DRAINAGE STATEMENT
SURF THRU CAR WASH
LOT 26 OF ORO VALLEY MARKETPLACE
AMENDED FINAL PLAT BK. 64 M&P PG. 42
A PORTION OF SECTION 5, T12S, R14E, G&SRM
11595 NORTH ORACLE ROAD
TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA.

PIMA COUNTY TAX CODE OF THE PARCEL: 220-04-3370
TOWN OF ORO VALLEY PROJECT NUMBER: 2201106

April 21, 2022
Revised July 27, 2022
Revised December 8, 2022

PREPARED FOR:
PAUL BROWN, ARCHITECT INC.
P.O. Box 13085
Bakersfield, California 93389
Attn: Paul Brown
Tel: (661) 834-9611
Email: pb@paulbrownarchitect.com

PREPARED BY:
THE WLB GROUP, INC.
4444 East Broadway Boulevard
Tucson, Arizona 85711
Phone: (520) 881-7480

PRINCIPAL INVESTIGATOR:
Erik Beam, CFM
Hydrologic/Hydraulic Designer

WLB Job No. 185050-PB01-0400

Q:\185050\PB-01 - Surf Thru\03 Hydro\Word Documents\185050PB01 DrnStment_SURF_DEC2022.docx

December 8, 2022

David Laws, P.E.
Town of Oro Valley
11000 N La Canada Drive
Oro Valley, AZ 85737

Re: Drainage Statement for Encantada at Steam Village; Phase III Steam Pump Village
WLB No. 110046-C001-0400

Dear Mr. Laws,

This drainage statement has been prepared in support of the proposed design as shown on the Surf Thru Car Wash at Oro Valley Marketplace improvement plans. The Surf Thru Car Wash at Oro Valley Marketplace project is located in Lot 26 of Oro Valley Marketplace. The "*Drainage Report for the Mass Grading of a portion of Neighborhood 4 in Rancho Vistoso (A.K.A. Oro Valley Market Place)*" prepared by The WLB Group, Inc. dated September 8, 2006 revised date April 25, 2007 (Oro Valley Case # OV12-04-30) and the "*Drainage Report for In-N-Out Burger, Lot 28 of Oro Valley Marketplace*" prepared by The WLB Group, Inc. dated April 6, 2009 revised May 11, 2009 was approved for the Lot 28 Oro Valley Marketplace Development. These reports are referenced herein in the design of the Surf Thru Car Wash at Oro Valley Marketplace project.

HYDROLOGIC RESULTS

There are a total of 2 post-developed watersheds (12.0 & 13.0) delineated within Lots 26 and 28 in the Mass Grading Drainage Report (April, 2007 - Figure 4, Sheet 4 of 4). These watersheds were modeled using the Rational Method under postdeveloped conditions (see Figure 3). The watersheds defined by these concentration points range in size from 2.2 acres to 4.87 acres with corresponding 100-year peak discharges of 21.4 cfs to 42.3 cfs. The estimated watershed areas with corresponding 100-year peak discharge rates are from the Mass Grading Drainage Report. Each corresponding onsite watershed is summarized in the table below:

TABLE OF 100-YEAR POST-DEVELOPED PEAK DISCHARGES		
CONC. POINT	**DRAINAGE AREA (AC)**	**Q100 (cfs)**
12.0	4.87	42.3
13.0	2.20	21.4

The stormwater from these two existing concentration points will exit the site, directly into the Big Wash, through existing hydraulic structures designed to convey these discharges. Lot 26 of Oro Valley Marketplace mostly discharges to CP 12.0, with the south boundary of the site discharging to CP 13.0. The proposed grading design of the Surf Thru Carwash project divides the existing CP 12.0 watersheds into smaller sub-watersheds, with associated analysis of onsite hydraulic structures. The sub-watersheds are labeled to designate the overall watershed that they are a part of (CP 12a is a sub-basin of CP 12.0, etc.). To maintain consistency with the approved drainage design, the peak flow discharges for this project were determined using a pro-rated discharge based on the previously approved drainage areas and discharges (see Figure 4). The pro-rated post developed discharge is 8.69 cfs/acre with a time of concentration of 5 minutes for both watersheds.

The In-N-Out Drainage Report watershed boundaries for CP 13.0 has increased to include the new building footprint and Drive thru. The drainage area for CP 13.0 is 2.5 acres with a peak discharge of 24.1 cfs. This flow discharges directly into the Big Wash through a 16’ wide (4 cells) Type 3 sidewalk scupper. Since the Surf Thru Carwash project will not be discharging to CP 13.0 under post developed conditions, the peak flow discharge will be reduced for this concentration point. It is necessary to note the correction of the post-developed watershed boundary (as described on the predeveloped watershed map) to demonstrate that development of this project does not increase the runoff due to the incorporation of onsite water harvesting basins onsite. The estimated watershed areas, with corresponding pro-rated 100-year peak discharge rates for each corresponding onsite watershed, are summarized in the following table:

TABLE OF 100-YEAR POST-DEVELOPED PEAK DISCHARGES		
CONC. POINT	**DRAINAGE AREA (AC)**	**Pro-Rated Q100 (cfs)**
12a	0.31	2.7
12b	0.03	0.3

HYDRAULIC RESULTS

The description of the conveyance and direction of runoff in this statement is valid only for the Surf Thru Carwash improvement plan. The conveyance of runoff through the proposed development is accomplished by a system of PVC and HDPE pipes, existing grate inlets and catch basin, existing culvert, constructed channels, and water harvesting basin structures. Hydraulic structures and constructed drainage channels are calculated designed per the final site plan. Refer to Appendix A of this report for details and supporting for the channels and hydraulic structures.

The Surf Thru Carwash Project is a commercial development plan with the construction of apartment buildings, commercial buildings, parking shade structures, associated parking and driveways, sidewalks and landscaping. The post-developed watersheds for this project will consist of several sub-watersheds. A large portion of each sub-watershed's runoff will flow into the proposed parking lot and/or water harvesting basins and into the existing stormdrain (see attached Figure 4). Each hydraulic structure has been labeled in such a fashion as to relate to the designated sub-basins (CP 12a is a sub-basin of CP 12.0, etc.). As a reminder from the Hydrologic Results Section of this report, the site has been divided into 2 major watersheds in order to be consistent with the Mass Grading Drainage report and Drainage Report for In-N-Out in order to evaluate the conveyance of onsite runoff associated with the proposed site grading.

The site is 100% located outside the Zone AE FEMA Floodplain for the Big Wash but is located adjacent to the wash (See Figure 2). Therefore, the Finish Floor Elevations for all new structures will be a minimum of 1-foot above the Base Flood Elevation (BFE). The FIS Base Flood Elevation (BFE) is 2640.0 at the upstream side of the building. Therefore, the minimum recommended Finish Floor Elevation (FFE) is recommended to be 2641.00 feet. The proposed FFE is 2643.00 feet (See Figure's 3 & 4).

At concentration point 12.0, 42.3 cfs discharges through an existing Type 5 catch basin with 5-EF-1 grates and 12' wing and is directed west to Big Wash through an existing 36" SRP. At concentration point 12a, a prorated discharge of 2.7 cfs is collected in water harvesting basin 12a. The basin will pond up to 6 inches in depth and then will uniformly discharge out of the basin at an approximate flow depth of 0.1-feet west to concentration point 12.0. Trapezoidal channel X12a will carry prorated discharges to water harvesting basin 12a. At CP 12b, the prorated discharge of 0.3

cfs is collected in the water harvesting basins, water harvesting depth (retention) to 4-inches in depth (0.33-feet), with 0.5' feet of detention storage (total depth 0.8'). The water harvesting basins will be constructed with a 4:1 side slope, except adjacent to North Water Harvest Way (6:1 sides lopes), with varying depths of 6 to 8 inches (4" WH retention; 2-4" Detention, see Figure 4 basin ponding depths). The remaining concentration points will discharge off the parking lot surfaces throughout the project site via existing hydraulic structures with first flush features at CP 12.0.

The proposed water harvesting basins are provided as part of the Rainwater Harvesting Plans and Landscape Plans. The Town's detention volume requirement has been waived and granted for Rancho Vistoso Neighborhood 4 (A.K.A. Oro Valley Marketplace). A waiver for the onsite detention was granted for this site for any storm event based on its immediate proximity to Big Wash and because onsite detention would severely restrict developable area. A copy of this waiver request is attached in Appendix B of this report. The following tables summarize the remaining drainage structures for this development:

TABLE OF EXISTING HYDRAULIC STRUCTURES		
CONC. PT.	**Q100 (cfs)**	**STRUCTURE**
12.0	42.3	Existing Type 5 Catch Basin w/ 5-EF 1 Grates & 12' Wing, 1-36"x 77.13' SRP; S=0.50% (Existing)
13.0	24.1	Existing 16' wide (4 cells)Type 3 sidewalk scupper w/6" Reveal

CONSTRUCTED DRAINAGE WAYS		
CONC. PT.	**Q100 (cfs)**	**DRAINAGE WAY DESCRIPTION**
X12a	1.1	Trapezoidal, BW=1', d=0.24', RB ss=6:1, LB ss=4:1 s=1.0% (min), fb=0.05', v=2.12fps, n=0.020
X12b	0.6	Trapezoidal, BW=1', d=0.24', RB ss=2:1, LB ss=4:1 s=1.3% (min), fb=0.02', v=1.42fps, n=0.036
X12c	0.3	Trapezoidal, BW=1', d=0.11', RB ss=3:1, LB ss=4:1 s=2.2% (min), fb=0.02', v=2.08fps, n=0.020
X12d	0.1	Trapezoidal, BW=1', d=0.05', RB ss=50:1, LB ss=4:1 s=1.6% (min), fb=0.01', v=0.92fps, n=0.020

WATER HARVESTING BASIN MAINTENANCE:

Water Harvesting Basins 12a and 12b are required to have routine maintenance and inspection to ensure adequate performance for the life of the basin. The basins are required to be inspected after every major storm event and cleared of all organic and inorganic debris. The basins shall be cleaned after 6" of sediment has accumulated on the bottom, or once every 24 months, whichever occurs first. Finally, inspection of the basin and maintenance records is to occur on an annual basis.

WATER HARVESTING BASIN ACCESS AND MAINTENANCE

Drainage specifications relating to vegetation:

When conducting drainage maintenance, adhere to the following guidance as it pertains to vegetation in the basins:

1. Minimum disturbance shall occur within the mitigation area, with emphasis on promoting the reestablishment of the habitat. Primarily, maintenance shall be to maintain basin sediment traps to remove excess sediment. NO VEHICULAR TRAFFIC SHALL OCCUR OUTSIDE OF THE DEFINED ACCESS ROUTE OR SEDIMENT TRAP AREAS.

2. Vegetation shall remain in a natural state. No pruning or alteration of vegetation in the basins shall occur to the vegetation unless specified within the report. Specifically, leave all native desert trees in their natural multi-trunk form, leave all native desert shrubs in their natural form and allow new native trees, shrubs, grasses and forbs to grow from seed in the basins and channels.

3. To prevent loss of vegetation due to spread of fire and extreme competition from non-native species, remove non-native invasive Buffelgrass, Johnson Grass, and Fountain Grass or any additional invasive non-native plants as specified within the annual report if they appear in the basins or channel. NOTE: Ensure that personnel conducting basin maintenance can distinguish between native grasses and non-native grasses. Remove only non-native invasive grasses.

4. If thinning of vegetation becomes necessary to maintain a discharge appropriate to a basin roughness coefficient, selectively trim vegetation in the following order:
    a.) First, remove any non-native trees that may have self-seeded in the basins. NOTE: Ensure that personnel conducting channel maintenance can distinguish between native trees and non-native trees. Remove only non-native trees.
    b.) Second, if additional trimming is needed to maintain basin conveyance, selectively trim low branches on native trees and thin the branches of native shrubs. Tree pruning shall be conducted by a Certified Arborist in coordination with the Landscape Architect of Record. This should only be done to achieve necessary discharge characteristics and should be kept to a minimum.
    c.) The irrigation system shall be programmed and maintained for a three-year period. The first year shall consist of regular watering periods to promote growth and establish the newly planted and salvaged vegetation. Tree stations shall be programmed to encourage deep watering and promote strong root systems. Shrubs and accents stations shall be programmed to promote and maintain growth. The second and third year, station programming shall be set to wean plant material from the irrigation system. Stations shall have longer durations between run times until plant material can sustain growth without supplemental irrigation. The irrigation controller shall be re-programmed every month to obtain this objective. The irrigation system shall be maintained as part of the overall maintenance program. Irrigation breaks and equipment failure shall be repaired until the end of the three-year establishment period. At the end of the three year establishment period, the irrigation system shall be turned off at the ball-valve point of connection and the system abandoned.

<u>The annual inspection report shall contain the following summaries:</u>

- A statement that no maintenance is needed at that time, or a list of repairs and work to be done to correct deficiencies to avoid potential problems. This work shall be followed with a letter

written by an Arizona Registered Landscape Architect and/or Engineer verifying the date of maintenance activities and description that the recommended work has been satisfactorily completed and complies with the approved improvement plans. The responsible individual (architect, HOA, etc.) shall provide these maintenance records to the Town of Oro Valley on a yearly basis.

- Subject to Town Engineer's written approval, basin maintenance schedules may be modified following a three-year period of operation. Supporting documentation for such a request is to include, at a minimum: (1) past maintenance records and photographs spanning the previous three years (if applicable); (2) current photographs of the basin and basin appurtenances; (3) a written explanation for the request to modify the maintenance requirements.

CONCLUSION

1. The site is a commercial development located in The Town of Oro Valley. The site is surrounded by existing commercial developments.
2. The site is located adjacent to a FEMA Zone AE floodplain and all new structures Finish Floor Elevations are required to be elevated a minimum of 1 foot above the 100-year WSEL. The 100-year WSEL was determined to be 2641.0, the proposed FFE is 2643.0, thereby providing an adequate freeboard/FFE.
3. Floodplain Use permit will not be required by Town of Oro Valley or PCRFCD.
4. The onsite runoff is designed to flow away from the proposed building and collected in either of the two proposed onsite water harvesting basins. These basins satisfy the Town of Oro Valley's requirements. The stormwater runoff is at or below existing discharge values under post-developed conditions.
5. Rainwater harvesting basins are provided as part of the Rainwater Harvesting Plans and Landscape Plans. The Town's detention volume requirement is waived on the basis of an approved Detention Waiver (due to proximity and direct runoff discharge to Big Wash). The peak flows will remain the same under post developed conditions as the existing structures are designed for the future development (as discussed herein).

The development plan for the Surf Thru Car Wash project has been analyzed within this report and a workable drainage concept has been developed. This concept will provide for the safe and efficient collection and conveyance of all onsite and offsite generated runoff. Development of this

project, in accordance with the Drainage Concept, will not produce any adverse effects for adjacent or downstream property owners. However, deviation in construction from the Improvement Plans, which have been based upon this Drainage Report, may nullify the conclusions of this report, as may variations in climatic conditions, vegetation and erosion/deposition.

If you should have any further questions or comments, please contact John Wise or me at 881-7480.

