

DS #: 4524

APN: 125-25-614-001

PROJECT: WINCO LAS VEGAS (UPDATE DECATUR/215)

SUBMITTAL: 1ST

SCANNED BY/DATE: _____

CHECKED BY/DATE: _____



CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		March 23, 2011
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	COPIES TO:	
Drainage Study for:	Thienes Engineering, Inc.	
WINCO Las Vegas (Update to Decatur / 215)		
Cross Streets:	NWC of Decatur Blvd. & Tropical Pkwy.	Winco Foods, LLC
File Number:	F:\Depot\DSMemos\DS4524A.doc	Bart Anderson, P.E., DevCo
Parcel Number:	125-25-614-001	CNLV
Zoning Action:	SDR-40223; SUP-40225 & VAR-40226	CCPW
FEMA Flood Zone	YES NO X	
Proposed Storm Drain	YES NO X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1 st Submittal	3/9/2011	3/23/2011	See Comments Below	\$400.00	164230: \$400
TOTAL FEES (LDDRS):				\$400.00	----

REMARKS:

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

	is approved subject to conformance to all City standards and the following conditions:
X	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Clark County Public Works Department concurrence.

1. Provide a copy of the zoning/planning conditions associated with this site (**SDR-40223; SUP-40225 & VAR-40226**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.
2. The site is adjacent to the jurisdiction of the *City of North Las Vegas* to the east. *City of North Las Vegas* concurrence must be obtained prior to the final approval of the drainage study.
3. **Detail Sheet G-1** was not provided in the last submittal. Please attach G-1 in the addendum to the drainage study.
4. **Grading Plan Sheet G-2:** Identify and label all existing public drainage easements (width varies from 20' to 95') with size of the storm drains and recorded document number such as plat and subdivision map book and page numbers.
5. **Grading Plan Sheet G-3:** The proposed drop inlets (catch basins) are all designed in local sump condition. In the addendum to the drainage study in the next submittal, address during a worst case scenario, in which all the inlets are completely clogged, are there any emergency overflow paths provided. Note that the proposed finish floor elevation of the new building must still have a minimum of 6" freeboard over the emergency overflow water surface.

6. **Grading Plan Sheet G-4:** Label an existing storm drain system in *Tropical Parkway* with *City of Las Vegas* recorded drawing number. Identify all drop inlets with type and size information.
7. **Grading Plan Sheet G-5:** (i) Label an existing storm drain system in *Decatur Boulevard* with *City of Las Vegas* recorded drawing number. Identify all drop inlets with type and size information. (ii) Show all onsite existing grade elevations and street grade elevations in *Tropical Parkway* and *Decatur Boulevard* at least at all control points such as grade break and curb return etc. This is necessary to verify whether the proposed design can match to the existing grades and drain properly.
8. **Utility Plan:** City of Las Vegas does not allow Type "A" drop inlet anymore. Revise all callout for the construction of drop inlets per *Clark County Uniform Standard Drawing No. 412A*. The lengths of the inlets are in the multiple of 2.5'. Revise Construction Note #30 accordingly.
9. Construction Note #33 calls for "SPPWC Standard". Provide the standard drawing in the detail sheet.
10. Construction Note #39 calls for a parkway culvert construction per SPPWC Standard at *Tropical Parkway*. Since this is within public right-of-way and it appears that the proposed 8" storm drain can tie to a sidewalk underdrain in the *Tropical Parkway* right-of-way. Revise the callout for the construction of sidewalk drain per *Uniform Standard Drawing No. 236*.
11. *City of Las Vegas* only allows the use of HDPE storm drain pipe for privately owned and privately maintained storm drain systems which serve and are located exclusively on private property. Any proposed HDPE storm drain pipe must meet all design criteria established by the *Clark County Regional Flood Control District* and must be installed per *Clark County Regional Transportation Commission Uniform Standard Drawings and Specifications*.
12. Provide a note on all grading plans: **All onsite storm drains are privately owned and to be privately maintained**".
13. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted Uniform Standard Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

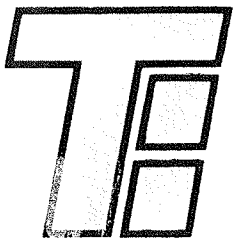
In an effort to increase administrative efficiency, the City of Las Vegas Public Works will be requiring all soils report, drainage study and traffic impact analysis submittals to be accompanied by an electronic copy of the submittal. Electronic documents must be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output replicating your submittal to be used for archival or display purposes. This may be more than one file if necessary. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats, but provided it is a high quality digitized replication of the submittal, other formats may be acceptable. If figures are in color, they must be scanned in color and saved as a separate file. The new submittal requirements will become effective on July 1, 2011. If there are any questions regarding these new requirements, please contact Robert Welch in the Flood Section at (702) 229-2177 or Rick Schroder in Traffic Engineering at (702) 229-6327.

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.

NOTES: This drainage study assumes that the project will be constructed in one phase. If improvement plans are submitted to break the project into separate phases, a drainage study update will be required for each phase addressing the interim condition.

END OF REMARKS
ays

T/R/S: T19S/R60E/25
AREA G-25



Thienes Engineering, Inc.

CIVIL ENGINEERING • LAND SURVEYING

TECHINICAL DRAINAGE STUDY

FOR

WINCO LAS VEGAS
DECATUR BOULEVARD AND TROPICAL PARKWAY
LAS VEGAS, NEVADA

PREPARED FOR

WINCO FOODS, LLC
650 NORTH ARMSTRONG PLACE
BOISE, ID. 83704
P. (208) 672-2086

MARCH 4, 2011

JOB NO. 3033

PREPARED BY

THIENES ENGINEERING
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90638
P. (714) 521-4811
FAX (714) 521-4173

DS 4524

3/8/11

G-25

\$400

SDR-40223
SUP-40225
VAR-40226

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE STUDY INFORMATION FORM

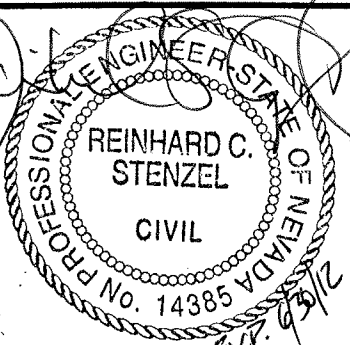
Name of Development: WINCO LAS VEGAS Date: 3/4/11Location of Development: a) Descriptive (Cross Streets) North/South DECATUR BLVD. East/West TROPICAL PARKWAY
b) Sect. 25 Twn. 19S Rng. 60EName of Owner: WINCO FOODS, LLC Assessors Parcel No: 125-25-614-001Telephone No: (208) 672-2086 Facsimile No: _____Address: 650 N. ARMSTRONG PLACE
BOISE ID 83704Contact Person-Name: BRIAN WEIL Telephone No: 714 521-4811Firm: THIENES ENGINEERING, INC.Address: 14349 FIRESTONE BLVD. LA MIRADA CA 90638

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: 10.5 AC.2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? YES* ☐ NO ☒3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? YES* ☐ NO ☒4. Proposed type of development (Residential, Commercial, Etc.)? COMMERCIAL

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:TECHNICAL DRAINAGE STUDY FOR DECATUR #215 By Southwest7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: ENGINEERINGSURFACE DRAINAGE TO DECATUR BLVD & TROPICAL PARKWAY.SOME DISCHARGE TO EXISTING STORM DRAIN.8. Briefly describe your proposed schedule for the subject project: AS SOON AS POSSIBLE.

Engineer's Seal

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

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

Local Entity File No. _____

Revision

Date

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: <u>WINCO LAS VEGAS</u>		Map ID:
Firm Name: <u>THIENES ENGINEERING</u>		Engineer: <u>REINHARD STENZEL</u>
Address: <u>14349 FIRESTONE BLVD.</u>		
City: <u>LA MIRADA</u>	State: <u>CA</u>	Zip: <u>90638</u>
Phone Number: <u>714 521-4611</u>	Fax Number: <u>714 521-4173</u>	
Property Owner: <u>WINCO FOODS LLC</u>		
Address: <u>650 N. ARMSTRONG PLACE</u>		
City: <u>BOISE</u>	State: <u>ID.</u>	Zip: <u>83704</u>
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

<u>✓</u>	<u> </u>	Design Manual Standard Form 1 with the engineer's seal and signature.
<u>✓</u>	<u> </u>	Design Manual Standard Form 4 .
<u>✓</u>	<u> </u>	2 copies of the 24" x 36" Drainage Plan.
<u>N/A</u>	<u> </u>	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	
☒	☐	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'. <i>1"=80 TO FIT ON SINGLE SHEET.</i>
☒	☐	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

- | | | |
|-------------------------------------|-------------------------------------|---|
| ☒ | ☐ | 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. — MAINTAIN EXIST. STREET. |
| ☐ | ☒ | Streets with off-set crowns. |
| ☒ | ☐ | Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes. |
| ☒ | ☐ | Property lines. |
| ☒ | ☐ | Right-of-way lines and widths, existing and proposed. |
| ☒ | ☐ | Existing improvements and their elevations. |
| ☒ | ☐ | Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points. |
| ☒ | ☐ | Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets. |
| ☒ | ☐ | Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows. |
| ☒ | ☐ | Location and cross-section of street capacity calculations. |
| ☐ | ☒ | Cross-sectional detail for channels, including cutoff wall locations. |
| ☒ | ☐ | Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations. |
| ☒ | ☐ | Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement. |
| ☐ | ☒ | 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. |
| ☐ | ☒ | 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

N/A _____

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

✓ _____

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

✓ _____

A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.

N/A _____

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

N/A _____

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

✓ _____

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

N/A _____

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

- Field survey data.
- Input and output information.
- Plotted cross-sections based on survey with proper encroachments.
- A map showing the location of the cross-sections.
- Analysis of both sub and super-critical flow segments.
- A summary table and a discussion of the results in the text of the report.

✓ _____

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

✓ _____

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

✓ _____

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

REFERENCE:

STANDARD FORM 2

GENERAL LOCATION AND DEVELOPMENT DESCRIPTION

Location of Property

The proposed project site is located at the northwest corner of Tropical Avenue and Decatur Boulevard in the City of Las Vegas, Clark County Nevada. The Las Vegas Beltway is to the north of the project site. The property is within Township 19 South, Range 60 East, Section 25, Southeast ¼ and part of the Northern Las Vegas Wash Drainage Basin. Please see Figure 1 for location map.

All runoff from the project site ultimately drains to Decatur Boulevard and into the existing storm drain system in Decatur Boulevard. The storm drain conveys runoff south to an existing R.C.B. in Ann Road (facilities ANWE 0000, 0027, 0031, 0076, and 0082 per 2008 Las Vegas Valley Flood Control Master Plan Update). The R.C.B. conveys runoff easterly to the Las Vegas Wash – Middle (LVMD 2170). Please see Figure 2 that depicts the existing storm drain facilities.

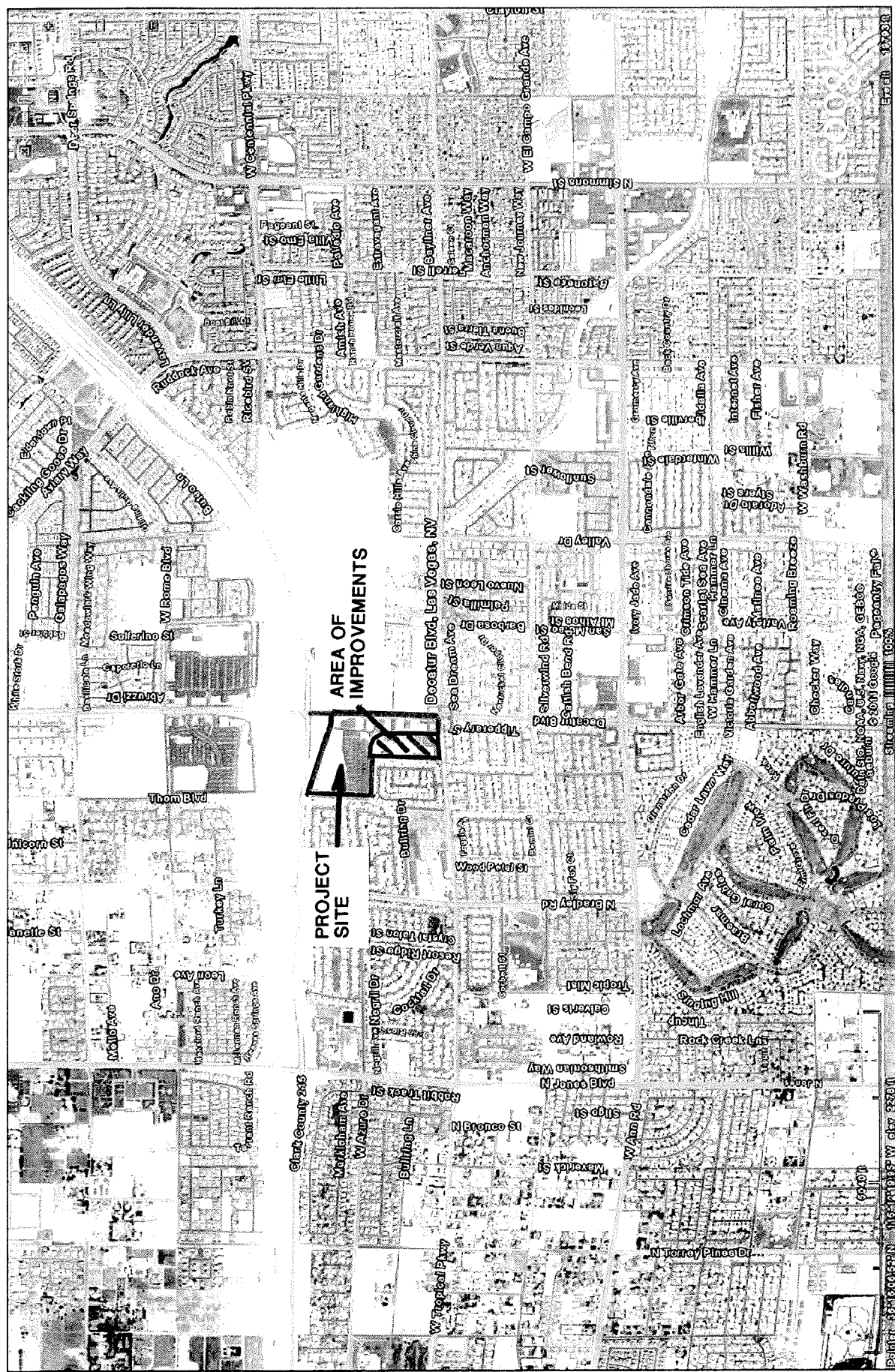
There is an existing retail store (Target) immediately to the north of the proposed project site and existing residential developments to the west. There is vacant land on the east side of Decatur Boulevard adjacent to the site.

Description of Property

The area of improvements within the project site encompasses approximately 10.5 acres. It is part of a larger commercial development that encompasses approximately 36.4 acres. The site is intended for future commercial/retail stores. The area of improvements is generally a paved parking lot with several existing landscaped areas. Locations of future buildings are currently graded dirt pads.

The existing retail site to the north generally drains from north to south. There is an existing storm drain system that collects a portion of the runoff from the north as well as an existing residential area to the west. The residential area surface drains to the existing retail site with portions of the runoff intercepted into the existing storm drain system. The storm drain conveys runoff easterly to an existing storm drain system in Decatur Boulevard. The remaining portion of the northerly area is collected in gutters and is directed toward Decatur Boulevard via surface flow. Offsite runoff from the north does not enter into the proposed improvements.

Runoff from the project site currently surface drains to Tropical Parkway and Decatur Boulevard. Runoff from the majority of the existing parking lot drains to Decatur Boulevard via three parkway culverts with some flow discharging through the existing drive aisle to the site. The remaining westerly portion of the site drains south and



“VICINITY MAP”
FOR
WINCO STORE—LAS VEGAS

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH: (714) 521-4811 FAX: (714) 521-4173

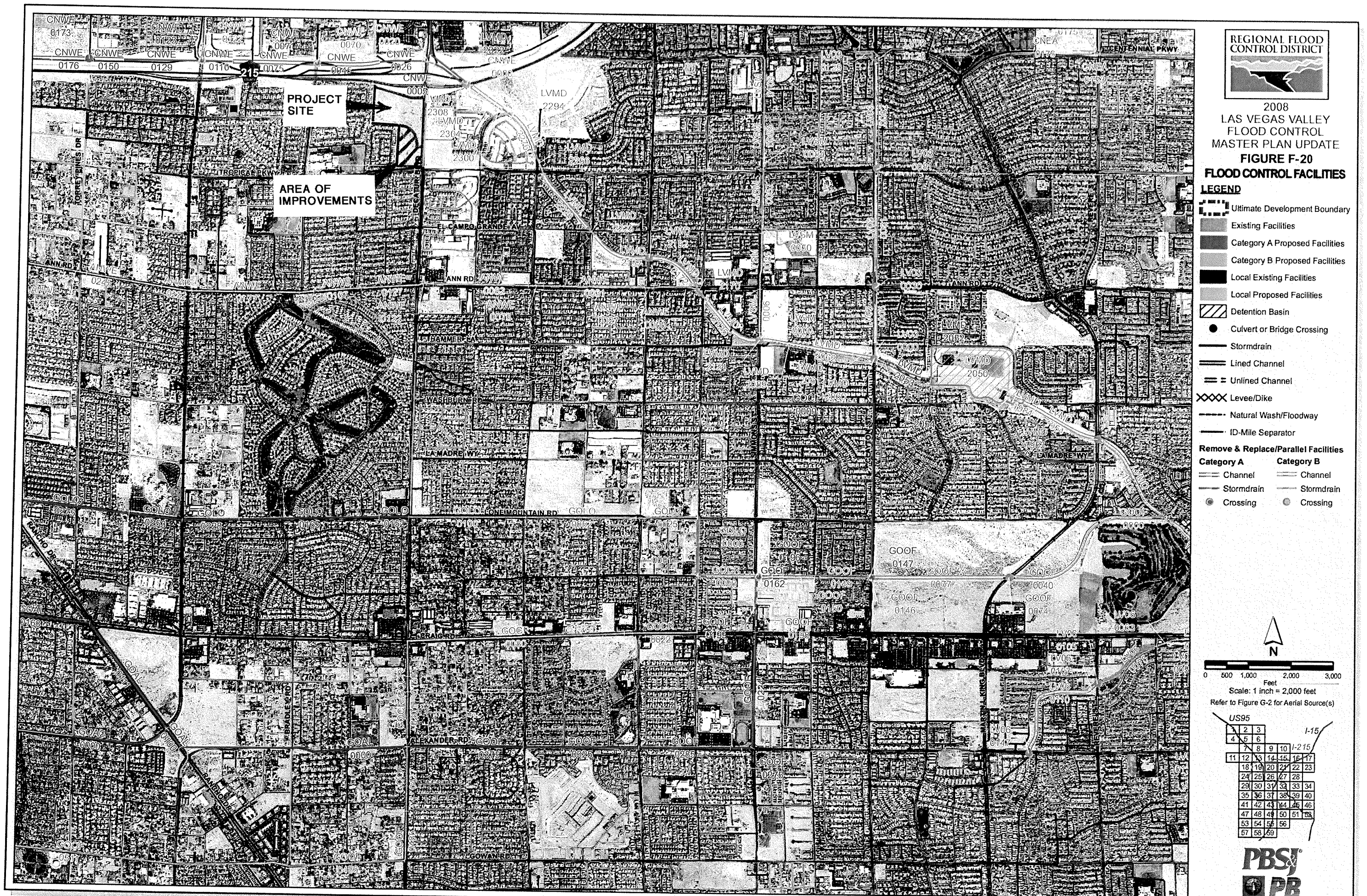


FIGURE 2

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%)**
ANWE		ANN ROAD CHANNEL WEST						
0000	E	12' X 12' RCB	1400	2214	CNN043-C	CWEST3	3.41	0.66
0027	E	14' X 9' RCB	203	2214	CNN043-C	CWEST3	3.41	0.77
0031	E	12' X 10' RCB	2382	2214	CNN043-C	CWEST3	3.41	1.40
0076	E	16' X 8' RCB	350	2214	CNN043-C	CWEST3	3.41	0.93
0082	E	12' X 11' RCB	2217	1947	CNN043-C	CWEST3	2.99	0.71
0122	E	12' X 10' RCB	260	1947	CNN043-C	CWEST3	2.99	0.71
0127	E	10' X 8' RCB	1450	1947	CNN043-C	CWEST3	2.99	2.55
0157	E	10' X 9' RCB	1112	1257	CNN043-C	CWEST3	1.95	1.13
0177	E	12' X 10' RCB	2787	1257	CNN043-C	CWEST3	1.95	0.39
0232	E	12' X 8' RCB	714	1257	CNN043-C	CWEST3	1.95	0.43
0245	E	10' X 9' RCB	1721	993	CNN043-C	CWEST3	6.84	0.80
0279	E	10' X 9' RCB	553	743	CNN043-C	CWEST3	6.37	0.80
0290	E	8' X 8' RCB	2050	743	CNN043-C	CWEST3	6.37	0.70
CNEA		CENTENNIAL PKWY CHANNEL EAST						
0123	E	14' X 6' RCB	1585	1457	CNN093-C	WEST3	1.67	0.82
0153	E	14' X 6' RCB	1125	1457	CNN093-C	WEST3	1.67	1.34
0175	E	15' X 6' RCB	125	1174	CNN078-C	WEST3	1.35	5.66
0176	E	Conc Chnl 15'W 6.5'D 0:1 SS	540	1174	CNN078-C	WEST3	1.35	0.70
CNWE		CENTENNIAL PKWY CHANNEL WEST						
0000	E	2: 27' X 10' RCBC @ Beltway	235	4465	CNN033-C	WEST3	6.41	1.51
0005	P2	2: 27' X 10' RCB	764	4465	CNN033-C	WEST3	6.41	1.10
0020	E	2: 27' X 10' RCBC @ Decatur	310	4465	CNN033-C	WEST3	6.41	2.58
0026	P2	2: 27' X 10' RCB	1006	4465	CNN033-C	WEST3	6.41	0.59
0045	P2	Conc Chnl 56'W 10'D 0:1 SS	1404	4465	CNN033-C	WEST3	6.41	0.59
0070	E	27' X 10' RCBC @ Bradley	155	2233 ^a	CNN033-C ^a	WEST3	6.41	0.40
0071	P2	Add 1: 27' X 10' RCBC @ Bradley	155	2233 ^a	CNN033-C ^a	WEST3	6.41	0.40
0075	P2	Conc Chnl 56'W 10'D 0:1 SS	1915	4465	CNN033-C	WEST3	6.41	0.40
0110	P2	2: 27' X 10' RCB	650	4382	2CW3B4-C	WEST3	6.15	0.40
0122	E	27' X 10' RCBC @ Jones	122	2191 ^a	2CW3B4-C ^a	WEST3	6.15	0.40
0123	P2	Add 1: 27' X 10' RCBC @ Jones	122	2191 ^a	2CW3B4-C ^a	WEST3	6.15	0.40
0129	P2	2: 27' X 10' RCB	1695	4382	2CW3B4-C	WEST3	6.15	0.40
0150	P2	Conc Chnl 42'W 10'D 0:1 SS	720	4233	CNN033-C	WEST3	5.64	0.40
0173	P2	42' X 10' RCBC @ Torrey Pines	190	4233	CNN033-C	WEST3	5.64	0.40
0176	P2	Conc Chnl 32'W 12'D 0:1 SS	765	4233	CNN033-C	WEST3	5.64	0.40
0189	P2	Conc Chnl 32'W 10'D 0:1 SS	1845	4067	CNN024-C	WEST3	5.15	0.54
GOA2		GOWAN OUTFALL - ALEXANDER BRANCH						
0000	P1	8' X 5' RCB	2281	523	CPT41-C	ALLGOW3	0.61	0.80
GOAL		GOWAN OUTFALL - ALEXANDER ROAD FACILITIES						
0000	P1	10' X 9' RCB	5280	1481	CPT5A2-C	ALLGOW3	3.23	1.00
0100	P1	10' X 8' RCB	540	1297	CCPT41-C	ALLGOW3	2.89	1.00
0111	P1	10' X 8' RCB	3000	880	CPT2B2	ALLGOW3	2.28	0.83
0168	P1	10' X 8' RCB	4200	880	CPT2B2	ALLGOW3	2.28	0.50
GOCL		GOWAN OUTFALL - CLAYTON BRANCH						
0000	P1	9' X 8' RCB	6785	814	CPT2B-1	ALLGOW3	1.11	0.61
GOGR		GOWAN OUTFALL - CRAIG ROAD						
0000	E	Conc Chnl 20'W 6'D 2:1 SS	1380	3101	CPT3D-3	ALLGOW3	5.78	1.30
0022	E	2: 8' X 8' RCB	3000	1120	CPT4C-2	ALLGOW3	1.75	0.50
0080	E	120" RCP	5850	995	CPT4C-1	ALLGOW3	1.50	0.50
0180	E	114" RCP	350	238	PT4B3-C	ALLGOW3	0.28	0.30
0201	E	96" RCP	1090	238	PT4B3-C	ALLGOW3	0.28	0.35
GOLO		GOWAN OUTFALL - LONE MTN. ROAD BRANCH						
0000	E	72" RCP	1370	308 ^a	CPT2AD-1 ^a	ALLGOW3	3.28	0.53
0001	E	13' X 8' RCB	1370	1433 ^a	CPT2AD-1 ^a	ALLGOW3	3.28	0.45
0025	E	16' X 8' RCB	1484	1741	CPT2AD-1	ALLGOW3	3.28	0.39
0052	E	16' X 8' RCB	2564	1741	CPT2AD-1	ALLGOW3	3.28	0.42
0100	E	16' X 8' RCB	2732	1605	C2AC2-C	ALLGOW3	2.96	0.37
0152	P1	10' X 10' RCB	700	1605	C2AC2-C	ALLGOW3	2.96	0.71
0165	P1	10' X 8' RCB	3300	1415	CPT2AB2	ALLGOW3	2.59	1.21
0228	P1	10' X 8' RCB	1300	1244	C2AB1C	ALLGOW3	2.31	1.00
0253	P1	10' X 8' RCB	1200	986	CPT3AC1	ALLGOW3	2.10	1.25
GOLO		GOWAN OUTFALL - LONE MTN. ROAD BRANCH						
0275	P1	8' X 6' RCB	3000	580	CPT3AA2	ALLGOW3	1.16	0.77
GOOF		GOWAN OUTFALL FACILITIES						
0000	E	Conc Chnl 20'W 7'D 2:1 SS	2500	5233	CPT2B-3	GW5SC	14.66	1.25
0040	E	Conc Chnl 20'W 7'D 2:1 SS	1900	5058	CCPT2C1 ^a	GW4SC	11.84	0.60
0074	E	2: 16' X 7' RCBC @ Camino Al Norte	131	5058	CCPT2C1 ^a	GW4SC	11.84	1.30
0077	E	Conc Chnl 20'W 7'D 2:1 SS	3157	5058	CCPT2C1 ^a	GW4SC	11.84	1.40
0146	E	3: 12' X 5' RCBC @ Clayton	150	4014 ^a	CCPT2C1 ^a	GW4SC	11.84	1.33
0147	P1	Add 1: 12' X 7' RCBC @ Clayton	150	1044 ^a	CCPT2C1 ^a	GW4SC	11.84	1.33
0149	E	Conc Chnl 20'W 7'D 2:1 SS	1228	5058	CCPT2C1	GW4SC	11.84	1.13
0150	E	Conc Chnl 20'W 7'D 2:1 SS	612	4772	CCPT3D-3	GW4SC	10.88	1.13
0161	E	Conc Chnl 20'W 7'D 2:1 SS (Replace w/ GOOF0162)	625	4772	CCPT3D-3	GW4SC	10.88	0.90
0162	P3	Confluence Structure (Replaces GOOF0161)	625	4772	CCPT3D-3	GW4SC	10.88	0.90
0166	P3	37.66' X 5.66' Bridge @ Simmons (Replaces GOOF0167)	120	3101	CPT3D-3	ALLGOW3	5.78	0.90
0197	E	3: 12' X 5' RCBC @ Simmons (Replace w/ GOOF0198)	120	3101	CPT3D-3	ALLGOW3	5.78	0.90
0198	E	14' X 6' RCB	1344	1164 ^a	CPT4C-3 ^a	GW3SC	5.85	0.41
0199	P3	Add 1: 24' X 6' RCB	1344	1581 ^a	CPT4C-3 ^a	GW3SC	5.85	0.40
0224	P3	1: 20' X 6' RCB and 1: 14' X 6' RCB	2700	2745	CPT4C-3	GW3SC	5.85	0.40
0275	P3	1: 16' X 8' RCB and 1: 14' X 6' RCB	515	2582	CPT5C-3	GW3SC	5.59	0.40
0285	P1	2: 14' X 8' RCB	2650	2582	CPT5C-3	GW3SC	5.59	0.45
0325	P1	2: 14' X 8' RCB	2650	2458	CPT5C-2	GW3SC	5.36	0.37
0375	P1	2: 12' X 8' RCB	2700	2375	CPT5C-1	GW3SC	5.17	0.56
0427	E	96" RCP	1510	630	DGOW2A	GW3SC	1.38	0.47
0485	E	90" RCP	1160	630	DGOW2A	GW3SC	1.38	0.47
0486	E	8' X 5' RCB	3300	630	DGOW2A	GW3SC	1.38	0.60
0511	E	8' X 5' RCB	8390	699	CPT6B-C	GW3SC	1.08	0.50
LV03		CLAYTON STREET CHANNEL						
0000	E	33' X 16' RCBC @ Hammer	400	1044	CNN057-C	WEST3	1.22	0.42
0006	E	Conc Chnl 8'W 9.4'D 1.5:1 SS	1300	1044	CNN057-C	WEST3	1.22	0.42
0030	E	2: 9' X 7' RCBC @ Ann	120	1044	CNN057-C	WEST3	1.22	0.42
0031	E	Conc Chnl 8'W 8.1'D 1.5:1 SS	2600	757	CNN054-C	WEST3	0.81	0.40
0081	E	2: 10' X 7' RCBC @ Tropical	100	757	CNN054-C	WEST3	0.81	0.42
0082	E	Conc Chnl 7'W 7.1'D 1.5:1 SS	2444	757	CNN054-C	WEST3	0.81	2.80
0128	E	Conc Chnl 7'W 7.1'D 1.5:1 SS	167	257	1/2NN052-C	WEST3	0.55	2.80
0129	E	2: 10' X 8' RCB	801	257	1/2NN052-C	WEST3	0.55	1.60
0131	E	10' X 6' RCB	665	257	1/2NN052-C	WEST3	0.55	1.28
LV05		WESTERN TRIBUTARY AT ALEXANDER RD						
0131	E	Conc Chnl 28'W 3'D 3:1 SS	1300	567	CLV99B-3	WEST3	0.64	0.76
LV06		WESTERN TRIBUTARY AT CRAIG RD						
0053	E	16' X 6' RCAP	782	1080	CLV99A-3	WEST3	1.31	1.56
0063	E	14' X 6' RCAP	526	1080	CLV99A-3	WEST3	1.31	1.88
0075	E	12' X 6' RCB	1808	1080	CLV99A-3	WEST3	1.31	0.72
0105	E	2: 8' X 6' RCBC @ Revere	158	1080	CLV99A-3	WEST3	1.31	1.71
0107	E	Conc Chnl 17.3'W 6'D 0:1 SS	140	1080	CLV99A-3	WEST3	1.31	3.79
0110	E	Conc Chnl 12'W 5.5'D 2:1 SS	2451	1080	CLV99A-3	WEST3	1.31	0.87
0147	E	12' X 6' RCBC @ Alexander	150	629	CLV99A-2	WEST3	0.74	1.16
LVMD		LAS VEGAS WASH - MIDDLE						
1877	E	Conc Chnl 30'W 10'D 1:1 SS	1570	6423	CNN104-C	WEST5	44.33	1.10
1905	E	Conc Chnl 12'W 10'D 1.65:1 SS	2440	3245	CNN086-C	WEST5	29.30	1.00
1953	E	2: 24' X 10' RCBC @ Camino Al Norte	145	3245	CNN086-C	WEST5	29.30	0.94
1954	E	Conc Chnl 32'W 7'D 2:1 SS	1587	3245	CNN086-C	WEST5	29.30	0.99
1984	E	Transition Structure	550	3221	LOWERDB	CWEST5	19.67	0.99
2048	E	68,000 cfs PMF Spillway	68000		LOWERIN	CWEST5	19.67	
2049	E	4: 7' X 7' RCB Outlet	200	3221	LOWERDB	CWEST5	19.67	
2050	E	700 ac-ft Lower Las Vegas Wash Detention Basin		6729	LOWERIN	CWEST5	19.67	
2052	P1	Conc Chnl 50'W 6'D 0:1 SS	240	6636	2C057-C	CWEST5	19.28	3.11
2053	P1	Conc Chnl 60'W 12'D 0:1 SS	690	6636	2C057-C	CWEST5	19.28	0.15
2054	P1	Conc Chnl 60'W 12'D 0:1 SS	260	6636	2C057-C	CWEST5	19.28	11.97
2055	P1	Conc Chnl 60'W 12'D 0:1 SS	165	6636	2C057-C	CWEST5	19.28	0.15
2080	E	4: 12.75' X 16' RCBC @ Clayton	144	6171	2C044-C	CWEST5	18.06	0.15
2081	E	Conc Chnl 54'W 18'D 0:1 SS	425	6171	2C044-C	CWEST5	18.06	0.15
LVMD		LAS VEGAS WASH - MIDDLE						
2062	E	Conc Chnl 54'W 9'D 0:1 SS	1200	6171	2C044-C	CWEST5	18.06	1.35
2089	E	Conc Chnl 54'W 9'-9.5'D 0:1 SS	908	6171	2C044-C	CWEST5	18.06	0.50
2124	E	2: 26.5' X 10' RCBC @ Simmons	110	6046	2C043-C	CLVMD5	15.94	0.50
2125	E	Conc Chnl 54'W 9'D 0:1 SS	1571	6046	2C043-C	CLVMD5	15.94	0.77
2170	E	4: 12' X 10' RCBC @ Ann Road	500	6046	2C043-C	CLVMD5	15.94	1.42
2172	E	Conc Chnl 50'W 10'D 0:1 SS	1289	5734	2C3D4-C ^a	CLVMD4	11.98	1.15
2192	E	2: 24.5' X 10' RCBC @ Allen	110	5734	2C3D4-C ^a	CLVMD4	11.98	1.15
2197	E	Conc Chnl 50'W 10'D 0:1 SS	1385	5734	2C3D4-C ^a	CLVMD4	11.98	1.37
2223	E	50' X 10' RCBC @ El Campo Grande	275	5734	2C3D4-C ^a	CLVMD4	11.98	1.60
2228	E	Conc Chnl 50'W 10'D 0:1 SS	1800	5734	2C3D4-C ^a	CLVMD4	11.98	1.83
2266	E	2: 24.5' X 10' RCBC @ Tropical	575	5734	2C3D4-C ^a	CLVMD4	11.98	1.04
2276	E	Conc Chnl 50'D 10'D 0:1 SS	985	5734	2C3D4-C ^a	CLVMD4	11.98	0.80
2294	E	2: 24.5' X 10' RCBC @ Ranchhouse	262	5734	2C3D4-C	CLVMD4	11.98	1.04
2300	E	Transition Structure	200	5734	2C3D4-C	CLVMD4	11.98	1.50
2304	E	Conc Chnl 70'W 10'D 0:1 SS</						

discharges into Tropical Parkway via the southwest drive aisle and a parkway culvert. There are existing catch basins in Tropical Parkway and Decatur Boulevard that intercept runoff from the existing site and convey flows to the existing storm drain systems in Tropical Parkway and Decatur Boulevard.

DRAINAGE BASIN DESCRIPTION

Off-Site Drainage Description

Off-site drainage enters the overall commercial development at two locations, both near the westerly property line at the northerly retail site. The 10- and 100-year peak flow rates tributary to the site is 51 cfs and 145 cfs respectively. The existing onsite storm drain is designed to convey 55 cfs, with the remaining peak flow rate designed to surface drain through the existing site to Decatur Boulevard. Proposed improvements do not alter the northerly portion of the parking area and will not effect the drainage patterns. Offsite runoff was calculated by Hunsaker and Associates Nevada, Inc. and is referenced in the study prepared by Southwest Engineering. Offsite area consists of existing residential developments.

While not tributary to the project site, there is offsite runoff conveyed in Tropical Parkway via an existing storm drain (52 cfs) and surface flow (282 cfs). Tributary area to Tropical Parkway consists of existing residential developments located north of Tropical Parkway and an existing school also north of Tropical Parkway. There is no vacant or natural area tributary to Tropical Parkway or the project site. Runoff in Tropical Parkway is taken from the Lodge III study prepared by Carter-Burgess.

On-Site Drainage Description

As previously mentioned, the site is currently developed. The existing development has an approved drainage study prepared by Southwest Engineers. Our proposed project will modify a portion of the existing study. The proposed area of improvements is generally a paved parking area. There are also several areas of landscaping throughout the site. Overall, the project site is commercially developed with the exception of the future buildings. Runoff from the site surface drains to Decatur Boulevard and Tropical Parkway.

Runoff on the northerly retail site will continue it's current drainage patterns and are not affected by the proposed improvements to the south.

Master Planning Information

The nearest drainage facility is in Decatur Boulevard as shown in the 2008 Las Vegas Valley Flood Control Master Plan Update (Figure F-20). The portion of storm drain in Decatur north of Tropical Parkway is depicted as Local Proposed Facility, however this storm drain was constructed with the already developed site. Existing facilities in Decatur

Boulevard continue south to Ann Road. The facility in Ann Road drains east to the Las Vegas Wash.

There are no Master Plan Flood Control Facilities on the site. Master Planned Facilities in County Road 215 (adjacent to the site at the north) keep offsite runoff to the north from entering the project site.

Please see Figure 2 that depicts the project site on the Flood Control Facilities Map.

Floodplain Information

The site is located within Flood Zone X (unshaded). Flood Zone X (unshaded) is defined as "areas to be determined outside the 0.2% annual chance floodplain." Please see Figure 3 for portion of FIRM map with project site depicted.

Previous Drainage Studies

Previously approved drainage study for the project site was prepared by Southwest Engineering. The Technical Drainage Study for the overall project was approved by the City of Las Vegas on May 8, 2008. Update No. 1 was approved on August 7, 2008. Update No. 2 was approved on October 21, 2008. Update No. 3 was approved on November 13, 2008. Update No. 4 was approved on January 22, 2009. The last update received by Thienes engineering is Update No. 5, dated February 5, 2009. It is assumed that this update was approved.

The Southwest Engineering study references studies by Hunsaker and Associates, Nevada and studies by Kimley-Horn and Associates, Inc. Both the Hunsaker and Kimley-Horn studies address offsite areas either tributary to the project site or to Tropical Parkway.

Pertinent calculations from the previous studies are referenced in Appendix "D".

PROPOSED DRAINAGE FACILITIES

General Description

A small storm drain system is proposed for a portion of the onsite improvements (approximately 2.16 acres). A portion of the proposed parking area will be intercepted by several catch basins. A storm drain system will convey runoff to the existing storm drain that traverses through the existing development.

The remaining portions of the improvements will continue to surface drain to Decatur Boulevard and Tropical Parkway. Since the drainage areas are generally consistent with the original study, no further storm drain improvements are necessary.

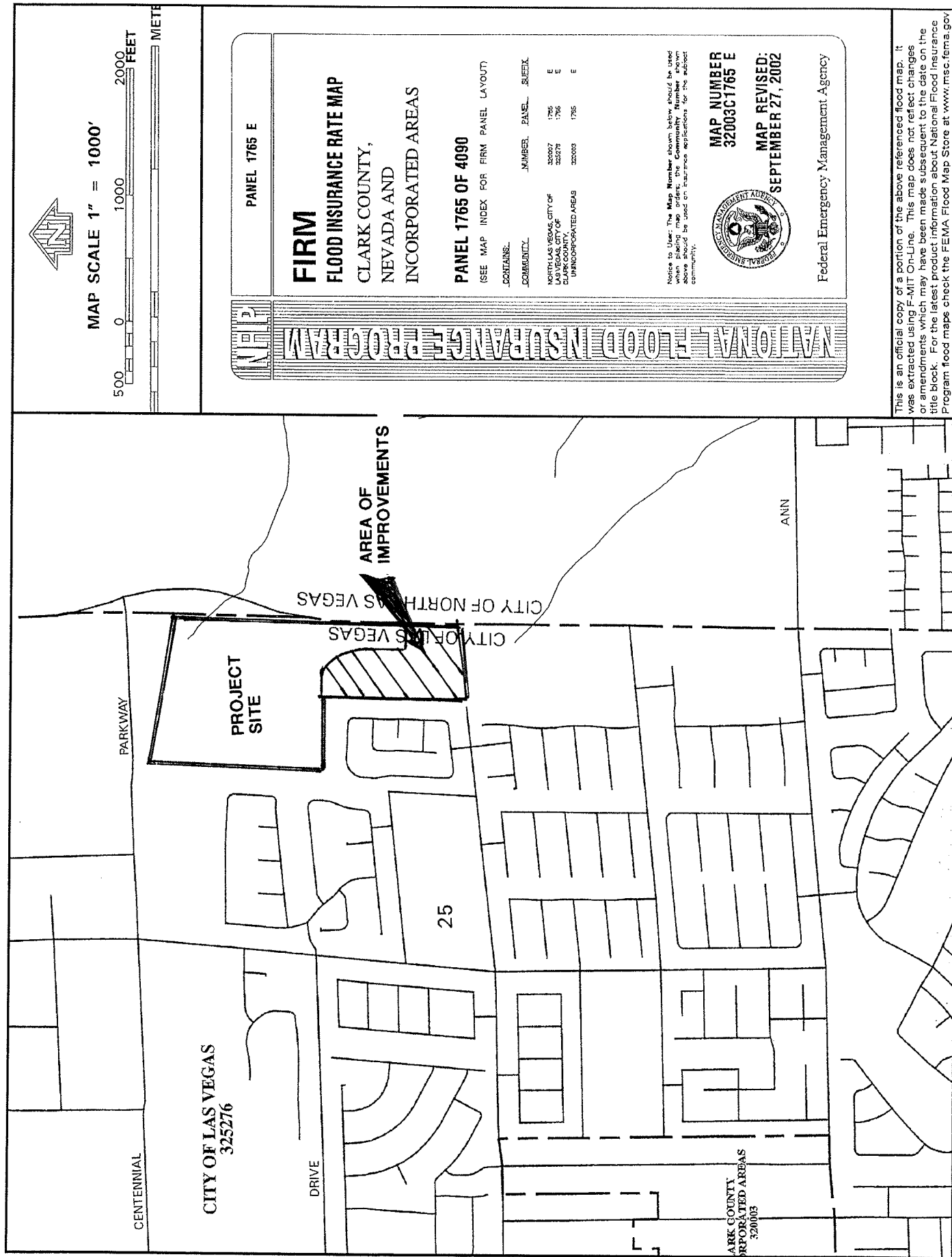


FIGURE 3

Compliance with Regulations and Adopted Plans

Proposed improvements are consistent with the previously approved Technical Drainage Report. Drainage is also consistent with the 2008 Las Vegas Valley Flood Control Master Plan Update (Figure H-20) for hydrologic areas. The Master Drainage Plan shows the site and surrounding areas tabled to Decatur Boulevard. Please see Figure 4 that depicts the project site on the Hydrologic Summary plan.

The project site is not within a designated flood plain. The proposed building pad is elevated over 6' higher than the top of curbs of the adjacent streets.

Improvements to the project site are in compliance with the previously approved study. The hydrologic model used for the proposed improvements is the same model used in the Southwest Engineering study with minor modifications to three subareas.

Hydrologic Analyses

The existing condition HEC-1 model prepared by Southwest Engineering was modified for the proposed improvements. Overall, three subareas from the existing study were affected (ON-DEV3, ON-DEV6 and ON-DEV7). The proposed building is located on the southerly half of the lot. The previously graded areas for future buildings (along the westerly property line) will not be used as building space in the proposed site. This area will be replaced by parking spaces.

With the relocation of the proposed building, some drainage areas were altered. The tributary area to Tropical Parkway (including $\frac{1}{2}$ of the street) is slightly larger than the previous study (4.94 acres compared to 4.54 acres). The area associated with existing ON-DVE6 is relatively unchanged (7.95 acres compared to 8.00 from existing study). The most significant change is contained within existing area ON-DEV7. Proposed improvements will take approximately 2.16 acres and add this to the existing storm drain system. The remainder of the area (3.74 acres) will continue to surface drain to Decatur Boulevard.

The U.S. Army Corps of Engineers HEC-1 Flood Hydrograph package was used to determine the peak runoff generated during the 10-year and 100-year, 6-hour storm event. All areas from the Southwest study (ON-DEV-1 through ON-DEV7) are included in the proposed condition HEC-1 calculations. An additional area (ON-DEV8) was created to represent the area that will be added to the existing storm drain as previously mentioned. The HEC-1 computer program was used to determine the peak flow rate for the analyzed subareas.

The project site lies within the McCarran Airport Rainfall Area. The 6-hour, 10-year and 100-year storm event rainfall depths were determined using referenced tables and figures from the CCRFCD Manual. The site is less than 8-square miles, so storm distribution number three (SDN#3) was used for the HEC-1 model.

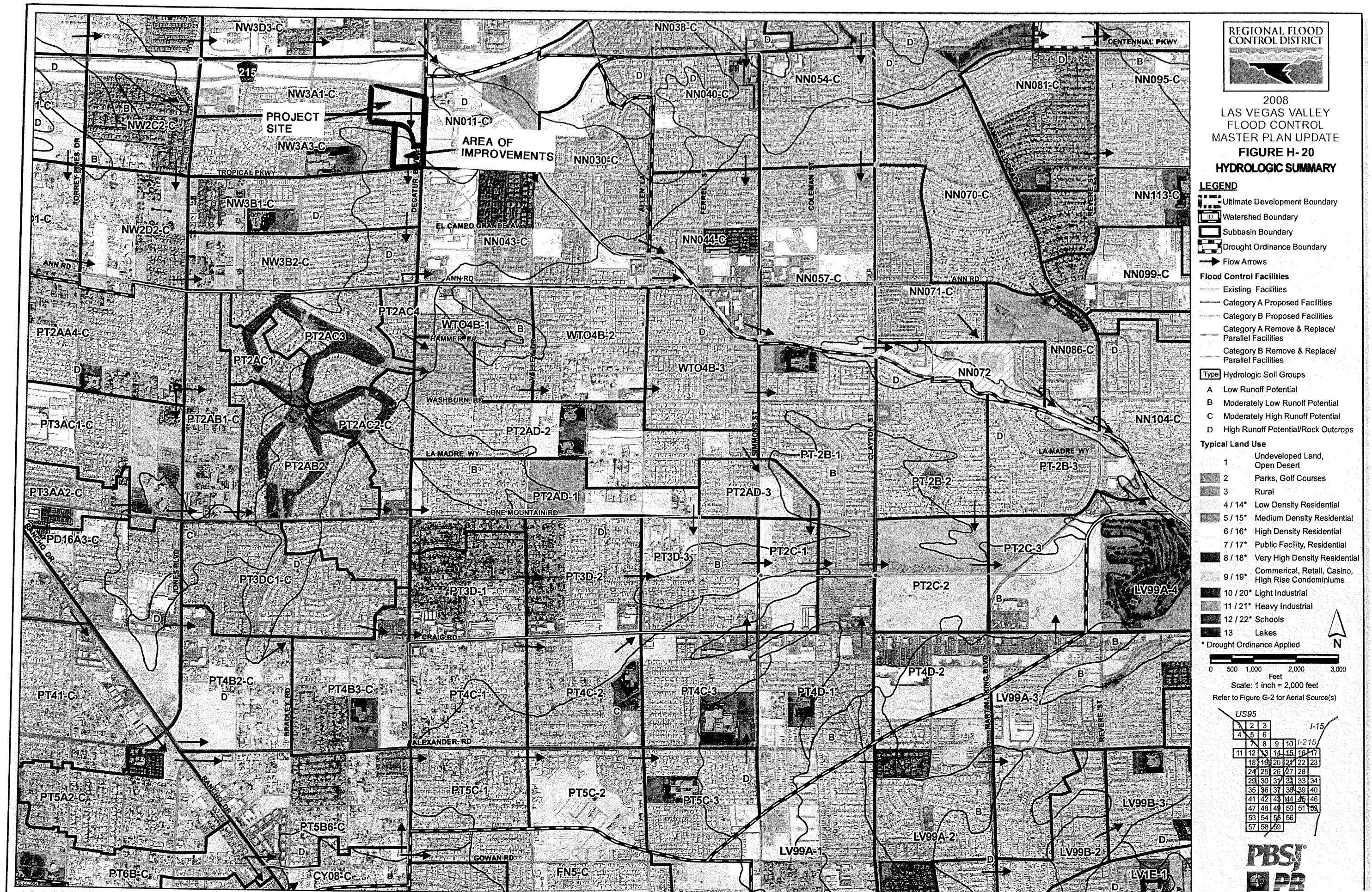


FIGURE 4

From Table 505, the 10-year, 6-hour rainfall is 1.58 inches while the 100-year, 6-hour rainfall is 2.77 inches.

The following table summarizes offsite flow tributary to the overall commercial development:

TABLE 1

Area Designation	Q10 (cfs)	Q100 (cfs)	Comments
OFF1	18	45	From Hunsaker study
OFF2	33	100	From Hunsaker study
OFF3	52 total 52 in drain 0 surface	346 total 52 in drain 294 surface	From Lodge III Study by Carter-Burgess

Please note that proposed improvements to the site do not effect offsite drainage or the ability that offsite runoff is conveyed through the site.

The following table summarizes existing Southwest Engineering study and revised HEC-1 calculations prepared by Thienes Engineering:

TABLE 2

Subarea Designation	Southwest HEC-1		Thienes HEC-1		Comments
	Q10 (cfs)	Q100 (cfs)	Q10(cfs)	Q100 (cfs)	
ON-DEV1	4	9	4	9	Into Storm Drian
ON-DEV2	8	15	8	15	Into Storm Drain
ON-DEV3	6	12	7	14	To Tropical Parkway
ON-DEV4	6	12	6	12	To Decatur Blvd.
ON-DEV5	6	11	6	11	To Decatur Blvd.
ON-DEV6	11	22	11	21	To Decatur Blvd.
ON-DEV7	9	17	6	11	To Decatur Blvd.
ON-DEV8	N/A	N/A	3	7	Into Storm Drain

From the table, 2 cfs has been added to Tropical Parkway in the 100-year event, while the flow to Decatur Boulevard is 7 cfs less for the 100-year event. The 100-year peak flow rate added to the storm drain system is 7 cfs.

Facility Design Calculations

An onsite storm drain system was designed to convey the runoff from the catch basins in the proposed parking lot to the existing onsite private storm drain system. Based on the approved Hydrology report and storm drain plans prepared by Southwest Engineers, the onsite storm drain has been designed to convey 55.0 cfs in both the 10- and 100-year events. The existing public storm drain in Decatur conveys the 55.0 cfs plus an additional 31 cfs from the street.

To measure the impact of the additional 7 cfs directed to the existing storm drain system in the 100-year event, hydraulic models were established based on existing plans under

existing conditions. The same models were then run with the additional 7 cfs. Hydraulic calculations show that there is no significant impact to the existing 54" storm drain in Decatur Boulevard. Adding the additional 7 cfs to the onsite storm drain raises the hydraulic grade line (H.G.L.) by about 1.5' upstream of the proposed connection. While the H.G.L. is higher upstream, it is still several feet below the finished surface. From the Southwest Engineering study, runoff into the storm drain system is controlled by the capacity of the inlets and allowable ponding at the inlets. The H.G.L. in the storm drain does not impact runoff entering the system. Overall, the increased flow into the existing storm drain does not have an adverse effect on the systems ability to convey allowable flow.

WSPG was used for the hydraulic calculations in the existing storm drain systems. The H.G.L. as shown on the storm drain plans for Decatur Boulevard was used as the downstream hydraulic control. All other parameters used in the program were taken from the approved storm drain plans. It is assumed that runoff in the Decatur Boulevard storm drain downstream of Tropical Parkway is unchanged, since there are catch basins in the street that allow surface runoff into the storm drain system that originated from the project site.

Runoff to Tropical Parkway increased by only 2 cfs. This increase is negligible compared to the 282 cfs that currently surface flows in the street. Overall surface flow to Decatur Boulevard has been reduced by 7 cfs and therefore does not adversely effect the hydraulic conditions in the street.

Catch basins in the proposed parking area are in sump locations. The maximum depth of ponding prior to spillover and ultimately surface draining to Decatur Boulevard is 8". The proposed storm drain system will be privately maintained. Catch basins shall be inspected monthly and any trash and debris shall be removed. Additional inspections should be conducted after large rain events. The onsite storm drain shall be inspected and maintained as necessary twice a year with one of the inspections prior to the start of the rainy season (October 1).

No additional easements are anticipated for the proposed project. Runoff from the northerly site and offsite areas will continue to surface drain through the northerly portion of the proposed improvements within the existing 95' wide drainage easement.

The project improvements will be constructed as a single phase.

CONCLUSIONS

Overall, drainage from the proposed improvements is consistent with the previously approved study. Drainage is consistent with the Las Vegas Valley Flood Control Master Plan Update. The HEC-1 computer model is an acceptable modeling method. Parameters used for the HEC-1 model are from the CCRFCD Hydrologic Criteria and Drainage Design Manual.

The site is not within a flood zone and the building pad is well above the adjacent streets to comply with County criteria.

The site is currently paved with building pads intended for retail use. Proposed improvements are also retail use. Drainage patterns were maintained as close as possible to the original study. Calculations show that flows will not be significantly altered by the proposed developments and no adjacent properties are negatively impacted hydraulically.

