CITY OF SURPRISE
Regular City Council Work Session Agenda
16000 N. Civic Center Plaza
Surprise, AZ 85374

Tuesday, April 17, 2018 @ 4:00 PM
COUNCIL CHAMBERS

Back Print

A. Call To Order

B. Roll Call

C. Pledge of Allegiance

D. Call To The Public:

INSTRUCTIONS: In order to address the City Council, you will need to fill out a Call to the Public Form available at the front counter, and then turn it in to the City Clerk before the meeting begins.
Download the Call to the Public form *(PDF download requires Adobe Acrobat Reader)*
Fill out the Call to the Public form online If submitting form electronically, please submit to City Clerk at least one hour before the meeting start time.
The Call to the Public form is also available at the front counter.

Note: A.R.S. 38-431.01(H)- During this time members of the public may address City Council only on issues within the jurisdiction of the City Council which are not an item on the agenda. At the conclusion of the open call, City Council may respond to criticism, may ask staff to review the matter or may ask that the matter be put on a future agenda. No discussion or action shall take place on any item raised.

Approval of items on the Consent Agenda – all items with an asterisk (*) are considered to be routine matters and will be enacted by one motion and one roll call vote to the City Council. There will be no separate discussion on these items unless a Councilmember requests, in which event the item will be removed from the consent agenda and considered in its normal sequence on the agenda.

E. Regular City Council Work Session Agenda:

Regular Agenda Item - Non-Public Hearing:

1.	District 5	Discussion as requested by Councilman Hall (seconded by Councilman Winters) pertaining to an, "Update from the City Staff and the Landowner about the development components and the future plan for the City Center."	None	Councilmember Hall and Councilmember Winters
2.	District Citywide	Discussion and presentation regarding the City Manager's FY2019 Recommended Budget.	None	Lindsey Duncan, Finance Director and Holly Osborn, Assistant

Finance
Director

F. Executive Session:

For information Purposes; Upon a public majority vote of a quorum of the City Council, the Council may hold an executive session, which will not be open to the public, but for only the following purposes:

- discussion or consideration of personnel matters (A.R.S. §38-431.03 (A)(1));
- discussion or consideration of records exempt by law from public inspection (A.R.S. §38-401.03 (A)(2));
- discussion or consultation for legal advice with the city's attorneys (A.R.S. §38-431.03 (A)(3));
- discussion or consultation with the city's attorneys regarding the city's position regarding contracts that are the subject of negotiations, in pending or contemplated litigation, or in settlement discussions conducted in order to avoid or resolve litigation (A.R.S.§38-431.03 (a)(4));
- discussion or consultation with designated representatives of the city in order to consider its position and instruct its representatives regarding negotiations with employee organizations (A.R.S. §38-431.03 (A)(5)); or
- discussion, consultation or consideration for international and interstate negotiations or for negotiations by a city or town, or its designated representatives, with members of a tribal council, or its designated representatives, of an Indian reservation located within or adjacent to the city or town. A.R.S. §38-401.03 (A)(6)).
- discussing or consulting with designated representatives of the city in order to consider its position and instruct its representatives regarding negotiations for the purchase, sale or lease of real property (A.R.S. §38-431.03 (A)(7)).

Confidentiality Requirements Pursuant to A.R.S. §38-431.03(C)(D): Any person receiving executive session information pursuant to A.R.S. §38-431.02 shall not disclose that information except to the Attorney General or County Attorney by agreement of the City Council, or as otherwise ordered by a court of competent jurisdiction.

The council may vote to hold an executive session for the purpose of obtaining legal advice from the Board's attorney on any matter listed on the agenda pursuant to A.R.S. § 38-431.03(A)(3).

G. Adjournment:

SHERRY ANN AGUILAR, CITY CLERK, MMC

POSTED:

SPECIAL NOTE: PERSONS WITH SPECIAL ACCESSIBILITY NEEDS, INCLUDING LARGE PRINT MATERIALS OR INTERPRETER, SHOULD CONTACT THE CITY CLERK'S OFFICE @ 623.222.1200 OR TTY 623.222.1002, BY NO LATER THAN 24 HOURS IN ADVANCE OF THE REGULAR SCHEDULED MEETING TIME.

CITY OF SURPRISE
Regular City Council Work Session

April 17, 2018 @ 4:00:00 PM

Back Print

Council Meeting Date:	April 17, 2018	Contact Person:	Councilmember Hall and Councilmember Winters
Submitting Department:	CD	District:	5
Staff Recommendations:	None		

Consent	Regular	Public Hearing	Report/Discussion

Agenda Wording:

Discussion as requested by Councilman Hall (seconded by Councilman Winters) pertaining to an, "Update from the City Staff and the Landowner about the development components and the future plan for the City Center."

Motion:

N/A

Background:

This item was requested by Councilmember Hall and seconded by Councilmember Winters at the March 27, 2018 meeting.

The City of Surprise over the course of the last two years has approved two developments, Thompson Thrift and the Surprise Medical at the City. The City has also worked towards a draft circulation plan, draft roadway cross-sections, a master drainage study, a fiscal impact analysis and the donation of 20 acres from the property owner to the City for higher education use.

Objective Analysis:

N/A. This item was requested for update purposes and discussion only.

Policy Compliant:

N/A. This item was requested for update purposes and discussion only.

Financial Impact:

N/A. This item was requested for update purposes and discussion only.

Budget Impact:

N/A. This item was requested for update purposes and discussion only.

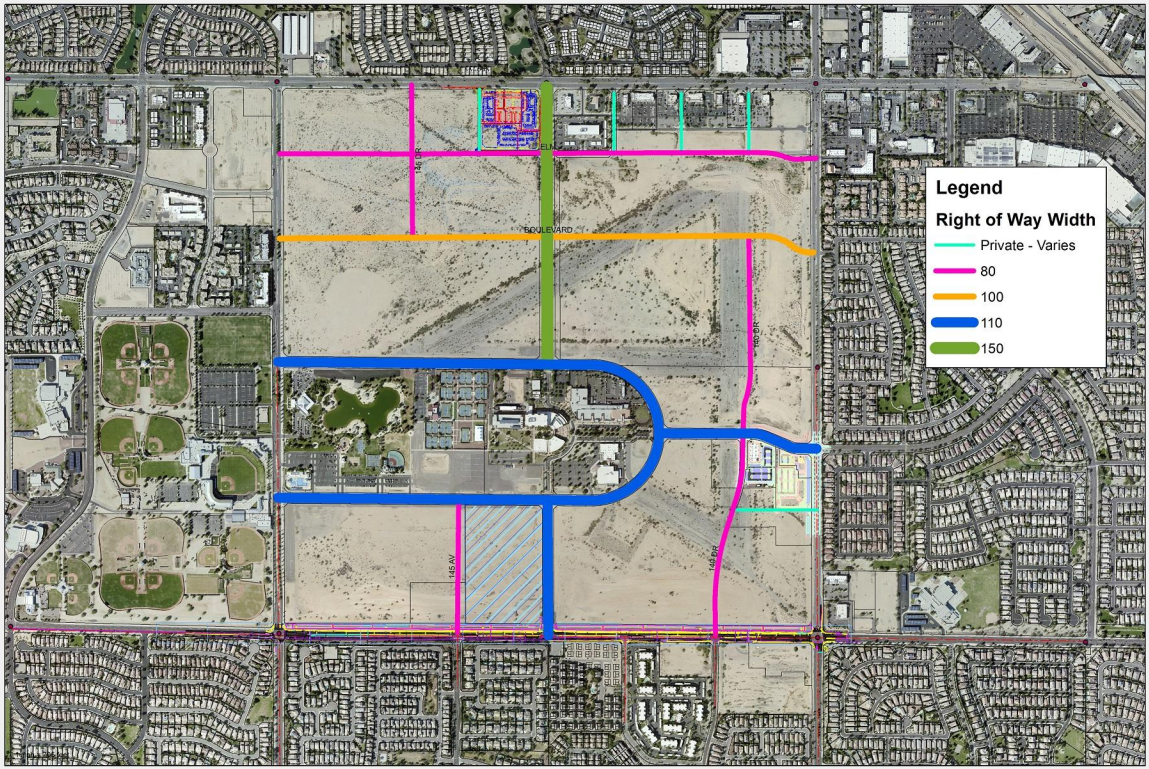
FTE Impact:

This item does not have an impact on current staff levels.

ATTACHMENTS:

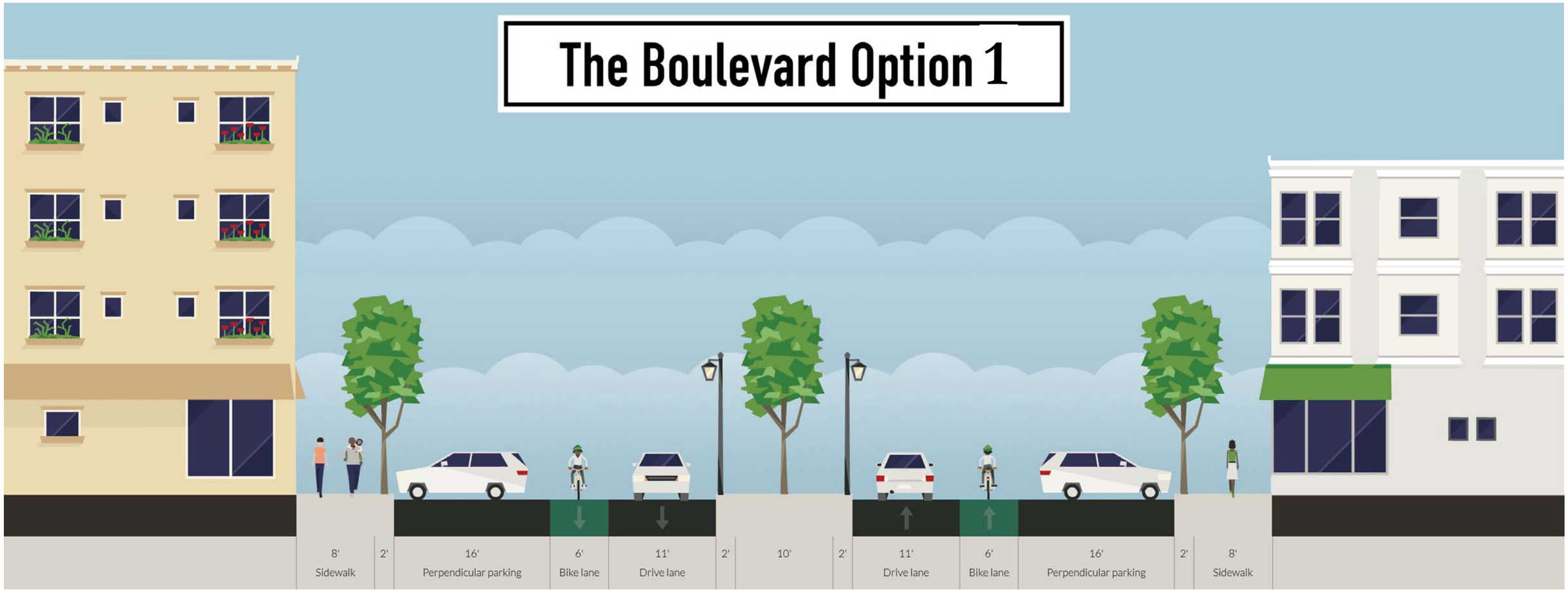
Click to download

- ☐ City Center Draft Circulation Plan
- ☐ Boulevard Draft Cross Section
- ☐ Civic Center Drive Cross-Section Draft
- ☐ Elm Street Cross-Section Draft
- ☐ Paradise-Tierra Buena Lane Cross-Section Draft
- ☐ Statler Cross-Section Draft
- ☐ City Center Master Drainage Study 062817
- ☐ City Center Master Drainage Study City Letter 071117
- ☐ FINAL_SCDC Fiscal Impact Analysis_7-3-17
- ☐ 20 acre Warranty Deed
- ☐ Presentation


Legend
Right of Way Width
Private - Varies
80
100
110
150
BOULEVARD
145 PR
145 PR
145 PR
145 AV

DRAFT

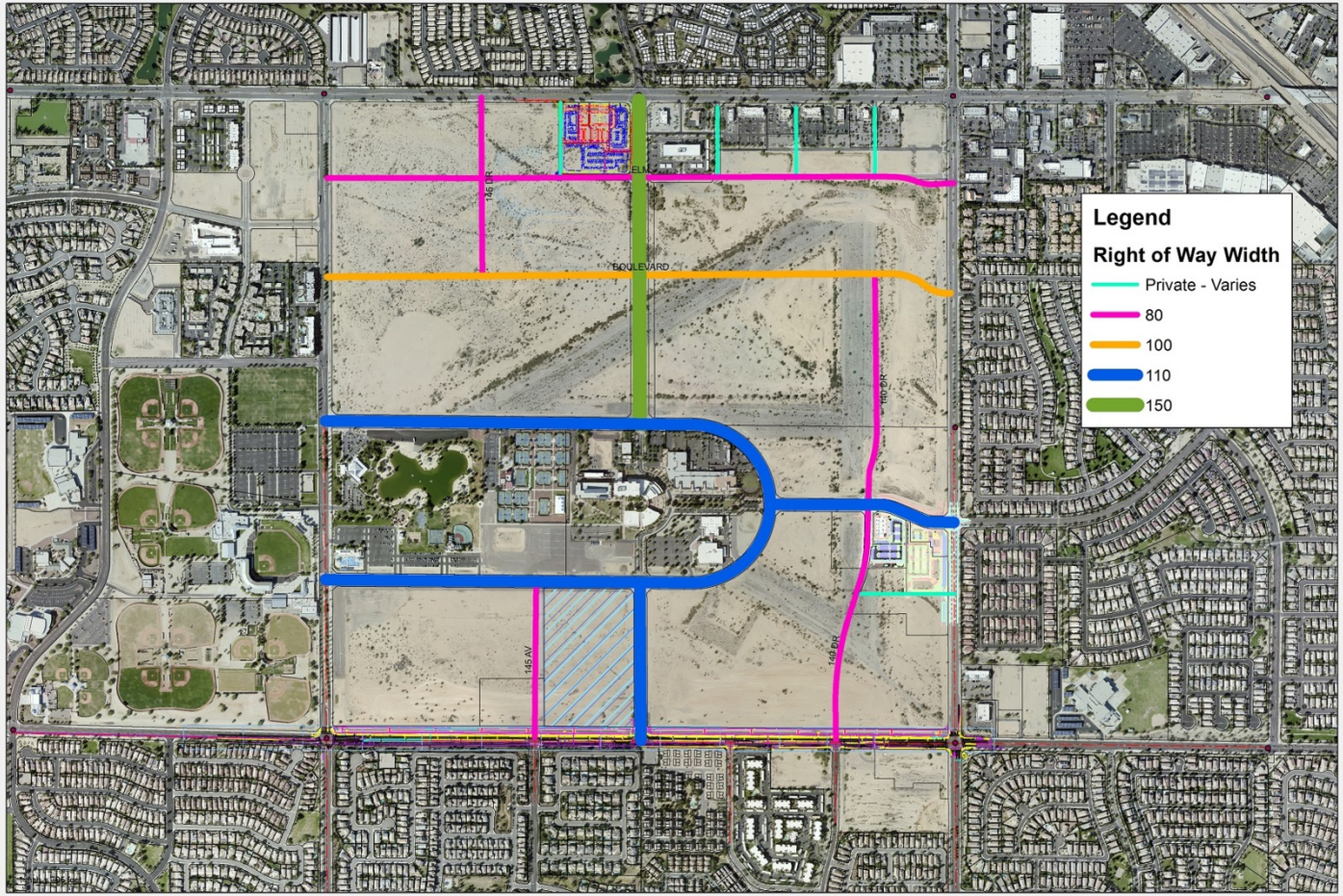
The Boulevard Option 1



SURPRISE
ARIZONA

City Center Update

April 17, 2018


Legend
Right of Way Width
Private - Varies
80
100
110
150
BOULEVARD
146 DR
145 AV
140 DR
140 DR

DRAFT


Civic Center Drive Future
10'
Sidewalk
4'
2'
10'
Bike lane
12'
Drive lane
12½'
Drive lane
1'
4'
30'
Planting strip
4'
1'
12½'
Drive lane
12'
Drive lane
10'
Bike lane
2'
4'
10'
Sidewalk

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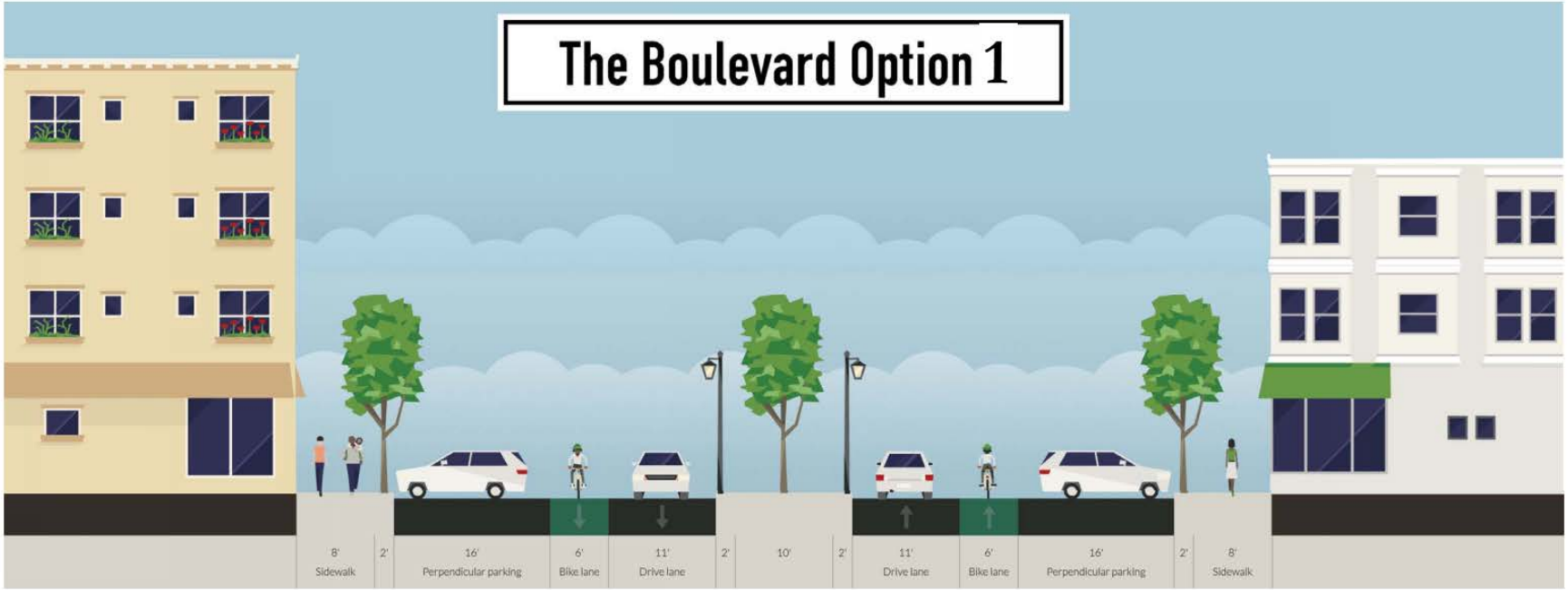
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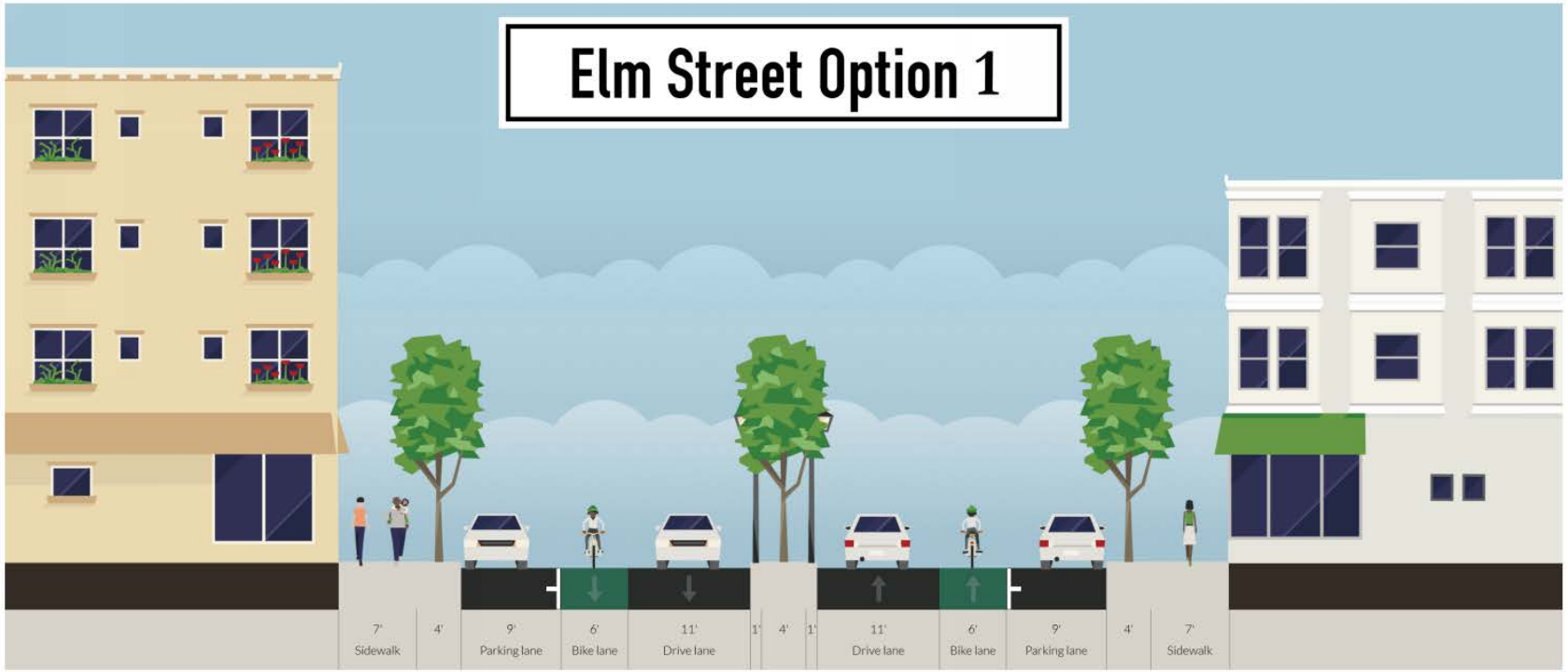
2'
16'
Perpendicular parking
6'
Bike lane
11'
Drive lane
2'
10'
2'
11'
Drive lane
6'
Bike lane
16'
Perpendicular parking
2'
8'
Sidewalk

DRAFT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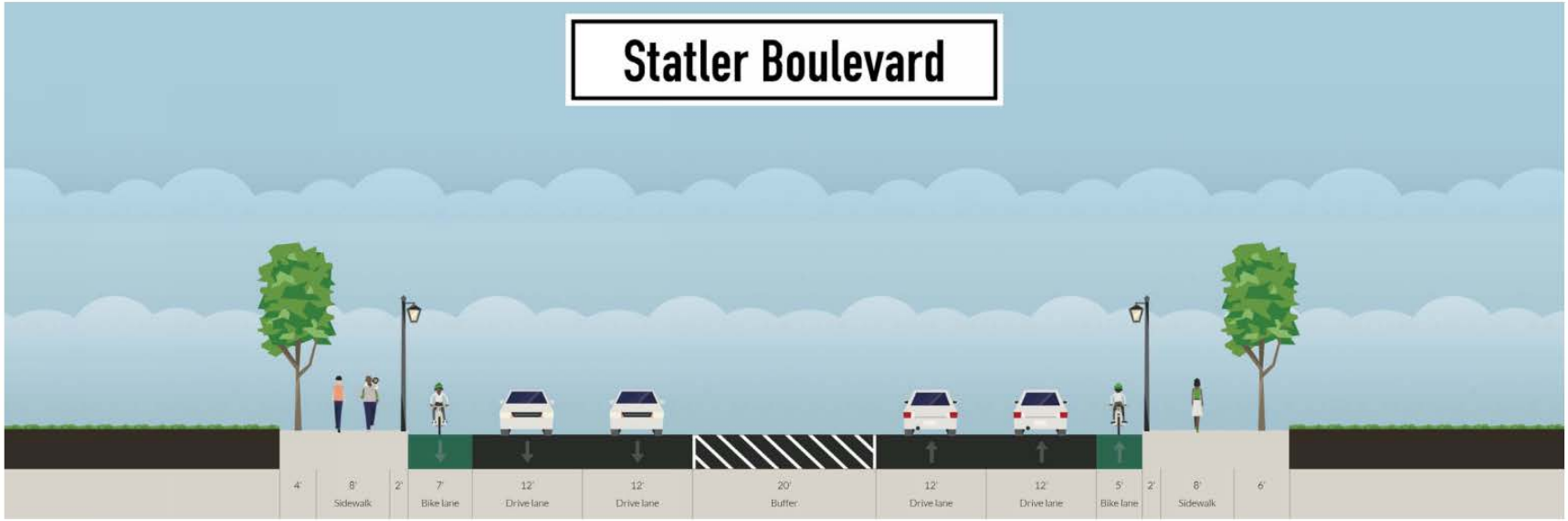
Sidewalk
4'
9'
Parking lane
6'
Bike lane
11'
Drive lane
1'
4'
1'
11'
Drive lane
6'
Bike lane
9'
Parking lane
4'
7'
Sidewalk

DRAFT


Paradise Lane
6½'
8'
Sidewalk
4'
2'
10½'
Parking lane
6'
Bike lane
11½'
Drive lane
11'
Planting strip
11½'
Drive lane
6'
Bike lane
10½'
Parking lane
2'
6'
8'
Sidewalk
6½'

DRAFT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4'
8'
Sidewalk
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Bike lane
12'
Drive lane
12'
Drive lane
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Buffer
12'
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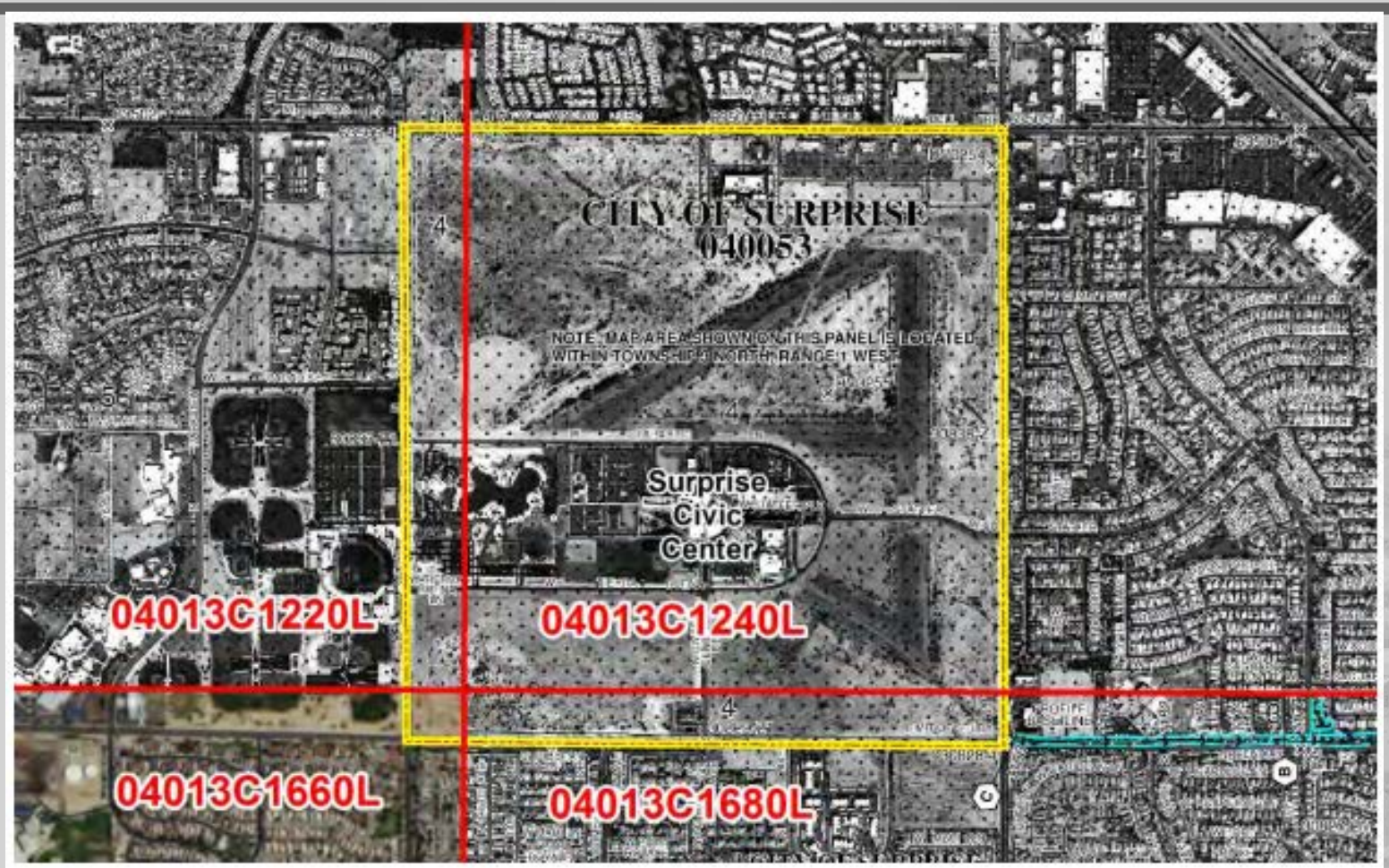
Drive lane
5'
Bike lane
2'
8'
Sidewalk
6'


CITY OF SURPRISE
040053
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Surprise
Civic
Center
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04013C1240L
04013C1660L
04013C1680L

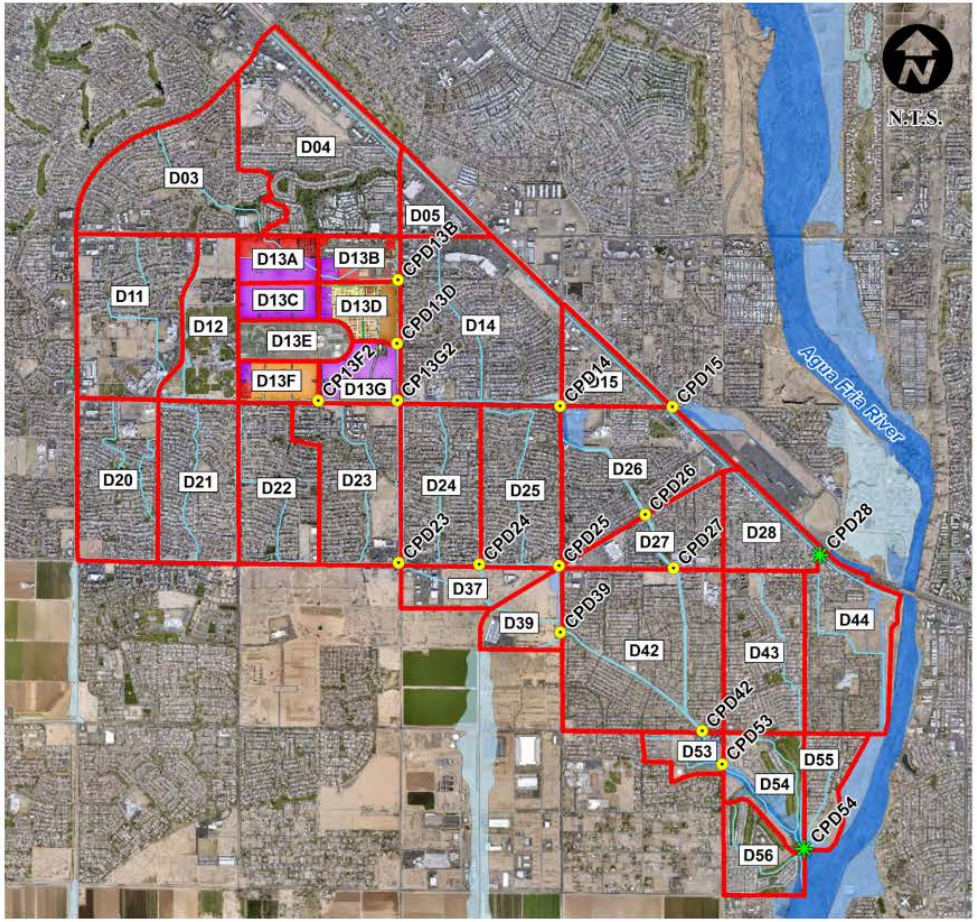


Figure 6 - Developed Conditions Watershed Map

HEC-1 Combine ID	Existing Conditions (cfs)	Scenario 1 First Flush (cfs)	Scenario 2 Detention (cfs)	Scenario 3 100Y2H Retention (cfs)
CPD13B	337	510	49	48
CPD13D	507	843	90	46
CP13F2	168	241	101	48
CP13G2	607	1105	179	52
CPD14	738	865	445	445
CPD28	481	480	480	480
CPD26	367	445	177	175
CPD27	494	496	490	490
CPD23	93	127	91	89
CPD24	100	343	97	73
CPD25	101	316	100	75
CPD39	123	379	107	107
CPD42	448	701	355	355
CPD53	361	570	229	229
CPD54	320	320	320	320

*100-year, 6-hour peak flow values shown in this table are provided at downstream combine points for comparison with post-development peak flows.

Legend

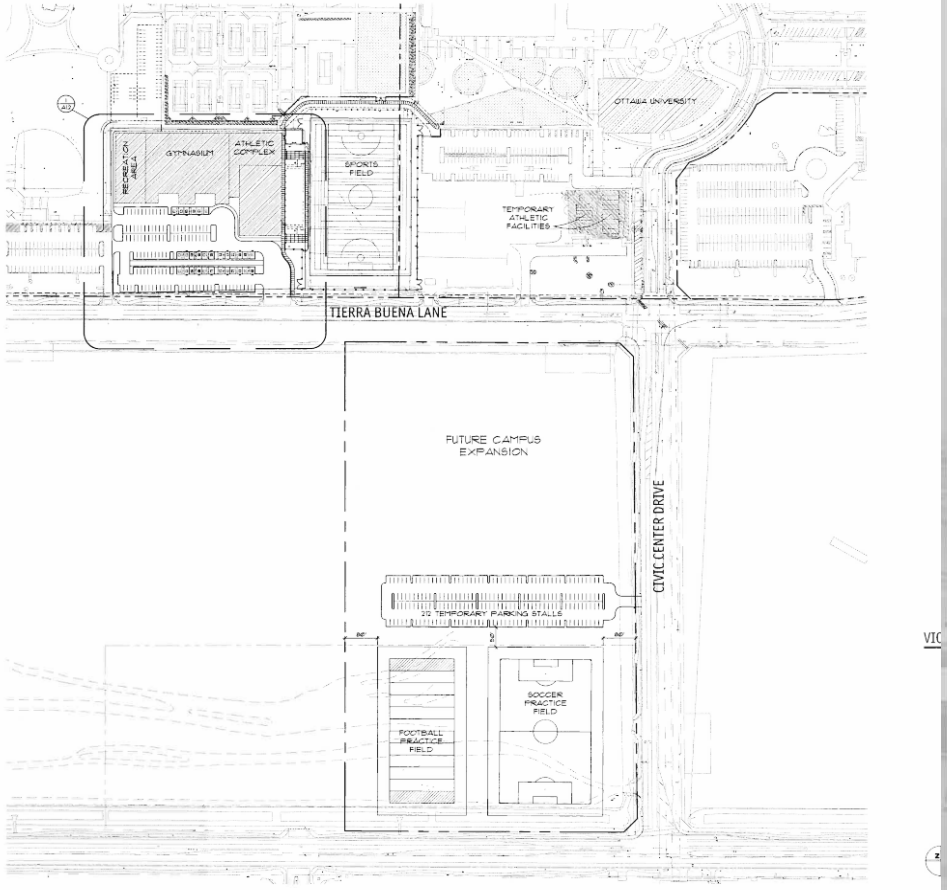
- Downstream Combine Point
- Watershed Outfall Point
- Subbasin Boundary
- ADMPU Flowlines

Floodplains

- A,
- AE,
- AE, Floodway
- AH,
- AO,

SURPRISE CENTER FISCAL IMPACT ANALYSIS

July 2017



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QUESTIONS OR COMMENTS?

Thank You

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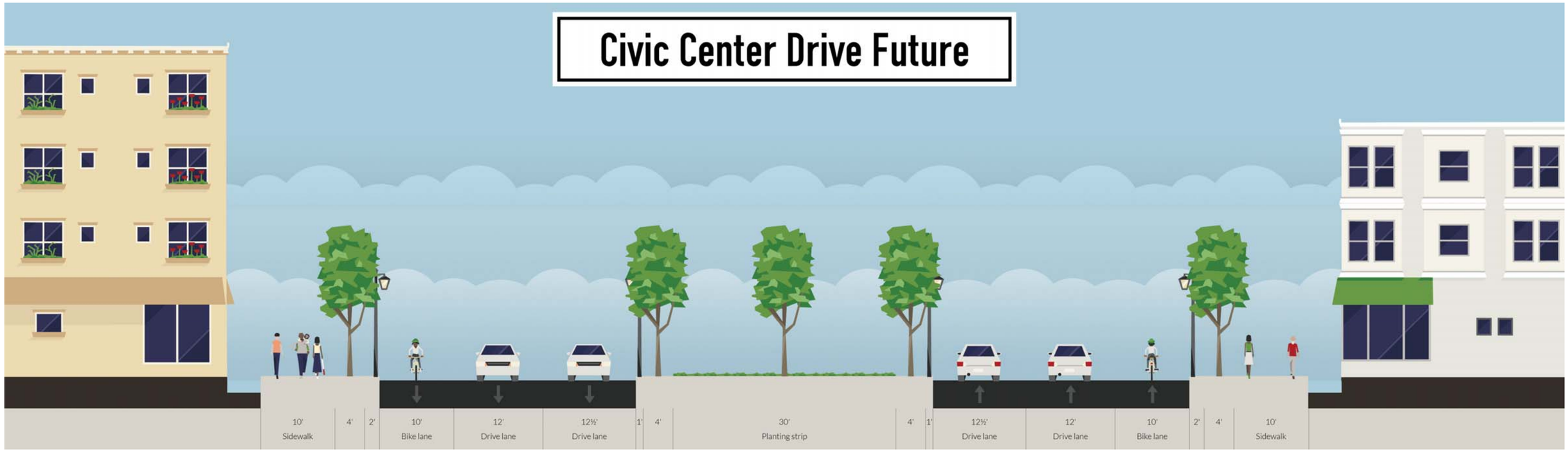
Civic Center Drive Future
10'
Sidewalk
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Drive lane
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Drive lane
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Planting strip
4'
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Drive lane
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Bike lane
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Sidewalk

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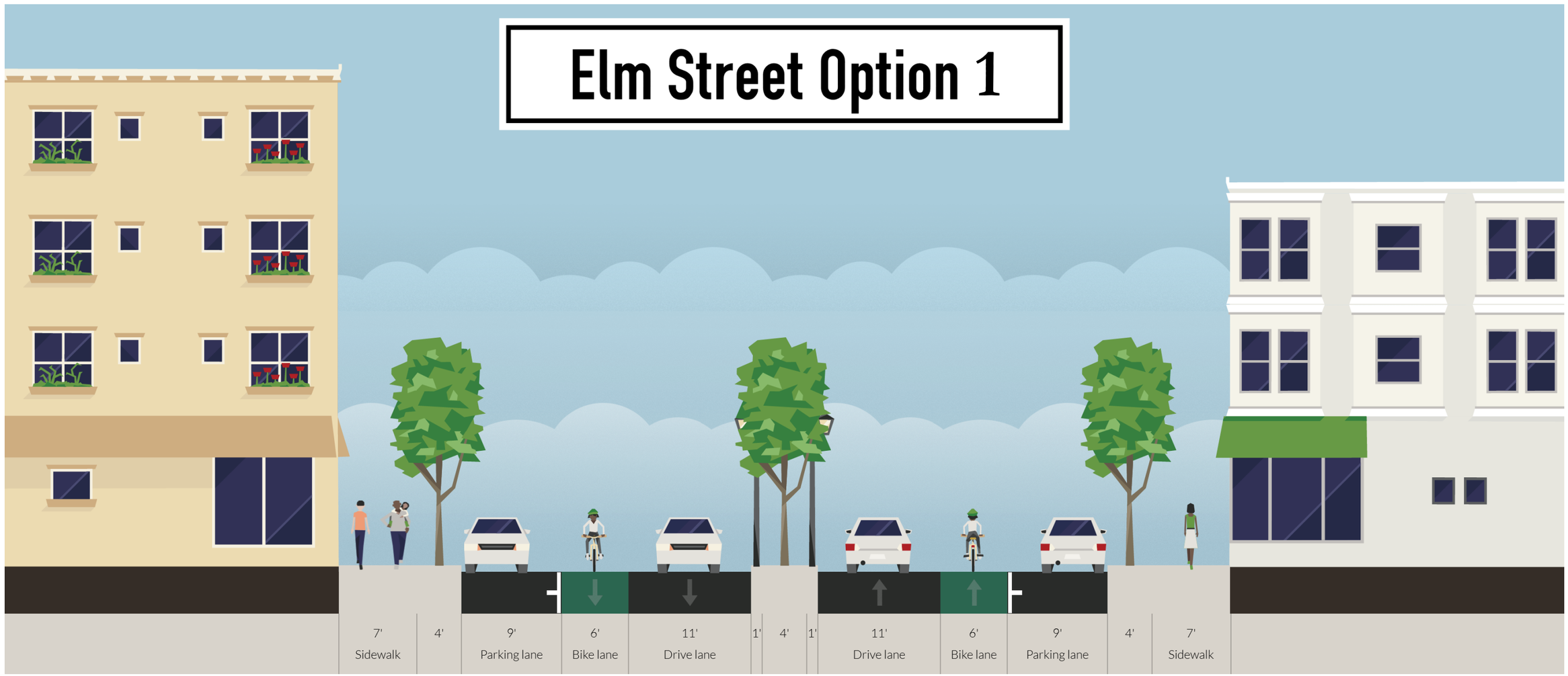
Elm Street Option 1



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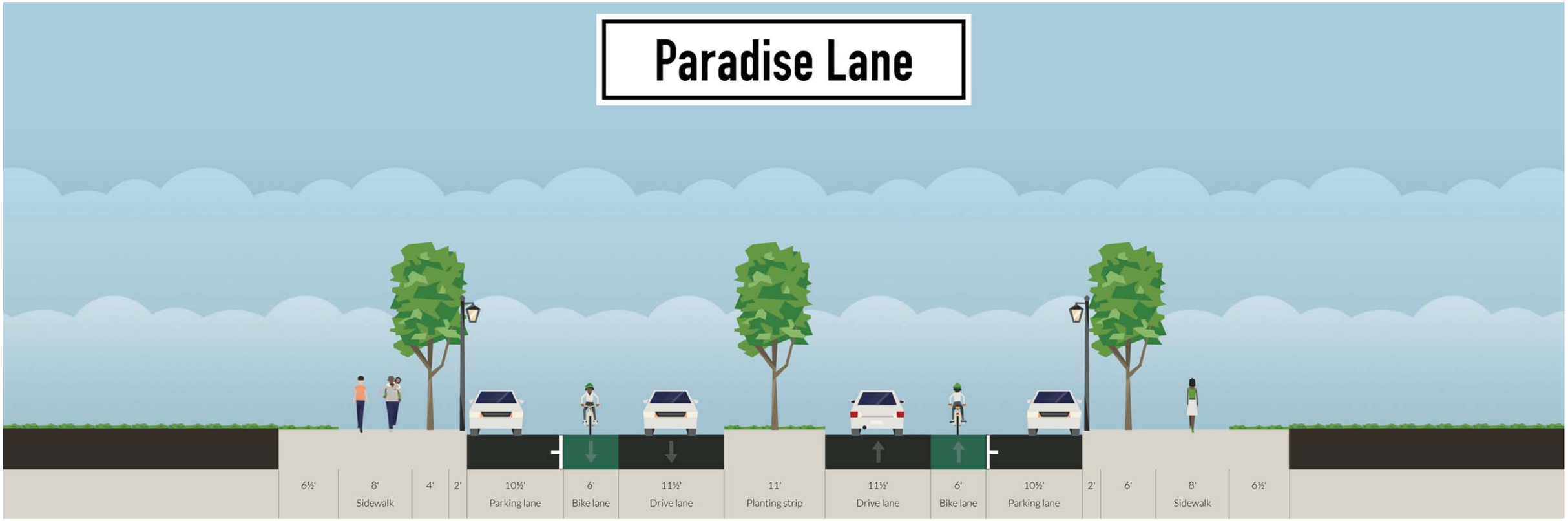
Paradise Lane
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Parking lane
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Bike lane
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Sidewalk
6½'

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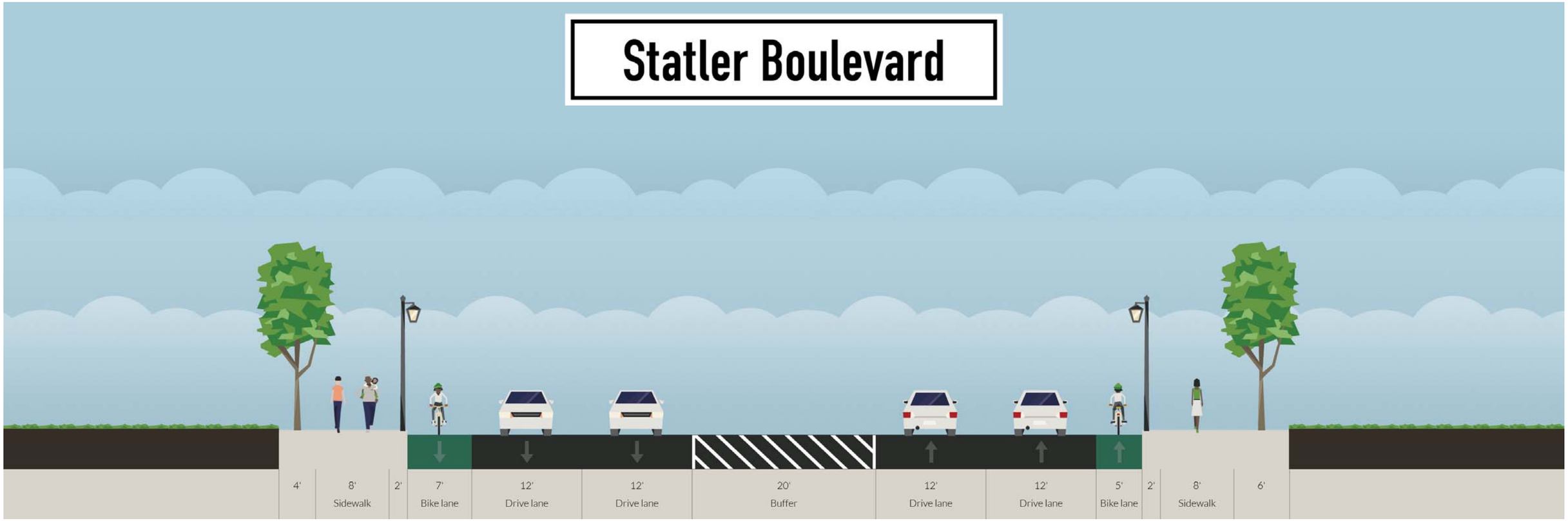
Statler Boulevard
4'
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12'
Drive lane
12'
Drive lane
20'
Buffer
12'
Drive lane
12'
Drive lane
5'
Bike lane
2'
8'
Sidewalk
6'

Master Drainage Study
For
Surprise Civic Center
Infrastructure Improvement Project

Dibble Project No. 1016064

June 28, 2017

Prepared For:

City of Surprise

SURPRISE
ARIZONA

Prepared by:

Dibble Engineering

7500 North Dreamy Draw Drive
Suite 200
Phoenix, Arizona 85020
P. 602.957.1155
F. 602.957.2838
www.dibblecorp.com

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Executive Summary

This report documents the hydrologic analyses performed as part of the Master Drainage Study (MDS) for the Surprise Civic Center (SCC) Infrastructure Improvement Project. The study prepared hydrologic models which account for varying levels of onsite storage within the study area in order to evaluate whether a reduction to the standard 100-year, 2-hour volume could be applied across the development without causing an increase to the flow rates at downstream locations. This drainage study was not prepared to evaluate or design any new drainage infrastructure or estimate a particular peak discharge within the SCC development area. Standard modeling assumptions have been made regarding the proposed land uses and loss coefficients for the developed conditions in order to provide general results that can assist with future development decisions.

The Flood Control District of Maricopa County's White Tanks/Loop 303 Area Drainage Master Plan Update (ADMPU) HEC-1 hydrology model was revised and updated to reflect current conditions. This model is used as the baseline for the evaluation of scenarios.

The site layout and land uses planned for the SCC development were provided by the developer. The SCC onsite storage scenarios analyzed are:

Scenario 1: Provide only the first flush volume onsite;
Scenario 2: Provide retention of the first flush storage volume and estimate the amount of onsite detention needed to cause no adverse impacts downstream; and,
Scenario 3: Provide the City and County typically required retention volume.

The results are as follow:

Scenario 1: Does not adequately protect downstream areas from increased flow rates originating from SCC;
Scenario 2: Can be designed to protect downstream areas. However, the maximum SCC basin(s) discharge cannot be greater than approximately 10% of the 100-year inflow discharge and the basin(s) must provide approximately 90% of the typically required retention volume; and,
Scenario 3: Adequately protects downstream areas from increased flow rates.

Additionally, a typical percolation rate was evaluated to assess the anticipated drain times for the required storage volumes and results indicate that most sites will likely meet the required 36 hour drain time without the need for additional drywells.

Two new linear retention basins were recently constructed on the north side of Greenway Road with a storage volume that did not meet the requirement for the 100-year, 2-hour developed conditions. Two storage scenarios were evaluated to determine if there would be downstream impacts. Model results indicate that if only the first flush volume is provided, then the downstream peak flows would exceed the existing conditions flows. However, if the adjacent development provides the remaining required onsite retention volume, then the post-development runoff conditions would not exceed the existing conditions flows.

Important Note: Subsequent to the development of this MDS, the City has accepted suggested revisions to the requirements stated in this report from the SCC Civil Engineer, Beck Consulting Engineers (Beck). A letter from Beck, dated June 15, 2017, outlining these deviations from the MDS is included in **Appendix D**.

I. Introduction

A. Project Background

The current Surprise Civic Center (SCC) development area is identified as a 100-plus acre civic center and recreation campus. As part of the City of Surprise continuing efforts to grow and attract new development within the study area, the city has contracted Dibble Engineering (Dibble) to provide professional services identifying, analyzing, and evaluating future development requirements. Elements of this project include a Master Drainage Study, water and wastewater analysis and roadway infrastructure improvement design. This master drainage study provides recommendations intended to help guide future development by identifying the onsite and downstream drainage impacts of multiple detention/retention scenarios.

B. Purpose and Objective

As part of this report, various drainage scenarios were modeled and resulting peak flows were compared to predeveloped existing conditions. Detailed model descriptions can be found in Section II – Study Approach & Model Revisions.

Three future condition scenarios were developed with different onsite retention requirements as follows:

1. Scenario 1 models future development conditions that provide onsite storage for "First Flush" storage retention only.
2. Scenario 2 models future development conditions that provide onsite storage for "First Flush" retention while providing supplemental detention for a 100-year, 2-hour storm event.
3. Scenario 3 models future development conditions that provide onsite storage for a 100-year, 2-hour storm event.

As a separate task, a "Greenway Road Analysis" model was prepared which derived a modified amount of onsite storage amounting to the difference in the 100-year, 2-hour storm volume minus the volume recently provided as part of the roadway storage basins located north of Greenway Road.

