

DS #: 5375.1

APN: 124-18-210.001

PROJECT: Valley Vista 1.3 Residential Development - Update #1
Project in CNLV for Concurrence

SUBMITTAL: 2nd

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: February 3, 2021
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: Valley Vista 1.3 Residential Development – Update #1 - Project in CNLV for CLV concurrence		COPIES TO: Triton Engineering
Cross Streets:	NEC of Decatur Boulevard & Farm Road	DR Horton
File Number:	F:\Depot\DSMemos\DS5375B.doc	Bart Anderson, P.E., DevCo
Parcel Number:	124-18-210-001	CNLV
Zoning Action:	N/A	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES NO X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	10/13/2020	10/29/2020	Approved	\$400.00	4031331: \$400
2 nd Submittal	1/21/2021	2/3/2021	See Comments Below	\$100.00	4142150: \$100
			TOTAL FEES (LDDRS):	\$500.00	----

REMARKS:

2nd Submittal: Update #1 for Storm Drain Alignment Revision in Farm Road

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

X	is approved subject to conformance to all City standards and the following conditions:
	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.

City of Las Vegas Flood Control staff has reviewed the Technical Drainage Study, including the Addendum #1 and Addendum #2 for the subject development "**Valley Vista 1.3**" within the jurisdiction of the **City of North Las Vegas**. **City of Las Vegas** concurs with the acceptance of the drainage study by the **City of North Las Vegas Public Works Department**. The review of this project was limited to issues of flood control significance to the **City of Las Vegas**.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

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
ays

T/R/S: T19S/R61E/18
AREA H-18

Mayor
John J. Lee

Council Members
Isaac E. Barron
Pamela A. Goynes-Brown
Scott Black
Richard J. Cherchio

City Manager
Ryann Juden



Department of Public Works

2250 N. Las Vegas Boulevard, Suite 200 • North Las Vegas, Nevada 89030
Telephone: (702) 633-1200 • Fax: (702) 649-4696 • TDD: (800) 326-6868
www.cityofnorthlasvegas.com

December 16, 2020

Mailed via: E-mail

Leah L. Proctor, P.E.
Momentum Engineers, Ltd.
4810 West Reno Avenue, Suite C
Las Vegas, NV 89118

**RE: Update to the Technical Drainage Study for Valley Vista 1.3, Residential Development
CNLV #395-2020**

Dear Ms. Proctor:

Staff has reviewed the Technical Drainage Study for Update for Valley Vista 1.3, dated December 3, 2020 and found the hydrological and hydraulic analyses to meet the minimum accepted standards for a technical drainage study. The acceptance of this drainage study is contingent upon the following conditions:

1. Concurrence must be obtained by the Clark County Regional Flood Control District due to the proposed improvements proximity to Regional Flood Control Facilities (LVDE 0027).
2. The site is adjacent to the City of Las Vegas (CLV). Please note that a copy of this study and any addenda must be submitted to CLV for their review and concurrence.
3. The Technical Drainage Study is predicated on full construction of the offsite street improvements and all associated drainage facilities for the following roadways:
 - a. Grand Teton Drive,
 - b. Decatur Boulevard,
 - c. Farm Road,
 - d. Aviary Way, and
 - e. Virage Park Drive.

Please note that no onsite development will be allowed until all required interim or the permanent infrastructure facilities are constructed to intercept all offsite flows and protect the proposed onsite improvements.

Leah L. Proctor, P.E.
TDS Update for Valley Vista 1.3
Page 2 of 2
December 16, 2020

4. The Technical Drainage Study is predicated on the construction of the CCRFCD facilities in Grand Teton Road and the Park Highlands West Detention Basin associated with the Park Highland West Amendment to the Las Vegas Valley Flood Control Master Plan Update (Figure F-14). Please note that no certificates of occupancy will be issued until the required permanent regional flood control and infrastructure facilities are constructed to intercept all offsite flows and protect the proposed onsite improvements.
5. Please note, prior to approving the Improvement Drawings for Valley Vista 1.3, Residential Development, all pertinent previously approved Improvement Plans in CNLV files in this master plan shall be revised to reflect the changes associated with this project.
6. The size and slope of the RCP pipe between DI #03 and SDMH No. 7-26A is called out on the Grading Plan, Sheet 11, as 36-inch with a slope of 1.35%. The pipe size and slope called out on the Plan and Profile on Sheet 15 is 30-inch and 1.42%. Please review and revise Sheet 11 and Sheet 15 accordingly

Please be advised that all land surface area disturbances over 1 acre and/or adjacent to a water way must submit a "Notice of Intent" to discharge to the Nevada Division of Environmental Protection, which certifies that a stormwater pollution prevention plan has been developed and is maintained on site. For more information including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm>.

Acceptance of this study does not imply approval of the grading plan associated with this site. A detailed review of the grading plan will be performed by staff during the improvement plan review process.

Any future changes in the proposed design (or design assumptions) as outlined in the approved drainage study and the attached preliminary grading plans which affect drainage must be addressed in a drainage study update and accepted by the CNLV Development and Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, CNLV reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

The City of North Las Vegas, its officials, or employees assume no liability for information, data, calculations and conclusions presented by the Engineer. We, therefore, make no warranties, either expressed or implied, in conducting this review. If you have any questions concerning this matter, please contact me at (702) 633-1933.

Note that the Clark County Regional Flood Control District (District) has begun efforts to update the *Hydrological Criteria and Drainage Design Manual (HCDDM)* and is requesting participation from the engineering community. The District is collecting comments and suggestions on errors, clarifications, or changes needed to the current Manual and/or content and usability enhancements to be incorporated into the updated Manual. Additional information on procedures and deadline to provide feedback and comments are available online at (<http://www.ccrfcd.org/hcddmupdate.html>).

Sincerely,



Mark Escobedo, P.E., CFM
Engineering Associate
Public Works/Development and Flood Control
City of North Las Vegas
(702) 633-1933

TRANSMITTAL

Date: January 20, 2021

Project No.: 156.001

To: City of Las Vegas
Attn: Albert Sung
495 S. Main Street
Las Vegas, NV 89101

Subject: Valley Vista Parcel 1.3, Drainage Study Update Concurrence
(CNLV#:392-2020/Previous Submittal CNLV#:165-2020)

The following items are forwarded by: HAND DELIVERY

Description

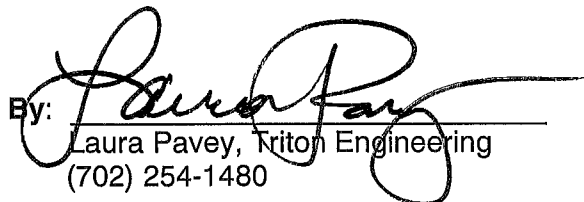
- 1 Copy of the latest CNLV Drainage Approval Letter, Dated 12/16/20
- 1 Technical Drainage Study, Update #1
- 1 Disc containing the study above and the approval letter

These items are submitted :

- | | | |
|---|--|---|
| ☐ At your request | ☒ For your review & approval | ☐ For your file |
| ☒ For your action | ☐ For your review & comments | ☐ For information only |

Remarks

Please send invoice to: lpavey@tritoneng.com for online payment.
Thank you & Happy New Year 🍀

By: 
Laura Pavey, Triton Engineering
(702) 254-1480

Copies to:

UPDATE #1
TO THE
TECHNICAL DRAINAGE STUDY
FOR
Valley Vista 1.3

City of North Las Vegas, Nevada

Prepared for:

DR Horton

1081 Whitney Ranch Drive, #141

Henderson, NV 89014

Office: (702)635-3600 - Fax: (702)538.0735

Prepared by:

Triton Engineering

6757 W. Charleston Blvd., Suite B

Las Vegas, NV 89146

Office: (702) 254-1480 - Fax: (702) 254-3062

APN 124-18-210-001

December 2020

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Update #1 to the Technical Drainage Study for Valley Vista 1.3 Date: December 2, 2020

Location of Development: a) Descriptive (Cross Streets) North/South: Decatur Boulevard

East/West: Farm Road

b) Section: 18 Township: 19S Range: 61E

c) APN : 124-18-210-001

Name of Owner: Highlands Park Holdings LLC (OWNERS) DR Horton (DEVELOPER)

Telephone No.: (702) 672-1939 Fax No.: (702) 538-0735 E-Mail Address: JRGenovese@drhorton.com

Address: 1081 Whitney Ranch Drive #141, Henderson, NV 89014

Contact Person-Name: Kelly J. Wittwer, P.E. Telephone No.: (702) 254-1480

* E-Mail Address: KWittwer@tritoneng.com Fax No.: (702) 254-3062

Firm: Triton Engineering, LLC

Address: 6757 West Charleston Boulevard, Suite B, Las Vegas NV 89146

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: 18.06 ac Being Developed/Disturbed: 18.06 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

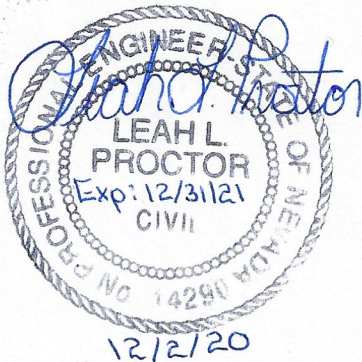
4. Proposed type of development (Residential, Commercial, Etc.): Residential

5. Approximate upstream land area which drains to the subject site: _____

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: TDS for Valley Vista 1.3 (CNLV #165-2020)

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Storm drain facility in Farm Road & surface flow to Farm Road

8. Briefly describe your proposed schedule for the subject project: ASAP



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:

STANDARD FORM 1



Drainage Study Checklist

Background

The City of North Las Vegas strives to provide the development community with adequate information to ensure the successful completion of any project in the City. To aid in the submittal of a complete, thorough drainage study, the following checklist has been compiled to assist the design engineer. This checklist focuses on requirements specific to the City of North Las Vegas. When preparing a drainage study, the engineer will still be required to adhere to all local criterion and guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Design Manual* (HCDDM) and the *Uniform Standard Drawings for Public Works' Construction Off-site Improvements* for Clark County Area, Nevada. **In order to have a complete drainage study for submittal to the City, this checklist must be completed, signed, and stamped by the engineer in responsible charge for the completion of the drainage.** Incomplete submittals will not be accepted at the front counter.

X = UPDATE REVISIONS

Checklist

Provide N/A to an item that is not applicable for the subject site.

I. General Requirement		
Yes	No	
X		Ensure that the new Standard Form 1 and 2 are utilized for all incoming drainage study submittals. The form can be acquired from the CCRFCD's website at http://www.ccrfcd.org/engineering.htm .
X		Ensure that the new 2008 CCRFCD's Master Plan Update (MPU) is utilized for all incoming drainage study submittals. Both the Flood Control Facilities and Facility Inventory Maps must be included with the drainage study.
X		A copy of the approved zoning/planning conditions associated with this site must be included with the initial submittal to verify compliance with conditions.
	NA	If offsite grading is anticipated, a notarized permission letter to construct from the property owner is required prior to the approval of this technical drainage study.
	NA	If the site is proposing to increase or concentrate storm flow and/or nuisance flows onto the adjacent property. A notarized permission letter to accept from the property owner is required prior to the approval of this technical drainage study.
	NA	The City of North Las Vegas (CNLV) does not allow valley gutters to be constructed across streets with right-of-way widths of 80 feet or greater.
X		Provide map pockets in the back of the drainage study in order to keep the improvement plans with the study.
X		Include a CD-ROM that contains a pdf of the entire study, including improvement plans.
X		When submitting flow split analysis for a site, staff suggests using the Pima County flow split calculations. Make sure to provide all supporting documents.

	NA	The project proposes to construct facilities and/or discharge flows within Nevada Department of Transportation (NDOT) right of way. The engineer must contact NDOT for an encroachment permit for the proposed project and it must be received prior to approval of the improvement plans. NOTE: NDOT does not allow for development to increase the 100-year flow rate into their ROW - onsite detention may be required.
	NA	Where right-of-way does not exist, a roadway or drainage easement must be obtained from the adjacent property owner(s) prior to improvement plans approval. Roadway and drainage easement dedication documentation must be processed through the CNLV Real Property Services Division. For more information, please contact Lorena Candelario at 633-2396.
	NA	This report serves as a master drainage study for the site. A separate technical drainage study will be required by the City of North Las Vegas upon development of areas shown on the conceptual site plan. Each technical drainage study should provide more detailed design information, including final grading plans with corresponding drainage facility details, hydraulic design calculations, etc.
X		Ensure that the longitudinal slope used to calculate the 100-year flow depth for a given street matches with the slope indicated on the grading plans.
	NA	The City of North Las Vegas (CNLV) is a member of the Community Rating System, which requires Base Flood Elevations (BFE's) to be indicated for any structures located within a Special Flood Hazard Area (SFHA) Zone A, AO, AE, etc.. Please indicate the extent of the effective regulatory SFHA on the grading plan and show the BFE's of the affected lots.
	NA	If a site is adjacent to a future Clark County Regional Flood Control Facility, the developer is required to construct drop inlets at the site's discharge point along the alignment, which will collect 100% of the site's 100-year discharge.
	NA	If the proposed development is required to construct flood control facilities that are depicted on the Clark County Regional Flood Control District's Master Plan Update, structural drawings must be submitted with the drainage study for review and approval by the City of North Las Vegas prior to submitting to CCRFCD for concurrence.
X		The City of North Las Vegas North Neighborhood Flood Control Master Plan (NNFCMP) has established centerline intersection grades with corresponding street slopes. Please ensure that the street intersection designs are compatible with the NNFCMP.
	NA	For rectangular shaped culverts, the minimum shall be 6 feet in height and 5 feet in width.
	NA	The City of North Las Vegas requires that all local drainage facilities identified on the North Neighborhood Flood Control Master Plan (NNFCMP) to be constructed by the developer for the full frontage of the site.
	NA	This property is adjacent to Unincorporated Clark County. Please note that a copy of this study and any addenda must be submitted to Clark County Development Services for their review and concurrence.
	NA	This property is adjacent to the City of Las Vegas. Please note that a copy of this study and any addenda must be submitted to City of Las Vegas for their review and concurrence.

	NA	Side lot easement for all residential development will need to meet all the requirements as set forth in the City of North Las Vegas Municipal Code under Title 17.24.210.D.4
	NA	"Arizona" style crossing is not permitted within CNLV right-of-way. Culvert crossings, sized to convey the 100-year flow without any backwater effects, must be designed to convey the flow back to its historical path.
	NA	The minimum pipe diameter to be constructed within public drainage easement or right-of-way shall be 18-inch in reinforced concrete pipe. HDPE pipes are allowed with the caveat that it must be slurry back fill.
	NA	Backwater ponding limits that extend outside of the public right-of-way shall be delineated on the grading plans and a public drainage easement or right-of-way be obtained from the property owner. Roadway and drainage easement dedication documentation must be processed through the CNLV Real Property Services Division. For more information, please contact Lorena Candelario at 633-2396.
X		When referencing other drainage studies, all relevant information such as approval letters, drainage basin maps, HEC-1 analyses, details, plans, etc. must be included with the study. The material being referenced should be highlighted in some manner to indicate what is being referenced.
	NA	Provide a discussion and necessary analyses regarding Best Management Practice per Section 1500 of the Clark County Regional Flood Control District Hydrological Criteria and Drainage Design Manual.

