

DS #: 5392

APN: 140.31.102.003

PROJECT: Olan K. Grayson Elementary School Addition

SUBMITAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		December 22, 2020
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:	COPIES TO:
	Oran K. Gragson Elementary School Addition	Lochsa Engineering
Cross Streets:	SEC of Bonanza Road & Honolulu Street	School Board of Trustees
File Number:	F:\Depot\DSMemos\DS5392A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	140-31-102-003	
Zoning Action:	XXXXX	
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	12/1/2020	12/22/2020	See Comments Below	\$400.00	4085386: \$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 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 revised and resubmitted.
2. Page 3 of the *Study* stated that an offsite exhibit (Figure OF1) has been created and included in Appendix C. It also said that offsite basin FX1 was determined to impact *Honolulu Street* west of the subject site. However, no such figure was found in Appendix C.

In **DR1** and **DR2** (Existing and Developed Conditions Onsite Drainage Maps), *Basin FX1* was shown. However, without showing the whole basin and pertinent topographic information, it was not justifiable to merely stating that the basin area is limited to 7.13 acres. Resolve in the next submittal.

In an effort to increase administrative efficiency, for all original and re-submittal packages including updates and the addenda, the City of Las Vegas Public Works Department requires both a hardcopy and a digital copy (PDF) on CD for the drainage study.

A letter sealed and signed by a Nevada registered civil engineer must be included in every submittal certifying documents on the electronic CD matches 100% of the hardcopy submittal. The new submittal requirement is effective on May 1, 2019. If there are any questions regarding these new requirements, please contact Albert Sung in the City Flood Control Section at (702) 229-6541.

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: T20S/R62E/31

AREA N-31

November 19, 2020

Albert Sung, P.E.
City of Las Vegas Public Works Department
(Flood Control Division)
333 North Rancho Drive
Las Vegas, NV 89106

Subject: **Technical Drainage Study for Oran K. Gragson Elementary School Addition**
Lochsa Job No. 201091

Mr. Sung:

This letter certifies that all items provided on the **Technical Drainage Study for Oran K. Gragson Elementary School Addition** electronic submittal matches the paper version bound into the study.

Respectfully submitted,

LOCHSA ENGINEERING

Guy Morris, P.E.



Technical Drainage Study for the Oran K. Gragson Elementary School Addition

November 2020

Prepared for:

School Board of Trustees
Jamie Schneck
1180 Military Tribute Place
Henderson, Nevada 89074
(702) 799-6450

Prepared by:

Lochsa Engineering
6345 South Jones Boulevard, Suite 100
Las Vegas, Nevada 89118
(702) 365-9312

Lochsa Job No. 201091

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: ORAN K. GRAGSON ELEMENTARY SCHOOL ADDITION Date: NOVEMBER 10, 2020
Location of Development: a) Descriptive (Cross Streets) North/South: Honolulu St.
East/West: Bonanza Rd.
b) Section: 31 Township: 20 SOUTH Range: 62 EAST
c) APN : 140-31-102-003

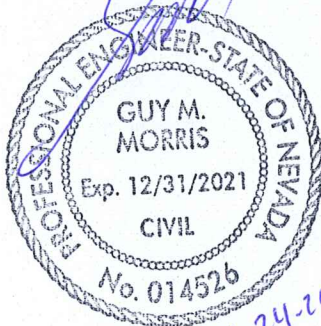
Name of Owner: School Board of Trustees
Telephone No.: (702) 799-6450 Fax No.: _____ E-Mail Address: N/A
Address: 1180 Military Tribute Place Henderson, NV 89014

Contact Person-Name: CHRIS BLAKE, EI Telephone No.: 702-365-9312
* E-Mail Address: CHRIS.BLAKE@LOCHSA.COM Fax No.: 702-365-9317
Firm: LOCHSA ENGINEERING
Address: 6345 S JONES BLVD STE 100 LAS VEGAS NV 89118

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: 9.48 +/- ACRES Being Developed/Disturbed: 1.29 +/- ACRES
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: 250 +/- ACRES
6. Has the site drainage been evaluated in the past? ☐ YES ☒ NO If yes, please identify documentation: _____
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: NEAR NORTHEAST CORNER OF SITE
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.**

Local Entity File No.	Revision	Date

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: ORAN K. GRAGSON BLDG. ADDITION		Map ID:
Firm Name: LOCHSA		Engineer: Guy Morris, PE
Address: 6345 S. JONES BLVD. STE. 100		
City: LAS VEGAS	State: NV	Zip: 89118
Phone Number: (702) 365-9312	Fax Number: (702) 365-9317	
Property Owner: SCHOOL BOARD OF TRUSTEES		
Address: 1180 MILITARY TRIBUTE PLACE		
City: HENDERSON	State: NV	Zip: 89074
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 ☐ | Design Manual Standard Form 1 with the engineer's seal and signature. |
| Yes ☒ | No ☐ | Design Manual Standard Form 4 . |
| Yes ☒ | No ☐ | 2 copies of the 24" x 36" Drainage Plan. |
| No ☐ | N/A ☒ | A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. |

II. MAPS AND EXHIBITS

- | | | |
|---|-----------------------------|---|
| Yes ☒ | No ☐ | A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. |
| Yes ☒ | No ☐ | A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated. |

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

Yes	No	
☒	☐	Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.
☒	☐	On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
☒	☐	Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

Yes	No	
☒	☐	Sheet size: 24" x 36" 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.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
	N/A	Streets with off-set 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 storm peak flows at basin concentration points.
✓		Concentration points and drainage flow direction 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.
✓		Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved 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.
	N/A	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs.
	N/A	Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.
	N/A	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.
	N/A	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
	N/A	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
☒	<u>N/A</u>	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 site 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.
☐	<u>N/A</u>	Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes	No	
☒	☐	Appropriate soil information and Soils Map for existing and future conditions with subbasins 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 future 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 subbasin 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.
☒	☐	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.
☐	<u>N/A</u>	Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
☒	N/A	Flow split calculations and supporting documentation or reference for the method of flow split calculations 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. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ 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.
☐	N/A	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
☐	N/A	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. Buildings 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.
☐	N/A	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.
☐	N/A	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 drain pipes 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.
☐	N/A	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2

Technical Drainage Study For Oran K. Gragson Elementary School Addition

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A	Hydrologic Analysis
B	Hydraulic Calculations
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1. GENERAL LOCATION AND DEVELOPMENT DESCRIPTION

1.1 Purpose

Lochsa Engineering has been retained by School Board of Trustees to provide a Technical Drainage Study for the proposed Building Addition at the Gragson Elementary School located 265 feet south of the southeast corner of Bonanza Road and Honolulu Street. The proposed improvements are limited to the proposed 2-story classroom building (1), a proposed garden area and a proposed Kindergarten playground turf area. The proposed improvements are located within an existing grass area and existing paved area. The proposed improvements are located approximately 265 feet south of the southeast corner of Bonanza Road and Honolulu Street intersection.

The purpose of this study is to provide a detailed hydrologic analysis of the site and watershed impacting it, and to substantiate the flood control design for the proposed improvements. The Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (HCDDM) and the 2018 Las Vegas Valley Flood Control Master Plan Update (2018 MPU) have been compiled and utilized to prepare this study. This report presents summary of the hydrologic and hydraulic analyses, methodology, and results of the study.

1.2 Location of Property

The property is located approximately 265 feet south of the southeast corner of Bonanza Road and Honolulu Street intersection. The project site is bordered to the north by an existing soccer field and then Bonanza Rd., east by an existing paved play area, south by an existing school building and paved parking lot and west by Honolulu St. There is one (1) proposed building on the site. The project site occupies a parcel identified by the Assessor's Parcel Number (APN) 140-31-102-003. The site occupies a portion of the Northern Half (N1/2) of the Northwest Quarter (NW 1/4) of Section 31, Township 20 South, Range 62 East, of the M.D.M., in Clark County, Nevada. Please refer to the copy of the Assessor's Parcel Map provided in the appendix. Figure 1 in Appendix C also provides the location of the subject site in relation to the surrounding major streets.

1.3 Description of Property

The project site occupies approximately 1.29 acres. The project area is entirely existing paved area and some grass area. The site generally slopes to the northeast at approximately 1.40%. A review of the 2018 CCRFCD W-5 Map indicates that the site is located within the hydrologic soil groups 'B' and 'C', defined as soils with "low infiltration rate, and moderately high runoff potential."

2. DRAINAGE DESCRIPTION

In the CCRFCD's 2018 MPU (Reference 2), the valley was hydrologically divided into ten watersheds and each watershed was further subdivided into sub-basins. The onsite and offsite basins impacting the subject project area fall within the Central watershed. As shown in Figure W-5 of the 2018 MPU, the project site is all located within sub-basin CA08-C.

2.1 Existing Drainage Condition

The offsite drainage areas tributary to the site have been partially addressed from the CLV Central Neighborhood Flood Control MPU. As shown in Figure E-11 from the Neighborhood Study, the 10yr and 100yr runoff within Bonanza Road were determined to be 362cfs and 1044cfs, respectively. Please note that the flows utilized in the reference study were from an older Neighborhood Study and these now govern for our Site. However, our site is located 265ft south of Bonanza Rd. and is protected by an existing landscape berm along Bonanza Rd. An existing soccer field also lies between our site and Bonanza Rd.

For the flows west of our site within Honolulu Street, our site is located at the upstream end of the street. We have performed our own offsite basin analysis for the flows impacting Honolulu Street from the west. An offsite exhibit (Figure OF1) has been created and included in Appendix C (Figures). It was determined offsite basin FX1 (7.13 acres) impacts Honolulu Street west of our site. The main area west of our site consists of Condos and Honolulu Street. Offsite basin FX1

discharges 5 and 13cfs in the 10 and 100yr storm events respectively. The flows mainly come from the west where the existing Condos convey flow east to Honolulu Street. Once they reach Honolulu Street, the flows discharge south along the west boundary of our site. Please note these flows are existing and proposed conditions, representing worse-case scenario for our development since a future storm drain in Bonanza Rd. is planned.

Figure OF1 also shows an offsite basin FX2 (1.31 acres) that is located just north of our site. Offsite basin FX2 consists of a soccer field. The flows discharge in a southeast direction. Offsite basin FX2 discharges 1 and 3cfs in the 10yr and 100yr storm events. These flows ultimately discharge to an existing concrete valley gutter that runs along the north boundary of our site.

The onsite basins have been divided into two sub-basins and are identified as NX1 and NX2. Refer to Figure DR1, *Existing Condition Basin Map*, for basin boundaries and flow paths. Basin NX1 (0.28ac.) is currently an existing paved area that drains in a southwest direction to an existing parking lot. Basin NX1 discharges <1 and 1cfs in the 10yr and 100yr storm events respectively. These flows ultimately combine with offsite basin FX1 flows in Honolulu Street south of our site at combination point CPX1 (5/14cfs).

Basin NX2 (1.01ac.) is currently mainly a grass area with sporadic hard dirt and paved areas which drain in a northeast direction to an existing concrete valley gutter that runs along the north boundary of our Site. Basin NX2 discharges 2 and 4cfs in the 10yr and 100yr storm events

respectively. These flows ultimately combine with offsite basin FX2 flows in the concrete valley gutter at the northeast corner of our site at combination point CPX2 (3/7cfs). These flows ultimately traverse east across the entire school site, where existing grates intercept the flow for an onsite storm drain system.

The most relevant study near the subject site includes the “*Technical Drainage Study for Bonanza - Sandhill Ball Fields*”, by Martin & Martin, approved on August 15, 2002 (DS# 3149 – Reference 5). Reference 5 makes up the soccer field north of our project site and areas east of our project site. The main purpose of Reference 5 for our analysis is to show our development is not negatively impacting their onsite storm drain where various grates are intercepting flow onsite. Unfortunately, they did not include a basin map for flows but our analysis of existing vs developed shows there is no increase of flow at our discharge points.

Please refer to Figure DR1 (Existing Drainage Plan) for the delineation of each onsite basin and Figure OF1 (offsite basin map in Appendix C) for our offsite basins.

The hydrologic analysis of the above mentioned offsite basins tributary to the site, as analyzed in Reference 5, have been incorporated into the site specific analyses provided with the subject study. Additionally, the offsite basins are located within the McCarran Airport Rainfall Area, hence the point precipitation values for the 10-year and 100-year 6-hour storms are 1.58” and 2.77” respectively.

The HEC-1 Flood Hydrograph Package was utilized to determine the relevant onsite runoff flows. Utilizing the 1-ft topographic map for the project site, the site was delineated into onsite basins and offsite basins. The delineation of the onsite basins as well as offsite basins are depicted on Exhibit DR1, labeled as the 'Existing Drainage Plan'. Referenced flows are also labeled on the plan. Excerpts of the basin maps and hydrologic analysis from the referenced studies have been included in the appendix.

2.2 Interim Drainage Condition

For the interim condition, the analysis of the offsite basins will remain the same as in the existing condition, while the site will be developed to consist of the proposed School building addition with surrounding parking lot. Therefore, the estimated flow rates from the offsite basins will remain the same as analyzed in the existing condition. See Figure DR2 (Interim/Developed Drainage Plan) for the flows and referenced flows in Bonanza Rd. for the site.

The developed site is analyzed as two (2) drainage basins labeled ND1 and ND2. Basin ND1 (1/1cfs) is 0.28ac. of a paved surface that discharges southwest to an existing parking lot. These flows match the existing condition and there is no increase from the historical pattern and flow rates.

Basin ND2 (1.01 ac. – 2/4cfs) is located north of onsite basin ND1 and runoff from this basin travels east and then north to an existing valley gutter at the northeast corner of the Site. Again, these flows match the existing condition and there is no increase from the historical pattern and flow rates.

The combination points show the 100r flows for existing and developed conditions match each other. There is no negative impact to downstream properties with the development of the site. CPX1 flows match CPD1 and CPX2 flows match CPD2 flow. See Figure DR2 (interim/developed conditions).

The HEC-1 Flood Hydrograph Package is utilized to determine the relevant onsite runoff flows. Utilizing the 1-ft topographic map for the project site, the site is delineated into onsite basins and offsite basins. The delineation of the onsite basins as well as offsite basins are depicted on Exhibit DR2, labeled as the 'Interim / Developed Drainage Plan'. Referenced flows are labeled on Figure DR2 for Bonanza Rd. Excerpts of the basin maps and hydrologic analysis from the referenced studies have been included in the appendix.

There are no onsite swales required for this site. Since there is no parking lot proposed, we are not required to satisfy the water quality Best Management Practice (BMP) requirement in Section 1500 of the CCRFCD Drainage Design Manual.

Normal depth calculations are being provided for Honolulu Street (section A) and Bonanza Road (section B). As shown in the attached FlowMaster output, flows within Honolulu Street are well below the maximum allowable velocity x depth ($v \times d$) values of 6.0 and 8.0 during 10- and 100-year storm events, respectively. Flows within Honolulu Street remain the same in existing and developed conditions since the upstream offsite area is constructed. Flows within Bonanza Rd. are NOT below the maximum allowable velocity x depth ($v \times d$) values of 6.0 and 8.0 during 10- and 100-year storm events, respectively. However, this is an existing condition. Our site is not discharging any additional flow into Bonanza Rd. Also, since the site adjacent has already been constructed, an existing landscape berm has been provided along the south side of Bonanza Rd. to protect our site a minimum of the 100yr double flow depth in Bonanza Rd.

As shown in the attached grading plan and exhibits, the finished floor (FF) elevation for the proposed building is more than double the 100yr flow depth in Honolulu Street. From the north, the site is protected by an existing landscape berm along Bonanza Rd. Normal depth calculations are also provided at one (1) location (Section 1) within the project site to illustrate the acceptable onsite flows through the project site. The FF is a minimum of double the 100yr flow depth onsite flow.

2.3 Future Drainage Condition

For the future condition, both the site and all the local offsite basins are assumed to be fully developed. One of the changes from the interim analysis is that the offsite flow north of our site will decrease substantially per the CLV Neighborhood Study MPU. A future storm drain upstream will be conveying a majority of the storm flow; thus reducing the street flow greatly. The flows reduce to 59 and 131 cfs in the street per the CLV Neighborhood MPU. Our design is already based on worse case scenario.

The building has been flood protected to twice the depth of flow onsite. As shown in the attached grading plan and exhibits, the finished floor (FF) elevation for the proposed building is more than double the 100yr flow depth within Honolulu Street.

2.4 Master Planning Information

The “*2018 Las Vegas Valley Flood Control Master Plan Update*” (2018 MPU, Reference 2), dated September 2018, as prepared by ATKINS, illustrates the existing and proposed regional master planned facilities. The CCRFCD facility exhibits and inventory tables were updated in 2018. Review of Figure F-30 of the 2018 MPU indicates that proposed improvements are not adjacent to a regional facility.

2.5 Floodplain Information

The project site is covered by Flood Insurance Rate Map (FIRM) for the Clark County, Nevada, and incorporated areas, Community Panel Number: 32003C2187F, Effective Date: November 16, 2011. The Site is entirely within FEMA Flood Zone “X” (un-shaded), defined as: “*Areas determined to be outside the 0.2% annual chance floodplain*”. Please refer to the attached Figure 2 for the location of the site on a portion of the FIRM Map Index.

2.6 Previous Drainage Studies

The overall area is covered within the CCRFCD “*2018 Las Vegas Valley Flood Control Master Plan Update, Volume I and II*” (Reference 2). The site is also covered in the FIRM for the Clark County, Nevada and incorporated areas, Community Panel Number: 32003C2187F, Effective Date: November 16, 2011.

The most relevant study near the subject site includes the “*Technical Drainage Study for Bonanza - Sandhill Ball Fields*”, by Martin & Martin, approved on August 15, 2002 (DS# 3149 – Reference 5). Reference 5 makes up the soccer field north of our project site and areas east of our project site. The main purpose of Reference 5 for our analysis is to show our development is not negatively impacting their onsite storm drain where various grates are intercepting flow onsite. Unfortunately, they did not include a basin map for flows but our analysis of existing vs developed shows there is no increase of flow at our discharge points.

The offsite drainage areas tributary to the site have been partially addressed from the CLV Central Neighborhood Flood Control MPU. As shown in Figure E-11 from the Neighborhood Study, the 10yr and 100yr runoff within Bonanza Road were determined to be 362cfs and 1044cfs, respectively. Please note that the flows utilized in the reference study were from an older Neighborhood Study and these now govern for our Site. However, our site is located 265ft south of Bonanza Rd. and is protected by an existing landscape berm along Bonanza Rd. An existing soccer field also lies between our site and Bonanza Rd.

Lochsa Engineering generally concurs with all the pertinent referenced analyses and results utilized in this study.

2.7 Compliance with CCRFCD Best Management Practices (BMP)

Since our site is only a building and a play area for kids, we are not required to satisfy the water quality BMP requirement in Section 1500 of the CCRFCD Drainage Design Manual. As shown in the grading plan, riprap-lined swales are not being proposed throughout the project site. There is no parking on our site.

3. PROPOSED DRAINAGE FACILITIES

3.1 General Description

The proposed improvements are limited to the proposed building (1) and an associated turf play area for kids. The proposed improvements are located within an existing graded area already.

3.2 Compliance with Regulations and Adopted Plans

The hydrologic analysis and drainage design of this development is in compliance with local requirements, including the CCRFCD “*Hydrologic Criteria and Drainage Design Manual*” (HCDDM) (Reference 1), and the CCRFCD “*2018 Las Vegas Valley Flood Control Master Plan Update*” (Reference 2). The site design is also in compliance with FEMA’s FIRM with panel number 23003C2187F (Reference 4).

3.3 Hydrologic Criteria

The onsite basins of the subject project area all fall within the Central watershed. The hydrologic and hydraulic analyses presented in this report are carried out in accordance with the CCRFCD’s HCDDM (Reference 1). The rainfall values used for the hydrologic analysis of the site represent the 10-year and 100-year storm recurrence events, each with six-hour duration. The site is within the boundary for using the McCarran Airport Rainfall Data. Therefore, the rainfall values for the 6-hour, 10-year and 100-year storm events are determined from Table 505 as 1.58 and 2.77 inches, respectively.

The rainfall losses due to infiltration, interception, etc. are represented using the SCS curve number (CN) method recommended in the CCRFCD HCDDM (Reference 1). The SCS method divides the soils into four hydrologic groups as A, B, C and D. Review of the 2018 MPU's Figure W-5 indicates that the site is located within the hydrologic soil group 'B', defined as soils with moderately high infiltration rate and a moderately low runoff potential. Soil type 1341 (soil type 'B') covers 100% of the site. The CN values for the different land use were determined from Table 602 (page 1) of the CCRFCD HCDDM. The runoff hydrograph is determined from the design precipitation for each sub-basin using the Soil Conservation Service (SCS) unit hydrograph method. Calculations used in the hydrologic analysis for the onsite basins for existing and proposed conditions are attached in Appendix A.

3.4 Facility Design Calculations

All drainage facilities within this project have been designed in accordance with the CCRFCD "*Hydrologic Criteria and Drainage Design Manual*" (Reference 1). The onsite drainage plan has been developed to closely resemble existing drainage patterns, and to minimize any impact to the adjacent properties.

4. CONCLUSIONS AND RECOMMENDATIONS

1. This project is in compliance with the applicable drainage laws as recognized by the State of Nevada.
2. This project is in compliance with the CCRFCD “2018 Las Vegas Valley Flood Control Master Plan”, as well as the CCRFCD “*Hydrologic Criteria and Drainage Design Manual*”.
3. The site and the proposed improvements are located entirely within areas designated by FEMA as Zone “X” (unshaded), described by FEMA “*Areas determined to be outside the 0.2% annual chance floodplain.*”
4. The drainage facilities for this project have been designed to convey runoff from the 100-year storm safely through the site. In addition, they have been designed based on generally accepted engineering practices.
5. No adverse effects are expected either upstream or downstream of the subject site.

5. REFERENCES

1. Clark County Regional Flood Control District, "*Hydrologic Criteria and Drainage Design Manual*", August 1999.
2. ATKINS, "*2018 Las Vegas Valley Flood Control Master Plan Update, Volume 1 and II*", September 2018.
3. W-5 Map from 2018 CCRFCD MPU
4. Federal Emergency Management Agency, "*Flood Insurance Rate Maps; Community Panel Numbers 32003C2187F; Clark County, Nevada and Incorporated Areas*," Dated November 16, 2011.
5. CLV Central Neighborhood Study MPU, Figures E-11 and F-11
6. TDS for Bonanza - Sandhill Ball Fields (DS #3149), approved by City of Las Vegas on August 15, 2002.

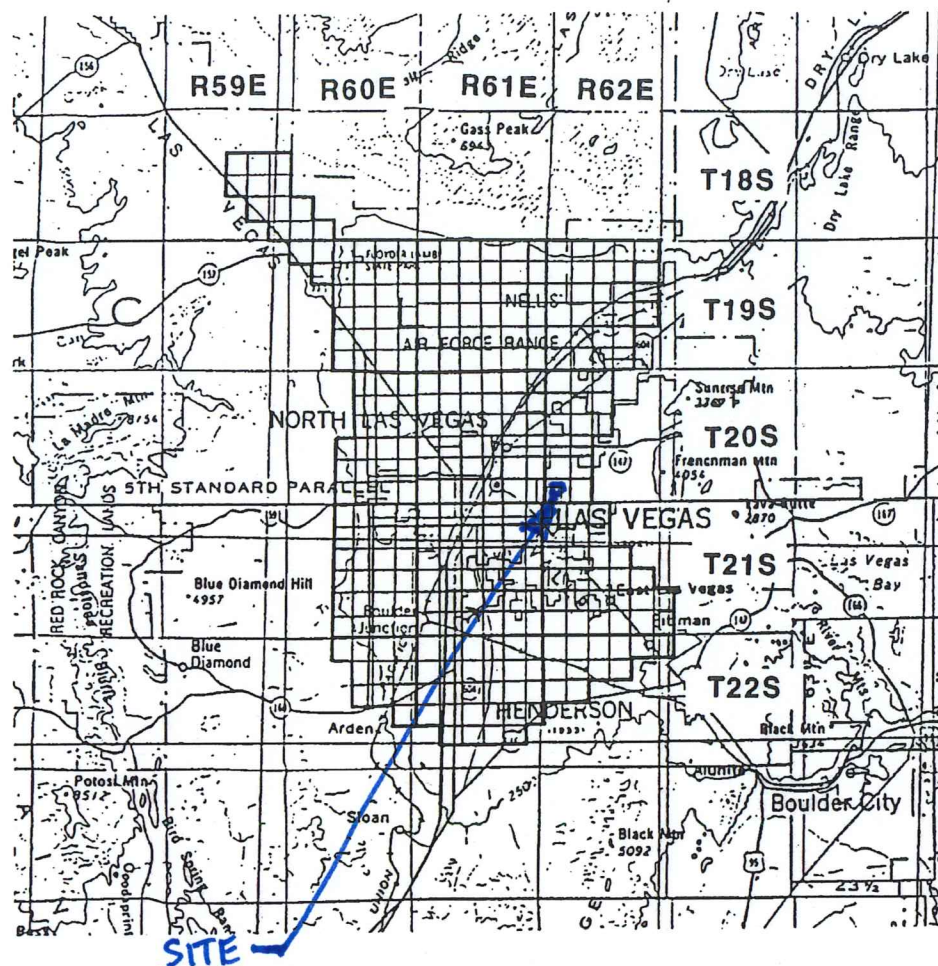
APPENDIX A

HYDROLOGIC ANALYSIS

HYDROLOGIC CHARTS

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DEPTH-DURATION-FREQUENCY VALUES FOR McCARRAN AIRPORT RAINFALL AREA (IN INCHES)

TIME	RECURRENCE INTERVAL					
	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

WRC
ENGINEERING

REFERENCE:

USACE, Los Angeles District, 1988

TABLE 505

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

Percent of Total Storm Depth				Percent of Total Storm Depth			
Storm Time (In Minutes)	SDN3	SDN4	SDN5	Storm Time (In Minutes)	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

SOIL MAP W-5 AND CURVE NUMBER MATRIX

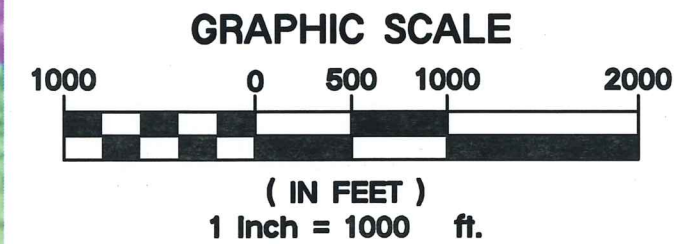
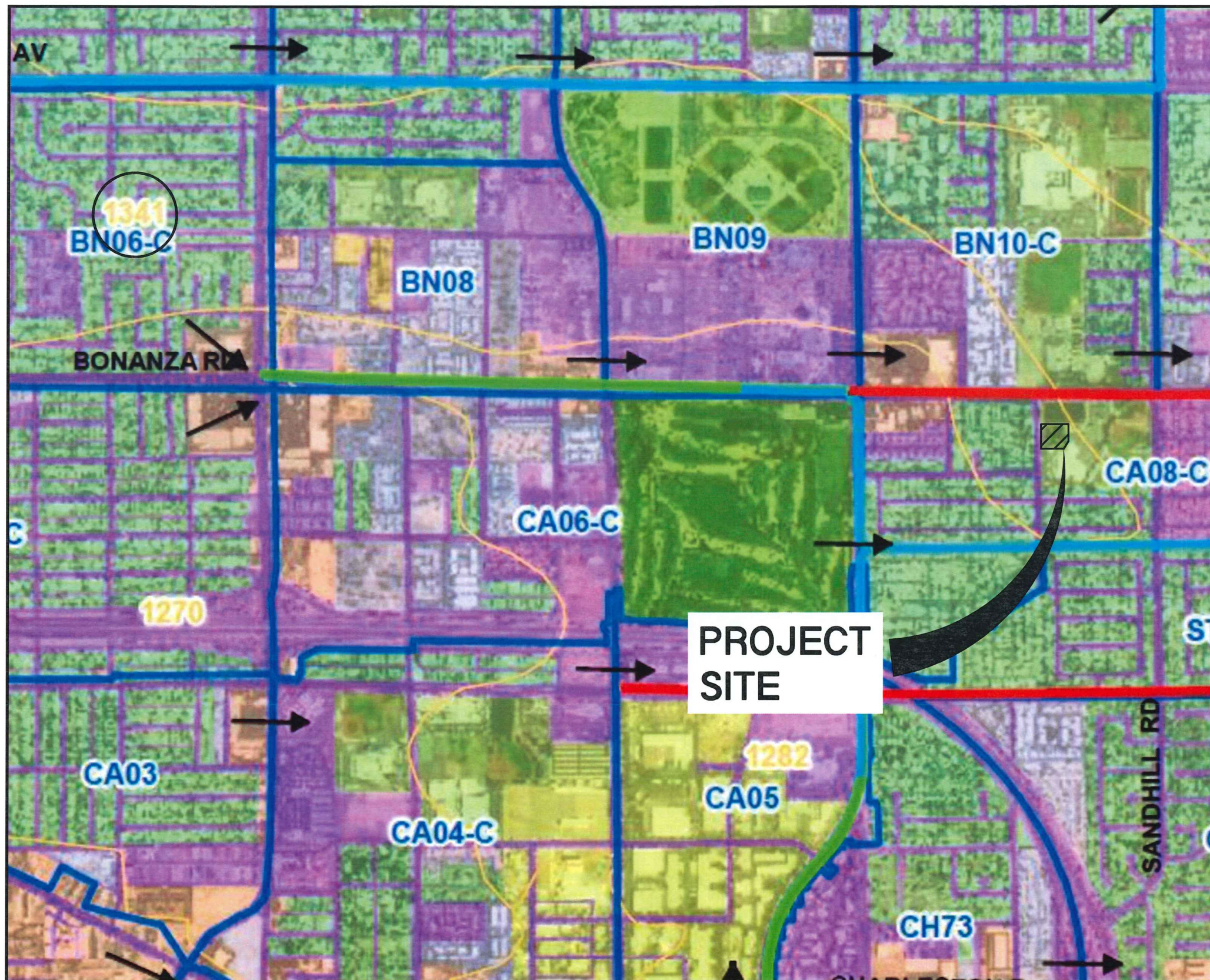


Figure W-5
Central Watershed

Legend

- Flow Arrows
- Concentration Points
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Ultimate Development Boundary
- Watershed
- Subbasins
- Soils
- 1: Undeveloped Land, Open desert
- 2: Parks, Golf Courses
- 3: Rural, 0.5-1 units per acre (uses 1 unit/acre)
- 4: Low-Density Residential, 1-2 units per acre (uses 2 units/acre)
- 5: Medium-Density Residential, 2-4 units per acre (uses 3 units/acre)
- 6: High-Density Residential, 4-8 units per acre (uses 6 units/acre)
- 7: Public Facility and Residential, 8-12 units/acre
- 8: Very High-Density Residential, 12 units/acre or more
- 9: Commercial, Retail, Casino, High Rise Condominiums
- 10: Light Industrial
- 11: Heavy Industrial
- 12: Schools
- 13: Lakes

SUBBASIN:
CA08-C

1341:
100% B-SOIL

DRAWN BY: JMD	SCALE: 1"=1000'	FILE NAME: C-201091-WMAP
CHECKED BY: HMN	DATE: 11/5/20	LEGEND
FOUND MONUMENTATION ⊕		
CENTER LINE — — — — —		
ROW LINE — — — — —		
EASEMENT LINE — — — — —		
SECTION LINE — — — — —		
PROPERTY LINE — — — — —		
ADJACENT PROPERTY LINE ·········		

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**FIGURE W-5
CENTRAL WATERSHED**

**ORAN K. GRAGSON
ELEMENTARY SCHOOL**

PROJECT No.:
201091

SHEET No.

W-5

SHEET 1 OF 1

Curve Number Matrix

SOIL MAP UNIT	HYDROLOGIC SOIL GROUP					LAND USE CATEGORY INDEX NUMBER												
	A	B	C	D	ROCK OUTCROP	1	2	3	4	5	6	7	8	9	10	11	12	13
	CN --->					63	47	57	60	62	74	84	89	92	86	92	71	30
		CN --->				77	66	73	74	76	83	89	93	94	91	94	81	30
			CN --->			85	77	82	83	84	88	92	95	95	93	95	87	30
				CN --->		88	83	86	87	88	91	94	96	96	95	96	90	30
						CN --->	90	90	92	92	92	94	96	97	96	97	94	30
						%	%	%	%	SOIL TYPE COMPOSITE CN FOR LAND USE CATEGORY								
1301	0	0	0	100	0	88.0	83.0	86.0	87.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1302	35	20	0	45	0	77.0	67.0	73.0	75.0	76.0	83.0	89.0	93.0	94.0	91.0	94.0	82.0	30.0
1305	5	0	35	60	0	86.0	79.0	83.0	84.0	85.0	89.0	93.0	95.0	96.0	94.0	96.0	88.0	30.0
1307	10	0	30	60	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	96.0	93.0	96.0	87.0	30.0
1313	8	68	0	24	0	79.0	68.0	75.0	76.0	78.0	84.0	90.0	93.0	94.0	91.0	94.0	82.0	30.0
1314	80	5	0	15	0	67.0	53.0	62.0	65.0	67.0	77.0	86.0	91.0	92.0	88.0	92.0	74.0	30.0
1320	0	2	0	83	15	88.0	83.0	87.0	87.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1323	0	0	0	85	15	88.0	84.0	87.0	88.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	91.0	30.0
1325	100	0	0	0	0	63.0	47.0	57.0	60.0	62.0	74.0	84.0	89.0	92.0	86.0	92.0	71.0	30.0
1326	100	0	0	0	0	63.0	47.0	57.0	60.0	62.0	74.0	84.0	89.0	92.0	86.0	92.0	71.0	30.0
1340	9	0	0	71	20	86.0	81.0	85.0	85.0	86.0	90.0	93.0	95.0	96.0	94.0	96.0	89.0	30.0
100% B-SOIL 1341	0	100	0	0	0	77.0	66.0	73.0	74.0	76.0	83.0	89.0	93.0	94.0	91.0	94.0	81.0	30.0
1342	0	7	0	78	15	88.0	83.0	86.0	87.0	87.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1360	15	0	0	35	50	85.0	81.0	84.0	85.0	86.0	90.0	93.0	95.0	96.0	94.0	96.0	89.0	30.0
1380	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1390	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1400	0	0	0	100	0	88.0	83.0	86.0	87.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1415	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1417	5	0	55	10	30	86.0	80.0	84.0	85.0	86.0	89.0	93.0	95.0	96.0	94.0	96.0	89.0	30.0
1419	35	0	55	10	0	78.0	67.0	74.0	75.0	77.0	83.0	89.0	93.0	94.0	91.0	94.0	82.0	30.0
1440	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1450	1	0	0	89	10	88.0	83.0	86.0	87.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1484	0	0	0	100	0	88.0	83.0	86.0	87.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1500	60	0	0	35	5	73.0	61.0	69.0	71.0	73.0	81.0	88.0	92.0	93.0	89.0	93.0	79.0	30.0
1501	100	0	0	0	0	63.0	47.0	57.0	60.0	62.0	74.0	84.0	89.0	92.0	86.0	92.0	71.0	30.0
1502	60	0	0	40	0	73.0	61.0	69.0	71.0	72.0	80.0	88.0	92.0	93.0	89.0	93.0	79.0	30.0
1505	55	0	0	40	5	74.0	63.0	70.0	72.0	74.0	81.0	88.0	92.0	94.0	90.0	94.0	80.0	30.0
1506	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1508	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1510	10	0	0	55	35	86.0	82.0	85.0	86.0	87.0	90.0	93.0	95.0	96.0	94.0	96.0	89.0	30.0
1540	100	0	0	0	0	63.0	47.0	57.0	60.0	62.0	74.0	84.0	89.0	92.0	86.0	92.0	71.0	30.0
1541	4	0	0	76	20	87.0	83.0	86.0	87.0	87.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1542	60	0	30	10	0	72.0	59.0	67.0	69.0	71.0	80.0	87.0	92.0	93.0	89.0	93.0	78.0	30.0
1545	60	0	10	30	0	73.0	60.0	68.0	70.0	72.0	80.0	88.0	92.0	93.0	89.0	93.0	78.0	30.0
1600	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1605	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1610	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1615	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1630	0	0	0	100	0	88.0	83.0	86.0	87.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1635	7	0	5	63	25	87.0	82.0	85.0	86.0	87.0	90.0	94.0	95.0	96.0	94.0	96.0	89.0	30.0
1640	0	0	0	10	90	90.0	90.0	91.0	91.0	92.0	94.0	96.0	96.0	97.0	96.0	97.0	94.0	30.0
1645	0	0	100	0	0	85.0	77.0	82.0	83.0	84.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1674	27	26	0	45	2	78.0	69.0	75.0	76.0	78.0	84.0	90.0	93.0	94.0	91.0	94.0	83.0	30.0
1700	0	0	3	93	4	88.0	83.0	86.0	87.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1710	2	89	0	9	0	78.0	67.0	74.0	75.0	77.0	83.0	89.0	93.0	94.0	91.0	94.0	82.0	30.0
1731	10	2	0	88	0	85.0	79.0	83.0	84.0	85.0	89.0	93.0	95.0	96.0	94.0	96.0	88.0	30.0
1732	3	0	0	96	1	87.0	82.0	85.0	86.0	87.0	90.0	94.0	95.0	96.0	94.0	96.0	89.0	30.0
1753	0	8	0	90	2	87.0	81.0	85.0	86.0	87.0	90.0	93.0	95.0	96.0	94.0	96.0	89.0	30.0
1850	0	0	0	94	6	88.0	83.0	86.0	87.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	90.0	30.0
1853	0	0	0	85	15	88.0	84.0	87.0	88.0	88.0	91.0	94.0	96.0	96.0	95.0	96.0	91.0	30.0
1871	17	0	0	83	0	84.0	76.0	81.0	82.0	83.0	88.0	92.0	95.0	95.0	93.0	95.0	87.0	30.0
1999	100	0	0	0	0	63.0	47.0	57.0	60.0	62.0	74.0	84.0	89.0	92.0	86.0	92.0	71.0	30.0

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
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 $I_p = 0.25$.

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

**WRC
ENGINEERING**

REFERENCE:
SCS TR-55, USDA, June 1986.

**TABLE 602
1 of 4**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

Average Lot Size or Usage ¹	Percent Impervious ²	Curve Number for Hydrologic Soil Groups			
		A	B	C	D
Apartments/Condos	72	81	88	91	93
Townhouses/6,000 sq ft lots or less ³	69	80	87	90	92
7,000 sq ft lots	63	76	84	89	91
8,000 sq ft lots	58	73	82	88	90
10,000 sq ft lots	38	61	75	83	87
14,000 sq ft lots	30	57	72	81	86
20,000 sq ft lots	25	54	70	80	85
40,000 sq ft lots	20	51	68	79	84
80,000 sq ft lots	12	46	65	77	82

1 Lot size should represent the size of the average lot and not the gross acreage divided by the number of lots.

2 Actual percent impervious value should be compared to selected land use type.

3 In cases where average residential lots are smaller than 6,000 sq ft, commercial/business/industrial land use should be used.