C. Study Area

The study area lies within Section 4 of Township 3 North, Range 1 West of the Gila and Salt River Base Meridian, City of Surprise, Maricopa County, Arizona. The 100+ acres SCC campus lies within a 1-square mile block which is the full study area for this Master Drainage study. The study area is bound by Bell Road on the north, Litchfield Road on the east, Greenway Road to the south and Bullard Avenue on the west. The study area is shown in **Figure 1 – Project Location Map**.

The existing study area is substantially undeveloped. The 100+ acre SCC campus is located near the center of the section and has been constructed to its built-out stage. The Surprise baseball complex is located to the west, residential housing is located to the East, North and South and some commercial sites have been developed in the northeast corner of the study area. A recent roadway improvement project along Greenway Road has added two new storage basins along the southern edge of the study area. A general site location exhibit is shown in **Figure 2 – Site Map.**

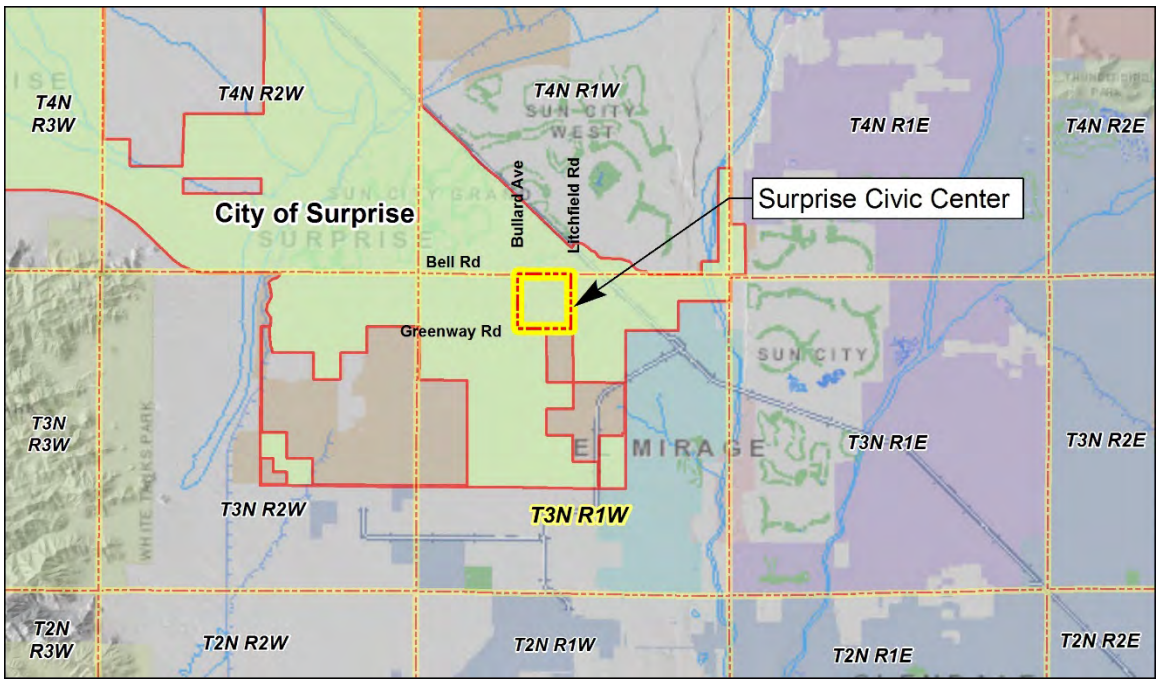


Figure 1 - Project Location Map

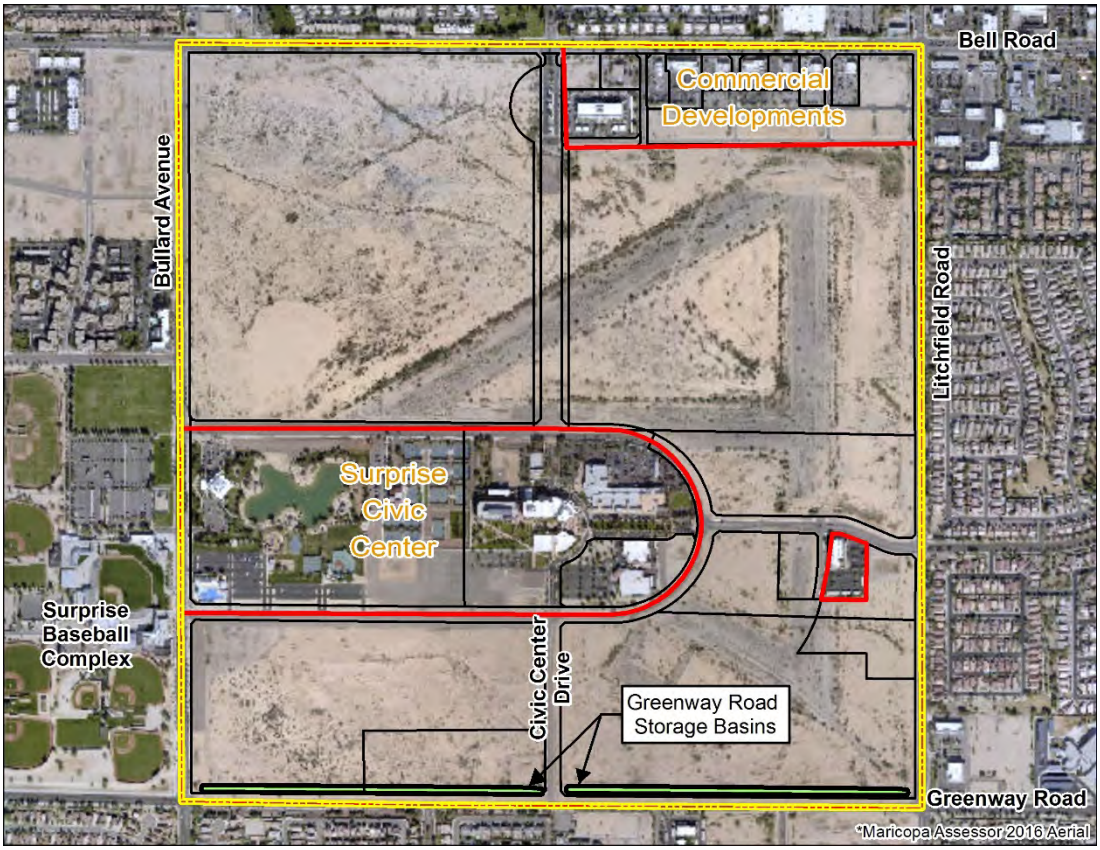


Figure 2 - Site Map

D. Data Collection

Dibble coordinated with the various agencies and stakeholders to collect relevant information for this study including the Flood Control District of Maricopa County (FCDMC), the City of Surprise (City) and the Surprise Center Development Company, LLC (SCDC) and their engineers.

The FCDMC provided data from the 2009 and 2015 updates to the Loop 303/White Tanks ADMPU project prepared for the District. The models from this study were modified and updated to prepare the watershed hydrology models for this Master Drainage Study. In addition, various offsite drainage reports were provided by the City to help with updating the hydrology models to account for existing offsite development retention volumes. The most helpful being a drainage study prepared for an ADOT project at the Bell Road traffic interchange on the US-60. This study provided key information about the existing retention volumes in three of the five upstream subbasins which resulted in a significant reduction to the anticipated upstream discharge flow rates. Excerpts from various studies referenced in this report have been included in **Appendix A** – **Supporting Documents**.

E. Conditions & Assumptions

The ADMPU included three different models prepared to represent both the Existing and Future land use conditions and also to reflect both interim completed drainage related Capital Improvement Projects (CIP) and fully completed CIP drainage projects. After an initial coordination meeting with the City of Surprise, it was decided that the most appropriate model to use as the base condition for this evaluation was the "Existing Conditions with (all) CIP projects in place". The assumption here is that certain projects along Bullard Avenue and Greenfield Road were assumed to be fully constructed at the time that the study area would also be fully developed. This changes the amount of flow that would be conveyed to the east and combine with the site discharge to locations downstream. This base model was found to be the most appropriate condition since there is already current progress on building these CIP projects and they will most likely be incorporated at the time of buildout for the SCC site.

F. Flood Insurance Zone

According to Flood Insurance Rate Map (FIRM) Panels 04013C1220L, 04013C1240L, 04013C1660L and 04013C1680L dated October 16, 2013, the study area is located in Flood Insurance Zone X. A portion of the FIRM panels are shown in **Figure 3 – FIRMette Map**.

Zone X (Shaded) is defined as follows:

> *"Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than one foot or with drainage areas less than one square mile; and areas protected by levees from 1% annual chance flood.''*

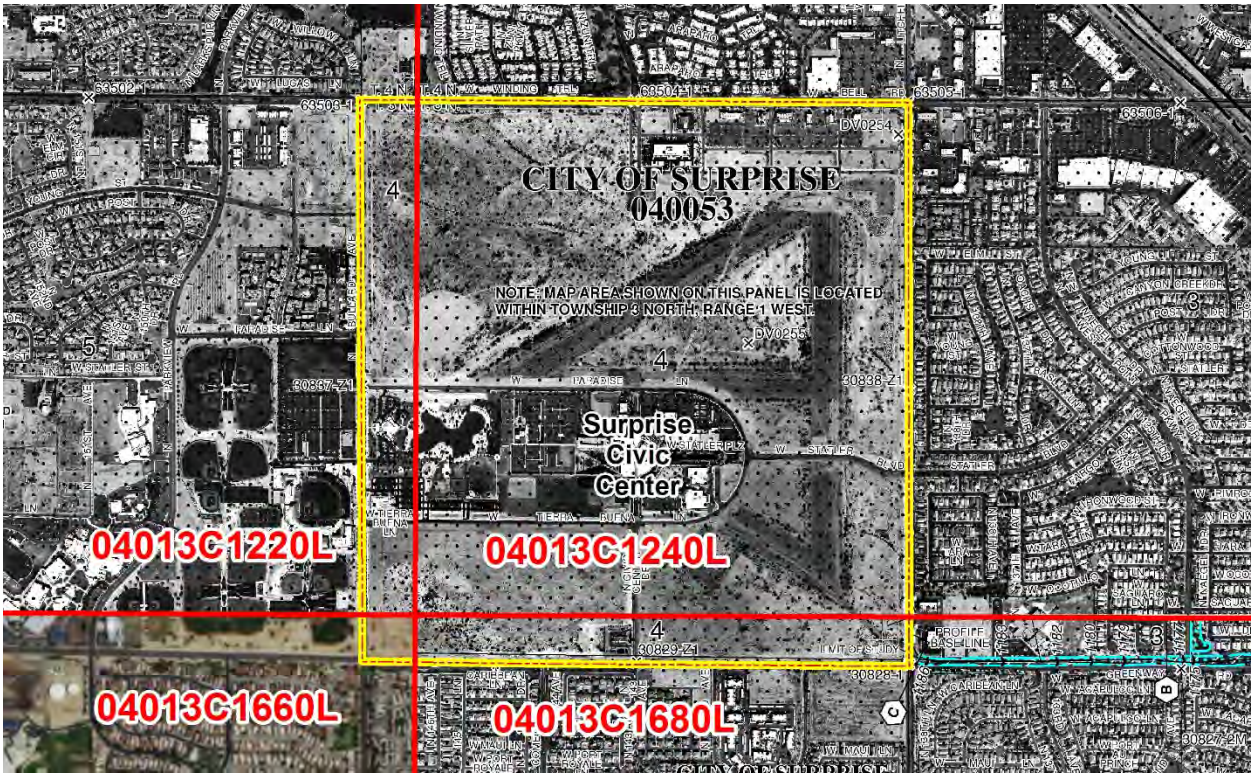


Figure 3 – FIRMette Map

II. Study Approach & Model Revisions

A. Hydrologic Modeling Parameters

Hydrologic models were revised to estimate downstream runoff impacts resulting from changes to land use and retention scenarios within the SCC study area. The methodology continues the ADMPU approach which generally follows the *Drainage Design Manuals for Maricopa County* (Hydrology & Hydraulics, September 2013). Excerpts from the ADMPU hydrologic modeling parameters have been included in **Appendix B** to help document the specifics used for the initial evaluation. Other modeling parameters updated or prepared as part of this hydrologic evaluation are listed below.

1. The ADMPU subbasin "D13" (See **Figure 4**) was subdivided based on a proposed land use map provided by SCDC. Boundary lines were generally drawn along proposed roadway centerlines. No other modifications were made to the ADMPU subbasin boundaries.
2. NOAA Atlas 14 Rainfall values were not modified from that used in the ADMPU.
3. Land use codes prepared and customized for the ADMPU were used for this study. Land use codes were estimated from the descriptions specified on the developer provided future land use map (see **Appendix A**).
4. New routing reaches were prepared to represent the conveyance parameters between the study area subbasins. 8-point north depth sections were prepared for existing and proposed conditions based on the assumed available right-of-way illustrated on the proposed land use plan.

5. Onsite retention volumes were accounted for in the model for the first flush and 100-year, 2-hour modeling scenarios using diversion records with a maximum volume value set. For the "Detention" scenario, a storage route was prepared to account for the relationship between stage-storage-discharge components.

B. Offsite Drainage Analysis

This SCC Master Drainage Study hydrologic model was built upon the FCDMC White Tanks/Loop 303 ADMPU models prepared in 2009 and updated in 2015. In order to provide a concise drainage evaluation from the contributing study area watershed, upstream and downstream contributing areas not relevant to the SCC development were removed. The ADMPU watershed along with the SCC model watershed is shown in **Figure 4 – APDMU AHA Study Area**.

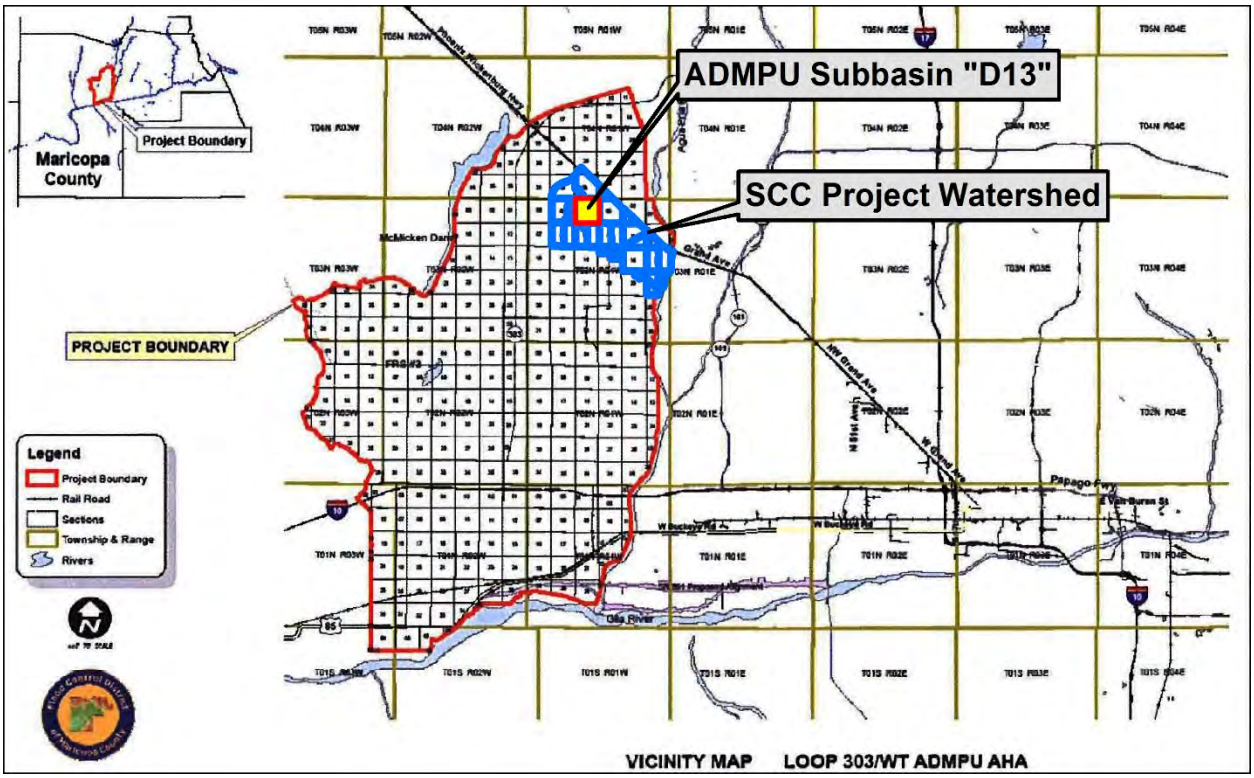


Figure 4 – ADMPU AHA Study Area

C. Existing Conditions Update

The one square mile ADMPU subbasin D13 that correlates with the SCC project area was subdivided into seven subbasins (D13A, D13B, D13C, D13D, D13E, D13F, D13G) as shown on **Figure 5 – Onsite Developed Conditions** and **Figure 6 - Developed Conditions Watershed Map.** The initial hydrology model was prepared to reflect an updated or "corrected effective" existing conditions model. This model incorporated existing conditions land uses to prepare the loss parameters for the new subbasins. In order to investigate the future buildout conditions of the SCC area, onsite model parameters were updated for these new subbasins to account for development changes since the original Loop 303/White Tanks ADMP

was prepared. Model changes include incorporation of anticipated drainage flow routes through subbasin D13, new storage basins and drainage infrastructure, and reassignment of existing retention volumes.

After the initial Existing Conditions model was clipped and updated, it was compared to the original ADMPU model for quality control purposes. There were significant changes in peak flow rates at certain locations due to the addition of increased storage modeled in certain subbasins. However, most subbasins had little to no change from the ADMPU model peak flow rates.

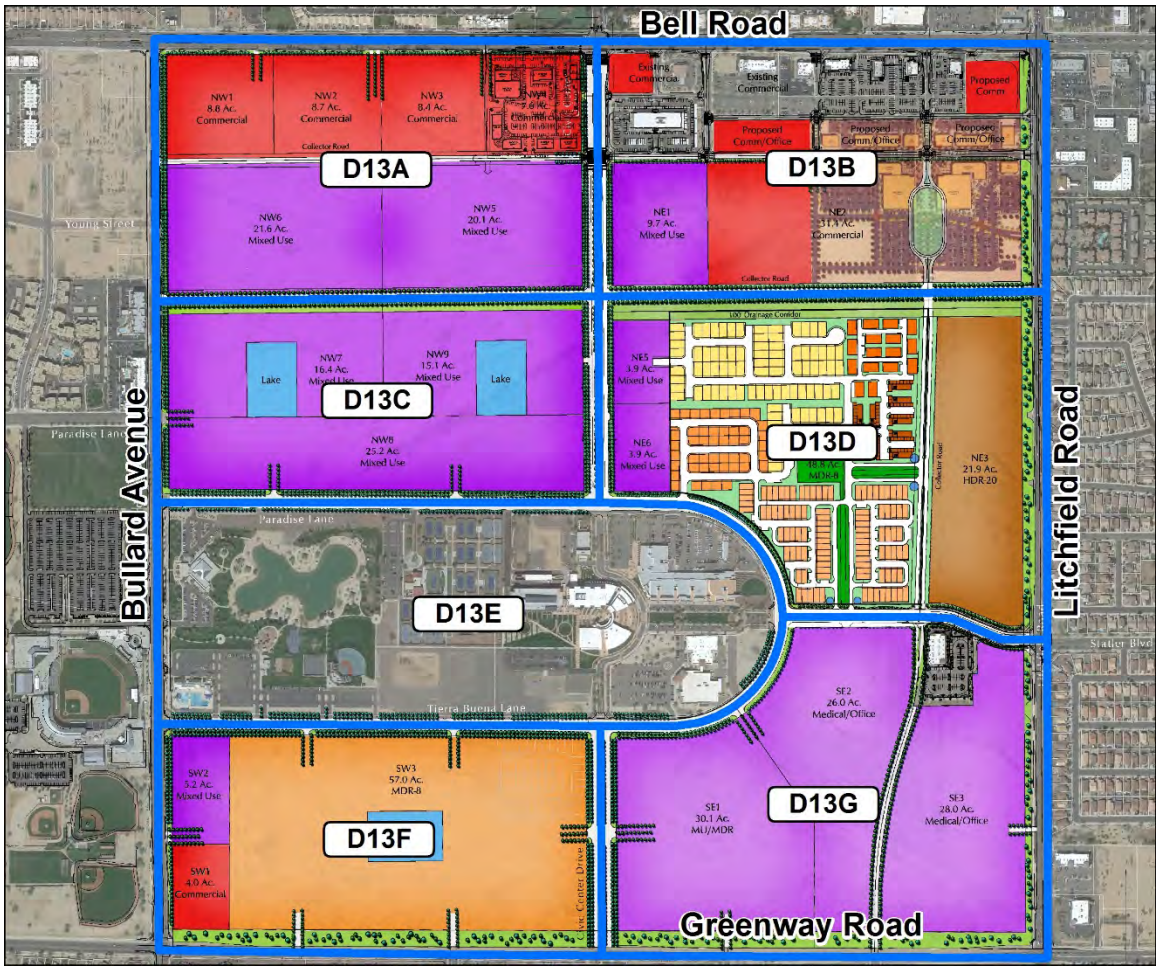


Figure 5 – Onsite Developed Conditions

1. Route Updates

Existing routing reaches flowing through subbasins were prepared with general sheet flow conditions and existing topography using the Normal Depth Method. The Normal Depth method uses 8-point sections to define the route cross sections. The section shapes for subbasins D13A, D13B, D13C, D13D and D13E (see **Figure 6 - Developed Conditions Watershed Map**) use an anticipated 200-foot drainage corridor width, a default side slope of 20H:1V and trapezoidal shape. Developed conditions routes use a 4H:1V side slope and use a maximum top width as defined by the greenbelt areas provided in the developed land use map. Section shapes for subbasins D13F and D13G were modified to reflect geometry shown in the City of Surprise Greenway Road design plans.

2. Current Onsite Conditions

Subbasin D13E is currently considered to be in its built out state, see **Figure 5 – Onsite Developed Conditions**. Subbasin D13E was excluded from changes in retention/dentition conditions in all modeling scenarios. For both existing and developed conditions scenarios, subbasin D13E was assumed to retain the entire volume that the ADMPU model designates as retained volume in subbasin D13, which is 17.1 acre-ft.

New improvements along the north side of Greenway Road have recently been completed. These improvements include the construction of two new retention basins. One basin is located east of Surprise Center Parkway and the other located on the west. The majority of the basin is retained using rock check dams and does not have an outfall drain pipe. The east ends of both basins do include an outfall that allow flows to drain under Surprise Center Parkway and Litchfield Road. For this reason, the basins were modeled using both a volume diversion and a separate stage-storage-discharge routing reach. The Greenway Road basins will be referred to herein as the East and West Greenway basins.

3. Retention Updates

Model revisions were made to account for additional offsite storage volumes that were not accounted for in the original ADMPU models. A recent hydrologic study provided by the City for an ADOT project along Bell road included detailed information about the residential storage volume in the developments immediately north of the SCC study area in subbasins D03, D04 and D05. The volumes determined within each of these subbasins are larger than the volumes modeled in the original models and were updated for this study. In addition, the recent retention basins included in the Greenway Road project provided additional storage within subbasins D13F and D13G.

D. Developed Conditions Scenarios

Developed Conditions models were prepared to evaluate the impacts of different retention requirements on a fully developed SCC land use condition. The developed conditions land uses were delineated and applied to the onsite subbasins using the Surprise Town Center Land Use Concept exhibit as shown on **Figure 5 – Onsite Developed Conditions**. Three storage requirement scenarios were modeled to evaluate their impacts to the downstream watershed. The results from these models were compared to the updated Existing Conditions model as basis for comparison.

SCENARIO 1- FIRST FLUSH RETENTION ONLY

The Scenario 1 model considers developed land uses and accounts for the minimum onsite retention requirement for the initial “First Flush” volume only. This model involves retaining the first 0.5 inch of the direct runoff from a storm event. The volume is determined using a rational method equation where the C-values is equal to 1. Storage volume is modeled as a diversion within the HEC-1 model.

SCENARIO 2 – 100-YEAR, 2-HOUR DETENTION/RETENTION

The Scenario 2 model considers developed land uses and accounts for a full retention of the first flush volume along with detention of an additional storage volume up to the 100-year, 2-hour volume. The detention basin allows a graduated discharge rate based on a rising headwater. In order to determine the

required amount of storage and the appropriate discharge rate, a spreadsheet was used to vary the basin size and discharge values until the peak flows at the various downstream combine pointes were at or below the existing conditions peak discharge, thereby indicating no adverse impact to downstream areas. The detention basin is modeled using a Stage-Storage-Discharge routing record within the HEC-1 model.

SCENARIO 3 – 100-YEAR, 2-HOUR RETENTION ONLY

The Scenario 3 model considers developed land uses and accounts for onsite storage of the full 100-year, 2-hour required storage volume. The volume is determined based on the an estimated runoff coefficient value of 0.95 for the developed condition and the 100-year, 2-hour rainfall depth (2.21 inches). The storage volume is modeled as a diversion within the HEC-1 model.

E. Greenway Road Basin Analysis

The Greenway Road project included linear storage basins along the north side of the roadway. The basins did not fully satisfy the City standard 100-year, 2-hour storage requirement and the remaining volume was assumed to be provided by SCDC upon development of the SCC property. The first scenario would involve SCDC storing the first flush volume and the remaining amount would discharge into the Greenway basins. This scenario was found to match the conditions found in the original "developed conditions" Scenario 1 model described above and a new model was not prepared.

The second condition was slightly different than the original "Scenario 3" model described above. In Scenario 3, SCDC would still provide the entire 100-year, 2-hour storage volume for subbasins D13F and D13G. As part of this Greenway Road basin analysis, an additional model was prepared to evaluate the downstream impacts for a condition where SCDC only provides the difference between the full 100-year, 2-hour storage volume and the volume already provided in the Greenway basins. **Table 1** below shows how the volume provided by SCDC is calculated.

Table 1 – Greenway Road Analysis Retention Volumes

HEC-1 Subbasin ID	Required 100-year, 2-Hour Volume (ac-ft)	Greenway Basin Volume Provided (cc-ft)	SCDC Required Storage Volume (ac-ft)
D13F (West Basin)	14.35	5.35	9.00
D13G (East Basin	18.85	5.40	13.45

III. Percolation and Drywell Analysis

A. Approach

As development occurs within the SCC study area, stormwater storage basins will be required to drain within 36 hours after the storm has ended. Drain times are dependent upon the basin footprint area and the site specific percolation rates. If ground percolation is not adequate, drywells can be added to help drain the basin within the required 36-hours. The City discusses the requirements for the design of detention/retention basins and their disposal in their 2016 Policies and Engineering Development Standards, Chapter 5 – Storm Water Standards. In some cases, the City refers to the Maricopa County

Drainage Policies and Standards. Pertinent sections from these two documents have been included with this Master Drainage Study in **Appendix C**.

To evaluate the feasibility of meeting the City-required drain time, a table was prepared to evaluate storage volumes proposed as part of the 3 modeling scenarios for first flush, detention and full retention. An estimated ground percolation rate of 1.4 in/hr was established from the minimum tested value at the recent Greenway Road improvement project. Pertinent excerpts from that testing is included in **Appendix C**.

Certain assumptions were made about the basins used for each scenario including the basin depth and side slope. The first flush scenario assumes a 1-ft deep basin. The basin is then sized to hold the required volume and the resulting footprint is used to evaluate the required drain time using the 1.4 in/hr drain rate. Similarly, the Detention and Retention volumes were also evaluated using a basin sized to hold the required volume that was 3-ft deep and another option that was 4-ft deep. The detention basin is assumed to drain to an outfall through other means such as a spillway or a drain pipe. However, for this sensitivity analysis, it was assumed that the basin must drain through ground percolation. Results of this analysis are included in **Table 2**. Additional detailed calculations are included in **Appendix C**.

Table 2 – Ground Percolation Analysis Results

HEC-1 Subbasin ID	First Flush Scenario Required Drain Time (1 ft Depth) (Hours)	Detention Scenario Required Drain Time (3 ft Depth) (Hours)	Retention Scenario Required Drain Time (3 ft Depth) (Hours)
D13A	8.7	27.1	27.1
D13B	8.7	27.1	27.1
D13C	8.8	27.3	27.2
D13D	8.7	27.2	27.0
D13E	*	*	*
D13F	8.8	27.4	27.1
D13G	8.7	27.0	27.0

**Subbasin D13E is considered to be built-out and was not analyzed.*

The results indicate that if the basins are sized to contain the required storage volumes using a total depth of 3-ft and a side slope of 4H:1V, then the footprint area *may* be adequate to drain the required volume using the test percolation rate of 1.4 in/hr. **All developments will be required to provide site specific percolation test rates for basin drain time calculations to verify this conclusion**.

As part of this task, Dibble also evaluated basins that were sized to store the required volume with a total depth of 4-ft. In this case, the increase depth allows for a smaller footprint at the basin bottom. This reduced area produced a drain time just over the required drain time at approximately 37 hours. A slightly larger basin footprint was required to meet the 36-hour drain time requirement which resulted in an average excess capacity of approximately 0.5 ac-ft.

The test also indicated that a percolation test rate lower than 1 in/hr typically produced a drain time greater than 36-hours when a 3-ft deep basin was used. In this condition, additional drywells may be warranted.

B. Drywells

Per the City requirements, "Drywells are required for any depth of retention in excess of one foot and for retention basins that have volume greater than 1,000 cubic feet." Pertinent sections related to drywells from the City and County standards are included in **Appendix C**.

IV. Results and Recommendations

The drainage concepts and calculations presented in this report are in conformance with the current Maricopa County Development Guidelines as well as the Drainage Design Manual by the Flood Control District of Maricopa County.

Peak flow estimations were generated for an Existing Condition model scenario along with three additional developed condition scenarios and one Greenway Road Basin scenario. Electronic HEC-1 models and DDMSW files will be included as a part of the study results. A comparison of the modeled scenarios is discussed below.

Offsite flows routed from subbasin D12 and D04 are anticipated to enter the study area at subbasin D13F and D13B. The routed flows travel along typical drainage paths, ultimately discharging at the southeast corner of subbasin D13G, northwest of the intersection at Litchfield Road and Greenway Road. Calculations were preprocessed using the Maricopa County DDMSW program (version 5.3.0) and run with the US Army Corps of Engineers' HEC-1 computer software program (version 4.1, June 1998). Results from the hydrologic analysis are included in **Appendix B**.

A. Developed Conditions Models Results

Peak discharges were determined within the study area using the developed conditions land use and the various storage scenarios. However, the primary purpose was to verify the impact to downstream locations based on these different storage requirement options. To illustrate a comparison of the downstream model results, a drainage map showing the key downstream combine point locations has been included as **Figure 6 - Developed Conditions Watershed Map**. The map includes a table which shows a side-by-side comparison of the 100-year peak discharge flow rates for the Existing Conditions, First Flush, Detention and Retention scenarios. Text color in the comparison table is used to show whether the flow rate falls above or below the existing conditions at that location. Red text displays a peak flow value higher than existing conditions and green text is used when the peak flow is at or lower than the existing condition. For more detailed summary of peak discharge values, refer to hydrology documentation included in **Appendix B**.

The results indicate that when the required storage is only provided for the first flush volumes, that the increased runoff caused by the new development will result in larger peak flows at all critical downstream

combine points. This is due to the increased onsite runoff coefficients and relative low onsite retention storage.

Jumping ahead to Scenario 3, the 100-year, 2-hour retained volumes result in no negative downstream impacts based on the model results. This volume requirement is chosen by many local cities and counties as the required storage volume to prevent increased flow rates downstream when development occurs.

The Detention model, Scenario 2, used an iterative process to estimate the amount of required storage and allowable discharge that would prevent an increase in flow rates at downstream confluence locations. A spreadsheet was used to modify the SCC basin sizes and discharge rating curves which were then used in the HEC-1 model. The results of the model were reviewed to check the SCC basins performance and observe whether the proposed condition peak flow rate was higher than the existing condition. The amount of discharge allowed to leave the SCC basins were decreased while the amount of basin volume was increased to prevent the basins from overtopping. SCC basins were assumed to reach a maximum depth of 4-feet with a side slope of 4H:1V. A discharge rating curve was produced based on a weir calculation with a varying bottom width. A result was eventually reached which produced downstream discharges that were at or lower than the existing condition flow rates at each downstream combination point. The maximum discharge rates when the basins were full were found to be approximately 10% of the incoming flow rate, which will vary depending on the drainage area sizes. In order to accommodate these reduced discharge rates, the storage volumes had to be increased to an average value equal to approximately 90% of the required 100-year, 2-hour storage volume.

When compared to the initial results discussed at the August 4, 2016 Progress Meeting, the required storage volume results for Scenario 2 increased. This is largely because the existing conditions peak flow rates were recently reduced based on some newly obtained information – notably the ADOT Bell Road/US-60 Drainage Study, and the addition of the new storage provided by the Greenway Road Improvements project. The results of adding this additional existing storage into the existing conditions model lowered the existing downstream flow rates. This in-turn required additional SCC onsite storage to match the new lower existing flow rates.

Design flows presented in this report are for evaluation of different storage requirement scenarios and are not intended to be used directly for the design of any proposed drainage infrastructure. The hydrologic models prepared for this analysis may be updated and further refined with more detailed parameters by developers for their design uses.

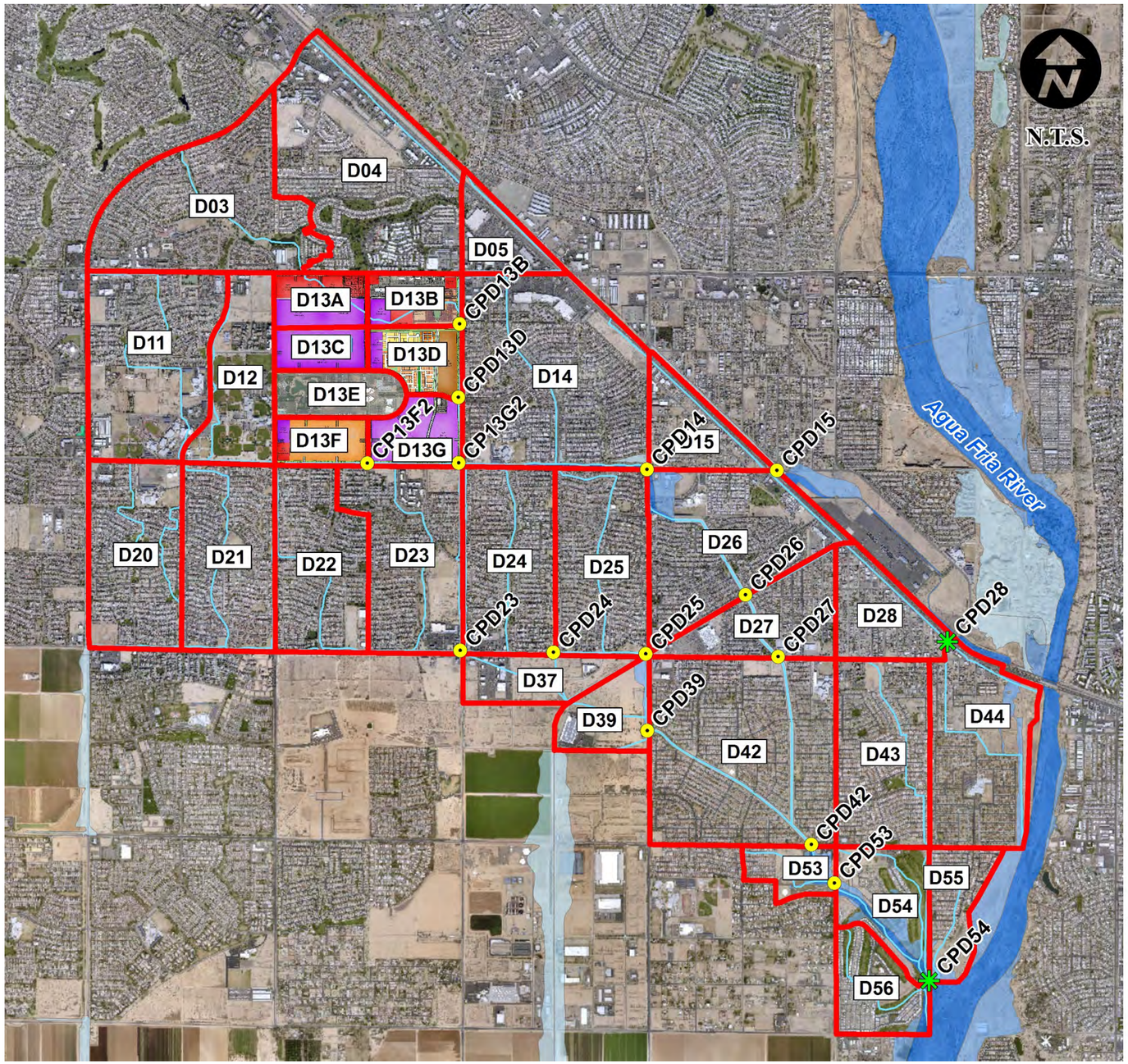
B. Greenway Road Basin Results

The City requested that Dibble review the storage options for the developable area adjacent to the newly constructed Greenway Road retention basins. The goal, once again, was to determine the storage requirement that would prevent an increased flow rate downstream of the study area when compared to the existing condition. The first scenario involved providing only the first flush volume in the developed condition and the remaining runoff would discharge into the Greenway basins. In this scenario, we have assumed that the other subbasins in the study will also assume a similar condition of storing only the first flush volume. Under these circumstances, the results match those modeled under the Scenario 1 Developed Conditions model which do not meet the existing conditions flow requirements.

The second scenario assumes that all subbasins in the study area provide 100-year, 2-hour retention except for subbasins D13F and D13G. Since these areas already have a portion of their 100-year, 2-hour storage provided, they only provide the difference between the Developed Conditions storage requirement and what was already provided in the East and West Greenway Road basins. The results indicate that under this condition, the downstream peak flows will not exceed the existing conditions values. Results are included as **Table 3 - Greenway Road Peak Discharge Flows**.

Table 3 - Greenway Road Peak Discharge Flows

	Existing Corrected Effective (cfs)	Greenway Retention Scenario (cfs)
CPD13B	337	**48**
CPD13D	507	**46**
CP13F2	168	**110**
CP13G2	607	**134**
CPD14	738	**445**
CPD15	417	**416**
CPD28	481	**480**
CPD26	367	**175**
CPD27	494	**490**
CPD20	328	328
CPD21	324	324
CPD22	80	80
CPD23	93	**90**
CPD24	100	**89**
CPD25	101	**91**
CPD39	123	**107**
CPD42	448	**355**
CPD53	361	**229**
CPD54	320	320



HEC-1 Combine ID	Existing Conditions (cfs)	Scenario 1 First Flush (cfs)	Scenario 2 Detention (cfs)	Scenario 3 100Y2H Retention (cfs)
CPD13B	337	510	49	48
CPD13D	507	843	90	46
CP13F2	168	241	101	48
CP13G2	607	1105	179	52
CPD14	738	865	445	445
CPD28	481	480	480	480
CPD26	367	445	177	175
CPD27	494	496	490	490
CPD23	93	127	91	89
CPD24	100	343	97	73
CPD25	101	316	100	75
CPD39	123	379	107	107
CPD42	448	701	355	355
CPD53	361	570	229	229
CPD54	320	320	320	320

*100-year, 6-hour peak flow values shown in this table are provided at downstream combine points for comparison with post-development peak flows.

Legend

- Downstream Combine Point
- Watershed Outfall Point
- Subbasin Boundary
- ADMPU Flowlines

Floodplains

- A,
- AE,
- AE, Floodway
- AH,
- AO,

Figure 6 - Developed Conditions Watershed Map

V. References

1. City of Surprise. Policies and Engineering Development Standards. Chapter 5 – Storm Water Standards. 2016.

2. Erie & Associates, Inc. *Northwest Corner of Greenway Road and Litchfield Road, Drainage Report*. December 10, 2015.

3. FEMA. FIRM Panels 04013C1220L, 04013C1220L and 04013C1220L. October 16, 2013.

4. Flood Control District of Maricopa County. *Drainage Design Manual for Maricopa County, Arizona, Hydrology*. August 2013.

5. Flood Control District of Maricopa County. *Drainage Design Manual for Maricopa County, Arizona, Hydraulics*. August 2013.

6. Flood Control District of Maricopa County. *Drainage Policies and Standards*. January 26, 2016.

7. GHD. *Greenway Road, Litchfield Road to Bullard Avenue, Asbuilt Plans*. September 23, 2015.

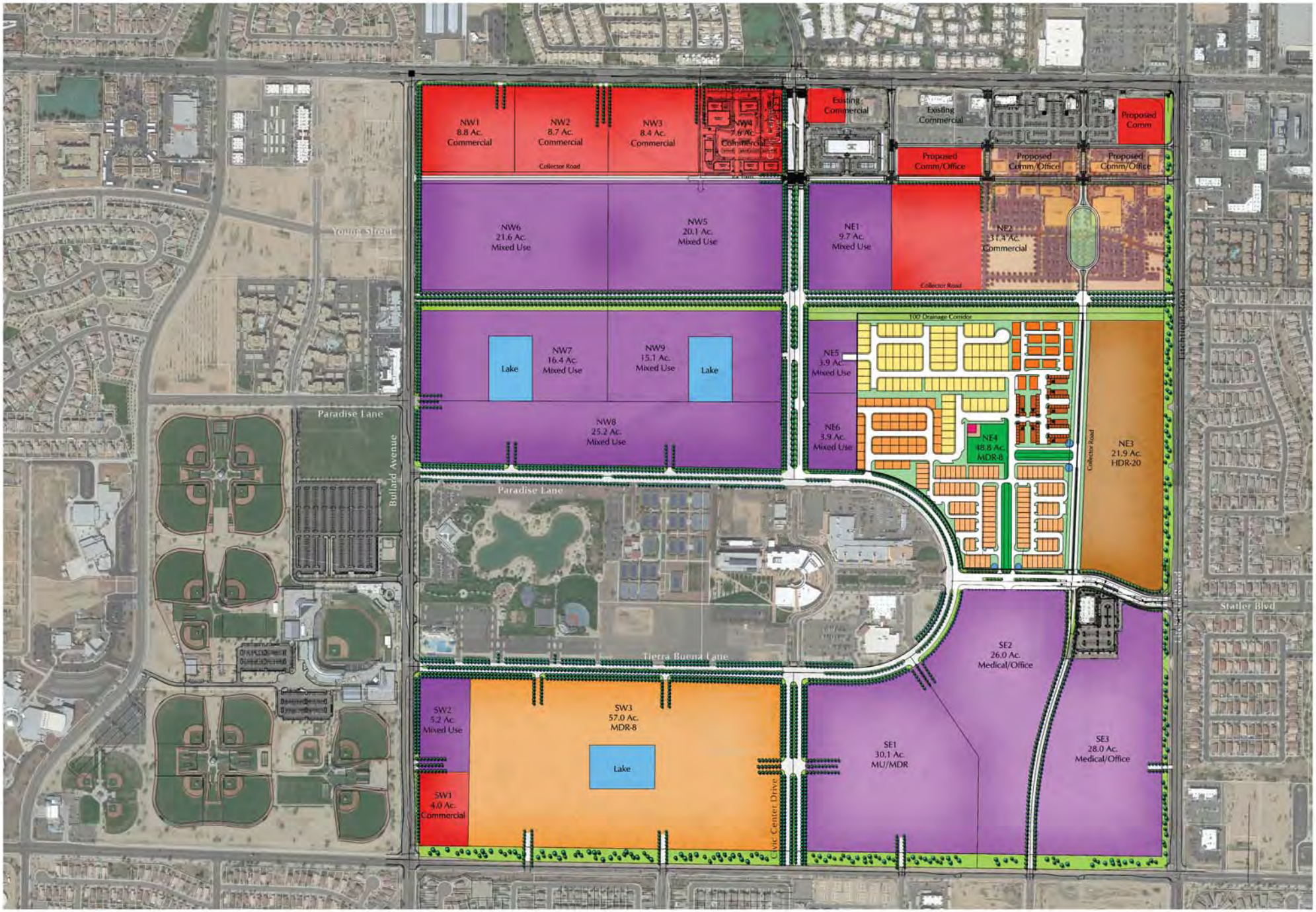
8. GHD. *Greenway Road, Litchfield Road to Bullard Avenue, Drainage Report*. November, 2015.

9. Greey Picket. *Town Center Land Use Concept* (for) SCDC, LLC. February 1, 2015.

10. TYLIN International. *US 60/Bell Road TI, Draft Final Drainage Report*. May 13, 2016.

Appendix A

Supporting Documents



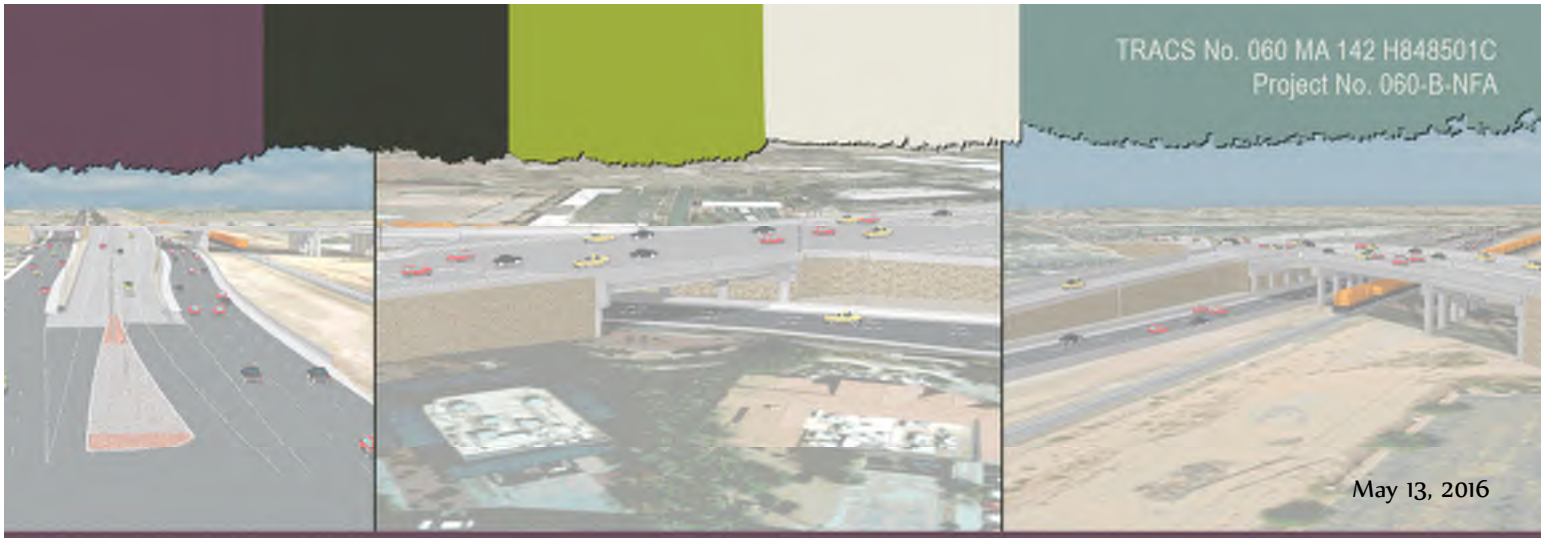
THE CITY
Surprise
by
Surprise Center Development Company

Town Center Land Use Concept

February 1, 2016

SCALE: 1" = 200'

S.C.D.C. LLC.
GREEY|PICKETT



TRACS No. 060 MA 142 H848501C
Project No. 060-B-NFA

May 13, 2016

DRAFT FINAL DRAINAGE REPORT

ADOT

WICKENBURG - PHOENIX HIGHWAY (US 60)

US 60/BELL ROAD TI

COFFMAN SPECIALTIES, INC.
TYLIN INTERNATIONAL
in association with Parsons Brinckerhoff

Subbasin D03		Subbasin D04				Subbasin D05	
Retention Basin	Volume Provided (AC-FT)	Retention Basin	Volume Provided (AC-FT)	Retention Basin	Volume Provided (AC-FT)	Retention Basin	Volume Provided (AC-FT)
3-01	1.50	4-01	1.03	4-13A	0.43	Other	13.88
3-02	0.72	4-02	0.40	4-13B	2.05	ON-1	1.500
3-03	0.67	4-03	0.69	4-13C	4.53	ON-2	0.655
3-04	16.28	4-04	1.26	4-14	0.25	ON-3	0.661
3-05	9.35	4-05	3.38	4-15	0.23	ON-4	0.114
3-06	4.20	4-06	1.45	4-16	1.73	ON-5	0.156
3-07	1.77	4-07	5.98	4-17	0.12	ON-6	0.123
3-08	3.49	4-08	3.04	Other	27.35	ON-7	0.126
3-09	58.81	4-09	9.51	**Total**	**76.49**	ON-8	0.143
3-10	4.51	4-10	5.46			**Total**	**17.36**
3-11	2.83	4-11	6.30				
3-12	6.61	4-12	1.29				
Total	**110.75**						

Assumes 100-year 2-hour Retention (2.13 inches) NOAA-14

Assume 100-year 1-hour Retention (2.40 inches) NOAA-2

D03

D04

D05

LEGEND

- Offsite Watershed Subbasins
- Excluded Subbasin Areas
- Retention Basin Areas

General Retention Areas

- NOAA-14 Area
- NOAA-2 Area

NGVD29 Contours

- 10-foot Contour
- 2-foot Contour
- Roads

ADOT

OFFSITE RETENTION BASIN MAP
EXHIBIT 9

US60 - BELL ROAD TRAFFIC INTERCHANGE
TRACS NO. 060 MA 142 H848501C
PROJECT NO. 060-B-NFA

0 400 800 Feet

TYLIN INTERNATIONAL
engineers| planners| scientists

Final Hydrology Report

Loop 303/White Tanks ADMPU Area Hydrologic Analysis in Maricopa County, Arizona

Flood Control District of Maricopa County

Version 1.2 / September 2009
HDR Project No. 079902
FCD Contract No. 2007C031

Registered Professional Engineer (Civil)
CERTIFICATE NO
35571
LINDA A.
POTTER
Date Signed 9/4/09
ARIZONA U.S.A.

Expires 12/31/09

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FCD 2014C003, Assignment #1
Loop 303 Corridor/White Tanks Hydrology and Delineation Update
PHASE 1 – UPDATING THE EXISTING HYDROLOGY MODEL

FINAL HYDROLOGY REPORT

JULY 2015
REVISED AUGUST 2015

Prepared For

Flood Control District of Maricopa County

EXPIRES: 6/30/16

Prepared By

PARSONS BRINCKERHOFF

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EXPIRES: 6/30/16

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EXHIBITS

Exhibit 1 HEC-1 Schematic for Existing Conditions with Partially Completed CIP Hydrology (Electronic Copy Only)

Exhibit 2 HEC-1 Schematic for Existing Conditions with CIP In Place Hydrology (Electronic Copy Only)

Exhibit 3 HEC-1 Schematic for Future Conditions with CIP In Place Hydrology (Electronic Copy Only)

NOTE: HEC-1 MODELS and DATA COLLECTION ITEMS are included in Electronic Copy Only.

1.0 INTRODUCTION

Parsons Brinckerhoff (PB) performed this study under Contract FCD 2014C003 with the Flood Control District of Maricopa County (FCDMC). The purpose of this study is to update the hydrology model from the Loop 303 Corridor/White Tanks Area Drainage Master Plan Update (ADMPU) Area Hydrology Analysis (AHA), dated July 10, 2009 (Reference 1). This study is Phase 1 – Updating the Capital Improvement Projects (CIP) in Hydrology Model. The project scope include performing a complete and detailed hydrology model update of the project area to reflect the completion of the Loop 303 from Grand Avenue (US 60) to Interstate 10 (I-10) and the FCDMC's Loop 303 Outfall Drainage System from Woodlands Avenue to Gila River. In addition, the Existing Conditions HEC-1 model will be updated to reflect those CIP projects completed after the completion of ADMPU AHA in 2009 up to 2014. There is also an Optional Task to be performed to the ADOT Basins Watershed regarding the construction of retention basins within the Suncor property locations.