II. Grading Plan Information		
Yes	No	
X		24"X36" copies of Grading Plans including Detail Sheets. Additionally, Plan and Profile sheets must be provided for all public offsite streets and/or storm drain/channel system improvements. The information provided in profile shall include: stationing, length, slope, size, discharge (Q100), material, class of pipe (Class III, IV, V, etc.), hydraulic grade line, inlet locations, finished grade over the pipe and etc.
X		On a 100' right-of-way street, the developer is required to build their half of the street, the median island, and one lane on the opposite side of the median. Additionally, the median island will be required to be landscaped.
X		Alignment of all existing, proposed, or future Regional Flood Control Facilities adjacent to the site must be shown on the grading plans.
	NA	Appropriate elevated "humps" 6 inches above the 100-year water surface elevation at all driveways location where the intent is to protect the site from the Q100 flows.
	NA	Erosion protection must be provided at the upstream and downstream terminus of all public roadway improvements.
	NA	Landscape berms used to protect property from flows in the adjacent streets must meet the criterium of being twice the depth of flow above the adjacent flowline up to 18 inches above the adjacent water surface.

	NA	Temporary pavements used to satisfy Clark County PM-10 requirements cannot be used to establish centerline grades for any proposed streets. All proposed street improvements must be designed per the Uniform Standard Drawings for Public Works Construction, Offsite Improvements, Clark County Area, Nevada.
X		Show cross sections along all project boundaries showing the elevational relationship, property line, and any existing or proposed walls.
X		Verify all finished floor elevations of the proposed development meet Section 304.4 of the HCDDM.
	NA	All onsite drainage swale must maintain a minimum of 1% slope. If < 1% is anticipated, concrete valley gutter is required.
X		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.), utilities conflict (if any), design hydraulic grade line (HGL) and the 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying the off-site flows.
X		Identify all adjacent parcels with the appropriate assessor parcel number and ownership information.
X		The Engineer must show existing and proposed development at least 100-feet beyond the project site limits. Finished floor elevations of existing buildings, centerline grades, centerline slopes, and top of existing curb elevations must be shown. Reference all adjacent existing improvements with a CNLV Project #. Ensure that it matches with the approved civil plans.
X		Make every effort to provide plan sheets that are clean and clear to review. Be sure to eliminate superimposed text.
X		Due to air quality regulations, all proposed streets must maintain a total of 32' asphalt area. For instance, a 60' half-street improvements will require an additional of 9-foot of overpaving from the centerline.
X		Full intersection designs abutting the proposed development must be provided to ensure that all quadrants of the intersection will drain properly.
X		Provide slopes of driveway fronting all public right-of-ways. Per CNLV Fire Code, the angles of approach and angles of departure must not exceed 6%.
	NA	For commercial and industrial developments, landscape areas are not allowed to sheet flow over the sidewalk. Provide flow lines with grades and sidewalk under drains for all landscape areas draining to the streets.

III. Hydrologic and Hydraulic Analyzes		
Yes	No	
X		Verify that the street capacity calculations for "ABC" and "XYZ" streets were completed for the worst case scenario for both water surface elevation and velocity (flattest and steepest slopes). In the interim condition, provide street capacity calculations for the 100-year event. In the ultimate condition, provide street capacity calculations for the 10-year and 100-year events.

	NA	For 100-year street flows with depths greater than 0.6' and velocities higher than 5 fps, erosion resistant landscaping or pony walls at the back of sidewalk (to the height of the flow in the street) must be provided.
X		If a CNLV modified 60' standard street section with offset sidewalk is to be proposed with the development. Ensure that the Flowmaster calculations and improvement drawings are reflected with the correct cross section.
	NA	For 80' and greater streets, if a median island is proposed with the site, ensure that the street capacity calculations are reflected with a median island.
X		For 80' and greater streets, the actual 12' dry lane determination must be shown on the Q10 street capacity calculations. CNLV only requires this criterion to be met in the FUTURE condition. Please note that the dual left turn lane and center median island cannot be used to satisfy the 12' dry lane criterion. Therefore, a minimum of 19' on each half of the street must be achieved for the entire stretch of the site.
X		All drainage studies for sites located within the North Neighborhood Flood Control Master Plan (NNFCMP) area must analyze four (4) separate conditions. a. A pure existing condition analysis that quantifies the amount of flow impacting the site in the existing condition. This condition has existing improvements and curve numbers for both onsite and offsite basins. Offsite basins should generally follow contours or existing development drainage patterns. b. An interim condition, where the offsite basins are the same as in the pure existing condition and the onsite basins are developed. The flows in this condition are modeled in the proposed half-streets being constructed with the development and homes/buildings must be at or above the WSE in the street. c. The NNFCMP existing condition flows are analyzed assuming a full street section, the CCRFCD street flow criterion does not need to be met, and the adjacent finished floor elevations must be above the associated WSE. d. The NNFCMP future condition flows are analyzed assuming a full street section, all CCRFCD street flow criteria must be met, and the finished floor elevations must have the required freeboard above the associated WSE.
	NA	For parcels impacted by a FEMA Special Flood Hazard Area, analyses of the floodzone, utilizing the FEMA effective flowrate must be completed for both pre- and post-development cases. The post-development analysis must tie into the effective SFHA in both width and water surface elevation.
X		For proposed storm drain connecting into other existing storm drain system, supporting documents must be provided for the beginning HGL used in the hydraulic modeling.
X		For the purpose of establishing adequate finished floor elevations for those structures adjacent to the proposed drainage easement, the City requires that submerged weir calculations are submitted. As the sidewalks at the upstream entrance of the drainage easement will effectively act as a broad-crested weir with a submerged tailwater, the water surface elevations at the easement entrances must be calculated as such.

	NA	The engineer must provide inlet control nomograph (see HCDDM) calculations for all proposed drop inlets to ensure that the storm sewer will have the capacity to convey the anticipated 100-year peak flow.
X		The CNLV requires that all drop inlet sizing to be performed with the HEC-22 software which can be acquired from the Federal Highway Administration's website at http://www.fhwa.dot.gov/engineering/hydraulics/software.cfm
	NA	Concrete headwalls are required at the inlet and outlet of all culvert installations. Flare end sections are acceptable for culvert less than 30-inch.
	NA	Erosion protection and/or cut off walls may be required at the upstream and downstream of a culvert.
X		For the ease of maintainability and constructability, all storm drain pipes must be designed with a soffit to soffit connections.
	NA	Swales that are designed to carry the 100-year flow must maintain a minimum freeboard of six inches above the depth of flow. Provide hydraulic calculations for verification.
X		For project sites that are 40 acres or greater, flow values must be labeled at the outlet point of each individual drainage basin and concentration points on all drainage basin maps.
X		The soil's map must include both the off-site and on-site sub-basin delineations for all drainage conditions.

IV. Local Entity Criteria - City of North Las Vegas - HCDDM Section 1603

Yes	No	
X		Within the interior streets of a residential subdivision, the depth times velocity for the major storm event shall be less than or equal to 6.
	NA	When downstream storm sewer facilities are not available, the City of North Las Vegas requires bubbler laterals for the conveyance of storm water under streets with right-of-way widths greater than or equal to 80 feet. The bubbler laterals must consist of a minimum 18-inch diameter reinforced concrete pipe. To accommodate the draining of the bubbler system prior to future downstream extension of the storm sewer system, a minimum 6-inch diameter PVC pipe must be daylighted downstream.
	NA	The City of North Las Vegas does not permit the construction of permanent structures within a Federal Emergency Management Agency (FEMA) designated Special Flood Hazard Area (SFHA). Under this policy, any developer/builder proposing to place structures within a SFHA must meet the following requirements prior to the issuance of various permits and certificates-of-occupancy: - Grading and off-site construction permits may be issued by the CNLV Department of Public Works once the improvement plans and drainage study have been approved and a copy of the completed Conditional Letter of Map Revision (CLOMR) application has been submitted to FEMA for processing. - Building permits can be issued once a favorable CLOMR has been obtained from FEMA. - Certificates-of-occupancy can be issued once a Letter of Map Revision (LOMR) has been obtained from FEMA.

X		The City of North Las Vegas requires that stormwater drop inlet signage be affixed to any installed drop inlets. The plaque must read "Don't pollute - drains to Lake Mead" in English and Spanish. CNLV Quality Control/Offsite inspectors will verify that the signs are properly installed.
	NA	A minimum longitudinal street slope of 0.4 percent (0.004 ft/ft) shall be used. If the Engineer can demonstrate, to the satisfaction and approval of the City Engineer, severe topographic constraints or other mitigating factors, the design of streets with slopes less than 0.4 percent may be permitted.
	NA	Side lot drainage easements are generally discouraged unless the engineer can demonstrate design constraints that render alternative site layout and drainage facility design options as impossible or impractical.
	NA	All wall openings must be designed to pass the 100-year storm event flows using the assumption that the bottom 50% of the openings are obstructed.
X		When a storm drain system is proposed at a sump area, a non-damaging emergency surface flow path must be provided to convey the 100-year flows. Adjacent finished floor elevations must be adequately protected.
	NA	For any ground-mounted air-conditioning pad that encroaches to within three (3) feet of a property line, the engineer must indicate on the plot plans how lot drainage will be accommodated beneath the pad. This can include, but is not limited to, the placement of a 4-inch diameter PVC pipe, with the inlet and outlet inverts of the pipe constructed to correspond with the flow line of the obstructed lot drainage swale.

Leah L. Proctor

Engineer in Responsible Charge Name (Printed)



Approved by CNLV Development and Flood Control

Date



December 3, 2020

Dan Le, P. E., CFM
Senior Engineer
Development and Flood Control Division
2250 North Las Vegas Boulevard Suite 200
City of North Las Vegas, NV 89030-6307

**Subject: Update #1 to the Technical Drainage Study for Valley Vista Parcel 1.3
CNLV #165-2020**

Mr. Le:

This document and attachments will serve as Update #1 to the Technical Drainage Study for Valley Vista 1.3 which was approved by the City of North Las Vegas on October 8, 2020. The original drainage study was prepared to address drainage and grading improvements for a proposed 18-acre residential development in the Park Highlands West Master Planned Community (see Figures 1 & 2 for location). This update is to address the following:

- Revised storm drain alignment in Farm Road to address comments to the improvement plan review

HYDROLOGY

There was no revision to the hydrology from the original TDS.

HYDRAULICS

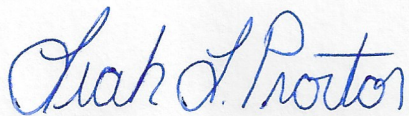
To summarize, the proposed storm drain system will no longer connect to the existing 36" stub in Farm Road (see Facility E52 on attached Exhibit P from the MDS). The revised design proposes to extend Facility E53 (the existing 36" RCP in Farm Road) further west from existing SDMH 7-26 to the proposed SDMH 7-26A near the entrance street. From SDMH 7-26A, a 30" RCP will extend north and connect to DI3 as shown on the attached plans. A revised WSPG was modeled for LAT1 and LAT2 and is attached along with the results summary table. Please note the outlet HGL was taken at SDMH 7-26 from the existing WSPG model in Farm Road (referenced from Update #2 to the MDS) and is attached. The HGL has been plotted on the revised plan set. Upon approval of the new storm drain design, the revision will be sent to Westwood where the Area 7 plans will be updated.

CONCLUSION

The purpose of this update is to address a slight change to the storm drain alignment in Farm Road which required and updated WSPG model. Please note this revision did not negatively affect the design and all criteria is still met.

If you have any questions, please contact me at 720-244-5574, email Leah@MomentumEngineers.com.

Sincerely,



Momentum Engineers, Ltd.

Leah L. Proctor, P. E.