Revision	Date

REFERENCE:

TABLE 602A

HYDROLOGY

Curve Number Calculations
 ORAN GRAGSON BUILDING ADDITION

Sub-Basin: NX1
 Total Area: 0.28 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	0.08	B	30%	98	29.4
Open Space: Poor Condition	0.17	B	60%	79	47.4
Newly graded area (pervious area only, no vegetation)	0.03	B	10%	86	8.6
Total:					
	0.28	-	100%	-	85.4

Curve Number Calculations
 ORAN GRAGSON BUILDING ADDITION

Sub-Basin: NX2
 Total Area: 1.01 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	1.01	B	100%	98	98.0
Total:					
	1.01	-	100%	-	98.0

Curve Number Calculations
 ORAN GRAGSON BUILDING ADDITION

Sub-Basin: FX1
 Total Area: 7.13 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Newly graded area (pervious area only, no vegetation)	7.13	B	100%	86	86.0
Total:	7.13	-	100%	-	86.0

Curve Number Calculations
 ORAN GRAGSON BUILDING ADDITION

Sub-Basin: FX2
 Total Area: 1.31 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	0.20	B	15%	98	14.7
Residential: Apartments/Condos	1.11	B	85%	88	74.8
Total:	1.31	-	100%	-	89.5

Curve Number Calculations
 ORAN GRAGSON BUILDING ADDITION

Sub-Basin: ND1
 Total Area: 0.28 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	0.28	B	100%	98	98.0
Total:	0.28	-	100%	-	98.0

Curve Number Calculations
 ORAN GRAGSON BUILDING ADDITION

Sub-Basin: ND2
 Total Area: 1.01 Acres

Land Use/Cover type	Area [A] (acres)	Soil Type	Percentage, P [P]	Curve Number [CN]	Product {CN x P}
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	1.01	B	100%	98	98.0
Total:	1.01	-	100%	-	98.0

HEC-1 MODEL OUTPUT

(EXISTING CONDITIONS)

Peak Flow Summary

Existing Condition

HEC-1 ID	Area (acres)	10-year Flow (cfs)	100-year Flow (cfs)	
FX1	7.13	5	13	
NX1	0.28	<1	1	
CPX1	-	5	14	(FX1+NX1)
FX2	1.31	1	3	
NX2	1.01	2	4	
CPX2	-	3	7	(FX2+NX2)

X

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1*****
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 05NOV20 TIME 11:03:29 *
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*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
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X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXXX X
X X X X X X
X X X X X
X X XXXXXXX XXXXX XXX
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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 -AMSK- 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 ORAN K GRAGSON BUILDING ADDITION
2 ID ***** TECHNICAL DRAINAGE STUDY *****
3 ID EXISTING CONDITION - ONSITE AND OFFSITE
4 ID USING SCS METHODS AND KINEMATIC WAVE ROUTING
5 ID MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION
6 ID
7 ID LOCHSA JOB # 201091
8 ID
9 ID
10 ID INPUT FILE NAME: X.DAT
11 ID
12 ID NOVEMBER 2020
13 ID
14 ID *****
15 ID *****
16 ID MCCARRAN AIRPORT RAINFALL AREA
17 ID 10 & 100 YEAR - 6 HOUR STORM EVENT
18 ID PRECIPITATION:
19 ID 10-YEAR : 1.58 INCHES
20 ID 100-YEAR : 2.77 INCHES
21 ID 10-YEAR/100-YEAR : 1.58/2.77= 0.5700
22 ID *****
23 ID *****
24 *DIAGRAM
25 IT 5 200
26 IO 5 0
27 IN 5
JR PREC .5700 1.0
28 KK FX1
29 KM OFFSITE BASIN WEST OF THE PROJECT SITE, INCLUDING HONOLULU STREET
30 PB 2.770
31 PC 0.0 .02 .057 .07 .087 .108 .124 .13 .13 .13
32 PC .13 .13 .13 .133 .14 .142 .148 .158 .172 .181
33 PC .19 .197 .199 .2 .201 .204 .214 .229 .241 .249
34 PC .251 .256 .27 .278 .281 .283 .295 .322 .352 .409
35 PC .499 .59 .71 .744 .781 .812 .819 .835 .851 .856
36 PC .86 .868 .876 .888 .91 .926 .937 .95 .97 .976
37 PC .982 .985 .987 .989 .99 .993 .993 .994 .995 .998
38 PC .998 .999 1.0
39 BA .01114
40 LS 0 86.0
41 UD .170
*
42 KK NX1
43 KM ONSITE BASIN DISCHARGING SOUTH TO ADJACENT PARKING LOT
44 BA .00044
45 LS 0 85.4
46 UD 0.050
*
```

1 HEC-1 INPUT PAGE 2

```
LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
47 KK CPX1
48 KM COMBINE FX1 AND NX1 FOR TOTAL FLOWS IN HONOLULU STREET SOUTH OF OUR SITE
49 HC 2
*
50 KK FX2
51 KM OFFSITE BASIN NORTH OF THE PROJECT SITE
52 BA .00205
53 LS 0 89.5
```

54 UD 0.097 X
 *
 55 KK NX2
 56 KM ONSITE BASIN DISCHARGING NORTHEAST TO EXISTING CONCRETE VALLEY GUTTER
 57 BA .00158
 58 LS 0 98.0
 59 UD 0.057
 *
 60 KK CPX2
 61 KM COMBINE FX2 AND NX2 FOR TOTAL FLOWS IN EXISTING VALLEY GUTTER AT NEC OF OUR S
 62 HC 2
 *
 63 ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
 NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
 28 FX1
 .
 42 . NX1
 .
 47 CPX1.....
 .
 50 . FX2
 .
 55 . NX2
 .
 60 . CPX2.....

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****

 *
 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * JUN 1998 *
 * VERSION 4.1 *
 *
 * RUN DATE 05NOV20 TIME 11:03:29 *
 *

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

ORAN K GRAGSON BUILDING ADDITION
 ***** TECHNICAL DRAINAGE STUDY *****
 EXISTING CONDITION - ONSITE AND OFFSITE
 USING SCS METHODS AND KINEMATIC WAVE ROUTING
 MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION

LOCHSA JOB # 201091

INPUT FILE NAME: X.DAT

NOVEMBER 2020

 MCCARRAN AIRPORT RAINFALL AREA
 10 & 100 YEAR - 6 HOUR STORM EVENT
 PRECIPITATION:
 10-YEAR : 1.58 INCHES
 100-YEAR : 2.77 INCHES
 10-YEAR/100-YEAR : 1.58/2.77= 0.5700

25 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 200 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 1 0 ENDING DATE
 NDTIME 1635 ENDING TIME
 ICENT 19 CENTURY MARK
 COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 16.58 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

X

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT					
+	FX1	.01	1 FLOW TIME	5. 3.58	13. 3.58
HYDROGRAPH AT					
+	NX1	.00	1 FLOW TIME	0. 3.50	1. 3.50
2 COMBINED AT					
+	CPX1	.01	1 FLOW TIME	5. 3.58	14. 3.58
HYDROGRAPH AT					
+	FX2	.00	1 FLOW TIME	1. 3.50	3. 3.50
HYDROGRAPH AT					
+	NX2	.00	1 FLOW TIME	2. 3.50	4. 3.50
2 COMBINED AT					
+	CPX2	.00	1 FLOW TIME	3. 3.50	7. 3.50

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

HEC-1 MODEL OUTPUT

(INTERIM / DEVELOPED CONDITIONS)

Peak Flow Summary

Developed Condition

HEC-1 ID	Area (acres)	10-year Flow	100-year Flow	
FX1	7.13	5	13	
ND1	0.28	1	1	
CPD1	-	5	14	(FX1+ND1)
FX2	1.31	1	3	
ND2	1.01	2	4	
CPD2	-	3	7	(FX2+ND2)

D

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1*****
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
*
* JUN 1998
*
* VERSION 4.1
*
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* RUN DATE 05NOV20 TIME 11:40:52
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*
* U.S. ARMY CORPS OF ENGINEERS
*
* HYDROLOGIC ENGINEERING CENTER
*
* 609 SECOND STREET
*
* DAVIS, CALIFORNIA 95616
*
* (916) 756-1104
*

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X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXX X
X X X X X X
X X X X X
X X XXXXXX XXXX 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 -AMSK- 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 ORAN K GRAGSON BUILDING ADDITION
2 ID ***** TECHNICAL DRAINAGE STUDY *****
3 ID DEVELOPED CONDITION - ONSITE AND OFFSITE
4 ID USING SCS METHODS AND KINEMATIC WAVE ROUTING
5 ID MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION
6 ID
7 ID LOCHSA JOB # 201091
8 ID
9 ID
10 ID INPUT FILE NAME: D.DAT
11 ID
12 ID NOVEMBER 2020
13 ID
14 ID *****
15 ID *****
16 ID MCCARRAN AIRPORT RAINFALL AREA
17 ID 10 & 100 YEAR - 6 HOUR STORM EVENT
18 ID PRECIPITATION:
19 ID 10-YEAR : 1.58 INCHES
20 ID 10-YEAR : 2.77 INCHES
21 ID 10-YEAR/100-YEAR : 1.58/2.77= 0.5700
22 ID *****
23 ID *****
24 ID *DIAGRAM
25 IT 5 200
26 IO 5 0
27 IN 5
JR PREC .5700 1.0
28 KK FX1
29 KM OFFSITE BASIN WEST OF THE PROJECT SITE, INCLUDING HONOLULU STREET
30 PB 2.770
31 PC 0.0 .02 .057 .07 .087 .108 .124 .13 .13 .13
32 PC .13 .13 .13 .133 .14 .142 .148 .158 .172 .181
33 PC .19 .197 .199 .2 .201 .204 .214 .229 .241 .249
34 PC .251 .256 .27 .278 .281 .283 .295 .322 .352 .409
35 PC .499 .59 .71 .744 .781 .812 .819 .835 .851 .856
36 PC .86 .868 .876 .888 .91 .926 .937 .95 .97 .976
37 PC .982 .985 .987 .989 .99 .993 .993 .994 .995 .998
38 PC .998 .999 1.0
39 BA .01114
40 LS 0 86.0
41 UD .170
*
42 KK ND1
43 KM ONSITE BASIN DISCHARGING SOUTH TO ADJACENT PARKING LOT
44 BA .00044
45 LS 0 98.0
46 UD 0.050
*

```

1

HEC-1 INPUT

PAGE 2

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
47 KK CPD1
48 KM COMBINE FX1 AND ND1 FOR TOTAL FLOWS IN HONOLULU STREET SOUTH OF OUR SITE
49 HC 2
*
50 KK FX2
51 KM OFFSITE BASIN NORTH OF THE PROJECT SITE
52 BA .00205
53 LS 0 89.5

```

D

54	UD	0.097	
	*		
55	KK	ND2	
56	KM	ONSITE	BASIN DISCHARGING NORTHEAST TO EXISTING CONCRETE VALLEY GUTTER
57	BA	.00158	
58	LS	0	98.0
59	UD	0.050	
	*		
60	KK	CPD2	
61	KM	COMBINE	FX2 AND ND2 FOR TOTAL FLOWS IN EXISTING VALLEY GUTTER AT NEC OF OUR S
62	HC	2	
	*		
63	ZZ		

1 SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
28	FX1	
	.	
42	.	ND1
	.	
47	CPD1.....	
	.	
50	.	FX2
	.	
55	.	ND2
	.	
60	.	CPD2.....

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

*		*
*	FLOOD HYDROGRAPH PACKAGE (HEC-1)	*
*	JUN 1998	*
*	VERSION 4.1	*
*		*
*	RUN DATE 05NOV20 TIME 11:40:52	*
*		*
*		*

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

ORAN K GRAGSON BUILDING ADDITION
 ***** TECHNICAL DRAINAGE STUDY *****
 DEVELOPED CONDITION - ONSITE AND OFFSITE
 USING SCS METHODS AND KINEMATIC WAVE ROUTING
 MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION
 LOCHSA JOB # 201091

INPUT FILE NAME: D.DAT
 NOVEMBER 2020

 MCCARRAN AIRPORT RAINFALL AREA
 10 & 100 YEAR - 6 HOUR STORM EVENT
 PRECIPITATION:
 10-YEAR : 1.58 INCHES
 100-YEAR : 2.77 INCHES
 10-YEAR/100-YEAR : 1.58/2.77= 0.5700

25 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	200	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	1 0	ENDING DATE
NDTIME	1635	ENDING TIME
ICENT	19	CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 16.58 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

D

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT +	FX1	.01	1 FLOW TIME	5. 3.58	13. 3.58
HYDROGRAPH AT +	ND1	.00	1 FLOW TIME	1. 3.50	1. 3.50
2 COMBINED AT +	CPD1	.01	1 FLOW TIME	5. 3.58	14. 3.58
HYDROGRAPH AT +	FX2	.00	1 FLOW TIME	1. 3.50	3. 3.50
HYDROGRAPH AT +	ND2	.00	1 FLOW TIME	2. 3.50	4. 3.50
2 COMBINED AT +	CPD2	.00	1 FLOW TIME	3. 3.50	7. 3.50

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

APPENDIX B

HYDRAULIC ANALYSIS

NORMAL DEPTH STREET HYDRAULICS

(10/100YR Existing & Developed Conditions)

Street Flow Summary
(Existing / Developed Condition)

10-year, 6-hour Storm

Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	10-Year Flow [Q10] (cfs)	10-Year Velocity [v] (fps)	10-Year Flow Depth [d] (ft)	10-Year Velocity x Depth [v x d]	Dry Lane Width (within 1/2 ROW) (ft)
Honolulu	60	A	5	2.14	0.44	0.94	N/A
Bonanza	100	B	362	4.61	1.36	6.27	N/A

Street Flow Summary
(Existing / Developed Condition)

100-year, 6-hour Storm

Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	100-Year Flow [Q100] (cfs)	100-Year Velocity [v] (fps)	100-Year Flow Depth [d] (ft)	100-Year Velocity x Depth [v x d]
Honolulu	60	A	13	2.30	0.59	1.36
Bonanza	100	B	1044	7.02	2.14	15.02

Section A - Honolulu - 10year Worksheet for Irregular Channel

Project Description	
Worksheet	Section A - Honolulu - 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	.005000 ft/ft
Discharge	5.00 cfs

FX1 Flow

Options	
Current Roughness Method	Overlotter's Method
Open Channel Weighting Method	Overlotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev.	85.17 ft
Elevation Range	84.73 to 85.71
Flow Area	2.3 ft ²
Wetted Perimeter	16.46 ft
Top Width	15.61 ft
Actual Depth	0.44 ft
Critical Elevation	85.17 ft
Critical Slope	0.004995 ft/ft
Velocity	2.14 ft/s
Velocity Head	0.07 ft
Specific Energy	85.24 ft
Froude Number	0.97
Flow Type	Subcritical

d₁₀

v₁₀

$$.44 \times 2.14 = 0.94 < 6 \text{ OK}$$

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+53.00	0.016
0+53.00	0+60.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	85.45
0+05.00	85.35
0+05.50	85.35
0+05.50	84.85
0+07.00	84.98
0+07.00	85.02
0+30.00	85.71
0+53.00	84.90

Section A - Honolulu - 10year Worksheet for Irregular Channel

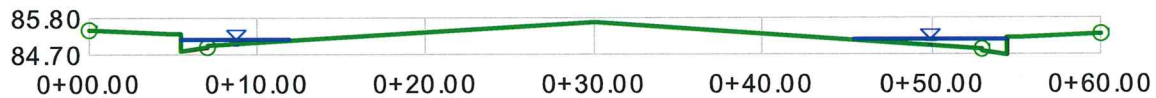
Natural Channel Points	
Station (ft)	Elevation (ft)
0+53.00	84.86
0+54.50	84.73
0+54.50	85.23
0+55.00	85.23
0+60.00	85.33

Section A - Honolulu - 10year Cross Section for Irregular Channel

Project Description	
Worksheet	Section A - Honolulu - 10
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Slope	0.005000 ft/ft
Water Surface Elev.	85.17 ft
Elevation Range	84.73 to 85.71
Discharge	5.00 cfs

Site



V:2.0
H:1
NTS

Section A - Honolulu - 100year Worksheet for Irregular Channel

Project Description	
Worksheet	Section A - Honolulu - 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	.005000 ft/ft
Discharge	13.00 cfs

Options	
Current Roughness Method	over Lotter's Method
Open Channel Weighting	over Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.015
Water Surface Elev.	85.32 ft
Elevation Range	84.73 to 85.71
Flow Area	5.6 ft ²
Wetted Perimeter	30.98 ft
Top Width	29.90 ft
Actual Depth	0.59 ft
Critical Elevation	85.31 ft
Critical Slope	0.005753 ft/ft
Velocity	2.30 ft/s
Velocity Head	0.08 ft
Specific Energy	85.40 ft
Froude Number	0.94
Flow Type	Subcritical

$.59 \times 2.30 = 1.36 < 8 \text{ OK}$

Calculation Messages:
Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+53.00	0.016
0+53.00	0+60.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	85.45
0+05.00	85.35
0+05.50	85.35
0+05.50	84.85
0+07.00	84.98
0+07.00	85.02
0+30.00	85.71
0+53.00	84.90

Section A - Honolulu - 100year Worksheet for Irregular Channel

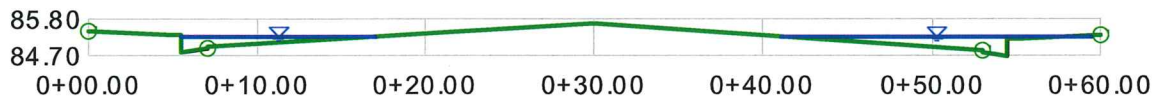
Natural Channel Points	
Station (ft)	Elevation (ft)
0+53.00	84.86
0+54.50	84.73
0+54.50	85.23
0+55.00	85.23
0+60.00	85.33

Section A - Honolulu - 100year Cross Section for Irregular Channel

Project Description	
Worksheet	Section A - Honolulu - 10
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.015
Slope	0.005000 ft/ft
Water Surface Elev.	85.32 ft
Elevation Range	84.73 to 85.71
Discharge	13.00 cfs

Site



V:2.0
H:1
NTS

Section B - Bonanza - 10year Worksheet for Irregular Channel

Project Description	
Worksheet	Section B - Bonanza - 10yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.003000 ft/ft
Discharge	362.00 cfs

CLV MPK Figure E-11

Options	
Current Roughness Method	Lotter's Method
Open Channel Weighting	Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elev.	86.65 ft
Elevation Range	85.29 to 86.04
Flow Area	78.5 ft ²
Wetted Perimeter	92.67 ft
Top Width	90.00 ft
Actual Depth	1.36 ft
Critical Elevation	86.57 ft
Critical Slope	0.004069 ft/ft
Velocity	4.61 ft/s
Velocity Head	0.33 ft
Specific Energy	86.98 ft
Froude Number	0.87
Flow Type	Subcritical

d₁₀

V₁₀

$$1.36 \times 4.61 = 6.27 > 6 \quad \text{Not ok}$$

But this is an
existing condition

No dry lanes

Calculation Messages:
Water elevation exceeds lowest end station by 0.85575864 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+88.00	0.016
0+88.00	0+90.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	85.79
0+00.50	85.79
0+00.50	85.29
0+02.00	85.42
0+02.00	85.46
0+45.00	86.04
0+88.00	85.60
0+88.00	85.56

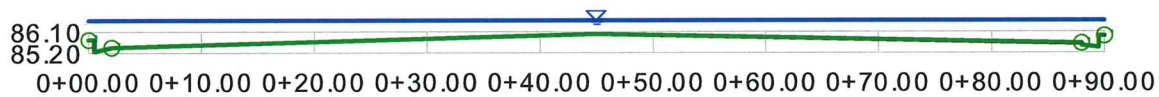
Section B - Bonanza - 10year Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+89.50	85.43
0+89.50	85.93
0+90.00	85.93

Section B - Bonanza - 10year Cross Section for Irregular Channel

Project Description	
Worksheet	Section B - Bonanza - 1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.003000 ft/ft
Water Surface Elev.	86.65 ft
Elevation Range	85.29 to 86.04
Discharge	362.00 cfs



V:2.0
H:1
NTS

Section B - Bonanza - 100year Worksheet for Irregular Channel

Project Description	
Worksheet	Section B - Bonanza - 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	003000 ft/ft
Discharge	1,044.00 cfs

Options	
Current Roughness Method	over Lotter's Method
Open Channel Weighting	over Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elev.	87.43 ft
Elevation Range	85.29 to 86.04
Flow Area	148.7 ft²
Wetted Perimeter	94.23 ft
Top Width	90.00 ft
Actual Depth	2.14 ft
Critical Elevation	87.38 ft
Critical Slope	0.003261 ft/ft
Velocity	7.02 ft/s
Velocity Head	0.77 ft
Specific Energy	88.19 ft
Froude Number	0.96
Flow Type	Subcritical

CLV MPU Figure E-11

1,044 cfs

d₁₀₀

V₁₀₀

$$2.14 \times 7.02 = 15.02 > 8 \text{ Not ok}$$

But this is an existing condition

Calculation Messages:
Water elevation exceeds lowest end station by 1.63644773 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+02.00	0.013
0+02.00	0+88.00	0.016
0+88.00	0+90.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	85.79
0+00.50	85.79
0+00.50	85.29
0+02.00	85.42
0+02.00	85.46
0+45.00	86.04
0+88.00	85.60
0+88.00	85.56

Section B - Bonanza - 100year Worksheet for Irregular Channel

Natural Channel Points	
Station (ft)	Elevation (ft)
0+89.50	85.43
0+89.50	85.93
0+90.00	85.93

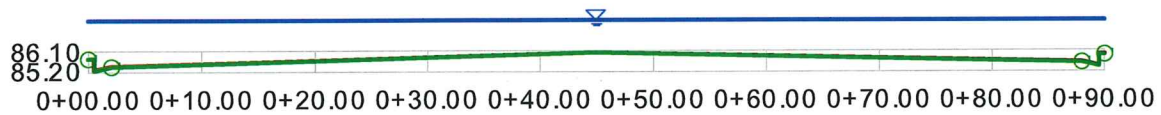
Section B - Bonanza - 100year Cross Section for Irregular Channel

Project Description

Worksheet	Section B - Bonanza - 100year
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.016
Slope	0.003000 ft/ft
Water Surface Elev.	87.43 ft
Elevation Range	85.29 to 86.04
Discharge	1,044.00 cfs



V:2.0
H:1
NTS

NORMAL DEPTH ONSITE HYDRAULIC CALCULATION

(100YR Developed Conditions)

On-site Sections
(Developed Condition)

Hydraulic Cross-Section Identifier	100-Year Flow [Q100] (cfs)	100-Year Velocity [v] (fps)	100-Year Flow Depth [d] (ft)	100-Year [v] x [d]
1	4	1.94	0.15	0.29

Onsite Section - 100year Worksheet for Irregular Channel

Project Description	
Worksheet	Onsite Section - 100yr
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	.009000 ft/ft
Discharge	4.00 cfs

Options	
Current Roughness Method	over Lotter's Method
Open Channel Weighting	over Lotter's Method
Closed Channel Weighting	Horton's Method

Results	
Mannings Coefficient	0.013
Water Surface Elev.	1,786.00 ft
Elevation Range	35.85 to 1,786.52
Flow Area	2.1 ft ²
Wetted Perimeter	27.24 ft
Top Width	27.24 ft
Actual Depth	0.15 ft
Critical Elevation	1,786.02 ft
Critical Slope	0.005654 ft/ft
Velocity	1.94 ft/s
Velocity Head	0.06 ft
Specific Energy	1,786.06 ft
Froude Number	1.24
Flow Type	Supercritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+92.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	1,786.20
0+17.00	1,786.00
0+31.00	1,785.85
0+44.00	1,786.00
0+92.00	1,786.52

ND2

d₁₀₀

$$.15 \times 1.94 = 0.29 < 8 \text{ OK}$$

V₁₀₀

$$FF = 1786.60'$$

$$W.S.E. = 1786.00'$$

$$+ d_{100} = .15'$$

$$1786.15' < 1786.60' (FF)$$

FF MEETS CRITERIA

Onsite Section - 100year Cross Section for Irregular Channel

Project Description	
Worksheet	Onsite Section - 100
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Slope	0.009000 ft/ft
Water Surface Elev.	1,786.00 ft
Elevation Range	35.85 to 1,786.52
Discharge	4.00 cfs

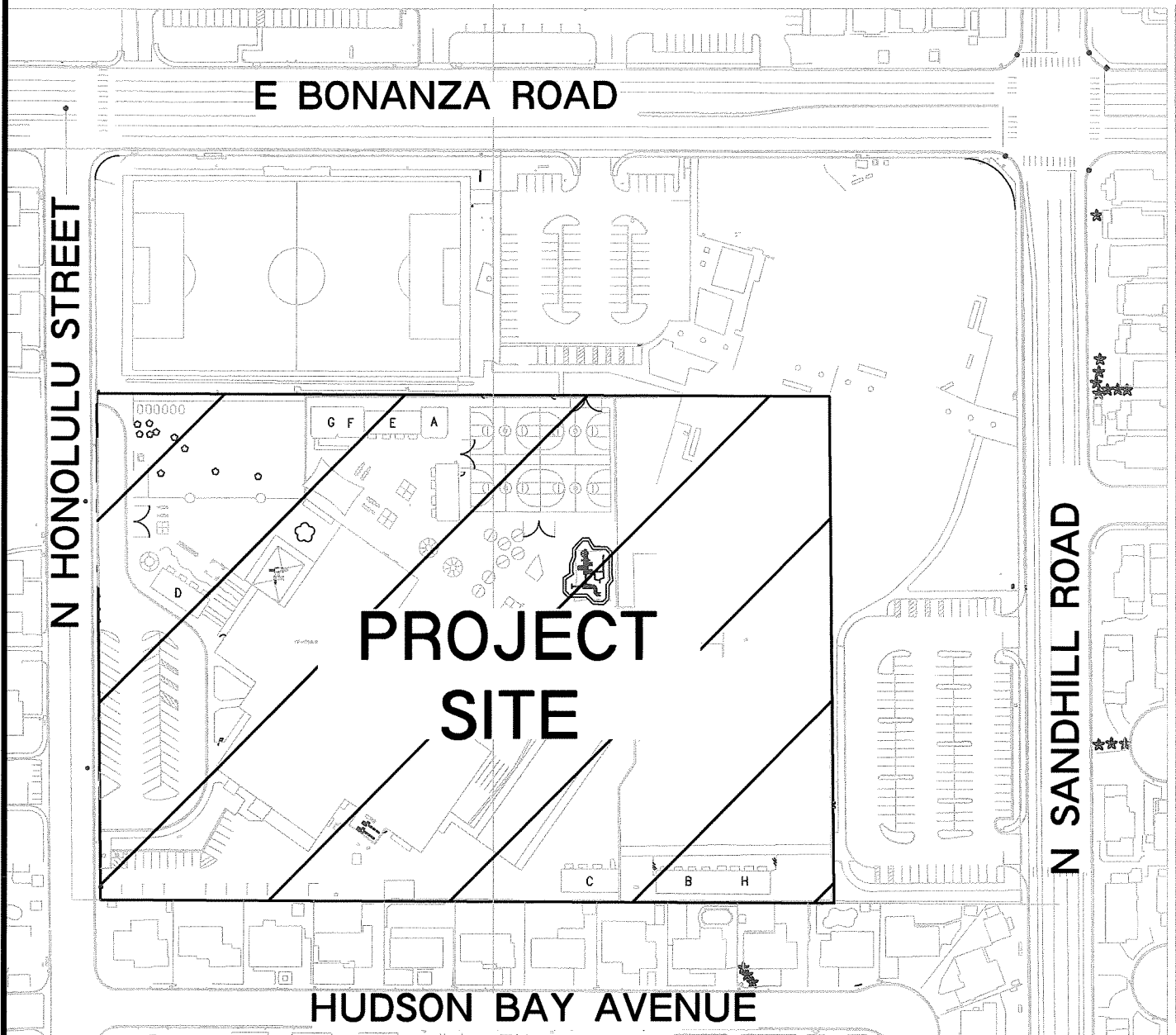
Site
Bldg.



V:2.0
H:1
NTS

APPENDIX C

FIGURES



VICINITY MAP

NOT TO SCALE

DRAWN BY: JMD SCALE: N.T.S.

CHECKED BY: HMN DATE: 11/2/20



6345 South Jones Blvd. Suite 100

Las Vegas, NV 89118

Phone (702) 365-9312 - Fax (702) 365-9317

VICINITY MAP (FIGURE 1)

ORAN K GRAGSON ELEMENTARY SCHOOL

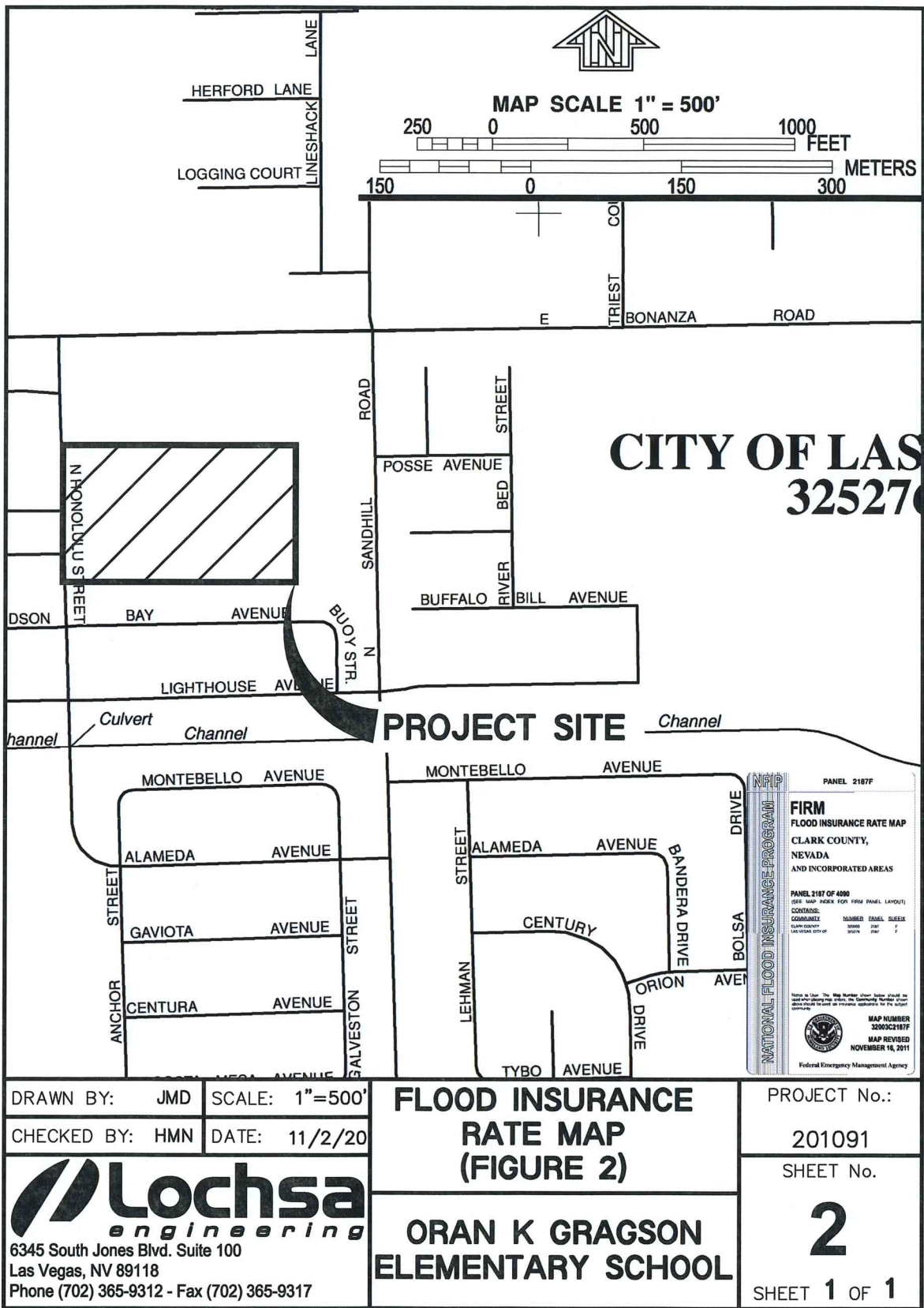
PROJECT No.:

201091

SHEET No.

1

SHEET 1 OF 1





LEGEND

Existing Facilities

Category B Proposed Facilities

 Detention Basin

— Stormdrain

≡ ≡ Unlined Channel

----- Natural Wash/Floodway

Remove & Replace/Parallel Facilities

 Channel  Channel

 Crossing

A

A diagram of a chromosome represented as a horizontal bar divided into four segments labeled I, II, III, and IV from left to right. Segment I is orange, II is white, III is orange, and IV is white.

Scale: 1 inch = 2,000 feet

10	11	12	13	14	15
16	17	18	19	20	21

27	28	29	30	31	
32	33	34	35	36	37
38	39	40	41	42	43

1215

50	51	52	53
		54	

ATKINS



ID / 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						
0000	P	16" X 14" RCB	1350	3952	CSA13*	SW3	7.93	0.50
0026	P	14" X 11" RCB	4000	3952	CSA13*	SW3	7.93	1.30
0075	P	12" X 11" RCB	5280	3952	CSA13	SW3	7.93	2.11
0175	P	14" X 14" RCB	6000	3952	CSA13	SW3	7.93	0.67
0289	P	14" X 12" RCB	2300	3669	CSA11	SW3	7.55	0.87
CABZ		CEDAR AVENUE - BONANZA						
0000	E	72" RCP	525					0.30
0010	E	60" RCP	1450					0.30
CACH		CEDAR AVENUE CHANNEL						
0000	E	CONC CHNL 10"W 8"D 1.5:1 SS (REPLACED W/ CACH0001)	1681	2427	CCA10-C	SW3	3.05	0.20
0001	P	CONC CHNL 22"W 12"D 0:1SS (REPLACES CACH0000)	1055	2427	CCA10-C	SW3	3.05	0.20
0020	P	CONC CHNL 31"W 6.5D-12"D 0:1SS (REPLACES CACH0000)	460	766	CCA10-C	SW3	0.90	2.19
0027	E	2: 15" X 5" RCBC @ MARION	82	766	CCA10-C	SW3	0.90	0.35
0029	E	CONC CHNL 10"W 8"D 1.5:1 SS	1284	766	CCA10-C	SW3	0.90	0.37
0051	E	2: 15" X 5" RCBC @ PAGE	64	766	CCA10-C	SW3	0.90	0.38
0053	E	CONC CHNL 10"W 6"D 1.5:1 SS	1275	766	CCA10-C	SW3	0.90	0.38
0079	E	2: 15" X 6" RCBC @ LAMB	100	594	CCA08-C	SW3	0.70	0.38
0081	E	CONC CHNL 12"W 6"D 1.5:1 SS	2562	594	CCA08-C	SW3	0.70	0.20
0127	E	1: 12" X 4" RCBC 2:11" X 4" RCBC @ SANDHILL	80	594	CCA08-C	SW3	0.70	0.20
0129	E	CONC CHNL 10"W 8"D 1.5:1 SS	971	594	CCA08-C	SW3	0.70	0.26
0146	E	2: 12" X 5.5" RCBC @ HONOLULU	62	594	CCA08-C	SW3	0.70	0.53
0148	E	CONC CHNL 10"W 8"D 1.5:1 SS	959	594	CCA08-C	SW3	0.70	0.53
CACN		CEDAR AVENUE - CHARLESTON						
0000	E	72" RCP	1867					0.41
0034	E	2: 48" RCP (REPLACE W/ CACN0035)	685	430	CCH70C	SW3	0.40	0.30
0035	P0	8" X 6" RCB (REPLACES CACN0034)	685	430	CCH70C	SW3	0.40	0.30
0049	E	66" RCP (REPLACE W/ CACN0050)	2146	430	CCH70C	SW3	0.40	0.60
0050	P0	6" X 7" RCB (REPLACES CACN0049)	2146	430	CCH70C	SW3	0.40	0.60
COLM		COLORADO / LAMB						
0000	E	72" RCP	1500	275	CH94	SW3	0.36	0.87
FLAG		FLAMINGO WASH - ALGONQUIN						
0026	E	60" RCP	427	432	FW21	FLAM3A	0.47	1.30
FLBN		FLAMINGO - BOULDER HIGHWAY NORTH						
0001	E	4: 10" X 6" RCB	350	4898	CCFR03	Boulder4	11.25	0.58
0008	E	2: 12" X 12" RCB	1055	4898	CCFR03	Boulder4	11.25	0.20
0028	E	3: 16" X 6" RCB	275	4898	CCFR03	Boulder4	11.25	0.20
0033	E	1: 15" X 10" RCB AND 1: 16" X 10" RCB	405	4898	CCFR03	Boulder4	11.25	0.20
0038	P	15" X 10" RCB	987	2471	CFR03	SW3	3.40	0.20
0056	P	24" X 6" RCB	391	2471	CFR03	SW3	3.40	7.00
0063	P	20" X 8" RCB	1393	2372	CFR04	SW3	3.21	0.68
0167	P	18" X 8" RCB	3565	2372	CFR04	SW3	3.21	0.38
0180	P	14" X 8" RCB	494	2013	CCH67A	SW3	2.43	1.80
0205	P	10" X 8" RCB	4478	2013	CCH67A	SW3	2.43	2.00
0275	P	12" X 8" RCB	223	1584	CCH56	SW3	1.75	2.50
0280	P	10" X 6" RCB	925	928	CH56	SW3	1.00	2.22
0281	P	10" X 7" RCB	2800	928	CCH56	SW3	1.00	1.33
0312	P	7" X 4" RCB	2160	621	CCH52	SW3	0.62	4.20
0342	P	7" X 4" RCB	2425	621	CCH52	SW3	0.62	4.20
FLBS		FLAMINGO - BOULDER HIGHWAY SOUTH						
0000	E	UNLINED MEDIAN CHNL 0"W 6.5"D 4.5:1 SS	4080	684	CB4	FLAM3A	1.38	1.30
0167	E	UNLINED MEDIAN CHNL 0"W 3.5"D 9:1 SS	8850	348	CB4N	FLAM3A	0.63	0.90
FLDN		DESERT INN DRAIN EAST						
0000	E	60" RCP (REPLACE W/ FLDN0001)	6160	959	CFW30AW	FLAM3A	2.12	1.22
0001	P0	12" X 5" RCB (REPLACES FLDN0000)	6160	959	CFW30AW	FLAM3A	2.12	1.22
0116	E	54" RCP (REPLACE W/ FLDN0117)	2330	954	CFW29	FLAM3A	1.82	1.77
0117	P0	10" X 5" RCB (REPLACES FLDN0116)	2330	954	CFW29	FLAM3A	1.82	1.77
0160	E	48" RCP (REPLACE W/ FLDN0161)	2950	742	CFW28	FLAM3A	1.51	1.28
0161	P0	10" X 5" RCB (REPLACES FLDN0160)	2950	742	CFW28	FLAM3A	1.51	1.28
FLMP		FLAMINGO WASH-MARYLAND PARKWAY SYSTEM						
0000	P	12" X 6" RCB	664	689	CCH60A	SW3	0.75	0.78
0013	P	12" X 4" RCB	1535	689	CCH60A	SW3	0.75	0.48

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
FLMP		FLAMINGO WASH-MARYLAND PARKWAY SYSTEM						
0042	P	6" X 4" RCB	1345	245	DFLAM	SW3	0.31	0.95
0068	P	42" RCP	475	245	DFLAM	SW3	0.31	0.61
FLWA		FLAMINGO WASH						
0080	E	CONC CHNL 90"W 8"D 0:1 SS	2665	9548	CFW36	FLAM5B	35.21	0.40
0130	E	CONC CHNL 70"W 10"D 0:1 SS	1470	9548	CFW36	FLAM5B	35.21	0.40
0136	E	TRANSITION CONC CHNL 104"W 12"D TO 70"W 10"D 0:1 SS	255	9548	CFW36	FLAM5B	35.21	3.79
0141	E	CONC CHNL 104"W 12"D 0:1 SS	450	9548	CFW36	FLAM5B	35.21	0.96
0150	E	CONC CHNL 104"W 9"D 0:1 SS	225	9548	CFW36	FLAM5B	35.21	6.00
0174	E	9: 10" X 6" RCBC @ LAMB	110	9504	CFW34	FLAM5B	34.77	1.40
0176	E	TRANSITION CONC CHNL 70"W 9"D TO 104"W 9"D 0:1 SS	290	9504	CFW34	FLAM5B	34.77	0.36
0181	E	CONC CHNL 70"W 9"D 0:1 SS	1270	9504	CFW34	FLAM5B	34.77	0.36
0200	E	CONC CHNL 70"W 8"D TO 12"D W/ PIER 0:1 SS	755	9504	CFW34	FLAM5B	34.77	0.50
0226	E	FREE SPAN BRIDGE 100"W 10"D @ I-515	170	9504	CFW34	FLAM5B	34.77	0.80
0228	E	CONC CHNL 70"W 8"D TO 12"D 0:1 SS	1500	9371	CFW33	FLAM5B	34.43	0.80
0255	E	2 SPAN BRIDGE 150"W 9"D @ BOULDER HWY	65	9371	CFW33	FLAM5B	34.43	1.00
0256	E	CONC CHNL 60"W 7.5"D 0:1 SS	40	6750	CFW33W	FLAM5B	23.17	1.00
0257	E	2 SPAN BRIDGE 150"W 9"D @ BOULDER HWY	60	6750	CFW33W	FLAM5B	23.17	1.00
0258	E	CONC CHNL 60"W 7.5"D 0:1 SS	750	6750	CFW33W	FLAM5B	23.17	0.44
0273	E	FREE SPAN BRIDGE 60"W 9"D @ MMMHP	20	6750	CFW33W	FLAM5B	23.17	0.40
0274	E	CONC CHNL 60"W 8.1"D 0:1 SS	1370	6750	CFW33W	FLAM5B	23.17	1.00
0295	E	CONC CHNL 60"W 8.1"D 0:1 SS	430	6416	CFW31	FLAM5B	21.56	0.80
0307	E	CONC CHNL 60"W 8.1"D 2:1 SS	410	6416	CFW31	FLAM5B	21.56	0.70
0314	E	CONC CHNL 60"W 8.1"D 2:1 SS	1500	6106	CFW30B	FLAM5B	20.19	0.90
0347	E	5: 10" X 8" RCBC @ MOJAVE	80	6106	CFW30B	FLAM5B	20.19	0.94
0348	E	CONC CHNL 30"W 12"D 1:1 SS	1150	6106	CFW30B	FLAM5B	20.19	0.70
0375	E	5: 10" X 8" RCBC @ DESERT INN	140	6074	CFW23	FLAM5B	18.30	2.70
0377	E	CONC CHNL 50"W 9.5"D 0:1 SS	1372	6074	CFW23	FLAM5B	18.30	1.04
0399	E	FREE SPAN BRIDGE 60"W 16"D @ MCLEOD	130	6074	CFW23	FLAM5B	18.30	0.50
0401	E	CONC CHNL 50"W 11.5"D 0:1 SS	107	6074	CFW23	FLAM5B	18.30	0.50
0406	E	CONC CHNL 33"W 11.5"D 0:1 SS	716	5277	CFW23W	FLAM5B	17.42	0.79
0419	E	CONC CHNL 33"-50"W 9.8"D 0:1 SS	206	5277	CFW23W	FLAM5B	17.42	2.00
0423	E	CONC CHNL 50"W 9.8"D 0:1 SS	1686	5277	CFW23W	FLAM5B	17.42	0.76
0455	E	CONC CHNL 50"-75"W 9.8"D 0:1 SS	170	5277	CFW23W	FLAM5B	17.42	1.83
0458	E	CONC CHNL 75"-80"W 9.8"D 0:1 SS	347	5277	CFW23W	FLAM5B	17.42	1.50
0471	E	5: 10" X 8" RCBC @ EASTERN	110	1841*	CFW22W*	FLAM5B	14.32	1.30
0472	E	22" X 8" RCBC @ EASTERN	110	3406*	CFW22W*	FLAM5B	14.32	0.50
0473	E	GRASS CHNL 60"W 15D 2:1 SS	100	5247	CFW22W	FLAM5B	14.32	0.47
0477	E	3 SPAN BRIDGE 47"W 15D	10	5247	CFW22W	FLAM5B	14.32	0.80
0478	E	GRASS CHNL 60"W 15D 2:1 SS	520	5247	CFW22W	FLAM5B	14.32	0.47
0481	E	3: 90" CMAP @ TIOGA (REPLACE W/ FLWA0482)	60	5247	CFW22W	FLAM5B	14.32	0.87
0482	P	4: 20" X 6" RCBC @ TIOGA (REPLACES FLWA0481)	60	5247	CFW22W	FLAM5B	14.32	0.87
0483	E	GRASS CHNL 60"W 15D 2:1 SS	300	5247	CFW22W	FLAM5B	14.32	0.63
FW15		FREEWAY CHANNEL FROM DESERT INN TO EXPRESSWAY						
0000	E	3: 12" X 10" RCB	2170	3685	CAL93	Boulder4	8.93	0.17
LCCH		LAS VEGAS CREEK CHANNEL						
0000	E	2: 12" X 7" RCB	730	3212	CAL93C	MEADOWS4	9.90	1.28
0013	E	2: 12" X 6" RCB	2035	3050	CLC20-C	MEADOWS4	9.60	0.82
LVBZ		LAS VEGAS WASH - BONANZA						
0000	P	2: 12" X 7" RCB	1760	1753	CBN15-C	SW3	2.15	0.40
0025	P	2: 12" X 7" RCB	2700	1753	CBN15-C	SW3	2.15	0.40
0064	P	2: 12" X 7" RCB	2630	1603	CBN12-C	SW3	1.87	0.40
0114	P	2: 12" X 6" RCB	2740	1311	CBN10-C	SW3	1.54	0.40
0166	E	54" RCP (REPLACE W/ LVBZ0167)	930	1106	CBN09	SW3	1.29	0.45
0167	P0	10" X 9" RCB (REPLACES LVBZ0166)	930	1106	CBN09	SW3	1.29	0.45
0187	E	48" RCP (REPLACE W/ LVBZ0188)	1235	1106	CBN09	SW3	1.29	0.71
0188	P0	9" X 9" RCB (REPLACES LVBZ0187)	1235	1106	CBN09	SW3	1.29	0.71
0210	E	42" RCP (REPLACE W/ LVBZ0211)	704	1004	CBN08	SW3	1.05	1.37
0211	P0	8" X 8" RCB (REPLACES LVBZ0210)	704	1004	CBN08	SW3	1.05	1.37
0223	E	36" RCP (REPLACE W/ LVBZ0224)	2275	856	CBN03	SW3	0.84	0.72
0224	P0	8" X 8" RCB (REPLACES LVBZ0223)	2275	856	CBN03	SW3	0.84	0.72

ID / Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
LVCA 0000	P	LAS VEGAS WASH - CHARLESTON 12" X 8" RCB	4600	985	CCH77-C	SW3	1.16	0.30
LVCO 0012	E	COLORADO AVENUE SYSTEM 14" X 8" RCB	2560	1144	CNEL06	SW3	1.32	0.24
0064	E	10" X 8" RCB	2165	901	CCH94	SW3	1.00	0.24
0106	E	10" X 8" RCB	590	402	CCH92-C	SW3	0.37	0.24
0109	E	10" X 5" RCB	2350	402	CCH92-C	SW3	0.37	0.67
LVOE 0345	P	OWENS AVENUE - EAST 13" X 12" RCB	990	2576	DLVOE	SW5	22.61	0.60
LVST 0000	P	LAS VEGAS WASH - STEWART 10" X 10" RCB	4684	1316	CST03-C	SW3	1.40	0.56
0088	P	10" X 9" RCB	4654	1135	CST01-C	SW3	1.18	0.56
0188	P	8" X 8" RCB	1980	601	CCA04	SW3	0.59	0.40
LVWH 0389	E	WASHINGTON AVENUE CHANNEL 12" X 8" RCB	2110	1562 ^A	CV1-C ^A	SWSSC	14.95	0.90
0426	E	16" X 8" RCB	150	1562 ^A	CV1-C ^A	SWSSC	14.95	1.08
0429	E	SPLITTER STRUCTURE (2: 12" X 8" RCB)	190	2870	DCLC21	SW5	22.61	1.90
0431	E	3: 14.33" X 10" RCB	665	2870	DCLC21	SW5	22.61	0.15
0446	E	JUNCTION STRUCTURE	69	2870	DCLC21	SW5	22.61	0.15
0447	E	3: 14.33" X 10" RCB	1955	5193	CCAL93	SW5	22.05	0.15
0484	E	CONFLUENCE STRUCTURE	455	5193	CCAL93	SW5	22.05	0.15
SAEA 0000	P	SAHARA AVENUE - EASTERN LATERAL 10" X 7" RCB	1440	492	CFR02	SW3	0.65	0.20
VAVD 0000	P	VEGAS VALLEY DRIVE 7" X 5" RCB	1300	649	CFW41	FLAM3A	1.30	2.10
0025	P	84" RCP	5300	649	CFW41	FLAM3A	1.30	1.60
VBCH 0000	E	VAN BUSKIRK CHANNEL 12" X 3" RCB	500	637	CVB16	FLAM3A	1.16	1.00
0008	E	8" X 5" RCB	5490	637	CVB16	FLAM3A	1.16	1.00
VBEA 0000	P	VAN BUSKIRK - EASTERN AVE 10" X 6" RCB	3020	896	CVB11	FLAM3A	2.85	1.30
VBMC 0000	E	VAN BUSKIRK - MCLEOD DRIVE 2: 8" X 8" RCB	3850	931	CVB13	FLAM3A	2.99	0.50
VBTW 0000	E	VAN BUSKIRK - TWAIN 18" RCP (REPLACE W/ VBTW0001)	6640	379	CB2	FLAM3A	0.74	0.70
0001	PO	84" RCP (REPLACES VBTW0000)	6640	379	CB2	FLAM3A	0.74	0.70
WAGC 0000	E	WASHINGTON AVENUE CHANNEL - GRAND CENTRAL 2: 12" X 4" RCB	700	505	LC21	SW3	0.56	0.20
0014	E	1: 12" X 4" RCB AND 1: 11" X 4" RCB	2440	505	LC21	SW3	0.56	0.20
0060	E	12" X 4" RCB	455	505	LC21	SW3	0.56	0.20
WAPR 0132	E	WASHINGTON AVENUE CHANNEL PARALLEL 2: 9" X 8" RCB	387	1562 ^A	CV1-C ^A	SWSSC	14.95	1.67



City of Las Vegas

CENTRAL NEIGHBORHOOD FLOOD CONTROL MASTER PLAN

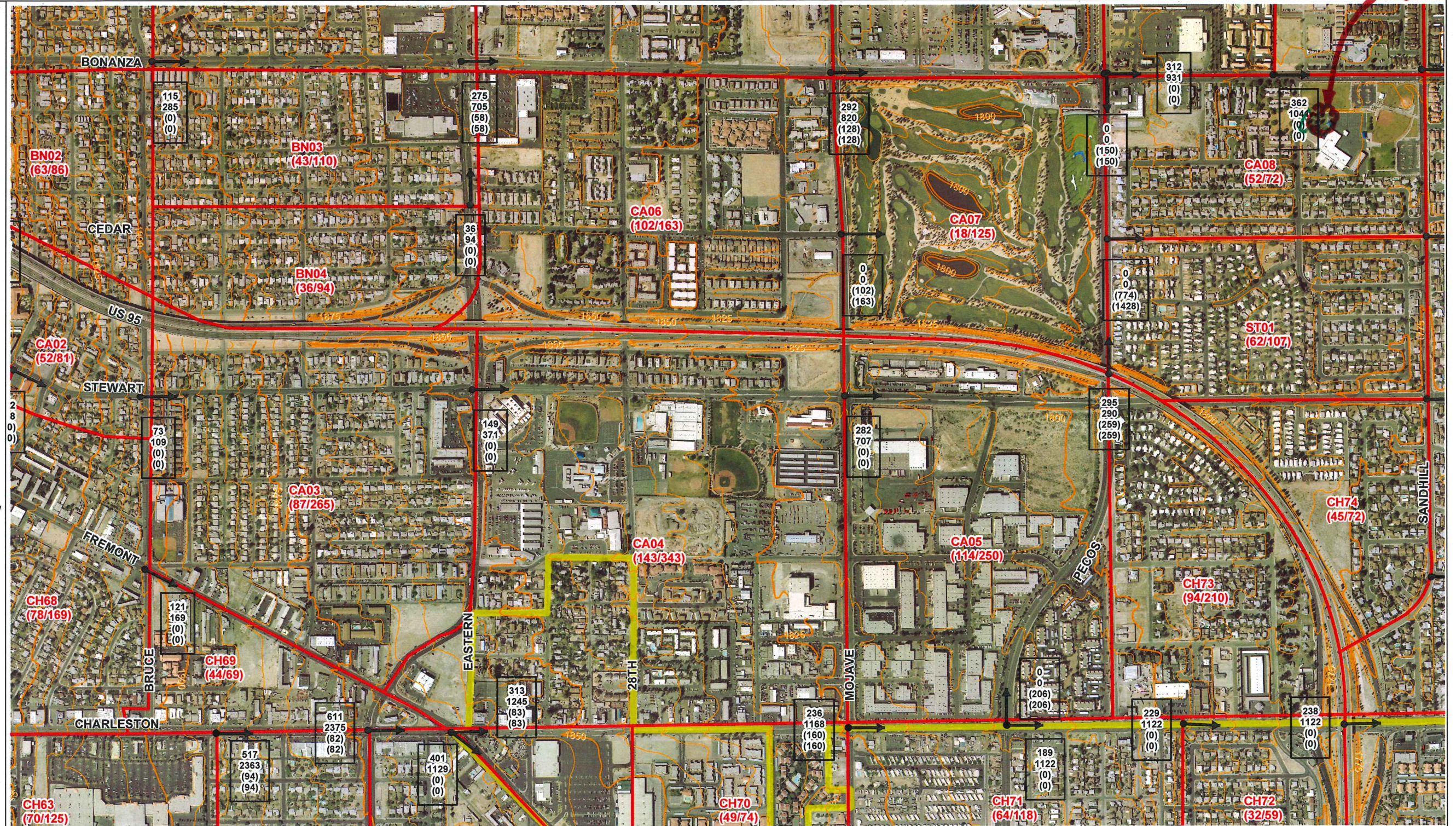
LEGEND

- Sub-basin Boundary
- LV12** Basin ID
- (10yr./100yr.)** Contributing flow from the basin (cfs)
- Flow Arrow
- | |
|-------|
| 250 |
| 500 |
| (300) |
| (800) |

 10-Year Street Flow
100-Year Street Flow
10-Year Facility Flow
100-Year Facility Flow
(Flows in CFS)
- Study Area Limit

PHOTO DATE: SPRING 2004

FIGURE E-11



EXISTING DRAINAGE CONDITIONS



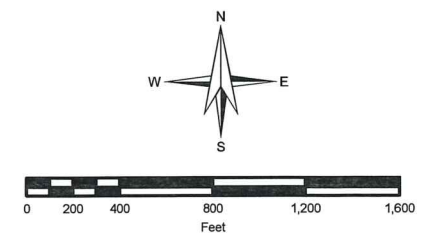
2270 Corporate Circle, Suite 100
Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200

	Durango	Rainbow	Decatur	Tonopah	5th	Pecos	Nellis
Lake Mead				1	2		
Washington				3	4	5	6
Charleston	7	8	9	10	11		12
Sahara	13	14	15	16	17		
Desert Inn		18	19				

NOTE:

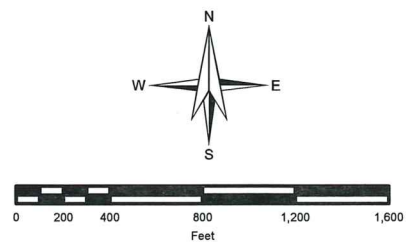
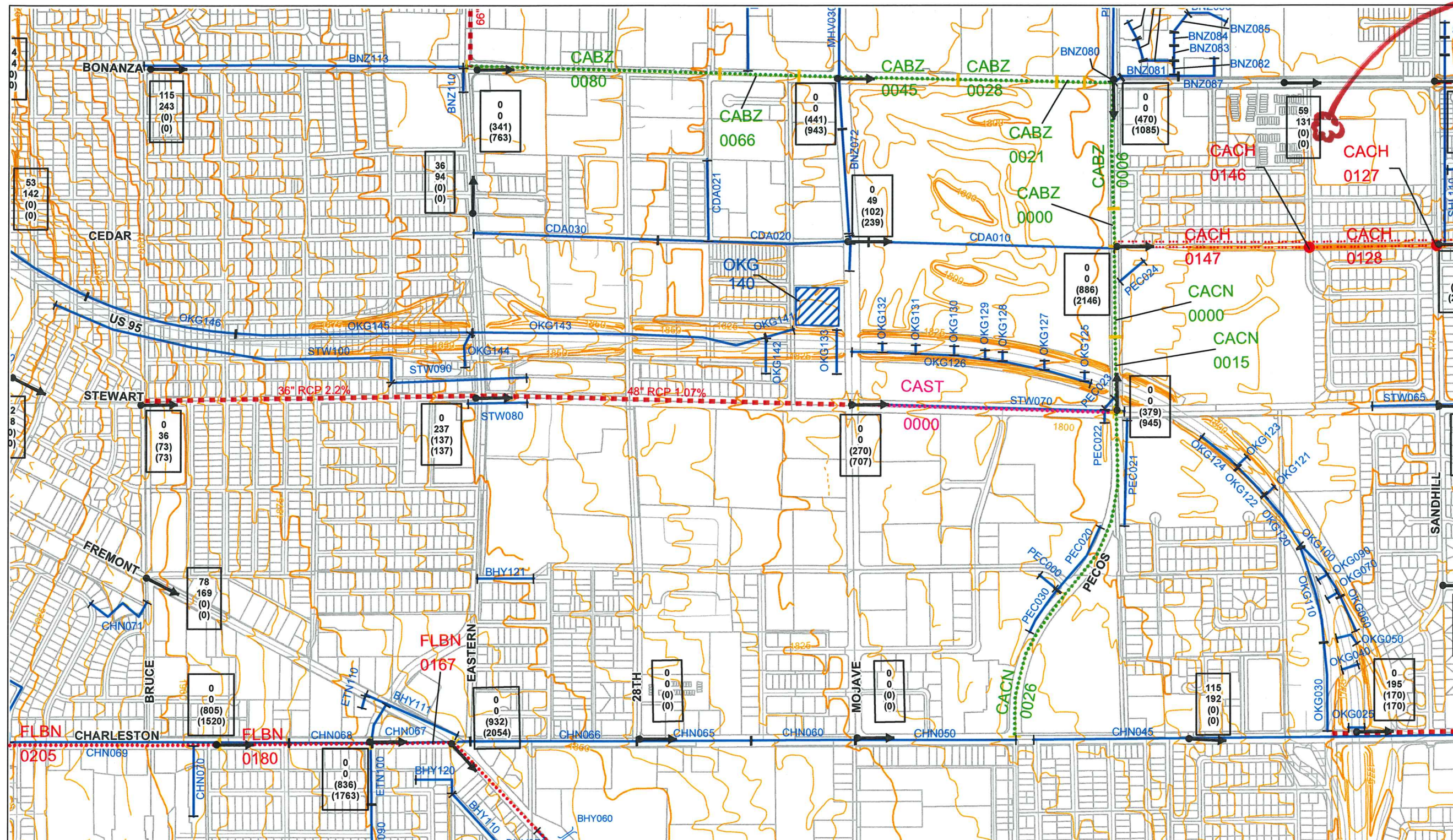
Existing conditions are based on future Curve Number values with only existing local and CCRFCD facilities in place.

100-Year flows at locations where a 100-Year subbasin concentration point does not exist in the hydrology model were based on an area-weighted ratio of the 100-Year flows from concentration points upstream and downstream of the location. See Volume I for a more detailed explanation.



SCALE: 1 inch = 800 feet

FIGURE F-11



SCALE: 1 inch = 800 feet

●→ Flow Arrow

250	10-Year Street Flow
500	100-Year Street Flow
(300)	10-Year Facility Flow
(800)	100-Year Facility Flow

(Flows in CFS)

NOTE:
Ultimate drainage conditions are based on
future Curve Number values with all flood control
facilities in place.

100-Year flows at locations where a 100-Year subbasin concentration point does not exist in the hydrology model were based on an area-weighted ratio of the 100-Year flows from concentration points upstream and downstream of the location. See Volume I for a more detailed explanation.

	Durango	Rainbow	Decatur	Tonopah	5th	Pecos
Lake Mead			1	2		
Washington			3	4	5	6
Charleston	7	8	9	10	11	12
Sahara	13	14	15	16	17	
Desert Inn		18	19			

FUTURE DRAINAGE CONDITIONS



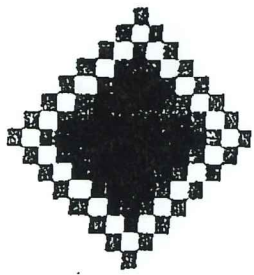
**2270 Corporate Circle, Suite 100
Henderson, NV 89074
(702) 263-7275
Fax: (702) 263-7200**

APPENDIX D

REFERENCES

REFERENCE 5

“Technical Drainage Study for Bonanza – Sandhill Ball Fields” (DS #3149)



DS #: 3149

DS INDEX:

APN: 178-06-101-021

PROJECT: BONANZA - SANDHILL BALL FIELDS

SUBMITTAL: 1ST SUBMITTAL



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: August 15, 2002
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT: Drainage Study for: Bonanza – Sandhill Ball Fields		COPIES TO: City of Las Vegas Architectural Services
Cross Streets:	Bonanza & Sandhill	Martin & Martin
FILE NO.:	F:\WDepot\Engineering_Planning\Flood\DSMEMOS\DS3149B.doc	
Parcel Number:	178-06-101-021	
Zoning/Action:		
FEMA Flood Zone	YES	No X
Proposed Storm Drain	YES X	No

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1 st Submittal	6/13/2002	6/25/2002	Not Approved	N/C
2 nd Submittal	7/18 & 8/7/2002	8/15/2002	See Comments Below	N/C
TOTAL FEES (LDDRS):				N/C

REMARKS:

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

X	is acceptable in concept subject to conformance to all City standards and the following conditions.
	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

1. All proposed public drainage easements (privately maintained) must be dedicated and recorded prior to final approval of improvement plans.

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 Amendment 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.

END OF REMARKS

Jwb/ays

T/R/S: T20S/R62E/S31

AREA N31

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Sandhill Ballfields

Date June 10, 2002

Location of Development: a) Descriptive: Bonanza and Sandhill

b) Section ~~46~~ Township 20 South Range 62 EAST

Name of Owner: The City of Las Vegas

Assessors Parcel No.: 178-06-101-021

Contact Person-Name: Gerald C. Webb

Telephone No.: 702-248-8000

Firm: Martin & Martin, Inc., Civil Engineers
Address: 2101 South Jones Boulevard, Suite A, Las Vegas, Nevada 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: $8.16 \pm$ ac Being Developed / Disturbed: $8.16 \pm$ AC

2. Is a portion or all of the subject property located in a designated F.E.M.A. 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.)? Recreation Center

5. Approximate upstream land area, which drains to the subject site? $1.7 \pm$ Sq. Mi.

6. Has the site drainage been evaluated in the past? YES NO If yes, please identify documentation:

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:

8. Briefly describe your proposed schedule for the subject project: A.S.A.P.

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.

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

Revision / Date

Engineer

No. 14717

Local Entity File No.

REFERENCE:

STANDARD FORM 1

1.0 INTRODUCTION

1.1 SCOPE

The City of Las Vegas has retained Martin & Martin, Inc. to provide a Technical Drainage Study and Civil Improvement Plans for the Sandhill Recreation Fields located in The City of Las Vegas south of Bonanza Avenue and west of Sandhill Road. The purpose of this report is to estimate off-site and on-site runoff under existing and developed conditions, examine the effects of the proposed development, if any, on the local vicinity for the 10-year and 100-year, six-hour storm events, and to provide recommendations for drainage facilities.

1.2 SITE DESCRIPTION AND LOCATION

The property is located in The City of Las Vegas, Nevada, south of Bonanza Avenue and west of Sandhill Road, more specifically within Section 46, Township 20 S, Range 62 E, of Las Vegas, Nevada. The site consists of 8.61ac, and will be developed into 2(two) Little League Baseball Diamonds, a Soccer Field, some playground recreational equipment, a concession stand with lavatories and other facilities needed to support such activities. The remaining area will be parking lot and cultivated grass. The developed property will drain similar to the existing property, having its ultimate discharge onto Sandhill Road and existing 42" storm drain system. All roof drains will discharge at grade and on-site.

1.3 FLOOD HAZARD ZONE

The flood hazard areas within this portion of Clark County, Nevada are delineated on the Federal Emergency Management Agency (FEMA) National Flood Insurance Program - Flood Insurance Rate Map (F.I.R.M.), dated August 16, 1995. As indicated on the Flood Hazard Map Community Panel No. 32003C2187D, the subject area lies within Zone X. Zone X areas are determined to be the areas outside of the 500-year flood plain. Please refer to Figure 2, in Appendix A, for the F.I.R.M. and description of flood zones.

1.4 EXISTING / PROPOSED REGIONAL FLOOD CONTROL FACILITIES

A review of the 1996 Flood Control Master Plan Update (MPU) for the Las Vegas Valley indicates that there are no existing or proposed regional facilities located within or in the vicinity of the subject site. Please refer to Figure 4 in Appendix A, for a copy of the Master Plan Update Flood Control Facilities.

1.5 LOCAL FLOOD CONTROL FACILITIES

There is an existing local 42" Stainless Steel storm drain system located within Sandhill Road Right of Way. This system ultimately converges with the Cedar Avenue Channel. The maximum capacity for the system determined from normal depth calculations is

65.1 cfs. The estimated 100-year flow in Sandhill Road as determined in the City wide Hydrology Study is 105 cfs. This indicates the pipe is unable to adequately convey the 100-year flow, however the ten-year storm of 42 cfs will be conveyed.

1.6 PREVIOUS DRAINAGE STUDIES

The following references were reviewed in the preparation of this report.

1. *Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual*, dated August 1999.
2. *City of Las Vegas, City of Las Vegas Flood Control Facilities Inventory and City Wide Hydrology Analysis, Volume II, December 1997*, by Post, Buckley, Schuh & Jernigan, INC.

The contributory drainage basins and general flow patterns, planned or existing drainage facilities and peak basins runoffs were reviewed and adopted for this report.

2.0 HYDROLOGY

2.1 METHODOLOGY

The Soils Conservation Service (SCS) Unit Hydrograph Method within the U.S. Army Corporation of Engineers HEC-1 Flood Hydrograph Package Computer Model, was utilized to determine the peak discharge for the on-site existing and developed conditions. Off-site conditions were previously determined within the approved Reference 2 hydrology study. Peak on-site discharges were computed for 10- and 100-year, 6-hour storm events. A complete discussion of the methodology used in hydrological analysis can be found in the U. S. Army Corps of Engineers HEC-1 Users Manual.

2.2 RAINFALL

The project site is located within the McCarran Airport Rainfall Area. The 10-year and 100-year point precipitation values used for this analysis were 1.58 inches and 2.77 inches, respectively. A 6-hour storm distribution number 3 (SDN) was used to compute the 10- and 100-year peak flow for the off-site and on-site drainage basins.

2.3 VELOCITY DETERMINATION FOR TIME OF CONCENTRATION

At the upstream end of a drainage area, the initial overland flows begin to collect and gradually increase from small, shallow flows to larger, deeper flows with greater velocities. To estimate the average velocity for flow condition, that constantly vary throughout the length of drainage area, two generalized relationships can be used. Velocity V_1 applies to the small shallow flows in the first 500 feet or less of travel distance and velocity V_2 applies to the remainder of the travel distance where the velocity is greater. Manning's equation was used to derive formulas for estimating the two travel time velocities. The equations are as follows:

$$V = CS^{1/2} \qquad C = 1.49/n R^{2/3} \qquad R = A/P$$

Where:

V = Average Velocity (fps)
S = Average Slope (ft/ft)
N = Manning's Roughness Coefficient
R = Hydraulic Radius (ft)
P = Wetted Perimeter (ft)
A = Area of Flow (sq. ft.)

Two sets of coefficients were determined, one for developed conditions and the other for undeveloped conditions. For the first developed conditions velocity (V_1), the appropriate coefficient ($C=20.2$) represents street flow with $n = 0.016$ and a depth in the gutter of 0.3 feet. For the second developed conditions velocity (V_2), the appropriate coefficient

($C=30.6$) represents curb height street flow. As may be noted, V_2 is approximately equal to 1.5 times V_1 . Typically, drainage areas are delineated such that the channelized flow considered in the calculations of travel times is within streets and other minor watercourses and does not include significant lengths of major improvement floodway and channels in the travel distance for the time of concentration. For the first undeveloped conditions velocity (V_1), the appropriate coefficient ($C = 14.8$) represents wide channel flow with $D = 0.25'$ and $n = 0.04$. For the second undeveloped conditions velocity (V_2), the appropriate coefficient ($C = 29.4$) represents wide channel flow with $D = 0.7'$ and $n = 0.04$.

These methods are consistent with the methods outlined in Technical Release 55, SCS (TR55) for calculating the time of concentration and should provide times of concentration and lag times that are consistent with one another and with the degree of accuracy of typical hydrologic modeling.

2.4 SOILS

Curve numbers for the contributing drainage basins have been estimated using procedures and data documented in the Soils Conservation Services (SCS) Technical Release 55 and the Clark County Regional Flood Control District Drainage Design Manual, Table 602. The computed curve numbers were based on soils types, present and future land uses and the assumed antecedent soils moisture conditions (AMII) for this region. The SCS Curve Number Method is the abstraction method used in HEC-1 model.

The on-site drainage basins have been mapped to be within Hydrologic Soil Groups "C", as shown in Figure 3. Hydrologic Soils Group "C" has a moderately high runoff potential.

2.5 RESULTS

The existing flow patterns are predominately in sheet form and traverse the lot from north to south. This flow is then conveyed through a swale, which runs along the upper southern and Middle Eastern boundaries, respectively (See existing On-Site Drainage Map for clarification). This flow currently discharges to Sandhill Road. The proposed project flows will follow a similar drainage pattern. However the engineer proposes to capture a majority of the flow on-site with a series of area drains and convey the flow through two on-site drainage systems, which terminate at the existing aforementioned 42" Storm Drain.

The velocity estimations for the lag time calculations were determined within the Standard Form 4. This revision in accordance with the Theorem located in Appendix B.

The Following table represents the results of the existing and proposed site discharges at specified locations:

TABLE 1 HEC-1 RESULTS			
AREA DESIGNATION	Q₁₀₀	Q₁₀	REMARKS
EXISTING			
EX1	1	1	Discharge to Sandhill Road
EX2	2	1	Discharge to Sandhill Road
EX3	1	0	Discharge to Sandhill Road
PROPOSED			
ON1	2	0	Enters proposed 15" on-site pipe
ON2	6	3	Enters proposed 18" on-site pipe
CP1	7	3	Discharge to Existing 42" S.D.
ON3	2	0	Discharge to Sandhill Road
ON4	2	0	Discharge to Existing 42" S.D.
ON5	4	2	Discharge to Sandhill Road

The existing and proposed site does not discharge to Bonanza Road. However, the existing site does discharge 4 c/s and 2 c/s during the 100-yr and 10-yr event respectively, to Sandhill Road. The proposed site provides on-site and street facilities capable of capturing flows exceeding these limits. Therefore the proposed project offers no adverse effects on the historical drainage pattern or quality.

3.0 HYDRAULICS

3.1 METHODOLOGY

Manning's Equation was used to determine the sizes of all on-site infrastructures. All water surfaces (W.S) elevations for existing street flows were calculated using normal depth, from Manning's Equation. The associated 100-year flow for Bonanza Road from the City Wide Hydrology Study is 690^{CFS}. This gives a W.S. elevation of 1.78 feet. For flood protection the Engineer proposes a berm along Bonanza Road to maintain the finish floor integrity. (See Grading Plan). The berms southern slope shall be protected with an appropriate geo-synthetic material.

3.2 BUILDING DRAINAGE

Roof drains will discharge at grade. Roof drains will be away from the buildings at a minimum grade of 2%. All roof drains will discharge on-site and have been considered in the Hydrologic and Hydraulic calculations.

3.3 PARKING LOT DRAINAGE

The parking lot drainage will be accomplished by Contour Grading.

3.4 RESULTS

TABLE 2 STREET FLOWS					
LOCATION	Q ₁₀₀ CFS	D FT	V FPS	(D) (V)	REMARKS
BONANZA ROAD	690	1.78	5.76	10.25	
SANDHILL ROAD	107	0.85	4.27	3.63	
	Q ₁₀ CFS	D FT	V FPS	(D) (V)	
BONANZA ROAD	170	1.09	3.30	3.60	
SANDHILL ROAD	45	0.66	3.33	2.20	

All flow depths were determined from Manning's Equation.

site

PROJECT LOCATION

PIERCE

WAY

LINCOLN

WAY

BRENNER

EAST

BONANZA

ROAD

STREET

ROAD

CITY OF LAS VEGAS
325276

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CLARK COUNTY,
NEVADA AND
INCORPORATED AREAS

PANEL 2187 OF 4090
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS	NUMBER	PANEL	SUFFIX
CLARK COUNTY	32003	287	D
UNINCORPORATED AREAS	325276	287	D
LAS VEGAS CITY OF			

MAP NUMBER
32003C2187 D

EFFECTIVE DATE:
AUGUST 16, 1995



Federal Emergency Management Agency



APPROXIMATE SCALE IN FEET

500 0 500

LEGEND

- SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD
- ZONE A** No base flood elevation determined.
- ZONE AE** Base flood elevation determined.
- ZONE AH** Flood depths of 1 to 3 feet usually areas of property; base flood velocities determined.
- ZONE AD** Flood depths of 1 to 3 feet usually areas of property; base flood velocities determined.
- ZONE APF** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- ZONE V** Coastal flood with velocity hazard wave action; no base flood elevation determined.
- ZONE VE** Coastal flood with velocity hazard wave action; base flood elevation determined.
- FLOODWAY AREAS IN ZONE AE
- OTHER FLOOD AREAS**
- ZONE X** Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.
- OTHER AREAS**
- ZONE X** Areas determined to be outside 500-year floodplain.
- ZONE D** Areas in which flood hazards are undetermined.

MONTEBELLO

STREET

LEHMAN

AVENUE

GALVESTON STREET

31

SANDHILL

**FEMA - FLOOD INSURANCE
RATE MAP**
FIGURE 2

MARTIN & MARTIN
CIVIL ENGINEERS
2101 S. JONES BLVD.
SUITE 120
LAS VEGAS, NEVADA 89148
PHONE (702) 248-8000



SUB-BASIN BOUNDARY

●→ FLOW ARROW

250	10-YEAR EXISTING FLOW
500	100-YEAR EXISTING FLOW
300	10-YEAR ULTIMATE FLOW
800	100-YEAR ULTIMATE FLOW

(FLOWS IN CFS)

NOTE:
Facility flows must be subtracted from flows shown to determine surface flows.
(See "F" sheets for facility flows)

FIGURE 5



1 INCH = 1600 FEET

FIGURE H-15

	1	2		
	3	4		
	5	6		
7	8	9	10	
11	12	13	14	15
	16	17	18	19

PBSJ POST,
BUCKLEY,
SCHUH &
JERNIGAN, INC.

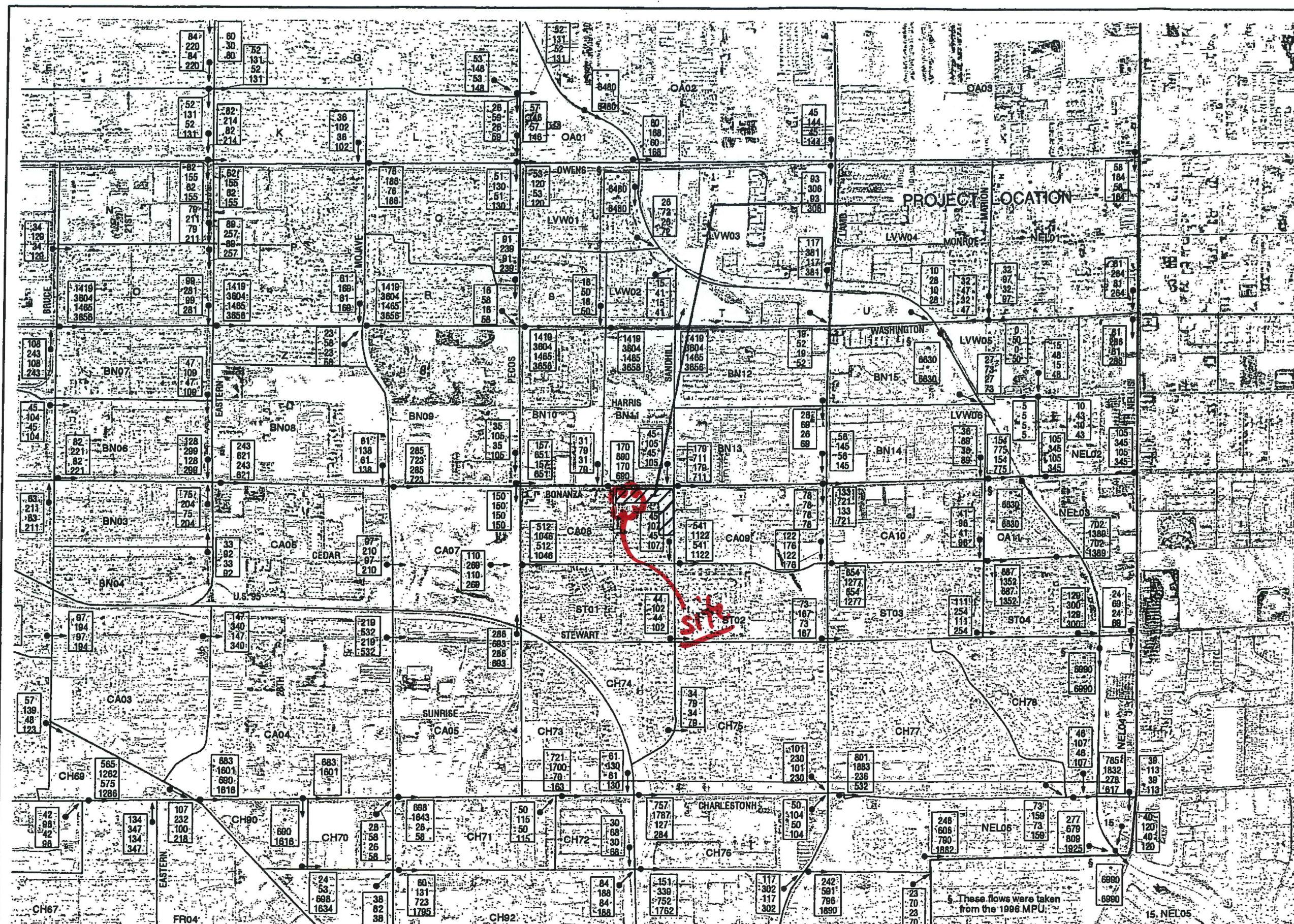


PHOTO DATE: APRIL 1996

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (URBAN AREAS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.) ³ :					
Poor condition (grass cover < 50%)		63	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) ...		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)⁴

77 86 91 94

1 Average runoff condition, and $I_p = 0.25$.

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

WRC
ENGINEERING

REFERENCE:
SCS TR-55, USDA, June 1986.

TABLE 602
1 of 4

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

STANDARD FORM 4

DEVELOPMENT: BONANZA & SANDHILL

CALCULATED BY: GCW

DATE: 06/03/2002

DES.	SUB-BASIN DATA			INITIAL / OVERLAND TIME (ti)			TRAVEL TIME (tt)				tc CHECK (URBANIZED BASINS)		FINAL tc		REMARKS	
	K	AREA	AREA	LEN.	SLOPE	ti	LEN	SLOPE	V1 VEL	V2 VEL	ft	TOTAL LENGTH	tc=(L/180) +10	Min	CN	TLAG
(1)	(2)	(3a)	(3b)	(4)	(5)	(6)	(7)	(8)	(9)	(9)	(10)	(11)	(12)	(13)	(14)	(15)

UNDEVELOPED CONDITIONS

EX1	0.745	4.44	0.0069	230	0.50	20.87	535	0.50	1.05	2.08	8.24	765	N/A	29.11	860	0.291
EX2	0.745	3.57	0.0056	190	0.40	11.95	530	0.45	0.99	1.97	8.65	720	N/A	20.59	860	0.206
EX3	0.745	0.60	0.0009	220	0.50	11.93	250	0.50	1.05	0.00	3.98	470	N/A	15.92	860	0.159

DEVELOPED CONDITIONS

ON1	0.587	2.89	0.0037	230	0.50	17.65	330	1.00	2.02	0.00	2.72	560	13.11	13.11	740	0.131
ON2	0.824	2.16	0.0034	245	1.00	7.76	597	0.20	0.90	1.37	10.41	842	14.68	14.68	920	0.147
ON3	0.587	0.75	0.0012	265	1.00	15.04	0	0.00	0.00	0.00	#####	265	11.47	#####	740	#DIV/0!
ON4	0.587	2.23	0.0035	65	1.00	7.45	450	1.00	2.02	0.00	3.71	515	12.86	11.16	740	0.112
ON5	0.824	1.32	0.0021	121	0.60	6.47	475	0.40	1.28	0.00	2.28	296	11.64	8.75	920	0.088

EQUATIONS:

$$tc = ti + tt$$

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

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

$$K = 0.0132 \times CN - 0.39$$

$$T lag = 0.60tc$$

Travel Time Calculations:

V1 for first 500 feet travel distance

$$\text{Existing } V1 = 14.8 \times (S/100)^{0.5}$$

$$\text{Developed } V1 = 20.2 \times (S/100)^{0.5}$$

V2 for remaining travel distance

$$\text{Existing } V2 = 29.4 \times (S/100)^{0.5}$$

$$\text{Developed } V2 = 30.6 \times (S/100)^{0.5}$$

STANDARD FORM 4:

0.114


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1.....
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   JUN 1998                       *
*   VERSION 4.1                   *
* RUN DATE 10JUN02 TIME 10:59:28 *
*.....

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

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X  X  X      X      X
X  X  X      X  X    X
X  X  XXXXXX  XXXXX  XXX

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EXISTING / PROPOSED

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 -AMSK- 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

HEC-1 INPUT

PAGE 1

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1         ID      MARTIN & MARTIN, INC.
2         ID      MARRIOTT RENAISSANCE HOTEL @ PARADISE RD
3         ID      LAS VEGAS, NV
4         ID
5         ID      INPUT FILE :BONASAN.DAT
6         ID      OUTPUT FILE:BONASAN.OUT
7         ID
8         ID      *
9         ID      * DRAINAGE BASINS AREA = 9.10AC *
10        ID      * DEPTH-DURATION-FREQUENCY VALUE = 2.77-in *
11        ID      * DEPTH-AREA REDUCTION VALUE = 0.60 (NOT USED) *
12        ID      * STORM DISTRIBUTION #3 *
13        ID      * ABSTRACTION METHOD: SCS CN *
14        ID      * HYDROLOGIC METHOD: SCS UM *
15        ID      * ROUTING METHOD: *
16        ID      * RATIO 1 = 100-YEAR EVENT *
17        ID      * RATIO 2 = 10-YEAR EVENT *
18        ID      * STARTED: 00/00/01 *
19        ID      * REVISED: 00/00/00 *
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27        IN      5
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[illegible]

[illegible]

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
28	EX1	
42		EX2
47		EX3
52		ON1
57		V
60		V
65		ROUT
68		
71		ON2
76		
81		CP1.....
		V
		V
		ROUT
		ON3
		ON4
		ON5

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1.....
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 10JUN02 TIME 10:59:28 *
*.....

