	est	SS	120	4320	2504.16	4320	2504.16	0.92	1.13	1.05	1	1	89.7	0.12	1.01	90.6
B-02	40	NO RETURN	0.0	0%	est	0%	est	0%	est		120	4920	2792.16	4920	2792.16	0.87	1.13	1.05	1	1	0.0	0.00	1.00	0.0
B-02												4920	4920	4920	4920	0.66	1.13	1.05	1	0.75	0.0	0.00	1.00	0.0
B-02												4920	4920	4920	4920	0.66	1.13	1.05	1	0.75	0.0	0.00	1.00	0.0
B-02												4920	4920	4920	4920	0.66	1.13	1.05	1	0.75	0.0	0.00	1.00	0.0
B-02												4920	4920	4920	4920	0.66	1.13	1.05	1	0.75	0.0	0.00	1.00	0.0
Averages	17.1		23.1	7%		31%		16%													22.2			25.9
St Devs	12.0		24.5	7%		26%		27%													26.5			26.0

"NL" indicates sample is outside of range of liquefiable soil types

Depth compared to MathCAD evalation: Are results comparable?

Copy row:	27.5	GP	50	0	est	0.05	est	0.75	est	SS	120	3420	2072.16	3420	2072.16	1.011	1.13	1.05	1	0.95	57.12	0	1	57.19014
Check:																								

Comparison OK? y

All SPT locations are driven 1.5 feet y

Energy Ratio correction relative to 60% theoretical hammer energy

Cer =
90% if safety hammer
75% if donut hammer
130% if automatic hammer

This means that actual hammer energy for safety hammer is 90%x65% = 58%
if hammer calibration value is available, it will be used in same manner

Borehole Diameter

Cb =
1 if 2.5 to 4.5 inches 1.3
1.05 if 6 inches
1.15 if 8 inches

Sampling Method

Cs =
1 1-3/8" ID sampler (with liner or no liner space)
1.2 1-1/2" ID sampler (space for liners, liners not used)

Rod Length - assume rod is probably at least 5 feet longer than the hole is deep

Cr =
1 if > 30 feet
0.95 if 20 to 30 feet
0.85 if 13 to 20 feet
0.75 if 10 to 13 feet

BLACK EAGLE CONSULTING INC.
Geotechnical and Construction Services

Project Name: Bella Vista Ranch
Project Number: 0199-08-1

Date: 8/19/2004
Revision No: v0311
Developed by: JWP
Calculated by: JWP/TJ
Checked by:

COMPUTE LIQUEFACTION CYCLIC STRESS AND REDUCTION RATIOS

Only cells with blue background and red text should be modified

Boring or Zone of Interest: B-02

	Curve1	Curve2
Moment Magnitude of EQ (Mw):	7.5	7.5
Horizontal Peak Ground Accel (g):	0.384	0.384
Depth to Groundwater (ft):	5	8
Magnitude Scaling Factor:	1.00	1.00

where N160cs is greater than 33.5, max value of CRR of 2.24 is used

COPIED CELLS:

Boring	Depth	Elevation	(N1)60	(N1)60CS	Description	Sample Plasticity	Sample Gravel Content	Elimin-ation Code	σvo at Mid Depth of Sample at EQ psf	σ'vo at Mid-Depth of Sample at EQ psf	Use Curve 1, 2, or both 0	CRR for M=7.5, clean non-plastic sand	Stress Reduction Rd	Curve 1 Cyclic Stress Ratio1	Gravel Scaling Factor GCSF	Plastic index Scaling factor PISF	CSR1	Curve 2 Cyclic Stress Ratio2	Gravel Scaling Factor GCSF	Plastic Index Scaling factor PISF	CSR2	Factor of Safety Curve 1	Description	Factor of Safety Curve 2	Description	Seed and Harder su psf	
680 ft, SE TP-6		EQ Water Level:			6.9	ft depth																					
													1.00			NA				NA							
B-02	0	4431	6.07	12.28	M; CL PP=4	20%	0%	SC	120	120	1	0.134	1.00	0.25	1.00	1.22	0.205	0.25	1.00	1.22	0.205	0.65	Hazard	na	na	229	
B-02	2.5	4428.5	16.69	25.03	3P-SM PP=	10%	0%	SC	420	420	1	0.292	0.99	0.25	1.00	1.00	0.248	0.25	1.00	1.00	0.248	1.16	Negligible	na	na		
B-02	5	4426	21.04	26.33	SP PP=0.8	10%	0%	SC	720	720	1	0.321	0.99	0.25	1.00	1.00	0.247	0.25	1.00	1.00	0.247	1.30	Negligible	na	na		
B-02	7.5	4423.5	21.65	29.70	); SM PP=1	12%	1%	X	1020	920.16	1	0.448	0.98	0.27	1.01	1.04	0.263	0.27	1.01	1.04	0.263	1.71	Negligible	na	na		X
B-02	10	4421	11.41	18.69	CL PP = 1.5	17%	1%	X	1320	1064.16	1	0.200	0.98	0.30	1.01	1.15	0.264	0.30	1.01	1.15	0.264	0.78	Hazard	na	na		X
B-02	12.5	4418.5	20.08	29.10	SM PP=2.6	15%	5%	X	1620	1208.16	1	0.415	0.97	0.32	1.04	1.11	0.305	0.32	1.04	1.11	0.305	1.36	Negligible	na	na		X
B-02	15	4416	14.14	18.88	C-SM PP=(	0%	6%	SM	1920	1352.16	1	0.202	0.97	0.34	1.05	1.00	0.359	0.34	1.05	1.00	0.359	0.56	Hazard	na	na	HALF	
B-02	17.5	4413.5	12.10	19.52	.C-SM PP=	5%	0%	X	2220	1496.16	1	0.210	0.96	0.36	1.00	1.00	0.355	0.36	1.00	1.00	0.355	0.59	Hazard	na	na		X
B-02	20	4411	8.99	15.79	SC PP=1-1.	5%	0%	X	2520	1640.16	1	0.168	0.95	0.37	1.00	1.00	0.366	0.37	1.00	1.00	0.366	0.46	Hazard	na	na		X
B-02	22.5	4408.5	61.56	63.76	3P-GM PP=	2%	35%	X	2820	1784.16	1	2.243	0.95	0.37	1.26	1.00	0.472	0.37	1.26	1.00	0.472	4.75	Negligible	na	na		X
B-02	25	4406	59.2	59.3	GP-GM	0%	70%	SS	3120	1928.16	1	2.243	0.94	0.38	1.65	1.00	0.628	0.38	1.65	1.00	0.628	3.57	Negligible	na	na		
B-02	27.5	4403.5	57.1	57.2	GP	0%	75%	SS	3420	2072.16	1	2.243	0.84	0.39	1.76	1.00	0.678	0.39	1.76	1.00	0.678	3.31	Negligible	na	na		
B-02	35	4396	89.7	90.6	GP	0%	30%	SS	4320	2504.16	1	2.243	0.89	0.38	1.25	1.00	0.477	0.38	1.25	1.00	0.477	4.70	Negligible	na	na		
B-02	40	4391	0.0	0.0	NO RETURI	0%	0%		4920	2792.16	1	0.049	0.85		1.00	1.00			1.00	1.00	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	
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Averages	17.1		28.6	33.3																		#VALUE!		#VALUE!			
St Devs	12.0		26.9	24.9																		#VALUE!		#VALUE!			

Depth compared to MathCAD evalation: Are results comparable?

Copy row:	0		6.1	#########	M; CL PP=4.0				120	120	1			0.25		1.22	0.20466		1	1.22	0.204664	0.854	Hazard	na	na
Check:																									
Comparison OK?	Nearly																								

Rd

Linear fit of average smear of stress reduction curves with depth
If(Depth<30 ft,Rd = 1-0.00233*Depth
If(Depth<75 ft, Rd = 1.174-0.00822*Depth
otherwise Rd is 0.56

Seed and Harder Strength Lookup

0	0	8	0
6	0	10	100
10	100	13	270

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Geotechnical and Construction Services

Date:	7/15/2004
Revision No:	v0311
Developed by:	JWP
Calculated by:	TJ
Checked by:	

Project Name: Bella Vista Ranch
Project Number: 0199-08-1

NCRR CURVE FOR LIQUEFACTION GRAPHICS FOR BORINGS BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS

Only cells with blue background and blue text should be modified

Location: **Boring ID:** B-02
Surf Elev ft: 4431 epth to Groundwater (ft): 6.9
Soil Unit Weight Above Groundwater (pcf): 120

	Curve1
Moment Magnitude of EQ (Mw):	7.25
Horizontal Peak Ground Accel (g):	0.384
Depth to Groundwater (ft):	6.9
Magnitude Scaling Factor:	1.09

Boring ID	Top Depth ft	Soil Total Unit Wt (pcf)	σ_{vo} at Mid Depth of Sample psf	σ'_{vo} at Mid-Depth of Sample psf	Stress Reduction Rd	CSR with depth for M and clean sand	Ncrr corresponding to CSR
B-02	6.9	120	828	828	0.98	0.225	20.740
B-02	9.4	120	1128	972	0.98	0.260	23.137
B-02	11.9	120	1428	1116	0.97	0.285	24.575
B-02	14.4	120	1728	1260	0.97	0.303	25.512
B-02	19.4	120	2328	1548	0.95	0.329	26.553
B-02	24.4	120	2928	1836	0.94	0.344	27.106
B-02	29.4	120	3528	2124	0.93	0.354	27.456
B-02	34.4	120	4128	2412	0.89	0.349	27.278
B-02	39.4	120	4728	2700	0.85	0.341	26.981
B-02	44.4	120	5328	2988	0.81	0.330	26.607
B-02	49.4	120	5928	3276	0.77	0.318	26.177
B-02	54.4	120	6528	3564	0.73	0.305	25.580
B-02	59.4	120	7128	3852	0.69	0.290	24.861

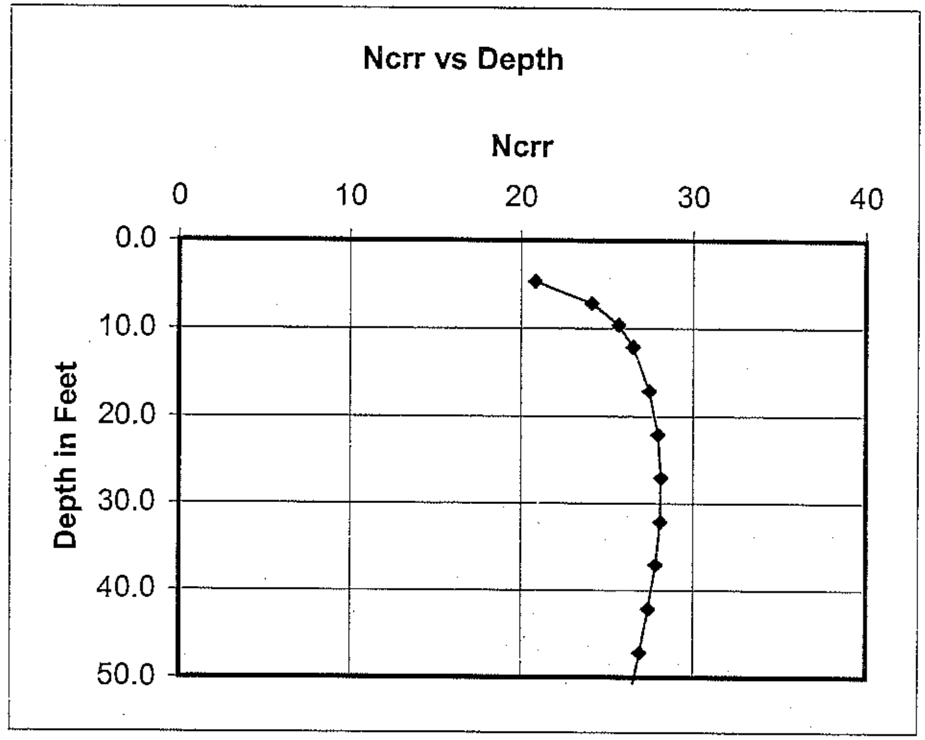
Boring ID:	B-02
Location:	0
Depth to Groundwater (ft):	6.9
Moment Magnitude of EQ (Mw):	7.25
Horizontal Peak Ground Accel (g):	0.384
Depth to Groundwater (ft):	6.9
Summary of Resul Elevation:	4431

Top Depth ft	Elevation	Ncrr NP CS corresponding to CSR value
6.9	4424.1	20.740
9.4	4421.6	23.137
11.9	4419.1	24.575
14.4	4416.6	25.512
19.4	4411.6	26.553
24.4	4406.6	27.106
29.4	4401.6	27.456
34.4	4396.6	27.278
39.4	4391.6	26.981
44.4	4386.6	26.607
49.4	4381.6	26.177
54.4	4376.6	25.580
59.4	4371.6	24.861

This analysis assumes there are no significant adjustments to CSR for plasticity or gravel content
These adjustments should modify the CSR value of the data, not the CSR for the clean sand, no fines, no gravel curve.
Because magnitude factors are made to adjust the N160 values, curve is made for M= 7.5

CRR vs N curve (from Raush Formula) for interpolation **Resulting curve:**

CRR_i	$N160_i$	$(CRR)_{i+1}$	$(N160)_{i+1}$
0.049	0	0.05	2
0.053	2	0.06	4
0.065	4	0.08	6
0.080	6	0.10	8
0.096	8	0.11	10
0.113	10	0.13	12
0.131	12	0.15	14
0.150	14	0.17	16
0.170	16	0.19	18
0.192	18	0.22	20
0.215	20	0.24	22
0.242	22	0.27	24
0.273	24	0.31	26
0.313	26	0.37	28
0.370	28	0.47	30
0.468	30	0.73	32
0.732	32	1.24	33
1.240	33	2.24	33.5
2.243	33.5		



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Geotechnical and Construction Services

Date: 8/19/2004
Revision Number: jwp0311
Developed By: SDB/JWP
Calculated By: TWJ
Checked By:DH

Project Name: Bella Vista Ranch
Project Number: 199-08-1

LEVEL-GROUND LIQUEFACTION ANALYSIS USING STANDARD PENETRATION TESTING (SPT) AND BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS

Location: Bella Vista Ranch Boring B-02
Analyzed Zone: 15-17.5 feet depth

This version of the liquefaction analysis procedure supports the spreadsheet analysis of multiple points

References

1. T. L. Youd, Chair, Member, ASCE, I. M. Idriss, Co-Chair, Fellow, ASCE, Ronald D. Andrus, Ignacio Arango, Gonzalo Castro, John T. Christian, Richardo Dobry, W. D. Liam Finn, Leslie F. Harder Jr., Mary Ellen Hynes, Kenji Ishihara, Joseph P. Koester, Sam S. C. Liao, William F. Marcuson III, Goeffrey R. Martin, James K. Mitchell, Yoshiharu Moriwaki, Maurice S. Power, Peter K. Robertson, Raymond B. Seed, and Kenneth H. Stokoe II, 2001, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Geoenvironmental Engineering, October, 2001, p. 817-833.

2. Federal Highway Administration (FWHA), 1998, Geotechnical Earthquake Engineering Reference Manual, Report No. FWHA-HI-99-012, 392 p.

3. U. S. Water Conservation Laboratory, 2003, Agricultural Research Service, Relative Humidity Equations (www.uswcl.ars.ag.gov/exper/relhumeq.htm).

4. Ishahara, Personal communication.

5. Tokimatsu, K. and Seed, H. B., 1987, Evaluation of Settlements in Sands due to Earthquake Shaking, Journal of Geotechnical Engineering, American Society of Civil Engineers (ASCE), v. 113, n. 8, p. 861-878.

6. Seed, R. B. and L.F. Harder, 1990, SPT-based Analyses of Cyclic Pore Pressure Generation and Undrained Residual Strength, *Proc., H. Bolton Seed Memorial Symp.*, BiTech Publishers Ltd., Vancouver, 351-376.

7. Olsen, S. M. and T.D. Stark, 2003, Yield Strength Ratop and Liquefaction Analysis of Slopes and Embankments, Journal of Geotechnical Engineering, Vol 129 No. 8, p. 727 -737.