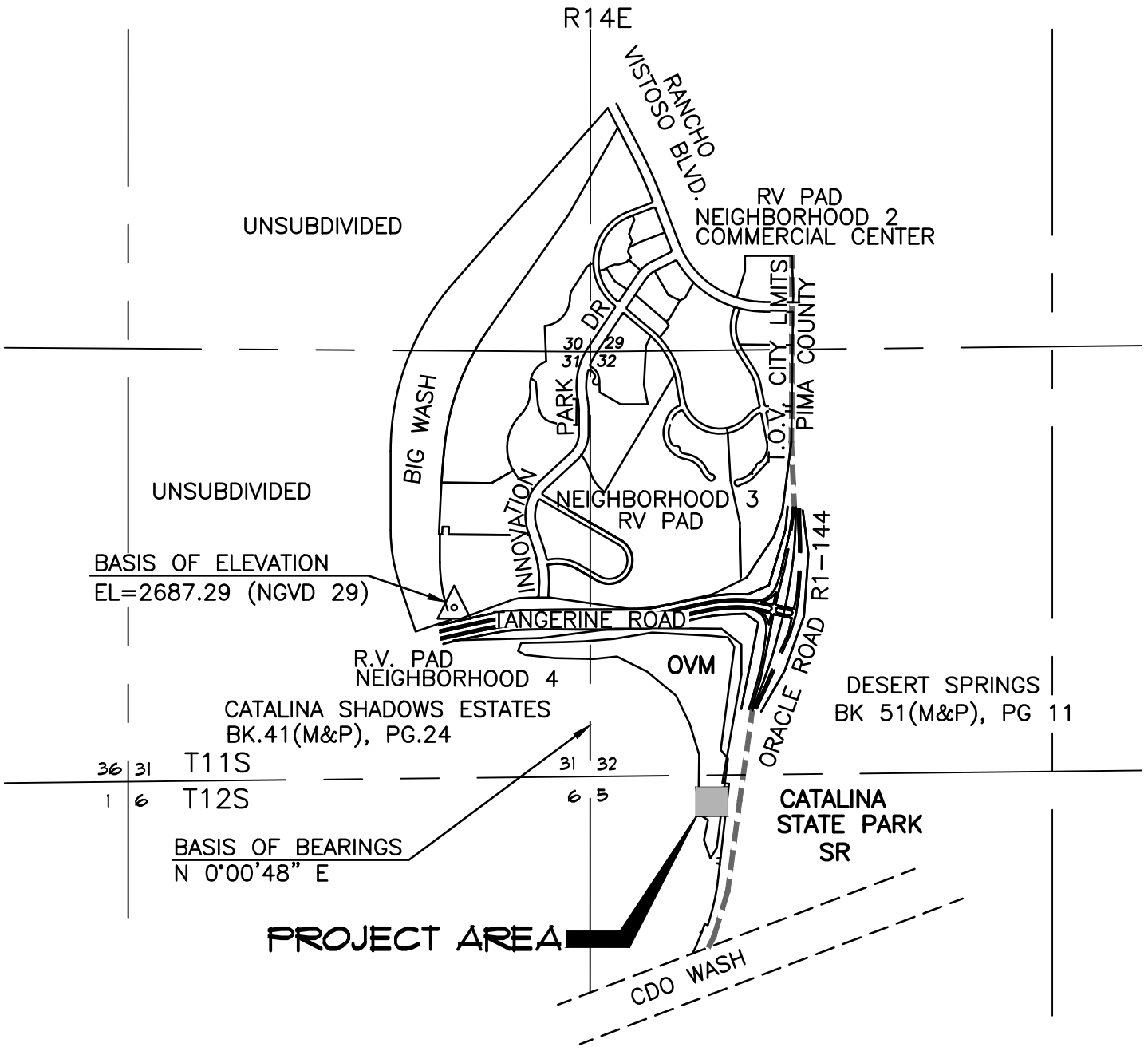
Sincerely,

The WLB Group, Inc.

Erik Beam

Erik Beam, CFM
Hydrologic/Hydraulic Designer

Figure 1: Vicinity Map



LOCATION MAP

BEING A PORTION OF SECTION 5, TOWNSHIP 12 SOUTH, RANGE 14 EAST
GILA & SALT RIVER MERIDIAN, TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA

SCALE: 3"=1 MILE

The WLB Group INC.
WLB
Offices located in Tucson, Phoenix
and Las Vegas, NV
4444 East Broadway
Tucson, Arizona 85711 (520) 881-7480

FIGURE 1

Q:\185050\PB-01 - Surf Thru\03 Hydro\Exhibits\FIG1_LOC.dwg Plotted: Apr 18, 2022

WLB JOB# 185050-PB01-0400

Figure 2: FIRM (Flood Insurance Rate Map)

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1090L

FIRM

FLOOD INSURANCE RATE MAP

PIMA COUNTY, ARIZONA
AND INCORPORATED AREAS

PANEL 1090 OF 4750

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORO VALLEY, TOWN OF	040109	1090	L
PIMA COUNTY	040073	1090	L

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
04019C1090L

MAP REVISED
JUNE 16, 2011

Federal Emergency Management Agency

EFFECTIVE FIRM MAP

SURF THRU CAR WASH

TOWN OF ORO VALLEY
PIMA COUNTY, ARIZONA

FIGURE 2

WLB JOB # 185050-PB01
APRIL 2022

Q:\185050\PB-01 - Surf Thru\03 Hydro\Exhibits\FIG2_FEMA.dwg Plotted: Apr 18, 2022

Figure 3: Onsite Pre Developed Watershed Map

BIG WASH
500-YEAR FLOODPLAIN
BOUNDARY; FEMA
ZONE X (SHADED)

BIG WASH
100-YEAR FLOODWAY

BIG WASH
100-YEAR FLOODPLAIN
BOUNDARY; FEMA ZONE AE

ORACLE ROAD (SR 77)

2641

CP 12.0 (PER MASTER REPORT)
EXISTING TYPE 5 CB W/
5 EF-1 GRATES & 12'WING
Q_{100}=42.3 CFS

EXISTING RIPRAP SPLASH
PAD APRON

12.0

BIG WASH
Q_{100}=18,300CFS

PROPERTY BOUNDARY

EXISTING 36" SRP; 77.13LF
@ 0.5% SLOPE; RUN M PER
MASTER GRADING REPORT

BIG WASH
500-YEAR FLOODPLAIN
BOUNDARY; FEMA
ZONE X (SHADED)

CP 12.0 (PER IN&OUT REPORT)
EXISTING 16' TYPE 3
SIDEWALK SCUPPER
Q_{100}=24.1 CFS

13.0

BIG WASH
100-YEAR FLOODPLAIN
BOUNDARY; FEMA ZONE AE

PROPERTY BOUNDARY

2638

2636

2635

A

0' 60' 120' 180'

CONTOUR INTERVAL = 1'

LEGEND

- WATERSHED BOUNDARY
- 2350 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 100-YEAR FLOODPLAIN LIMIT FEMA ZONE AE
- 500-YEAR FLOODPLAIN LIMIT FEMA ZONE X (SHADED)
- 85 BASE FLOOD ELEVATION (BFE) FIS ELEVATIONS (FEMA)
- A FEMA CROSS SECTION
- PROPERTY BOUNDARY
- 12.0 CONCENTRATION POINT
- FLOW DIRECTION

FIGURE 3

WLB JOB # 185050-PB01-0400
JULY 2022

ONSITE PREDEVELOPED WATERSHED MAP

SURF THRU CAR WASH

TOWN OF ORO VALLEY

PIMA COUNTY, ARIZONA

Engineering Planning Surveying
Landscape Architecture Urban Design
Offices located in Tucson, Phoenix,
and Flagstaff, Arizona, and Las Vegas, Nevada
4444 East Broadway Boulevard,
Tucson, Arizona 85711 (520) 881-7480

The WLB Group Inc.

Figure 4: Onsite Post Developed Watershed Map

SEE FIGURE 3 FOR WATERSHED CONTINUATION

BIG WASH
100-YEAR FLOODPLAIN
BOUNDARY; FEMA ZONE AE

BIG WASH
500-YEAR FLOODPLAIN
BOUNDARY; FEMA
ZONE X (SHADED)

BIG WASH
Q_{100}=18,300CFS

EXISTING RIPRAP SPLASH
PAD APRON

BASIN 12a
TOTAL VOL.=1,557 CF
VOL. DET.=917 CF
WSEL=2641.6 FT
RWH DEPTH=0.33'
PONDING DEPTH=0.6'
TOTAL DEPTH=0.8'
BOTTOM EL.=2641.00
TOP EL.=2641.80
Q100(IN)=2.7 cfs
Q100(OUT)=2.7 cfs

EXISTING TYPE 5 CATCH BASIN
W/5 EF-1 GRATES & 12' WING
RIM=40.20
36" RCP INV=36.75
EX. Q100(IN)=42.3cfs

BASIN 12b
TOTAL VOL.=391 CF
VOL. RET.=161 CF
WSEL=2642.85 FT
RWH DEPTH=0.33'
PONDING DEPTH=0.6'
BOTTOM EL.=2642.25
TOP EL.=2643.05
Q100(IN)=0.3 cfs
Q100(OUT)=0.2 cfs

TOP OF BASIN

PROPERTY BOUNDARY

EXISTING CULVERTS

DUMPED RIP-RAP
OVER FILTER FABRIC
D50=6" RIP-RAP
T=2D50

FOR DETAILED GRADING SEE DETAIL 3, SHEET 10 FOR ADDITIONAL INFORMATION

FOR DETAILED GRADING SEE DETAIL 3, SHEET 9 FOR ADDITIONAL INFORMATION

FOR DETAILED GRADING SEE DETAIL 5, SHEET 9 FOR ADDITIONAL INFORMATION

FOR DETAILED GRADING SEE DETAIL 4, SHEET 9 FOR ADDITIONAL INFORMATION

FOR DETAILED GRADING SEE DETAIL 4, SHEET 10 FOR ADDITIONAL INFORMATION

FOR DETAILED GRADING SEE DETAIL 5, SHEET 10 FOR ADDITIONAL INFORMATION

CAR WASH TUNNEL GRADES VARIES
PER CAR WASH EQUIPMENT PLANS

FUTURE IN-N-OUT DRIVE
THRU DESIGNED BY OTHERS

CP 13.0 (PER IN&OUT REPORT)
EXISTING 16' TYPE 3
SIDEWALK SCUPPER
Q_{100}=24.1 CFS

ORACLE ROAD (SR 77)

TABLE OF POST-DEVELOPED PEAK DISCHARGES		
CONC. PT	DRAINAGE AREA (ac)	Q_{100}(cfs) (PRORATED)
12a	0.31	2.7
12b	0.03	0.3

LEGEND

- WATERSHED BOUNDARY
- 2350 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 100-YEAR FLOODPLAIN LIMIT FEMA ZONE AE
- 500-YEAR FLOODPLAIN LIMIT FEMA ZONE X (SHADED)
- 85 BASE FLOOD ELEVATION (BFE) FIS ELEVATIONS (FEMA)
- PROPERTY BOUNDARY
- 12.0 CONCENTRATION POINT
- FLOW DIRECTION

0' 20' 40' 60'

CONTOUR INTERVAL = 1'

FIGURE 4

ONSITE POSTDEVELOPED WATERSHED MAP

SURF THRU CAR WASH

TOWN OF ORO VALLEY

PIMA COUNTY, ARIZONA

WLB JOB # 185050-PB01-0400
DECEMBER 2022

Engineering Planning Surveying
Landscape Architecture Urban Design
Offices located in Tucson, Phoenix,
and Flagstaff, Arizona, and Las Vegas, Nevada
4444 East Broadway Boulevard,
Tucson, Arizona 85711 (520) 881-7480

The WLB Group, INC.

Appendix A Hydraulic Analysis

A.1 Water Harvesting Basin Volume and Hydrograph

A.2 Channel Worksheets

A.1 Water Harvesting Basin Volume and Hydrograph

Water Harvesting Basin 12a
Stage/Storage/Discharge

Elevation	Stage	Area	Volume	Discharge
2641.00	0.00	1346.9	0	0.0
2641.30	0.30	1896.6	810.9	0.0
2641.80	0.80	3075.7	1556.7	19.9

BROAD CRESTED WEIR OUTLET (Uniform discharge over curb above 0.5' Ponding Depth):

Equation: $Q = C_{rect}LH^{3/2} + C_{trianagle}(8/15\sqrt{2g}\tan\theta/2)H^{5/2}$

where:
Q = Discharge flow (cfs)
C_{rect} = discharge coefficient for rectangular weir
C_{rect} = 3.3 for sharp crested weir
C_{rect} = 3.1 for broad crested weir
$C_{triangle}$ = discharge coefficient for V-notch weir (Typically $C_{triangle}$ = 0.6)

L = length (ft)
H = distance from top of structure to water surface (ft)

$\tan\theta/2$ = side slopes
for 3H:1V slope $\tan\theta/2$ = 3
for rectangular weir $\tan\theta/2$ = 0

C_{rect} = 3.00
$C_{triangle}$ = 0.60

Elevation	$\tan\theta/2$	LENGTH*	HEIGHT	Qcapacity
(ft)		[L]	[H]	[CFS]
2641.30	3.00	0.0	0.0	0.0
2641.80	3.00	40.0	0.3	19.9

* Length of curb overtopping 0.3' in depth

BASIN ROUTING

PROJECT: SURFTHRU CARWASH
BASIN: RWH BASIN 12A
PREPARED BY: EJB

JOB #: 185050-PB01-0400
Q100
DATE: 07-26-2022

DISCHARGE-cfs	STORAGE-cf
0.00	0.0
0.00	810.9
19.90	1556.7

TIME-min	INFLOW-cfs	OUTFLOW-cfs	CUM.STORAGE-cf
0.00	0.00	0.00	0.0
1.33	0.00	0.00	0.0
2.66	0.06	0.01	4.4
3.99	0.23	0.01	22.1
5.32	0.44	0.01	56.3
6.65	0.66	0.01	108.6
7.99	0.92	0.01	181.0
9.32	1.22	0.01	277.3
10.65	1.57	0.01	402.2
11.98	1.98	0.01	559.9
13.31	2.40	0.01	750.5
14.64	2.71	0.62	917.0
15.97	2.48	2.65	903.0
17.30	2.27	2.36	895.2
18.63	2.06	2.15	887.4
19.96	1.85	1.95	879.7
21.30	1.66	1.75	872.4
22.63	1.47	1.56	865.6
23.96	1.30	1.38	859.2
25.29	1.14	1.22	853.3
26.62	1.00	1.07	847.9
27.95	0.87	0.93	843.0
29.28	0.76	0.81	838.7
30.61	0.65	0.70	834.9
31.94	0.56	0.61	831.6
33.27	0.49	0.52	828.7
34.61	0.42	0.45	826.3
35.94	0.37	0.39	824.2
37.27	0.32	0.34	822.5
38.60	0.28	0.30	821.0
39.93	0.25	0.26	819.8
41.26	0.22	0.23	818.8
42.59	0.20	0.21	818.0
43.92	0.18	0.19	817.3

45.25	0.17	0.17	816.7
46.58	0.15	0.16	816.2
47.92	0.14	0.14	815.7
49.25	0.12	0.13	815.2
50.58	0.11	0.12	814.7
51.91	0.10	0.11	814.3
53.24	0.09	0.09	813.8
54.57	0.08	0.08	813.3
55.90	0.06	0.07	812.9
57.23	0.05	0.06	812.4
58.56	0.04	0.04	812.0
59.89	0.03	0.03	811.6
61.23	0.02	0.02	811.3
62.56	0.02	0.02	811.1
63.89	0.00	0.01	810.3

TOTAL VOLUME STORED= 917.0 CU.FT.

RETENTION VOLUME= 810.9 cu.ft. DETENTION VOLUME= 106.1cu.ft.
TIME =1416.16 min. for OUTFLOW = 0 cfs.

Water Harvesting Basin 12b
Stage/Storage/Discharge

Elevation	Stage	Area	Volume	Discharge
2642.25	0.00	376.5	0	0.0
2642.55	0.30	544	161.1	0.0
2643.05	0.80	986	390.6	16.0

BROAD CRESTED WEIR OUTLET (Uniform discharge over curb above 0.5' Ponding Depth):

Equation: $Q = C_{rect}LH^{3/2} + C_{trianagle}(8/15\sqrt{2g}\tan\theta/2)H^{5/2}$

where:
Q = Discharge flow (cfs)
C_{rect} = discharge coefficient for rectangular weir
C_{rect} = 3.3 for sharp crested weir
C_{rect} = 3.1 for broad crested weir
$C_{triangle}$ = discharge coefficient for V-notch weir (Typically $C_{triangle}$ = 0.6)

L = length (ft)
H = distance from top of structure to water surface (ft)

$\tan\theta/2$ = side slopes
for 3H:1V slope $\tan\theta/2$ = 3
for rectangular weir $\tan\theta/2$ = 0

C_{rect} = 3.00
$C_{triangle}$ = 0.60

Elevation (ft)	$\tan\theta/2$	LENGTH* [L]	HEIGHT [H]	Qcapacity [CFS]
2642.55	3.00	0.0	0.0	0.0
2643.05	3.00	32.0	0.3	16.0

* Length of curb overtopping 0.3' in depth

BASIN ROUTING

PROJECT: SURFTHRU CARWASH
BASIN: RWH BASIN 12B
PREPARED BY: EJB

JOB #: 185050-PB01-0400
Q100
DATE: 07-26-2022

DISCHARGE-cfs	STORAGE-cf
0.00	0.0
0.00	161.1
16.00	390.6

TIME-min	INFLOW-cfs	OUTFLOW-cfs	CUM.STORAGE-cf
0.00	0.00	0.00	0.0
1.33	0.00	0.00	0.0
2.66	0.01	0.01	0.0
3.99	0.03	0.01	1.3
5.32	0.05	0.01	4.4
6.65	0.07	0.01	9.5
7.99	0.10	0.01	16.8
9.32	0.14	0.01	26.8
10.65	0.17	0.01	39.9
11.98	0.22	0.01	56.8
13.31	0.27	0.01	77.2
14.64	0.30	0.01	100.4
15.97	0.28	0.01	121.6
17.30	0.25	0.01	140.9
18.63	0.23	0.01	158.4
19.96	0.21	0.10	166.5
21.30	0.18	0.24	162.2
22.63	0.16	0.14	163.8
23.96	0.14	0.16	162.7
25.29	0.13	0.12	162.8
26.62	0.11	0.12	162.4
27.95	0.10	0.10	162.3
29.28	0.08	0.09	162.1
30.61	0.07	0.07	162.0
31.94	0.06	0.06	161.8
33.27	0.05	0.06	161.7
34.61	0.05	0.05	161.6
35.94	0.04	0.04	161.5
37.27	0.04	0.04	161.4
38.60	0.03	0.03	161.4
39.93	0.03	0.03	161.3
41.26	0.02	0.03	161.3
42.59	0.02	0.02	161.3
43.92	0.02	0.02	161.2

45.25	0.02	0.02	161.2
46.58	0.02	0.02	161.2
47.92	0.02	0.02	161.2
49.25	0.01	0.01	161.1
50.58	0.01	0.01	161.1
51.91	0.01	0.01	161.1
53.24	0.01	0.01	161.1
54.57	0.01	0.01	161.0
55.90	0.01	0.01	160.7
57.23	0.01	0.01	160.4
58.56	0.00	0.01	159.9
59.89	0.00	0.01	159.4
61.23	0.00	0.01	158.8
62.56	0.00	0.01	158.1
63.89	0.00	0.01	157.3

TOTAL VOLUME STORED= 168.3 CU.FT.

