

DS #: 4838

APN: 138.22.102.002

PROJECT: Highgate Senior Living

SUBMITTAL: 1st Submittal

SCANNED BY/DATE:

CHECKED BY/DATE:



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		November 18, 2016
TO: Land Development Services Department of Building & Safety		FROM: Albert Sung, P.E.  Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	COPIES TO:
	Highgate Senior Living	Collins Engineers, Inc.
Cross Streets:	SEQ of Lake Mead Boulevard and Rock Springs	Buron, Inc.
File Number:	F:\Depot\DSMemos\DS4838A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	138-22-702-002	
Zoning Action:	SDR-65235; SUP-60376; ZON-60375	
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES X NO	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1 st Submittal	10/31/2016	11/18/2016	See Comments Below	\$400.00	463379 : \$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.

1. The project proposes to construct facilities and/or increase flows within *Nevada Department of Transportation* (NDOT) right-of-way. The engineer must contact NDOT for encroachment permit for the proposed project.
2. The following finish floors do not meet the Regional Flood Control District minimum criteria of twice the Q_{100} depth of flow up to 18-inches above the water surface (CCRFCD Manual Section 304.4.E.1) or 6-inch minimum above the highest adjacent top of curb (CCRFCD Manual Section 1602 304.4.E.1).
3. Revise finish floor elevations to be minimum of 8-inch above the highpoint of the onsite swale adjacent to the proposed buildings.
4. Check the velocity head for the "REF1" of 100-year flow of 67-cfs heading toward the proposed site to verify that no additional flow enters the site.
5. Provide an explanation and/or supporting calculation on how the basin "OND3" drains through the existing NDOT sound barrier wall. Is there an existing wall opening in the NDOT sound barrier wall?
6. Is the proposed 12-inch NYLOPLAST drop inlet calculation includes 50-percent clogging factor?

7. Provide an overflow opening for the proposed drop inlets along the east and northern boundary walls.
8. Label Document Number or Book and Page Number for all existing easements on the grading plan.
9. Provide a detail for the proposed drop inlet and manhole on the plan.
10. Provide a detail on how the proposed 18-inch RCP ties into the proposed wall openings.
11. Label CLV drawing number for the existing storm drain in Rock Springs.
12. Label right-of-way width, street name, and drainage study compliance note in the grading plan.

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

END OF REMARKS

ays

T/R/S: T20S/R60E/22
AREA L-22



Technical Drainage Study for Highgate Senior Living

APN 138-22-702-002

October 2016

Prepared for:

Buron Inc.
1177 W Hastings Street, Suite 2133
Vancouver, BC V6E 2K3
Contact: Dianne Grover
Phone: (604) 687-2280

Prepared by:

COLLINS
ENGINEERS INC.

3130 S. Durango Drive, Suite 404
Las Vegas, Nevada 89117
702.248.8000 • www.collinsengr.com

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HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: **Highgate Senior Living** Date: **10/25/2016**
 Location of Development: a) Descriptive (Cross Streets) North/South: **Rock Springs**
 East/West: **Lake Mead Boulevard**
 b) Section: **22** Township: **20 South** Range: **60 East**
 C) APN: **138-22-702-002**

Name of Owner : **Buron Inc.**

Telephone Number: **(604) 687-2280** Fax No: Email Address:
 Address: **1177 W Hastings Street, Suite 2133**
Vancouver, BC V6E 2K3

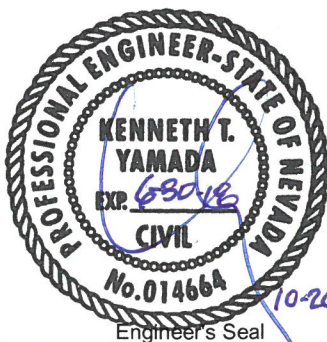
Contact Person Name: **Kenneth Yamada (P.E.)** Telephone Number: **(702) 248-8000**
 * Email Address Kyamada@collinsengr.com Fax Number: **(702) 248-8070**

Firm: **Collins Engineers, Inc.**
 Address: **3130 South Durango Dr., Suite 404, Las Vegas, Nevada 89117**

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	X	Building Permit		

- Total Owned Land Area: At Site: **± 5.62 Ac** Being Developed: **± 5.62 Ac**
- Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No
- Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No
- Proposed type of development (Residential, Commercial, Etc.)? **Residential**
- Approximate upstream land area which drains to the subject site? **0 ± Ac**
- Has the site drainage been evaluated in the past? Yes ☒ No ☐
 IF Yes, Please identify documentation:
IN-N-Out Burger Lake Mead Boulevard and Rock Springs Drive, DS 1100.
- If known, please briefly identify the proposed discharge point(s) of runoff from the site:
 Site area drains towards east to the public Right-Of-Way (138-22-799-003)
- Briefly describe your proposed schedule for the subject project: **As Soon As Possible**



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

*New Required Field

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

	Revision	Date
Local Entity File No.		

REFERENCE: Collins Engineers Project No. 9754

STANDARD FORM 1



October 25, 2016

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

**Subject: Technical Drainage Study for Highgate Senior Living
Collins Engineers Project No. 9754**

Dear Mr. Sung:

Enclosed please find one (1) copy of the Technical Drainage Study and a CD (An electronic copy of the Study) for the Highgate Senior Living Development which consists of $\pm$ 122,500 sq. ft. living area with 6 buildings and two entrance from Rock Springs Drive.

The proposed residential development is located south of Lake Mead Boulevard and east of Rock Springs Drive which is located in the City of Las Vegas, Clark County, NV.

The following study shows the proposed development is in compliance with City of Las Vegas and Clark County Regional Flood Control criteria.

If you have any questions or additional information is needed, please feel free to contact our office.

Respectfully,

A blue ink signature of Said A. Mohammed, featuring a stylized, cursive script.

Said A. Mohammed, P.E., CFM, Ph.D.
Sr. Project Engineer
Collins Engineers

A blue ink signature of Kenneth Yamada, featuring a stylized, cursive script.

Kenneth Yamada, P.E.
Sr. Project Manager
Collins Engineers

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

		Map ID: Kenneth Yamada	
Firm Name: Collins Engineers		Engineer: Kenneth Yamada, P.E.	
Address: 3130 South Durango Drive, Suite 404			
City: Las Vegas		State: NV	Zip: 89117
Phone Number: (702) 248-8000		Fax Number: (702) 248-8070	
Property Owner: Buron Inc.		Contact: (604) 687-2280	
1177 W Hastings Street Suite 2133.			
Vancouver		State: BC	Zip: V6E 2K3
		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 (HC&DDM). 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 REQUIREMENTS			
<u>Yes</u>	<u>No</u>		
X		Design Manual Standard Form 1 with the engineer's seal and signature.	
X		Design Manual Standard Form 4 .	
X		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.	
REFERENCE:			STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS

YES

NO

- | | |
|---|--|
| X | A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. |
| X | A copy of the current CCRFCD Master Plan Update Figure, for Flood Control Facilities and Environmental areas with the site delineated. |
| X | Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs. |
| X | 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. |
| X | Vicinity Map with local and major cross streets identified and a north arrow. |

III. DRAINAGE PLAN

YES

NO

- | | |
|---|---|
| X | Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada |
| X | Minimum scale: 1"=100' |
| X | Project Name. |
| X | Vicinity Map with local and major cross streets. |
| X | Revision box. |
| X | North arrow and bar scale. |
| X | Engineer's /consultants address and phone number. |
| X | Elevation datum and benchmark. |
| X | Legend for symbols and abbreviations. |
| X | Cut/fill scarps, where applicable. |
| X | Street names, grades, widths. |
| X | Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. |
| X | Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate. |

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

<u>YES</u>	<u>NO</u>	
X		Minimum finished floor elevations with top-of-curb elevations at upstream end of lot.
X		Proposed typical street sections.
	N/A	Streets with offset crowns.
X		Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
X		Property lines.
X		Right-of-way lines and widths, existing and proposed.
X		Existing improvements and their elevations.
X		Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
X		Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
X		Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
X		Location and cross-section of street capacity calculations.
X		Cross-sectional detail for channels, including cutoff wall locations.
X		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.
X		Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
X		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.
X		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.
X		Building and/or lot numbers.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

YES

NO

- | | |
|-----|--|
| N/A | Alignment of all existing, proposed, or future Regional Facilities adjacent to the site. |
| N/A | Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information. |
| 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. N/A |
| X | 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. |
| X | Street slopes for perimeters 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

- | | |
|-----|---|
| X | Appropriate soil information for existing and future conditions. |
| X | 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. |
| X | 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. |
| X | Use of correct precipitation values in and around the McCarran Airport rainfall area. |
| X | A discussion in the text of the hydrologic analysis justifying sub-basin boundaries and cutoffs, supporting assumptions, and calculations. |
| X | A summary table of Stormwater flows showing basin area, Q ₁₀ and Q ₁₀₀ for both individual basins and combined basin flows, where applicable. |
| X | Copies of supporting technical information referenced from a previously approved study and a statement accepting these results. |
| X | On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent owners in accordance with current Nevada Drainage Law. |
| N/A | Calculations for impervious area for parking lots and LIDs (if required) |

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

YES

NO

N/A Flow split calculations and supporting documentation or reference for the method of flow split calculations used.

X Normal depth street flow calculations and cross section diagrams for all interior and perimeter street. Provide “d x v” products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} \text{ d x v} \leq 8$. $Q_{10} \text{ d x v} \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.

X 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.

X Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)

N/A Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, super elevation and tee intersection losses, where appropriate.

X Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.

N/A A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. N/A

- 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 this report.

X Provide a 50 percent clogging factor in the capacity calculations for drop inlets.

X Hydraulic calculations for culverts and storm drains. D-load calculations must be provided for storm drain pipes in public right-of-way, including headwater pool inundation.

X The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.

N/A Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2



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 (CCRFCDD) 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 CCRFCDD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCDD 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.)
	X	Copies of all conditions of approval for development related to this property. (E.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
X		An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file. Said _____ by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

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

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.
X		All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X		Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
X		Back of lot elevations and lot drainage pattern for all lots including common lots.
	X	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
	N/A	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	
X		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.
X		Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir Calculation.
	N/A	The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
X		Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
X		Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater?

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.



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
MAYOR

STEVEN D. ROSS
MAYOR PRO TEM

LOIS TARKANIAN

RICKI Y. BARLOW

STAVROS S. ANTHONY

BOB COFFIN

BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

July 26, 2016

Buron Inc.
2133-1177 W. Hasting Street
Vancouver, BC V6E 2K3

**RE: SDR-65235 [PRJ-64657] – ADMINISTRATIVE SITE DEVELOPMENT
PLAN REVIEW
ADMINISTRATIVE CYCLE – JULY 2016**

Dear Applicant:

Your request for a Minor Amendment of an approved Site Development Plan Review (SDR-60377) FOR A PROPOSED 29-UNIT CONVALESCENT CARE FACILITY/NURSING HOME, 62-UNIT ASSISTED LIVING APARTMENT AND 10-UNIT SENIOR CITIZEN APARTMENT DEVELOPMENT WITH A TOTAL OF 133 BEDS, INCLUDING REVISED ELEVATIONS on 5.62 acres on the east side of Rock Springs Drive, approximately 630 feet south of Lake Mead Boulevard (APN 138-22-702-002), R-3 (Medium Density Residential) Zone, Ward 1 (Tarkanian) [PRJ-64657], has been considered administratively by the Department of Planning staff.

The Department of Planning has administratively **APPROVED** your request subject to the following:

Planning

1. Conformance to the Conditions of Approval for Site Development Plan Review (SDR-60377) shall be required, except as amended herein.
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 06/20/16, 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.

CITY OF LAS VEGAS
DEPARTMENT OF PLANNING
DEVELOPMENT SERVICES CENTER
333 NORTH RANCHO DRIVE
3RD FLOOR
LAS VEGAS, NEVADA 89106

VOICE 702.229.6301

FAX 702.474.0352

TTY 7-1-1

www.lasvegasnevada.gov



/city of las vegas

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. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

Public Works

8. The egress only gate shall be located at a location acceptable to the City Traffic Engineer in order to minimize wrong way traffic prior to approval of construction drawing for this site.
9. Comply with all applicable conditions of approval for SDR-60377 and any other site related actions.

This action by the Department of Planning staff on July 26, 2016 is final unless a written appeal is filed with the Director of the Department of Planning within ten days of the date of this letter.

Sincerely,

A handwritten signature in black ink, appearing to read 'Steve Gebeke', with a long horizontal line extending to the right.

Steve Gebeke, AICP
Planning Supervisor
Case Planning Division

SG:nl



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
MAYOR

STEVEN D. ROSS
MAYOR PRO TEM

LOIS TARKANIAN
RICKI Y. BARLOW
STAVROS S. ANTHONY
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

October 22, 2015

Mr. Renaldo M. Tiberti
Rock Springs Commercial LLC
7155 South Rainbow Boulevard, Suite #200
Las Vegas, Nevada 89118

**RE: ZON-60375 [PRJ-60251] - REZONING RELATED TO SUP-60376 AND
SDR-60377
CITY COUNCIL MEETING OF OCTOBER 21, 2015**

Dear Mr. Tiberti:

The City Council at a regular meeting held on October 21, 2015 **APPROVED** a request for a Rezoning FROM: U (UNDEVELOPED) [M (MEDIUM DENSITY RESIDENTIAL) GENERAL PLAN DESIGNATION] TO: R-3 (MEDIUM DENSITY RESIDENTIAL) on 5.62 acres on the east side of Rock Springs Drive, approximately 630 feet south of Lake Mead Boulevard (APN 138-22-702-002), Ward 1 (Tarkanian) [PRJ-60251].

The Notice of Final Action was filed with the Las Vegas City Clerk on October 22, 2015.

Sincerely,

Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Ms. Dianne Grover
Buron Inc.
1177 West Hasting Street, Suite #2133
Vancouver, British Columbia V751L9
Canada

CITY OF LAS VEGAS
DEPARTMENT OF PLANNING
DEVELOPMENT SERVICES CENTER
333 NORTH RANCHO DRIVE
3RD FLOOR
LAS VEGAS, NEVADA 89106

VOICE 702.229.6301
FAX 702.474.7463
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www.lasvegasnevada.gov



/city of las vegas

2014 WINNER OF THE U.S. CONFERENCE OF MAYORS CLIMATE PROTECTION AWARD



**LAS VEGAS
CITY COUNCIL**

CAROLYN G. GOODMAN
MAYOR

STEVEN D. ROSS
MAYOR PRO TEM

LOIS TARKANIAN
RICKI Y. BARLOW
STAVROS S. ANTHONY
BOB COFFIN
BOB BEERS

ELIZABETH N. FRETWELL
CITY MANAGER

October 22, 2015

Mr. Renaldo M. Tiberti
Rock Springs Commercial, LLC
7155 South Rainbow Boulevard, Suite #200
Las Vegas, Nevada 89118

**RE: SUP-60376 [PRJ-60251] - SPECIAL USE PERMIT RELATED TO ZON-
60375 AND SDR-60377
CITY COUNCIL MEETING OF OCTOBER 21, 2015**

Dear Mr. Tiberti:

The City Council at a regular meeting held on October 21, 2015 **APPROVED** a request for a Special Use Permit FOR A PROPOSED 117-BED CONVALESCENT CARE FACILITY/NURSING HOME on the east side of Rock Springs Drive, approximately 630 feet south of Lake Mead Boulevard (APN 138-22-702-002), U (UNDEVELOPED)[M (Medium Density Residential) General Land Use designation)] [PROPOSED: R-3 (Medium Density Residential)], Ward 1 (Tarkanian) [PRJ-60251].

This approval is subject to the following conditions:

Planning

1. Approval of and conformance to the Conditions of Approval for Rezoning (ZON-60375) and Site Development Plan Review (SDR-60377) shall be required.
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 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.
4. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit, as well as submitted as part of any business license application.

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333 NORTH RANCHO DRIVE
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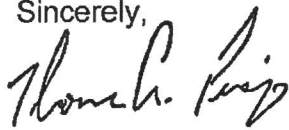
2014 WINNER OF THE U.S. CONFERENCE OF MAYORS CLIMATE PROTECTION AWARD

Mr. Renaldo M. Tiberti
Rock Springs Commercial LLC
SUP-60376 [PRJ-60251] - Page Two
October 22, 2015

5. All City Code requirements and design standards of all City departments must be satisfied, except as modified herein.

The Notice of Final Action was filed with the Las Vegas City Clerk on October 22, 2015.

Sincerely,



Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Ms. Dianne Grover
Buron Inc.
1177 West Hasting Street, Suite #2133
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/city of las vegas

October 22, 2015

Mr. Renaldo M. Tiberti
Rock Springs Commercial, LLC
7155 South Rainbow Boulevard, Suite #200
Las Vegas, Nevada 89118

**RE: SDR-60377 [PRJ-60251] - SITE DEVELOPMENT PLAN REVIEW
RELATED TO ZON-60375 AND SUP-60376
CITY COUNCIL MEETING OF OCTOBER 21, 2015**

Dear Mr. Tiberti:

The City Council at a regular meeting held on October 21, 2015 **APPROVED** a request for a Site Development Plan Review FOR A PROPOSED 117-BED CONVALESCENT CARE FACILITY/NURSING HOME on 5.62 acres on the east side of Rock Springs Drive, approximately 630 feet south of Lake Mead Boulevard (APN 138-22-702-002), U (UNDEVELOPED)[M (Medium Density Residential) General Land Use designation] [PROPOSED: R-3 (Medium Density Residential)], Ward 1 (Tarkanian) [PRJ-60251].

This approval is subject to the following conditions:

Planning

1. Approval of and conformance to the Conditions of Approval for Rezoning (ZON-60375) and Special Use Permit (SUP-60376) 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 07/23/15, 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. An Exception is hereby approved to allow no trees in the east perimeter landscape buffer area where an existing sewer easement is located.

6. These Conditions of Approval shall be affixed to the cover sheet of any plan set submitted for building permit.
7. The minimum distance between buildings shall be ten feet.
8. 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.
9. 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.
10. A Comprehensive Construction Staging Plan shall be submitted to the Department of Planning for review and approval prior to the issuance of any building permits. The ~~Construction Staging Plan shall include the following information:~~ Design and location of construction trailer(s); design and location of construction fencing; all proposed temporary construction signage; location of materials staging area; and the location and design of parking for all construction workers.
11. Prior to or at the time of submittal for any building permit, the applicant shall provide written verification by the FAA and/or the Clark County Department of Aviation of the following:
 - a. Applicant is required to file a valid FAA Form 7460-1, "Notice of Proposed Construction or Alteration" with the FAA, in accordance with 14 CFR Part 77, or submit to the Clark County Director of Aviation a "Property Owner's Shielding Determination Statement" and request written concurrence from the Clark County Department of Aviation;
 - b. No Building Permit or other construction permit shall be issued for any structure greater than 35 feet above the surface of land that, based upon the FAA's 7460 airspace determination (the outcome of filing the FAA Form 7460-1) would (a) constitute a hazard to air navigation, (b) would result in an increase to minimum flight altitudes during any phase of flight (unless approved by the Department of Aviation), or (c) would otherwise be determined to pose a significant adverse impact on airport or aircraft operations.
 - c. Applicant is advised that FAA's airspace determinations are dependent on petitions by any interested party and the height that will not present a hazard as determined by the FAA may change based on these comments.
 - d. Applicant is advised that the FAA's airspace determinations include expiration dates and that the separate airspace determinations will be needed for construction cranes or other temporary equipment.

Mr. Renaldo M. Tiberti
Rock Springs Commercial, LLC
SDR-60377 [PRJ-60251] - Page Three
October 22, 2015

12. Prior to the submittal of a building permit application, the applicant shall meet with Department of Planning staff to develop a comprehensive address plan for the subject site. A copy of the approved address plan shall be submitted with any future building permit applications related to the site.
13. deleted
14. All City Code requirements and design standards of all City Departments must be satisfied, except as modified herein.

Public Works

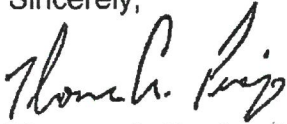
15. Construct all half-street improvements on Rock Springs Drive meeting current City Standards to match existing improvements to the north and south concurrent with on site development activities. The proposed curb line shall align with the existing improvements to the north and south.
16. Install a cross walk across Rock Springs Drive near the north end of this site at a location acceptable to the Traffic Engineer concurrent with on-site development activities.
17. The northern driveway shall be egress only. Coordinate specific requirements for signage and gating for the northern driveway with the City Traffic Engineer prior to approval of construction drawings for this site. Comply with the recommendations of the Traffic Engineer.
18. Landscape and maintain all unimproved rights-of-way adjacent to this site. All landscaping and private improvements installed with this project shall be situated and maintained so as to not create sight visibility obstructions for vehicular traffic at all development access drives and abutting street intersections.
19. Submit an Encroachment Agreement for landscaping and private improvements, if any, in the Rock Springs Drive public right-of-way prior to the issuance of permits for these improvements. The applicant must carry an insurance policy for the term of the Encroachment Agreement and add the City of Las Vegas as an additionally insured entity on this insurance policy. If requested by the City, the applicant shall remove property encroaching in the public right- of way at the applicant's expense pursuant to the terms of the City's Encroachment Agreement. The installation and maintenance of all private improvements in the public right of way shall be the responsibility of the adjacent property owner(s) and shall be transferred with the sale of the property for the entire term of the Encroachment Agreement. Coordinate all requirements for the Encroachment Agreement with the Land Development Section of the Department of Building and Safety (229-4836).

Mr. Renaldo M. Tiberti
Rock Springs Commercial, LLC
SDR-60377 [PRJ-60251] - Page Four
October 22, 2015

20. A Drainage Plan and Technical Drainage Study must be submitted to and approved by the Department of Public Works prior to the issuance of any building or grading permits or submittal of any construction drawings, whichever may occur first. Provide and improve all drainageways recommended in the approved drainage plan/study. The developer of this site shall be responsible to construct such neighborhood or local drainage facility improvements as are recommended by the City of Las Vegas Neighborhood Drainage Studies and approved Drainage Plan/Study concurrent with development of this site.

The Notice of Final Action was filed with the Las Vegas City Clerk on October 22, 2015.

Sincerely,



Thomas A. Perrigo
Director
Department of Planning

TAP:clb

cc: Ms. Dianne Grover
Buron Inc.
1177 West Hasting Street, Suite #2133
Vancouver, British Columbia V751L9
Canada

The first part of the paper discusses the importance of the study of the history of the English language. It is a branch of linguistics which deals with the changes in the English language over time. The study of the history of the English language is important for several reasons. First, it helps us to understand the development of the English language and the factors which have influenced its development. Second, it helps us to understand the relationship between the English language and other languages. Third, it helps us to understand the cultural and social context in which the English language has developed.

The second part of the paper discusses the importance of the study of the history of the English language. It is a branch of linguistics which deals with the changes in the English language over time. The study of the history of the English language is important for several reasons. First, it helps us to understand the development of the English language and the factors which have influenced its development. Second, it helps us to understand the relationship between the English language and other languages. Third, it helps us to understand the cultural and social context in which the English language has developed.

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I. GENERAL DESCRIPTION

A. Study Overview And Purpose

This study has been prepared as the Technical Drainage Study for Highgate Senior Living Development. The current development consists of ± 122,500 sq. ft. living area with one main building and five villas (Building B to F). The facility has two entrance from Rock Springs Drive.

This study was conducted in accordance with the criteria set forth by the Clark County Regional Flood Control District (CCRFCDD) Hydrologic Criteria and Drainage Design Manual (Criteria Manual), adopted August 1999, by WRC Engineering (updated by Montgomery Watson) and revised September 12, 2013.

The following tasks were performed in the preparation of this report:

- Review of the Approved Technical Drainage Study in the vicinity of the site.
- Identification of the Federal Emergency Management Agency (FEMA) Flood Plain designation for the project site,
- Identification of known, existing or planned Clark County Regional Flood Control District (CCRFCDD) or local drainage facilities that affect or are affected by the site and,
- Estimation of runoff generated within and around the project site for the 10 and 100-year storm events to set the finished floor elevation of the proposed building and design storm drain facilities.

The purpose of this analysis is to obtain an approved drainage study to allow development of the site.

B. Site Description and Location

The proposed Highgate Senior Living development is located on the Southwest corner of US 95 and Lake Mead Boulevard. The site bordered on the west by partially developed Rock Springs Drive, on the north by fully developed commercial Development (APN: 138-22-701-005), on the south by Multifamily Residential Development (APN: 138-22-802-001), and on the east by South Ramp of US 95 (NDOT Right-Of-Way APN: 138-22-799-003)

The project site is the portion of Northeast Quarter (NE ¼) of the Southeast Quarter (SE1/4) of Section 22, Township 20 South, Range 60 East, M.D.M, City of Las Vegas, and Clark County, Nevada. The properties Assessor's Parcel Map Number is 138-22-702-002. For more information, see Figure 1(Assessor's Parcel Map) and Figure 2 (Vicinity Map) in Appendix A.

C. Master Planning Information

Figures 3 and 4 are the reproductions of the Clark County Regional Flood Control District 2013 Las Vegas Valley Flood Control Master Plan Update F-25. Per these figures, there is no existing or proposed Clark County Regional Flood Control Facility adjacent to the site property. East of US 95, there is an existing CCRFCDD Facility (LVLM 0255). However, the site does not discharge directly to this facility.

Figure 7 to 9 are the reproductions of the City-Wide Hydrology Analysis Figures H9 and F9. Per these figures northeast of the site there is an existing 24" RCP (Facility OKG 211), and on the

southeast side of the property, there is an existing 2"10'x4' RCB (Facility OKG210). Figures 3, 4, 7, 8 and 9 are included in Appendix A.

D. FEMA Floodplain Information

Figure 5 is a reproduction of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for Clark County, Nevada, Community Panel Number 32003C2155F effective November 16, 2011. Figure 5 shows that the site is located within unshaded Flood Zone "X". Unshaded Flood Zone "X" is defined by FEMA as an area outside the 500-year floodplain. Figure 5 is included in Appendix A.

E. Previous Drainage Study

The following approved drainage studies were reviewed in the preparation of this technical drainage study.

- IN-N-Out Burger Lake Mead Boulevard and Rock Springs Drive, DS 1100, which was prepared by Martin & Martin, July 8, 1993, and approved by the City of Las Vegas on January 11, 1994.
- Hydrology Study for James E. McMillan Elementary School, DS 458, which was prepared by Arturo Cambeiro & Associates, LTD, and approved by the City of Las Vegas on April 18, 1989.

Collins Engineers has reviewed the Martin & Martin and Arturo Cabeiro & Associate studies and concurs with and accepts the analyses as presented in these approved drainage studies. Refer to specific cited and highlighted sections of these studies in Appendix D.

II. HYDROLOGIC PARAMETERS

The SCS Unit Hydrograph Methodology in conjunction with the HEC-1 Flood Hydrograph Package, from the US Army Corps of Engineers, was used to determine the peak runoff generated by the 10-year and 100-year, 6-hour storm events. Parameters used in the HEC- 1 analyses are described in the following paragraphs (refer to HEC-1 output data in Appendix B.)

A. Precipitation

Figure 513 of the Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual (Manual) shows that the property is located within the McCarran Airport Rainfall Area. The 6-Hour, 10-year and 100-year Storm event rainfall depths were obtained from Table 505 of the Manual. The values referenced are 1.58 inches and 2.77 inches for 10 and 100-Year storm events respectively. The six-hour depth-area reduction factor of 1.00 is accepted based on the site area which is less than 0.5 square miles. The 10-year/100-year precipitation depth ratio, for the HEC-1 analysis, is calculated and accepted as 0.57 (see Precipitation Depth Calculation, Appendix B).

The Rainfall Calculation Table for the final precipitation values and referenced materials are included in Appendix B.

B. Soil Classification

The soil information for the study area was determined from the 2008 Las Vegas Valley Flood Control Master Plan Update (Hydrologic Sub-Areas, Land Use & Soils) H-25 (Figure 6 included in Appendix A). Using the type of soil indicated on the map, the site is accepted as hydronic soil type "D".

According to the Web Soils Survey (WSS) map, the proposed site is located on the soil type 152, Cave gravelly fine sandy loam, 0 to 4 percent slopes. A negligible of an area on the corner of the public Right-Of-Way is located on soil type C. since the area is negligible, the CN is accepted by the Soil type D.

Per the Soil Survey of Las Vegas Area Table 15, soil type 152 is also classified as Hydrologic Soil group "B". The Web Soil Survey Map and Table 15 are included in Appendix B.

In existing conditions, the project site is undeveloped vacant land with poor hydrologic conditions (less than 30% covered with desert shrub-major plants include saltbush ...). Per the Manual (Table 602, sheet 4 of 4) a curve number 88 is used for existing condition HEC-1 calculation.

In the develop condition, the Highgate Senior Living development is considered as a multifamily residential development. For developed condition HEC-1 calculation, per the manual Table 602A, a curve number 93 is used. The curve number summary table is included in Appendix B.

C. Time of Concentration and Lag Time

Calculations for Time of Concentrations were performed per section 602 of the HCDDM for basins less than one square mile. The methodology was developed by the Federal Aviation Administration (FAA1970) and is outlined as follows:

$$T_c = t_i + t_t$$

$$TLAG = 0.60 * t_c / 60 \text{ (hr.)} - \text{Lag time used in HEC1 model}$$

In which t_c = Time of Concentration (min)
 t_i = Initial, Inlet, or Overland Flow Time (min)
 t_t = Travel Time in the Ditch, Gutter, Storm Sewer, etc. (min)

The initial overland flow time is calculated as follows:

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

Where K = flow resistance factor
 L_o = overland flow length
 L = length of channel (etc.)
 S = average slope of basin (%)

For SCS & TR55 unit hydrographic Methods

$$K = 0.0132(CN) - 0.39$$

Where: CN = SCS runoff curve number
 $t_t = L/60V$ (min)

V = average channel velocity (ft. /sec)

Velocity determination for time of concentration

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

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

Where: V = Average Velocity (fps)

S = Average Slope (ft./ft.)

N = Manning's Roughness Coefficient

R = Hydraulic Radius (ft.)

P = Wetted Perimeter (ft.)

A = Area of Flow (sq. ft.)

Two sets of coefficients were determined, one for developed conditions and the other for undeveloped conditions. For the first developed-conditions velocity (V_1), the appropriate coefficient ($C=20.2$) represents street flow with $n = 0.016$ and a depth of flow in the gutter of 0.3 feet. For the second developed-conditions velocity (V_2), the appropriate coefficient ($C=30.6$) represents curb height street flow. As may be noted, V_2 is approximately equal to 1.5 times V_1 . Typically, drainage areas are delineated such that the channelized flow considered in the calculations of travel times is within streets and other minor watercourses and does not include significant lengths of major improvement floodway and channels in the travel distance for the time of concentration. For the first undeveloped conditions velocity (V_1), the appropriate coefficient ($C = 14.8$) represents wide channel flow with $D = 0.25'$ and $n = 0.04$. For the second undeveloped conditions velocity (V_2), the appropriate coefficient ($C = 29.4$) represents wide channel flow with a depth of 0.7 feet and $n = 0.04$.

For urbanized basins, the time of concentration should not exceed the time of concentration calculated by the following equation.

$$t_c = L/180 + 10$$

Where: L = Watershed Length (ft.)

Additionally, the minimum t_c for urbanized areas is 5 minutes.

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

The Standard Form 4 for Existing and Developed conditions are included in Appendix B.

III. HYDROLOGY

A. Hydrologic Methodology and Criteria

The U.S. Army Corps of Engineers HEC-1 Flood Hydrograph Package was used to determine the peak runoff values generated by the 10 and 100-Year, 6-hour storm events. The HEC-1 input and output values for the existing and developed condition are included in Appendix B.

B. Existing Drainage Condition

The following description refers to Figure 10, Existing Condition Drainage Basin Map which is included in Appendix A.

The existing on-site and off-site drainage basins were determined from the available aerial topography, GISMO, and field investigation. Based on the topography and surrounding property conditions.

The site area and the public property which is located on the southeast side of the site and the sound barrier wall are considered as three basins: The majority area of the site (ONX1), basin ONX2 and ONX3. Sub-basin ONX1 with 4.9 acres generates 4/11 cfs and drains east to the adjacent public-Right-Of-Way property. Basin ONX2 and ONX3 generates 1/2 cfs at their concertation basin CP-1.

The off-site flows which are affecting Rock Springs Drive are taken from the approved reference studies. The southern portion of James E. McMillan Elementary School (property APN: 138-22-701-004) drains towards the south and east (towards Walt Lott Drive and Rock Springs Drive).

As shown in the approved study (Ref 10), the area west of Rock Springs Drive and north of Vegas Drive drains towards Rock Springs Right-Of-Way. This area includes the existing Woofter Family Park, Edythe/Lloyd Katz Elementary School property, and Walt Lott Drive from Leaning Pine Way to Rock Springs Drive (There is a high point east of Leaning Pine Way on Walt Lott Drive west of the high point drains north along Leaning Pine Way). Flows which are generated by this area prorated from basin OS6 of Ref. 10 (see Figure 10 for prorated flows).

On the west side of Rock Springs Drive, there is two (2) 10-foot Type A drop inlets, one on the north side of the Edythe/Lloyd Katz Elementary School entrance and the other is located south of Walt Lott Drive. Per FlowMaster drop inlet capacity calculation with 50% clogging factor, the existing drop inlets do not have the capacity to capture all flow and discharge into the existing 48" RCP.

To analyze the capacity and the amount of flow capture by the existing drop inlets, prorated flows are calculated from the approved study (Ref. 10). Ref. 10 ** with 14.7 acres generates 11/27 cs. From this flow, 50% conveyed by the east side of Rock Springs ROW. From 50% of this flow (4.2 cfs) capture by the ex 10' drop inlet (the south drop inlet). Flow bypass from this drop inlet with the flow generates by Ref. 10* (Q100=12 cfs), flow north towards the existing 10' drop inlet. The north drop inlet capture 6.5 cfs and the rest combined with flow comes from James ES study (Ref.11) and drain toward the north side of Walt Lott Drive.

Per this study (REF 11) area "B" with 5.83 acres generates 5/13 cfs in 10 and 100-year storm events. The same study shows this flow conveys by the existing 48" RCP. However, the existing 3' Type "A" drop inlet at the southeast corner of the school property at the west side of Rock Spring Drive, north of Walt Lott Drive, does not have the capacity to capture this flow. Per the

FlowMaster calculation, 1.6 cfs intercept and 19.1 cfs bypass and drains towards north along Rock Springs Drive.

On the cross section of Walt Lott and Rock Springs, on the east side of Rock Springs, there is one 2' type "A" drop inlet. From flow which carries by the east side of Rock Springs Drive, 1.1cfs intercepted by the existing 2' drop inlet and 19.6 cfs bypasses and drains north along Rock Springs Drive. The total flow on the southwest corner of the site is 38.7 cfs.

The 10-year flow which creates west of the Rock Springs Drive remains on the west half side of Rock Springs Drive. The east half side carries <1 cfs.

In existing condition, this flow partially drains north along Rock Springs Drive partially turns east via the site property to the east, but it does not drain towards the existing 2:10'x4' RCB.

On the other hand, all approved study north of the side including the Inn-N-Out study (Ref. 10) considered there is a grade brake at the center of the site property and south of the grade brake drains south to the existing drop inlet and conveyed by the easing 48" RCP to the east. This information does not reflect reality. Rock Springs Drive slopes south to north and does not have a grade brake (high point) at the site.

The basin area and flow rates during the 10-year and 100-year storm events are included in Table 1 and prorated flow from the approved studies are shown on basin maps (Figure 10).

C. Developed Drainage Condition

The following description refers to Figure 11, Developed Condition Drainage Basin Map which is included in Appendix A:

In developed condition, off-site flows remain the same as in existing condition. The site area is divided into three sub-basins. The northern portion of the site, basin OND1 with 1.8 acres generates 2/5 cfs in 10 and 100-year storm events respectively. The south portion of the site (OND2) with 3.2 acres generates 4/9 cfs. The southeast portion of the site with 0.6 acres drains 1/2 cfs towards southeast via proposed wall opening. The Very negligible area, from the front side of the site property, drains towards Rock Springs Drive and included on STD1. Basin STD1 with 1.0 acres generates 2/3 cfs and drains north towards Lake Mead Boulevard.

The basin areas and flow rates during the 10-year and 100-year storm events are included in Table 1.

D. Future Drainage Condition

Off-site properties which could affect the adjacent street (Rock Springs Drive) drainage condition are fully developed. So, the developed and future conditions off-site, and on-site flows are remaining the same.

IV. HYDRAULIC ANALYSIS

A. Peak Flows

The following Table 1 shows a summary of the runoff generated by each basin determined from the HEC-1 model. The HEC-1 analyses in the existing and developed conditions are included in Appendix B.

Table 1
Peak Flow Summary

Basin	(ac) Area	10-year Flow (cfs)	100-year Flow (cfs)
Existing Condition			
ONX1	4.9	4	11
ONX2	0.7	1	2
ONX3	0.3	<1	1
STX1	0.9	1	3
CP-1		1	2
Developed Condition			
OND1	1.8	2	5
OND2	3.2	4	9
OND3	0.6	1	2
STD1	1.0	2	3

B. Flow Depth Analysis

The Flow Master V8i computer program was utilized to determine the maximum velocity and depth for the on-site and off-site Street flows. Table 2 summarizes the flow depth analysis for the 10-year and 100-year storm events for the hydraulic sections shown in Figure 8. Copies of the flow depth calculations are included in Appendix C.

Table 2
Flow Depth Analysis

Hydraulic	Street	Slope	Q ₁₀₀	D ₁₀₀	V ₁₀₀	VD ₁₀₀	Q ₁₀	D ₁₀	V ₁₀	VD ₁₀
Section	Width (ft.)	%	(Cfs.)	(ft.)	(Fps.)		(Cfs.)	(ft.)	(fps)	
FM1	60	0.7	41.7	0.64	3.02	1.93	2.4	0.35	1.89	0.65
FM2	60	1.0	108.7	0.78	4.92	3.84	-	-	-	-
FM3	60	0.7	38.7	0.63	2.92	1.84	0.4	0.21	1.40	0.29

The IN-N-Out study (REF 10) was assumed that Rock Springs Drive has a grade break. The recent survey verification shows that Rock Springs sloped from the south towards Lake Mead Boulevard. By the same study was calculated that 67 cfs drains from the west towards Rock Springs Road and was calculated at the southwest corner of the REF. 10 property (northwest of this site) $d_{100}=0.68'$. Since the slope assumption was wrong, the flow is revised to 108.7 cfs and the depth $d_{100} = 0.78'$. However, the flow depth change is minor (0.1') and does not affect the property which is located north of this site.