Subcontractor for

Triton Engineering, LLC

ATTACHMENTS

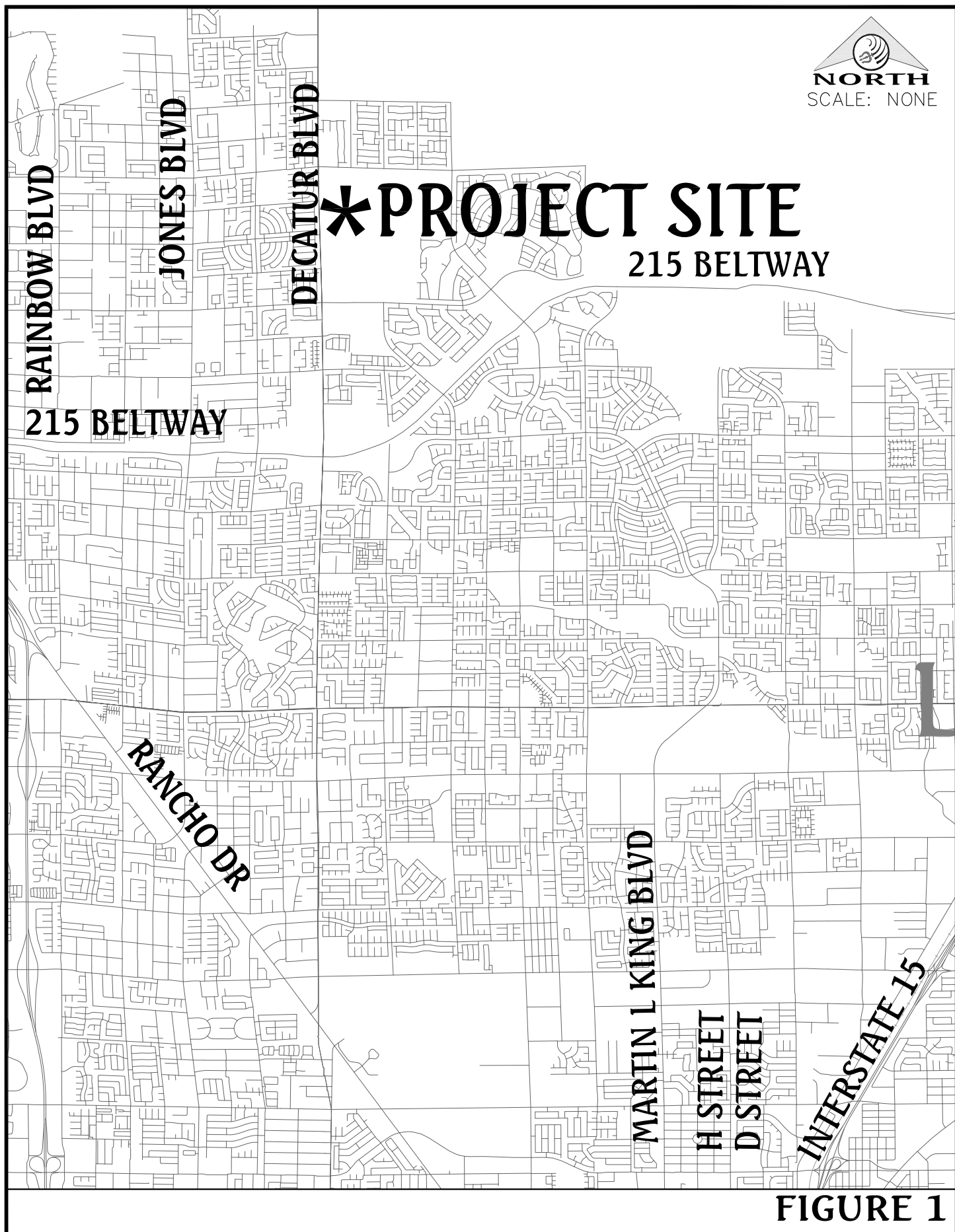


FIGURE 1

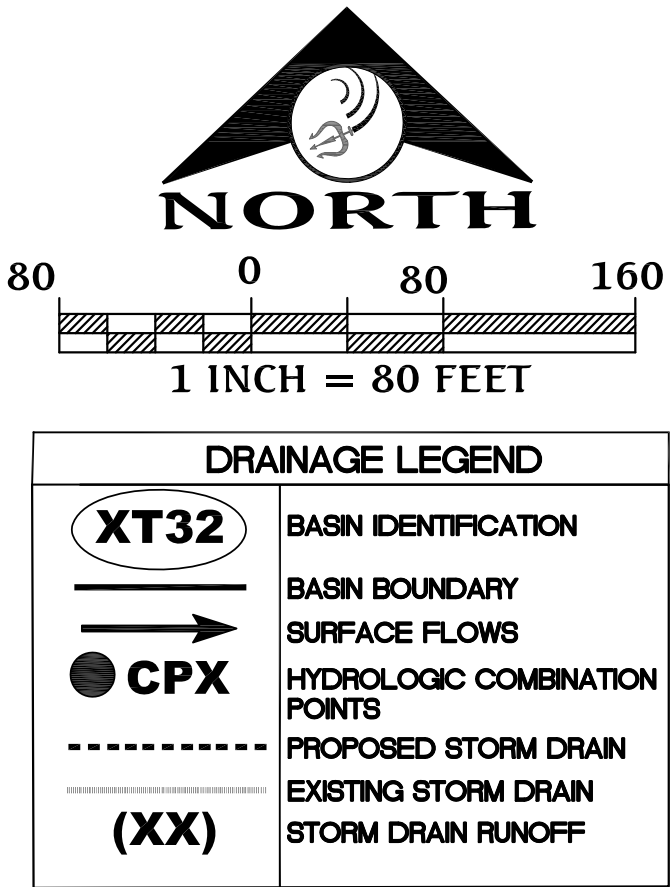
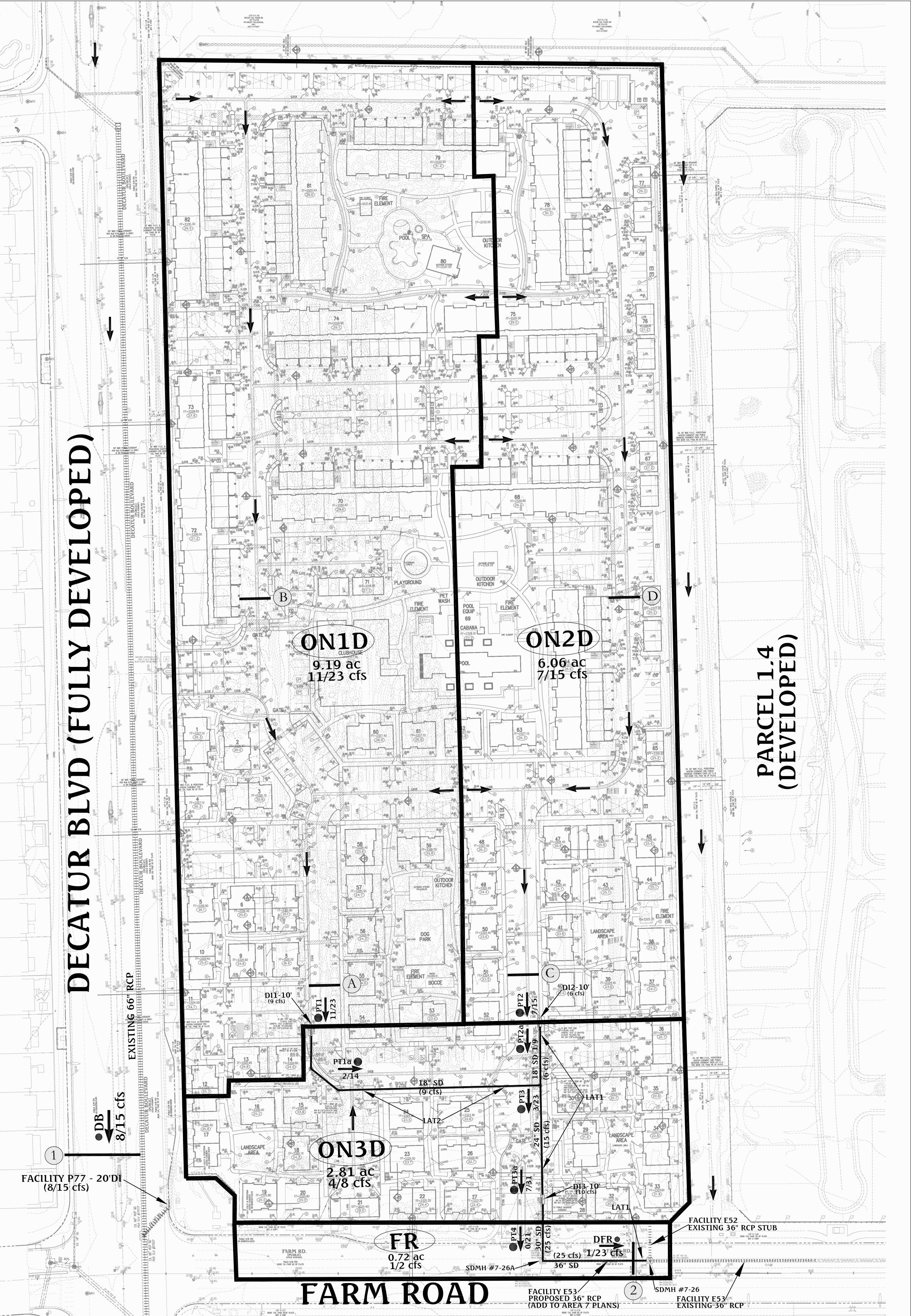


FIGURE 2

**VALLEY VISTA 1.3
LOCATION MAP**



Triton
Engineering



PEAK FLOW RATES FOR DEVELOPED CONDITIONS VALLEY VISTA 1.3 ADDENDUM 1				
CONC. POINT/ DRAINAGE AREA / FACILITY	AREA, ACRES	PEAK FLOW, CFS		NOTES
		10-YR	100-YR	
DB		8	15	1
FACILITY P77		-8	-15	2
ON1D	9.16	11	23	
PT1		11	23	ON1D
DI1		9	9	Runoff intercepted by DI1
PT1a		2	14	PT1-DI1
ON2D	6.06	7	15	
PT2		7	15	ON2D
DI2		6	6	Runoff intercepted by DI2
PT2a		1	9	PT2-DI2
PT3		3	23	PT1a+PT2a
ON3D	2.81	4	8	
PT3a		7	31	PT3+ON3D
DI3		10	10	Runoff intercepted by DI3
PT4		0	21	PT3a-DI3
FR		1	2	
DFR		1	23	PT4+FR

1. See Section B East on FIG 6 (Area 5 Excerpts)
2. Runoff intercepted by Facility P77 on Exhibit G2 (IS Excerpts)

NORMAL DEPTH CALCULATIONS FOR EASEMENTS, CHANNELS, & SWALES DEVELOPED CONDITIONS							
HYDRAULIC SECTION LABEL	DESCRIPTION	SLOPE, PERCENT	Q ₁₀₀ CFS	D ₁₀₀ NORMAL FEET	V ₁₀₀ NORMAL FEET/SEC	V _{h100} Vel. Head FEET	WEIR DEPTH FEET
A	Drive Aisle	0.60	23	0.64	3.07	0.15	na
B	Drive Aisle	0.60	13	0.54	2.99	0.14	na
C	Drive Aisle	1.00	15	0.33	2.79	0.12	na
D	Drive Aisle	0.60	8	0.37	2.34	0.08	na

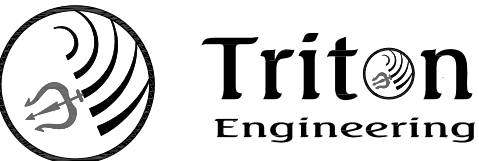
STREET CAPACITY CALCULATIONS ADDENDUM 1 VALLEY VISTA 1.3 DEVELOPED CONDITIONS						
HYDRAULIC SECTION	SLOPE, %	RUNOFF BASIN/POINT	Q ₁₀ / Q ₁₀₀ CFS	D ₁₀ / D ₁₀₀ , FEET	V ₁₀ / V ₁₀₀ , FPS	V ₁₀ * D ₁₀ / V ₁₀₀ * D ₁₀₀
1 Decatur Blvd	0.42	DB	8/15	0.44/0.53	1.72/1.96	0.75/1.03
2 Farm Road (Half Street)	0.53	DFR	1/23	0.29/0.70	1.37/2.86	0.39/2.00

10 YEAR DRY LANE RESULTS ADDENDUM 1 VALLEY VISTA 1.3 DEVELOPED CONDITIONS					
HYDRAULIC SECTION	SLOPE, %	RUNOFF BASIN/POINT	Q ₁₀ CFS	DRAY LANE CAPACITY	DRAY LANE MET
1 (Decatur East Half)	0.42	DB	8	43	YES
2 (Farm North Half)	0.53	DFR	1	5.5*	YES

* Per Section 20 Exhibit H2 from the IS, Q 10 yr Limit = 11 cfs, therefore the half street capacity = 5.5 cfs

UPDATE #1 VALLEY VISTA 1.3
DEVELOPED CONDITIONS DRAINAGE MAP

FIGURE 4



WSPG MODELS

**WSPG STATION EQUIVALENT SUMMARY & OUTPUT RESULTS LAT1
VALLEY VISTA 1.3 UPDATE #1**

WSPG STA	STATION/DESCRIPTION ON PLANS	FACILITY DIMENSION	Q100 cfs	INLET/JUNCTION cfs	FG/GRATE/RIM ft	HGL ft	FG - HGL ft	NOTES
1000.00	16+12.46 (SDMH 7-26)	60" MH	25	NA	2318.50	2311.48	NA	OUTFAL-MH
1110.00-1121.50	REACH	36 RCP	25	NA				MANHOLE
1121.50 - 1126.50	14+88.43 (SDMH 7-26A)	60" MH	25	NA	2319.20	2311.42	7.78	
1126.50 - 1189.17	REACH	30" RCP						
1189.17 - 1199.17	DI3	10' DI	15	10	2319.03	2314.08	4.95	DROP INLET
1199.17 - 1323.93	REACH	24" RCP						
1323.93 - 1328.93	SDMH#3	48" MH	6	9	2320.94	2315.10	5.84	MANHOLE
1328.93 - 1397.43	DI2	10' DI	0	6	2321.29	2315.33	5.96	HEADWORKS-DI

WSPG STATION EQUIVALENT SUMMARY & OUTPUT RESULTS LAT2

WSPG STA	STATION/DESCRIPTION ON PLANS	FACILITY DIMENSION	Q100 cfs	INLET/JUNCTION cfs	FG/GRATE/RIM ft	HGL ft	FG - HGL ft	NOTES
1000 - 1231.00	SDMH#3	60" MH	6	9	2320.94	2315.10	NA	OUTFALL-MH
1231.00-1235.00	SDMH#2	48" MH	6	NA	2322.68	2316.91	5.77	MANHOLE
1271.00-1275.00	SDMH#1	48" MH	6	NA	2323.20	2317.27	5.93	DROP INLET
1275.00 - 1312.00	DI1	10' DI	0	6	2322.76	2317.67	5.09	HEADWORKS-DI

T1	UPDATE #1 Valley Vista 1.3 - LAT1										0
T2	1	2	3	4	5	6	7	8	9		
T3	4567890123456789012345678901234567890123456789012345678901234567890										
SO	1000.0002309.700	36				2311.480					
R	1121.5002310.200	36	.013				.000	00.000	0		
R	1126.5002310.400	36	.013				.000	90.000	1		
R	1189.1702311.290	30	.013				.000	00.000	0		
WE	1189.1702311.290	4	.22								
JX	1199.1702311.790	4 24	.013	10.000		2311.59	90.0	00.000			
WX	1199.1702311.790	24									
R	1323.9302312.460	24	.013				.000	00.000	1		
WE	1323.9302312.460	48	.22								
JX	1328.9302312.960	48 24	.013	9.000		2312.76	90.0	00.000			
	.000	00.000									
WX	1328.9302312.960	18									
R	1397.4302313.300	18	.013				.000	00.000	0		
SH	1397.4302313.300	18				2313.300					
CD	36 4 0	.000	3.000	.000	.000	.000	.000	.00			
CD	24 4 0	.000	2.000	.000	.000	.000	.000	.00			
CD	18 4 0	.000	1.500	.000	.000	.000	.000	.00			
CD	42 4 0	.000	3.500	0.000	.000	.000	.000	.00			
CD	30 4 0	.000	2.500	0.000	.000	.000	.000	.00			
CD	48 4 0	.000	4.000	0.000	.000	.000	.000	.00			
CD	4 3 0	.000	8.000	3.000	.000	.000	.000	.00			
CD	6 3 0	.000	4.000	8.000	.000	.000	.000	.00			
CD	8 3 0	.000	5.000	3.000	.000	.000	.000	.00			
Q		6.000	.0								

