DS #: 5068

APN: 139-34-110-012

PROJECT: Symphony Park Residential - A.K.A. Aspen Heights

SUBMITTAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: December 5, 2018
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Symphony Park Residential – A.K.A. Aspen Heights**			**COPIES TO:** Kimley Horn and Associates Inc.
Cross Streets:	NEC Symphony Park Avenue & City Parkway			Breckenridge Group Las Vegas Nevada LLC
File Number:	F:\Depot\DSMemos\DS5068A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	139-34-110-012			
Zoning Action:	SDR-73538			
FEMA Flood Zone	YES	NO **X**		
Proposed Storm Drain	YES **X**	NO		

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	11/15/2018	11/28/2018 & 12/5/2018	See Comments Below	$400.00	501052: $400
			TOTAL FEES (LDDRS):	**$400.00**	----

REMARKS:

The Drainage Study for the subject project has been reviewed and:

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Clark County Public Works Department concurrence.

1. Provide a copy of the zoning/planning conditions associated with this site (**SDR-73538**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be re vised and resubmitted.
2. Coordinate the ongoing construction of the adjacent 15'x3' RCB with *Mr. Randy McConnell* (702-229-2186), *Engineering Project Manager* of the project regarding any new storm drains connection and boundary concerns prior to the final approval of the subject drainage study.
3. ***Existing Conditions Map***: Page 6 of the Study in the last paragraph under *Subsection "Off-Site Drainage"*, it states that runoff from "EOFF4" combines with onsite basin at "CP2". However, "CP1" is shown in the *Existing Condition Map* and also in the *Flow Summary Table*. "CP2" is also listed in **Table 1** in the Study. Review and correct the confusion in the next submittal.
4. ***Proposed Conditions Map***: Page 8 of the Study mentioned about subbasin "OFF2U", however, the basin was not found anywhere in the *Proposed Conditions Map* or in any tables. Address and resolve in the next submittal.

5. **Appendix B** is missing, provide in next submittal.

6. The depth velocity calculations for *Hydraulic Section S* 100-year shown on the table of the *Proposed Conditions Map* should be the same as the 10-year.

7. There are calculations for 2 Type II grate inlets, but only one is shown on the proposed storm drain plan. Discuss the discrepancy or show the second inlet on the plans.

8. **Sheets C3.1 to C3.4**: It is not clear how the two courtyard areas drain. Even the blowup details didn't clearly show the drainage patterns. The blowup details noted that "storm drain for future connection of courtyard drain (by others)" are unacceptable.

   The courtyard blowup details or the general grading plan shall clearly show the grading, flowlines and identify any storm drains and the associated facilities such as grate inlets, manholes etc. Address and resolve in the next submittal.

9. Address whether there are emergency overflow paths provided in the courtyards in the next submittal.

10. Show and identify the location of all roof drains and down sprouts and how they are to be connected to the existing storm drain systems in the perimeter streets or just daylight through sidewalk underdrains. Address and revise the plans and all pertinent details accordingly in the next submittal.

11. **Sheet C3.1**: There are three identical TC elevations (39.75TC/FG) in *Symphony Park Avenue* near the intersection with *City Parkway*. Review and revise accordingly.

    Identify all existing storm drain systems in the perimeter streets and label with *City of Las Vegas* recorded drawing numbers on the plan.

12. **Sheet C3.2**: There is a storm drain across the subject site and daylights to the east edge of the project in the existing condition. Identify and provide a note what to do about this storm drain, review and address in the next submittal.

    Relocate the proposed 36"-RCP to within the *City Parkway* right-of-way. The **City** is not maintaining any storm drains in private property.

13. **Sheet C3.6**: Identify the property line in Sections A, D, E and F.

    Section E and Section F: Identify the existing 15'x3' box culvert.

    Section F: It appears that a retaining wall is required.

14. Discuss the BMP method that will be used. The drainage method for the parking garage needs to be shown on the grading plans and the storm drain plan, and the BMPs that will be used to treat the flow from the parking garage needs to be shown on plans.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

END OF REMARKS
WSP/AYS

T/R/S: T20S/R61E/34
AREA M-34

Albert Sung

From: Albert Sung
Sent: Wednesday, December 12, 2018 9:59 AM
To: 'Ackeret, Thomas'
Cc: Oh-Sang Kwon
Subject: RE: Symphony Park Bridger SD Relocation (DS 5068)

Hi Thomas,

It appears that the proposed relocation of the 36"-RCP will be within the landscaping area and below some trees. If the trees are deep rooted, they may damage the storm drain in the future and need frequent maintenance. Please address how the storm drain will be protected and will not cause maintenance headache for the City in the future. Also, are there other utilities lines adjacent to the storm drain?

If the above concerns are addressed, the proposed relocation with a dedicated public drainage easement will be acceptable.

Albert Y. Sung
Project Engineer
Public Works Dept. / Flood Control
(702) 229-6541
333 N. Rancho Dr. 7th Floor
Las Vegas, NV 89106

lasvegasnevada.gov

Your opinion is important! Click here to take a short survey.

From: Ackeret, Thomas <thomas.ackeret@kimley-horn.com>
Sent: Tuesday, December 11, 2018 11:04 AM
To: Albert Sung <YSung@LasVegasNevada.GOV>
Cc: Hammersland, Brice <Brice.Hammersland@kimley-horn.com>
Subject: FW: Symphony Park Bridger SD Relocation (DS 5068)

Albert-

Following up on the voicemail I left you. We are in the process of addressing the TDS comments received last week but wanted to clarify Comment 12. The portion of that comment we are looking to clarify states, "Relocate the proposed 36"-RCP to within the City Parkway right-of-way. The City is not maintaining any storm drain in private property."

To clarify, we had coordinated this design with the City back in May and had received the below email acceptance of the concept. If we add a "Public Drainage Easement to be Privately Maintained" along the proposed routing, will that allow us to maintain the design as-is? Additionally, the roadways within Symphony Park were master planned with all of the

utilities needed to support the future developments, as-such there does not appear to be a clear route within City Parkway (with the required separations) to locate this new pipe.

We are working with EUD (Economic and Urban Development) to get the TDS resubmitted back to the City before the end of the year.

Should you have any questions, or need anything additional, please do not hesitate to reach out.

Thanks-

Thomas Ackeret, P.E. (NV, TX), PTOE, P.Eng
Kimley-Horn | 6671 Las Vegas Boulevard South, Suite 320 Las Vegas, NV 89119
Direct: 702-862-3608 | Mobile: 702-978-9103 | Main: 702-862-3600
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From: Peter Jackson <pjackson@LasVegasNevada.GOV>
Sent: Wednesday, May 16, 2018 7:52 AM
To: Ortiz, Tony <Tony.Ortiz@kimley-horn.com>; Randy McConnell <rmcconnell@LasVegasNevada.GOV>
Cc: Oh-Sang Kwon <okwon@LasVegasNevada.GOV>; Albert Sung <YSung@LasVegasNevada.GOV>; Ackeret, Thomas <thomas.ackeret@kimley-horn.com>
Subject: RE: Symphony Park Bridger SD Relocation

Flood Control takes no exception to the concept of relocating the storm drain from Bridger to Carson.

Detailed hydraulics & hydrology will be required for the storm drain system with the drainage study for your proposed development.
The existing storm drain shall be removed with the construction of the relocated storm drain and the connection to the RCB plugged.
The final size of the storm drain will be determined with the drainage study analysis.
The storm drain pipe "n-value" needs to be 0.013 per the Manual requirements.
Drainage easement is required for the storm drain outside of right-of-way. Easement width is 20-foot.
Pipe material is RCP or water quality (C905).
Manholes outside of the right-of-way/roadways need to be accessible for cleaning and maintenance.

Flood Control concurs with the concept of adding a new storm drain stub at Carson at this time for the ease of the proposed storm drain relocation.
Once the RCB is complete, it will be more costly for the developer to add a new stub connection to the RCB.
The costs associated with adding the stub to the plans and constructing the new stub is a developer cost and needs to be coordinated to allow this change to the plans.

Coordinate your proposed changes with the Project Manager, Randy McConnell.
Thanks,

Peter Jackson, CFM
Senior Engineering Associate

City of Las Vegas | Dept. of Public Works
City Engineering Division, Flood Control Section
Development Service Center (DSC) 7th Floor
333 North Rancho Drive | Las Vegas, Nevada 89106

Work: 702-229-5266 Link: www.lasvegasnevada.gov
pjackson@lasvegasnevada.gov

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From: Ortiz, Tony [mailto:Tony.Ortiz@kimley-horn.com]
Sent: Tuesday, May 15, 2018 9:50 AM
To: Oh-Sang Kwon
Cc: Albert Sung; Ackeret, Thomas; Randy McConnell; Peter Jackson
Subject: Symphony Park Bridger SD Relocation

Oh-Sang,

Per our meeting last Thursday regarding the relocation of the 36" SD line from Bridger to the future Carson Ave. alignment, we ran some calcs to confirm that the pipe will still contain the 21 CFS shown on the original plan. I am attaching a printout of the Flow Master sheet showing that the pipe will work at the flatter slope. I have also attached the original design sheet and the concept plan for reference. Please let me know if you require any additional information to allow us to relocate the connection to the box.

Thank you,
Tony Ortiz, P.E.
Kimley-Horn | 6671 Las Vegas Boulevard South, #320, Las Vegas, NV 89119
Mobile: 702 812 7409 | Direct: 702 862 3696
tony.ortiz@kimley-horn.com
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TECHNICAL DRAINAGE STUDY for

Symphony Park Residential

A Portion of APN: 139-34-110-012

SEC of Symphony Park Avenue & City Parkway

City of Las Vegas, Nevada

Prepared for:

Breckenridge Group Las Vegas Nevada, LLC
1301 S. Capital of Texas Highway,
Ste. B-201,
Austin, TX 78746
(512) 910-3561

Date Prepared:

November 2018

Kimley»Horn

November 14, 2018
KH Project No: 192008000

Mr. Albert Sung, P.E.
City of Las Vegas Flood Control
333 Rancho Drive
Las Vegas, NV 89106

RE: ***Technical Drainage Study for Symphony Park Residentail (A Portion of APN: 139-34-110-012)***

Dear Mr. Sung,

Attached are one (1) copy and 1 (one) CD of the Technical Drainage Study for "Symphony Park Residential" for your review. The site consists of a portion of APN: 139-34-110-012 totaling approximately 3.7 +/- acres. The proposed development entails a 4,000-sf restaurant, approximately 255 residential multifamily units and an associated parking garage containing approximately 389 parking spaces. The proposed development is located at the southeast corner (SEC) of Symphony Park Avenue and South City Parkway located in the City of Las Vegas, Nevada

This project has been designed in accordance with the Symphony Park guidelines issued by the City of Las Vegas.

Please contact me at (480) 207-2676 or brice.hammersland@kimley-horn.com should you have any questions or concerns.

Sincerely,

Brice Hammersland, P.E.

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Symphony Park Residential Date: 11/14/18

Location of Development: a) Descriptive (Cross Streets) North/South: West Carson Avenue

East/West: S City Parkway

b) Section: 34 Township: 20 Range: 61

c) APN : 139-34-110-012

Name of Owner: Breckenridge Group Las Vegas Nevada, LLC

Telephone No.: 512-910-3561 Fax No.: E-Mail Address: pbrennan@ahpliving.com

Address: 1301 S. Capital of Texas Highway, Ste. B-201, Austin, Texas 78746

Contact Person-Name: Brice Hammersland, P.E. **Telephone No.:** 480-207-2676

* **E-Mail Address:** brice.hammersland@kimley-horn.com **Fax No.:** None

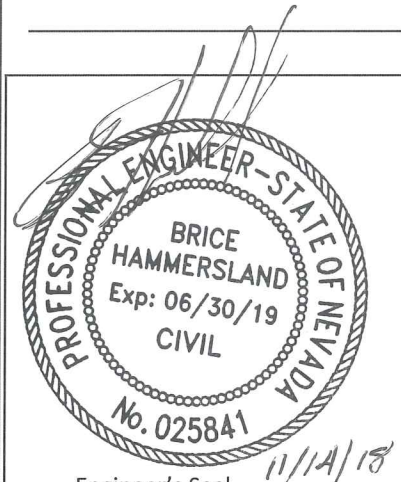
Firm: Kimley-Horn and Associates, Inc.

Address: 6671 Las Vegas Boulevard South, Suite 320, Las Vegas, NV 89119

Type of Land Development/Land Disturbance Process:

	Rezoning		Subdivision Map		Clearing and Grading Only
	Parcel Map		Planned Unit Development		Other (Please specify below)
	Large Parcel Map	✓	Building Permit		

1. Total Owned Land Area: At Site: 3.7 ac Being Developed/Disturbed: 3.7 ac
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☑ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ **Yes**** ☑ **No**
4. Proposed type of development (Residential, Commercial, Etc.): Commercial
5. Approximate upstream land area which drains to the subject site: Approx 5 ac
6. Has the site drainage been evaluated in the past? ☑ **YES** ☐ **NO** If yes, please identify documentation: 61 Acres @ Grand Central Parkway, Union Park Update, Symphony Park at Union Park
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Maintaining existing drainage patterns, site drains from the southwest to the northeast
8. Briefly describe your proposed schedule for the subject project: As soon as possible



11/14/18

Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

*New Required Field

**Review and concurrence of the Clark County Regional Flood Control District is required.

Revision	Date

Local Entity File No.

REFERENCE: KH Project # 192008001

STANDARD FORM 1

Updated 05/01/2008

CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA
STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFCD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCD Standard Form 2 prior to the City accepting a new drainage study for review. The engineer must contact the Flood Control Section at (702) 229-6541 to schedule a submittal appointment.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT		
Yes	No	
N/A		A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
N/A		Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
X		An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file. _____ by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

II. GRADING PLAN INFORMATION		
Yes	No	
X		(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
X		Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required.
X		Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet* around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.)

II. GRADING PLAN INFORMATION		
Yes	No	
N/A		Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
X		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
X		Back of lot elevations and lot drainage pattern for all lots including common lots.
N/A		Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
N/A		This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
X		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
N/A		Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
N/A		Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
N/A		The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
X		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
X		Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
N/A		Lots with “B and C Type Drainage” that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16” x 24” minimum block wall openings are required for both options.
N/A		Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36”. Inlets must be sized to match the pipe size provided.

- Contact the Flood Control Section regarding the drainage study review fee. These fees are payable at the time of submittal.
- The Drainage Study must be conditionally approved prior to submitting improvement plans to the Civil and Planning Development of the Department of Building and Safety for review.

This document is intended as an **aid** in preparing Technical Drainage Studies for the City of Las Vegas. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name:	**Symphony Park Residential**	Map ID:	**139-34-110-012**
Firm Name:	**Kimley-Horn**	Engineer:	**Brice Hammersland, P.E.**
Address:	**6671 Las Vegas Boulevard South, Suite 320**		
City:	**Las Vegas** State: **Nevada**	Zip:	**89119**
Phone No.:	**(702) 862-3600**	Fax No.	
Property Owner:	**Breckenridge Group Las Vegas, Nevada LLC**		
Address:	**1301 S. Capital of Texas Highway Ste B-201**		
City:	**Austin** State: **Texas**	Zip:	**78746**

Reviewed By:	**Date Received:**	**Date Accepted for Review:**

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL).

This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations, or exhibits, which may be necessary to properly evaluate the intended land use.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT

YES	NO	N/A	
☒	☐	☐	Design Manual **Standard Form 1** with the Engineer's seal and signature.
☒	☐	☐	Design Manual **Standard Form 4.**
☒	☐	☐	2 copies of the 24" x 36" **Drainage Plan.**
☐	☐	☒	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

YES	NO	N/A	
☒	☐	☐	A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
☒	☐	☐	A copy of the current CCRCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.
☒	☐	☐	Off-site drainage basin maps for existing, interim, and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.

II. MAPS AND EXHIBITS (CONTINUED)

☒	☐	☐	Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

YES	NO	N/A	
☒	☐	☐	Sheet size: 24”x36” sealed by a registered engineer in the State of Nevada.
☒	☐	☐	Minimum scale: 1”=60’
☒	☐	☐	Project name.
☒	☐	☐	Vicinity Map with local and major cross streets.
☒	☐	☐	Revision box.
☒	☐	☐	North arrow and bar scale.
☒	☐	☐	Engineer’s/consultant’s address and phone number.
☒	☐	☐	Elevation datum and benchmark.
☒	☐	☐	Legend for symbols and abbreviations.
☒	☐	☐	Cut/Fill scarps, where applicable.
☒	☐	☐	Street names, grades, widths.
☒	☐	☐	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
☒	☐	☐	Existing contours encompassing the site and 100-feet beyond with spot elevations for important locations, where appropriate.
☒	☐	☐	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
☐	☐	☒	Proposed typical street sections.
☐	☐	☒	Streets with offset crowns.
☒	☐	☐	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
☒	☐	☐	Property lines.
☒	☐	☐	Right-of-way lines and widths, existing and proposed.
☒	☐	☐	Existing improvements and their elevations.
☒	☐	☐	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year peak flows at basin concentration points.
☒	☐	☐	Concentration points and drainage flow directions with Q_{100} and V_{100} and D_{100} in streets.
☒	☐	☐	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
☒	☐	☒	Location and cross-section of street capacity calculations.
☐	☐	☒	Cross-sectional detail for channels, including cutoff wall locations.

III. DRAINAGE PLAN (CONTINUED)

YES	NO	N/A	
☒	☐	☐	Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk ditches, swales, storm drain systems, unimproved channels, and culverts, etc.) stating size, material shape, and slope with plan and profile and HGL calculations.
☐	☐	☒	Existing and proposed drainage easements and widths shown with sufficient detail. A cross-sectional detail must be provided that shows appropriate lining and reinforcement.
☐	☐	☒	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16"x48". Wrought iron gate is required for flows > 10 cfs.
☐	☐	☒	Location and detail of flood-wall(s) illustrating depth of flow, proposed grouting height, etc.
☐	☐	☒	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
☒	☐	☐	Building and/or lot numbers.
☐	☐	☒	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
☐	☐	☒	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.
☐	☐	☒	For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
☒	☐	☐	Appropriately elevated "humps" 6 inches above the 100-year water surface elevation at the accesses where the intent is to protect the site from the Q_{100} flows.
☒	☐	☐	Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
☒	☐	☐	Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required)

IV. HYDROLOGIC ANALYSIS

YES	NO	N/A	
☒	☐	☐	Appropriate soil information and Soils Map for existing and future conditions with sub-basins and property delineated.
☒	☐	☐	Input and Output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	☐	Input and Output information for proposed conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	☐	Use of correct precipitation values in and around the McCarran Airport rainfall area.
☒	☐	☐	A discussion in the text of the hydrologic analysis justifying sub-basin boundaries and cutoffs, supporting assumptions, and calculations.
☒	☐	☐	A summary table of stormwater flows showing basin area Q_{10} and Q_{100} for both individual basins and combined basin flows, where applicable.

IV. HYDROLOGIC ANALYSIS (CONTINUED)

☒	☐	☐	Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
☒	☐	☐	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
☒	☐	☐	Calculation for impervious area for parking lots and LIDs (if required)

V. HYDRAULIC ANALYSIS

YES	NO	N/A	
☐	☐	☒	Flow split calculations and supporting documentation or reference for the method of flow calculation used.
☒	☐	☐	Normal depth street flow calculations and cross-section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. Q_{100} d x v ≤ 8. Q_{10} d x v ≤ 6 and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the **Grading Plan**.
☒	☐	☐	A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
☐	☐	☒	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
☐	☐	☒	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
☒	☐	☐	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Building adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.
☐	☐	☒	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
☒	☐	☐	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
☒	☐	☐	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drainpipes in public rights-of-way, including headwater pool inundation.
☒	☐	☐	The mitigation of nuisance water, both during construction and in the fully developed condition must be addressed.
☒	☐	☐	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required)

Kimley»Horn

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INTRODUCTION

This report is a Technical Drainage Study for **Symphony Park Residential** which is a proposed mixed used development consisting of multifamily residential and retail with a 4,000-sf restaurant, approximately 255 residential multifamily units and an associated parking garage containing approximately 389 parking spaces. The proposed development is located at the southeast corner (SEC) of Symphony Park Avenue and South City Parkway in the City of Las Vegas, Nevada. Refer to **Figure 1** – *Vicinity Map* following this page. The purpose of this study is as follows:

1. Determine the 10-year and 100-year on-site and off-site peak runoff for existing and fully developed conditions.

2. Determine the Finish Floor Elevation for the proposed building.

3. Determine the stormwater runoff generated by the 85th Percentile Rainfall for fully developed conditions that will need to be treated to meet Parking Lot Low Impact Development (LID) requirements.

LOCATION AND DEVELOPMENT DESCRIPTION

The site is located in Section 34, Township 20 South, Range 61 East, and M.D.M. Clark County, Nevada. The project site is composed of Assessor's Parcel Number 139-34-110-012. A copy of the *Assessor's Parcel Map* is included in **Appendix A**.

The project site is approximately 3.7 acres and is bounded by South City Parkway to the northwest, addition parking lots reside adjacent to the northeast and southwest of the project, and the Union Pacific Railroad right-of-way to the east.

The project site is currently developed as a parking lot and drains toward the east end of the parking into a natural swale. The natural swale conveys flow northeast until the flow is captured an area drain, which conveys flow into a proposed 15'x3' reinforced concrete box (RCB). Flow from the 15'x3' RCB is discharged into an existing inverted crown channel under the Ogden overpass.

LAND USE CONDITIONS

The parcel on which the project site is located has a zoning classification of Planned Development District (PD).

PREVIOUS DRAINAGE STUDIES

Previous hydrology studies that were utilized in the preparation of this report:

1. *Technical Drainage Study for View at Symphony Park Apartments; Prepared by Kimley-Horn. Dated September 25, 2018. (DS5034A)*
2. *Technical Drainage Study for Union Park and Addenda; Prepared by Kimley-Horn and Associates. Dated January 8, 2008. (DS4486)*

These studies, hereafter will be referred to as the **View at Symphony Park Study** and **Park Study**. The *View at Symphony Park Study* was generated as and updated Technical Drainage Study to the Park Study. This study provided hydrologic analysis, and hydraulic analysis of the land to the west of project site.

The *Park Study*, was generated as an update for the approved Technical Drainage Study for 61 Acres @ 100 Grand Central Parkway. This study provided hydrologic analysis, and hydraulic analysis of the now existing storm drain that this project will tie into.

Kimley-Horn has reviewed the reference studies listed above and is in agreement with the information included therein except for where noted otherwise. The information referenced is for the purpose of determining the existing and future development patterns and quantities of flow adjacent to the proposed project site. Flows referenced are indicated throughout this report and are accepted by Walker Engineering for the purpose of this study. Referenced portions of these particular Technical Drainage Studies are included in **Appendix E** for your convenience.

CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) MASTER PLAN FACILITIES

"*The Las Vegas Valley Flood Control Master Plan Update*", Figure **F-31**, dated September 2013, as prepared by the Clark County Regional Flood Control District (CCRFCD) illustrates the existing and proposed master planned facilities in the area (**See Appendix A**).

FLOOD HAZARD DESIGNATION

The Special Flood Hazard Areas for both the unincorporated and the incorporated portions of Clark County, Nevada, are outlined in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps. This subject site is located on Community Panel No. **32003C2170F** map revised November 16, 2011. As shown on the *FEMA FIRM* located in **Appendix A**, the subject site is located within a **Zone X** area, which is not a FEMA designated SFHA. **Zone X** are areas determined to be outside the 0.2% annual chance floodplain.

HYDROLOGIC METHODOLOGY

The hydrologic model and design of this site development are in compliance with local requirements, including Clark County (CC), the CCRFCD's "*Hydrologic Criteria and Drainage Design Manual*", and the CCRFCD's "*Flood Control Master Plan Update*".

HYDROLOGIC MODEL

The hydrologic model utilized in this study is the **HEC-1** Flood Hydrograph Package developed by the U.S. Army Corps of Engineers Hydrologic Engineering Center. **HEC-1** is a rainfall runoff event simulation model utilizing an interconnected system of hydrologic and hydraulic components to simulate

the surface runoff response of a drainage area to precipitation. The calculations of this study were performed using the SCS Unit Hydrograph of the **HEC-1** Flood Hydrograph Model. The detailed explanation of the theory and background is presented in Section 4 of the SCS National Engineering Handbook and the **HEC-1** User Manual.

PRECIPITATION

According to Figure **513** of the CCRFCD Manual, the project **does** lie within the McCarran Airport Rainfall Area, and therefore, point rainfall values for the 10-year and 100-year, six-hour storm duration are **1.58** inches and **2.77** inches, respectively, according to **Table 505**. Refer to **Table 503** and **505**, and **Figure 513** located in **Appendix B**.

CURVE NUMBER

The soils information for the project watershed was referenced from the Soil Survey of Las Vegas Area, Nevada, Part of Clark County" prepared by the United States Department of Agriculture Natural Resources Conservation Services (USDA NRCS). A *Custom Soil Resource Report* for the project site is included in **Appendix B**. The report indicates that the project area is classified as hydrologic soil group "**C**". Group "**C**" is characterized has having low/moderately low/moderately high/high runoff potential. The project site is existing as a developed parking lot, using **Table 602, 1 of 4**, from the CCRFCD Manual a curve number of **98** was used for the project site, which is designated as an impervious area.

A copy of *The Las Vegas Valley Flood Control Master Plan Update"*, Figure **H-31**, dated September 2008, as prepared by Post, Buckley, Schuh & Jernigan, Inc. (PBS&J), Parsons Brinckerhoff and Louis Berger Group for the CCRFCD is included in **Appendix A** for the purpose of illustrating the Regional's hydrologic subareas, land use and soils in the area (See **Appendix A**).

LAG TIME

The time between a brief, heavy rain and maximum runoff rate is called Lag Time. Lag Time can be estimated from historical hydrographs or it can be estimated from specific watershed characteristics such as watershed length, slope and flow impedance. Based on studies of many storm events for a range of watershed conditions, the following empirical relationship between Lag Time (T) and Time of Concentration (T_c) was derived:

$$T = 0.6T_c$$

The Time of Concentration (T_c) is defined as the time required for runoff to the flow from the most remote part of the drainage basin to the outlet or to a combination point. The procedure for calculating the T_c is outlined in **Section 602** of CCRFCD's "*Hydrologic Criteria and Drainage Design Manual"*. Lag time calculations for this site are included in **Appendix B** as shown on Standard Form 4.

EXISTING HYDROLOGIC CONDITION

OFF-SITE DRAINAGE

Offsite drainage subbasins were used to analyze the surrounding offsite areas to determine drainage patterns and peak runoff rates. **EOFF1** is approximately 0.12 acres and generates **<1/1 cfs**, **EOFF1** is the southern drive entrance to the project site. Runoff flow from **EOFF1** runs to the east end of the parking lot the flow is captured by the existing swale and conveyed northeast into the existing inverted crown channel.

EOFF2 is one of two offsite basins representing City Parkway heading northbound. **EOFF2** is approximately 0.17 acres and generate about **<1/1 cfs**. Runoff flow from **EOFF2** flows north along an existing L-Curb until it is captured by an existing Type DM2 drop inlet.

EOFF3 is the other offsite basin representing City Parkway. **EOFF3** is approximately 0.20 acres and generates about **<1/1 cfs**. Runoff flow from **EOFF3** flows north along an existing L-Curb until it is captured by an existing Type DM2 drop inlet.

EOFF4 is approximately 0.12 acres and generates **<1/1 cfs**. **EOFF4** is the northern drive entrance to the project site. Runoff flow from **EOFF4** combines with runoff flow from onsite basin **CP2** and runs to the east end of the parking lot until the flow is captured by the existing swale and conveyed northeast into the existing inverted crown channel. Reference material can be found in **Appendix E** and an *Existing Condition Basin Map* is included in **Appendix F**.

ON-SITE DRAINAGE

Onsite drainage can be generalized into two (2) basins **EON1** and **EON2**. **EON1** is approximately 1.82 acres and generates **4/7 cfs**. **EON1** covers the southern portion of the project site and drains to the east end of the parking lot where it is captured by an existing swale conveying flow northeast to the existing inverted crown channel.

EON2 is approximately 1.76 acres and generates **4/7 cfs**. **EON2** covers the northern portion of the project site and drains to the east end of the parking lot where the flow is captured by an existing swale conveying flow northeast to an existing inverted crown channel.

Table 1 located below summarizes the results of the Existing Condition HEC-1 model located in **Appendix B**.

Table 1: Existing Condition HEC-1 Summary

BASIN ID/ COMB. PT.	BASIN AREA (ac)	10-YR FLOW (cfs)	100-YR FLOW (cfs)
EON1	1.82	4	7
EON2	1.76	4	7

BASIN ID/ COMB. PT.	BASIN AREA (ac)	10-YR FLOW (cfs)	100-YR FLOW (cfs)
EOFF1	0.12	<1	1
EOFF2	0.17	<1	1
EOFF3	0.20	<1	1
EOFF4	0.12	<1	1
CP2 EON1 + EON2 + EOFF4	-	7	13

PROPOSED HYDROLOGIC CONDITION

OFF-SITE DRAINAGE

The offsite drainage patterns discussed earlier in the report remain the same. Refer to the Park Study in **Appendix E** for the offsite drainage patterns and existing storm drain pipe. The offsite improvements per the City of Las Vegas Promenade Place & Carson Avenue Offsite Improvements project (CLV Hansen #60311) will install a 15'x3' box culvert, storm drain connections, and drop inlets along the east side of the site. These offsite improvements are assumed to be existing by the time this project begins construction.

The proposed offsite sub basins slightly increased in size. Due to the onsite proposed landscape and sidewalk areas adjacent to each street. **PR05** is approximately 0.40 acres and generates **1/1 cfs**, **PR05** is the Symphony Park Ave on the south side of the site. Runoff from **PR05** flows to the east of the site and is captured by a proposed drop inlet #1 located near the southeast corner of the site. The flow is captured by the drop inlet and then conveyed to the northeast via the existing 15'x3' box culvert.

PR30 is one offsite basin that represents City Parkway. **PR30** is approximately 0.80 acres and generates about **2/3 cfs.** Runoff from the basin flows north along the existing curb and gutter until it is captured by two existing drop inlets as mentioned in the existing conditions basins **EOFF2** and **EOFF3**.

PR35 is approximately 0.30 acres and generates **1/1 cfs**. **PR35** represents the portion of West Carson Ave adjacent to the project site. Runoff from the basin flows to the east. The flow is captured by a proposed drop inlet #2 located near the northeast corner of the site and is conveyed to the northeast via the existing 15'x3' box culvert.

PR25 is a basin located along the east side of the site. **PR25** is approximately 0.60 acres and generates **1/2 cfs**. The basin represents the portion of East Frontage Street adjacent to the site. The runoff from the basin is directed to the northeast and is captured by a proposed drop inlet #2. The flow is then conveyed to the northeast via the existing 15'x3' box culvert.

A proposed swale located along the east property line will capture and convey the runoff produced by the existing railroad adjacent to the site to the northeast per the Park Study. A portion of the area identified as OFF2U will be directed to the swale. The prorated flow being directed to the swale was approximated from the Park Study to be **5 cfs**. The proposed swale calculations have been included in **Appendix C**.

ON-SITE DRAINAGE

The onsite area consists of three (3) drainage basins **PR10**, **PR15**, and **PR20**. **PR10** is approximately 1.02 acres and generates **2/4 cfs**. The runoff generated by this area is captured by roof drains and is conveyed to the south into the existing 36-inch storm drain pipe. The existing storm drain is called **Phase 1 - Line 2** in the Park Study and in this study.

Basin **PR15** is approximately 0.77 acres and generates **2/3 cfs**. The runoff generated by this area is captured by roof drains and is conveyed to the proposed realigned storm drain system located on the west side of the site. The storm drain system is called **Phase 2 – Line 4** in the Park Study and in this study.

Basin **PR20** is approximately 0.96 acres and generates **2/4 cfs**. The runoff produced by this area is captured by roof drains and is directed to the proposed storm drain system realignment located on the north side of the site. The storm drain system then outfalls to the exiting box culvert located along the east side of the site. The storm drain system is called **Phase 2 – Line 4** in the Park Study and in this study.

Table 2: Proposed Condition HEC-1 Summary.

BASIN ID	BASIN AREA	10-YR FLOW	100-YR FLOW
	(ac)	(cfs)	(cfs)
PR05	0.40	1	1
PR10	1.02	2	4
PR15	0.77	2	3
PR20	0.96	2	4
PR25	0.60	1	2
PR30	0.80	2	3
PR35	0.30	1	1

HYDRAULIC CALCULATIONS

EXISTING CONDITION HYDRAULIC SECTIONS - STREETS

SOUTH CITY PARKWAY

Two hydraulic section was taken along the South City Parkway. HS-1 and HS-2, as shown in Table 3, shows the existing flows do not impact the site and meet depth and D*V criteria for both the minor and major storms.

SYMPHONY PARK AVENUE & WEST CARSON AVENUE

Symphony Park Avenue and West Carson Avenue are not improved in the existing condition; therefore, no hydraulic sections were taken.

Table 3: Existing Hydraulic Sections Summary Table.

SECTION	Q_{10} (cfs)	FLOW DEPTH (ft)	V_{10} (fps)	D*V	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V	DRY LANE
HS-1	1	0.23	1.63	0.37	1	0.23	1.63	0.37	N/A
HS-2	1	0.23	1.63	0.37	1	0.23	1.63	0.37	N/A

PROPOSED CONDITION HYDRAULIC SECTIONS – STREETS

SYMPHONY PARK AVENUE

Symphony Park Avenue will be improved adjacent to the project site. One hydraulic section was taken along Symphony Park Avenue. S, as shown in **Table 4**, shows the building is adequately protected to twice the depth of flow at each location. Refer to **Appendix C** for the FlowMaster hydraulic sections.

WEST CARSON AVENUE

West Carson Avenue will be fully improved minus “L” curb before the construction of this site per CLV Hansen #60311. “L” curb will be installed with the construction of the site. One hydraulic section was taken along the 34-foot public right-of-way. N, as shown in **Table 4**, shows the building is adequately protected to twice the depth of flow. Refer to **Appendix C** for the FlowMaster hydraulic sections.

SOUTH CITY PARKWAY

The “L” curb will be cut where the proposed parking stalls will be constructed along South City Parkway. Two hydraulic sections were taken along South City Parkway. CP-1 and CP-2, at the north and south part of the site respectively, show the building is adequately protected. Refer to **Appendix C** for the FlowMaster hydraulic sections and **Table 4** for a summary of the sections.

Table 4: Proposed Hydraulic Sections Summary Table.

SECTION	Q_{10} (cfs)	FLOW DEPTH (ft)	V_{10} (fps)	D*V	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V
N	1	0.24	1.66	0.40	1	0.24	1.66	0.40
E	1	0.19	1.75	0.33	2	0.24	2.08	0.50
S	1	0.32	1.78	0.57	1	0.24	1.66	0.40
CP-1	1	0.23	1.21	0.28	1	0.23	1.21	0.28
CP-2	2	0.31	1.60	0.50	3	0.35	1.76	0.62

INLET CALCULATIONS

NDOT Type 2 drop inlets were sized to capture the flows generated from the respective streets. The inlets were calculated in a sump condition, 6-inches of ponding depth, and a 50% clogging factor. The calculations can be found in **Appendix C**.

WSPG ANALYSIS

Water Surface Pressure Gradient (WSPG) Analysis Program is a hydraulic software program produced by Civil Design Corporation. The *Park Study* and *View at Symphony Park Study* designed and analyzed 4 storm drain systems using WSPG; **Southeast Box Culvert, Phase 1 - Line 2**, **Phase 1 - Line 3**, and **Phase 2 - Line 4**. The *View at Symphony Park Study* included updates to some of the existing storm drain models. This study utilized WSPG models from both studies to analyze the impacts to the existing and proposed storm drain that this project will convey flow to.

Southeast Box Culvert runs along east side of the project site. The flows being directed into the box culvert from the project site. Will be conveyed to the box culvert via storm drain systems **Phase 2 – Line** and **Phase 1 Line 2**. The **Phase 1 – Line 2** storm drain alignment will remain the same and tie

into the same location per the Park Study. A portion of the existing **Phase 2 – Line 4** alignment will be realigned due to the location of the proposed building. The new alignment will tie into the existing system located on the west side of the site along City Parkway. The new alignment will then continue to the north and head to the east on West Carson Avenue. The proposed storm drain system will then tie back into the **Southeast Box Culvert** system downstream of the current location shown in the Park Study. Although the flow is coming into the box culvert at a different location the existing storm drain is not adversely affected. Refer to the WSPG model, Southeast Box Culvert in **Appendix C**.

Phase 2 – Line 4 runs along South City Parkway and outfalls on the east side of the project site. The onsite drainage areas conveying flow to the storm drain system will be **PR15** and **PR20**. The 100-yr being flows generated by these areas are **3 cfs** and **4 cfs**. The Park Study shows that the future stubs for this portion of the project area was designed for **7 cfs** therefore, the proposed conditions correlate with Park Study design. An additional flow will enter the Southeast Box Culvert at this same location via a drop inlet. This flow is generated from the **PR25** and **PR35** drainage basins. The total flow generated from the two areas is **3 cfs**. The Park Study shows a flow of **2 cfs** being directed to the drop inlet located on the east end of Carson Ave. The existing storm drain system is not adversely affected by the additional **1 cfs**. Refer to the WSPG model, **Phase 2 – Line 4**, in **Appendix C**, and the reference model of the same name can be found in **Appendix E**.

Phase 1 – Line 2 runs east to west in Symphony Park Avenue. The referenced flow from the project site to the storm drain system is **4 cfs** per the Park Study. The onsite drainage area convey flow to the storm drain will be **PR10**. A new storm drain manhole will be constructed to tie in the proposed storm drain pipe. The drainage area will discharge **4 cfs** into the existing 36-inch storm drain system matching the Park Study design flow. Refer to the WSPG model, **Phase 1 - LINE2**, in **Appendix C**, and the reference model of the same name can be found in **Appendix E**.

PARKING LOT LOW IMPACT DEVELOPMENT (LID)

Per Section 1502.2 of the CCRFCD “Hydrologic Criteria and Drainage Design Manual”, this project is categorized as a Medium Parking Lot since the size of the site is approximately +/-0.8 acres.

For Medium parking lot category, treatment BMPs are required to treat stormwater runoff from at least 75 percent of the parking lot. BMPs are sized for the 85th Percentile Rainfall. Please refer to **Appendix D** for all LID calculations.

FINISHED FLOOR ELEVATION

The Clark County Regional Flood Control District requirement for the finish floor elevation (FF) is that it must be 18 inches above the centerline grade of the adjacent street or be elevated to twice the depth of flow up to 18 inches above the water surface elevation (WSE). Additional criteria requires the finished floor elevation to be 6 inches above adjacent on-site flowline high point.

The finished floor elevations of the proposed building varies throughout the site. The highest finished floor elevation set at **2040.35**-feet at the southwest corner of the site, and the lowest finished floor elevation set at **2037.25**-feet at the northeast corner of the site. As shown with hydraulic sections taken on each side of the site, the finished floor elevations of the building **will meet** CCRFCD’s requirement

of twice the depth of flow within all four adjacent streets, the building **will not meet** the criteria of 18-inches above the top-of-curb along the entire south side of the site and a portion of the east side of the site. Please refer to the grading plans included in Appendix F. **Table 5** below summarizes how the buildings are protected with the finished floors being elevated more than twice the depth of flow.

CONCLUSIONS AND RECOMMENDATIONS

The proposed commercial development will not adversely impact the surrounding areas in both the 10-year and 100-year storm events. The development of this project site is in compliance with the *CCFCD Hydrologic Criteria and Design Manual* and Clark County criteria.

1. This project is in compliance with the applicable drainage laws recognized by the State of Nevada.

2. This project is in compliance with the CCRFCD's "*Master Plan Update*", and will **not** conflict with any Master Planned Facilities.

3. This project is in compliance with the CCRFCD's "*Hydrologic Criteria and Drainage Design Manual*", with the exceptions noted in the study.

4. This project lies within FEMA Flood Zone unshaded "**Zone X**".

5. The drainage facilities for this project have been designed to control and convey the on-site runoff from the 100-year storm safely around the site. In addition, they have been designed based upon generally accepted engineering practices and in accordance with local requirements.

6. The finished floor elevation for some buildings are not 18-inches above top-of-curb, however the building is adequately protected from offsite flows by being elevated more than twice the depth of flow.

REFERENCES

1. Clark County Regional Flood Control District, "*Hydrologic Criteria and Drainage Design Manual*," August 1999, Revise September 2013.

2. Clark County Regional Flood Control District, "*2008/2013 Las Vegas Valley Flood Control Master Plan Update*," September 2008, 2013.

3. Technical Drainage Study for Union Park and Addenda, Prepared by Kimley-Horn and Associates. Dated January 8, 2008. (DS4486)

4. Technical Drainage Study for View at Symphony Park Apartments, Prepared by Kimley-Horn. Dated September 25, 2018 (DS5034A)

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LIST OF APPENDICES

Appendix A – Documents & Figures

- Assessor's Parcel Map
- Vicinity Map
- FIRM Exhibit
- Figure F-31 Flood Control Facilities
- Figure H-31 Hydrologic Subareas, Land Use & Soils

Appendix B – Hydrologic Parameters & HEC-1 Analyses

- Figure 513 McCarran Airport Rainfall Area
- Table 503 Six-hour Storm Distributions
- Table 505 Depth-Duration-Frequency Values
- Table 602 page 1 of 4 Runoff Curve Numbers (Urban Areas)
- USDA NRCS Custom Soils Resource Report for Las Vegas Valley
- Existing Condition Standard Form 4
- Existing Condition HEC-1 Output
- Proposed Condition Standard Form 4
- Proposed Condition HEC-1 Output

Appendix C – Hydraulic Calculations

- Drop Inlet Calculations
- FlowMaster Hydraulic Sections – Streets
- FlowMaster Hydraulic Sections – Onsite
- WSPG Models

Appendix D – Parking Lot LID Calculations

Appendix E – Reference Materials

- Technical Drainage Study for Union Park and Addenda, Prepared by Kimley-Horn and Associates. Dated January 8, 2008. (DS4486)
- Technical Drainage Study for View at Symphony Park and Addenda, Prepared by Kimley-Horn. Dated September 25, 2018. (DS5034A)
- Symphony Park Promenade Place & Carson City Offsite Improvements, CLV HANSEN #60311 Anticipated Approval Mid September.

Appendix F – Plans

- EX-1 Existing Conditions Basin Map
- PR-1 Proposed Conditions Basin Map
- Grading Plans

APPENDIX A – DOCUMENTS & FIGURES

- Assessor's Parcel Map
- FEMA Firm Map
- Figure F-31 Flood Control Facilities
- Figure H-31 Hydrologic Subbasins, Land Use & Soils

NOTES

This map is for assessment use only and does NOT represent a survey.

No liability is assumed for the accuracy of the data deliniated herein. Information on roads and other non-assessed parcels may be obtained from the Road Document Listing in the Assessor's Office.

This map is compiled from official records, including surveys and deeds, but only contains the information required for assessment. See the recorded documents for more detailed legal information.

USE THIS SCALE(FEET) WHEN MAP REDUCED FROM 11X17 ORIGINAL

0 100 200 400 600 800

MAP LEGEND

- PARCEL BOUNDARY
- SUB BOUNDARY
- PM/LD BOUNDARY
- ROAD EASEMENT
- MATCH / LEADER LINE
- HISTORIC LOT LINE
- HISTORIC SUB BOUNDARY
- HISTORIC PM/LD BOUNDARY
- SECTION LINE
- CONDOMINIUM UNIT
- AIR SPACE PCL
- RIGHT OF WAY PCL
- SUB-SURFACE PCL

ASSESSOR'S PARCELS - CLARK CO., NV.

Michele W. Shafe - Assessor

001 ROAD PARCEL NUMBER
001 PARCEL NUMER
1.00 ACREAGE
202 PARCEL SUB/SEQ NUMBER
PB 24-45 PLAT RECORDING NUMBER
5 BLOCK NUMBER
5 LOT NUMBER
GL5 GOV. LOT NUMBER

BOOK	
T20S R61E	

SEC.	
34	

MAP	
N 2 NW 4	

125	124	123
138	139	140
163	162	161
176	177	178

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

8	4	8	4
5	1	5	1
6	2	6	2
7	3	7	3
8	4	8	4
5	1	5	1

139-34-1

CLARK COUNTY ASSESSOR MAPPING DIVISION NEVADA

Scale: 1" = 200'

Rev: 4/2/2018

GRAND CENTRAL PKWY

PT 3

PT 139-27-410-005

PT 139-27-410-005

PT 139-33-511-004

PT 139-33-511-004

005 2.71

PT 139-33 -511-004

PT 4

PT 139-27-402-008

112

100 N MAIN STREET

001 2.08

PB 154-13

005 6.42

007 5.9

PARKWAY CENTER

110

PB 53-61

008 1.84

PT5

CARSON AVE

U.P.R.R.

101

005 1.37

007 1.88

012 1.32

011 0.42

011 0.12

004 0.13

006 1.49

008 1.67

009 3.63

012 7.37

009 5.25

008 3.3

010 0.34

001 1.6

PT 139 -33 -511 -008

PT 139 -34 -211 -001

PT 139 -34 -210-032

PT 139 -34 -210-031

PT 139-34-101-009

98-001

98-002

SITE LOCATION

MAIN ST

113

18 FREMONT STREET ACQUISITION

PB 154-14

001 2.76

OGDEN AVE

STEWART AVE

FIRST ST

SECOND ST

THIRD ST

CASINO CENTER BLVD

FREMONT ST

(FREMONT STREET EXPERIENCE)

501

010 0.72

510

PB 1-37

BK3 308311 VAC

LEASE

SYMPHONY PARK AVE

PROMENADE PL

BRIDGER AVE

C/TY PKWY

TAX DIST 203

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the Clark County GIS Management Office (GISMO).

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

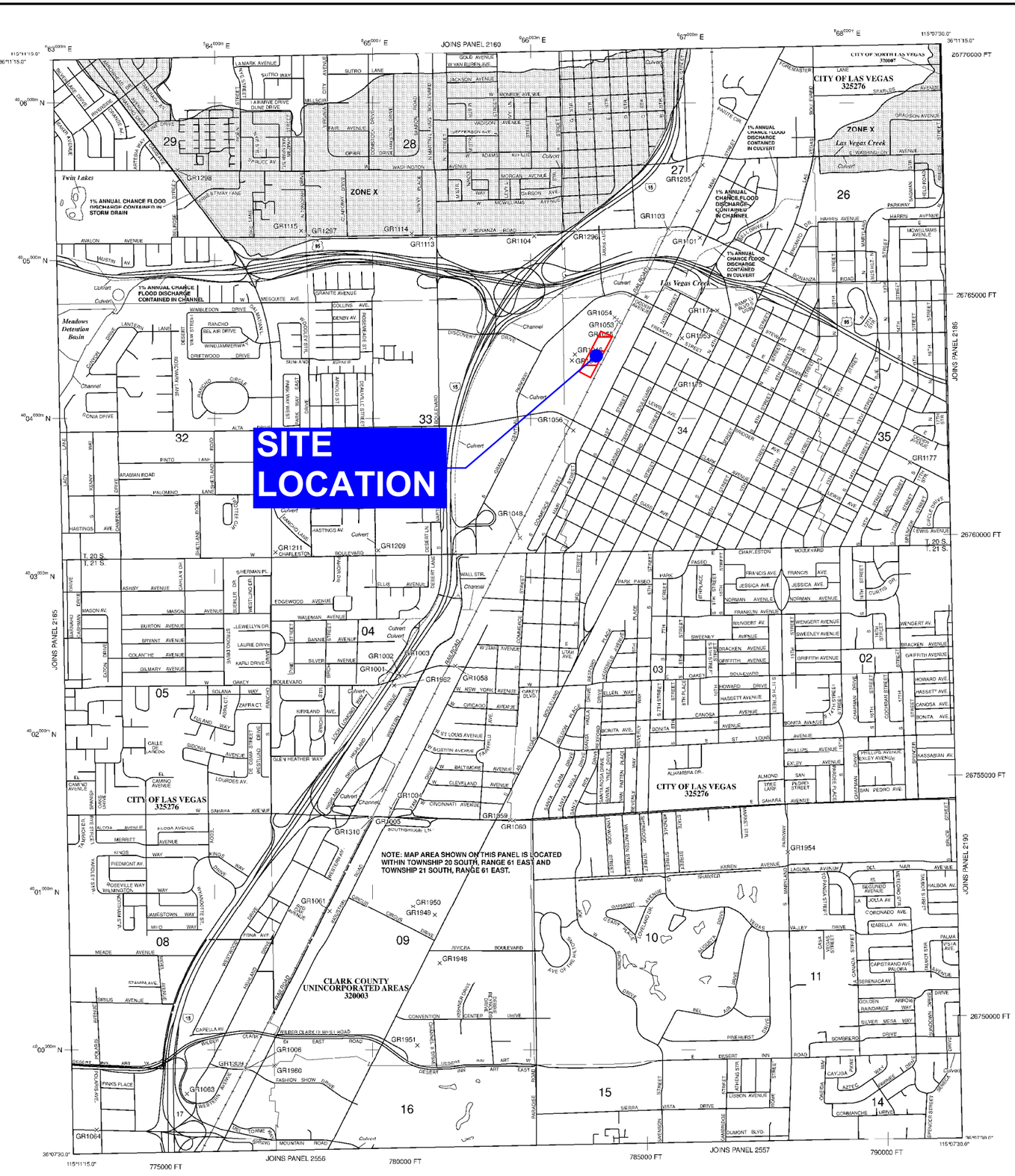
The Digital Flood Insurance Rate Map (DFIRM) was produced through a unique partnership between Clark County and the Federal Emergency Management Agency (FEMA). Clark County has developed a long-term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the Clark County commitment to share and maintain floodplain layers within their Geographic Information System Management Office (GISMO).

This DFIRM reflects several innovative features. These include:

+ Southern Nevada GIS–Cooperation among local government agencies throughout Clark County. The foundation of cooperation is the GIS Interlocal Agreements formed between fourteen regional participants. In part, the agreements specify that the Clark County GIS Management Office (GISMO) will be responsible for maintaining a GIS data warehouse and associated Southern Nevada GIS metadata.

+ The GISMO's responsibilities go beyond maintaining the GIS data warehouse. GISMO also maintains the Street Centerline Database used by 911 dispatch services. This centerline database serves as the basemap for this DFIRM.

DIGITAL DATA AVAILABILITY: http://www.co.clark.nv.us/oeit/gismo/gismo.htm



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'39", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 11
- 6000000 FT — 5000-foot grid ticks: Nevada State Plane coordinate system, east zone (FIPSZONE 2701), Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
September 27, 2002

November 16, 2011 - To reflect updated topographic information, to change floodway, to add Base Flood Elevations, to update corporate limits, to change Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to delete Special Flood Hazard Areas, to change zone designations, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2170F

FIRM
FLOOD INSURANCE RATE MAP
CLARK COUNTY, NEVADA AND INCORPORATED AREAS

PANEL 2170 OF 4090
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLARK COUNTY	320003	2170	F
LAS VEGAS, CITY OF	325276	2170	F
NORTH LAS VEGAS, CITY OF	320007	2170	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
32003C2170F
MAP REVISED
NOVEMBER 16, 2011

Federal Emergency Management Agency

REGIONAL FLOOD CONTROL DISTRICT

2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F- 31
FLOOD CONTROL FACILITIES

LEGEND

- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin

- Stormdrain
- Lined Channel
- Unlined Channel
- Levee/Dike
- Natural Wash/Floodway
- ID-Mile Separator

Remove & Replace/Parallel Facilities

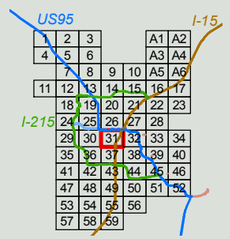
Category A	Category B
Channel	Channel
Stormdrain	Stormdrain

N

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

Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)



ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
BHSA		**BOULDER HIGHWAY SAHARA AVENUE**						
0175	P1	14' X 14' RCB	6000	3837	CSA13	SW3	7.93	0.67
0289	P1	14' X 12' RCB	2300	3566	CSA11	SW3	7.55	0.87
0331	P1	14' X 11' RCB	2000	3232	CSA10-1	SW3	7.15	1.00
CHRA		**WEST CHARLESTON DRAINS - RANCHO**						
0000	E	6' X 5' RCB	310	286	CAL95	SW3	0.62	1.92
0006	E	5' X 5' RCB	420	286	CAL95	SW3	0.62	1.00
0014	E	5' X 4' RCB	600	286	CAL95	SW3	0.62	1.50
FLBN		**FLAMINGO - BOULDER HIGHWAY NORTH**						
0281	P1	10' X 7' RCB	1300	1259	CCH56	SW3	1.64	1.33
0312	P1	7' X 4' RCB	1800	555	CCH52	SW3	0.55	4.20
0342	P1	7' X 4' RCB	2500	555	CCH52	SW3	0.55	4.20
FLFA		**FLAMINGO - FASHION**						
0000	E	12' X 5' RCB	2050	747	CFW17N	FLAM3A	0.72	0.28
0037	E	8' X 5' RCB	3060	526	FW14	FLAM3A	0.44	0.45
FW15		**FREEWAY CHANNEL FROM DESERT INN TO EXPRESSWAY**						
0000	E	3: 12' X 10' RCB	2170	3728	CAL93	SW4	10.63	0.17
0010	E	3: 12' X 10' RCB	677	3403	CAL96	SW4	10.10	0.17
0038	E	3: 12' X 10' RCB	1945	3344	CCCH22	SW4	9.92	0.17
0050	E	3: 12' X 10' RCB	870	2613	CCH50	SW4	8.54	0.17
0089	E	3: 12' X 10' RCB	980	2448	CCWAL2	SW4	8.28	0.17
0100	E	3: 12' X 9' RCB	1575	2295	COK11C	SW3	7.83	0.17
0125	E	2: 10' X 8' RCB	1350	1450	DCCSA08	SW3	6.67	0.80
0150	E	2: 10' X 8' RCB	1067	1450	DCCSA08	SW3	6.67	0.80
0175	E	2: 10' X 8' RCB	985	1450	DCCSA08	SW3	6.67	0.75
0214	P1	2: 12' X 10' RCB	1610	4104	CED10-C	SW3	6.25	0.73
0242	P1	2: 12' X 9' RCB	1500	3968	CCPS08	SW3	6.03	0.93
0271	P1	2: 12' X 10' RCB	1520	3674	CPS08	SW3	5.59	0.59
0301	P1	Conc Chnl 12'W 4'D 2:1 SS	1300	433	CCE3FD-C	SW3	0.54	0.42
FWCH		**WEST CHARLESTON DRAIN**						
0000	E	10' X 7' RCB	1710	1008	CCH22	SW3	1.38	0.74
0020	E	10' X 7' RCB	840	783	CCCH18-C	SW3	1.15	0.40
0036	E	9' X 7' RCB	425	783	CCCH18-C	SW3	1.15	0.40
0044	E	9' X 7' RCB	145	538	CCH18-C	SW3	0.53	0.40
0047	E	7' X 5' RCB	710	538	CCH18-C	SW3	0.53	2.05
0060	E	5' X 4' RCB	400	538	CCH18-C	SW3	0.53	0.40
FWOK		**OAKEY DRAIN**						
0000	E	10' X 8' RCB	1350	928	1COK11C	SW3	1.16	0.62
0020	E	10' X 8' RCB	1025	928	1COK11C	SW3	1.16	0.60
0040	E	8' X 8' RCB	960	721	COK10	SW3	0.85	1.00
0060	E	5' X 5' RCB	970	453	COK09-C	SW3	0.55	1.50
0076	E	6' X 6' RCB	1175	453	COK09-C	SW3	0.55	9.40
0100	E	6' X 6' RCB	980	453	COK09-C	SW3	0.55	1.98
FWPS		**PALMYRA / SIRIUS DRAIN**						
0000	P1	12' X 11' RCB	3000	3240	CCPS06	SW3	4.88	1.50
0057	P1	10' X 10' RCB	5220	1941	CPS06	SW3	2.78	1.28
0157	P1	2: 66" RCP	5100	521	CPS03	SW3	0.60	1.15
FWR2		**FREEWAY CHANNEL - RAILROAD CHANNEL**						
0000	E	5' X 5' RCB	377					1.60
0020	E	Earth Chnl 10'W 4'D 2:1 SS	650					0.50
FWRR		**FREEWAY CHANNEL BYPASS FACILITY RR BRANCH**						
0000	E	48" RCP	70					1.22
0010	E	Conc Chnl 4'W 4'D 0:1 SS	220					1.22
FWSA		**FREEWAY CHANNEL - SAHARA**						
0000	P1	7' X 5' RCB	5700	486	CSA08	SW3	0.42	1.49
FWSH		**SHADOW LANE DRAIN**						
0000	E	7' X 4' RCB	950	253	CH22-C	SW3	0.23	0.20

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
FWUP		**FREEWAY CHANNEL BYPASS FACILITY**						
0000	E	10' X 9' RCB	350	242	CH50	SW3	0.26	0.37
0010	E	10' X 8' RCB	804	242	CH50	SW3	0.26	0.37
0059	E	10' X 6' RCB	2680	242	CH50	SW3	0.26	0.40
0100	E	8' X 4' RCB	1440	242	CH50	SW3	0.26	0.47
FWVV		**VALLEY VIEW DRAIN**						
0000	P1	12' X 11' RCB	1320	1475	CCE3FA	SW3	2.67	0.30
0025	P1	10' X 10' RCB	2665	1006	CR4C1	SW3	1.74	0.30
0050	P1	8' X 6' RCB	7785	712	DFW5	SW3	1.34	1.50
FWWL		**FREEWAY CHANNEL-WALDMAN AVENUE**						
0000	E	6' X 6' RCB	1000	418	CWAL2	SW3	0.45	0.20
LCCH		**LAS VEGAS CREEK CHANNEL**						
0000	E	2: 12' X 7' RCB	730	2894	CLC20-C	MEADOWS4	9.68	1.28
0013	E	2: 12' X 6' RCB	2035	2894	CLC20-C	MEADOWS4	9.68	0.82
0051	E	2:14' X 7' RCB	3113	2894	CLC20-C	MEADOWS4	9.68	0.60
0110	E	Transition Structure	220	2798	CCLC16-C	MEADOWS4	9.51	
0114	E	2: 14' X 7' RCB	670	2329	CRMEDET	MEADOWS4	8.25	0.80
0127	E	Transition Structure	110	2329	CRMEDET	MEADOWS4	8.25	
0129	E	2: 14' X 7' RCB	1130	2329	CRMEDET	MEADOWS4	8.25	0.50
0150	E	2: 13' X 7' RCB	200	2329	CRMEDET	MEADOWS4	8.25	0.95
0154	E	Transition Structure	190	2329	CRMEDET	MEADOWS4	8.25	
0157	E	2: 12' X 6' RCB	1650	1631	CCLC14-C	SW3	2.99	1.06
0230	E	12' X 6' RCB	2140	1381	CLC14-C	SW3	2.54	1.74
0270	E	12' X 6' RCB	1705	774	CCWA02-C	SW3	1.84	0.54
0302	E	8' X 6' RCB	3940	774	CCWA02-C	SW3	1.84	2.49
0377	E	10' X 7' RCB	1226	774	CCWA02-C	SW3	1.84	0.74
0400	E	Transition Structure	110	437	CWA02-C	SW3	1.47	0.49
0402	E	8' X 6' RCB @ Jones	535	437	CWA02-C	SW3	1.47	0.49
0412	E	60" RCP	1370	437	CWA02-C	SW3	1.47	1.08
0438	E	60" RCP	1090	162	CLC01-C	SW3	1.20	1.60
0458	E	60" RCP	1060	162	CLC01-C	SW3	1.20	1.60
0478	E	60" RCP	1110	162	CLC01-C	SW3	1.20	0.55
LCDE		**LAS VEGAS CREEK - DECATUR**						
0000	E	6' X 5' RCB	1800	404	LC11-C	SW3	0.38	1.26
0034	E	72" RCP	700	404	LC11-C	SW3	0.38	0.50
LCJO		**LAS VEGAS CREEK - JONES**						
0000	E	6' X 6' RCB	380	358	AL01B-C	SW3	0.37	0.50
0007	E	6' X 5' RCB	675	358	AL01B-C	SW3	0.37	0.62
LCME		**LAS VEGAS CREEK - MEADOWS**						
0000	E	14' X 8' RCB	895	1423	MEADOWDB	SW3SC	5.67	0.72
0016	E	Stilling Basin	140	1423	MEADOWDB	SW3SC	5.67	0.21
0017	E	3,300 cfs Spillway (Replace w/ LCME0018)		3300	MEADOWIN	SW3SC	5.67	
0018	P1	Modify Spillway, raise height by 1' (Replaces LCME0017)		3300	MEADOWIN	SW3SC	5.67	
0019	E	1: 11' X 5' RCB and 1: 11.5' X 5' RCB	110	1423	MEADOWDB	SW3SC	5.67	0.81
0020	E	213 ac-ft Meadows Detention Basin		4713	MEADOWIN	SW3SC	5.67	
0021	P1	Upgrade to 235 ac-ft Meadows Detention Basin		4713	MEADOWIN	SW3SC	5.67	
0026	E	Energy Dissipator	110	4713	MEADOWIN	SW3SC	5.67	2.94
0028	E	Conc Chnl 42'W 9'D 0:1 SS	922	4713	MEADOWIN	SW3SC	5.67	0.40
0040	E	Conc Chnl 40'W 10'D 0:1 SS	525	4593	CAL90-C	SW3SC	5.44	0.40
0070	E	Conc Chnl 40'W 8.5'D 0:1 SS	255	4593	CAL90-C	SW3SC	5.44	0.40
0076	E	Free Span Bridge 18'W 8'D @ Alta	100	4441	CCAL16	SW3SC	5.27	1.89
0077	E	Conc Chnl 18'W 8'D 1:1 SS	618	4441	CCAL16	SW3SC	5.27	1.89
0085	E	10' X 6' RCBC @ Valley View	275	1661	1CAL16	SW3	2.09	1.89
LCRA		**LAS VEGAS CREEK - RANCHO**						
0000	E	12' X 8' RCB	380	783	CLC16-C	SW3	1.71	0.60
0004	E	12' X 6' RCB	2367	783	CLC16-C	SW3	1.71	0.77
LVOE		**OWENS AVENUE - EAST**						
0345	P1	13' X 11' RCB	1685	2369	DLVOE	SW5	22.79	0.60

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVWH		**WASHINGTON AVENUE CHANNEL**						
0431	E	3: 14.33' X 10' RCB	665	2870	DCLC21	SW5	22.79	0.15
0446	E	Junction Structure	69	2870	DCLC21	SW5	22.79	0.15
0447	E	3: 14.33' X 10' RCB	1955	4978	CCAL93	SW5	22.19	0.15
0484	E	Confluence Structure	455	4978	CCAL93	SW5	22.19	0.15
MEAL		**MEADOWS ALTA**						
0000	E	Conc Chnl 8'W 11'D 1:1 SS	700	1207	CAL13-3	SW3	1.48	1.58
0012	E	12' X 6' RCBC @ Red Sky	160	1161	CAL10-C	SW3	1.42	3.03
0013	E	Conc Chnl 8'W 11'D 1:1 SS	320	1161	CAL10-C	SW3	1.42	3.03
0015	E	72" RCP	2500	1126	CAL11-C	SW3	1.38	1.94
0060	E	60" RCP	905	792	CBR3	SW3	1.08	1.00
0100	E	72" RCP	1160	792	CBR3	SW3	1.08	1.00
0120	E	60" RCP	3500	733	CAL05-C	SW3	1.01	1.00
0130	E	6' X 4' RCB	1150	186	AL04-C	SW3	0.18	0.40
0150	E	60" RCP	285	499	CCUS	SW3	0.74	1.40
0160	E	36" RCP	2600	331	CUS	SW3	0.56	1.25
0209	E	48" RCP	2500	150	DCR2	SW3	0.41	1.70
MECH		**EXTENSION OF MEADOWS / CHARLESTON**						
0059	E	36" RCP	1310					0.25
0084	E	30" RCP	2960					1.26
0108	E	30" RCP	8550	32	OAKEYOT	SW3	1.88	1.43
0310	E	24" RCP	1000	32	OAKEYOT	SW3	1.88	1.43
0323	E	15" RCP Outlet	200	32	OAKEYDB	SW3	1.88	
0324	E	201 ac-ft Oakey Detention Basin		1652	OAKEYIN	SW3	1.88	
0334	E	11' X 6' RCB	200	573	C5-OAK-C	SW3	0.56	0.50
0337	E	9' X 6' RCB	520	573	C5-OAK-C	SW3	0.56	0.50
0338	E	10' X 8' RCB	2060	1131	C3A-OAKC	SW3	1.32	1.62
0351	E	90" RCP	1350	573	C5-OAK-C	SW3	0.56	0.50
MECN		**MEADOWS - CHARLESTON**						
0000	P1	9' X 8' RCB	1570	1105	CCH10	SW3	1.00	1.09
0061	P1	8' X 7' RCB	3300	1105	CCH10	SW3	1.00	1.82
0123	P1	8' X 6' RCB	5200	821	CCH09-C	SW3	0.72	1.64
0223	P1	6' X 5' RCB	2700	422	CCH05-C	SW3	0.34	2.04
MEOK		**OAKEY MEADOWS STORMDRAIN**						
0000	E	19' X 7' RCB	900	2718	COK13	SW3SC	2.94	0.91
0017	E	19' X 8' RCB	1550	2718	COK13	SW3SC	2.94	0.80
0048	E	18' X 9' RCB	1700	2718	COK13	SW3SC	2.94	0.50
0070	E	7' X 6' RCB	1320	226	CH14B	SW3	0.22	0.44
0079	E	18' X 8' RCB	630	2450	COK12	SW3SC	2.62	0.50
0091	E	18' X 8' RCB	850	2450	COK12	SW3SC	2.62	0.50
0110	E	12' X 8' RCB	2304	1491	COK08	SW3	1.58	0.77
0150	P3	12' X 8' RCB	642	1491	COK08	SW3	1.58	0.77
0166	P3	12' X 9' RCB	1350	1491	COK08	SW3	1.58	0.45
0191	P3	12' X 7' RCB	660	957	COK07	SW3	0.93	0.71
0204	P3	12' X 6' RCB	655	957	COK07	SW3	0.93	0.71
0217	P3	12' X 5' RCB	1276	556	CSA06	SW3	0.52	0.44
MEPA		**MEADOWS PARALLEL**						
0000	E	10' X 6' RCB	1370	259	CCH14A	SW3	0.25	0.50
0022	E	6' X 5' RCB	200	259	CCH14A	SW3	0.25	1.45
0025	E	78" RCP	470	259	CCH14A	SW3	0.25	1.16
PSDE		**PALMYRA / SIRIUS DRAIN - DECATUR LATERAL**						
0000	P1	12' X 8' RCB	1330	1018	CED02	SW3	1.21	0.38
0025	P1	10' X 8' RCB	1320	598	CED13	SW3	0.65	0.25
WAGC		**WASHINGTON AVENUE CHANNEL - GRAND CENTRAL**						
0000	E	2: 12' X 4' RCB	700	557	LC21	SW3	0.60	0.20
0014	E	1: 12' X 4' RCB and 1: 11' X 4' RCB	2440	557	LC21	SW3	0.60	0.20
0060	E	12' X 4' RCB	455	557	LC21	SW3	0.60	0.20

** The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.*

*** As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.*

^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).