Unit Conversions — **Checked By:**

$psf := \frac{lbf}{ft^2}$ $pcf := \frac{lbf}{ft^3}$ $kPa := 1000Pa$

Input Data — **Checked By:**

Sample Top Depth:	$d := 15ft$
Depth to Mid-Sample (typically 0.5' waste barrel +1' sampler length/2 = 1'):	$l := 1.0ft$
Soil Total Unit Weight above Water Table:	$\gamma_{above} := 110pcf$
Soil Total Unit Weight below Water Table:	$\gamma := 120pcf$
SPT N-Value at Sample Depth:	$N_m := 10$
Soil Sample Plasticity Index (PI):	$PI := 0$
Percentage of Fines or Fines Content [%]:	$FC := 20$
Percentage of Gravel or Gravel Content [%]:	$GC := 6$
Thickness of Potentially Liquefiable Zone:	$T := 2.5ft$

Depth to Ground Water during Exploration: $d_{gw} := 6.9ft$

during Liquefaction Event: $d_{gwatEQ} := 5ft$

Borehole Diameter: $d_b := 6in$

Length of Drill Rod above the Ground Surface to Hammer: $l_{rgs} := 5ft$

Sampler Type (Standard = 1, Sampler without Liners = 2): $Sampler := 1$

Hammer Type (Cathead = 1, Auto Hammer [Uncorrected = 2, Corrected = 3]): $Hammer := 3$

Corrected Hammer Efficiency (Must enter 3 for Hammer Type above)(% not decimal: this is relative to theoretical 100%. $ER := 68$

Horizontal Peak Ground Acceleration (PGA) [%g]: $a_{max} := 0.384g$

Moment Magnitude of Earthquake: $M_w := 7.5$

Calculations, Section 1: Vertical Soil Stresses **Checked By:**

Calculate Depth at Midpoint of Sample:

$z := d + l$ $z = 16\,ft$

Calculate Soil Vertical Total Stress at Midpoint of Sample:

$\sigma_v := \gamma_{above} \cdot d_{gw} + \gamma \cdot (z - d_{gw})$ $\sigma_v = 1851\,psf$

Calculate Soil Effective Unit Weight at Sample Depth (Since sample is below the ground water surface):

$\gamma_{eff} := \gamma - 62.4pcf$ $\gamma_{eff} = 57.6\,pcf$

Calculate Effective Stress at Midpoint of Sample for SPT Correction:

$\sigma_{veff} := \sigma_v + -[62.4pcf \cdot (z - d_{gw})]$ $\sigma_{veff} = 1.283 \times 10^3\,psf$

Calculate Soil Vertical Total Stress at Midpoint of Sample for EQ event:

$\sigma_{vatEQ} := \gamma_{above} \cdot d_{gwatEQ} + \gamma \cdot (z - d_{gwatEQ})$ $\sigma_{vatEQ} = 1870\,psf$

Calculate Effective Stress at Midpoint of Sample for EQ event:

$\sigma_{veffatEQ} := \sigma_{vatEQ} + -[62.4pcf \cdot (z - d_{gwatEQ})]$ $\sigma_{veffatEQ} = 1.184 \times 10^3\,psf$

Calculations, Section 2: SPT N-Value Correction **Checked By:**

Calculate Overburden Pressure Correction Factor:

As noted by Reference 6, the Overburden correction is to have N values representative of the equivalent penetration resistance at a hypothetical overburden stress of 100 kpa, 1 ton/ft^2, or roughly 1 atmosphere. The use of "atmospheres" is merely a convenience for conversion between unit systems, and is not related to local atmospheric pressure.

$P_a := 100kPa$ $P_a = 2.089 \times 10^3\,psf$

$$C_n := \begin{cases} \left(\frac{P_a}{\sigma_{veff}}\right)^{0.5} & \text{if } \left[\left(\frac{P_a}{\sigma_{veff}}\right)^{0.5} \le 1.7\right] \\ 1.7 & \text{otherwise} \end{cases}$$

$C_n = 1.276$

Determine Hammer Energy Correction Factor:

$$C_e := \begin{cases} 1.0 & \text{if (Hammer = 1)} \\ 1.3 & \text{if (Hammer = 2)} \\ \left(\frac{ER}{60}\right) & \text{if (Hammer = 3)} \\ 0 & \text{otherwise} \end{cases}$$

$C_e = 1.133$
If C_e = 0, then input error.

Determine Borehole Diameter Correction Factor:

$$C_b := \begin{cases} 1.00 & \text{if } (65mm < d_b < 115mm) \\ 1.05 & \text{if } (150mm < d_b < 154mm) \\ 1.15 & \text{if } (200mm < d_b < 204mm) \\ 0 & \text{otherwise} \end{cases}$$

$C_b = 1.05$
If C_b = 0, then input error.

Calculate Drill Rod Length:

$l_r := d + l_{rgs}$ $\qquad l_r = 20\,ft \qquad l_r = 6.096\,m$

Determine Rod Length Correction Factor:

$$C_r := \begin{cases} 0.75 & \text{if } (l_r < 3m) \\ 0.80 & \text{if } (3m \le l_r < 4m) \\ 0.85 & \text{if } (4m \le l_r < 6m) \\ 0.95 & \text{if } (6m \le l_r < 10m) \\ 1.00 & \text{if } (10m \le l_r < 30m) \\ 0 & \text{otherwise} \end{cases}$$

$C_r = 0.95$
If C_r = 0, then input error.

Determine Sampler Correction Factor (with or without liners):

$$C_s := \begin{cases} 1.0 & \text{if (Sampler = 1)} \\ 1.2 & \text{if (Sampler = 2)} \\ 0 & \text{otherwise} \end{cases}$$

$C_s = 1$
If C_s = 0, then input error.

Calculate Corrected SPT $(N_1)_{60}$ Value:

$N1_{60} := (N_m \cdot C_n \cdot C_e \cdot C_b \cdot C_r \cdot C_s)$ $\qquad N1_{60} = 14.4$

Calculations, Section 3: $(N_1)_{60}$ Equivalent Clean Sand Correction **Checked By:**

Calculate Clean Sand Correction Coefficients:

$$\alpha := \begin{cases} 0 & \text{if } (FC \le 5) \\ \exp\left[1.76 - \left(\frac{190}{FC^2}\right)\right] & \text{if } (5 < FC < 35) \\ 5.0 & \text{if } (FC \ge 35) \\ 0 & \text{otherwise} \end{cases}$$

$\alpha = 3.615$
If α = 0, then input error.

$$\beta := \begin{cases} 1.0 & \text{if } (FC \le 5) \\ \left[0.99 + \left(\dfrac{FC^{1.5}}{1000}\right)\right] & \text{if } (5 < FC < 35) \\ 1.2 & \text{if } (FC \ge 35) \\ 0 & \text{otherwise} \end{cases}$$

$\beta = 1.079$

If $\beta = 0$, then input error.

Calculate Corrected $(N_1)_{60}$ Equivalent Clean Sand Value:

$$N1_{60cs} := \alpha + \beta \cdot (N1_{60})$$

$N1_{60cs} = 19.2$

Calculations, Section 4: Cyclic Stress Ratio and Cyclic Resistance Ratio (CSR) Checked By:

Calculate Cyclic Resistance Ratio (CRR) for Moment Magnitude M_w = 7.5 Earthquake (This is the boomerang curve on the SPT ver CSR lplot - function of clean sand resistance only):

$$CRR_{7.5} := \begin{cases} \left[\dfrac{1}{34 - N1_{60cs}} + \dfrac{N1_{60cs}}{135} + \dfrac{50}{(10 \cdot N1_{60cs} + 45)^2} - \dfrac{1}{200}\right] & \text{if } N1_{60cs} < 34 \\ 100 & \text{otherwise} \end{cases}$$

$CRR_{7.5} = 0.205$

Calculate Stress Reduction Coefficent to Account for Flexiblity in Soil Profile:

$$r_d := \begin{cases} (1.0m - 0.00765 \cdot z) & \text{if } (z \le 9.15m) \\ (1.174m - 0.0267 \cdot z) & \text{if } (9.15m < z \le 23m) \\ 0 & \text{otherwise} \end{cases}$$

$r_d = 3.158\,ft$ $\quad r_d = 0.963\,m$

If $r_d = 0$, then input error.

Redefine Stress Reduction Coefficent for Calculations:

$$r_d := \frac{r_d}{m}$$

Calculate Cyclic Stress Ratio (CSR) using water level and effective stress during the earthquake, not exploration levels:

$$CSR := 0.65 \cdot \left(\frac{a_{max}}{g}\right) \cdot \left(\frac{\sigma_{vatEQ}}{\sigma_{veffatEQ}}\right) r_d$$

$CSR = 0.38$

Calculations, Section 5: CSR Scaling Factors **Checked By:**

Note : Cyclic stress ratio (CSR) is divided by the magnitude scaling factor, gravel content, and plasticity factor to compare to the cyclic resistance ratio curve. All the modifications are put on the CSR side of the equation, because (a) the 1998 NCEER method does not specify whether to apply scaling factors to CSR (division) or Cyclic Resistance Ratio (multiplication), and (b) graphically, we can compare a wide variety of data with ahd without modifications to a single CRR curve and put all modifications in CSR.

Calculate Magnitude Scaling Factor (MSF) to Scale CSR Data:

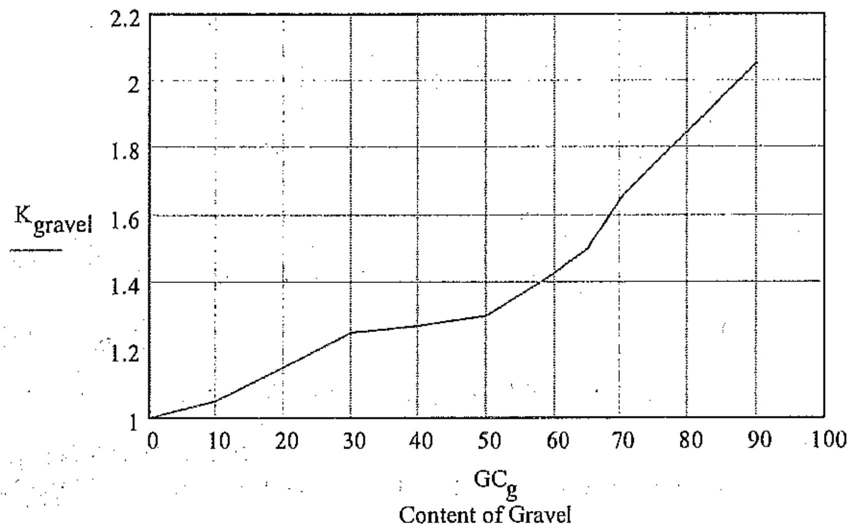
$$MSF := \frac{10^{2.24}}{M_w^{\;2.56}}$$

$MSF = 1$

Reproduce Figure 8-7, Reference 2 (Effect of Gravel Content on Liquefaction Resistance of Gravelly Soils):

Data for Gravel Content: Data for Plasticity Modification

$$GC_g := \begin{pmatrix} 0 \\ 10 \\ 20 \\ 25 \\ 30 \\ 40 \\ 50 \\ 58 \\ 65 \\ 70 \\ 90 \end{pmatrix} \quad K_{gravel} := \begin{pmatrix} 1.00 \\ 1.05 \\ 1.15 \\ 1.20 \\ 1.25 \\ 1.27 \\ 1.30 \\ 1.40 \\ 1.50 \\ 1.65 \\ 2.05 \end{pmatrix} \qquad PI_g := \begin{pmatrix} 0 \\ 10 \\ 55 \end{pmatrix} \quad SR_g := \begin{pmatrix} 1.0 \\ 1.0 \\ 2.0 \end{pmatrix}$$

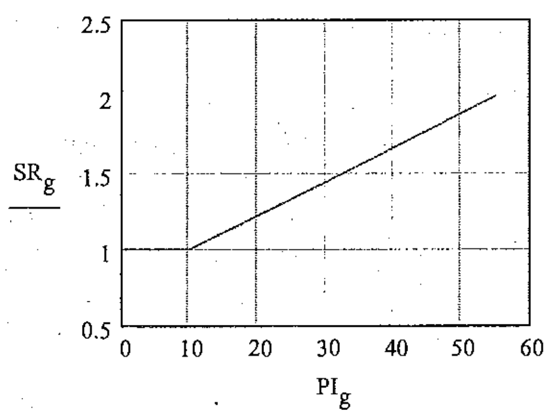


Note - gravel scaling factor is to account for unrepresentatively high blows for gravel layers - should decrease overall factor of safety.

Calculate Gravel Content Scaling Factor (GCSF):

$GCSF := \text{linterp}\left(GC_g, K_{gravel}, GC\right)$ $\qquad GCSF = 1$

Reproduce Chart for Modification of Cyclic Strength Allowing for Effects of Plasticity (From Ishihara):



Calculate Plasticity Index Scaling Factor (PISF):

$PISF := \text{linterp}\left(PI_g, SR_g, PI\right)$ $\qquad PISF = 1$

Calculations, Section 6: Factor of Safety (FS) Against Liquefaction **Checked By:**

Calculate Modified and Scaled CSR:

$$CSR_{mod} := \frac{CSR \cdot GCSF}{MSF \cdot PISF}$$ $CSR_{mod} = 0.391$

Calculate Factor of Safety Against Liquefaction:

$$FS := \left(\frac{CRR_{7.5}}{CSR}\right) \cdot MSF \cdot \frac{PISF}{GCSF}$$ $FS = 0.525$

Determine Liquefaction Hazard based upon Calculated Factor of Safety:

$$Hazard := \begin{vmatrix} 0 & \text{if } (FS \geq 1.1) \\ 1 & \text{if } (1.0 < FS < 1.1) \\ 2 & \text{otherwise} \end{vmatrix}$$ $Hazard = 2$

Hazard Levels
Negligible = 0
Possible = 1
Likely = 2

Calculations, Section 7: Potential Settlement due to Liquefaction **Checked By:**

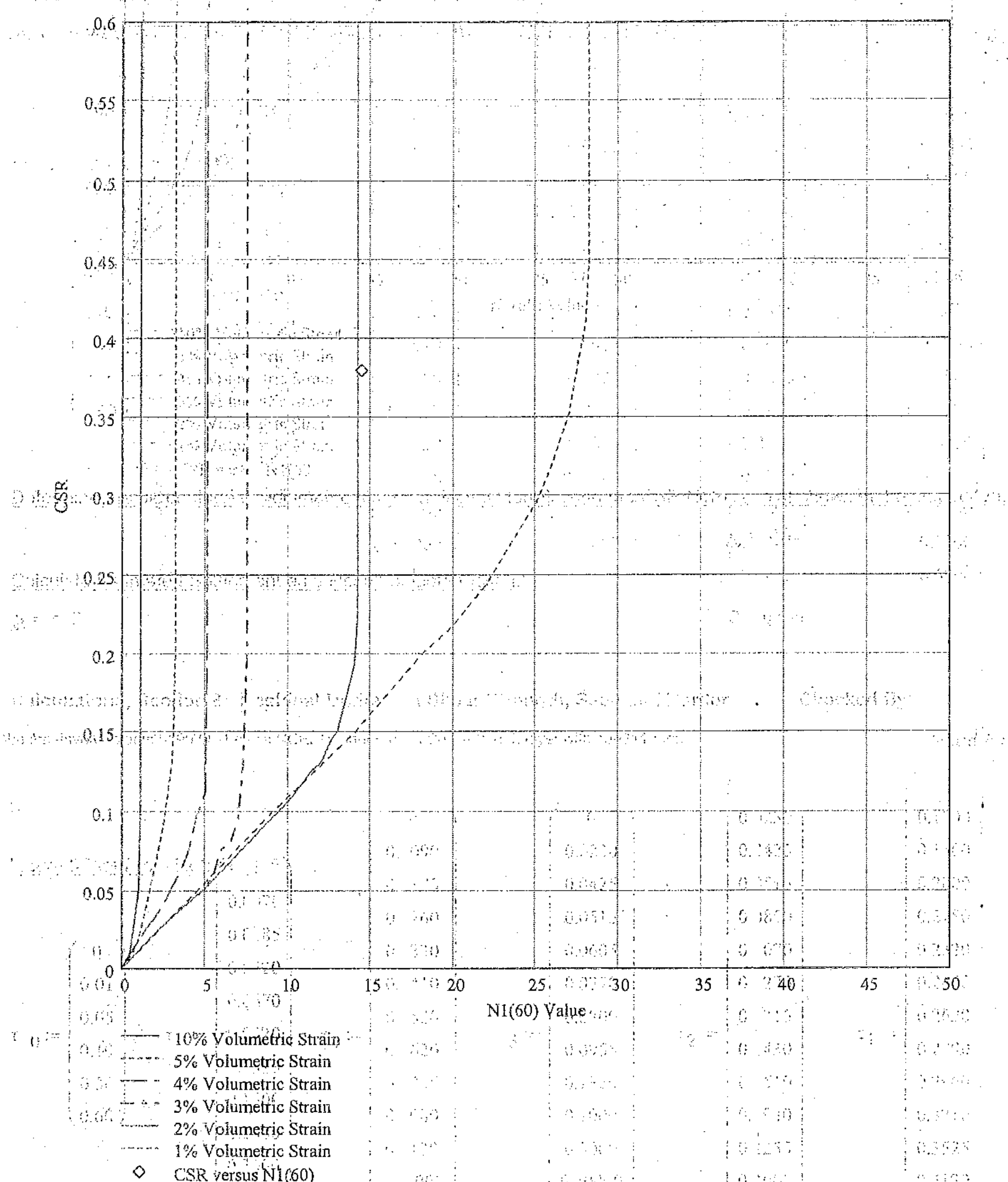
Data to Reproduce Figure 5 from Reference 5:

