SUMMIT CIVIL GROUP

3/26/10 2nd

Preliminary Drainage Report
For:
Northwest Corner of Pima Rd. and Dynamite Blvd.
Plan Check Number 2701-09

Owner/Client:
Scottsdale and Dynamite LLC
6032 E. Paradise Drive
Scottsdale, AZ 85254
602-326-2600

DRAINAGE

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EXPIRES 3-31-11

5521-09

Comments on Case drainage report (Cycle #2)
NWC of Pima & Dynamite
(City of Scottsdale Plan #: 5521-09; Previous Plan #: 2701-09)

This Case Drainage Report is the same that was produced after the 1st review cycle of 2701-09. The comments made during the 2nd cycle of 2701-09 were not addressed or resubmitted. Therefore, those comments should be addressed this time at the 1st cycle.

Please address the comments that appear in red only:

1. The original lot was a residential Metes & Bounds and requires full onsite storage. Developing the lot as a commercial one does not waive the lot from full onsite storage. Therefore, "pre-post storage" is not allowed for this lot and full storage should be provided for this development. Onsite storage requirement should be based on actual disturbed area (any grading and landscaping in addition to impervious/paved areas). – OK. However, it should be noted that "full-storage" volume calculation should be based on the entire disturbed ground in the parcel and not just as "total area–NAOS area" since NAOS could be re-vegetated disturbed areas. This should be clarified in the drainage report. The 'C' value of 0.65 is too low for the volume calculation considering the development a commercial one. A 'C' value of 9.0 is more appropriate. The provided volume was still found more than the required volume when the higher 'C' value was used. Please revise the volume calc.

   Cycle#2: Please note that the rainfall depth of 2.82" (100-yr, 2-hr) is no longer valid under NOAA 14. Please look into the current version of DS&PM and make necessary changes in the storage volume calculations.

2. The culvert (with two 36" CMP) under Pima Road should be analyzed to see if it has the capacity to carry the entire flow of 260 cfs of Wash #5 or whether or not flow will overtop Pima Road and will divert to elsewhere in the lot to flood other areas. Sufficient topography (contours) along the entire width of Pima Road should be shown on the plans to justify any flow diversion. – OK.

   Cycle#2: The 100-yr rainfall depth has been changed under NOAA 14 and the City has revised its I-D-F curve. Please recalculate the 100-yr discharge for Wash #5 using revised parameters and the current version of DS&PM.

3. At higher elevations, split flow is likely to occur along Wash #5 downstream of Pima Road and portion of flow may divert to the Center Wash in between Wash #3 (103 cfs) and Wash #5, which according to COS LIS is a significant wash with flow capacity >50 cfs (not necessarily the real flow from the contributing watershed). At least two typical cross-sections should be cut along the Center Wash from the existing 1.0 ft. contours and their flow capacity should be determined. If the flow capacity is found to be >50 cfs, wash modification permit (from the COS Planning Dept.) is required to kill

the Center Wash and appropriate documentation should be included in the case drainage report (e.g. copy of wash modification application or the approved permit). All relevant calculations should be shown in the case drainage report. Please note that assumption of trapezoidal channel is not appropriate in the flow capacity calculations for natural channel. – Not addressed. The "Center Wash" (located in between Wash #3 and Wash #5) has been marked on the G&D plan in the drainage report. Please cut at least 2 or 3 cross-sections from the 1.0 ft. contours (as indicated by XS-1, XS-2, XS-3… on the plan) and calculate the bank-full flow capacity. If the flow capacity is >50 cfs, "Wash Modification Permit" is required to kill this wash. This must be clarified in the drainage report along with all supporting calculations.

Cycle#2: Addressed. However, please label/mark Wash #6 in Exhibit 5 of the Drainage Report and on the Grading & Drainage Plan.

4. The natural entrance of Wash #3 is actually near the upstream of the proposed 2 – 18" HDPE (proposed to capture Wash #4) as has been indicated (redlined) on the plan and not where it has been shown on the plan. In fact, Wash #3 and Wash #4 combine upstream of the proposed 2 – 18" HDPE. An appropriate culvert analysis should be performed to handle the combined flow underneath the proposed entrance road. Appropriate wing walls upstream of the culvert should be provided to capture the combined flows. All necessary corrections/ updates should be demonstrated both on the plans and in the case drainage report. Any alteration to the natural wash alignment will require wash modification permit and should be documented in the drainage report. – OK.

Cycle#2: The 100-yr rainfall depth has been changed under NOAA 14 and the City has revised its I-D-F curve. Please recalculate the 100-yr discharge for Wash #3 using revised parameters and the current version of DS&PM.

The G&D plan shows 3-36" proposed CMP for Wash #3. However, the Drainage Report shows CulvertMaster calculation for 3-30" CMP. Please also note that the computed headwater elevation is 74 ft. and long before this elevation is reached, the floodwater will travel from east to west by overtopping the 72 ft. contour and will end up somewhere else. Therefore the capacity of this culvert is not sufficient. The tailwater elevation used in the CulvertMaster calculation should be based on the 100-yr water surface elevation in the wash immediate d/s of the proposed pipe culvert based on real irregular cross-section (not trapezoidal channel section). Please refer to the marked G&D plan for reference.

5. The proposed realignment of Wash #5 through the lot needs wash modification permit and should be documented in the case drainage report. At least two or three typical cross-sections should be cut for Wash #5 from the existing 1.0 ft. contours for the natural portion of the wash (in between Pima Road and the proposed entrance road) and the 100-yr WSE should be

calculated. Any Drainage Easement (DE) dedication should be based on the WSE calculations and subsequent 100-yr floodplain delineation. Flow calculation for a representative cross-section for the proposed channel will suffice. However, proposed contours for the proposed channel should be shown on the plan and need to be tied back to the existing contours to demonstrate no adverse impact on the wash bottom. If there is an increase in velocity in the proposed channel from the existing condition wash, velocity attenuation should be achieved within the proposed channel so that no erosion of wash bottom occurs passed the proposed channel. Please document. – Plan revised. Wash #3 and Wash #5 combine to form a larger wash that goes through the proposed 3 – 4'X8' box culvert. Wash #5 goes through another 2 – 4'X8' box culvert located halfway along its length within the parcel. A HEC-RAS model is required to correctly simulate the backwater effect of the downstream culvert and the momentum across the wash confluence (confluence of Wash #3 and Wash #5) and to delineate the 100-yr floodplain correctly. Please setup a HEC-RAS model that appropriately covers the wash system within the parcel (Wash #3, Wash #5, the confluence, and the downstream combined wash). Please consider 330 cfs for Wash #5, 103 cfs for Wash #3 and 363 cfs for the confluence in the HEC-RAS model as has been described in the drainage report. Please include the HEC-RAS summary results in the drainage report. Generate a "HEC-RAS report" and include it in the drainage report. Include a CD in the drainage report containing the HEC-RAS digital files and a PDF version of the entire drainage report.

Cycle#2: Please note that FlowMaster calculations using trapezoidal channel for Wash #3 and Wash #5 are not acceptable. Real irregular cross-sections should be cut from the contours and should be used in FlowMaster.

For Wash #5, please cut two cross-sections immediate u/s and d/s of the proposed box culvert and perform FlowMaster calculations. For the Combined Wash (confluence of Wash #3 and Wash #5, please give it a name), please do the same. For Wash #3, a cross-section along Section C-C is fine. Please show these FlowMaster cross-section locations on the G&D plan.

For CulvertMaster calculations for the box culverts along Wash #5 and the Combined Wash, please use tailwater elevations calculated earlier using FlowMaster.

Although bottom 2' of the box culverts have been proposed to be buried in ground for both the box culverts (for Wash #5 and the Combined Wash), the entire box opening (6'X8') have been used in the culvert analysis. Please recalculate. Please show the culvert finished level elevations (along with the inverts) for the box culvert along Wash #5. It has been shown for the Combined Wash.

Apparently, backwater resulted in both the box culverts and the culvert capacity seems inadequate. Unless culvert capacities are increased for both locations not to cause any backwater, a HEC-RAS model must be set up and run for any backwater simulation.

Conclusion on the use of any d/s riprap depends on the correct simulation of the box culverts at these two locations.

Wherever, proposed D.E. has been mentioned/labeled in the Drainage Report or on the G&D plan, please label/mark it as "Tentative Proposed D.E." since the delineation has not been done at this stage of the study.

6. Justification of the selection of the riprap size upstream and downstream of the proposed culverts along Wash #3 and Wash #5 should be based on hydraulic calculations. The extent of the riprap protection (riprap length) should also be calculated based on hydraulic analysis and should be shown on the plans (with appropriate label). All relevant calculations should be documented in the case drainage report. – Please note that at a minimum, the extent of the riprap protection should be calculated for the downstream 3 – 4'X8' box culvert since the extent of the riprap protection is not allowed to go beyond the parcel limit. Riprap protection should be calculated based on the exit velocity of the culvert and the flow velocity and WSE for the wash should be resumed to its pre-development condition before the wash exits the parcel.