REFERENCES

Portions of following previously approved studies are included in Appendix "C":

- Addendum #1 to the Technical Drainage Study for Decatur 215, prepared by Southwest Engineering, dated January 16, 2008.
- Addendum #2 to the Technical Hydrology Study for Bradley/Decatur, prepared by Hunsaker & Associates Nevada, dated February 1998.
- Technical Drainage Study for The Lodge III, prepared by Carter Burgess, dated October, 2000

APPENDICES

Appendix "A" – Hydrology Calculations

Appendix "B" – Hydraulic Calculations

Appendix "C" – Catch Basin Calculations

Appendix "D" – Reference Material

Appendix "E" – Hydrology Map and Conceptual Grading Plan

Appendix "F" – Grading Plans

APPENDIX

DESCRIPTION

A	HYDROLOGY CALCULATIONS
B	HYDRAULIC CALCULATIONS
C	CATCH BASIN CALCULATIONS
D	REFERENCE MATERIAL
E	HYDROLOGY MAP
F	GRADING PLANS

APPENDIX A

HYDROLOGY CALCULATIONS

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION AND HEC-1 INPUT

DEVELOPMENT

CALCULATED BY

DATE

Sub-Basin Data				Initial/Overland Time (t _i)				Travel Time (t _t)				to Check (Urbanized Basins)			Final t _c	UD	LS	Remarks
KK			BA															
Desig: (1)	K (2)	Area Ac (3)	Area sq mi (4)	Length Ft (5)	Slope % (6)	t _i Min (7)	Length Ft (8)	Slope % (9)	Vel. FPS (10)	t _t Min (11)	Total Length Ft (12)	t _c = (L/180) + 10 Min (13)	Min (14)	LagTime hr (15)	CN (16)			
0N-DEV3	0.864	4.44	0.0077	100	1.80	3.5	974	0.72	17 2.6	7.9	1074	16.0	11.4	0.114	95		0NDE3	
0N-DEV6	0.864	7.95	0.0124	150	0.72	5.8	1100	0.72	17 2.6	8.7	1250	16.9	14.5	0.145	95		0NDE6	
0N-DEV7	0.864	3.74	0.0058	100	1.00	4.2	341	1.00	2.7 2.1	2.1	441	12.4	6.3	0.083*	95		0NDE7	
0N-DEV8	0.864	2.16	0.0034	180	1.00	5.7	139	1.00	2.9 3.1	1.2	319	11.8	6.9	0.083*	95		0NDE8	

$$t_i = 1.8 (1.1 - K) L^{1.2} / S^{1/3}$$

$$t_c = t_i + t_t$$

* MINIMUM 5 MINUTES

Revision	Date

REFERENCE:

STANDARD FORM 4

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* JUN 1998
* VERSION 4.1
*
* RUN DATE 28FEB11 TIME 18:00:25
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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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XXXXXX XXXX X XXXX
X X X X X X
X X X X X XXX
X X XXXXXXX XXXX XXX
```

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

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

THE DEFINITION OF -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

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
48	KK ONDE5
49	KM BASIN ON-DEV5
50	BA .0064
51	LS 0 95
52	UD 0.144
53	KK ONDE6
54	KM BASIN ON-DEV6
55	BA .0124
56	LS 0 95
57	UD 0.145
58	KK ONDE7
59	KM BASIN ON-DEV7
60	BA .0058
61	LS 0 95
62	UD 0.083
63	KK COM1
64	KM COMBINE ONDEV4-ONDEV7
65	HC 4
66	KK ONDE8
67	KM BASIN ON-DEV8
68	BA .0034
69	LS 0 95
70	UD 0.083
71	ZZ

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
NO.	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
19	ONDE1	
33	.	ONDE2
38	.	ONDE3
43	.	ONDE4
48	.	ONDE5
53	.	ONDE6
58	.	ONDE7
63	.	COM1
66	.	ONDE8

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* JUN 1998 *
* VERSION 4.1 *
* RUN DATE 28FEB11 TIME 18:00:25 *

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

LIFESTYLES CENTER *****
Input = 1103-dev.dat *****
DEVELOPED CONDITION *****
WATERSHED ANALYSIS *****
SDN-3 6 HOUR STORM *****

JR = 2.77/2.77 = 1.00 100-year Ratio *****
JR = 1.58/2.77 = 0.57 10-year Ratio *****
PB = 2.77 *****

16 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 STARTING DATE
ITIME 0000 STARTING TIME
NQ 300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 2 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 1 NUMBER OF PLANS
NPLAN

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
.57 1.00

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
HYDROGRAPH AT	ONDE1	.00	1	.57	1.00
+					
HYDROGRAPH AT	ONDE2	.01	1	4.	9.
+				3.50	3.50
HYDROGRAPH AT	ONDE3	.01	1	8.	15.
+				3.58	3.58
HYDROGRAPH AT	ONDE4	.01	1	7.	14.
+				3.58	3.50
HYDROGRAPH AT	ONDE5	.01	1	6.	12.
+				3.58	3.58
HYDROGRAPH AT	ONDE6	.01	1	6.	11.
+				3.58	3.58
HYDROGRAPH AT	ONDE7	.01	1	11.	21.
+				3.58	3.58
4 COMBINED AT	COM1	.03	1	6.	11.
+				3.50	3.50
HYDROGRAPH AT	ONDE8	.00	1	28.	54.
+				3.58	3.58
				3.	7.
				3.50	3.50

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

APPENDIX B

HYDRAULIC CALCULATIONS

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

EXISTING 54" STORM DRAIN IN DECATUR

HEADING LINE NO 2 IS -

PER APPROVED PLANS

HEADING LINE NO 3 IS -

100-YEAR

DATE: 2/23/2011
TIME: 15:46

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

[illegible]

WATER SURFACE PROFILE LISTING
EXISTING 54" STORM DRAIN IN DECATUR
PER APPROVED PLANS
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		

-3693.49	2267.17	3.830	2271.000	86.0	5.96	0.552	2271.552	0.00	2.717	4.50	0.00	0.00	0	0.00
234.71	0.00249					.001883	0.44		3.262			0.00		
-3458.78	2267.76	3.631	2271.387	86.0	6.25	0.607	2271.994	0.00	2.717	4.50	0.00	0.00	0	0.00
105.99	0.00249					.002011	0.21		3.262			0.00		
-3352.79	2268.02	3.555	2271.575	86.0	6.38	0.632	2272.207	0.00	2.717	4.50	0.00	0.00	0	0.00
268.56	0.00253					.002162	0.58		3.243			0.00		
-3084.23	2268.70	3.394	2272.094	86.0	6.68	0.693	2272.787	0.00	2.717	4.50	0.00	0.00	0	0.00
JUNCT STR	0.31250											0.00		
-3076.23	2271.20	1.413	2272.613	31.0	13.07	2.652	2275.265	0.00	1.877	2.00	0.00	0.00	0	0.00
22.15	0.02860					.025656	0.57		1.363			0.00		
-3054.08	2271.83	1.434	2273.268	31.0	12.85	2.565	2275.833	0.00	1.877	2.00	0.00	0.00	0	0.00
34.92	0.02860					.023843	0.83		1.363			0.00		
-3019.16	2272.83	1.501	2274.333	31.0	12.25	2.331	2276.664	0.00	1.877	2.00	0.00	0.00	0	0.00
19.33	0.02860					.021414	0.41		1.363			0.00		
-2999.83	2273.39	1.574	2274.959	31.0	11.68	2.120	2277.079	0.00	1.877	2.00	0.00	0.00	0	0.00
11.98	0.02860					.019357	0.23		1.363			0.00		
-2987.85	2273.73	1.656	2275.384	31.0	11.14	1.927	2277.311	0.00	1.877	2.00	0.00	0.00	0	0.00
7.26	0.02860					.017697	0.13		1.363			0.00		
-2980.59	2273.94	1.752	2275.688	31.0	10.62	1.753	2277.441	0.00	1.877	2.00	0.00	0.00	0	0.00
2.95	0.02860					.016600	0.05		1.363			0.00		
-2977.64	2274.02	1.877	2275.897	31.0	10.12	1.592	2277.489	0.00	1.877	2.00	0.00	0.00	0	0.00

EXISTING 54" STORM DRAIN IN DECATUR
PER APPROVED PLANS
100-YEAR

[illegible]

NOTES

1. GLOSSARY

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

EXISTING 54" STORM DRAIN IN DECATUR

HEADING LINE NO 2 IS -

PER APPROVED PLANS WITH ADDITIONAL 7.0 CFS

HEADING LINE NO 3 IS -

100-YEAR

TIME: 13:29

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

[illegible]

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A SYSTEM OUTLET	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		-3693.49	2267.17	54															
ELEMENT NO	2 IS A REACH	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		-3352.79	2268.02	54															
ELEMENT NO	3 IS A REACH	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		-3084.23	2268.70	54															
ELEMENT NO	4 IS A JUNCTION	*	*	*	*														
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4						
		-3076.23	2271.20	24	36	0	0.013	62.0	0.0	2268.90	0.00	90.00	0.00						
ELEMENT NO	5 IS A REACH	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		-2977.64	2274.02	24															
ELEMENT NO	6 IS A SYSTEM HEADWORKS	*		*															
	U/S DATA	STATION	INVERT	SECT															
		-2977.64	2274.02	24															

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

EXISTING 54" STORM DRAIN IN DECATUR
PER APPROVED PLANS WITH ADDITIONAL 7.0 CFS
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		

-3693.49	2267.17	3.830	2271.000	93.0	6.45	0.646	2271.646	0.00	2.830	4.50	0.00	0.00	0	0.00
340.70	0.00249					.002178	0.74		3.490			0.00		
-3352.79	2268.02	3.672	2271.692	93.0	6.69	0.696	2272.388	0.00	2.830	4.50	0.00	0.00	0	0.00
268.56	0.00253					.002312	0.62		3.466			0.00		
-3084.23	2268.70	3.578	2272.278	93.0	6.86	0.730	2273.008	0.00	2.830	4.50	0.00	0.00	0	0.00
JUNCT STR	0.31250											0.00		
-3076.23	2271.20	1.413	2272.613	31.0	13.07	2.652	2275.265	0.00	1.877	2.00	0.00	0.00	0	0.00
22.15	0.02860					.025656	0.57		1.363			0.00		
-3054.08	2271.83	1.434	2273.268	31.0	12.85	2.565	2275.833	0.00	1.877	2.00	0.00	0.00	0	0.00
34.92	0.02860					.023843	0.83		1.363			0.00		
-3019.16	2272.83	1.501	2274.333	31.0	12.25	2.331	2276.664	0.00	1.877	2.00	0.00	0.00	0	0.00
19.33	0.02860					.021414	0.41		1.363			0.00		
-2999.83	2273.39	1.574	2274.959	31.0	11.68	2.120	2277.079	0.00	1.877	2.00	0.00	0.00	0	0.00
11.98	0.02860					.019357	0.23		1.363			0.00		
-2987.85	2273.73	1.656	2275.384	31.0	11.14	1.927	2277.311	0.00	1.877	2.00	0.00	0.00	0	0.00
7.26	0.02860					.017697	0.13		1.363			0.00		
-2980.59	2273.94	1.752	2275.688	31.0	10.62	1.753	2277.441	0.00	1.877	2.00	0.00	0.00	0	0.00
2.95	0.02860					.016600	0.05		1.363			0.00		
-2977.64	2274.02	1.877	2275.897	31.0	10.12	1.592	2277.489	0.00	1.877	2.00	0.00	0.00	0	0.00

EXISTING 54" STORM DRAIN IN DECATUR
PER APPROVED PLANS WITH ADDITIONAL 7.0 CFS
100-YEAR

Wavenumber (cm ⁻¹)	Assignment	Wavenumber (cm ⁻¹)	Assignment	Wavenumber (cm ⁻¹)	Assignment	Wavenumber (cm ⁻¹)	Assignment	Wavenumber (cm ⁻¹)	Assignment	Wavenumber (cm ⁻¹)	Assignment
3693.49	I										
3678.88			C		W		X				R
3664.27											
3649.66											
3635.05											
3620.44											
3605.83											
3591.23											
3576.62											
3562.01											
3547.40											
3532.79											
3518.18											
3503.57											
3488.96											
3474.35											
3459.74											
3445.13											
3430.52											
3415.92											
3401.31											
3386.70											
3372.09											
3357.48											
3342.87	I			C		W		EH			R
3328.26											
3313.65											
3299.04											
3284.43											
3269.82											
3255.21											
3240.61											
3226.00											
3211.39											
3196.78											
3182.17											
3167.56											
3152.95											
3138.34											
3123.73											
3109.12											
3094.51											
3079.90		I			C		W		E H		JX
3065.30				I			W		CH		R
3050.69					I			W		CH	R
3036.08											
3021.47											
3006.86							I				
2992.25								I			
2977.64								I			

NOTES

1. GLOSSARY

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

T1 WINCO - LAS VEGAS

T2 EXISTING ONSITE STORM DRAIN

T3 100-YEAR

SO	-3572.3802268.900	30	.013		2272.610				
R	-3367.5302272.020	30	.013			.000	.000	0	
JX	-3362.5302272.220	36 18	.013	0.001	2273.020	90.0	-80.000		
R	-3104.5202273.540	36	.013			.000	.000	0	
R	-3099.5202273.740	36	.013			.000	50.000	1	
R	-2913.4802274.690	36	.013			.000	.000	0	
R	-2908.4802274.890	36	.013			.000	30.000	1	
R	-2594.2202276.490	36	.013			.000	.000	0	
JX	-2589.2202276.490	36 18	.013	0.001	2277.990	90.0	.000	.000	
R	-2394.2202277.490	36	.013			.000	.000	0	
JX	-2389.2202277.490	36 18	.013	0.001	2278.990	90.0	.000	.000	
R	-2194.2202278.490	36	.013			.000	.000	0	
JX	-2189.2202278.690	36 18	.013	0.001	2279.990	90.0	-45.000		
R	-2054.3402279.390	36	.013			.000	.000	0	
JX	-2049.3402279.590	36 24	.013	21.000	2280.390	45.0	-45.000		
R	-1895.0802280.380	36	.013			.000	.000	0	
JX	-1890.0802281.380	24 18 18	.013	0.001	0.0012281.8802281.880	-45.0	90.0	.000	
SH	-1890.0802281.380	24							
CD	18 4 1	.000	1.500	.000	.000	.000	.00		
CD	24 4 1	.000	2.000	.000	.000	.000	.00		
CD	30 4 2	.000	2.000	.000	.000	.000	.00		
CD	36 4 1	.000	3.000	.000	.000	.000	.00		
Q		34.000	.0						

FILE: 3033exsd.wsw

3033exsd.EDT

W S P G W - EDIT LISTING - Version 14.06

Date: 2-25-2011 Time: 6:42:38

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD NO	SECT NO	CHN TYPE	NO OF PIER	AVE PIP WIDTH	HEIGHT 1 BASE DIAMETER	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
---------	---------	----------	------------	---------------	------------------------	----	----	-----	------	------	------	------	------	------	------	------	------	-------

CD	18	4	4	1	1.500													
CD	24	4	4	1	2.000													
CD	30	4	4	2	2.000													
CD	36	4	4	1	3.000													

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

PAGE NO 1

WINCO - LAS VEGAS

HEADING LINE NO 1 IS -
HEADING LINE NO 2 IS -
HEADING LINE NO 3 IS -

EXISTING ONSITE STORM DRAIN

100-YEAR

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

PAGE NO 2

ELEMENT NO	1	IS A	SYSTEM OUTLET	STATION	INVERT	SECT	U/S DATA	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4	ANGLE	RADIUS	ANG PT	MAN H
ELEMENT NO	2	IS A	REACH	-3572.380	2268.900	30	*	*	*	*	*	*	*	.000	.000	.000	0
ELEMENT NO	3	IS A	JUNCTION	-3367.530	2272.020	30	*	*	*	*	*	*	*	.000	.000	.000	0
ELEMENT NO	4	IS A	REACH	-3362.530	2272.220	36	18	0	0	.001	.001	.001	.001	.000	2272.610	.000	0

ELEMENT NO	5	IS A	REACH	-3104.520	2273.540	36	*	*	*	*	*	*	*	.000	.000	.000	0
ELEMENT NO	6	IS A	REACH	-3099.520	2273.740	36	*	*	*	*	*	*	*	.000	.000	.000	1
ELEMENT NO	7	IS A	REACH	-2913.480	2274.690	36	*	*	*	*	*	*	*	.000	.000	.000	0
ELEMENT NO	8	IS A	REACH	-2908.480	2274.890	36	*	*	*	*	*	*	*	.000	.000	.000	1
ELEMENT NO	9	IS A	JUNCTION	-2594.220	2276.490	36	*	*	*	*	*	*	*	.000	.000	.000	0

PAGE NO 3

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

W S P G W
WATER SURFACE PROFILE - ELEMENT CARD LISTING

PAGE NO 3

ELEMENT NO	10	IS A	REACH	-2394.220	2277.490	36	*	*	*	*	*	*	*	.000	.000	.000	0
ELEMENT NO	11	IS A	JUNCTION	-2389.220	2277.490	36	18	0	0	.001	.001	.001	.001	.000	2278.990	.000	0

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

Date: 2-25-2011 Time: 6:42:48

WINCO - LAS VEGAS
EXISTING ONSITE STORM DRAIN
100-YEAR

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top width	Height/Dia.-FT	Base wt for I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-3572.380	2268.900	3.710	2272.610	55.01	8.75	1.19	2273.80	.00	1.82	.00	2.000	.000	.00	2 .0
204.850	.0152					.0148	3.03	3.71	.00	1.61	.013	.00	.00	PIPE
-3367.530	2272.020	3.618	2275.638	55.01	8.75	1.19	2276.83	.00	1.82	.00	2.000	.000	.00	2 .0
JUNCT STR	.0400					.0108	.05	.00	.00		.013	.00	.00	PIPE
-3362.530	2272.220	3.721	2275.941	55.00	7.78	.94	2276.88	.00	2.41	.00	3.000	.000	.00	1 .0
258.010	.0051					.0068	1.75	3.72	.00	3.00	.013	.00	.00	PIPE
-3104.520	2273.540	4.155	2277.695	55.00	7.78	.94	2278.64	.00	2.41	.00	3.000	.000	.00	1 .0
5.000	.0400					.0068	.03	4.16	.00	1.34	.013	.00	.00	PIPE
-3099.520	2273.740	4.191	2277.931	55.00	7.78	.94	2278.87	.00	2.41	.00	3.000	.000	.00	1 .0
186.040	.0051					.0068	1.27	4.19	.00	3.00	.013	.00	.00	PIPE
-2913.480	2274.690	4.507	2279.197	55.00	7.78	.94	2280.14	.00	2.41	.00	3.000	.000	.00	1 .0
5.000	.0400					.0068	.03	4.51	.00	1.34	.013	.00	.00	PIPE
-2908.480	2274.890	4.481	2279.371	55.00	7.78	.94	2280.31	.00	2.41	.00	3.000	.000	.00	1 .0
314.260	.0051					.0068	2.14	4.48	.00	3.00	.013	.00	.00	PIPE
-2594.220	2276.490	5.018	2281.508	55.00	7.78	.94	2282.45	.00	2.41	.00	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0068	.03	5.02	.00		.013	.00	.00	PIPE
-2589.220	2276.490	5.052	2281.542	55.00	7.78	.94	2282.48	.00	2.41	.00	3.000	.000	.00	1 .0
195.000	.0051					.0068	1.33	5.05	.00	3.00	.013	.00	.00	PIPE

W S P G W - CIVILDESIGN Version 14.06
Program Package Serial Number: 1872

Date: 2-25-2011 Time: 6:42:48

WINCO - LAS VEGAS
EXISTING ONSITE STORM DRAIN
100-YEAR

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top width	Height/Dia.-FT	Base wt for I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
-2394.220	2277.490	5.378	2282.868	55.00	7.78	.94	2283.81	.00	2.41	.00	3.000	.000	.00	1 .0
JUNCT STR	.0000					.0068	.03	5.38	.00		.013	.00	.00	PIPE

3033exsd, OUT

-2389.220	2277.490	5.412	2282.902	55.00	7.78	.94	2283.84	.00	2.41	.00	3.000	.000	.00	1	.0
195.000	.0051	-	-	-	-	.0068	1.33	5.41	.00	3.00	.013	.00	.00	PIPE	
-2194.220	2278.490	5.738	2284.229	55.00	7.78	.94	2285.17	.00	2.41	.00	3.000	.000	.00	1	.0
JUNCT STR	.0400	-	-	-	-	.0068	.03	.00	.00	-	.013	.00	.00	PIPE	
-2189.220	2278.690	5.573	2284.262	55.00	7.78	.94	2285.20	.00	2.41	.00	3.000	.000	.00	1	.0
134.880	.0052	-	-	-	-	.0068	.92	5.57	.00	3.00	.013	.00	.00	PIPE	
-2054.340	2279.390	5.790	2285.180	55.00	7.78	.94	2286.12	.00	2.41	.00	3.000	.000	.00	1	.0
JUNCT STR	.0400	-	-	-	-	.0047	.02	.00	.00	-	.013	.00	.00	PIPE	
-2049.340	2279.590	6.339	2285.929	34.00	4.81	.36	2286.29	.00	1.89	.00	3.000	.000	.00	1	.0
154.260	.0051	-	-	-	-	.0026	.40	6.34	.00	1.87	.013	.00	.00	PIPE	
-1895.080	2280.380	5.950	2286.330	34.00	4.81	.36	2286.69	.00	1.89	.00	3.000	.000	.00	1	.0
JUNCT STR	.2000	-	-	-	-	.0126	.06	5.95	.00	-	.013	.00	.00	PIPE	
-1890.080	2281.380	3.769	2285.149	34.00	10.82	1.82	2286.97	.00	1.91	.00	2.000	.000	.00	1	.0
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

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T1 WINCO - LAS VEGAS

T2 EXISTING ONSITE STORM DRAIN WITH ADDITIONAL 7.0 CFS

T3 100-YEAR

SO	-3572.3802268.900	30	.013		2272.610							
R	-3367.5302272.020	30	.013			.000	.000	0				
JX	-3362.5302272.220	36 18	.013	7.000	2273.020	90.0		-80.000				
R	-3104.5202273.540	36	.013			.000	.000	0				
R	-3099.5202273.740	36	.013			.000	50.000	1				
R	-2913.4802274.690	36	.013			.000	.000	0				
R	-2908.4802274.890	36	.013			.000	30.000	1				
R	-2594.2202276.490	36	.013			.000	.000	0				
JX	-2589.2202276.490	36 18	.013	0.001	2277.990	90.0		.000				
R	-2394.2202277.490	36	.013			.000	.000	0				
JX	-2389.2202277.490	36 18	.013	0.001	2278.990	90.0		.000				
R	-2194.2202278.490	36	.013			.000	.000	0				
JX	-2189.2202278.690	36 18	.013	0.001	2279.990	90.0		-45.000				
R	-2054.3402279.390	36	.013			.000	.000	0				
JX	-2049.3402279.590	36 24	.013	21.000	2280.390	45.0		-45.000				
R	-1895.0802280.380	36	.013			.000	.000	0				
JX	-1890.0802281.380	24 18 18	.013	0.001	0.0012281.8802281.880	-45.0	90.0	.000				
SH	-1890.0802281.380	24										
CD	18 4 1	.000	1.500	.000	.000	.000	.00					
CD	24 4 1	.000	2.000	.000	.000	.000	.00					
CD	30 4 2	.000	2.000	.000	.000	.000	.00					
CD	36 4 1	.000	3.000	.000	.000	.000	.00					
Q		34.000	.0									

FILE: 3033proposd.wsw

3033proposd.EDT

W S P G W - EDIT LISTING - Version 14.06

Date: 2-28-2011 Time: 5:31:53

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIER	AVE PIP WIDTH	HEIGHT 1 BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4	4	1	1.500													
CD	24	4	4	1	2.000													
CD	30	4	4	2	2.000													
CD	36	4	4	1	3.000													

PAGE 1

W S P G W
WATER SURFACE PROFILE - TITLE CARD LISTING

PAGE NO 1

WINCO - LAS VEGAS

EXISTING ONSITE STORM DRAIN WITH ADDITIONAL 7.0 CFS

100-YEAR

W S P G W
WATER SURFACE PROFILE - ELEMENT CARD LISTING

PAGE NO 2

ELEMENT NO	1 IS A SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	2 IS A REACH	U/S DATA	-3572.380	2268.900	30	2272.610				
ELEMENT NO	3 IS A JUNCTION	U/S DATA	-3367.530	2272.020	30					
ELEMENT NO	3 IS A JUNCTION	U/S DATA	-3362.530	2272.220	36					
ELEMENT NO	4 IS A REACH	U/S DATA	-3104.520	2273.540	36					
ELEMENT NO	5 IS A REACH	U/S DATA	-3099.520	2273.740	36					
ELEMENT NO	6 IS A REACH	U/S DATA	-2913.480	2274.690	36					
ELEMENT NO	7 IS A REACH	U/S DATA	-2908.480	2274.890	36					
ELEMENT NO	8 IS A REACH	U/S DATA	-2594.220	2276.490	36					
ELEMENT NO	9 IS A JUNCTION	U/S DATA	-2589.220	2276.490	36					

ELEMENT NO	10 IS A REACH	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	11 IS A JUNCTION	U/S DATA	-2394.220	2277.490	36					
ELEMENT NO	11 IS A JUNCTION	U/S DATA	-2389.220	2277.490	36					

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

W S P G W
WATER SURFACE PROFILE - ELEMENT CARD LISTING

PAGE NO 3

ELEMENT NO	10 IS A REACH	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	11 IS A JUNCTION	U/S DATA	-2394.220	2277.490	36					
ELEMENT NO	11 IS A JUNCTION	U/S DATA	-2389.220	2277.490	36					

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

WINCO - LAS VEGAS
EXISTING ONSITE STORM DRAIN WITH ADDITIONAL 7.0 CFS
100-YEAR

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow width	Height/Dia.-FT or I.D.	Base wt	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	Type Ch
-3572.380	2268.900	3.710	2272.610	62.00	9.87	1.51	2274.12	.00	1.88	.00	2.000	.000	2 .0
204.850	.0152	-	-	-	-	.0188	3.85	3.71	.00	2.00	.013	.00	PIPE
-3367.530	2272.020	4.437	2276.457	62.00	9.87	1.51	2277.97	.00	1.88	.00	2.000	.000	2 .0
JUNCT STR	.0400	-	-	-	-	.0128	.06	.00	.00	-	.013	.00	PIPE
-3362.530	2272.220	5.157	2277.377	55.00	7.78	.94	2278.32	.00	2.41	.00	3.000	.000	1 .0
258.010	.0051	-	-	-	-	.0068	1.75	5.16	.00	3.00	.013	.00	PIPE
-3104.520	2273.540	5.591	2279.131	55.00	7.78	.94	2280.07	.00	2.41	.00	3.000	.000	1 .0
5.000	.0400	-	-	-	-	.0068	.03	5.59	.00	1.34	.013	.00	PIPE
-3099.520	2273.740	5.628	2279.367	55.00	7.78	.94	2280.31	.00	2.41	.00	3.000	.000	1 .0
186.040	.0051	-	-	-	-	.0068	1.27	5.63	.00	3.00	.013	.00	PIPE
-2913.480	2274.690	5.943	2280.633	55.00	7.78	.94	2281.57	.00	2.41	.00	3.000	.000	1 .0
5.000	.0400	-	-	-	-	.0068	.03	5.94	.00	1.34	.013	.00	PIPE
-2908.480	2274.890	5.917	2280.807	55.00	7.78	.94	2281.75	.00	2.41	.00	3.000	.000	1 .0
314.260	.0051	-	-	-	-	.0068	2.14	5.92	.00	3.00	.013	.00	PIPE
-2594.220	2276.490	6.454	2282.944	55.00	7.78	.94	2283.88	.00	2.41	.00	3.000	.000	1 .0
JUNCT STR	.0000	-	-	-	-	.0068	.03	6.45	.00	-	.013	.00	PIPE
-2589.220	2276.490	6.488	2282.978	55.00	7.78	.94	2283.92	.00	2.41	.00	3.000	.000	1 .0
195.000	.0051	-	-	-	-	.0068	1.33	6.49	.00	3.00	.013	.00	PIPE

WINCO - LAS VEGAS
EXISTING ONSITE STORM DRAIN WITH ADDITIONAL 7.0 CFS
100-YEAR

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow width	Height/Dia.-FT or I.D.	Base wt	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	Type Ch
-2394.220	2277.490	6.814	2284.304	55.00	7.78	.94	2285.24	.00	2.41	.00	3.000	.000	1 .0
JUNCT STR	.0000	-	-	-	-	.0068	.03	6.81	.00	-	.013	.00	PIPE

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-2389.220	2277.490	6.849	2284.338	55.00	7.78	.94	2285.28	.00	2.41	.00	3.000	.000	.00	1	.0
195.000	.0051	-	-	-	-	.0068	1.33	6.85	.00	3.00	.013	.00	.00	PIPE	
-2194.220	2278.490	7.174	2285.665	55.00	7.78	.94	2286.60	.00	2.41	.00	3.000	.000	.00	1	.0
JUNCT STR	.0400	-	-	-	-	.0068	.03	.00	.00	-	.013	.00	.00	PIPE	
-2189.220	2278.690	7.009	2285.698	55.00	7.78	.94	2286.64	.00	2.41	.00	3.000	.000	.00	1	.0
134.880	.0052	-	-	-	-	.0068	.92	7.01	.00	3.00	.013	.00	.00	PIPE	
-2054.340	2279.390	7.226	2286.616	55.00	7.78	.94	2287.56	.00	2.41	.00	3.000	.000	.00	1	.0
JUNCT STR	.0400	-	-	-	-	.0047	.02	.00	.00	-	.013	.00	.00	PIPE	
-2049.340	2279.590	7.775	2287.365	34.00	4.81	.36	2287.72	.00	1.89	.00	3.000	.000	.00	1	.0
154.260	.0051	-	-	-	-	.0026	.40	7.77	.00	1.87	.013	.00	.00	PIPE	
-1895.080	2280.380	7.386	2287.766	34.00	4.81	.36	2288.13	.00	1.89	.00	3.000	.000	.00	1	.0
JUNCT STR	.2000	-	-	-	-	.0126	.06	7.39	.00	-	.013	.00	.00	PIPE	
-1890.080	2281.380	5.205	2286.585	34.00	10.82	1.82	2288.40	.00	1.91	.00	2.000	.000	.00	1	.0
		-	-	-	-	-	-	-	-	-	-	-	-	-	

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WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

WINCO LAS VEGAS

HEADING LINE NO 2 IS -

LINE A

HEADING LINE NO 3 IS -

100-YEAR

DATE: 3/ 3/2011
TIME: 11:29

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

[illegible]

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A SYSTEM OUTLET	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		1000.00	2273.00	18															
ELEMENT NO	2 IS A REACH	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		1048.00	2276.08	18															
ELEMENT NO	3 IS A REACH	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		1146.59	2278.05	18															
ELEMENT NO	4 IS A JUNCTION	*	*	*	*														
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4						
		1150.59	2278.10	12	12	0	0.012	3.5	0.0	2278.10	0.00	77.00	0.00						
ELEMENT NO	5 IS A REACH	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		1189.88	2280.62	12															
ELEMENT NO	6 IS A SYSTEM HEADWORKS			*															
	U/S DATA	STATION	INVERT	SECT															
		1189.88	2280.62	12															

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

WINCO LAS VEGAS
LINE A
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		

1000.00	2273.00	4.380	2277.380	7.0	3.96	0.244	2277.624	0.00	1.024		1.50	0.00	0.00	0	0.00
47.70	0.06417					.003743	0.18			0.500			0.00		
1047.70	2276.06	1.500	2277.560	7.0	3.96	0.244	2277.804	0.00	1.024		1.50	0.00	0.00	0	0.00
0.30	0.06417					.003572	0.00			0.500			0.00		
1048.00	2276.08	1.480	2277.560	7.0	3.97	0.245	2277.805	0.00	1.024		1.50	0.00	0.00	0	0.00
0.87	0.01998					.003445	0.00			0.690			0.00		
1048.87	2276.10	1.480	2277.577	7.0	3.97	0.245	2277.822	0.00	1.024		1.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1048.87	2276.10	0.697	2276.794	7.0	8.71	1.177	2277.971	0.00	1.024		1.50	0.00	0.00	0	0.00
45.33	0.01998					.018513	0.84			0.690			0.00		
1094.20	2277.00	0.718	2277.721	7.0	8.37	1.089	2278.810	0.00	1.024		1.50	0.00	0.00	0	0.00
20.61	0.01998					.016490	0.34			0.690			0.00		
1114.81	2277.41	0.745	2278.160	7.0	7.98	0.989	2279.149	0.00	1.024		1.50	0.00	0.00	0	0.00
11.16	0.01998					.014522	0.16			0.690			0.00		
1125.97	2277.64	0.774	2278.412	7.0	7.61	0.899	2279.311	0.00	1.024		1.50	0.00	0.00	0	0.00
7.21	0.01998					.012801	0.09			0.690			0.00		
1133.18	2277.78	0.804	2278.586	7.0	7.25	0.817	2279.403	0.00	1.024		1.50	0.00	0.00	0	0.00
4.99	0.01998					.011288	0.06			0.690			0.00		
1138.17	2277.88	0.835	2278.717	7.0	6.92	0.743	2279.460	0.00	1.024		1.50	0.00	0.00	0	0.00
3.45	0.01998					.009963	0.03			0.690			0.00		
1141.62	2277.95	0.868	2278.819	7.0	6.60	0.676	2279.495	0.00	1.024		1.50	0.00	0.00	0	0.00
2.37	0.01998					.008806	0.02			0.690			0.00		

WATER SURFACE PROFILE LISTING

WINCO LAS VEGAS
LINE A
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO	AVBPR PIER
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		

1143.99	2278.00	0.903	2278.901	7.0	6.29	0.614	2279.515	0.00	1.024	1.50	0.00	0.00	0	0.00
1.46	0.01998					.007798	0.01		0.690			0.00		
1145.45	2278.03	0.941	2278.968	7.0	6.00	0.559	2279.527	0.00	1.024	1.50	0.00	0.00	0	0.00
0.90	0.01998					.006914	0.01		0.690			0.00		
1146.35	2278.05	0.980	2279.025	7.0	5.72	0.508	2279.533	0.00	1.024	1.50	0.00	0.00	0	0.00
0.24	0.01998					.006135	0.00		0.690			0.00		
1146.59	2278.05	1.024	2279.074	7.0	5.45	0.461	2279.535	0.00	1.024	1.50	0.00	0.00	0	0.00
JUNCT STR	0.01250					.006996	0.03					0.00		
1150.59	2278.10	1.573	2279.673	3.5	4.46	0.309	2279.982	0.00	0.799	1.00	0.00	0.00	0	0.00
2.35	0.06414					.008223	0.02		0.410			0.00		
1152.94	2278.25	1.458	2279.709	3.5	4.46	0.309	2280.018	0.00	0.799	1.00	0.00	0.00	0	0.00
HYDRAULIC JUMP												0.00		
1152.94	2278.25	0.432	2278.683	3.5	10.77	1.801	2280.484	0.00	0.799	1.00	0.00	0.00	0	0.00
1.16	0.06414					.053895	0.06		0.410			0.00		
1154.10	2278.32	0.435	2278.760	3.5	10.64	1.757	2280.517	0.00	0.799	1.00	0.00	0.00	0	0.00
9.98	0.06414					.049815	0.50		0.410			0.00		
1164.08	2278.97	0.452	2279.417	3.5	10.14	1.598	2281.015	0.00	0.799	1.00	0.00	0.00	0	0.00
6.36	0.06414					.043797	0.28		0.410			0.00		
1170.44	2279.37	0.468	2279.841	3.5	9.67	1.452	2281.293	0.00	0.799	1.00	0.00	0.00	0	0.00
4.46	0.06414					.038503	0.17		0.410			0.00		
1174.90	2279.66	0.486	2280.145	3.5	9.23	1.324	2281.469	0.00	0.799	1.00	0.00	0.00	0	0.00
3.34	0.06414					.033915	0.11		0.410			0.00		

WATER SURFACE PROFILE LISTING

WINCO LAS VEGAS
LINE A
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR	

1178.24	2279.87	0.505	2280.379	3.5	8.79	1.201	2281.580	0.00	0.799	1.00	0.00	0.00	0	0.00
2.64	0.06414					.029877	0.08			0.410			0.00	
1180.88	2280.04	0.524	2280.567	3.5	8.39	1.094	2281.661	0.00	0.799	1.00	0.00	0.00	0	0.00
2.10	0.06414					.026320	0.06			0.410			0.00	
1182.98	2280.18	0.544	2280.721	3.5	7.99	0.992	2281.713	0.00	0.799	1.00	0.00	0.00	0	0.00
1.67	0.06414					.023226	0.04			0.410			0.00	
1184.65	2280.28	0.566	2280.850	3.5	7.63	0.903	2281.753	0.00	0.799	1.00	0.00	0.00	0	0.00
1.35	0.06414					.020531	0.03			0.410			0.00	
1186.00	2280.37	0.589	2280.960	3.5	7.28	0.822	2281.782	0.00	0.799	1.00	0.00	0.00	0	0.00
1.10	0.06414					.018165	0.02			0.410			0.00	
1187.10	2280.44	0.613	2281.055	3.5	6.93	0.746	2281.801	0.00	0.799	1.00	0.00	0.00	0	0.00
0.89	0.06414					.016085	0.01			0.410			0.00	
1187.99	2280.50	0.638	2281.137	3.5	6.60	0.677	2281.814	0.00	0.799	1.00	0.00	0.00	0	0.00
0.70	0.06414					.014267	0.01			0.410			0.00	
1188.69	2280.54	0.665	2281.209	3.5	6.31	0.618	2281.827	0.00	0.799	1.00	0.00	0.00	0	0.00
0.53	0.06414					.012686	0.01			0.410			0.00	
1189.22	2280.58	0.694	2281.271	3.5	6.01	0.562	2281.833	0.00	0.799	1.00	0.00	0.00	0	0.00
0.35	0.06414					.011318	0.00			0.410			0.00	
1189.57	2280.60	0.726	2281.326	3.5	5.73	0.510	2281.836	0.00	0.799	1.00	0.00	0.00	0	0.00
0.23	0.06414					.010134	0.00			0.410			0.00	
1189.80	2280.61	0.760	2281.375	3.5	5.46	0.463	2281.838	0.00	0.799	1.00	0.00	0.00	0	0.00
0.08	0.06414					.009105	0.00			0.410			0.00	

WATER SURFACE PROFILE LISTING

WINCO LAS VEGAS
LINE A
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1189.88	2280.62	0.799	2281.419	3.5	5.20	0.420	2281.839	0.00	0.799	1.00	0.00	0.00	0	0.00

WINCO LAS VEGAS
LINE A
100-YEAR

[illegible]

NOTES

1. GLOSSARY

I = INVERT ELEVATION
C = CRITICAL DEPTH
W = WATER SURFACE ELEVATION
H = HEIGHT OF CHANNEL
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X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

WINCO LAS VEGAS

HEADING LINE NO 2 IS -

LINE B

HEADING LINE NO 3 IS -

100-YEAR

DATE: 3/ 3/2011
TIME: 12:39

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

[illegible]

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A SYSTEM OUTLET	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		1002.00	2278.10	12															
ELEMENT NO	2 IS A REACH	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		1168.68	2278.93	12															
ELEMENT NO	3 IS A JUNCTION	*	*	*	*														
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N												
		1172.68	2278.97	12	12	12	0.012												
ELEMENT NO	4 IS A REACH	*	*	*															
	U/S DATA	STATION	INVERT	SECT															
		1174.68	2278.98	12															
ELEMENT NO	5 IS A SYSTEM HEADWORKS			*															
	U/S DATA	STATION	INVERT	SECT															
		1174.68	2278.98	12															

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

WINCO LAS VEGAS
LINE B
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH		ZR		

1002.00	2278.10	1.610	2279.710	3.5	4.46	0.309	2280.019	0.00	0.799	1.00	0.00	0.00	0	0.00
166.68	0.00498					.008223	1.37			1.000		0.00		
1168.68	2278.93	2.166	2281.096	3.5	4.46	0.309	2281.405	0.00	0.799	1.00	0.00	0.00	0	0.00
JUNCT STR	0.01000					.004115	0.02					0.00		
1172.68	2278.97	2.651	2281.621	0.1	0.13	0.000	2281.621	0.00	0.129	1.00	0.00	0.00	0	0.00
2.00	0.00500					.000007	0.00			0.100		0.00		
1174.68	2278.98	2.641	2281.621	0.1	0.13	0.000	2281.621	0.00	0.129	1.00	0.00	0.00	0	0.00

100-YEAR

2278.10	2278.45	2278.80	2279.16	2279.51	2279.86	2280.21	2280.56	2280.92	2281.27	2281.62
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------

NOTES

1. GLOSSARY

I = INVERT ELEVATION
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H = HEIGHT OF CHANNEL
E = ENERGY GRADE LINE
X = CURVES CROSSING OVER
B = BRIDGE ENTRANCE OR EXIT
Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

WINCO LAS VEGAS

HEADING LINE NO 2 IS -

LATERAL B-1

HEADING LINE NO 3 IS -

100-YEAR

DATE: 3/ 3/2011
TIME: 12:46

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

[illegible]

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
 U/S DATA STATION INVERT SECT
 1002.00 2278.98 12

W S ELEV
 2281.62

ELEMENT NO 2 IS A REACH * * *
 U/S DATA STATION INVERT SECT
 1107.83 2279.51 12

N
 0.012

RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 3 IS A JUNCTION * * * *
 U/S DATA STATION INVERT SECT LAT-1 LAT-2 N
 1111.77 2279.61 12 12 0 0.012

Q3 Q4 INVERT-3 INVERT-4 PHI 3 PHI 4
 1.5 0.0 2280.61 0.00 90.00 0.00

ELEMENT NO 4 IS A REACH * * *
 U/S DATA STATION INVERT SECT
 1173.77 2280.02 12

N
 0.012

RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 5 IS A SYSTEM HEADWORKS *
 U/S DATA STATION INVERT SECT
 1173.77 2280.02 12

W S ELEV
 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

WINCO LAS VEGAS
LATERAL B-1
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH		ZR		
1002.00	2278.98	2.640	2281.620	2.5	3.18	0.157	2281.777	0.00	0.677	1.00	0.00	0.00	0	0.00
105.83	0.00501					.004195	0.44			0.750		0.00		
1107.83	2279.51	2.554	2282.064	2.5	3.18	0.157	2282.221	0.00	0.677	1.00	0.00	0.00	0	0.00
JUNCT STR	0.02538					.002433	0.01					0.00		
1111.77	2279.61	2.728	2282.338	1.0	1.27	0.025	2282.363	0.00	0.420	1.00	0.00	0.00	0	0.00
62.00	0.00661					.000671	0.04			0.380		0.00		
1173.77	2280.02	2.360	2282.380	1.0	1.27	0.025	2282.405	0.00	0.420	1.00	0.00	0.00	0	0.00

WINCO LAS VEGAS
LATERAL B-1
100-YEAR

1002.00	I		C	H						W	E			R
1005.51	.													
1009.01	.													
1012.52	.													
1016.02	.													
1019.53	.													
1023.03	.													
1026.54	.													
1030.04	.													
1033.55	.													
1037.06	.													
1040.56	.													
1044.07	.													
1047.57	.													
1051.08	.													
1054.58	.													
1058.09	.													
1061.59	.													
1065.10	.													
1068.60	.													
1072.11	.													
1075.62	.													
1079.12	.													
1082.63	.													
1086.13	.													
1089.64	.													
1093.14	.													
1096.65	.													
1100.15	.													
1103.66	.													
1107.17	.													
1110.67	.	I		C	H					W	E			JX
1114.18	.	I		C	H							X		R
1117.68	.													
1121.19	.													
1124.69	.													
1128.20	.													
1131.70	.													
1135.21	.													
1138.71	.													
1142.22	.													
1145.73	.													
1149.23	.													
1152.74	.													
1156.24	.													
1159.75	.													
1163.25	.													
1166.76	.													
1170.26	.													
1173.77	.		I	C	H							X		R
		2278.98	2279.32	2279.67	2280.01	2280.35	2280.69	2281.04	2281.38	2281.72	2282.06	2282.41		

NOTES

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- X = CURVES CROSSING OVER
- B = BRIDGE ENTRANCE OR EXIT
- Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

WINCO LAS VEGAS

HEADING LINE NO 2 IS -

LATERAL B-2

HEADING LINE NO 3 IS -

100-YEAR

DATE: 3/ 3/2011
TIME: 12:54

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

[illegible]

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
U/S DATA STATION INVERT SECT
1002.00 2278.98 12

W S ELEV
2281.62

ELEMENT NO 2 IS A REACH * * *
U/S DATA STATION INVERT SECT
1031.93 2279.78 12

N
0.012

RADIUS ANGLE ANG PT MAN H
0.00 0.00 0.00 0

ELEMENT NO 3 IS A SYSTEM HEADWORKS *
U/S DATA STATION INVERT SECT
1031.93 2279.78 12

W S ELEV
0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

WINCO LAS VEGAS
LATERAL B-2
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
1002.00	2278.98	2.640	2281.620	1.0	1.27	0.025	2281.645	0.00	0.420	1.00	0.00	0.00	0	0.00
29.93	0.02673					.000671	0.02		0.260			0.00		
1031.93	2279.78	1.860	2281.640	1.0	1.27	0.025	2281.665	0.00	0.420	1.00	0.00	0.00	0	0.00

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

WINCO LAS VEGAS

HEADING LINE NO 2 IS -

LINE C

HEADING LINE NO 3 IS -

100-YEAR

TIME: 9:43

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

[illegible]

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
 U/S DATA STATION INVERT SECT
 992.50 2277.67 1

W S ELEV
 2278.34

ELEMENT NO 2 IS A REACH * * *
 U/S DATA STATION INVERT SECT
 998.00 2277.77 1

N
 0.014

RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 3 IS A TRANSITION * * *
 U/S DATA STATION INVERT SECT
 1000.00 2277.82 8

N
 0.014

ELEMENT NO 4 IS A REACH * * *
 U/S DATA STATION INVERT SECT
 1052.91 2278.03 8

N
 0.012

RADIUS ANGLE ANG PT MAN H
 0.00 0.00 11.25 0

ELEMENT NO 5 IS A REACH * * *
 U/S DATA STATION INVERT SECT
 1074.31 2278.12 8

N
 0.012

RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 6 IS A SYSTEM HEADWORKS * * *
 U/S DATA STATION INVERT SECT
 1074.31 2278.12 8

W S ELEV
 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

WINCO LAS VEGAS
LINE C
100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR		
992.50	2277.67	0.670	2278.340	0.8	1.95	0.059	2278.399	0.00	0.171	0.33	2.00	0.00	0	0.00
5.50	0.01818					.008636	0.05		0.120			0.00		
998.00	2277.77	0.617	2278.387	0.8	1.95	0.059	2278.446	0.00	0.171	0.33	2.00	0.00	0	0.00
TRANS STR	0.02500					.006836	0.01					0.00		
1000.00	2277.82	0.544	2278.364	0.8	2.61	0.105	2278.469	0.00	0.423	0.67	0.00	0.00	0	0.00
52.91	0.00397					.003798	0.20		0.510			0.00		
1052.91	2278.03	0.530	2278.560	0.8	2.68	0.111	2278.671	0.00	0.423	0.67	0.00	0.00	0	0.00
21.40	0.00421					.003965	0.08		0.500			0.00		
1074.31	2278.12	0.521	2278.641	0.8	2.72	0.115	2278.756	0.00	0.423	0.67	0.00	0.00	0	0.00

WINCO LAS VEGAS
LINE C
100-YEAR

992.50	.I		C		H			W	E											R
994.17	.																			
995.84	.																			
997.51	.																			
999.18	.	I		C		H			W	E										TX
1000.85	.		I				C		W		E	H								R
1002.52	.																			
1004.19	.																			
1005.86	.																			
1007.53	.																			
1009.20	.																			
1010.87	.																			
1012.54	.																			
1014.20	.																			
1015.87	.																			
1017.54	.																			
1019.21	.																			
1020.88	.																			
1022.55	.																			
1024.22	.																			
1025.89	.																			
1027.56	.																			
1029.23	.																			
1030.90	.																			
1032.57	.																			
1034.24	.																			
1035.91	.																			
1037.58	.																			
1039.25	.																			
1040.92	.																			
1042.59	.																			
1044.26	.																			
1045.93	.																			
1047.60	.																			
1049.27	.																			
1050.94	.																			
1052.61	.																			
1054.27	.				I					C		W		E	H					R
1055.94	.																			
1057.61	.																			
1059.28	.																			
1060.95	.																			
1062.62	.																			
1064.29	.																			
1065.96	.																			
1067.63	.																			
1069.30	.																			
1070.97	.																			
1072.64	.																			
1074.31	.				I					C		W		E	H					R
	.		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
		2277.67	2277.78	2277.89	2278.01	2278.12	2278.23	2278.34	2278.45	2278.57	2278.68	2278.79								

NOTES

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- I = INVERT ELEVATION
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- B = BRIDGE ENTRANCE OR EXIT
- Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

APPENDIX C

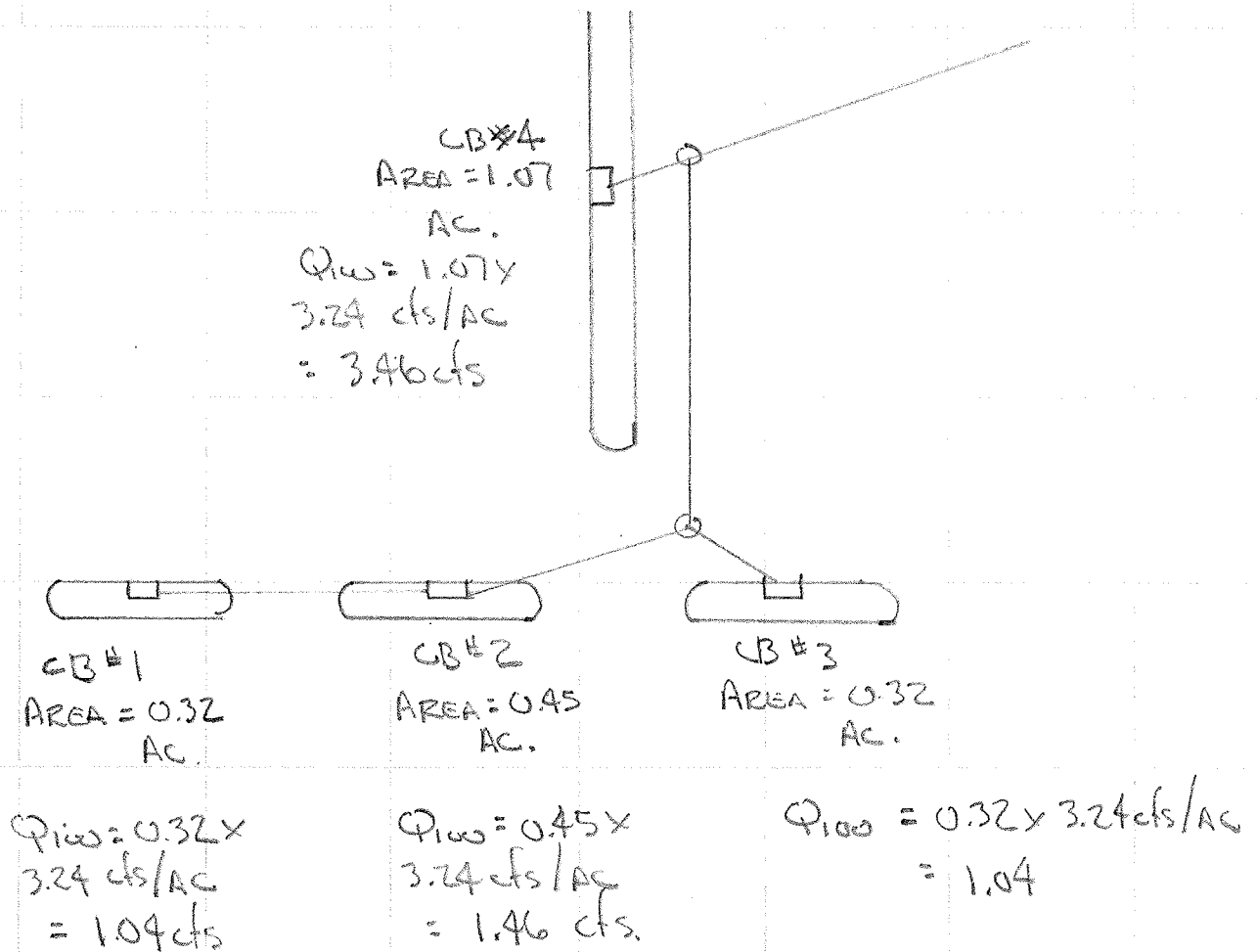
CATCH BASIN CALCULATIONS

Thienes Engineering, Inc.

CIVIL ENGINEERING • LAND SURVEYING

subject	by	date	job no.	sheet of
---------	----	------	---------	----------

PEAK FLOW RATE @ CATCH BASINS



Thienes Engineering, Inc.

CIVIL ENGINEERING • LAND SURVEYING

subject	by	date	job no.	sheet of
---------	----	------	---------	----------

CATCH BASIN CALCS.

$h = \text{height of opening} = 0.54'$

$H = \text{MAX Depth of PONDING} = 0.44' @ \text{C.B. \#1 \& C.B. \#3}$
 $0.67' @ \text{C.B. \#2 \& C.B. \#4}$

C.B. \#1 \& \#3

$H/h = .44/.54 = 0.81$ USE TABLE "L" $\Rightarrow 0.92 \text{ cfs/L.F.}$

STD. 4' WIDE C.B. CAN INTERCEPT $4 \times 0.92 \text{ cfs/L.F.}$
 $= 3.68 \text{ cfs.}$

$Q_{\text{flow}} @ \text{C.B. \#1} = 1.04 \text{ cfs}$
 $\text{C.B. \#3} = 1.04 \text{ cfs}$ } $< 3.68 \text{ cfs.}$

C.B. \#2 \& \#4

$H/h = .67/.54 = 1.24$ USE TABLE L $\Rightarrow 1.6 \text{ cfs/L.F.}$

STD 4' WIDE C.B. CAN INTERCEPT 6.4 cfs.

$Q_{\text{flow}} @ \text{C.B. \#2} = 1.46$
 $\text{C.B. \#4} = 3.46$ } $< 6.4 \text{ cfs.}$

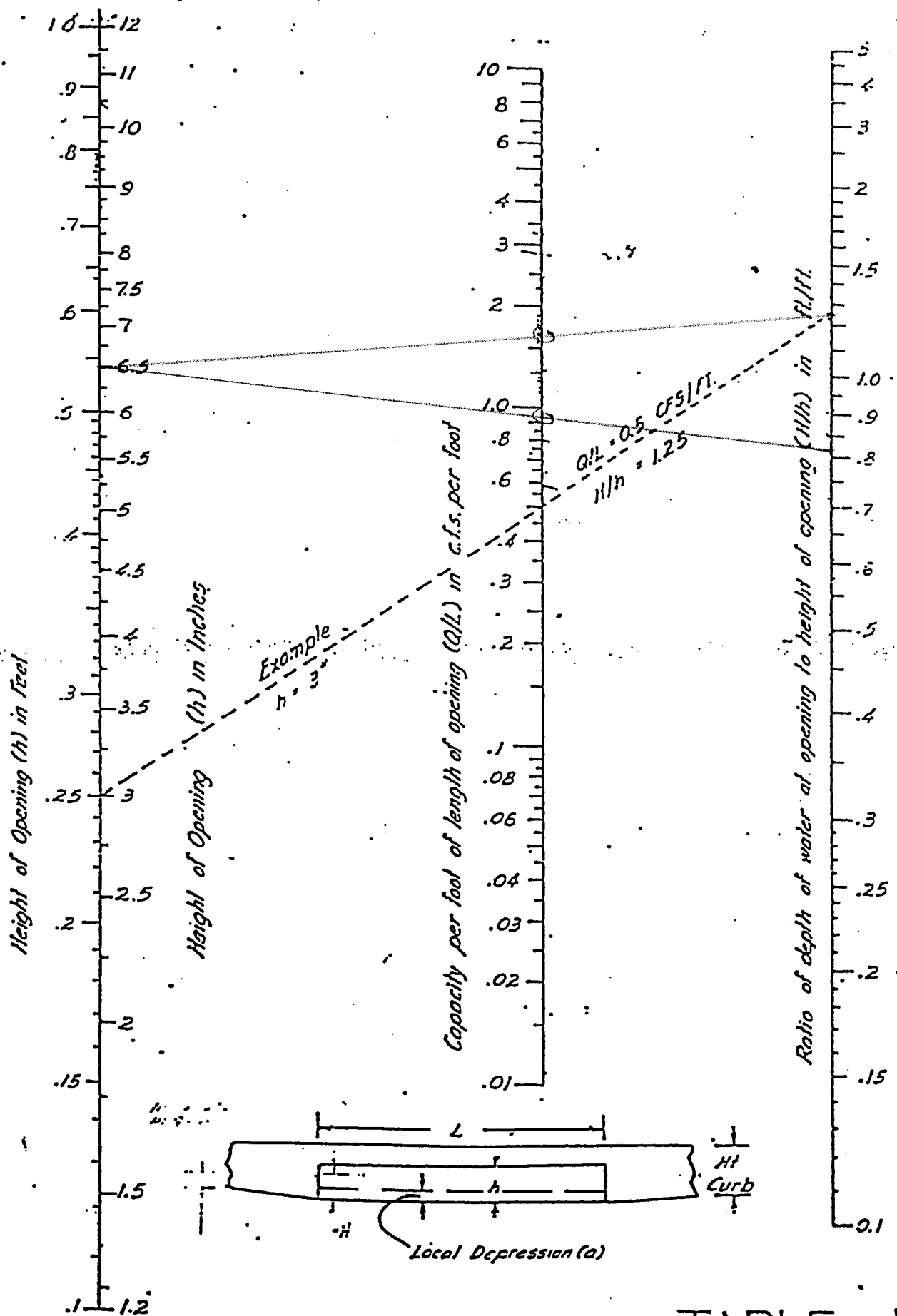


TABLE L

APPENDIX D

REFERENCE MATERIAL



SOUTHWEST

DATE : 27-Nov-07

REVISÉD 1/08

[illegible]

DEVELOPED