RETENTION VOLUME= 161.1 cu.ft. DETENTION VOLUME= 7.2cu.ft.
TIME = 327.42 min. for OUTFLOW = 0 cfs.

A.2 Channel Worksheets

Worksheet for Trapezoidal Channel - X12a

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020	
Channel Slope	0.01000	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	6.00	ft/ft (H:V)
Bottom Width	1.00	ft
Discharge	1.10	ft³/s

Results

Normal Depth	0.24	ft
Flow Area	0.52	ft²
Wetted Perimeter	3.43	ft
Hydraulic Radius	0.15	ft
Top Width	3.38	ft
Critical Depth	0.23	ft
Critical Slope	0.01116	ft/ft
Velocity	2.12	ft/s
Velocity Head	0.07	ft
Specific Energy	0.31	ft
Froude Number	0.95	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.24	ft
Critical Depth	0.23	ft
Channel Slope	0.01000	ft/ft

Worksheet for Trapezoidal Channel - X12a

GVF Output Data

Critical Slope	0.01116	ft/ft

Cross Section for Trapezoidal Channel - X12a

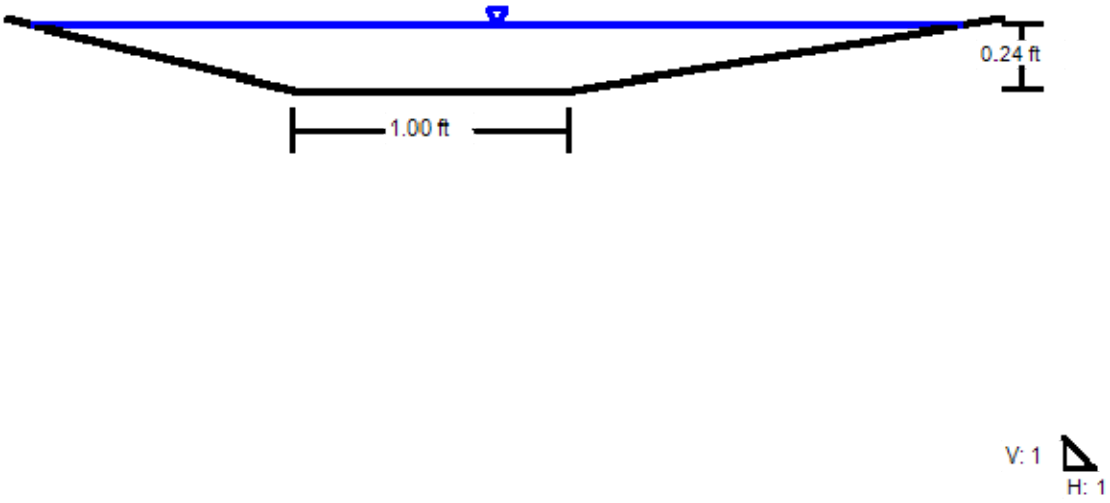
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020	
Channel Slope	0.01000	ft/ft
Normal Depth	0.24	ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	6.00	ft/ft (H:V)
Bottom Width	1.00	ft
Discharge	1.10	ft³/s

Cross Section Image



Worksheet for Trapezoidal Channel - X12b

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.036	
Channel Slope	0.01300	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	1.00	ft
Discharge	0.60	ft³/s

Results

Normal Depth	0.24	ft
Flow Area	0.42	ft²
Wetted Perimeter	2.55	ft
Hydraulic Radius	0.17	ft
Top Width	2.46	ft
Critical Depth	0.18	ft
Critical Slope	0.03826	ft/ft
Velocity	1.42	ft/s
Velocity Head	0.03	ft
Specific Energy	0.28	ft
Froude Number	0.60	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.24	ft
Critical Depth	0.18	ft
Channel Slope	0.01300	ft/ft

Worksheet for Trapezoidal Channel - X12b

GVF Output Data

Critical Slope	0.03826	ft/ft

Cross Section for Trapezoidal Channel - X12b

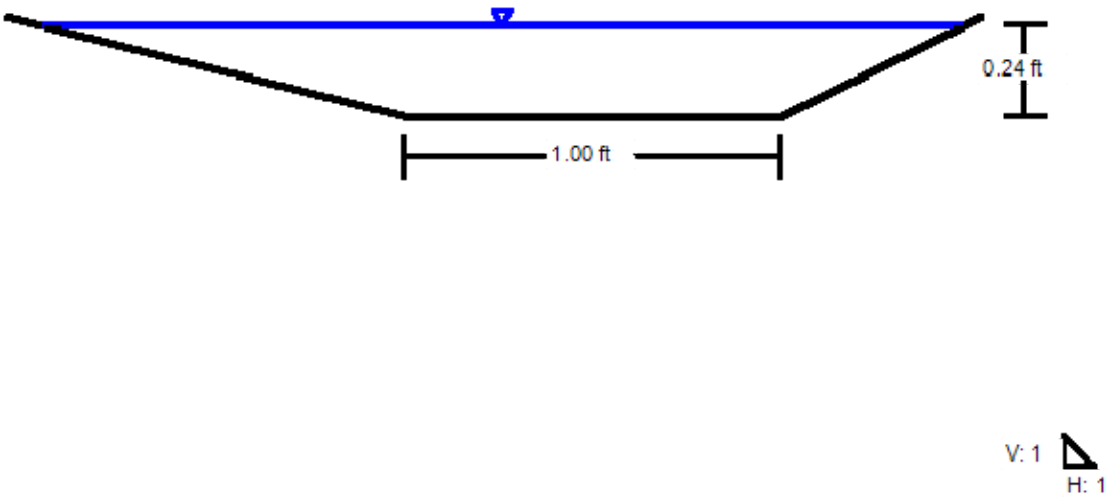
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.036	
Channel Slope	0.01300	ft/ft
Normal Depth	0.24	ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	1.00	ft
Discharge	0.60	ft³/s

Cross Section Image



Worksheet for Trapezoidal Channel - X12c

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020	
Channel Slope	0.02200	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	1.00	ft
Discharge	0.30	ft³/s

Results

Normal Depth	0.11	ft
Flow Area	0.14	ft²
Wetted Perimeter	1.77	ft
Hydraulic Radius	0.08	ft
Top Width	1.74	ft
Critical Depth	0.12	ft
Critical Slope	0.01318	ft/ft
Velocity	2.08	ft/s
Velocity Head	0.07	ft
Specific Energy	0.17	ft
Froude Number	1.27	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.11	ft
Critical Depth	0.12	ft
Channel Slope	0.02200	ft/ft

Worksheet for Trapezoidal Channel - X12c

GVF Output Data

Critical Slope	0.01318	ft/ft

Cross Section for Trapezoidal Channel - X12c

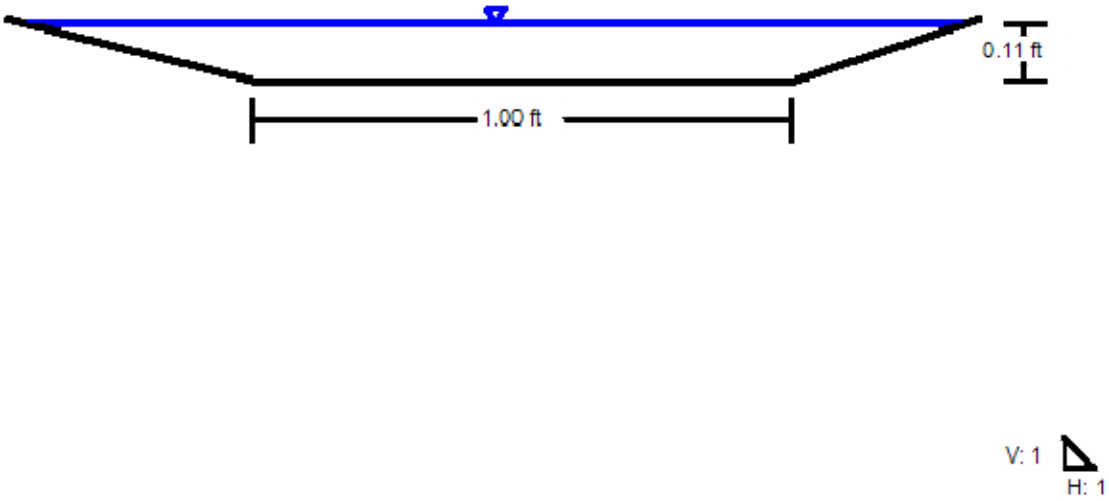
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020	
Channel Slope	0.02200	ft/ft
Normal Depth	0.11	ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	1.00	ft
Discharge	0.30	ft³/s

Cross Section Image



Worksheet for Trapezoidal Channel - X12d

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020	
Channel Slope	0.01600	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	50.00	ft/ft (H:V)
Bottom Width	1.00	ft
Discharge	0.10	ft³/s

Results

Normal Depth	0.05	ft
Flow Area	0.11	ft²
Wetted Perimeter	3.58	ft
Hydraulic Radius	0.03	ft
Top Width	3.57	ft
Critical Depth	0.05	ft
Critical Slope	0.01889	ft/ft
Velocity	0.92	ft/s
Velocity Head	0.01	ft
Specific Energy	0.06	ft
Froude Number	0.93	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.05	ft
Critical Depth	0.05	ft
Channel Slope	0.01600	ft/ft

Worksheet for Trapezoidal Channel - X12d

GVF Output Data

Critical Slope	0.01889	ft/ft

Cross Section for Trapezoidal Channel - X12d

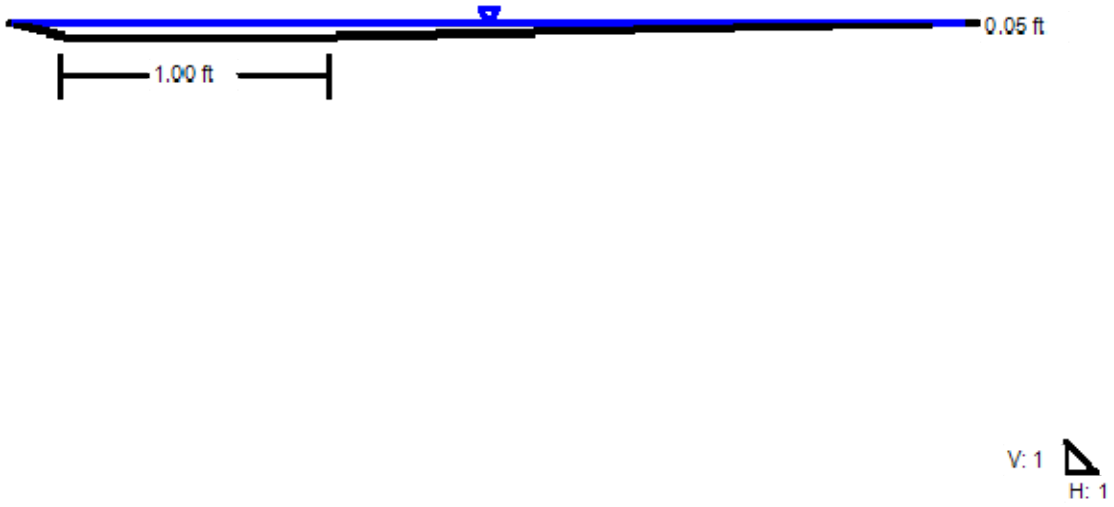
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.020	
Channel Slope	0.01600	ft/ft
Normal Depth	0.05	ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	50.00	ft/ft (H:V)
Bottom Width	1.00	ft
Discharge	0.10	ft³/s

Cross Section Image



Appendix B Report Excerpts

B.1 Copy of Detention Waiver

B.2 Drainage Report for In-N-Out Burger

B.1 Copy of Detention Waiver

The WLB Group Inc.

REVISED
PRELIMINARY DRAINAGE REPORT
FOR A PORTION OF NEIGHBORHOOD 4
IN RANCHO VISTOSO
(A.K.A. ORO VALLEY MARKET PLACE)

OV12-04-30

April 27, 2005

Revised September 29, 2005

Revised November 19, 2005

Revised December 16, 2005

Revised January 19, 2006

PREPARED FOR:

VISTOSO PARTNERS LLC

1121 W. Warner Road

Tempe, Arizona 85284

PREPARED BY:

THE WLB GROUP, INC.

4444 East Broadway Boulevard

Tucson, Arizona 85711

PRINCIPAL INVESTIGATOR:

Erik Beam

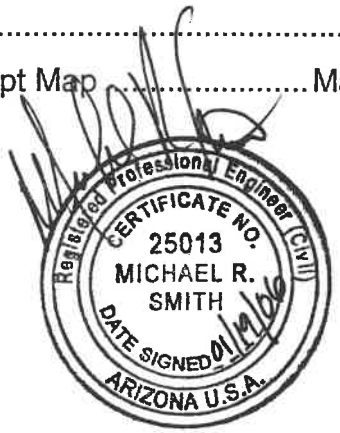
Hydrologic/Hydraulic Designer

WLB No. 185050-A004-0400

The WLB Group Inc.

TABLE OF CONTENTS

LIST OF EXHIBITS



The WLB Group Inc.

DRAINAGE STATEMENT FOR DETENTION WAIVER
AT RANCHO VISTOSO, NEIGHBORHOOD 4

This drainage statement has been prepared in support of the proposed detention plan for Neighborhood 4 at Rancho Vistoso. This detention plan proposes routing the post-developed storm water runoff from portions of Neighborhood 4 through the proposed future development and into the adjacent Big Wash located on the western boundary of the project site. This portion of Neighborhood 4 analyzed in this statement contains a gross area of 101 acres and currently discharges storm water runoff through natural channels and sheet flow to Big Wash.

The site is bordered by Big Wash on the west, Oracle Road on the east, the Canada Del Oro Wash on the south, and Tangerine Road on the north.

In the unapproved Preliminary Drainage Report for Rancho Vistoso Neighborhoods 3 and 4, dated May 24, 2000 the computed Neighborhood 4 discharges were for the post-developed condition and these discharges were intended to flow unimpeded downstream to Big Wash. Since the date of this report, the Town of Oro Valley has declared the entire town as being within a critical basin. This decision requires the discharges leaving the developed site to be reduced to or below the pre-developed levels.

A waiver for the onsite detention is requested for this project for any storm event based on its immediate proximity to Big Wash and because onsite detention would severely restrict developable area.

B.2 Drainage Report for In-N-Out Burger

The WLB Group Inc.

Engineering • Planning
Surveying • Urban Design
Landscape Architecture

May 11, 2009

Marvin Miller, Fritz Laos, David Parker, P.E., and David Laws, P.E.
Town of Oro Valley
11,000 N. La Canada Drive
Oro Valley AZ 85737

Re: In-N-Out Burger Lot 28 of Oro Valley Marketplace
WLB No. 185050-GF01
OV12-09-01

Gentlemen:

The following will address the drainage review comments dated May 6, 2009. This response letter is prepared in support of the Drainage Report for In-N-Out Burger Lot 28 of Oro Valley Marketplace dated April 6, 2009 and revised on May 8, 2009. The responses are presented in the same order of the comments on your letter.

20. The cover sheet of the report now reflects the Town of Oro Valley's Project Number as OV12-09-01.

21. A 404 Compliance statement is included as page 5 of the drainage report.

22. A type 2 scupper is designed for this CP 13.0. The report and Figure 3 have been updated accordingly.

23. An expanded discussion on CP 16.0, as per our telephone conversation on May 8, 2009, has been added on pages 8 and 9 of the revised drainage report.