C. Storm Drain Capacity Analysis

The site proposed 6 buildings. Building B to F are located on the south side of the site and assigned different elevations. The finished floor elevation of Building A, the main building which covers the majority area of the site, is set at 2366.00'. The site grading is required local storm drain facilities to maintain the existing condition flow pattern.

Flow generated by onsite basin OND1 ($Q_{100} = 5$ cfs) will be captured by the proposed Nyloplast 12" grate inlets (CB #2 and 4) and Jensen Type Catch Basins (CB #1 and 3) and discharged into proposed wall opening #1.

Flow generated by onsite basin OND2 ($Q_{100} = 9$ cfs) will be captured by the proposed Nyloplast 12" grate inlet (CB #6) and 24x24 Jensen Type Catch Basins (CB #5, 7, 8 and 9) and discharged in to proposed wall opening #2.

The majority of the basin OND2 area drains towards Catch Basin #7 (24"x24" Jensen Type droop inlet). The drop inlet is located on the landscaping area and captures 5 cfs and discharges towards the east adjacent property. Catch basin #4 and 6 capture 0.5 and 0.4 cfs and drain toward catch basin #5. At the bottom of Catch basin #5 a total of 2 cfs discharges towards the adjacent property.

The capacities of the proposed storm drains system (the South and the North branch) are checked by WSPG Model. The input and output results are included in Appendix C.

Flow which is generated by onsite basin OND3 drains towards southeast via the proposed wall opening #3.

Prorated flow table for the proposed catch basins based on the area, the capacity of the proposed catch basin and pipes are included in Appendix C.

D. Onsite Parking Lot Storm Water Treatment

The Highgate Senior Living Development is considered as a multifamily residential development. Per the manual section 1502.1, BMPs are not required.

V. SUMMARY

A. Conclusion

As detailed in this study, the Highgate Senior Living development is in compliance with the CCRFCD HC&DDM.

- Runoff from the project site continues to flow in accordance with the natural historical drainage patterns to the east adjacent property.
- The proposed building finished floor elevations are set below the TC elevation on Rock Springs Drive. An 18" berm or a flood wall above the adjacent TC elevation is proposed to protect the site.
- In all perimeter of the building, water drains away the proposed building.
- Both driveways are humped > 6" above the 100-year flow depth at FM1.
- Onsite flow drains as in existing condition towards the adjacent property.
- The site is located adjacent to the NDOT property, upon approval by the city of Las Vegas, the study will be submitted to the NDOT for concurrence.
- Off-site properties drain the same pattern as in historical condition, and the proposed improvement does not affect this flow pattern.
- The development is considered as a multifamily residential and no BMP requirement.

A. References

- 1 Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual, Adopted August 1999, WRC Engineering (updated by Montgomery Watson). Revised September 12, 2013
- 2 Clark County Regional Flood Control District Website, <http://www.ccrfcd.org>
- 3 2013 and 2008 Clark County Regional Flood Control District Flood Control Master Plan Update, PBS&J, G.C. Wallace and Louis Berger Group.
- 4 HEC-1 Flood Hydrograph Package Version 4.1, June 1998, U.S. Army Corps of Engineers.
- 5 Flood Insurance Rate Map Number 32003C2155F, map revised November 16, 2011, Federal Emergency Management Agency.
- 6 Federal Emergency Management Agency Website,
https://msc.fema.gov/webapp/wcs/stores/servlet/info?storeId=10001&catalogId=10001&langId=-1&content=firnetteHelp_A&title=FIRMettes
- 7 Web soil survey website,
<http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- 8 FlowMaster Version V8i, 2009, Bentley Systems, Inc.
- 9 Soil Survey of Las Vegas Area, Nevada part of Clark County, by US Department of Agriculture Soil conservation Service, July 1985.
- 10 IN-N-Out Burger Lake Mead Boulevard and Rock Springs Drive, DS 1100, which was prepared by Martin & Martin, July 8, 1993, and approved by the City of Las Vegas on January 11, 1994.
- 11 Hydrology Study for James E. McMillan Elementary School, DS 458, which was prepared by Arturo Cambeiro & Associates, LTD, and approved by the City of Las Vegas on April 18, 1989.

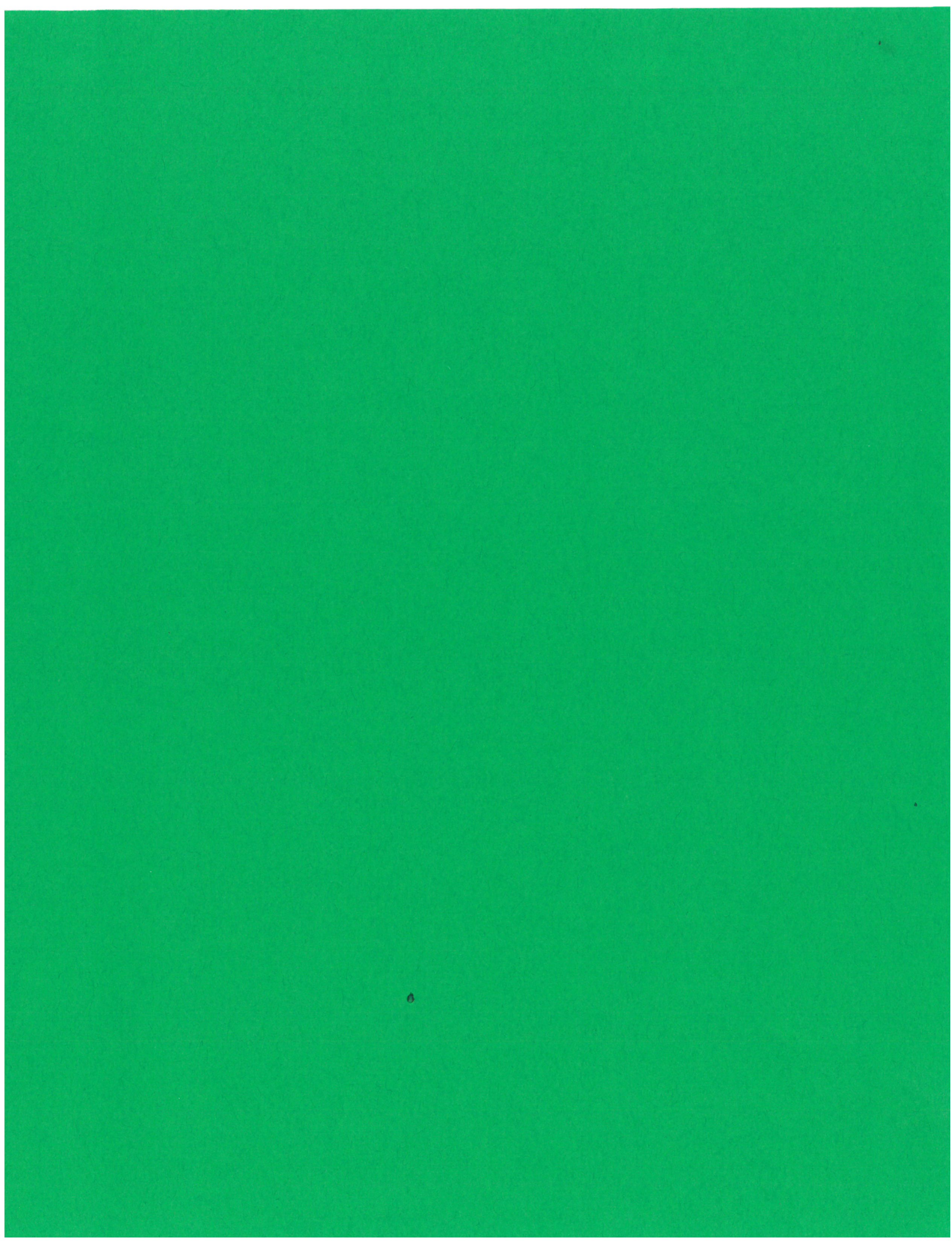


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- Storm Drain Capacity Analysis (WSPG Model In-Put and Out-Put)

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- IN-N-Out Burger Lake Mead Boulevard and Rock Springs Drive, DS 1100, which was prepared by Martin & Martin, July 8, 1993, and approved by the City of Las Vegas on January 11, 1994.
- Hydrology Study for James E. McMillan Elementary School, DS 458, which was prepared by Arturo Cambeiro & Associates, LTD, and approved by the City of Las Vegas on April 18, 1989.

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- General Notes Sheet
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APPENDIX A
(Figures)

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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.

0100200400600800

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

MAP LEGEND

—

PARCEL BOUNDARY

—

SUB BOUNDARY

—

PM/LD BOUNDARY

—

ROAD EASEMENT

—

MATCH / LEADER LINE

—

HISTORIC LOT LINE

—

HISTORIC SUB BOUNDARY

—

HISTORIC PM/LD BOUNDARY

—

SECTION LINE

CONDOMINIUM UNIT

AIR SPACE PCL

RIGHT OF WAY PCL

SUB-SURFACE PCL

001

ROAD PARCEL NUMBER

001

PARCEL NUMBER

1.00

ACREAGE

202

PARCEL SUB/SEQ NUMBER

PB 24-45

PLAT RECORDING NUMBER

5

BLOCK NUMBER

5

LOT NUMBER

GL5

GOV. LOT NUMBER

BOOK

T20S R60E

SEC.

22

MAP

N 2 SE 4

138-22-7

126125124

137138139

164163162

654321

789101112

1314151617

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313233343536

8484

5151

6262

7373

8484

5151

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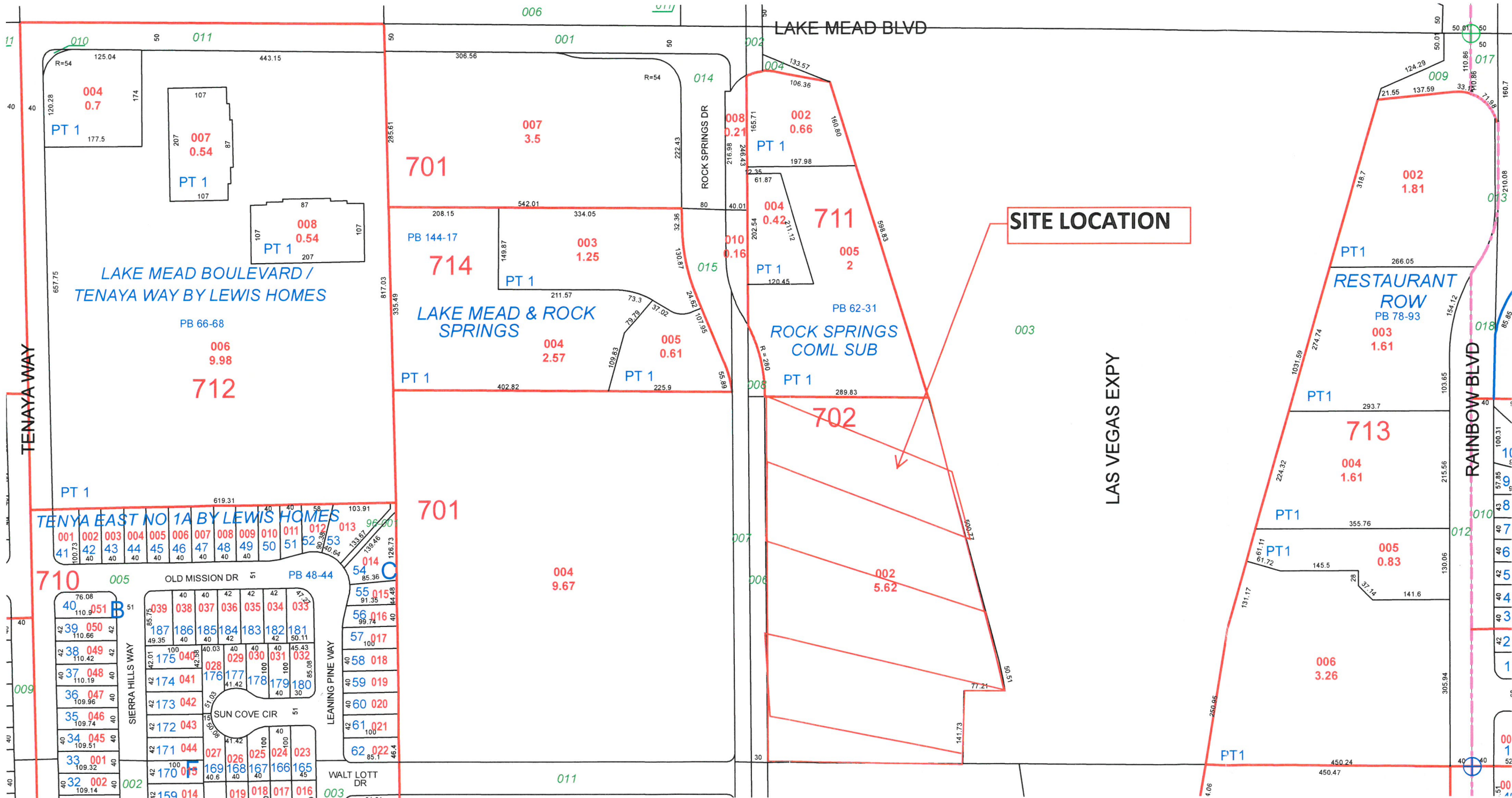
Rev: 8/19/2015

CLARK COUNTY

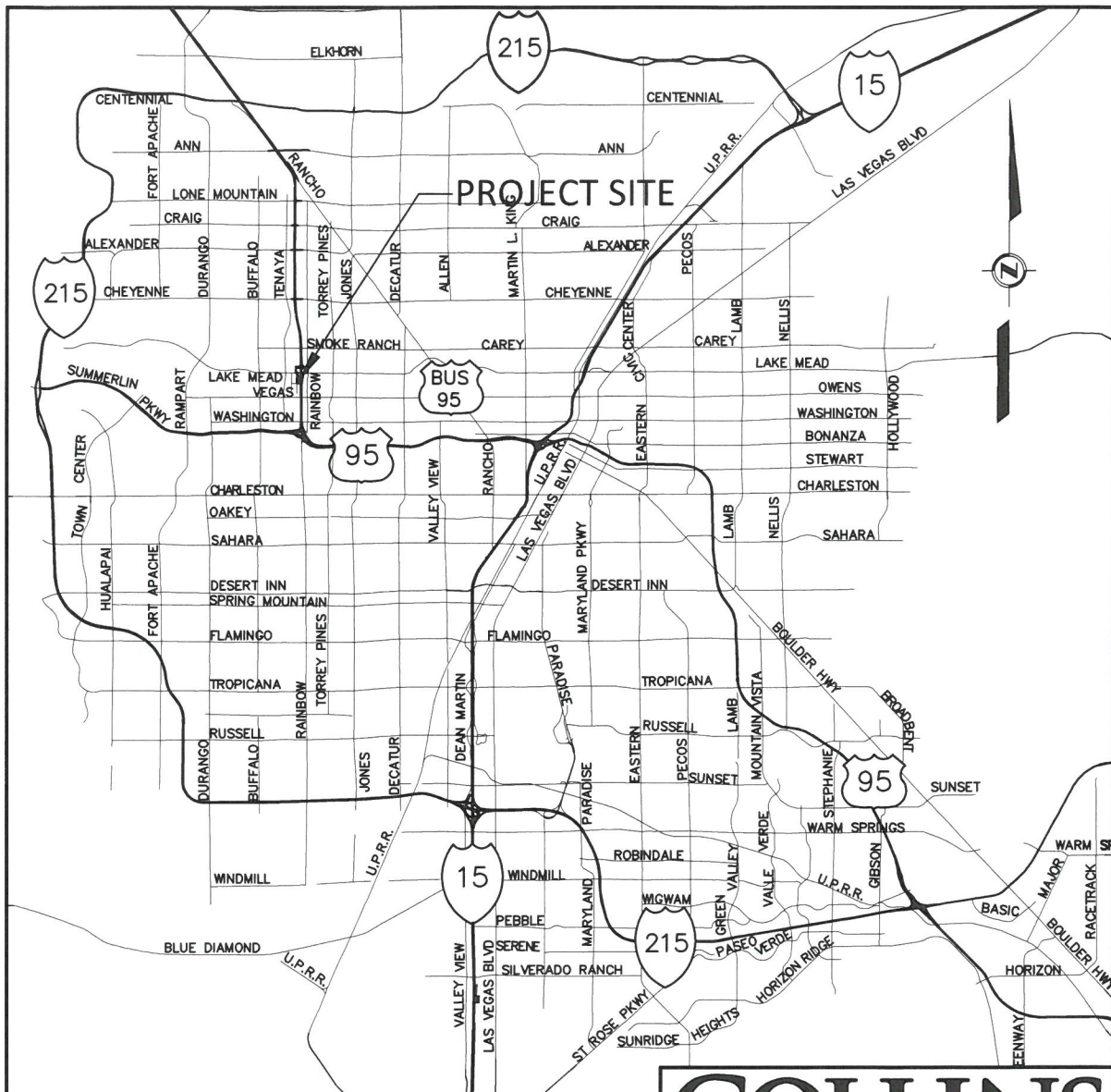
ASSESSOR

MAPPING DIVISION

NEVADA



TAX DIST 200
FIGURE 1



COLLINS ENGINEERS^{PC}

3130 S. DURANGO DR., SUITE 404
LAS VEGAS, NV 89117
PHONE: (702) 248-8000
FAX: (702) 248-8070

www.collinsengr.com

VICINITY MAP

DATE: 07/20/16
MAP NTS

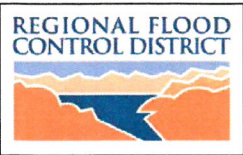
FIG 2

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APMD 0000	E	ANGEL PARK - MIDDLE BRANCH						
0027	E	Natural Wash	940	6048	C11A-3*	ALLGOW4	11.31	2.90
0030	E	1: 12' X 10' and 2: 12' X 2' RCBC @ Canyon Run	170	6048	C11A-3*	ALLGOW4	11.31	3.00
0132	E	Natural Wash	7000	6048	C11A-3*	ALLGOW4	11.31	3.00
	E	2: 12'X10' RCBC @ Hualapai	120	6048	C11A-3*	ALLGOW4	11.31	1.00
APNO 0001	E	ANGEL PARK NORTH						
0002	E	1,512 ac-ft Angel Park Detention Basin		9199	ANGLPKIN	ALLGOW5	21.99	
0004	E	2: 33" & 1: 42" RCP Emergency Outlet	190	406	ANGLPKDB	ALLGOW5	21.99	
0005	E	14' X 12' RCB Connector Pipe under Summerlin Pkwy	380	9199	ANGLPKIN	ALLGOW5	21.99	1.00
0012	E	Natural Wash	1559	7988	CC3B-2B*	GW3SC	7.68	2.00
0013	E	3: 12' X 10' RCBC @ Rampart	232	7988	CC3B-2B*	GW3SC	7.68	1.00
0015	E	Natural Wash	1283	7988	CC3B-2B	GW3SC	7.68	1.40
	E	Two Span Bridge 28' W 14'D @ Summerlin Pkwy	236	7988	CC3B-2B	GW3SC	7.68	1.00
APOF 0000	E	ANGEL PARK OUTFALL						
0015	E	66" RCP	1297	728	CGD34AC	GW3SC	0.65	1.90
0124	E	60" RCP	5472	454	CGD34AB	ALLGOW5	22.25	2.20
	E	54" RCP Outlet	810	406	ANGLPKDB	ALLGOW5	21.99	2.50
APSP 0000	E	ANGEL PARK - SUMMERLIN PARKWAY						
0001	E	Concrete Chute Drop	103	7988	CC3B-2B	GW3SC	7.68	3.00
0002	E	Unlined Chnl with Gabion Drops 20'W Depth Varies 2:1 SS	3924	2746	C3B-2B	ALLGOW3	2.67	3.00
0066	E	Unlined Chnl with Gabion Drops 50'W 3:1 SS	1424	2746	C3B-2B	ALLGOW3	2.67	3.50
0069	E	5: 8' X 4' RCBC @ Town Center Dr.	200	1697	C8B-2	ALLGOW3	1.56	2.40
0133	E	Conc Chnl 10'W 6'D 2:1 SS	3195	1697	C8B-2	ALLGOW3	1.56	2.40
0135	E	3: 9'X4' RCBC @ Crestdale	180	1173	C8B-1	ALLGOW3	1.14	2.33
	E	Conc Chnl 10'W 6'D 2:1 SS	2030	1173	C8B-1	ALLGOW3	1.14	2.40
GO02 0000	E	GOWAN SOUTH FACILITIES (CHEYENNE CHANNEL)						
0010	E	Free Span Bridge 34'W 9.25'D @ Ronemus	100	4978	C16-C	ALLGOW3	7.09	0.50
0015	E	Conc Chnl 30'W 9'D 0:1 SS	600	4978	C16-C	ALLGOW3	7.09	0.50
0018	E	Free Span Bridge 31'W 7.25'D @ Buffalo	102	4978	C16-C	ALLGOW3	7.09	1.40
0020	E	Conc Chnl 30'W 9'D 0:1 SS	250	4978	C16-C	ALLGOW3	7.09	1.50
0028	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	1000	4978	C16-C	ALLGOW3	7.09	1.50
0029	E	Free Span Bridge 35'W 7'D @ Soft Breezes	72	4800	CC7-C	ALLGOW3	6.78	2.20
0084	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	2700	4800	CC7-C	ALLGOW3	6.78	1.50
0085	E	Free Span Bridge 35'W 7'D @ Soaring Gulls	95	4657	CCB-C	ALLGOW3	6.07	1.30
0111	E	Conc Chnl 10'W 7.25'D 1.5:1 SS	1240	4657	CCB-C	ALLGOW3	6.07	1.50
0112	E	Free Span Bridge 35'W 7'D @ Rampart	127	4657	CCB-C	ALLGOW3	6.07	2.90
0257	E	Conc Chnl 10'W 7'D 1.5:1 SS	7640	4225	CC-C	ALLGOW3	5.42	2.30
	E	Conc Chnl 10'W 6.75'D 1.5:1 SS	4293	2577	CCJ-C	ALLGOW3	2.97	4.10
GO95 0000	P1	GOWAN OUTFALL - U.S. 95 CHANNEL						
	P1	Conc Chnl 12'W 4'D 2:1 SS	2640	299	GD17BG-C	ALLGOW3	0.36	0.30
GODU 0000	E	GOWAN NORTH - DURANGO BRANCH						
0050	E	12' X 6' RCB	2629	1150	CLV14-C	ALLGOW3	1.40	0.91
	E	9' X 6' RCB	865	835	CLV20-C	ALLGOW3	0.97	1.50
GOLB 0000	E	GOWAN LAKE MEAD-BUFFALO						
0025	E	12' X 6' RCB	1294	1071	CCVILL23	ALLGOW3	1.46	1.50
0030	E	10' X 7' RCB	145	1071	CCVILL23	ALLGOW3	1.46	0.50
	E	2: 8' X 4' RCB	408	1071	CCVILL23	ALLGOW3	1.46	0.85
GOLM 0146	E	GOWAN LONE MOUNTAIN SYSTEM						
	E	888 ac-ft Lone Mountain Detention Basin		7252	LMTNIN	GW3SC	6.13	
GONO 0000	E	GOWAN NORTH SYSTEM						
0001	E	8' X 8' RCB Outlet	184	558	GWNNDB	ALLGOW5	68.49	0.51
0006	E	8' X 8' RCB Outlet	156	558	GWNNDB	ALLGOW5	68.49	0.63
0008	E	30,780 cfs PMF Spillway		30780	GWNNDB	ALLGOW5	68.49	
	E	921 ac-ft Gowan North Detention Basin		4937	CCLV43-C*	GW4SC	11.93	
GOOF 0511	E	GOWAN OUTFALL FACILITIES						
0531	E	8' X 5' RCB	8390	699	CPT6B-C	GW3SC	1.08	0.50
0551	E	8' X 5' RCB	1300	558	GWNNDB	ALLGOW5	68.49	0.50
0773	E	72" RCP	524	558	GWNNDB	ALLGOW5	68.49	0.62
0775	E	60" RCP	803	286	LV30-C	ALLGOW3	0.42	1.40
	E	60" RCP	1300	286	LV30-C	ALLGOW3	0.42	1.00
ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
GOSO 0000	E	GOWAN SOUTH FACILITIES						
0050	E	72" RCP Outlet	2303	454	GWNSDB	GW5SC	12.13	0.53
0051	E	39,030 cfs PMF Spillway		39030	GWNSIN	GW5SC	12.13	
0052	E	624 ac-ft Gowan South Detention Basin		5625	GWNSIN	GW5SC	12.13	
0052	P1	Upgrade to 686 ac-ft Gowan South Detention Basin		5625	GWNSIN	GW5SC	12.13	
0068	E	Conc Chnl 15'W 7'D 2:1 SS	380	3796	CBUF01-C	GW3SC	4.88	0.40
0076	E	2: 10' X 7' RCBC @ Peak Dr	80	2119 [^]	CBUF01-C [^]	GW3SC	4.88	0.56
0077	P0	Add 2: 14' X 7' RCBC @ Peak Dr	80	1677 [^]	CBUF01-C [^]	GW3SC	4.88	0.56
0078	E	Conc Chnl 22'W 10'D 0:1 SS	60	3796	CBUF01-C	GW3SC	4.88	0.56
0080	E	Conc Chnl 12'W 7'D 2:1 SS	2078	3796	CBUF01-C	GW3SC	4.88	0.56
0119	E	Conc Chnl 22'W 10'D 0:1 SS	180	3587	CCCIL23	GW3SC	4.52	0.95
0123	E	2: 10' X 7' RCBC @ Smoke Ranch	100	2229 [^]	CCCIL23 [^]	GW3SC	4.52	0.62
0124	P0	Add 2: 10' X 7' RCBC @ Smoke Ranch	100	1358 [^]	CCCIL23 [^]	GW3SC	4.52	0.62
0125	E	Conc Chnl 22'W 9'D 0:1 SS	50	3587	CCCIL23	GW3SC	4.52	0.62
0126	E	Conc Chnl 12'W 7'D 2:1 SS	2155	3587	CCCIL23	GW3SC	4.52	0.62
0170	E	Conc Chnl 12'W 7'D 2:1 SS	220	2657	CCGD34AC	GW3SC	3.06	0.62
0173	E	Conc Chnl 22'W 7'D 0:1 SS	158	2657	CCGD34AC	GW3SC	3.06	0.62
0176	E	2: 10' X 7' RCBC @ Lake Mead	100	2657	CCGD34AC	GW3SC	3.06	0.62
0178	E	Conc Chnl 22'W 7'D 0:1 SS	150	2657	CCGD34AC	GW3SC	3.06	1.00
0181	E	Conc Chnl 12'W 7'D 2:1 SS	2429	2657	CCGD34AC	GW3SC	3.06	0.58
0227	E	2: 10' X 7' RCBC @ Vegas Drive	100	2065	CGD34AA	ALLGOW3	2.41	1.36
0229	E	Conc Chnl 12'W 7'D 1:1 SS	2649	2065	CGD34AA	ALLGOW3	2.41	1.36
0279	E	12' X 7' RCB	80	2065	CGD34AA	ALLGOW3	2.41	1.36
0280	E	12' X 8' RCB	875	2065	CGD34AA	ALLGOW3	2.41	0.34
0297	E	12' X 7' RCB	2124	1825	CW1BB-C	ALLGOW3	2.14	1.60
0336	E	12' X 7' RCB	602	1593	C1-WESTC	ALLGOW3	1.84	3.40
0352	E	2: 8' X 5' RCB	2740	1374	C1-DUCHC	ALLGOW3	1.60	0.73
GOTE 0000	E	GOWAN -TENAYA BRANCH						
	E	60" RCP	1954	272	LV29-C	ALLGOW3	0.28	1.30
GOWC 0000	E	GOWAN SOUTH FACILITIES - WEST CLIFF						
	E	24" RCP	5400	257	1-WEST-C	ALLGOW3	0.24	1.67
LCCH 0438	E	LAS VEGAS CREEK CHANNEL						
0458	E	60" RCP	1090	162	CLC01-C	SW3	1.20	1.60
0478	E	60" RCP	1060	162	CLC01-C	SW3	1.20	1.60
0499	E	60" RCP	1110	162	CLC01-C	SW3	1.20	0.55
0513	E	42" RCP Outlet	660	85	RAINBWDB	SW3	1.11	1.88
0518	E	102 ac-ft Rainbow Detention Basin		970	RAINBWIN	SW3	1.11	
0534	E	60" RCP Connector Pipe Under Rainbow Blvd	670	970	RAINBWIN	SW3	1.11	1.85
0543	E	60" RCP	460	279	AL00A-C	SW3	0.23	5.38
0543	E	Conc Chnl 10'W 4'D 0:1 SS	700	279	AL00A-C	SW3	0.23	1.88
LCLO 0000	P3	LAS VEGAS CREEK - LORENZI						
0008	P3	7' X 6' RCB	445	265	DAL00A	SW3	0.41	3.37
	P3	7' X 6' RCB	2415	265	DAL00A	SW3	0.41	0.40
LVLM 0475	E	LAS VEGAS WASH - LAKE MEAD						
0525	E	48" RCP	2632	235	LM02-C	NW3	0.29	1.24
	E	48" RCP	2600	542	CLM01-C	NW3	0.64	1.24
LVOW 0460	P1	OWENS AVENUE SYSTEM						
	P1	7' X 6' RCB	2700	616	CVG03-C	NW3	0.95	1.48
LVPK 0130	E	PEAK DRIVE SYSTEM						
	E	7' X 5' RCB	1435	400	CPD01-C	NW3	0.67	0.61
LVSR 0496	P1	LAS VEGAS WASH - SMOKE RANCH						
0546	P1	10' X 7' RCB	2855	1245	CSR02E	NW3	1.64	1.27
	P1	8' X 8' RCB	2640	758	CSR00A	NW3	1.01	0.57

* 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.

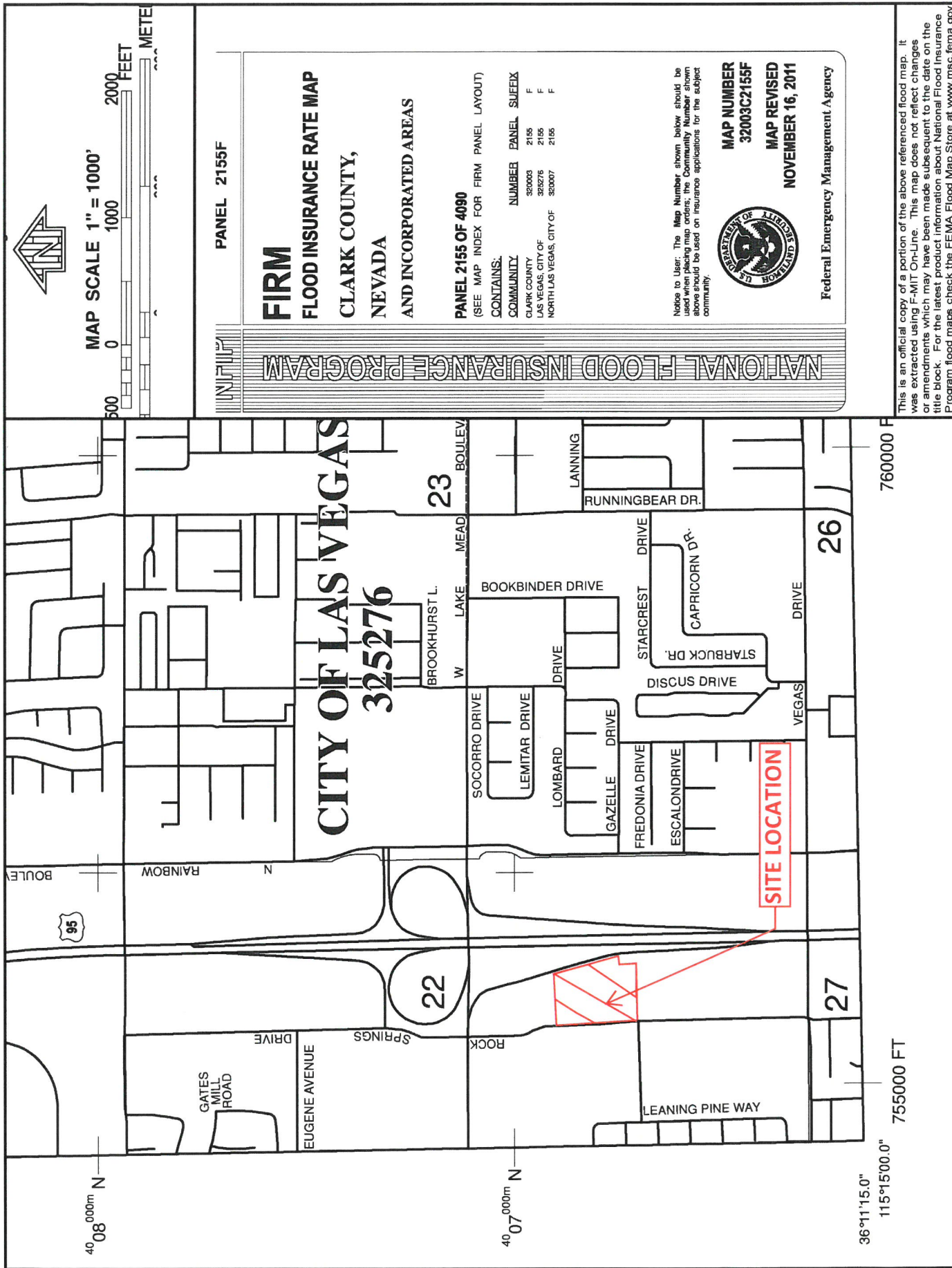
[^] For parallel facilities, the existing facility flow equals its normal depth capacity, and the proposed parallel facility flow equals the remaining flow (i.e., HEC-1 Node flow = existing facility normal depth capacity + proposed parallel facility flow).