```
*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* SEPTEMBER 1990
* VERSION 4.0
*
* RUN DATE 01/16/2008 TIME 16:19:54
*****
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 756-1104
*****
```

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

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HECIGS, HECIDB, AND HEC1KN.

THE DEFINITIONS OF VARIABLES -RTMP- 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 ANPT INFILTRATION

KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

PAGE 1

HEC-1 INPUT

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

```

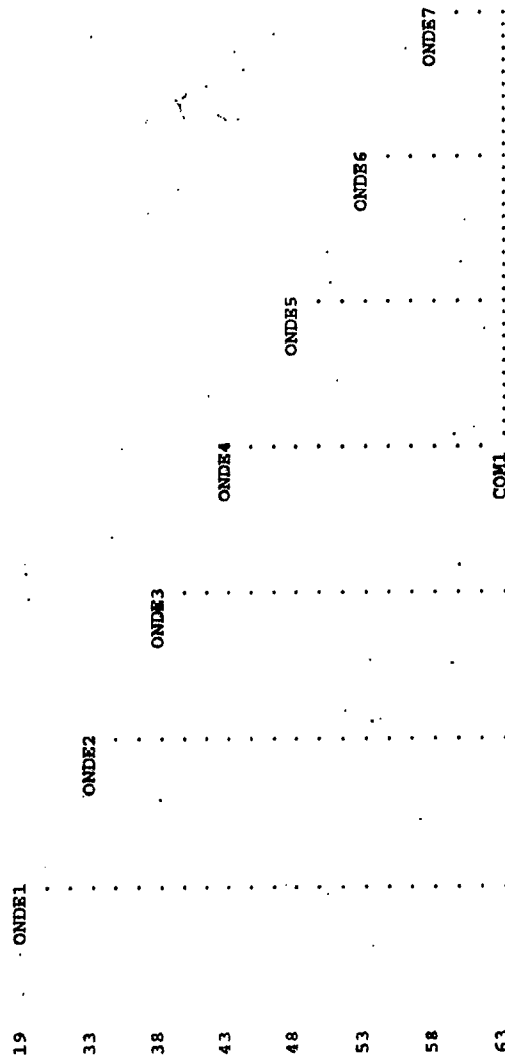
1 ID
2 ID
3 ID
4 ID
5 ID
6 ID
7 ID
8 ID
9 ID
10 ID
11 ID
12 ID
13 ID
14 ID

*****
LIFESTYLES CENTER 070619
Input = 070619dev.dat
DEVELOPED CONDITION
WATERSHED ANALYSIS
SDN-3 6 HOUR STORM
JR = 2.77/2.77 = 1.00 100-year Ratio
JR = 1.58/2.77 = 0.57 10-year Ratio
PB = 2.77
*****
```


56	LS	0	95
57	UD	.145	
58	KK	ONDE7	
59	KM	BASIN ON-DEV7	
60	BA	.0098	
61	LS	0	95
62	UD	.145	
63	KK	COM1	
64	KM	COMBINE ONDEV4-ONDEV7	
65	HC	4	
66	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

1*****

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *

* SEPTEMBER 1990 *

* VERSION 4.0 *

* RUN DATE 01/16/2008 TIME 16:19:54 *

* *

* U.S. ARMY CORPS OF ENGINEERS *

* HYDROLOGIC ENGINEERING CENTER *

* 609 SECOND STREET *

* DAVIS, CALIFORNIA 95616 *

* (916) 756-1104 *

* *

LIFESTYLES CENTER 070619
Input = 070619dev.dat.
DEVELOPED CONDITION
WATERSHED ANALYSIS
SDN-3 6 HOUR STORM
JR = 2.77/2.77 = 1.00 100-year Ratio
JR = 1.58/2.77 = 0.57 10-year Ratio
PB = 2.77

16 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

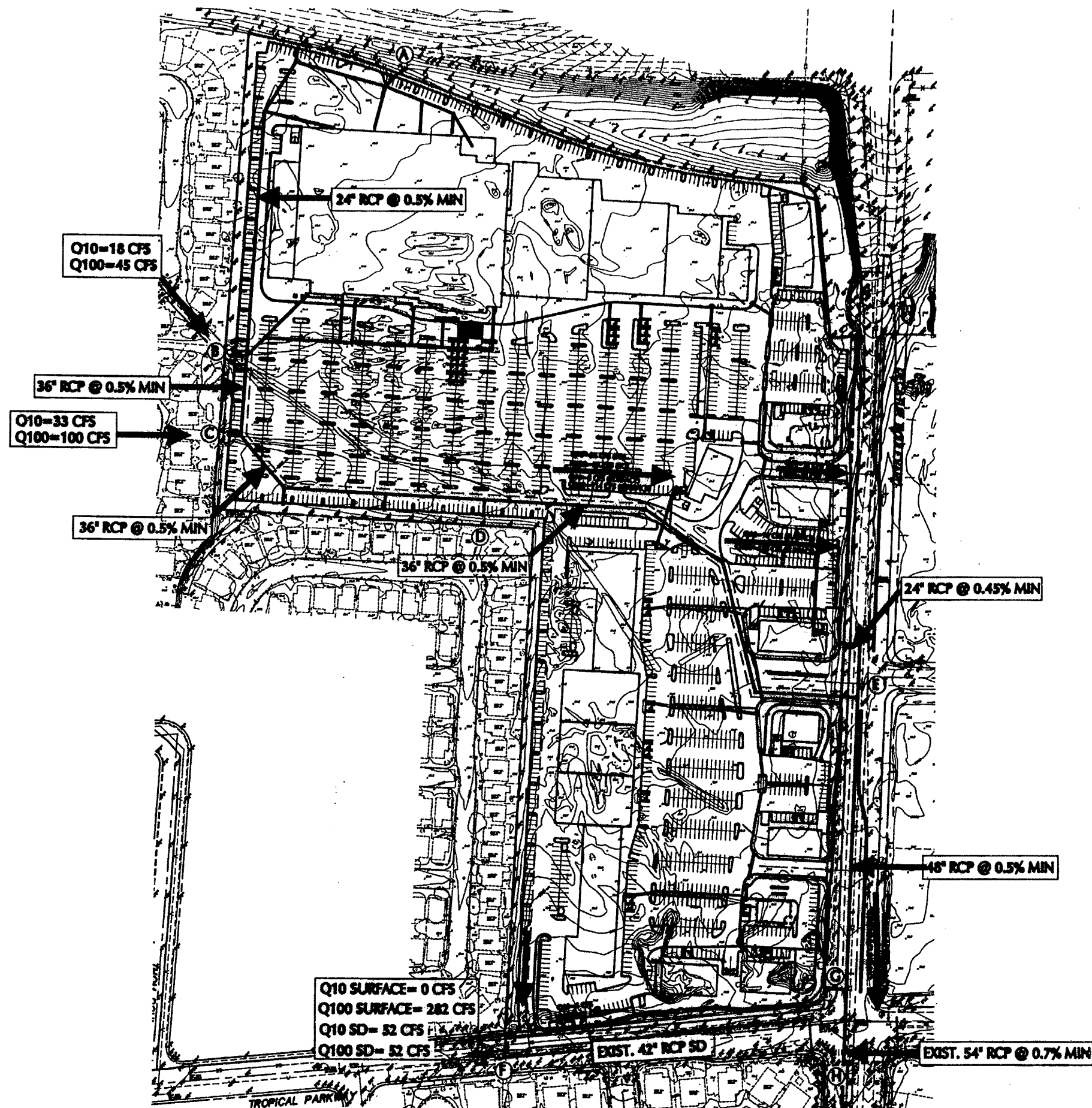
.57 1.00

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
HYDROGRAPH AT	ONDE1	.06	1	.57	1.00
+				4.	9.
				3.50	3.50
HYDROGRAPH AT	ONDE2	.01	1	8.	15.
+				3.58	3.58
HYDROGRAPH AT	ONDE3	.01	1	6.	12.
+				3.58	3.58
HYDROGRAPH AT	ONDE4	.01	1	6.	12.
+				3.58	3.58
HYDROGRAPH AT	ONDE5	.01	1	6.	11.
+				3.58	3.58
HYDROGRAPH AT	ONDE6	.01	1	11.	22.
+				3.58	3.58
HYDROGRAPH AT	ONDE7	.01	1	9.	17.
+				3.58	3.58
4 COMBINED AT	COM1	.04	1	32.	61.
+				3.58	3.58

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



STORM DRAIN SUMMARY

PT	Q10 IN SD	Q100 IN SD	Q10 INTO DI	Q100 INTO DI
A	4 CFS	9 CFS	4	9
B	22 CFS	34 CFS	18	25
C	55 CFS	55 CFS	33	21
D	55 CFS	55 CFS	0	0
E	86 CFS	86 CFS	31	31
F	52 CFS	52 CFS	0	0
G	86 CFS	86 CFS	0	0
H	138 CFS	138 CFS	0	0

SURFACE FLOW SUMMARY

PT	Q10	Q100
A	0 CFS	0 CFS
B	0 CFS	20 CFS
C	0 CFS	99 CFS
D	8 CFS	114 CFS
E	0 CFS	138 CFS
F	0 CFS	282 CFS
G	9 CFS	155 CFS
H	15 CFS	439 CFS



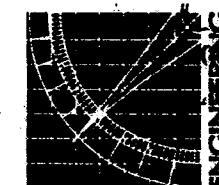
DECATUR/TROPICAL

070619.00

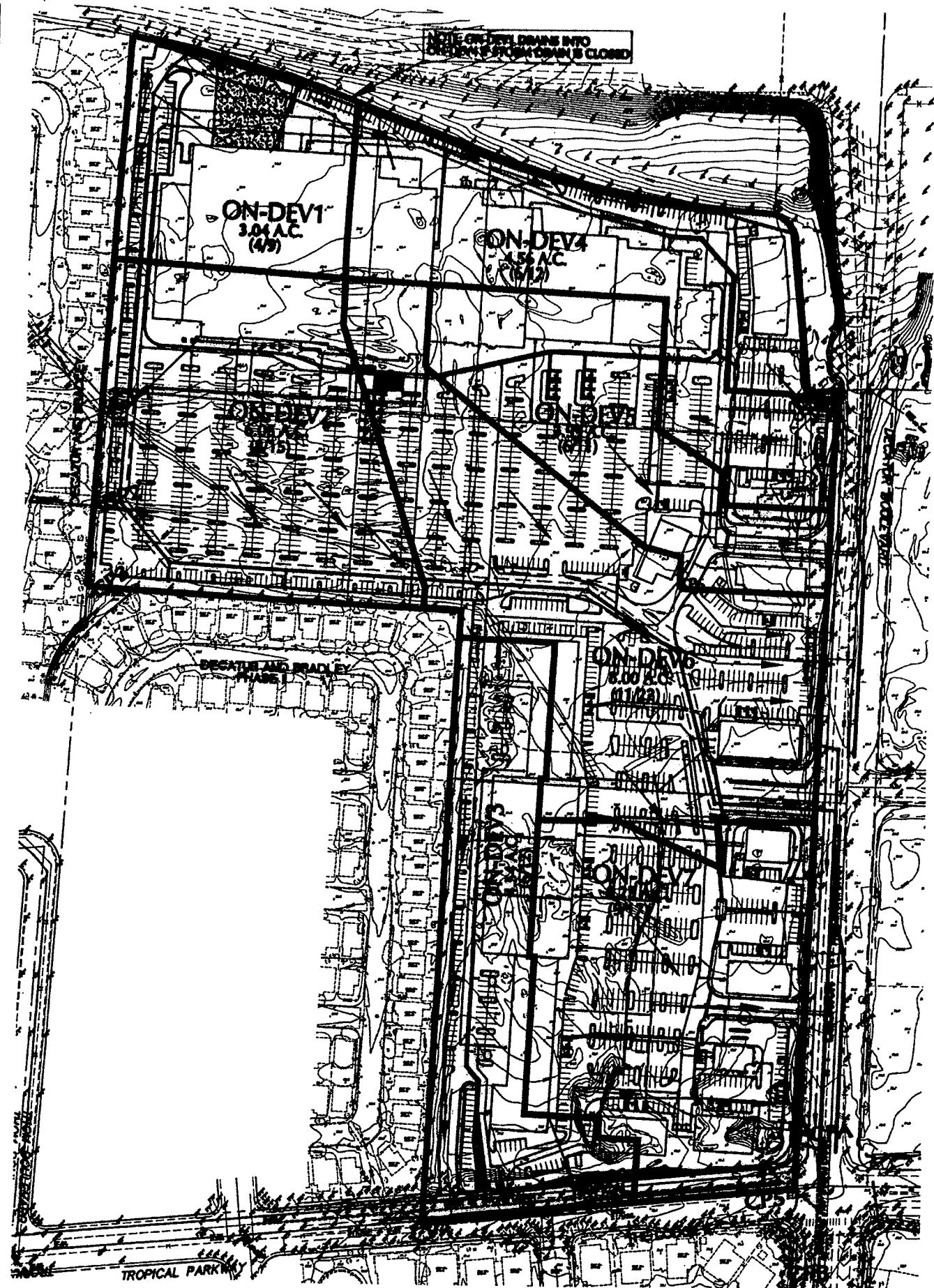
FIGURE 8
STORM DRAIN
SYSTEM (REVISED 01/08)

1"=100'

This grading plan is a
part of drainage study
which was received
on 1/24/2000 and rejected on 1/28/2000
13510 North Rancho Drive
Las Vegas, Nevada 89130
Telephone: (702) 648-9700
fax: (702) 648-4143



SOUTHWEST
LAND PLANNING • MAPPING • DEVELOPMENT



STREET FLOW SUMMARY								
STREET	Q10, CFS	Q100, CFS	d10, FT	d100, FT	v10, FPS	v100, FPS	10-YR, PKV	100-YR, PKV
TROPICAL PKWY	6	294	0.42	1.12	2.44	5.71	1.0	6.4
DECATUR BLVD	31 MAX	169 MAX	0.73	1.03 WEST HALF	2.88	3.88	2.1	4.0

FLOW SUMMARY			
CONC. POINT	Q10, CFS	Q100, CFS	COMMENT
CP1	18	45	FROM DRAINAGE STUDY FOR BRADLEY AND DECATUR
CP2	33	100	FROM DRAINAGE STUDY FOR BRADLEY AND DECATUR
CP3	N/A	N/A	MINIMAL DRAINAGE FROM THIS AREA
CP4	TOTAL= 52 SD= 52 SURFACE= 0	TOTAL= 334 SD= 52 SURFACE= 282	FROM DRAINAGE STUDY FOR THE LODGE III
CP5	TOTAL= 58 CFS SD= 52 CFS SURFACE= 6	TOTAL= 348 CFS SD= 52 CFS SURFACE= 294	CP4 ADDING ON-DEV3
CP6	59	160	CP1 & CP2 & ON-DEV2
CPA	95	231	FROM ON-DEV4 TO ON-DEV7 AND ON-DEV1 TO ON-DEV2
CPB	TOTAL= 153 CFS SURFACE= 18 CFS SD= 135 CFS	TOTAL= 877 CFS SURFACE= 439 CFS SD= 438 CFS	SURFACE AND STORM DRAIN (TOTAL)
ON-DEV1	4	9	INTO STORM DRAIN
ON-DEV2	8	15	INTO STORM DRAIN
ON-DEV3	6	12	TO TROPICAL PARKWAY
ON-DEV4	6	12	TO DECATUR
ON-DEV5	6	11	TO DECATUR
ON-DEV6	11	22	TO DECATUR
ON-DEV7	9	17	TO DECATUR

LEGEND

- EX-ON BASIN NAME
- CP1 CONCENTRATION POINT
- 21/45 Q(10) / Q(100) IN CFS
- FLOW DIRECTION
- BASIN BOUNDARY



DECATUR/TROPICAL

070619.00

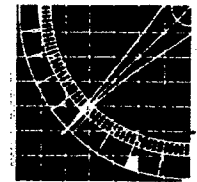
FIGURE 7

DEVELOPED CONDITION

(REVISED 01/08)

DRAINAGE MAP

1"=100' grading plan is a part of drainage study 4201, which was received on 1/25/00 from 3610 North Rancho Drive, Las Vegas, Nevada 89130 Telephone: (702) 648-9700 fax: (702) 648-4143



SOUTHWEST
LAND PLANNING • MAPPING • DEVELOPMENT

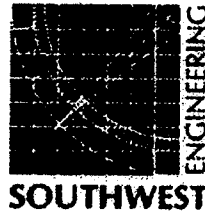
Rec'd 2/27/2008
DS 4261
A-25
Supp. Info
N/C.

**SUPPLEMENT TO
ADDENDUM #2 TO THE
TECHNICAL DRAINAGE STUDY
DECATUR / 215
SWE JOB # 070619**

February 27, 2008

**Prepared for:
AM PM Enterprises
655 Madison Avenue, 25th Floor
New York, New York 10021**

Prepared by:



**SOUTHWEST ENGINEERING
3610 North Rancho Drive
Las Vegas, Nevada 89130
Ph: (702) 648-9700 Fax (702) 648-9700**

February 27, 2008

Oh Sang Kwon, P.E.
Flood Control Project Engineer
Department of Public Works
Land Development Services
City of Las Vegas, Nevada 89101

**RE: Supplement to Addendum #2 to the Drainage Study for Decatur / 215-
located at the northwest corner of Decatur Blvd. and Tropical Pkwy.**

Dear Mr. Kwon:

This is in response to issues discussed in a February 20, 2008 meeting with Southwest Engineering and the City of Las Vegas (Robert Welch and Albert Sung). The City of Las Vegas is concerned about potential impacts to the existing flows downstream of the intersection of Tropical Parkway and Decatur Boulevard caused by the development of the project. It is important to add that the existing beltway, and existing improvements in Decatur Boulevard and Tropical Boulevard that were built with the Lodge III project have essentially established the drainage patterns at the intersection. The Lodge III site is located at the southwest corner of the intersection of Tropical Parkway and Decatur Boulevard.

The approved Lodge III Drainage Study (refer to attached excerpts) had established that the design flow for the 42-inch storm drain in Tropical Parkway is 52 cfs and the future design flow for the 54-inch storm drain in Decatur Boulevard is 149 cfs. The additional 97 cfs was assumed to enter the storm drain in Decatur Boulevard, north of Tropical Parkway, in the future. The Lodge III study also established that a total of 334 cfs would drain east in Tropical Parkway and a total of 444 cfs would drain south in Decatur Boulevard adjacent to the Lodge III site. Hence, the existing surface flow in Tropical Parkway is 282 cfs and the existing surface flow in Decatur Boulevard is 392 cfs at this location.

The Lodge III study essentially established the hydrologic design criteria in this area. The City of North Las Vegas had concurred with the conclusions of the Lodge III study. It is also important to note that the flows established in the Lodge III study somewhat deviate from the 1999 City of Las Vegas Northwest Neighborhood Study Update (see attached excerpt).

The following flows were established in the subject Decatur/215 drainage study:

Flows draining east in Tropical Parkway (west of Decatur):

Existing Q₁₀=59 cfs total (52 cfs in storm drain and 7 cfs surface flow)

Existing Q₁₀₀=350 cfs total (52 cfs in storm drain and 298 cfs surface flow)

Developed Q₁₀=58 cfs total (52 cfs in storm drain and 6 cfs surface flow)

Developed Q₁₀₀=346 cfs total (52 cfs in storm drain and 294 cfs surface flow)

Flows draining south in Decatur Boulevard (north of Tropical):

Existing Q₁₀=72 cfs total (72 cfs surface flow)

Existing Q₁₀₀=197 cfs total (197 cfs surface flow)

Developed Q₁₀=95 cfs total (86 cfs in storm drain and 9 cfs surface flow)

Developed $Q_{100}=241$ cfs total (86 cfs in storm drain and 155 cfs surface flow)

The flows draining to the intersection are not significantly impacted by the development of the Decatur/215 project. The existing and developed flows in Tropical Parkway (west of Decatur) are essentially the same. The flows in Decatur Boulevard (north of Tropical Parkway) have increased by 44 cfs in the 100-year storm, but the storm drain reduces the surface flow to 155 cfs. Hence, the development of the project will not cause significant negative impact the drainage patterns at the intersection of Tropical Parkway and Decatur Boulevard. The City of Las Vegas had requested that a flow split calculation be performed for this intersection. The previous drainage study did not provide a flow split calculation, but only provided calculations showing the maximum flow in Decatur if no split occurred:

The Pima County Method was utilized to estimate a flow split at the intersection for the developed condition. Since most of the flow in Decatur Boulevard (north of the intersection) is contained in the west side of the street-it was assumed that this flow would essentially continue south in Decatur. The flow draining east to the intersection in Tropical Parkway was assumed to split based on the Pima County Method. It was also assumed that no surface flow split would occur at the intersection for the 10-year storm. The flow split estimate (see attached calculations) yields the following flows downstream of the intersection:

Flows draining east in Tropical Parkway (east of Decatur):

Developed $Q_{10}=0$ cfs total (0 cfs surface flow)

Developed $Q_{100}=193$ cfs total (193 cfs surface flow)

Flows draining south in Decatur Boulevard (south of Tropical):

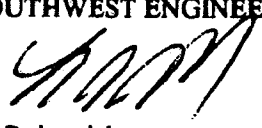
Developed $Q_{10}=153$ cfs total (138 cfs in storm drain and 15 cfs surface flow)

Developed $Q_{100}=394$ cfs total (138 cfs in storm drain and 256 cfs surface flow)

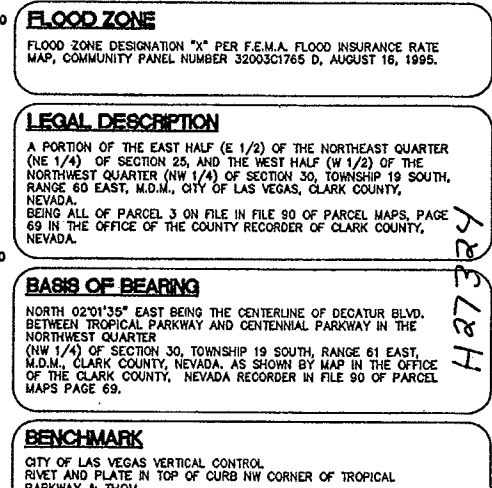
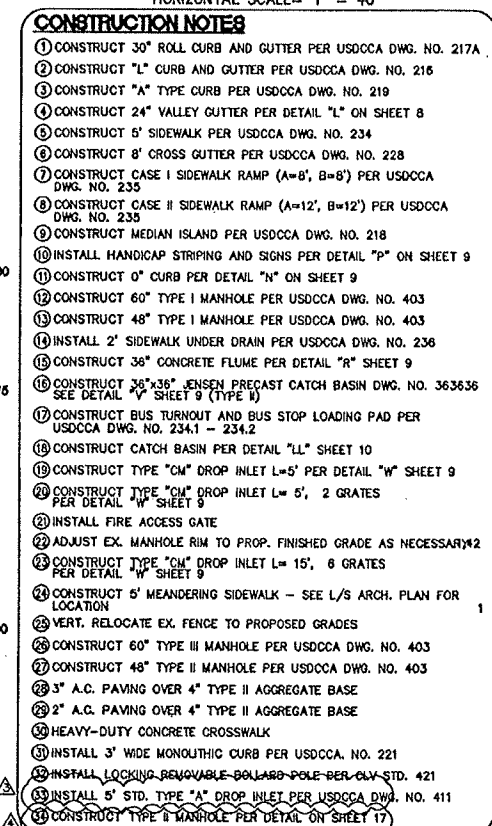
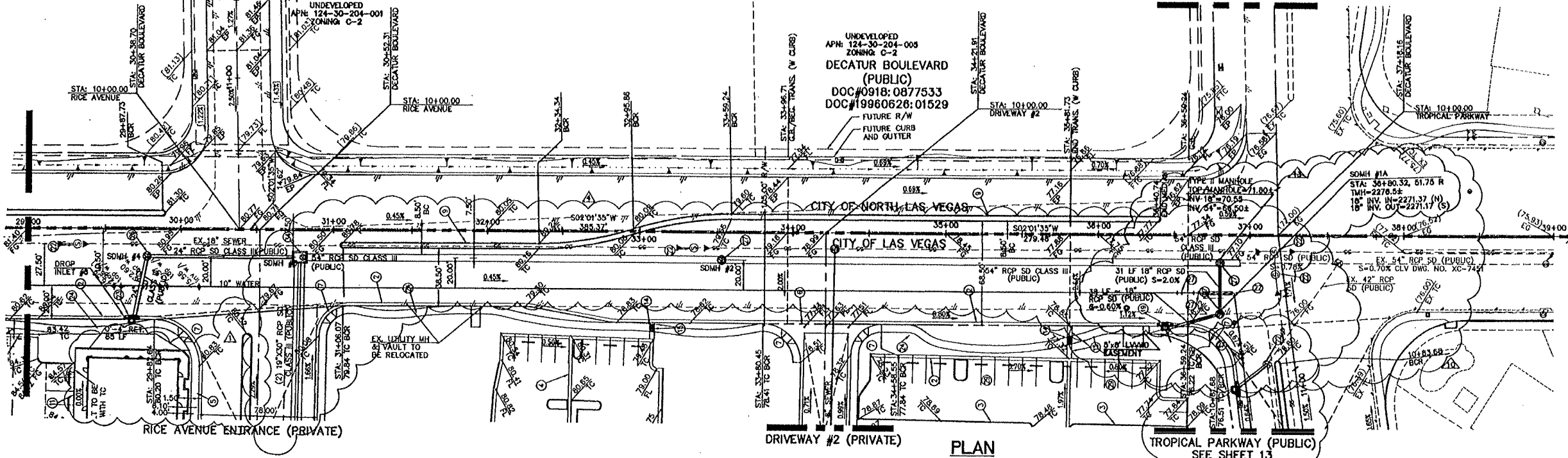
The resulting flow split estimate shows that the flows in Decatur, south of Tropical Parkway, are about the same as the previous surface flow of 392 cfs. Also, the storm drain design flow at this location (149 cfs) is not exceeded. For these reasons it is concluded that the development of the Decatur/215 project is consistent with established flows and drainage patterns in this vicinity.

If you have any questions or require additional information, please call me at Southwest Engineering at (702) 648-9700.

Sincerely,
SOUTHWEST ENGINEERING



Ed Rajnovich
Project Manager



NO.	DATE	BY	APPROV.	REVISION DESCRIPTION
A	07/20/08	KSA		REVISE STORM DRAIN & PROFILE
A	07/20/08	KSA		REVISE DROP INLET & S.D. / ADD SF
A	07/20/08	PMD		REVISE DRAINAGE CONSTRUCTION IN
A	07/20/08	PMD		REVISE STORM DRAINAGE INLET
A	07/20/08	PMD		REVISE STORM DRAINAGE INLET
A	07/20/08	PMD		REVISE STORM DRAINAGE INLET



STAMP DATE: 7-3-08



3610 North Rancho Drive
Las Vegas, Nevada 89130
Telephone: (702) 648-9700
Fax: (702) 648-4145

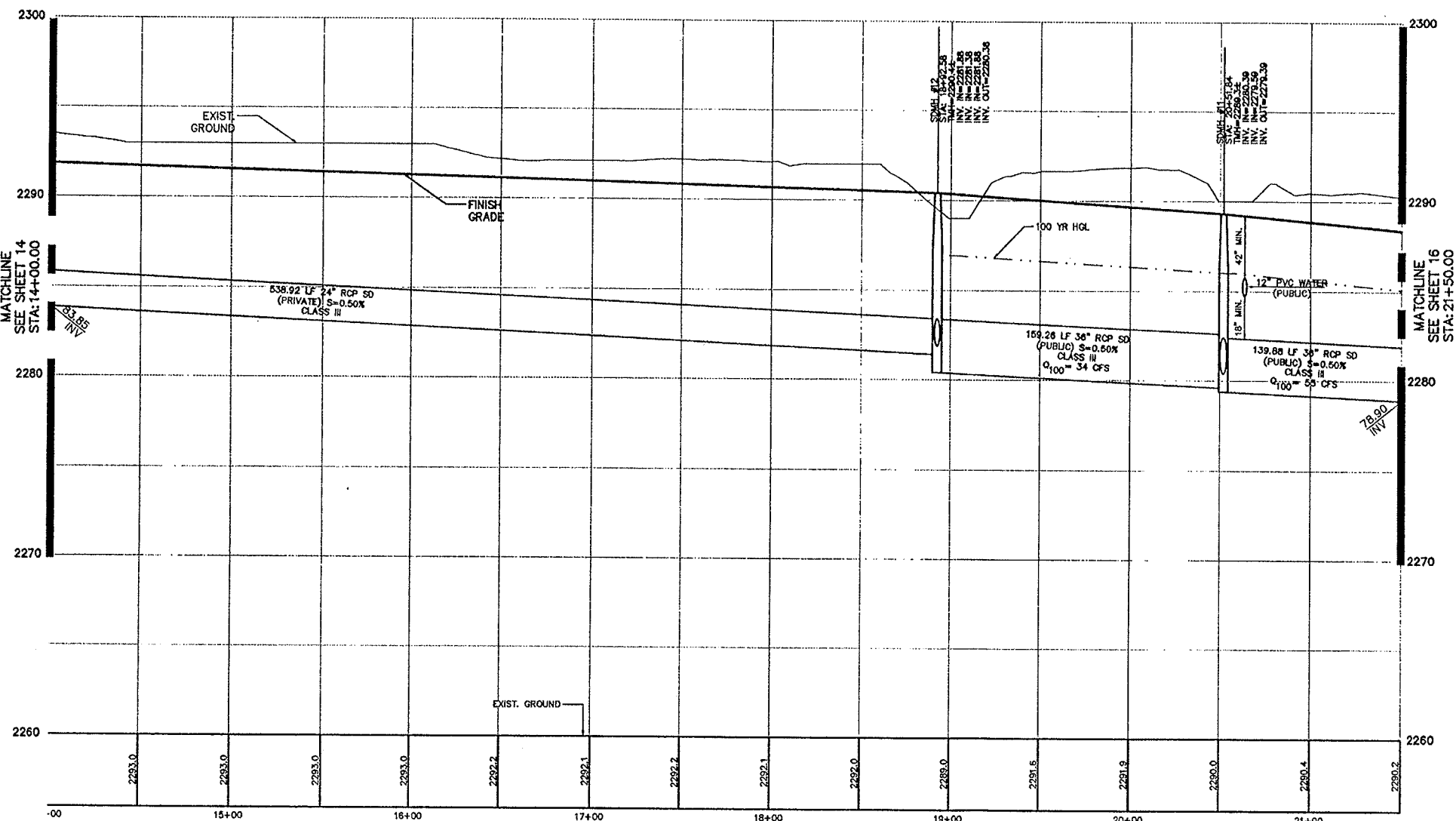
STREET AND STORM DRAIN PLAN AND PROFILE II

DECATUR BOULEVARD - STA: 29+00.00 TO STA: 39+00.00

DECATUR & TROPICAL

DECATUR 0101E IIC

TITLE	PROJECT
WORK ORDER NO: 070819	DESIGN BY: KDS
DRAWN BY: KDS/WK	DATE: Mar 03, 2009
SCALE:	

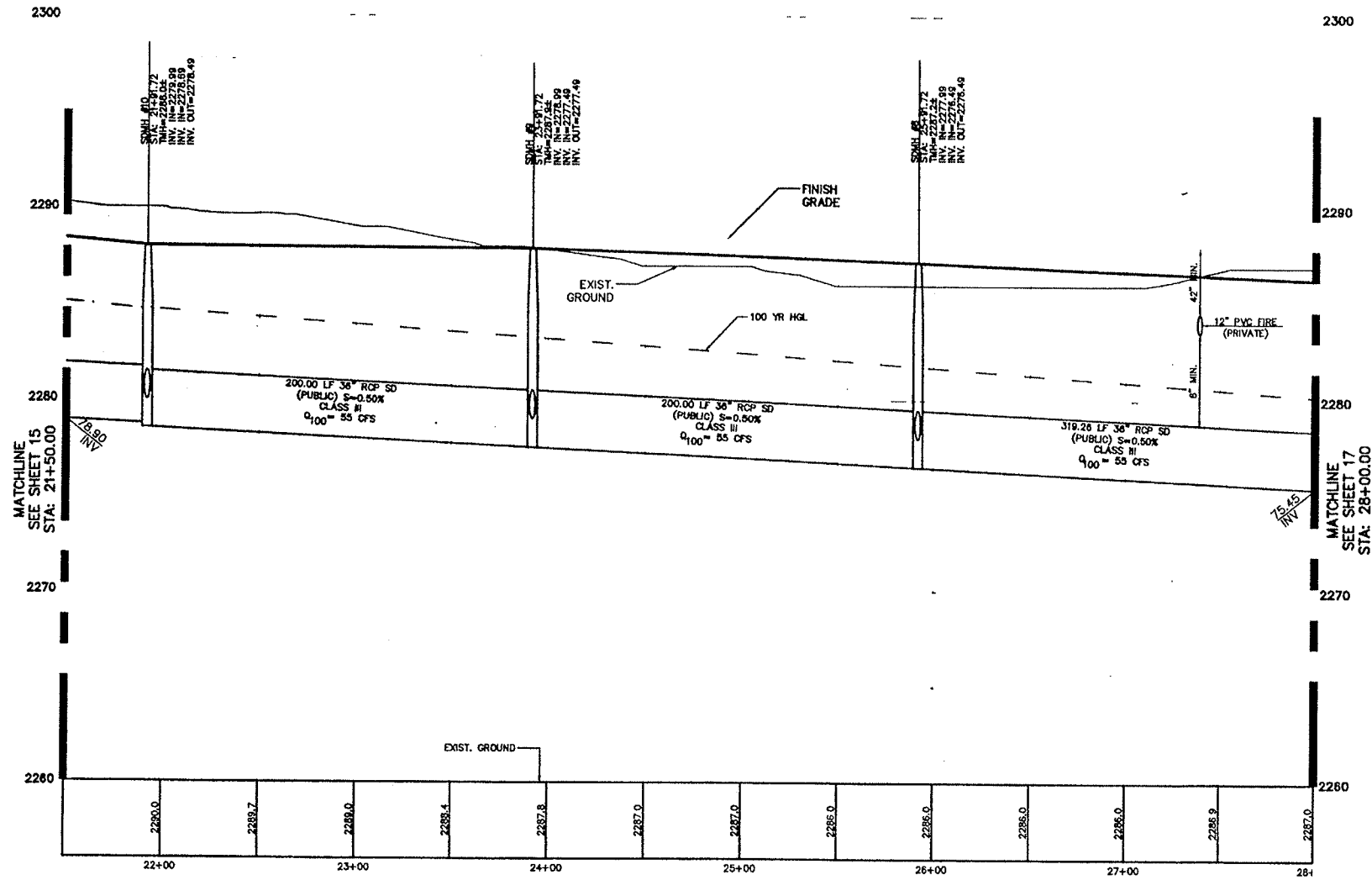
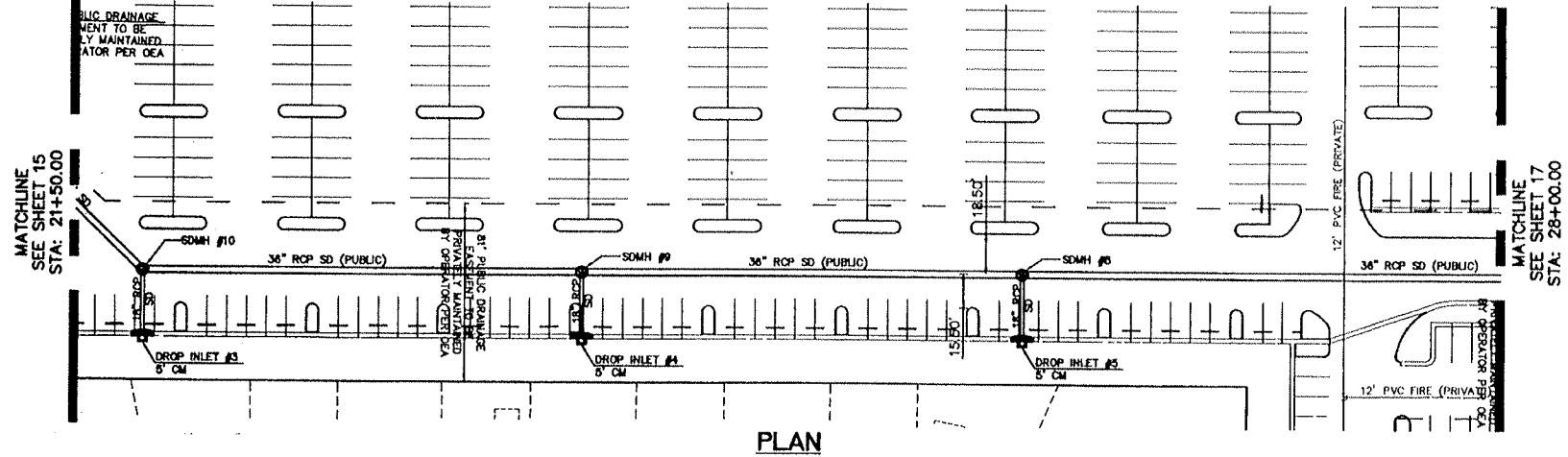


STA 14+00.00 TO STA 21+50.00
SCALE: HORIZONTAL = 1" = 40'
VERTICAL = 1" = 4'

**CALL BEFORE
YOU DO**



BENCHMARK
CITY OF LAS VEGAS VERTICAL CONTROL
PIVOT AND BENCH IN TOP OF CONCRETE CORNER OF TOWER



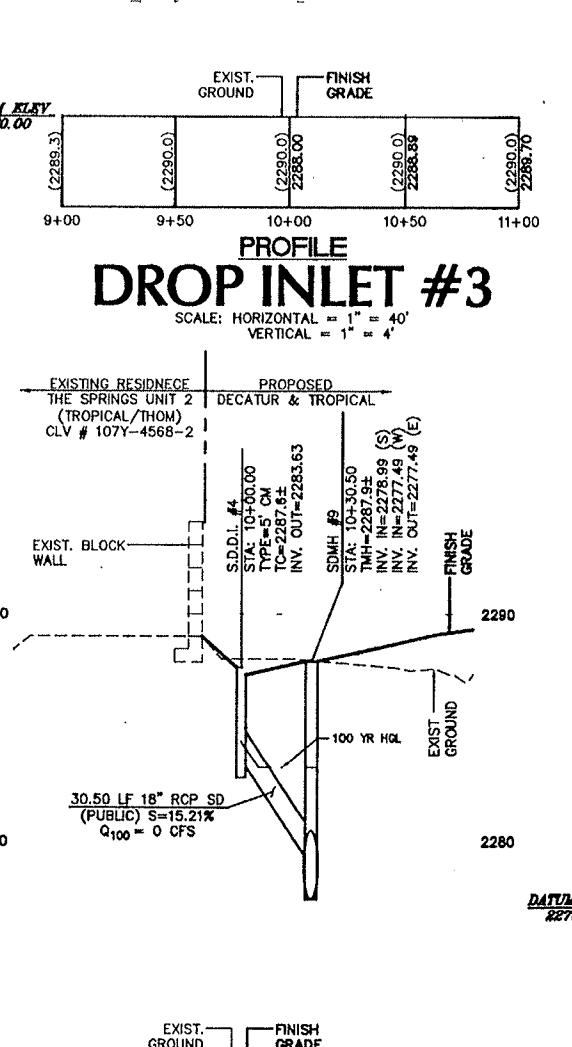
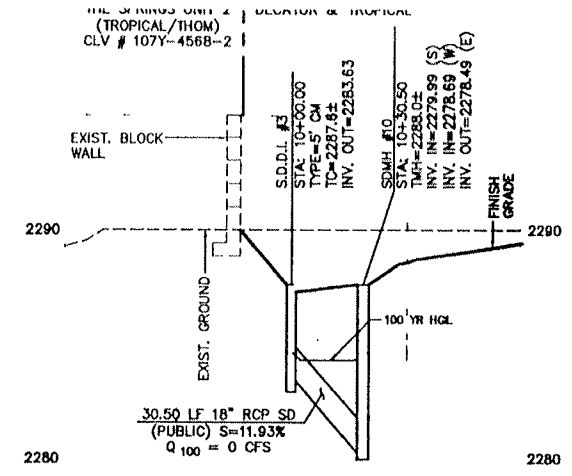
PROFILE
ONSITE STORM DRAIN
STA 22+00.00 TO STA 29+00.00
SCALE: HORIZONTAL = 1" = 40'
VERTICAL = 1" = 4'

STORM DRAIN MANHOLE TABLE			
SDMH	TYPE	NORTH/STA	EAST/OFFSET
#8	60" TYPE I	N 11020.4143	E 9252.5518
#9	60" TYPE I	N 11039.7904	E 9052.8209
#10	60" TYPE III	N 11050.1668	E 8853.0903

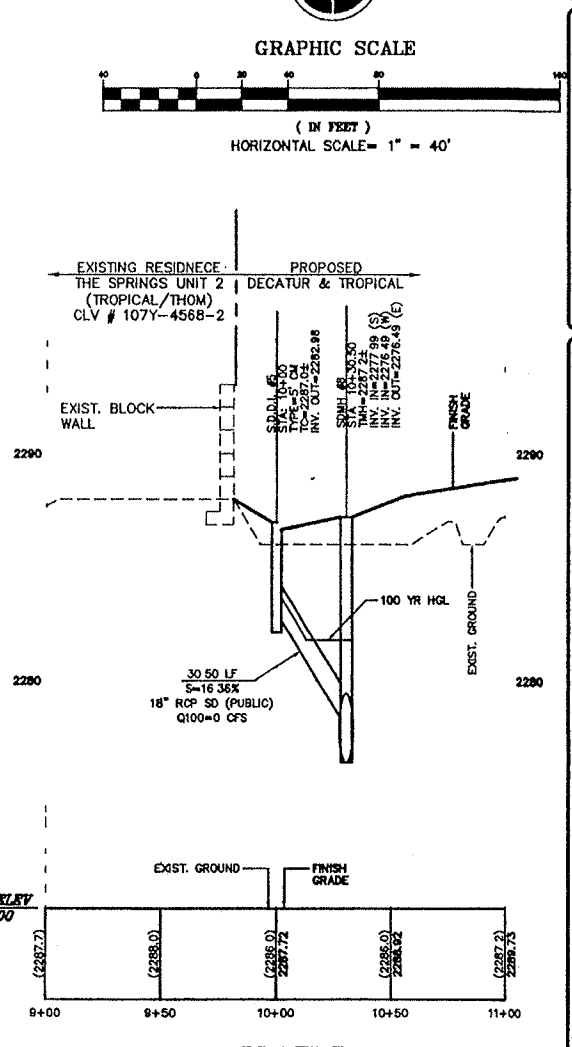
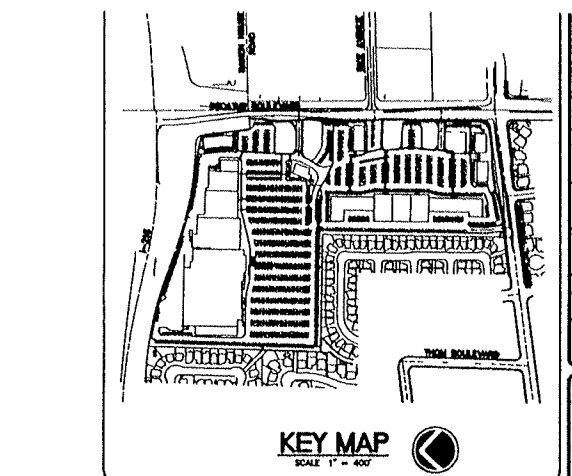
DROP INLET TABLE			
D.I.	TYPE	NORTH/STA	EAST/OFFSET
#3	4" CM	N 11019.7077	E 8851.5079
#4	4" CM	N 11009.3315	E 9051.2386
#5	4" CM	N 10998.9553	E 9250.9692

LEGEND

- DROP INLET
- CATCH BASIN
- STORM DRAIN (MAIN AND LATERALS)
- PROPOSED INVERT ELEVATION
- STORM DRAIN MANHOLE



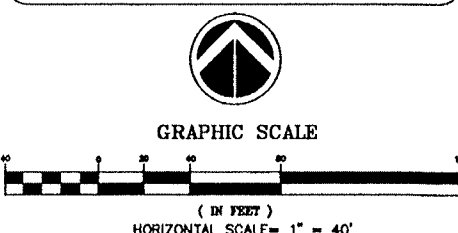
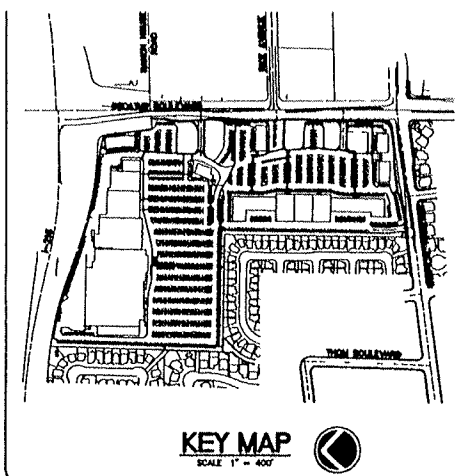
PROFILE
DROP INLET #4
SCALE: HORIZONTAL = 1" = 40'
VERTICAL = 1" = 4'



PROFILE
DROP INLET #5
SCALE: HORIZONTAL = 1" = 40'
VERTICAL = 1" = 4'

BASIS OF BEARING
NORTH 02°01'35" EAST BEING THE CENTERLINE OF DECATUR BLVD BETWEEN TROPICAL PARKWAY AND CENTENNIAL PARKWAY IN THE NORTHWEST QUARTER (NW 1/4) OF SECTION 30, TOWNSHIP 19 SOUTH, RANGE 61 EAST, M.D.M., CLARK COUNTY, NEVADA AS SHOWN BY MAP IN THE OFFICE OF THE CLARK COUNTY, NEVADA RECORDER IN FILE 90 OF PARCEL MAPS PAGE 69

BENCHMARK
CITY OF LAS VEGAS VERTICAL CONTROL
SHEET AND PLATE IN TOP OF CURB NW CORNER OF TROPICAL PARKWAY & THOM BOULEVARD
STATION: 81.90
ELEVATION: 697.5653 METERS (NAV88)
2288.60 FEET



ON-SITE PUBLIC STORM DRAIN PLAN AND PROFILE III
STA 21+50.00 TO 28+00.00, AND DROP INLETS 4-5
DECATUR & TROPICAL

DESIGNER
KDS

DRAWN BY
KDS/WK

DATE
Apr 15, 2008

SCALE
1" = 40'

SHEET 16 OF 45 SHEETS

CLY DWG NO.
107Y496

PROJECT
H27324

WORK ORDER NO.
070619

DESIGN BY
KDS

DRAWN BY
KDS/WK

DATE
Apr 15, 2008

SCALE
1" = 40'

SHEET 16 OF 45 SHEETS

CLY DWG NO.
107Y496

NOTICE TO CONTRACTOR I

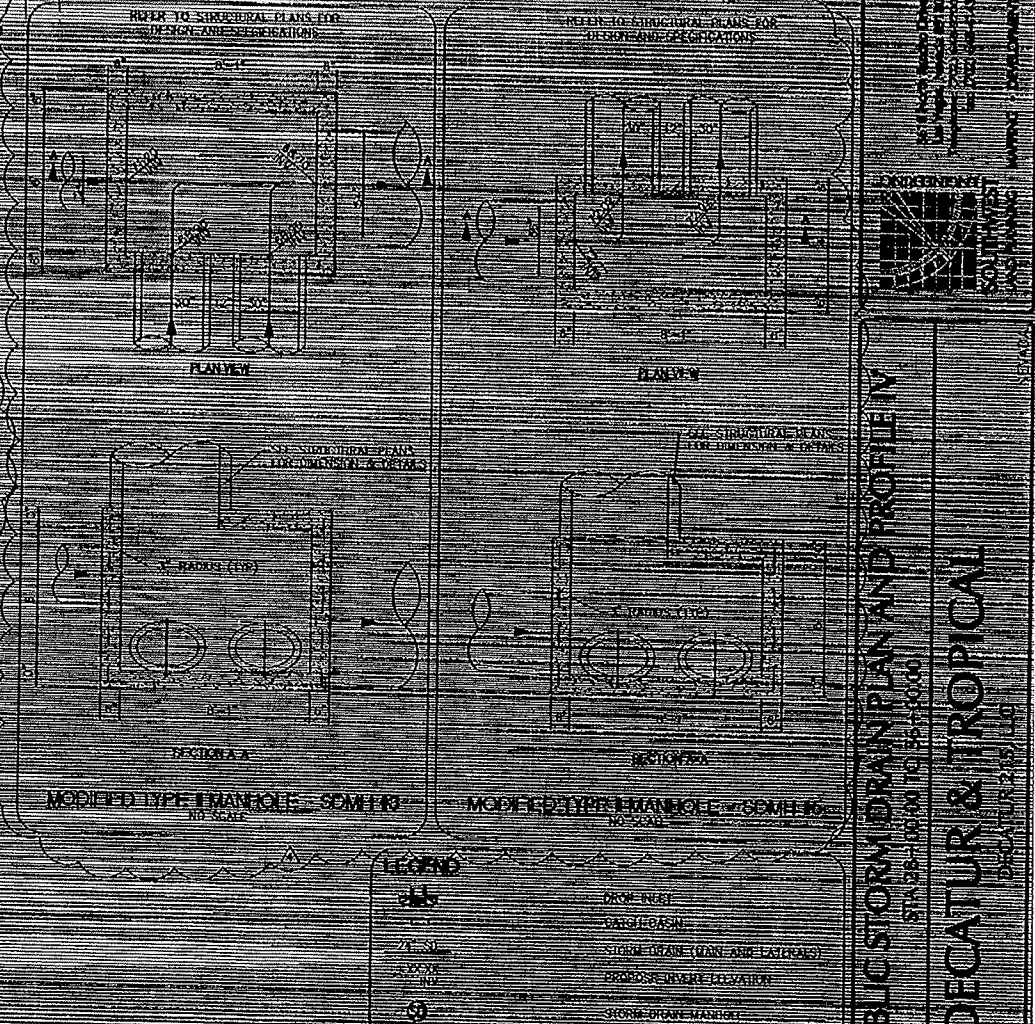
EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

CALL before you Dig

1-800-227-2600
UNDERGROUND SERVICE (USA)

CALL BEFORE YOU DIG

1-800-227-2600
UNDERGROUND SERVICE (USA)



ON-SITE PUBLIC STORM DRAIN PLAN AND PROFILE

DECATUR & TROPICAL

9330

UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE
IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO
THE EXACT VERTICAL AND HORIZONTAL LOCATION OF
EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING
CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL
EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES
RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT
OWN IN THEIR PROPER LOCATION.

CALL
before you

Dig
1=800-227-2600

CALL BEFORE
YOU DO
OVERHEAD

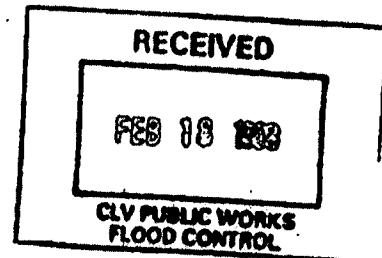
[illegible][illegible]

CITY OF EAST YAKA - VERTICAL CURVING
 ROAD AND BRIDGE IN TOP OF CREEK NW CORNER OF TROTTEN
 PARKWAY & 11TH HOLLOWAY

STATION: WY96
2050
ELEVATION: 697.6653 METERS (WY9685)

**BRADLEY AND DECATUR
BY HUNSAKER (1998)**

2173
625
\$250



ADDENDUM #2 TO THE TECHNICAL/CONCEPTUAL HYDROLOGY STUDY FOR BRADLEY DECATUR

CITY OF LAS VEGAS

Prepared by
AVANT HOMES
2325- Renaissance Drive
Las Vegas, Nevada 89119

Prepared by
HUNSEKER & ASSOCIATES NEVADA, INC.
101 N. Buffalo Drive, Suite 100
Las Vegas, Nevada 89128
(702) 242-4500
FAX (702) 242-2100

February 1998
HA Project Number 1922-2

File

CITY OF LAS VEGAS
INTER-OFFICE MEMORANDUM

DATE: March 10, 1998
Revised March 19, 1998

TO:
Diane Phomninh, P.E.
Land Development Services
Department of Public Works

FROM:
Dennis W. Stansky, P.E.
Flood Control Project Manager
Department of Public Works

SUBJECT: Drainage Study for:
Bradley/Decatur

COPIES TO:
Hunsaker & Associates Nevada, Inc.
Avante Homes
John McNellis, P.E.

FILE NO. E:\Depot\DSMEMOS\ds2173c.doc\khan\Re
ed\Depot\DSMEMOS\ds2173a.doc

FEMA Flood Zone	YES	No X
Proposed Storm Drain	YES	No X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	11/19/97	12/2/97	Not Accepted	\$250.00
2nd submittal	1/23/98	2/9/98	Not Accepted	\$250.00
3rd submittal	2/18/98	3/10/98	See Comments Below	\$250.00
Revised 3/19/98				
TOTAL FEES				\$750.00

REMARKS:

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

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

1. A maintenance and liability agreement for the proposed temporary berm and ditch along the north property line must be signed prior to receiving a final improvement plan approval grading permit.
2. The drainage easements and private streets must be labeled on the grading plans as public drainage easement to be privately maintained and granted as such by the Final Map.
3. The walls adjacent to the drainage easement between Lots 49 and 50 must be extended to and along the driveways of these lots to insure that the flows entering the easement will not impact these lots. The wall must be solid grouted and extent to a height of one course above the depth of flow in the roadway.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction.

PLANS SENT TO LAND DEVELOPMENT yes (initial)

END OF REMARKS
dws

T/R/S: 25 S/ 60 E/19
AREA G25

CITY OF LAS VEGAS		DATE:
INTER-OFFICE MEMORANDUM		March 10, 1998
TO: Diane Phomninh, P.E. Land Development Services Department of Public Works		FROM: Dennis W. Skransky, P.E. Flood Control Project Manager Department of Public Works
SUBJECT: Drainage Study for: Bradley/Decatur		COPIES TO: Hunsaker & Associates Nevada, Inc. Avante Homes John McNellis, P.E.
FILE NO. \\khan\lood\Depot\DSMEMOS\ds2173c.doc		
FEMA Flood Zone	YES	No X
Proposed Storm Drain	YES	No X

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1st Submittal	11/19/97	12/2/97	Not Accepted	\$250.00
2 nd submittal	1/23/98	2/9/98	Not Accepted	\$250.00
3 rd submittal	2/18/98	3/10/98	See Comments Below	\$250.00
TOTAL FEES				\$750.00

REMARKS:

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

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

1. A maintenance and liability agreement for the proposed temporary berm and ditch along the north property line must be signed prior to receiving a grading permit.
2. The drainage easements and private streets must be labeled on the grading plans as public drainage easement to be privately maintained and granted as such by the Final Map.
3. The walls adjacent to the drainage easement between Lots 49 and 50 must be extended to and along the driveways of these lots to insure that the flows entering the easement will not impact these lots. The wall must be solid grouted and extent to a height of one course above the depth of flow in the roadway.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the City of Las Vegas Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction.

PLANS SENT TO LAND DEVELOPMENT yes (initial)

END OF REMARKS
dws

T/R/S: 25 S/ 60 E/19
AREA G25

**HEC-1 ANALYSIS
FOR
FUTURE CONDITION**

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* SEPTEMBER 1990 *
* VERSION 4.0 *
* RUN DATE 02/12/1998 TIME 11:21:07 *
*****

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

