

DS #: 5025

APN: 137-25-310.002

PROJECT: John W. Bonner E.S. Addition

SUBMITTAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		August 28, 2018
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	
	John W. Bonner E.S. Addition	
Cross Streets:	NWC Oxford Cross Drive & Crestdale Lane	
File Number:	F:\Depot\DSMemos\DS5025A.doc	
Parcel Number:	137-25-310-002	
Zoning Action:	CRG-73778	
FEMA Flood Zone	YES	NO X
Proposed Storm Drain	YES X	NO
COPIES TO:		
		Lochsa Engineering
		Clark County School District
		Bart Anderson, P.E., DevCo

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	8/9/2018 & 8/22/2018	8/27/2018	See Comments Below	\$400.00	497951: \$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.

- The proposed finished floor elevation of the new building is lower than the corresponding street grade in *Oxford Cross Drive*. Provide a berm in the landscaping area behind the property line for onsite flood protection. The top of the berm shall be at least 18" above the corresponding street grade. Review and revise the grading plan and the pertinent *Detail Section 11/C6.01* accordingly.
- Address in the next submittal that the new driveway entrance at *Oxford Cross Drive* has adequate hump against the 100-year flow in the street for onsite protection.
- The total area of the parking lot is greater than 1 acre, per *Section 1500* of the *Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual*, BMPS will need to be provided in order to treat the surface runoff before it enters the public right of way.
There appears to be areas of landscaping within the curb islands in the proposed parking lot, it is recommended that they are used to treat the surface runoff.
- The proposed onsite sidewalk on the south side of the proposed building has a slope of 4.7%, however, as shown in *Detail Section 15/C6.01*, the sidewalk has a maximum slope of 2%, review and revise accordingly.
- Since the flow in the parking area is being changed from a sheet flow condition to a point discharge, provide velocity calculations at the point of discharge to confirm that the 100-year velocity is less than 5 ft/s.

6. Show wall footings in the provided cross section details.

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

END OF REMARKS
WSP/AYS

T/R/S: T20S/R59E/25
AREA K-25

TRANSACTION REPORT

AUG/28/2018/TUE 02:51 PM

FAX(TX)

#	DATE	START T.	RECEIVER	COM.TIME	PAGE	TYPE/NOTE	FILE
001	AUG/28	02:50PM	7023659317	0:00:36	2	MEMORY OK	SG3 2042

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: August 28, 2018	
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works	
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Cross Streets:	NWC Oxford Cross Drive & Crestdale Lane	Clark County School District	
File Number:	F:\Depot\DSMemos\DS5025A.doc	Bart Anderson, P.E., DevCo	
Parcel Number:	137-25-310-002		
Zoning Action:	CRG-73778		
FEMA Flood Zone	YES	NO	X
Proposed Storm Drain	YES	X	NO

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Job No.: 171058
Date: 8/9/2018



TRANSMITTAL

City of Las Vegas Public Works Department

(Flood Control Division)

333 North Rancho Drive

Las Vegas, NV 89106

T 702-365-9312 | F 702-365-9317

6345 S Jones Blvd, Suite 100

Las Vegas, NV 89118

Sent By:

Attention: Mr. Albert Sung, PE

- ☒ Our Messenger
☐ Your Messenger
☐ U.S. Mail
☐ Overnight Delivery

RE: Technical Drainage Study Update for John W. Bonner E.S. Addition

TRANSMITTED: ☐ Prints ☐ Shop Drawings ☐ Calcs ☐ Specs ☒ Other

Copies	Sheet No.	Description
1		Technical Drainage Study Update and Grading & detail Plans
1		Compact Disc (CD) for TDS Update and Plans
1		Drainage Study Submittal Sheet
1		\$400 Submittal Fee Check (Clark County School District) Check #000008215688

☒ For your use ☐ Review as noted ☐ Per your request ☐ Approved and return ____ copies

REMARKS:

Sent By: Abdul Bakhshi

Received By: _____

Technical Drainage Study Update For John W. Bonner E.S. Addition (DS #1806)

JOB# 171058

August 2018

Prepared for:

Clark County School District
4190 McLeod Drive
Las Vegas, NV 89121

Prepared By:

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

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: John W. Bonner E.S. Addition Date: August 7, 2018

Location of Development: a) Descriptive (Cross Streets) North/South: Crestdale Lane

East/West: Oxford Cross Drive

b) Section: 25 Township: 20 South Range: 59 East

c) APN: 137-25-310-002

Name of Owner: Clark County School District

Telephone No.: 702-799-6450 Fax No.: _____ E-Mail Address: _____

Address: 4190 McLeod Drive Las Vegas, NV 89121

Contact Person-Name: Abdul Bakhshi Telephone No.: (702) 365-9312

* E-Mail Address: Abdul.bakhshi@lochsa.com Fax No.: (702) 365-9317

Firm: Lochsa Engineering

Address: 6345 South Jones Boulevard, Suite 100, Las Vegas, Nevada 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: 8.64 +/- Acres Being Developed/Disturbed: 1.92 +/- 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

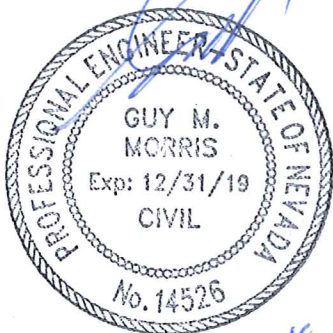
4. Proposed type of development (Residential, Commercial, Etc.): school building with parking addition

5. Approximate upstream land area which drains to the subject site: N/A

6. Has the site drainage been evaluated in the past? ☒ YES ☐ NO If yes, please identify documentation: Elementary School at the Crossing-0830 (Village 8, Parcel P) Technical Study (DS# 1806)

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

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: John W. Bonner E.S. Addition		Map ID:
Firm Name: Lochsa Engineering		Engineer: Guy M. Morris, PE
Address: 6345 South Jones Boulevard, Ste. 100		
City: Las Vegas	State: NV	Zip: 89118
Phone Number: 702-365-9312	Fax Number: 702-365-9317	
Property Owner: Clark County School District		
Address: 4190 McLeod Drive		
City: Las Vegas	State: NV	Zip: 89121
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 (CCRFCDD) 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. |
| ☒ | ☐ | Design Manual Standard Form 4 . |
| ☒ | ☐ | 2 copies of the 24" x 36" Drainage Plan. |
| ☐ | ☒ 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. |
| ☒ | ☐ | A copy of the current CCRFCDD 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.
☒	☒ N/A	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.
☐	☒ N/A	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.
☒	☐	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

- | | | |
|-------------------------------------|---|--|
| ☒ | ☒ N/A | 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. |
| ☐ | ☒ N/A | 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. |
| ☒ | ☐ | 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

- | | |
|---|---|
| <p>_____ <u>N/A</u></p> <p><u>✓</u> _____</p> <p><u>✓</u> _____</p> <p>_____ <u>N/A</u></p> <p>_____ <u>N/A</u></p> <p><u>✓</u> _____</p> <p>_____ <u>N/A</u></p> <p>_____ <u>N/A</u></p> <p><u>✓</u> _____</p> <p>_____ <u>N/A</u></p> <p>_____ <u>N/A</u></p> <p><u>✓</u> _____</p> <p>_____ <u>N/A</u></p> | <p>Flow split calculations and supporting documentation or reference for the method of flow split calculations used.</p> <p>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.</p> <p>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.</p> <p>Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)</p> <p>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.</p> <p>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.</p> <p>A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones.</p> <ul style="list-style-type: none"> • 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. <p>Provide a 50 percent clogging factor in the capacity calculation for drop inlets.</p> <p>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.</p> <p>The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.</p> <p>Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).</p> |
|---|---|

REFERENCE:

STANDARD FORM 2



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

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

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

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

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

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

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

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

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

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

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

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

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

August 8, 2018

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

Subject: **John W. Bonner E.S. Addition**
Update to the "Elementary School at the Crossing-0830 (Village 8, Parcel P)
Technical Drainage Study" (DS 1806)

Dear Mr. Sung,

This letter is intended as an Update to the "*Technical Drainage Study for Elementary School at the Crossing-0830 (Village 8, Parcel P)*", approved by City of Las Vegas on April, 1996, CLV DS#1806) originally prepared by G.C. Wallace Engineering, Inc. with addendum. The area is a part of the overall Conceptual Master Drainage Plan for Summerlin Village 8, April 1994. Proposed improvements to the site being addressed in the subject update will consist of an additional proposed building and surface parking on the existing grass play field.

Lochsa Engineering generally concurs with all the pertinent referenced analyses and results utilized in these studies.

The entire site is located within a portion of the southeast quarter of (SE 1/4) of Section 25, Township 20 South, Range 59 East of the M.D.M., in the City of Las Vegas, Nevada. Assessor's Parcel Number 137-25-310-002. The subject site is bordered by Crestdale Lane to east, Oxford Cross Drive to the south, on the west by the existing baseball park, and single-family residential subdivision Sycamore Ridge to the north, respectively.

The site is not within the boundary for using the McCarran Airport Rainfall Data. Therefore, precipitation data was determined using Tables 501 and 503, along with Figures 503 and 506 of the HCDDM (Reference 1). The adjusted point rainfall values for the 6-hour, 10-year and 100-year storm events are determined from Table 501 and were calculated to be as 1.80 and 3.15 inches, respectively. Review of the 2008 MPU's Figure H-24 (Reference 2 within Appendix C) indicates that the site and offsite area are entirely located within the hydrologic soil group B. The 1995 SCS Soil Survey of Las Vegas Area (Reference 3 within Appendix A) indicates the soil group comprised of type A and D. However, the 1995 SCS Soil Survey supersedes the 2008 MPU.

The TDS for *Elementary School at the Crossing-0830 Village 8, Parcel P* (DS# 1806) by GCW Engineering determined both the offsite and onsite flows and established flows along the adjacent streets. The offsite runoff for our subject site has been referenced from the Original

Study and enclosed within this Update. Per the original study, all onsite runoff from the subject site currently drains easterly to the existing Crestdale Lane.

The two referenced offsite basins OFF1 (9/22cfs) and OFF2 (9/22cfs) adjacent to the subject site to the west are fully developed into ball parks, per Figure 4, Proposed Drainage (reference 5 within Appendix D). However, both offsite basins OFF1 and OFF2 flow easterly towards our western perimeter wall which separates parcel Q and P, per reference 6 Offsite Drainage. Our subject site is within a portion of Parcel P. Flows from both OFF1 and OFF2 are conveyed along the west side of perimeter wall and drain northerly away from our site.

Due to the highpoint along Crestdale Lane, per Figure 4 Proposed Drainage (reference 5 of Appendix D), offsite basin OFF3 (1/1cfs) travels northerly and the southern portion of Crestdale Lane along with Oxford Cross Drive (portion adjacent to our site) are part of the offsite basin OFF4 (3/5cfs). Basin OFF 5 (2/3cfs) is routed through Basin OFF4 and combined with onsite basin '3' (8/16cfs) at the intersection of Crestdale Lane and Oxford Cross Drive. Therefore, the combined flow at the intersection of Crestdale Lane and Oxford Cross Drive is 12/23cfs, for both 10 and 100-yr storm runoff.

Per the original study, the subject site was divided into three onsite basins, labeled as basins '1' (6/12cfs), '2' (1/1cfs) and '3' (8/16cfs). Our Update is a portion of onsite basin '3'. Onsite referenced basin '3' was divided into onsite basin '3R' (2.59 acres, 5/10cfs), ON3A (0.33 acres 1/1cfs) and ON3B (1.59 acres 4/6cfs). The ratio calculation method was used and enclosed within Appendix A. Delineated onsite basin ON3A shall be sheet flowing northerly direction along 2-ft valley gutter and combined with onsite basin '1' and ultimately onto Crestdale Lane. Onsite basin ON3B shall conveyed along another 2-ft valley gutter and sheet flow through the site traveling easterly onsite and eventually discharge onto Crestdale Lane. The proposed drainage patterns shall follow its historic design per the original study.

The existing building has positive drainage away from it along its entire perimeter. The proposed onsite revision and offsite drainage at the combined intersection of Crestdale Lane and Oxford Drive is 14/24cfs, a slight increase from 12/23cfs. The increase was expected due to the replacement of the play field area into parking and additional building.

The proposed grading plans for our site show that flow is conveyed in a northeasterly direction and conform to the original study, matching the approved drainage pattern. The developed flows from the revised site will follow the historic drainage pattern. Oxford Cross Drive is 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.

The drainage patterns have not significantly changed since the Original Study and per this Update.

Master Planning Information

The "2008 Las Vegas Valley Flood Control Master Plan Update", dated September 2008, as prepared by Post Buckley Schuh and Jernigan, Inc. (PBS&J), in association with Louis Berger Group and Parsons Brinckerhoff, for the Clark County Regional Flood Control District (CCRFCD) illustrates the existing and proposed regional master planned facilities around the site

as shown on Figure F-24. Review of the Master Plan Update, indicates no existing or proposed CCRFCD facilities adjacent or crossing through the site.

Floodplain Information

The project site is covered by Flood Insurance Rate Map (FIRM) for Clark County, Nevada, and incorporated areas, Community Panel Number: 32003C2150E, Effective Date: September 27, 2002. Review of the Flood Insurance Rate Map indicates that the proposed building addition and is located within an area designated by FEMA as Zone "X" (unshaded). Zone "X" (unshaded) is described by FEMA as "*Areas determined to be outside the 0.2% annual chance flood*". Figure 2 in the Appendix illustrates the location of the site on a portion of the above referenced Flood Insurance Rate Map.

Compliance with Regulations and Adopted Plans

The subject drainage study update is specifically provided to support construction of the proposed building expansion and surface parking adjacent to the existing building. This update is in conformance to the original "*Technical Drainage Study for Elementary School at the Crossing-0830 (Village 8, Parcel P)*", approved by City of Las Vegas on April, 1996, CLV DS#1806." originally prepared by G.C. Wallace Engineer, Inc. The site, as previously designed, is in accordance with the City of Las Vegas Department of Public Works and the CCRFCD drainage design criteria, and is also based on generally accepted engineering principles and practices. The proposed building expansion and removal of grass field will not cause any adverse impact on the adjacent and/or downstream properties. The finished floor elevation of the proposed building is set to at least twice the depth of the 100-yr flow in the adjacent upstream flow line. The FF is also set to a minimum of 6-inches above the onsite adjacent flowline highpoint. Please refer to the attached grading plans and details for further clarification of the proposed improvements.

Compliance with CCRFCD Best Management Practices (BMP)

Due to the limited landscaping area at the downstream end of the site, it was not feasible providing BMP swale. Therefore, storm runoff generated from onsite development shall sheet flow through the ac pavement play area within 300-ft and ultimately onto Crestdale Lane, resulting settlement of the sediments.

The area of revision for the subject site is approximately 1.92 acres, accounting for only 22% of the total school campus area, there contributing less than 50% of the significant redevelopment area.

References

1. Clark County Regional Flood Control District, "Hydrologic Criteria and Drainage Design Manual", August 1999.
2. Post Buckley, Schuh & Jernigan (PBS&J), Inc., in association with, Louis Berger Group and Parsons Brinckerhoff, "2008 Las Vegas Valley Flood Control Master Plan Update, Volume 1 and II", September 2008.
3. Natural Resources Conservation Service (NRCS), "1995 Soil Survey of the Las Vegas Valley", Issued July 1985, in conjunction with the Web Soil Survey.
4. Federal Emergency Management Agency, "Flood Insurance Rate Map; Community Panel Number 32003C2150 E; Clark County, Nevada and Incorporated Areas", Effective Date: September 27, 2002.
5. G.C.W. Engineering, Technical Drainage Study for "Elementary School at the Crossing-0830" (Village 8, Parcel P)", approved by City of Las Vegas on April, 1996, CLV DS#1806)
6. G.C.W. Engineering, Conceptual Master Drainage Plan for Summerlin Village 8, April 1994.

If you have any questions or comments, please do not hesitate to contact our office at your earliest convenience.

Sincerely,

LOCHSA ENGINEERING



Abdul Bakhshi
Hydrologist

Copy of Notice of Final Action



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
Mayor

LOIS TARKANIAN
Mayor Pro Tem

STAVROS S. ANTHONY

BOB COFFIN
STEVEN G. SEROKA
MICHELE FIORE
CEDRIC CREAR

SCOTT D. ADAMS
City Manager

**DEVELOPMENT
SERVICES CENTER**

333 N. RANCHO DRIVE
LAS VEGAS, NV 89106
702.229.4830 | VOICE
711 | TTY



cityoflasvegas
lasvegasnevada.gov

July 25, 2018

Ms. Gabrielle Greer
CCSD Real Property Management
1180 Military Tribute Place
Henderson, Nevada 89074

Re: CRG-73778 [PRJ-73736] - CITY REFERRAL GROUP

Dear Ms. Greer:

The City Referral Group at a regular meeting held on July 25, 2018 voted to **APPROVE** request for a Minor Amendment of an approved Site Development Plan Review (SV-0012-96) FOR A PROPOSED 36,400 SQUARE-FOOT BUILDING ADDITION TO AN EXISTING 66,145 SQUARE-FOOT ELEMENTARY SCHOOL on 8.64 acres at 765 Crestdale Lane (APN 137-25-310-002), PC (Planned Community) Zone, Ward 2 (Seroka) [PRJ-73736].

This approval is subject to the following conditions:

Planning

1. Conformance to the Conditions of Approval for City Referral Group (SV-0012-96) shall be required, if approved.
2. This approval shall be void two years from the date of final approval, unless exercised pursuant to the provisions of LVMC Title 19.16. An Extension of Time may be filed for consideration by the City of Las Vegas.
3. All development shall be in conformance with the site plan, landscape plan, and building elevations, date stamped 06/26/18, except as amended by conditions herein.
4. All necessary building permits shall be obtained and final inspections shall be completed in compliance with Title 19 and all codes as required by the Department of Building and Safety.
5. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
6. A technical landscape plan, signed and sealed by a Registered Architect, Landscape Architect, Residential Designer or Civil Engineer, must be submitted prior to or at the same time application is made for a building permit. A permanent underground sprinkler system is required, and shall be permanently maintained in a satisfactory manner; the landscape plan shall include irrigation specifications. Installed landscaping shall not impede visibility of any traffic control device.

6. A technical landscape plan, signed and sealed by a Registered Architect, Landscape Architect, Residential Designer or Civil Engineer, must be submitted prior to or at the same time application is made for a building permit. A permanent underground sprinkler system is required, and shall be permanently maintained in a satisfactory manner; the landscape plan shall include irrigation specifications. Installed landscaping shall not impede visibility of any traffic control device.
7. A fully operational fire protection system, including fire apparatus roads, fire hydrants and water supply, shall be installed and shall be functioning prior to construction of any combustible structures.
8. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

Public Works

9. Correct all American's with Disabilities Act (ADA) deficiencies on the sidewalks adjacent to this site in accordance with code requirements of Title 13.56.040 to the satisfaction of the City Engineer concurrent with development of this site.
10. The owner shall be responsible to remove any portion of the existing play equipment or structures that are within the existing Public Drainage and Public Sewer Easement (File 85, Page 72 of Parcel Maps) when the City needs to maintain or reconstruct existing facilities within this easement.
11. A Traffic Impact Analysis or other information acceptable to the City Traffic Engineer must be submitted to and approved by the Department of Public Works prior to issuance of any building or grading permits. Comply with the recommendation of the City Traffic Engineer.
12. An update to the previously approved Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to submittal of any construction drawings or the issuance of any building or grading permits, whichever may occur first. Provide and improve all drainage ways recommended in the approved drainage study update.

This action by the City Referral Group on July 25, 2018 is final unless a written appeal is filed with the Director of the Department of Planning within ten (10) days of the date of the City Referral Group's decision.

Sincerely,



Nicole Eddowes
Senior Planner
Department of Planning
Case Planning Division

APPENDIX A

HYDROLOGIC ANALYSIS

HEC-1 MODEL OUTPUT

(INTERIM / DEVELOPED CONDITION)

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 07AUG18 TIME 16:45:32
*
*****

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d

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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  XXXXX  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  X  XXXXXX  XXXXX  XXX

```

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

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

1

HEC-1 INPUT

PAGE 1

```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1         ID      JHON W BONNER ES ADDITION
2         ID      ***** TECHNICAL DRAINAGE STUDY *****
3         ID      DEVELOPED CONDITION - ONSITE
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 # 171058
8         ID
9         ID
10        ID      INPUT FILE NAME: D.DAT
11        ID
12        ID      MAY 2018
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      : 1.80 INCHES
20        ID      100-YEAR     : 3.15 INCHES
21        ID      10-YEAR/100-YEAR : 1.80/3.15= 0.5714
22        ID
23        ID      *****
24        ID      *****
25        ID      *DIAGRAM
26        IT      5      300
27        IO      5      0
28        IN      5
29        JR      PREC .5714 1.0
30
31        KK      ON3A
32        KM      DEVELOPED ONSITE BASIN DRAINING TOWARDS THE NORTHEAST
33        PB      3.15
34        PC      0.0 .02 .057 .07 .087 .108 .124 .13 .13 .13
35        PC      .13 .13 .13 .133 .14 .142 .148 .158 .172 .181
36        PC      .19 .197 .199 .2 .201 .204 .214 .229 .241 .249
37        PC      .251 .256 .27 .278 .281 .283 .295 .322 .352 .409
38        PC      .499 .59 .71 .744 .781 .812 .819 .835 .851 .856
39        PC      .86 .868 .876 .888 .91 .926 .937 .95 .97 .976
40        PC      .982 .985 .987 .989 .99 .993 .993 .994 .995 .998
41        PC      .998 .999 1.0
42        BA      .00052
43        LS      0 98.0
44        UD      .069
45        *
46
47        KK      ON3B
48        KM      DEVELOPED ONSITE BASIN DRAINING TO NORTHEASTERLY
49        BA      .00248
50        LS      0 98.0
51        UD      .060
52        *
53
54        ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT
LINE      (V) ROUTING      (--->) DIVERSION OR PUMP FLOW
NO.      (.) CONNECTOR    (<---) RETURN OF DIVERTED OR PUMPED FLOW
29       ON3A
43       .
43       .      ON3B

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1

```

*****
*
*
*

```



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* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   JUN 1998                     *
*   VERSION 4.1                   *
* RUN DATE 07AUG18 TIME 16:45:32 *
*                               *
*****

```

d

