



Technical Drainage Study
for

Whataburger Nellis and Walnut

Date Prepared:
January 2025

Prepared for:
Panda Restaurant Group, INC.
1683 Walnut Grove Avenue
Rosemead, CA 91770-3711

Prepared by:
Kimley-Horn and Associates, Inc.
6671 Las Vegas Boulevard South, Suite 320
Las Vegas, NV 89119
702.862.3600

Kimley»Horn

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Whataburger - Nellis and Walnut Date: January 2025

Location of Development: a) Descriptive (Cross Streets) North/South: Nellis Boulevard
East/West: Walnut Avenue

b) Section: 32 Township: 20S Range: 62E

c) APN : 176-14-401-015, -016

Name of Owner: Panda Restaurant Group, INC.

Telephone No.: _____ Fax No.: _____ E-Mail Address: sean.ho@pandarg.com

Address: 1683 Walnut Grove Avenue, Rosemead, CA 91770-3711

Contact Person-Name: Michael Schwab, P.E. Telephone No.: 702.790.0206

* E-Mail Address: michael.schwab@kimley-horn.com Fax No.: _____

Firm: KIMLEY-HORN

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

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 2.10 acres Being Developed/Disturbed: +/- 1.50 acres

2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ Yes** ☒ No

3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☐ Yes** ☒ No

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

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

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: Runoff is discharged east to Nellis BLVD

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

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

***New Required Field**

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

Local Entity File No.	Revision	Date

Engineer's Seal

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL			
DRAINAGE SUBMITTAL CHECKLIST			
Project Name:	Whataburger Nellis and Walnut	Map ID:	140-32-517-001
Firm Name:	Kimley-Horn	Engineer:	
Address:	6671 Las Vegas Boulevard South, Suite 320		
City:	Las Vegas	State:	Nevada
		Zip:	89119
Phone No.:	(702) 862-3600	Fax No.	
Property Owner:	Panda Restaurant Group, INC.		
Address:	1683 Walnut Grove Avenue		
City:	Rosemead	State:	CA
		Zip:	91770-3711
Reviewed By:		Date Received:	Date Accepted for Review:

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

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

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

I. GENERAL REQUIREMENT

YES NO N/A

- | | | | |
|-------------------------------------|--------------------------|-------------------------------------|--|
| ☒ | ☐ | ☐ | Design Manual Standard Form 1 with the Engineer's seal and signature. |
| ☒ | ☐ | ☐ | Design Manual Standard Form 4 . |
| ☒ | ☐ | ☐ | 2 copies of the 24" x 36" Drainage Plan . |
| ☐ | ☐ | ☒ | A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. |

II. MAPS AND EXHIBITS

YES NO N/A

- | | | | |
|-------------------------------------|--------------------------|--------------------------|--|
| ☒ | ☐ | ☐ | A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. |
| ☒ | ☐ | ☐ | A copy of the current CCRCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated. |
| ☒ | ☐ | ☐ | Off-site drainage basin maps for existing, interim, and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs. |

II. MAPS AND EXHIBITS (CONTINUED)

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

III. DRAINAGE PLAN

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

III. DRAINAGE PLAN (CONTINUED)

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

IV. HYDROLOGIC ANALYSIS

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

IV. HYDROLOGIC ANALYSIS (CONTINUED)

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

V. HYDRAULIC ANALYSIS

YES NO N/A

- | | | | |
|-------------------------------------|--------------------------|-------------------------------------|--|
| ☐ | ☐ | ☒ | Flow split calculations and supporting documentation or reference for the method of flow calculation used. |
| ☒ | ☐ | ☐ | Normal depth street flow calculations and cross-section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan . |
| ☒ | ☐ | ☐ | A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria. |
| ☐ | ☐ | ☒ | Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.) |
| ☐ | ☐ | ☒ | Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate. |
| ☒ | ☐ | ☐ | Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Building adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater. |
| ☐ | ☐ | ☒ | <p>A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones.</p> <ul style="list-style-type: none"> • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report. |
| ☐ | ☐ | ☒ | Provide a 50 percent clogging factor in the capacity calculation for drop inlets. |
| ☐ | ☐ | ☒ | Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drainpipes in public rights-of-way, including headwater pool inundation. |
| ☒ | ☐ | ☐ | The mitigation of nuisance water, both during construction and in the fully developed condition must be addressed. |
| ☒ | ☐ | ☐ | Provide BMP type, size and supporting calculations for parking lots and LIDs (if required) |



