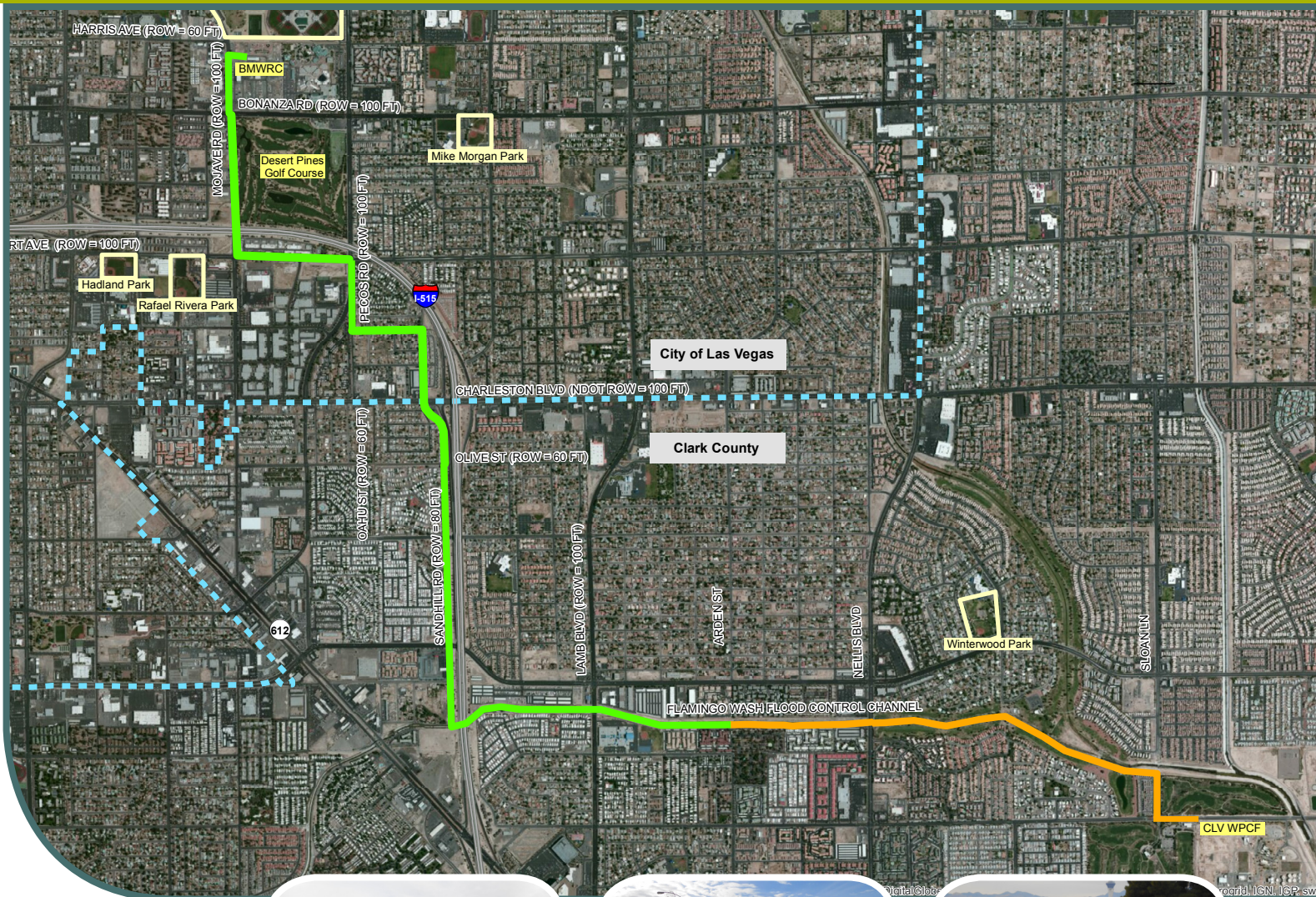




CITY OF LAS VEGAS BOMO Force Main Phase 2 | Bonanza Mojave Recycling Facility to Arden Street *Preliminary Design Report*

April 2014



Preliminary Design Report
BOMO Force Main - Phase 2
Bonanza Mojave Recycling Facility to Arden Street

CITY OF LAS VEGAS

**PRELIMINARY
FOR REVIEW ONLY**

April 2014



Prepared under the responsible charge of

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Preliminary Design Report

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Acronyms and Abbreviations

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACP	Asbestos Cement Pipe
AEP	Authorization to Enter Property
Alignment Study	<i>Bonanza Mojave (BOMO) Water Resource Center Decommissioning Project – Task 2220 Reuse Pipeline Alignment Alternatives, B&V, June 28, 2012</i>
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BMWRC	Bonanza Mojave Water Resource Center
BOMO	Bonanza Mojave Proposed 18” Reclaimed Waterline – BMWRC to WPCF
B&V	Black & Veatch
CCWRD	Clark County Water Reclamation District
CLV	City of Las Vegas
CMAR	Construction Manager at Risk
DCSWCS	<i>Design and Construction Standards for Wastewater Collection Systems, 2010 Edition</i>
DPGC	Desert Pines Golf Course
EOP	Engineer’s Opinion of Cost
fps	feet per second
FWFCC	Flamingo Wash Flood Control Channel
gpm	gallons per minute
HGL	Hydraulic grade line
LVVWD	Las Vegas Valley Water District
MGD	Million gallons per day
MUTCD	<i>Manual on Uniform Traffic Control Devices</i>
NDOT	Nevada Department of Transportation
NDWR	Nevada Division of Water Resources
NDEP	Nevada Department of Environmental Protection
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NPW	Non-potable water
NTP	Notice-to-Proceed
O&M	Operation and maintenance
OPCC	Opinion of Probable Construction Cost
P&P	Plan and Profile
PDR	Preliminary Design Report
PLS	Professional Land Surveyor
psi	pounds per square inch
PVC	Polyvinyl Chloride
ROW	Right-of-way
RWSS	Reuse Water Supply System
RTC	Clark County Regional Transportation Commission
SNWA	Southern Nevada Water Authority
SOP	Standard Operating Procedure
SWG	Southwest Gas
UDACS	<i>Uniform Design and Construction Standards, 2010 Edition</i>
VCP	Vitrified Clay Pipe
WPCF	Water Pollution Control Facility

Executive Summary

The City of Las Vegas (CLV) Bonanza Mojave Water Resource Center (BMWRC) is a waste water treatment facility with a capacity of 1.0 million gallons per day (MGD) currently serving nearby golf course customers. Based on a maintenance cost evaluation associated with BMWRC, CLV has decided to decommission the facility and serve reuse customers directly from the CLV Water Pollution Control Facility.

To serve the current and future reuse water customers, CLV will construct a new Reuse Water Supply System (RWSS) with a buildout supply capacity of 3.23 MGD. The new system includes a reuse pump station (by others) located at the Water Pollution Control Facility (WPCF) site and approximately 33,000 feet of reclaimed water (reuse) force main with a capacity of 3.23 MGD.

The proposed Bonanza Mojave non-potable water transmission main (BOMO) will convey treated effluent water from the WPCF to the BMWRC.

Due to the construction schedule of the CLV Sahara Arden Sewer Replacement project, BOMO was divided into two phases:

- Phase 1 –Currently in construction - runs from the WPCF to the Flamingo Wash Channel approximately 2,600 LF west of the intersection of Nellis Blvd and the Flamingo Wash. Total Phase 1 length is 11,000 LF.
- Phase 2 - continues from the end of Phase 1 to the BMWRC in Mojave Rd, north of Bonanza Ave. Total Phase 2 length is 22,000 LF.

Recommended Alignment

HDR performed an alternative alignment evaluation on the previously developed *Bonanza Mojave (BOMO) Water Resource Center Decommissioning Project – Task 2220 Reuse Pipeline Alignment Alternatives*, B&V, June 28, 2012 (**Alignment Study**). Preliminary plan and profile (P&P) sheets were created along the conceptual and alternative alignments and were used to evaluate and determine the recommended alignment, based on the following Criteria:

- Potential Utility Conflicts
- Impact to the Public
- Construction Cost
- Constructability
- Ease of Maintenance
- Right-of-Way (ROW) Permitting/Acquisition Requirements

Based on this evaluation, the Recommended Alignment for BOMO Phase 2 varies slightly from the Conceptual Alignment originally identified. Refer to **Summary Figure EX-1**.

Preliminary Construction Cost Estimate

The Engineer's Opinion of Cost for the Recommended Alignment shown in **Summary Figure EX-1** is listed in **Summary Table EX-1** below:

Summary Table EX-1: OPCC

ITEM #	ITEM	QUANTITY	UOM	UNIT PRICE	EXTENDED PRICE
	MOBILIZATION/DEMOBILIZATION	1	LS	5%	\$372,102.00
	QUALITY CONTROL	1	LS	2%	\$148,841.00
	TRAFFIC CONTROL	1	LS	\$660,500.00	\$660,500.00
BOMO Force Main Phase 2					
1	18-INCH RECLAIMED - AWWA C905, DR 18, PRESSURE CLASS 235 (BEDDING, BACKFILL, COMPACTION, PAVEMENT SECTION)	21,615	LF	\$200	\$4,323,000.00
2	18" IN-LINE ISOLATION GATE VALVE	12	EA	\$8,000	\$96,000.00
3	36" CASING (US 95 CROSSINGS)	400	LF	\$2,500	\$1,000,000.00
4	REMOVE AND REPLACE ASPHALT-MINOR	11,709	SY	\$30.00	\$351,270.00
5	REMOVE AND REPLACE ASPHALT-MAJOR	19,812	SY	\$40.00	792480.00
6	REMOVE AND REPLACE ASPHALT-NDOT	260	SY	\$50.00	\$13,000.00
7	REMOVE AND REPLACE CONCRETE	576	SY	\$120.00	\$69,120.00
8	REMOVE AND REPLACE ASPHALT-TRAIL	667	SY	\$25.00	\$16,675.00
9	UTILITY POLE SUPPORT	6	EA	\$20,000.00	\$120,000.00
Subtotal Construction Cost					\$7,962,988.00
Cost Plus Contingency (30%)					\$10,351,884.00

The preliminary OPCC for the project totals \$10,351,884. BOMO Phase 2 and quantity of ancillary items are based upon Recommended Alignment preliminary quantities, which will be refined as the design progresses. The OPCC will be updated with each progress design submittal.

Preliminary Geotechnical Interpretive Report (GIR) and Environmental/Hydrogeologic Reports and have been prepared. The GIR report identified areas impacted by groundwater and caliche. Four of the thirty-one borings along the alignment encountered caliche, with the pipe depths at or below the caliche layer at three of the boring locations. Also reviewed in this report is the suitability of existing soils to be used as backfill. Only four of the twenty-six soil samples tested were acceptable for use as backfill. As a result, most of the alignment will require imported backfill material. Groundwater was encountered at eight of the thirty-one boring locations along the conceptual BOMO alignment, with three of the locations having

groundwater at or above the proposed pipe depth. Further evaluation of groundwater is evaluated in the preliminary Hydrogeologic Report.

Permitting Summary

The BOMO Phase 2 Recommended Alignment proceeds through CLV, Clark County and NDOT jurisdictions, and has been reviewed to identify the documentation and permits necessary to proceed with construction.

- Within the Clark County-owned Flamingo Wash Flood Control Channel, an agreement for easement access and a temporary construction easement is anticipated.
- When within Clark County ROW, a CCPW Encroachment Permit will be required. It is estimated that the Clark County permitting process will take six to nine months.
- NDOT ROW access will require NDOT ROW Occupancy permits at I-515 at the Flamingo Wash, Charleston Blvd, Sahara Ave, and at I-515 at Mojave Rd. Both I-515 and Charleston Blvd ROW are owned by NDOT in fee, and will require NDOT ROW Occupancy Permits. Sahara Ave is owned by Clark County; however, NDOT has maintenance responsibility and will require a permit in addition to the encroachment permit required by Clark County. It is estimated that the NDOT permitting process will take six- to nine-months.

Groundwater Discharge Permits from NDEP will be required where dewatering is necessary. Based on a preliminary evaluation of the water table along the Conceptual Alignment, the discharge flow rates are not anticipated to exceed 250-gpm, which is the maximum limit for a Nevada Department of Environmental Protection (NDEP) Category 4 DeMinimis discharge permit. Discharged water quality must be monitored and tested as part of the DeMinimis permit; however, it is anticipated that these permits will suffice along the majority of the Alignment. Additional samples and testing will be required where the Recommended Alignment deviates from the Conceptual Alignment. It is estimated that the NDEP DeMinimis permitting process will take 60 to 90 days after submittal to NDEP.

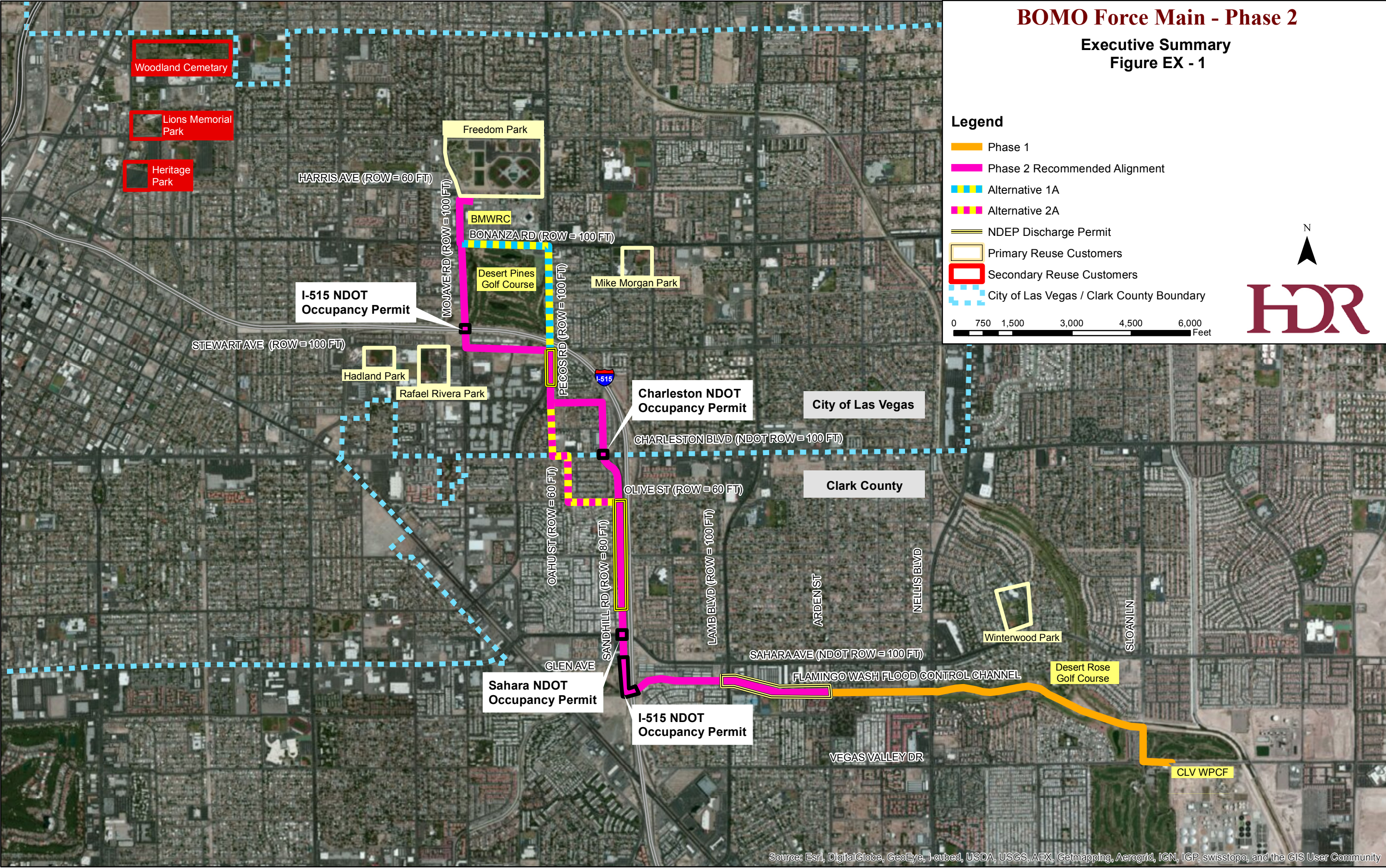
Based on the preliminary design, standard construction methods and construction schedule, the project does not warrant the use of the CMAR delivery method. This project is a viable candidate for Design Bid Build competitive bidding process.

BOMO Force Main - Phase 2

Executive Summary
Figure EX - 1

Legend

- Phase 1
 - Phase 2 Recommended Alignment
 - Alternative 1A
 - Alternative 2A
 - NDEP Discharge Permit
 - Primary Reuse Customers
 - Secondary Reuse Customers
 - City of Las Vegas / Clark County Boundary
- 0 750 1,500 3,000 4,500 6,000 Feet



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

1.0 Introduction

1.1 Background

The City of Las Vegas (CLV) Bonanza Mojave Water Resource Center (BMWRC), a wastewater treatment facility, has a capacity of 1.0 million gallons per day (MGD) and is responsible for providing treated reuse water to the Desert Pines Golf Course. After conducting a facilities evaluation, the CLV determined that the operation and maintenance of the BMWRC results in an annual deficit ranging from \$500,000 to \$750,000; therefore, the CLV decided to decommission it in order to reduce operation and maintenance (O&M) costs and expand the CLV water reuse system.

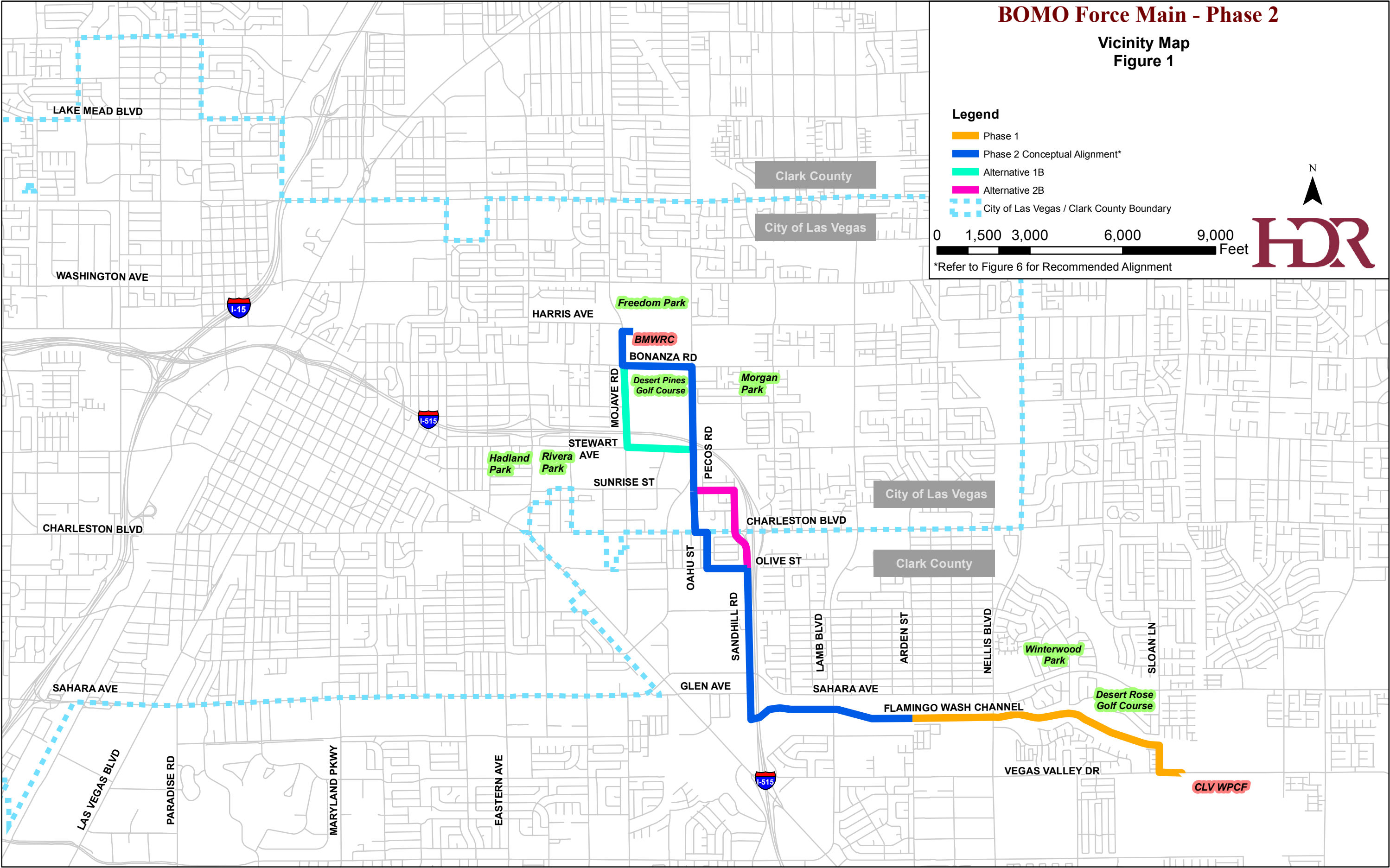
The CLV will construct a new Reuse Water Supply System with a capacity of 3.23 MGD based on peak system demand. The new system includes a reuse pump station located at the Water Pollution Control Facility (WPCF) site and approximately 33,000 feet of reclaimed water (reuse) force main. The system will supply reclaimed water from the WPCF to the BMWRC and provide service to existing reclaimed water users including the Desert Pines Golf Course and Freedom Park. The Transient Analysis for the proposed Pump Station will be completed by others and will determine, air valve placement to be included along BOMO to dissipate transient pressures.

The Western Alignment, as identified in the *Alignment Study*, was chosen as the Conceptual BOMO alignment for further development. CLV retained HDR to perform engineering design and construction support services for the final BOMO design. Refer to **Figure 1** for the General Project Location.

Due to the timing of the CLV Sahara Arden Sewer Replacement project, BOMO was divided into two phases. Phase 1 was designed under an accelerated schedule and is currently under construction. Phase 1 generally parallels the Sahara Arden interceptor sewer along the Desert Rose Golf Course and Flamingo Wash from the WPCF to the Flamingo Wash west of Nellis Blvd. Phase 2 continues from the end of Phase 1 to the BMWRC. See **Figure 2** for the Conceptual Alignment corridors.

The total BOMO alignment, from the point exiting the WPCF to the BMWRC is approximately 33,000 LF of 18" reclaimed water (reuse) force main. Phases 1 and 2 consist of approximately 11,000 LF and 22,000 LF, respectively.

The proposed BOMO Phase 2 alignment will require encroachment permits within Clark County and NDOT ROW, as well as easements within private property. In addition, some areas may require temporary and/or permanent easements.



1.2 Purpose

The following Preliminary Design Report (PDR) summarizes the initial design efforts for BOMO Phase 2, which includes a review of existing conditions, site investigations, preliminary hydrologic analysis, facility sizing, utility coordination, surveying, preliminary design plan preparation, and development of a preliminary opinion of probable construction cost (OPCC).

The following activities have been completed to date for the preparation of the PDR:

- Project baseline and control surveys
- Aerial mapping and one-foot contour topography
- Subsurface Utility Engineering (SUE) designations
- Review of record plans for existing utilities and other improvements or facilities within the project corridor
- Preliminary geotechnical report outlining soil and groundwater conditions
- Development of preliminary plan and profile (P&P) design drawings
- Development of Engineer's Opinion of Probable Cost
- Development of a list of probable construction permits required

1.3 Supporting Reports and Documentation

Existing documents prepared by others were used as reference in the preparation of BOMO Phase 2 PDR and a summary of these documents are provided below:

- *Bonanza Mojave Water Resource Center (BMWRC) Decommissioning and WPCF Reuse Pump Station Project - Task 2230 Bonanza Mojave Reuse Water Supply System Service Area Demands and Pump Station Evaluation*, B&V, February 18, 2013
- *Bonanza Mojave (BOMO) Water Resource Center Decommissioning Project – Task 2220 Reuse Pipeline Alignment Alternatives*, B&V, June 28, 2012– hereafter referred to as the “**Alignment Study**”
- *Meeting Notes - City of Las Vegas BOMO Pipeline Project Route Alternative Coordination Meeting*, B&V, September 13, 2012
- *Geotechnical Interpretive Report Bonanza-Mojave Reuse Pipeline Freedom Park to Sloan Lane Las Vegas, Nevada*, Ninyo & Moore, October 9, 2013
- *Hydrogeologic Aquifer Testing Report Bonanza-Mojave (BOMO) Reuse Pipeline*, Ninyo & Moore, March 5, 2014
- *Prime Design Services Agreement for Sahara-Arden Sewer Replacement and BOMO Force Main*, March 7, 2013.
- *Additional Services Authorization Request 2*, November 22, 2013

2.0 Pipeline Alignment Evaluation

Conceptual BOMO alignments were identified in the Alignment Study. The Western Alignment, as depicted in this technical memorandum, was selected for BOMO from the WPCF to the BMWRC.

During development of the 30% Plans, conflict areas due to existing high pressure gas line routes, high volume traffic corridors, and new street improvements. Alternative alignments were identified and evaluated in order to identify a Recommended Alignment. The following sections document the development, process, and evaluation of the final recommended alignment.

2.1 Conceptual Alignment

The Conceptual Alignment, as identified in the Alignment Study, is shown in **Figure 2** and begins at the BMWRC and continues as follows:

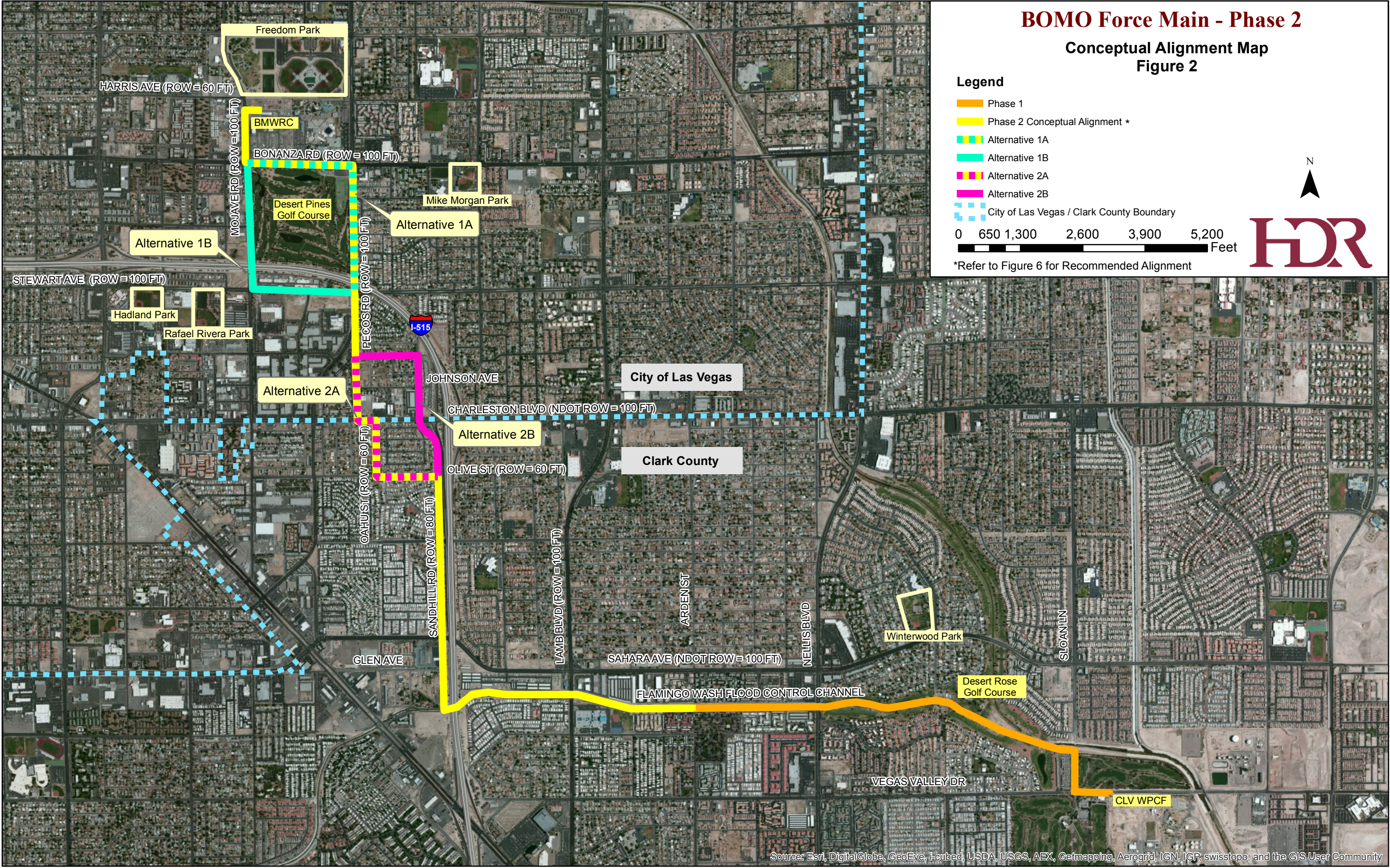
- South along Mojave Rd;
- East along Bonanza Rd to Pecos Rd;
- South along Pecos Rd to Pecos St (note that where Pecos Rd curves west, BOMO alignment continues straight onto Pecos St);
- South along Pecos St to Charleston Blvd;
- East along Charleston Blvd to Oahu St;
- South along Oahu St to Olive St;
- East along Olive St to Sandhill Rd;
- South along Sandhill Rd to Glen Ave;
- South along the west side of Interstate 515 (I-515) to the north side of Flamingo Wash Flood Control Channel (FWFCC);
- Along the north and east side of the FWFCC to Arden St and its connection to BOMO Phase 1, an 18-inch reuse force main currently under construction.