7. The locations of all cross-sections (for Wash #3, Wash #5 and the Center Wash) and delineation of the 100-yr floodplains (for Wash #3 and Wash #5) should be shown on the plans. The limit of DE should be based on the limit of the 100-yr floodplains and both should be labeled on the plans appropriately. The limits of DE should also encompass the wing walls for all the culverts involved. – Please show all cross-section locations (HEC-RAS cross-section locations for Wash #3 and Wash #5 and FlowMaster cross-section locations for the "Center Wash") on the G&D plan. Please show the respective 100-yr water surface elevations (WSE) for all HEC-RAS cross-sections on the plan.

8. For Detention Basin #4 near the southwest corner of the lot, the natural terrain keeps sloping towards the south and does not seem to form a natural detention basin. Please see if proposed contours are needed to tie back to the existing contours to form a detention basin. – OK.

9. Please calculate the 100-yr flow coming to each grate inlet and perform spread calculation for each inlet to determine the depth of flow over each inlet located in the parking lots. Perform hydraulic grade line calculation for the end drain pipe (or the only drain pipe where appropriate) to show that they have adequate capacity to handle the onsite runoff. Please show all calculations in the case drainage report. – Not addressed. Please generate another plan sheet showing contributing drainage areas to each detention basin

and to each inlet in the parking lots. The inlets must have enough capacity to handle runoff without causing flooding in the parking lots. Hydraulic grade lines should be calculated for the pipes to ensure that the pipes connectivity makes sense. Apparently, Basin #2 is draining into Basin #3 through an inlet and two interconnected pipes. Hydrograph routing and/or stage-discharge and drain time calculation should be performed for the interconnected Basin #2 and Basin #3 to ensure that Basin #2 drains fast enough into Basin #3 without overtopping. The storage volume calculation for Basin #1 should be separated from the total volume calculation to ensure that it has enough capacity to provide full-storage for the contributing drainage area draining into this basin.

10. Please label all washes (e.g. Wash #3, Wash #5, etc.) on the G&D plan along with their respective input discharge values (Q_{100}).

Please briefly respond to each of the above notes (or check them with markers) and include the responses in the re-submittals.

Stormwater Review By:
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Review Cycle #2 Date 4/9/10

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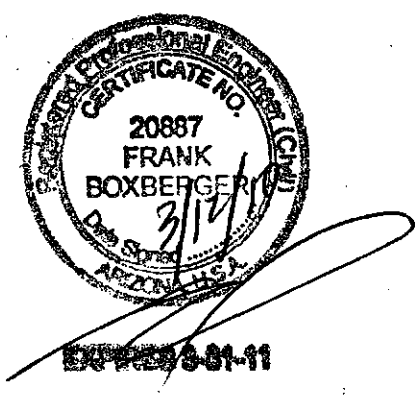

EXPIRES 6-30-11

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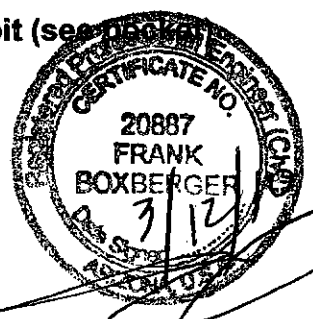

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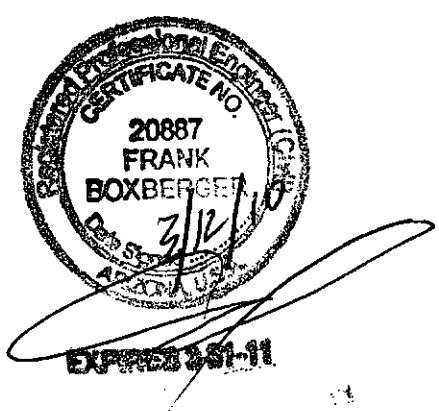


1. INTRODUCTION:

This drainage report document has been provided for the purpose of aiding in the design of the grading and drainage plan for a proposed commercial use. Great care was taken in the site design to ensure that the two main existing washes would remain in their natural state. This includes dedicating a drainage easement over a portion of this parcel. Drainage easements will encompass the washes, channels and drainage structures as later discussed in this report. The site is located directly north of Dynamite Blvd. and west of Pima Rd. (see Exhibit 1). The undeveloped eight plus or minus acre site is currently zoned R1-190 ESL located in the Upper Desert Landform. The purpose of this report is to provide the engineering analysis of onsite and offsite drainage and to determine the 6 hour 100 year peak discharge of offsite water sheds. This report contains the hydrologic and hydraulic methods utilized and ensures their compliance with the C.O.S. ordinances.

2. SITE CONDITIONS

This site is described as ESL located in the Upper Desert with Sonoran native desert vegetation trees and cactus (see Vegetation Map Pocket Folder) having rolling terrain (see Topo Map Pocket Folder). Although most of the site is decomposed granite, on the surface there are deposits of hardened soil and some rock outcroppings and exposed bedrock (See Boulder/Bedrock/Photo Exhibit Pocket Folder). This Site is in Section 36, T5N and R4E of the Gila and Salt River Meridian, Maricopa County, Arizona in the City of Scottsdale (directly north of Dynamite Blvd. and Directly west of Pima Rd.), also being located in the COS quarter section map #51-48. The site is located in a FEMA Zone X per Panel 1235G dated 9/30/05.

3. OFFSITE WATERSHED CONDITIONS

The offsite watershed area is described as ESL located in the Upper Desert with Sonoran native desert vegetation trees and cactus. The Off Site Watershed to the east and north of the property is also located in the City of Scottsdale in Section 31, T5N, R5E of the Gila and Salt River Meridian, Maricopa County, Arizona; located just east of Pima and north of Dynamite Boulevard in COS Quarter Sections maps 51-49, 51-50, 52-49 and 52-50. This offsite water shed area can be described as relatively well defined with washes having concentrated flows and not subject to sheet flow conditions. This property is currently owned by the Arizona State Land Trust and is zoned for Residential ESL Lots of a minimum size of 190,000 sf each (R1-190 ESL located in the Upper Desert).

4. DESCRIPTION OF EXISTING DRAINAGE CONDITIONS AND CHARACTERISTICS:

Onsite drainage of the eight plus or minus acre site consists of concentrated flow from the northeast to the west, defined within onsite sub basins at an average of 3-6% slope. For reference please see Watershed Exhibit Map Pocket Folder. There are two major defined washes, Wash #3, exits the site at the west property line. Wash #5 exits the property to the west property line also and converges with Wash #3 prior to exiting the site. Both of these washes flow to historical outfall path. This existing drainage network pattern is created by only two major offsite watersheds. The calculations for these two washes are based on drainage areas of existing development conditions per the watershed map. Both of these large watersheds are disrupted by Pima Road. There are existing culverts under Pima Road at these two locations but the existing culverts do not convey the entire 100 year 6 hour event. Therefore, a detailed study of how much of this flow overtops Pima Road along with where this storm water travels to will be further studied within this report at the final review phase. It has been determined that a HEC-RAS study is not required at this time, however, one will be performed and submitted prior to the final approval of the Grading and Drainage plan.

The existing crossing along Pima Road for Wash #3 consists of one 30" CMP that carries only 33 cfs under Pima Road (see Appendix I). Therefore there is 70 cfs which will overtop Pima at this location. The grading design accommodates this 70 cfs overtopping flow for both wash #3 (as if all of it crosses the road directly and ends up back in Wash #3; along with assuming that 100% of the 70 cfs overtops Pima Road and then travels downstream to Wash #5. This is of course, in both cases, a very conservative approach to the design and considered the "worst case scenario." All Driveway crossings on the Grading Plan have been designed to accommodate this "worst case scenario" (see Appendix I).

Wash #3 has a peak 100 year 6 hour discharge of 103 cfs and Wash #5 has a peak discharge of 260 cfs in today's current conditions (the driveway crossings however are designed to accommodate the 260 cfs along with the additional 70 cfs potential overtopping as earlier mentioned from the Pima Road Wash #3 crossing. With reference to existing and proposed adjacent upstream and downstream properties the 100 year flow of Wash #3 is contained within the existing banks of wash 3 (see the grading and drainage plan exhibit). The flow in Wash #5 is also contained within the existing banks of Wash #5 (for the high water elevations and the depth of flows, see the grading and drainage plan and Appendix C: flow master v6.0). The conditions of the existing conveyance of the watershed contributing to Wash #3 with a 100 year flow is referenced with the overview layout, and the photos 1-14 (see Boulder/Bedrock/Photo Exhibit Pocket

Folder).

5. PROPOSED PRELIMINARY GRADING AND DRAINAGE PLAN:

Both Washes #3 and #5 which have greater than 50cfs will have drainage easements dedicated throughout the project. The 100 year 6 hour High Water Surface Elevation Limits (HWSE) are shown on the Grading Plan. These Drainage easements will encompass all designed drainage structures (culverts, box culverts driveway crossings) and the 100 year 6 hour event High Water Surface Elevation (HWSE). The general description of the proposed drainage system is that it will remain in its historical outflow path, including the conveyance of both onsite and offsite flows. The watershed areas used in the calculation of the flows are based on existing developed areas. The present undeveloped site is on R1-190 ESL Upper Desert zoning. The basis of these flow calculations are based on existing developed conditions.