$k_1 := 0..5$ $k_2 := 0..10$ $k_3 := 0..13$ $k_4 := 0..15$

$$N_{10} := \begin{pmatrix} 0 \\ 0.5 \\ 1.0 \\ 1.1 \\ 1.1 \\ 1.1 \end{pmatrix} \quad N_5 := \begin{pmatrix} 0 \\ 0.5 \\ 1.0 \\ 1.5 \\ 2.0 \\ 2.5 \\ 3.0 \\ 3.1 \\ 3.2 \\ 3.2 \\ 3.2 \end{pmatrix} \quad N_4 := \begin{pmatrix} 0 \\ 0.5 \\ 1.0 \\ 1.5 \\ 2.0 \\ 2.5 \\ 3.0 \\ 3.5 \\ 4.0 \\ 4.5 \\ 5.0 \\ 5.1 \\ 5.1 \\ 5.1 \end{pmatrix} \quad N_3 := \begin{pmatrix} 0 \\ 2.0 \\ 4.0 \\ 5.0 \\ 5.5 \\ 6.0 \\ 6.5 \\ 7.0 \\ 7.3 \\ 7.5 \\ 7.5 \\ 7.5 \\ 7.5 \\ 7.5 \end{pmatrix} \quad N_2 := \begin{pmatrix} 0 \\ 2.0 \\ 4.0 \\ 5.0 \\ 8.0 \\ 10.0 \\ 11.5 \\ 12.0 \\ 12.5 \\ 13.0 \\ 14.0 \\ 14.2 \\ 14.2 \\ 14.2 \\ 14.2 \\ 14.2 \end{pmatrix} \quad N_1 := \begin{pmatrix} 0 \\ 9.05 \\ 14.0 \\ 18.1 \\ 20.0 \\ 21.0 \\ 22.0 \\ 23.0 \\ 24.0 \\ 25.0 \\ 26.0 \\ 27.0 \\ 28.0 \\ 28.2 \\ 28.2 \\ 28.2 \end{pmatrix}$$

$$\tau_{10} := \begin{pmatrix} 0 \\ 0.01 \\ 0.05 \\ 0.10 \\ 0.30 \\ 0.60 \end{pmatrix} \quad \tau_5 := \begin{pmatrix} 0 \\ 0.0070 \\ 0.0185 \\ 0.0420 \\ 0.0670 \\ 0.0920 \\ 0.1310 \\ 0.1500 \\ 0.2000 \\ 0.3000 \\ 0.6000 \end{pmatrix} \quad \tau_4 := \begin{pmatrix} 0 \\ 0.0090 \\ 0.0175 \\ 0.0260 \\ 0.0330 \\ 0.0410 \\ 0.0520 \\ 0.0620 \\ 0.0755 \\ 0.0980 \\ 0.1130 \\ 0.20000 \\ 0.4000 \\ 0.6000 \end{pmatrix} \quad \tau_3 := \begin{pmatrix} 0 \\ 0.0230 \\ 0.0425 \\ 0.0515 \\ 0.0605 \\ 0.0770 \\ 0.0800 \\ 0.0955 \\ 0.1320 \\ 0.2000 \\ 0.3000 \\ 0.40000 \\ 0.5000 \\ 0.6000 \end{pmatrix} \quad \tau_2 := \begin{pmatrix} 0 \\ 0.0230 \\ 0.0425 \\ 0.0515 \\ 0.0850 \\ 0.1070 \\ 0.1270 \\ 0.1315 \\ 0.1430 \\ 0.1510 \\ 0.1940 \\ 0.2255 \\ 0.3000 \\ 0.4000 \\ 0.5000 \\ 0.6000 \end{pmatrix} \quad \tau_1 := \begin{pmatrix} 0 \\ 0.1000 \\ 0.1500 \\ 0.2000 \\ 0.2180 \\ 0.2320 \\ 0.2450 \\ 0.2620 \\ 0.2790 \\ 0.2960 \\ 0.3210 \\ 0.3525 \\ 0.4120 \\ 0.4500 \\ 0.5000 \\ 0.6000 \end{pmatrix}$$

Figure 5 Plot From Reference 5:



Determine the percentage of volumetric strain [in decimal form] using the CSR/N1(60) point shown in the plot above:

$\varepsilon := 0.02$

Calculate Estimated Settlement as a Result of Liquefaction:

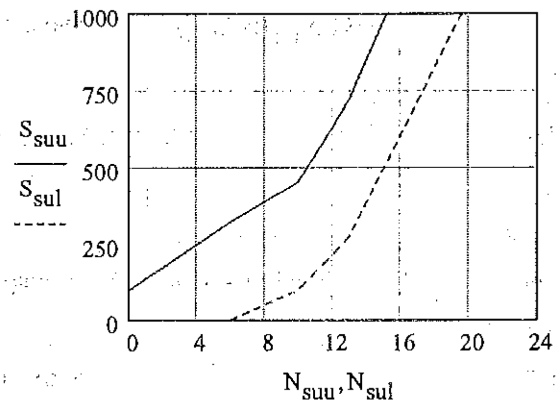
$S := \varepsilon \cdot T$

$S = 0.6\,\text{in}$

Please use with caution - based on limited case studies of large-strain liquefaction failures, may not be appropriate at all for small-strain liquefaction failures.

Reproduce Chart for Residual Undrained Shear Strength from Reference 6

$$N_{sul} := \begin{pmatrix} 0 \\ 6 \\ 10 \\ 13 \\ 20 \end{pmatrix} \quad S_{sul} := \begin{pmatrix} 0 \\ 0 \\ 100 \\ 270 \\ 1040 \end{pmatrix} \quad N_{suu} := \begin{pmatrix} 0 \\ 6 \\ 10 \\ 13 \\ 16 \end{pmatrix} \quad S_{suu} := \begin{pmatrix} 100 \\ 320 \\ 450 \\ 720 \\ 1100 \end{pmatrix}$$



Note: Chart is extrapolated above N = 15 and below N=3

Calculate Upper and Lower Bound Undrained Strength from Seed and Harder:

$$Sul := \begin{cases} \text{round}(\text{linterp}(N_{sul}, S_{sul}, N1_{60cs}), -1) & \text{if } N1_{60cs} \le 20 \\ 0 & \text{otherwise} \end{cases}$$

$$Suu := \begin{cases} \text{round}(\text{linterp}(N_{suu}, S_{suu}, N1_{60cs}), -1) & \text{if } N1_{60cs} \le 20 \\ 0 & \text{otherwise} \end{cases}$$

$N1_{60cs} = 19.2$

$Sul = 950$ psf

$Suu = 1500$ psf

As noted by Reference 6, "it is recommended that the lower bound, or near-lower-bound relationship between N160cs and [residual undrained shear strength] be used...at this time, owing to scatter and uncertainty, and the limited number of case studies back-analyzed to date."

Calculations, Section 9: Residual Undrained Shear Strength from Reference 7 **Checked By:**

If values are zero, indicates not valid range of N160 for relationship

$$Su_{yield} := \begin{cases} \sigma_{veffatEQ} \cdot (0.205 + 0.0075 \cdot N1_{60}) & \text{if } N1_{60} \le 12 \\ 0 & \text{otherwise} \end{cases}$$

$$Su_{yield} = 0 \frac{m\,s^2}{kg} \text{psf}$$

This value is primarily relevant for "static" rather than seismic liquefaction

$$Su_{triggered} := \begin{cases} \sigma_{veffatEQ} \cdot (0.03 + 0.0075 \cdot N1_{60}) & \text{if } N1_{60} \le 12 \\ 0 & \text{otherwise} \end{cases}$$

$$Su_{triggered} = 0 \frac{m\,s^2}{kg} \text{psf}$$

Calculations, Section 10: Summary of Results **Checked By:**

Layer Depth, d: $z = 16$ ft

Blowcounts : $N_m = 10$ $N1_{60} = 14.42$ $N1_{60cs} = 19.2$

Liquefied ? Hazard Levels Negligible = 0 Marginal = 1 Liquefies = 2 $FS = 0.525$ $Hazard = 2$

Settlement Strain : $\varepsilon = 0.02$ Manually picked

Undrained Strength: Seed and Harder $Sul = 950$

Yield undrained strength for static failures (Olsen and Stark 2003) $Su_{yield} = 0 \frac{m\,s^2}{kg}$ psf

Liquefied residual strength (Olsen and Stark 2003) $Su_{triggered} = 0 \frac{m\,s^2}{kg}$ psf

These values will be zero if N160 is outside of the correlated range.

BLACK EAGLE CONSULTING, INC.
Geotechnical and Construction Services

Project Name: Bella Vista Ranch
Project Number: 199-08-1

Date: 8/19/2004
Revision Number: jwp0311
Developed By: SDB/JWP
Calculated By: TWJ
Checked By:DH

LEVEL-GROUND LIQUEFACTION ANALYSIS USING STANDARD PENETRATION TESTING (SPT) AND BASED UPON 1996 AND 1998 NCEER WORKSHOP RECOMMENDATIONS

Location: Bella Vista Ranch Boring B-03
Analyzed Zone: 25-27.5 feet depth

This version of the liquefaction analysis procedure supports the spreadsheet analysis of multiple points

References

1. T. L. Youd, Chair, Member, ASCE, I. M. Idriss, Co-Chair, Fellow, ASCE, Ronald D. Andrus, Ignacio Arango, Gonzalo Castro, John T. Christian, Richardo Dobry, W. D. Liam Finn, Leslie F. Harder Jr., Mary Ellen Hynes, Kenji Ishihara, Joseph P. Koester, Sam S. C. Liao, William F. Marcuson III, Goeffrey R. Martin, James K. Mitchell, Yoshiharu Moriwaki, Maurice S. Power, Peter K. Robertson, Raymond B. Seed, and Kenneth H. Stokoe II, 2001, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Geoenvironmental Engineering, October, 2001, p. 817-833.

2. Federal Highway Administration (FWHA), 1998, Geotechnical Earthquake Engineering Reference Manual, Report No. FWHA-HI-99-012, 392 p.

3. U. S. Water Conservation Laboratory, 2003, Agricultural Research Service, Relative Humidity Equations (www.uswcl.ars.ag.gov/exper/relhumeq.htm).

4. Ishahara, Personal communication.

5. Tokimatsu, K. and Seed, H. B., 1987, Evaluation of Settlements in Sands due to Earthquake Shaking, Journal of Geotechnical Engineering, American Society of Civil Engineers (ASCE), v. 113, n. 8, p. 861-878.

6. Seed, R. B. and L.F. Harder, 1990, SPT-based Analyses of Cyclic Pore Pressure Generation and Undrained Residual Strength, *Proc., H. Bolton Seed Memorial Symp.*, BiTech Publishers Ltd., Vancouver, 351-376.

7. Olsen, S. M. and T.D. Stark, 2003, Yield Strength Ratop and Liquefaction Analysis of Slopes and Embankments, Journal of Geotechnical Engineering, Vol 129 No. 8, p. 727 -737.

Unit Conversions — **Checked By:**

$psf := \frac{lbf}{ft^2}$ $\quad pcf := \frac{lbf}{ft^3}$ $\quad kPa := 1000Pa$

Input Data — **Checked By:**

Sample Top Depth:	$d := 25ft$
Depth to Mid-Sample (typically 0.5' waste barrel +1' sampler length/2 = 1'):	$l := 1.0ft$
Soil Total Unit Weight above Water Table:	$\gamma_{above} := 110pcf$
Soil Total Unit Weight below Water Table:	$\gamma := 120pcf$
SPT N-Value at Sample Depth:	$N_m := 18$
Soil Sample Plasticity Index (PI):	$PI := 5$
Percentage of Fines or Fines Content [%]:	$FC := 22$
Percentage of Gravel or Gravel Content [%]:	$GC := 0$
Thickness of Potentially Liquefiable Zone:	$T := 2.5ft$

Depth to Ground Water during Exploration: $d_{gw} := 4.6ft$

during Liquefaction Event: $d_{gwatEQ} := 4ft$

Borehole Diameter: $d_b := 6in$

Length of Drill Rod above the Ground Surface to Hammer: $l_{rgs} := 5ft$

Sampler Type (Standard = 1, Sampler without Liners = 2): Sampler := 1

Hammer Type (Cathead = 1, Auto Hammer [Uncorrected = 2, Corrected = 3]): Hammer := 3

Corrected Hammer Efficiency (Must enter 3 for Hammer Type above)(% not decimal: this is relative to theoretical 100%. ER := 68

Horizontal Peak Ground Acceleration (PGA) [%g]: $a_{max} := 0.384g$

Moment Magnitude of Earthquake: $M_w := 7.5$

Calculations, Section 1: Vertical Soil Stresses **Checked By:**

Calculate Depth at Midpoint of Sample:

$z := d + l$ $\qquad z = 26\,ft$

Calculate Soil Vertical Total Stress at Midpoint of Sample:

$\sigma_v := \gamma_{above} \cdot d_{gw} + \gamma \cdot (z - d_{gw})$ $\qquad \sigma_v = 3074\,psf$

Calculate Soil Effective Unit Weight at Sample Depth (Since sample is below the ground water surface):

$\gamma_{eff} := \gamma - 62.4pcf$ $\qquad \gamma_{eff} = 57.6\,pcf$

Calculate Effective Stress at Midpoint of Sample for SPT Correction:

$\sigma_{veff} := \sigma_v + -[62.4pcf \cdot (z - d_{gw})]$ $\qquad \sigma_{veff} = 1.739 \times 10^3\,psf$

Calculate Soil Vertical Total Stress at Midpoint of Sample for EQ event:

$\sigma_{vatEQ} := \gamma_{above} \cdot d_{gwatEQ} + \gamma \cdot (z - d_{gwatEQ})$ $\qquad \sigma_{vatEQ} = 3080\,psf$

Calculate Effective Stress at Midpoint of Sample for EQ event:

$\sigma_{veffatEQ} := \sigma_{vatEQ} + -[62.4pcf \cdot (z - d_{gwatEQ})]$ $\qquad \sigma_{veffatEQ} = 1.707 \times 10^3\,psf$

Calculations, Section 2: SPT N-Value Correction **Checked By:**

Calculate Overburden Pressure Correction Factor:

As noted by Reference 6, the Overburden correction is to have N values representative of the equivalent penetration resistance at a hypothetical overburden stress of 100 kpa, 1 ton/ft^2, or roughly 1 atmosphere. The use of "atmospheres" is merely a convenience for conversion between unit systems, and is not related to local atmospheric pressure.

$P_a := 100kPa$ $\qquad P_a = 2.089 \times 10^3\,psf$

$$C_n := \begin{cases} \left(\frac{P_a}{\sigma_{veff}}\right)^{0.5} & \text{if } \left[\left(\frac{P_a}{\sigma_{veff}}\right)^{0.5} \le 1.7\right] \\ 1.7 & \text{otherwise} \end{cases}$$

$C_n = 1.096$

Determine Hammer Energy Correction Factor:

$$C_e := \begin{cases} 1.0 & \text{if (Hammer = 1)} \\ 1.3 & \text{if (Hammer = 2)} \\ \left(\frac{ER}{60}\right) & \text{if (Hammer = 3)} \\ 0 & \text{otherwise} \end{cases}$$

$C_e = 1.133$

If $C_e = 0$, then input error.

Determine Borehole Diameter Correction Factor:

$$C_b := \begin{cases} 1.00 & \text{if } (65mm \le d_b < 115mm) \\ 1.05 & \text{if } (150mm < d_b < 154mm) \\ 1.15 & \text{if } (200mm < d_b \le 204mm) \\ 0 & \text{otherwise} \end{cases}$$

$C_b = 1.05$

If $C_b = 0$, then input error.

Calculate Drill Rod Length:

$l_r := d + l_{ags}$

$l_r = 30ft$ $l_r = 9.144m$

Determine Rod Length Correction Factor:

$$C_r := \begin{cases} 0.75 & \text{if } (l_r < 3m) \\ 0.80 & \text{if } (3m \le l_r < 4m) \\ 0.85 & \text{if } (4m \le l_r < 6m) \\ 0.95 & \text{if } (6m \le l_r < 10m) \\ 1.00 & \text{if } (10m \le l_r < 30m) \\ 0 & \text{otherwise} \end{cases}$$

$C_r = 0.95$

If $C_r = 0$, then input error.

Determine Sampler Correction Factor (with or without liners):

$$C_s := \begin{cases} 1.0 & \text{if (Sampler = 1)} \\ 1.2 & \text{if (Sampler = 2)} \\ 0 & \text{otherwise} \end{cases}$$

$C_s = 1$

If $C_s = 0$, then input error.

Calculate Corrected SPT $(N_1)_{60}$ Value:

$N1_{60} := (N_m \cdot C_n \cdot C_e \cdot C_b \cdot C_r \cdot C_s)$

$N1_{60} = 22.3$

Calculations, Section 3: $(N_1)_{60}$ Equivalent Clean Sand Correction **Checked By:**

Calculate Clean Sand Correction Coefficients:

$$\alpha := \begin{cases} 0 & \text{if } (FC \le 5) \\ \exp\left[1.76 - \left(\frac{190}{FC^2}\right)\right] & \text{if } (5 < FC < 35) \\ 5.0 & \text{if } (FC \ge 35) \\ 0 & \text{otherwise} \end{cases}$$

$\alpha = 3.925$

If $\alpha = 0$, then input error.

$$\beta := \begin{cases} 1.0 & \text{if } (FC \le 5) \\ 0.99 + \left(\frac{FC^{1.5}}{1000}\right) & \text{if } (5 < FC < 35) \\ 1.2 & \text{if } (FC \ge 35) \\ 0 & \text{otherwise} \end{cases}$$

$\beta = 1.093$

If $\beta = 0$, then input error.

Calculate Corrected $(N_1)_{60}$ Equivalent Clean Sand Value:

$$N1_{60cs} := \alpha + \beta \cdot (N1_{60})$$

$N1_{60cs} = 28.3$

Calculations, Section 4: Cyclic Stress Ratio and Cyclic Resistance Ratio (CSR) Checked By:

Calculate Cyclic Resistance Ratio (CRR) for Moment Magnitude $M_w = 7.5$ Earthquake (This is the boomerang curve on the SPT ver CSR plot - function of clean sand resistance only):

$$CRR_{7.5} := \begin{cases} \left[\frac{1}{34 - N1_{60cs}} + \frac{N1_{60cs}}{135} + \frac{50}{(10 \cdot N1_{60cs} + 45)^2} - \frac{1}{200}\right] & \text{if } N1_{60cs} < 34 \\ 100 & \text{otherwise} \end{cases}$$

$CRR_{7.5} = 0.381$

Calculate Stress Reduction Coefficent to Account for Flexibility in Soil Profile:

$$r_d := \begin{cases} (1.0m - 0.00765 \cdot z) & \text{if } (z \le 9.15m) \\ (1.174m - 0.0267 \cdot z) & \text{if } (9.15m < z \le 23m) \\ 0 & \text{otherwise} \end{cases}$$

$r_d = 3.082\,ft$ $\quad r_d = 0.939\,m$

If $r_d = 0$, then input error.