```

PREPARED FOR:
AVANTE HOMES

FUTURE CONDITION

file name: decfut.dat
Project Number: 1922-2

Hunsaker & Associates Nevada
3151 W. Post Road
Las Vegas, Nevada 89118

* SON 3 VALUES *

22 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
NDATE 2 0 ENDING DATE
NOTIME 0055 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .06 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

*** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION- 1

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					
+	INT-1	.21	1 FLOW TIME	68. 3.83	183. 3.75
ROUTED TO					
+	RTE-1	.21	1 FLOW TIME	68. 3.92	183. 3.83
HYDROGRAPH AT					
+	INT-3	.12	1 FLOW TIME	29. 3.75	97. 3.67
2 COMBINED AT					
+	COM-1	.33	1 FLOW TIME	92. 3.83	265. 3.83
ROUTED TO					
+	RTE-2	.33	1 FLOW TIME	91. 3.92	263. 3.83
HYDROGRAPH AT					
+	INT-5	.11	1 FLOW TIME	52. 3.67	128. 3.67
2 COMBINED AT					
+	COM-2	.44	1 FLOW TIME	126. 3.92	368. 3.83
DIVERSION TO					
+	DINT6	.44	1 FLOW TIME	63. 3.92	184. 3.83
HYDROGRAPH AT					
+	DIV-1	.44	1 FLOW TIME	63. 3.92	184. 3.83
ROUTED TO					
+	RTE-3	.44	1 FLOW TIME	63. 4.00	181. 3.92
HYDROGRAPH AT					
+	INT-7	.11	1 FLOW TIME	44. 3.67	118. 3.67
2 COMBINED AT					
+	COM-3	.56	1 FLOW TIME	88. 4.00	278. 3.83
DIVERSION TO					
+	OINT8	.56	1 FLOW TIME	69. 4.00	220. 3.83
HYDROGRAPH AT					
+	DIV-2	.56	1 FLOW TIME	18. 4.00	58. 3.83

ROUTED TO	RTE-4	.56	1	FLOW TIME	18. 4.17	58. 3.92
HYDROGRAPH AT	INT-9	.13	1	FLOW TIME	66. 3.67	154. 3.67
2 COMBINED AT	COM-4	.68	1	FLOW TIME	67. 3.75	186. 3.75
DIVERSION TO	ON6	.68	1	FLOW TIME	41. 3.75	98. 3.75
HYDROGRAPH AT	DIV-3	.68	1	FLOW TIME	26. 3.75	88. 3.75
HYDROGRAPH AT	ON-SS	.01	1	FLOW TIME	7. 3.58	17. 3.58
2 COMBINED AT	COM-5	.70	1	FLOW TIME	33. 3.67	100. 3.75
HYDROGRAPH AT	ON-S1	.01	1	FLOW TIME	5. 3.58	11. 3.58
ROUTED TO	RTE-5	.01	1	FLOW TIME	5. 3.58	11. 3.58
HYDROGRAPH AT	ON-S2	.01	1	FLOW TIME	5. 3.58	12. 3.58
2 COMBINED AT	COM-6	.02	1	FLOW TIME	10. 3.58	23. 3.58
HYDROGRAPH AT	ON-S3	.01	1	FLOW TIME	4. 3.58	11. 3.58
ROUTED TO	RTE-6	.01	1	FLOW TIME	4. 3.67	10. 3.67
HYDROGRAPH AT	ON-S4	.01	1	FLOW TIME	5. 3.58	12. 3.58
2 COMBINED AT	COM-7	.02	1	FLOW TIME	9. 3.67	22. 3.58
2 COMBINED AT	COM-8	.03	1	FLOW TIME	18. 3.58	45. 3.58
HYDROGRAPH AT	ON-M1	.02	1	FLOW TIME	16. 3.58	32. 3.58

← COMBINE DIV. OFFSITE FLOW W/ ON-SS
DRAIN. ESRI @ WATER MEADOW

← DRAIN. ESRI @ MONARCH CREEK

3 COMBINED AT	COM-9	.75	1	FLOW TIME	65. 3.67	168. 3.67
HYDROGRAPH AT	ON-C1	.04	1	FLOW TIME	30. 3.58	60. 3.58
2 COMBINED AT	COM-10	.79	1	FLOW TIME	95. 3.58	224. 3.58
HYDROGRAPH AT	INT-2	.12	1	FLOW TIME	49. 3.75	124. 3.75
ROUTED TO	RTE-7	.12	1	FLOW TIME	48. 3.83	123. 3.75
HYDROGRAPH AT	INT-4	.12	1	FLOW TIME	37. 3.67	108. 3.67
2 COMBINED AT	COM-11	.24	1	FLOW TIME	81. 3.83	226. 3.75
DIVERSION TO	TENEYA	.24	1	FLOW TIME	41. 3.83	113. 3.75
HYDROGRAPH AT	DIV-4	.24	1	FLOW TIME	41. 3.83	113. 3.75
ROUTED TO	RTE-8	.24	1	FLOW TIME	40. 3.92	112. 3.83
HYDROGRAPH AT	RTV-18	.00	1	FLOW TIME	63. 3.92	184. 3.83
ROUTED TO	RTE-9	.00	1	FLOW TIME	62. 3.92	183. 3.83
HYDROGRAPH AT	INT-6	.11	1	FLOW TIME	31. 3.75	95. 3.67
3 COMBINED AT	COM-12	.35	1	FLOW TIME	126. 3.92	375. 3.83
DIVERSION TO	TORRP	.35	1	FLOW TIME	63. 3.92	187. 3.83
HYDROGRAPH AT	DIV-5	.35	1	FLOW TIME	63. 3.92	187. 3.83

ROUTED TO	RTE-10	.35	1	FLOW TIME	61. 4.00	184. 3.83
HYDROGRAPH AT	RTV-19	.00	1	FLOW TIME	69. 4.00	220. 3.83
ROUTED TO	RTE-11	.00	1	FLOW TIME	69. 4.00	217. 3.83
HYDROGRAPH AT	INT-8	.12	1	FLOW TIME	41. 3.75	115. 3.67
3 COMBINED AT	COM-13	.47	1	FLOW TIME	155. 4.00	499. 3.83
DIVERSION TO	JONES	.47	1	FLOW TIME	78. 4.00	249. 3.83
HYDROGRAPH AT	DIV-6	.47	1	FLOW TIME	78. 4.00	249. 3.83
ROUTED TO	RTE-12	.47	1	FLOW TIME	76. 4.08	246. 3.92
HYDROGRAPH AT	INT-10	.14	1	FLOW TIME	65. 3.67	157. 3.67
2 COMBINED AT	COM-14	.60	1	FLOW TIME	107. 4.00	358. 3.83
DIVERSION TO	BRAD	.60	1	FLOW TIME	53. 4.00	184. 3.83
HYDROGRAPH AT	DIV-7	.60	1	FLOW TIME	53. 4.00	184. 3.83
ROUTED TO	RTE-13	.60	1	FLOW TIME	53. 4.00	180. 3.83
HYDROGRAPH AT	ELEM-1	.01	1	FLOW TIME	12. 3.50	25. 3.50
HYDROGRAPH AT	ELEM-2	.01	1	FLOW TIME	13. 3.50	25. 3.50
HYDROGRAPH AT	ELEM-3	.00	1	FLOW TIME	4. 3.58	8. 3.58
4 COMBINED AT	COM-15	.63	1	FLOW TIME	58. 4.00	197. 3.83

ROUTED TO	RTE-14	.63	1	FLOW TIME	58. 4.08	194. 3.92
DIVERSION TO	TJ	.63	1	FLOW TIME	58. 4.08	194. 3.92
HYDROGRAPH AT	DIV-8	.63	1	FLOW TIME	0. .08	0. .08
HYDROGRAPH AT	ON-S6	.01	1	FLOW TIME	5. 3.58	11. 3.58
HYDROGRAPH AT	RTV-20	.00	1	FLOW TIME	41. 3.75	98. 3.75
2 COMBINED AT	COM-16	.01	1	FLOW TIME	45. 3.67	105. 3.75
HYDROGRAPH AT	ON-S7	.01	1	FLOW TIME	4. 3.58	10. 3.58
2 COMBINED AT	COM-17	.01	1	FLOW TIME	48. 3.67	110. 3.75
HYDROGRAPH AT	ON-S8	.01	1	FLOW TIME	5. 3.50	12. 3.50
2 COMBINED AT	COM-18	.02	1	FLOW TIME	52. 3.67	118. 3.67
HYDROGRAPH AT	ON-S9	.01	1	FLOW TIME	8. 3.58	16. 3.58
2 COMBINED AT	COM-19	.03	1	FLOW TIME	58. 3.67	131. 3.67
HYDROGRAPH AT	RTV-21	.00	1	FLOW TIME	58. 4.08	194. 3.92
2 COMBINED AT	COM-20	.03	1	FLOW TIME	182. 3.67	386. 3.83
HYDROGRAPH AT	ON-S10	.00	1	FLOW TIME	4. 3.58	8. 3.58
HYDROGRAPH AT	ON-S11	.01	1	FLOW TIME	11. 3.58	21. 3.58

+ 2 COMBINED AT	COM-21	.02	1	FLOW TIME	15. 3.58	28. 3.58
+ 2 COMBINED AT	COM-22	.05	1	FLOW TIME	115. 3.67	322. 3.83

1

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

ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	INTERPOLATED TO COMPUTATION INTERVAL			
						DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
FOR PLAN - 1 RATIO- .57									
	RTE-1 MAWE	3.18	68.13	235.16	.55	5.00	68.11	235.00	.55
CONTINUITY SUMMARY (AC-FT) - INFLOW- .5984E+01 EXCESS- .0000E+00 OUTFLOW- .5999E+01 BASIN STORAGE- .6090E-03 PERCENT ERROR- .3									
FOR PLAN - 1 RATIO- 1.00									
	RTE-1 MAWE	2.20	182.66	229.82	1.47	5.00	182.54	230.00	1.47
CONTINUITY SUMMARY (AC-FT) - INFLOW- .1610E+02 EXCESS- .0000E+00 OUTFLOW- .1614E+02 BASIN STORAGE- .6493E-03 PERCENT ERROR- .2									
FOR PLAN - 1 RATIO- .57									
	RTE-2 MAWE	2.81	91.48	235.54	.48	5.00	90.56	235.00	.48
CONTINUITY SUMMARY (AC-FT) - INFLOW- .8292E+01 EXCESS- .0000E+00 OUTFLOW- .8292E+01 BASIN STORAGE- .1575E-02 PERCENT ERROR- .0									
FOR PLAN - 1 RATIO- 1.00									
	RTE-2 MAWE	1.80	264.22	232.09	1.35	5.00	263.43	230.00	1.35
CONTINUITY SUMMARY (AC-FT) - INFLOW- .2347E+02 EXCESS- .0000E+00 OUTFLOW- .2349E+02 BASIN STORAGE- .1524E-02 PERCENT ERROR- .1									
FOR PLAN - 1 RATIO- .57									
	RTE-3 MAWE	3.10	62.76	239.95	.26	5.00	62.74	240.00	.26
CONTINUITY SUMMARY (AC-FT) - INFLOW- .6108E+01 EXCESS- .0000E+00 OUTFLOW- .6103E+01 BASIN STORAGE- .1925E-02 PERCENT ERROR- .1									
FOR PLAN - 1 RATIO- 1.00									
	RTE-3 MAWE	2.15	183.09	234.35	.71	5.00	181.42	235.00	.71
CONTINUITY SUMMARY (AC-FT) - INFLOW- .1669E+02 EXCESS- .0000E+00 OUTFLOW- .1671E+02 BASIN STORAGE- .1780E-02 PERCENT ERROR- .1									
FOR PLAN - 1 RATIO- .57									
	RTE-4 MAWE	5.00	18.29	246.76	.07	5.00	18.05	250.00	.07
CONTINUITY SUMMARY (AC-FT) - INFLOW- .1983E+01 EXCESS- .0000E+00 OUTFLOW- .1983E+01 BASIN STORAGE- .1389E-02 PERCENT ERROR- .1									
FOR PLAN - 1 RATIO- 1.00									
	RTE-4 MAWE	3.18	58.15	235.53	.18	5.00	57.92	235.00	.18
CONTINUITY SUMMARY (AC-FT) - INFLOW- .5396E+01 EXCESS- .0000E+00 OUTFLOW- .5400E+01 BASIN STORAGE- .1421E-02 PERCENT ERROR- .1									
FOR PLAN - 1 RATIO- .57									

RTE-5	MAVE	1.77	4.74	218.03	.69	5.00	4.52	215.00	.69
CONTINUITY SUMMARY (AC-FT) - INFLOW= .2836E+00 EXCESS= .0000E+00 OUTFLOW= .2848E+00 BASIN STORAGE= .8535E-05 PERCENT ERROR= -.4									
FOR PLAN = 1 RATIO= 1.00									
RTE-5	MAVE	1.32	11.07	216.68	1.70	5.00	10.94	215.00	1.70
CONTINUITY SUMMARY (AC-FT) - INFLOW= .6954E+00 EXCESS= .0000E+00 OUTFLOW= .6992E+00 BASIN STORAGE= .1035E-04 PERCENT ERROR= -.6									
FOR PLAN = 1 RATIO= .57									
RTE-6	MAVE	2.68	4.38	219.36	.70	5.00	4.34	220.00	.70
CONTINUITY SUMMARY (AC-FT) - INFLOW= .2689E+00 EXCESS= .0000E+00 OUTFLOW= .2708E+00 BASIN STORAGE= .2791E-04 PERCENT ERROR= -.7									
FOR PLAN = 1 RATIO= 1.00									
RTE-6	MAVE	1.99	10.33	217.99	1.71	5.00	10.06	220.00	1.71
CONTINUITY SUMMARY (AC-FT) - INFLOW= .6582E+00 EXCESS= .0000E+00 OUTFLOW= .6641E+00 BASIN STORAGE= .3007E-04 PERCENT ERROR= -.7									
FOR PLAN = 1 RATIO= .57									
RTE-7	MAVE	3.49	47.98	229.95	.59	5.00	47.97	230.00	.59
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3893E+01 EXCESS= .0000E+00 OUTFLOW= .3908E+01 BASIN STORAGE= .5396E-03 PERCENT ERROR= -.4									
FOR PLAN = 1 RATIO= 1.00									
RTE-7	MAVE	2.38	123.62	229.30	1.55	5.00	122.68	225.00	1.55
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1015E+02 EXCESS= .0000E+00 OUTFLOW= .1019E+02 BASIN STORAGE= .6097E-03 PERCENT ERROR= -.4									
FOR PLAN = 1 RATIO= .57									
RTE-8	MAVE	3.74	40.20	235.71	.27	5.00	39.94	235.00	.27
CONTINUITY SUMMARY (AC-FT) - INFLOW= .3384E+01 EXCESS= .0000E+00 OUTFLOW= .3396E+01 BASIN STORAGE= .1047E-02 PERCENT ERROR= -.4									
FOR PLAN = 1 RATIO= 1.00									
RTE-8	MAVE	2.47	112.69	229.56	.72	5.00	112.27	230.00	.72
CONTINUITY SUMMARY (AC-FT) - INFLOW= .9210E+01 EXCESS= .0000E+00 OUTFLOW= .9222E+01 BASIN STORAGE= .1383E-02 PERCENT ERROR= -.1									
FOR PLAN = 1 RATIO= .57									
RTE-9	MAVE	1.54	62.94	237.74	-1.00	5.00	62.30	235.00	-1.00
FOR PLAN = 1 RATIO= 1.00									
RTE-9	MAVE	1.03	183.40	231.29	-1.00	5.00	182.72	230.00	-1.00
FOR PLAN = 1 RATIO= .57									
RTE-10	MAVE	2.97	62.70	240.85	.32	5.00	61.41	240.00	.32

CONTINUITY SUMMARY (AC-FT) - INFLOW- .5960E+01 EXCESS- .0000E+00 OUTFLOW- .5955E+01 BASIN STORAGE- .2303E-02 PERCENT ERROR- .0

FOR PLAN - 1 RATIO- 1.00
RTE-10 MAHE 2.05 186.36 233.03 .90 5.00 184.17 230.00 .90

CONTINUITY SUMMARY (AC-FT) - INFLOW- .1657E+02 EXCESS- .0000E+00 OUTFLOW- .1658E+02 BASIN STORAGE- .2310E-02 PERCENT ERROR- .1

FOR PLAN - 1 RATIO- .57
RTE-11 MAHE 1.68 69.17 242.66 -1.00 5.00 68.81 240.00 -1.00

FOR PLAN - 1 RATIO- 1.00
RTE-11 MAHE 1.08 218.90 232.30 -1.00 5.00 217.13 230.00 -1.00

FOR PLAN - 1 RATIO- .57
RTE-12 MAHE 3.03 76.71 247.01 .33 5.00 75.86 245.00 .33

CONTINUITY SUMMARY (AC-FT) - INFLOW- .8303E+01 EXCESS- .0000E+00 OUTFLOW- .8277E+01 BASIN STORAGE- .3548E-02 PERCENT ERROR- .3

FOR PLAN - 1 RATIO- 1.00
RTE-12 MAHE 1.89 246.86 234.70 .92 5.00 246.11 235.00 .92

CONTINUITY SUMMARY (AC-FT) - INFLOW- .2288E+02 EXCESS- .0000E+00 OUTFLOW- .2288E+02 BASIN STORAGE- .3518E-02 PERCENT ERROR- .0

FOR PLAN - 1 RATIO- .57
RTE-13 MAHE 1.83 53.26 243.41 .21 5.00 53.11 245.00 .21

CONTINUITY SUMMARY (AC-FT) - INFLOW- .6641E+01 EXCESS- .0000E+00 OUTFLOW- .6642E+01 BASIN STORAGE- .1556E-02 PERCENT ERROR- .0

FOR PLAN - 1 RATIO- 1.00
RTE-13 MAHE 1.21 183.21 232.20 .55 5.00 179.55 230.00 .55

CONTINUITY SUMMARY (AC-FT) - INFLOW- .1757E+02 EXCESS- .0000E+00 OUTFLOW- .1758E+02 BASIN STORAGE- .1538E-02 PERCENT ERROR- .1

FOR PLAN - 1 RATIO- .57
RTE-14 MAHE 2.69 57.96 246.53 .25 5.00 57.88 245.00 .25

CONTINUITY SUMMARY (AC-FT) - INFLOW- .8313E+01 EXCESS- .0000E+00 OUTFLOW- .8321E+01 BASIN STORAGE- .2851E-02 PERCENT ERROR- .1

FOR PLAN - 1 RATIO- 1.00
RTE-14 MAHE 1.65 196.17 233.64 .63 5.00 194.40 235.00 .63

CONTINUITY SUMMARY (AC-FT) - INFLOW- .2110E+02 EXCESS- .0000E+00 OUTFLOW- .2113E+02 BASIN STORAGE- .3001E-02 PERCENT ERROR- .1

**EXCERPTS FROM THE LODGE III
TECHNICAL DRAINAGE STUDY**

RECEIVED

OCT 16 2000

CLV PUBLIC WORKS
FLOOD CONTROL

625 2785
TECHNICAL DRAINAGE STUDY \$250

FOR

BPH

THE LODGE III

CITY OF LAS VEGAS, NEVADA

JOB #240100

Local SA

42" in Tropical / 54" in Decatur / 24" El Campo Grande

Prepared by:

Carter-Burgess

6655 Bermuda Road
Las Vegas, Nevada 89119

Submitted to:

City of Las Vegas Public Works
731 S. Fourth Street
Las Vegas, NV 89101

October 2000

3. Analysis

The HEC-1 Flood Hydrograph Package was used to compute the storm water peaks and FlowMaster PE was used to determine the depths of flow on the surface streets. StormCadd was used to analyze the storm drain system.

D. FACILITY DESIGN CALCULATIONS

The interior streets were analyzed for depth, velocity, and depth times velocity. The offsite street flows were taken from adjacent studies for interim flows. The results are shown below. The calculations are included in the Appendix.

TABLE 3
ONSITE STREET FLOW SUMMARY

STREET	SLOPE (%)	FLOW Q10/Q100 (cfs)	DEPTH D10/D100 (ft)	VELOCITY V10/V100 (ft/s)	D x V
Friar Tuck	0.50	5/11	0.36/0.45	1.9/2.2	0.7/1.0
Edwardian	0.50	5/10	0.36/0.44	1.9/2.1	0.7/0.9
Maiden	0.50	5/10	0.36/0.44	1.9/2.1	0.7/0.9
Lionesse	0.50	5/10	0.36/0.44	1.9/2.1	0.7/0.9
Charlemagne	0.50	5/10	0.36/0.44	1.9/2.1	0.7/0.9
Mad Marion	0.50	20/42	0.55/0.66	2.3/2.9	1.2/1.9
Spiers	1.63	24/52	0.48/0.60	4.1/4.6	2.0/2.7
Tropical	0.60	-282	-1.11	-15.1	-15.7
El Campo Grande	0.40	-236	-1.15	-14.7	-15.4
Decatur	0.69	-392	-1.21	-15.6	-16.8

52 cfs assumed in storm drain

The offsite streets were also analyzed for the maximum future flow determined in Reference #1.

TABLE 4
REFERENCE #1 OFFSITE STREET FLOW SUMMARY

STREET	SLOPE (%)	FLOW Q10/Q100 (cfs)	DEPTH d10/d100 (ft)	VELOCITY V10/V100 (ft/s)	D x V
Tropical	0.60	349/1220	1.19/1.98	5.6/9.1	6.6/17.9
El Campo Grande	0.40	212/674	1.11/1.79	4.5/7.0	5.0/12.5
Decatur	0.69	346/1460	1.16/1.97	5.3/9.4	6.2/18.3

* Does not include storm drain

Storm Drain System

The 42-inch Reinforced Concrete Pipe (RCP) in Tropical Parkway at the northwest corner of the site has been extended east to Decatur Boulevard. The design flow of this storm drain is 52 cfs. At Decatur Boulevard the storm drain is increased to a 54-inch RCP. A stub is directed to the north to tie into a future storm drain in Decatur Boulevard north of Tropical Parkway. This pipe will add another 70 cfs into the system in the future. The 54-inch RCP will extend to El Campo Grande. The proposed site to the south is planning on continuing this pipe southward to Ann Road. The timing on this construction is not known at this time. In order to proceed without that tie in, a 36-inch RCP will be directed eastward to keep the natural drainage pattern. This pipe is sized for the 52 cfs from the 42-inch RCP in Tropical Parkway. The 54-inch RCP will have a plug to the south. The design flow of the 54-inch RCP is 149 cfs. A 24-inch RCP is proposed in El Campo Grande by the developer to the south. This pipe will tie into the future 54-inch RCP in Decatur Boulevard. The storm drain system has been sized in Reference #1.

E NUISANCE FLOWS

The onsite nuisance flow will drain through the interior streets to El Campo Grande.

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM		DATE: March 15, 2001
TO: Land Development Services Department of Public Works		FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for:	
	The Lodge III	
Cross Streets:	SWC Decatur Boulevard & Tropical Parkway	
FILE NO.:	F:\Depot\DSMEMOS\DS2785D.doc	
Parcel Number:	125-25-701-009 to -013	
Zoning Action:		
FEMA Flood Zone	YES	No X
Proposed Storm Drain	YES X	No
COPIES TO:		
		Signature Homes
		Carter Burgess
		Charl Edleman, P.E. DEVCO
		City of North Las Vegas; Steve Casmus

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES
1 st Submittal	10/16/2000	10/26/2000	Not Acceptable	\$250.00
2 nd Submittal	1/30/2001	2/13/2001	Not Acceptable	\$250.00
3 rd Submittal	2/20/2001	2/20/2001	Needs CNLV Concurrence	\$250.00
CNLV	3/15/2001	3/15/2001	Concurred	N/C
TOTAL FEES (LDDRS):				\$750.00

REMARKS:

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

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

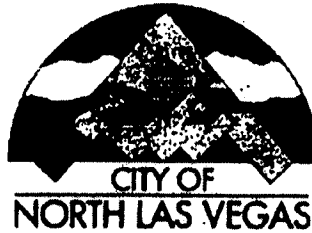
NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Amendment and accepted by the CLV Flood Control Section. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the City of Las Vegas reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

END OF REMARKS
B&H, ays

T/R/S: T19S/R60E/25
AREA G-25

Mayor
Michael L. Montandon

Council Members
William E. Robinson
John K. Rhodes
Stephanie S. Smith
Shari Buck



Your Community of Choice

2200 Civic Center Drive • North Las Vegas, Nevada 89030-6307
Telephone: (702) 633-1005 • Fax: (702) 633-1339
www.cityofnorthlasvegas.com

City Manager
Kurt Fritsch

Assistant City Managers
Michele F. Richardson
Gregory E. Rose

June 4, 1999

David W. Trushaw, P. E.
Carter Burgess
6655 Bermuda Road
Las Vegas, NV 89119-3605

Re: Technical Drainage Study for The Lodge III
CNLV No. 2543E

Dear David:

Staff has reviewed the above referenced study, dated October 6, 2000, and its addenda dated January 25, 2001 and February 16, 2001. In addition, the City of North Las Vegas is in receipt of the conditional acceptance letter by the City of Las Vegas.

Staff concurs with the acceptance of the Technical Drainage Study by the City of Las Vegas.

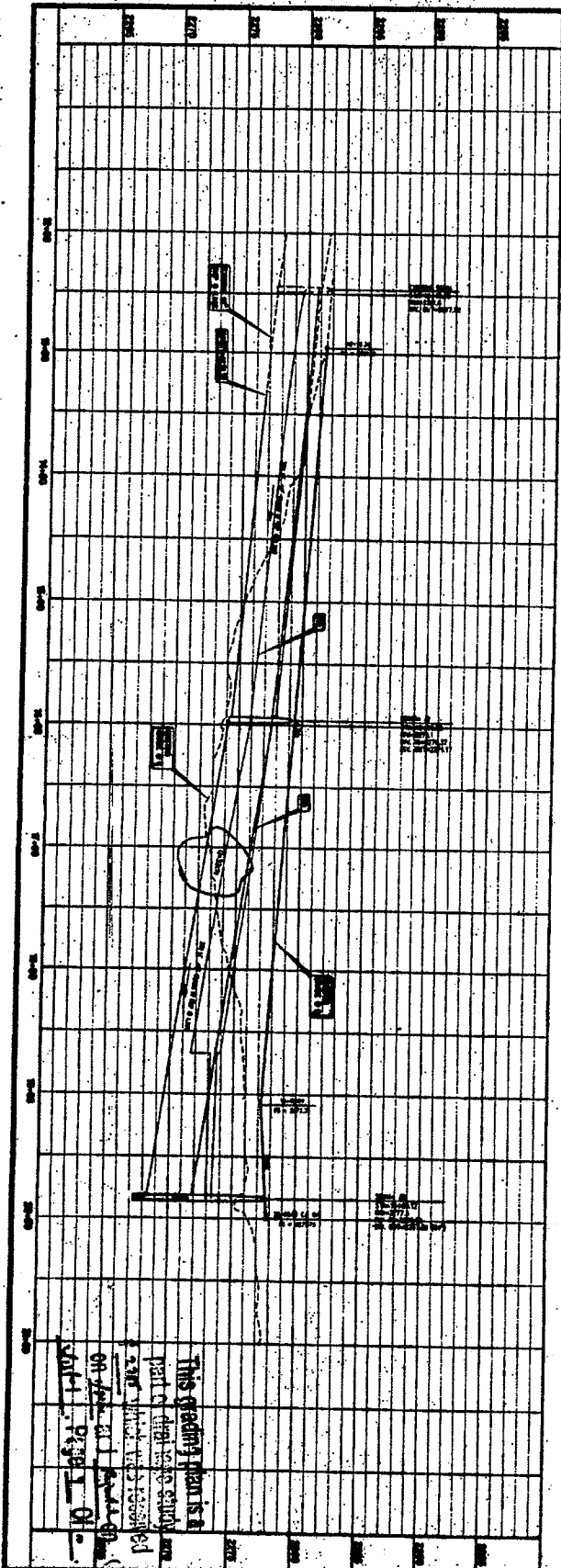
The City assumes no responsibility for the information, data, and conclusions presented in this report. If you have any questions concerning this matter, please contact me at 633-2008.

Sincerely,

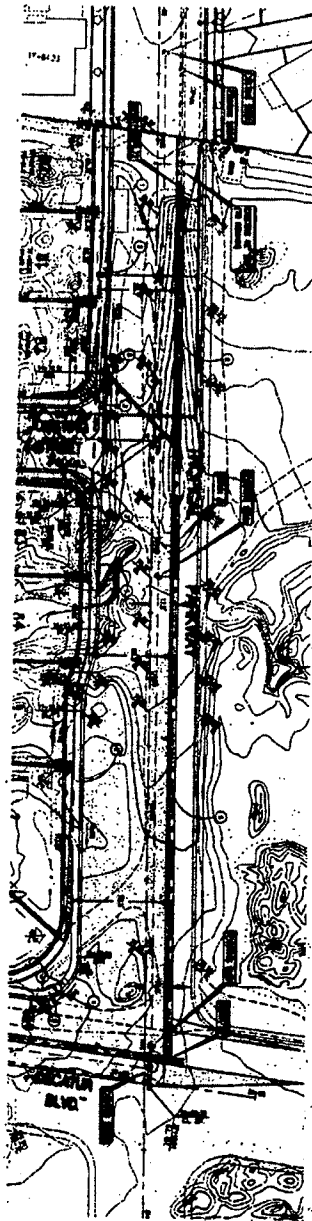


Stephen E. Casmus, P.E.
Development and Flood Control Coordinator

cc: Albert Sung, P.E.
City of Las Vegas Flood Control
731 S. 4th Street
Las Vegas, NV 89101



TROPICAL PARKWAY



NOTES

1. This plan and profile were prepared for the purpose of showing the proposed location and elevation of the road.
2. The proposed road is shown in solid lines.
3. The existing road is shown in dashed lines.
4. The proposed road is shown in solid lines.
5. The existing road is shown in dashed lines.

TYPICAL HALF STREET SECTION (NOT TO SCALE)

- NOTES**
1. This plan and profile were prepared for the purpose of showing the proposed location and elevation of the road.
 2. The proposed road is shown in solid lines.
 3. The existing road is shown in dashed lines.
 4. The proposed road is shown in solid lines.
 5. The existing road is shown in dashed lines.

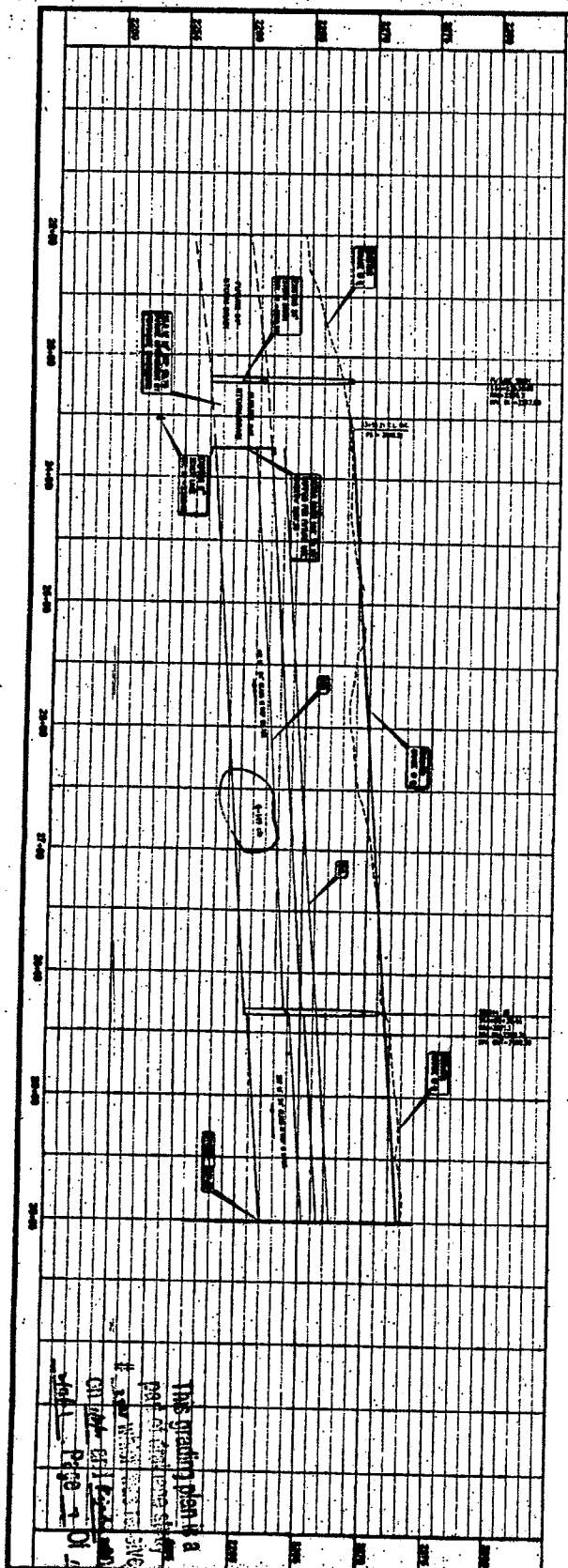
NOTES

1. This plan and profile were prepared for the purpose of showing the proposed location and elevation of the road.

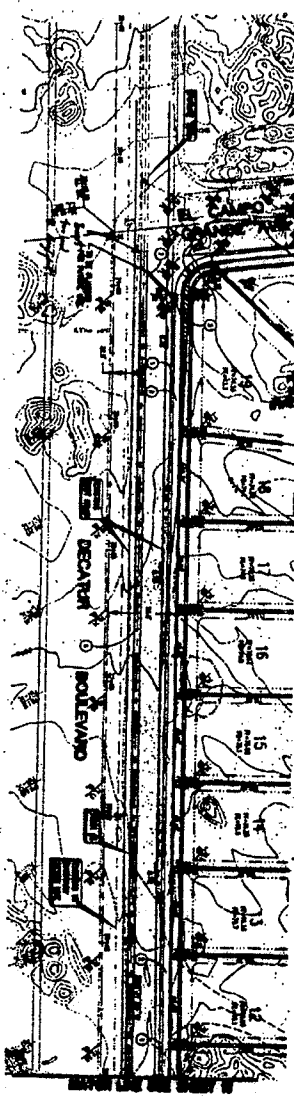
This grading plan is a part of the study on the subject of road improvement. It is not to be used for any other purpose without the written consent of the engineer.

	DRAWN BY: J.B.S. CHECKED BY: J.B.S. PROJECT NO.: 12345 SCALE: 1" = 20'	PLAN AND PROFILE TROPICAL PARKWAY LODGE & PLASTER DEVELOPMENT, INC.	Center-Surgess Consulting & Planning Engineers Construction Management, and Related Services 1000 South Main Street Fort Worth, TX 76102 (817) 551-1234 Fax: (817) 551-1235
	REV: 01 BY: J.B.S.		

	DRAWN BY DATE CHECKED BY DATE PROJECT NO. SCALE	PLAN AND PROFILE DISCATOR BOULEVARD	Loose II PLASTER DEVELOPMENT, INC.	Carter-Burgess Consultants in Planning, Engineering, Construction Management, and Related Services 6015 University Road Las Vegas, NV 89120 (702) 835-2525 Fax (702) 835-2525	REV. DATE BY
	PLASTER DEVELOPMENT, INC. 1000 E. Flamingo Avenue, Suite 100 Las Vegas, NV 89119 (702) 735-1111				



DECATUR BOULEVARD



GENERAL NOTE

1. ALL DIMENSIONS ARE IN FEET AND INCHES.

2. ALL ELEVATIONS ARE IN FEET ABOVE SEA LEVEL.

3. ALL DISTANCES ARE IN FEET.

4. ALL ANGLES ARE IN DEGREES.

5. ALL CURVES ARE CIRCULAR.

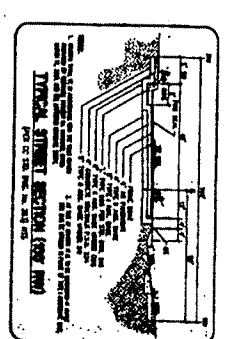
6. ALL GRADES ARE PERCENT.

7. ALL SLOPES ARE PERCENT.

8. ALL VERTICAL CURVES ARE PARABOLIC.

9. ALL HORIZONTAL CURVES ARE CIRCULAR.

10. ALL UTILITY LINES ARE SHOWN AS EXISTING OR PROPOSED.



- EXISTING CONDITIONS**
1. EXISTING ROADWAY WIDTH IS 100 FEET.
 2. EXISTING ROADWAY GRADE IS 1.0%.
 3. EXISTING ROADWAY CURVE RADIUS IS 100 FEET.
 4. EXISTING ROADWAY SLOPE IS 1.0%.
 5. EXISTING ROADWAY VERTICAL CURVE LENGTH IS 100 FEET.
 6. EXISTING ROADWAY HORIZONTAL CURVE LENGTH IS 100 FEET.
 7. EXISTING ROADWAY UTILITY LINES ARE SHOWN AS EXISTING OR PROPOSED.
 8. EXISTING ROADWAY ADJACENT AREAS ARE SHOWN AS EXISTING OR PROPOSED.
 9. EXISTING ROADWAY SLOPES ARE SHOWN AS EXISTING OR PROPOSED.
 10. EXISTING ROADWAY GRADES ARE SHOWN AS EXISTING OR PROPOSED.

PROPOSED CONDITIONS

1. PROPOSED ROADWAY WIDTH IS 100 FEET.

2. PROPOSED ROADWAY GRADE IS 1.0%.

3. PROPOSED ROADWAY CURVE RADIUS IS 100 FEET.

4. PROPOSED ROADWAY SLOPE IS 1.0%.

5. PROPOSED ROADWAY VERTICAL CURVE LENGTH IS 100 FEET.

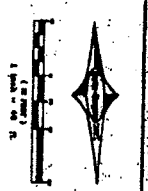
6. PROPOSED ROADWAY HORIZONTAL CURVE LENGTH IS 100 FEET.

7. PROPOSED ROADWAY UTILITY LINES ARE SHOWN AS EXISTING OR PROPOSED.

8. PROPOSED ROADWAY ADJACENT AREAS ARE SHOWN AS EXISTING OR PROPOSED.

9. PROPOSED ROADWAY SLOPES ARE SHOWN AS EXISTING OR PROPOSED.

10. PROPOSED ROADWAY GRADES ARE SHOWN AS EXISTING OR PROPOSED.



THIS GRADING PLAN IS A PART OF THE PROJECT SHOWN ON SHEET 1 OF 1. DATE: 11/08/2006 BY: [Signature] CHECKED BY: [Signature] SCALE: 1" = 100'		PLAN AND PROFILE DECATUR BOULEVARD LOOSE II PLASTER DEVELOPMENT, INC.		Cartersburg 1100-17 11/08/2006 11/08/2006 11/08/2006	
--	--	---	--	--	--

APPENDIX E

HYDROLOGY MAP

APPENDIX F

GRADING PLANS

Albert Sung

From: Brian W. [brianw@thieneseng.com]
Sent: Wednesday, February 23, 2011 2:56 PM
To: Albert Sung
Subject: winco hydrology

Albert:

I'm working on the technical drainage study for the winco site located at Decatur and tropical. I have a few questions before I get too far along:

1. The study for this area was previously done by southwest engineering. The new building layout is significantly different than what was previously approved and built. The previous study had 7 drainage areas, the new configuration will alter three of the existing drainage areas. We have already set up the HEC-1 file based on the previous study and just intend on changing the three affected areas. For our study, do you prefer to see all seven areas to be consistent with original report, or just include only the three areas that changed?
2. I have a huge stack of previous studies, updates and addendums. I intent on referencing only the previous hec-1 calcs and drainage map. Is this acceptable?
3. I am working on the write up for the report. I am currently following the outline of items to be discussed as shown in section 204.1 of the Hydrologic Criteria and Design Manual. I assume this will be acceptable.

That's it for now. I might have more questions as I get further along. You can contact me at (714) 521-4811. Thanks.
Brian weil

Thienes Engineering, Inc.

Albert Sung

From: Shelly M. [shelly@thieneseng.com]
Sent: Wednesday, February 23, 2011 8:28 AM
To: Albert Sung
Subject: Winco Store

Good morning, Albert,

I am working on the SWPPP and Erosion Control Plan for this project on Tropical Parkway and Dectur Boulevard (Winco Site). I need to get erosion control notes and details for Las Vegas. If there is any information you can help me with (on the SWPPP and Erosion Control Plan), I would greatly appreciate it, being from California.

Thank you,
Shelly McMasters
Water Quality Specialist
Thienes Engineering, Inc.
14349 Firestone Boulevard
La Mirada, Ca. 90638
Phone: (714) 521-4811
Fax: (714) 521-4173
shelly@thieneseng.com

Albert Sung

From: Albert Sung
Sent: Monday, January 24, 2011 4:50 PM
To: 'Amy Head'
Cc: Robert Welch
Subject: RE: SDR-40223;Winco Foods @Tropical/Decatur

Amy,

The drainage study you want to reference is titled "Decatur / 215" done by Southwest Engineering back in 2007 with updates spanned through 2008 and 2009. You can either called up Southwest Engineering for a courteous copy or call Raymond Martin at the City at 229-2149 to burn the studies onto a DVD which will be sold for about \$30. When you call Ray, you need to confer this information to him: Study Name: Decatur / 215; Drainage Study Number: DS4261 and Box Numbers 384 and 438.

If your proposed design keeps the original drainage pattern the same and no change in the site layout and proposed finish floor elevations etc. the required update study could just be in a letter form simply stating that as such.

Regarding the drainage study review fee, since you are a different engineer other than the original, ie, Southwest Engineering, there will be a \$400 review fee to be paid when you submit your drainage study/update to us. We only need one set of the study and plans.

Hope this information help.

Albert Sung, P.E.
Flood Control Section
Public Works

From: Amy Head [<mailto:amy@sheacarrjewell.com>]
Sent: Friday, January 21, 2011 2:55 PM
To: Albert Sung
Subject: RE: SDR-40223;Winco Foods @Tropical/Decatur

Albert:

I will give you a call when your phones are back up and running, but I wanted to touch base on what I am trying to get. First, I was hoping you could send me a copy of the drainage report that was done for the original project. Second, I am trying to determine the level of information you want to see in the update. We are proposing to keep the drainage patterns the same as the original project and will likely have a reduced amount of impervious area.

Thanks and I hope you have a good weekend.

Amy M. Head, PE, LEED AP
Associate Principal

From: Lucien Paet [<mailto:lpayet@LasVegasNevada.GOV>]
Sent: Thursday, January 20, 2011 4:08 PM
To: Amy Head; George Smith
Cc: Albert Sung; Rick Schroder; Bart Anderson; Roger Bailey
Subject: SDR-40223;Winco Foods @Tropical/Decatur

Amy & George,

In response to your phone messages, I'm providing contact information for your Flood Control and Traffic related questions. We are in the process of moving today and we are closed on Fridays so late Monday 1/24 or sometime Tuesday 1/25 may be when we are able to get you the information you are requesting.

Flood Control – Albert Sung (CC'd); 702-229-2001

Traffic Studies - Rick Schroder (CC'd); 702-229-2452

Since this item is on the Planning Commission agenda for 1/25 and starts at 6 PM, please let me know if there are any major concerns with the recommended conditions prior to the meeting.

Thank you,

Lucien Paet, P.E., M.B.A.

Engineering Project Manager - Development Coordination

ph: (702) 229-6145

fax: (702) 474-7599

**** Duplicate Receipt ****

City of Las Vegas

Development Services Center

731 South Fourth Street

Las Vegas, NV 89101

03/09/2011 11:48 Trn 164230
Cashier 890381

PRJ Permit # 084524 \$400.00

Subtotal \$400.00

Tax \$0.00

Total \$400.00

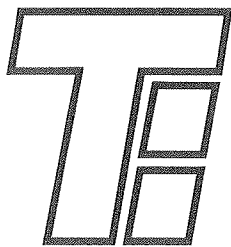
Received CHECK \$400.00

Check # 25589

Change \$0.00

For questions related to this receipt call

702-775-6250



Thienes Engineering, Inc.

CIVIL ENGINEERING • LAND SURVEYING

**STORM WATER POLLUTION PREVENTION PLAN FOR
CONSTRUCTION ACTIVITIES
(SWPPP)**

FOR

**“WINCO STORE-LAS VEGAS”
NWC OF DECATUR BOULEVARD AND TROPICAL PARKWAY
LAS VEGAS, NEVADA 89130**

**PREPARED FOR
WINCO FOODS, LLC
650 NORTH ARMSTRONG PLACE
BOISE, IDAHO 83704
P. (208) 377-0110
DAVID VAN EITEN**

MARCH 2, 2011

JOB NO. 3033

PREPARED BY

**THIENES ENGINEERING
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90638
P. (714) 521-4811
FAX. (714) 521-4173
CONTACT: SHELLY McMASTERS**

**STORM WATER POLLUTION PREVENTION PLAN FOR
CONSTRUCTION ACTIVITIES
(SWPPP)**

FOR

“WINCO STORE-LAS VEGAS”

**PREPARED BY SHELLY MCMASTERS
UNDER THE SUPERVISION OF**

**REIHARD STENZEL DATE:
R.C.E. 14385
EXP. 06/30/12**

STORM WATER POLLUTION PREVENTION PLAN (SWPPP) FOR CONSTRUCTION ACTIVITIES

Project Name:	Winco Store
----------------------	-------------

Project Location:			
<u>Street Address:</u>	6101 N. Decatur Boulevard-N.W.C. of Decatur Blvd. & Tropical Pkwy		
<u>City:</u>	Las Vegas, Nevada	<u>County:</u>	Clark County
<u>APN (at least one):</u>	125-25-6		

Permittee* Information:			
<u>Company or Agency :</u>	Winco Foods, LLC		
<u>Address:</u>	650 North Armstrong Place		
<u>City, State, Zip:</u>	Boise, Idaho 83704		
<u>Contact Person:</u>	David Van Eiten	<u>Phone :</u>	208-377-0110

Person Responsible for Implementing SWPPP:			
<u>Name:</u>	ESI Contractors-ID	<u>Phone :</u>	208-362-3040
<u>Address:</u>	12400 West Overland Road		
<u>City, State, Zip:</u>	Boise, Idaho 83709		

Notice of Intent Filing Date:	
--------------------------------------	--

* The Permittee is defined as the owner and/or operator of the construction site. This is the person that has operational control of the construction plans and specifications, or has day-to-day operational control of the activities necessary to ensure compliance with the SWPPP.

NOTES:

1. A WORKING COPY OF THIS SWPPP MUST BE KEPT AT THE CONSTRUCTION SITE OR BE LOCALLY AVAILABLE FOR REVIEW BY NDEP AND LOCAL REGULATORY AGENCIES
2. THIS MODEL SWPPP TEMPLATE WAS DEVELOPED FOR COMPLIANCE WITH STORM WATER GENERAL PERMIT NVR100000, DATED SEPTEMBER 16, 2007. ALL SECTION NUMBERS REFERENCED IN THIS DOCUMENT REFER TO THE 2007 PERMIT. A COPY OF PERMIT NVR100000 MUST BE ATTACHED TO THIS DOCUMENT
3. GUIDANCE FOR SELECTING AND IMPLEMENTING BMPs IS AVAILABLE IN THE TRUCKEE MEADOWS CONSTRUCTION SITE BMP HANDBOOK.
4. ATTACH ADDITIONAL PAGES WHEN NECESSARY TO PROVIDE THE REQUIRED INFORMATION

NOTICE OF INTENT

Insert Notice of Intent in place of this page

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Attachment "A" Stormwater General Permit NVR100000

Attachment "B" Construction Site Best Management Practices

Attachment "C" Amendment Log

**Attachment "D" Las Vegas Stormwater Quality Management Program Construction
Permit Submittal Checklist**

I. Project Description

A. Description of the Proposed Construction Activity [§ III.A.1.f]

The existing site is currently paved with a few graded dirt pads. The total 10.5 acres will be disturbed. The proposed commercial building will be approximately 95,000 square feet and will be occupied by Winco Foods. The building will be located on the south side of the site. Proposed loading/unloading truck docks will be located on the south side of the building. Proposed landscaping throughout the site with the remainder of the site to be paved for vehicle parking.