This project will not be phased, but constructed as one entire project. All drainage structures will be constructed per the Grading Plan as one continuous system. The drainage system is designed to completely contain the 100 year 6 hour peak runoff and carry the flow through the site. The flows will be accepted and released as per the historical patterns and velocities. The peak runoff will be transported through the site via natural washes, man-made channels, culverts and bridges. All peak runoff flows over 50 cfs will have drainage easements dedicated at the time of the final Grading Plan approval which will encompass the drainage structures and the 100 year HSWE/flood limits.

Great care and coordination between client, architect and engineer has been taken to design this project ensuring that natural wash #3 and #5 will be maintained in their natural condition. The box culverts at the driveway crossings have been oversized and buried 2' below natural grade to ensure the wash bottoms are not affected and the water surface elevations remain unchanged.

The 100 year High Water Surface Elevations (HWSE) through the washes and proposed channels has been calculated using Flowmaster. This elevation plus a minimum of 1' of freeboard have been added to set the minimum elevation of each proposed finished floor of each structure.

A Wash Modification will be submitted at the final review for permitting stage to address Wash #6.. Although wash #6 (see Exhibit 5) has the capacity to hold in excess of 50 cfs, the offsite watershed feeding wash #6 is only 0.23 acres, yielding a 100 year peak flow of only 2 cfs. The flow resulting from this off site watershed will be conveyed to detention basin #3 once it enters the site via the driveway in the northeast corner of the site. As a result, the downstream channel will be withdrawn.

6. SPECIAL CONDITIONS 404 DOCUMENTATION:

The Preliminary Grading Plan shows washes that are classified as a 404. See Pocket Folder for 404 Exhibit. The development of this project will not disturb over the allowable 10th (one tenth) of an Acre (4,356 s.f.). This project will be processed for a Nation Wide Permit under Section 14 through the Army Corp of Engineers.

7. DATA ANALYSIS METHOD:

The Hydrologic and Hydraulic procedures, parameter selections and assumptions for data analyses methods are as follows. These Hydrologic and Hydraulic procedures were used to compile data for six offsite watersheds which discharge storm water onto the site via open channels (see Preliminary Grading and Drainage Plan). The parameter selection and assumptions included in the peak flow calculations were obtained using the Rational Method for existing development conditions from the Maricopa County Drainage Design Management System, for the 100 year 6 hour peak event (see Appendix A). The watersheds convey to a point where the water remains in historic outfall flow path. Wash #3 will remain within the proposed banks with a peak flow of 103 cfs. Wash #5 will remain in the proposed banks with a 100 year peak flow of 260 cfs. See Appendix C, Flow Master V6.0 for velocity of flows and depths of washes.

Wash #5 will remain in its natural historic location and condition with the exception of two driveway crossing which will incorporate box culverts with the inverts buried 2' as to allow the wash to flow in its natural state and condition. The culvert at the first crossing is designed to easily accommodate the 330 cfs which may occur as earlier stated. The second culvert is designed to allow the peak discharge of 363 cfs to pass through (See Appendix I).

Culverts required at the private driveway crossing were calculated using the Haested Method Culvert Master (See Appendix I).

Wash #3, 103 cfs (first driveway crossing): 5-30" CMPs (see Appendix I).

Wash #5 (first driveway crossing), 260 cfs plus 70 cfs(overtopping) = 330 cfs: 2 - 5' x 8' Box Culverts (calculations shown in Appendix I only account for a 2' depth (this method is very conservative).

Wash #3 and #5 convened (2nd driveway crossing), 103 cfs plus 260 cfs = 363 cfs: 4 - 5' x 8' Box Culverts (calculations shown in Appendix I only account for a 2' depth (this method is very conservative).

8. DETENTION REQUIREMENTS

There are 100 year detention requirements on this site. This site is designed to detain the full 100 year, 6 hour storm water event. The slope analysis for the Upper Desert Landform revealed an NAOS requirement of 35.5 % (123,595 sf). The NAOS requirement consists of 107,373 sf of undisturbed area along with 16,222 sf of disturbed area. There will be no detention required for the undisturbed NAOS area. An Appendix has been created (see Appendix L in pocket) showing the runoff areas for each detention basin along with the "required" and "provided" volumes. The formula used for this is per the COS standard formula as follows: Vr = (p/12)AC where Vr is Volume, P is 2.82 "(100 year 2 hour); A is Area; C is the weighted Runoff coefficient of 0.86. The weighted "C" value was based on 0.95 for impervious areas and 0.45 for landscaped areas. Detention Basins will outlet into the existing washes by the use a metered bleed off pipe. The basins will completely be drained by these bleed off pipes within the minimum required 36 hour period. The metered bleed off to these washes will not adversely add to the downstream peak discharge flow rate. Although there is some Detention in the Parking lots of depths of 6" or less, they will be ignored for the purposes of the calculations in this report. All Detention Basins will be in landscaped areas and not in the Parking or Driveway areas themselves.

9. WARNING AND DISCLAIMER OF LIABILITY (SEE APPENDIX K, 4-C): See Letter

10. LEED CERTIFICATION AND COMPLIANCE: This site is to meet LEED requirements and to obtain LEED Certification. There requirements include: Restoration of 50% of the Native Planting and Vegetation, Minimum 25% Open Space, Storm Water Management Reducing runoff by 25% Minimum Pervious Pavement.

11. NPDES COMPLIANCE: This Project will comply with the NPES (National Pollutant Discharge Elimination System) requirements. Permanent and temporary basins will be constructed at the commencement of this project as to insure that no downstream pollutants are released during the course of construction.

11. CONCLUSIONS:

1. All offsite runoff will enter and exit the site in the same manner and location as in predevelopment, thereby preserving the natural historic out flow locations.

2. The existing washes have more than adequate capacity to contain the offsite flows of the 100 year event, (see Appendix C: Flow Master v6.0)

3. Construction of all onsite drainage improvements will be the responsibility of the developer and will occur along with the infrastructure. These Structures will contain and transport the 100 year peak flows.

4. The finished floors have been set in accordance with FEMA Base Flood Elevation, Panel 1235G, floodplain and floodway ordinance Revised 37-42 This site is Located in the X Zone per firm map 1235G dated 9/30/05.

5. A watershed map was used to calculate the 100 year peak flow velocity for wash 1,2,3,4, and 5. The rational Method was used to verify these flows.

12. REFERENCES

Design Standards and Policies Manual (August 2008)

The City of Scottsdale Website for Exhibits

Hydraulics - Calculations (Flow Master V6.0), (Haested Culvert Master)

Hydrology – Rational Method Calculations (Drainage Design Management System, DDMS3)

Appendix J: Detention Calculations

The formula used for this is per the COS standard formula as follows: Vr = (p/12)AC where Vr is Volume, P is 2.82 "(100 year 2 hour), A is Area, C is the Runoff coefficient.

There are 100 year detention requirements on this site. This Site is designed to detain the full post development runoff. Appendix L shows the calculations of the post development runoff areas for each of the 3 detention basins. There will be no detention required for the undisturbed NAOS area.

Vr = (p/12)AC
where Vr is Volume,
P is 2.82" (100 year 2 hour),
A is Area,
C is the Runoff coefficient, (weighted C value = 0.86 for developed area)

Weighted C: 82% impervious area, C value of 0.95;
18% landscape area, C value of 0.45
(.95 x .82) + (.45 x .18) = 0.86

Post Development Runoff Volume = (2.82/12)(218,439 sf)(0.86) = <u>44,147cf</u>

Total Volume Provided per the Grading Plan:
Detention Basin #1: 26,811 cf
Detention Basin #2: 3,486 cf
Detention Basin #3: 41,207 cf
Parking Detention will not be calculated in this volume.

<u>Total Provided = 71,504 cf</u>
Minimum Total Required Detention Volume = Vr Post =
44,147 cf is less than <u>71,504 c.f. OK</u>

Detention Basins will outlet into the existing washes by the use a metered bleed off pipe. The basins will completely be drained by these bleed off pipes within the minimum required 36 hour period. The metered bleed off to these washes will not adversely add to the downstream peak discharge flow rate.