```

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

```

JHON W BONNER ES ADDITION
 ***** TECHNICAL DRAINAGE STUDY *****
 DEVELOPED CONDITION - ONSITE
 USING SCS METHODS AND KINEMATIC WAVE ROUTING
 MASTER PLAN ADJUSTED 6-HOUR RAINFALL AND STORM DISTRIBUTION

LOCHSA JOB # 171058

INPUT FILE NAME: D.DAT

MAY 2018

MCCARRAN AIRPORT RAINFALL AREA
 10 & 100 YEAR - 6 HOUR STORM EVENT
 PRECIPITATION:
 10-YEAR : 1.80 INCHES
 100-YEAR : 3.15 INCHES
 10-YEAR/100-YEAR : 1.80/3.15= 0.5714

26 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 0300 STARTING TIME
 NQ 101 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 1 0 ENDING DATE
 NDTIME 1120 ENDING TIME
 ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 8.33 HOURS

ENGLISH UNITS

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

JP

MULTI-PLAN OPTION

NPLAN 1 NUMBER OF PLANS

JR

MULTI-RATIO OPTION

RATIOS OF PRECIPITATION
 .57 1.00

1

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
				.57	1.00
HYDROGRAPH AT					
+	ON3A	.00	1	FLOW	1.
				TIME	3.50
HYDROGRAPH AT					
+	ON3B	.00	1	FLOW	4.
				TIME	3.50

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

RATIO METHOD CALCULATION

RATIO CALCULATION METHOD

REFERENCED ONSITE BASIN "3" 4.51 ACRES $\frac{Q}{16} = \frac{Q_{10}}{Q_{100}}$

$$\frac{4.51}{16} = \frac{2.59}{Q_{100}} \Rightarrow Q_{100} = 9.2 \approx 10 \text{ cfs}$$

$$\frac{4.51}{8} = \frac{2.59}{Q_{10}} \Rightarrow Q_{10} = 4.6 \approx 5 \text{ cfs}$$

$\Rightarrow$ REVISED BASIN '3R'

$\Rightarrow 5/10 \text{ cfs} \rightarrow 10/100\text{-yr}$

Hydrologic Parameters

John W. Bonner E.S. Addition
Abdul Bakhshi
171058

171058

LOCATION:		Onsite
HYDROLOGIC CONDITION:		Existing/Interim
TRIAL:		Final Iteration
$t_i = 1.8 (1.1 - K) L^{(0.5)} / S^{(1/3)}$	$t_c = t_i + t_t$	
$K = 0.0132 \text{ CN} - 0.39$	$t_L = t_{LAG} = 0.6 t_c$	
$t_t = L / (60 V)$		

[illegible]

Output Variables									
Normal Depth, Yn (ft):	0.09	0.14							
Area of Flow, A, (sf):	0.57	1.27							
Velocity, V (fps):	0.88	2.37							
Wetted Perimeter, p (ft):	10.84	16.04							
Hydraulic Radius, Rh (ft):	0.05	0.08							
Free Surface Top Width, T (ft):	10.84	16.04							
Centroid, Y* (ft):	0.03	0.05							

* NOTE : HALF OF THE 100-YEAR STORM RUNOFF FLOWS IS USED TO DETERMINE THE BASIN TRAVEL VELOCITY REQUIRED FOR THE LAG TIME CALCULATIONS

Curve Number Calculations
John W. Bonner E.S. Addition

Sub-Basin: ON3A
Total Area: 0.33 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)	0.18	A	55%	98	53.9
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	0.13	D	40%	98	39.2
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	0.02	D	5%	98	4.9
Total:					
	0.33	-	100%	-	98.0

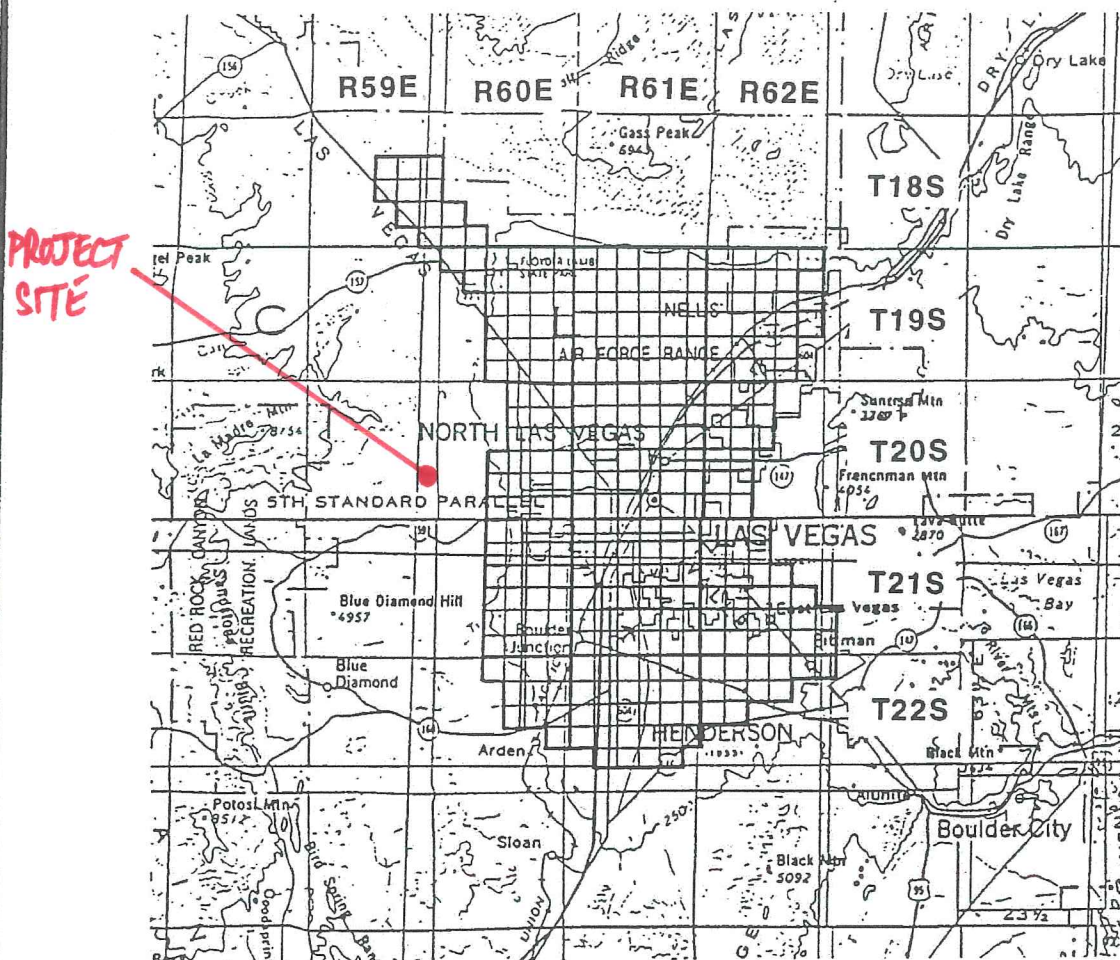
Curve Number Calculations
John W. Bonner E.S. Addition

Sub-Basin: ON3B
Total Area: 1.59 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)	0.87	A	55%	98	53.9
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	0.64	D	40%	98	39.2
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	0.08	D	5%	98	4.9
Total:					
	1.59	-	100%	-	98.0

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

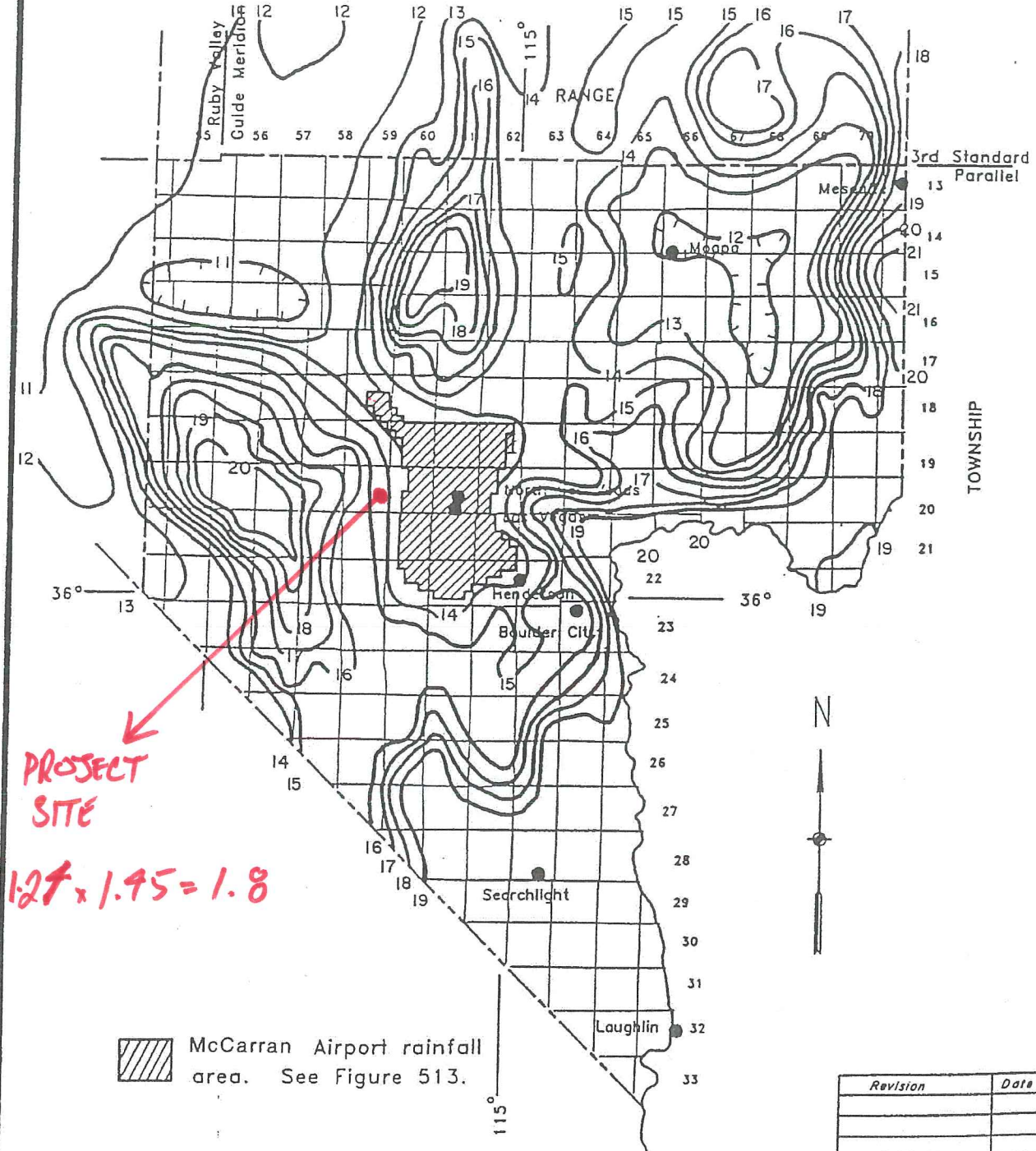
REFERENCE:

USACE, Los Angeles District, 1988

FIGURE 513

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RAINFALL DEPTH-DURATION-FREQUENCY 10-YEAR, 6-HOUR (DEPTHS IN TENTHS OF INCHES)



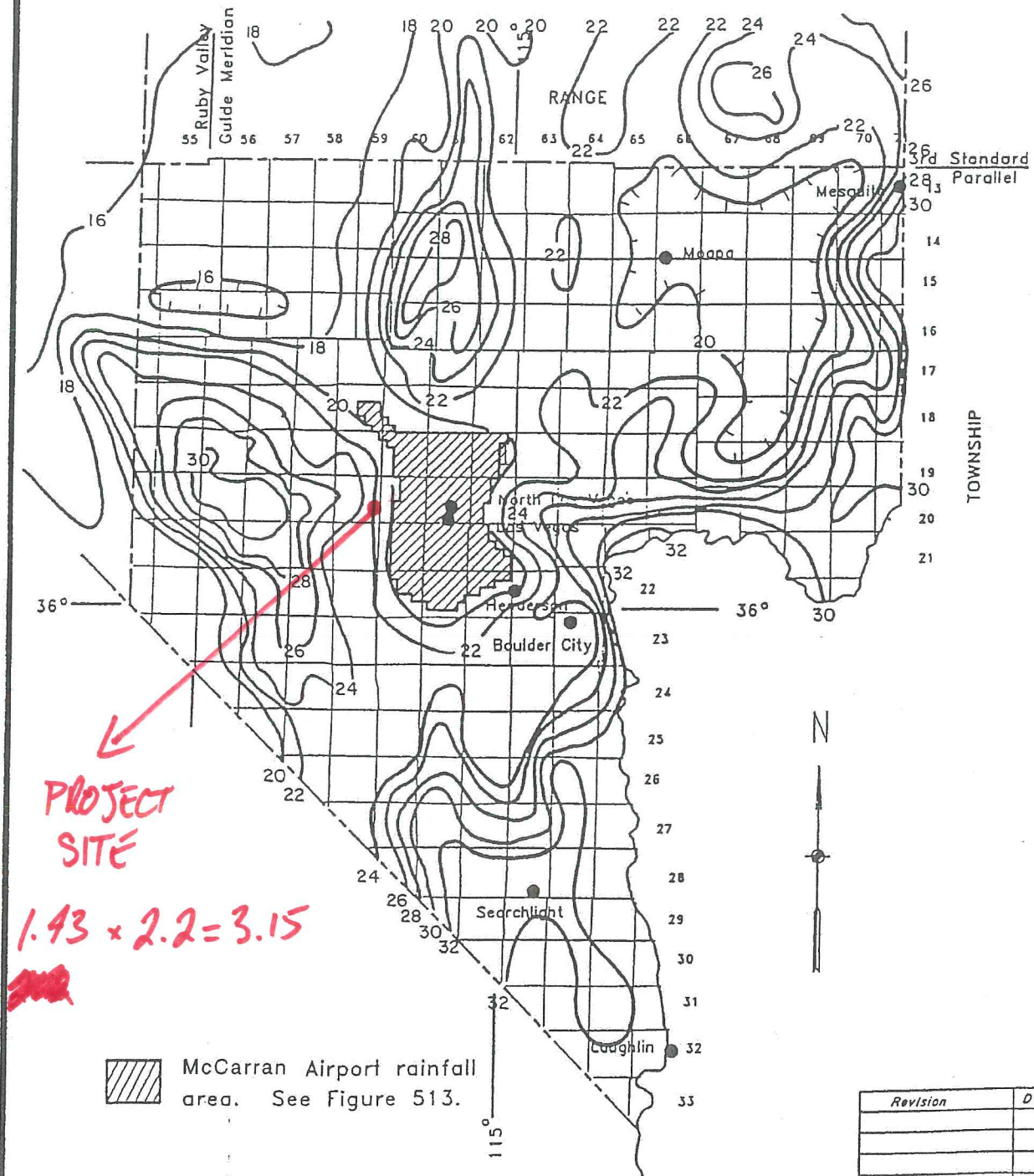
WRC
ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 503

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RAINFALL DEPTH-DURATION-FREQUENCY 100-YEAR, 6-HOUR (DEPTHS IN TENTHS OF INCHES)



WRC
ENGINEERING

REFERENCE:
NOAA ATLAS 2, VOLUME VII NEVADA, 1973

FIGURE 506

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

PRECIPITATION ADJUSTMENT RATIOS

<u>Recurrence Interval</u>	<u>Ratio to NOAA Atlas 2</u>
2-year	1.00
5-year	1.16
10-year	<u>1.24</u>
25-year	1.33
50-year	1.39
100-year	<u>1.43</u>

- NOTE: 1. Multiply the values obtained from the NOAA Atlas 2 by the above ratios to obtain the adjusted precipitation values.
2. NOAA Atlas 2 values for use with TR-55 shall not be adjusted by the above ratios.
3. Tables 505 and 506 require no adjustments.

<i>Revision</i>	<i>Date</i>

**WRC
ENGINEERING**

REFERENCE:
USACE, Los Angeles District, 1988

TABLE 501

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

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 $I_p = 0.2S$.

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

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

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

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

Revision	Date

WRC
ENGINEERING

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

TABLE 602
1 of 4

Web Soil Survey



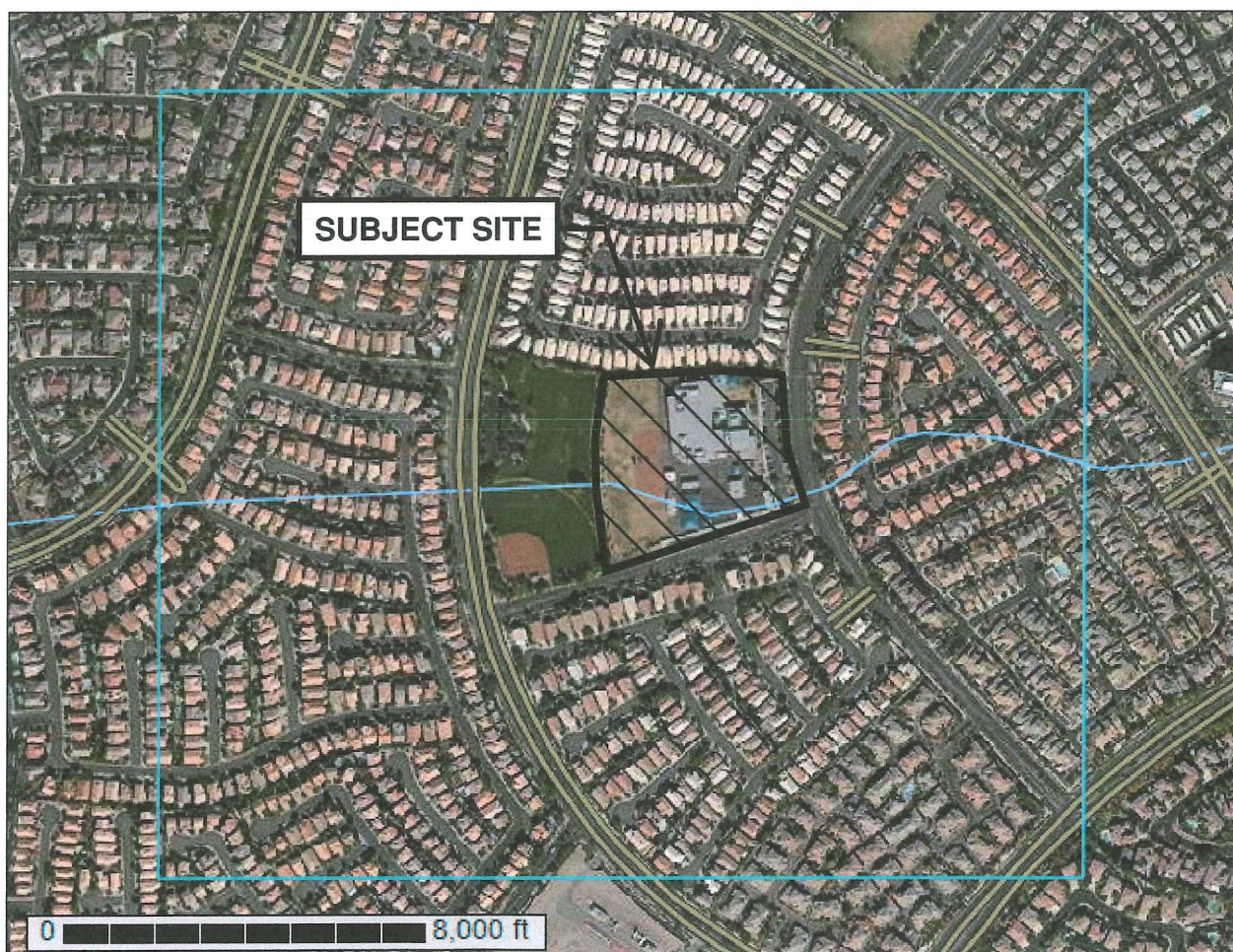
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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

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



Custom Soil Resource Report Soil Map



502—Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: hrcf
Elevation: 1,700 to 4,800 feet
Mean annual precipitation: 4 to 12 inches
Mean annual air temperature: 57 to 70 degrees F
Frost-free period: 180 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Canutio and similar soils: 55 percent
Cave and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canutio

Setting

Landform: Inset fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 9 inches: gravelly fine sandy loam
H2 - 9 to 60 inches: stratified extremely gravelly loamy coarse sand to gravelly loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: **A** 'A' SOIL
Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)
Hydric soil rating: No

Custom Soil Resource Report

Description of Cave

Setting

Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 16 inches: gravelly fine sandy loam
H2 - 16 to 30 inches: indurated
H3 - 30 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 4 to 20 inches to petrocalcic
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 40 percent
Gypsum, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 12.0
Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Other vegetative classification: LIMY 3-5" P.Z. (030XB019NV_3)
Hydric soil rating: No

Minor Components

Arizo

Percent of map unit: 5 percent
Landform: Channels
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: VALLEY WASH (R030XB028NV)
Hydric soil rating: No

Custom Soil Resource Report Map—Drainage Class



Custom Soil Resource Report

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
152	Cave gravelly fine sandy loam, 0 to 4 percent slopes	D	37.4	18.9%
502	Canutio-Cave gravelly fine sandy loams, 2 to 8 percent slopes	A	161.2	81.1%
Totals for Area of Interest			198.7	100.0%

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

HYDRAULIC ANALYSIS

Crestdale Lane @ Section C (10-Year) Worksheet for Irregular Channel

Project Description	
Worksheet	Crestdale Lane @ Section C (
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	0.017400 ft/ft
Discharge	14.00 cfs

← PROPOSED / DEVELOPED CONDITION (3R + ON3B + OFF5 + OFF4)

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

Results	
Mannings Coefficient	0.016
Water Surface Elev	46.78 ft
Elevation Range	46.22 to 46.90
Flow Area	3.5 ft²
Wetted Perimeter	19.15 ft
Top Width	18.60 ft
Actual Depth	0.56 ft
Critical Elevation	46.86 ft
Critical Slope	0.006252 ft/ft
Velocity	3.99 ft/s
Velocity Head	0.25 ft
Specific Energy	47.03 ft
Froude Number	1.62
Flow Type	Supercritical

$d_{10} = 0.56$
 $v_{10} = 3.99$
 $d \times v = 0.56 \times 3.99 = 2.23 < 6$
OK

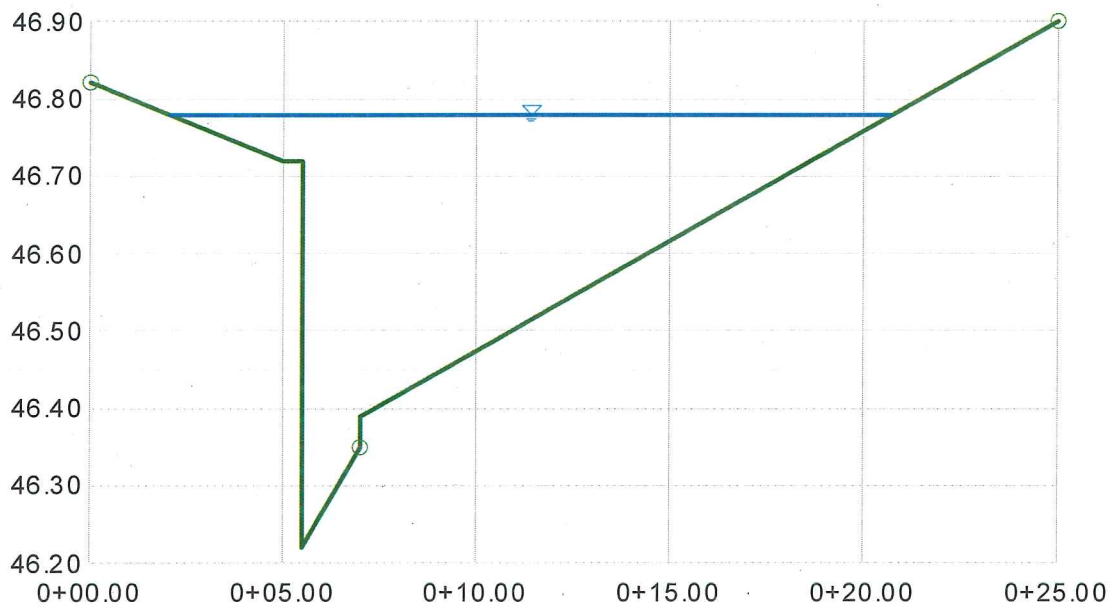
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+25.00	0.017

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	46.82
0+05.00	46.72
0+05.50	46.72
0+05.50	46.22
0+07.00	46.35
0+07.00	46.39
0+25.00	46.90

Crestdale Lane @ Section C (10-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	Crestdale Lane @ Section C (
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.017400 ft/ft
Water Surface Elev	46.78 ft
Elevation Range	46.22 to 46.90
Discharge	14.00 cfs



V:20.0
H:1
NTS

Crestdale Lane @ Section C (100-Year) Worksheet for Irregular Channel

Project Description	
Worksheet	Crestdale Lane @ Section C
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	017400 ft/ft
Discharge	24.00 cfs

← PROPOSED/DEVELOPED CHANNEL (3R+ON3B+OFF5+OFF4)

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

Results	
Mannings Coefficient	0.016
Water Surface Elev	46.86 ft
Elevation Range	46.22 to 46.90
Flow Area	5.3 ft ²
Wetted Perimeter	24.23 ft
Top Width	23.63 ft
Actual Depth	0.64 ft
Critical Elevation	46.96 ft
Critical Slope	0.005590 ft/ft
Velocity	4.52 ft/s
Velocity Head	0.32 ft
Specific Energy	47.18 ft
Froude Number	1.68
Flow Type	Supercritical

d_{100}
 V_{100}

$$d \times V = 0.64 \times 4.52 = 2.89 < 8$$

OK

Calculation Messages:
Water elevation exceeds lowest end station by 0.41254427e-1 ft.

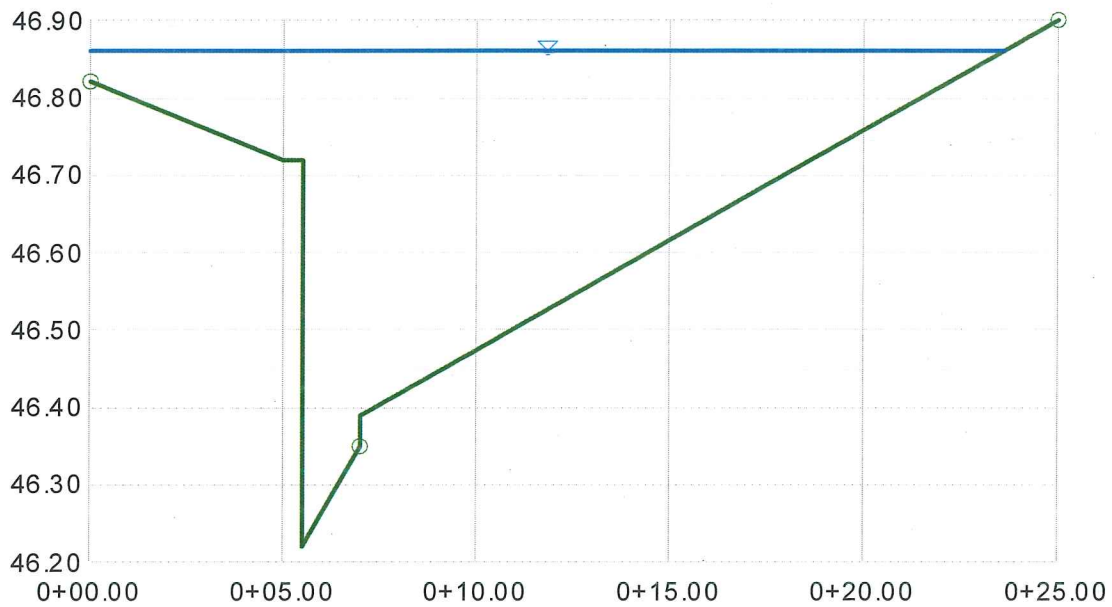
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+25.00	0.017

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	46.82
0+05.00	46.72
0+05.50	46.72
0+05.50	46.22
0+07.00	46.35
0+07.00	46.39
0+25.00	46.90

Crestdale Lane @ Section C (100-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	Crestdale Lane @ Section C ('
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.017400 ft/ft
Water Surface Elev	46.86 ft
Elevation Range	46.22 to 46.90
Discharge	24.00 cfs



V:20.0
H:1
NTS

Oxford Cross Drive (10yr) Worksheet for Irregular Channel

Project Description	
Worksheet	oxford cross @ Section B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	048000 ft/ft
Discharge	4.00 cfs

(FROM REF. TDS FOR E.S. @ CROSSING)

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

Results	
Mannings Coefficient	0.016
Water Surface Elev	71.40 ft
Elevation Range	.07 to 71.71
Flow Area	0.9 ft ²
Wetted Perimeter	7.88 ft
Top Width	7.51 ft
Actual Depth	0.33 ft
Critical Elevation	71.49 ft
Critical Slope	0.007396 ft/ft
Velocity	4.63 ft/s
Velocity Head	0.33 ft
Specific Energy	71.73 ft
Froude Number	2.40
Flow Type	Supercritical

d₁₀
V₁₀

$$d \times V = 0.33 \times 4.63 = 1.53 < 6$$

OK

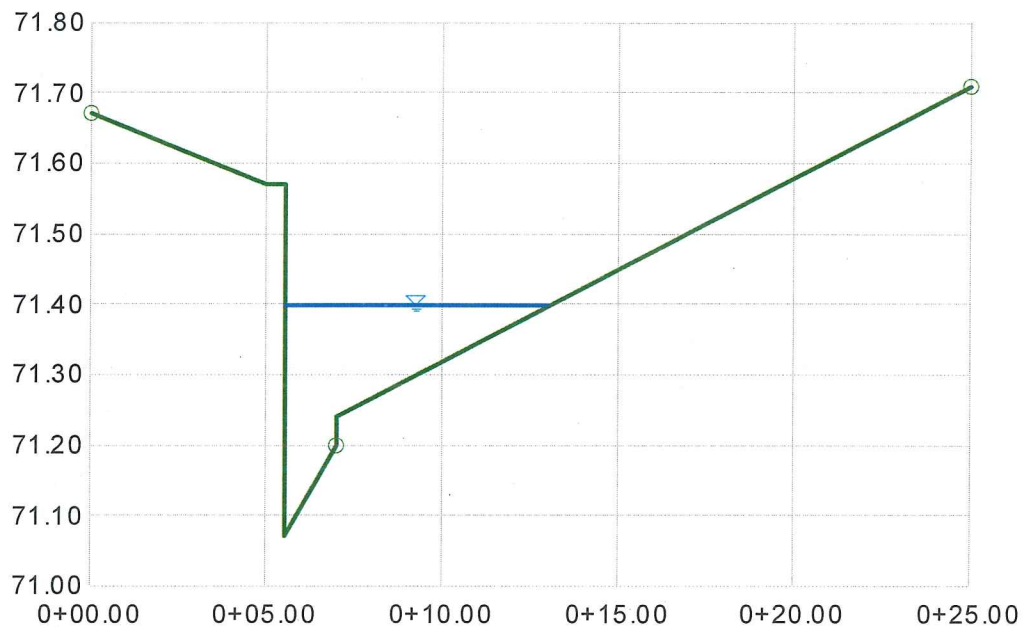
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+25.00	0.017

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	71.67
0+05.00	71.57
0+05.50	71.57
0+05.50	71.07
0+07.00	71.20
0+07.00	71.24
0+25.00	71.71

Oxford Cross Drive (10yr future) Cross Section for Irregular Channel

Project Description	
Worksheet	oxford cross @ Section A (1'
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.016
Slope	0.048000 ft/ft
Water Surface Elev	71.40 ft
Elevation Range	.07 to 71.71
Discharge	4.00 cfs



V:20.0
H:1
NTS

Oxford Cross Drive (100yr) Worksheet for Irregular Channel

Project Description	
Worksheet	oxford cross @ Section B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	048000 ft/ft
Discharge	8.00 cfs

(FROM REF. TDS FOR E.S. @ CROSSING)

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

Results	
Mannings Coefficient	0.013
Water Surface Elev	71.45 ft
Elevation Range	.07 to 71.71
Flow Area	1.3 ft ²
Wetted Perimeter	9.80 ft
Top Width	9.38 ft
Actual Depth	0.38 ft
Critical Elevation	71.60 ft
Critical Slope	0.004737 ft/ft
Velocity	6.27 ft/s
Velocity Head	0.61 ft
Specific Energy	72.06 ft
Froude Number	2.99
Flow Type	Supercritical

d_{100}

V_{100}

$$d \times V = 0.38 \times 6.27 = 2.38 < 8$$

OK

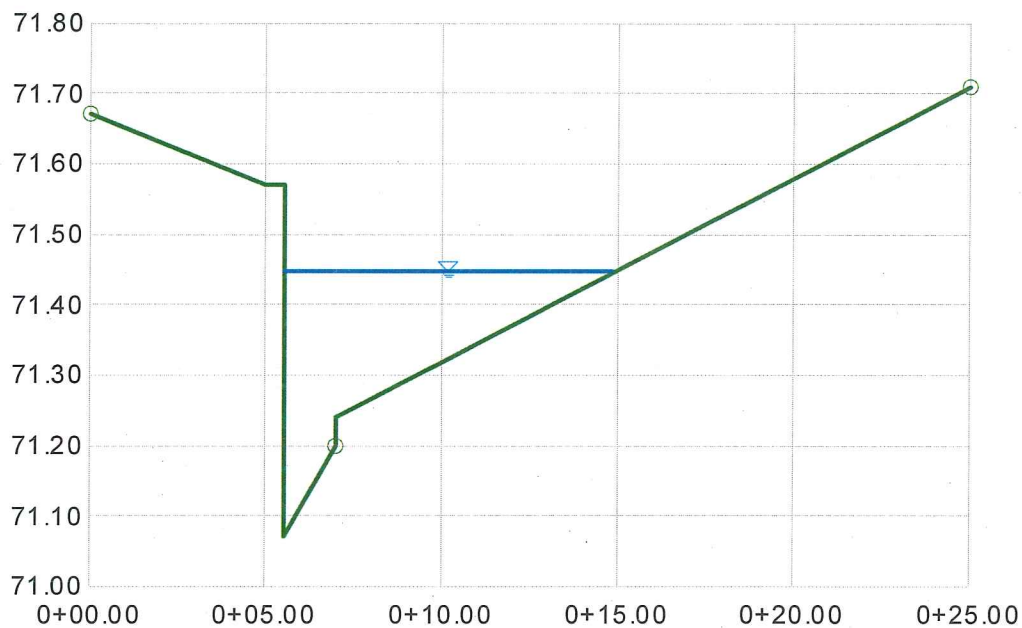
Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+07.00	0.013
0+07.00	0+25.00	0.017

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	71.67
0+05.00	71.57
0+05.50	71.57
0+05.50	71.07
0+07.00	71.20
0+07.00	71.24
0+25.00	71.71

Oxford Cross Drive (100yr) Cross Section for Irregular Channel

Project Description	
Worksheet	oxford cross @ Section A (10
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Slope	0.048000 ft/ft
Water Surface Elev	71.45 ft
Elevation Range	.07 to 71.71
Discharge	8.00 cfs



V:20.0
H:1
NTS

Onsite Section @ A (100-Year) **Worksheet for Irregular Channel**

Project Description	
Worksheet	Onsite Section @ A (100)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Slope	004000 ft/ft
Discharge	6.00 cfs

100-YR FLOW FROM BASIN ON3B

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

Results	
Mannings Coefficient	0.013
Water Surface Elev	58.45 ft
Elevation Range	57.93 to 61.00
Flow Area	2.4 ft ²
Wetted Perimeter	11.64 ft
Top Width	11.10 ft
Actual Depth	0.52 ft
Critical Elevation	58.44 ft
Critical Slope	0.004669 ft/ft
Velocity	2.47 ft/s
Velocity Head	0.09 ft
Specific Energy	58.55 ft
Froude Number	0.93
Flow Type	Subcritical

d_{100}
 V_{100}

$$d \times v = 0.52 \times 2.47 = 1.28 < 6$$

OK
 NON-EROSIVE

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00.00	0+13.00	0.013
0+13.00	0+36.00	0.015
0+36.00	0+70.00	0.013

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00.00	59.00
0+11.00	58.43
0+11.00	57.93
0+13.00	58.07
0+13.00	58.10
0+36.00	59.03
0+36.00	59.53
0+70.00	61.00

$$FF = 2959.55$$

$$FL/HP = 2958.41 + 2(0.52) = 1.07$$

$$2959.45 < 2959.55$$

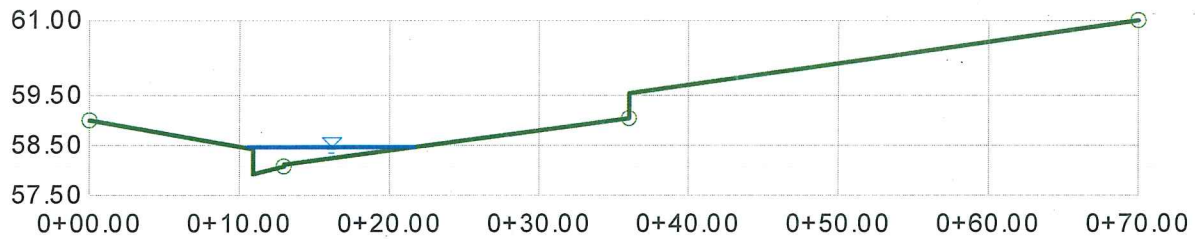
OK

Notes: * Q100= 11cfs = 100-year runoff flows from combination point CP2R(6/11cfs)

Onsite Section @ A (100-Year) Cross Section for Irregular Channel

Project Description	
Worksheet	Onsite Section @ A (100-Year)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.013
Slope	0.004000 ft/ft
Water Surface Elev	58.45 ft
Elevation Range	57.93 to 61.00
Discharge	6.00 cfs



V:3.33333333
H:1
NTS

APPENDIX C

FIGURES

NOTES

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

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

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

MAP LEGEND

PARCEL BOUNDARY