Redefine Stress Reduction Coefficent for Calculations:

$$r_d := \frac{r_d}{m}$$

Calculate Cyclic Stress Ratio (CSR) using water level and effective stress during the earthquake, not exploration levels:

$$CSR := 0.65 \cdot \left(\frac{a_{max}}{g}\right) \cdot \left(\frac{\sigma_{vatEQ}}{\sigma_{veffatEQ}}\right) \cdot r_d$$

$CSR = 0.423$

Calculations, Section 5: CSR Scaling Factors **Checked By:**

Note: Cyclic stress ratio (CSR) is divided by the magnitude scaling factor, gravel content, and plasticity factor to compare to the cyclic resistance ratio curve. All the modifications are put on the CSR side of the equation, because (a) the 1998 NCEER method does not specify whether to apply scaling factors to CSR (division) or Cyclic Resistance Ratio (multiplication), and (b) graphically, we can compare a wide variety of data with and without modifications to a single CRR curve and put all modifications in CSR.

Calculate Magnitude Scaling Factor (MSF) to Scale CSR Data:

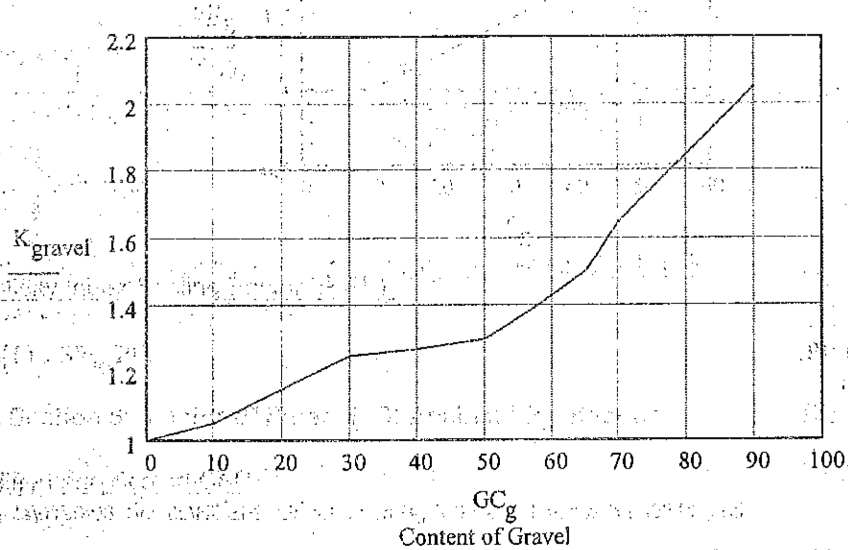
$$MSF := \frac{10^{2.24}}{M_w^{2.56}}$$

$MSF = 1$

Reproduce Figure 8-7, Reference 2 (Effect of Gravel Content on Liquefaction Resistance of Gravelly Soils):

Data for Gravel Content: Data for Plasticity Modification

$$GC_g := \begin{pmatrix} 0 \\ 10 \\ 20 \\ 25 \\ 30 \\ 40 \\ 50 \\ 58 \\ 65 \\ 70 \\ 90 \end{pmatrix} \qquad K_{gravel} := \begin{pmatrix} 1.00 \\ 1.05 \\ 1.15 \\ 1.20 \\ 1.25 \\ 1.27 \\ 1.30 \\ 1.40 \\ 1.50 \\ 1.65 \\ 2.05 \end{pmatrix} \qquad PI_g := \begin{pmatrix} 0 \\ 10 \\ 55 \end{pmatrix} \qquad SR_g := \begin{pmatrix} 1.0 \\ 1.0 \\ 2.0 \end{pmatrix}$$

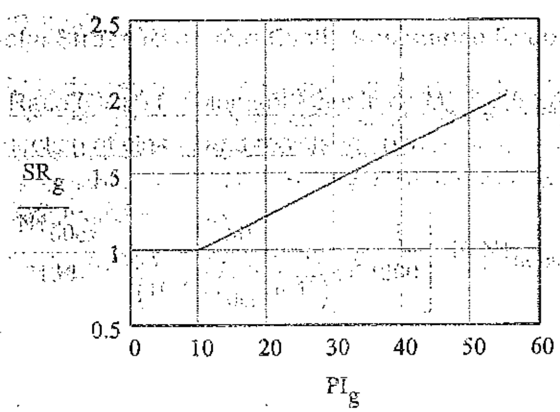


Note - gravel scaling factor is to account for unrepresentatively high blows for gravel layers - should decrease overall factor of safety.

Calculate Gravel Content Scaling Factor (GCSF):

$GCSF := \text{linterp}(GC_g, K_{gravel}, GC)$ $\qquad$ $GCSF = 1$

Reproduce Chart for Modification of Cyclic Strength Allowing for Effects of Plasticity (From Ishihara):



Calculate Plasticity Index Scaling Factor (PISF):

$PISF := \text{linterp}(PI_g, SR_g, PI)$ $\qquad$ $PISF = 1$

Calculations, Section 6: Factor of Safety (FS) Against Liquefaction $\qquad$ **Checked By:**

Calculate Modified and Scaled CSR:

$$CSR_{mod} := \frac{CSR \cdot GCSF}{MSF \cdot PISF}$$ $CSR_{mod} = 0.423$

Calculate Factor of Safety Against Liquefaction:

$$FS := \left(\frac{CRR_{7.5}}{CSR}\right) \cdot MSF \cdot \frac{PISF}{GCSF}$$ $FS = 0.9$

Determine Liquefaction Hazard based upon Calculated Factor of Safety:

$$Hazard := \begin{vmatrix} 0 & \text{if } (FS \ge 1.1) \\ 1 & \text{if } (1.0 < FS < 1.1) \\ 2 & \text{otherwise} \end{vmatrix}$$ $Hazard = 2$

Hazard Levels
Negligible = 0
Possible = 1
Likely = 2

Calculations, Section 7: Potential Settlement due to Liquefaction **Checked By:**

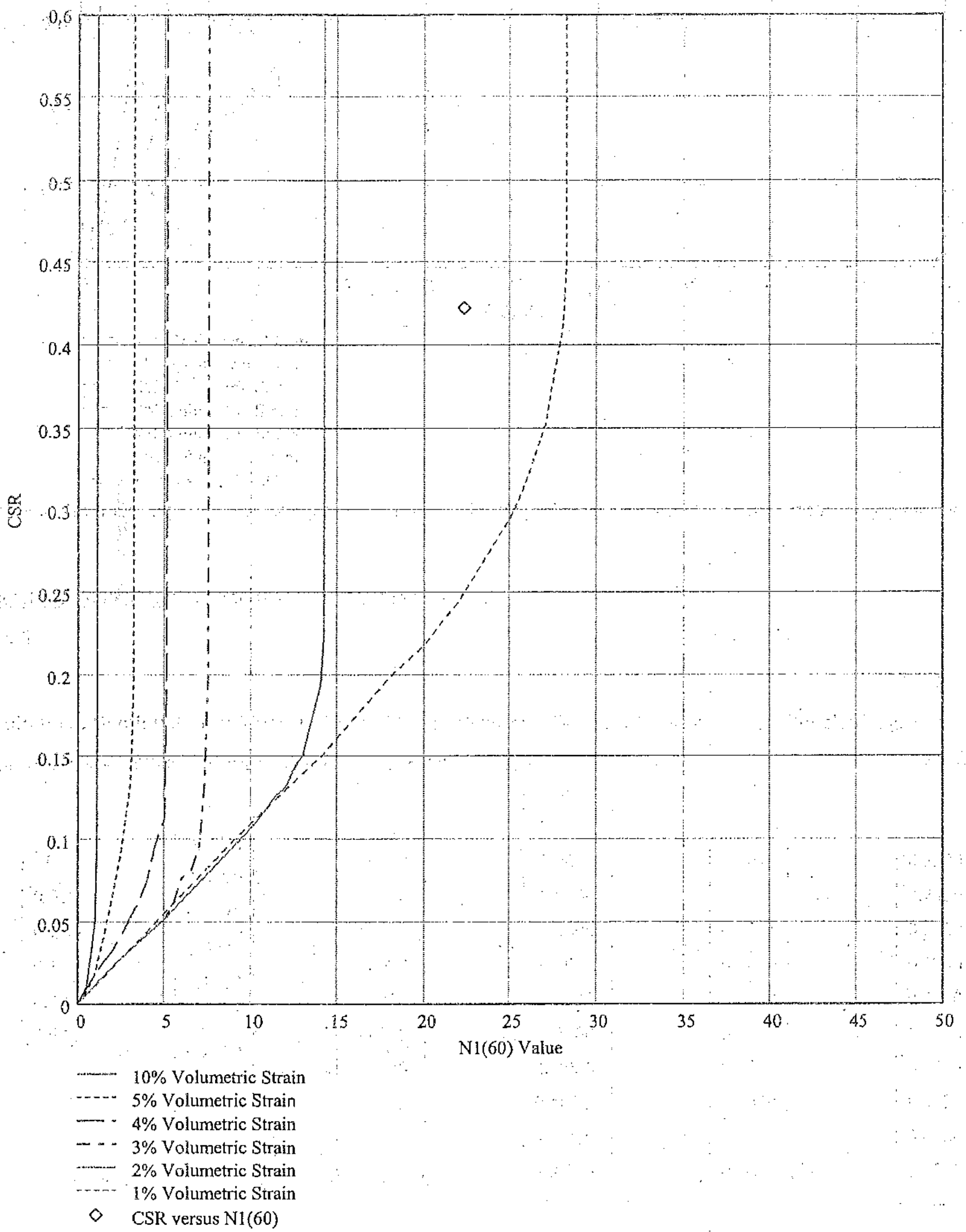
Data to Reproduce Figure 5 from Reference 5:

$k_1 := 0..5$ $k_2 := 0..10$ $k_3 := 0..13$ $k_4 := 0..15$

$$N_{10} := \begin{pmatrix} 0 \\ 0.5 \\ 1.0 \\ 1.1 \\ 1.1 \\ 1.1 \end{pmatrix} \quad N_5 := \begin{pmatrix} 0 \\ 0.5 \\ 1.0 \\ 1.5 \\ 2.0 \\ 2.5 \\ 3.0 \\ 3.1 \\ 3.2 \\ 3.2 \\ 3.2 \end{pmatrix} \quad N_4 := \begin{pmatrix} 0 \\ 0.5 \\ 1.0 \\ 1.5 \\ 2.0 \\ 2.5 \\ 3.0 \\ 3.5 \\ 4.0 \\ 4.5 \\ 5.0 \\ 5.1 \\ 5.1 \\ 5.1 \end{pmatrix} \quad N_3 := \begin{pmatrix} 0 \\ 2.0 \\ 4.0 \\ 5.0 \\ 5.5 \\ 6.0 \\ 6.5 \\ 7.0 \\ 7.3 \\ 7.5 \\ 7.5 \\ 7.5 \\ 7.5 \\ 7.5 \end{pmatrix} \quad N_2 := \begin{pmatrix} 0 \\ 2.0 \\ 4.0 \\ 5.0 \\ 8.0 \\ 10.0 \\ 11.5 \\ 12.0 \\ 12.5 \\ 13.0 \\ 14.0 \\ 14.2 \\ 14.2 \\ 14.2 \\ 14.2 \\ 14.2 \end{pmatrix} \quad N_1 := \begin{pmatrix} 0 \\ 9.05 \\ 14.0 \\ 18.1 \\ 20.0 \\ 21.0 \\ 22.0 \\ 23.0 \\ 24.0 \\ 25.0 \\ 26.0 \\ 27.0 \\ 28.0 \\ 28.2 \\ 28.2 \\ 28.2 \end{pmatrix}$$

$$\tau_{10} := \begin{pmatrix} 0 \\ 0.01 \\ 0.05 \\ 0.10 \\ 0.30 \\ 0.60 \end{pmatrix} \quad \tau_5 := \begin{pmatrix} 0 \\ 0.0070 \\ 0.0185 \\ 0.0420 \\ 0.0670 \\ 0.0920 \\ 0.1310 \\ 0.1500 \\ 0.2000 \\ 0.3000 \\ 0.6000 \end{pmatrix} \quad \tau_4 := \begin{pmatrix} 0 \\ 0.0090 \\ 0.0175 \\ 0.0260 \\ 0.0330 \\ 0.0410 \\ 0.0520 \\ 0.0620 \\ 0.0755 \\ 0.0980 \\ 0.1130 \\ 0.20000 \\ 0.4000 \\ 0.6000 \end{pmatrix} \quad \tau_3 := \begin{pmatrix} 0 \\ 0.0230 \\ 0.0425 \\ 0.0515 \\ 0.0605 \\ 0.0770 \\ 0.0800 \\ 0.0955 \\ 0.1320 \\ 0.2000 \\ 0.3000 \\ 0.40000 \\ 0.5000 \\ 0.6000 \end{pmatrix} \quad \tau_2 := \begin{pmatrix} 0 \\ 0.0230 \\ 0.0425 \\ 0.0515 \\ 0.0850 \\ 0.1070 \\ 0.1270 \\ 0.1315 \\ 0.1430 \\ 0.1510 \\ 0.1940 \\ 0.2255 \\ 0.3000 \\ 0.4000 \\ 0.5000 \\ 0.6000 \end{pmatrix} \quad \tau_1 := \begin{pmatrix} 0 \\ 0.1000 \\ 0.1500 \\ 0.2000 \\ 0.2180 \\ 0.2320 \\ 0.2450 \\ 0.2620 \\ 0.2790 \\ 0.2960 \\ 0.3210 \\ 0.3525 \\ 0.4120 \\ 0.4500 \\ 0.5000 \\ 0.6000 \end{pmatrix}$$

Figure 5 Plot From Reference 5:



Determine the percentage of volumetric strain [in decimal form] using the CSR/N1(60) point shown in the plot above:

$\varepsilon := 0.0145$

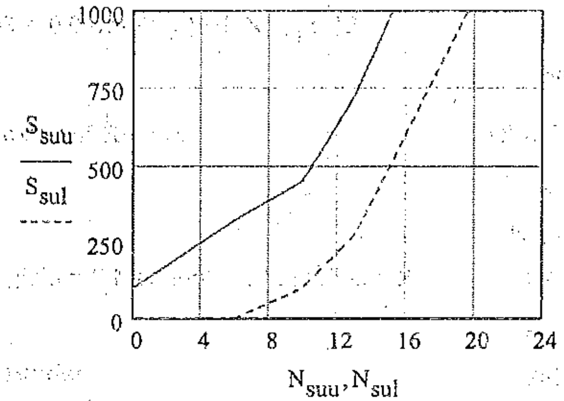
Calculate Estimated Settlement as a Result of Liquefaction:

$S := \varepsilon \cdot T$ $\qquad S = 0.4\,\text{in}$

Please use with caution - based on limited case studies of large-strain liquefaction failures, may not be appropriate at all for small-strain liquefaction failures.

Reproduce Chart for Residual Undrained Shear Strength from Reference 6:

$$N_{sul} := \begin{pmatrix} 0 \\ 6 \\ 10 \\ 13 \\ 20 \end{pmatrix} \quad S_{sul} := \begin{pmatrix} 0 \\ 0 \\ 100 \\ 270 \\ 1040 \end{pmatrix} \quad N_{suu} := \begin{pmatrix} 0 \\ 6 \\ 10 \\ 13 \\ 16 \end{pmatrix} \quad S_{suu} := \begin{pmatrix} 100 \\ 320 \\ 450 \\ 720 \\ 1100 \end{pmatrix}$$



Note: Chart is extrapolated above N = 15 and below N=3

Calculate Upper and Lower Bound Undrained Strength from Seed and Harder:

$$Sul := \begin{cases} \text{round}\left(\text{linterp}\left(N_{sul}, S_{sul}, N1_{60cs}\right), -1\right) & \text{if } N1_{60cs} \le 20 \\ 0 & \text{otherwise} \end{cases}$$

$$Suu := \begin{cases} \text{round}\left(\text{linterp}\left(N_{suu}, S_{suu}, N1_{60cs}\right), -1\right) & \text{if } N1_{60cs} \le 20 \\ 0 & \text{otherwise} \end{cases}$$

$N1_{60cs} = 28.3$

$Sul = 0$ psf

$Suu = 0$ psf

As noted by Reference 6, "it is recommended that the lower bound, or near-lower-bound relationship between N160cs and [residual undrained shear strength] be used...at this time, owing to scatter and uncertainty, and the limited number of case studies back-analyzed to date."

Calculations, Section 9: Residual Undrained Shear Strength from Reference 7 **Checked By:**

If values are zero, indicates not valid range of N160 for relationship

$$Su_{yield} := \begin{cases} \sigma_{veffatEQ} \cdot \left(0.205 + 0.0075 \cdot N1_{60}\right) & \text{if } N1_{60} \le 12 \\ 0 & \text{otherwise} \end{cases}$$

$Su_{yield} = 0 \frac{m\,s^2}{kg}$ psf

This value is primarily relevant for "static" rather than seismic liquefaction

$$Su_{triggered} := \begin{cases} \sigma_{veffatEQ} \cdot \left(0.03 + 0.0075 \cdot N1_{60}\right) & \text{if } N1_{60} \le 12 \\ 0 & \text{otherwise} \end{cases}$$

$Su_{triggered} = 0 \frac{m\,s^2}{kg}$ psf

Calculations, Section 10: Summary of Results **Checked By:**

Layer Depth, d:	$z = 26$ ft
Blowcounts :	$N_m = 18$ $N1_{60} = 22.3$ $N1_{60cs} = 28.3$
Liquefied ? Hazard Levels: Negligible = 0 Marginal = 1 Liquefies = 2	$FS = 0.9$ Hazard = 2
Settlement Strain :	$\varepsilon = 0.015$ Manually picked
Undrained Strength: Seed and Harder	$Sul = 0$
Yield undrained strength for static failures (Olsen and Stark 2003)	$Su_{yield} = 0 \frac{m\,s^2}{kg}$ psf
Liquefied residual strength (Olsen and Stark 2003)	$Su_{triggered} = 0 \frac{m\,s^2}{kg}$ psf

These values will be zero if N160 is outside of the correlated range.