REGIONAL FLOOD CONTROL DISTRICT

2013 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F - 31

LEGEND

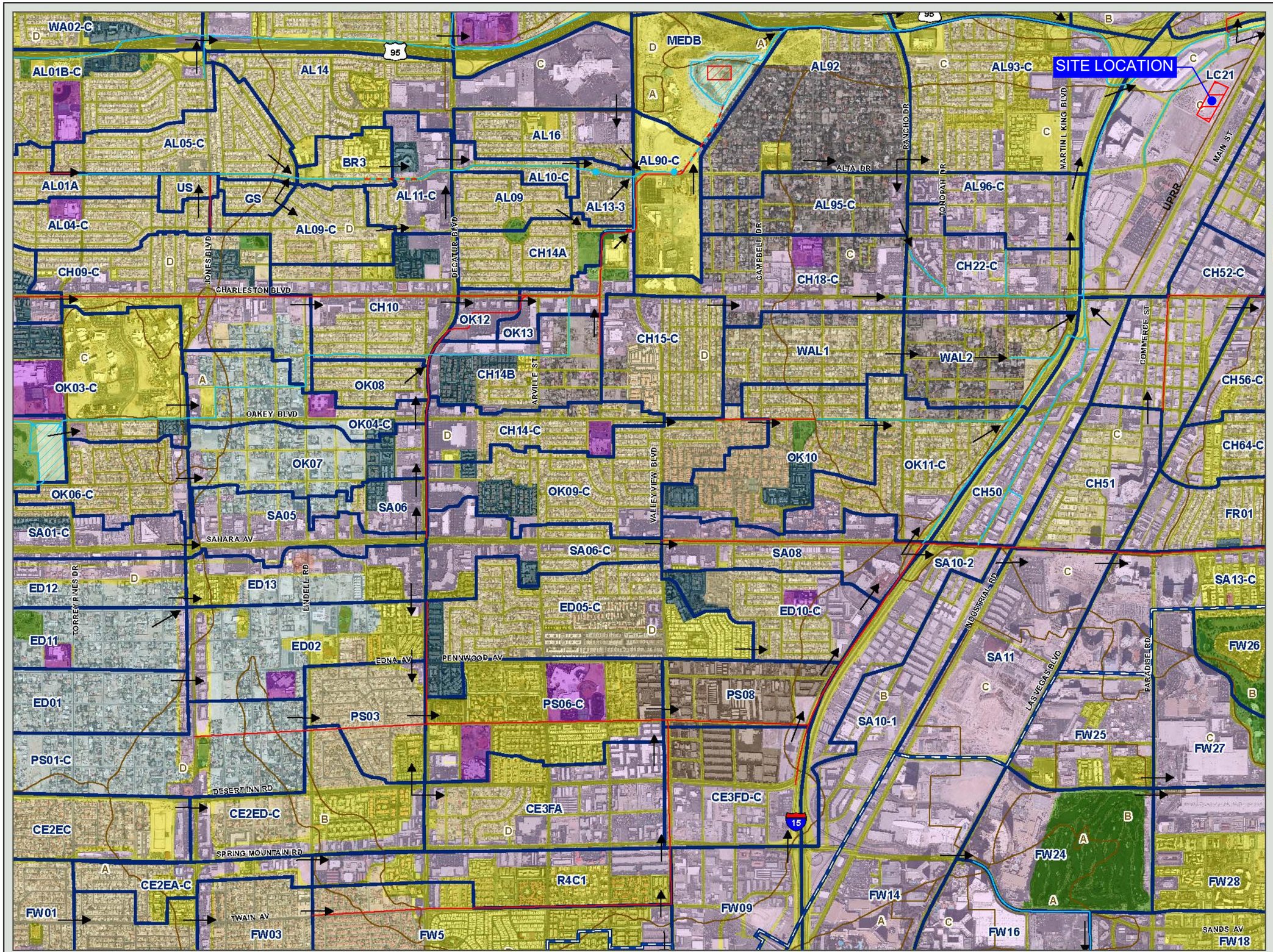
ID (Facility Identifier) AABB
Parent Stream Name
Stream Name
River Mile 0000
Distance Above Confluence with Parent Stream (Miles)
Miles in Hundredths

Existing Facility.....E
Proposed or Modified Facility.....P
Contingency Level
Category B.....P0
Master Plan.....P1
Preliminary Design.....P2
Design.....P3

Bottom Width.....W
Depth.....D
Side Slope, H:V.....SS

Construction Features

Cast in Place Concrete Pipe.....CIPCP
Corrugated Metal Arch Pipe Culvert.....CMAP
Corrugated Metal Pipe Culvert.....CMPC
High Density Polyethylene.....HDPE
Horizontal Elliptical Reinforced Concrete Pipe.....HERCP
Reinforced Concrete Arch Pipe.....RCAP
Reinforced Concrete Arch Culvert.....RCAC
Reinforced Concrete Box.....RCB
Reinforced Concrete Box Culvert.....RCBC
Reinforced Concrete Pipe.....RCP
Reinforced Concrete Pipe Culvert.....RCPC
Storm Sewer Pipe.....SSP



REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE H-31
HYDROLOGIC SUMMARY

LEGEND

- Ultimate Development Boundary
- Watershed Boundary
- Subbasin Boundary
- Drought Ordinance Boundary
- Flow Arrows

Flood Control Facilities

- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Category A Remove & Replace/ Parallel Facilities
- Category B Remove & Replace/ Parallel Facilities

Type Hydrologic Soil Groups

- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential/Rock Outcrops

Typical Land Use

1	Undeveloped Land, Open Desert
2	Parks, Golf Courses
3	Rural
4 / 14*	Low Density Residential
5 / 15*	Medium Density Residential
6 / 16*	High Density Residential
7 / 17*	Public Facility, Residential
8 / 18*	Very High Density Residential
9 / 19*	Commerical, Retail, Casino, High Rise Condominiums
10 / 20*	Light Industrial
11 / 21*	Heavy Industrial
12 / 22*	Schools
13	Lakes

* Drought Ordinance Applied

N

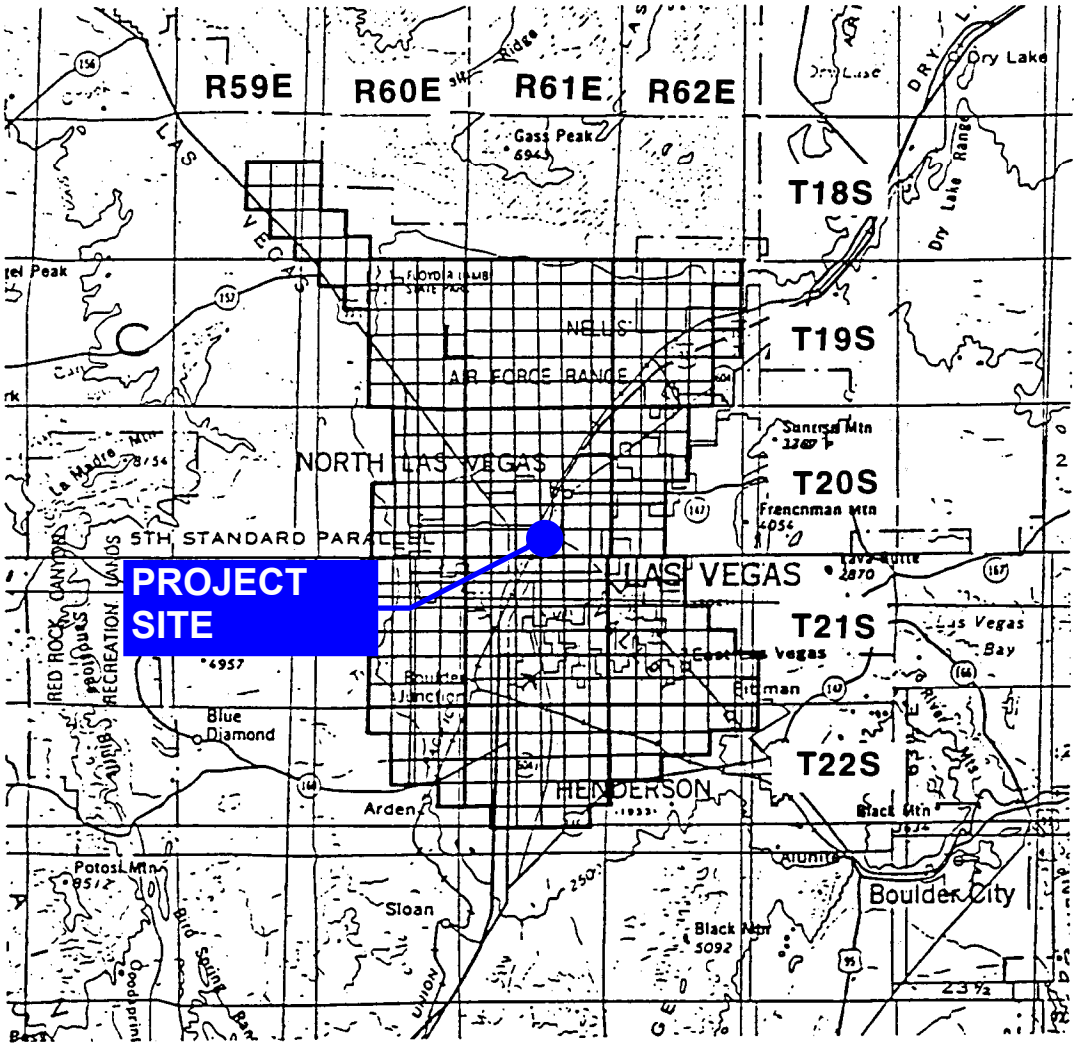
0 500 1,000 2,000 3,000
Feet
Scale: 1 inch = 2,000 feet

Refer to Figure G-2 for Aerial Source(s)

PBSJ
PB

APPENDIX B – HYDROLOGIC PARAMETERS & HEC-1 ANALYSIS

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP	RANGE	SECTIONS	TOWNSHIP	RANGE	SECTIONS
18 South	59 East	13-15,22-26,36	20 South	62 East	4-9,16-20,29-32
18 South	60 East	30-32	21 South	60 East	1-4,9-16,21-28,33-36
19 South	60 East	1-6,8-16,21-28,33-36	21 South	61 East	ALL SECTIONS
19 South	61 East	ALL SECTIONS	21 South	62 East	4-9,15-23, 25-36
19 South	62 East	2-11,14-23,27-34	22 South	60 East	1-4,10-15,24
20 South	60 East	1-3,10-15,21-28,33-36	22 South	61 East	1-24,26-29
20 South	61 East	ALL SECTIONS	22 South	62 East	1-10,17-18

Notes:
1. Refer to Table 505 and Figure 516 Depth-Duration- Frequency values in the McCarran Airport Rainfall Area.
2. Refer to Table 506 and Figure 517 for Time-Intensity-Frequency values on the McCarran Airport Rainfall Area.

Revision	Date

WRC ENGINEERING

REFERENCE:
USACE, Los Angeles District, 1988

FIGURE 513

SIX-HOUR STORM DISTRIBUTIONS

Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5	Storm Time (In Minutes)	Percent of Total Storm Depth SDN3	SDN4	SDN5
0	0.0	0.0	0.0	185	32.2	37.6	43.0
5	2.0	2.0	2.0	190	35.2	41.5	47.7
10	5.7	5.8	5.9	195	40.9	46.2	51.4
15	7.0	7.5	8.0	200	49.9	53.0	56.1
20	8.7	9.9	11.0	205	59.0	61.0	63.0
25	10.8	12.6	14.4	210	71.0	71.0	71.0
30	12.4	13.7	15.0	215	74.4	73.2	72.0
35	13.0	14.5	16.0	220	78.1	75.6	73.1
40	13.0	14.9	16.8	225	81.2	78.2	75.2
45	13.0	15.1	17.1	230	81.9	79.9	77.9
50	13.0	15.5	18.0	235	83.5	81.3	79.0
55	13.0	15.6	18.2	240	85.1	82.3	79.5
60	13.0	15.9	18.7	245	85.6	83.0	80.4
65	13.3	16.2	19.0	250	86.0	83.5	81.0
70	14.0	16.9	19.7	255	86.8	84.4	82.0
75	14.2	17.2	20.2	260	87.6	85.1	82.6
80	14.8	17.9	21.0	265	88.8	86.4	84.0
85	15.8	18.9	22.0	270	91.0	88.5	85.9
90	17.2	20.1	23.0	275	92.6	90.8	88.9
95	18.1	21.1	24.1	280	93.7	92.4	91.0
100	19.0	22.0	25.0	285	95.0	94.4	93.8
105	19.7	22.8	25.9	290	97.0	96.8	96.6
110	19.9	23.2	26.5	295	97.6	97.3	97.0
115	20.0	24.0	28.0	300	98.2	97.8	97.4
120	20.1	24.6	29.0	305	98.5	98.2	97.9
125	20.4	25.2	30.0	310	98.7	98.4	98.1
130	21.4	26.0	30.5	315	98.9	98.6	98.3
135	22.9	26.9	30.9	320	99.0	98.8	98.5
140	24.1	27.6	31.0	325	99.3	99.1	98.9
145	24.9	28.3	31.7	330	99.3	99.2	99.0
150	25.1	28.6	32.1	335	99.4	99.3	99.2
155	25.6	29.2	32.7	340	99.5	99.4	99.3
160	27.0	30.2	33.3	345	99.8	99.7	99.6
165	27.8	31.2	34.6	350	99.8	99.8	99.7
170	28.1	32.1	36.1	355	99.9	99.9	99.9
175	28.3	33.2	38.1	360	100.0	100.0	100.0
180	29.5	35.2	40.8				

Notes:
1. For drainage areas less than 8 square miles in size, use SDN 3.
2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
4. A graphical representation of these values is presented on **Figure 515**.

Revision	Date

REFERENCE:

TABLE 503

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA

(IN INCHES)

	RECURRENCE INTERVAL					
TIME	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5 min.	0.15	0.27	0.35	0.46	0.54	0.63
10 min.	0.25	0.44	0.57	0.74	0.89	1.02
15 min.	0.33	0.57	0.74	0.97	1.15	1.32
30 min.	0.44	0.78	1.01	1.31	1.55	1.79
1 hour	0.52	0.89	1.15	1.50	1.78	2.06
2 hour	0.59	1.01	1.30	1.70	2.01	2.30
3 hour	0.64	1.08	1.39	1.82	2.15	2.48
6 hour	0.72	1.22	1.58	2.05	2.41	2.77
24 hour (TR-55)	1.20	1.60	1.80	2.40	2.70	2.96

NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.

2. The 24 hour values presented above are for use with TR-55 only.

3. Table 501 adjustments not required.

Revision	Date

RUNOFF CURVE NUMBERS
(URBAN AREAS[1])

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
See Table 602A					
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system. Impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using Figure 603.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using Figure 603 based on the impervious area percentage (CN #98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using Figure 603 based on the degree of development impervious area percentage) and the CN's for the newly graded pervious areas.

Revision	Date

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Las Vegas Valley Area, Nevada, Part of Clark County

October 12, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

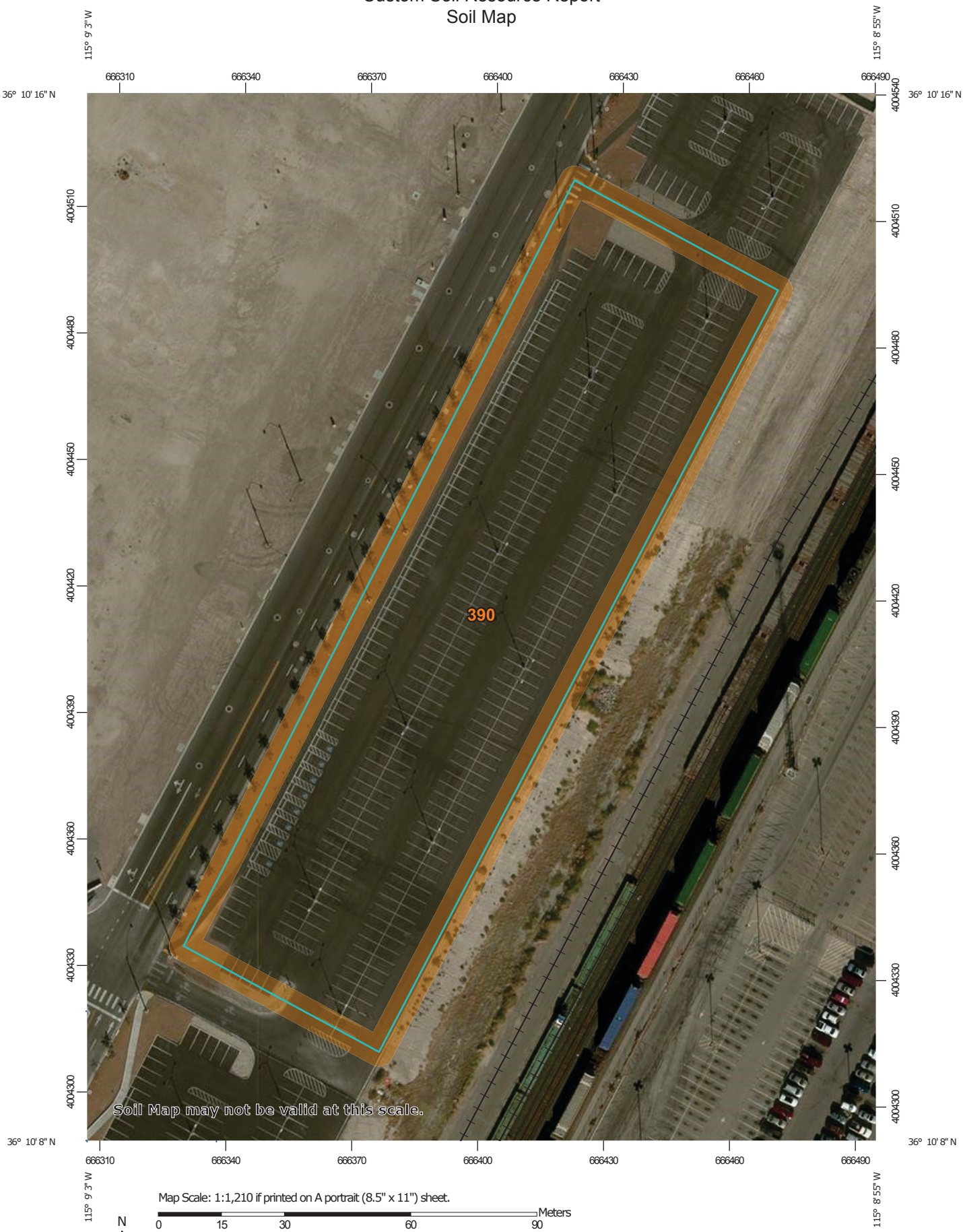
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



Map Scale: 1:1,210 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
Survey Area Data: Version 13, Sep 14, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2013—Feb 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
390	Spring clay loam	2.7	100.0%
Totals for Area of Interest		**2.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Las Vegas Valley Area, Nevada, Part of Clark County

390—Spring clay loam

Map Unit Setting

National map unit symbol: hrc0
Elevation: 1,600 to 2,000 feet
Mean annual precipitation: 4 to 6 inches
Mean annual air temperature: 66 to 68 degrees F
Frost-free period: 240 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Spring and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Spring

Setting

Landform: Alluvial flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Lacustrine deposits derived from gypsum

Typical profile

H1 - 0 to 11 inches: clay loam
H2 - 11 to 43 inches: gypsiferous material
H3 - 43 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 30 percent
Salinity, maximum in profile: Strongly saline (16.0 to 32.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: SALINE BOTTOM (R030XY024NV)
Hydric soil rating: No

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HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL - STANDARD FORM 4

Development: SYMPHONY PARK RESIDENTIAL
Calculated by: AL/MS
Checked by: MS
Date: 11/14/2018

TIME OF CONCENTRATION - EXISTING CONDITION

SUB-BASIN DATA					INITIAL / OVERLAND TIME: t(i)				TRAVEL TIME t(t)				CONCENTRATION TIME t(c)			
DESIG:	AREA Acre	AREA Sq. Mi.	EX/DEV EX = 1 DEV = 2	CN	K	LENGTH Ft.	SLOPE %	t(i) Min	LENGTH Ft.	SLOPE %	VEL. FPS	t(t) Min	T_L Ft.	FINAL t(c)	t(c) URBANIZED = (L/180)+10 Min	t(lag) $=(0.6*T_L)/60$ Hr
EXISTING CONDITION:																
EON1	1.82	0.0028	2	98	0.9036	92	3.70	2.19	204	1.96	4.28	0.00	296	5.00	11.6	0.0500
EON2	1.76	0.0028	2	98	0.9036	187	2.89	3.39	280	0.14	1.16	1.00	467	5.00	12.6	0.0500
EOFF1	0.12	0.0002	2	98	0.9036	29	0.69	2.15	194	3.40	5.64	2.00	223	5.00	11.2	0.0500
EOFF2	0.17	0.0003	2	98	0.9036	31	1.29	1.81	252	0.91	2.92	3.00	283	5.00	11.6	0.0500
EOFF3	0.20	0.0003	2	98	0.9036	32	0.63	2.34	294	0.41	1.95	4.00	326	6.34	11.8	0.0634
EOFF4	0.12	0.0002	2	98	0.9036	26	0.77	1.97	201	3.63	5.83	5.00	227	6.97	11.3	0.0697

Equations Used. . .

t(i) = 1.8 x (1.1 - K) x L $^{1/2}$ / S $^{1/3}$

t(t) = L / (60 x V)

t(c) = t(i) + t(t)

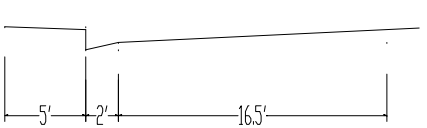
K = 0.0132 x CN - 0.39

For Developed Conditions:

Flow depth at top of curb - Velocity = 30.6 X (Slope)$^{1/2}$

n = 0.016

R = (A/P) ~ 0.187 ft.

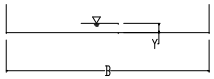


For Existing Conditions:

Wide Rectangular - Velocity = 29.4 X (Slope)$^{1/2}$

n = 0.040

R = (A/P) ~ y



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1 1****************************************                                                    ****************************************
  *                                      *                                                    *                                      *
  *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
  *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
  *            VERSION 4.1               *                                                    *          609 SECOND STREET           *
  *                                      *                                                    *       DAVIS, CALIFORNIA 95616        *
  *  RUN DATE   15OCT18  TIME  08:17:59  *                                                    *           (916) 756-1104             *
  *                                      *                                                    *                                      *
  ****************************************                                                    ****************************************
 10
 11
 12
 13
 14
 15                                                X     X  XXXXXXX   XXXXX           X
 16                                                X     X  X        X     X         XX
 17                                                X     X  X        X               X
 18                                                XXXXXXX  XXXX     X        XXXXX  X
 19                                                X     X  X        X               X
 20                                                X     X  X        X     X         X
 21                                                X     X  XXXXXXX   XXXXX          XXX
 22
 23
 24
 25
 26            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.
 27
 28            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 29            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 30            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 31            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 32            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
 33
 34
 35 1                                                HEC-1 INPUT                                                                 PAGE  1
 36
 37           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
 38
 39                          *DIAGRAM
 40  *** FREE ***
 41              1           ID
 42              2           ID   ***********************************************
 43              3           ID   *          HYDROLOGIC ANALYSIS                *
 44              4           ID   *                FOR                          *
 45              5           ID   *         SYMPHONY PARK RESIDENTIAL           *
 46              6           ID   *            EXISTING CONDITION               *
 47              7           ID   *                                             *
 48              8           ID   ***********************************************
 49              9           ID
 50             10           ID   ****************************
 51             11           ID   *       10 & 100 YEAR       *
 52             12           ID   *        STORM EVENT        *
 53             13           ID   ****************************
 54             14           ID
 55                          *DIAGRAM
 56             15           IT       5       0       0     300
 57             16           IO       5       0       0
 58             17           IN       5       0       0
 59             18           JR    PREC    0.57    1.00
 60
 61             19           KK    EON1
 62             20           KM    ONSITE BASIN 1
 63             21           BA   .0028
 64             22           PB    2.77
 65             23           PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
 66             24           PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
 67             25           PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
 68             26           PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
 69             27           PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
 70             28           PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
 71             29           PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
 72             30           PC    .998    .999   1.00
 73             31           LS       0      98
 74             32           UD   .0500
 75                          *
 76
 77             33           KK   REON1
 78             34           KM    ROUTE EON1 TO CP1
 79             35           RD     351    0.10   0.013       0    TRAP       0       3
 80                          *
 81
 82             36           KK    EON2
 83             37           KM    ONSITE BASIN 2
 84             38           BA   .0028
 85             39           LS       0      98
 86             40           UD   .0500
 87                          *
 88 1                                                HEC-1 INPUT                                                                 PAGE  2
 89
 90           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
 91
 92
 93             41           KK   EOFF4
 94             42           KM    OFFSITE BASIN ON CARSON AVENUE
 95             43           BA   .0002
 96             44           LS       0      98
 97             45           UD  0.0697
 98                          *
 99
100             46           KK     CP1
101             47           KM    COMBINE EON1 & EON2 & EOFF4
```

```
             48           HC       3
                          *
             49           KK   EOFF1
             50           KM    OFFSITE BASIN ON PARK AVENUE
             51           BA   .0002
             52           LS       0      98
             53           UD   .0500
                          *

             54           KK   EOFF2
             55           KM    OFFSITE BASIN ON CITY PARKWAY
             56           BA   .0003
             57           LS       0      98
             58           UD   .0500
                          *

             59           KK   EOFF3
             60           KM    OFFSITE BASIN ON CITY PARKWAY
             61           BA   .0003
             62           LS       0      98
             63           UD   .0634
                          *
             64           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    19        EON1
                V
                V
    33       REON1
                .
                .
    36           .        EON2
                 .           .
                 .           .
    41           .           .       EOFF4
                 .           .           .
                 .           .           .
    46         CP1.......................
                 .
                 .
    49           .       EOFF1
                 .           .
                 .           .
    54           .           .       EOFF2
                 .           .           .
                 .           .           .
    59           .           .           .       EOFF3

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                                    ****************************************
 *                                      *                                   *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                   *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                   *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                   *          609 SECOND STREET           *
 *                                      *                                   *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   15OCT18  TIME  08:17:59  *                                   *           (916) 756-1104             *
 *                                      *                                   *                                      *
 ****************************************                                    ****************************************


                           ********************************************
                           *          HYDROLOGIC ANALYSIS             *
                           *                FOR                       *
                           *         SYMPHONY PARK RESIDENTIAL          *
                           *            EXISTING CONDITION             *
                           *                                           *
                           ********************************************

                           ****************************
                           *       10 & 100 YEAR      *
                           *        STORM EVENT       *
                           ****************************


   16 IO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN          5  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1   0  STARTING DATE
                        ITIME       0000  STARTING TIME
                           NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      2   0  ENDING DATE
                       NDTIME       0055  ENDING TIME
                       ICENT         19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
                         TOTAL TIME BASE   24.92 HOURS
```

```
            ENGLISH UNITS
                 DRAINAGE AREA         SQUARE MILES
                 PRECIPITATION DEPTH   INCHES
                 LENGTH, ELEVATION     FEET
                 FLOW                  CUBIC FEET PER SECOND
                 STORAGE VOLUME        ACRE-FEET
                 SURFACE AREA          ACRES
                 TEMPERATURE           DEGREES FAHRENHEIT

      JP           MULTI-PLAN OPTION
                        NPLAN          1  NUMBER OF PLANS

      JR           MULTI-RATIO OPTION
                       RATIOS OF PRECIPITATION
                       .57      1.00
1

                 PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                          TIME TO PEAK IN HOURS


                                                                  RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1  RATIO 2
                                                        .57     1.00

 HYDROGRAPH AT
+                   EON1       .00     1   FLOW           4.       7.
                                           TIME         3.50     3.50

 ROUTED TO
+                   REON1      .00     1   FLOW           4.       6.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   EON2       .00     1   FLOW           4.       7.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   EOFF4      .00     1   FLOW           0.       0.
                                           TIME         3.50     3.50

  3 COMBINED AT
+                     CP1      .01     1   FLOW           7.      13.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   EOFF1      .00     1   FLOW           0.       0.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   EOFF2      .00     1   FLOW           0.       1.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   EOFF3      .00     1   FLOW           0.       1.
                                           TIME         3.50     3.50
1
                                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                      PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

            FOR PLAN = 1  RATIO=  .00
               REON1  MANE          .49      3.59    210.53      1.36      5.00      3.56    210.00        1.36


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2028E+00 EXCESS= .0000E+00 OUTFLOW= .2028E+00 BASIN STORAGE= .3472E-04 PERCENT ERROR=    .0


            FOR PLAN = 1  RATIO=  .00
               REON1  MANE          .42      6.44    210.23      2.54      5.00      6.40    210.00        2.54


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3792E+00 EXCESS= .0000E+00 OUTFLOW= .3792E+00 BASIN STORAGE= .3364E-04 PERCENT ERROR=    .0




 *** NORMAL END OF HEC-1 ***
```

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL - STANDARD FORM 4

Development: SYMPHONY PARK RESIDENTIAL
Calculated by: ACH
Checked by: BAH
Date: 11/14/2018

TIME OF CONCENTRATION - PROPOSED CONDITION

SUB-BASIN DATA					INITIAL / OVERLAND TIME: t(i)				TRAVEL TIME t(t)				CONCENTRATION TIME t(c)			
SUBBASIN ID	AREA Acre	AREA Sq. Mi.	EX/DEV EX = 1 DEV = 2	CN	K	LENGTH Ft.	SLOPE %	t(i) Min	LENGTH Ft.	SLOPE %	VEL. FPS	t(t) Min	T_L Ft.	FINAL t(c)	t(c) URBANIZED = (L/180)+10 Min	t(lag) =(0.6*T_L)/60 Hr
DEVELOPED CONDITIONS:																
PR05	0.40	0.0006	2	98	0.9036	300	1.40	5.47	5	0.50	2.16	0.04	305	5.51	11.7	0.0551
PR10	1.02	0.0016	2	98	0.9036	116	0.50	4.80	0	0.50	2.16	0.00	116	5.00	10.6	0.0500
PR15	0.77	0.0012	2	98	0.9036	98	0.60	4.15	0	0.60	2.37	0.00	98	5.00	10.5	0.0500
PR20	0.96	0.0015	2	98	0.9036	70	0.20	5.06	0	0.20	1.37	0.00	70	5.06	10.4	0.0506
PR25	0.60	0.0009	2	98	0.9036	300	0.20	10.47	351	0.50	2.16	2.70	651	13.17	13.6	0.1317
PR30	0.80	0.0013	2	98	0.9036	300	3.50	4.03	343	0.50	2.16	2.64	643	6.67	13.6	0.0667
PR35	0.30	0.0005	2	98	0.9036	193	1.20	4.62	193	1.20	3.35	0.96	386	5.58	12.1	0.0558

Equations Used. . .

$t(i) = 1.8 \times (1.1 - K) \times L^{1/2} / S^{1/3}$

$t(t) = L / (60 \times V)$

$t(c) = t(i) + t(t)$

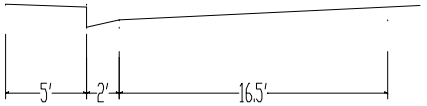
$K = 0.0132 \times CN - 0.39$

For Developed Conditions:

Flow depth at top of curb - Velocity = 30.6 X (Slope)$^{1/2}$

n = 0.016

R = (A/P) ~ 0.187 ft.

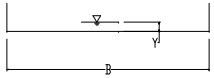


For Existing Conditions:

Wide Rectangular - Velocity = 29.4 X (Slope)$^{1/2}$

n = 0.040

R = (A/P) ~ y



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1*****************************************                                  ***************************************
 *                                       *                                  *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *               JUN   1998              *                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.1                *                                  *         609 SECOND STREET           *
 *                                       *                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   12NOV18  TIME  08:43:44   *                                  *           (916) 756-1104            *
 *                                       *                                  *                                     *
 *****************************************                                  ***************************************


                                          X     X  XXXXXXX   XXXXX           X
                                          X     X  X        X     X         XX
                                          X     X  X        X                X
                                          XXXXXXX  XXXX     X        XXXXX   X
                                          X     X  X        X                X
                                          X     X  X        X     X          X
                                          X     X  XXXXXXX   XXXXX          XXX


            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                HEC-1 INPUT                                                    PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                         *DIAGRAM
 *** FREE ***
               1         ID
               2         ID   ***********************************************
               3         ID   *          HYDROLOGIC ANALYSIS                *
               4         ID   *                FOR                          *
               5         ID   *         SYMPHONY PARK RESIDENTIAL           *
               6         ID   *            EXISTING CONDITION               *
               7         ID   *                                             *
               8         ID   ***********************************************
               9         ID
              10         ID   ****************************
              11         ID   *       10 & 100 YEAR       *
              12         ID   *        STORM EVENT        *
              13         ID   ****************************
              14         ID
                         *DIAGRAM
              15         IT       5       0       0     300
              16         IO       5       0       0
              17         IN       5       0       0
              18         JR    PREC    0.57    1.00

              19         KK    PR05
              20         KM    SOUTHERN PRIVATE STREET
              21         BA   .0006
              22         PB    2.77
              23         PC    .000    .020    .057    .070    .087    .108    .124    .130    .130    .130
              24         PC    .130    .130    .130    .133    .140    .142    .148    .158    .172    .181
              25         PC    .190    .197    .199    .200    .201    .204    .214    .229    .241    .249
              26         PC    .251    .256    .270    .278    .281    .283    .295    .322    .352    .409
              27         PC    .499    .590    .710    .744    .781    .812    .819    .835    .851    .856
              28         PC    .860    .868    .876    .888    .910    .926    .937    .950    .970    .976
              29         PC    .982    .985    .987    .989    .990    .993    .993    .994    .995    .998
              30         PC    .998    .999   1.00
              31         LS       0      98
              32         UD   .0551
                         *

              33         KK    PR10
              34         KM    ONSITE BASIN
              35         BA   .0016
              36         LS       0      98
              37         UD   .0500
                         *

              38         KK    PR15
              39         KM    ONSITE BASIN
              40         BA   .0012
              41         LS       0      98
              42         UD   .0500
                         *
1                                                HEC-1 INPUT                                                    PAGE  2

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


              43         KK    PR20
              44         KM    ONSITE BASIN
              45         BA   .0016
              46         LS       0      98
              47         UD   .0506
                         *
```

```
             48           KK    PR25
             49           KM    EAST PRIVATE STREET
             50           BA   .0009
             51           LS       0      98
             52           UD   .1317
                          *

             53           KK    PR30
             54           KM    WEST PRIVATE STREET
             55           BA   .0013
             56           LS       0      98
             57           UD   .0667
                          *

             58           KK    PR35
             59           KM    NORTHERN PRIVATE STREET
             60           BA   .0005
             61           LS       0      98
             62           UD   .0558
             63           ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    19        PR05
                 .
                 .
    33           .        PR10
                 .           .
                 .           .
    38           .           .        PR15
                 .           .           .
                 .           .           .
    43           .           .           .        PR20
                 .           .           .           .
                 .           .           .           .
    48           .           .           .           .        PR25
                 .           .           .           .           .
                 .           .           .           .           .
    53           .           .           .           .           .        PR30
                 .           .           .           .           .           .
                 .           .           .           .           .           .
    58           .           .           .           .           .           .        PR35

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                                                    ****************************************
 *                                      *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
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 *                                      *                                                    *                                      *
 ****************************************                                                    ****************************************



                            ********************************************
                            *          HYDROLOGIC ANALYSIS             *
                            *                FOR                       *
                            *         SYMPHONY PARK RESIDENTIAL        *
                            *            EXISTING CONDITION            *
                            *                                          *
                            ********************************************

                            ****************************
                            *       10 & 100 YEAR      *
                            *        STORM EVENT       *
                            ****************************


   16 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           5  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME         0000  STARTING TIME
                           NQ          300  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      2    0  ENDING DATE
                       NDTIME         0055  ENDING TIME
                       ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE   24.92 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
```

```
                TEMPERATURE           DEGREES FAHRENHEIT

      JP          MULTI-PLAN OPTION
                        NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                      .57      1.00
1

                PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                    FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                 TIME TO PEAK IN HOURS


                                                                          RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1  RATIO 2
                                                         .57     1.00

 HYDROGRAPH AT
+                   PR05       .00     1   FLOW           1.       1.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   PR10       .00     1   FLOW           2.       4.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   PR15       .00     1   FLOW           2.       3.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   PR20       .00     1   FLOW           2.       4.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   PR25       .00     1   FLOW           1.       2.
                                           TIME         3.58     3.58

 HYDROGRAPH AT
+                   PR30       .00     1   FLOW           2.       3.
                                           TIME         3.50     3.50

 HYDROGRAPH AT
+                   PR35       .00     1   FLOW           1.       1.
                                           TIME         3.50     3.50


 *** NORMAL END OF HEC-1 ***
```

APPENDIX C – HYDRAULIC CALCULATIONS

- Proposed Drop Inlet Calculation
- FlowMaster Hydraulic Sections – Streets
- FlowMaster Hydraulic Sections - Onsite
- WSPG Model

Symphony Park Residential

Inlet Calculation for NDOT Drop Inlets in Sump Condition

Inlet interception for the 100 yr event based on HEC-22 in accordance with NDOT Drainage Manual

By: BAH
Date: 11/14/2018

Determination of Flow Interception Capacitly of NDOT Drop Inlets

			1	2	3	4	5	6	7	8	9	10	11	12	14	15	
Location	Inlet Type		Q_{100}	Equivelant Pipe Size	Perimeter	Usable Perimeter	Ag	Clogging Factor Grate	Depth	Depth Available	Q_{grate}	Q_{grate}	Weir vs. Orifice Control	Grate Interception	Outlet Pipe Capacity	Actual Interception	Controling Inteception
Subbasin			(cfs)	(in)	(ft)	(ft)	(ft^2)	(%)	(ft)	(ft)	(cfs)	(cfs)		(cfs)	(cfs)	(cfs)	(cfs)
PR05 - Inlet #1	NDOT	Type 2	1.00	18	9	9	3.40	50%	0.50	0.50	9.55	6.46	Orifice	6.46	13.82	6.46	Grate
PR25 & PR35 - Inlet #2	NDOT	Type 2	3.00	18	9	9	3.40	50%	0.50	0.50	9.55	6.46	Orifice	6.46	13.82	6.46	Grate

Notes:

2 Total flow that gets to sump inlet
3 Outflow Pipe Size
4 Actual perimeter of the grate
5 This is the perimeter of the grate accounting for clogging and structures which are expected to impede the flow
6 Ag = Clear opening area of grate = Area of grate - Area of bars
7 Clogging Factor of Grate in Sump Condition
8 Ponding depth to capture 100 - year flow
9 The available depth for ponding to occur in the channel
10 Capacity of grate inlet operating as a weir: $Q_i = C_w P d^{1.5}$ where $C_w = 3.0$, P = Usable Perimeter, d = flow depth Hec-22 Eq. 4-26 Pg. 4-46
11 Capacity of grate inlet operating as an orifice: $Q_i = C_o A_g (1 - \text{CLOGGING FACTOR})(2gd)^{0.5}$ where $C_o = 0.65$, Ag = Clear opening of grate, $g = 32.2\ ft/s^2$, d = flow depth, Hec-22 Eq. 4-27 Pg. 4-46
12 This column shows if the flow is by weir control or orifice control
13 The flow captured is the lesser of the total flow that gets to the sump, the expected weir flow capture, and the expected orifice capture (units as shown)
Drop inlet outlet pipe capacity: $Q_p = CA(2GH)^{0.5}$ where C = 0.65 per HCDDM, A = area of opening, $G = 32.2\ ft/s^2$, H = head above centroid of orifice

Kimley»Horn

Worksheet for HS-1 EOFF2 Q10

Results

Critical Depth		0.24	ft
Critical Slope		0.00862	ft/ft
Velocity		1.63	ft/s
Velocity Head		0.04	ft
Specific Energy		0.27	ft
Froude Number		1.08	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		0.23	ft
Critical Depth		0.24	ft
Channel Slope		0.01000	ft/ft
Critical Slope		0.00862	ft/ft

Cross Section for HS-1 EOFF2 Q10

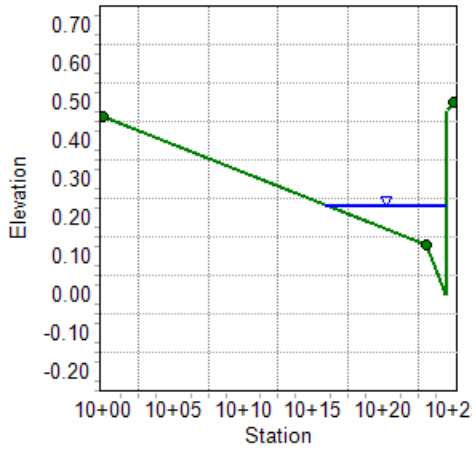
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.23	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for HS-1 EOFF2 Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	0.46
10+23.00	0.13
10+24.42	0.00
10+24.50	0.48
10+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 0.46)	(10+23.00, 0.13)	0.016
(10+23.00, 0.13)	(10+25.00, 0.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.23	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.61	ft²
Wetted Perimeter	8.86	ft
Hydraulic Radius	0.07	ft
Top Width	8.65	ft
Normal Depth	0.23	ft

Worksheet for HS-1 EOFF2 Q100

Results

Critical Depth		0.24	ft
Critical Slope		0.00862	ft/ft
Velocity		1.63	ft/s
Velocity Head		0.04	ft
Specific Energy		0.27	ft
Froude Number		1.08	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.23	ft
Critical Depth	0.24	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00862	ft/ft

Cross Section for HS-1 EOFF2 Q100

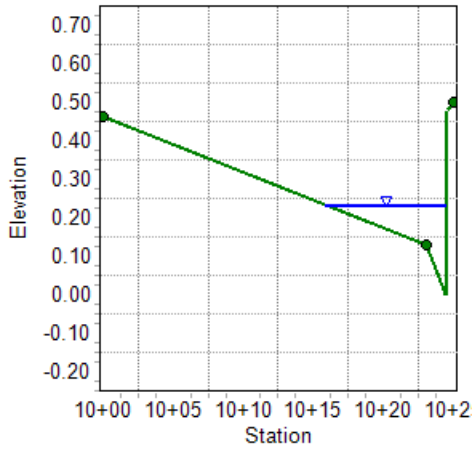
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.23	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for HS-2 EOFF3 Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	0.46
10+23.00	0.13
10+24.42	0.00
10+24.50	0.48
10+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 0.46)	(10+23.00, 0.13)	0.016
(10+23.00, 0.13)	(10+25.00, 0.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.23	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.61	ft²
Wetted Perimeter	8.86	ft
Hydraulic Radius	0.07	ft
Top Width	8.65	ft
Normal Depth	0.23	ft

Worksheet for HS-2 EOFF3 Q10

Results

Critical Depth		0.24	ft
Critical Slope		0.00862	ft/ft
Velocity		1.63	ft/s
Velocity Head		0.04	ft
Specific Energy		0.27	ft
Froude Number		1.08	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.23	ft
Critical Depth	0.24	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00862	ft/ft

Cross Section for HS-2 EOFF3 Q10

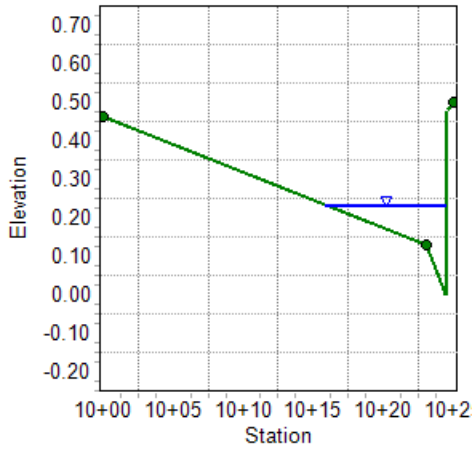
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.23	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for HS-2 EOFF3 Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	0.46
10+23.00	0.13
10+24.42	0.00
10+24.50	0.48
10+25.00	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 0.46)	(10+23.00, 0.13)	0.016
(10+23.00, 0.13)	(10+25.00, 0.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.23	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.61	ft²
Wetted Perimeter	8.86	ft
Hydraulic Radius	0.07	ft
Top Width	8.65	ft
Normal Depth	0.23	ft

Worksheet for HS-2 EOFF3 Q100

Results

Critical Depth		0.24	ft
Critical Slope		0.00862	ft/ft
Velocity		1.63	ft/s
Velocity Head		0.04	ft
Specific Energy		0.27	ft
Froude Number		1.08	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		0.23	ft
Critical Depth		0.24	ft
Channel Slope		0.01000	ft/ft
Critical Slope		0.00862	ft/ft

Cross Section for HS-2 EOFF3 Q100

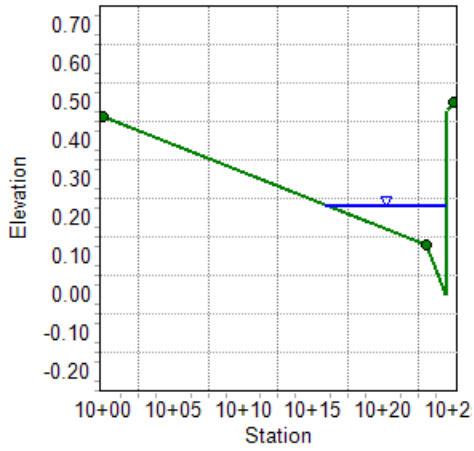
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.23	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for CP 10 yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00550	ft/ft
Discharge	2.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2040.00
0+00.00	2036.23
0+19.99	2035.95
0+21.86	2035.96
0+22.86	2035.83
0+23.36	2036.33
0+24.49	2036.35
0+24.49	2040.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2040.00)	(0+24.49, 2040.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.27	ft
Elevation Range	2035.83 to 2040.00 ft	
Flow Area	1.38	ft²
Wetted Perimeter	14.30	ft
Hydraulic Radius	0.10	ft

Worksheet for CP 10 yr

Results

Top Width		14.18	ft
Normal Depth		0.27	ft
Critical Depth		0.26	ft
Critical Slope		0.00843	ft/ft
Velocity		1.45	ft/s
Velocity Head		0.03	ft
Specific Energy		0.31	ft
Froude Number		0.82	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.27	ft
Critical Depth	0.26	ft
Channel Slope	0.00550	ft/ft
Critical Slope	0.00843	ft/ft

Cross Section for CP 10 yr

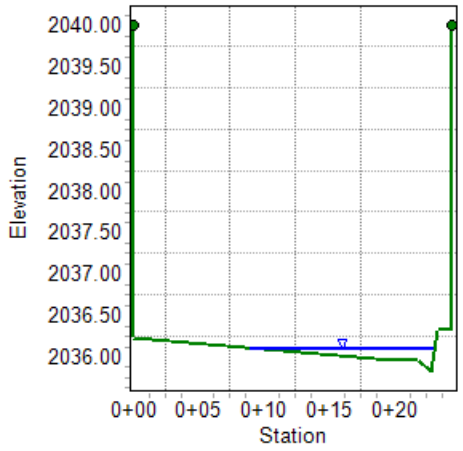
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00550	ft/ft
Normal Depth	0.27	ft
Discharge	2.00	ft³/s

Cross Section Image



Worksheet for CP 100 yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00550	ft/ft
Discharge	3.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2040.00
0+00.00	2036.23
0+19.99	2035.95
0+21.86	2035.96
0+22.86	2035.83
0+23.36	2036.33
0+24.49	2036.35
0+24.49	2040.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2040.00)	(0+24.49, 2040.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.31	ft
Elevation Range	2035.83 to 2040.00 ft	
Flow Area	1.87	ft²
Wetted Perimeter	16.64	ft
Hydraulic Radius	0.11	ft

Worksheet for CP 100 yr

Results

Top Width		16.50	ft
Normal Depth		0.31	ft
Critical Depth		0.29	ft
Critical Slope		0.00798	ft/ft
Velocity		1.60	ft/s
Velocity Head		0.04	ft
Specific Energy		0.35	ft
Froude Number		0.84	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.31	ft
Critical Depth	0.29	ft
Channel Slope	0.00550	ft/ft
Critical Slope	0.00798	ft/ft

Cross Section for CP 100 yr

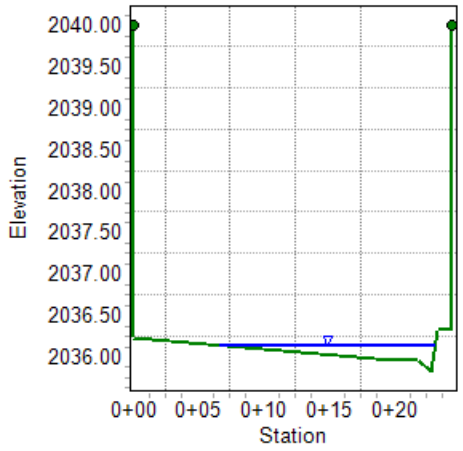
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00550	ft/ft
Normal Depth	0.31	ft
Discharge	3.00	ft³/s

Cross Section Image



Worksheet for CP-2 10 YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00550	ft/ft
Discharge	2.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2040.00
0+00.00	2037.48
0+21.27	2037.07
0+22.98	2036.93
0+23.48	2037.43
0+28.78	2037.56
0+28.78	2040.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2040.00)	(0+28.78, 2040.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.31	ft
Elevation Range	2036.93 to 2040.00 ft	
Flow Area	1.25	ft²
Wetted Perimeter	11.18	ft
Hydraulic Radius	0.11	ft
Top Width	11.05	ft

Worksheet for CP-2 10 YR

Results

Normal Depth		0.31	ft
Critical Depth		0.30	ft
Critical Slope		0.00801	ft/ft
Velocity		1.60	ft/s
Velocity Head		0.04	ft
Specific Energy		0.35	ft
Froude Number		0.84	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		0.31	ft
Critical Depth		0.30	ft
Channel Slope		0.00550	ft/ft
Critical Slope		0.00801	ft/ft

Cross Section for CP-2 10 YR

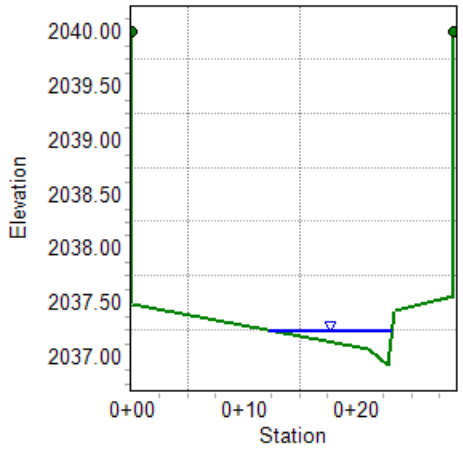
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00550	ft/ft
Normal Depth	0.31	ft
Discharge	2.00	ft³/s

Cross Section Image



Worksheet for CP-2 100 YR

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00550	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2040.00
0+00.00	2037.48
0+21.27	2037.07
0+22.98	2036.93
0+23.48	2037.43
0+28.78	2037.56
0+28.78	2040.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2040.00)	(0+28.78, 2040.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.26	ft
Elevation Range	2036.93 to 2040.00 ft	
Flow Area	0.73	ft²
Wetted Perimeter	8.30	ft
Hydraulic Radius	0.09	ft
Top Width	8.19	ft

Worksheet for CP-2 100 YR

Results

Normal Depth		0.26	ft
Critical Depth		0.24	ft
Critical Slope		0.00872	ft/ft
Velocity		1.37	ft/s
Velocity Head		0.03	ft
Specific Energy		0.29	ft
Froude Number		0.81	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		0.26	ft
Critical Depth		0.24	ft
Channel Slope		0.00550	ft/ft
Critical Slope		0.00872	ft/ft

Cross Section for CP-2 100 YR

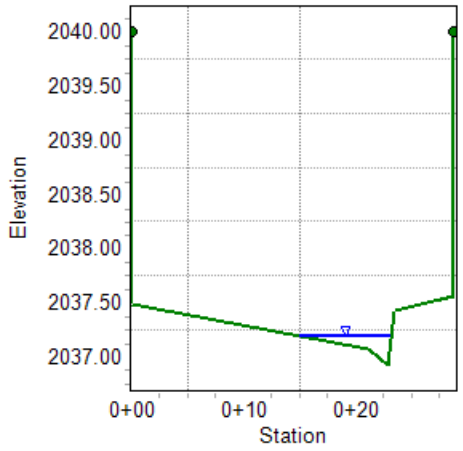
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00550	ft/ft
Normal Depth	0.26	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for E 10 yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00870	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2040.00
0+00.06	2035.53
0+01.71	2035.40
0+05.69	2035.48
0+06.19	2034.98
0+29.22	2034.27
0+29.22	2040.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2040.00)	(0+29.22, 2040.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.19	ft
Elevation Range	2034.27 to 2040.00 ft		
Flow Area		0.57	ft²
Wetted Perimeter		6.28	ft
Hydraulic Radius		0.09	ft
Top Width		6.09	ft

Worksheet for E 10 yr

Results

Normal Depth		0.19	ft
Critical Depth		0.19	ft
Critical Slope		0.00854	ft/ft
Velocity		1.75	ft/s
Velocity Head		0.05	ft
Specific Energy		0.24	ft
Froude Number		1.01	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.19	ft
Critical Depth	0.19	ft
Channel Slope	0.00870	ft/ft
Critical Slope	0.00854	ft/ft

Cross Section for E 10 yr

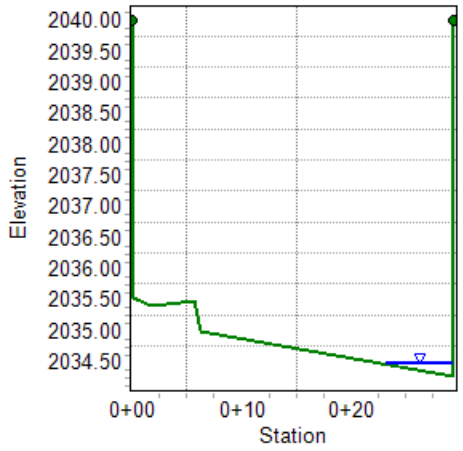
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00870	ft/ft
Normal Depth	0.19	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for E 100 yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00870	ft/ft
Discharge	2.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2040.00
0+00.06	2035.53
0+01.71	2035.40
0+05.69	2035.48
0+06.19	2034.98
0+29.22	2034.27
0+29.22	2040.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2040.00)	(0+29.22, 2040.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.24	ft
Elevation Range	2034.27 to 2040.00 ft		
Flow Area		0.96	ft²
Wetted Perimeter		8.14	ft
Hydraulic Radius		0.12	ft
Top Width		7.89	ft

Worksheet for E 100 yr

Results

Normal Depth		0.24	ft
Critical Depth		0.25	ft
Critical Slope		0.00779	ft/ft
Velocity		2.08	ft/s
Velocity Head		0.07	ft
Specific Energy		0.31	ft
Froude Number		1.05	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.24	ft
Critical Depth	0.25	ft
Channel Slope	0.00870	ft/ft
Critical Slope	0.00779	ft/ft

Cross Section for E 100 yr

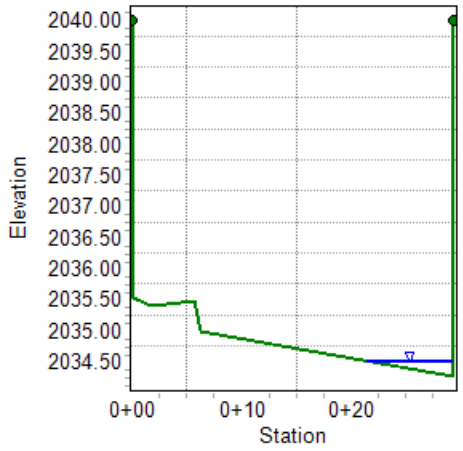
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00870	ft/ft
Normal Depth	0.24	ft
Discharge	2.00	ft³/s

Cross Section Image



Worksheet for N 10 & 100 yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01100	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2040.00
0+00.00	2034.58
0+01.47	2034.55
0+01.97	2034.05
0+02.97	2034.18
0+17.98	2034.41
0+17.98	2040.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2040.00)	(0+17.98, 2040.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.24	ft
Elevation Range	2034.05 to 2040.00 ft		
Flow Area		0.60	ft²
Wetted Perimeter		8.56	ft
Hydraulic Radius		0.07	ft
Top Width		8.46	ft

Worksheet for N 10 & 100 yr

Results

Normal Depth		0.24	ft
Critical Depth		0.25	ft
Critical Slope		0.00905	ft/ft
Velocity		1.66	ft/s
Velocity Head		0.04	ft
Specific Energy		0.28	ft
Froude Number		1.09	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.24	ft
Critical Depth	0.25	ft
Channel Slope	0.01100	ft/ft
Critical Slope	0.00905	ft/ft

Cross Section for N 10 & 100 yr

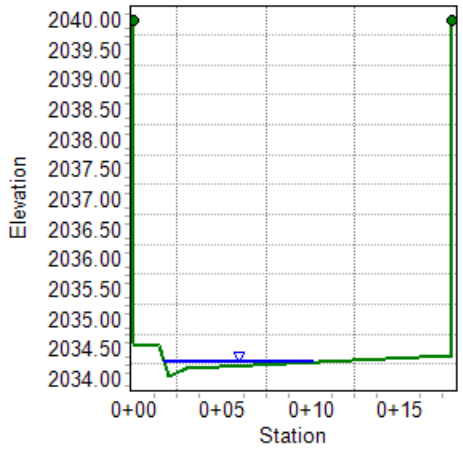
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01100	ft/ft
Normal Depth	0.24	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for S 10 & 100 yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00447	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2050.00
0+00.00	2039.36
0+22.68	2036.94
0+26.32	2039.01
0+26.32	2050.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2050.00)	(0+26.32, 2050.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.32	ft
Elevation Range	2036.94 to 2050.00 ft		
Flow Area		0.56	ft²
Wetted Perimeter		3.63	ft
Hydraulic Radius		0.15	ft
Top Width		3.53	ft
Normal Depth		0.32	ft
Critical Depth		0.29	ft

Worksheet for S 10 & 100 yr

Results

Critical Slope		0.00738	ft/ft
Velocity		1.78	ft/s
Velocity Head		0.05	ft
Specific Energy		0.37	ft
Froude Number		0.79	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	0.29	ft
Channel Slope	0.00447	ft/ft
Critical Slope	0.00738	ft/ft