SUB BOUNDARY

PMD BOUNDARY

ROAD EASEMENT

MATCH / LEADER LINE

HISTORIC LOT BOUNDARY

HISTORIC SUB BOUNDARY

SECTION LINE

CONDOMINIUM UNIT

AIR SPACE PCL

RIGHT OF WAY PCL

SUB-SURFACE PCL

PB 24-45 PLAT RECORDING NUMBER

5 BLOCK NUMBER

5 LOT NUMBER

GLS GOV LOT NUMBER

1" = 200'

Scale: 1" = 200'

Rev: 02/09/2011

BOOK

T20S R59E

25

MAP

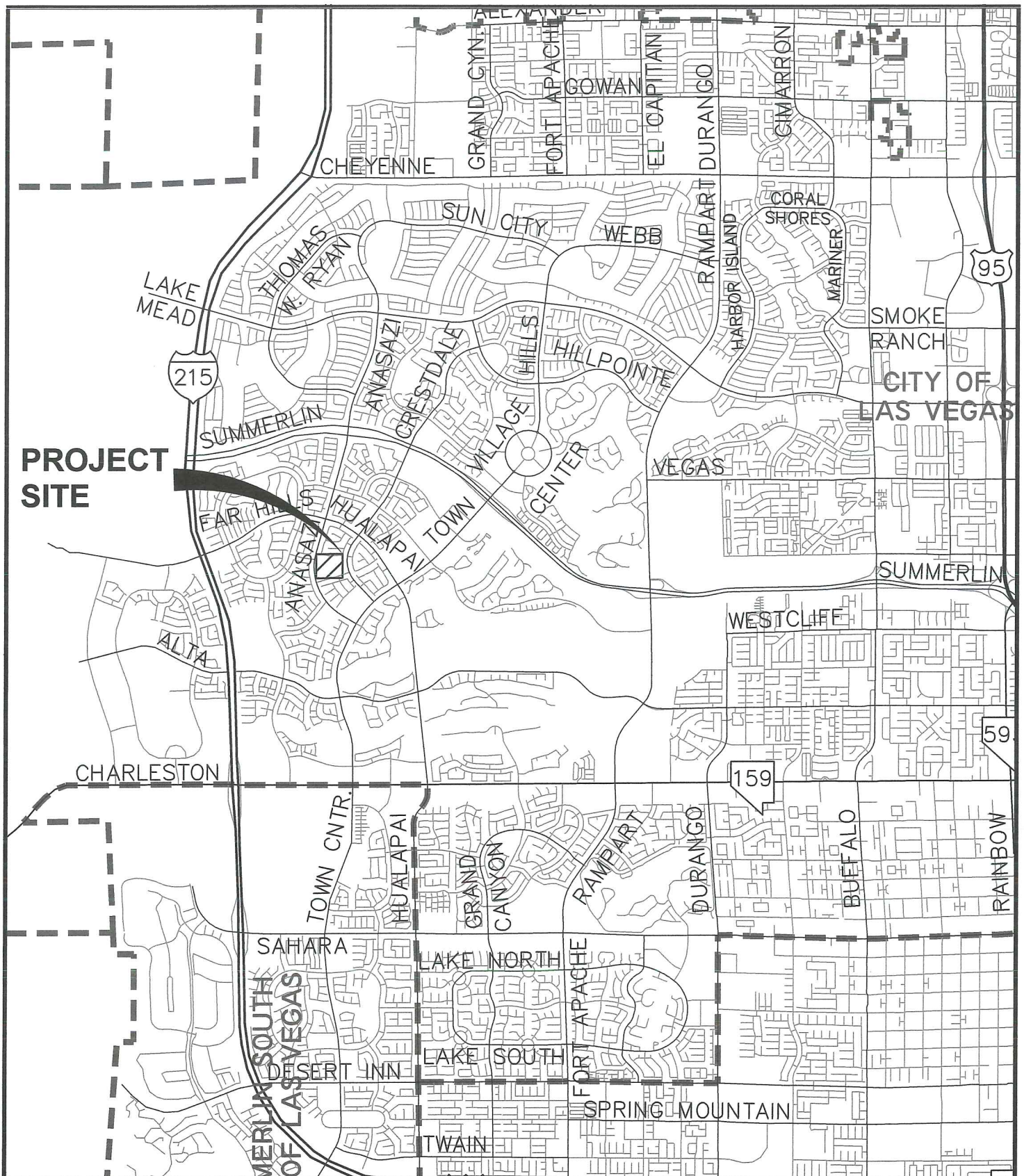
N 2 SE 4

137-25-7

CLARK COUNTY

NEVADA

TAX DIST 200



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

CHECKED BY: HMN DATE: 5/24/18



6345 South Jones Blvd. Suite 100
Las Vegas, NV 89118
Phone (702) 365-9312 - Fax (702) 365-9317

VICINITY MAP (FIGURE 1)

**JOHN W. BONNER
E.S. ADDITION**

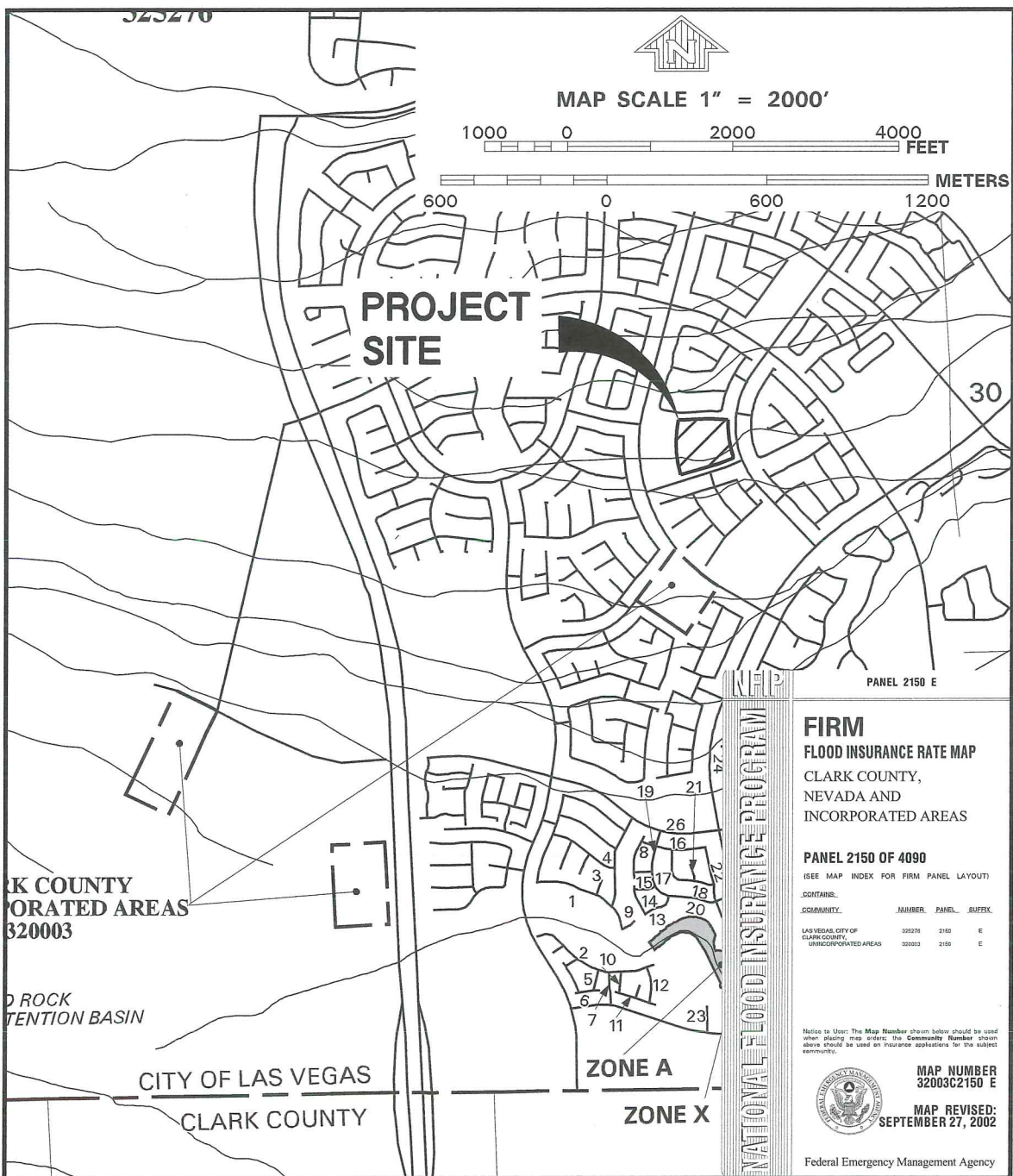
PROJECT No.:

171058

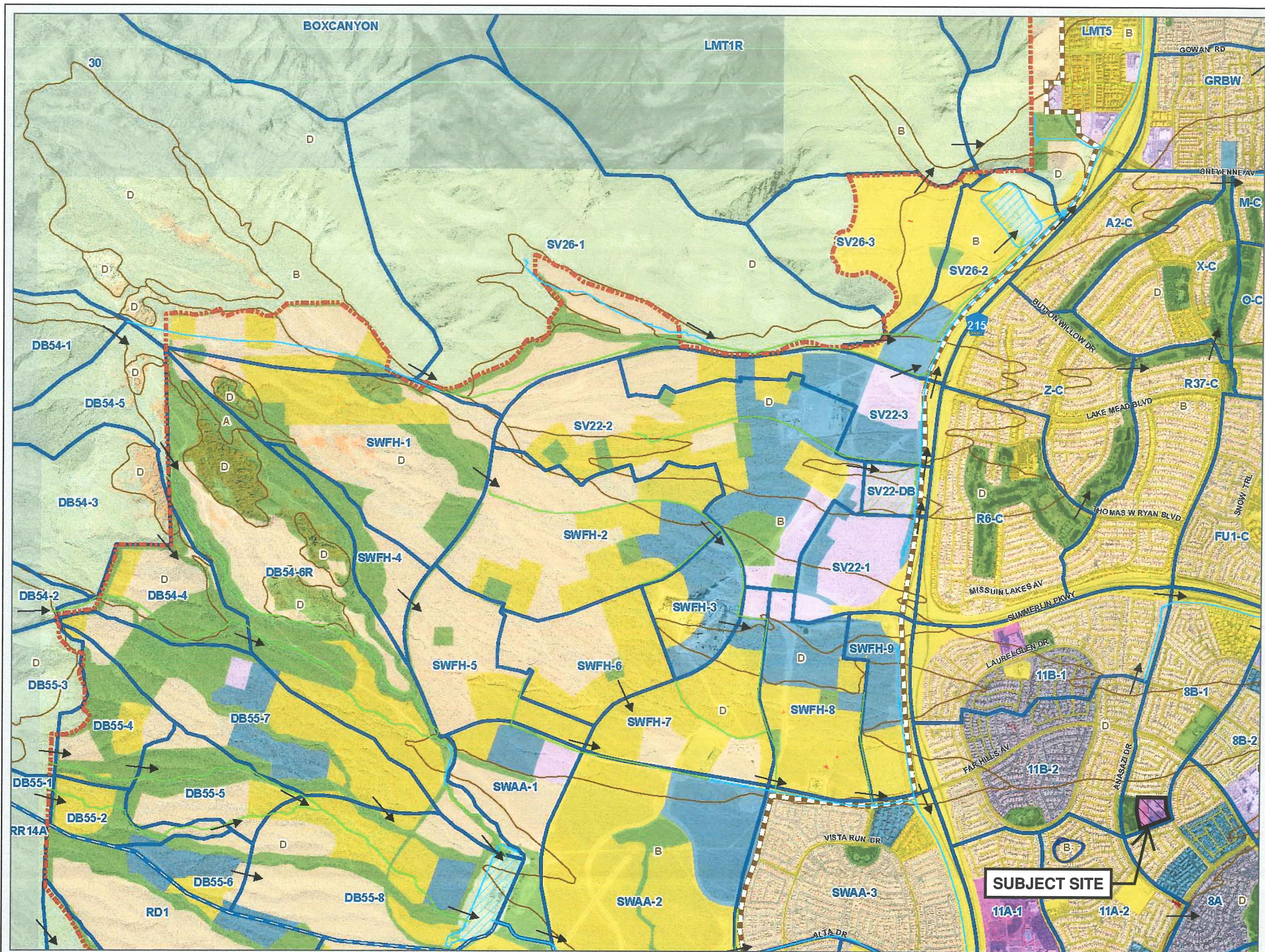
SHEET No.

1

SHEET 1 OF 1



DRAWN BY: JMD		SCALE: 1"=2000'		FLOOD INSURANCE RATE MAP (FIGURE 2)		PROJECT No.: 171058	
CHECKED BY: HMN		DATE: 5/24/18				SHEET No. 2	
 Lochsa engineering 6345 South Jones Blvd. Suite 100 Las Vegas, NV 89118 Phone (702) 365-9312 - Fax (702) 365-9317				JOHN W. BONNER E.S. ADDITION		SHEET 1 OF 1	



2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

**FIGURE H-24
HYDROLOGIC SUMMARY**

LEGEND

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

Flood Control Facilities

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

Hydrologic Soil Groups

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

Typical Land Use

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

* Drought Ordinance Applied



Scale: 1 inch = 2,000 feet

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





2013
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

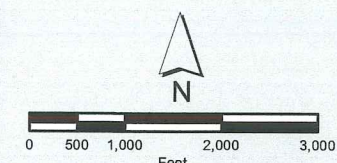
**FIGURE F- 24
FLOOD CONTROL FACILITIES**

LEGEND

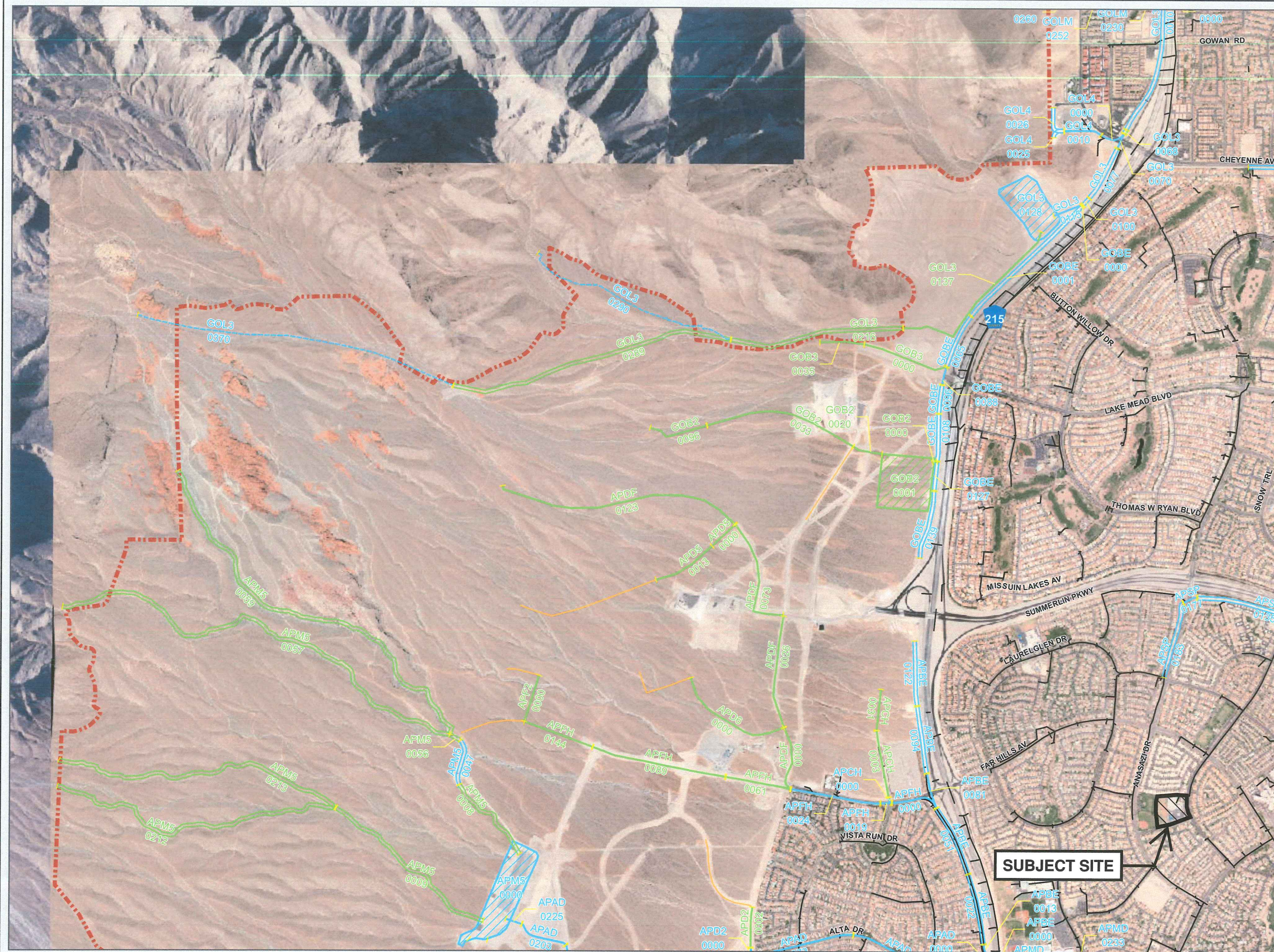
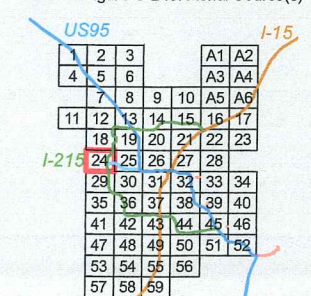
- Ultimate Development Boundary
- Existing Facilities
- Category A Proposed Facilities
- Category B Proposed Facilities
- Local Existing Facilities
- Local Proposed Facilities
- Detention Basin

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

- Remove & Replace/Parallel Facilities**
- | Category A | Category B |
|------------|------------|
| Channel | Channel |
| Stormdrain | Stormdrain |



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



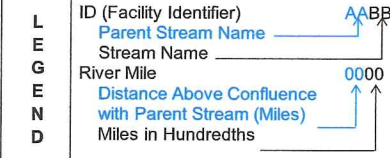
ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APAD 0044	E	ANGEL PARK - ALTA DRIVE BRANCH						
0073	E	11' X 8' RCAP	1565	3140	CSWAA-3	ALLGOW4	8.26	4.24
0146	E	11' X 8' RCAP	2220	2917	CSWAA-2	ALLGOW3	7.68	3.50
0203	E	10' X 8' RCB	3010	2220	CSWAA-1	ALLGOW3	6.98	4.40
0225	E	2: 7' X 5.5' RCB	1136	2220	CSWAA-1	ALLGOW3	6.98	5.28
	E	2: 7' X 5.5' RCB Outlet	360	2149	SUM5DB	ALLGOW3	6.74	3.40
APBE		ANGEL PARK - BELTWAY BRANCH						
0013	E	3: 12' X 8' RCB	489	4060	CSWFH-9	ALLGOW3	2.65	6.50
0022	E	Conc Chnl 20"W 7'D 2:1 SS	1556	4060	CSWFH-9	ALLGOW3	2.65	1.81
0051	E	Conc Chnl 20"W 7'D 2:1 SS	1583	4060	CSWFH-9	ALLGOW3	2.65	2.77
0081	E	8' X 8' RCBC @ Far Hills	777	423	SWFH-9	ALLGOW3	0.17	2.32
0094	E	Conc Chnl 10"W 5'D 2:1 SS	1465	423	SWFH-9	ALLGOW3	0.17	1.88
0122	E	Conc Chnl 10"W 4'D 2:1 SS	1409	423	SWFH-9	ALLGOW3	0.17	0.80
APCH		ANGEL PARK - CARRIAGE HILL BRANCH						
0000	E	8' X 6' RCB	152	585	SWFH-8	ALLGOW3	0.29	0.87
0003	P0	8' X 7' RCB	1461	585	SWFH-8	ALLGOW3	0.29	2.39
0031	P0	8' X 5' RCB	896	585	SWFH-8	ALLGOW3	0.29	0.60
APD2		ANGEL PARK - DESERT FOOTHILLS 2 BRANCH						
0002	P0	7' X 7' RCB	964	948	SWAA-2	ALLGOW3	0.70	2.00
APD5		ANGEL PARK - DESERT FOOTHILLS 5 BRANCH						
0000	P0	8' X 6' RCB	685	1701	CSWFH-2	ALLGOW3	1.09	1.89
0013	P0	72" RCP	1436	1701	CSWFH-2	ALLGOW3	1.09	4.18
APD6		ANGEL PARK - DESERT FOOTHILLS 6 BRANCH						
0000	P0	6' X 6' RCB	2604	1076	CSWFH-6	ALLGOW3	0.56	6.15
APDF		ANGEL PARK - DESERT FOOTHILLS BRANCH						
0000	P0	12' X 10' RCB	1356	2897	CSWFH-7	ALLGOW3	1.81	2.20
0026	P0	12' X 10' RCB	2463	1962	CSWFH-3	ALLGOW3	1.25	1.62
0073	P0	10' X 8' RCB	2679	1962	CSWFH-3	ALLGOW3	1.25	4.10
0123	P0	6' X 5' RCB	5355	1701	CSWFH-2	ALLGOW3	1.09	6.53
APF2		ANGEL PARK - FAR HILLS 2 BRANCH						
0000	P0	8' X 6' RCB	1046	669	CSWFH-5	ALLGOW3	0.38	1.00
APFH		ANGEL PARK - FAR HILLS BRANCH						
0000	E	2: 8' X 8' RCB	995	3862	CSWFH-8	ALLGOW3	2.48	3.50
0019	E	2: 8' X 8' RCB	250	3392	CCSWFH-7	ALLGOW3	2.18	4.19
0024	E	16' X 8' RCAP	1943	3392	CCSWFH-7	ALLGOW3	2.18	5.10
0061	P0	8' X 6' RCB	1492	669	CSWFH-5	ALLGOW3	0.38	2.00
0089	P0	8' X 6' RCB	2902	669	CSWFH-5	ALLGOW3	0.38	2.00
0144	P0	7' X 6' RCB	1556	669	CSWFH-5	ALLGOW3	0.38	5.50
APM5		ANGEL PARK - MIDDLE 5 BRANCH						
0000	E	384 ac-ft Detention Basin #5		7001	SUM5IN	ALLGOW3	6.74	
0001	E	12,153 cfs PMF Spillway		12153	SUM5IN	ALLGOW3	6.74	
0008	P0	Conc Chnl 50"W 4.5'D 2:1 SS	2102	3725	CDB54-6R	ALLGOW3	4.30	5.20
0009	P0	Conc Chnl 50"W 4.5'D 2:1 SS	4180	3624	CDB55-8	ALLGOW3	2.45	5.80
0047	E	Diversion Berm with Gabion Bank Protection	1000	3725	CDB54-6R	ALLGOW3	4.30	1.30
0056	P0	Conc Chnl 80"W 4'D 2:1 SS	264	3725	CDB54-6R	ALLGOW3	4.30	1.30
0057	P0	Conc Chnl 50"W 3'D 2:1 SS	9922	1821	CDB54-4	ALLGOW3	1.01	6.80
0059	P0	Conc Chnl 100"W 3'D 2:1 SS	8923	2358	CDB54-5	ALLGOW3	2.45	7.00
0212	P0	Conc Chnl 30"W 3.5'D 2:1 SS	6695	1238	CDB55-2	ALLGOW3	0.74	7.50
0213	P0	Conc Chnl 50"W 2.5'D 2:1 SS	6522	1125	CDB55-5	ALLGOW3	0.62	7.30
APSP		ANGEL PARK - SUMMERLIN PARKWAY						
0135	E	Conc Chnl 10"W 6'D 2:1 SS	2030	1173	C8B-1	ALLGOW3	1.14	2.40
0177	E	9' X 8' RCBC @ Anasazi	330	867	C11B-1	ALLGOW3	0.84	1.70
0183	E	Conc Chnl 10"W 6'D 2:1 SS	1680	867	C11B-1	ALLGOW3	0.84	1.70
GO02		GOWAN SOUTH FACILITIES (CHEYENNE CHANNEL)						
0257	E	Conc Chnl 10"W 6.75'D 1.5:1 SS	4293	2577	CCJ-C	ALLGOW3	2.97	4.10
GOB2		GOWAN LONE MOUNTAIN SYST. 2 BELTWAY						
0000	P0	36" RCP Outlet	118	75	DET22	ALLGOW3	0.76	6.76
0001	P0	123 ac-ft Village 22 Detention Basin		1344	CSV22-DB	ALLGOW3	0.76	
0020	P0	8' X 7' RCB	657	1247	SV22-2	ALLGOW3	0.70	8.30
0033	P0	8' X 6' RCB	3359	1247	SV22-2	ALLGOW3	0.70	6.90
0096	P0	6' X 5' RCB	1332	1247	SV22-2	ALLGOW3	0.70	6.00

* The HEC-1 node shown identifies the controlling concentration point for the associated facility and is located upstream of this facility due to decreasing peak flow with increasing tributary area caused by storm distribution transitions, depth area reduction factors, or attenuation of flow from routing.
** As-built or design slopes were used when available. All other slopes are based on existing topography. The user should verify the facility slope listed prior to performing any facility specific analysis.
^ For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).



2013 LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FACILITY INVENTORY
FIGURE F - 24



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

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

Construction Features

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

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOB3		GOWAN LONE MOUNTAIN SYST. 3 BELTWAY						
0000	P0	66" RCP	1877	530	SV22-3	ALLGOW3	0.28	6.60
0035	P0	54" RCP	965	530	SV22-3	ALLGOW3	0.28	6.40
GOBE		GOWAN LONE MOUNTAIN SYST. BELTWAY						
0000	E	20' X 10' RCBC @ Access Rd	30	958	CSV22-3	GW3SC	0.28	5.67
0001	E	Conc Chnl 20"W 5'D 2:1 SS	3355	958	CSV22-3	GW3SC	0.28	6.50
0065	E	Conc Chnl 20"W 6'D 2:1 SS	1220	958	CSV22-3	GW3SC	0.28	1.90
0088	E	2: 10'X9' RCBC @ Lake Mead	400	471	CDET22	ALLGOW3	0.96	0.50
0096	E	Conc Chnl 20"W 9'D 2:1 SS	627	471	CDET22	ALLGOW3	0.96	0.50
0108	E	Conc Chnl 20"W 6'D 2:1 SS	1021	471	CDET22	ALLGOW3	0.96	0.50
0127	E	Conc Chnl 20"W 6'D 2:1 SS	638	442	SV22-1	ALLGOW3	0.20	0.50
0139	E	Conc Chnl 10"W 5.5'D 2:1 SS	1500	442	SV22-1	ALLGOW3	0.20	1.02
GOL3		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 3						
0010	E	Conc Chnl 20"W 10'D 0:1 SS	3037	2946	CRCLMT1R	GW3SC	2.61	2.78
0068	E	Transition Structure	100	2946	CRCLMT1R	GW3SC	2.61	3.50
0070	E	20' X 6' RCBC @ Cliff Shadows	350	1162	CRCSV223	ALLGOW3	5.68	2.44
0077	E	Conc Chnl 20"W 6'D 0:1 SS	1229	1162	CRCSV223	ALLGOW3	5.68	6.11
0100	E	Conc Chnl 20"W 10'D 0:1 SS	200	1162	CRCSV223	ALLGOW3	5.68	5.67
0115	E	66" RCP Outlet	670	679	DET26	ALLGOW3	4.43	
0128	E	333 ac-ft Village 26 Detention Basin		3767	VIL26IN	ALLGOW3	4.43	
0137	P0	14' X 14' RCB	4335	3767	VIL26IN	ALLGOW3	4.43	0.50
0216	P0	Conc Chnl 50"W 4.5'D 2:1 SS	3761	3693	CSV26-1	ALLGOW3	4.15	6.08
0289	P0	Conc Chnl 50"W 3.5'D 2:1 SS	6215	2396	30	ALLGOW3	2.51	7.95
0290	E	Natural Wash 363"W	4850	1465	SV26-1	ALLGOW3	1.64	22.50
0370	E	Natural Wash 450"W	7000	2396	30	ALLGOW3	2.51	8.50
GOL4		GOWAN LONE MOUNTAIN SYSTEM-BRANCH 4						
0000	E	14' X 8' RCB	554	2257	CLMT1R	ALLGOW3	2.33	2.50
0010	E	2: 9' X 8' RCB	820	2257	CLMT1R	ALLGOW3	2.33	4.74
0025	E	Soil Cement Chnl 60"W 8'D 3-4:1 SS	320	2257	CLMT1R	ALLGOW3	2.33	2.00
0026	E	Soil Cement Chnl 42"W 6'D 3-4:1 SS	700	2257	CLMT1R	ALLGOW3	2.33	1.00

NO ADJACENT FACILITIES

APPENDIX D

REFERENCES

REFERENCE 5

"Technical Drainage Study for Elementary School at the Crossing- 0830 (Village 8, Parcel P)", CLV DS#1806.

1806
K-25
Rec'd
3-26-96

**DRAINAGE STUDY
FOR THE
ELEMENTARY SCHOOL AT THE CROSSING-0830
(VILLAGE 8, PARCEL P)**

619.219H

March 1996

Prepared for:

**JMA Architects, Inc.
4292 South Maryland Parkway
Las Vegas, NV 89119
(702)731-2033**

CITY OF LAS VEGAS		DATE: April 26, 1996
INTER-OFFICE MEMORANDUM		
TO: Barry Thompson, E.I.T. Land Development Services Department of Public Works		FROM:  Dennis W. Stransky, P.E. Department of Public Works Flood Control
SUBJECT: Conceptual Drainage Study for: Elementary School at the Crossing 0830 FILE NO.: DS1806B		COPIES TO: G.C. Wallace, Inc. John McNellis, P.E. Willdan Associates JMA Architects, Inc. Howard Hughes Corporation

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	3/26/96	04/04/96	Not Acceptable	\$250.00
2nd Submittal	4/16/96	4/26/96	See comments below	\$250.00
TOTAL FEES				\$500.00

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.
☐	must be resubmitted or supplemented including the following:
☐	must have Clark County Regional Flood Control District concurrence

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.

PLANS SENT TO LAND DEVELOPMENT YES (initial)

END OF REMARKS
dbm

T/R/S 25 S / 59 E / 20
AREA K-25

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: Elementary School at the Crossing

Date: March 1996

Location of Development: a) Descriptive Crestdale Lane/Oxford Cross Drive

b) Sect. 25 Twn. 20S Rng. 59E

Name of Owner: The Howard Hughes Corporation

Assessors Parcel No: _____

Contact Person-Name: Randall K. Gremlich, P.E.

Telephone No: 363-1200

Firm: G. C. Wallace, Inc.

Address: 1555 South Rainbow Boulevard, Las Vegas, NV 89102

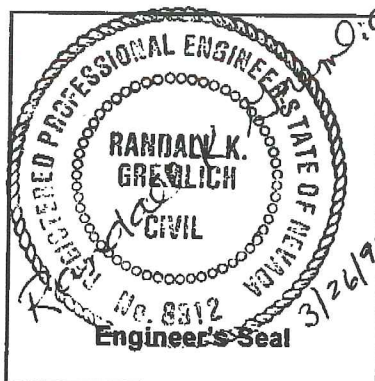
Type of Land Development/Land Disturbance Process:

- ☐ Rezoning
☐ Parcel Map
☐ Large Parcel Map

- ☐ Subdivision Map
☐ Planned Unit Development
☐ Building Permit

- ☐ Clearing and Grading Only
☒ Other (Please specify below)
School Construction

1. Total Owned Land Area: At Site: 10.3 ac. Being Developed/Disturbed: 10.3 ac.
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? YES* NO
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? YES* NO
4. Proposed type of development (Residential, Commercial, Etc.)? School
5. Approximate upstream land area which drains to the subject site? 14.5 ac.
6. Has the site drainage been evaluated in the past? YES NO If yes, please identify documentation: Conceptual Master Drainage Plan for Summerlin Village 8; GCW, April 1994
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Crestdale Lane
8. Briefly describe your proposed schedule for the subject project: ASAP



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.

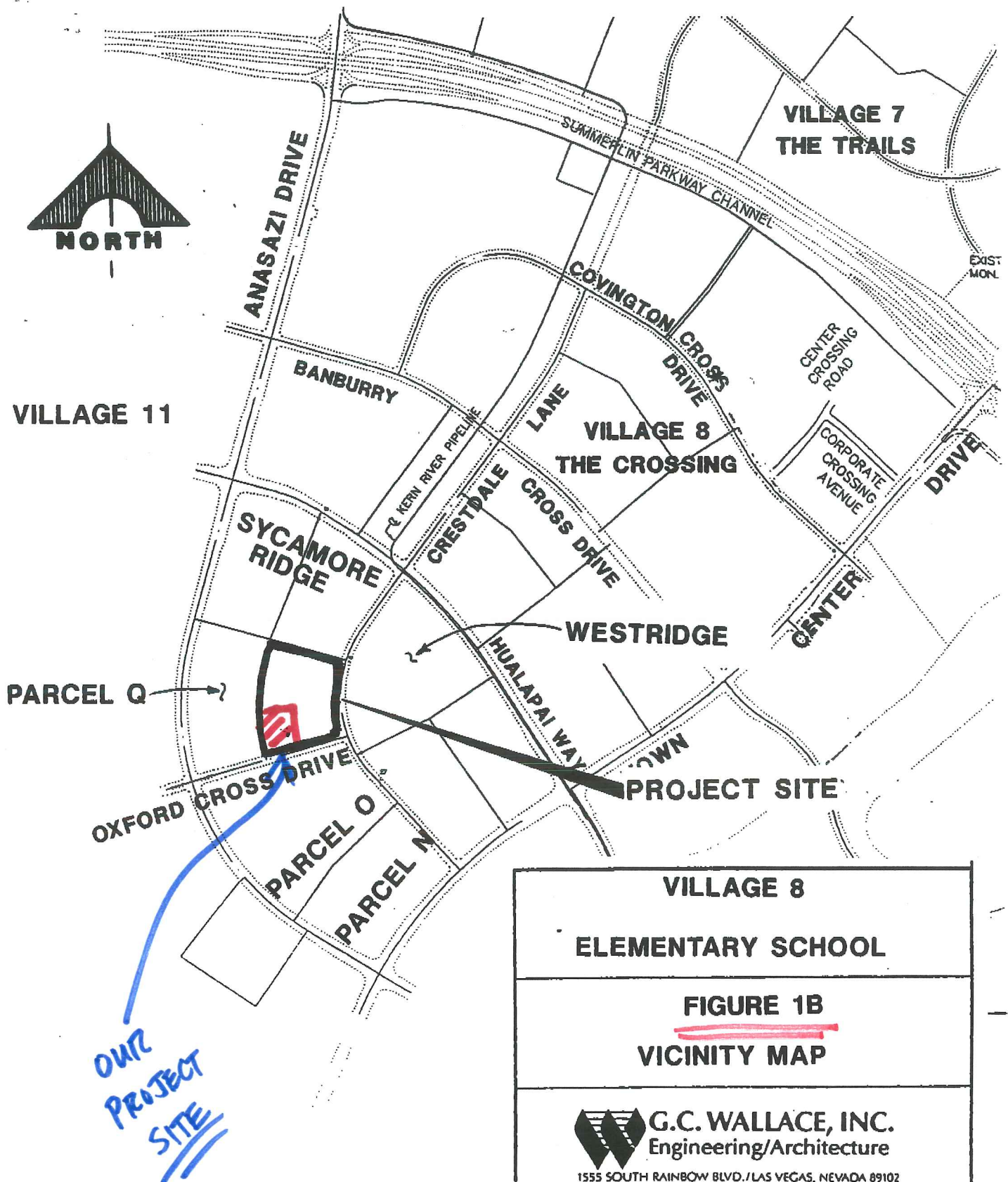
* Review and concurrence of the Clark County Regional Flood Control District is required.

Revision	Date

Local Entity File No. _____

REFERENCE:

STANDARD FORM 1



1" = 300'

RR

R

RRR

OFF 1

Q

OFF 2

24" SD
3.7% MIN.

P

(SCHOOL)

PROJECT
SITE

SCHOOL

ROAD

30" SD STUB
2.5% MIN.

OFF 5

O

110+29
24" SD
STUB
2% MIN.
30 C.F.S.

MM

Source:

Figure 7
of the Village
Master Plan

2976
L.V.V.W.D.
RESERVOIR

OFFSITE
DRAINAGE

115+74
24" SD
STUB
2% MIN.
30 C.F.S.
SUMP
0.7' MIN.

24" SD
2% MIN.

30" SD
2% MIN.

21+51
24" SD
2% MIN.
32 C.F.S.

24" SD
2% MIN.

32 C.F.S.

N

N

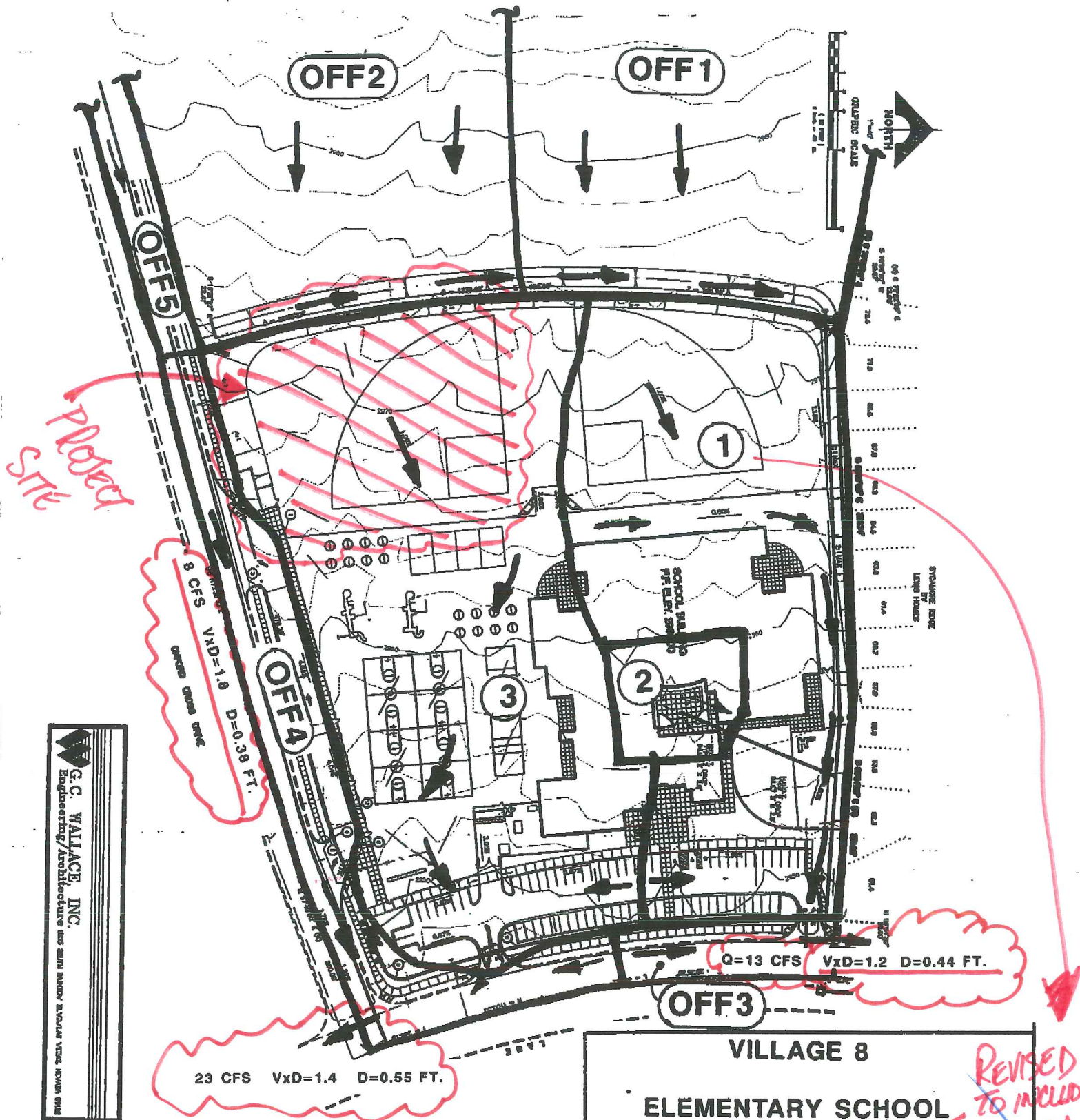
30" SD
2% MIN.

30" SD
2% MIN.

30" SD
2% MIN.

30" SD
2% MIN.

30" SD
2% MIN.



G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

	CLARK COUNTY SCHOOL DISTRICT COMMUNITY IMPROVEMENT 4000 FORD ST. LAS VEGAS, NEVADA 89102
ELEMENTARY SCHOOL AT THE CROSSING - 0830	
GRADING PLAN	

VILLAGE 8
ELEMENTARY SCHOOL
FIGURE 4
PROPOSED DRAINAGE
G.C. WALLACE, INC. Engineering/Architecture 1555 SOUTH RAINBOW BLVD. / LAS VEGAS, NEVADA 89102

REVISED TO INCLUDE BASIN 1A PER 3rd SUBMITTAL T.D.S.

**TABLE 2
RUNOFF***

Drainage Basin	10-Year Runoff (cfs)	100-Year Runoff (cfs)
1	6	12
2	1	1
3	8	16
OFF1	9	22
OFF2	9	22
OFF3	1	1
OFF4	3	5
OFF5	2	3

*See Figure 4

IX. DOWNSTREAM IMPACTS

The site will generate 29 cfs in a 100-year storm. This runoff is less than 37 cfs which was estimated in the Conceptual Master Plan. However, the direction of runoff from the site differs from the Master Plan. Due to site grading restraints it is only possible to drain 13 of the 29 cfs to the north. The remaining 16 cfs will drain south in Crestdale Lane. This 16 cfs will combine with 7 cfs from Oxford Cross Drive to produce 23 cfs draining south on Crestdale Lane.

The downstream streets and storm drain have been analyzed to determine the impact of this 23 cfs. The first area is the Crestdale Lane frontage of Parcel O. The Parcel O frontage landscaping is designed to be stable for 55 cfs. The CCRFCD criteria is also met.

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

*DIAGRAM