Appendix I: Culvert Master Calculations

Appendix C: Flow Master calculations V6.0

Appendix A: Rational Method Calculations (Drainage Design Management System)

Appendix H: 404 Certification Form

Photos 1-14 Flow Conveyance(see Pocket Folder Boulder/Bedrock/Photo Exhibit)

Appendix K: Warning and Disclaimer Letter of Liability

VICINITY MAP

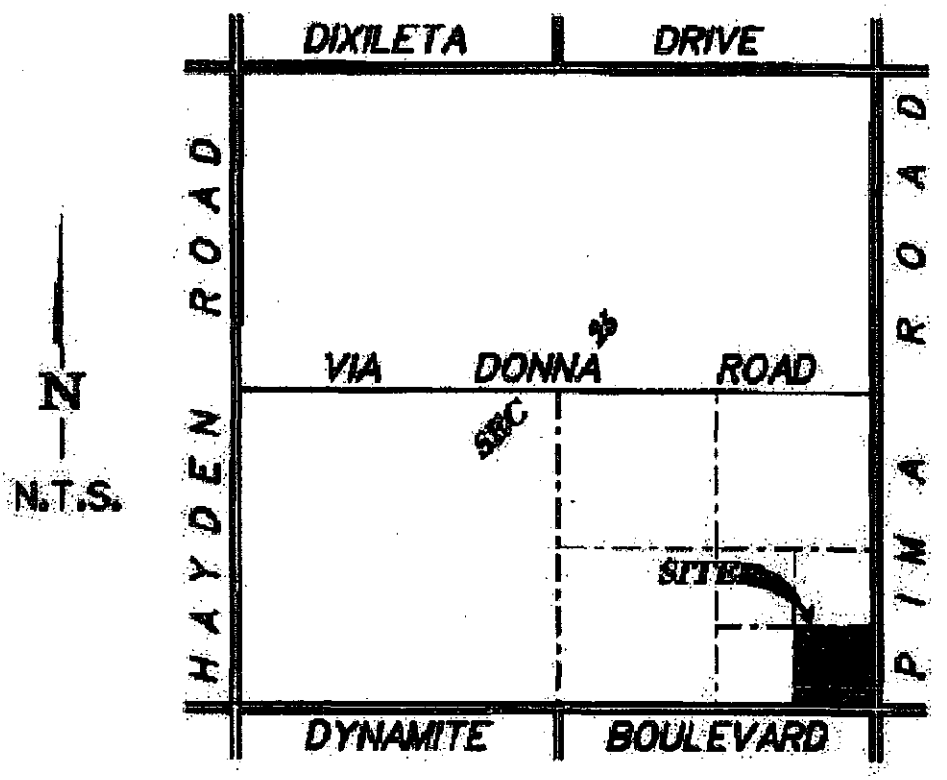
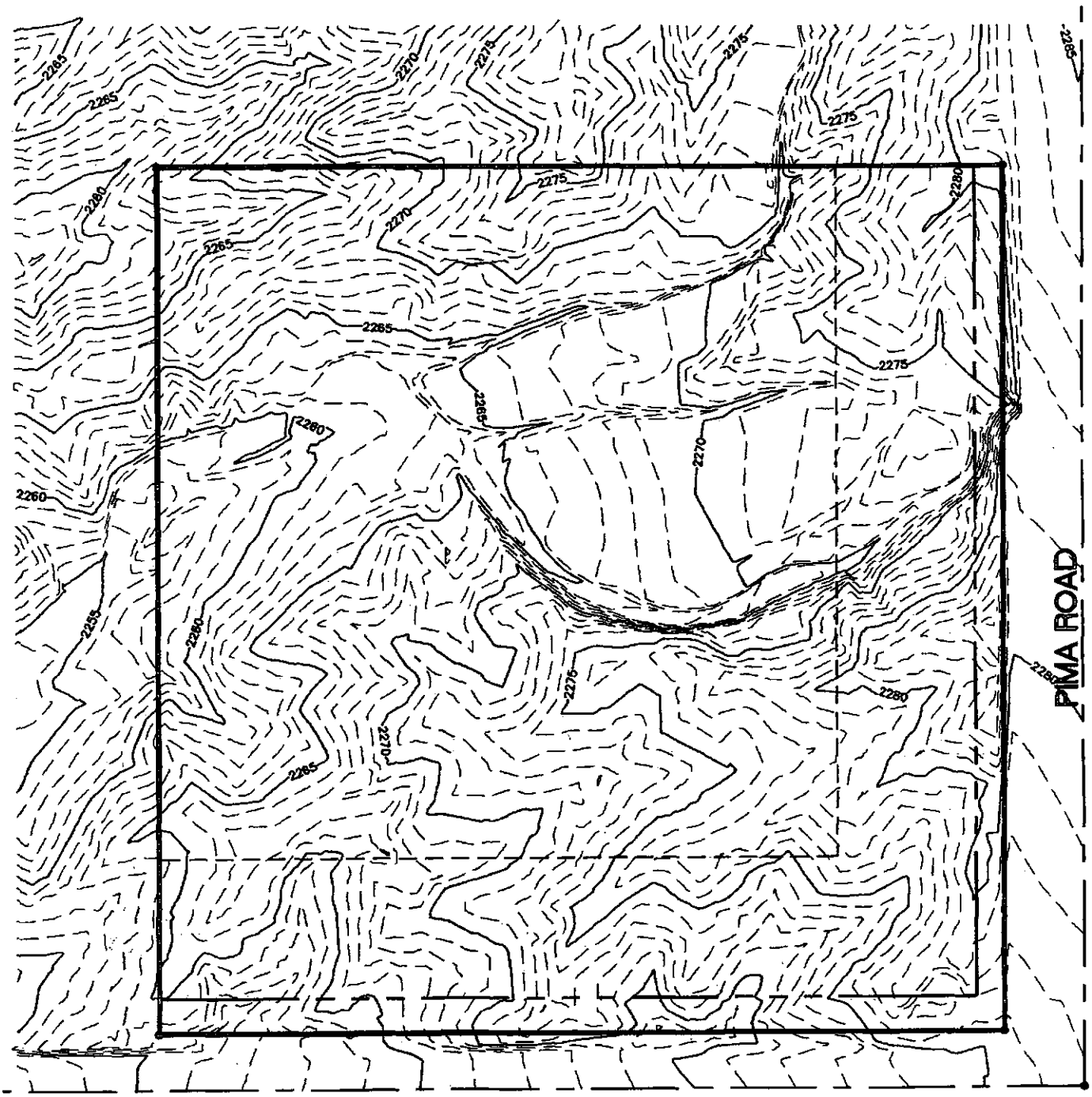


Exhibit 1

AERIAL MAP
SCALE: 1"=100'

Exhibit 2



SITE TOPOGRAPHY
SCALE: 1"=100'