Program Package Serial Number: 7204

WATER SURFACE PROFILE LISTING

Date:11-29-2020 Time: 5:16:58

UPDATE #1 Valley Vista 1.3 - LAT1

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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	2309.700	1.780	2311.480	25.00	5.72	.51	2311.99	.00	1.61	2.95	3.000	.000	.00	0	.0		
26.190	.0041					.0034	.09	1.78	.83	1.65	.013	.00	.00	PIPE			
1026.190	2309.808	1.711	2311.519	25.00	6.00	.56	2312.08	.00	1.61	2.97	3.000	.000	.00	0	.0		
19.609	.0041					.0039	.08	1.71	.89	1.65	.013	.00	.00	PIPE			
1045.799	2309.888	1.648	2311.536	25.00	6.29	.61	2312.15	.00	1.61	2.99	3.000	.000	.00	0	.0		
HYDRAULIC JUMP																	
1045.799	2309.888	1.524	2311.412	25.00	6.93	.75	2312.16	.00	1.61	3.00	3.000	.000	.00	0	.0		
4.609	.0041					.0053	.02	1.52	1.11	1.65	.013	.00	.00	PIPE			
1050.408	2309.907	1.524	2311.431	25.00	6.93	.75	2312.18	.00	1.61	3.00	3.000	.000	.00	0	.0		
11.911	.0041					.0057	.07	1.52	1.11	1.65	.013	.00	.00	PIPE			
1062.320	2309.956	1.468	2311.424	25.00	7.27	.82	2312.25	.00	1.61	3.00	3.000	.000	.00	0	.0		
12.230	.0041					.0065	.08	1.47	1.20	1.65	.013	.00	.00	PIPE			
1074.550	2310.007	1.415	2311.421	25.00	7.63	.90	2312.32	.00	1.61	3.00	3.000	.000	.00	0	.0		
12.169	.0041					.0073	.09	1.41	1.28	1.65	.013	.00	.00	PIPE			
1086.719	2310.057	1.364	2311.420	25.00	8.00	.99	2312.41	.00	1.61	2.99	3.000	.000	.00	0	.0		
11.921	.0041					.0084	.10	1.36	1.38	1.65	.013	.00	.00	PIPE			
1098.640	2310.106	1.315	2311.420	25.00	8.39	1.09	2312.51	.00	1.61	2.98	3.000	.000	.00	0	.0		
11.603	.0041					.0095	.11	1.31	1.48	1.65	.013	.00	.00	PIPE			

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Date:11-29-2020 Time: 5:16:58

UPDATE #1 Valley Vista 1.3 - LAT1

45678901234567890123456789012345678901234567890123456789012345678901234567890123																
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.	Base Wt./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	
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1110.242	2310.154	1.268	2311.422	25.00	8.80	1.20	2312.62	.00	1.61	2.96	3.000	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
11.258	.0041					.0108	.12	1.27	1.58	1.65	.013	.00	.00	PIPE		
1121.500	2310.200	1.223	2311.423	25.00	9.23	1.32	2312.75	.00	1.61	2.95	3.000	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
.562	.0400					.0114	.01	1.22	1.70	.88	.013	.00	.00	PIPE		
1122.062	2310.222	1.232	2311.454	25.00	9.14	1.30	2312.75	.00	1.61	2.95	3.000	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
2.478	.0400					.0106	.03	1.23	1.67	.88	.013	.00	.00	PIPE		
1124.540	2310.322	1.277	2311.598	25.00	8.72	1.18	2312.78	.00	1.61	2.97	3.000	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1.960	.0400					.0093	.02	1.28	1.56	.88	.013	.00	.00	PIPE		
1126.500	2310.400	1.324	2311.724	25.00	9.47	1.39	2313.12	.00	1.70	2.50	2.500	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
10.753	.0142					.0120	.13	1.32	1.62	1.27	.013	.00	.00	PIPE		
1137.253	2310.552	1.338	2311.891	25.00	9.35	1.36	2313.25	.00	1.70	2.49	2.500	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
23.083	.0142					.0111	.26	1.34	1.59	1.27	.013	.00	.00	PIPE		
1160.336	2310.880	1.391	2312.271	25.00	8.91	1.23	2313.50	.00	1.70	2.48	2.500	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
12.980	.0142					.0098	.13	1.39	1.48	1.27	.013	.00	.00	PIPE		
1173.316	2311.065	1.446	2312.511	25.00	8.50	1.12	2313.63	.00	1.70	2.47	2.500	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
7.886	.0142					.0087	.07	1.45	1.37	1.27	.013	.00	.00	PIPE		
1181.202	2311.177	1.504	2312.681	25.00	8.10	1.02	2313.70	.00	1.70	2.45	2.500	.000	.00	0	.0	
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
4.719	.0142					.0077	.04	1.50	1.27	1.27	.013	.00	.00	PIPE		

Date:11-29-2020 Time: 5:16:58

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Program Package Serial Number: 7204

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Date:11-29-2020 Time: 5:16:58

UPDATE #1 Valley Vista 1.3 - LAT1

1	2	3	4	5	6	7
4567890123456789012345678901234567890123456789012345678901234567890123						
*****	*****	*****	*****	*****	*****	*****
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head
1328.930	2312.960	2.147	2315.107	6.00	3.40	.18
68.500	.0050					.0033
1397.430	2313.300	2.031	2315.331	6.00	3.40	.18

T1	UPDATE #1 Valley Vista 1.3 - LAT2																		0
T2	1		2		3		4		5		6		7		8		9		
T3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	
SO	1000.000	2312.960	18																2315.100
R	1231.000	2314.140	18																.000 00.000
R	1235.000	2314.340	18																.000 45.000 1
R	1271.000	2314.540	18																.000 00.000 0
R	1275.000	2314.740	18																.000 45.000 1
R	1312.000	2314.930	18																.000 90.000 0
SH	1312.000	2314.930	18																2314.93
CD	18	4	0	.000	1.500		.000	.000	.000	.000	.00								
CD	2	4	0	.000	2.000		.000	.000	.000	.000	.00								
CD	3	4	0	.000	1.500		.000	.000	.000	.000	.00								
CD	4	4	0	.000	5.000		.000	.000	.000	.000	.00								
CD	5	4	0	.000	4.500		0.000	.000	.000	.000	.00								
CD	6	3	0	.000	4.000		8.000	.000	.000	.000	.00								
CD	8	3	0	.000	5.000		3.000	.000	.000	.000	.00								
Q				9.000	.0														

Date:11-29-2020 Time: 5:18: 0

1 2 3 4 5 6 7
4567890123456789012345678901234567890123456789012345678901234567890123

*****															*****	
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	2312.960	2.140	2315.100	9.00	5.09	.40	2315.50	.00	1.16	.00	1.500	.000	.00	0 .0		
231.000	.0051					.0073	1.70	2.14	.00	1.50	.013	.00	.00	PIPE		
1231.000	2314.140	2.656	2316.796	9.00	5.09	.40	2317.20	.00	1.16	.00	1.500	.000	.00	0 .0		
4.000	.0500					.0073	.03	2.66	.00	.64	.013	.00	.00	PIPE		
1235.000	2314.340	2.565	2316.905	9.00	5.09	.40	2317.31	.00	1.16	.00	1.500	.000	.00	0 .0		
36.000	.0056					.0073	.26	2.57	.00	1.50	.013	.00	.00	PIPE		
1271.000	2314.540	2.630	2317.169	9.00	5.09	.40	2317.57	.00	1.16	.00	1.500	.000	.00	0 .0		
4.000	.0500					.0073	.03	2.63	.00	.64	.013	.00	.00	PIPE		
1275.000	2314.740	2.539	2317.279	9.00	5.09	.40	2317.68	.00	1.16	.00	1.500	.000	.00	0 .0		
37.000	.0051					.0073	.27	2.54	.00	1.50	.013	.00	.00	PIPE		
1312.000	2314.930	2.740	2317.670	9.00	5.09	.40	2318.07	.00	1.16	.00	1.500	.000	.00	0 .0		

EXCERPTS UPDATE 2 MDS



Proposed Facility Summary

Item Concentration

Facility ID

Facility Description
(Type, Size & Slope)

Flow Breakdown
Notes

Qs/Qc
Total
(cfs)

Qs/Qc
Storm Drain
(cfs)

Qs/Qc
Surface
(cfs)

P1

34-ft Trench Down Channel (48"x60" Lateral)

Concentration Point CP19: Facility E1, E2, E3 & E16

154,911

091,791

69,485

P2

12.5-ft 24" CM Drop Inlet with 48" RCP Lateral @ 0.34% Slope

Bypass from Facility P1

65,465

41,952

26,422

Proposed Facility Summary

Ultimate Capacity

Facility ID

Facility Description
(Type, Size & Slope)

Flow Breakdown
Notes

Qs/Qc
Total
(cfs)

Qs/Qc
Storm Drain
(cfs)

Qs/Qc
Surface
(cfs)

Facility ID P1 and P2 are Not Used

P3

12"x6" RCB @ 1.14% Slope

Concentration Point CP17

313,527

313,508

6422

P4

36-inch RCP @ 0.61% Slope

Facility E6

N/A

N/A

N/A

P5

12"x6" RCB @ 1.14% Slope

Concentration Point CP17

313,527

313,508

6422

P7

12"x6" RCB @ 1.14% Slope

Concentration Point CP17

313,527

313,507

6200

P8

Drop Inlet with Dual 36-inch RCP Lateral @ Varying Slopes (0.50% to 0.60%)

Half of the Bypass from Facility P1/P2

6,211

6,112

69,485

P9

12"x6" RCB @ 1.14% and 1.60% Slopes

Concentration Point CP17

313,527

313,506

6178

Facility ID P10 thru P19 are Not Used

P17

Transition Structure @ 1.97% Slope

Concentration Point CP18

314,626

314,772

6156

P18

Drop Inlet with Dual 24-inch RCP Lateral @ Varying Slopes (0.50% to 1.44-45%)

Bypass from Facility P8

986

651

928

P19

12"x7" Arch @ 0.49% Slope

Concentration Point CP18

314,626

314,824

6105

P20

Drop Inlet with 24-inch RCP Lateral @ 0.52% and 18.00% Slopes

Bypass from Facility P18

937

913

925

P21

12"x7" Arch @ 0.49% Slope

Concentration Point CP18

314,626

314,837

6162

P22

Drop Inlet with 24-inch RCP Lateral @ 0.52% and 18.00% Slopes

Bypass from Facility P20

925

910

912

P23

12"x7" Arch @ 0.49% Slope

Concentration Point CP18

314,626

314,847

6162

P24

Drop Inlet with 24-inch RCP Lateral @ 0.52% and 18.00% Slopes

Bypass from Facility P22

915

907

918

P25

12"x7" Arch @ 0.49% Slope

Concentration Point CP18

313,569

314,894

7105

P26

36-inch RCP Lateral @ 1.30% Slope

Bypass from Facility E16 to the Difference between Concentration Points CP18 & CP19

3187

754

643

P27

12"x7" Arch @ 0.49% Slope

Concentration Point CP20

325,678

321,968

919

P28

12"x7" Arch @ 0.49% Slope

Concentration Point CP20

325,678

326,969

919

P29

Drop Inlet @ 0.49% Slope

Concentration Point CP20A

325,678

326,910

08

P30

Drop Inlet with 24-inch RCP Lateral @ 0.50% Slope

Bypass from Facility P24

08

08

08

P31

12"x7" Arch @ 0.49% Slope

Concentration Point CP20A

325,678

326,907

08

P32

72-inch RCP @ 0.50% Slope

Concentration Point CP21

148,507

149,589

08

P33

Junction Structure

Concentration Point CP21A

407,103

407,103

08

P34

14-ft Arch @ 0.30% Slopes

Concentration Point CP21A

407,103

407,103

08

P35

Drop Inlet with 36-inch RCP Lateral @ 0.50% Slope

Half of (Concentration Point 2A - Facility E17)

2,553

2,553

08

P36

Drop Inlet with 36-inch RCP Lateral @ 0.50% Slope

Half of (Concentration Point 2A - Facility E17)

2,553

2,553

08

P37

Junction Structure

Concentration Point 2A

72,155

72,155

08

P38

66-inch RCP @ 0.51% Slope

Concentration Point 2A

72,155

72,155

08

P39

Detention Basin

Concentration Point 2B

419,124

419,124

N/A

Facility ID P39 is Not Used

P36a

7.0-ft Wide Low Flow Channel

N/A

N/A

1,512

N/A

P36b

5.0-ft Wide Low Flow Channel

N/A

N/A

1,215

N/A

P36c

200.0-ft Spillway

N/A

N/A

N/A

N/A

P36d

53-inch Orifice Plate & Trash Rack

Concentration Point DB1 (Memorial A)

135,626

135,626

08

P40

72-inch RCP @ 0.50% Slope

Concentration Point DB1 (Memorial A)

135,626

135,626

08

P41

72-inch RCP @ 0.50% Slope

Concentration Point DB1 (Memorial A)

135,626

135,626

08

P42

72-inch RCP @ 0.50% Slope

Concentration Point DB1 (Memorial A)

135,626

135,626

08

P43

72-inch RCP @ 0.50% Slope

Concentration Point 2C (Memorial A)

135,626

135,626

08

P44

48-inch RCP Sub @ 0.50% Slope

Basin 2-7

319

319

07

P45

Junction Structure

Concentration Point 2C (Memorial A)

135,626

135,626

08

P46

60-ft RCB @ 0.52% Slope

Concentration Point 2C (Memorial A)

135,626

135,626

08

P47

48-inch RCP Sub @ 0.50% Slope

Concentration Point 2J

3,882

3,882

08

P48

Drop Inlet with 18-inch RCP Lateral @ 0.50% Slope

N/A

N/A

N/A

N/A

P49

54"VRF Arch @ 0.41% Slope

Concentration Point 4A

61,129

61,129

08

P50

Drop Inlet

Half of (Bypass from Facility P54 + Basin 4A)

949

648

09

P51

54"VRF Arch @ 0.41% Slope

Concentration Point 4A + Half of (Bypass from Facility P55 + Basin 4A)

31,188

72,898

08

P52

36-inch RCP Sub @ 0.50% Slope

Basin 4-2

4,386

4,383

93

P53

36-inch RCP @ 0.67% Slope

Basin 4-2 (Ulti00)

59,102

4,383

93

P54

36-inch RCP Sub @ 0.50% Slope

Basin 4-3

3,065

3,050

93

P55

48-inch RCP @ 0.59% Slope

Concentration Point 4C

72,155

65,373

978

P56

48-inch RCP @ 0.59% Slope

Concentration Point 4C

72,155

65,373

978

P57

Drop Inlet

Half of (Bypass from Facility P54 + Basin 4A)

949

648

09

P58

6"vc RCB @ 0.41% Slope

Concentration Point 4D

15,016

15,016

08

P59

6"vc RCB @ 0.41% Slope

Concentration Point 4D

15,016

15,016

08

P60

48-inch RCP Sub @ 0.50% Slope

Basin 4-5

59,100

15,016

08

P61

Drop Inlet with 24-inch RCP Lateral @ 0.50% Slope

Concentration Point 4A

41,881

24,254

1167

P62

24-inch RCP @ 0.50% Slope

Concentration Point 4A

41,881

24,254

1167

P63

Drop Inlet with 18-inch RCP Lateral @ 0.50% Slope

Bypass from Facility P61

11,567

11,567

640

P64

36-inch RCP @ 0.50% Slope

Concentration Point 4A

41,881

41,881

640

P65

Junction Structure

Concentration Point P7A

241,607

241,607

08

P66

30-inch RCP Lateral @ 0.50% Slope

Basin U703

2,687

2,687

93

P67

30-inch RCP @ 0.50% Slope

Concentration Point P7B

58,141

26,291

3112

P68

42-inch RCP Lateral @ 0.50% Slope

Bypass from Facility P67

31,112

31,112

01

P69

Drop Inlet with 18-inch RCP Lateral @ 0.50% Slope

Bypass from Facility P67

31,112

N/A

01

P70

48-inch RCP @ 0.50% Slope

Concentration Point P7A

58,141

58,100

01

P71

72-inch RCP @ 0.50% Slope

Concentration Point CP27

101,248

101,207

01

P74

36-inch RCP Sub @ 0.60% Slope

Basin 2-13

18,339

18,339

08

P75

18-inch RCP RCP Sub @ 0.60% Slope

Facility E106

N/A

N/A

08

0

350

700

SCALE - 1" = 350'

FEET

LEGEND

STORM DRAIN FACILITY
(RCP, RCB, DITCH, ETC.)