Cross Section for S 10 & 100 yr

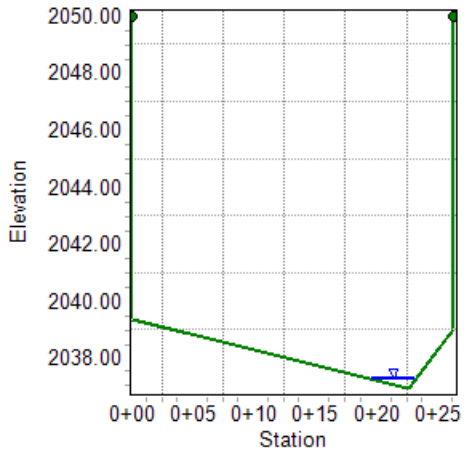
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00447	ft/ft
Normal Depth	0.32	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for SWALE #1 Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Discharge	4.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	2.00
10+35.00	1.50
10+39.50	0.00
10+44.00	1.50
10+47.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 2.00)	(10+35.00, 1.50)	0.016
(10+35.00, 1.50)	(10+47.00, 1.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.76	ft
Elevation Range	0.00 to 2.00 ft	
Flow Area	1.73	ft²
Wetted Perimeter	4.80	ft
Hydraulic Radius	0.36	ft
Top Width	4.56	ft
Normal Depth	0.76	ft

Worksheet for SWALE #1 Q10

Results

Critical Depth		0.64	ft
Critical Slope		0.00385	ft/ft
Velocity		2.31	ft/s
Velocity Head		0.08	ft
Specific Energy		0.84	ft
Froude Number		0.66	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.76	ft
Critical Depth	0.64	ft
Channel Slope	0.00160	ft/ft
Critical Slope	0.00385	ft/ft

Cross Section for SWALE #1 Q10

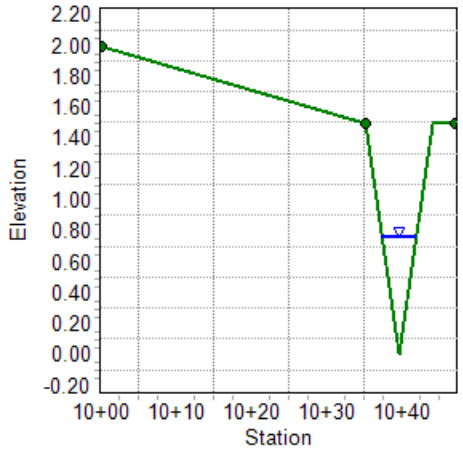
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Normal Depth	0.76	ft
Discharge	4.00	ft³/s

Cross Section Image



Worksheet for SWALE #1 Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Discharge	7.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	2.00
10+35.00	1.50
10+39.50	0.00
10+44.00	1.50
10+47.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 2.00)	(10+35.00, 1.50)	0.016
(10+35.00, 1.50)	(10+47.00, 1.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.94	ft
Elevation Range	0.00 to 2.00 ft	
Flow Area	2.63	ft²
Wetted Perimeter	5.92	ft
Hydraulic Radius	0.44	ft
Top Width	5.62	ft
Normal Depth	0.94	ft

Worksheet for SWALE #1 Q100

Results

Critical Depth		0.81	ft
Critical Slope		0.00358	ft/ft
Velocity		2.66	ft/s
Velocity Head		0.11	ft
Specific Energy		1.05	ft
Froude Number		0.69	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		0.94	ft
Critical Depth		0.81	ft
Channel Slope		0.00160	ft/ft
Critical Slope		0.00358	ft/ft

Cross Section for SWALE #1 Q100

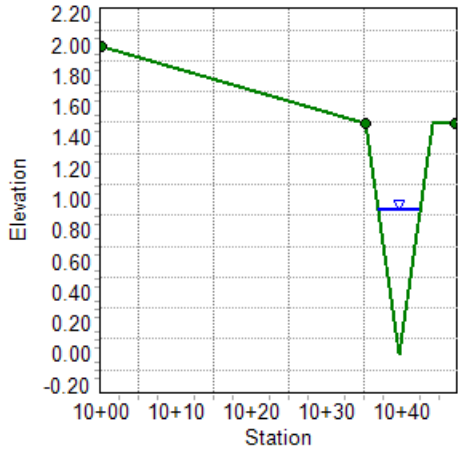
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Normal Depth	0.94	ft
Discharge	7.00	ft³/s

Cross Section Image



Worksheet for SWALE #2 Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Discharge	7.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	2.00
10+35.00	1.50
10+39.50	0.00
10+44.00	1.50
10+47.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 2.00)	(10+35.00, 1.50)	0.016
(10+35.00, 1.50)	(10+47.00, 1.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.94	ft
Elevation Range	0.00 to 2.00 ft	
Flow Area	2.63	ft²
Wetted Perimeter	5.92	ft
Hydraulic Radius	0.44	ft
Top Width	5.62	ft
Normal Depth	0.94	ft

Worksheet for SWALE #2 Q10

Results

Critical Depth		0.81	ft
Critical Slope		0.00358	ft/ft
Velocity		2.66	ft/s
Velocity Head		0.11	ft
Specific Energy		1.05	ft
Froude Number		0.69	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.94	ft
Critical Depth	0.81	ft
Channel Slope	0.00160	ft/ft
Critical Slope	0.00358	ft/ft

Cross Section for SWALE #2 Q10

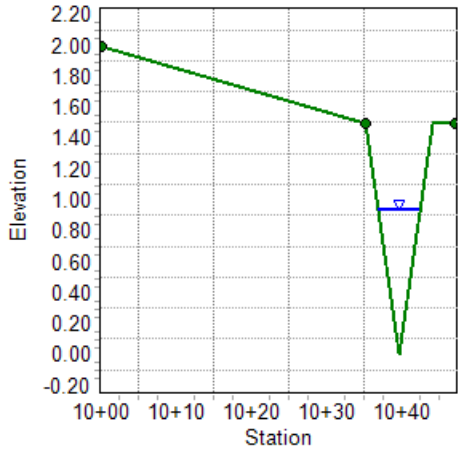
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Normal Depth	0.94	ft
Discharge	7.00	ft³/s

Cross Section Image



Worksheet for SWALE #2 Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Discharge	13.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	2.00
10+35.00	1.50
10+39.50	0.00
10+44.00	1.50
10+47.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 2.00)	(10+35.00, 1.50)	0.016
(10+35.00, 1.50)	(10+47.00, 1.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.18	ft
Elevation Range	0.00 to 2.00 ft	
Flow Area	4.18	ft²
Wetted Perimeter	7.47	ft
Hydraulic Radius	0.56	ft
Top Width	7.09	ft
Normal Depth	1.18	ft

Worksheet for SWALE #2 Q100

Results

Critical Depth		1.03	ft
Critical Slope		0.00329	ft/ft
Velocity		3.11	ft/s
Velocity Head		0.15	ft
Specific Energy		1.33	ft
Froude Number		0.71	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		1.18	ft
Critical Depth		1.03	ft
Channel Slope		0.00160	ft/ft
Critical Slope		0.00329	ft/ft

Cross Section for SWALE #2 Q100

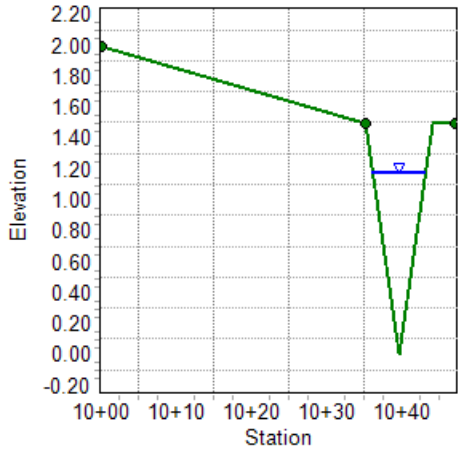
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Normal Depth	1.18	ft
Discharge	13.00	ft³/s

Cross Section Image



Cross Section for PR SWALE

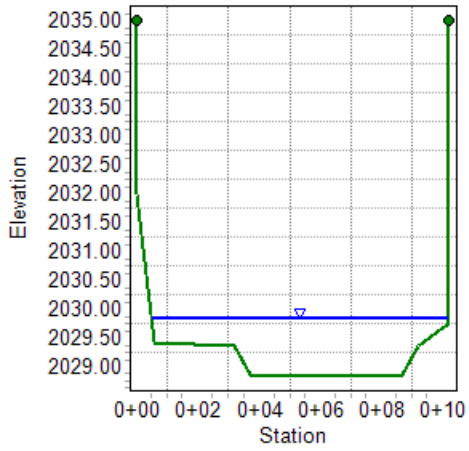
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00180	ft/ft
Normal Depth	1.01	ft
Discharge	5.00	ft³/s

Cross Section Image



Worksheet for PR SWALE

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00180	ft/ft
Discharge	5.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2035.00
0+00.00	2031.97
0+00.58	2029.42
0+03.20	2029.36
0+03.70	2028.86
0+06.20	2028.82
0+08.70	2028.86
0+09.20	2029.36
0+10.20	2029.75
0+10.20	2035.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2035.00)	(0+10.20, 2035.00)	0.069

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.01	ft
Elevation Range	2028.82 to 2035.00 ft	
Flow Area	7.13	ft²

Worksheet for PR SWALE

Results

Wetted Perimeter		10.61	ft
Hydraulic Radius		0.67	ft
Top Width		9.71	ft
Normal Depth		1.01	ft
Critical Depth		0.33	ft
Critical Slope		0.11059	ft/ft
Velocity		0.70	ft/s
Velocity Head		0.01	ft
Specific Energy		1.02	ft
Froude Number		0.14	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.01	ft
Critical Depth	0.33	ft
Channel Slope	0.00180	ft/ft
Critical Slope	0.11059	ft/ft

Worksheet for S 10 & 100 yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00447	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2050.00
0+00.00	2039.36
0+22.68	2036.94
0+26.32	2039.01
0+26.32	2050.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2050.00)	(0+26.32, 2050.00)	0.016

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.32	ft
Elevation Range	2036.94 to 2050.00 ft		
Flow Area		0.56	ft²
Wetted Perimeter		3.63	ft
Hydraulic Radius		0.15	ft
Top Width		3.53	ft
Normal Depth		0.32	ft
Critical Depth		0.29	ft

Worksheet for S 10 & 100 yr

Results

Critical Slope		0.00738	ft/ft
Velocity		1.78	ft/s
Velocity Head		0.05	ft
Specific Energy		0.37	ft
Froude Number		0.79	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	0.29	ft
Channel Slope	0.00447	ft/ft
Critical Slope	0.00738	ft/ft

Cross Section for S 10 & 100 yr

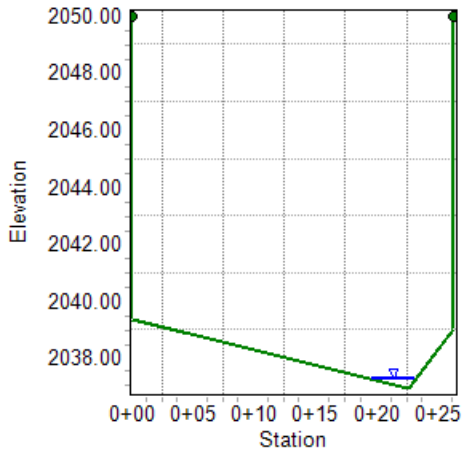
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00447	ft/ft
Normal Depth	0.32	ft
Discharge	1.00	ft³/s

Cross Section Image



Worksheet for SWALE #1 Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Discharge	4.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	2.00
10+35.00	1.50
10+39.50	0.00
10+44.00	1.50
10+47.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 2.00)	(10+35.00, 1.50)	0.016
(10+35.00, 1.50)	(10+47.00, 1.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.76	ft
Elevation Range	0.00 to 2.00 ft	
Flow Area	1.73	ft²
Wetted Perimeter	4.80	ft
Hydraulic Radius	0.36	ft
Top Width	4.56	ft
Normal Depth	0.76	ft

Worksheet for SWALE #1 Q10

Results

Critical Depth		0.64	ft
Critical Slope		0.00385	ft/ft
Velocity		2.31	ft/s
Velocity Head		0.08	ft
Specific Energy		0.84	ft
Froude Number		0.66	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.76	ft
Critical Depth	0.64	ft
Channel Slope	0.00160	ft/ft
Critical Slope	0.00385	ft/ft

Cross Section for SWALE #1 Q10

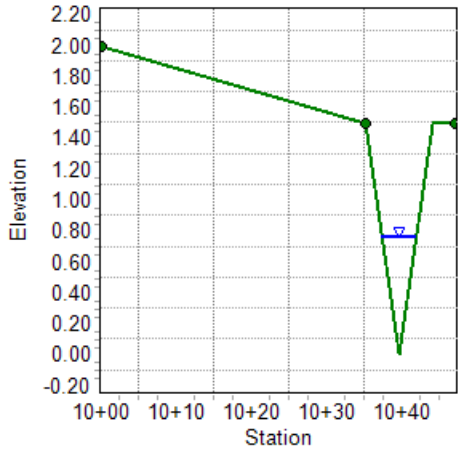
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Normal Depth	0.76	ft
Discharge	4.00	ft³/s

Cross Section Image



Worksheet for SWALE #1 Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Discharge	7.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	2.00
10+35.00	1.50
10+39.50	0.00
10+44.00	1.50
10+47.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 2.00)	(10+35.00, 1.50)	0.016
(10+35.00, 1.50)	(10+47.00, 1.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.94	ft
Elevation Range	0.00 to 2.00 ft	
Flow Area	2.63	ft²
Wetted Perimeter	5.92	ft
Hydraulic Radius	0.44	ft
Top Width	5.62	ft
Normal Depth	0.94	ft

Worksheet for SWALE #1 Q100

Results

Critical Depth		0.81	ft
Critical Slope		0.00358	ft/ft
Velocity		2.66	ft/s
Velocity Head		0.11	ft
Specific Energy		1.05	ft
Froude Number		0.69	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		0.94	ft
Critical Depth		0.81	ft
Channel Slope		0.00160	ft/ft
Critical Slope		0.00358	ft/ft

Cross Section for SWALE #1 Q100

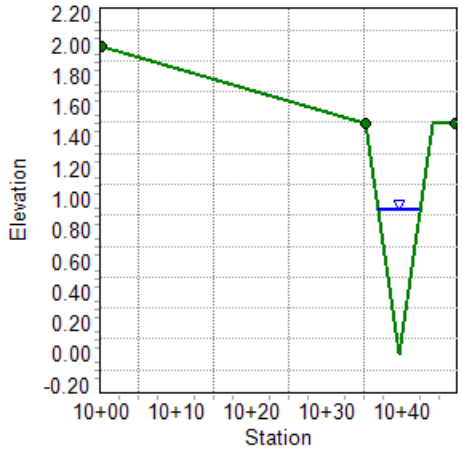
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Normal Depth	0.94	ft
Discharge	7.00	ft³/s

Cross Section Image



Worksheet for SWALE #2 Q10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Discharge	7.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	2.00
10+35.00	1.50
10+39.50	0.00
10+44.00	1.50
10+47.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 2.00)	(10+35.00, 1.50)	0.016
(10+35.00, 1.50)	(10+47.00, 1.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.94	ft
Elevation Range	0.00 to 2.00 ft	
Flow Area	2.63	ft²
Wetted Perimeter	5.92	ft
Hydraulic Radius	0.44	ft
Top Width	5.62	ft
Normal Depth	0.94	ft

Worksheet for SWALE #2 Q10

Results

Critical Depth		0.81	ft
Critical Slope		0.00358	ft/ft
Velocity		2.66	ft/s
Velocity Head		0.11	ft
Specific Energy		1.05	ft
Froude Number		0.69	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.94	ft
Critical Depth	0.81	ft
Channel Slope	0.00160	ft/ft
Critical Slope	0.00358	ft/ft

Cross Section for SWALE #2 Q10

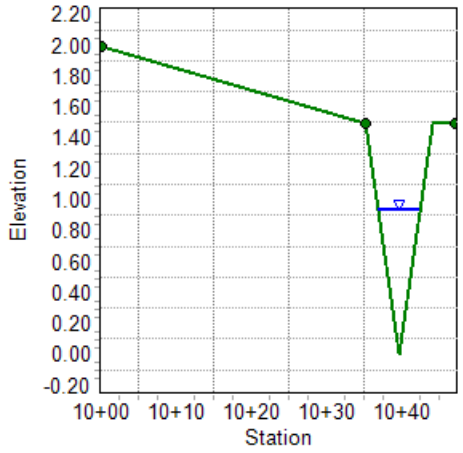
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Normal Depth	0.94	ft
Discharge	7.00	ft³/s

Cross Section Image



Worksheet for SWALE #2 Q100

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Discharge	13.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
10+00.00	2.00
10+35.00	1.50
10+39.50	0.00
10+44.00	1.50
10+47.00	1.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(10+00.00, 2.00)	(10+35.00, 1.50)	0.016
(10+35.00, 1.50)	(10+47.00, 1.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.18	ft
Elevation Range	0.00 to 2.00 ft	
Flow Area	4.18	ft²
Wetted Perimeter	7.47	ft
Hydraulic Radius	0.56	ft
Top Width	7.09	ft
Normal Depth	1.18	ft

Worksheet for SWALE #2 Q100

Results

Critical Depth		1.03	ft
Critical Slope		0.00329	ft/ft
Velocity		3.11	ft/s
Velocity Head		0.15	ft
Specific Energy		1.33	ft
Froude Number		0.71	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		1.18	ft
Critical Depth		1.03	ft
Channel Slope		0.00160	ft/ft
Critical Slope		0.00329	ft/ft

Cross Section for SWALE #2 Q100

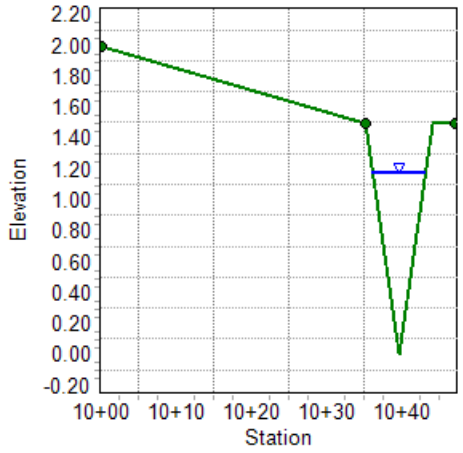
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00160	ft/ft
Normal Depth	1.18	ft
Discharge	13.00	ft³/s

Cross Section Image



Worksheet for PR SWALE

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00180	ft/ft
Discharge	5.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	2036.86
0+01.03	2032.93
0+01.27	2029.43
0+03.89	2029.37
0+04.84	2028.82
0+06.93	2028.82
0+09.39	2028.87
0+12.70	2030.12
0+16.82	2030.77
0+21.76	2030.91

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 2036.86)	(0+21.76, 2030.91)	0.068

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.98	ft
Elevation Range	2028.82 to 2036.86 ft	
Flow Area	7.24	ft²

Worksheet for PR SWALE

Results

Wetted Perimeter		11.26	ft
Hydraulic Radius		0.64	ft
Top Width		10.60	ft
Normal Depth		0.98	ft
Critical Depth		0.33	ft
Critical Slope		0.10602	ft/ft
Velocity		0.69	ft/s
Velocity Head		0.01	ft
Specific Energy		0.99	ft
Froude Number		0.15	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		0.98	ft
Critical Depth		0.33	ft
Channel Slope		0.00180	ft/ft
Critical Slope		0.10602	ft/ft

Cross Section for PR SWALE

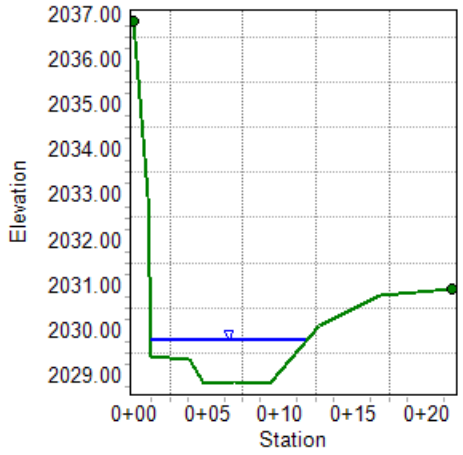
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00180	ft/ft
Normal Depth	0.98	ft
Discharge	5.00	ft³/s

Cross Section Image



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 1 T1 SYMPHONY PARK RESIDENTIAL TDS                                                                    0
 2 T2 KHA 192008000 - NOVEMBER 2018
 3 T3 LINE-2-PHASE-I - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK TDS

 4 SO   1000.0002028.670  5                          2030.879
 5 R    1039.8802028.830  5      .013                                .000    .000 1
 6 R    1047.0002028.853  5      .013                                .000    .000 0
 7 JX   1076.3802028.950  7  3   .013    4.00          2028.950         90.0
 8 R    1255.6202029.690  7      .013                                .000    .000 1
 9 JX   1258.1202029.690  7  2   .013   10.00          2030.41          90.0
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11 R    1310.9502030.030  7      .013                                .000    .000 1
12 JX   1313.4502030.030  7  1  3.013    6.000    1.0002029.9902029.990 90.0 90.0    .000
13 TS   1315.9502030.230  2      .013                                .000    .000 0
14 R    1519.7002030.750  2      .013                                .000    .000 0
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17 SH   1617.1602031.190  1                            .000
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19 CD   2  4   1    .000   2.500     .000  .000  .000   .00
20 CD   3  4   1    .000   1.500     .000  .000  .000   .00
21 CD   5  3   0    .000   3.000    4.000  .000  .000   .00
22 CD   6  4   1    .000   4.000     .000  .000  .000   .00
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24 Q            10.000   .0
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FILE: P1UP-LINE2.WSW W S P G W - CIVILDESIGN Version 14.06 PAGE 1

Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date:11-12-2018 Time: 1:58:13

SYMPHONY PARK RESIDENTIAL TDS

KHA 192008000 - NOVEMBER 2018

LINE-2-PHASE-I - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK TD

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2028.670	2.209	2030.879	31.00	3.51	.19	2031.07	.00	1.23	4.00	3.000	4.000	.00	0 .0
27.282	.0040					.0009	.02	2.21	.42	1.27	.013	.00	.00	BOX
1027.282	2028.779	2.106	2030.886	31.00	3.68	.21	2031.10	.00	1.23	4.00	3.000	4.000	.00	0 .0
12.598	.0040					.0010	.01	2.11	.45	1.27	.013	.00	.00	BOX
1039.880	2028.830	2.059	2030.889	31.00	3.76	.22	2031.11	.00	1.23	4.00	3.000	4.000	.00	0 .0
7.120	.0032					.0011	.01	2.06	.46	1.37	.013	.00	.00	BOX
1047.000	2028.853	2.040	2030.893	31.00	3.80	.22	2031.12	.00	1.23	4.00	3.000	4.000	.00	0 .0
JUNCT STR	.0033					.0025	.07	2.04	.47		.013	.00	.00	BOX
		---------- WARNING - Junction Analysis - Change in Channel Type ----------												
1076.380	2028.950	1.761	2030.711	27.00	6.26	.61	2031.32	.00	1.68	2.95	3.000	.000	.00	1 .0
34.385	.0041					.0040	.14	1.76	.91	1.73	.013	.00	.00	PIPE
1110.765	2029.092	1.727	2030.819	27.00	6.41	.64	2031.46	.00	1.68	2.97	3.000	.000	.00	1 .0
144.855	.0041					.0041	.59	1.73	.95	1.73	.013	.00	.00	PIPE
1255.620	2029.690	1.727	2031.417	27.00	6.41	.64	2032.05	.00	1.68	2.97	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0024	.01	1.73	.95		.013	.00	.00	PIPE
1258.120	2029.690	2.485	2032.175	17.00	2.72	.11	2032.29	.00	1.32	2.26	3.000	.000	.00	1 .0
1.411	.0800					.0007	.00	2.49	.29	.61	.013	.00	.00	PIPE

Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date:11-12-2018 Time: 1:58:13

SYMPHONY PARK RESIDENTIAL TDS
KHA 192008000 - NOVEMBER 2018
LINE-2-PHASE-I - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK TD

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1259.531	2029.803	2.362	2032.165	17.00	2.85	.13	2032.29	.00	1.32	2.46	3.000	.000	.00	1 .0
1.089	.0800					.0007	.00	2.36	.32	.61	.013	.00	.00	PIPE
1260.620	2029.890	2.265	2032.155	17.00	2.97	.14	2032.29	.00	1.32	2.58	3.000	.000	.00	1 .0
44.371	.0028					.0008	.04	2.26	.35	1.47	.013	.00	.00	PIPE
1304.991	2030.013	2.164	2032.177	17.00	3.11	.15	2032.33	.00	1.32	2.69	3.000	.000	.00	1 .0
5.959	.0028					.0009	.01	2.16	.39	1.47	.013	.00	.00	PIPE
1310.950	2030.030	2.150	2032.180	17.00	3.14	.15	2032.33	.00	1.32	2.70	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0006	.00	2.15	.39		.013	.00	.00	PIPE
1313.450	2030.030	2.351	2032.381	10.00	1.68	.04	2032.43	.00	1.00	2.47	3.000	.000	.00	1 .0
TRANS STR	.0800					.0004	.00	2.35	.19		.013	.00	.00	PIPE
1315.950	2030.230	2.125	2032.355	10.00	2.25	.08	2032.43	.00	1.06	1.78	2.500	.000	.00	1 .0
51.908	.0026					.0006	.03	2.13	.25	1.22	.013	.00	.00	PIPE
1367.858	2030.362	2.016	2032.378	10.00	2.36	.09	2032.46	.00	1.06	1.98	2.500	.000	.00	1 .0
46.028	.0026					.0006	.03	2.02	.28	1.22	.013	.00	.00	PIPE
1413.885	2030.480	1.919	2032.399	10.00	2.47	.09	2032.49	.00	1.06	2.11	2.500	.000	.00	1 .0
42.223	.0026					.0007	.03	1.92	.31	1.22	.013	.00	.00	PIPE
1456.108	2030.588	1.832	2032.420	10.00	2.59	.10	2032.52	.00	1.06	2.21	2.500	.000	.00	1 .0
39.522	.0026					.0008	.03	1.83	.35	1.22	.013	.00	.00	PIPE

Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date:11-12-2018 Time: 1:58:13

SYMPHONY PARK RESIDENTIAL TDS

KHA 192008000 - NOVEMBER 2018

LINE-2-PHASE-I - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK TD

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1495.631	2030.688	1.752	2032.441	10.00	2.72	.11	2032.56	.00	1.06	2.29	2.500	.000	.00	1 .0
24.069	.0026					.0009	.02	1.75	.38	1.22	.013	.00	.00	PIPE
1519.700	2030.750	1.705	2032.455	10.00	2.80	.12	2032.58	.00	1.06	2.33	2.500	.000	.00	1 .0
2.000	.0000					.0009	.00	1.71	.40	.00	.013	.00	.00	PIPE
1521.700	2030.750	1.708	2032.458	10.00	2.80	.12	2032.58	.00	1.06	2.33	2.500	.000	.00	1 .0
TRANS STR	.1000					.0019	.00	1.71	.40		.013	.00	.00	PIPE
1523.700	2030.950	1.395	2032.344	10.00	4.28	.28	2032.63	.00	1.13	1.84	2.000	.000	.00	1 .0
TRANS STR	.1000					.0084	.02	1.39	.67		.013	.00	.00	PIPE
1617.160	2031.190	1.395	2032.584	10.00	4.28	.28	2032.87	.00	1.13	1.84	2.000	.000	.00	1 .0

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 1 T1 SYMPHONY PARK RESIDENTIAL TDS                                                                    0
 2 T2 KHA 192008000 - NOVEMBER 2018
 3 T3 LINE-4-PHASE-II - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK TDS

 4 SO   0659.7722027.570  1                          2030.213
 5 JX   0659.7722027.570  1      .013                                    .0   .0    .000
 6 R    0711.7722027.770  5      .013                                 .000    .000 1
 7 JX   0800.4002027.990  5  2   .013    4.000         2027.99         -90.0   .0    .000
 8 R    0892.3002028.220  5      .013                                 .000 -90.000 0
 9 JX   0892.3002028.220  5      .013                                 .000    .0    .000
10 R    1220.7902029.040  5      .013                                 .000  90.000 1
11 JX   1220.7902029.040  5  6   .013    3.000         2031.38         -90.0   .0    .000
12 R    1255.7902029.150  5      .013                                 .000    .000 1
13 JX   1258.2902029.250  5  4  4.013    4.000    3.0002029.3202029.320   .0 90.0    .000
14 R    1260.7902029.350  5      .013                                 .000    .000 0
15 R    1316.8602029.470  5      .013                                 .000    .000 0
16 R    1320.8602029.670  5      .013                                 .000    .000 0
17 R    1532.7402030.210  3      .013                                 .000    .000 1
18 JX   1534.7402030.310  3  4  2.013    1.000    2.0002030.4102030.410 90.0-90.0    .000
19 R    1536.7402030.410  3      .013                                 .000    .000 0
20 R    1590.5402030.560  4      .013                                 .000    .000 1
21 R    1593.0402030.660  4      .013                                 .000  90.050 0
22 R    1595.5402030.760  4      .013                                 .000    .000 0
23 R    1647.5802030.900  4      .013                                 .000    .000 1
24 SH   1647.5802030.900  4                        2032.390
25 CD   1  3   0    .000   3.000    4.000  .000  .000   .00
26 CD   2  4   1    .000   1.500     .000  .000  .000   .00
27 CD   3  4   1    .000   2.500     .000  .000  .000   .00
28 CD   4  4   1    .000   2.000     .000  .000  .000   .00
29 CD   5  4   1    .000   3.000     .000  .000  .000   .00
30 CD   6  4   1    .000   1.000     .000  .000  .000   .00
31 Q            11.000   .0
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Program Package Serial Number: 1911

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SYMPHONY PARK RESIDENTIAL TDS

KHA 192008000 - NOVEMBER 2018

LINE-4-PHASE-II - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK T

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
JUNCT STR	.0000					.0005	.00	2.64	.29		.013	.00	.00	BOX
659.772	2027.570	2.643	2030.213	28.00	4.25	.28	2030.49	.00	1.71	1.94	3.000	.000	.00	1 .0
52.000	.0038					.0016	.09	2.64	.41	1.81	.013	.00	.00	PIPE
711.772	2027.770	2.502	2030.272	28.00	4.45	.31	2030.58	.00	1.71	2.23	3.000	.000	.00	1 .0
JUNCT STR	.0025					.0015	.13	2.50	.47		.013	.00	.00	PIPE
800.400	2027.990	2.583	2030.573	24.00	3.71	.21	2030.79	.00	1.58	2.07	3.000	.000	.00	1 .0
91.900	.0025					.0013	.11	2.58	.37	1.88	.013	.00	.00	PIPE
JUNCT STR	.0000					.0013	.00	2.45	.42		.013	.00	.00	PIPE
892.300	2028.220	2.448	2030.667	24.00	3.89	.23	2030.90	.00	1.58	2.33	3.000	.000	.00	1 .0
85.044	.0025					.0014	.12	2.45	.42	1.89	.013	.00	.00	PIPE
977.344	2028.432	2.329	2030.761	24.00	4.08	.26	2031.02	.00	1.58	2.50	3.000	.000	.00	1 .0
83.089	.0025					.0015	.13	2.33	.47	1.89	.013	.00	.00	PIPE
1060.434	2028.640	2.222	2030.862	24.00	4.28	.28	2031.15	.00	1.58	2.63	3.000	.000	.00	1 .0
86.576	.0025					.0017	.15	2.22	.52	1.89	.013	.00	.00	PIPE
1147.010	2028.856	2.124	2030.980	24.00	4.48	.31	2031.29	.00	1.58	2.73	3.000	.000	.00	1 .0
73.780	.0025					.0019	.14	2.12	.56	1.89	.013	.00	.00	PIPE

Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date:11-12-2018 Time: 4:34: 4

SYMPHONY PARK RESIDENTIAL TDS
KHA 192008000 - NOVEMBER 2018
LINE-4-PHASE-II - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK T

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1220.790	2029.040	2.055	2031.095	24.00	4.65	.34	2031.43	.00	1.58	2.79	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0016	.00	2.06	.60		.013	.00	.00	PIPE
1220.790	2029.040	2.250	2031.290	21.00	3.69	.21	2031.50	.00	1.47	2.60	3.000	.000	.00	1 .0
35.000	.0031					.0012	.04	2.25	.44	1.61	.013	.00	.00	PIPE
1255.790	2029.150	2.167	2031.317	21.00	3.84	.23	2031.55	.00	1.47	2.69	3.000	.000	.00	1 .0
JUNCT STR	.0400					.0009	.00	2.17	.47		.013	.00	.00	PIPE
1258.290	2029.250	2.299	2031.549	14.00	2.41	.09	2031.64	.00	1.19	2.54	3.000	.000	.00	1 .0
2.409	.0400					.0005	.00	2.30	.28	.66	.013	.00	.00	PIPE
1260.699	2029.346	2.195	2031.542	14.00	2.53	.10	2031.64	.00	1.19	2.66	3.000	.000	.00	1 .0
.091	.0400					.0006	.00	2.20	.31	.66	.013	.00	.00	PIPE
1260.790	2029.350	2.191	2031.541	14.00	2.53	.10	2031.64	.00	1.19	2.66	3.000	.000	.00	1 .0
55.204	.0021					.0006	.03	2.19	.31	1.42	.013	.00	.00	PIPE
1315.994	2029.468	2.096	2031.564	14.00	2.65	.11	2031.67	.00	1.19	2.75	3.000	.000	.00	1 .0
.866	.0021					.0006	.00	2.10	.34	1.42	.013	.00	.00	PIPE
1316.860	2029.470	2.095	2031.565	14.00	2.66	.11	2031.67	.00	1.19	2.75	3.000	.000	.00	1 .0
1.560	.0500					.0007	.00	2.09	.34	.62	.013	.00	.00	PIPE
1318.420	2029.548	2.007	2031.555	14.00	2.79	.12	2031.68	.00	1.19	2.82	3.000	.000	.00	1 .0
1.422	.0500					.0008	.00	2.01	.37	.62	.013	.00	.00	PIPE

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                              Program Package Serial Number: 1911
                                          WATER SURFACE PROFILE LISTING                    Date:11-12-2018  Time: 4:34: 4
                            SYMPHONY PARK RESIDENTIAL TDS
                              KHA 192008000 - NOVEMBER 2018
                                LINE-4-PHASE-II - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK T
 ********************************************************************************************************************************** ********
          | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|       |No Wth
  Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL   |Prs/Pip
 ---------|---------|--------|---------|---------|------|-------|---------|-------|--------|--------|-------|-------|-------|-------
  L/Elem  |Ch Slope |        |         |         |      SF Ave  |    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR   |Type Ch
 *********|*********|********|*********|*********|******|*******|*********|*******|********|********|*******|*******|*******|*******
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1319.842  2029.619    1.925  2031.544     14.00    2.92     .13  2031.68     .00    1.19     2.88    3.000     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
     1.018    .0500                                          .0008      .00     1.92     .40     .62     .013      .00   .00  PIPE
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1320.860  2029.670    1.865  2031.535     14.00    3.57     .20  2031.73     .00    1.26     2.18    2.500     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    59.823    .0025                                          .0015      .09     1.86     .47    1.51     .013      .00   .00  PIPE
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1380.683  2029.823    1.782  2031.605     14.00    3.74     .22  2031.82     .00    1.26     2.26    2.500     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    62.484    .0025                                          .0017      .11     1.78     .51    1.51     .013      .00   .00  PIPE
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1443.168  2029.982    1.707  2031.688     14.00    3.92     .24  2031.93     .00    1.26     2.33    2.500     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    70.681    .0025                                          .0019      .13     1.71     .56    1.51     .013      .00   .00  PIPE
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1513.849  2030.162    1.636  2031.798     14.00    4.11     .26  2032.06     .00    1.26     2.38    2.500     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    18.891    .0025                                          .0020      .04     1.64     .61    1.51     .013      .00   .00  PIPE
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1532.740  2030.210    1.620  2031.830     14.00    4.16     .27  2032.10     .00    1.26     2.39    2.500     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
 JUNCT STR   .0500                                          .0015      .00    1.62      .62                .013      .00   .00  PIPE
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1534.740  2030.310    1.746  2032.056     11.00    3.01     .14  2032.20     .00    1.11     2.30    2.500     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
     1.212    .0500                                          .0011      .00     1.75     .42     .58     .013      .00   .00  PIPE
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1535.952  2030.371    1.672  2032.043     11.00    3.15     .15  2032.20     .00    1.11     2.35    2.500     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
      .788    .0500                                          .0012      .00     1.67     .46     .58     .013      .00   .00  PIPE
          |         |        |         |         |      |       |         |       |        |        |       |       |       |
  1536.740  2030.410    1.623  2032.033     11.00    4.03     .25  2032.29     .00    1.19     1.56    2.000     .000   .00   1    .0
         -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    53.800    .0028                                          .0024      .13     1.62     .54    1.51     .013      .00   .00  PIPE
 FILE: P2UP-LINE4.WSW                    W S P G W - CIVILDESIGN Version 14.06                                          PAGE    4
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Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date:11-12-2018 Time: 4:34: 4

SYMPHONY PARK RESIDENTIAL TDS
KHA 192008000 - NOVEMBER 2018
LINE-4-PHASE-II - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK T

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1590.540	2030.560	1.597	2032.157	11.00	4.09	.26	2032.42	.00	1.19	1.60	2.000	.000	.00	1 .0
1.327	.0400					.0026	.00	1.60	.56	.67	.013	.00	.00	PIPE
1591.867	2030.613	1.522	2032.135	11.00	4.29	.29	2032.42	.00	1.19	1.71	2.000	.000	.00	1 .0
1.074	.0400					.0029	.00	1.52	.62	.67	.013	.00	.00	PIPE
1592.941	2030.656	1.453	2032.109	11.00	4.50	.31	2032.42	.00	1.19	1.78	2.000	.000	.00	1 .0
.099	.0400					.0031	.00	1.45	.68	.67	.013	.00	.00	PIPE
1593.040	2030.660	1.447	2032.107	11.00	4.52	.32	2032.42	.00	1.19	1.79	2.000	.000	.00	1 .0
.833	.0400					.0033	.00	1.45	.68	.67	.013	.00	.00	PIPE
1593.873	2030.693	1.384	2032.078	11.00	4.74	.35	2032.43	.00	1.19	1.85	2.000	.000	.00	1 .0
.418	.0400					.0037	.00	1.38	.75	.67	.013	.00	.00	PIPE
1594.290	2030.710	1.326	2032.036	11.00	4.97	.38	2032.42	.00	1.19	1.89	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1594.290	2030.710	1.018	2031.728	11.00	6.84	.73	2032.46	.00	1.19	2.00	2.000	.000	.00	1 .0
.230	.0400					.0084	.00	1.02	1.35	.67	.013	.00	.00	PIPE
1594.520	2030.719	1.057	2031.777	11.00	6.53	.66	2032.44	.00	1.19	2.00	2.000	.000	.00	1 .0
.577	.0400					.0074	.00	1.06	1.25	.67	.013	.00	.00	PIPE
1595.097	2030.742	1.099	2031.841	11.00	6.22	.60	2032.44	.00	1.19	1.99	2.000	.000	.00	1 .0
.333	.0400					.0065	.00	1.10	1.16	.67	.013	.00	.00	PIPE

Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date:11-12-2018 Time: 4:34: 4

SYMPHONY PARK RESIDENTIAL TDS
KHA 192008000 - NOVEMBER 2018
LINE-4-PHASE-II - REFERENCE UNION PARK TDS AND VIEW AT SYMPHONY PARK T

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1595.430	2030.756	1.142	2031.898	11.00	5.93	.55	2032.44	.00	1.19	1.98	2.000	.000	.00	1 .0
.110	.0400					.0057	.00	1.14	1.08	.67	.013	.00	.00	PIPE
1595.540	2030.760	1.189	2031.949	11.00	5.65	.50	2032.44	.00	1.19	1.96	2.000	.000	.00	1 .0
1.478	.0027					.0051	.01	1.19	1.00	1.54	.013	.00	.00	PIPE
1597.018	2030.764	1.238	2032.002	11.00	5.39	.45	2032.45	.00	1.19	1.94	2.000	.000	.00	1 .0
5.928	.0027					.0045	.03	1.24	.93	1.54	.013	.00	.00	PIPE
1602.947	2030.780	1.289	2032.069	11.00	5.14	.41	2032.48	.00	1.19	1.91	2.000	.000	.00	1 .0
13.684	.0027					.0040	.05	1.29	.86	1.54	.013	.00	.00	PIPE
1616.631	2030.817	1.345	2032.161	11.00	4.90	.37	2032.53	.00	1.19	1.88	2.000	.000	.00	1 .0
29.195	.0027					.0036	.10	1.34	.79	1.54	.013	.00	.00	PIPE
1645.825	2030.895	1.404	2032.299	11.00	4.67	.34	2032.64	.00	1.19	1.83	2.000	.000	.00	1 .0
1.755	.0027					.0033	.01	1.40	.73	1.54	.013	.00	.00	PIPE
1647.580	2030.900	1.406	2032.306	11.00	4.66	.34	2032.64	.00	1.19	1.83	2.000	.000	.00	1 .0

```
 1 T1 SYMPHONY PARK RESIDENTIAL TDS                                                                    0
 2 T2 KHA 192008000
 3 T3 SOUTHEAST BOX CULVERT (PHASE-I/II) - REFERENCE UNION PARK TDS

 4 SO   1000.0002025.870 15                          2027.020
 5 TS   1057.8402025.960  1      .013                                  .000
 6 JX   1059.5102025.970  1 21   .013   11.000         2026.110         90.0    .000
 7 JX   1872.0402027.260  1 18   .013   15.000         2027.420         90.0    .000
 8 JX   2067.8102027.570  1 22 23.013   28.000    3.0002027.5702027.570 90.0-90.0    .000
 9 JX   2753.0302028.670  1 22 23.013   31.000    1.0002028.6702028.670 90.0-90.0    .000
10 JX   3472.9202029.830  1 20   .013   35.000         2030.020         90.0   .0    .000
11 R    3692.8502030.160  1      .013                                  .000 -18.000 0
12 R    3742.8502030.240  1      .013                                  .000  34.000 0
13 TS   3742.8902030.240  5      .013                                  .000
14 SH   3742.8902030.240  5                              .000
15 CD   1  3   0    .000   3.000   15.000  .000  .000   .00
16 CD   2  4   1    .000   3.000     .000  .000  .000   .00
17 CD   3  4   1    .000   2.500     .000  .000  .000   .00
18 CD   4  4   1    .000   3.000     .000  .000  .000   .00
19 CD   5  3   0    .000   4.000   12.000  .000  .000   .00
20 CD   7  4   1    .000   3.000     .000  .000  .000   .00
21 CD   9  4   1    .000   3.000     .000  .000  .000   .00
22 CD  11  4   1    .000   3.000     .000  .000  .000   .00
23 CD  13  4   1    .000   3.000     .000  .000  .000   .00
24 CD  15  3   0    .000   3.000   55.000  .000  .000   .00
25 CD  16  4   1    .000   2.500     .000  .000  .000   .00
26 CD  18  4   1    .000   2.500     .000  .000  .000   .00
27 CD  20  4   1    .000   2.500     .000  .000  .000   .00
28 CD  21  4   1    .000   2.000     .000  .000  .000   .00
29 CD  22  3   0    .000   3.000    4.000  .000  .000   .00
30 CD  23  4   1    .000   1.500     .000  .000  .000   .00
31 Q           122.000   .0
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FILE: UNION_BOX_ONSITE.WSW W S P G W - CIVILDESIGN Version 14.06 PAGE 1

Program Package Serial Number: 1911

WATER SURFACE PROFILE LISTING Date:11-12-2018 Time: 1:51:44

SYMPHONY PARK RESIDENTIAL TDS

KHA 192008000

SOUTHEAST BOX CULVERT (PHASE-I/II) - REFERENCE UNION PARK TDS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2025.870	.428	2026.298	246.00	10.44	1.69	2027.99	.00	.85	55.00	3.000	55.000	.00	0 .0
TRANS STR	.0016					.0145	.84	.43	2.81		.013	.00	.00	BOX
1057.840	2025.960	2.029	2027.989	246.00	8.08	1.01	2029.00	.00	2.03	15.00	3.000	15.000	.00	0 .0
JUNCT STR	.0060					.0013	.00	2.03	1.00		.013	.00	.00	BOX
1059.510	2025.970	2.489	2028.459	235.00	6.29	.62	2029.07	.00	1.97	15.00	3.000	15.000	.00	0 .0
JUNCT STR	.0016					.0013	1.07	2.49	.70		.013	.00	.00	BOX
1872.040	2027.260	2.376	2029.636	220.00	6.17	.59	2030.23	.00	1.88	15.00	3.000	15.000	.00	0 .0
JUNCT STR	.0016					.0007	.14	2.38	.71		.013	.00	.00	BOX
2067.810	2027.570	2.643	2030.213	189.00	4.77	.35	2030.57	.00	1.70	15.00	3.000	15.000	.00	0 .0
JUNCT STR	.0016					.0007	.49	2.64	.52		.013	.00	.00	BOX
2753.030	2028.670	2.209	2030.879	157.00	4.74	.35	2031.23	.00	1.50	15.00	3.000	15.000	.00	0 .0
JUNCT STR	.0016					.0008	.61	2.21	.56		.013	.00	.00	BOX
3472.920	2029.830	1.873	2031.703	122.00	4.34	.29	2032.00	.00	1.27	15.00	3.000	15.000	.00	0 .0
97.652	.0015					.0008	.08	1.87	.56	1.55	.013	.00	.00	BOX
3570.572	2029.977	1.785	2031.762	122.00	4.56	.32	2032.08	.00	1.27	15.00	3.000	15.000	.00	0 .0
113.304	.0015					.0010	.11	1.79	.60	1.55	.013	.00	.00	BOX
3683.875	2030.147	1.702	2031.849	122.00	4.78	.35	2032.20	.00	1.27	15.00	3.000	15.000	.00	0 .0
8.975	.0015					.0011	.01	1.70	.65	1.55	.013	.00	.00	BOX

```
                              Program Package Serial Number: 1911
                                          WATER SURFACE PROFILE LISTING                  Date:11-12-2018  Time: 1:51:44
                          SYMPHONY PARK RESIDENTIAL TDS
                            KHA 192008000
                              SOUTHEAST BOX CULVERT (PHASE-I/II) - REFERENCE UNION PARK TDS
**************************************************************************************************************************** ********
         | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|       |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL   |Prs/Pip
-|-      -|-      -|-       -|-       -|-       -|-     -|-      -|-      -|-      -|-       -|-      -|-      -|-      -|-
 L/Elem  |Ch Slope |        |         |         |        SF Ave   |    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall |  ZR   |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****  |*******
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 3692.850  2030.160    1.697  2031.857    122.00    4.79     .36  2032.21     .00    1.27    15.00    3.000   15.000   .00   0   .0
-|-      -|-      -|-       -|-       -|-       -|-     -|-      -|-      -|-      -|-       -|-      -|-      -|-      -|-
   47.544    .0016                                        .0011      .05     1.70     .65    1.52     .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 3740.394  2030.236    1.660  2031.896    122.00    4.90     .37  2032.27     .00    1.27    15.00    3.000   15.000   .00   0   .0
-|-      -|-      -|-       -|-       -|-       -|-     -|-      -|-      -|-      -|-       -|-      -|-      -|-      -|-
HYDRAULIC JUMP
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 3740.394  2030.236     .944  2031.180    122.00    8.62    1.15  2032.33     .00    1.27    15.00    3.000   15.000   .00   0   .0
-|-      -|-      -|-       -|-       -|-       -|-     -|-      -|-      -|-      -|-       -|-      -|-      -|-      -|-
    2.456    .0016                                        .0073      .02      .94    1.56    1.52     .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 3742.850  2030.240     .939  2031.179    122.00    8.66    1.17  2032.34     .00    1.27    15.00    3.000   15.000   .00   0   .0
-|-      -|-      -|-       -|-       -|-       -|-     -|-      -|-      -|-      -|-       -|-      -|-      -|-      -|-
HYDRAULIC DROP
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 3742.850  2030.240    1.660  2031.900    122.00    4.90     .37  2032.27     .00    1.27    15.00    3.000   15.000   .00   0   .0
-|-      -|-      -|-       -|-       -|-       -|-     -|-      -|-      -|-      -|-       -|-      -|-      -|-      -|-
TRANS STR   .0000                                        .0012      .00    1.66     .67              .013       .00   .00  BOX
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 3742.890  2030.240    1.480  2031.720    122.00    6.87     .73  2032.45     .00    1.48    12.00    4.000   12.000   .00   0   .0
-|-      -|-      -|-       -|-       -|-       -|-     -|-      -|-      -|-      -|-       -|-      -|-      -|-      -|-
```

APPENDIX D – PARKING LOT LID

- Parking Lot Data Calculations

PROJECT NAME: Symphony Park Residential

CALC'D BY: ACH CHECKED BY: BAH

DATE: 11/14/18 KHA No. 192008000

PARKING LOT DATA CALCULATIONS

Note: Stormwater Quality Design Volume calculated using steps from Section 1500 Figures 1501-1503 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: Multifamily/Retail

Parking Lot Data		Acreage	
Property Size (PS)	=	3.70	
Building Area (BA)	=	2.85	
Total Pervious Area (TPA)	=	0.05	
Parking Lot Area (PLA) = (PLA = PS-BA-TPA)	=	0.80	
Minimum PLA to be treated = (PLA * 0.75)	=	**0.60**	acres

Area to be treated by the proposed LID BMPs

Drainage Area "A"	=	0.8	
Total	=	**0.8**	acres

Since **0.80 ac** >= **0.74 ac** then site satisfies Parking Lot LID criteria

PROJECT NAME: Symphony Park Residential

CALC'D BY: BAH CHECKED BY: BAH

DATE: 11/14/18 KHA No. 192008000

PARKING LOT LID CALCULATIONS - Peak QBMP FOR DRAINAGE AREA "A"

Note: Stormwater Quality Design Volume calculated using steps from Section 1502.3 of the CCRFCD HCDDM, Revised 2013

GIVEN:

Project Description: Multifamily/Retail

Drainage Area = **0.80** acres

Avg % Impervious = **100** %

Determine BMP Design Precipitation - 85th Percentile Rainfall Depth

Is site located within McCarran Airport Rainfall Area? (Yes/No?) **YES**

If yes, use Table 505 to obtain 2-year 6-hour rainfall depth; this is your **D2**

If no, use Figure 501 to obtain 2-year 6-hour rainfall depth; this is your **D2**

D2 = **0.72**

Compute ratio of D2 of site to D2 for the McCarran Area

$\mathbf{D2_{,site}/D2_{,\ McCarran}}$ = **1**

Compute 85th Percentile Rainfal depth $\mathbf{D_{85}}$ using following equation

$\mathbf{D_{85}}$ = $0.32 * D2_{,site}/D2_{,McCarran}$

= **0.32**

Calculate BMP Design Peak Discharge, **QBMP**

Use the following regression equation to calculate the unit discharge (**Qp/A**) for the 90 percent average percent impervious area condition based on $\mathbf{D_{85}}$ value

Y = 1.5042**X** - 0.0066

where, **Y** = Average **Qp/A** in cfs/ac

X = $\mathbf{D_{85}}$ in inches

Qp/A = **0.47** cfs/ac

Adjust the **Qp/A** for site based on actual percent impervious using the following regression equation

Y = 0.0059**X** +0.4688

where, **Y** = Ratio **Qp/A** to 90% Impervious Value (unitless)

X = Percent Impervious

Y = **1.06**

Qp/A (adjusted) = **0.50** cfs/ac

QBMP = **Qp/A (adjusted) * Area**

= **0.40 cfs**

APPENDIX E – REFERENCE MATERIAL

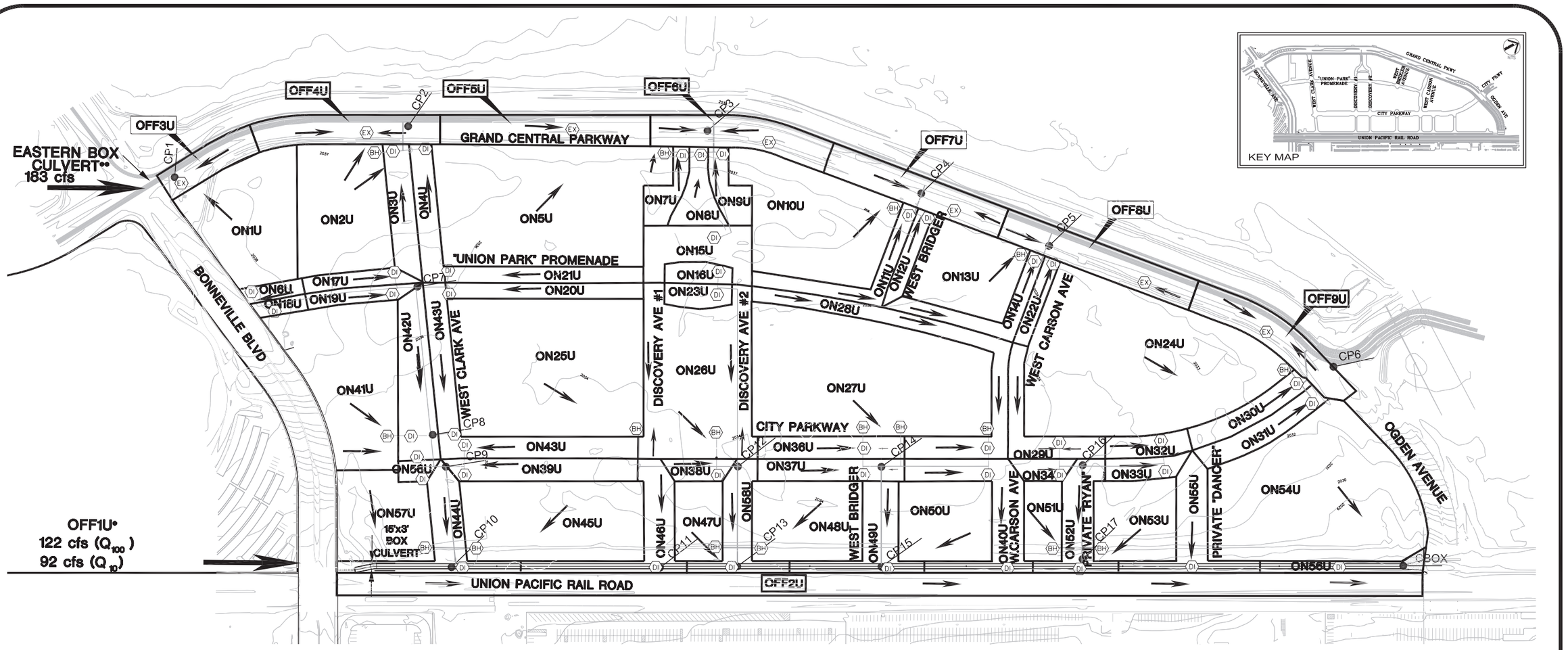
- Technical Drainage Study for View at Symphony Park and Addenda, Prepared by Kimley-Horn. Dated September 25, 2018. (DS5034A)
- Symphony Park Promenade Place & Carson City Offsite Improvements, CLV HANSEN #60311 Anticipated Approval Mid-September
- Technical Drainage Study for Union Park and Addenda; Prepared by Kimley-Horn and Associates. Dated January 8, 2008. (DS4486)

Technical Drainage Study Update

Union Park

Prepared for: City Parkway IV, Inc. &
City Parkway V, Inc.

© Kimley-Horn and Associates, Inc. 2007
092587000



BASIN RUNOFF

BASIN	AREA (AC)	Q_{10} /Q_{100}(cfs)	BASIN	AREA (AC)	Q_{10} /Q_{100}(cfs)	BASIN	AREA (AC)	Q_{10} /Q_{100}(cfs)	BASIN	AREA (AC)	Q_{10} /Q_{100}(cfs)	BASIN	AREA (AC)	Q_{10} /Q_{100}(cfs)
ON1U	1.83	3/6	ON15U	0.75	1/2	ON29U	0.54	1/2	ON44U	0.76	2/3	ON56U	0.11	0/0
ON2U	1.55	2/5	ON16U	0.19	0/0	ON30U	0.43	1/2	ON45U	2.16	3/6	ON57U	1.23	2/4
ON3U	0.52	1/2	ON17U	0.25	0/1	ON31U	0.48	1/2	ON46U	0.77	2/3	ON58U	0.63	1/2
ON4U	0.46	2/3	ON18U	0.19	0/1	ON32U	0.29	1/1	ON47U	0.57	0/1	OFF1U	N/A	92/122
ON5U	3.93	5/10	ON19U	0.25	0/1	ON33U	0.30	1/1	ON48U	1.32	2/4	OFF2U	3.71	3/7
ON6U	0.15	0/0	ON20U	0.47	1/1	ON34U	0.30	1/1	ON49U	0.67	1/2	OFF3U	0.78	1/3
ON7U	0.30	1/1	ON21U	0.47	1/1	ON36U	0.50	1/2	ON50U	1.11	2/3	OFF4U	0.82	2/3
ON8U	0.36	0/1	ON22U	0.22	0/1	ON37U	0.50	1/2	ON51U	0.46	1/1	OFF5U	0.93	2/3
ON9U	0.31	1/1	ON23U	0.19	0/0	ON38U	0.20	0/1	ON52U	0.65	1/2	OFF6U	0.80	2/3
ON10U	2.37	3/7	ON24U	4.71	7/14	ON39U	0.64	1/2	ON53U	1.01	2/3	OFF7U	0.82	2/3
ON11U	0.53	1/2	ON25U	3.93	5/10	ON40U	0.96	1/2	ON54U	3.95	5/11	OFF8U	0.90	2/3
ON12U	0.24	1/1	ON26U	2.56	2/6	ON41U	2.29	3/7	ON55U	0.70	1/2	OFF9U	0.80	2/3
ON13U	1.02	2/3	ON27U	4.09	5/11	ON42U	0.87	2/3						
ON14U	0.49	1/2	ON28U	1.14	2/4	ON43U	1.20	2/4						

CONCENTRATION POINT RUNOFF

COMBINATION POINT	Q_{10} /Q_{100}(cfs)	COMBINATION POINT	Q_{10} /Q_{100}(cfs)
CP1	4/8	CP10	111/157
CP2	10/20	CP11	142/159
CP3	19/38	CP12	8/18
CP4	26/52	CP13	153/184
CP5	28/56	CP14	10/18
CP6	38/77	CP15	166/207
CP7	3/6	CP16	3/5
CP8	10/19	CP17	8/14
CP9	12/22	CPBOX	146/229

GRAPHIC SCALE

120 0 60 120 240

(IN FEET)
1 inch = 120 ft.

LEGEND

- DIRECTION OF FLOW
- BASIN BOUNDARY
- ON1U — BASIN NAME
- (DI) — PROPOSED DROP INLET
- (BH) — PROPOSED BEEHIVE GRATE
- CP1 — COMBINATION POINT
- (EX) — EXISTING CURB INLET

NOTES:
* OFF1U REFERENCED FROM 61 ACRES @ 100 GRAND CENTRAL PARKWAY TDS
** FLOWS FOR THE EASTERN BOX CULVERT REFERENCED FROM 61 ACRES @ 100 GRAND CENTRAL PARKWAY TDS

ULTIMATE DRAINAGE BASIN MAP

Kimley-Horn and Associates, Inc. ©2007

Date: May 25, 2007 - 10:45am / User: tom.kelley
Path: K:\Civil\092442 CityParkway\004\Drainage\TDS Union Park\Drawings\ACAD-Basin Exhibit.dwg

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JUN   1998              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   14MAY07  TIME  14:42:44   *
 *                                       *
 *****************************************

*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************

X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX           XXX

 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                          HEC-1 INPUT                                          PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1           ID
            2           ID
            3           ID   UNION PARK
            4           ID   CITY OF LAS VEGAS
            5           ID   KHA PROJECT NO. 092442004
            6           ID
            7           ID    ULTIMATE CONDITION-SOUTHEAST MODEL
            8           ID    UNION PARK
            9           ID
           10           ID
           11           ID    ************************************************************************
           12           ID             INSIDE OF McCARRAN AIRPORT RAINFALL AREA
           13           ID    ************************************************************************
                        *DIAGRAM
           14           IT       5       0       0     300
           15           IO       5       0       0
           16           IN       5       0       0
           17           JR    PREC    0.57
                        *
                        *

           18           KK    ON6U
           19           KM  offsite basin 3 flow (captured by the existing curb inlet E1)
                        *
           20           PC    0.00    0.02   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
           21           PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
           22           PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
           23           PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
           24           PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
           25           PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
           26           PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
           27           PC   0.998   0.999   1.000
           28           PB    2.77
           29           BA  0.0002
           30           LS       0      98
           31           UD    0.05
                        *

           32           KK   ON18U
           33           KM  onsite basin 18 flow
           34           BA  0.0003
           35           LS       0      98
           36           UD   0.050
                        *

           37           KK   ON17U
           38           KM  onsite basin 17 flow
           39           BA  0.0004
           40           LS       0      98
           41           UD   0.087
                        *
1                                          HEC-1 INPUT                                          PAGE  2

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           42           KK   ON19U
           43           KM  onsite basin 19 flow
           44           BA  0.0004
           45           LS       0      98
           46           UD   0.084
```

```
                *
             47 KK   ON21U
             48 KM  onsite basin 21 flow(
             49 BA  0.0007
             50 LS       0      98
             51 UD   0.109
                *
             52 KK   ON20U
             53 KM  Onsite basin 20 flow(
             54 BA  0.0007
             55 LS       0      98
             56 UD   0.106
                *
             57 KK     CP7
             58 KM  Combine ON20U, ON21U, ON19U, ON17U, ON18U, ON6U
             59 HC       6
                *
             60 KK    RCP8
             61 KM
             62 RK     385  0.0016   0.012            TRAP     1.5       0
                *
             63 KK   ON42U
             64 KM  Onsite basin 42 flow
             65 BA  0.0014
             66 LS       0      98
             67 UD   0.071
                *
             68 KK   ON41U
             69 KM  Onsite basin 41 flow
             70 BA  0.0036
             71 LS       0      94
             72 UD   0.097
                *
             73 KK   ON43U
             74 KM  Onsite basin 41 flow(
             75 BA  0.0019
             76 LS       0      98
             77 UD   0.077
                *
1                                       HEC-1 INPUT                                          PAGE  3

          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             78 KK     CP8
             79 KM  Combine ON41U, ON42U, ON43U, CP7
             80 HC       4
                *
             81 KK   ON39U
             82 KM  Onsite basin 39 flow
             83 BA   0.001
             84 LS       0      98
             85 UD   0.065
                *
             86 KK   ON56U
             87 KM  Onsite basin 56 flow
             88 BA  0.0002
             89 LS       0      98
             90 UD    0.05
                *
             91 KK     CP9
             92 KM  COMBINE ON56U,ON39U,CP8
             93 HC       3
                *
             94 KK   OFF1U
             95 KM  Offsite flow (CC. GOVT CENTER + FLOW FROM PUMP-BONNEVILLE UNDERPASS)
             96 BF      92
                *
             97 KK   ON57U
             98 KM  Onsite basin 57 flow
             99 BA  0.0019
            100 LS       0      94
            101 UD    0.07
            102 BF       0
                *
            103 KK   ON44U
            104 KM  Onsite basin 44 flow
            105 BA  0.0012
            106 LS       0      98
            107 UD   0.051
                *
            108 KK   ON45U
            109 KM  Onsite basin 45 flow
            110 BA  0.0034
            111 LS       0      94
```

```
          112          UD   0.087
                       *
1                                        HEC-1 INPUT                                                    PAGE  4

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          113          KK    CP10
          114          KM  Combine CP9,OFF1U,ON57U,ON44U,ON45U
          115          HC       5
                       *

          116          KK   RCP11
          117          KM
          118          RK     530  0.0016   0.012            TRAP      16       0
                       *

          119          KK   ON46U
          120          KM  Onsite basin 46 flow
          121          BA  0.0012
          122          LS       0      98
          123          UD    0.05
                       *

          124          KK    CP11
          125          KM  COMBINE ON46U,CP10
          126          HC       2
                       *

          127          KK   ON26U
          128          KM  onsite basin 26 flow
          129          BA   0.004
          130          LS       0      87
          131          UD   0.076
                       *

          132          KK   ON38U
          133          KM  onsite basin 38 flow
          134          BA  0.0003
          135          LS       0      98
          136          UD    0.05
                       *

          137          KK   ON16U
          138          KM  onsite basin 16 flow
          139          BA  0.0003
          140          LS       0      82
          141          UD    0.05
                       *

          142          KK   ON23U
          143          KM  onsite basin 23 flow
          144          BA  0.0003
          145          LS       0      82
          146          UD    0.05
                       *
1                                        HEC-1 INPUT                                                    PAGE  5

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          147          KK   ON25U
          148          KM  Onsite basin 25 flow
          149          BA  0.0061
          150          LS       0      94
          151          UD   0.119
                       *

          152          KK    CP12
          153          KM  Combine ON25U, ON26U, ON38U, ON16U, ON23U
          154          HC       5
                       *

          155          KK   ON58U
          156          KM  onsite basin 58 flow
          157          BA   0.001
          158          LS       0      98
          159          UD   0.055
                       *

          160          KK   ON48U
          161          KM  onsite basin 48 flow
          162          BA  0.0021
          163          LS       0      94
          164          UD   0.082
                       *

          165          KK   ON47U
          166          KM  onsite basin 47 flow
          167          BA  0.0009
          168          LS       0      74
          169          UD   0.061
                       *

          170          KK    CP13
          171          KM  Combine CP12,ON47U,ON48U,ON58U,CP11
          172          HC       5
                       *
```

```
          173          KK   RCP15
          174          KM
          175          RK     360  0.0016   0.012            TRAP      16       0
                       *

          176          KK   ON36U
          177          KM  onsite basin 36 flow
          178          BA  0.0008
          179          LS       0      98
          180          UD    0.05
                       *
1                                        HEC-1 INPUT                                                 PAGE  6

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          181          KK   ON37U
          182          KM  onsite basin 37 flow
          183          BA  0.0008
          184          LS       0      98
          185          UD    0.05
                       *

          186          KK   ON28U
          187          KM
          188          BA  0.0018
          189          LS       0      98
          190          UD   0.087
                       *

          191          KK   ON27U
          192          KM
          193          BA  0.0064
          194          LS       0      94
          195          UD   0.118
                       *

          196          KK   ON35U
          197          KM
          198          BA  0.0005
          199          LS       0      98
          200          UD   0.078
                       *

          201          KK    CP14
          202          KM  COMBINE ON27U,ON28U,ON37U,ON36U,ON35U
          203          HC       5
                       *

          204          KK   ON49U
          205          KM
          206          BA   0.001
          207          LS       0      98
          208          UD   0.055
                       *

          209          KK   ON50U
          210          KM
          211          BA  0.0017
          212          LS       0      94
          213          UD   0.071
                       *

          214          KK    CP15
          215          KM  COMBINE CP14,ON50U,ON49U,CP13
          216          HC       4
                       *
1                                        HEC-1 INPUT                                                 PAGE  7

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          217          KK   RCP22
          218          KM
          219          RK    1333  0.0016   0.012            TRAP      16       0
                       *

          220          KK   ON29U
          221          KM  onsite basin 29 flow
          222          BA  0.0008
          223          LS       0      98
          224          UD   0.063
                       *

          225          KK   ON34U
          226          KM  onsite basin 34 flow
          227          BA  0.0005
          228          LS       0      98
          229          UD    0.05
                       *

          230          KK   ON32U
          231          KM  onsite basin 32 flow
          232          BA  0.0005
          233          LS       0      98
          234          UD    0.05
                       *

          235          KK   ON33U
```

```
            236          KM  onsite basin 33 flow
            237          BA  0.0005
            238          LS       0      98
            239          UD    0.05
                         *

            240          KK    CP16
            241          KM  Combine ON29U, ON34U, ON32U, ON33U
            242          HC       4
                         *

            243          KK   ON40U
            244          KM  onsite basin 40 flow
            245          BA   0.001
            246          LS       0      98
            247          UD   0.055
                         *

            248          KK   ON51U
            249          KM  onsite basin 51 flow
            250          BA  0.0007
            251          LS       0      94
            252          UD   0.057
                         *
1                                          HEC-1 INPUT                                                PAGE  8

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


            253          KK   ON53U
            254          KM  onsite basin 53 flow
            255          BA  0.0016
            256          LS       0      94
            257          UD   0.074
                         *

            258          KK   ON52U
            259          KM
            260          BA   0.001
            261          LS       0      98
            262          UD   0.068
                         *

            263          KK    CP17
            264          KM  Combine CP16,ON51U,ON53U,ON52U,ON40U
            265          HC       5
                         *

            266          KK   RCP22
            267          KM
            268          RK     816  0.0016   0.012            TRAP      16       0
                         *

            269          KK   ON55U
            270          KM  onsite basin 55 flow
            271          BA  0.0011
            272          LS       0      98
            273          UD   0.064
                         *

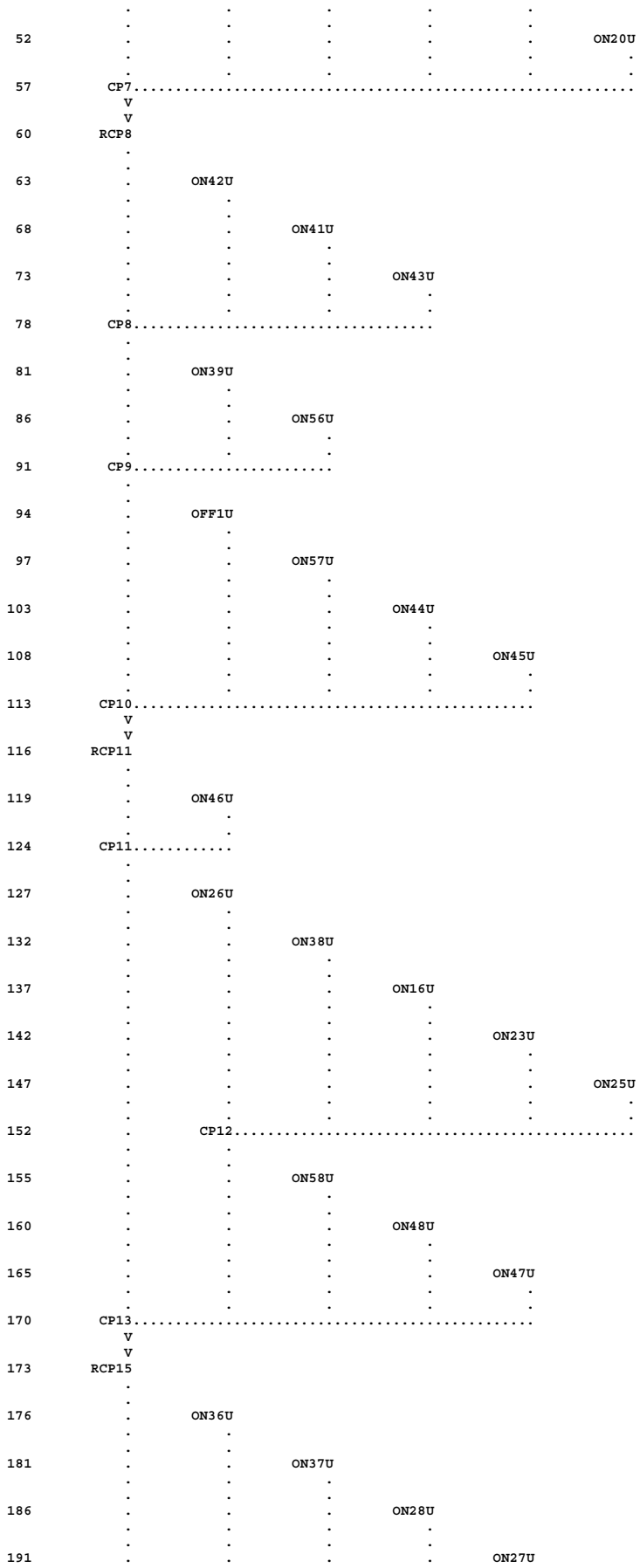
            274          KK   ON54U
            275          KM  onsite basin 54 flow
            276          BA  0.0062
            277          LS       0      94
            278          UD   0.107
                         *

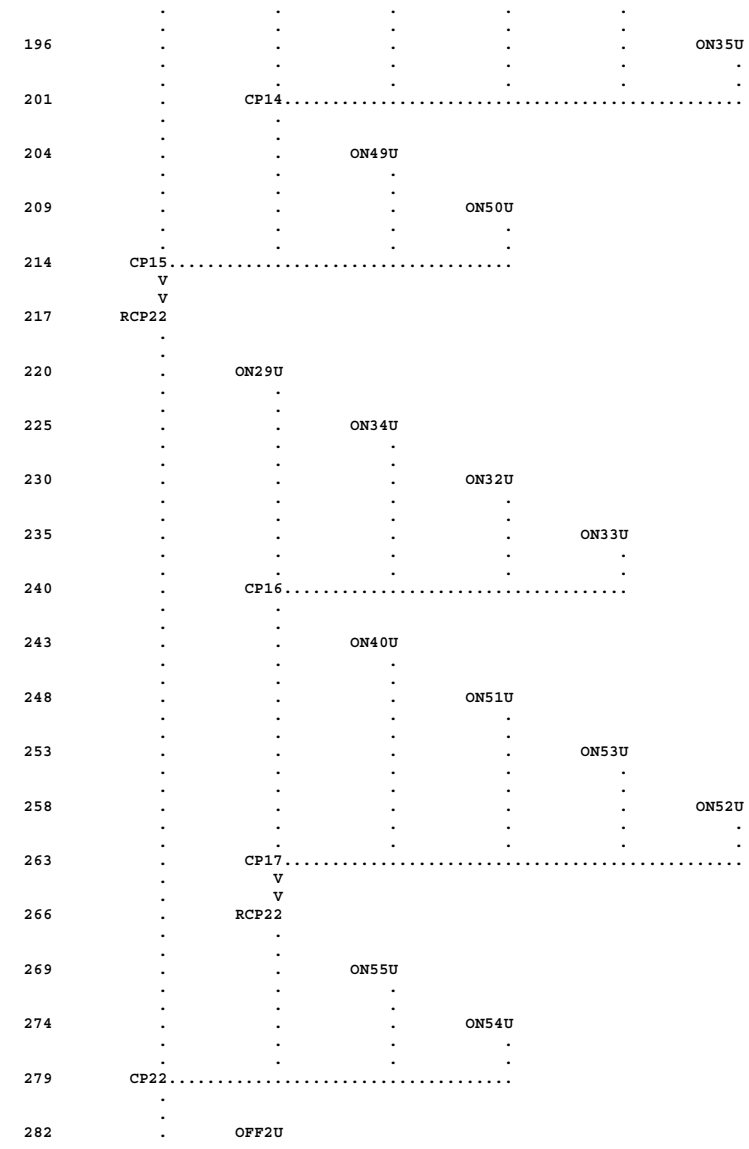
            279          KK    CP22
            280          KM  Combine CP21, ON54U, CP19, ON55U,OFF2U
            281          HC       4
                         *

            282          KK   OFF2U
            283          KM  FLOW FROM U.P.R.R-reference from 61 acres study*
            284          BA  0.0058
            285          LS       0      91
            286          UD   0.256
                         *
            287          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    18        ON6U
                 .
                 .
    32           .       ON18U
                 .           .
                 .           .
    37           .           .       ON17U
                 .           .           .
                 .           .           .
    42           .           .           .       ON19U
                 .           .           .           .
                 .           .           .           .
    47           .           .           .           .       ON21U
```