2.0 LOCATION OF STUDY

The study area and watersheds for the ADMPU include 238 square miles in unincorporated Maricopa County, the City of Avondale, the City of Buckeye, the City of El Mirage, the City of Glendale, the City of Goodyear, the City of Litchfield Park, the City of Surprise, and Luke Air Force Base. The study area encompasses the Agua Fria River, Gila River, El Mirage Drain, Sun City Drains, Dysart Drain, Colter Channel, Watson Drain, Beardsley Canal, White Tanks FRS #3, and White Tanks FRS #4. Figure 1 contains a Project Location and Vicinity Map.

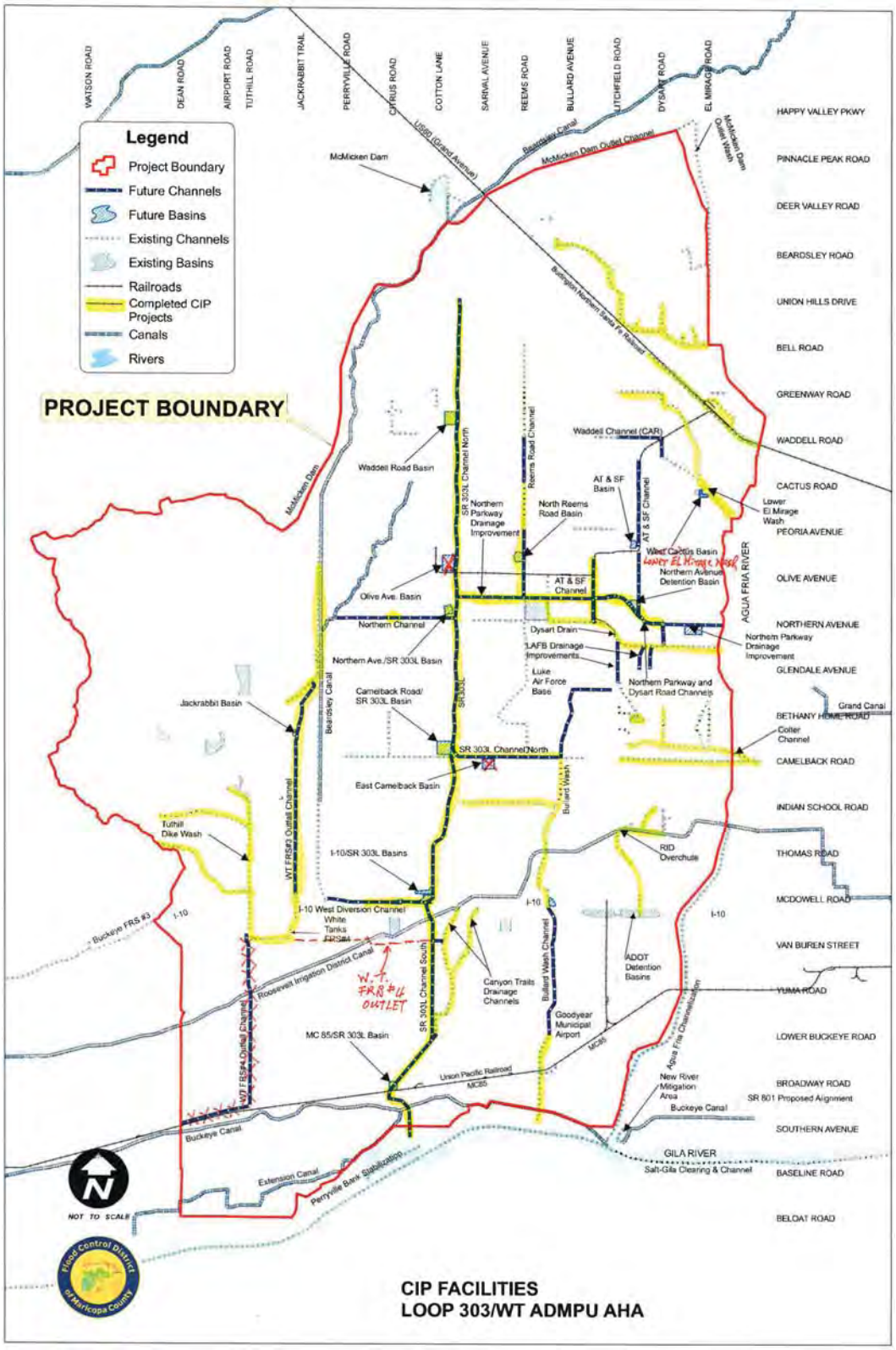

Figure 2: Existing Partially Completed CIP Facilities Map

The ADMPU AHA hydrology models were further updated by Hydrology and Hydraulics Branch of FCDMC in October 2009 and January 2010 with a new HEC-1 model names through each update. Table 1 shows the HEC-1 model names with descriptions.

Table 1: Existing HEC-1 Model Names with Model Descriptions

Description	HEC-1 Name (Used by HDR)	HEC-1 Name (Used by FCDMC)
Existing Conditions	EX-MB1.DAT	WT1E02.DAT
Existing Conditions with CIP in Place	ECIP-MB1.DAT	WT1EC02.DAT
Future Conditions with CIP in Place	FCIP-MB1.DAT	WT1FC02.DAT

3.3 UPDATING HYDROLOGY MODELS

PB used the existing 2010 hydrology models for Major Basin 01 furnished by FCDMC for this study. The U.S. Army Corps of Engineers' HEC-1 computer software program, Version 4.1, June 1998 was used for the hydrological analyses (Reference 2). PB made changes and updated these hydrology models by keeping their same HEC-1 Model names with slightly different descriptions that ADMPU AHA used.

It should be noted that the land use and soil and bedrock maps have not changed from previous iterations of this project, and as such do not need to be updated as a part of this project.

Table 2 presents comparison between FCDMC's 2010 HEC-1 Model names and PB's 2015 updated HEC-1 Model names.

Table 2: Updated HEC-1 Model Names with Model Descriptions

ADMPU AHA Model Description	HEC-1 Model Name (Used by FCDMC)	Updated Model Description	Updated HEC-1 Model Name
Existing Conditions	WT1E02.DAT	Existing Conditions with Partially Completed CIP in Place	WT_EXST.DAT
Existing Conditions with CIP in Place	WT1EC02.DAT	Existing Conditions with CIP in Place	WT_EXCIP.DAT
Future Conditions with CIP in Place	WT1FC02.DAT	Future Conditions with CIP in Place	WT_FUCIP.DAT

Appendix B

Hydrology Calculations

APPENDIX B

EXISTING CONDITIONS

DDMSW RESULTS

ID	Method	Duration	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
DEFAULT	CUSTOM	5 MIN	0.248	0.337	0.405	0.497	0.568	0.641
	CUSTOM	10 MIN	0.377	0.513	0.617	0.757	0.865	0.975
	CUSTOM	15 MIN	0.468	0.636	0.765	0.938	1.072	1.209
	CUSTOM	30 MIN	0.630	0.857	1.030	1.264	1.443	1.628
	CUSTOM	1 HOUR	0.779	1.060	1.275	1.564	1.786	2.015
	CUSTOM	2 HOUR	0.876	1.175	1.404	1.717	1.957	2.208
	CUSTOM	3 HOUR	0.914	1.208	1.441	1.763	2.022	2.295
	CUSTOM	6 HOUR	1.050	1.354	1.596	1.929	2.190	2.464
	CUSTOM	12 HOUR	1.163	1.480	1.730	2.067	2.325	2.593
	CUSTOM	24 HOUR	1.471	1.903	2.244	2.717	3.089	3.480

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin 01								
D03	Hydrograph	0.72						958
RD03	Diversion	0.72						958
DD03RE	Hydrograph	0.72						
D03D04	Routed	0.72						
D04	Hydrograph	0.89						1,149
RD04	Diversion	0.89						1,149
DD04RE	Hydrograph	0.89						27
CPD04	Combined	1.61						27
DD04S	Diversion	1.61						
DD04SE	Hydrograph	1.61						27
D04D05	Routed	1.61						23
D05	Hydrograph	0.16						325
RD05	Diversion	0.16						325
DD05RE	Hydrograph	0.16						30
CPD05	Combined	1.78						30
D05D14	Routed	1.78						28
DD141S	Diversion	1.78						
DD141	Hydrograph	1.78						28
D05D15	Routed	1.78						28
D11	Hydrograph	0.66						776
RD11	Diversion	0.66						746
DD11RE	Hydrograph	0.66						715
DD111S	Diversion	0.66						587
DD111	Hydrograph	0.66						127
DD112S	Diversion	0.66						46
DD112	Hydrograph	0.66						81
D11D12	Routed	0.66						50
D12	Hydrograph	0.35						277
RD12	Diversion	0.35						260
DD12RE	Hydrograph	0.35						261
CPD12	Combined	1.01						305
DD121S	Diversion	1.01						134
DD121	Hydrograph	1.01						171
DD122S	Diversion	1.01						69
DD122	Hydrograph	1.01						101
D12D13	Routed	1.01						68
D13F	Hydrograph	0.13						204
CP13F1	Combined	1.14						203
RDGWW	Diversion	1.14						176
DDGWW	Hydrograph	1.14						168
D13E	Hydrograph	0.17						310
RD13E	Diversion	0.17						310
DDD13E	Hydrograph	0.17						35
RTD13E	Routed	0.17						23
CP13F2	Combined	1.31						168
SRGWW	Routed	1.31						101
RTD13F	Routed	1.31						77
D13G	Hydrograph	0.17						230
CP13G1	Combined	1.47						229
RDGWE	Diversion	1.47						229
DDGWE	Hydrograph	1.47						199
D13A	Hydrograph	0.14						215
RTD13A	Routed	0.14						129
D13B	Hydrograph	0.14						240
DD04S	Hydrograph	1.61						
D04D13	Routed	1.61						
CPD13B	Combined	0.29						337
RTD13B	Routed	0.29						277
D13C	Hydrograph	0.11						129
RTD13C	Routed	0.11						73
D13D	Hydrograph	0.16						227
CPD13D	Combined	0.56						507
RTD13D	Routed	0.56						443
CP13G2	Combined	2.04						607
SRGWE	Routed	2.04						635

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
DD131S	Diversion	2.04						49
DD131	Hydrograph	2.04						586
DD132S	Diversion	2.04						172
DD132	Hydrograph	2.04						414
D13D14	Routed	2.04						329
D14	Hydrograph	0.94						1,090
RD14	Diversion	0.94						1,090
DD14RE	Hydrograph	0.94						445
DD141	Hydrograph	1.78						
D0514A	Routed	1.78						
CPD14	Combined	4.76						738
DD142S	Diversion	4.76						480
DD142	Hydrograph	4.76						259
D14D15	Routed	4.76						217
D15	Hydrograph	0.22						419
CPD15	Combined	4.98						417
D15D26	Routed	4.98						328
D15D28	Routed	4.98						288
D28	Hydrograph	0.25						417
CPD28	Combined	5.23						481
D28AFR	Routed	5.23						459
D26	Hydrograph	0.64						982
RD26	Diversion	0.64						982
DD26RE	Hydrograph	0.64						29
DD142	Hydrograph	4.76						480
D14D26	Routed	4.76						370
CPD26	Combined	5.40						367
D26D27	Routed	5.40						349
D27	Hydrograph	0.32						497
RD27	Diversion	0.32						101
DD27RE	Hydrograph	0.32						497
CPD27	Combined	5.72						494
SRD27	Routed	5.72						494
D27D42	Routed	5.72						352
D20	Hydrograph	0.50						583
RD20	Diversion	0.50						583
DD20RE	Hydrograph	0.50						9
DD111	Hydrograph	0.66						587
D11D20	Routed	0.66						330
CPD20	Combined	1.16						328
D20D21	Routed	1.16						245
D21	Hydrograph	0.50						561
RD21	Diversion	0.50						561
DD21RE	Hydrograph	0.50						8
DD112	Hydrograph	0.66						46
D11D21	Routed	0.66						22
DD121	Hydrograph	1.01						134
D12D21	Routed	1.01						104
CPD21	Combined	2.00						324
DD211S	Diversion	2.00						216
DD211	Hydrograph	2.00						108
DD212S	Diversion	2.00						54
DD212	Hydrograph	2.00						54
D21D22	Routed	2.00						38
D22	Hydrograph	0.45						558
RD22	Diversion	0.45						558
DD22RE	Hydrograph	0.45						7
DD122	Hydrograph	1.01						69
D12D22	Routed	1.01						49
CPD22	Combined	2.46						80
D22D23	Routed	2.46						72
D23	Hydrograph	0.54						552
RD23	Diversion	0.54						552
DD23RE	Hydrograph	0.54						63
DD131	Hydrograph	2.04						49
D13D23	Routed	2.04						17

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
CPD23	Combined	5.64						93
DD231S	Diversion	5.64						9
DD231	Hydrograph	5.64						84
DD232S	Diversion	5.64						10
DD232	Hydrograph	5.64						74
D23D24	Routed	5.64						71
D24	Hydrograph	0.49						534
RD24	Diversion	0.49						534
DD24RE	Hydrograph	0.49						4
DD132	Hydrograph	2.04						172
D13D24	Routed	2.04						102
CPD24	Combined	6.13						100
D24D25	Routed	6.13						93
D25	Hydrograph	0.50						570
RD25	Diversion	0.50						570
DD25RE	Hydrograph	0.50						19
CPD25	Combined	6.63						101
D25D39	Routed	6.63						99
D39	Hydrograph	0.18						112
CPD39	Combined	6.81						123
D39D42	Routed	6.81						112
D42	Hydrograph	0.99						1,315
RD42	Diversion	0.99						1,315
DD42RE	Hydrograph	0.99						215
CPD42	Combined	9.87						448
SRD42	Routed	9.87						366
D42D53	Routed	9.87						361
D53	Hydrograph	0.12						180
RD53	Diversion	0.12						180
DD53RE	Hydrograph	0.12						
CPD53	Combined	9.99						361
SRD53	Routed	9.99						221
D53D54	Routed	9.99						197
D43	Hydrograph	0.50						638
RD43	Diversion	0.50						638
DD43RE	Hydrograph	0.50						76
D43D54	Routed	0.50						40
D54	Hydrograph	0.27						338
RD54	Diversion	0.27						66
DD54RE	Hydrograph	0.27						338
CPD54	Combined	10.76						320
D44	Hydrograph	0.54						544
RD44	Diversion	0.54						540
DD44RE	Hydrograph	0.54						462
D55	Hydrograph	0.19						219
RD55	Diversion	0.19						219
DD55RE	Hydrograph	0.19						33
D56	Hydrograph	0.22						266
RD56	Diversion	0.22						37
DD56RE	Hydrograph	0.22						266
DUMMY	Combined	11.71						676
DUMMY	Combined	16.94						1,004

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Basin          D03
Divert           .-------> RD03
Hydrograph     DD03RE
Route          D03D04
Basin            .     D04
Divert           .     .-------> RD04
Hydrograph       .   DD04RE
Combine        CPD04.....
Divert           .-------> DD04S
Hydrograph     DD04SE
Route          D04D05
Basin            .     D05
Divert           .     .-------> RD05
Hydrograph       .   DD05RE
Combine        CPD05.....
Route          D05D14
Divert           .-------> DD141S
Hydrograph     DD141
Route          D05D15
Basin            .     D11
Divert           .     .-------> RD11
Hydrograph       .   DD11RE
Divert           .     .-------> DD111S
Hydrograph       .   DD111
Divert           .     .-------> DD112S
Hydrograph       .   DD112
Route            .   D11D12
Basin            .     .     D12
Divert           .     .     .-------> RD12
Hydrograph       .     .   DD12RE
Combine          .   CPD12.....
Divert           .     .-------> DD121S
Hydrograph       .   DD121
Divert           .     .-------> DD122S
Hydrograph       .   DD122
Route            .   D12D13
Basin            .     .     D13F
Combine          .   CP13F1.....
Divert           .     .-------> RDGWW
Hydrograph       .   DDGWW
Basin            .     .     D13E
Divert           .     .     .-------> RD13E
Hydrograph       .     .   DDD13E
Route            .     .   RTD13E
Combine          .   CP13F2.....
Route            .   SRGWW
Route            .   RTD13F
Basin            .     .     D13G
Combine          .   CP13G1.....
Divert           .     .-------> RDGWE
Hydrograph       .   DDGWE
Basin            .     .     D13A
Route            .     .   RTD13A
Basin            .     .     .     D13B
Retrieve         .     .     .     .     .<------- DD04S
Hydrograph       .     .     .     .   DD04S
Route            .     .     .     .   D04D13
Combine          .     .   CPD13B.....
Route            .     .   RTD13B
Basin            .     .     .     D13C
Route            .     .     .   RTD13C
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Basin D13D
Combine . . CPD13D.....
Route . . RTD13D
Combine . CP13G2.....
Route . SRGWE
Divert . .-------> DD131S
Hydrograph . DD131
Divert . .-------> DD132S
Hydrograph . DD132
Route . D13D14
Basin . . D14
Divert . . .-------> RD14
Hydrograph . . DD14RE
Retrieve . . . .<------- DD141S
Hydrograph . . . DD141
Route . . . D0514A
Combine . CPD14.....
Divert . .-------> DD142S
Hydrograph . DD142
Route . D14D15
Basin . . D15
Combine CPD15.....
Route D15D26
Route D15D28
Basin . D28
Combine CPD28.....
Route D28AFR
Basin . D26
Divert . .-------> RD26
Hydrograph . DD26RE
Retrieve . . .<------- DD142S
Hydrograph . . DD142
Route . . D14D26
Combine . CPD26.....
Route . D26D27
Basin . . D27
Divert . . .-------> RD27
Hydrograph . . DD27RE
Combine . CPD27.....
Route . SRD27
Route . D27D42
Basin . . D20
Divert . . .-------> RD20
Hydrograph . . DD20RE
Retrieve . . . .<------- DD111S
Hydrograph . . . DD111
Route . . . D11D20
Combine . . CPD20.....
Route . . D20D21
Basin . . . D21
Divert . . . .-------> RD21
Hydrograph . . . DD21RE
Retrieve . . . . .<------- DD112S
Hydrograph DD112
Route D11D21
Retrieve . . . . . .<------- DD121S
Hydrograph DD121
Route D12D21
Combine . . CPD21.....
Divert . . .-------> DD211S
Hydrograph . . DD211
Divert . . .-------> DD212S

Hydrograph . . DD212
Route . . D21D22
Basin . . . D22
Divert . . . .-------> RD22
Hydrograph . . . DD22RE
Retrieve . . . . .<------- DD122S
Hydrograph DD122
Route D12D22
Combine . . CPD22.....
Route . . D22D23
Basin . . . D23
Divert . . . .-------> RD23
Hydrograph . . . DD23RE
Retrieve . . . . .<------- DD131S
Hydrograph DD131
Route D13D23
Combine . . CPD23.....
Divert . . .-------> DD231S
Hydrograph . . DD231
Divert . . .-------> DD232S
Hydrograph . . DD232
Route . . D23D24
Basin . . . D24
Divert . . . .-------> RD24
Hydrograph . . . DD24RE
Retrieve . . . . .<------- DD132S
Hydrograph DD132
Route D13D24
Combine . . CPD24.....
Route . . D24D25
Basin . . . D25
Divert . . . .-------> RD25
Hydrograph . . . DD25RE
Combine . . CPD25.....
Route . . D25D39
Basin . . . D39
Combine . . CPD39.....
Route . . D39D42
Basin . . . D42
Divert . . . .-------> RD42
Hydrograph . . . DD42RE
Combine . CPD42.....
Route . SRD42
Route . D42D53
Basin . . D53
Divert . . .-------> RD53
Hydrograph . . DD53RE
Combine . CPD53.....
Route . SRD53
Route . D53D54
Basin . . D43
Divert . . .-------> RD43
Hydrograph . . DD43RE
Route . . D43D54
Basin . . . D54
Divert . . . .-------> RD54
Hydrograph . . . DD54RE
Combine . CPD54.....
Basin . . D44
Divert . . .-------> RD44
Hydrograph . . DD44RE
Basin . . . D55

Divert . . . .-------> RD55
Hydrograph . . . DD55RE
Basin D56
Divert . . . . .-------> RD56
Hydrograph DD56RE
Combine . DUMMY.....
Combine DUMMY.....

Area ID	Sub Basin Parameters								Rainfall Losses				
	Area (sq mi)	Length (mi)	Slope (ft/mi)	S-Graph	Lca (mi)	Lag (min)	Velocity (f/s)	Kn	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
Major Basin ID: 01													
D03	0.723	1.11	25.2	VALLEY	0.69	21.10	4.62	0.030	0.23	0.25	4.87	0.374	35
D04	0.891	1.62	24.7	VALLEY	0.90	24.40	5.84	0.027	0.22	0.27	5.71	0.249	36
D05	0.163	0.76	26.2	VALLEY	0.40	10.90	6.19	0.022	0.11	0.25	4.96	0.392	73
D11	0.662	1.90	18.5	VALLEY	0.70	28.60	5.85	0.031	0.25	0.25	5.58	0.265	37
D12	0.347	1.45	19.1	VALLEY	0.86	48.30	2.64	0.054	0.24	0.25	5.85	0.289	33
D13A	0.145	0.62	26.1	VALLEY	0.39	13.50	4.02	0.030	0.10	0.25	4.87	0.473	5
D13B	0.143	0.74	13.8	VALLEY	0.38	14.00	4.63	0.026	0.10	0.25	4.87	0.431	39
D13C	0.114	0.69	4.8	VALLEY	0.46	20.70	2.92	0.030	0.10	0.25	4.87	0.473	5
D13D	0.163	0.75	19.7	VALLEY	0.36	14.90	4.44	0.030	0.10	0.25	4.87	0.473	5
D13E	0.169	1.02	12.3	VALLEY	0.36	14.10	6.40	0.023	0.10	0.25	4.87	0.423	69
D13F	0.128	0.70	18.9	VALLEY	0.25	12.80	4.85	0.030	0.10	0.25	5.24	0.393	6
D13G	0.168	0.97	12.4	VALLEY	0.24	15.40	5.53	0.030	0.10	0.25	4.96	0.446	5
D14	0.942	1.82	21.9	VALLEY	0.96	27.70	5.77	0.028	0.23	0.26	5.14	0.330	37
D15	0.220	0.87	25.9	VALLEY	0.44	14.00	5.46	0.026	0.19	0.15	7.00	0.157	53
D20	0.498	1.58	21.1	VALLEY	0.68	24.80	5.58	0.030	0.26	0.26	4.72	0.399	30
D21	0.496	1.52	19.8	VALLEY	0.80	26.40	5.07	0.030	0.25	0.25	4.72	0.395	32
D22	0.454	1.47	22.6	VALLEY	0.75	23.90	5.39	0.029	0.24	0.25	4.79	0.376	32
D23	0.541	1.70	21.7	VALLEY	0.77	31.10	4.81	0.035	0.27	0.27	5.05	0.330	26
D24	0.492	1.48	20.2	VALLEY	0.75	29.60	4.39	0.035	0.27	0.25	5.14	0.323	28
D25	0.497	1.55	17.6	VALLEY	0.73	26.30	5.20	0.030	0.25	0.25	4.87	0.356	30
D26	0.642	0.96	16.7	VALLEY	0.31	18.10	4.66	0.034	0.24	0.25	5.85	0.236	34

* Non default value

Area ID	Sub Basin Parameters								Rainfall Losses				
	Area (sq mi)	Length (mi)	Slope (ft/mi)	S-Graph	Lca (mi)	Lag (min)	Velocity (f/s)	Kn	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
Major Basin ID: 01													
D27	0.316	0.91	5.0	VALLEY	0.25	16.30	4.92	0.027	0.20	0.24	4.96	0.353	42
D28	0.255	0.77	22.1	VALLEY	0.36	14.20	4.74	0.029	0.22	0.25	4.51	0.444	36
D37	0.197	0.63	14.4	AGRICULTURE	0.22	40.60	1.37	0.099	0.50	0.25	5.58	0.324	
D39	0.182	0.50	18.6	AGRICULTURE	0.27	38.60	1.14	0.100	0.50	0.25	5.58	0.328	
D42	0.994	1.46	22.4	VALLEY	0.57	22.30	5.76	0.030	0.24	0.24	5.24	0.294	32
D43	0.500	1.33	20.0	VALLEY	0.59	22.30	5.26	0.030	0.25	0.25	4.79	0.379	33
D44	0.535	1.45	13.8	VALLEY	0.71	25.60	4.97	0.029	0.26	0.26	3.86	0.578	23
D53	0.118	0.66	19.5	VALLEY	0.33	13.80	4.22	0.030	0.31	0.32	4.65	0.358	11
D54	0.271	1.07	18.7	VALLEY	0.44	18.60	5.06	0.030	0.20	0.27	4.45	0.491	14
D55	0.187	0.91	13.6	VALLEY	0.44	18.50	4.30	0.030	0.28	0.28	3.47	0.747	24
D56	0.225	1.15	18.3	VALLEY	0.60	21.60	4.69	0.030	0.20	0.26	4.39	0.499	24

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD03RE	110.75		**Inflow (cfs)**		500	5,000	50,000						
RD03			**Diversion (cfs)**		500	5,000	50,000						
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD04RE	76.49		**Inflow (cfs)**		500	5,000	50,000						
RD04			**Diversion (cfs)**		500	5,000	50,000						
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD04SE			**Inflow (cfs)**		86	159	512	904	1,940				
DD04S			**Diversion (cfs)**			42	259	534	1,278				
DD05RE	17.36		**Inflow (cfs)**		500	5,000	50,000						
RD05			**Diversion (cfs)**		500	5,000	50,000						
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD141			**Inflow (cfs)**		122	500	1,000						
DD141S			**Diversion (cfs)**			378	878						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD11RE	32.40		**Inflow (cfs)**		500	5,000	50,000						
RD11			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD111			**Inflow (cfs)**		34	453	1,486	2,999					
DD111S			**Diversion (cfs)**		26	377	1,210	2,419					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD112			**Inflow (cfs)**		8	77	276	579					
DD112S			**Diversion (cfs)**		5	35	79	133					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD12RE	15.30		**Inflow (cfs)**		500	5,000	50,000						
RD12			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD121			**Inflow (cfs)**		69	371	1,187	2,407					
DD121S			**Diversion (cfs)**		20	166	705	1,553					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD122			**Inflow (cfs)**		49	205	482	854					
DD122S			**Diversion (cfs)**		24	82	159	251					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DDD13E	17.10		**Inflow (cfs)**		500	5,000	50,000						
RD13E			**Diversion (cfs)**		500	5,000	50,000						
DIBBLE EXISTING MODEL STILL USES ADMS DIVERSION OF 17.1 ac-ft.													
DD131			**Inflow (cfs)**		519	917	1,651	2,842					
DD131S			**Diversion (cfs)**		19	121	423	996					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD132			**Inflow (cfs)**		500	796	1,227	1,846					
DD132S			**Diversion (cfs)**		112	318	584	899					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD14RE	63.40		**Inflow (cfs)**		500	5,000	50,000						
RD14			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD142			**Inflow (cfs)**		296	693	1,325	2,532					
DD142S			**Diversion (cfs)**		269	457	770	1,406					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD26RE	52.40		**Inflow (cfs)**		500	5,000	50,000						
RD26			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD27RE	8.20		**Inflow (cfs)**		500	5,000	50,000						
RD27			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD20RE	38.10		**Inflow (cfs)**		500	5,000	50,000						
RD20			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD21RE	39.90		**Inflow (cfs)**		500	5,000	50,000						
RD21			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD211			**Inflow (cfs)**		185	770	1,885	3,511					
DD211S			**Diversion (cfs)**		139	463	1,049	1,871					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD212			**Inflow (cfs)**		46	307	836	1,639					
DD212S			**Diversion (cfs)**		36	111	210	327					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD22RE	37.50		**Inflow (cfs)**		500	5,000	50,000						
RD22			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD23RE	36.30		**Inflow (cfs)**		500	5,000	50,000						
RD23			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD231			**Inflow (cfs)**		519	867	1,681	2,985					
DD231S			**Diversion (cfs)**		51	223	728	1,504					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD232			**Inflow (cfs)**		468	644	953	1,482					
DD232S			**Diversion (cfs)**		56	138	243	365					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD24RE	40.90		**Inflow (cfs)**		500	5,000	50,000						
RD24			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD25RE	37.10		**Inflow (cfs)**		500	5,000	50,000						
RD25			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD53RE	12.10		**Inflow (cfs)**		500	5,000	50,000						
RD53			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD43RE	35.50		**Inflow (cfs)**		500	5,000	50,000						
RD43			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD54RE	3.00		**Inflow (cfs)**		500	5,000	50,000						
RD54			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD44RE	19.40		**Inflow (cfs)**		500	5,000	50,000						
RD44			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD55RE	9.80		**Inflow (cfs)**		500	5,000	50,000						
RD55			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD56RE	3.10		**Inflow (cfs)**		500	5,000	50,000						
RD56			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD42RE	71.80		**Inflow (cfs)**		500	5,000	50,000						
RD42			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DDGWW	4.00		**Inflow (cfs)**		500	5,000	50,000						
RDGWW			**Diversion (cfs)**		500	5,000	50,000						
Diversion value estimate from Greenway Road plans & report for west basin													
DDGWE	4.61		**Inflow (cfs)**		500	5,000	50,000						
RDGWE			**Diversion (cfs)**		500	5,000	50,000						
Diversion value estimate from Greenway Road plans & report for east basin													

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
NORMAL DEPTH															
Major Basin 01															
D03D04	0.032	0.013	0.032	4,458.00	0.0038	-	X:	100.00	108.00	119.00	119.10	155.00	155.10	160.00	165.00
							Y:	1,000.30	1,000.00	999.50	999.00	999.70	1,000.20	1,000.30	1,000.40
D04D05	0.032	0.013	0.013	2,993.00	0.0027	-	X:	100.00	119.00	135.00	135.10	180.00	180.10	181.00	182.00
							Y:	1,000.00	999.80	999.50	999.00	999.80	1,000.30	1,000.40	1,000.50
D04D13	0.025	0.025	0.025	1,445.00	0.0040	-	X:	100.00	110.00	190.00	193.00	307.00	310.00	390.00	400.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
D0514A	0.032	0.013	0.032	3,147.00	0.0051	-	X:	100.00	120.00	140.00	140.10	200.00	200.10	220.00	240.00
							Y:	1,000.00	999.50	1,000.00	999.50	999.50	1,000.00	999.50	1,000.00
D05D14	0.032	0.032	0.032	3,385.00	0.0053	-	X:	100.00	101.00	102.00	122.00	142.00	162.00	163.00	164.00
							Y:	1,000.00	999.90	999.80	996.80	996.70	999.80	999.90	1,000.00
D05D15	0.016	0.016	0.016	4,588.00	0.0044	-	X:	100.00	101.00	102.00	127.00	131.00	140.00	141.00	142.00
							Y:	1,000.00	999.90	999.80	996.80	996.70	999.80	999.90	1,000.00
D11D12	0.022	0.022	0.022	2,668.00	0.0037	-	X:	100.00	124.00	154.00	155.00	156.00	157.00	158.00	159.00
							Y:	1,208.00	1,203.00	1,208.00	1,208.10	1,208.20	1,208.30	1,208.40	1,208.50
D11D20	0.025	0.025	0.025	6,256.00	0.0032	-	X:	100.00	101.00	102.00	114.00	190.00	202.00	203.00	204.00
							Y:	1,000.20	1,000.10	1,000.00	997.00	996.90	1,000.00	1,000.10	1,000.20
D11D21	0.032	0.013	0.032	8,031.00	0.0035	-	X:	100.00	106.00	115.00	115.10	167.00	167.10	174.00	179.00
							Y:	1,000.00	999.80	999.50	999.00	998.90	999.50	999.80	1,000.00
D12D13	0.025	0.025	0.025	2,562.00	0.0040	-	X:	100.00	110.00	122.00	125.00	150.00	153.00	165.00	175.00
							Y:	1,000.00	1,000.00	996.00	995.50	995.50	996.00	1,000.00	1,000.00
D12D21	0.013	0.013	0.032	2,810.00	0.0078	-	X:	100.00	105.00	110.00	115.00	140.00	140.10	176.00	177.00
							Y:	1,000.00	999.90	999.80	999.70	999.20	999.70	999.80	1,000.00

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
D12D22	0.032	0.013	0.013	7,744.00	0.0040	-	X:	100.00	105.00	145.00	145.10	160.00	174.00	178.00	180.00
							Y:	1,000.00	999.90	999.50	999.00	999.20	999.50	999.60	999.70
D13D14	0.025	0.025	0.025	5,304.00	0.0015	-	X:	100.00	120.00	122.40	140.40	158.40	176.40	176.80	196.80
							Y:	1,175.50	1,175.40	1,175.00	1,172.00	1,171.90	1,175.00	1,175.40	1,175.50
D13D23	0.032	0.013	0.032	5,460.00	0.0044	-	X:	100.00	100.00	109.00	109.00	148.00	148.00	197.00	198.00
							Y:	1,180.00	1,176.30	1,176.30	1,175.80	1,175.00	1,175.50	1,177.00	1,177.10
D13D24	0.032	0.013	0.013	5,460.00	0.0044	-	X:	100.00	100.10	145.00	145.10	175.00	175.10	184.90	185.00
							Y:	1,178.00	1,176.50	1,175.50	1,175.00	1,175.80	1,176.30	1,176.30	1,180.00
D14D15	0.022	0.013	0.013	3,351.00	0.0029	-	X:	100.00	100.10	110.00	110.10	120.00	125.00	133.90	134.00
							Y:	1,003.00	999.80	999.70	999.20	999.40	999.50	999.70	1,000.50
D14D26	0.022	0.022	0.022	5,050.00	0.0048	-	X:	100.00	102.50	105.50	137.50	187.50	219.50	222.00	225.00
							Y:	1,000.00	999.50	999.00	991.00	991.10	999.00	999.80	1,000.00
D15D26	0.016	0.016	0.016	9,949.00	0.0050	-	X:	100.00	112.00	122.00	134.00	145.00	157.00	169.00	185.00
							Y:	1,040.40	1,040.20	1,040.00	1,034.00	1,034.00	1,040.00	1,040.20	1,040.60
D15D28	0.016	0.016	0.016	7,000.00	0.0050	-	X:	100.00	112.00	122.00	134.00	145.00	157.00	169.00	185.00
							Y:	1,040.40	1,040.20	1,040.00	1,034.00	1,034.00	1,040.00	1,040.20	1,040.60
D20D21	0.032	0.032	0.013	5,323.00	0.0023	-	X:	100.00	100.50	112.00	150.00	162.00	198.00	198.00	220.00
							Y:	1,000.10	1,000.00	997.00	997.00	1,000.00	999.50	998.90	999.40
D21D22	0.032	0.025	0.032	2,720.00	0.0029	-	X:	100.00	103.00	105.00	116.00	151.00	160.00	165.00	170.00
							Y:	1,000.20	1,000.10	1,000.00	997.00	997.10	1,000.00	1,000.10	1,000.20
D22D23	0.032	0.032	0.032	2,705.00	0.0037	-	X:	100.00	104.00	106.00	110.00	118.00	122.00	126.00	138.00
							Y:	1,161.00	1,160.00	1,159.00	1,158.00	1,158.10	1,159.00	1,160.00	1,161.00
D23D24	0.035	0.035	0.035	2,646.00	0.0044	-	X:	894.00	906.00	912.00	918.00	926.00	930.00	934.00	942.00
							Y:	1,157.00	1,155.00	1,154.00	1,153.00	1,153.00	1,154.00	1,155.00	1,157.00

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
D24D25	0.030	0.030	0.030	2,701.00	0.0020	-	X:	1,000.00	1,018.00	1,019.00	1,020.00	1,026.00	1,027.00	1,028.00	1,046.00
							Y:	1,100.00	1,094.00	1,094.00	1,094.00	1,094.00	1,094.00	1,094.00	1,100.00
D25D39	0.030	0.030	0.030	2,020.00	0.0040	-	X:	-	20.00	25.00	30.00	35.00	41.50	51.10	82.30
							Y:	10.00	-	-	-	-	-	4.80	10.00
D26D27	0.022	0.022	0.022	2,050.00	0.0039	-	X:	100.00	102.50	105.50	137.50	187.50	219.50	222.00	225.00
							Y:	1,000.00	999.50	999.00	991.00	991.00	999.00	999.50	1,000.00
D27D42	0.030	0.030	0.030	5,599.00	0.0020	-	X:	-	24.40	34.40	44.40	54.40	64.40	74.40	98.80
							Y:	1,128.50	1,122.40	1,122.40	1,122.40	1,122.40	1,122.40	1,122.40	1,128.50
D28AFR	0.016	0.016	0.016	2,990.00	0.0050	-	X:	100.00	112.00	122.00	134.00	145.00	157.00	169.00	185.00
							Y:	1,040.40	1,040.20	1,040.00	1,034.00	1,034.00	1,040.00	1,040.20	1,040.60
D39D42	0.030	0.030	0.030	5,691.00	0.0039	-	X:	-	30.00	38.00	54.00	76.50	104.00	139.00	154.00
							Y:	10.00	4.00	4.00	-	-	-	7.00	10.00
D42D53	0.030	0.030	0.030	1,558.00	0.0020	-	X:	-	10.00	22.00	97.00	171.00	172.00	184.00	194.00
							Y:	3.50	3.00	-	-	-	-	3.00	3.50
D43D54	0.025	0.025	0.025	3,872.00	0.0023	-	X:	100.00	200.00	400.00	500.00	550.00	600.00	800.00	900.00
							Y:	1,000.00	999.50	998.50	998.00	998.30	998.50	999.50	1,000.00
D53D54	0.030	0.030	0.030	3,999.00	0.0038	-	X:	-	36.00	39.00	42.00	45.00	48.00	51.00	87.00
							Y:	1,102.80	1,096.80	1,096.80	1,096.80	1,096.80	1,096.80	1,096.80	1,102.80
RTD13A	0.025	0.025	0.025	2,634.00	0.0040	-	X:	100.00	110.00	190.00	193.00	307.00	310.00	390.00	400.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
RTD13B	0.025	0.025	0.025	2,069.00	0.0040	-	X:	100.00	110.00	190.00	193.00	307.00	310.00	390.00	400.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
RTD13C	0.025	0.025	0.025	2,984.00	0.0040	-	X:	100.00	110.00	190.00	193.00	307.00	310.00	390.00	400.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
RTD13D	0.025	0.025	0.025	1,850.00	0.0040	-	X:	100.00	110.00	190.00	193.00	307.00	310.00	390.00	400.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
RTD13E	0.025	0.025	0.025	1,334.00	0.0040	-	X:	100.00	110.00	190.00	193.00	307.00	310.00	390.00	400.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
RTD13F	0.025	0.025	0.025	2,575.00	0.0040	-	X:	100.00	110.00	122.00	125.00	150.00	153.00	165.00	175.00
							Y:	1,000.00	1,000.00	996.00	995.50	995.50	996.00	1,000.00	1,000.00

Storage Basin ID:	SRD27										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**							22.8	51.4		
Spillway Length:	-NA-	**Discharge (cfs)**	0	52	202	415	658	906	1,127	2,999	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,140.0	1,142.0	1,144.0	1,146.0	1,148.0	1,150.0	1,152.0	1,154.0	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	0.00				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,146.65				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	494				
Weir Coefficient:	-NA-											

Storage Basin ID:	SRD42										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.6	4.6	17.3	27.6	56.3				
Spillway Length:	-NA-	**Discharge (cfs)**	0	0	139	426	827	1,295	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,105.3	1,108.0	1,110.0	1,112.0	1,114.0	1,116.0	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	14.64				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,111.58				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	366				
Weir Coefficient:	-NA-											

Storage Basin ID:	SRD53										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		5.7	11.6	18.2	32.0	39.5	67.5	67.5	67.5	67.5
Spillway Length:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	546	731	890
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,098.5	1,099.5	1,100.5	1,101.5	1,103.5	1,104.5	1,108.5	1,111.0	1,112.0	1,113.0
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	67.53				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,109.51				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	221				
Weir Coefficient:	-NA-											

Storage Basin ID:	SRGWE										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.4	0.6	0.8	1.2				
Spillway Length:	-NA-	**Discharge (cfs)**	0	51	146	268	388	800	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,183.0	1,184.0	1,185.0	1,186.0	1,187.0	1,188.0	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	Greenway East basin SSD area upstream of culvert			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	1.04				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,187.60				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	635				
Weir Coefficient:	-NA-											

Storage Basin ID:	**SRGWW**										
Spillway Characteristics (SS)			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.3	0.8	1.3	1.9				
Spillway Length:	-NA-	**Discharge (cfs)**	0	6	19	35	50	350	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,192.0	1,193.0	1,194.0	1,195.0	1,196.0	1,197.0	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			**11**	**12**	**13**	**14.**	**15**	**16**	**17**	**18**	**19**	**20**
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	Greenway West basin SSD area upstream of culvert			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	1.44				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,196.17				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	101				
Weir Coefficient:	-NA-											

APPENDIX B

SCENARIO 1 – FIRST FLUSH RETENTION

DDMSW RESULTS

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin 01								
D03	Hydrograph	0.72						958
RD03	Diversion	0.72						958
DD03RE	Hydrograph	0.72						
D03D04	Routed	0.72						
D04	Hydrograph	0.89						1,149
RD04	Diversion	0.89						1,149
DD04RE	Hydrograph	0.89						27
CPD04	Combined	1.61						27
DD04S	Diversion	1.61						
DD04SE	Hydrograph	1.61						27
D04D05	Routed	1.61						23
D05	Hydrograph	0.16						325
RD05	Diversion	0.16						325
DD05RE	Hydrograph	0.16						30
CPD05	Combined	1.78						30
D05D14	Routed	1.78						28
DD141S	Diversion	1.78						
DD141	Hydrograph	1.78						28
D05D15	Routed	1.78						28
D11	Hydrograph	0.66						776
RD11	Diversion	0.66						746
DD11RE	Hydrograph	0.66						715
DD111S	Diversion	0.66						587
DD111	Hydrograph	0.66						127
DD112S	Diversion	0.66						46
DD112	Hydrograph	0.66						81
D11D12	Routed	0.66						50
D12	Hydrograph	0.35						277
RD12	Diversion	0.35						260
DD12RE	Hydrograph	0.35						261
CPD12	Combined	1.01						305
DD121S	Diversion	1.01						134
DD121	Hydrograph	1.01						171
DD122S	Diversion	1.01						69
DD122	Hydrograph	1.01						101
D12D13	Routed	1.01						67
D13F	Hydrograph	0.13						259
RDD13F	Diversion	0.13						21
DDD13F	Hydrograph	0.13						259
CP13F1	Combined	1.14						257
RDGWW	Diversion	1.14						195
DDGWW	Hydrograph	1.14						241
D13E	Hydrograph	0.17						304
RDD13E	Diversion	0.17						304
DDD13E	Hydrograph	0.17						75
RTD13E	Routed	0.17						52
CP13F2	Combined	1.31						241
SRGWW	Routed	1.31						217
RTD13F	Routed	1.31						98
D13G	Hydrograph	0.17						328
RDD13G	Diversion	0.17						15
DDD13G	Hydrograph	0.17						328
CP13G1	Combined	1.47						333
RDGWE	Diversion	1.47						202
DDGWE	Hydrograph	1.47						333
D13A	Hydrograph	0.14						292
RDD13A	Diversion	0.14						9
DDD13A	Hydrograph	0.14						292
RTD13A	Routed	0.14						248
D13B	Hydrograph	0.14						282
RDD13B	Diversion	0.14						9
DDD13B	Hydrograph	0.14						282
DD04S	Hydrograph	1.61						
D04D13	Routed	1.61						
CPD13B	Combined	0.29						510

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
RTD13B	Routed	0.29						475
D13C	Hydrograph	0.11						191
RDD13C	Diversion	0.11						9
DDD13C	Hydrograph	0.11						191
RTD13C	Routed	0.11						162
D13D	Hydrograph	0.16						305
RDD13D	Diversion	0.16						27
DDD13D	Hydrograph	0.16						305
CPD13D	Combined	0.56						843
RTD13D	Routed	0.56						809
CP13G2	Combined	2.04						1,105
SRGWE	Routed	2.04						1,079
DD131S	Diversion	2.04						188
DD131	Hydrograph	2.04						891
DD132S	Diversion	2.04						377
DD132	Hydrograph	2.04						514
D13D14	Routed	2.04						473
D14	Hydrograph	0.94						1,090
RD14	Diversion	0.94						1,090
DD14RE	Hydrograph	0.94						445
DD141	Hydrograph	1.78						
D0514A	Routed	1.78						
CPD14	Combined	4.76						865
DD142S	Diversion	4.76						542
DD142	Hydrograph	4.76						323
D14D15	Routed	4.76						285
D15	Hydrograph	0.22						419
CPD15	Combined	4.98						417
D15D26	Routed	4.98						329
D15D28	Routed	4.98						288
D28	Hydrograph	0.25						417
CPD28	Combined	5.23						480
D28AFR	Routed	5.23						459
D26	Hydrograph	0.64						982
RD26	Diversion	0.64						982
DD26RE	Hydrograph	0.64						29
DD142	Hydrograph	4.76						542
D14D26	Routed	4.76						451
CPD26	Combined	5.40						445
D26D27	Routed	5.40						428
D27	Hydrograph	0.32						497
RD27	Diversion	0.32						101
DD27RE	Hydrograph	0.32						497
CPD27	Combined	5.72						496
SRD27	Routed	5.72						496
D27D42	Routed	5.72						417
D20	Hydrograph	0.50						583
RD20	Diversion	0.50						583
DD20RE	Hydrograph	0.50						9
DD111	Hydrograph	0.66						587
D11D20	Routed	0.66						330
CPD20	Combined	1.16						328
D20D21	Routed	1.16						245
D21	Hydrograph	0.50						558
RD21	Diversion	0.50						558
DD21RE	Hydrograph	0.50						7
DD112	Hydrograph	0.66						46
D11D21	Routed	0.66						22
DD121	Hydrograph	1.01						134
D12D21	Routed	1.01						104
CPD21	Combined	2.00						324
DD211S	Diversion	2.00						216
DD211	Hydrograph	2.00						108
DD212S	Diversion	2.00						54
DD212	Hydrograph	2.00						54
D21D22	Routed	2.00						38

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
D22	Hydrograph	0.45						558
RD22	Diversion	0.45						558
DD22RE	Hydrograph	0.45						7
DD122	Hydrograph	1.01						69
D12D22	Routed	1.01						49
CPD22	Combined	2.46						80
D22D23	Routed	2.46						72
D23	Hydrograph	0.54						552
RD23	Diversion	0.54						552
DD23RE	Hydrograph	0.54						63
DD131	Hydrograph	2.04						188
D13D23	Routed	2.04						131
CPD23	Combined	5.64						127
DD231S	Diversion	5.64						13
DD231	Hydrograph	5.64						115
DD232S	Diversion	5.64						14
DD232	Hydrograph	5.64						101
D23D24	Routed	5.64						87
D24	Hydrograph	0.49						534
RD24	Diversion	0.49						534
DD24RE	Hydrograph	0.49						4
DD132	Hydrograph	2.04						377
D13D24	Routed	2.04						305
CPD24	Combined	6.13						343
D24D25	Routed	6.13						316
D25	Hydrograph	0.50						570
RD25	Diversion	0.50						570
DD25RE	Hydrograph	0.50						19
CPD25	Combined	6.63						316
D25D39	Routed	6.63						297
D39	Hydrograph	0.18						112
CPD39	Combined	6.81						379
D39D42	Routed	6.81						315
D42	Hydrograph	0.99						1,315
RD42	Diversion	0.99						1,315
DD42RE	Hydrograph	0.99						215
CPD42	Combined	9.87						701
SRD42	Routed	9.87						580
D42D53	Routed	9.87						570
D53	Hydrograph	0.12						180
RD53	Diversion	0.12						180
DD53RE	Hydrograph	0.12						
CPD53	Combined	9.99						570
SRD53	Routed	9.99						349
D53D54	Routed	9.99						317
D43	Hydrograph	0.50						638
RD43	Diversion	0.50						638
DD43RE	Hydrograph	0.50						76
D43D54	Routed	0.50						40
D54	Hydrograph	0.27						338
RD54	Diversion	0.27						66
DD54RE	Hydrograph	0.27						338
CPD54	Combined	10.76						320
D44	Hydrograph	0.54						544
RD44	Diversion	0.54						540
DD44RE	Hydrograph	0.54						462
D55	Hydrograph	0.19						219
RD55	Diversion	0.19						219
DD55RE	Hydrograph	0.19						33
D56	Hydrograph	0.22						266
RD56	Diversion	0.22						37
DD56RE	Hydrograph	0.22						266
DUMMY	Combined	11.71						676
DUMMY	Combined	16.94						1,004

Developed Conditions Subbasin data is the same for all developed model scenarios and is only printed here once.