After review of the reference documents and development of preliminary P&Ps along the Conceptual Alignment, several conflicts/constraints were identified and an evaluation of alternative corridors for determination of the final design alignment was deemed necessary.

Conflicts/constraints were identified along the following corridors:

- Bonanza Rd from Mojave Rd to Pecos Rd – construction constraints
- Pecos St from Sunrise Ave to Charleston Blvd – utility constraints
- Olive St from Oahu St to Sandhill Rd – utility conflicts

Refer to **Figure 3** for conflict locations along the original routes and the associated alternative alignment.



BOMO Force Main - Phase 2
Conceptual Alignment Map
Figure 2

Legend

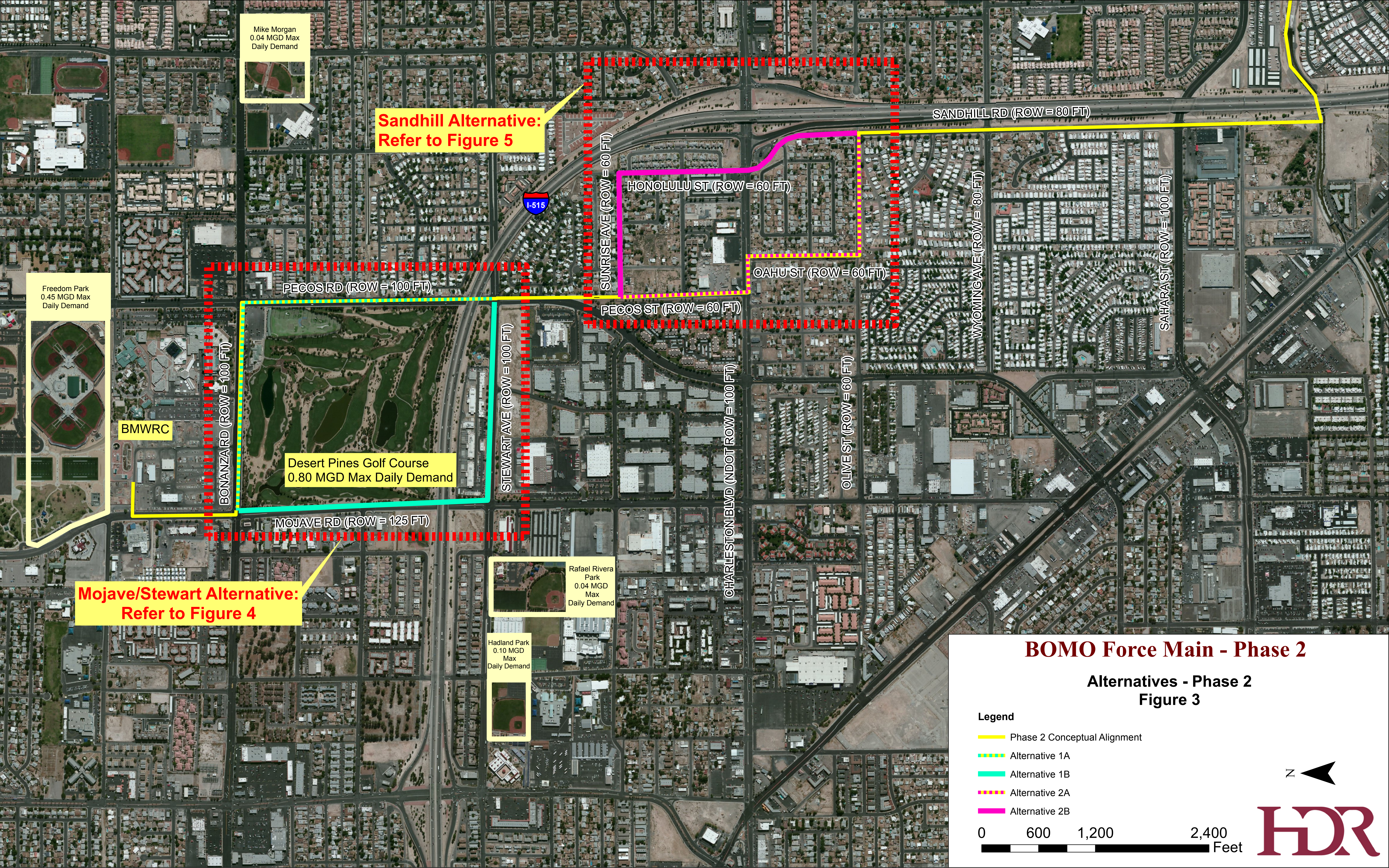
- Phase 1
- Phase 2 Conceptual Alignment *
- Alternative 1A
- Alternative 1B
- Alternative 2A
- Alternative 2B
- City of Las Vegas / Clark County Boundary

0 650 1,300 2,600 3,900 5,200 Feet

*Refer to Figure 6 for Recommended Alignment



Source: Esri, DigitalGlobe, GeoEye, Earthstar, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



2.2 Alternate Alignment Evaluation Criteria

The following sections summarize criterion used to evaluate and establish the corridors the Recommended Alignment:

2.2.1 Potential Utility Conflicts

Potential utility conflicts occur in locations where existing utilities in the alignment corridors may interfere with the proposed BOMO horizontal and/or vertical alignment, which could increase the construction cost and/or duration. Examples of potential utility conflicts include:

- Structures (public or private) such as manholes, vaults, buildings and drainage channels
- Underground utilities such as water and sewer lines, high pressure gas lines, storm drains, fiber optic and telephone or electric duct banks.
- Above-ground utilities such as telephone or electric lines, lighting, and traffic controls
- Existing utilities with prior rights can also present challenges because relocations may be infeasible or cost-prohibitive.

2.2.2 Impact to Public

The impact to the general public considers the potential effects that construction can have on traffic, access to residences or businesses, and general disruption to the surrounding community. Impacts to the public include:

- Traffic restrictions, including lane reductions and road closures
- Access restrictions to businesses, residences and residential areas
- Noise during construction
- Potential hazards due to roadway and sidewalk closures or restrictions

2.2.3 Construction Cost

The OPCC is based on the total expenditure anticipated for the installation of the utility infrastructure including materials, equipment and labor. Construction costs are affected by areas that require special consideration, such as work within NDOT ROW, trenchless construction, installation of the force main at excessive depth, work in close proximity to existing infrastructure, existing utility relocations and replacement of pavement or other existing infrastructure. See Section 17 for the preliminary OPCC based on the Recommended Alignment.

2.2.4 Constructability

Constructability considers the complexity, duration, pace, and risks associated with construction based on the probable method of construction.

Restrictive conditions that increase the difficulty and cost of construction include:

- Work performed within NDOT ROW, traffic control and construction requirements
- Work performed under hazardous conditions, such as in the proximity of high pressure gas mains, electrical duct banks or power poles
- Work performed in the proximity of existing facilities, retaining walls, drilled shafts or poles
- The need to support existing utilities, specifically fiber optic lines, and utilities made of asbestos cement pipe (ACP) or vitrified clay pipe (VCP)
- Poor soil conditions, including both hard soils and soft or sloughing soil.
- The presence of groundwater

2.2.5 Ease of Maintenance

Maintenance includes routine maintenance, as well as activities necessary to perform repairs. Ease of maintenance refers to the level of difficulty related to maintenance activities associated with BOMO, including:

- Pipe location
- Availability of a staging area
- Number of traffic lanes on either side of a maintenance location
- Speed limit along the maintenance location
- Proximity to adjacent structures and utilities

2.2.6 ROW Requirements

ROW refers to legally granted access on property owned by another entity. CLV ROW or CLV-owned parcels are preferable locations for BOMO installation; where these are not available, the following must be obtained:

- Clark County
 - Clark County ROW requires an Encroachment Permit.
 - This permit allows for the purposes of minor construction, modification or maintenance of existing improvements, the installation of new utility facilities, or any other minor encroachment approved by the Director of Public Works.
 - An approved traffic control plan conforming to MUTCD needs to be submitted with the encroachment permit application, unless using the Standard Traffic Control plans in the *Uniform Standard Specifications For*

Public Works Construction Off-Site Improvements, Clark County Area, Nevada, and Clark County Supplement to Uniform Standard Drawings and Specifications

- Clark County-owned parcels, such as the Flamingo Wash, require agreements between CLV and CCPW.
 - Coordination between the public agencies that defining the conditions for construction and maintenance of the CLV facility
 - Easements allow for the right of usage of property owned by another private party, and are necessary for construction and maintenance on Clark County-owned parcels
 - Easement documentation must be prepared by a PLS and recorded at the Clark County Recorder's office
- Privately-owned parcels require an easement
 - Negotiations must occur with the property owner, including an appraisal, and terms and conditions must be agreed to. If the terms and conditions are acceptable to the property owner, fair market value is then paid for the easement.
 - Easement documentation must be prepared by a PLS and recorded at the Clark County Recorder's office
 - This option is less desirable than construction in Clark County ROW or parcels owned by Clark County, because it can take more time and increase cost.
- Authorizations to Enter Property (AEPs) must be obtained prior to construction when the construction corridor is not within ROW. An AEP grants the CLV Contractor access to enter property for the pipeline construction.
- NDOT ROW involves an NDOT ROW Occupancy Permit. This is a revocable permit that only grants CLV permission to install BOMO. Traffic control plans will be required to be submitted to NDOT whenever maintenance needs to be performed. NDOT owns and controls the ROW: if they deem it necessary, they can request BOMO be relocated at the cost of CLV. Due to the potential risks associated with this option, it is the least desirable alternative. NDOT corridors are also associated with higher traffic volumes.

2.3 Alternate Alignment Evaluations

Alternative Alignments, shown in **Figure 2** were established as potential mitigation to the conflicts found along the Conceptual Alignment. The Conceptual and Alternative Alignments were evaluated for consideration as the Recommended Alignment for final design.

Bonanza/Pecos vs Mojave/Stewart

Refer to **Figure 4: Alternatives 1A and 1B Conflict Map**

Alternative 1A (Conceptual Alignment): Bonanza Rd from Mojave Rd to Pecos Rd, and Pecos Rd from Bonanza Rd to Stewart Ave.

Alternative 1B (Alternate Alignment): Mojave Rd from Bonanza Rd to Stewart Ave, and Stewart Ave from Mojave Rd to Pecos Rd.

Pecos/Charleston/Oahu/Olive vs Sunrise/Honolulu/Sandhill

Refer to **Figure 5: Alternatives 2A and 2B Conflict Map**

Alternative 2A (Conceptual Alignment): Pecos St from Sunrise Ave to Charleston Blvd, Charleston Blvd from Pecos St to Oahu St, Oahu St from Charleston Blvd to Olive St, and Olive St from Oahu St to Sandhill Rd.

Alternative 2B (Alternate Alignment): Sunrise Ave from Pecos St to Honolulu St, Honolulu St from Sunrise Ave to Charleston Blvd, and Sandhill Rd from Charleston Blvd to Olive St.

Each of these alternatives is described in detail in the following sections.



BOMO Force Main - Phase 2
Alternative 2A and 2B Conflict Map
Figure 5

Legend

- Phase 2 Conceptual Alignment
- Alternative 2A (L = 4,240')
- Alternative 2B (L = 4,015')
- Alt 2A and 2B Constrained Corridor

0 215 430 860 Feet



2.3.1 Alternative 1A (Conceptual Alignment): Bonanza Road and Pecos Road

Refer to Drawings CA-01 to CA-06 in the 30% Plans for Plan and Profile sheets associated with the Pecos/Bonanza corridors.

As shown in **Figure 4**, both Bonanza Rd. and Pecos Rd. are highly traveled minor arterials with an Average Annual Daily Traffic (AADT) of 23,000 and 18,000, respectively. Both roads are fully-developed 100-foot CLV ROW with curb & gutter and sidewalk on both sides, and concrete medians between intersections. Both roads are on the Regional Transportation Commission (RTC) transit route and five bus stops (one on each side of Bonanza Rd, two on the west side and one on east side of Pecos Rd) are located in this alternative.



Image 1: Alternative 1A and 1B

The north side of Bonanza Rd intersects an access road to the BMWRC and a parking lot access to the Clark County Family Courts & Services Center. The south side of Bonanza Rd is adjacent to Desert Pines Golf Club, with three parking lot access points, all of which must remain open to the public during business hours. Desert Pines Golf Club is adjacent to the west side of Pecos Rd with no access. A mid-block pedestrian crossing is located on Pecos Rd at the Flamingo Arroyo Trail. Pecos Rd intersects two residential streets on the east: Asbury Hill Ave and Diamond Head Dr.

a) Potential Utility Conflicts

Bonanza Rd contains several utilities including a 33-inch sewer, 54-inch storm drain and 12-inch water. These utilities run parallel to the street and a corridor for BOMO is available from Mojave Rd to Pecos Rd. Upon reaching Pecos Rd, additional utilities include a 60-inch/72-inch storm drain, 36-inch sewer, 8-inch water, and a 10-inch high pressure gas. A corridor for BOMO is available on the east side of the street.

b) Impact to Public

Both Bonanza Rd and Pecos Rd are highly-traveled minor arterials, and high traffic impact would be anticipated during construction and maintenance.

The RTC transit routes and bus stops on Bonanza Rd and Pecos Rd must remain accessible to transit users during construction. Access to businesses must also be provided to the public during normal business hours. The east side of Pecos Rd intersects Asbury Hill Ave and Diamond Head Dr, both of which are residential roads; however, alternate access is available from nearby streets.

Pedestrian travel would be disrupted at the Flamingo Arroyo Trail and the mid-block street crossing at Pecos Rd would need to be rerouted to alternate crossings at Bonanza Rd or Stewart Ave. Noise disturbances and pedestrian safety for area residents and businesses must be considered.

c) Opinion of Probable Construction Cost

The OPCC for **Conceptual Alignment Alternative 1A** is listed in **Table 1** below:

Table 1: Alternative 1A Bonanza/Pecos OPCC

ITEM DESCRIPTION	QUANTITY	UOM	UNIT PRICE	EXTENDED PRICE
MOBILIZATION AND DEMOBILIZATION	1	LS	5%	\$82,688
QUALITY CONTROL TESTING	1	LS	2%	\$32,427
REMOVE AND REPLACE ASPHALT (BONANZA RD/PECOS RD)	10,233	SY	\$40	\$409,333
TRAFFIC CONTROL AND MAINTENANCE	1	LS	\$200,000	\$200,000
18-INCH C905 PVC PIPE	4,980	LF	\$200	\$996,000
18-INCH GATE VALVE (ESTIMATED)	2	EA	\$8,000	\$16,000
SUBTOTAL				\$1,733,948
CONTINGENCY @			30%	\$520,184
SUBTOTAL CONSTRUCTION ITEM NO.				\$2,254,132

d) Constructability

Alternative 1A (Conceptual Alignment) utilizes two roadway corridors. An adequate utility corridor is available for BOMO installation along each of the roads. In several locations, BOMO would need to be installed at greater than normal depths due to existing utilities that would require temporary support.

Several businesses are located along Bonanza Rd, and two residential roads intersect Pecos Rd on the east. The Flamingo Arroyo Trail has a mid-block crosswalk on Pecos Rd. Additionally, there are several RTC bus stops along both roads that will need to be considered.

When work is performed in the NDOT ROW where Pecos Rd crosses under I-515 additional construction and permitting requirements will be necessary. Additionally, overhead clearance below I-515 may constrain construction equipment (e.g. excavator) and necessitate specialized excavation equipment and/or techniques.

e) Ease of Maintenance

Table 2: Alternative 1A Bonanza/Pecos Ease of Maintenance

EVALUATION BASED ON:	PROS	CONS
PIPE LOCATION	CLV ROW requires no outside Agency permitting is required to access BOMO	- Numerous utility crossings require deep installation of BOMO on Bonanza Rd - The crossing of I-515 is NDOT ROW and will require an Encroachment Permit - Pipe location will require takedown of multiple lanes on Bonanza Rd during maintenance activities
STAGING AREA	Space available for work staging area along Pecos Rd sidewalk due to the placement of pipe in the curb lane	Location of pipe in center lane makes for a restricted work staging area along Bonanza Rd
MAINTENANCER SET-UP	- Pipe runs in the curb lane, reducing number of lane takedowns on Pecos Rd - Pipe location places all through traffic on one side of the maintenance area on Pecos Rd	Pipe work zone on Bonanza Rd will entail traffic on both sides of the work area, which is less preferred during maintenance activities
SPEED LIMIT		A speed limit of 45 mph on Pecos Rd would necessitate increased caution during maintenance activities
PIPE PLACEMENT AND EX UTILITIES		- Pecos Rd consists of residential areas; maintenance in these areas would obstruct residential access - Maintenance would impede access to commercial driveways along Bonanza Rd by blocking or redirecting drivers - Construction and maintenance activities below I-515 constrained by limited overhead clearance
SAFETY CONSIDERATIONS	Location of alignment on Pecos Rd is on the curb lane	Bonanza Rd is a minor arterial with a higher daily traffic volumes

f) ROW

Alternative 1A- Pecos Bonanza, is located in CLV ROW, with the only exception occurring where Pecos St passes underneath the I-515. At this location, 250-foot NDOT ROW Occupancy Permits would be required for both construction and maintenance activities.

2.3.2 Alternative 1B: Mojave Road and Stewart Avenue

Refer to Drawings CN-04 to CN-09 in the 30% Plans for Plan and Profile sheets associated with the Stewart/Mojave corridors.

As seen in **Figure 4**, Mojave Rd is a minor collector with moderately low traffic volume and AADT of 6,200. It is a fully-developed 100-foot CLV ROW with curb & gutter and sidewalk on both sides and concrete medians between intersections.

Desert Pines Golf Club is adjacent to Mojave Rd and has a street crossing with signal that is used on a daily basis for maintenance equipment and activities. Cedar Ave intersects Mojave Rd on the west. An access to Rebel Gas Station,



Image 2: Alternative 1A and 1B

accesses to a senior apartment complex, and two churches with access are all located on the west side of Mojave Rd between Bonanza Rd and Cedar Ave. Between Cedar Ave and Stewart Ave Mojave Rd crosses underneath I-515 and along the west side are CLV-owned undeveloped parcels, CLV ROW, and Urban Lofts XV Ltd.

Stewart Ave is a minor arterial with moderately high traffic volume and AADT of 13,500. It is a fully-developed 100-foot CLV ROW with curb & gutter and sidewalk on north side and curb & gutter on south side, and concrete medians between Mojave Rd and Pecos Rd. Stewart Ave is the RTC transit route with two bus stops (one on each side of the street).

Stewart Ave intersects Spectrum Blvd on the south. Along the north side of Stewart Ave is the CLV Detention Center, which has five accesses and an area that is unofficially used as on-street parking. A commercial building is located on the southeast corner of Stewart Ave and Mojave Rd with no access from Stewart Ave. An undeveloped parcel is located at the southwest corner of Stewart Ave and Spectrum Blvd. Another undeveloped parcel belonging to the Clark County School District is located at the southwest corner of Stewart Ave and Pecos Rd, which has no access from Stewart Ave.

a) Potential Utility Conflicts

Several existing utilities are located along Mojave Rd, including: a 12-inch water, 12-inch reuse water, 10-inch and 42-inch storm drains, and a 12-inch sewer. These utilities run parallel to the street and a clear corridor is available, except at the

intersection of Mojave Rd and Cedar Ave. Several utilities, including 10- inch and 36-inch sewers and a 48-inch/60-inch storm drain including two drop inlets cross Mojave Rd into Desert Pines Golf Course.

On Stewart Ave the existing utilities include: an 18-inch water, 24-inch storm drain and an 8-inch sewer. A clear corridor is available along Stewart Ave.

b) Impact to Public

The impact to traffic would be moderate on Stewart Ave and low on Mojave Rd.

The RTC transit routes and bus stops on Stewart Ave must remain accessible to the transit users.

The access into Rebel Gas Station must remain open during business hours. The senior apartment complex access and the parking access to the churches from the west side of Mojave Rd would require coordination with respective owners, as would the signaled maintenance crossing into the Desert Pine Golf Club. Along the west side of Mojave Rd between Cedar Ave and Stewart Ave minimal impact to the adjacent the properties' accessibility is anticipated due to their undeveloped and under developed condition. The accesses into the CLV Detention Center on the north side of Stewart Ave must remain open at all times. There would be no impact to adjacent properties south of Stewart Ave.

c) Opinion of Probable Construction Cost

The OPCC for **Conceptual Alignment Alternative 1B** is listed in **Table 3** below:

Table 3: Alternative 1B Mojave/Stewart OPCC

ITEM DESCRIPTION	QUANTITY	UOM	UNIT PRICE	EXTENDED PRICE
MOBILIZATION AND DEMOBILIZATION	1	LS	5%	\$82,346
QUALITY CONTROL TESTING	1	LS	2%	\$32,292
REMOVE AND REPLACE ASPHALT (MOJAVE RD/STEWART AVE)	10,791	SY	\$40	\$431,622
TRAFFIC CONTROL AND MAINTENANCE	1	LS	\$200,000	\$200,000
18-INCH C905 PVC PIPE	4,835	LF	\$200	\$967,000
18-INCH GATE VALVE (ESTIMATED)	2	EA	\$8,000	\$16,000
SUBTOTAL				\$1,729,260
CONTINGENCY @			30%	\$518,778
SUBTOTAL CONSTRUCTION ITEM NO.				\$2,248,039

d) Constructability

Alternative 1B utilizes two roadway corridors. Utility corridors have been identified for the majority of the alignment, with one possible area of constraint

located on Mojave Rd at Cedar Ave. In a few locations, BOMO would need to be installed at greater depths due to existing utility conflicts.

A few businesses are located along Mojave Rd, and Stewart Ave also has a few commercial access points. Stewart Ave has two RTC bus stops that will need to be considered.

When work is performed in the NDOT ROW where Mojave Rd crosses under I-515 additional construction and permitting requirements will be necessary.

e) Ease of Maintenance

Table 4: Alternative 1B Mojave/Stewart Ease of Maintenance

EVALUATED BASED ON:	PROS	CONS
PIPE LOCATION	- CLV ROW requires no outside Agency permits are required for access to BOMO - Minimal utility crossings allow for installation at typical depths	- Pipe location will require takedown of multiple lanes on Mojave Rd during maintenance processes - The crossing of I-515 is NDOT ROW and will require an Encroachment Permit
STAGING AREA	Sufficient space for work staging area along Stewart Ave due to location of pipe in outside lane of Mojave Rd	Restricted work staging area due to the placement of the pipe in Mojave Rd's center turn lane
MAINTENANCE SET-UP		Pipe work zone on Mojave Rd will have travel lanes on both sides of the work area, which creates a hazardous condition during maintenance activities
SPEED LIMIT		A speed limit of 40 mph on Stewart Ave would necessitate increased caution during maintenance activities
PIPE PLACEMENT AND EX UTILITIES		Construction and maintenance activities below I-515 constrained by limited overhead clearance
SAFETY CONSIDERATIONS	Low traffic count on Mojave Rd	

f) ROW

Alternative 1B is located in CLV ROW, with the only exception occurring where Mojave Rd passes underneath the I-515. At this location, 250-foot NDOT ROW Occupancy Permits would be required for both construction and maintenance activities.

2.3.3 Criteria Matrix Alternative 1A and Alternative 1B

The Alternative Alignments were evaluated based on criterion as defined in Section 2.2. Potential benefits and concerns have been summarized in **Table 5** on the following page:

Table 5: Alternative 1 Criteria Matrix

				ALTERNATIVE 1A BONANZA RD/PECOS RD			ALTERNATIVE 1B MOJAVE RD/STEWART AVE
EVALUATION CRITERIA	WEIGHTING FACTOR	Raw Score (1-4) HIGH = Better LOW = Worse	Weighted Score (1-4) HIGH = Better LOW = Worse	COMMENTS	Raw Score (1-4) HIGH = Better LOW = Worse	Weighted Score (1-4) HIGH = Better LOW = Worse	COMMENTS
POTENTIAL UTILITY CONFLICTS	1.5	2	3	Storm drain crossings at Flamingo Arroyo Trail and intersection of Bonanza Rd and Pecos Rd; installation depth up to 23'	2	3	Storm drain, sewer and water crossings at Cedar Ave; installation depth up to 21'
IMPACT TO PUBLIC	1	2	2	- High traffic area on both streets; AADT of 23,000 on Bonanza Rd and 18,000 on Pecos Rd - Access to BMWRC, Clark County Juvenile Justice Center & Desert Pines Golf Course on Bonanza Rd - Two residential roads and one convenience store adjacent to Pecos Rd 5 bus stops along RTC transit routes - Access to Flamingo Arroyo Trail - Residential neighborhoods include higher pedestrian traffic volume - Noise disturbance, especially along residential areas	3	3	- Access to Clark County Detention Center on Stewart Ave. - Residential access and one convenience store adjacent to Mojave Rd 2 bus stops locations along RTC transit routes - Undeveloped parcels along portion of alignment - Residential neighborhoods include higher pedestrian traffic - Noise disturbance, especially along residential areas - Impact to Desert Pines Golf Course maintenance crossing traffic signal
OPCC	1.25	2	2.5	\$2,254,000	2	3.125	\$2,249,000
CONSTRUCTIBILITY	1	3	3	- Utility crossing requires installation at depth to 23' & utility support for ~400 LF - Pedestrian safety and access, especially in residential areas and at Flamingo Arroyo Trail - NDOT permit where Pecos Rd crosses under I-515 - Pedestrian safety and access, especially in residential areas and at Flamingo Arroyo Trail - NDOT permit where Pecos Rd crosses under I-515 - Construction below I-515 constrained by limited overhead clearance	2	2	- Utility crossing requires installation at depth to 23' & utility support for ~150 LF - Pedestrian safety and access, especially in residential areas - NDOT permit where Mojave Rd crosses under I-515 - Construction below I-515 constrained by limited overhead clearance
EASE OF MAINTENANCE	1.5	2	3	- Installation depth up to 23' - NDOT ROW Occupancy permit required each time NDOT ROW is entered (I-515) - Pipe along center lane of Bonanza Rd: increased concern for safety and reduced staging area - High traffic count in Bonanza Rd: increased safety concerns 45 mph speed limit on Pecos Rd necessitates increased caution - Maintenance activities below I-515 constrained by limited overhead clearance	3	4.5	- Installation depth up to 21' - NDOT ROW Occupancy permit required each time NDOT ROW is entered (I-515) - Pipe along center lane of Mojave Rd: increased safety concerns and reduced staging area - Low to moderate traffic counts on Mojave Rd and Stewart Ave 40 mph speed limit on Stewart Ave necessitates increased caution - Maintenance activities below I-515 constrained by limited overhead clearance
RIGHT-OF-WAY	1	1	1	NDOT ROW Occupancy permit required where Pecos Rd crosses I-515	1	1	NDOT ROW Occupancy permit required at I-515 at Stewart Ave
TOTALS	HIGH = Better LOW = Worse	12	14.5		16	16.625	* RECOMMENDED ALIGNMENT

2.3.4 Alternative 2A (Conceptual Alignment): Pecos Street, Charleston Boulevard, Oahu Street, and Olive Street

Refer to Drawings CA-07 to CA-13 in the 30% Plans for Plan and Profile sheets associated with the corridors.

As shown in **Figure 5**, Pecos St is a 60-foot CLV ROW with curb & gutter on the west side and curb & gutter and sidewalk on the east side in a residential area.

Charleston Blvd is a 100-foot NDOT ROW with curb & gutter and sidewalk on both sides and a concrete median. Charleston Blvd is the RTC bus route; however, there are no bus stops in this area.

Oahu St is a 60-foot Clark County ROW with curb & gutter and sidewalk on the east side and intermittent curb & gutter and sidewalk on the west side. Olive St is a 60-foot Clark County ROW with curb & gutter and sidewalk in a residential area.

Charleston Blvd is an NDOT major arterial with high volume traffic and AADT of 31,000. Pecos St, Oahu St and Olive St, are local streets with low traffic volume.



Image 3: Alternatives 2A and 2B

Spectrum Village apartment complex has emergency access to the west side of Pecos St. The east side of Pecos St intersects two streets: Sunrise Ave and Johnson Ave, which lead into mostly residential areas with driveway accesses to residences, a commercial building and Circle K Store at the south end.