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. _____ 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.
	N/A	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.
	N/A	Back of lot elevations and lot drainage pattern for all lots including common lots.
	N/A	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
X		Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

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

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

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

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

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



January 14, 2025

Mr. Albert Sung, P.E.
City of Las Vegas Flood Control
495 S. Main Street
Las Vegas, NV 89101

RE: *Technical Drainage Study Whataburger – Nellis and Walnut*

Dear Mr. Sung,

Attached is one (1) copy of the *Technical Drainage Study for Whataburger – Nellis and Walnut* for your review. This letter certifies that all items provided on the electronic submittal (CD) match the paper version bound into the study.

With Kimley-Horn, you should expect more and will experience better. Please contact me at (702) 790-0206 or michael.schwab@kimley-horn.com should you have any questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read 'Sean Schofield', written in a cursive style.

Michael E. Schwab, P.E.

Sean Schofield, Analyst

Technical Drainage Study

for

Whataburger Nellis and Walnut

Date Prepared:

January 2025

Prepared for:

Panda Restaurant Group, INC.

1683 Walnut Grove Avenue

Rosemead, CA 91770-3711

Prepared by:

Kimley-Horn and Associates, Inc.

6671 Las Vegas Boulevard South, Suite 320

Las Vegas, NV 89119

702.862.3600

Table of Contents

INTRODUCTION	2
LOCATION AND DEVELOPMENT DESCRIPTION.....	2
LAND USE CONDITIONS	2
PREVIOUS DRAINAGE STUDIES.....	4
CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) MASTER PLAN FACILITIES.....	4
FLOOD HAZARD DESIGNATION.....	4
HYDROLOGIC METHODOLOGY	5
MODEL DESCRIPTION	5
PRECIPITATION	5
CURVE NUMBER	5
DRAINAGE AREAS AND FLOW PATTERNS	6
LAG TIME	6
HYDROLOGY	6
EXISTING CONDITION.....	6
PROPOSED CONDITION	7
HYDRAULIC CALCULATIONS	8
HYDRAULIC SECTIONS - OFFSITE	8
HYDRAULIC SECTIONS - ONSITE	9
PARKING LOT LOW IMPACT DEVELOPMENT (LID)	9
FINISHED FLOOR ELEVATION	10
CONCLUSIONS AND RECOMMENDATIONS	11
REFERENCES	12

INTRODUCTION

GWA has contracted with Kimley-Horn (KH) to provide design services for the **Whataburger** improvements northeast of Warm Springs Road and Gagnier Boulevard. Panda Restaurant Group is proposing to develop a **1.24± acre lot** which will include a building, parking lot, and half-street improvements for Warm Springs Road and Gagnier Boulevard.

The purpose of this report is to accompany the grading plans, to provide detailed hydrologic and hydraulic analyses for the site, and to determine adequate protection for the project from offsite and onsite flows. The following tasks were performed in the preparation of this report:

1. Identify previous drainage studies for the project site and surrounding areas.
2. Identify the FEMA floodplain designation for the project site.
3. Identify existing and proposed regional drainage facilities adjacent to the site.
4. Estimate runoff generated for the peak 10-year and 100-year return period storms for existing, interim, and ultimate conditions.
5. Verify proposed finished floor elevations meet CCPW Criteria.
6. Recommend drainage features to protect the project from storm runoff.
7. Determine the stormwater runoff generated by the 85th Percentile Rainfall for fully developed conditions and recommend on-site water quality structural Best Management Practices (BMP) to meet Parking Lot Low Impact Development (LID) requirements.

LOCATION AND DEVELOPMENT DESCRIPTION

The project site is located in Section 32, Township 20 South, Range 62 East, M.D.M. Clark County, Nevada. The project site is composed of APN **140-32-517-001**. A copy of the *Assessor's Parcel Map* is included in **Appendix A**. Please refer to **Figure 1 – Vicinity Map** following this page for the location of the project.

Currently the site is undeveloped desert terrain with sparse vegetation encompassing approximately **2.10 acres** and is bounded by residential development to the west, Oasis Springs and commercial development to the south, Nellis Boulevard to the east, and commercial development to the north. The existing site sheet flows from west to east into Nellis Boulevard, which conveys runoff south to existing drainage facilities. Drainage improvements will include roadway improvements, swales, valley gutters, and roof drains facilities to convey offsite and onsite runoff.