2013 LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE
FACILITY INVENTORY
FIGURE F - 25

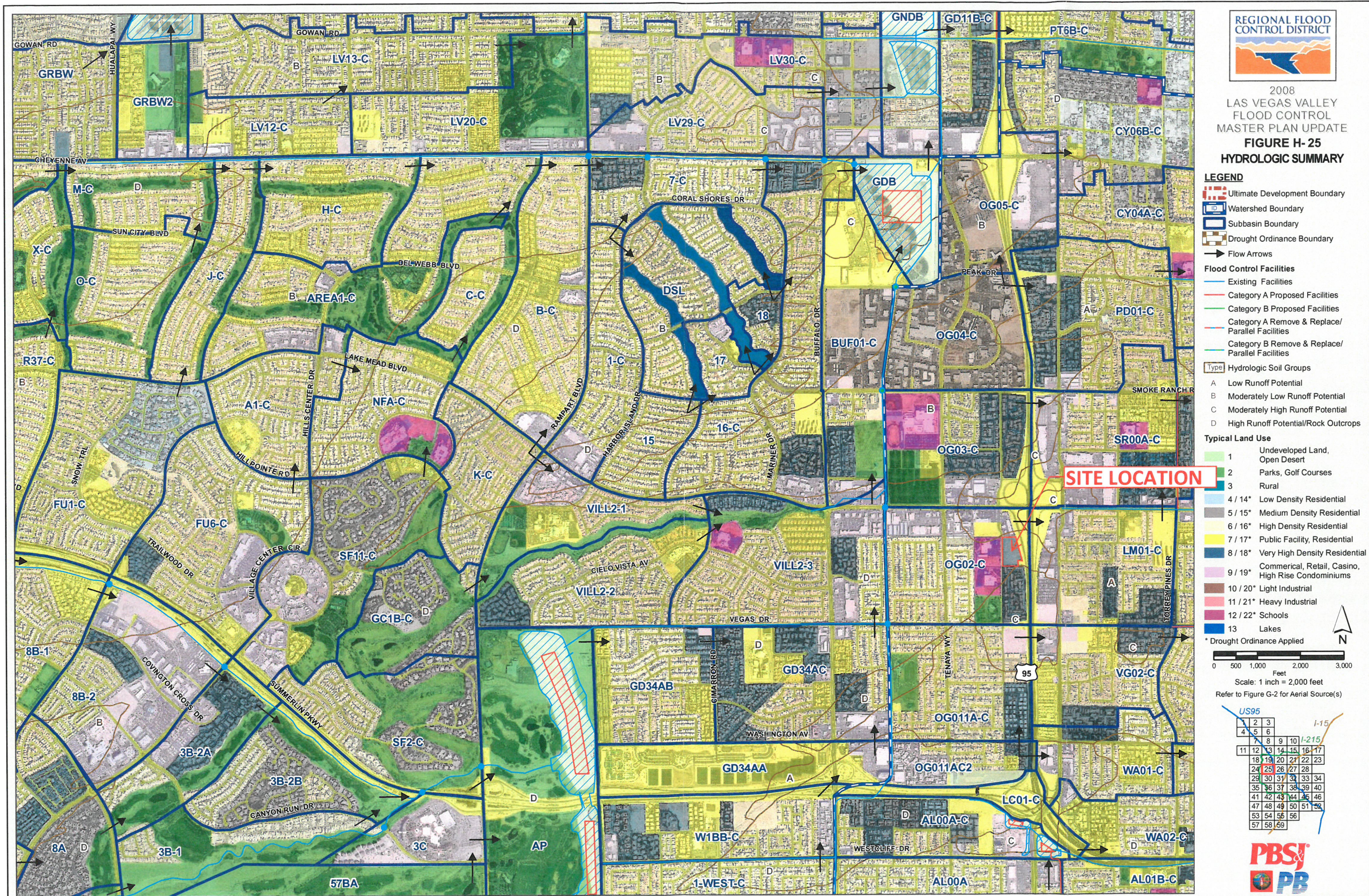
LEGEND	ID (Facility Identifier)	AABB	Existing Facility.....	E	Bottom Width.....W	Construction Features
	Parent Stream Name		Proposed or Modified Facility.....	P		
	Stream Name		Contingency Level			
	River Mile	0000	Category B.....	P0		
	Distance Above Confluence with Parent Stream (Miles)		Master Plan.....	P1		
	Miles in Hundredths		Preliminary Design.....	P2	Side Slope, H:V.....SS	Cast in Place Concrete Pipe..... CIPCP Corrugated Metal Arch Pipe Culvert..... CMAP Corrugated Metal Pipe Culvert..... CMPC High Density Polyethylene..... HDPE Horizontal Elliptical Reinforced Concrete Pipe..... HERCP Reinforced Concrete Arch Pipe..... RCAP
		Design.....	P3	Reinforced Concrete Arch Culvert..... RCAC Reinforced Concrete Box..... RCB Reinforced Concrete Box Culvert..... RCBC Reinforced Concrete Pipe..... RCP Reinforced Concrete Pipe Culvert..... RPCP Storm Sewer Pipe..... SSP		

FIGURE 4



This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

FIGURE 5

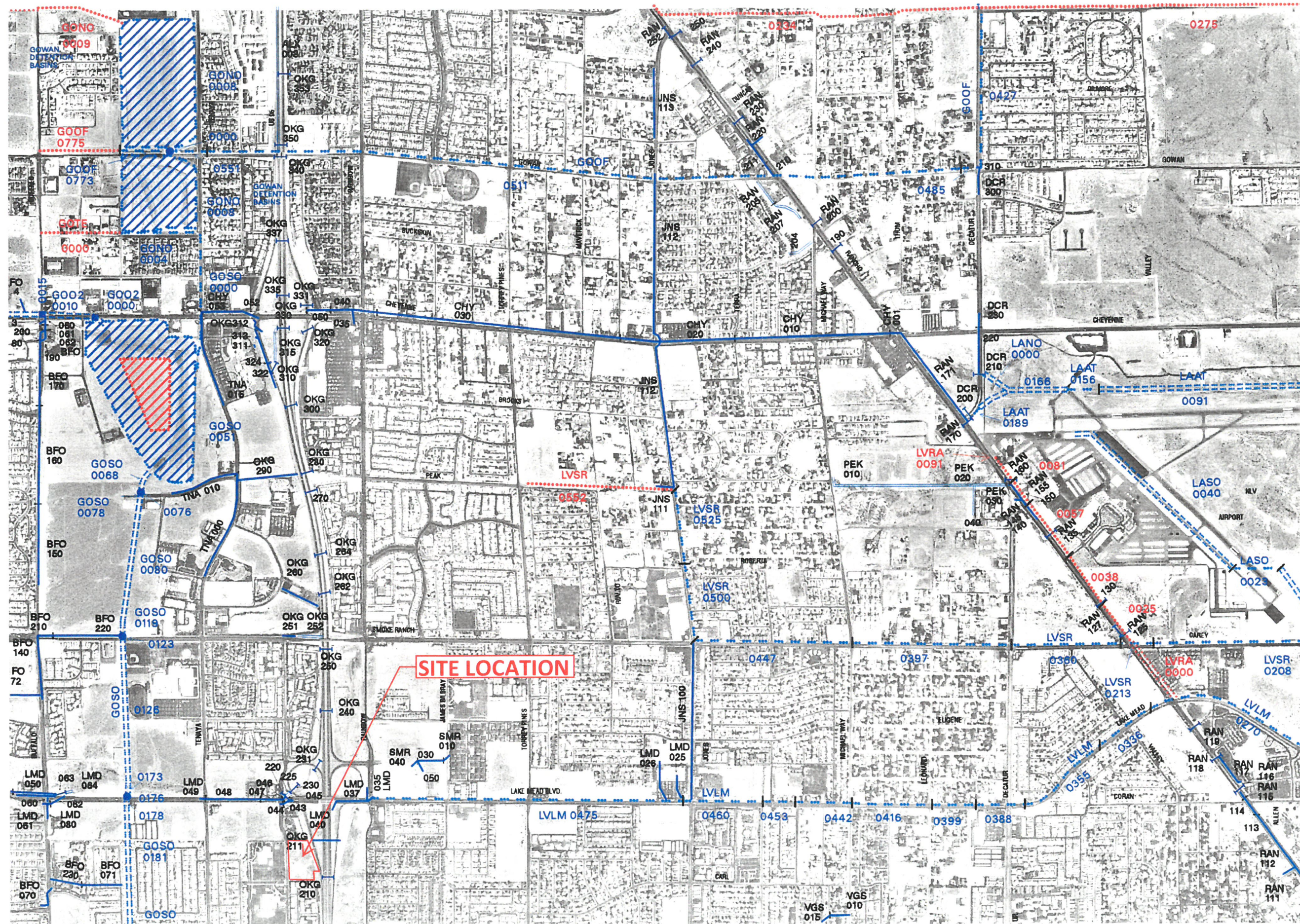


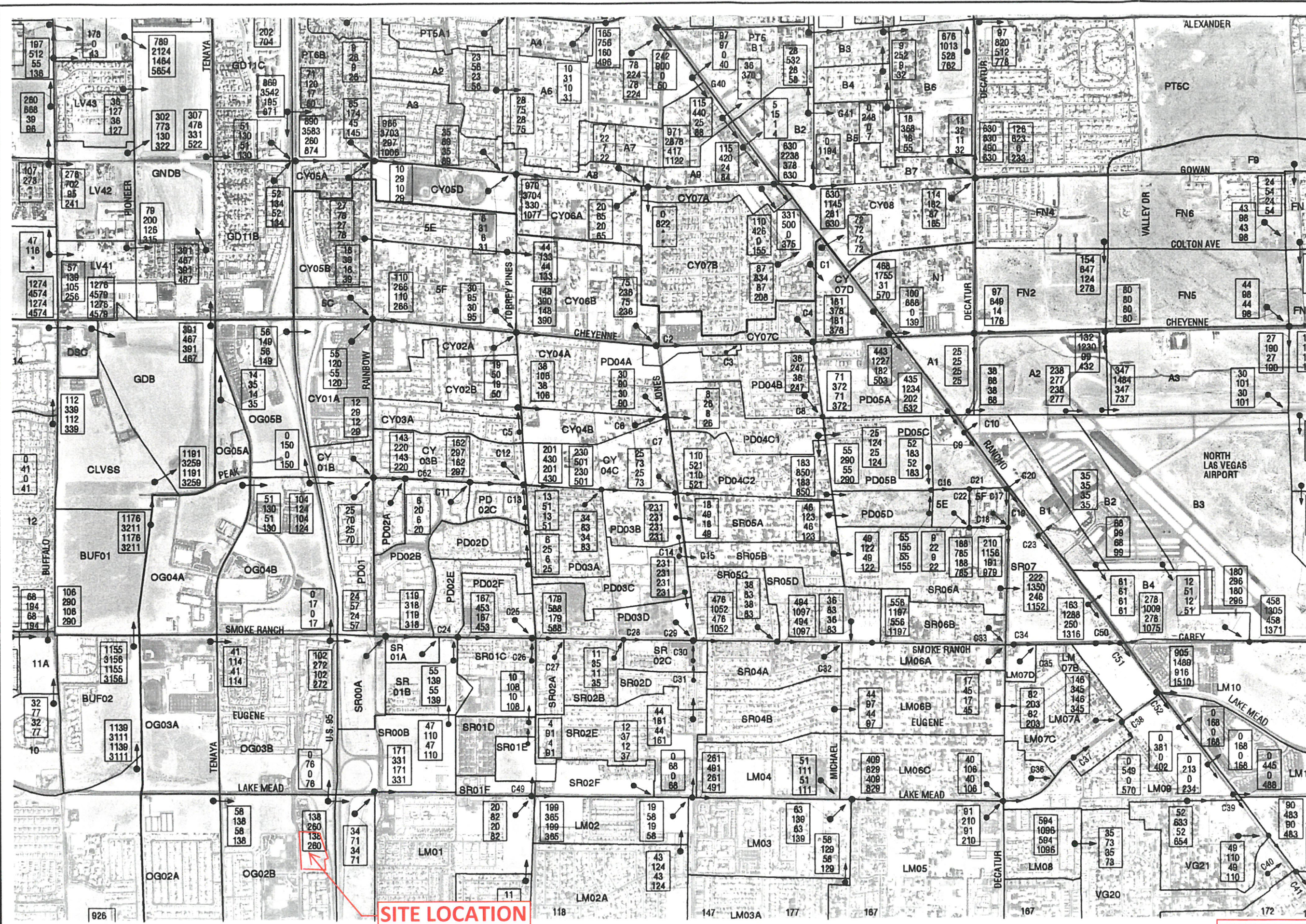


City of Las Vegas
CITY - WIDE HYDROLOGY
ANALYSIS

	EXISTING REGIONAL DETENTION BASIN
	PROPOSED REGIONAL DETENTION BASIN
	EXISTING LOCAL DETENTION BASIN
	EXISTING REGIONAL BRIDGES
	PROPOSED REGIONAL BRIDGES
	EXISTING LOCAL BRIDGES
	EXISTING REGIONAL CULVERT
	PROPOSED REGIONAL CULVERT
	EXISTING LOCAL CULVERT
	EXISTING REGIONAL PIPELINE
	PROPOSED REGIONAL PIPELINE
	EXISTING LOCAL PIPELINE
	EXISTING REGIONAL CHANNEL
	PROPOSED REGIONAL CHANNEL
	EXISTING LOCAL CHANNEL
	EXISTING REGIONAL DIKE/LEEVE
	PROPOSED REGIONAL DIKE/LEEVE
	EXISTING LOCAL DIKE/LEEVE
	EXISTING STORM WATER PUMPING STATION
	PROPOSED BELTWAY ALIGNMENT

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





CITY WIDE HYDROLOGY STUDY UPDATE - 1997

LEGEND

— SUB-BASIN BOUNDARY

• FLOW ARROW

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

(FLOWS IN CFS)

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

1 INCH = 1600 FEET

FIGURE H-9

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

FIGURE 8

PBSJ POST,
BUCKLEY,
SCHUH &
JERNIGAN, INC.

1999 CITY OF LAS VEGAS FLOOD CONTROL FACILITY INVENTORY UPDATE LEGEND

REGIONAL STREAM NAME DESIGNATOR AAB
PARENT STREAM NAME
STREAM NAME

REGIONAL ID / RIVER MILE 0000
DISTANCE ABOVE
CONFLUENCE WITH PARENT STREAM
MILES
TENTHS OF A MILE

LOCAL STREAM NAME DESIGNATOR AAB

LOCAL ID NUMBER 000

EXISTING FACILITY E

PROPOSED OR MODIFIED FACILITY P
CONTINGENCY LEVEL:
MASTER PLAN P1
FACILITY PLAN P2
PRELIMINARY DESIGN P3
DESIGN P4

BOTTOM WIDTH W

DEPTH D

SIDE SLOPE, H:V SS

CORRUGATED METAL PIPE CMP
CULVERT

CORRUGATED METAL ARCH CMAP
PIPE CULVERT

REINFORCED CONCRETE BOX RCB

RCB CULVERT RCBC

REINFORCED CONCRETE PIPE RCP

RCP CULVERT RCPC

REINFORCED CONCRETE ARCH PIPE CULVERT RCACP

GENERAL COMMENT G1

FACILITY SPECIFIC COMMENT S1

PUBLIC DRAINAGE EASEMENT PDE

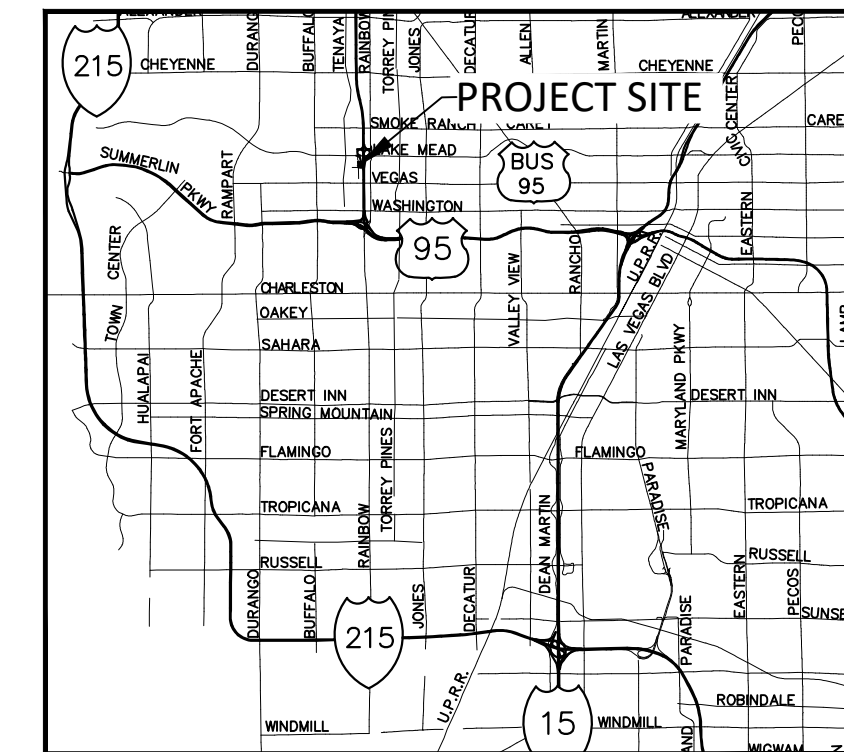
NOTES:
FLOW = 100 YEAR DESIGN FLOW
(REGIONAL FACILITIES)
FLOW = FACILITY CAPACITY
(LOCAL FACILITIES)

FLOOD CONTROL FACILITIES INVENTORY

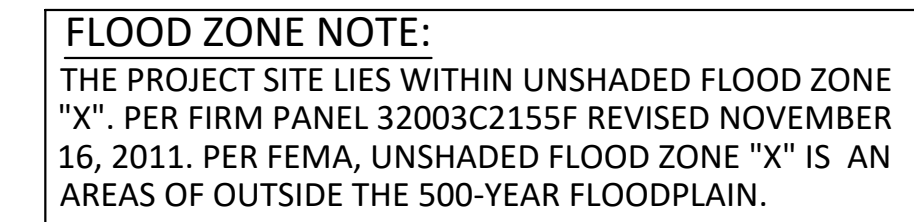
SHEET F-9

PBS&J, INC

LOCAL FACILITIES									
ALX	000	E	107-V2000	Unreinforced Concrete	2,345	0.25	3.578		
BFO	080	E	721-48	24" RCP	102		210		
BFO	081	E	721-48	24" RCP	102		210		
BFO	082	E	721-48	36" RCP	128		84		
BFO	083	E	721-48	12" RCP	103		128		
BFO	084	E	721-48	24" RCP	128	0.38	13		
BFO	085	E	107-V4787	42" RCP	331		101		
BFO	071	E	107-V4162	42" RCP	531		180		
BFO	180	E	107-V4162	24" RCP	1,302				
BFO	180	E	107-V2914	30" RCP	1,710				
BFO	170	E	107-V2914	30" RCP	1,002				
BFO	180	E	107-V2914	12" RCP	1,723				
BFO	180	E	107-V2914	24" RCP	60				
BFO	220	E	107-V2914	42" RCP	2,112				
BFO	220	E	107-V2914	42" RCP	1,562	0.38	82		
BFO	310	E	107-V2914	42" RCP	1,562				
BFO	310	E	107-V2914	42" RCP	1,562				
BFO	310	E	107-V2914	42" RCP	1,562				
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BFO	310	E	107-V2914	42" RCP	1,562				
BFO	310	E	107-V2914	42" RCP	1,562				
BFO	310	E	107-V2914	42" RCP	1,562				
BFO	310	E							



BASIN ID	AREA (ACRES)	Q ₁₀ (CFS)	Q ₁₀₀ (CFS)
ONX1	4.9	4	11
ONX2	0.7	1	2
ONX3	0.3	1<	1
STX1	0.9	1	3



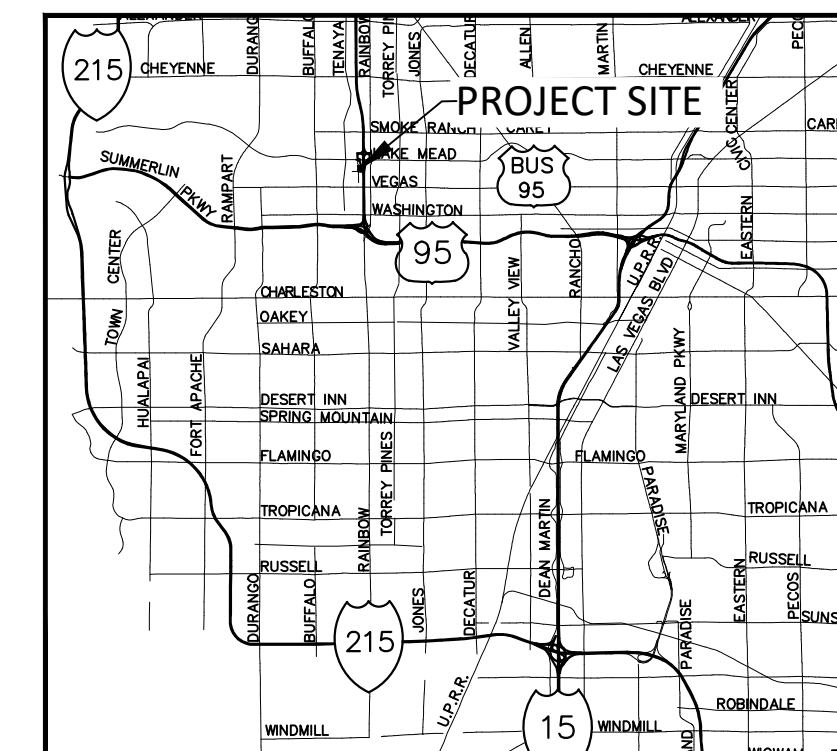
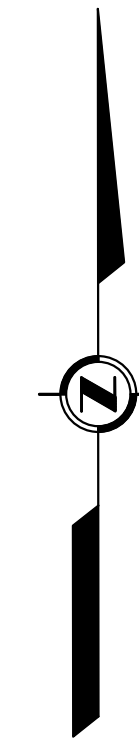
REF10 REPRESENTS THE IN-N-OUT STUDY (DS 1100)
REF10* IS PRORATED FROM BASIN OS6 FOR 6.4 ACRES NORTH OF THE SOUTH DI
REF10** IS PRORATED FROM BASIN OS6 FOR 14.7 ACRES SOUTH OF THE EX DI
REF10*** IS TAKEN FROM CP2 OF THE REF STUDY
REF11 REPRESENTS FLOW FROM JAMES E. McMILLAN E.S. (DS 458)

[illegible]

HIGHGATE SENIOR LIVING
APN: 138-22-702-002
EXISTING CONDITION BASIN MAP

DATE:	10/27/16
JOB NUMBER:	9754
DESIGNED:	SAM
DRAWN:	SAM
CHECKED:	S. MOHAMMED P.E.
SHEET NUMBER	

FIG. 10



VICINITY MAP

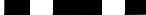
DRAINAGE AREA SUMMARY TABLE			
BASIN ID	AREA (ACRES)	Q ₁₀ (CFS)	Q ₁₀₀ (CFS)
OND1	1.8	2	5
OND2	3.2	4	9
OND3	0.6	1	2
STD1	1.0	2	3

GRAPHIC SCALE



FLOOD ZONE NOTE:
THE PROJECT SITE LIES WITHIN UNSHADED FLOOD ZONE "X". PER FIRM PANEL 32003C2155F REVISED NOVEMBER 16, 2011. PER FEMA, UNSHADED FLOOD ZONE "X" IS AN AREAS OF OUTSIDE THE 500-YEAR FLOODPLAIN.

DRAINAGE LEGEND

$(Q_{10/100})$	PEAK 10 YR FLOW / PEAK 100 YR FLOW
	DRAINAGE AREA BOUNDARY
	PRORATED FLOW BOUNDARY
	SOIL BOUNDARY
	DRAINAGE AREA FLOW DIRECTION
ONX1	AREA DESIGNATION
CP1 ●	CONCENTRATION FLOW POINT
	LOCATION OF HYDRAULIC CROSS SECTION

FLOW DEPTH ANALYSIS SUMMARY

SECTION	ST. WIDTH (FT)	SLOPE (%)	Q ₁₀₀ (CFS)	D ₁₀₀ (ft)	V ₁₀₀ (ft/sec)	D ₁₀₀ x V ₁₀₀	Q ₁₀	D ₁₀ (ft)	V (ft/sec)	D ₁₀ x V ₁₀
FM1	60	0.7	41.7	0.64	3.02	1.93	2.4	0.35	1.89	0.66
FM3	60	0.7	38.7	0.63	2.92	1.84	0.4	0.21	1.40	0.29
FM2	60	1.0	108.7	0.78	4.92	3.84	WITH REVISED FLOW			
FM2	60	1.0	67	0.68	4.06	WITH APPROVED FLOW BY IN-N-OUT STUDY				

REF10 REPRESENTS THE IN-N-OUT STUDY (DS 1100)
REF10* IS PRORATED FROM BASIN OS6 FOR 6.4 ACRES NORTH OF THE SOUTH D
REF10** IS PRORATED FROM BASIN OS6 FOR 14.7 ACRES SOUTH OF THE EX DI
REF10*** IS TAKEN FORM CP2 OF THE REF STUDY
REF11 REPRESENTS FLOW FROM JAMES E. McMILLAN E.S. (DS 458)

[illegible]

HIGHGATE SENIOR LIVING

APN: 138-22-702-002

DEVELOPED CONDITION BASIN MAP

DATE:	10/25/16
JOB NUMBER:	9754
DESIGNED:	SAM
DRAWN:	SAM
CHECKED:	S. MOHAMMED P
SHEET NUMBER	

FIG. 11

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APPENDIX B
(Hydrologic Parameters)

- Rainfall Depth Calculation
- McCarran Airport Rainfall Area (Figure 513)
- Depth-Duration-Frequency Values for McCarran Airport Rainfall Area (Table 505)
- Six-Hour Depth Area Reduction Factors (Table 502)
- Six-Hour Storm Distributions (Table 503)
- Soil Map and Soil Info
- Soil Survey of Las Vegas Valley Area, Clark County (Table 15)
- Runoff Curve Numbers – Urban Area (Table 602 Sheet 1 of 4)
- Runoff Curve Numbers – Residential District (Table 602A)
- Curve Number Summary Tables
- Standard Form 4 and HEC-1 Analysis (Existing Condition)
- Standard Form 4 and HEC-1 Analysis (Developed Condition)

HIGHGATE SENIOR LIVING

JOB NO. 9754

SHEET 1 OF 1

RAINFALL DEPTH CALCULATION

APN: 138-22-702-002

Township 20 South, Range 60 East, Section 22

Per Figure 513 of the Hydrologic Criteria and Design Manual the subject site
is *Within the McCarran Airport Rainfall Area*

Per Table 505 and 502 of the *Hydrologic Criteria and
Drainage Design Manual*:

STORM EVENT	RAINFALL DEPTH (IN)	PRECIPITATION ADJUSTMENT RATIOS	SIX-HOUR DEPTH AREA REDUCTION FACTORS	DESIGN RAINFALL DEPTH (IN)
10-YEAR	1.57	1.00	1.00	1.57
100-YEAR	2.77	1.00	1.00	2.77

10YEAR/100-YEAR DESIGN RAINFALL DEPTH PB CARD RATIO:

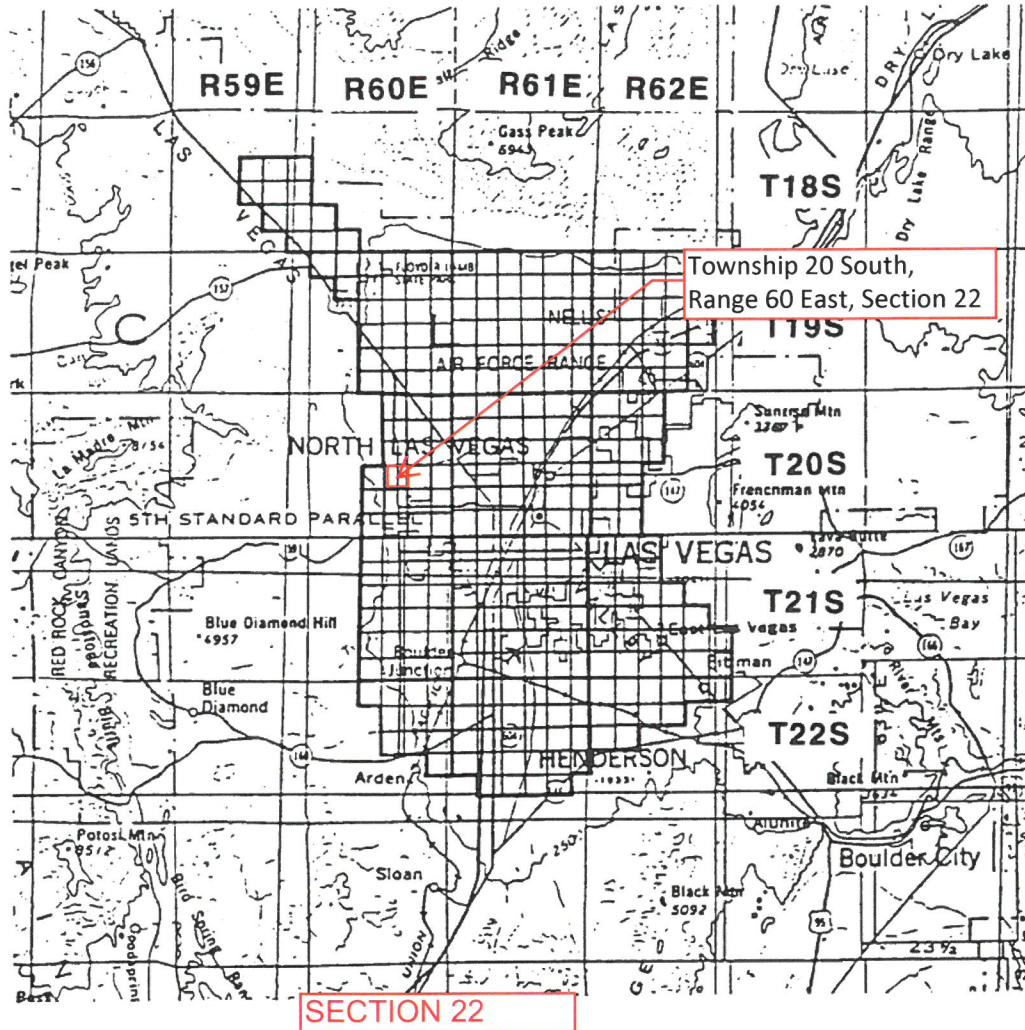
0.57

NOTE:

1. Rainfall Depth are taken from Table 505 of the Drainage Design Manual.
2. Six-Hour Depth Area Reduction Factors is taken from Table 502.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

McCARRAN AIRPORT RAINFALL AREA



TOWNSHIP	RANGE	SECTIONS	TOWNSHIP	RANGE	SECTIONS
18 South	59 East	13-15,22-26,35	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

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REFERENCE:

USACE, Los Angeles District, 1988

FIGURE 513

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

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

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

- NOTE: 1. Refer to Figure 513 for a description and drawing of the area included in the McCarran Airport Rainfall Area.
2. The 24 hour values presented above are for use with TR-55 only.
3. Table 501 adjustments not required.

Revision	Date

**WRC
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REFERENCE:

USACE, Los Angeles District, 1988

TABLE 505

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX HOUR DEPTH-AREA REDUCTION FACTORS

<u>Drainage Area (Square Miles)</u>	<u>Six-Hour Depth-Area Reduction Factor</u>
0.0	1.00
0.5	0.98
1.0	0.97
2.0	0.93
4.0	0.91
6.0	0.90
8.0	0.88
10.0	0.86
20.0	0.79
30.0	0.74
50.0	0.68
100.0	0.60
150.0	0.55
200.0	0.51
300.0	0.46
400.0	0.42
500.0	0.39

- NOTES: 1. A graphical representation of these factors is presented in Figure 514.
2. Consult with the local entity and/or the CCRFCD for guidance in using the Depth-Area Reduction Factors for drainage areas greater than 200 square miles.

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

SIX-HOUR STORM DISTRIBUTIONS

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

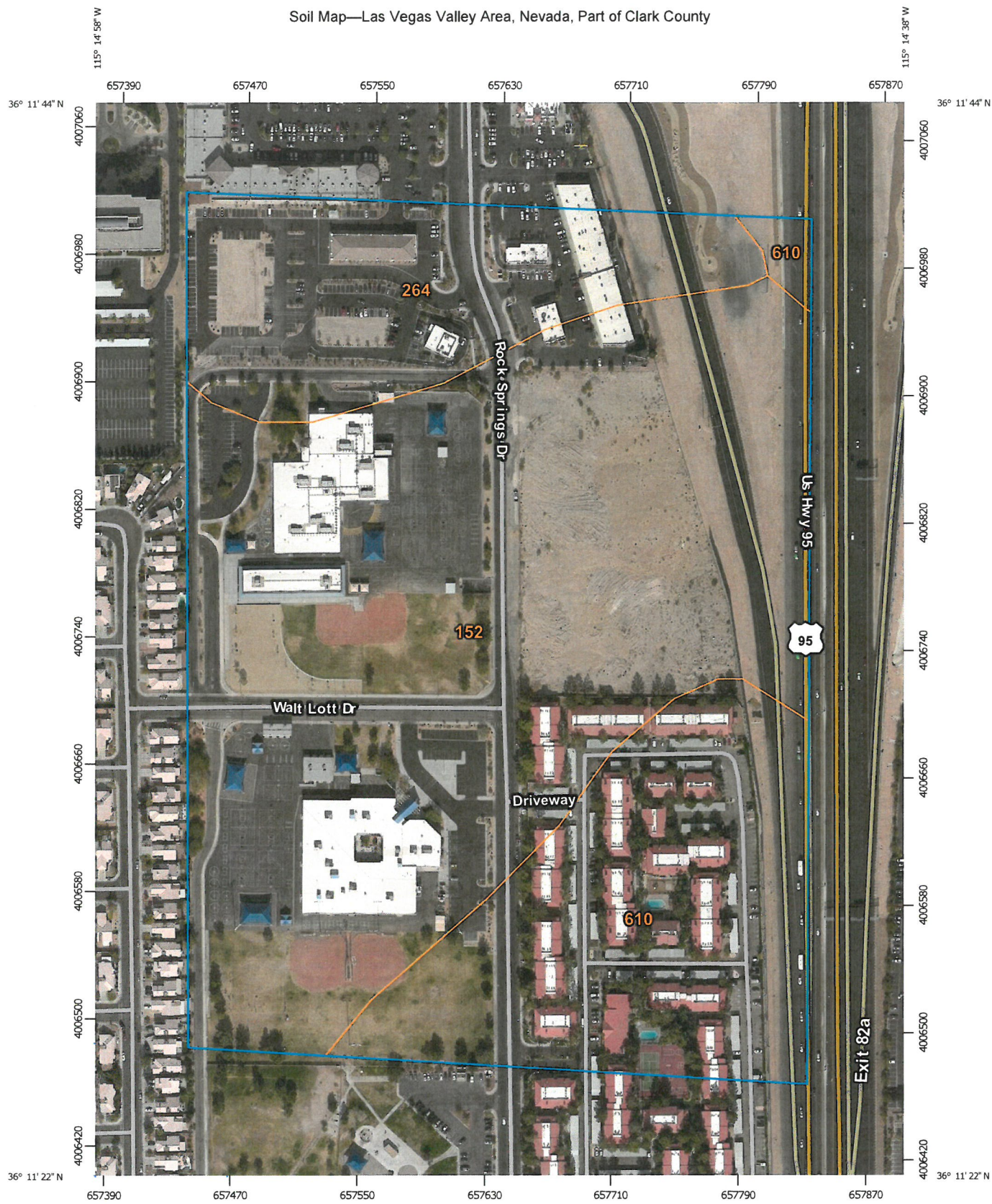
- Notes: 1. For drainage areas less than 8 square miles in size, use SDN 3.
 2. For drainage areas greater than or equal to 8 square miles and less than 12 square miles in size, use SDN 4.
 3. For drainage areas greater than or equal to 12 square miles, use SDN 5.
 4. A graphical representation of these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

Revision	Date

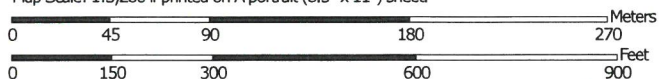
REFERENCE:

TABLE 503

Soil Map—Las Vegas Valley Area, Nevada, Part of Clark County



Map Scale: 1:3,280 if printed on A portrait (8.5" x 11") sheet.



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



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

7/18/2016
Page 1 of 3

Soil Map—Las Vegas Valley Area, Nevada, Part of Clark County

MAP LEGEND

Area of Interest (AOI)		Area of Interest (AOI)		Spoil Area
Soils		Soil Map Unit Polygons		Stony Spot
		Soil Map Unit Lines		Very Stony Spot
		Soil Map Unit Points		Wet Spot
Special Point Features		Blowout		Other
		Borrow Pit		Special Line Features
		Clay Spot	Water Features	
		Closed Depression		Streams and Canals
		Gravel Pit	Transportation	
		Gravelly Spot		Rails
		Landfill		Interstate Highways
		Lava Flow		US Routes
		Marsh or swamp		Major Roads
		Mine or Quarry		Local Roads
		Miscellaneous Water	Background	
		Perennial Water		Aerial Photography
		Rock Outcrop		
		Saline Spot		
		Sandy Spot		
		Severely Eroded Spot		
		Sinkhole		
		Slide or Slip		
		Sodic Spot		

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Las Vegas Valley Area, Nevada, Part of Clark County
Survey Area Data: Version 10, Aug 22, 2014

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

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

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Las Vegas Valley Area, Nevada, Part of Clark County (NV788)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
152	Cave gravelly fine sandy loam, 0 to 4 percent slopes	31.9	60.8%
264	Jean very gravelly loamy fine sand, 2 to 4 percent slopes	8.6	16.5%
610	Pits, gravel	11.9	22.7%
Totals for Area of Interest		52.4	100.0%

TABLE 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare" and "occasional" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding		High water table		Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Months	Depth	Months	Depth	Thick-ness	Depth	Hard-ness	Uncoated steel	Concrete
				<u>Ft</u>		<u>In</u>		<u>In</u>			
105*: McCullough-----	B	Rare-----	---	>6.0	---	>60	---	---	---	High-----	High.
Jean-----	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Bluepoint-----	A	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
107----- Arizo	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	Low.
112----- Arizo	A	Occasional	Mar-Sep	>6.0	---	>60	---	---	---	High-----	Low.
113----- Arizo	A	Rare-----	---	>6.0	---	>60	---	---	---	High-----	High.
117----- Arizo	A	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
120----- Bluepoint	A	Rare-----	---	4.0-6.0	Jun-Sep	>60	---	---	---	High-----	Moderate.
127, 128, 129----- Bluepoint	A	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
130*: Bracken-----	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
Destazo-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	High.
132----- Bracken	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
133*: Bracken----- Rock outcrop.	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
134----- Bracken	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
140----- Casaga	C	None-----	---	>6.0	---	>60	---	---	---	High-----	High.
150----- Cave	D	None-----	---	>6.0	---	>60	---	4-20	Thick	High-----	Low.
151----- Cave	D	None-----	---	>6.0	---	>60	---	10-20	Thick	High-----	Low.
152, 155----- Cave	D	None-----	---	>6.0	---	>60	---	4-20	Thick	High-----	Low.
160----- Destazo	B	None-----	---	>6.0	---	>60	---	---	---	High-----	High.
181*: Calliza-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Pittman-----	C	None-----	---	>6.0	---	>60	---	20-30	Thick	High-----	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding		High water table		Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Months	Depth	Months	Depth	Thick-ness	Depth	Hard-ness	Uncoated steel	Concrete
				<u>ft</u>		<u>in</u>		<u>in</u>			
419*: Aztec-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	High.
Bracken-----	B	None-----	---	>6.0	---	40-60	Soft	---	---	High-----	High.
430----- Knob Hill	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
440----- Nickel	B	None-----	---	>6.0	---	40-60	Hard	---	---	High-----	Low.
450----- Cave Variant	D	None-----	---	>6.0	---	>60	---	5-18	Thick	High-----	High.
481, 484----- Hobog	D	None-----	---	>6.0	---	8-20	Hard	---	---	High-----	Low.
500* Canutio-----	b	None-----	---	>6.0	---	40-60	Hard	---	---	High-----	Low.
Akela-----	D	None-----	---	>6.0	---	10-20	Hard	---	---	High-----	Low.
501----- Canutio	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
502*: Canutio-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Cave-----	D	None-----	---	>6.0	---	>60	---	4-20	Thick	High-----	Low.
505* Canutio-----	B	None-----	---	>6.0	---	40-60	Hard	---	---	High-----	Low.
Akela-----	D	None-----	---	>6.0	---	10-20	Hard	---	---	High-----	Low.
510*: Akela-----	D	None-----	---	>6.0	---	10-20	Hard	---	---	High-----	Low.
Rock outcrop.											
540----- Weiser	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
542*: Weiser-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Aztec-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	High.
545*: Weiser-----	B	None-----	---	>6.0	---	>60	---	---	---	High-----	Low.
Goodsprings-----	D	None-----	---	>6.0	---	>60	---	9-20	Thick	High-----	Low.
600*. Slickens											
605*. Dumps											
610*. Pits											
615*. Urban land											
630*. Badlands											
635*, 640*. Rock outcrop											
645*. Pits											

* See description of the map unit for composition and behavior characteristics of the map unit.