52 ON20U
57 CP7
60 RCP8
63 ON42U
68 ON41U
73 ON43U
78 CP8
81 ON39U
86 ON56U
91 CP9
94 OFF1U
97 ON57U
103 ON44U
108 ON45U
113 CP10
116 RCP11
119 ON46U
124 CP11
127 ON26U
132 ON38U
137 ON16U
142 ON23U
147 ON25U
152 CP12
155 ON58U
160 ON48U
165 ON47U
170 CP13
173 RCP15
176 ON36U
181 ON37U
186 ON28U
191 ON27U



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JUN   1998              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   14MAY07  TIME  14:42:44   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
UNION PARK
CITY OF LAS VEGAS
KHA PROJECT NO. 092442004

 ULTIMATE CONDITION-SOUTHEAST MODEL
 UNION PARK

 ***********************************************************************
          INSIDE OF McCARRAN AIRPORT RAINFALL AREA
 ***********************************************************************

 15 IO          OUTPUT CONTROL VARIABLES
                IPRNT           5  PRINT CONTROL
                IPLOT           0  PLOT CONTROL
                QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
```

```
                      NMIN           5  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1    0  STARTING DATE
                     ITIME        0000  STARTING TIME
                        NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE      2    0  ENDING DATE
                    NDTIME        0055  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.92 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                     .57
1

               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                           FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                        TIME TO PEAK IN HOURS


                                                                RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN                 RATIO 1
                                                             .57

 HYDROGRAPH AT
+                   ON6U       .00     1   FLOW              0.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON18U       .00     1   FLOW              0.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON17U       .00     1   FLOW              0.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON19U       .00     1   FLOW              0.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON21U       .00     1   FLOW              1.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON20U       .00     1   FLOW              1.
                                           TIME            3.50

   6 COMBINED AT
+                    CP7       .00     1   FLOW              3.
                                           TIME            3.50

 ROUTED TO
+                   RCP8       .00     1   FLOW              3.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON42U       .00     1   FLOW              2.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON41U       .00     1   FLOW              3.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON43U       .00     1   FLOW              2.
                                           TIME            3.50

   4 COMBINED AT
+                    CP8       .01     1   FLOW             10.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON39U       .00     1   FLOW              1.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON56U       .00     1   FLOW              0.
                                           TIME            3.50

   3 COMBINED AT
+                    CP9       .01     1   FLOW             12.
                                           TIME            3.50

 HYDROGRAPH AT
+                  OFF1U       .00     1   FLOW             92.
```

```
                                        TIME         3.50

 HYDROGRAPH AT
+                  ON57U       .00     1   FLOW          2.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON44U       .00     1   FLOW          2.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON45U       .00     1   FLOW          3.
                                            TIME         3.50

  5 COMBINED AT
+                   CP10       .02     1   FLOW        111.
                                            TIME         3.50

 ROUTED TO
+                  RCP11       .02     1   FLOW        110.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON46U       .00     1   FLOW          2.
                                            TIME         3.50

  2 COMBINED AT
+                   CP11       .02     1   FLOW        112.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON26U       .00     1   FLOW          2.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON38U       .00     1   FLOW          0.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON16U       .00     1   FLOW          0.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON23U       .00     1   FLOW          0.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON25U       .01     1   FLOW          5.
                                            TIME         3.58

  5 COMBINED AT
+                   CP12       .01     1   FLOW          8.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON58U       .00     1   FLOW          1.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON48U       .00     1   FLOW          2.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON47U       .00     1   FLOW          0.
                                            TIME         3.50

  5 COMBINED AT
+                   CP13       .03     1   FLOW        123.
                                            TIME         3.50

 ROUTED TO
+                  RCP15       .03     1   FLOW        123.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON36U       .00     1   FLOW          1.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON37U       .00     1   FLOW          1.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON28U       .00     1   FLOW          2.
                                            TIME         3.50

 HYDROGRAPH AT
+                  ON27U       .01     1   FLOW          5.
                                            TIME         3.58

 HYDROGRAPH AT
+                  ON35U       .00     1   FLOW          1.
                                            TIME         3.50

  5 COMBINED AT
+                   CP14       .01     1   FLOW         10.
                                            TIME         3.50

 HYDROGRAPH AT
```

```
+                  ON49U       .00     1   FLOW           1.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON50U       .00     1   FLOW           2.
                                           TIME         3.50

  4 COMBINED AT
+                   CP15       .05     1   FLOW         136.
                                           TIME         3.50

 ROUTED TO
+                  RCP22       .05     1   FLOW         133.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON29U       .00     1   FLOW           1.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON34U       .00     1   FLOW           1.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON32U       .00     1   FLOW           1.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON33U       .00     1   FLOW           1.
                                           TIME         3.50

  4 COMBINED AT
+                   CP16       .00     1   FLOW           3.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON40U       .00     1   FLOW           1.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON51U       .00     1   FLOW           1.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON53U       .00     1   FLOW           2.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON52U       .00     1   FLOW           1.
                                           TIME         3.50

  5 COMBINED AT
+                   CP17       .01     1   FLOW           8.
                                           TIME         3.50

 ROUTED TO
+                  RCP22       .01     1   FLOW           7.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON55U       .00     1   FLOW           1.
                                           TIME         3.50

 HYDROGRAPH AT
+                  ON54U       .01     1   FLOW           5.
                                           TIME         3.50

  4 COMBINED AT
+                   CP22       .06     1   FLOW         146.
                                           TIME         3.50

 HYDROGRAPH AT
+                  OFF2U       .01     1   FLOW           3.
                                           TIME         3.67
1
                                       SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                           (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK     TIME TO     VOLUME      DT       PEAK     TIME TO     VOLUME
                                                       PEAK                                     PEAK

                                 (MIN)      (CFS)      (MIN)      (IN)    (MIN)      (CFS)      (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .57
              RCP8  MANE          .43       3.05     210.74      1.36     5.00       2.98     210.00       1.36

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1955E+00 EXCESS= .0000E+00 OUTFLOW= .1958E+00 BASIN STORAGE= .1337E-06 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .57
             RCP11  MANE          .34     110.50     210.53     204.19      5.00     110.13     210.00      204.16

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1906E+03 EXCESS= .0000E+00 OUTFLOW= .1906E+03 BASIN STORAGE=-.6894E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .57
```

```
            RCP15  MANE          .23    123.18    210.36    106.46      5.00    122.73    210.00      106.45

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1913E+03 EXCESS= .0000E+00 OUTFLOW= .1913E+03 BASIN STORAGE=-.4669E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .57
            RCP22  MANE          .85    135.03    211.29     77.14      5.00    132.85    210.00       77.13

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1921E+03 EXCESS= .0000E+00 OUTFLOW= .1921E+03 BASIN STORAGE=-.1726E+00 PERCENT ERROR=    .1

          FOR PLAN = 1  RATIO=  .57
            RCP22  MANE         1.44      7.53    212.20      1.25      5.00      6.80    210.00        1.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4351E+00 EXCESS= .0000E+00 OUTFLOW= .4387E+00 BASIN STORAGE= .8831E-05 PERCENT ERROR=   -.8



*** NORMAL END OF HEC-1 ***
```

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JUN   1998              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   14MAY07  TIME  14:27:41   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX           XXX
```

```
 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
1                                          HEC-1 INPUT                                          PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1           ID
            2           ID
            3           ID   UNION PARK
            4           ID   CITY OF LAS VEGAS
            5           ID   KHA PROJECT NO. 092442004
            6           ID
            7           ID    ULTIMATE CONDITION-SOUTHEAST MODEL
            8           ID    UNION PARK
            9           ID
           10           ID
           11           ID    ************************************************************************
           12           ID             INSIDE OF McCARRAN AIRPORT RAINFALL AREA
           13           ID    ************************************************************************
                        *DIAGRAM
           14           IT       5       0       0     300
           15           IO       5       0       0
           16           IN       5       0       0
           17           JR    PREC       1
                        *
                        *

           18           KK    ON6U
           19           KM  offsite basin 3 flow (captured by the existing curb inlet E1)
                        *
           20           PC    0.00    0.02   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
           21           PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
           22           PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
           23           PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
           24           PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
           25           PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
           26           PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
           27           PC   0.998   0.999   1.000
           28           PB    2.77
           29           BA  0.0002
           30           LS       0      98
           31           UD    0.05
                        *

           32           KK   ON18U
           33           KM  onsite basin 18 flow
           34           BA  0.0003
           35           LS       0      98
           36           UD   0.050
                        *

           37           KK   ON17U
           38           KM  onsite basin 17 flow
           39           BA  0.0004
           40           LS       0      98
           41           UD   0.087
                        *
1                                          HEC-1 INPUT                                          PAGE  2

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           42           KK   ON19U
           43           KM  onsite basin 19 flow
           44           BA  0.0004
           45           LS       0      98
           46           UD   0.084
```

```
                *
             47 KK   ON21U
             48 KM  onsite basin 21 flow(
             49 BA  0.0007
             50 LS       0      98
             51 UD   0.109
                *
             52 KK   ON20U
             53 KM  Onsite basin 20 flow(
             54 BA  0.0007
             55 LS       0      98
             56 UD   0.106
                *
             57 KK     CP7
             58 KM  Combine ON20U, ON21U, ON19U, ON17U, ON18U, ON6U
             59 HC       6
                *
             60 KK    RCP8
             61 KM
             62 RK     385  0.0016   0.012            TRAP     1.5       0
                *
             63 KK   ON42U
             64 KM  Onsite basin 42 flow
             65 BA  0.0014
             66 LS       0      98
             67 UD   0.071
                *
             68 KK   ON41U
             69 KM  Onsite basin 41 flow
             70 BA  0.0036
             71 LS       0      94
             72 UD   0.097
                *
             73 KK   ON43U
             74 KM  Onsite basin 41 flow(
             75 BA  0.0019
             76 LS       0      98
             77 UD   0.077
                *
1                                       HEC-1 INPUT                                          PAGE  3

          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             78 KK     CP8
             79 KM  Combine ON41U, ON42U, ON43U, CP7
             80 HC       4
                *
             81 KK   ON39U
             82 KM  Onsite basin 39 flow
             83 BA   0.001
             84 LS       0      98
             85 UD   0.065
                *
             86 KK   ON56U
             87 KM  Onsite basin 56 flow
             88 BA  0.0002
             89 LS       0      98
             90 UD    0.05
                *
             91 KK     CP9
             92 KM  COMBINE ON56U,ON39U,CP8
             93 HC       3
                *
             94 KK   OFF1U
             95 KM  Offsite flow (CC. GOVT CENTER + FLOW FROM PUMP-BONNEVILLE UNDERPASS)
             96 BF     122
                *
             97 KK   ON57U
             98 KM  Onsite basin 57 flow
             99 BA  0.0019
            100 LS       0      94
            101 UD    0.07
            102 BF       0
                *
            103 KK   ON44U
            104 KM  Onsite basin 44 flow
            105 BA  0.0012
            106 LS       0      98
            107 UD   0.051
                *
            108 KK   ON45U
            109 KM  Onsite basin 45 flow
            110 BA  0.0034
            111 LS       0      94
```

```
          112          UD   0.087
                       *
1                                        HEC-1 INPUT                                                    PAGE  4

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          113          KK    CP10
          114          KM  Combine CP9,OFF1U,ON57U,ON44U,ON45U
          115          HC       5
                       *

          116          KK   RCP11
          117          KM
          118          RK     530  0.0016   0.012            TRAP      16       0
                       *

          119          KK   ON46U
          120          KM  Onsite basin 46 flow
          121          BA  0.0012
          122          LS       0      98
          123          UD    0.05
                       *

          124          KK    CP11
          125          KM  COMBINE ON46U,CP10
          126          HC       2
                       *

          127          KK   ON26U
          128          KM  onsite basin 26 flow
          129          BA   0.004
          130          LS       0      87
          131          UD   0.076
                       *

          132          KK   ON38U
          133          KM  onsite basin 38 flow
          134          BA  0.0003
          135          LS       0      98
          136          UD    0.05
                       *

          137          KK   ON16U
          138          KM  onsite basin 16 flow
          139          BA  0.0003
          140          LS       0      82
          141          UD    0.05
                       *

          142          KK   ON23U
          143          KM  onsite basin 23 flow
          144          BA  0.0003
          145          LS       0      82
          146          UD    0.05
                       *
1                                        HEC-1 INPUT                                                    PAGE  5

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          147          KK   ON25U
          148          KM  Onsite basin 25 flow
          149          BA  0.0061
          150          LS       0      94
          151          UD   0.119
                       *

          152          KK    CP12
          153          KM  Combine ON25U, ON26U, ON38U, ON16U, ON23U
          154          HC       5
                       *

          155          KK   ON58U
          156          KM  onsite basin 58 flow
          157          BA   0.001
          158          LS       0      98
          159          UD   0.055
                       *

          160          KK   ON48U
          161          KM  onsite basin 48 flow
          162          BA  0.0021
          163          LS       0      94
          164          UD   0.082
                       *

          165          KK   ON47U
          166          KM  onsite basin 47 flow
          167          BA  0.0009
          168          LS       0      74
          169          UD   0.061
                       *

          170          KK    CP13
          171          KM  Combine CP12,ON47U,ON48U,ON58U,CP11
          172          HC       5
                       *
```

```
          173          KK   RCP15
          174          KM
          175          RK     360  0.0016   0.012            TRAP      16       0
                       *

          176          KK   ON36U
          177          KM  onsite basin 36 flow
          178          BA  0.0008
          179          LS       0      98
          180          UD    0.05
                       *
1                                        HEC-1 INPUT                                                PAGE  6

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          181          KK   ON37U
          182          KM  onsite basin 37 flow
          183          BA  0.0008
          184          LS       0      98
          185          UD    0.05
                       *

          186          KK   ON28U
          187          KM
          188          BA  0.0018
          189          LS       0      98
          190          UD   0.087
                       *

          191          KK   ON27U
          192          KM
          193          BA  0.0064
          194          LS       0      94
          195          UD   0.118
                       *
                       *

          196          KK    CP14
          197          KM  COMBINE ON27U,ON28U,ON37U,ON36U
          198          HC       4
                       *

          199          KK   ON49U
          200          KM
          201          BA   0.001
          202          LS       0      98
          203          UD   0.055
                       *

          204          KK   ON50U
          205          KM
          206          BA  0.0017
          207          LS       0      94
          208          UD   0.071
                       *

          209          KK    CP15
          210          KM  COMBINE CP14,ON50U,ON49U,CP13
          211          HC       4
                       *

          212          KK   RCP22
          213          KM
          214          RK    1333  0.0016   0.012            TRAP      16       0
                       *
1                                        HEC-1 INPUT                                                PAGE  7

          LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          215          KK   ON29U
          216          KM  onsite basin 29 flow
          217          BA  0.0008
          218          LS       0      98
          219          UD   0.063
                       *

          220          KK   ON34U
          221          KM  onsite basin 34 flow
          222          BA  0.0005
          223          LS       0      98
          224          UD    0.05
                       *

          225          KK   ON32U
          226          KM  onsite basin 32 flow
          227          BA  0.0005
          228          LS       0      98
          229          UD    0.05
                       *

          230          KK   ON33U
          231          KM  onsite basin 33 flow
          232          BA  0.0005
          233          LS       0      98
          234          UD    0.05
                       *
```

```
            235           KK    CP16
            236           KM  Combine ON29U, ON34U, ON32U, ON33U
            237           HC       4
                          *

            238           KK   ON40U
            239           KM  onsite basin 40 flow
            240           BA   0.001
            241           LS       0      98
            242           UD   0.055
                          *

            243           KK   ON51U
            244           KM  onsite basin 51 flow
            245           BA  0.0007
            246           LS       0      94
            247           UD   0.057
                          *

            248           KK   ON53U
            249           KM  onsite basin 53 flow
            250           BA  0.0016
            251           LS       0      94
            252           UD   0.074
                          *
1                                          HEC-1 INPUT                                                PAGE  8

           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            253           KK   ON52U
            254           KM
            255           BA   0.001
            256           LS       0      98
            257           UD   0.068
                          *

            258           KK    CP17
            259           KM  Combine CP16,ON51U,ON53U,ON52U,ON40U
            260           HC       5
                          *

            261           KK   RCP22
            262           KM
            263           RK     816  0.0016   0.012            TRAP      16       0
                          *

            264           KK   ON55U
            265           KM  onsite basin 55 flow
            266           BA  0.0011
            267           LS       0      98
            268           UD   0.064
                          *

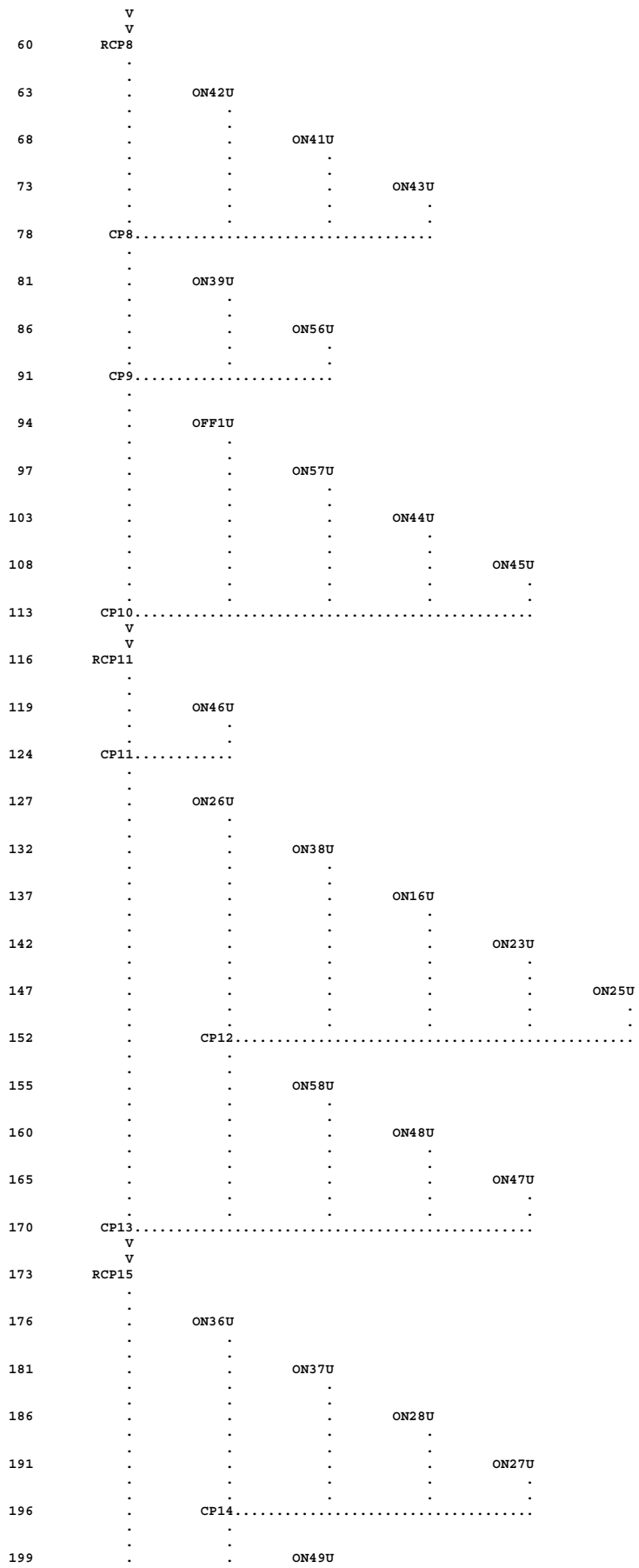
            269           KK   ON54U
            270           KM  onsite basin 54 flow
            271           BA  0.0062
            272           LS       0      94
            273           UD   0.107
                          *

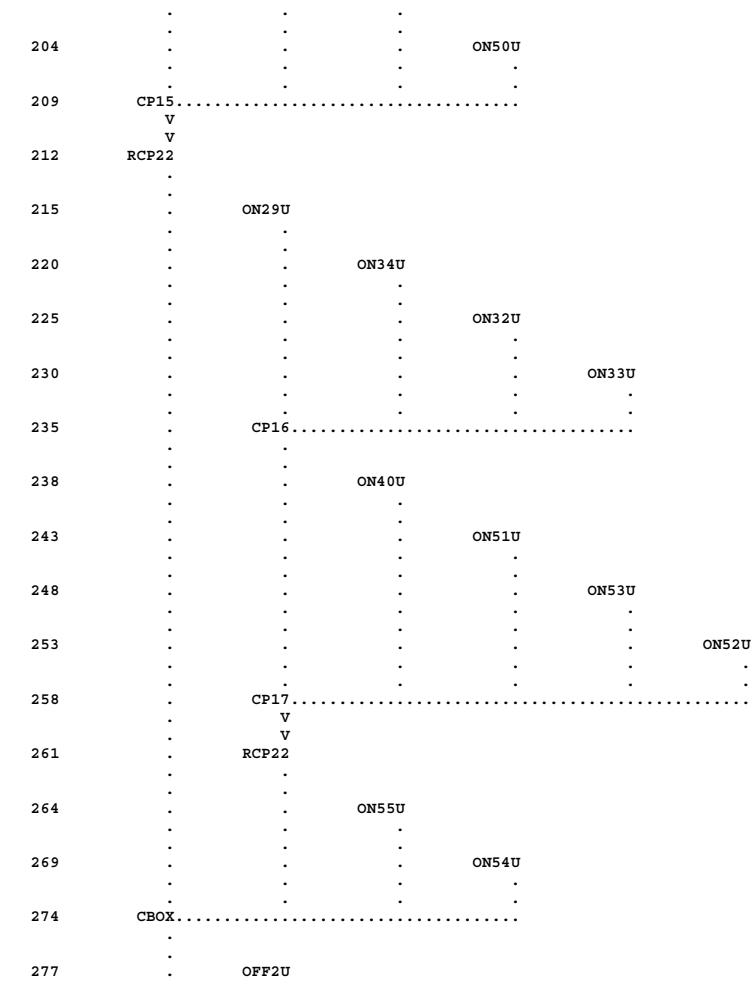
            274           KK    CBOX
            275           KM  Combine CP21, ON54U, CP19, ON55U,OFF2U
            276           HC       4
                          *

            277           KK   OFF2U
            278           KM  FLOW FROM U.P.R.R-referenced from 61 acres study*
            279           BA  0.0058
            280           LS       0      91
            281           UD   0.256
                          *
            282           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<----) RETURN OF DIVERTED OR PUMPED FLOW

    18        ON6U
                 .
                 .
    32           .       ON18U
                 .           .
                 .           .
    37           .           .       ON17U
                 .           .           .
                 .           .           .
    42           .           .           .       ON19U
                 .           .           .           .
                 .           .           .           .
    47           .           .           .           .       ON21U
                 .           .           .           .           .
                 .           .           .           .           .
    52           .           .           .           .           .       ON20U
                 .           .           .           .           .           .
                 .           .           .           .           .           .
    57         CP7.....................................................
```


60 RCP8
63 ON42U
68 ON41U
73 ON43U
78 CP8
81 ON39U
86 ON56U
91 CP9
94 OFF1U
97 ON57U
103 ON44U
108 ON45U
113 CP10
116 RCP11
119 ON46U
124 CP11
127 ON26U
132 ON38U
137 ON16U
142 ON23U
147 ON25U
152 CP12
155 ON58U
160 ON48U
165 ON47U
170 CP13
173 RCP15
176 ON36U
181 ON37U
186 ON28U
191 ON27U
196 CP14
199 ON49U



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   14MAY07  TIME  14:27:41   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
                        UNION PARK
                        CITY OF LAS VEGAS
                        KHA PROJECT NO. 092442004

                         ULTIMATE CONDITION-SOUTHEAST MODEL
                         UNION PARK


                         ***********************************************************************
                                  INSIDE OF McCARRAN AIRPORT RAINFALL AREA
                         ***********************************************************************

  15 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0055  ENDING TIME
                      ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .08 HOURS
```

```
                        TOTAL TIME BASE   24.92 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT

      JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00
1

               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                          TIME TO PEAK IN HOURS


                                                                  RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN                 RATIO 1
                                                             1.00

 HYDROGRAPH AT
+                   ON6U       .00     1   FLOW              0.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON18U       .00     1   FLOW              1.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON17U       .00     1   FLOW              1.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON19U       .00     1   FLOW              1.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON21U       .00     1   FLOW              1.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON20U       .00     1   FLOW              1.
                                           TIME            3.50

  6 COMBINED AT
+                    CP7       .00     1   FLOW              6.
                                           TIME            3.50

 ROUTED TO
+                   RCP8       .00     1   FLOW              5.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON42U       .00     1   FLOW              3.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON41U       .00     1   FLOW              7.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON43U       .00     1   FLOW              4.
                                           TIME            3.50

  4 COMBINED AT
+                    CP8       .01     1   FLOW             19.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON39U       .00     1   FLOW              2.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON56U       .00     1   FLOW              0.
                                           TIME            3.50

  3 COMBINED AT
+                    CP9       .01     1   FLOW             22.
                                           TIME            3.50

 HYDROGRAPH AT
+                  OFF1U       .00     1   FLOW            122.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON57U       .00     1   FLOW              4.
                                           TIME            3.50

 HYDROGRAPH AT
+                  ON44U       .00     1   FLOW              3.
                                           TIME            3.50
```

```
 HYDROGRAPH AT
+                  ON45U       .00     1   FLOW           6.
                                             TIME         3.50

  5 COMBINED AT
+                   CP10       .02     1   FLOW         157.
                                             TIME         3.50

 ROUTED TO
+                  RCP11       .02     1   FLOW         156.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON46U       .00     1   FLOW           3.
                                             TIME         3.50

  2 COMBINED AT
+                   CP11       .02     1   FLOW         159.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON26U       .00     1   FLOW           6.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON38U       .00     1   FLOW           1.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON16U       .00     1   FLOW           0.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON23U       .00     1   FLOW           0.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON25U       .01     1   FLOW          10.
                                             TIME         3.58

  5 COMBINED AT
+                   CP12       .01     1   FLOW          18.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON58U       .00     1   FLOW           2.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON48U       .00     1   FLOW           4.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON47U       .00     1   FLOW           1.
                                             TIME         3.50

  5 COMBINED AT
+                   CP13       .03     1   FLOW         184.
                                             TIME         3.50

 ROUTED TO
+                  RCP15       .03     1   FLOW         183.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON36U       .00     1   FLOW           2.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON37U       .00     1   FLOW           2.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON28U       .00     1   FLOW           4.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON27U       .01     1   FLOW          11.
                                             TIME         3.58

  4 COMBINED AT
+                   CP14       .01     1   FLOW          18.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON49U       .00     1   FLOW           2.
                                             TIME         3.50

 HYDROGRAPH AT
+                  ON50U       .00     1   FLOW           3.
                                             TIME         3.50

  4 COMBINED AT
+                   CP15       .05     1   FLOW         207.
                                             TIME         3.50

 ROUTED TO
+                  RCP22       .05     1   FLOW         203.
```

```
                                        TIME         3.50

 HYDROGRAPH AT
+                   ON29U       .00     1   FLOW          2.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON34U       .00     1   FLOW          1.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON32U       .00     1   FLOW          1.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON33U       .00     1   FLOW          1.
                                            TIME         3.50

  4 COMBINED AT
+                    CP16       .00     1   FLOW          5.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON40U       .00     1   FLOW          2.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON51U       .00     1   FLOW          1.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON53U       .00     1   FLOW          3.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON52U       .00     1   FLOW          2.
                                            TIME         3.50

  5 COMBINED AT
+                    CP17       .01     1   FLOW         14.
                                            TIME         3.50

 ROUTED TO
+                   RCP22       .01     1   FLOW         13.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON55U       .00     1   FLOW          2.
                                            TIME         3.50

 HYDROGRAPH AT
+                   ON54U       .01     1   FLOW         11.
                                            TIME         3.50

  4 COMBINED AT
+                    CBOX       .06     1   FLOW        229.
                                            TIME         3.50

 HYDROGRAPH AT
+                   OFF2U       .01     1   FLOW          7.
                                            TIME         3.67
1
                                        SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                            (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                 INTERPOLATED TO
                                                                                COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                 (MIN)      (CFS)      (MIN)      (IN)    (MIN)      (CFS)      (MIN)       (IN)

          FOR PLAN = 1  RATIO= 1.00
              RCP8  MANE          .42       5.48     210.64       2.54     5.00       5.40     210.00        2.55

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3657E+00 EXCESS= .0000E+00 OUTFLOW= .3661E+00 BASIN STORAGE= .1295E-06 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO= 1.00
             RCP11  MANE          .30     157.04     210.48     271.55     5.00     156.48     210.00      271.50

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2534E+03 EXCESS= .0000E+00 OUTFLOW= .2534E+03 BASIN STORAGE=-.8184E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO= 1.00
             RCP15  MANE          .20     184.22     210.43     141.93     5.00     183.48     210.00      141.92

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2551E+03 EXCESS= .0000E+00 OUTFLOW= .2551E+03 BASIN STORAGE=-.5561E-01 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO= 1.00
             RCP22  MANE          .76     206.66     211.50     104.18     5.00     203.01     210.00      104.14

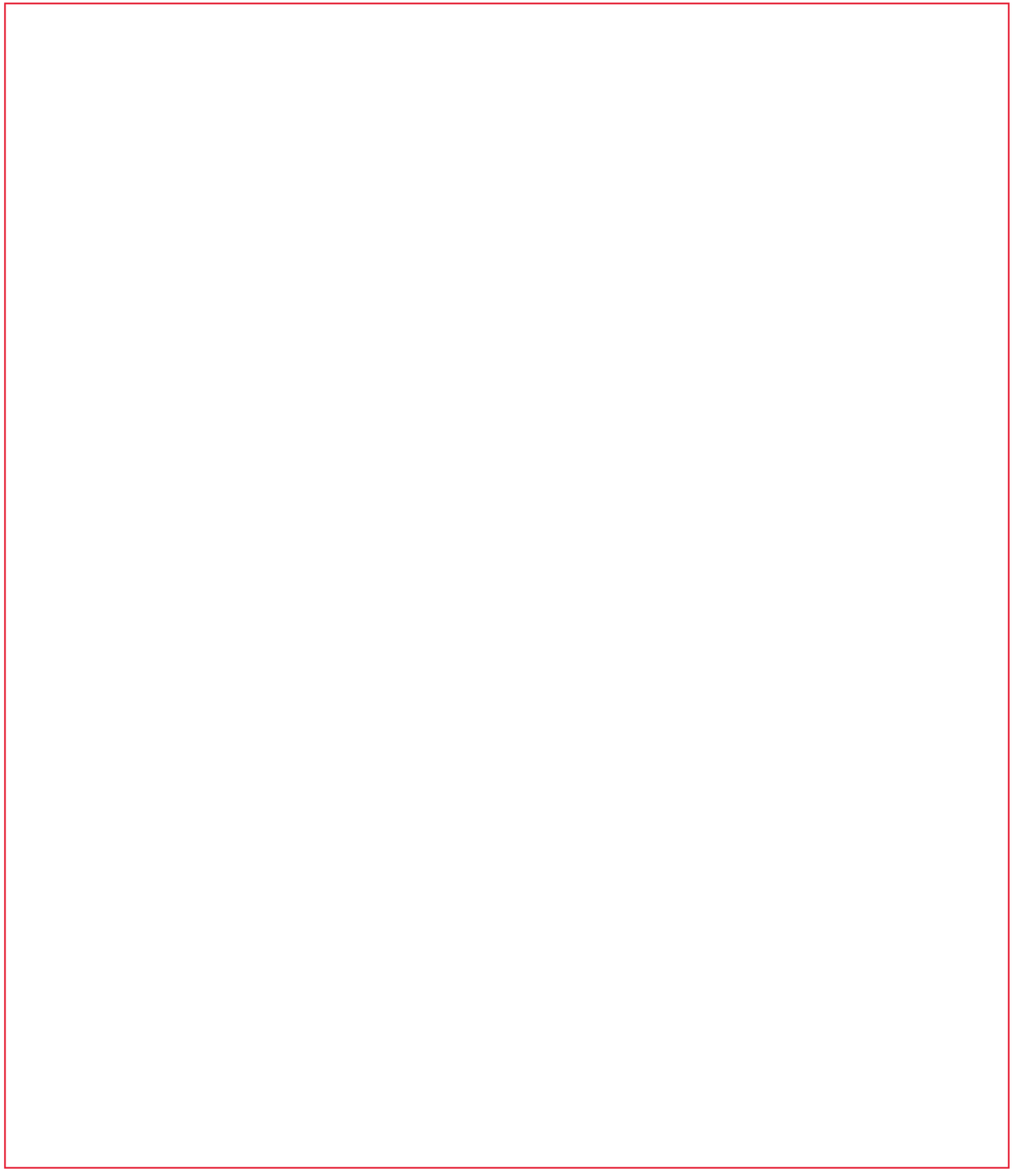
 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2566E+03 EXCESS= .0000E+00 OUTFLOW= .2567E+03 BASIN STORAGE=-.2051E+00 PERCENT ERROR=    .0
```

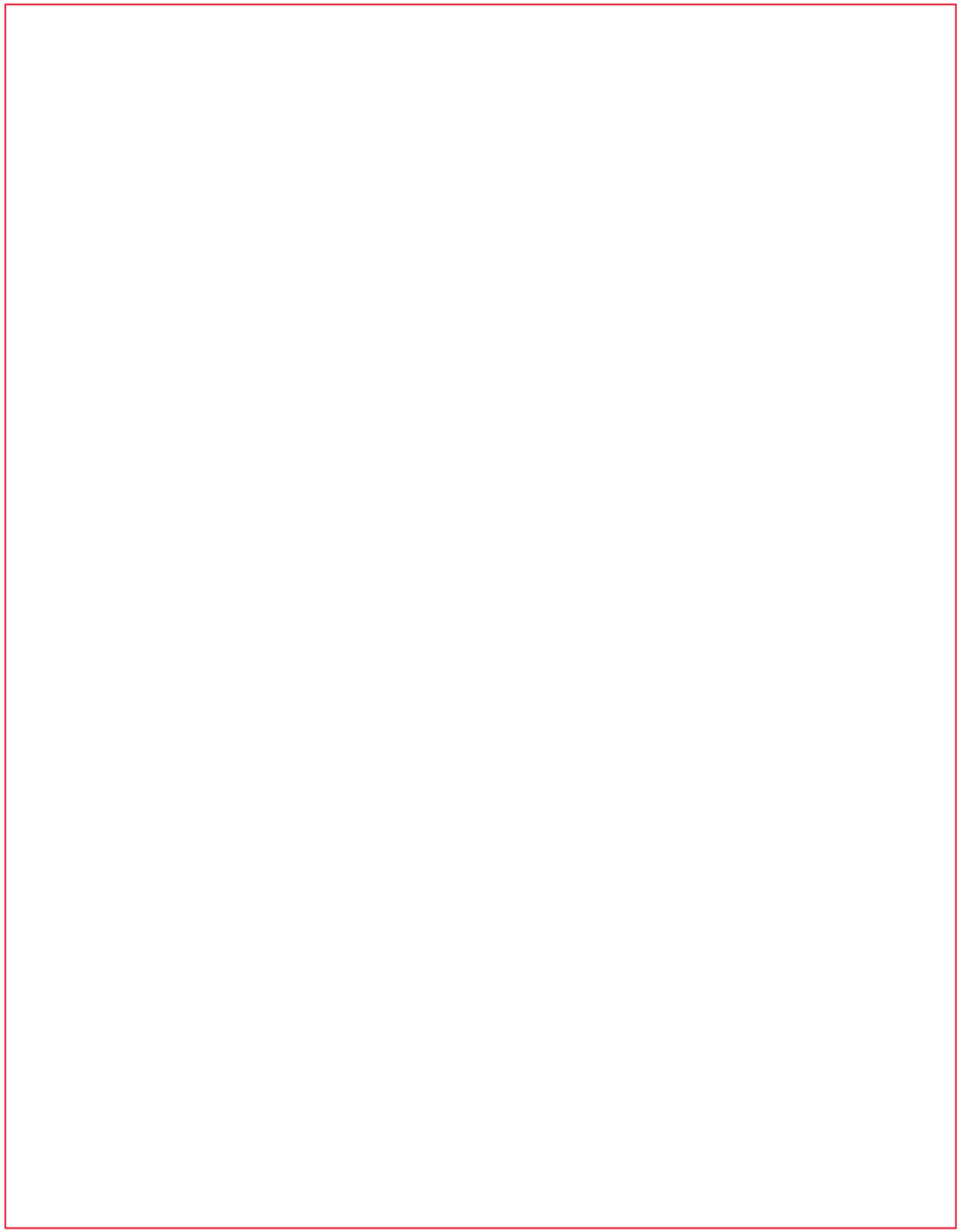
```
          FOR PLAN = 1  RATIO= 1.00
             RCP22  MANE         1.22     14.04    212.57      2.41      5.00     13.10    210.00        2.42

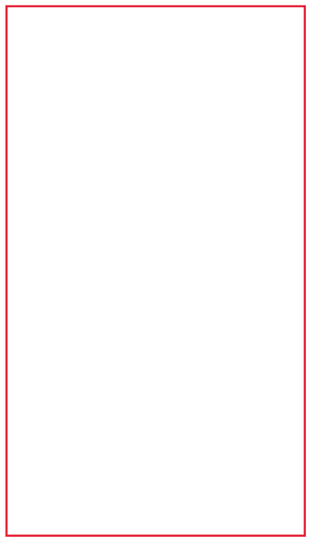
 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8434E+00 EXCESS= .0000E+00 OUTFLOW= .8500E+00 BASIN STORAGE= .1007E-04 PERCENT ERROR=   -.8

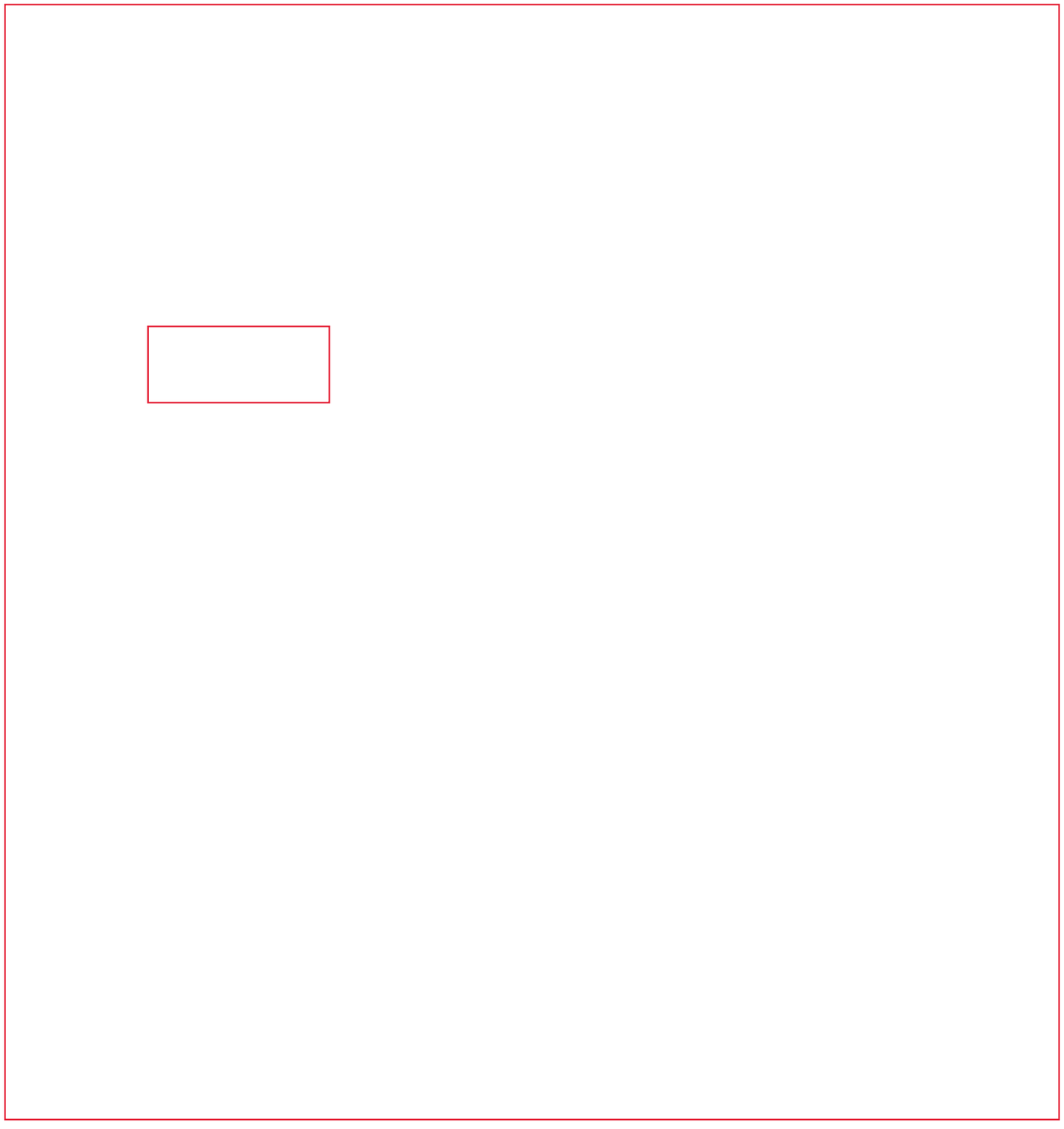


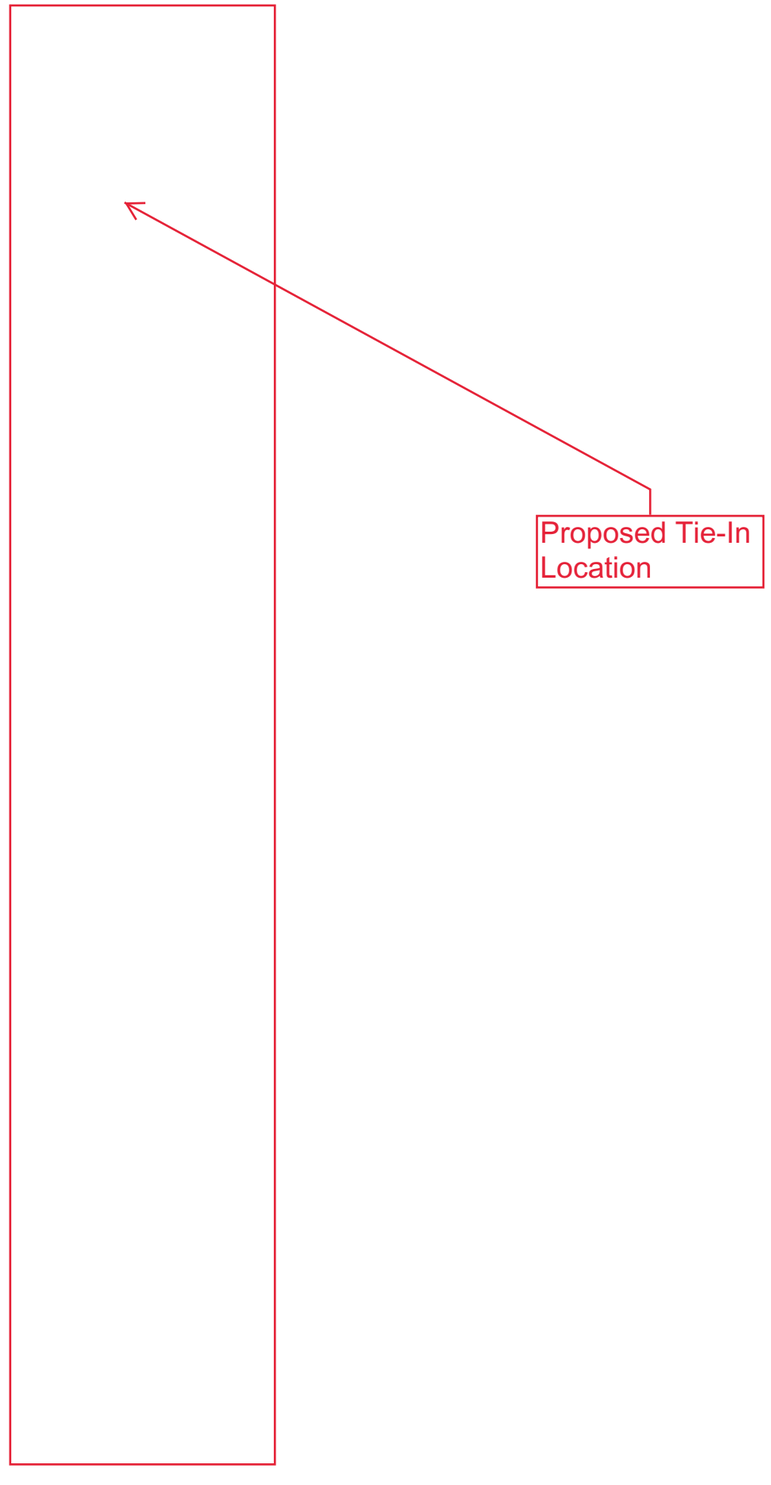
 *** NORMAL END OF HEC-1 ***
```





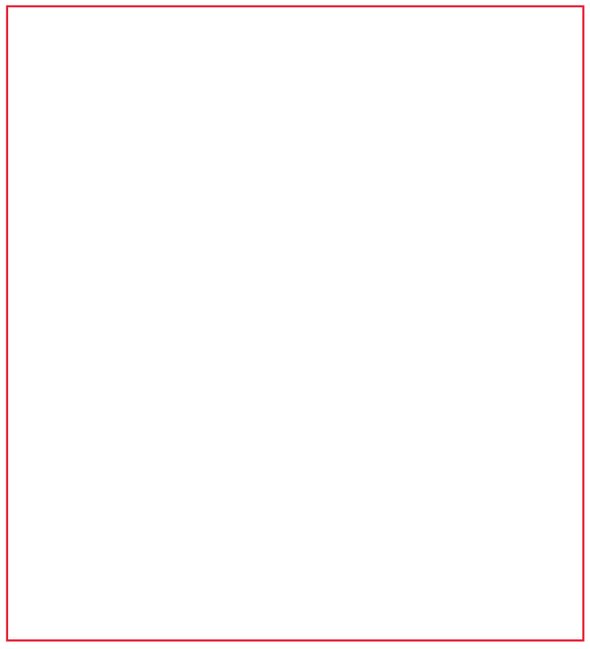





Proposed Tie-In
Location

PROP 1 CFS

PROP. 2 CFS



Technical Drainage Study for

View at Symphony Park Apartments

APN: 139-34-110-009

NWC of Symphony Park Avenue & South City Parkway

City of Las Vegas, Nevada

Prepared for:

Symphony Park Vegas, LLC
4514 Cole Avenue, Suite 810
Dallas, TX 75205
214.420.3055

Date Prepared:

August 28, 2018

APPENDIX C – HYDRAULIC CALCULATIONS

- Proposed Drop Inlet Calculation
- FlowMaster Hydraulic Sections – Streets
- WSPG Model
    - P1UP – Line 2
    - P1UP – Line 3
    - P2UP – Line 4
- Standard Form 6

```
T1 VIEW AT SYMPHONY PARK TDS                                                    0
T2 KHA 192005000 - AUGUST 2018
T3 LINE-2-PHASE-I - REFERENCE UNION PARK TDS
SO   1039.8802029.150  5                          2031.135
R    1047.0002029.160  5      .013                                .000    .000 0
R    1255.6202029.690  7      .013                                .000    .000 1
JX   1258.1202029.690  7  2   .013   10.00          2030.41          90.0
R    1260.6202029.890  7      .013                                .000    .000 0
R    1310.9502030.030  7      .013                                .000    .000 1
JX   1313.4502030.030  7  1  3.013    6.000    1.0002029.9902029.990 90.0 90.0    .000
TS   1315.9502030.230  2      .013                                .000    .000 0
R    1519.7002030.750  2      .013                                .000    .000 0
R    1521.7002030.750  2      .013                                .000 -90.000 1
TS   1523.7002030.950  1      .013                                .000
SH   1617.1602031.190  1                             .000
CD   1  4   1    .000   2.000     .000  .000  .000   .00
CD   2  4   1    .000   2.500     .000  .000  .000   .00
CD   3  4   1    .000   1.500     .000  .000  .000   .00
CD   5  3   0    .000   3.000    4.000  .000  .000   .00
CD   6  4   1    .000   4.000     .000  .000  .000   .00
CD   7  4   1    .000   3.000     .000  .000  .000   .00
Q            10.000   .0
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Program Package Serial Number: 7214

WATER SURFACE PROFILE LISTING Date: 8-28-2018 Time: 2:24:29

VIEW AT SYMPHONY PARK TDS
KHA 192005000 - AUGUST 2018
LINE-2-PHASE-I - REFERENCE UNION PARK TDS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1039.880	2029.150	1.985	2031.135	27.00	3.40	.18	2031.31	.00	1.12	4.00	3.000	4.000	.00	0 .0
7.120	.0014					.0009	.01	1.98	.43	1.68	.013	.00	.00	BOX
1047.000	2029.160	1.981	2031.141	27.00	5.45	.46	2031.60	.00	1.68	2.84	3.000	.000	.00	1 .0
208.620	.0025					.0027	.55	1.98	.73	2.04	.013	.00	.00	PIPE
1255.620	2029.690	2.029	2031.719	27.00	5.31	.44	2032.16	.00	1.68	2.81	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0016	.00	2.03	.69		.013	.00	.00	PIPE
1258.120	2029.690	2.563	2032.253	17.00	2.64	.11	2032.36	.00	1.32	2.12	3.000	.000	.00	1 .0
1.546	.0800					.0006	.00	2.56	.27	.61	.013	.00	.00	PIPE
1259.666	2029.814	2.429	2032.243	17.00	2.77	.12	2032.36	.00	1.32	2.35	3.000	.000	.00	1 .0
.954	.0800					.0007	.00	2.43	.30	.61	.013	.00	.00	PIPE
1260.620	2029.890	2.345	2032.235	17.00	2.87	.13	2032.36	.00	1.32	2.48	3.000	.000	.00	1 .0
47.109	.0028					.0008	.04	2.35	.33	1.47	.013	.00	.00	PIPE
1307.729	2030.021	2.237	2032.258	17.00	3.01	.14	2032.40	.00	1.32	2.61	3.000	.000	.00	1 .0
3.221	.0028					.0008	.00	2.24	.36	1.47	.013	.00	.00	PIPE
1310.950	2030.030	2.230	2032.260	17.00	3.02	.14	2032.40	.00	1.32	2.62	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0005	.00	2.23	.36		.013	.00	.00	PIPE
1313.450	2030.030	2.416	2032.446	10.00	1.64	.04	2032.49	.00	1.00	2.38	3.000	.000	.00	1 .0
TRANS STR	.0800					.0004	.00	2.42	.18		.013	.00	.00	PIPE