STORM DRAIN FACILITY
(DETENTION BASIN)

STORM DRAIN FACILITY
(DROP INLET)

FACILITY ID

EXISTING

PROPOSED

PROPOSED INTERIM

FUTURE (BY OTHERS)

EXISTING TO BE
REMOVED OR ABANDONED

SURFACE FLOW

BASIN BOUNDARY

BASIN ID

SUBBASIN BOUNDARY

SUBBASIN ID

CONCENTRATION POINT

[illegible]

Ultimate Condition WSPG Summary

FARM-A Storm Drain System

WSPG Station	Equivalent Roadway Station	Storm Drain Width/Dia. (ft)	Storm Drain Height (ft)	Q ₁₀₀ (cfs)	Invert Elevation (ft)	WSE (ft)	Velocity (ft/s)	FG Elevation	Description	HGL Check ¹
0.01	21+98.00	10.0	5.0	465.2	2284.21	2288.54	11.80	2292.71	end of arch	OK
24.01	21+74.00	10.0	5.0	465.2	2284.28	2288.81	11.28	2293.28	end curve	OK
102.54	20+95.47	10.0	5.0	465.2	2284.52	2289.13	11.10	2293.52	begin curve	OK
202.54	19+95.47	10.0	5.0	429.2	2284.82	2290.12	9.49	2293.82	junction for flow	OK
780.59	14+17.42	10.0	5.0	354.2	2286.55	2292.91	7.83	2295.85	junction for flow	OK
1909.04	2+88.97	10.0	5.0	354.2	2289.94	2295.73	7.83	2298.94	end curve	OK
1937.58	2+60.43	10.0	5.0	354.2	2290.02	2295.91	7.83	2299.02	end transition/begin curve	OK
1943.53	2+54.48	10.0	5.0	354.2	2290.04	2296.53	5.08	2299.04	begin transition	OK
1950.20	2+47.81	14.0	5.0	354.2	2290.06	2296.54	5.08	2299.06	mics.	OK
2074.47	47+03.70	14.0	5.0	354.2	2290.68	2296.71	5.08	2300.50	angle point	OK
2074.48	47+03.70	14.0	5.0	269.2	2290.68	2296.86	3.86	2300.40	junction for flow (starting WSE for VPDE-A)	OK
2103.18	46+80.80	14.0	5.0	222.2	2290.79	2296.97	3.19	2300.35	junction for flow	OK
2132.18	46+58.99	14.0	5.0	222.2	2290.86	2297.00	3.19	2300.30	angle point	OK
2144.08	46+47.72	14.0	5.0	222.0	2290.89	2297.01	3.18	2300.20	junction for flow	OK
2166.58	46+25.00	14.0	5.0	147.0	2290.96	2297.15	2.11	2300.20	junction for flow	OK
2179.28	46+13.15	14.0	5.0	147.0	2291.00	2297.15	2.11	2300.25	end transition	OK
2197.28	45+93.98	-	5.0	147.0	2291.14	2296.54	3.48	2300.30	begin transition	OK
2275.51	45+12.87	-	5.0	147.0	2291.78	2296.86	3.48	2300.89	angle point	OK
2280.51	45+06.77	-	4.5	147.0	2292.28	2296.78	9.24	2300.95	misc.	OK
2508.82	42+77.11	-	4.5	147.0	2294.04	2297.26	12.06	2302.95	angle point	OK
2734.82	40+49.25	-	4.5	147.0	2295.74	2298.97	12.03	2305.44	angle point	OK
2918.12	38+64.41	-	4.5	147.0	2297.11	2300.33	12.06	2306.59	angle point	OK
3155.02	36+27.10	-	4.5	147.0	2298.89	2302.14	11.95	2307.83	angle point	OK
3258.62	35+24.72	-	4.5	147.0	2299.67	2303.23	10.89	2308.63	angle point	OK
3417.62	33+65.71	-	4.5	92.0	2300.24	2306.18	5.78	2309.49	junction for flow	OK
3508.70	32+74.63	-	4.5	67.0	2301.54	2306.87	4.21	2309.70	junction for flow	OK
3780.30	30+03.09	-	4.5	67.0	2302.63	2307.20	4.21	2311.10	manhole	OK
4051.80	27+31.55	-	4.5	67.0	2303.72	2307.41	4.80	2312.50	manhole	OK
4320.80	24+60.00	-	4.5	28.0	2304.81	2308.53	1.99	2314.00	junction for flow	OK
4325.80	24+65.00	-	3.0	28.0	2306.31	2308.35	5.47	2314.05	mics.	OK
4608.30	21+77.49	-	3.0	28.0	2307.44	2309.23	6.39	2315.40	manhole	OK
4890.80	18+94.97	-	3.0	28.0	2308.56	2310.35	6.37	2317.00	manhole	OK
5173.30	16+12.45	-	3.0	28.0	2309.70	2311.48	6.41	2318.50	angle point	OK
5238.50	-	-	3.0	28.0	2310.03	2311.74	6.72	2317.00	start of pipe	OK

1 - 'HGL Check' reflects the minimum 1-ft below finished grade.

- Area 3 plans
- Area 2 plans
- Area 4 plans
- Area 7 plans

OUTFALL HGL

0
 T1 PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
 T2 EXISTING STORM DRAIN - FARM RD TO ALAINTIE FLOOD CHANNEL
 T3 ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015
 SO 0.012284.21 1 2287.34
 R 24.012284.28 1 .013
 R 102.542284.52 1 .013 50.00 90.00
 R 202.542284.82 1 .013
 JX 202.542284.82 1 7 .013 36.0 2284.82 45.00
 R 780.592286.55 1 .013
 JX 780.592286.55 1 5 .013 75.0 2286.03 45.00
 R 1909.042289.94 1 .013
 R 1937.582290.02 1 .013 50.00 33.00
 TS 1943.532290.04 2 .013
 R 1950.202290.06 2 .013
 R 2074.472290.68 2 .013 45.00
 JX 2074.482290.68 2 5 .013 85.0 2290.68 45.00
 R 2103.182290.79 2 .013
 JX 2103.182290.79 2 5 .013 47.0 2291.24 45.00
 R 2132.182290.86 2 .013 42.00
 R 2144.082290.89 2 .013
 JX 2144.082290.89 2 5 5.013 .1 0.12291.342291.34 90.00 90.00
 R 2166.582290.96 2 .013
 JX 2166.582290.96 2 4 4.013 37.5 37.52291.162291.16 60.00 60.00
 R 2179.282291.00 2 .013
 TS 2197.282291.14 3 .013 10.00 1
 R 2275.512291.78 3 .013
 R 2280.512292.28 3 .013 10.00 1
 R 2508.822294.04 4 .013 10.00 1
 R 2734.822295.74 4 .013 4.00 1
 R 2918.122297.11 4 .013 10.00 1
 R 3155.022298.89 4 .013 10.00 1
 R 3258.622299.67 4 .013
 R 3417.622300.24 4 .013 55.0 2301.25 90.00
 JX 3417.622300.24 4 6 .013
 R 3508.702301.54 4 .013 25.0 2303.04 90.00
 JX 3508.702301.54 4 7 .013 1
 R 3780.302302.63 4 .013 1
 R 4051.802303.72 4 .013
 R 4320.802304.81 4 .013
 JX 4320.802304.81 4 7 8.013 28.0 11.02306.322307.31 90.00 90.00
 R 4325.802306.31 4 .013 1
 R 4608.302307.44 7 .013 1
 R 4890.802308.56 7 .013 1
 R 4890.802309.70 7 .013 90.00 1
 R 5173.302310.03 7 .013
 R 5238.502310.03 7
 SH 5238.502310.03 7
 CD 1 3 5.00 9.10
 CD 2 3 5.00 14.00
 CD 3 4 5.00
 CD 4 4 4.50
 CD 5 4 4.00
 CD 6 4 3.50
 CD 7 4 3.00
 CD 8 4 2.00

0
Q

28.0

FARM-A.WSQ

DATE: 2/24/2015
TIME: 16:26

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	1	3	0	0.00	5.00	9.10	0.00	0.00	0.00										
CD	2	3	0	0.00	5.00	14.00	0.00	0.00	0.00										
CD	3	4			5.00														
CD	4	4			4.50														
CD	5	4			4.00														
CD	6	4			3.50														
CD	7	4			3.00														
CD	8	4			2.00														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY

HEADING LINE NO 2 IS -

EXISTING STORM DRAIN - FARM RD TO ALAINTIE FLOOD CHANNEL

HEADING LINE NO 3 IS -

ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015
F 0 5 1 5 P

F

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS A	SYSTEM OUTLET	0.01	2284.21	1	2287.34				
2	IS A	REACH	24.01	2284.28	1		0.00	0.00	0.00	0
3	IS A	REACH	102.54	2284.52	1		50.00	90.00	0.00	0
4	IS A	REACH	202.54	2284.82	1		0.00	0.00	0.00	0
5	IS A	JUNCTION	202.54	2284.82	1					
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING										
6	IS A	REACH	780.59	2286.55	1		0.00	0.00	0.00	0
7	IS A	JUNCTION	780.59	2286.55	1					
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING										
8	IS A	REACH	1909.04	2289.94	1		0.00	0.00	0.00	0
9	IS A	REACH	1937.58	2290.02	1		50.00	33.00	0.00	0

FARM-A.OUT

ELEMENT NO 10 IS A TRANSITION
U/S DATA STATION INVERT SECT N
1943.53 2290.04 2 0.013
F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 11 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
1950.20 2290.06 2 0.013 0.00 0.00 0.00 0

ELEMENT NO 12 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2074.47 2290.68 2 0.013 0.00 0.00 45.00 0

ELEMENT NO 13 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
2074.48 2290.68 2 5 0 0.013 85.0 0.0 2290.68 0.00 45.00 0.00
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 14 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2103.18 2290.79 2 0.013 0.00 0.00 0.00 0

ELEMENT NO 15 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
2103.18 2290.79 2 5 0 0.013 47.0 0.0 2291.24 0.00 45.00 0.00
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 16 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2132.18 2290.86 2 0.013 0.00 0.00 42.00 0

ELEMENT NO 17 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2144.08 2290.89 2 0.013 0.00 0.00 0.00 0

ELEMENT NO 18 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
2144.08 2290.89 2 5 0 0.013 0.1 0.1 2291.34 2291.34 90.00 90.00
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 19 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2166.58 2290.96 2 0.013 0.00 0.00 0.00 0
F 0 5 1 5 P
PAGE NO 4

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 20 IS A JUNCTION
U/S DATA STATION INVERT SECT LAT-1 LAT-2 N Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
2166.58 2290.96 2 4 4 0.013 37.5 37.5 2291.16 2291.16 60.00 60.00
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 21 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2179.28 2291.00 2 0.013 0.00 0.00 0.00 0

ELEMENT NO 22 IS A TRANSITION
U/S DATA STATION INVERT SECT N
2197.28 2291.14 3 0.013

ELEMENT NO 23 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2275.51 2291.78 3 0.013 0.00 0.00 10.00 1

ELEMENT NO 24 IS A REACH
U/S DATA STATION INVERT SECT N RADIUS ANGLE ANG PT MAN H
2280.51 2292.28 3 0.013 0.00 0.00 0.00 0
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS

ELEMENT NO 25 IS A REACH

				FARM-A. OUT											
U/S DATA				STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
				2508.82	2294.04	4	0.013	0.00	0.00	10.00	1				
ELEMENT NO	26	IS A REACH													
U/S DATA				STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
				2734.82	2295.74	4	0.013	0.00	0.00	10.00	1				
ELEMENT NO	27	IS A REACH													
U/S DATA				STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
				2918.12	2297.11	4	0.013	0.00	0.00	4.00	1				
ELEMENT NO	28	IS A REACH													
U/S DATA				STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
				3155.02	2298.89	4	0.013	0.00	0.00	10.00	1				
ELEMENT NO	29	IS A REACH													
U/S DATA				STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
				3258.62	2299.67	4	0.013	0.00	0.00	10.00	1				
ELEMENT NO	30	IS A REACH													
U/S DATA				STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H				
				3417.62	2300.24	4	0.013	0.00	0.00	0.00	0				
ELEMENT NO	31	IS A JUNCTION													
U/S DATA				STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
				3417.62	2300.24	4	6	0	0.013	55.0	0.0	2301.25	0.00	90.00	0.00
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING															
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING															
F 0 5 1 5 P															
														PAGE NO	5

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	32	IS A REACH													
U/S DATA			STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H					
			3508.70	2301.54	4	0.013	0.00	0.00	0.00	0					
ELEMENT NO	33	IS A JUNCTION													
U/S DATA			STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4	
			3508.70	2301.54	4	0	7	0.013	0.0	25.0	0.00	2303.04	0.00	90.00	
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING															
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING															
ELEMENT NO	34	IS A REACH													
U/S DATA			STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H					
			3780.30	2302.63	4	0.013	0.00	0.00	0.00	1					
ELEMENT NO	35	IS A REACH													
U/S DATA			STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H					
			4051.80	2303.72	4	0.013	0.00	0.00	0.00	1					
ELEMENT NO	36	IS A REACH													
U/S DATA			STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H					
			4320.80	2304.81	4	0.013	0.00	0.00	0.00	0					
ELEMENT NO	37	IS A JUNCTION													
U/S DATA			STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4	
			4320.80	2304.81	4	7	8	0.013	28.0	11.0	2306.32	2307.31	90.00	90.00	
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING															
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING															
ELEMENT NO	38	IS A REACH													
U/S DATA			STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H					
			4325.80	2306.31	4	0.013	0.00	0.00	0.00	0					
WARNING - ADJACENT SECTIONS ARE NOT IDENTICAL - SEE SECTION NUMBERS AND CHANNEL DEFINITIONS															
ELEMENT NO	39	IS A REACH													
U/S DATA			STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H					
			4608.30	2307.44	7	0.013	0.00	0.00	0.00	1					
ELEMENT NO	40	IS A REACH													
U/S DATA			STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H					
			4890.80	2308.56	7	0.013	0.00	0.00	0.00	1					
ELEMENT NO	41	IS A REACH													
U/S DATA			STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H					
			5173.30	2309.70	7	0.013	0.00	0.00	90.00	1					