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.):					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved: curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ⁴		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					

See Table 602A

Developing urban areas

Newly graded areas (pervious areas only, no vegetation) ⁵	77	86	91	94
--	----	----	----	----

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

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

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

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

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

Revision	Date

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS (SEMIARID RANGELANDS¹)

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

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

²Poor: < 30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

Revision	Date

**WRC
ENGINEERING**

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

**TABLE 602
4 of 4**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

RUNOFF CURVE NUMBERS - RESIDENTIAL DISTRICTS

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

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

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

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

Revision	Date

REFERENCE:

TABLE 602A

HIGHGATE SENIOR LIVING**JOB NO. 9754****SHEET 1 OF 2****CURVE NUMBER TABLE**

Per Table 602 Sheet 1 of 4 and Table 602A in the *Hydrologic Criteria and Drainage Design Manual and the National Cooperative Soil Survey*

Soil # 152 Cave gravelly fine sandy loam, 0 to 4 percent slopes

Soil # 610 Pits, gravel

SOIL	%	HYDRO-LOGIC GROUP	Undeveloped Conditions <i>SEE NOTE #1</i>	For Developed Conditions <i>SEE NOTE #2</i>	Street Existing/Developed Conditions <i>SEE NOTE #3</i>
152	100	D	88	93	98
610	100	C	85	91	98

CN = CURVE NUMBER

NOTE:

- 1 For existing condition undeveloped land , per Table 602, Sheet 4 of 4
2. Developed Curve Number for Apartments/Condos, per 602A
3. Developed Curve Number for Paved Asphalt, per 602, sheet 1 of 4

HIGHGATE SENIOR LIVING**JOB NO. 9754****SHEET 2 OF 2****Curve Number Summary**

Per Table 602 Sheet 1 of 4 , 4 of 4 and 602 A in the *Hydrologic Criteria and Drainage Design Manual and the National Cooperative Soil Survey*

EXISTING CONDITION

BASIN	TYPE OF DEVELOPMENT	SOIL 152 undeveloped (88)	SOIL610 Undeveloped (85)	152/610 ASPHALT (98)	CURVE NUMBER
ONX1	Undeveloped	100%	0%	0%	88
ONX2	Undeveloped	100%	0%	0%	88
OFX3	Undeveloped	70%	30%	0%	87
STX1	P. Dev.	39%	0%	61%	94

DEVELOPED CONDITION

BASIN	TYPE OF DEVELOPMENT	SOIL 152 APARTMENTS /CONDO (93)	SOIL 610 APARTMENTS/ CONDO (91)	SOIL 152/610(ASPHALT (98)	CURVE NUMBER
OND1	Ddveloped	100%	0%	0%	93
OND2	Ddveloped	100%	0%	0%	93
OND3	Ddveloped	100%	0%	0%	93
STD1	Ddveloped	0%	0%	100%	98

HIGHGATE SENIOR LIVING**JOB NO. 9754****SHEET 2 OF 2****Curve Number Summary**

Per Table 602 Sheet 1 of 4 , 4 of 4 and 602 A in the *Hydrologic Criteria and Drainage Design Manual* and the *National Cooperative Soil Survey*

EXISTING CONDITION

BASIN	TYPE OF DEVELOPMENT	SOIL 152 undeveloped (88)	SOIL610 Undeveloped (85)	152/610 ASPHALT (98)	CURVE NUMBER
ONX1	Undeveloped	100%	0%	0%	88
ONX2	Undeveloped	100%	0%	0%	88
OFX3	Undeveloped	70%	30%	0%	87
STX1	P. Dev.	39%	0%	61%	94

DEVELOPED CONDITION

BASIN	TYPE OF DEVELOPMENT	SOIL 152 APARTMENTS /CONDO (93)	SOIL 610 APARTMENTS/ CONDO (91)	SOIL 152/610(ASPHALT (98)	CURVE NUMBER
OND1	Ddveloped	100%	0%	0%	93
OND2	Ddveloped	100%	0%	0%	93
STD1	Ddveloped	0%	0%	100%	98


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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 20JUL16 TIME 09:56:18
*
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*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
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X X XXXXXX XXXX X
X X X X X XX
X X X X X
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X X X X X
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X X XXXXXX XXXX XXX

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -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

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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1          ID          TECHNICAL DRAINAGE STUDY FOR HIGHGATE SENIOR LIVING
2          ID          LAS VEGAS, NEVADA
3          ID
4          ID
5          ID          PREPARED BY:
6          ID          COLLINS ENGINEERS INC
7          ID          3130 S. DURANGO DRIVE SUITE 404
8          ID          LA VEGAS, NV 89117
9          ID
10         ID
11         ID          EXISTING CONDITIONS 10-YEAR AND 100-YEAR
12         ID          FILENAME:EX.DAT
13         ID          JOB#9754
14         ID
15         ID          JR RATIOS
16         ID          1.00 100-YEAR NO DARF
17         ID          0.57 10-YEAR NO DARF
18         ID
19         ID          *DIAGRAM
20         IT          5          0          0          300
21         IO          5
22         IN          5
23         JR          PREC          0.57          1.00
24         *
25         KK          ONX1
26         KM          EXISTING CONDITION UNDEVELOPED ON-SITE BASIN
27         BA          .00766
28         PB          2.77
29         PC          .000          .020          .057          .070          .087          .108          .124          .130          .130          .130
30         PC          .130          .130          .130          .133          .140          .142          .148          .158          .172          .181
31         PC          .190          .197          .199          .200          .201          .204          .214          .229          .241          .249
32         PC          .251          .256          .270          .278          .281          .283          .295          .322          .352          .409
33         PC          .499          .590          .710          .744          .781          .812          .819          .835          .851          .856
34         PC          .860          .868          .876          .888          .910          .926          .937          .950          .970          .976
35         PC          .982          .985          .987          .989          .990          .993          .993          .994          .995          .998
36         PC          .998          .999          1.00
37         LS          0          88
38         UD          .1380
39         *
40         KK          STX1
41         KM          EXISTING CONDITION ROCK SPRINGS DR FROM WALT LOTT DR TO N/W CORNER
42         BA          .00141
43         LS          0          94
44         UD          .0760
45         *
46         KK          ONX2
47         KM          EXISTING CONDITION UNDEVELOPED ON-SITE BASIN
48         BA          .00109
49         LS          0          88
50         UD          .1000
51         *

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1

HEC-1 INPUT

PAGE 2

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

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47 KK ONX3
 48 KM EXISTING CONDITION UNDEVELOPED ON-SITE BASIN
 49 BA .00047
 50 LS 0 87
 51 UD .1000
 *

52 KK CP-1
 53 KM COMBINATION POINT FROM ONX2 AND ONX3
 54 HC 2
 *
 55 ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

```

  23 ONX1
    .
    .
  37 . STX1
    .
    .
  42 . ONX2
    .
    .
  47 . ONX3
    .
    .
  52 . CP-1.....
  
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
 *
 * FLOOD HYDROGRAPH PACKAGE (HEC-1)
 * JUN 1998
 * VERSION 4.1
 *
 * RUN DATE 20JUL16 TIME 09:56:18
 *

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

TECHNICAL DRAINAGE STUDY FOR HIGHGATE SENIOR LIVING LAS VEGAS, NEVADA

PREPARED BY:
 COLLINS ENGINEERS INC
 3130 S. DURANGO DRIVE SUITE 404
 LA VEGAS, NV 89117

EXISTING CONDITIONS 10-YEAR AND 100-YEAR
 FILENAME:EX.DAT
 JOB#9754

JR RATIOS
 1.00 100-YEAR NO DARF
 0.57 10-YEAR NO DARF

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

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

COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
 NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
 RATIOS OF PRECIPITATION
 .57 1.00

1

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1	RATIO 2
				.57	1.00
HYDROGRAPH AT					
+	ONX1	.01	1	FLOW	11.
				TIME	3.58
HYDROGRAPH AT					
+	STX1	.00	1	FLOW	3.
				TIME	3.50
HYDROGRAPH AT					
+	ONX2	.00	1	FLOW	2.
				TIME	3.50
HYDROGRAPH AT					
+	ONX3	.00	1	FLOW	1.
				TIME	3.50
2 COMBINED AT					
+	CP-1	.00	1	FLOW	2.
				TIME	3.50

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

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

Collins Engineers		Technical Drainage Study												
File: Standardform4.xls		For Highgate Senior Living										BY:	SM	
Project No.: 9754		Developed Condition										DATE:	10/17/16	
SUB-BASIN				INITIAL / OVERLAND				TRAVEL TIME				Tc	Flag	REMARKS
DATA				TIME (Ti)				(Tt)						
				INITIAL			TRAVEL			V1				
DESIG:	DEV./EX.	CN	AREA	LENGTH	SLOPE	Ti	LENGTH	SLOPE	VELOCITY	VELOCITY	Tt	Tc	RAINFALL	
	(D or E)		Ac	Feet	%	Min	Feet	%	FPS	FPS	Min	Calc.	Inches	
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)	(13)	100-Yr	
EXISTING CONDITION														
OND1	D	93	0.8376	1.80	0.00281	118	0.40	7.0	1.4	2.2	5.6	12.5	13.3	
OND2	D	93	0.8376	3.20	0.00500	92.8	0.90	4.7	1.4	2.2	5.1	9.8	12.9	
OND3	D	93	0.8376	0.60	0.00094	142	1.50	4.9	1.4	2.2	0.0	4.9	10.8	
STD1	D	98	0.9036	1.00	0.00156	24.5	2.00	1.4	1.8	2.7	5.6	7.0	13.9	
Tc = Ti + Tt			Tt = L/V		Flag = 0.6 Tc				V1 = 14.8*(S/100)^1/2		Developed			
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3							For the travel time (Ti) calculations,				V1 = 20.2*(S/100)^1/2			
K = 0.0132 (CN) - 0.39							V1 applies to the first 500 feet of travel distance;				V2 = 30.6*(S/100)^1/2			
REFERENCE :								Existing				Developed	STANDARD FORM 4	

Note: Per sec-602.1 of Clark County Regional Flood Control District Hydrologic Criteria and Drainage Design Manual, the minimum TC are recommended 10 minutes(Tlag=0.10) for undeveloped area and TC=5 (TLAG=0.05) for developed area.

Basin	TC used (MIN.)	TLAG (HR.)
OND3	5	0.05

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 17OCT16 TIME 11:45:53
*
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*****
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* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*
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X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXXX XXXX X XXXXX X
X X X X X X
X X X X X X
X X XXXXXX XXXXX XXX

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

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -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

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LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID TECHNICAL DRAINAGE STUDY FOR HIGHGATE SENIOR LIVING
2 ID LAS VEGAS, NEVADA
3 ID
4 ID
5 ID PREPARED BY:
6 ID COLLINS ENGINEERS INC
7 ID 3130 S. DURANGO DRIVE SUITE 404
8 ID LAVEGAS, NV 89117
9 ID
10 ID
11 ID DEVELOPED CONDITIONS 10-YEAR AND 100-YEAR
12 ID FILENAME:DEV.DAT
13 ID JOB#9754
14 ID
15 ID JR RATIOS
16 ID 1.00 100-YEAR NO DARF
17 ID 0.57 10-YEAR NO DARF
18 ID
19 *DIAGRAM
20 IT 5 0 0 300
21 IO 5
22 IN 5
23 JR PREC 0.57 1.00
24 *
25 KK OND1
26 KM DEVELOPED CONDITION ONSITE BASIN (APARTMENTS/CONDOS)
27 BA .00281
28 PB 2.77
29 PC .000 .020 .057 .070 .087 .108 .124 .130 .130 .130
30 PC .130 .130 .130 .133 .140 .142 .148 .158 .172 .181
31 PC .190 .197 .199 .200 .201 .204 .214 .229 .241 .249
32 PC .251 .256 .270 .278 .281 .283 .295 .322 .352 .409
33 PC .499 .590 .710 .744 .781 .812 .819 .835 .851 .856
34 PC .860 .868 .876 .888 .910 .926 .937 .950 .970 .976
35 PC .982 .985 .987 .989 .990 .993 .993 .994 .995 .998
36 PC .998 .999 1.00
37 LS 0 93
38 UD .1250
39 *
40 KK OND2
41 KM DEVELOPED CONDITION ONSITE BASIN (APARTMENTS/CONDOS)
42 BA .00500
43 LS 0 93
44 UD .0980
45 *
46 KK OND3
47 KM DEVELOPED CONDITION ONSITE BASIN (APARTMENTS/CONDOS)
48 BA .00094
49 LS 0 93
50 UD .0500
51 *

```

1 HEC-1 INPUT PAGE 2

```

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

```


47 KK STD1
48 KM DEVELOPED CONDITION ROCK SPRINGS DR FROM WALT LOTT DR TO THE N/W CORNER
49 BA .00156
50 LS 0 98
51 UD .0700
*
52 ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW
23 OND1
.
.
37 . OND2
.
.
42 . OND3
.
.
47 . STD1

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****

*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
*
* RUN DATE 17OCT16 TIME 11:45:53 *
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* U.S. ARMY CORPS OF ENGINEERS *
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*

TECHNICAL DRAINAGE STUDY FOR HIGHGATE SENIOR LIVING
LAS VEGAS, NEVADA

PREPARED BY:
COLLINS ENGINEERS INC
3130 S. DURANGO DRIVE SUITE 404
LAVEGAS, NV 89117

DEVELOPED CONDITIONS 10-YEAR AND 100-YEAR
FILENAME:DEV.DAT
JOB#9754

JR RATIOS
1.00 100-YEAR NO DARF
0.57 10-YEAR NO DARF

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

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

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

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

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.57 1.00

1

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT +	OND1	.00	1	FLOW	2.
				TIME	5.
				3.58	3.58
HYDROGRAPH AT +	OND2	.00	1	FLOW	4.
				TIME	9.
				3.50	3.50
HYDROGRAPH AT +	OND3	.00	1	FLOW	1.
				TIME	2.
				3.50	3.50
HYDROGRAPH AT +	STD1	.00	1	FLOW	2.
				TIME	3.
				3.50	3.50

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

APPENDIX C
(Hydraulic Analysis)

- Flow Depth Analysis
- Drop Inlet Capacity Analysis
- Storm Drain Capacity Analysis (WSPG Model In-Put and Out-Put)

PRORATED FLOWS FROM THE APPROVED REFERENCED STUDY
 APPROVED STUDY (REF. 10) BASIN AREA AND FLOWS

BASIN	AREA	Q ₁₀	Q ₁₀₀	Unit Prorated Flow	
				Q ₁₀ /ACRE	Q ₁₀₀ /acre
SO6	55.6	41	101	0.7	1.8

PRORATED FLOWS

	PRORATED FROM REF1. BASIN V13A2a			
Sub basin	A (sq. ft.)	acres	Q ₁₀	Q ₁₀₀
REF10*	6.4	6.40	5	12
REF10**	14.7	14.70	11	27

OFF-SITE FLOW QUANTITY ANALYSIS																						
				South DI						North DI				Total		2 and 3' DI					FROM	
		TOTAL	FROM	INT	Byp.		ADD	Total		INT	BYP.	Total	ADD			INT.	BYP.	Q ₁₀₀ FM3	ADD	Q ₁₀₀ FM1	REF10***	Q ₁₀₀ FM2
			REF 10**				REF 10*						REF 11						STD1			
Q100	west	27	13.5	4.2	9.3	22.8	12	34.8	17.4	6.5	10.9	28.3	13	41.3	20.7	1.6	19.1	38.7	3.0	41.7	67.0	108.7
	east		13.5		13.5				17.4		17.4					20.7	1.1	19.6				
																		Q ₁₀ FM3				
Q10	west		10.5	3.7	6.8		5		11.8	6.7	5.1		5		10.1	1.2	8.9	8.9				
	east		0..5		0.5		0.2								0.7	0.3	0.4	0.4	2.0	2.4	27.0	29.4

Cross Section for FM1-Q100

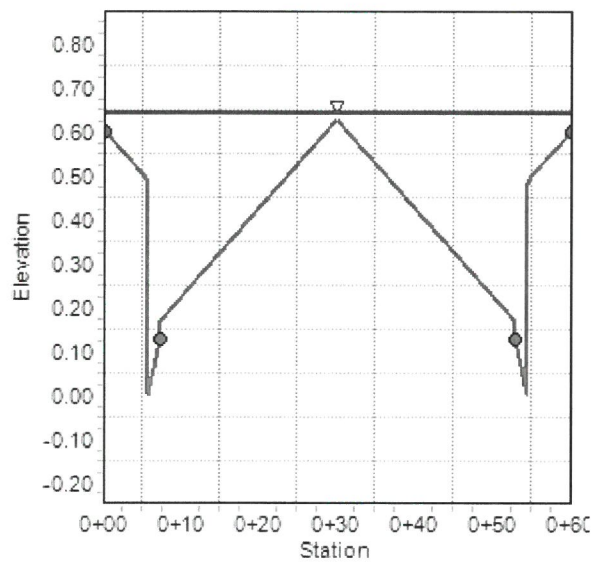
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00700	ft/ft
Normal Depth	0.64	ft
Discharge	41.70	ft ³ /s

Cross Section Image



Cross Section for FM1-Q10

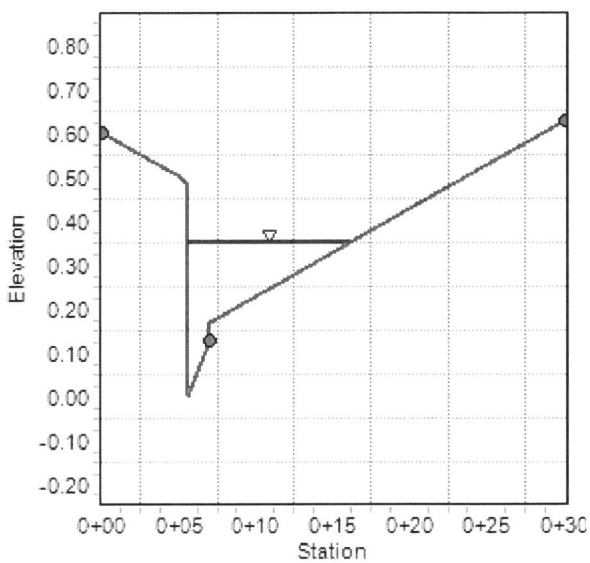
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00700	ft/ft
Normal Depth	0.35	ft
Discharge	2.40	ft ³ /s

Cross Section Image



Worksheet for FM1-Q10

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00700 ft/ft
Discharge 2.40 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.60
0+05.000	0.50
0+05.500	0.48
0+05.500	0.00
0+07.000	0.13
0+07.000	0.17
0+30.000	0.63

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.60)	(0+07.000, 0.13)	0.013
(0+07.000, 0.13)	(0+30.000, 0.63)	0.016

Options

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

Results

Normal Depth 0.35 ft
Elevation Range 0.000 to 0.626 ft
Flow Area 1.27 ft²
Wetted Perimeter 11.061 ft
Hydraulic Radius 0.11 ft

Worksheet for FM1-Q10

Results

Top Width	10.663	ft
Normal Depth	0.35	ft
Critical Depth	0.35	ft
Critical Slope	0.00754	ft/ft
Velocity	1.89	ft/s
Velocity Head	0.06	ft
Specific Energy	0.40	ft
Froude Number	0.97	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.35	ft
Critical Depth	0.35	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00754	ft/ft

Cross Section for FM2-WITH REVISED FLOW Q100=108.7

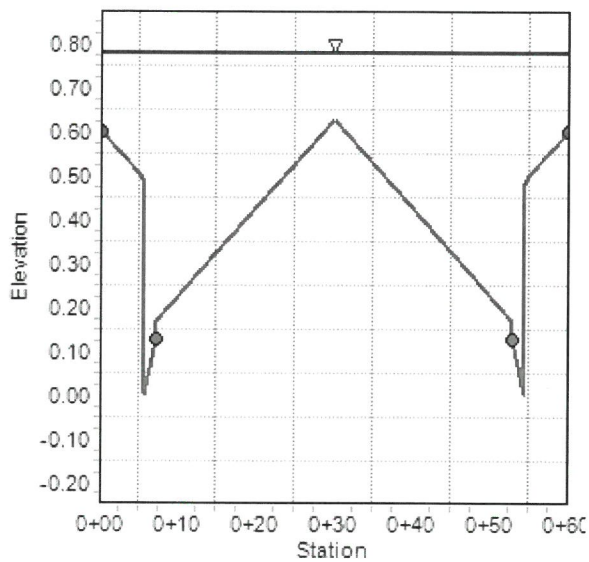
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.78	ft
Discharge	108.70	ft ³ /s

Cross Section Image



Worksheet for FM2-WITH REVISED FLOW Q100=108.7

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.01000 ft/ft
Discharge 108.70 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.60
0+05.000	0.50
0+05.500	0.48
0+05.500	0.00
0+07.000	0.13
0+07.000	0.17
0+30.000	0.63
0+53.000	0.17
0+53.000	0.13
0+54.500	0.00
0+54.500	0.48
0+55.000	0.50
0+60.000	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.60)	(0+07.000, 0.13)	0.013
(0+07.000, 0.13)	(0+53.000, 0.13)	0.016
(0+53.000, 0.13)	(0+60.000, 0.60)	0.013

Options

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

Worksheet for FM2-WITH REVISED FLOW Q100=108.7

Results

Normal Depth		0.78	ft
Elevation Range	0.000 to 0.626 ft		
Flow Area		22.11	ft ²
Wetted Perimeter		61.415	ft
Hydraulic Radius		0.36	ft
Top Width		60.000	ft
Normal Depth		0.78	ft
Critical Depth		0.87	ft
Critical Slope		0.00456	ft/ft
Velocity		4.92	ft/s
Velocity Head		0.38	ft
Specific Energy		1.15	ft
Froude Number		1.43	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.78	ft
Critical Depth	0.87	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00456	ft/ft

Cross Section for FM2-WITH APPROVED FLOW -Q100=67 CFS

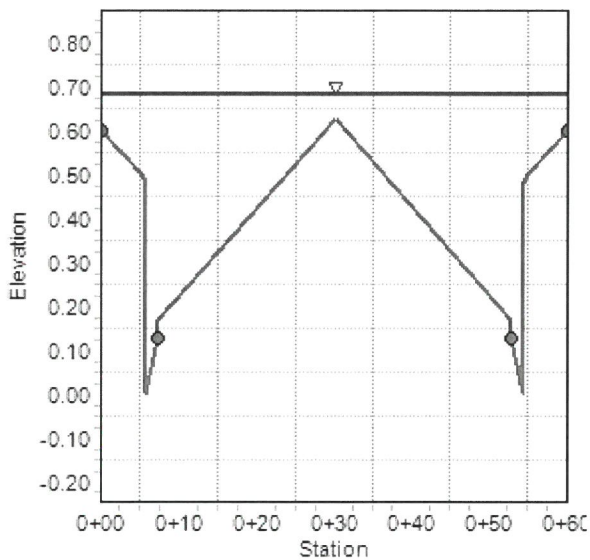
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	0.68	ft
Discharge	67.00	ft ³ /s

Cross Section Image



Worksheet for FM2-WITH APPROVED FLOW -Q100=67 CFS

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.01000 ft/ft
Discharge 67.00 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.60
0+05.000	0.50
0+05.500	0.48
0+05.500	0.00
0+07.000	0.13
0+07.000	0.17
0+30.000	0.63
0+53.000	0.17
0+53.000	0.13
0+54.500	0.00
0+54.500	0.48
0+55.000	0.50
0+60.000	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.60)	(0+07.000, 0.13)	0.013
(0+07.000, 0.13)	(0+53.000, 0.13)	0.016
(0+53.000, 0.13)	(0+60.000, 0.60)	0.013

Options

Current roughness weighted Pavlovskii's Method
Method
Open Channel Weighting Method Pavlovskii's Method
Closed Channel Weighting Method Pavlovskii's Method

Worksheet for FM2-WITH APPROVED FLOW -Q100=67 CFS

Results

Normal Depth	0.68	ft
Elevation Range	0.000 to 0.626 ft	
Flow Area	16.52	ft ²
Wetted Perimeter	61.228	ft
Hydraulic Radius	0.27	ft
Top Width	60.000	ft
Normal Depth	0.68	ft
Critical Depth	0.75	ft
Critical Slope	0.00505	ft/ft
Velocity	4.06	ft/s
Velocity Head	0.26	ft
Specific Energy	0.94	ft
Froude Number	1.36	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.68	ft
Critical Depth	0.75	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00505	ft/ft

Cross Section for FM3-Q100

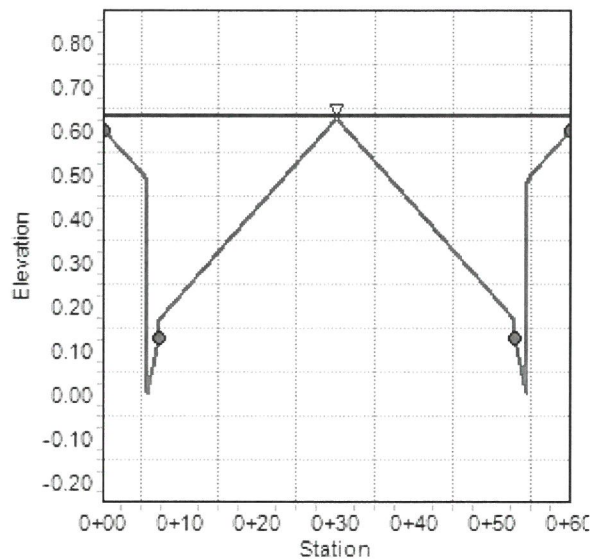
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00700	ft/ft
Normal Depth	0.63	ft
Discharge	38.70	ft ³ /s

Cross Section Image



Worksheet for FM3-Q100

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00700 ft/ft
Discharge 38.70 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.60
0+05.000	0.50
0+05.500	0.48
0+05.500	0.00
0+07.000	0.13
0+07.000	0.17
0+30.000	0.63
0+53.000	0.17
0+53.000	0.13
0+54.500	0.00
0+54.500	0.48
0+55.000	0.50
0+60.000	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.60)	(0+07.000, 0.13)	0.013
(0+07.000, 0.13)	(0+53.000, 0.13)	0.016
(0+53.000, 0.13)	(0+60.000, 0.60)	0.013

Options

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

Worksheet for FM3-Q100

Results

Normal Depth		0.63	ft
Elevation Range	0.000 to 0.626		ft
Flow Area		13.23	ft²
Wetted Perimeter		61.119	ft
Hydraulic Radius		0.22	ft
Top Width		60.000	ft
Normal Depth		0.63	ft
Critical Depth		0.64	ft
Critical Slope		0.00568	ft/ft
Velocity		2.92	ft/s
Velocity Head		0.13	ft
Specific Energy		0.76	ft
Froude Number		1.10	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.63	ft
Critical Depth	0.64	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00568	ft/ft

Cross Section for FM3-Q10

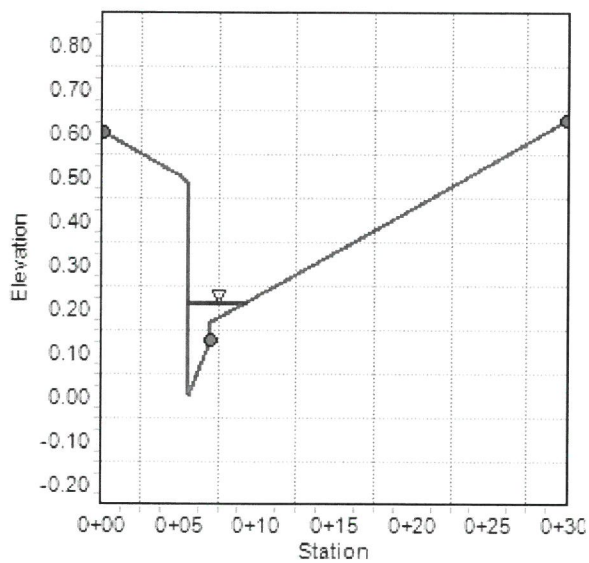
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00700	ft/ft
Normal Depth	0.21	ft
Discharge	0.40	ft ³ /s

Cross Section Image



Worksheet for FM3-Q10

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00700 ft/ft
Discharge 0.40 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.60
0+05.000	0.50
0+05.500	0.48
0+05.500	0.00
0+07.000	0.13
0+07.000	0.17
0+30.000	0.63

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.60)	(0+07.000, 0.13)	0.013
(0+07.000, 0.13)	(0+30.000, 0.63)	0.016

Options

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

Results

Normal Depth 0.21 ft
Elevation Range 0.000 to 0.626 ft
Flow Area 0.29 ft²
Wetted Perimeter 4.164 ft
Hydraulic Radius 0.07 ft

Worksheet for FM3-Q10

Results

Top Width	3.903	ft
Normal Depth	0.21	ft
Critical Depth	0.21	ft
Critical Slope	0.00841	ft/ft
Velocity	1.40	ft/s
Velocity Head	0.03	ft
Specific Energy	0.24	ft
Froude Number	0.92	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.21	ft
Critical Depth	0.21	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00841	ft/ft

Cross Section for INTERCEPTING CAPACITY OF EX South 10' DI

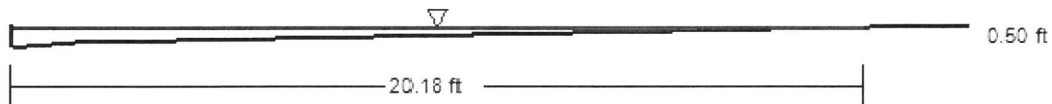
Project Description

Solve For Efficiency

Input Data

Discharge	13.50	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Efficiency	31.15	%
Curb Opening Length	5.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for IINTERCEPTING CAPACITY OF EX South 10' DI (Q100)

Project Description

Solve For Efficiency

Input Data

Discharge	13.50	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	5.00	ft
Local Depression	2.00	in
Local Depression Width	1.50	ft

Results

Efficiency	31.15	%
Intercepted Flow	4.21	ft ³ /s
Bypass Flow	9.29	ft ³ /s
Spread	20.18	ft
Depth	0.50	ft
Flow Area	4.14	ft ²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	3.26	ft/s
Equivalent Cross Slope	0.05787	ft/ft
Length Factor	0.19	
Total Interception Length	26.70	ft

Cross Section for Q100-Flow Depth at North 10-Foot DI

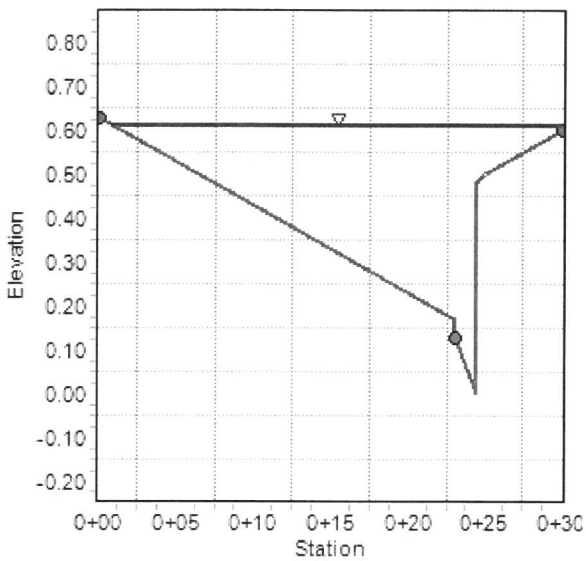
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00700	ft/ft
Normal Depth	0.61	ft
Discharge	17.40	ft ³ /s

Cross Section Image



Worksheet for Q100-Flow Depth at North 10-Foot DI

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00700 ft/ft
Discharge 17.40 ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.63
0+23.000	0.17
0+23.000	0.13
0+24.500	0.00
0+24.500	0.48
0+25.000	0.50
0+30.000	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.63)	(0+23.000, 0.13)	0.016
(0+23.000, 0.13)	(0+30.000, 0.60)	0.013

Options

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

Results

Normal Depth 0.61 ft
Elevation Range 0.000 to 0.625 ft
Flow Area 6.15 ft²
Wetted Perimeter 29.817 ft
Hydraulic Radius 0.21 ft

Worksheet for Q100-Flow Depth at North 10-Foot DI

Results

Top Width	29.276	ft
Normal Depth	0.61	ft
Critical Depth	0.62	ft
Critical Slope	0.00580	ft/ft
Velocity	2.83	ft/s
Velocity Head	0.12	ft
Specific Energy	0.74	ft
Froude Number	1.09	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.61	ft
Critical Depth	0.62	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00580	ft/ft

Cross Section for IINTERCEPTING CAPACITY OF EX North 10' DI

Project Description

Solve For Spread

Input Data

Discharge	6.50	ft ³ /s
Spread	25.63	ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Curb Opening Length	5.00	ft
Opening Height	0.50	ft
Curb Throat Type	Horizontal	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Throat Incline Angle	90.00	degrees

Cross Section Image



V: 1
H: 1

Worksheet for IINTERCEPTING CAPACITY OF EX North 10' DI (Q100)-

Project Description

Solve For Spread

Input Data

Discharge	6.50	ft³/s
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Curb Opening Length	5.00	ft
Opening Height	0.50	ft
Curb Throat Type	Horizontal	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Throat Incline Angle	90.00	degrees

Results

Spread	25.63	ft
Depth	0.61	ft
Gutter Depression	0.09	ft
Total Depression	0.26	ft

Cross Section for INTERCEPTING CAPACITY OF 3' TYPE A DI (WEST

Project Description

Solve For Efficiency

Input Data

Discharge	20.65	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Efficiency	7.78	%
Curb Opening Length	1.50	ft

Cross Section Image



V: 1
H: 1

Worksheet for IINTERCEPTING CAPACITY OF 3' TYPE A DI (WEST

Project Description

Solve For

Efficiency

Input Data

Discharge	20.65	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	1.50	ft
Local Depression	2.00	in
Local Depression Width	1.50	ft

Results

Efficiency	7.78	%
Intercepted Flow	1.61	ft ³ /s
Bypass Flow	19.04	ft ³ /s
Spread	23.75	ft
Depth	0.57	ft
Flow Area	5.71	ft ²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	3.61	ft/s
Equivalent Cross Slope	0.05189	ft/ft
Length Factor	0.04	
Total Interception Length	34.08	ft

Cross Section for IINTERCEPTING CAPACITY OF 2' TYPE A DI (EAST

Project Description

Solve For

Efficiency

Input Data

Discharge	20.65	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Efficiency	5.22	%
Curb Opening Length	1.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for IINTERCEPTING CAPACITY OF 2' TYPE A DI (EAST SIDE)

Project Description

Solve For

Efficiency

Input Data

Discharge	20.65	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	1.00	ft
Local Depression	2.00	in
Local Depression Width	1.50	ft

Results

Efficiency	5.22	%
Intercepted Flow	1.08	ft ³ /s
Bypass Flow	19.57	ft ³ /s
Spread	23.75	ft
Depth	0.57	ft
Flow Area	5.71	ft ²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	3.61	ft/s
Equivalent Cross Slope	0.05189	ft/ft
Length Factor	0.03	
Total Interception Length	34.08	ft

Cross Section for INTERCEPTING CAPACITY OF EX South 10' DI (Q10)

Project Description

Solve For

Efficiency

Input Data

Discharge	10.50	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Efficiency	35.59	%
Curb Opening Length	5.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for IINTERCEPTING CAPACITY OF EX South 10' DI (Q10)

Project Description

Solve For Efficiency

Input Data

Discharge	10.50	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	5.00	ft
Local Depression	2.00	in
Local Depression Width	1.50	ft

Results

Efficiency	35.59	%
Intercepted Flow	3.74	ft ³ /s
Bypass Flow	6.76	ft ³ /s
Spread	18.31	ft
Depth	0.46	ft
Flow Area	3.42	ft ²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	3.07	ft/s
Equivalent Cross Slope	0.06195	ft/ft
Length Factor	0.22	
Total Interception Length	23.06	ft

Cross Section for Q10-Flow Depth at North 10-Foot DI

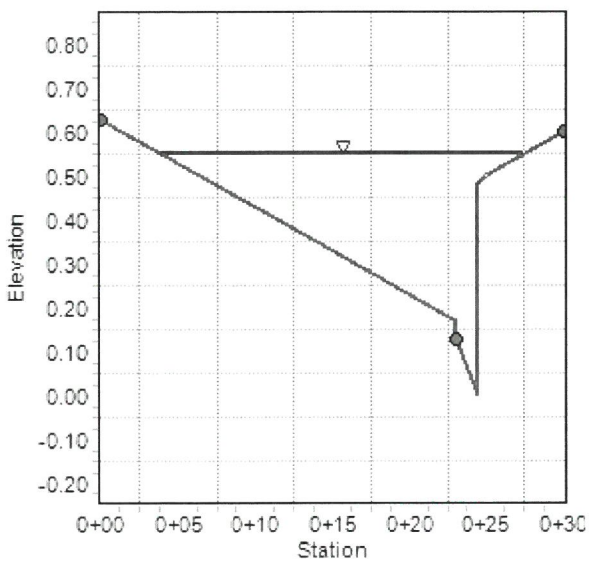
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00700	ft/ft
Normal Depth	0.55	ft
Discharge	11.80	ft ³ /s

Cross Section Image



Worksheet for Q10-Flow Depth at North 10-Foot DI

Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Channel Slope 0.00700 ft/ft
Discharge 11.80 ft³/s
Section Definitions

Station (ft)	Elevation (ft)
0+00.000	0.63
0+23.000	0.17
0+23.000	0.13
0+24.500	0.00
0+24.500	0.48
0+25.000	0.50
0+30.000	0.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.000, 0.63)	(0+23.000, 0.13)	0.016
(0+23.000, 0.13)	(0+30.000, 0.60)	0.013

Options

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

Results

Normal Depth 0.55 ft
Elevation Range 0.000 to 0.625 ft
Flow Area 4.49 ft²
Wetted Perimeter 24.128 ft
Hydraulic Radius 0.19 ft

Worksheet for Q10-Flow Depth at North 10-Foot DI

Results

Top Width	23.598	ft
Normal Depth	0.55	ft
Critical Depth	0.56	ft
Critical Slope	0.00619	ft/ft
Velocity	2.63	ft/s
Velocity Head	0.11	ft
Specific Energy	0.66	ft
Froude Number	1.06	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.000	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.55	ft
Critical Depth	0.56	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00619	ft/ft

Cross Section for INTERCEPTING CAPACITY OF EX North 10-Foot DI

Project Description

Solve For Spread

Input Data

Discharge	6.70	ft ³ /s
Spread	26.15	ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Curb Opening Length	5.00	ft
Opening Height	0.50	ft
Curb Throat Type	Horizontal	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Throat Incline Angle	90.00	degrees