Appendix G
First Amended Public Facility Site Agreement

FIRST AMENDED AND RESTATED PUBLIC FACILITY SITE AGREEMENT

BETWEEN

CITY OF RENO,
A municipal corporation

AND

CORONA CYAN LLC,
A Delaware Limited Liability Corporation

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FIRST AMENDED AND RESTATED
PUBLIC FACILITY SITE AGREEMENT

THIS FIRST AMENDED AND RESTATED PUBLIC FACILITY SITE AGREEMENT ("Agreement") is entered into by and between the CITY OF RENO, a municipal corporation ("City"); and CORONA CYAN LLC, a Delaware limited liability company and its successors and assigns ("Developer"). In consideration of the mutual covenants and agreements hereinafter set forth, the parties agree as follows:

1 **GENERAL**

1.1 On February 14, 2007, the City and Centex Homes, a Nevada general partnership ("Centex"), entered into a Fire Station Development Agreement ("Prior Agreement") which was executed by the City on March 14, 2007. On March 29, 2008, Centex and Developer, executed a General Assignment, Bill of Sale and Assignment and Assumption Agreement (the "General Assignment") whereby Centex granted, sold, assigned, transferred, conveyed and delivered to Developer any and all rights and obligations previously held by Centex in and under the Prior Agreement, all in connection with Developer's acquisition from Centex of the Bella Vista Ranch real estate development project located in Reno, Nevada. Pursuant to the General Assignment, Developer succeeded to the rights and obligations of Centex under the Prior Agreement and is now the "Developer" (as that term is defined in the Prior Agreement).

1.2 Pursuant to Sections 1.2 and 3.4 of the Prior Agreement, Centex voluntarily agreed and offered to dedicate to the City a fire station site and construct a turnkey fire station as indicated in the Prior Agreement. Pursuant to Section 5.3 of the Prior Agreement, if the fire station has not been constructed, Centex may assign its obligation to construct the fire station subject to approval by the City. The City desires to approve an assignment of the Prior Agreement to Developer, as is amended herein.

1.3 The City and Developer desire to amend the Prior Agreement to modify their respective obligations thereunder, and to provide for, among other modifications, the application of the Prior Agreement, as amended, to the 637+/- acres of real property located in the City of Reno and more particularly described in Exhibit "A" attached hereto and incorporated herein by this reference. This Agreement covers the following two (2) planned unit developments (PUD's): 1) City of Reno Case No. LDC05-00127, the planned unit development handbook which was approved by the City in August, 2005 (the "Phase 1 Handbook") as may be amended; and 2) City of Reno Case No. LDC10-00051, the planned unit development handbook (the "Phase 2 Handbook") as may be amended, which is currently being processed by the City. Both projects, for ease of reference are referred to collectively as the PUD's and all terms herein apply to both projects. This Agreement is subject to all other provisions contained in the applicable PUD's.

1.4 Pursuant to the provisions of this Agreement, Developer will transfer to the City by a Grant, Bargain and Sale Deed that certain Public Facility Site defined in Section 2 below, and make certain contributions from the PUD's toward the City's construction of a fire station that will serve the PUD's.

1.5 The Public Facility Site defined in Section 2 below, and all improvements thereon shall not be part of any homeowners' associations, landscape maintenance districts, drainage districts, or any other association or district established as a part of the PUD.

1.6 Upon full execution hereof and payment of the Initial Contribution (as defined below), this Agreement fully amends, restates, and supersedes the Prior Agreement.

2 TRANSER OF PUBLIC FACILITY SITE TO THE CITY

The Public Facility Site is more particularly described in Exhibit "B" (the "Public Facility Site"). Promptly following full execution of this Agreement, Developer shall execute and cause to be recorded at Developer's sole cost and expense a Grant Bargain and Sale Deed in the form attached hereto as Exhibit "C", and all related transfer documents approved by the City Attorney's Office which will transfer ownership of the Public Facility Site to the City. The Public Facility Site shall be transferred to the City free and clear of all encumbrances and liens except for permitted exceptions agreed to by the City in its reasonable discretion. When ownership of the Public Facility Site is transferred to the City, it shall be in good condition, free of any hazardous waste, weeds and/or debris, and shall include all water rights, if any, owned by the Developer. The Developer shall bring all utilities up to the Public Facility Site prior to transfer of ownership to the Public Facility Site to the City. The Developer shall also execute a Developers Release and Affidavit in the form attached as Exhibit "D". With this transfer, the Developer hereby waives any reversionary rights to the Public Facility Site, including any rights under NRS 268.050. Once the City receives the Initial Contribution (defined below) and the City has received a fully executed Grant Bargain and Sale Deed and related documents that has been recorded by the Developer in the official records of Washoe County, the Developer shall have no further responsibility, liability, or obligation for the Public Facility Site and the City agrees to take ownership and maintain the Public Facility Site in accordance with City codes.

3 CONTRIBUTIONS

3.1 Initial Contribution. Within thirty (30) days of execution of this Agreement, Developer shall pay to the City the sum of One Million and No/100ths Dollars ($1,000,000.00) (the "Initial Contribution"), which funds shall be placed in a restricted City account and shall only be used by the City toward the construction of a fire station which will serve the PUD's consistent with the City's response times utilized to provide fire service. The location of this fire station shall be in the sole discretion of the City but the location shall be adequate to provide fire services to the PUD's as noted above. The Initial Contribution shall be comprised of the following and shall be paid as follows: (1) Developer shall cause to be transferred to the City all right, title, and interest in and to that certain deposit account with Wells Fargo Bank, which account is identified as account number #1763113667 (the "Account") which balance shall be no less than Two Hundred Twenty Seven Thousand and No/100ths ($227,000.00). This Account is currently owned by Centex Homes, a Nevada general partnership (Centex). Centex shall be a party and signatory to this Agreement for the sole purpose of transferring ownership of this Account to the City. Once Centex has caused this Account to be transferred to the City, Centex shall have no further obligations under this Agreement. (2) The Developer shall also authorize the transfer and release to the City of all funds the City has collected and currently holds for the issuance of building permits for the PUD's pursuant to the Prior Agreement (Building Permit Funds). This amount is estimated to be One Hundred Twenty Thousand and No/100ths ($120,000.00). Developer shall pay to the City, via wire transfer, an amount equal to the difference between the Initial Contribution and the actual balances in the Account and Building Permit Funds at the time the Account and Building Permit Funds are transferred from or released by Developer to the City.

If the Initial Contribution is not paid to City within this thirty (30) day period, interest shall accrue at the rate of one (1) percent, compounded monthly, until the Initial Contribution has been paid to the City. In addition to the above, if the Initial Contribution is not paid by the Developer to the City within thirty (30) days, this shall be a material breach of this Agreement and Developer shall have the full obligation to construct a turn-key fire station at the Public Facility Site by December 31, 2025 but shall have no further obligations hereunder. The City shall also withhold all building permits if the Initial Contribution is not paid within (30) days.

3.2 <u>Contributions</u>. In addition to the Initial Contribution, Developer shall provide contributions for the construction of the fire station in connection with the development of each of the PUD's which obtain building permits after the execution of this Agreement. The contribution due (the "Contribution" or "Contributions") for each Unit under this Section 3.2 shall be as follows: (1) the sum of Three Hundred and No/100ths Dollars ($300.00) for each Residential Unit constituting a single family dwelling; (2) the sum of Two Hundred and No/100ths Dollars ($200.00) for each Residential Unit constituting an individual multi-family dwelling; and (3) thirty five cents ($0.35) per gross building square foot for Non-Residential Units. As used herein, "Residential Unit" means any single family dwelling or individual multi-family dwelling in the Project, and "Non-Residential Unit" means any stand-alone building in the Project located upon property holding a commercial land use designation which is not a "Residential Unit". (Residential Units and Non-Residential Units may be referred to herein individually as a "Unit" and collectively as "Units"). Units shall not include civic uses, such as parks, schools, recreational amenities (e.g. golf course, fitness center, community center, or homeowner association facilities), open space, wetlands, common area, government-owned facilities, streets, flood control improvements, etc (collectively, the "Civic Uses"). It is noted that certain Units that have already obtained building permits paid at a different rate, which is deemed to be adequate and no further capital contributions shall be required for those units. Once a Contribution is made for a Unit, that Unit shall be completely released from all further obligations to contribute under this Section 3 without the need to record a release of the lien and charge of this Agreement as to said Unit, and said Unit owner shall have no liability if Contributions are not timely made for other Units or any Developer obligations of this Agreement are not performed. If requested, the City agrees to sign and deliver to Developer, which Developer may cause to be recorded at its sole cost and expense, a release of lien required by a title company with respect to the sale of a Unit, provided that the form of the release of lien is acceptable to the City, in the City's reasonable discretion.

3.3. Payment of Contributions. Each and every Contribution required by Section 3.2 above shall be paid to the City prior to the issuance of a building permit for that Unit. The City shall have the right to delay or deny the issuance of any and all building permits for a material default of this Agreement or deny or delay a building permit for any Unit for which the Contribution has not been paid until such time as the Contribution has been paid. For purposes of clarification, the approval of parcel maps, tentative maps, special use permits, records of survey, final subdivision maps, or approval of certificates of occupancy for Civic Uses within the Project shall not trigger the obligation to make Contributions hereunder.

3.4 Sale Proceeds. City shall receive full ownership of the Public Facility Site. If City determines it no longer has a municipal or government use for the site, it may sell all or a portion of the property. After January 1, 2028, City shall receive all proceeds from the sale. If such sale occurs prior to the January 1, 2028, Developer and the City shall equally share the net sales proceeds of the sale. As used herein, "net sales proceeds" means the gross sales price of the sale of the Public Facility Site, less reasonable brokerage commission and other reasonable closing costs which costs shall be split evenly between the City and the Developer. Notwithstanding the foregoing, Developer may, in its sole and absolute discretion, apply its portion of the proceeds from a sale occurring before January 1, 2028 to any remaining amounts due under of this Agreement. If the Developer applies its portion of the net sales proceeds during this time, such amount shall be credited toward either the applicable amount of One Million Five Hundred Thousand and No/100ths Dollars ($1,500,000.00) the Developer must pay to the City by January 1, 2023 (See Section 3.6) or the One Million Eight Hundred Thousand and No/100ths Dollars ($1,800,000.00) the Developer must pay to the City after January 1, 2023 but before January 1, 2028 (See Section 3.6 below).

3.5 <u>Pre-paid Contributions</u>. In its sole and absolute discretion and without any obligation whatsoever to do so, at any time Developer may pre-pay a Contribution to the City under this Agreement ("Pre-paid Contribution"). The Developer shall indicate to what obligation or to which Units the Pre-paid Contribution applies.

3.6 <u>Increased Contributions</u>. If, by January 1, 2023, the City has not collected One Million Five Hundred Thousand and No/100ths Dollars ($1,500,000.00) under the terms of this Agreement, the Developer shall process, at its sole cost and expense, an amendment to the PUD's which shall increase the Contributions required of Units within the PUD's to ensure the City receives an increase in total compensation to be the sum of One Million Eight Hundred Thousand and No/100ths Dollars ($1,800,000.00). If the City has not received this increased amount of One Million Eight Hundred Thousand and No/100ths Dollars ($1,800,000.00) by January 1, 2028 the Developer shall make a lump sum payment to the City for the difference between what the City has received and the One Million Eight Hundred Thousand and No/100ths Dollars ($1,800,000.00). If the Developer does not make this payment within thirty (30) days from this date, the City shall cease to issue all building permits within the PUD's. The City also reserves the right to pursue all other legal remedies.

3.7 Certificate of Compliance. Within thirty (30) working days after receiving a specific request from Developer and if all amounts due and payable under this Agreement have been paid and all other conditions have been satisfied, the City shall execute in recordable form, a Certificate of Compliance with the Agreement, which, when recorded in the official records of Washoe County shall indicate satisfaction of the obligations of the parties under this Agreement. A Release of Lien is different than a Certificate of Compliance and no recorded Release of Lien terminating the lien and charge upon a portion of Units shall operate to terminate any outstanding obligations of the Developer or the City, including any unperformed obligation of Developer to contribute for all other Units not subject to the recorded Release of Lien or to pay Contributions which have not been paid.

4 COVENANTS RUNNING WITH THE LAND / ASSIGNMENT

4.1 Recordation. In order to provide notice to bind all future owners of the property within the PUD's regarding obligations for Contributions specified in this Agreement, and to provide them with the benefits hereof, this Agreement shall be recorded, at Developers sole cost and expense, in the official records of Washoe County. The terms and provisions of this Agreement regarding Contributions shall constitute covenants running with the land for the Units, and no successor in interest to all or part of the Units shall assume Developer's obligations under Sections 2 or 3.1, unless the successor to Developer is assigned the obligation and expressly assumes the obligation, subject to City approval, as provided in Section 4.2 of this Agreement.

4.2 Assignment of Agreement. Developer may assign this Agreement, subject to the City's written approval of the assignee, which approval shall not be unreasonably withheld, provided that the approved assignee assumes the applicable obligations and duties of Developer and is capable of performing such outstanding obligations and duties. In determining whether an assignee is capable of performing the outstanding obligations and duties of the Agreement, the City may consider, among other things, the assignee's financial resources, past business and/or development history and/or any other matters which may impact the assignee's ability to perform the outstanding obligations and duties contained in the Agreement.

4.3 Subordination. The parties agree that this Agreement, and all terms and conditions hereof, shall be junior to and subordinated to the recorded priority of all deeds of trust encumbering all or any portion of the Units which are recorded subsequent in time to this Agreement, provided any such deed of trust secures the payment of loan proceeds used to purchase or construct improvements which benefit the Units subject to subordination. Nothing contained in this Agreement grants any right nor imposes any obligation on a trustee or a beneficiary of a deed of trust encumbering all or any portion of the Units. Upon request, the City shall execute recordable subordination agreements consistent with the provisions of this Section.

5 TERM

Except as otherwise expressly provided herein, this Agreement shall terminate fifty (50) years from the date hereof or earlier upon the recordation of a Certificate of Compliance.

6 MISCELLANEOUS

The parties further agree as follows:

6.1 Governing Law; Venue. This Agreement is being executed and delivered in Washoe County, Nevada, and is intended to be performed in the State of Nevada, and the laws of Nevada shall govern the validity, construction, enforcement and interpretation of the Agreement. Venue for any legal action arising out of this Agreement shall be in a court of competent jurisdiction located in Washoe County, Nevada.

6.2 Entirety and Amendments. This Agreement embodies the entire agreement between the parties and supersedes all prior agreements and understandings relating to the subject matter hereof and may be amended or supplemented only by an instrument in writing executed by the party against whom enforcement is sought, provided that nothing contained in this Agreement shall be interpreted to change, amend or modify the conditions of the PUD's, as approved by the City. No oral statements or representations made before or after the execution of this Agreement regarding the subject matter of this Agreement are binding on a party, nor may any such oral statements or representations be relied on by a party.

6.3 Invalid Provisions. If any provision of this Agreement is held to be illegal, invalid or unenforceable under present or future laws, such provision shall be fully severable. The Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part of the Agreement. The remaining provisions of the Agreement shall remain in full force and effect and shall not be affected by the illegal, invalid or unenforceable provision or by its severance from this Agreement.

6.4 Parties Bound and Assignment. Except as otherwise provided herein, this Agreement shall be binding upon and inure to the benefit of the parties, and their respective heirs, personal representatives, successors and assigns.

6.5 Further Acts. In addition to the acts recited in the Agreement to be performed, the parties agree to perform, or cause to be performed, any and all further acts as may be reasonably necessary to consummate the obligations contemplated hereby.

6.6 Headings. Headings used in this Agreement are used for reference purposes only and do not constitute substantive matter to be considered in construing the terms of this Agreement.

6.7 Attorneys' Fees. In the event that any action is necessary to enforce the rights of any party hereto, the prevailing party in any such action shall be entitled to reasonable costs and attorneys' fees.

6.8 Notice. All notices given pursuant to this Agreement shall be in writing and shall be given by personal delivery, by facsimile transmission, by United States mail or by United States express mail or other established express delivery service (such as Federal Express), postage or delivery charge prepaid, addressed to the appropriate party at the address set forth below:

City:	City of Reno City Manager's Office P.O. Box 1900 Reno, NV 89505 Telephone: (775) 334-2400 Facsimile: (775) 334-2097
Copy to:	City of Reno City Attorney's Office P.O. Box 1900 Reno, NV 89505 Telephone: (775) 334-2050 Facsimile: (775) 334-2420
Developer:	Corona Cyan LLC Attn: Tony Koeijmans RSF Partners 3232 McKinney, Suite 890, Dallas, TX 75204 Telephone: (214) 849-9819 Facsimile: (214) 855-9407

The persons and addresses to which notices are to be given may be changed at any time by any party upon written notice to the other party. All notices given pursuant to this Agreement shall be deemed given upon receipt.

6.9 Receipt Defined. For the purpose of this Agreement, the term "receipt" shall mean any of the following: (a) the date of delivery of the notice or other document as

6.12 Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original but all of which together will constitute one and the same instrument.

IN WITNESS WHEREOF, each Party hereto has executed this Agreement as of the date opposite that Party's signature.