Exhibit 3

FEMA MAP

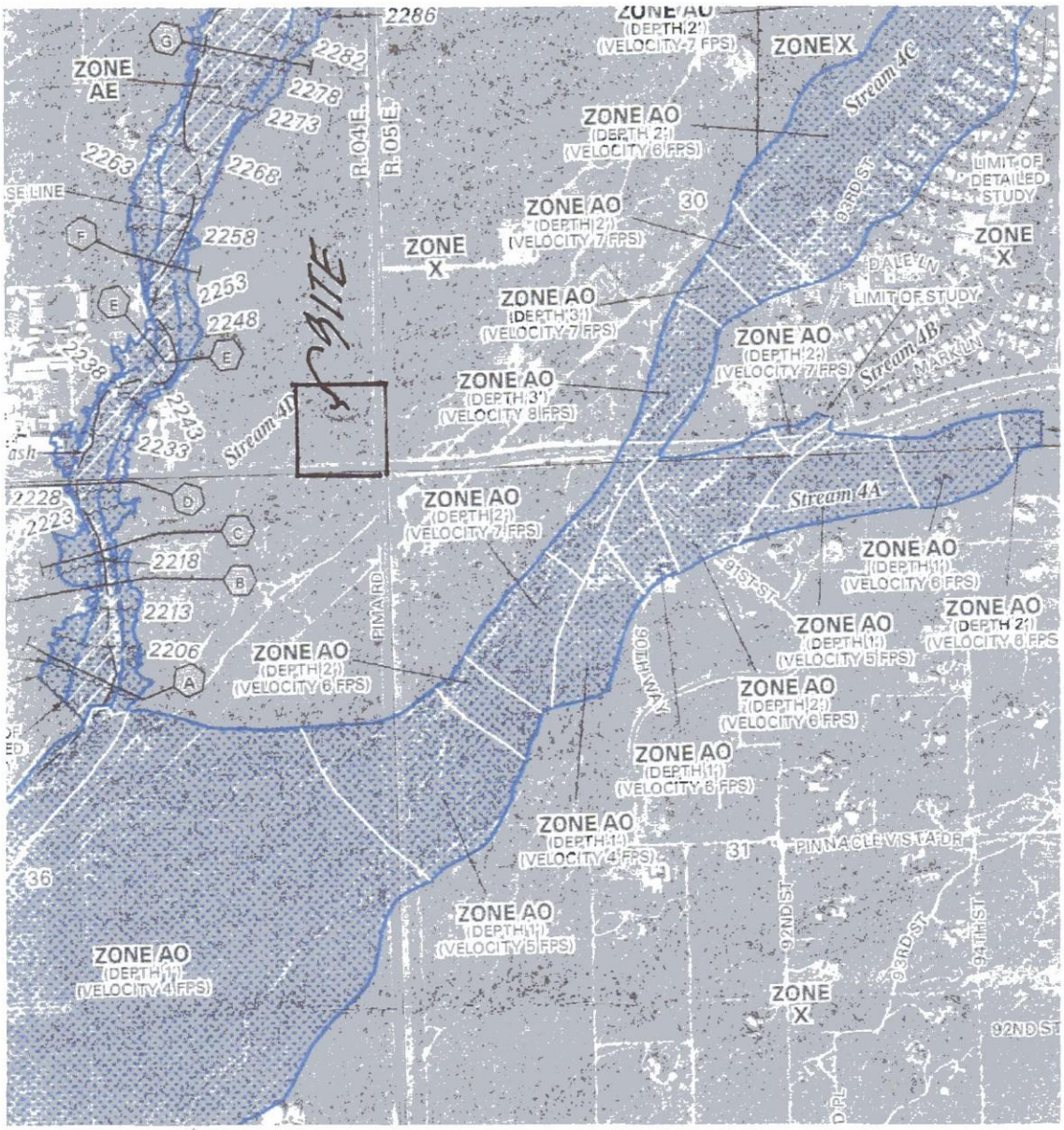


EXHIBIT 4A

FEMA LEGEND

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

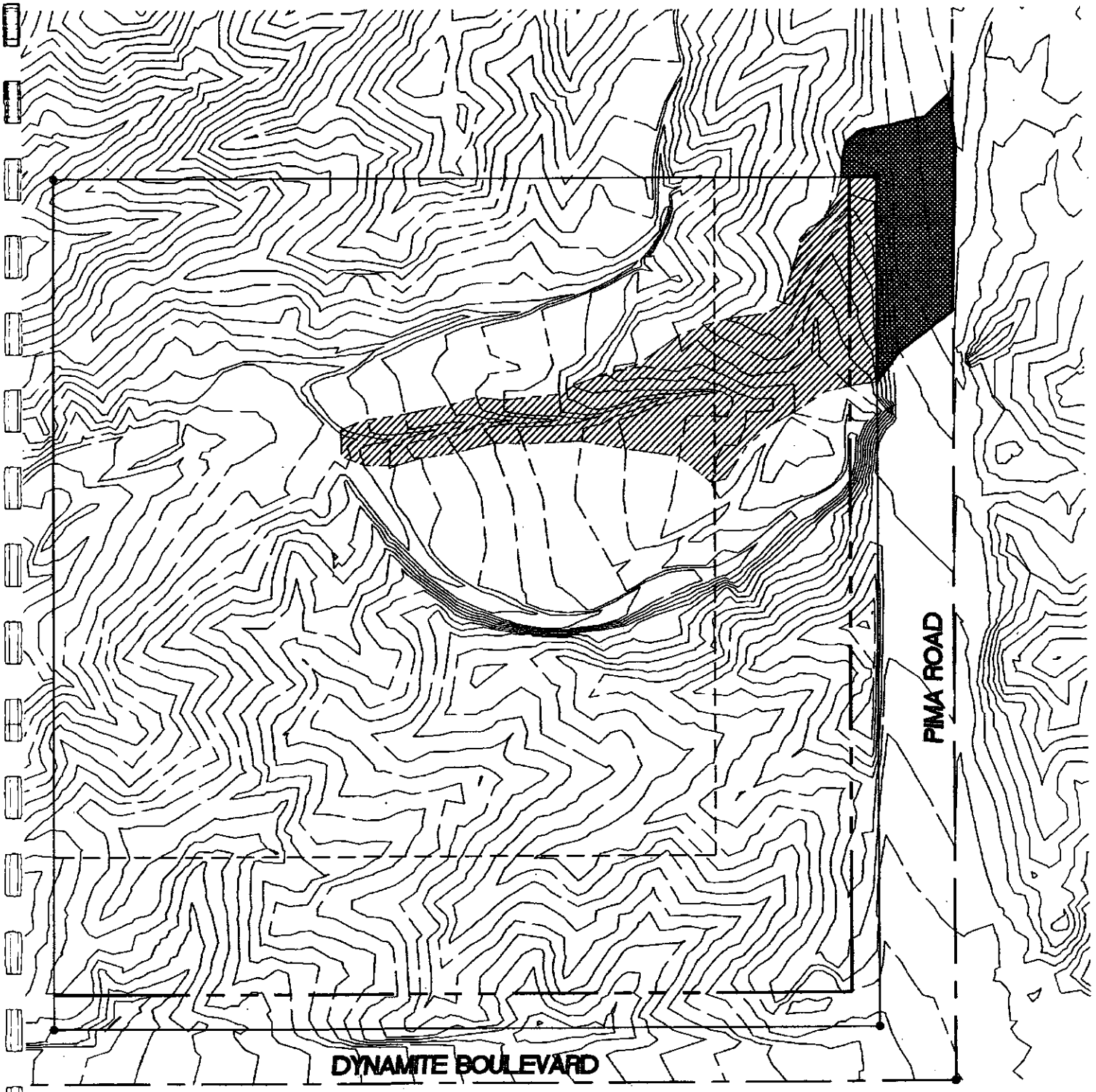
ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

EXHIBIT 4B



WASH #6 OFFSITE DRAINAGE AREA=0.23 ACRES,
YIELDING A 100 YEAR PEAK FLOW OF 2 cfs

N

SCALE: 1"=100'

EXHIBIT 5

Appendix A: Rational Method Calculations
(Drainage Design Management System)

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE DEFAULTS
Project Reference: PIMA DYNAMITE

6/9/2009

Code	Description	Rational Method C						Resistance Coefficient Kb
		2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	
Agriculture								
AG	Agriculture Areas	0.15	0.15	0.15	0.17	0.18	0.20	LOW
Commercial								
COMM	Business/Commercial Areas	0.75	0.75	0.75	0.83	0.90	0.90	MIN
Industrial								
IND	Industrial Areas	0.70	0.70	0.70	0.77	0.84	0.90	MIN
Open Space								
DESERT	Undeveloped Desert	0.35	0.35	0.35	0.39	0.42	0.45	LOW
MOUNT	Mountain Terrain (Slopes > 10%)	0.70	0.70	0.70	0.77	0.84	0.85	MAX
PARK	Lawns, Parks and Cemeteries	0.25	0.25	0.25	0.28	0.30	0.30	MIN
Residential								
RE-35	Single Family Zoning District RE-35	0.45	0.45	0.45	0.50	0.54	0.55	MIN
R1-18	Single Family Zoning District R1-18	0.50	0.50	0.50	0.55	0.60	0.60	MIN
R1-10	Single Family Zoning District R1-10	0.55	0.55	0.55	0.61	0.65	0.65	MIN
R1-8	Single Family Zoning District R1-8	0.60	0.60	0.60	0.66	0.70	0.70	MIN
R1-6	Single Family Zoning District R1-6	0.65	0.65	0.65	0.72	0.75	0.75	MIN
R-2	Single/Multi Family Zoning District R-2	0.70	0.70	0.70	0.77	0.80	0.80	MIN
R-3	Single/Multi Family Zoning District R-3	0.70	0.70	0.70	0.77	0.80	0.80	MIN
R-3A	Single/Multi Family Zoning District R-3A	0.75	0.75	0.75	0.83	0.85	0.85	MIN
R-4	Single/Multi Family Zoning District R-4	0.75	0.75	0.75	0.83	0.85	0.85	MIN
R-5	Single/Multi Family Zoning District R-5	0.75	0.75	0.75	0.83	0.85	0.85	MIN
Streets and Roads								
GRAVEL	Graveled Surfaces	0.70	0.70	0.70	0.77	0.84	0.85	MIN
PAVEMENT	Paved Streets, Roads and Parking Lots	0.95	0.95	0.95	0.95	0.95	0.95	MIN

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: PIMA DYNAMITE

ID	Sub Basin Data								Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb	CustomTc (min)		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01														
01	0.2	124	2,278.50	2,269.50	383.2	0.09	-	Q (cfs)	-	-	-	1	1	1
								C	0.35	0.35	0.35	0.39	0.42	0.45
								CA (ac)	0.08	0.08	0.08	0.09	0.10	0.10
								Tc (min)	10	10	10	10	10	10
								I (in/hr)	2.85	3.84	4.58	5.54	6.26	6.99

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: PIMA DYNAMITE

ID	Sub Basin Data								Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb	CustomTc (min)		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 02														
02	0.6	308	2,286.50	2,271.20	262.3	0.08	-	Q (cfs)	1	1	1	1	2	2
								C	0.35	0.35	0.35	0.39	0.42	0.45
								CA (ac)	0.20	0.20	0.20	0.23	0.24	0.26
								Tc (min)	10	10	10	10	10	10
								i (in/hr)	2.85	3.84	4.58	5.54	6.26	6.99

ID	Sub Basin Data								Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb	CustomTc (min)		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 03														
03	41.8	4,750	2,393.50	2,269.50	137.8	0.06	-	Q (cfs)	26	39	49	67	84	103
								C	0.35	0.35	0.35	0.39	0.42	0.45
								CA (ac)	14.61	14.61	14.61	16.28	17.54	18.79
								Tc (min)	26	22	20	19	18	17
								I (in/hr)	1.76	2.64	3.32	4.12	4.79	5.48

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: PIMA DYNAMITE

6/1/2009

ID	Sub Basin Data								Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb	CustomTc (min)		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 04														
04	0.6	339	2,288.50	2,271.00	272.6	0.08	-	Q (cfs)	1	1	1	1	2	2
								C	0.35	0.35	0.35	0.39	0.42	0.45
								CA (ac)	0.20	0.20	0.20	0.23	0.24	0.26
								Tc (min)	10	10	10	10	10	10
								i (in/hr)	2.85	3.84	4.58	5.54	6.26	6.99