Total Area of Site (acres)	10.5 Acres
-----------------------------------	------------

Total Area to be disturbed by excavation, grading, or other construction activities including on and off-site borrow and fill areas (acres) [§ III.A.1.h]	10.5 Acres
--	------------

B. Intended Sequence of Major Soil Disturbing Activities [§ III.A.1.g] (include dates when these activities occur.)

- | | |
|----|--|
| 1. | Demolition activities: demo existing paving and parking area islands. |
| 2. | Grade proposed building pad. |
| 3. | Grade proposed parking areas. |
| 4. | Install utilities and move existing utilities if necessary. |
| 5. | Construction of the proposed building. |
| 6. | Construction of the parking areas and parking lot islands. |
| 7. | Install proposed landscaping. |
| 8. | Clean-up and stabilize construction site. Properly dispose of all construction site waste. |

C. Existing Soil and Water Quality Data [§ III.A.1.i]

Provide a description of the existing soil and/or water quality data of any discharges from the site, if available. Water quality data for adjacent waterways that may receive discharges from the site is also recommended.

The soil type for the project site is "D". Currently approximately 4.0 acres on the west side of the site drain to Tropical Parkway and the remainder of the site drains to Decatur Boulevard.

D. Runoff Coefficients [§ III.A.1.i].			
Use the following worksheet for sites with only 1 or 2 land uses, such as an undeveloped site with a proposed parking lot. For sites with 3 or more land uses (pre and/or post-project) attach a separate worksheet.			
1. Describe Pre-Project Conditions and Land Use(s)			
The project site is currently a paved site with some graded dirt pads.			
2. Pre-Project Land Use 1	Coefficient	Acres (A1)	C1
	_____ x _____		= _____
3. Pre-Project Land Use 2	Coefficient	Acres (A2)	C2
	_____ x _____		= _____
4. Average Pre-Project Runoff Coefficient		$(C1 + C2) / (A1 + A2) =$ <u>.90</u>	
5. Pre-Project Land Use 1	Coefficient	Acres (A3)	C3
	_____ x _____		= _____
6. Pre-Project Land Use 2	Coefficient	Acres (A4)	C4
	_____ x _____		= _____
7. Average Pre-Project Runoff Coefficient		$(C3 + C4) / (A3 + A4) =$ <u>.90</u>	

II. Site Layout Maps

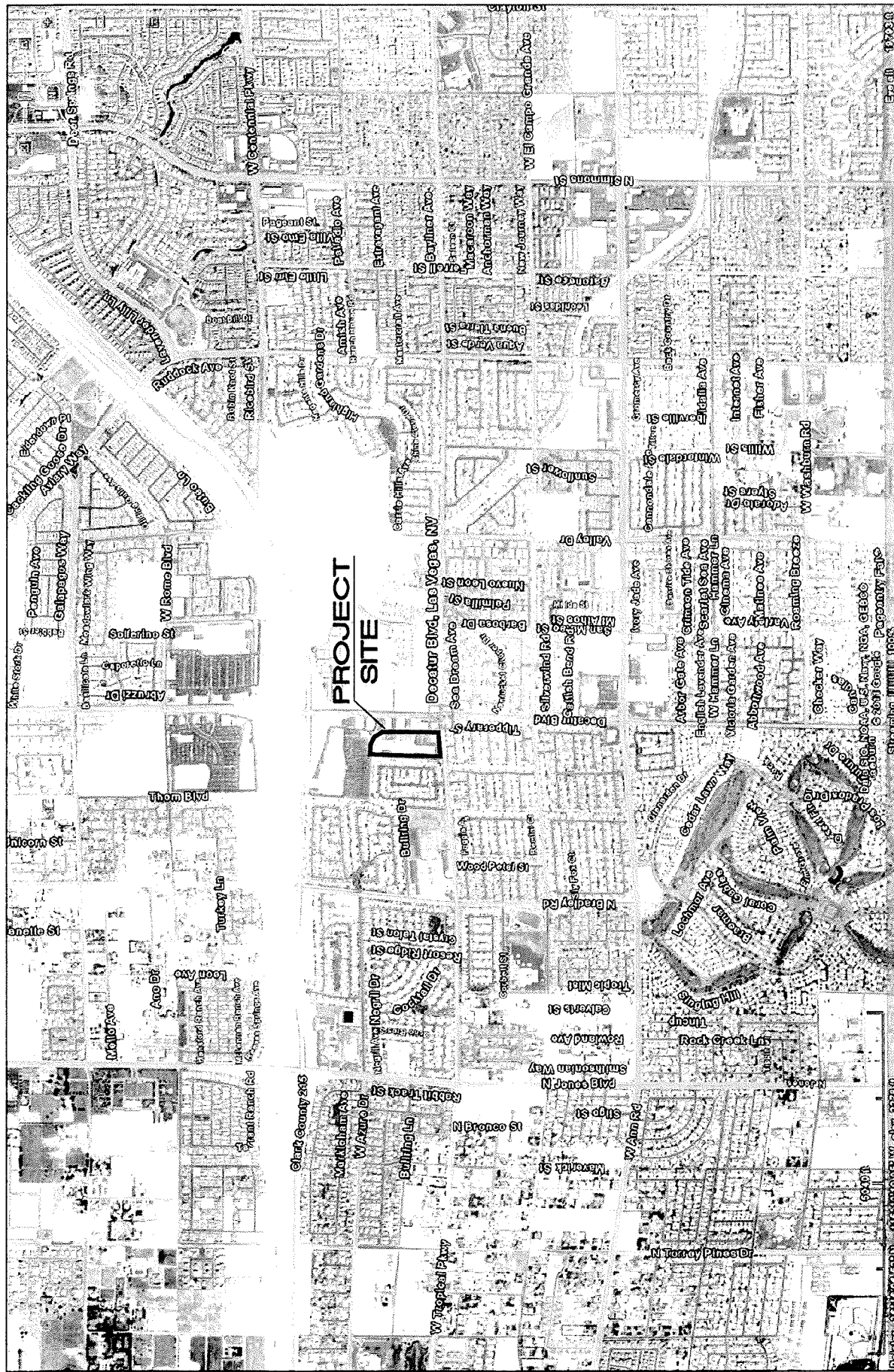
Attach the Following:

A. General Location Map showing nearby roads and highways [§ III.A.1.j.]

B. Detailed Site Map [§ III.A.1.j.i. - xiii.] *updated and revised as site conditions change, new BMPs are implemented, and areas are stabilized.*

The Detailed Site Map must be drawn to scale and indicate the following:

- Existing and proposed topography, including drainage patterns and approximate slopes.
- Areas where soils will be disturbed and areas that will not be disturbed.
- Locations of onsite and offsite soil borrow and stockpile areas.
- Locations of major structural and non-structural BMPs identified in this SWPPP.
- Locations where stabilization practices will be applied.
- Locations where vehicles and equipment will be stored and maintained.
- Locations of onsite and offsite material and waste storage areas.
- Locations of concrete washout areas.
- Locations and aerial extent of all surface waters (including ephemeral water bodies, dry washes and wetlands) that may receive discharges from the disturbed areas of the project.
- Locations where storm water discharges will enter surface waters, the municipal storm drain system and/or ephemeral waters or dry washes at or near the site.
- Location and description of any discharge associated with industrial activity other than construction, including storm water discharges from dedicated asphalt or concrete plants;
- Areas where final stabilization has been accomplished;
- A legend describing all symbols, BMP numbers and abbreviations used on the map.
- A north arrow and a map scale.



"VICINITY MAP"
FOR
WINCO STORE-LAS VEGAS

Thienes Engineering, Inc.
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C. Industrial Discharges [§III.A.1.j.xi]

Provide the location and description of any discharge(s) associated with industrial activity other than construction, including any storm water discharges from dedicated asphalt or concrete plants covered under General Permit NVR100000.

N/A

III. Receiving Waters**A. Receiving Water(s) Identification [§III.A.1.j.xii]:**

Identify the name and location of the streams, rivers, ditches, drainages, lakes, wetlands (both perennial and intermittent), or other special aquatic sites that will be disturbed or will receive runoff from the construction site. If the site will drain to the municipal storm drain system, identify the receiving water to which the system discharges.

The Las Vegas Wash is the receiving water for the project site. The Las Vegas Wash lies within the Colorado River Watershed.

B. 303(d) Impaired Water Body Listing [§III.A.10.b]:

Check the current 303(d) listing of Impaired Water Bodies, issued by the Nevada Division of Environmental Protection (<http://ndep.nv.gov/bwqp/standard.htm>). If any of the receiving waters noted above appear on the 303(d) list, describe: a) the condition for which the water body has been listed, b) whether discharges from the site will contribute significantly to any 303(d) listing, and c) the BMPs that will be implemented to ensure that discharges from the site will not cause or contribute to an exceedance of State water quality standards.

The Las Vegas Wash is an impaired water body with Total Dissolved Solids, Iron and Selenium. BMPs selected for the project site include sand bag barriers, check dams, sediment basin, tire wash and stabilized entrance/exit to clean and prevent runoff from exiting the project site.

C. Total Maximum Daily Load (TMDL) requirements [§III.A.10.b]:

Does the construction site discharge runoff into a water body with an established TMDL?

☐ YES ☒ NO

Describe the BMPs that will be applied to comply with all applicable TMDL requirements

The Las Vegas Wash has a LOW Priority TMDL.

Sand Bag Barrier (SPC-2) will be utilized to filter storm water runoff and slow the runoff from leaving the site.

IV. BMP Implementation

A. Storm Water Best Management Practices (BMPs)

Describe each storm water control measure and the general sequence of implementation during the construction process. Clearly identify the BMPs that will be used for each of the major soil-disturbing activities identified in Section I.B, above [§ III.A.2].

Describe the design, installation and maintenance of each BMP, and indicate the parties that will be responsible for carrying out these functions for each control measure. Control measures must be properly selected, installed, and maintained in accordance with the manufactures specifications and good engineering practices.

Offsite material storage areas used solely by the permitted project must also be addressed [§ III.A.3].

- | | |
|----|---|
| 1. | Check Dams: Weekly inspections- replace bags as necessary/Will be utilized in the construction phase |
| 2. | Sand Bag Barrier: Weekly inspections- replace bags as necessary/Will be utilized in the demo and construction phase |
| 3. | Storm Drain inlet Protection: Weekly inspections-replace bags as necessary and remove sedimentation as necessary/ Will be utilized in the demo and construction phase |
| 4. | Sediment Basin: Weekly Inspections, before and after storm events- Make repairs and remove any obstructions as needed/ Will be utilized in the construction phase |
| 5. | Street sweeping and vacuuming: Weekly inspections- Sweep after daily construction Inspect paved areas and vacuum/sweep as needed/ Will be utilized in the demo, construction and final stabilization phase |
| 6. | Wind erosion Control: Daily attention as needed depending on wind conditions- Daily attention to wind conditions. Water site as necessary/ Will be utilized in the demo and construction phase |
| 7. | Stabilized Construction Entrance/Exit: Weekly inspections-Replace rock/gravel as necessary/ Will be utilized in the demo, construction and final stabilization phase |
| 8. | Spill prevention and control: Weekly inspection, before and after storm events. Daily during non-storm water discharges are occurring- Keep ample supplies of appropriate spill control and cleanup materials/ Will be utilized in the demo, construction and final stabilization phase |

B. Temporary Soil Stabilization Practices [§ III.A.5]

Describe the interim or temporary stabilization BMPs (e.g. soil binders, revegetation and/or mulching) that will be provided on stockpiles and disturbed portions of the site where construction activity is expected to cease for 14 days or more and will not be resumed within 21 days.

Stockpiles or exposed dirt will not be inactive for more than 21 days. If soil will be exposed for more than 21 days a soil binder will be used to stabilize the soil.

C. Permanent Soil Stabilization Practices [§III.A.5]

Describe the permanent stabilization BMPs (e.g. permanent revegetation and/or rolled erosion control products) that will be provided on disturbed portions of the site where construction activities have permanently ceased.

When construction activities are completed, permanent landscaping will be installed throughout the project site for final stabilization. .

D. Structural Practices [§ III.A.6]

Provide a description of the temporary and permanent erosion and sediment control BMPs (e.g. silt fences, fiber rolls, earth dikes, drainage swales, check dams, sediment traps, storm drain inlet protection, etc.) that will be used during construction to divert flows from exposed soils, and/or temporarily store flows and limit runoff from the exposed areas of the site.

For common drainage locations serving areas with ten (10) or more acres of disturbed soils, sediment basins shall be provided until final stabilization of the site. Sediment basins must be designed to the criteria outlined in the Truckee Meadows Construction Site BMP Handbook. From May to October, water must not be allowed to pond in any structural practice in excess of 7 days.

Velocity dissipation devices (e.g. rock outlet protection, channel lining, etc.) must be placed at stormdrain pipe outfall locations and along the length of channels to reduce flow velocities and prevent erosion and degradation of receiving waters.

Sandbag Barriers-Will be utilized around the perimeter of the project site.

Check Dams-Will be utilized in the project sites flow lines, every 100' to slow the flow onsite.

Sediment Basins-Will be utilized to capture flow and let the sediment settle before the clean water discharges.

Sediment Basin Riprap-To prevent erosion in the basin.

E. Post-Construction Storm Water Management Controls [§ III.A.7]

Provide a description of the permanent measures that will be installed during construction to control pollutants in storm water discharges that will occur after construction is complete. These permanent storm water management BMPs include structural treatment controls and Low Impact Development (LID) practices such as vegetated swales, landscape detention, sedimentation basins, and sand filters (refer to the Truckee Meadows Structural Controls Design Manual and LID Handbook). Permittees are responsible for the installation and maintenance of these storm water BMPs until an approved Notice of Termination is received by NDEP. The installation of these devices may also require a separate NPDES permit.

Outdoor loading/unloading truck dock maintenance

Parking area maintenance

Building and grounds maintenance

Spill prevention, control and cleanup

Good Housekeeping practices

Site design and landscape planning

Efficient irrigation

Landscape maintenance

Trash enclosure maintenance

F. Non-Storm Water Discharge Management [§ III.A.8.]

Provide a description of the activities that may produce non-storm water discharges, the measures used to reduce or eliminate non-storm water discharges, and the BMPs used to minimize pollutants in any non-storm water discharges that may occur. Non-storm water discharges include, but are not limited to water line flushings, vehicle or building wash-down, and dewatering from excavation (see §I.D.2 for a full list).

N/A

V. Other Controls**A. Material Storage, Spill Prevention and Response [§ III.A.9.a]**

Provide a description of the construction materials and chemicals that are expected to be stored onsite, with updates as appropriate. Describe the BMPs that will be provided to ensure proper storage of these construction materials that will minimize their exposure to storm water. Describe the response measures that will be provided if a spill occurs.

Several types of vehicles and equipment will be used on-site throughout the project, such as graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes, forklifts, generators, compressors, and traffic control equipment. Activities including Vehicle and Equipment Cleaning, Fueling, or Maintenance should not be performed on-site, except for concrete washout.

Drip pans or absorbent pads will be used for all vehicle and equipment maintenance activities that involve grease, oil, solvents, or other vehicle fluids.

B. Offsite Vehicle Tracking Controls [§ III.A.9.b]

Provide a description of the control measures that will be provided to prevent tracking or deposition of sediments offsite and the measures that will be used to remove any sediments that have been deposited on the paved roadways bordering the site.

Road Cleaning BMPs – Street Sweeping and Vacuuming

Road sweeping and vacuuming will occur during soil hauling and as necessary to keep street surfaces clear of soil and debris. Washing of sediment tracked onto streets into storm drains will not occur.

C. Dust Control [§ III.A.9.b]

Describe the control measures that will be used to prevent the generation of dust on-site.

Dust Control

During grading, soils will be disturbed and exposed. Materials may be applied to the soil surface to prevent the movement of dust from exposed soil due to wind and traffic. Particular attention should be paid to stock piled materials. The most commonly used method of soil stabilization is watering to prevent dust from polluting the air.

Wind Erosion Control, Water Conservation Practices, will be implemented to provide dust control and prevent discharges from dust control activities and water supply equipment. Water application rates will be minimized as necessary to prevent runoff and ponding and water equipment leaks will be repaired immediately.

During windy conditions (forecast or actual wind conditions of approximately 25 mph or greater), dust control will be applied to disturbed areas, including haul roads, to adequately control wind erosion.

D. Construction Waste Storage and Disposal [§ III.A.9.d]

Describe the wastes that will be generated onsite. Construction wastes include concrete washout, excess building materials, chemicals, litter and debris. Describe the BMPs that will be used to temporarily store these wastes, how they will be collected and disposed, and the response measures that will be provided if a spill occurs.

Spill Prevention and Control

Spill Prevention and Control, will be implemented to contain and clean-up spills and prevent material discharges to the storm drain system. Spill prevention is discussed below in the following waste management and equipment maintenance sections. Spill clean-up materials, material safety data sheets, a material inventory, and emergency contact numbers will be maintained and stored in the general storage area.

Waste Management

Solid Waste Management will be implemented to minimize storm water contact with waste materials and prevent waste discharges. Solid wastes will be loaded directly into trucks for off-site disposal. When on-site storage is necessary, solid wastes will be stored in watertight dumpsters in the general storage area. AC and PCC rubble will be stockpiled in the general storage area and will be surrounded with sediment controls (sand bag Barrier) and covered when necessary. Solid waste, including rubble stockpiles, will be removed and disposed off-site at least weekly. Hazardous wastes will be stored in covered containment areas. Hazardous wastes will be appropriate and clearly marked containers and segregated from other non-waste materials.

E. Hazardous and Sanitary Waste Storage and Disposal

Provide a description of the hazardous and/or sanitary wastes that are expected to be generated at the site, the measures used to temporarily store these wastes, how they will be collected and disposed and the response measures that will be provided if a spill occurs.

Hazardous wastes will be stored in covered containment areas. Hazardous wastes will be appropriate and clearly marked containers and segregated from other non-waste materials.

Sanitary and Septic Wastes

The Contractor will implement, Sanitary and Septic Waste Management, and portable toilets will be located and maintained on the project site for the duration of the project. The toilets will be located away from concentrated flow paths and traffic flow. A properly licensed contractor will conduct weekly maintenance.

F. Offsite Discharges [§ III.A.9.e]

Provide a description of the potential offsite pollutant sources and the BMPs that will be provided to minimize storm water pollution from these sites. Offsite sources may include dedicated sites such as asphalt or concrete plants.

N/A

G. Soil Stabilization at Culverts [§ III.A.9.c]

Provide a description of the measures used to sufficiently stabilize soil at culvert locations to prevent the formation of rills and gullies during construction.

During the rainy season, temporary sediment controls will be implemented at the draining perimeter of disturbed soil areas, at the toe of slopes, at storm drain inlets and at outfall areas at all times. During the non-rainy season, temporary sediment controls will be implemented at the draining perimeter of disturbed soil areas and at storm drain downstream from disturbed areas before rain events.

Gravel bags and check dams will also be placed in the flow-lines on site to prevent erosion and reduce sediments at storm drain inlets.

During the non-rainy season, in the event of a predicted storm, the following temporary sediment control materials will be maintained on-site.

VI. Inspection/Maintenance Procedures

The contractor or his qualified agent is required to routinely inspect all areas of disturbed and bare soil, areas used for storage of materials and equipment that are exposed to precipitation, onsite vehicle entrance and exit locations and all onsite erosion and sediment control BMPs. Inspectors must also observe discharge locations to receiving waters to ensure proper operation of sediment and erosion control measures. **Inspections shall occur weekly, prior to forecasted rain events, and within 24 hours after any actual rain event of 0.5 inches or greater.** Sediments must be removed when the BMP design capacity has been reduced to 50%. Construction materials, chemicals, wastes, litter and debris must be prevented from becoming a storm water pollutant source. When sediment escapes the construction site, off-site accumulations of sediment must be removed to ensure no adverse effects on water quality and public safety [§ III.A.4]

The following sources may be used to obtain weather forecasts:

- The National Weather Service: Telephone: (775) 673-8100, <http://www.wrh.noaa.gov/Reno/>
- The Western Regional Climate Center, <http://www.wrcc.dri.edu/CURRENTOBS.html>
- The Weather Channel, http://www.weather.com/weather/local/USNV0076?from=search_city

Once storms are imminent, a portable NOAA weather radio can also provide useful information. NOAA weather radio broadcasts are made on one of seven high-band FM frequencies. These frequencies are typically available only on radios that provide a “weather band” as an added feature or portable weather radios that exclusively provide weather broadcasts. The local FM frequency for the Reno/Sparks area is 162.500 MHz. Taped weather messages are repeated every four to six minutes and are routinely revised at least once every one to three hours, 24 hours daily.

A. Inspection and Maintenance of Best Management Practices [§III.A.11-12]
Provide a description of the practices that will be used to inspect and maintain all Temporary and Permanent Stabilization Practices Structural Practices, Post-Construction Storm Water Management Controls and Non-Storm Water Discharges described in Section IV, above. Maintenance shall be performed if any BMP is not operating effectively or if the capacity has been reduced by 50%. Maintenance must be conducted as soon as practicable and before the next anticipated storm event.
Check Dams: Weekly inspections- replace bags as necessary Owner is responsible for BMPs Sand Bag Barrier: Weekly inspections- replace bags as necessary Owner is responsible for BMPs Storm Drain inlet Protection: Weekly inspections-replace bags as necessary and remove sedimentation as necessary Owner is responsible for BMPs Sediment Basin: Weekly Inspections, before and after storm events- Make repairs and remove any obstructions as needed Owner is responsible for BMPs
B. Inspection and Maintenance of Other Controls [§III.A.11-12]
Provide a description of the practices that will be used to inspect and maintain all Other Controls described above in Section V,
Street sweeping and vacuuming: Weekly inspections- Sweep after daily construction Inspect paved areas and vacuum/sweep as needed Owner is responsible for BMPs Wind erosion Control: Daily attention as needed depending on wind conditions- Daily attention to wind conditions. Water site as necessary Owner is responsible for BMPs Stabilized Construction Entrance/Exit: Weekly inspections-Replace rock/gravel as necessary Owner is responsible for BMPs Spill prevention and control: Weekly inspection, before and after storm events. Daily during non-storm water discharges are occurring- Keep ample supplies of appropriate spill control and cleanup materials. Owner is responsible for BMPs
C. Inspector Qualifications [§III.A.12c]
Describe the qualifications of the person(s) selected to inspect the BMPs discussed above. “Qualified Personnel” means someone knowledgeable in the principles and practice of erosion and sediment control who possess the skills necessary to assess the site conditions and the effectiveness of BMPs.

VII. Certifications of Compliance

This SWPPP must be certified that it is consistent with all applicable Federal, State and Local regulations, or other approved site plans or permits. It is to be prepared in accordance with the latest version of the Truckee Meadows Construction Site Best Management Practices Handbook. This SWPPP must be updated as necessary to remain consistent with changes in other site plans that effect soil disturbing activities, site drainage patterns or any other activity that may impact storm water runoff quality. It must also be re-certified annually by July 1 until the construction project is complete and a Notice of Termination has been submitted to NDEP.

A. OWNER/OPERATOR CERTIFICATION STATEMENT [§ V.B.1.d]

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. I also confirm that a storm water pollution prevention plan (SWPPP) has been completed, will be maintained at the project site from the start of construction activities, and that the SWPPP will be compliant with any applicable local sediment and erosion control plans. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines for knowing violations.

Initial Certification:

Print Name: Winco Foods, LLC-David Van Eiten

Title:

Signature:

Date:

Annual Re-Certification

Print Name:

Title:

Signature:

Date:

All contractors and subcontractors responsible for implementing pollution control measures must be identified in this SWPPP with the measures for which they are responsible. They must also sign the following certification statement that indicates they understand the requirements of the attached General Permit for Construction Activities (Attach additional sheet if necessary for additional contractors).

B. CONTRACTOR'S CERTIFICATION STATEMENT

I certify under penalty of law that I understand the terms and conditions of the State's General Permit (NVR100000) that authorizes storm water discharges associated with industrial activity from the construction site identified as part of this certification.

Company 1

Name: ESI Contractors-ID

Phone: 208-362-3040

Address: 12400 West Overland Road

City: Boise

State: Idaho

Zip: 83709

Print Name: JJ Nelson

Title:

Signature:

Date:

Company 2

Name:

Phone:

Address:

City:

State:

Zip:

Print Name:

Title:

Signature:

Date:

Company 3

Name:

Phone:

Address:

City:

State:

Zip:

Print Name:

Title:

Signature:

Date:

VIII. Records of Inspection and Construction Activities

A. Record of Major Construction Activities and BMP Implementation [§ III.A.5.b]

Provide the dates of when major grading activities occur, the dates when construction activities on a portion of a site temporarily or permanently cease, and list the dates when temporary and permanent stabilization practices are implemented. Photo documentation of major construction activities and implementation of BMPs is strongly recommended.

B. Record of Construction Site Inspections [§ III.A.12.e-f]

Provide a record of inspection reports to include the name and qualifications of person making the inspections, the dates of inspection, and major observations relating to the implementation of the SWPPP. Major observation should include the location(s) of discharges of sediment or other pollutants from the site, location(s) of BMPs that need to be maintained, location(s) of BMPs that failed or proved to be inadequate, and location(s) where additional BMPs are needed. All issues of non-compliance shall be noted. If the site is in full compliance with this SWPPP and permit NVR100000 on the date of inspection, the report shall contain a certification of compliance. These records shall be retained as part of the SWPPP for at least three years from the date that permit coverage expires or the site is finally stabilized.

C. Record of Follow-up Actions

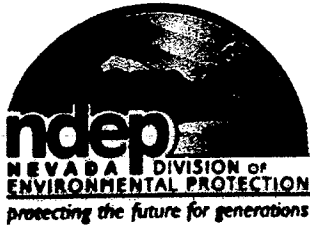
Based on the results of the inspections conducted above, provide a record of the follow-up maintenance and corrective actions conducted at the site. Implementation of follow-up actions should occur within seven (7) days following receipt of inspection results or prior to the next anticipated storm event.

CONSTRUCTION SITE INSPECTION CHECKLIST

[illegible]

Attachment A

Stormwater General Permit NVR100000



STATE OF NEVADA

Department of Conservation & Natural Resources

Jim Gibbons, Governor

Allen Biaggi, Director

DIVISION OF ENVIRONMENTAL PROTECTION

Leo M. Drozdoff, P.E., Administrator

Stormwater General Permit NVR100000

In compliance with the provisions of the Federal Clean Water Act as amended (33 U.S.C. 1251 et seq; the "Act") and Chapter 445A of the Nevada Revised Statutes (NRS), eligible dischargers who have submitted a Notice of Intent, filing fee, and have a Stormwater Pollution Prevention Plan(s) completed and maintained on the permittee's site location in accordance with this permit, are authorized to discharge

Stormwater Associated with Large Construction Activity

or

Stormwater Associated with Small Construction Activity

and

Stormwater Associated with Industrial Activity from Temporary Concrete, Asphalt, and Material Plants or Operations Dedicated to the Permitted Construction Project

to Waters of the United States in accordance with the conditions set forth in Parts I - V hereof.

This permit shall become effective on September 16, 2007.

This permit and the authorization to discharge shall expire at midnight September 15, 2012.

Signed this 14th day of September, 2007.



Steve McGoff, P.E.
Bureau of Water Pollution Control

PART I. COVERAGE UNDER THIS GENERAL PERMIT

- A. Permit Area.** This General Permit covers the State of Nevada, except for Tribal Areas.¹
- B. Objective.** The objective of this permit is to control and reduce pollution of Waters of the U.S. ("WOUS") from: Stormwater Discharges Associated with Large Construction Activity; Stormwater Discharges Associated with Small Construction Activity; and Stormwater Discharges Associated with Industrial Activity from temporary plants or operations set up to produce concrete, asphalt, or other materials for the permitted construction project; through the use of Best Management Practices ("BMPs"), as defined in Appendix A. In addition, BMPs shall include erosion and sediment controls, stormwater conveyance, stormwater diversion, and treatment structures, and any procedure or facility used to minimize the exposure of pollutants to stormwater or to remove pollutants from stormwater. Discharges to storm drain systems that in turn discharge to WOUS are considered to be discharges to WOUS.
- C. Eligibility.** This General Permit authorizes discharges from stormwater discharge associated with large construction activity as defined in Appendix A, small construction activity as defined in Appendix A and industrial activities as defined in Appendix A provided the operator complies with all the requirements of this general permit and submits a Notice of Intent ("NOI") in accordance with Part II of this general permit.

Any discharges that do not comply with the eligibility conditions of this permit are not authorized by the permit. A person must either apply for a separate National Pollutant Discharge Elimination System ("NPDES") permit to cover the ineligible discharge(s), cease the discharge(s), or take the necessary steps to make the discharge(s) eligible for coverage under this permit.

D. Authorized Discharges

1. **Allowable Stormwater Discharges.** Subject to compliance with the terms and conditions of this permit, an operator may discharge pollutants in:
 - a. Discharges of stormwater runoff associated with construction activities as defined in Appendix A;
 - b. Discharges that are designated by NDEP as requiring a stormwater permit under 40 CFR 122.26(a)(1)(v); 40 CFR 122.26(b)(15)(ii); or under 40 CFR 122.26(a)(9);

¹ The State of Nevada, Division of Environmental Protection, Bureau of Water Pollution Control does not have permit authority for Tribal Lands. Construction discharge permits for Tribal Lands within the state must be acquired through EPA Region IX.

- c. Discharges from support activities(e.g. concrete or asphalt batch plants, equipment staging yards, material storage yards, excavated material disposal areas, borrow areas) provided:
 - i. The support activity is directly related to a construction site that is required to have NPDES permit coverage for discharges of stormwater associated with construction activity;
 - ii. The support activity is not a commercial operation serving multiple unrelated construction projects by different operators and does not operate beyond the completion of the construction activity at the last construction project it supports; and
 - iii. Appropriate controls and measures covering the discharges from the support activity areas are identified in a stormwater pollution prevention plan ("SWPPP").
 - d. Non-stormwater discharges as noted in Part I.D.2 or as otherwise specifically allowed by the permit; and
 - e. Discharges comprised of a discharge listed in Part I (a) through (d) commingled with a discharge authorized by a different NDPEs permit and/or discharge that does not require NPDES permit authorization.
2. Miscellaneous Non-Stormwater Discharges. An operator may discharge the following non-stormwater discharges, provided they are not a significant source of pollutants and the operator implements appropriate BMPs to minimize pollutants discharged per Part III:
- a. Discharges from fire-fighting activities. Although fire-fighting drainage may contain significant pollutant concentrations, the frequency of discharge is low and the discharge is hereby authorized out of necessity;
 - b. Fire hydrant flushing;
 - c. Water used to wash vehicles where detergents are not used;
 - d. Water used to control dust, provided effluent or other wastewaters are not used;
 - e. Potable water sources including water line flushing;
 - f. Routine external building wash down where detergents are not used;
 - g. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
 - h. Uncontaminated air conditioning or compressor condensate;
 - i. Uncontaminated groundwater or spring water;
 - j. Foundation or footing drains where flows are not contaminated with process materials such as solvents;
 - k. Potable water well flushing where the receiving waters are ephemeral;
 - l. Water used for compacting soil, provided effluent or other wastewaters are not used;

- m. Water used for drilling and coring such as for evaluation of foundation materials, where flows are not contaminated with additives; and
- n. Water obtained from dewatering operations of foundations in preparation for and during excavation and construction that will have flows of 300 gallons per minute (“gpm”) or less for thirty (30) days or less.

E. Limitations of Coverage

1. Post Construction Discharges. This permit does not authorize stormwater discharges that originate from the site after construction activities have been completed and the site, including any temporary support activity site, has undergone final stabilization. Post-construction stormwater discharges from industrial sites may need to be covered by a separate NPDES permit.
2. Prohibition on Discharges Mixed With Non-Stormwater. This permit does not authorize discharges that are mixed with sources of non-stormwater, except as allowed in Part I.D.
3. Discharges Covered by Another NPDES Permit. This general permit does not authorize stormwater discharges associated with construction activities that have been covered under an individual permit or have been required to obtain coverage under an alternative general permit. Construction discharges at mining operations are covered under the Mining General Permit NVR300000.
4. Discharges Threatening Water Quality. This general permit does not authorize discharges that will cause or contribute to non-attainment of water quality standards or to the designated use of receiving waters. The operator must design and implement BMPs sufficient to meet this requirement.

F. Waiver for Small Construction Activities. NDEP may exempt a small construction operator from the requirement to obtain coverage under a stormwater permit, if certain criteria are met and proper application procedures followed.

1. Low Erosion Potential. If the small construction site is between 1 acre and 5 acres and the rainfall erosivity factor calculation (“R” in the Revised Universal Soil Loss Equation) is less than 5 during the **entire** period of construction activity, the site will be eligible for a waiver. The applicant must certify to NDEP that construction activity will occur only when R is less than 5. The erosivity factor can be calculated using NDEP’s NOI database.

The period of construction activity begins at initial earth disturbance and ends with the final site stabilization. The operator must submit a Permit Waiver electronically to NDEP in accordance with Part II of this permit before commencing construction activities in accordance with Part II.

Persons that are not required to file for permit coverage per this section must operate exempt construction sites in a manner that minimizes pollutants in the discharge. In the event discharges from the site may cause or contribute to non-

attainment of water quality standards, NDEP may require the operator to obtain permit coverage.

Note: Construction activities that will disturb 5 acres or more cannot be exempted from stormwater permitting requirements. Also, construction activities less than 5 acres, but the parcel is part of a greater (5 acres or more) common plan of development or sale cannot be exempted.

G. Requirement for Individual Permit. NDEP may require the holder of a general stormwater permit to apply for and obtain an individual permit in accordance with NAC 445A.269.

H. Requirement for Stormwater Permit for Projects Less Than 1 Acre. If NDEP determines that a project less than one (1) acre in size will impact receiving waters or its tributaries within a 1/4-mile radius of the project, the owner of the project will be required to obtain a stormwater permit and abide by the terms of this permit.

I. Waiver for Certain Oil and Gas Operations. NDEP may not require a permit for discharges of storm water runoff from construction operations at oil and gas exploration, production, processing or treatment operations or transmission facilities, composed entirely of flows which are from conveyances or systems of conveyances (including but not limited to pipes, conduits, ditches, and channels) used for collecting and conveying precipitation runoff and which are not contaminated by contact with or that has not come into contact with, any overburden, raw material, intermediate products, finished product, byproduct or waste products located on the site of such operations. A permit will be required if a stormwater discharge from a construction operation at an oil and/or gas exploration, production, processing, treatment, or transmission facility contributes to a violation of a water quality standard (except for discharges of sediment.)

PART II. REQUEST FOR INCLUSION UNDER THIS GENERAL PERMIT

A. Application for Coverage. A person may be authorized to discharge under this general permit only if the stormwater discharge is associated with construction activities with the project site. An application seeking inclusion under this permit shall:

1. Submit a Notice of Intent ("NOI") no later than two (2) days prior to the start of construction. Eligible concrete, asphalt, and material plants or operations shall be included on the NOI submitted for the construction project. The site is covered provisionally under this permit once the NOI has been received electronically by NDEP and until approval of the permit by NDEP.
2. For each new NOI, the permittee must develop and implement a SWPPP that meets the requirements of Part III of this permit and covers either the entire site or

all portions of the site for which the permittee is an operator. The SWPPP shall be prepared and maintained on the permittee's project site for these discharges.

B. NOI Electronic Filing Requirements. NOI forms must be completed on-line at NDEP's website at the following address:

http://ndep.nv.gov/bwpc/storm_cont03.htm. The applicant will be required to provide the following information to complete the NOI and submit it to NDEP:

1. Owner/operator (applicant) information including the name, address, city, state, zip code and phone number of both the owner and operator;
2. Project/site information including the project name, project address/location, city, state, zip code, latitude, longitude, at least one Assessor's Parcel Number ("APN") associated with the project and the county;
3. Name of the receiving water for any stormwater discharge;
4. The estimated construction start date;
5. The estimated completion date of construction;
6. An estimate of the area to be disturbed to the nearest acre;
7. An estimate of the likelihood of a stormwater discharge;
8. The address of the location where the SWPPP can be viewed including the city, state, zip code and phone number. *Note: It is not necessary to submit a copy of the SWPPP to NDEP.*

C. Submitting the Completed NOI. After completing the NOI and filing it electronically with NDEP, the applicant must perform the following steps within thirty (30) days to complete the NOI application:

1. Print out a copy of the NDEP confirmation page and sign below the certification statement. The certification statement and the person responsible for signing the NOI is discussed in Part V of this permit;
2. Write a check to "NDEP" for the required permit fees; and
3. Mail the check and confirmation page with the original signature to:

Stormwater Coordinator
Bureau of Water Pollution Control
Nevada Division of Environmental Protection
901 S. Stewart Street, Suite 4001
Carson City NV 89701

D. Continuation of Coverage in the General Permit. To continue to be included in this general permit, holders of expired general permit NVR100000 must submit a renewal NOI to NDEP within ninety (90) days of the effective date of this permit to remain included under the original NOI. The permittee must verify that the information on the renewal NOI is valid and accurate before submitting the renewal NOI for continued inclusion. No additional filing fee is required to file this renewal NOI. In addition, the previously supplied permit identification number (CSW-xxxx) must be included with the submittal.

E. Authorization Date of the Permit. The authorization date of the new permit shall be:

1. The date the NOI is approved by NDEP; or
2. The effective date of this permit for all holders of expired general permit NVR100000 that have submitted a renewal NOI for this permit;
3. An approval letter will be sent to the applicant stating the authorization date. Special conditions may be included in the permit.
4. During the period beginning on the authorization date and lasting until permit coverage is terminated, the permittee is authorized to discharge stormwater or approved non-stormwater to WOUS, as discussed in Part I.D. and in accordance with the SWPPP and the conditions listed in this permit.

PART III. STORM WATER POLLUTION PREVENTION PLAN

A. Objective. Prior to submitting the NOI and filing fee, the SWPPP shall be completed and available for inspection at the project site for each construction project and material plant or operation covered by this permit. The purpose of the SWPPP is to identify stormwater pollution sources, reduce their impacts, and comply with the conditions of this permit. The SWPPP shall be prepared in accordance with good engineering practices and shall consist of project information, BMPs, inspection and maintenance, controls for non-stormwater discharges, and a description of permanent stormwater controls that will be built as part of the project. Each of the plan elements must be revised as necessary to maintain accuracy if there are changes in design or construction of the project or if the SWPPP is found to be insufficient. NDEP may require modifications to a SWPPP within a specified time frame. The permittee shall make the SWPPPs available upon request to the State or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; or the operator of a municipal separate storm sewer receiving discharges from the site. The SWPPP must be kept on-site or locally available and must be available for review by NDEP at the time of an on-site inspection. The SWPPP shall include the following minimum elements:

1. Project Description

- a. Permittee information including the company or agency, street address, city, state, zip code, and phone number;
- b. Contact information of the permittee including the name, street address, city, state, zip code, and phone number;
- c. The name(s) of the person(s) responsible for implementation of the SWPPP;
- d. The project name;
- e. The project location including the address, city, county and at least one APN associated with the project;

- f. A description of the nature of the construction activity;
 - g. A description of the intended sequence of major activities which disturb soils for major portions of the site (e.g., grubbing, excavation, grading, utilities and infrastructure installation);
 - h. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other construction activities including offsite borrow and fill areas;
 - i. An estimate of the runoff coefficient of the site for both the preconstruction and post-construction conditions and data describing the soil or the quality of any discharge from the site;
 - j. A general location map of the project (e.g., a portion of a city or county map) and a site map of the project indicating the following:
 - i. Drainage patterns and approximate slopes anticipated after major grading;
 - ii. Construction activities and areas of soil disturbance;
 - iii. Areas of the project that will not be disturbed;
 - iv. Locations of major structural and nonstructural controls identified in the SWPPP;
 - v. Locations where stabilization practices are expected to occur;
 - vi. Locations of off-site material and waste;
 - vii. Borrow or equipment storage areas;
 - viii. Location of all surface waters (including wetlands);
 - ix. Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply;
 - x. Locations where storm water discharges to a surface water (including ephemeral waters or dry washes) and to Municipal Separate Storm Sewer Systems ("MS4s");
 - xi. Location and description of any discharge associated with industrial activity other than construction, including storm water discharges from dedicated asphalt plants and dedicated concrete plants, which is covered by this permit;
 - xii. The name of the receiving water(s) and the aerial extent and description of wetland or other special aquatic sites at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project;
 - xiii. Identify and address offsite material storage areas or borrow areas used solely by the permittee's project;
 - xiv. A copy of the permit requirements (attaching a copy of this permit is acceptable).
2. **Stormwater Controls.** Each SWPPP shall include a description of appropriate control measures (i.e., BMPs) that will be implemented as part of the construction activity to control pollutants in storm water discharges. The SWPPP must clearly describe for each major activity identified in Part III.1.g: (a) Appropriate control

measures and the general timing (or sequence) during the construction process that the measures will be implemented; and (b) which permittee is responsible for implementation.

3. **Offsite Material Storage Areas.** Offsite material storage areas (also including overburden and stockpiles of dirt, borrow areas, etc.) used solely by the permitted project are considered a part of the project and must be addressed in the SWPPP.
4. **Erosion and Sediment Controls.** The SWPPP must describe the implementation of control measures, including the following minimum components:
 - a. **Design.** The construction-phase erosion and sediment controls should be designed to retain sediment on site to the degree attainable.
 - b. **Selection, Installation and Maintenance.** All control measures must be properly selected, installed, and maintained in accordance with the manufacturers' specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately, or incorrectly, the permittee must replace or modify the control for site situations, as soon as practicable and before the next storm event. If implementation prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable.
 - c. **Offsite Accumulation of Sediment.** When sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to ensure no adverse effects on water quality (e.g., fugitive sediment in street could be washed into storm drains by the next rain and/or pose a safety hazard to users of public streets).
 - d. **Good Housekeeping.** The SWPPP must describe good housekeeping procedures to prevent litter, construction debris, and construction chemicals exposed to stormwater from becoming a pollutant source for storm water discharges (e.g., screening outfalls, picked up daily).
5. **Stabilization Practices.**
 - a. **Description and Schedule.** The SWPPP must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include but are not limited to: establishment of temporary vegetation, establishment of permanent vegetation, mulching, geotextiles, sod

stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures.

- b. **Records of Stabilization.** The following records shall be maintained and attached to the SWPPP: the dates when major grading activities occur; the dates when construction activities temporarily or permanently cease on a portion of the site; and the dates when stabilization measures are initiated.
 - c. **Deadlines for Stabilization.** Except as provided in Part III.A.5.c.(i), (ii), and (iii) below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than fourteen (14) days after the construction activity in that portion of the site has temporarily or permanently ceased.
 - i. Where the initiation of stabilization measures by the fourteenth (14th) day after construction activity temporary or permanently cease(s) is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable.
 - ii. Where construction activity on a portion of the site is temporarily ceased, and earth-disturbing activities will be resumed within twenty-one (21) days, temporary stabilization measures do not have to be initiated on that portion of site.
 - iii. In arid areas (areas with an average annual precipitation of 0 to 10 inches), semiarid areas (areas with an average annual precipitation of 10 to 20 inches), and areas experiencing droughts where the initiation of stabilization measures by the fourteenth (14th) day after construction activity has temporarily or permanently ceased is precluded by seasonal arid conditions, stabilization measures shall be initiated as soon as practicable.
6. **Structural Practices.** The SWPPP must include a description of structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Structural practices may include but are not limited to: silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Placement of structural practices in floodplains should be avoided to the degree attainable. The installation of these devices may be subject to section 404 of the Clean Water Act ("CWA"). A combination of sediment and erosion control measures is required to achieve maximum pollutant removal.

a. Sediment Basins.

- i. For common drainage locations that serve an area with ten (10) or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from a 2-year, 24-hour storm event from each disturbed acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, shall be provided where attainable until final stabilization of the site. When computing the number of acres draining into a common location it is not necessary to include flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. In determining whether installing a sediment basin is attainable, the permittee may consider factors such as site soils, slope, available area on site, etc. In any event, the permittee must consider public safety, especially as it relates to children, as a design factor for the sediment basin and alternative sediment controls shall be used where site limitations would preclude a safe design.
- ii. For drainage locations that serve ten (10) or more disturbed acres at one time and where a temporary sediment basin or equivalent controls is not attainable, smaller sediment basins and/or sediment traps should be used. Where neither the sediment basin nor equivalent controls are attainable due to site limitations, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries of the construction area and for those side slope boundaries deemed appropriate as dictated by individual site conditions.
- iii. For drainage locations serving less than ten (10) acres, smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin providing storage for a calculated volume of runoff from a 2-year, 24-hour storm event or 3,600 cubic feet of storage per acre drained is provided.

b. Velocity Dissipation Devices.

Velocity dissipation devices must be placed at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g. no significant changes in the hydrological regime of the receiving water).

7. **Post-Construction Stormwater Management.** The SWPPP must include a description of stormwater management measures that will be installed during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Structural measures should be placed on upland soils to the degree attainable. Such measures must be designed and installed consistent with applicable local or state stormwater management requirements.

Such practices may include but are not limited to: stormwater detention structures (including wet ponds); stormwater retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices). The SWPPP shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels.

Note: The installation of these devices may also require a separate permit under section 404 of the CWA. Permittees are only responsible for the installation and maintenance of stormwater management measures prior to final stabilization of the site, and are not responsible for maintenance after stormwater discharges associated with construction activity have been eliminated from the site. However, post construction stormwater BMPs that discharge pollutants from point sources once construction is completed may, in themselves, need authorization under a separate NPDES permit.

8. **Non-Storm Water Discharge Maintenance.** The SWPPP must identify all allowable sources of non-stormwater discharges listed in Part I.D.2 of this permit, except for flows from fire fighting activities. Non-stormwater discharges are to be eliminated or reduced to extent possible. The operator must implement appropriate pollution prevention measures to minimize pollutants in any non-storm water component(s) of the discharge and must describe those measures in the SWPPP. Except if used in emergency firefighting, superchlorinated wastewaters must be held on-site until the chlorine dissipates, or otherwise dechlorinated prior to discharge.

9. **Other Controls.** The SWPPP must describe:

- a. Measures to prevent the discharge of solid materials, including building

materials, to WOUS, except as authorized by a permit issued under section 404 of the CWA;

- b. Measures to minimize off-site vehicle tracking of sediments, to the extent practicable, and the generation of on-site dust;
- c. Measures to sufficiently stabilize soil at culvert locations to prevent the formation of rills and gullies during construction;
- d. A description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWPPP shall also include a description of controls to reduce pollutants from these materials including storage practices to minimize exposure of the materials to stormwater, and spill prevention and response; and
- e. A description of pollutant sources from areas other than construction (including stormwater discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.

10. Applicable Federal, State, or Local Programs.

- a. The SWPPP shall be consistent with applicable State, and/or local waste disposal, sanitary sewer or septic system regulations to the extent these are located within the permitted area;
- b. When discharges to water quality-impaired waters that are contained in the current 303(d) Impaired Water Body listing issued by the Nevada Division of Environmental Protection, Bureau of Water Quality Planning, the permittee must investigate whether discharges from the permittee's site will contribute significantly to any 303(d) listing, and when the permittee discharges into a water body with an established Total Maximum Daily Load ("TMDL"), the permittee shall comply with all applicable TMDL requirements. This information can be found on the following NDEP website: <http://ndep.nv.gov/bwqp/standard.htm>.

When a TMDL has not been established as described in paragraph above, the permittee must include a section in the SWPPP describing the condition for which the water has been listed. The SWPPP must also include a demonstration that the BMPs that are selected for implementation will be sufficient to ensure that the discharges will not cause or contribute to an exceedance of an applicable State water quality standard;

- c. Permittees that discharge storm water associated with construction

activities must ensure their SWPPP is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or stormwater management site plans or site permits approved by State or local officials;

- d. SWPPPs must be updated as necessary to remain consistent with any changes applicable to protecting surface water resources in sediment and erosion site plans or site permits, or stormwater management site plans or site permits approved by State or local officials for which the permittee receives written notice; and
- e. The SWPP may incorporate by reference the appropriate elements of plans required by other agencies. A copy of the requirements incorporated by reference shall be included as an attachment to the SWPPP.

11. Maintenance of BMPs

- a. All erosion and sediment control measures and other protective measures identified in the SWPPP must be maintained in effective operating condition. If site inspections required by Part III.A.12 identify BMPs that are not operating effectively or if the capacity has been reduced by 50%, maintenance shall be performed before the next anticipated storm event, or as soon as possible if maintenance before the next anticipated storm event is not practicable;
- b. If existing BMPs need to be modified or additional BMPs are necessary, implementation must be completed before the next anticipated storm event. If implementation prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable; and
- c. The permittee must remove sediment from sediment traps or sedimentation ponds when design capacity has been reduced by 50%.

12. Construction Site Inspections

- a. **Routine Inspection Schedule.** The permittee must ensure routine inspections are performed at the site to ensure the BMPs are functional and that the SWPPP is being properly implemented. The permittee must have the site inspected at least once every seven (7) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater;
- b. **Inspection Waiver.** Permittees are eligible for a waiver of weekly inspection requirements until one month before thawing conditions are expected to result in a discharge if all of the following requirements are

met:

- i. The project is located in an area where frozen conditions are anticipated to continue for extended periods of time (i.e., more than one month);
 - ii. Land disturbance activities have been suspended; and
 - iii. The beginning and ending dates of the waiver period are documented in the SWPPP.
- c. **Inspectors.** Qualified personnel (provided by the permittee or cooperatively by multiple permittees) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter or exit the site. "Qualified personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls and who possesses the skills to assess conditions at the site that could impact stormwater quality and the effectiveness of the BMPs selected to control the quality of the stormwater discharges;
- d. **Scope of Inspections.** Inspections must include all areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation. Inspectors must look for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion control measures identified in the SWPPP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether sediment and erosion control measures are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking. All BMPs and areas inspected and their condition must be documented in the inspection report;
- e. **Inspection Report.** An inspection report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, and major observations relating to the implementation of the SWPPP shall be made. Major observations should include the location(s) of discharges of sediment or other pollutants from the site; location(s) of BMPs that need to be maintained; location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location; and location(s) where additional BMPs are needed that did not exist at the time of inspection;

- f. **Maintaining Inspection Records.** The permittee must ensure that the inspection reports and record of any follow-up actions taken in accordance with Part III.A.12.e of this permit is retained as part of the SWPPP for at least three years from the date that permit coverage expires or the site is finally stabilized. Inspection reports shall identify any incidents of noncompliance with this permit. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the facility is in compliance with the SWPPP and this permit. The report shall be signed in accordance with Part V.B.1 of this permit;
 - g. **Follow-Up Actions.** Based on the results of the inspection, the SWPPP shall be modified as necessary (e.g., show additional controls on a map required by Part III.A.1.j and/or revise the description of controls required by Part III.A.2) to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) calendar days following the inspection. If existing BMPs need to be modified or if additional BMPs are necessary, implementation shall be completed within 7 days following receipt of the inspection results or prior to the next anticipated storm event, whenever practicable. If implementation of the BMPs before the next storm event is impracticable, the BMPs shall be implemented as soon as possible if implementation before the next anticipated storm event is not practicable.
- 13. **Maintaining an Updated SWPPP.** The operator must amend the SWPPP within seven (7) business days whenever:
 - a. There is a change in design, construction, operation, or maintenance at the construction site that has a significant effect on the discharge of pollutants to WOUS that has not been previously addressed in the SWPPP; or
 - b. During inspections, monitoring if required, or investigations by the permittee or by local, state, MS4, or federal officials, it is determined the discharges are causing or contributing to water quality exceedances or the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the construction site.; or
 - c. If implementation of the BMPs required by the SWPPP revision before the next storm event is impracticable, the BMPs shall be implemented as soon as possible if implementation of the BMP before the next anticipated storm event is not practicable.
- 14. **Deficiencies in the SWPPP.** NDEP may notify the permittee at any time that the SWPPP does not meet one or more requirements of this section. The notification must identify the provisions of this permit that are not being met and parts of the

SWPPP that require modification. Within fifteen (15) days of receipt of the notification by NDEP, the permittee must make the required changes to the SWPPP and submit to NDEP a written certification that the requested changes have been made. NDEP may request a copy of the SWPPP to confirm that all deficiencies have been adequately addressed. NDEP may also take appropriate enforcement action for the period of time the permittee was operating under a plan that did not meet the minimum requirements of this permit.

PART IV. NOTICE OF TERMINATION

A. Notice of Termination. A Notice of Termination ("NOT") must be submitted upon completion of the project. To terminate permit coverage, an NOT, as approved by NDEP, shall be submitted when final stabilization has been achieved or when the project has been transferred to another permittee.

B. Information Required. The following minimum information is required on an NOT:

1. The stormwater general permit number;
2. Facility operator information, including the name, address, city, state, zip code and phone number;
3. Facility/site location information including the name, address, city, state, zip code, phone number and at least one APN associated with the project; and
4. A certification statement signed and dated by the permittee. The certification statement is:

"I certify under penalty of law that all storm water discharges associated with construction activity from the identified facility that was authorized by a general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this notice of termination, I am no longer authorized to discharge stormwater associated with construction activity under this general permit, and that discharging pollutants in stormwater associated with construction activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this Notice of Termination does not release an operator from liability for any violations of this permit or the Clean Water Act."

Note: For construction projects with more than one permittee and/or operator, the permittee need only make this certification for those portions of the construction site where the permittee was authorized under this permit and not for areas where the permittee was not an operator.

C. Final Stabilization. Final Stabilization means that either:

1. All soil disturbing activities at the site have been completed and a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures have been employed. In such parts of the country, background native vegetation will cover less than 100% of the ground. Establishing at least 70% of the natural cover of the native vegetation meets the vegetative cover criteria for final stabilization (e.g., if the native vegetation covers 50% of the ground, 70% of 50% would require 35% total cover for final stabilization; on a beach with no natural vegetation, no stabilization is required); or

For individual lots in residential construction by either:

- a. The homebuilder completing final stabilization as specified above, or
 - b. The homebuilder establishing temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for, and benefits of, final stabilization; or
2. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to WOUS, and areas which are not being returned to their preconstruction agricultural use must meet the final stabilization criteria listed above.