```

```

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

```

MARTIN & MARTIN, INC.
HARRIOTT RENAISSANCE HOTEL @ PARADISE RD
LAS VEGAS, NV

INPUT FILE :BONASAN.DAT
OUTPUT FILE:BONASAN.OUT

```

*.....
* DRAINAGE BASINS AREA = 9.10AC *
* DEPTH-DURATION-FREQUENCY VALUE = 2.77-in *
* DEPTH-AREA REDUCTION VALUE = 0.00 (NOT USED) *
* STORM DISTRIBUTION #3 *
* ABSTRACTION METHOD: SCS CN *
* HYDROLOGIC METHOD: SCS UH *
* ROUTING METHOD: *
* RATIO 1 = 100-YEAR EVENT *
* RATIO 2 = 10-YEAR EVENT *
* STARTED: 00/00/01 *
* REVISED: 00/00/00 *
*.....

```

```

25 IO      OUTPUT CONTROL VARIABLES
          IPRNT      4 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 .57

```


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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
				1.00	.57
HYDROGRAPH AT					
+	EX1	.00	1 FLOW	1.	1.
			TIME	3.75	3.75
HYDROGRAPH AT					
+	EX2	.00	1 FLOW	2.	1.
			TIME	3.67	3.67
HYDROGRAPH AT					
+	EX3	.00	1 FLOW	1.	0.
			TIME	3.58	3.58
HYDROGRAPH AT					
+	ON1	.00	1 FLOW	2.	0.
			TIME	3.58	3.58
ROUTED TO					
+	ROUT	.00	1 FLOW	2.	0.
			TIME	3.58	3.67
HYDROGRAPH AT					
+	ON2	.00	1 FLOW	6.	3.
			TIME	3.58	3.58
2 COMBINED AT					
+	CP1	.01	1 FLOW	7.	3.
			TIME	3.58	3.58
ROUTED TO					
+	ROUT	.01	1 FLOW	7.	3.
			TIME	3.58	3.58
HYDROGRAPH AT					
+	ON3	.00	1 FLOW	2.	0.
			TIME	3.58	3.58
HYDROGRAPH AT					
+	ON4	.00	1 FLOW	2.	0.
			TIME	3.58	3.58
HYDROGRAPH AT					
+	ON5	.00	1 FLOW	4.	2.
			TIME	3.50	3.50

APPENDIX C

(HYDRAULICS)

- 18 L.F. Concrete Channel for Sandhill Ballfields
- 15" HDPE for Sandhill Ballfields, System 1
- 15" HDPE for Sandhill Ballfields, System 1, Cont.
- 18" RCP for Sandhill Ballfields, System 1
- 18" RCP for Sandhill Ballfields, System 2
- Bonanza near Sandhill Road, 100-Year Street Flow
- Bonanza near Sandhill Road, 10-Year Street Flow
- Sandhill Road near Bonanza Avenue, 100-Year, Existing
- Sandhill Road near Bonanza Avenue, 10-Year, Existing
- Sandhill Road near Bonanza Avenue, 100-Year Existing Flow
- Sandhill Road near Bonanza Avenue, 100-Year Proposed Future Flow
- Sandhill Near Bonanza Avenue, 10-Year Flow, Proposed Future Flow
- Flow Capacity for Existing 42" SS Pipe in Sandhill Road
- Sidewalk Underdrain for Sandhill Ballfields
- Sandhill Road near Bonanza Avenue, Proposed Project 100-year Flow
- Combined Inlet Calculations

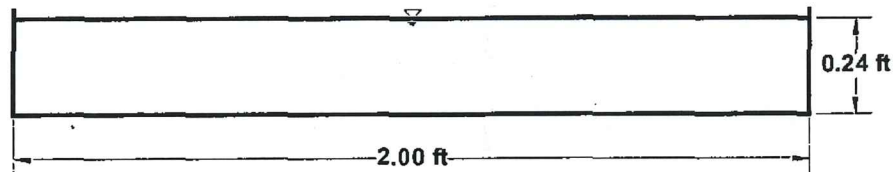
18 L.F. Concrete Channel FOR SANDHILL BALLFIELDS
Cross Section for Rectangular Channel

Project Description

Worksheet	MLKBP.
Flow Element	Rectangular Chann
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.013
Slope	0.012000 ft/ft
Depth	0.24 ft
Bottom Width	2.00 ft
Discharge	2.00 cfs



V:1
H:1
NTS

11 18 L.F. CONCRETE CHANNEL FOR SANDHILL BALLFIELDS
Worksheet for Rectangular Channel

Project Description	
Worksheet	MLKBP.
Flow Element	Rectangular Chann
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.013
Slope	0.012000 ft/ft
Bottom Width	2.00 ft
Discharge	2.00 cfs

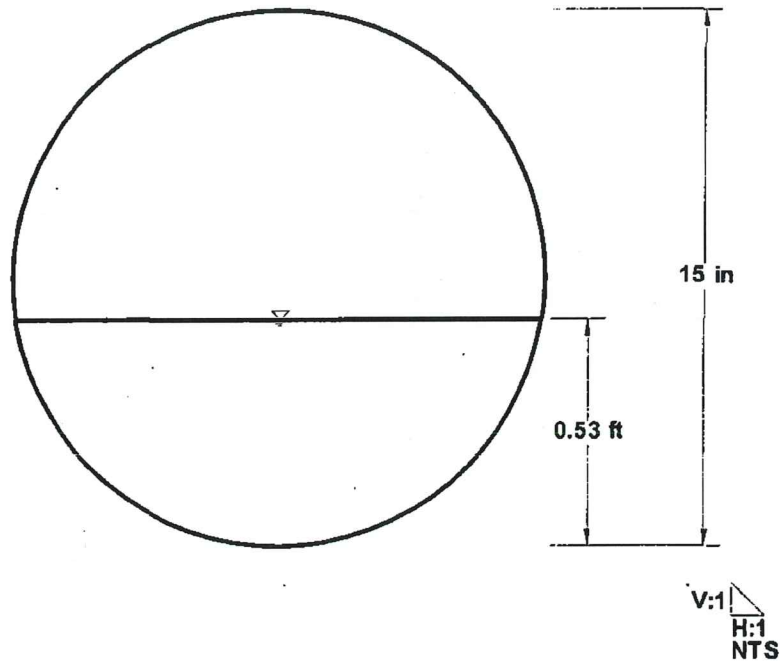
Results	
Depth	0.24 ft
Flow Area	0.5 ft ²
Wetted Perimete	2.48 ft
Top Width	2.00 ft
Critical Depth	0.31 ft
Critical Slope	0.005214 ft/ft
Velocity	4.18 ft/s
Velocity Head	0.27 ft
Specific Energy	0.51 ft
Froude Number	1.51
Flow Type	Supercritical

15" HDPE FOR SANDHILL BALLFIELDS
Cross Section for Circular Channel

SYSTEM 1

Project Description	
Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.011
Slope	0.005000 ft/ft
Depth	0.53 ft
Diameter	15 in
Discharge	2.00 cfs



15" HDPE FOR SANDHILL BALLFIELDS

Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.011
Slope	0.005000 ft/ft
Diameter	15 in
Discharge	2.00 cfs

Results	
Depth	0.53 ft
Flow Area	0.5 ft ²
Wetted Perimeter	1.77 ft
Top Width	1.23 ft
Critical Depth	0.56 ft
Percent Full	42.1 %
Critical Slope	0.003929 ft/ft
Velocity	4.07 ft/s
Velocity Head	0.26 ft
Specific Energy	0.78 ft
Froude Number	1.14
Maximum Dischar	5.81 cfs
Discharge Full	5.40 cfs
Slope Full	0.000686 ft/ft
Flow Type	Supercritical