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: PIMA DYNAMITE

6/1/2009

ID	Sub Basin Data								Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb	CustomTc (min)		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 05														
05	123.6	8,183	2,464.00	2,274.50	122.3	0.05	-	Q (cfs)	62	91	116	170	212	260
								C	0.35	0.35	0.35	0.39	0.42	0.45
								CA (ac)	43.27	43.27	43.27	48.21	51.92	55.63
								Tc (min)	36	31	28	25	24	23
								i (in/hr)	1.44	2.10	2.68	3.52	4.09	4.68

Appendix C: Flow Master calculations V6.0

Pima Dynamite Wash #3
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel - 1 Pima I
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.035	
Slope	030000	ft/ft
Left Side Slope	0.33	V : H
Right Side Slope	0.33	V : H
Bottom Width	6.00	ft
Discharge	103.00	cfs

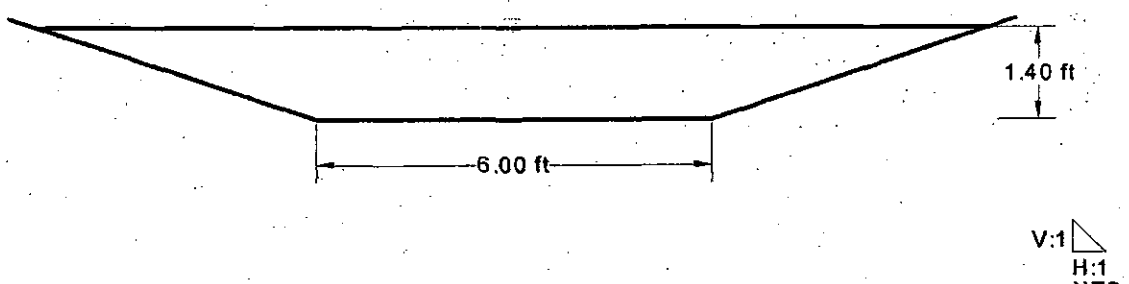
Results		
Depth	1.40	ft
Flow Area	14.4	ft²
Wetted Perim	14.95	ft
Top Width	14.50	ft
Critical Depth	1.60	ft
Critical Slope	0.018033	ft/ft
Velocity	7.16	ft/s
Velocity Head	0.80	ft
Specific Ener	2.20	ft
Froude Numb	1.27	
Flow Type	Supercritical	

Pinnacle Engineering
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Cross Section
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel - 1 Pima I
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.035	
Slope	030000	ft/ft
Depth	1.40	ft
Left Side Slope	0.33	V : H
Right Side Slope	0.33	V : H
Bottom Width	6.00	ft
Discharge	103.00	cfs



Wash # 5 330 cfs Maximum Flow
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Wash #5
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

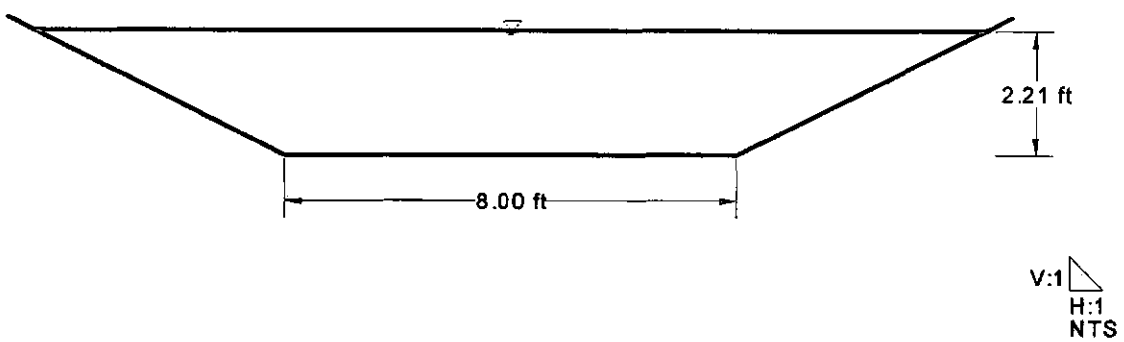
Input Data		
Mannings Coeffic	0.030	
Slope	033000	ft/ft
Left Side Slope	0.50	V : H
Right Side Slope	0.50	V : H
Bottom Width	8.00	ft
Discharge	330.00	cfs

Results		
Depth	2.21	ft
Flow Area	27.5	ft²
Wetted Perim	17.91	ft
Top Width	16.86	ft
Critical Depth	2.93	ft
Critical Slope	0.011286	ft/ft
Velocity	11.99	ft/s
Velocity Head	2.23	ft
Specific Ener	4.45	ft
Froude Numb	1.65	
Flow Type	Supercritical	

Cross Section
Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Wash #5
Flow Element	Trapezoidal Cha
Method	Manning's Formi
Solve For	Channel Depth

Section Data		
Mannings Coeffic	0.030	
Slope	033000	ft/ft
Depth	2.21	ft
Left Side Slope	0.50	V : H
Right Side Slope	0.50	V : H
Bottom Width	8.00	ft
Discharge	330.00	cfs



Appendix I: Culvert Master Calculations

Culvert Calculator Report
1 -30" CMP at Pima Rd. Wash #3

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	86.00	ft	Headwater Depth/Height	1.68	
Computed Headwater Elev	86.00	ft	Discharge	33.08	cfs
Inlet Control HW Elev.	85.23	ft	Tailwater Elevation	83.50	ft
Outlet Control HW Elev.	86.00	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	81.80	ft	Downstream Invert	81.00	ft
Length	65.00	ft	Constructed Slope	0.012308	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	2.50	ft
Slope Type	N/A		Normal Depth	N/A	ft
Flow Regime	N/A		Critical Depth	1.96	ft
Velocity Downstream	6.74	ft/s	Critical Slope	0.024242	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	86.00	ft	Upstream Velocity Head	0.71	ft
Ke	0.50		Entrance Loss	0.35	ft

Inlet Control Properties					
Inlet Control HW Elev.	85.23	ft	Flow Control	Submerged	
Inlet Type	Headwall		Area Full	4.9	ft²
K	0.00780		HDS 5 Chart	2	
M	2.00000		HDS 5 Scale	1	
C	0.03790		Equation Form	1	
Y	0.69000				

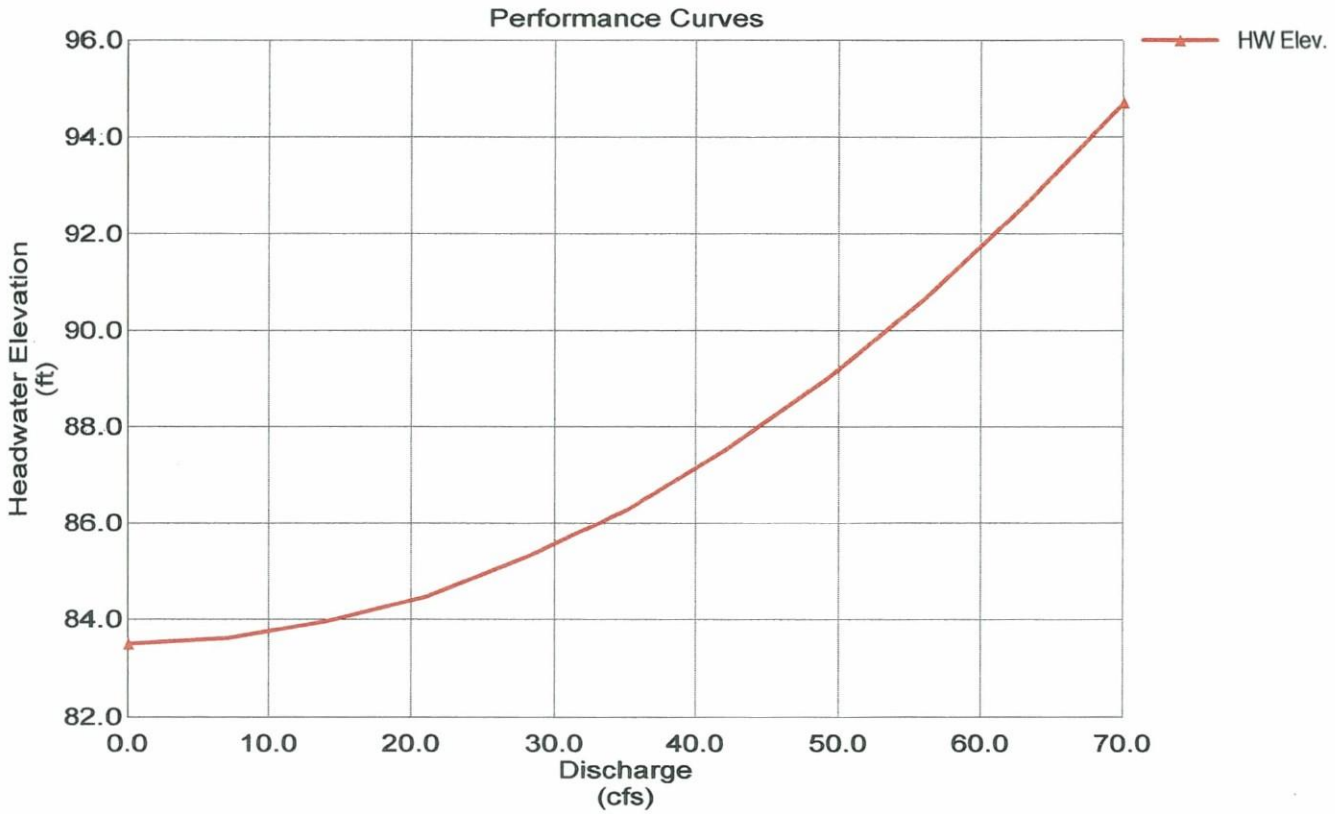
Rating Table Report
1 -30" CMP at Pima Rd. Wash #3