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 42 IS A REACH * * *
 U/S DATA STATION INVERT SECT N
 5238.50 2310.03 7 0.013

RADIUS 0.00
 ANGLE 0.00
 ANG PT 0.00
 MAN H 0

ELEMENT NO 43 IS A SYSTEM HEADWORKS *
 U/S DATA STATION INVERT SECT W S ELEV
 5238.50 2310.03 7 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC $\frac{P}{2}$
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LICENSEE: SLATER HANIFAN GROUP

WATER SURFACE PROFILE LISTING
 PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
 EXISTING STORM DRAIN - FARM RD TO ALAINTIE FLOOD CHANNEL
 ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
0.01	2284.21	4.331	2288.541	465.2	11.80	2.163	2290.704	0.00	4.331	5.00	9.10	0.00	0	0.00
24.00	0.00292					.003474	0.08		4.727			0.00		
24.01	2284.28	4.532	2288.812	465.2	11.28	1.976	2290.788	0.00	4.331	5.00	9.10	0.00	0	0.00
78.53	0.00306					.003194	0.25		4.645			0.00		
102.54	2284.52	4.605	2289.125	465.2	11.10	1.913	2291.038	0.00	4.331	5.00	9.10	0.00	0	0.00
100.00	0.00300					.003084	0.31		4.677			0.00		
202.54	2284.82	4.653	2289.473	465.2	10.99	1.875	2291.348	0.00	4.331	5.00	9.10	0.00	0	0.00
JUNCT STR	0.00000					.003354	0.00					0.00		
202.54	2284.82	5.298	2290.118	429.2	9.49	1.397	2291.515	0.00	4.104	5.00	9.10	0.00	0	0.00
578.05	0.00299					.003665	2.12		4.407			0.00		
780.59	2286.55	5.687	2292.237	429.2	9.49	1.397	2293.634	0.00	4.104	5.00	9.10	0.00	0	0.00
JUNCT STR	0.00000					.003080	0.00					0.00		
780.59	2286.55	6.361	2292.911	354.2	7.83	0.951	2293.862	0.00	3.611	5.00	9.10	0.00	0	0.00
1128.45	0.00300					.002496	2.82		3.818			0.00		
1909.04	2289.94	5.788	2295.728	354.2	7.83	0.951	2296.679	0.00	3.611	5.00	9.10	0.00	0	0.00
28.54	0.00280					.002496	0.07		3.916			0.00		
1937.58	2290.02	5.894	2295.914	354.2	7.83	0.951	2296.865	0.00	3.611	5.00	9.10	0.00	0	0.00
TRANS STR	0.00336					.001687	0.01					0.00		
1943.53	2290.04	6.491	2296.531	354.2	5.08	0.400	2296.931	0.00	2.710	5.00	14.00	0.00	0	0.00
6.67	0.00300					.000878	0.01		2.626			0.00		
1950.20	2290.06	6.476	2296.536	354.2	5.08	0.400	2296.936	0.00	2.710	5.00	14.00	0.00	0	0.00
124.27	0.00499					.000878	0.11		2.215			0.00		$\frac{P}{2}$
LICENSEE: SLATER HANIFAN GROUP						F0515P							PAGE	2

WATER SURFACE PROFILE LISTING
 PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
 EXISTING STORM DRAIN - FARM RD TO ALAINTIE FLOOD CHANNEL
 ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
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FARM-A.OUT

L/ELEM	SO					SF	AVE	HF				NORM	DEPTH	ZR			

2074.47	2290.68	6.025	2296.705	354.2	5.08	0.400	2297.105	0.00	2.710			5.00	14.00	0.00	0	0.00	
JUNCT STR	0.00000					.000692	0.00							0.00			
2074.48	2290.68	6.182	2296.862	269.2	3.86	0.231	2297.093	0.00	2.257			5.00	14.00	0.00	0	0.00	
28.70	0.00383					.000507	0.01			2.016				0.00			
2103.18	2290.79	6.087	2296.877	269.2	3.86	0.231	2297.108	0.00	2.257			5.00	14.00	0.00	0	0.00	
JUNCT STR	0.00000					.000427	0.00							0.00			
2103.18	2290.79	6.179	2296.969	222.2	3.19	0.158	2297.127	0.00	1.986			5.00	14.00	0.00	0	0.00	
29.00	0.00241					.000346	0.01			2.069				0.00			
2132.18	2290.86	6.141	2297.001	222.2	3.19	0.158	2297.159	0.00	1.986			5.00	14.00	0.00	0	0.00	
11.90	0.00252					.000346	0.00			2.039				0.00			
JUNCT STR	0.00000					.000345	0.00							0.00			
2144.08	2290.89	6.115	2297.005	222.0	3.18	0.157	2297.162	0.00	1.984			5.00	14.00	0.00	0	0.00	
22.50	0.00311					.000345	0.01			1.902				0.00			
2166.58	2290.96	6.053	2297.013	222.0	3.18	0.157	2297.170	0.00	1.984			5.00	14.00	0.00	0	0.00	
JUNCT STR	0.00000					.000248	0.00							0.00			
2166.58	2290.96	6.191	2297.151	147.0	2.11	0.069	2297.220	0.00	1.508			5.00	14.00	0.00	0	0.00	
12.70	0.00315					.000151	0.00			1.449				0.00			
2179.28	2291.00	6.152	2297.152	147.0	2.11	0.069	2297.221	0.00	1.508			5.00	14.00	0.00	0	0.00	
TRANS STR	0.00778					.001669	0.03							0.00			
2197.28	2291.14	5.401	2296.541	147.0	7.49	0.870	2297.411	0.00	3.476			5.00	0.00	0.00	0	0.00	
78.23	0.00818					.003186	0.25			2.861				0.00			
2275.51	2291.78	5.083	2296.863	147.0	7.49	0.870	2297.733	0.00	3.476			5.00	0.00	0.00	0	0.00	
LICENSEE: SLATER HANIFAN GROUP																	
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WATER SURFACE PROFILES LISTING																	

WATER SURFACE PROFILE LISTING
 PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
 EXISTING STORM DRAIN - FARM RD TO ALAINT FLOOD CHANNEL
 ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR	
L/ELEM	SO	SF AVE										HF	NORM DEPTH			ZR

0.86	0.10000					.003167	0.00				1.430		0.00			
2276.37	2291.87	5.000	2296.866	147.0	7.49	0.870	2297.736	0.00	3.476		5.00	0.00	0.00	0	0.00	
3.87	0.10000					.002968	0.01				1.430		0.00			
2280.24	2292.25	4.536	2296.789	147.0	7.85	0.957	2297.746	0.00	3.476		5.00	0.00	0.00	0	0.00	
0.27	0.10000					.002796	0.00				1.430		0.00			
2280.51	2292.28	4.498	2296.778	147.0	9.24	1.327	2298.105	0.00	3.560		4.50	0.00	0.00	0	0.00	
112.60	0.00771					.005191	0.58				3.191		0.00			
2393.11	2293.15	4.082	2297.230	147.0	9.69	1.459	2298.689	0.00	3.560		4.50	0.00	0.00	0	0.00	
23.74	0.00771					.004972	0.12				3.191		0.00			
Page 5																

										FARM-A. OUT				
2416.85	2293.33	3.942	2297.273	147.0	9.95	1.538	2298.811	0.00	3.560	4.50	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00		
2416.85	2293.33	3.206	2296.537	147.0	12.13	2.283	2298.820	0.00	3.560	4.50	0.00	0.00	0	0.00
91.97	0.00771					.007568	0.70			3.191		0.00		
2508.82	2294.04	3.222	2297.262	147.0	12.06	2.260	2299.522	0.00	3.560	4.50	0.00	0.00	0	0.00
58.55	0.00752					.007522	0.44			3.222		0.00		
2567.37	2294.48	3.222	2297.702	147.0	12.06	2.260	2299.962	0.00	3.560	4.50	0.00	0.00	0	0.00
167.45	0.00752					.007498	1.26			3.222		0.00		
2734.82	2295.74	3.230	2298.970	147.0	12.03	2.248	2301.218	0.00	3.560	4.50	0.00	0.00	0	0.00
19.88	0.00747					.007475	0.15			3.230		0.00		
2754.70	2295.89	3.230	2299.119	147.0	12.03	2.248	2301.367	0.00	3.560	4.50	0.00	0.00	0	0.00
163.42	0.00747					.007496	1.22			3.230		0.00		
2918.12	2297.11	3.223	2300.333	147.0	12.06	2.258	2302.591	0.00	3.560	4.50	0.00	0.00	0	0.00
LICENSEE: SLATER HANIFAN GROUP													PAGE	4

WATER SURFACE PROFILE LISTING														
PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY														
EXISTING STORM DRAIN - FARM RD TO ALAINT FLOOD CHANNEL														
ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015														
STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO	SF AVE		HF		NORM DEPTH		ZR		*****				
67.34	0.00751					.007516	0.51		3.223			0.00		
2985.46	2297.62	3.223	2300.839	147.0	12.06	2.258	2303.097	0.00	3.560	4.50	0.00	0.00	0	0.00
169.56	0.00751					.007436	1.26		3.223			0.00		
3155.02	2298.89	3.251	2302.141	147.0	11.95	2.217	2304.358	0.00	3.560	4.50	0.00	0.00	0	0.00
89.26	0.00753					.006998	0.62		3.220			0.00		
3244.28	2299.56	3.392	2302.954	147.0	11.43	2.028	2304.982	0.00	3.560	4.50	0.00	0.00	0	0.00
14.34	0.00753					.006310	0.09		3.220			0.00		
3258.62	2299.67	3.560	2303.230	147.0	10.89	1.842	2305.072	0.00	3.560	4.50	0.00	0.00	0	0.00
9.23	0.00359					.005708	0.05		4.500			0.00		
3267.85	2299.70	3.747	2303.450	147.0	10.39	1.675	2305.125	0.00	3.560	4.50	0.00	0.00	0	0.00
41.25	0.00359					.005227	0.22		4.500			0.00		
3309.10	2299.85	3.967	2303.818	147.0	9.90	1.523	2305.341	0.00	3.560	4.50	0.00	0.00	0	0.00
108.52	0.00359					.004925	0.53		4.500			0.00		
3417.62	2300.24	4.248	2304.488	147.0	9.45	1.387	2305.875	0.00	3.560	4.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.003511	0.00					0.00		
3417.62	2300.24	5.941	2306.181	92.0	5.78	0.520	2306.701	0.00	2.814	4.50	0.00	0.00	0	0.00
91.08	0.01427					.002189	0.20		1.956			0.00		
3508.70	2301.54	4.840	2306.380	92.0	5.78	0.520	2306.900	0.00	2.814	4.50	0.00	0.00	0	0.00
JUNCT STR	0.00000					.001675	0.00					0.00		

3508.70	2301.54	5.328	2306.868	67.0	4.21	0.276	2307.144	0.00	2.385	FARM-A.OUT	4.50	0.00	0.00	0	0.00
271.60	0.00401					.001161	0.32		2.350			0.00			
3780.30	2302.63	4.567	2307.197	67.0	4.21	0.276	2307.473	0.00	2.385		4.50	0.00	0.00	0	0.00%

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WATER SURFACE PROFILE LISTING
PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
EXISTING STORM DRAIN - FARM RD TO ALAINTIE FLOOD CHANNEL
ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
24.01	0.00402					.001154	0.03		2.350			0.00		
3804.31	2302.73	4.500	2307.226	67.0	4.21	0.276	2307.502	0.00	2.385	4.50	0.00	0.00	0	0.00
132.69	0.00402					.001081	0.14		2.350			0.00		
3937.00	2303.26	4.082	2307.341	67.0	4.42	0.303	2307.644	0.00	2.385	4.50	0.00	0.00	0	0.00
71.41	0.00402					.001050	0.08		2.350			0.00		
4008.41	2303.55	3.840	2307.386	67.0	4.63	0.333	2307.719	0.00	2.385	4.50	0.00	0.00	0	0.00
43.39	0.00402					.001123	0.05		2.350			0.00		
4051.80	2303.72	3.691	2307.411	67.0	4.80	0.358	2307.769	0.00	2.385	4.50	0.00	0.00	0	0.00
51.42	0.00405					.001220	0.06		2.343			0.00		
4103.22	2303.93	3.509	2307.437	67.0	5.03	0.393	2307.830	0.00	2.385	4.50	0.00	0.00	0	0.00
45.03	0.00405					.001351	0.06		2.343			0.00		
4148.25	2304.11	3.348	2307.459	67.0	5.28	0.433	2307.892	0.00	2.385	4.50	0.00	0.00	0	0.00
41.12	0.00405					.001505	0.06		2.343			0.00		
4189.37	2304.28	3.200	2307.477	67.0	5.54	0.476	2307.953	0.00	2.385	4.50	0.00	0.00	0	0.00
37.34	0.00405					.001685	0.06		2.343			0.00		
4226.71	2304.43	3.064	2307.493	67.0	5.81	0.524	2308.017	0.00	2.385	4.50	0.00	0.00	0	0.00
34.09	0.00405					.001892	0.06		2.343			0.00		
4260.80	2304.57	2.938	2307.505	67.0	6.09	0.576	2308.081	0.00	2.385	4.50	0.00	0.00	0	0.00
31.94	0.00405					.002130	0.07		2.343			0.00		
4292.74	2304.70	2.819	2307.515	67.0	6.39	0.634	2308.149	0.00	2.385	4.50	0.00	0.00	0	0.00
28.06	0.00405					.002397	0.07		2.343			0.00		
4320.80	2304.81	2.712	2307.522	67.0	6.69	0.695	2308.217	0.00	2.385	4.50	0.00	0.00	0	0.00%

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WATER SURFACE PROFILE LISTING
PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
EXISTING STORM DRAIN - FARM RD TO ALAINTIE FLOOD CHANNEL
ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
JUNCT STR	0.00000					.001368	0.00					0.00		
4320.80	2304.81	3.724	2308.534	28.0	1.99	0.061	2308.595	0.00	1.513	4.50	0.00	0.00	0	0.00