```

1  ID *****
2  ID  * elementary school site in Village 8 (parcel d)  *
3  ID  *      G.C. WALLACE INC      ASSUMING PARCEL 0 EXIST.  *
4  ID  *      100-YEAR, 6-HOUR CCRFCD STORM      SDN=3      *
5  ID  *      FILE= v8d.h1      DATE:14MAR1996      *
6  ID  *****
7  IT    2      0      0      300
8  IN    5      0
9  IO    5      0
10 JR  PREC    1      .56

11 KK  OFF1
12 KM  ESTIMATED RUNOFF FROM NORTH HALF OF PARCEL 0 (EXISTING)
13 BA  .01133
14 PB  3.15
15 PC  .000      .020      .057      .070      .087      .108      .124      .130      .130      .130
16 PC  .130      .130      .130      .133      .140      .142      .148      .158      .172      .181
17 PC  .190      .197      .199      .200      .201      .204      .214      .229      .241      .249
18 PC  .251      .256      .270      .278      .281      .283      .295      .322      .352      .409
19 PC  .499      .590      .710      .744      .781      .812      .819      .835      .851      .856
20 PC  .860      .868      .876      .888      .910      .926      .937      .950      .970      .976
21 PC  .982      .985      .987      .989      .990      .993      .993      .994      .995      .998
22 PC  .998      .999      1.00
23 LS    0      86
24 UD  .067

25 KK  OFF2
26 BA  .01133
27 LS    0      86
28 UD  .067

29 KK  NW COR
30 KM  ROUTE FLOW to type 2a inlet at northwest corner
31 RD  300      .004      .03      TRAP    0.1      3

32 KK  NW COR
33 HC    2

34 KK  NH
35 KM  ROUTE FLOW TO ONSITE MANHOLE JUNCTION W/BASIN 2
36 RD  440      .04      .013      CIRC    2.5

37 KK    2
38 BA  .00054
39 LS    0      98
40 UD  .05

41 KK  NH
42 KM  ROUTE FLOW TO ONSITE MANHOLE JUNCTION W/ OFF1
43 RD  170      .056      .013      CIRC    1.0

```

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

44 KK MH

45 HC 2

46 KK CREST

47 KM ROUTE FLOW TO EXIST STORM DRAIN IN CRESTDALE

48 RD 250 .04 .013 CIRC 2.5

49 KK 1

50 BA .00517

51 LS 0 93.5

52 UD .098

53 KK CREST

54 KM FLOW TO CRESTDALE RIGHT OF WAY

55 HC 2

56 KK OFF3

57 BA .00047

58 LS 0 98

59 UD .050

60 KK CREST

61 KM TOTAL FLOW IN CRESTDALE RIGHT OF WAY NORTHBOUND

62 HC 2

63 KK OFF5

64 BA .00109

65 LS 0 98

66 UD .05

67 KK CR/OX

68 RD 700 .04 .016 TRAP 50 2

69 KK OFF4

70 BA .00213

71 LS 0 98

72 UD .127

73 KK CR/OX

74 KM TOTAL FLOW IN OXFORD CROSS RIGHT OF WAY (EXISTING OFFSITE)

75 HC 2

76 KK 3

77 BA .00705

78 LS 0 93.5

79 UD .092

80 KK CR/OX

81 KM TOTAL FLOW IN OXFORD CROSS/CRESTDALE INTERSECTION

82 HC 2

83 ZZ

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE

(V) ROUTING

(--->) DIVERSION OR PUMP FLOW

NO.

(.) CONNECTOR

(<---) RETURN OF DIVERTED OR PUMPED FLOW

11 OFF1

.

25 OFF2

.

V

.

V

29 NW COR

.

.

32 NW COR.....

V

V

34 MH

.

37 2

.

V

.

V

41 MH

.

.

44 MH.....

V

V

46 CREST

.

49 1

.

.

53 CREST.....

.

56 OFF3

.

60 CREST.....

.

63 OFF5

.

V

.

V

67 CR/OX

.

69 OFF4

.

.

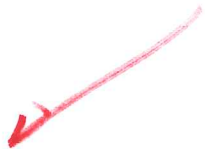
73 CR/OX.....

.

76 3

.

3



80

CR/OX.....

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION


```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* SEPTEMBER 1990 *
* VERSION 4.0 *
*
* RUN DATE 03/25/1996 TIME 15:55:15 *
*
*****

```

```

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

```

```

*****
* elementary school site in Village 8 (parcel p) *
* G.C. WALLACE INC ASSUMING PARCEL Q EXIST. *
* 100-YEAR, 6-HOUR CCRPCD STORM SDN=3 *
* FILE= v8p.h1 DATE:14MAR1996 *
*****

```

```

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

```

```

IT HYDROGRAPH TIME DATA
    MNIN      2 MINUTES IN COMPUTATION INTERVAL
    IDATE      1 0 STARTING DATE
    ITIME      0000 STARTING TIME
    NO        300 NUMBER OF HYDROGRAPH ORDINATES
    NDDATE      1 0 ENDING DATE
    NDTIME      0958 ENDING TIME
    ICENT      19 CENTURY MARK

```