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	70.00	7.00	cfs

Discharge (cfs)	HW Elev. (ft)
0.00	83.50
7.00	83.63
14.00	83.98
21.00	84.48
28.00	85.29
35.00	86.30
42.00	87.53
49.00	88.98
56.00	90.66
63.00	92.57
70.00	94.69

Performance Curves Report
1 -30" CMP at Pima Rd. Wash #3

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	70.00	7.00 cfs



Culvert Calculator Report
2 - 36" CMP at Pima Rd. Wash #5

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	83.00	ft	Headwater Depth/Height	1.73	
Computed Headwater Elev	83.00	ft	Discharge	111.54	cfs
Inlet Control HW Elev.	82.21	ft	Tailwater Elevation	80.00	ft
Outlet Control HW Elev.	83.00	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	77.80	ft	Downstream Invert	77.00	ft
Length	65.00	ft	Constructed Slope	0.012308	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	3.00	ft
Slope Type	N/A		Normal Depth	N/A	ft
Flow Regime	N/A		Critical Depth	2.42	ft
Velocity Downstream	7.89	ft/s	Critical Slope	0.024498	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	83.00	ft	Upstream Velocity Head	0.97	ft
Ke	0.50		Entrance Loss	0.48	ft

Inlet Control Properties					
Inlet Control HW Elev.	82.21	ft	Flow Control	Submerged	
Inlet Type	Headwall		Area Full	14.1	ft²
K	0.00780		HDS 5 Chart	2	
M	2.00000		HDS 5 Scale	1	
C	0.03790		Equation Form	1	
Y	0.69000				

Rating Table Report
2 - 36" CMP at Pima Rd. Wash #5

Range Data:

	Minimum	Maximum	Increment	
Discharge	0.00	220.00	22.00	cfs

Discharge (cfs)	HW Elev. (ft)
0.00	80.00
22.00	80.13
44.00	80.48
66.00	81.03
88.00	81.87
110.00	82.92
132.00	84.20
154.00	85.72
176.00	87.47
198.00	89.45
220.00	91.67

Culvert Calculator Report
3 - 30" CMP Wash # 3 First Crossing

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	74.00	ft	Headwater Depth/Height	1.80	
Computed Headwater Elev	74.00	ft	Discharge	106.90	cfs
Inlet Control HW Elev.	73.18	ft	Tailwater Elevation	72.00	ft
Outlet Control HW Elev.	74.00	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	69.50	ft	Downstream Invert	68.50	ft
Length	30.00	ft	Constructed Slope	0.033333	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	3.50	ft
Slope Type	N/A		Normal Depth	1.82	ft
Flow Regime	N/A		Critical Depth	2.03	ft
Velocity Downstream	7.26	ft/s	Critical Slope	0.026271	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	74.00	ft	Upstream Velocity Head	0.82	ft
Ke	0.50		Entrance Loss	0.41	ft

Inlet Control Properties					
Inlet Control HW Elev.	73.18	ft	Flow Control	Submerged	
Inlet Type	Headwall		Area Full	14.7	ft²
K	0.00780		HDS 5 Chart	2	
M	2.00000		HDS 5 Scale	1	
C	0.03790		Equation Form	1	
Y	0.69000				

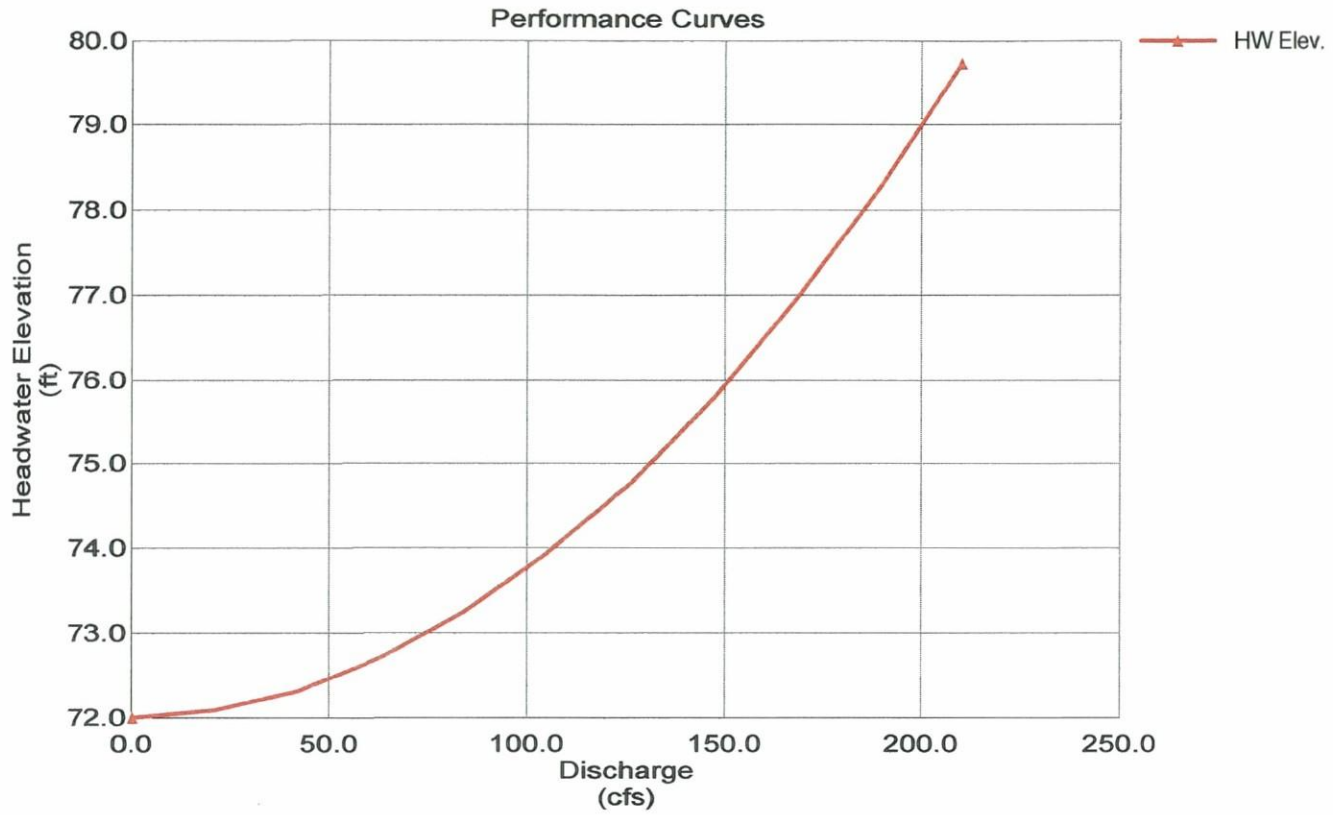
Rating Table Report
3 - 30" CMP Wash # 3 First Crossing

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	210.00	21.00 cfs

Discharge (cfs)	HW Elev. (ft)
0.00	72.00
21.00	72.08
42.00	72.31
63.00	72.69
84.00	73.23
105.00	73.93
126.00	74.78
147.00	75.78
168.00	76.94
189.00	78.25
210.00	79.72

Performance Curves Report
3 - 30" CMP Wash # 3 First Crossing

Range Data:				
	Minimum	Maximum	Increment	
Discharge	0.00	210.00	21.00	cfs



2 - 6' x 8 ' (one box only) 1st crossing
Worksheet for Rectangular Channel

Project Description	
Worksheet	2-6' x 8' Box Culve
Flow Element	Rectangular Chanı
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.035	
Slope	030000	ft/ft
Bottom Width	8.00	ft
Discharge	130.00	cfs

Results		
Depth	1.88	ft
Flow Area	15.0	ft²
Wetted Perim	11.75	ft
Top Width	8.00	ft
Critical Depth	2.02	ft
Critical Slope	0.024351	ft/ft
Velocity	8.66	ft/s
Velocity Head	1.16	ft
Specific Ener	3.04	ft
Froude Numb	1.11	
Flow Type	Supercritical	

Culvert Calculator Report
2 -6' x 8' Box Culverts 1st crossing Wash #5

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	73.00 ft	Headwater Depth/Height	0.71
Computed Headwater Elevation	72.76 ft	Discharge	260.00 cfs
Inlet Control HW Elev.	71.68 ft	Tailwater Elevation	69.88 ft
Outlet Control HW Elev.	72.76 ft	Control Type	Outlet Control