Program Package Serial Number: 7214

WATER SURFACE PROFILE LISTING Date: 8-28-2018 Time: 2:24:29

VIEW AT SYMPHONY PARK TDS
KHA 192005000 - AUGUST 2018
LINE-2-PHASE-I - REFERENCE UNION PARK TDS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1315.950	2030.230	2.191	2032.421	10.00	2.19	.07	2032.50	.00	1.06	1.64	2.500	.000	.00	1 .0
56.493	.0026					.0006	.03	2.19	.23	1.22	.013	.00	.00	PIPE
1372.443	2030.374	2.071	2032.446	10.00	2.30	.08	2032.53	.00	1.06	1.88	2.500	.000	.00	1 .0
48.768	.0026					.0006	.03	2.07	.27	1.22	.013	.00	.00	PIPE
1421.210	2030.499	1.969	2032.467	10.00	2.41	.09	2032.56	.00	1.06	2.05	2.500	.000	.00	1 .0
44.045	.0026					.0007	.03	1.97	.30	1.22	.013	.00	.00	PIPE
1465.255	2030.611	1.877	2032.488	10.00	2.53	.10	2032.59	.00	1.06	2.16	2.500	.000	.00	1 .0
40.864	.0026					.0008	.03	1.88	.33	1.22	.013	.00	.00	PIPE
1506.120	2030.715	1.794	2032.509	10.00	2.65	.11	2032.62	.00	1.06	2.25	2.500	.000	.00	1 .0
13.580	.0026					.0008	.01	1.79	.36	1.22	.013	.00	.00	PIPE
1519.700	2030.750	1.767	2032.517	10.00	2.70	.11	2032.63	.00	1.06	2.28	2.500	.000	.00	1 .0
2.000	.0000					.0008	.00	1.77	.37	.00	.013	.00	.00	PIPE
1521.700	2030.750	1.769	2032.519	10.00	2.69	.11	2032.63	.00	1.06	2.27	2.500	.000	.00	1 .0
TRANS STR	.1000					.0016	.00	1.77	.37		.013	.00	.00	PIPE
1523.700	2030.950	1.472	2032.422	10.00	4.04	.25	2032.67	.00	1.13	1.76	2.000	.000	.00	1 .0
TRANS STR	.1000					.0082	.02	1.47	.60		.013	.00	.00	PIPE
1617.160	2031.190	1.472	2032.661	10.00	4.04	.25	2032.91	.00	1.13	1.76	2.000	.000	.00	1 .0

```
T1 VIEW AT SYMPHONY PARK TDS
0
T2 KHA 192005000 - AUGUST 2018
T3 LINE-3 PHASE-I/II - REFERENCE UNION PARK TDS
SO   1258.1202029.890  1                          2031.720
R    1258.1202029.890  1      .013                                  .000    .000 0
R    1462.64 2030.410  1      .013
JX   1462.64 2030.410  1  2   .013    6.00          2030.61          90.0
R    1465.1402030.610  1      .013                                  .000    .000 0
R    1686.6402031.180  3      .013                                  .000    .000 0
R    1688.6402031.185  3      .013                                  .000    .000 1
R    1690.6402031.380  3      .013                                  .000    .000 0
R    1749.4502031.540  3      .013                                  .000    .000 1
R    1751.4502031.540  3      .013                                  .000    .000 0
R    1753.4502036.000  3      .013                                  .000    .000 0
R    1778.9702036.070  3      .013                                  .000    .000 1
R    1781.9702036.270  3      .013                                  .000    .000 0
SH   1871.5602036.500  3                             .000
CD   1  4   1    .000   2.500     .000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
CD   3  4   1    .000   1.500     .000  .000  .000   .00
Q            4.000   .0
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Program Package Serial Number: 7214

WATER SURFACE PROFILE LISTING Date: 8-28-2018 Time: 2:27:21

VIEW AT SYMPHONY PARK TDS
KHA 192005000 - AUGUST 2018
LINE-3 PHASE-I/II - REFERENCE UNION PARK TDS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1258.120	2029.890	1.831	2031.721	10.00	2.60	.10	2031.83	.00	1.06	2.21	2.500	.000	.00	1 .0
39.719	.0025					.0008	.03	1.83	.35	1.23	.013	.00	.00	PIPE
1297.839	2029.991	1.751	2031.742	10.00	2.72	.12	2031.86	.00	1.06	2.29	2.500	.000	.00	1 .0
37.761	.0025					.0009	.03	1.75	.38	1.23	.013	.00	.00	PIPE
1335.600	2030.087	1.677	2031.764	10.00	2.86	.13	2031.89	.00	1.06	2.35	2.500	.000	.00	1 .0
36.556	.0025					.0010	.04	1.68	.41	1.23	.013	.00	.00	PIPE
1372.156	2030.180	1.609	2031.789	10.00	3.00	.14	2031.93	.00	1.06	2.39	2.500	.000	.00	1 .0
35.917	.0025					.0011	.04	1.61	.45	1.23	.013	.00	.00	PIPE
1408.073	2030.271	1.544	2031.816	10.00	3.14	.15	2031.97	.00	1.06	2.43	2.500	.000	.00	1 .0
35.965	.0025					.0013	.05	1.54	.48	1.23	.013	.00	.00	PIPE
1444.038	2030.363	1.484	2031.846	10.00	3.29	.17	2032.01	.00	1.06	2.46	2.500	.000	.00	1 .0
18.602	.0025					.0014	.03	1.48	.52	1.23	.013	.00	.00	PIPE
1462.640	2030.410	1.454	2031.864	10.00	3.38	.18	2032.04	.00	1.06	2.47	2.500	.000	.00	1 .0
JUNCT STR	.0000					.0008	.00	1.45	.54		.013	.00	.00	PIPE
1462.640	2030.410	1.731	2032.141	4.00	1.10	.02	2032.16	.00	.66	2.31	2.500	.000	.00	1 .0
.882	.0800					.0001	.00	1.73	.16	.32	.013	.00	.00	PIPE
1463.522	2030.481	1.658	2032.139	4.00	1.16	.02	2032.16	.00	.66	2.36	2.500	.000	.00	1 .0
.820	.0800					.0002	.00	1.66	.17	.32	.013	.00	.00	PIPE

Program Package Serial Number: 7214

WATER SURFACE PROFILE LISTING Date: 8-28-2018 Time: 2:27:21

VIEW AT SYMPHONY PARK TDS
KHA 192005000 - AUGUST 2018
LINE-3 PHASE-I/II - REFERENCE UNION PARK TDS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1464.341	2030.546	1.591	2032.137	4.00	1.21	.02	2032.16	.00	.66	2.41	2.500	.000	.00	1 .0
.765	.0800					.0002	.00	1.59	.18	.32	.013	.00	.00	PIPE
1465.106	2030.607	1.528	2032.135	4.00	1.27	.03	2032.16	.00	.66	2.44	2.500	.000	.00	1 .0
.034	.0800					.0002	.00	1.53	.20	.32	.013	.00	.00	PIPE
1465.140	2030.610	1.525	2032.135	4.00	2.26	.08	2032.21	.00	.77	.00	1.500	.000	.00	1 .0
22.249	.0026					.0014	.03	1.52	.00	.97	.013	.00	.00	PIPE
1487.389	2030.667	1.500	2032.167	4.00	2.26	.08	2032.25	.00	.77	.00	1.500	.000	.00	1 .0
105.795	.0026					.0013	.14	1.50	.00	.97	.013	.00	.00	PIPE
1593.184	2030.940	1.361	2032.301	4.00	2.37	.09	2032.39	.00	.77	.87	1.500	.000	.00	1 .0
57.155	.0026					.0013	.08	1.36	.30	.97	.013	.00	.00	PIPE
1650.339	2031.087	1.280	2032.367	4.00	2.49	.10	2032.46	.00	.77	1.06	1.500	.000	.00	1 .0
36.301	.0026					.0014	.05	1.28	.36	.97	.013	.00	.00	PIPE
1686.640	2031.180	1.231	2032.411	4.00	2.58	.10	2032.51	.00	.77	1.15	1.500	.000	.00	1 .0
2.000	.0025					.0014	.00	1.23	.39	.98	.013	.00	.00	PIPE
1688.640	2031.185	1.229	2032.414	4.00	2.58	.10	2032.52	.00	.77	1.16	1.500	.000	.00	1 .0
.518	.0975					.0015	.00	1.23	.39	.35	.013	.00	.00	PIPE
1689.158	2031.236	1.168	2032.404	4.00	2.71	.11	2032.52	.00	.77	1.24	1.500	.000	.00	1 .0
.442	.0975					.0017	.00	1.17	.44	.35	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1689.600	2031.279	1.115	2032.393	4.00	2.84	.13	2032.52	.00	.77	1.31	1.500	.000	.00	1 .0
.382	.0975					.0019	.00	1.11	.48	.35	.013	.00	.00	PIPE
1689.982	2031.316	1.066	2032.382	4.00	2.98	.14	2032.52	.00	.77	1.36	1.500	.000	.00	1 .0
.331	.0975					.0021	.00	1.07	.53	.35	.013	.00	.00	PIPE
1690.312	2031.348	1.020	2032.369	4.00	3.12	.15	2032.52	.00	.77	1.40	1.500	.000	.00	1 .0
.283	.0975					.0024	.00	1.02	.58	.35	.013	.00	.00	PIPE
1690.596	2031.376	.978	2032.354	4.00	3.28	.17	2032.52	.00	.77	1.43	1.500	.000	.00	1 .0
.044	.0975					.0025	.00	.98	.62	.35	.013	.00	.00	PIPE
1690.640	2031.380	.971	2032.352	4.00	3.30	.17	2032.52	.00	.77	1.43	1.500	.000	.00	1 .0
1.323	.0027					.0026	.00	.97	.63	.95	.013	.00	.00	PIPE
1691.963	2031.384	.960	2032.344	4.00	3.35	.17	2032.52	.00	.77	1.44	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1691.963	2031.384	.587	2031.970	4.00	6.24	.61	2032.58	.00	.77	1.46	1.500	.000	.00	1 .0
1.308	.0027					.0139	.02	.59	1.66	.95	.013	.00	.00	PIPE
1693.270	2031.387	.587	2031.974	4.00	6.24	.61	2032.58	.00	.77	1.46	1.500	.000	.00	1 .0
3.307	.0027					.0148	.05	.59	1.66	.95	.013	.00	.00	PIPE
1696.577	2031.396	.566	2031.963	4.00	6.55	.67	2032.63	.00	.77	1.45	1.500	.000	.00	1 .0
3.313	.0027					.0169	.06	.57	1.78	.95	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1699.890	2031.405	.547	2031.952	4.00	6.87	.73	2032.68	.00	.77	1.44	1.500	.000	.00	1 .0
3.288	.0027					.0193	.06	.55	1.91	.95	.013	.00	.00	PIPE
1703.178	2031.414	.528	2031.942	4.00	7.20	.81	2032.75	.00	.77	1.43	1.500	.000	.00	1 .0
3.241	.0027					.0220	.07	.53	2.04	.95	.013	.00	.00	PIPE
1706.419	2031.423	.510	2031.933	4.00	7.56	.89	2032.82	.00	.77	1.42	1.500	.000	.00	1 .0
3.182	.0027					.0251	.08	.51	2.18	.95	.013	.00	.00	PIPE
1709.601	2031.432	.492	2031.924	4.00	7.92	.98	2032.90	.00	.77	1.41	1.500	.000	.00	1 .0
3.111	.0027					.0287	.09	.49	2.33	.95	.013	.00	.00	PIPE
1712.712	2031.440	.476	2031.916	4.00	8.31	1.07	2032.99	.00	.77	1.40	1.500	.000	.00	1 .0
3.038	.0027					.0327	.10	.48	2.49	.95	.013	.00	.00	PIPE
1715.750	2031.448	.459	2031.908	4.00	8.72	1.18	2033.09	.00	.77	1.38	1.500	.000	.00	1 .0
2.957	.0027					.0374	.11	.46	2.67	.95	.013	.00	.00	PIPE
1718.708	2031.457	.444	2031.901	4.00	9.14	1.30	2033.20	.00	.77	1.37	1.500	.000	.00	1 .0
2.871	.0027					.0427	.12	.44	2.85	.95	.013	.00	.00	PIPE
1721.579	2031.464	.429	2031.893	4.00	9.59	1.43	2033.32	.00	.77	1.36	1.500	.000	.00	1 .0
2.787	.0027					.0488	.14	.43	3.05	.95	.013	.00	.00	PIPE
1724.366	2031.472	.415	2031.886	4.00	10.06	1.57	2033.46	.00	.77	1.34	1.500	.000	.00	1 .0
2.701	.0027					.0557	.15	.41	3.25	.95	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1727.067	2031.479	.401	2031.880	4.00	10.55	1.73	2033.61	.00	.77	1.33	1.500	.000	.00	1 .0
2.612	.0027					.0637	.17	.40	3.48	.95	.013	.00	.00	PIPE
1729.679	2031.486	.387	2031.874	4.00	11.06	1.90	2033.77	.00	.77	1.31	1.500	.000	.00	1 .0
2.526	.0027					.0728	.18	.39	3.71	.95	.013	.00	.00	PIPE
1732.205	2031.493	.374	2031.868	4.00	11.60	2.09	2033.96	.00	.77	1.30	1.500	.000	.00	1 .0
2.440	.0027					.0833	.20	.37	3.97	.95	.013	.00	.00	PIPE
1734.645	2031.500	.362	2031.862	4.00	12.17	2.30	2034.16	.00	.77	1.28	1.500	.000	.00	1 .0
2.355	.0027					.0953	.22	.36	4.24	.95	.013	.00	.00	PIPE
1737.000	2031.506	.350	2031.856	4.00	12.76	2.53	2034.39	.00	.77	1.27	1.500	.000	.00	1 .0
2.272	.0027					.1089	.25	.35	4.53	.95	.013	.00	.00	PIPE
1739.271	2031.512	.338	2031.851	4.00	13.38	2.78	2034.63	.00	.77	1.25	1.500	.000	.00	1 .0
2.191	.0027					.1246	.27	.34	4.83	.95	.013	.00	.00	PIPE
1741.462	2031.518	.327	2031.846	4.00	14.04	3.06	2034.91	.00	.77	1.24	1.500	.000	.00	1 .0
2.111	.0027					.1426	.30	.33	5.16	.95	.013	.00	.00	PIPE
1743.573	2031.524	.317	2031.841	4.00	14.72	3.37	2035.21	.00	.77	1.22	1.500	.000	.00	1 .0
2.034	.0027					.1631	.33	.32	5.51	.95	.013	.00	.00	PIPE
1745.607	2031.530	.306	2031.836	4.00	15.44	3.70	2035.54	.00	.77	1.21	1.500	.000	.00	1 .0
1.958	.0027					.1867	.37	.31	5.88	.95	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1747.565	2031.535	.296	2031.831	4.00	16.20	4.07	2035.90	.00	.77	1.19	1.500	.000	.00	1 .0
1.885	.0027					.2137	.40	.30	6.28	.95	.013	.00	.00	PIPE
1749.450	2031.540	.286	2031.827	4.00	16.99	4.48	2036.31	.00	.77	1.18	1.500	.000	.00	1 .0
.216	.0000					.2304	.05	.29	6.70	.00	.013	.00	.00	PIPE
1749.666	2031.540	.285	2031.825	4.00	17.11	4.54	2036.37	.00	.77	1.18	1.500	.000	.00	1 .0
1.784	.0000					.2495	.45	.29	6.76	.00	.013	.00	.00	PIPE
1751.450	2031.540	.276	2031.816	4.00	17.94	5.00	2036.81	.00	.77	1.16	1.500	.000	.00	1 .0
.093	2.2300					.2592	.02	.28	7.22	.17	.013	.00	.00	PIPE
1751.543	2031.747	.279	2032.027	4.00	17.60	4.81	2036.84	.00	.77	1.17	1.500	.000	.00	1 .0
.214	2.2300					.2362	.05	.28	7.03	.17	.013	.00	.00	PIPE
1751.758	2032.226	.289	2032.515	4.00	16.78	4.37	2036.89	.00	.77	1.18	1.500	.000	.00	1 .0
.192	2.2300					.2064	.04	.29	6.59	.17	.013	.00	.00	PIPE
1751.949	2032.653	.299	2032.952	4.00	16.00	3.97	2036.93	.00	.77	1.20	1.500	.000	.00	1 .0
.171	2.2300					.1803	.03	.30	6.17	.17	.013	.00	.00	PIPE
1752.121	2033.035	.309	2033.344	4.00	15.25	3.61	2036.96	.00	.77	1.21	1.500	.000	.00	1 .0
.153	2.2300					.1576	.02	.31	5.78	.17	.013	.00	.00	PIPE
1752.274	2033.377	.319	2033.696	4.00	14.54	3.28	2036.98	.00	.77	1.23	1.500	.000	.00	1 .0
.137	2.2300					.1377	.02	.32	5.42	.17	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1752.411	2033.684	.330	2034.014	4.00	13.87	2.99	2037.00	.00	.77	1.24	1.500	.000	.00	1 .0
.123	2.2300					.1204	.01	.33	5.07	.17	.013	.00	.00	PIPE
1752.535	2033.959	.341	2034.300	4.00	13.22	2.71	2037.01	.00	.77	1.26	1.500	.000	.00	1 .0
.111	2.2300					.1052	.01	.34	4.75	.17	.013	.00	.00	PIPE
1752.646	2034.206	.353	2034.559	4.00	12.61	2.47	2037.03	.00	.77	1.27	1.500	.000	.00	1 .0
.099	2.2300					.0920	.01	.35	4.45	.17	.013	.00	.00	PIPE
1752.745	2034.427	.365	2034.792	4.00	12.02	2.24	2037.04	.00	.77	1.29	1.500	.000	.00	1 .0
.089	2.2300					.0805	.01	.37	4.17	.17	.013	.00	.00	PIPE
1752.834	2034.625	.378	2035.003	4.00	11.46	2.04	2037.04	.00	.77	1.30	1.500	.000	.00	1 .0
.080	2.2300					.0704	.01	.38	3.90	.17	.013	.00	.00	PIPE
1752.914	2034.803	.391	2035.194	4.00	10.93	1.85	2037.05	.00	.77	1.32	1.500	.000	.00	1 .0
.072	2.2300					.0616	.00	.39	3.65	.17	.013	.00	.00	PIPE
1752.985	2034.963	.404	2035.367	4.00	10.42	1.69	2037.05	.00	.77	1.33	1.500	.000	.00	1 .0
.064	2.2300					.0539	.00	.40	3.42	.17	.013	.00	.00	PIPE
1753.049	2035.106	.418	2035.524	4.00	9.93	1.53	2037.06	.00	.77	1.35	1.500	.000	.00	1 .0
.057	2.2300					.0471	.00	.42	3.20	.17	.013	.00	.00	PIPE
1753.106	2035.233	.433	2035.666	4.00	9.47	1.39	2037.06	.00	.77	1.36	1.500	.000	.00	1 .0
.051	2.2300					.0413	.00	.43	2.99	.17	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1753.157	2035.347	.448	2035.794	4.00	9.03	1.27	2037.06	.00	.77	1.37	1.500	.000	.00	1 .0
.045	2.2300					.0361	.00	.45	2.80	.17	.013	.00	.00	PIPE
1753.202	2035.448	.464	2035.911	4.00	8.61	1.15	2037.06	.00	.77	1.39	1.500	.000	.00	1 .0
.040	2.2300					.0316	.00	.46	2.62	.17	.013	.00	.00	PIPE
1753.243	2035.537	.480	2036.017	4.00	8.21	1.05	2037.06	.00	.77	1.40	1.500	.000	.00	1 .0
.036	2.2300					.0277	.00	.48	2.45	.17	.013	.00	.00	PIPE
1753.278	2035.617	.497	2036.113	4.00	7.83	.95	2037.06	.00	.77	1.41	1.500	.000	.00	1 .0
.031	2.2300					.0243	.00	.50	2.29	.17	.013	.00	.00	PIPE
1753.309	2035.686	.514	2036.201	4.00	7.46	.86	2037.07	.00	.77	1.42	1.500	.000	.00	1 .0
.027	2.2300					.0213	.00	.51	2.14	.17	.013	.00	.00	PIPE
1753.337	2035.747	.533	2036.280	4.00	7.12	.79	2037.07	.00	.77	1.44	1.500	.000	.00	1 .0
.024	2.2300					.0186	.00	.53	2.00	.17	.013	.00	.00	PIPE
1753.360	2035.800	.552	2036.352	4.00	6.78	.71	2037.07	.00	.77	1.45	1.500	.000	.00	1 .0
.020	2.2300					.0163	.00	.55	1.87	.17	.013	.00	.00	PIPE
1753.381	2035.846	.571	2036.417	4.00	6.47	.65	2037.07	.00	.77	1.46	1.500	.000	.00	1 .0
.017	2.2300					.0143	.00	.57	1.75	.17	.013	.00	.00	PIPE
1753.398	2035.884	.592	2036.476	4.00	6.17	.59	2037.07	.00	.77	1.47	1.500	.000	.00	1 .0
.015	2.2300					.0126	.00	.59	1.63	.17	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1753.413	2035.917	.614	2036.530	4.00	5.88	.54	2037.07	.00	.77	1.47	1.500	.000	.00	1 .0
.012	2.2300					.0110	.00	.61	1.53	.17	.013	.00	.00	PIPE
1753.425	2035.943	.636	2036.579	4.00	5.61	.49	2037.07	.00	.77	1.48	1.500	.000	.00	1 .0
.009	2.2300					.0097	.00	.64	1.42	.17	.013	.00	.00	PIPE
1753.434	2035.964	.660	2036.624	4.00	5.35	.44	2037.07	.00	.77	1.49	1.500	.000	.00	1 .0
.007	2.2300					.0085	.00	.66	1.33	.17	.013	.00	.00	PIPE
1753.441	2035.980	.684	2036.664	4.00	5.10	.40	2037.07	.00	.77	1.49	1.500	.000	.00	1 .0
.005	2.2300					.0075	.00	.68	1.24	.17	.013	.00	.00	PIPE
1753.446	2035.991	.710	2036.701	4.00	4.86	.37	2037.07	.00	.77	1.50	1.500	.000	.00	1 .0
.003	2.2300					.0066	.00	.71	1.16	.17	.013	.00	.00	PIPE
1753.449	2035.998	.736	2036.734	4.00	4.63	.33	2037.07	.00	.77	1.50	1.500	.000	.00	1 .0
.001	2.2300					.0058	.00	.74	1.08	.17	.013	.00	.00	PIPE
1753.450	2036.000	.765	2036.766	4.00	4.41	.30	2037.07	.00	.77	1.50	1.500	.000	.00	1 .0
.873	.0027					.0051	.00	.77	1.00	.95	.013	.00	.00	PIPE
1754.323	2036.002	.795	2036.797	4.00	4.21	.27	2037.07	.00	.77	1.50	1.500	.000	.00	1 .0
3.448	.0027					.0045	.02	.80	.93	.95	.013	.00	.00	PIPE
1757.771	2036.012	.826	2036.838	4.00	4.01	.25	2037.09	.00	.77	1.49	1.500	.000	.00	1 .0
3.814	.0027					.0042	.02	.83	.86	.95	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1761.585	2036.022	.826	2036.848	4.00	4.01	.25	2037.10	.00	.77	1.49	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1761.585	2036.022	.677	2036.700	4.00	5.16	.41	2037.11	.00	.77	1.49	1.500	.000	.00	1 .0
1.677	.0027					.0083	.01	.68	1.26	.95	.013	.00	.00	PIPE
1763.262	2036.027	.677	2036.704	4.00	5.16	.41	2037.12	.00	.77	1.49	1.500	.000	.00	1 .0
2.826	.0027					.0088	.02	.68	1.26	.95	.013	.00	.00	PIPE
1766.087	2036.035	.653	2036.688	4.00	5.41	.46	2037.14	.00	.77	1.49	1.500	.000	.00	1 .0
3.071	.0027					.0100	.03	.65	1.35	.95	.013	.00	.00	PIPE
1769.159	2036.043	.630	2036.673	4.00	5.68	.50	2037.17	.00	.77	1.48	1.500	.000	.00	1 .0
3.206	.0027					.0114	.04	.63	1.45	.95	.013	.00	.00	PIPE
1772.365	2036.052	.608	2036.660	4.00	5.96	.55	2037.21	.00	.77	1.47	1.500	.000	.00	1 .0
3.284	.0027					.0130	.04	.61	1.55	.95	.013	.00	.00	PIPE
1775.649	2036.061	.587	2036.647	4.00	6.25	.61	2037.25	.00	.77	1.46	1.500	.000	.00	1 .0
3.321	.0027					.0148	.05	.59	1.66	.95	.013	.00	.00	PIPE
1778.970	2036.070	.566	2036.636	4.00	6.55	.67	2037.30	.00	.77	1.45	1.500	.000	.00	1 .0
.225	.0667					.0155	.00	.57	1.78	.39	.013	.00	.00	PIPE
1779.195	2036.085	.571	2036.656	4.00	6.47	.65	2037.31	.00	.77	1.46	1.500	.000	.00	1 .0
.733	.0667					.0143	.01	.57	1.75	.39	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1779.928	2036.134	.592	2036.726	4.00	6.17	.59	2037.32	.00	.77	1.47	1.500	.000	.00	1 .0
.595	.0667					.0126	.01	.59	1.63	.39	.013	.00	.00	PIPE
1780.523	2036.174	.614	2036.787	4.00	5.88	.54	2037.32	.00	.77	1.47	1.500	.000	.00	1 .0
.475	.0667					.0110	.01	.61	1.53	.39	.013	.00	.00	PIPE
1780.998	2036.205	.636	2036.841	4.00	5.61	.49	2037.33	.00	.77	1.48	1.500	.000	.00	1 .0
.366	.0667					.0097	.00	.64	1.42	.39	.013	.00	.00	PIPE
1781.365	2036.230	.660	2036.889	4.00	5.35	.44	2037.33	.00	.77	1.49	1.500	.000	.00	1 .0
.272	.0667					.0085	.00	.66	1.33	.39	.013	.00	.00	PIPE
1781.637	2036.248	.684	2036.932	4.00	5.10	.40	2037.34	.00	.77	1.49	1.500	.000	.00	1 .0
.187	.0667					.0075	.00	.68	1.24	.39	.013	.00	.00	PIPE
1781.824	2036.260	.710	2036.970	4.00	4.86	.37	2037.34	.00	.77	1.50	1.500	.000	.00	1 .0
.109	.0667					.0066	.00	.71	1.16	.39	.013	.00	.00	PIPE
1781.933	2036.268	.736	2037.004	4.00	4.63	.33	2037.34	.00	.77	1.50	1.500	.000	.00	1 .0
.037	.0667					.0058	.00	.74	1.08	.39	.013	.00	.00	PIPE
1781.970	2036.270	.765	2037.036	4.00	4.41	.30	2037.34	.00	.77	1.50	1.500	.000	.00	1 .0

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T1 VIEW AT SYMPHONY PARK TDS                                                    0
T2 KHA 192005000 - AUGUST 2018
T3 LINE-4-PHASE-II - REFERENCE UNION PARK TDS
SO   1040.0002028.260  5
R    1040.0002028.260  5      .013
R    1255.7902029.120  5      .013                                  .000    .000 1
JX   1258.2902029.220  5  4  4.013    4.000    3.0002029.3202029.320   .0 90.0    .000
R    1260.7902029.320  5      .013                                  .000    .000 0
R    1316.8602029.470  5      .013                                  .000    .000 0
R    1320.8602029.670  5      .013                                  .000    .000 0
R    1532.7402030.210  3      .013                                  .000    .000 1
JX   1534.7402030.310  3  4  2.013    1.000    2.0002030.4102030.410 90.0-90.0    .000
R    1536.7402030.410  3      .013                                  .000    .000 0
R    1590.5402030.560  4      .013                                  .000    .000 1
R    1593.0402030.660  4      .013                                  .000  90.050 0
R    1595.5402030.760  4      .013                                  .000    .000 0
R    1647.5802030.900  4      .013                                  .000    .000 1
SH   1647.5802030.900  4                        2032.390
CD   1  3   0    .000   3.000    4.000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
CD   3  4   1    .000   2.500     .000  .000  .000   .00
CD   4  4   1    .000   2.000     .000  .000  .000   .00
CD   5  4   1    .000   3.000     .000  .000  .000   .00
Q            11.000   .0
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Program Package Serial Number: 7214

WATER SURFACE PROFILE LISTING Date: 8-28-2018 Time: 2:14: 9

VIEW AT SYMPHONY PARK TDS
KHA 192005000 - AUGUST 2018
LINE-4-PHASE-II - REFERENCE UNION PARK TDS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1040.000	2028.260	1.472	2029.732	21.00	6.09	.58	2030.31	.00	1.47	3.00	3.000	.000	.00	1 .0
7.630	.0040					.0041	.03	1.47	1.00	1.50	.013	.00	.00	PIPE
1047.630	2028.290	1.498	2029.788	21.00	5.95	.55	2030.34	.00	1.47	3.00	3.000	.000	.00	1 .0
208.160	.0040					.0040	.82	1.50	.97	1.50	.013	.00	.00	PIPE
1255.790	2029.120	1.498	2030.618	21.00	5.95	.55	2031.17	.00	1.47	3.00	3.000	.000	.00	1 .0
JUNCT STR	.0400					.0024	.01	1.50	.97		.013	.00	.00	PIPE
1258.290	2029.220	1.986	2031.205	14.00	2.82	.12	2031.33	.00	1.19	2.84	3.000	.000	.00	1 .0
1.743	.0400					.0008	.00	1.99	.38	.66	.013	.00	.00	PIPE
1260.033	2029.290	1.905	2031.194	14.00	2.96	.14	2031.33	.00	1.19	2.89	3.000	.000	.00	1 .0
.757	.0400					.0008	.00	1.90	.41	.66	.013	.00	.00	PIPE
1260.790	2029.320	1.869	2031.189	14.00	3.02	.14	2031.33	.00	1.19	2.91	3.000	.000	.00	1 .0
34.044	.0027					.0009	.03	1.87	.42	1.33	.013	.00	.00	PIPE
1294.834	2029.411	1.795	2031.206	14.00	3.17	.16	2031.36	.00	1.19	2.94	3.000	.000	.00	1 .0
22.026	.0027					.0010	.02	1.80	.46	1.33	.013	.00	.00	PIPE
1316.860	2029.470	1.749	2031.219	14.00	3.27	.17	2031.39	.00	1.19	2.96	3.000	.000	.00	1 .0
1.032	.0500					.0011	.00	1.75	.48	.62	.013	.00	.00	PIPE
1317.892	2029.522	1.682	2031.203	14.00	3.43	.18	2031.39	.00	1.19	2.98	3.000	.000	.00	1 .0
.930	.0500					.0013	.00	1.68	.52	.62	.013	.00	.00	PIPE

Program Package Serial Number: 7214

WATER SURFACE PROFILE LISTING Date: 8-28-2018 Time: 2:14: 9

VIEW AT SYMPHONY PARK TDS
KHA 192005000 - AUGUST 2018
LINE-4-PHASE-II - REFERENCE UNION PARK TDS

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1318.822	2029.568	1.618	2031.186	14.00	3.60	.20	2031.39	.00	1.19	2.99	3.000	.000	.00	1 .0
.829	.0500					.0015	.00	1.62	.56	.62	.013	.00	.00	PIPE
1319.651	2029.610	1.558	2031.167	14.00	3.78	.22	2031.39	.00	1.19	3.00	3.000	.000	.00	1 .0
.733	.0500					.0017	.00	1.56	.60	.62	.013	.00	.00	PIPE
1320.384	2029.646	1.500	2031.146	14.00	3.96	.24	2031.39	.00	1.19	3.00	3.000	.000	.00	1 .0
.476	.0500					.0018	.00	1.50	.64	.62	.013	.00	.00	PIPE
1320.860	2029.670	1.460	2031.130	14.00	4.70	.34	2031.47	.00	1.26	2.46	2.500	.000	.00	1 .0
177.254	.0025					.0027	.47	1.46	.75	1.51	.013	.00	.00	PIPE
1498.114	2030.122	1.506	2031.628	14.00	4.53	.32	2031.95	.00	1.26	2.45	2.500	.000	.00	1 .0
34.626	.0025					.0025	.09	1.51	.71	1.51	.013	.00	.00	PIPE
1532.740	2030.210	1.506	2031.716	14.00	4.53	.32	2032.03	.00	1.26	2.45	2.500	.000	.00	1 .0
JUNCT STR	.0500					.0018	.00	1.51	.71		.013	.00	.00	PIPE
1534.740	2030.310	1.682	2031.992	11.00	3.13	.15	2032.14	.00	1.11	2.35	2.500	.000	.00	1 .0
1.103	.0500					.0012	.00	1.68	.45	.58	.013	.00	.00	PIPE
1535.843	2030.365	1.613	2031.979	11.00	3.28	.17	2032.15	.00	1.11	2.39	2.500	.000	.00	1 .0
.897	.0500					.0014	.00	1.61	.49	.58	.013	.00	.00	PIPE
1536.740	2030.410	1.555	2031.965	11.00	4.20	.27	2032.24	.00	1.19	1.66	2.000	.000	.00	1 .0
53.800	.0028					.0026	.14	1.55	.59	1.51	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1590.540	2030.560	1.543	2032.103	11.00	4.23	.28	2032.38	.00	1.19	1.68	2.000	.000	.00	1 .0
1.144	.0400					.0028	.00	1.54	.60	.67	.013	.00	.00	PIPE
1591.684	2030.606	1.473	2032.079	11.00	4.44	.31	2032.38	.00	1.19	1.76	2.000	.000	.00	1 .0
.422	.0400					.0031	.00	1.47	.66	.67	.013	.00	.00	PIPE
1592.106	2030.623	1.409	2032.031	11.00	4.65	.34	2032.37	.00	1.19	1.83	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
1592.106	2030.623	.960	2031.583	11.00	7.38	.84	2032.43	.00	1.19	2.00	2.000	.000	.00	1 .0
.934	.0400					.0102	.01	.96	1.50	.67	.013	.00	.00	PIPE
1593.040	2030.660	.997	2031.657	11.00	7.03	.77	2032.42	.00	1.19	2.00	2.000	.000	.00	1 .0
.629	.0400					.0092	.01	1.00	1.40	.67	.013	.00	.00	PIPE
1593.669	2030.685	1.018	2031.703	11.00	6.84	.73	2032.43	.00	1.19	2.00	2.000	.000	.00	1 .0
.851	.0400					.0084	.01	1.02	1.35	.67	.013	.00	.00	PIPE
1594.520	2030.719	1.057	2031.777	11.00	6.53	.66	2032.44	.00	1.19	2.00	2.000	.000	.00	1 .0
.577	.0400					.0074	.00	1.06	1.25	.67	.013	.00	.00	PIPE
1595.097	2030.742	1.099	2031.841	11.00	6.22	.60	2032.44	.00	1.19	1.99	2.000	.000	.00	1 .0
.333	.0400					.0065	.00	1.10	1.16	.67	.013	.00	.00	PIPE
1595.430	2030.756	1.142	2031.898	11.00	5.93	.55	2032.44	.00	1.19	1.98	2.000	.000	.00	1 .0
.110	.0400					.0057	.00	1.14	1.08	.67	.013	.00	.00	PIPE

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1595.540	2030.760	1.189	2031.949	11.00	5.65	.50	2032.44	.00	1.19	1.96	2.000	.000	.00	1 .0
1.478	.0027					.0051	.01	1.19	1.00	1.54	.013	.00	.00	PIPE
1597.018	2030.764	1.238	2032.002	11.00	5.39	.45	2032.45	.00	1.19	1.94	2.000	.000	.00	1 .0
5.928	.0027					.0045	.03	1.24	.93	1.54	.013	.00	.00	PIPE
1602.947	2030.780	1.289	2032.069	11.00	5.14	.41	2032.48	.00	1.19	1.91	2.000	.000	.00	1 .0
13.684	.0027					.0040	.05	1.29	.86	1.54	.013	.00	.00	PIPE
1616.631	2030.817	1.345	2032.161	11.00	4.90	.37	2032.53	.00	1.19	1.88	2.000	.000	.00	1 .0
29.195	.0027					.0036	.10	1.34	.79	1.54	.013	.00	.00	PIPE
1645.825	2030.895	1.404	2032.299	11.00	4.67	.34	2032.64	.00	1.19	1.83	2.000	.000	.00	1 .0
1.755	.0027					.0033	.01	1.40	.73	1.54	.013	.00	.00	PIPE
1647.580	2030.900	1.406	2032.306	11.00	4.66	.34	2032.64	.00	1.19	1.83	2.000	.000	.00	1 .0

DEPARTMENT OF PUBLIC WORKS

Mayor:
CAROLYN G. GOODMAN

City Council:
LOIS TARKANIAN (MAYOR PRO-TEM)
STAVROS S. ANTHONY
BOB COFFIN
STEVEN G. SEROKA
MICHELE FIORE
CEDRIC CREAR

City Manager:
SCOTT D. ADAMS

Director of Public Works:
MIKE JANSSEN, P.E. (ACTING)
City Engineer:
ALLEN E. PAVELKA, P.E.

Funded By:
CITY OF LAS VEGAS
RTC OF SOUTHERN NEVADA

SYMPHONY PARK

PROMENADE PLACE & CARSON AVE. OFFSITE IMPROVEMENTS

Reviewed By:

CLV CITY ENGINEER — DATE

CLV PROJECT MANAGER — DATE

CLV CITY TRAFFIC ENGINEER — DATE

CLV CONSTRUCTION MANAGER — DATE

N/A
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT — DATE

REGIONAL TRANSPORTATION COMMISSION OF SOUTHERN NEVADA — DATE

SOUTHWEST GAS CORPORATION — DATE

CENTRAL TELEPHONE COMPANY, d/b/a CENTURYLINK — DATE

THE AFFIXED CENTURYLINK NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION STANDARD REGULATIONS.

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

NV ENERGY – DISTRIBUTION — DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

N/A
NV ENERGY – TRANSMISSION — DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT No. 126442 FIRST APPROVED DATE: _____
SHEET: GN1–GN3, TYP1, DT1, DD1–DD4, WT1–WT3, UTD1–UTD3

THIS PROJECT PROVIDES FOR THE INSTALLATION OF OFF-SITE WATER MAINS ONLY, AND DOES NOT PROVIDE OR IMPLY ANY WATER COMMITMENT.

THE SIGNATURE ABOVE ACKNOWLEDGES THAT THE UTILITY COMPANY REPRESENTATIVE HAS REVIEWED THE PLANS, AND THAT TO THE BEST OF HIS OR HER KNOWLEDGE THE UTILITY LINES ARE SHOWN IN THE CORRECT LOCATIONS AND ARE THE CORRECT SIZES. WHILE SUCH DATA HAS BEEN COLLECTED WITH REASONABLE CARE, THERE IS NO EXPRESSED OR IMPLIED GUARANTEE THAT THE LOCATIONS ARE EXACT. THE CONTRACTOR SHALL BEAR THE RESPONSIBILITY OF OBTAINING THE ACTUAL FIELD LOCATIONS.

THE SIGNATURE ABOVE FURTHER ACKNOWLEDGES THAT THE UTILITY COMPANY DOES NOT ANTICIPATE CONSTRUCTION OR MAINTENANCE IN THE PROJECT AREA FOR FIVE (5) YEARS IN CONFORMANCE WITH THE CLV NO-CUT POLICY.

REV	DATE	BY	REVISION

092256032 – PARCEL C OFFSITE IMPROVEMENTS

DRAWN BY: MAH | DESIGNED BY: RAM | CHECKED BY: RAM
SCALE (H): – | SCALE (V): – | DATE: JULY 9, 2018

Kimley»Horn

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6671 LAS VEGAS BLVD. S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

DEPARTMENT OF PUBLIC WORKS

PROJECT: SYMPHONY PARK
PROMENADE PLACE & CARSON AVE. OFF-SITE IMPROVEMENTS

SHEET: COVER SHEET

90% SUBMITTAL
NOT FOR CONSTRUCTION

SHEET NUMBER
GN-1
SHEET 1 OF 27

BID #18.60311
CLV HANSEN #60311

Plotted By:Ortiz, Tony Sheet Set:Kha Layout:COVER SHEET August 14, 2018 04:35:53pm K:\LAV_Civil\092256032 – Symphony Park\CAD\Packages\Parcel C Offsites\Plansheets\092256032_GN.dwg
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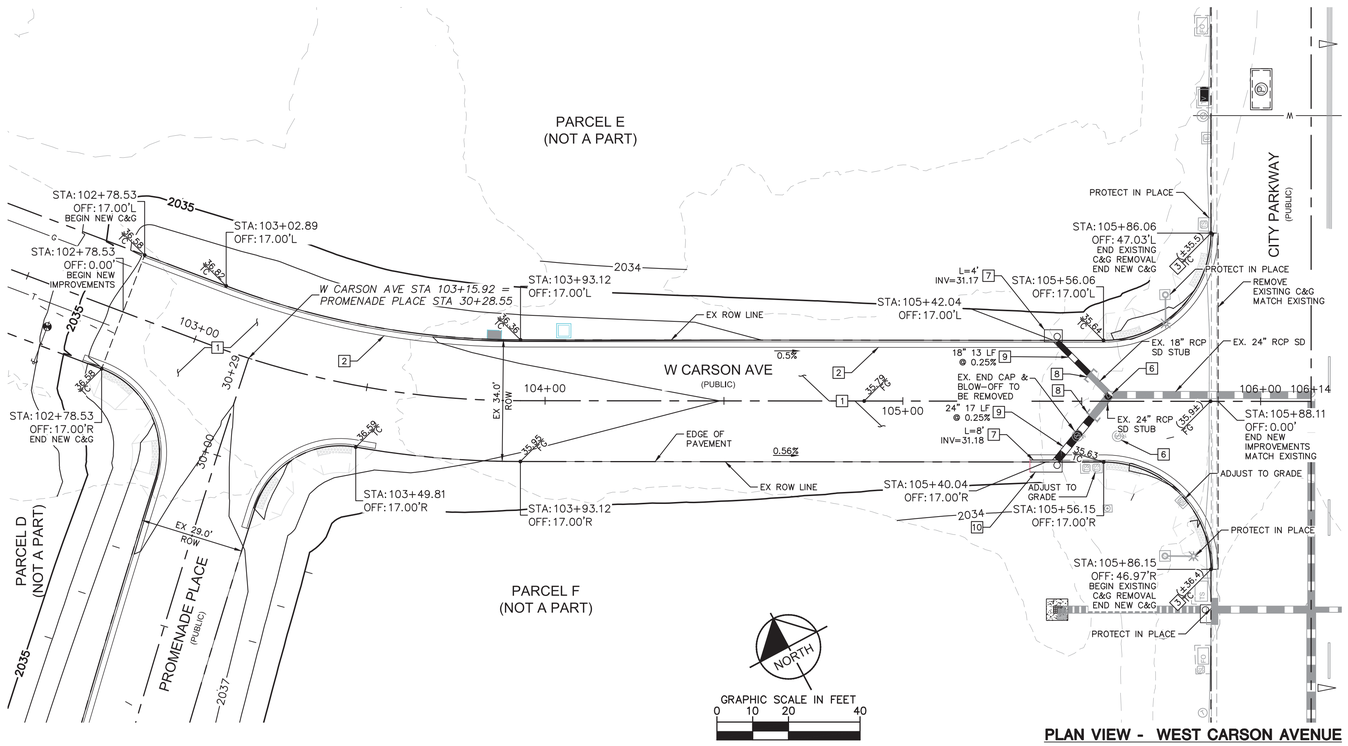
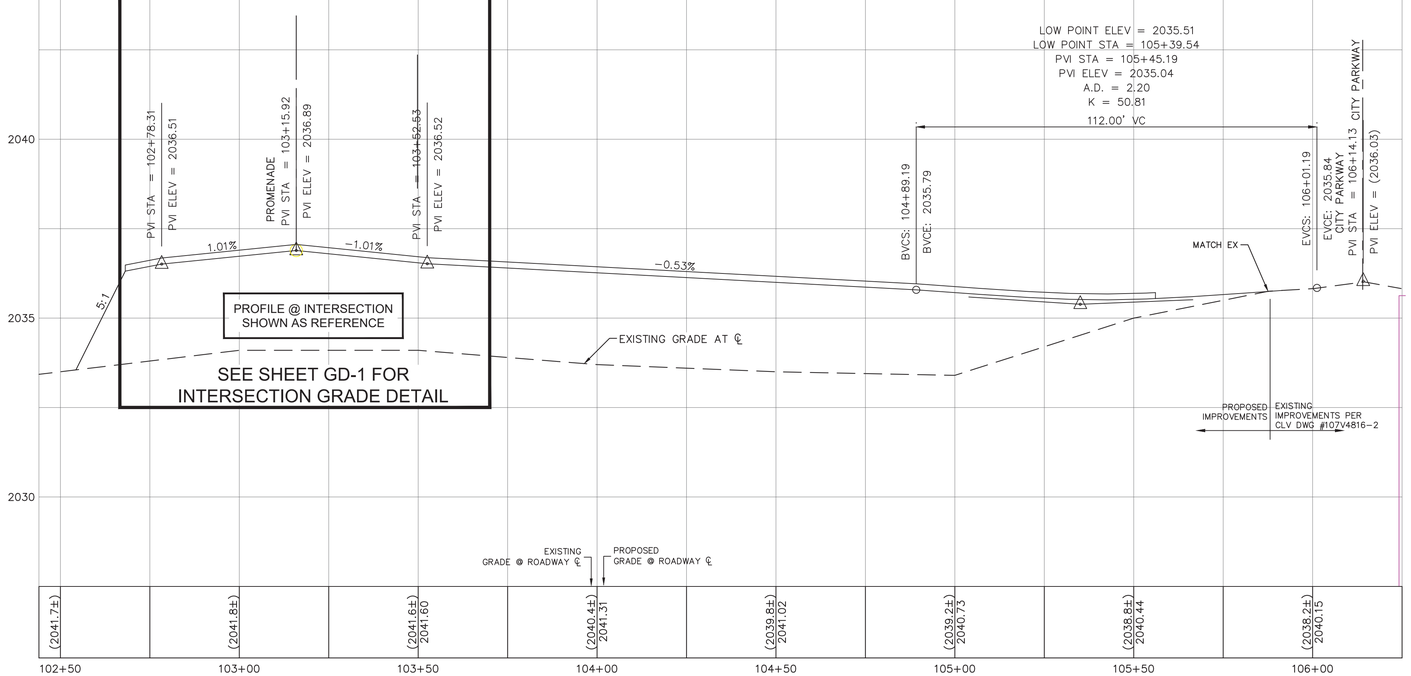
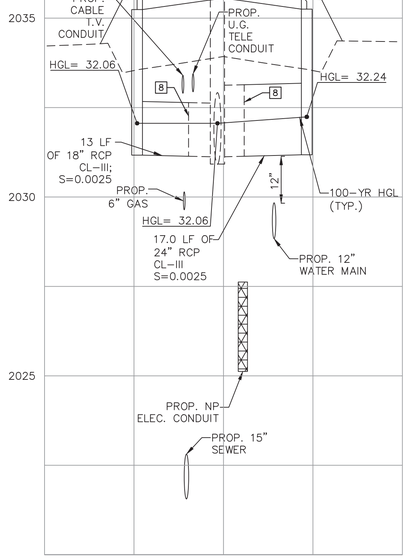


PLAN VIEW - WEST CARSON AVENUE



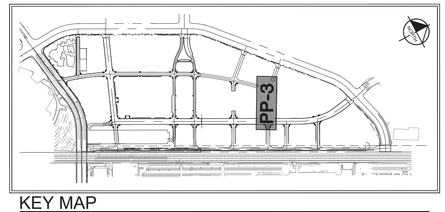
PROFILE VIEW - WEST CARSON AVENUE

SCALE: (H) 1" = 20'
(V) 1" = 2'



SD PROFILE

SCALE: (H) 1" = 20'
(V) 1" = 2'



KEY MAP

GENERAL NOTES

1. REFER TO SHEET GD-1 FOR INTERSECTION GRADING
2. ADD 2000 FEET TO ALL 2-DIGIT SPOT ELEVATIONS

ROADWAY CONSTRUCTION NOTES

1. INSTALL PAVEMENT SECTION TO LIMITS SHOWN ON PLANS, SEE TYPICAL SECTIONS SHEETS TYP-1 FOR STRUCTURAL DIMENSIONS AND DETAILS
2. INSTALL "L" TYPE CURB AND GUTTER PER CCAUSD NO. 216
3. MATCH EXISTING CONSTRUCTION BY OTHERS
6. ADJUST MANHOLE TO PROPOSED GRADE
7. INSTALL TYPE "C-D" MODIFIED DROP INLET PER CCAUSD DWG. NO. 412.1, LENGTH PER PLAN
8. CONNECT TO EXISTING RCB SD STUB
9. INSTALL RCP SD, SIZE AND SLOPE PER PLAN. REFER TO SD PROFILE, THIS SHEET.
10. PROVIDE KNOCK OUT IN PRE-CAST DROP INLET FOR FUTURE CONNECTION.

BASIS OF BEARING

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NRCS), LAS VEGAS AND LAS VEGAS HIGH ELEVATION ZONES, NORTH AMERICAN DATUM OF 1983 SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN. THE REFERENCE FRAME UTILIZED BEING NAD 83 (2011) EPOCH 2010.0.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 8LV0133NE6, BEING A RIVET & PLATE IN TOP OF CURB ON THE SOUTHWEST CORNER OF SYMPHONY PARK AVENUE AND GRAND CENTRAL PARKWAY.

ELEVATION: 2034.12' (NAVD88 – 2008 CLV ADJUSTMENT)

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL SYSTEMS AND STREET LIGHT SYSTEM CONDUITS IT'S COSTLY
CALL BEFORE YOU DO UNDERGROUND
Call before you UnderGround 1-702-432-5300
Call 811 OR 1-800-227-2600
Call Before You Overhead 1-702-227-2929
Avoid overhead power line contact. It's costly.
Call before you Dig
Avoid cutting underground utility lines. It's costly.

REV	DATE	BY	REVISION

DRAWN BY: MKH | DESIGNED BY: RAM | CHECKED BY: RAM
SCALE (H): 1"=20' | SCALE (V): 1"=2' | DATE: JULY 9, 2018

Kimley»Horn
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6671 LAS VEGAS BLVD. S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-862-3600
WWW.KIMLEY-HORN.COM

CITY OF LAS VEGAS

DEPARTMENT OF PUBLIC WORKS

PROJECT: SYMPHONY PARK
PROMENADE PLACE & CARSON AVE. OFF-SITE IMPROVEMENTS

SHEET: PLAN AND PROFILE - WEST CARSON AVE. STA 102+50 - 106+14

WOS SUBMITTAL
NOT FOR CONSTRUCTION

SHEET NUMBER
PP-3
SHEET 10 OF 27

BID #18-60311
CLV HANSEN #60311

092256032 – PARCEL C OFFSITE IMPROVEMENTS

Plotted By: Ortiz, Tony Sheet Set: Kha Layout: PLAN AND PROFILE – WEST CARSON AVE August 14, 2018 04:41:37pm K:\LAV_Civil\092256032 – Symphony Park\CAD\Packages\Parcel C Offsites\Plansheets\092256032-PP-Carson.dwg
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```
T1 UNION PARK                                                                0
T2 KHA 092587000
T3 LINE-2-PHASE-I
SO   1039.8802029.150  5                          2031.135
R    1047.0002029.160  5      .013                                .000    .000 0
R    1255.6202029.690  7      .013                                .000    .000 1
JX   1258.1202029.690  7  2  2.013    2.000    4.0002029.6702029.64 -90.0  0.0  90.000
R    1260.6202029.890  7      .013                                .000    .000 0
R    1310.9502030.030  7      .013                                .000    .000 1
JX   1313.4502030.030  7  1  3.013    6.000    1.0002029.9902029.990 90.0 90.0    .000
TS   1315.9502030.230  2      .013                                .000    .000 0
R    1519.7002030.750  2      .013                                .000    .000 0
R    1521.7002030.750  2      .013                                .000 -90.000 1
TS   1523.7002030.950  1      .013                                .000
SH   1617.1602031.190  1                             .000
CD   1  4   1    .000   2.000     .000  .000  .000   .00
CD   2  4   1    .000   2.500     .000  .000  .000   .00
CD   3  4   1    .000   1.500     .000  .000  .000   .00
CD   5  3   0    .000   3.000    4.000  .000  .000   .00
CD   6  4   1    .000   4.000     .000  .000  .000   .00
CD   7  4   1    .000   3.000     .000  .000  .000   .00
Q            10.000   .0
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Program Package Serial Number: 1887

WATER SURFACE PROFILE LISTING Date:11-29-2007 Time: 5:19:12

UNION PARK
KHA 092587000
LINE-2-PHASE-I

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1039.880	2029.150	1.985	2031.135	23.00	2.90	.13	2031.27	.00	1.01	4.00	3.000	4.000	.00	0 .0
7.120	.0014					.0006	.00	1.98	.36	1.49	.013	.00	.00	BOX
1047.000	2029.160	1.979	2031.139	23.00	4.65	.34	2031.47	.00	1.54	2.84	3.000	.000	.00	1 .0
111.021	.0025					.0021	.24	1.98	.62	1.82	.013	.00	.00	PIPE
1158.021	2029.442	1.899	2031.341	23.00	4.88	.37	2031.71	.00	1.54	2.89	3.000	.000	.00	1 .0
97.599	.0025					.0023	.23	1.90	.67	1.82	.013	.00	.00	PIPE
1255.620	2029.690	1.859	2031.549	23.00	5.00	.39	2031.94	3.00	1.54	2.91	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0015	.00	3.00	.70		.013	.00	.00	PIPE
1258.120	2029.690	2.498	2032.188	17.00	2.70	.11	2032.30	.00	1.32	2.24	3.000	.000	.00	1 .0
1.432	.0800					.0007	.00	2.50	.28	.61	.013	.00	.00	PIPE
1259.552	2029.805	2.373	2032.178	17.00	2.83	.12	2032.30	.00	1.32	2.44	3.000	.000	.00	1 .0
1.068	.0800					.0007	.00	2.37	.32	.61	.013	.00	.00	PIPE
1260.620	2029.890	2.278	2032.168	17.00	2.95	.14	2032.30	.00	1.32	2.56	3.000	.000	.00	1 .0
44.808	.0028					.0008	.04	2.28	.35	1.47	.013	.00	.00	PIPE
1305.428	2030.015	2.176	2032.191	17.00	3.10	.15	2032.34	.00	1.32	2.68	3.000	.000	.00	1 .0
5.522	.0028					.0009	.00	2.18	.38	1.47	.013	.00	.00	PIPE
1310.950	2030.030	2.164	2032.194	17.00	3.11	.15	2032.34	.00	1.32	2.69	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0006	.00	2.16	.39		.013	.00	.00	PIPE

Program Package Serial Number: 1887

WATER SURFACE PROFILE LISTING Date:11-29-2007 Time: 5:19:12

UNION PARK
KHA 092587000
LINE-2-PHASE-I

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1313.450	2030.030	2.362	2032.392	10.00	1.68	.04	2032.44	.00	1.00	2.46	3.000	.000	.00	1 .0
TRANS STR	.0800					.0004	.00	2.36	.19		.013	.00	.00	PIPE
1315.950	2030.230	2.136	2032.366	10.00	2.24	.08	2032.44	.00	1.06	1.76	2.500	.000	.00	1 .0
52.577	.0026					.0006	.03	2.14	.25	1.22	.013	.00	.00	PIPE
1368.527	2030.364	2.025	2032.389	10.00	2.35	.09	2032.47	.00	1.06	1.96	2.500	.000	.00	1 .0
46.500	.0026					.0006	.03	2.03	.28	1.22	.013	.00	.00	PIPE
1415.026	2030.483	1.928	2032.410	10.00	2.46	.09	2032.50	.00	1.06	2.10	2.500	.000	.00	1 .0
42.540	.0026					.0007	.03	1.93	.31	1.22	.013	.00	.00	PIPE
1457.566	2030.591	1.840	2032.431	10.00	2.58	.10	2032.53	.00	1.06	2.20	2.500	.000	.00	1 .0
39.675	.0026					.0008	.03	1.84	.34	1.22	.013	.00	.00	PIPE
1497.241	2030.693	1.760	2032.452	10.00	2.71	.11	2032.57	.00	1.06	2.28	2.500	.000	.00	1 .0
22.459	.0026					.0009	.02	1.76	.38	1.22	.013	.00	.00	PIPE
1519.700	2030.750	1.715	2032.465	10.00	2.79	.12	2032.59	.00	1.06	2.32	2.500	.000	.00	1 .0
2.000	.0000					.0009	.00	1.72	.39	.00	.013	.00	.00	PIPE
1521.700	2030.750	1.717	2032.467	10.00	2.78	.12	2032.59	.00	1.06	2.32	2.500	.000	.00	1 .0
TRANS STR	.1000					.0018	.00	1.72	.39		.013	.00	.00	PIPE
1523.700	2030.950	1.408	2032.358	10.00	4.23	.28	2032.64	.00	1.13	1.83	2.000	.000	.00	1 .0
TRANS STR	.1000					.0083	.02	1.41	.66		.013	.00	.00	PIPE

Program Package Serial Number: 1887

WATER SURFACE PROFILE LISTING Date:11-29-2007 Time: 5:19:12

UNION PARK
KHA 092587000
LINE-2-PHASE-I

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1617.160	2031.190	1.408	2032.598	10.00	4.23	.28	2032.88	.00	1.13	1.83	2.000	.000	.00	1 .0

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T1 UNION PARK                                                                0
T2 KHA 092587000
T3 LINE-3 PHASE-I/II
SO   1258.1202029.890  1                          2032.188
R    1460.1402030.410  1      .013                                .000    .000 0
R    1462.6402030.410  1      .013                                .000  90.000 1
TS   1465.1402030.610  3      .013                                .000    .000 0
R    1686.6402031.180  3      .013                                .000    .000 0
R    1688.6402031.180  3      .013                                .000    .000 1
R    1690.6402031.380  3      .013                                .000    .000 0
R    1749.4502031.540  3      .013                                .000    .000 1
R    1751.4502031.540  3      .013                                .000    .000 0
R    1753.4502036.000  3      .013                                .000    .000 0
R    1778.9702036.070  3      .013                                .000    .000 1
R    1781.9702036.270  3      .013                                .000    .000 0
SH   1871.5602036.500  3                              .000
CD   1  4   1    .000   2.500     .000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
CD   3  4   1    .000   1.500     .000  .000  .000   .00
Q            4.000   .0
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Program Package Serial Number: 1887

WATER SURFACE PROFILE LISTING Date:11-29-2007 Time: 5:51:33

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1258.120	2029.890	2.298	2032.188	4.00	.85	.01	2032.20	.00	.66	1.36	2.500	.000	.00	1 .0
56.390	.0026					.0001	.00	2.30	.08	.74	.013	.00	.00	PIPE
1314.510	2030.035	2.157	2032.192	4.00	.89	.01	2032.20	.00	.66	1.72	2.500	.000	.00	1 .0
45.590	.0026					.0001	.00	2.16	.10	.74	.013	.00	.00	PIPE
1360.100	2030.152	2.042	2032.195	4.00	.93	.01	2032.21	.00	.66	1.93	2.500	.000	.00	1 .0
39.642	.0026					.0001	.00	2.04	.11	.74	.013	.00	.00	PIPE
1399.742	2030.255	1.943	2032.197	4.00	.98	.01	2032.21	.00	.66	2.08	2.500	.000	.00	1 .0
35.580	.0026					.0001	.00	1.94	.12	.74	.013	.00	.00	PIPE
1435.322	2030.346	1.854	2032.200	4.00	1.02	.02	2032.22	.00	.66	2.19	2.500	.000	.00	1 .0
24.818	.0026					.0001	.00	1.85	.14	.74	.013	.00	.00	PIPE
1460.140	2030.410	1.792	2032.202	4.00	1.06	.02	2032.22	.00	.66	2.25	2.500	.000	.00	1 .0
2.500	.0000					.0001	.00	1.79	.14	.00	.013	.00	.00	PIPE
1462.640	2030.410	1.792	2032.202	4.00	1.06	.02	2032.22	.00	.66	2.25	2.500	.000	.00	1 .0
TRANS STR	.0800					.0008	.00	1.79	.14		.013	.00	.00	PIPE
1465.140	2030.610	1.563	2032.173	4.00	2.26	.08	2032.25	.00	.77	.00	1.500	.000	.00	1 .0
55.885	.0026					.0014	.08	1.56	.00	.97	.013	.00	.00	PIPE
1521.025	2030.754	1.500	2032.254	4.00	2.26	.08	2032.33	.00	.77	.00	1.500	.000	.00	1 .0
105.795	.0026					.0013	.14	1.50	.00	.97	.013	.00	.00	PIPE

Program Package Serial Number: 1887

WATER SURFACE PROFILE LISTING Date:11-29-2007 Time: 5:51:33

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1626.820	2031.026	1.361	2032.387	4.00	2.37	.09	2032.47	.00	.77	.87	1.500	.000	.00	1 .0
57.155	.0026					.0013	.08	1.36	.30	.97	.013	.00	.00	PIPE
1683.974	2031.173	1.280	2032.453	4.00	2.49	.10	2032.55	.00	.77	1.06	1.500	.000	.00	1 .0
2.666	.0026					.0014	.00	1.28	.36	.97	.013	.00	.00	PIPE
1686.640	2031.180	1.277	2032.457	4.00	2.50	.10	2032.55	.00	.77	1.07	1.500	.000	.00	1 .0
2.000	.0000					.0014	.00	1.28	.36	.00	.013	.00	.00	PIPE
1688.640	2031.180	1.280	2032.460	4.00	2.49	.10	2032.56	.00	.77	1.06	1.500	.000	.00	1 .0
.578	.1000					.0014	.00	1.28	.36	.35	.013	.00	.00	PIPE
1689.218	2031.238	1.213	2032.451	4.00	2.61	.11	2032.56	.00	.77	1.18	1.500	.000	.00	1 .0
.485	.1000					.0016	.00	1.21	.40	.35	.013	.00	.00	PIPE
1689.703	2031.286	1.155	2032.441	4.00	2.74	.12	2032.56	.00	.77	1.26	1.500	.000	.00	1 .0
.416	.1000					.0017	.00	1.15	.45	.35	.013	.00	.00	PIPE
1690.119	2031.328	1.102	2032.430	4.00	2.87	.13	2032.56	.00	.77	1.32	1.500	.000	.00	1 .0
.359	.1000					.0019	.00	1.10	.49	.35	.013	.00	.00	PIPE
1690.478	2031.364	1.054	2032.418	4.00	3.01	.14	2032.56	.00	.77	1.37	1.500	.000	.00	1 .0
.162	.1000					.0021	.00	1.05	.54	.35	.013	.00	.00	PIPE
1690.640	2031.380	1.032	2032.412	4.00	3.09	.15	2032.56	.00	.77	1.39	1.500	.000	.00	1 .0
7.190	.0027					.0023	.02	1.03	.56	.95	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1697.830	2031.400	.993	2032.393	4.00	3.22	.16	2032.55	.00	.77	1.42	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1697.830	2031.400	.547	2031.946	4.00	6.87	.73	2032.68	.00	.77	1.44	1.500	.000	.00	1 .0
2.060	.0027					.0180	.04	.55	1.91	.95	.013	.00	.00	PIPE
1699.890	2031.405	.547	2031.952	4.00	6.87	.73	2032.68	.00	.77	1.44	1.500	.000	.00	1 .0
3.288	.0027					.0193	.06	.55	1.91	.95	.013	.00	.00	PIPE
1703.178	2031.414	.528	2031.942	4.00	7.20	.81	2032.75	.00	.77	1.43	1.500	.000	.00	1 .0
3.241	.0027					.0220	.07	.53	2.04	.95	.013	.00	.00	PIPE
1706.419	2031.423	.510	2031.933	4.00	7.56	.89	2032.82	.00	.77	1.42	1.500	.000	.00	1 .0
3.182	.0027					.0251	.08	.51	2.18	.95	.013	.00	.00	PIPE
1709.601	2031.432	.492	2031.924	4.00	7.92	.98	2032.90	.00	.77	1.41	1.500	.000	.00	1 .0
3.111	.0027					.0287	.09	.49	2.33	.95	.013	.00	.00	PIPE
1712.712	2031.440	.476	2031.916	4.00	8.31	1.07	2032.99	.00	.77	1.40	1.500	.000	.00	1 .0
3.038	.0027					.0327	.10	.48	2.49	.95	.013	.00	.00	PIPE
1715.750	2031.448	.459	2031.908	4.00	8.72	1.18	2033.09	.00	.77	1.38	1.500	.000	.00	1 .0
2.957	.0027					.0374	.11	.46	2.67	.95	.013	.00	.00	PIPE
1718.708	2031.457	.444	2031.901	4.00	9.14	1.30	2033.20	.00	.77	1.37	1.500	.000	.00	1 .0
2.871	.0027					.0427	.12	.44	2.85	.95	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1721.579	2031.464	.429	2031.893	4.00	9.59	1.43	2033.32	.00	.77	1.36	1.500	.000	.00	1 .0
2.787	.0027					.0488	.14	.43	3.05	.95	.013	.00	.00	PIPE
1724.366	2031.472	.415	2031.886	4.00	10.06	1.57	2033.46	.00	.77	1.34	1.500	.000	.00	1 .0
2.701	.0027					.0557	.15	.41	3.25	.95	.013	.00	.00	PIPE
1727.067	2031.479	.401	2031.880	4.00	10.55	1.73	2033.61	.00	.77	1.33	1.500	.000	.00	1 .0
2.612	.0027					.0637	.17	.40	3.48	.95	.013	.00	.00	PIPE
1729.679	2031.486	.387	2031.874	4.00	11.06	1.90	2033.77	.00	.77	1.31	1.500	.000	.00	1 .0
2.526	.0027					.0728	.18	.39	3.71	.95	.013	.00	.00	PIPE
1732.205	2031.493	.374	2031.868	4.00	11.60	2.09	2033.96	.00	.77	1.30	1.500	.000	.00	1 .0
2.440	.0027					.0833	.20	.37	3.97	.95	.013	.00	.00	PIPE
1734.645	2031.500	.362	2031.862	4.00	12.17	2.30	2034.16	.00	.77	1.28	1.500	.000	.00	1 .0
2.355	.0027					.0953	.22	.36	4.24	.95	.013	.00	.00	PIPE
1737.000	2031.506	.350	2031.856	4.00	12.76	2.53	2034.39	.00	.77	1.27	1.500	.000	.00	1 .0
2.272	.0027					.1089	.25	.35	4.53	.95	.013	.00	.00	PIPE
1739.271	2031.512	.338	2031.851	4.00	13.38	2.78	2034.63	.00	.77	1.25	1.500	.000	.00	1 .0
2.191	.0027					.1246	.27	.34	4.83	.95	.013	.00	.00	PIPE
1741.462	2031.518	.327	2031.846	4.00	14.04	3.06	2034.91	.00	.77	1.24	1.500	.000	.00	1 .0
2.111	.0027					.1426	.30	.33	5.16	.95	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1743.573	2031.524	.317	2031.841	4.00	14.72	3.37	2035.21	.00	.77	1.22	1.500	.000	.00	1 .0
2.034	.0027					.1631	.33	.32	5.51	.95	.013	.00	.00	PIPE
1745.607	2031.530	.306	2031.836	4.00	15.44	3.70	2035.54	.00	.77	1.21	1.500	.000	.00	1 .0
1.958	.0027					.1867	.37	.31	5.88	.95	.013	.00	.00	PIPE
1747.565	2031.535	.296	2031.831	4.00	16.20	4.07	2035.90	.00	.77	1.19	1.500	.000	.00	1 .0
1.885	.0027					.2137	.40	.30	6.28	.95	.013	.00	.00	PIPE
1749.450	2031.540	.286	2031.827	4.00	16.99	4.48	2036.31	.00	.77	1.18	1.500	.000	.00	1 .0
.216	.0000					.2304	.05	.29	6.70	.00	.013	.00	.00	PIPE
1749.666	2031.540	.285	2031.825	4.00	17.11	4.54	2036.37	.00	.77	1.18	1.500	.000	.00	1 .0
1.784	.0000					.2495	.45	.29	6.76	.00	.013	.00	.00	PIPE
1751.450	2031.540	.276	2031.816	4.00	17.94	5.00	2036.81	.00	.77	1.16	1.500	.000	.00	1 .0
.093	2.2300					.2592	.02	.28	7.22	.17	.013	.00	.00	PIPE
1751.543	2031.747	.279	2032.027	4.00	17.60	4.81	2036.84	.00	.77	1.17	1.500	.000	.00	1 .0
.214	2.2300					.2362	.05	.28	7.03	.17	.013	.00	.00	PIPE
1751.758	2032.226	.289	2032.515	4.00	16.78	4.37	2036.89	.00	.77	1.18	1.500	.000	.00	1 .0
.192	2.2300					.2064	.04	.29	6.59	.17	.013	.00	.00	PIPE
1751.949	2032.653	.299	2032.952	4.00	16.00	3.97	2036.93	.00	.77	1.20	1.500	.000	.00	1 .0
.171	2.2300					.1803	.03	.30	6.17	.17	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1752.121	2033.035	.309	2033.344	4.00	15.25	3.61	2036.96	.00	.77	1.21	1.500	.000	.00	1 .0
.153	2.2300					.1576	.02	.31	5.78	.17	.013	.00	.00	PIPE
1752.274	2033.377	.319	2033.696	4.00	14.54	3.28	2036.98	.00	.77	1.23	1.500	.000	.00	1 .0
.137	2.2300					.1377	.02	.32	5.42	.17	.013	.00	.00	PIPE
1752.411	2033.684	.330	2034.014	4.00	13.87	2.99	2037.00	.00	.77	1.24	1.500	.000	.00	1 .0
.123	2.2300					.1204	.01	.33	5.07	.17	.013	.00	.00	PIPE
1752.535	2033.959	.341	2034.300	4.00	13.22	2.71	2037.01	.00	.77	1.26	1.500	.000	.00	1 .0
.111	2.2300					.1052	.01	.34	4.75	.17	.013	.00	.00	PIPE
1752.646	2034.206	.353	2034.559	4.00	12.61	2.47	2037.03	.00	.77	1.27	1.500	.000	.00	1 .0
.099	2.2300					.0920	.01	.35	4.45	.17	.013	.00	.00	PIPE
1752.745	2034.427	.365	2034.792	4.00	12.02	2.24	2037.04	.00	.77	1.29	1.500	.000	.00	1 .0
.089	2.2300					.0805	.01	.37	4.17	.17	.013	.00	.00	PIPE
1752.834	2034.625	.378	2035.003	4.00	11.46	2.04	2037.04	.00	.77	1.30	1.500	.000	.00	1 .0
.080	2.2300					.0704	.01	.38	3.90	.17	.013	.00	.00	PIPE
1752.914	2034.803	.391	2035.194	4.00	10.93	1.85	2037.05	.00	.77	1.32	1.500	.000	.00	1 .0
.072	2.2300					.0616	.00	.39	3.65	.17	.013	.00	.00	PIPE
1752.985	2034.963	.404	2035.367	4.00	10.42	1.69	2037.05	.00	.77	1.33	1.500	.000	.00	1 .0
.064	2.2300					.0539	.00	.40	3.42	.17	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1753.049	2035.106	.418	2035.524	4.00	9.93	1.53	2037.06	.00	.77	1.35	1.500	.000	.00	1 .0
.057	2.2300					.0471	.00	.42	3.20	.17	.013	.00	.00	PIPE
1753.106	2035.233	.433	2035.666	4.00	9.47	1.39	2037.06	.00	.77	1.36	1.500	.000	.00	1 .0
.051	2.2300					.0413	.00	.43	2.99	.17	.013	.00	.00	PIPE
1753.157	2035.347	.448	2035.794	4.00	9.03	1.27	2037.06	.00	.77	1.37	1.500	.000	.00	1 .0
.045	2.2300					.0361	.00	.45	2.80	.17	.013	.00	.00	PIPE
1753.202	2035.448	.464	2035.911	4.00	8.61	1.15	2037.06	.00	.77	1.39	1.500	.000	.00	1 .0
.040	2.2300					.0316	.00	.46	2.62	.17	.013	.00	.00	PIPE
1753.243	2035.537	.480	2036.017	4.00	8.21	1.05	2037.06	.00	.77	1.40	1.500	.000	.00	1 .0
.036	2.2300					.0277	.00	.48	2.45	.17	.013	.00	.00	PIPE
1753.278	2035.617	.497	2036.113	4.00	7.83	.95	2037.06	.00	.77	1.41	1.500	.000	.00	1 .0
.031	2.2300					.0243	.00	.50	2.29	.17	.013	.00	.00	PIPE
1753.309	2035.686	.514	2036.201	4.00	7.46	.86	2037.07	.00	.77	1.42	1.500	.000	.00	1 .0
.027	2.2300					.0213	.00	.51	2.14	.17	.013	.00	.00	PIPE
1753.337	2035.747	.533	2036.280	4.00	7.12	.79	2037.07	.00	.77	1.44	1.500	.000	.00	1 .0
.024	2.2300					.0186	.00	.53	2.00	.17	.013	.00	.00	PIPE
1753.360	2035.800	.552	2036.352	4.00	6.78	.71	2037.07	.00	.77	1.45	1.500	.000	.00	1 .0
.020	2.2300					.0163	.00	.55	1.87	.17	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1753.381	2035.846	.571	2036.417	4.00	6.47	.65	2037.07	.00	.77	1.46	1.500	.000	.00	1 .0
.017	2.2300					.0143	.00	.57	1.75	.17	.013	.00	.00	PIPE
1753.398	2035.884	.592	2036.476	4.00	6.17	.59	2037.07	.00	.77	1.47	1.500	.000	.00	1 .0
.015	2.2300					.0126	.00	.59	1.63	.17	.013	.00	.00	PIPE
1753.413	2035.917	.614	2036.530	4.00	5.88	.54	2037.07	.00	.77	1.47	1.500	.000	.00	1 .0
.012	2.2300					.0110	.00	.61	1.53	.17	.013	.00	.00	PIPE
1753.425	2035.943	.636	2036.579	4.00	5.61	.49	2037.07	.00	.77	1.48	1.500	.000	.00	1 .0
.009	2.2300					.0097	.00	.64	1.42	.17	.013	.00	.00	PIPE
1753.434	2035.964	.660	2036.624	4.00	5.35	.44	2037.07	.00	.77	1.49	1.500	.000	.00	1 .0
.007	2.2300					.0085	.00	.66	1.33	.17	.013	.00	.00	PIPE
1753.441	2035.980	.684	2036.664	4.00	5.10	.40	2037.07	.00	.77	1.49	1.500	.000	.00	1 .0
.005	2.2300					.0075	.00	.68	1.24	.17	.013	.00	.00	PIPE
1753.446	2035.991	.710	2036.701	4.00	4.86	.37	2037.07	.00	.77	1.50	1.500	.000	.00	1 .0
.003	2.2300					.0066	.00	.71	1.16	.17	.013	.00	.00	PIPE
1753.449	2035.998	.736	2036.734	4.00	4.63	.33	2037.07	.00	.77	1.50	1.500	.000	.00	1 .0
.001	2.2300					.0058	.00	.74	1.08	.17	.013	.00	.00	PIPE
1753.450	2036.000	.765	2036.766	4.00	4.41	.30	2037.07	.00	.77	1.50	1.500	.000	.00	1 .0
.873	.0027					.0051	.00	.77	1.00	.95	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1754.323	2036.002	.795	2036.797	4.00	4.21	.27	2037.07	.00	.77	1.50	1.500	.000	.00	1 .0
3.448	.0027					.0045	.02	.80	.93	.95	.013	.00	.00	PIPE
1757.771	2036.012	.826	2036.838	4.00	4.01	.25	2037.09	.00	.77	1.49	1.500	.000	.00	1 .0
3.814	.0027					.0042	.02	.83	.86	.95	.013	.00	.00	PIPE
1761.585	2036.022	.826	2036.848	4.00	4.01	.25	2037.10	.00	.77	1.49	1.500	.000	.00	1 .0
HYDRAULIC JUMP														
1761.585	2036.022	.677	2036.700	4.00	5.16	.41	2037.11	.00	.77	1.49	1.500	.000	.00	1 .0
1.677	.0027					.0083	.01	.68	1.26	.95	.013	.00	.00	PIPE
1763.262	2036.027	.677	2036.704	4.00	5.16	.41	2037.12	.00	.77	1.49	1.500	.000	.00	1 .0
2.826	.0027					.0088	.02	.68	1.26	.95	.013	.00	.00	PIPE
1766.087	2036.035	.653	2036.688	4.00	5.41	.46	2037.14	.00	.77	1.49	1.500	.000	.00	1 .0
3.071	.0027					.0100	.03	.65	1.35	.95	.013	.00	.00	PIPE
1769.159	2036.043	.630	2036.673	4.00	5.68	.50	2037.17	.00	.77	1.48	1.500	.000	.00	1 .0
3.206	.0027					.0114	.04	.63	1.45	.95	.013	.00	.00	PIPE
1772.365	2036.052	.608	2036.660	4.00	5.96	.55	2037.21	.00	.77	1.47	1.500	.000	.00	1 .0
3.284	.0027					.0130	.04	.61	1.55	.95	.013	.00	.00	PIPE
1775.649	2036.061	.587	2036.647	4.00	6.25	.61	2037.25	.00	.77	1.46	1.500	.000	.00	1 .0
3.321	.0027					.0148	.05	.59	1.66	.95	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1778.970	2036.070	.566	2036.636	4.00	6.55	.67	2037.30	.00	.77	1.45	1.500	.000	.00	1 .0
.225	.0667					.0155	.00	.57	1.78	.39	.013	.00	.00	PIPE
1779.195	2036.085	.571	2036.656	4.00	6.47	.65	2037.31	.00	.77	1.46	1.500	.000	.00	1 .0
.733	.0667					.0143	.01	.57	1.75	.39	.013	.00	.00	PIPE
1779.928	2036.134	.592	2036.726	4.00	6.17	.59	2037.32	.00	.77	1.47	1.500	.000	.00	1 .0
.595	.0667					.0126	.01	.59	1.63	.39	.013	.00	.00	PIPE
1780.523	2036.174	.614	2036.787	4.00	5.88	.54	2037.32	.00	.77	1.47	1.500	.000	.00	1 .0
.475	.0667					.0110	.01	.61	1.53	.39	.013	.00	.00	PIPE
1780.998	2036.205	.636	2036.841	4.00	5.61	.49	2037.33	.00	.77	1.48	1.500	.000	.00	1 .0
.366	.0667					.0097	.00	.64	1.42	.39	.013	.00	.00	PIPE
1781.365	2036.230	.660	2036.889	4.00	5.35	.44	2037.33	.00	.77	1.49	1.500	.000	.00	1 .0
.272	.0667					.0085	.00	.66	1.33	.39	.013	.00	.00	PIPE
1781.637	2036.248	.684	2036.932	4.00	5.10	.40	2037.34	.00	.77	1.49	1.500	.000	.00	1 .0
.187	.0667					.0075	.00	.68	1.24	.39	.013	.00	.00	PIPE
1781.824	2036.260	.710	2036.970	4.00	4.86	.37	2037.34	.00	.77	1.50	1.500	.000	.00	1 .0
.109	.0667					.0066	.00	.71	1.16	.39	.013	.00	.00	PIPE
1781.933	2036.268	.736	2037.004	4.00	4.63	.33	2037.34	.00	.77	1.50	1.500	.000	.00	1 .0
.037	.0667					.0058	.00	.74	1.08	.39	.013	.00	.00	PIPE

Program Package Serial Number: 1887

WATER SURFACE PROFILE LISTING Date:11-29-2007 Time: 5:51:33

UNION PARK
KHA 092587000
LINE-3 PHASE-I/II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1781.970	2036.270	.765	2037.036	4.00	4.41	.30	2037.34	.00	.77	1.50	1.500	.000	.00	1 .0
1871.560	2036.500	.765	2037.266	4.00	4.41	.30	2037.57	.00	.77	1.50	1.500	.000	.00	1 .0

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T1 UNION PARK                                                                0
T2 KHA 092587000
T3 LINE-4-PHASE-II
SO   1000.0002028.100  1                          2030.376
JX   1038.2502028.260  1  2  2.013    4.000    3.0002028.2602028.260-90.0 90.0    .000
TS   1040.0002028.260  5      .013                                 .000    .000 0
R    1255.7902029.120  5      .013                                 .000    .000 1
JX   1258.2902029.120  5  4  4.013    6.000    2.0002029.3202029.320   .0 90.0    .000
R    1260.7902029.320  5      .013                                 .000    .000 0
R    1316.8602029.470  5      .013                                 .000    .000 0
JX   1318.8602029.470  5  2   .013    2.000         2029.670         90.0         .000
TS   1320.8602029.670  3      .013                                 .000    .000 0
R    1532.7402030.210  3      .013                                 .000    .000 1
JX   1534.7402030.210  3  4  2.013    5.000    1.0002030.4102030.410 90.0-90.0    .000
TS   1536.7402030.410  4      .013                                 .000    .000 0
R    1590.5402030.560  4      .013                                 .000    .000 1
R    1593.0402030.560  4      .013                                 .000  90.050 0
R    1595.5402030.760  4      .013                                 .000    .000 0
R    1645.5802030.900  4      .013                                 .000    .000 0
JX   1647.5802030.900  4  2   .013    1.000         2031.100        -90.0         .000
R    1649.5802031.100  4      .013                                 .000  45.000 1
SH   1670.9102031.160  4                          .000
CD   1  3   0    .000   3.000    4.000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
CD   3  4   1    .000   2.500     .000  .000  .000   .00
CD   4  4   1    .000   2.000     .000  .000  .000   .00
CD   5  4   1    .000   3.000     .000  .000  .000   .00
Q            4.000   .0
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UNION PARK
KHA 092587000
LINE-4-PHASE-II

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1000.000	2028.100	2.276	2030.376	28.00	3.08	.15	2030.52	.00	1.15	4.00	3.000	4.000	.00	0 .0
JUNCT STR	.0042					.0007	.03	2.28	.36		.013	.00	.00	BOX
1038.250	2028.260	2.264	2030.524	21.00	2.32	.08	2030.61	.00	.95	4.00	3.000	4.000	.00	0 .0
TRANS STR	.0000					.0008	.00	2.26	.27		.013	.00	.00	BOX
1040.000	2028.260	2.196	2030.456	21.00	3.79	.22	2030.68	.00	1.47	2.66	3.000	.000	.00	1 .0
27.625	.0040					.0013	.04	2.20	.46	1.50	.013	.00	.00	PIPE
1067.625	2028.370	2.101	2030.471	21.00	3.97	.25	2030.72	.00	1.47	2.75	3.000	.000	.00	1 .0
25.707	.0040					.0015	.04	2.10	.50	1.50	.013	.00	.00	PIPE
1093.332	2028.473	2.012	2030.485	21.00	4.17	.27	2030.75	.00	1.47	2.82	3.000	.000	.00	1 .0
24.067	.0040					.0017	.04	2.01	.55	1.50	.013	.00	.00	PIPE
1117.399	2028.568	1.930	2030.498	21.00	4.37	.30	2030.79	.00	1.47	2.87	3.000	.000	.00	1 .0
22.839	.0040					.0019	.04	1.93	.60	1.50	.013	.00	.00	PIPE
1140.237	2028.660	1.853	2030.512	21.00	4.58	.33	2030.84	.00	1.47	2.92	3.000	.000	.00	1 .0
21.759	.0040					.0021	.05	1.85	.64	1.50	.013	.00	.00	PIPE
1161.997	2028.746	1.780	2030.526	21.00	4.81	.36	2030.88	.00	1.47	2.95	3.000	.000	.00	1 .0
21.002	.0040					.0024	.05	1.78	.70	1.50	.013	.00	.00	PIPE
1182.999	2028.830	1.711	2030.541	21.00	5.04	.39	2030.94	.00	1.47	2.97	3.000	.000	.00	1 .0
20.614	.0040					.0027	.06	1.71	.75	1.50	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-4-PHASE-II

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1203.612	2028.912	1.646	2030.558	21.00	5.29	.43	2030.99	.00	1.47	2.99	3.000	.000	.00	1 .0
20.925	.0040					.0031	.06	1.65	.81	1.50	.013	.00	.00	PIPE
1224.537	2028.995	1.584	2030.580	21.00	5.55	.48	2031.06	.00	1.47	3.00	3.000	.000	.00	1 .0
23.906	.0040					.0035	.08	1.58	.87	1.50	.013	.00	.00	PIPE
1248.443	2029.091	1.526	2030.616	21.00	5.82	.53	2031.14	.00	1.47	3.00	3.000	.000	.00	1 .0
7.347	.0040					.0038	.03	1.53	.93	1.50	.013	.00	.00	PIPE
1255.790	2029.120	1.514	2030.634	21.00	5.87	.54	2031.17	.00	1.47	3.00	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0022	.01	1.51	.95		.013	.00	.00	PIPE
1258.290	2029.120	2.067	2031.187	13.00	2.50	.10	2031.28	.00	1.15	2.78	3.000	.000	.00	1 .0
.962	.0800					.0006	.00	2.07	.32	.53	.013	.00	.00	PIPE
1259.252	2029.197	1.981	2031.178	13.00	2.63	.11	2031.28	.00	1.15	2.84	3.000	.000	.00	1 .0
.879	.0800					.0007	.00	1.98	.35	.53	.013	.00	.00	PIPE
1260.131	2029.267	1.901	2031.168	13.00	2.75	.12	2031.29	.00	1.15	2.89	3.000	.000	.00	1 .0
.659	.0800					.0008	.00	1.90	.38	.53	.013	.00	.00	PIPE
1260.790	2029.320	1.839	2031.159	13.00	2.86	.13	2031.29	.00	1.15	2.92	3.000	.000	.00	1 .0
32.271	.0027					.0008	.03	1.84	.40	1.28	.013	.00	.00	PIPE
1293.061	2029.406	1.768	2031.174	13.00	3.00	.14	2031.31	.00	1.15	2.95	3.000	.000	.00	1 .0
23.799	.0027					.0009	.02	1.77	.44	1.28	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-4-PHASE-II

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1316.860	2029.470	1.716	2031.186	13.00	3.11	.15	2031.34	.00	1.15	2.97	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0008	.00	1.72	.46		.013	.00	.00	PIPE
1318.860	2029.470	1.813	2031.283	11.00	2.46	.09	2031.38	.00	1.05	2.93	3.000	.000	.00	1 .0
TRANS STR	.1000					.0010	.00	1.81	.35		.013	.00	.00	PIPE
1320.860	2029.670	1.551	2031.221	11.00	3.44	.18	2031.40	.00	1.11	2.43	2.500	.000	.00	1 .0
42.030	.0025					.0015	.06	1.55	.53	1.30	.013	.00	.00	PIPE
1362.890	2029.777	1.490	2031.267	11.00	3.61	.20	2031.47	.00	1.11	2.45	2.500	.000	.00	1 .0
45.987	.0025					.0017	.08	1.49	.57	1.30	.013	.00	.00	PIPE
1408.877	2029.894	1.432	2031.327	11.00	3.78	.22	2031.55	.00	1.11	2.47	2.500	.000	.00	1 .0
54.952	.0025					.0020	.11	1.43	.61	1.30	.013	.00	.00	PIPE
1463.829	2030.034	1.378	2031.412	11.00	3.97	.24	2031.66	.00	1.11	2.49	2.500	.000	.00	1 .0
68.911	.0025					.0022	.15	1.38	.66	1.30	.013	.00	.00	PIPE
1532.740	2030.210	1.334	2031.544	11.00	4.13	.26	2031.81	.00	1.11	2.49	2.500	.000	.00	1 .0
JUNCT STR	.0000					.0013	.00	1.33	.70		.013	.00	.00	PIPE
1534.740	2030.210	1.718	2031.928	5.00	1.39	.03	2031.96	.00	.74	2.32	2.500	.000	.00	1 .0
TRANS STR	.1000					.0004	.00	1.72	.20		.013	.00	.00	PIPE
1536.740	2030.410	1.497	2031.907	5.00	1.98	.06	2031.97	.00	.79	1.74	2.000	.000	.00	1 .0
27.800	.0028					.0006	.02	1.50	.29	.90	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-4-PHASE-II

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1564.540	2030.488	1.430	2031.918	5.00	2.08	.07	2031.99	.00	.79	1.81	2.000	.000	.00	1 .0
26.000	.0028					.0007	.02	1.43	.32	.90	.013	.00	.00	PIPE
1590.540	2030.560	1.370	2031.930	5.00	2.18	.07	2032.00	.00	.79	1.86	2.000	.000	.00	1 .0
2.500	.0000					.0007	.00	1.37	.35	.00	.013	.00	.00	PIPE
1593.040	2030.560	1.372	2031.932	5.00	2.18	.07	2032.01	.00	.79	1.86	2.000	.000	.00	1 .0
.627	.0800					.0008	.00	1.37	.34	.38	.013	.00	.00	PIPE
1593.667	2030.610	1.315	2031.925	5.00	2.28	.08	2032.01	.00	.79	1.90	2.000	.000	.00	1 .0
.570	.0800					.0009	.00	1.32	.37	.38	.013	.00	.00	PIPE
1594.237	2030.656	1.262	2031.918	5.00	2.39	.09	2032.01	.00	.79	1.93	2.000	.000	.00	1 .0
.522	.0800					.0010	.00	1.26	.41	.38	.013	.00	.00	PIPE
1594.759	2030.698	1.212	2031.910	5.00	2.51	.10	2032.01	.00	.79	1.95	2.000	.000	.00	1 .0
.474	.0800					.0011	.00	1.21	.44	.38	.013	.00	.00	PIPE
1595.233	2030.736	1.165	2031.900	5.00	2.63	.11	2032.01	.00	.79	1.97	2.000	.000	.00	1 .0
.307	.0800					.0012	.00	1.16	.47	.38	.013	.00	.00	PIPE
1595.540	2030.760	1.133	2031.893	5.00	2.72	.12	2032.01	.00	.79	1.98	2.000	.000	.00	1 .0
22.202	.0028					.0014	.03	1.13	.50	.90	.013	.00	.00	PIPE
1617.742	2030.822	1.090	2031.913	5.00	2.85	.13	2032.04	.00	.79	1.99	2.000	.000	.00	1 .0
22.869	.0028					.0016	.04	1.09	.54	.90	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-4-PHASE-II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1640.611	2030.886	1.050	2031.936	5.00	2.99	.14	2032.07	.00	.79	2.00	2.000	.000	.00	1 .0
4.969	.0028					.0017	.01	1.05	.58	.90	.013	.00	.00	PIPE
1645.580	2030.900	1.041	2031.941	5.00	3.02	.14	2032.08	.00	.79	2.00	2.000	.000	.00	1 .0
JUNCT STR	.0000					.0012	.00	1.04	.59		.013	.00	.00	PIPE
1647.580	2030.900	1.160	2032.060	4.00	2.12	.07	2032.13	.00	.70	1.97	2.000	.000	.00	1 .0
.378	.1000					.0008	.00	1.16	.38	.32	.013	.00	.00	PIPE
1647.958	2030.938	1.116	2032.054	4.00	2.22	.08	2032.13	.00	.70	1.99	2.000	.000	.00	1 .0
.349	.1000					.0009	.00	1.12	.41	.32	.013	.00	.00	PIPE
1648.307	2030.973	1.074	2032.046	4.00	2.33	.08	2032.13	.00	.70	1.99	2.000	.000	.00	1 .0
.319	.1000					.0011	.00	1.07	.44	.32	.013	.00	.00	PIPE
1648.626	2031.005	1.034	2032.038	4.00	2.44	.09	2032.13	.00	.70	2.00	2.000	.000	.00	1 .0
.292	.1000					.0012	.00	1.03	.48	.32	.013	.00	.00	PIPE
1648.918	2031.034	.996	2032.029	4.00	2.56	.10	2032.13	.00	.70	2.00	2.000	.000	.00	1 .0
.266	.1000					.0014	.00	1.00	.51	.32	.013	.00	.00	PIPE
1649.184	2031.060	.959	2032.020	4.00	2.69	.11	2032.13	.00	.70	2.00	2.000	.000	.00	1 .0
.239	.1000					.0015	.00	.96	.55	.32	.013	.00	.00	PIPE
1649.423	2031.084	.925	2032.009	4.00	2.82	.12	2032.13	.00	.70	1.99	2.000	.000	.00	1 .0
.157	.1000					.0017	.00	.92	.59	.32	.013	.00	.00	PIPE

UNION PARK
KHA 092587000
LINE-4-PHASE-II

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1649.580	2031.100	.900	2032.000	4.00	2.92	.13	2032.13	.00	.70	1.99	2.000	.000	.00	1 .0
21.330	.1000					.0087	.02	.90	.62	.32	.013	.00	.00	PIPE
1670.910	2031.160	.900	2032.060	4.00	2.92	.13	2032.19	.00	.70	1.99	2.000	.000	.00	1 .0

UNION PARK

KHA 092587000

LINE-4-PHASE-II