LAND USE CONDITIONS

The parcels on which the project site is located has a zoning classification of C-2 (General Commercial). The proposed development matches the zoning of the parcel.

VICINITY MAP

PREVIOUS DRAINAGE STUDIES

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

1. *Technical Drainage Study for Taco Bell & Pizza Hut Restaurants*; Approved March 2007 (DS4123C).

This study, hereinafter referred to as the *Taco Bell Study*, references offsite flow from the residential development to the west. The *Taco Bell Study* also referenced flows (**24/69 cfs**) in Nellis Boulevard from the *City Wide Hydrology Study Update – 1997*. Flow rates and sections were referenced for Oasis Springs, the drive aisle south of the site, and for Nellis Boulevard east of the site.

2. *Technical Drainage Study for Culinary Health Fund Parking Lot*; Approved August 2018 (PW18-14449)

This study, hereinafter referred to as the *Culinary Study*, also referenced flows (**24/69 cfs**) in Nellis Boulevard from the *City Wide Hydrology Study Update – 1997*, produced by the City of Las Vegas.

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

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

“*The Las Vegas Valley Flood Control Master Plan Update*”, Figure **F-31**, dated July 2024, as prepared by the Clark County Regional Flood Control District (CCRFCD) illustrates the existing and proposed master planned facilities in the area. A copy of Figure **F-31** has been included in **Appendix A**. As shown on Figure **F-31**, the project site is not located adjacent to any existing or proposed CCRFCD Facilities.

FLOOD HAZARD DESIGNATION

The Special Flood Hazard Areas for both the unincorporated and the incorporated portions of Clark County, Nevada, are outlined in the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps. This subject site is located on Community Panel No. **32003C 2187F** and **2195F**, revised November 16, 2011. As shown on the *FEMA FIRM Exhibit* (see **Appendix A**), the subject site is located within **Zone X**, which is not a FEMA designated SFHA. Zone X are areas of minimal flood hazard.

HYDROLOGIC METHODOLOGY

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

MODEL DESCRIPTION

The hydrologic model utilized in this study is the **HEC-1** Flood Hydrograph Package developed by the U.S. Army Corps of Engineers Hydrologic Engineering Center. **HEC-1** is a rainfall runoff event simulation model utilizing an interconnected system of hydrologic and hydraulic components to stimulate the surface runoff response of a drainage area to precipitation. The calculations of this study were performed using the SCS Unit Hydrograph of the HEC-1 Flood Hydrograph Model. The detailed explanation of the theory and background is presented in Section 4 of the SCS National Engineering Handbook and the **HEC-1** User Manual. Since the drainage area for the overall watershed is less than 8 square miles, and SDN3 design storm was selected for the use in the HEC-1 computer model.

PRECIPITATION

According to Figure 513 of the Manual, the project is located within the **McCarran Airport Rainfall Area**, and therefore, point rainfall values for the 10-year and 100-year, six-hour storm duration are **1.58 and 2.77** inches, respectively (see **Appendix B**).

CURVE NUMBER

The soils information for the project watershed was referenced from the Soil Survey of Las Vegas Area, Nevada, Part of Clark County" prepared by the United States Department of Agriculture Natural Resources Conservation Services (USDA NRCS). A *Custom Soil Resource Report* for the project site is included in **Appendix B**.

The report shows that the project area and offsite subbasins consist of Soil Type 200 (Glencarb silt loam). Soil Type 200 is classified as Hydrologic Soil Group (HSG) Type "C" with moderate high runoff potential.

The land uses / land covers for the project site consist of: "**Desert (Poor Condition)**" for undeveloped areas and "**Commercial**" for developed areas.

Due to the presence of multiple soil types, a weighted average curve number computation was prepared. These calculations are included in **Appendix B**.

For the given soil, CN values were determined from appropriate columns of **Table 602** of the Manual. Curve numbers ranging from **85** to **94** were determined for the existing and proposed conditions subbasins.

A copy of “*The Las Vegas Valley Flood Control Master Plan Update*”, Figure **W-3**, dated December 2018, as prepared by CCRFCD is included in **Appendix A** to illustrate Regional’s hydrologic subareas, land use and soils in the area.