Area ID	Sub Basin Parameters								Rainfall Losses				
	Area (sq mi)	Length (mi)	Slope (ft/mi)	S-Graph	Lca (mi)	Lag (min)	Velocity (f/s)	Kn	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
Major Basin ID: 01													
D03	0.723	1.11	25.2	VALLEY	0.69	21.10	4.62	0.030	0.23	0.25	4.87	0.374	35
D13A	0.145	0.75	21.5	VALLEY	0.39	12.10	5.45	0.024	0.10	0.30	4.87	0.415	82
D04	0.891	1.62	24.7	VALLEY	0.90	24.40	5.84	0.027	0.22	0.27	5.71	0.249	36
D13B	0.143	0.73	13.9	VALLEY	0.38	12.90	5.01	0.024	0.10	0.26	4.87	0.392	80
D05	0.163	0.76	26.2	VALLEY	0.40	10.90	6.19	0.022	0.11	0.25	4.96	0.392	73
D13C	0.114	0.70	4.7	VALLEY	0.46	16.70	3.67	0.024	0.09	0.30	4.87	0.415	71
D11	0.662	1.90	18.5	VALLEY	0.70	28.60	5.85	0.031	0.25	0.25	5.58	0.265	37
D13D	0.163	0.74	19.9	VALLEY	0.36	10.90	6.02	0.022	0.20	0.26	4.87	0.385	51
D12	0.347	1.45	19.1	VALLEY	0.86	48.30	2.64	0.054	0.24	0.25	5.85	0.289	33
D13E	0.169	1.02	12.3	VALLEY	0.36	15.30	5.89	0.025	0.10	0.24	4.87	0.386	74
D13F	0.128	0.71	18.7	VALLEY	0.25	9.40	6.64	0.022	0.19	0.25	5.24	0.316	52
D13G	0.168	0.97	12.4	VALLEY	0.24	11.80	7.23	0.023	0.14	0.25	4.96	0.392	67
D14	0.942	1.82	21.9	VALLEY	0.96	27.70	5.77	0.028	0.23	0.26	5.14	0.330	37
D15	0.220	0.87	25.9	VALLEY	0.44	14.00	5.46	0.026	0.19	0.15	7.00	0.157	53
D20	0.498	1.58	21.1	VALLEY	0.68	24.80	5.58	0.030	0.26	0.26	4.72	0.399	30
D21	0.496	1.52	19.8	VALLEY	0.80	26.40	5.07	0.030	0.25	0.25	4.72	0.395	31
D22	0.454	1.47	22.6	VALLEY	0.75	23.90	5.39	0.029	0.24	0.25	4.79	0.376	32
D23	0.541	1.70	21.7	VALLEY	0.77	31.10	4.81	0.035	0.27	0.27	5.05	0.330	26
D24	0.492	1.48	20.2	VALLEY	0.75	29.60	4.39	0.035	0.27	0.25	5.14	0.323	28
D25	0.497	1.55	17.6	VALLEY	0.73	26.30	5.20	0.030	0.25	0.25	4.87	0.356	30
D26	0.642	0.96	16.7	VALLEY	0.31	18.10	4.66	0.034	0.24	0.25	5.85	0.236	34

Area ID	Sub Basin Parameters								Rainfall Losses				
	Area (sq mi)	Length (mi)	Slope (ft/mi)	S-Graph	Lca (mi)	Lag (min)	Velocity (f/s)	Kn	IA (in)	DTHETA	PSIF (in)	XKSAT (in/hr)	RTIMP (%)
Major Basin ID: 01													
D27	0.316	0.91	5.0	VALLEY	0.25	16.30	4.92	0.027	0.20	0.24	4.96	0.353	42
D28	0.255	0.77	22.1	VALLEY	0.36	14.20	4.74	0.029	0.22	0.25	4.51	0.444	36
D37	0.197	0.63	14.4	AGRICULTURE	0.22	40.60	1.37	0.099	0.50	0.25	5.58	0.324	
D39	0.182	0.50	18.6	AGRICULTURE	0.27	38.60	1.14	0.100	0.50	0.25	5.58	0.328	
D42	0.994	1.46	22.4	VALLEY	0.57	22.30	5.76	0.030	0.24	0.24	5.24	0.294	32
D43	0.500	1.33	20.0	VALLEY	0.59	22.30	5.26	0.030	0.25	0.25	4.79	0.379	33
D44	0.535	1.45	13.8	VALLEY	0.71	25.60	4.97	0.029	0.26	0.26	3.86	0.578	23
D53	0.118	0.66	19.5	VALLEY	0.33	13.80	4.22	0.030	0.31	0.32	4.65	0.358	11
D54	0.271	1.07	18.7	VALLEY	0.44	18.60	5.06	0.030	0.20	0.27	4.45	0.491	14
D55	0.187	0.91	13.6	VALLEY	0.44	18.50	4.30	0.030	0.28	0.28	3.47	0.747	24
D56	0.225	1.15	18.3	VALLEY	0.60	21.60	4.69	0.030	0.20	0.26	4.39	0.499	24

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DDD13A	3.87		**Inflow (cfs)**		500	5,000	50,000						
RDD13A			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13B	3.81		**Inflow (cfs)**		500	5,000	50,000						
RDD13B			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13C	3.04		**Inflow (cfs)**		500	5,000	50,000						
RDD13C			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13D	4.35		**Inflow (cfs)**		500	5,000	50,000						
RDD13D			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13E	17.10		**Inflow (cfs)**		500	5,000	50,000						
RDD13E			**Diversion (cfs)**		500	5,000	50,000						
Builtout basin uses ADMS diversion volume of 17.1 ac-ft. First Flush volume not evaluated.													
DDD13F	3.41		**Inflow (cfs)**		500	5,000	50,000						
RDD13F			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13G	4.48		**Inflow (cfs)**		500	5,000	50,000						
RDD13G			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DD03RE	110.75		**Inflow (cfs)**		500	5,000	50,000						
RD03			**Diversion (cfs)**		500	5,000	50,000						
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD04RE	76.49		**Inflow (cfs)**		500	5,000	50,000						
RD04			**Diversion (cfs)**		500	5,000	50,000						
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD04SE			**Inflow (cfs)**	86	159	512	904	1,940					
DD04S			**Diversion (cfs)**		42	259	534	1,278					

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD05RE	17.36		**Inflow (cfs)**		500	5,000	50,000						
RD05			**Diversion (cfs)**		500	5,000	50,000						
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD141			**Inflow (cfs)**		122	500	1,000						
DD141S			**Diversion (cfs)**			378	878						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD11RE	32.40		**Inflow (cfs)**		500	5,000	50,000						
RD11			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD111			**Inflow (cfs)**		34	453	1,486	2,999					
DD111S			**Diversion (cfs)**		26	377	1,210	2,419					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD112			**Inflow (cfs)**		8	77	276	579					
DD112S			**Diversion (cfs)**		5	35	79	133					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD12RE	15.30		**Inflow (cfs)**		500	5,000	50,000						
RD12			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD121			**Inflow (cfs)**		69	371	1,187	2,407					
DD121S			**Diversion (cfs)**		20	166	705	1,553					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD122			**Inflow (cfs)**		49	205	482	854					
DD122S			**Diversion (cfs)**		24	82	159	251					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD131			**Inflow (cfs)**		519	917	1,651	2,842					
DD131S			**Diversion (cfs)**		19	121	423	996					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD132			**Inflow (cfs)**		500	796	1,227	1,846					
DD132S			**Diversion (cfs)**		112	318	584	899					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD14RE	63.40		**Inflow (cfs)**		500	5,000	50,000						
RD14			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD142			**Inflow (cfs)**		296	693	1,325	2,532					
DD142S			**Diversion (cfs)**		269	457	770	1,406					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD26RE	52.40		**Inflow (cfs)**		500	5,000	50,000						
RD26			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD27RE	8.20		**Inflow (cfs)**		500	5,000	50,000						
RD27			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD20RE	38.10		**Inflow (cfs)**		500	5,000	50,000						
RD20			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD21RE	39.90		**Inflow (cfs)**		500	5,000	50,000						
RD21			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD211			**Inflow (cfs)**		185	770	1,885	3,511					
DD211S			**Diversion (cfs)**		139	463	1,049	1,871					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD212			**Inflow (cfs)**		46	307	836	1,639					
DD212S			**Diversion (cfs)**		36	111	210	327					
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD22RE	37.50		**Inflow (cfs)**		500	5,000	50,000						
RD22			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD23RE	36.30		**Inflow (cfs)**		500	5,000	50,000						
RD23			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD231			**Inflow (cfs)**		519	867	1,681	2,985					
DD231S			**Diversion (cfs)**		51	223	728	1,504					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD232			**Inflow (cfs)**		468	644	953	1,482					
DD232S			**Diversion (cfs)**		56	138	243	365					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD24RE	40.90		**Inflow (cfs)**		500	5,000	50,000						
RD24			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD25RE	37.10		**Inflow (cfs)**		500	5,000	50,000						
RD25			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD53RE	12.10		**Inflow (cfs)**		500	5,000	50,000						
RD53			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD43RE	35.50		**Inflow (cfs)**		500	5,000	50,000						
RD43			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD54RE	3.00		**Inflow (cfs)**		500	5,000	50,000						
RD54			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD44RE	19.40		**Inflow (cfs)**		500	5,000	50,000						
RD44			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD55RE	9.80		**Inflow (cfs)**		500	5,000	50,000						
RD55			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD56RE	3.10		**Inflow (cfs)**		500	5,000	50,000						
RD56			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD42RE	71.80		**Inflow (cfs)**		500	5,000	50,000						
RD42			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DDGWW	4.00		**Inflow (cfs)**		500	5,000	50,000						
RDGWW			**Diversion (cfs)**		500	5,000	50,000						
Diversion value estimate from Greenway Road plans & report for west basin													
DDGWE	4.61		**Inflow (cfs)**		500	5,000	50,000						
RDGWE			**Diversion (cfs)**		500	5,000	50,000						
Diversion value estimate from Greenway Road plans & report for east basin													

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
NORMAL DEPTH															
Major Basin 01															
D03D04	0.032	0.013	0.032	4,458.00	0.0038	-	X:	100.00	108.00	119.00	119.10	155.00	155.10	160.00	165.00
							Y:	1,000.30	1,000.00	999.50	999.00	999.70	1,000.20	1,000.30	1,000.40
D04D05	0.032	0.013	0.013	2,993.00	0.0027	-	X:	100.00	119.00	135.00	135.10	180.00	180.10	181.00	182.00
							Y:	1,000.00	999.80	999.50	999.00	999.80	1,000.30	1,000.40	1,000.50
D04D13	0.035	0.030	0.035	1,445.00	0.0050	-	X:	100.00	114.00	130.00	133.00	137.00	140.00	156.00	170.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
D0514A	0.032	0.013	0.032	3,147.00	0.0051	-	X:	100.00	120.00	140.00	140.10	200.00	200.10	220.00	240.00
							Y:	1,000.00	999.50	1,000.00	999.50	999.50	1,000.00	999.50	1,000.00
D05D14	0.032	0.032	0.032	3,385.00	0.0053	-	X:	100.00	101.00	102.00	122.00	142.00	162.00	163.00	164.00
							Y:	1,000.00	999.90	999.80	996.80	996.70	999.80	999.90	1,000.00
D05D15	0.016	0.016	0.016	4,588.00	0.0044	-	X:	100.00	101.00	102.00	127.00	131.00	140.00	141.00	142.00
							Y:	1,000.00	999.90	999.80	996.80	996.70	999.80	999.90	1,000.00
D11D12	0.022	0.022	0.022	2,668.00	0.0037	-	X:	100.00	124.00	154.00	155.00	156.00	157.00	158.00	159.00
							Y:	1,208.00	1,203.00	1,208.00	1,208.10	1,208.20	1,208.30	1,208.40	1,208.50
D11D20	0.025	0.025	0.025	6,256.00	0.0032	-	X:	100.00	101.00	102.00	114.00	190.00	202.00	203.00	204.00
							Y:	1,000.20	1,000.10	1,000.00	997.00	996.90	1,000.00	1,000.10	1,000.20
D11D21	0.032	0.013	0.032	8,031.00	0.0035	-	X:	100.00	106.00	115.00	115.10	167.00	167.10	174.00	179.00
							Y:	1,000.00	999.80	999.50	999.00	998.90	999.50	999.80	1,000.00
D12D13	0.035	0.030	0.035	2,562.00	0.0050	-	X:	100.00	110.00	122.00	125.00	150.00	153.00	165.00	175.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
D12D21	0.013	0.013	0.032	2,810.00	0.0078	-	X:	100.00	105.00	110.00	115.00	140.00	140.10	176.00	177.00
							Y:	1,000.00	999.90	999.80	999.70	999.20	999.70	999.80	1,000.00

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
D12D22	0.032	0.013	0.013	7,744.00	0.0040	-	X:	100.00	105.00	145.00	145.10	160.00	174.00	178.00	180.00
							Y:	1,000.00	999.90	999.50	999.00	999.20	999.50	999.60	999.70
D13D14	0.025	0.025	0.025	5,304.00	0.0015	-	X:	100.00	120.00	122.40	140.40	158.40	176.40	176.80	196.80
							Y:	1,175.50	1,175.40	1,175.00	1,172.00	1,171.90	1,175.00	1,175.40	1,175.50
D13D23	0.032	0.013	0.032	5,460.00	0.0044	-	X:	100.00	100.00	109.00	109.00	148.00	148.00	197.00	198.00
							Y:	1,180.00	1,176.30	1,176.30	1,175.80	1,175.00	1,175.50	1,177.00	1,177.10
D13D24	0.032	0.013	0.013	5,460.00	0.0044	-	X:	100.00	100.10	145.00	145.10	175.00	175.10	184.90	185.00
							Y:	1,178.00	1,176.50	1,175.50	1,175.00	1,175.80	1,176.30	1,176.30	1,180.00
D14D15	0.022	0.013	0.013	3,351.00	0.0029	-	X:	100.00	100.10	110.00	110.10	120.00	125.00	133.90	134.00
							Y:	1,003.00	999.80	999.70	999.20	999.40	999.50	999.70	1,000.50
D14D26	0.022	0.022	0.022	5,050.00	0.0048	-	X:	100.00	102.50	105.50	137.50	187.50	219.50	222.00	225.00
							Y:	1,000.00	999.50	999.00	991.00	991.10	999.00	999.80	1,000.00
D15D26	0.016	0.016	0.016	9,949.00	0.0050	-	X:	100.00	112.00	122.00	134.00	145.00	157.00	169.00	185.00
							Y:	1,040.40	1,040.20	1,040.00	1,034.00	1,034.00	1,040.00	1,040.20	1,040.60
D15D28	0.016	0.016	0.016	7,000.00	0.0050	-	X:	100.00	112.00	122.00	134.00	145.00	157.00	169.00	185.00
							Y:	1,040.40	1,040.20	1,040.00	1,034.00	1,034.00	1,040.00	1,040.20	1,040.60
D20D21	0.032	0.032	0.013	5,323.00	0.0023	-	X:	100.00	100.50	112.00	150.00	162.00	198.00	198.00	220.00
							Y:	1,000.10	1,000.00	997.00	997.00	1,000.00	999.50	998.90	999.40
D21D22	0.032	0.025	0.032	2,720.00	0.0029	-	X:	100.00	103.00	105.00	116.00	151.00	160.00	165.00	170.00
							Y:	1,000.20	1,000.10	1,000.00	997.00	997.10	1,000.00	1,000.10	1,000.20
D22D23	0.032	0.032	0.032	2,705.00	0.0037	-	X:	100.00	104.00	106.00	110.00	118.00	122.00	126.00	138.00
							Y:	1,161.00	1,160.00	1,159.00	1,158.00	1,158.10	1,159.00	1,160.00	1,161.00
D23D24	0.035	0.035	0.035	2,646.00	0.0044	-	X:	894.00	906.00	912.00	918.00	926.00	930.00	934.00	942.00
							Y:	1,157.00	1,155.00	1,154.00	1,153.00	1,153.00	1,154.00	1,155.00	1,157.00

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
D24D25	0.030	0.030	0.030	2,701.00	0.0020	-	X:	1,000.00	1,018.00	1,019.00	1,020.00	1,026.00	1,027.00	1,028.00	1,046.00
							Y:	1,100.00	1,094.00	1,094.00	1,094.00	1,094.00	1,094.00	1,094.00	1,100.00
D25D39	0.030	0.030	0.030	2,020.00	0.0040	-	X:	-	20.00	25.00	30.00	35.00	41.50	51.10	82.30
							Y:	10.00	-	-	-	-	-	4.80	10.00
D26D27	0.022	0.022	0.022	2,050.00	0.0039	-	X:	100.00	102.50	105.50	137.50	187.50	219.50	222.00	225.00
							Y:	1,000.00	999.50	999.00	991.00	991.00	999.00	999.50	1,000.00
D27D42	0.030	0.030	0.030	5,599.00	0.0020	-	X:	-	24.40	34.40	44.40	54.40	64.40	74.40	98.80
							Y:	1,128.50	1,122.40	1,122.40	1,122.40	1,122.40	1,122.40	1,122.40	1,128.50
D28AFR	0.016	0.016	0.016	2,990.00	0.0050	-	X:	100.00	112.00	122.00	134.00	145.00	157.00	169.00	185.00
							Y:	1,040.40	1,040.20	1,040.00	1,034.00	1,034.00	1,040.00	1,040.20	1,040.60
D39D42	0.030	0.030	0.030	5,691.00	0.0039	-	X:	-	30.00	38.00	54.00	76.50	104.00	139.00	154.00
							Y:	10.00	4.00	4.00	-	-	-	7.00	10.00
D42D53	0.030	0.030	0.030	1,558.00	0.0020	-	X:	-	10.00	22.00	97.00	171.00	172.00	184.00	194.00
							Y:	3.50	3.00	-	-	-	-	3.00	3.50
D43D54	0.025	0.025	0.025	3,872.00	0.0023	-	X:	100.00	200.00	400.00	500.00	550.00	600.00	800.00	900.00
							Y:	1,000.00	999.50	998.50	998.00	998.30	998.50	999.50	1,000.00
D53D54	0.030	0.030	0.030	3,999.00	0.0038	-	X:	-	36.00	39.00	42.00	45.00	48.00	51.00	87.00
							Y:	1,102.80	1,096.80	1,096.80	1,096.80	1,096.80	1,096.80	1,096.80	1,102.80
RTD13A	0.035	0.030	0.035	2,634.00	0.0050	-	X:	100.00	114.00	130.00	133.00	137.00	140.00	156.00	170.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
RTD13B	0.035	0.030	0.035	2,069.00	0.0050	-	X:	100.00	114.00	130.00	133.00	137.00	140.00	156.00	170.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
RTD13C	0.035	0.030	0.035	2,984.00	0.0050	-	X:	100.00	114.00	130.00	133.00	137.00	140.00	156.00	170.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00

Route ID	LOB N	Chan N	ROB N	Length (ft)	Slope (ft/ft)	Max Elev (ft)		1.	2.	3.	4.	5.	6.	7.	8.
RTD13D	0.035	0.030	0.035	1,850.00	0.0050	-	X:	100.00	114.00	130.00	133.00	137.00	140.00	156.00	170.00
							Y:	1,001.00	999.00	995.00	994.50	994.50	995.00	999.00	1,001.00
RTD13E	0.035	0.030	0.035	1,334.00	0.0050	-	X:	100.00	114.00	130.00	133.00	137.00	140.00	156.00	170.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00
RTD13F	0.035	0.030	0.035	2,575.00	0.0050	-	X:	100.00	110.00	122.00	125.00	150.00	153.00	165.00	175.00
							Y:	1,000.00	999.00	995.00	994.50	994.50	995.00	999.00	1,000.00

APPENDIX B

SCENARIO 2 – DETENTION + FF

DDMSW RESULTS

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin 01								
D03	Hydrograph	0.72						958
RD03	Diversion	0.72						958
DD03RE	Hydrograph	0.72						
D03D04	Routed	0.72						
D04	Hydrograph	0.89						1,149
RD04	Diversion	0.89						1,149
DD04RE	Hydrograph	0.89						27
CPD04	Combined	1.61						27
DD04S	Diversion	1.61						
DD04SE	Hydrograph	1.61						27
D04D05	Routed	1.61						23
D05	Hydrograph	0.16						325
RD05	Diversion	0.16						325
DD05RE	Hydrograph	0.16						30
CPD05	Combined	1.78						30
D05D14	Routed	1.78						28
DD141S	Diversion	1.78						
DD141	Hydrograph	1.78						28
D05D15	Routed	1.78						28
D11	Hydrograph	0.66						776
RD11	Diversion	0.66						746
DD11RE	Hydrograph	0.66						715
DD111S	Diversion	0.66						587
DD111	Hydrograph	0.66						127
DD112S	Diversion	0.66						46
DD112	Hydrograph	0.66						81
D11D12	Routed	0.66						50
D12	Hydrograph	0.35						277
RD12	Diversion	0.35						260
DD12RE	Hydrograph	0.35						261
CPD12	Combined	1.01						305
DD121S	Diversion	1.01						134
DD121	Hydrograph	1.01						171
DD122S	Diversion	1.01						69
DD122	Hydrograph	1.01						101
D12D13	Routed	1.01						83
D13F	Hydrograph	0.13						259
RDD13F	Diversion	0.13						14
DDD13F	Hydrograph	0.13						259
SRD13F	Routed	0.13						22
CP13F1	Combined	1.14						103
RDGWW	Diversion	1.14						103
DDGWW	Hydrograph	1.14						80
D13E	Hydrograph	0.17						304
RDD13E	Diversion	0.17						304
DDD13E	Hydrograph	0.17						75
RTD13E	Routed	0.17						52
CP13F2	Combined	1.31						101
SRGWW	Routed	1.31						77
RTD13F	Routed	1.31						68
D13G	Hydrograph	0.17						328
RDD13G	Diversion	0.17						13
DDD13G	Hydrograph	0.17						328
SRD13G	Routed	0.17						29
CP13G1	Combined	1.47						93
RDGWE	Diversion	1.47						59
DDGWE	Hydrograph	1.47						93
D13A	Hydrograph	0.14						292
RDD13A	Diversion	0.14						9
DDD13A	Hydrograph	0.14						292
SRD13A	Routed	0.14						25
RTD13A	Routed	0.14						25
D13B	Hydrograph	0.14						282
RDD13B	Diversion	0.14						9
DDD13B	Hydrograph	0.14						282

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
SRD13B	Routed	0.14						25
DD04S	Hydrograph	1.61						
D04D13	Routed	1.61						
CPD13B	Combined	0.29						49
RTD13B	Routed	0.29						49
D13C	Hydrograph	0.11						191
RDD13C	Diversion	0.11						8
DDD13C	Hydrograph	0.11						191
SRD13C	Routed	0.11						17
RTD13C	Routed	0.11						17
D13D	Hydrograph	0.16						305
RDD13D	Diversion	0.16						18
DDD13D	Hydrograph	0.16						305
SRD13D	Routed	0.16						26
CPD13D	Combined	0.56						90
RTD13D	Routed	0.56						90
CP13G2	Combined	2.04						179
SRGWE	Routed	2.04						186
DD131S	Diversion	2.04						7
DD131	Hydrograph	2.04						179
DD132S	Diversion	2.04						40
DD132	Hydrograph	2.04						139
D13D14	Routed	2.04						123
D14	Hydrograph	0.94						1,090
RD14	Diversion	0.94						1,090
DD14RE	Hydrograph	0.94						445
DD141	Hydrograph	1.78						
D0514A	Routed	1.78						
CPD14	Combined	4.76						445
DD142S	Diversion	4.76						330
DD142	Hydrograph	4.76						94
D14D15	Routed	4.76						48
D15	Hydrograph	0.22						419
CPD15	Combined	4.98						416
D15D26	Routed	4.98						328
D15D28	Routed	4.98						287
D28	Hydrograph	0.25						417
CPD28	Combined	5.23						480
D28AFR	Routed	5.23						459
D26	Hydrograph	0.64						982
RD26	Diversion	0.64						982
DD26RE	Hydrograph	0.64						29
DD142	Hydrograph	4.76						330
D14D26	Routed	4.76						182
CPD26	Combined	5.40						177
D26D27	Routed	5.40						159
D27	Hydrograph	0.32						497
RD27	Diversion	0.32						101
DD27RE	Hydrograph	0.32						497
CPD27	Combined	5.72						490
SRD27	Routed	5.72						490
D27D42	Routed	5.72						344
D20	Hydrograph	0.50						583
RD20	Diversion	0.50						583
DD20RE	Hydrograph	0.50						9
DD111	Hydrograph	0.66						587
D11D20	Routed	0.66						330
CPD20	Combined	1.16						328
D20D21	Routed	1.16						245
D21	Hydrograph	0.50						558
RD21	Diversion	0.50						558
DD21RE	Hydrograph	0.50						7
DD112	Hydrograph	0.66						46
D11D21	Routed	0.66						22
DD121	Hydrograph	1.01						134
D12D21	Routed	1.01						104

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
CPD21	Combined	2.00						324
DD211S	Diversion	2.00						216
DD211	Hydrograph	2.00						108
DD212S	Diversion	2.00						54
DD212	Hydrograph	2.00						54
D21D22	Routed	2.00						38
D22	Hydrograph	0.45						558
RD22	Diversion	0.45						558
DD22RE	Hydrograph	0.45						7
DD122	Hydrograph	1.01						69
D12D22	Routed	1.01						49
CPD22	Combined	2.46						80
D22D23	Routed	2.46						72
D23	Hydrograph	0.54						552
RD23	Diversion	0.54						552
DD23RE	Hydrograph	0.54						63
DD131	Hydrograph	2.04						7
D13D23	Routed	2.04						6
CPD23	Combined	5.64						91
DD231S	Diversion	5.64						9
DD231	Hydrograph	5.64						82
DD232S	Diversion	5.64						10
DD232	Hydrograph	5.64						72
D23D24	Routed	5.64						69
D24	Hydrograph	0.49						534
RD24	Diversion	0.49						534
DD24RE	Hydrograph	0.49						4
DD132	Hydrograph	2.04						40
D13D24	Routed	2.04						35
CPD24	Combined	6.13						97
D24D25	Routed	6.13						93
D25	Hydrograph	0.50						570
RD25	Diversion	0.50						570
DD25RE	Hydrograph	0.50						19
CPD25	Combined	6.63						100
D25D39	Routed	6.63						97
D39	Hydrograph	0.18						112
CPD39	Combined	6.81						107
D39D42	Routed	6.81						86
D42	Hydrograph	0.99						1,315
RD42	Diversion	0.99						1,315
DD42RE	Hydrograph	0.99						215
CPD42	Combined	9.87						355
SRD42	Routed	9.87						239
D42D53	Routed	9.87						229
D53	Hydrograph	0.12						180
RD53	Diversion	0.12						180
DD53RE	Hydrograph	0.12						
CPD53	Combined	9.99						229
SRD53	Routed	9.99						200
D53D54	Routed	9.99						189
D43	Hydrograph	0.50						638
RD43	Diversion	0.50						638
DD43RE	Hydrograph	0.50						76
D43D54	Routed	0.50						40
D54	Hydrograph	0.27						338
RD54	Diversion	0.27						66
DD54RE	Hydrograph	0.27						338
CPD54	Combined	10.76						320
D44	Hydrograph	0.54						544
RD44	Diversion	0.54						540
DD44RE	Hydrograph	0.54						462
D55	Hydrograph	0.19						219
RD55	Diversion	0.19						219
DD55RE	Hydrograph	0.19						33
D56	Hydrograph	0.22						266

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
RD56	Diversion	0.22						37
DD56RE	Hydrograph	0.22						266
DUMMY	Combined	11.71						676
DUMMY	Combined	16.94						1,004

```
Basin          D03
Divert           .-------> RD03
Hydrograph     DD03RE
Route          D03D04
Basin            .     D04
Divert           .     .-------> RD04
Hydrograph       .   DD04RE
Combine        CPD04.....
Divert           .-------> DD04S
Hydrograph     DD04SE
Route          D04D05
Basin            .     D05
Divert           .     .-------> RD05
Hydrograph       .   DD05RE
Combine        CPD05.....
Route          D05D14
Divert           .-------> DD141S
Hydrograph      DD141
Route          D05D15
Basin            .     D11
Divert           .     .-------> RD11
Hydrograph       .   DD11RE
Divert           .     .-------> DD111S
Hydrograph       .    DD111
Divert           .     .-------> DD112S
Hydrograph       .    DD112
Route            .   D11D12
Basin            .     .     D12
Divert           .     .     .-------> RD12
Hydrograph       .     .   DD12RE
Combine          .    CPD12.....
Divert           .     .-------> DD121S
Hydrograph       .    DD121
Divert           .     .-------> DD122S
Hydrograph       .    DD122
Route            .   D12D13
Basin            .     .     D13F
Divert           .     .     .-------> RDD13F
Hydrograph       .     .   DDD13F
Route            .     .   SRD13F
Combine          .   CP13F1.....
Divert           .     .-------> RDGWW
Hydrograph       .    DDGWW
Basin            .     .     D13E
Divert           .     .     .-------> RDD13E
Hydrograph       .     .   DDD13E
Route            .     .   RTD13E
Combine          .   CP13F2.....
Route            .    SRGWW
Route            .   RTD13F
Basin            .     .     D13G
Divert           .     .     .-------> RDD13G
Hydrograph       .     .   DDD13G
Route            .     .   SRD13G
Combine          .   CP13G1.....
Divert           .     .-------> RDGWE
Hydrograph       .    DDGWE
Basin            .     .     D13A
Divert           .     .     .-------> RDD13A
Hydrograph       .     .   DDD13A
Route            .     .   SRD13A
```

```
Route          .    .    RTD13A
Basin          .    .    .    D13B
Divert         .    .    .    .-------> RDD13B
Hydrograph     .    .    .    DDD13B
Route          .    .    .    SRD13B
Retrieve       .    .    .    .    .<------- DD04S
Hydrograph     .    .    .    .    DD04S
Route          .    .    .    .    D04D13
Combine        .    .    CPD13B.....................
Route          .    .    RTD13B
Basin          .    .    .    D13C
Divert         .    .    .    .-------> RDD13C
Hydrograph     .    .    .    DDD13C
Route          .    .    .    SRD13C
Route          .    .    .    RTD13C
Basin          .    .    .    .    D13D
Divert         .    .    .    .    .-------> RDD13D
Hydrograph     .    .    .    .    DDD13D
Route          .    .    .    .    SRD13D
Combine        .    .    CPD13D.....................
Route          .    .    RTD13D
Combine        .    CP13G2.............
Route          .    SRGWE
Divert         .    .-------> DD131S
Hydrograph     .    DD131
Divert         .    .-------> DD132S
Hydrograph     .    DD132
Route          .    D13D14
Basin          .    .    D14
Divert         .    .    .-------> RD14
Hydrograph     .    .    DD14RE
Retrieve       .    .    .    .<------- DD141S
Hydrograph     .    .    .    DD141
Route          .    .    .    D0514A
Combine        .    CPD14.....................
Divert         .    .-------> DD142S
Hydrograph     .    DD142
Route          .    D14D15
Basin          .    .    D15
Combine        CPD15.....................
Route          D15D26
Route          D15D28
Basin          .    D28
Combine        CPD28.............
Route          D28AFR
Basin          .    D26
Divert         .    .-------> RD26
Hydrograph     .    DD26RE
Retrieve       .    .    .<------- DD142S
Hydrograph     .    .    DD142
Route          .    .    D14D26
Combine        .    CPD26.............
Route          .    D26D27
Basin          .    .    D27
Divert         .    .    .-------> RD27
Hydrograph     .    .    DD27RE
Combine        .    CPD27.............
Route          .    SRD27
Route          .    D27D42
Basin          .    .    D20
Divert         .    .    .-------> RD20
Hydrograph     .    .    DD20RE
```

```
Retrieve . . . .<------- DD111S
Hydrograph . . . DD111
Route . . . D11D20
Combine . . CPD20.....
Route . . D20D21
Basin . . . D21
Divert . . . .-------> RD21
Hydrograph . . . DD21RE
Retrieve . . . . .<------- DD112S
Hydrograph . . . . DD112
Route . . . . D11D21
Retrieve . . . . . .<------- DD121S
Hydrograph . . . . . DD121
Route . . . . . D12D21
Combine . . CPD21.....
Divert . . .-------> DD211S
Hydrograph . . DD211
Divert . . .-------> DD212S
Hydrograph . . DD212
Route . . D21D22
Basin . . . D22
Divert . . . .-------> RD22
Hydrograph . . . DD22RE
Retrieve . . . . .<------- DD122S
Hydrograph . . . DD122
Route . . . D12D22
Combine . . CPD22.....
Route . . D22D23
Basin . . . D23
Divert . . . .-------> RD23
Hydrograph . . . DD23RE
Retrieve . . . . .<------- DD131S
Hydrograph . . . DD131
Route . . . D13D23
Combine . . CPD23.....
Divert . . .-------> DD231S
Hydrograph . . DD231
Divert . . .-------> DD232S
Hydrograph . . DD232
Route . . D23D24
Basin . . . D24
Divert . . . .-------> RD24
Hydrograph . . . DD24RE
Retrieve . . . . .<------- DD132S
Hydrograph . . . DD132
Route . . . D13D24
Combine . . CPD24.....
Route . . D24D25
Basin . . . D25
Divert . . . .-------> RD25
Hydrograph . . . DD25RE
Combine . . CPD25.....
Route . . D25D39
Basin . . . D39
Combine . . CPD39.....
Route . . D39D42
Basin . . . D42
Divert . . . .-------> RD42
Hydrograph . . . DD42RE
Combine . CPD42.....
Route . SRD42
Route . D42D53
```

```
Basin          .    .    D53
Divert         .    .    .-------> RD53
Hydrograph     .    .    DD53RE
Combine        .    CPD53.....
Route          .    SRD53
Route          .    D53D54
Basin          .    .    D43
Divert         .    .    .-------> RD43
Hydrograph     .    .    DD43RE
Route          .    .    D43D54
Basin          .    .    .    D54
Divert         .    .    .    .-------> RD54
Hydrograph     .    .    .    DD54RE
Combine        .    CPD54.....
Basin          .    .    D44
Divert         .    .    .-------> RD44
Hydrograph     .    .    DD44RE
Basin          .    .    .    D55
Divert         .    .    .    .-------> RD55
Hydrograph     .    .    .    DD55RE
Basin          .    .    .    .    D56
Divert         .    .    .    .    .-------> RD56
Hydrograph     .    .    .    .    DD56RE
Combine        .    DUMMY.....
Combine        DUMMY.....
```

Storage Basin ID:	**SRD13A**											
Spillway Characteristics (SS)			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		2.9	5.8	8.9	12.2					
Spillway Length:	-NA-	**Discharge (cfs)**	0	2	7	15	26	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	100.0	101.0	102.0	103.0	104.0	-	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			**11**	**12**	**13**	**14.**	**15**	**16**	**17**	**18**	**19**	**20**
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	SCC ALT2 Dibble designed Detention basin with 91% reduction to peak			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	11.88				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	103.91				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	25				
Weir Coefficient:	-NA-											

Storage Basin ID:	**SRD13B**											
Spillway Characteristics (SS)			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		2.8	5.6	8.6	11.7					
Spillway Length:	-NA-	**Discharge (cfs)**	0	2	6	14	25	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	100.0	101.0	102.0	103.0	104.0	-	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			**11**	**12**	**13**	**14.**	**15**	**16**	**17**	**18**	**19**	**20**
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	SCC ALT2 Dibble designed Detention basin with 91% reduction to peak			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	11.67				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	104.00				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	25				
Weir Coefficient:	-NA-											

Storage Basin ID:	**SRD13C**											
Spillway Characteristics (SS)			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		2.0	4.0	6.2	8.4					
Spillway Length:	-NA-	**Discharge (cfs)**	0	1	4	9	17	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	100.0	101.0	102.0	103.0	104.0	-	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			**11**	**12**	**13**	**14.**	**15**	**16**	**17**	**18**	**19**	**20**
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	SCC ALT2 Dibble designed Detention basin with 91% reduction to peak			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	8.44				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	104.00				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	17				
Weir Coefficient:	-NA-											

Storage Basin ID:	**SRD13D**											
Spillway Characteristics (SS)			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		2.3	4.5	6.9	9.5					
Spillway Length:	-NA-	**Discharge (cfs)**	0	3	7	15	27	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	100.0	101.0	102.0	103.0	104.0	-	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			**11**	**12**	**13**	**14.**	**15**	**16**	**17**	**18**	**19**	**20**
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	SCC ALT2 Dibble designed Detention basin with 91% reduction to peak			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	9.26				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	103.92				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	26				
Weir Coefficient:	-NA-											

Storage Basin ID:	**SRD13F**											
Spillway Characteristics (SS)			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		1.8	3.7	5.7	7.8					
Spillway Length:	-NA-	**Discharge (cfs)**	0	2	6	13	23	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	100.0	101.0	102.0	103.0	104.0	-	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			**11**	**12**	**13**	**14.**	**15**	**16**	**17**	**18**	**19**	**20**
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	SCC ALT2 Dibble designed Detention basin with 91% reduction to peak			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	7.54				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	103.90				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	22				
Weir Coefficient:	-NA-											

Storage Basin ID:	**SRD13G**											
Spillway Characteristics (SS)			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		2.9	5.8	8.9	12.1					
Spillway Length:	-NA-	**Discharge (cfs)**	0	3	8	17	30	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	100.0	101.0	102.0	103.0	104.0	-	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			**11**	**12**	**13**	**14.**	**15**	**16**	**17**	**18**	**19**	**20**
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	SCC ALT2 Dibble designed Detention basin with 91% reduction to peak			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	11.81				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	103.92				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	29				
Weir Coefficient:	-NA-											

Storage Basin ID:	SRD27										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**							22.8	51.4		
Spillway Length:	-NA-	**Discharge (cfs)**	0	52	202	415	658	906	1,127	2,999	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,140.0	1,142.0	1,144.0	1,146.0	1,148.0	1,150.0	1,152.0	1,154.0	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	0.00				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,146.62				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	490				
Weir Coefficient:	-NA-											

Storage Basin ID:	SRD42										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.6	4.6	17.3	27.6	56.3				
Spillway Length:	-NA-	**Discharge (cfs)**	0	0	139	426	827	1,295	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,105.3	1,108.0	1,110.0	1,112.0	1,114.0	1,116.0	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	9.03				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,110.70				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	239				
Weir Coefficient:	-NA-											

Storage Basin ID:	SRD53										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		5.7	11.6	18.2	32.0	39.5	67.5	67.5	67.5	67.5
Spillway Length:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	546	731	890
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,098.5	1,099.5	1,100.5	1,101.5	1,103.5	1,104.5	1,108.5	1,111.0	1,112.0	1,113.0
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr				
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	67.53				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,109.42				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	200				
Weir Coefficient:	-NA-											

Storage Basin ID:	SRGWE										
Spillway Characteristics (SS)			1	2	3	4	5	6	7	8	9	10
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.4	0.6	0.8	1.2				
Spillway Length:	-NA-	**Discharge (cfs)**	0	51	146	268	388	1,000	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,183.0	1,184.0	1,185.0	1,186.0	1,187.0	1,188.0	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			11	12	13	14.	15	16	17	18	19	20
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	Greenway East basin SSD area upstream of culvert			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	0.48				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,185.33				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	186				
Weir Coefficient:	-NA-											

Storage Basin ID:	**SRGWW**											
Spillway Characteristics (SS)			**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Spillway Crest Elevation:	-NA-	**Volume (ac-ft)**		0.1	0.3	0.8	1.3	1.9				
Spillway Length:	-NA-	**Discharge (cfs)**	0	6	19	35	50	350	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	1,192.0	1,193.0	1,194.0	1,195.0	1,196.0	1,197.0	-	-	-	-
Weir Coefficient:	-NA-											
Low-Level Outlet (SL)			**11**	**12**	**13**	**14.**	**15**	**16**	**17**	**18**	**19**	**20**
Centerline Elevation:	-NA-	**Volume (ac-ft)**	-	-	-	-	-	-	-	-	-	-
Cross-Section Area:	-NA-	**Discharge (cfs)**	0	0	0	0	0	0	0	0	0	0
Discharge Coefficient:	-NA-	**Elevation (ft)**	-	-	-	-	-	-	-	-	-	-
Orifice Equation Exponent:	-NA-											
Top of Dam Overflow (ST)			2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	Greenway West basin SSD area upstream of culvert			
Elevation Top of Dam:	-NA-	**Peak Volume (ac-ft)**	0.00	0.00	0.00	0.00	0.00	1.39				
Length of Dam:	-NA-	**Peak Stage (ft)**	0.00	0.00	0.00	0.00	0.00	1,196.09				
Discharge Coefficient:	-NA-	**Peak Discharge (cfs)**	0	0	0	0	0	77				
Weir Coefficient:	-NA-											

APPENDIX B

SCENARIO 3 – RETENTION

DDMSW RESULTS

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin 01								
D03	Hydrograph	0.72						958
RD03	Diversion	0.72						958
DD03RE	Hydrograph	0.72						
D03D04	Routed	0.72						
D04	Hydrograph	0.89						1,149
RD04	Diversion	0.89						1,149
DD04RE	Hydrograph	0.89						27
CPD04	Combined	1.61						27
DD04S	Diversion	1.61						
DD04SE	Hydrograph	1.61						27
D04D05	Routed	1.61						23
D05	Hydrograph	0.16						325
RD05	Diversion	0.16						325
DD05RE	Hydrograph	0.16						30
CPD05	Combined	1.78						30
D05D14	Routed	1.78						28
DD141S	Diversion	1.78						
DD141	Hydrograph	1.78						28
D05D15	Routed	1.78						28
D11	Hydrograph	0.66						776
RD11	Diversion	0.66						746
DD11RE	Hydrograph	0.66						715
DD111S	Diversion	0.66						587
DD111	Hydrograph	0.66						127
DD112S	Diversion	0.66						46
DD112	Hydrograph	0.66						81
D11D12	Routed	0.66						50
D12	Hydrograph	0.35						277
RD12	Diversion	0.35						260
DD12RE	Hydrograph	0.35						261
CPD12	Combined	1.01						305
DD121S	Diversion	1.01						134
DD121	Hydrograph	1.01						171
DD122S	Diversion	1.01						69
DD122	Hydrograph	1.01						101
D12D13	Routed	1.01						75
D13F	Hydrograph	0.13						259
RDD13F	Diversion	0.13						259
DDD13F	Hydrograph	0.13						2
CP13F1	Combined	1.14						75
RDGWW	Diversion	1.14						75
DDGWW	Hydrograph	1.14						20
D13E	Hydrograph	0.17						304
RDD13E	Diversion	0.17						304
DDD13E	Hydrograph	0.17						75
RTD13E	Routed	0.17						52
CP13F2	Combined	1.31						48
SRGWW	Routed	1.31						30
RTD13F	Routed	1.31						28
D13G	Hydrograph	0.17						328
RDD13G	Diversion	0.17						328
DDD13G	Hydrograph	0.17						12
CP13G1	Combined	1.47						34
RDGWE	Diversion	1.47						34
DDGWE	Hydrograph	1.47						28
D13A	Hydrograph	0.14						292
RDD13A	Diversion	0.14						292
DDD13A	Hydrograph	0.14						32
RTD13A	Routed	0.14						25
D13B	Hydrograph	0.14						282
RDD13B	Diversion	0.14						282
DDD13B	Hydrograph	0.14						29
DD04S	Hydrograph	1.61						
D04D13	Routed	1.61						
CPD13B	Combined	0.29						48

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
RTD13B	Routed	0.29						46
D13C	Hydrograph	0.11						191
RDD13C	Diversion	0.11						191
DDD13C	Hydrograph	0.11						10
RTD13C	Routed	0.11						8
D13D	Hydrograph	0.16						305
RDD13D	Diversion	0.16						305
DDD13D	Hydrograph	0.16						2
CPD13D	Combined	0.56						46
RTD13D	Routed	0.56						45
CP13G2	Combined	2.04						52
SRGWE	Routed	2.04						52
DD131S	Diversion	2.04						2
DD131	Hydrograph	2.04						50
DD132S	Diversion	2.04						11
DD132	Hydrograph	2.04						39
D13D14	Routed	2.04						33
D14	Hydrograph	0.94						1,090
RD14	Diversion	0.94						1,090
DD14RE	Hydrograph	0.94						445
DD141	Hydrograph	1.78						
D0514A	Routed	1.78						
CPD14	Combined	4.76						445
DD142S	Diversion	4.76						330
DD142	Hydrograph	4.76						94
D14D15	Routed	4.76						48
D15	Hydrograph	0.22						419
CPD15	Combined	4.98						416
D15D26	Routed	4.98						328
D15D28	Routed	4.98						287
D28	Hydrograph	0.25						417
CPD28	Combined	5.23						480
D28AFR	Routed	5.23						459
D26	Hydrograph	0.64						982
RD26	Diversion	0.64						982
DD26RE	Hydrograph	0.64						29
DD142	Hydrograph	4.76						330
D14D26	Routed	4.76						180
CPD26	Combined	5.40						175
D26D27	Routed	5.40						154
D27	Hydrograph	0.32						497
RD27	Diversion	0.32						101
DD27RE	Hydrograph	0.32						497
CPD27	Combined	5.72						490
SRD27	Routed	5.72						490
D27D42	Routed	5.72						344
D20	Hydrograph	0.50						583
RD20	Diversion	0.50						583
DD20RE	Hydrograph	0.50						9
DD111	Hydrograph	0.66						587
D11D20	Routed	0.66						330
CPD20	Combined	1.16						328
D20D21	Routed	1.16						245
D21	Hydrograph	0.50						558
RD21	Diversion	0.50						558
DD21RE	Hydrograph	0.50						7
DD112	Hydrograph	0.66						46
D11D21	Routed	0.66						22
DD121	Hydrograph	1.01						134
D12D21	Routed	1.01						104
CPD21	Combined	2.00						324
DD211S	Diversion	2.00						216
DD211	Hydrograph	2.00						108
DD212S	Diversion	2.00						54
DD212	Hydrograph	2.00						54
D21D22	Routed	2.00						38

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
D22	Hydrograph	0.45						558
RD22	Diversion	0.45						558
DD22RE	Hydrograph	0.45						7
DD122	Hydrograph	1.01						69
D12D22	Routed	1.01						49
CPD22	Combined	2.46						80
D22D23	Routed	2.46						72
D23	Hydrograph	0.54						552
RD23	Diversion	0.54						552
DD23RE	Hydrograph	0.54						63
DD131	Hydrograph	2.04						2
D13D23	Routed	2.04						2
CPD23	Combined	5.64						89
DD231S	Diversion	5.64						9
DD231	Hydrograph	5.64						80
DD232S	Diversion	5.64						10
DD232	Hydrograph	5.64						70
D23D24	Routed	5.64						67
D24	Hydrograph	0.49						534
RD24	Diversion	0.49						534
DD24RE	Hydrograph	0.49						4
DD132	Hydrograph	2.04						11
D13D24	Routed	2.04						10
CPD24	Combined	6.13						73
D24D25	Routed	6.13						68
D25	Hydrograph	0.50						570
RD25	Diversion	0.50						570
DD25RE	Hydrograph	0.50						19
CPD25	Combined	6.63						75
D25D39	Routed	6.63						70
D39	Hydrograph	0.18						112
CPD39	Combined	6.81						107
D39D42	Routed	6.81						75
D42	Hydrograph	0.99						1,315
RD42	Diversion	0.99						1,315
DD42RE	Hydrograph	0.99						215
CPD42	Combined	9.87						355
SRD42	Routed	9.87						239
D42D53	Routed	9.87						229
D53	Hydrograph	0.12						180
RD53	Diversion	0.12						180
DD53RE	Hydrograph	0.12						
CPD53	Combined	9.99						229
SRD53	Routed	9.99						92
D53D54	Routed	9.99						88
D43	Hydrograph	0.50						638
RD43	Diversion	0.50						638
DD43RE	Hydrograph	0.50						76
D43D54	Routed	0.50						40
D54	Hydrograph	0.27						338
RD54	Diversion	0.27						66
DD54RE	Hydrograph	0.27						338
CPD54	Combined	10.76						320
D44	Hydrograph	0.54						544
RD44	Diversion	0.54						540
DD44RE	Hydrograph	0.54						462
D55	Hydrograph	0.19						219
RD55	Diversion	0.19						219
DD55RE	Hydrograph	0.19						33
D56	Hydrograph	0.22						266
RD56	Diversion	0.22						37
DD56RE	Hydrograph	0.22						266
DUMMY	Combined	11.71						676
DUMMY	Combined	16.94						1,004

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DDD13A	16.24		**Inflow (cfs)**		500	5,000	50,000						
RDD13A			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13B	15.99		**Inflow (cfs)**		500	5,000	50,000						
RDD13B			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13C	12.79		**Inflow (cfs)**		500	5,000	50,000						
RDD13C			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13D	18.21		**Inflow (cfs)**		500	5,000	50,000						
RDD13D			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13E	17.10		**Inflow (cfs)**		500	5,000	50,000						
RDD13E			**Diversion (cfs)**		500	5,000	50,000						
Builtout basin uses ADMS diversion volume of 17.1 ac-ft. First Flush volume not evaluated.													
DDD13F	14.35		**Inflow (cfs)**		500	5,000	50,000						
RDD13F			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DDD13G	18.85		**Inflow (cfs)**		500	5,000	50,000						
RDD13G			**Diversion (cfs)**		500	5,000	50,000						
First Flush volume per Rational Method													
DD03RE	110.75		**Inflow (cfs)**		500	5,000	50,000						
RD03			**Diversion (cfs)**		500	5,000	50,000						
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD04RE	76.49		**Inflow (cfs)**		500	5,000	50,000						
RD04			**Diversion (cfs)**		500	5,000	50,000						
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD04SE			**Inflow (cfs)**	86	159	512	904	1,940					
DD04S			**Diversion (cfs)**		42	259	534	1,278					

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD05RE	17.36		**Inflow (cfs)**	500	5,000	50,000							
RD05			**Diversion (cfs)**	500	5,000	50,000							
Revised per City provided ADOT US60 Bell Road TI 060-B-NFA, project by TYLIN													
DD141			**Inflow (cfs)**	122	500	1,000							
DD141S			**Diversion (cfs)**		378	878							
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD11RE	32.40		**Inflow (cfs)**	500	5,000	50,000							
RD11			**Diversion (cfs)**	500	5,000	50,000							
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD111			**Inflow (cfs)**	34	453	1,486	2,999						
DD111S			**Diversion (cfs)**	26	377	1,210	2,419						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD112			**Inflow (cfs)**	8	77	276	579						
DD112S			**Diversion (cfs)**	5	35	79	133						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD12RE	15.30		**Inflow (cfs)**	500	5,000	50,000							
RD12			**Diversion (cfs)**	500	5,000	50,000							
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD121			**Inflow (cfs)**	69	371	1,187	2,407						
DD121S			**Diversion (cfs)**	20	166	705	1,553						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD122			**Inflow (cfs)**	49	205	482	854						
DD122S			**Diversion (cfs)**	24	82	159	251						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DDD13E	17.10		**Inflow (cfs)**	500	5,000	50,000							
RD13E			**Diversion (cfs)**	500	5,000	50,000							
DIBBLE EXISTING MODEL STILL USES ADMS DIVERSION OF 17.1 ac-ft.													
DD131			**Inflow (cfs)**	519	917	1,651	2,842						
DD131S			**Diversion (cfs)**	19	121	423	996						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD132			**Inflow (cfs)**		500	796	1,227	1,846					
DD132S			**Diversion (cfs)**		112	318	584	899					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD14RE	63.40		**Inflow (cfs)**		500	5,000	50,000						
RD14			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD142			**Inflow (cfs)**		296	693	1,325	2,532					
DD142S			**Diversion (cfs)**		269	457	770	1,406					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD26RE	52.40		**Inflow (cfs)**		500	5,000	50,000						
RD26			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD27RE	8.20		**Inflow (cfs)**		500	5,000	50,000						
RD27			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD20RE	38.10		**Inflow (cfs)**		500	5,000	50,000						
RD20			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD21RE	39.90		**Inflow (cfs)**		500	5,000	50,000						
RD21			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD211			**Inflow (cfs)**		185	770	1,885	3,511					
DD211S			**Diversion (cfs)**		139	463	1,049	1,871					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD212			**Inflow (cfs)**		46	307	836	1,639					
DD212S			**Diversion (cfs)**		36	111	210	327					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD22RE	37.50		**Inflow (cfs)**		500	5,000	50,000						
RD22			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD23RE	36.30		**Inflow (cfs)**		500	5,000	50,000						
RD23			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD231			**Inflow (cfs)**		519	867	1,681	2,985					
DD231S			**Diversion (cfs)**		51	223	728	1,504					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD232			**Inflow (cfs)**		468	644	953	1,482					
DD232S			**Diversion (cfs)**		56	138	243	365					
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD24RE	40.90		**Inflow (cfs)**		500	5,000	50,000						
RD24			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD25RE	37.10		**Inflow (cfs)**		500	5,000	50,000						
RD25			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD53RE	12.10		**Inflow (cfs)**		500	5,000	50,000						
RD53			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD43RE	35.50		**Inflow (cfs)**		500	5,000	50,000						
RD43			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD54RE	3.00		**Inflow (cfs)**		500	5,000	50,000						
RD54			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD44RE	19.40		**Inflow (cfs)**		500	5,000	50,000						
RD44			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											
DD55RE	9.80		**Inflow (cfs)**		500	5,000	50,000						
RD55			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT		07/05/2016											

Diversion ID/ DT Card ID	Maximum Volume (ac-ft)	Maximum Diversion (cfs)		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
DD56RE	3.10		**Inflow (cfs)**		500	5,000	50,000						
RD56			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DD42RE	71.80		**Inflow (cfs)**		500	5,000	50,000						
RD42			**Diversion (cfs)**		500	5,000	50,000						
Data imported from HEC-1 file: WT_EXCIP.DAT 07/05/2016													
DDGWW	4.00		**Inflow (cfs)**		500	5,000	50,000						
RDGWW			**Diversion (cfs)**		500	5,000	50,000						
Diversion value estimate from Greenway Road plans & report for west basin													
DDGWE	4.61		**Inflow (cfs)**		500	5,000	50,000						
RDGWE			**Diversion (cfs)**		500	5,000	50,000						
Diversion value estimate from Greenway Road plans & report for east basin													