The Circle K Store has two accesses on the north side of Charleston Blvd. Charleston Blvd intersects Pearl Ave on the south along with two accesses into commercial properties. Oahu St is a residential area with driveway access to residences on both the east and west side. Oahu St also intersects Center Dr on the west side and Waikiki Ave on the east side. The north side of Olive St is a residential area with driveway access to residences. Boulder Cascade Mobile Home Park is adjacent to Olive St on the south side with no access. All accesses to business must remain open during business hours and residential access would require coordination to accommodate residents.

a) Potential Utility Conflicts

Pecos St contains the following existing utilities: an 8-inch VCP sewer, 8-inch ACP water and 10-inch/12-inch high pressure gas. The 10-inch/12-inch high pressure gas is not parallel to Pecos St, but rather weaves across the road at skewed angles multiple times. In addition, there are homes located on the east side of the street, so service laterals are likely to be encountered. Due to the brittle nature of these materials, trenching close to the 8-inch VCP sewer or 8-inch ACP water may result in damage and the need to replace all or portions of these lines. It is difficult to identify a clear corridor on this street, and the alignment would require several bends in order to avoid existing utilities.

Charleston Blvd is a major roadway that serves as a corridor for several utilities including: a 4-inch and 6-inch/12-inch high pressure gas, 10-inch and a 27-inch sewer, an 8-inch water, and an 18-inch storm drain system with three drop inlets. Although Charleston Blvd comprises only short portion of this alternative alignment, navigation through this corridor would be difficult due to the existing utilities and associated structures.

Oahu St contains smaller diameter utilities including: a 6-inch ACP water, 8-inch VCP sewer and a 2-inch gas. These utilities are all located along the east side of the road, and a clear corridor can be identified along the west side.

In Olive St the existing utilities include: a 6-inch ACP water, 8-inch VCP sewer, 2-inch gas, and a newly-installed storm drain system with a 42-inch RCP to 5'x2' RCB to 4'x2' concrete channel with a grate directed toward an existing culvert that crosses under I-515. The storm drain project also contains a 10-foot wide sidewalk along the south side of the street.

Multiple conflicts have been identified along this alignment, and a clear corridor would be difficult to identify without waiving utility placement design standards.

b) Impact to Public

Most of this alignment lies within a residential area with few businesses; a short segment runs through Charleston Blvd, which is a major arterial with high traffic volume, and high traffic impact would be anticipated during construction and maintenance activities.

All accesses to businesses must remain open during normal business hours and residential accesses would require coordination to accommodate residents.

Although the traffic impact to residential areas would be nominal, there is concern for the effect of noise on residents and pedestrian safety.

c) Opinion of Probable Construction Cost

The OPCC for **Conceptual Alignment Alternative 2A** is listed in **Table 6** below:

Table 6: Alternative 2A Pecos/Charleston/Oahu/Olive OPCC

ITEM DESCRIPTION	QUANTITY	UOM	UNIT PRICE	EXTENDED PRICE
MOBILIZATION AND DEMOBILIZATION	1	LS	5%	\$70,644
QUALITY CONTROL TESTING	1	LS	2%	\$27,703
REMOVE AND REPLACE ASPHALT (PECOS ST/OAHU ST/OLIVE ST)	6,517	SY	\$30	\$195,500
REMOVE AND REPLACE ASPHALT (CHARLESTON BLVD - NDOT)	493	SY	\$50	\$24,667
REMOVE AND REPLACE PORTLAND CEMENT CONCRETE PAVING (OLIVE ST)	1,467	SY	\$120	\$176,000
TRAFFIC CONTROL AND MAINTENANCE (PECOS ST/OAHU ST/OLIVE ST)	1	LS	\$90,000	\$90,000
TRAFFIC CONTROL AND MAINTENANCE (CHARLESTON BLVD - NDOT)	1	LS	\$35,000	\$35,000
18-INCH C905 PVC PIPE	4,240	LF	\$200	\$848,000
18-INCH GATE VALVE (ESTIMATED)	2	EA	\$8,000	\$16,000
SUBTOTAL				\$1,483,514
CONTINGENCY @30%				\$445,054
<i>SUBTOTAL CONSTRUCTION ITEM NO.</i>				<i>\$1,928,568</i>

d) Constructability

Alternative 2A includes construction within NDOT ROW, construction near several high-pressure gas lines, and a highly-congested utility corridor in Olive St. A portion of construction would also be within residential areas, which would adversely impact the local community. This alternative includes several locations that would require additional effort for construction, and a waiver of design requirements would be required for certain areas. Finally, special traffic control conditions would need to be satisfied during construction within NDOT ROW.

In general, the constructability of Alternative 2A would involve a substantial amount of additional effort on behalf of the contractor during construction.

e) Ease of Maintenance

Table 7: Alternative 2A Pecos/Charleston/Oahu/Olive Ease of Maintenance

EVALUATED BASED ON:	PROS	CONS
PIPE LOCATION	CLV and Clark County ROW requires no additional permitting for access to the force main	Charleston Blvd is NDOT ROW and would require an Encroachment Permit
STAGING AREA	Sufficient space for work staging area along Pecos Rd, Charleston Blvd, Oahu St, and Olive St sidewalks due to location of pipe.	
MAINTENANCE SET-UP	- Pipe runs in the shoulder lane, which reduces number of lane takedowns on Charleston Blvd, Oahu St, and Olive St - The pipe placement allows for through traffic on one side of the road during maintenance.	
SPEED LIMIT	A speed limit of 25 mph on Pecos St, Olive St, and Oahu St increases safety and reduces the likelihood of accidents during maintenance activities	A speed limit of 45 mph on Charleston Blvd would necessitate increased caution during maintenance activities
PIPE PLACEMENT AND EX UTILITIES		- Alignment is located under sidewalk on Olive St - Retaining wall on Olive St. would require temporary support - Pecos St, Oahu St, and Olive St are residential areas: maintenance activities would affect driveways by blocking off or redirecting drivers - Multiple existing utilities located on Charleston Blvd including: 12" HP gas, 8" water, 27" sanitary sewer, 18" SD, 10" sanitary sewer, and 4" gas could affect maintenance activities
SAFETY CONSIDERATIONS	Lower traffic count on Pecos St, Oahu St and Olive St reduces the likelihood of accidents during maintenance activities	Higher traffic count on Charleston Blvd increases the likelihood of accidents during maintenance activities

f) Right-of-Way

North of Charleston Blvd Alternative 2A is located within CLV ROW and 400-foot Encroachment Permits would be required both for construction and maintenance activities. South of Charleston Blvd, this alternative is located within Clark County ROW and would require easements in both Oahu St and Olive St.

2.3.5 Alternative 2B: Sunrise Avenue, Honolulu Street and Sandhill Road

Refer to Drawings CN-12 to CN-17 in the 30% Plans for Plan and Profile sheets associated with the Sandhill to Sunrise corridors.

As seen in **Figure 5**, Charleston Blvd is a major arterial with high-volume traffic and AADT of 31,000. It is a major arterial 100-foot NDOT ROW with curb & gutter and sidewalk on both sides. Charleston Blvd is the RTC bus route; however, there are no bus stops in this area.

Sunrise Ave, Honolulu St and Sandhill Rd are local streets with low traffic volume: AADTs are not readily available on these streets. Sunrise Ave and Honolulu St are 60-foot CLV ROWs with curb & gutter and sidewalks on both sides. Sandhill Rd is an 80-foot Clark County ROW with curb & gutter and sidewalk on west side; its east side contains curb & gutter and intermittent sidewalk between Charleston Blvd and a location approximately 250-feet south of Hawaii Ave; thereafter no curb & gutter or sidewalk are present.

Sunrise Ave is in a residential area with driveway access to residences on both the north and south sides of the street, an intersection with Maya St on the south and intersections with Pearl St on both the north and south. Honolulu St is in a residential area with driveway access to residences and two businesses located on the west side of street with one access. Honolulu St intersects both Palomar Ave and Johnson Ave on the west. The west side of Sandhill Rd has driveway access to residences and intersects Hawaii Ave. The east side of Sandhill Rd is an unpaved area adjacent to the I-515 on-ramp.



Image 4 Alternatives 2A and 2B

a) Potential Utility Conflicts

Sunrise Ave contains an existing 6-inch ACP water, 8-inch VCP sewer and 2-inch gas. These utilities run parallel to the street and a clear corridor is available. Residences are present along both sides of the street, and service laterals would be encountered during construction.

Honolulu St contains an existing 36-inch sewer, 8-inch VCP sewer, 6-inch ACP water and 2-inch gas. Residences are present along both sides of street, so service

laterals would be encountered; however, a clear corridor is available along the east side of the street despite the crossing of service laterals.

Charleston Blvd contains several existing utilities including: a 10-inch and 27-inch sewer, 18-inch storm drain, 8-inch water and a 12-inch high pressure gas.

Trenchless construction methods would be required to cross Charleston Blvd, which is NDOT ROW.

Sandhill Rd contains several existing utilities including: an 8-inch sewer, 6-inch ACP water, 2-inch and 4-inch gas and a 12-inch high pressure gas. Identifying a clear corridor may require the relocation of a small-diameter gas.

This alternative contains relatively few potential utility conflicts, and contains clear corridors along the majority of the alignment.

b) Impact to Public

A trenchless construction method would be required to cross Charleston Blvd in order to reduce the impact to traffic on the highly-traveled road. Open-trench construction methods would have a high traffic impact, and NDOT requirements for traffic control would need to be satisfied. Construction of this alternative would have relatively low impact to the traffic on Sunrise Ave, Honolulu St, and Sandhill Rd.

A business access on Honolulu St must remain open during normal business hours. All residential accesses along Sunrise Ave, Honolulu St, and Sandhill Rd would require coordination to accommodate access.

c) Opinion of Probable Construction Cost

The OPCC for **Conceptual Alignment Alternative 2B** is listed in **Table 8** below:

Table 8: Alternative 2B Sunrise/Honolulu/Sandhill OPCC

ITEM DESCRIPTION	QUANTITY	UOM	UNIT PRICE	EXTENDED PRICE
MOBILIZATION AND DEMOBILIZATION	1	LS	5%	\$76,423
QUALITY CONTROL TESTING	1	LS	2%	\$29,970
REMOVE AND REPLACE ASPHALT (SUNRISE AVE/HONOLULU ST/SANDHILL RD)	10,149	SY	\$30	\$304,483
REMOVE AND REPLACE ASPHALT (CHARLESTON BLVD - NDOT)	0	SY	\$50	\$0
TRAFFIC CONTROL AND MAINTENANCE (SUNRISE AVE/HONOLULU ST/SANDHILL RD)	1	LS	\$90,000	\$90,000
TRAFFIC CONTROL AND MAINTENANCE (CHARLESTON BLVD - NDOT)	1	LS	\$35,000	\$35,000
18-INCH C905 PVC PIPE	4,015	LF	\$200	\$803,000
18-INCH GATE VALVE (ESTIMATED)	2	EA	\$8,000	\$16,000
BORING AND JACKING INCLUDING 36-INCH STEEL CASING (CHARLESTON BLVD)	100	LF	\$2,500	\$250,000
SUBTOTAL				\$1,604,876
CONTINGENCY @30%				\$481,463
<i>SUBTOTAL CONSTRUCTION ITEM NO.</i>				<i>\$2,086,338</i>

d) Constructability

Alternative 2B requires construction across NDOT ROW and within a corridor that contains high-pressure gas lines. A portion of construction would also be within residential areas, which would adversely impact the local community. Although trenchless construction is typically more costly than open trenching, it is a common construction practice, and is not anticipated to place undue burden on the contractor. A corridor is available with sufficient separation distance from the high-pressure gas lines, so construction and safety issues are anticipated to be relatively minor.

Generally, the constructability of Alternative 2B would include a moderate amount of additional effort on behalf of the contractor during construction.

e) Ease of Maintenance

Table 9: Alternative 2B Sunrise/Honolulu/Sandhill Ease of Maintenance

EVALUATED BASED ON:	PROS	CONS
PIPE LOCATION	CLV and Clark County ROW require no additional permitting for access to the force main	Charleston Blvd is NDOT ROW and would require an Encroachment Permit
STAGING AREA	Trenchless construction option for crossing at Charleston Blvd	Restricted work staging area on Sunrise Ave, Honolulu St and Sandhill Rd due to center turn lane placement of pipe
MAINTENANCE SET-UP		Pipe work zone on Sunrise Ave, Honolulu St, and Sandhill Rd would result in travel lanes on both sides of the work area, which creates a hazardous condition during maintenance activities
SPEED LIMIT	Speed limit of 25 mph on Sunrise Ave, Honolulu St, and Sandhill Rd increases safety and reduces the likelihood of accidents during maintenance activities	
PIPE PLACEMENT AND EX UTILITIES		Sunrise Ave, Honolulu St, and Sandhill Rd are residential areas: maintenance activities would affect driveways by blocking off or redirecting drivers
SAFETY CONSIDERATIONS	Low traffic count on Sunrise Ave, Honolulu St, and Sandhill Rd reduces the likelihood of accidents during maintenance activities	

f) Right-of-Way

To the north of Charleston Blvd, Alternative 2B is located within CLV ROW and 100-foot Encroachment Permits would be required for both construction and maintenance activities. To the south of Charleston Blvd, this alternative is located within Clark County ROW, which would require an easement within Sandhill Rd.

2.3.6 Criteria Matrix Alternative 2A and Alternative 2B

The Alternative Alignments were evaluated based on criteria as defined in Section 2.2. Potential benefits and concerns have been summarized in Alternative 2 Criteria Matrix (**Table 10**) on the following page:

Table 10: Alternative 2 Criteria Matrix

				ALTERNATIVE 2A Pecos/Charleston/Oahu/Olive			ALTERNATIVE 2B Sunrise/Honolulu/Sandhill
EVALUATION CRITERIA	WEIGHTING FACTOR	Raw Score (1-4) HIGH=Better LOW=Worse	Weighted Score (1-4) HIGH=Better LOW=Worse	Comments	Raw Score (1-4) HIGH=Better LOW=Worse	Weighted Score (1-4) HIGH=Better LOW=Worse	Comments
POTENTIAL UTILITY CONFLICT	1.5	1	1.5	- Existing ACP water & VCP sewer pipes parallel and cross in several locations - High pressure 6"/10"/12" gas line parallel and crossing in Pecos Street 12" high pressure gas & 27" sewer, storm drain system, small-diameter water, sewer, gas, dry utility crossings in Charleston Blvd (NDOT ROW) - Service lateral crossings along Pecos St & Oahu St - Congested corridor along Olive St. No clear corridor within roadway.	3	4.5	- Existing ACP water & VCP sewer pipes parallel and cross in several locations 12" high pressure gas in Sandhill Rd 12" high pressure gas & 27" sewer, storm drain system, small-diameter water, sewer, gas, dry utility crossings in Charleston Blvd (NDOT ROW) - Service lateral crossings along Sunrise Ave and Honolulu St
IMPACT TO PUBLIC	1	1	1	- High traffic count on Charleston Blvd; AADT of 31,000 - Majority of construction would be in residential areas - Construction in Charleston Blvd would reduce lanes in a high traffic corridor - Noise disturbance, especially along residential areas - Residential neighborhoods include higher pedestrian traffic - Noise disturbance	3	3	- High traffic count on Charleston Blvd: AADT of 31,000 - Majority of construction in residential areas - Trenchless construction could be utilized for Charleston Blvd crossing - Noise disturbance, especially along residential areas - Residential neighborhoods include higher pedestrian traffic - Noise disturbance
OPCC	1.25	2	2.5	\$1,929,000	1	1.25	\$2,087,000
CONSTRUCTABILITY	1	1	1	- High pressure gas crossing in Pecos St & Charleston Blvd - Work within Charleston Blvd (NDOT ROW) requires encroachment permit & restrictive traffic control requirements - BOMO installation in Olive St under sidewalk or curb & gutter - Olive St recently resurfaced - Retaining wall at intersection of Olive St and Oahu St requires additional effort to protect - Lateral crossings within residential areas	3	3	- High pressure gas parallel in Sandhill Rd - Work within Charleston Blvd (NDOT ROW) requires encroachment permit; trenchless construction can be utilized. - Lateral crossings within residential areas
EASE OF MAINTENANCE	1.5	1	1.5	- NDOT ROW Occupancy permit required anytime NDOT right-of-way is entered (Charleston Blvd.) - Adequate staging areas - Alignments in residential areas and edge of Charleston; adequate staging areas - High traffic count in Charleston Blvd increases safety concerns 45 mph speed limit on Charleston Blvd necessitates increased caution	2	3	- NDOT ROW Occupancy permit required each time NDOT ROW is entered (Charleston Blvd) - Adequate staging areas - Alignment in residential areas and edge of Charleston Blvd: adequate staging areas - High traffic count in Charleston Blvd increases safety concerns 45 mph speed limit on Charleston Ave necessitates increased caution
RIGHT-OF-WAY	1	1	1	NDOT ROW Occupancy permit required at Charleston Blvd	1	1	NDOT ROW Occupancy permit required at Charleston Blvd
TOTALS	HIGH = Better LOW=Worse	7	8.5		13	15.75	* RECOMMENDED ALIGNMENT

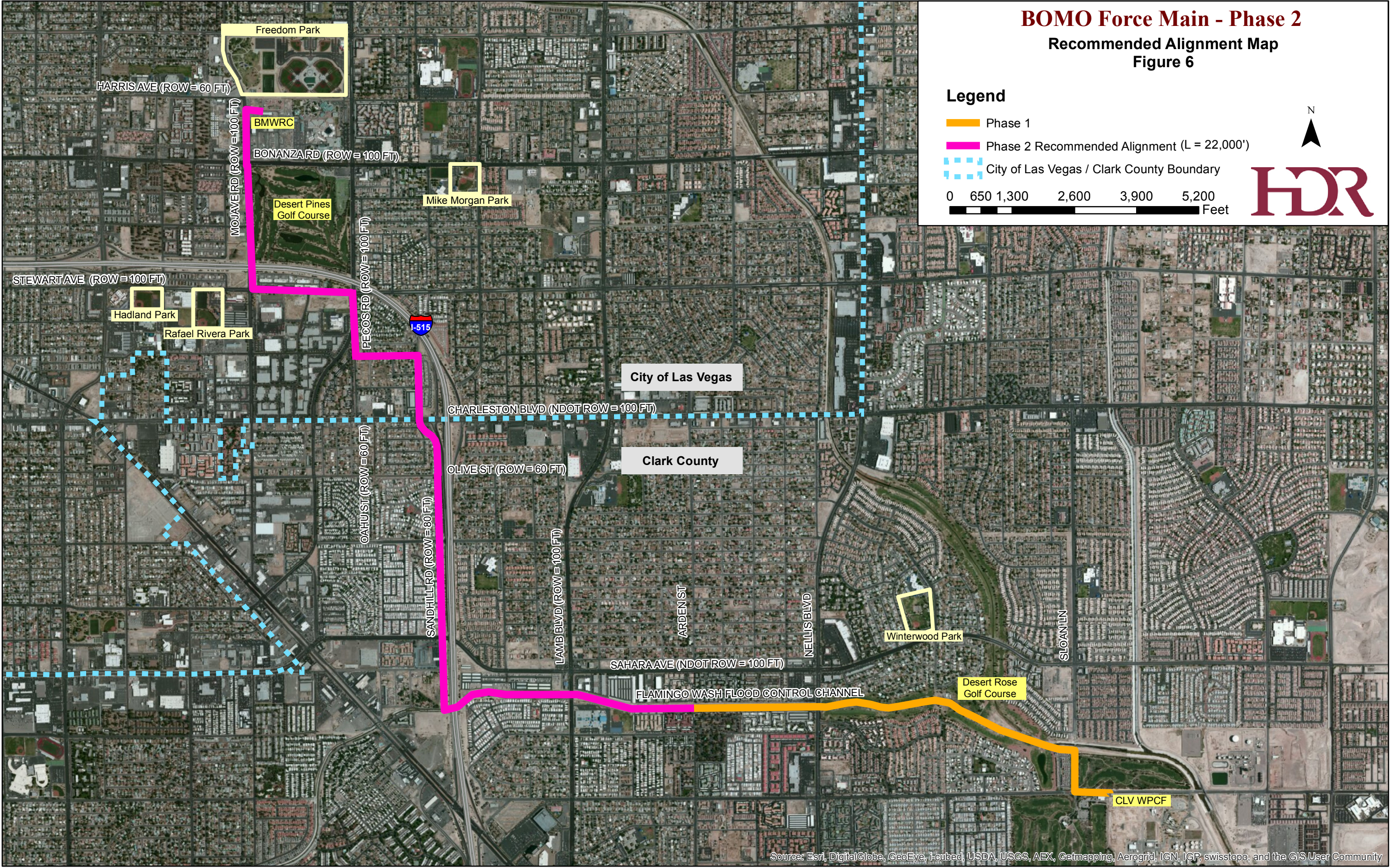
Recommended Alignment

RECOMMENDED ALIGNMENT

3.0 Recommended Alignment

Upon review of the alternatives, the Recommended Alignment incorporates Alternatives 1B and 2B into the Conceptual Alignment. A detailed description of the BOMO Phase 2 Recommended Alignment is shown on **Figure 6** and described below.

Refer to Drawings CN-01 to CN-30 in the BOMO Phase 2 30% Plans for Plan and Profile sheets associated with the Recommended Alignment.



Source: Esri, DigitalGlobe, GeoEye, Earthstar, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

3.1.1 Mojave Road (Bonanza Mojave Water Resource Center to Bonanza Road)

Mojave Rd is a fully-developed 100-foot CLV ROW with curb & gutter and sidewalk on both sides, and a 375-LF concrete median north of the intersection of Bonanza Rd.

The west side of Mojave Rd has driveways that provide access to Lied Animal Shelter, CLV's Fire Department Training Center, and Bonanza Mohave Square. BMWRC is adjacent to Mojave Rd on the east side and has an access road into BMWRC and parking.

The Recommended Alignment would run close to the centerline of Mojave Rd in order to avoid the following existing utilities: street lights, 36"/42" storm drain and 33" sewer located on the west side; and 12" water, 2" gas, 12" reuse-waterline, street lights, telephone, and electric located on the east side.



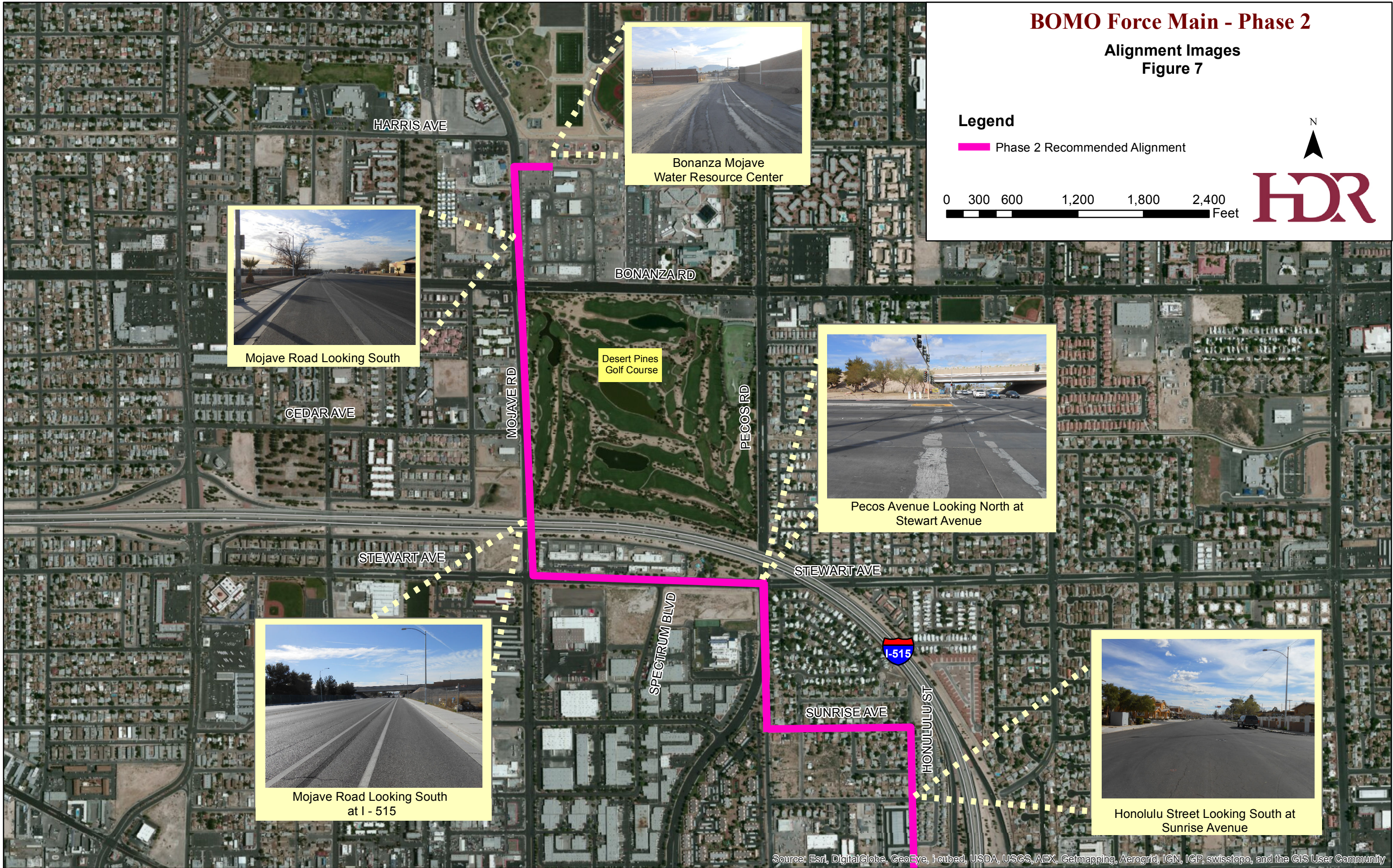
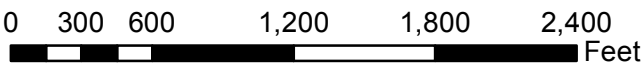
Image 5: Mojave Rd looking south (left) Bonanza Mojave Water Resource Center (right)