24. A Triton First Flush insert is recommended for use at CP's 13.0 and 16.0. The report and Figure 3 have been updated accordingly.

25. Seven Triton TDAM 30-PK's will be used, one at each cell of the seven-cell Type 2 Scupper. Specifications and dimension information are included in Appendix D of the revised drainage report.

Engineering • Planning • Surveying • Urban Design • Landscape Architecture
Offices located in Tucson, Phoenix, Las Vegas • E-mail: tucson@wlbgroup.com
4444 East Broadway • Tucson, Arizona 85711 • (520) 881-7480 • FAX (520) 881-7492

The WLB Group Inc.

26. Manufacturer's maintenance and inspection procedures for the Triton First Flush insert are included in Appendix D of the revised drainage report.

27. CP 16.0 label has been updated.

28. The tables on Figure 3 have been updated to reflect the peak discharge for CP 13.0.

ADDITIONAL COMMENTS FROM DRAINAGE REPORT:

Page 2: The zoning for this site has been identified.

Page 8: The area for CP 16.0 has been updated.

If you have any questions or require additional information, please contact Mike Smith or me at 881-7480.

Sincerely,

THE WLB GROUP, INC.

Elena Badilla

Elena Badilla, E.I.T., CFM
Hydrologic/Hydraulic Designer

The WLB Group Inc.

DRAINAGE REPORT
FOR IN-N-OUT BURGER
LOT 28 OF ORO VALLEY MARKETPLACE
WITHIN RANCHO VISTOSO NEIGHBORHOOD 4
A PORTION OF SECTION 5, T12S, R14E, G&SRM
11595 NORTH ORACLE ROAD
TOWN OF ORO VALLEY, PIMA COUNTY, ARIZONA.

PIMA COUNTY TAX CODE OF THE PARCEL: 220-04-3350
TOWN OF ORO VALLEY PROJECT NUMBER: OV12-09-01

April 6, 2009
Revised May 11, 2009

PREPARED FOR:

IN-N-OUT BURGER
13502 Hamburger Lane
Baldwin Park, CA. 91706-5885
(626) 813-8263

PREPARED BY:

THE WLB GROUP, INC.
4444 East Broadway Boulevard
Tucson, Arizona 85711

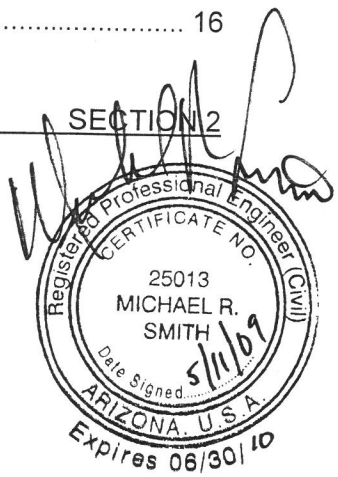
PRINCIPAL INVESTIGATOR:
Elena Badilla, EIT, CFM
Hydrologic/Hydraulic Designer

WLB No. 185050-GF01

W:\DRAIN-RPT\185050\Neighborhood 3&4\Neighborhood 4\In-N-Out\Drainage Report.doc

The WLB Group Inc.

TABLE OF CONTENTS



LIST OF EXHIBITS

The WLB Group Inc.

INTRODUCTION

This Drainage Report has been prepared in support of the development plan for In-N-Out Burger commercial development, which consists of a fast food restaurant. In-N-Out Burger is lot 28 of the Oro Valley Market Place development, part of an Industrial/Commercial development within Rancho Vistoso Neighborhood 4. This development is zoned as RV PAD C-2. In-N-Out Burger commercial development contains a gross area of 0.76 acre. This project site is bounded by lot 26 (Danny's Market) on the north, Oracle Road on the east and the Big Wash on the west; on the south, it is bounded by lot 29 of the Oro Valley Market Place development. Figure 1 shows a location map of the site.

> This site is more specifically described as being a portion of Section 5, Township 12 South, Range 14 East, Gila and Salt River Meridian, Town of Oro Valley, Arizona.

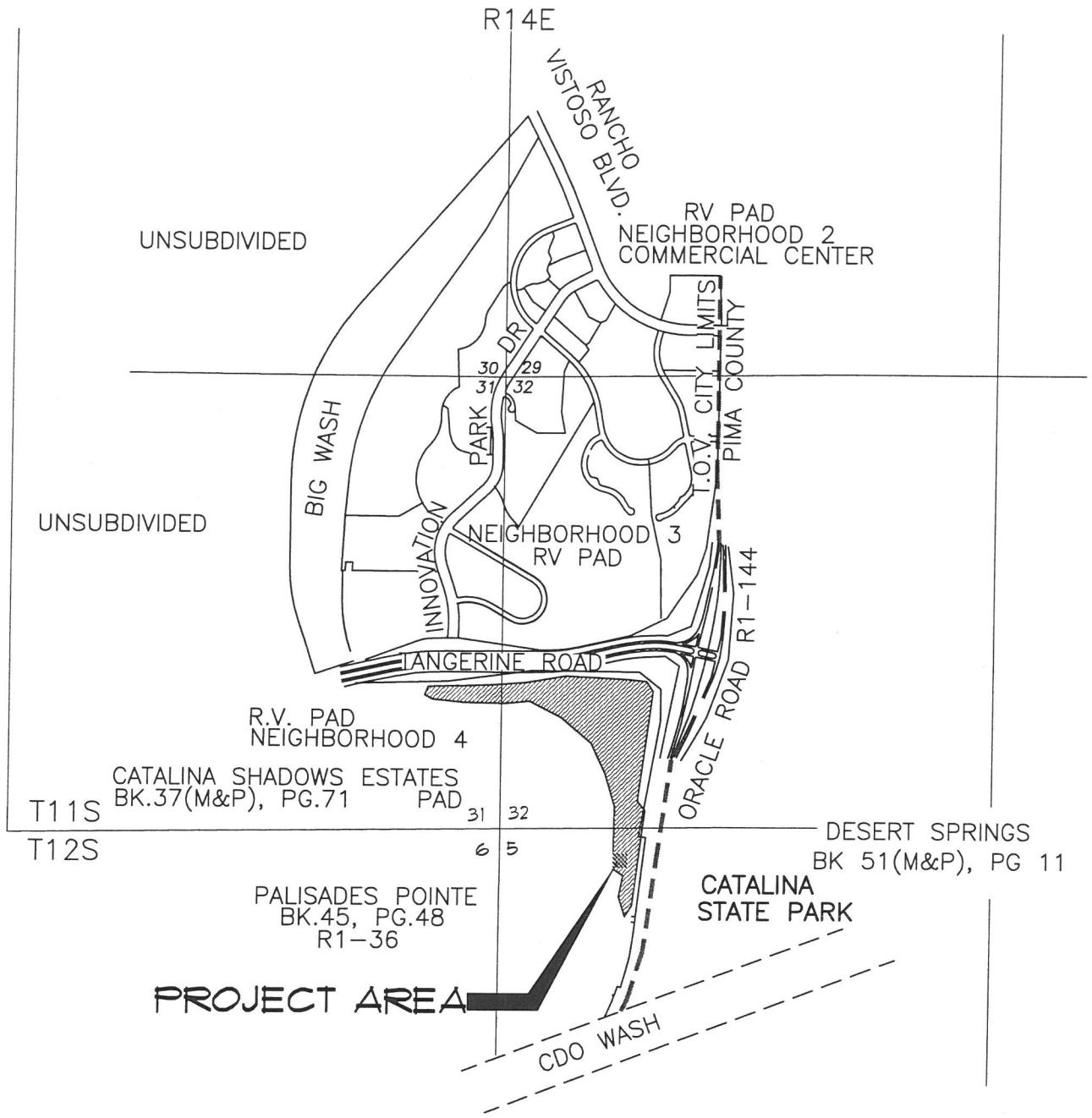
In-N-Out Burger development is located at the south end of Oro Valley Market Place development, within watershed CP13.0 as defined on the master drainage report for that development. Excerpts of the Revised Drainage Report for Oro Valley Market Place (Reference 2) are attached in Appendix D of this report. Most of the Oro Valley Market Place development has already been built. Onsite storm water drains from the northeast to the southwest predominately as sheet flow at an approximate slope rate of 2%. In-N-Out Burger receives offsite flow from within the watershed, which is discharged via an existing scupper into the Big Wash. Bank protection along the Big Wash is provided as part of the Oro Valley Market Place development design.

The water surface elevations of the Big Wash were previously determined using a Hec-RAS analysis. According to the mass grading of Oro Valley Market Place, the top-of bank elevation for the mass grading of the site was designed at three feet higher than the water surface elevations of the Big Wash. No additional floodplain mapping was done in this analysis. In addition, a LOMR for

The WLB Group Inc.

the Big Wash at Rancho Vistoso, Neighborhood 4 (Case No. 08-09-1800P) is currently under review by FEMA.

Due to the proximity of the project site to the Big Wash and the difference in times of concentration, a Storm Water Detention Waiver was requested with the Master Drainage Report in support of the mass grading for Rancho Vistoso Neighborhood 4. The Detention Waiver was accepted by the Town Engineer for the Town of Oro Valley. A copy of the request letter dated September 28, 2005 is included in Appendix D of this report.



LOCATION MAP

A PORTION OF SECTION 5 T12S R14E,
G&SRM, TOWN OF ORO VALLEY,
PIMA COUNTY, ARIZONA

3" = 1 MILE

The WLB Group INC. WLB
Engineering • Planning • Surveying
Landscape Architecture • Urban Design
Offices located in: Tucson, Phoenix and Flagstaff, Arizona and Las Vegas, Nevada.
4444 E. Broadway Tucson, Az 85711
(520) 881-7480

IN-N-OUT BURGER
LOCATION MAP

The WLB Group Inc.

404 COMPLIANCE STATEMENT

Rancho Vistoso, Neighborhood 4 is a development project on 101 acres in Sections 31, 32, and 5 Townships 11 and 12 South Range 14 East of the Gila and Salt River Meridian, in Pima County, Arizona.

I, Michael Smith, am a Registered Professional Civil Engineer in the State of Arizona and am responsible for the preparation of the report for the above-referenced project. I attest to the following statement:

This project has been determined to be non-jurisdictional pursuant to Section 404 of the Federal Water Pollution Control Act amendments of 1972, 33 USC 1334.

ATTESTED TO THIS 19th DAY OF November 2005.

COUNTY OF PIMA)

) SS

STATE OF ARIZONA)

THIS STATEMENT WAS ACKNOWLEDGED BEFORE ME THIS 19th DAY OF November 2005.

NOTARY PUBLIC Tiffany Gorrell

MY COMMISSION EXPIRES 3/31/2008

OFFICIAL SEAL
TIFFANY GORRELL
NOTARY PUBLIC-ARIZONA
PIMA COUNTY
My Comm. Exp. March 31, 2008

The WLB Group Inc.

OBJECTIVES

The objective of this report is to evaluate the conveyance of onsite runoff associated with the development plan of In-N-Out Burger. In addition, a drainage concept that would safely and efficiently utilize the project site while maintaining natural drainage patterns is being provided. This is accomplished by:

1. Developing designs that comply with Development Standards Code of The Town of Oro Valley (Reference 1).

2. Estimating the hydrologic and hydraulic conditions given the proposed future densities and development, i.e. post-development 100-year peak storm water discharges.

3. Estimating locations and sizes of hydraulic structures used in the conveyance of post-developed storm water runoff that will be constructed as a part of the mass-grading of the project site.

The WLB Group Inc.

PROCEDURES

The general procedure within this design report is to estimate the storm water runoff rates and then design facilities that will accept, convey, direct, and span these discharges. The actual procedure is more specifically described as follows:

1. All onsite watersheds were delineated using 1" = 200' topography with 1 foot contour intervals. Basin coefficients and imperviousness values were based on the Drainage Criteria Manual for the Town of Oro Valley (Reference 1).

2. The 10-year and 100-year pre and post-development peak storm water discharges affecting this project were estimated using the Rational Method. Computer printouts of a spreadsheet outlining the method have been included in Appendix A of this report.

3. Sidewalk Scupper & Grate openings were sized and rated using the weir equation ($Q = C_{rect}LY^{3/2}$). The Sidewalk Scupper rated for this development is Type 2, PC/COT Standard Detail 205. Ratings for this structure have been outlined and formatted on a spreadsheet and are included in Appendix B of this report.

The WLB Group Inc.

HYDROLOGIC RESULTS

The following tables are found in this section:

- Table of 10 and 100-Year Pre-Developed Peak Discharge Rates.
- Table of 10 and 100-Year Post-Developed Peak Discharge Rates.

See the Existing Conditions Watershed Map for Rancho Vistoso neighborhood 4 (Figure 2) and Drainage Concept Map (Figure 3) for basin delineations and Concentration Points.

PRE-DEVELOPED CONDITIONS

The pre-developed conditions of this site were discussed in the "Revised Preliminary Drainage Report for a Portion of Neighborhood 4 in Rancho Vistoso (A.K.A. Oro Valley Market Place)", dated January 19, 2006 and last revised on April 25, 2007 by the WLB Group (Reference 2). A copy of the Existing Conditions Watershed Map for Rancho Vistoso Neighborhood 4, Figure 2, is included with this report for reference. In-N-Out Burger is located within watershed 4E.

TABLE OF PRE-DEVELOPED 10-YEAR & 100-YEAR DISCHARGES

CONC. POINT	WATERSHED AREA (AC)	*Q_{10} (CFS)	*Q_{100} (CFS)	Q_{100} OFFSITE FLOWS (CFS)
4E	52.58	93.2	183.1	1076

POST-DEVELOPED CONDITIONS

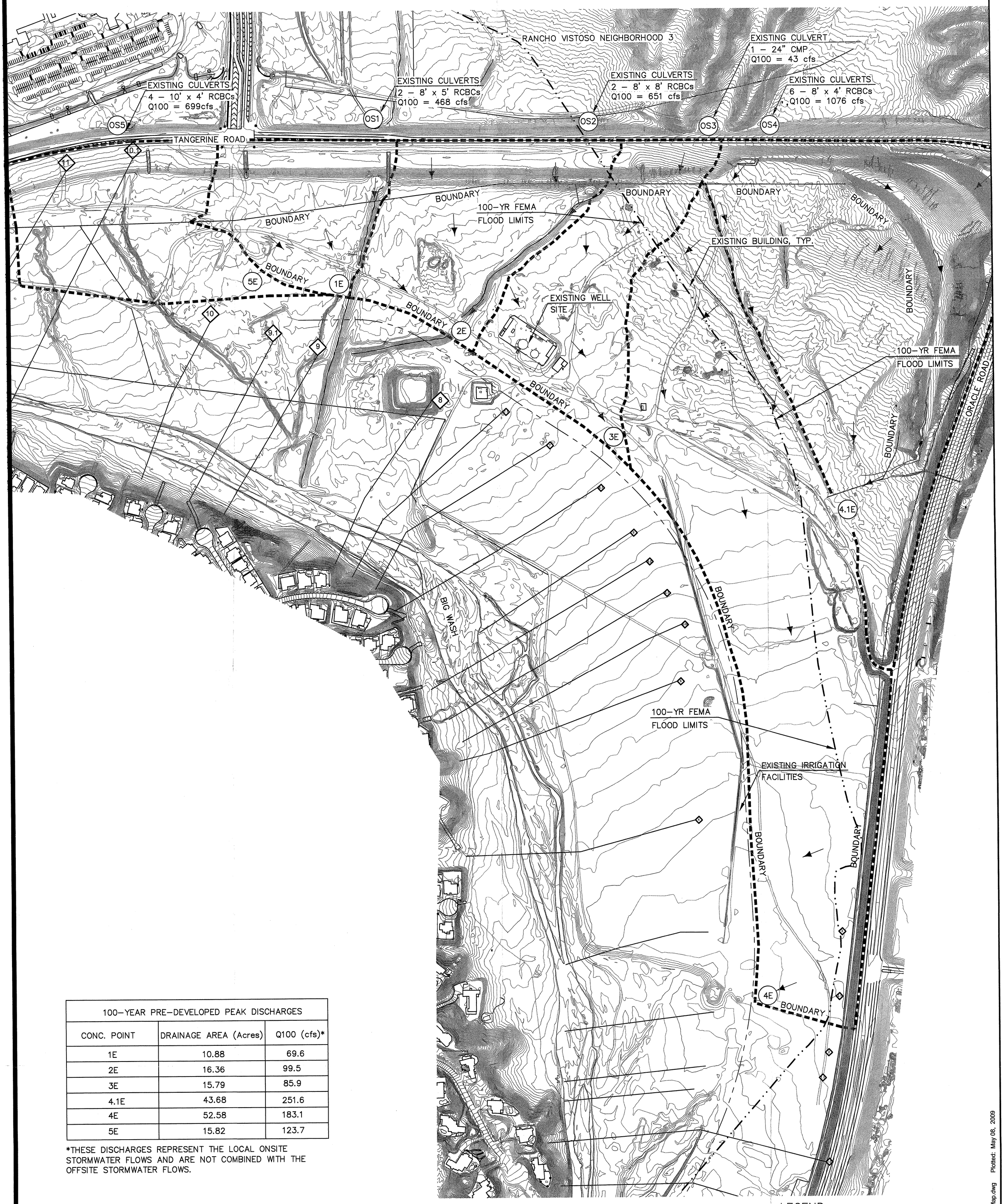
As mentioned before, In-N-Out Burger site is located within watershed CP13.0 of the Oro Valley Market Place. For the design of In-N-Out Burger, one additional watershed was defined as CP16.0 with an area of 0.13 acres. This watershed consists of the In-N-Out building and part of the drive-

The WLB Group Inc.

thru lane. The weighted runoff coefficient of 0.89 was used to model developed conditions. The area of watershed 13.0 was modified to 2.50 acres, resulting in a change of peak discharge from 22.8cfs to 24.1 cfs.