APPENDIX B

HEC-1 Output

Existing Conditions

100-year, 24-hour

```
1***************************************                                                                 ***************************************
 *                                     *                                                                 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                               *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998             *                                                                 *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                                                                 *          609 SECOND STREET          *
 *                                     *                                                                 *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06SEP16  TIME  17:15:40   *                                                               *           (916) 756-1104            *
 *                                     *                                                                 *                                     *
 ***************************************                                                                 ***************************************


                                                   X     X  XXXXXXX   XXXXX          X
                                                   X     X  X        X     X        XX
                                                   X     X  X        X               X
                                                   XXXXXXX  XXXX     X       XXXXX   X
                                                   X     X  X        X               X
                                                   X     X  X        X     X         X
                                                   X     X  XXXXXXX   XXXXX         XXX


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

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                             HEC-1 INPUT                                                     PAGE  1

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

            1           ID        City of Surprise, AZ
            2           ID        CORREFF SURPRISE - SCC Drainage Study - Corrected Effective Existing
            3           ID        100 YEAR
            4           ID        24 Hour Storm
            5           ID        Unit Hydrograph: S-Graph
            6           ID        Storm: Multiple
            7           ID        09/06/2016
                        *DIAGRAM
            8           IT      5  1JAN99      0    2000
            9           IO      5
           10           IN     15
                        *
           11           JD   3.480  0.0001
           12           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
           13           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
           14           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
           15           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
           16           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
           17           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
           18           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
           19           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
           20           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
           21           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
           22           JD   3.393     5.0
           23           JD   3.306    10.0
           24           JD   3.219    20.0
           25           JD   3.132    30.0
                        *

           26           KK     D03   BASIN
           27           KM   BASIN BOUNDARY FROM KINGSWOOD PARKE
           28           BA   0.723
           29           LG    0.23    0.25    4.87    0.37      35
           30           UI       0     123     481     721    1150    1206     816     545     244     150
           31           UI      70      35      35       0       0       0       0       0       0       0
           32           UI       0       0       0       0       0       0       0       0       0       0
           33           UI       0       0       0       0       0       0       0       0       0       0
           34           UI       0       0       0       0       0       0       0       0       0       0
                        *
                        *

           35           KK  DD03RE  DIVERT
           36           KM   Volume updated per TYLIN ADOT study for Bell Road
           37           DT    RD03  110.75     0.0
           38           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           39           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                        *
                        *

           40           KK  D03D04   ROUTE
           41           KM   Cross-section: Cross-section determined from aerial
           42           KM   Manning's N Value: street and earth with sparse trees and shrubs
           43           RS       4    FLOW
           44           RC   0.032   0.013   0.032    4458  0.0038    0.00
           45           RX  100.00  108.00  119.00  119.10  155.00  155.10  160.00  165.00
1                                             HEC-1 INPUT                                                     PAGE  2

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

```
  46          RY  1000.3 1000.00  999.50  999.00  999.70 1000.20 1000.30 1000.40
              *
              *

  47          KK     D04   BASIN
  48          KM   BASIN BOUNDARY FROM GRAND VILLAGE NORTH/SOUTH, BELLAZANO CONDOS,
  49          KM   HOPI VILLAGE, PIMA VILLAGE, SUN VILLAGE, ZUNI VILLAGE, PUEBLO VILLAGE,
  50          KM   GRAND AVE PROFF PLAZA AND GRAND AVE CHANNEL
  51          BA   0.891
  52          LG    0.22    0.27    5.71    0.25      36
  53          UI       0     123     429     682     934    1451    1138     831     585     291
  54          UI     187     115      38      38      38       0       0       0       0       0
  55          UI       0       0       0       0       0       0       0       0       0       0
  56          UI       0       0       0       0       0       0       0       0       0       0
  57          UI       0       0       0       0       0       0       0       0       0       0
              *
              *

  58          KK  DD04RE  DIVERT
  59          KM   Volume updated per TYLIN ADOT study for Bell Road
  60          DT    RD04   76.49     0.0
  61          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  62          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

  63          KK   CPD04 COMBINE
  64          HC       2   1.614
              *
              *

  65          KK  DD04SE  DIVERT
  66          KM   Split flow Bell Rd at Litchfield Rd intersection
  67          DT   DD04S    0.00     0.0
  68          DI     0.0    86.1   158.5   512.0   904.0  1940.0     0.0     0.0     0.0     0.0
  69          DQ     0.0     0.0    42.4   259.0   534.0  1278.0     0.0     0.0     0.0     0.0
              *
              *

  70          KK  D04D05   ROUTE
  71          KM   Cross-section: Cross-section determined from aerial
  72          KM   Manning's N Value: street and earth with sparse trees and shrubs
  73          RS       3    FLOW
  74          RC   0.032   0.013   0.013    2993  0.0027    0.00
  75          RX  100.00  119.00  135.00  135.10  180.00  180.10  181.00  182.00
  76          RY  1000.0  999.80  999.50  999.00  999.80 1000.30 1000.40 1000.50
              *
              *

  77          KK     D05   BASIN
  78          KM   BASIN BOUNDARY FROM WAL MART STORE
  79          KM   SURPRISE TOWN CENTER AND GRAND AVE CHANNEL
  80          BA   0.163
  81          LG    0.11    0.25    4.96    0.39      73
  82          UI       0     127     387     470     197      58      15       0       0       0
1                                      HEC-1 INPUT                                          PAGE  3

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

  83          UI       0       0       0       0       0       0       0       0       0       0
  84          UI       0       0       0       0       0       0       0       0       0       0
  85          UI       0       0       0       0       0       0       0       0       0       0
  86          UI       0       0       0       0       0       0       0       0       0       0
              *
              *

  87          KK  DD05RE  DIVERT
  88          KM   Volume updated per TYLIN ADOT study for Bell Road
  89          DT    RD05   17.36     0.0
  90          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  91          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

  92          KK   CPD05 COMBINE
  93          HC       2   1.777
              *
              *

  94          KK  D05D14   ROUTE
  95          KM   Cross-section: Cross-section determined from aerial, assumed
  96          KM   3' depth / Manning's N Value: earth with grass and forbs
  97          RS       2    FLOW
  98          RC   0.032   0.032   0.032    3385  0.0053    0.00
  99          RX  100.00  101.00  102.00  122.00  142.00  162.00  163.00  164.00
 100          RY  1000.0  999.90  999.80  996.80  996.70  999.80  999.90 1000.00
              *
              *

 101          KK   DD141  DIVERT
 102          KM
 103          DT  DD141S    0.00     0.0
 104          DI     0.0   122.0   500.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0
 105          DQ     0.0     0.0   378.0   878.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
```

```
                *
          106   KK  D05D15   ROUTE
          107   KM   Cross-section: Cross-section determined from aerial, assumed
          108   KM   3' depth  / Manning's N Value: concrete
          109   RS       8    FLOW
          110   RC   0.016   0.016   0.016    4588  0.0044    0.00
          111   RX  100.00  101.00  102.00  127.00  131.00  140.00  141.00  142.00
          112   RY  1000.0  999.90  999.80  996.80  996.70  999.80  999.90 1000.00
                *
                *

          113   KK     D11   BASIN
          114   KM   BASIN BOUNDARY FROM ORCHIDS DEVELOPMENT
          115   KM   AND  GREENWAY ROAD DRAINAGE REPORT BY CMX (2008)
          116   BA   0.662
          117   LG    0.25    0.25    5.58    0.27      37
          118   UI       0      78     212     386     499     683     948     708     543     408
          119   UI     261     135     102      67      24      24      24       0       0
1                                       HEC-1 INPUT                                          PAGE  4

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

          120   UI       0       0       0       0       0       0       0       0       0       0
          121   UI       0       0       0       0       0       0       0       0       0       0
          122   UI       0       0       0       0       0       0       0       0       0       0
                *
                *

          123   KK  DD11RE  DIVERT
          124   KM   Final Drainage Report for Parkway Bank, Drainage Report for Deer Valley
          125   KM   Credit Union Final Drainage Report for Jiffy Lube at Bell and Reems
          126   KM   for The Orchard Estates Apartments, Drainage Report
          127   KM   for Mountainside Fitness Center Lot 7 a
          128   DT    RD11   32.40     0.0
          129   DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          130   DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
                *

          131   KK   DD111  DIVERT
          132   KM   Greenway at Parkview intersection split flow
          133   DT  DD111S    0.00     0.0
          134   DI     0.0    33.8   453.4  1486.3  2998.5     0.0     0.0     0.0     0.0     0.0
          135   DQ     0.0    25.6   376.5  1210.3  2419.3     0.0     0.0     0.0     0.0     0.0
                *
                *

          136   KK   DD112  DIVERT
          137   KM   Greenway at Parkview intersection split flow
          138   DT  DD112S    0.00     0.0
          139   DI     0.0     8.2    77.0   276.0   579.1     0.0     0.0     0.0     0.0     0.0
          140   DQ     0.0     5.4    35.1    78.9   133.0     0.0     0.0     0.0     0.0     0.0
                *
                *

          141   KK  D11D12   ROUTE
          142   KM   Cross-section: Cross-section determined from aerial
          143   KM   Manning's N Value: clean earth; straight
          144   RS       2    FLOW
          145   RC   0.022   0.022   0.022    2668  0.0037    0.00
          146   RX  100.00  124.00  154.00  155.00  156.00  157.00  158.00  159.00
          147   RY  1208.0 1203.00 1208.00 1208.10 1208.20 1208.30 1208.40 1208.50
                *
                *

          148   KK     D12   BASIN
          149   KM   BASIN BOUNDARY FROM ORCHIDS PARK
          150   KM   AND  GREENWAY ROAD DRAINAGE REPORT BY CMX (2008)
          151   BA   0.347
          152   LG    0.24    0.25    5.85    0.29      33
          153   UI       0      24      24      69     103     126     144     170     202     274
          154   UI     299     238     202     173     146     122     100      63      43      40
          155   UI      30      24      17       7       7       7       7       7       7       0
          156   UI       0       0       0       0       0       0       0       0       0       0
          157   UI       0       0       0       0       0       0       0       0       0       0
                *
                *
1                                       HEC-1 INPUT                                          PAGE  5

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

          158   KK  DD12RE  DIVERT
          159   KM   Final Drainage Report for Residence Inn by Marriot
          160   KM   Final Drainage Report for The Orchards Parcel 5
          161   KM   (Includes Parcels 9,11,12 and 1/2 of 8), Final Drainage Report for
          162   KM   Stadium Village (South) Residences
          163   KM   Final Drainage Report for Stadium Village Residences
          164   DT    RD12   15.30     0.0
          165   DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          166   DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
                *

          167   KK   CPD12 COMBINE
```

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 168           HC       2   1.009
               *
               *

 169           KK   DD121  DIVERT
 170           KM   Greenway at Bullard intersection split flow
 171           DT  DD121S    0.00     0.0
 172           DI     0.0    68.7   371.0  1186.5  2407.4     0.0     0.0     0.0     0.0     0.0
 173           DQ     0.0    19.7   166.4   705.0  1553.4     0.0     0.0     0.0     0.0     0.0
               *
               *

 174           KK   DD122  DIVERT
 175           KM   Greenway at Bullard intersection split flow
 176           DT  DD122S    0.00     0.0
 177           DI     0.0    48.9   204.6   481.5   854.0     0.0     0.0     0.0     0.0     0.0
 178           DQ     0.0    24.3    82.0   159.0   251.4     0.0     0.0     0.0     0.0     0.0
               *
               *

 179           KK  D12D13   ROUTE
 180           KM   Cross-section: determined from aerial and contours
 181           KM   Manning's N Value: earth with sparse trees and shrubs for left
 182           KM   overbank and main channel, right overbank is pavement
 183           RS       1    FLOW
 184           RC   0.025   0.025   0.025    2562  0.0040    0.00
 185           RX  100.00  110.00  122.00  125.00  150.00  153.00  165.00  175.00
 186           RY  1000.0 1000.00  996.00  995.50  995.50  996.00 1000.00 1000.00
               *
               *

 187           KK    D13F   BASIN
 188           BA   0.128
 189           LG    0.10    0.25    5.24    0.39       6
 190           UI       0      72     211     360     217      85      30      10       0       0
 191           UI       0       0       0       0       0       0       0       0       0       0
 192           UI       0       0       0       0       0       0       0       0       0       0
 193           UI       0       0       0       0       0       0       0       0       0       0
 194           UI       0       0       0       0       0       0       0       0       0       0
               *
               *
1                                            HEC-1 INPUT                                         PAGE  6

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


 195           KK  CP13F1 COMBINE
 196           KM   Combines upstream routed flow from D12D13 with D13F
 197           HC       2
               *
               *

 198           KK   DDGWW  DIVERT
 199           KM   Storage held by diversion berms in West Greenway Basin
 200           DT   RDGWW    4.00     0.0
 201           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 202           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
               *
               *

 203           KK    D13E   BASIN
 204           BA   0.169
 205           LG    0.10    0.25    4.87    0.42      69
 206           UI       0      76     232     425     315     162      59      21      12       0
 207           UI       0       0       0       0       0       0       0       0       0       0
 208           UI       0       0       0       0       0       0       0       0       0       0
 209           UI       0       0       0       0       0       0       0       0       0       0
 210           UI       0       0       0       0       0       0       0       0       0       0
               *
               *

 211           KK  DDD13E  DIVERT
 212           KM   *Dibble Engineering* - Used ADMS provided volume for developed
 213           KM   portion of subbasin D13
 214           KM   Final Drainage Report for Surprise Festival, Final Drainage Report
 215           KM   for The City at Surprise Office Building, Final Drainage Report for
 216           KM   Surprise Tennis Center, Final Drainage Report for City of Surprise
 217           KM   Central Utility Plant, Final Drainage Report for Hear
 218           DT   RD13E   17.10     0.0
 219           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 220           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
               *
               *

 221           KK  RTD13E   ROUTE
 222           RS       1    FLOW
 223           RC   0.025   0.025   0.025    1334  0.0040    0.00
 224           RX  100.00  110.00  190.00  193.00  307.00  310.00  390.00  400.00
 225           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
               *
               *

 226           KK  CP13F2 COMBINE
 227           KM   Combines D13E with upstream combined flow at CP13F1
 228           HC       2
               *
```

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                    *
1                                               HEC-1 INPUT                                              PAGE  7

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


          229          KK   SRGWW STORAGE
          230          KM   Storage upstream of pipe outlet in West Greenway Basin
          231          KO
          232          RS       1    STOR
          233          SV            0.07    0.34    0.80    1.34    1.91
          234          SQ            6.00   19.00   35.00   50.00  350.00
          235          SE  1192.0 1193.00 1194.00 1195.00 1196.00 1197.00
                       *
                       *

          236          KK  RTD13F   ROUTE
          237          RS       1    FLOW
          238          RC   0.025   0.025   0.025    2575  0.0040    0.00
          239          RX  100.00  110.00  122.00  125.00  150.00  153.00  165.00  175.00
          240          RY  1000.0 1000.00  996.00  995.50  995.50  996.00 1000.00 1000.00
                       *
                       *

          241          KK    D13G   BASIN
          242          BA   0.168
          243          LG    0.10    0.25    4.96    0.45       5
          244          UI       0      63     195     356     342     201      81      38      11      11
          245          UI       0       0       0       0       0       0       0       0       0       0
          246          UI       0       0       0       0       0       0       0       0       0       0
          247          UI       0       0       0       0       0       0       0       0       0       0
          248          UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

          249          KK  CP13G1 COMBINE
          250          KM   Combine upstream route RTD13F with subbasin D13G
          251          HC       2
                       *
                       *

          252          KK   DDGWE  DIVERT
          253          KM   Storage held by diversion berms in East Greenway Basin
          254          DT   RDGWE    4.61     0.0
          255          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          256          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *

          257          KK    D13A   BASIN
          258          BA   0.145
          259          LG    0.10    0.25    4.87    0.47       5
          260          UI       0      72     216     387     260     119      46      12      11       0
          261          UI       0       0       0       0       0       0       0       0       0       0
          262          UI       0       0       0       0       0       0       0       0       0       0
          263          UI       0       0       0       0       0       0       0       0       0       0
          264          UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *
1                                               HEC-1 INPUT                                              PAGE  8

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


          265          KK  RTD13A   ROUTE
          266          RS       1    FLOW
          267          RC   0.025   0.025   0.025    2634  0.0040    0.00
          268          RX  100.00  110.00  190.00  193.00  307.00  310.00  390.00  400.00
          269          RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                       *
                       *

          270          KK    D13B   BASIN
          271          BA   0.143
          272          LG    0.10    0.25    4.87    0.43      39
          273          UI       0      65     199     364     265     134      49      17      11       0
          274          UI       0       0       0       0       0       0       0       0       0       0
          275          UI       0       0       0       0       0       0       0       0       0       0
          276          UI       0       0       0       0       0       0       0       0       0       0
          277          UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

          278          KK   DD04SRETRIEVE
          279          DR   DD04S
                       *
                       *

          280          KK  D04D13   ROUTE
          281          RS       1    FLOW
          282          RC   0.025   0.025   0.025    1445  0.0040    0.00
          283          RX  100.00  110.00  190.00  193.00  307.00  310.00  390.00  400.00
          284          RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                       *
                       *
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```
          285           KK  CPD13B COMBINE
          286           HC       3
                        *
                        *

          287           KK  RTD13B   ROUTE
          288           RS       1    FLOW
          289           RC   0.025   0.025   0.025    2069  0.0040    0.00
          290           RX  100.00  110.00  190.00  193.00  307.00  310.00  390.00  400.00
          291           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                        *
                        *

          292           KK    D13C   BASIN
          293           BA   0.114
          294           LG    0.10    0.25    4.87    0.47       5
          295           UI       0      21      78     118     192     186     126      81      36      22
          296           UI       9       6       6       0       0       0       0       0       0       0
          297           UI       0       0       0       0       0       0       0       0       0       0
          298           UI       0       0       0       0       0       0       0       0       0       0
          299           UI       0       0       0       0       0       0       0       0       0       0
                        *
                        *
1                                                    HEC-1 INPUT                                       PAGE  9

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


          300           KK  RTD13C   ROUTE
          301           RS       1    FLOW
          302           RC   0.025   0.025   0.025    2984  0.0040    0.00
          303           RX  100.00  110.00  190.00  193.00  307.00  310.00  390.00  400.00
          304           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                        *
                        *

          305           KK    D13D   BASIN
          306           BA   0.163
          307           LG    0.10    0.25    4.87    0.47       5
          308           UI       0      65     202     373     321     183      70      28      11       0
          309           UI       0       0       0       0       0       0       0       0       0       0
          310           UI       0       0       0       0       0       0       0       0       0       0
          311           UI       0       0       0       0       0       0       0       0       0       0
          312           UI       0       0       0       0       0       0       0       0       0       0
                        *
                        *

          313           KK  CPD13D COMBINE
          314           HC       3
                        *
                        *

          315           KK  RTD13D   ROUTE
          316           RS       1    FLOW
          317           RC   0.025   0.025   0.025    1850  0.0040    0.00
          318           RX  100.00  110.00  190.00  193.00  307.00  310.00  390.00  400.00
          319           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                        *
                        *

          320           KK  CP13G2 COMBINE
          321           KM   Combine upstream route RTD13D with flow
          322           KM   from West Greenway Basin
          323           HC       2
                        *
                        *

          324           KK   SRGWE STORAGE
          325           KM   Storage upstream of box culvert outlet in East Greenway Basin
          326           KO
          327           RS       1    STOR
          328           SV            0.13    0.43    0.58    0.78    1.22
          329           SQ           51.00  146.00  268.00  388.00  800.00
          330           SE  1183.0 1184.00 1185.00 1186.00 1187.00 1188.00
                        *
                        *
1                                                    HEC-1 INPUT                                       PAGE 10

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


          331           KK   DD131  DIVERT
          332           KM   Greenway at Litchfield intersection split flow
          333           DT  DD131S    0.00     0.0
          334           DI     0.0   519.2   917.3  1650.7  2842.4     0.0     0.0     0.0     0.0     0.0
          335           DQ     0.0    18.8   121.1   423.4   996.3     0.0     0.0     0.0     0.0     0.0
                        *
                        *

          336           KK   DD132  DIVERT
          337           KM   Greenway at Litchfield intersection split flow
          338           DT  DD132S    0.00     0.0
          339           DI     0.0   500.4   796.2  1227.2  1846.1     0.0     0.0     0.0     0.0     0.0
          340           DQ     0.0   112.4   318.0   584.2   899.4     0.0     0.0     0.0     0.0     0.0
                        *
                        *
```

```
341          KK  D13D14   ROUTE
342          KM   Cross-section: Cross-section determined from FCDMC 69
343          KM   Manning's N Value: earth with grass and forbs
344          RS       5    FLOW
345          RC   0.025   0.025   0.025    5304  0.0015    0.00
346          RX  100.00  120.00  122.40  140.40  158.40  176.40  176.80  196.80
347          RY  1175.5 1175.40 1175.00 1172.00 1171.90 1175.00 1175.40 1175.50
             *
             *

348          KK     D14   BASIN
349          KM   BASIN BOUNDARY FROM WEST POINT DEVELOPMENT AND GRANDE AVE CHANNEL
350          BA   0.942
351          LG    0.23    0.26    5.14    0.33      37
352          UI       0     115     326     583     757    1079    1353     984     745     547
353          UI     300     193     123      66      35      35      35       0       0       0
354          UI       0       0       0       0       0       0       0       0       0       0
355          UI       0       0       0       0       0       0       0       0       0       0
356          UI       0       0       0       0       0       0       0       0       0       0
             *
             *

357          KK  DD14RE  DIVERT
358          KM   West Point Towne Center Final Master Infrastructure Drainage Report
359          DT    RD14   63.40     0.0
360          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
361          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
             *

362          KK   DD141RETRIEVE
363          DR  DD141S
             *
             *
```



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

364          KK  D0514A   ROUTE
365          KM   Cross-section: Cross-section determined from aerial
366          KM   Manning's N Value: street and ROW
367          KM   Route is from DD141 diversion to CPD14
368          RS       3    FLOW
369          RC   0.032   0.013   0.032    3147  0.0051    0.00
370          RX  100.00  120.00  140.00  140.10  200.00  200.10  220.00  240.00
371          RY  1000.0  999.50 1000.00  999.50  999.50 1000.00  999.50 1000.00
             *
             *

372          KK   CPD14 COMBINE
373          HC       3   4.758
             *
             *
             *  ********************************************************************
             *  Removed SRD 14 from schematic to show no storage routing per
             *  site visit by AMM  -  FCDMC/JWH 10-19-09
             *  ********************************************************************
             *  KK STORAGE
             *  KM      Storage in basin at Greenway and Dysart
             *  KM      Volume estimated from topo
             *  KO
             *  RS     1    STOR
             *  SV          0.30    4.10   17.00   40.40   95.20
             *  SQ         23.60   83.80  162.00  645.50 2369.50
             *  SE1164.0 1165.00 1166.00 1167.00 1168.00 1169.00
             *  ST
             *

374          KK   DD142  DIVERT
375          KM   Greenway at Dysart intersection split flow
376          DT  DD142S    0.00     0.0
377          DI     0.0   295.5   693.0  1325.3  2531.5     0.0     0.0     0.0     0.0     0.0
378          DQ     0.0   269.3   457.1   770.3  1405.9     0.0     0.0     0.0     0.0     0.0
             *
             *

379          KK  D14D15   ROUTE
380          KM   Cross section: Cross-section determined from  aerial, 1/2 street section
381          KM   Manning's N Value: street, clean earth
382          RS       3    FLOW
383          RC   0.022   0.013   0.013    3351  0.0029    0.00
384          RX  100.00  100.10  110.00  110.10  120.00  125.00  133.90  134.00
385          RY  1003.0  999.80  999.70  999.20  999.40  999.50  999.70 1000.50
             *
             *

386          KK     D15   BASIN
387          KM   BASIN BOUNDARY FROM SUCCESS SCHOOL
388          BA   0.220
389          LG    0.19    0.15    7.00    0.16      53
390          UI       0     101     306     560     408     206      75      26      16       0
391          UI       0       0       0       0       0       0       0       0       0       0
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          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           392      UI       0       0       0       0       0       0       0       0       0       0
           393      UI       0       0       0       0       0       0       0       0       0       0
           394      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           395      KK   CPD15 COMBINE
           396      HC       3   4.978
                    *
                    *

           397      KK  D15D26   ROUTE
           398      KM   Cross-section: Concrete channel along Grand Ave, assumed slope
           399      KM   2:1 slide slopes, width and geometry based on aerial
           400      RS       3    FLOW
           401      RC   0.016   0.016   0.016    9949  0.0050    0.00
           402      RX  100.00  112.00  122.00  134.00  145.00  157.00  169.00  185.00
           403      RY  1040.4 1040.20 1040.00 1034.00 1034.00 1040.00 1040.20 1040.60
                    *
                    *

           404      KK  D15D28   ROUTE
           405      KM   Channel along Grand Avenue
           406      KM   Flow in basin D26 does not enter channel
           407      RS       2    FLOW
           408      RC   0.016   0.016   0.016    7000  0.0050    0.00
           409      RX  100.00  112.00  122.00  134.00  145.00  157.00  169.00  185.00
           410      RY  1040.4 1040.20 1040.00 1034.00 1034.00 1040.00 1040.20 1040.60
                    *
                    *

           411      KK     D28   BASIN
           412      KM   BASIN BOUNDARY FROM EL MIRAGE TR 1-3 AND GRAND AVE CHANNEL
           413      BA   0.255
           414      LG    0.22    0.25    4.51    0.44      36
           415      UI       0     113     346     635     479     251      90      33      19       0
           416      UI       0       0       0       0       0       0       0       0       0       0
           417      UI       0       0       0       0       0       0       0       0       0       0
           418      UI       0       0       0       0       0       0       0       0       0       0
           419      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           420      KK   CPD28 COMBINE
           421      HC       2   5.233
                    *
                    *

           422      KK  D28AFR   ROUTE
           423      KM   Direct discharge into Agua Fria River, field verified by FCDMC
           424      RS       1    FLOW
           425      RC   0.016   0.016   0.016    2990  0.0050    0.00
           426      RX  100.00  112.00  122.00  134.00  145.00  157.00  169.00  185.00
           427      RY  1040.4 1040.20 1040.00 1034.00 1034.00 1040.00 1040.20 1040.60
                    *
                    *
1                                        HEC-1 INPUT                                        PAGE 13

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

           428      KK     D26   BASIN
           429      KM   BASIN BOUNDARY FROM RACHO EL MIRAGE, SCHOOL
           430      KM   MOBILE HOME PARK, SUNWEST CEMETARY AND GRAND AVE CHANNEL
           431      BA   0.642
           432      LG    0.24    0.25    5.85    0.24      34
           433      UI       0     165     560     873    1364     927     587     245     140      44
           434      UI      37       0       0       0       0       0       0       0       0       0
           435      UI       0       0       0       0       0       0       0       0       0       0
           436      UI       0       0       0       0       0       0       0       0       0       0
           437      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           438      KK  DD26RE  DIVERT
           439      KM   Retention volume estimated based on aerial
           440      DT    RD26   52.40     0.0
           441      DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           442      DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                    *
                    *

           443      KK   DD142RETRIEVE
           444      DR  DD142S
                    *
                    *

           445      KK  D14D26   ROUTE
           446      KM   Cross-section: Cross-section from Lower El Mirage Channelization
           447      KM   (Report FCDMC 18-198B) / Manning's N Value: clean earth; straight
           448      RS       2    FLOW
           449      RC   0.022   0.022   0.022    5050  0.0048    0.00
           450      RX  100.00  102.50  105.50  137.50  187.50  219.50  222.00  225.00
           451      RY  1000.0  999.50  999.00  991.00  991.10  999.00  999.80 1000.00
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                *
                *

 452            KK   CPD26 COMBINE
 453            HC       2     5.4
                *
                *

 454            KK  D26D27   ROUTE
 455            KM   Cross-section: Cross-section determined from FCDMC 18
 456            KM   Manning's N Value: Clean earth
 457            RS       1    FLOW
 458            RC   0.022   0.022   0.022    2050  0.0039    0.00
 459            RX  100.00  102.50  105.50  137.50  187.50  219.50  222.00  225.00
 460            RY  1000.0  999.50  999.00  991.00  991.00  999.00  999.50 1000.00
                *
                *
1                                       HEC-1 INPUT                                          PAGE 14

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

 461            KK     D27   BASIN
 462            KM   BASIN BOUNDARY FROM RANCHO EL MIRAGE
 463            KM   WEST EL MIRAGE AND BNSF RR ALIGNMENT
 464            BA   0.316
 465            LG    0.20    0.24    4.96    0.35      42
 466            UI       0     103     332     568     679     409     199      89      33      20
 467            UI       0       0       0       0       0       0       0       0       0       0
 468            UI       0       0       0       0       0       0       0       0       0       0
 469            UI       0       0       0       0       0       0       0       0       0       0
 470            UI       0       0       0       0       0       0       0       0       0       0
                *
                *

 471            KK  DD27RE  DIVERT
 472            KM   Retention volume estimated based on aerial
 473            DT    RD27    8.20     0.0
 474            DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 475            DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
                *

 476            KK   CPD27 COMBINE
 477            HC       2   5.716
                *
                *

 478            KK   SRD27 STORAGE
 479            KM   Storage at culvert under TB Road
 480            KO
 481            RS       1    STOR
 482            SV                                                 22.80   51.41
 483            SQ           52.00  202.00  415.00  658.00  906.00 1127.00 2999.00
 484            SE  1140.0 1142.00 1144.00 1146.00 1148.00 1150.00 1152.00 1154.00
                *
                *

 485            KK  D27D42   ROUTE
 486            KM   Cross-section: Cross-section determined from Waddell Road
 487            KM   Drainage Improvement CAR Final by HDR
 488            KM   dated April 10, 2009, RLE2
 489            RS       5    FLOW
 490            RC   0.030   0.030   0.030    5599  0.0020    0.00
 491            RX    0.00   24.40   34.40   44.40   54.40   64.40   74.40   98.80
 492            RY  1128.5 1122.40 1122.40 1122.40 1122.40 1122.40 1122.40 1128.50
                *
                *

 493            KK     D20   BASIN
 494            KM   BASIN BOUNDARY FROM COUNTRYSIDE UNITS 1-4 AND COTTON GIN
 495            BA   0.498
 496            LG    0.26    0.26    4.72    0.40      30
 497            UI       0      68     230     371     502     789     646     473     338     179
 498            UI     111      68      25      21      21       0       0       0       0       0
 499            UI       0       0       0       0       0       0       0       0       0       0
1                                       HEC-1 INPUT                                          PAGE 15

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

 500            UI       0       0       0       0       0       0       0       0       0       0
 501            UI       0       0       0       0       0       0       0       0       0       0
                *
                *

 502            KK  DD20RE  DIVERT
 503            KM   Final Drainage Report Greenway Marketplace Wal-mart Neighborhood
 504            KM   Market #4218-00, Drainage Report for Countryside Elementary School, Ash
 505            KM   Ranch Water Supply Facility Expansion, Countryside - Preliminary Drainag
 506            KM   Report, Final Drainage Report for Cotton Gin
 507            DT    RD20   38.10     0.0
 508            DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 509            DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
                *
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510          KK   DD111RETRIEVE
511          DR  DD111S
             *
             *

512          KK  D11D20   ROUTE
513          KM   Cross-section: Cross-section determined from aerial
514          KM   Manning's N Value: retention basins, earth w/ grass
515          RS       5    FLOW
516          RC   0.025   0.025   0.025    6256  0.0032    0.00
517          RX  100.00  101.00  102.00  114.00  190.00  202.00  203.00  204.00
518          RY  1000.2 1000.10 1000.00  997.00  996.90 1000.00 1000.10 1000.20
             *
             *

519          KK   CPD20 COMBINE
520          HC       2    1.16
             *
             *

521          KK  D20D21   ROUTE
522          KM   Cross-section:  / Manning's N Value: street and earth with sparse
523          KM   trees and shrubs
524          RS       6    FLOW
525          RC   0.032   0.032   0.013    5323  0.0023    0.00
526          RX  100.00  100.50  112.00  150.00  162.00  198.00  198.00  220.00
527          RY  1000.1 1000.00  997.00  997.00 1000.00  999.50  998.90  999.40
             *
             *

528          KK     D21   BASIN
529          KM   BASIN BOUNDARY FROM ASHTON RANCH MULTI UNITS
530          BA   0.496
531          LG    0.25    0.25    4.72    0.40      32
532          UI       0      63     196     332     438     665     691     499     368     251
533          UI     122      87      55      19      19      19       0       0       0       0
534          UI       0       0       0       0       0       0       0       0       0       0
535          UI       0       0       0       0       0       0       0       0       0       0
536          UI       0       0       0       0       0       0       0       0       0       0
             *
             *
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

537          KK  DD21RE  DIVERT
538          KM   Final Drainage Report for Ashton Ranch Unit 3, Final Drainage Report for
539          KM   Ashton Ranch Unit 1, Final Drainage Report for Ashton Ranch Unit 2, Fina
540          KM   Drainage Report for Ashton Ranch Unit 4
541          DT    RD21   39.90     0.0
542          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
543          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
             *

544          KK   DD112RETRIEVE
545          DR  DD112S
             *
             *

546          KK  D11D21   ROUTE
547          KM   Cross-section: determined from aerial, street section through subdivisio
548          KM   Manning's N Value: street, earth with sparse trees and shrubs
549          RS      10    FLOW
550          RC   0.032   0.013   0.032    8031  0.0035    0.00
551          RX  100.00  106.00  115.00  115.10  167.00  167.10  174.00  179.00
552          RY  1000.0  999.80  999.50  999.00  998.90  999.50  999.80 1000.00
             *
             *

553          KK   DD121RETRIEVE
554          DR  DD121S
             *
             *

555          KK  D12D21   ROUTE
556          KM   Cross-section: Cross-section determined from aerial
557          KM   Manning's N Value: street and earth with sparse trees and shrubs
558          RS       2    FLOW
559          RC   0.013   0.013   0.032    2810  0.0078    0.00
560          RX  100.00  105.00  110.00  115.00  140.00  140.10  176.00  177.00
561          RY  1000.0  999.90  999.80  999.70  999.20  999.70  999.80 1000.00
             *
             *

562          KK   CPD21 COMBINE
563          HC       4   2.003
             *
             *

564          KK   DD211  DIVERT
565          KM   Waddell at Bullard split flow
566          DT  DD211S    0.00     0.0
567          DI     0.0   184.9   770.2  1884.9  3510.6     0.0     0.0     0.0     0.0     0.0
568          DQ     0.0   139.4   462.9  1049.1  1871.4     0.0     0.0     0.0     0.0     0.0
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                    *
1                                                  HEC-1 INPUT                                        PAGE 17

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


           569      KK   DD212  DIVERT
           570      KM   Waddell at Bullard split flow
           571      DT  DD212S    0.00     0.0
           572      DI     0.0    45.5   307.3   835.8  1639.2     0.0     0.0     0.0     0.0     0.0
           573      DQ     0.0    36.2   111.1   209.5   326.8     0.0     0.0     0.0     0.0     0.0
                    *
                    *

           574      KK  D21D22   ROUTE
           575      KM   Cross-section: Cross-section determined from aerial
           576      KM   Manning's N Value: earth with grass and forbs (main channel)
           577      KM   earth with sparse trees and shrubs (overbanks)
           578      RS       4    FLOW
           579      RC   0.032   0.025   0.032    2720  0.0029    0.00
           580      RX  100.00  103.00  105.00  116.00  151.00  160.00  165.00  170.00
           581      RY  1000.2 1000.10 1000.00  997.00  997.10 1000.00 1000.10 1000.20
                    *
                    *

           582      KK     D22   BASIN
           583      KM   BASIN BOUNDARY FROM ROYAL RANCH UNIT I AND II
           584      BA   0.454
           585      LG    0.24    0.25    4.79    0.38      32
           586      UI       0      64     230     360     501     760     570     413     282     134
           587      UI      88      50      20      20      20       0       0       0       0       0
           588      UI       0       0       0       0       0       0       0       0       0       0
           589      UI       0       0       0       0       0       0       0       0       0       0
           590      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           591      KK  DD22RE  DIVERT
           592      KM   Drainage Report for Royal Ranch Unit 2 (Basins P1&N in D23), Final Drain
           593      KM   Report for Royal Ranch Unit 2, Parcel 5, Final Drainage Report for Royal
           594      KM   Unit 2 Parcel 8, portion estimated by aerial for Del Webb
           595      DT    RD22   37.50     0.0
           596      DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           597      DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                    *
                    *

           598      KK   DD122RETRIEVE
           599      DR  DD122S
                    *
                    *

           600      KK  D12D22   ROUTE
           601      KM   Cross-section: Cross section determined from aerial
           602      KM   Manning's N Value: street and earth with sparse trees and shrubs
           603      RS       7    FLOW
           604      RC   0.032   0.013   0.013    7744  0.0040    0.00
           605      RX  100.00  105.00  145.00  145.10  160.00  174.00  178.00  180.00
           606      RY  1000.0  999.90  999.50  999.00  999.20  999.50  999.60  999.70
                    *
                    *
1                                                  HEC-1 INPUT                                        PAGE 18

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


           607      KK   CPD22 COMBINE
           608      HC       3   2.457
                    *
                    *

           609      KK  D22D23   ROUTE
           610      KM   Cross-section: Cross-section determined from aerial
           611      KM   Manning's N Value: earth with sparse trees and shrubs/ riprap
           612      RS       2    FLOW
           613      RC   0.032   0.032   0.032    2705  0.0037    0.00
           614      RX  100.00  104.00  106.00  110.00  118.00  122.00  126.00  138.00
           615      RY  1161.0 1160.00 1159.00 1158.00 1158.10 1159.00 1160.00 1161.00
                    *
                    *

           616      KK     D23   BASIN
           617      KM   BASIN BOUNDARY FROM SIERRA VERDE
           618      BA   0.541
           619      LG    0.27    0.27    5.05    0.33      26
           620      UI       0      59     139     271     348     447     672     631     480     373
           621      UI     285     172     101      77      55      18      18      18      18       0
           622      UI       0       0       0       0       0       0       0       0       0       0
           623      UI       0       0       0       0       0       0       0       0       0       0
           624      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           625      KK  DD23RE  DIVERT
           626      KM   Final Drainage Report for Sierra Verde Parcel 5, Infrastructure Drainage
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         627           KM   Sierra Verde (temporary basins removed), Final Drainage Report for Sierr
         628           KM   Final Drainage Report for Harmony Apartments, Drainage Report for Royal
         629           KM   Final Drainage Report for Sierra Verde Parcel 9, Final Drainage Report f
         630           KM   Parcel 3, Final Drainage Report for Sierra Verde Parcel 2, Final Drainag
         631           KM   Sierra Verde Parcel 1, Drainage Report for Fry's at Waddell and Litchfie
         632           DT    RD23   36.30     0.0
         633           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
         634           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *

         635           KK   DD131RETRIEVE
         636           DR  DD131S
                       *
                       *

         637           KK  D13D23   ROUTE
         638           KM   Cross-section: Cross-section determined from aerial 1/2 street section
         639           KM   Manning's N Value: street, earth with sparse trees and shrubs
         640           RS       3    FLOW
         641           RC   0.032   0.013   0.032    5460  0.0044    0.00
         642           RX  100.00  100.00  109.00  109.00  148.00  148.00  197.00  198.00
         643           RY  1180.0 1176.30 1176.30 1175.80 1175.00 1175.50 1177.00 1177.10
                       *
                       *
1                                                   HEC-1 INPUT                                                     PAGE 19

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


         644           KK   CPD23 COMBINE
         645           HC       3   5.642
                       *
                       *

         646           KK   DD231  DIVERT
         647           KM   Waddell at Litchfield split flow
         648           DT  DD231S    0.00     0.0
         649           DI     0.0   518.8   867.4  1680.6  2985.0     0.0     0.0     0.0     0.0     0.0
         650           DQ     0.0    51.3   223.3   727.6  1503.5     0.0     0.0     0.0     0.0     0.0
                       *
                       *

         651           KK   DD232  DIVERT
         652           KM   Waddell at Litchfield split flow
         653           DT  DD232S    0.00     0.0
         654           DI     0.0   467.5   644.1   953.0  1481.6     0.0     0.0     0.0     0.0     0.0
         655           DQ     0.0    55.8   138.4   242.9   365.2     0.0     0.0     0.0     0.0     0.0
                       *
                       *

         656           KK  D23D24   ROUTE
         657           KM   Cross-section: Cross-section determined from Waddell
         658           KM   Road Drainage Improvement CAR Final by HDR
         659           KM   dated April 10, 2009, R137
         660           RS       3    FLOW
         661           RC   0.035   0.035   0.035    2646  0.0044    0.00
         662           RX  894.00  906.00  912.00  918.00  926.00  930.00  934.00  942.00
         663           RY  1157.0 1155.00 1154.00 1153.00 1153.00 1154.00 1155.00 1157.00
                       *
                       *

         664           KK     D24   BASIN
         665           KM   BASIN BOUNDARY FROM LITCHFIELD MANOR
         666           BA   0.492
         667           LG    0.27    0.25    5.14    0.32      28
         668           UI       0      56     144     269     347     461     679     542     419     317
         669           UI     226     116      88      56      26      17      17      17       0       0
         670           UI       0       0       0       0       0       0       0       0       0       0
         671           UI       0       0       0       0       0       0       0       0       0       0
         672           UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

         673           KK  DD24RE  DIVERT
         674           KM   Final Drainage Report for Litchfield Manor (excess retention per report)
         675           DT    RD24   40.90     0.0
         676           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
         677           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *
1                                                   HEC-1 INPUT                                                     PAGE 20

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


         678           KK   DD132RETRIEVE
         679           DR  DD132S
                       *
                       *

         680           KK  D13D24   ROUTE
         681           KM   Cross-section: Cross-section determined from aerial 1/2 street section
         682           KM   Manning's N Value: street, earth with sparse trees and shrubs
         683           RS       3    FLOW
         684           RC   0.032   0.013   0.013    5460  0.0044    0.00
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685          RX  100.00  100.10  145.00  145.10  175.00  175.10  184.90  185.00
686          RY  1178.0 1176.50 1175.50 1175.00 1175.80 1176.30 1176.30 1180.00
             *
             *

687          KK   CPD24 COMBINE
688          HC       3   6.134
             *
             *

689          KK  D24D25   ROUTE
690          KM   Cross-section: Cross-section determined from Waddell
691          KM   Road Drainage Improvement CAR Final by HDR
692          KM   dated April 10, 2009, R138
693          RS       2    FLOW
694          RC   0.030   0.030   0.030    2701  0.0020    0.00
695          RX  1000.0 1018.00 1019.00 1020.00 1026.00 1027.00 1028.00 1046.00
696          RY  1100.0 1094.00 1094.00 1094.00 1094.00 1094.00 1094.00 1100.00
             *
             *

697          KK     D25   BASIN
698          KM   BASIN BOUNDARY FROM ROSEVIEW MULTI PHASE
699          BA   0.497
700          LG    0.25    0.25    4.87    0.36      30
701          UI       0      64     198     335     442     675     689     499     367     248
702          UI     120      86      53      20      20      20       0       0       0       0
703          UI       0       0       0       0       0       0       0       0       0       0
704          UI       0       0       0       0       0       0       0       0       0       0
705          UI       0       0       0       0       0       0       0       0       0       0
             *
             *

706          KK  DD25RE  DIVERT
707          KM   Drainage Report for Roseview - Parcels 1-6, Master Drainage
708          KM   Report for Roseview, Retention for Parcels 7 and 8 were estimated
709          KM   based on aerial, Parcel 5a has no retention
710          DT    RD25   37.10     0.0
711          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
712          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

713          KK   CPD25 COMBINE
714          HC       2   6.631
             *
             *

715          KK  D25D39   ROUTE
716          KM   Cross-section: Cross-section determined from Waddell Road
717          KM   Drainage Improvement CAR Final by HDR dated April 10, 2009, RLLE
718          RS       1    FLOW
719          RC   0.030   0.030   0.030    2020  0.0040    0.00
720          RX    0.00   20.00   25.00   30.00   35.00   41.50   51.10   82.30
721          RY   10.00    0.00    0.00    0.00    0.00    0.00    4.80   10.00
             *
             *

722          KK     D39   BASIN
723          KM   BASIN BOUNDARY FROM  AG LAND, 1990 TOPO AND BNSF RR ALIGNMENT
724          BA   0.182
725          LG    0.50    0.25    5.58    0.33       0
726          UI       0      17      25      56      98     120     137     146     139     125
727          UI     113      98      69      54      50      31      26      21      16      14
728          UI      10      10       7       2       2       2       2       2       2       2
729          UI       2       2       2       2       2       0       0       0       0       0
730          UI       0       0       0       0       0       0       0       0       0       0
             *
             *

731          KK   CPD39 COMBINE
732          HC       2   6.813
             *
             *

733          KK  D39D42   ROUTE
734          KM   Cross-section: Cross-section determined from Waddell
735          KM   Road Drainage Improvement CAR Final
736          KM   by HDR dated April 10, 2009, RLLE1
737          RS       3    FLOW
738          RC   0.030   0.030   0.030    5691  0.0039    0.00
739          RX    0.00   30.00   38.00   54.00   76.50  104.00  139.00  154.00
740          RY   10.00    4.00    4.00    0.00    0.00    0.00    7.00   10.00
             *
             *

741          KK     D42   BASIN
742          KM   BASIN BOUNDARY FROM PARQUE VERDE MULTI PHASE
743          KM   DYSART SCHOOL DISTRICT, AND BUENA VISTA
744          BA   0.994
745          LG    0.24    0.24    5.24    0.29      32
746          UI       0     150     592     894    1340    1711    1182     824     458     248
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         747           UI     147      46      46      46       0       0       0       0       0       0
         748           UI       0       0       0       0       0       0       0       0       0       0
         749           UI       0       0       0       0       0       0       0       0       0       0
         750           UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *
1                                                HEC-1 INPUT                                         PAGE 22

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


         751           KK  DD42RE  DIVERT
         752           KM   Retention volume estimated based on aerial, Cactus and Dysart
         753           KM   Subdivision and Parque Verde - No Reports available
         754           DT    RD42   71.80     0.0
         755           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
         756           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *

         757           KK   CPD42 COMBINE
         758           HC       3    9.87
                       *
                       *

         759           KK   SRD42 STORAGE
         760           KM   Storage behind Cactus Road
         761           KO
         762           RS       1    STOR
         763           SV            0.64    4.60   17.30   27.60   56.30
         764           SQ                  139.00  426.00  827.00 1295.00
         765           SE  1105.3 1108.00 1110.00 1112.00 1114.00 1116.00
                       *
                       *

         766           KK  D42D53   ROUTE
         767           KM   Cross-section: Cross-section determined from
         768           KM   Waddell Road Drainage Improvement CAR Final
         769           KM   by HDR dated April 10, 2009, RLE3
         770           RS       1    FLOW
         771           RC   0.030   0.030   0.030    1558  0.0020    0.00
         772           RX    0.00   10.00   22.00   97.00  171.00  172.00  184.00  194.00
         773           RY    3.50    3.00    0.00    0.00    0.00    0.00    3.00    3.50
                       *
                       *

         774           KK     D53   BASIN
         775           KM   BASIN BOUNDARY FROM EL MIRAGE MARKET PLACE, RANCHO MIRAGE UNIT 3
         776           BA   0.118
         777           LG    0.31    0.32    4.65    0.36      11
         778           UI       0      56     169     306     216     105      39      12       9       0
         779           UI       0       0       0       0       0       0       0       0       0       0
         780           UI       0       0       0       0       0       0       0       0       0       0
         781           UI       0       0       0       0       0       0       0       0       0       0
         782           UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

         783           KK  DD53RE  DIVERT
         784           KM   Retention volume estimated based on aerial
         785           DT    RD53   12.10     0.0
         786           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
         787           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *
1                                                HEC-1 INPUT                                         PAGE 23

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


         788           KK   CPD53 COMBINE
         789           HC       2   9.988
                       *
                       *

         790           KK   SRD53 STORAGE
         791           KM   Waddell CAR West Cactus Basin
         792           KO
         793           RS       1    STOR
         794           SV            5.72   11.59   18.17   32.01   39.46   67.53   67.53   67.53   67.53
         795           SQ                                                          546.00  731.00  890.00
         796           SE  1098.5 1099.50 1100.50 1101.50 1103.50 1104.50 1108.50 1111.00 1112.00 1113.00
                       *
                       *

         797           KK  D53D54   ROUTE
         798           KM   Cross-section: Cross-section determined from
         799           KM   Waddell Road Drainage Improvement CAR Final
         800           KM   by HDR dated April 10, 2009, RLE4
         801           RS       4    FLOW
         802           RC   0.030   0.030   0.030    3999  0.0038    0.00
         803           RX    0.00   36.00   39.00   42.00   45.00   48.00   51.00   87.00
         804           RY  1102.8 1096.80 1096.80 1096.80 1096.80 1096.80 1096.80 1102.80
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 805          KK     D43   BASIN
 806          KM   BASIN BOUNDARY FROM MONTA BLANCA ESTATES, SUNNYVALE AND SUNDIAL
 807          BA   0.500
 808          LG    0.25    0.25    4.79    0.38      33
 809          UI       0      75     298     450     674     861     594     414     230     125
 810          UI      74      23      23      23       0       0       0       0       0       0
 811          UI       0       0       0       0       0       0       0       0       0       0
 812          UI       0       0       0       0       0       0       0       0       0       0
 813          UI       0       0       0       0       0       0       0       0       0       0
              *
              *

 814          KK  DD43RE  DIVERT
 815          KM   Retention volume estimated based on aerial
 816          DT    RD43   35.50     0.0
 817          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 818          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

 819          KK  D43D54   ROUTE
 820          KM   Cross-section: Golf course, assumed 0.5%
 821          KM   side slopes, V-ditch / Manning's N Value: grass - golf course
 822          RS      14    FLOW
 823          RC   0.025   0.025   0.025    3872  0.0023    0.00
 824          RX  100.00  200.00  400.00  500.00  550.00  600.00  800.00  900.00
 825          RY  1000.0  999.50  998.50  998.00  998.30  998.50  999.50 1000.00
              *
              *
1                                        HEC-1 INPUT                                        PAGE 24

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

 826          KK     D54   BASIN
 827          KM   BASIN BOUNDARY FROM FAIRWAYS GOLF COURSE DIVISION
 828          KM   AND PUEBLO EL MIRAGE RV RESORT
 829          BA   0.271
 830          LG    0.20    0.27    4.45    0.49      14
 831          UI       0      65     225     347     561     401     260     119      64      26
 832          UI      15      15       0       0       0       0       0       0       0       0
 833          UI       0       0       0       0       0       0       0       0       0       0
 834          UI       0       0       0       0       0       0       0       0       0       0
 835          UI       0       0       0       0       0       0       0       0       0       0
              *
              *

 836          KK  DD54RE  DIVERT
 837          KM   NO REPORTS - ESTIMATED FIRST FLUSH RETENTION FROM AERIAL
 838          KM   DUE TO LOCATION OF DEVELOPMENT TO THE RIVER
 839          DT    RD54    3.00     0.0
 840          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 841          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

 842          KK   CPD54 COMBINE
 843          HC       3  10.759
              *
              *

 844          KK     D44   BASIN
 845          KM   BASIN BOUNDARY FROM SUNDIAL MULTI PHASE, AGULAR HOMES, TERROVES,
 846          KM   EL MIRAGE HOUSING, ARIZONA BRISAS, MOUNTAIN TRAILE DEVELPMENTS AND
 847          KM   AGUA FRIA RIVER
 848          BA   0.535
 849          LG    0.26    0.26    3.86    0.58      23
 850          UI       0      70     229     377     503     789     717     524     381     235
 851          UI     121      83      43      22      22      22       0       0       0       0
 852          UI       0       0       0       0       0       0       0       0       0       0
 853          UI       0       0       0       0       0       0       0       0       0       0
 854          UI       0       0       0       0       0       0       0       0       0       0
              *
              *

 855          KK  DD44RE  DIVERT
 856          KM   Retention volume estimated based on aerial
 857          DT    RD44   19.40     0.0
 858          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 859          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *
1                                        HEC-1 INPUT                                        PAGE 25

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

 860          KK     D55   BASIN
 861          KM   BASIN BOUNDARY FROM AERIAL AND 1990 TOPO
 862          BA   0.187
 863          LG    0.28    0.28    3.47    0.75      24
 864          UI       0      46     157     242     389     275     178      80      43      17
 865          UI      10      10       0       0       0       0       0       0       0       0
 866          UI       0       0       0       0       0       0       0       0       0       0
 867          UI       0       0       0       0       0       0       0       0       0       0
 868          UI       0       0       0       0       0       0       0       0       0       0
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          869        KK  DD55RE  DIVERT
          870        KM   Retention volume estimated based on aerial
          871        DT    RD55    9.80     0.0
          872        DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          873        DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                     *
                     *

          874        KK     D56   BASIN
          875        KM   BASIN BOUNDARY FROM SUNDIAL UNIT 1 & 2 AND AGUA FRIA RIVER
          876        BA   0.225
          877        LG    0.20    0.26    4.39    0.50      24
          878        UI       0      36     143     215     332     384     260     177      87      50
          879        UI      27      11      11       0       0       0       0       0       0       0
          880        UI       0       0       0       0       0       0       0       0       0       0
          881        UI       0       0       0       0       0       0       0       0       0       0
          882        UI       0       0       0       0       0       0       0       0       0       0
                     *
                     *

          883        KK  DD56RE  DIVERT
          884        KM   NO REPORT - ESTIMATED FIRST FLUSH RETENTION FROM AERIAL
          885        KM   DUE TO LOCATION OF DEVELOPMENT TO THE RIVER
          886        DT    RD56    3.10     0.0
          887        DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          888        DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                     *
                     *

          889        KK   DUMMY COMBINE
          890        HC       4
                     *
                     *

          891        KK   DUMMY COMBINE
          892        HC       2
                     *
          893        ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    26         D03
                 .
                 .
    37           .-------->    RD03
    35       DD03RE
                 V
                 V
    40       D03D04
                 .
                 .
    47           .         D04
                 .           .
                 .           .
    60           .           .-------->    RD04
    58           .      DD04RE
                 .           .
                 .           .
    63        CPD04.............
                 .
                 .
    67           .-------->   DD04S
    65       DD04SE
                 V
                 V
    70       D04D05
                 .
                 .
    77           .         D05
                 .           .
                 .           .
    89           .           .-------->    RD05
    87           .      DD05RE
                 .           .
                 .           .
    92        CPD05.............
                 V
                 V
    94       D05D14
                 .
                 .
   103           .-------->  DD141S
   101        DD141
                 V
                 V
   106       D05D15
                 .
                 .
   113           .         D11
```