```

COMPUTATION INTERVAL .03 HOURS
TOTAL TIME BASE 9.97 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      .56

```

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

PERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION	
					RATIO 1	RATIO 2
					1.00	.56
YDROGRAPH AT	OFF1	.01	1	FLOW	22.	9.
				TIME	3.53	3.53
YDROGRAPH AT	OFF2	.01	1	FLOW	22.	9.
				TIME	3.53	3.53
ROUTED TO	NW COR	.01	1	FLOW	21.	8.
				TIME	3.53	3.57
2 COMBINED AT	NW COR	.02	1	FLOW	42.	17.
				TIME	3.53	3.53
ROUTED TO	MH	.02	1	FLOW	42.	17.
				TIME	3.53	3.53
HYDROGRAPH AT	2	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
ROUTED TO	MH	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
2 COMBINED AT	MH	.02	1	FLOW	43.	18.
				TIME	3.53	3.53
ROUTED TO	CREST	.02	1	FLOW	43.	17.
				TIME	3.53	3.53
YDROGRAPH AT	1	.01	1	FLOW	12.	6.
				TIME	3.53	3.53
2 COMBINED AT	CREST	.03	1	FLOW	55.	23.
				TIME	3.53	3.53
YDROGRAPH AT	OFF3	.00	1	FLOW	1.	1.
				TIME	3.50	3.50
2 COMBINED AT	CREST	.03	1	FLOW	56.	24.
				TIME	3.53	3.53
HYDROGRAPH AT	OFF5	.00	1	FLOW	3.	2.
				TIME	3.50	3.50
ROUTED TO	CR/OX	.00	1	FLOW	3.	2.
				TIME	3.57	3.57
HYDROGRAPH AT	OFF4	.00	1	FLOW	5.	3.
				TIME	3.57	3.57
2 COMBINED AT	CR/OX	.00	1	FLOW	8.	4.

Flow @ Oxford cross Dd.

				TIME	3.57	3.57
HYDROGRAPH AT	3	.01	1	FLOW	16.	8.
				TIME	3.53	3.53
2 COMBINED AT	CR/OX	.01	1	FLOW	23.	12.
				TIME	3.53	3.53

Project
Site
is portion
of
Basin (3)

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

DEVELOPMENT Village 8 PARCEL P (ELEMENTARY SCHOOL)

CALCULATED BY RAJ DATE 3/12/96

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				t_c CHECK (URBANIZED BASINS)		FINAL t_c	REMARKS
DESIG:	K	AREA A_c (3)	LENGTH Ft (4)	SLOPE % (5)	t_i Min (6)	LENGTH Ft (7)	SLOPE % (8)	VEL. FPS (9)	t_t Min (10)	TOTAL LENGTH F_t (11)	$t_c = (L/180) + 10$ Min (12)	MIn (13)	
86 OFF1	.745	7.25	200	4	5.7	300	4	5.1*	1.0	—	—	6.7	LAG (HOURS) 0.067
86 OFF2	.745	7.25	200	4	5.7	300	4	5.1*	1.0	—	—	6.7	0.067
98 OFF3	.884	0.33	10	2	1.0	230	0.5	2.1**	1.8	240	11.3	5.0	0.050
98 OFF4	.884	1.40	75	3	10.8	690	4	6.0***	1.9	765	14.3	12.7	0.127
93.5 1	.844	3.31	250	1	7.3	525	1.4	3.5***	2.5	715	14.3	9.8	0.098
98 2	.884	0.34	—	—	—	110	0.5	2.1***	0.9	110	10.6	5	0.050
93.5 3	.844	4.51	250	1	7.3	490	2	4.2***	1.9	730	14.1	9.2	0.092
98 OFF5	.884	0.7	15	2	1.2	500	4	6.0***	1.4	515	12.9	5.0	0.050
													0.75

* ASSUME $S:1$
5:1
n=0.03

$$t_c = t_i + t_t$$

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

$$K = .0132 (CN)^{-0.39}$$

$$CN \text{ FOR AREA 1: APPROX 75\% PAVED/ROOF \& 25\% GRASS} \rightarrow CN = (.75)(98) + (.25)(80) = 93.5$$

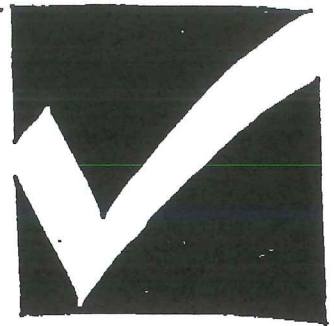
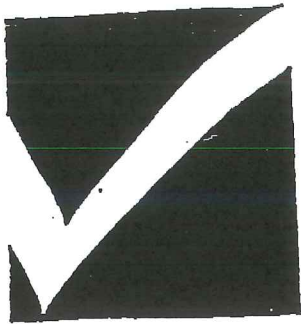
AREA 3

** ASSUME FLOOD AT TOP CUT

*** $n=0.02$
10:1 d=0.5

REFERENCE:

STANDARD FORM 4



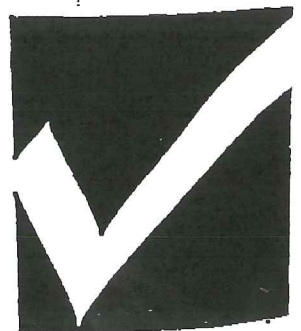
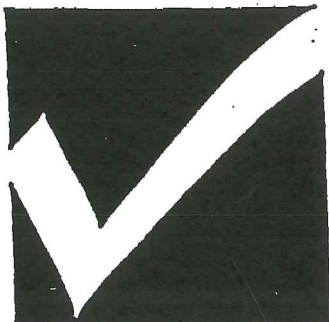
DS# 1806

DS INDEX 4200

APN 137-25-310-002

PROJECT Elementary School at the
Crossing - 0830

SUBMITTAL 2nd Submittal - Drainage Study



CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: April 26, 1996
TO: Barry Thompson, E.I.T. Land Development Services Department of Public Works		FROM: Dennis W. Stransky, P.E. Department of Public Works Flood Control
SUBJECT: Conceptual Drainage Study for: Elementary School at the Crossing 0830		COPIES TO:
FILE NO. DS1806B		G.C. Wallace, Inc. John McNellis, P.E. Willdan Associates JMA Architects, Inc. Howard Hughes Corporation

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	3/26/96	04/04/96	Not Acceptable	\$250.00
2nd Submittal	4/16/96	4/26/96	See comments below	\$250.00
TOTAL FEES				\$500.00

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.
☐	must be resubmitted or supplemented including the following:
☐	must have Clark County Regional Flood Control District concurrence

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.

PLANS SENT TO LAND DEVELOPMENT YES (initial)

END OF REMARKS
dbm

T/R/S 25 S / 59 E / 20
AREA K-25



G.C. WALLACE, INC.
Engineering/Architecture

1806
K25
\$250

RECEIVED
APR 16 1996
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FLOOD CONTROL

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SAUNDRA L. VANCE, CCS
G. IRA WALLACE, PE
SCOTT H. WEILER, PE
ROBERT WOODSON, PE

619.219H

April 16, 1996

City of Las Vegas
400 East Stewart Avenue
Las Vegas, NV 89101

Attention: Dennis Stransky, P.E.

Subject: Village 8 Elementary School, DS 1806

Gentlemen:

This letter responds to comments made in the April 4, 1996 review memorandum for the subject drainage study. Our responses are as follows:

Comment: "1. The area over the proposed storm drain along the north property line must be dedicated as a 22-foot public drainage easement to be privately maintained and as shown on the grading plan. An overflow path through the easement must be provided;"

Response: The drainage easement has been labeled as requested. Revised drawings are included showing the new label. The overflow path in case of total plugging of the Type 2A inlet was addressed on pages 5 and 6 of the study. The temporary 20-foot long chain link fence will pass the 43 cfs onto the site. The proposed site grading will drain this flow across the ball fields and then to the playground near the school.

The grading near the school will route the emergency flow easterly past the school at a depth of 1.5 feet which allows more than 0.7 feet of freeboard. The emergency flow would then drain through the chain link fence northeast of the school to Crestdale Lane.

It is impossible to maintain this emergency overflow in the pipe easement since the easement is located under a 2:1 cut slope. However, the overflow will still drain by gravity across grass and asphalt to Crestdale Lane which is the present outfall for the flow.

Comment: "2. A wall opening with appropriate sizing calculations for the wall northeast of the building must be provided;"

Response: Northeast of the building is a chain link fence. This fence is labeled on the enclosed revised drawings. No wall opening is required.

G.C. WALLACE, INC.

City of Las Vegas
April 16, 1996
Page 2

619.219H

Comment: "3. The grading for the proposed V-ditch is being performed outside of the project boundary and on private property. This work shall not be performed until notarized, written permission and easement have been obtained from the offsite property owner;"

Response: The site is for the school (Parcel P) are both owned by Howard Hughes Properties. The transfer of ownership to the school district is underway, but will not be complete until a later time. It is expected that the grading of the offsite ditch will be performed before any transfer of ownership.

Comment: "4. The following additional items pertaining to the grading plan must be addressed in the resubmittal:

- a. A detail of the V-ditch located along the western boundary of the site must be shown on the grading plan
- b. Street slopes for Crestdale Lane must be shown on the grading plan
- c. The thickness of the rip-rap pad must be shown on the grading plan
- d. Provide a legend on each sheet"

Response: The requested additions have been made except for item d. The legend is already shown on the cover sheet.

If you have any questions, please contact us.

Very truly yours,

G. C. WALLACE, INC.

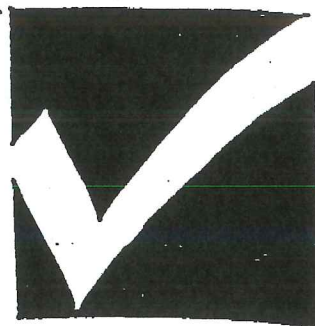
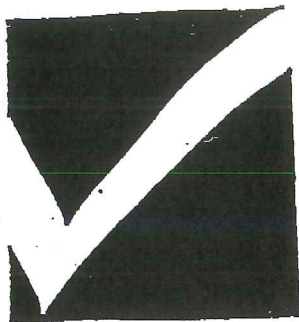
Randall K. Gremlich

Randall K. Gremlich, P.E.
Engineer

RKG:sjl

Encl.





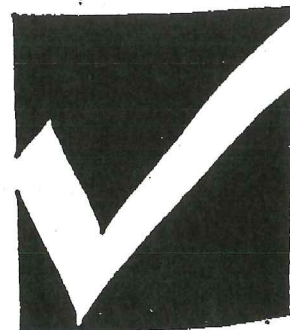
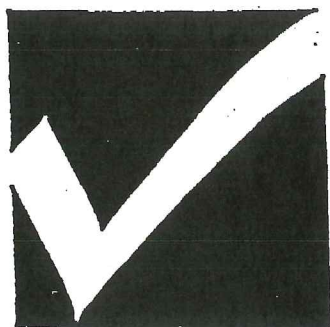
DS# 1806

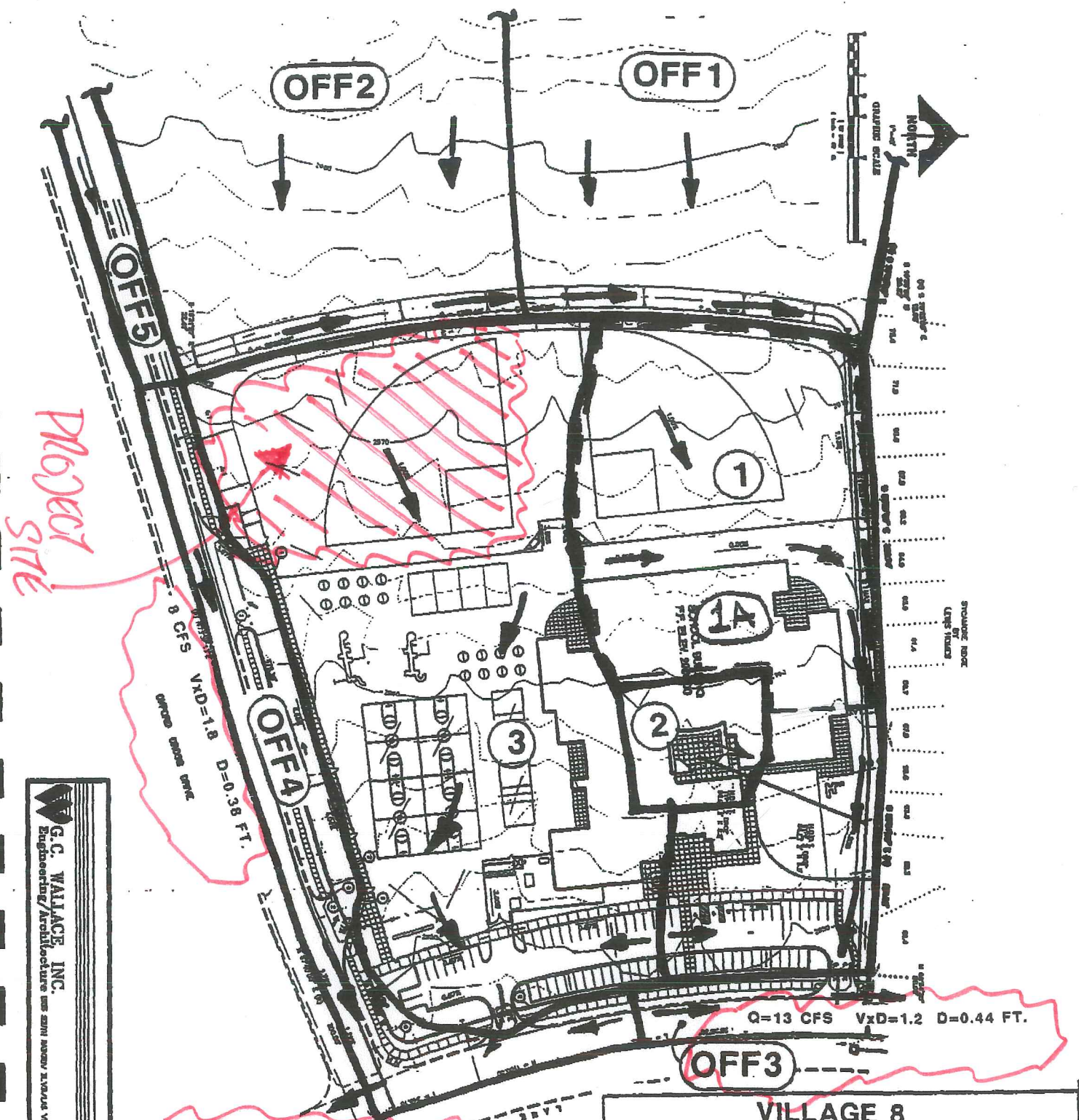
DS INDEX 4890

APN 13T-25-310-002

PROJECT Elementary School at the
Crossing - 0830

SUBMITTAL 3rd Submittal - Drainage Study





Project Site

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102
TEL: 792-1111 FAX: 792-1112

	CLARK COUNTY SCHOOL DISTRICT ADMINISTRATIVE SERVICES 4000 FLOOR, ST. LAS VEGAS, NEVADA 89101
ELEMENTARY SCHOOL AT THE CROSSING - 0830	
GRADING PLAN	

VILLAGE 8
ELEMENTARY SCHOOL
FIGURE 4
<u>PROPOSED DRAINAGE</u>
G.C. WALLACE, INC. Engineering/Architecture 1555 SOUTH RAINBOW BLVD. LAS VEGAS, NEVADA 89102

Source: Drainage study for the Elementary School ...

TABLE 2
RUNOFF*

Drainage Basin	10-Year Runoff (cfs)	100-Year Runoff (cfs)
1	6	12
2	1	1
3	8	16
OFF1	9	22
OFF2	9	22
OFF3	1	1
OFF4	3	5
OFF5	2	3

*See Figure 4

(1A) IS APPROX 2/3 OF (1)

$$Q_{100} \approx \frac{2}{3} (12) = 8 \text{ cfs}$$

IX. DOWNSTREAM IMPACTS

The site will generate 29 cfs in a 100-year storm. This runoff is less than 37 cfs which was estimated in the Conceptual Master Plan. However, the direction of runoff from the site differs from the Master Plan. Due to site grading restraints it is only possible to drain 13 of the 29 cfs to the north. The remaining 16 cfs will drain south in Crestdale Lane. This 16 cfs will combine with 7 cfs from Oxford Cross Drive to produce 23 cfs draining south on Crestdale Lane.

$$\rightarrow Q_{100} \approx \frac{2}{3} (6) \Rightarrow 4.0 \text{ cfs}$$

The downstream streets and storm drain have been analyzed to determine the impact of this 23 cfs. The first area is the Crestdale Lane frontage of Parcel O. The Parcel O frontage landscaping is designed to be stable for 55 cfs. The CCRFCD criteria is also met.

Source: "Drainage Study for the
Elementary School at the 7
Crossing - 0830, 1996"

CITY OF LAS VEGAS		DATE: May 16, 1997
INTER-OFFICE MEMORANDUM		
TO: Barry Thompson, P.E. Land Development Services Department of Public Works		FROM:  Dennis W. Stransky, P.E. Department of Public Works Flood Control
SUBJECT: Conceptual Drainage Study for: Elementary School at the Crossing 0830 FILE NO. H:\DEPOT\DS\DS1806B.DOC		COPIES TO: G.C. Wallace, Inc. JMA Architects, Inc. John McNellis, P.E. Howard Hughes Corporation

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	3/26/96	04/04/96	Not Acceptable	\$250.00
2nd Submittal	4/16/96	4/26/96	Accepted	\$250.00
3rd Submittal	05/09/97	05/14/97	See comments below	N/C
TOTAL FEES				\$500.00

REMARKS:

3rd Submittal: Update, revised grading plan.

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.
☐	must be resubmitted or supplemented including the following:
☐	must have Clark County Regional Flood Control District concurrence

1. The proposed drop inlets reference an NDOT Standard Drawing. Either a detail must be provided on the Grading Plan or a Clark County Area Standard Drawing must be referenced.
2. The note "STUB & CAP 30" RCP" is indicated at the 8 inch sewer, not the 30 inch storm drain. The detail on Sheet 2 of 6 must be revised accordingly.

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.

PLANS SENT TO LAND DEVELOPMENT YES  (initial)

END OF REMARKS
dws

T/R/S 25 S / 59 E / 20'
AREA K-25



G.C. WALLACE, INC.
Engineering/Architecture

1806
K25
#100

RECEIVED

MAY 9 1997

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FLOOD CONTROL**

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RICHARD A. E. STRUTZ
SAUNDRA L. VANCE, CCS
G. IRA WALLACE, PE
ROBERT WOODSON, PE

619.2193

May 2, 1997

City of Las Vegas
Department of Public Works
731 South Fourth Street
Las Vegas, NV 89101

Attention: Dennis Stransky, P.E.

Subject: Elementary School at the Crossing - 0830
(Village 8, Parcel P) - DS1806

Gentlemen:

The drainage study for the subject project was approved on April 26, 1996 and the construction of the site has begun. A revision to the drainage pattern is now proposed in order to make the kindergarten playground area safer.

The proposed revision consists of regrading the area northeast of the building to flatten the slope across the playground. This change necessitates addition of a grated surface inlet for onsite runoff and a culvert system to drain the emergency overflow runoff from Parcel Q and a portion of this site.

The proposed revision is shown on Figure A. A step in the grading will be created at Point 1 in order to flatten the grades to the east. A small sump condition is now created which will pond water to a depth of 1.3 feet before spilling to the east. The grated surface inlet will be located at this point to intercept approximately 8 cfs which is the 100-year runoff from the onsite area tributary to this point. This 8 cfs will drain to the 30-inch RCP.

