

# HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

## DRAINAGE STUDY INFORMATION FORM

Name of Development: \_\_\_\_\_ Date: \_\_\_\_\_

Location of Development: a) Descriptive (Cross Streets) North/South: \_\_\_\_\_

East/West: \_\_\_\_\_

b) Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_

c) APN : \_\_\_\_\_

Name of Owner: \_\_\_\_\_

Telephone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_ E-Mail Address: \_\_\_\_\_

Address: \_\_\_\_\_

Contact Person-Name: \_\_\_\_\_ Telephone No.: \_\_\_\_\_

\* E-Mail Address: \_\_\_\_\_ Fax No.: \_\_\_\_\_

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: \_\_\_\_\_ Being Developed/Disturbed: \_\_\_\_\_

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.): \_\_\_\_\_

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

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

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

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

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.		

Engineer's Seal

REFERENCE:

STANDARD FORM 1

# HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## DRAINAGE SUBMITTAL CHECKLIST

Project Name:	Map ID:	
Firm Name:	Engineer:	
Address:		
City:	State:	Zip:
Phone Number:	Fax Number:	
Property Owner:		
Address:		
City:	State:	Zip:
Reviewed By:	Date Received:	Date Accepted for Review:

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

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

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

### I. GENERAL REQUIREMENT

- | Yes   | No    |  |
|-------|-------|--|
| _____ | _____ | Design Manual <b>Standard Form 1</b> with the engineer's seal and signature.                   |
| _____ | _____ | Design Manual <b>Standard Form 4</b> .   |
| _____ | _____ | 2 copies of the 24" x 36" Drainage Plan.   |
| _____ | _____ | A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. |

<b>REFERENCE:</b>	<b>STANDARD FORM 2</b>
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# HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## DRAINAGE SUBMITTAL CHECKLIST

### II. MAPS AND EXHIBITS

Yes    No

- A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
- A copy of the current CCRFCD 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.
- On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
- Vicinity Map with local and major cross streets identified and a north arrow.

### III. DRAINAGE PLAN

Yes    No

- Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
- Minimum scale: 1" = 60'.
- Project name.
- Vicinity Map with local and major cross streets.
- Revision box.
- North arrow and bar scale.
- Engineer's/consultant's address and phone number.
- Elevation datum and benchmark.
- Legend for symbols and abbreviations.
- Cut/fill scarps, where applicable.
- Street names, grades, widths.
- Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.

**REFERENCE:**

**STANDARD FORM 2**

# HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## DRAINAGE SUBMITTAL CHECKLIST

### III. DRAINAGE PLAN (Continued)

Yes    No

- |                          |                          |   |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.  |
| <input type="checkbox"/> | <input type="checkbox"/> | Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Proposed typical street sections.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Streets with off-set crowns.  |
| <input type="checkbox"/> | <input type="checkbox"/> | Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Property lines.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Right-of-way lines and widths, existing and proposed.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Existing improvements and their elevations.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.  |
| <input type="checkbox"/> | <input type="checkbox"/> | Concentration points and drainage flow direction with $Q_{100}$ and $V_{100}$ and $D_{100}$ in streets.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Location and cross-section of street capacity calculations.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Cross-sectional detail for channels, including cutoff wall locations.   |
| <input type="checkbox"/> | <input type="checkbox"/> | 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. |
| <input type="checkbox"/> | <input type="checkbox"/> | Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.  |
| <input type="checkbox"/> | <input type="checkbox"/> | 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.   |
| <input type="checkbox"/> | <input type="checkbox"/> | Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.   |

**REFERENCE:**

**STANDARD FORM 2**

# HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## DRAINAGE SUBMITTAL CHECKLIST

### III. DRAINAGE PLAN (Continued)

Yes    No

- \_\_\_\_    \_\_\_\_    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 site accesses where the intent is to protect the site from the  $Q_{100}$  flows.
- \_\_\_\_    \_\_\_\_    Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.

### IV. HYDROLOGIC ANALYSIS

Yes    No

- \_\_\_\_    \_\_\_\_    Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
- \_\_\_\_    \_\_\_\_    Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
- \_\_\_\_    \_\_\_\_    Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
- \_\_\_\_    \_\_\_\_    Use of correct precipitation values in and around the McCarran Airport rainfall area.
- \_\_\_\_    \_\_\_\_    A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
- \_\_\_\_    \_\_\_\_    A summary table of stormwater flows showing basin area,  $Q_{10}$  and  $Q_{100}$  for both individual basins and combined basin flows, where applicable.
- \_\_\_\_    \_\_\_\_    Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
- \_\_\_\_    \_\_\_\_    On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.