The estimated watershed areas, with corresponding 10-year and 100-year peak discharge rates for the proposed concentration points are shown in the table below. The hydrologic calculations are included in Appendix A.

TABLE OF POST DEVELOPED 10-YEAR AND 100-YEAR DISCHARGES			
CONC. POINT	DRAINAGE AREA (AC)	10-YEAR DISCHARGE (CFS)	100-YEAR DISCHARGE (CFS)
13.0	2.50	14.5	24.1
16.0	0.13	0.7	1.2



100–YEAR PRE–DEVELOPED PEAK DISCHARGES		
CONC. POINT	DRAINAGE AREA (Acres)	Q100 (cfs)*
1E	10.88	69.6
2E	16.36	99.5
3E	15.79	85.9
4.1E	43.68	251.6
4E	52.58	183.1
5E	15.82	123.7

*THESE DISCHARGES REPRESENT THE LOCAL ONSITE STORMWATER FLOWS AND ARE NOT COMBINED WITH THE OFFSITE STORMWATER FLOWS.

LEGEND

- WATERSHED BOUNDARY
- (1E) CONCENTRATION POINT
- FLOW DIRECTION
- 100–YEAR WSEL=2636.50' (2) HEC 2 CROSS SECTION
- ENCROACHMENT LINE

EXISTING CONDITIONS WATERSHED MAP
RANCHO VISTOSO NEIGHBORHOOD 4
FIGURE 2

The WLB Group INC. **WLB**
Offices located in Tucson, Phoenix and Las Vegas, NV
4444 East Broadway
Tucson, Arizona 85711 (520) 881–7480

1" = 200'

N:\185050\NEIGH4\Oro Valley Marketplace\Hydro\Existing Conditions Watershed Map.dwg Plotted: May 08, 2009

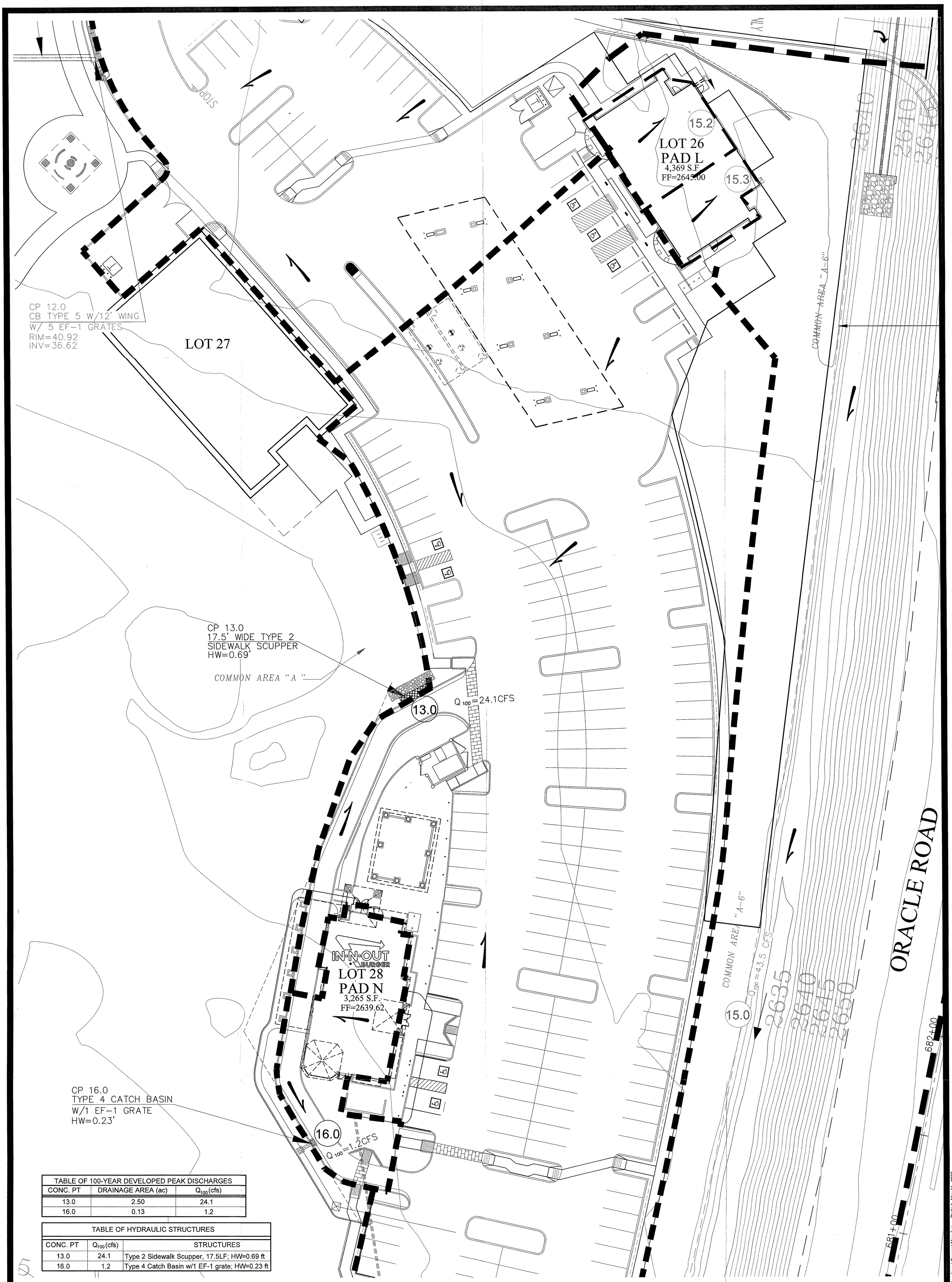


TABLE OF 100-YEAR DEVELOPED PEAK DISCHARGES		
CONC. PT	DRAINAGE AREA (ac)	Q_{100}(cfs)
13.0	2.50	24.1
16.0	0.13	1.2

TABLE OF HYDRAULIC STRUCTURES		
CONC. PT	Q_{100}(cfs)	STRUCTURES
13.0	24.1	Type 2 Sidewalk Scupper, 17.5LF; HW=0.69 ft
16.0	1.2	Type 4 Catch Basin w/1 EF-1 grate; HW=0.23 ft

0' 20' 40' 60'

LEGEND

- WATERSHED BOUNDARY
- (1.0) CONCENTRATION POINT
- FLOW DIRECTION
- SPLASH PAD

The WLB Group Inc.
WLB
Engineering Planning Surveying
Landscape Architecture Urban Design
Offices located in Tucson, Phoenix and
Flagstaff, Arizona & Las Vegas, Nevada.
4444 East Broadway
Tucson, Arizona (520) 881-7480

DEVELOPED CONCEPT MAP
IN-N-OUT BURGER
RANCHO VISTOSO-NEIGH.4
FIGURE 3

REVISED MAY 2009

The WLB Group Inc.

HYDRAULIC RESULTS

The following table is found in this section:

- Table of Proposed Hydraulic Structures

HYDRAULIC STRUCTURES

This section describes the new drainage structures proposed for this development. Structures consist of a catch basin and a scupper and they are described as follows:

Originally, a 12LF sidewalk scupper had been designed at CP13.0 to convey the flow to the Big Wash. For the design of In-N-Out, the site will be re-graded to move the concentration point approximately 150 ft north. A new sidewalk scupper has been designed at this location. The new sidewalk scupper will be a 17.5 LF type 2 scupper with a headwater of 0.69'. This scupper will convey a maximum flow of 24.1 cfs towards the Big Wash along the western boundary of the project site. To minimize ponding in the drive thru area, a local 3" depression will be provided in front of the scupper.

At CP16.0 a type 4 catch basin with one EF-1 grate inlet, with a headwater of 0.23', will convey a peak discharge of 1.2 cfs from within the watershed towards the Big Wash. Calculations are included in Appendix B. Figure 3 shows the proposed developed conditions of the site.

TABLE OF HYDRAULIC STRUCTURES		
CP	**Q_{100} (CFS)**	**STRUCTURE**
13.0	24.1	17.5 ft Wide Type 2 Scupper, HW=0.69 ft.
16.0	1.2	Type 4 Catch Basin w/1 EF-1 grate, HW=0.23 ft

The WLB Group Inc.

Erosion Control

Erosion control for the development of this site will be accomplished by the use of appropriate Best Management Practices (BMP's) and will be shown on the SWPPP plan for the site in conjunction with the SWPPP for Oro Valley Market Place. At locations where riprap will be used as erosion control, the riprap sizes have been determined utilizing the ASCE Bridge Scour Analysis Workshop. Bank protection for the Big Wash has been provided as part of the Oro Valley Market Place development.

First Flush

Triton TDAM first flush inserts can be used to treat the "First Flush" water generated from the pavement surfaces. At CP 13.0, seven cells of type 2-sidewalk scupper (total length of opening of 17.5LF), will be used. At each cell, one Triton TDAM30-PK insert can be installed. A type 2-sidewalk scupper will allow access to the Triton insert for maintenance. At CP 16.0, one Triton Series catch basin insert can be installed to provide first flush treatment. Alternatively, an equivalent first flush system may be used.

According to testing results, the Triton inserts removes 94.91% TSS for 149-420 micron particles. It also removes 89.03% of fats, oils, and grease. The XSORB material (i.e. filter media) that is entrained in the filters is licensed by the State of California as an oil spill cleanup agent, and is tested and approved as follows:

1.EPA Paint Filter Liquids test, Method #9095, which determines the leaching and non-leaching characteristics of an absorbent. The test results concluded that XSORB did not leach any of the absorbed liquids once encapsulated.

2. Abalone Larval Toxicity Test, XSORB has been tested and approved for use on the most sensitive waterways according the EPA's Abalone Larval Development Short-term Toxicity

Test for Oil Spill Cleanup Agents.

3. TCLP Test, XSORB has been tested and approved for disposal in hazardous landfills according to the EPA's Toxicity Characteristic Leaching Procedure, which determines leaching rates and toxicity levels as required by numerous federal and state agencies.

4. XSORB has been tested and approved for use on the Canadian waterways according to the Canadian General Standards Board's Dynamic Degradation and L-W test which is used to determine the buoyancy and hydrophobic properties along with total saturation levels when applied to marine environments.

According to Revel Environmental Manufacturing, Inc (REM) the Triton filter is designed to filter large amounts of runoff without impeding the drains designed hydraulic capacity. Documentation about the efficiency of Triton systems is included in Appendix D of this report.

As with any infrastructure, maintenance of the insert will be required. The frequency of maintenance services depends on the specific site conditions and can usually be determined by visual inspection. Typically, the inserts should be serviced two to three times a year to remove debris and the filter changed once a year. The Inspection interval for the In-N-Out project will be determined as based upon observations during the first year inspection period. Cartridge packs are to be replaced on a yearly basis or sooner if needed. Specs sheets and information regarding the maintenance and inspection requirement for the Triton TDAM first flush systems are included in Appendix D of this report.

The WLB Group Inc.

CONCLUSION

A drainage plan has been developed and presented within this report, which provides for the safe and efficient routing of storm water runoff throughout the development. All drainage facilities have been analyzed in accordance with current local engineering practices, are in compliance with the Town of Oro Valley and Pima County standards, and are not intended to produce any adverse effect to adjacent or down stream property owners. The Drainage Report in support of the mass grading of Oro Valley Market Place indicates and demonstrates that the property downstream of it, the Big Wash, will not be negatively affected by the development. In-N-Out Burger Development does not significantly change the flows exiting the site, therefore will not alter the previous findings and conclusions.

The WLB Group Inc.

REFERENCES

1. Drainage Criteria Manual of The Town of Oro Valley, Pima County, Arizona October 2002, Prepared by Kimley-Horn and Associates, Inc., 7600 N.15th Street, Suite 250, Phoenix, AZ 85020.

2. Drainage Report for the Mass Grading of a Portion of Neighborhood 4 in Ranch Vistoso (A.K.A. Oro Valley Market Place), The WLB Group, Inc. WLB No. 185050-VE01, September 8, 2006, Revised on April 25, 2007

3. Triton Stormwater Filtration Systems Documentation, Revel Environmental Manufacturing, Inc.

The WLB Group Inc.

LIMITATIONS

The above services consist of professional opinions and conclusions by a consulting civil engineer. The only warranty or guarantee made by the Consultant, in connection with the services performed for this project, is that such services are performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions, at the same time, and in the same or a similar locality. No other warranty, expressed or implied, is made or intended by rendering such consulting services or by furnishing written reports of the findings.

APPENDIX A

HYDROLOGIC DATA WORKSHEETS

THE WLB GROUP, INC
ELENA BADILLA, EIT, CFM

POST-DEVELOPED PEAK DISCHARGES

THE WLB GROUP, INC
ELENA BADILLA, EIT, CFM

POST-DEVELOPED PEAK DISCHARGES

THE WLB GROUP, INC
ELENA BADILLA, EIT, CFM

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

LOCATION: In-N-Out Burger

DRAINAGE CONCENTRATION POINT: CP 13.0

DESIGN DATA

DESIGN FREQUENCY			10 YEAR
DRAINAGE AREA [AC]		A1	2.20
		A2	0.30
		A3	0.00
TOTAL AREA		At	2.50 [AC]
DRAINAGE LENGTH [FT]			300 [FT]
ELEVATION			
TOP OF DRAINAGE AREA			44.00
AT STRUCTURE			39.00
DRAINAGE AREA SLOPE [%]			1.67 [%]
PRECIPITATION			
P= 6 HOUR			2.30 [IN]
P = 24 HOUR			3.10 [IN]

DESIGN COMPUTATIONS

PRECIPITATION P1 = 1 HOUR		1.90 [IN]
TIME OF CONCENTRATION		5 [min]
RAINFALL INTENSITY		6.65 [IN/HR]
RUNOFF COEFFICIENT		
	C1	0.94
	C2	0.37
	C3	0.00
WEIGHTED RUNOFF COEFFICIENT		0.872
PEAK DISCHARGE Qp = C i A		14.5 [CFS]

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

LOCATION: In-N-Out Burger

DRAINAGE CONCENTRATION POINT: CP 13.0

DESIGN DATA

DESIGN FREQUENCY		100 YEAR
DRAINAGE AREA [AC]	A1	2.20
	A2	0.300
	A3	0.000
TOTAL AREA	At	2.50 [AC]
DRAINAGE LENGTH [FT]		300.00 [FT]
ELEVATION		
TOP OF DRAINAGE AREA		44.00
AT STRUCTURE		39.00
DRAINAGE AREA SLOPE [%]		1.67 [%]
PRECIPITATION		
P= 6 HOUR		3.60 [IN]
P = 24 HOUR		4.80 [IN]

DESIGN COMPUTATIONS

PRECIPITATION P1 = 1 HOUR		3.00 [IN]
TIME OF CONCENTRATION		5 [min]
RAINFALL INTENSITY		10.50 [IN/HR]
RUNOFF COEFICIENT		
	C1	0.96
	C2	0.6
	C3	0
WEIGHTED RUNOFF COEFFICIENT		0.92
PEAK DISCHARGE Qp = C i A		24.1 [CFS]