Cross Section Image



V: 1
H: 1

Worksheet for INTERCEPTING CAPACITY OF EX North 10-Foot DI

Project Description

Solve For Spread

Input Data

Discharge	6.70	ft ³ /s
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Curb Opening Length	5.00	ft
Opening Height	0.50	ft
Curb Throat Type	Horizontal	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Throat Incline Angle	90.00	degrees

Results

Spread	26.15	ft
Depth	0.62	ft
Gutter Depression	0.09	ft
Total Depression	0.26	ft

Cross Section for INTERCEPTING CAPACITY OF 3' TYPE A DI (WEST

Project Description

Solve For Efficiency

Input Data

Discharge	10.10	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Efficiency	11.66	%
Curb Opening Length	1.50	ft

Cross Section Image



V: 1
H: 1

Worksheet for IINTERCEPTING CAPACITY OF 3' TYPE A DI (WEST

Project Description

Solve For

Efficiency

Input Data

Discharge	10.10	ft³/s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	1.50	ft
Local Depression	2.00	in
Local Depression Width	1.50	ft

Results

Efficiency	11.66	%
Intercepted Flow	1.18	ft³/s
Bypass Flow	8.92	ft³/s
Spread	18.03	ft
Depth	0.46	ft
Flow Area	3.32	ft²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	3.04	ft/s
Equivalent Cross Slope	0.06261	ft/ft
Length Factor	0.07	
Total Interception Length	22.54	ft

Cross Section for INTERCEPTING CAPACITY OF 2' TYPE A DI (EAST

Project Description

Solve For

Efficiency

Input Data

Discharge	0.70	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Local Depression	2.00	in
Local Depression Width	1.50	ft
Efficiency	36.58	%
Curb Opening Length	1.00	ft

Cross Section Image



V: 1
H: 1

Worksheet for IINTERCEPTING CAPACITY OF 2' TYPE A DI (EAST SIDE)

Project Description

Solve For Efficiency

Input Data

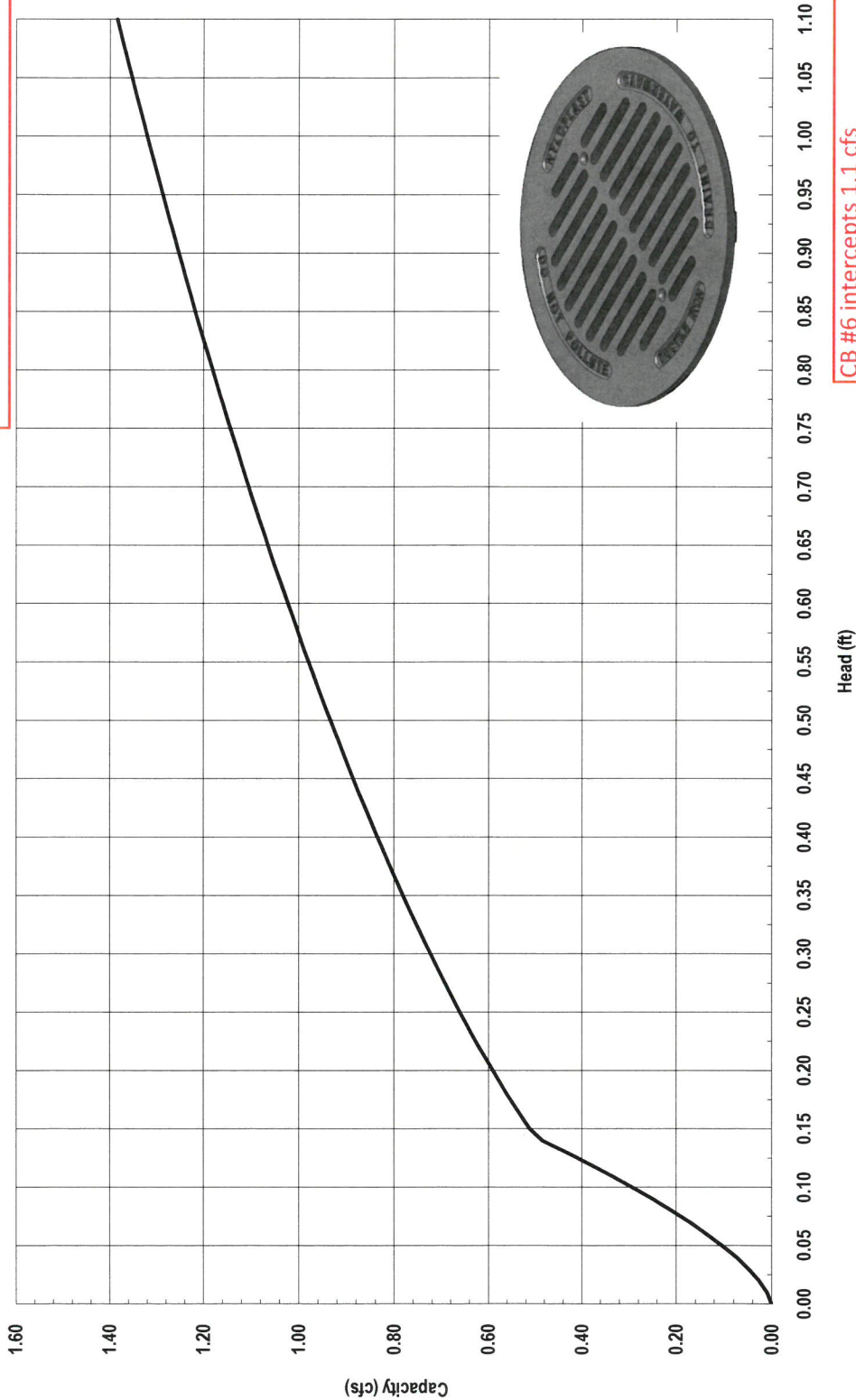
Discharge	0.70	ft ³ /s
Slope	0.00700	ft/ft
Gutter Width	1.50	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.016	
Curb Opening Length	1.00	ft
Local Depression	2.00	in
Local Depression Width	1.50	ft

Results

Efficiency	36.58	%
Intercepted Flow	0.26	ft ³ /s
Bypass Flow	0.44	ft ³ /s
Spread	5.76	ft
Depth	0.21	ft
Flow Area	0.40	ft ²
Gutter Depression	0.09	ft
Total Depression	0.26	ft
Velocity	1.74	ft/s
Equivalent Cross Slope	0.14318	ft/ft
Length Factor	0.22	
Total Interception Length	4.47	ft

Nyloplast 12" Drop In Grate Inlet Capacity Chart

CB #2, 4 and 6 are assigned Nyloplast 12" Drop inlets



CB #6 intercepts 1.1 cfs

Depth of flow = 0.67'

2xd=1.34'

Grate elevation = 65.0'

2d water surface elevation 66.34'

FFE 66.91' (above the 2d WSE)



Nyloplast

3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490
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24"x24" DROP INLET CAPACITY CALCULATION

Proposed 2'x2' Jensen Type Drop Inlet.

Effective Opening Area Calculation:

Per Jensen Precast 2424 Drop Inlets H-20 Traffic Rated Grate Drawing

Bearing Bars quantity = 24	Area	$24 \times 2' \times 0.25/12 =$	1.00 (Sq. ft.)
Cross Bars quantity = 7	Area	$7 \times 2' \times 0.25"/12 =$	0.29 (Sq. ft.)
		Total area(ft2)	1.29 (Sq. ft.)

Gross Area 4 (Sq. ft.)
Net area 2.71 (Sq. ft.)

Account for 50% clogging due to debris

Net Area (ft2) 1.36 (Sq. ft.)

Use Orifice Equation: $Q = CA(2gh)^{0.5}$

C=0.6

A= Area of the aerial drain in Sq. Ft

Q=Flow from basin ON1P and OF1P in cfs

h=Available head in ft. (accepted the ditch depth=0.5 feet)

C= 0.65

A= 1.36 (Sq. ft.)

g= 32.2

h= 0.6

Discharge Capacity

Q(cfs)= 5.47

CB #	Capacity	
	h (ft.)	Q (cfs)
1	0.16	2.8
3	<0.1	1.4
5	<0.1	1.3
7	<0.1	0.7
8	0.6	5.47
9	<0.1	0.6

CB #1,3, 5, 7, 8 and 9 are assigned 24"x24" Jensen Type drop inlets

Project Highgate Senior Living

Subject Block Wall Opening Calculation B/W #1

Designed by SM

Date October 25, 2016

Job No. 9754

Checked by

Date

Sheet No. 1 of 1

Capacity of Wall Opening

Q	5	: Magnitude of Flow (cfs)
Cf	0.5	: Clogging Factor
Cw	3	: Weir Coefficient
Co	0.67	: Orifice Coefficient
L	4.00	: Length of Wall Opening (feet)
H	1.33	: Height of Wall Opening (feet)
D		: Depth of water surface (feet)

Weir Equation

$$D_w = \left(\frac{Q}{CL} \right)^{2/3}$$

$$D_w = 1.22$$

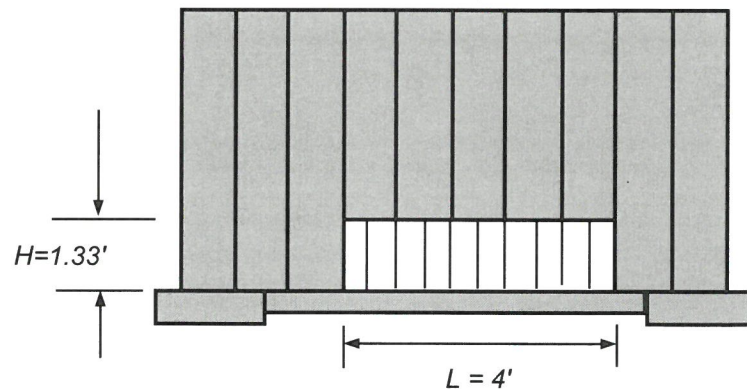
Orifice Equation

$$D_o = \left(\frac{1}{2g} \right)^{1/2} \left(\frac{Q}{C_o C_f L H} \right)^2 + \frac{3}{2} C_f H$$

$$D_o = 1.12$$

If Depth is greater than the height of the opening then the Orifice Equation Governs
Otherwise the Weir Equation Governs. Therefore,

$$D_o = 1.12$$



Project Highgate Senior Living

Subject Block Wall Opening Calculation B/W #2

Designed by SM

Date October 19, 2016

Job No. 9754

Checked by

Date

Sheet No. 1 of 1

Capacity of Wall Opening

Q	9	: Magnitude of Flow (cfs)
Cf	0.5	: Clogging Factor
Cw	3	: Weir Coefficient
Co	0.67	: Orifice Coefficient
L	4.00	: Length of Wall Opening (feet)
H	1.33	: Height of Wall Opening (feet)
D		: Depth of water surface (feet)

Weir Equation

$$D_w = \left(\frac{Q}{CL} \right)^{2/3}$$

$$D_w = 1.49$$

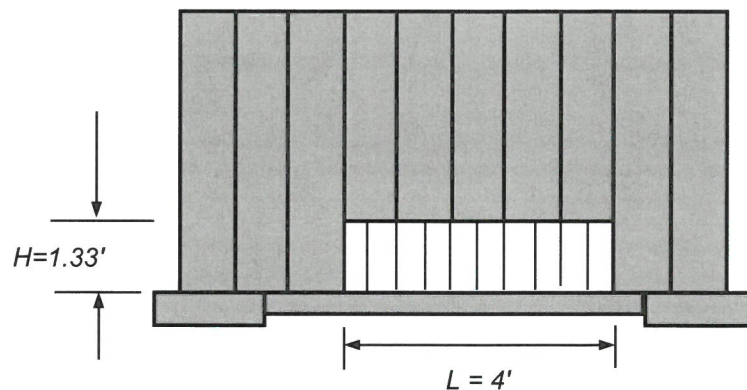
Orifice Equation

$$D_o = \left(\frac{1}{2g} \right)^{1/2} \left(\frac{Q}{C_o C_f L H} \right)^2 + \frac{3}{2} C_f H$$

$$D_o = 1.40$$

If the Weir Depth is greater than the height of the opening then the Orifice Equation Governs
Otherwise the Weir Equation Governs. Therefore,

Do= 1.40



Project Highgate Senior Living

Subject Block Wall Opening Calculation B/W #3

Designed by SM

Date October 19, 2016

Job No. 9754

Checked by

Date

Sheet No. 1 of 1

Capacity of Wall Opening

Q	2	: Magnitude of Flow (cfs)
Cf	0.5	: Clogging Factor
Cw	3	: Weir Coefficient
Co	0.67	: Orifice Coefficient
L	4.00	: Length of Wall Opening (feet)
H	1.33	: Height of Wall Opening (feet)
D		: Depth of water surface (feet)

Weir Equation

$$D_w = \left(\frac{Q}{CL} \right)^{2/3}$$

$$D_w = 0.97$$

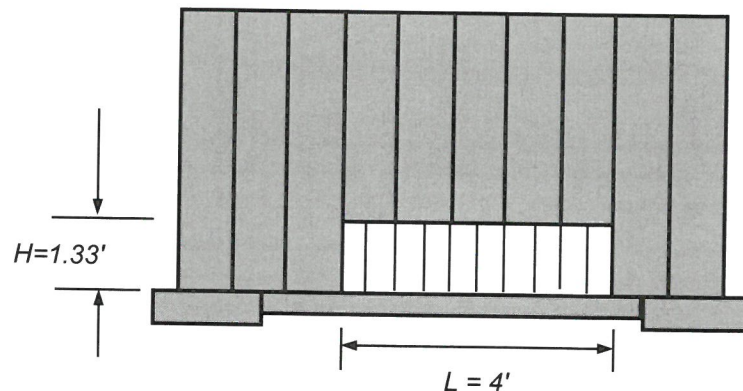
Orifice Equation

$$D_o = \left(\frac{1}{2g} \right)^{1/2} \left(\frac{Q}{C_o C_f L H} \right)^2 + \frac{3}{2} C_f H$$

$$D_o = 1.02$$

If the Weir Depth is greater than the height of the opening then the Orifice Equation Governs
Otherwise the Weir Equation Governs. Therefore,

Do= 1.02



PRORATED FLOW FOR CATCH BASINS						
INTERCEPTS	SUB	Area	Area	Prorated	Q100	
				from		Size of
BY	BASIN	sq. ft.	Acres	OND1	cfs	CB
CB #1		43162	1.0	1.8	2.8	24"x24"
CB #2		7942	0.2	1.8	0.5	12x12 *
CB #3		21456	0.5	1.8	1.4	24"x24"
CB #4		4017	0.1	1.8	0.3	12x12*
			1.8		4.9	
CB #5		19469	0.4	3.2	1.3	24"x24"
CB #6		16567	0.4	3.2	1.1	12x12*
CB #7		10237	0.2	3.2	0.7	24"x24"
CB #8		83304	1.9	3.2	5.4	24"x24"
CB #9		9823	0.2	3.2	0.6	12x12
			3.2		9.0	

* 12" NYLOPLAST TYPE DROP INLET

STORM SEWER ENERGY LOSS COEFFICIENTS

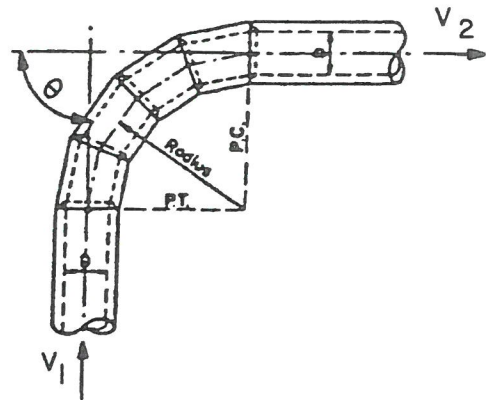
(C) BENDS

I. Large Radius Bends (Pipe Diameter > Bend Radius)

$$K_b = 0.25 (\theta / 90)^{0.5}$$

θ	K_b
90"	0.25
60"	0.20
45"	0.18
30"	0.14

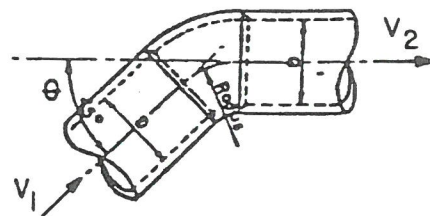
Note: Head loss applied at P.C.



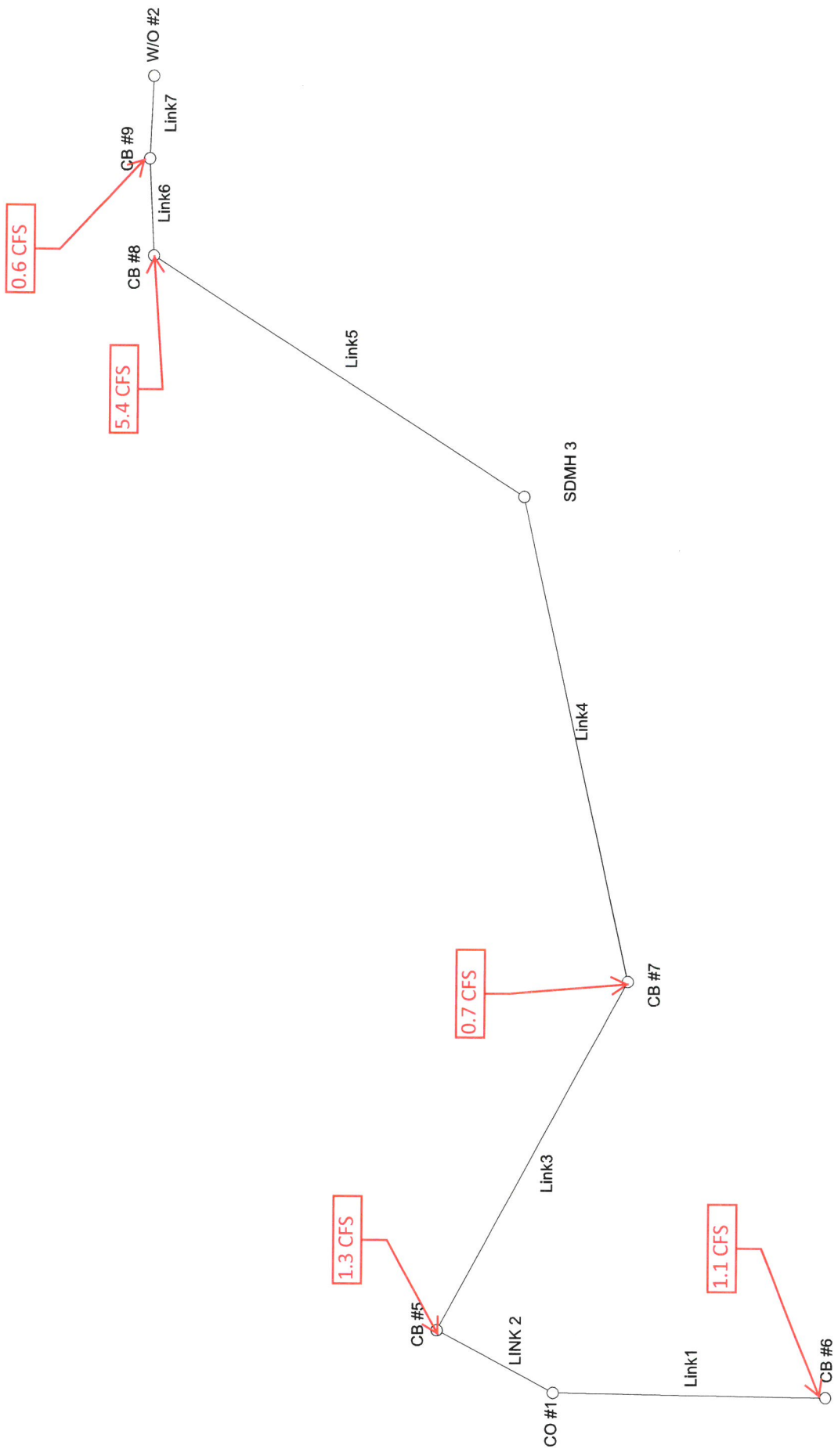
II. Sharp Radius Bends (Pipe Diameter = Bend Radius)

θ	K_b
90"	0.50
60"	0.43
45"	0.35
30"	0.25

Note: Head loss applied at entrance to bend.



Revision	Date



[TITLE]
HIGHGATE SENIOR LIVING
SOUTH BRANCH SD CAPACITY ANALYSIS
COLLINS ENGINEERS JOB No. 9754

[REPORT]
COMPOSITE_ONLY

[NETWORK]
**TYPE NAME

Outlet "W/O #2"
Reach "Link7"
Junction "CB #9"
Reach "Link6"
Junction "CB #8"
Reach "Link5"
Reach "Link4"
Junction "CB #7"
Reach "Link3"
Junction "CB #5"
Reach "LINK 2"
Reach "Link1"
Headwork "CB #6"

**BRANCH DEFINITIONS

[OUTLET]
**NAME STATION INVERT GROUND CHANNEL WATER SURFACE
** ELEV ELEV ELEV ID ELEV (opt.)

"W/O #2" 1000 60.47 62.67 "18-INCH" 61.87

[HEADWORK]
**NAME INVERT GROUND CHANNEL FLOW WATER SURFACE
** ELEV ELEV ID ELEV (opt.)

"CB #6" 62.65 65 "12-INCH" 1.1 0

[WALLENTANCE]
**NAME INVERT GROUND CHANNEL LOSS
** ELEV ELEV ID COEFFICIENT(opt.)

[WALLEXIT]
**NAME INVERT GROUND CHANNEL LOSS
** ELEV ELEV ID COEFFICIENT(opt.)

[BRIDGEENTRANCE]
**NAME INVERT GROUND CHANNEL REDUCTION

ELEV	ELEV	ID	FACTOR(opt.)	
**	**	----	----	----
**	**	----	----	----
[BRIDGEEXIT]				
***NAME				
**	INVERT	CHANNEL	REDUCTION	
**	ELEV	ID	FACTOR(opt.)	
**	----	----	----	----
[JOIN]				
***NAME				
**	INVERT	CHANNEL	LENGTH	CONFLUENCE
**	ELEV	ID		ANGLE
**	----	----	----	----
[JUNCTION]				
***Name				
**	INVERT	CHANNEL	LENGTH	CONFLUENCE
**	ELEV	ID		ANGLE
**	----	----	----	----
"CB #5"	62.17	"12-INCH"	2	90
"CB #5_Lateral1"	65.15	"12-INCH"	0.013	1.3
"CB #7"	61.71	"18-INCH"	2	90
"CB #7_Lateral1"	65.5	"18-INCH"	0.013	0.7
"CB #8"	60.6	"18-INCH"	2	90
"CB #8_Lateral1"	63.76	"18-INCH"	0.013	5.4
"CB #9"	60.5	"18-INCH"	2	90
"CB #9_Lateral1"	63.8	"18-INCH"	0.013	0.6
[TRANSITION]				
***NAME				
**	INVERT	CHANNEL	LENGTH	
**	ELEV	ID		
**	----	----	----	----
[REACH]				
***NAME				
**	INVERT	CHANNEL	LENGTH	NUMBER
**	ELEV	ID		MANHOLES(opt)
**	----	----	----	----
"Link1"	62.65	"12-INCH"	83.7	0
"LINK 2"	62.31	"12-INCH"	36.4	0
"Link3"	62.17	"18-INCH"	116.6	0
"Link4"	61.71	"18-INCH"	147.7	0
"Link5"	61.12	"18-INCH"	130.3	0
"Link6"	60.6	"18-INCH"	25.1	0
"Link7"	60.5	"18-INCH"	6	0
[DROP]				
***Name				
**	INVERT	CHANNEL	LOSS	
**	ELEV	ID	COEFFICIENT	
**	----	----	----	----

Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.0 30/09/2011
 Alameda Extension
XP Solutions www.xpsolutions.com

INPUT FILE

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Computed 10/20/16 13:13:48

TITLE INFORMATION

 HIGHGATE SENIOR LIVING
 SOUTH BRANCH SD CAPACTY ANALYSIS
 COLLINS ENGINEERS JOB No. 9754

WARNING SUMMARY

 WARNING 47: Junction CB #5 has a different channel than its direct downstream element.
 WARNING 36: D/S processing stopped in junction CB #5 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction CB #7 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction CB #8 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction CB #9 because critical momentum is greater than maximum momentum.
 WARNING 63: Alameda upper junction loss limit exceeded for CB #8.
 WARNING 63: Alameda upper junction loss limit exceeded for CB #5.

RESULTS

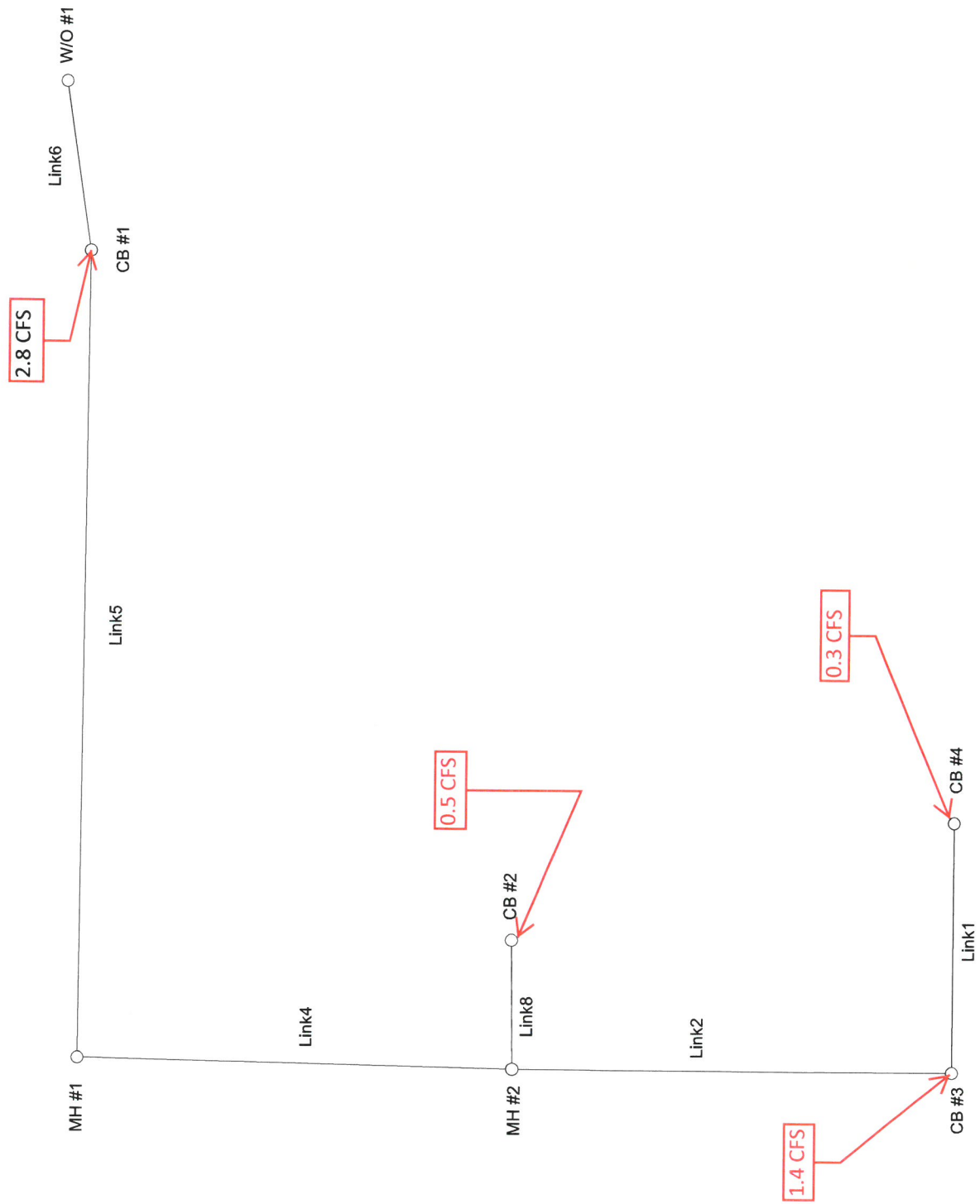
=====
 Main Line
=====

Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
###																	
"W/O #2"	Outlet	1000.00	60.47	62.67	61.870	1.400	9.10	1	5.30	0.44	62.31	0.000	1.167	0.000	0.00000	0.000	Circular Pipe
"Link7"	Reach	1006.00	60.50	63.80	61.914	1.414	9.10	1	5.27	0.43	62.35	0.000	1.167	0.590	0.00500	1.500	Circular Pipe
"CB #9"	Junction	1008.00	60.50	63.80	62.053	1.553	8.50	1	4.81	0.36	62.41	0.000	1.129	0.000	0.00000	0.000	Circular Pipe
"Link6"	Reach	1033.10	60.60	63.76	62.307	1.707	8.50	1	4.81	0.36	62.67	0.000	1.129	0.000	0.00398	1.500	Circular Pipe
"CB #8"	Junction	1035.10	60.60	63.76	62.937	2.337	3.10	1	1.75	0.05	62.99	0.000	0.670	0.000	0.00000	0.000	Circular Pipe
"Link5"	Reach	1165.40	61.12	65.66	63.071	1.951	3.10	1	1.75	0.05	63.12	0.000	0.670	0.000	0.00399	0.721	Circular Pipe
"Link4"	Reach	1313.10	61.71	65.50	63.219	1.509	3.10	1	1.75	0.05	63.27	0.000	0.670	0.000	0.00399	0.721	Circular Pipe
"CB #7"	Junction	1315.10	61.71	65.50	63.259	1.549	2.40	1	1.36	0.03	63.29	0.000	0.586	0.000	0.00000	0.000	Circular Pipe
	"i.p."	1332.27	61.78	65.45	63.278	1.500	2.40	1	1.36	0.03	63.31	0.000	0.586	0.028	0.00395	0.626	Circular Pipe

	"i.p."	1371.61	61.93	65.33	63.294	1.361	2.40	1	1.42	0.03	63.33	0.000	0.586	0.180	0.00395	0.626	Circular Pipe
	"i.p."	1393.96	62.02	65.26	63.301	1.280	2.40	1	1.49	0.03	63.34	0.000	0.586	0.214	0.00395	0.626	Circular Pipe
	"i.p."	1412.36	62.09	65.21	63.307	1.214	2.40	1	1.57	0.04	63.35	0.000	0.586	0.242	0.00395	0.626	Circular Pipe
	"i.p."	1428.51	62.16	65.16	63.313	1.155	2.40	1	1.64	0.04	63.35	0.000	0.586	0.269	0.00395	0.626	Circular Pipe
"Link3"	Reach	1431.70	62.17	65.15	63.314	1.144	2.40	1	1.66	0.04	63.36	0.000	0.586	0.275	0.00395	0.626	Circular Pipe
"CB #5"	Junction	1433.70	62.17	65.15	63.383	1.213	1.10	1	1.40	0.03	63.41	0.000	0.441	0.000	0.00000	0.000	Circular Pipe
"LINK 2"	Reach	1470.10	62.31	67.18	63.433	1.123	1.10	1	1.40	0.03	63.46	0.000	0.441	0.000	0.00385	0.499	Circular Pipe
	"i.p."	1512.90	62.48	66.07	63.484	1.000	1.10	1	1.40	0.03	63.51	0.000	0.441	0.039	0.00406	0.491	Circular Pipe
	"i.p."	1541.16	62.60	65.33	63.506	0.907	1.10	1	1.47	0.03	63.54	0.000	0.441	0.228	0.00406	0.491	Circular Pipe
"Link1"	Reach	1553.80	62.65	65.00	63.514	0.864	1.10	1	1.52	0.04	63.55	0.000	0.441	0.262	0.00406	0.491	Circular Pipe
"CB #6"	Headwrk	1553.80	62.65	65.00	63.514	0.864	1.10	1	1.52	0.04	63.55	0.000	0.441	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches



[TITLE]
HIGHGATE SENIOR LIVING
NORTH BRANCH SD CAPACITY ANALYSIS
COLLINS ENGINEERS JOB No. 9754

[REPORT]
COMPOSITE_ONLY

[NETWORK]
**TYPE NAME
**-----
Outlet "W/O #1"
Reach "Link6"
Junction "CB #1"
Reach "Link5"
Reach "Link4"
Join "MH #2"
Reach "Link2"
Junction "CB #3"
Reach "Link1"
Headwork "CB #4"

**BRANCH DEFINITIONS

"MH #2_Branch1"
Join "MH #2"
Reach "Link8"
Headwork "CB #2"

[OUTLET]	**NAME	**	STATION	INVERT ELEV	GROUND ELEV	CHANNEL ID	WATER SURFACE ELEV (opt.)
	**-----						
	"W/O #1"		500	60.3	64	"18-INCH"	61.42

[HEADWORK]	**NAME	**	INVERT ELEV	GROUND ELEV	CHANNEL ID	FLOW	WATER SURFACE ELEV (opt.)
	**-----						
	"CB #4"		62.5	64.98	"12-INCH"	0.3	0

				N.BRANCH.wsx			
		61.91	64.98	"12-INCH"	0.5	0	
"CB #2"							
[WALLENTRENCE]							
**NAME	INVERT	GROUND	CHANNEL	LOSS			
**	ELEV	ELEV	ID	COEFFICIENT(opt.)			
**	-----	-----	-----	-----			
[WALLEEXIT]							
**NAME	INVERT	GROUND	CHANNEL	LOSS			
**	ELEV	ELEV	ID	COEFFICIENT(opt.)			
**	-----	-----	-----	-----			
[BRIDGEENTRENCE]							
**NAME	INVERT	GROUND	CHANNEL	REDUCTION			
**	ELEV	ELEV	ID	FACTOR(opt.)			
**	-----	-----	-----	-----			
[BRIDGEEXIT]							
**NAME	INVERT	GROUND	CHANNEL	REDUCTION			
**	ELEV	ELEV	ID	FACTOR(opt.)			
**	-----	-----	-----	-----			
[JOIN]							
**NAME	INVERT	GROUND	CHANNEL	LENGTH	MANNINGS	n	NUMBER OF
**	ELEV	ELEV	ID				BRANCHES
**	-----	-----	-----	-----	-----	-----	-----
"MH #2"	61.78	66.95	"12-INCH"	4	0.013	1	
"MH #2_Branch1"	61.78		"12-INCH"				-90
[JUNCTION]							
**Name	INVERT	GROUND	CHANNEL	LENGTH	MANNINGS	n	NUMBER OF
**	ELEV	ELEV	ID				LATERALS
**	-----	-----	-----	-----	-----	-----	-----
"CB #3"	62.24	64.89	"12-INCH"	2	0.013	1	
"CB #3_Lateral1"	64.89		"12-INCH"				90 1.4
"CB #1"	60.48	63.84	"12-INCH"	2	0.013	1	
"CB #1_Lateral1"	64.26		"12-INCH"				90 2.8

N.BRANCH.wsx

[TRANSITION]

**NAME	INVERT ELEV	GROUND ELEV	CHANNEL ID	LENGTH	MANNINGS n
**-----	-----	-----	-----	-----	-----

[REACH]

**NAME	INVERT ELEV	GROUND ELEV	CHANNEL ID	LENGTH	MANNINGS n	CURVE (opt)	ANGLE POINT(opt)	NUMBER MANHOLES(opt)
**-----	-----	-----	-----	-----	-----	-----	-----	-----
"Link1"	62.5	64.98	"12-INCH"	64.54	0.013	0	0	1
"Link4"	61.78	66.95	"12-INCH"	111.99	0.013	0	0	1
"Link5"	61.32	66.73	"12-INCH"	211.11	0.013	0	0	0
"Link2"	62.24	64.89	"12-INCH"	112.58	0.013	0	0	0
"Link8"	61.91	64.98	"12-INCH"	30.35	0.013	0	0	0
"Link6"	60.48	63.84	"18-INCH"	44.77	0.013	0	0	0

[DROP]

**Name	INVERT ELEV	GROUND ELEV	CHANNEL ID	LOSS COEFFICIENT
**-----	-----	-----	-----	-----

[ALAMEDA]

ANGLE_LOSS_COEFFICIENT "Link1" 0.5
 ANGLE_LOSS_COEFFICIENT "Link4" 0.5
 ANGLE_LOSS_COEFFICIENT "Links" 0.25

[CHANNEL]

**REGULAR TYPES 1-4 7-8

**ID	TYPE	HEIGHT	WIDTH	LEFT SLOPE	RIGHT SLOPE	NUMBER PIERS	AVG PIER WIDTH	INVERT CROSS FALL	NUM OF BARRELS
**-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
"18-INCH"	4	1.5							1
"12-INCH"	4	1							1

**IRREGULAR TYPES 5-6

**ID	TYPE	NUMBER	AVG PIER	PIER1	PIER2	PIER3	PIER4	PIER5	PIER6	PIER7
PIER8	PIER9	PIER10								
**	PIERS	WIDTH	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV	ELEV
ELEV	ELEV	ELEV								
**-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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[POINT]
** ID          XCOORD      YCOORD
**-----
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Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 3.0 30/09/2011
 Alameda Extension
XP Solutions www.xpsolutions.com

INPUT FILE

H:\Cad\Land\9754\ADMIN\Drainage\HYDRAULIC\wspg\N.BRANCH.wsx
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TITLE INFORMATION

 HIGHGATE SENIOR LIVING
 NORTH BRANCH SD CAPACITY ANALYSIS
 COLLINS ENGINEERS JOB No. 9754

WARNING SUMMARY

 WARNING 47: Junction CB #1 has a different channel than its direct downstream element.
 WARNING 36: D/S processing stopped in junction CB #3 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction MH #2 because critical momentum is greater than maximum momentum.
 WARNING 36: D/S processing stopped in junction CB #1 because critical momentum is greater than maximum momentum.
 WARNING 63: Alameda upper junction loss limit exceeded for CB #1.
 WARNING 63: Alameda upper junction loss limit exceeded for CB #3.