CITY OF RENO

for ____________ DAVID L. AIAZZI Date: 11-14-12, 2012
By: ROBERT A. CASHELL, SR.
Its: Mayor

ATTEST:

____
CITY CLERK

CITY OF RENO CORPORATE SEAL WASHOE COUNTY, NEVADA

APPROVED AS TO LEGAL FORM:

____
CITY ATTORNEY ROB BONY
DEPUTY

ACKNOWLEDGEMENT – NRS 240.1665

STATE OF NEVADA)
: ss.
COUNTY OF WASHOE)

This instrument was acknowledged before me on this 14th day of November, 2012, by DAVID L. AIAZZI as VICE MAYOR of the City of Reno, a municipal corporation.

BEVERLY BEATY-BENADOM
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 08-101994-2 - Expires December 2, 2013

____
Notary Public

Corona Cyan LLC,
A Delaware limited liability company

By: ________________ Date: 11/8, 2012
Name: Tony Koelymans
Title: Authorized Signatory

ACKNOWLEDGEMENT – NRS 240.1665

STATE OF Texas)
: ss
COUNTY OF Dallas)

This instrument was acknowledged before me on this 8th day of Nov., 2012, by Tony Koelymans as Authorized Signatory of Corona Cyan LLC, a Delaware limited liability company.

EUNICE ANN CHRISTMAN
Notary Public, State of Texas
My Commission Expires
March 24, 2015

12856197-4

____
Notary Public, State of Texas

CENTEX HOMES,
A Nevada General Partnership
By: Centex Real Estate Corporation, a Nevada Corporation Managing Partner

By: [signature] Date: November 1st, 2012
Name: Chris Winter
Title: Division VP, Finance

~~**ACKNOWLEDGEMENT – NRS 240.1665**~~

~~STATE OF __________)~~
~~) ss~~
~~COUNTY OF _________)~~

~~This instrument was acknowledged before me on this ________ day of ____________________, 20__, by ______________________________ as ____________________ of Centex Homes, a Nevada General Partnership~~

____
Notary Public, State of ____________

STATE OF CALIFORNIA)
) ss.
COUNTY OF ALAMEDA)

On November 1, 2012, before me, Lesley A. Rosselli, Notary Public, personally appeared **CHRISTOPHER WINTER,** who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature ______________________ (Seal)
Print Name: Lesley A. Rosselli
Notary Public, State of California
My commission expires: March 28, 2013

LESLEY A. ROSSELLI
COMM. # 1842691
NOTARY PUBLIC-CALIFORNIA
CONTRA COSTA COUNTY
MY COMM. EXP. MAR. 28, 2013

EXHIBIT "A"

LEGAL DESCRIPTION OF THE PROJECT

EXHIBIT "A"

PARCEL B OF P.M. 4526
ORIGINAL (PHASE I OF) BELLA VISTA RANCH

All that certain real property situated within the a portion of the South One-half (1/2) of Section Three (3) and the north one-half (1/2) of Section Ten (10), Township 18 North, Range 20 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel B as shown on that "Parcel Map For Bella Vista Ranch", recorded in the office of the Washoe County Recorder, March 10, 2006, as Parcel Map No. 4528, Document No. 3359967, Official Records of Washoe County, Nevada.

CONTAINING: 367.11 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.

PROFESSIONAL LAND SURVEYOR - STATE OF NEVADA
JAMES D. BAILEY JR.
Exp. 12-31-12
No. 18369

9/27/12

PREPARED BY THE FIRM OF
PLACES CONSULTING SERVICES INCORPORATED
6250 FIELDSTONE PLACE
RENO, NEVADA 89523
(775) 355-7721

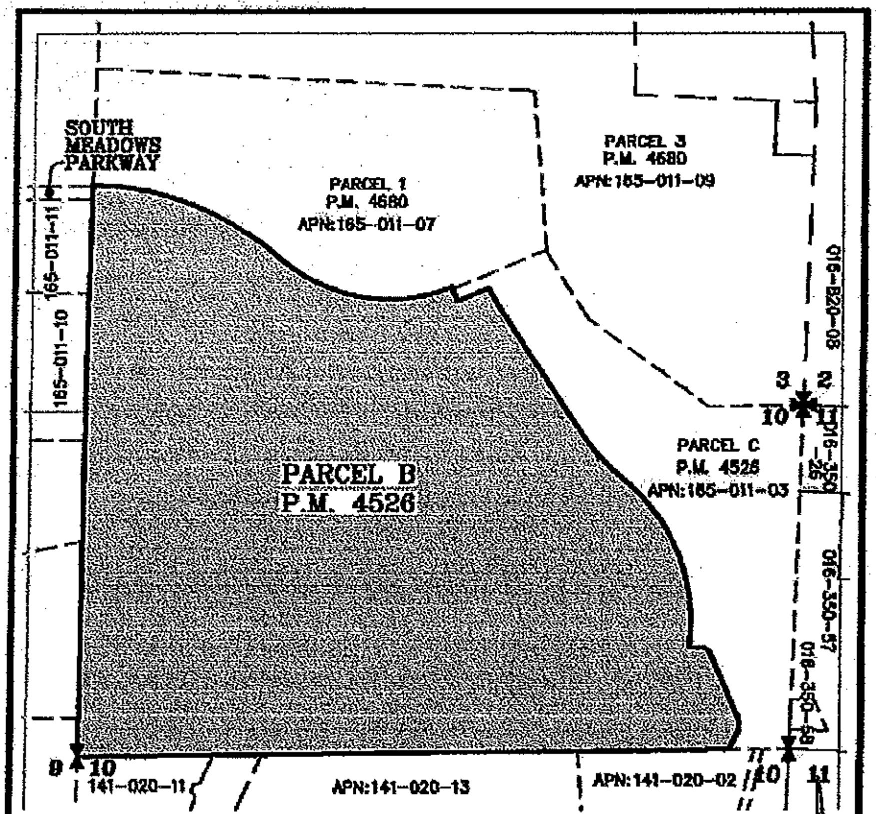


EXHIBIT A-1

PARCEL B OF P.M. 4526

ORIGINAL (PH. 1 OF) BELLA VISTA RANCH

SCALE: 1"=1000'

367.11 ACRES TOTAL

PLACES Consulting Services, Inc.
PLANNING LANDSCAPE ARCHITECTURE CIVIL ENGINEERING SERVICES
6250 Fieldstone Place Reno, Nevada 89523
Ph. (775) 355-7721 Fax. (775) 355-7795

EXHIBIT "A"

PARCEL C OF P.M. 4526
PHASE II - BELLA VISTA RANCH
(APN: 165-011-03)

All that certain real property situated within the a portion of the South One-half (1/2) of Section Three (3) and the northeast one-quarter (1/4) of Section Ten (10), Township 18 North, Range 20 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel C as shown on that "Parcel Map For Bella Vista Ranch", recorded in the office of the Washoe County Recorder, March 10, 2006, as Parcel Map No. 4526, Document No. 3359987, Official Records of Washoe County, Nevada.

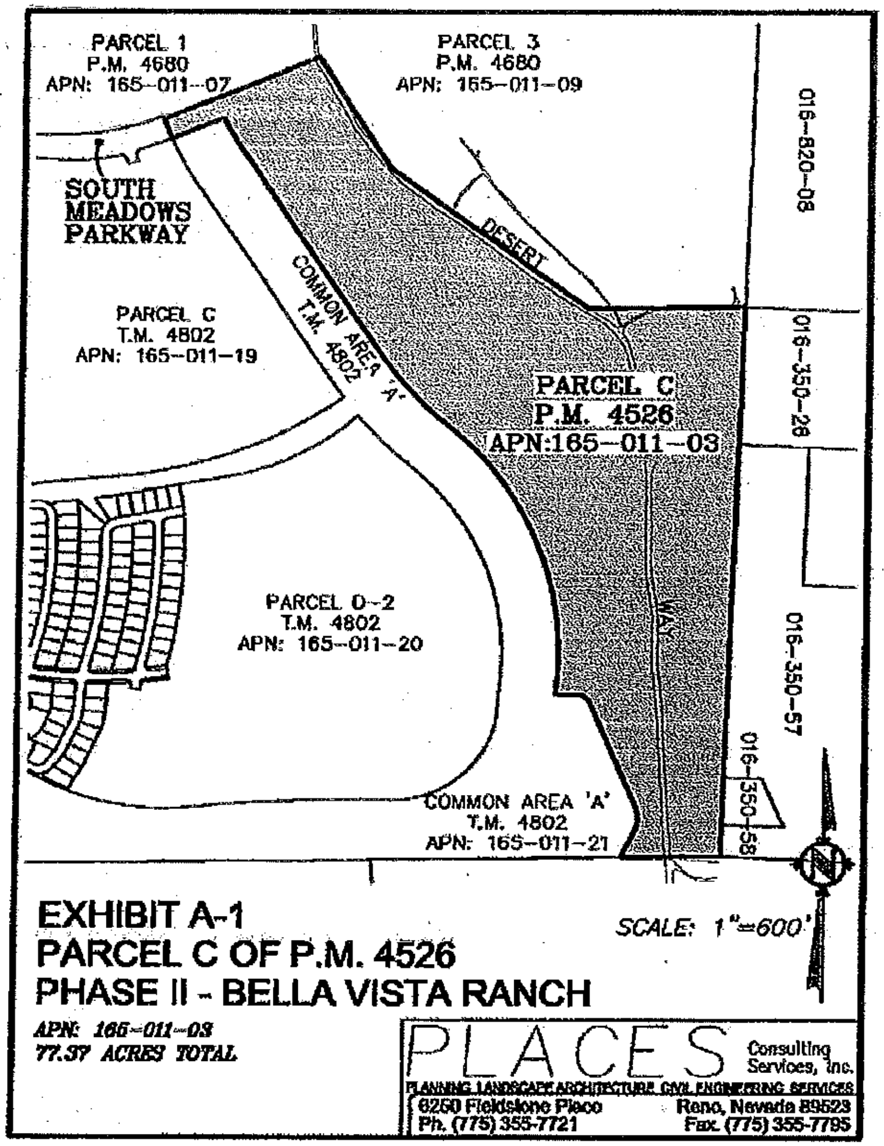
CONTAINING: 77.37 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
JAMES D. BAILEY JR.
Exp. 12-31-12
No. 18388

9/27/12

PREPARED BY THE FIRM OF
PLACES CONSULTING SERVICES INCORPORATED
6250 FIELDSTONE PLACE
RENO, NEVADA 89523
(775) 355-7721



PARCEL 1
P.M. 4680
APN: 165-011-07
PARCEL 3
P.M. 4680
APN: 165-011-09
016-820-08
SOUTH MEADOWS PARKWAY
DESERT
COMMON AREA 'A'
T.M. 4802
PARCEL C
T.M. 4802
APN: 165-011-19
016-350-26
PARCEL C
P.M. 4526
APN:165-011-03
PARCEL D-2
T.M. 4802
APN: 165-011-20
WAY
016-350-57
016-350-58
COMMON AREA 'A'
T.M. 4802
APN: 165-011-21
EXHIBIT A-1
PARCEL C OF P.M. 4526
PHASE II - BELLA VISTA RANCH
SCALE: 1"=600'
APN: 165-011-03
77.37 ACRES TOTAL
PLACES Consulting Services, Inc.
PLANNING LANDSCAPE ARCHITECTURE CIVIL ENGINEERING SERVICES
6250 Fieldstone Place
Ph. (775) 355-7721
Reno, Nevada 89523
Fax (775) 355-7795

EXHIBIT "B"

LEGAL DESCRIPTION OF PROJECT PUBLIC FACILITY SITE

EXHIBIT "A"

PARCEL B OF T.M. 4792
PUBLIC FACILITY PARCEL
(APN: 165-060-01)

All that certain real property situated within the a portion of the northwest one-quarter (1/4) of Section Ten (10), Township 18 North, Range 20 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel B as shown on that "Official Plat Of Bella Vista Ranch Village B – Unit 1", recorded in the office of the Washoe County Recorder, June 20, 2007, as Tract Map No. 4792, Document No. 3546189, Official Records of Washoe County, Nevada.

CONTAINING: 6.50 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.

PROFESSIONAL LAND SURVEYOR · STATE OF NEVADA
JAMES D. BAILEY JR.
Exp. 12-31-12
No. 18388

7/27/12

PREPARED BY THE FIRM OF
PLACES CONSULTING SERVICES INCORPORATED
6250 FIELDSTONE PLACE
RENO, NEVADA 89523
(775) 355-7721

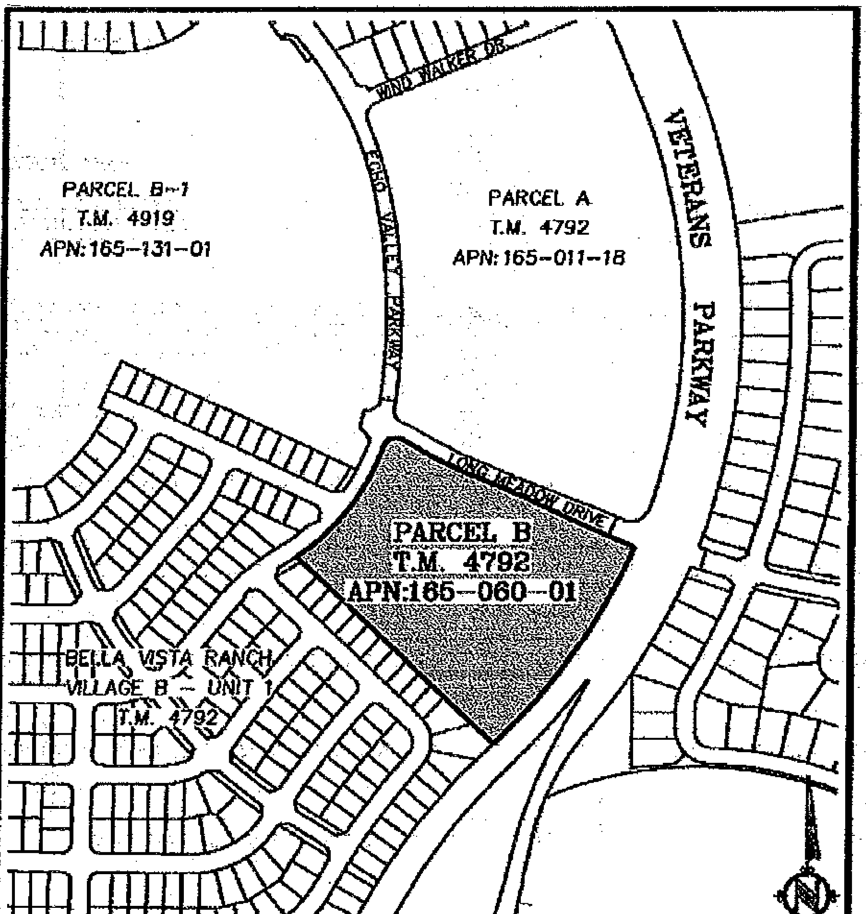


EXHIBIT A-1
PARCEL B OF T.M. 4792
PUBLIC FACILITY PARCEL

SCALE: 1"=300'

APN: 165-060-01
6.50 ACRES TOTAL

PLACES Consulting Services, Inc.
PLANNING LANDSCAPE ARCHITECTURE CIVIL ENGINEERING SERVICES
6250 Fieldstone Place Reno, Nevada 89523
Ph. (775) 355-7721 Fax. (775) 355-7795

EXHIBIT C

GRANT, BARGAIN AND SALE DEED

A.P.N. # [to be provided by Developer]

After recording, mail original and
Tax Statements to:
City of Reno
C/O Property Manager
P.O. Box 1900
Reno, Nevada 89505

With a Conformed Copy to:
[Developer]

GRANT, BARGAIN and SALE DEED

THIS INDENTURE WITNESSETH: That [Developer], "Grantor", in consideration of $10.00, the receipt of which is hereby acknowledged, does hereby Grant, Bargain, Sell and Convey to the City of Reno, a municipal corporation, "Grantee", all that real property situate in the City of Reno, County of Washoe, State of Nevada, bounded as described as follows:

See Exhibit "A" attached hereto and made a part hereof.

TO HAVE AND TO HOLD said premises, together with all and singular the rights and appurtenances thereof to Grantee in fee simple. Developer has no reserved rights in the Park Facility or the Park Site and Developer waives any first refusal rights it has under NRS 268.050, or successor statutes.

Together with all and singular the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining including any mineral and water rights. Witness my hand this _______ day of ________________________, 20__;

Grantor:

[Developer]
By:______________________________________
[Insert Name, Title]

STATE OF TEXAS)
: ss
COUNTY OF __________)

On ______________________________, 20__, personally appeared before me, a Notary Public, ___________________________________, personally known (or proved) to me the person(s) whose name is/are subscribed to the above instrument who acknowledged that he/they executed the within instrument.

____
Notary Public

Exhibit 1
to Grant, Bargain and Sale Deed
Legal Description

THE LAND REFERRED TO HEREIN IS SITUATED IN THE COUNTY OF WASHOE, STATE OF NEVADA, AND IS DESCRIBED AS FOLLOWS:

EXHIBIT "A"

PARCEL B OF T.M. 4792
PUBLIC FACILITY PARCEL
(APN: 165-080-01)

All that certain real property situated within the a portion of the northwest one-quarter (1/4) of Section Ten (10), Township 18 North, Range 20 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel B as shown on that "Official Plat Of Bella Vista Ranch Village B – Unit 1", recorded in the office of the Washoe County Recorder, June 20, 2007, as Tract Map No. 4792, Document No. 3546189, Official Records of Washoe County, Nevada.