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
0.60	0.30000					.000209	0.00							
4321.40	2304.99	3.539	2308.528	28.0	2.09	0.068	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.52	0.30000					.000232	0.00							
4321.92	2305.15	3.374	2308.521	28.0	2.19	0.074	2308.595	0.00	1.513	4.50	0.00	0.00	0	0.00
0.48	0.30000					.000258	0.00							
4322.40	2305.29	3.225	2308.514	28.0	2.30	0.082	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.43	0.30000					.000289	0.00							
4322.83	2305.42	3.087	2308.506	28.0	2.41	0.090	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.40	0.30000					.000324	0.00							
4323.23	2305.54	2.959	2308.497	28.0	2.53	0.099	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.36	0.30000					.000365	0.00							
4323.59	2305.65	2.839	2308.487	28.0	2.65	0.109	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.34	0.30000					.000411	0.00							
4323.93	2305.75	2.726	2308.476	28.0	2.78	0.120	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.32	0.30000					.000464	0.00							
4324.25	2305.84	2.620	2308.464	28.0	2.91	0.132	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.29	0.30000					.000525	0.00							
4324.54	2305.93	2.520	2308.451	28.0	3.06	0.145	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.27	0.30000					.000595	0.00							
4324.81	2306.01	2.424	2308.437	28.0	3.20	0.159	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00

LICENSEE: SLATER HANIFAN GROUP

WATER SURFACE PROFILE LISTING
 PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
 EXISTING STORM DRAIN - FARM RD TO ALAINE FLOOD CHANNEL
 ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
0.25	0.30000					.000674	0.00							
4325.06	2306.09	2.334	2308.421	28.0	3.36	0.175	2308.596	0.00	1.513	4.50	0.00	0.00	0	0.00
0.23	0.30000					.000764	0.00							
4325.29	2306.16	2.248	2308.404	28.0	3.52	0.193	2308.597	0.00	1.513	4.50	0.00	0.00	0	0.00
0.21	0.30000					.000868	0.00							
4325.50	2306.22	2.165	2308.385	28.0	3.70	0.212	2308.597	0.00	1.513	4.50	0.00	0.00	0	0.00
0.19	0.30000					.000986	0.00							
4325.69	2306.28	2.087	2308.364	28.0	3.88	0.233	2308.597	0.00	1.513	4.50	0.00	0.00	0	0.00
0.11	0.30000					.001095	0.00							
4325.80	2306.31	2.039	2308.349	28.0	5.47	0.465	2308.814	0.00	1.712	3.00	0.00	0.00	0	0.00
34.02	0.00400					.002887	0.10							
4359.82	2306.45	1.955	2308.401	28.0	5.74	0.511	2308.912	0.00	1.712	3.00	0.00	0.00	0	0.00
37.13	0.00400					.003250	0.12							

FARM-A.OUT											
4396.95	2306.59	1.876	2308.471	28.0	6.02	0.563	2309.034	0.00	1.712	3.00	0.00 0.00 0 0.00
53.07	0.00400					.003666	0.19		1.785	0.00	
4450.02	2306.81	1.802	2308.609	28.0	6.31	0.619	2309.228	0.00	1.712	3.00	0.00 0.00 0 0.00
47.02	0.00400					.003946	0.19		1.785	0.00	
4497.04	2306.99	1.785	2308.780	28.0	6.39	0.633	2309.413	0.00	1.712	3.00	0.00 0.00 0 0.00
111.26	0.00400					.004004	0.45		1.785	0.00	
4608.30	2307.44	1.785	2309.225	28.0	6.39	0.633	2309.858	0.00	1.712	3.00	0.00 0.00 0 0.00
33.60	0.00396					.003988	0.13		1.790	0.00	
4641.90	2307.57	1.790	2309.363	28.0	6.37	0.629	2309.992	0.00	1.712	3.00	0.00 0.00 0 0.00

LICENSEE: SLATER HANIFAN GROUP

WATER SURFACE PROFILE LISTING
PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
EXISTING STORM DRAIN - FARM RD TO ALAINTIE FLOOD CHANNEL
ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO	*****										ZR	*****	
248.90	0.00396					.003970	0.99		1.790			0.00		
4890.80	2308.56	1.790	2310.350	28.0	6.37	0.629	2310.979	0.00	1.712	3.00	0.00	0.00	0	0.00
50.02	0.00404					.004006	0.20		1.780			0.00		
4940.82	2308.76	1.780	2310.542	28.0	6.41	0.638	2311.180	0.00	1.712	3.00	0.00	0.00	0	0.00
232.48	0.00404					.004039	0.94		1.780			0.00		
5173.30	2309.70	1.780	2311.480	28.0	6.41	0.638	2312.118	0.00	1.712	3.00	0.00	0.00	0	0.00
2.17	0.00506					.004303	0.01		1.657			0.00		
5175.47	2309.71	1.712	2311.423	28.0	6.72	0.701	2312.124	0.00	1.712	3.00	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00		
5175.47	2309.71	1.657	2311.368	28.0	6.99	0.759	2312.127	0.00	1.712	3.00	0.00	0.00	0	0.00
48.61	0.00506					.005067	0.25		1.657			0.00		
5224.08	2309.96	1.657	2311.614	28.0	6.99	0.759	2312.373	0.00	1.712	3.00	0.00	0.00	0	0.00
14.42	0.00506					.004816	0.07		1.657			0.00		
5238.50	2310.03	1.712	2311.742	28.0	6.72	0.701	2312.443	0.00	1.712	3.00	0.00	0.00	0	0.00

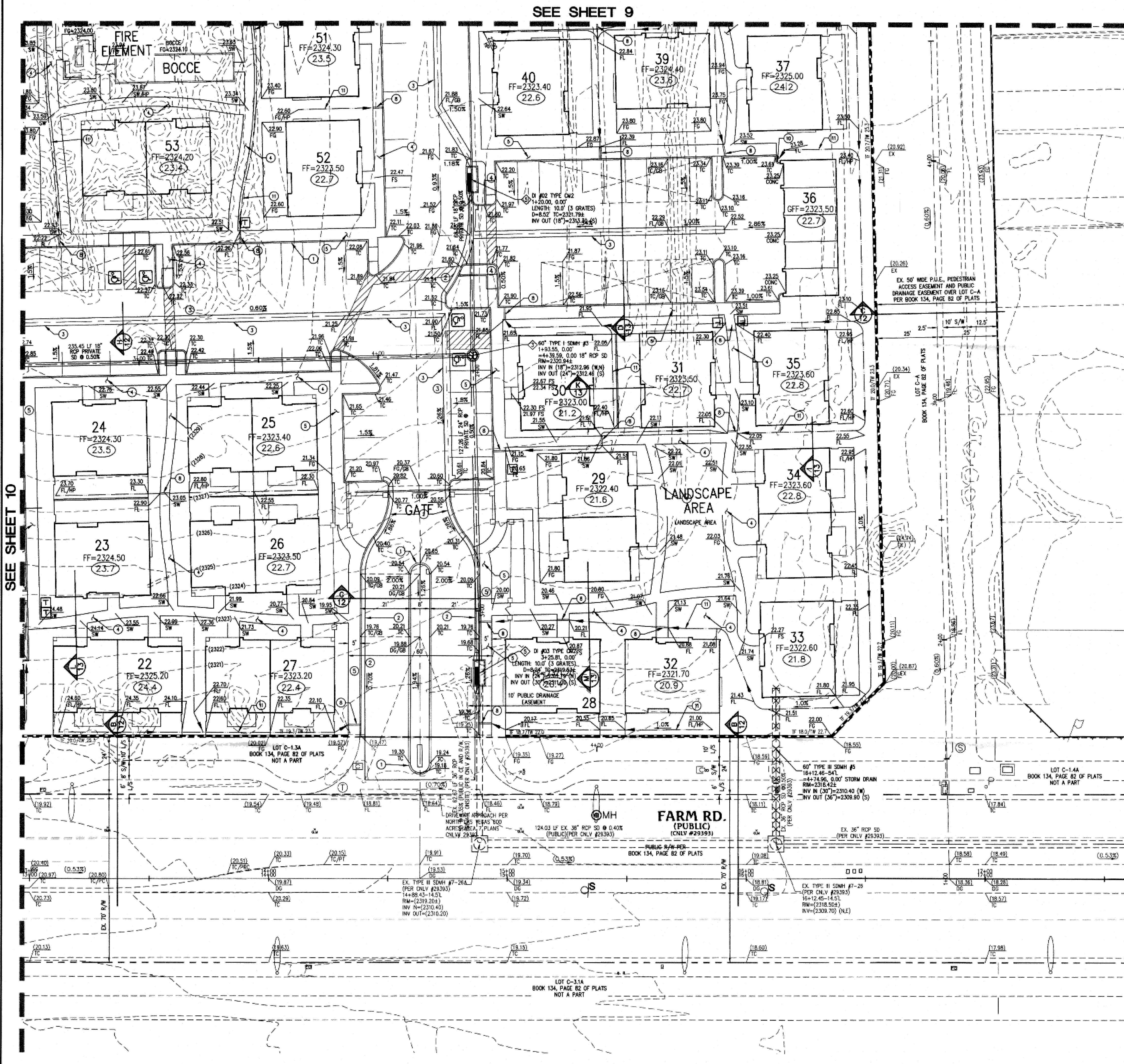
PARK HIGHLANDS WEST - GRAND TETON REGIONAL FLOOD CONTROL FACILITY
EXISTING STORM DRAIN - FARM RD TO ALAINTIE FLOOD CHANNEL
ULTIMATE CONDITION 100-YEAR WITH METHOD A FLOWS - MARCH 2015

0.01	.I	X H	E											
31.38	.I	X H	E											
62.75	.													
94.11	.													
125.48	.I	CWH	E											
156.85	.													
188.22	.													
219.59	.I	CWH	E											
250.96	.I	C HW	E											
282.32	.													
313.69	.													
345.06	.													

R
R
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R

PLANS AND DETAILS

H:\Land Projects\24560720 Valley Vista Parcel 1.3\Drawings\BusinessStudy\WVS\02 156.001 TDS-Parcel 1.3-Grading.dwg Job done Mon, 23 Nov 2020 - 11:17am



CONSTRUCTION NOTES

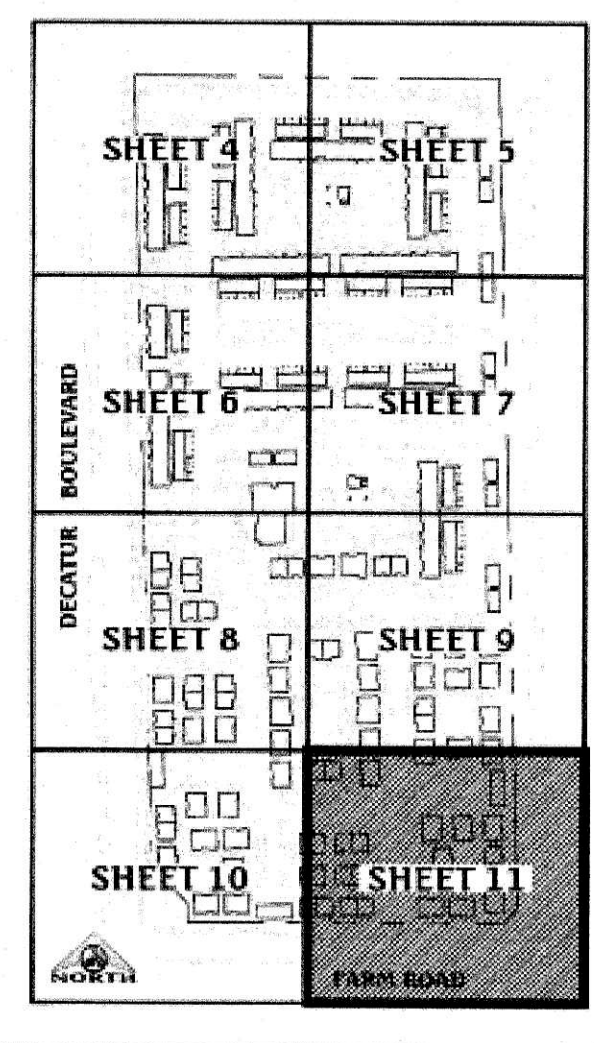
1. CONSTRUCT "A" TYPE CURB PER CCAUSD #219
2. CONSTRUCT "L" TYPE CURB AND GUTTER PER CCAUSD #216
3. CONSTRUCT 3" WIDE CONCRETE CROSS GUTTER, PER DETAIL B/13
4. CONSTRUCT 4" THICK 4" WIDE SIDEWALK, PER CCAUSD #234 (MODIFIED)
5. CONSTRUCT 4" THICK 5" WIDE SIDEWALK, PER CCAUSD #234
6. CONSTRUCT 3" WIDE CONCRETE U-CHANNEL, PER DETAIL C/13
7. CONSTRUCT SIDEWALK DRAIN, PER CCAUSD #236
8. INSTALL NDS SPEED-D CHANNEL (400-10) WITH NDS SPEED-D CHANNEL GRATE, DECORATIVE WAVE GRATE, HOPE PER MANUFACTURER'S RECOMMENDATIONS.
9. CONSTRUCT 10' TRANSITION FROM L-TYPE CURB/SPANDREL TO A-TYPE CURB
10. PROVIDE 1' WIDE OPENING IN CURB FOR DRAINAGE
11. CONSTRUCT DRAINAGE SWALE

STORM DRAIN NOTES

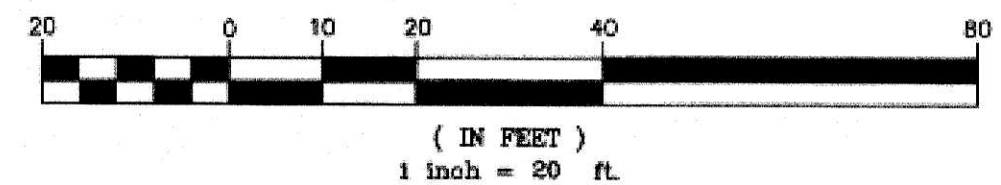
1. STORM DRAIN POINT OF CONNECTION: REMOVE 25.75' IF EXISTING 36" RCP SD AND INSTALL SD MANHOLE
2. INSTALL 60" TYPE III STORM DRAIN MANHOLE PER CCAUSD #401 AND #406
3. INSTALL 60" TYPE I STORM DRAIN MANHOLE PER CCAUSD #401 AND #403
4. INSTALL 48" TYPE I STORM DRAIN MANHOLE PER CCAUSD #401 AND #403
5. CONSTRUCT TYPE CM2 DROP INLET PER CCAUSD #412.1. SEE PROFILE SHEETS 14 AND 15. STORM DRAIN STAMP TO BE LOCATED ADJACENT TO DROP INLET PER CCAUSD #421

KEY MAP

SCALE: 1"=300'



GRAPHIC SCALE



Call before you Dig
Avoid cutting underground utility lines. It's costly.
CALL 811
OR
1-800-227-2600

FAST
Call before you Dig
Underground
1-702-432-5300
IDENTIFY AND MARK
SYSTEM OF TRANSPORTATION

Call before you Overhead
Avoid hitting overhead power lines. It's costly.
Call before you Overhead
1-702-227-2929

UTILITY DISCLAIMER

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LEGAL DESCRIPTION

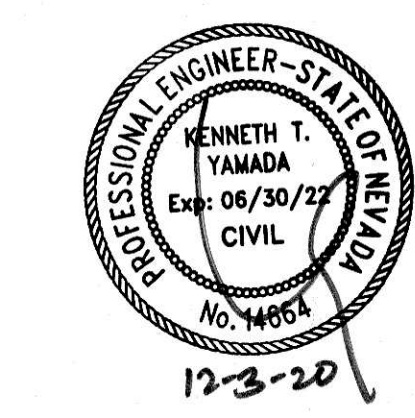
PARCEL 1.3 OF PARENT FINAL MAP OF PROJECT "O" WEST PARCEL AS SHOWN ON MAP THEREOF ON FILE IN BOOK 134, PAGE 82 OF PLATS, IN THE OFFICE OF THE COUNTY RECORDER OF CLARK COUNTY, NEVADA.