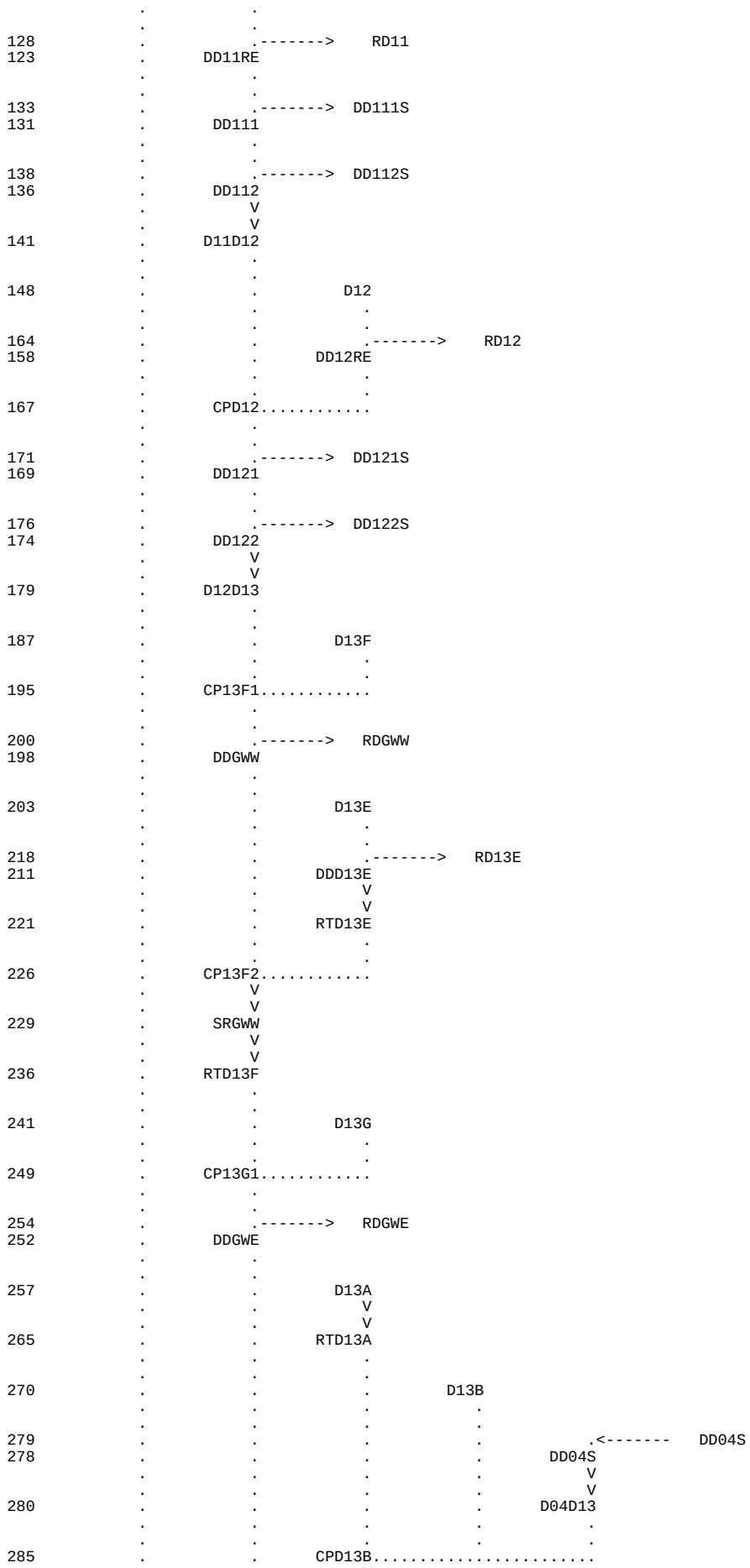
128
RD11
123
DD11RE
133
DD111S
131
DD111
138
DD112S
136
DD112
141
D11D12
148
D12
164
RD12
158
DD12RE
167
CPD12
171
DD121S
169
DD121
176
DD122S
174
DD122
179
D12D13
187
D13F
195
CP13F1
200
RDGWW
198
DDGWW
203
D13E
218
RD13E
211
DDD13E
221
RTD13E
226
CP13F2
229
SRGWW
236
RTD13F
241
D13G
249
CP13G1
254
RDGWE
252
DDGWE
257
D13A
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RTD13A
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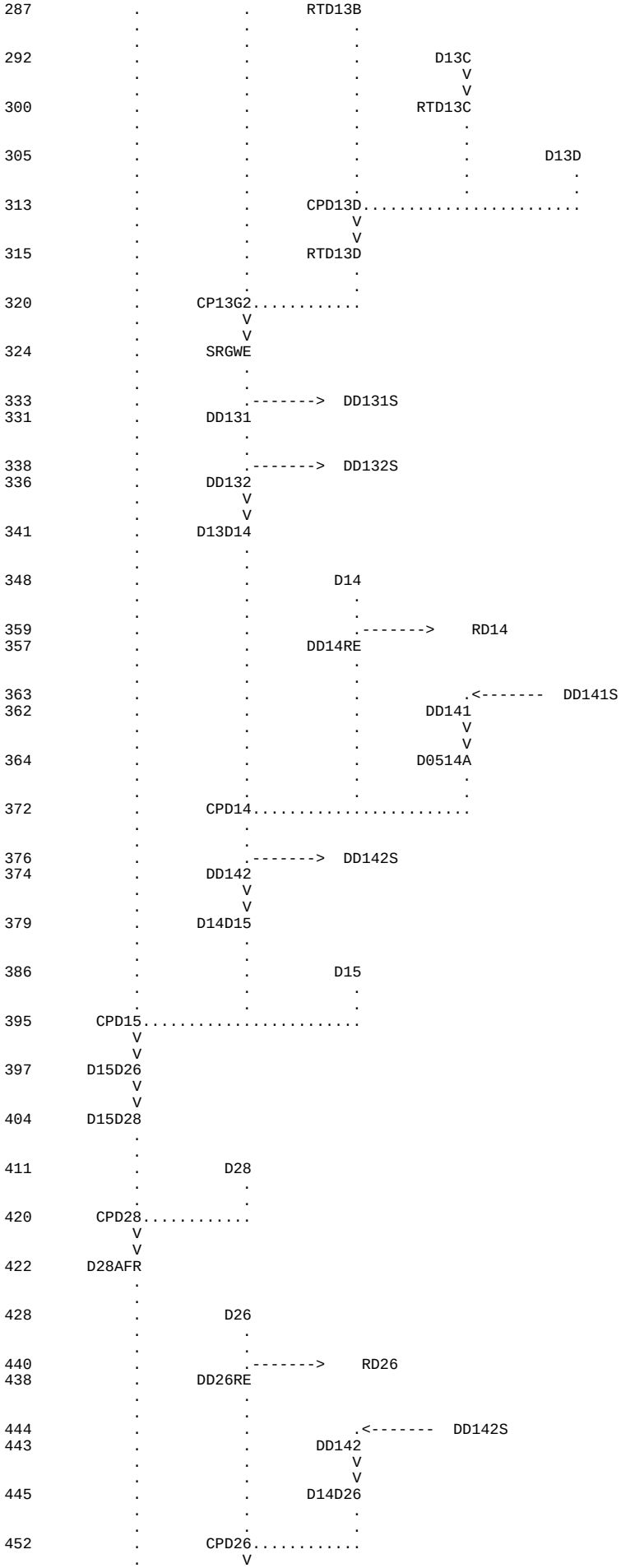
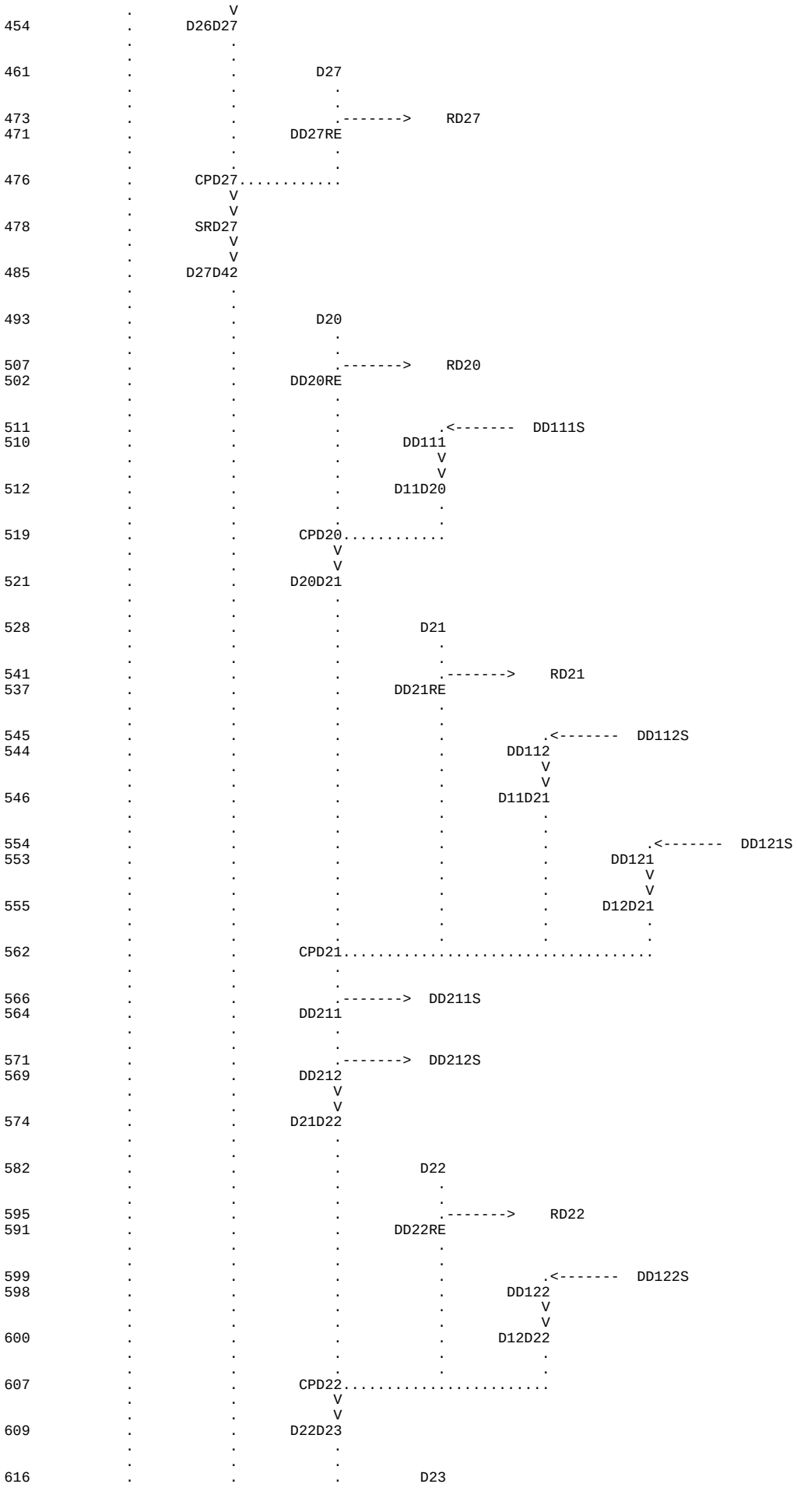
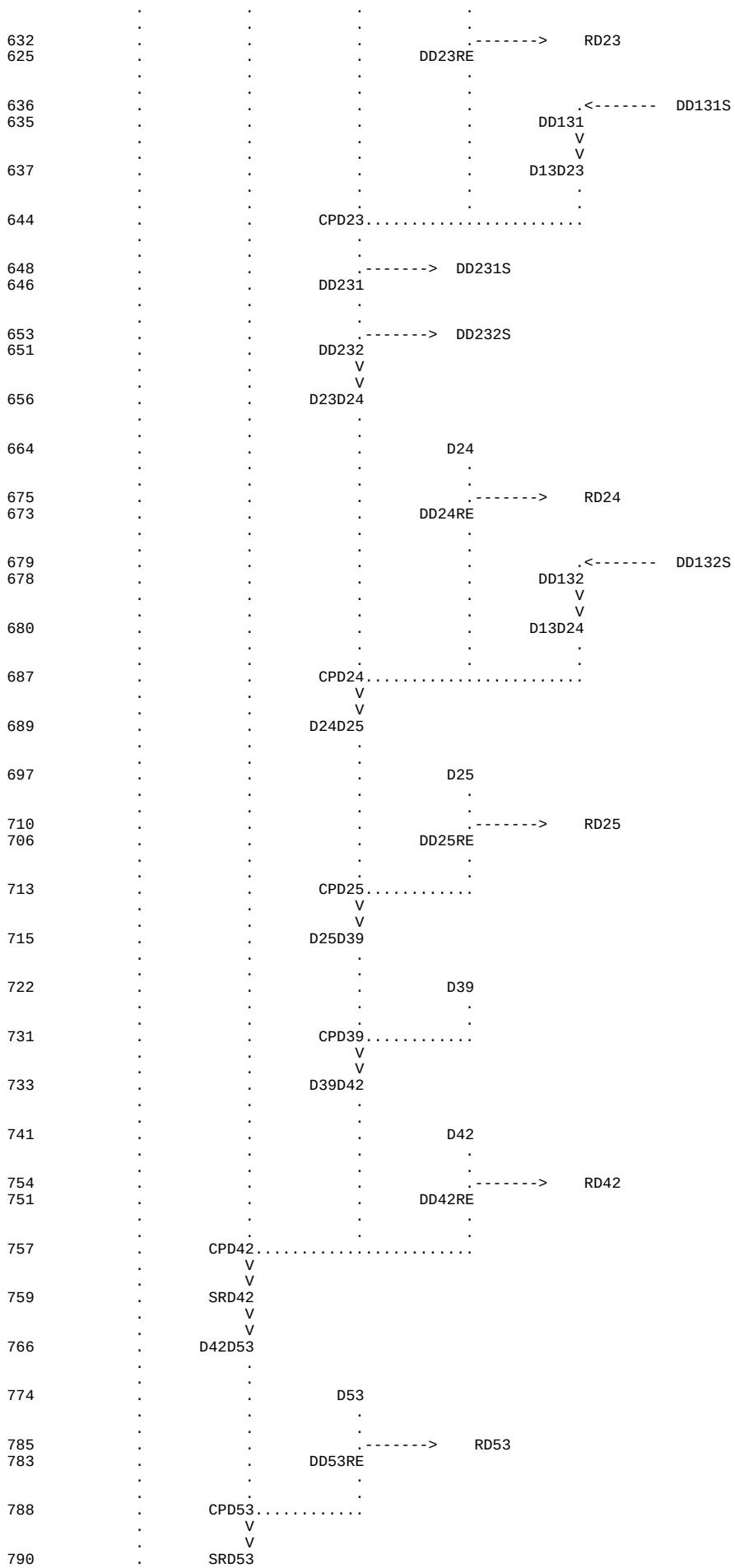
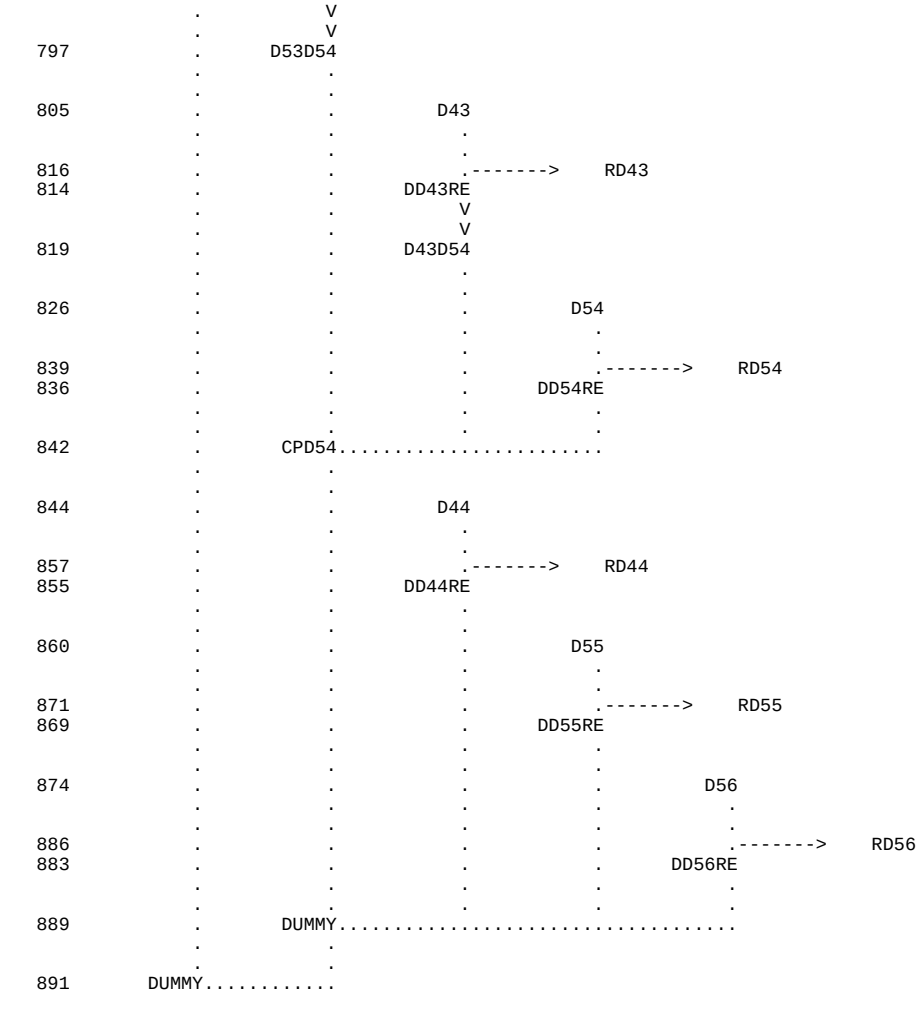
D13B
279
DD04S
278
DD04S
280
D04D13
285
CPD13B


RTD13B
D13C
RTD13C
D13D
CPD13D
RTD13D
CP13G2
SRGWE
DD131S
DD131
DD132S
DD132
D13D14
D14
RD14
DD14RE
DD141S
DD141
D0514A
CPD14
DD142S
DD142
D14D15
D15
CPD15
D15D26
D15D28
D28
CPD28
D28AFR
D26
RD26
DD26RE
DD142S
D14D26
CPD26


D26D27
D27
RD27
DD27RE
CPD27
SRD27
D27D42
D20
RD20
DD20RE
DD111S
DD111
D11D20
CPD20
D20D21
D21
RD21
DD21RE
DD112S
DD112
D11D21
DD121S
DD121
D12D21
CPD21
DD211S
DD211
DD212S
DD212
D21D22
D22
RD22
DD22RE
DD122S
DD122
D12D22
CPD22
D22D23
D23


632
625 DD23RE
RD23
636
635 DD131
DD131S
637 D13D23
644 CPD23
648
646 DD231
DD231S
653
651 DD232
DD232S
656 D23D24
664 D24
675
673 DD24RE
RD24
679
678 DD132
DD132S
680 D13D24
687 CPD24
689 D24D25
697 D25
710
706 DD25RE
RD25
713 CPD25
715 D25D39
722 D39
731 CPD39
733 D39D42
741 D42
754
751 DD42RE
RD42
757 CPD42
759 SRD42
766 D42D53
774 D53
785
783 DD53RE
RD53
788 CPD53
790 SRD53



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1**************************************                    ************************************
 *                                    *                    *                                  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)*                    *    U.S. ARMY CORPS OF ENGINEERS  *
 *              JUN   1998            *                    *    HYDROLOGIC ENGINEERING CENTER *
 *            VERSION 4.1             *                    *         609 SECOND STREET        *
 *                                    *                    *       DAVIS, CALIFORNIA 95616    *
 *  RUN DATE   06SEP16  TIME  17:15:40*                    *           (916) 756-1104         *
 *                                    *                    *                                  *
 **************************************                    ************************************
```

City of Surprise, AZ
CORREFF SURPRISE - SCC Drainage Study - Corrected Effective Existing
100 YEAR
24 Hour Storm
Unit Hydrograph: S-Graph
Storm: Multiple
09/06/2016

```
    9 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1JAN99  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      7JAN99  ENDING DATE
                      NDTIME        2235  ENDING TIME
                      ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL    0.08 HOURS
                         TOTAL TIME BASE  166.58 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
```

```
                  STORAGE VOLUME         ACRE-FEET
                  SURFACE AREA           ACRES
                  TEMPERATURE            DEGREES FAHRENHEIT

   11 JD           INDEX STORM NO. 1
                     STRM        3.48  PRECIPITATION DEPTH
                     TRDA        0.00  TRANSPOSITION DRAINAGE AREA

   12 PI            PRECIPITATION PATTERN
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.01     0.00     0.01
           0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.03     0.03
           0.03     0.09     0.09     0.09     0.01     0.01     0.01     0.01     0.01     0.01
           0.01     0.01     0.01     0.01     0.01     0.01     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00

   22 JD           INDEX STORM NO. 2
                     STRM        3.39  PRECIPITATION DEPTH
                     TRDA        5.00  TRANSPOSITION DRAINAGE AREA

    0 PI            PRECIPITATION PATTERN
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.01     0.00     0.01
           0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.03     0.03
           0.03     0.09     0.09     0.09     0.01     0.01     0.01     0.01     0.01     0.01
           0.01     0.01     0.01     0.01     0.01     0.01     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00

   23 JD           INDEX STORM NO. 3
                     STRM        3.31  PRECIPITATION DEPTH
                     TRDA       10.00  TRANSPOSITION DRAINAGE AREA

    0 PI            PRECIPITATION PATTERN
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.01     0.00     0.01
           0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.01     0.03     0.03
           0.03     0.09     0.09     0.09     0.01     0.01     0.01     0.01     0.01     0.01
           0.01     0.01     0.01     0.01     0.01     0.01     0.00     0.00     0.00     0.00
           0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
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                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

  24 JD         INDEX STORM NO. 4
                       STRM       3.22  PRECIPITATION DEPTH
                       TRDA      20.00  TRANSPOSITION DRAINAGE AREA

   0 PI           PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                    0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

  25 JD         INDEX STORM NO. 5
                       STRM       3.13  PRECIPITATION DEPTH
                       TRDA      30.00  TRANSPOSITION DRAINAGE AREA

   0 PI           PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                    0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 229 KK    *    SRGWW   *      STORAGE
           *            *
           **************

 231 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
```

```
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  324 KK    *     SRGWE  *      STORAGE
            *            *
            **************

  326 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  478 KK    *     SRD27  *      STORAGE
            *            *
            **************

  480 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE

 WARNING --- ROUTED OUTFLOW (    119.) IS GREATER THAN MAXIMUM OUTFLOW (    112.) IN STORAGE-OUTFLOW TABLE

 WARNING --- ROUTED OUTFLOW (    120.) IS GREATER THAN MAXIMUM OUTFLOW (    112.) IN STORAGE-OUTFLOW TABLE

 WARNING --- ROUTED OUTFLOW (    113.) IS GREATER THAN MAXIMUM OUTFLOW (    112.) IN STORAGE-OUTFLOW TABLE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  759 KK    *     SRD42  *      STORAGE
            *            *
            **************

  761 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  790 KK    *     SRD53  *      STORAGE
            *            *
            **************

  792 KO          OUTPUT CONTROL VARIABLES
                     IPRNT           5  PRINT CONTROL
                     IPLOT           0  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                RUNOFF SUMMARY
                                           FLOW IN CUBIC FEET PER SECOND
                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION     FLOW     PEAK                                          AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                            D03       958.   12.25         109.         34.         11.       0.72

          DIVERSION TO
+                          RD03        958.   12.25         109.         34.         11.       0.72

          HYDROGRAPH AT
+                         DD03RE         0.    0.00           0.          0.          0.       0.72

          ROUTED TO
+                         D03D04         0.    0.00           0.          0.          0.       0.72

          HYDROGRAPH AT
+                            D04      1149.   12.33         142.         44.         15.       0.89
```

+	DIVERSION TO RD04	1149.	12.33	140.	39.	13.	0.89
+	HYDROGRAPH AT DD04RE	27.	14.50	15.	5.	2.	0.89
+	2 COMBINED AT CPD04	27.	14.50	15.	5.	2.	1.61
+	DIVERSION TO DD04S	0.	0.00	0.	0.	0.	1.61
+	HYDROGRAPH AT DD04SE	27.	14.50	15.	5.	2.	1.61
+	ROUTED TO D04D05	23.	15.00	15.	5.	2.	1.61
+	HYDROGRAPH AT D05	325.	12.17	35.	12.	4.	0.16
+	DIVERSION TO RD05	325.	12.17	31.	9.	3.	0.16
+	HYDROGRAPH AT DD05RE	30.	12.67	9.	3.	1.	0.16
+	2 COMBINED AT CPD05	30.	15.00	21.	8.	3.	1.78
+	ROUTED TO D05D14	28.	15.50	20.	8.	3.	1.78
+	DIVERSION TO DD141S	0.	0.00	0.	0.	0.	1.78
+	HYDROGRAPH AT DD141	28.	15.50	20.	8.	3.	1.78
+	ROUTED TO D05D15	28.	15.75	20.	8.	3.	1.78
+	HYDROGRAPH AT D11	776.	12.42	106.	33.	11.	0.66
+	DIVERSION TO RD11	746.	12.33	58.	16.	5.	0.66
+	HYDROGRAPH AT DD11RE	715.	12.50	60.	17.	6.	0.66
+	DIVERSION TO DD111S	587.	12.50	48.	13.	4.	0.66
+	HYDROGRAPH AT DD111	127.	12.50	11.	3.	1.	0.66
+	DIVERSION TO DD112S	46.	12.50	6.	2.	1.	0.66
+	HYDROGRAPH AT DD112	81.	12.50	6.	2.	1.	0.66
+	ROUTED TO D11D12	50.	12.67	6.	2.	1.	0.66
+	HYDROGRAPH AT D12	277.	12.75	53.	16.	5.	0.35
+	DIVERSION TO RD12	260.	12.67	28.	8.	3.	0.35
+	HYDROGRAPH AT DD12RE	261.	12.75	30.	8.	3.	0.35
+	2 COMBINED AT CPD12	305.	12.75	36.	10.	3.	1.01
+	DIVERSION TO DD121S	134.	12.75	13.	4.	1.	1.01
+	HYDROGRAPH AT DD121	171.	12.75	22.	6.	2.	1.01
+	DIVERSION TO DD122S	69.	12.75	10.	3.	1.	1.01
+	HYDROGRAPH AT DD122	101.	12.75	12.	3.	1.	1.01
+	ROUTED TO D12D13	68.	13.00	12.	3.	1.	1.01
+	HYDROGRAPH AT D13F	204.	12.17	13.	3.	1.	0.13

+	2 COMBINED AT CP13F1	203.	12.17	25.	7.	2.	1.14
+	DIVERSION TO RDGWW	176.	12.08	8.	2.	1.	1.14
+	HYDROGRAPH AT DDGWW	168.	12.25	18.	5.	2.	1.14
+	HYDROGRAPH AT D13E	310.	12.17	35.	12.	4.	0.17
+	DIVERSION TO RD13E	310.	12.17	31.	9.	3.	0.17
+	HYDROGRAPH AT DDD13E	35.	12.67	10.	3.	1.	0.17
+	ROUTED TO RTD13E	23.	13.00	10.	3.	1.	0.17
+	2 COMBINED AT CP13F2	168.	12.25	27.	8.	3.	1.31
+	ROUTED TO SRGWW	101.	13.08	26.	8.	3.	1.31
+	ROUTED TO RTD13F	77.	13.25	26.	8.	3.	1.31
+	HYDROGRAPH AT D13G	230.	12.17	16.	4.	1.	0.17
+	2 COMBINED AT CP13G1	229.	12.17	41.	12.	4.	1.47
+	DIVERSION TO RDGWE	229.	12.17	9.	2.	1.	1.47
+	HYDROGRAPH AT DDGWE	199.	12.25	33.	10.	3.	1.47
+	HYDROGRAPH AT D13A	215.	12.17	14.	4.	1.	0.14
+	ROUTED TO RTD13A	129.	12.33	14.	4.	1.	0.14
+	HYDROGRAPH AT D13B	240.	12.17	22.	7.	2.	0.14
+	HYDROGRAPH AT DD04S	0.	0.00	0.	0.	0.	1.61
+	ROUTED TO D04D13	0.	0.00	0.	0.	0.	1.61
+	3 COMBINED AT CPD13B	337.	12.25	36.	11.	4.	0.29
+	ROUTED TO RTD13B	277.	12.33	36.	11.	4.	0.29
+	HYDROGRAPH AT D13C	129.	12.25	11.	3.	1.	0.11
+	ROUTED TO RTD13C	73.	12.50	11.	3.	1.	0.11
+	HYDROGRAPH AT D13D	227.	12.17	15.	4.	1.	0.16
+	3 COMBINED AT CPD13D	507.	12.25	62.	18.	6.	0.56
+	ROUTED TO RTD13D	443.	12.33	62.	18.	6.	0.56
+	2 COMBINED AT CP13G2	607.	12.33	93.	27.	9.	2.04
+	ROUTED TO SRGWE	635.	12.33	93.	27.	9.	2.04
+	DIVERSION TO DD131S	49.	12.33	4.	1.	0.	2.04
+	HYDROGRAPH AT DD131	586.	12.33	90.	26.	9.	2.04
+	DIVERSION TO DD132S	172.	12.33	21.	6.	2.	2.04
+	HYDROGRAPH AT DD132	414.	12.33	69.	20.	7.	2.04

+	ROUTED TO	D13D14	329.	12.75	69.	20.	7.	2.04
+	HYDROGRAPH AT	D14	1090.	12.42	147.	46.	15.	0.94
+	DIVERSION TO	RD14	1090.	12.42	117.	32.	11.	0.94
+	HYDROGRAPH AT	DD14RE	445.	12.67	46.	14.	5.	0.94
+	HYDROGRAPH AT	DD141	0.	0.00	0.	0.	0.	1.78
+	ROUTED TO	D0514A	0.	0.00	0.	0.	0.	1.78
+	3 COMBINED AT	CPD14	738.	12.67	113.	34.	11.	4.76
+	DIVERSION TO	DD142S	480.	12.67	95.	29.	10.	4.76
+	HYDROGRAPH AT	DD142	259.	12.67	19.	5.	2.	4.76
+	ROUTED TO	D14D15	217.	12.83	19.	5.	2.	4.76
+	HYDROGRAPH AT	D15	419.	12.17	44.	14.	5.	0.22
+	3 COMBINED AT	CPD15	417.	12.17	73.	27.	9.	4.98
+	ROUTED TO	D15D26	328.	12.33	73.	27.	9.	4.98
+	ROUTED TO	D15D28	288.	12.50	73.	27.	9.	4.98
+	HYDROGRAPH AT	D28	417.	12.17	38.	12.	4.	0.25
+	2 COMBINED AT	CPD28	481.	12.25	107.	38.	13.	5.23
+	ROUTED TO	D28AFR	459.	12.25	107.	38.	13.	5.23
+	HYDROGRAPH AT	D26	982.	12.25	101.	31.	10.	0.64
+	DIVERSION TO	RD26	982.	12.25	98.	26.	9.	0.64
+	HYDROGRAPH AT	DD26RE	29.	13.50	13.	5.	2.	0.64
+	HYDROGRAPH AT	DD142	480.	12.67	95.	29.	10.	4.76
+	ROUTED TO	D14D26	370.	13.00	93.	29.	10.	4.76
+	2 COMBINED AT	CPD26	367.	13.00	104.	33.	11.	5.40
+	ROUTED TO	D26D27	349.	13.08	104.	33.	11.	5.40
+	HYDROGRAPH AT	D27	497.	12.17	52.	17.	6.	0.32
+	DIVERSION TO	RD27	101.	11.92	13.	4.	1.	0.32
+	HYDROGRAPH AT	DD27RE	497.	12.17	45.	12.	4.	0.32
+	2 COMBINED AT	CPD27	494.	12.17	144.	45.	15.	5.72
+	ROUTED TO	SRD27	494.	12.17	144.	45.	15.	5.72
+	ROUTED TO	D27D42	352.	12.58	139.	45.	15.	5.72
+	HYDROGRAPH AT	D20	583.	12.33	70.	21.	7.	0.50
+	DIVERSION TO	RD20	583.	12.33	69.	19.	6.	0.50

+	HYDROGRAPH AT	DD20RE	9.	15.33	6.	2.	1.	0.50
+	HYDROGRAPH AT	DD111	587.	12.50	48.	13.	4.	0.66
+	ROUTED TO	D11D20	330.	12.92	46.	13.	4.	0.66
+	2 COMBINED AT	CPD20	328.	12.92	50.	16.	5.	1.16
+	ROUTED TO	D20D21	245.	13.33	48.	16.	5.	1.16
+	HYDROGRAPH AT	D21	561.	12.33	72.	22.	7.	0.50
+	DIVERSION TO	RD21	561.	12.33	71.	20.	7.	0.50
+	HYDROGRAPH AT	DD21RE	8.	16.25	6.	2.	1.	0.50
+	HYDROGRAPH AT	DD112	46.	12.50	6.	2.	1.	0.66
+	ROUTED TO	D11D21	22.	13.33	5.	2.	1.	0.66
+	HYDROGRAPH AT	DD121	134.	12.75	13.	4.	1.	1.01
+	ROUTED TO	D12D21	104.	13.00	13.	4.	1.	1.01
+	4 COMBINED AT	CPD21	324.	13.33	68.	23.	8.	2.00
+	DIVERSION TO	DD211S	216.	13.33	50.	17.	6.	2.00
+	HYDROGRAPH AT	DD211	108.	13.33	18.	6.	2.	2.00
+	DIVERSION TO	DD212S	54.	13.33	13.	4.	1.	2.00
+	HYDROGRAPH AT	DD212	54.	13.33	5.	2.	1.	2.00
+	ROUTED TO	D21D22	38.	13.67	5.	2.	1.	2.00
+	HYDROGRAPH AT	D22	558.	12.33	66.	20.	7.	0.45
+	DIVERSION TO	RD22	558.	12.33	66.	19.	6.	0.45
+	HYDROGRAPH AT	DD22RE	7.	17.08	5.	2.	1.	0.45
+	HYDROGRAPH AT	DD122	69.	12.75	10.	3.	1.	1.01
+	ROUTED TO	D12D22	49.	13.42	10.	3.	1.	1.01
+	3 COMBINED AT	CPD22	80.	13.58	17.	6.	2.	2.46
+	ROUTED TO	D22D23	72.	13.75	17.	6.	2.	2.46
+	HYDROGRAPH AT	D23	552.	12.42	74.	22.	7.	0.54
+	DIVERSION TO	RD23	552.	12.42	69.	18.	6.	0.54
+	HYDROGRAPH AT	DD23RE	63.	13.08	12.	4.	1.	0.54
+	HYDROGRAPH AT	DD131	49.	12.33	4.	1.	0.	2.04
+	ROUTED TO	D13D23	17.	12.75	4.	1.	0.	2.04
+	3 COMBINED AT	CPD23	93.	13.75	30.	11.	4.	5.64
+	DIVERSION TO	DD231S	9.	13.75	3.	1.	0.	5.64

+	HYDROGRAPH AT	DD231	84.	13.75	27.	9.	3.	5.64
+	DIVERSION TO	DD232S	10.	13.75	3.	1.	0.	5.64
+	HYDROGRAPH AT	DD232	74.	13.75	23.	8.	3.	5.64
+	ROUTED TO	D23D24	71.	13.92	23.	8.	3.	5.64
+	HYDROGRAPH AT	D24	534.	12.42	70.	21.	7.	0.49
+	DIVERSION TO	RD24	534.	12.42	70.	21.	7.	0.49
+	HYDROGRAPH AT	DD24RE	4.	21.83	2.	1.	0.	0.49
+	HYDROGRAPH AT	DD132	172.	12.33	21.	6.	2.	2.04
+	ROUTED TO	D13D24	102.	12.67	21.	6.	2.	2.04
+	3 COMBINED AT	CPD24	100.	12.67	42.	14.	5.	6.13
+	ROUTED TO	D24D25	93.	14.08	41.	14.	5.	6.13
+	HYDROGRAPH AT	D25	570.	12.33	71.	22.	7.	0.50
+	DIVERSION TO	RD25	570.	12.33	69.	19.	6.	0.50
+	HYDROGRAPH AT	DD25RE	19.	13.75	9.	3.	1.	0.50
+	2 COMBINED AT	CPD25	101.	14.00	47.	17.	6.	6.63
+	ROUTED TO	D25D39	99.	14.17	47.	17.	6.	6.63
+	HYDROGRAPH AT	D39	112.	12.50	16.	4.	1.	0.18
+	2 COMBINED AT	CPD39	123.	12.92	59.	20.	7.	6.81
+	ROUTED TO	D39D42	112.	13.25	58.	20.	7.	6.81
+	HYDROGRAPH AT	D42	1315.	12.33	151.	46.	15.	0.99
+	DIVERSION TO	RD42	1315.	12.33	135.	36.	12.	0.99
+	HYDROGRAPH AT	DD42RE	215.	12.75	31.	10.	3.	0.99
+	3 COMBINED AT	CPD42	448.	13.50	209.	70.	23.	9.87
+	ROUTED TO	SRD42	366.	13.83	206.	69.	23.	9.87
+	ROUTED TO	D42D53	361.	13.92	204.	69.	23.	9.87
+	HYDROGRAPH AT	D53	180.	12.17	13.	4.	1.	0.12
+	DIVERSION TO	RD53	180.	12.17	13.	4.	1.	0.12
+	HYDROGRAPH AT	DD53RE	0.	0.00	0.	0.	0.	0.12
+	2 COMBINED AT	CPD53	361.	13.92	204.	69.	23.	9.99
+	ROUTED TO	SRD53	221.	15.58	99.	35.	12.	9.99
+	ROUTED TO	D53D54	197.	16.00	97.	35.	12.	9.99
+	HYDROGRAPH AT	D43	638.	12.33	74.	23.	8.	0.50

	DIVERSION TO						
+	RD43	638.	12.33	66.	18.	6.	0.50
	HYDROGRAPH AT						
+	DD43RE	76.	12.83	15.	5.	2.	0.50
	ROUTED TO						
+	D43D54	40.	13.75	14.	5.	2.	0.50
	HYDROGRAPH AT						
+	D54	338.	12.25	29.	8.	3.	0.27
	DIVERSION TO						
+	RD54	66.	12.00	5.	2.	1.	0.27
	HYDROGRAPH AT						
+	DD54RE	338.	12.25	26.	7.	2.	0.27
	3 COMBINED AT						
+	CPD54	320.	12.25	103.	45.	15.	10.76
	HYDROGRAPH AT						
+	D44	544.	12.33	63.	19.	6.	0.54
	DIVERSION TO						
+	RD44	540.	12.33	36.	10.	3.	0.54
	HYDROGRAPH AT						
+	DD44RE	462.	12.42	34.	9.	3.	0.54
	HYDROGRAPH AT						
+	D55	219.	12.25	21.	6.	2.	0.19
	DIVERSION TO						
+	RD55	219.	12.25	18.	5.	2.	0.19
	HYDROGRAPH AT						
+	DD55RE	33.	12.58	5.	1.	0.	0.19
	HYDROGRAPH AT						
+	D56	266.	12.33	28.	8.	3.	0.22
	DIVERSION TO						
+	RD56	37.	11.92	5.	2.	1.	0.22
	HYDROGRAPH AT						
+	DD56RE	266.	12.33	26.	7.	2.	0.22
	4 COMBINED AT						
+	DUMMY	676.	12.42	138.	60.	20.	11.71
	2 COMBINED AT						
+	DUMMY	1004.	12.50	208.	86.	29.	16.94

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

APPENDIX B

HEC-1 Output

Scenario 2 – Detention + FF

100-year, 24-hour

**Only this Developed Conditions model has been printed.*

See electronic files on CD for additional model results

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1***************************************                                                         ***************************************
 *                                      *                                                        *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                        *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998               *                                                        *    HYDROLOGIC ENGINEERING CENTER    *
 *          VERSION 4.1                 *                                                        *         609 SECOND STREET           *
 *                                      *                                                        *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   06SEP16  TIME  17:26:55  *                                                        *          (916) 756-1104             *
 *                                      *                                                        *                                     *
 ****************************************                                                        ***************************************



                                                   X     X  XXXXXXX   XXXXX          X
                                                   X     X  X        X     X        XX
                                                   X     X  X        X               X
                                                   XXXXXXX  XXXX     X       XXXXX   X
                                                   X     X  X        X               X
                                                   X     X  X        X     X         X
                                                   X     X  XXXXXXX   XXXXX         XXX



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

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                 HEC-1 INPUT                                                PAGE  1

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

              1           ID        City of Surprise, AZ
              2           ID        DEV COND A2 DETEN - SCC Drainage Study - DEV. COND. ALT2 DETENTION
              3           ID        100 YEAR
              4           ID        24 Hour Storm
              5           ID        Unit Hydrograph: S-Graph
              6           ID        Storm: Multiple
              7           ID        09/06/2016
                          *DIAGRAM
              8           IT       5  1JAN99       0    2000
              9           IO       5
             10           IN      15
                          *
             11           JD   3.480  0.0001
             12           PC   0.000   0.002   0.005   0.008   0.011   0.014   0.017   0.020   0.023   0.026
             13           PC   0.029   0.032   0.035   0.038   0.041   0.044   0.048   0.052   0.056   0.060
             14           PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
             15           PC   0.110   0.115   0.120   0.126   0.133   0.140   0.147   0.155   0.163   0.172
             16           PC   0.181   0.191   0.203   0.218   0.236   0.257   0.283   0.387   0.663   0.707
             17           PC   0.735   0.758   0.776   0.791   0.804   0.815   0.825   0.834   0.842   0.849
             18           PC   0.856   0.863   0.869   0.875   0.881   0.887   0.893   0.898   0.903   0.908
             19           PC   0.913   0.918   0.922   0.926   0.930   0.934   0.938   0.942   0.946   0.950
             20           PC   0.953   0.956   0.959   0.962   0.965   0.968   0.971   0.974   0.977   0.980
             21           PC   0.983   0.986   0.989   0.992   0.995   0.998   1.000
             22           JD   3.393     5.0
             23           JD   3.306    10.0
             24           JD   3.219    20.0
             25           JD   3.132    30.0
                          *

             26           KK     D03   BASIN
             27           KM   BASIN BOUNDARY FROM KINGSWOOD PARKE
             28           BA   0.723
             29           LG    0.23    0.25    4.87    0.37      35
             30           UI       0     123     481     721    1150    1206     816     545     244     150
             31           UI      70      35      35       0       0       0       0       0       0       0
             32           UI       0       0       0       0       0       0       0       0       0       0
             33           UI       0       0       0       0       0       0       0       0       0       0
             34           UI       0       0       0       0       0       0       0       0       0       0
                          *
                          *

             35           KK  DD03RE  DIVERT
             36           KM   Volume updated per TYLIN ADOT study for Bell Road
             37           DT    RD03  110.75     0.0
             38           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             39           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                          *
                          *

             40           KK  D03D04   ROUTE
             41           KM   Cross-section: Cross-section determined from aerial
             42           KM   Manning's N Value: street and earth with sparse trees and shrubs
             43           RS       4    FLOW
             44           RC   0.032   0.013   0.032    4458  0.0038    0.00
             45           RX  100.00  108.00  119.00  119.10  155.00  155.10  160.00  165.00
1                                                 HEC-1 INPUT                                                PAGE  2

           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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 46          RY  1000.3 1000.00  999.50  999.00  999.70 1000.20 1000.30 1000.40
             *
             *

 47          KK     D04   BASIN
 48          KM   BASIN BOUNDARY FROM GRAND VILLAGE NORTH/SOUTH, BELLAZANO CONDOS,
 49          KM   HOPI VILLAGE, PIMA VILLAGE, SUN VILLAGE, ZUNI VILLAGE, PUEBLO VILLAGE,
 50          KM   GRAND AVE PROFF PLAZA AND GRAND AVE CHANNEL
 51          BA   0.891
 52          LG    0.22    0.27    5.71    0.25      36
 53          UI       0     123     429     682     934    1451    1138     831     585     291
 54          UI     187     115      38      38      38       0       0       0       0       0
 55          UI       0       0       0       0       0       0       0       0       0       0
 56          UI       0       0       0       0       0       0       0       0       0       0
 57          UI       0       0       0       0       0       0       0       0       0       0
             *
             *

 58          KK  DD04RE  DIVERT
 59          KM   Volume updated per TYLIN ADOT study for Bell Road
 60          DT    RD04   76.49     0.0
 61          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 62          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
             *

 63          KK   CPD04 COMBINE
 64          HC       2   1.614
             *
             *

 65          KK  DD04SE  DIVERT
 66          KM   Split flow Bell Rd at Litchfield Rd intersection
 67          DT   DD04S    0.00     0.0
 68          DI     0.0    86.1   158.5   512.0   904.0  1940.0     0.0     0.0     0.0     0.0
 69          DQ     0.0     0.0    42.4   259.0   534.0  1278.0     0.0     0.0     0.0     0.0
             *
             *

 70          KK  D04D05   ROUTE
 71          KM   Cross-section: Cross-section determined from aerial
 72          KM   Manning's N Value: street and earth with sparse trees and shrubs
 73          RS       3    FLOW
 74          RC   0.032   0.013   0.013    2993  0.0027    0.00
 75          RX  100.00  119.00  135.00  135.10  180.00  180.10  181.00  182.00
 76          RY  1000.0  999.80  999.50  999.00  999.80 1000.30 1000.40 1000.50
             *
             *

 77          KK     D05   BASIN
 78          KM   BASIN BOUNDARY FROM WAL MART STORE
 79          KM   SURPRISE TOWN CENTER AND GRAND AVE CHANNEL
 80          BA   0.163
 81          LG    0.11    0.25    4.96    0.39      73
 82          UI       0     127     387     470     197      58      15       0       0       0
1                                      HEC-1 INPUT                                          PAGE  3

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

 83          UI       0       0       0       0       0       0       0       0       0       0
 84          UI       0       0       0       0       0       0       0       0       0       0
 85          UI       0       0       0       0       0       0       0       0       0       0
 86          UI       0       0       0       0       0       0       0       0       0       0
             *
             *

 87          KK  DD05RE  DIVERT
 88          KM   Volume updated per TYLIN ADOT study for Bell Road
 89          DT    RD05   17.36     0.0
 90          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 91          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
             *

 92          KK   CPD05 COMBINE
 93          HC       2   1.777
             *
             *

 94          KK  D05D14   ROUTE
 95          KM   Cross-section: Cross-section determined from aerial, assumed
 96          KM   3' depth / Manning's N Value: earth with grass and forbs
 97          RS       2    FLOW
 98          RC   0.032   0.032   0.032    3385  0.0053    0.00
 99          RX  100.00  101.00  102.00  122.00  142.00  162.00  163.00  164.00
100          RY  1000.0  999.90  999.80  996.80  996.70  999.80  999.90 1000.00
             *
             *

101          KK   DD141  DIVERT
102          KM
103          DT  DD141S    0.00     0.0
104          DI     0.0   122.0   500.0  1000.0     0.0     0.0     0.0     0.0     0.0     0.0
105          DQ     0.0     0.0   378.0   878.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
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                *
          106   KK  D05D15   ROUTE
          107   KM   Cross-section: Cross-section determined from aerial, assumed
          108   KM   3' depth  / Manning's N Value: concrete
          109   RS       8    FLOW
          110   RC   0.016   0.016   0.016    4588  0.0044    0.00
          111   RX  100.00  101.00  102.00  127.00  131.00  140.00  141.00  142.00
          112   RY  1000.0  999.90  999.80  996.80  996.70  999.80  999.90 1000.00
                *
                *

          113   KK     D11   BASIN
          114   KM   BASIN BOUNDARY FROM ORCHIDS DEVELOPMENT
          115   KM   AND  GREENWAY ROAD DRAINAGE REPORT BY CMX (2008)
          116   BA   0.662
          117   LG    0.25    0.25    5.58    0.27      37
          118   UI       0      78     212     386     499     683     948     708     543     408
          119   UI     261     135     102      67      24      24      24       0       0
1                                       HEC-1 INPUT                                          PAGE  4

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

          120   UI       0       0       0       0       0       0       0       0       0       0
          121   UI       0       0       0       0       0       0       0       0       0       0
          122   UI       0       0       0       0       0       0       0       0       0       0
                *
                *

          123   KK  DD11RE  DIVERT
          124   KM   Final Drainage Report for Parkway Bank, Drainage Report for Deer Valley
          125   KM   Credit Union Final Drainage Report for Jiffy Lube at Bell and Reems
          126   KM   for The Orchard Estates Apartments, Drainage Report
          127   KM   for Mountainside Fitness Center Lot 7 a
          128   DT    RD11   32.40     0.0
          129   DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          130   DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
                *

          131   KK   DD111  DIVERT
          132   KM   Greenway at Parkview intersection split flow
          133   DT  DD111S    0.00     0.0
          134   DI     0.0    33.8   453.4  1486.3  2998.5     0.0     0.0     0.0     0.0     0.0
          135   DQ     0.0    25.6   376.5  1210.3  2419.3     0.0     0.0     0.0     0.0     0.0
                *
                *

          136   KK   DD112  DIVERT
          137   KM   Greenway at Parkview intersection split flow
          138   DT  DD112S    0.00     0.0
          139   DI     0.0     8.2    77.0   276.0   579.1     0.0     0.0     0.0     0.0     0.0
          140   DQ     0.0     5.4    35.1    78.9   133.0     0.0     0.0     0.0     0.0     0.0
                *
                *

          141   KK  D11D12   ROUTE
          142   KM   Cross-section: Cross-section determined from aerial
          143   KM   Manning's N Value: clean earth; straight
          144   RS       2    FLOW
          145   RC   0.022   0.022   0.022    2668  0.0037    0.00
          146   RX  100.00  124.00  154.00  155.00  156.00  157.00  158.00  159.00
          147   RY  1208.0 1203.00 1208.00 1208.10 1208.20 1208.30 1208.40 1208.50
                *
                *

          148   KK     D12   BASIN
          149   KM   BASIN BOUNDARY FROM ORCHIDS PARK
          150   KM   AND  GREENWAY ROAD DRAINAGE REPORT BY CMX (2008)
          151   BA   0.347
          152   LG    0.24    0.25    5.85    0.29      33
          153   UI       0      24      24      69     103     126     144     170     202     274
          154   UI     299     238     202     173     146     122     100      63      43      40
          155   UI      30      24      17       7       7       7       7       7       7       0
          156   UI       0       0       0       0       0       0       0       0       0       0
          157   UI       0       0       0       0       0       0       0       0       0       0
                *
                *
1                                       HEC-1 INPUT                                          PAGE  5

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

          158   KK  DD12RE  DIVERT
          159   KM   Final Drainage Report for Residence Inn by Marriot
          160   KM   Final Drainage Report for The Orchards Parcel 5
          161   KM   (Includes Parcels 9,11,12 and 1/2 of 8), Final Drainage Report for
          162   KM   Stadium Village (South) Residences
          163   KM   Final Drainage Report for Stadium Village Residences
          164   DT    RD12   15.30     0.0
          165   DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          166   DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
                *

          167   KK   CPD12 COMBINE
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168          HC       2   1.009
             *
             *

169          KK   DD121  DIVERT
170          KM   Greenway at Bullard intersection split flow
171          DT  DD121S    0.00     0.0
172          DI     0.0    68.7   371.0  1186.5  2407.4     0.0     0.0     0.0     0.0     0.0
173          DQ     0.0    19.7   166.4   705.0  1553.4     0.0     0.0     0.0     0.0     0.0
             *
             *

174          KK   DD122  DIVERT
175          KM   Greenway at Bullard intersection split flow
176          DT  DD122S    0.00     0.0
177          DI     0.0    48.9   204.6   481.5   854.0     0.0     0.0     0.0     0.0     0.0
178          DQ     0.0    24.3    82.0   159.0   251.4     0.0     0.0     0.0     0.0     0.0
             *
             *

179          KK  D12D13   ROUTE
180          KM   Cross-section: determined from aerial and contours
181          KM   Manning's N Value: earth with sparse trees and shrubs for left
182          KM   overbank and main channel, right overbank is pavement
183          RS       3    FLOW
184          RC   0.035   0.030   0.035    2562  0.0050    0.00
185          RX  100.00  110.00  122.00  125.00  150.00  153.00  165.00  175.00
186          RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
             *
             *

187          KK    D13F   BASIN
188          BA   0.128
189          LG    0.19    0.25    5.24    0.32      52
190          UI       0     134     421     316      90      21       0       0       0       0
191          UI       0       0       0       0       0       0       0       0       0       0
192          UI       0       0       0       0       0       0       0       0       0       0
193          UI       0       0       0       0       0       0       0       0       0       0
194          UI       0       0       0       0       0       0       0       0       0       0
             *
             *
1                                        HEC-1 INPUT                                          PAGE  6

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

195          KK  DDD13F  DIVERT
196          KM   *DE* - Diversion of First Flush storage initially diverted out.
197          DT  RDD13F    3.24     0.0
198          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
199          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
             *

200          KK  SRD13F STORAGE
201          KM   *DE* - Detention Basin designed with specific volume & discharge
202          KM   for ALT 2 analysis
203          KO
204          RS       1    STOR
205          SV            1.83    3.66    5.65    7.75
206          SQ            2.00    6.00   13.00   23.00
207          SE  100.00  101.00  102.00  103.00  104.00
             *
             *

208          KK  CP13F1 COMBINE
209          KM   Combines upstream routed flow from D12D13 with D13F
210          HC       2
             *
             *

211          KK   DDGWW  DIVERT
212          KM   Storage held by diversion berms in West Greenway Basin
213          DT   RDGWW    4.00     0.0
214          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
215          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
             *

216          KK    D13E   BASIN
217          BA   0.169
218          LG    0.10    0.24    4.87    0.39      74
219          UI       0      64     199     364     341     200      80      36      11      11
220          UI       0       0       0       0       0       0       0       0       0       0
221          UI       0       0       0       0       0       0       0       0       0       0
222          UI       0       0       0       0       0       0       0       0       0       0
223          UI       0       0       0       0       0       0       0       0       0       0
             *
             *

224          KK  DDD13E  DIVERT
225          KM   *Dibble Engineering* - Used ADMS provided volume for developed
226          KM   portion of subbasin D13
227          KM   Final Drainage Report for Surprise Festival, Final Drainage Report
228          KM   for The City at Surprise Office Building, Final Drainage Report for
229          KM   Surprise Tennis Center, Final Drainage Report for City of Surprise
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          230           KM   Central Utility Plant, Final Drainage Report for Hear
          231           DT  RDD13E   17.10     0.0
          232           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          233           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                        *
                        *
1                                             HEC-1 INPUT                                          PAGE  7

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


          234           KK  RTD13E   ROUTE
          235           RS       1    FLOW
          236           RC   0.035   0.030   0.035    1334  0.0050    0.00
          237           RX  100.00  114.00  130.00  133.00  137.00  140.00  156.00  170.00
          238           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                        *
                        *

          239           KK  CP13F2 COMBINE
          240           KM   Combines D13E with upstream combined flow at CP13F1
          241           HC       2
                        *
                        *

          242           KK   SRGWW STORAGE
          243           KM   Storage upstream of pipe outlet in West Greenway Basin
          244           KO
          245           RS       1    STOR
          246           SV            0.07    0.34    0.80    1.34    1.91
          247           SQ            6.00   19.00   35.00   50.00  350.00
          248           SE  1192.0 1193.00 1194.00 1195.00 1196.00 1197.00
                        *
                        *

          249           KK  RTD13F   ROUTE
          250           RS       2    FLOW
          251           RC   0.035   0.030   0.035    2575  0.0050    0.00
          252           RX  100.00  110.00  122.00  125.00  150.00  153.00  165.00  175.00
          253           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                        *
                        *

          254           KK    D13G   BASIN
          255           BA   0.168
          256           LG    0.14    0.25    4.96    0.39      67
          257           UI       0     112     328     494     250      78      24      15       0       0
          258           UI       0       0       0       0       0       0       0       0       0       0
          259           UI       0       0       0       0       0       0       0       0       0       0
          260           UI       0       0       0       0       0       0       0       0       0       0
          261           UI       0       0       0       0       0       0       0       0       0       0
                        *
                        *

          262           KK  DDD13G  DIVERT
          263           KM   *DE* - Diversion of First Flush storage initially diverted out.
          264           DT  RDD13G    4.26     0.0
          265           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          266           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                        *
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1                                             HEC-1 INPUT                                          PAGE  8

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


          267           KK  SRD13G STORAGE
          268           KM   *DE* - Detention Basin designed with specific volume & discharge
          269           KM   for ALT 2 analysis
          270           KO
          271           RS       1    STOR
          272           SV            2.88    5.77    8.85   12.06
          273           SQ            3.00    8.00   17.00   30.00
          274           SE  100.00  101.00  102.00  103.00  104.00
                        *
                        *

          275           KK  CP13G1 COMBINE
          276           KM   Combine upstream route RTD13F with subbasin D13G
          277           HC       2
                        *
                        *

          278           KK   DDGWE  DIVERT
          279           KM   Storage held by diversion berms in East Greenway Basin
          280           DT   RDGWE    4.61     0.0
          281           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
          282           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                        *
                        *

          283           KK    D13A   BASIN
          284           BA   0.145
          285           LG    0.10    0.30    4.87    0.42      82
          286           UI       0      91     267     423     228      74      24      12       0       0
          287           UI       0       0       0       0       0       0       0       0       0       0
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         288           UI       0       0       0       0       0       0       0       0       0       0
         289           UI       0       0       0       0       0       0       0       0       0       0
         290           UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

         291           KK  DDD13A  DIVERT
         292           KM   *DE* - Diversion of First Flush storage initially diverted out.
         293           DT  RDD13A    3.67     0.0
         294           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
         295           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *

         296           KK  SRD13A STORAGE
         297           KM   *DE* - Detention Basin designed with specific volume & discharge
         298           KM   for ALT 2 analysis
         299           KO
         300           RS       1    STOR
         301           SV            2.91    5.82    8.93   12.18
         302           SQ            2.00    7.00   15.00   26.00
         303           SE  100.00  101.00  102.00  103.00  104.00
                       *
                       *
1                                               HEC-1 INPUT                                         PAGE  9

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


         304           KK  RTD13A   ROUTE
         305           RS       3    FLOW
         306           RC   0.035   0.030   0.035    2634  0.0050    0.00
         307           RX  100.00  114.00  130.00  133.00  137.00  140.00  156.00  170.00
         308           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                       *
                       *

         309           KK    D13B   BASIN
         310           BA   0.143
         311           LG    0.10    0.26    4.87    0.39      80
         312           UI       0      79     232     400     244      98      36      11       0       0
         313           UI       0       0       0       0       0       0       0       0       0       0
         314           UI       0       0       0       0       0       0       0       0       0       0
         315           UI       0       0       0       0       0       0       0       0       0       0
         316           UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

         317           KK  DDD13B  DIVERT
         318           KM   *DE* - Diversion of First Flush storage initially diverted out.
         319           DT  RDD13B    3.62     0.0
         320           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
         321           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *

         322           KK  SRD13B STORAGE
         323           KM   *DE* - Detention Basin designed with specific volume & discharge
         324           KM   for ALT 2 analysis
         325           KO
         326           RS       1    STOR
         327           SV            2.79    5.57    8.56   11.67
         328           SQ            2.00    6.00   14.00   25.00
         329           SE  100.00  101.00  102.00  103.00  104.00
                       *
                       *

         330           KK   DD04SRETRIEVE
         331           DR   DD04S
                       *
                       *

         332           KK  D04D13   ROUTE
         333           RS       1    FLOW
         334           RC   0.035   0.030   0.035    1445  0.0050    0.00
         335           RX  100.00  114.00  130.00  133.00  137.00  140.00  156.00  170.00
         336           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                       *
                       *
1                                               HEC-1 INPUT                                         PAGE 10

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


         337           KK  CPD13B COMBINE
         338           HC       3
                       *
                       *

         339           KK  RTD13B   ROUTE
         340           RS       2    FLOW
         341           RC   0.035   0.030   0.035    2069  0.0050    0.00
         342           RX  100.00  114.00  130.00  133.00  137.00  140.00  156.00  170.00
         343           RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
                       *
                       *
```

```
 344          KK    D13C   BASIN
 345          BA   0.114
 346          LG    0.09    0.30    4.87    0.42      71
 347          UI       0      35     115     192     246     152      80      34      15       7
 348          UI       0       0       0       0       0       0       0       0       0       0
 349          UI       0       0       0       0       0       0       0       0       0       0
 350          UI       0       0       0       0       0       0       0       0       0       0
 351          UI       0       0       0       0       0       0       0       0       0       0
              *
              *

 352          KK  DDD13C  DIVERT
 353          KM   *DE* - Diversion of First Flush storage initially diverted out.
 354          DT  RDD13C    2.89     0.0
 355          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 356          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

 357          KK  SRD13C STORAGE
 358          KM   *DE* - Detention Basin designed with specific volume & discharge
 359          KM   for ALT 2 analysis
 360          KO
 361          RS       1    STOR
 362          SV            2.00    4.00    6.16    8.44
 363          SQ            1.00    4.00    9.00   17.00
 364          SE  100.00  101.00  102.00  103.00  104.00
              *
              *

 365          KK  RTD13C   ROUTE
 366          RS       3    FLOW
 367          RC   0.035   0.030   0.035    2984  0.0050    0.00
 368          RX  100.00  114.00  130.00  133.00  137.00  140.00  156.00  170.00
 369          RY  1000.0  999.00  995.00  994.50  994.50  995.00  999.00 1000.00
              *
              *
```