RESULTS

=====
 Main Line
=====

Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION

###																	
"W/O #1"	Outlet	500.00	60.30	64.00	61.420	1.120	5.00	1	3.53	0.19	61.61	0.000	0.860	0.000	0.00000	0.000	Circular Pipe
	"i.p."	527.19	60.41	63.90	61.480	1.071	5.00	1	3.71	0.21	61.69	0.000	0.860	0.655	0.00402	0.970	Circular Pipe
"Link6"	Reach	544.77	60.48	63.84	61.524	1.044	5.00	1	3.81	0.23	61.75	0.000	0.860	0.688	0.00402	0.970	Circular Pipe
"CB #1"	Junction	546.77	60.48	63.84	61.912	1.432	2.20	1	2.80	0.12	62.03	0.000	0.633	0.000	0.00000	0.000	Circular Pipe
"Link5"	Reach	757.88	61.32	66.73	62.748	1.428	2.20	1	2.80	0.12	62.87	0.000	0.633	0.000	0.00398	0.801	Circular Pipe
"Link4"	Reach	869.87	61.78	66.95	63.242	1.462	2.20	1	2.80	0.12	63.36	0.000	0.633	0.000	0.00411	0.789	Circular Pipe
"MH #2"	Join	873.87	61.78	66.95	63.352	1.572	1.70	1	2.16	0.07	63.42	0.000	0.553	0.000	0.00000	0.000	Circular Pipe
"Link2"	Reach	986.45	62.24	64.89	63.608	1.368	1.70	1	2.16	0.07	63.68	0.000	0.553	0.000	0.00409	0.644	Circular Pipe
"CB #3"	Junction	988.45	62.24	64.89	63.752	1.512	0.30	1	0.38	0.00	63.75	0.000	0.225	0.000	0.00000	0.000	Circular Pipe
"Link1"	Reach	1052.99	62.50	64.98	63.757	1.257	0.30	1	0.38	0.00	63.76	0.000	0.225	0.000	0.00403	0.246	Circular Pipe

"CB #4"	Headwrk	1052.99	62.50	64.98	63.757	1.257	0.30	1	0.38	0.00	63.76	0.000	0.225	0.000	0.00000	0.000	Circular Pipe
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*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

=====

MH #2_Branch1

=====

Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	BARREL	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
###																	
"Outlet/M"	Outlet	873.87	61.78	66.95	63.297	1.517	0.50	1	0.64	0.01	63.30	0.000	0.293	0.000	0.00000	0.000	Circular Pipe
"Link8"	Reach	904.22	61.91	64.98	63.303	1.393	0.50	1	0.64	0.01	63.31	0.000	0.293	0.000	0.00428	0.314	Circular Pipe
"CB #2"	Headwrk	904.22	61.91	64.98	63.303	1.393	0.50	1	0.64	0.01	63.31	0.000	0.293	0.000	0.00000	0.000	Circular Pipe

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

APPENDIX D
(Reference Material)

IN-N-Out Burger Lake Mead Boulevard and Rock Springs Drive, DS 1100, which was prepared by Martin & Martin, July 8, 1993, and approved by the City of Las Vegas on January 11, 1994.

The study material is used to support off-site flow from west side of the site which affecting Rock Springs Drive.

DRAINAGE STUDY
FOR
IN-N-OUT BURGER
LAKE MEAD BOULEVARD AND
ROCK SPRINGS DRIVE

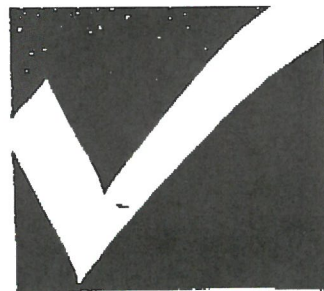
July 8, 1993

Prepared For:

In-N-Out Burger
13502 East Virginia Avenue
Baldwin Park, California 91706
818-338-5587

Prepared By:

Martin & Martin, Inc., Civil Engineers
1701 West Charleston Boulevard
Suite 420
Las Vegas, Nevada 89102
702-386-8005



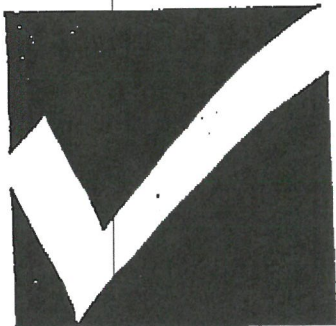
DS# 1100

DS INDEX 8594

APN

PROJECT IN - N - OUT Burger

SUBMITTAL 1ST



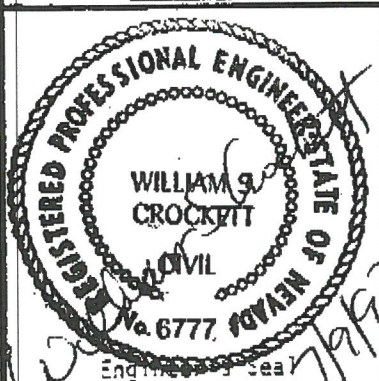
DRAINAGE STUDY INFORMATION FORM

Name of Development: In-N-Out Burger/Lake Mead & Rock Springs Date: July 7, 1993Location of Development: a) Descriptive Rock Springs Road at Lake Mead Boulevard
b) Sect. 22 Twn. 20 S Rng. 60 EName of Owner: In-N-Out Burger, Inc. Assessors Parcel No: 300-640-004Contact Person-Name: William S. Crockett Telephone No: 386-8005Firm: Martin & Martin, Inc.Address: 1701 West Charleston Boulevard, Suite 420
Las Vegas, Nevada 89102

Type of Land Development/Land Disturbance Process:

- ☐ Reasoning ☐ Subdivision Map ☐ Clearing and Grading Only
☐ Parcel Map ☐ Planned Unit Development ☒ Other (Please specify below)
☐ Large Parcel Map ☐ Building Permit
Fast Food Restaurant

1. Total Owned Land Area: At Site: 3.2 Acre Being Developed/Disturbed: 3.2 Acre
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.)? Restaurant
5. Approximate upstream land area which drains to the subject site? 149.3 Acres
6. Has the site drainage been evaluated in the past? YES NO. If yes, please identify documentation: _____
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site:
Site discharges to existing earthen engineering channel along West edge of Southbound on-ramp to US95
8. Briefly describe your proposed schedule for the subject project: Start August, 1993
Complete December, 1993.



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.

Local Entity File No. _____

Revision	Date

REFERENCE:

STANDARD FORM 1

CITY OF LAS VEGAS

DATE:

INTER-OFFICE MEMORANDUM

January 11, 1994

TO:

Kent Nash
Land Development Services
Department of Public Works

FROM:

MAS for
Tom Chiatovich, PE
Chief, Flood Control
Dept. of Public Works

SUBJECT:

In-N-Out Burger Drainage Study
File No. DS1100C.ZNA
Date of Engineer's Stamp: 11/22/93
Date Received by City: 11/22/93

COPIES TO:

Martin & Martin
John McNellis, PE
Charles Kajkowski, PE
CCRFCFCD

HISTORY:

1st Submittal	08/26/93 - Not Acceptable
2nd Submittal	10/27/93 - Not Acceptable
3rd Submittal	01/11/93 - (see comments below)

REMARKS:

3rd Submittal (Addendum 2)

The drainage study for the subject project has been reviewed and

_____ is acceptable in concept subject to conformance to all
City standards and the following conditions:

 X must receive CCRFCFCD concurrence.

NOTE: This site is located in a **FEMA Zone A**. CCRFCFCD review and approval is required prior to recordation of final map or issuance of building/grading permits (the Engineer must send a copy of the report to the CCRFCFCD for review). FEMA Elevation Certificates, showing as-built finish floor elevations, must be completed (by the developer through his engineer/surveyor) for each building and submitted to CLV Flood Control prior to release of bonds, final inspection or issuance of occupancy permits.

1. The drainage study is acceptable in concept, however, the City will not formally accept a drainage study in an A Zone until CCRFCFCD concurrence is received. The Engineer may wish to contact the CCRFCFCD to confirm that they have begun their review.
2. The conceptual acceptance is for the In-N-Out Burger site only. Any additional construction on or parceling of the overall site

will require an additional technical drainage study (including additional hydraulic analysis).

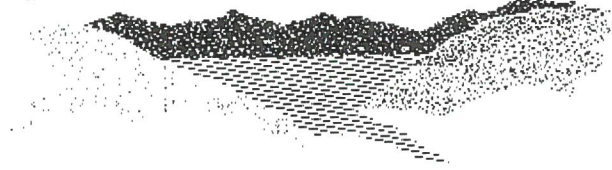
END OF REMARKS

mas

T/R/S: 20/60/19

L-19

C L A R K C O U N T Y
REGIONAL FLOOD CONTROL DISTRICT



Gale Wm. Fraser, II, P.E.
General Manager/Chief Engineer

BOARD OF DIRECTORS

Iris Bletsch
Chairman
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City of North Las Vegas

Jan Lavery Jones
City of Las Vegas

Larry Scheffler
City of Henderson

Bruce L. Woodbury
Clark County

January 12, 1994

Mr. Tom Chiatovich, P.E.
City of Las Vegas Public Works
400 East Stewart Avenue
Las Vegas, Nevada 89101

DISTRICT CONCURRENCE: IN-N-OUT-BURGER

Dear Mr. Chiatovich:

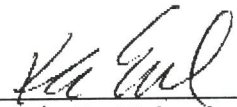
The District has reviewed the Drainage Study for the above referenced project as submitted by Martin & Martin, Inc. In addition, the District is in receipt of the Conditional Letter of Acceptance from the City of Las Vegas.

The District concurs with the conditional acceptance of this study by the City of Las Vegas. The District's review of this project was limited to issues of Regional Flood Control Significance as defined in the Uniform Regulations for the Control of Drainage.

Please be aware that as additional information becomes available and/or restudies of Flood Insurance Studies are performed, the information presented by Martin & Martin, Inc., may be superseded. Compliance with the regulatory elements and design standards specified in the Uniform Regulations for the Control of Drainage does not imply a guarantee that properties will be free from flooding or flood damage. No liability is assumed by the District, its officials or employees for the information, data or conclusions presented by the consulting engineer. We therefore make no warranties, either expressed or implied, in conducting this review.

GALE WM. FRASER, II, P.E.
General Manager/Chief Engineer

BY:


Kevin L. Eubanks, P.E.
Senior Engineer

cc: Martin & Martin, Inc.

KLE:MPC:mak

FILE: 20-60-22.MAR

TIME OF CONCENTRATION

DEVELOPMENT IN-N-OUT LAKE MEAD ROCK SPRINGS

CALCULATED BY WSC DATE 7/2/93

DESIG. (1)	SUB-BASIN DATA		INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)			t_c CHECK (URBANIZED BASINS)		FINAL t_c	REMARKS
	K (2)	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 Ft (11)	$t_c = L / 100 + 10$ Min (12)	
051	0.772	90.8	100	1.0	5.90	1280	1.8	4.0	5.33	5210	38.94	$CN = 88$
						2150	1.0	3.0	11.94			
						1200	1.8	4.0	5.00			
						480	1.0	3.0	2.67	$\Sigma =$	30.84	
052	0.772	13.9	300	1.0	10.23	1400	1.8	1.3	17.95	1700	19.44	
053	0.772	24.8	100	1.0	5.90	1600	1.0	3.0	8.89	2120	21.78	
						420	1.8	4.0	1.75	$\Sigma =$	16.54	
054	0.772	8.8	50	1.0	4.17	660	1.8	1.3	8.46	150	18.39	
						800	1.8	4.0	3.33	$\Sigma =$	15.96	
055	0.772	5.1	200	1.0	8.35	480	1.8	1.3	6.15	1030	15.72	
						350	0.5	1.0	5.83	$\Sigma =$	20.33	
056	0.772	55.6	0		0	2700	1.8	4.0	11.25	4600	35.56	
						1900	1.0	3.0	10.56	$\Sigma =$	21.81	
LM1	0.772	13.0	200	1.0	8.35	1400	1.8	1.3	17.95	NA		
LM2	0.772	13.5	200	1.0	8.35	1400	1.8	1.3	17.95	NA		✓

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

$$t_c = t_i + t_t$$

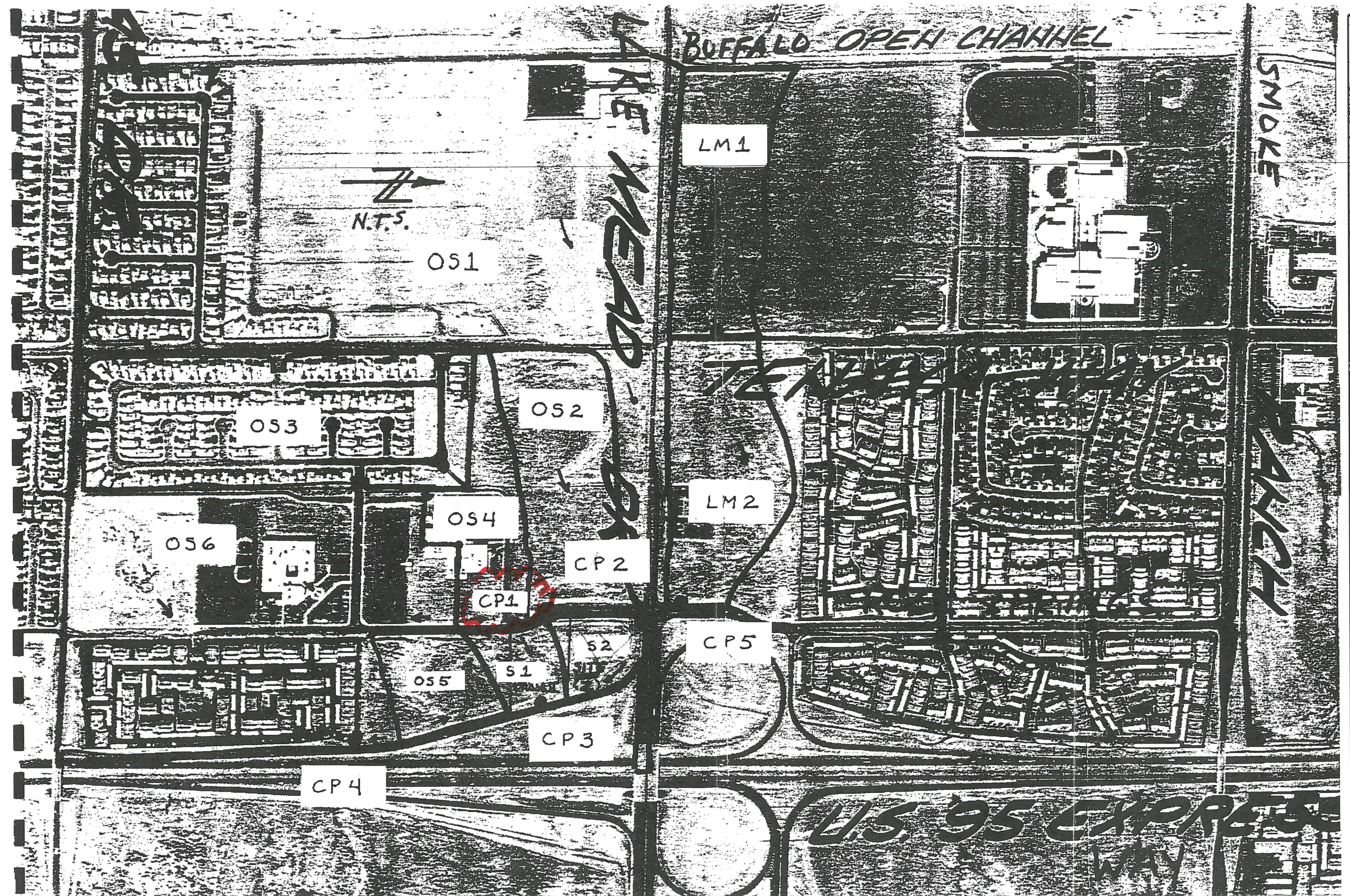
$$CN = 88 \quad K = 0.0132 CN - 0.39$$

$$K = 0.7716$$

REFERENCE:

STANDARD FORM 4

Revision	Date





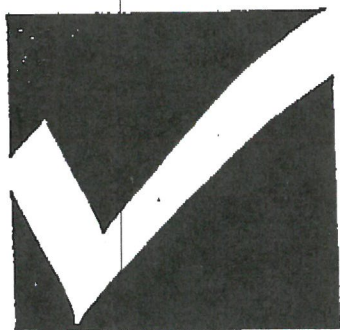
DS# 1100

DS INDEX 8597

APN

PROJECT N - N - OUT Burger

SUBMITTAL } 3rd Submittal - Addendum 2



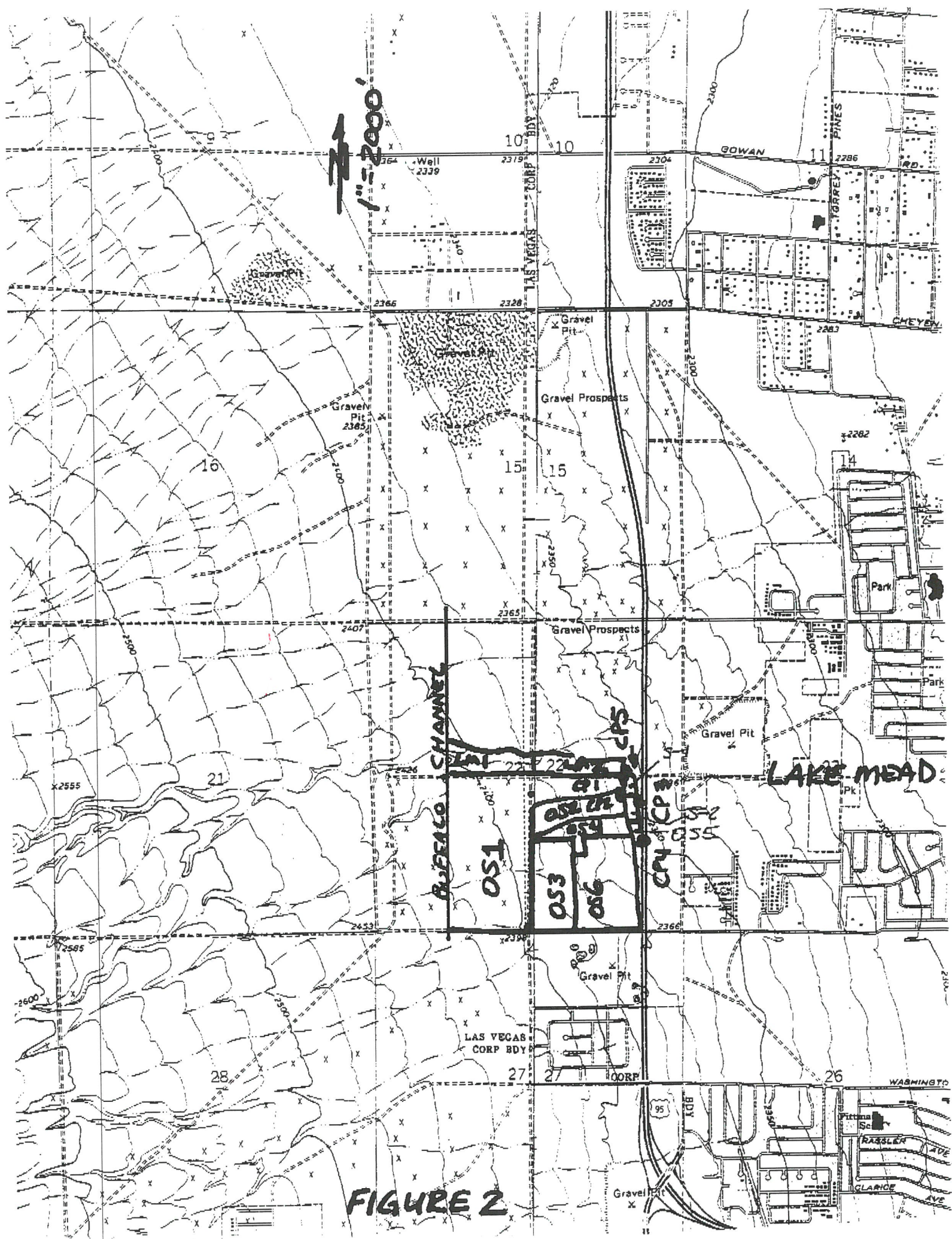


FIGURE 2

DEVELOPED

```
*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* BY THE COE IN FEBRUARY 1981 *
* REVISED 02 AUG 88 *
*
* RUN DATE 07/02/1993 TIME 15:05:19 *
*
*****
```

```
*****
*
* DODSON AND ASSOCIATES, INC. *
* HYDROLOGIST AND CIVIL ENGINEERS *
* 7015 W TIDWELL SUITE 107 *
* HOUSTON, TEXAS 77092 *
* (713) 895-8322 *
*
*****
```

```

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

```

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

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


```

LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1         ID      IN-N-OUT LAKE MEAD AND ROCK SPRINGS DEVELOPED 7/2/93
2         ID      DEVELOPED CONDITIONS - OFF-SITE & ON-SITE
3         ID      USING SCS METHODS AND KINEMATIC WAVE ROUTING
4         ID      CLARK COUNTY, NEVADA
5         ID      INPUT FILE NAME:INND OUTPUT  FILE:INND.OUT
6         ID
7         ID      *****
8         ID
9         ID      10 AND 100 YEAR - 6 HOUR STORM EVENTS
10        ID
11        ID      *****
12        *DIAGRAM
13        IT      5          300
14        IO      5          0
15        IN      5
16        JR      PREC      .57      1.00
17
18        KK      OS1 OFF-SITE BASIN
19        PB      2.77
20        PC      0.0      .02      .057      .07      .087      .108      .124      .13      .13      .13
21        PC      .13      .13      .13      .133      .14      .142      .148      .158      .172      .181
22        PC      .19      .197      .199      .2      .201      .204      .214      .229      .241      .249
23        PC      .251      .256      .27      .278      .281      .283      .295      .322      .352      .409
24        PC      .499      .59      .71      .744      .781      .812      .819      .835      .851      .856
25        PC      .86      .868      .876      .888      .91      .926      .937      .95      .97      .976
26        PC      .982      .985      .987      .989      .99      .993      .993      .994      .995      .998
27        PC      .998      .999      1.0
28        BA      .1419
29        LS      0      88      0
30        UD      0.308
31
32        KK      OS2 OFF SITE BASIN
33        BA      .0217
34        LS      0      88      0
35        UD      .194
36
37        KK      OS3 OFF SITE BASIN
38        BA      .0388
39        LS      0      88      0
40        UD      .165
41
42        KK      R053 ROUTE OS3 BASIN TO CP1
43        RK      140      .010      0.013      TRAP      10      0
44        RK      900      .018      0.016      TRAP      50      0
45
46        KK      OS4 OFF SITE BASIN
47        BA      .0138
48        LS      0      88      0
49        UD      0.160

```

HEC-1 INPUT

PAGE 2

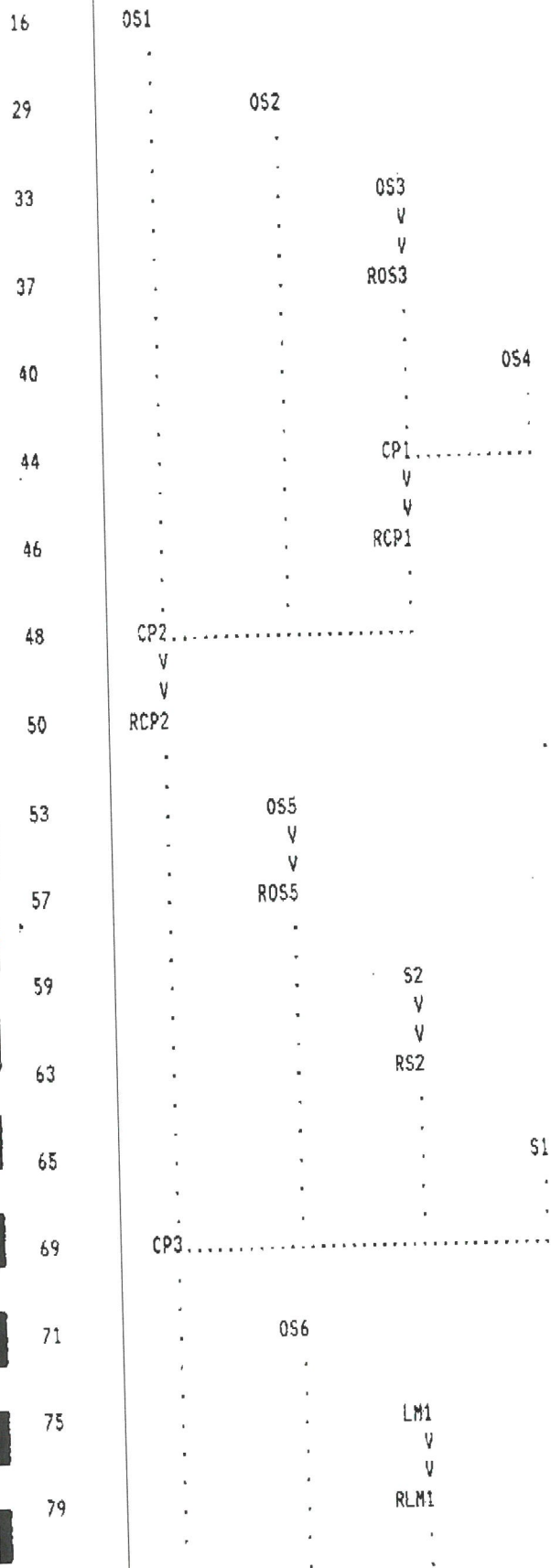
LINE	ID	1	2	3	4	5	6	7	8	9	10
44	KK	CP1									
45	HC	2									
46	KK	RCP1									
47	RK	750	.010	.016		TRAP	80		0		
48	KK	CP2									
49	HC	3									
50	KK	RCP2									
51	RK	300	.010	.025		TRAP	10		3		
52	RK	400	.004	.025		TRAP	20		3		
53	KK	OS5 OFF SITE BASIN									
54	BA	.0080									
55	LS	0	88	0							
56	UD	.157									
57	KK	ROS5									
58	RK	350	.005	.025		TRAP	20		3		
59	KK	S2									
60	BA	.0047									
61	LS	0	98	0							
62	UD	0.050									
63	KK	RS2									
64	RK	200	.005	.025		TRAP	20		3		
65	KK	S1 BASIN									
66	BA	.0045									
67	LS	0	98	0							
68	UD	0.050									
69	KK	CP3									
70	HC	4									
71	KK	OS6									
72	BA	.0869									
73	LS	0	88	0							
74	UD	.218									
75	KK	LM1									
76	BA	.0203									
77	LS	0	88	0							
78	UD	.263									
79	KK	RLM1									
80	RK	1400	.018	.027		TRAP	100		0		

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

81	KK	LM2		
82	BA	.0219		
83	LS	0	88	0
84	UD	.263		
85	KK	CP5		
86	HC	2		
87	ZZ			

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT
LINE (V) ROUTING (---) DIVERSION OR PUMP FLOW
NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION	
				RATIO 1 .57	RATIO 2 1.00
HYDROGRAPH AT	OS1	.14	1 FLOW TIME	58. 3.75	144. 3.75
HYDROGRAPH AT	OS2	.02	1 FLOW TIME	11. 3.67	26. 3.58
HYDROGRAPH AT	OS3	.04	1 FLOW TIME	21. 3.58	51. 3.58
ROUTED TO	RCS3	.04	1 FLOW TIME	20. 3.67	48. 3.58
HYDROGRAPH AT	OS4	.01	1 FLOW TIME	7. 3.58	18. 3.58
2 COMBINED AT	CP1	.05	1 FLOW TIME	27. 3.67	67. 3.58
ROUTED TO	RCP1	.05	1 FLOW TIME	26. 3.67	65. 3.67
3 COMBINED AT	CP2	.22	1 FLOW TIME	93. 3.75	230. 3.67
ROUTED TO	RCP2	.22	1 FLOW TIME	92. 3.75	226. 3.67
HYDROGRAPH AT	OS5	.01	1 FLOW TIME	4. 3.58	11. 3.58
ROUTED TO	ROS5	.01	1 FLOW TIME	4. 3.67	10. 3.58
HYDROGRAPH AT	S2	.00	1 FLOW TIME	6. 3.50	11. 3.50
ROUTED TO	RS2	.00	1 FLOW TIME	6. 3.50	11. 3.50
HYDROGRAPH AT	S1	.00	1 FLOW TIME	6. 3.50	10. 3.50
4 COMBINED AT	CP3	.23	1 FLOW TIME	100. 3.75	245. 3.67
HYDROGRAPH AT	OS6	.09	1 FLOW TIME	41. 3.67	101. 3.67
HYDROGRAPH AT	LM1	.02	1 FLOW TIME	9. 3.67	22. 3.67

				TIME	3.83	3.83
HYDROGRAPH AT	LM2	.02	1	FLOW	10.	24.
				TIME	3.67	3.67
2 COMBINED AT	CP5	.04	1	FLOW	17.	44.
				TIME	3.83	3.75

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

(Reference Material)

- Hydrology Study for James E. McMillan Elementary School, DS 458, which was prepared by Arturo Cambeiro & Associates, LTD, and approved by the City of Las Vegas on April 18, 1989.

The study material is used to support off-site flow on towards Walt Lott Drive.



DS# 458

DS INDEX

APN 138-22-

PROJECT JAMES E. McMILLAN ELEM. SCHOOL

SUBMITTAL 1ST SUBMITTAL, TECHNICAL
DRAINAGE STUDY



Rec'd 3/23/89

458

L 22

HYDROLOGY STUDY

JAMES E. McMILLAN ELEMENTARY SCHOOL

CITY OF LAS VEGAS, NEVADA

A Portion of the Northeast Quarter (NE 1/4) of
Section 22, Township 20 South, Range 60 East, M.D.M.

March 1989

Prepared for: ARTURO CAMBEIRO & ASSOCIATES, LTD.

CITY OF LAS VEGAS

INTER-OFFICE MEMORANDUM

Date

4-18-89

TO:

KENT NASH

Land Development Division
Department of Public Works

FROM:

Charles Kajkowski, P.E.
City Planning Engineer
Department of Public Works

SUBJECT:

JAMES E. McMILLAN ELEM-
SCHOOL
HYDROLOGY STUDY

COPIES TO:

Drainage Study File

By: SEA 3/23/89

CC. SEA KEN ACKERET

The drainage study for the subject project has been reviewed and

☒ is acceptable 90

☐ is not acceptable

in concept.

REMARKS:

1) KEEP IN MIND THAT ALTHOUGH THE ANGEL
PARK DETENTION BASIN HAS REMOVED THE
SITE FROM THE 100 YR FLOOD PLAIN; THE SPILLWAYS
OF ANGEL PARK WILL STILL OVERFLOW WHEN
RUNOFF EXCEEDS Q100. KEEPING THE FINISHED
FLOOR ELEVATIONS 18" ABOVE THE STREETS AS
PROPOSED IN THIS STUDY IS A GOOD IDEA.

B. RUNOFF

The determined on-site and off-site storm discharge is given in the following Table 1 (see Figure 4 & Appendix for calculations):

TABLE 1

<u>Drainage Area</u>	<u>Area Acres</u>	<u>CN</u>	<u>Ti Hrs</u>	<u>Concen. Point</u>	<u>Peak Flow (cfs)</u>		
					<u>10 yr.</u>	<u>25 yr.</u>	<u>100 yr.</u>
<u>Off-Site Existing</u>							
Area A	34.52	88	0.475	*	14	23	40
<u>On-Site Existing</u>							
Area B	8.82	88	0.116	4	6	10	17
Combined A+B	43.34	-	-	4	16	27	46
<u>Off-Site Future</u>							
Area A	12.85	92	0.155	*	12	18	29
Area E	1.30	98	0.129	4	2	3	4
<u>On-Site Future</u>							
Area B	5.83	90	0.105	1	5	8	13
Area C	1.17	92	0.071	2	0	1	2
Area D	2.26	98	0.107	3	4	5	7
Combined A+C+D+E	16.41	-	-	1	17	25	40

* Sheet flows to street west of project site.

Table 1 shows the 10, 25 and 100-year discharge at the concentration points for each drainage area. The flood water from the off-site Subbasin A (see Figure 4) will flow east into the proposed road located west of the project site.

This flow and Area D+C+E storm flow is collected at Point 4 and travels northeast to the existing swale and a 24 inch RCP beneath Oran K. Gragson Highway. The 100-year existing flow is expected to travel north along Oran K. Gragson Highway. The on-site runoff from Subbasin B is concentrated at Point 1 and discharges into the existing 48 inch RCP via an appropriate drop inlet.

B. RUNOFF

The determined on-site and off-site storm discharge is given in the following Table 1 (see Figure 4 & Appendix for calculations):

TABLE 1

<u>Drainage Area</u>	<u>Area Acres</u>	<u>CN</u>	<u>Ti Hrs</u>	<u>Concen. Point</u>	<u>Peak Flow (cfs)</u>		
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Area A	12.85	92	0.155	*	12	18	29
Area E	1.30	98	0.129	4	2	3	4
<u>On-Site Future</u>							
Area B	5.83	90	0.105	1	5	8	13
Area C	1.17	92	0.071	2	0	1	2
Area D	2.26	98	0.107	3	4	5	7
Combined A+C+D+E	16.41	-	-	1	17	25	40

* Sheet flows to street west of project site.

Table 1 shows the 10, 25 and 100-year discharge at the concentration points for each drainage area. The flood water from the off-site Subbasin A (see Figure 4) will flow east into the proposed road located west of the project site.

This flow and Area D+C+E storm flow is collected at Point 4 and travels northeast to the existing swale and a 24 inch RCP beneath Oran K. Gragson Highway. The 100-year existing flow is expected to travel north along Oran K. Gragson Highway. The on-site runoff from Subbasin B is concentrated at Point 1 and discharges into the existing 48 inch RCP via an appropriate drop inlet.

IV CONCLUSIONS

This study concludes that the improvements of the project site will have the benefit of confining the existing storm drainage within the presently undeveloped site without significantly increasing the existing flood water depths.

To mitigate any adverse effects of the proposed project upon the adjacent area, the following recommendations should be incorporated into the design of this project:

- ✓ 1. The school finish floor elevations must be at least eighteen inches (18") above the street centerline or top of curb, whichever is higher from the surrounding roadways.
2. On-site grading around the building should provide for positive drainage away from the structure.
3. Area A at the west side of the project is naturally sloped through the project site. Minor grading will be required to discharge the runoff effectively toward the north and Rock Springs Drive.
4. An appropriate drop inlet and a sidewalk underdrain are recommended to be constructed at Point 1 (see Figure 4) with an eighteen inch (18") RCP pipe to convey the storm flow from this point into the existing forty eight inch (48") storm drain pipe located in Rock Springs Drive.
5. A Type A drop inlet and sidewalk underdrain is required to convey the storm flow from Area C to Rock Springs Drive (see Figure 4).