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

LOCATION: In-N-Out Burger

DRAINAGE CONCENTRATION POINT: CP 16.0

DESIGN DATA

DESIGN FREQUENCY			10 YEAR
DRAINAGE AREA [AC]		A1	0.11
		A2	0.02
		A3	0.00
TOTAL AREA		At	0.13 [AC]
DRAINAGE LENGTH [FT]			152 [FT]
ELEVATION			
TOP OF DRAINAGE AREA			39.93
AT STRUCTURE			38.93
DRAINAGE AREA SLOPE [%]			0.66 [%]
PRECIPITATION			
P= 6 HOUR			2.30 [IN]
P = 24 HOUR			3.10 [IN]

DESIGN COMPUTATIONS

PRECIPITATION P1 = 1 HOUR		1.90 [IN]
TIME OF CONCENTRATION		5 [min]
RAINFALL INTENSITY		6.65 [IN/HR]
RUNOFF COEFFICIENT		
	C1	0.94
	C2	0.37
	C3	0.00
WEIGHTED RUNOFF COEFFICIENT		0.852
PEAK DISCHARGE Qp = C i A		0.7 [CFS]

HYDROLOGIC DESIGN DATA SHEET
RATIONAL METHOD

LOCATION DATA

LOCATION: In-N-Out Burger

DRAINAGE CONCENTRATION POINT: CP 16.0

DESIGN DATA

DESIGN FREQUENCY		100 YEAR
DRAINAGE AREA [AC]	A1	0.11
	A2	0.020
	A3	0.000
TOTAL AREA	At	0.13 [AC]
DRAINAGE LENGTH [FT]		152.00 [FT]
ELEVATION		
TOP OF DRAINAGE AREA		39.93
AT STRUCTURE		38.93
DRAINAGE AREA SLOPE [%]		0.66 [%]
PRECIPITATION		
P= 6 HOUR		3.60 [IN]
P = 24 HOUR		4.80 [IN]

DESIGN COMPUTATIONS

PRECIPITATION P1 = 1 HOUR		3.00 [IN]
TIME OF CONCENTRATION		5 [min]
RAINFALL INTENSITY		10.50 [IN/HR]
RUNOFF COEFICIENT		
	C1	0.96
	C2	0.6
	C3	0
WEIGHTED RUNOFF COEFFICIENT		0.90
PEAK DISCHARGE Qp = C i A		1.2 [CFS]

APPENDIX B

HYDRAULIC DATA WORKSHEETS

THE WLB GROUP, INC
ELENA BADILLA, EIT, CFM

SCUPPER

THE WLB GROUP, INC
ELENA BADILLA, EIT, CFM

PROJECT: In-N-Out Burger
WLB NO: 185050-GF01
DESCRIPTION: 13.0 Q_{100} = 24.1 cfs
DATE: 5/11/2009

Calculation sheet for a Type 2 Sidewalk Scupper as per COT/PC Standard Detail 205

SCUPPER INLET

DEPTH (FT)	LENGTH (FT)	OPENING (FT)	INCLINED TROAT ANGLE (ϕ)	DISCHARGE (CFS)				
				[1] WEIR EQ.	[2] ORIFICE EQ.	CONTROL	[3]DESIGN	
0.05	17.50	0.50	60.0	0.59	N/A	0.59	0.47	
0.10	17.50	0.50	60.0	1.66	N/A	1.66	1.33	
0.15	17.50	0.50	60.0	3.05	N/A	3.05	2.44	
0.20	17.50	0.50	60.0	4.70	N/A	4.70	3.76	
0.25	17.50	0.50	60.0	6.56	8.57	6.56	5.25	
0.30	17.50	0.50	60.0	8.63	13.53	8.63	6.90	
0.35	17.50	0.50	60.0	10.87	17.10	10.87	8.70	
0.40	17.50	0.50	60.0	13.28	20.05	13.28	10.63	
0.45	17.50	0.50	60.0	15.85	22.62	15.85	12.68	
0.50	17.50	0.50	60.0	18.56	24.92	18.56	14.85	
0.55	17.50	0.50	60.0	21.41	27.03	21.41	17.13	
0.60	17.50	0.50	60.0	24.40	28.99	24.40	19.52	
0.65	17.50	0.50	60.0	27.51	30.82	27.51	22.01	
0.69	**17.50**	**0.50**	**60.0**	**30.09**	**32.21**	**30.09**	**24.07**	**HW=0.69'**
0.70	17.50	0.50	60.0	30.75	32.55	30.75	24.60	
0.75	17.50	0.50	60.0	34.10	34.19	34.10	27.28	
0.80	17.50	0.50	60.0	37.57	35.76	35.76	28.61	
0.85	17.50	0.50	60.0	41.14	37.26	37.26	29.81	

1. Weir equation for curb inlet without depression: $Q=3LY^{3/2}$
2. Orifice equation for curb inlet, inclined throat, no depression: $Q=5.35A(Y-h/2\sin\phi)^{1/2}$
3. Design discharge equals Control discharge/1.25 to account for clogging

INLET RATING

THE WLB GROUP, INC
ELENA BADILLA, EIT, CFM

PROJECT: In-N-Out Burger
WLB NO: 185050-GF01
DESCRIPTION: CP 16.0 Q_{100}= 1.20
DATE: 5/11/2009

Type of Grate EF-1 Width, ft 1.97
Number of Grates 1 Length, ft 3.33
Area, ft^2 4.67 Wing, ft
Perimeter, ft 7.27 Y, ft 0.50

Required Perimeter,ft (Clogging) 2.26
Required Area,ft (Clogging) 0.63

GRATE INLET

DEPTH (FT)	* PERIM. (FT)	AREA (SQ.FT)	DISCHARGE (CFS)		CONTROL (CFS)	DESIGN (CFS)	
			[1] WEIR EQ. (CFS)	[2] ORIFICE EQ. (CFS)			
0.05	7.27	4.67	0.24	5.58	0.24	0.12	
0.10	7.27	4.67	0.69	7.90	0.69	0.34	
0.15	7.27	4.67	1.27	9.67	1.27	0.63	
0.20	7.27	4.67	1.95	11.17	1.95	0.98	
0.23	**7.27**	**4.67**	**2.41**	**11.97**	**2.41**	**1.20**	**HW=0.23'**
0.25	7.27	4.67	2.73	12.48	2.73	1.36	
0.30	7.27	4.67	3.58	13.67	3.58	1.79	
0.35	7.27	4.67	4.52	14.77	4.52	2.26	
0.40	7.27	4.67	5.52	15.79	5.52	2.76	
0.45	7.27	4.67	6.58	16.75	6.58	3.29	
0.50	7.27	4.67	7.71	17.65	7.71	3.86	
0.55	7.27	4.67	8.90	18.52	8.90	4.45	
0.60	7.27	4.67	10.14	19.34	10.14	5.07	
0.65	7.27	4.67	11.43	20.13	11.43	5.71	
0.70	7.27	4.67	12.77	20.89	12.77	6.39	
0.75	7.27	4.67	14.17	21.62	14.17	7.08	
0.80	7.27	4.67	15.61	22.33	15.61	7.80	
0.82	7.27	4.67	16.19	22.61	16.19	8.10	
0.85	7.27	4.67	17.09	23.02	17.09	8.55	
0.90	7.27	4.67	18.62	23.69	18.62	9.31	
0.95	7.27	4.67	20.19	24.33	20.19	10.10	
1.00	7.27	4.67	21.81	24.97	21.81	10.91	
1.05	7.27	4.67	23.47	25.58	23.47	11.73	
1.10	7.27	4.67	25.16	26.19	25.16	12.58	
1.15	7.27	4.67	26.90	26.77	26.77	13.39	

1. Weir equation for grate inlet: $Q=3.0P_gY^{3/2}$
2. Orifice equation for grate inlet: $Q=5.35AY^{1/2}$

* Required perimeter and area are multiplied by 2 to account for clogging.

APPENDIX C

DETENTION WAIVER AND

404 JURISDICTIONAL DETERMINATION

The WLB Group inc.

Engineering • Planning
Surveying • Urban Design
Landscape Architecture

September 28, 2005

Mr. Craig Civalier, P.E.
Town Engineer
Town of Oro Valley
Department of Public Works
11,000 N La Canada Drive
Oro Valley, AZ 85737

Subject: **Rancho Vistoso Neighborhood 4 (Oro Valley Market Place)**
Request for Storm Water Detention Waiver
OV12-04-30
WLB No. 185050-A-004

Dear Mr. Civalier:

The purpose of this letter is request a storm water detention waiver for the above referenced subdivision due to its immediate proximity to the Big Wash and because of the need to supply water to the Big Wash restoration part of this development. Additionally, the times of concentration for the on-site project flows are significantly less than that of the Big Wash and therefore will not increase the peak flow of the Big Wash. Calculations for the on-site times of concentration are included in the latest version of the project drainage report.

Please call me at 881-7480 if you have any questions.

Sincerely,

The WLB Group, INC.

Michael R. Smith, P.E.
Hydrology/Hydraulics Projects Manager

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
ARIZONA-NEVADA AREA OFFICE
3636 NORTH CENTRAL AVENUE, SUITE 760
PHOENIX, ARIZONA 85012-1936

REPLY TO
Office of the Chief
Regulatory Branch

May 7, 2001

Mr. Tracy A. Bogardus
The WLB Group, Inc.
4444 East Broadway Boulevard
Tucson, Arizona 85711-3508

File Number: 2000-01327-MJF

Dear Mr. Bogardus:

Reference is made to your letter of May 19, 2000 in which you inquired as to the jurisdictional limits of Section 404 of the Clean Water Act for the Big Wash in (Section 29, 30, 31, and 32, 5 and 6, T11S, T12S, R14E, R14E), Oro Valley, Pima County, Arizona.

The enclosed aerial photograph or map delineates the waters of the United States, including wetlands, regulated by Section 404 of the Clean Water Act. This approved jurisdictional determination will remain in effect for five years from the date of this letter unless an unusual flood event occurs. After this five-year period or after an unusual flood event alters stream conditions, the Corps of Engineers reserves the authority to retain the original jurisdictional limits or to establish new jurisdictional limits as conditions warrant.

Each water of the United States herein delineated is an interstate water or a water that is tributary to an interstate water. The Section 404 jurisdictional limit for a water of the United States is defined at 33 CFR Part 328. The jurisdictional limit for a non-tidal water of the United States is determined by the jurisdictional wetland boundary and/or the ordinary high water mark. The jurisdictional limit of a wetland is determined in accordance with the Corps of Engineers 1987 Wetlands Delineation Manual. Otherwise, presence of the indicators stated in the definition of ordinary high mark (33CFR 328.3(e)) are used to establish the jurisdictional limit of a water of the United States. The basis of this jurisdictional determination is shown on the enclosed checklist.

Any discharge of dredged or fill material within the designated jurisdictional area requires a Section 404 permit from the Corps of Engineers. The Corps of Engineers emphasizes avoidance of the delineated jurisdictional area. Please review this delineation and evaluate your proposed activity to ensure that avoidance of the jurisdictional area is given full consideration in your design. If all discharges of dredged or fill material occur outside the designated jurisdictional area, no Section 404 permit is required. If avoidance is not practicable, please reference File Number 2000-01327-MJF when submitting your Section 404 permit application to the Corps of Engineers. Please be advised that your application needs to substantiate that avoidance of designated jurisdictional areas is not practicable and substantiate that impacts to waters of the United States have been minimized.

Furthermore, you are hereby advised that the Corps of Engineers has established an Administrative Appeal Process for jurisdictional determinations which is fully described at 33 CFR Part 331. The Administrative Appeal Process for jurisdictional determinations is diagrammed on the enclosed Appendix C. If you decide not to accept this approved jurisdictional determination and wish to provide new information please send the information to this office. If you do not supply additional information you may appeal this approved jurisdictional determination by completing the attached "Notification of Administrative Appeal Options and Process and Request for Appeal" form and submitting it directly to the Appeal Review Officer at the address provided on the form.

The receipt of your letter is appreciated. If you have questions, please contact Michael J. Fink at (602) 640-5385 x 228.

Sincerely,

Cindy Lester

Cindy Lester
Chief, Arizona Section
Regulatory Branch

Enclosure(s)

Basis of Jurisdictional Determination

Date of field visit: December 21, 2000

Indicators observed during site visit:

__X__ Destruction of terrestrial vegetation
__X__ Changes in soil characteristics (e.g. sandy channel bottoms)
_____ Impression of water line on bank
__X__ Shelving or cut banks
_____ Presence of litter/debris
_____ Sediment deposits
_____ Water stains
_____ Exposed roots
_____ Presence of manmade drainage features/scour protection
_____ Other

Supporting documentation:

_____ Applicant's proposed jurisdictional determination
_____ Wetland delineation following 1987 Corps Wetland Delineation Manual
__X__ Aerial photography interpretation
_____ Ground photographs/videotape of site
__X__ Topographic map interpretation
_____ Review of historical records and/or aerial photography
_____ Comparison of previously accepted delineations of the area
__X__ USGS map(s)
_____ Flow data (drainage reports, modeled flows, USGS gage data, or other sources)
_____ Floodplain maps
_____ Soil Maps
_____ Environmental Assessment/ Environmental Impact Statement
_____ National Wetland Inventory Maps
_____ Staff knowledge of precipitation and fluvial dynamics of the region
_____ Biological resource reports
_____ Other

Applicant: Rancho Vistoso Partners	File Number: 2000-01327-MIF	Date: May 7, 2001
Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

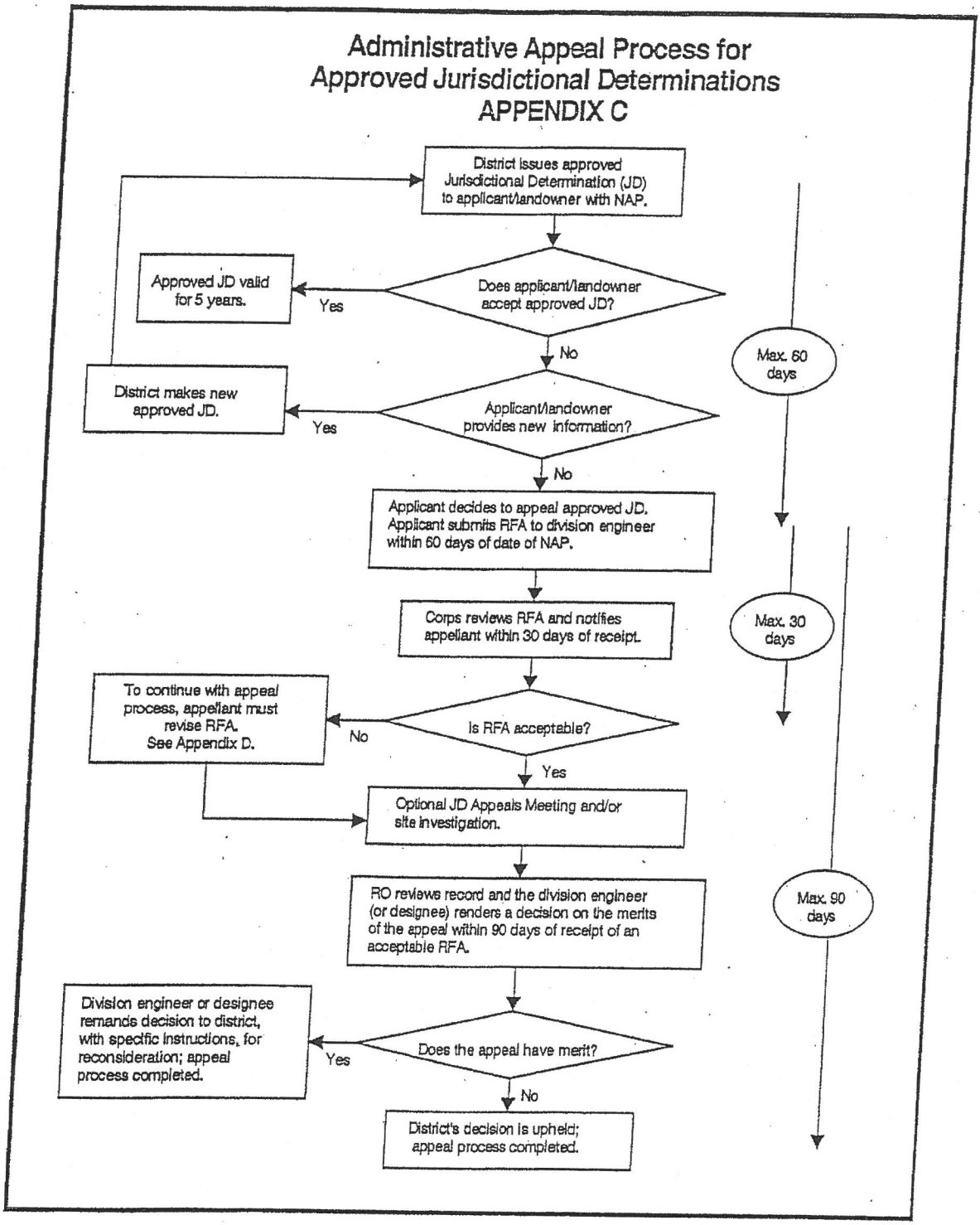
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
Cindy Lester, Chief, Arizona Section U.S. Army Corps of Engineers, CESPL-CO-RA 3636 North Central Avenue, Suite 760 Phoenix, AZ 85012-1936 Tel. (602) 640-5385x222 FAX (602) 640-2020	Douglas R. Pomeroy, Appeal Review Officer U.S. Army Corps of Engineers, CESPD-ET-CO 333 Market Street San Francisco, CA 94015-2195 Tel. (415) 977-8035 FAX (415) 977-8047

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

	Date:	Telephone number:
_____ Signature of appellant or agent.		