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

 370          KK    D13D   BASIN
 371          BA   0.163
 372          LG    0.20    0.26    4.87    0.39      51
 373          UI       0     127     387     470     197      58      15       0       0       0
 374          UI       0       0       0       0       0       0       0       0       0       0
 375          UI       0       0       0       0       0       0       0       0       0       0
 376          UI       0       0       0       0       0       0       0       0       0       0
 377          UI       0       0       0       0       0       0       0       0       0       0
              *
              *

 378          KK  DDD13D  DIVERT
 379          KM   *DE* - Diversion of First Flush storage initially diverted out.
 380          DT  RDD13D    4.13     0.0
 381          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
 382          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
              *
              *

 383          KK  SRD13D STORAGE
 384          KM   *DE* - Detention Basin designed with specific volume & discharge
 385          KM   for ALT 2 analysis
 386          KO
 387          RS       1    STOR
 388          SV            2.25    4.50    6.92    9.47
 389          SQ            3.00    7.00   15.00   27.00
 390          SE  100.00  101.00  102.00  103.00  104.00
              *
              *

 391          KK  CPD13D COMBINE
 392          HC       3
              *
              *

 393          KK  RTD13D   ROUTE
 394          RS       1    FLOW
 395          RC   0.035   0.030   0.035    1850  0.0050    0.00
 396          RX  100.00  114.00  130.00  133.00  137.00  140.00  156.00  170.00
 397          RY  1001.0  999.00  995.00  994.50  994.50  995.00  999.00 1001.00
              *
              *

 398          KK  CP13G2 COMBINE
 399          KM   Combine upstream route RTD13D with flow
 400          KM   from West Greenway Basin
 401          HC       2
              *
              *
```



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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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402          KK   SRGWE STORAGE
403          KM   Storage upstream of box culvert outlet in East Greenway Basin
404          KO
405          RS       1    STOR
406          SV            0.13    0.43    0.58    0.78    1.22
407          SQ           51.00  146.00  268.00  388.00 1000.00
408          SE  1183.0 1184.00 1185.00 1186.00 1187.00 1188.00
             *
             *

409          KK   DD131  DIVERT
410          KM   Greenway at Litchfield intersection split flow
411          DT  DD131S    0.00     0.0
412          DI     0.0   519.2   917.3  1650.7  2842.4     0.0     0.0     0.0     0.0     0.0
413          DQ     0.0    18.8   121.1   423.4   996.3     0.0     0.0     0.0     0.0     0.0
             *
             *

414          KK   DD132  DIVERT
415          KM   Greenway at Litchfield intersection split flow
416          DT  DD132S    0.00     0.0
417          DI     0.0   500.4   796.2  1227.2  1846.1     0.0     0.0     0.0     0.0     0.0
418          DQ     0.0   112.4   318.0   584.2   899.4     0.0     0.0     0.0     0.0     0.0
             *
             *

419          KK  D13D14   ROUTE
420          KM   Cross-section: Cross-section determined from FCDMC 69
421          KM   Manning's N Value: earth with grass and forbs
422          RS       5    FLOW
423          RC   0.025   0.025   0.025    5304  0.0015    0.00
424          RX  100.00  120.00  122.40  140.40  158.40  176.40  176.80  196.80
425          RY  1175.5 1175.40 1175.00 1172.00 1171.90 1175.00 1175.40 1175.50
             *
             *

426          KK     D14   BASIN
427          KM   BASIN BOUNDARY FROM WEST POINT DEVELOPMENT AND GRANDE AVE CHANNEL
428          BA   0.942
429          LG    0.23    0.26    5.14    0.33      37
430          UI       0     115     326     583     757    1079    1353     984     745     547
431          UI     300     193     123      66      35      35      35       0       0       0
432          UI       0       0       0       0       0       0       0       0       0       0
433          UI       0       0       0       0       0       0       0       0       0       0
434          UI       0       0       0       0       0       0       0       0       0       0
             *
             *

435          KK  DD14RE  DIVERT
436          KM   West Point Towne Center Final Master Infrastructure Drainage Report
437          DT    RD14   63.40     0.0
438          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
439          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
             *
             *
```

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

440          KK   DD141RETRIEVE
441          DR  DD141S
             *
             *

442          KK  D0514A   ROUTE
443          KM   Cross-section: Cross-section determined from aerial
444          KM   Manning's N Value: street and ROW
445          KM   Route is from DD141 diversion to CPD14
446          RS       3    FLOW
447          RC   0.032   0.013   0.032    3147  0.0051    0.00
448          RX  100.00  120.00  140.00  140.10  200.00  200.10  220.00  240.00
449          RY  1000.0  999.50 1000.00  999.50  999.50 1000.00  999.50 1000.00
             *
             *

450          KK   CPD14 COMBINE
451          HC       3   4.758
             *
             *
             *  ********************************************************************
             *  Removed SRD 14 from schematic to show no storage routing per
             *  site visit by AMM  -  FCDMC/JWH 10-19-09
             *  ********************************************************************
             *  KK STORAGE
             *  KM      Storage in basin at Greenway and Dysart
             *  KM      Volume estimated from topo
             *  KO
             *  RS     1    STOR
             *  SV           0.30    4.10   17.00   40.40   95.20
             *  SQ          23.60   83.80  162.00  645.50 2369.50
             *  SE1164.0 1165.00 1166.00 1167.00 1168.00 1169.00
             *  ST
             *
```

```
        452            KK   DD142  DIVERT
        453            KM   Greenway at Dysart intersection split flow
        454            DT  DD142S    0.00     0.0
        455            DI     0.0   295.5   693.0  1325.3  2531.5     0.0     0.0     0.0     0.0     0.0
        456            DQ     0.0   269.3   457.1   770.3  1405.9     0.0     0.0     0.0     0.0     0.0
                       *
                       *

        457            KK  D14D15   ROUTE
        458            KM   Cross section: Cross-section determined from  aerial, 1/2 street section
        459            KM   Manning's N Value: street, clean earth
        460            RS       3    FLOW
        461            RC   0.022   0.013   0.013    3351  0.0029    0.00
        462            RX  100.00  100.10  110.00  110.10  120.00  125.00  133.90  134.00
        463            RY  1003.0  999.80  999.70  999.20  999.40  999.50  999.70 1000.50
                       *
                       *
1                                             HEC-1 INPUT                                              PAGE 14

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


        464            KK     D15   BASIN
        465            KM   BASIN BOUNDARY FROM SUCCESS SCHOOL
        466            BA   0.220
        467            LG    0.19    0.15    7.00    0.16      53
        468            UI       0     101     306     560     408     206      75      26      16       0
        469            UI       0       0       0       0       0       0       0       0       0       0
        470            UI       0       0       0       0       0       0       0       0       0       0
        471            UI       0       0       0       0       0       0       0       0       0       0
        472            UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

        473            KK   CPD15 COMBINE
        474            HC       3   4.978
                       *
                       *

        475            KK  D15D26   ROUTE
        476            KM   Cross-section: Concrete channel along Grand Ave, assumed slope
        477            KM   2:1 slide slopes, width and geometry based on aerial
        478            RS       3    FLOW
        479            RC   0.016   0.016   0.016    9949  0.0050    0.00
        480            RX  100.00  112.00  122.00  134.00  145.00  157.00  169.00  185.00
        481            RY  1040.4 1040.20 1040.00 1034.00 1034.00 1040.00 1040.20 1040.60
                       *
                       *

        482            KK  D15D28   ROUTE
        483            KM   Channel along Grand Avenue
        484            KM   Flow in basin D26 does not enter channel
        485            RS       2    FLOW
        486            RC   0.016   0.016   0.016    7000  0.0050    0.00
        487            RX  100.00  112.00  122.00  134.00  145.00  157.00  169.00  185.00
        488            RY  1040.4 1040.20 1040.00 1034.00 1034.00 1040.00 1040.20 1040.60
                       *
                       *

        489            KK     D28   BASIN
        490            KM   BASIN BOUNDARY FROM EL MIRAGE TR 1-3 AND GRAND AVE CHANNEL
        491            BA   0.255
        492            LG    0.22    0.25    4.51    0.44      36
        493            UI       0     113     346     635     479     251      90      33      19       0
        494            UI       0       0       0       0       0       0       0       0       0       0
        495            UI       0       0       0       0       0       0       0       0       0       0
        496            UI       0       0       0       0       0       0       0       0       0       0
        497            UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *
1                                             HEC-1 INPUT                                              PAGE 15

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


        498            KK   CPD28 COMBINE
        499            HC       2   5.233
                       *
                       *

        500            KK  D28AFR   ROUTE
        501            KM   Direct discharge into Agua Fria River, field verified by FCDMC
        502            RS       1    FLOW
        503            RC   0.016   0.016   0.016    2990  0.0050    0.00
        504            RX  100.00  112.00  122.00  134.00  145.00  157.00  169.00  185.00
        505            RY  1040.4 1040.20 1040.00 1034.00 1034.00 1040.00 1040.20 1040.60
                       *
                       *

        506            KK     D26   BASIN
        507            KM   BASIN BOUNDARY FROM RACHO EL MIRAGE, SCHOOL
        508            KM   MOBILE HOME PARK, SUNWEST CEMETARY AND GRAND AVE CHANNEL
        509            BA   0.642
        510            LG    0.24    0.25    5.85    0.24      34
        511            UI       0     165     560     873    1364     927     587     245     140      44
        512            UI      37       0       0       0       0       0       0       0       0       0
```

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        513            UI       0       0       0       0       0       0       0       0       0       0
        514            UI       0       0       0       0       0       0       0       0       0       0
        515            UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

        516            KK  DD26RE  DIVERT
        517            KM   Retention volume estimated based on aerial
        518            DT    RD26   52.40     0.0
        519            DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
        520            DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *

        521            KK   DD142RETRIEVE
        522            DR  DD142S
                       *
                       *

        523            KK  D14D26   ROUTE
        524            KM   Cross-section: Cross-section from Lower El Mirage Channelization
        525            KM   (Report FCDMC 18-198B) / Manning's N Value: clean earth; straight
        526            RS       2    FLOW
        527            RC   0.022   0.022   0.022    5050  0.0048    0.00
        528            RX  100.00  102.50  105.50  137.50  187.50  219.50  222.00  225.00
        529            RY  1000.0  999.50  999.00  991.00  991.10  999.00  999.80 1000.00
                       *
                       *
1                                             HEC-1 INPUT                                                 PAGE 16

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


        530            KK   CPD26 COMBINE
        531            HC       2     5.4
                       *
                       *

        532            KK  D26D27   ROUTE
        533            KM   Cross-section: Cross-section determined from FCDMC 18
        534            KM   Manning's N Value: Clean earth
        535            RS       1    FLOW
        536            RC   0.022   0.022   0.022    2050  0.0039    0.00
        537            RX  100.00  102.50  105.50  137.50  187.50  219.50  222.00  225.00
        538            RY  1000.0  999.50  999.00  991.00  991.00  999.00  999.50 1000.00
                       *
                       *

        539            KK     D27   BASIN
        540            KM   BASIN BOUNDARY FROM RANCHO EL MIRAGE
        541            KM   WEST EL MIRAGE AND BNSF RR ALIGNMENT
        542            BA   0.316
        543            LG    0.20    0.24    4.96    0.35      42
        544            UI       0     103     332     568     679     409     199      89      33      20
        545            UI       0       0       0       0       0       0       0       0       0       0
        546            UI       0       0       0       0       0       0       0       0       0       0
        547            UI       0       0       0       0       0       0       0       0       0       0
        548            UI       0       0       0       0       0       0       0       0       0       0
                       *
                       *

        549            KK  DD27RE  DIVERT
        550            KM   Retention volume estimated based on aerial
        551            DT    RD27    8.20     0.0
        552            DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
        553            DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                       *
                       *

        554            KK   CPD27 COMBINE
        555            HC       2   5.716
                       *
                       *

        556            KK   SRD27 STORAGE
        557            KM   Storage at culvert under TB Road
        558            KO
        559            RS       1    STOR
        560            SV                                                     22.80   51.41
        561            SQ           52.00  202.00  415.00  658.00  906.00 1127.00 2999.00
        562            SE  1140.0 1142.00 1144.00 1146.00 1148.00 1150.00 1152.00 1154.00
                       *
                       *
1                                             HEC-1 INPUT                                                 PAGE 17

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


        563            KK  D27D42   ROUTE
        564            KM   Cross-section: Cross-section determined from Waddell Road
        565            KM   Drainage Improvement CAR Final by HDR
        566            KM   dated April 10, 2009, RLE2
        567            RS       5    FLOW
        568            RC   0.030   0.030   0.030    5599  0.0020    0.00
        569            RX    0.00   24.40   34.40   44.40   54.40   64.40   74.40   98.80
        570            RY  1128.5 1122.40 1122.40 1122.40 1122.40 1122.40 1122.40 1128.50
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                 *
                 *

   571           KK     D20   BASIN
   572           KM   BASIN BOUNDARY FROM COUNTRYSIDE UNITS 1-4 AND COTTON GIN
   573           BA   0.498
   574           LG    0.26    0.26    4.72    0.40      30
   575           UI       0      68     230     371     502     789     646     473     338     179
   576           UI     111      68      25      21      21       0       0       0       0       0
   577           UI       0       0       0       0       0       0       0       0       0       0
   578           UI       0       0       0       0       0       0       0       0       0       0
   579           UI       0       0       0       0       0       0       0       0       0       0
                 *
                 *

   580           KK  DD20RE  DIVERT
   581           KM   Final Drainage Report Greenway Marketplace Wal-mart Neighborhood
   582           KM   Market #4218-00, Drainage Report for Countryside Elementary School, Ash
   583           KM   Ranch Water Supply Facility Expansion, Countryside - Preliminary Drainag
   584           KM   Report, Final Drainage Report for Cotton Gin
   585           DT    RD20   38.10     0.0
   586           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
   587           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                 *
                 *

   588           KK   DD111RETRIEVE
   589           DR  DD111S
                 *
                 *

   590           KK  D11D20   ROUTE
   591           KM   Cross-section: Cross-section determined from aerial
   592           KM   Manning's N Value: retention basins, earth w/ grass
   593           RS       5    FLOW
   594           RC   0.025   0.025   0.025    6256  0.0032    0.00
   595           RX  100.00  101.00  102.00  114.00  190.00  202.00  203.00  204.00
   596           RY  1000.2 1000.10 1000.00  997.00  996.90 1000.00 1000.10 1000.20
                 *
                 *
1                                             HEC-1 INPUT                                                 PAGE 18

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


   597           KK   CPD20 COMBINE
   598           HC       2    1.16
                 *
                 *

   599           KK  D20D21   ROUTE
   600           KM   Cross-section:  / Manning's N Value: street and earth with sparse
   601           KM   trees and shrubs
   602           RS       6    FLOW
   603           RC   0.032   0.032   0.013    5323  0.0023    0.00
   604           RX  100.00  100.50  112.00  150.00  162.00  198.00  198.00  220.00
   605           RY  1000.1 1000.00  997.00  997.00 1000.00  999.50  998.90  999.40
                 *
                 *

   606           KK     D21   BASIN
   607           KM   BASIN BOUNDARY FROM ASHTON RANCH MULTI UNITS
   608           BA   0.496
   609           LG    0.25    0.25    4.72    0.40      31
   610           UI       0      63     196     332     438     665     691     499     368     251
   611           UI     122      87      55      19      19      19       0       0       0       0
   612           UI       0       0       0       0       0       0       0       0       0       0
   613           UI       0       0       0       0       0       0       0       0       0       0
   614           UI       0       0       0       0       0       0       0       0       0       0
                 *
                 *

   615           KK  DD21RE  DIVERT
   616           KM   Final Drainage Report for Ashton Ranch Unit 3, Final Drainage Report for
   617           KM   Ashton Ranch Unit 1, Final Drainage Report for Ashton Ranch Unit 2, Fina
   618           KM   Drainage Report for Ashton Ranch Unit 4
   619           DT    RD21   39.90     0.0
   620           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
   621           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                 *
                 *

   622           KK   DD112RETRIEVE
   623           DR  DD112S
                 *
                 *

   624           KK  D11D21   ROUTE
   625           KM   Cross-section: determined from aerial, street section through subdivisio
   626           KM   Manning's N Value: street, earth with sparse trees and shrubs
   627           RS      10    FLOW
   628           RC   0.032   0.013   0.032    8031  0.0035    0.00
   629           RX  100.00  106.00  115.00  115.10  167.00  167.10  174.00  179.00
   630           RY  1000.0  999.80  999.50  999.00  998.90  999.50  999.80 1000.00
                 *
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1                                        HEC-1 INPUT                                        PAGE 19

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

           631      KK   DD121RETRIEVE
           632      DR  DD121S
                    *
                    *

           633      KK  D12D21   ROUTE
           634      KM   Cross-section: Cross-section determined from aerial
           635      KM   Manning's N Value: street and earth with sparse trees and shrubs
           636      RS       2    FLOW
           637      RC   0.013   0.013   0.032    2810  0.0078    0.00
           638      RX  100.00  105.00  110.00  115.00  140.00  140.10  176.00  177.00
           639      RY  1000.0  999.90  999.80  999.70  999.20  999.70  999.80 1000.00
                    *
                    *

           640      KK   CPD21 COMBINE
           641      HC       4   2.003
                    *
                    *

           642      KK   DD211  DIVERT
           643      KM   Waddell at Bullard split flow
           644      DT  DD211S    0.00     0.0
           645      DI     0.0   184.9   770.2  1884.9  3510.6     0.0     0.0     0.0     0.0     0.0
           646      DQ     0.0   139.4   462.9  1049.1  1871.4     0.0     0.0     0.0     0.0     0.0
                    *
                    *

           647      KK   DD212  DIVERT
           648      KM   Waddell at Bullard split flow
           649      DT  DD212S    0.00     0.0
           650      DI     0.0    45.5   307.3   835.8  1639.2     0.0     0.0     0.0     0.0     0.0
           651      DQ     0.0    36.2   111.1   209.5   326.8     0.0     0.0     0.0     0.0     0.0
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                    *

           652      KK  D21D22   ROUTE
           653      KM   Cross-section: Cross-section determined from aerial
           654      KM   Manning's N Value: earth with grass and forbs (main channel)
           655      KM   earth with sparse trees and shrubs (overbanks)
           656      RS       4    FLOW
           657      RC   0.032   0.025   0.032    2720  0.0029    0.00
           658      RX  100.00  103.00  105.00  116.00  151.00  160.00  165.00  170.00
           659      RY  1000.2 1000.10 1000.00  997.00  997.10 1000.00 1000.10 1000.20
                    *
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           660      KK     D22   BASIN
           661      KM   BASIN BOUNDARY FROM ROYAL RANCH UNIT I AND II
           662      BA   0.454
           663      LG    0.24    0.25    4.79    0.38      32
           664      UI       0      64     230     360     501     760     570     413     282     134
           665      UI      88      50      20      20      20       0       0       0       0       0
           666      UI       0       0       0       0       0       0       0       0       0       0
1                                        HEC-1 INPUT                                        PAGE 20

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

           667      UI       0       0       0       0       0       0       0       0       0       0
           668      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           669      KK  DD22RE  DIVERT
           670      KM   Drainage Report for Royal Ranch Unit 2 (Basins P1&N in D23), Final Drain
           671      KM   Report for Royal Ranch Unit 2, Parcel 5, Final Drainage Report for Royal
           672      KM   Unit 2 Parcel 8, portion estimated by aerial for Del Webb
           673      DT    RD22   37.50     0.0
           674      DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           675      DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
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           676      KK   DD122RETRIEVE
           677      DR  DD122S
                    *
                    *

           678      KK  D12D22   ROUTE
           679      KM   Cross-section: Cross section determined from aerial
           680      KM   Manning's N Value: street and earth with sparse trees and shrubs
           681      RS       7    FLOW
           682      RC   0.032   0.013   0.013    7744  0.0040    0.00
           683      RX  100.00  105.00  145.00  145.10  160.00  174.00  178.00  180.00
           684      RY  1000.0  999.90  999.50  999.00  999.20  999.50  999.60  999.70
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           685      KK   CPD22 COMBINE
           686      HC       3   2.457
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   687            KK  D22D23   ROUTE
   688            KM   Cross-section: Cross-section determined from aerial
   689            KM   Manning's N Value: earth with sparse trees and shrubs/ riprap
   690            RS       2    FLOW
   691            RC   0.032   0.032   0.032    2705  0.0037    0.00
   692            RX  100.00  104.00  106.00  110.00  118.00  122.00  126.00  138.00
   693            RY  1161.0 1160.00 1159.00 1158.00 1158.10 1159.00 1160.00 1161.00
                  *
                  *

   694            KK     D23   BASIN
   695            KM   BASIN BOUNDARY FROM SIERRA VERDE
   696            BA   0.541
   697            LG    0.27    0.27    5.05    0.33      26
   698            UI       0      59     139     271     348     447     672     631     480     373
   699            UI     285     172     101      77      55      18      18      18      18       0
   700            UI       0       0       0       0       0       0       0       0       0       0
   701            UI       0       0       0       0       0       0       0       0       0       0
   702            UI       0       0       0       0       0       0       0       0       0       0
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1                                              HEC-1 INPUT                                                 PAGE 21

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


   703            KK  DD23RE  DIVERT
   704            KM   Final Drainage Report for Sierra Verde Parcel 5, Infrastructure Drainage
   705            KM   Sierra Verde (temporary basins removed), Final Drainage Report for Sierr
   706            KM   Final Drainage Report for Harmony Apartments, Drainage Report for Royal
   707            KM   Final Drainage Report for Sierra Verde Parcel 9, Final Drainage Report f
   708            KM   Parcel 3, Final Drainage Report for Sierra Verde Parcel 2, Final Drainag
   709            KM   Sierra Verde Parcel 1, Drainage Report for Fry's at Waddell and Litchfie
   710            DT    RD23   36.30     0.0
   711            DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
   712            DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
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                  *

   713            KK   DD131RETRIEVE
   714            DR  DD131S
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                  *

   715            KK  D13D23   ROUTE
   716            KM   Cross-section: Cross-section determined from aerial 1/2 street section
   717            KM   Manning's N Value: street, earth with sparse trees and shrubs
   718            RS       3    FLOW
   719            RC   0.032   0.013   0.032    5460  0.0044    0.00
   720            RX  100.00  100.00  109.00  109.00  148.00  148.00  197.00  198.00
   721            RY  1180.0 1176.30 1176.30 1175.80 1175.00 1175.50 1177.00 1177.10
                  *
                  *

   722            KK   CPD23 COMBINE
   723            HC       3   5.642
                  *
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   724            KK   DD231  DIVERT
   725            KM   Waddell at Litchfield split flow
   726            DT  DD231S    0.00     0.0
   727            DI     0.0   518.8   867.4  1680.6  2985.0     0.0     0.0     0.0     0.0     0.0
   728            DQ     0.0    51.3   223.3   727.6  1503.5     0.0     0.0     0.0     0.0     0.0
                  *
                  *

   729            KK   DD232  DIVERT
   730            KM   Waddell at Litchfield split flow
   731            DT  DD232S    0.00     0.0
   732            DI     0.0   467.5   644.1   953.0  1481.6     0.0     0.0     0.0     0.0     0.0
   733            DQ     0.0    55.8   138.4   242.9   365.2     0.0     0.0     0.0     0.0     0.0
                  *
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1                                              HEC-1 INPUT                                                 PAGE 22

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


   734            KK  D23D24   ROUTE
   735            KM   Cross-section: Cross-section determined from Waddell
   736            KM   Road Drainage Improvement CAR Final by HDR
   737            KM   dated April 10, 2009, R137
   738            RS       3    FLOW
   739            RC   0.035   0.035   0.035    2646  0.0044    0.00
   740            RX  894.00  906.00  912.00  918.00  926.00  930.00  934.00  942.00
   741            RY  1157.0 1155.00 1154.00 1153.00 1153.00 1154.00 1155.00 1157.00
                  *
                  *

   742            KK     D24   BASIN
   743            KM   BASIN BOUNDARY FROM LITCHFIELD MANOR
   744            BA   0.492
   745            LG    0.27    0.25    5.14    0.32      28
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         746          UI       0      56     144     269     347     461     679     542     419     317
         747          UI     226     116      88      56      26      17      17      17       0       0
         748          UI       0       0       0       0       0       0       0       0       0       0
         749          UI       0       0       0       0       0       0       0       0       0       0
         750          UI       0       0       0       0       0       0       0       0       0       0
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                      *

         751          KK  DD24RE  DIVERT
         752          KM   Final Drainage Report for Litchfield Manor (excess retention per report)
         753          DT    RD24   40.90     0.0
         754          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
         755          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                      *
                      *

         756          KK   DD132RETRIEVE
         757          DR  DD132S
                      *
                      *

         758          KK  D13D24   ROUTE
         759          KM   Cross-section: Cross-section determined from aerial 1/2 street section
         760          KM   Manning's N Value: street, earth with sparse trees and shrubs
         761          RS       3    FLOW
         762          RC   0.032   0.013   0.013    5460  0.0044    0.00
         763          RX  100.00  100.10  145.00  145.10  175.00  175.10  184.90  185.00
         764          RY  1178.0 1176.50 1175.50 1175.00 1175.80 1176.30 1176.30 1180.00
                      *
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         765          KK   CPD24 COMBINE
         766          HC       3   6.134
                      *
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        LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


         767          KK  D24D25   ROUTE
         768          KM   Cross-section: Cross-section determined from Waddell
         769          KM   Road Drainage Improvement CAR Final by HDR
         770          KM   dated April 10, 2009, R138
         771          RS       2    FLOW
         772          RC   0.030   0.030   0.030    2701  0.0020    0.00
         773          RX  1000.0 1018.00 1019.00 1020.00 1026.00 1027.00 1028.00 1046.00
         774          RY  1100.0 1094.00 1094.00 1094.00 1094.00 1094.00 1094.00 1100.00
                      *
                      *

         775          KK     D25   BASIN
         776          KM   BASIN BOUNDARY FROM ROSEVIEW MULTI PHASE
         777          BA   0.497
         778          LG    0.25    0.25    4.87    0.36      30
         779          UI       0      64     198     335     442     675     689     499     367     248
         780          UI     120      86      53      20      20      20       0       0       0       0
         781          UI       0       0       0       0       0       0       0       0       0       0
         782          UI       0       0       0       0       0       0       0       0       0       0
         783          UI       0       0       0       0       0       0       0       0       0       0
                      *
                      *

         784          KK  DD25RE  DIVERT
         785          KM   Drainage Report for Roseview - Parcels 1-6, Master Drainage
         786          KM   Report for Roseview, Retention for Parcels 7 and 8 were estimated
         787          KM   based on aerial, Parcel 5a has no retention
         788          DT    RD25   37.10     0.0
         789          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
         790          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
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         791          KK   CPD25 COMBINE
         792          HC       2   6.631
                      *
                      *

         793          KK  D25D39   ROUTE
         794          KM   Cross-section: Cross-section determined from Waddell Road
         795          KM   Drainage Improvement CAR Final by HDR dated April 10, 2009, RLLE
         796          RS       1    FLOW
         797          RC   0.030   0.030   0.030    2020  0.0040    0.00
         798          RX    0.00   20.00   25.00   30.00   35.00   41.50   51.10   82.30
         799          RY   10.00    0.00    0.00    0.00    0.00    0.00    4.80   10.00
                      *
                      *

         800          KK     D39   BASIN
         801          KM   BASIN BOUNDARY FROM  AG LAND, 1990 TOPO AND BNSF RR ALIGNMENT
         802          BA   0.182
         803          LG    0.50    0.25    5.58    0.33       0
         804          UI       0      17      25      56      98     120     137     146     139     125
         805          UI     113      98      69      54      50      31      26      21      16      14
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          LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

           806      UI      10      10       7       2       2       2       2       2       2       2
           807      UI       2       2       2       2       2       0       0       0       0       0
           808      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           809      KK   CPD39 COMBINE
           810      HC       2   6.813
                    *
                    *

           811      KK  D39D42   ROUTE
           812      KM   Cross-section: Cross-section determined from Waddell
           813      KM   Road Drainage Improvement CAR Final
           814      KM   by HDR dated April 10, 2009, RLLE1
           815      RS       3    FLOW
           816      RC   0.030   0.030   0.030    5691  0.0039    0.00
           817      RX    0.00   30.00   38.00   54.00   76.50  104.00  139.00  154.00
           818      RY   10.00    4.00    4.00    0.00    0.00    0.00    7.00   10.00
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           819      KK     D42   BASIN
           820      KM   BASIN BOUNDARY FROM PARQUE VERDE MULTI PHASE
           821      KM   DYSART SCHOOL DISTRICT, AND BUENA VISTA
           822      BA   0.994
           823      LG    0.24    0.24    5.24    0.29      32
           824      UI       0     150     592     894    1340    1711    1182     824     458     248
           825      UI     147      46      46      46       0       0       0       0       0       0
           826      UI       0       0       0       0       0       0       0       0       0       0
           827      UI       0       0       0       0       0       0       0       0       0       0
           828      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           829      KK  DD42RE  DIVERT
           830      KM   Retention volume estimated based on aerial, Cactus and Dysart
           831      KM   Subdivision and Parque Verde - No Reports available
           832      DT    RD42   71.80     0.0
           833      DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           834      DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                    *
                    *

           835      KK   CPD42 COMBINE
           836      HC       3    9.87
                    *
                    *

           837      KK   SRD42 STORAGE
           838      KM   Storage behind Cactus Road
           839      KO
           840      RS       1    STOR
           841      SV            0.64    4.60   17.30   27.60   56.30
           842      SQ                  139.00  426.00  827.00 1295.00
1                                        HEC-1 INPUT                                                    PAGE 25

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

           843      SE  1105.3 1108.00 1110.00 1112.00 1114.00 1116.00
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           844      KK  D42D53   ROUTE
           845      KM   Cross-section: Cross-section determined from
           846      KM   Waddell Road Drainage Improvement CAR Final
           847      KM   by HDR dated April 10, 2009, RLE3
           848      RS       1    FLOW
           849      RC   0.030   0.030   0.030    1558  0.0020    0.00
           850      RX    0.00   10.00   22.00   97.00  171.00  172.00  184.00  194.00
           851      RY    3.50    3.00    0.00    0.00    0.00    0.00    3.00    3.50
                    *
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           852      KK     D53   BASIN
           853      KM   BASIN BOUNDARY FROM EL MIRAGE MARKET PLACE, RANCHO MIRAGE UNIT 3
           854      BA   0.118
           855      LG    0.31    0.32    4.65    0.36      11
           856      UI       0      56     169     306     216     105      39      12       9       0
           857      UI       0       0       0       0       0       0       0       0       0       0
           858      UI       0       0       0       0       0       0       0       0       0       0
           859      UI       0       0       0       0       0       0       0       0       0       0
           860      UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *

           861      KK  DD53RE  DIVERT
           862      KM   Retention volume estimated based on aerial
           863      DT    RD53   12.10     0.0
           864      DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
           865      DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
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  866           KK   CPD53 COMBINE
  867           HC       2   9.988
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  868           KK   SRD53 STORAGE
  869           KM   Waddell CAR West Cactus Basin
  870           KO
  871           RS       1    STOR
  872           SV           5.72   11.59   18.17   32.01   39.46   67.53   67.53   67.53   67.53
  873           SQ                                                       546.00  731.00  890.00
  874           SE  1098.5 1099.50 1100.50 1101.50 1103.50 1104.50 1108.50 1111.00 1112.00 1113.00
                *
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1                                            HEC-1 INPUT                                           PAGE 26

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


  875           KK  D53D54   ROUTE
  876           KM   Cross-section: Cross-section determined from
  877           KM   Waddell Road Drainage Improvement CAR Final
  878           KM   by HDR dated April 10, 2009, RLE4
  879           RS       4    FLOW
  880           RC   0.030   0.030   0.030    3999  0.0038    0.00
  881           RX    0.00   36.00   39.00   42.00   45.00   48.00   51.00   87.00
  882           RY  1102.8 1096.80 1096.80 1096.80 1096.80 1096.80 1096.80 1102.80
                *
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  883           KK     D43   BASIN
  884           KM   BASIN BOUNDARY FROM MONTA BLANCA ESTATES, SUNNYVALE AND SUNDIAL
  885           BA   0.500
  886           LG    0.25    0.25    4.79    0.38      33
  887           UI       0      75     298     450     674     861     594     414     230     125
  888           UI      74      23      23      23       0       0       0       0       0       0
  889           UI       0       0       0       0       0       0       0       0       0       0
  890           UI       0       0       0       0       0       0       0       0       0       0
  891           UI       0       0       0       0       0       0       0       0       0       0
                *
                *

  892           KK  DD43RE  DIVERT
  893           KM   Retention volume estimated based on aerial
  894           DT    RD43   35.50     0.0
  895           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  896           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
                *

  897           KK  D43D54   ROUTE
  898           KM   Cross-section: Golf course, assumed 0.5%
  899           KM   side slopes, V-ditch / Manning's N Value: grass - golf course
  900           RS      14    FLOW
  901           RC   0.025   0.025   0.025    3872  0.0023    0.00
  902           RX  100.00  200.00  400.00  500.00  550.00  600.00  800.00  900.00
  903           RY  1000.0  999.50  998.50  998.00  998.30  998.50  999.50 1000.00
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  904           KK     D54   BASIN
  905           KM   BASIN BOUNDARY FROM FAIRWAYS GOLF COURSE DIVISION
  906           KM   AND PUEBLO EL MIRAGE RV RESORT
  907           BA   0.271
  908           LG    0.20    0.27    4.45    0.49      14
  909           UI       0      65     225     347     561     401     260     119      64      26
  910           UI      15      15       0       0       0       0       0       0       0       0
  911           UI       0       0       0       0       0       0       0       0       0       0
  912           UI       0       0       0       0       0       0       0       0       0       0
  913           UI       0       0       0       0       0       0       0       0       0       0
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 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  914           KK  DD54RE  DIVERT
  915           KM   NO REPORTS - ESTIMATED FIRST FLUSH RETENTION FROM AERIAL
  916           KM   DUE TO LOCATION OF DEVELOPMENT TO THE RIVER
  917           DT    RD54    3.00     0.0
  918           DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
  919           DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                *
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  920           KK   CPD54 COMBINE
  921           HC       3  10.759
                *
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  922           KK     D44   BASIN
  923           KM   BASIN BOUNDARY FROM SUNDIAL MULTI PHASE, AGULAR HOMES, TERROVES,
  924           KM   EL MIRAGE HOUSING, ARIZONA BRISAS, MOUNTAIN TRAILE DEVELPMENTS AND
  925           KM   AGUA FRIA RIVER
  926           BA   0.535
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            927          LG    0.26    0.26    3.86    0.58      23
            928          UI       0      70     229     377     503     789     717     524     381     235
            929          UI     121      83      43      22      22      22       0       0       0       0
            930          UI       0       0       0       0       0       0       0       0       0       0
            931          UI       0       0       0       0       0       0       0       0       0       0
            932          UI       0       0       0       0       0       0       0       0       0       0
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            933          KK  DD44RE  DIVERT
            934          KM   Retention volume estimated based on aerial
            935          DT    RD44   19.40     0.0
            936          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
            937          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
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            938          KK     D55   BASIN
            939          KM   BASIN BOUNDARY FROM AERIAL AND 1990 TOPO
            940          BA   0.187
            941          LG    0.28    0.28    3.47    0.75      24
            942          UI       0      46     157     242     389     275     178      80      43      17
            943          UI      10      10       0       0       0       0       0       0       0       0
            944          UI       0       0       0       0       0       0       0       0       0       0
            945          UI       0       0       0       0       0       0       0       0       0       0
            946          UI       0       0       0       0       0       0       0       0       0       0
                         *
                         *

            947          KK  DD55RE  DIVERT
            948          KM   Retention volume estimated based on aerial
            949          DT    RD55    9.80     0.0
            950          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
            951          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                         *
                         *
1                                                HEC-1 INPUT                                                PAGE 28

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

            952          KK     D56   BASIN
            953          KM   BASIN BOUNDARY FROM SUNDIAL UNIT 1 & 2 AND AGUA FRIA RIVER
            954          BA   0.225
            955          LG    0.20    0.26    4.39    0.50      24
            956          UI       0      36     143     215     332     384     260     177      87      50
            957          UI      27      11      11       0       0       0       0       0       0       0
            958          UI       0       0       0       0       0       0       0       0       0       0
            959          UI       0       0       0       0       0       0       0       0       0       0
            960          UI       0       0       0       0       0       0       0       0       0       0
                         *
                         *

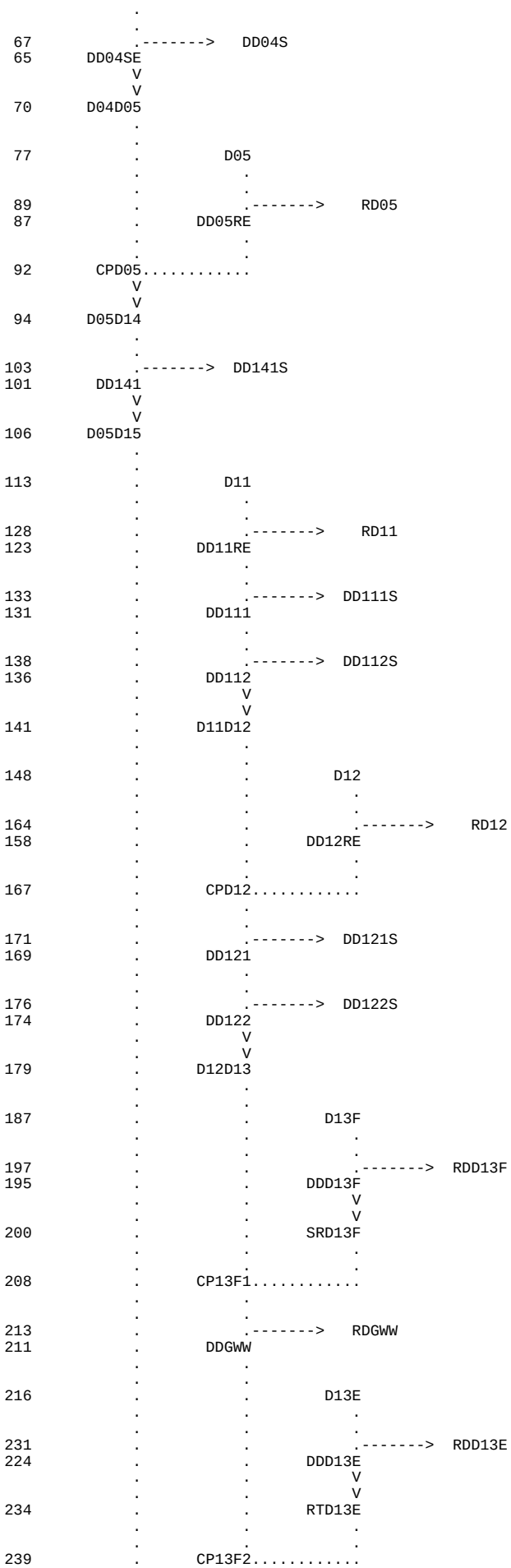
            961          KK  DD56RE  DIVERT
            962          KM   NO REPORT - ESTIMATED FIRST FLUSH RETENTION FROM AERIAL
            963          KM   DUE TO LOCATION OF DEVELOPMENT TO THE RIVER
            964          DT    RD56    3.10     0.0
            965          DI     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
            966          DQ     0.0   500.0  5000.0 50000.0     0.0     0.0     0.0     0.0     0.0     0.0
                         *
                         *

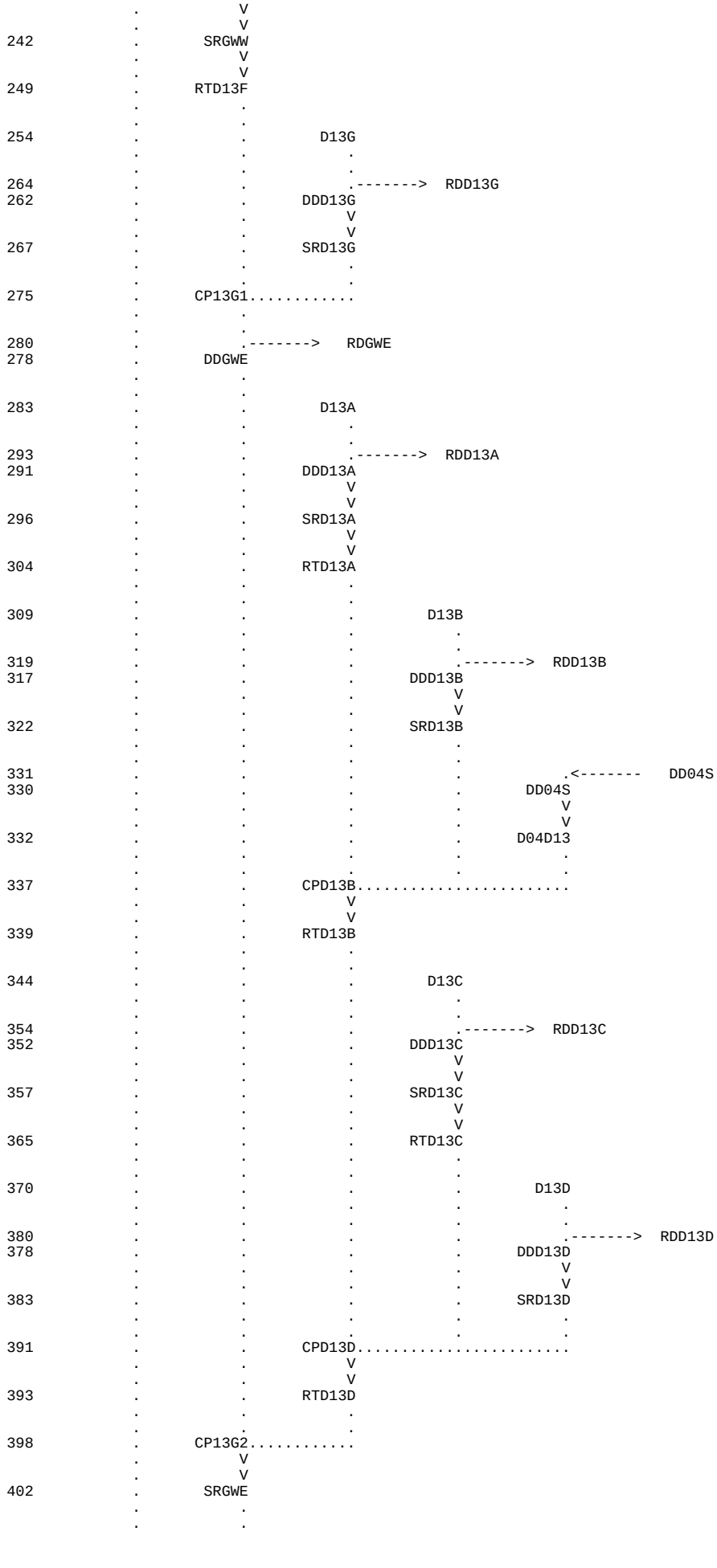
            967          KK   DUMMY COMBINE
            968          HC       4
                         *
                         *

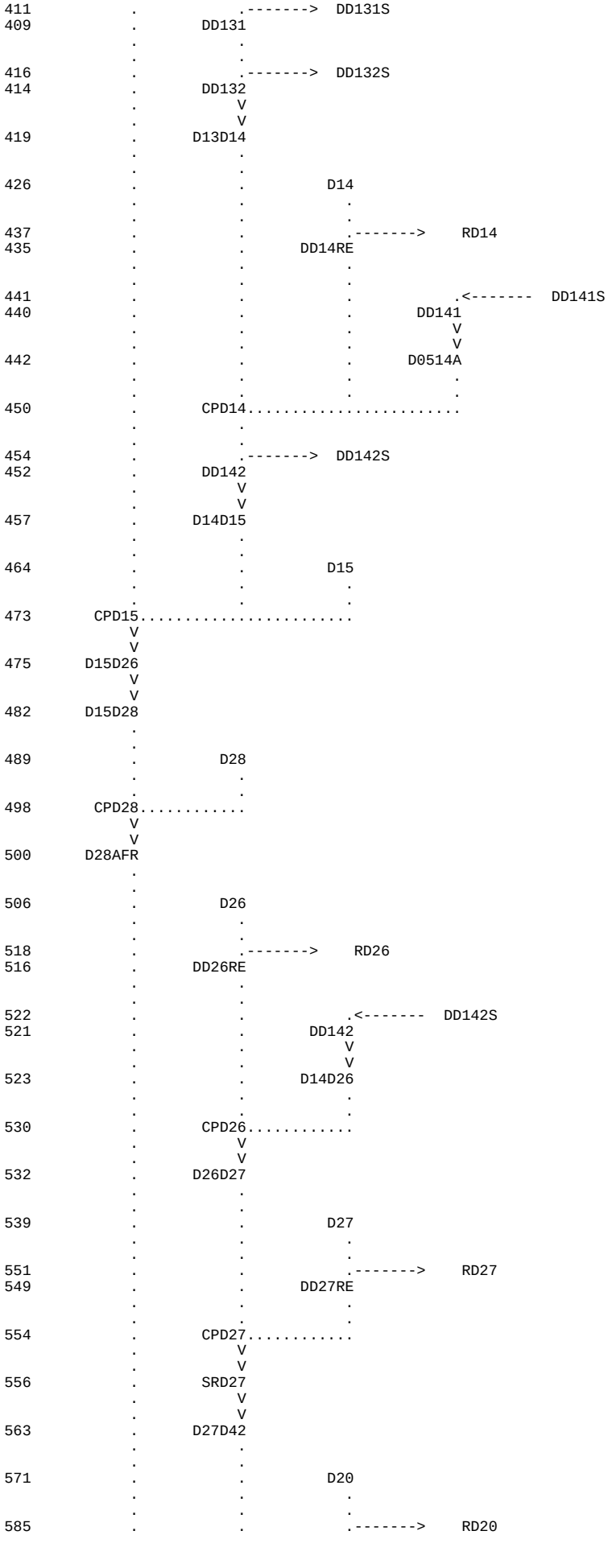
            969          KK   DUMMY COMBINE
            970          HC       2
                         *
            971          ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE       (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

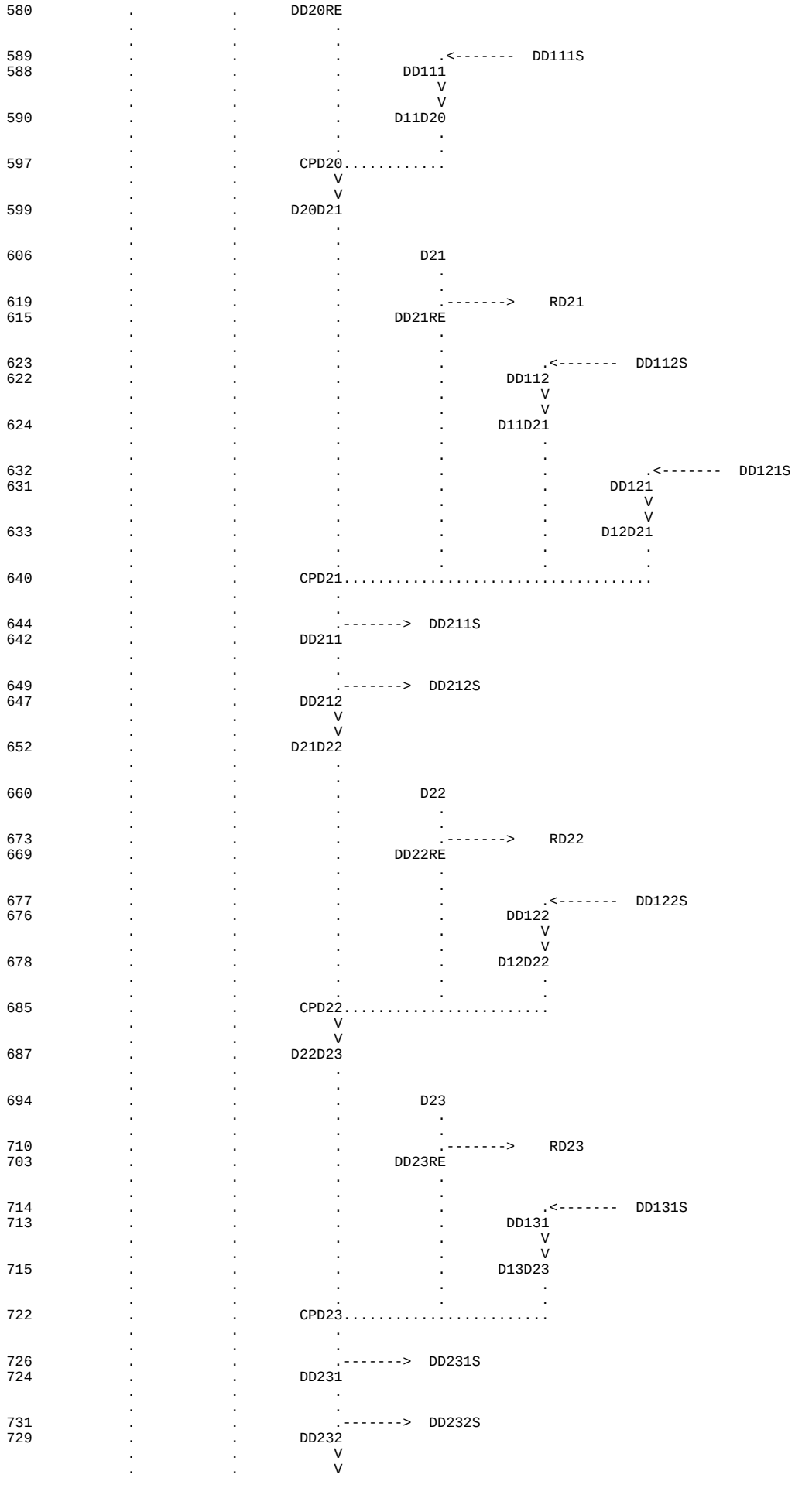
   NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    26          D03
                  .
                  .
    37            .-------->    RD03
    35       DD03RE
                  V
                  V
    40       D03D04
                  .
                  .
    47            .          D04
                  .            .
                  .            .
    60            .            .-------->    RD04
    58            .       DD04RE
                  .            .
                  .            .
    63        CPD04............
```