CONSULTING ENGINEERS

☐ Reno/Sparks
950 Industrial Way
Sparks, NV 89431-6092
(702) 358-6931

☐ Las Vegas
1405 Arville Street
Las Vegas, NV 89102
(702) 877-3000

☐ Phoenix
2920 N. 24th Ave., #6
Phoenix, AZ 85015-5948
(602) 257-4699

JOB NO. 2-442-011

SHEET _____ OF _____

PROJECT JAMES McMillan SCHOOL

DATE 02/24/89

SUBJECT HEC-1

DESIGNED TMB CHECKED _____

ONSITE FUTURE

AREA B ^{AREA} (INCLUDES HALF OF ROCK SPRINGS)

AREA = 5.83 ACRES

0.0091094 mi²

SOIL TYPE D CN = 90

L = 600 FT

$S = \frac{1000}{CN} - 10 = 1.11$

AVG. SLOPE = 2.0%

$$t_f = \frac{(600)^{0.8} (2.11)^{0.7}}{1900 (2.0)^{0.5}} = 0.10477 \text{ HR.}$$

AREA C

AREA = 1.19 ACRE

0.001828 mi²

SOIL TYPE D CN = 92

L = 310 FT

$S = \frac{1000}{CN} - 10 = 0.86$

AVG. SLOPE = 1.25%

$$t_f = \frac{(310)^{0.8} (1.86)^{0.7}}{1900 (1.25)^{0.5}} = 0.07154 \text{ HR.}$$

```

*****
#
# FLOOD HYDROGRAPH PACKAGE (HEC-1)
# FEBRUARY 1981
# REVISED 01 JUN 88
#
# RUN DATE 02/27/1989 TIME 11:25:16
#
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*****
#
# U.S. ARMY CORPS OF ENGINEERS
# THE HYDROLOGIC ENGINEERING CENTER
# 609 SECOND STREET
# DAVIS, CALIFORNIA 95616
# (916) 551-1748
#
*****

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FUTURE 100-YEAR FLOOD FREQUENCY

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X X XXXXXX XXXX X
X X X X X XX
X X X X X
XXXXXX XXXX X XXXX X
X X X X X
X X X X X
X X XXXXXX XXXX XXX

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1BS, HEC1DB, AND HEC1KW.

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

88:

1

HEC-1 INPUT

PAGE 1

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

*** FREE ***

```

1 ID JAMES McMILLAN ELEMENTARY SCHOOL
2 ID CREATED 02-24-89 BY TMB
3 ID USING SCS METHODS AND KINEMATIC WAVE ROUTING
4 ID MASTER PLAN ADJUSTED 3-HOUR RAINFALL AND STORM DISTRIBUTION
5 ID INPUT HDMF10 OUTPUT HDMFG99
6 ID *****
7 ID FUTURE OFFSITE AND ONSITE FLOWS
8 ID
9 ID 2-MINUTE COMPUTATION TIME INTERVAL
10 ID 100 YEAR FLOOD FREQUENCY
11 ID *****
12 ID
13 IT 2 0 0 300
14 ID 5 0
15 IN 2

16 KK AREA
17 PB 2.56
18 PC 0.0000 0.0014 0.0028 0.0042 0.0061 0.0089 0.0117 0.0145 0.0171 0.0200
19 PC 0.0222 0.0257 0.0300 0.0437 0.0517 0.0609 0.0705 0.0813 0.0926 0.1035
20 PC 0.1178 0.1318 0.1468 0.1712 0.1934 0.2158 0.2417 0.2630 0.3113 0.3481
21 PC 0.3932 0.4376 0.4824 0.5226 0.5601 0.5975 0.6350 0.6530 0.6711 0.6896
22 PC 0.7650 0.7175 0.7300 0.7422 0.7528 0.7625 0.7722 0.7819 0.7915 0.8014
23 PC 0.8112 0.8209 0.8306 0.8403 0.8500 0.8597 0.8694 0.8791 0.8888 0.8985

```


25 PC 0.9334 0.9389 0.9445 0.9500 0.9542 0.9583 0.9625 0.9661 0.9689 0.9717
 26 PC 0.9745 0.9772 0.9800 0.9828 0.9856 0.9883 0.9911 0.9939 0.9958 0.9972
 27 PC 0.9986 1.0000
 28 BA 0.0200
 29 LS 0 92 0
 30 UD 0.1557

31 KK RTP4
 32 KM ROUTE AREA M TO THE NORTH EAST CORNER OF THE PROJECT
 33 RK 1220 .018 0.017 0 TRAP 30 0

34 KK AREAE
 35 KM HALF OF STREETS AREA WEST,NORTH AND EAST OF PROJECT SITE
 36 BA 0.0020
 37 LS 0 98 0
 38 UD 0.1295

39 KK AREAD
 40 BA 0.0035
 41 LS 0 98 0
 42 UD 0.1075

43 KK RTP4
 44 KM ROUTE AREA D TO THE NORTH EAST CORNER OF THE PROJECT
 45 RK 280 .017 0.017 0 TRAP 30 0

HEC-1 INPUT

PAGE 2

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

46 KK ARE+
 47 KM COMBINE AREAS ABOVE
 48 HC 3

49 KK AREAB
 50 BA 0.0091
 51 LS 0 90 0
 52 UD 0.1047

53 KK AREAC
 54 BA 0.0018
 55 LS 0 82 0
 56 UD 0.0715
 57 ZZ

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*****
#
# FLOOD HYDROGRAPH PACKAGE (HEC-1)
# FEBRUARY 1981
# REVISED 01 JUN 88
#
# RUN DATE 02/27/1989 TIME 11:25:16
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*****
#
# U.S. ARMY CORPS OF ENGINEERS
# THE HYDROLOGIC ENGINEERING CENTER
# 609 SECOND STREET
# DAVIS, CALIFORNIA 95616
# (916) 561-1748
#
*****
  
```

JAMES McMILLAN ELEMENTARY SCHOOL
 CREATED 02-24-89 BY TMB
 USING R10 METHODS AND KINEMATIC WAVE FLOWING
 MASTER PLAN ADJUSTED 3-HOUR RAINFALL AND STORM DISTRIBUTION
 INPUT - BMP10 OUTPUT - BMP247
 PRESENT FUTURE OFFSITE AND ONSITE FLOWS

2-MINUTE COMPUTATION TIME INTERVAL
100 YEAR FLOOD FREQUENCY

20

14 IO

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT

HYDROGRAPH TIME DATA

MMIN 2 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 300 NUMBER OF HYDROGRAPH ORDINATES
MDATE 1 0 ENDING DATE
NDATE 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

RUNOFF SUMMARY

FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	AREAA	29.	1.27	4.	2.	2.	.02		
ROUTED TO	RTP4	29.	1.30	4.	2.	2.	.02		
HYDROGRAPH AT	AREAE	4.	1.20	1.	0.	0.	.00		
HYDROGRAPH AT	AREAD	7.	1.17	1.	1.	1.	.00		
ROUTED TO	RTP4	7.	1.20	1.	1.	1.	.00		
3 COMBINED AT	ADE+	38.	1.27	5.	3.	3.	.03		
HYDROGRAPH AT	AREAB	13.	1.20	2.	1.	1.	.01		
HYDROGRAPH AT	AREAC	2.	1.20	0.	0.	1.	.00		

SUMMARY OF KINEMATIC WAVE ROUTING
(FLOW IS REPORTED SINCE WITHOUT BASE FLOW)

ISTAD	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	COMPUTATION INTERVAL			
						DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)

RTP4	3	.12	28.73	76.65	1.75	2.00	28.71	78.00	1.74
------	---	-----	-------	-------	------	------	-------	-------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= 1.865 EXCESS= .000 OUTFLOW= 1.862 BASIN STORAGE= .000 PERCENT ERROR= .186

RTP4	3	.20	6.75	71.09	2.32	2.00	6.76	72.00	2.32
------	---	-----	------	-------	------	------	------	-------	------

CONTINUITY SUMMARY (AC-FT) - INFLOW= .435 EXCESS= .000 OUTFLOW= .433 BASIN STORAGE= .000 PERCENT ERROR= .512

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


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*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* FEBRUARY 1981 *
* REVISED 01 JUN 88 *
* RUN DATE 02/27/1989 TIME 11:29:31 *
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*****
* U.S. ARMY CORPS OF ENGINEERS *
* THE HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 *
*****

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FUTURE 10-YEAR FLOOD FREQUENCY

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X X XXXXXX XXXX X
X X X X X XX
X X X X X
XXXXXX XXXX X XXXXX X
X X X X X
X X X X X
X X XXXXXX XXXX XXX

```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC10S, HEC10B, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIGR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMEKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 26 SEP 81. THIS IS THE FORTRAN77 VERSION. NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DES:WRITE STAGE FREQUENCY, DES: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

*** FREE ***

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1 ID JAMES McMILLAN ELEMENTARY SCHOOL
2 ID CREATED 02-24-89 BY THB
3 ID USING SDS METHODS AND KINEMATIC WAVE ROUTING
4 ID MASTER PLAN ADJUSTED 3-HOUR RAINFALL AND STORM DISTRIBUTION
5 ID INPUT HJMF10 OUTPUT HJMF09
6 ID *****
7 ID FUTURE OFFSITE AND ONSITE FLOWS
8 ID
9 ID 2-MINUTE COMPUTATION TIME INTERVAL
10 ID 10 YEAR FLOOD FREQUENCY
11 ID *****
12 ID
13 IT 2 0 0 300
14 IC 5 0
15 IN 2
16 KK AREA4
17 FB 1.44
18 PC 0.0000 0.0014 0.0028 0.0043 0.0061 0.0088 0.0117 0.0146 0.0172 0.0200
19 PC 0.0123 0.0147 0.0173 0.0201 0.0231 0.0264 0.0300 0.0339 0.0380 0.0423
20 PC 0.0176 0.0216 0.0267 0.0322 0.0384 0.0451 0.0523 0.0600 0.0683 0.0767
21 PC 0.0232 0.0286 0.0348 0.0419 0.0491 0.0567 0.0648 0.0734 0.0825 0.0920
22 PC 0.0300 0.0376 0.0460 0.0551 0.0649 0.0755 0.0868 0.0987 0.1111 0.1240
23 PC 0.03112 0.0200 0.0234 0.0275 0.0310 0.0350 0.0391 0.0437 0.0487 0.0538

```

25 PC 0.9334 0.9389 0.9445 0.9500 0.9542 0.9583 0.9625 0.9661 0.9697 0.9717
 26 PC 0.9745 0.9772 0.9800 0.9828 0.9856 0.9883 0.9911 0.9939 0.9958 0.9972
 27 PC 0.9986 1.0000
 28 BA 0.0200
 29 LS 0 92 0
 30 UD 0.1557

11

31 KK RTP4
 32 KM ROUTE AREA M TO THE NORTH EAST CORNER OF THE PROJECT
 33 RK 1220 .019 0.017 0 TRAP 30 0

34 KK AREAE
 35 KM HALF OF STREETS AREA WEST,NORTH AND EAST OF PROJECT SITE
 36 BA 0.0020
 37 LS 0 98 0
 38 UD 0.1295

39 KK AREAD
 40 BA 0.0035
 41 LS 0 98 0
 42 UD 0.1075

43 KK RTP4
 44 KM ROUTE AREA D TO THE NORTH EAST CORNER OF THE PROJECT
 45 RK 280 .017 0.017 0 TRAP 30 0

HEC-1 INPUT

PAGE 2

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

46 KK ADE+
 47 KM COMBINE AREAS ABOVE
 48 HC 3

49 KK AREAB
 50 BA 0.0091
 51 LS 0 90 0
 52 UD 0.1047

53 KK AREAD
 54 BA 0.0018
 55 LS 0 82 0
 56 UD 0.0715
 57 ZZ

 * FLOOD HYDROGRAPH PACKAGE (HEC-1) *
 * FEBRUARY 1981 *
 * REVISED 01 JUN 88 *
 * RUN DATE 02/27/1989 TIME 11:29:31 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * THE HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET *
 * DAVIS, CALIFORNIA 95616 *
 * (916) 831-1748 *

JAMES McMILLAN ELEMENTARY SCHOOL
 CREATED 02-24-89 BY TMB
 USING SCS METHOD 2 AND KINEMATIC WAVE ROUTING
 MASTER PLAN ASSUMED 3-HR RAINFALL AND STORM DISTRIBUTION
 INPUT 40MPH OUTPUT 40MPH

 FUTURE OFFSITE AND ONSITE FLOW

14 10

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

17

HYDROGRAPH TIME DATA

NMIN 2 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 1 0 ENDING DATE
 NDTIME 0959 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

RUNOFF SUMMARY

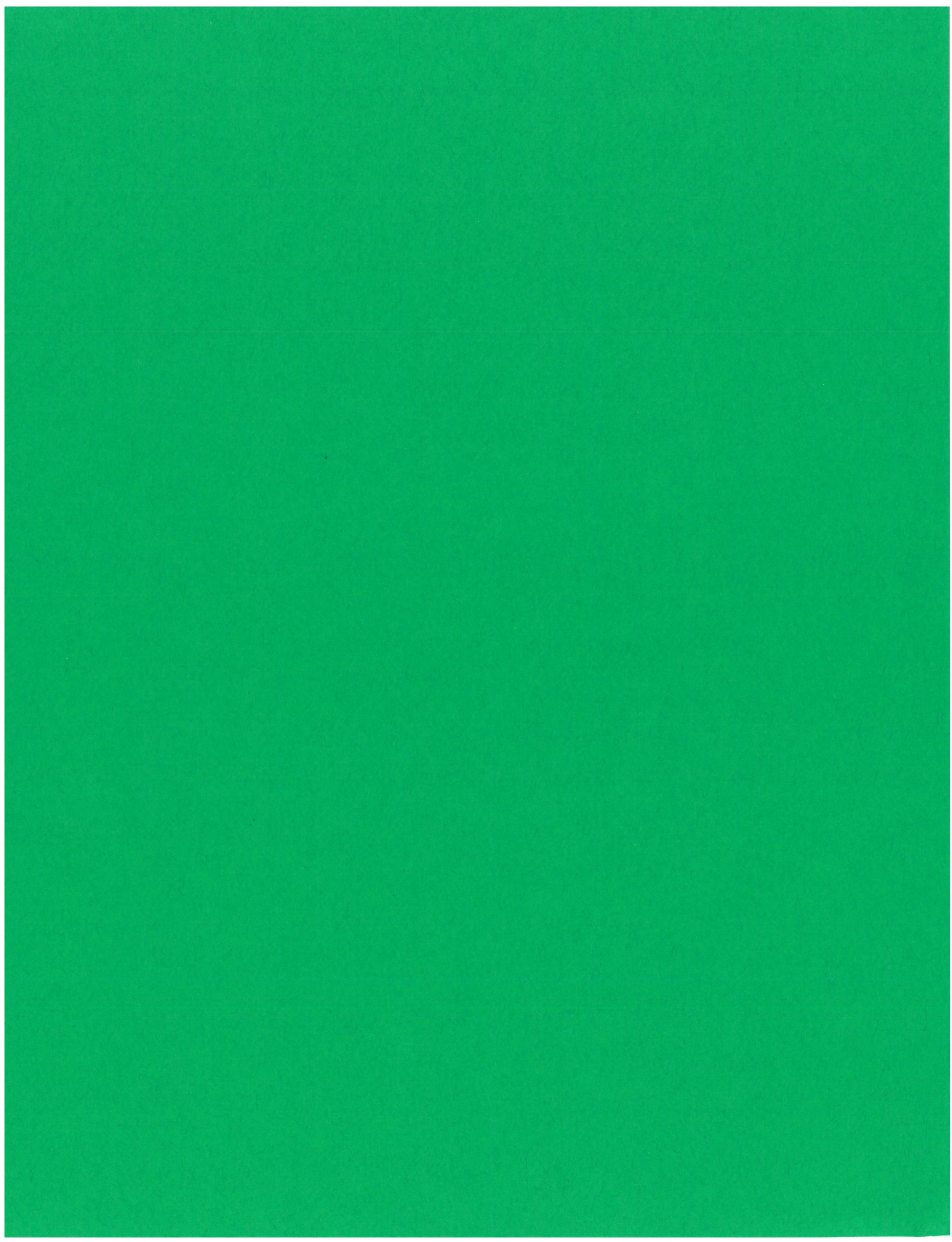
FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	AREA4	12.	1.27	2.	1.	1.	.02		
ROUTED TO	STP4	12.	1.33	2.	1.	1.	.02		
HYDROGRAPH AT	AREA5	2.	1.20	0.	0.	0.	.00		
HYDROGRAPH AT	AREA3	4.	1.17	0.	0.	0.	.00		
ROUTED TO	STP4	4.	1.20	0.	0.	0.	.00		
3 COMBINED AT	ARE4	17.	1.30	2.	1.	1.	.03		
HYDROGRAPH AT	AREA3	5.	1.23	1.	0.	0.	.01		
HYDROGRAPH AT	AREA4	1.	1.23	0.	0.	0.	.00		

SUMMARY OF KINEMATIC WAVE ROUTING
 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAG	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	COMPUTATION INTERVAL			
						DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
RTP4	3	.12	12.18	79.93	.75	2.00	12.17	80.00	.75
CONTINUITY SUMMARY (AC-FT) - INFLOW= .801 EXCESS= .000 OUTFLOW= .800 BASIN STORAGE= .000 PERCENT ERROR= .045									
RTP4	3	.22	3.64	71.33	1.22	2.00	3.64	72.00	1.22
CONTINUITY SUMMARY (AC-FT) - INFLOW= .228 EXCESS= .000 OUTFLOW= .228 BASIN STORAGE= .000 PERCENT ERROR= .024									

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



APPENDIX E

(Plans)

- Cover and Approval Sheet
- General Notes Sheet
- Grading Plans
- Detail Sheets

SHEET INDEX

1.

C1.01

COVER AND APPROVAL SHEET
2.

C1.02

GENERAL NOTES SHEET
3.

C3.01

HORIZONTAL CONTROL PLAN
4.

C3.02

HORIZONTAL CONTROL PLAN
5.

C4.01

GRADING PLAN
6.

C4.02

GRADING PLAN
7.

C4.03

ROCK SPRINGS DRIVE PLAN AND PROFILE
8.

C5.01

UTILITY AND FIRELANE PLAN
9.

C5.02

UTILITY AND FIRELANE PLAN
10.

C8.01

DETAILS SHEET

IMPROVEMENT PLANS

FOR

HIGHGATE SENIOR LIVING

APN: 138-22-702-002

LEGAL DESCRIPTION

BEING A PORTION OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 22, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS TO WIT:

BEGINNING AT A POINT ON THE LEFT OR WESTERLY RIGHT OF WAY OF US 95 RAINBOW EXPRESSWAY, 341.19 FEET LEFT OF AND AT RIGHT ANGLES TO HIGHWAY ENGINEER'S "B" 603+80.46 P.O.T (PROJECT RFTQF-006-2(10)), SAID POINT BEING FURTHER DESCRIBED AS BEARING SOUTH 56°38'00" WEST, A DISTANCE OF 1201.94 FEET (SOUTH 56°36'32" WEST, 1201.47 FEET - MEAS.) FROM THE EAST QUARTER CORNER OF SECTION 22, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M.;

THENCE SOUTH 16°29'34" EAST ALONG SAID WESTERLY RIGHT OF WAY A DISTANCE OF 500.77 FEET TO A POINT;

THENCE SOUTH 08°20'16" EAST, CONTINUING ALONG SAID WESTERLY RIGHT OF WAY A DISTANCE OF 50.51 FEET TO A POINT;

THENCE SOUTH 89°52'54" WEST, CONTINUING ALONG SAID WESTERLY RIGHT OF WAY A DISTANCE OF 77.21 FEET TO A POINT;

THENCE SOUTH 00°07'06" EAST, CONTINUING ALONG SAID WESTERLY RIGHT OF WAY A DISTANCE OF 141.73 FEET (SOUTH 00°07'06" EAST, 141.69 FEET-MEAS.) TO A POINT ON THE SOUTH LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SAID SECTION 22;

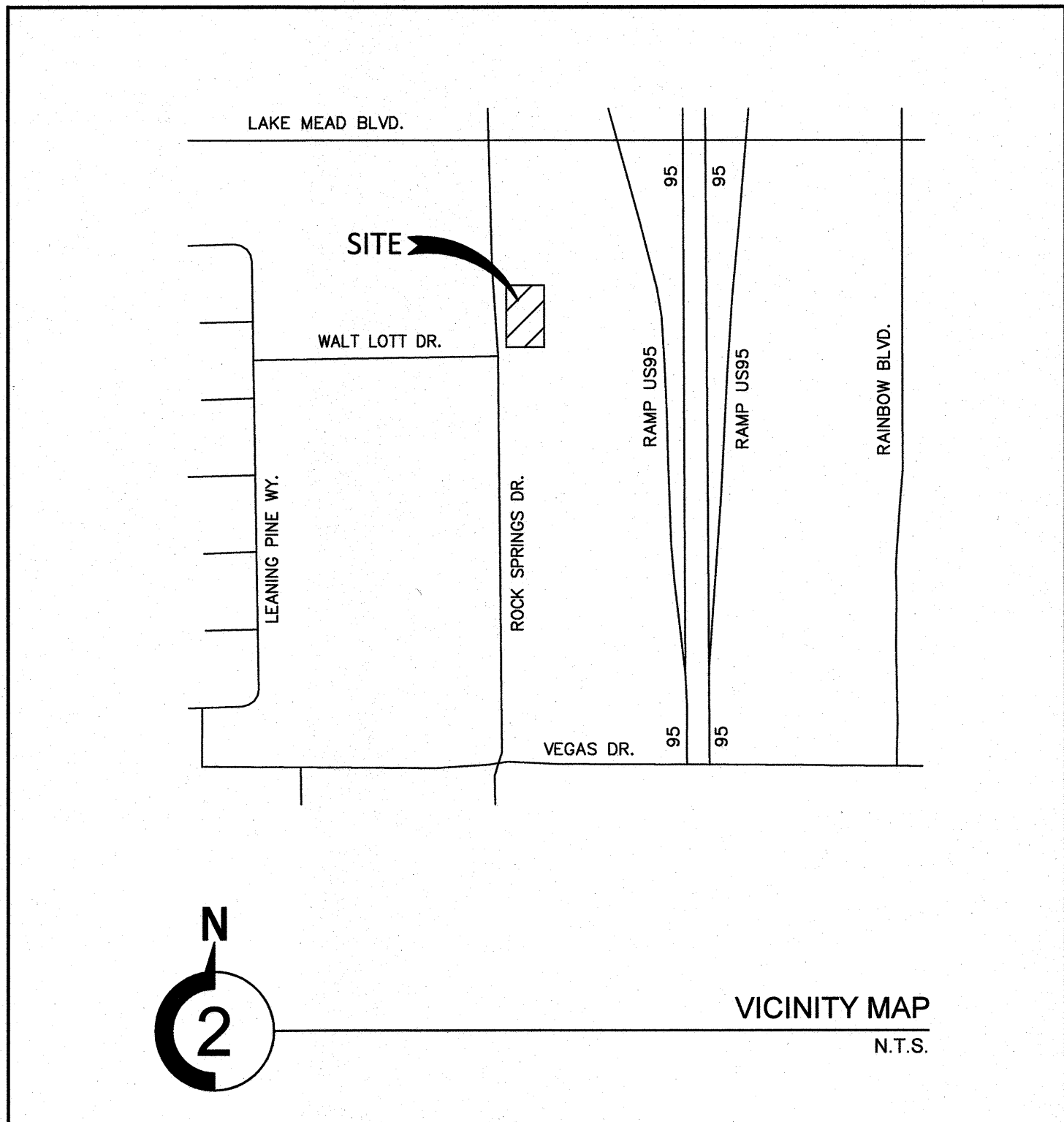
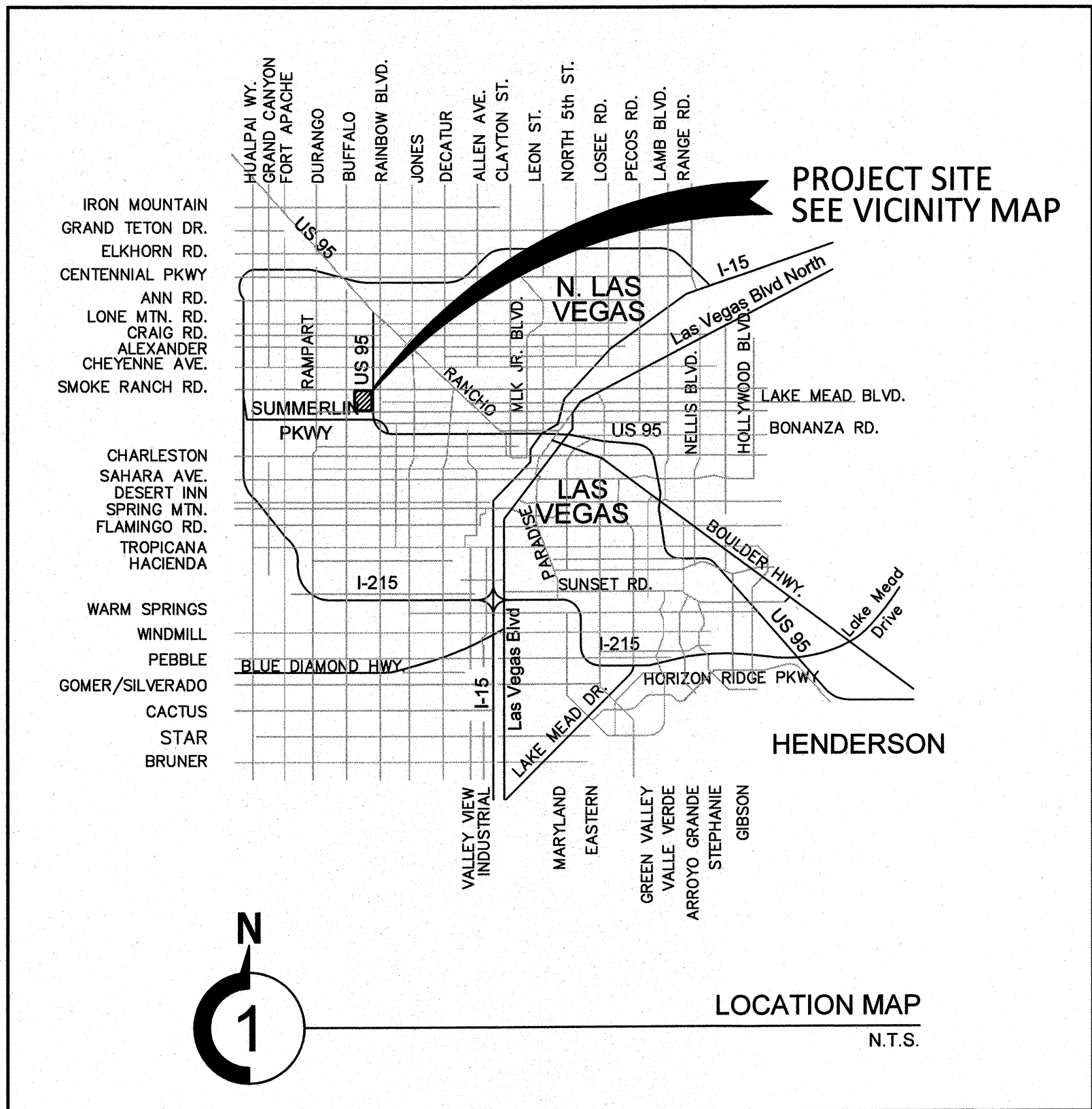
THENCE NORTH 89°23'02" WEST (NORTH 89°23'49" WEST, 387.83 FEET - MEAS.) ALONG SAID SOUTH LINE A DISTANCE OF 387.83 FEET TO A POINT ON THE EAST 1/16 SECTION LINE;

THENCE NORTH 00°22'57" WEST ALONG SAID EAST 1/16 SECTION LINE A DISTANCE OF 671.22 FEET (NORTH 00°22'57" WEST, 671.20 FEET - MEAS.) TO A POINT ON THE SOUTH LINE OF THE NORTHWEST QUARTER (NW 1/4) OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHEAST QUARTER (SE 1/4) OF SAID SECTION 22;

THENCE SOUTH 89°24'05" EAST (SOUTH 89°24'47" EAST, 319.73 FEET - MEAS.) ALONG SAID SOUTH LINE 319.73 FEET TO THE POINT OF BEGINNING.

EXCEPTING THEREFROM THE WEST THIRTY (30.00) FEET THEREOF, AS CONVEYED TO THE CITY OF LAS VEGAS FOR ROAD AND UTILITY PURPOSES BY DEED RECORDED SEPTEMBER 16, 1986 AS DOCUMENT NO. 00900, OFFICIAL RECORDS.

SUBJECT PROPERTY COMMONLY KNOWN AS: VACANT LAND, 5.62 ACRES, LAS VEGAS, NV



REV#	REV. DESCRIPTION	SHEET(S)	APPD BY	DATE

BASIS OF BEARING

NORTH 00°22'57" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 22, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN IN STATE OF NEVADA, DEPARTMENT OF HIGHWAYS RIGHT OF WAY PLAN, PROJECT RF-TQF-006-2(10), SHEET 8 OF 24.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 7LV0022SE6 BEING A RIVET AND PLATE IN TOP OF CURB NORTHWEST CORNER OF WALT LOTT DRIVE AND ROCK SPRINGS DRIVE.

ELEVATION = 722.55 (METERS) / 2370.57 (U.S. SURVEY FEET)
NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD' 88)

OWNER

BURON
1177 WEST HASTINGS STREET
SUITE 2133
VANCOUVER, BC V6E 2K3

DEVELOPER

BURON
1177 WEST HASTINGS STREET
SUITE 2133
VANCOUVER, BC V6E 2K3

APPROVALS

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENT CONSTRUCTED IN THE DEDICATED RIGHT-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARD." THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATIONS FROM STANDARDS" IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

ALLEN PAVELKA, PE #9029
ACTING CITY ENGINEER
DATE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES MANAGER
DATE: PROJECT NO:
LVVWD APPROVED FIRE FLOW GPM AT 20 PSI RESIDUAL
(SHEETS:)

LAS VEGAS FIRE & RESCUE
DATE

CHRIS KNIGHT, DIRECTOR, BUILDING AND SAFETY
THIS PLAN CONFORMS TO THE APPLICABLE STANDARDS OF THE PLANNING DEPARTMENT.
DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY
DATE

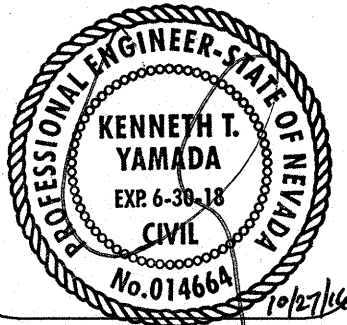
"THE AFFIXED CENTURYLINK CORPORATION APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS."

CENTRAL TELEPHONE CO. D/B/A CENTURY LINK
DATE

COX COMMUNICATIONS, LAS VEGAS, INC.
DATE

SOUTHWEST GAS CORPORATION
DATE

COLLINS ENGINEERS
3130 S. DURANGO DR., SUITE 404
LAS VEGAS, NV 89117
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HIGHGATE SENIOR LIVING
APN: 138-22-702-002
COVER SHEET

ROCK SPRINGS DR. & WALT LOTT DR.
LAS VEGAS, CLARK COUNTY, NEVADA

DESCRIPTION

DESIGN BY

DATE

NO.

CEI PROJECT: 9754

DESIGN BY: SHAYAN S.

DRAWN BY: SHAYAN S.

CHECKED BY: J. YANCEY

DATE:

09/13/16

SCALE:

N/A

SHEET NUMBER

C1.01

SHEET 1 OF 10

GENERAL NOTES

1. CONTRACTOR SHALL PROVIDE ALL NECESSARY HORIZONTAL AND VERTICAL TRANSITIONS BETWEEN NEW CONSTRUCTION AND EXISTING SURFACES TO PROVIDE FOR PROPER DRAINAGE AND INGRESS AND EGRESS TO SAID CONSTRUCTION. EXTENT OF TRANSITIONS TO BE DETERMINED BY THE COUNTY ENGINEER.

2. LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM INFORMATION RECEIVED FROM THE APPLICABLE UTILITY COTS. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES OR STRUCTURES NOT IN THE LOCATION SHOWN PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR'S RESPONSIBILITY REGARDING UTILITIES SHALL BE AS REQUIRED UNDER SECTION 107.17 OF THE UNIFORM STANDARD SPECIFICATIONS FOR CLARK COUNTY AREA, NEVADA AND AS PROVIDED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING OVER OR NEAR EXISTING GAS MAINS AND UNDERGROUND POWER LINES.

3. 48 HOURS PRIOR TO START OF CONSTRUCTION THE CONTRACTOR SHALL CONTACT: LAS VEGAS VALLEY WATER DISTRICT 870-2011 NV ENERGY 367-5001 CENTURY LINK 244-5001 SOUTHWEST GAS CORPORATION 651-2111 COX COMMUNICATIONS (CABLE CO.) 384-8084

4. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING IMPROVEMENTS, WHICH ARE TO REMAIN IN PLACE FROM DAMAGE AND ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR RECONSTRUCTED SATISFACTORY TO THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.

5. ALL BARRICADING AND TEMPORARY TRAFFIC CONTROL DEVICES OR METHODS USED DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CLARK COUNTY TRAFFIC CONTROL PLANS EXCEPT AS OTHERWISE PROVIDED IN THE CONTRACT SPECIFICATIONS OR REQUIRED BY THE ENGINEER.

6. THE QUANTITIES GIVEN IN THE DRAWINGS ARE APPROXIMATE ONLY, BEING GIVEN AS A BASIS FOR THE COMPARISON OF BIDS, AND THE OWNER DOES NOT EXPRESSLY OR BY IMPLICATION, AGREE THAT THE ACTUAL AMOUNT OF WORK WILL CORRESPOND THEREWITH, BUT RESERVES THE RIGHT TO MAKE SUCH ALTERATIONS, ADDITIONS, TO OR OMISSIONS FROM THE PLANS AND SPECIFICATIONS, INCLUDING THE RIGHT TO INCREASE OR DECREASE THE QUANTITY OF ANY ITEM OR PORTION OF THE WORK, AS MAY BE DEEMED BY THE OWNER TO BE NECESSARY. ANY SUCH CHANGES WILL BE SET FORTH IN A CONTRACT CHANGE ORDER WHICH WILL SPECIFY, IN ADDITION TO THE WORK TO BE DONE IN CONNECTION WITH THE CHANGE MADE, ADJUSTMENT OF CONTRACT TIME, IF ANY, AND THE BASIS OF COMPENSATION FOR SUCH WORK. A CONTRACT CHANGE ORDER WILL NOT BECOME EFFECTIVE UNTIL APPROVED BY THE OWNER.

7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERTICAL ADJUSTMENT OF ALL EXISTING SANITARY, WATER AND STORM SEWER MANHOLES TO THE FINAL FINISH GRADES IN ACCORDANCE WITH SECTION 609 OF THE STANDARD SPECIFICATIONS.

8. REMOVAL OR RELOCATION OF POWER POLES, TELEPHONE POLES, JOINTLY-OWNED POLES AND APPURTENANCES WHICH INTERFERE WITH IMPROVEMENTS REQUIRED TO BE CONSTRUCTED UNDER THIS CONTRACT, SHALL BE THE RESPONSIBILITY OF CONTRACTOR.

9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERTICAL ADJUSTMENT OF ALL TELEPHONE COMPANY MANHOLES TO THE FINAL FINISH GRADES AS SHOWN ON THE CONTRACT DRAWINGS.

10. ALL CONCRETE FOR THIS PROJECT SHALL USE TYPE V CEMENT.

11. SLOPES STEEPER THAN 4:1 AND FINE-GRAINED MATERIALS THAT HAVE BEEN DISTURBED (SANDY AND SILTY MATERIALS), SHOULD BE PROTECTED WITH EROSION AND OTHER EROSION CONTROL FABRIC/MATERIAL, UNLESS OTHERWISE SPECIFIED BY THE LANDSCAPE DRAWINGS AND SPECIFICATIONS, OR THE SOILS REPORT.

12. 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.

13. CONTRACTOR SHALL NOTIFY MARTIN & MARTIN WITHIN 24 HOURS OF OMISSIONS AND ERRORS DISCOVERED ON PLANS. CIVIL SQUARED ENGINEERING WILL REVISE AND RE-ISSUE DRAWINGS AS SOON AS POSSIBLE. CIVIL SQUARED ENGINEERING WILL NOT BE RESPONSIBLE FOR ANY "CORRECTIVE" WORK DONE BY OTHERS.

DEVIATIONS FROM STANDARDS

1. INSPECTIONS ARE REQUIRED. CALL 24 HOURS IN ADVANCE TO SCHEDULE AT (702) 455-4610. PERMIT, APPROVED PLANS, AND BARRICADE PLANS FOR THIS WORK MUST BE ON THE JOB SITE AT ALL TIMES.

2. EXACT LOCATION OF ALL SAW-CUT LINES SHALL BE DETERMINED IN THE FIELD BY A CLARK COUNTY INSPECTOR.

3. CURB AND GUTTER WITH A GRADE OF LESS THAN 4/10 OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.

4. FINAL ASPHALTIC CONCRETE (AC) PAVEMENT SURFACES SHALL BE ONE-HALF (1/2") INCH ABOVE THE LIP OF THE GUTTER (INCLUDING OPEN GRADE).

5. ALL OFF-SITE IMPROVEMENT CONSTRUCTION SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS AND STANDARD DRAWINGS CLARK COUNTY AREA NEVADA AND CLARK COUNTY SUPPLEMENT TO UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS, LATEST REVISION.

6. PRIVATE STREETS, CURBS, GUTTER AND VALLEY GUTTERS REFLECTED ON THESE PLANS ARE TO BE INSPECTED BY A CLARK COUNTY INSPECTOR.

7. WHEEL CHAIR RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS SHALL BE DETERMINED IN THE FIELD BY A CLARK COUNTY PUBLIC WORKS INSPECTOR.

8. PROPER SIGNS, BARRIERS, BARRICADES AND LIGHTS SHALL BE PLACED AND MAINTAINED IN ACCORDANCE WITH THE LATEST "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS". TRAFFIC SCHOOLS, TRAFFIC SIGNS OF ANY KIND ARE NOT TO BE MOVED FOR ANY REASON WITHOUT FIRST COORDINATING WITH THE DEPARTMENT OF PUBLIC WORKS INSPECTIONS AT (702)455-4610.

9. THIS PLAN DOES NOT AUTHORIZE CLOSURE OF ANY ROAD OR STREET.

10. NO OPEN TRENCH SHALL BE ALLOWED ACROSS ANY STREET OR WITHIN TEN (10') OF ANY TRAVEL-WAY. EXCEPT WHEN WORK IS IN ACTUAL PROGRESS, AREAS COVERED BY ACCEPTABLE STEEL PLATE ARE NOT TO BE CONSIDERED AS A TRENCH. NO OPEN TRENCH IS PERMITTED IN EXCESS OF 500 FEET OR LENGTH NECESSARY TO ACCOMMODATE PIPE INSTALLATION IN A SINGLE DAY, WHICH EVER IS GREATER. ALL TRENCH CROSSINGS AND BACKFILL SHALL MEET THE STANDARD SPECIFICATION UNLESS OTHERWISE STATED.

11. A TEMPORARY PATCH IS TO BE IN PLACE AT THE END OF EACH WORK DAY WHERE THE BACKFILL IN THE TRENCH HAS BEEN COMPLETED AND PRIOR TO OPENING THE WORK AREA BACK TO TRAFFIC AND IS TO BE MAINTAINED BY THE PERMITTEE. A PERMANENT PATCH IS TO BE IN PLACE WITHIN THIRTY (30) DAYS AFTER THE INSTALLATION OF THE TEMPORARY PATCH.

12. COMPACTION TESTS ARE REQUIRED.

DEVIATIONS FROM STANDARDS

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

2. CALL BEFORE YOU DIG
AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY

3. FAST
Call before you dig
Underground
1-702-432-3300
FREEMAN ARTERIAL
SYSTEM OF TRANSPORTATION

4. AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE
OVERHEAD
WORK
1-702-227-2929

LVVWD STANDARD NOTES

LVVWD PROJECT #

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE.

2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE 2010 EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS). THE LATEST EDITION OF UDACS SHALL SUPERSEDE ANY CONFLICTS CONTAINED IN THE APPROVED DRAWINGS AND/OR SPECIFICATIONS.

3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.

4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.

5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.

6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.

7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.

8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE 2010 EDITION OF UDACS.

9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED, AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.

10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3802, TWO (2) WORKING DAYS PRIOR TO METER PICKUP.

11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01 AND APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.

12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.

13. TELEPHONE "CALL BEFORE YOU DIG" AT "811" OR 1-800-227-2600.

14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN ACCORDANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LVVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDE THE PLACEMENT OF AN APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

15. ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S INDIVIDUAL PROPERTY OWNERS. IF NO OWNER'S ASSOCIATION IS IN EXISTENCE, OR THE AGENCY HAVING JURISDICTION, DECORATIVE SURFACE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OR PRIVATE STREET, IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LVVWD WITH AN APPROPRIATELY SIZE PLAIN FINISH CONCRETE PATCH. THE LVVWD WILL NOT RESTORE, AND WILL NOT BE RESPONSIBLE FOR THE RESTORATION OF, ANY DECORATIVE PAVING SURFACE WITHIN THE STREET. THE LVVWD WILL NOT ATTEMPT TO MATCH COLOR OR FINISH OF ANY ADJACENT MATERIALS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER

PROJECT NO. _____ DATE: _____

PRIVATE FIRE SERVICE MAIN STANDARD NOTES

1. A PRIVATE FIRE SERVICE MAIN IS THAT PIPE AND IT'S APPURTENANCES ON PRIVATE PROPERTY:

A. BETWEEN A SOURCE OF WATER AND THE BASE OF THE RISER NOT OVER 6 IN. ABOVE FLOOR). FOR WATER-BASED FIRE PROTECTION.

B. BETWEEN A SOURCE OF WATER AND THE BASE ELBOW OF PRIVATE HYDRANTS OR MONITORING NOZZLES.

C. THE NEVADA STATE FIRE MARSHAL HAS DETERMINED THAT THE UNDERGROUND PORTIONS OF A SPRINKLER SYSTEM ARE DEFINED AS: THAT PORTION OF THE PIPING BETWEEN A SOURCE OF PUBLIC WATER (USUALLY IN A PUBLIC STREET) AND THE BASE OF THE SPRINKLER RISER (NOT OVER 6 IN. ABOVE THE FLOOR).