DRAINAGE AREAS AND FLOW PATTERNS

The subbasins and flow patterns used for the hydrologic modeling were determined from elevations established for the project site in a master grading digital file. Aerial topography with 1-foot contour intervals and survey data has been used for subbasin delineations.

LAG TIME

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

$$T = 0.6T_c$$

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

HYDROLOGY

Existing and proposed conditions hydrology has been prepared to address the proposed onsite development and adjacent roadway improvements. Existing and proposed conditions subbasins have been included on **Figures EX** and **PRO**, respectively, and depict the drainage patterns used in the hydrologic analysis for this project. Copies of the figures are included in **Appendix A**. Hydrologic calculations are included in **Appendix B**. HEC-1 Models for the existing and proposed conditions subbasins have been included in **Appendix B**. Tables summarizing the results of the HEC-1 Models have been included on **Figures EX** and **PRO** in **Appendix A**.

EXISTING CONDITION

Existing conditions assume the site undeveloped with Oasis Springs and Nellis Boulevard fully developed, and the tributary watershed as a fully developed. Offsite flows represented in the *Taco Bell Study* discharge south of the project site on Oasis Springs. Offsite flows in Nellis Boulevard are assumed to be contained in the respective streets.

The project-specific existing conditions hydrology consists of one (1) onsite subbasins (EON1) and offsite basins that have been referenced from the *Taco Bell Study*. **Figure EX** depicts the subbasins

and drainage patterns used in the existing conditions hydrologic analysis for this project. Hydrologic calculations have been included in **Appendix B**. **Table 1** summarizes the HEC-1 results for existing conditions.

Table 1: Existing Condition Flow Summary

BASIN ID	BASIN AREA	100-YR FLOW	10-YR FLOW
	(ac)	(cfs)	(cfs)
EON1	2.08	4	2
NELLIS*	N/A	69	24
OASIS*	N/A	17	7

*Referenced from the Taco Bell Study (HTE# 07-4358)

The OASIS* flow rates are referenced from the *Taco Bell Study*, and the **NELLIS*** flow rates are referenced from the *Taco Bell Study* which referenced them for the City of Las Vegas *City Wide Hydrology Update – 1997*.

PROPOSED CONDITION

In the proposed condition, the project site is developed while the offsite areas remain the same as the existing condition. The project-specific proposed conditions hydrology consists of one (1) onsite subbasins (DON1) and offsite basins that have been referenced from the *Taco Bell Study*. A unit flowrate (cfs/acre) for the onsite subbasin was calculated by dividing the total flowrate of the subbasin by the overall subbasin area. The flowrates generated by the areas shown on **Figure PRO** is approximated by multiplying the calculated unit flow rate (cfs/acre) by the delineated portion of tributary area (acres). Prorate calculations for the onsite subbasins have been included on **Figure PRO**. Refer to **Table 2** for a summary of the proposed condition flow rates. Refer to **Appendix A** for the **Figure PRO**. **Table 3** summarizes the prorated proposed conditions flowrates. Hydrologic calculations have been included in **Appendix B**.

Table 2 – Proposed Condition Flow Summary

BASIN ID	BASIN AREA	100-YR FLOW	10-YR FLOW
	(ac)	(cfs)	(cfs)
DON1	2.08	7	4
NELLIS*	N/A	69	24
OASIS*	N/A	17	7

*Referenced from the Taco Bell Study (HTE# 07-4358)

Table 3 – Proposed Condition Prorate Flow Summary

Proposed Onsite					
SUBBASIN	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	AREA (ac)	CFS/ACRE ₁₀₀	CFS/ACRE ₁₀
DON1	7	4	2.08	3.37	1.92
Proposed Onsite Prorated Basins					
SUBBASIN	Q ₁₀₀ (cfs)	Q ₁₀ (cfs)	AREA (ac)	CFS/ACRE ₁₀₀	CFS/ACRE ₁₀
DON1-A	2	1.5	0.73	3.37	1.92
DON1-B	1	0.5	0.24	3.37	1.92
DON1-C	1	<1	0.18	3.37	1.92
DON1-D	1	0.5	0.19	3.37	1.92
DON1-E	2	1.5	0.74	3.37	1.92
TOTAL	7	4	2.08	NA	NA

HYDRAULIC CALCULATIONS

HYDRAULIC SECTIONS - OFFSITE

The normal depth calculations presented herein assume the proposed site and adjacent roadways, Nellis Boulevard and Oasis Springs, as fully developed. Nellis Boulevard consists of existing west half street improvements within a 100-foot right-of-way. The proposed street section includes “L” type curb and gutter and sidewalk. Oasis Springs consists of existing north half street improvements within a 56-foot private drive aisle which includes “L” type curb and gutter and sidewalk.