BOMO Force Main - Phase 2

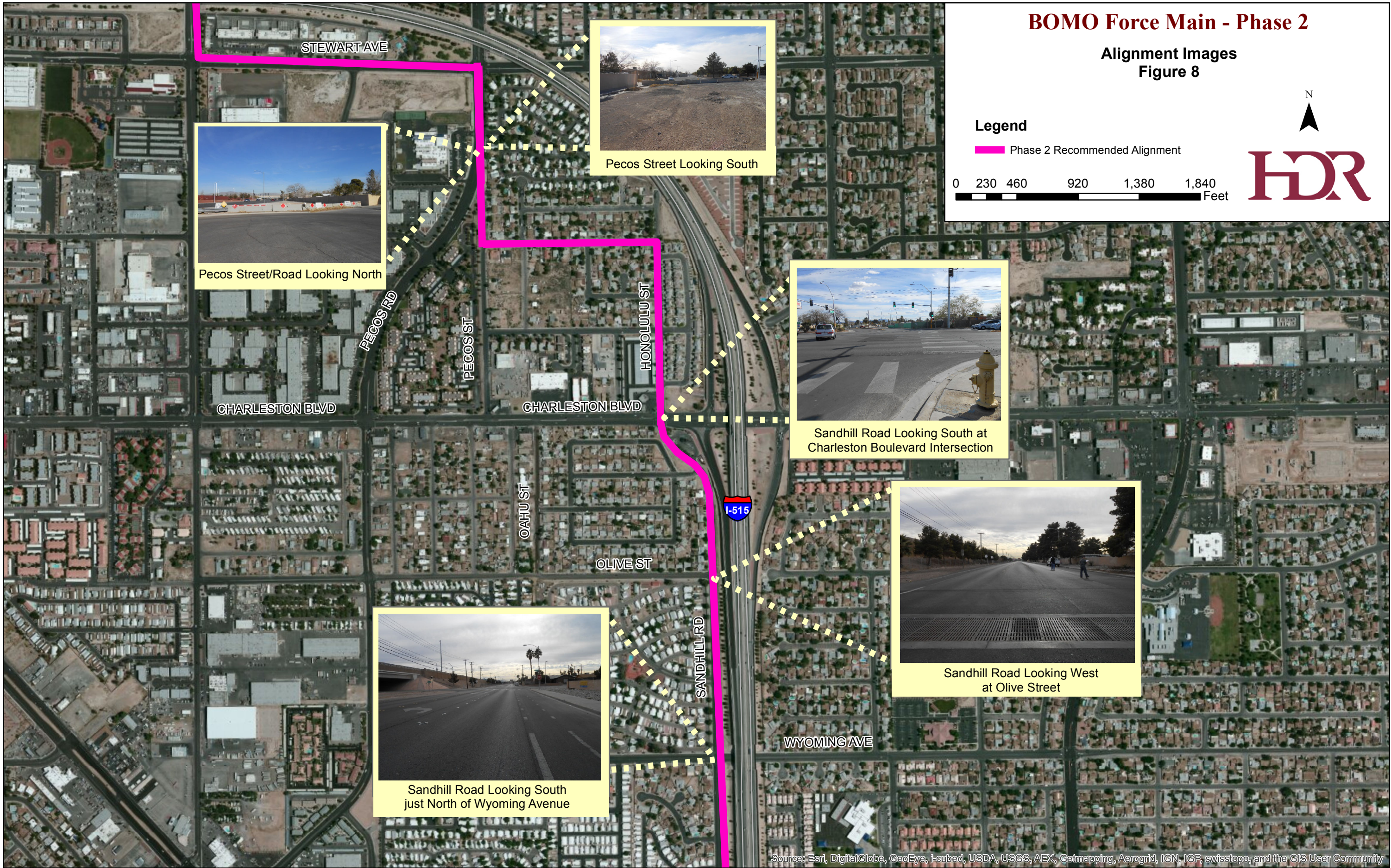
Alignment Images
Figure 7

Legend

Phase 2 Recommended Alignment



Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



BOMO Force Main - Phase 2

**Alignment Images
Figure 8**

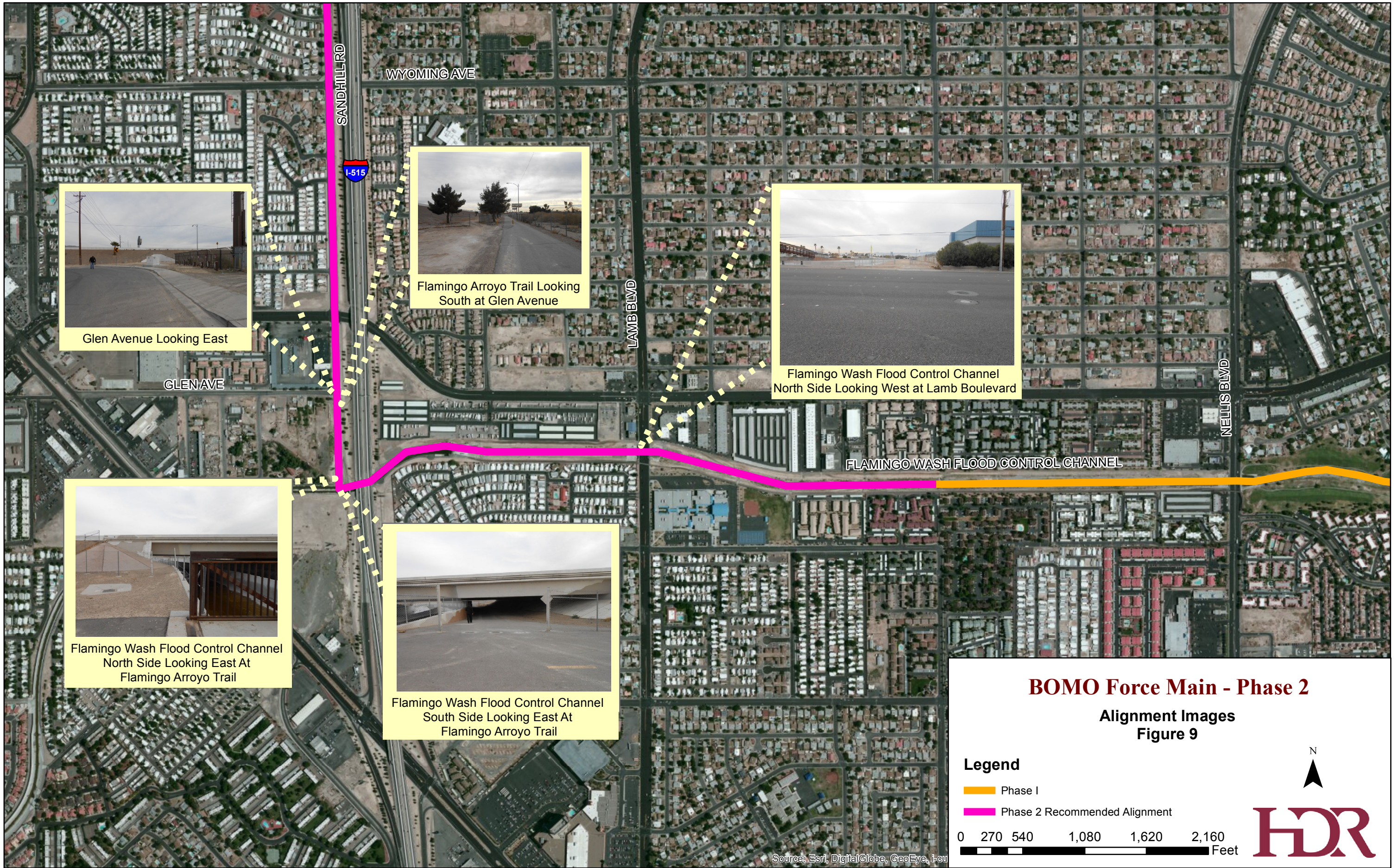
Legend

 Phase 2 Recommended Alignment

0 230 460 920 1,380 1,840 Feet



Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



BOMO Force Main - Phase 2

**Alignment Images
Figure 9**

- Legend**
- Phase I
 - Phase 2 Recommended Alignment

0 270 540 1,080 1,620 2,160 Feet



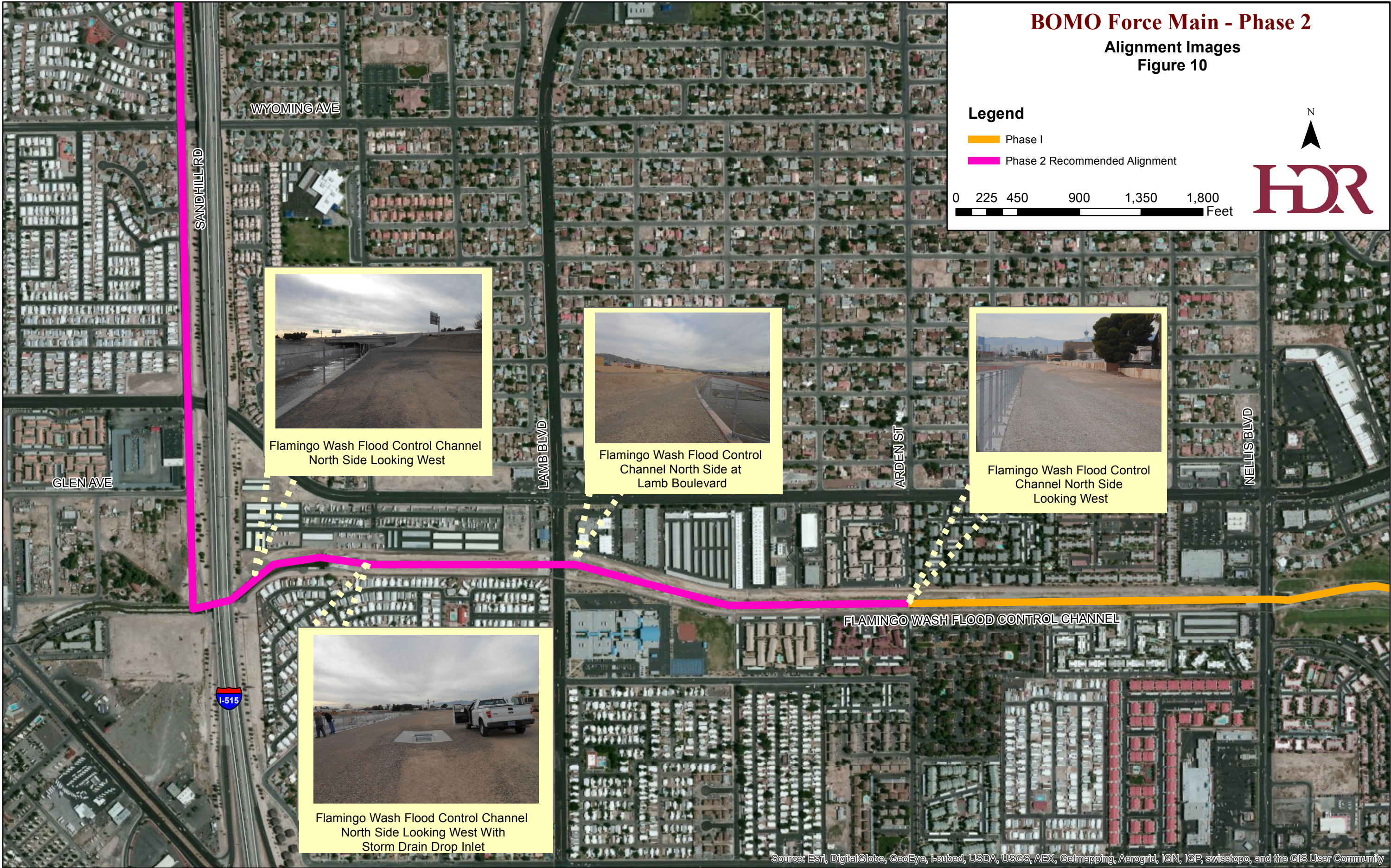
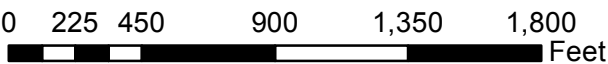
Source: Esri, DigitalGlobe, GeoEye, I-fo

BOMO Force Main - Phase 2

**Alignment Images
Figure 10**

Legend

- Phase I
- Phase 2 Recommended Alignment



3.1.2 Mojave Road (Bonanza Road to Stewart Avenue) and Stewart Avenue (Mojave Road to Pecos Road)

Mojave Rd is a minor collector with moderately low traffic volume and AADT of 6,200. It is a fully-developed 100-foot CLV ROW with curb & gutter and sidewalk on both sides and concrete medians between intersections.

Desert Pines Golf Club is adjacent to Mojave Rd and has a maintenance access to the east. Cedar Ave intersects Mojave Rd on the west. An access to Rebel Gas Station, accesses to a senior apartment complex, and two churches with access are all located on the west side of Mojave Rd between Bonanza Rd and Cedar Ave. Between Cedar Ave and Stewart Ave, Mojave Rd crosses underneath I-515, and south of I-515 there is an access road/gate into the CLV Detention center on the east side of Mojave Rd, and along the west side are CLV-owned undeveloped parcels, CLV ROW, and Urban Lofts XV Ltd.

Stewart Ave is a minor arterial with moderately high traffic volume and AADT of 13,500. It is a fully-developed 100-foot CLV ROW with curb & gutter and sidewalk on north side and curb & gutter on south side, and concrete medians between Mojave Rd and Pecos Rd. Stewart Ave is the RTC transit route and with two bus stops (one on each side of the street).

Stewart Ave intersects Spectrum Blvd on the south. Along the north side of Stewart Ave is the CLV Detention Center, which has five accesses. A commercial building is located on the southeast corner of Stewart Ave and Mojave Rd with no access from Stewart Ave. An undeveloped parcel is located at the southwest corner of Stewart Ave and Spectrum Blvd. Another undeveloped parcel belonging to the Clark County School District is located at the southwest corner of Stewart Ave and Pecos Rd, which has no access from Stewart Ave.



Image 6: Mojave Rd looking north at Cedar Ave (left) Mojave Rd Looking south at I-515 (right)



Image 7: Stewart Ave looking east at Mojave Rd (left) Stewart Ave looking west at Spectrum Blvd (right)

3.1.3 Pecos Road (Stewart Avenue to 570 feet north of Sunrise Avenue) and Pecos Street (570 feet north of Sunrise Avenue to Sunrise Avenue)

Pecos Rd is a fully-developed 100-foot CLV ROW with curb & gutter and sidewalk on both sides and concrete medians prior to intersections. Pecos Rd is on the RTC transit route and has two bus stops (one on each side).

The west side of Pecos Rd has an access into Miley Achievement Center School, which creates heightened concern for pedestrian safety and requires access during school hours. The east side of Pecos Rd includes the only access for Pecos Park residents, which must be accounted for.



Image 8: Pecos Rd looking south (left) Pecos Rd looking south at I-515 crossing (right)



Image 9: Pecos St looking south (left) Pecos St/Rd looking north (right)

3.1.4 Sunrise Avenue (Pecos Street to Honolulu Street), Honolulu Street (Sunrise Avenue to Charleston Boulevard) and Sandhill Road (Charleston Boulevard to Olive Street)

Charleston Blvd is a major arterial with high-volume traffic and AADT of 31,000. It is a 100-foot NDOT ROW with curb & gutter and sidewalk on both sides. Charleston Blvd is the RTC bus route with no bus stop in this area.

Sunrise Ave, Honolulu St and Sandhill Rd are local streets with low traffic volume: AADTs are not readily available on these streets. Sunrise Ave and Honolulu St are 60-foot CLV ROWs with curb & gutter and sidewalks on both sides. Sandhill Rd is an 80-foot Clark County ROW with curb & gutter and sidewalk on west side; its east side contains curb & gutter and intermittent sidewalk between Charleston Blvd and a location approximately 250-feet south of Hawaii Ave; thereafter no curb & gutter or sidewalk are present.

Sunrise Ave is in a residential area with driveway access to residences on both the north and south sides of the street, an intersection Maya St on the south and intersections with Pearl St on both the north and south. Honolulu St is in a residential area with driveway access to residences and two businesses located on the west side of street with one access. Honolulu St intersects both Palomar Ave and Johnson Ave on the west. The west side of Sandhill Rd has

driveway access to residences and intersects Hawaii Ave. There is a Sinclair gas station on the southeast corner of Charleston Blvd and Sandhill Rd with two accesses from Sandhill Rd which need to remain accessible during business hours. The east side of Sandhill Rd is an unpaved area adjacent to the I-515 on-ramp.



Image 10: Sunrise Ave looking west at Mata St (left) Sunrise Ave looking east at Maya St (right)



Image 11: Honolulu St looking south at Sunrise Ave (left) Honolulu St looking south at Chang St (right)



Image 12: Sandhill Rd looking south at Charleston Blvd (left) Sandhill Rd looking north at Olive St (right)

3.1.5 Sandhill Road (Olive Street to Glen Avenue)

Sandhill Rd is an 80-foot Clark County ROW with curb & gutter and sidewalk on the west side. It intersects Sahara Ave, which is an NDOT ROW, and Wyoming Ave. The west side includes several accesses: one into Boulder Cascade Mobile Home Park, an intersection with Silbert Ln, an private entrance to a residential area, two accesses into Maycliff Mobile Home Park and one into a commercial property. Along the east side of Sandhill Rd is an unpaved area adjacent to a NDOT ROW fence.

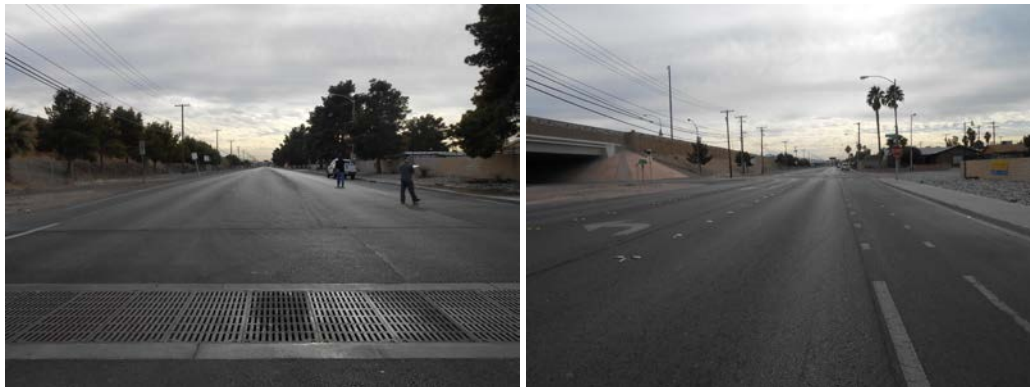


Image 13: Sandhill Rd looking south at Olive St (left) Sandhill Rd looking south at Wyoming Ave (right)

3.1.6 I-515 (Glen Avenue to Flamingo Wash Flood Control Channel)

The west side of I-515 is in an NDOT ROW, with a landscaped area containing a 10-foot wide asphalt Flamingo Arroyo Trail, that has trail lights with overhead power along the east side of the trail. To the west of the NDOT ROW is an undeveloped private parcel (APN# 161-07-103-013) containing two large billboards. Underground utilities, 12" high pressure gas, 18" sewer,

and electrical lines are located within the private parcel (APN# 161-07-103-013) on the east side of the trail.



Image 14: Glen Ave looking east (left) Flamingo Arroyo Trail looking south at Glen Ave (right)



Image 15: Flamingo Wash Flood Control Channel north side looking east at Flamingo Arroyo Trail (left)
Flamingo Wash Flood Control Channel south side looking east at Flamingo Arroyo Trail (right)

3.1.7 Flamingo Wash Flood Control Channel (I-515 to Arden Street)

The north side of FWFCC is an unpaved maintenance road containing several storm drain drop inlets and sewer manholes. The construction of BOMO Phase 2 would require an interlocal agreement and temporary construction easement with Clark County.

A 27" sewer is running along north side of the wash between I-515 and Arden, and also a fiber optic cable is running between Lamb Blvd and Arden St. The proposed alignment will need to maintain acceptable clearance between the existing channel wall and utilities.



Image 16: Flamingo Wash Flood Control Channel north side looking west (left) Flamingo Wash Flood Control Channel north side looking west with storm drain drop inlet (right)



Image 17: Flamingo Wash Flood Control Channel north side looking west at Lamb Blvd (left) Flamingo Wash Flood Control Channel north side looking east at Lamb Blvd (right)



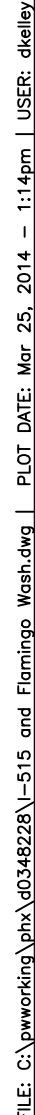
Image 18: Flamingo Wash Flood Control Channel north side looking west (left) Flamingo Wash Flood Control Channel north side looking east (right)

4.0 I-515 Crossing at Flamingo Wash

The crossing of the I-515 at the Flamingo Wash will require trenchless construction through NDOT ROW. The final crossing alignment will be determined after additional survey and subsurface utility locating is complete.

Figure 11 identifies alternative locations for I-515 crossing.

- The I-515 Crossing Alternative 1 is the alignment used in the 30% plan and profile documents. This alignment stays in CC and NDOT ROW, and crosses I-515 perpendicularly. However, the depth of the existing VCP sewer may require a deep boring pit. Because of the proximity to the FWFCC and the I-515, a deep boring pit may not be feasible.
- The I-515 Crossing Alternative 2 moves the crossing north, placing a portion of BOMO in a privately owned parcel, which would require easement acquisition from the land owner. This alignment would cross the I-515 perpendicularly, and would allow for more room during construction.
- The I-515 Crossing Alternative 3 runs parallel to the existing sewer, and would cross the I-515 at an angle. This locates the crossing of the sewer to the west side of the I-515, allowing for more flexibility while crossing the I-515. There is an existing storm drain apron near the west bore pit location, and could pose a conflict.



5.0 Geotechnical Investigation

A preliminary Geotechnical Interpretive Report (GIR), Ninyo & Moore October 9, 2013, was prepared as part of the preliminary design of BOMO. The report includes recommendations for various design-related issues such as: trench excavation, mapped fault considerations, pipe bedding, pipe zone backfill, trench backfill, and jack-and-bore considerations.

The preliminary GIR indicates that construction of BOMO may encounter caliche and/or rock, which would require heavy-duty excavation techniques in these areas. Based on the GIR, contractors should also anticipate the need for dewatering to stabilize and to facilitate proper compaction along the trench during pipe installation.

The following provides a summary of the findings contained in the GIR. Additional geotechnical investigation will be necessary during final design along the alternative corridor reaches.

5.1 Potential Geologic Hazards and Problematic Soils

Based on the preliminary GIR, the Conceptual Alignment does not traverse active faults; however, distances to active and potentially-active faults are included in the report. It should be noted that the GIR indicates that the Conceptual Alignment may be crossed by several unnamed faults of uncertain origin and no established seismic activity level.

According to the preliminary GIR by Ninyo and Moore “Ground Fissures, generally believed to be caused by erosion and differential stress resulting from regional subsidence due primarily to withdrawal of groundwater, are known to occur near faults in southern Nevada.” No ground fissures were observed; however, the ground surface was noted to have been disturbed/obscured by previous development.

Based on a Special Geotechnical Consideration Area of Clark County Soil Guidelines Map (Clark County Building Department, 1998), the Conceptual Alignment extends through Special Geotechnical Consideration Areas as follows:

- *Subsidence and 2,000-Foot Compaction or Seismic Fault Buffer Zone:* This buffer zone is considered to contain 90-percent of mapped ground fissures; these potential ground fissure areas extend approximately 1,000 feet to each side of faults.
- *Solubility, clay Swell, Corrosion, Gypsum Salt, Expansive or Hydro-collapsible Potential:* This area is indicative of potentially moisture-sensitive and corrosive soils.
- *Potential Drainage Areas or Recent Sediment Deposits, which may also have Solubility, Clay Swell, Corrosion, Gypsum Salt, Expansive or Hydro-collapsible Potential:* This area is in the vicinity of major drainages and may also contain potentially moisture-sensitive and corrosive soils.

The Clark County Expansive Soil Guidelines Map (Clark County Development Services Department, 2006) indicates general trends of near-surface soils in Las Vegas Valley. Based on this map, the Conceptual Alignment extends through areas prone to moderately and highly expansive soils.

5.2 Preliminary Geotechnical Investigation Borings

A subsurface evaluation was performed that consisted of drilling, logging, and sampling thirty-one (31) soil borings to depths ranging from seven to 36-feet below the existing road grade along the Conceptual Alignment performed between June 12 and July 22, 2013. The GIR includes a summary of the subsurface conditions based on the information obtained from these soil borings and will be made available to the construction contractor.

5.3 Subsurface Site Conditions

Fill and native soil were encountered in the borings along the Conceptual Alignment.

Based on the GIR, fill was encountered in borings to depths of up to approximately 10-1/2-feet. The approximate thicknesses of asphalt concrete and underlying aggregate base material encountered in the explorations are included in the GIR.

Native soil was encountered in the borings to the total depths explored (up to approximately 36-feet). The encountered native soils varied and included medium to very dense soils and soft to very stiff fine-graded soils.

5.3.1 Caliche layers

Caliche was encountered in four of the borings, as described in the GIR and summarized in

Table 11 below. The table provides a synopsis of areas where the Conceptual Alignment extends into the caliche layer, which represent areas that will involve more difficulty during construction. Per the GIR, caliche that is “moderately hard and moderately cemented can generally be gouged with a knife with difficulty and broken with a few hammer blows”, and “hard and very hard, strongly cemented caliche is difficult to scratch with a knife and breaks with difficulty with repeated hammer blows.” Caliche was encountered at three of the four boring points along the alignment and should be anticipated during construction in these areas. In addition to the caliche layers, thin cemented layers were also noted by Ninyo and Moore during their investigation.

Table 11: Caliche Layers vs. Pipe Depth

Boring Number	Boring Location	Approximate Depth to Top of Caliche Layer (ft)	Approximate Caliche Layer Thickness (ft)	Trench Depth (ft)	Caliche Hardness and Degree of Cementation	Caliche Layer above Pipe and Trench
B-103	North of Bonanza Rd and Mojave Rd	15.8	Boring was terminated in caliche layer	13	Moderately hard, moderately cemented	No
B-106	South of Bonanza Rd and Pecos Rd	11.0	2.0	12	Hard, strongly cemented	Yes
B-118	South of Olive St and Sandhill Rd	11.0	2.0	12	Hard, strongly cemented	Yes
B-122	South of Sahara Ave and Sandhill Rd	3.5	1.0	14.5	Hard, strongly cemented	Yes

5.3.2 Laboratory Testing of Soil

Laboratory testing was performed on the soils extracted from the borings and the results are summarized in the GIR. In terms of corrosion potential, the soils tested were found to be moderately to very corrosive to steel, negligibly to severely deleterious to concrete, and have a low to severe corrosive potential for metals.

Based on the results, steel pipe should not be used for the reuse water main without the implementation of some form of corrosion protection. In areas where steel casing is used, the deflection design for the PVC pipeline accounts for only the pipeline and not the steel casing. Due to the corrosive soil conditions, steel casings can be used during installation, but should not be considered to provide support or protection to BOMO unless corrosion protection measures are implemented on the steel casing.

5.3.3 Backfill Suitability

Ninyo and Moore investigated the suitability of the soils encountered along the Phase 2 BOMO Conceptual Alignment for use as a backfill material in accordance with DCSWCS. Out of the twenty-six soil samples tested only five meet the requirements for Selected Backfill, and none met the requirements for Granular Backfill; therefore, most of BOMO will require imported backfill material, which will likely lead to increased construction cost.

6.0 Preliminary Hydrogeological Report

A Preliminary Hydrogeological Report (HGR) was prepared by Ninyo & Moore, July 12, 2013, as part of preliminary design and will be made available to the construction contractor. This section discusses groundwater levels encountered along the BOMO Phase 2 Conceptual Alignment and groundwater quality.

6.1 Groundwater

Borings were performed for the BOMO Phase 2 Conceptual Alignment and groundwater was encountered at eight (8) of the thirty-one (31) locations. Depths to the groundwater table varied from 8- to 20-feet along the alignment. **Table 12** summarizes the depth to the groundwater table along the BOMO Phase 2 Conceptual Alignment as provided in the GIR.

Based on the boring data and the preliminary design depth of the BOMO, groundwater is anticipated to be encountered in the trench at eight (8) of the boring locations, which includes two feet allotted below the pipe for bedding. Any groundwater encountered along the alignment would need to be discharged and permitted and as part of this process, groundwater quality testing is required as discussed in Section 6.1.1.

Based on boring samples taken along the Conceptual Alignment and finite groundwater modeling, the water table is anticipated to be encountered at the following locations during construction:

- Bonanza Rd at the Pecos Rd crossing
- Pecos Rd at the Flamingo Arroyo Trail crossing
- Pecos Rd from the Flamingo Arroyo Trail to Stewart Ave
- Oahu St and Olive St
- Sandhill Rd at Wyoming Ave
- Flamingo Wash from Lamb Blvd to the Phase 1 connection

Four of the locations identified fall within the Recommended Alignment and Geotechnical investigations will need to be performed in these areas not previously covered under the Conceptual Alignment investigation. **Figure 12** identifies areas where the water table is anticipated to be encountered during construction along the Conceptual Alignment along with areas where additional investigation will be needed.