PART V. STANDARD PERMIT CONDITIONS

A. Operating Requirements

1. **Proper Operation and Maintenance.** The permittee shall implement all BMPs used to comply with this permit and maintain them in good working order;
2. **Removed Substances.** Solids and other pollutants removed in the course of treatment or control of stormwater shall be disposed of in accordance with applicable laws, regulations, codes, and ordinances;
3. **Water Quality Standards.** There shall be no discharge of substances that cause or contribute to a violation of the water quality standards of the State of Nevada;

4. **Sampling and Analysis.** If any samples or measurements are taken pursuant to this permit they shall be representative of the volume and nature of the discharge. Laboratory analyses shall be performed by a State of Nevada certified laboratory. Results from this lab must be provided to NDEP.
5. **Test Procedures.** Test procedures for analyses of pollutants shall conform to regulations (40 CFR § 136) published pursuant to Section 304(h) of the Act, under which such procedures may be required, unless other procedures are approved by NDEP;
6. **Recording the Results.** If any measurement or sample is taken pursuant to this permit, the permittee shall record the following information:
 - a. The exact place, date, and time of sampling;
 - b. The dates the analyses were performed;
 - c. The person(s) who performed the analyses;
 - d. The analytical techniques or methods used; and
 - e. The results of all required analyses.
7. **Adverse Impact.** The permittee shall take all reasonable steps to minimize any adverse impacts to receiving waters from any unauthorized discharge including monitoring as necessary to determine the nature and impact of the unauthorized discharge.

B. Administrative Requirements

1. Signature Requirements

a. Notices of Intent

All NOIs shall be signed as follows:

- i. **For a corporation.** By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
 - (1) A president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or
 - (2) The manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other

comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

- ii. **For a partnership or sole proprietorship.** By a general partner or the proprietor, respectively; or
 - iii. **For a municipality, state, federal, or other public agency.** By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:
 - (1) The chief executive officer of the agency, or
 - (2) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
- b. **Duly Authorized Representative.** All SWPPPs and any other information required by this permit or requested by NDEP shall be signed by a person described in Part V.B.1, or by a duly authorized representative of that person. A person is a duly authorized representative only if:
- i. The authorization is made in writing by a person described in Part V.B.1;
 - ii. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
 - iii. The written authorization is submitted to NDEP.
- c. **Changes to Authorization.** If an authorization in Part V.B.1 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new written authorization satisfying the requirements of Part V.B.1.b must be submitted to NDEP prior to or together with any information signed by the new representative.

- d. **Certification.** Any person signing a document in Part V.B shall make the following certification.

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. I also confirm that a stormwater pollution prevention plan (SWPPP) has been completed, will be maintained at the project site from the start of construction activities, and that the SWPPP will be compliant with any applicable local sediment and erosion control plans. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines for knowing violations.”

2. **Records Retention.** All records and information resulting from activities performed pursuant to this permit shall be retained for a minimum of three years; or longer if required by NDEP.
3. **Availability of Reports.** Except for data determined to be confidential under NRS 445A.665, all reports prepared in accordance with the terms of this permit shall be available for public inspection at NDEP's office. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in NRS 445A.710.
4. **Continuation of Coverage.** In accordance with NAC 445A.241, this permit shall remain in effect until reissued, and existing permittees shall be included in the reissued permit if a new NOI is submitted prior to the expiration date of this permit. A filing fee is not required for this new submittal.
5. **Transfer of Ownership or Control.** If control or ownership of the construction project changes, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to NDEP. To transfer permit coverage, the new owner or controller must submit a written request to NDEP. All transfer of permits shall be approved by NDEP.
6. **Annual Fee.** The permittee shall remit an annual fee in accordance with NAC 445A.268 on or before July 1 every year. If the original submittal for this permit is done prior to July 1, the permittee shall resubmit a new annual fee on or before July 1 of that same year.

7. **Right of Entry.** The permittee shall allow NDEP's representatives upon the presentation of credentials:
 - a. To enter upon the construction site or the permittee's premises where any records are kept under the terms and conditions of this permit; and
 - b. At reasonable times, to have access to and copy any records kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method used pursuant to this permit; and to perform any necessary sampling to determine compliance with this permit or to sample any discharge.
8. **Penalty for Violation of Permit Conditions.** The permittee shall comply with all conditions of this permit. Any permit non-compliance constitutes a violation of the CWA and is grounds for enforcement action, permit termination, revocation and re-issuance, or modification, or denial of a permit renewal application. NRS 445A.675 provides that any person who violates a permit condition is subject to administrative and judicial sanctions as outlined in NRS 445A.690 through 445A.705.
9. **Furnishing False Information and Tampering with Monitoring Devices.** Any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained by the provisions of NRS 445A.300 to 445A.730, inclusive, or by any permit, rule, regulation or order issued pursuant thereto, or who falsifies, tampers with or knowingly renders inaccurate any monitoring device or method required to be maintained under the provisions of NRS 445A.300 to 445A.730, inclusive, or by any permit, rule, regulation or order issued pursuant thereto, is guilty of a gross misdemeanor and shall be punished by a fine of not more than \$10,000 or by imprisonment. This penalty is in addition to any other penalties, civil or criminal, provided pursuant to NRS 445A.300 to 445A.730, inclusive.
10. **Permit Modification, Suspension or Revocation.** After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:
 - a. Violation of any terms or conditions of this permit;
 - b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
 - c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.
11. **Liability.** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or

penalties established pursuant to any applicable Federal, State or local laws, regulations, or ordinances.

12. **Property Rights.** The issuance of this permit does not convey any property rights, in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.
13. **Severability.** The provisions of this permit are severable, and if any provision of this permit, or the application of any provisions of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

Appendix A – Definitions

Best management practices ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of "Waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Construction Activities - Construction activities include any clearing, grading and excavation activities that result in the disturbance of one (1) acre or more of total land area, or will disturb less than one (1) acre but are part of a larger common plan for development or sale that will ultimately disturb one (1) or more acres..

CWA - Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483 and Public Law 97-117, 33 U.S.C. 1251 et seq. CWA and regulations means the Clean Water Act (CWA) and applicable regulations promulgated thereunder. In the case of an approved State program, it includes State program requirements.

Industrial Activities means temporary concrete, asphalt and material plants which are dedicated to the permitted construction activity.

Large construction activity includes clearing, grading and excavation that results in the disturbance of five acres or more of total land area.

Small construction activity includes the disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than one and less than five acres. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility. NDEP may waive the otherwise applicable requirements in a general permit for a storm water discharge from construction activities that disturb less than five acres where the value of the rainfall erosivity factor ("R" in the Revised Universal Soil Loss Equation) is less than five during the period of construction activity. The rainfall erosivity factor is determined in accordance with Chapter 2 of Agriculture Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE), pages 21-64, dated January 1997.

Stormwater means storm water runoff, snow melt runoff, and surface runoff and drainage.

Attachment B

Construction Site Best Management Practices

Construction Site Best Management Practices

PL-1

Site Design

Definition

The incorporation of site design features in the planning process that will help reduce sediment pollution and minimize the need for additional sediment control BMPs.

RATINGS			
Associated Costs	H	M	L
Implementation			x
Maintenance			x
Training			x
Target Pollutants Removal	H	M	L
Oil and Grease			x
Nutrients		x	
Sediment	x		
Floatable Material		x	
Metals		x	
Other Construction Waste			x
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: • All Construction Projects– high Most effective when used with: • All Applicable BMPs Alternative BMPs: • None		Photos/Sketches: • PL-1 Active Construction Site Sketch CAD Drawings: • None	

Purpose

To implement design features in the planning process that can significantly help to minimize the need for additional sediment controls. Some of these design features can also be used to control and enhance the quality of stormwater runoff during construction as well as provide post-construction structural controls.

Appropriate Applications

Site Design considerations can be used on all construction projects.

Limitations

- Site constraints may limit the ability to use existing vegetation as a filter strip.

Construction Site Best Management Practices

- Grass lined swales are difficult to establish in the Las Vegas Valley unless they have a permanent irrigation system.

Recommended Standards and Specifications

- Limit the amount of continuously connected disturbed soil areas.
- Provide active construction areas with base grade elevations below the elevation of the surrounding area. An active construction area located below the grade of surrounding pavement and sidewalks may be considered to have effective perimeter controls since the entire work area would effectively function as a detention basin during storm events. An example is provided in the graphic below where below grade construction activities and existing curb and gutter result in effective perimeter control.
- Provide additional perimeter control using vegetated filter strips in conjunction with other controls such as fiber rolls or silt fences. Vegetated filter strips can also provide permanent post construction structural controls and can consist of preserved existing vegetated areas.
- Limit flow velocities and trap sediments using grass lined swales. If these features are located downstream of the site and are constructed prior to the majority of other construction activities, they can also provide permanent post construction structural controls.

Recommended Maintenance and Inspection

- Inspect site design features weekly during construction activities that are intended to block or filter stormwater runoff to ensure they are adequate to prevent sediment transport off-site. If they are not, additional BMPs should be installed.

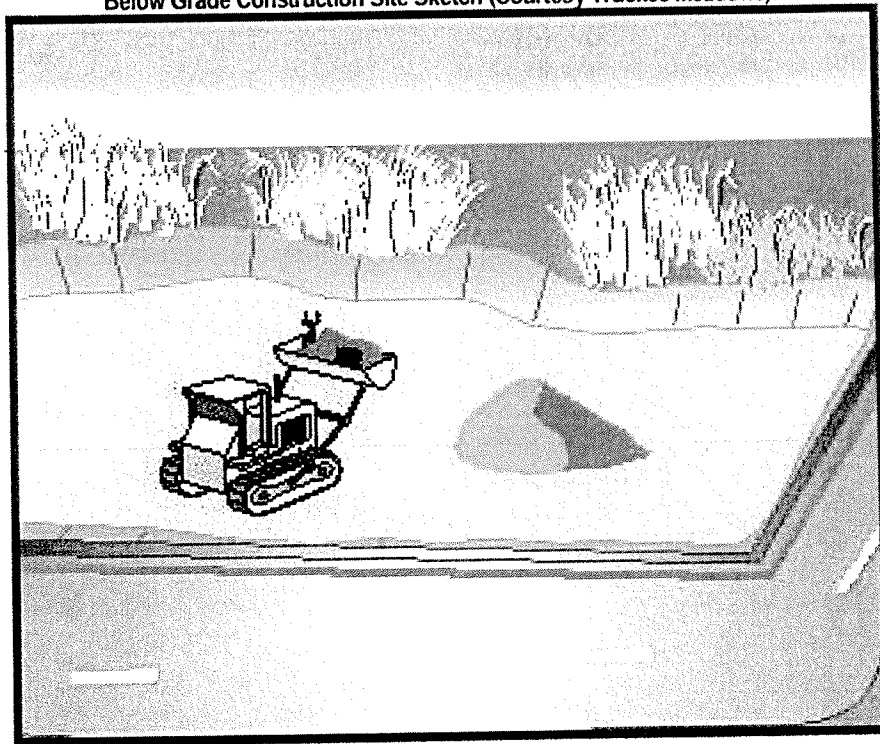
References

Truckee Meadows, *Construction Site Best Management Practices Handbook*, February 2003

Construction Site Best Management Practices

PL-1 Active Construction Site Sketch

Below Grade Construction Site Sketch (Courtesy Truckee Meadows).



Construction Site Best Management Practices

PL-2

Scheduling

Definition

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration.

RATINGS			
Associated Costs	H	M	L
Implementation			x
Maintenance			x
Training			x
Target Pollutants Removal	H	M	L
Oil and Grease			x
Nutrients		x	
Sediment	x		
Floatable Material		x	
Metals		x	
Other Construction Waste			x
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: All Construction Projects that Include Grading or Earthwork– high		Photos/Sketches: None	
Most effective when used with: All Applicable BMPs		CAD Drawings: None	
Alternative BMPs: None			

Purpose

The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Appropriate Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Construction Site Best Management Practices

Limitations

Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Recommended Standards and Specifications

- Avoid intense rainy periods. Schedule major grading operations to minimize disturbance during months in which intense thunderstorms are common (July and August), when practical. Allow enough time before the summer thunderstorm season begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the summer thunderstorm season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.
- Include on the schedule, details on the thunderstorm season implementation and deployment of:
 - Erosion control BMPs
 - Sediment control BMPs
 - Tracking control BMPs
 - Wind erosion control BMPs
 - Non-stormwater BMPs
 - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring, utilities installation, etc., to minimize the active construction area during the rainy season.
 - Sequence trenching activities so that most open portions are closed before new trenching begins.
 - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
 - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.

Construction Site Best Management Practices

- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Recommended Maintenance and Inspection

- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the summer thunderstorm season to show updated information on the deployment and implementation of construction site BMPs.

References

CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.
<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

Truckee Meadows, *Construction Site Best Management Practices Handbook*, February 2003

Construction Site Best Management Practices

PL-3 **Phased Construction**

Definition

The sequencing of land disturbance on large construction projects.

RATINGS			
Associated Costs	H	M	L
Implementation			x
Maintenance			x
Training			x
Target Pollutants Removal	H	M	L
Oil and Grease			x
Nutrients		x	
Sediment	x		
Floatable Material		x	
Metals		x	
Other Construction Waste			x
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: • Large Construction Projects– high Most effective when used with: • All Applicable BMPs Alternative BMPs: • None		Photos/Sketches: • None CAD Drawings: • None	

Purpose

To reduce on-site erosion and sediment transport off-site by sequencing land disturbance and erosion and sediment control measures.

Appropriate Applications

Locations where water quality might be impacted by erosion from earthwork.

Limitations

Weather and other unforeseen conditions that may affect construction phasing.

Construction Site Best Management Practices

Recommended Standards and Specifications

Construction phasing schedules should include at a minimum the following:

- A schedule for the installation of erosion and sediment controls.
- A schedule that is compatible with the general construction schedule.

The following is an example of construction site sequencing:

1. Construction Access	Stabilize bare ground as soon as construction begins.
2. Sediment Traps and Barriers	Barriers should be installed and added prior to grading.
3. Runoff Control	Install diversion channels and dikes before the onset of grading activities.
4. Erosion Control	Disturbed stream banks should be stabilized as soon as possible.
5. Land Clearing and Grading	Clear and grade the site after sediment and runoff control measures have been installed.
6. Maintenance	Conduct frequent inspections and remove accumulated sediments from the BMPs.
7. Surface Stabilization	Apply immediately to any disturbed areas to control dust and erosion.
8. Building Construction	Install needed erosion and sediment control devices.
9. Maintenance	Conduct frequent inspections and remove accumulated sediments from the BMPs
10. Landscaping and Final Stabilization	Stabilize the area and remove all temporary sediment control and construction wastes.

Recommended Maintenance and Inspection

- Verify frequently that work is on schedule according to the project plan.
- Revise the plan before construction activities are implemented when changes to the project schedule are unavoidable.
- Communicate significant schedule changes to city/county staff to assist with inspection efforts.

References

Truckee Meadows Construction Site Best Management Practices Handbook, February 2003

Construction Site Best Management Practices

PL-4

Topsoil Reuse

Definition

The salvaging, stockpiling, and reapplication of native topsoil and other selected materials for reuse during revegetation activities.

RATINGS			
Associated Costs	H	M	L
Implementation			x
Maintenance			x
Training			x
Target Pollutants Removal	H	M	L
Oil and Grease			x
Nutrients		x	
Sediment		x	
Floatable Material			x
Metals			x
Other Construction Waste			x
GENERAL INFORMATION	FIGURES		
Applicability – Effectiveness: Projects where revegetation is desirable.– high	Photos/Sketches: - None CAD Drawings: - None		
Most effective when used with: All Applicable BMPs			
Alternative BMPs: None			

Purpose

To encourage the salvaging, stockpiling and reapplication of native topsoil and other selected materials for reuse during revegetation activities. Reuse of native topsoil can be a critical factor to the success of revegetation efforts, particularly when attempting to reestablish native vegetation.

Appropriate Applications

- Sites where revegetation with native plant species is desirable.
- Particularly applicable on floodplains, wetlands, streambanks, and sensitive habitat areas.
- Proper topsoil management can result in successful revegetation, enhanced productivity, reduced erosion, and permanent stabilization.

Construction Site Best Management Practices

Limitations

- Requires advanced planning prior to grading and earthwork activities.
- Stockpiles may constrict the area available for construction activity.
- Stockpile runoff can negatively impact water quality.

Recommended Standards and Specifications

- Conduct a soil survey as part of pre-project site assessment to identify the location, depth and amount of soils suitable for salvaging.
- Excavate topsoil carefully, avoid large rocks, and stockpile material where it will not be contaminated by demolition or construction activities.
- Screen topsoil to remove large rocks, roots and vegetation when necessary to establish a representative native growth medium.
- If there is sufficient turf in good condition on site, it can be machine cut and stockpiled for reuse.
- Where suitable, strip groundcover and shrubs for reuse after construction.
- Shrubs can be carefully removed and stored with their roots covered with mulch or loose soil.
- Soil stockpiles must be covered or protected with temporary stabilization measures such as mulch or temporary vegetation.
- Temporary stabilization must be established no later than 21 days after stockpiles are created.
- Perimeter controls such as sandbag barriers must be installed as soon as practicable and must be in place prior to the onset of precipitation.

The following elements should be considered when developing a topsoil management plan:

- The amount and quality of existing topsoil.
- The area that topsoil will be reused and the required depth of application.
- Methodology for salvaging topsoil.
- Stockpile location, duration of storage and protection against erosion and sediment transport.
- Availability of additional amendments to supplement topsoil reclamation.

Construction Site Best Management Practices

Recommended Maintenance and Inspection

- Inspect covers and perimeter controls weekly.
- Replace or repair covers or augment temporary stabilization measures as needed.
- Replace or repair perimeter controls as needed.

References

Truckee Meadows, *Construction Site Best Management Practices Handbook*, February 2003

Construction Site Best Management Practices

PL-5

Employee Training

Definition

Training employees of contractors, subcontractors, and other personnel who may be on-site in basic stormwater management principles and regulatory requirements.

RATINGS			
Associated Costs	H	M	L
Implementation			x
Maintenance			x
Training			x
Target Pollutants Removal	H	M	L
Oil and Grease	x		
Nutrients	x		
Sediment	x		
Floatable Material	x		
Metals	x		
Other Construction Waste	x		
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: • All construction intending to include grading or earthwork - high Most effective when used with: • All Applicable BMPs Alternative BMPs: • None		Photos/Sketches: • None CAD Drawings: • None	

Purpose

Ensure that contractors, subcontractors and government review and inspection staff are able to identify activities that may potentially impact stormwater quality, identify possible solutions, and implement appropriate BMPs.

Appropriate Applications

All construction intending to include grading or earthwork.

Limitations

None have been indicated.

Construction Site Best Management Practices

Recommended Standards and Specifications

- Incorporate stormwater quality management training with existing construction related training programs.
- Provide refresher courses or training classes on a regular basis.
- Include standard operating procedures and training in spill prevention and response.
- Train personnel in the proper use, storage, and disposal of pesticides and other construction related chemicals.
- Inform off-site contractors of on-site procedures.
- Conduct “tailgate” training sessions at project sites prior to the start of construction activities.
- A formal training course should include information about the following:
 - Environmental concerns about runoff from construction sites
 - The Clean Water Act and the NPDES program
 - NDEP’s General Permit and local policies and procedures
 - Principles of erosion and sediment control
 - Best Management Practices and appropriate applications
 - Proper design and installation procedures
 - Inspection, maintenance, and reporting requirements

References

Truckee Meadows, *Construction Site Best Management Practices Handbook*, February 2003

EC Erosion Control

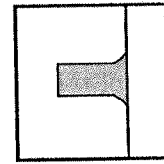
Erosion control refers to methods for reducing the volume or velocity of stormwater runoff, which will come into contact with exposed areas of the project site. Erosion control methods involve limiting the exposure of graded areas to off-site runoff through modifications of the construction design plan or scheduling, reducing runoff velocities, providing vegetative cover, installing structural controls, and implementing other on-site management options. **If a pre-manufactured product is to be implemented on a site for erosion control, the contractor should always follow the manufacturer's installation and maintenance recommendations as the primary reference for implementation.**

- EC-1 Erosion Control Mats
- EC-2 Mulching
- EC-3 Protection of Trees and Vegetation in Construction Areas
- EC-4 Pipe Slope Drains
- EC-5 Stabilized Construction Entrance
- EC-6 Construction Road Stabilization
- EC-7 Dust Control
- EC-8 Temporary Access Waterway Crossing
- EC-9 Diversion Dikes
- EC-10 Drainage Swales
- EC-11 Outlet Protection, Velocity Dissipation Devices
- EC-12 Surface Roughening

Construction Site Best Management Practices

EC-5

Stabilized Construction Entrance



Definition

A stabilized pad of aggregate underlain with filter cloth located at any point where traffic will be entering or exiting a construction site to or from a public right-of-way, street, alley, sidewalk or parking area. For added effectiveness, a wheel wash or wash rack area can be incorporated into the design to further reduce sediment tracking.

RATINGS			
Associated Costs	H	M	L
Implementation		X	
Maintenance		X	
Training			X
Target Pollutants Removal	H	M	L
Oil and Grease			X
Nutrients			X
Sediment		X	
Floatable Material			X
Metals			X
Other Construction Waste			X
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: - Perimeter and Access Controls – high Most effective when used with: - EC-6 Construction Road Stabilization - EC-7 Dust Control - GH-6 Road Sweeping/Trackout Cleaning Alternative BMPs: - GH-4 Designated Washdown Areas – wheel wash is especially useful with clay soils		Photos/Sketches: - EC-5 Stabilized Construction Entrance Photos CAD Drawings: - Stabilized Construction Entrance	

Purpose

Stabilized construction entrances reduce or eliminate the tracking of sediment onto public rights-of-ways or streets. Reducing trackout of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drain and production of airborne dust. It also can direct traffic to a single location, reducing the number of disturbed areas on the site and providing traffic control.

Appropriate Applications

A stabilized construction entrance should be used at all points of construction ingress and egress. Use at construction sites:

Construction Site Best Management Practices

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where clayey or silty soils are encountered.
- Where dust is a problem during dry weather conditions.

NDPES construction permits require that appropriate measures be implemented to prevent trackout of sediments onto paved roadways.

Limitations

Stabilized construction entrances may not be completely effective against preventing the deposition of sediments onto paved surfaces. To further reduce the chance of these sediments polluting stormwater runoff, sweeping of the paved area adjacent to the stabilized site entrance is recommended.

Planning Considerations

Limit points of entrance/exit to only stabilized locations.

Stabilized construction entrances are most effective when used in conjunction with Construction Road Stabilization, Dust Control, and Road Sweeping/Trackout Cleaning.

Recommended Standards and Specifications

Stabilized construction entrances alone are reasonably effective in removing sediment from equipment leaving a construction site. Efficiency is greatly increased, though, when a washing rack is included at the point of egress. See SPC-11 Construction Entrance/Exit Tire Wash for further guidelines.

- Design and Sizing Considerations
 - The aggregate for stabilized construction entrance aprons should have a **nominal diameter of 1 to 3 inches in size, washed, well-graded gravel or crushed rock**. The apron dimensions recommended are 30 feet by 50 feet and 6 inches deep.
 - The entrance must be properly graded to prevent runoff from leaving the construction site.
 - **Consider installing a wash rack as detailed in SPC-11 Construction Entrance/Exit Tire Wash.**
 - When wash areas are provided, washing should be done on an area stabilized with crushed stone which drains into a properly constructed sediment trap or basin (pond).

Construction Site Best Management Practices

Recommended Maintenance and Inspection

- Inspect monthly and after each rainfall.
- Replace gravel mat when surface voids are no longer visible. Periodic top dressing with additional stone will be required.
- All sediments deposited on paved roadways must be removed within 24 hours.
- Remove gravel and filter fabric upon completion of construction.

Post Construction Methods

None.

References

CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.

<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

Center for Watershed Protection, Inc., *Stormwater Manager's Resource Center (SMRC)*.

<http://www.stormwatercenter.net/>

City of Austin, Texas, *Environmental Criteria Manual*, March, 2004.

Kamber Engineering, Gaithersburg, Maryland, *Sedimentation and Erosion Control, An Inventory of Current Practices*, USEPA, April, 1991

North Carolina State University, (NCSU) *North Carolina Nonpoint Source Pollution Control Measures*

<http://h2osparc.wq.ncsu.edu/info/bmps.html>

North Central Texas Council of Governments, *Integrated Storm Water Management (iSWM) Design Manual for Construction*, December 2003.

Tacoma Public Works Environmental Services, *City of Tacoma Surface Water Management Manual Volume II, Construction Stormwater Pollution Prevention*, January 1993.

<http://www.ci.tacoma.wa.us/waterservices/permits/Manual.htm>

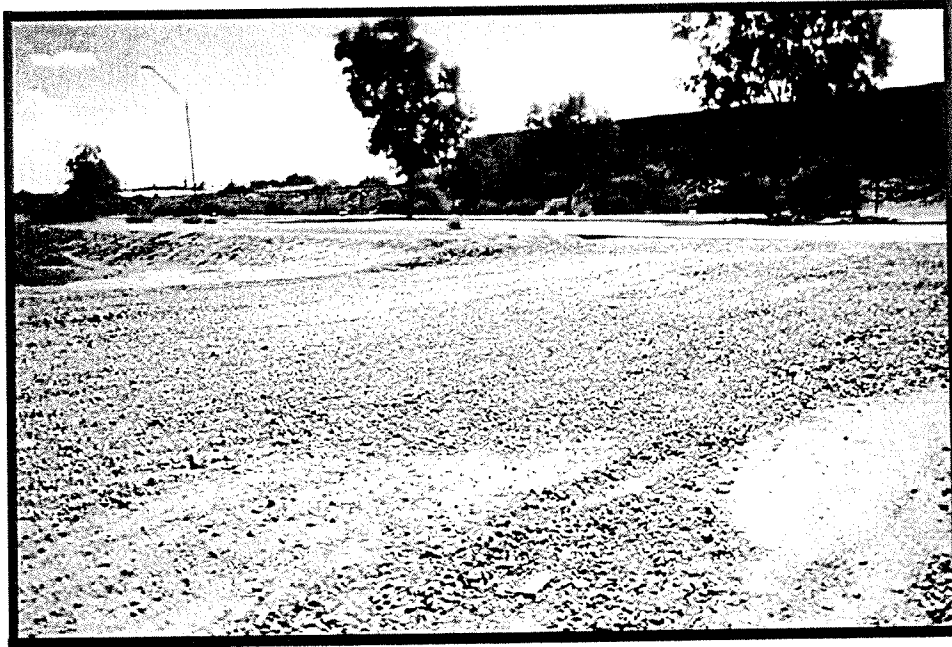
U. S. Environmental Protection Agency, *Construction Site Storm Water Runoff Control, National Menu of Best Management Practices for Storm Water Phase II*, December 1999.

http://cfpub2.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm

Construction Site Best Management Practices

EC-5 Stabilized Construction Entrance Photos/Sketches

Stabilized entrances should consist of well-graded, washed gravel up to 3 inches in diameter
(Courtesy of Maricopa County)

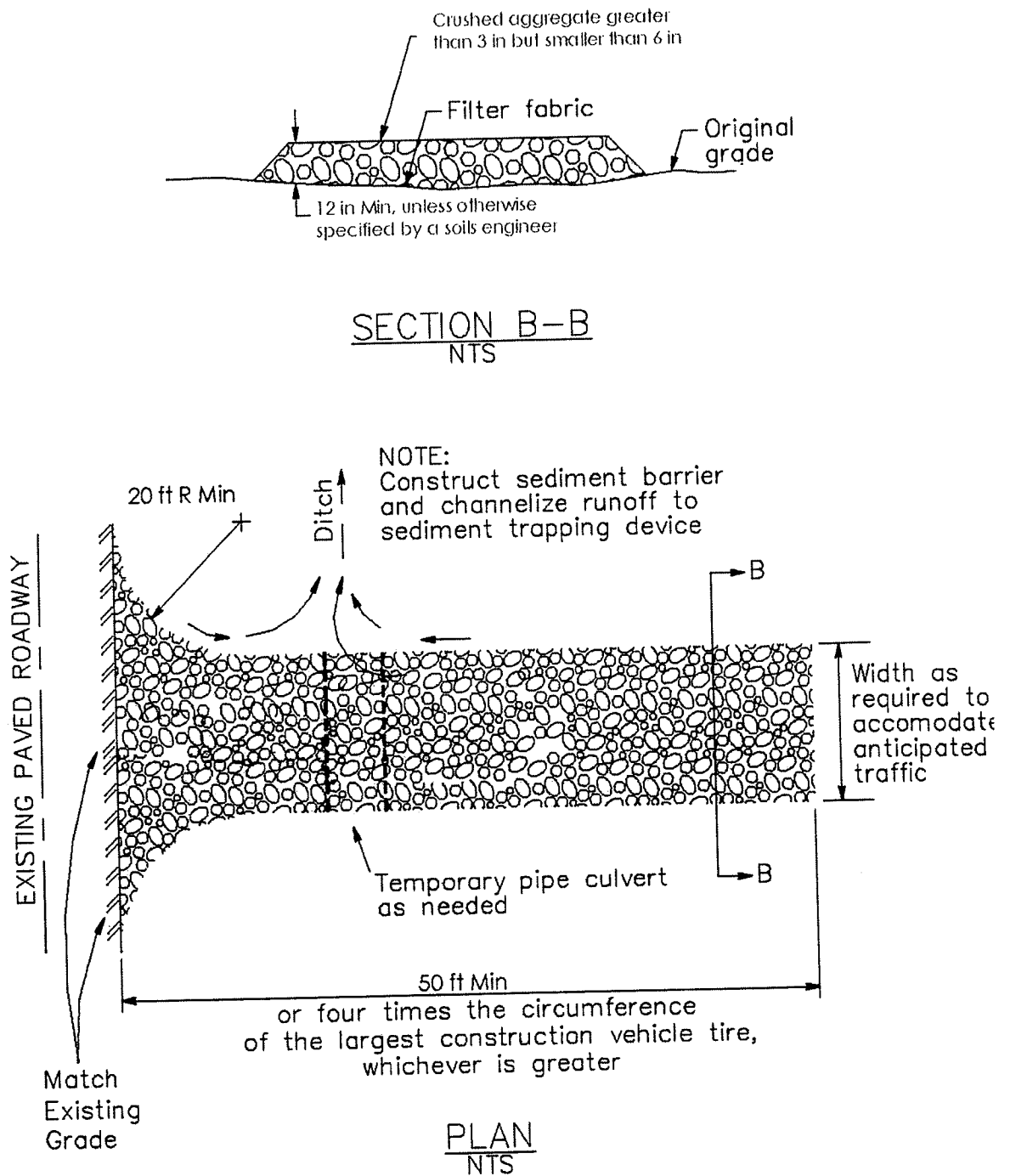


Stabilized construction entrances reduce trackout to public right-of-ways or streets
(Courtesy of Maricopa County)



Construction Site Best Management Practices

EC-5 Stabilized Construction Entrance Drawing

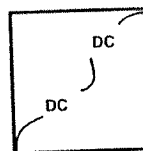


(Courtesy of Caltrans)

Construction Site Best Management Practices

EC-7

Dust Control



Definition

A comprehensive plan to limit off-site sediment depression by minimizing or controlling airborne fugitive dust.

RATINGS			
Associated Costs	H	M	L
Implementation			x
Maintenance	x		
Training			x
Target Pollutants Removal	H	M	L
Oil and Grease			x
Nutrients			x
Sediment	x		
Floatable Material			x
Metals		x	
Other Construction Waste			x
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: - Perimeter and Access Controls – high Most effective when used with: - EC-5 Stabilized Construction Entrance - EC-6 Construction Road Stabilization - GH-6 Road Sweeping/Trackout Cleaning Alternative BMPs: - For long-term dust control, consider SPC-6 Revegetation or Gravel Mulch EC-2		Photos/Sketches: - EC-7 Dust Control Photos CAD Drawings: - None Tables: - Commonly Used Dust Suppressants	

Purpose

Sediments which are transported from construction sites by stormwater runoff, wind, erosion and vehicle trackout are often re-dispersed to the air by subsequent vehicular traffic and high winds. Likewise, these sediments may be transported by the next rainfall into public storm sewer systems. Implementation of control measures to minimize the generation of fugitive dust from construction sites will reduce particulate matter in the air, which has significant health effects to workers and nearby residents. There are three methods of dust control: (1) Geotextiles, mats, plastic covers, and other mechanical methods (2) dust palliatives (soil binders), and (3) revegetation. Erosion control mats and revegetation are covered more completely under other BMP descriptions (e.g. EC-1, SPC-6).

Construction Site Best Management Practices

Appropriate Applications

Dust control measures should be applied at the following locations and activities:

- Grading Operations (land clearing and earthmoving)
- Drilling and blasting
- Batch drop operations (loader operation)
- Exposed areas, cleared unstabilized area.
- Vehicle traffic on unpaved surfaces
- Sediment tracking on paved surfaces
- Blasting and wrecking ball operations
- Soil and debris storage piles

Limitations

Dust suppressants have a range of limitations and precautions. Refer to Commonly Used Dust Suppressants Table for limitations of each type of dust suppressant.

- All dust suppressants are temporary in nature and may need reapplication(s) throughout the life of a project.
- Dust suppressants require a minimum curing time until fully effective, as prescribed by the manufacturer, which may be 24 hours or longer. Reapplication may be necessary after a storm event.
- Dust suppressants will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, the runoff may completely undercut the stabilized soil layer and discharge at a point further down the slope.
- Dust suppressants may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.
- Some dust suppressants can be environmentally hazardous, especially if the dust suppressant dissolves in water. Dissolved chemicals can migrate with the runoff or percolate further below the ground surface. For additional information, refer to the EPA document, "Potential Environmental Impacts of Dust Suppressants: Avoiding Another Times Beach", referenced at the end of this BMP.
- Some dust suppressants do not perform well with low relative humidity, while others become slippery or leach out of the soil under heavy precipitation.
- Dust suppressants should always be applied in accordance with manufacturers specifications and with the guidance for dust suppression for air quality management provided by Clark County Department of Air Quality and Environmental Management.

Construction Site Best Management Practices

Planning Considerations

Many of the reasonably available control measures for controlling fugitive dust from construction sites can also be implemented as Best Management Practices for stormwater pollution prevention. Those best management practices include:

- Pave, vegetate, or chemically stabilize access points to paved roads.
- Provide covers for trucks transporting materials that contribute dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid cleanup of sediments deposited on paved roads.
- Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize unpaved haul roads, parking and staging areas.
- Implement dust control measures for material stockpiles.
- **Prevent drainage of sediment-laden** stormwater onto paved surfaces.
- Stabilize abandoned construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

Recommended Standards and Specifications

There are many products available as dust suppressants. For chemicals available and recommendations for their use, see the Commonly Used Dust Suppressants Table.

In many applications, water is the most cost-effective dust suppressant. When water is used, care should be taken to apply at sufficient frequencies to maintain a damp surface. Any runoff of water used as a dust suppressant should be avoided.

Clark County has adopted comprehensive dust control ordinances and regulations that establish policies for mitigating dust production from construction sites. These policies should be carefully followed in conjunction with the Dust Control stormwater BMP.

Recommended Maintenance and Inspection

Dust control is an ongoing process during site construction. **Re-application of dust control measure** may be necessary until construction is complete.

Construction Site Best Management Practices

Post Construction Methods

Consider Revegetation or emulsion chip seals for more permanent dust control after the construction project has been completed.

References

CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.

<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

North Central Texas Council of Governments, *Integrated Storm Water Management (iSWM) Design Manual for Construction*, December 2003.

Tacoma Public Works Environmental Services, *City of Tacoma Surface Water Management Manual Volume II, Construction Stormwater Pollution Prevention*, January 1993.

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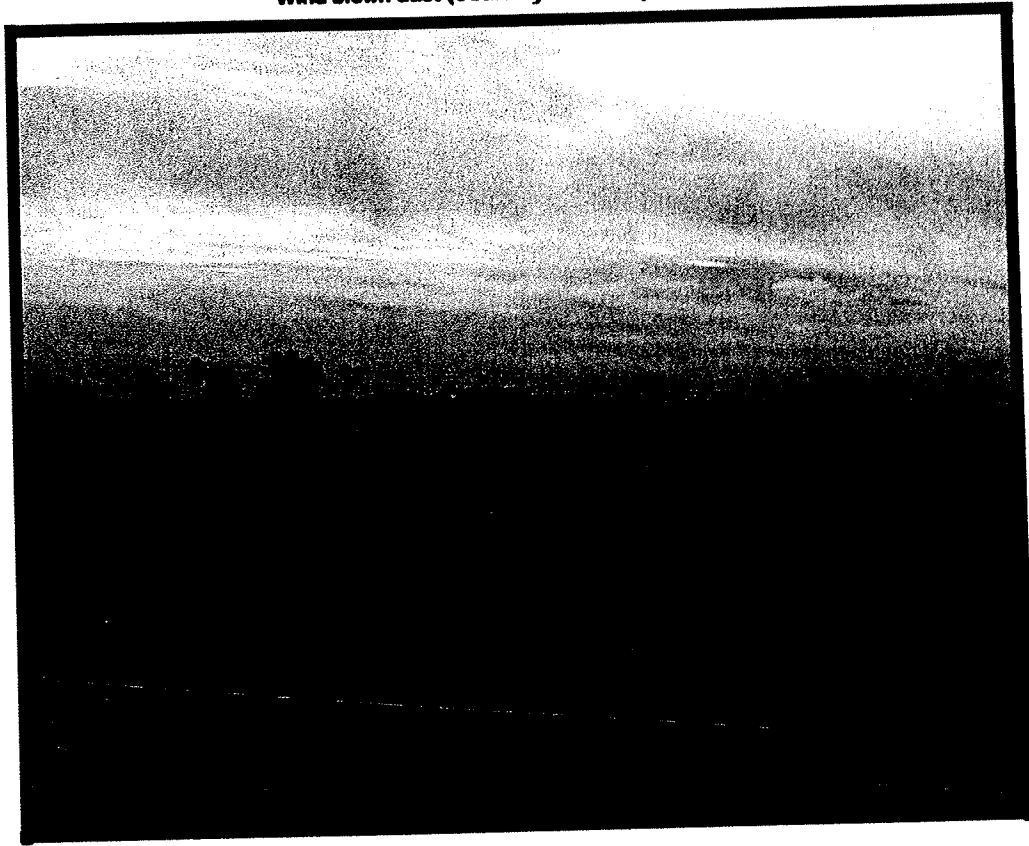
http://cfpub2.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm

--- Nevada Potential Environmental Impacts of Dust Suppressants: "Avoiding Another Times Beach" An Expert Panel Summary, Las Vegas, May 30–31, 2002.

Construction Site Best Management Practices

EC-7 Dust Control Photos/Sketches

Wind blown dust (Courtesy of Maricopa County)



Construction Site Best Management Practices

EC-7 Dust Control Table

Commonly Used Dust Suppressants

TYPES	FUNCTIONAL MECHANISM	ADVANTAGES	LIMITATIONS
Freshwater	Moisture wets particles, thereby increasing their mass and binding them together.	Usually readily available, low material cost, and easy to supply	Frequent light applications may be necessary during hot dry weather and can be labor intensive. Over application may result in loss of traction, erosion, or points of road failure.
Calcium Chloride	At a relative humidity greater than approximately 30% (77° F), the salts within the soil will pull moisture from the air above and retain it in the soil.	Reduces evaporation rate of surface moisture, lowers the freezing point of water, which reduces frost heave and freeze-thaw cycles, thereby reducing required road maintenance. Calcium Chloride also increases the compacted density of existing road base material. Effectiveness is retained after reblading.	Effectiveness in arid and semi-arid regions may be limited due to low relative humidity. It is very corrosive to aluminium alloys and slightly corrosive to steel. Solubility of calcium chloride results in leaching during heavy precipitation.
Magnesium Chloride	At a relative humidity greater than approximately 30% (77°F), the salts within the soil will pull moisture from the air above and retain it in the soil.	Reduces evaporation rate of surface moisture, lowers the freezing point of water, which reduces frost heave and freeze-thaw cycles, thereby reducing required road maintenance. Magnesium Chloride increases the compacted density of existing road base material more than Calcium Chloride. Effectiveness is retained after reblading.	Effectiveness in arid and semi-arid regions may be limited due to low relative humidity. It is very corrosive to aluminium alloys and slightly corrosive to steel. Solubility of calcium chloride results in leaching during heavy precipitation.
Lignin Derivatives	Act as adhesives by binding soil particles together and curing.	Greatly increases dry strength of soil, not humidity-dependent, imparts some plasticity to road surfaces, and lowers freezing point of road surface and base. Effectiveness is retained after reblading.	High solubility results in leaching during heavy precipitation. It is corrosive to aluminium alloys due to acidity (CaCO ₃ can neutralize the acidity). Proper aggregate mix is important to performance. Becomes slippery when wet and brittle when dry.
Tree Resin Emulsions (tall oil)	Act as adhesives by binding soil particles together and curing.	Low solubility after curing minimizes leaching and provides degree of surface waterproofing. Imparts some plasticity to road surfaces, has a high bonding strength, and is non-corrosive.	Requires proper weather and time to cure. No residual effectiveness after reblading. Equipment requires prompt cleanup to avoid curing of resin in hoses and pipes.

Construction Site Best Management Practices

TYPES	FUNCTIONAL MECHANISM	ADVANTAGES	LIMITATIONS
Synthetic Polymer	Bind soil particles together by forming a polymerizing matrix; a function similar to adhesives.	Applicable to a range of emission sources and function well in sandy soil conditions. Some types allow seeded vegetation to grow through the polymer matrix.	Requires proper weather and time to cure. Water repellent. May be subject to UV (sunlight) degradation. Application equipment requires timely cleaning. There is no residual effectiveness after reblading.
Bitumens, Tars, and Resins	Asphalt and resinous products are adhesive binding soil particles together. Petroleum oil products coat soil particles, increasing their mass and binding them together.	Water insoluble when dry; provide a degree of surface waterproofing. Good residual effectiveness.	Surface crusting fracturing and potholing may develop. Long-term application may cause road to become too hard for reblading. Bitumens won't lower freezing point and petroleum oil products lack adhesive characteristics.
Cementitious Based Binders	High purity gypsum mixes with water and mulch to form a thin cement-like crust on the soil surface.	Flexible, durable, water permeable, and resists soil chemicals. Reduces amount of aggregate required during initial construction and has lower maintenance costs than other dust suppressants.	Cementitious based binders are only effective for dust control in non-traffic areas. Instead, consider mixing cementitious based binders with sub-base soils for greater soil strength.

TYPES	IDEAL SOIL CHARACTERISTICS	RELATIVE COST COMPARISON (AVERAGE LIFE EXPECTANCY)	ENVIRONMENTAL CONSIDERATIONS
Freshwater	None	Low initial cost, high long-term maintenance cost (0 months).	Minimal environmental hazard. If applied excessively, may result in erosion and sediment runoff. Supply may be limited in some areas and depending on the source, may require a water right permit.
Calcium Chloride	Plasticity index > 8 10–20 percent fines passing the No. 200 sieve (by weight)	Low initial cost, medium long-term maintenance cost (1–6 months)	Repeated applications and long term use may harm adjacent vegetation (See the manufacturer's product information).
Magnesium Chloride	Plasticity index > 8 10–20 percent fines passing the No. 200 sieve (by weight)	Low initial cost, medium long-term maintenance cost (1–6 months)	Repeated applications and long term use may harm adjacent and nearby vegetation (See the manufacturer's product information).

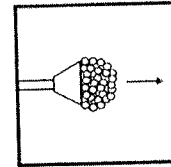
Construction Site Best Management Practices

TYPES	IDEAL SOIL CHARACTERISTICS	RELATIVE COST COMPARISON (AVERAGE LIFE EXPECTANCY)	ENVIRONMENTAL CONSIDERATIONS
Lignin Derivatives	Plasticity index > 8 10–30 percent fines passing the No. 200 sieve (by weight)	Medium initial cost, low long-term maintenance cost (3–12 months)	Lignin products have high BOD (biological oxygen demand) in aquatic systems. Spills or runoff into surface or groundwaters may create low dissolved oxygen conditions resulting in fish kills or increases in ground water concentrations of iron, sulfur compounds and other pollutants. (See the product MSDS for specific information).
Tree Resin Emulsions (tall oil)	Plasticity index < 3 10–20 percent fines passing the No. 200 sieve (by weight)	Medium initial cost, low long-term maintenance cost (1–6 months)	(See the manufacturer's product information)
Synthetic Polymer	Plasticity index < 3 5–20 percent fines passing the No. 200 sieve (by weight)	High initial cost, low long-term maintenance cost (1–3 months)	(See the manufacturer's product information)
Bitumens, Tars, and Resins	Plasticity index < 3 < 20 percent fines passing the No. 200 sieve (by weight)	High initial cost, low long-term maintenance cost (1–3 months)	Use of soils prohibited. Some petroleum based products may contain carcinogenic polycyclic aromatic hydrocarbons (PAHs). (See the manufacturer's product information)
Cementitious Based Binders	Depending on type of cementitious based binder, will work with both high and low plasticity index soils.	Low initial cost, medium long-term maintenance cost (3–6 months)	None

Construction Site Best Management Practices

EC-11

Outlet Protection, Velocity Dissipation Devices



Definition

Structures and devices placed at pipe outlets to prevent scour and reduce the velocity and/or energy of stormwater flows. These structures may include a section of rock, grouted riprap, and concrete rubble placed at the outlet end of culverts, conduits, or channels. Various products can also be installed for velocity reduction including hydrobrakes, vortex valves, and drop shafts.

RATINGS			
Associated Costs	H	M	L
Implementation	X		
Maintenance		X	
Training		X	
Target Pollutants Removal	H	M	L
Oil and Grease			X
Nutrients			X
Sediment	X		
Floatable Material			X
Metals			X
Other Construction Waste			X
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: - Perimeter and Access Controls – high Most effective when used with: - None Alternative BMPs: - None		Photos/Sketches: - EC-11 Outlet Protection, Velocity Dissipation Devices Photos CAD Drawings: - Pipe Outlet Conditions	

Purpose

Outlet protection and velocity dissipation reduces the velocity and energy of the runoff water, thereby preventing the flow from eroding the receiving downstream reach.

Appropriate Applications

- Outlet protection and velocity dissipation can be used at the following locations:
 - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels.
 - Outlets located at the bottom of mild to steep slopes.
 - Discharge outlets that carry continuous flows of water.

Construction Site Best Management Practices

- Outlets subject to short, intense flows of water, such as flash floods.
- Points where lined conveyances discharge to unlined conveyances.

Note: Rock outlet protection is usually less expensive and easier to install than concrete aprons or other energy dissipators.

Limitations

Rock outlet protection may need continual maintenance because large storms often wash away the stone and leave the area susceptible to erosion.

- Loose rock may have stones washed away during high flows.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Planning Considerations

Rock outlet protection is effective when the rock is sized and placed properly. When this is accomplished, rock outlets do much to limit erosion at pipe outlets. If runoff is sediment-laden, a sediment trap below the pipe outlet is recommended.

Permanent rock riprap protection should be designed and sized by the engineer as part of the culvert, conduit or channel design.

Recommended Standards and Specifications

General recommendations for rock size and length of outlet protection mat are shown in the CAD drawing figure.

When outlet protection measures are incorporated into permanent drainage solutions, they should be designed in accordance with CCRFCD HCDDM criteria.

Recommended Maintenance and Inspection

- Inspect temporary measures prior to the rainy season, after rainfall events, and regularly during the rainy season.
- Inspect apron for displacement of the riprap and/or damage to the underlying fabric. Repair fabric and replace riprap that has washed away.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.

Construction Site Best Management Practices

Post Construction Methods

Rock outlet protection and other velocity dissipation devices can remain after the construction project for long term erosion protection. However, the design engineer should consult with the local municipality or the Clark County Regional Flood Control District for specific requirements of permanent outlet protection.

References

CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.
<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

City of Austin, Texas, *Environmental Criteria Manual*, March, 2004.

North Carolina State University, (NCSU) *North Carolina Nonpoint Source Pollution Control Measures*
<http://h2osparc.wq.ncsu.edu/info/bmps.html>

Tacoma Public Works Environmental Services, *City of Tacoma Surface Water Management Manual Volume II, Construction Stormwater Pollution Prevention*, January 1993.
<http://www.ci.tacoma.wa.us/waterservices/permits/Manual.htm>

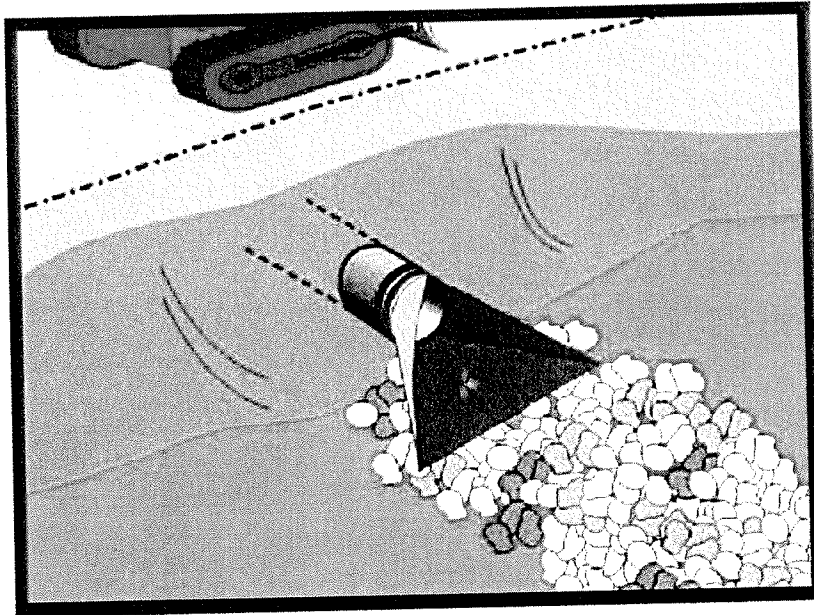
Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, *Virginia Erosion and Sedimentation Control Handbook, Third Edition*, 1992.

Washington Department of Ecology, *Stormwater Management Manual for Western Washington*, Publications #99-11 through 99-15, August 2001.

Construction Site Best Management Practices

EC-11 Outlet Protection, Velocity Dissipation Devices Photos/Sketches

Schematic of culvert outlet protection (Courtesy of CALTRANS)

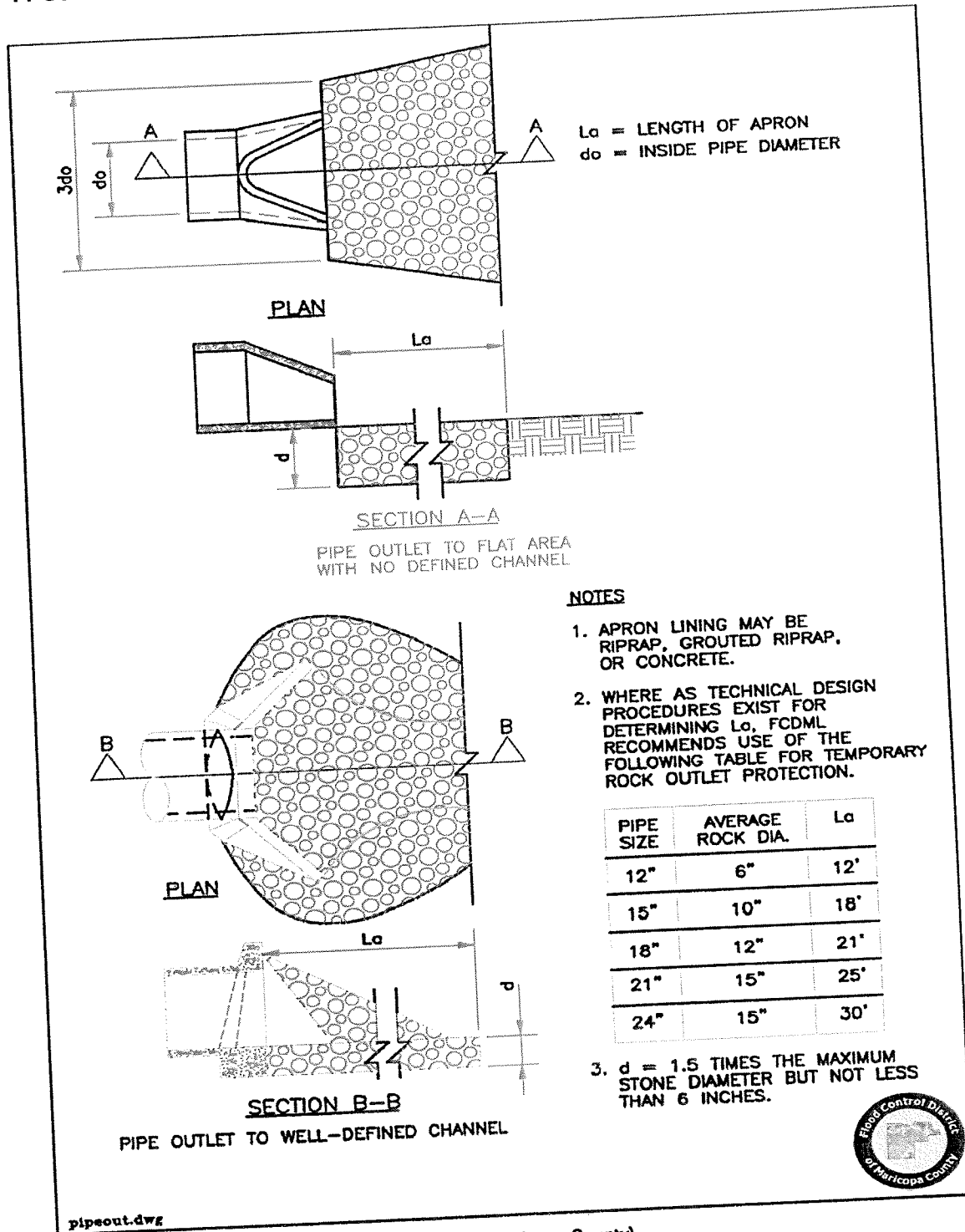


Drainage outlet protection to the shoulder of a highway (Courtesy of Maricopa County)



Construction Site Best Management Practices

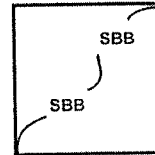
EC-11 Outlet Protection, Velocity Dissipation Devices Drawing



Construction Site Best Management Practices

SPC-2

Sand Bag Barrier



Definition

A temporary berm constructed of stacked sandbags, along the perimeter of a site, installed across a channel, or along the right of way in a disturbed area. The sandbags may be filled with pea-sized gravel to enhance filtration.