Two hydraulic sections were referenced from the *Taco Bell Study* to analyze the street flow in the adjacent streets, one in Nellis Boulevard and one in Oasis Springs. The resulting street flow data based on the flows generated during the proposed conditions has been presented in **Table 4**, and the normal depth calculations can be found in the reference material located in **Appendix E**. The Proposed Conditions Basin Map, found in **Appendix A**, shows the location of the hydraulic sections.

Table 4 – Offsite Hydraulic Cross Sections-Proposed

STREET SECTION	TRIBUTARY BASINS	SLOPE	Q ₁₀₀	FLOW DEPTH	VELOCITY	D*V	Q ₁₀	FLOW DEPTH	VELOCITY	D*V	DRY LANE
		%	(cfs)	(ft)	(ft/s)	ft ² /s	(cfs)	(ft)	(ft/s)	ft ² /s	
*1-1	-	0.50	17	0.51	2.02	1.03	-	-	-	-	-
*2-2	-	0.40	69	0.88	3.11	2.74	24	0.64	2.27	1.45	22'

*Referenced from the Day Care Study (PW21-11586)

Please note that referenced flow rate in Nellis Boulevard from the *City of Las Vegas City Wide Hydrology Update - 1997* already accounted for this project site to be developed. Therefore, the flow rate in Nellis Boulevard is the same in the existing and proposed conditions.

Based on the calculated flow characteristics, the Manual criteria for depth (D) and velocity times depth ($V \cdot D$) during the 100-year storm event will be met.

The Manual criteria for a major roadway requires a 12-foot-wide dry lane in addition to a dry center turn lane in each direction for streets with a ROW greater than 80 feet during a 10-year storm event. Please note there will be a 10-year dry lane in Nellis Boulevard which meets the criteria.

HYDRAULIC SECTIONS - ONSITE

Four hydraulic sections that represent locations around the site were prepared in FlowMaster and can be found in **Appendix B**. Flow rates were obtained by using prorated flows from the onsite basin **DON1** to determine approximate flow rates for each hydraulic section. Refer to **Figure PRO - Proposed Conditions Basin Map** in **Appendix A** for the prorated flow summary table. The resulting street flow data based on the flows generated during the proposed conditions has been presented in **Table 5**. The Proposed Condition Basin Map, found in **Appendix A**, shows the location of the hydraulic sections. The physical characteristics of each section are based on the sections shown on the grading plans in **Appendix E**.

Table 5 – Onsite Hydraulic Sections

SECTION	TRIBUTARY BASINS	CHANNEL SLOPE	Q_{100}	FLOW DEPTH	VELOCITY	FLOW LINE	FLOW LINE + 2D	FFE BLDG	BLDG PROTECTED?
		%	(cfs)	(ft)	(ft/s)	(ft)	(ft)	(ft)	
ON-A	DON1-A	0.50	2.0	0.20	1.24	1757.54	1757.94	1759.00	YES
ON-B	DON1-B	0.50	1.0	0.14	0.81	1758.58	1758.86	1759.00	YES
ON-C	DON1-C	0.61	1.0	0.29	1.41	1758.37	1758.95	1759.00	YES
ON-D	DON1-D	0.50	1.0	0.28	1.18	1758.00	1758.56	1759.00	YES

**ADD 2600 FT

PARKING LOT LOW IMPACT DEVELOPMENT (LID)

Per Section 1502.2 of the CCRFCD "Hydrologic Criteria and Drainage Design Manual", this project is categorized as a Medium Parking Lot since the size of the site is approximately +/-2.1 acres and the size of the parking lot is approximately +/-0.94 acres.

For the medium parking lot category, treatment BMPs are required to treat stormwater runoff. BMPs are sized for the 85th Percentile Rainfall. Please refer to **Appendix D** for all LID calculations and **Figure LID - LID Basin Map**.

One type of BMPs are incorporated into the project design: rock-lined swales. Due to site design and grading constraints, the project site was delineated into two (2) sub-areas; Drainage Management Area “1” (DMA-1) and DMA-2.