CONTAINING: 6.50 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
JAMES D. BAILEY JR.
Exp. 12-31-12
No. 18388

9/27/12

PREPARED BY THE FIRM OF
PLACES CONSULTING SERVICES INCORPORATED
6250 FIELDSTONE PLACE
RENO, NEVADA 89523
(775) 355-7721

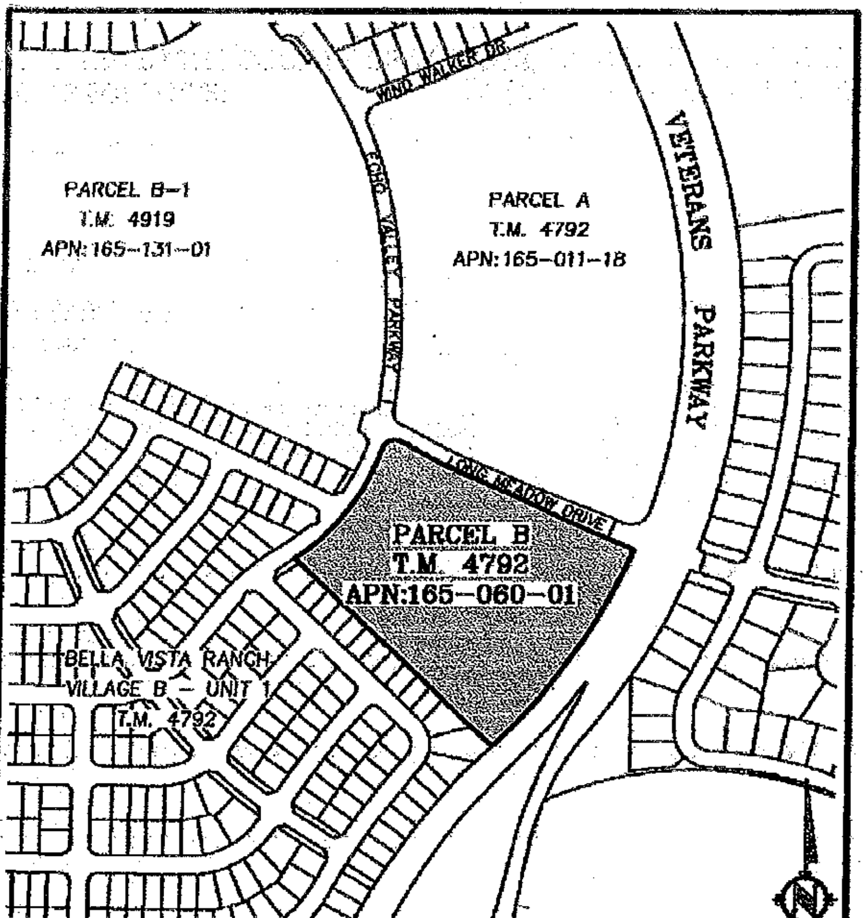


EXHIBIT A-1
PARCEL B OF T.M. 4792
PUBLIC FACILITY PARCEL

SCALE: 1"=300'

APN: 165-060-01
6.50 ACRES TOTAL

PLACES Consulting Services, Inc.
PLANNING LANDSCAPE ARCHITECTURE CIVIL ENGINEERING SERVICES
6250 Fieldstone Place Reno, Nevada 89523
Ph. (775) 355-7721 Fax. (775) 355-7795

EXHIBIT D

DEVELOPER'S RELEASE AND AFFIDAVIT

I, ____________, being first duly sworn, depose and say under penalty of perjury:

1. This Developer's Release and Affidavit is made pursuant to that certain Public Facility Site Agreement by and between the City of Reno ("City") and ________________ ("Developer"), dated _________ (hereafter the "Agreement").

2. I am the ________ of ________________, the Developer. I am making this Affidavit individually and I am authorized to make this Affidavit and Release on behalf of ___________, the Developer. This Affidavit and the representations made herein are intended to be relied upon by the City in conjunction with the Closing of the Agreement, and shall survive the Closing.

3. I certify and warrant on behalf of myself and Developer that to the best of our information and belief after diligent inquiry, as of the date hereof, there are no actual or threatened legal claims, including but not limited to lawsuits, material man's claims, mechanics liens, wage claims, property claims, or claims by resident's of the PUD, against the City or the Public Facility Site arising out of the Agreement, or which may affect the City's interest in the Agreement or the Public Facility Site, except those expressly set forth below:

   a. [Describe any exceptions].

4. I certify and warrant on behalf of myself and Developer that Developer will indemnify, defend and hold City harmless from any claims against the City arising out of developer's obligations under the Agreement.

5. I certify and warrant on behalf of myself and Developer that Developer has no claims against the City arising out of the Agreement.

6. I certify and warrant on behalf of myself and Developer that Developer has not become aware of any Contamination or Hazardous Substances on or under the Public Facility Site, or on or under the surrounding lands which might possibly affect the Public Facility Site, which have not been previously disclosed or disclosed in writing to City.

7.

8. I certify and warrant on behalf of myself and Developer that any applicable property taxes and utilities attributable to the Public Facility Site are fully paid and will be fully paid as of Closing.

THIS PORTION OF THIS PAGE HAS BEEN LEFT INTENTIONALLY BLANK

9. I certify and warrant on behalf of myself and Developer that all public utilities required to be brought up to the Public Facility Site abut the Public Facility Site through adjoining public streets or, if they pass through adjoining private lands, do so in accordance with valid public easements that will inure to the benefit of City upon Closing.

DEVELOPER

By: ____________________________
Its: ____________________________

STATE OF TEXAS)
:ss.
COUNTY OF __________)

This instrument was acknowledged before me on the ____ day of ______________, 2012, by ____________________, as ____________________ of __________________(DEVELOPER).

____
Notary Public

Appendix H
Residential Construction Tax Agreement

ASSIGNMENT AND ASSUMPTION OF PARK DEVELOPMENT AGREEMENT
&
FIRST AMENDMENT AND RESTATEMENT OF PARK DEVELOPMENT AGREEMENT

THIS ASSIGNMENT AND ASSUMPTION OF PARK DEVELOPMENT AGREEMENT & FIRST AMENDMENT AND RESTATEMENT OF PARK DEVELOPMENT AGREEMENT (this "Assignment"), is entered into by and among the CITY OF RENO, a municipal corporation ("City"), CORONA CYAN, LLC, a Delaware limited liability company ("Corona"), and CENTEX HOMES, a Nevada general partnership ("Centex"). The City, Corona, and Centex are each individually referred to herein as a "Party" and collectively as the "Parties."

RECITALS:

A. On June 28, 2006, the City and Centex entered into a Park Development Agreement (the "Park Agreement"), which Park Agreement provides for the construction of a park in relation to that planned unit development ("PUD") in Reno, Nevada, commonly known as Bella Vista Ranch (City of Reno Case No. LDC05-00127) (hereafter "BVR").

B. Centex has sold, assigned, transferred, and conveyed unto Corona all of Centex's right, title and interest in and to BVR, the Park Agreement and other interests, including Centex's rights relating to the project described in Recital D below;

C. In connection with Corona's acquisition of BVR and the Park Agreement from Centex, the Parties desire that Centex further assign to Corona, and that Corona assume from Centex, all rights, obligations, and interests of Centex in and under the Park Agreement;

D. Corona, as the developer, is in the process of obtaining approval of that proposed PUD, adjacent to BVR, commonly known as Bella Vista Ranch Phase II (City of Reno Case No. LDC10-00051) (hereafter "BVR Phase II");

E. Corona and City desire to amend the Park Agreement by providing for the City to construct some or all of the park. To clarify their relationship, Corona and City desire to amend and restate the Park Agreement between them as set forth hereafter in this Assignment;

NOW, THEREFORE, in consideration of the mutual covenants contained herein and other valuable consideration, the receipt and adequacy of which are expressly acknowledged, the parties agree as follows:

1. **Assignment and Assumption.**

(a) Centex hereby assigns, transfers and sets over unto Corona all of Centex's right, title and interest in, under and to the Park Agreement.

(b) Corona hereby accepts the foregoing assignment and assumes all of the liabilities and obligations of Centex under the Park Agreement.

2. **Consent to Assignment.** The City, in accordance with Section 9.8 of the Park Agreement, hereby (a) consents to the assignment effected hereby; and (b) agrees to recognize Corona as "Owner" under the Park Agreement and thereby establishes direct privity of estate and privity of contract with Corona.

3. **Restatement of Park Agreement.** The Park Agreement is hereby restated and superseded in its entirety, except to the extent specific portions of the Park Agreement are referenced herein in this Assignment.

4. **Definitions.** The following definitions shall apply to this Assignment.

a. Director: shall mean the Director of the City's Parks Recreation and Community Services Department ("PRCS"), or the Director's designee.

b. Improvements: shall mean the improvements described in section 8, entitled Park Site Improvements, below.

c. Park Site: shall mean that certain park site parcel of land described in the next subsection entitled Park Site Parcel, together with the related Improvements thereon.

d. Park Site Parcel: shall mean that certain parcel of land containing approximately 14 acres, plus or minus, as set forth in Exhibit "A" to this Assignment.

e. PUD: shall mean Planned Unit Development.

f. RCT: shall mean Residential Construction Tax which is that certain tax created pursuant to Nevada Revised Statutes ("NRS") 278.497 through 278.4987, as subsequently amended and Reno Municipal Code ("RMC") 18.14.401 - 18.14.406, as subsequently amended (collectively "Enabling Statutes"). RMC imposes a tax upon the construction of apartment houses, residential dwelling units and mobile home lots (collectively "Units"), and establishes a method for collection of the RCT to enable City to provide neighborhood parks and facilities for parks. RCT imposes one percent (1%) of the valuation of each building permit issued, or One Thousand Dollars ($1,000.00) per residential dwelling unit or mobile home, whichever is less.

5. Transfer of Land. Corona agrees to donate the Park Site Parcel to the City at no cost to the City by grant, bargain and sale deed in a form attached hereto as Exhibit "C" within 45 days following a request in writing from the City's Director, which transfer shall occur prior to commencement of any construction by the City or within 30 days after the issuance of the 850th certificate of occupancy in BVR, whichever first occurs.

The Park Site Parcel shall be subject to a use restriction that for a period of 50 years the property shall be used solely as a city park, for related recreational purposes, and for telecommunications facilities that do not interfere with the park and recreation use and are camouflaged to minimize visual impact; and that after such time, the City, in its sole discretion, may sell or modify the use of the property provided the City Council finds at a hearing noticing all neighbors within 750 feet of the property that the proposed modification in use or sale of the property best serves the public interest. In the event of a transfer by the City, Corona hereby represents that it is reserving no right or claim in or to the Park Site Parcel and Corona, on behalf of itself and its successors and assigns, hereby waives any first refusal rights it has under NRS 268.050, or successor or similar statutes.

6. Preliminary Title Commitment. Thirty (30) days prior to transfer of the Parks Site Parcel to the City, Corona shall provide a preliminary commitment for an owner's standard coverage ALTA policy of title insurance for the final Park Site Parcel from a reputable title company. Prior to acceptance of the Park Site Parcel by the City, Corona shall remove all title exceptions, monetary encumbrances, encroachments, and all exceptions to coverage which could have a material and negative impact on the City's intended use of the Park Site (collectively "Encumbrances"), unless City accepts the Encumbrance in writing or unless the Encumbrance existed of record when the Park Agreement initially became effective. The cost of the preliminary report and title insurance, and any charges or fees related to escrow or transfer of the Park Site Parcel, shall be paid by Corona.

7. Developer's Affidavit. At the time of transfer of the Park Site Parcel to the City, Corona shall provide City with an Affidavit substantially in the form of the Developer's Affidavit attached hereto as Exhibit "B".

8. Park Site Improvements. City agrees to construct the improvements to the Park Site generally as described in Exhibits "B" and "C" to the Park Agreement and generally as described in the BVR PUD Handbook description of park facilities; however, City may make reasonable modifications to the improvements, facilities, amenities and to their locations within the Park Site Parcel which are in the public interest and, if it is a major change, following review by the Recreation and Parks Commission (hereafter collectively, the "Improvements").

Construction the Improvements shall take place in two phases, as provided in this section and section 9, hereafter. The first phase, to the extent it is constructed by the City, shall be designed and constructed consistent with both the City's ability to provide maintenance for the first phase and with the City's ability to fund construction with RCT collected at that time from the BVR and the BVR Phase II PUD's. Construction of the Improvements in the first phase, whether by the City or by Corona, will begin prior to or upon issuance of the 850th Certificate of Occupancy.

Construction of the second phase will begin when the City determines that it has the ability to provide maintenance for the completed park and that it has sufficient RCT from the BVR PUD and the BVR Phase II PUD to complete construction of the Improvements. Once construction by either City or Corona is commenced, construction shall be pursued diligently until completion of that phase.

9. Accelerated Park Site Improvements.

a. The City recognizes that Corona may desire to construct park improvements prior to the City's park construction schedule. If Corona chooses to exercise this option, Corona's construction of a portion of the Improvements shall relieve the City of any requirement to build park improvements in phase one referenced in the preceding section, but shall not relieve the City of the obligation to complete the overall contemplated park Improvements in the second construction phase described in section 8.

b. Corona shall initiate the process by forwarding a written proposal to the City which shall include its intention to exercise its option. A preliminary park plan design for the entire site shall be developed and approved by the City, prior to the City's approval of Corona's accelerated improvements proposal in order to coordinate Corona's improvements into the overall Park Site planning. The proposal shall include a description of Corona's desired site amenities, total estimated construction costs, and timing of construction.

c. Corona will be eligible to utilize RCT funds collected from the BVR and BVR Phase II PUD's for reimbursement following construction of the accelerated improvements. If sufficient RCT funds are not available from the BVR and BVR Phase II PUD's, when construction commences, Corona may choose to advance its own funds to complete the project. If it does so, City will agree to reimburse Corona from future collections of RCT funds from the BVR and BVR Phase II PUD's in the fund amount advanced by Corona to complete the accelerated park improvements. City shall have the right to inspect all relevant documents to verify cost claims. The maintenance and operation of the park parcel, including the accelerated improvements, shall be the sole responsibility of Corona until the Park Site Parcel is transferred to City ownership.

d. Prevailing Wage Laws shall be applicable to construction by Corona, as follows:

(1) Indemnity. Corona and all Corona's contractors and subcontractors shall comply with NRS 338.010 to 338.090, inclusive, and regulations adopted pursuant thereto ("Prevailing Wage Laws"), and be responsible for carrying out the requirements of such provisions. Corona shall, and hereby agrees to, unconditionally indemnify, reimburse, defend, protect and hold harmless City and its elective and appointive boards, commissions, officers, agents, attorneys, consultants and employees, and all of their respective successors and assigns, from and against any and all claims, demands, suits and actions at law or in equity, and losses, liabilities, expenses, penalties, fines, orders, judgments, injunctive or other relief, and costs and damages of every kind, nature and description (including but not limited to attorneys' fees and court costs; with counsel reasonably acceptable to City), and administrative, enforcement or judicial proceedings, whether known or unknown, and which directly or indirectly, in whole or in part, are caused by, arise from, or relate to, or are alleged to be caused by, arise from, or relate to the failure to comply with any state or federal labor laws, regulations or standards in connection with this agreement, including but not limited to Prevailing Wage Laws.

(2) Wages. As provided in NRS 338.020, the hourly and daily rate of wages to be paid each of the classes of mechanics and workmen employed in connection with construction of the Improvements shall not be less than the rate of such wages then prevailing in Washoe County.

(3) Penalty. Pursuant to NRS 338.060, Corona agrees to and shall forfeit as a penalty to the City, the sums established and applicable pursuant to the NRS 338.080 for each calendar day or portion thereof that each workman employed in connection with the project is paid less than the rates designated in the above in Subsection (2) for any work performed under this Agreement by Corona or any subcontractors or agents of Corona; or is not reported to the labor commissioner and City as required pursuant to NRS 338.070.

(4) Withholding Payments. Notwithstanding any other provisions of the Assignment, the City may withhold payments of RCT sufficient to pay any reasonably threatened or likely expenses or fines relating to Prevailing Wage Law violations or claims resolution of the issue. If any prevailing wage expenses or fines are actually incurred or imposed, City may offset otherwise required payments from RCT, or pursue such amounts by any lawful means.

(5) Reporting, Recordkeeping and Investigations. Prior to commencement of construction, and thereafter as often as reasonably necessary, Corona and the Director shall meet and agree upon reasonable reporting and record-keeping procedures to enable the parties to comply with Prevailing Wage Law requirements.

10. Right of Access. Prior to transfer of the Park Site Parcel, the City shall have the reasonable right of access to the Park Site Parcel, upon reasonable notice to Corona, for the purpose of conducting surveys, soils tests, staking, inspections or any other activities reasonably related to planning, engineering or construction of the Improvements. City shall have this right even if Corona accelerates construction, as provided in the preceding section entitled Accelerated Park Site Improvements.

11. Residential Construction Tax. City shall be entitled to collect and retain all RCT from the BVR PUD and the BVR Phase II PUD, including amounts already collected; and Corona waives any rights to RCT under the Park Agreement or otherwise, except as set forth in paragraph 9 herein. Any RCT not used to construct the Park Site Improvements shall be available to the City to use within the City's Park District 4 for any purpose authorized by the RCT Enabling Statutes, regardless of whether the RCT was collected from the BVR or BVR Phase II PUD's.

12. **Water.** Corona shall ensure that at the time of conveyance of the Park Site Parcel to City, that City has sufficient water service to meet the needs of both phases of the completed park, including but not necessarily limited to irrigation, restroom and drinking needs. Corona shall secure "will serve" letters or other rights to water and ensure that water lines run to the boundary of Park Site Parcel. Effluent or nonpotable water may be provided for irrigation where the City deems such water to be consistent with public health.

13. **Utilities:** Corona shall ensure that infrastructure is in place to provide utility services to the boundary of the Park Site Parcel, including but not necessarily limited to, electricity, gas, cable, sewer and water.