**REFERENCE:**

**STANDARD FORM 2**

# HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

## DRAINAGE SUBMITTAL CHECKLIST

### V. HYDRAULIC ANALYSIS

Yes      No

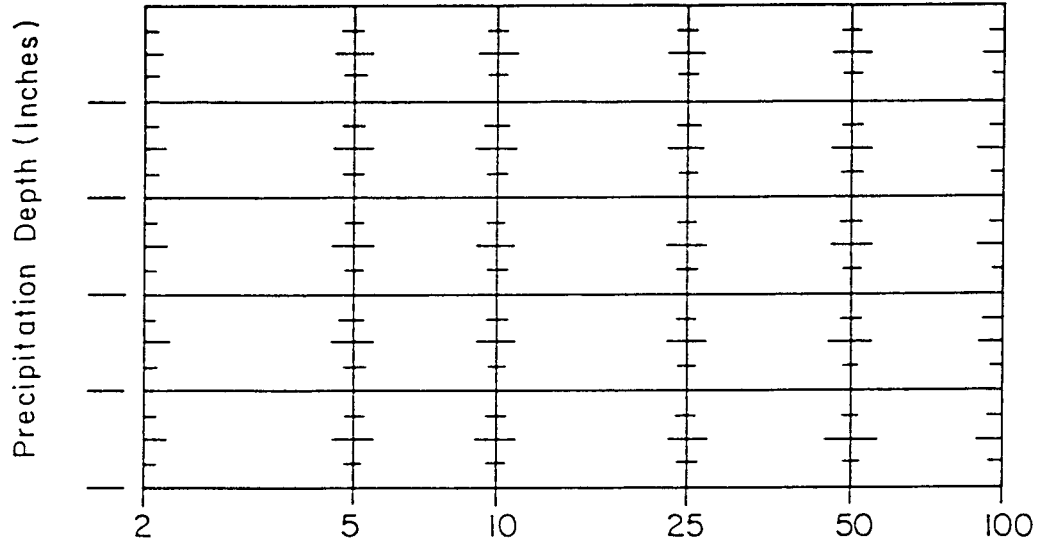
- |                          |                          |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | Flow split calculations and supporting documentation or reference for the method of flow split calculations used.  |
| <input type="checkbox"/> | <input type="checkbox"/> | 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. $Q_{100} d x v \leq 8$ . $Q_{10} d x v \leq 6$ and 12 foot dry lane for rights-of-way $\geq 80$ feet. Calculations must be labeled by street name as indicated on the Grading Plan.   |
| <input type="checkbox"/> | <input type="checkbox"/> | 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.  |
| <input type="checkbox"/> | <input type="checkbox"/> | Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)  |
| <input type="checkbox"/> | <input type="checkbox"/> | 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.  |
| <input type="checkbox"/> | <input type="checkbox"/> | 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, which ever is greater.  |
| <input type="checkbox"/> | <input type="checkbox"/> | A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. <ul style="list-style-type: none"><li>● Field survey data.</li><li>● Input and output information.</li><li>● Plotted cross-sections based on survey with proper encroachments.</li><li>● A map showing the location of the cross-sections.</li><li>● Analysis of both sub and super-critical flow segments.</li><li>● A summary table and a discussion of the results in the text of the report.</li></ul> |
| <input type="checkbox"/> | <input type="checkbox"/> | Provide a 50 percent clogging factor in the capacity calculation for drop inlets.  |
| <input type="checkbox"/> | <input type="checkbox"/> | Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.   |
| <input type="checkbox"/> | <input type="checkbox"/> | The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.  |

**REFERENCE:**

**STANDARD FORM 2**

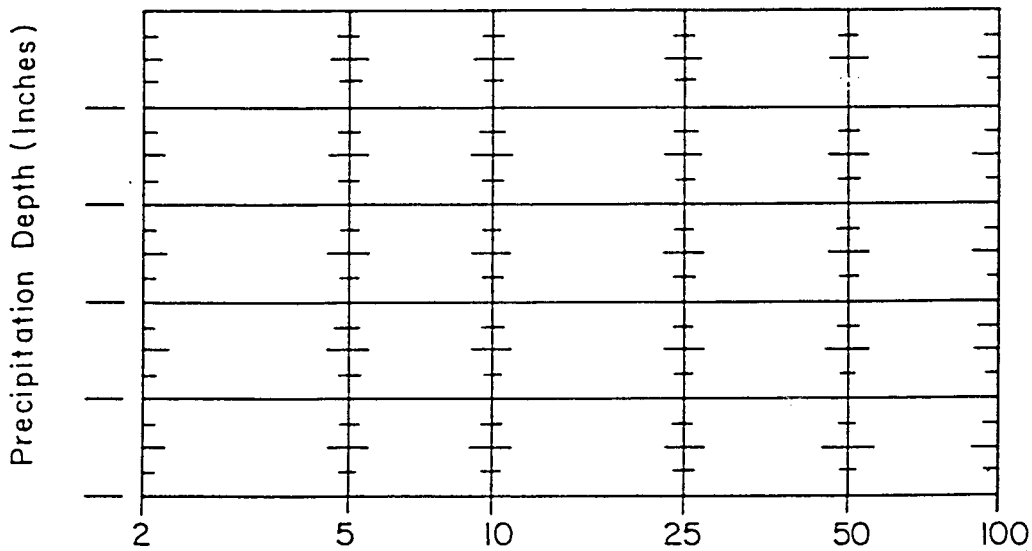
## PRECIPITATION DEPTH VERSUS RETURN PERIOD

A. PLOT OF 6-HOUR AND 24-HOUR PRECIPITATION DEPTH VALUES



Return Period in Years, Partial - Duration Series

B. PLOT OF 1-HOUR PRECIPITATION DEPTH VALUES



Return Period in Years, Partial - Duration Series

Revision	Date

**REFERENCE:** NOAA ATLAS 2, VOLUME VII NEVADA, 1973

**STANDARD FORM 3**