The DMA-1 will be treated by a rock-lined swale proposed along Nellis Boulevard. The DMA-2 will be treated by a rock-lined swale proposed along Oasis Springs. The swales are a minimum 30 feet long, have 4:1 side slopes, longitudinal slopes less than one percent, and are a minimum nine inches deep. The proposed swales will treat more than 75 percent of the parking lot area.

The proposed **LID Basin Map** is included in **Appendix D**. The proposed BMPs are shown on the grading plans included in **Appendix F**. The proposed BMPs will treat 75 percent of the parking lot area and will convey, contain, and treat the peak BMP discharge (QBMP) as well as facilitate the 100-year peak flow rate.

FINISHED FLOOR ELEVATION

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

The proposed building is set above at least twice the depth of flow in the adjacent swales and valley gutters. The proposed driveway along Nellis Boulevard is humped 6-inches above the WSE in the street along the north side of the driveway. The south side of the driveway along Nellis Boulevard is elevated above the depth flow; however, 6-inches of freeboard was not able to be obtained due to the adjacent ADA ramp. Refer to the grading plans included in **Appendix E. Table 5** in the previous section, is a summary of the finished floor checks for the onsite hydraulic sections.

CONCLUSIONS AND RECOMMENDATIONS

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

1. This project is in compliance with the applicable drainage laws recognized by the State of Nevada.
2. This project is in compliance with the CCRFCD's "*Master Plan Update*" and will **not** conflict with any Master Planned Facilities.
3. This project is in compliance with the CCRFCD's "*Hydrologic Criteria and Drainage Design Manual*", with the exceptions noted in the study.
4. This project lies within FEMA Flood Zone "**Zone X**".
5. The recommended drainage facilities for this project have been designed to control and convey the on-site runoff from the 100-year storm safely around the site. In addition, they have been designed based upon generally accepted engineering practices and in accordance with local requirements.
6. The finished floor elevation meets Clark County minimum requirements and is protected by solid grouted floodwall where otherwise.
7. Runoff generated from, or conveyed by, the project will not adversely impact any downstream properties or facilities.

REFERENCES

1. Clark County Regional Flood Control District, "*Hydrologic Criteria and Drainage Design Manual*," August 1999, Revise September 2013.
2. Clark County Regional Flood Control District, "*2018 Las Vegas Valley Flood Control Master Plan Update*," December 2018.
3. U.S. Army Corps of Engineers, *HEC-1 Flood Hydrograph Package*. Revised June 1998.
4. U. S. Department of Agriculture Soil Conservation Service, Soil Survey of Las Vegas Valley Area, Nevada, Part of Clark County, September 2018, Version 13
5. *Technical Drainage Study for Taco Bell & Pizza Hut Restaurants*; Prepared by Development Resource Consultants, Inc. Approved March 2007 (DS4123C).
6. *Technical Drainage Study for Culinary Health Fund Parking Lot*; Prepared by Lochsa Engineering. Approved August 2018 (PW18-14449).

LIST OF APPENDICES

Appendix A – Documents & Figures

- EX Existing Condition Basin Map
- PRO Proposed Condition Basin Map
- Assessor's Parcel Maps
- FIRM Exhibit
- Figure F-31 Flood Control Facilities
- Figure W Hydrologic Subareas, Land Use & Soils
- Entitlements: 24-0460-SDR1

Appendix B – Hydrologic Calculations

- Figure 513 McCarran Airport Rainfall Area
- Table 503 Six-hour Storm Distributions
- Table 505 Depth-Duration-Frequency Values
- USDA NRCS Custom Soils Resource Report for Las Vegas Valley
- Curve Number Calculations
- Existing Condition Standard Form 4
- Existing Condition HEC-1 Output
- Proposed Condition Standard Form 4
- Proposed Condition HEC-1 Output

Appendix C – Hydraulic Calculations

- Normal Depth Calculations – Onsite
- Normal Depth Calculations – Swales

Appendix D – Parking Lot LID Calculations

- LID Parking Lot LID Map & Calculations

Appendix E – Reference Materials

- Technical Drainage Study for Taco Bell & Pizza Hut Restaurants; Prepared by Development Resource Consultants, Inc. Approved January 2007 (DS4123)
- Technical Drainage Study for Culinary Health Fun Parking Lot; Prepared by Lochsa Engineering, Approved November 16, 2011 (PW18-14449)

Appendix F – Improvement Plans

Appendix G – Data CD