15" HDPE FOR SANDHILL BALLFIELDS
Cross Section for Circular Channel

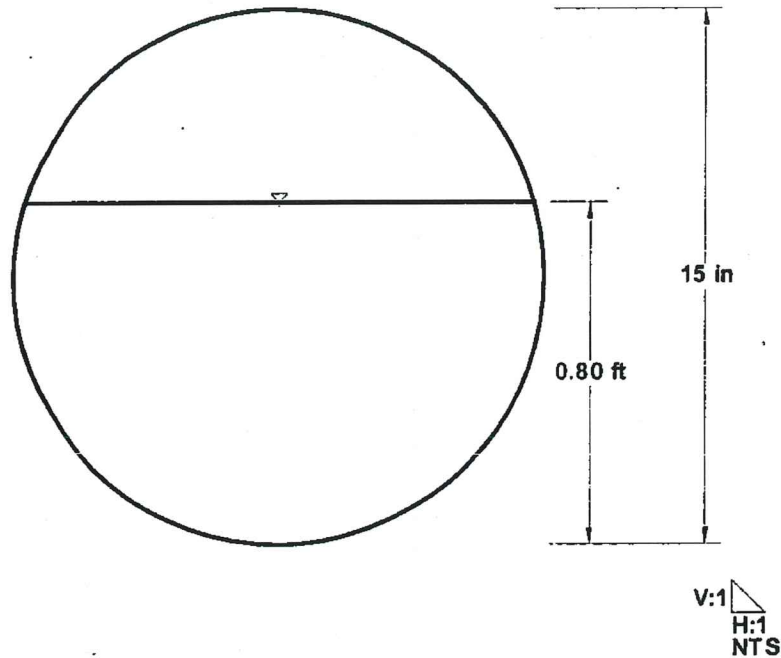
SYSTEM 1

Project Description

Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.011
Slope	0.005000 ft/ft
Depth	0.80 ft
Diameter	15 in
Discharge	4.00 cfs



15" HDPE FOR SANDHILL BALLFIELDS

Worksheet for Circular Channel

Project Description

Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.011
Slope	0.005000 ft/ft
Diameter	15 in
Discharge	4.00 cfs

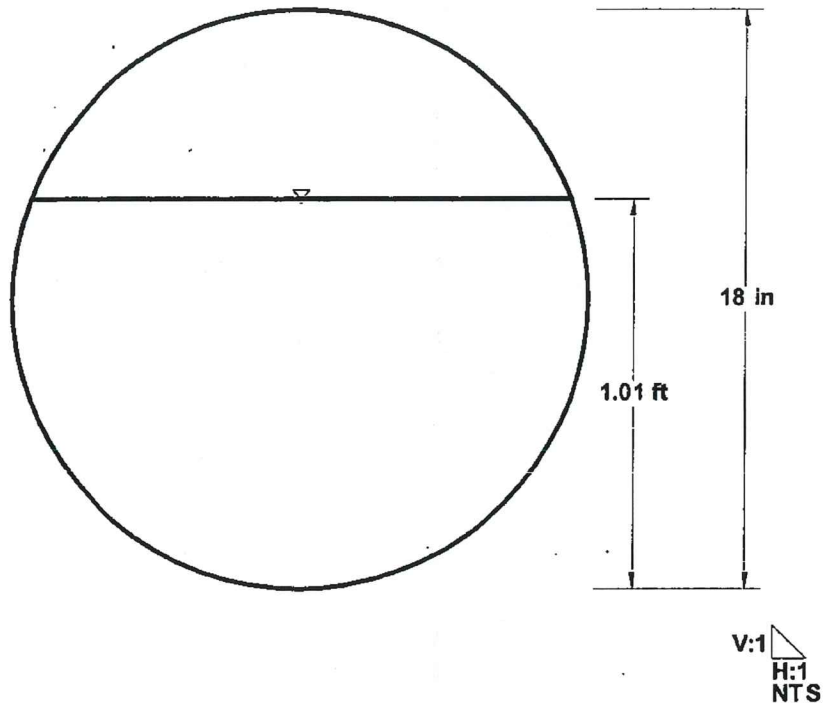
Results

Depth	0.80 ft
Flow Area	0.8 ft ²
Wetted Perimeter	2.32 ft
Top Width	1.20 ft
Critical Depth	0.81 ft
Percent Full	64.1 %
Critical Slope	0.004850 ft/ft
Velocity	4.82 ft/s
Velocity Head	0.36 ft
Specific Energy	1.16 ft
Froude Number	1.02
Maximum Dischar	5.81 cfs
Discharge Full	5.40 cfs
Slope Full	0.002746 ft/ft
Flow Type	Supercritical

18" HDPE for Sandhill Ballfields, System 1
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.011
Slope	0.005000 ft/ft
Depth	1.01 ft
Diameter	18 in
Discharge	7.00 cfs



18" HDPE for Sandhill Ballfields, System 1
Worksheet for Circular Channel

Project Description

Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.011
Slope	0.005000 ft/ft
Diameter	18 in
Discharge	7.00 cfs

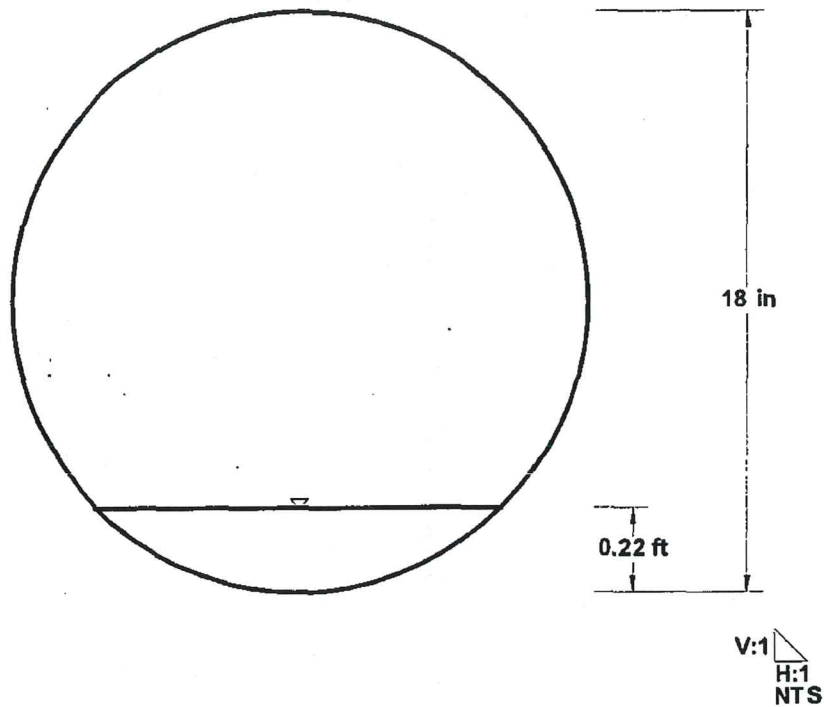
Results

Depth	1.01 ft
Flow Area	1.3 ft ²
Wetted Perimeter	2.89 ft
Top Width	1.41 ft
Critical Depth	1.02 ft
Percent Full	67.5 %
Critical Slope	0.004844 ft/ft
Velocity	5.52 ft/s
Velocity Head	0.47 ft
Specific Energy	1.49 ft
Froude Number	1.02
Maximum Dischar	9.44 cfs
Discharge Full	8.78 cfs
Slope Full	0.003180 ft/ft
Flow Type	Supercritical

18" HDPE for Sandhill Ballfields, System 2, @ 42" S.D.
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.011
Slope	0.120000 ft/ft
Depth	0.22 ft
Diameter	18 in
Discharge	2.00 cfs



18" HDPE for Sandhill Ballfields, System 2, @ 42" S.D.
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.011
Slope	0.120000 ft/ft
Diameter	18 in
Discharge	2.00 cfs

Results	
Depth	0.22 ft
Flow Area	0.2 ft ²
Wetted Perimeter	1.18 ft
Top Width	1.06 ft
Critical Depth	0.53 ft
Percent Full	14.7 %
Critical Slope	0.003538 ft/ft
Velocity	12.41 ft/s
Velocity Head	2.39 ft
Specific Energy	2.61 ft
Froude Number	5.62
Maximum Dischar	46.26 cfs
Discharge Full	43.00 cfs
Slope Full	0.000260 ft/ft
Flow Type	Supercritical

Bonanza near Sandhill Road, 100-yr Flow Worksheet for Irregular Channel

Project Description	
Worksheet	100 FOOT ROW
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

EXISTING/PROPOSED

Input Data	
Slope	0.003000 ft/ft
Discharge	690.00 cfs

CLV
MPU
From

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Metho	mproved Lotter's Method
Closed Channel Weighting Met	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevatio	1.78 ft
Elevation Range	0.00 to 1.03
Flow Area	119.8 ft ²
Wetted Perimeter	101.11 ft
Top Width	100.00 ft
Actual Depth	1.78 ft
Critical Elevation	1.72 ft
Critical Slope	0.003547 ft/ft
Velocity	5.76 ft/s
Velocity Head	0.52 ft
Specific Energy	2.29 ft
Froude Number	0.93
Flow Type	Subcritical

d100
V100

$$1.78 \times 5.76 = 10.25 > 8$$

Not ok

(But this is an existing condition)

Calculation Messages:
Water elevation exceeds lowest end station by 1.17668235 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+07	0.015
0+07	0+93	0.016
0+93	1+00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+50	1.03
0+93	0.17
0+93	0.13

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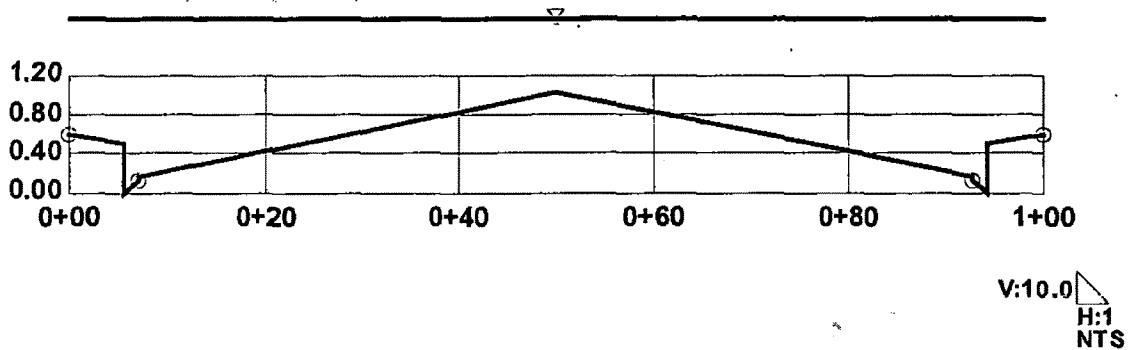
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Page 1 of 2

Bonanza near Sandhill Road, 100-yr Cross Section for Irregular Channel

EXISTING/PROPOSED

Project Description	
Worksheet	100 FOOT ROW
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth
Section Data	
Mannings Coefficient	0.016
Slope	0.003000 ft/ft
Water Surface Elevatio	1.78 ft
Elevation Range	0.00 to 1.03
Discharge	690.00 cfs



Bonanza near Sandhill Road, 10-yr Flow Worksheet for Irregular Channel

EXISTING/PROPOSED

Project Description	
Worksheet	100 FOOT ROW
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data	
Slope	0.003000 ft/ft
Discharge	170.00 cfs

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Metho	mproved Lotter's Method
Closed Channel Weighting Met	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevatio	1.09 ft
Elevation Range	0.00 to 1.03
Flow Area	51.5 ft ²
Wetted Perimeter	101.11 ft
Top Width	100.00 ft
Actual Depth	1.09 ft
Critical Elevation	1.03 ft
Critical Slope	0.004785 ft/ft
Velocity	3.30 ft/s
Velocity Head	0.17 ft
Specific Energy	1.26 ft
Froude Number	0.81
Flow Type	Subcritical

$$1.09 \times 3.30 = 3.60 < 6$$

OK✓

Calculation Messages:
Water elevation exceeds lowest end station by 0.4937814 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+07	0.015
0+07	0+93	0.016
0+93	1+00	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+50	1.03
0+93	0.17
0+93	0.13

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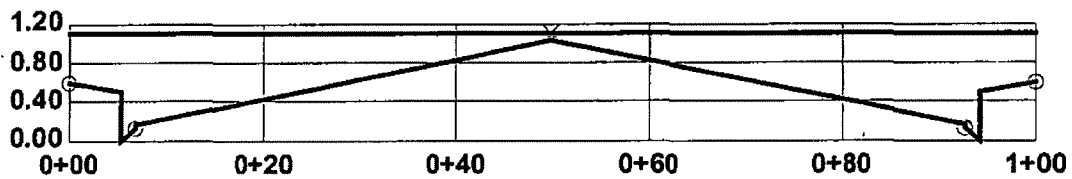
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FlowMaster v6.1 [614k]
Page 1 of 2

Bonanza near Sandhill Road, 10-yr Cross Section for Irregular Channel

Project Description	
Worksheet	100 FOOT ROW
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth
Section Data	
Mannings Coefficient	0.016
Slope	0.003000 ft/ft
Water Surface Elevatio	1.09 ft
Elevation Range	0.00 to 1.03
Discharge	170.00 cfs

EXISTING/PROPOSED



V:10.0
H:1
NTS

Sandhill Road near Bonanza Avenue, 100-yr Flow Worksheet for Irregular Channel

Project Description	
Worksheet	Copy of test
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data	
Slope	0.008300 ft/ft
Discharge	107.00 cfs

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Metho	mproved Lotter's Method
Closed Channel Weighting Met	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevatio	1,781.83 ft
Elevation Range	1,780.82 to 1,782.11
Flow Area	24.9 ft ²
Wetted Perimeter	66.33 ft
Top Width	65.00 ft
Actual Depth	1.01 ft
Critical Elevation	1,781.89 ft
Critical Slope	0.005341 ft/ft
Velocity	4.29 ft/s
Velocity Head	0.29 ft
Specific Energy	1,782.12 ft
Froude Number	1.22
Flow Type	Supercritical

$$1.01 \times 4.29 = 4.33 < 8$$

OK ✓

div
h₀₀

Calculation Messages:
Water elevation exceeds lowest end station by 0.51262966 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+02	0.015
0+02	0+63	0.017
0+63	0+66	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	1,782.11
0+01	1,782.11
0+01	1,781.61
0+02	1,781.74
0+02	1,781.78
0+33	1,781.54
0+63	1,780.99
0+63	1,780.95

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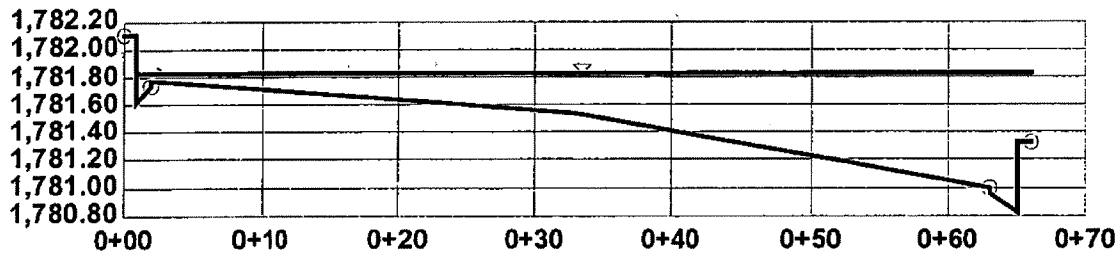
Project Engineer: MARTIN & MARTIN
FlowMaster v6.1 [614k]
Page 1 of 2

Sandhill Road near Bonanza Avenue, 100-yr Flow
Cross Section for Irregular Channel

EXISTING

Project Description	
Worksheet	Copy of test
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.008300 ft/ft
Water Surface Elevatio	1,781.83 ft
Elevation Range	1,780.82 to 1,782.11
Discharge	107.00 cfs



V:10.0
H:1
NTS

Sandhill Road near Bonanza Avenue, 10-yr Flow Worksheet for Irregular Channel

Project Description	
Worksheet	Copy of test
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data	
Slope	0.008300 ft/ft
Discharge	45.00 cfs

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Metho	mproved Lotter's Method
Closed Channel Weighting Met	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevatio	1,781.61 ft
Elevation Range	1,780.82 to 1,782.11
Flow Area	12.4 ft ²
Wetted Perimeter	42.85 ft
Top Width	42.02 ft
Actual Depth	0.79 ft
Critical Elevation	1,781.66 ft
Critical Slope	0.005946 ft/ft
Velocity	3.63 ft/s
Velocity Head	0.20 ft
Specific Energy	1,781.81 ft
Froude Number	1.18
Flow Type	Supercritical

$79 \times 3.63 = 2.87 < 6$
OK

d_{10}
 v_{10}

Calculation Messages:
Water elevation exceeds lowest end station by 0.28979722 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+02	0.015
0+02	0+63	0.017
0+63	0+66	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	1,782.11
0+01	1,782.11
0+01	1,781.61
0+02	1,781.74
0+02	1,781.78
0+33	1,781.54
0+63	1,780.99
0+63	1,780.95

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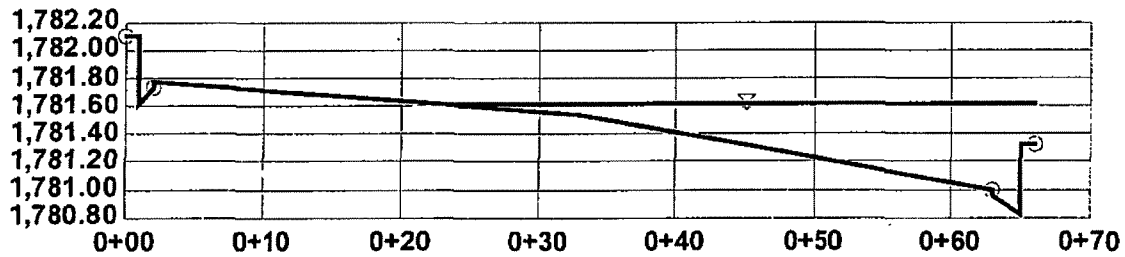
Page 1 of 2

Sandhill Road near Bonanza Avenue, 10-yr Flow Cross Section for Irregular Channel

EXISTING

Project Description	
Worksheet	Copy of test
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.008300 ft/ft
Water Surface Elevatio	1,781.61 ft
Elevation Range	1,780.82 to 1,782.11
Discharge	45.00 cfs



V:10.0
H:1
NTS

Sandhill Road near Bonanza Avenue, Existing Site 100-yr Flow
Worksheet for Irregular Channel

Project Description	
Worksheet	Copy of test
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Input Data	
Slope	0.008300 ft/ft
Discharge	3.00 cfs

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Metho	mproved Lotter's Method
Closed Channel Weighting Met	Horton's Method

Results	
Mannings Coefficient	0.017
Water Surface Elevatio	1,781.17 ft
Elevation Range	1,780.82 to 1,782.11
Flow Area	1.5 ft ²
Wetted Perimeter	12.46 ft
Top Width	12.06 ft
Actual Depth	0.35 ft
Critical Elevation	1,781.17 ft
Critical Slope	0.008422 ft/ft
Velocity	1.99 ft/s
Velocity Head	0.06 ft
Specific Energy	1,781.24 ft
Froude Number	0.99
Flow Type	Subcritical

← d₁₀₀

← V₁₀₀

.35 x 1.99 = 0.70 < 8 OK

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+02	0.015
0+02	0+63	0.017
0+63	0+66	0.015

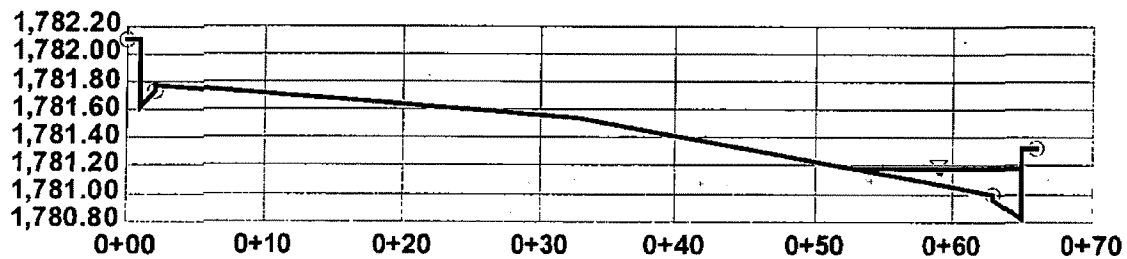
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	1,782.11
0+01	1,782.11
0+01	1,781.61
0+02	1,781.74
0+02	1,781.78
0+33	1,781.54
0+63	1,780.99
0+63	1,780.95
0+65	1,780.82
0+65	1,781.32
0+66	1,781.32

Sandhill Road near Bonanza Avenue, Existing Site 100-yr Flow Cross Section for Irregular Channel

EXISTING

Project Description	
Worksheet	Copy of test
Flow Element	Irregular Channel
Method	Manning's Formul
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.017
Slope	0.008300 ft/ft
Water Surface Elevatio	1,781.17 ft
Elevation Range	1,780.82 to 1,782.11
Discharge	3.00 cfs



V:10.0
H:1
NTS

Sandhill Road near Bonanza Avenue, 100-yr Flow Worksheet for Irregular Channel

Project Description	
Worksheet	65 FOOT SECTION - NO SID
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.008300 ft/ft
Discharge	107.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.017
Water Surface Elevation	0.85 ft
Elevation Range	0.00 to 0.79
Flow Area	25.0 ft ²
Wetted Perimeter	66.10 ft
Top Width	65.00 ft
Actual Depth	0.85 ft
Critical Elevation	0.90 ft
Critical Slope	0.005389 ft/ft
Velocity	4.27 ft/s
Velocity Head	0.28 ft
Specific Energy	1.13 ft
Froude Number	1.21
Flow Type	Supercritical

d₁₀₀

V₁₀₀

$.85 \times 4.27 = 3.63 < 8$ OK ✓

Calculation Messages:
 Water elevation exceeds lowest end station by 0.34622055 ft.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+02	0.015
0+02	0+63	0.017
0+63	0+65	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.13
0+02	0.17
0+33	0.79
0+63	0.17
0+63	0.13

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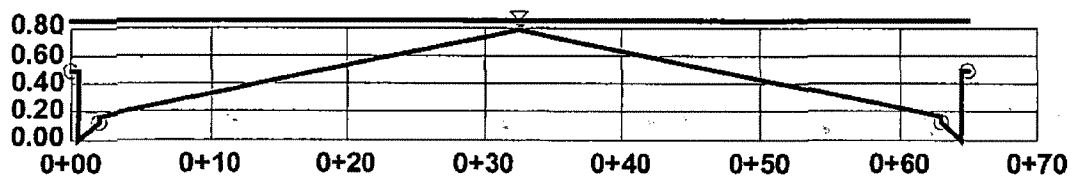
Project Engineer: MARTIN & MARTIN
 FlowMaster v6.1 [614k]
 Page 1 of 2

Sandhill Road near Boanaza Avenue, 100-yr Flow Cross Section for Irregular Channel

PROPOSED

Project Description	
Worksheet	65 FOOT SECTION - NO SID
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.017
Slope	0.008300 ft/ft
Water Surface Elevatio	0.85 ft
Elevation Range	0.00 to 0.79
Discharge	107.00 cfs



V:10.0
H:1
NTS

Sandhill Road near Bonanza Avenue, 10-yr Flow Worksheet for Irregular Channel

Project Description	
Worksheet	65 FOOT SECTION - NO SID
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.008300 ft/ft
Discharge	45.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.016
Water Surface Elevation	0.66 ft
Elevation Range	0.00 to 0.79
Flow Area	13.5 ft ²
Wetted Perimeter	52.83 ft
Top Width	51.73 ft
Actual Depth	0.66 ft
Critical Elevation	0.69 ft
Critical Slope	0.006152 ft/ft
Velocity	3.33 ft/s
Velocity Head	0.17 ft
Specific Energy	0.83 ft
Froude Number	1.15
Flow Type	Supercritical

d_{10}

V_{10}

$$.66 \times 3.33 = 2.20 < 6$$

OK ✓

Calculation Messages:
 Water elevation exceeds lowest end station by 0.15513692 ft.
 Flow is divided.

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+02	0.015
0+02	0+63	0.017
0+63	0+65	0.015

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	0.50
0+01	0.50
0+01	0.00
0+02	0.13
0+02	0.17
0+33	0.79
0+63	0.17

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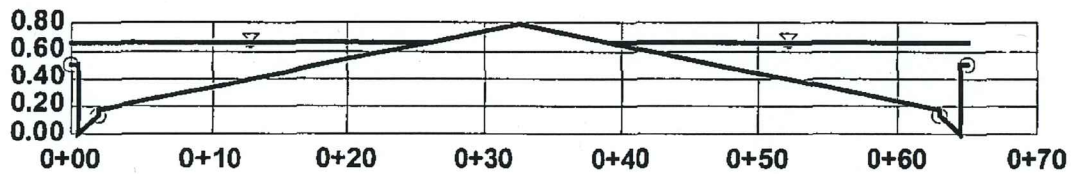
Project Engineer: MARTIN & MARTIN
 FlowMaster v6.1 [614k]
 Page 1 of 2

Sandhill Road near Boanaza Avenue, 10-yr Flow Cross Section for Irregular Channel

PROPOSED

Project Description	
Worksheet	65 FOOT SECTION - NO SID
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.008300 ft/ft
Water Surface Elevatio	0.66 ft
Elevation Range	0.00 to 0.79
Discharge	45.00 cfs



V:10.0
H:1
NTS

FLOW CAPACITY FOR EXISTING 42" SS PIPE IN SANDHILL ROAD

Worksheet for Circular Channel

Project Description

Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data

Mannings Coefficient	0.011
Slope	0.003000 ft/ft
Diameter	42 in

Results

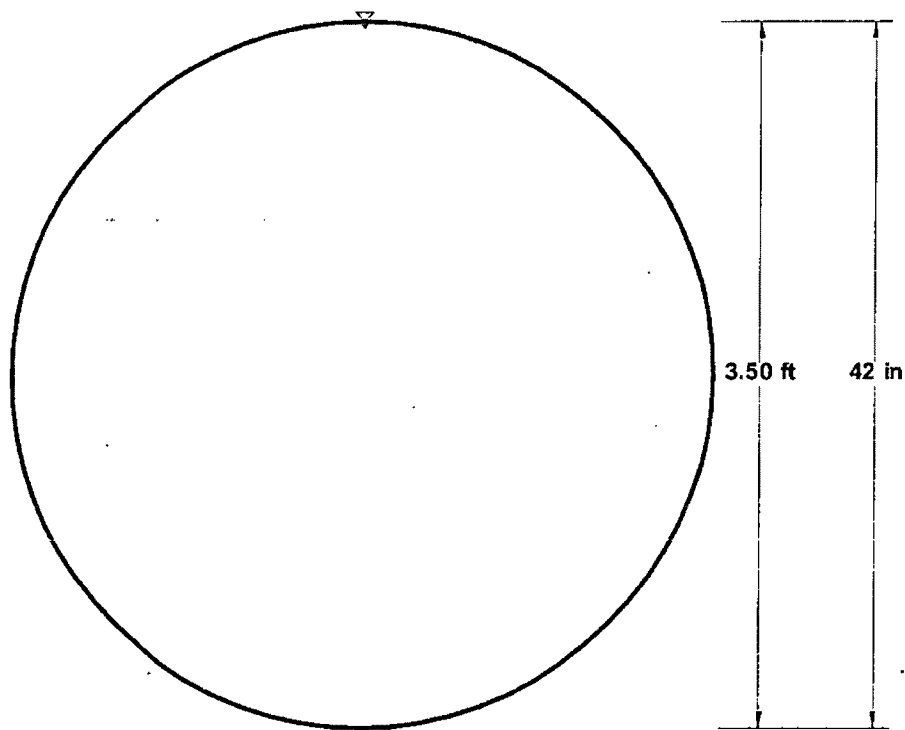
Depth	3.50 ft
Discharge	65.12 cfs
Flow Area	9.6 ft ²
Wetted Perimeter	11.00 ft
Top Width	0.00 ft
Critical Depth	2.53 ft
Percent Full	100.0 %
Critical Slope	0.003943 ft/ft
Velocity	6.77 ft/s
Velocity Head	0.71 ft
Specific Energy	4.21 ft
Froude Number	0.00
Maximum Dischar	70.05 cfs
Discharge Full	65.12 cfs
Slope Full	0.003000 ft/ft
Flow Type	N/A

← CAPACITY

FLOW CAPACITY FOR EXISTING 42" SS PIPE IN SANDHILL ROAD
Cross Section for Circular Channel

Project Description	
Worksheet	Circular Channel - 1
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Section Data	
Mannings Coefficient	0.011
Slope	0.003000 ft/ft
Depth	3.50 ft
Diameter	42 in
Discharge	65.12 cfs



V:1
H:1
NTS

SIDEWALK UNDERDRAIN FOR SANDHILL BALLFIELDS

Worksheet for Rectangular Channel

Project Description	
Worksheet	
Flow Element	Rectangular Chann
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.013
Slope	0.013800 ft/ft
Bottom Width	1.00 ft
Discharge	2.00 cfs

Results	
Depth	0.40 ft
Flow Area	0.4 ft ²
Wetted Perimete	1.81 ft
Top Width	1.00 ft
Critical Depth	0.50 ft
Critical Slope	0.007814 ft/ft
Velocity	4.95 ft/s
Velocity Head	0.38 ft
Specific Energy	0.78 ft
Froude Number	1.37
Flow Type	Supercritical

SIDEWALK UNDERDRAIN FOR SANDHILL BALLFIELDS

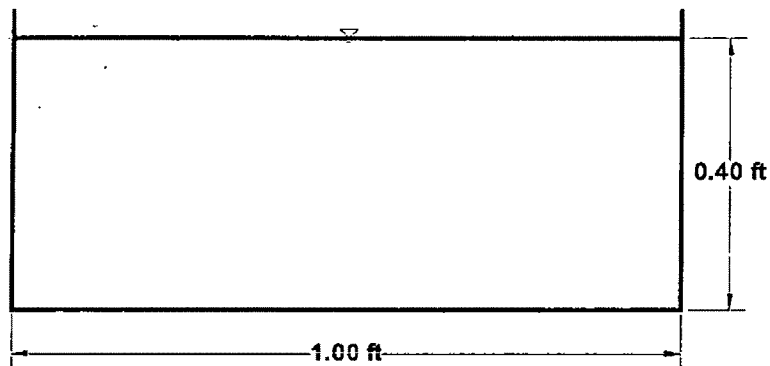
Cross Section for Rectangular Channel

Project Description

Worksheet	
Flow Element	Rectangular Chann
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.013
Slope	0.013800 ft/ft
Depth	0.40 ft
Bottom Width	1.00 ft
Discharge	2.00 cfs



V:1
H:1
NTS

Sandhill Road near Bonanza Avenue, Proposed Project 100-yr Flow Worksheet for Irregular Channel

Project Description	
Worksheet	60 FOOT ROW HALF S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.006400 ft/ft
Discharge	2.00 cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.017
Water Surface Elevation	0.35 ft
Elevation Range	0.00 to 0.63
Flow Area	1.2 ft ²
Wetted Perimeter	10.74 ft
Top Width	10.34 ft
Actual Depth	0.35 ft
Critical Elevation	0.33 ft
Critical Slope	0.008884 ft/ft
Velocity	1.66 ft/s
Velocity Head	0.04 ft
Specific Energy	0.39 ft
Froude Number	0.86
Flow Type	Subcritical

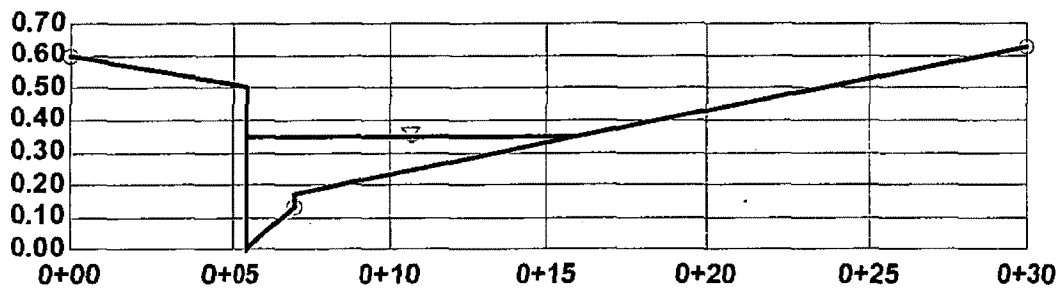
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+07	0.015
0+07	0+30	0.017

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	0.60
0+06	0.50
0+06	0.00
0+07	0.13
0+07	0.17
0+30	0.63

Sandhill Road near Bonanza Avenue, Proposed Project 100-yr Flow Cross Section for Irregular Channel

Project Description	
Worksheet	60 FOOT ROW HALF S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.017
Slope	0.006400 ft/ft
Water Surface Elevatio	0.35 ft
Elevation Range	0.00 to 0.63
Discharge	2.00 cfs



V:10.0
H:1
NTS

COMBINED INLET CALCULATIONS **7'- 5" Grated Inlet (7'- 5" Type "DM2" Drop Inlet)**

GRATE

Q_i = Ideal inlet capacity

L = Grate inlet length in ft

Q_w = Frontal flow

W = Grate inlet width in ft

Q_s = Street capacity

S_x = Street transverse slope in ft/ft

V_s = Flow velocity

S_o = Street longitudinal slope in ft/ft

V_o = Splash-over velocity

T = Water spread on street

n = Manning's roughness

INPUT VARIABLES

$W = 2$

$n = 0.017$

$V_s = 1.66$

$S_x = 0.02$

$V_o = 1.66$

$S_o = 0.005$

$L = 7.5$

$T = 10.34$

$*Q = 2$

* Computed flow in street

EQUATIONS USED

$$Q_i = [R_f E_o + R_s (1-E_o)]Q_s$$

$$R_f = 1 - 0.09 (V_s - V_o) \text{ if } V_s > V_o, \text{ otherwise } R_f = 1$$

$$R_s = 1/[1 + (0.15 V_s^{1.8})/(S_x L^{2.3})]$$

$$E_o = Q_w/Q_s$$

$$Q_w = Q_s - [(0.56/n) S_x^{1.67} (T - W)^{2.67} S_o^{0.5}]$$

$$Q_s = (.56/n) S_x^{1.67} T^{2.67} S_o^{0.5}$$

RESULTS

$Q_s = 1.7327$

$R_s = 0.8465$

$Q_w = 0.7566$

$R_f = 1$

$E_o = 0.4367$

$Q_i = 1.5828$

Using 50% Clogging Factor, Total Grate Capture = 7079 CFS

6/5/2002

COMBINED INLET CALCULATIONS

7' - 5" Grated Inlet (7' - 5" Type "DM2" Drop Inlet)

CURB OPENING

Q_i = Ideal inlet capacity

Q_w = Frontal flow

Q_s = Street capacity

L_i = Required curb opening length in ft

L_c = Designed curb opening length in ft

a = Gutter depression

S_x = Street transverse slope in ft/ft

S_o = Street longitudinal slope in ft/ft

S_w = Gutter cross slope in ft/ft

T = Water spread on street

n = Manning's roughness

INPUT VARIABLES

L_c = 7.5

n = 0.013

T = 10.34

a = 0.17

S_x = 0.02

S_o = 0.005

W = 2

EQUATIONS USED

$$Q_i = [1 - (1 - L_c / L_i)^{1.8}] Q_s$$

$$L_i = 0.60 Q_s^{0.42} S_o^{0.30} [1 / (n S_e)]^{0.6}$$

$$S_e = S_x + (S_w * E_o)$$

$$S_w = a / 12 W$$

$$E_o = Q_w / Q_s$$

$$Q_w = Q_s - [(0.56/n) S_x^{1.67} (T - W)^{2.67} S_o^{0.5}]$$

$$Q_s = (0.56/n) S_x^{1.67} T^{2.67} S_o^{0.5}$$

RESULTS

Q_s = 2.26579

S_w = 0.00708

Q_w = 0.98946

S_e = 0.02309

E_o = 0.4367

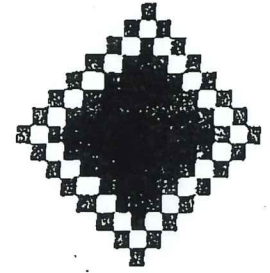
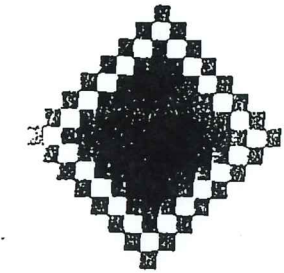
L_i = 22.417

Q_i = 1.18

Using 50% Clogging Factor, Total Curb Capture = 0.59 CFS

TOTAL COMBINED CAPTURE (0% CLOGGING) = 2.76 CFS

TOTAL COMBINED CAPTURE (50% CLOGGING) = 1.18 CFS



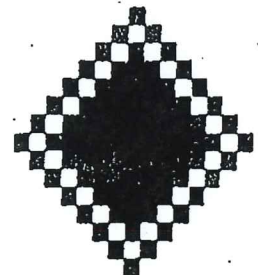
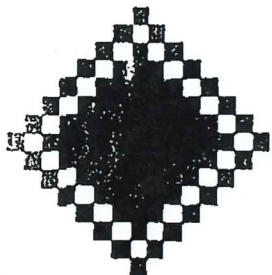
DS #: 3149

DS INDEX:

APN: 178-06-101-021

PROJECT: BONANZA - SANDHILL BALL FIELDS

SUBMITTAL: 2ND SUBMITTAL / ADDENDUM



RIPRAP - Rock Sizing: RINCON

STA:1800

$$V = 3(d_{50})^{0.5}(S_s - 1) / S^{0.17}$$

EQ. 734

Where:

V = Mean Channel Velocity in fps

S = Longitudinal Channel Slope in ft/ft

S_s = Specific Gravity of Rock

d₅₀ = Rock size in feet for which 50% of the riprap weight is smaller.

=	6.00
=	0.003
=	2.5

solve for d₅₀:

d ₅₀ = 0.25	ft.
= 2.96	in.

* FROM STREET FLOW CALCS PREVIOUSLY SUBMITTED

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Sandhill Ballfields

Date June 18, 2002

Location of Development: a) Descriptive: Bonanza and Sandhill

b) Section 46 Township 20 South Range 62 EAST

Name of Owner: The City of Las Vegas

Assessors Parcel No.: 140-31-102-002

Contact Person-Name: Gerald C. Webb

Telephone No.: 702-248-8000

Firm: Martin & Martin, Inc., Civil Engineers

Address: 2101 South Jones Boulevard, Suite A, Las Vegas, Nevada 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: 8.16 ± ac Being Developed / Disturbed: 8.16 ± AC

2. Is a portion or all of the subject property located in a designated F.E.M.A. 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

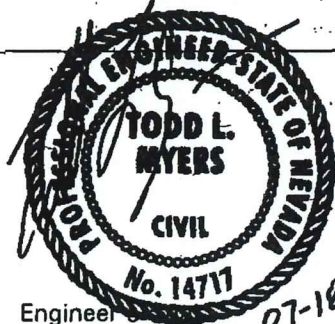
4. Proposed type of development (Residential, Commercial, Etc.)? Recreation Center

5. Approximate upstream land area, which drains to the subject site? 1.7 ± Sq. Mi.

6. Has the site drainage been evaluated in the past? YES NO If yes, please identify documentation:

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:

8. Briefly describe your proposed schedule for the subject project: A.S.A.P.



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.

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

Revision / Date

Engineer

Local Entity File No.

REFERENCE:

STANDARD FORM 1

CITY OF LAS VEGAS		DATE:	
INTER-OFFICE MEMORANDUM		June 25, 2002 	
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works	
SUBJECT: Drainage Study for: Bonanza – Sandhill Ball Fields		COPIES TO: City of Las Vegas Architectural Services	
Cross Streets: Bonanza & Sandhill		Martin & Martin Cheri Edelman, P.E., DEVCO	
FILE NO.: F:\WDepot\Engineering_Planning\Flood\DSMEMOS\DS3149A.doc			
Parcel Number: 178-06-101-021			
Zoning Action:			
FEMA Flood Zone: YES No X			
Proposed Storm Drain: YES X No			

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1 st Submittal	06/13/2002	06/25/2002	See Comments Below	\$250.00 <i>N/C</i>
			TOTAL FEES (LDDRS):	\$250.00 <i>N/C</i>

REMARKS:

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

	is acceptable in concept subject to conformance to all City standards and the following conditions.
X	must be resubmitted or supplemented including the following:
	must have Clark County Regional Flood Control District concurrence

- The flow in Bonanza Road is above the back of sidewalk and is erosive. Provide erosion protection for the landscape area in the form of a stem wall, riprap, or approved alternate as required in the Regional Flood Control District Manual in section 904.3. Revise the grading plan and sections accordingly. Erosion protection is to extend 6-inches above the Q100 water surface elevation.
- The following comments pertain to the grading plans:
 - Existing topography is to extend 100 ft minimum around proposed improvements. Provide additional topography on the grading plan or a separate figure for the drainage study. The parcel southwest of the proposed development appears to drain into this parcel. Verify positive drainage. Drainage easements across this parcel may be required.
 - Provide additional sections through the western property line at Honolulu; through the southern property line approximately 300 feet off of Honolulu; through the western property line 200 feet north of the southern most property line; and through the southern property line 150 feet off of Sandhill. Show existing and proposed improvements in the sections.
 - The improvement plans show improvements on the Clark County School District Parcel 140-31-102-003. Provide a notarized letter of permission for offsite grading and construction. This letter must be secured prior to drainage study approval.
 - The berm adjacent to Bonanza should extend or bend around the returns for the driveway entrance. Revise grading plan to show the berm around the driveway entrance accordingly.

REC'D 7-18-02
DS 3149
N 31
H/C



July 18, 2001

Mr. Albert Sung
City of Las Vegas, Flood Control
Development and Public Works
2266 Civic Center Drive
Las Vegas, Nevada 89030

John A. Martin, S.E.
John A. Martin, Jr., S.E.
Roger M. Peltyn, P.E.

James R. Davis, P.E.
David H. Malpass, P.E.

Re: Response to City of Las Vegas Plan Review of the Technical Drainage Study for Bonanza - Sandhill Ball Fields, dated June 11, 2002, Las Vegas. Section 46, Township 20S, Range 62E.....Martin & Martin Job No.1925.00

Dear Mr. Sung

This letter is in response to the comments received by our office. The subject is the proposed Bonanza - Sandhill Ball Fields in the City of Las Vegas.

Comment No. 1

The flow in Bonanza Road is above the back of sidewalk and is erosive. Provide erosion protection for the landscape area in the form of a stem wall. Riprap, or approved alternate as required in the Regional Flood Control District Manual in section 904.3. Revise the grading plan and sections accordingly. Erosion protection is to extend 6-inches above the Q100 water surface elevation.

Response No. 1

Erosion protection will be in the form of High Performance geosynthetic TRM (Turf Reinforcement Mat), Pyramat type, by Landlok. TRM's are permanent, and have a peak permissible velocity of 25fps with vegetation. See Appendix A for Specifications.

Comment No. 2

The following comments pertain to the grading plans:

- A. Existing topography is to extend 100 ft minimum around proposed improvements. Provide additional topography on the grading plan or a separate figure for the drainage study. The parcel southwest of the proposed development appears to drain into this parcel. Verify positive drainage. Drainage easements across this parcel may be required.

Response to City of Las Vegas Plan Review of the Technical Drainage Study for Bonanza-Sandhill Ball Fields
Mr. Albert Sung
City of Las Vegas, Flood Control
July 18, 2001

Page 3 of 3

Comment No. 3

The following comments pertain to the sections and details:

- A. Show and label the erosion control in section 4 and 5/C8.01.
- B. Label compaction for the proposed berm in section 4 and 5/C8.01.
- C. Provide type CM2 storm drain drop inlet detail on the plans. Contract John Bettencourt at 229-6171 for an Autocad file of the detail.

Reponse No 3

The following responses are from comments on the sections and details:

- A. The erosion control method (TRM's) has been shown and labeled on the Sections 4 and 5/C8.01.
- B. Compaction specifications for the berm's in sections 4 and 5/C8.01 has been Labeled.
- C. A type CM2 drop inlet detail has been provided as requested.