14. **Maintenance Prior to Transfer.** Corona shall maintain the Park Site Parcel in good condition free and clear of hazards, dangerous conditions or substances, debris, dumping, digging, litter, garbage, weeds over 6 inches in height and noxious weeds until title is transferred to the City.

15. **Maintenance After Transfer.** Following the acceptance of the transfer of the Park Site Parcel to the City, the City shall be responsible for maintenance of the Park Site Parcel. Maintenance of improved portions of the park, whether by Corona or by the City shall be subject to the maintenance provisions contained in Exhibit "D" ("Scope of City Maintenance") to the Park Agreement, as amended from time to time. Without limiting the preceding sentence, maintenance shall be to standards required by all applicable laws and ordinances and shall be at least equal to actual maintenance performed by City for similar parks. Following construction of any phase of Improvements, the improved portion of the Park Site shall be open to the public.

16. **Owner's Reservation of Rights.** Notwithstanding the transfer of the Park Site Parcel, Corona reserves all mineral rights, but without right of entry on the surface of the Park Site, nor the right to drill, mine, store, explore or operate through the surface of the Park Site or within five hundred feet (500') from the surface of the Park Site. Corona further reserves unto itself all rights and benefits of wetlands wherever located, and any and all rights to change or modify the Wetlands Permit and/or mitigation program, including but not limited to the right to sell excess mitigation area from time to time. Additionally, Corona reserves all mineral rights, oil, gas and/or hydrocarbon rights, geothermal rights, and storm water runoff located or produced within the Park Site.

17. **Corona's Access and Use of Park Site.** After transfer of the Park Site Parcel to the City, and conditioned upon the City's written approval, Corona shall be granted the right to limited access to the Park Site for installation and maintenance of utilities and related facilities, for installation and maintenance of drainage and other facilities and equipment, for compliance with the Wetlands Permit, to adjust or relocate walls and/or fencing or otherwise to correct boundary discrepancies, to comply with drainage needs, to

fulfill any jurisdictional agency requirements, to extend, construct, connect to, and maintain utilities and drainage lines, and to accomplish any other tasks required of Corona. City's approval for such access may be further conditioned upon, including but not limited to, requiring Corona to repair or replace any portions of the Park Site or Improvements that are altered or damaged as a result of Corona's access and use of the Park Site. Corona shall not cause or allow utility vaults or pump stations to be placed on the Park Site without the City's prior written approval.

18. Default. In the event Corona defaults in the performance of its obligations under this Assignment, City shall (subject to the provisions of the following section entitled Notice of Default) without limitation have any or all of the following nonexclusive remedies:

a. Stop issuing building permits in either the BVR PUD or the BVR Phase II PUD, or both;
b. Demand and receive transfer of the Park Site Parcel;
c. Avail itself of any other remedy allowed by law or equity.

19. Notice of Default. Prior to utilizing a remedy specified above, City shall deliver written notice of default to Corona specifying in detail the circumstances of Corona's default, and Corona shall have thirty (30) days from the date of delivery of the notice to cure the default.

20. Recording. Corona, at its expense, shall record this Assignment, or a Memorandum of this Assignment approved in form by the Director, against all owners within the BVR PUD within thirty (30) days of execution by all Parties, and shall provide City with a conformed recorded copy.

21. Indemnification of Owner. Subject to the limitations of applicable law, and without waiving its statutory protections, City shall indemnify, protect, defend and hold harmless Corona and its successors, assigns, shareholders, officers, directors, employees, authorized agents, contractors and subcontractors from and against any and all liability, costs and expenses (including defense costs and legal fees), and claims, losses, liabilities, suits, or actions of any kind (collectively "Claims and Expenses"), for damages for bodily injury, death, personal injury or property damage, arising out of, relating to or as a result of any negligent acts or omissions of City or its officers, directors, employees, authorized agents, contractors or subcontractors in carrying out City's obligations hereunder, except to the extent such Claims and Expenses are proximately caused by the negligence or willful misconduct of the parties indemnified or their agents, servants or independent contractors who are directly responsible to such indemnified parties.

22. Indemnification of City. Owner shall indemnify, protect, defend and hold harmless City and its governing board, employees, authorized agents, contractors and subcontractors, and their respective successors and assigns from and against any and all Claims and Expenses, for damages for bodily injury, death, personal injury or property damage, arising out of, relating to or as a result of any negligent acts or omissions of

Corona or its officers, directors, employees, authorized agents, contractors, or subcontractors in carrying out Corona's obligations hereunder, except to the extent such Claims and Expenses are proximately caused by the negligence or willful misconduct of the parties indemnified, or their agents, servants or independent contractors who are directly responsible to such indemnified parties.

23. **Insurance.** Prior to commencement of construction on the Park Site Parcel by Corona pursuant to paragraph 9 herein, Corona shall maintain liability insurance in an occurrence amount of at least one million dollars covering its indemnification, defense and hold harmless obligations under this Assignment, and naming the City as an additional insured, with the certificate of insurance providing that coverage for the City shall not be cancelled without 30 days prior notice to the City.

24. **Defenses not Waived.** The City does not waive, and intends to assert, any common law or statutory defenses available to it, including those in NRS Chapter 41.

25. **Exigency.** Time is of the essence of this Assignment.

26. **Notice – Delivery.** Any notices, requests or instructions by a party to be given to another party shall be given in writing, by personal delivery or are to be mailed by certified mail with return receipt requested, to the following addresses or by facsimile copy to the respective number set forth.

If to Corona:

Corona Cyan, LLC
c/o RSF Partners
3232 McKinney
Dallas, Texas 75204
Attention: Tony Koeijmans
FAX: 214-855-9407

If to City:

CITY OF RENO
c/o Director, Parks, Recreation and Community Services Dept.
P.O. Box 1900
Reno, Nevada 89505
Fax Number: (775) 334-2449

<u>WITH COPY TO:</u>
Reno City Attorney's Office
P.O. Box 1900
Reno, Nevada 89505
Fax Number: (775) 334-2420

A notice shall be effective on the date of personal delivery if personally delivered before 5:00 p.m. (local time), otherwise on the day following personal delivery, or two (2) business days following the date the notice is postmarked, if mailed as set forth above or, if by facsimile, on the date of actual notice if received before 5:00 p.m. (local time) otherwise on the next business day. Any party may change the address to which notice is to be given to it by giving notice of such change of address in the manner set forth above for giving notice.

27. **Entire Agreement.** This Assignment contains the entire agreement between the parties hereto and supersedes any and all prior agreement, arrangements or understandings regarding the same subject matter as this Agreement, which are null and void.

28. **Survival.** The representations, covenants and agreements contained herein shall not be discharged or dissolved upon transfer of the Park Site Parcel, but shall survive the same.

29. **Governing Law.** This Assignment shall be constructed and enforced in accordance with the laws of the State of Nevada and venue for any such action shall be in Washoe County, Nevada.

30. **Modification and Amendments.** This Assignment may not be modified, amended, altered or changed in any respect whatsoever except by further agreement in writing, duly executed by the parties.

31. **Successors and Assigns.** This Assignment shall be binding upon and inure to the benefit of the parties hereto and their respective successors, subcontractors, personal representatives, and assigns; provided that no assignment of the rights or obligations of Corona shall take place by the mere transfer or title of all or any portion of BVR or BVR Phase II. Only an express, written assignment approved by City shall operate to assign any rights or obligations of Corona to a third party.

32. **Consultation with Legal Counsel.** The parties hereto acknowledge and agree that each has been given the opportunity to review this Assignment with legal counsel independently, and has the requisite experience and sophistication to understand, interpret, and agree to the particular language of the provisions hereof. The parties have equal bargaining power and intend the plain meaning of the provisions herein. In the event of an ambiguity in or dispute regarding interpretation of terms, the interpretation of this Assignment shall not be resolved by any rule of interpretation providing for interpretation against the party who causes the uncertainty to exist or against the draftsman.

33. **Headings.** The headings and captions used in this Assignment are for convenience and ease of reference only and shall not be used to construe, interpret, expand or limit the terms of this Assignment. All exhibits attached to this Assignment, all exhibits to the Park Agreement referenced herein, and the recitals at the front of this Assignment are incorporated fully herein by this reference.

34. **Counterparts and Signatures.** This Assignment may be executed in a number of counterparts, the conglomeration of which shall constitute a complete agreement if signed by all parties hereto. The parties hereby warrant that the persons executing this Assignment are authorized to execute this Assignment and are authorized to obligate the respective parties to perform this Assignment. A facsimile or electronic signature on this Assignment shall be treated for all purposes as an original signature.

IN WITNESS WHEREOF, each Party hereto has executed this Assignment as of the date opposite that Party's signature.

CENTEX:

CENTEX HOMES, a
Nevada general partnership
By: Centex Real Estate Corporation
a Nevada corporation, Managing Partner

By: [signature] Date: November 1st, 2012
Chris Winter
Its: Division VP, Finance

CORONA:

Corona Cyan, LLC,
a Delaware limited liability company

By: [signature] Date: 11/8, 2012
Print: Tony Bosiyanos
Its: Authorized Signatory

Signatures continued on next page.

THE CITY:

City of Reno,
a municipal corporation

By: ______________________ DAVID L. AIAZZI
for Robert A. Cashell, Sr.
Its: Mayor

Date: 11-14-12, 2012

ATTEST:

____
City Clerk

APPROVED AS TO FORM:

____
Deputy City Attorney

CITY OF RENO
CORPORATE
SEAL
WASHOE COUNTY, NEVADA

STATE OF CALIFORNIA)
) ss.
COUNTY OF ALAMEDA)

On November 1, 2012, before me, Lesley A. Rosselli, Notary Public, personally appeared **CHRISTOPHER WINTER,** who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature ______________________ (Seal)
Print Name: Lesley A. Rosselli
Notary Public, State of California
My commission expires: March 28, 2013

LESLEY A. ROSSELLI
COMM. # 1842881
NOTARY PUBLIC-CALIFORNIA
CONTRA COSTA COUNTY
MY COMM. EXP. MAR. 28, 2013

ACKNOWLEDGMENTS – NRS 240.1665

STATE OF NEVADA)
COUNTY OF WASHOE)

This instrument was acknowledged before me on this 14th of ~~October~~ NOVEMBER 2012, by ~~Robert A. Cashell, Sr., as Mayor~~, of the CITY OF RENO, a municipal corporation.
DAVID L. AIAZZI, VICE MAYOR

BEVERLY BEATY-BENADOM
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 06-101994-2 - Expires December 2, 2013

Beverly Beaty-Benadom
(Signature of notarial officer)

STATE OF Texas)
) ss.
COUNTY OF Dallas)

This instrument was acknowledged before me on this 8th day of ~~October,~~ November 2012 by Tony Kreitmans, as Authorized Signatory of CORONA CYAN, LLC, a Delaware limited liability company.

EUNICE ANN CHRISTMAN
Notary Public, State of Texas
My Commission Expires
March 24, 2015

12856197-4

(Signature of notarial officer)

~~STATE OF ________)~~
~~) ss~~
~~COUNTY OF ________)~~

~~This instrument was acknowledged before me on this ______ day of __________, 20__, by __________________ as __________ of CENTEX HOMES, a Nevada General Partnership.~~

~~____________________~~
~~Notary Public, State of ________~~

Exhibit "A"

Bella Vista Ranch PUD Park Site Legal Description
[*to be attached*]

EXHIBIT "A"

PARCEL A OF T.M. 4792
NEIGHBORHOOD PARK
(APN: 165-011-18)

All that certain real property situated within the a portion of the northwest one-quarter (1/4) of Section Ten (10), Township 18 North, Range 20 East, Mount Diablo Meridian, City of Reno, County of Washoe, State of Nevada, more particularly described as follows:

Parcel A as shown on that "Official Plat Of Bella Vista Ranch Village B – Unit 1", recorded in the office of the Washoe County Recorder, June 20, 2007, as Tract Map No. 4792, Document No. 3546189, Official Records of Washoe County, Nevada.

CONTAINING: 14.24 acres of land, more or less.

See Exhibit "A-1" attached hereto, and made a part hereof.

PROFESSIONAL LAND SURVEYOR-STATE OF NEVADA
JAMES D. BAILEY JR.
Exp. 12-31-12
No. 18368

9/27/12

PREPARED BY THE FIRM OF
PLACES CONSULTING SERVICES INCORPORATED
6250 FIELDSTONE PLACE
RENO, NEVADA 89523
(775) 355-7721

EXHIBIT "B"

DEVELOPER'S AFFIDAVIT FORM

I, ______________, being first duly sworn, depose and say under penalty of perjury:

1. This Affidavit is made pursuant to that certain **ASSIGNMENT AND ASSUMPTION OF PARK DEVELOPMENT AGREEMENT & FIRST AMENDMENT AND RESTATEMENT OF PARK DEVELOPMENT AGREEMENT** by and between the City of Reno ("City"), CORONA CYAN, LLC, a Delaware limited liability company ("Developer") and CENTEX HOMES, a Nevada general partnership, dated __________ (hereafter the "Agreement").

2. I am the ________ of _________________, the Developer. I am making this Affidavit individually and I am authorized to make this Affidavit on behalf of ___________, the Developer. This Affidavit and the representations made herein are intended to be relied upon by the City in conjunction with the transfer of the Bella Vista Ranch Planned Unit Development ("PUD") Park Site Parcel, and shall survive the transfer.

3. I certify and warrant on behalf of myself and Developer that to the best of our information and belief after diligent inquiry as of the date hereof, there are no actual or threatened legal claims, including but not limited to lawsuits, material man's claims, mechanics liens, wage claims, property claims, or claims by resident's of the Bella Vista Ranch PUD or the Bella Vista Ranch, Phase II PUD, against the City or the Park Site Parcel arising out of the Agreement, or which may affect the City's interest in the Agreement or the Park Site Parcel, except those expressly set forth below:

a. [*Describe any exceptions*].

4. I certify and warrant on behalf of myself and Developer that Developer will indemnify, defend and hold City harmless from any claims against the City which are known as of the date hereof, but not disclosed and approved by the City, affecting the City's title to the Park Site Parcel.

5. I certify and warrant on behalf of myself and Developer that Developer has no claims against the City arising out of the Agreement except those expressly set forth below:

6. I certify and warrant on behalf of myself and Developer that to the best of our information and belief after diligent inquiry there are no Hazardous Substances on or affecting or likely to affect the Park Site except those expressly set forth below:.

7. I certify and warrant on behalf of myself and Developer that any applicable property taxes and utilities attributable to the Park Site are fully paid as of the date hereof. t

8. I certify and warrant on behalf of myself and Developer that all public utilities required for the operation of the Park have been provided and that they either abutt the Park Site Parcel through adjoining public streets or, if they pass through adjoining private lands, do so in accordance with valid public easements that will inure to the benefit of City upon Closing.

DEVELOPER

By: Tony Koezymans
Its: Authorized Signatory

STATE OF Texas)
):ss.
COUNTY OF Dallas)

This instrument was acknowledged before me on the 8th day of Nov., 2012, by Tony Koezymans, as Authorized Signatory of Corona Cyan, LLC.

NOTARY PUBLIC

EUNICE ANN CHRISTMAN
Notary Public, State of Texas
My Commission Expires
March 24, 2015
12856197-4

EXHIBIT "C"
FORM OF GRANT DEED

A.P. # ____________

After recording, mail to:
City of Reno
% Property Manager
P.O. Box 1900
Reno, Nevada 89505

Grant, Bargain, Sale Deed

THIS INDENTURE WITNESSETH: That CORONA CYAN, LLC, a Delaware limited liability company, Grantor, in consideration of good and valuable consideration, the receipt of which is hereby acknowledged, does hereby Grant, Bargain, Sell and Convey to the City of Reno, a Nevada municipal corporation, Grantee, all that real property situate in the City of Reno, County of Washoe, State of Nevada, bounded and described as follows:

See Exhibit A attached hereto and made a part hereof.

TO HAVE AND TO HOLD said premises, together with all singular the rights and appurtenances thereof to Grantee, in fee simple, together with all and singular the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining, excepting any mineral and water rights;

And subject to a use restriction that for a period of 50 years from recording, the property shall used solely as a city park, for related recreational purposes, and for telecommunications facilities that do not interfere with the park and recreation use and are camouflaged to minimize visual impact; and that after such time, the City, in its sole discretion, may sell or modify the use of the property provided the City Council finds at a hearing noticing all neighbors within 750 feet of the property that the proposed modification in use or sale of the property best serves the public interest.

CORONA CYAN, LLC waives any first refusal rights it has under NRS 268.050, or successor or similar statutes.

Witness my hand this __ day of ________, 20__;

____
____
Signatures of Seller

State of Nevada)
)ss
County of Washoe)

On ____________________, 20__, personally appeared before me, a Notary Public, ____________________, personally known (or proved) to me to be the person(s) whose name is/are subscribed to the above instrument who acknowledged that he/they executed the within instrument.

WASHOE COUNTY RECORDER

OFFICE OF THE RECORDER
KALIE M. WORK, RECORDER

1001 E. NINTH STREET
RENO, NV 89512
PHONE (775) 328-3661
FAX (775) 325-8010

LEGIBILITY NOTICE

The Washoe County Recorder's Office has determined that the attached document may not be suitable for recording by the method used by the Recorder to preserve the Recorder's records. The customer was advised that copies reproduced from the recorded document would not be legible. However, the customer demanded that the document be recorded without delay as the parties rights may be adversely affected because of a delay in recording. Therefore, pursuant to NRS 247.120 (3), the County Recorder accepted the document conditionally, based on the undersigned's representation (1) that a suitable copy will be submitted at a later date (2) it is impossible or impracticable to submit a more suitable copy.

By my signing below, I acknowledge that I have been advised that once the document has been microfilmed it may not reproduce a legible copy.

Signature

5/9/2022
Date

Eric Hasty
Printed Name