Grades			
Upstream Invert	68.50 ft	Downstream Invert	68.00 ft
Length	28.00 ft	Constructed Slope	-0.035714 ft/ft

Hydraulic Profile			
Profile	A2	Depth, Downstream	2.02 ft
Slope Type	Adverse	Normal Depth	2.00 ft
Flow Regime	Subcritical	Critical Depth	2.02 ft
Velocity Downstream	8.06 ft/s	Critical Slope	0.017890 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.030
Section Material	Concrete	Span	8.00 ft
Section Size	8 x 6 ft	Rise	6.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	72.76 ft	Upstream Velocity Head	0.26 ft
Ke	0.20	Entrance Loss	0.05 ft

Inlet Control Properties			
Inlet Control HW Elev.	71.68 ft	Flow Control	Unsubmerged
Inlet Type	90° headwall w 45° bevels	Area Full	96.0 ft²
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

2 - 6' x 8 ' (one box only) 2nd crossing(330/2 cfs)
Worksheet for Rectangular Channel

Project Description	
Worksheet	2-6' x 8' Box Culve
Flow Element	Rectangular Chanı
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.035	
Slope	030000	ft/ft
Bottom Width	8.00	ft
Discharge	165.00	cfs

Results		
Depth	2.21	ft
Flow Area	17.7	ft²
Wetted Perim	12.43	ft
Top Width	8.00	ft
Critical Depth	2.36	ft
Critical Slope	0.024889	ft/ft
Velocity	9.31	ft/s
Velocity Head	1.35	ft
Specific Ener	3.56	ft
Froude Numb	1.10	
Flow Type	Supercritical	

Pinnacle Engineering
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
2 -6' x 8' Box Culverts 1st crossing Wash #5(330 cfs)(165 cfs one box)

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	73.00 ft	Headwater Depth/Height	0.80
Computed Headwater Elevation	73.31 ft	Discharge	165.00 cfs
Inlet Control HW Elev.	72.22 ft	Tailwater Elevation	70.21 ft
Outlet Control HW Elev.	73.31 ft	Control Type	Outlet Control

Grades			
Upstream Invert	68.50 ft	Downstream Invert	68.00 ft
Length	28.00 ft	Constructed Slope	-0.035714 ft/ft

Hydraulic Profile			
Profile	A2	Depth, Downstream	2.36 ft
Slope Type	Adverse	Normal Depth	0.00 ft
Flow Regime	Subcritical	Critical Depth	2.36 ft
Velocity Downstream	8.72 ft/s	Critical Slope	0.018286 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.030
Section Material	Concrete	Span	8.00 ft
Section Size	8 x 6 ft	Rise	6.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	73.31 ft	Upstream Velocity Head	0.34 ft
Ke	0.20	Entrance Loss	0.07 ft

Inlet Control Properties			
Inlet Control HW Elev.	72.22 ft	Flow Control	Unsubmerged
Inlet Type	90° headwall w 45° bevels	Area Full	48.0 ft²
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

4 - 6' x 8 ' (one box only) 2nd crossing
Worksheet for Rectangular Channel

Project Description	
Worksheet	2-6' x 8' Box Culve
Flow Element	Rectangular Chan
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.035	
Slope	030000	ft/ft
Bottom Width	8.00	ft
Discharge	92.00	cfs

Results		
Depth	1.48	ft
Flow Area	11.9	ft²
Wetted Perim	10.97	ft
Top Width	8.00	ft
Critical Depth	1.60	ft
Critical Slope	0.023904	ft/ft
Velocity	7.75	ft/s
Velocity Head	0.93	ft
Specific Ener	2.42	ft
Froude Numb	1.12	
Flow Type	Supercritical	

Pinnacle Engineering
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
4 - 4' x 8' Box Culverts 2nd crossing

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	66.00 ft	Headwater Depth/Height	0.85
Computed Headwater Elevation	63.10 ft	Discharge	365.00 cfs
Inlet Control HW Elev.	63.00 ft	Tailwater Elevation	58.98 ft
Outlet Control HW Elev.	63.10 ft	Control Type	Entrance Control

Grades			
Upstream Invert	58.00 ft	Downstream Invert	57.50 ft
Length	28.00 ft	Constructed Slope	0.017857 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	5.50 ft
Slope Type	Steep	Normal Depth	1.58 ft
Flow Regime	Supercritical	Critical Depth	1.59 ft
Velocity Downstream	2.07 ft/s	Critical Slope	0.017558 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.030
Section Material	Concrete	Span	8.00 ft
Section Size	8 x 6 ft	Rise	6.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev.	63.10 ft	Upstream Velocity Head	0.08 ft
Ke	0.20	Entrance Loss	0.02 ft

Inlet Control Properties			
Inlet Control HW Elev.	63.00 ft	Flow Control	Unsubmerged
Inlet Type	90° headwall w 45° bevels	Area Full	192.0 ft²
K	0.49500	HDS 5 Chart	10
M	0.66700	HDS 5 Scale	2
C	0.03140	Equation Form	2
Y	0.82000		

Appendix H: 404 Certification Form

City of Scottsdale Section 404 Certification Form

Before the City issues development permits for a project, the developer's Engineer or the property owner must certify that it complies with, or is exempt from, Section 404 of the Clean Water Act of the United States. *[Section 404 regulates the discharge of dredged or fill material into a wetland, lake, (including dry lakes), river, stream (including intermittent streams, ephemeral washes, and arroyos), or other waters of the United States.*

Prior to submittal of improvement plans to Project Review the form below must be completed (and submitted with the improvement plans) as evidence of compliance.

Certification of Section 404 Permit Status

Owner's Name: Scottsdale and Dynamite LLC Phone No. 602-326-2600

Project Name/Description: Dynamite Blvd and Pima Rd Case No. _____

Project Location/Address Northwest corner of Pima Rd. and Dynamite Blvd

Scottsdale, Arizona

A registered Engineer or the property Owner must check the applicable condition and certify by *signing* below that:

1. **Section 404 does apply to the project because there will be a discharge of dredged or fill material to waters of the U.S., and:**

   ☐ **a: A Section 404 Permit has already been obtained for this project.**

   -or-

   ☐ **b: This project qualifies for a "Nationwide Permit," and this project will meet all terms and conditions of the applicable nationwide permit.**

2. **Section 404 does not apply to the project because:**

   ☒ **a: No watercourses or other waters of the U.S. exist on the property.**

   -or-

   ☐ **b: Watercourses or other waters of the U.S. do exist on the property, but the project will not involve the discharge of dredged or fill material into any of these waters.**

I certify that the above statement is true.

REGISTERED LAND SURVEYOR CERTIFICATE NO. 20887 FRANK BOXBERGER U.S.A.

Engineer's Signature and Seal, or Owner's Signature — June 10, 2009 Date

Owner Summit Civil Group

Title Company

EXPIRES 6-31-11

COS404Form8-31-99

Appendix J: Detention Calculations

The formula used for this is per the COS standard formula as follows: Vr = (p/12)AC where Vr is Volume, P is 2.82 "(100 year 2 hour), A is Area, C is the Runoff coefficient.

There are 100 year detention requirements on this site. This Site is designed to detain the full post development runoff. Appendix L shows the calculations of the post development runoff areas for each of the 3 detention basins. There will be no detention required for the undisturbed NAOS area.

Vr = (p/12)AC
where Vr is Volume,
P is 2.82" (100 year 2 hour),
A is Area,
C is the Runoff coefficient, (weighted C value = 0.86 for developed area)

Weighted C: 82% impervious area, C value of 0.95;
18% landscape area, C value of 0.45
(.95 x .82) + (.45 x .18) = 0.86

Post Development Runoff Volume = (2.82/12)(218,439 sf)(0.86) = <u>44,147cf</u>

Total Volume Provided per the Grading Plan:
Detention Basin #1: 26,811 cf
Detention Basin #2: 3,486 cf
Detention Basin #3: 41,207 cf
Parking Detention will not be calculated in this volume.

<u>Total Provided = 71,504 cf</u>
Minimum Total Required Detention Volume = Vr Post =
44,147 cf is less than <u>71,504 c.f. OK</u>

Detention Basins will outlet into the existing washes by the use a metered bleed off pipe. The basins will completely be drained by these bleed off pipes within the minimum required 36 hour period. The metered bleed off to these washes will not adversely add to the downstream peak discharge flow rate.

Appendix K: Warning and Disclaimer Letter of Liability

CITY OF SCOTTSDALE

Appendix 4-1C

WARNING & DISCLAIMER OF LIABILITY

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "*Special flood hazard* area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22
"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by man-made or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

Plan Check No.	Owner or Agent	Date
	RLL	08/06/09

Photos 1-14 Flow Conveyance(see Pocket Folder Boulder/Bedrock/Photo Exhibit)

Photos of Flow Conveyance(see Pocket Folder Boulder/Bedrock/Photo Exhibit)

Photo 1

Photo 2

Photo 3

Photo 4

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

Photo 13

Photo 14