Sincerely,
MARTIN & MARTIN,



Gerald C. Webb
Civil Designer

GCW/smh
H:\HOMEVALL\1925.00\DRAINAGE\BonSanadd.doc

MARTIN & MARTIN
Civil Engineers
Las Vegas, NV 89102



HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

STANDARD FORM 4

DEVELOPMENT: BONANZA & SANDHILL

DATE: 06/03/2002

CALCULATED BY: GCW

DES.	SUB-BASIN DATA			INITIAL / OVERLAND TIME (t)			TRAVEL TIME (t)				tc CHECK (URBANIZED BASINS)		FINAL		REMARKS	
	K	AREA	AREA	LEN.	SLOP	ti	LEN	SLOP	V1	V2	ft	TOTAL LENGTH	ft	Min	CN	TLAG
(1)	(2)	(3a)	(3b)	(4)	(5)	(6)	(7)	(8)	(9)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
UNDEVELOPED CONDITIONS																
EX1	0.745	4.44	0.0069	230	0.10	20.87	535	0.50	1.05	2.08	8.24	765	N/A	29.11	860	0.291
EX2	0.745	3.57	0.0056	190	0.40	11.95	530	0.45	0.99	1.97	8.65	720	N/A	20.59	860	0.206
EX3	0.745	0.60	0.0009	220	0.50	11.93	250	0.50	1.05	0.00	3.98	470	N/A	15.92	860	0.159
DEVELOPED CONDITIONS																
ON1	0.587	2.39	0.0037	230	0.50	17.65	330	1.00	2.02	0.00	2.72	560	13.11	13.11	740	0.131
ON2	0.824	2.16	0.0034	245	1.00	7.76	597	0.20	0.90	1.37	10.41	842	14.68	14.68	920	0.147
ON3	0.587	0.75	0.0012	265	1.00	15.04	0	0.00	0.00	0.00	#####	265	11.47	#####	740	#DIV/0!
ON4	0.587	2.23	0.0035	65	1.00	7.45	450	1.00	2.02	0.00	3.71	515	12.86	11.16	740	0.112
ON5	0.824	1.32	0.0021	121	0.60	6.47	175	0.40	1.28	0.00	2.28	296	11.64	8.75	920	0.088
OFF-SITE CONDITIONS																
OFF1	0.904	1.18	0.0018	95	0.30	5.15	540	0.33	0.85	1.69	0.00	635	N/A	5.15	930	0.051
OFF2	0.904	1.31	0.0020	65	0.63	3.32	765	0.40	0.94	1.86	0.00	830	N/A	3.32	930	0.033
OFF3	0.904	3.95	0.0062	440	2.00	5.89	350	2.00	2.09	0.00	2.79	790	N/A	8.67	930	0.087

EQUATIONS:

Travel Time Calculations:

$$t_c = t(t) + t(t)$$

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

$$t(t) = 1.8 \times (1.4 - K) \times L^{0.75} / S^{0.5}$$

$$K = 0.0132 \times CN - 0.39$$

$$T_{lag} = 0.60t_c$$

V1 for first 500 feet travel distance

$$\text{Existing } V1 = 14.8 \times (S/100)^{0.5}$$

$$\text{Developed } V1 = 20.2 \times (S/100)^{0.5}$$

V2 for remaining travel distance

$$\text{Existing } V2 = 29.4 \times (S/100)^{0.5}$$

$$\text{Developed } V2 = 30.6 \times (S/100)^{0.5}$$

STANDARD FORM 4:


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1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   JUN 1998                       *
*   VERSION 4.1                     *
* RUN DATE 09JUL02 TIME 13:09:00   *
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*****
* U.S. ARMY CORPS OF ENGINEERS     *
* HYDROLOGIC ENGINEERING CENTER    *
* 609 SECOND STREET                *
* DAVIS, CALIFORNIA 95616          *
* (916) 756-1104                   *
*****

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(EXISTING / PROPOSED) + OFF-SITE

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

THE DEFINITIONS OF VARIABLES -RTIME- 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