BOMO Force Main - Phase 2

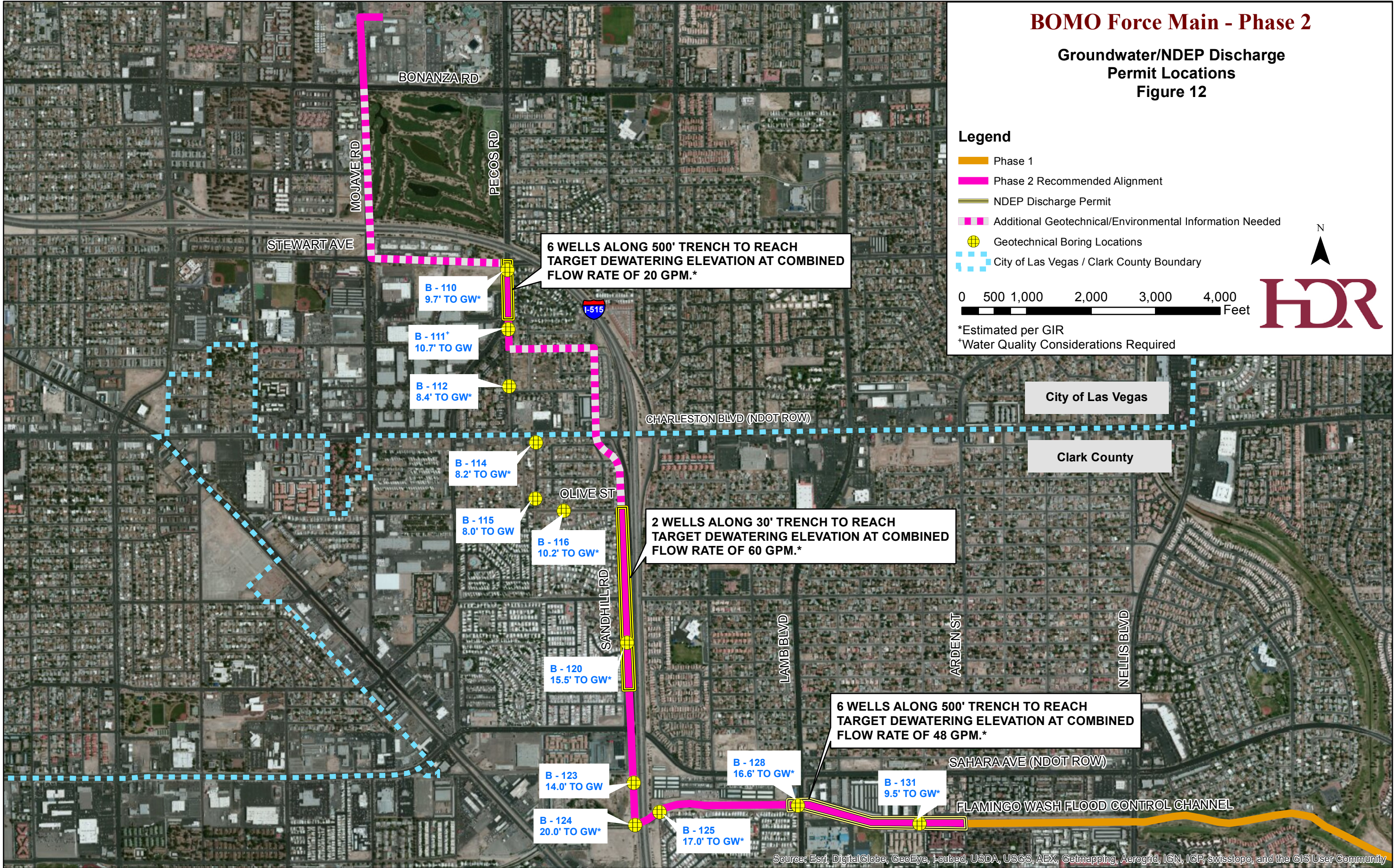
**Groundwater/NDEP Discharge
Permit Locations
Figure 12**

Legend

- Phase 1
- Phase 2 Recommended Alignment
- NDEP Discharge Permit
- Additional Geotechnical/Environmental Information Needed
- Geotechnical Boring Locations
- City of Las Vegas / Clark County Boundary

0 500 1,000 2,000 3,000 4,000 Feet

*Estimated per GIR
*Water Quality Considerations Required



Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Table 12: Groundwater Depths versus Pipe & Trench Depths

Boring Number	Boring Location	Depth to Water Table (feet from surface)	Pipe Trench Depth (feet from surface)	Groundwater Table above Pipe Trench?
B-110	South of Stewart Ave and Pecos Rd	9.7	13	Yes
B-111	South of Pecos Rd and Pecos St	10.7	11	Yes
B-112	North of Pecos St and Johnson Ave	8.4	10.5	Yes
B-114	South of Charleston Blvd and Oahu St	8.2	12	Yes
B-115	North of Olive St and Oahu St	8.0	12	Yes
B-116	East of Olive St and Oahu St	10.2	12	Yes
B-120	South of Wyoming Ave and Sandhill Rd	15.5	12	No
B-123	East of Glen Ave and Stratford Ave	14.0	14	No
B-124	Flamingo Wash	20.0	14	No
B-125	Flamingo Wash	17.0	10	No
B-128	Flamingo Wash	16.6	16	No
B-131	Flamingo Wash	9.5	12	Yes

6.1.1 Groundwater Quality

As part of the HGR, groundwater quality testing was performed by Advanced Technology Laboratories, Inc. at the four borings where groundwater was encountered. For a complete record of the groundwater quality test results refer to the HGR. It should be noted that the dewatering discharge estimates obtained from the HGR are from limited Hydrogeologic testing, and these results should be used for initial planning purposes only.

One of the most important concerns with regards groundwater quality is whether or not the groundwater encountered during construction can be discharged under a NDEP Category 4 DeMinimis permit for subsurface water discharges, which affects the cost and timing of the project. If the groundwater cannot be discharged under a NDEP DeMinimis permit then a NPDES permit must be obtained prior to discharge, which takes from 7 to 9 months to obtain and is more costly. To qualify for a NDEP DeMinimis permit, the required discharge must not exceed 250 gpm and must meet water quality guidelines set forth by NDEP Category 4 Parameter Limits. Discharges greater than 250 gpm or with water quality not meeting Category 4 requirements will require an NDEP individual Discharge to Surface Waters Permit. Table 13 below compares the tested constituents to the limits for both a NDEP Category 4 DeMinimis discharge permit and a NPDES Individual Discharge to Surface Waters- Profile 1 permit. All but one of the borings meet the water quality requirements for the DeMinimis permit: Boring

B-111 does not due to residual chlorine levels. All pollutants labeled “monitor and report” under Category 4 must be measured as part of the permitting requirements for a DeMinimis discharge permit and be reported to NDEP. It should be noted that groundwater quality can vary widely depending on where the sample is taken. For example, B-111 is less than 3,000 feet away from B-115, yet B-111 does not meet the DeMinimis requirements while B-115 does. Although the residual chlorine level sampled at B-111 exceeds DeMinimis permit limits, it is anticipated at this time that a DeMinimis permit can be applied for, with monitoring and reporting of the discharged water necessary. Coordination with NDEP will be completed prior to submitting the permit.

Discharge permits will be required for any dewatering. Based on a preliminary evaluation of the water table along the Conceptual Alignment, discharge flow rates are not anticipated to exceed 250 gpm, which is the maximum limit for a NDEP DeMinimis permit.

While all the locations except B-111 meet the requirements for the DeMinimis discharge permit, should the required groundwater discharge exceeds the 250 gpm limit, a NPDES Profile 1 permit would be required. It should be noted that none of the groundwater quality samples meet the quality requirements for a NPDES Profile 1 permit: concentrations of magnesium, total sulfate, and total dissolved solids all exceed the limits. Other constituents that also exceed Profile 1 requirements were: arsenic (B-128), chloride (B-115), and manganese (B-124 and B-128). Under a NPDES permit, onsite treatment would be required prior to discharge.

Table 13: Groundwater Quality and Limits for NPDES Profile 1 and NDEP Category 4 DeMinimis Permits

Constituent	Boring Location B-111 (mg/L)	Boring Location B-115 (mg/L)	Boring Location B-124 (mg/L)	Boring Location B-128 (mg/L)	Discharge Limit NPDES Profile I (mg/L)	Discharge Limit NDEP Category 4 DeMinimis (mg/L)
Aluminum	0.1	<.05	<.05	<.05	0.2	--
Antimony	<0.0005	<0.0005	<0.0005	<0.0005	0.006	Monitor & Report
Arsenic	0.0038	0.0018	0.0035	0.014	0.01	Monitor & Report
Barium	<0.001	<0.001	0.0011	0.014	2	2
Beryllium	<0.0005	<0.0005	<0.0005	<0.0025	0.004	Monitor & Report
Boron	1.1	1.6	1.4	0.97	--	Monitor & Report
Cadmium	<0.0005	<0.0005	<0.0005	<0.0005	0.005	Monitor & Report
Calcium	350	500	380	330	--	Monitor & Report
Chromium	<0.001	0.002	<0.001	<0.001	0.1	--
Copper	0.002	<0.001	<0.001	<0.001	1	Monitor & report
Iron	<.5	<.5	<.5	<.5	0.6	1

Constituent	Boring Location B-111 (mg/L)	Boring Location B-115 (mg/L)	Boring Location B-124 (mg/L)	Boring Location B-128 (mg/L)	Discharge Limit NPDES Profile I (mg/L)	Discharge Limit NDEP Category 4 DeMinimis (mg/L)
Lead	<0.001	<0.001	<0.001	<0.001	0.015	Monitor & Report
Magnesium	470	600	280	190	150	Monitor & Report
Manganese	<0.0005	<0.0005	0.2	0.45	0.1	Monitor & Report
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	0.002	Monitor & Report
Molybdenum	0.029	0.028	0.012	0.016	--	6.16
Nickel	<0.001	<0.001	<0.001	0.0045	0.1	Monitor & Report
Potassium	110	52	41	29	--	--
Total Phosphorous	<0.020	0.085	<0.020	<0.020	--	Monitor & Report
Selenium	0.008	0.0054	0.023	0.00081	0.05	Monitor & Report
Silver	<0.0005	<0.0005	<0.0005	<0.0005	0.1	Monitor & Report
Sodium	500	930	380	340	--	--
Sulfur	830	1200	810	1200	--	Monitor & Report
Thallium	<0.0005	<0.0005	<0.0005	<0.0005	0.002	Monitor & Report
Zinc	<0.01	<0.01	<0.01	<0.01	--	Monitor & Report
Chloride	390	1400	270	270	400	--
Fluoride	<1	<1	2.1	2	4	Monitor & Report
Nitrate as Nitrogen	2.1	<1	3.8	<1	10	--
Nitrite as Nitrogen	<1	<1	<1	<1	10	--
Total Nitrogen	2.2	0.56	4.1	3.2	10	10
Total Kjeldahl Nitrogen (TKN)	0.16	0.56	0.31	3.2	--	--
Total Alkalinity as Calcium Carbonate	250	290	270	200	--	--
Alkalinity, bicarbonate	250	290	270	200	--	--
pH - (Standard Units)	7.2	6.9	7.1	7.3	6.5 - 8.5	6.5 - 9.0
Total Sulfate	2900	3200	2000	1700	500	Monitor & Report
Total Dissolved Solids (TDS)	5400	6100	3500	3000	1000	Monitor & Report
Total Suspended Solids (TSS)	130	120	<10	13	--	Monitor & Report
Turbidity - (NTU)	140	68	3.6	12	--	Monitor & Report
Residual Chlorine	0.58	<.1	<.1	<.1	--	0.1
Hardness, as CaCO ₃	2800	3700	2100	1600	--	Monitor & Report
Fecal Coliform (cfu/100mL)	< 1	< 1	< 1	>200	--	Monitor & Report
E. Coli (MPN/100 ml)	<1	<1	<1	<1	--	Monitor & Report

Constituent	Boring Location B-111 (mg/L)	Boring Location B-115 (mg/L)	Boring Location B-124 (mg/L)	Boring Location B-128 (mg/L)	Discharge Limit NPDES Profile I (mg/L)	Discharge Limit NDEP Category 4 DeMinimis (mg/L)
Total Petroleum Hydrocarbons, gasoline range (GRO)	<0.050	<0.050	<0.050	<0.050	--	1
Total Petroleum Hydrocarbons, diesel range (DRO)	<.2	<.2	<.2	<.2	--	1
Total Petroleum Hydrocarbons, oil range organics (ORO)	<.2	<.2	<.2	<.2	--	1
Methyl Tertiary Butyl Ether (MTBE)	<0.0005	<0.0005	<0.0005	<0.0005	--	0.02
Trichloroethylene (TCE)	<0.0005	<0.0005	<0.0005	<0.0005	--	0.005
Perchloroethylene (PCE)	<0.0005	<0.0005	<0.0005	<0.0005	--	0.005
Benzene	<.0.0005	<.0.0005	<.0.0005	<.0.0005	--	0.005
Ethylbenzene	<.0.0005	<.0.0005	<.0.0005	<.0.0005	--	0.1
Toluene	<.0.0005	<.0.0005	<.0.0005	<.0.0005	--	0.1
Total xylenes	<0.0015	<0.0015	<0.0015	<0.0015	--	0.2
Dissolved Oxygen (DO)	3.52	5.44	1.78	0.15	--	Monitor & Report
Perchlorate per EPA Method 331.0	<0.004	<0.01	0.011	<0.002	--	--
Exceeds NDEP Category 4 DeMinimis limits						

7.0 Drainage Study

7.1 Drainage Study

A Drainage Study was not conducted for this project. BOMO Phase 2 will be constructed underneath the existing roadway and the Flamingo Wash Flood Channel Maintenance Road and its construction is not anticipated to affect or change any existing surface grade

8.0 Traffic / Community Impacts

8.1 Traffic Study

A Traffic Study was not conducted for this project. BOMO Phase 2 will be constructed underneath the existing roadway and Flamingo Wash Flood Channel Maintenance Road, and its construction is not anticipated to affect or change any roadway geometrics or traffic signal configurations.

8.2 Community Impacts

The Average Annual Daily Traffic (AADT) data for some of the streets in the project area were obtained from Nevada DOT website; http://apps.nevadadot.com/TRINA/TRINA_Map.aspx as summarized in **Table 14** below:

Table 14: 2012 AADT Values

Street	Location	2012 AADT	Functional System
Bonanza Road	150ft W of Mojave Rd	23,000	Minor Arterial
Mojave Road	0.2mi N of Charleston Blvd	6,200	Minor Collector
Pecos Road	150ft S of Stewart Ave	18,000	Minor Arterial
Charleston Boulevard	0.1mi W of Sandhill Rd	31,000	Major Arterial
Stewart Avenue	0.1mi. E of Eastern Avenue	13,500	Minor Arterial

(Note: AADT for other streets in the project vicinity were not available on NDOT website)

9.0 Preliminary Plans

A preliminary BOMO Phase 2 30% plan set has been prepared along the Conceptual and Recommended Alignments.

- Recommended Alignment sheet names are prefixed with a “CN”
- Conceptual Alignment sheet names are prefixed with a “CA”
- See Appendix D for a CD containing PDFs of the approved construction plans for *Sahara-Arden Sewer Replacement and BOMO Force Main – Phase 1* and the 30% Plans of *BOMO Force Main Phase 2*.

10.0 Reuse Water Customers

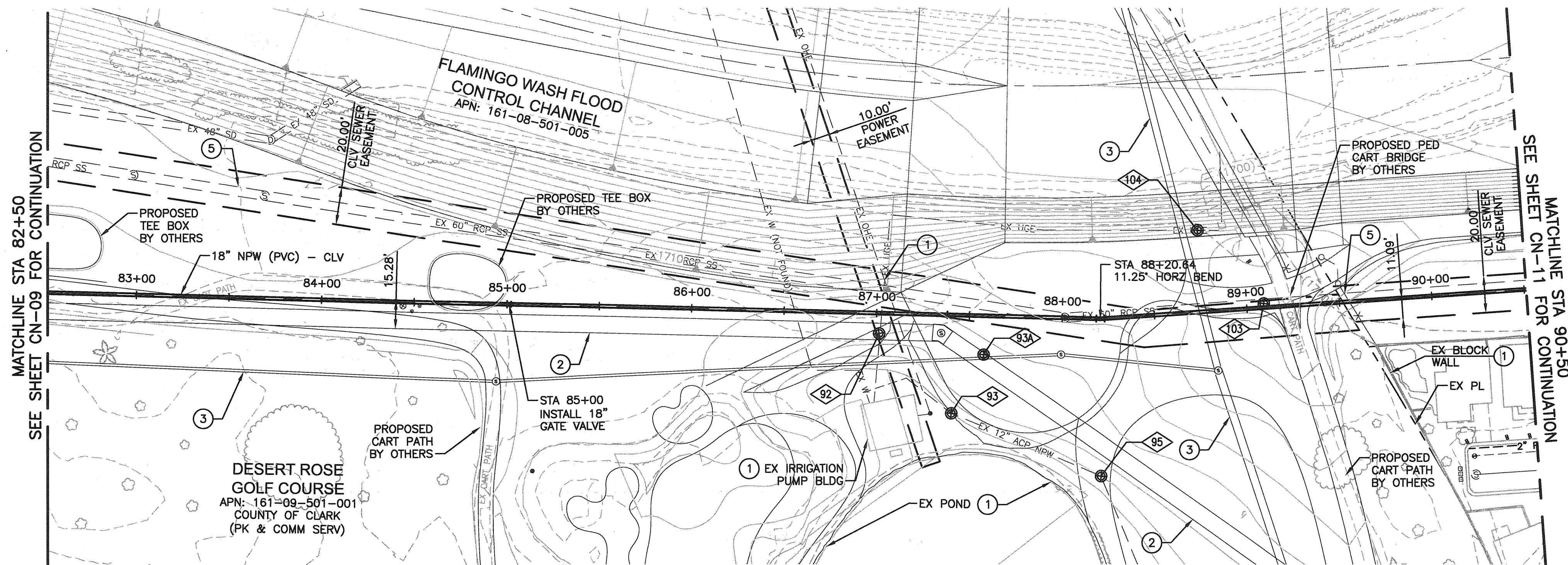
Potential water reuse water customers were evaluated and the findings presented in *Bonanza Mojave (BOMO) Water Resource Center Decommissioning Project Task 2220 Reuse Pipeline Alignment Alternatives Draft*, B&V, dated June 28, 2012.

10.1 Primary Customers

Potential reuse customers were defined as those located within a one-mile radius of the Conceptual Alignment. The report summarized potential reuse customers, their corresponding irrigated acreage, and their maximum daily demand. **Table 15** below identifies the approximate distance between the BMWRC facility and each primary and secondary potential reuse customer. The primary customers include Desert Pines Golf Club, Clark County's Winterwood Park, Rafael Rivera Park, Hadland Park, Mike Morgan Family Park, and Freedom Park.

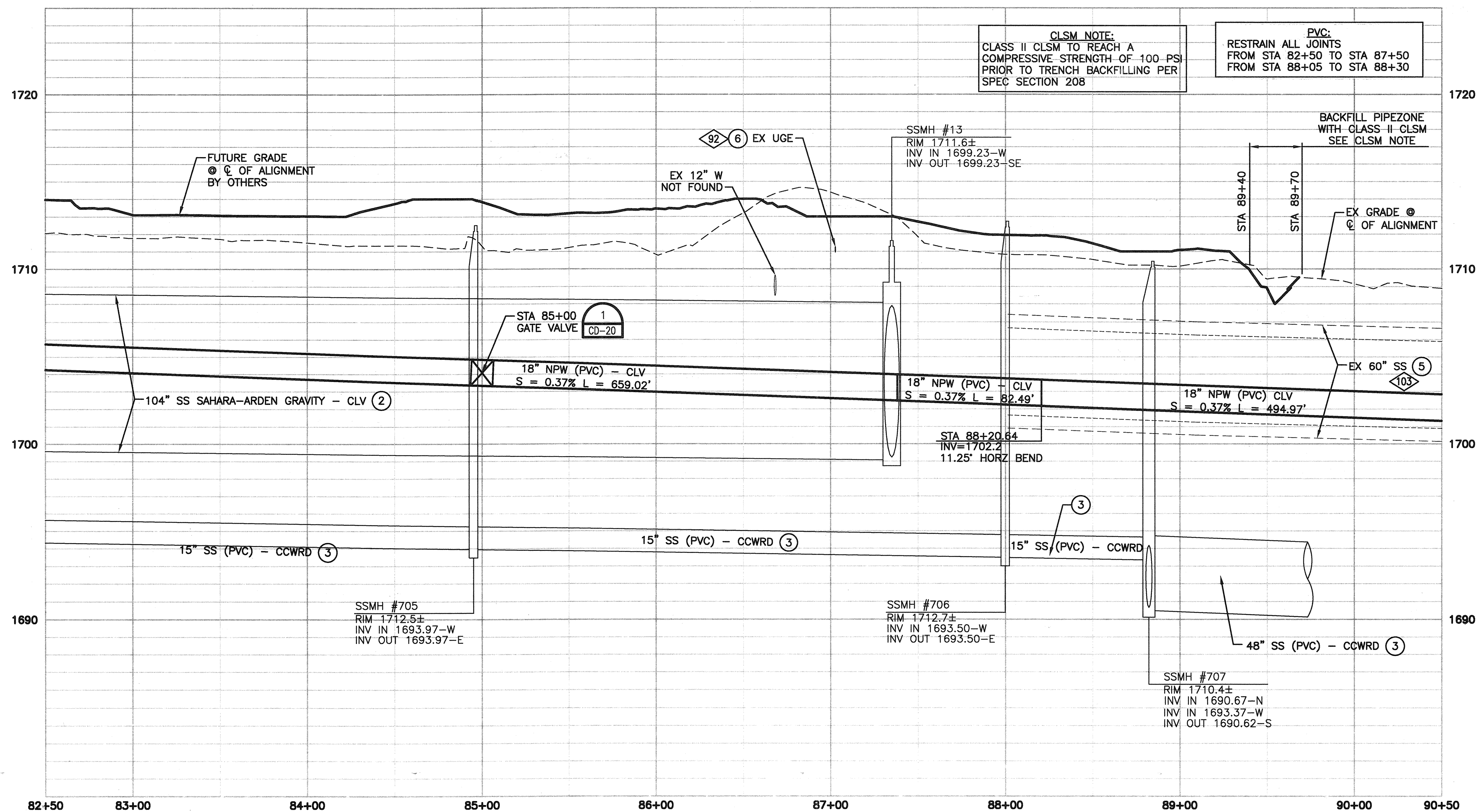
Phase 1 of BOMO is currently under construction and is routed through Desert Rose Golf Course; however, Desert Rose Golf Course is currently being served by Clark County Water Reclamation District 12" reclaimed waterline and was not included in the reuse water supply/demand evaluation. The Phase 1 BOMO alignment is located adjacent to the existing Desert Rose Golf Course Hole #2. *A tee, 60 LF of pipe, and valve system would need to be added to provide immediate service to Clark County Parks & Recreation-owned Desert Rose Golf Course.*

See **Figure 2** for the location of potential primary reuse customers and Drawing CN-10 from Sahara-Arden and BOMO Phase I construction plans, shown in **Figure 13**, for the location of BOMO and Desert Rose Golf Course Hole #2 irrigation pond.



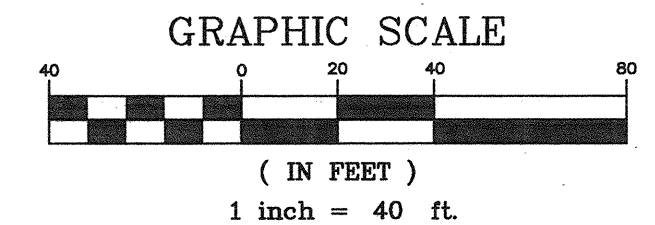
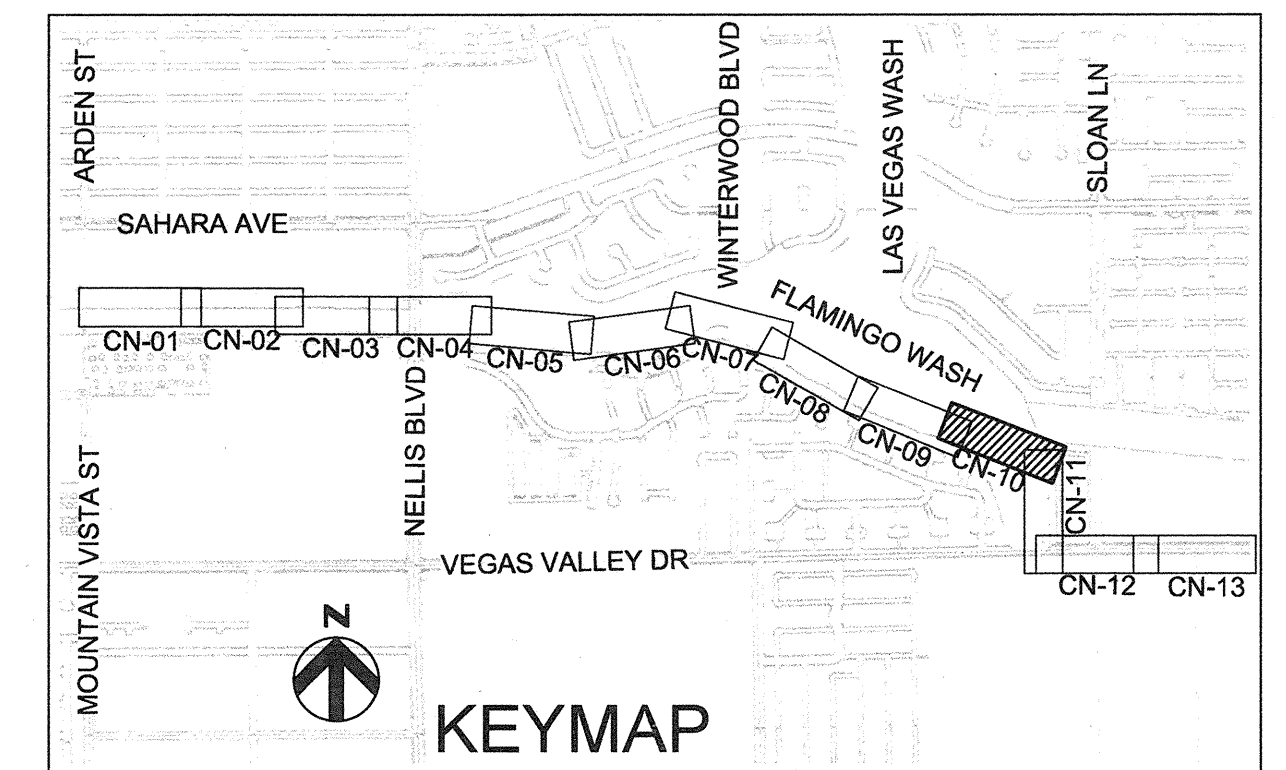
PLAN - FLAMINGO WASH/ DESERT ROSE GOLF COURSE CORRIDOR

SCALE: 1" = 40'



PROFILE - CLV NPW

SCALE: HORZ 1" = 40' VERT 1" = 4'



CONSTRUCTION NOTES:

- ① PROTECT IN PLACE.
- ② REFER TO CS SHEETS FOR GRAVITY SEWER LINE - CLV
- ③ REFER TO SS SHEETS FOR GRAVITY SEWER LINE - CCWRD.
- ④ REFER TO CW SHEETS FOR 12" NPW (PVC) - CCWRD.
- ⑤ ABANDON AND/OR REMOVE EX PER SPEC. SEE CR SHEETS.
- ⑥ REMOVE AND REPLACE AS REQUIRED FOR CONSTRUCTION OF NEW PIPELINE. SEE CR AND UT SHEETS.
- ⑦ MAINTAIN SD FLOWS THROUGHOUT CONSTRUCTION.

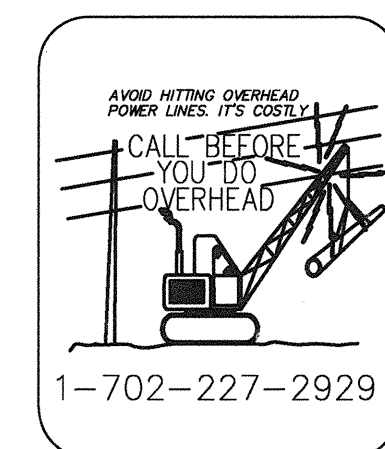
GENERAL NOTES:

1. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO LVWWD BEFORE CONSTRUCTION TO SHOW HOW EXISTING PIPE SPANNING A TRENCH WILL BE SUPPORTED DURING EXCAVATION AND BACKFILL. ALL DRAWINGS SHALL INCLUDE ALL LOCATIONS WHERE WATER LINES SPAN A TRENCH GREATER THAN FOUR (4) FEET WIDE.
 2. CCTV ALL SS PIPES PRIOR TO ABANDONMENT IN ACCORDANCE WITH DCSWCS AND SPECIFICATIONS.
 3. FINISHED GRADE BY OTHERS PROVIDED FOR INFORMATION PURPOSES ONLY.
 4. MH RIM ELEVATIONS ARE PROVIDED FOR COST PURPOSES ONLY. ALL MH RIMS & COVERS MUST BE ADJUSTED TO MATCH FINISHED GRADE AT TIME OF CONSTRUCTION.
 5. EXIST 69 KV OHE: COORDINATE WITH NV ENERGY TRANSMISSION FOR MINIMUM VERTICAL CLEARANCES AND REQUIREMENTS FOR ACTIVITIES BELOW AND ADJACENT TO POWER LINES.
 6. CONTRACTOR SHALL INSTALL PIPING IN ACCORDANCE WITH TRENCH SECTION DETAILS ON SHEET CD-18.
- SEE SHEET G-08 FOR POTHOLE SCHEDULE DATA.
- * MANHOLE FIELD VERIFIED

EXISTING UTILITY NOTE
EXISTING UTILITIES SHOWN HEREIN ARE APPROXIMATE ONLY AND MAY NOT SHOW ALL EXISTING FACILITIES WITHIN THE PROJECT AREA. CONTRACTOR MUST FIELD VERIFY AND POTHOLE EXISTING UTILITIES WITHIN THE PROJECT AREA PRIOR TO BEGINNING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE PROTECTED IN PLACE DURING CONSTRUCTION.

CLARK COUNTY
WATER RECLAMATION DISTRICT
BY: *[Signature]* DATE: 1/3/15
CCWRD PROJECT CONTROL NO. IS 8878.13

SIGNATURE ON THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF CLARK COUNTY WATER RECLAMATION DISTRICT RULES, REGULATIONS, OR DESIGN AND CONSTRUCTION STANDARDS. THE APPROVAL OF THESE DRAWINGS DOES NOT GUARANTEE CAPACITY IN THE DISTRICT'S COLLECTION OR TREATMENT SYSTEM.



REVISIONS		NO.	DATE	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROJECT MANAGER: KRISTINA SWALLOW, P.E.
DESIGNED BY: JAM
DRAWN BY: DDD
CHECKED BY: AMM
DATE: 11/14/13

SAHARA-ARDEN SEWER REPLACEMENT AND BOMO FORCE MAIN - PHASE 1
FORCE MAIN PLAN AND PROFILE
STA 82+50 TO STA 90+50

SHEET: **CN-10**
53 of 105
DRAWING NO.