Administrative Appeal Process for Approved Jurisdictional Determinations
APPENDIX C



APPENDIX D

TRITON TDAM-PK'S INFORMATION

THE WLB GROUP, INC
ELENA BADILLA, EIT, CFM

From: "Marcel Sloane" <marcel@remfilters.com>
Sent: Fri, 08 May 2009 15:49:28 Pacific Daylight Time
To: "Josh Potter" <jpotter@wlbgroup.com>
Subject: FW: Triton Filters - Testing

Josh,

Charlie is on the road. He asked me to help you with the city?s concerns.

You are absolutely correct. The media for the TDAM is identical to the Triton Drop Inlet. You can expect identical removal results.

Best regards, -Marcel

Marcel Sloane

REM (Revel Environmental Manufacturing), Inc.

960 B Detroit Ave.

Concord, CA 94518

(925) 676-4736 x 103 office

(925) 858-8005 mobile

(925) 676-8676 fax

marcel@remfilters.com <mailto:marcel@remfilters.com>

www.remfilters.com <http://www.remfilters.com>

Revel Environmental Manufacturing Inc.
sales@remfilters.com (888) 526-4736 Lic. No. 857410

REM
www.remfilters.com

Northern California
960-B Detroit Avenue
Concord, California 94518
P: (925) 676-4736
F: (925) 676-8676

Southern California
2110 South Grand Avenue
Santa Ana, California 92705
P: (714) 557-2676
F: (714) 557-2679

TRITON Filtration Series™

Materials used on each the different section of our filters:

- Due to the environment that catch basins are often subjected to (wet and corrosive conditions) we have chosen to make our filters housings out of Non-reactive, High Density Polyethylene Plastic construction. This gives the unit a very long life due to the durable qualities found in H.D.P.E. (Same material used in outdoor playground equipment)

- UV inhibitors have also been added to our housing in order to protect our filters from UV rays.

- By using these materials we are able to create light-weight filters that can be easily removed for access below the frame and grate of the catch basins when necessary.

- The filter Media Cartridge is made out of Type 304 Stainless Steel, which has also been designed for corrosive environments. The top and bottom caps are made out of High Impact Polystyrene, with UV inhibitors added. These are made out of over 40% recycled content.

- The disposable Filter Media-Pak is constructed from durable geo-textile high density polyethylene fabric.

- The TRITON Filter™ uses an aggressive, yet environmentally safe absorbent material. Due to the filter mediums ability to repel water ("hydrophobic"), water is able to flow smoothly through the filter.

- The media used is non-hazardous, per EPA and OSHA standard. Our media is licensed as an oil cleanup agent by the California EPA's State Water Resources Control Board. It has also been tested and approved for: Paint Filter Test #9095, the Abalone Larval Toxicity Test, the Toxicity Characteristic Leaching Procedure (TCLP), the Dynamic Degradation & L-W Test for Canadian waterways License for oil spill cleanup agent for the State of California, Abalone Larval Toxicity Test – Passed, TCLP Test – Passed,

Benefits of the TRITON Series

- The overall design of the TRITON Series catch basin filter inserts was to make a filter that was modular in scope. Since not all sites are the same (residential, retail, commercial, industrial, etc.), so too should be the filter that is required in those different application. The TRITON Series is able to adjust for the different environments that it will be used in. Once the filter housing is in place, different media options can be placed in the cartridge housing to attain different degrees of filtering. Our standard Media-Pak has been designed to attain good flow rates while at the same time balanced with good pollutant removal. For area's that have high oil and grease concerns, such as dumpster area's and restaurants, we provide a MediaPak that carries three times the media capacity. For area's having sediment concerns, there are pre-screens that are installed that help filter out the sediment while the second level of filtering still captures the hydrocarbons.

- All flow is directed through our cartridge system, thus allowing consistent filtering. Our patented design incorporates the TRITON Vertical Filter Cartridge System. As the heavy debris accumulates on the bottom of the filter vessel, storm water is continually forced laterally through the media. The lateral flow reduces filter blinding and thus provides for much better filtration and encapsulation of hydrocarbons over time.

- The TRITON filtration system also incorporates a bypass system, which allows for natural overflow abilities in case of a large storm event.

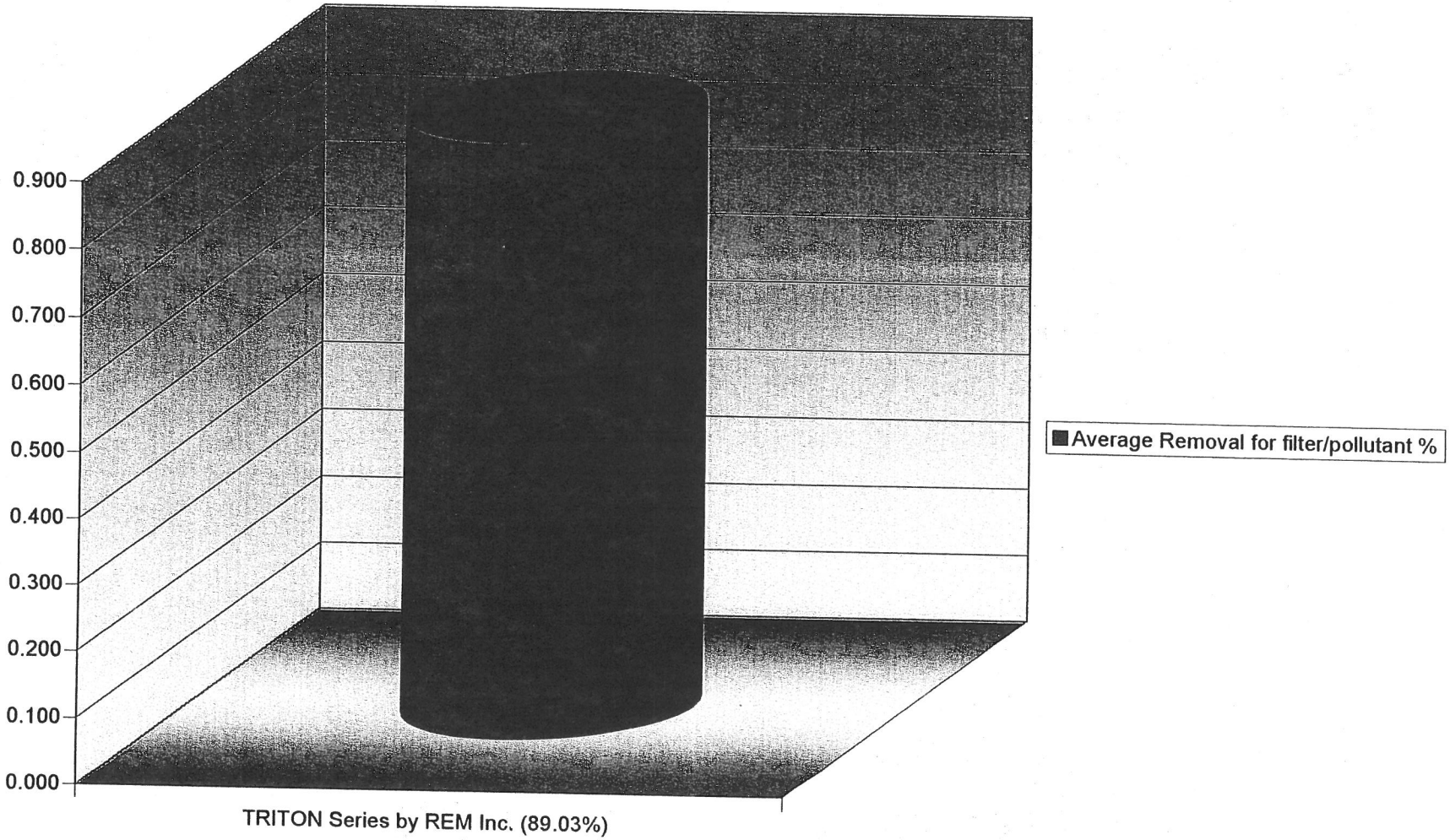
- The disposable MediaPak's can easily be removed from the cartridge housing allowing for quick and easy maintenance.

- The TRITON Filters can also come in Dual Capacity models. These Dual Capacity helps in areas with large debris concerns, such as loading docks and dumpster areas. These have also been used to help keep maintenance cost down, since the need for maintenance is needed less.

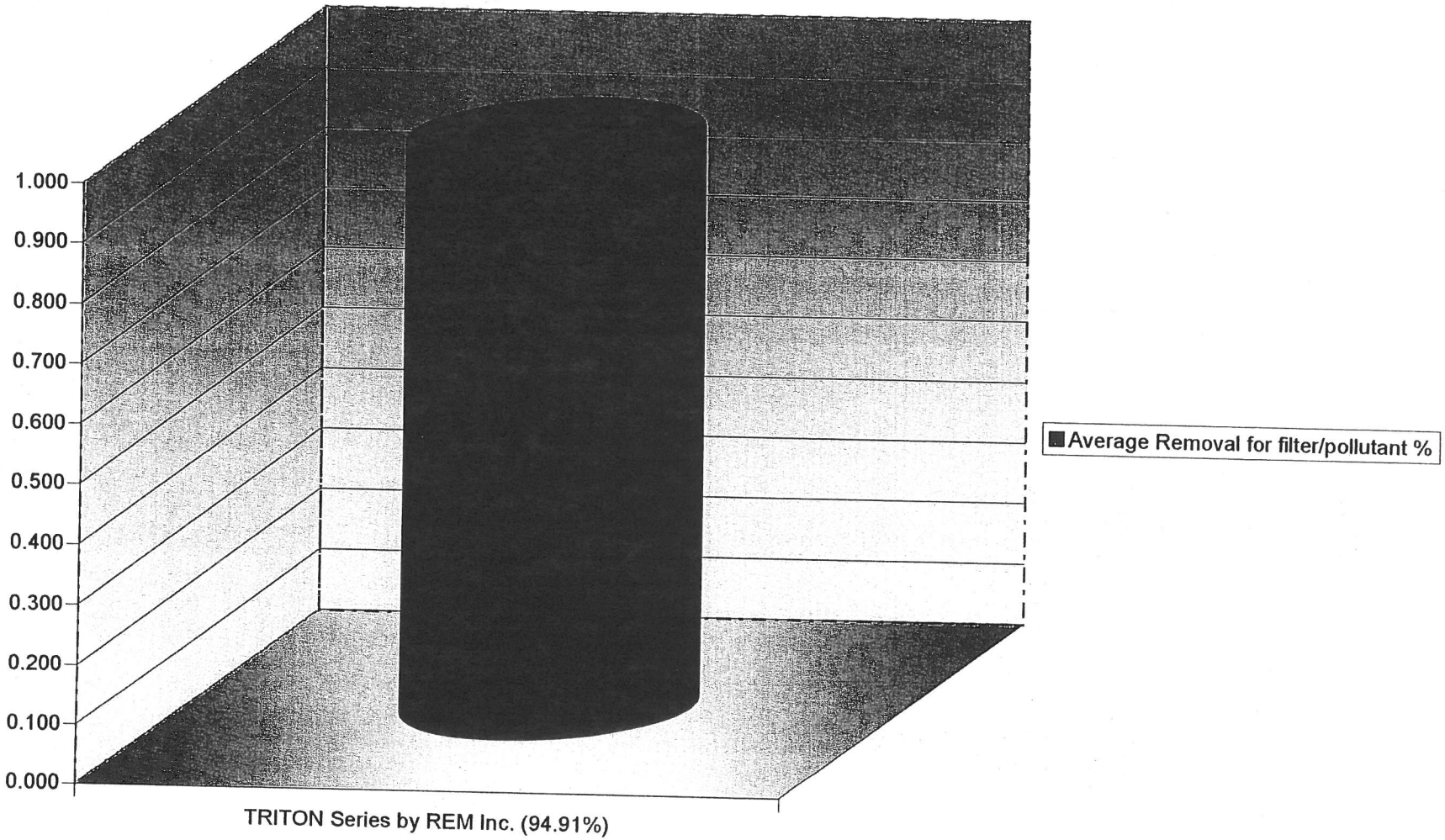
- Dual Stage filtering for polishing applications, such as capturing trash in one section, while hydrocarbon in the other.

- Since REM is unable to see all the different sites that our filters are installed in, we work closely with the owners on adjusting the filters to attain the appropriate filtering for each site.

FOG pollutants

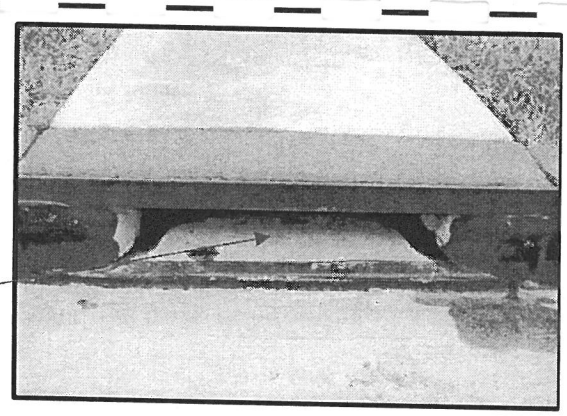


TSS pollutants

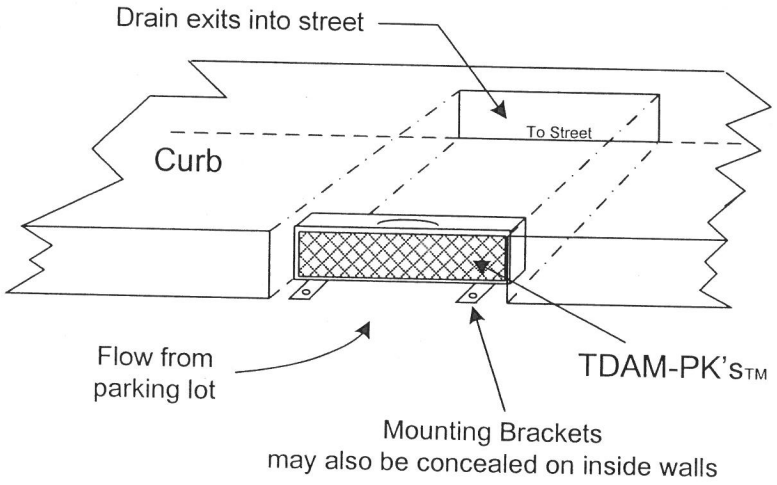


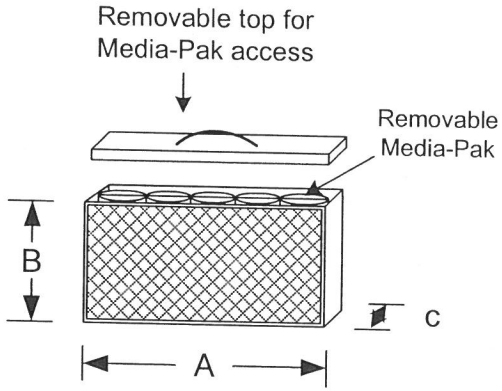
TRITON TDAM-PK'S™

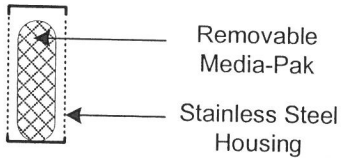
(Designed for Parkway Drains)
REM Inc. (888) 526-4736



Parkway Drains







END VIEW

STANDARD DIMENSIONS

(CUSTOM SIZES AVAILABLE UPON REQUEST)

MODEL NO.	A	B	C
TDAM12-PK	11.5"	3.5"	1.5"
TDAM18-PK	17.5"	3.5"	1.5"
TDAM24-PK	23.5"	3.5"	1.5"
TDAM30-PK	29.5"	3.5"	1.5"
TDAM36-PK	35"	3.5"	1.5"
TDAM42-PK	41"	3.5"	1.5"
TDAM48-PK	47"	3.5"	1.5"
TDAM54-PK	53"	3.5"	1.5"
TDAM60-PK	59"	3.5"	1.5"
TDAM66-PK	65"	3.5"	1.5"
TDAM72-PK	71"	3.5"	1.5"

NOTES:

TDAM-PK™ model numbers represent Parkway Drains width I.D. sizes. (Example: TDAM24-PK fits into a 24" wide Parkway Drain) The height of the units can be sized larger for higher drains openings if necessary. Most common height tends to be 4" tall, which will also allow for additional overflow within the drain.