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2          ID          HARRIOTT RENAISSANCE HOTEL @ PARADISE RD
3          ID          LAS VEGAS, NV
4          ID
5          ID          INPUT FILE :BONASAN.DAT
6          ID          OUTPUT FILE:BONASAN.OUT
7          ID
8          ID          +-----+
9          ID          *          DRAINAGE BASINS AREA = 9.10AC          *
10         ID          *          DEPTH-DURATION-FREQUENCY VALUE = 2.77-in          *
11         ID          *          DEPTH-AREA REDUCTION VALUE = 0.00 (NOT USED)          *
12         ID          *          STORM DISTRIBUTION #3          *
13         ID          *          ABSTRACTION METHOD: SCS CN          *
14         ID          *          HYDROLOGIC METHOD: SCS UH          *
15         ID          *          ROUTING METHOD:          *
16         ID          *          RATIO 1 = 100-YEAR EVENT          *
17         ID          *          RATIO 2 = 10-YEAR EVENT          *
18         ID          *          STARTED: 00/00/01          *
19         ID          *          REVISED: 00/00/00          *
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25         ID          IO      4              0
26         ID          IN      5
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424        ID          *
425        ID          *
426        ID          *
427        ID          *
428        ID          *
429        ID          *
430        ID          *
431        ID          *
432        ID          *
433        ID          *
434        ID          *
435        ID          *
436        ID          *
437        ID          *
438        ID          *
439        ID          *
440        ID          *
441        ID          *
442        ID          *
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451        ID          *
452        ID          *
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462        ID          *
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464        ID          *
465        ID          *
466        ID          *
467        ID          *
468        ID          *
469        ID          *
470        ID          *
471        ID          *
472        ID          *
473        ID          *
474        ID          *
475        ID          *
476        ID          *
477        ID          *
478        ID          *
479        ID          *
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483        ID          *
484        ID          *
485        ID          *
486        ID          *
487        ID          *
488        ID          *
489        ID          *
490        ID          *
491        ID         
```

[illegible]

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
75	KK EX3
76	KM
77	BA .0009
78	LS 0 86
79	UD .159
	*
80	KK ROUT
81	KM
82	RK 475 .005 .025 TRAP
	*
83	KK COMB
84	KM
85	HC 2
	*
86	KK ROUT
87	KM
88	RK 200 .009 .025 TRAP
	*
89	KK EX2
90	KM
91	BA .0056
92	LS 0 86
93	UD .206
	*
94	KK CP1
95	KM
96	HC 3
	*
	*
	* % ON-SITE ESTIMATED FUTURE RUNOFF UNDER DEVELOPED CONDITIONS *
	*
	*
	*
97	KK ON1
98	KM
99	BA .004
100	LS 0 74
101	UD .131
	*
102	KK ROUT
103	KM
104	RK 519 0.002 0.013 CIRC 1.25
	*

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
105	KK ON2
106	KM
107	BA .0035
108	LS 0 92
109	UD 0.147
	*
110	KK CP1
111	KM
112	HC 2
	*
113	KK ROUT
114	KM
115	RK 75 0.002 0.013 CIRC 1.5
	*
116	KK ON3
117	KM
118	BA .001
119	LS 0 74
120	UD .114
	*
	*
	*
121	KK ON4
122	KM
123	BA .0035
124	LS 0 74
125	UD .112
	*
	*
	*
126	KK ON5
127	KM
128	BA .002
129	LS 0 92
130	UD .088
	*
	*
131	ZZ

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(---) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
28	OFF1	
	V	
42	ROUT	
	.	
45	OFF3	
	V	
50	ROUT	
	.	
53	COMB.....	
	.	
56	OFF2	
	.	
61	COMB.....	
	V	
	V	
64	ROUT	
	.	
67	EX1	
	V	
	V	
72	ROUT	
	.	
75	.	EX3
	.	V
	.	V
80	.	ROUT
	.	.
83	COMB.....	
	V	
	V	
86	ROUT	
	.	
89	.	EX2
	.	.
94	CPI.....	
	.	
97	ON1	
	V	
	V	
102	ROUT	
	.	
105	.	ON2
	.	.
110	CPI.....	
	V	
	V	
113	ROUT	
	.	
116	.	ON3
	.	.
121	.	ON4
	.	.
126	.	ON5

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 1.00	RATIO 2 .57
HYDROGRAPH AT +	OFF1	.00	1 FLOW TIME	3. 3.50	1. 3.50
ROUTED TO +	ROUT	.00	1 FLOW TIME	3. 3.58	1. 3.58
HYDROGRAPH AT +	OFF3	.01	1 FLOW TIME	13. 3.50	7. 3.50
ROUTED TO +	ROUT	.01	1 FLOW TIME	13. 3.50	7. 3.50
2 COMBINED AT +	COMB	.01	1 FLOW TIME	15. 3.50	8. 3.50
HYDROGRAPH AT +	OFF2	.00	1 FLOW TIME	5. 3.50	3. 3.50
2 COMBINED AT +	COMB	.01	1 FLOW TIME	20. 3.50	10. 3.50
ROUTED TO +	ROUT	.01	1 FLOW TIME	19. 3.50	10. 3.50
HYDROGRAPH AT +	EX1	.01	1 FLOW TIME	7. 3.75	2. 3.75
ROUTED TO +	ROUT	.01	1 FLOW TIME	6. 3.75	2. 3.83
HYDROGRAPH AT +	EX3	.00	1 FLOW TIME	1. 3.58	0. 3.58
ROUTED TO +	ROUT	.00	1 FLOW TIME	1. 3.67	0. 3.67
2 COMBINED AT +	COMB	.01	1 FLOW TIME	7. 3.75	3. 3.83
ROUTED TO +	ROUT	.01	1 FLOW TIME	7. 3.75	3. 3.83
HYDROGRAPH AT +	EX2	.01	1 FLOW TIME	6. 3.67	2. 3.67
3 COMBINED AT +	CP1	.02	1 FLOW TIME	27. 3.50	13. 3.50
HYDROGRAPH AT +	ON1	.00	1 FLOW TIME	3. 3.58	1. 3.58
ROUTED TO +	ROUT	.00	1 FLOW TIME	3. 3.58	0. 3.67
HYDROGRAPH AT +	ON2	.00	1 FLOW TIME	6. 3.58	3. 3.58
2 COMBINED AT +	CP1	.01	1 FLOW TIME	6. 3.58	3. 3.58
ROUTED TO +	ROUT	.01	1 FLOW TIME	6. 3.58	3. 3.58

HYDROGRAPH AT						
+	ON3	.00	1	FLOW	1.	0.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ON4	.00	1	FLOW	2.	0.
				TIME	3.58	3.58
HYDROGRAPH AT						
+	ON5	.00	1	FLOW	4.	2.
				TIME	3.50	3.50

198 L.F. Swale for Sandhill Park @ South Boundary (Q100-yr, Proposed)
Worksheet for Triangular Channel

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.025
Slope	0.007500 ft/ft
Left Side Slope	50.00 H : V
Right Side Slope	50.00 H : V
Discharge	21.00 cfs

Results

Depth	0.46 ft
Flow Area	10.8 ft ²
Wetted Perimete	46.48 ft
Top Width	46.47 ft
Critical Depth	0.41 ft
Critical Slope	0.015507 ft/ft
Velocity	1.95 ft/s
Velocity Head	0.06 ft
Specific Energy	0.52 ft
Froude Number	0.71
Flow Type	Subcritical

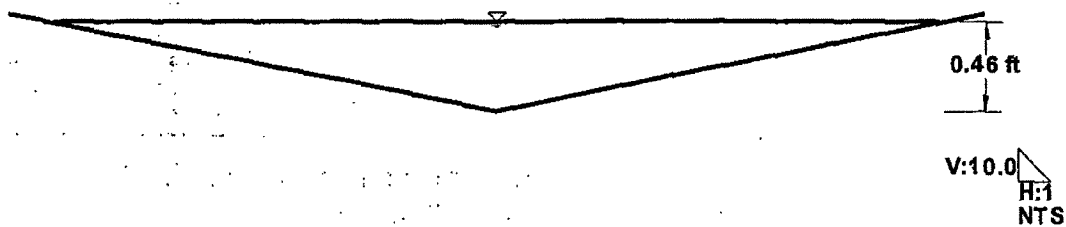
198 L.F. Swale for Sandhill Park @ South Boundary (Q100, Proposed) Cross Section for Triangular Channel

Project Description

Worksheet	Triangular Channel - 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data

Mannings Coefficient	0.025
Slope	0.007500 ft/ft
Depth	0.46 ft
Left Side Slope	50.00 H : V
Right Side Slope	50.00 H : V
Discharge	21.00 cfs



4.0

RIPRAP - Rock Sizing: RINCON

STA:1800

$$V = 3(d_{50})^{0.5}(S_s - 1) / S^{0.17}$$

EQ. 734

Where:

V = Mean Channel Velocity in fps

S = Longitudinal Channel Slope in ft/ft

S_s = Specific Gravity of Rock

d₅₀ = Rock size in feet for which 50% of the riprap weight is smaller.

=	2.00
=	0.0075
=	2.5

solve for d₅₀:

d ₅₀ = 0.04	ft.
= 0.45	in.

CONCRETE CHANNEL FOR SANDHILL PARK, @ SOUTHERN BOUNDARY
Worksheet for Rectangular Channel

Project Description

Worksheet	Rectangular Channel -
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data

Mannings Coefficient	0.013
Slope	0.014300 ft/ft
Depth	0.52 ft
Bottom Width	2.00 ft

Results

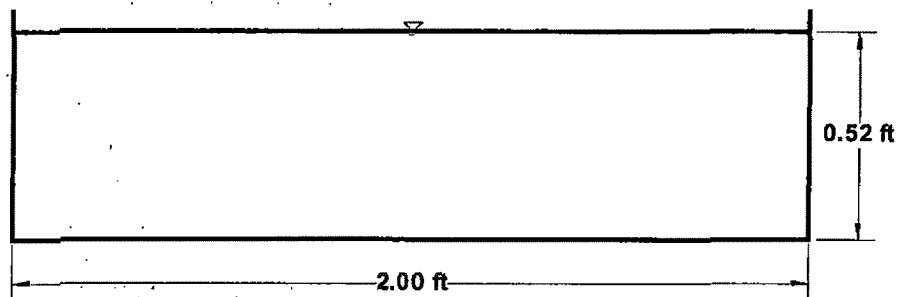
Discharge	6.89 cfs
Flow Area	1.0 ft ²
Wetted Perimete	3.03 ft
Top Width	2.00 ft
Critical Depth	0.72 ft
Critical Slope	0.005657 ft/ft
Velocity	6.67 ft/s
Velocity Head	0.69 ft
Specific Energy	1.21 ft
Froude Number	1.64
Flow Type	Supercritical

CONCRETE CHANNEL FOR SANDHILL PARK, @ SOUTHERN BOUNDARY

Cross Section for Rectangular Channel

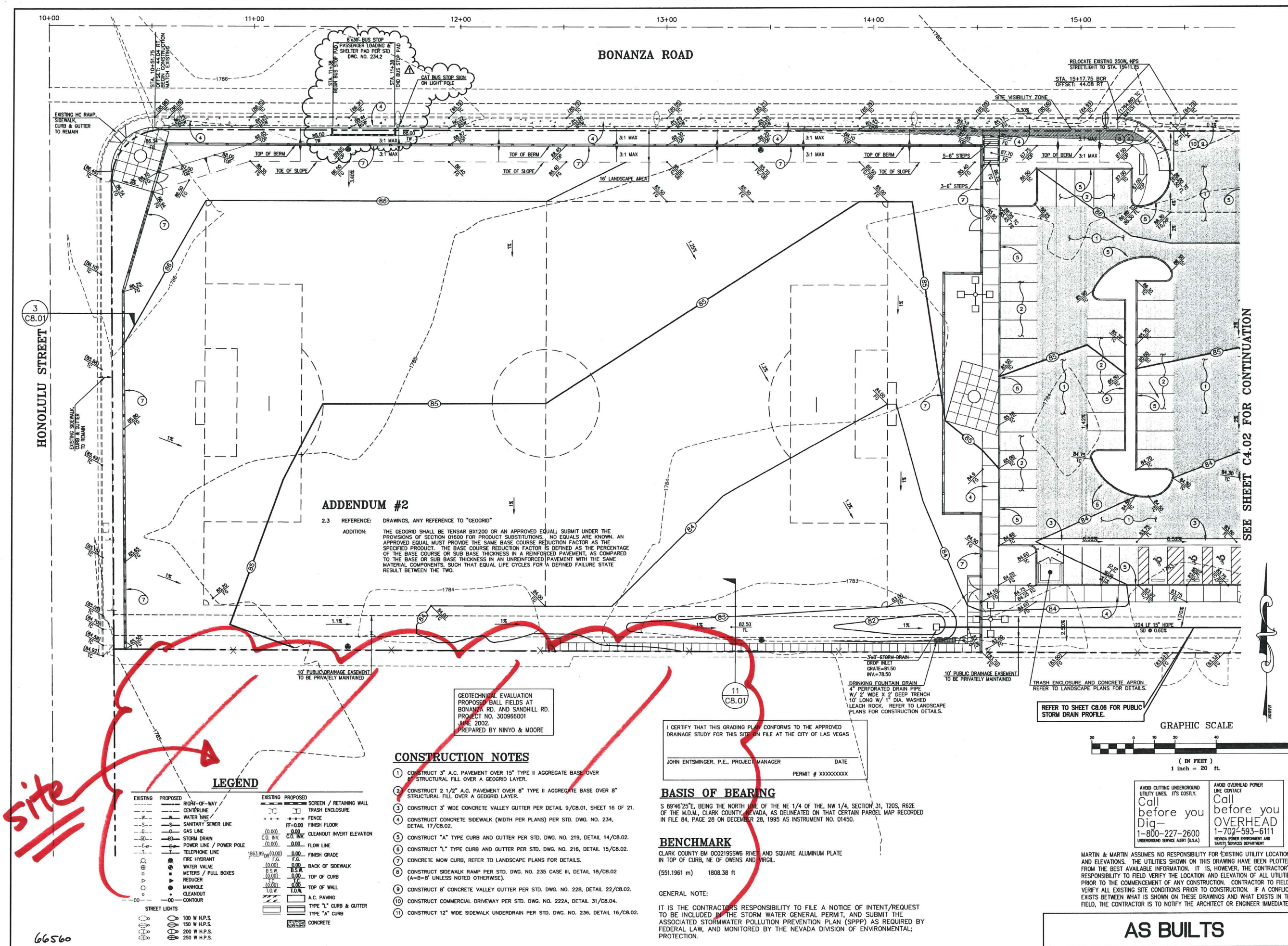
Project Description	
Worksheet	Rectangular Channel -
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.013
Slope	0.014300 ft/ft
Depth	0.52 ft
Bottom Width	2.00 ft
Discharge	6.89 cfs



V:1
H:1
NTS

6.0



ADDENDUM #2

2.3 REFERENCE: DRAWINGS, ANY REFERENCE TO "GEGRID"
ADDITION: THE GEGRID SHALL BE TENSAR B11200 OR AN APPROVED EQUAL; SUBMIT UNDER THE PROVISIONS OF SECTION 01600 FOR PRODUCT SUBSTITUTIONS. NO EQUALS ARE KNOWN. AN APPROVED EQUAL MUST PROVIDE THE SAME BASE COURSE REDUCTION FACTOR AS THE SPECIFIED PRODUCT. THE BASE COURSE REDUCTION FACTOR IS DEFINED AS THE PERCENTAGE OF THE BASE COURSE OR SUB BASE THICKNESS IN A REINFORCED PAVEMENT, AS COMPARED TO THE BASE OR SUB BASE THICKNESS IN AN UNREINFORCED PAVEMENT WITH THE SAME MATERIAL COMPONENTS, SUCH THAT EQUAL LIFE CYCLES FOR A DEFINED FAILURE STATE RESULT BETWEEN THE TWO.

GEOTECHNICAL EVALUATION
PROPOSED BALL FIELDS AT
BONANZA RD. AND SANDHILL RD.
PROJECT NO. 300966001
JUNE 2002
PREPARED BY NINYO & MOORE

CONSTRUCTION NOTES

1. CONSTRUCT 3" A.C. PAVEMENT OVER 15" TYPE II AGGREGATE BASE OVER 8" STRUCTURAL FILL OVER A GEGRID LAYER.
2. CONSTRUCT 2 1/2" A.C. PAVEMENT OVER 8" TYPE II AGGREGATE BASE OVER 8" STRUCTURAL FILL OVER A GEGRID LAYER.
3. CONSTRUCT 3" WIDE CONCRETE VALLEY GUTTER PER DETAIL 9/C8.01, SHEET 16 OF 21.
4. CONSTRUCT CONCRETE SIDEWALK (WIDTH PER PLANS) PER STD. DWG. NO. 234, DETAIL 17/C8.02.
5. CONSTRUCT "A" TYPE CURB AND GUTTER PER STD. DWG. NO. 219, DETAIL 14/C8.02.
6. CONSTRUCT "L" TYPE CURB AND GUTTER PER STD. DWG. NO. 216, DETAIL 15/C8.02.
7. CONSTRUCT 8" CONCRETE VALLEY GUTTER PER DETAILS.
8. CONSTRUCT SIDEWALK RAMP PER STD. DWG. NO. 235 CASE III, DETAIL 16/C8.02 (A=B=8" UNLESS NOTED OTHERWISE).
9. CONSTRUCT 8" CONCRETE VALLEY GUTTER PER STD. DWG. NO. 228, DETAIL 22/C8.02.
10. CONSTRUCT COMMERCIAL DRIVEWAY PER STD. DWG. NO. 222A, DETAIL 31/C8.04.
11. CONSTRUCT 12" WIDE SIDEWALK UNDERDRAIN PER STD. DWG. NO. 236, DETAIL 16/C8.02.

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS

JOHN ENTSMINGER, P.E., PROJECT MANAGER DATE
PERMIT # XXXXXXXXX

BASIS OF BEARING

S 89°46'25"E, BEING THE NORTH LINE OF THE NE 1/4 OF THE NW 1/4, SECTION 31, T20S, R62E OF THE M.D.M., CLARK COUNTY, NEVADA, AS DELINEATED ON THAT CERTAIN PARCEL MAP RECORDED IN FILE 84, PAGE 28 ON DECEMBER 28, 1995 AS INSTRUMENT NO. 01450.

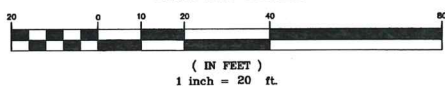
BENCHMARK

CLARK COUNTY BM 00021955W6 RIVER AND SQUARE ALUMINUM PLATE IN TOP OF CURB, NE OF OWENS AND MORGAN.
(551.1961 m) 1808.38 ft

GENERAL NOTE:

IT IS THE CONTRACTOR'S RESPONSIBILITY TO FILE A NOTICE OF INTENT/REQUEST TO BE INCLUDED IN THE STORM WATER GENERAL PERMIT, AND SUBMIT THE ASSOCIATED STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AS REQUIRED BY FEDERAL LAW, AND MONITORED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION.

GRAPHIC SCALE



AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.
Call before you Dig-
1-800-227-2600
UNDERGROUND SERVICE ALERT (USA)

AVOID OVERHEAD POWER LINE CONTACT
Call before you OVERHEAD
1-702-593-6111
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

MARTIN & MARTIN ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS, HOWEVER, THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO CONSTRUCTION. IF A CONFLICT EXISTS BETWEEN WHAT IS SHOWN ON THESE DRAWINGS AND WHAT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE ARCHITECT OR ENGINEER IMMEDIATELY.

AS BUILTS



REVISIONS

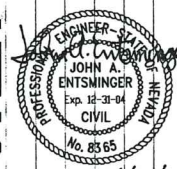
ADDED RTC BUS STOP 12-24-02

CONSULTANT

MARTIN & MARTIN
Civil Engineers
2101 South Jones Blvd.
Suite 120
Las Vegas, Nevada 89146
Phone (702) 248-8000
Fax (702) 248-8070
E-MAIL MARTIN@VON.COM

BONANZA-SANDHILL PARK

GRADING PLAN

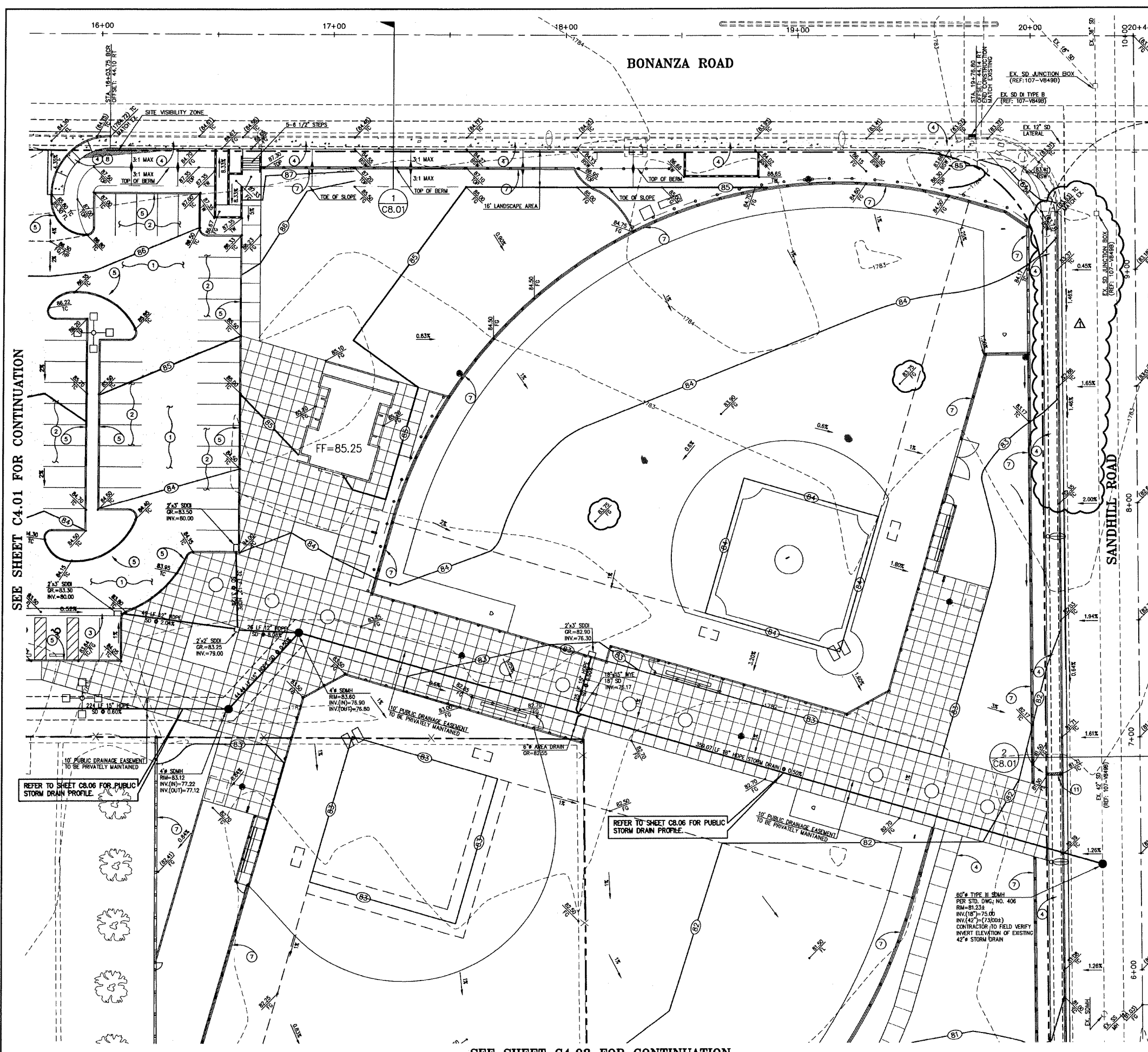


OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

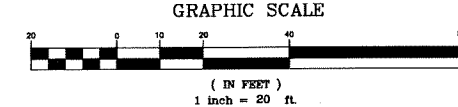
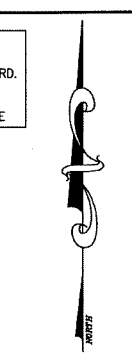
400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89101
PHONE: (702) 229-5535
FAX: (702) 382-3233
TDD: (702) 386-9108

DRAWN	V.J.W. / J.B.J.
FILE	1925GRADING.DWG
DATE	8-23-02
SCALE	1"=20'
GRID NO.	02.15341.07
GRID NO.	650.69
SHEET NO.	8
SHEET NO.	C4.01
SHEET NO.	SHEET 7 OF 21

REF.



GEOTECHNICAL EVALUATION
PROPOSED BALL FIELDS AT
BONANZA RD. AND SANDHILL RD.
PROJECT NO. 300966001
JUNE 2002
PREPARED BY NINYO & MOORE



BASIS OF BEARING

S 89°46'25"E, BEING THE NORTH LINE OF THE NE 1/4 OF THE, NW 1/4, SECTION 31, T20S, R62E OF THE M.D.M., CLARK COUNTY, NEVADA, AS DELINEATED ON THAT CERTAIN PARCEL MAP RECORDED IN FILE 84, PAGE 28 ON DECEMBER 28, 1995 AS INSTRUMENT NO. 01450.

BENCHMARK

CLARK COUNTY BM 00021955W5 RIVET AND SQUARE ALUMINUM PLATE
IN TOP OF CURB, NE OF OWENS AND VIRGIL.

(551.1961 m) 1808.38 ft

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED
DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS

JOHN ENTSMINGER, P.E., PROJECT MANAGER DATE
PERMIT # XXXXXXXXXX

CONSTRUCTION NOTES

1. CONSTRUCT 3" A.C. PAVEMENT OVER 15" TYPE II AGGREGATE BASE OVER 8" STRUCTURAL FILL OVER A GEGRID LAYER.
2. CONSTRUCT 2 1/2" A.C. PAVEMENT OVER 8" TYPE II AGGREGATE BASE OVER 8" STRUCTURAL FILL OVER A GEGRID LAYER.
3. CONSTRUCT 3' WIDE CONCRETE VALLEY GUTTER PER DETAIL 9/C8.01, SHEET 16 OF 21.
4. CONSTRUCT CONCRETE SIDEWALK (WIDTH PER PLANS) PER STD. DWG. NO. 234, DETAIL 17/C8.02.
5. CONSTRUCT "A" TYPE CURB AND GUTTER PER STD. DWG. NO. 219, DETAIL 14/C8.02.
6. CONSTRUCT "L" TYPE CURB AND GUTTER PER STD. DWG. NO. 216, DETAIL 15/C8.02.
7. CONCRETE MOW CURB, REFER TO LANDSCAPE PLANS FOR DETAILS.
8. CONSTRUCT SIDEWALK RAMP PER STD. DWG. NO. 235 CASE III, DETAIL 18/C8.02 (A-B-B' UNLESS NOTED OTHERWISE).
9. CONSTRUCT 8" CONCRETE VALLEY GUTTER PER STD. DWG. NO. 228, DETAIL 22/C8.02.
10. CONSTRUCT COMMERCIAL DRIVEWAY PER STD. DWG. NO. 222A, DETAIL 31/C8.04.
11. CONSTRUCT 12" WIDE SIDEWALK UNDERDRAIN PER STD. DWG. NO. 236, DETAIL 16/C8.02.

LEGEND

EXISTING	PROPOSED	EXISTING	PROPOSED
---	RIGHT-OF-WAY	---	SCREEN / RETAINING WALL
---	CENTERLINE	---	TRASH ENCLOSURE
---	WATER LINE	---	FENCE
---	SANITARY SEWER LINE	---	FF=0.00 FINISH FLOOR
---	GAS LINE	---	C.O. INV. CLEANSUIT INVERT ELEVATION
---	STORM DRAIN	---	0.00 FLOW LINE
---	POWER LINE / POWER POLE	---	0.00 FINISH GRADE
---	TELEPHONE LINE	---	0.00 BACK OF SIDEWALK
---	FIRE HYDRANT	---	0.00 TOP OF CURB
---	WATER VALVE	---	0.00 TOP OF PAVING
---	REDUCER	---	0.00 TYPE "L" CURB & GUTTER
---	MANHOLE	---	0.00 TYPE "A" CURB
---	CLEANSUIT	---	0.00 CONCRETE
---	CONTOUR		
---	STREET LIGHTS		
---	100 W.H.P.S.		
---	150 W.H.P.S.		
---	200 W.H.P.S.		
---	250 W.H.P.S.		

GENERAL NOTE:
IT IS THE CONTRACTOR'S RESPONSIBILITY TO FILE A NOTICE OF INTENT/REQUEST TO BE INCLUDED IN THE STORM WATER GENERAL PERMIT, AND SUBMIT THE ASSOCIATED STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AS REQUIRED BY FEDERAL LAW, AND MONITORED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION.

AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.
Call before you Dig- 1-800-227-2600
UNDERGROUND SERVICE ALERT (U.S.A.)

AVOID OVERHEAD POWER LINE CONTACT
Call before you OVERHEAD 1-702-593-6111
NEVADA POWER CORPORATION AND SAFETY SERVICES DEPARTMENT

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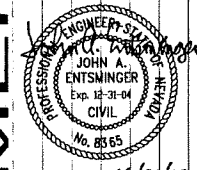
AS BUILTS



REVISIONS
REV. STREET GRADES 12-18-02

CONSULTANT
MARTIN & MARTIN
Civil Engineers
2101 South Jones Blvd. Suite 120
Las Vegas, Nevada 89146
Phone (702) 248-8000
Fax (702) 248-8070
E-MAIL MARTIN@MVM.COM

DEPARTMENT OF PUBLIC WORKS
BONANZA-SANDHILL PARK
GRADING PLAN



06/30/03

OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89101
PHONE: (702) 229-5535
FAX: (702) 392-3232
(702) 396-9108

NAME: N.A.W. / J.B.L.
FILE: 1925GRADING.DWG
DATE: 8-23-02
SCALE: 1"=20'
SHEET NO: 02.15341.07
SHEET 3 OF 21

REF.

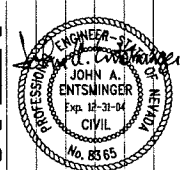
SEE SHEET C4.02 FOR CONTINUATION



RELOCATED DRIVEWAY 11-17-08
17' NORTH, TEL. INT. CONTACT

MARTIN & MARTIN
Civil Engineers
2101 South Jones Blvd.
Suite 120
Las Vegas, Nevada 89146
Phone (702) 248-8000
Fax (702) 248-8070
E-MAIL MARTIN@VON.COM

BONANZA-SANDHILL PARK
GRADING PLAN



OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89101
PHONE: (702) 229-5535
FAX: (702) 382-5232
TDD: (702) 386-9108

DATE: 8-23-02
SCALE: 1"=20'

SHEET NO: 02.15341.07
COVERED: 650.69

SHEET: C4.03
SHEET 9 OF 21

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

BASIS OF BEARING

S 89°46'25"E, BEING THE NORTH LINE OF THE NE 1/4 OF THE, NW 1/4, SECTION 31, T20S, R62E OF THE M.D.M., CLARK COUNTY, NEVADA, AS DELINEATED ON THAT CERTAIN PARCEL MAP RECORDED IN FILE 84, PAGE 28 ON DECEMBER 28, 1995 AS INSTRUMENT NO. 01450.

BENCHMARK

CLARK COUNTY BM 00219SSW6 RIVET AND SQUARE ALUMINUM PLATE IN TOP OF CURB, NE OF OWENS AND VIRGIL.

(551.1961 m) 1808.38 ft

I CERTIFY THAT THIS GRADING PLAN CONFORMS TO THE APPROVED DRAINAGE STUDY FOR THIS SITE ON FILE AT THE CITY OF LAS VEGAS

JOHN ENTSMINGER, P.E., PROJECT MANAGER

DATE

PERMIT # XXXXXXXX

CONSTRUCTION NOTES

1. CONSTRUCT 3" A.C. PAVEMENT OVER 15" TYPE II AGGREGATE BASE OVER 8" STRUCTURAL FILL OVER A GEOTRID LAYER.
2. CONSTRUCT 2 1/2" A.C. PAVEMENT OVER 8" TYPE II AGGREGATE BASE OVER 8" STRUCTURAL FILL OVER A GEOTRID LAYER.
3. CONSTRUCT 3' WIDE CONCRETE VALLEY GUTTER PER DETAIL 9/CB.01, SHEET 16 OF 21.
4. CONSTRUCT CONCRETE SIDEWALK (WIDTH PER PLANS) PER STD. DWG. NO. 234, DETAIL 17/CB.02.
5. CONSTRUCT "A" TYPE CURB AND GUTTER PER STD. DWG. NO. 219, DETAIL 14/CB.02.
6. CONSTRUCT "L" TYPE CURB AND GUTTER PER STD. DWG. NO. 216, DETAIL 15/CB.02.
7. CONCRETE MOW CURB, REFER TO LANDSCAPE PLANS FOR DETAILS.