PROFESSIONAL ENGINEER - STATE OF NEVADA
ANTHONY M. MARQUEZ
1241115
CIVIL
No. 19176
1/3/14

10.2 Secondary Customers

The secondary customers include Woodlawn Cemetery, Heritage Park, and Lions Memorial Park. A reuse force main would need to be extended approximately two-miles west from the BMWRC facility to supply these secondary customers.

Table 15: Potential Reuse Customers Distance from BMWRC facility

Potential Reuse Customers		
Primary Reuse Customers	Distance (LF)	Max Daily Demand (GPM)
Desert Pines Golf Club	1,740	0.80
Winterwood Park (Clark County)	2,000	0.15
Rafael Rivera Park	850	0.10
Hadland Park	2,200	0.04
Mike Morgan Family Park	4,500	0.04
Freedom Park	750	0.45
Secondary Reuse Customers	Distance (LF)	Max Daily Demand (GPM)
Desert Rose Golf Club	26,270	1.40
Woodlawn Cemetery	12,200	0.37
Heritage Park	11,150	0.01
Lions Memorial Park	11,150	0.06

11.0 BOMO Design Considerations

Design criteria were established for the CLV reuse water supply system expansion by utilizing the design requirements as outlined below. CLV desires that the reuse water supply system encompass a larger service area and have an increased capacity. To satisfy the needs of BOMO, the following design requirements have been identified and evaluated.

11.1 Design Calculations

The design shall conform to the standards published in the latest versions / current editions of the following documents:

- *Design and Construction Standards for Wastewater Collection Systems (DCSWCS)*
- *Uniform Design and Constriction Standards for Potable Water Systems (UDACS)*
- *Uniform Standard Drawings and Specifications for Public Works Construction Off-Site Improvements, Clark County Area Nevada*
- *Nevada Department of Transportation (NDOT) Standard Plans for Road and Bridge Construction*

11.2 Loading Criteria

The loading design criteria, including soil loading and buckling pressures, are based on the anticipated depth of BOMO.

The external loading includes the dead loads of the trench and pipe zone material plus any live loads transmitted to the pipe by surface traffic, whether from construction activities or long-term vehicular travel.

The total external loads on buried pipe are generally comprised of the weight of the backfill combined with live and impact loads. The Marston theory is generally used to determine the loads imposed on buried pipe by the soil surrounding it, and is applicable to both flexible and rigid pipes installed under a variety of conditions.

- **Dead Load:** Dead loads attributable to the weight of backfill are computed using the compacted soil weight determined by the geotechnical investigation. Dead loads caused by improvements constructed near the pipeline are computed by standard geotechnical engineering practices.
 - **Lateral Earth Pressure:** The values for the lateral earth pressure are included in the GIR

- Internal Water Pressure: The internal water pressure of 218 psi is assumed based on system operating parameters
- External Water Pressure: The groundwater density is assumed to be 62.4 pcf
- Live Load: Traffic load is assumed AASHTO HS-20 wheel loading
- Construction Load: It shall be the responsibility of the contractor and pipe supplier to ensure that the pipe is handled, stored, and installed such that there will no undue stress placed on the pipe due to construction activities
- Backfill Material: Based on the GIR, a backfill unit weight of 125 pcf will be used
- Modulus of Soil Reaction (E'): Based on the GIR E' values below are used:
 - $E'=1,300$ psi for type II aggregate base as bedding and pipe zone material.
 - $E'=5,400$ psi for controlled low-strength material (CLSM) as bedding and pipe zone material.
 - Assumptions: pipe depth up to approximately 10 feet in cut-and-cover areas, 90% relative compaction by ASTM D 1557 for pipe zone materials.
 - $E'=500$ psi for in-place soils located beyond one pipe diameter when using flexible pipe for undisturbed trench walls located one pipe diameter from the edge of the pipe

11.3 Material

Design criteria for BOMO were originally identified in *Reuse Pipeline Alignment Alternatives Technical Memorandum*, B&V, June 28, 2012. Subsequent to the completion of this memorandum, system requirements were further refined in *Bonanza Mojave Reuse Water Supply System, Service Area Demands and Pump Station Evaluation*, B&V, February 18, 2013. BOMO design criteria are summarized in **Table 16** below.

Table 16: Force Main Design Criteria

Parameter	Value
Design Flow	3.23. MGD (2,240 GPM) based on peak system demand
Design Velocity	Maximum 4-feet per second
Pipe Diameter	18-inch
Pipe Length	Phase 1 = ~11,000LF Phase 2 = ~22,000LF
Minimum Depth of Cover	6-feet
Working Pressure	145 psi (max)
Working + Surge	218 psi
Pipe Material	PVC DR18 rated for 235 psi
Pipe fittings	Installation per UDACS Section 3.11.02

For this project the requirements in Uniform Design and Constriction Standards for Potable Water Systems (UDACS) will be followed. Accordingly, AWWA C-905 PVC pressure pipe with a working pressure rating of 235 psi (DR18) will be used. The pipe shall conform to all applicable ASTM International Standards.

11.4 Flexible Pipe Analysis

Based on deflection calculations, a pipe stiffness of PVC DR 18 will perform adequately with anticipated depth of backfill. The maximum allowable pipe deflection is 3%. Deflection calculations for 18-inch PVC (DR-18) are included in Appendix B. The calculations demonstrate that the PVC pipe deflection is within allowable limits at depths up to 25-feet

11.5 Utility Clearances

- **Horizontal Utility Clearances:** Maintain minimum 10-foot horizontal separation between exterior pipe walls from any potable water line, sewer line, or storm drain; or other separation as required by UDACS and DCSWCS.

- **Vertical Utility Clearances:** Maintain minimum 18-inches vertical separation between exterior pipe walls where water and sewer lines cross. Where water and reuse pipelines parallel each other, the reuse line invert shall be located below the potable water line invert
- **Existing ACP waterline:** The requirements for construction near existing ACP waterline are described in *LVVWD Meeting Minutes* included in Appendix A.

12.0 Special Construction

12.1 Groundwater

Based on the GIR, relatively shallow groundwater is expected to be encountered. Dewatering should be anticipated during earthwork operations where excavation occurs near or below the groundwater level. In accordance with the DCSWCS, the trench must be dewatered to at least 2-feet below the bottom of the excavation prior to installation of the pipe. Soil would likely require stabilization by adding crushed rock, drain rock, and geotextile separation fabric prior to installing pipe in groundwater areas, which will need to be confirmed during final design.

12.2 Caliche

Caliche is a naturally-occurring cemented soil with rock-like characteristics. Based on the GIR, caliche is anticipated to be encountered during construction of BOMO. Caliche presents a challenge to construction activities since its removal may require special excavation methods, including: large track-mounted excavators, ripping equipment or blasting operations.

12.3 Trenchless Construction

Trenchless construction is an alternative method of pipe installation that is commonly used to cross highways, roadways congested with utilities, flood control channels and other areas where construction is difficult using standard open trench methods. BOMO Phase 2 will utilize trenchless construction methods where it crosses I-515 at the Flamingo Wash. Trenchless construction can also be utilized at Charleston Blvd and Sahara Ave, which are both NDOT ROW crossings.

There are several methods of trenchless construction utilized on the Las Vegas valley.

- Bore-and-Jack - accomplished with an auger boring machine by jacking a casing pipe through the earth while at the same time removing earth spoil from the casing by means of rotation auger inside the casing. This method is considered the most cost-effective and reliable trenchless option for BOMO Phase 2 in areas where groundwater is not a concern.
- Microtunneling - consists of a bi-directional rotating cutter head equipped with cutter teeth, picks, or spades for excavation of soil, and a cone-shaped crushing chamber to pulverize cobbles and boulders. During excavation, slurry is pumped to the head and mixed with the soil cuttings. Slurry pressure-balanced Microtunneling systems enable installations below the water table or in very wet soil without the need for dewatering.
- Horizontal Directional Drilling - uses steered drilling technology to install pipelines. A series of successive drill drives ream the drill hole with larger bits until the desired diameter is achieved and the carrier pipe pulled through the drill hole.

13.0 Appurtenances

13.1 Existing and Proposed Facilities Coordination

The BOMO Phase 1 force main consists of approximately 11,000 LF of 18" PVC pipe beginning at the WPCF and ending at Flamingo Wash and Arden St. BOMO Phase 2 consists of approximately 22,000 LF of 18" PVC pipe and will connect to the termination point of BOMO Phase 1 and continue to the BMWRC.

A WPCF pumping station will be used to transfer reclaimed water to the site of the BMWRC, utilizing BOMO. The BMWRC is to be decommissioned and replaced with an onsite pressure reducing valve and control station at the BMWRC. From the BMWRC site, reclaimed water will be provided to reuse customers.

The initial demand condition is to provide service to Desert Pines Golf Course. All potential reuse water customers are discussed in Section 8.

Another CLV project in the area that will require coordination is the Las Vegas Wash Central Cedar Avenue Channel project, located near the Desert Pines Golf Course. Scheduling of the CLV's Cedar Ave Channel construction with the Phase 2 construction can be coordinated to minimize impact to the surrounding areas. Although BOMO design may be completed before this project, the placement of the storm drain system will be considered and coordinated with the Channel consultant during design, as it is a large gravity system with limited ability to adjust vertically. As such, the BOMO phase 2 design should identify areas where the storm system will be crossed, and adjust as necessary to avoid conflicts. This would include adjusting BOMO vertically to cross below the future storm system, and horizontally in order to avoid conflicts and to satisfy separation requirements.

13.2 Appurtenances

- Combination Air Vacuum/Air Release (AVAR): Combination AVARs shall be installed at all high points within a pipeline system as specified in UDACS. These valves also provide surge protection for the WPCF.
- Blow-off assemblies: Blow-off assemblies shall be installed at all low points in the pipeline and also at the high side of isolation valves as specified in UDACS.
- Mainline valves: Mainline valves shall be installed every 2,500 LF at a minimum, with additional valves placed as needed to accommodate future connections.
- Tees and stubs to future extensions will be placed to correspond with the primary and secondary customers.

14.0 ROW Requirements/Permits

Construction of BOMO will require easements, encroachment permits and occupancy permits. See Section 15 for permit requirements. Parcel numbers and ownership are listed in Appendix C.

Refer to **Figure 14** for Permit Map.

14.1 NDOT ROW

The BOMO force main construction within NDOT ROW must satisfy the requirements in NDOT's Terms and Conditions relating to ROW Occupancy Permits.

A NDOT ROW Occupancy Permit will be required where the BOMO force main crosses NDOT ROW, totaling four locations as follows:

- I-515 at Pecos Rd
- Charleston Blvd
- Sahara Ave
- I-515 at Flamingo Wash Flood Control Channel

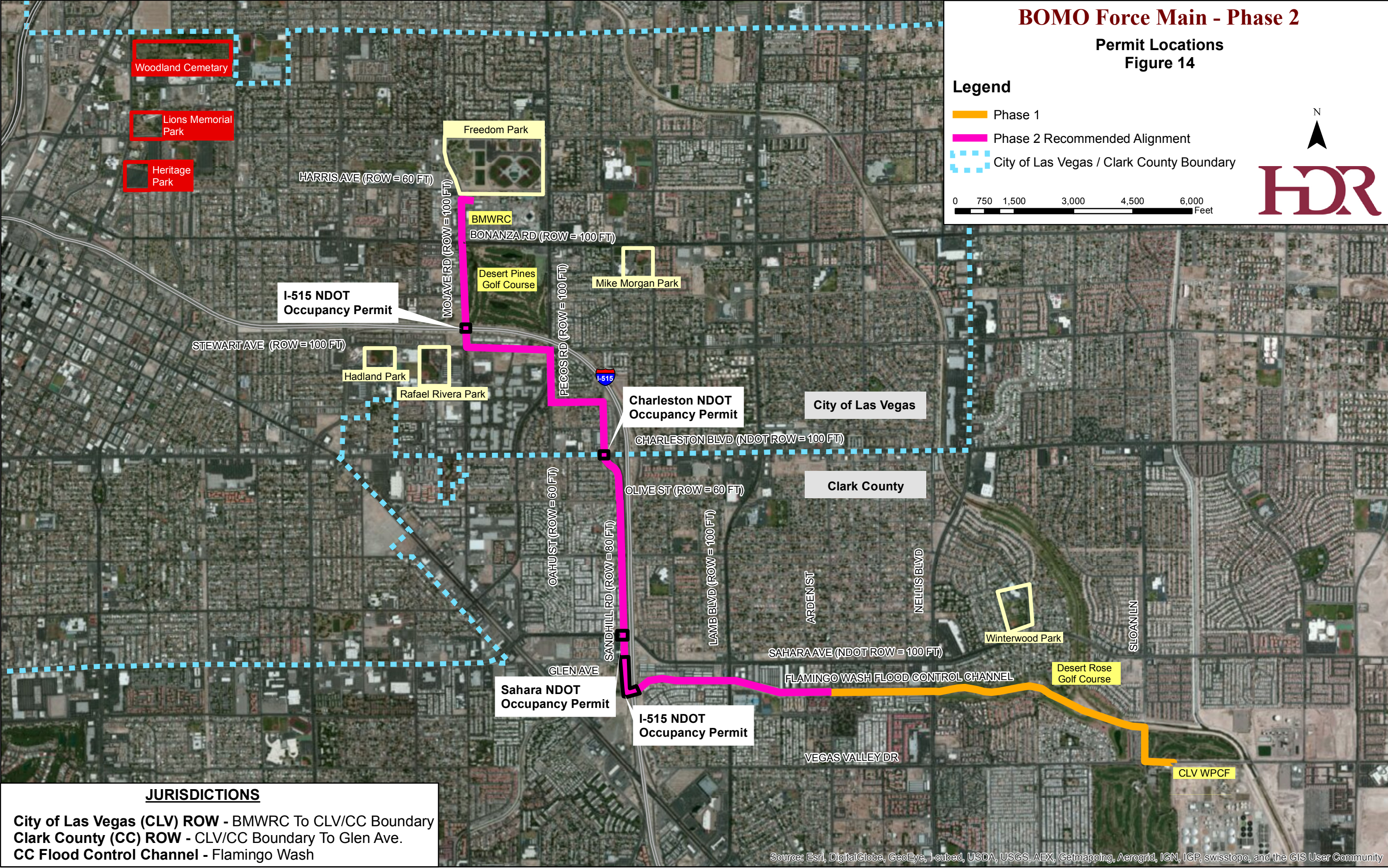
14.2 Clark County Jurisdiction

14.2.1 Clark County ROW

Encroachment Permit(s) will be required for BOMO within the Clark County ROW at Sandhill Road.

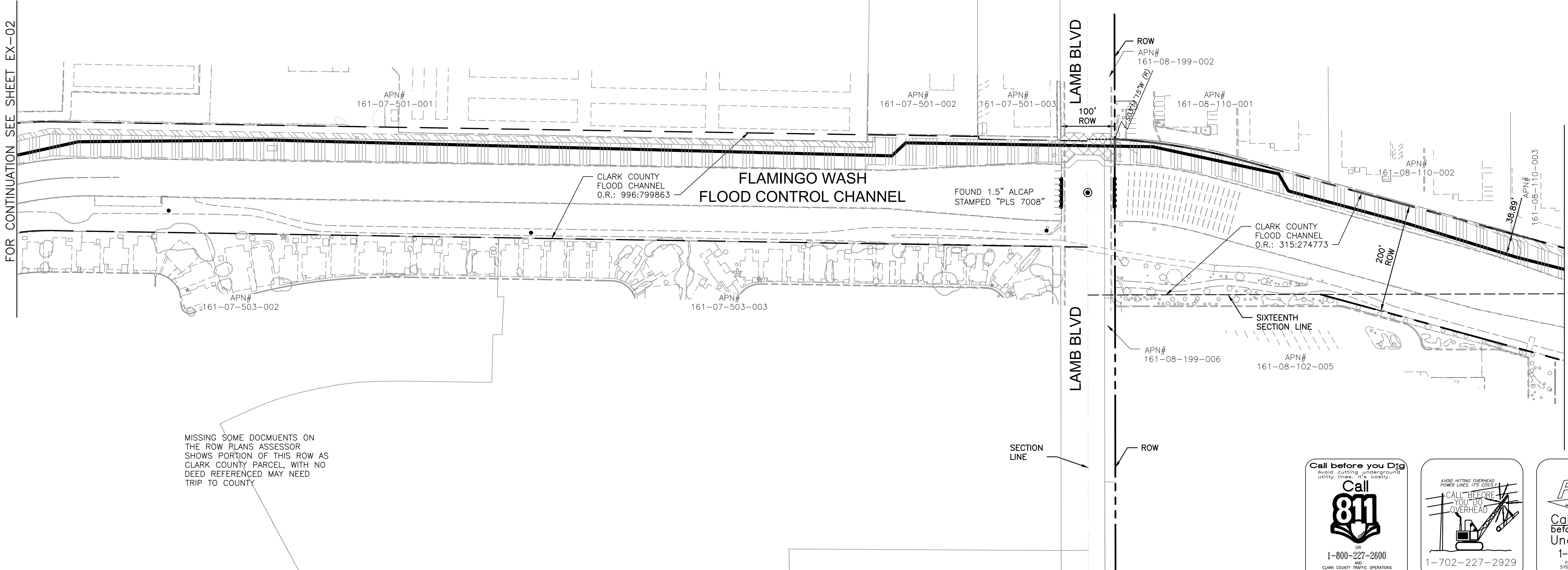
14.2.2 Flamingo Wash Flood Control Channel

The BOMO force main construction within Clark County Flood Control Drainage Easement will require an Encroachment Permit and easement. Coordination with CC will be required after the preliminary alignment approval to confirm agreement requirements with CCPW.

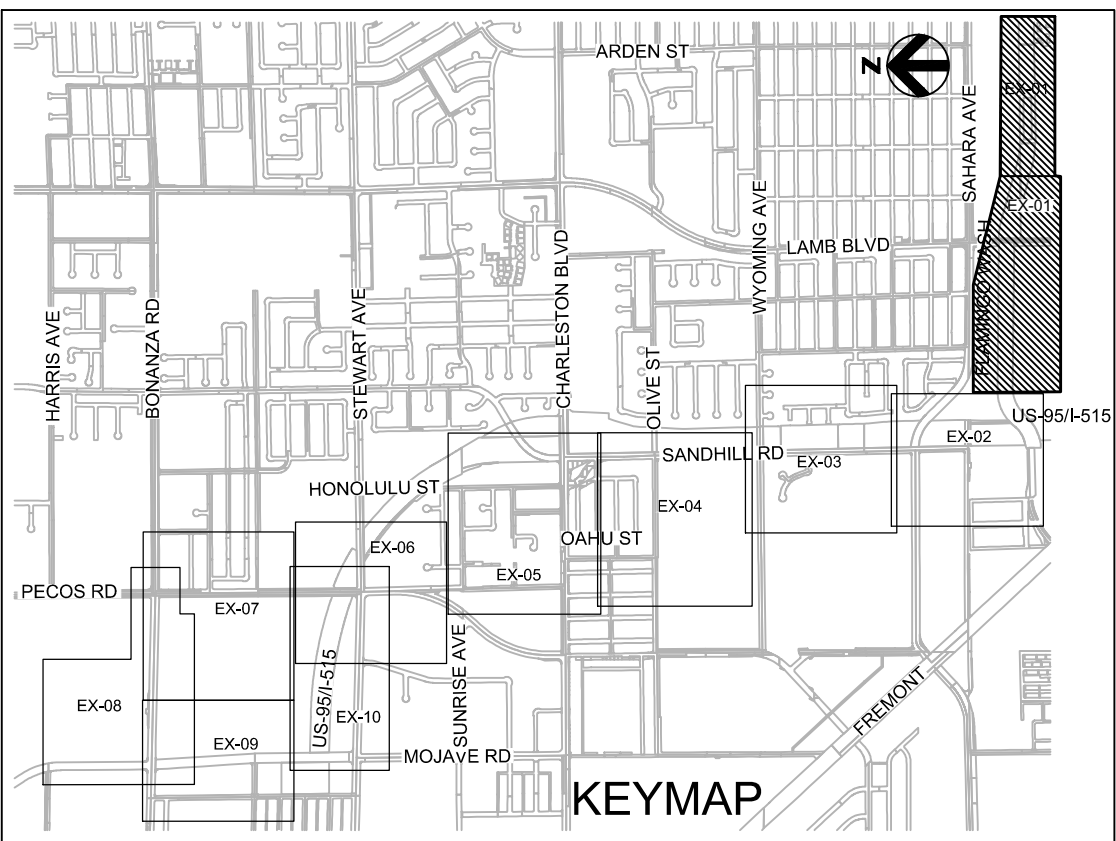
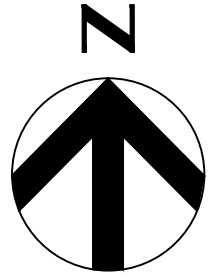
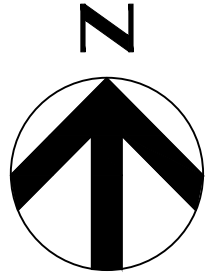
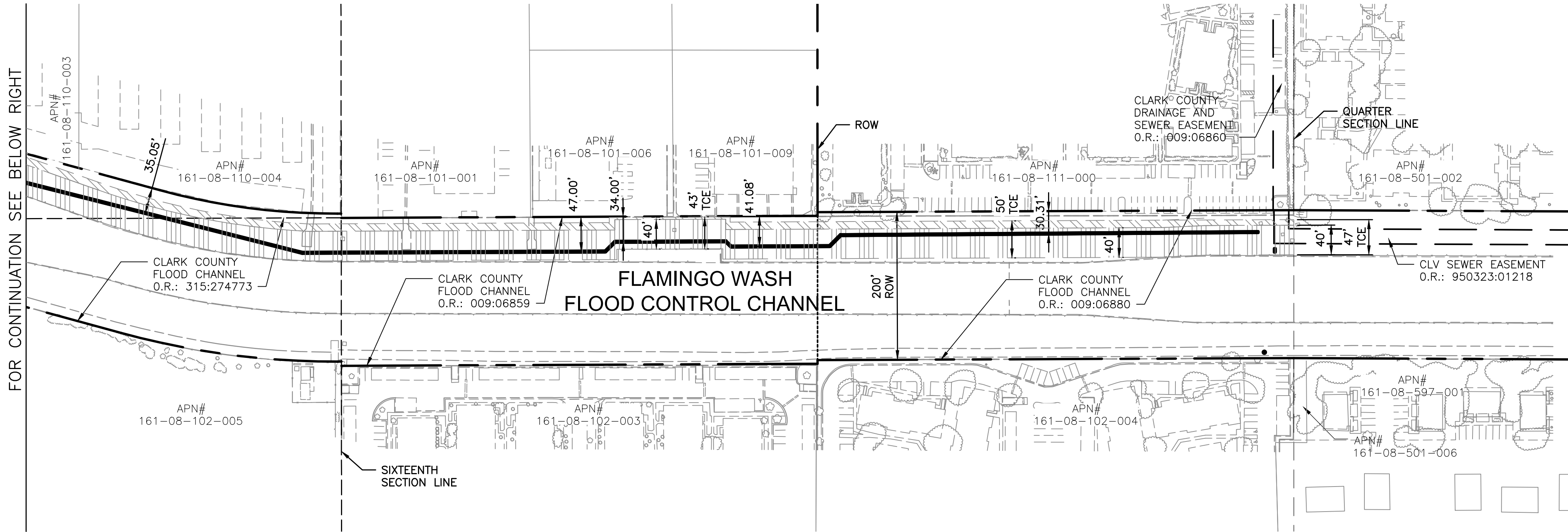


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- CC ENCROACHMENT PERMIT (EP)
- NDOT ROW OCCUPANCY PERMIT
- PROPOSED TEMPORARY CONSTRUCTION EASEMENT (TCE)
- PROPOSED PERMANENT EASEMENT
- EXISTING PARCEL LINE
- EXISTING ROW
- EXISTING EASEMENT
- RECOMMENDED BOMO FORCE MAIN ALIGNMENT
- CONCEPTUAL BOMO FORCE MAIN ALIGNMENT ALTERNATIVE

BONANZA-MOHAVE (BOMO) FORCE MAIN - PHASE 2 RIGHT-OF-WAY EXHIBIT

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1 of 10
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DEPARTMENT OF PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROJECT MANAGER: KRISTINA SWALLOW, P.E.

DESIGNED BY: XXX
DRAWN BY: XXX
CHECKED BY: XXX

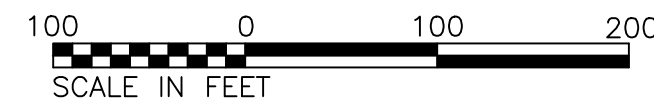
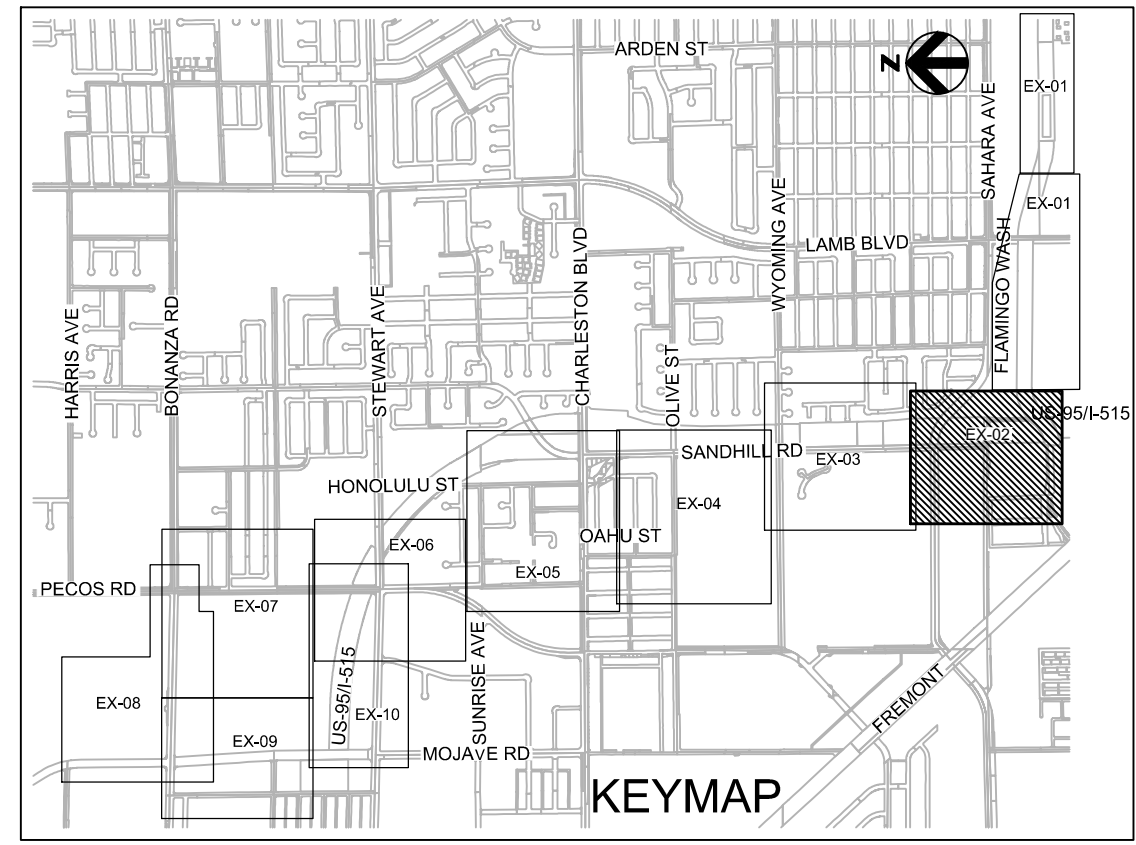
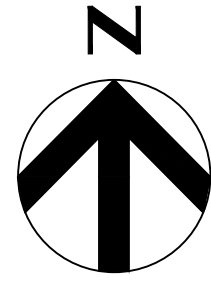
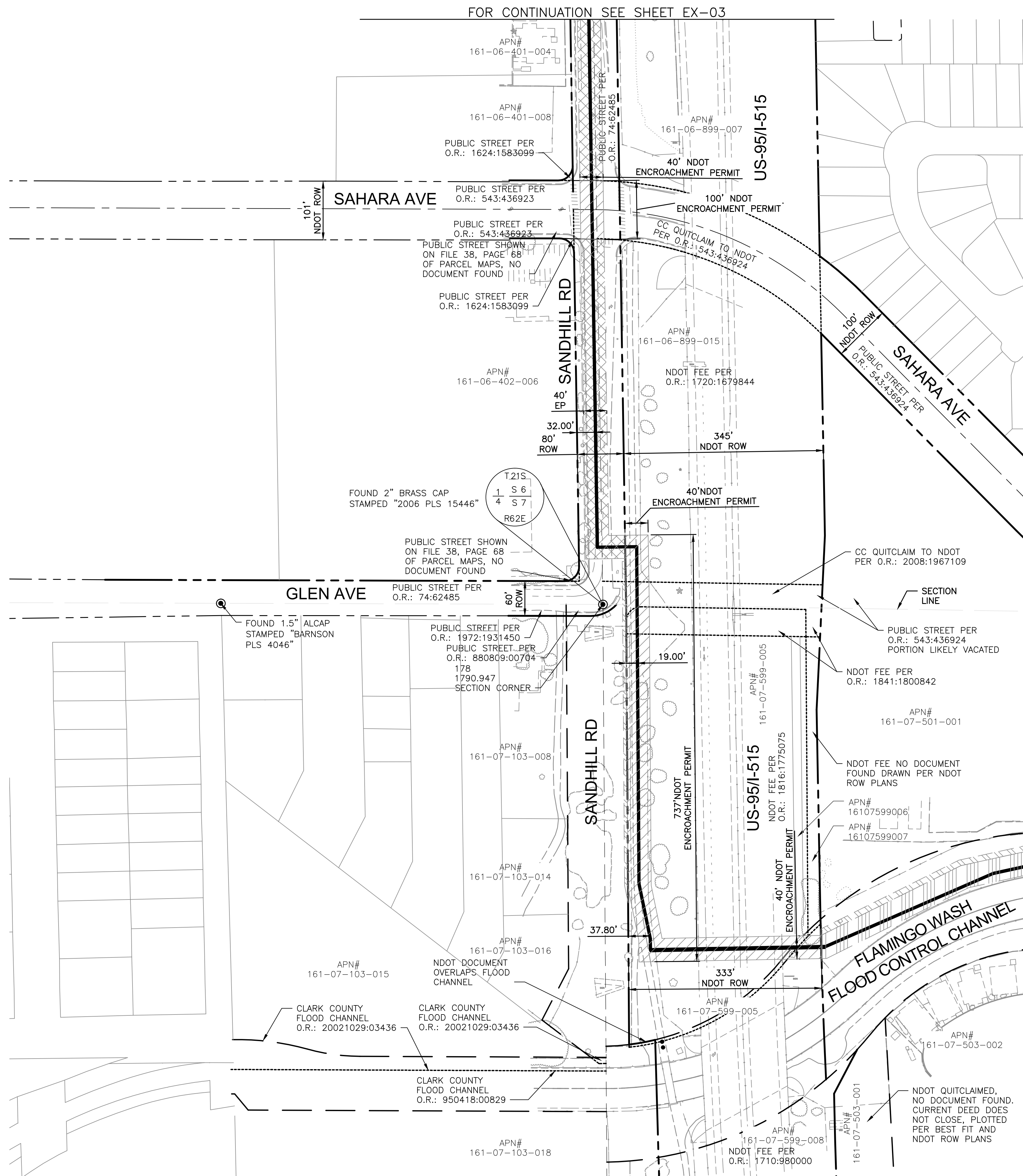
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	PROPOSED PERMANENT EASEMENT
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	EXISTING EASEMENT
	RECOMMENDED BOMO FORCE MAIN ALIGNMENT
	CONCEPTUAL BOMO FORCE MAIN ALIGNMENT ALTERNATIVE

FOR CONTINUATION SEE SHEET EX-01

Call before you Dig
Avoid cutting underground utility lines. It's costly.