RATINGS			
Associated Costs	H	M	L
Implementation	X		
Maintenance	X		
Training		X	
Target Pollutants Removal	H	M	L
Oil and Grease			X
Nutrients			X
Sediment		X	
Floatable Material	X		
Metals		X	
Other Construction Waste		X	
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: • Slope Protection – moderate • Excavated Areas (trenches, pits, etc.) – high • Perimeter and Access Controls – high Most effective when used with: • An Erosion Control (EC) BMP Alternative BMPs: • If the berm is to be permanent, consider using SPC-4 Check Dams • If used for storm drain inlet protection, consider other methods under SPC-7 Storm Drain Inlet Protection		Photos/Sketches: • SPC-2 Sand Bag Barrier Photos CAD Drawings: • Sand Bag Barrier	

Purpose

A sandbag barrier is designed to intercept and slow the flow of sediment-laden runoff. Sandbag barriers allow sediment to settle from runoff before water leaves the construction site.

Appropriate Applications

Sandbag berms may be used during construction activities when the contributing areas is less than 5 acres. Sandbag berms may also be used to create temporary sediment traps, retention basins and in place of straw bales or silt fences. They are also useful for storm drain protection because they do not need to be anchored down to the paved surfaces. Two main applicable areas include:

Construction Site Best Management Practices

- **Perimeter control:**

- These areas include the entire construction site boundary, around stockpiles, along streams and channels, across channels to serve as a barrier for utility trenches, parallel to a roadway to keep sediment off paved areas, and along the perimeter of vehicle and equipment fuelling and maintenance areas or chemical storage areas.
- Furthermore, sand bag barriers are useful when site conditions or construction sequencing require adjustments or relocation of the barrier to meet changing field conditions and needs during construction, and to temporarily close or continue broken, damaged or incomplete curbs.

- **Temporary diversion structure**

- Sand bag barriers can be used as a temporary diversion structure below the toe of exposed and erodible slopes and down slope of exposed soil areas. They can also be used as a temporary sediment/desilting basin.

Limitations

- Limit the drainage area upstream of the barrier to 10 acres or less.
- Degraded sandbags may rupture when removed, spilling sand.
- Sandbag barrier installation can be labor intensive.
- **Sandbag barriers have limited durability for long-term projects.**
- When used to detain concentrated flows, maintenance requirements of sandbags increases.

Planning Considerations

Sandbag barriers are appropriate to use when construction of check dams in a channel is unnecessary. They can provide the same function as a check dam with less disturbance to the stream or vegetation. The sandbag barrier can also retain sediment prior to construction of final detention basins. For lower flows and paved surfaces, consider using rock socks (described below in Recommended Standards and Specifications). Small rock socks are easier to handle and cause less traffic problems than sand bags.

Recommended Standards and Specifications

- **Materials:**

- **Sandbags:** The bag should be made of woven polypropylene, polyethylene or polyamide fabric, minimum unit weight 4 ounces per square yard, mullen burst strength exceeding 300 psi in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70 percent in conformance with the requirements in ASTM designation D4355. Use of

Construction Site Best Management Practices

burlap is not acceptable. Bag dimensions are nominal, and may vary based on locally available materials. Sand-filled bags generally are 24–30 inches long, 16–18 inches wide, 6–8 inches thick, and weigh approximately 90–125 pounds. The choice of fill material depends on the objectives that are desired from the sand bag barriers. If fine grained sand is used as fill material, the sand bag barrier will provide a barrier and act as a diversion dike. If coarser grained materials are used (i.e., pea-sized gravel), the barrier will allow flow to pass through and act more as a sediment filter.

- Rock socks: An alternative to sand bags are rock socks, which are more elongated than sand bags and contain pea-size rock. A rock sock should be made of a loosely woven material, such as burlap, when used for filtration. A tighter weave, such as a geotextile, is better for diversion. Note that burlap rock socks are not as sturdy as geotextile ones, but can be recycled on site since they quickly biodegrade.
- **Installation:** When used as a linear sediment control:
 - Install along a level contour.
 - Turn ends of sandbag row up slope to prevent flow around the ends.
 - Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.
 - Sandbag barriers should be set back at least 3 feet from the toe of a slope where practical.

Recommended Maintenance and Inspection

- Inspect sandbag barriers before and after each rainfall event, and weekly otherwise.
- Reshape or replace sandbags as needed.
- Inspect sandbag barriers for sediment accumulations and remove sediments when accumulation reaches one-third the barrier height.
- Remove sandbags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

Construction Site Best Management Practices

Post Construction Methods

None.

References

CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.
<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

City of Tacoma, *Surface Water Management Manual Volume II, Construction Stormwater Pollution Prevention*, Tacoma Public Works Environmental Services, January 1993.
<http://www.ci.tacoma.wa.us/waterservices/permits/Manual.htm>

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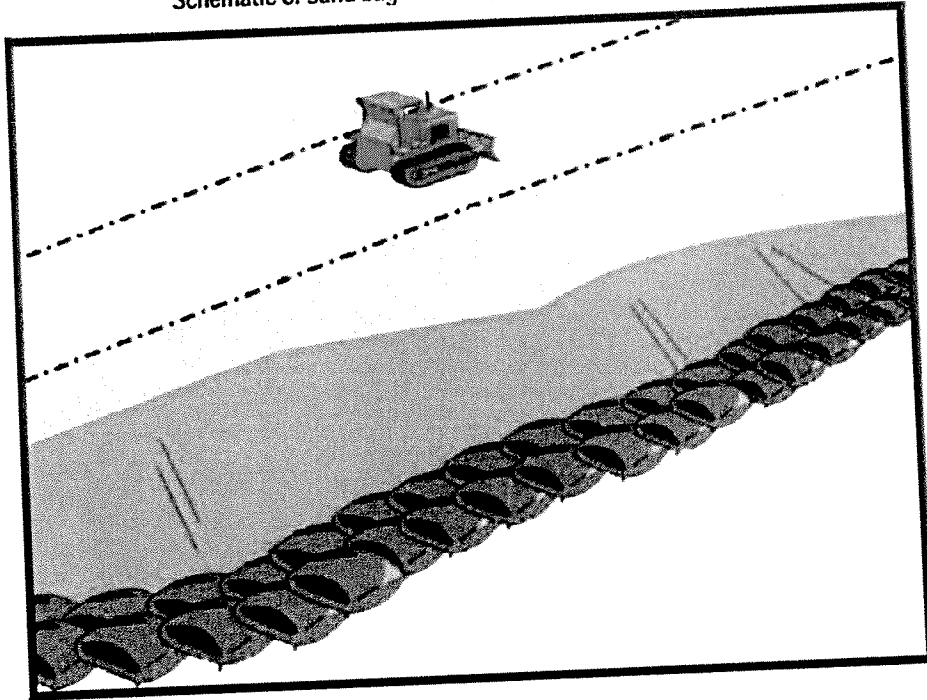
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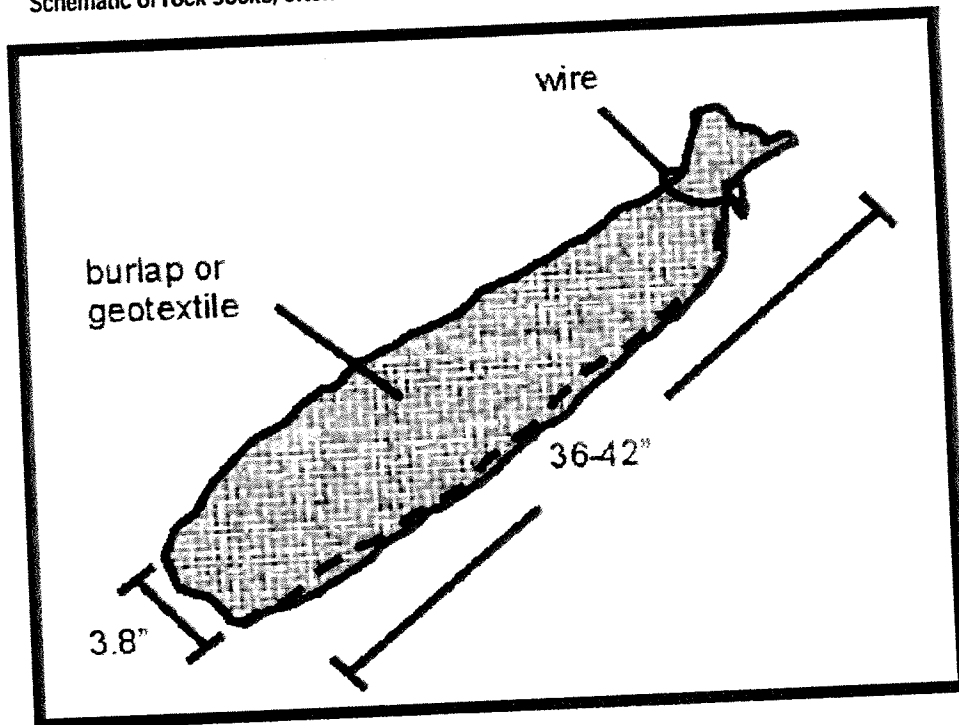
Construction Site Best Management Practices

SPC-2 Sand Bag Barrier Photos/Sketches

Schematic of sand bag barriers (Courtesy of CALTRANS)

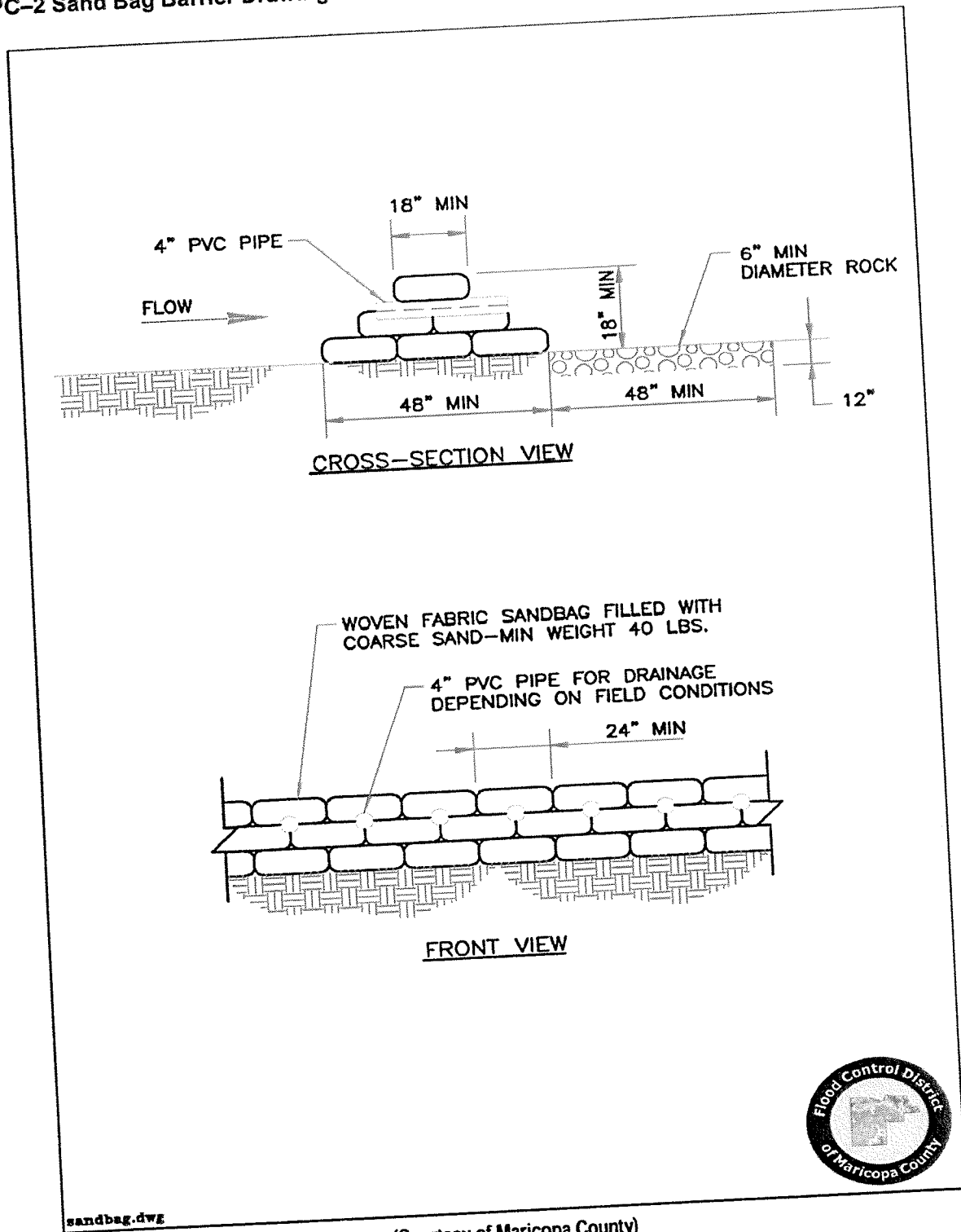


Schematic of rock socks, often more versatile than sand bags (Courtesy of Island County)



Construction Site Best Management Practices

SPC-2 Sand Bag Barrier Drawing

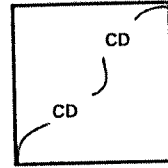


(Courtesy of Maricopa County)

Construction Site Best Management Practices

SPC-4

Check Dams



Definition

Small barriers consisting of rock, sand bag, or earth berms placed across a drainage swale or ditch. Typically, they are used in conjunction with other channel protection techniques such as vegetation lining and turf reinforcement mats.

RATINGS			
Associated Costs	H	M	L
Implementation		X	
Maintenance	X		
Training			X
Target Pollutants Removal	H	M	L
Oil and Grease			X
Nutrients			X
Sediment		X	
Floatable Material		X	
Metals			X
Other Construction Waste		X	
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: - Slope Protection – moderate - Excavated Areas (trenches, pits, etc.) – high - Perimeter and Access Controls – high - Channels and Medians – high Most effective when used with: - An Erosion Control (EC) BMP Alternative BMPs: - For a more temporary dam, consider SPC-2 Sand Bag Barrier		Photos/Sketches: - SPC-4 Check Dams Photos CAD Drawings: - Check Dams Specifications	

Purpose

Check dams reduce the velocity of small concentrated flows, provide a barrier for sediment, and help disperse concentrated flows, thereby reducing potential erosion.

Appropriate Applications

Check dams are appropriate where a temporary measure is needed to retain sediments such as:

- Near the toe of slopes.
- At construction site perimeters.

Construction Site Best Management Practices

- May be used as check dams across one or more lanes of construction traffic temporary roads, or unsurfaced rights of way subject to construction traffic.

Limitations

- Check dams should not be used in live, flowing streams. They should not be **used as a stand-alone substitute for other** sediment trapping devices. Do not install check dams in channels, which have already been lined or vegetated. Leaves can clog check dams, thereby reducing their filtering and velocity dissipating functions.
- Check dams only perform their function of reducing velocities of concentrated flows and energy if they have been sized and constructed correctly and are maintained properly.

Planning Considerations

- Construct along a level contour for intercepting sheet flow.
- Provide an undisturbed or stabilized outlet suitable for sheet flow.
- Allow ample room for sediment removal equipment between the berm and toe-of-slope.
- Installation in stream beds requires large rock, staking of woven wire sheathing, and daily inspection.

Recommended Standards and Specifications

- Check dams should be installed as soon as construction will allow and be used in conjunction with other sediment reduction techniques prior to releasing the flow off-site.
- Check dams should be placed at a distance and height to allow small pools to form between each one. Typically, dam height should be between 18 and 36 inches. Dams should be spaced such that the top of the downstream dam is the same elevation as the toe of the upstream dam. Place check dams along the same contour line, perpendicular to the flow of water.
- Major flows (greater than 2 year design storm) must pass the check dam without causing excessive upstream flooding.
- Use geotextile filter fabric under check dams exceeding 18 inches in height.

Construction Site Best Management Practices

Three main types of check dams:

- **Rock Check Dam** – usually the simplest and least expensive option.
 - Stone should be well graded with a size range from 1.5 to 3.5 inches in diameter, depending on expected flows
 - Rock check dams should be triangular in cross section with side slopes of 1:1 or flatter on the upstream side and 2:1 or flatter on the downstream side.
- **Sand Bag Check Dam** – are lighter and more manageable than rock dams.
 - Sand bag check dams should have a maximum flow through rate of 0.1 cubic feet per second (cfs) per square foot of surface with a minimum top width of 16 inches and bottom width of 48 inches. Bags should be filled with clean coarse sand, pea gravel, or filter stone.
 - Bag should be 24–30 inches long, 16–18 inches wide, 6–8 inches thick, and approximately 40 pounds in weight.
 - Bag material should be polypropylene, polyethylene, polyamide, or cotton burlap woven fabric, minimum unit weight of four ounces per square yard, Mullen burst strength exceeding 300 pounds per square inch (psi) as determined by ASTM D3786.
 - PVC pipes may be installed through the sand bag dam near the top to allow for controlled flow through the dam. Pipe should be schedule 40 or heavier, having a nominal internal diameter of 4 inches.
- **Geotextile–Encased Check Dam (or Triangular Silt Dike)** – may provide the most effective filtration of sediment laden water.
 - Consist of a triangular urethane foam sewn into a woven geosynthetic fabric. **Dimensions include 10–14 inches high in the center, with a 20–28 inch base.** A 2 foot apron extends beyond both sides of the triangle along its standard section of 7 feet. A sleeve at one end of one section can be overlapped and stapled with an adjacent section.
 - Install with ends curved up to prevent water from flowing around the ends.
 - The fabric flaps and check dam units are attached to the ground with wire staples. Wire staples should be No. 11 gauge wire and should be 8 to 12 inches long.
 - The leading edge must be secured with rocks, sandbags, or a small key slot and staples.

Construction Site Best Management Practices

Recommended Maintenance and Inspection

- Check dams should be inspected after each storm event to ensure continued effectiveness. During inspection, large debris, trash, and leaves should be removed. The center of a check dam should always be slightly lower than its edges. If erosion or heavy flows cause the edges of a dam to fall to a height equal to or below the height of the center, repairs should be made immediately.
- Accumulated sediment should be removed from the upstream side of a check dam when the sediment has reached a height of approximately one-half the original height of the dam (measured at the center). In addition, all accumulated sediment should also be removed prior to removing a check dam.
- Removal of a check dam should be completed only after the contributing drainage area has been completely stabilized. Permanent vegetation and mulching should replace areas from where the check dam has been removed.

Post Construction Methods

None.

References

- CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.
<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>
- Kamber Engineering, Gaithersburg, Maryland, *Sedimentation and Erosion Control, An Inventory of Current Practices*, USEPA, April, 1991.
- North Central Texas Council of Governments, *Integrated Storm Water Management (iSWM) Design Manual for Construction*, December 2003.
- Tacoma Public Works Environmental Services, *City of Tacoma Surface Water Management Manual Volume II, Construction Stormwater Pollution Prevention*, January 1993.
<http://www.ci.tacoma.wa.us/waterservices/permits/Manual.htm>
- U. S. Environmental Protection Agency, *Construction Site Storm Water Runoff Control, National Menu of Best Management Practices for Storm Water Phase II*, December 1999.
http://cfpub2.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm
- Washington Department of Ecology, *Stormwater Management Manual for Western Washington, Publications #99-11 through 99-15*, August 2001.

Construction Site Best Management Practices

SPC-4 Check Dams Photos/Sketches

Check dams can be constructed of crushed rock material from the construction project
(Courtesy of Newfoundland)

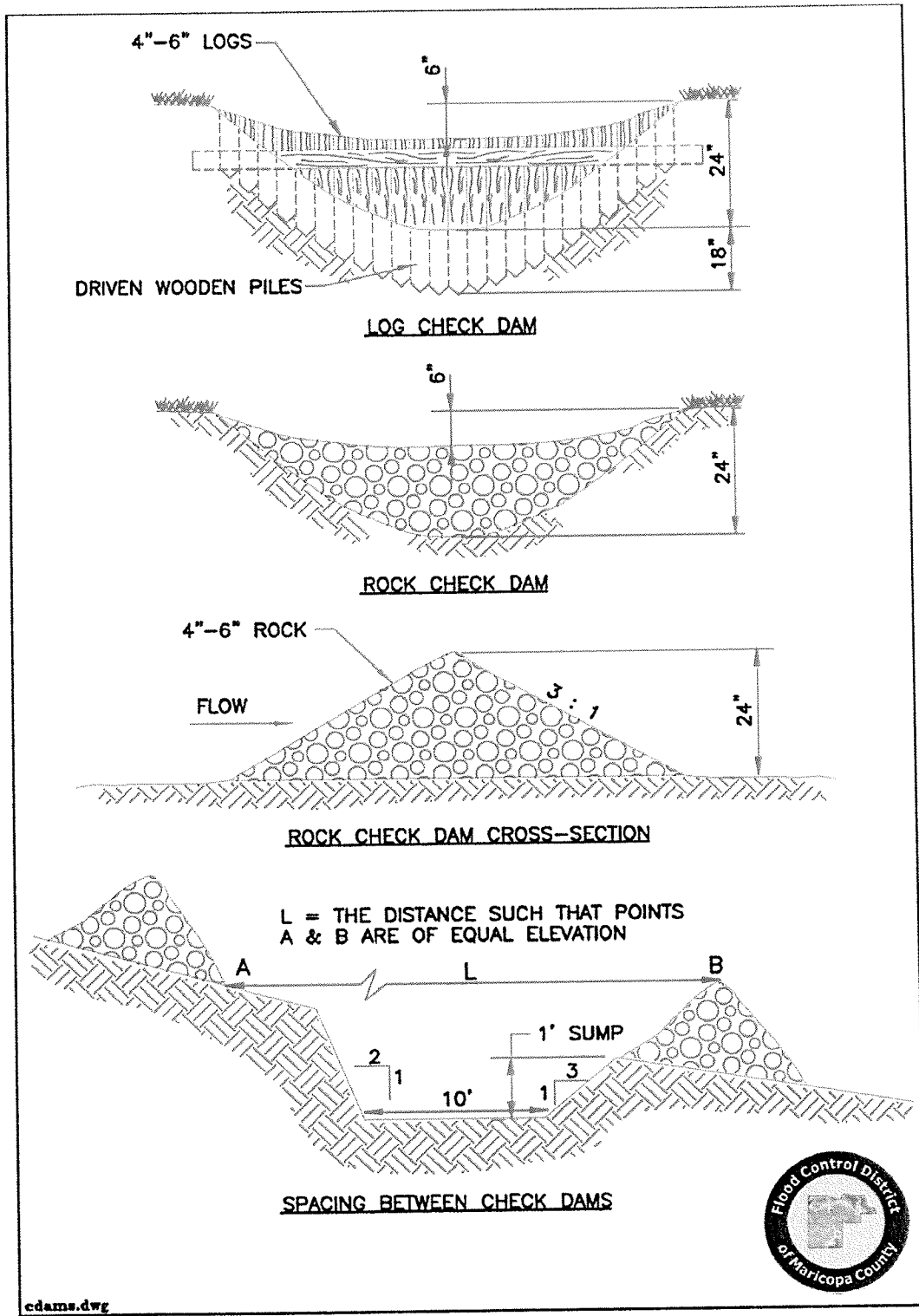


Check dams are most effective when placed in series (Courtesy of NCDOT)



Construction Site Best Management Practices

SPC-4 Check Dams Drawing

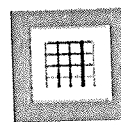


(Courtesy of Maricopa County)

Construction Site Best Management Practices

SPC-7

Storm Drain Inlet Protection



or



Definition

A variety of methods of intercepting sediment at low point inlets through the use of stone, filter fabric, inlet inserts, and other materials. This is normally located at the inlet, providing either detention or filtration to reduce sediment and floatable materials in stormwater.

RATINGS			
Associated Costs	H	M	L
Implementation	X		
Maintenance	X		
Training			X
Target Pollutants Removal	H	M	L
Oil and Grease			X
Nutrients			X
Sediment		X	
Floatable Material		X	
Metals			X
Other Construction Waste			X
GENERAL INFORMATION		FIGURES	
In Las Vegas Valley, storm drain inlet protection is prohibited in public rights-of-way. This BMP is approved for use only for private development properties. Applicability – Effectiveness: • Inlet Drain Protection – high • Channels and Medians – high • Perimeter and Access Controls – high Most effective when used with: • An Erosion Control (EC) BMP Alternative BMPs: • SPC-1 Organic Filter Barrier • SPC-2 Sand-Bag Barrier • SPC-3 Gravel Filter Berms • SPC-5 Silt Fence		Photos/Sketches: • SPC-7 Storm Drain Inlet Protection Photos CAD Drawings: • Filter Fabric Fence Drop Inlet Filter • Curb Inlet Protection	

Purpose

Storm drain inlet protection measures prevent soil and debris from site erosion from entering storm drain drop inlets and clogging them. Typically, these measures are temporary controls that are implemented prior to large-scale disturbance of the surrounding site. The early use of storm drains during project development significantly reduces the occurrence of future erosion problems. In Las Vegas Valley, storm drain inlet protection is prohibited on all public roadways and rights-of-way. Storm drain inlet protection methods are only approved for use on private development properties.

Construction Site Best Management Practices

Appropriate Applications

Storm drain inlet protection is appropriate where storm drain inlets are to be made operational before permanent stabilization of the disturbed drainage area. There are a variety of types of structures that are applicable to different conditions:

- **Filter Fabric Fence** – applicable where the inlet drains a relatively small (less than 1 acre) flat area (less than 5 percent slope). Intended for relatively low flows.
- **Excavated Drop Inlet Sediment Trap** – intended for relatively high flows. An excavated drop inlet trap provides protections against sediment entering a storm drain inlet can be provided by excavating an area in the approach to the drain. The excavation volume should be approximately 1800 to 3600 cubic feet per acre of disturbed area drained.
- **Block and Gravel Protection** – used when the flows exceed 0.5 cubic feet per second (cfs) and it is necessary to allow for overtopping to prevent flooding around the inlet area.
- **Foam or Fiber Roll Barriers** – use for relatively low flows in areas where they can be anchored to the surface. Most appropriate for inlets on an unpaved surface.
- **Sand or Gravel Bags** – use for relatively low flows.

Limitations

- Installing inlet protection on publicly travelled streets or in developed areas is prohibited by Las Vegas Valley entities. Drain inlets in public rights-of-way should be protected by using BMPs at the construction site boundary to prevent pollutant runoff.
- Inlet protection is only viable at low point inlets. Inlets that are on slope can not be effectively protected because stormwater will bypass the inlet and continue downstream, causing an overload on downstream inlets.
- Ponding will occur at the inlet with possible short term flooding.
- Curb inlets on slopes cannot be effectively protected because the stormwater will bypass the inlet and continue downgrade.
- Filter fabric fences are limited to storm drain inlets for small drainage areas of five acres or less. Filter fabric fences are not appropriate in paved areas. For larger drainage areas, smaller sediment catchment areas are recommended.

Construction Site Best Management Practices

Planning Considerations

Where storm sewers are made operational before their drainage area is stabilized, or where construction is adjacent to an existing storm sewer, large amounts of sediment may enter the storm sewer system. In cases of extreme sediment loading, the storm sewer itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

This practice contains several types of inlet filters and traps which have different applications dependent upon site conditions and type of inlet. Other innovative techniques for accomplishing the same purpose are encouraged, but only after specific plans and details are submitted to and approved by the local government.

Recommended Standards and Specifications

Install inlet protection in accordance with the following:

- **Filter fabric fence:** Place 2 inch by 2 inch wooden stakes around the perimeter of the inlet a maximum of 3 feet apart and drive them at least 8 inches into the ground. Excavate a trench approximately 8 inches wide and 12 inches deep around the outside perimeter of the stakes. Staple the filter fabric (for material specifications, see Silt Fence) to wooden stakes so that 32 inches of the fabric extends out and can be formed into the trench. **Use heavy-duty wire staples at least 1/2 inch in length.** Backfill the entire trench with 3/4 inch or less washed gravel.
- **Excavated Drop Inlet Sediment Trap:** Construct the inlet trap as shown in the CAD drawing. Ensure that the excavation volume can contain approximately 1800 to 3600 cubic feet per acre of disturbed area.
- **Gravel Bag Filter:** If there is a high content of clays and silts, use filter fabric in conjunction with gravel for additional filtering capacity. Construct the gravel bag filter as specified by Gravel Filter Berms.
- **Foam or Fiber Roll Barrier:** Foam or fiber roll is placed around the inlet and must be anchored to the curb surface, so that it is not carried away by runoff flows.

Recommended Maintenance and Inspection

For systems using filter fabric, inspections should be made on a regular basis, especially after large storm events. If the fabric becomes clogged, it should be replaced. Sediment should be removed when it reaches approximately half the height of the fence. If an excavated inlet sediment trap is used, sediment should be removed when it fills approximately half the depth of the hole.

Construction Site Best Management Practices

Post Construction Methods

Following the completion of construction projects in residential and municipal areas, more permanent drop-inlet protection devices can be installed in storm drain inlets.

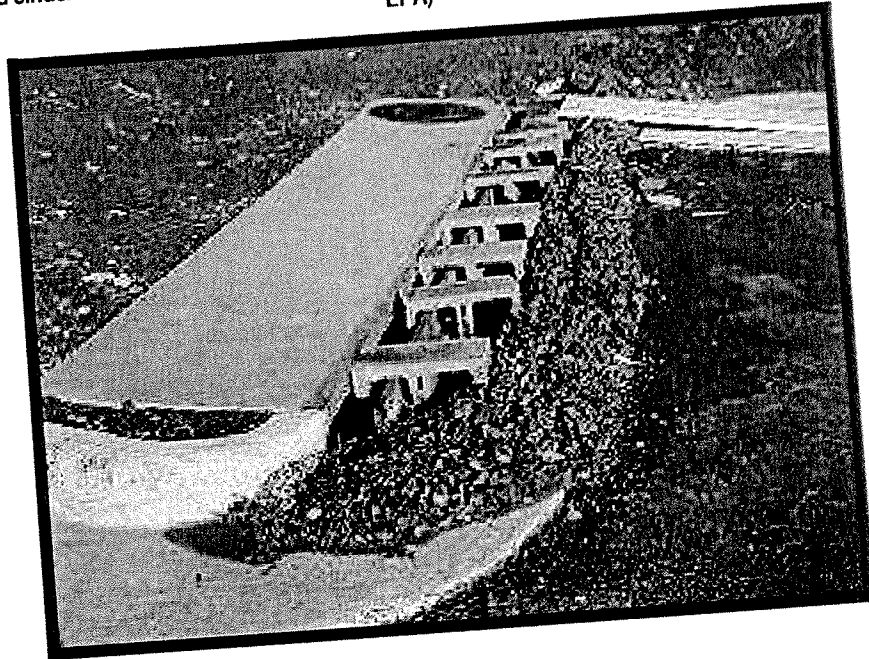
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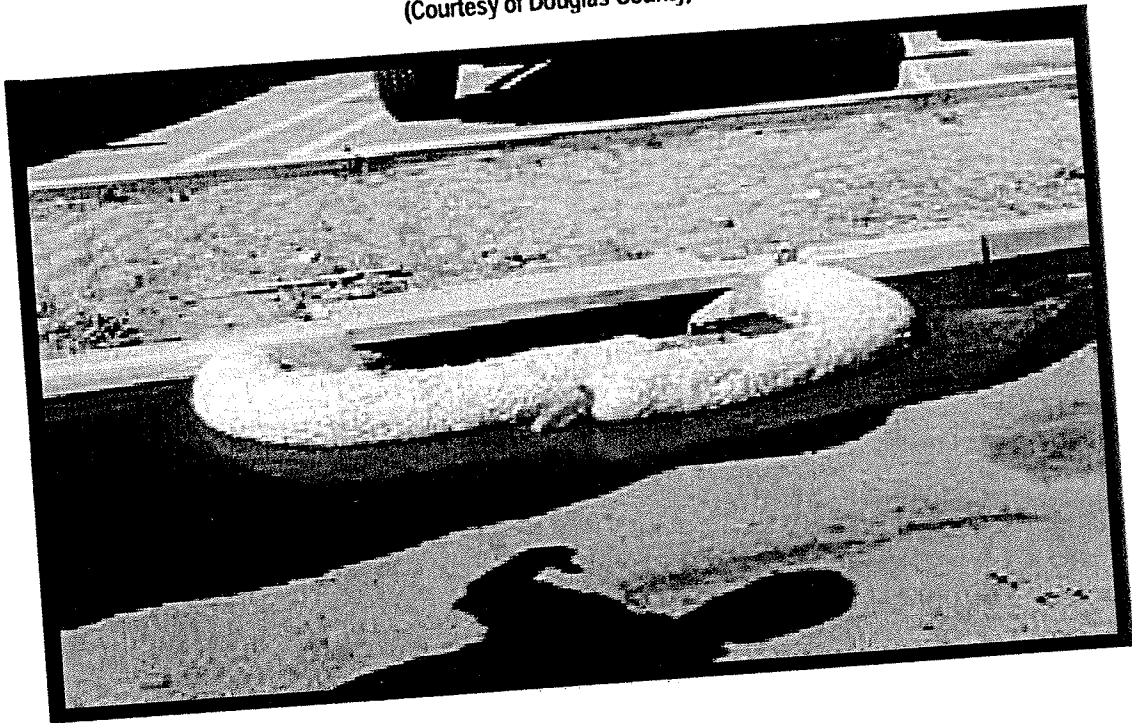
Construction Site Best Management Practices

SPC-7 Storm Drain Inlet Protection Photos/Sketches

Coarse gravel and cinder blocks are often used to keep sediment and other pollutants out of storm drains (Courtesy of EPA)

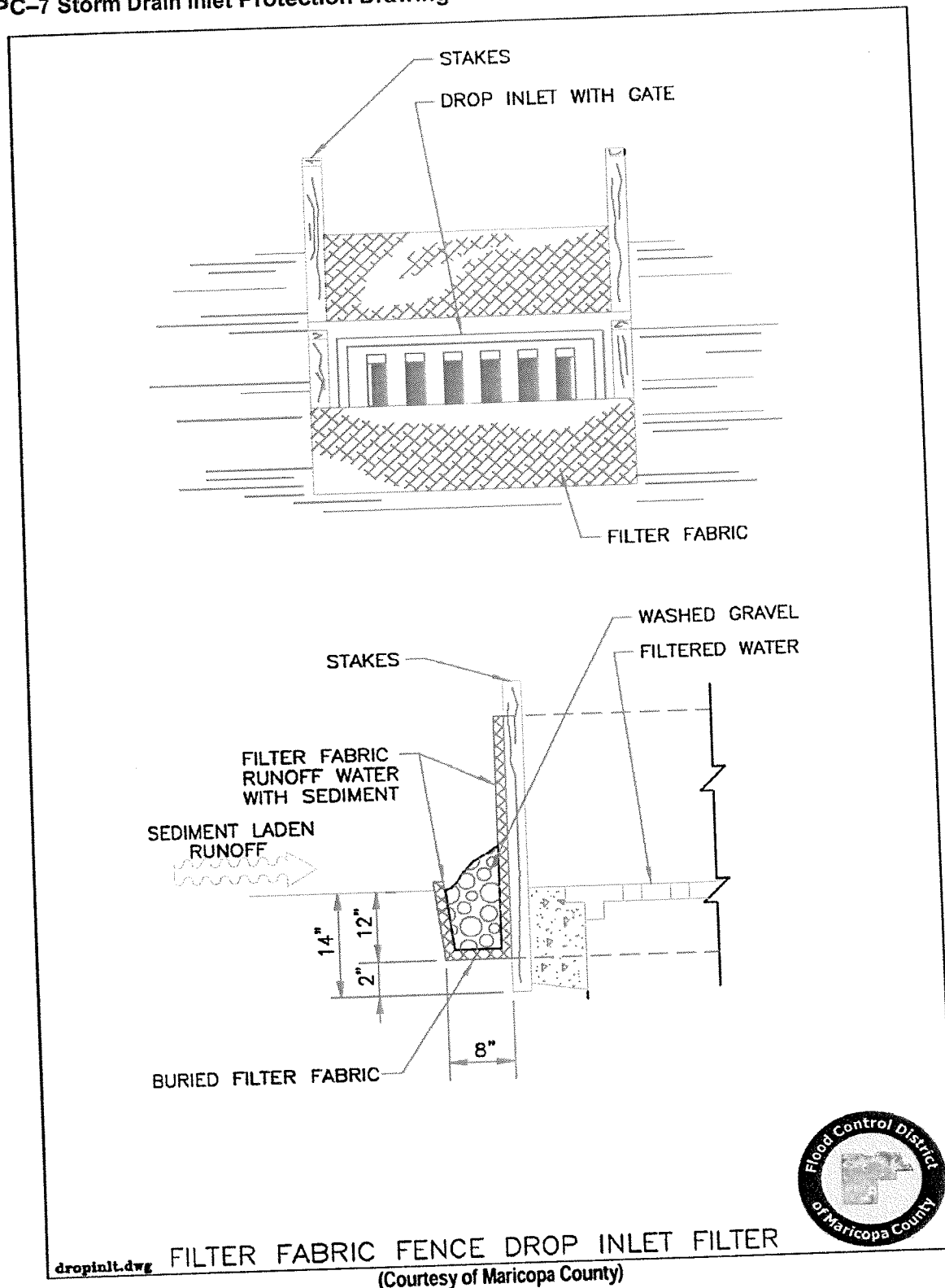


Straw wattle inlet drain protection
(Courtesy of Douglas County)

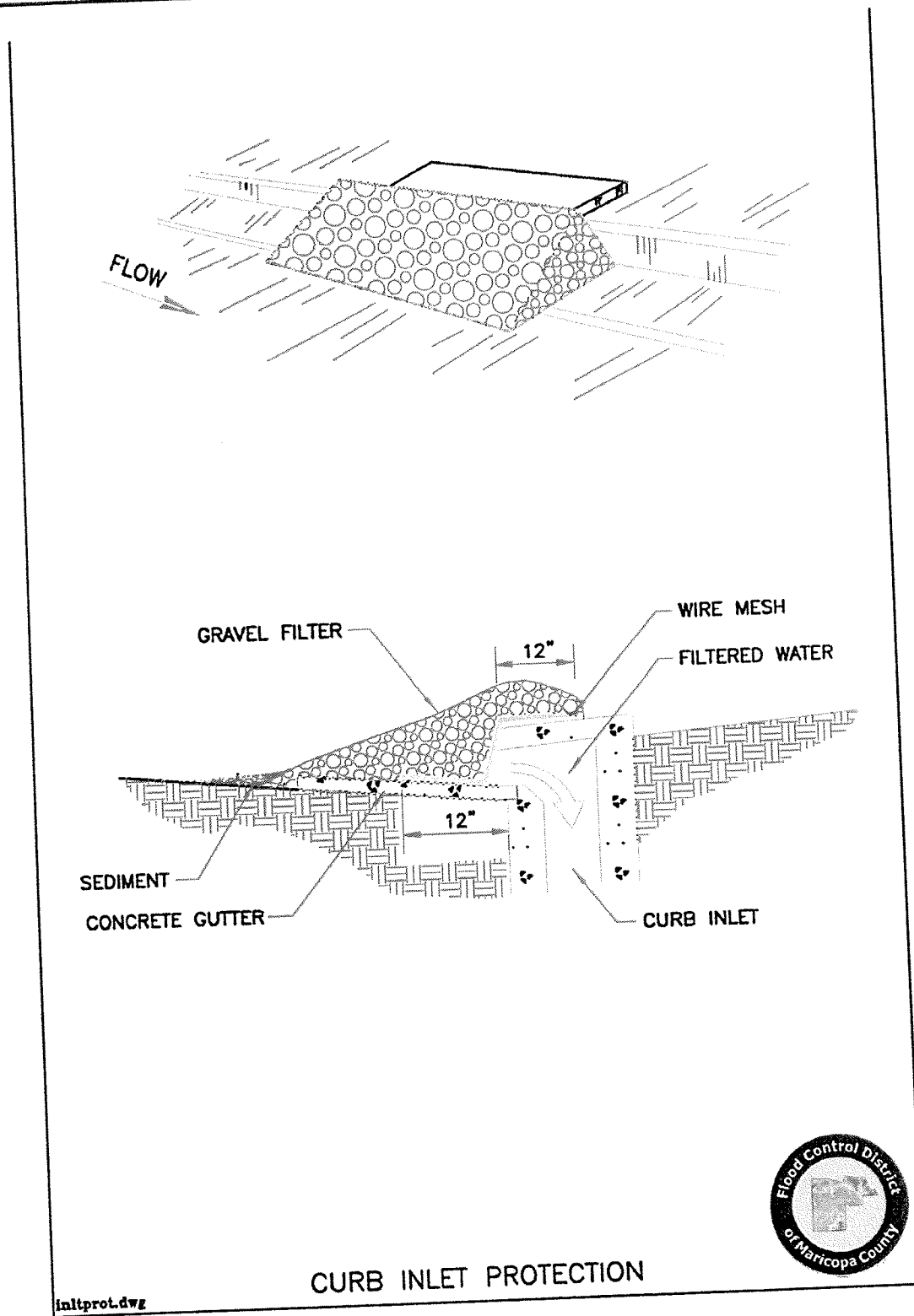


Construction Site Best Management Practices

SPC-7 Storm Drain Inlet Protection Drawing



Construction Site Best Management Practices

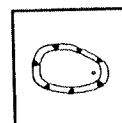


(Courtesy of Maricopa County)

Construction Site Best Management Practices

SPC-8

Temporary Sediment Basins



Definition

A pond area formed by constructing an embankment of compacted soil across a drainageway with a controlled outlet in which sedimentary laden runoff is directed to allow settling of suspended sediment from the runoff.

RATINGS			
Associated Costs	H	M	L
Implementation	X		
Maintenance		X	
Training			X
Target Pollutants Removal	H	M	L
Oil and Grease			X
Nutrients		X	
Sediment	X		
Floatable Material		X	
Metals		X	
Other Construction Waste			X
GENERAL INFORMATION	FIGURES		
Applicability – Effectiveness: - Slope Protection – high - Excavated Areas (trenches, pits, etc.) – high - Perimeter and Access Controls – high - Landscaping and Vegetation – high Most effective when used with: - An Erosion Control (EC) BMP Alternative BMPs: - To treat lower flows and volumes than described in this BMP, consider SPC-9 Temporary Sediment Traps	Photos/Sketches: - SPC-8 Temporary Sediment Basins Photos CAD Drawings: - Temporary Sediment Basins		

Purpose

To collect and store sediment from sites cleared and/or graded during construction or for extended periods of time before reestablishment of permanent vegetation and/or construction of structures. It is intended to help treat and control silt-laden runoff. The basin is a temporary measure (with a design life less than 1 year) and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Appropriate Applications

Sediment basins serve as treatment devices which can be used on a variety of project types. They are normally used in construction projects where:

Construction Site Best Management Practices

- Large areas of land drain to the basin
- A **minor stream or off-line drainage way crosses the site**
- A specific water feature is planned for the site
- Disturbed areas are greater than 5 acres during the rainy season
- **Sediment-laden water may enter the drainage system**

Limitations

Sediment basins and ponds must be installed only within the property limits where failure of the structure would not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Also, sediment basins and ponds are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the pond is required, the type of fence and its location should be shown on the Stormwater Pollution Prevention Plan (SWPPP).

- Generally, temporary sedimentation basins are for disturbed upstream drainage areas of 5 acres or more.
- Because of additional detention time, sediment basins may be capable of trapping smaller sediment particles than traps. However, they are most effective when used in conjunction with other BMPs such as seeding or mulching.
- Sediment basins may become attractive to children and care must be taken to adhere to all safety practices. Also, standing water can attract mosquitoes.
- Sediment basins are only practically effective in removing sediment down to **about the medium silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) will pass through untreated.** This emphasizes the need to control erosion to the maximum extent first, rather than relying on sediment basins alone.

Planning Considerations

- **Effectiveness:**
 - **Sediment basins are at best only 70–80 percent effective** in trapping sediment which flows into them. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc. to reduce the amount of sediment flowing into the basin.
 - Whenever possible, construct the sedimentation basins before clearing and grading work begins.
- **Location:**
 - To improve the effectiveness of the basin, it should be located so as to intercept the largest possible amount of runoff from the disturbed area. The best locations are generally low areas below disturbed areas. Drainage into

Construction Site Best Management Practices

the basin can be improved by the use of diversion dikes and ditches. The basin must not be located in a stream but should be located to trap **sediment-laden runoff before it enters the stream. The basin should not be** located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads. The sediment basin should be located more than 25 feet from septic system facilities.

Recommended Standards and Specifications

The sediment basin may be formed by partial excavation and/or by construction of a compacted embankment. It may have one or more inflow points carrying polluted runoff. A securely anchored riser pipe is the principal discharge mechanism along with an emergency overflow spillway. The riser pipe should be solid with two 1-inch diameter dewatering holes located at the top of the sediment storage volume on opposite sides of the riser pipe as shown in the CAD file. Outlet protection is provided to reduce erosion at the pipe outlet.

- As a general guideline, the sediment basin volume should be designed for 2,000 cubic feet, assuming limited infiltration.
- A hydraulics engineer should be consulted to properly design a sediment basin. Refer to the CCRFCD Hydrologic Criteria and Drainage Design Manual for detailed design guidance. Total sediment pond volume and dimensions are determined as outlined below:
- Determine pond geometry for the storage volume calculated above using 3 feet in depth and 3:1 side slopes from the bottom of the basin. Note, the basin bottom is level.
- Adjust the geometry of the basin to effectively combine the settling zone volume and sediment storage volumes while preserving the depth and side slope criteria.
- Provide an emergency spillway with a crest elevation 1 foot above the top of the riser pipe.
- A minimum 3:1 length to width ratio is necessary. A larger length to width ratio (6:1) is even more effective to prevent **short-circuiting. Baffles may also be** implemented.

Maintenance and Inspection

- Inspect sediment basins before and after rainfall events or exceptionally large storms.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage, obstructions, or erosion.

Construction Site Best Management Practices

- Sediment basins should be drained within 36 hours after a rain event.
- Remove accumulated sediment when its volume reaches one-third the volume of the sediment storage. Properly dispose of sediment and debris removed from the basin, within the construction site.
- Check fencing for damage and repair.

Post Construction Methods

Sediment basins can be converted to permanent structures after completion of the construction project. Remove all excess sediment from the basin. The containment volume of permanent sediment basins will need to be expanded to meet the design storm requirements in the CCRFCD Hydrologic Criteria and Drainage Design Manual. The inside of a permanent sediment basin should either be vegetated or rock lined. Alternatively, if the permeability of the soil is high and groundwater is close to the ground surface, a clay or synthetic liner may be installed. Ensure that the sedimentation basin has a stabilized outlet (see Outlet Protection, Velocity Dissipation Devices).

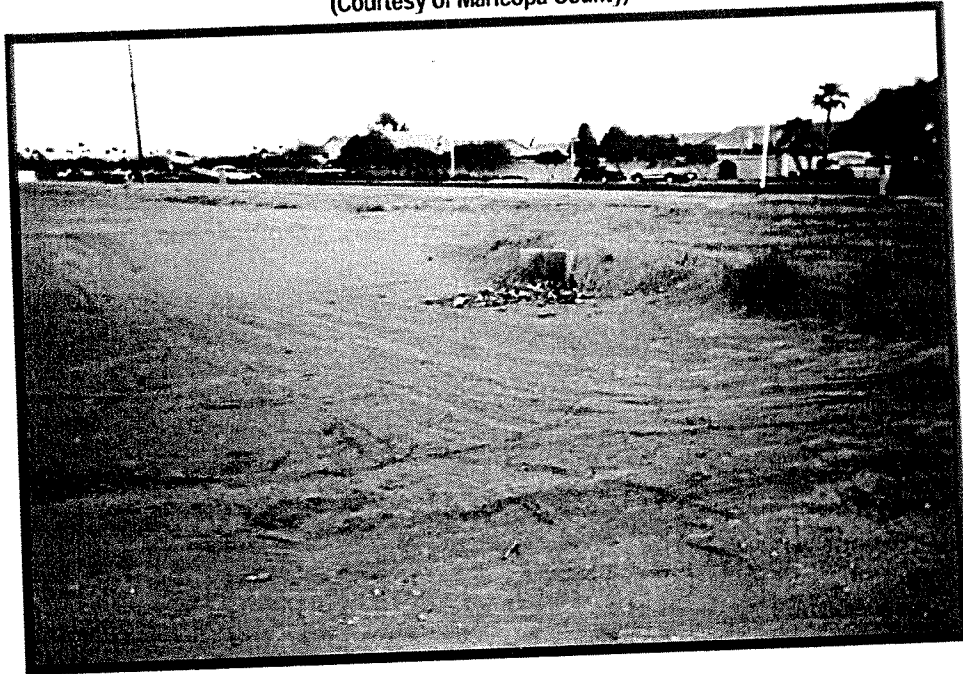
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<http://www.stormwatercenter.net/>
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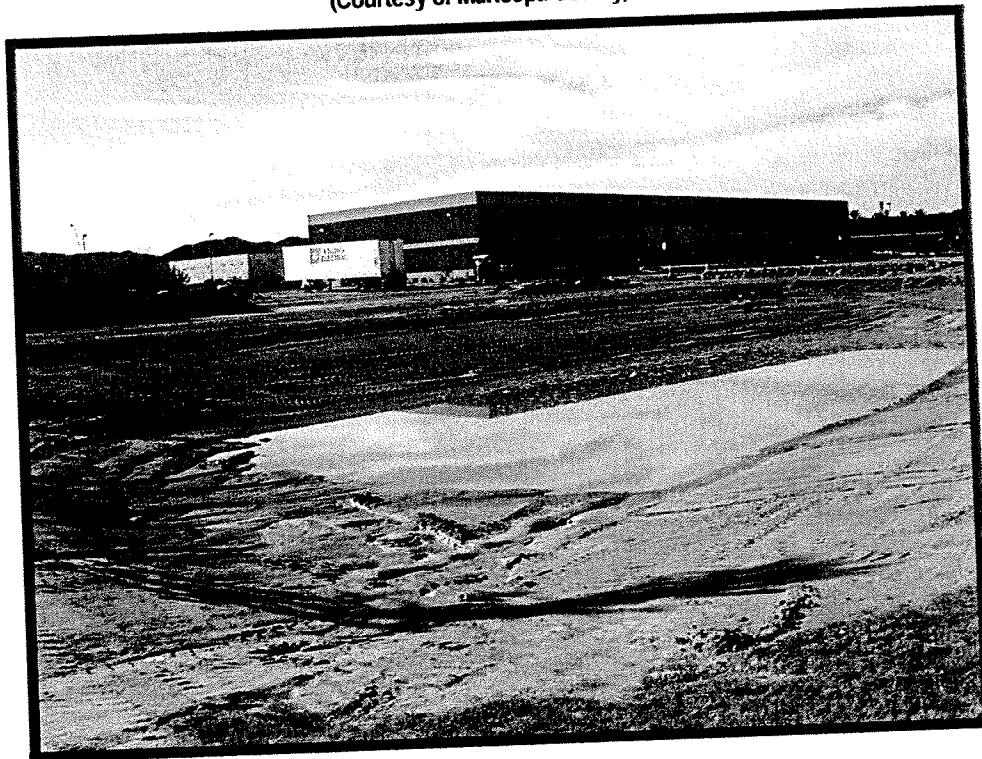
Construction Site Best Management Practices

SPC-8 Temporary Sediment Basins Photos/Sketches

Temporary sediment basin with outlet protection
(Courtesy of Maricopa County)

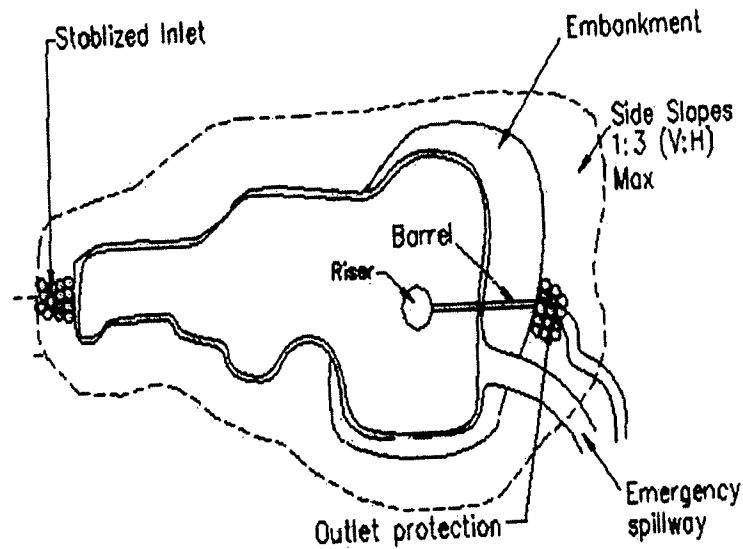


Temporary sediment basins provide stormwater storage during the construction process
(Courtesy of Maricopa County)

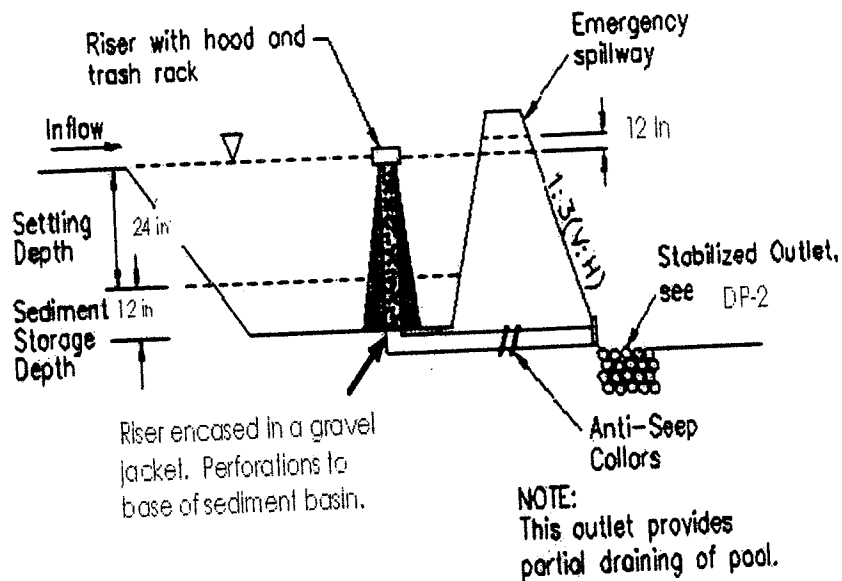


Construction Site Best Management Practices

SPC-8 Temporary Sediment Basins Drawing



TOP VIEW



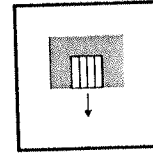
TYPICAL TEMPORARY SEDIMENT BASIN - OUTLET #1
NOT TO SCALE

(Courtesy of Caltrans)

Construction Site Best Management Practices

SPC-11

Construction Entrance/Exit Tire Wash



Definition

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

RATINGS			
Associated Costs	H	M	L
Implementation			X
Maintenance		X	
Training			X
Target Pollutants Removal	H	M	L
Oil and Grease			X
Nutrients			X
Sediment		X	
Floatable Material			X
Metals			X
Other Construction Waste			X
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: - Perimeter and Access Controls – high Most effective when used with: - EC-6 Construction Road Stabilization - EC-7 Dust Control - GH-6 Road Sweeping/Trackout Cleaning Alternative BMPs: - GH-4 Designated Washdown Areas		Photos/Sketches: - SPC-11 Construction Entrance/Exit Tire Wash Photos CAD Drawings: - Construction Entrance/Exit Tire Wash	

Purpose

Tire wash stations can be located at stabilized construction egress points to remove sediment from tires and under-carriages, and to prevent sediment from being transported onto public roadways.