The 30-inch RCP was originally established to drain only the estimated 100-year runoff of 43 cfs from Parcel Q. The pipe is now in place. However, the technical drainage study for Parcel Q calculates the 100-year runoff to be 17 cfs. The decrease is due to a change in the Parcel Q land use from residential (which was assumed in the Village 8 Master Plan) to a park. Therefore, capacity exists in the 30-inch RCP to drain up to 26 cfs from the school site.

G.C. WALLACE, INC.

City of Las Vegas

May 2, 1997

Page 2

619.2193

The 8 cfs from the site will be intercepted by a proposed NDOT Type 2 inlet in a sump condition. A 50 percent clogging factor is included in the grate sizing. Calculations are included with this letter.

The second drainage requirement to be met by this revision is that the entire 100-year runoff from Parcel Q must be able to surface drain through the school site in case of plugging of the inlet in the park. The approved drainage study showed that 30 cfs could surface flow past the north side of the building. Because of this revision, this overflow concept is not valid anymore.

In order to drain the offsite 100-year flow of 17 cfs through the site in an emergency situation it is necessary to install at least five 12-inch PVC pipe culverts under the kindergarten playground area. The headwater required for this flow is 1.44-feet which produces a water surface elevation at least 0.5 feet below the finish floor of the building.

In case both the Parcel Q park inlet and the newly proposed NDOT Type 2 inlet are simultaneously plugged, the flow to pass through the 12-inch PVC pipes would be 25 cfs. The culvert would then need to consist of six pipes. It is proposed to use six 12-inch PVC pipes as shown on the attached revised grading plan.

The revised grading plan also proposes lowering the slope along the west side of the building to 0.47percent. A concrete valley gutter will be constructed along the flowline to insure that water will drain. All the proposed changes are reflected on the attached revised grading plans. All calculations are included in the Appendix.

If you have any questions regarding this revision and drainage study addendum, please contact us.

Very truly yours,

G. C. WALLACE, INC.

Randall K. Gremlich

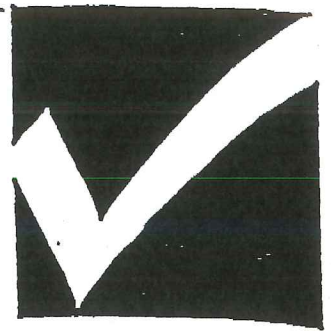
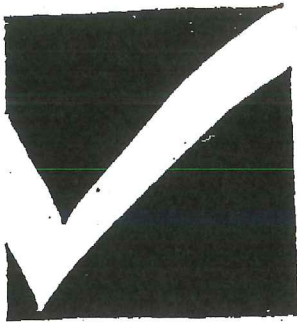
Randall K. Gremlich, P.E.

RKG:sjl

Encl.

pc: Rick Strutz, GCW, w/encl.





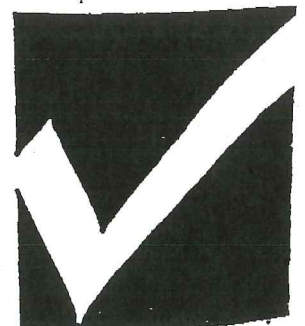
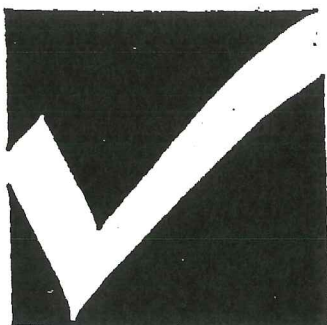
DS# 1806

DS INDEX 5116

APN 137-25-310-002

PROJECT Elementary School at the
Crossing - 0830

SUBMITTAL 4th Submittal - Drainage Study



CITY OF LAS VEGAS		DATE: October 20, 1997
INTER-OFFICE MEMORANDUM		
TO: Barry Thompson, P.E. Land Development Services Department of Public Works		FROM:  Dennis W. Stransky, P.E. Department of Public Works Flood Control
SUBJECT: Conceptual Drainage Study for: Elementary School at the Crossing 0830 FILE NO. L:\DEPOT\DS\DS1806C.DOC		COPIES TO: G.C. Wallace, Inc. JMA Architects, Inc. John McNellis, P.E. Howard Hughes Corporation

HISTORY	DATE: RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	3/26/96	04/04/96	Not Acceptable	\$250.00
2nd Submittal	4/16/96	4/26/96	Accepted	\$250.00
3rd Submittal	05/09/97	05/14/97	Accepted	N/C
4th Submittal	10/06/97	10/20/97	See comments below	N/C
TOTAL FEES				\$500.00

REMARKS:

4th Submittal: Update, revised grading plan.

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

- The proposed drop inlets reference an NDOT Standard Drawing. Either a detail must be provided on the Grading Plan or a Clark County Area Standard Drawing must be referenced.
- The wall opening at the northwest corner of the site must be a minimum of 24" high X 48" wide.

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.

PLANS SENT TO LAND DEVELOPMENT YES (initial)

END OF REMARKS
gam

T/R/S 25 S / 59 E / 20
AREA K-25



G.C. WALLACE, INC.
Engineering/Architecture

G. C. WALLACE, PE/SE, PLS
JAMES A. DUDDLESTEN, PE
MARIE RAINWATER
MICHAEL D. ROSS, PE
CHRISTOPHER W. ANDERSON, PE
CALVIN L. BLACK, PE, PLS
BENJAMIN C. SMITH, PE
PAUL BURN, PLS
JACK H. MITCHELL, PE
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C. RUSSELL DAVIS, PE/SE
JEFFREY J. FREIBERG, PE
DOUGLAS M. HANKEL
DONALD A. HASELHOFF, PE, CEM
NOEL C. LAUGHLIN, PE
MARVIN W. MAIZE
WILLIAM NEIGHBORS, PE
GREGORY PATCH, PE
ALLEN E. PAVELKA, PE
JEFF W. STAYTON, PE
JOHN R. TOBIN, PE
ARNE H. WAGLEY
EUGENE W. WRIGHT, PE

DOUGLAS F. AHLSTROM
SAMI F. ALHWAYEK, PE
CHRIS P. ALTURAS, PE
DANA A. AMES, PE/SE
JIM B. BAKKEDAH, PE
JOSEPH A. BODROG, PLS
DENNIS R. BROWN, PE
MYRON E. BROWNING, PE
GARY L. CARLSON, RA
RICHARD G. CLARKE
HUBERTO DeLUNA, RA
JAMES H. DUGGER
THOMAS P. DYSON, PE
RANDALL K. GREMLICH, PE
SALLY HENSLEY
ROBERT J. HERMAN
DANNY E. HILL, PLS
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KRISTOFER D. KORPI
LLOYD B. MATHESON
DOUG MCCARTNEY, PE
TIMOTHY A. MCCOY, PE
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RANDY W. MROWICKI, PLS
D. GREGORY NEEL, PLS
JOHNNIE R. PATE, JR., PE
JERRY E. PRUITT, PE
AL L. ROBINSON, PE
BRIAN L. SCHMIDT, PE
RICHARD STEUBING, PLS
RICHARD A. E. STRUTZ
MILO L. TERZICH, PE
SAUNDRA L. VANCE, CCS, CCCA
G. IRA WALLACE, PE
ROBERT WOODSON, PE

619.219H

October 9, 1997

City of Las Vegas
Department of Public Works
731 South Fourth Street
Las Vegas, NV 89101

Attention: Dennis Stransky, P.E.

Subject: Village 8 Elementary School,
DS 1806

Gentlemen:

The October 3, 1997 addendum to the subject drainage study was submitted to you last week and included two sets of the revised plans. The revised plans show wall details which inadvertently had not been totally updated. The enclosed two sets of plans are submitted to you to replace those previously submitted. Please discard the previous plans.

If you have any questions, please contact us.

Very truly yours,

G. C. WALLACE, INC.

Randall K. Gremlich

Randall K. Gremlich, P.E.

RKG:sjl

Encl.

pc: Rick Strutz, GCW

1806
K-75
Rec'd
10-6-97



G.C. WALLACE, INC.
Engineering/Architecture

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SAUNDRA L. VANCE, CCS, CCA
G. IRA WALLACE, PE
ROBERT WOODSON, PE

1806
K25
N/C

619.219H

October 3, 1997

City of Las Vegas
Department of Public Works
731 South Fourth Street
Las Vegas, NV 89101

Attention: Dennis Stransky, P. E.

Subject: Village 8 Elementary School, DS 1806

Gentlemen:

The technical drainage study for the subject school was approved April 16, 1997 and subsequently an addendum was approved on May 14, 1997. This letter serves as a second addendum to address one small issue which was not previously addressed.

The wall opening at the northwest corner of the site was created when the wall was built to allow for an emergency overflow from the parcel on the west. Since that site was undeveloped at the time, a temporary chain link fence was built across the wall opening to allow an overflow until future development dictated the size of opening needed. The site on the west is now being developed as a park and it is desirable to permanently remove the chain link fence.

It is proposed to construct a 4-foot wide wall opening to allow the 100-year flow from the park (17 cfs) to drain in case of clogging of the inlet at that point. The construction detail of the 16-inch high, 4-foot wide opening is attached. Calculations are attached for your reference.

If you have any questions, please contact us.

Very truly yours,

G. C. WALLACE, INC.

Randall K. Gremlich
Randall K. Gremlich, P.E.

RKG:sjl
Encl.

pc: Rick Strutz, GCW

RECEIVED

OCT 6 1997

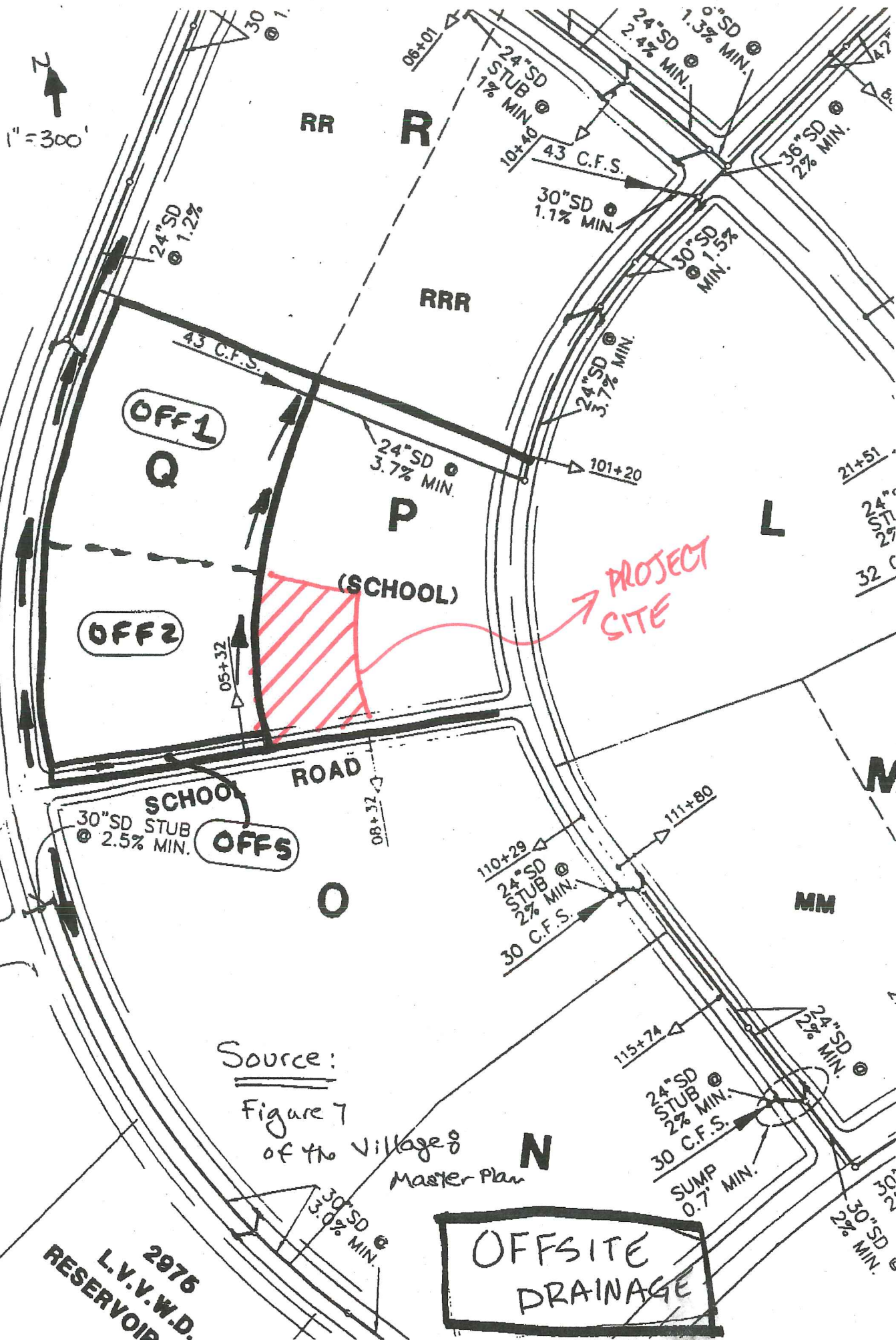
CLV PUBLIC WORKS
FLOOD CONTROL



REFERENCE 6

HEC-1 copy from GC Wallace "Conceptual Master Drainage Plan for Summerlin Village 8, April 1994"

1" = 300'



Source:

Figure 7
of the Village
Master Plan

2976
L.V.V.W.D.
RESERVOIR

OFFSITE
DRAINAGE

TABLE 2A
ONSITE RUNOFF FOR FUTURE CONDITIONS*

Subbasin	10-Year Flow (cfs)	100-Year Flow (cfs)
A1	23	44
A2	25	48
A3	59	116
B	40	78
C	32	66
D	40	77
E1	31	60
E2	30	59
F	13	25
G	4	7
H	17	34
I1	25	49
I2	29	57
J	25	52
K	24	51
L	37	78
M1	24	51
M2	20	43
N	30	62
O	41	87
P	17	37
Q	20	43
RRR	20	43
RR	21	45
S	11	31
T	41	88
U	30	63
V	36	77
W	41	87
X1	14	28

Source: Village 8 Conceptual Master Plan

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
322	KK PK2
323	BA .01734
324	LS 0 94
325	UD .14
326	KK 18/21
327	KM FLOW AT THE UPSTREAM END OF THE CRESTDALE CULVERT
328	HC 3
329	KK Q ←
330	BA .02047
331	PB 3.00
332	LS 0 92
333	UD .1
334	KK 8
335	KM ROUTE IN STORMDRAIN EASEMENT TO CRESTDALE
336	RK 500 .03 .016 0 TRAP 50 2
337	KK P ←
338	BA .01719
339	LS 0 92
340	UD .09
341	KK 8
342	HC 2
343	KK 9
344	KM ROUTE IN STREET TO POINT 9
345	RK 400 .03 .016 0 TRAP 50 2
346	KK RRR
347	BA .02063
348	LS 0 92
349	UD .10
350	KK 9
351	KM COMBINE FLOWS
352	HC 2
353	KK 10
354	KM ROUTE FLOWS IN STORMDRAIN TO POINT 10 ON CRESTDALE
355	RK 400 .03 .013 0 CIRC 2.5
356	KK RR
357	BA .02156
358	LS 0 92
359	UD .10

Source:

Village 8

Conceptual
master
Plan

				TIME	3.53	3.53	3.53	3.53
ROUTED TO	19	.01	1	FLOW TIME	12.	23.	23.	23.
					3.55	3.53	3.53	3.53
HYDROGRAPH AT	X1	.01	1	FLOW TIME	14.	30.	29.	29.
					3.53	3.53	3.53	3.53
2 COMBINED AT	19	.02	1	FLOW TIME	26.	54.	52.	52.
					3.53	3.53	3.53	3.53
ROUTED TO	20	.02	1	FLOW TIME	26.	53.	52.	52.
					3.53	3.53	3.53	3.53
HYDROGRAPH AT	Y	.00	1	FLOW TIME	5.	9.	9.	9.
					3.52	3.50	3.50	3.50
2 COMBINED AT	20	.03	1	FLOW TIME	30.	62.	61.	60.
					3.53	3.53	3.53	3.53
ROUTED TO	18/21	.03	1	FLOW TIME	30.	62.	61.	60.
					3.53	3.53	3.53	3.53
HYDROGRAPH AT	PK2	.02	1	FLOW TIME	19.	37.	36.	36.
					3.57	3.57	3.57	3.57
3 COMBINED AT	18/21	.70	1	FLOW TIME	426.	974.	949.	937.
					3.75	3.73	3.73	3.73
HYDROGRAPH AT	Q	.02	1	FLOW TIME	20.	43.	42.	41.
					3.55	3.53	3.53	3.53
ROUTED TO	8	.02	1	FLOW TIME	20.	43.	42.	41.
					3.55	3.55	3.55	3.55
HYDROGRAPH AT	P	.02	1	FLOW TIME	17.	37.	36.	36.
					3.53	3.53	3.53	3.53
2 COMBINED AT	8	.04	1	FLOW TIME	37.	79.	77.	76.
					3.55	3.53	3.55	3.55
ROUTED TO	9	.04	1	FLOW TIME	37.	79.	77.	76.
					3.57	3.55	3.55	3.55
HYDROGRAPH AT	RRR	.02	1	FLOW TIME	20.	43.	42.	42.
					3.55	3.53	3.53	3.53
2 COMBINED AT	9	.06	1	FLOW TIME	57.	122.	119.	118.
					3.55	3.55	3.55	3.55
ROUTED TO	10	.06	1	FLOW TIME	57.	122.	119.	117.
					3.57	3.55	3.55	3.55
HYDROGRAPH AT	RR	.02	1	FLOW TIME	21.	45.	44.	43.
					3.55	3.53	3.53	3.53
ROUTED TO	11	.02	1	FLOW TIME	21.	45.	44.	43.
					3.55	3.55	3.55	3.55
ROUTED TO	10	.02	1	FLOW	21.	45.	44.	43.

Source:

Village 8

Conceptual
master
plan

TIME 3.57 3.57

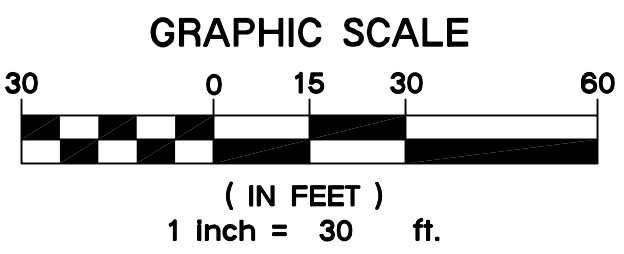
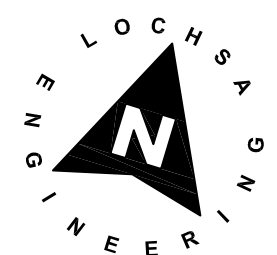
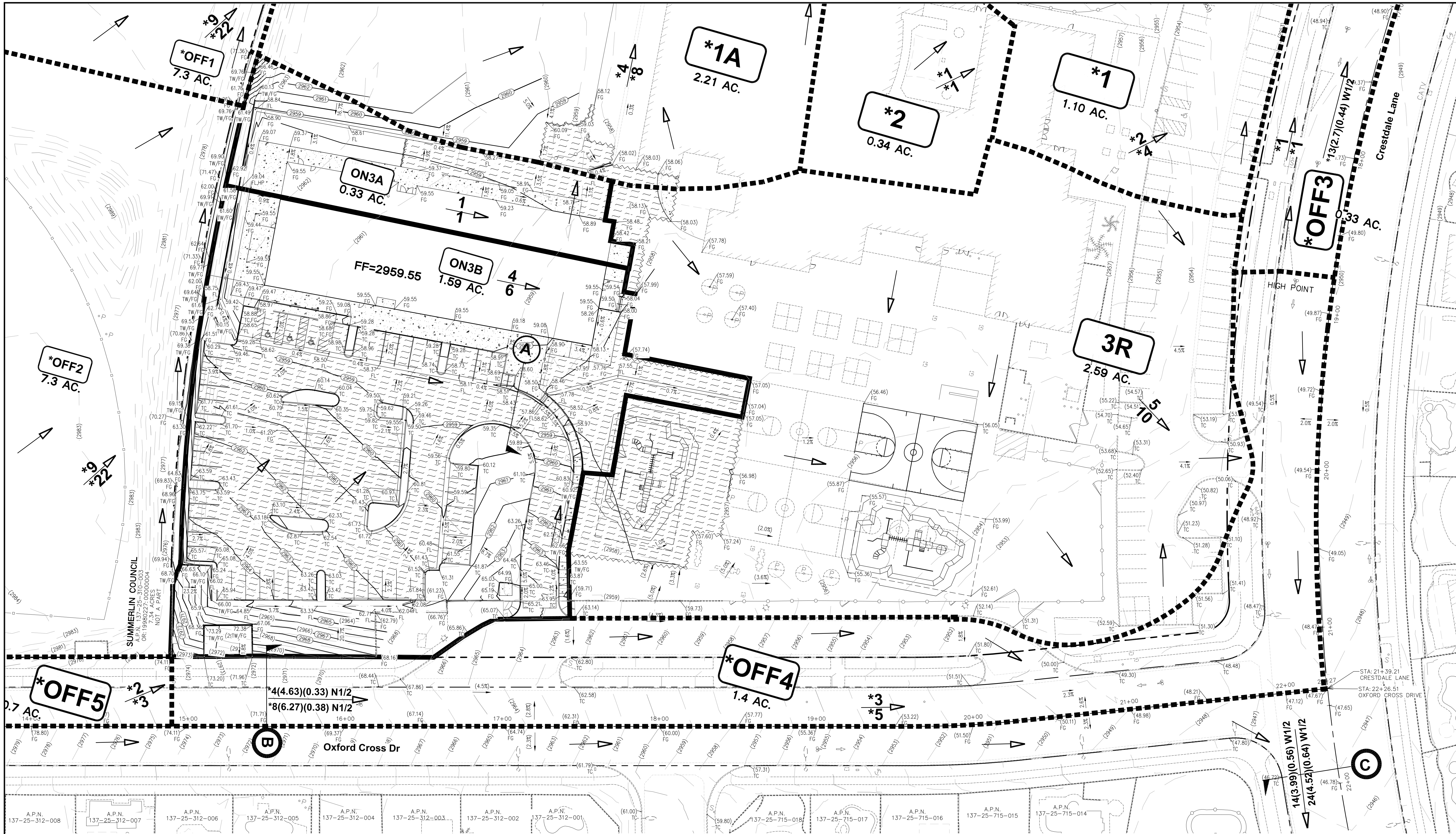
HYDROGRAPH AT 3 .01 1 FLOW 16. 8.
TIME 3.53 3.53

2 COMBINED AT CR/OX .01 1 FLOW 23. 12.
TIME 3.53 3.53



GISMO

0 75 150
feet



Onsite Hydraulic Sections					
Section Name	Q100 (cfs)	Depth (D100) - ft.	Velocity (V100)-ft/s	Velocity x Depth (v x d)	Slope (ft/ft)
A	6	0.52	2.47	1.28	0.004

Street Flow Summary						
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]
Oxford Cross Drive	50	B	4	4.63	0.33	1.53
Crestdale Lane	72	C	14	3.99	0.56	2.23

Street Flow Summary						
100-year, 6-hour Storm						
Street	Right of Way Width (ft)	Hydraulic Cross-Section Identifier	100-Year Flow [Q10] (cfs)	100-year Velocity [v] (fps)	100-year Flow Depth [d] (ft)	100-year Velocity x Depth [v x d]
Oxford Cross Drive	50	B	8	6.27	0.38	2.38
Crestdale Lane	72	C	24	4.52	0.64	2.89

DRAINAGE LEGEND

ND1 DRAINAGE BASIN LABEL

CPD1 CONCENTRATION POINT COMBINATION POINT

2 **3** **ON** ONSITE BASIN BOUNDARY

Q10 **Q100** FLOW IN CFS (INTERIM) FLOW IN CFS (INTERIM)

***X (X)(XX)** ***X (X)(XX)** **Q10 (V10)(D10)** **Q100 (V100)(D100)**

— **—** BASIN FLOW DIRECTION

* APPROVED TDS FOR ELEMENTARY SCHOOL AT THE CROSSING—0830 (VILLAGE 8, PARCEL P) CLV DS#1806

REVISIONS:

REV.	DESCRIPTION:	DATE:

SEAL: PROFESSIONAL ENGINEER-STATE OF CALIFORNIA
GUY M. MORRIS
EXP. 12-31-19
CIVIL
No. 14558
08/07/18

DATE: 08/07/18
DRAWN BY: NMG
SUBMITTAL: BID SET
A/E PROJECT NO.: 171058

3883 Howard Hughes Pkwy
Suite 650
Las Vegas NV 89169
Tel: 702.893.2800
Fax: 702.893.2805

Gensler

Lochsa engineering
6345 South Jones Blvd.
Las Vegas, NV 89118
Phone: 702.365.9312
Fax: 702.365.9317
www.lochsa.com

A/E:

CONSTRUCTION MGMT: DATE:

PROJECT MANAGER:

COORDINATOR:

BUILDING DEPARTMENT:

CODE COMPLIANCE:

AHERA REVIEW:

ASBESTOS WORK IS:
REQUIRED ☐ NOT REQUIRED ☐

MPID: 0013529

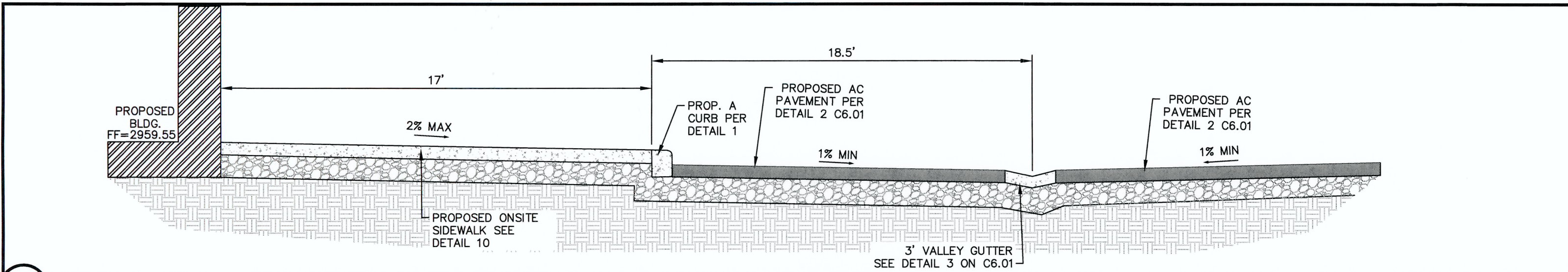
CLARK COUNTY SCHOOL DISTRICT
CONSTRUCTION MANAGEMENT DEPARTMENT 1180 MILITARY TRIBUTE PL HENDERSON NV 89074 PHONE: 702-799-8710

JOHN W. BONNER E.S. ADDITION

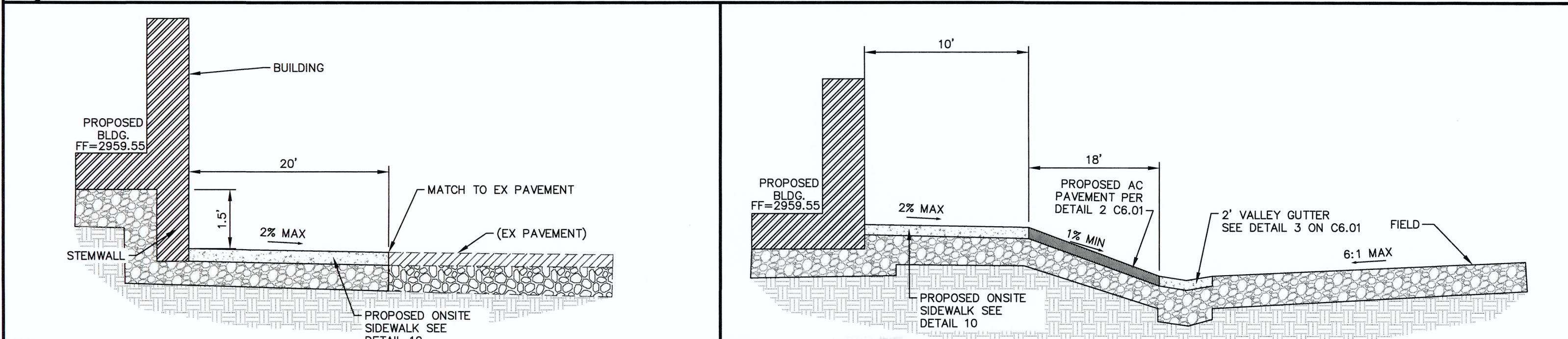
DRAWING TITLE: DEVELOPED DRAINAGE PLAN

FACILITY: JOHN W. BONNER E.S. - LOCATION 309

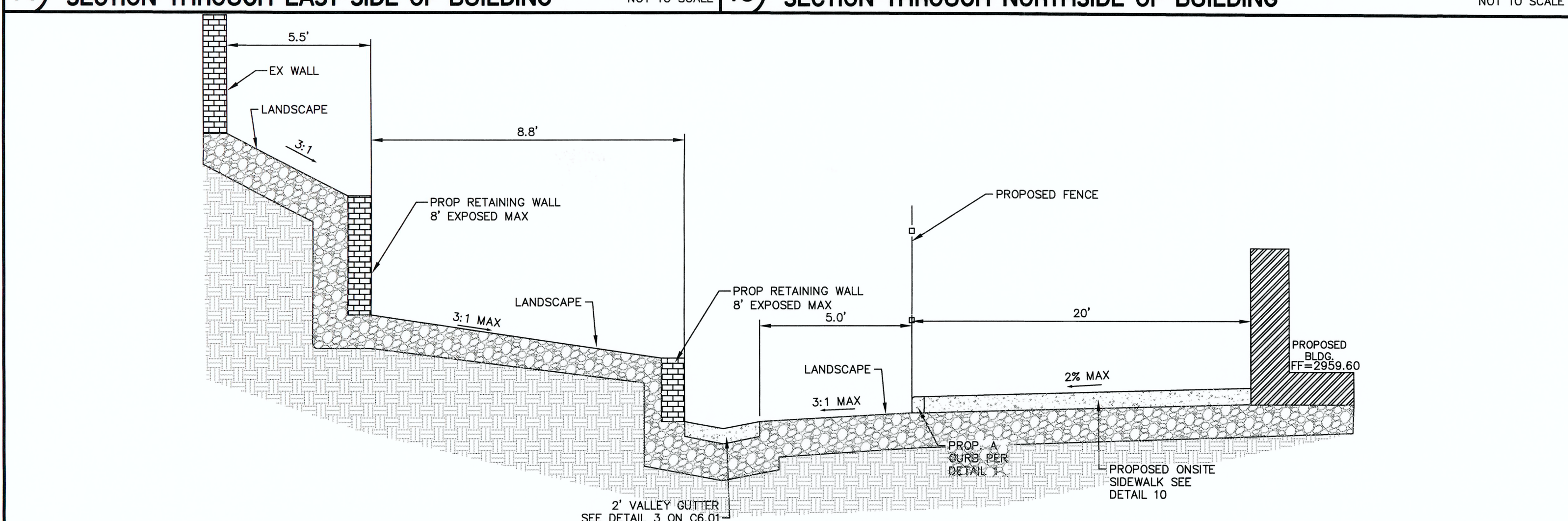
SHEET NO: DR2
SHEET 1 OF 1



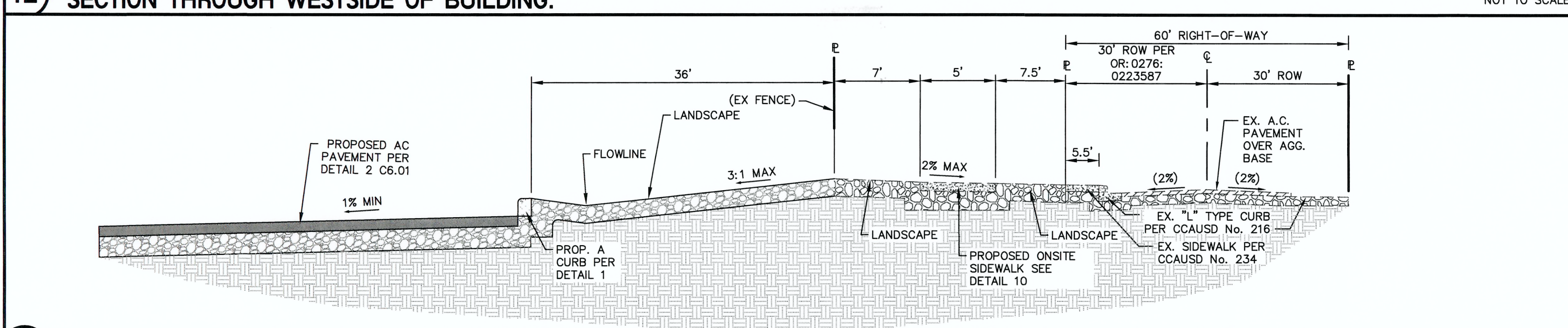
15 SECTION THROUGH SOUTHSIDE OF BUILDING NOT TO SCALE



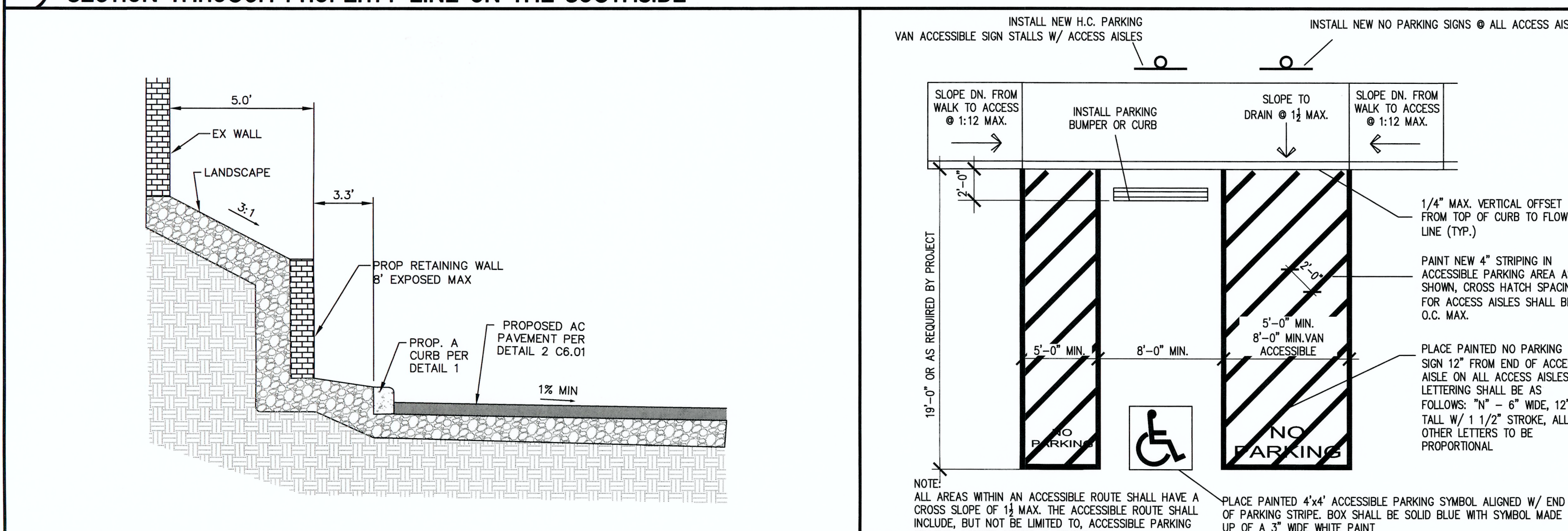
14 SECTION THROUGH EAST SIDE OF BUILDING NOT TO SCALE



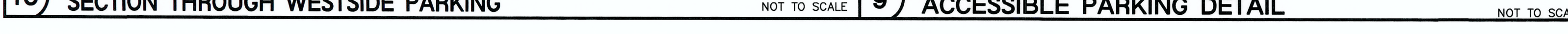
13 SECTION THROUGH NORTHSIDE OF BUILDING NOT TO SCALE



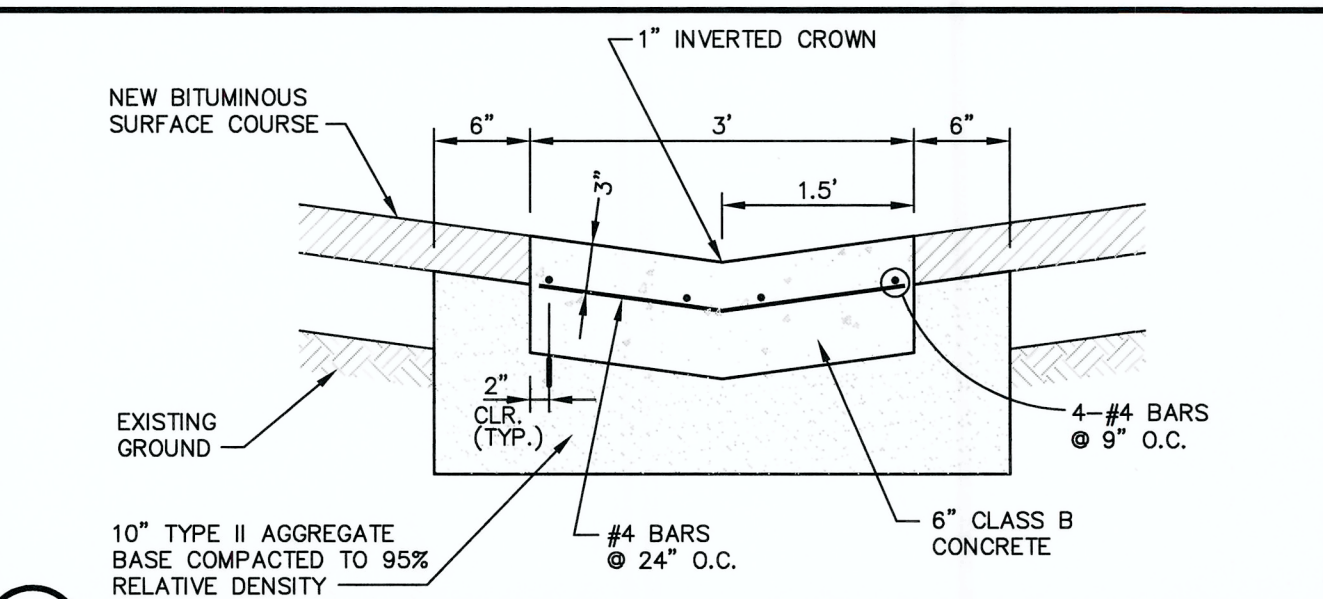
12 SECTION THROUGH WESTSIDE OF BUILDING. NOT TO SCALE



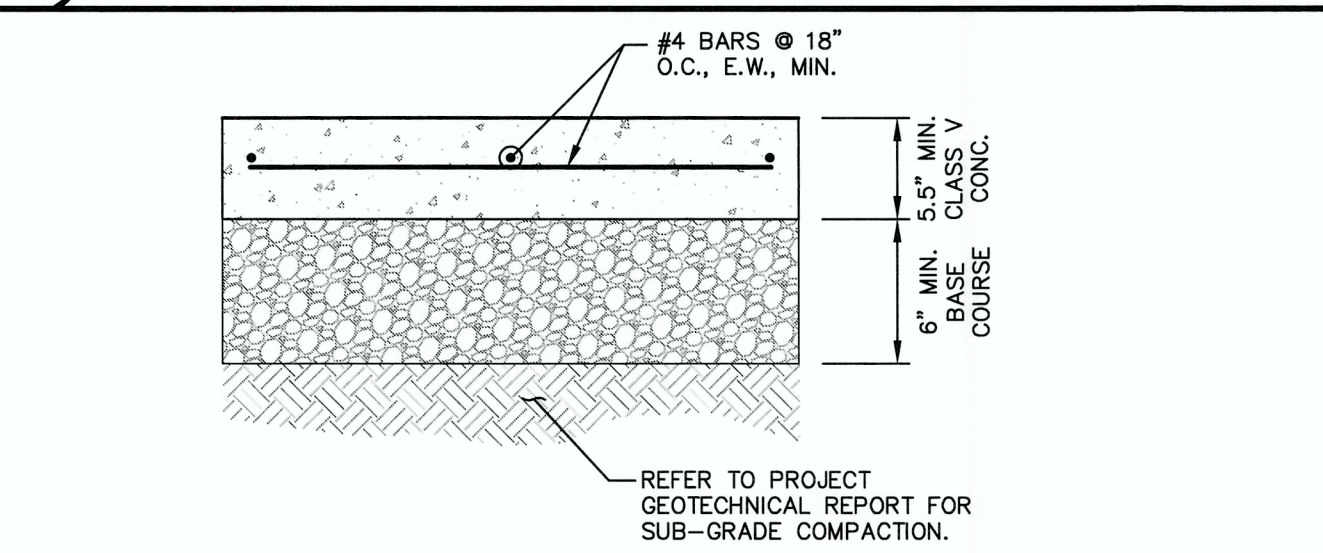
11 SECTION THROUGH PROPERTY LINE ON THE SOUTHSIDE NOT TO SCALE



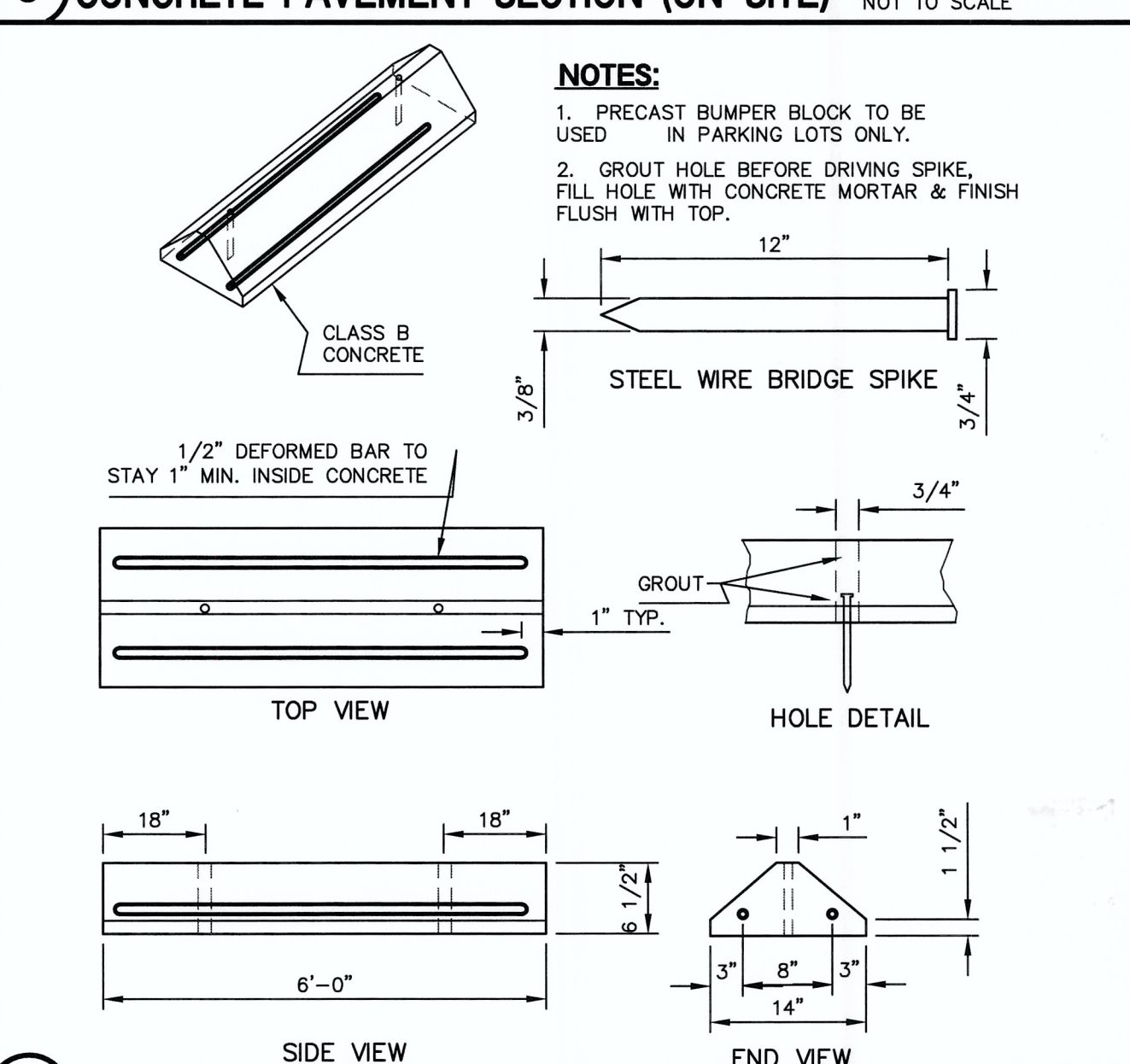
16 SECTION THROUGH WESTSIDE PARKING NOT TO SCALE



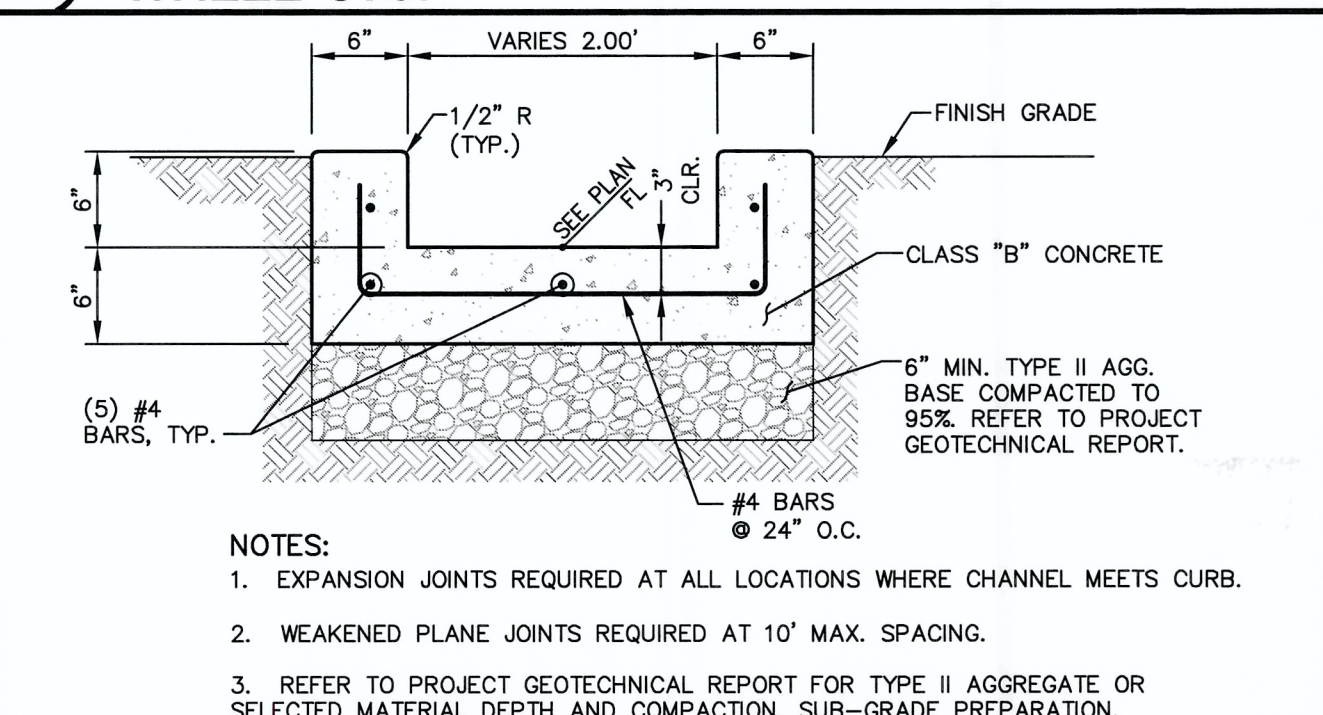
10 3' VALLEY GUTTER



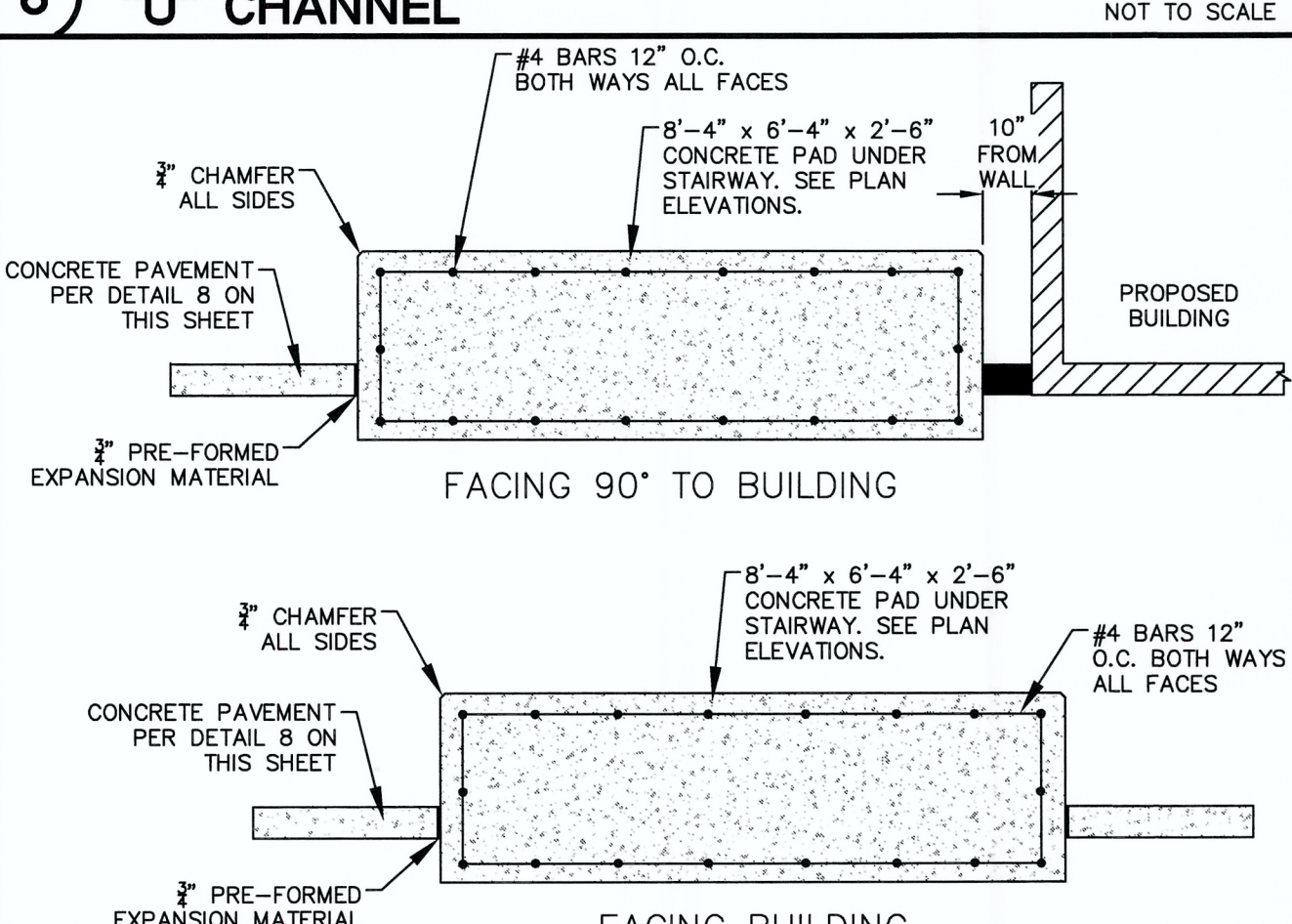
8 CONCRETE PAVEMENT SECTION (ON-SITE) NOT TO SCALE



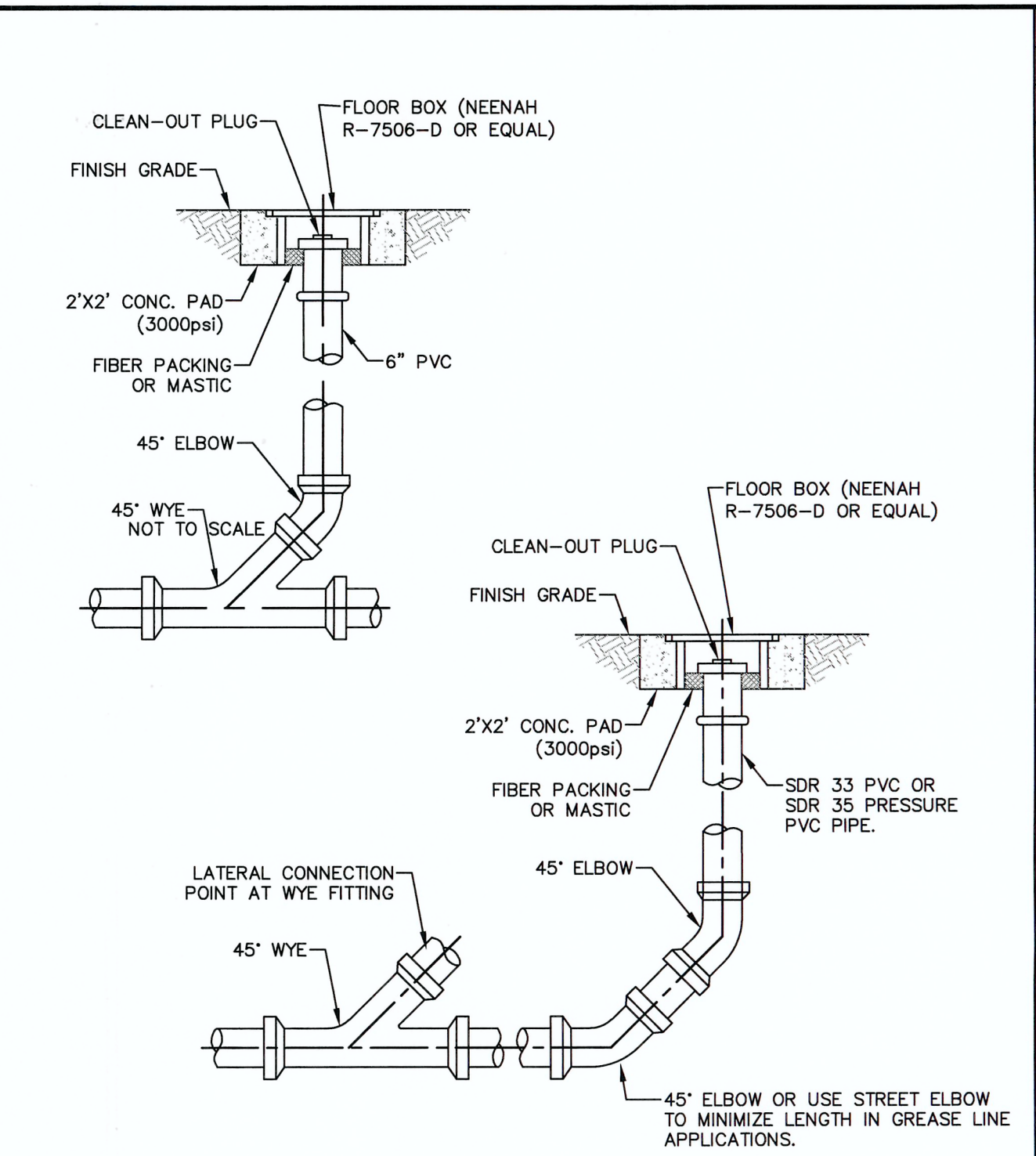
7 WHEEL STOP NOT TO SCALE



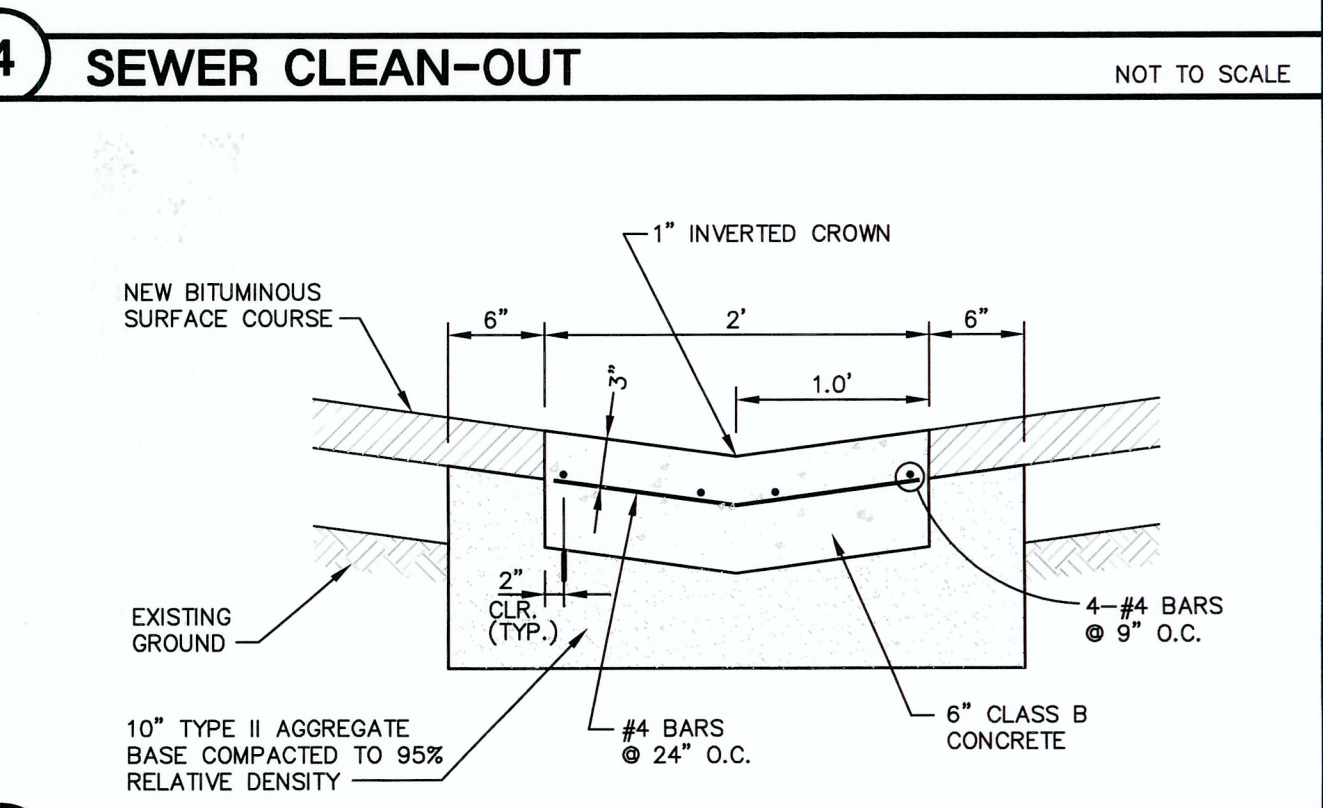
6 "U" CHANNEL NOT TO SCALE



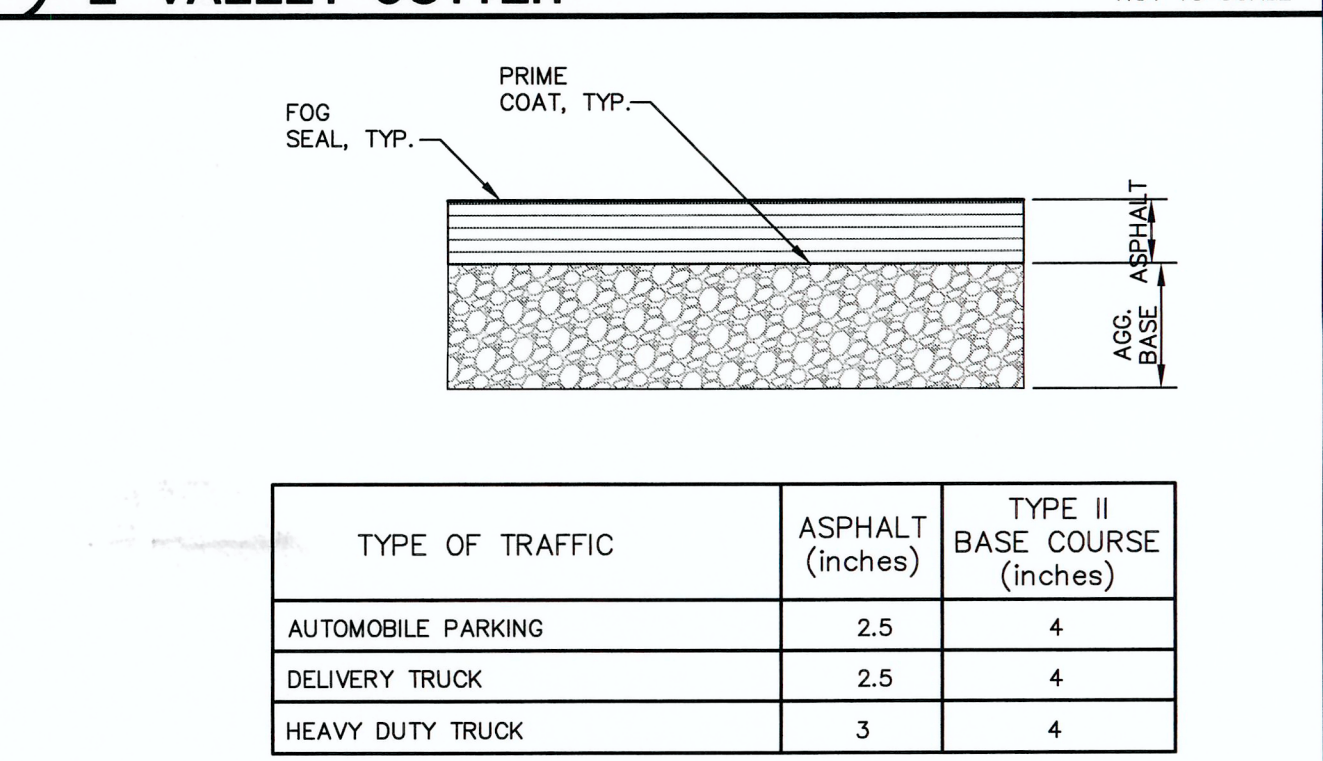
5 PROP. CONCRETE PAD UNDER STAIRWAY NOT TO SCALE



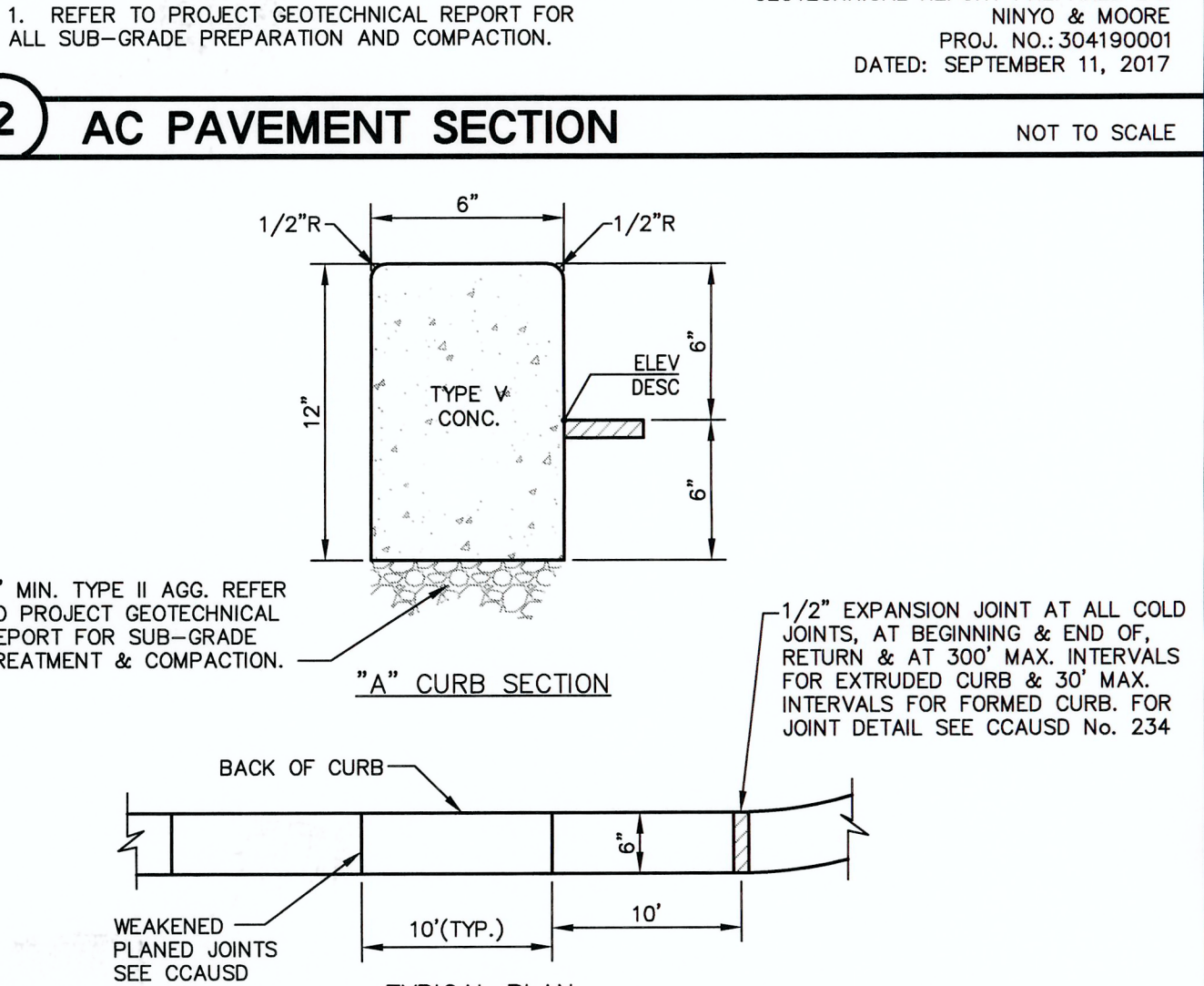
4 SEWER CLEAN-OUT NOT TO SCALE



3 2' VALLEY GUTTER NOT TO SCALE



2 AC PAVEMENT SECTION NOT TO SCALE



1 ON-SITE "A" TYPE CURB NOT TO SCALE

REVISIONS:

REV.	DESCRIPTION	DATE

CLARK COUNTY SCHOOL DISTRICT

CONSTRUCTION MANAGEMENT DEPARTMENT 180 MILITARY TRIBUTE PL HENDERSON NV 89074 PHONE: 702-799-8710

PROJECT: JOHN W. BONNER E.S. ADDITION

DRAWING TITLE: DETAIL SHEETS SHEET 1 OF 3

FACILITY: JOHN W. BONNER E.S. - LOCATION 309

Gensler

Lochsa Engineering

3883 Howard Hughes Pkwy Suite 650 Las Vegas NV 89169 Tel: 702.893.2800 Fax: 702.893.2805

CONSULTANT:

CONSTRUCTION MGMT. DATE:

COORDINATOR:

BUILDING DEPARTMENT:

ASBESTOS WORK IS: REQUIRED ☐ NOT REQUIRED ☐

MPID: 0013529

SEAL: PROFESSIONAL ENGINEER-STATE OF NEVADA GUY M. MORRIS EXP. 12-31-19 CIVIL No. 14528 08/07/18

DATE: 08/07/18

BY: NMG

SUBMITTAL: BID SET

A/E PROJECT NO. 171058

SHEET NO. C6.01

SHEET 8 OF 10

General

1. The Contractor shall verify all dimensions prior to starting construction. The Architect shall be notified of any discrepancies or inconsistencies.

2. Notes and details on the drawings shall take precedence over these general notes, typical details, and the project specifications.

3. All work shall conform to the minimum standards of following codes:

The 2012 edition of the International Building Code (IBC), and other regulating codes which have authority over any portion of the work, and those codes and standard listed in these notes.

4. The contract Structural drawings and specifications represent the finished structure. They do not indicate the method of construction.

5. All specifications and codes noted shall be the latest approved editions and revisions by the governmental agency having jurisdiction over this project.

6. Contractor shall investigate the site during clearing and earth work operations for filled excavations or buried structures such as cesspools, cisterns, foundations, utilities, etc. If any such structures are found, the Structural Engineer shall be notified immediately.

7. IBC Lateral Loads:

Earthquake Design Data:			
Spectral Response Coefficients			
S _s	0.424g	S ₁	0.229g
Mapped Spectral Response Acceleration			
S _s	0.438g	S ₁	0.159g
Soil Factor Coefficients			
F _a	1.449	F _v	2.164

8. ACI 318-11 table 4.3.1 Sulfate Exposure (See General Notes - Concrete Item #3 for concrete water cement ratio limits): S1 (MODERATE)

Foundation

1. The design of the foundation system is based on the geotechnical report (and any addenda) prepared by the following company:

Company:	Ninjo & Moore
Report no.:	304190001
Dated:	09-11-2017

Copies are available for review at the Architect's office and Contractor shall have a copy at the jobsite.

2. The foundation system is designed based on the following:

Allowable Soil Bearing Pressure	Continuous Footings	2800 psf *
Active Earth Pressure	36 PCF	
Passive Pressure	375 PCF	
Friction Coefficient	0.64	

a ½ increase is allowed for Seismic or Wind Loading where asterisk (*) is indicated.

3. The Contractor shall provide for proper dewatering of excavations from surface water, ground water, seepage, etc.

4. The Contractor shall provide for the installation and design of all cribbing, sheeting and shoring required to safely and adequately retain the earth banks and support any existing structures in accordance with all national, state and local safety ordinances.

5. All abandoned utilities, footings, etc., that interfere with the new construction shall be removed. Notify the Civil Engineer should any foundations for existing structures be encountered that are not shown on the structural drawings.

6. Footings shall be placed and estimated according to depths shown on the drawings. Excavations for footings shall be approved by the Geotechnical Engineer prior to placing the concrete and reinforcing. The Contractor shall notify the Geotechnical Engineer when the excavations are ready for inspection. The Geotechnical Engineer shall submit a letter of compliance to the Owner. Should soil encountered at these depths not be approved by the Geotechnical Engineer, footing elevations or footing designs will be altered by change order.

7. All excavations shall be properly backfilled. Footing backfill and utility trench backfill within the building perimeter shall be mechanically compacted in layers, to the approval of the Geotechnical Engineer. See geotechnical report for requirements. Flooding will not be permitted.

8. The Contractor shall not backfill behind retaining walls before the concrete or masonry walls have reached full design strength. The Contractor shall brace or protect all building and pit walls below grade from lateral loads until attaching floors are completely in place and have reached full design strength. The Contractor shall provide for the design, any required permits and the installation of such bracing and protection with the requirements of IBC section 1704.

Reinforcing Steel (for Concrete and Masonry)

1. All reinforcing steel shall be detailed and placed in accordance with the 'Building Code Requirements for Reinforced Concrete' and the Manual of Standard Practice for Reinforced Concrete Construction' by CRSI and WORS as modified by the project drawings and specifications.

2. Deformed reinforcing bars shall conform to the requirements of ASTM A615 grade 60 and ASTM A706 grade 60 for deformed weldable bars.

3. All reinforcing bar bends shall be made cold.

4. Lap splices shall be made only where shown on the structural drawings.

5. Reinforcing dowels between footings and walls or columns shall be the same number, size, spacing and grade as the specified vertical reinforcing, u.n.o.

6. All reinforcing bars shall be marked so their identification can be made when the final in-place inspection occurs.

Quality Assurance and Special Inspection

Testing Laboratory: Retained by owner and satisfactory to Architect/Structural Engineer and governing code authority to perform required tests and inspections of this contract and applicable code.

Material Certification: Submit laboratory test reports certifying materials are of identifiable tested stock to owner, testing laboratory, Architect/Structural Engineer and, upon request, to governing code authority. If laboratory test reports cannot be made available, testing laboratory will perform tests as directed by Architect/Structural Engineer. Contractor shall pay testing laboratory for costs related to tests and inspections of unidentifiable materials or materials furnished without laboratory test reports, materials found deficient after initial tests and inspections, or materials replacing deficient materials.

Reinforcing:
(a) During placement

3. Structural masonry.

4. Ten percent of drilled-in, epoxy, or grout set anchors

and will perform the following concrete tests at frequency indicated in IBC section 1905.6:
(a) Slump tests in compliance with ASTM C143.
(b) Prepare four test cylinders for compressive strength testing in compliance with ASTM C39, ACI 318 and IBC section 1905.6. Test one cylinder at 7 days, two cylinders at 28 days and retain remaining cylinder for tests until completion of project. Determine concrete compressive strength at 28 days based on average of two cylinders tested.
(c) Entrained air content in compliance with ASTM C231 for air entrained concrete.

5. Excavation and back-filling.

All special inspection shall be performed in accordance with the requirements of IBC section 1704.

Concrete

1. All aspects of work pertaining to the concrete construction shall be in accordance with ACI 318-11, 'Building Code Requirements for Structural Concrete' and the latest edition of 'Specifications for Structural Concrete for Buildings', ACI 301, with modifications as noted on the project drawings and/or specifications.

2. Concrete mix designs shall be submitted to the Structural Engineer for review. All mix designs shall be designed by a qualified testing laboratory and shall be wet stamped by a Civil Engineer licensed in the State of NEVADA. Base design mix on field experience or trial mixtures as stipulated in ACI 318 Section 5.3

3. Portland cement shall conform to ASTM C150 Type V where the concrete is in contact with soil. Concrete that will be exposed to sulfate-containing solutions shall comply with ACI 318 chapter 4. Severe and Very Severe sulfate exposures as identified in the project geotechnical report, the water cement ratio shall not exceed 0.45 and shall not exceed 0.50 for Moderate sulfate exposure. Type I cement shall be used at all other locations in the structure.

4. Fly ash may be used in concrete mixes. The fly ash shall conform to ASTM C618 Class F. The loss of ignition shall be limited to 2%. The addition rate for fly ash shall be limited to 15% of the cement weight. The Contractor shall submit all certificates showing the fly ash is in accordance with the above criteria.

5. All concrete exposed to freeze - thaw cycles shall contain 6% +/- 1% of entrained air.

6. Hard rock concrete - aggregate shall conform to all requirements and tests of ASTM C33 and project specifications. Exceptions may be used only with approval of the Structural Engineer. Provide concrete mix design with proven shrinkage characteristics of less than 0.0005 inches/inch.

7. Structural concrete 28-day strengths & types are as follows:

Location of Concrete	Strength, psi	Type
Retaining walls	4500	Hard Rock
Footings	4500	Hard Rock

8. Concrete mixing operations, etc., shall be in accordance with ASTM C94.

9. Concrete placement shall be in accordance with ACI standard 304 and project specifications. Provide keys in construction joints unless detailed otherwise. Thoroughly clean, remove laitance and thoroughly wet and remove standing water in construction joints before placing new concrete. At vertical joints, slash with a coat of neat cement before placing new concrete.

10. Roughen concrete surface to a full amplitude of 1/4 inch where masonry walls intersect concrete or where new concrete interfaces with existing concrete.

11. Clear coverage of concrete over reinforcing bars shall be as follows:

Location of Concrete	Minimum Concrete Cover
Concrete cast against and permanently exposed to earth	3"
Concrete exposed to earth or weather: #6 through #18 bar #5 bar and smaller	2" 1 1/2"
Concrete not exposed to weather or in contact with ground, UNO: Slabs, walls, joists #14 and #18 bar #11 bar and smaller.	1 1/2" 3/4"
Beams, columns: Primary reinforcing, ties stirrups, spirals.	1 1/2"
Slab on grade:	2" clear from top

12. Prior to concrete placement, all reinforcing bars, anchor bolts and other concrete inserts shall be well secured in position.

Tension Development and Lap Splice Length (for Masonry only)

CMU Thickness	Masonry Design Strength	f _m = 1500 psi	
		Center	Edge
8"	Placement of Bar		
	BAR SIZE		