```
1000.00   .I                  C                  W  E          H                                .   JX
1007.21   .                                                                                     .
1014.43   .                                                                                     .
1021.64   .                                                                                     .
1028.86   .                                                                                     .
1036.07   .                                                                                     .
1043.28   .   I               C                      W E          H                           .   TX
1050.50   .   I                          C           W   E          H                          .   R
1057.71   .                                                                                     .
1064.93   .                                                                                     .
1072.14   .     I                          C          W    E          H                        .   R
1079.35   .                                                                                     .
1086.57   .                                                                                     .
1093.78   .       I                          C         W    E           H                       .   R
1101.00   .                                                                                     .
1108.21   .                                                                                     .
1115.43   .                                                                                     .
1122.64   .         I                          C       W     E            H                     .   R
1129.85   .                                                                                     .
1137.07   .                                                                                     .
1144.28   .           I                          C     W     E             H                    .   R
1151.50   .                                                                                     .
1158.71   .                                                                                     .
1165.92   .           I                          C     W      E             H                   .   R
1173.14   .                                                                                     .
1180.35   .                                                                                     .
1187.57   .             I                          C    W      E             H                  .   R
```

```
1194.78    .                                                                .
1201.99    .                                                                .
1209.21    .              I                C  W       E              H      .   R
1216.42    .                                                                .
1223.64    .                                                                .
1230.85    .              I                C  W       E              H      .   R
1238.06    .                                                                .
1245.28    .                                                                .
1252.49    .                  I                CW         E              H   .   R
1259.71    .                  I                CW         E              H   .   JX
1266.92    .                  I              C              WE             H   .   R
1274.14    .                   I             C             W E            H   .   R
1281.35    .                     I           C             W E              H .   R
1288.56    .                      I          C             W E              H .   R
1295.78    .                       I         C           W  E                H .   R
1302.99    .                                                                .
1310.21    .                                                                .
1317.42    .                       I          C         W  E                H .   JX
1324.63    .                       I          C           W E               H .   TX
1331.85    .                          I             C       W   E           H   .   R
1339.06    .                                                                .
1346.28    .                                                                .
1353.49    .                                                                .
1360.70    .                                                                .
1367.92    .                          I             C     W   E            H   .   R
1375.13    .                                                                .
1382.35    .                                                                .
1389.56    .                                                                .
1396.77    .                                                                .
1403.99    .                                                                .
1411.20    .                          I             C    W   E            H   .   R
1418.42    .                                                                .
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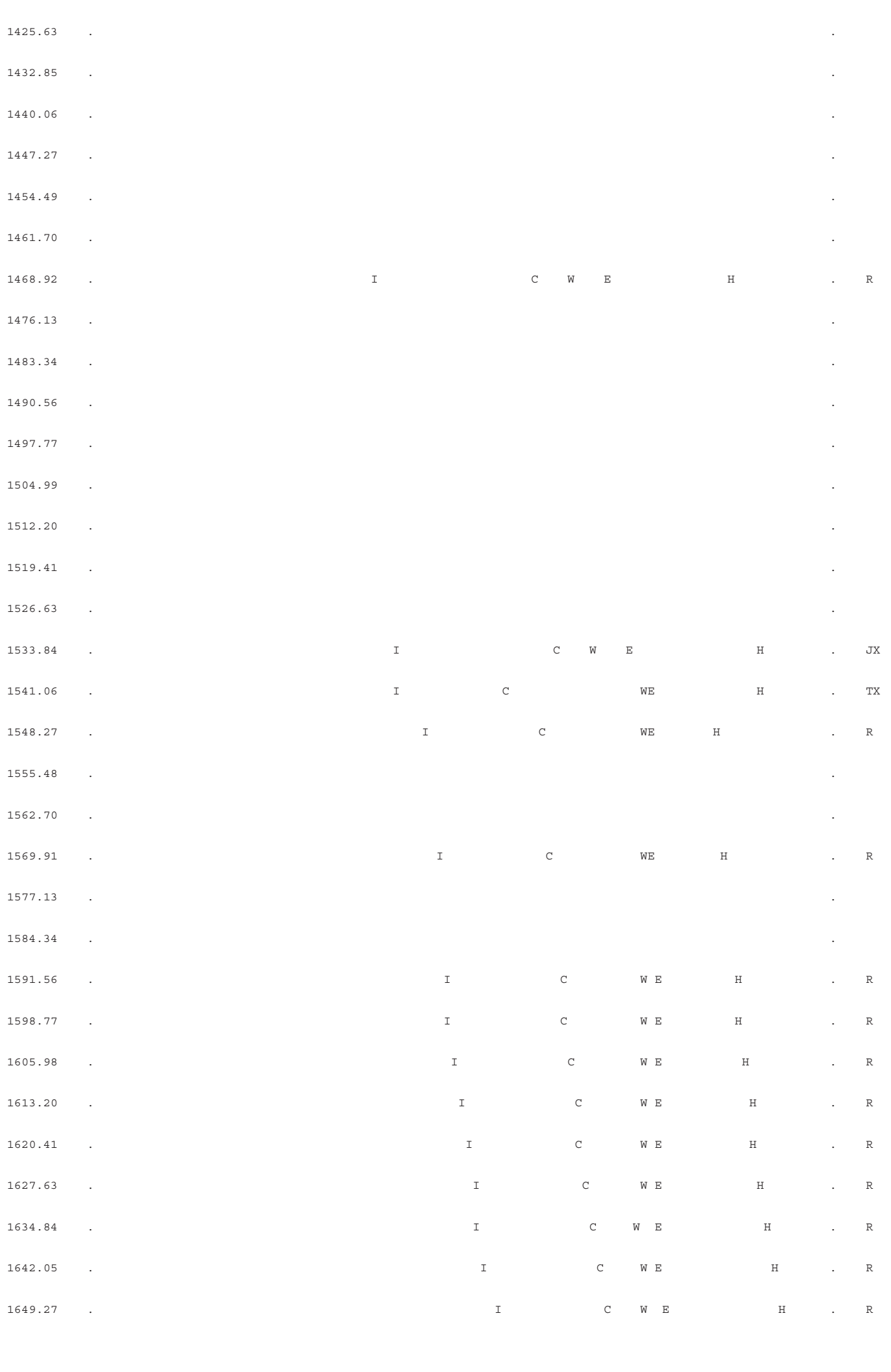
1425.63 . .
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1440.06 . .
1447.27 . .
1454.49 . .
1461.70 . .
1468.92 . I C W E H . R
1476.13 . .
1483.34 . .
1490.56 . .
1497.77 . .
1504.99 . .
1512.20 . .
1519.41 . .
1526.63 . .
1533.84 . I C W E H . JX
1541.06 . I C WE H . TX
1548.27 . I C WE H . R
1555.48 . .
1562.70 . .
1569.91 . I C WE H . R
1577.13 . .
1584.34 . .
1591.56 . I C W E H . R
1598.77 . I C W E H . R
1605.98 . I C W E H . R
1613.20 . I C W E H . R
1620.41 . I C W E H . R
1627.63 . I C W E H . R
1634.84 . I C W E H . R
1642.05 . I C W E H . R
1649.27 . I C W E H . R

```
   1656.48    .                                                I             C    W  E             H      .    JX

   1663.70    .                                                I             C       WE            H      .    R

   1670.91    .                                                 I            C       WE             H     .    R

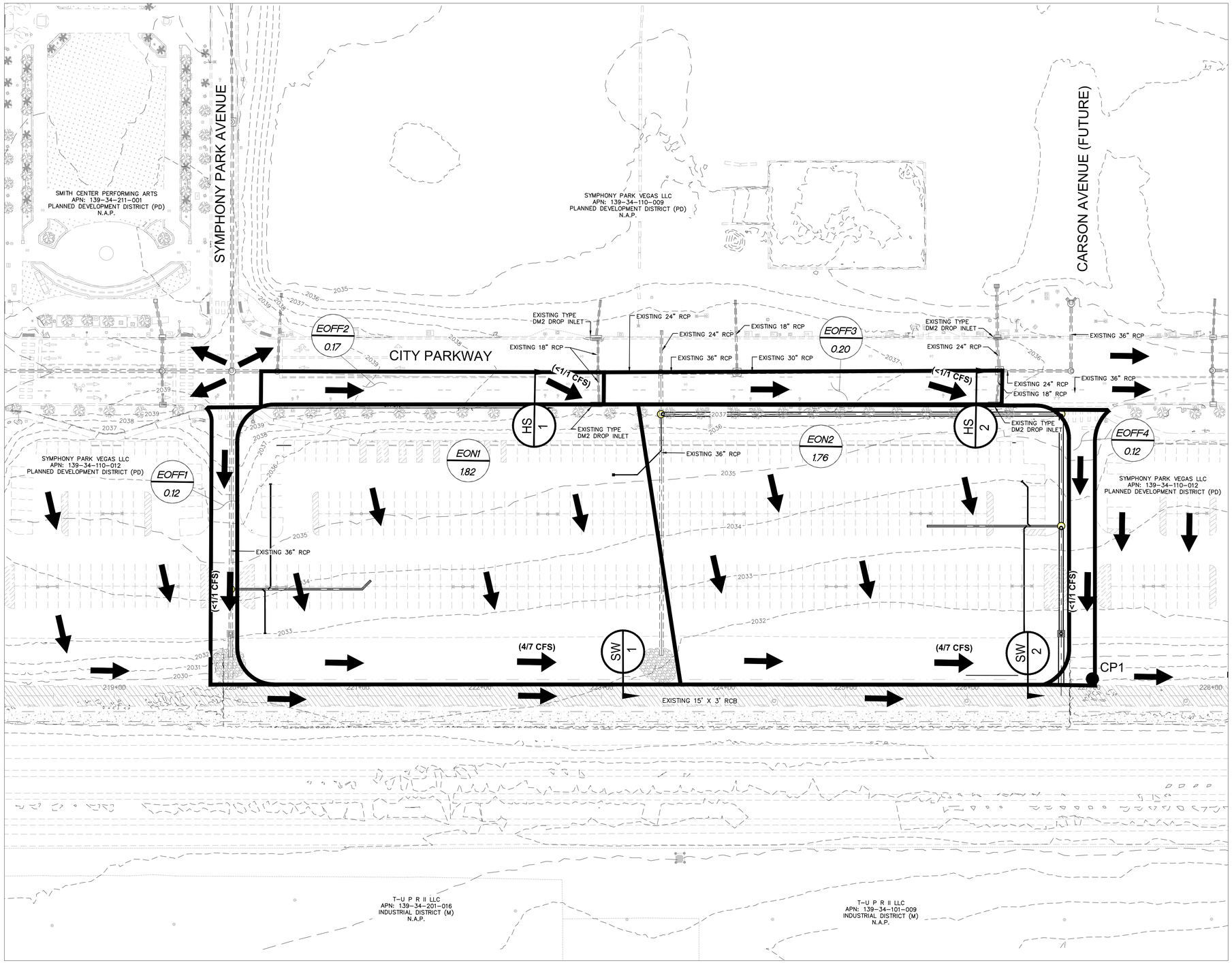
            2028.100  2028.606  2029.112  2029.618  2030.124  2030.630  2031.136  2031.642  2032.148  2032.654  2033.160
```

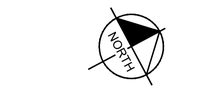
N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - S = SUPER-ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

APPENDIX F – PLANS

- EX-1 Existing Condition Drainage Basin Map
- PR-1 Proposed Condition Drainage Basin Map
- Grading Plans
-





LEGEND

- XX / XX-X — BASIN ID / BASIN AREA (ACRES)
- BASIN BOUNDARY
- FLOW ARROW
- (xx/xxx) — (10YR/100YR) CFS
- FLOW ARROW
- XX / X — SECTION ID
- CPX — COMBINATION POINT

FLOW SUMMARY TABLE

BASIN ID/ COMB. PT.	BASIN AREA (ac)	10-YR FLOW (cfs)	100-YR FLOW (cfs)
EON1	1.82	4	7
EON2	1.76	4	7
EOFF1	0.12	<1	1
EOFF2	0.17	<1	1
EOFF3	0.20	<1	1
EOFF4	0.12	<1	1
CP1 EON1 + EON2 + EOFF4	-	7	13

OFF-SITE HYDRAULIC CALCULATION SUMMARY

SECTION	Q_{10} (cfs)	FLOW DEPTH (ft)	V_{10} (fps)	D*V	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V	DRY LANE
HS-1	1	0.23	1.63	0.37	1	0.23	1.63	0.37	N/A
HS-2	1	0.23	1.63	0.37	1	0.23	1.63	0.37	N/A
SW 1	4	0.76	2.31	1.76	7	0.94	2.66	2.50	N/A
SW 2	7	0.94	2.66	2.50	13	1.18	3.11	3.67	N/A

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

No.	REVISIONS	DATE	BY

Kimley»Horn
© 2018 KIMLEY-HORN AND ASSOCIATES, INC.
2080 E. FLAMINGO ROAD, SUITE 210, LAS VEGAS, NV 89119
PHONE: 702-734-5666 FAX: 702-735-4949
WWW.KIMLEY-HORN.COM

KHA PROJECT	192008000
DATE	10/15/2018
SCALE	AS SHOWN
DESIGNED BY	AL
DRAWN BY	AL
CHECKED BY	MS

SYMPHONY PARK RESIDENTIAL

PREPARED FOR

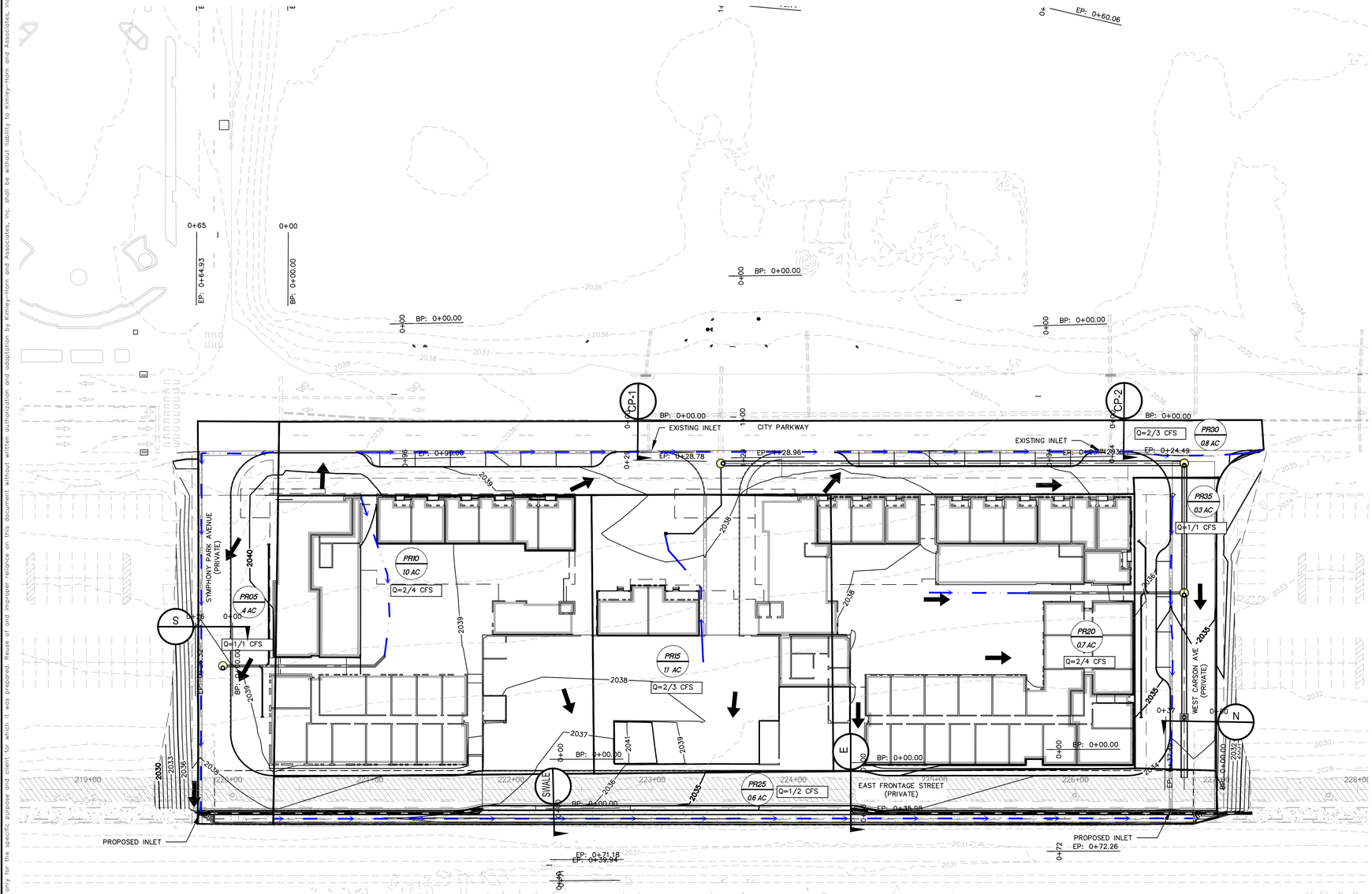
ASPEN HEIGHTS

CITY OF LAS VEGAS NEVADA

CONCEPT FOR DISCUSSION ONLY

SHEET NUMBER

EX-1



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NORTH

GRAPHIC SCALE IN FEET
0 20 40 80
SCALE: 1" = 40'

LEGEND

- XX / XX-X — BASIN ID / BASIN AREA (ACRES)
- BASIN BOUNDARY
- FLOWPATH
- FLOW ARROW
- xx/xxx — 10YR/100YR CFS SURFACE FLOW ARROW
- (xx CFS) / [xx CFS] — 100YR REFERENCED STORM DRAIN FLOW / 100YR DESIGN STORM DRAIN FLOW
- XX / X — SECTION ID

FLOW SUMMARY TABLE

SYMPHONY PARK RESIDENTIAL			
BASIN ID	BASIN AREA (ac)	10-YR FLOW (cfs)	100-YR FLOW (cfs)
PR05	0.40	1	1
PR10	1.00	2	4
PR15	1.10	2	3
PR20	0.70	2	4
PR25	0.60	1	2
PR30	0.80	2	3
PR35	0.30	1	1

STREET SECTIONS

SECTION	Q_{10} (cfs)	FLOW DEPTH (ft)	V_{10} (fps)	D*V	Q_{100} (cfs)	FLOW DEPTH (ft)	V_{100} (fps)	D*V
N	1	0.24	1.66	0.40	1	0.24	1.66	0.40
E	1	0.19	1.75	0.33	2	0.24	2.08	0.50
S	1	0.32	1.78	0.57	1	0.24	1.66	0.40
CP-1	1	0.23	1.21	0.28	1	0.23	1.21	0.28
CP-2	2	0.31	1.60	0.50	3	0.35	1.76	0.62

No.	REVISIONS	DATE	BY

Kimley»Horn
© 2018 KIMLEY-HORN AND ASSOCIATES, INC.
2080 E. FLAMINGO ROAD, SUITE 210, LAS VEGAS, NV 89119
PHONE: 702-784-4660 FAX: 702-735-4949
WWW.KIMLEY-HORN.COM

KHA PROJECT 192008000
DATE NOVEMBER 2018
SCALE AS SHOWN
DESIGNED BY ACH
DRAWN BY ACH
CHECKED BY BAH

PROPOSED CONDITIONS MAP

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
PR-1

CIVIL IMPROVEMENT PLANS

FOR

SYMPHONY PARK RESIDENTIAL

APN: 139-34-110-012

LAS VEGAS, NEVADA

PROJECT CONTACTS

CIVIL ENGINEER
KIMLEY-HORN AND ASSOCIATES, INC.
6671 LAS VEGAS BOULEVARD SOUTH, SUITE 320
LAS VEGAS, NEVADA 89119

CONTACT: THOMAS ACKERET, P.E.
(702) 862-3608

ARCHITECT
CALLISONRTKL INC.
1717 PACIFIC AVE.
DALLAS, TX 75201

CONTACT: CRISTI LANDRUM
(214) 465-7692

LAND SURVEYOR
HERITAGE SURVEYING
1895 VILLAGE CENTER CIRCLE
LAS VEGAS, NV 89134

CONTACT: DENNIS LAYTON, R/PLS, WRS, CFEDS
(702) 474-6277

PROJECT INFORMATION

CURRENT ZONING: PLANNED DEVELOPMENT DISTRICT (PD)
ACREAGE: ±3.7 ACRES

FLOOD ZONE NOTE

THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) INDICATES THAT THE SITE IS LOCATED IN ZONE "X" OF THE FLOOD INSURANCE RATE MAP (FIRM) No. 32003C2170F AS SHOWN ON THE FIRM INDEX REVISED NOVEMBER 16, 2011. ZONE "X" IS DEFINED BY FEMA AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN."

BENCHMARK

CITY OF LAS VEGAS VERTICAL CONTROL
BENCHMARK NO. "BLV0133NE6"

MONUMENT DESCRIPTION IN RIVET & PLATE IN TOP OF CURB AT THE SOUTHWEST CORNER OF SYMPHONY PARK AVENUE AND GRAND CENTRAL PARKWAY.

ELEVATION = 619.999 METERS
2034.12 FEET

CITY OF LAS VEGAS VERTICAL CONTROL DATUM BASED UPON NORTH AMERICAN VERTICAL DATUM OF 2008 (NAVD '88)

BASIS OF BEARING

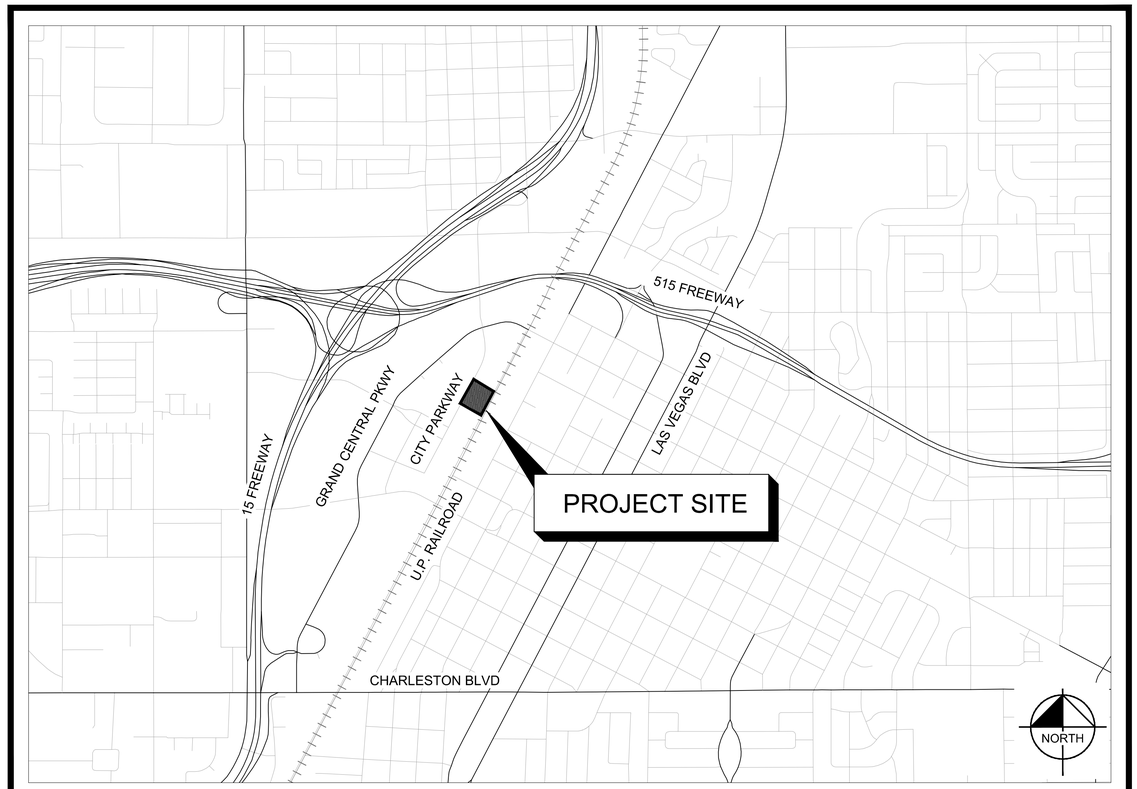
SOUTH 27°55'16" WEST, BEING THE EAST LINE OF LOT 5 OF THAT COMMERCIAL SUBDIVISION KNOWN AS "PARKWAY CENTER" ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA IN BOOK 53 OF PLATS, AT PAGE 61.

UTILITY NOTE

KIMLEY-HORN AND ASSOCIATES TAKES NO RESPONSIBILITY FOR EXISTING UTILITIES SHOWN HEREIN. THE EXISTING UTILITIES SHOWN ARE BASED ON INFORMATION PROVIDED BY-OTHER PARTIES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND VERIFY THE LOCATIONS AND INVERTS OF THE EXISTING WITHIN THE VICINITY OF CONSTRUCTION ACTIVITIES. IF A CONFLICT IS FOUND TO EXIST, THE CONTRACTOR SHALL COORDINATE THE PROJECT ENGINEER, PROJECT ARCHITECT, AND THE OWNER IMMEDIATELY.

SHEET INDEX

SHEET NO.	SHEET TITLE
C0.1	COVER SHEET
C0.2	GENERAL NOTES
C3.1	ONSITE GRADING PLAN 1
C3.2	ONSITE GRADING PLAN 2
C3.3	ENLARGED GRADING DETAILS SHEET 1
C3.4	ENLARGED GRADING DETAILS SHEET 2
C3.5	ENLARGED GRADING DETAILS SHEET 3
C3.6	GRADING SECTIONS SHEET 1
C3.7	GRADING SECTIONS SHEET 2
C3.8	DETAILS 1
C3.9	DETAILS 2
C3.10	ONSITE STORM DRAIN PLAN 1
C3.11	ONSITE STORM DRAIN PLAN 2
C3.12	STORM DRAIN PLAN & PROFILE 1
C3.13	STORM DRAIN PLAN & PROFILE 2
C3.14	STORM DRAIN PLAN & PROFILE 3
C5.0	CITY PARKWAY PLAN & PROFILE – STA 47+00 – 51+50
C5.1	CITY PARKWAY PLAN & PROFILE – STA 51+50 – 55+00
C5.2	SYMPHONY PARK AVE PLAN & PROFILE
C5.3	WEST CARSON AVE PLAN & PROFILE
C5.4	EAST FRONTAGE STREET PLAN & PROFILE – STA 0+00 – 4+50
C5.5	EAST FRONTAGE STREET PLAN & PROFILE – STA 4+50 – 8+50



PROJECT VICINITY MAP
NTS

ALLEN PAVELKA, PE, PE#009029 DATE

APPROVAL OF THESE PLANS BY THE CITY ENGINEER IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY, AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER THE DEVIATION FORM STANDARDS. THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN DEVIATIONS FROM STANDARDS IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS, CLARK COUNTY AREA, NEVADA.

CLV FIRE AND RESCUE DATE

CITY OF LAS VEGAS PLANNING DEPARTMENT DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT

CENTRAL TELEPHONE COMPANY, D/B/A CENTURYLINK DATE

THE AFFIXED CENTURYLINK NEVADA APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION STANDARD REGULATIONS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT No. _____ FIRST APPROVED DATE: _____
SHEETS:

NV ENERGY – DISTRIBUTION DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

SOUTHWEST GAS CORPORATION DATE

COX COMMUNICATIONS LAS VEGAS, INC. DATE

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR 1-800-227-2600

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No.	REVISIONS	DATE	BY

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6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702.862.3600
WWW.KIMLEY-HORN.COM

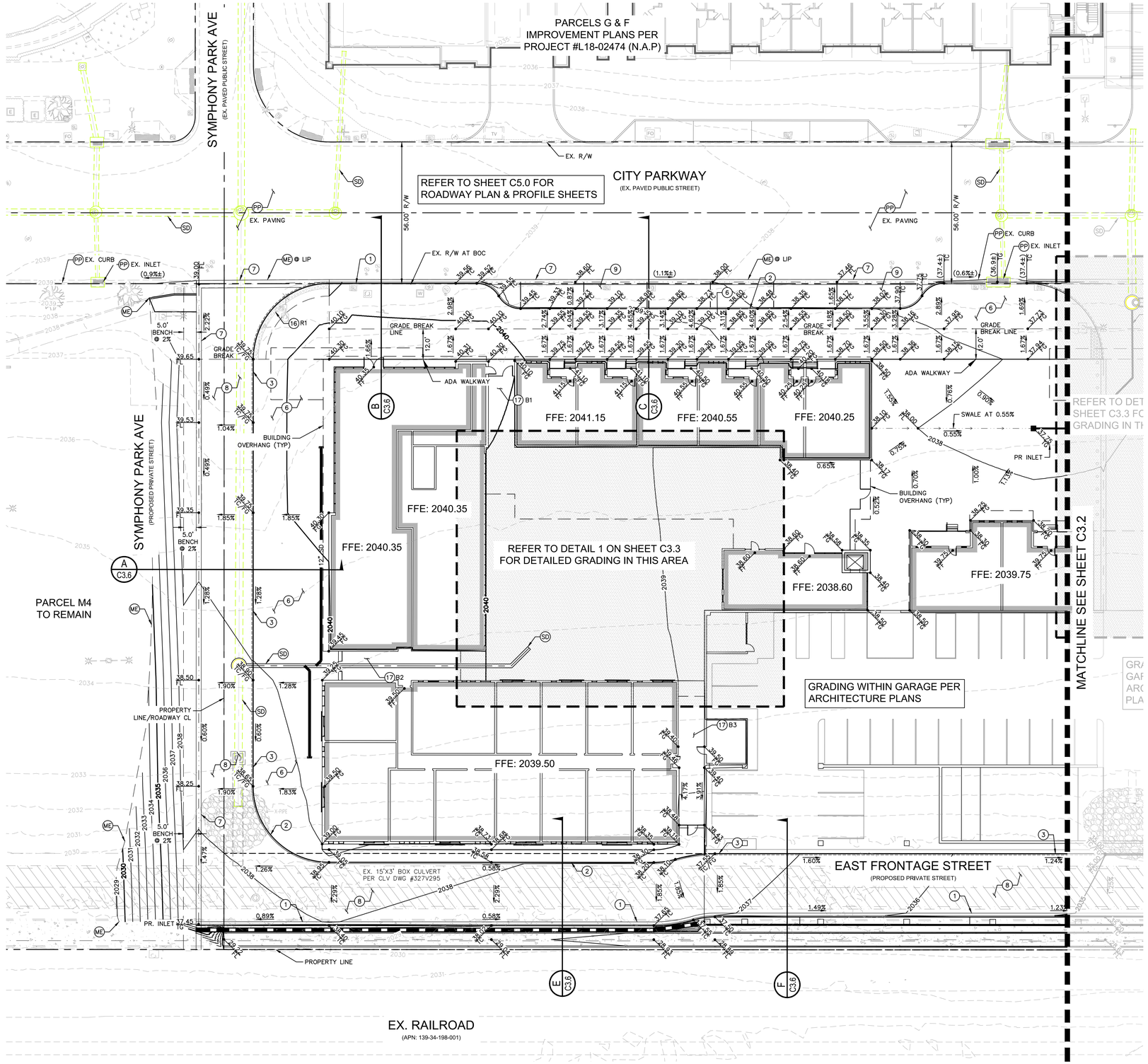
PROFESSIONAL ENGINEER – STATE OF NEVADA
RICHARD MOLES
Exp. 12/31/19
CIVIL
No. 10381

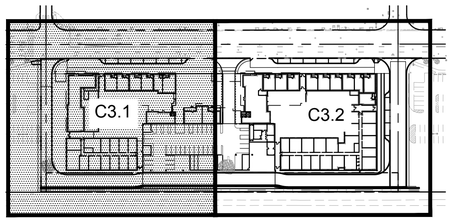
KHA PROJECT 192008000
DATE 11/14/2018
SCALE AS SHOWN
DESIGNED BY TA
DRAWN BY JPH
CHECKED BY TA

COVER SHEET

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C0.1





KEY MAP

NTS

GENERAL NOTES

1. CONTRACTOR TO VERIFY EXISTING IMPROVEMENTS SHOWN ON THE PLAN.
2. CONTRACTOR TO PROTECT IN PLACE, DURING DEMOLITION AND CONSTRUCTION, ALL EXISTING IMPROVEMENTS THAT ARE TO REMAIN AS NOTED ON THE PLAN.
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5. ALL DIMENSIONS ARE MEASURED FROM BACK OF CURB UNLESS OTHERWISE NOTED ON PLANS.
6. ADD 2000 FEET TO ALL SPOT ELEVATIONS UNLESS OTHERWISE NOTED.