Call
811

OR

1-800-227-2600
AND
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7544

AVOID HITTING OVERHEAD
POWER LINES. IT'S COSTLY.

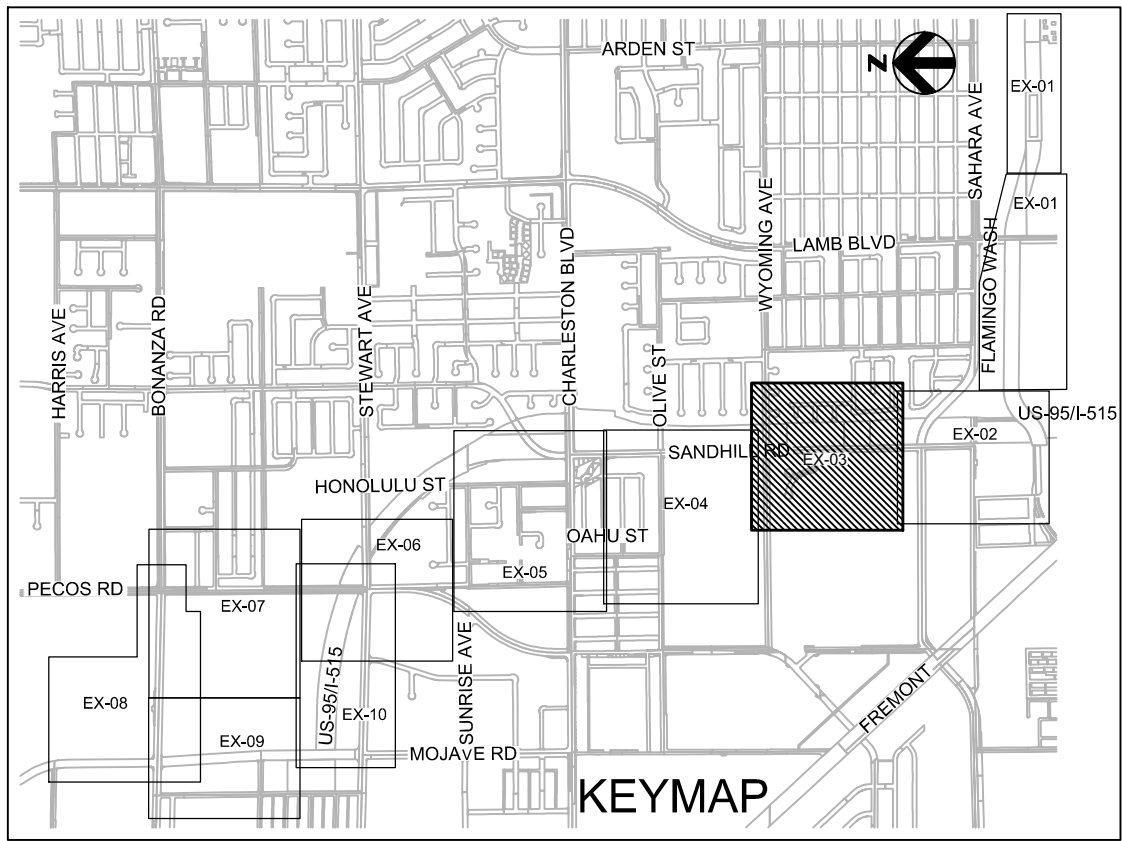
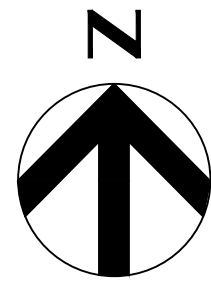
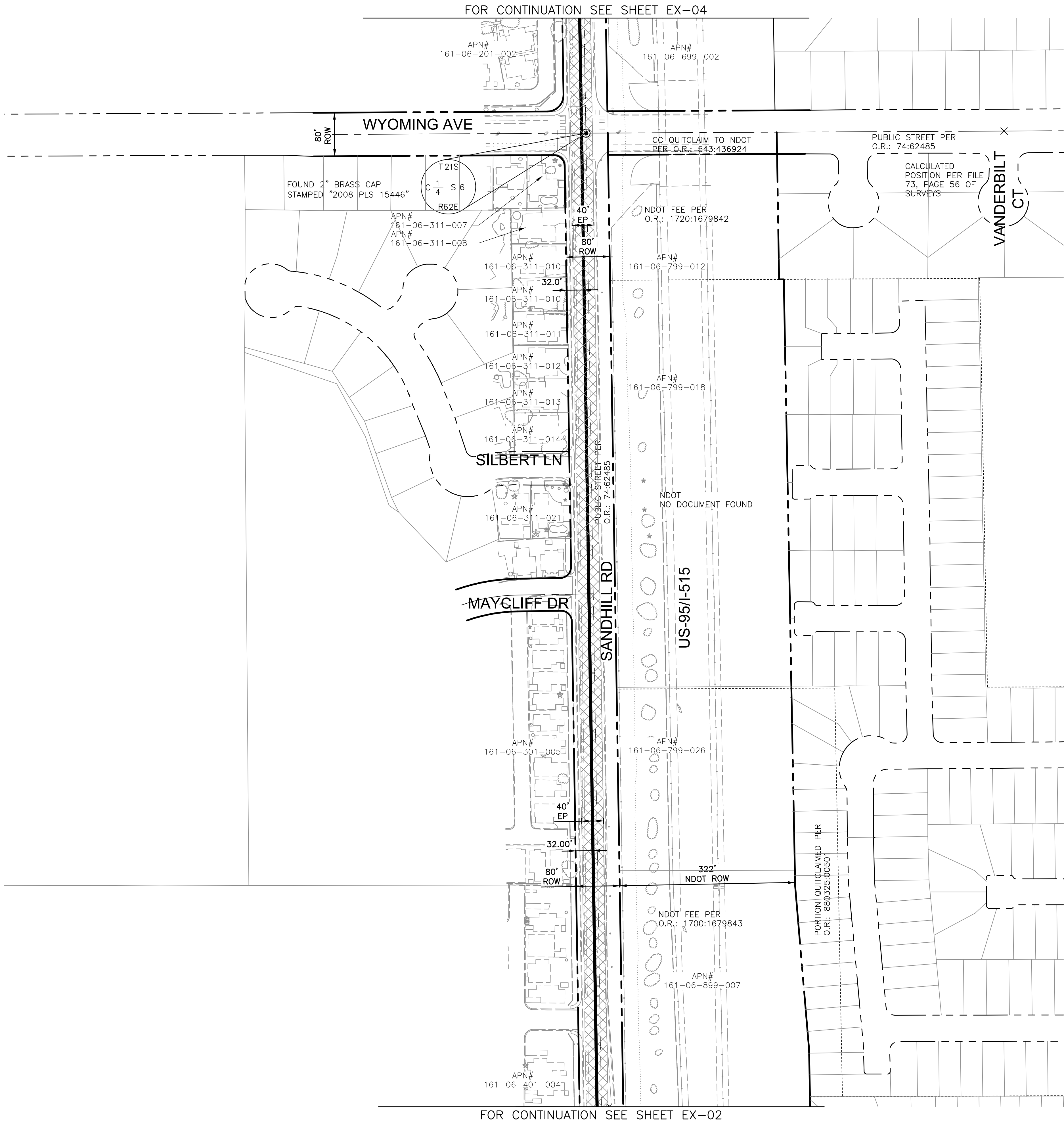
CALL BEFORE
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1-702-227-2929



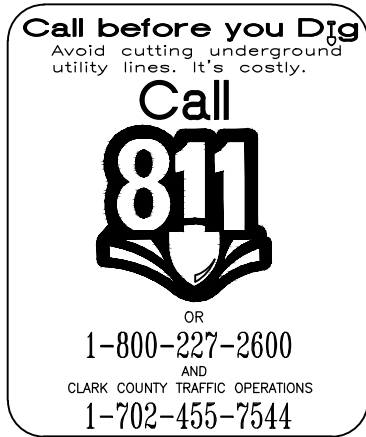
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			 DESIGNED BY: XXX DRAWN BY: XXX CHECKED BY: XXX DATE: XX/XX/XX	
			HDR Engineering, Inc. 180 Polaris Drive Ste. 200 Las Vegas, NV 89115 702.938.6000	
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- CC ENCROACHMENT PERMIT (EP)
- NDOT ROW OCCUPANCY PERMIT
- PROPOSED TEMPORARY CONSTRUCTION EASEMENT (TCE)
- PROPOSED PERMANENT EASEMENT
- EXISTING PARCEL LINE
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- EXISTING EASEMENT
- RECOMMENDED BOMO FORCE MAIN ALIGNMENT
- CONCEPTUAL BOMO FORCE MAIN ALIGNMENT ALTERNATIVE



REVISIONS				DEPARTMENT OF PUBLIC WORKS			
NO.	DATE	DESCRIPTION	APP'D	CAPITAL PROJECT MANAGEMENT			
				CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.			
				PROJECT MANAGER: KRISTINA SWALLOW, P.E.			
				DESIGNED BY: XXX			
				DRAWN BY: XXX			
				CHECKED BY: XXX			
				DATE: XX/XX/XX			

CLARK COUNTY

NEVADA

TITLE:

BONANZA-MOHAVE (BOMO)
FORCE MAIN - PHASE 2

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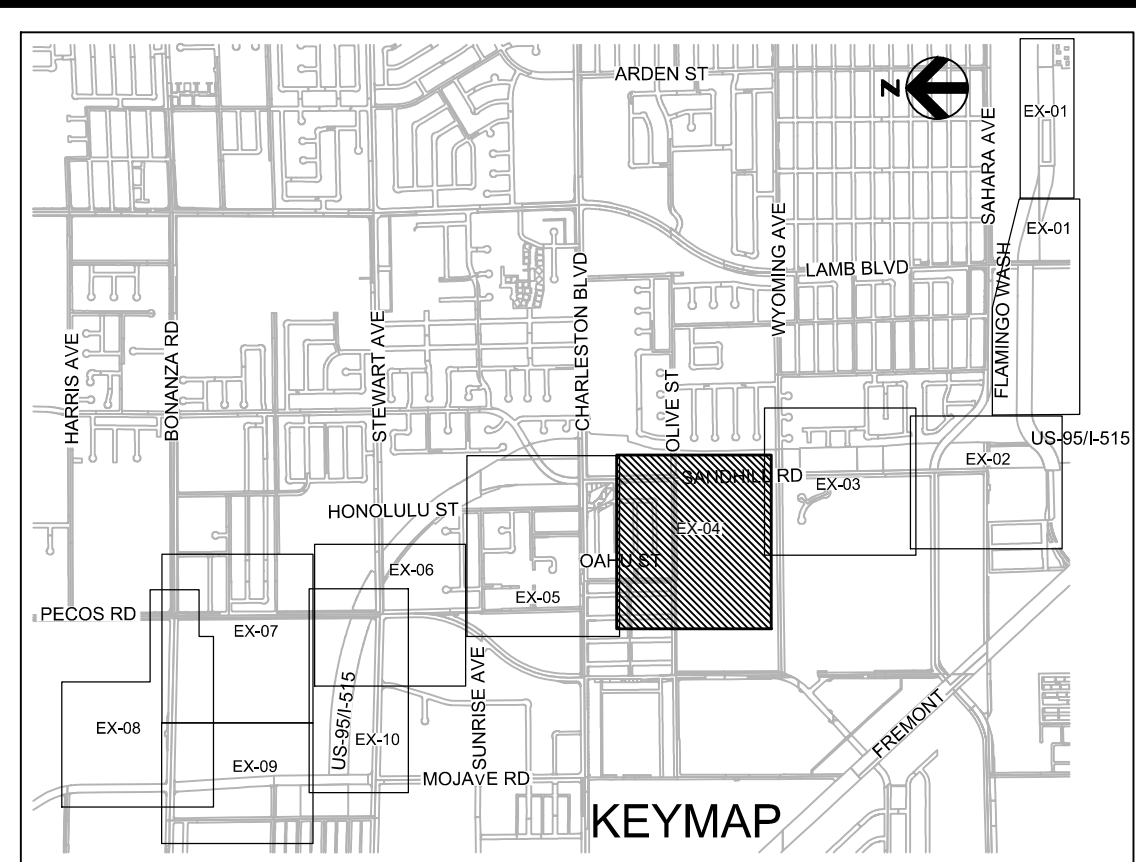
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|  | EXISTING EASEMENT |
|  | RECOMMENDED BOMO FORCE MAIN ALIGNMENT |
|  | CONCEPTUAL BOMO FORCE MAIN ALIGNMENT ALTERNATIVE |

Call before you Dig
Avoid cutting underground
utility lines. It's costly.

Call
811

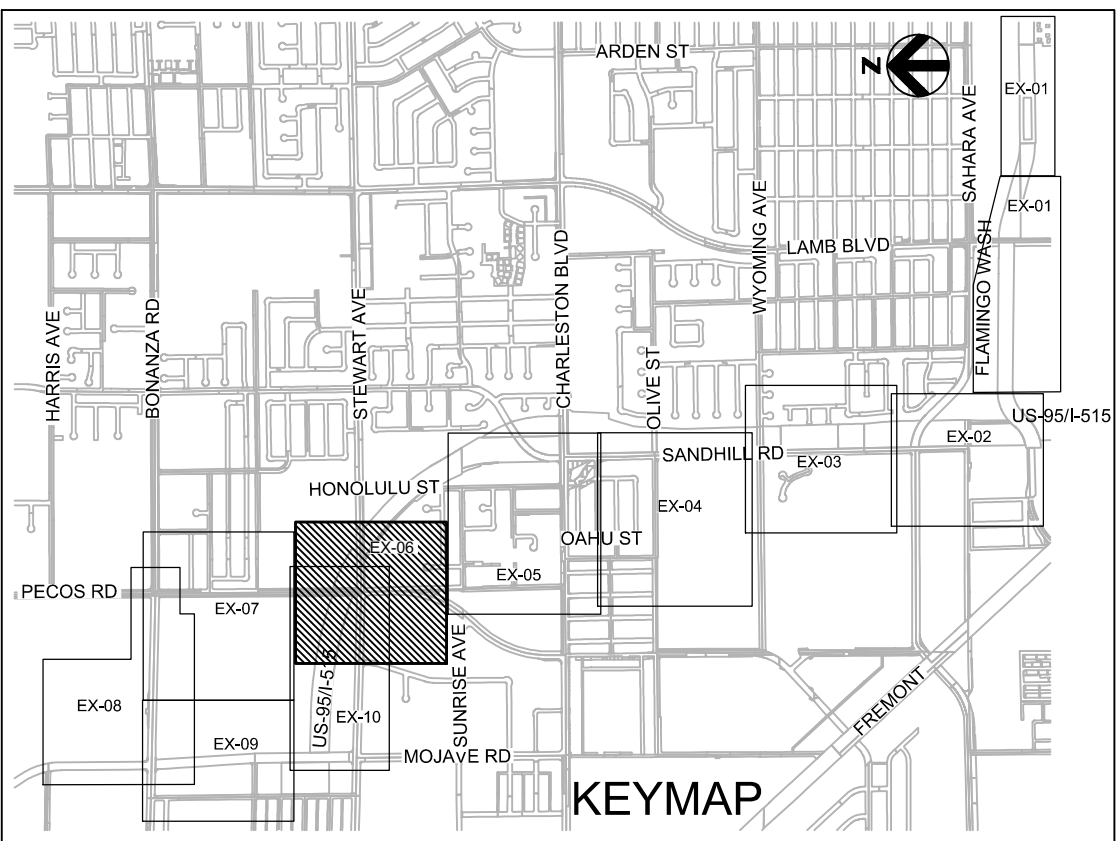
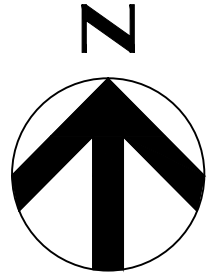
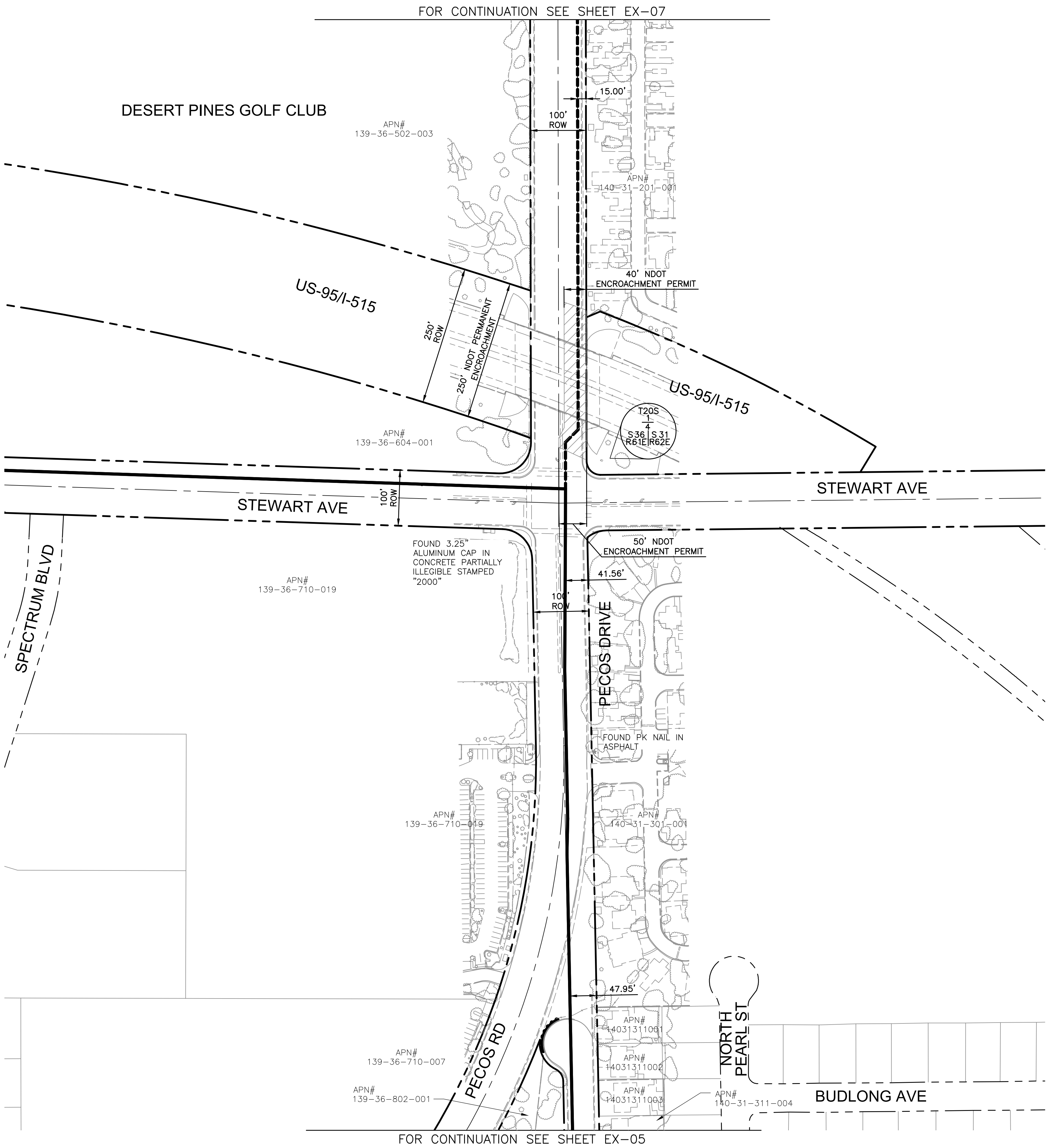
OR
1-800-227-2600
AND
CLARK COUNTY TRAFFIC OPERATIONS
1-702-455-7544



Call
before you 
UnderGround.
1-702-432-5300
FREEWAY AND ARTERIAL
SYSTEM OF TRANSPORTATION

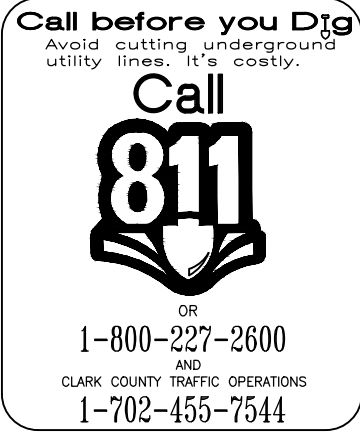
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			NO.	DATE:	DESCRIPTION	APP'D

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- CC ENCROACHMENT PERMIT (EP)
- NDOT ROW OCCUPANCY PERMIT
- PROPOSED TEMPORARY CONSTRUCTION EASEMENT (TCE)
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- EXISTING ROW
- EXISTING EASEMENT
- RECOMMENDED BOMO FORCE MAIN ALIGNMENT
- CONCEPTUAL BOMO FORCE MAIN ALIGNMENT ALTERNATIVE

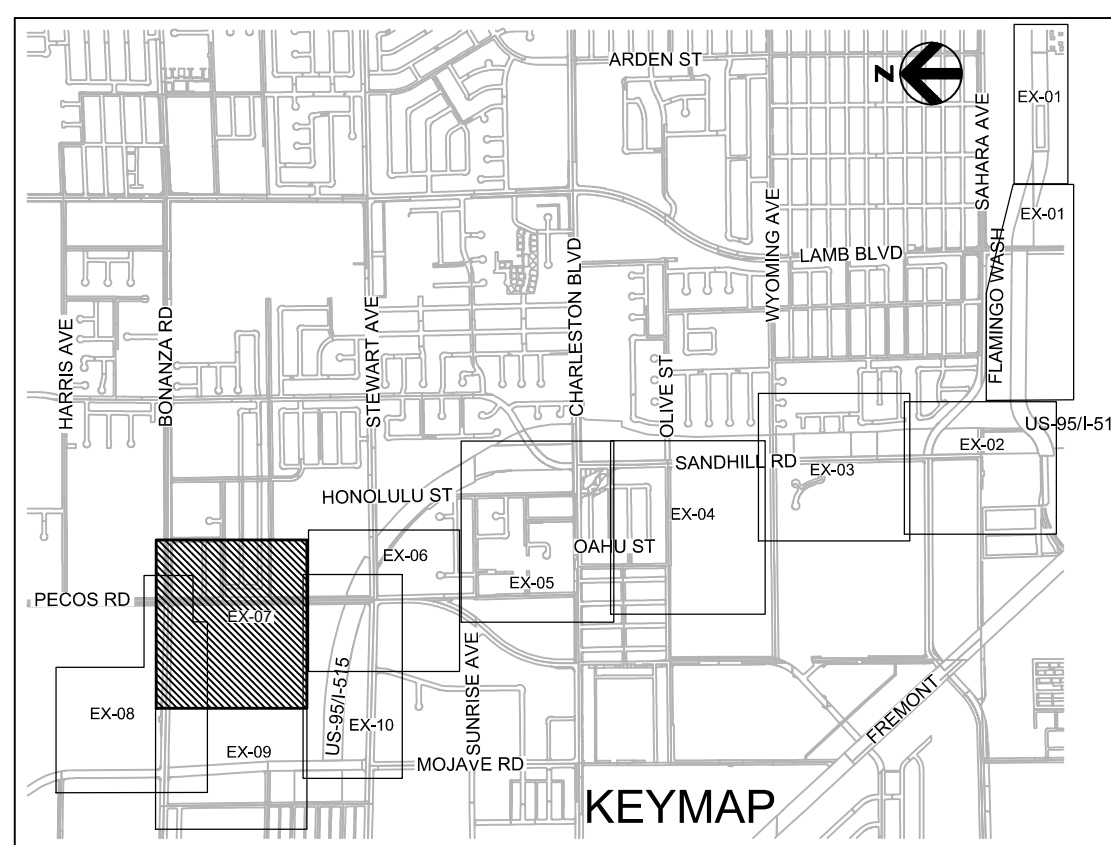
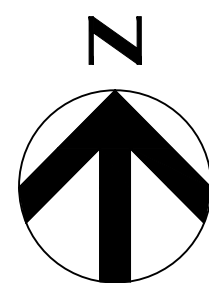


REVISIONS		NO.	DATE:	DESCRIPTION	APP'D

DEPARTMENT OF PUBLIC WORKS		CAPITAL PROJECT MANAGEMENT	
CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.		PROJECT MANAGER: KRISTINA SWALLOW, P.E.	
DESIGNED BY: XXX		DRAWN BY: XXX	
CHECKED BY: XXX		DATE: XX/XX/XX	

BONANZA-MOHAVE (BOMO)	
FORCE MAIN - PHASE 2	
RIGHT-OF-WAY EXHIBIT	

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|  | EXISTING PARCEL LINE |
|  | EXISTING ROW |
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|  | RECOMMENDED BOMO
FORCE MAIN ALIGNMENT |
|  | CONCEPTUAL BOMO FORCE
MAIN ALIGNMENT ALTERNATIVE |

DEPARTMENT OF PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROJECT MANAGER: KRISTINA SWALLOW, P.E.