	#3	12	13
	#4	14	24
	#5	22	38
	#6	43	74
	#7	59	92
	#8	91	121
#9	118	NP	

7 TENSION DEVELOPMENT AND LAP SPICE LENGTH (FOR MASONRY ONLY) NOT TO SCALE

NOTES:
1. All lengths are in inches.
2. For bar placement, edge distance (d Dim.) see detail 8/-.
3. Where 2 bars per cell occur they shall be placed per edge condition see note 2.
4. 6" CMU 2 bars per cell is not permitted. 8" CMU 2 bars per cell up to #5 are permitted, 10" CMU 2 bars per cell up to #7 are permitted.
5. NP Indicated Not Permitted.
6. #10 and #11 bars where shown on plans or details require a mechanical splice.

CMU (Concrete Masonry Units)					Concrete Masonry Unit		
NOMINAL THICKNESS	ACTUAL THICKNESS (t)	d (inches)			NOMINAL THICKNESS	ACTUAL THICKNESS (t)	d (inches)
		#3-#6	#7	#8			
6" CMU	5 5/8"	3.25	NP	NP	6" CMU	5 5/8"	2.8
8" CMU	7 5/8"	5.25	5	4.625	8" CMU	7 5/8"	3.8
10" CMU	9 5/8"	7.25	7	6.625	10" CMU	9 5/8"	4.8
12" CMU	11 5/8"	9.25	9	8.625	12" CMU	11 5/8"	5.8
16" CMU	15 5/8"	13.25	13	12.625	16" CMU	15 5/8"	7.8

NOTE:
1. Where vertical reinforcing bars occur in a cell, bars shall be secured in place by a bar positioner at the top and bottom, and at the intervals not exceeding 200 diameters.

8 PLAN DETAIL FOR REBAR PLACEMENT IN CMU NOT TO SCALE

CMU (Concrete Masonry Units)					Concrete Masonry Unit		
NOMINAL THICKNESS	ACTUAL THICKNESS (t)	d (inches)			NOMINAL THICKNESS	ACTUAL THICKNESS (t)	d (inches)
		#3-#6	#7	#8			
6" CMU	5 5/8"	3.25	NP	NP	6" CMU	5 5/8"	2.8
8" CMU	7 5/8"	5.25	5	4.625	8" CMU	7 5/8"	3.8
10" CMU	9 5/8"	7.25	7	6.625	10" CMU	9 5/8"	4.8
12" CMU	11 5/8"	9.25	9	8.625	12" CMU	11 5/8"	5.8
16" CMU	15 5/8"	13.25	13	12.625	16" CMU	15 5/8"	7.8

NOTE:
1. Where vertical reinforcing bars occur in a cell, bars shall be secured in place by a bar positioner at the top and bottom, and at the intervals not exceeding 200 diameters.

CMU (Concrete Masonry Units)					Concrete Masonry Unit		
NOMINAL THICKNESS	ACTUAL THICKNESS (t)	d (inches)			NOMINAL THICKNESS	ACTUAL THICKNESS (t)	d (inches)
		#3-#6	#7	#8			
6" CMU	5 5/8"	3.25	NP	NP	6" CMU	5 5/8"	2.8
8" CMU	7 5/8"	5.25	5	4.625	8" CMU	7 5/8"	3.8
10" CMU	9 5/8"	7.25	7	6.625	10" CMU	9 5/8"	4.8
12" CMU	11 5/8"	9.25	9	8.625	12" CMU	11 5/8"	5.8
16" CMU	15 5/8"	13.25	13	12.625	16" CMU	15 5/8"	7.8

NOTE:
1. Where vertical reinforcing bars occur in a cell, bars shall be secured in place by a bar positioner at the top and bottom, and at the intervals not exceeding 200 diameters.

Masonry

1. The masonry units shall conform to ASTM C90 grade N-1 and ASTM Standard C90-09.

2. Mortar and grout shall comply with the provisions of Section 2103 of the IBC

3. Mortar mix shall conform to requirements for ACI 530.1-11 Table SC-1, Type S, and project specifications.

4. Grout shall be coarse grout and shall comply with ACI 530.1-11 and ASTM C476-10. Use sufficient water for grout to flow into all joints of the masonry without segregation.

5. Cement - see notes under 'CONCRETE' for requirements and type of cement.

6. The design strength f_m shall be 1500 psi unless noted otherwise in the drawings. The f_m shall be verified by the prism method (IBC Section 2105.3).

The minimum required 28-day compressive strengths for grout, mortar, and block shall be as follows:

Masonry Design Strength						
f _m =	1500 psi	2000 psi	2500 psi	3000 psi	3500 psi	4000 psi
Grout	2000 psi	2500 psi	3125 psi	3750 psi	4375 psi	5000 psi
Mortar	1800 psi	1800 psi	2500 psi	2500 psi	2500 psi	2500 psi
Type S	Type S	Type M	Type M	Type M	Type M	Type M
Block(*)	2000 psi	2500 psi	3125 psi	3750 psi	4375 psi	5000 psi

* Minimum compressive strength at 28-days on the net area.
Note: These strengths are minimum requirements only. If greater strengths are required to reach the required f_m for the combined system, these greater strengths shall be used.

7. Mortar and grout mix designs shall be submitted to the Structural Engineer for review. All mix designs shall be designed by a qualified testing laboratory and be wet stamped by a Civil Engineer licensed in the State of Nevada.

8. Testing data by a qualified testing laboratory for the masonry block shall be submitted to the Structural Engineer for review.

9. All masonry shall be solid grouted unless noted otherwise on the drawings.

10. Refer to architectural drawings for surface and height of units, laying pattern and joint type.

11. Grout lift provisions shall be in accordance with ACI 530.1-11 Masonry Standards S-66 Section 3.5.

12. Reinforcing bars shall be ASTM A615, Grade 60, unless noted otherwise. See notes under 'reinforcing steel' for additional requirements.

13. Placement of reinforcing bars shall conform to ACI 530.1-11 Masonry standards S-58 Section 3.4. A minimum of 1/2 inch grout between the main reinforcing and masonry units shall be provided.

14. Minimum dimensions of grout spaces and cells shall be in accordance with ACI 530.1-11, S-66, Table 7. All cells shall be in vertical alignment and footing dowels shall align with cells containing vertical reinforcing steel.

15. For reinforcing bar tension development and lap splice lengths in CMU see typical detail 7/-, For reinforcing bar placement in CMU cells see typical detail 8/-.

16. Coring openings in grouted masonry is not permitted.

17. No pipes or electrical conduit shall pass through masonry lintels unless specifically detailed.

18. Mechanical pipes and electrical conduits which pass through masonry walls do not require sleeves, unless otherwise indicated in the project specifications, mechanical and/or electrical drawings. If sleeves are required, install sleeves before grouting. Do not cut any reinforcing which may interfere with sleeve placement. Notify the Structural Engineer in advance of conditions not shown on the structural drawings.

3 TENSION LAP SPICE (IN CONCRETE) NOT TO SCALE

BAR SIZE CLASS	f'c = 4500 psi			
	TOP BARS CASE 1	CASE 2	OTHER BARS CASE 1	CASE 2
#3	A 18	27	14	21
#4	B 23	34	18	27
#5	A 24	45	18	27
#6	B 31	46	24	35
#7	A 29	44	23	34
#8	B 38	57	26	44
#9	A 35	53	27	41
#10	B 46	68	35	53
#11	A 51	77	40	59
#12	B 59	88	45	68
#13	A 57	84	44	64
#14	B 66	99	51	76
#15	A 66	99	51	76
#16	B 76	114	59	88
#17	A 66	99	51	76
#18	B 85	128	66	99
#19	A 73	109	56	84
#20	B 95	142	73	109
#21	A 80	120	62	93
#22	B 104	156	80	120

BAR SIZE CLASS	f'c = 4500 psi			
	TOP BARS CASE 1	CASE 2	OTHER BARS CASE 1	CASE 2
#3	A 18	27	14	21
#4	B 23	34	18	27
#5	A 24	45	18	27
#6	B 31	46	24	35
#7	A 29	44	23	34
#8	B 38	57	26	44
#9	A 35	53	27	41
#10	B 46	68	35	53
#11	A 51	77	40	59
#12	B 59	88	45	68
#13	A 57	84	44	64
#14	B 66	99	51	76
#15	A 66	99	51	76
#16	B 76	114	59	88
#17	A 66	99	51	76
#18	B 85	128	66	99
#19	A 73	109	56	84
#20	B 95	142	73	109
#21	A 80	120	62	93
#22	B 104	156	80	120

6 STEPPED FOOTING (IN CONCRETE) NOT TO SCALE

BAR SIZE CLASS	f'c = 4500 psi			
	TOP BARS CASE 1	CASE 2	OTHER BARS CASE 1	CASE 2
#3	A 18	27	14	21
#4	B 23	34	18	27
#5	A 24	45	18	27
#6	B 31	46	24	35
#7	A 29	44	23	34
#8	B 38	57	26	44
#9	A 35	53	27	41
#10	B 46	68	35	53
#11	A 51	77	40	59
#12	B 59	88	45	68
#13	A 57	84	44	64
#14	B 66	99	51	76
#15	A 66	99	51	76
#16	B 76	114	59	88
#17	A 66	99	51	76
#18	B 85	128	66	99
#19	A 73	109	56	84
#20	B 95	142	73	109
#21	A 80	120	62	93
#22	B 104	156	80	120

BAR SIZE CLASS	f'c = 4500 psi			
	TOP BARS CASE 1	CASE 2	OTHER BARS CASE 1	CASE 2
#3	A 18	27	14	21
#4	B 23	34	18	27
#5	A 24	45	18	27
#6	B 31	46	24	35
#7	A 29	44	23	34
#8	B 38	57	26	44
#9	A 35	53	27	41
#10	B 46	68	35	53
#11	A 51	77	40	59
#12	B 59	88	45	68
#13	A 57	84	44	64
#14	B 66	99	51	76
#15	A 66	99	51	76
#16	B 76	114	59	88
#17	A 66	99	51	76
#18	B 85	128	66	99
#19	A 73	109	56	84
#20	B 95	142	73	109
#21	A 80	120	62	93
#22	B 104	156	80	120

2 BAR BENDS NOT TO SCALE

BAR SIZE CLASS	f'c = 4500 psi			
	TOP BARS CASE 1	CASE 2	OTHER BARS CASE 1	CASE 2
#3	A 18	27	14	21
#4	B 23	34	18	27
#5	A 24	45	18	27
#6	B 31	46	24	35
#7	A 29	44	23	34
#8	B 38	57	26	44
#9	A 35	53	27	41
#10	B 46	68	35	53
#11	A 51	77	40	59
#12	B 59	88	45	68
#13	A 57	84	44	64
#14	B 66	99	51	76
#15	A 66	99	51	76
#16	B 76	114	59	88
#17	A 66	99	51	76
#18	B 85	128	66	99
#19	A 73	109	56	84
#20	B 95	142	73	109
#21	A 80	120	62	93
#22	B 104	156	80	120

BAR SIZE CLASS	f'c = 4500 psi			
	TOP BARS CASE 1	CASE 2	OTHER BARS CASE 1	CASE 2
#3	A 18	27	14	21
#4	B 23	34	18	27
#5	A 24	45	18	27
#6	B 31	46	24	35
#7	A 29	44	23	34
#8	B 38	57	26	44
#9	A 35	53	27	41
#10	B 46	68	35	53
#11	A 51	77	40	59
#12	B 59	88	45	68
#13	A 57	84	44	64
#14	B 66	99	51	76
#15	A 66	99	51	76
#16	B 76	114	59	88
#17	A 66	99	51	76
#18	B 85	128	66	99
#19	A 73	109	56	84
#20	B 95	142	73	109
#21	A 80	120	62	93
#22	B 104	156	80	120

5 CONCRETE ST

[illegible]

A/F:

CONSTRUCTION MGMT:		DATE:
PROJECT MANAGER:		
COORDINATOR:		
BUILDING DEPARTMENT:		
CODE COMPLIANCE:		
AHERA REVIEW:		

ASBESTOS WORK IS:
REQUIRED ☐ NOT REQUIRED ☐

MPID: 0013529

CLARK COUNTY SCHOOL DISTRICT
CONSTRUCTION MANAGEMENT DEPARTMENT 1180 MILITARY TRIBUTE PL HENDERSON NV 89074 PHONE: 702-795-8710

PROJECT: **JOHN W. BONNER E.S. ADDITION**

DRAWING TITLE:
DETAIL SHEETS SHEET 3 OF 3

FACILITY: JOHN W. BONNER E.S. - LOCATION 309

SHEET NO:

C6.03

SHEET 10 OF 10



CONSTRUCTION NOTES:

- ALL CONSTRUCTION TO BE DONE IN ACCORDANCE WITH CLARK COUNTY AREA UNIFORM STANDARD DRAWINGS (C.C.A.U.S.D.) LATEST EDITION AND/OR REGULATING ENTITY HAVING JURISDICTION.
- NOT ALL NOTES USED ON THIS SHEET -
- 1] CONSTRUCT AC PAVEMENT PER DETAIL 2 ON C6.01.
 - 2] CONSTRUCT "A" TYPE CURB PER DETAIL 1 ON C6.01.
 - 3] CONSTRUCT "L" TYPE CURB PER CCAUSD No. 216.
 - 4] CONSTRUCT CONC. SIDEWALK PER CCAUSD No. 234. REFER TO ARCH. PLANS FOR FINISHING SPECIFICATIONS.
 - 5] CONSTRUCT 2" VALLEY GUTTER PER DETAIL 3 ON C6.01.
 - 6] CONSTRUCT "U" CHANNEL PER DETAIL 6 ON C6.01.
 - 7] CONSTRUCT SIDEWALK UNDER DRAIN PER CCAUSD No. 236.
 - 8] CONSTRUCT HANDICAP RAMP CASE 1 PER CCAUSD No. 235. A=8", B=8".
 - 9] SAWCUT AND MATCH EXISTING.
 - 10] FENCE PER ARCHITECTURAL PLANS.
 - 11] PLAYGROUND PER ARCHITECTURAL PLANS.
 - 12] CONSTRUCT CONC. SIDEWALK PER DETAIL 8 ON C6.01. REFER TO ARCH. PLANS FOR FINISHING SPECIFICATIONS.
 - 13] CONSTRUCT CONC. PAD UNDER STAIRS PER DETAIL 5 ON SHEET C6.01.
 - 14] CONSTRUCT SIDEWALK PER CCAUSD No. 503, 500.4, AND 500.5.
 - 15] TRENCH, BACKFILL, AND AC RESTORATION CCAUSD No. 503, 500.4, AND 500.5.
 - 16] CONSTRUCT 3" VALLEY GUTTER PER DETAIL 10 ON C6.01.
 - 17] PLAYGROUND EQUIPMENT TO BE REMOVED AND REPLACED AFTER GRADING.
 - 18] CONSTRUCT RETAINING WALL PER STRUCTURAL DETAILS.

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

TYPICAL GRADING AWAY FROM BUILDING

CUT	FILL
3025 CY	1816 CY

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

EXISTING UTILITY NOTE:

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

FLOOD ZONE NOTE:

THE PROJECT SITE IS COVERED BY THE FLOOD INSURANCE RATE MAP (FIRM) FOR THE CLARK COUNTY AND INCORPORATED AREAS, NEVADA, COMMUNITY PANEL NUMBER: 32003C2150E, EFFECTIVE DATE: SEPTEMBER 27, 2002. THE SITE FALLS WITHIN ZONE "X", DESCRIBED BY FEMA AS: AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

GRADING NOTES:

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 ROUGH GRADING PLANS. ADDITIONALLY, STRUCTURE BACKFILL 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, PROJECT No. 304190001.

NORTH PAVEMENT AREA

A.P.N.:
137-25-310-002

SAFETY ALERT

Before You Overhead
1-702-227-2929

NOTE: 1 Inch = 30 ft.

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

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

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	100W HPS STREETLIGHTS	150W HPS STREETLIGHTS
	PROPERTY LINE	SAWCUT LINE	EXISTING:	---(2210)---								(12.34) BC		⑥	⑥ = SANITARY SEWER ⑦ = STORM DRAIN ⑧ = ELECTRICAL ⑨ = TELEPHONE								
	ROW LINE	SCARP LINE	PROPOSED:	---(2122)---								(12.34) BC		⑥									

REVISIONS:

REV.	DESCRIPTION:	DATE:

SEAL:

GUY M. MORRIS
EXP. 12-31-19
CIVIL
No. 14528
PER OR: 9950927, 00886

DATE: 08/07/18
DRAWN BY: NMG
SUBMITTAL: BID SET
A/E PROJECT NO.: 171058

3883 Howard Hughes Pkwy
Suite 650
Las Vegas NV 89169
Tel: 702.893.2800
Fax: 702.893.2805

Gensler

CONSULTANT:

Lochsa Engineering
6446 South Jones Blvd.
Suite 100
Las Vegas, NV 89118
Phone (702) 365-9512
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: **JOHN W. BONNER E.S. ADDITION**

DRAWING TITLE: **GRADING PLANS SHEET 1 OF 1**

FACILITY: **JOHN W. BONNER E.S. - LOCATION 309**

SHEET NO.: **C4.01**
SHEET 5 OF 10