GEOTECHNICAL REPORT

ALL GRADING SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: NOVA GEOTECHNICAL & INSPECTION SERVICES
DATED: MAY 15, 2018
PROJECT No: G-18-038

CONSTRUCTION NOTES

(1) INSTALL MODIFIED TYPE 'L' CONCRETE CURB AND GUTTER PER DETAIL 1 ON SHEET C3.8
(2) INSTALL MODIFIED TYPE 'A' CONCRETE CURB PER DETAIL PER DETAIL 2 ON SHEET C3.8
(3) INSTALL 0" FACE CURB PER DETAIL 3 ON SHEET C3.8.
(6) INSTALL CONCRETE SIDEWALK PER CCAUSD No. 234.
(7) INSTALL 2' VALLEY GUTTER PER DETAIL 4 ON SHEET C3.8.
(8) INSTALL 3" ASPHALT PAVING OVER 11" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.
(9) INSTALL ASPHALT PAVING SECTION (MATCH EXISTING).
(16) SEE SHEETS C3.3–C3.4 FOR CORNER RAMP DETAIL.
(17) SEE SHEETS C3.4–C3.5 FOR BREEZEWAY GRADING DETAILS.
(ME) MATCH EXISTING.
(PP) PROTECT IN PLACE.
(SD) REFER TO STORM DRAIN PLANS FOR DETAIL (C3.10–C3.11)

ESTIMATED CUT/FILL QUANTITIES

CUT FILL ANALYSIS
CUT VOLUME: 68 CY
FILL VOLUME: 33658 CY
NET VOLUME: 33590 CY (IMPORT)*

*BASED ON A SURFACE TO SURFACE, UNADJUSTED ANALYSIS

FLOOD ZONE NOTE

THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) INDICATES THAT THE SITE IS LOCATED IN ZONE "X" OF THE FLOOD INSURANCE RATE MAP (FIRM) No. 32003C2170F AS SHOWN ON THE FIRM INDEX REVISED NOVEMBER 16, 2011. ZONE "X" IS DEFINED BY FEMA AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN."

BENCHMARK

CITY OF LAS VEGAS VERTICAL CONTROL
BENCHMARK NO. "BLV0133NE6"

MONUMENT DESCRIPTION IN RIVET & PLATE IN TOP OF CURB AT THE SOUTHWEST CORNER OF SYMPHONY PARK AVENUE AND GRAND CENTRAL PARKWAY.

ELEVATION = 619.999 METERS
2034.12 FEET

CITY OF LAS VEGAS VERTICAL CONTROL DATUM BASED UPON NORTH AMERICAN VERTICAL DATUM OF 2008 (NAVD '88)

BASIS OF BEARING

SOUTH 27°55'16" WEST, BEING THE EAST LINE OF LOT 5 OF THAT COMMERCIAL SUBDIVISION KNOWN AS "PARKWAY CENTER" ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA IN BOOK 53 OF PLATS, AT PAGE 61.

GRAPHIC SCALE IN FEET
0 10 20 40

NORTH

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No.	REVISIONS	DATE	BY

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WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER–STATE OF NEVADA
RICHARD A. MOLES
Exp. 12/31/19
CIVIL
No. 10381

KHA PROJECT 192008000

DATE	11/14/2018
SCALE	AS SHOWN
DESIGNED BY	TA
DRAWN BY	JPH
CHECKED BY	TA

ONSITE GRADING PLAN 1

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C3.1

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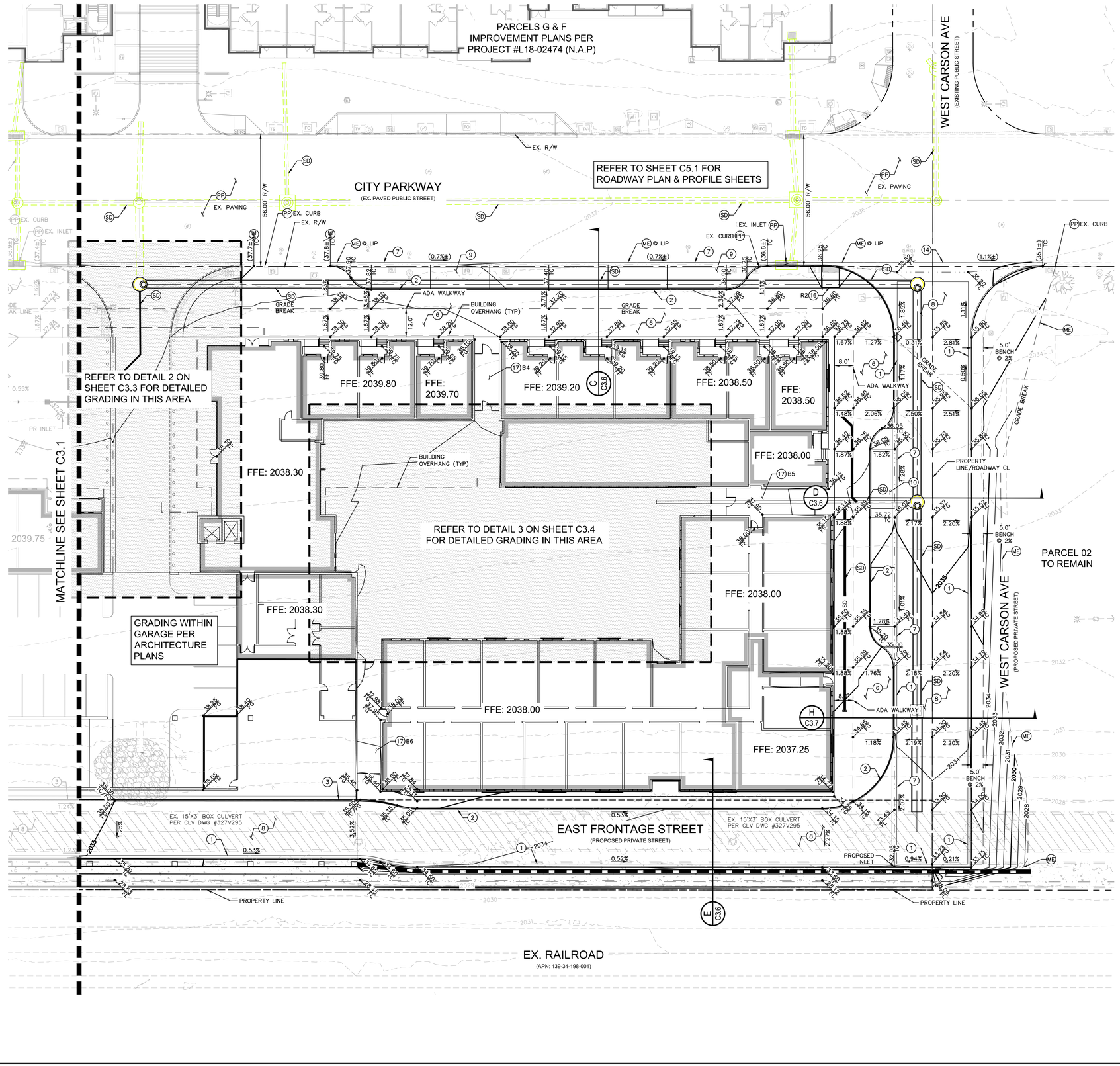

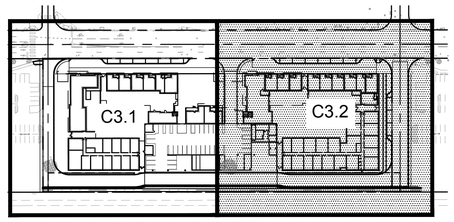

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DATED: MAY 15, 2018
PROJECT No: G-18-038

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3. INSTALL 0" FACE CURB PER DETAIL 3 ON SHEET C3.8.
6. INSTALL CONCRETE SIDEWALK PER CCAUSD No. 234.
7. INSTALL 2' VALLEY GUTTER PER DETAIL 4 ON SHEET C3.8.
8. INSTALL 3" ASPHALT PAVING OVER 11" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.
9. INSTALL ASPHALT PAVING SECTION (MATCH EXISTING).
10. INSTALL 2" ASPHALT PAVING OVER 7" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.
14. INSTALL COMMERCIAL DRIVEWAY PER CCAUSD No. 225 & PER CCAUSD No. 228.
16. SEE SHEETS C3.3–C3.4 FOR CORNER RAMP DETAIL.
17. SEE SHEETS C3.4–C3.5 FOR BREEZEWAY GRADING DETAILS.

ME. MATCH EXISTING.
PP. PROTECT IN PLACE.
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BENCHMARK NO. "BLV0133NE6"

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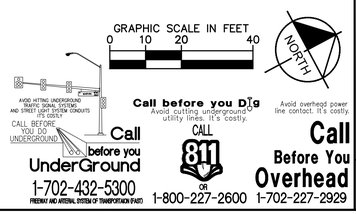
GRAPHIC SCALE IN FEET
0 10 20 40



No.	REVISIONS	DATE	BY

Kimley»Horn
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PROFESSIONAL ENGINEER-STATE OF NEVADA
RICHARD MOLES
No. 10381
Exp. 12/31/19
CIVIL

KHA PROJECT 192008000
DATE 11/14/2018
SCALE AS SHOWN
DESIGNED BY TA
DRAWN BY JPH
CHECKED BY TA

ONSITE GRADING PLAN 2

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C3.2

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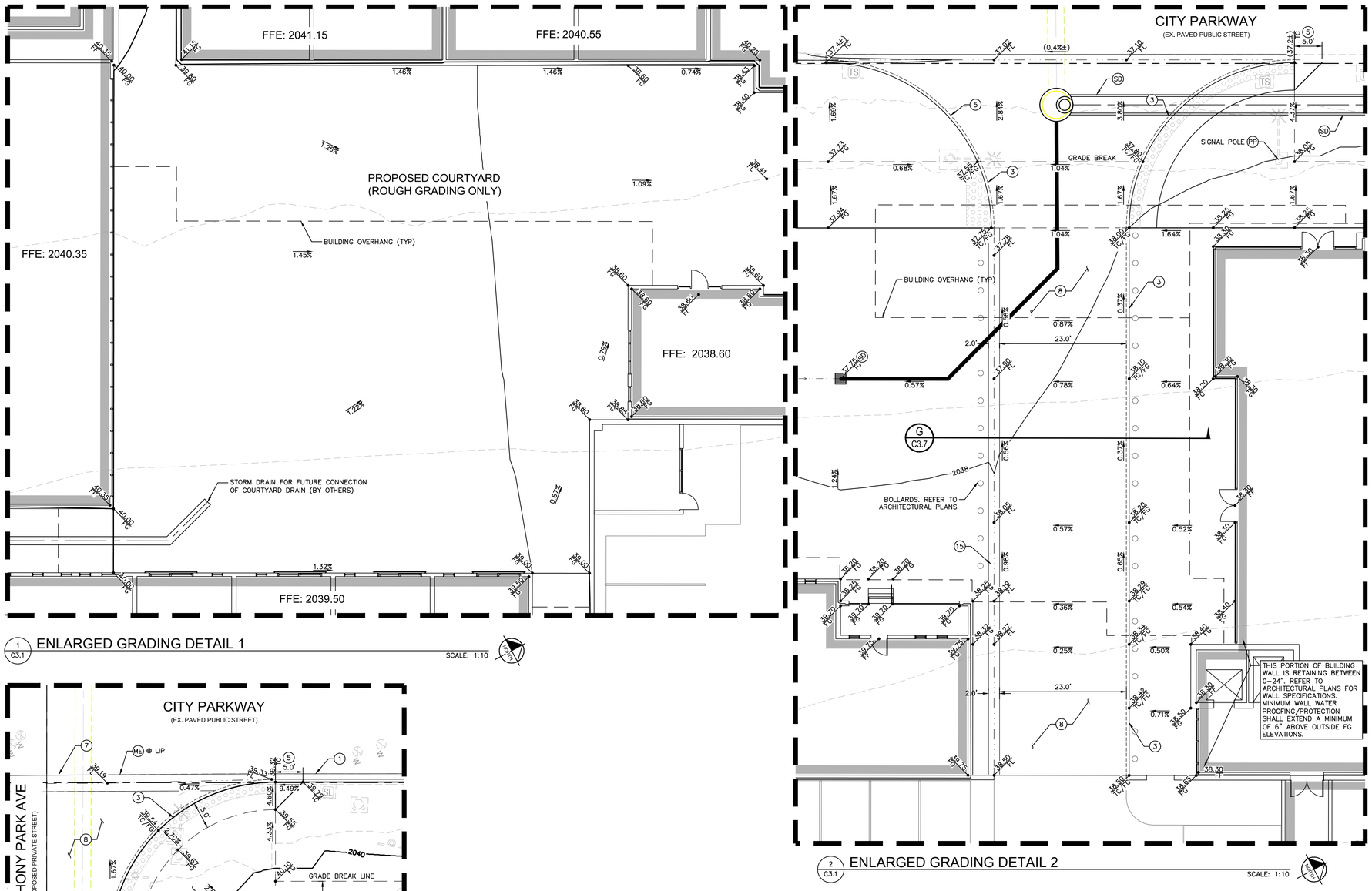
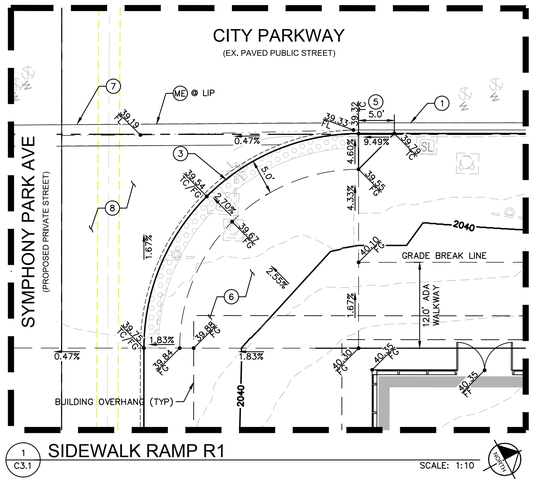
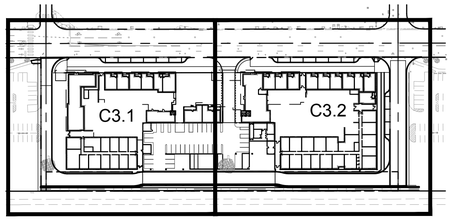


1 C3.1 ENLARGED GRADING DETAIL 1 — SCALE: 1:10

2 C3.1 ENLARGED GRADING DETAIL 2 — SCALE: 1:10



1 C3.1 SIDEWALK RAMP R1 — SCALE: 1:10



KEY MAP

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ENGINEER: NOVA GEOTECHNICAL & INSPECTION SERVICES
DATED: MAY 15, 2018
PROJECT No: G-18-038

CONSTRUCTION NOTES

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(3) INSTALL 0" FACE CURB PER DETAIL 3 ON SHEET C3.8.
(5) INSTALL TRANSITION FROM TYPE 'L' CURB TO MODIFIED "0" FACE CURB. LENGTH STATED ON PLAN.
(6) INSTALL CONCRETE SIDEWALK PER CCAUSD No. 234.
(7) INSTALL 2' VALLEY GUTTER PER DETAIL 4 ON SHEET C3.8.
(8) INSTALL 3" ASPHALT PAVING OVER 11" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.
(15) INSTALL 2' ADA ACCESSIBLE VALLEY GUTTER PER DETAIL 6 ON SHEET C3.8
(ME) MATCH EXISTING.
(PP) PROTECT IN PLACE.
(SD) REFER TO STORM DRAIN PLANS FOR DETAIL (C3.10-C3.11)

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BENCHMARK

CITY OF LAS VEGAS VERTICAL CONTROL
BENCHMARK NO. "BLV013.3NE6"

MONUMENT DESCRIPTION IN RIVET & PLATE IN TOP OF CURB AT THE SOUTHWEST CORNER OF SYMPHONY PARK AVENUE AND GRAND CENTRAL PARKWAY.

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2034.12 FEET

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CIVIL
No. 10381

KHA PROJECT	192008000
DATE	11/14/2018
SCALE	AS SHOWN
DESIGNED BY	TA
DRAWN BY	JPH
CHECKED BY	TA

ENLARGED GRADING DETAILS SHEET 1

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C3.3

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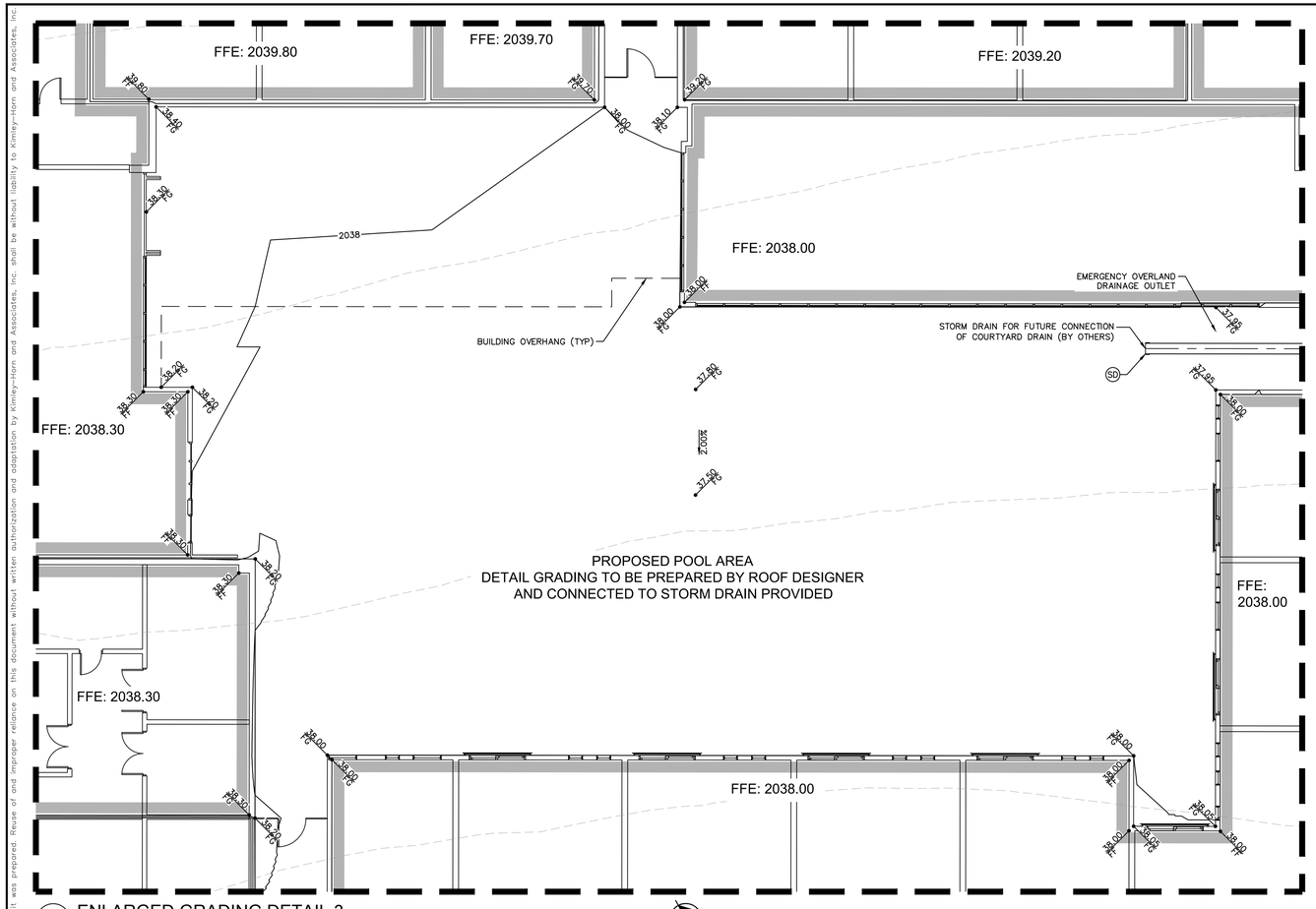
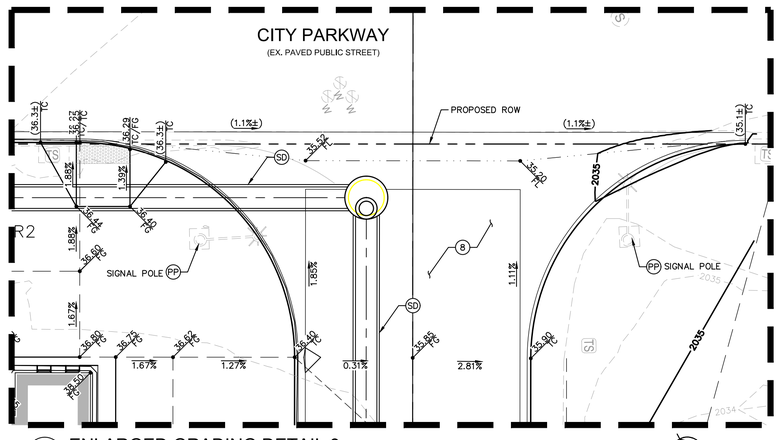
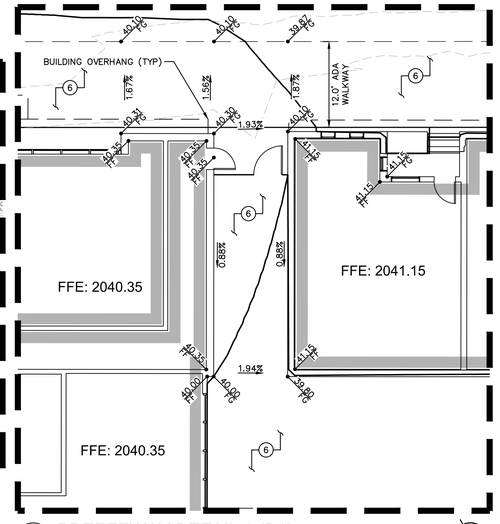


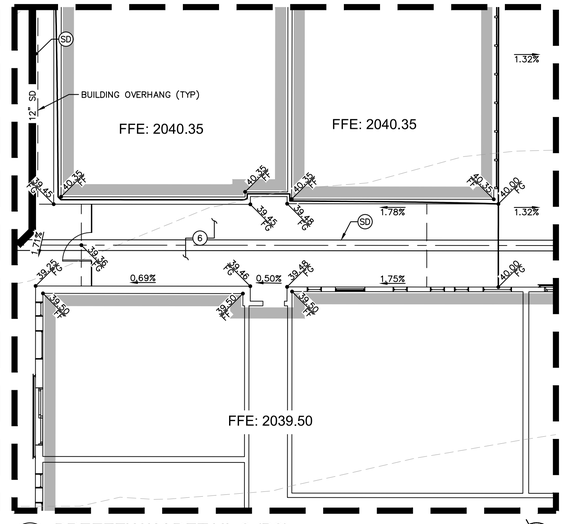
3 C3.2 ENLARGED GRADING DETAIL 3 SCALE: 1:10



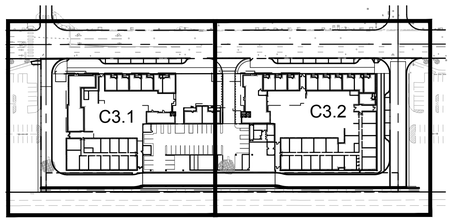
3 C3.2 ENLARGED GRADING DETAIL 3 SCALE: 1:10



1 C3.1 BREEZEWAY DETAIL 1 (B1) SCALE: 1:10



1 C3.1 BREEZEWAY DETAIL 2 (B2) SCALE: 1:10



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DATED: MAY 15, 2018
PROJECT No: G-18-038

CONSTRUCTION NOTES

- (6) INSTALL CONCRETE SIDEWALK PER CCAUSD No. 234.
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SOUTH 27°55'16" WEST, BEING THE EAST LINE OF LOT 5 OF THAT COMMERCIAL SUBDIVISION KNOWN AS "PARKWAY CENTER" ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA IN BOOK 53 OF PLATS, AT PAGE 61.

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL SYSTEMS AND STREET LIGHT SYSTEM CONDUITS. IT'S COSTLY.
CALL BEFORE YOU DO UNDERGROUND
Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST)
Call before you Dig Avoid cutting underground utility lines. It's costly. CALL 811 OR 1-800-227-2600
Avoid overhead power line contact. It's costly. Call Before You Overhead 1-702-227-2929

No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S, SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-382-3500
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER - STATE OF NEVADA
RICHARD A MOLES
Exp. 12/31/19
CIVIL
No. 10381

KHA PROJECT 192008000
DATE 11/14/2018
SCALE AS SHOWN
DESIGNED BY TA
DRAWN BY JPH
CHECKED BY TA

ENLARGED GRADING DETAILS SHEET 2

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C3.4

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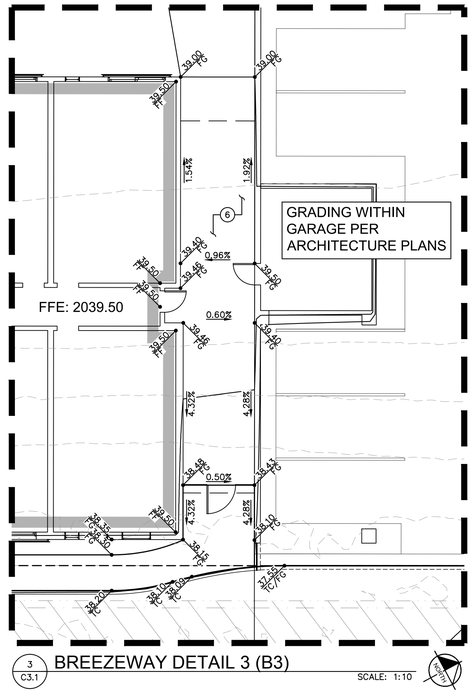
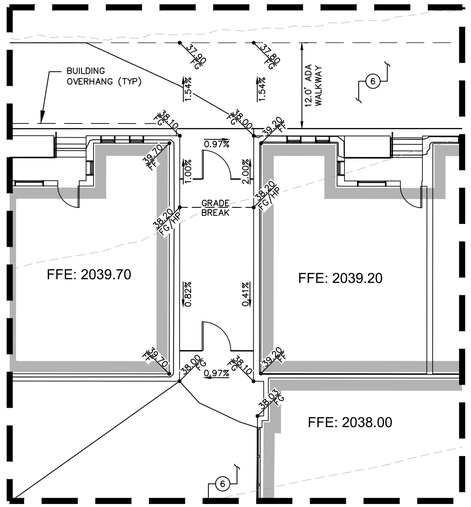


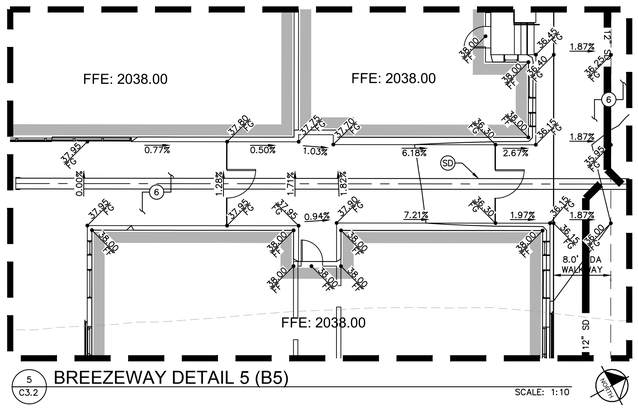
3 C3.1 BREEZEWAY DETAIL 3 (B3)

SCALE: 1:10



4 C3.2 BREEZEWAY DETAIL 4 (B4)

SCALE: 1:10



5 C3.2 BREEZEWAY DETAIL 5 (B5)

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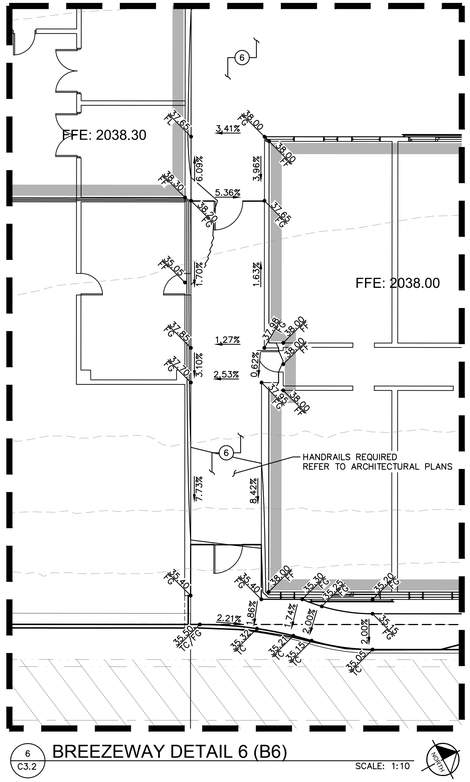

6 C3.2 BREEZEWAY DETAIL 6 (B6)

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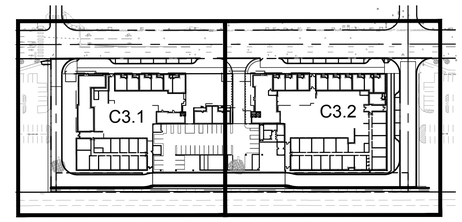

KEY MAP

NTS

GENERAL NOTES

1. CONTRACTOR TO VERIFY EXISTING IMPROVEMENTS SHOWN ON THE PLAN.
2. CONTRACTOR TO PROTECT IN PLACE, DURING DEMOLITION AND CONSTRUCTION, ALL EXISTING IMPROVEMENTS THAT ARE TO REMAIN AS NOTED ON THE PLAN.
3. ANY EXISTING STRUCTURE, IMPROVEMENT, OR APPURTENANCE TO REMAIN THAT IS DAMAGED DURING DEMOLITION OR CONSTRUCTION SHALL BE IMMEDIATELY REPAIRED OR REPLACED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.
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5. ALL DIMENSIONS ARE MEASURED FROM BACK OF CURB UNLESS OTHERWISE NOTED ON PLANS.
6. ADD 2000 FEET TO ALL SPOT ELEVATIONS UNLESS OTHERWISE NOTED.

GEOTECHNICAL REPORT

ALL GRADING SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: NOVA GEOTECHNICAL & INSPECTION SERVICES
DATED: MAY 15, 2018
PROJECT No: G-18-038

CONSTRUCTION NOTES

(6) INSTALL CONCRETE SIDEWALK PER CCAUSD No. 234.
(SD) REFER TO STORM DRAIN PLANS FOR DETAIL (C3.10-C3.11)

ESTIMATED CUT/FILL QUANTITIES

CUT FILL ANALYSIS
CUT VOLUME: 68 CY
FILL VOLUME: 33658 CY
NET VOLUME: 33590 CY (IMPORT)*

*BASED ON A SURFACE TO SURFACE, UNADJUSTED ANALYSIS

FLOOD ZONE NOTE

THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) INDICATES THAT THE SITE IS LOCATED IN ZONE "X" OF THE FLOOD INSURANCE RATE MAP (FIRM) No. 32003C2170F AS SHOWN ON THE FIRM INDEX REVISED NOVEMBER 16, 2011. ZONE "X" IS DEFINED BY FEMA AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN."

BENCHMARK

CITY OF LAS VEGAS VERTICAL CONTROL
BENCHMARK NO. "BLV0133NE6"

MONUMENT DESCRIPTION IN RIVET & PLATE IN TOP OF CURB AT THE SOUTHWEST CORNER OF SYMPHONY PARK AVENUE AND GRAND CENTRAL PARKWAY.

ELEVATION = 619.999 METERS
2034.12 FEET

CITY OF LAS VEGAS VERTICAL CONTROL DATUM BASED UPON NORTH AMERICAN VERTICAL DATUM OF 2008 (NAVD '88)

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PROFESSIONAL ENGINEER-STATE OF NEVADA
RICHARD MOLES
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No. 10381

KHA PROJECT 192008000			
DATE	11/14/2018	DESIGNED BY	TA
SCALE	AS SHOWN	DRAWN BY	JPH
		CHECKED BY	TA

ENLARGED GRADING DETAILS SHEET 3

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C3.5

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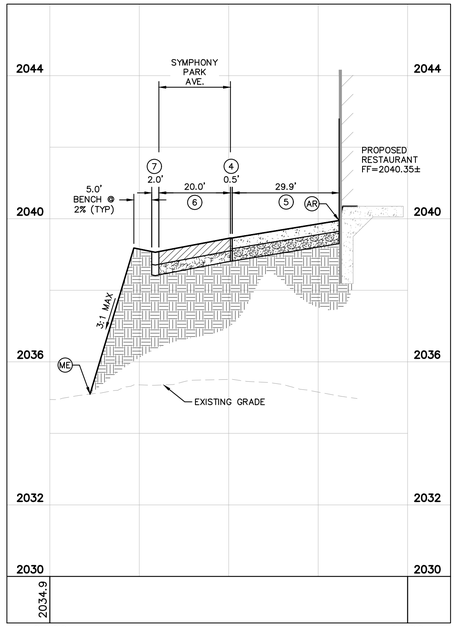

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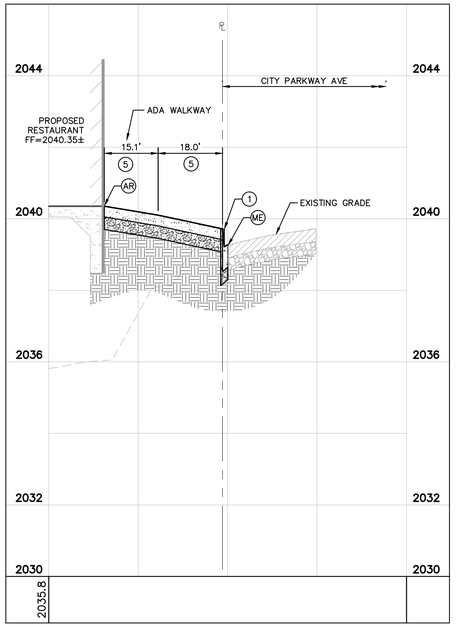

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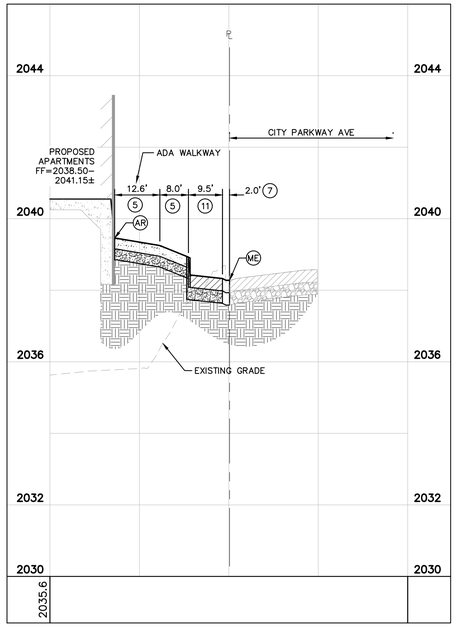

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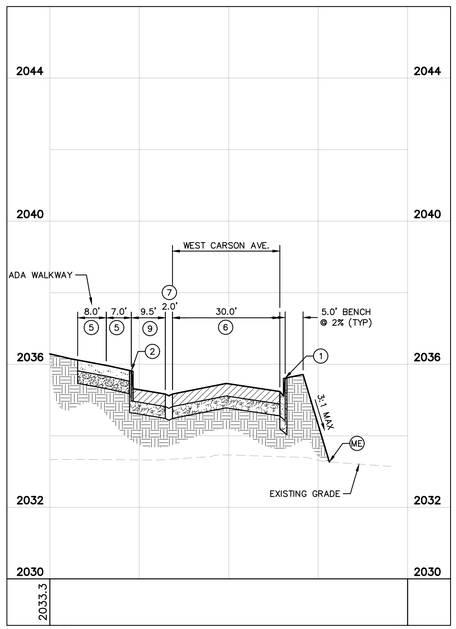

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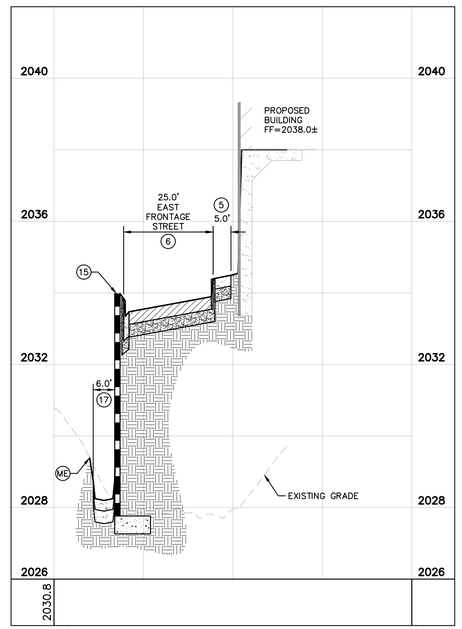

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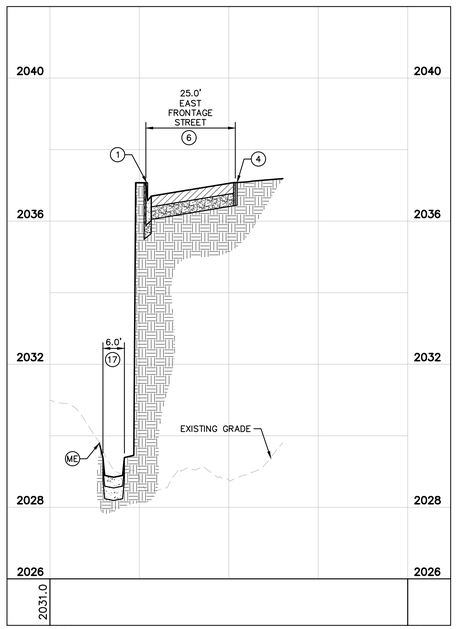

SECTION F

GENERAL NOTES

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CONSTRUCTION NOTES

(1) INSTALL MODIFIED TYPE 'L' CONCRETE CURB AND GUTTER PER DETAIL 1 ON SHEET C3.8
(2) INSTALL MODIFIED TYPE 'A' CONCRETE CURB PER DETAIL PER DETAIL 2 ON SHEET C3.8
(4) INSTALL 0" FACE CURB PER DETAIL 3 ON SHEET C3.8.
(5) INSTALL CONCRETE SIDEWALK PER CCAUSD No. 234.
(6) INSTALL 3" ASPHALT PAVING OVER 11" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.
(7) INSTALL 2' VALLEY GUTTER PER DETAIL 4 ON SHEET C3.8.
(9) INSTALL 2" ASPHALT PAVING OVER 7" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.
(11) INSTALL ASPHALT PAVING SECTION (MATCH EXISTING).
(15) INSTALL RETAINING WALL BY-OTHERS.
(17) INSTALL 5' X 0.5' CONCRETE U-CHANNEL.
(AR) REFER TO ARCHITECTURAL PLANS FOR DETAILS.
(ME) MATCH EXISTING

BENCHMARK

CITY OF LAS VEGAS VERTICAL CONTROL
BENCHMARK NO. "BLV0133NE6"

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HORIZONTAL
0 1 2 4
VERTICAL

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RICHARD MOLES
Exp. 12/31/19
CIVIL
No. 10381

KHA PROJECT	192008000
DATE	11/14/2018
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DRAWN BY	JPH
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GRADING SECTIONS SHEET 1

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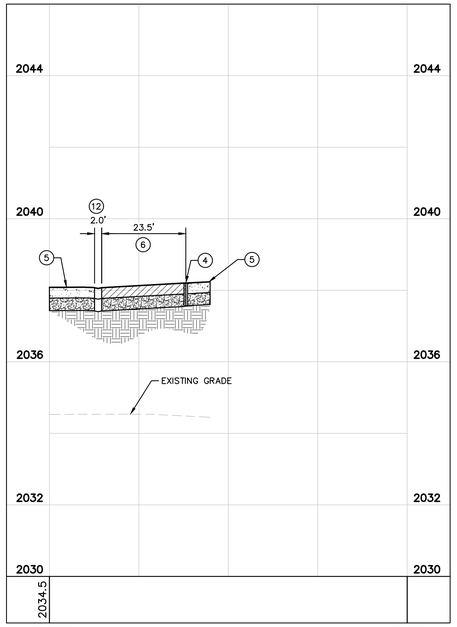
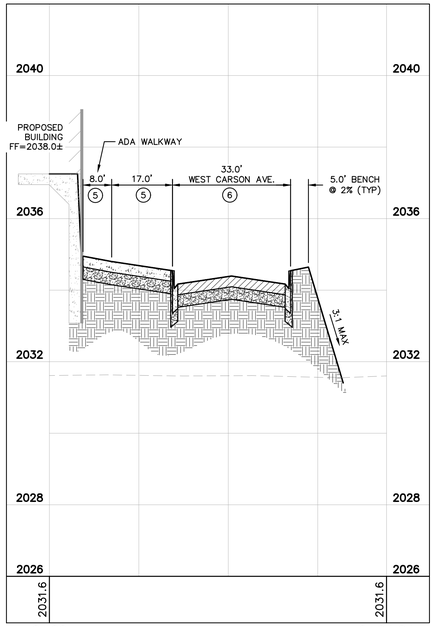
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C3.6



SECTION G



SECTION H

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CONSTRUCTION NOTES

(4) INSTALL 0" FACE CURB PER DETAIL 3 ON SHEET C3.8.

(5) INSTALL CONCRETE SIDEWALK PER CCAUSD No. 234.

(6) INSTALL 3" ASPHALT PAVING OVER 11" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.

(12) INSTALL 2' ADA COMPLIANT VALLEY GUTTER PER DETAIL 6 ON SHEET C3.8

BENCHMARK

CITY OF LAS VEGAS VERTICAL CONTROL
BENCHMARK NO. "BLV0133NE6"

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GRADING SECTIONS SHEET 2

SYMPHONY PARK RESIDENTIAL
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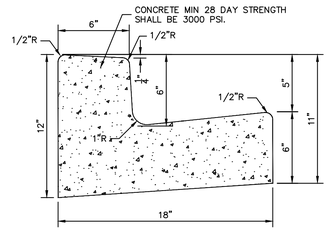
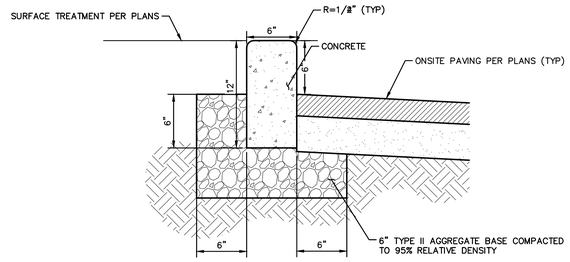
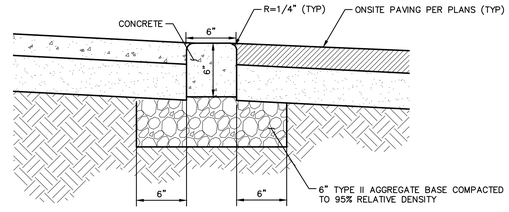


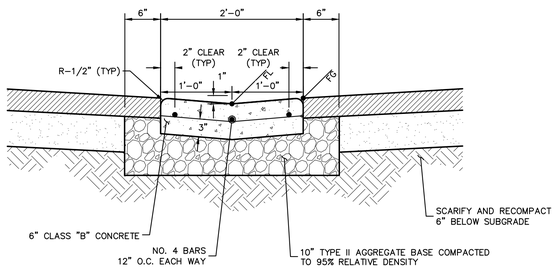
1 — DETAIL 1
MODIFIED "L" CURB & GUTTER
NTS



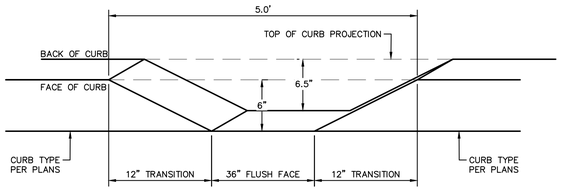
2 — DETAIL 2
MODIFIED 'TYPE A' CURB DETAIL
NTS



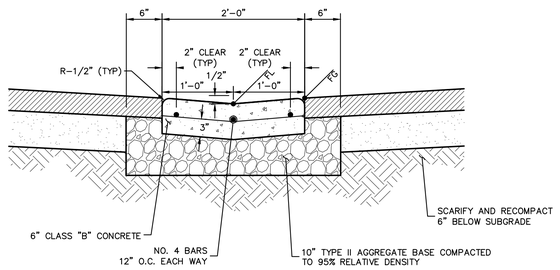
3 — DETAIL 3
FLUSH CURB DETAIL
NTS



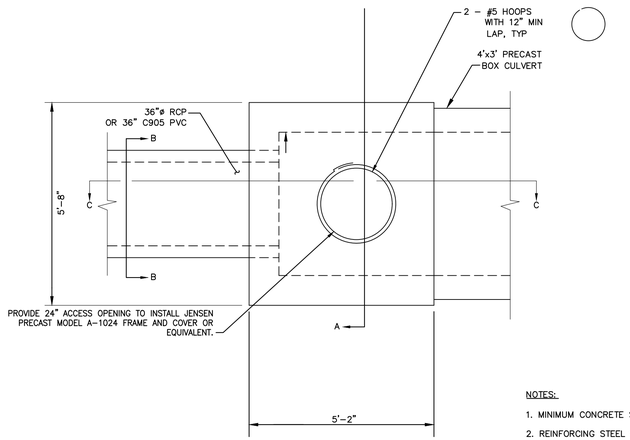
4 — DETAIL 4
ONSITE 2' VALLEY GUTTER DETAIL
NTS



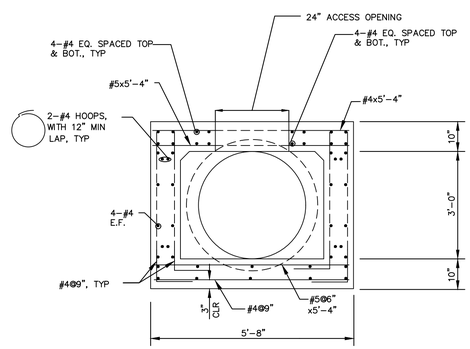
5 — DETAIL 5
3' CURB CUT DETAIL
NTS



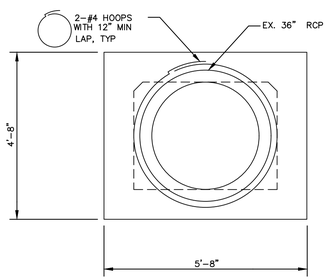
6 — DETAIL 6
2' ADA COMPLIANT VALLEY GUTTER DETAIL
NTS



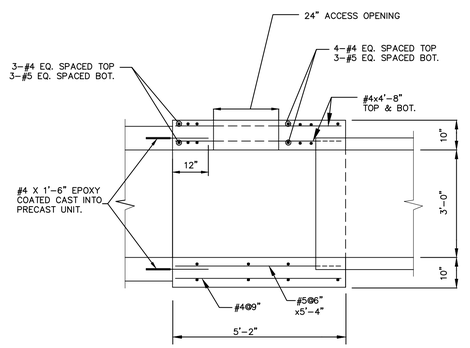
PLAN VIEW
NOT TO SCALE



SECTION A-A
NOT TO SCALE



SECTION B-B
NOT TO SCALE



SECTION C-C
NOT TO SCALE

NOTES:

1. MINIMUM CONCRETE STRENGTH TO BE f'c=4500psi AT 28 DAYS.
2. REINFORCING STEEL SHALL BE ASTM 615, GRADE 60.
3. ALL BENDS AND HOOKS SHALL MEET THE REQUIREMENTS OF AASHTO ARTICLE 8.23. ALL BEND DIMENSIONS FOR REINFORCING STEEL SHALL BE OUT-TO-OUT OF BARS. ALL PLACEMENT DIMENSIONS FOR REINFORCING STEEL SHALL BE CENTER-TO-CENTER OF BARS, UNLESS NOTED OTHERWISE.
4. CUT REINFORCING STEEL TO CLEAR OPENING.
5. ALL REINFORCING STEEL SHALL HAVE 2" CLEAR COVER, UNLESS NOTED OTHERWISE.

7 — DETAIL 7
CAST-IN PLACE JUNCTION STRUCTURE
NTS

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DETAILS 1

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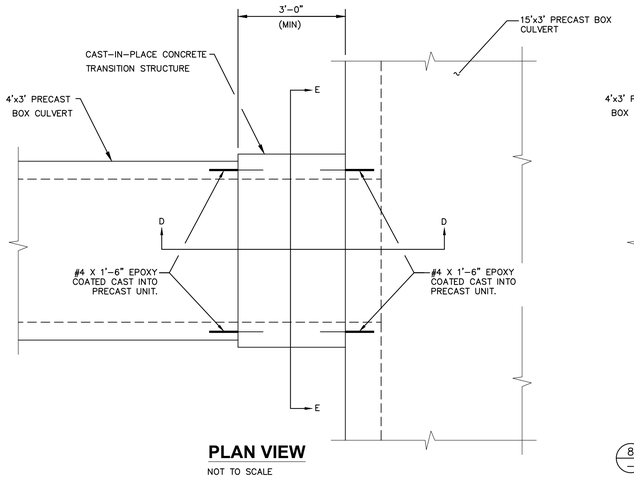
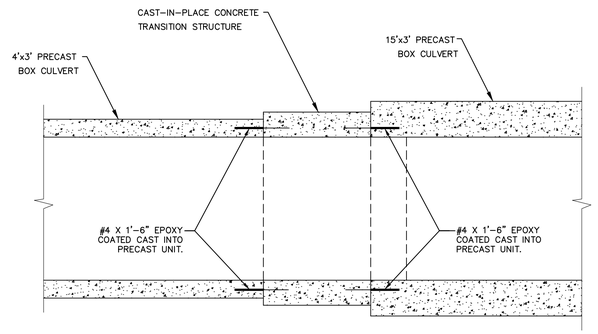


PLAN VIEW
NOT TO SCALE



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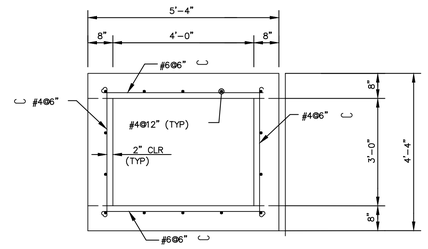

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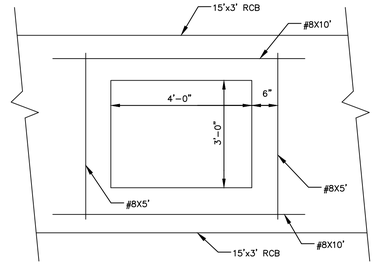
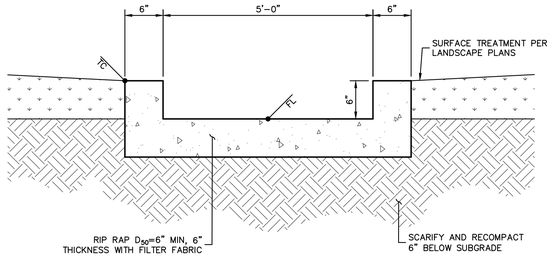


15'X3' RCB OPENING DETAIL
NOT TO SCALE

(8) DETAIL8
15'x3' PRECAST CULVERT-TO-4'x3' PRECAST CULVERT CONNECTION NTS



(9) DETAIL 9
5' WIDE RECTANGULAR CONCRETE DRAINAGE SWALE
(U-CHANNEL) NTS

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PROFESSIONAL ENGINEER — STATE OF NEVADA
RICHARD MOLES
Exp. 12/31/19
CIVIL
No. 10381

KHA PROJECT 192008000
DATE 11/14/2018
SCALE AS SHOWN
DESIGNED BY TA
DRAWN BY JPH
CHECKED BY TA

DETAILS 2

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C3.9

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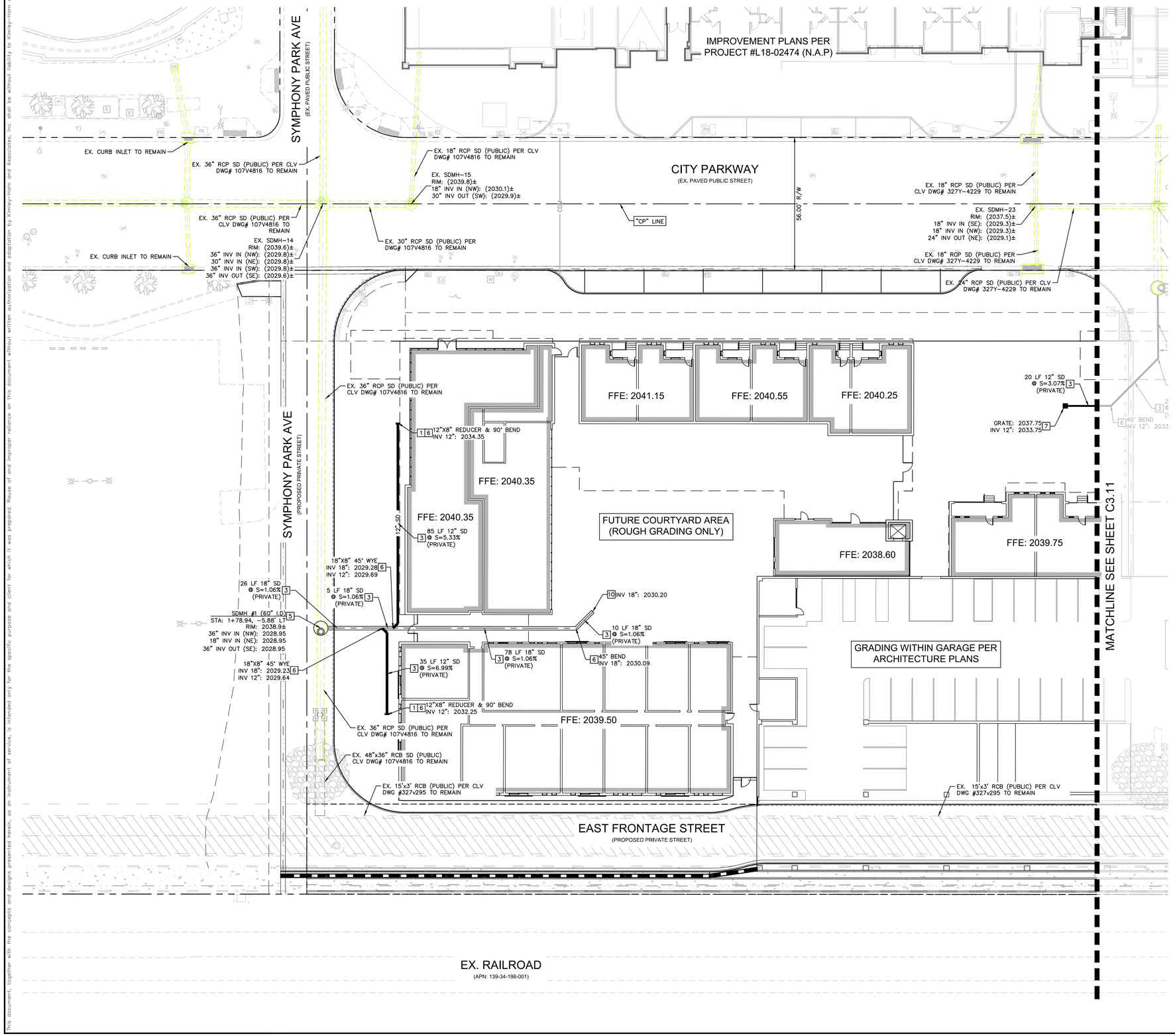

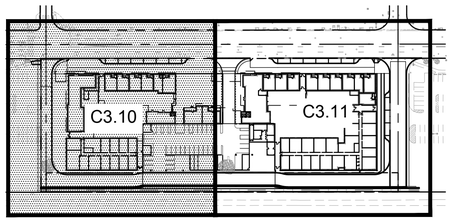

KEY MAP

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GENERAL NOTES

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1 STORM DRAIN POINT OF CONNECTION. REFER TO MEP PLANS FOR CONTINUATION

3 INSTALL HDPE STORM DRAIN PIPE WITH EXCAVATION, BACKFILL AND TYPE 2 BEDDING PER CCAUSD No. 503.1. SIZE, LENGTH AND SLOPE AS NOTED ON PLAN.

5 INSTALL TYPE III STORM DRAIN MANHOLE PER CCAUSD No. 406.1, COLLAR PER CCAUSD No. 408.1, COVER PER CCAUSD No. 409.1 AND 410.

6 INSTALL HDPE FITTING, SIZE PER PIPE. TYPE AS NOTED ON PLAN.

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BENCHMARK NO. "8LV0133NE6"

MONUMENT DESCRIPTION IN RIVET & PLATE IN TOP OF CURB AT THE SOUTHWEST CORNER OF SYMPHONY PARK AVENUE AND GRAND CENTRAL PARKWAY.