BASIS OF BEARING

NORTH 87°29'39" WEST, BEING THE BEARING OF THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 18, TOWNSHIP 19 SOUTH, RANGE 81 EAST, M.D.M., CITY OF NORTH LAS VEGAS, NEVADA, AS SHOWN BY MAP THEREOF ON FILE IN THE OFFICE OF THE CLARK COUNTY, NEVADA RECORDER IN BOOK 134, PAGE 82 OF PLATS.

BENCHMARK

CITY OF NORTH LAS VEGAS BENCHMARK No. NLV91 18N4
RIVET AND 2" ROUND ALUMINUM DISK, STAMPED NORTH LAS VEGAS BM No. NLV9118N4, SET IN THE TOP OF CURB, LOCATED APPROX. 14 FEET EAST OF THE SOUTHEAST EAST COR AT THE INTERSECTION OF ELKHORN RD. AND AVARY WAY.
ELEVATION = 699.658 Meters (NAVD'88)
ELEVATION = 2295.46 US Survey Feet (NAVD'88)



SEE SHEET 2 FOR CITY OF NORTH LAS VEGAS GENERAL GRADING AND DRAINAGE NOTES AND LEGEND

FLOODZONE NOTE

THIS SITE IS LOCATED COMPLETELY WITHIN ZONE X PER FEMA MAP #32003C1765F, PANEL 1765F, DATED NOVEMBER 16, 2011. ZONE X IS DETERMINED TO BE OUTSIDE THE 100-YEAR FLOODPLAIN.

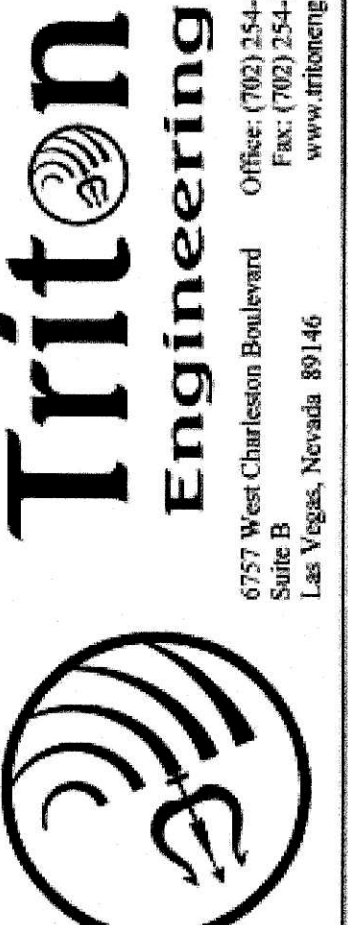
SOILS DATA

SOILS REPORT DATA
REPORT BY: GEOTECH RESIDENTIAL, LLC
PROJECT No.: 13481.1.3-LVR
DATED: APRIL 6, 2020

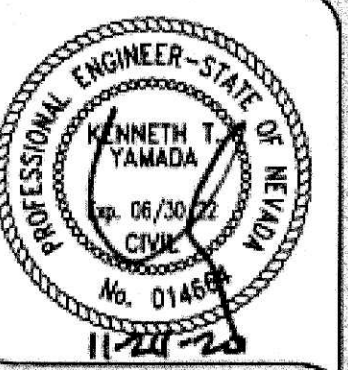
CUT AND FILL DATA
CUT TOTAL: 43,238 CY
FILL TOTAL: 50,023 CY
NET (FILL): 6,785 CY

APPROVALS

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED TECHNICAL DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF NORTH LAS VEGAS. CNLV # 165-2020
Kenneth T. Yamada 11-24-20
KENNETH T. YAMADA, P.E. No. 014864 DATE
ROBERT A. MCLAUGHLIN, P.E. CFM
MANAGER, DEVELOPMENT AND FLOOD CONTROL DIVISION
CNLV PROJ #351-2020

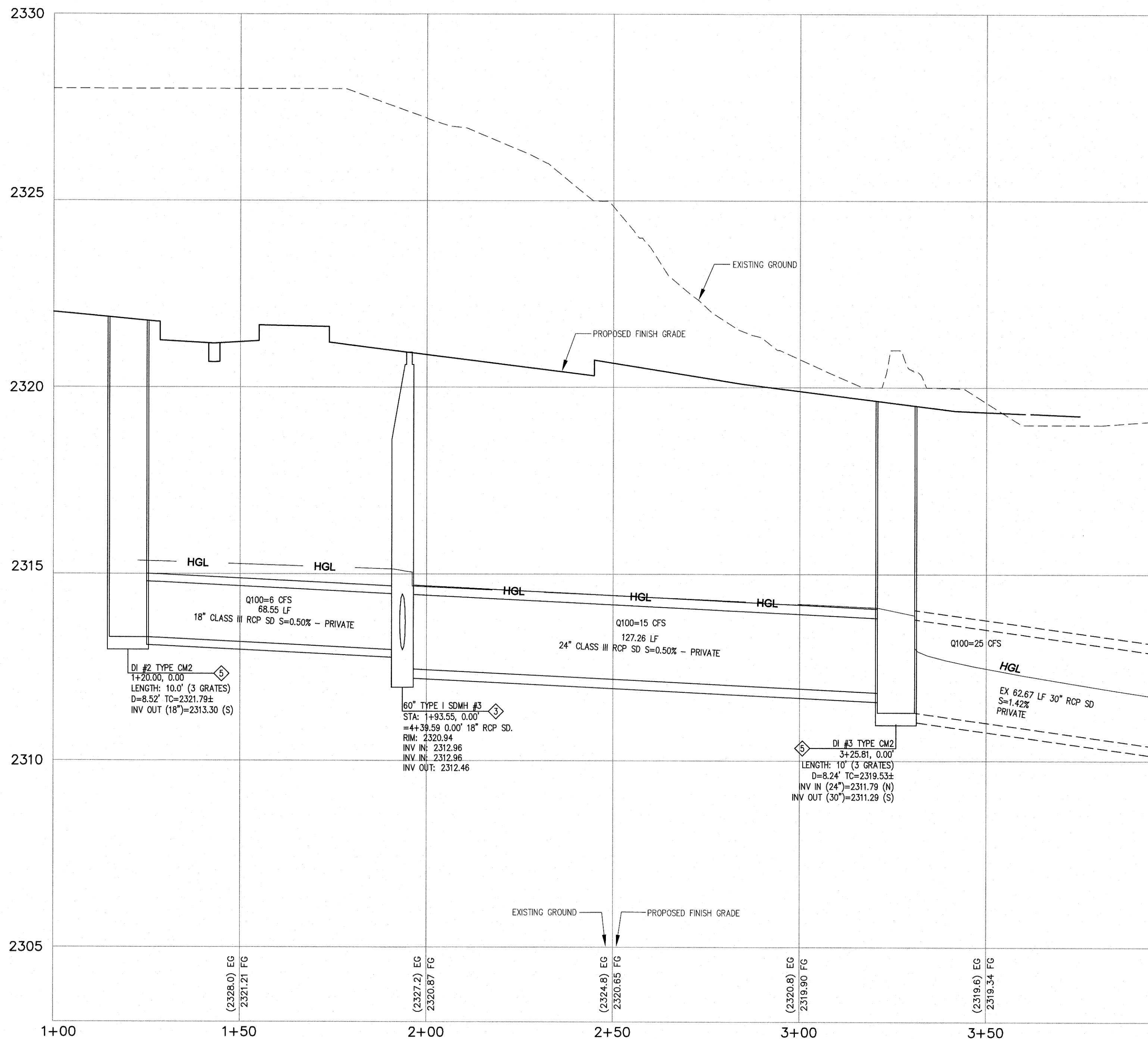


DR HORTON
VALLEY VISTA PARCEL 1.3
GRADING PLAN VIII



SHEET
11
OF 31

Q:\Triton Drawings\156.001 Valley Vista 1.3 Drawings\Improvements 05 156.001-Profiles-SD.dwg created Thu, 03 Dec 2020 - 3:05pm



RCP PRIVATE SD PROFILE

SCALE: HORIZ. 1" = 20'
VERT. 1" = 2'

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

CALL



OR

1-800-642-2444

FAST

Call
before you
Underground

1-702-432-5300

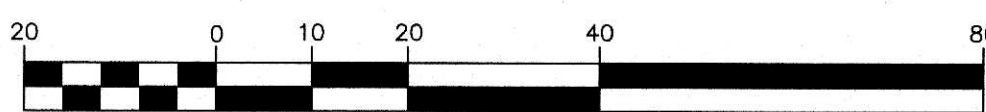
FREWAY AND ARTERIAL
SYSTEM OF TRANSPORTATION

AVOID HITTING OVERHEAD
POWER LINES. IT'S COSTLY

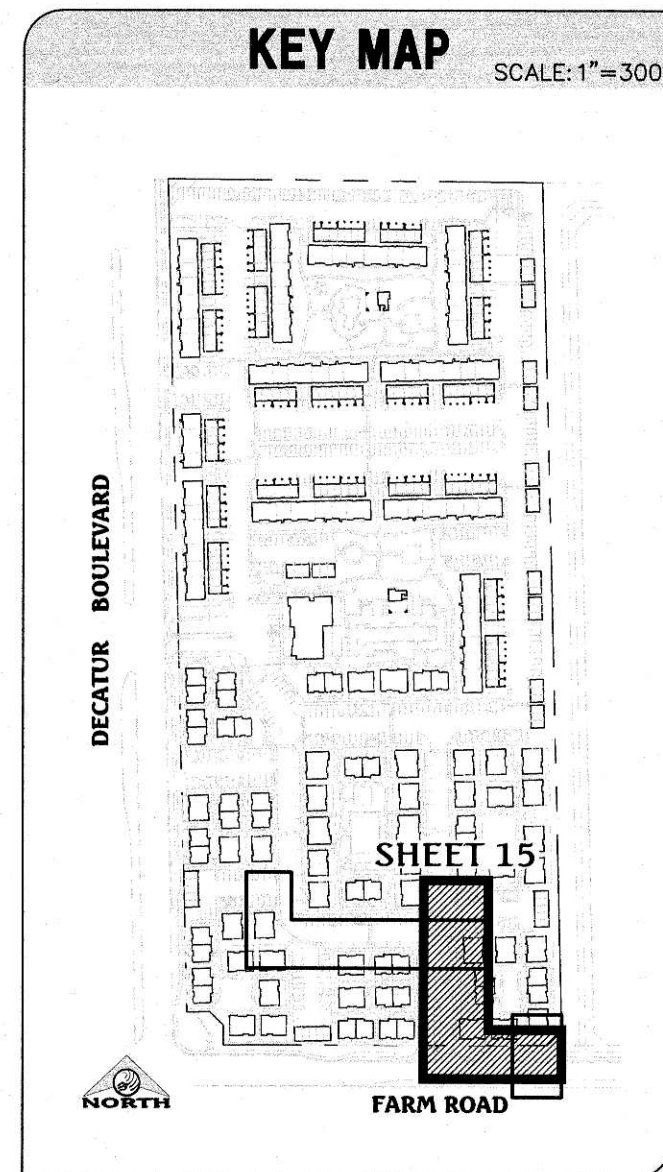
Call
before you
Overhead

1-702-227-2929

GRAPHIC SCALE



(IN FEET)
1 inch = 20 ft.

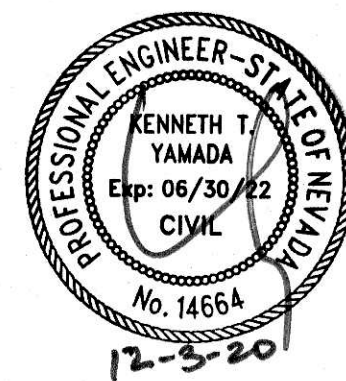


CONSTRUCTION NOTES

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10. PROVIDE 1' WIDE OPENING IN CURB FOR DRAINAGE
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3. INSTALL 60" TYPE I STORM DRAIN MANHOLE PER CCAUSD #401 AND #403
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5. CONSTRUCT TYPE CM2 DROP INLET PER CCAUSD #412.1. SEE PROFILE SHEETS 14 AND 15. STORM WATER STAMP TO BE LOCATED ADJACENT TO DROP INLET PER CCAUSD #421



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BENCHMARK

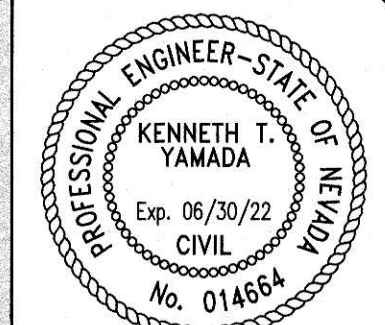
CITY OF NORTH LAS VEGAS BENCHMARK No. NLV91 19N4
RIVET AND 2" ROUND ALUMINUM DISK, STAMPED NORTH LAS VEGAS BM No. NLV9119N4, SET IN THE TOP OF CURB, LOCATED APPROX. 14 FEET EAST OF THE SOUTHEAST EAST COR AT THE INTERSECTION OF ELKHORN RD. AND AVIARY WAY.
ELEVATION = 699.658 Meters (NAVD'88)
ELEVATION = 2295.46 US Survey Feet (NAVD'88)

DATE : 10/19/20
PN : K. YAMADA
DRAWN BY : T.E.
DESIGNED BY : T.E.
CHECKED BY : T.E.
ADA CHECKED : T.E.
JOB NO. : 156.001
SCALE : 1" = 20'

Triton Engineering
6757 West Charleston Boulevard
Suite B
Las Vegas, Nevada 89146
Office: (702) 254-1480
Fax: (702) 254-1962
www.tritoneeng.com



DR HORTON
VALLEY VISTA PARCEL 1.3
STORM DRAIN PROFILES II



SHEET
15
OF 31