8. CONSTRUCT SIDEWALK RAMP PER STD. DWG. NO. 235 CASE III, DETAIL 18/CB.02 (A=B=8' UNLESS NOTED OTHERWISE).
9. CONSTRUCT 8" CONCRETE VALLEY GUTTER PER STD. DWG. NO. 228, DETAIL 22/CB.02.
10. CONSTRUCT COMMERCIAL DRIVEWAY PER STD. DWG. NO. 222A, DETAIL 31/CB.04.
11. CONSTRUCT 2' WIDE SIDEWALK UNDERDRAIN PER STD. DWG. NO. 236, DETAIL 16/CB.02.

LEGEND

EXISTING	PROPOSED	EXISTING	PROPOSED
RIGHT-OF-WAY	RIGHT-OF-WAY	SCREEN / RETAINING WALL	SCREEN / RETAINING WALL
CENTERLINE	CENTERLINE	TRASH ENCLOSURE	TRASH ENCLOSURE
WATER LINE	WATER LINE	FENCE	FENCE
SANITARY SEWER LINE	SANITARY SEWER LINE	FINISH FLOOR	FINISH FLOOR
GAS LINE	GAS LINE	C.O. INV.	C.O. INV.
STORM DRAIN	STORM DRAIN	CLEANOUT INVERT ELEVATION	CLEANOUT INVERT ELEVATION
POWER LINE / POWER POLE	POWER LINE / POWER POLE	FLOW LINE	FLOW LINE
TELEPHONE LINE	TELEPHONE LINE	FINISH GRADE	FINISH GRADE
FIRE HYDRANT	FIRE HYDRANT	BACK OF SIDEWALK	BACK OF SIDEWALK
WATER VALVE	WATER VALVE	TOP OF CURB	TOP OF CURB
METERS / PULL BOXES	METERS / PULL BOXES	TOP OF WALL	TOP OF WALL
REDUCER	REDUCER	A.C. PAVING	A.C. PAVING
MANHOLE	MANHOLE	TYPE "L" CURB & GUTTER	TYPE "L" CURB & GUTTER
CLEANOUT	CLEANOUT	TYPE "A" CURB	TYPE "A" CURB
CONTOUR	CONTOUR	CONCRETE	CONCRETE

AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.
Call before you Dig-
1-800-227-2600
UNDERGROUND SERVICE ALERT (USA)

AVOID OVERHEAD POWER LINE CONTACT
Call before you OVERHEAD
1-702-593-6111
NEVADA POWER DIVISION AND SAFETY SERVICES DEPARTMENT

MARTIN & MARTIN ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS, HOWEVER, THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. CONTRACTOR TO FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO CONSTRUCTION. IF A CONFLICT EXISTS BETWEEN WHAT IS SHOWN ON THESE DRAWINGS AND WHAT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE ARCHITECT OR ENGINEER IMMEDIATELY.

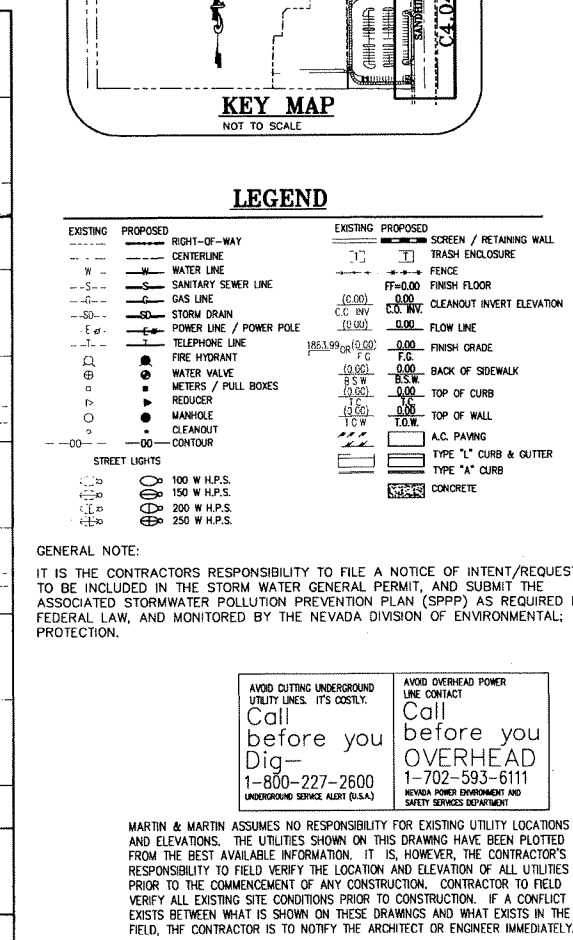
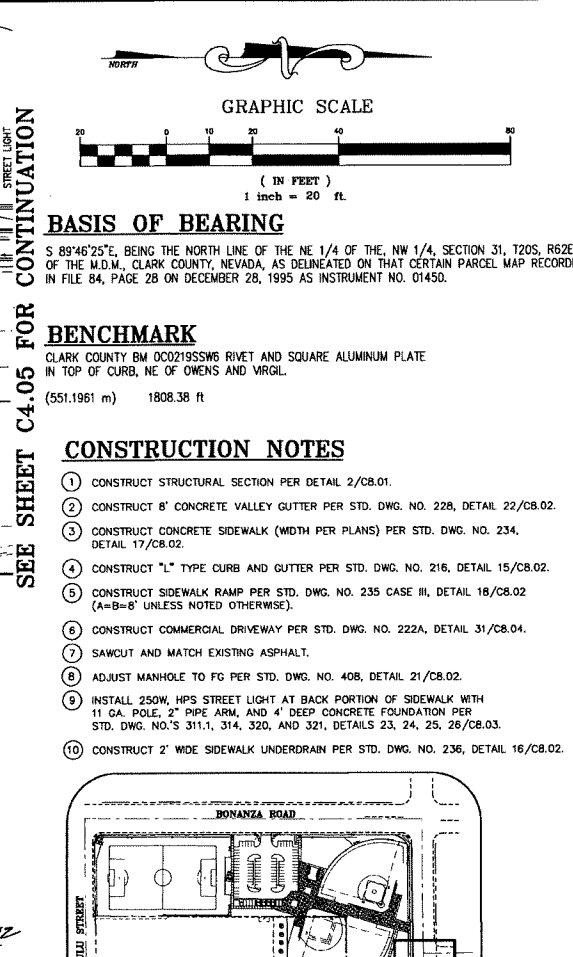
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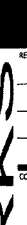
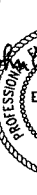
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GENERAL NOTE:
IT IS THE CONTRACTOR'S RESPONSIBILITY TO FILE A NOTICE OF INTENT/REQUEST TO BE INCLUDED IN THE STORM WATER GENERAL PERMIT, AND SUBMIT THE ASSOCIATED STORMWATER POLLUTION PREVENTION PLAN (SPPP) AS REQUIRED BY FEDERAL LAW, AND MONITORED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION.

GEOTECHNICAL EVALUATION
PROPOSED BALL FIELDS AT
BONANZA RD. AND SANDHILL RD.
PROJECT NO. 300966001
JUNE 2002
PREPARED BY NINYO & MOORE

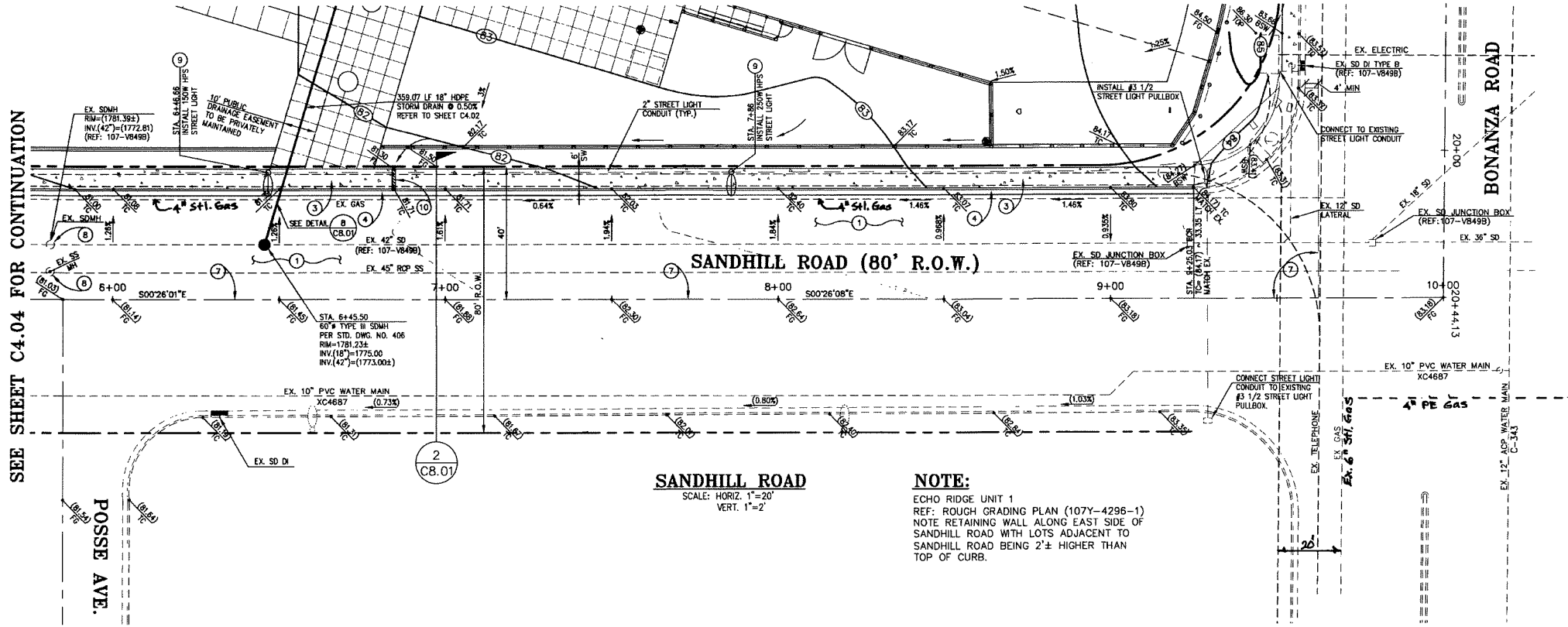
66562



	REVISIONS CONSULTANT MARTIN & MARTIN MARTIN & MARTIN Civil Engineers 2101 South Jones Blvd. Suite 120 Las Vegas, Nevada 89146 Phone (702) 248-8000 Fax (702) 248-8070 E-MAIL MARTMART@VCM.COM
DEPARTMENT OF PUBLIC WORKS	PLAN & PROFILE - SANDHILL ROAD
BONANZA-SANDHILL PARK	STAFF  JOHN A. ENTSMINGER Exp. 12-31-02 CIVIL No. 8365 11/01/02
OWNER: CITY OF LAS VEGAS DEPARTMENT OF PUBLIC WORKS ARCHITECTURAL SERVICES	400 EAST STEWART AVENUE LAS VEGAS, NEVADA 89101 PHONE: (702) 229-6535 FAX: (702) 382-3232 TDD: (702) 386-9408
DRAWN	V.J.L. / J.B.J.
FILE	132564DHILL.DWG
DATE	8-23-02
SCALE	1"=20'
BID NO	02.15341.07
CLP DWG NO	65069
SHT NO	C4.04

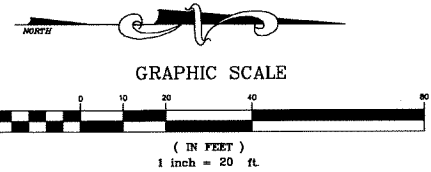
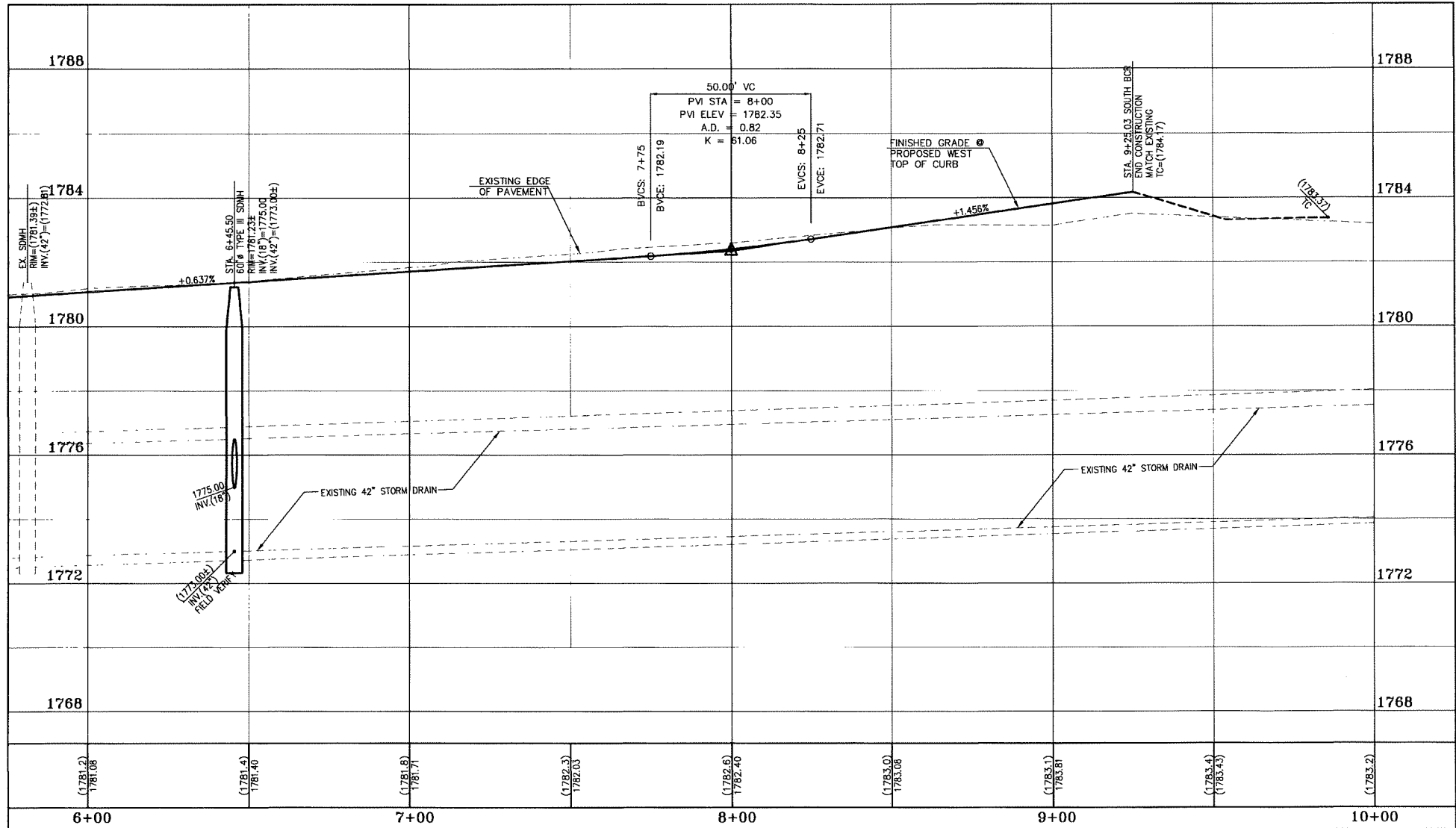
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SEE SHEET C4.04 FOR CONTINUATION



SANDHILL ROAD (80' R.O.W.)
SCALE: HORIZ. 1"=20'
VERT. 1"=2'

NOTE:
ECHO RIDGE UNIT 1
REF: ROUGH GRADING PLAN (107Y-4296-1)
NOTE RETAINING WALL ALONG EAST SIDE OF
SANDHILL ROAD WITH LOTS ADJACENT TO
SANDHILL ROAD BEING 2'± HIGHER THAN
TOP OF CURB.



BASIS OF BEARING

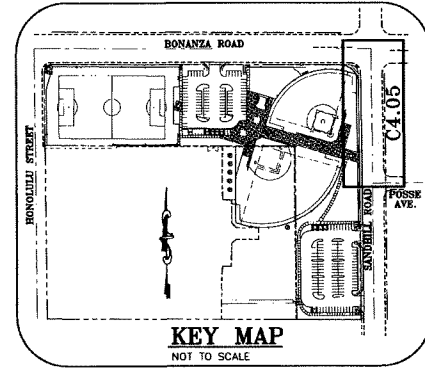
S 89°46'25"E, BEING THE NORTH LINE OF THE NE 1/4 OF THE, NW 1/4, SECTION 31, T20S, R62E OF THE M.D.M., CLARK COUNTY, NEVADA, AS DELINEATED ON THAT CERTAIN PARCEL MAP RECORDED IN FILE 84, PAGE 28 ON DECEMBER 28, 1995 AS INSTRUMENT NO. 01450.

BENCHMARK

CLARK COUNTY BM 00021955WGS RIVET AND SQUARE ALUMINUM PLATE IN TOP OF CURB, NE OF OWENS AND VIRGL.
(551.1961 m) 1808.38 ft

CONSTRUCTION NOTES

1. CONSTRUCT STRUCTURAL SECTION PER DETAIL 2/CB.01.
2. CONSTRUCT 8" CONCRETE VALLEY GUTTER PER STD. DWG. NO. 228, DETAIL 22/CB.02.
3. CONSTRUCT CONCRETE SIDEWALK (WIDTH PER PLANS) PER STD. DWG. NO. 234, DETAIL 17/CB.02.
4. CONSTRUCT "L" TYPE CURB AND GUTTER PER STD. DWG. NO. 216, DETAIL 15/CB.02.
5. CONSTRUCT SIDEWALK RAMP PER STD. DWG. NO. 235 CASE III, DETAIL 18/CB.02 (A=B=8' UNLESS NOTED OTHERWISE).
6. CONSTRUCT COMMERCIAL DRIVEWAY PER STD. DWG. NO. 222A, DETAIL 31/CB.04.
7. SAWCUT AND MATCH EXISTING ASPHALT.
8. ADJUST MANHOLE TO FG PER STD. DWG. NO. 408, DETAIL 21/CB.02.
9. INSTALL 250W, HPS STREET LIGHT AT BACK PORTION OF SIDEWALK WITH 11 GA. POLE, 2" PIPE ARM, AND 4" DEEP CONCRETE FOUNDATION PER STD. DWG. NO.'S 311.1, 314, 320, AND 321, DETAILS 23, 24, 25, 26/CB.03.
10. CONSTRUCT 12" WIDE SIDEWALK UNDERDRAIN PER STD. DWG. NO. 236, DETAIL 16/CB.02.



LEGEND

EXISTING	PROPOSED	EXISTING	PROPOSED
--- RIGHT-OF-WAY	--- RIGHT-OF-WAY	--- SCREEN / RETAINING WALL	--- SCREEN / RETAINING WALL
--- CENTERLINE	--- CENTERLINE	--- TRASH ENCLOSURE	--- TRASH ENCLOSURE
--- WATER LINE	--- WATER LINE	--- FENCE	--- FENCE
--- GAS LINE	--- GAS LINE	--- FINISH FLOOR	--- FINISH FLOOR
--- STORM DRAIN	--- STORM DRAIN	--- CLEANOUT INVERT ELEVATION	--- CLEANOUT INVERT ELEVATION
--- POWER LINE / POWER POLE	--- POWER LINE / POWER POLE	--- FLOW LINE	--- FLOW LINE
--- TELEPHONE LINE	--- TELEPHONE LINE	--- FINISH GRADE	--- FINISH GRADE
--- FIRE HYDRANT	--- FIRE HYDRANT	--- F.G.	--- F.G.
--- WATER VALVE	--- WATER VALVE	--- BACK OF SIDEWALK	--- BACK OF SIDEWALK
--- REDUCER	--- REDUCER	--- TOP OF CURB	--- TOP OF CURB
--- MANHOLE	--- MANHOLE	--- TOP OF WALL	--- TOP OF WALL
--- CLEANOUT	--- CLEANOUT	--- T.O.W.	--- T.O.W.
--- CONTOUR	--- CONTOUR	--- A.C. PAVING	--- A.C. PAVING
--- STREET LIGHTS	--- STREET LIGHTS	--- TYPE "L" CURB & GUTTER	--- TYPE "L" CURB & GUTTER
100 W.H.P.S.	100 W.H.P.S.	--- TYPE "A" CURB	--- TYPE "A" CURB
150 W.H.P.S.	150 W.H.P.S.	--- CONCRETE	--- CONCRETE
200 W.H.P.S.	200 W.H.P.S.		
250 W.H.P.S.	250 W.H.P.S.		

GENERAL NOTE:

IT IS THE CONTRACTOR'S RESPONSIBILITY TO FILE A NOTICE OF INTENT/REQUEST TO BE INCLUDED IN THE STORM WATER GENERAL PERMIT, AND SUBMIT THE ASSOCIATED STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AS REQUIRED BY FEDERAL LAW, AND MONITORED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION.

AVOID CUTTING UNDERGROUND UTILITY LINES. ITS COSTLY.
Call before you Dig—
1-800-227-2600
UNDERGROUND SERVICE ALERT (U.S.A.)

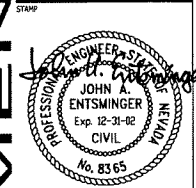
AVOID OVERHEAD POWER LINE CONTACT
Call before you OVERHEAD
1-702-593-6111
NEVADA POWER ENVIRONMENT AND SAFETY SERVICES DEPARTMENT

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MARTIN & MARTIN
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2101 South Jones Blvd.
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Las Vegas, Nevada 89146
Phone (702) 248-8000
Fax (702) 248-8070
E-MAIL: MARTIN@LVCM.COM

BONANZA-SANDHILL PARK
PLAN & PROFILE - SANDHILL ROAD

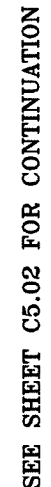


OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89101
PHONE: (702) 229-6535
FAX: (702) 382-3232
TDD: (702) 386-9108

DATE: 8-23-02
SCALE: 1"=20'
SHEET NO: 02.15341.07
SHEET 11 OF 21

REF



BASIS OF BEARING

BENCHMARK

(551.1961 m) 1808.38 ft

GENERAL NOTE:

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT

DATE _____	AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call before you Dig— 1-800-227-2600 UNDERGROUND SERVICE ALERT (U.S.A.)	AVOID OVERHEAD POWER LINE CONTACT Call before you OVERHEAD 1-702-593-6111 NEVER POWER EMERGENCY AND SAFETY PROJECTS INDEPENDENT
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AS BUILTS



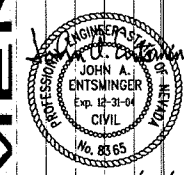
CONSULTA

MARTIN

MARTIN & MARTIN
Civil Engineers
2101 South Jones Blvd.
Suite 120
Las Vegas, Nevada 89146
Phone (702) 248-8000
Fax (702) 248-8070
E-MAIL WARTWART@VCM.COM

BONANZA—SANDHILL PARK

UTILITY PLAN



OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89101
PHONE: (702) 229-5535
FAX: (702) 382-3232
TDD: (702) 386-0108

DRAWN M.W. / R.I.

FILE	100-51701-210
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19250	ILDW6
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DATE	B-23-02		
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SCALE	1" = 20'
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870 NO	02 15341 07
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02.15341.07
02.15341.07

650.69	
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SYN NO. 25 21

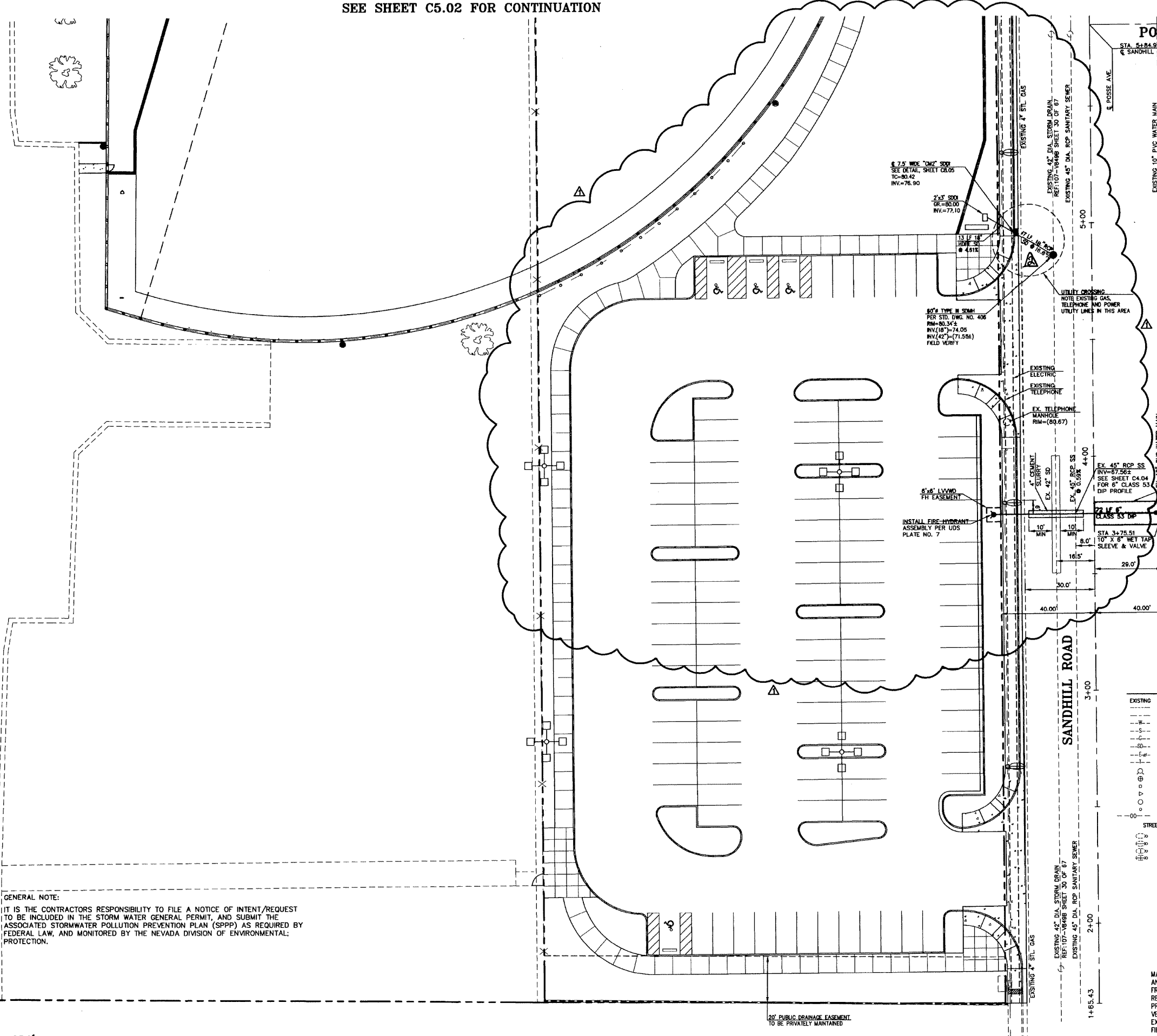
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SHEET 12 OF 21

REF.

H:\cad\ind\1925\dwg\ASB\ULTS\Sheets\1925UTL.dwg, 06/30/03 01:40:19 PM, J. JUNSAY

SEE SHEET C5.02 FOR CONTINUATION



GENERAL NOTE:
IT IS THE CONTRACTOR'S RESPONSIBILITY TO FILE A NOTICE OF INTENT/REQUEST TO BE INCLUDED IN THE STORM WATER GENERAL PERMIT, AND SUBMIT THE ASSOCIATED STORMWATER POLLUTION PREVENTION PLAN (SPPP) AS REQUIRED BY FEDERAL LAW, AND MONITORED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION.

POSSE AVE.

STA 5+84.85
SANDHILL ROAD

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

BASIS OF BEARING

S 89°46'25"E, BEING THE NORTH LINE OF THE NE 1/4 OF THE NW 1/4, SECTION 31, T20S, R62E OF THE M.D.M., CLARK COUNTY, NEVADA, AS DELINEATED ON THAT CERTAIN PARCEL MAP RECORDED IN FILE 84, PAGE 28 ON DECEMBER 28, 1995 AS INSTRUMENT NO. 01450.

BENCHMARK

CLARK COUNTY BM 002193SW6 RIVET AND SQUARE ALUMINUM PLATE IN TOP OF CURB, NE OF OWENS AND VIRGIL.
(551.1961 m) 1808.38 ft

APPROVED FOR CONSTRUCTION

FIRST APPROVAL 11/21/02

LAS VEGAS VALLEY WATER DISTRICT 1/22/03 DATE

CITY FIRE MARSHALL 1/22/03 DATE

LEGEND

EXISTING	PROPOSED	EXISTING	PROPOSED
RIGHT-OF-WAY	RIGHT-OF-WAY	SCREEN / RETAINING WALL	SCREEN / RETAINING WALL
CENTERLINE	CENTERLINE	TRASH ENCLOSURE	TRASH ENCLOSURE
WATER LINE	WATER LINE	FENCE	FENCE
SANITARY SEWER LINE	SANITARY SEWER LINE	FINISH FLOOR	FINISH FLOOR
GAS LINE	GAS LINE	C.O. INV.	C.O. INV.
STORM DRAIN	STORM DRAIN	CLEANOUT INVERT ELEVATION	CLEANOUT INVERT ELEVATION
POWER LINE / POWER POLE	POWER LINE / POWER POLE	FLOW LINE	FLOW LINE
TELEPHONE LINE	TELEPHONE LINE	FINISH GRADE	FINISH GRADE
FIRE HYDRANT	FIRE HYDRANT	BACK OF SIDEWALK	BACK OF SIDEWALK
WATER VALVE	WATER VALVE	TOP OF CURB	TOP OF CURB
WATERS / PULL BOXES	WATERS / PULL BOXES	TOP OF WALL	TOP OF WALL
REDUCER	REDUCER	A.C. PAVING	A.C. PAVING
MANHOLE	MANHOLE	TYPE "L" CURB & GUTTER	TYPE "L" CURB & GUTTER
CLEANOUT	CLEANOUT	TYPE "A" CURB	TYPE "A" CURB
CONTOUR	CONTOUR	CONCRETE	CONCRETE
STREET LIGHTS	STREET LIGHTS		
EXISTING 10" P.V.C. WATER MAIN	EXISTING 10" P.V.C. WATER MAIN		
EXISTING 42" DIA. STORM DRAIN	EXISTING 42" DIA. STORM DRAIN		
EXISTING 45" DIA. ROP SANITARY SEWER	EXISTING 45" DIA. ROP SANITARY SEWER		
EXISTING 2" STL GAS	EXISTING 2" STL GAS		

AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY.
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1-800-227-2600
UNDERGROUND SERVICE ALERT (U.S.A.)

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REVISIONS
1. RELOCATED DRIVEWAY 11/21/02
2. Rev. SD Internal 01/22/03

MARTIN & MARTIN
Civil Engineers
2101 South Jones Blvd.
Suite 120
Las Vegas, Nevada 89146
Phone: (702) 248-8000
Fax: (702) 248-8070
E-MAIL: MARTIN@VCM.COM

BONANZA-SANDHILL PARK
UTILITY PLAN

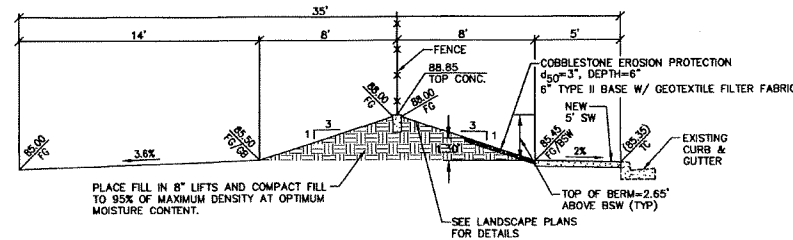
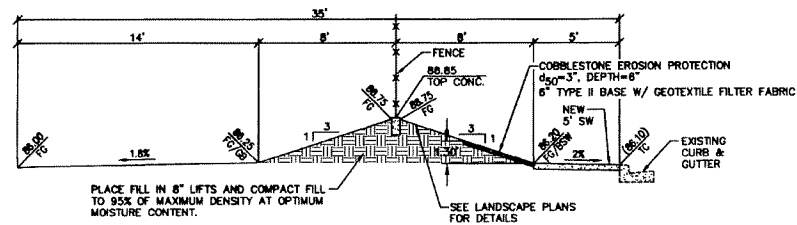
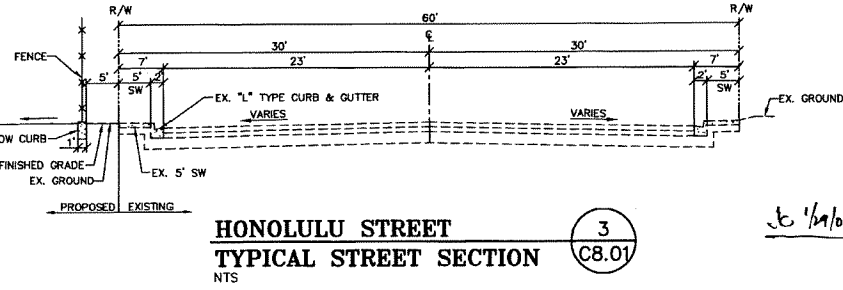
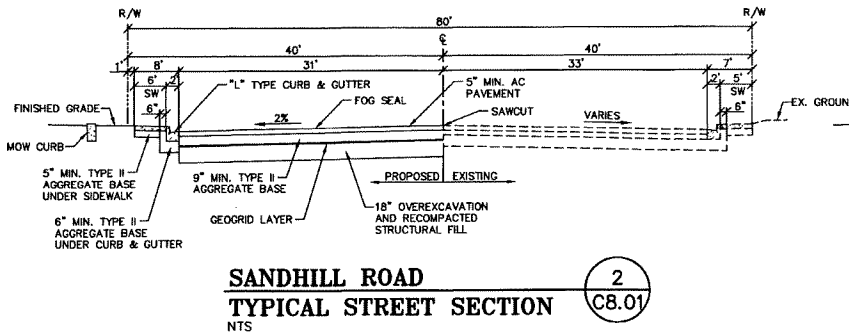
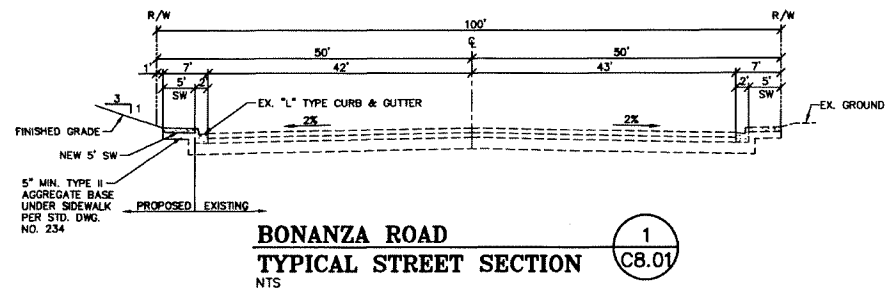
JOHN A. ENTSMINGER
Exp. 12-31-04
No. 8865
CIVIL
01/21/03

OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89103
PHONE: (702) 229-5535
FAX: (702) 382-9532
TDD: (702) 386-1108

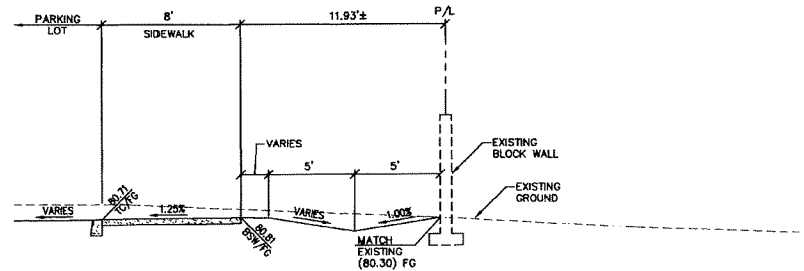
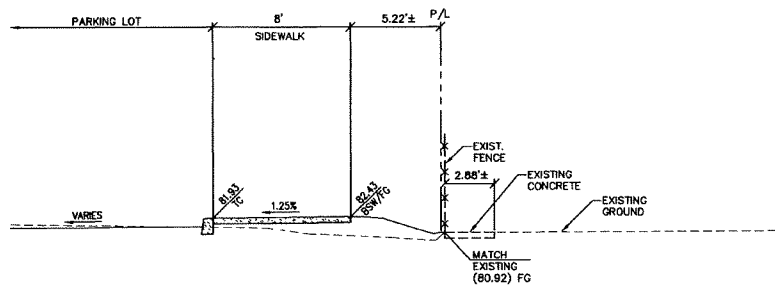
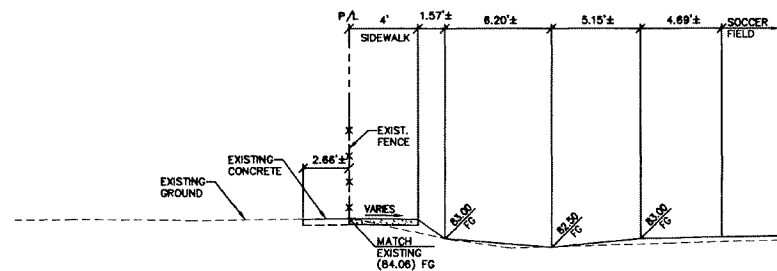
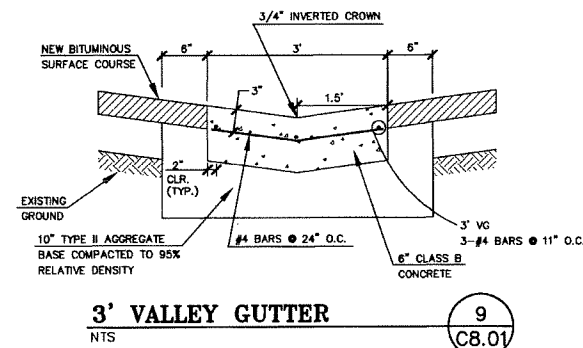
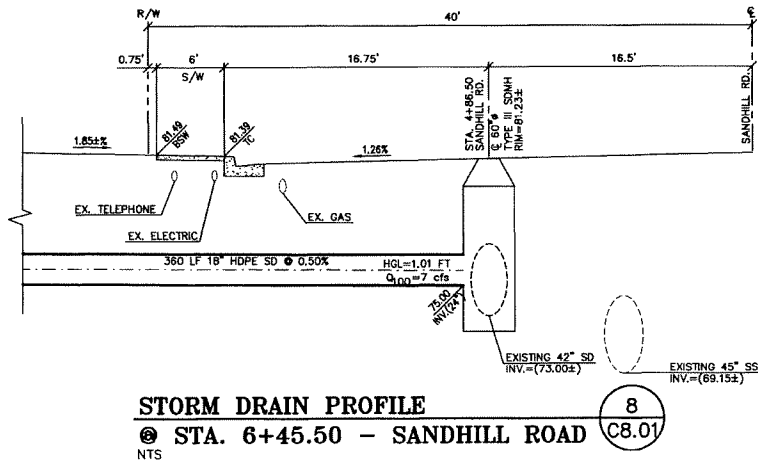
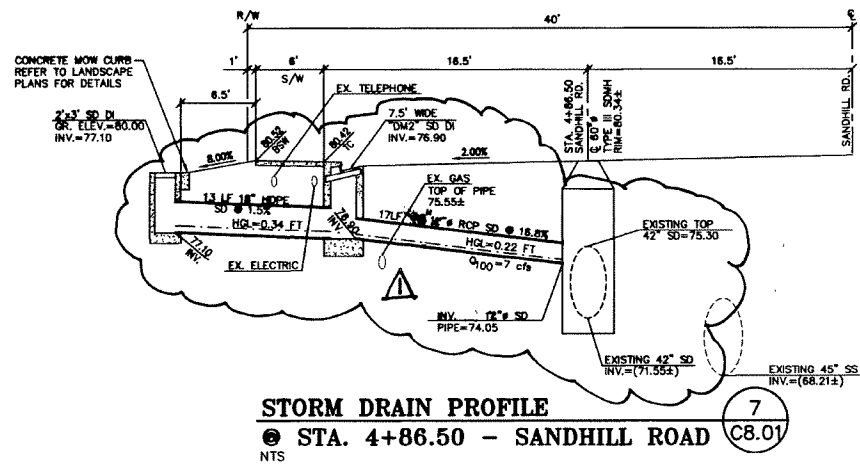
NO. 021534107
65069
C5.03
SHEET 4 OF 21

REF.



BERM CROSS-SECTION ALONG BONANZA ROAD
18' EAST OF NW CORNER OF SOCCER FIELD
SCALE: 1"=5'

BERM CROSS-SECTION ALONG BONANZA ROAD
18' WEST OF NE CORNER OF SOCCER FIELD
SCALE: 1"=5'



CROSS-SECTION THROUGH THE SOUTHERN PROPERTY
LINE 300 FEET OFF HONOLULU STREET
SCALE: 1"=5'

CROSS-SECTION THROUGH THE WESTERN PROPERTY
LINE 200 FEET NORTH OF THE SOUTHERN MOST
PROPERTY LINE
SCALE: 1"=5'

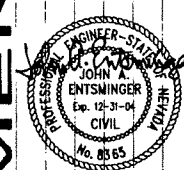
CROSS-SECTION THROUGH THE SOUTHERN PROPERTY
LINE 150 FEET OFF SANDHILL ROAD
SCALE: 1"=5'



01/28/03
Rev. 50 Internal due to
4" Street Gas Line Conflict

MARTIN & MARTIN
Civil Engineers
2101 South Jones Blvd.
Suite 120
Las Vegas, Nevada 89146
Phone (702) 248-8000
Fax (702) 248-8070
E-MAIL MARTIN@LVCM.COM

BONANZA-SANDHILL PARK
DETAIL SHEET



OWNER: CITY OF LAS VEGAS
DEPARTMENT OF PUBLIC WORKS
ARCHITECTURAL SERVICES

400 EAST STEWART AVENUE
LAS VEGAS, NEVADA 89103
PHONE: (702) 239-5535
FAX: (702) 382-9232
TDD: (702) 386-9108

DATE: 8-23-02
SCALE: AS SHOWN
SHEET NO: 02.15341.07
SHEET 16 OF 2

C8.01

REF.

APN:140-31-102-002
CITY OF LAS VEGAS
OR:19960131:02337
B.O.(1784)IES

**PROPOSED KINDERGARTEN
PLAYGROUND TURF AREA**

EXISTING BUILDING
APN: 140-31-102-003
FF=(1786.60)

MATCH-LINE SEE SHEET C4.02

1. SLOPES 4:1 OR STEEPER AND FINE-GRAINED MATERIALS THAT HAVE BEEN DISTURBED (SANDY AND SILTY MATERIALS) SHOULD BE PROTECTED WITH BURLAP OR OTHER EROSION CONTROL FABRIC/MATERIAL, UNLESS OTHERWISE SPECIFIED BY LANDSCAPE DRAWINGS AND SPECIFICATIONS OR THE SOILS REPORT.
2. CONTRACTOR SHALL DETERMINE HIS OWN FOOTING OR BASEMENT EXCAVATION QUANTITIES, EVEN THOUGH SHOWN ON GRADING PLANS. EXISTING STRUCTURE, STRUCTURE BASKET/COSTS SHOULD BE INCLUDED IN THE COST OF THE STRUCTURE, UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS.
3. CONTRACTOR SHALL NOTIFY LOCHSA ENGINEERING WITHIN 24 HOURS OF OMISSIONS AND ERRORS DISCOVERED ON PLANS. LOCHSA ENGINEERING WILL NOT BE RESPONSIBLE FOR ANY "CORRECTIVE" WORK DONE BY OTHERS.
4. CONTRACTOR TO ENSURE POSITIVE DRAINAGE, NO PONDING ALLOWED. CONTRACTOR TO FOLLOW RECOMMENDATIONS AS OUTLINED IN THE PROJECT GEOTECHNICAL REPORT, INCLUDING BUT NOT LIMITED TO EXCAVATION, GRADING, AND COMPACTION. REFER TO THE REPORT PREPARED BY NINYO & MOORE, DATED JUNE 5, 2019, PROJECT NO. 304250002, PHONE: (702)433-0330.

EXISTING IRRIGATION, LANDSCAPING, ELECTRICAL, LIGHTING, SIGNAGE AND OTHER EXISTING IMPROVEMENTS MAY BE IMPACTED BY PROPOSED CONSTRUCTION. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL VERIFY ALL EXISTING IMPROVEMENTS AND IDENTIFY CONFLICTS. CONTRACTOR SHALL COORDINATE WITH SITE FACILITIES AND ENGINEERING STAFF TO REMOVE AND/OR RELOCATE ANY AND ALL IMPROVEMENTS IN CONFLICT.

CONTRACTOR IS RESPONSIBLE TO RESTORE/ REPLACE SURFACE IMPROVEMENTS AS NECESSARY TO PROVIDE SURFACING CONSISTENT WITH EXISTING SURFACING. IMPROVEMENTS TO EXISTING SURFACING AND ADJACENT IMPROVEMENTS TO EXISTING IMPROVEMENTS REQUIRE ADJUSTMENT, RELOCATION, RESTORATION OR REMOVAL (INCLUDING, BUT NOT LIMITED TO THE POSSIBLE RELOCATION OF PLANTERS, LIGHTING IMPROVEMENTS, COMMUNICATIONS, SANITARY SEWER CLEAN-OUTS, DRAINS, WATER IMPROVEMENTS, ETC.). CONTRACTOR SHALL BE RESPONSIBLE TO RESTORE AND TO PROVIDE CONTINUED SURFACE TO ALL INSTALLED IMPROVED SURFACING CONTRACTOR IS RESPONSIBLE TO INVESTIGATE SITE CONDITIONS PRIOR TO BIDDING TO IDENTIFY AND QUANTIFY ANY CONCERNS ASSOCIATED WITH THE RELOCATION OF IMPROVEMENTS.

ADD 1700 FEET TO ALL ELEVATIONS ON PLAN

CONTRACTOR TO ADJUST ALL EXISTING UTILITIES TO
MATCH PROPOSED FINISH GRADE ELEVATIONS.

STORM DRAIN NOTE:
ONSITE STORM DRAIN TO BE MAINTAINED BY
PROPERTY OWNER

 PROPOSED AC PAVEMENT
 PROPOSED CONCRETE
 PROPOSED BMP AREA
 PROPOSED LANDSCAPE
 SEE LANDSCAPE PLANS
 FOR SPECIFICATIONS
 LIMIT OF DISTURBANCE

SIGHT VISIBILITY ZONE AREA

NOTE:

NO WALLS, FENCES, SHRUBS, UTILITY APPURTENANCES OR ANY OTHER OBSTACLE OTHER THAN TRAFFIC CONTROL DEVICES, FIRE HYDRANTS, TREES AND STREET LIGHT POLES, MAY BE CONSTRUCTED OR MAINTAINED WITHIN THE SIGHT VISIBILITY ZONE UNLESS AVOID OBSTACLE IS MAINTAINED AT LEAST 2' IN HEIGHT MEASURED FROM TOP OF CURB OR WHERE THE CURB IS 4' OR MORE HEIGHT OF 2' MEASURED FROM THE TOP OF ADJACENT ASPHALT GRAVE OR PAVEMENT STREET SURFACE. THIS RESTRICTION APPLIES TO ALL SIGHT VISIBILITY LINE THROUGH LANDSCAPED MEDIANS.

MAX 2% H.S. BUILDING FF
MIN. 5% L.S.

TYPICAL GRADING IN LANDSCAPE AREAS
AWAY FROM BUILDING

CUT	FILL	NET
28 CY	1,983 CY	1,955 CY

NOTE: CUT/FILL QUANTITIES ARE TO FINISHED GRADE & DO NOT INCLUDE MATERIAL THICKNESS FOOTINGS, ETC.

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THE PROJECT SITE IS COVERED BY THE FLOOD INSURANCE RATE MAP (FIRM) FOR THE CLARK COUNTY, NEVADA AND INCORPORATED AREAS, COMMUNITY PANEL NUMBER: 32003C2170F, DATED NOVEMBER 16, 2011. THE PROJECT SITE FALLS WITHIN ZONE 'X' (UNSHADED), DESCRIBED BY FEMA AS: AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