Appropriate Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roadways by construction vehicles may occur.

Limitations

- The tire wash requires a supply of fresh water. Potential sources include existing water service connections if available, fire hydrants, or temporary water storage

Construction Site Best Management Practices

tanks. The contractor shall verify that the use of any municipal or other existing water service is allowable with the appropriate agency.

- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area
- Do not use where wet tired trucks leaving the site leave the road dangerously slick.

Planning Considerations

Incorporate tire washes with a **EC-5 Stabilized Construction Entrance**.

Recommended Standards and Specifications

- This BMP should be used in combination with **EC-5 Stabilized Construction Entrance**.
- Construct tire washes on level ground when possible, on a pad of course aggregate. A geotextile fabric should be placed below the aggregate.
- Wash rack must be designed and constructed/manufactured for anticipated traffic loads.
- Provide a drainage ditch that will convey the runoff from the wash area to a **sediment trapping device**. See **SPC-9 Temporary Sediment Traps** for additional guidance regarding sediment traps. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- **Implement GH-6 Road Sweeping/Trackout Cleaning, as needed.**

Recommended Maintenance and Inspection

- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

Post Construction Methods

None.

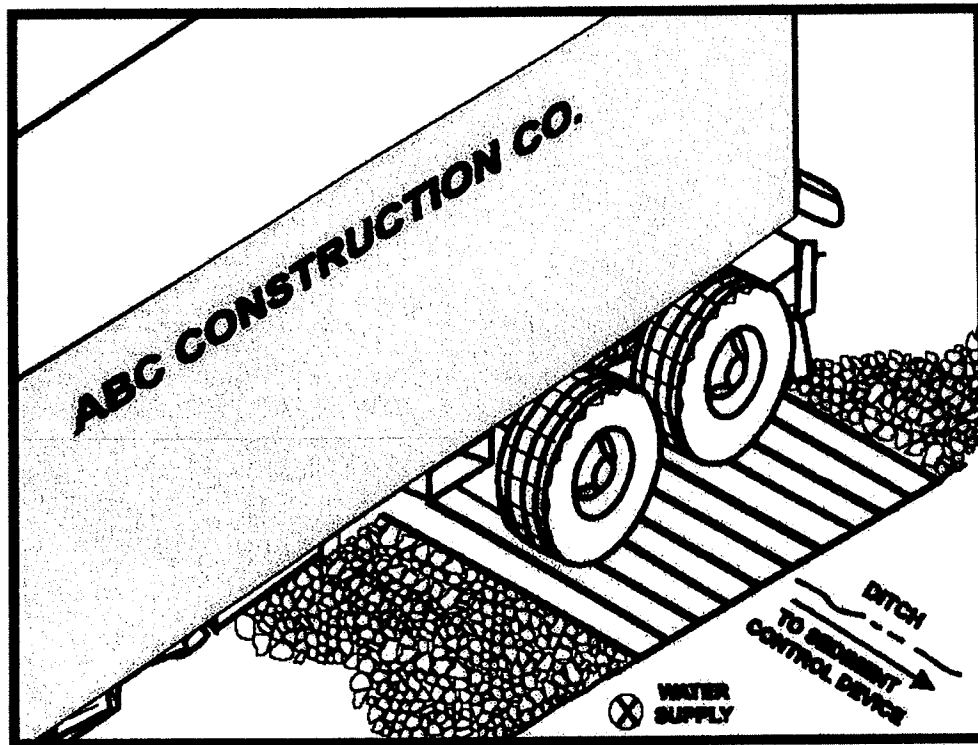
Construction Site Best Management Practices

References

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Construction Site Best Management Practices

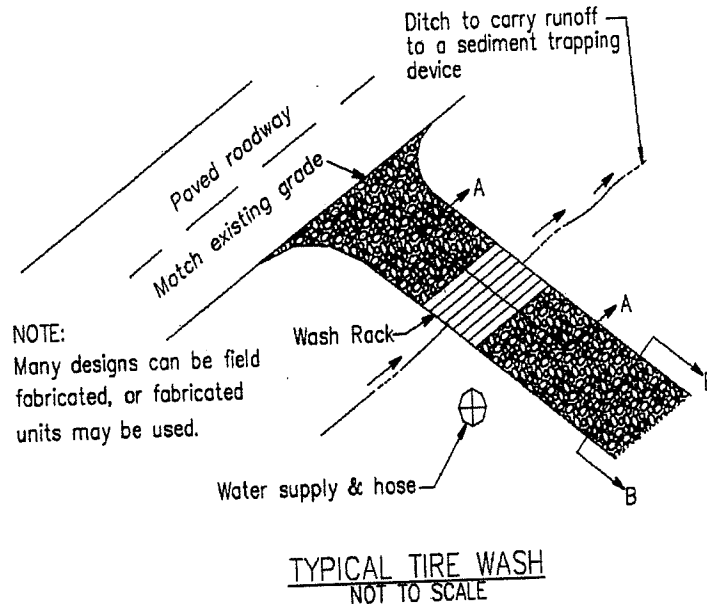
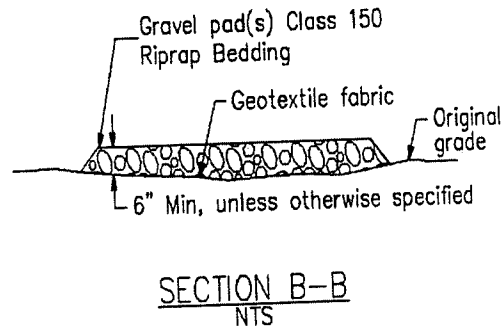
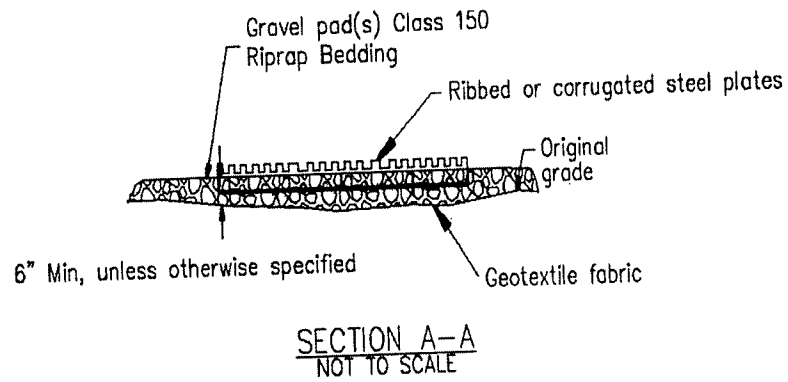
SPC-11 Construction Entrance/Exit Tire Wash Photos/Sketches



Schematic of Construction Exit Tire Wash (Courtesy Caltrans)

Construction Site Best Management Practices

SPC-11 Construction Entrance/Exit Tire Wash Drawing



(Courtesy of Caltrans)

GH General Housekeeping

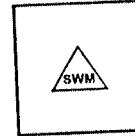
General housekeeping refers to any management and/or work practices implemented on a construction site to prevent the contamination of stormwater by materials other than sediment. General housekeeping practices involve proper management of chemicals and other potentially hazardous construction materials, equipment, and wastes. Managing potential pollutants off-site (i.e., conducting equipment maintenance back at the maintenance shop rather than at the site) is an effective method of eliminating potential spills and contamination on the construction site. If a pre-manufactured product is to be implemented on a site for general housekeeping, the contractor should always follow the manufacturer's installation and maintenance recommendations as the primary reference for implementation.

- GH-1 Chemical Management
- GH-2 Solid Waste Management
- GH-3 Equipment Maintenance Procedures
- GH-4 Designated Washdown Areas
- GH-5 Spill Containment Plan
- GH-6 Road Sweeping and Road Trackout Cleaning

Construction Site Best Management Practices

GH-2

Solid Waste Management



Definition

The routine collection, recycling, and disposal of accumulated solid waste generated at the construction site.

RATINGS			
Associated Costs	H	M	L
Implementation		X	
Maintenance		X	
Training		X	
Target Pollutants Removal	H	M	L
Oil and Grease		X	
Nutrients			X
Sediment			
Floatable Material	X		
Metals	X		
Other Construction Waste	X		
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: - Debris Management, Cleanup, and Washout – moderate - Trash Collection/Management – high Most effective when used with: - GH-1 Chemical Management - GH-3 Equipment Maintenance Procedures - GH-5 Spill Containment Plan Alternative BMPs: - None		Photos/Sketches: - GH-2 Solid Waste Management Photos CAD Drawings: - None	

Purpose

Solid waste is one of the major pollutants caused by construction activities. By limiting the trash and debris on site and through proper disposal methods, stormwater quality is improved and there is reduced clean up at the completion of a project.

Appropriate Applications

Proper solid waste management is applicable to all construction activities. Solid wastes include, but are not limited to:

- Construction wastes including plastic, glass, rubber, brick, mortar, timber, steel and metal scraps, sawdust, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package

Construction Site Best Management Practices

construction materials, materials from the demolition of structures. Highway planting wastes, including vegetative material, plant containers, and packaging materials.

- Domestic waste products, including sanitary wastes, food containers, beverage cans, coffee cups, paper bags, plastic wrappers, cigarettes, and litter generated by the public.

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.
This practice only applies to non-hazardous solid waste.

Recommended Standards and Specifications

- Education:
 - Site supervisor or other designated personnel should oversee and enforce proper solid waste procedures and practices.
 - Instruct employees and subcontractors on identification of solid waste and hazardous waste, solid waste storage and disposal procedures. Require that employees and subcontractors follow solid waste handling and storage procedures.
 - Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
 - Prohibit littering by employees, subcontractors, and visitors.
 - Wherever possible, minimize production of solid waste materials.
- **Collection, Storage, and Disposal:**
 - Covered dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project operations.
 - Prevent clogging of the storm drainage system by removing litter and debris from drainage grates, trash racks, and ditch lines.
 - Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
 - Construction debris and litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly regardless of whether the litter was generated by the contractor,

Construction Site Best Management Practices

the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.

- Full dumpsters should be removed from the project site.
- Litter stored in collection areas and containers should be handled and disposed of by trash hauling contractors every two weeks or more frequently, if necessary. Notify trash hauling contractors that only watertight dumpsters are acceptable for use on-site. Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Stormwater runoff should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures.
- Solid waste storage areas should be located more than 50 feet from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Dumpster washout on the project site is not allowed.
- Keep the site clean of litter debris.
- **Hazardous Waste Management:**
 - Segregate potentially hazardous waste **from non-hazardous construction site** waste. Make sure that toxic liquid wastes (e.g., used oils, solvents, and paints) and chemicals (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris. For disposal of hazardous waste, see Chemical Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility
- **Recycling:**
 - Salvage or recycle useful vegetation debris, packaging and/or surplus building materials when practical. For example, trees and shrubs from land clearing can be converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.
- **Sanitary Waste Management:**
 - Educate employees, subcontractors, and suppliers on sanitary/septic waste storage and disposal procedures and potential dangers to humans and the environment from sanitary/ septic wastes.
 - Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings) and to educate new employees.
 - Locate portable toilets a minimum of 20 feet away from storm drain inlets, drainage facilities, watercourses, and from traffic circulation. If unable to

Construction Site Best Management Practices

meet the 20-foot distance requirement, provide secondary containment for portable toilets.

- Properly connect temporary sanitary facilities that discharge to the sanitary sewer system to avoid illicit discharges. Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- If using an on-site disposal system, such as a septic system, comply with local health agency requirements.
- Ensure that sanitary/septic facilities are maintained in good working order by a licensed service. Use only reputable, licensed sanitary/septic waste haulers.

The effectiveness of solid waste management is enhanced when the following BMPs are also implemented: Chemical Management, Equipment Maintenance Procedures, and Spill Containment Plan.

Recommended Maintenance and Inspection

- On-site trash should be collected and disposed of on a regular basis. Sanitary systems should also be regularly serviced.
- Repair trash containers and dumpsters on an as needed basis. Where possible provide cover for waste containers to prevent the entry of rainwater and loss of contents by wind.
- Maintain a contingency plan in the case that hazardous or toxic materials are discovered on-site.

Post Construction Methods

Long term solid waste practices should be implemented (i.e., dumpsters, and regular trash pickups, etc.)

References

North Central Texas Council of Governments, *Integrated Storm Water Management (iSWM) Design Manual for Construction*, December 2003.

Washington Department of Ecology, *Stormwater Management Manual for Western Washington*, Publications #99-11 through 99-15, August 2001.

Construction Site Best Management Practices

GH-2 Solid Waste Management Photos/Sketches

Separate out different wastes from each other for recycling
(Courtesy of Maricopa County)



Place signage on the dumpster to prevent improper disposal of hazardous wastes
(Courtesy of Maricopa County)



Construction Site Best Management Practices

GH-3

Equipment Maintenance Procedures

EMP

Definition

Establish a program of equipment maintenance procedures, which will reduce contamination of on-site soils.

RATINGS			
Associated Costs	H	M	L
Implementation		X	
Maintenance		X	
Training		X	
Target Pollutants Removal	H	M	L
Oil and Grease	X		
Nutrients			X
Sediment			X
Floatable Material			X
Metals	X		
Other Construction Waste		X	
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: • Equipment Storage/Maintenance – high • Debris Management, Cleanup, and Washout – moderate • Trash Collection/Management – moderate Most effective when used with: • GH-1 Chemical Management • GH-4 Designated Washdown Areas • GH-5 Spill Containment Plan Alternative BMPs: • None		Photos/Sketches: • GH-3 Equipment Maintenance Procedures Photos CAD Drawings: • None	

Purpose

Non-sediment stormwater pollution can occur through improper disposal of equipment fluids and disposables such as filters, batteries, and tires. An established program of maintenance procedures can prevent job site pollution and contamination of stormwater.

Appropriate Applications

These procedures are applied on all construction projects where an on-site yard area is necessary for storage and maintenance of heavy equipment and vehicles. Perform equipment maintenance, if possible, back at the maintenance shop.

Construction Site Best Management Practices

Limitations

None identified.

Recommended Standards and Specifications

- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- All maintenance areas are required to have spill kits and/or use other spill protection devices.
- Dedicated maintenance areas should be protected from stormwater runoff and should be located at least 50 feet from downstream drainage facilities and watercourses.
- **Absorbent spill clean-up materials should be available in maintenance areas and should be disposed of properly after use. Substances used to coat asphalt transport trucks and asphalt spreading equipment should be non-toxic.**
- Use off-site maintenance facilities whenever practical.
- **For long-term projects, consider constructing roofs or portable tents over maintenance areas.**
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials. Do not dump fuels and lubricants onto the ground, place used oil in a dumpster, or pour into a storm drain or watercourse. Repair fluid and oil leaks immediately. Provide spill containment dikes or secondary containment around stored oil and chemical drums.
- Properly dispose or recycle used batteries.

The effectiveness of equipment maintenance procedures is enhanced when the following BMPs are also implemented: Chemical Management, Designated Washdown Areas, and Spill Containment Plan.

Recommended Maintenance and Inspection

- Maintain waste fluid containers in leak proof condition.
- Vehicle and equipment maintenance areas should be inspected regularly.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.

Construction Site Best Management Practices

- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

Post Construction Methods

None.

References

CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.
<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

U. S. Environmental Protection Agency, *Construction Site Storm Water Runoff Control, National Menu of Best Management Practices for Storm Water Phase II*, December 1999.
http://cfpub2.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm

Washington Department of Ecology, *Stormwater Management Manual for Western Washington, Publications #99-11 through 99-15*, August 2001.

Construction Site Best Management Practices

GH-4

Designated Washdown Areas

WD

Definition

Procedures and practices that are designed to minimize or eliminate the discharge of concrete waste materials to the storm drain systems of watercourses.

RATINGS			
Associated Costs	H	M	L
Implementation		X	
Maintenance		X	
Training		X	
Target Pollutants Removal	H	M	L
Oil and Grease		X	
Nutrients			X
Sediment			X
Floatable Material		X	
Metals			
Other Construction Waste	X		
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: - Inlet Drain Protection – high - Debris Management, Cleanup, and Washout – moderate Most effective when used with: - GH-1 Chemical Management - GH-3 Equipment Maintenance Procedures - GH-5 Spill Containment Plan Alternative BMPs: - None		Photos/Sketches: - GH-4 Designated Washdown Area Photos CAD Drawings: - None	

Purpose

Designated washout areas and associated procedures ensure the proper washout of concrete trucks, tools, and equipment and prevents fresh concrete or cement laden mortar from entering a storm drainage system.

Appropriate Applications

Concrete waste management procedures and practices are implemented on construction projects where concrete is used as a construction material or where concrete dust and debris result from demolition activities.

Construction Site Best Management Practices

- Where slurries containing Portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from sawcutting, coring, grinding, grooving, and hydro-concrete demolition.
- Where mortar-mixing stations exist.
- Where concrete trucks and other concrete-coated equipment are washed on site. See also Equipment Maintenance Procedures.

Limitations

None.

Planning Considerations

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- The site supervisor or designated personnel should oversee and enforce concrete waste management procedures.

The effectiveness of washdown areas may be enhanced when the following BMPs are also implemented: Chemical Management, Equipment Maintenance Procedures, and Spill Containment Plan.

Recommended Standards and Specifications

- **PCC and AC Wastes:**
 - PCC and AC waste should not be allowed to enter storm drains or watercourses. Instead, PCC and AC waste should be collected and properly disposed of outside the highway right-of-way or placed in a temporary concrete washout structure.
 - Install a sign adjacent to each temporary concrete washout structure to inform concrete equipment operators to utilize the installed structures.
 - A foreman and/or construction supervisor should monitor on-site concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
 - Saw cutting residue should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. Vacuum slurry residue and dispose in a temporary facility and allow slurry to dry. Dispose of dry slurry residue in accordance with Solid Waste Management.
 - Similarly, residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine.

Construction Site Best Management Practices

- **On-Site Temporary Concrete Washout Facility Procedures:**

- Temporary concrete washout facilities should be located a minimum of 50 feet from storm drain inlets, open drainage facilities, and watercourses, unless determined infeasible by the site supervisor. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor and have sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Perform washout of concrete mixer trucks in designated areas only. A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Wash concrete only from mixer truck chutes into approved concrete washout facility. Washout may be collected in an impermeable bag for disposal.

- **Above Grade Temporary Concrete Washout Structure:**

- Above grade temporary concrete washout structures should have a minimum length and width of 10 feet or larger to provide sufficient volume to contain all liquid and concrete waste generated by washout operations. If deemed necessary, the length and width of the washout structure may be expanded for more capacity.
- Straw bales, wood stakes, and sandbag materials should conform to the specifications in Organic Filter Barrier and Sand Bag Barrier.
- Plastic lining material should be a **minimum of 10-mil polyethylene sheeting** and should be free of holes, tears or other defects that compromise the impermeability of the material.

- **Below Grade Temporary Concrete Washout Structure:**

- Below grade temporary concrete washout should have a minimum length and width of 10 feet or larger to provide sufficient volume to contain all liquid and concrete waste generated by washout operations. If deemed necessary, the length and width of the washout structure may be expanded for more capacity.
- Plastic lining material should be a **minimum of 10-mil polyethylene sheeting** and should be free of holes, tears or other defects that compromise the impermeability of the material.
- Ensure that the soil base is free of rocks or other debris that may cause tears or holes in the plastic lining material.

Construction Site Best Management Practices

- **Removal of Temporary Concrete Washout Facilities:**
 - When temporary concrete washout facilities are no longer required for the work, as determined by the site supervisor, hardened concrete should be broken up, removed, and disposed of in accordance with Solid Waste Management.
 - Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled.

Recommended Maintenance and Inspection

- Monitor on site concrete waste storage and disposal procedures at least weekly.
- Monitor concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are employed.

Post Construction Methods

None.

References

CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.

<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

North Central Texas Council of Governments, *Integrated Storm Water Management (ISWM) Design Manual for Construction*, December 2003.

U. S. Environmental Protection Agency, *Construction Site Storm Water Runoff Control, National Menu of Best Management Practices for Storm Water Phase II*, December 1999.

http://cfpub2.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm

Washington Department of Ecology, *Stormwater Management Manual for Western Washington, Publications #99-11 through 99-15*, August 2001.

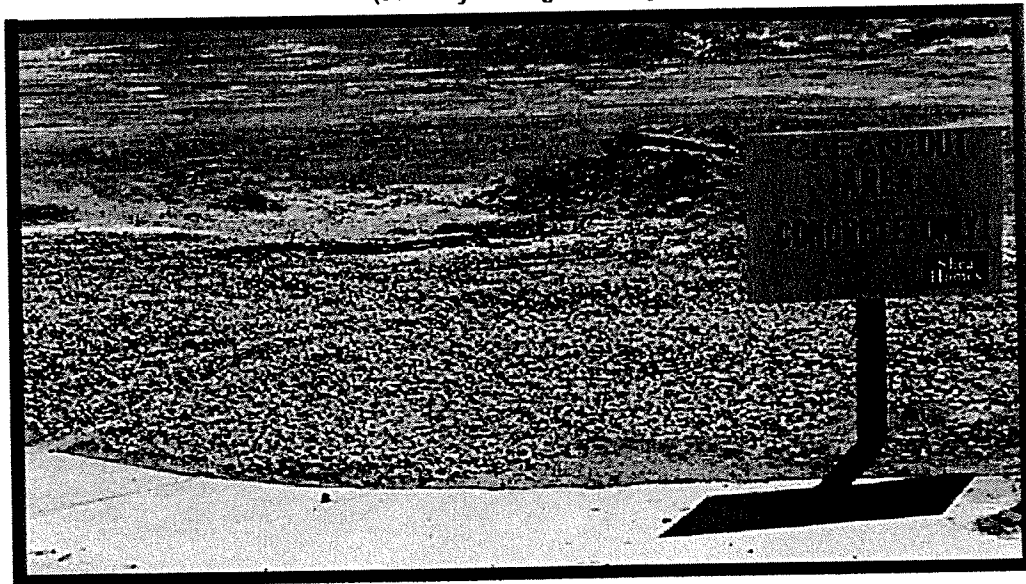
Construction Site Best Management Practices

GH-4 Designated Washdown Areas Photos/Sketches

Concrete washout container
(Courtesy of Concrete Washout Systems, Inc.)



Concrete washout area
(Courtesy of Douglas County)



Construction Site Best Management Practices

GH-5

Spill Containment Plan



Definition

An emergency plan to contain spills of dangerous, hazardous, or toxic wastes which mitigates environmental damage and provides prompt notice to proper authorities.

RATINGS			
Associated Costs	H	M	L
Implementation		X	
Maintenance			X
Training		X	
Target Pollutants Removal	H	M	L
Oil and Grease		X	
Nutrients			X
Sediment			X
Floatable Material			X
Metals		X	
Other Construction Waste		X	
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: • Inlet Drain Protection – high • Debris Management, Cleanup, and Washout – high Most effective when used with: • GH-1 Chemical Management • GH-3 Equipment Maintenance Procedures • GH-4 Designated Washdown Area Alternative BMPs: • None		Photos/Sketches: • GH-5 Spill Containment Plan Photos CAD Drawings: • None	

Purpose

These procedures and practices are implemented to prevent and control spills in a manner that minimizes or prevents the discharge of spilled material to the drainage system or watercourses.

Appropriate Applications

This best management practice (BMP) applies to all construction projects. Spill control procedures are implemented any time chemicals and/or hazardous substances are stored. Substances may include, but are not limited to:

- Soil stabilizers/binders.
- Dust Palliatives.

Construction Site Best Management Practices

- Herbicides.
- Growth inhibitors.
- Fertilizers.
- De-icing chemicals.
- Fuels.
- Lubricants.
- Other petroleum distillates.

Sanitary and Septic Wastes Limitations

The procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored on-site. This BMP only applies to emergency spill response. Refer to Chemical Management for proper storage, use, and disposal of dangerous, hazardous, and toxic wastes that should be observed at all times to minimize the potential for a spill.

Planning Considerations

- **Education:**
 - Educate employees and subcontractors on what a significant spill is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
 - Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
 - Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings) and establish a program to instruct new employees.
- **Spill Response Procedures:**
 - **Significant/Hazardous Spills** – for significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
 - **Immediately notify the following:**
 - Site supervisor and follow up with a written report.
 - Local emergency response (Fire department).
 - **A spills contractor or a Haz-Mat team immediately.** Construction personnel should not attempt to clean up the spill until the appropriate and qualified staff have arrived at the job site.

Construction Site Best Management Practices

- For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center (see contact number in table below).
- Any applicable divisions within the Nevada Division of Environmental Protection (NDEP) should also be contacted. Notification should first be made by telephone and followed up with a written report.

Agency	Situation	Phone
Nevada Division of Environmental Protection (NDEP) – Spill Report Hotline	Routine Business	888-331-6337
National Response Center	Emergency	800-424-8802
Local Fire Department/District	Emergency	911

- **Post Spill Response Procedures:**

- Spills should not be buried or washed with water.
- Used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose should be stored and disposed of in conformance with the special provisions.
- Water used for cleaning and decontamination should not be allowed to enter storm drains or watercourses and should be collected and disposed of in accordance with Chemical Management. Water overflow or minor water spillage should be contained and should not be allowed to discharge into drainage facilities or watercourses.
- Proper storage, clean-up and spill reporting instruction for hazardous materials stored or used on the project site should be posted at all times in an open, conspicuous and accessible location.
- Waste storage areas should be kept clean, well organized and equipped with ample clean-up supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners should be repaired or replaced as needed to maintain proper function.

The effectiveness of spill containment is enhanced when the following BMPs are also implemented: Chemical Management, Equipment Maintenance Procedures, and Designated Wash-down Areas.

Recommended Maintenance and Inspection

- Comply with suggestions and requirements set by local fire department.
- Verify weekly that spill control clean up materials are located near material storage, unloading, and use areas. Restock appropriate clean-up materials after a spill incident has occurred.

Construction Site Best Management Practices

- Update spill prevention and control plans and stock appropriate clean-up materials whenever changes occur in the types of chemicals used or stored on-site, or after a spill incident has occurred.

Post Construction Methods

None.

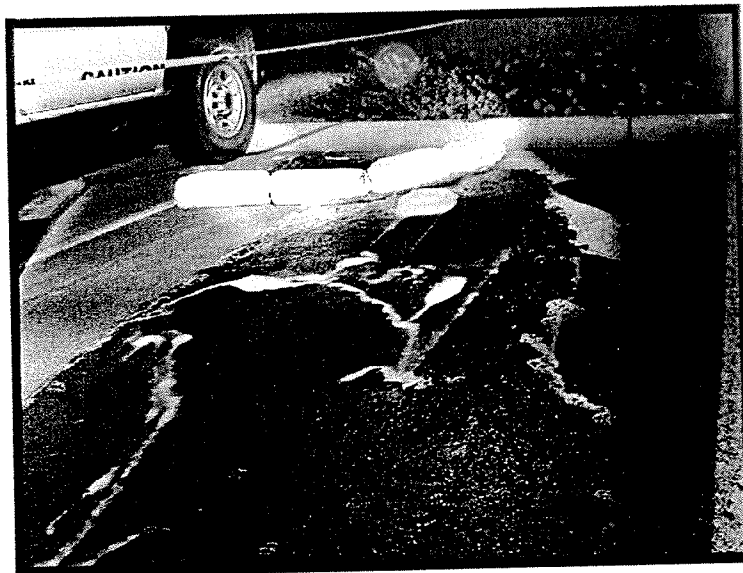
References

- CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003
<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>
- Tacoma Public Works Environmental Services, *City of Tacoma Surface Water Management Manual Volume II, Construction Stormwater Pollution Prevention*, January 1993.
<http://www.ci.tacoma.wa.us/waterservices/permits/Manual.htm>
- U. S. Environmental Protection Agency, *Construction Site Storm Water Runoff Control, National Menu of Best Management Practices for Storm Water Phase II*, December 1999.
http://cfpub2.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm

Construction Site Best Management Practices

GH-5 Spill Containment Plan Photos/Sketches

Provide temporary inlet protection against any spills approaching drain inlets to a stormwater collection system
(Courtesy of Maricopa County)



Containing leaks from equipment (Courtesy of Stormwater 911)

Construction Site Best Management Practices

GH-6

Road Sweeping/Trackout Cleaning



Definition

Road trackout cleaning procedures refer to methods to remove tracked sediment around construction site points of egress.

RATINGS			
Associated Costs	H	M	L
Implementation		X	
Maintenance	X		
Training		X	
Target Pollutants Removal	H	M	L
Oil and Grease			X
Nutrients			X
Sediment	X		
Floatable Material	X		
Metals		X	
Other Construction Waste	X		
GENERAL INFORMATION		FIGURES	
Applicability – Effectiveness: - Perimeter and Access Controls – high - Debris Management, Cleanup, and Washout – high Most effective when used with: - EC-5 Stabilized Construction Entrance - EC-6 Construction Road Stabilization - EC-7 Dust Control Alternative BMPs: - None		Photos/Sketches: - GH-6 Road Sweeping/Trackout Cleaning Photos CAD Drawings: - None	

Purpose

Cleaning road trackout prevents the sediment from entering a storm drain or watercourse.

Appropriate Applications

These practices are implemented anywhere sediment is tracked from the project site onto public or private paved roads, typically at points of ingress/egress. Studies have shown that vacuum or regenerative air street sweepers can effectively remove fine dust particles and yield significant runoff quality benefits.

Construction Site Best Management Practices

Limitations

- Sweeping and vacuuming may not be effective when soil is wet or muddy.
- Mechanical brush sweepers may only remove coarser particles.

Recommended Standards and Specifications

- Visible sediment tracking should be swept and/or vacuumed daily. For smaller areas of trackout, kick brooms can be used. For larger areas, consider mechanical brush or vacuum sweepers. Some mechanical sweepers can remove debris and dust particles down to 2.5 microns.
- Conduct sweepings at least once per week during the project operations, and prior to any predicted rainfall events.
- Consider incorporating the removed sediment back into the project, rather than hauling off-site to disposal.

Recommended Maintenance and Inspection

- Inspect ingress/egress access points daily and sweep tracked sediment as needed.
- Properly dispose of any unknown substances or objects that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, sweeper water can be reused or disposed of at an approved dump-site.

Post Construction Methods

In most cases, the municipality will continue with road sweeping operations after construction is complete.

References

CALTRANS, State of California Department of Transportation, *Construction Site Best Management Practices (BMPs) Manual*, March 2003.
<http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm>

Kamber Engineering, Gaithersburg, Maryland, *Sedimentation and Erosion Control, An Inventory of Current Practices*, USEPA, April, 1991.

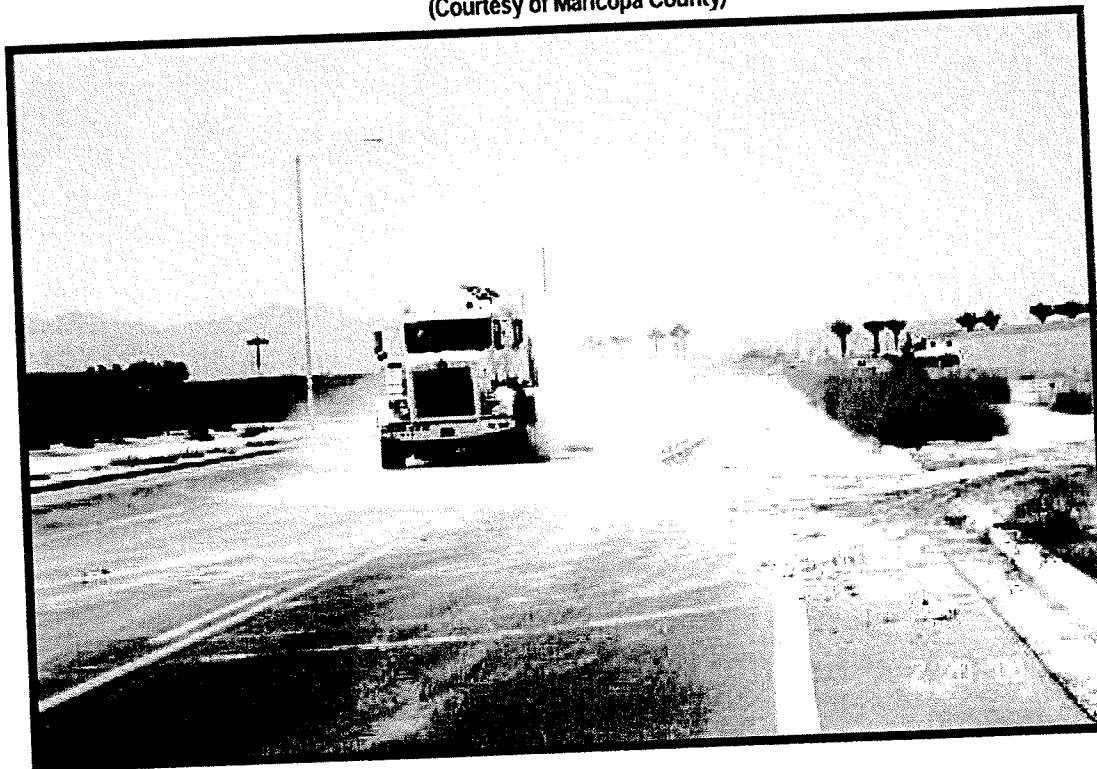
Construction Site Best Management Practices

GH-6 Road Sweeping/Trackout Cleaning Photos/Sketches

Road sweeping
(Courtesy of Douglas County)



Construction site trackout
(Courtesy of Maricopa County)



Attachment C

Amendment Log

SWPPP Amendment Log

Attachment "C"

Instructions:

Include in your records:

- A log of the date and description of any amendments to your SWPPP.

Amend. No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

Attachment D

Las Vegas Stormwater Quality Management Program Construction Permit Submittal Checklist

**LAS VEGAS VALLEY STORMWATER QUALITY MANAGEMENT PROGRAM
CONSTRUCTION PERMIT SUBMITTAL CHECKLIST**
(Applies to all projects with off-site construction activities.)

Owner / Operator (applicant) Information

Name: Wingo Foods, LLC

Address: 650 North Armstrong Place

City: Boise State: ID Zip Code: 83704 Phone: 208-377-0110

Project Name: Wingo Store

Project Address/Location: 6101 North Decatur Blvd.

Signature: _____ Date: _____

Total land disturbance = 10.5 acres, 457,380 square feet. [Must match permit application.]
(1.0 acre = 43,560 square feet)

If the area of land disturbance is one acre or more, the applicant must submit a copy of their Notice of Intent (NOI) to Nevada Division of Environmental Protection (NDEP) to be regulated under Stormwater General Permit NVR100000 and submit a copy of the receipt for payment of the annual fee or the letter of authorization from NDEP (address attached). Once payment has been received by NDEP, the applicant is immediately covered under the State's permit.

- ☐ 1. Copy of NOI attached
☐ 2. Copy of receipt or letter of authorization attached

By submitting a copy of the NOI and the receipt or authorization from NDEP, the applicant acknowledges that they are aware of the requirements set forth in the State's General Permit and have developed and will implement a site specific Stormwater Pollution Prevention Plan (SWPPP). The applicant further acknowledges that they are aware of the Las Vegas Valley Construction Site BMP Guidance Manual and the required performance standards set forth in Section 3.2 of the manual. To ensure compliance with these performance standards, the applicant shall submit a completed Performance Standards Compliance Checklist, indicating the BMPs that implement standards 1 - 12. It is recommended that the applicant also attach a copy of the checklist to their SWPPP.

☒ Copy of Performance Standards Compliance Checklist completed (see reverse side)

Yes No Were calculations required for sizing of diversion channels and/or sediment retention basins? If the answer is yes, pursuant to NRS 625.565, a Nevada Registered Professional Engineer must review and stamp plans, such as grading plans and reports that require engineering calculations.
☐ ☒

In addition to the submittal requirements specified above and in the ordinances, the following shall be included as a set of standard notes to be depicted on all site plans that disturb one acre or larger:

☒ Stormwater Runoff Management Notes (from Section 3.5 of the Las Vegas Valley Construction Site BMP Guidance Manual) on design plans.

To submit a Notice of Intent (NOI), contact:
Nevada Division of Environmental Protection
Bureau of Water Pollution Control
901 South Stewart Street
Suite 4001
Carson City, NV 89701-5249
Phone: (775) 687-8429
Fax: (775) 687-4884
Web: <http://ndep.nv.gov/bwpc/index.htm>

LAS VEGAS VALLEY STORMWATER QUALITY MANAGEMENT PROGRAM CONSTRUCTION PERMIT SUBMITTAL CHECKLIST

The checklist that follows identifies the BMP's that can be used at construction sites to meet each of the Performance Standards of the Las Vegas Valley Construction Site BMP Guidelines Manual (BMP Guidelines Manual). You must select at least one BMP for each performance standard to meet the minimum requirements. Please refer to the BMP Guidelines Manual to select the BMP's for your site. It is the responsibility of the applicant to select the BMP's and the applicant is responsible for the BMP's selected and implemented at the site. If your project or site has characteristics that make meeting a performance standard infeasible or impractical (e.g., steep slopes, etc.), please explain these characteristics at the bottom of the form.

Performance Standard	Check if Selected	BMP's	Comments
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1. Schedule construction and minimize clearing and grading	☒	PL-1 Site Control	
	☒	PL-2 Staking	
	☒	PL-3 Phased Construction	
	☒	PL-4 Topped Roads	
	☒	EC-2 Protect Topsoil Vegetation	
	☐	Other or N/A (explain)	

2. Stabilize disturbed areas	☒	EC-1 Erosion Control Mats	soil binders if needed
	☒	EC-2 Mulching	
	☒	EC-3 Seed Control	
	☒	EC-12 Surface Revegetation	
	☒	SPC-5 Revegetation	
	☐	Other or N/A (explain)	

3. Protect slopes	☐	EC-4 Diversion Ditch	
	☐	EC-4 Pile Slope Drains	
	☐	EC-12 Surface Revegetation	
	☐	EC-7 Dust Control	
	☐	EC-1 Erosion Control Mats	
	☐	SPC-8 Revegetation	
	☐	SPC-1 Organic Fiber Barriers	
	☐	SPC-2 Sand Bag Barriers	
	☐	SPC-3 Gravel Filter Berms	
	☐	SPC-4 Silt Fences	
	☐	Other or N/A (explain)	
	☐		

4. Design conveyances for non-erosive vehicles	☐	EC-4 Diversion Ditch	
	☐	SPC-4 Check Dams	
	☐	EC-11 Outlet Protection	
	☐	Other or N/A (explain)	

5. Protect watersheds, natural drainage and storm drains	☐	PL-1 Site Control	
	☐	EC-4 Diversion Ditch	
	☐	EC-3 Protect Topsoil Vegetation	
	☐	SPC-1 Organic Fiber Barriers	
	☐	SPC-2 Sand Bag Barriers	
	☐	SPC-3 Gravel Filter Berms	
	☐	SPC-4 Silt Fences	
	☐	SPC-8 Temporary Stream Crossing	
	☐	EC-11 Outlet Protection	
	☐	SPC-7 Storm Drain Inlet Protection	
	☐	Other or N/A (explain)	

Performance Standard	Check if Selected	BMP's	Comments
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A. Install sediment traps / retain eroded sediment on-site	☐	SPC-4 Check Dams	
	☐	SPC-1 Organic Fiber Barrier	
	☐	SPC-2 Sand Bag Barriers	
	☐	SPC-3 Gravel Filter Berms	
	☐	SPC-4 Silt Fences	
	☐	SPC-5 Temporary Sediment Traps	
B. Remove accumulated sediment	☐	SPC-6 Temporary Sediment Basins	
	☐	Other or N/A (explain)	

Stormwater Runoff Management
(required for all sites greater than 1 acre(43,560 sq.ft.))

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 accumulate in, the public rights of ways of the City of Las Vegas as a result of construction activities associated with this site development or construction project. Such materials shall be prevented from entering the storm sewer 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 in the City of Las Vegas and the Las Vegas Valley Construction Site Best Management Practices 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 Nevada Stormwater General Permit for Construction Activity NVR100000, Section III.A.5.

4 At a minimum, the Contractor or his agent shall inspect all disturbed areas, areas used for storage of materials and equipment that are exposed to precipitation, vehicle entrance and exit locations and all BMPs weekly, and within 24 hours after any actual rain event of 0.5 inches or more. The Contractor or his agent shall update or modify the Stormwater Pollution Prevention Plan as necessary. Some exceptions to weekly inspections may apply, such as suspension of land disturbance activities. Refer to Nevada Stormwater General Permit for Construction Activity NVR100000, Section III.A.12.

5. Accumulated sediment in BMPs shall be removed within seven days after a stormwater 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.

As part of a Valley-wide effort to manage the discharge of pollutants from construction sites into municipal storm drain systems and the Las Vegas Wash, the City of Las Vegas has adopted a new stormwater quality ordinance (MC §14.18). This ordinance requires that Best Management Practices (BMPs) be implemented to control the discharge of pollutants from construction sites, and establishes the authority of City inspectors to monitor BMP installation, maintenance, and effectiveness. The ordinance also outlines enforcement actions available to the City.

All projects must submit a completed Construction Permit Submittal Checklist. For construction sites that require coverage under the Nevada Stormwater General Permit for Construction Activity, additional submittal, inspection, and termination requirements are generally outlined as follows:

Submittal Requirements

- Submit a completed Performance Standards Compliance Checklist.
- Submit a copy of the Notice of Intent (NOI) and a receipt showing fees paid, or a copy of a letter from NDEP authorizing coverage under General Construction Permit.

Inspection Requirements

- A minimum of two inspections will take place during the lifetime of a project. An examination of the Storm Water Pollution Prevention Plan may occur if necessary.
- If a violation is noted, inspectors will first work with contractors to attain compliance. However, enforcement actions may be pursued in cases of willful violations or repeated non-cooperation.

Site Termination Requirements

- A Notice of Termination (NOT) form must be submitted to NDEP at the end of construction activities.

General information on BMPs can be found in the *Las Vegas Valley Construction Site Best Management Practices Guidance Manual*. This document, which includes the Construction Permit Submittal Checklist and the Performance Standards Compliance Checklist, is available on the Stormwater Quality Management Committee's website, at www.lvstormwater.com.

Inspections and the new submittal requirements will become effective on July 1st, 2009. If there are any questions regarding these new requirements, please contact Cheng Shih at (702) 229-2338.

**LAS VEGAS VALLEY STORMWATER QUALITY MANAGEMENT PROGRAM
CONSTRUCTION PERMIT SUBMITTAL CHECKLIST**
(Applies to all projects with off-site construction activities.)

Owner / Operator (applicant) Information

Name: Winco Foods, LLC
Address: 650 North Armstrong Place
City: Boise State: ID Zip Code: 83704 Phone: 208-377-0110
Project Name: Winco store
Project Address/Location: 6101 North Decatur Blvd.
Signature: _____ Date: _____

Total land disturbance = 10.5 acres, 457,380 square feet. [Must match permit application.]
(1.0 acre = 43,560 square feet)

If the area of land disturbance is one acre or more, the applicant must submit a copy of their Notice of Intent (NOI) to Nevada Division of Environmental Protection (NDEP) to be regulated under Stormwater General Permit NVR100000 and submit a copy of the receipt for payment of the annual fee or the letter of authorization from NDEP (address attached). Once payment has been received by NDEP, the applicant is immediately covered under the State's permit.

- ☐ 1. Copy of NOI attached
☐ 2. Copy of receipt or letter of authorization attached

By submitting a copy of the NOI and the receipt or authorization from NDEP, the applicant acknowledges that they are aware of the requirements set forth in the State's General Permit and have developed and will implement a site specific Stormwater Pollution Prevention Plan (SWPPP). The applicant further acknowledges that they are aware of the Las Vegas Valley Construction Site BMP Guidance Manual and the required performance standards set forth in Section 3.2 of the manual. To ensure compliance with these performance standards, the applicant shall submit a completed Performance Standards Compliance Checklist, indicating the BMPs that implement standards 1 - 12. It is recommended that the applicant also attach a copy of the checklist to their SWPPP.

☒ Copy of Performance Standards Compliance Checklist completed (see reverse side)

Yes No Were calculations required for sizing of diversion channels and/or sediment retention basins? If the answer is yes, pursuant to NRS 625.565, a Nevada Registered Professional Engineer must review and stamp plans, such as grading plans and reports that require engineering calculations.
☐ ☒

In addition to the submittal requirements specified above and in the ordinances, the following shall be included as a set of standard notes to be depicted on all site plans that disturb one acre or larger.

☒ Stormwater Runoff Management Notes (from Section 3.5 of the Las Vegas Valley Construction Site BMP Guidance Manual) on design plans.

To submit a Notice of Intent (NOI), contact:
Nevada Division of Environmental Protection
Bureau of Water Pollution Control
901 South Stewart Street
Suite 4001
Carson City, NV 89701-5249
Phone: (775) 687-4429
Fax: (775) 687-4684
Web: <http://ndep.nv.gov/bwpc/index.htm>

LAS VEGAS VALLEY STORMWATER QUALITY MANAGEMENT PROGRAM CONSTRUCTION PERMIT SUBMITTAL CHECKLIST

This checklist identifies the BMPs that can be used at construction sites to meet each of the Performance Standards of the Las Vegas Valley Construction Site BMP Guidelines Manual (BMP Guidelines Manual). You must select at least one BMP for each performance standard to meet the minimum requirements. Please refer to the BMP Guidelines Manual to assist you in selecting BMPs for your site. It is the responsibility of the permittee to select the BMPs that will be used on the site. The BMPs selected must be described in the permit application and implemented at the site. If your project or site has characteristics that make meeting a performance standard infeasible or inappropriate (e.g., size of site, slope of site), please explain these characteristics at the bottom of the form.

Performance Standard	Check if Selected	BMPs	Comments
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1. Schedule construction and activities during and grading	☒	PL-1 Site Design	
	☒	PL-2 Scheduling	
	☒	PL-3 Planned Construction	
	☒	PL-4 Topsoil Reuse	
	☒	EC-3 Protected Tree/Vegetation	
	☒	Other or N/A (explain)	

2. Stabilize disturbed areas	☒	EC-1 Erosion Control Mats	soil binders if needed
	☒	EC-2 Mulching	
	☒	EC-7 Dust Control	
	☒	EC-12 Surface Roughening	
	☒	SPC-4 Revegetation	
	☒	Other or N/A (explain)	

3. Protect slopes	☒	EC-8 Diversion Ditches	
	☒	EC-4 Pipe Slope Drains	
	☒	EC-12 Surface Roughening	
	☒	EC-7 Dust Control	
	☒	EC-1 Erosion Control Mats	
	☒	SPC-8 Revegetation	
	☒	SPC-1 Organic Filter Barriers	
	☒	SPC-3 Sand Bag Barriers	
	☒	SPC-3 Gravel Filter Berms	
	☒	Other or N/A (explain)	

4. Design conveyance for non-erodible vehicles	☒	EC-8 Diversion Ditches	
	☒	SPC-4 Check Dams	
	☒	EC-11 Outlet Protection	
	☒	Other or N/A (explain)	

5. Protect waterways, natural drainage and storm drains	☒	PL-1 Site Design	
	☒	EC-8 Diversion Ditches	
	☒	EC-3 Protected Tree/Vegetation	
	☒	SPC-1 Organic Filter Barriers	
	☒	SPC-3 Sand Bag Barriers	
	☒	SPC-3 Gravel Filter Berms	
	☒	SPC-8 Silt Fence	
	☒	SPC-8 Temporary Stream Crossing	
	☒	EC-11 Outlet Protection	
	☒	SPC-7 Storm Drain Inlet Protection	
	☒	Other or N/A (explain)	

Performance Standard	Check if Selected	BMPs	Comments
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6. Install sediment traps / retain eroded sediments on-site	☒	SPC-4 Check Dams	
	☒	SPC-1 Organic Filter Barrier	
	☒	SPC-3 Sand Bag Barrier	
	☒	SPC-3 Gravel Filter Berms	
	☒	SPC-8 Silt Fence	
	☒	SPC-8 Temporary Sediment Traps	
	☒	Other or N/A (explain)	

7. Remove accumulated sediment	☒	Use Standard Note No. 6	
	☒	Other or N/A (explain)	

8. Control site entrances and exits	☒	EC-5 Stabilized Site Entrances	
	☒	EC-4 Construction Road Stabilization	
	☒	SPC-11 Entrance/Exit The Wash	
	☒	GH-8 Road Sweeping/Truckbed Cleaning	
	☒	Other or N/A (explain)	

9. Manage materials and wastes	☒	GH-2 Solid Waste Management	
	☒	GH-6 Spill Containment Plan	
	☒	Other or N/A (explain)	

10. Manage equipment and vehicles	☒	GH-3 Equipment Maintenance Procedure	
	☒	GH-4 Designated Washdown Area	
	☒	Other or N/A (explain)	

11. Stabilization of inactive disturbed areas	☒	PL-4 Topsoil Reuse	
	☒	EC-2 Mulching	
	☒	EC-7 Dust Control	
	☒	SPC-8 Revegetation	
	☒	Other or N/A (explain)	

Explanation why performance standard(s) cannot be met:			

Stormwater Runoff Management

(required for all sites greater than 1 acre(43,560 sq.ft.))

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 accumulate in, the public rights of ways of the City of Las Vegas as a result of construction activities associated with this site development or construction project. Such materials shall be prevented from entering the storm sewer 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 in the City of Las Vegas and the Las Vegas Valley Construction Site Best Management Practices 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 Nevada Stormwater General Permit for Construction Activity NVR100000, Section III.A.5.

4 At a minimum, the Contractor or his agent shall inspect all disturbed areas, areas used for storage of materials and equipment that are exposed to precipitation, vehicle entrance and exit locations and all BMPs weekly, and within 24 hours after any actual rain event of 0.5 inches or more. The Contractor or his agent shall update or modify the Stormwater Pollution Prevention Plan as necessary. Some exceptions to weekly inspections may apply, such as suspension of land disturbance activities. Refer to Nevada Stormwater General Permit for Construction Activity NVR100000, Section III.A.12.

5. Accumulated sediment in BMPs shall be removed within seven days after a stormwater 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.

As part of a Valley-wide effort to manage the discharge of pollutants from construction sites into municipal storm drain systems and the Las Vegas Wash, the City of Las Vegas has adopted a new stormwater quality ordinance (MC §14.18). This ordinance requires that Best Management Practices (BMPs) be implemented to control the discharge of pollutants from construction sites, and establishes the authority of City inspectors to monitor BMP installation, maintenance, and effectiveness. The ordinance also outlines enforcement actions available to the City.

All projects must submit a completed Construction Permit Submittal Checklist. For construction sites that require coverage under the Nevada Stormwater General Permit for Construction Activity, additional submittal, inspection, and termination requirements are generally outlined as follows:

Submittal Requirements

- Submit a completed Performance Standards Compliance Checklist.
- Submit a copy of the Notice of Intent (NOI) and a receipt showing fees paid, or a copy of a letter from NDEP authorizing coverage under General Construction Permit.

Inspection Requirements

- A minimum of two inspections will take place during the lifetime of a project. An examination of the Storm Water Pollution Prevention Plan may occur if necessary.
- If a violation is noted, inspectors will first work with contractors to attain compliance. However, enforcement actions may be pursued in cases of willful violations or repeated non-cooperation.

Site Termination Requirements

- A Notice of Termination (NOT) form must be submitted to NDEP at the end of construction activities.

General information on BMPs can be found in the *Las Vegas Valley Construction Site Best Management Practices Guidance Manual*. This document, which includes the Construction Permit Submittal Checklist and the Performance Standards Compliance Checklist, is available on the Stormwater Quality Management Committee's website, at www.lvstormwater.com.

Inspections and the new submittal requirements will become effective on July 1st, 2009. If there are any questions regarding these new requirements, please contact Cheng Shih at (702) 229-2338.