DESIGNED BY: XXX
DRAWN BY: VVV
HDR Engineering, Inc.
7100 Ballpark Drive, Ste. 200

DRAWN BY: XXX
 CHECKED BY: XXX
 DATE: XX/XX/XX
 Las Vegas, NV 89119
 702.938.6000

**BONANZA-MOHAVE (BOMO)
FORCE MAIN - PHASE 2**

**RIGHT-OF-WAY
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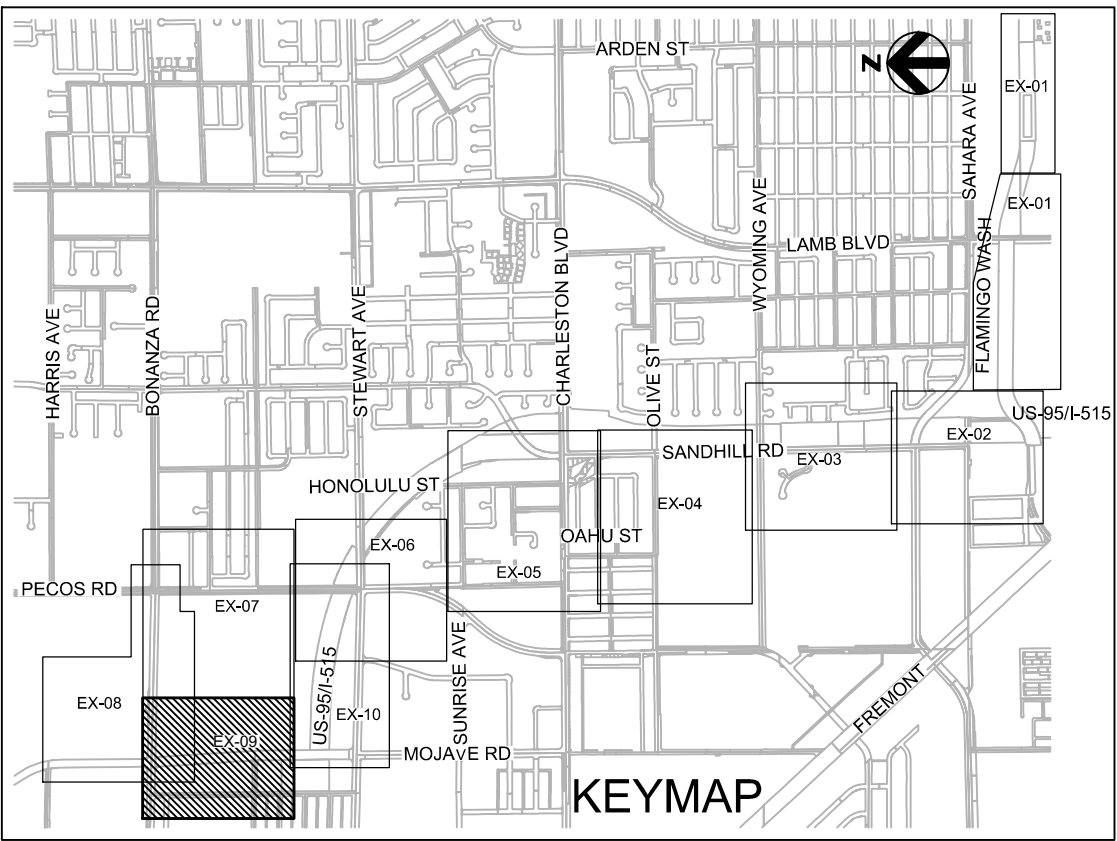
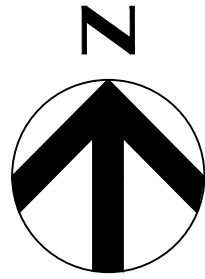
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				CAPITAL PROJECT MANAGEMENT							
				DESIGNED BY: XXX							
				DRAWN BY: XXX							
				CHECKED BY: XXX							
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LEGEND

- EASEMENT AND ENCROACHMENT PERMIT
- CC ENCROACHMENT PERMIT (EP)
- NDOT ROW OCCUPANCY PERMIT
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DEPARTMENT OF PUBLIC WORKS

CAPITAL PROJECT MANAGEMENT

CITY ENGINEER: DAVID BOWERS, P.E., P.T.O.E.
PROJECT MANAGER: KRISTINA SWALLOW, P.E.

DESIGNED BY: XXX
DRAWN BY: XXX
CHECKED BY: XXX

DATE: XX/XX/XX



BONANZA-MOHAVE (BOMO)
FORCE MAIN - PHASE 2

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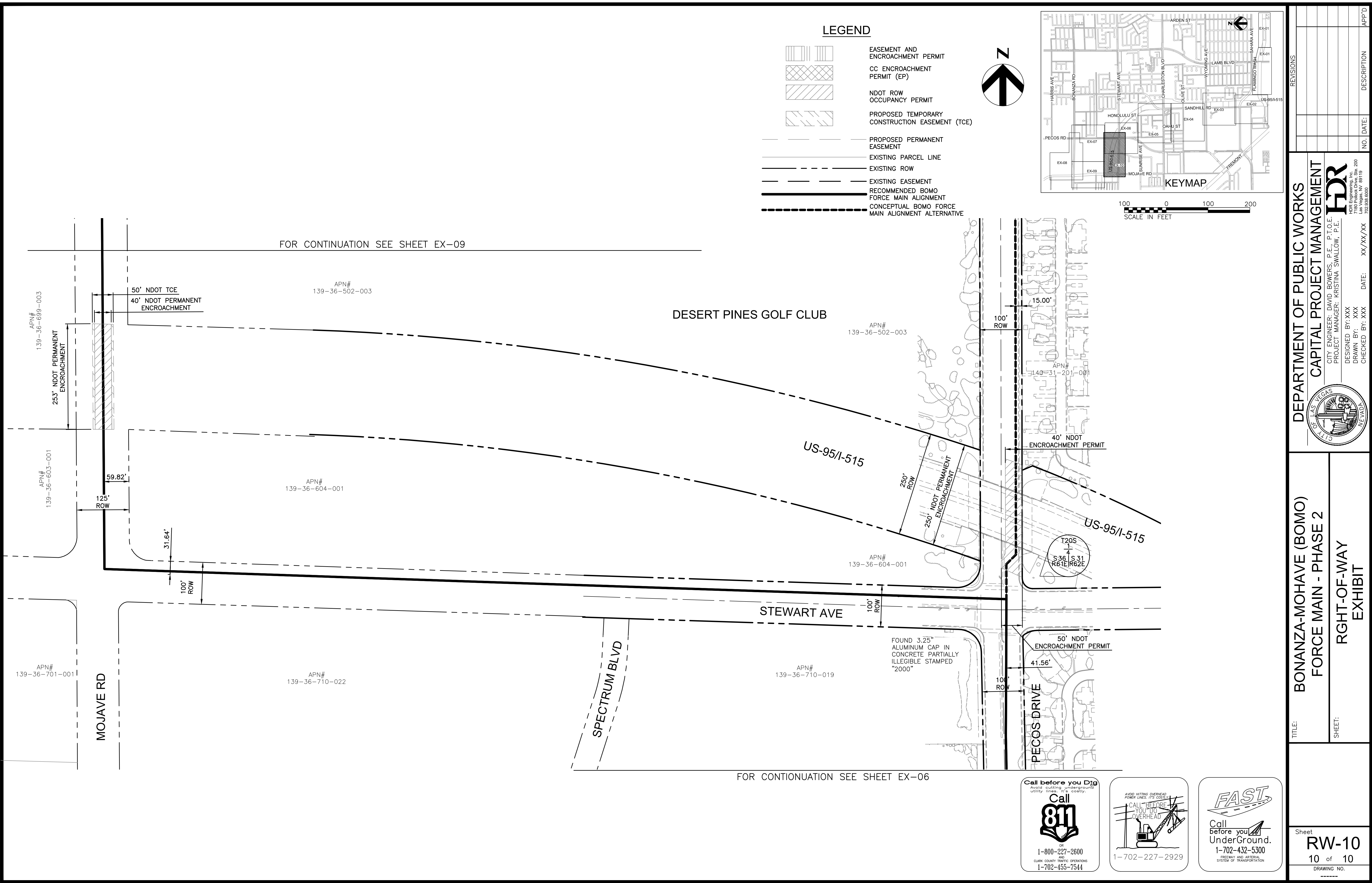
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TITLE: BONANZA-MOHAVE (BOMO) FORCE MAIN - PHASE 2 SHEET: RGHT-OF-WAY EXHIBIT			CAPITAL PROJECT MANAGEMENT				 HDR Engineering, Inc. Las Vegas, NV 89119 702.938.6000																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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15.0 Public Agency and Utility Agency Information and Reviews

An underground utility investigation was conducted in the vicinity of the BOMO Conceptual Alignment. The utility investigation consisted of gathering existing utility as-builts, verifying manhole invert elevations, and potholing existing utilities from the agencies listed below. These agencies have been identified as requiring approval of design documents and providing signatures on the final design documents. More agencies may be identified during final design.

- City of Las Vegas (CLV)
- Clark County Public Works (CCPW)
- Las Vegas Valley Water District (LVVWD)
- Clark County Water Reclamation District (CCWRD)
- Clark County Regional Flood Control District (CCRFCD)
- Clark County Regional Transportation Commission (RTC)
- Nevada Department of Transportation (NDOT)
- Nevada Division of Environmental Protection (NDEP)
- Southern Nevada Water Authority (SNWA)
- Southwest Gas (SWG)
- NV Energy Transmission / Distribution
- AT&T Transmission / Distribution
- COX Communication
- CenturyLink
- Integra Telecom
- Level 3
- Verizon/MCI

Permits will be required from various agencies for this project as summarized in **Table 17** below. A detailed description of the permitting requirements is included in Appendix A.

Table 17: Required Permits

AGENCY	PERMIT NAME	PHASE	RESPONSIBLE PARTY
NDOT	ROW Occupancy Permit	Design	Owner
CCPW	Encroachment Permit	Design	Owner
CCPW	Off-site Construction Permit	Design	Owner
NDEP	General DeMinimis Discharge Permit (Category 4)	Design	Owner
CC Dept of Air Quality	Dust Control Permit	Prior to Construction	Contractor
NDEP	NPDES General Storm Water Discharge Permit	Prior to Construction	Contractor
NDWR	Dewatering Waiver	Construction	Contractor
NDWR	Monitoring Well Waiver	Construction	Contractor
CCPW	Traffic Barricade Plan Approval	Construction	Contractor
CLV	Traffic Barricade Plan Approval	Construction	Contractor

16.0 Technical Specification Sections

The pipeline project will be located in City of Las Vegas, NDOT, and Clark County ROW. Therefore, additional Sections, specific to each jurisdiction are required.

The following is a list of specification sections anticipated for BOMO.

SECTION	TITLE
SECTION 100	GENERAL PROJECT REQUIREMENTS (CLV); NDOT RIGHT-OF-WAY OCCUPANCY PERMITS (UNDER A SEPARATE COVER)
SECTION 101	DEFINITIONS AND TERMS (CLV)
SECTION 102	BIDDING REQUIREMENTS AND CONDITIONS (CLV)
SECTION 103	AWARD AND EXECUTION OF CONTRACT (CLV)
SECTION 104	SCOPE OF WORK (CLV)
SECTION 105	CONTROL OF WORK (CLV)
SECTION 107	LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC (CLV)
SECTION 108	PROSECUTION AND PROGRESS (CLV)
SECTION 109	MEASUREMENT AND PAYMENT (CLV)
SECTION 110	WAGES, HOURS AND CONDITIONS OF EMPLOYMENT (CLV)
SECTION 170	CONSTRUCTION CONFLICTS AND CONTINGENCIES (CLV)
SECTION 200	MOBILIZATION AND DEMOBILIZATION (CLV)
SECTION 201	CLEARING AND GRUBBING (CLV)
SECTION 202	REMOVAL OF STRUCTURES AND OBSTRUCTIONS (CLV)
SECTION 203	EXCAVATION AND EMBANKMENT (CLV)
SECTION 208	TRENCH EXCAVATION AND BACKFILL (CLV)
SECTION 212	LANDSCAPING (CLV)
SECTION 270	DEWATERING (CLV)
SECTION 302CLV	AGGREGATE BASE COURSES (CLV)
SECTION 302NDOT	AGGREGATE BASE COURSES (NDOT)
SECTION 302CCPW	AGGREGATE BASE COURSES (CCPW)

SECTION 401CLV – PLANTMIX BITUMINOUS PAVEMENT – GENERAL (CLV)

SECTION 401NDOT – PLANTMIX BITUMINOUS PAVEMENTS (NDOT)

SECTION 401CCPW - PLANTMIX BITUMINOUS PAVEMENT – GENERAL (CCPW)

SECTION 402CLV – PLANTMIX BITUMINOUS SURFACE (CLV)

SECTION 402NDOT – PLANTMIX BITUMINOUS SURFACE (NDOT)

SECTION 402CCPW – PLANTMIX BITUMINOUS SURFACE (CCPW)

SECTION 405CLV – TACK COAT (CLV)

SECTION 405NDOT – TACK COAT (NDOT)

SECTION 405CCPW – TACK COAT (CCPW)

SECTION 406CLV – PRIME COAT (CLV)

SECTION 406NDOT – PRIME COAT (NDOT)

SECTION 406CCPW – PRIME COAT (CCPW)

SECTION 407CLV – SEAL COAT (CLV)

SECTION 407NDOT – SEAL COAT (NDOT)

SECTION 407CCPW – SEAL COAT (CCPW)

SECTION 409CLV-PORTLAND CEMENT CONCRETE PAVEMENT (CLV)

SECTION 501CLV – PORTLAND CEMENT CONCRETE (CLV)

SECTION 501NDOT – PORTLAND CEMENT CONCRETE (NDOT)

SECTION 501CCPW – PORTLAND CEMENT CONCRETE (CCPW)

SECTION 505CLV – REINFORCING STEEL (CLV)

SECTION 505NDOT – NDOT – REINFORCING STEEL (NDOT)

SECTION 505CCPW – REINFORCING STEEL (CCPW)

**SECTION 613CLV – CONCRETE CURB, WALK, GUTTERS, DRIVEWAYS AND ALLEY
INTERSECTIONS (CLV)**

**SECTION 613NDOT – CONCRETE CURB, WALK, GUTTERS, DRIVEWAYS AND ALLEY
INTERSECTIONS (NDOT)**

**SECTION 613CCPW – CONCRETE CURB, WALK, GUTTERS, DRIVEWAYS AND ALLEY
INTERSECTIONS (CCPW)**

SECTION 624CLV - ACCOMMODATIONS FOR PUBLIC TRAFFIC (CLV)

SECTION 624NDOT - ACCOMMODATIONS FOR PUBLIC TRAFFIC (NDOT)

SECTION 624CCPW - ACCOMMODATIONS FOR PUBLIC TRAFFIC (CCPW)

SECTION 625 – CONSTRUCTION SIGNS (CLV)

SECTION 626 – FINAL CLEANUP (CLV)

SECTION 627 – PERMANENT SIGNS (CLV)

SECTION 628CLV - PAINTING TRAFFIC STRIPING, PAVEMENT MARKINGS AND CURB MARKINGS (CLV)

SECTION 628NDOT - PAINTING TRAFFIC STRIPING, PAVEMENT MARKINGS AND CURB MARKINGS (NDOT)

SECTION 628CCPW - PAINTING TRAFFIC STRIPING, PAVEMENT MARKINGS AND CURB MARKINGS (CCPW)

SECTION 629 – WATER DISTRIBUTION FACILITIES (CLV)

SECTION 629.A – POLYVINYL CHLORIDE PRESSURE PIPE (4 INCH THROUGH 48 INCH)

SECTION 629.B – REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIAL

SECTION 629.C – VALVES

SECTION 629.D – APPURTENANCES

SECTION 629.E – LINE-STOPS ON ASBESTOS CEMENT PIPE

SECTION 629.F – BORING AND JACKING

SECTION 629.G – CELLULAR CONCRETE

SECTION 629.H – CONTACT GROUTING

SECTION 629.I – INSTALLATION OF CARRIER PIPE IN CASING

SECTION 629.J – JACKED CASING

SECTION 629.K – SHAFT EXCAVATION

SECTION 633CLV – PAVEMENT MARKERS (CLV)

SECTION 633NDOT – PAVEMENT MARKERS (NDOT)

SECTION 633CCPW – PAVEMENT MARKERS (CCPW)

SECTION 703CCPW – BITUMINOUS MATERIALS (CCPW)

SECTION 703NDOT – BITUMINOUS MATERIALS (NDOT)

SECTION 705NDOT – AGGREGATES FOR BITUMINOUS COURSES (NDOT)

SECTION 706CCPW – AGGREGATES FOR PORTLAND CEMENT PRODUCTS (CCPW)

SECTION 706NDOT – AGGREGATES FOR PORTLAND CEMENT PRODUCTS (NDOT)

SECTION 707 – JOINT MATERIAL (CCPW)

SECTION 708 – CONCRETE AND CLAY PIPE AND DRAINS (CCPW)

SECTION 714CCPW – PAINT AND PAVEMENT MARKINGS (CCPW)

SECTION 714CLV – PAINT AND PAVEMENT MARKINGS (CLV)

SECTION 729NDOT – TRAFFIC PAINT (NDOT)

APPENDIX A – PROJECT SIGNS

APPENDIX B – CITY OF LAS VEGAS TRENCH PLATE REQUIREMENTS

Opinion of Probable
Construction Cost

17.0 Preliminary Engineer's Opinion of Cost

17.1 Preliminary Opinion of Probable Construction Cost

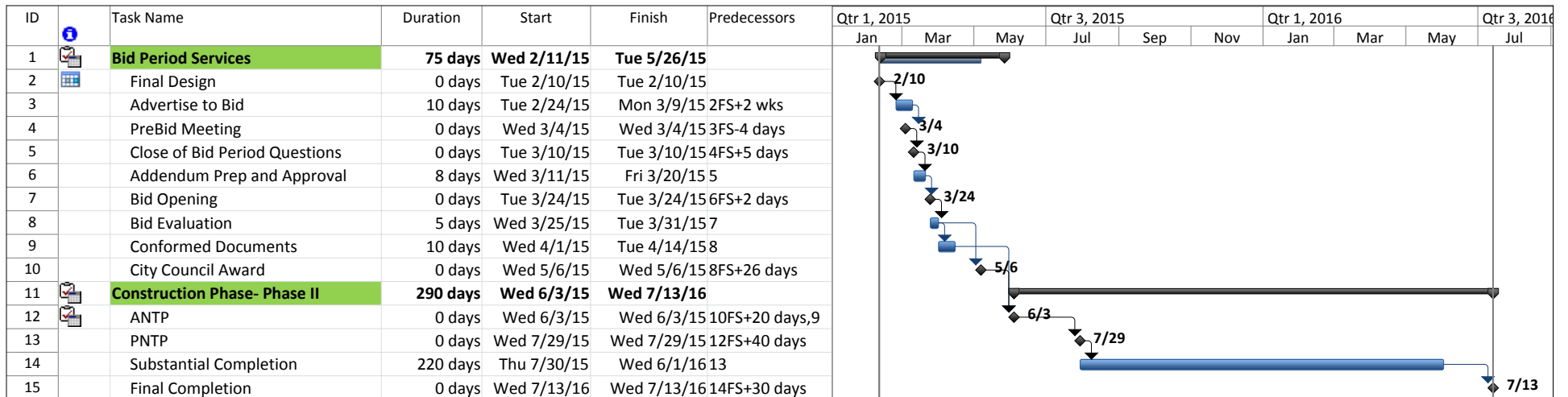
The preliminary OPCC for the project totals \$10,351,884. The length of force main and quantity of ancillary items is based upon Recommended Alignment preliminary quantities, which will be refined as the design progresses.

Table 18: OPCC

ITEM #	ITEM	QUANTITY	UOM	UNIT PRICE	EXTENDED PRICE
	MOBILIZATION/DEMObILIZATION	1	LS	5%	\$372,102.00
	QUALITY CONTROL	1	LS	2%	\$148,841.00
	TRAFFIC CONTROL	1	LS	\$660,500.00	\$660,500.00
BOMO Force Main Phase I (Items 1-9)					\$7,442,045.00
1	18-INCH RECLAIMED - AWWA C905, DR 18, PRESSURE CLASS 235 (BEDDING, BACKFILL, COMPACTION, PAVEMENT SECTION)	21,615	LF	\$200	\$4,323,000.00
2	18" IN-LINE ISOLATION GATE VALVE	12	EA	\$8,000	\$96,000.00
3	36" CASING (US 95 CROSSINGS)	400	LF	\$2,500	\$1,000,000.00
4	REMOVE AND REPLACE ASPHALT-MINOR	11,709	SY	\$30.00	\$351,270.00
5	REMOVE AND REPLACE ASPHALT-MAJOR	19,812	SY	\$40.00	792480.00
6	REMOVE AND REPLACE ASPHALT-NDOT	260	SY	\$50.00	\$13,000.00
7	REMOVE AND REPLACE CONCRETE	576	SY	\$120.00	\$69,120.00
8	REMOVE AND REPLACE ASPHALT-TRAIL	667	SY	\$25.00	\$16,675.00
9	UTILITY POLE SUPPORT	6	EA	\$20,000.00	\$120,000.00
Note: All Costs are installed Costs					
Subtotal Construction Cost					\$7,962,988.00
Cost Plus Contingency (30%)					\$10,351,884.00

18.0 Preliminary Construction Schedule

A preliminary construction schedule has been prepared, and is included as **Figure 25**. The construction phase of BOMO Phase 2 is expected to begin on May 27, 2015 and continue for approximately 260 working days, with substantial completion by May 24, 2016.



Project: SABOMO Project Schedul
Date: Wed 3/26/14

Task

Split

Milestone

Summary

Project Summary

External Tasks

External Milestone

Inactive Task

Inactive Milestone

Inactive Summary

Manual Task

Duration-only

Manual Summary Rollup

Manual Summary

Start-only

Finish-only

Deadline

Progress

Page 1

19.0 Summary

An alternative alignment evaluation on the previously developed *Alignment Study*, based on criteria that included potential utility conflicts, impact to the public, construction cost, constructability, ease of maintenance and right-of-way (ROW) requirements. The Recommended Alignment for BOMO Force Main Phase 2 that will provide the CLV with the most efficient route from its connection at BOMO Phase 1 to the BMWRC.

Preliminary plan and profile (P&P) sheets were created along the Conceptual and Recommended Alignments, which were then used to evaluate each alignment and identify potential areas of concern.

The BOMO Force Main Phase 2 Recommended Alignment proceeds through CLV, Clark County and NDOT jurisdictions, and has been reviewed to identify the documentation and permits necessary to proceed with the construction. Within the Clark County-owned Flamingo Wash Flood Control Channel an agreement and/or easements will be needed. North of the wash the BOMO will be within Clark County and NDOT ROW where CCPW Encroachment Permits and NDOT ROW Occupancy Permits will be required. It is estimated that the permitting processes can take approximately six- to nine-months.

The Recommended Alignment crosses NDOT ROW at four locations: I-515 at Mojave and again at I-515 and the Flamingo Wash, once at Charleston Blvd and Sandhill, and once at Sahara Ave at Sandhill. Both I-515 and Charleston ROW are owned by NDOT in fee, and will require NDOT ROW Occupancy Permits. Sahara Ave is owned by Clark County; however, NDOT has maintenance responsibility. Because of the existing agreement NDOT will require a permit in addition to the encroachment permit required by Clark County. It is estimated that the NDOT permitting process will take six- to nine-months.

Discharge Permits will be required where dewatering is necessary. Based on a preliminary evaluation of the water table along the Conceptual Alignment, the discharge flow rates are not anticipated to exceed 250-gpm, which is the maximum limit for a NDEP Category 4 DeMinimis permit. Discharged water quality must be tested as part of the DeMinimis permit; however, it is anticipated that this permit will suffice along the Conceptual Alignment. Additional testing and analysis will be required where the Recommended Alignment deviates from the Conceptual Alignment. It is estimated that the NDEP DeMinimis permitting process will take 60 to 90 days.

The completed system will offer greater flexibility for CLV to provide potential customers with reuse water, while reducing the annual O&M costs associated with the existing BMWRC. The preliminary OPCC for the project totals \$10,351,884. The length of force main and quantity of ancillary items is based upon Recommended Alignment preliminary quantities, which will be refined as the design progresses.

Appendix A – Coordination and Meeting Notes

- Meeting Minutes – LVVWD Construction requirements near ACP water pipe and PE laterals, February 5, 2014
- NDOT Underlying Fee Ownership requirements email, February 25, 2014
- Meeting Minutes – NDOT criteria when within NDOT ROW, March 7, 2014
- Bonanza Mojave Water Resource Center (BMWRC) Decommissioning and WPCF Reuse Pump Station Project – Task 2230 Bonanza Mojave Reuse Water Supply System Service Area Demands and Pump Station Evaluation, B&V, February 18, 2013
- Bonanza Mojave (BOMO) Water Resource Center Decommissioning Project – Task 2220 Reuse Pipeline Alignment Alternatives, B&V, June 28, 2012
- Bonanza Mojave Water Resource Center (BMWRC) Decommissioning and WPCF Reuse Pump Station Project – WPCF Reuse Pump Station Transient Analysis, B&V, February 28, 2014
- Meeting Notes – City of Las Vegas BOMO Pipeline Project Route Alternative Coordination Meeting, B&V, September 13, 2012
- Utility Coordination

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- *Utility Coordination*

Appendix B – Calculations

- PVC Pipe Deflection Calculation

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- PVC Pipe Deflection Calculation

Appendix C – Right-of-Way List

- Right-of-Way List

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- Right-of-Way List

Appendix D – Digital Reference Plans

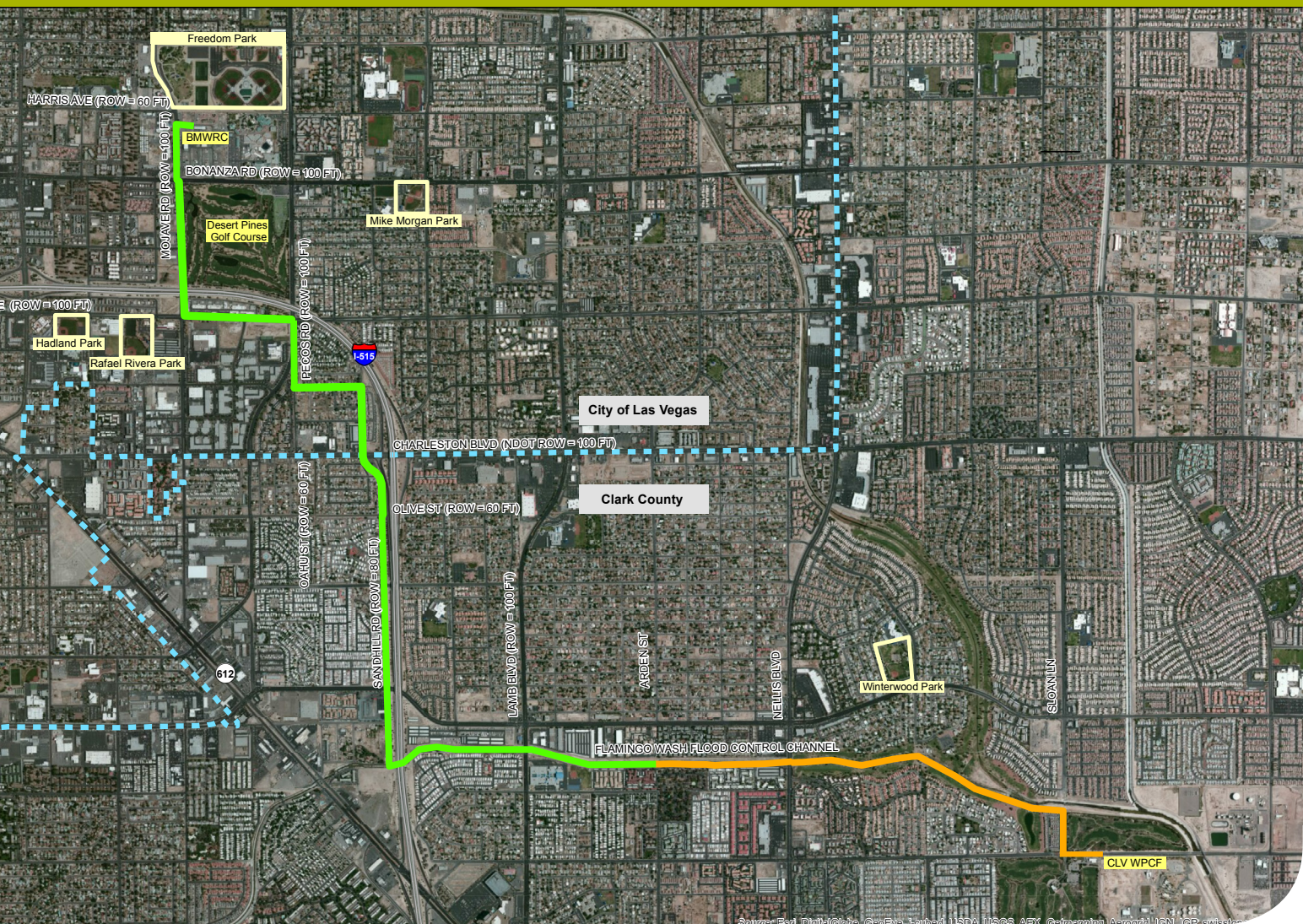
(Included in the CD attached to this report)

- City of Las Vegas – Sahara Arden Sewer Replacement and BOMO Force Main-Phase 1 Final GMP Documents, December 2013
- City of Las Vegas – WPCF Reuse Pump Station Project-Preliminary Design, B&V, November 2013

Appendix D - Digital Reference Plans

(Included in the CD attached to this report)

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- *City of Las Vegas – WPCF Reuse Pump Station Project-Preliminary Design*, B&V, November 2013
- BOMO Force Main Phase 2 Preliminary Design Report
- BOMO Force Main Phase 2 30% Plans



H&R

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