A.P.N.:
140-31-102-003

BASIS OF BEARINGS:
GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS AND LAS VEGAS HIGH ELEVATION ZONES, NORTH AMERICAN DATUM OF 1983; SAGD MERIDIAN BEING COINCIDENT WITH THE TRUE MEST WEST THE GREENWICH MERIDIAN; LAS VEGAS ELEVATION ZONE; LAS VEGAS DATUM (REFERENCE FRAME); NAD 1983(2011) EPOCH 2010.0 SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

BENCHMARK:
CLARK COUNTY BENCHMARK: 2LV023054
BEING A RIVET & PLATE IN TOP OF CURB AT NE CORNER OF HUNZA & SANDHILL 543.45 METERS OR 1782.95 US FEET
SURVEY FET

LOCHSA ENGINEERING ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THIS PLAN ARE FROM THE BEST AVAILABLE INFORMATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL UTILITIES, INCLUDING BUT NOT LIMITED TO, THE WATER, FIRE, SANITARY SEWER, STORM SEWER, TELEPHONE, POWER, GAS, AND RAILROAD LINES PRIOR TO THE BEGINNING OF ANY CONSTRUCTION. IF CONFLICT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE PROJECT ARCHITECT, OWNER'S REPRESENTATIVE AND THE PROJECT ENGINEER IMMEDIATELY.

Call Before You Overhead  **Call 811**  utility lines. It's costly.

1-702-227-2929 1-702-432-5300 1-800-227-2800

	EASEMENT LINE	DESCRIPTION:	CONTOUR LINES	EDGE OF PAVEMENT	"A" TYPE CURBS	"L" TYPE CURBS	WALLS	FENCES	AC PAVEMENT	CONCRETE	SPOT ELEVATIONS	SIGNS	MANHOLE W/ DESCRIPTION	MANHOLE DESCRIPTIONS ① = SANITARY SEWER ② = STORM DRAIN ③ = ELECTRICAL ④ = TELEPHONE	FIRE HYDRANTS	GATE VALVES	REDUCERS	CLEAN OUTS	UTILITY BOX OR VAULT	BACKWATER VALVES	'80' ROW LED STREETLIGHTS	'80' ROW LED STREETLIGHTS
CL. OR SURVEY LINE _____ PROPERTY LINE _____ ROW LINE _____	SAWTOOTH SCARP LINE 	EXISTING: PROPOSED:	(-2210) (-2122) 								(+12.34) BC (+12.34) PC 		Ⓢ 	① ② ③ ④		● 	▽ 	○ 	□ 	BWWV 		

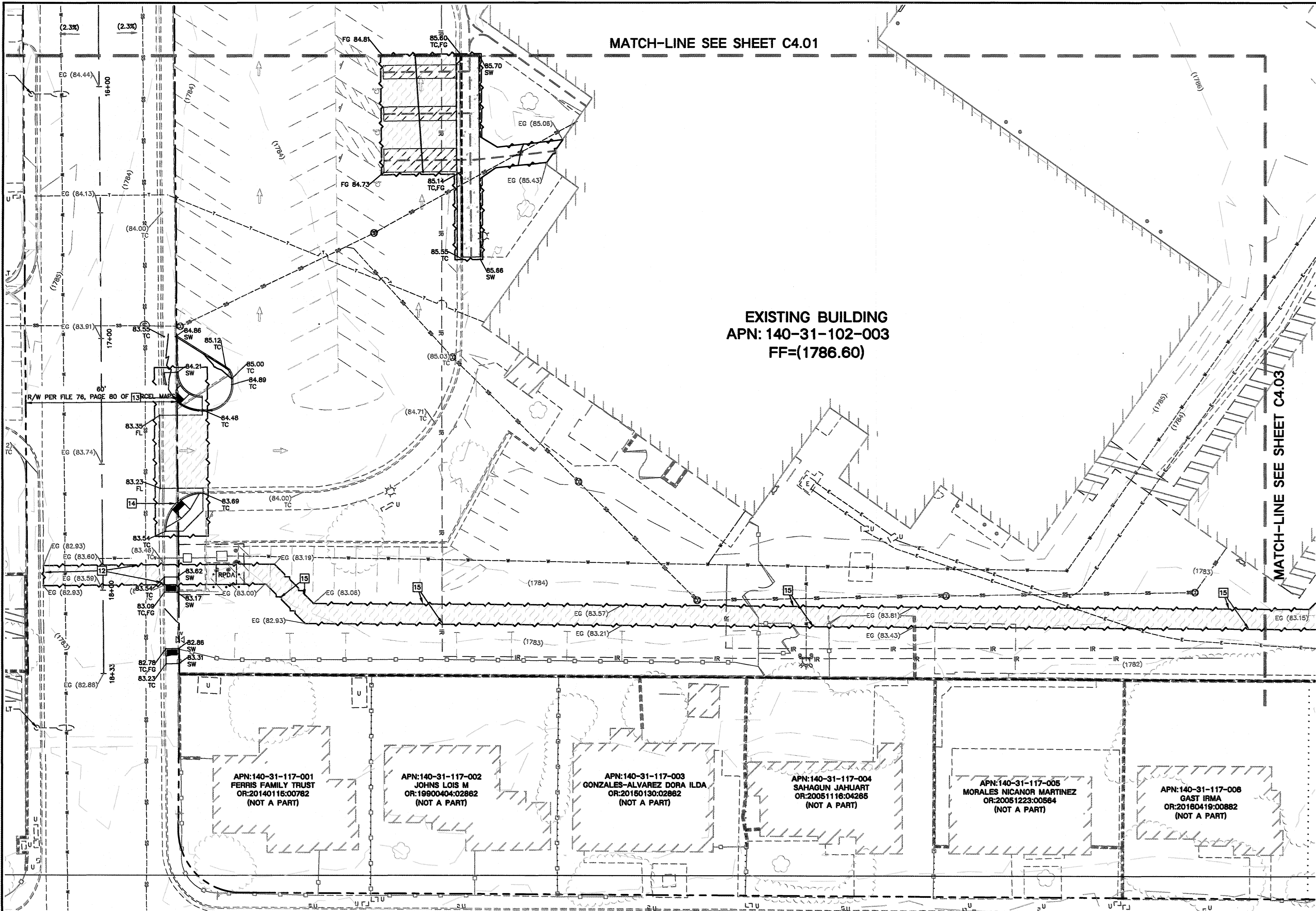
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Lochner Engineering
6346 South Jones Blvd.
Las Vegas, NV 89118
Phone (702) 365-5454
Fax (702) 365-5455
www.lochner.com

CONSTRUCTION MGMT:		DATE:
PROJECT MANAGER:		
COORDINATOR:		
BUILDING DEPARTMENT:		
CODE COMPLIANCE:		
AHERA REVIEW:		
ASBESTOS WORK IS: ☐ REQUIRED ☐ NOT REQUIRED		
MPID: 001630		

 CLARK COUNTY SCHOOL DISTRICT CONSTRUCTION MANAGEMENT DEPARTMENT 1180 MILITARY TRIBUTE PL HENDERSON NV 89074 PHONE: 702-799-8710
PROJECT: ORAN K GRAGSON ELEMENTARY SCHOOL
DRAWING TITLE: GRADING PLANS SHEET 1 OF 3
FACILITY: ELEMENTARY SCHOOL ADDITION

C4.01
SHEET 7 OF 14



GRADING NOTES:

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- PROPOSED BMP AREA
- PROPOSED LANDSCAPE
- SEE LANDSCAPE PLANS FOR SPECIFICATIONS
- LIMIT OF DISTURBANCE

SIGHT VISIBILITY ZONE (SVZ)

SIGHT VISIBILITY ZONE AREA

NOTE:

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A.P.N.:

140-31-102-003

BASIS OF BEARINGS:

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BENCHMARK:

CLARK COUNTY BENCHMARK: 2LV023054 BEING A RIVET & PLATE IN TOP OF CURB AT NE CORNER OF BONANZA & SANDHILL 543.45 METERS OR 1782.98 U.S. SURVEY FEET

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SAFETY ALERT

Call Before You Overhead

Call before you dig

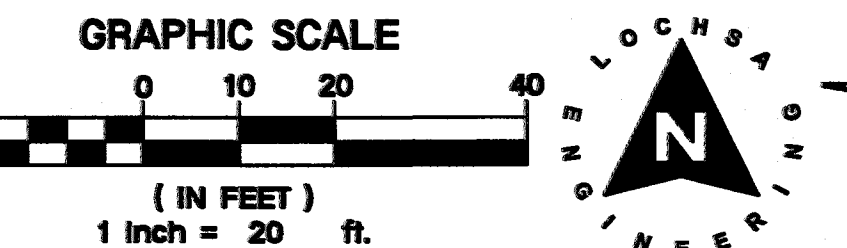
Call before you dig

Call before you dig

1-702-432-5300

1-702-227-2929

1-800-227-2800



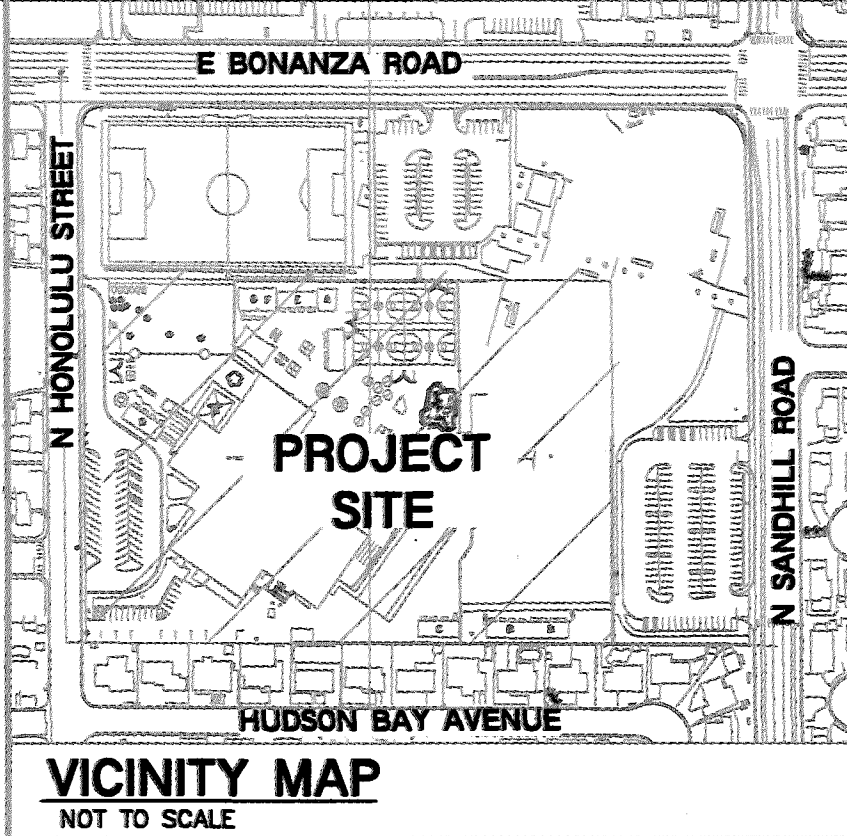
CONSTRUCTION NOTES:

- ALL PRIVATE CONSTRUCTION TO BE DONE IN ACCORDANCE WITH "CLARK COUNTY AREA UNIFORM STANDARD DRAWINGS (USDCCA)" LATEST EDITION AND/OR REGULATING ENTITY HAVING JURISDICTION.
- EXISTING FENCE. PROTECT IN PLACE.
- CONSTRUCT CONCRETE SIDEWALK PER USDCCA NO. 234.
- CONSTRUCT AC PAVEMENT PER DETAIL 1 ON C8.01.
- CONSTRUCT 4" VALLEY GUTTER PER DETAIL 5 ON C8.02.
- CONSTRUCT "A" TYPE CURB PER DETAIL 3 ON C8.02.
- CONSTRUCT "L" TYPE CURB PER USDCCA NO. 216.
- SAWCUT AND MATCH EXISTING GRADE.
- CONSTRUCT 42" RAILING/HAND RAIL PER ARCHITECTURAL PLANS.
- CONSTRUCT DEEPEDED FOOTING.
- CONSTRUCT TURNED DOWN SIDEWALK PER DETAIL 4 ON C8.01.
- TEMPORARY REMOVE THE 6" CHAIN LINK FENCE WHILE CONSTRUCTING THE 10" SIDEWALK.
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- CONSTRUCT CASE II RAMP PER USDCCA NO. 235.
- CONSTRUCT CASE II RAMP PER USDCCA NO. 235.
- TRENCH AND BACKFILL PER SOILS REPORT. REPLACE AC.
- PLAYGROUND PAINT, VALLEY GUTTER AND CURB, GUTTER AND SIDEWALK AS NECESSARY.
- INSTALL RETAINING WALL PER STRUCTURAL DETAILS AND PROFILES.

GRADING PLAN CERTIFICATION

NAME: GUY M. MORRIS PE #14526 DATE

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH APPROVED DRAINAGE STUDY HTE PWXX-XXXXX FOR THIS SITE ON FILE AT CLARK COUNTY FOR THIS PROJECT.



REVISIONS:		
REV.	DESCRIPTION	DATE

PROJECT: CLARK COUNTY SCHOOL DISTRICT

PROJECT SITE

HUDSON BAY AVENUE

N HONOLULU STREET

N SANDHILL ROAD

E BONANZA ROAD

NOT TO SCALE

GRAPHIC SCALE

1 INCH = 20 FT.

CONSTRUCTION NOTES:

1. ALL PRIVATE CONSTRUCTION TO BE DONE IN ACCORDANCE WITH "CLARK COUNTY AREA UNIFORM STANDARD DRAWINGS (USDCCA)" LATEST EDITION AND/OR REGULATING ENTITY HAVING JURISDICTION.

2. EXISTING FENCE. PROTECT IN PLACE.

3. CONSTRUCT CONCRETE SIDEWALK PER USDCCA NO. 234.

4. CONSTRUCT AC PAVEMENT PER DETAIL 1 ON C8.01.

5. CONSTRUCT 4" VALLEY GUTTER PER DETAIL 5 ON C8.02.

6. CONSTRUCT "A" TYPE CURB PER DETAIL 3 ON C8.02.

7. CONSTRUCT "L" TYPE CURB PER USDCCA NO. 216.

8. SAWCUT AND MATCH EXISTING GRADE.

9. CONSTRUCT 42" RAILING/HAND RAIL PER ARCHITECTURAL PLANS.

10. CONSTRUCT DEEPEDED FOOTING.

11. CONSTRUCT TURNED DOWN SIDEWALK PER DETAIL 4 ON C8.01.

12. TEMPORARY REMOVE THE 6" CHAIN LINK FENCE WHILE CONSTRUCTING THE 10" SIDEWALK.

13. FIELD VERIFY LOCATION AND ELEVATION OF ALL UTILITIES, INCLUDING BUT NOT LIMITED TO, THE WATER, FIRE, SANITARY SEWER, STORM SEWER, TELEPHONE, POWER, GAS, AND IRRIGATION LINES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. IF CONFLICT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE PROJECT ARCHITECT, OWNER'S REPRESENTATIVE AND THE PROJECT ENGINEER IMMEDIATELY.

14. CONSTRUCT CASE II RAMP PER USDCCA NO. 235.

15. CONSTRUCT CASE II RAMP PER USDCCA NO. 235.

16. TRENCH AND BACKFILL PER SOILS REPORT. REPLACE AC.

17. PLAYGROUND PAINT, VALLEY GUTTER AND CURB, GUTTER AND SIDEWALK AS NECESSARY.

18. INSTALL RETAINING WALL PER STRUCTURAL DETAILS AND PROFILES.

ethos three ARCHITECTURE

Lochsa ENGINEERING

8985 S Eastern Avenue, Suite 220, Las Vegas, NV 89123

P: 702.456.1070 F: 702.456.7020 www.ethosthree.com

CONSULTANT:

PROJECT MANAGER: GUY M. MORRIS

DATE: NOV 25, 2020

DRAWN BY: BZ

SUBMITTAL: 201091

DATE: 11/25/2020

PROJECT NO. 201091

CONSTRUCTION MGMT. DATE:

BUILDING DEPARTMENT:

ASBESTOS WORK IS:

REQUIRED ☐ NOT REQUIRED ☐

MPID: 001630

CLARK COUNTY SCHOOL DISTRICT

CONSTRUCTION MANAGEMENT DEPARTMENT 1180 MILITARY TRIBUTE PL. HENDERSON NV 89074 PHONE: 702-799-8710

ORAN K GRAGSON ELEMENTARY SCHOOL

GRADING PLANS

SHEET 2 OF 3

ELEMENTARY SCHOOL ADDITION

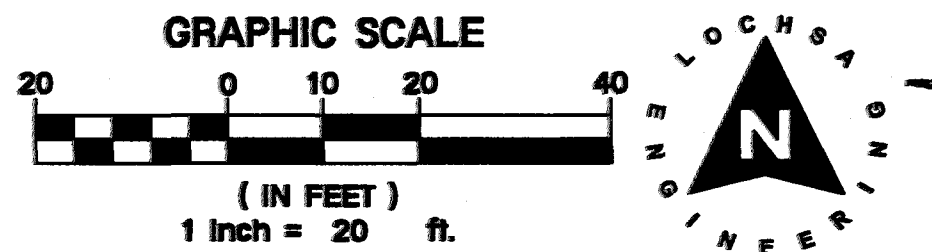
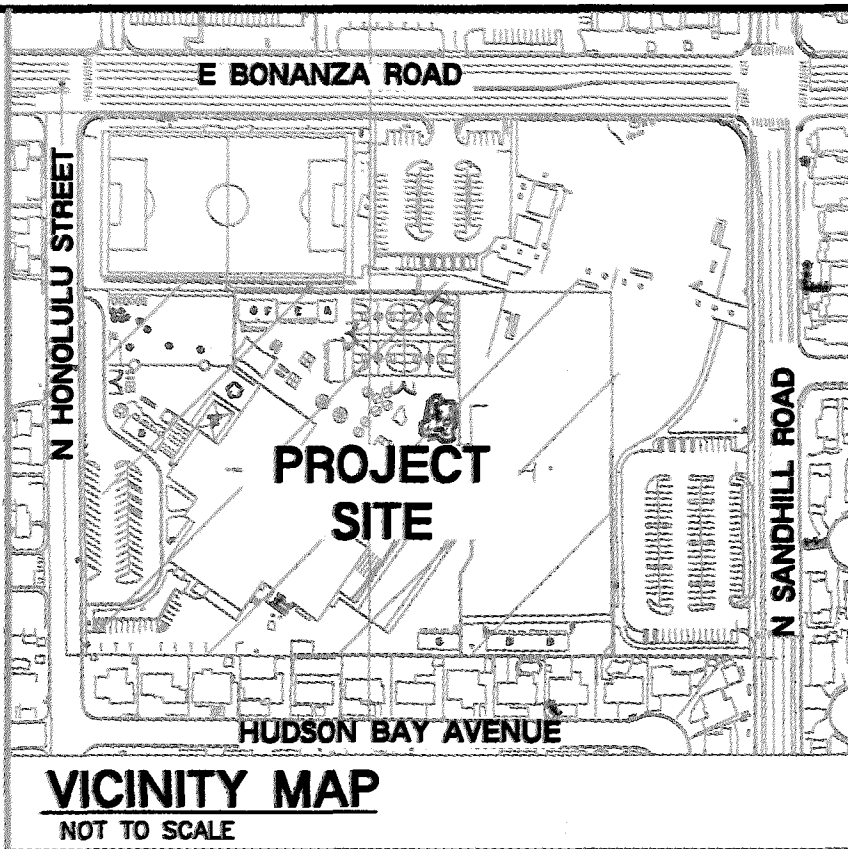
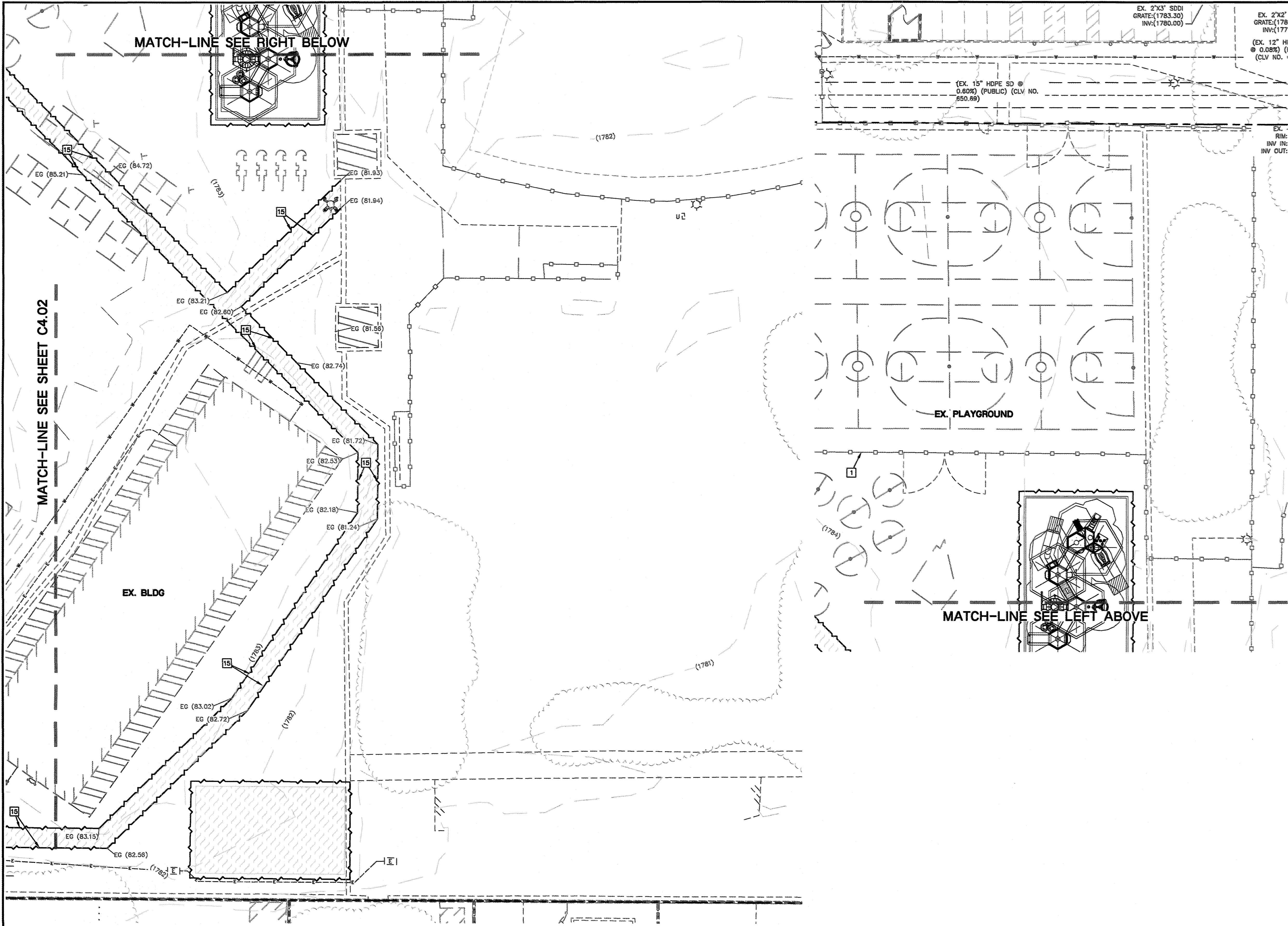
PROJECT:

DRAWING TITLE:

FACILITY:

SHEET NO: C4.02

SHEET 8 OF 14



- CONSTRUCTION NOTES:**
- 1. ALL PRIVATE CONSTRUCTION TO BE DONE IN ACCORDANCE WITH CLARK COUNTY AREA UNIFORM STANDARD DRAWINGS (USDCCA) LATEST EDITION AND/OR REGULATING ENTITY HAVING JURISDICTION.
 - 2. EXISTING FENCE. PROTECT IN PLACE.
 - 3. CONSTRUCT CONCRETE SIDEWALK PER USDCCA NO. 234.
 - 4. CONSTRUCT AC PAVEMENT PER DETAIL 1 ON C6.01.
 - 5. CONSTRUCT 4" VALLEY GUTTER PER DETAIL 5 ON C6.02.
 - 6. CONSTRUCT "A" TYPE CURB PER DETAIL 3 ON C6.02.
 - 7. CONSTRUCT "L" TYPE CURB PER USDCCA NO. 216.
 - 8. SAWCUT AND MATCH EXISTING GRADE.
 - 9. CONSTRUCT 42" RAILING/HAND RAIL PER ARCHITECTURAL PLANS.
 - 10. CONSTRUCT DEEPEDED FOOTING.
 - 11. CONSTRUCT TURNED DOWN SIDEWALK PER DETAIL 4 ON C6.01.
 - 12. TEMPORARY REMOVE THE 6" CHAIN LINK FENCE WHILE CONSTRUCTING THE 10" SIDEWALK.
 - 13. TRENCH PAVEMENT REPAIR/RESTORATION PER CCAUSD #500.3, #500.4, #500.5, & #503. REPLACE CURB, GUTTER AND SIDEWALK AS NECESSARY.
 - 14. CONSTRUCT CASE I RAMP PER USDCCA NO. 235.
 - 15. CONSTRUCT CASE II RAMP PER USDCCA NO. 235.
 - 16. TRENCH AND BACKFILL PER SOILS REPORT. REPLACE AC, PLAYGROUND PAINT, VALLEY GUTTER AND CURB, GUTTER AND SIDEWALK AS NECESSARY.
 - 17. INSTALL RETAINING WALL PER STRUCTURAL DETAILS AND PROFILES.

GRADING PLAN CERTIFICATION

NAME: GUY M. MORRIS PE #14526 DATE: 11/25/2020

CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH APPROVED DRAINAGE STUDY HTE P100X-XXXXX FOR THIS SITE ON FILE AT CLARK COUNTY FOR THIS PROJECT.

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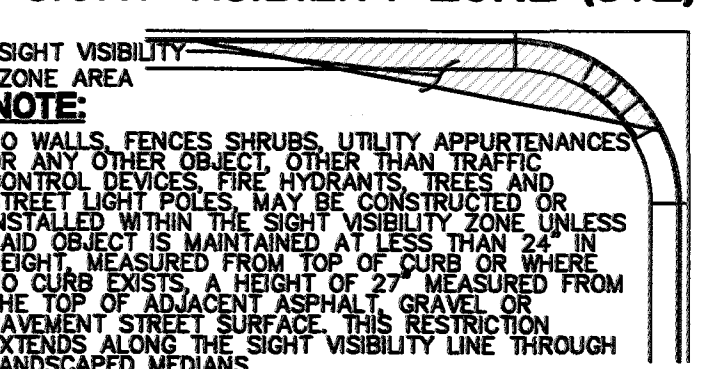
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LEGEND:

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A.P.N.:

140-31-102-003

BASIS OF BEARINGS:

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), 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. ZONE: LAS VEGAS ELEVATION ZONE. DATUM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)

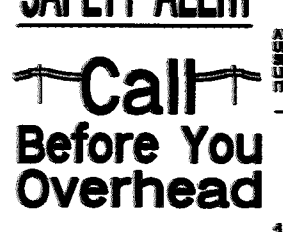
BENCHMARK:

CLARK COUNTY BENCHMARK: 2LV023054 BEING A RIVET & PLATE IN TOP OF CURB AT NE CORNER OF BONANZA & SANDHILL 543.45 METERS OR 1782.98 U.S. SURVEY FEET

NOTE:

LOCHSA ENGINEERING ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS AND ELEVATIONS. THE UTILITIES SHOWN ON THIS PLAN ARE FROM THE BEST AVAILABLE INFORMATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND ELEVATION OF ALL UTILITIES, INCLUDING BUT NOT LIMITED TO, THE WATER, FIRE, SANITARY SEWER, STORM SEWER, TELEPHONE, POWER, GAS, AND IRRIGATION LINES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. IF CONFLICT EXISTS IN THE FIELD, THE CONTRACTOR IS TO NOTIFY THE PROJECT ARCHITECT, OWNER'S REPRESENTATIVE AND THE PROJECT ENGINEER IMMEDIATELY.

SAFETY ALERT



REVISIONS:

REV.	DESCRIPTION	DATE
1		

PROJECT: CLARK COUNTY SCHOOL DISTRICT

DRAWING TITLE: GRADING PLANS

SHEET 3 OF 3

FACILITY: ELEMENTARY SCHOOL ADDITION

CONSULTANT: Lochsa Engineering

8985 S Eastern Avenue, Suite 220, Las Vegas, NV 89123

P: 702.456.1070 F: 702.456.7020 www.ethosthree.com

CONSTRUCTION MGMT. DATE:

BUILDING DEPARTMENT:

ASBESTOS WORK IS:

REQUIRED ☐ NOT REQUIRED ☐

MPID: 001630

CLARK COUNTY SCHOOL DISTRICT

CONSTRUCTION MANAGEMENT DEPARTMENT 1180 MILITARY TRIBUTE PL. HENDERSON NV 89074 PHONE: 702-799-8710

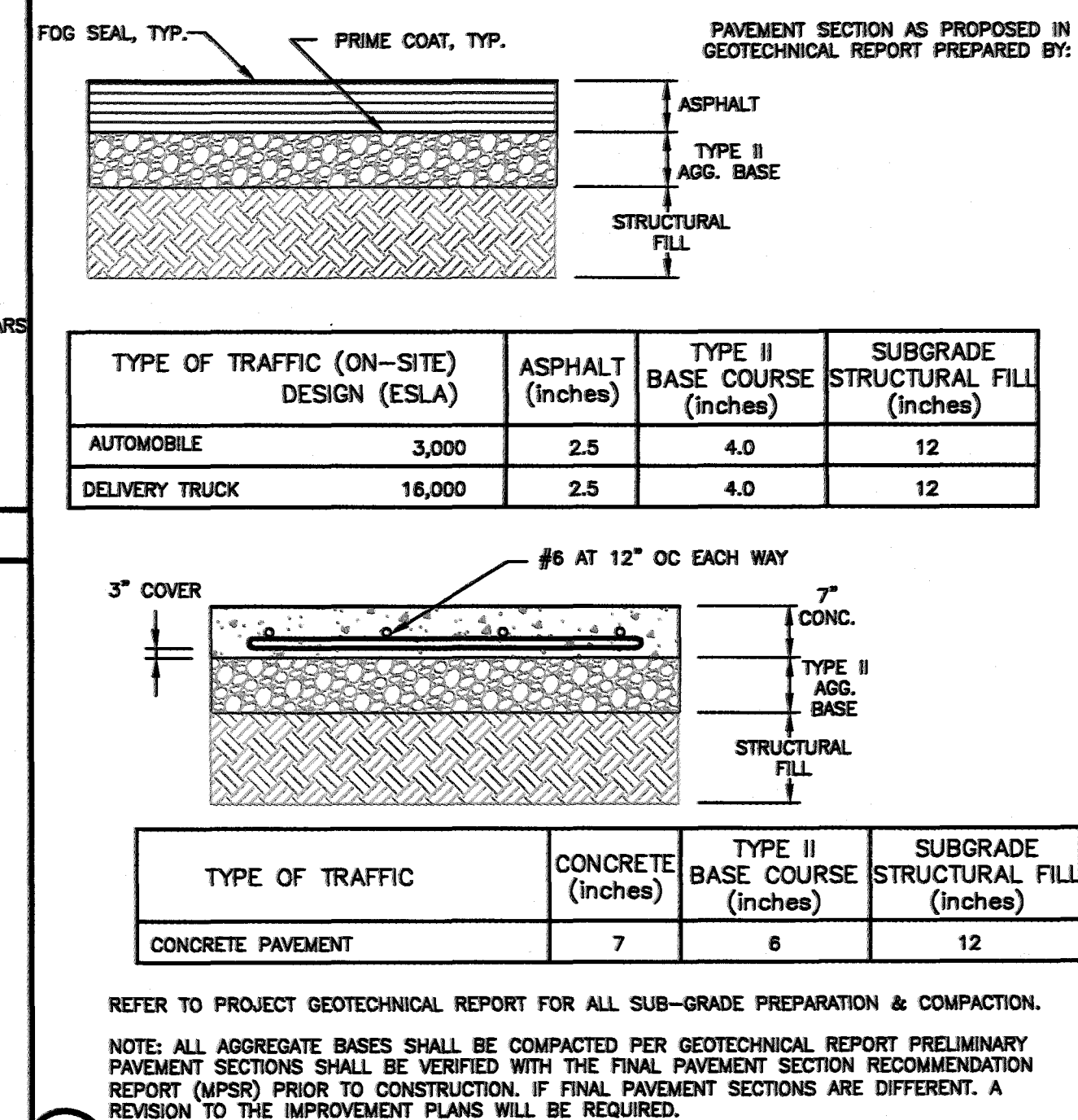
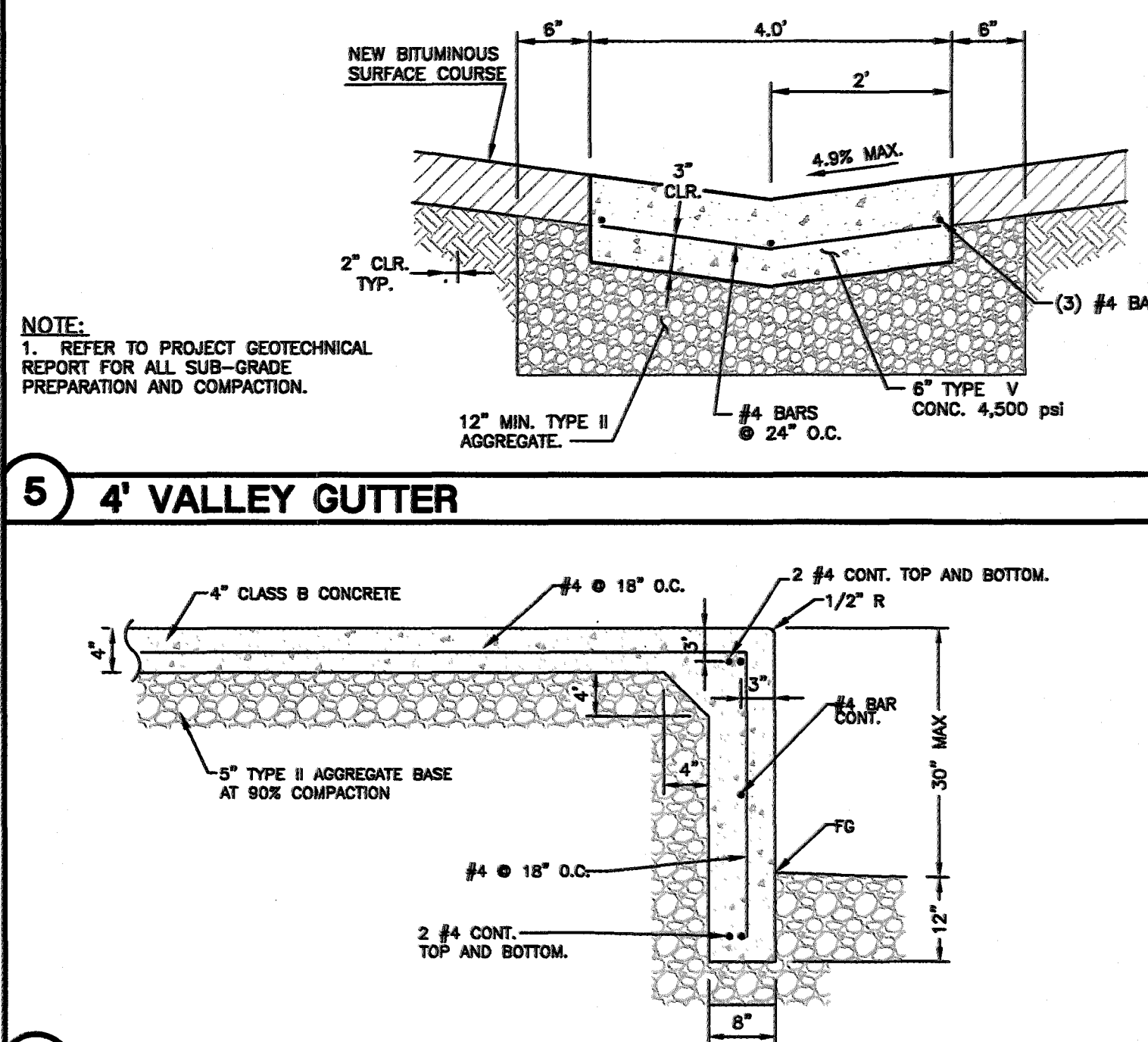
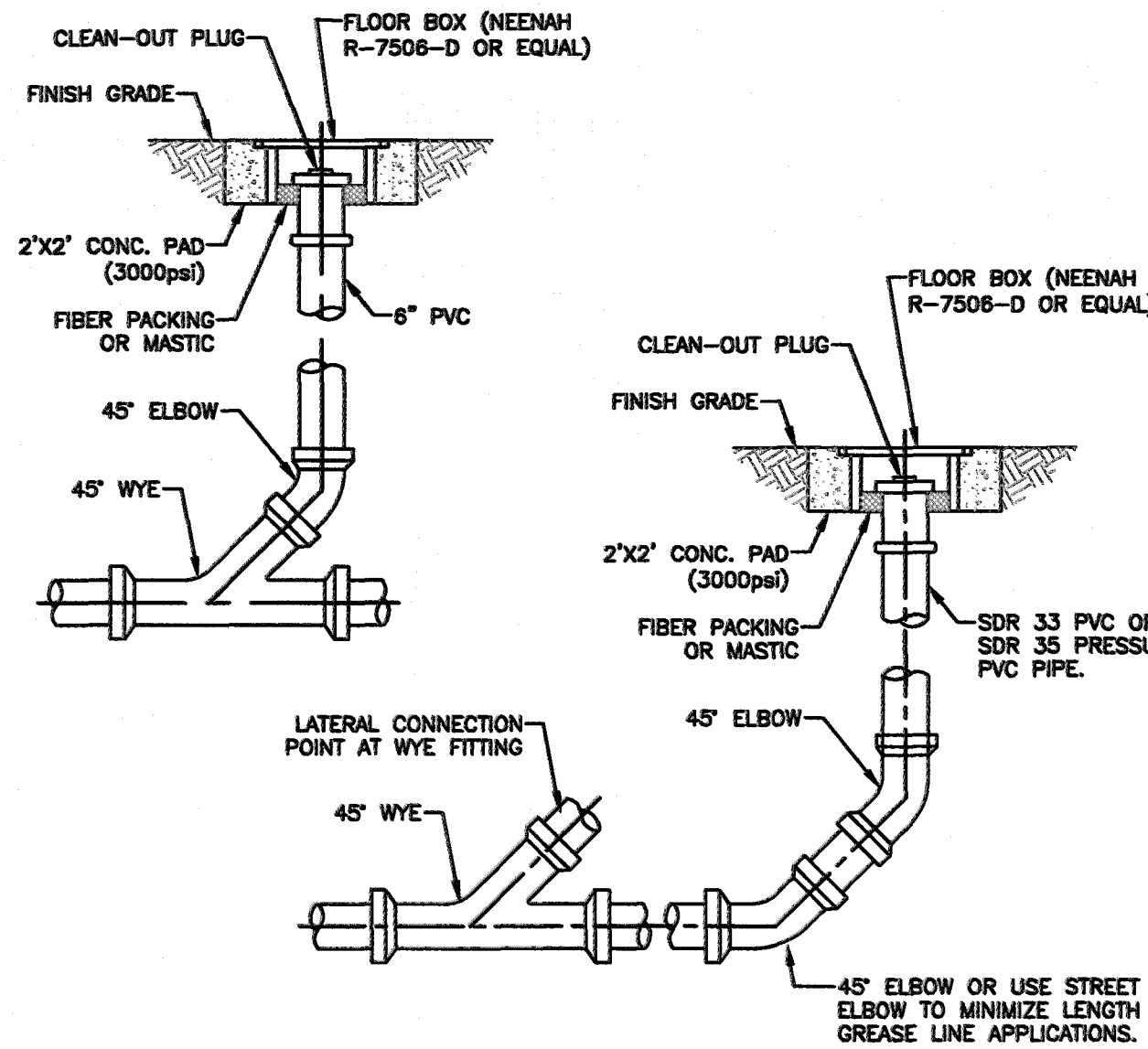
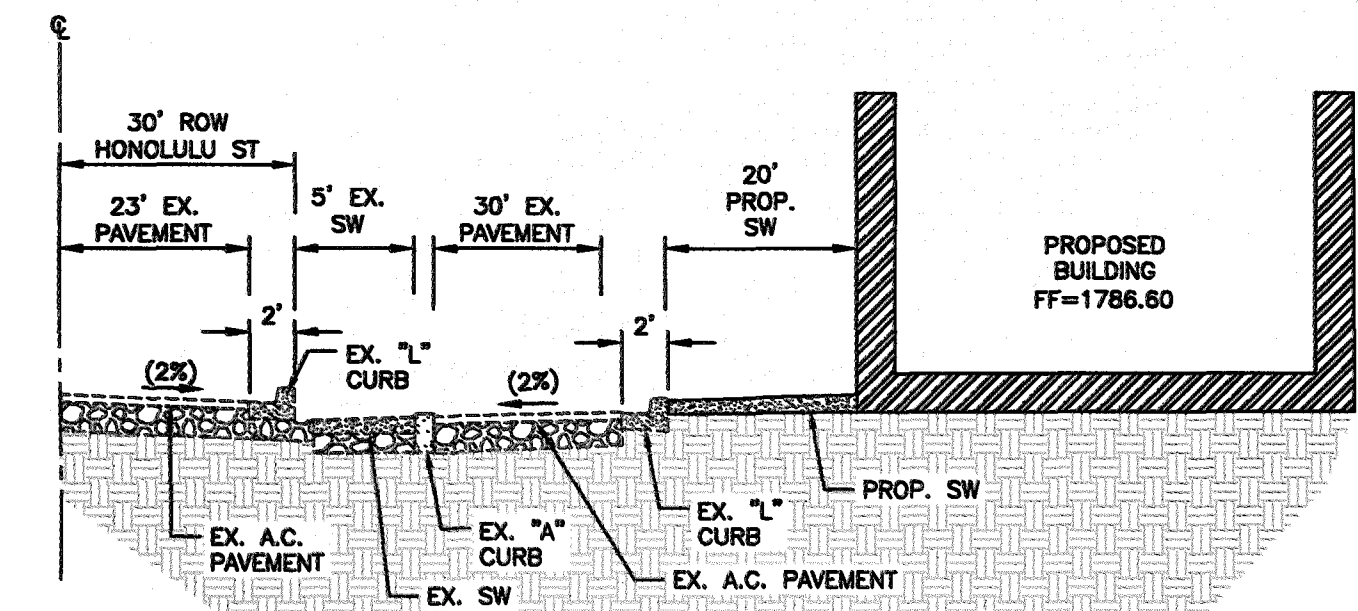
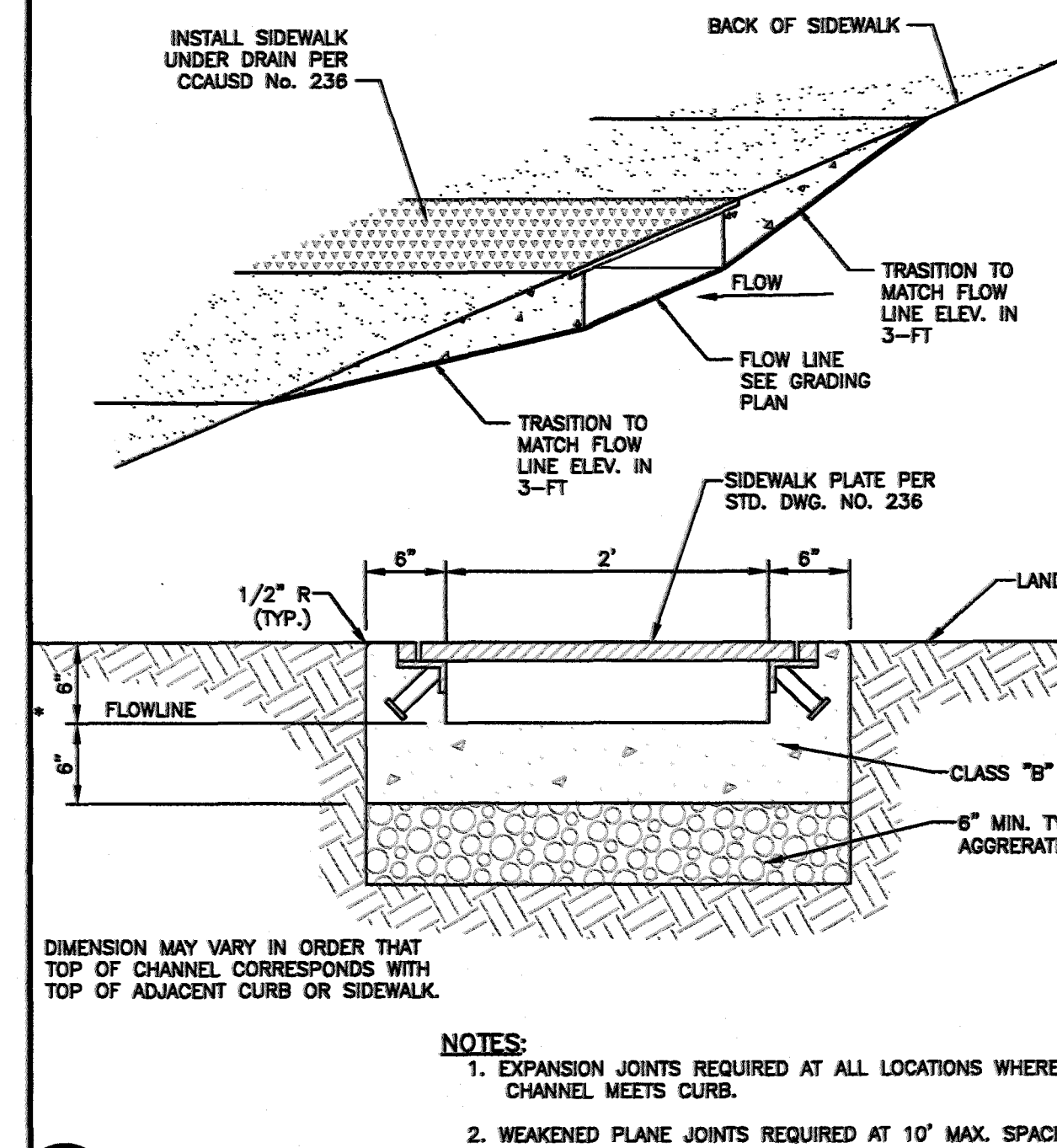
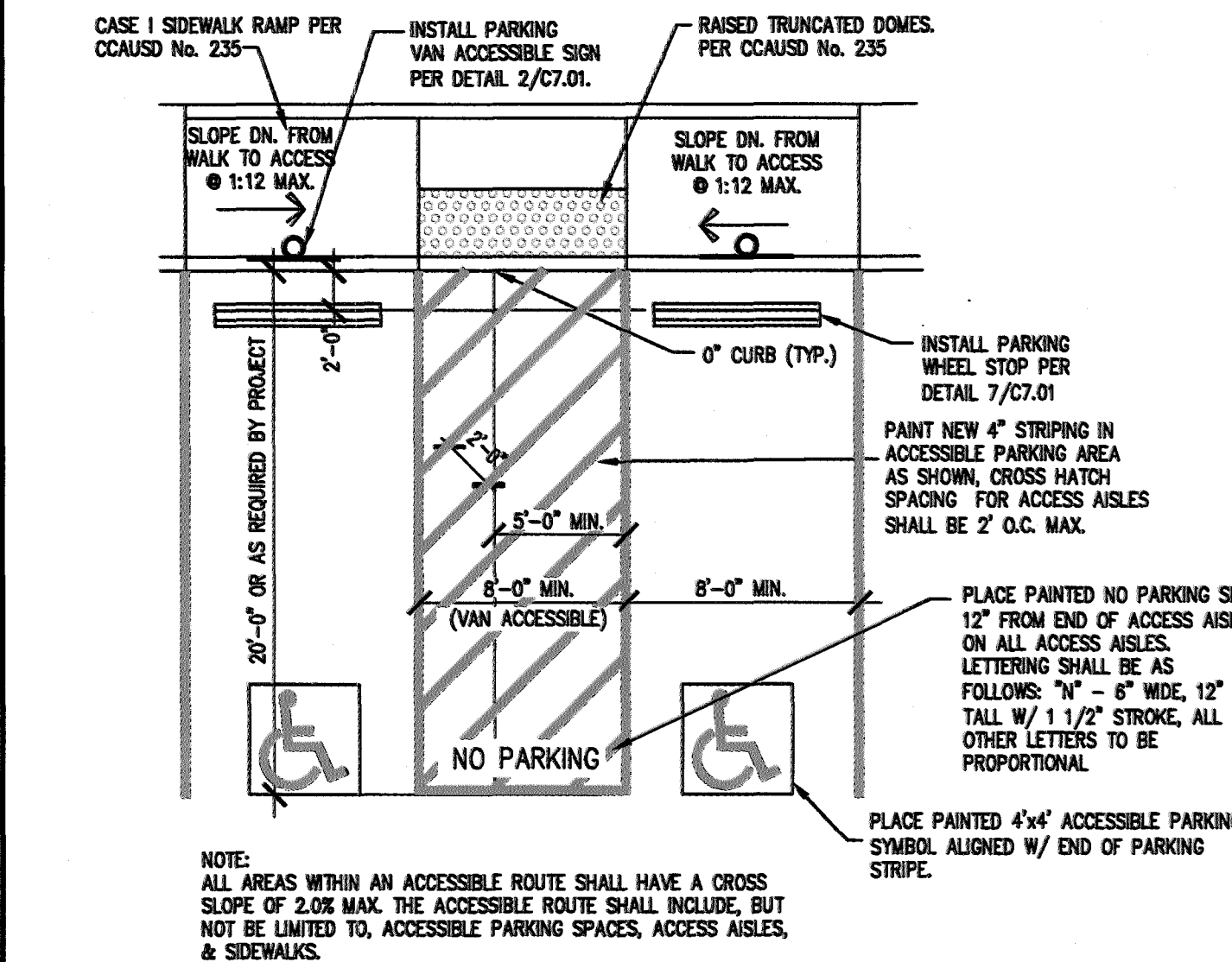
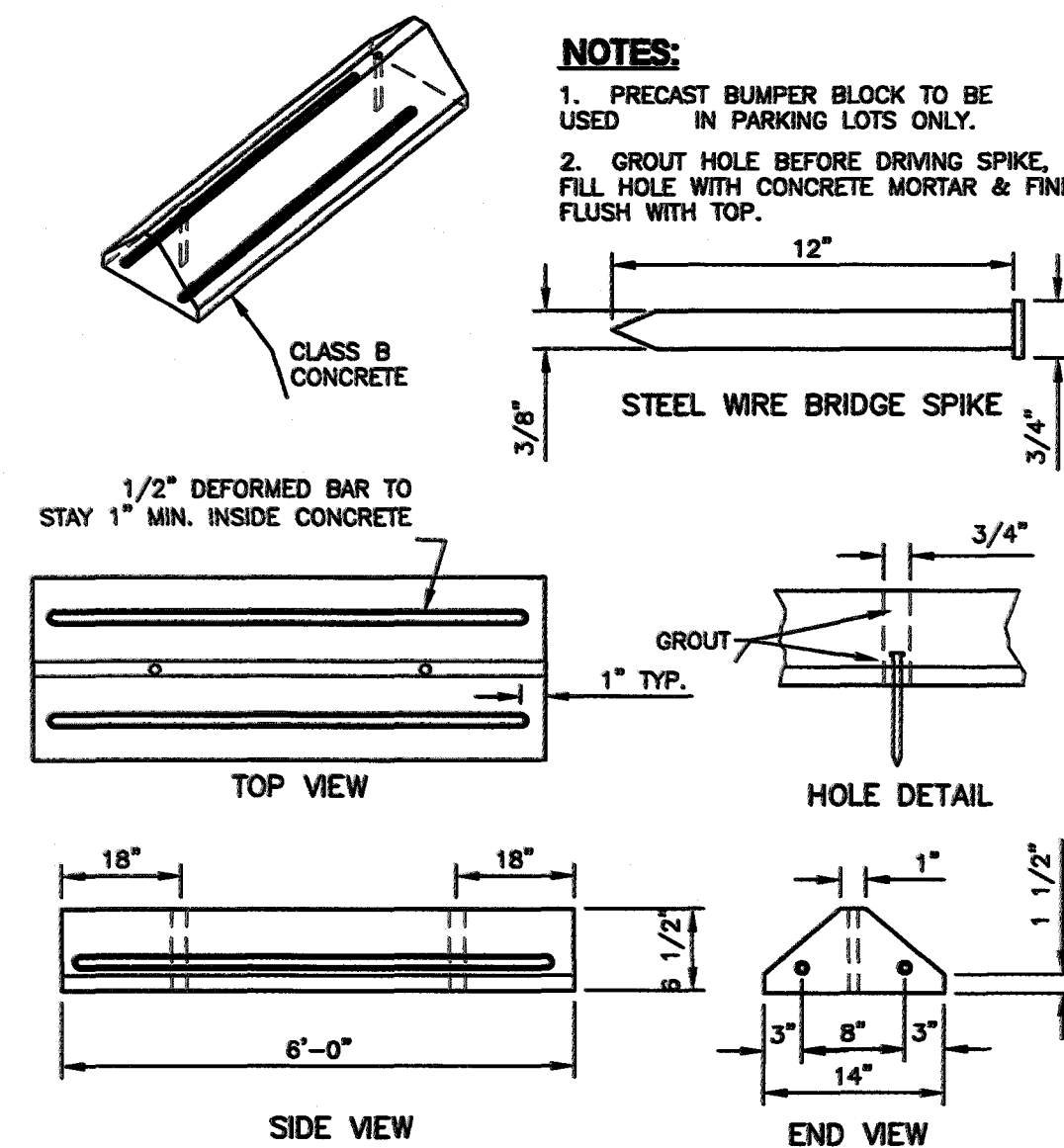
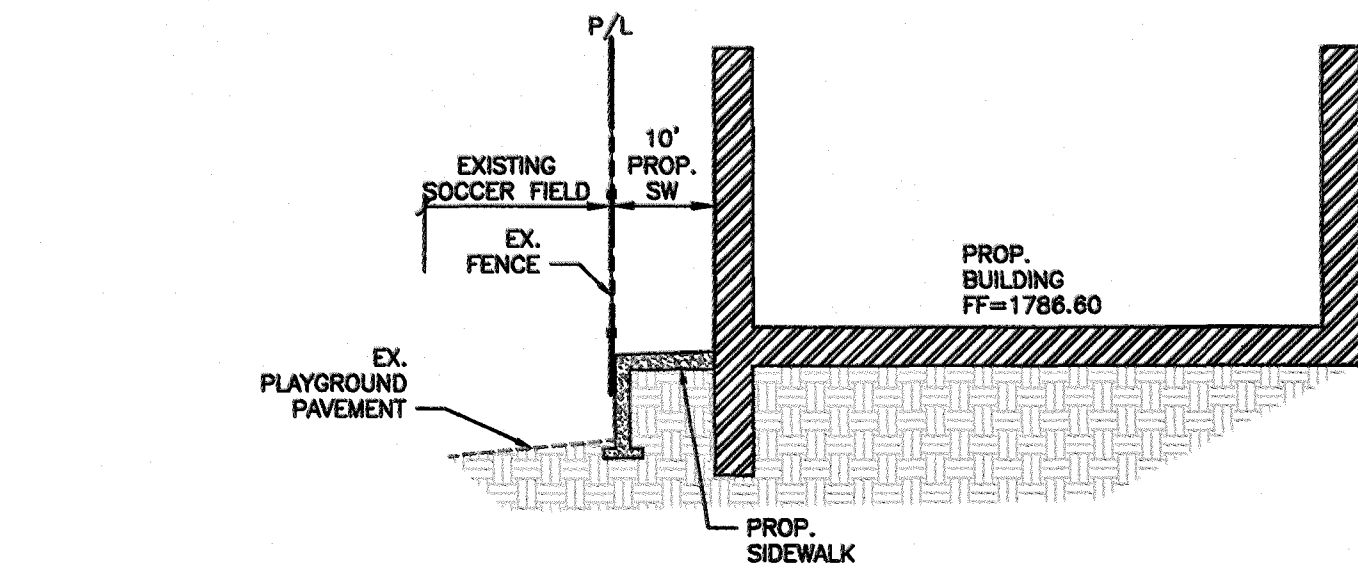
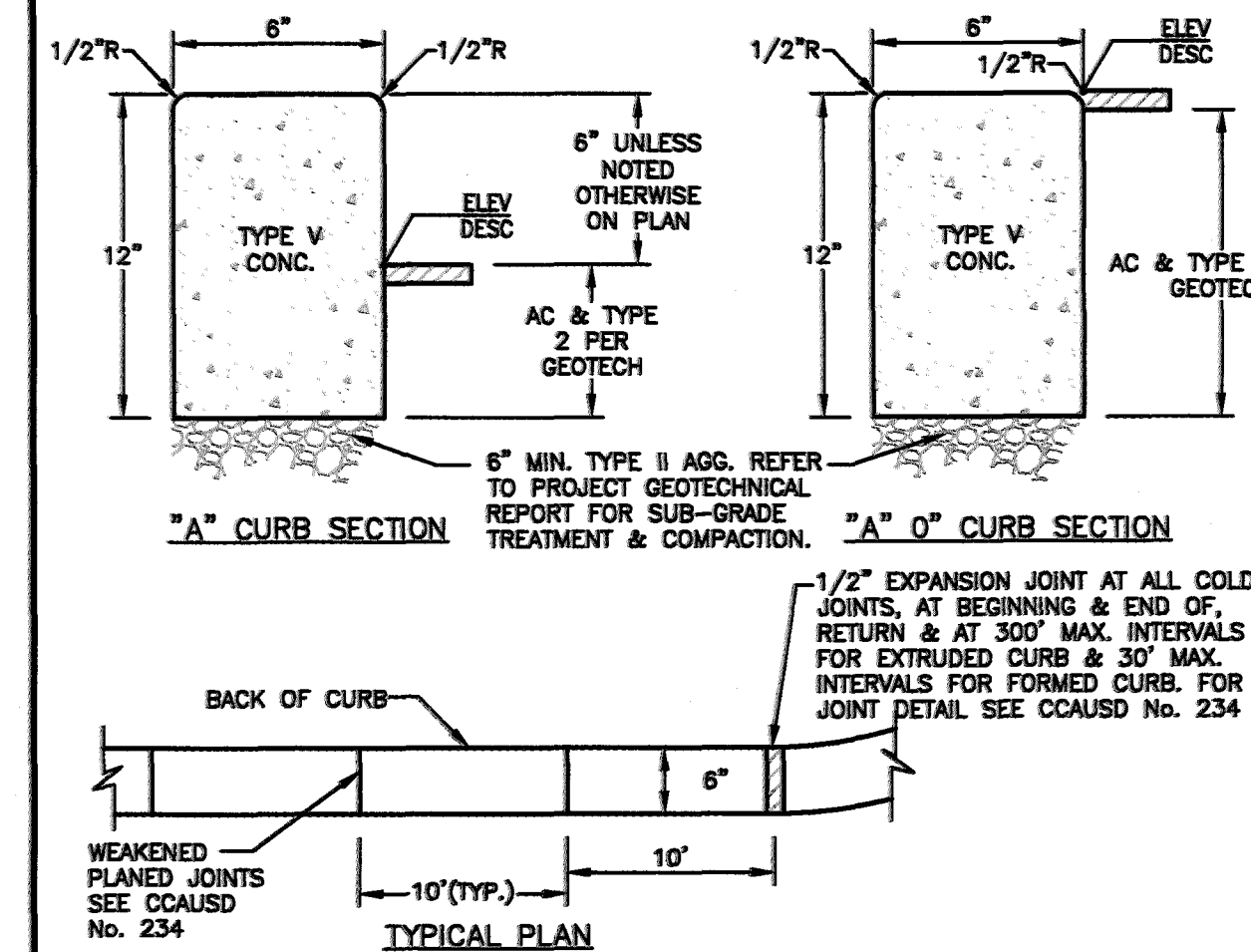
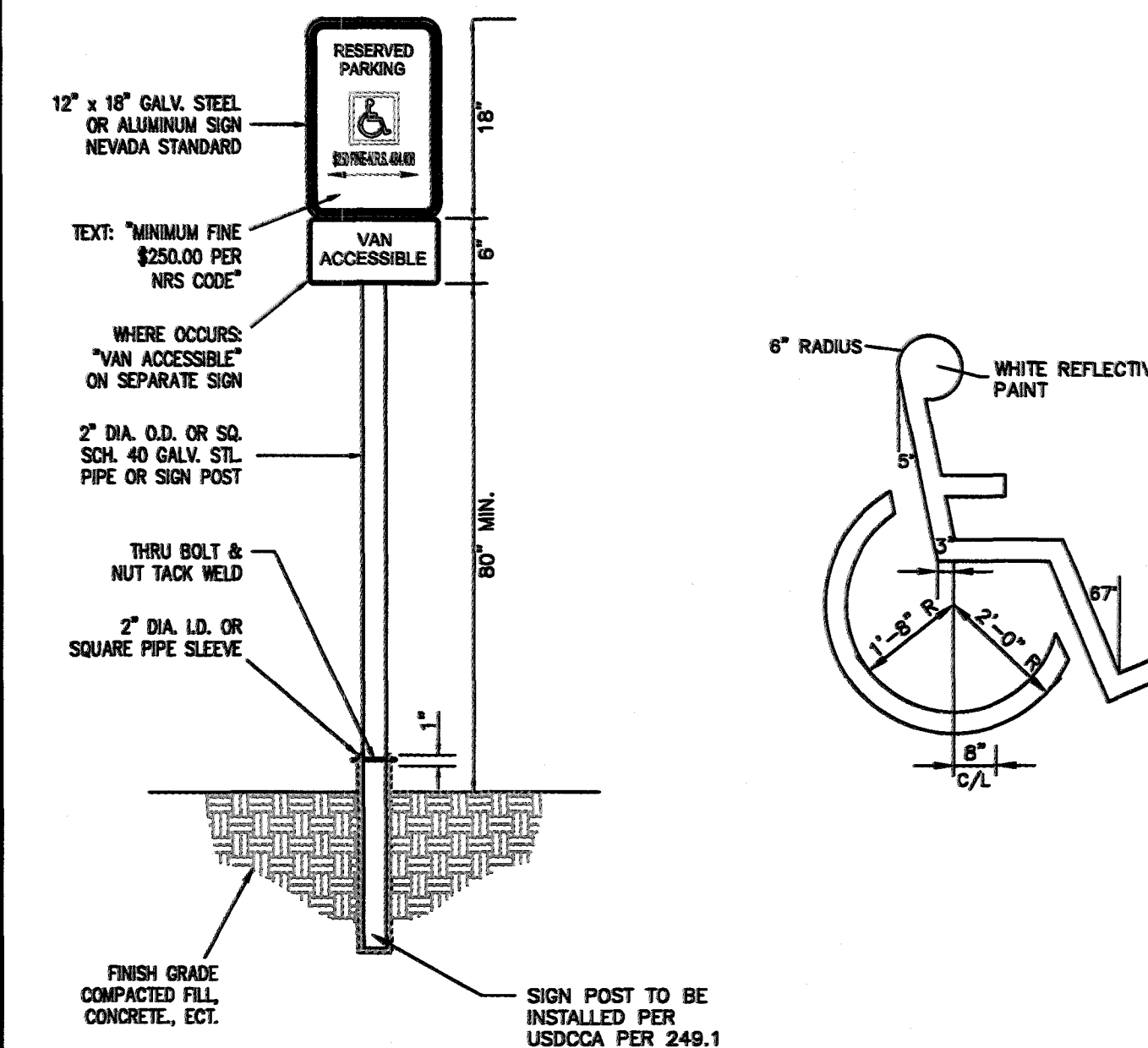
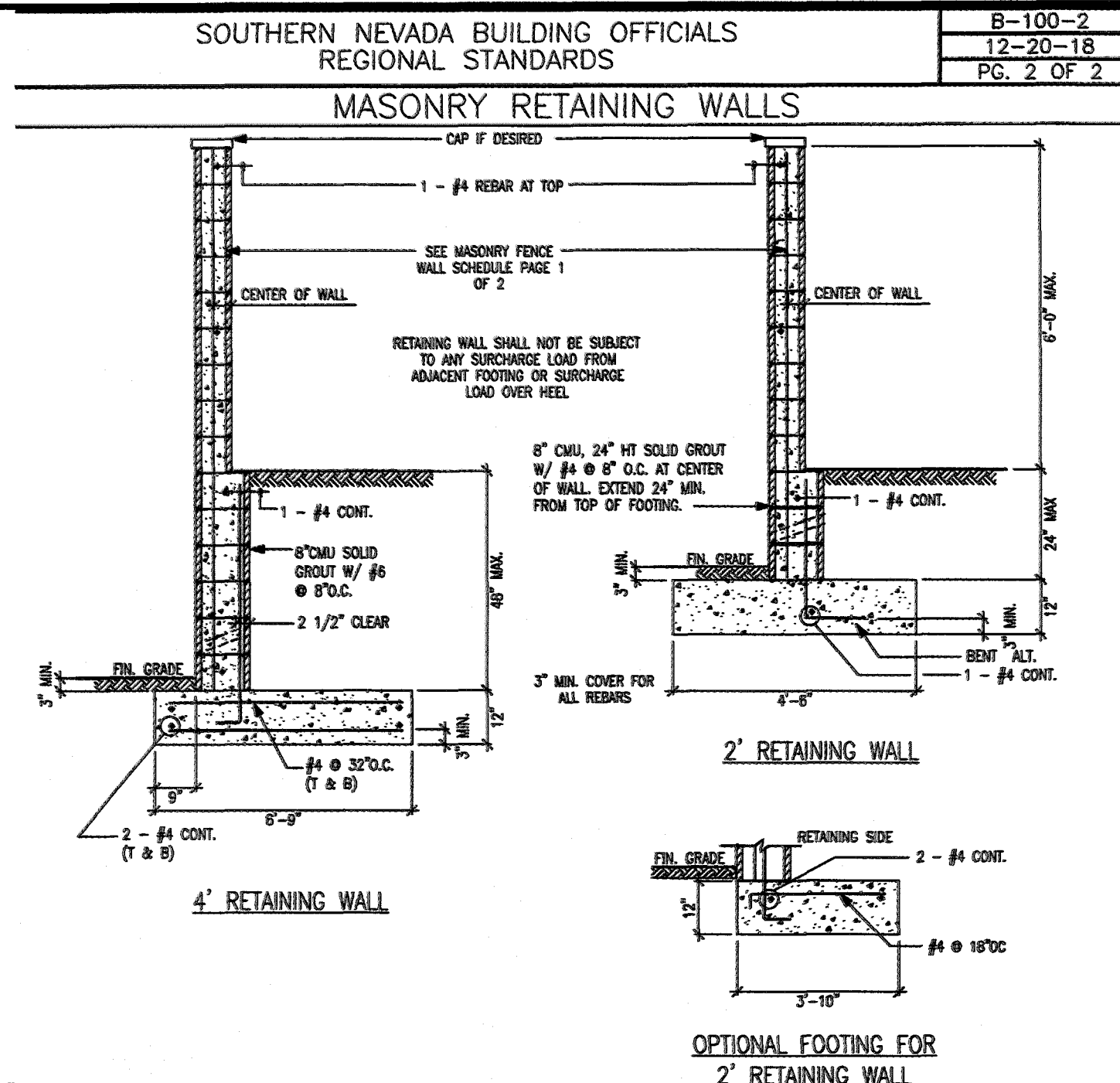
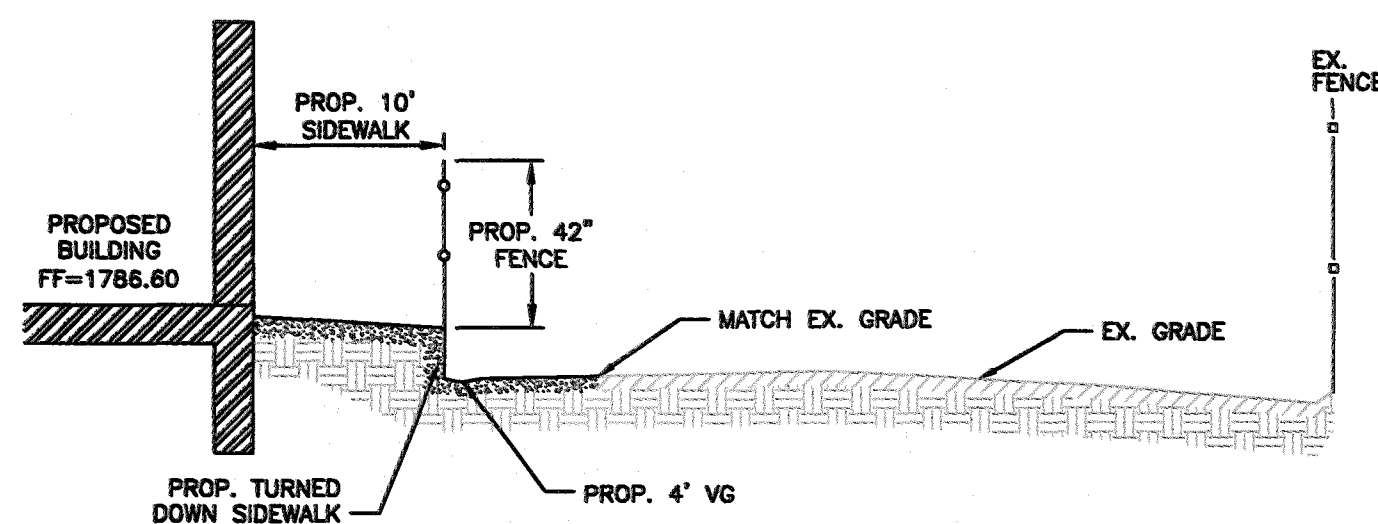
ORAN K GRAGSON ELEMENTARY SCHOOL

1-702-432-5300

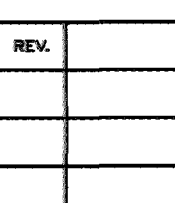
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SHEET NO: C4.03

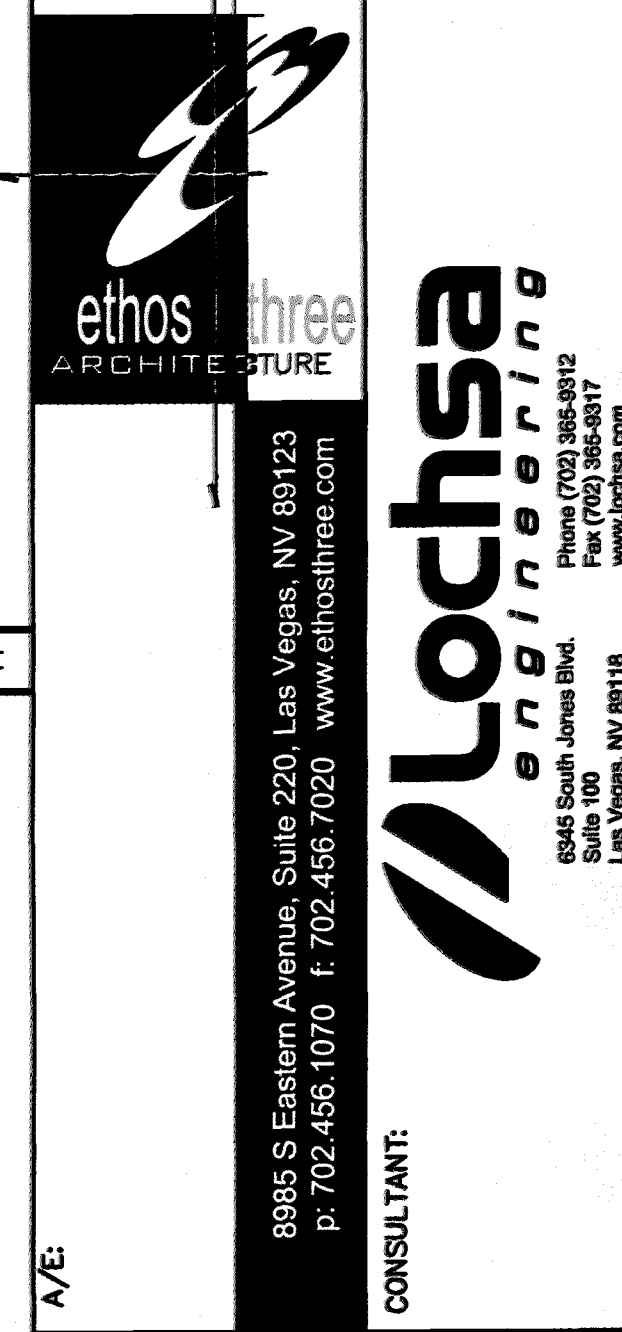
SHEET 9 OF 14



REVISIONS:		
REV.	DESCRIPTION:	DATE:

SEAL: 

DRAWN BY: SUBMITTAL: DATE:	NOV 25, 2020	6Z 201091
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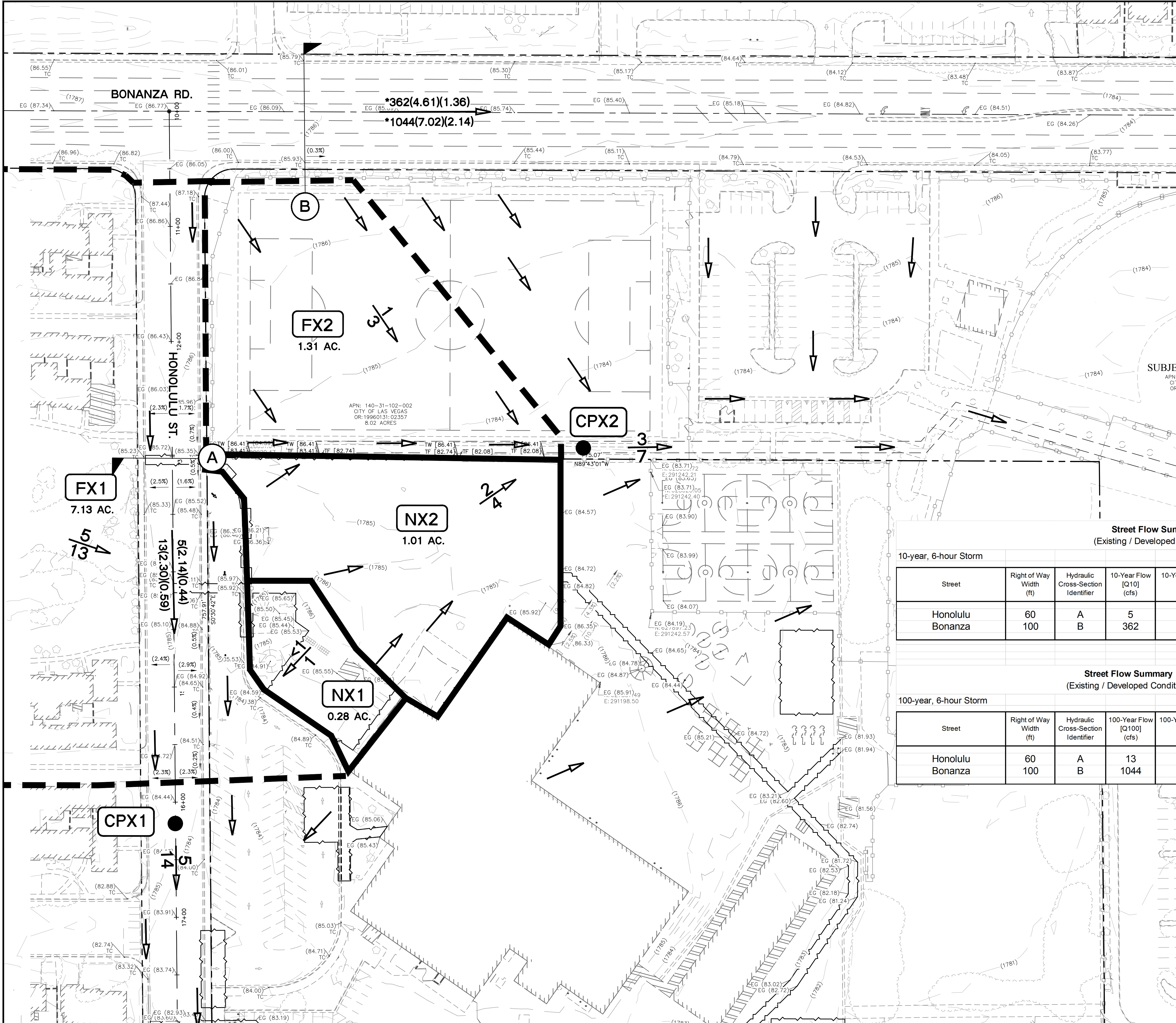


CONSTRUCTION MGMT:		DATE:
PROJECT MANAGER:		
COORDINATOR:		
BUILDING DEPARTMENT:		
CODE COMPLIANCE:		
AHERA REVIEW:		
ASBESTOS WORK IS: REQUIRED ☐ NOT REQUIRED ☐		

MPID:	001630		
TRICT	E: 702-799-8710	HOOL	

 CLARK COUNTY SCHOOL DISTRICT CONSTRUCTION MANAGEMENT DEPARTMENT 1180 MILITARY TRIBUTE PL. HENDERSON, NV 89074 PHON: 702.735.2000	PROJECT: ORAN K GRAGSON ELEMENTARY SCHOOL	DRAWING TITLE: DETAIL SHEETS	FACILITY: ELEMENTARY SCHOOL ADDITION
	SHEET NO:	C6.01	SHEET 14 OF 14

11/20/2020 11:04 AM
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DRAINAGE LEGEND

ND1
●
CMD1

2
3

1 (1.0)(1.2)
1 (1.0)(1.2)

1

DRAINAGE BASIN LABEL
CONCENTRATION POINT
COMBINATION POINT
ONSITE BASIN BOUNDARY
Q10 FLOW IN CFS (10 YR.)
Q100 FLOW IN CFS (100 YR.)
Q10 (V10)(D10)
Q100 (V100)(D100)
BASIN FLOW DIRECTION
OFFSITE BASIN BOUNDARY
HYDRAULIC CROSS-SECTION

Street Flow Summary
(Existing / Developed Condition)

10-year, 6-hour Storm

Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	10-Year Flow [Q10] (cfs)	10-Year Velocity [V] (fps)	10-Year Flow Depth [d] (ft)	10-Year Velocity x Depth [v x d]	Dry Lane Width (within 1/2 ROW) (ft)
Honolulu	60	A	5	2.14	0.44	0.94	N/A
Bonanza	100	B	362	4.61	1.36	6.27	N/A

Street Flow Summary
(Existing / Developed Condition)

100-year, 6-hour Storm

Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	100-Year Flow [Q100] (cfs)	100-Year Velocity [V] (fps)	100-Year Flow Depth [d] (ft)	100-Year Velocity x Depth [v x d]
Honolulu	60	A	13	2.30	0.59	1.36
Bonanza	100	B	1044	7.02	2.14	15.02

Peak Flow Summary
Existing Condition

HEC-1 ID	Area (acres)	10-year Flow (cfs)	100-year Flow (cfs)
FX1	7.13	5	13
NX1	0.28	<1	1
CPX1	-	5	14
FX2	1.31	1	3
NX2	1.01	2	4
CPX2	-	3	7

(FX1+NX1)
(FX2+NX2)

*FLOWS from CLV NEIGHBORHOOD MPU

LEGEND

CL OR SURVEY LINE	EASEMENT LINE	DESCRIPTION:	CONTOUR LINES	EDGE OF PAVEMENT	"A" TYPE CURBS	"L" TYPE CURBS	WALLS	FENCES	AC PAVEMENT	CONCRETE	SPOT ELEVATIONS	SIGNS	MANHOLE W/ DESCRIPTION	MANHOLE DESCRIPTIONS	FIRE HYDRANTS	GATE VALVES	REDUCERS	CLEAN OUTS	UTILITY BOX OR VAULT	BACKWATER VALVES	60" ROW LED STREETLIGHTS	80" ROW LED STREETLIGHTS
PROPERTY LINE	SAWCUT LINE	EXISTING:	(2210)								(12.34)		⊙	⊙ = SANITARY SEWER ⊙ = STORM DRAIN ⊙ = ELECTRICAL ⊙ = TELEPHONE	⊙	⊙	▶	○	□	BWV (BWV)	○	○
ROW LINE	SCARP LINE	PROPOSED:	(2122)								(12.34)		⊙					●	□		○	○

REVISIONS:

REV.	DESCRIPTION	DATE

SEAL: 12/01/2020

ethos three ARCHITECTURE

Lochsa engineering

8985 S Eastern Avenue, Suite 220, Las Vegas, NV 89123
p: 702.456.1070 f: 702.456.7020 www.ethosthree.com

CONSULTANT:

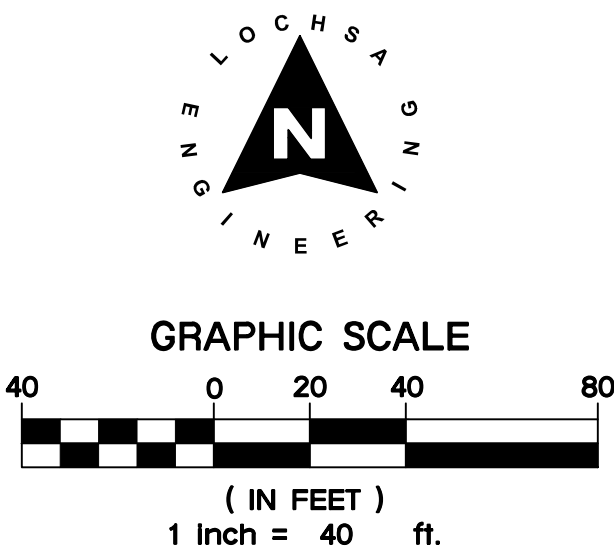
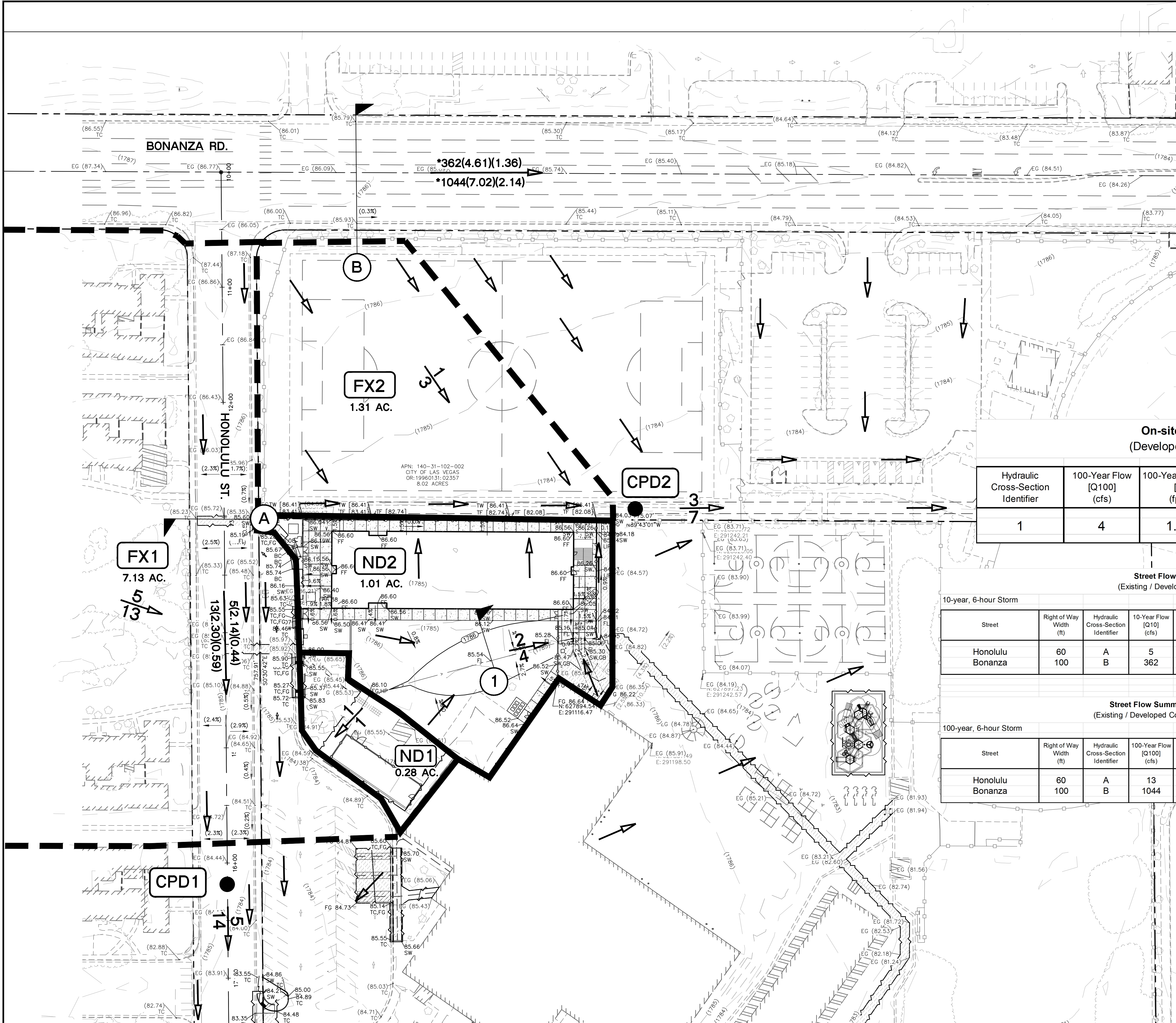
PROJECT: CLARK COUNTY SCHOOL DISTRICT
CONSTRUCTION MANAGEMENT 1180 MILITARY TRIBUTE PL HENDERSON NV 89074 PHONE: 702-799-8710

DRAWING TITLE: ORAN K GRAGSON ELEMENTARY SCHOOL
ONSITE DRAINAGE MAP - EXISTING CONDITION

FACILITY: ELEMENTARY SCHOOL ADDITION

SHEET NO: DR1
SHEET 1 OF 2

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T:\CADD\2019\Drawings\Drainage\DR2.dwg



DRAINAGE LEGEND	
ND1	DRAINAGE BASIN LABEL
●	CONCENTRATION POINT
—●—	COMBINATION POINT
---	ONSITE BASIN BOUNDARY
$\frac{2}{3}$	Q10 FLOW IN CFS (10 YR.)
$\frac{1}{100}$	Q100 FLOW IN CFS (100 YR.)
$\frac{1}{100} (1.0)(1.2)$	Q10 (V10)(D10)
$\frac{1}{100} (1.0)(1.2)$	Q100 (V100)(D100)
→	BASIN FLOW DIRECTION
---	OFFSITE BASIN BOUNDARY
①	HYDRAULIC CROSS-SECTION

On-site Sections
(Developed Condition)

Hydraulic Cross-Section Identifier	100-Year Flow [Q100] (cfs)	100-Year Velocity [V] (fps)	100-Year Flow Depth [d] (ft)	100-Year [V] x [d]
1	4	1.94	0.15	0.29

Street Flow Summary
(Existing / Developed Condition)

10-year, 6-hour Storm							
Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	10-Year Flow [Q10] (cfs)	10-Year Velocity [V] (fps)	10-Year Flow Depth [d] (ft)	10-Year Velocity x Depth [v x d]	Dry Lane Width (within 1/2 ROW) (ft)
Honolulu Bonanza	60 100	A B	5 362	2.14 4.61	0.44 1.36	0.94 6.27	N/A N/A

Street Flow Summary
(Existing / Developed Condition)

100-year, 6-hour Storm						
Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	100-Year Flow [Q100] (cfs)	100-Year Velocity [V] (fps)	100-Year Flow Depth [d] (ft)	100-Year Velocity x Depth [v x d]
Honolulu Bonanza	60 100	A B	13 1044	2.30 7.02	0.59 2.14	1.36 15.02

Peak Flow Summary
Developed Condition

HEC-1 ID	Area (acres)	10-year Flow	100-year Flow
FX1	7.13	5	13
ND1	0.28	1	1
CPD1	-	5	14
FX2	1.31	1	3
ND2	1.01	2	4
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*FLOWS from CLV NEIGHBORHOOD MPU

CL OR SURVEY LINE	EASEMENT LINE	DESCRIPTION:	CONTOUR LINES	EDGE OF PAVEMENT	"A" TYPE CURBS	"L" TYPE CURBS	WALLS	FENCES	AC PAVEMENT	CONCRETE	SPOT ELEVATIONS	SIGNS	MANHOLE W/ DESCRIPTION	MANHOLE DESCRIPTIONS	FIRE HYDRANTS	GATE VALVES	REDUCERS	CLEAN OUTS	UTILITY BOX OR VAULT	BACKWATER VALVES	60" ROW LED STREETLIGHTS	80" ROW LED STREETLIGHTS
---	---	EXISTING:	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
---	---	PROPOSED:	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

REVISIONS:

REV.	DESCRIPTION	DATE

SEAL:

12/01/2020

DATE:

DEC 01, 2020

DRAWN BY:

BZ

SUBMITAL:

60% DD

A/E PROJECT NO.:

201091

ethos three ARCHITECTURE

8985 S Eastern Avenue, Suite 220, Las Vegas, NV 89123
p: 702.456.1070 f: 702.456.7020 www.ethosthree.com

CONSULTANT:

Lochsa engineering

6345 Dean Jones Blvd., Suite 100, Las Vegas, NV 89118
p: 702.365.9317 fax: 702.365.9317 www.lochsa.com

CLARK COUNTY SCHOOL DISTRICT

CONSTRUCTION MANAGEMENT DEPARTMENT 1180 MILITARY TRIBUTE PL HENDERSON NV 89074 PHONE: 702-799-8710

PROJECT:

ORAN K GRAGSON ELEMENTARY SCHOOL

DRAWING TITLE:

ONSITE DRAINAGE MAP - DEVELOPED CONDITION

FACILITY:

ELEMENTARY SCHOOL ADDITION

SHEET NO.:

DR2

SHEET 2 OF 2