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2034.12 FEET

CITY OF LAS VEGAS VERTICAL CONTROL DATUM BASED UPON NORTH AMERICAN VERTICAL DATUM OF 2008 (NAVD '88)

BASIS OF BEARING

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GRAPHIC SCALE IN FEET
0 10 20 40

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PROFESSIONAL ENGINEER-STATE OF NEVADA
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Exp. 12/31/19
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No. 10381

KHA PROJECT	192008000
DATE	11/14/2018
SCALE	AS SHOWN
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CHECKED BY	TA

ONSITE STORM DRAIN PLAN 1

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

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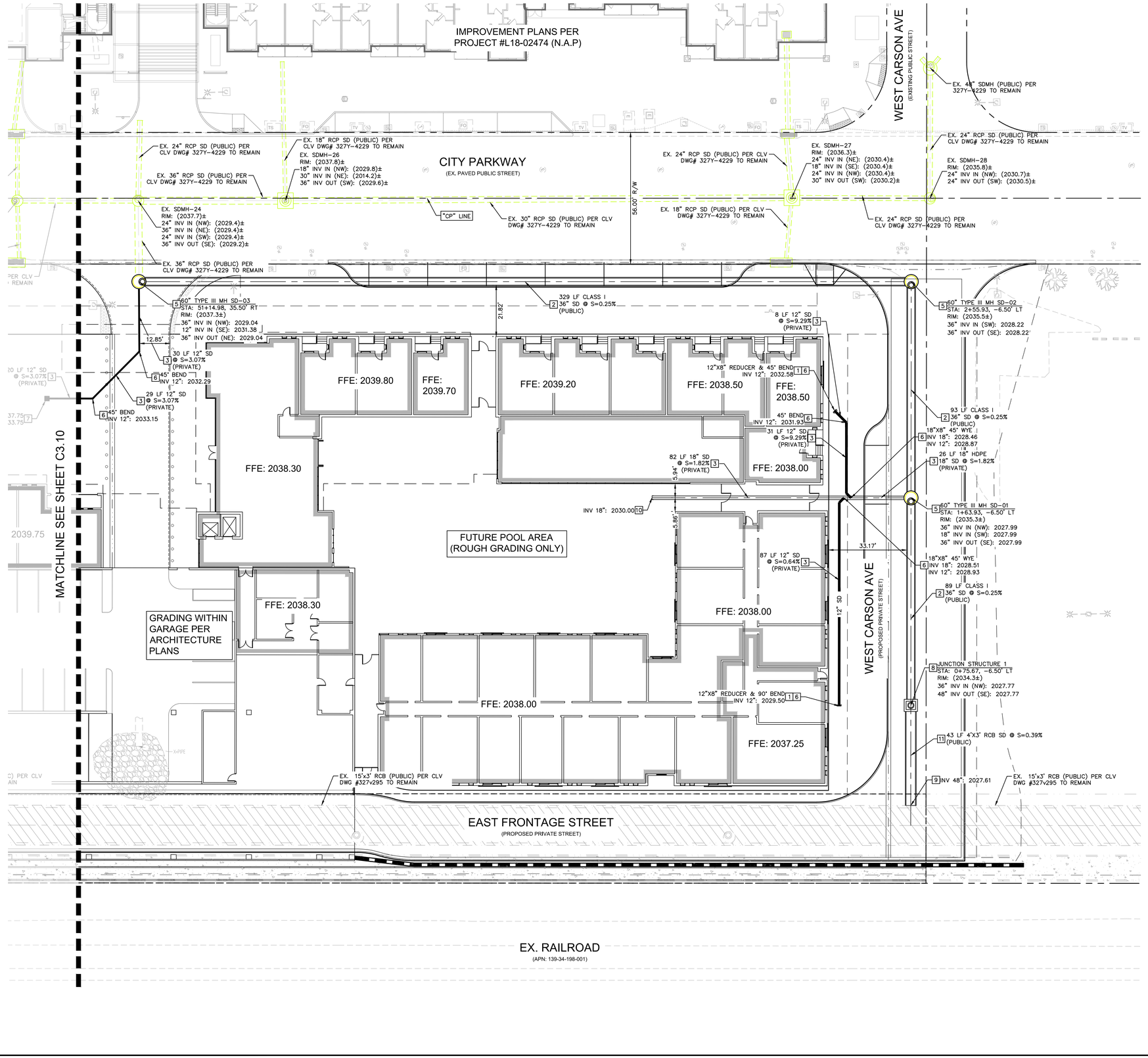

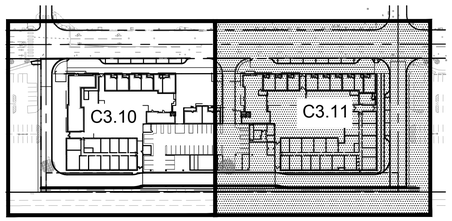

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8. INSTALL JUNCTION STRUCTURE PER DETAIL 7 ON SHEET C3.8
9. CONNECT TO KNOCKOUT IN EXISTING BOX CULVERT PER DETAIL 8 ON SHEET C3.9. INVERT AS NOTED ON PLAN.
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GRAPHIC SCALE IN FEET
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PROFESSIONAL ENGINEER-STATE OF NEVADA
RICHARD MOLES
Exp. 12/31/19
CIVIL
No. 10381

KHA PROJECT 192008000	DESIGNED BY TA	DRAWN BY JPH	CHECKED BY TA
DATE 11/14/2018			
SCALE AS SHOWN			

ONSITE STORM DRAIN PLAN 2

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
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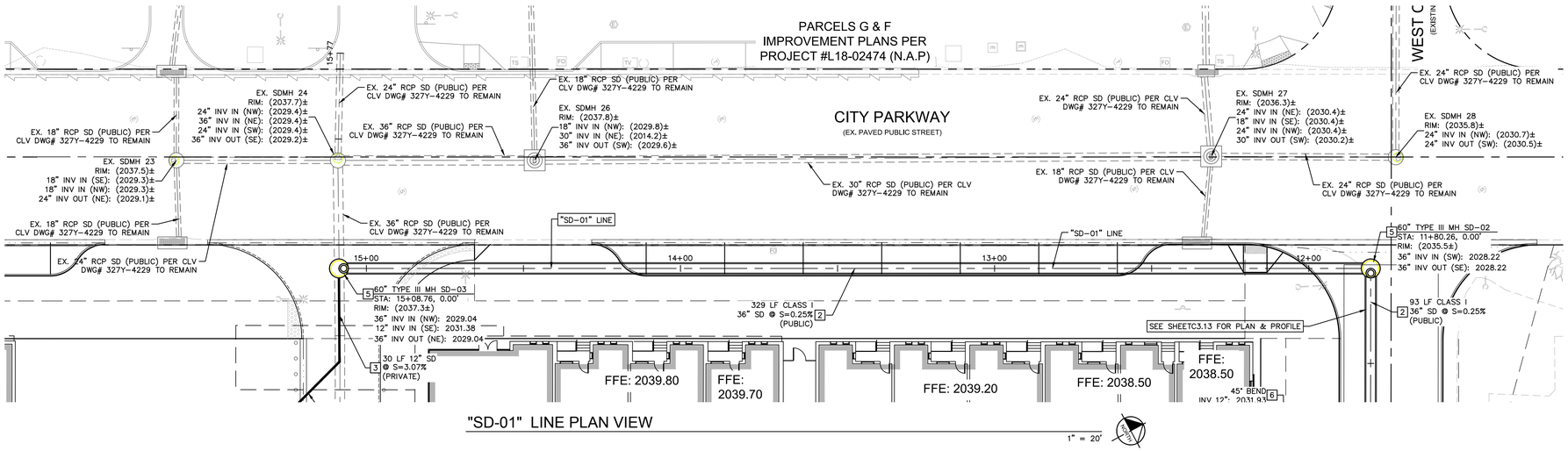
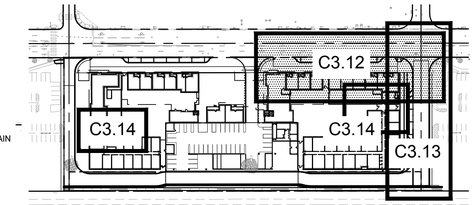


"SD-01" LINE PLAN VIEW

1" = 20'



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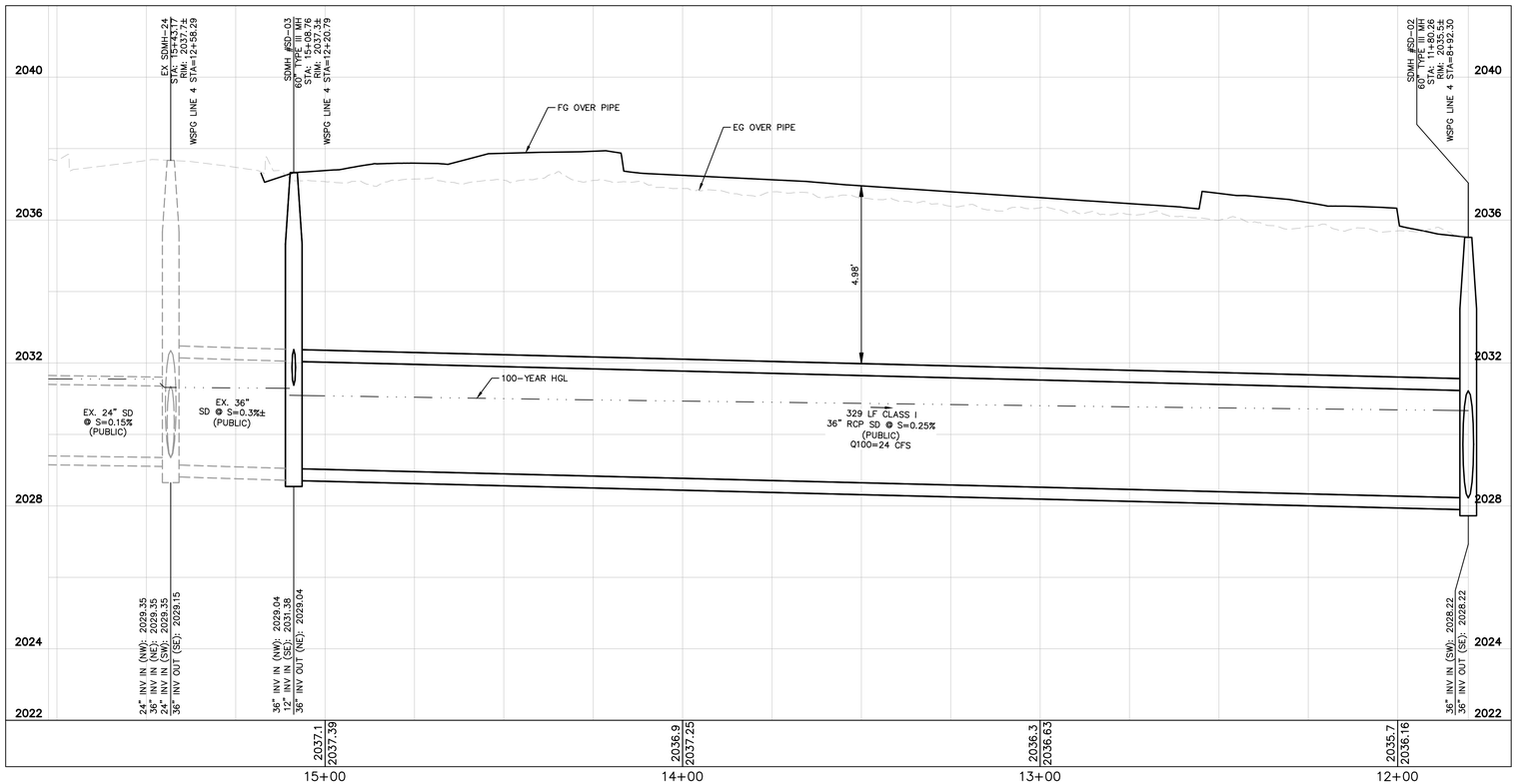

"SD-01" LINE PROFILE VIEW

HORIZONTAL SCALE= 1" = 20'
VERTICAL SCALE= 1" = 2'

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KHA PROJECT	192008000
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STORM DRAIN PLAN & PROFILE 1

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
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CITY OF LAS VEGAS NEVADA

SHEET NUMBER
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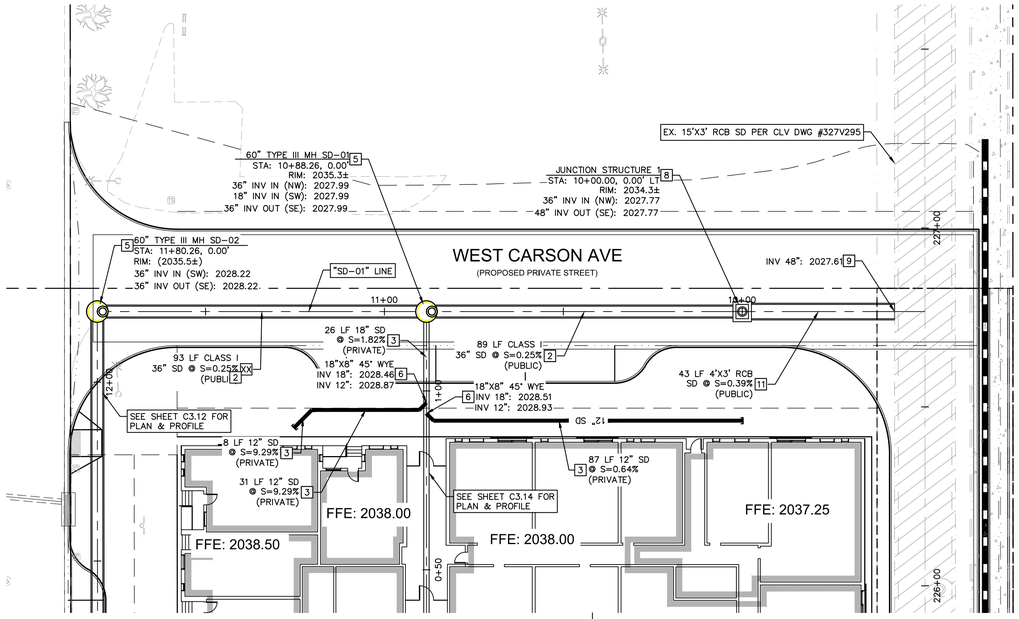

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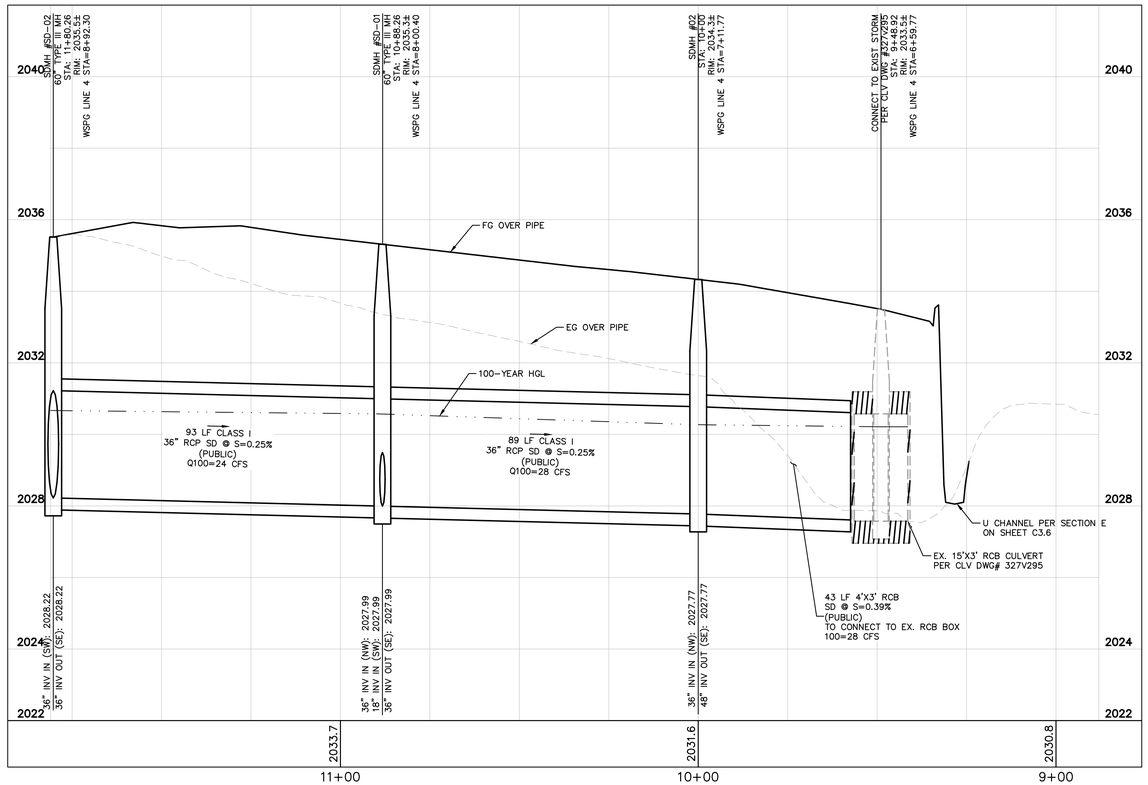
SCALE: 1" = 20'



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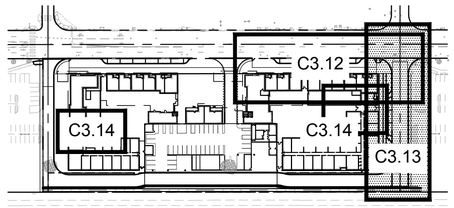

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STORM DRAIN PLAN & PROFILE 2

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SHEET NUMBER
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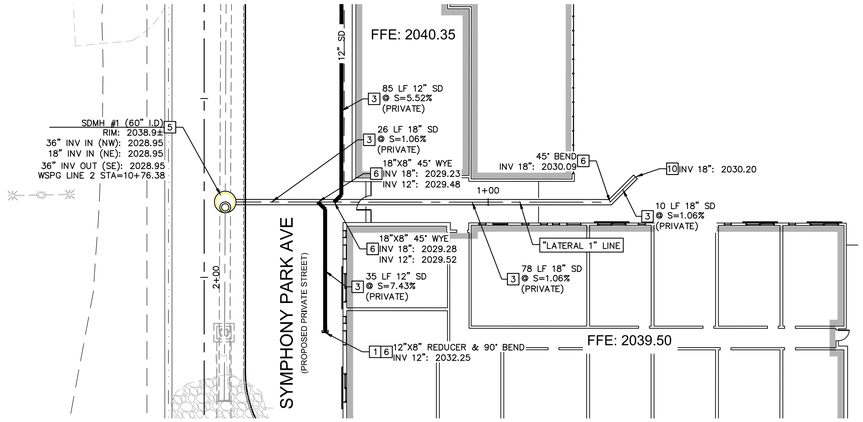
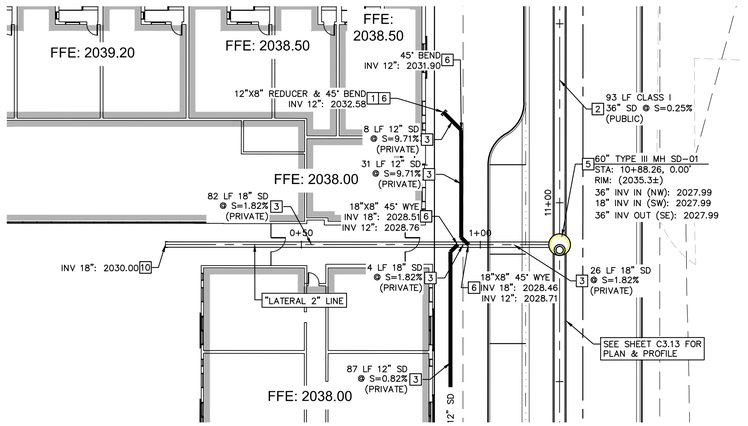


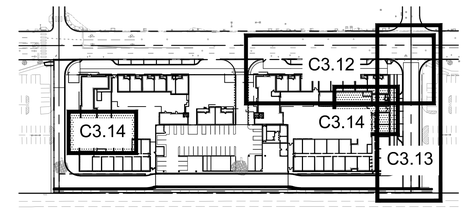
"LATERAL 1" PLAN VIEW

SCALE: 1:20



"LATERAL 2" PLAN VIEW

SCALE: 1:20



KEY MAP

NTS

GENERAL NOTES

1. CONTRACTOR TO VERIFY EXISTING IMPROVEMENTS SHOWN ON THE PLAN.
2. CONTRACTOR TO PROTECT IN PLACE, DURING DEMOLITION AND CONSTRUCTION, ALL EXISTING IMPROVEMENTS THAT ARE TO REMAIN AS NOTED ON THE PLAN.
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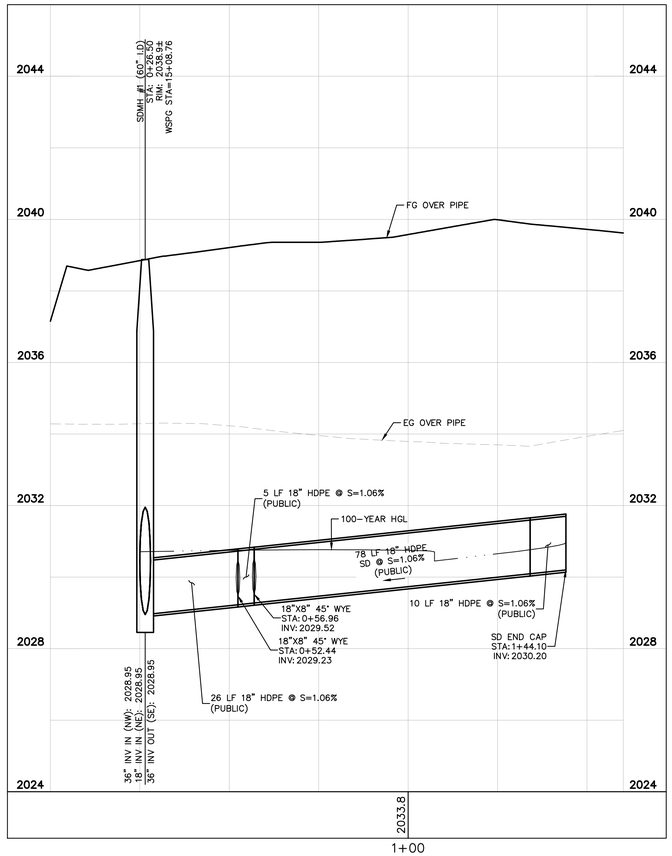
5. ALL DIMENSIONS ARE MEASURED FROM BACK OF CURB UNLESS OTHERWISE NOTED ON PLANS.
6. ADD 2000 FEET TO ALL SPOT ELEVATIONS UNLESS OTHERWISE NOTED.

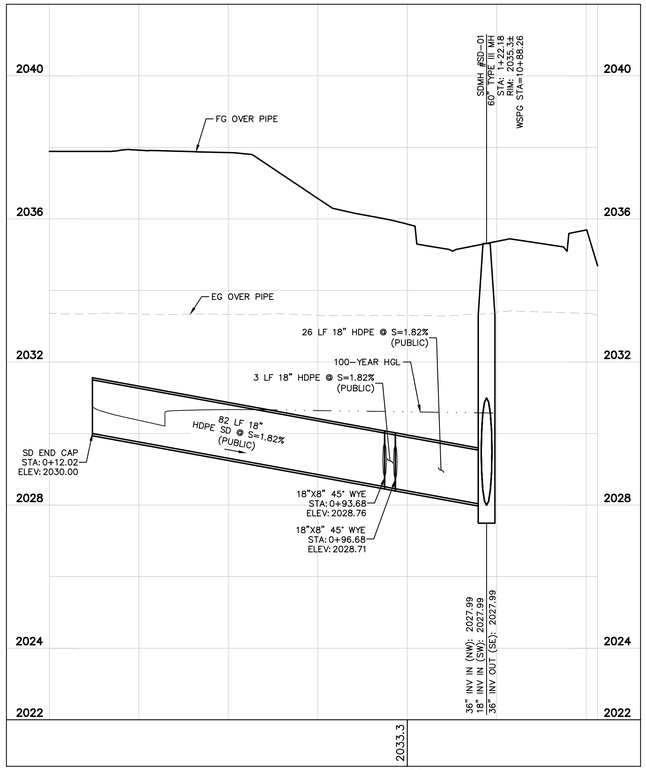
STORM DRAIN NOTES

1. STORM DRAIN POINT OF CONNECTION. REFER TO MEP PLANS FOR CONTINUATION
2. INSTALL RCP STORM DRAIN PIPE WITH EXCAVATION, BACKFILL AND TYPE 2 BEDDING PER CCAUSD No. 503. CLASS, SIZE, LENGTH AND SLOPE AS NOTED ON PLAN.
3. INSTALL HDPE STORM DRAIN PIPE WITH EXCAVATION, BACKFILL AND TYPE 2 BEDDING PER CCAUSD No. 503.1. SIZE, LENGTH AND SLOPE AS NOTED ON PLAN.
5. INSTALL TYPE III STORM DRAIN MANHOLE PER CCAUSD No. 406.1, COLLAR PER CCAUSD No. 408.1, COVER PER CCAUSD No. 409.1 AND 410.
6. INSTALL HDPE FITTING, SIZE PER PIPE. TYPE AS NOTED ON PLAN.
10. STUB & CAP STORM DRAIN FOR FUTURE CONNECTION.



"LATERAL 1" PROFILE VIEW

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE = 1" = 2'



"LATERAL 2" PROFILE VIEW

HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE = 1" = 2'

HORIZONTAL SCALE = 1:20
VERTICAL SCALE = 1:2

FLOOD ZONE NOTE

THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) INDICATES THAT THE SITE IS LOCATED IN ZONE "X" OF THE FLOOD INSURANCE RATE MAP (FIRM) No. 32003C2170F AS SHOWN ON THE FIRM INDEX REVISED NOVEMBER 16, 2011. ZONE "X" IS DEFINED BY FEMA AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN."

BENCHMARK

CITY OF LAS VEGAS VERTICAL CONTROL
BENCHMARK NO. "BLV0133NE6"

MONUMENT DESCRIPTION IN RIVET & PLATE IN TOP OF CURB AT THE SOUTHWEST CORNER OF SYMPHONY PARK AVENUE AND GRAND CENTRAL PARKWAY.

ELEVATION = 619.999 METERS
2034.12 FEET

CITY OF LAS VEGAS VERTICAL CONTROL DATUM BASED UPON NORTH AMERICAN VERTICAL DATUM OF 2008 (NAVD '88)

BASIS OF BEARING

SOUTH 27°55'16" WEST, BEING THE EAST LINE OF LOT 5 OF THAT COMMERCIAL SUBDIVISION KNOWN AS "PARKWAY CENTER" ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA IN BOOK 53 OF PLATS, AT PAGE 61.

GRAPHIC SCALE IN FEET
0 10 20 40

NORTH

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CALL BEFORE YOU DO UNDERGROUND
Call before you UnderGround
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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST)

Call before you Dig
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CALL 811 OR
1-800-227-2600

Avoid overhead power line contact. It's costly.
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1-702-227-2929

No.	REVISIONS	DATE	BY

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6671 LAS VEGAS BOULEVARD S, SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-498-8500
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER-STATE OF NEVADA
RICHARD MOLES
Exp. 12/31/19
CIVIL
No. 10381

KHA PROJECT	192008000
DATE	11/14/2018
SCALE	AS SHOWN
DESIGNED BY	TA
DRAWN BY	JPH
CHECKED BY	TA

STORM DRAIN PLAN & PROFILE 3

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
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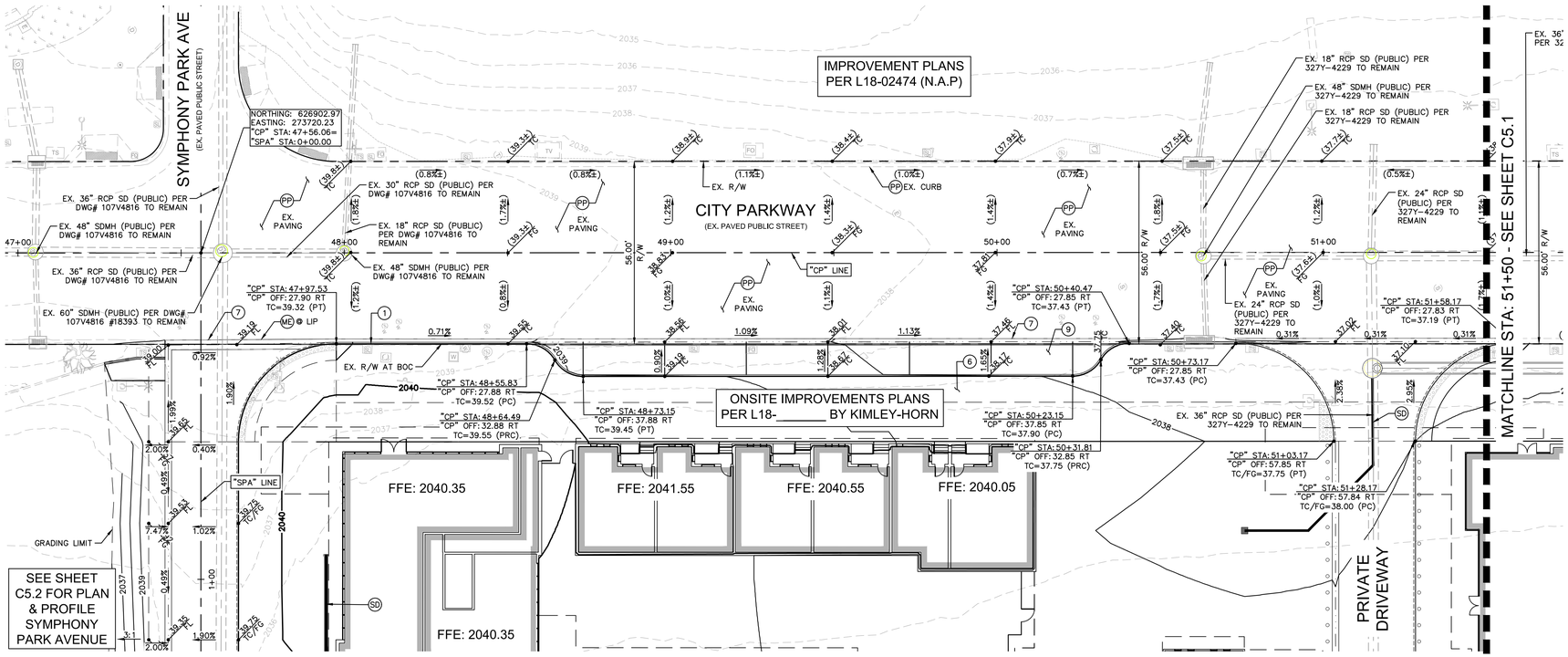
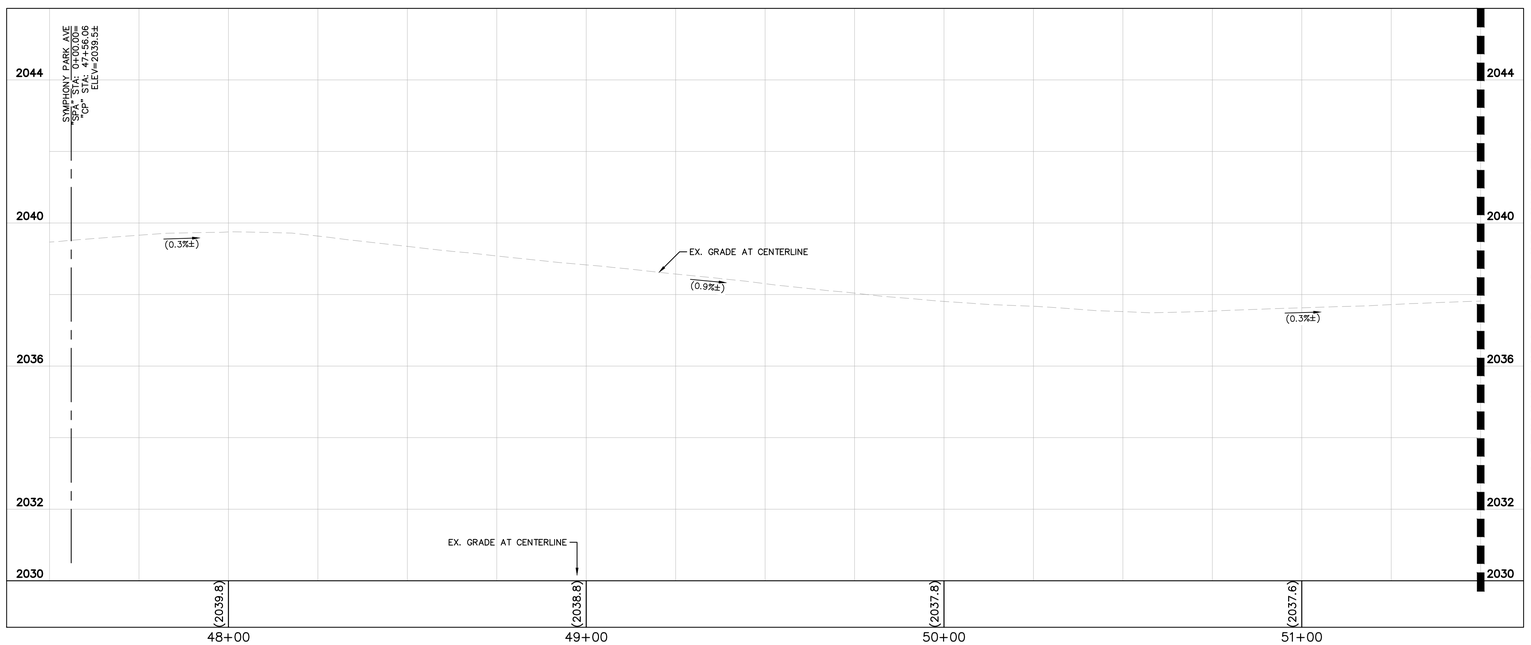
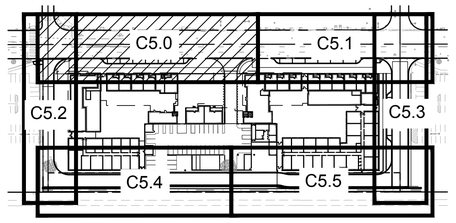




CITY PARKWAY PROFILE



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GEOTECHNICAL REPORT

ALL GRADING SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: NOVA GEOTECHNICAL & INSPECTION SERVICES
DATED: MAY 15, 2018
PROJECT No: G-18-038

CONSTRUCTION NOTES

(1) INSTALL MODIFIED TYPE 'L' CONCRETE CURB AND GUTTER PER DETAIL 1 ON SHEET C3.8
(6) INSTALL CONCRETE SIDEWALK PER CCAUSD No. 234.
(7) INSTALL 2' VALLEY GUTTER PER DETAIL 4 ON SHEET C3.8.
(9) INSTALL ASPHALT PAVING SECTION (MATCH EXISTING).
(ME) MATCH EXISTING.
(PP) PROTECT IN PLACE.

FLOOD ZONE NOTE

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BENCHMARK NO. "8LV0133NE6"

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GRAPHIC SCALE IN FEET
0 10 20 40
HORIZONTAL
0 1 2 4
VERTICAL

NORTH

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL SYSTEM AND STREET LIGHT SYSTEM CONDUITS AND CABLES
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Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST)
Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR 1-800-227-2600
Avoid overhead power line contact. It's costly.
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No.	REVISIONS	DATE	BY

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6671 LAS VEGAS BOULEVARD S, SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-796-9090
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER — STATE OF NEVADA
RICHARD MOLES
Exp. 12/31/19
CIVIL
No. 10381

KHA PROJECT	192008000
DATE	11/14/2018
SCALE	AS SHOWN
DESIGNED BY	TA
DRAWN BY	JPH
CHECKED BY	TA

CITY PARKWAY PLAN & PROFILE - STA 47+00 - 51+50

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C5.0

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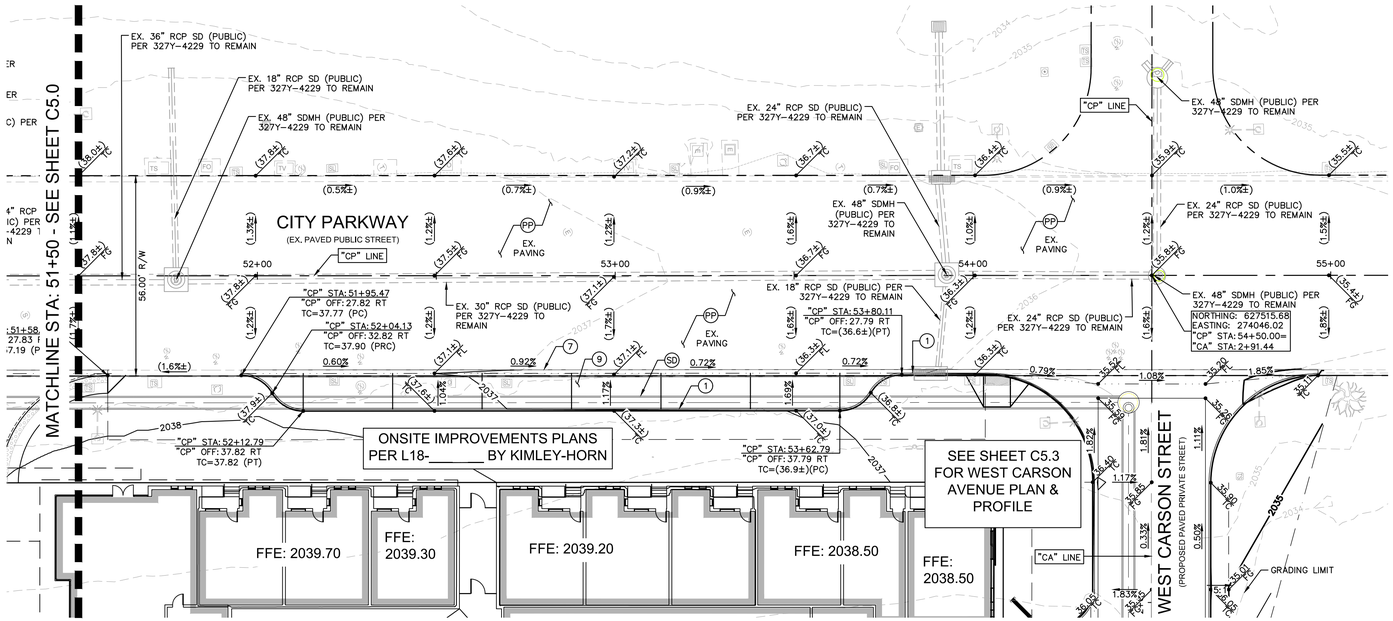
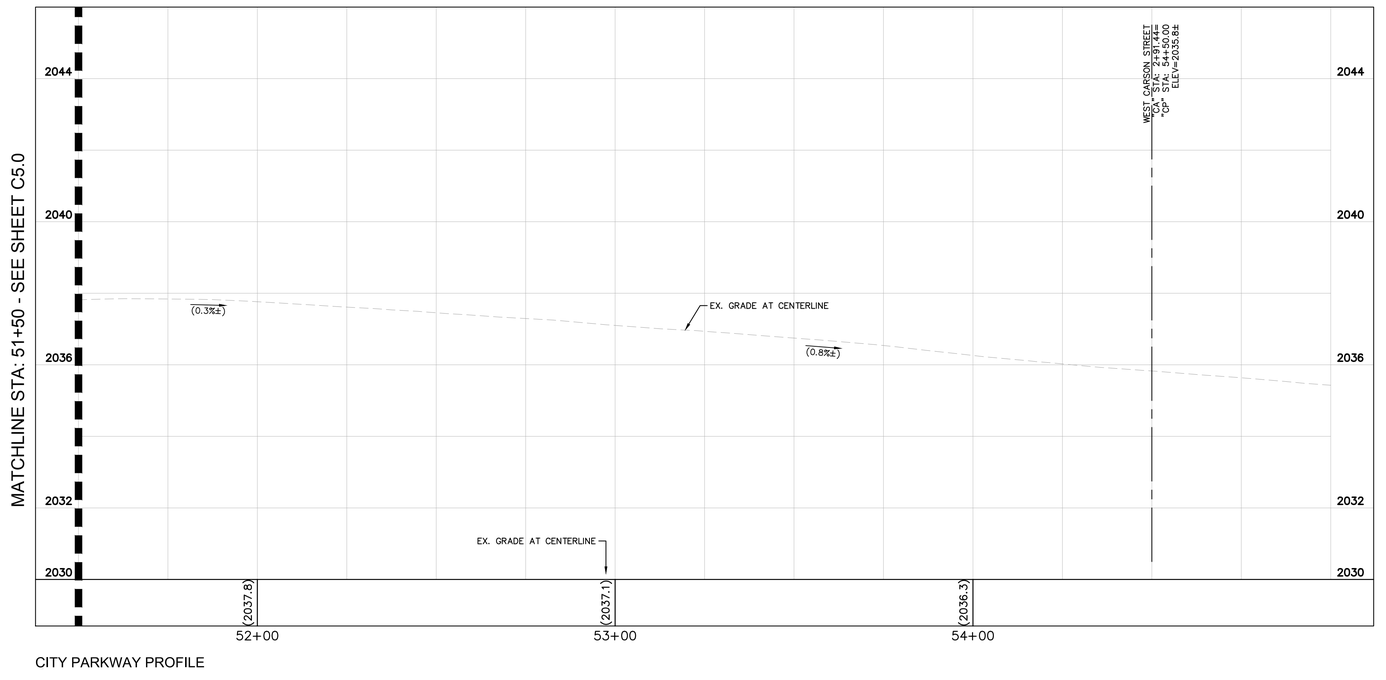
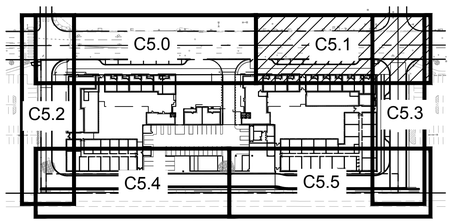




CITY PARKWAY PROFILE



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BENCHMARK NO. "8LV0133NE6"

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PHONE: 702-862-3500
WWW.KIMLEY-HORN.COM

PROFESSIONAL ENGINEER - STATE OF NEVADA
RICHARD MOLES
Exp. 12/31/19
CIVIL
No. 10381

KHA PROJECT 192008000
DATE 11/14/2018
SCALE AS SHOWN
DESIGNED BY TA
DRAWN BY JPH
CHECKED BY TA

CITY PARKWAY PLAN & PROFILE - STA 51+50 - 55+00

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C5.1

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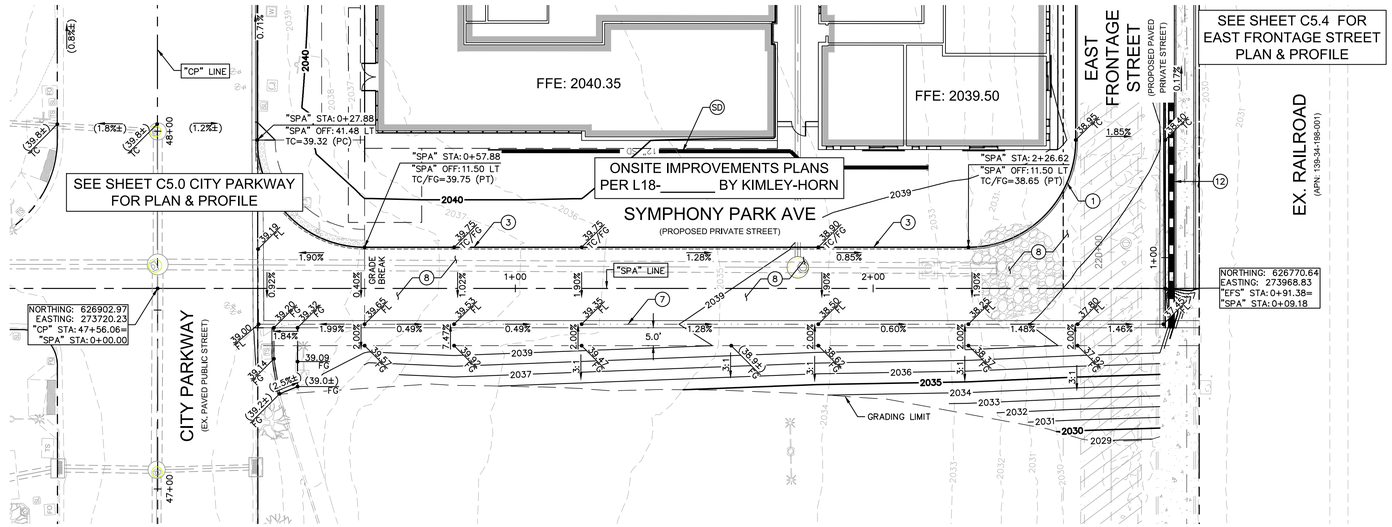
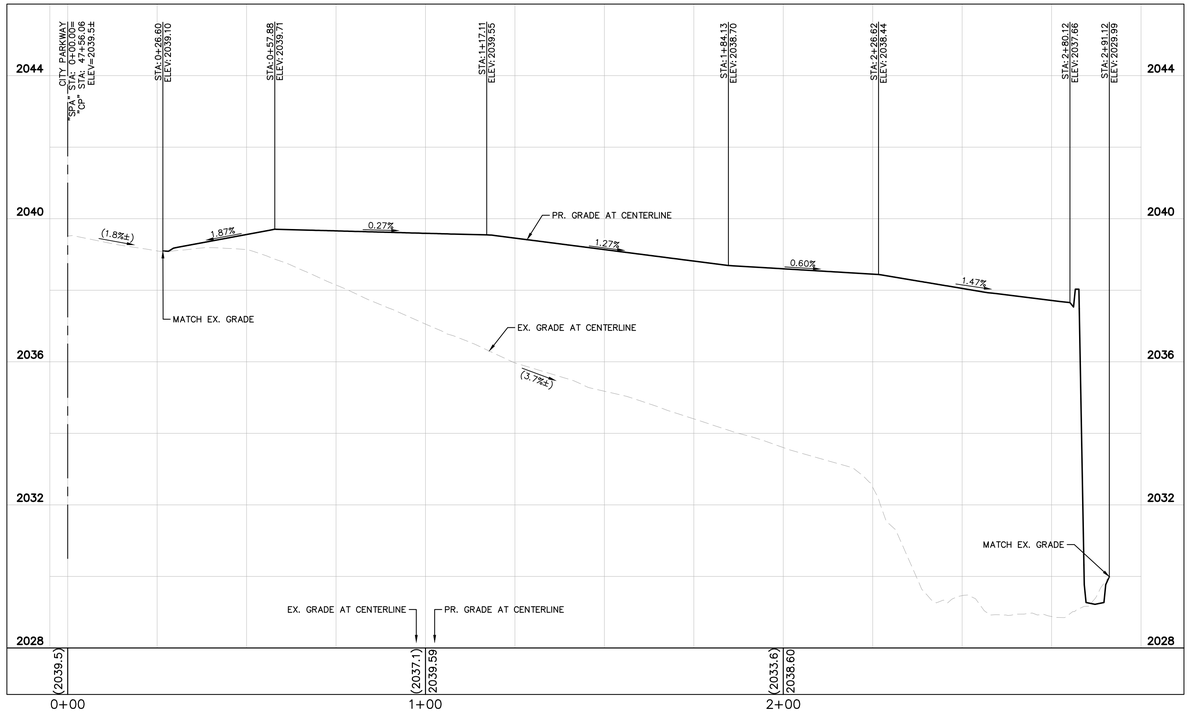
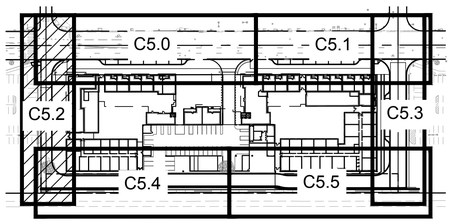




SYMPHONY PARK PROFILE



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(8) INSTALL 3" ASPHALT PAVING OVER 11" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.
(12) INSTALL RETAINING WALL BY OTHERS.

FLOOD ZONE NOTE

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SCALE AS SHOWN
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SYMPHONY PARK AVE PLAN & PROFILE

SYMPHONY PARK RESIDENTIAL
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PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
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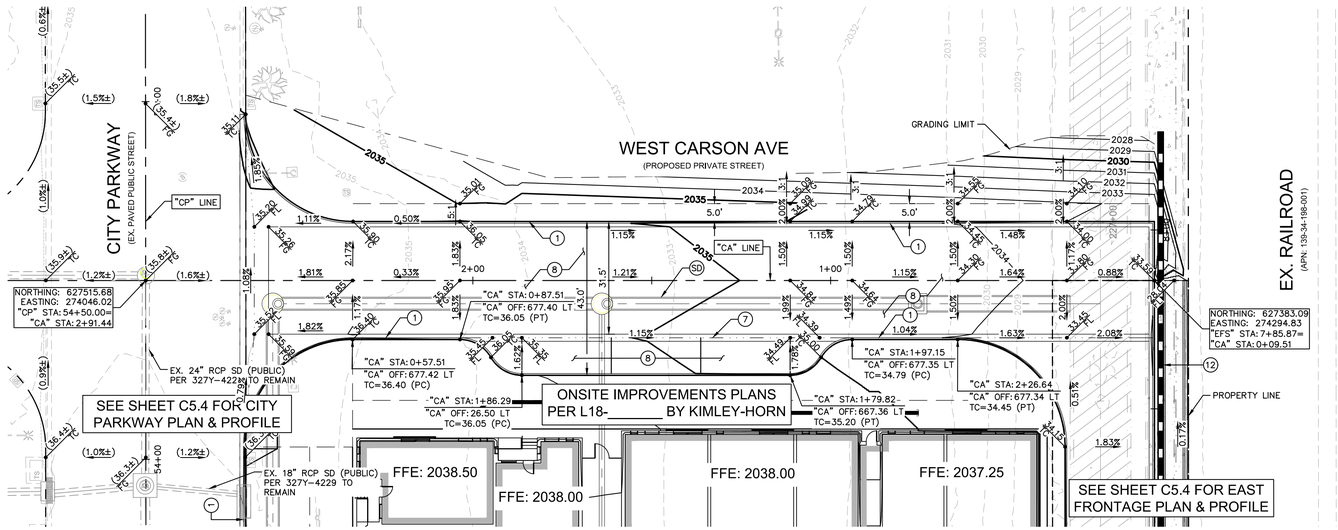
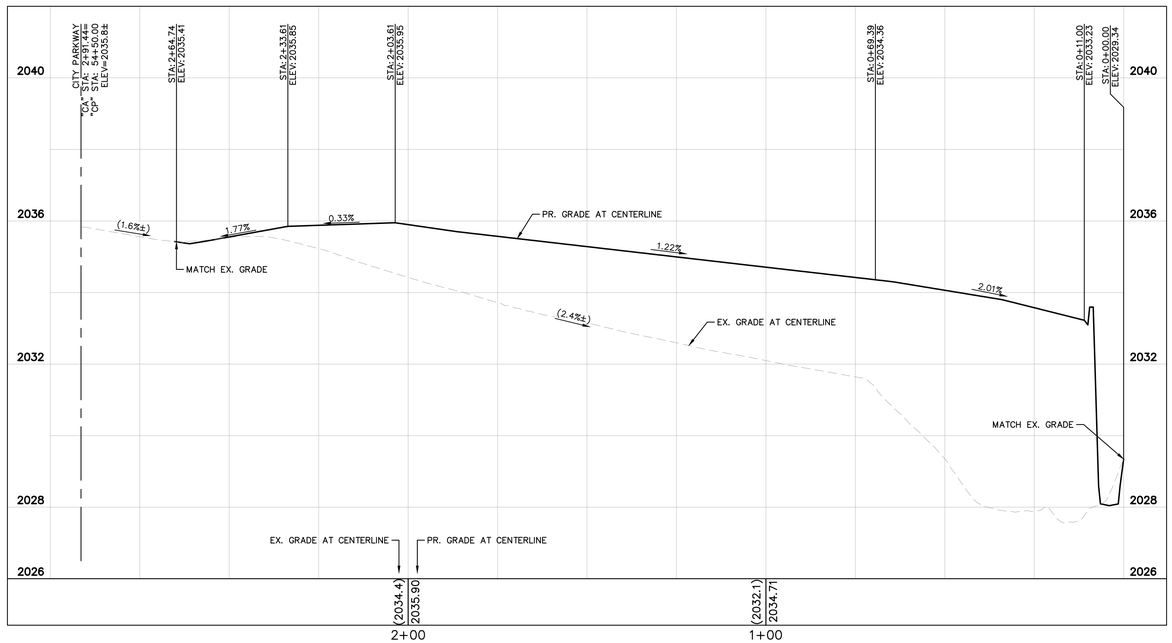
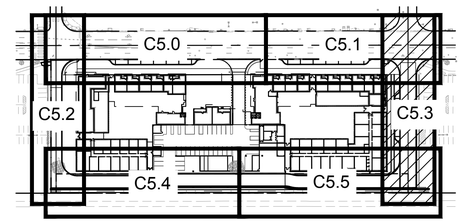




WEST CARSON AVENUE



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GEOTECHNICAL REPORT

ALL GRADING SHALL CONFORM TO THE GEOTECHNICAL REPORT:

ENGINEER: NOVA GEOTECHNICAL & INSPECTION SERVICES
DATED: MAY 15, 2018
PROJECT No: G-18-038

CONSTRUCTION NOTES

1. INSTALL MODIFIED TYPE 'L' CONCRETE CURB AND GUTTER PER DETAIL 1 ON SHEET C3.8
7. INSTALL 2' VALLEY GUTTER PER DETAIL 4 ON SHEET C3.8.
8. INSTALL 3" ASPHALT PAVING OVER 11" TYPE 2 AGGREGATE BASE PER GEOTECHNICAL RECOMMENDATIONS.
12. INSTALL RETAINING WALL BY OTHERS.
SD. REFER TO STORM DRAIN PLANS FOR DETAIL (C3.10-C3.11)

FLOOD ZONE NOTE

THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) INDICATES THAT THE SITE IS LOCATED IN ZONE "X" OF THE FLOOD INSURANCE RATE MAP (FIRM) No. 32003C2170F AS SHOWN ON THE FIRM INDEX REVISED NOVEMBER 16, 2011. ZONE "X" IS DEFINED BY FEMA AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN."

BENCHMARK

CITY OF LAS VEGAS VERTICAL CONTROL
BENCHMARK NO. "8LV0133NE6"

MONUMENT DESCRIPTION IN RIVET & PLATE IN TOP OF CURB AT THE SOUTHWEST CORNER OF SYMPHONY PARK AVENUE AND GRAND CENTRAL PARKWAY.

ELEVATION = 619.999 METERS
2034.12 FEET

CITY OF LAS VEGAS VERTICAL CONTROL DATUM BASED UPON NORTH AMERICAN VERTICAL DATUM OF 2008 (NAVD '88)

BASIS OF BEARING

SOUTH 27°55'16" WEST, BEING THE EAST LINE OF LOT 5 OF THAT COMMERCIAL SUBDIVISION KNOWN AS "PARKWAY CENTER" ON FILE IN THE OFFICE OF THE COUNTY RECORDER, CLARK COUNTY, NEVADA IN BOOK 53 OF PLATS, AT PAGE 61.

GRAPHIC SCALE IN FEET
0 10 20 40
HORIZONTAL
0 1 2 4
VERTICAL

NORTH

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No.	REVISIONS	DATE	BY

Kimley»Horn
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6671 LAS VEGAS BOULEVARD S, SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-897-7500
WWW.KIMLEY-HORN.COM

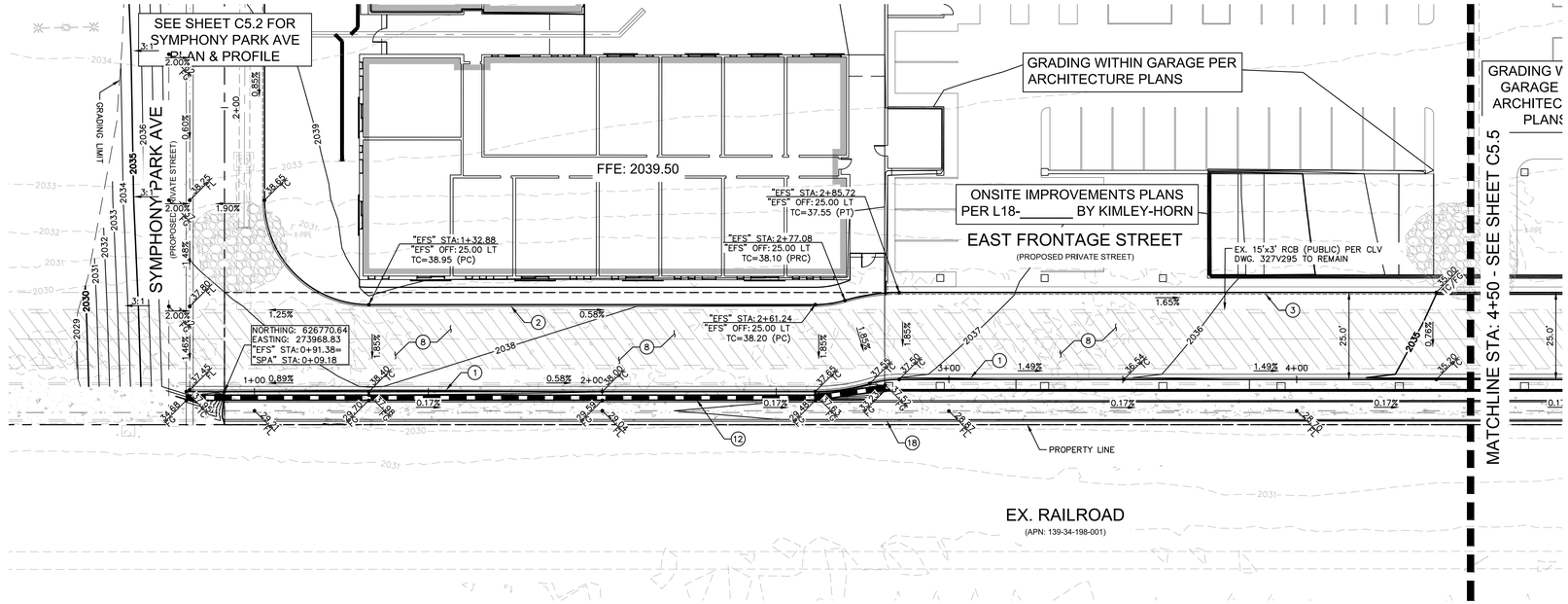
PROFESSIONAL ENGINEER-STATE OF NEVADA
RICHARD A MOLES
Exp. 12/31/19
CIVIL
No. 10381

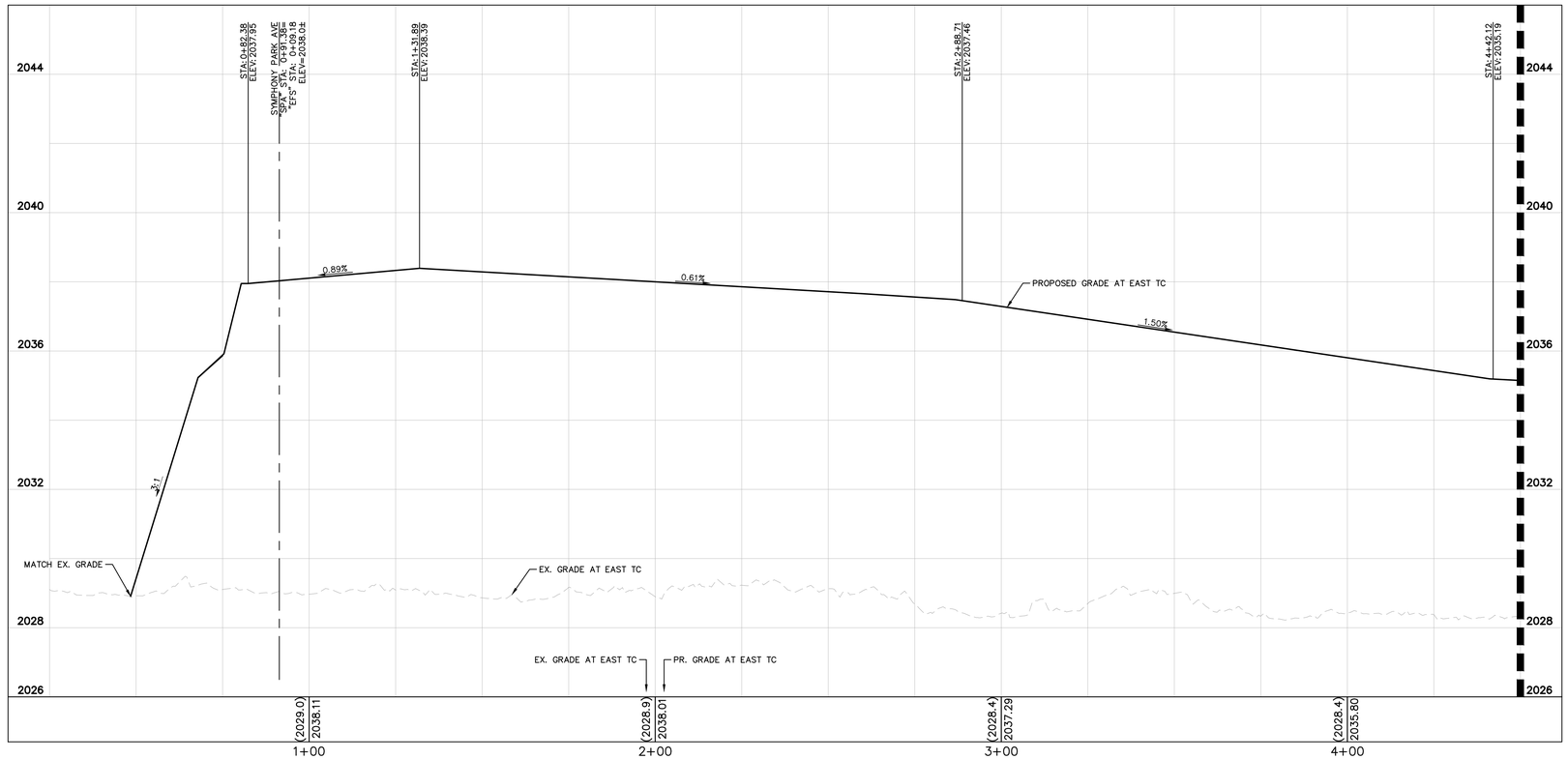
KHA PROJECT	192008000
DATE	11/14/2018
SCALE	AS SHOWN
DESIGNED BY	TA
DRAWN BY	JPH
CHECKED BY	TA

WEST CARSON AVE PLAN & PROFILE

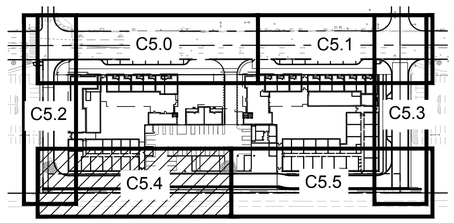
SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C5.3





EAST FRONTAGE TC PROFILE



KEY MAP

NTS

GENERAL NOTES

1. CONTRACTOR TO VERIFY EXISTING IMPROVEMENTS SHOWN ON THE PLAN.
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FLOOD ZONE NOTE

THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) INDICATES THAT THE SITE IS LOCATED IN ZONE "X" OF THE FLOOD INSURANCE RATE MAP (FIRM) No. 32003C2170F AS SHOWN ON THE FIRM INDEX REVISED NOVEMBER 16, 2011. ZONE "X" IS DEFINED BY FEMA AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN."

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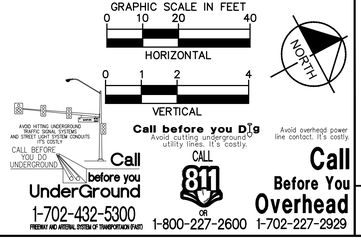
0 10 20 40
HORIZONTAL
0 1 2 4
VERTICAL

NORTH



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Kimley»Horn
© 2018 KIMLEY-HORN AND ASSOCIATES, INC.
6671 LAS VEGAS BOULEVARD S., SUITE 320, LAS VEGAS, NV 89119
PHONE: 702-498-8200
WWW.KIMLEY-HORN.COM

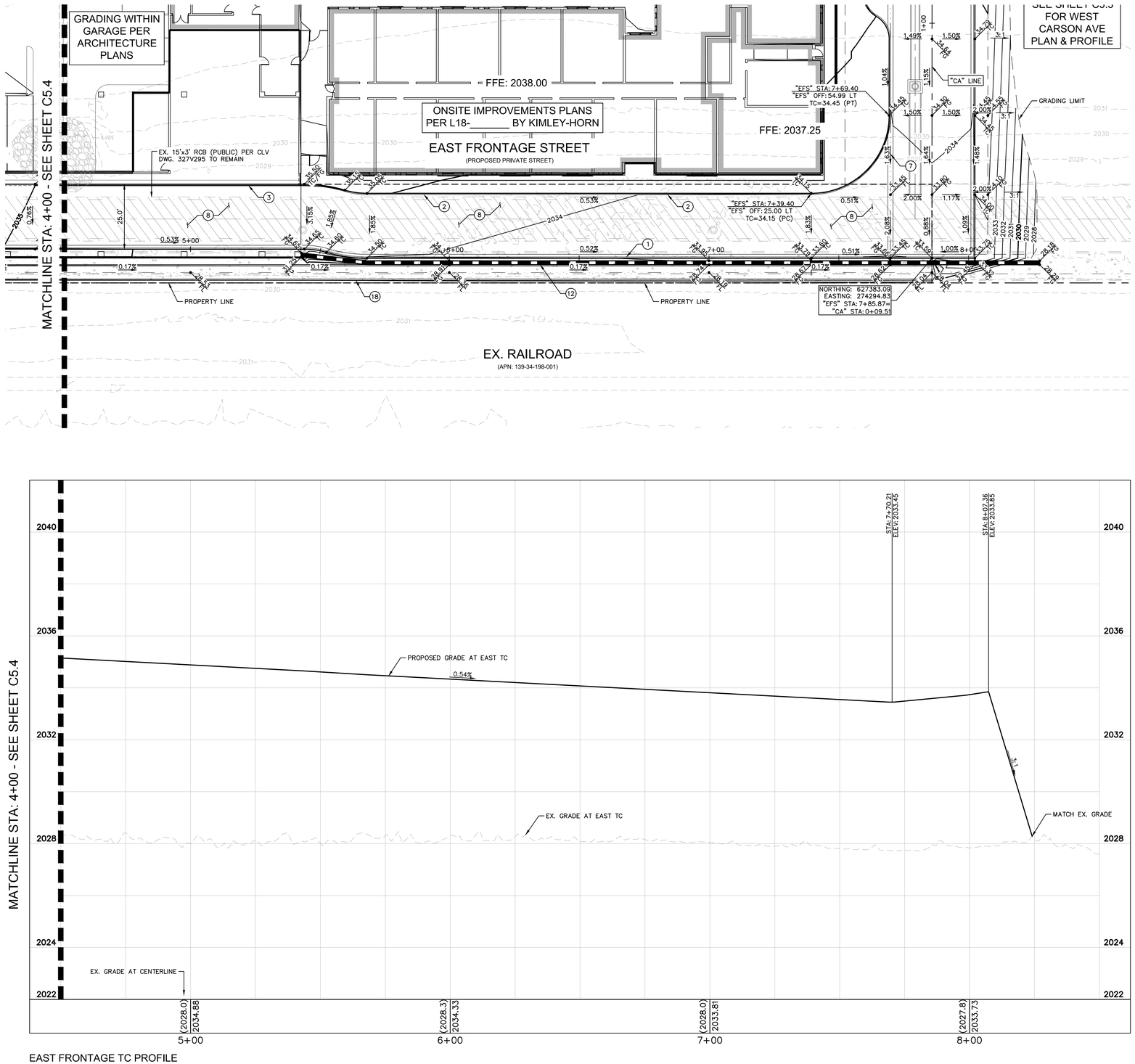
PROFESSIONAL ENGINEER - STATE OF NEVADA
RICHARD MOLES
Exp. 12/31/19
CIVIL
No. 10381

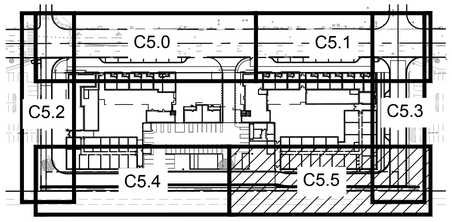
KHA PROJECT 192008000
DATE 11/14/2018
SCALE AS SHOWN
DESIGNED BY TA
DRAWN BY JPH
CHECKED BY TA

EAST FRONTAGE STREET PLAN & PROFILE - STA 0+00 - 4+50

SYMPHONY PARK RESIDENTIAL
CIVIL IMPROVEMENT PLANS
PREPARED FOR
ASPEN HEIGHTS PARTNERS
CITY OF LAS VEGAS NEVADA

SHEET NUMBER
C5.4





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0 1 2 4
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NORTH

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL SYSTEMS AND STREET LIGHT SYSTEM CONDUITS. IT'S COSTLY.
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Call before you UnderGround 1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST)

Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811 OR 1-800-227-2600

Avoid overhead power line contact. It's costly.
Call Before You Overhead 1-702-227-2929

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SHEET NUMBER
C5.5