2. THE UNDERGROUND CONTRACTOR INSTALLING THE PRIVATE FIRE SERVICE MAIN SUPPLYING ANY AUTOMATIC FIRE SPRINKLER SYSTEM MUST BE LICENSED BY THE STATE OF NEVADA, STATE FIRE MARSHAL DIVISION, FOR THE UNDERGROUND INSTALLATION OF SPRINKLER PIPING.

3. THE INSPECTION AND TESTING OF ALL PRIVATE FIRE SERVICE MAINS SHALL BE WITNESSED AND APPROVED BY THE FIRE PREVENTION DIVISION.

4. ALL VALVES CONTROLLING CONNECTIONS TO WATER SUPPLIES AND TO SPRINKLER PIPING SHALL BE LISTED INDICATING VALVES OR AS APPROVED BY THE FIRE PREVENTION DIVISION.

5. ALL VALVES CONTROLLING CONNECTIONS TO WATER SUPPLIES AND TO SPRINKLER PIPING SHALL BE PROTECTED FROM FREEZING WHEN EXPOSED TO TEMPERATURES LESS THAN 40°F. FREEZE PROTECTION SHALL BE PROVIDED IN SUCH A MANNER THAT IT WILL LAST THE LIFETIME OF THE VALVE.

6. ALL VALVES CONTROLLING THE FLOW OF WATER THROUGH A PRIVATE FIRE SERVICE MAIN SUPPLYING WATER FOR AUTOMATIC FIRE SPRINKLER SYSTEMS SHALL BE ELECTRICALLY SUPERVISED WHEN REQUIRED BY THE UNIFORM FIRE CODE. WHEN REQUIRED, VALVE SUPERVISION AND TROUBLE SIGNALS SHALL BE CONNECTED TO A FIRE ALARM PANEL FOR RETRANSMISSION TO AN APPROVED CENTRAL STATION.

7. ALL FIRE DEPARTMENT CONNECTIONS (FDC) FOR FIRE SPRINKLER SYSTEMS SHALL BE LOCATED WITHIN 100 FEET OF FIRE HYDRANT.

8. ALL WORK SHALL BE IN ACCORDANCE WITH NFPA 24, STANDARD FOR THE INSTALLATION OF PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES.

FIRE DEPARTMENT GENERAL NOTES

A. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CLARK COUNTY FIRE CODE AS AMENDED, AND THE 2007 EDITION OF NATIONAL FIRE PROTECTION ASSOCIATION PAMPHLET #24.

B. FIRE HYDRANTS AND WATER SUPPLIES FOR FIRE PROTECTION SHALL BE MADE SERVICEABLE PRIOR TO AND DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 1412 OF THE CLARK COUNTY FIRE CODE.

C. IF DURING CONSTRUCTION IT BECOMES NECESSARY TO CLOSE ANY CONTROL VALVE OR PLACE A HYDRANT OUT OF SERVICE, APPROVAL SHALL BE OBTAINED FROM THE FIRE DEPARTMENT PRIOR TO PLACING THE HYDRANT OUT OF SERVICE.

D. PAINTING OF CURBS AND/OR STRIPING OF ASPHALT AREAS AND PROTECTION OF HYDRANTS FROM PHYSICAL INJURY PER FIRE HYDRANT INSTALLATION SPECIFICATIONS OF THE FIRE PREVENTION DIVISION.

E. NO FIRE HYDRANT SHALL BE LOCATED WITHIN 25 FEET OF ANY STRUCTURE, OR 6 FEET OF A DRIVEWAY, POWER POLE, LIGHT STAND, MANHOLE, OR ANY OTHER OBSTRUCTION, OR WALL, FENCE AND PLANTER LOCATIONS, A PERIMETER AROUND THE HYDRANT MEASURING A MINIMUM OF 3 FEET FROM ITS EXTERIOR SHALL BE MAINTAINED CLEAR OF ALL OBSTRUCTION AT ALL TIMES.

F. FIRE APPARATUS ACCESS ROADS SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF FIRE APPARATUS, WITH A MINIMUM VEHICLE LOAD OF 18,000 POUNDS PER AXLE, AND SHALL BE SURFACED AND PAVED SO AS TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES.

G. PRIOR TO ACCEPTANCE OF ANY FIRE SERVICE MAIN, A SATISFACTORY HYDROSTATIC TEST WITH PIPING JOINTS UNCOVERED MUST BE CONDUCTED. APPROVED PLANS, AN INSTALLATION PERMIT AND A CONTRACTOR'S MATERIALS AND TEST CERTIFICATE MUST BE PROVIDED AT TIME OF INSPECTION. SCHEDULE INSPECTION AT WWW.CLARKCOUNTYNV.GOV/DEPTS/FIRE.

H. FIRE HYDRANTS SHALL BE LOCATED 4' TO 7' FROM BACK OF CURB AND A MINIMUM OF 6 FEET AWAY FROM TURNS.

I. BLUE REFLECTIVE MARKERS MUST BE INSTALLED BEFORE FINAL HYDRANT ACCEPTANCE CAN BE ATTAINED (SECTION 107 OF THE CLARK COUNTY FIRE CODE, AS AMENDED).

J. HYDRANTS THAT ARE PROPOSED FOR INSTALLATION IN PUBLIC WATER SYSTEMS SHALL BE IN ACCORDANCE WITH APPROVED FIRE HYDRANTS AS ALLOWED BY THE WATER PURVEYOR. HYDRANTS PROPOSED FOR INSTALLATION ON PRIVATE WATER SYSTEMS SHALL BE IN ACCORDANCE WITH APPROVED FIRE HYDRANTS AS ALLOWED BY THE FIRE DEPARTMENT.

CLARK COUNTY STORM WATER NOTES

1. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATED IN, THE CLARK COUNTY PUBLIC RIGHT OF WAY AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM DRAIN SYSTEM.

2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED BY THE CLARK COUNTY BUILDING ADMINISTRATIVE CODE 24.40 AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.

3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO THE NEVADA STORM WATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.

4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPs WEEKLY, AND DOES NOT RELIEVE YOU OF LIABILITY FOR ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORM WATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS MODIFICATION(S) OF LAND DISTURBANCE ACTIVITIES, REFERENCE TO THE NEVADA STORM WATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.

5. ACCUMULATED SEDIMENT IN BMPs SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORM WATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

FLOOD ZONE NOTE:

PER FIRM PANEL 32003C2155F REVISED NOVEMBER 16, 2011, THE PROJECT SITE IS LOCATED WITHIN NON-SHADED FLOOD ZONE 'X'. NON-SHADED FLOOD ZONE 'X' IS DEFINED BY FEMA AS AN AREA OUTSIDE THE 500- YEAR FLOOD PLAN.

CLARK COUNTY WATER RECLAMATION DISTRICT NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL CONFORM TO THE LATEST EDITION OF THE DESIGN & CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS LATEST EDITION; UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS, LATEST EDITION; THE UNIFORM STANDARDS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY, NEVADA, AS AMENDED; THE UNIFORM PLUMBING CODE. CONTRACTOR SHALL ADVISE THE CONTROLLING AGENCY OF ANY CONFLICTS DISCOVERED BETWEEN THESE SPECIFICATIONS PRIOR TO THE PROCEEDING WITH THE WORK GOVERNED BY THE CONFLICTING REQUIREMENTS. THE ENGINEER AND/OR CONTRACTOR SHALL PROPOSE A RESOLUTION TO THE CONFLICT FOR REVIEW BY THE AGENCY PRIOR TO PERFORMING THE WORK AFFECTED BY THE CONFLICT. THE RESOLUTION SHALL GENERALLY BE IN THE MANNER THAT YIELDS THE HIGHER QUALITY AND/OR PERFORMANCE OF THE WORK. THE CONTROLLING AGENCY SHALL ISSUE WRITTEN APPROVAL FOR THE RESOLUTION OF THE CONFLICT WHICH SHALL BECOME A PART OF THE CONSTRUCTION DOCUMENTS FOR THE WORK.

2. THESE STANDARDS APPLY TO ALL CONSTRUCTION.

3. SEWER MAINS SHALL BE LAID INDIVIDUALLY IN TRENCHES THAT ARE INDEPENDENT FROM THE TRENCHES FOR OTHER UTILITIES.

4. ALL LATERALS TO BE LAID AT SLOPES NOT LESS THAN THE MINIMUM SLOPES SHOWN IN THESE SPECIFICATIONS.

5. IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO PERFORM CONSTRUCTION IN FULL CONFORMANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS. SHOULD THE DEVELOPER, ENGINEER OR CONTRACTOR WISH TO MAKE CHANGES TO THE APPROVED CONSTRUCTION DOCUMENTS, SUCH CHANGES SHALL BE APPROVED BY THE AGENCY PRIOR TO CONSTRUCTION OF THE AFFECTED IMPROVEMENTS. CHANGES CONSTRUCTED WITHOUT AGENCY APPROVAL SHALL BE REMOVED BY THE CONTRACTOR AT ITS OWN EXPENSE AND THE WORK CONSTRUCTED AS DEPICTED IN THE APPROVED CONSTRUCTION DOCUMENTS.

6. SOIL TESTING SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 3.15 OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS, LATEST EDITION.

7. ALL AIR TESTING, VISUAL INSPECTIONS, SYSTEM CLEANING, DEFLECTION TESTING, TELEVISION, PRESSURE TESTING AND LEAKAGE TESTING SHALL BE IN ACCORDANCE WITH SECTION 3.19 OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS, LATEST EDITION.

8. CUT SHEETS CONFORMING TO SECTION 3.6 OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS, LATEST EDITION SHALL BE SUBMITTED BY THE CONTRACTOR TO THE CONTROLLING AGENCY FOR REVIEW BEFORE BEGINNING CONSTRUCTION. CONTRACTOR SHALL NOT BEGIN CONSTRUCTION UNTIL AUTHORIZED BY THE AGENCY.

9. CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE AGENCY SHALL POSSESS A CLASS "A" LICENSE PER THE NEVADA STATE CONTRACTOR'S BOARD.

10. WHEN CONNECTING TO AN EXISTING STUB, CONTRACTOR SHALL CLEAN AND TEST BOTH THE NEW AND EXISTING PORTIONS OF THE LINE TO THE NEXT MANHOLE UPSTREAM/DOWNSTREAM.

11. ALL SANITARY SEWER MANHOLES SHALL BE LOCATED AND CONSTRUCTED SUCH THAT THEY ARE ACCESSIBLE TO CONVENTIONAL SEWER MAINTENANCE VEHICLES AT ALL TIMES AND UNDER ALL WEATHER CONDITIONS. THOSE MANHOLES INSTALLED ALONG ACCESS ROADS HAVING SINGLE POINTS OF ENTRY AND EGRESS (I.E. "DEAD-END ROADS") SHALL HAVE AT LEAST ONE LOCATION ALONG THE ACCESS ROAD HAVING SUFFICIENT WIDTH TO ALLOW TURN-AROUNDS OF VEHICLES HAVING INSIDE TURNING RADI OF 50- FEET.

12. ALL SEWER MAINS UNDER CONSTRUCTIONS SHALL HAVE A DEBRIS TRAP PER STANDARD DRAWING SD-30 AT THE POINT OF CONNECTION TO THE EXISTING SEWER SYSTEM UNTIL ALL CONSTRUCTION ACTIVITIES, INCLUDING FINAL TESTING, ARE COMPLETED AND THE SEWER IS READY FOR THE FINAL ACCEPTANCE BY THE AGENCY.

13. ALL MANHOLES UNDER CONSTRUCTION SHALL HAVE PLUGS PLACED IN THEIR OUTLET PIPES DURING ALL CONSTRUCTION ACTIVITIES TO PREVENT THE MIGRATION OF SEWER CONSTRUCTION DEBRIS DOWNSTREAM. THESE PLUGS MAY BE REMOVED FOR SHORT PERIODS AS NECESSARY TO ACCOMPLISH FINAL SEWER CLEANING AND TESTING TASKS PRIOR TO FINAL ACCEPTANCE OF IMPROVEMENTS.

14. PRIOR TO ANY SEWER MAIN BEING PLACED IN SERVICE AND AS A CONDITION OF FINAL ACCEPTANCE, ALL NEW SEWER MAINS SHALL BE TELEVISION IN ACCORDANCE WITH SECTION 3.19.1.E OF THE DESIGN STANDARDS.

15. IF ANY EXISTING MANHOLE HAVING A LINING SYSTEM IS BEING MODIFIED AS PART OF THE CONSTRUCTION OF THE NEW SANITARY SEWER, THAT LINING SYSTEM SHALL BE RESTORED TO ITS ORIGINAL CONDITION PRIOR TO THE MODIFICATIONS USING LINING MATERIALS AND SYSTEMS THAT ARE FULLY COMPATIBLE WITH THE ORIGINAL LINING.

16. FIELD-INSTALLED SEWER LINING SYSTEMS MAY NOT BE INSTALLED UNTIL AFTER ALL MANHOLE CONSTRUCTION TASKS ARE COMPLETED, INCLUDING BACKFILLING AND INITIAL GRADE ADJUSTMENTS, BUT PRIOR TO FINAL GRADE ADJUSTMENT.

17. NEW SEWERS HAVING GRADES OF 0.5 PERCENT OR LESS SHALL BE STAKED FOR CONSTRUCTION AT A MAXIMUM OF 25- FEET ON CENTER.

18. SEWER LATERALS SHALL BE CONNECTED TO SEWER MAINS ONLY. LATERALS MAY NOT BE CONNECTED TO SANITARY SEWER MANHOLES UNLESS APPROVED BY THE AGENCY.

19. SEWER PIPE MATERIAL, PIPE SPECIFICATION, WALL THICKNESS, INTERNAL DIAMETER AND PIPE SLOPE SHALL BE UNIFORM BETWEEN MANHOLES. CHANGES IN PIPE MATERIALS, SPECIFICATIONS, WALL THICKNESSES, INTERNAL DIAMETERS AND/OR PIPE SLOPES SHALL BE MADE AT MANHOLES ONLY.

20. LOCATOR RIBBON AND MARKER BALLS SHALL BE PLACED ABOVE ALL NEW SANITARY SEWERS, LATERALS AND FORCE MAINS IN ACCORDANCE WITH SECTION 3.14 FOR THE DESIGN STANDARDS.

BASIS OF BEARING

NORTH 00°22'57" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 22, TOWNSHIP 20 NORTH, RANGE 60 EAST, N.D.M., AS SHOWN IN STATE OF NEVADA, DEPARTMENT OF HIGHWAYS RIGHT OF WAY PLAN, PROJECT RF-TQF-006-2(10), SHEET 8 OF 24.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 7LV0022568 BEING A RIVET AND PLATE IN TOP OF CURB NORTHWEST CORNER OF WALT LOTT DRIVE AND ROCK SPRINGS DRIVE.
ELEVATION = 722.55 (METERS) / 2370.57 (U.S. SURVEY FEET)
NORTH AMERICAN VERTICAL DATUM OF 1985 (NAVD 88)

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

CLARK COUNTY WATER RECLAMATION DISTRICT

DATE

HIGHGATE SENIOR LIVING

APN: 138-22-702-002

GENERAL NOTES

ROCK SPRINGS DR. & WALT LOTT DR.
LAS VEGAS, CLARK COUNTY, NEVADA

CEI PROJECT: 9754

DESIGN BY: SHAYAN S.

DRAWN BY: SHAYAN S.

CHECKED BY: J. YANCEY

DATE: 09/13/16

SCALE: N/A

SHEET NUMBER C1.02

SHEET 2 OF 10

COLLINS ENGINEERS

3130 S. DURANGO DR., SUITE 404
LAS VEGAS, NV 89117
PHONE: (702) 248-8070
FAX: (702) 248-8070
www.collinsengr.com

PROFESSIONAL ENGINEER-STATE OF NEVADA
KENNETH A. YAMADA
DP: 06-30-08
CIVIL
NO. 014684

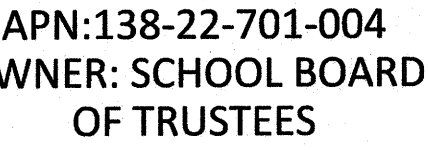
DESCRIPTION

DESIGN BY

DATE

NO.

H:\CAD\LAND\9754\DWG\SHEETS\9754-CL-01-NTS.DWG 10/27/2016 09:52:01 AM



APN:138-22-711-005
OWNER: 1910 ROCK SPRINGS RETAIL LLC

$$FF=2364.1 \pm'$$

FF=66.00

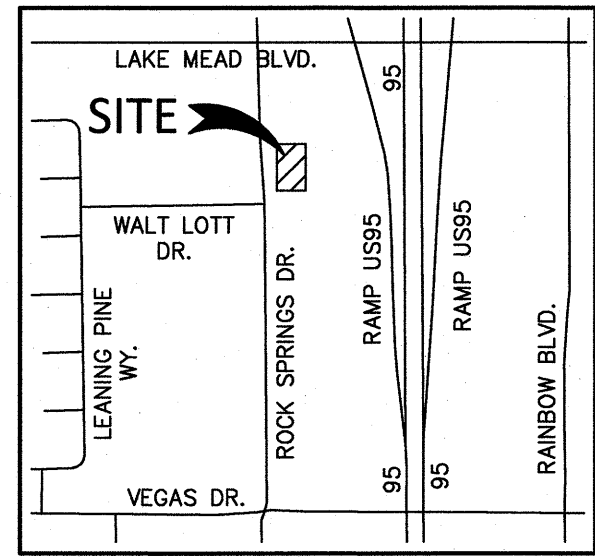
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FF=66.00

PAD=65.50
FF=66.00

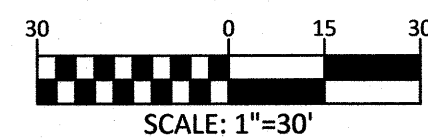
BLDG 'A'

PAD=65.50
FF=66.00

APN:138-22-799-003
OWNER: PUBLIC RIGHT-OF-WAY



GRAPHIC SCALE



BASIS OF BEARING

NORTH 00°22'57" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 22, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN IN STATE OF NEVADA, DEPARTMENT OF HIGHWAYS RIGHT OF WAY PLAN, PROJECT RF-TQF-006-2(10), SHEET 8 OF 24.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 7LV0022SE6 BEING A RIVET AND PLATE IN TOP OF CURB NORTHWEST CORNER OF WALT LOTT DRIVE AND ROCK SPRINGS DRIVE.

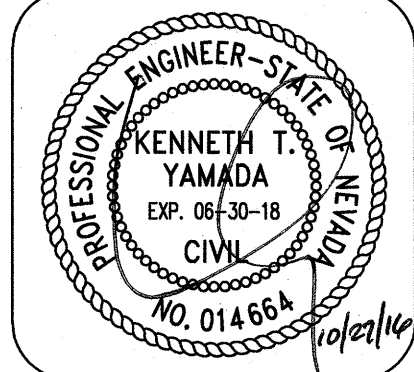
ELEVATION = 722.55 (METERS) / 2370.57 (U.S. SURVEY FEET)
NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD' 88)

CONSTRUCTION NOTES

NO.	ITEM	USDOCA: UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA.
1	CONSTRUCT "A" TYPE CURB PER DETAIL 'A' SHEET C8.01.	
2	CONSTRUCT "L" TYPE CURB PER USDOCA DWG. No. 216.	
3	CONSTRUCT CONCRETE SIDEWALK PER USDOCA DWG. No. 234. SEE ARCHITECTURAL PLANS FOR COLOR, FINISH, SCORING AND JOINTS.	
4	CONSTRUCT SIDEWALK ADA RAMP PER USDOCA DWG. No. 235 CASE I.	
5	CONSTRUCT SIDEWALK DRAIN PER USDOCA DWG. No. 236.	
6	CONSTRUCT 2' WIDE CONCRETE VALLEY GUTTER PER DETAIL 'D' SHEET C8.01.	
7	CONSTRUCT CURB OPENING PER DETAIL 'E' SHEET C8.01.	
8	CONSTRUCT COMMERCIAL DRIVEWAY PER USDOCA DWG. No. 222.1 AND 228.	
9	SAWCUT AND MATCH EXISTING AC PAVEMENT.	
10	CONSTRUCT 2" AC PAVING OVER 4" TYPE II AGGREGATE BASE.	
11	CONSTRUCT 3" AC PAVING OVER 4" TYPE II AGGREGATE BASE.	
12	CONSTRUCT GRADED SWALE.	
13	CONSTRUCT "O" TALL TYPE "A" CURB PER DETAIL 'C' SHEET C8.01.	
14	ADJUST TO GRADE RELOCATE OR MODIFY.	

**COLLINS
ENGINEERS^{INC.}**

33130 S. DURANGO DR., SUITE 404
LAS VEGAS, NV 89117
PHONE: (702) 248-8000
FAX: (702) 248-8070
www.collinsengr.com



HIGHGATE SENIOR LIVING
APN: 138-22-702-002

GRADING PLAN

ROCK SPRINGS DR. & WALT LOTT DR.
LAS VEGAS CLARK COUNTY NEVADA

[illegible]

CEI PROJECT:	9754
--------------	------

DESIGN BY: SHAYAN S.

DRAWN BY: SHAYAN S.

CHECKED BY: J. YANCEY

DATE:

09/13/16

SCALE:
1"=30'

1 = 30
SHEET NUMBER

SHEET NUMBER

C4.01

CALL BEFORE YOU DIG AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call  1-800-227-2600	AVOID HITTING UNDERGROUND TRAFFIC SIGNALS AND STREET LIGHT SYSTEMS. IT'S COSTLY. CALL BEFORE  YOU DO UNDERGROUND WORK CALL 1-702-435-7511 4355 QUINCY TRAFFIC OPERATIONS AND CALL 1-702-432-5300 FREE ESTIMATES	AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE  YOU DO OVERHEAD WORK 1-702-227-2929
---	--	--

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

LEGEND

EXISTING	PROPOSED	
(0.00%)	0.00%	SLOPE
(0.00) XX	0.00 XX	ELEVATION TAG
		STORM MANHOLE
		DROP INLET
--00--	00	CONTOUR
		RETAINING WALL
		SCREEN WALL

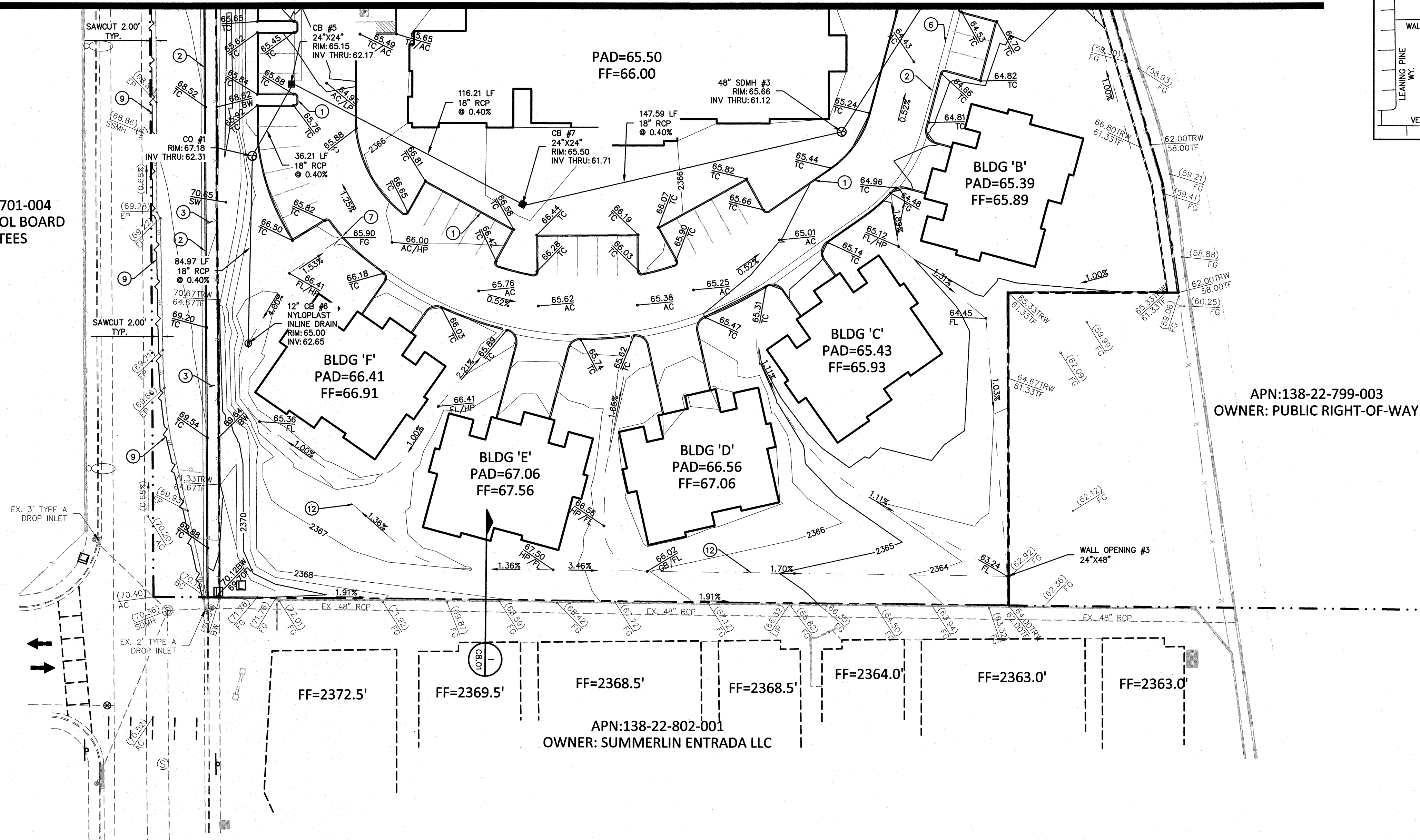
<u>EXISTING</u>	<u>PROPOSED</u>	
		AC PAVEMENT
		6" TYPE "A" CURB
		24" TYPE "L" CURB & GUTTER
		30" ROLL CURB

---	PL-RIGHT-OF-WAY
---	PL-ADJACENT
---	CENTERLINE
---	EASEMENT LINE
---	FLOW LINE
---	SAWCUT LINE

H:\CAD\LAND\9754\DWG\SHEETS\9754-C4-01-GRD.DWG 10/27/2016 10:45:38 AM

APN:138-22-701-004
OWNER: SCHOOL BOARD
OF TRUSTEES

FOR CONTINUATION SEE SHEET C4.01



APN:138-22-799-003
OWNER: PUBLIC RIGHT-OF-WAY

APN:138-22-802-001
OWNER: SUMMERLIN ENTRADA LLC

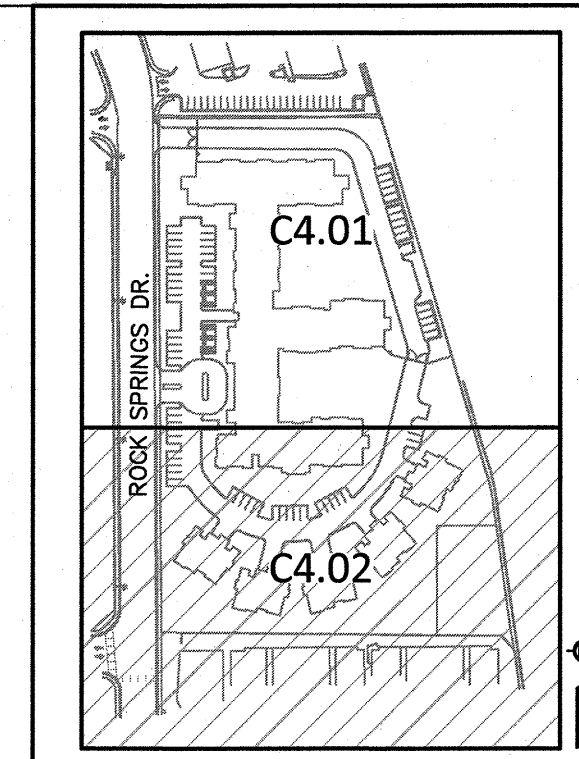
CALL BEFORE YOU DIG AVOID HITTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811  1-800-227-2600	AVOID HITTING UNDERGROUND UTILITY LINES. IT'S COSTLY.  CALL 1-702-455-7511 CANE COUNTY PUBLIC WORKS AND CALL 1-702-432-5300 (PEPPER HARBOR)	AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.  1-702-227-2929
---	--	---

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

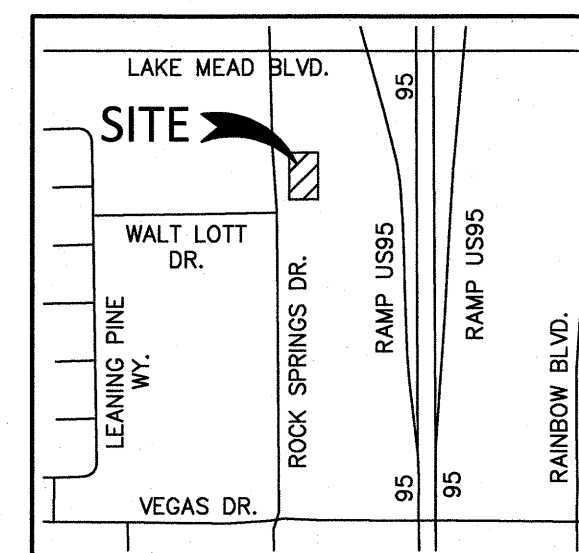
EXISTING	PROPOSED	
(0.00%)	0.00%	SLOPE
(0.00)	0.00	ELEVATION TAG
XX	XX	
		STORM MANHOLE
		DROP INLET
--00--	--00--	CONTOUR
		RETAINING WALL
		SCREEN WALL

<u>EXISTING</u>	<u>PROPOSED</u>	
		AC PAVEMENT
		6" TYPE "A" CURB
		24" TYPE "L" CURB & GUTTER
		30" ROLL CURB

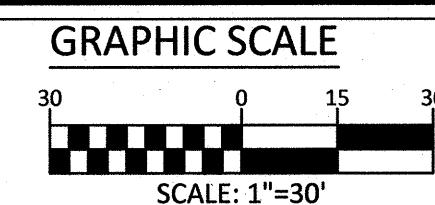
----	PL—RIGHT-OF-WAY
----	PL—ADJACENT
----	CENTERLINE
----	EASEMENT LINE
----	FLOW LINE
—v—	SAWCUT LINE



KEY MAP
NTS



VICINITY MAP



BASIS OF BEARING

NORTH 00°22'57" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHEAST QUARTER (NE 1/4) OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 22, TOWNSHIP 20 SOUTH, RANGE 60 EAST, M.D.M., AS SHOWN IN STATE OF NEVADA, DEPARTMENT OF HIGHWAYS RIGHT OF WAY PLAN, PROJECT RF-TQF-006-2(10), SHEET 8 OF 24.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 7LV0022SE6 BEING A RIVET AND PLATE IN TOP OF CURB NORTHWEST CORNER OF WALT LOTT DRIVE AND ROCK SPRINGS DRIVE.

ELEVATION = 722.55 (METERS) / 2370.57 (U.S. SURVEY FEET)
NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD' 88)

CONSTRUCTION NOTES

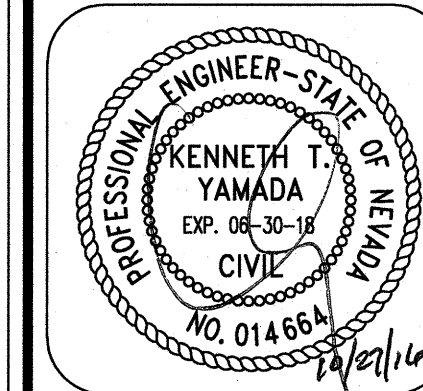
NO.	ITEM	USDCCA: UNIFORM STANDARD DRAWINGS CLARK COUNTY AREA.
①	CONSTRUCT "A" TYPE CURB PER DETAIL 'A' SHEET C8.01.	
②	CONSTRUCT "L" TYPE CURB PER USDCCA DWG. No. 216.	
③	CONSTRUCT CONCRETE SIDEWALK PER USDCCA DWG. No. 234. SEE ARCHITECTURAL PLANS FOR COLOR, FINISH, SCORING AND JOINTS.	
④	CONSTRUCT SIDEWALK ADA RAMP PER USDCCA DWG. No. 235 CASE I.	
⑤	CONSTRUCT SIDEWALK DRAIN PER USDCCA DWG. No. 236.	
⑥	CONSTRUCT 2' WIDE CONCRETE VALLEY GUTTER PER DETAIL 'D' SHEET C8.01.	
⑦	CONSTRUCT CURB OPENING PER DETAIL 'E' SHEET C8.01.	
⑧	CONSTRUCT COMMERCIAL DRIVEWAY PER USDCCA DWG. No. 222.1 AND 228.	
⑨	SAWCUT AND MATCH EXISTING AC PAVEMENT.	
⑩	CONSTRUCT 2" AC PAVING OVER 4" TYPE II AGGREGATE BASE.	
⑪	CONSTRUCT 3" AC PAVING OVER 4" TYPE II AGGREGATE BASE.	
⑫	CONSTRUCT GRADED SWALE.	
⑬	CONSTRUCT "O" TALL TYPE "A" CURB PER DETAIL 'C' SHEET C8.01.	
⑭	ADJUST TO GRADE RELOCATE OR MODIFY.	

HIGHGATE SENIOR LIVING
APN: 138-22-702-002

GRADING PLAN

ROCK SPRINGS DR. & WALT LOTT DR.
LAS VEGAS, CLARK COUNTY, NEVADA

**COLLINS
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LAS VEGAS, NV 89117
PHONE: (702) 248-8000
FAX: (702) 248-8070
www.collinsengr.com

[illegible]

CEI PROJECT:	975
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DESIGN BY: SHAYAN S.

DRAWN BY: SHAYAN S.

CHECKED BY: J. YANCEY

DATE:

09/13/16
0015

SCALE:
1"=30'

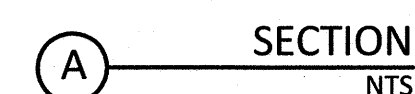
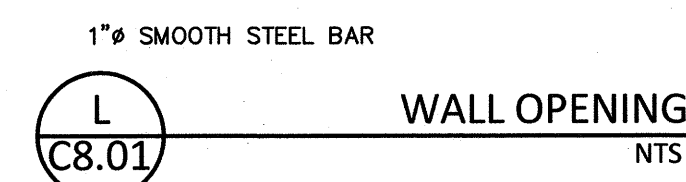
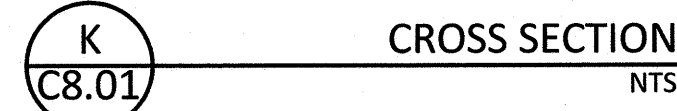
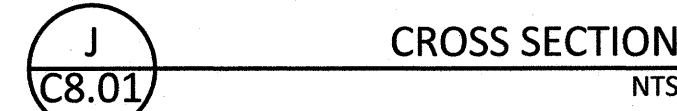
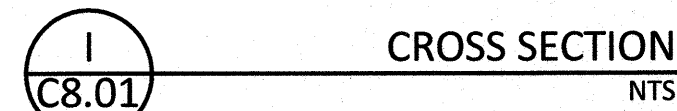
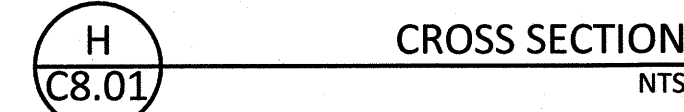
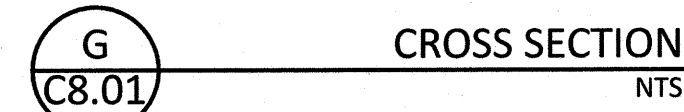
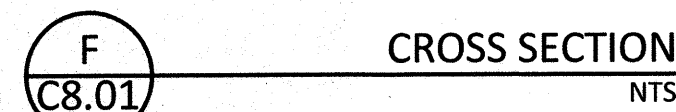
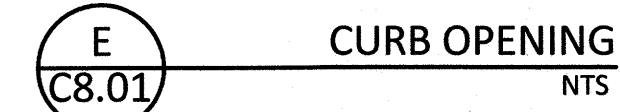
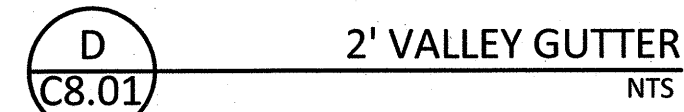
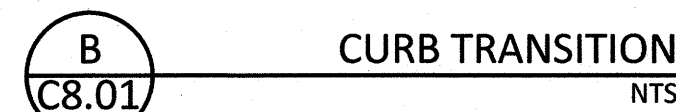
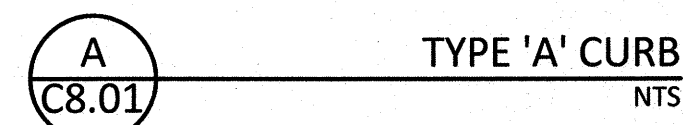
SHEET NUMBER

C4.02

C4.02
SHEET 6 OF 10



NOTES:
1. CONTINUOUS #4 REBAR IN RADIUS OF CURB ONLY



ROCK SPRINGS DR. & WALT LOTT DR.
LAS VEGAS, CLARK COUNTY, NEVADA

SHEET 10 OF 10