Custom sizes can also be accommodated, please call our office and allow our staff to help you specify a specific requirement.

STANDARD FEATURES:

- Filter frame shall be made of Type 304 Stainless Steel, bottom and side plates to be 20ga., Type 304 Stainless Steel.
- Removable top shall be made of High Impact Polystyrene Plastic, with U.V. inhibitors. Made from over 40% recycled plastic.
- The exterior cage of the cartridges shall be made of 8 gauge stainless steel Type 304, having 2" square welded openings.
- Filter media cartridges are easily removed from units for easy maintenance.
- Filter design requires storm events to be filtered through Media Pak. This prevents flows from bypassing Media Pak, which filters out hydrocarbons and other pollutants.
- Disposable Cartridge Media Pak's are constructed from durable geo-textile polypropylene fabric.
- Media is non-hazardous, per EPA and OSHA standards.
- Please refer to manufacture's recommendations for an approved maintenance program.

Patent Pending

PH: (888) 526-4736

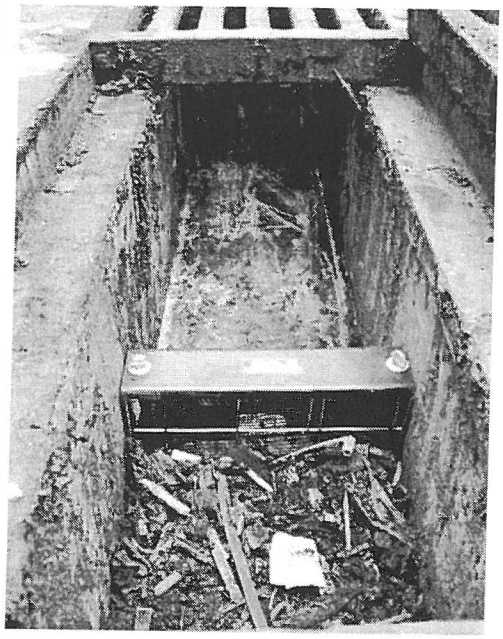
DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

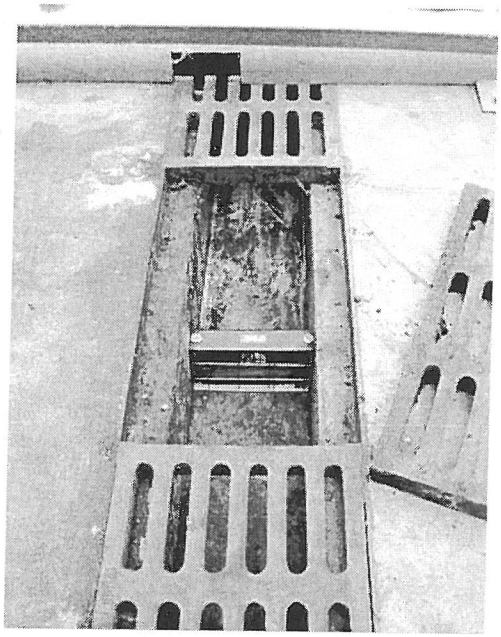
REM Inc.

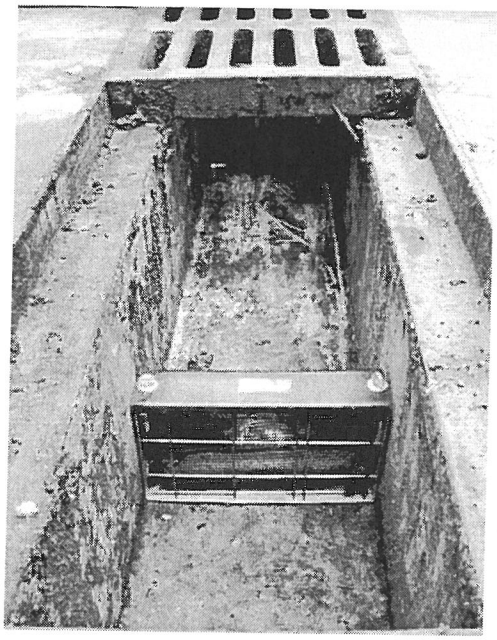
TRITON TDAM-PK's

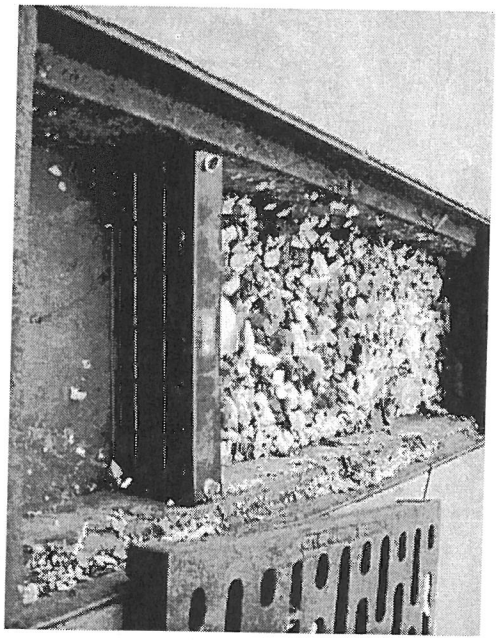
(Designed for Parkway Drains and other application)

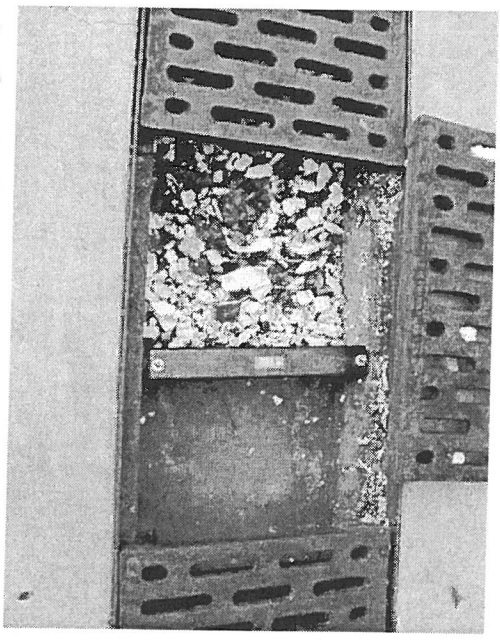
SIZE	DRAWN BY:	FOR:	REV
	C.F.	Parkway Drains	
SCALE	1/4 : 1	DATE: 5/12/2005	SHEET 1 OF 1

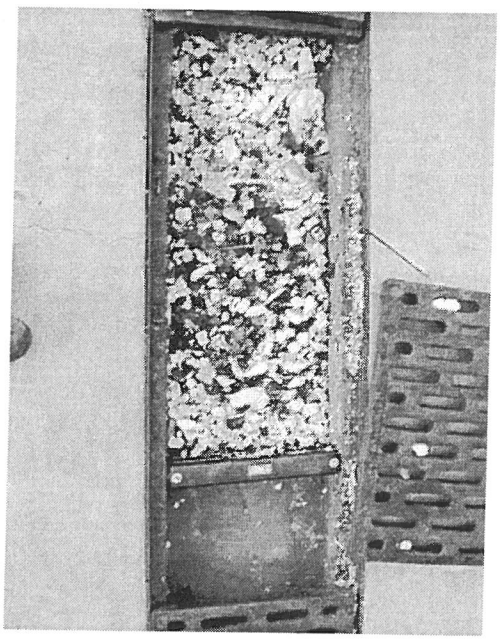


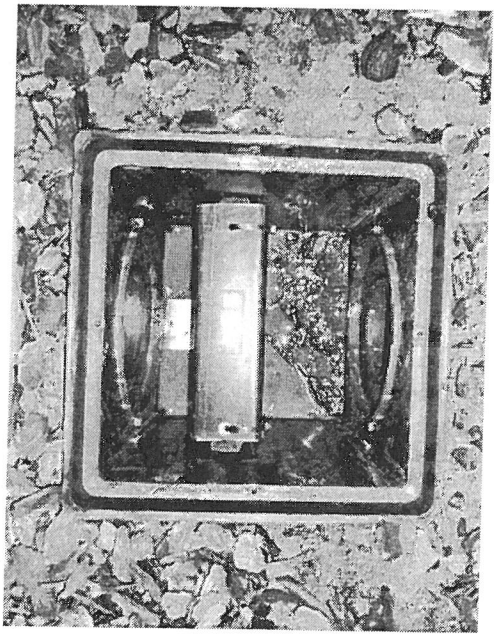












Revel Environmental Manufacturing Inc.
sales@remfilters.com (888) 526-4736 Lic. No. 857410

Northern California
960-B Detroit Avenue
Concord, California 94518
P: (925) 676-4736
F: (925) 676-8676

Southern California
2110 South Grand Avenue
Santa Ana, California 92705
P: (714) 557-2676
F: (714) 557-2679

REM
www.remfilters.com

TRITON Service Procedures:

Procedure listing for inspections and maintenance:

On site Procedures:

1) Secure area (Traffic and Pedestrian Control, cones etc.)
2) Clean surface area immediate around each catch basin.
3) Unlock grates, pull and set aside.
4) Clean grates, remove litter and debris that may be trapped within grate.
5) Inspect perimeter gasket system of filter, making sure no flows are bypassing filter, repair if needed.
6) Remove (VAC) debris that has been trapped in trough area. Dispose of in accordance with local, state, and federal regulatory agency requirements). Most debris that is captured will fall into non-hazardous waste and disposed of accordingly.
7) Visually inspect and check condition of trough area.
8) Inspect each filter's media condition. The removable MediaPak can be easily viewed to determine the media's condition. When the normally white colored media turns black, the media should be changed. When service requires the replacement of the filter media, a separate container will be used for the spent media. The media that is removed is then disposed of in accordance with local, state, and federal regulatory agency requirements).
9) Replace grate and lockdown.
10) Secure and date weatherproof lock-out tags.
11) Number filtration unit on site map for tracking and pin-pointing problem areas.
12) Report any concerns or improvements regarding specific filter system on report.
13) Un-secure area for traffic control.
14) Write up service report.

APPENDIX E

EXCERPTS FROM ORO VALLEY MARKETPLACE DRAINAGE REPORT FOR THE MASS GRADING

THE WLB GROUP, INC
ELENA BADILLA, EIT, CFM

The WLB Group Inc.

DRAINAGE REPORT
FOR THE MASS GRADING
OF A PORTION OF NEIGHBORHOOD 4
IN RANCHO VISTOSO
(A.K.A. ORO VALLEY MARKET PLACE)

OV12-04-30

September 8, 2006

Revised February 19, 2007

Revised April 25, 2007

PREPARED FOR:

VISTOSO PARTNERS LLC

1121 W. Warner Road

Tempe, Arizona 85284

PREPARED BY:

THE WLB GROUP, INC.

4444 East Broadway Boulevard

Tucson, Arizona 85711

PRINCIPAL INVESTIGATOR:

Erik Beam

Hydrologic/Hydraulic Designer

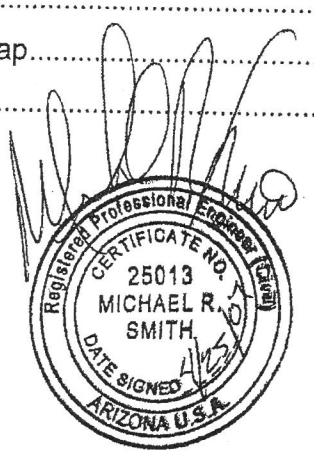
WLB No. 185050-VE01

W:\DRAIN-RPT\185050\Neighborhood 3&4\Neighborhood4\Mass Grading Report\MG Drainage Report-RevisedAPR07.doc

The WLB Group Inc.

TABLE OF CONTENTS

LIST OF EXHIBITS



The WLB Group Inc.

INTRODUCTION

This Drainage Report has been prepared in support of the proposed mass grading plan for Oro Valley Market Place located in Rancho Vistoso Neighborhood 4, part of an Industrial/Commercial development within Rancho Vistoso. This report discusses only the on-site drainage conditions in detail that are necessary for the mass grading of the project site. The specific details and calculations of those drainage features that are to be constructed as a part of the actual grading and paving improvement plans (such as scuppers, curb openings etc.) will be discussed in the drainage report that will accompany those plans.

The proposed development contains a gross area of approximately 101 acres. The site is located at the southwest corner of Tangerine Road and Oracle Road. This site is more specifically described as being a portion of Sections 31 and 32, Township 11 South, Range 14 East, and a portion of Section 5, Township 12 South, Range 14 East, Gila and Salt River Meridian, Town of Oro Valley, Arizona.

Offsite storm water runoff that enters the site is conveyed through 5 different existing RCBC's under Tangerine Road located at Station's 777+32, 788+39, 798+20, 803+95 and 805+60 of the Tangerine Road alignment. At Station 777+32 there is a 4-10'x4' existing RCBC that receives a peak discharge for the 100-year storm event of 699 cfs. At Station 788+39 there is a 2-8'x5'x214' existing RCBC that receives a peak discharge for the 100-year storm event of 468 cfs. At Station 798+20 there is a 2-8'x8'x282' existing RCBC that receives a peak discharge for the 100-year storm event of 651 cfs. At Station 805+60 there is an existing 6-8'x4'x174' RCBC that receives a peak discharge for the 100-year event of 1076 cfs. There is also 1-24" CMP located at Station 803+95 that receives a peak discharge for the 100-year storm event of 43 cfs. The Arizona Department of Transportation (ADOT) Tangerine Road Improvement Plan consultant Entranco supplied these flows. Onsite storm water drains from the northeast to the southwest predominately by sheet flow at a variable slope rate. These flows are ultimately intercepted by the Big Wash located along the western property boundary of the project site.

The WLB Group Inc.

Within Neighborhood 4, in the southwest quadrant of the intersection of Tangerine Road and Oracle Highway, several retail stores and other commercial buildings with appropriate parking are proposed. According to the latest FEMA criteria, parcels to be removed from "special flood hazard areas" through the installation of bank protection are required to have a minimum of one foot of fill for protection from the 100-year water surface elevation. The top-of-bank elevations used in this report are derived from the latest restoration plan for the Big Wash and the corresponding HEC-RAS analysis. Three feet was then added to the calculated water surface elevation to give the top-of-bank elevation necessary for the mass grading of the site.

The re-grading of the Big Wash will be done as a part of the restoration plan of the Big Wash and will be done as a separate plan set with the appropriate accompanying documents. Key elements of that plan were used in the design of the mass-grading plan when it was necessary to tie the two together. These elements are included on the mass-grading plans and in the analysis presented in this report.

The WLB Group Inc.

HYDROLOGIC RESULTS

The following tables are found in this section:

- Table of 10 and 100-Year Pre-Developed Peak Discharge Rates.
- Table of 10 and 100-Year Post-Developed Peak Discharge Rates.

See the Pre-Developed Watershed Map (Figure 3) and Drainage Concept Maps (Figure 4) for basin delineations and Concentration Points.

PRE-DEVELOPED CONDITIONS

The pre-developed conditions of this site were discussed in the "Revised Preliminary Drainage Report For a Portion of Neighborhood 4 in Rancho Vistoso (A.K.A. Oro Valley Market Place)", dated January 19, 2006 by the WLB Group and are only discussed here generally.

Offsite flows discharging onto the site are conveyed underneath Tangerine Road within several existing culverts as previously mentioned above. The offsite flows were obtained from the Tangerine Road Plans (see Reference 6).

Currently, the site exists as a combination of old farmland and natural desert landscape, with the exception of a well site and various small buildings. There are four main concentration points and one sub watershed. Concentration Point 4E is the largest of the four; it receives flows from the majority of the offsite watersheds plus the flows from the western portion of the Oracle Road right-of-way located within sub-watershed 4.1E. Concentration point 1E is located downstream of the existing RCBC at station 788+39 of the Tangerine Road alignment. Concentration point 2E is located downstream of the RCBC at Tangerine Road station 798+20. Concentration Point 3E is the second largest of the four and receives flows from a small portion of Tangerine Road near the existing well site.

LIMITATIONS

The above services consist of professional opinions and conclusions by a consulting civil engineer. The only warranty or guarantee made by the Consultant, in connection with the services performed for this project, is that such services are performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions, at the same time, and in the same or a similar locality. No other warranty, expressed or implied, is made or intended by rendering such consulting services or by furnishing written reports of the findings.