67 DD04S
65 DD04SE
70 D04D05
77 D05
89 RD05
87 DD05RE
92 CPD05
94 D05D14
103 DD141S
101 DD141
106 D05D15
113 D11
128 RD11
123 DD11RE
133 DD111S
131 DD111
138 DD112S
136 DD112
141 D11D12
148 D12
164 RD12
158 DD12RE
167 CPD12
171 DD121S
169 DD121
176 DD122S
174 DD122
179 D12D13
187 D13F
197 RDD13F
195 DDD13F
200 SRD13F
208 CP13F1
213 RDGWW
211 DDGWW
216 D13E
231 RDD13E
224 DDD13E
234 RTD13E
239 CP13F2


242 SRGWW
249 RTD13F
254 D13G
264 RDD13G
262 DDD13G
267 SRD13G
275 CP13G1
280 RDGWE
278 DDGWE
283 D13A
293 RDD13A
291 DDD13A
296 SRD13A
304 RTD13A
309 D13B
319 RDD13B
317 DDD13B
322 SRD13B
331 DD04S
330 DD04S
332 D04D13
337 CPD13B
339 RTD13B
344 D13C
354 RDD13C
352 DDD13C
357 SRD13C
365 RTD13C
370 D13D
380 RDD13D
378 DDD13D
383 SRD13D
391 CPD13D
393 RTD13D
398 CP13G2
402 SRGWE


411
409 DD131
416
414 DD132
419 D13D14
426 D14
437
435 DD14RE
441
440 DD141
442 D0514A
450 CPD14
454
452 DD142
457 D14D15
464 D15
473 CPD15
475 D15D26
482 D15D28
489 D28
498 CPD28
500 D28AFR
506 D26
518
516 DD26RE
522
521 DD142
523 D14D26
530 CPD26
532 D26D27
539 D27
551
549 DD27RE
554 CPD27
556 SRD27
563 D27D42
571 D20
585
RD131S
RD132S
RD14
DD141S
RD142S
RD26
RD27
RD20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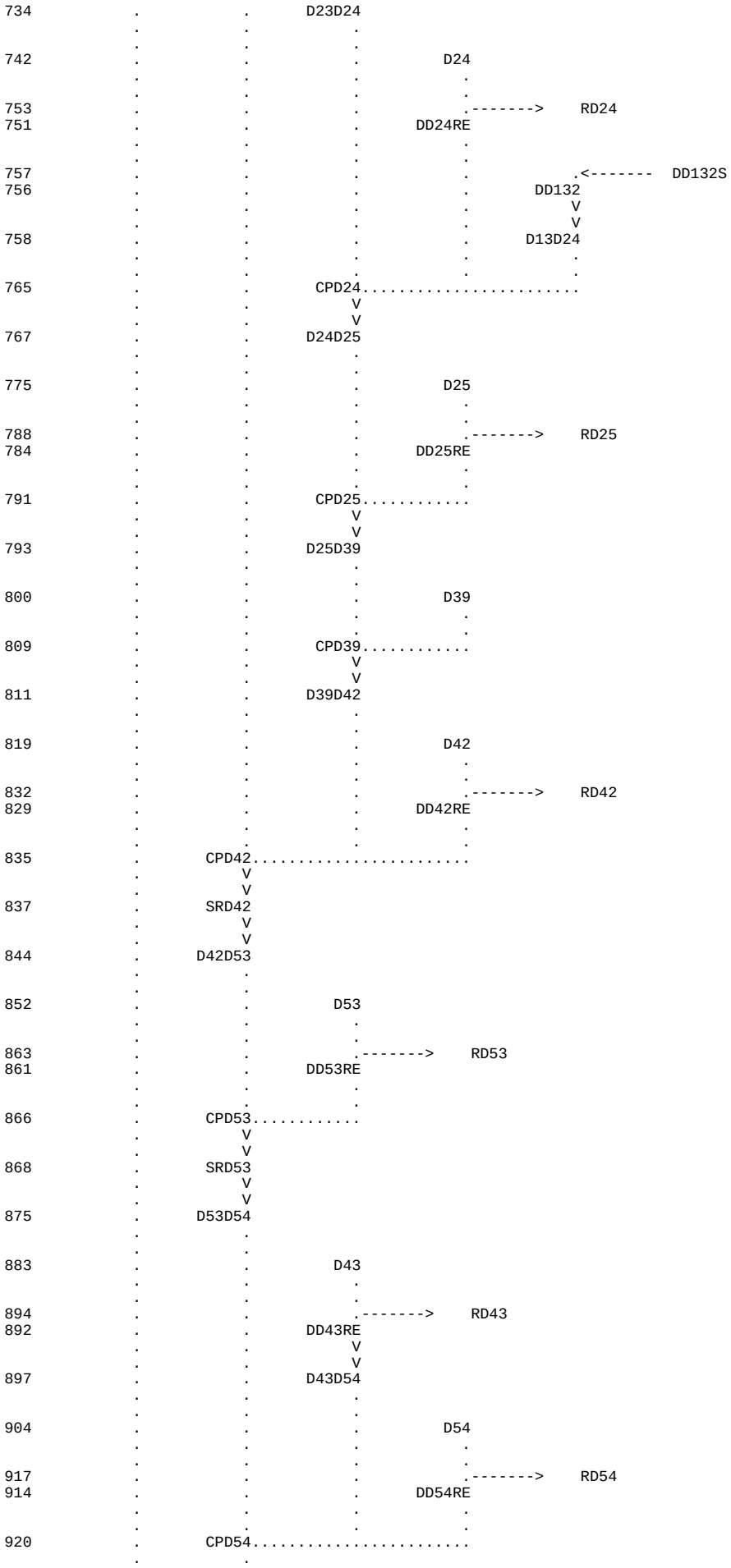
DD20RE
589
DD111S
588
DD111
590
D11D20
597
CPD20
599
D20D21
606
D21
619
RD21
615
DD21RE
623
DD112S
622
DD112
624
D11D21
632
DD121S
631
DD121
633
D12D21
640
CPD21
644
DD211S
642
DD211
649
DD212S
647
DD212
652
D21D22
660
D22
673
RD22
669
DD22RE
677
DD122S
676
DD122
678
D12D22
685
CPD22
687
D22D23
694
D23
710
RD23
703
DD23RE
714
DD131S
713
DD131
715
D13D23
722
CPD23
726
DD231S
724
DD231
731
DD232S
729
DD232


734 D23D24
742 D24
753 RD24
751 DD24RE
757 DD132S
756 DD132
758 D13D24
765 CPD24
767 D24D25
775 D25
788 RD25
784 DD25RE
791 CPD25
793 D25D39
800 D39
809 CPD39
811 D39D42
819 D42
832 RD42
829 DD42RE
835 CPD42
837 SRD42
844 D42D53
852 D53
863 RD53
861 DD53RE
866 CPD53
868 SRD53
875 D53D54
883 D43
894 RD43
892 DD43RE
897 D43D54
904 D54
917 RD54
914 DD54RE
920 CPD54

```
              .           .
  922         .           .         D44
              .           .           .
              .           .           .
  935         .           .           .------->    RD44
  933         .           .      DD44RE
              .           .           .
              .           .           .
  938         .           .           .         D55
              .           .           .           .
              .           .           .           .
  949         .           .           .           .------->    RD55
  947         .           .           .      DD55RE
              .           .           .           .
              .           .           .           .
  952         .           .           .           .         D56
              .           .           .           .           .
              .           .           .           .           .
  964         .           .           .           .           .------->    RD56
  961         .           .           .           .      DD56RE
              .           .           .           .           .
              .           .           .           .           .
  967         .       DUMMY...................................
              .           .
              .           .
  969       DUMMY............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****************************************                                                ***************************************
 *                                       *                                                *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998                *                                                *    HYDROLOGIC ENGINEERING CENTER    *
 *          VERSION 4.1                  *                                                *         609 SECOND STREET           *
 *                                       *                                                *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   06SEP16  TIME  17:26:55   *                                                *           (916) 756-1104            *
 *                                       *                                                *                                     *
*****************************************                                                ***************************************




                               City of Surprise, AZ
                               DEV COND A2 DETEN - SCC Drainage Study - DEV. COND. ALT2 DETENTION
                               100 YEAR
                               24 Hour Storm
                               Unit Hydrograph: S-Graph
                               Storm: Multiple
                               09/06/2016

   9 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1JAN99  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        2000  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      7JAN99  ENDING DATE
                      NDTIME        2235  ENDING TIME
                       ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL    0.08 HOURS
                      TOTAL TIME BASE  166.58 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

  11 JD          INDEX STORM NO. 1
                        STRM        3.48  PRECIPITATION DEPTH
                        TRDA        0.00  TRANSPOSITION DRAINAGE AREA

  12 PI            PRECIPITATION PATTERN
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                      0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
```

```
                0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 22 JD         INDEX STORM NO. 2
                      STRM        3.39  PRECIPITATION DEPTH
                      TRDA        5.00  TRANSPOSITION DRAINAGE AREA

  0 PI           PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 23 JD         INDEX STORM NO. 3
                      STRM        3.31  PRECIPITATION DEPTH
                      TRDA       10.00  TRANSPOSITION DRAINAGE AREA

  0 PI           PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 24 JD         INDEX STORM NO. 4
                      STRM        3.22  PRECIPITATION DEPTH
                      TRDA       20.00  TRANSPOSITION DRAINAGE AREA

  0 PI           PRECIPITATION PATTERN
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
```

```
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                     0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

  25 JD         INDEX STORM NO. 5
                       STRM       3.13  PRECIPITATION DEPTH
                       TRDA      30.00  TRANSPOSITION DRAINAGE AREA

   0 PI           PRECIPITATION PATTERN
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.00      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.01      0.03      0.03
                     0.03      0.09      0.09      0.09      0.01      0.01      0.01      0.01      0.01      0.01
                     0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00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            *            *
 200 KK     *    SRD13F  *      STORAGE
            *            *
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 203 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

WARNING --- ROUTED OUTFLOW (     23.) IS GREATER THAN MAXIMUM OUTFLOW (     23.) IN STORAGE-OUTFLOW TABLE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 242 KK     *     SRGWW  *      STORAGE
            *            *
            **************

 244 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE


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           *            *
 267 KK    *   SRD13G   *     STORAGE
           *            *
           **************

 270 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

WARNING --- ROUTED OUTFLOW (     30.) IS GREATER THAN MAXIMUM OUTFLOW (     30.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     30.) IS GREATER THAN MAXIMUM OUTFLOW (     30.) IN STORAGE-OUTFLOW TABLE

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           *            *
 296 KK    *   SRD13A   *     STORAGE
           *            *
           **************

 299 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE


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           *            *
 322 KK    *   SRD13B   *     STORAGE
           *            *
           **************

 325 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

WARNING --- ROUTED OUTFLOW (     25.) IS GREATER THAN MAXIMUM OUTFLOW (     25.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     25.) IS GREATER THAN MAXIMUM OUTFLOW (     25.) IN STORAGE-OUTFLOW TABLE

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WARNING --- ROUTED OUTFLOW (     25.) IS GREATER THAN MAXIMUM OUTFLOW (     25.) IN STORAGE-OUTFLOW TABLE


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           *            *
 357 KK    *   SRD13C   *     STORAGE
           *            *
           **************

 360 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

WARNING --- ROUTED OUTFLOW (     17.) IS GREATER THAN MAXIMUM OUTFLOW (     17.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     17.) IS GREATER THAN MAXIMUM OUTFLOW (     17.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     18.) IS GREATER THAN MAXIMUM OUTFLOW (     17.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     18.) IS GREATER THAN MAXIMUM OUTFLOW (     17.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     18.) IS GREATER THAN MAXIMUM OUTFLOW (     17.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     18.) IS GREATER THAN MAXIMUM OUTFLOW (     17.) IN STORAGE-OUTFLOW TABLE
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WARNING --- ROUTED OUTFLOW (     17.) IS GREATER THAN MAXIMUM OUTFLOW (     17.) IN STORAGE-OUTFLOW TABLE

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WARNING --- ROUTED OUTFLOW (     17.) IS GREATER THAN MAXIMUM OUTFLOW (     17.) IN STORAGE-OUTFLOW TABLE


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           *            *
 383 KK    *    SRD13D  *      STORAGE
           *            *
           **************

 386 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

WARNING --- ROUTED OUTFLOW (     27.) IS GREATER THAN MAXIMUM OUTFLOW (     27.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     27.) IS GREATER THAN MAXIMUM OUTFLOW (     27.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (     27.) IS GREATER THAN MAXIMUM OUTFLOW (     27.) IN STORAGE-OUTFLOW TABLE


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           *            *
 402 KK    *     SRGWE  *      STORAGE
           *            *
           **************

 404 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


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           *            *
 556 KK    *     SRD27  *      STORAGE
           *            *
           **************

 558 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

WARNING --- ROUTED OUTFLOW (    119.) IS GREATER THAN MAXIMUM OUTFLOW (    112.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (    120.) IS GREATER THAN MAXIMUM OUTFLOW (    112.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (    113.) IS GREATER THAN MAXIMUM OUTFLOW (    112.) IN STORAGE-OUTFLOW TABLE


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           *            *
 837 KK    *     SRD42  *      STORAGE
           *            *
           **************

 839 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE


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           *            *
 868 KK    *     SRD53  *      STORAGE
           *            *
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  870 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                RUNOFF SUMMARY
                                           FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD       BASIN     MAXIMUM     TIME OF
          OPERATION       STATION   FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                            D03     958.   12.25         109.         34.         11.       0.72
          DIVERSION TO
+                           RD03     958.   12.25         109.         34.         11.       0.72
          HYDROGRAPH AT
+                         DD03RE       0.    0.00           0.          0.          0.       0.72
          ROUTED TO
+                         D03D04       0.    0.00           0.          0.          0.       0.72
          HYDROGRAPH AT
+                            D04    1149.   12.33         142.         44.         15.       0.89
          DIVERSION TO
+                           RD04    1149.   12.33         140.         39.         13.       0.89
          HYDROGRAPH AT
+                         DD04RE      27.   14.50          15.          5.          2.       0.89
          2 COMBINED AT
+                          CPD04      27.   14.50          15.          5.          2.       1.61
          DIVERSION TO
+                          DD04S       0.    0.00           0.          0.          0.       1.61
          HYDROGRAPH AT
+                         DD04SE      27.   14.50          15.          5.          2.       1.61
          ROUTED TO
+                         D04D05      23.   15.00          15.          5.          2.       1.61
          HYDROGRAPH AT
+                            D05     325.   12.17          35.         12.          4.       0.16
          DIVERSION TO
+                           RD05     325.   12.17          31.          9.          3.       0.16
          HYDROGRAPH AT
+                         DD05RE      30.   12.67           9.          3.          1.       0.16
          2 COMBINED AT
+                          CPD05      30.   15.00          21.          8.          3.       1.78
          ROUTED TO
+                         D05D14      28.   15.50          20.          8.          3.       1.78
          DIVERSION TO
+                         DD141S       0.    0.00           0.          0.          0.       1.78
          HYDROGRAPH AT
+                          DD141      28.   15.50          20.          8.          3.       1.78
          ROUTED TO
+                         D05D15      28.   15.75          20.          8.          3.       1.78
          HYDROGRAPH AT
+                            D11     776.   12.42         106.         33.         11.       0.66
          DIVERSION TO
+                           RD11     746.   12.33          58.         16.          5.       0.66
          HYDROGRAPH AT
+                         DD11RE     715.   12.50          60.         17.          6.       0.66
          DIVERSION TO
+                         DD111S     587.   12.50          48.         13.          4.       0.66
          HYDROGRAPH AT
+                          DD111     127.   12.50          11.          3.          1.       0.66
          DIVERSION TO
+                         DD112S      46.   12.50           6.          2.          1.       0.66
          HYDROGRAPH AT
+                          DD112      81.   12.50           6.          2.          1.       0.66
          ROUTED TO
+                         D11D12      50.   12.67           6.          2.          1.       0.66
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+	HYDROGRAPH AT D12	277.	12.75	53.	16.	5.	0.35
+	DIVERSION TO RD12	260.	12.67	28.	8.	3.	0.35
+	HYDROGRAPH AT DD12RE	261.	12.75	30.	8.	3.	0.35
+	2 COMBINED AT CPD12	305.	12.75	36.	10.	3.	1.01
+	DIVERSION TO DD121S	134.	12.75	13.	4.	1.	1.01
+	HYDROGRAPH AT DD121	171.	12.75	22.	6.	2.	1.01
+	DIVERSION TO DD122S	69.	12.75	10.	3.	1.	1.01
+	HYDROGRAPH AT DD122	101.	12.75	12.	3.	1.	1.01
+	ROUTED TO D12D13	83.	13.00	12.	3.	1.	1.01
+	HYDROGRAPH AT D13F	259.	12.08	23.	8.	3.	0.13
+	DIVERSION TO RDD13F	14.	11.50	5.	2.	1.	0.13
+	HYDROGRAPH AT DDD13F	259.	12.08	22.	6.	2.	0.13
+	ROUTED TO SRD13F	22.	12.50	14.	6.	2.	0.13
+	2 COMBINED AT CP13F1	103.	13.00	25.	9.	3.	1.14
+	DIVERSION TO RDGWW	103.	13.00	8.	2.	1.	1.14
+	HYDROGRAPH AT DDGWW	80.	13.25	19.	7.	2.	1.14
+	HYDROGRAPH AT D13E	304.	12.17	37.	13.	4.	0.17
+	DIVERSION TO RDD13E	304.	12.17	31.	9.	3.	0.17
+	HYDROGRAPH AT DDD13E	75.	12.50	12.	4.	1.	0.17
+	ROUTED TO RTD13E	52.	12.58	12.	4.	1.	0.17
+	2 COMBINED AT CP13F2	101.	13.25	30.	11.	4.	1.31
+	ROUTED TO SRGWW	77.	13.50	29.	11.	4.	1.31
+	ROUTED TO RTD13F	68.	13.67	29.	11.	4.	1.31
+	HYDROGRAPH AT D13G	328.	12.17	35.	12.	4.	0.17
+	DIVERSION TO RDD13G	13.	10.75	6.	2.	1.	0.17
+	HYDROGRAPH AT DDD13G	328.	12.17	34.	10.	3.	0.17
+	ROUTED TO SRD13G	29.	12.67	20.	9.	3.	0.17
+	2 COMBINED AT CP13G1	93.	13.67	47.	19.	7.	1.47
+	DIVERSION TO RDGWE	59.	13.33	9.	2.	1.	1.47
+	HYDROGRAPH AT DDGWE	93.	13.67	43.	17.	6.	1.47
+	HYDROGRAPH AT D13A	292.	12.17	33.	11.	4.	0.14
+	DIVERSION TO RDD13A	9.	9.83	5.	2.	1.	0.14

+	HYDROGRAPH AT	DDD13A	292.	12.17	33.	10.	3.	0.14
+	ROUTED TO	SRD13A	25.	12.83	19.	8.	3.	0.14
+	ROUTED TO	RTD13A	25.	13.08	19.	8.	3.	0.14
+	HYDROGRAPH AT	D13B	282.	12.17	32.	11.	4.	0.14
+	DIVERSION TO	RDD13B	9.	10.00	5.	2.	1.	0.14
+	HYDROGRAPH AT	DDD13B	282.	12.17	32.	9.	3.	0.14
+	ROUTED TO	SRD13B	25.	12.83	18.	8.	3.	0.14
+	HYDROGRAPH AT	DD04S	0.	0.00	0.	0.	0.	1.61
+	ROUTED TO	D04D13	0.	0.00	0.	0.	0.	1.61
+	3 COMBINED AT	CPD13B	49.	13.00	36.	16.	6.	0.29
+	ROUTED TO	RTD13B	49.	13.08	36.	16.	6.	0.29
+	HYDROGRAPH AT	D13C	191.	12.25	24.	8.	3.	0.11
+	DIVERSION TO	RDD13C	8.	10.58	4.	1.	0.	0.11
+	HYDROGRAPH AT	DDD13C	191.	12.25	23.	7.	2.	0.11
+	ROUTED TO	SRD13C	17.	13.00	12.	6.	2.	0.11
+	ROUTED TO	RTD13C	17.	13.25	12.	6.	2.	0.11
+	HYDROGRAPH AT	D13D	305.	12.17	29.	9.	3.	0.16
+	DIVERSION TO	RDD13D	18.	11.58	6.	2.	1.	0.16
+	HYDROGRAPH AT	DDD13D	305.	12.17	27.	7.	2.	0.16
+	ROUTED TO	SRD13D	26.	12.58	16.	7.	2.	0.16
+	3 COMBINED AT	CPD13D	90.	13.08	64.	29.	11.	0.56
+	ROUTED TO	RTD13D	90.	13.17	64.	29.	11.	0.56
+	2 COMBINED AT	CP13G2	179.	13.67	104.	46.	17.	2.04
+	ROUTED TO	SRGWE	186.	13.67	104.	46.	17.	2.04
+	DIVERSION TO	DD131S	7.	13.67	4.	2.	1.	2.04
+	HYDROGRAPH AT	DD131	179.	13.67	100.	44.	16.	2.04
+	DIVERSION TO	DD132S	40.	13.67	22.	10.	4.	2.04
+	HYDROGRAPH AT	DD132	139.	13.67	78.	34.	13.	2.04
+	ROUTED TO	D13D14	123.	14.25	77.	34.	13.	2.04
+	HYDROGRAPH AT	D14	1090.	12.42	147.	46.	15.	0.94
+	DIVERSION TO	RD14	1090.	12.42	117.	32.	11.	0.94
+	HYDROGRAPH AT	DD14RE	445.	12.67	46.	14.	5.	0.94

+	HYDROGRAPH AT	DD141	0.	0.00	0.	0.	0.	1.78
+	ROUTED TO	D0514A	0.	0.00	0.	0.	0.	1.78
+	3 COMBINED AT	CPD14	445.	12.67	119.	48.	17.	4.76
+	DIVERSION TO	DD142S	330.	12.67	106.	43.	16.	4.76
+	HYDROGRAPH AT	DD142	94.	12.67	12.	5.	2.	4.76
+	ROUTED TO	D14D15	48.	12.92	11.	5.	2.	4.76
+	HYDROGRAPH AT	D15	419.	12.17	44.	14.	5.	0.22
+	3 COMBINED AT	CPD15	416.	12.17	65.	26.	9.	4.98
+	ROUTED TO	D15D26	328.	12.33	65.	26.	9.	4.98
+	ROUTED TO	D15D28	287.	12.50	64.	26.	9.	4.98
+	HYDROGRAPH AT	D28	417.	12.17	38.	12.	4.	0.25
+	2 COMBINED AT	CPD28	480.	12.25	98.	37.	13.	5.23
+	ROUTED TO	D28AFR	459.	12.25	98.	37.	13.	5.23
+	HYDROGRAPH AT	D26	982.	12.25	101.	31.	10.	0.64
+	DIVERSION TO	RD26	982.	12.25	98.	26.	9.	0.64
+	HYDROGRAPH AT	DD26RE	29.	13.50	13.	5.	2.	0.64
+	HYDROGRAPH AT	DD142	330.	12.67	106.	43.	16.	4.76
+	ROUTED TO	D14D26	182.	13.00	102.	43.	16.	4.76
+	2 COMBINED AT	CPD26	177.	13.00	113.	47.	17.	5.40
+	ROUTED TO	D26D27	159.	13.17	112.	47.	17.	5.40
+	HYDROGRAPH AT	D27	497.	12.17	52.	17.	6.	0.32
+	DIVERSION TO	RD27	101.	11.92	13.	4.	1.	0.32
+	HYDROGRAPH AT	DD27RE	497.	12.17	45.	12.	4.	0.32
+	2 COMBINED AT	CPD27	490.	12.17	144.	59.	21.	5.72
+	ROUTED TO	SRD27	490.	12.17	144.	59.	21.	5.72
+	ROUTED TO	D27D42	344.	12.58	138.	58.	21.	5.72
+	HYDROGRAPH AT	D20	583.	12.33	70.	21.	7.	0.50
+	DIVERSION TO	RD20	583.	12.33	69.	19.	6.	0.50
+	HYDROGRAPH AT	DD20RE	9.	15.33	6.	2.	1.	0.50
+	HYDROGRAPH AT	DD111	587.	12.50	48.	13.	4.	0.66
+	ROUTED TO	D11D20	330.	12.92	46.	13.	4.	0.66
+	2 COMBINED AT	CPD20	328.	12.92	50.	16.	5.	1.16

+	ROUTED TO	D20D21	245.	13.33	48.	16.	5.	1.16
+	HYDROGRAPH AT	D21	558.	12.33	71.	22.	7.	0.50
+	DIVERSION TO	RD21	558.	12.33	71.	20.	7.	0.50
+	HYDROGRAPH AT	DD21RE	7.	17.08	5.	2.	1.	0.50
+	HYDROGRAPH AT	DD112	46.	12.50	6.	2.	1.	0.66
+	ROUTED TO	D11D21	22.	13.33	5.	2.	1.	0.66
+	HYDROGRAPH AT	DD121	134.	12.75	13.	4.	1.	1.01
+	ROUTED TO	D12D21	104.	13.00	13.	4.	1.	1.01
+	4 COMBINED AT	CPD21	324.	13.33	67.	22.	7.	2.00
+	DIVERSION TO	DD211S	216.	13.33	49.	17.	6.	2.00
+	HYDROGRAPH AT	DD211	108.	13.33	18.	6.	2.	2.00
+	DIVERSION TO	DD212S	54.	13.33	13.	4.	1.	2.00
+	HYDROGRAPH AT	DD212	54.	13.33	5.	2.	1.	2.00
+	ROUTED TO	D21D22	38.	13.67	5.	2.	1.	2.00
+	HYDROGRAPH AT	D22	558.	12.33	66.	20.	7.	0.45
+	DIVERSION TO	RD22	558.	12.33	66.	19.	6.	0.45
+	HYDROGRAPH AT	DD22RE	7.	17.08	5.	2.	1.	0.45
+	HYDROGRAPH AT	DD122	69.	12.75	10.	3.	1.	1.01
+	ROUTED TO	D12D22	49.	13.42	10.	3.	1.	1.01
+	3 COMBINED AT	CPD22	80.	13.58	17.	6.	2.	2.46
+	ROUTED TO	D22D23	72.	13.75	17.	6.	2.	2.46
+	HYDROGRAPH AT	D23	552.	12.42	74.	22.	7.	0.54
+	DIVERSION TO	RD23	552.	12.42	69.	18.	6.	0.54
+	HYDROGRAPH AT	DD23RE	63.	13.08	12.	4.	1.	0.54
+	HYDROGRAPH AT	DD131	7.	13.67	4.	2.	1.	2.04
+	ROUTED TO	D13D23	6.	14.33	4.	2.	1.	2.04
+	3 COMBINED AT	CPD23	91.	13.75	31.	11.	4.	5.64
+	DIVERSION TO	DD231S	9.	13.75	3.	1.	0.	5.64
+	HYDROGRAPH AT	DD231	82.	13.75	27.	10.	3.	5.64
+	DIVERSION TO	DD232S	10.	13.75	3.	1.	0.	5.64
+	HYDROGRAPH AT	DD232	72.	13.75	24.	9.	3.	5.64
+	ROUTED TO	D23D24	69.	13.92	24.	9.	3.	5.64

+	HYDROGRAPH AT	D24	534.	12.42	70.	21.	7.	0.49
+	DIVERSION TO	RD24	534.	12.42	70.	21.	7.	0.49
+	HYDROGRAPH AT	DD24RE	4.	21.83	2.	1.	0.	0.49
+	HYDROGRAPH AT	DD132	40.	13.67	22.	10.	4.	2.04
+	ROUTED TO	D13D24	35.	14.25	22.	10.	4.	2.04
+	3 COMBINED AT	CPD24	97.	14.00	45.	19.	7.	6.13
+	ROUTED TO	D24D25	93.	14.17	45.	19.	7.	6.13
+	HYDROGRAPH AT	D25	570.	12.33	71.	22.	7.	0.50
+	DIVERSION TO	RD25	570.	12.33	69.	19.	6.	0.50
+	HYDROGRAPH AT	DD25RE	19.	13.75	9.	3.	1.	0.50
+	2 COMBINED AT	CPD25	100.	14.17	51.	21.	7.	6.63
+	ROUTED TO	D25D39	97.	14.33	51.	21.	7.	6.63
+	HYDROGRAPH AT	D39	112.	12.50	16.	4.	1.	0.18
+	2 COMBINED AT	CPD39	107.	12.50	57.	25.	9.	6.81
+	ROUTED TO	D39D42	86.	14.92	55.	24.	9.	6.81
+	HYDROGRAPH AT	D42	1315.	12.33	151.	46.	15.	0.99
+	DIVERSION TO	RD42	1315.	12.33	135.	36.	12.	0.99
+	HYDROGRAPH AT	DD42RE	215.	12.75	31.	10.	3.	0.99
+	3 COMBINED AT	CPD42	355.	12.58	202.	86.	31.	9.87
+	ROUTED TO	SRD42	239.	13.08	196.	86.	31.	9.87
+	ROUTED TO	D42D53	229.	13.33	195.	86.	31.	9.87
+	HYDROGRAPH AT	D53	180.	12.17	13.	4.	1.	0.12
+	DIVERSION TO	RD53	180.	12.17	13.	4.	1.	0.12
+	HYDROGRAPH AT	DD53RE	0.	0.00	0.	0.	0.	0.12
+	2 COMBINED AT	CPD53	229.	13.33	195.	86.	31.	9.99
+	ROUTED TO	SRD53	200.	16.67	126.	53.	19.	9.99
+	ROUTED TO	D53D54	189.	17.17	124.	53.	19.	9.99
+	HYDROGRAPH AT	D43	638.	12.33	74.	23.	8.	0.50
+	DIVERSION TO	RD43	638.	12.33	66.	18.	6.	0.50
+	HYDROGRAPH AT	DD43RE	76.	12.83	15.	5.	2.	0.50
+	ROUTED TO	D43D54	40.	13.75	14.	5.	2.	0.50
+	HYDROGRAPH AT	D54	338.	12.25	29.	8.	3.	0.27

	DIVERSION TO						
+	RD54	66.	12.00	5.	2.	1.	0.27
	HYDROGRAPH AT						
+	DD54RE	338.	12.25	26.	7.	2.	0.27
	3 COMBINED AT						
+	CPD54	320.	12.25	129.	60.	22.	10.76
	HYDROGRAPH AT						
+	D44	544.	12.33	63.	19.	6.	0.54
	DIVERSION TO						
+	RD44	540.	12.33	36.	10.	3.	0.54
	HYDROGRAPH AT						
+	DD44RE	462.	12.42	34.	9.	3.	0.54
	HYDROGRAPH AT						
+	D55	219.	12.25	21.	6.	2.	0.19
	DIVERSION TO						
+	RD55	219.	12.25	18.	5.	2.	0.19
	HYDROGRAPH AT						
+	DD55RE	33.	12.58	5.	1.	0.	0.19
	HYDROGRAPH AT						
+	D56	266.	12.33	28.	8.	3.	0.22
	DIVERSION TO						
+	RD56	37.	11.92	5.	2.	1.	0.22
	HYDROGRAPH AT						
+	DD56RE	266.	12.33	26.	7.	2.	0.22
	4 COMBINED AT						
+	DUMMY	676.	12.42	132.	75.	27.	11.71
	2 COMBINED AT						
+	DUMMY	1004.	12.50	179.	99.	36.	16.94

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

APPENDIX B

Excerpts from White Tanks/Loop 303 ADMPU regarding HEC-1 model hydrologic parameters

3.0 HYDROLOGIC MODELING PARAMETERS

3.1 Methodology

Hydrology models were created to estimate runoff resulting from several different rainfall events, frequencies, land use, and improvement scenarios. The methodology generally follows the Drainage Design Manual for Maricopa County (DDMMC, November 2003 Draft). Any exceptions to the methodology are discussed below. The US Army Corps of Engineers' HEC-1 computer software program (version 4.1, June 1998) was used to perform calculations.

A Technical Approaches Memorandum was written for the project in June of 2008, which summarized the proposed technical approaches to the modeling effort. The following is a summary of the memo, including FCDMC comments.

1. *Precipitation – The watershed is divided into two distinct areas: subbasins generally located within the White Tank Mountains/foothills (the far western portion of the watershed), and all other subbasins, which are similar and located in milder terrain. The results indicate that precipitation estimate variability is generally low within each of the two regions. Therefore, a basin average precipitation value for each region will be used in the HEC-1 model. (Note: For localized design purposes, specific rainfall depth should be used for each basin)*

2. *S-graphs will be used and converted into unit hydrographs to perform the hydrologic routing. The Clark Unit Hydrograph will not be used as it has an upper watershed limit of 10 square miles.*

3. *Rainfall losses for each subbasin will be calculated using Green and Ampt. Channel transmission losses will be assumed to be zero in man-made and lined channels. Normal depth routing will be used in most routing reaches except for small man-made channels for little potential for flow attenuation where the kinematic wave method will be used.*

4. *Stock ponds and agricultural water quality storage basins will be assumed to be full in all storm events.*

5. *Canals, railroad embankments, and roadway embankments will be assumed to remain intact and functional during all storm events unless a reasonable expectation of failure exists. An example of a reasonable expectation of failure would be overtopping of an embankment during a storm event where the overtopping location was not specifically designed to carry such flows.*

6. *Conveyance from detention basin bleed pipes will be ignored for pipe sizes 24" in diameter and smaller. Basins will be assumed to be 80% effective, including underground retention.*

7. *The time step used will be 5 minutes and the number of ordinates will be 2000.*

8. *Areal Reduction: a sensitivity analysis will be performed on areal reduction as it relates to diversions in the model. The results of the sensitivity analysis may determine the methodology. (See Areal Reduction section, below)*

3.2 Model Descriptions

Models were created for the 100-year frequency (1% chance) storm, for the 2-hour, 6-hour, and 24-hour storm event. The 10-day duration event was originally part of the scope of work to determine volumes in the White Tanks structures, but was deleted by direction of the FCDMC. Flows larger than the 1% chance storm runoff can and do happen and are not analyzed as part of this project. Existing conditions are based on previously constructed or under construction items as of June 1, 2008.

Future conditions models were created with an estimate of future land usages (as described below in Section 3.5). A "2017" model was prepared to estimate the conditions that might exist along the new Loop 303 freeway corridor in the year 2017, which is the estimated completion date of the freeway. Additionally, both the existing and future land use models were run with and without regional improvement projects. **Figures 3 through 6** contain maps of existing facilities, proposed capital improvement project facilities, existing land use, and future land use. **Figure 12** contains "2017" land use conditions.

The area was divided into two models, Major Basin 01 and Major Basin 02. Several reasons for the division exist which are discussed throughout the report. Additionally, the HEC-1 model was initially created using the newest version of the District's Drainage Design Management System for Windows (DDMSW, Version 4.1.9). The software aids in creating HEC-1 files, and performs many calculations for the user, such as creating unit hydrographs, calculating NSTPS, and compositing land use parameter values.

3.3 Precipitation

NOAA Atlas 14 precipitation estimates were used in this model over the previous NOAA Atlas 2 estimates, which have historically been the precipitation estimates used by regulatory agencies in Maricopa County. NOAA Atlas 14 was released in 2004, which contains an additional 30 years of data over NOAA Atlas 2, issued in 1973.

Due to the large size of the watershed, it was unknown if precipitation estimates would vary significantly across the watershed. In order to determine the precipitation variability, numerous locations within the watershed were surveyed using NOAA Atlas 14 data. The watershed was divided into two distinct areas: subbasins generally located within the White Tank Mountains/foothills (the far western portion of the watershed, named Major Basin 02), and all other subbasins (Major Basin 01), which are similar and located in milder terrain. The results indicate that precipitation estimate variability is generally low within each of the two regions (reference the appendicies for numerical results). Therefore, a basin average precipitation value for each region was used in the HEC-1 model. The 100-year, 24-hour NOAA Atlas 14 average precipitation for the mountainous region is 3.941 inches, and 3.47 inches for all other subbasins.

However, due to limitations in the HEC-1 program, only one precipitation estimate can be used in the model. This would not differentiate between the mountainous region from the rest of the

model and would incorrectly give a value that is too low for the mountainous region and too high for the remainder of the basins. Therefore, the project was separated into two distinct models (Major Basin 01 and Major Basin 02) to allow for different precipitation in each basin.

3.4 Subbasin Delineation

Subbasin delineation was accomplished using the topographic sources described in Section 3.4.1, aerial photography, available reports, and field verification. In general, the target minimum subbasin size was 0.5 square miles and maximum subbasin size was 1 square mile. However, exceptions exist due to basin characteristics.

The watershed was divided into six regions with the following nomenclature: Northeast Region (N), White Tanks Region (W), Loop 303 Region (L), Dysart Region (D), Bullard Region (B) and Southwest Region (S). The subbasin ID's consist of the region letter followed by a number. This will make the sub-basins easier to find on a map or in the HEC-1 code. Subbasin boundaries are show for both "with" and "without" capital improvement projects in **Figures 9 and 10**.

3.4.1 Topographic Data Sources

Topographic sources are as follows. In general, 2-foot contour interval topo from 1990 was available for most of the watershed with the exception of the area to the north of Grand Avenue, where only 20-foot contour interval topography from 2001 was available. In some locations, additional detailed topography was available from development reports and design plans. These sources are described in detail in the *Data Collection Memo* prepared for this project, and summarized as:

- 2-foot contour interval for the entire project area (except the area north of Grand Avenue), by the FCDMC dated February of 1990;
- 20-foot contour interval for the entire project area, by USGS dated January 2001;
- 1-meter contour interval for Luke AFB, by Luke AFB dated 2003;
- 1-foot contour interval for the Loop 303 corridor, by ADOT dated 2001/2003;
- 1-foot contour interval for the I-10 corridor, by ADOT dated 2006;
- 2-foot contour interval for various spot areas (discussed further below), by FCDMC dated March 22, 2008;
- 2-foot contour interval for the area south of Lower Buckeye Road, by ADOT dated 2006.

As part of this project, aerial photography was performed for a majority of the project area using Airborne GPS on March 22, 2008. The area was flown at a 1"=200' mapping scale for a 2-foot contour interval mapping accuracy. Although the flight was performed, it was not the intent to map (i.e. extract topographic information) for the entire area flown. Rather, distinct limited areas were chosen for mapping. These areas included potential split flow locations, areas of substantial change from the 1990 mapping (not covered by

other topographic sources), and areas needing additional information to determine flow directions. Volumes 5 through 10 of this report contain hard copies of the topographic information obtained (sorted by area).

3.5 Land Use

Existing and future conditions land use was created for this project. Land Use maps are included as **Figures 5 and 6**. Existing conditions land use was created by visual inspection of the watershed, and summarized into general land use codes. Future conditions land use was created by obtaining planning maps from the municipalities within the watershed, as well as the Maricopa Association of Governments (MAG). The watershed was assumed to be in the "build out" condition for the future conditions models.

The land use codes used for this project generally follow the allowable land use codes found in the DDMMC and DDMSW program. These codes are summarized in Table 3.5.1, below.

Table 3.5.1 – Land Use Codes

Land Use	LUCODE	Land Use (Level 4 - Detailed)	Description	Kn	RTIMP
Single Family Low Density - Less than 1 du/ac	**110**	Rural Residential	<= 1/5 du* per acre (SF)	0.035	5
	120	Estate Residential	1/5 du per acre to 1 du per acre (SF)	0.035	5
Single Family Medium Density - 1 to 4 du/ac	**130**	Large Lot Residential (SF)	1 du per acre to 2 du per acre (SF)	0.035	15
	140	Medium Lot Residential (SF)	2-4 du per acre (SF)	0.032	25
Single Family High Density - Greater than 4 du/ac - Includes Mobile Homes	**150**	Small Lot Residential (SF)	4-6 du per acre (SF)	0.030	30
	160	Very Small Lot Residential (SF)	>6 du per acre (SF)	0.030	35
Multi Family	**170**	Medium Density Residential (MF)	5-10 du per acre (MF)	0.022	45
	180	High Density Residential (MF)	10-15 du per acre (MF)	0.022	45
	190	Very High Density Residential (MF)	>15 DU/AC Residential (MF)	0.025	45
Retail Low - Amusement/Movie Theatre/Specialty Retail/Neighborhood Retail	**200**	General Retail	Commercial where no detail available	0.025	80
	210	Specialty Commercial	<=50,000 square feet	0.022	80
	220	Neighborhood Commercial	50,000 to 100,000 square feet	0.022	80
Retail High - Community Retail/Regional Retail	**230**	Community Commercial	100,000 to 500,000 square feet	0.020	85
	240	Regional Commercial	500,000 to 1,000,000 square feet	0.020	85
	250	Super-Regional Commercial	>= 1,000,000 square feet	0.020	85
Industrial	**300**	General Industrial	General Industrial	0.020	55
	310	Light Industrial	Warehouse/Distribution Centers	0.020	55
	320	Industrial	Industrial	0.020	55

Table 3.5.1 – Land Use Codes (con't)

Land Use	LUCODE	Land Use (Level 4 - Detailed)	Description	Kn	RTIMP
Office	400	Office General	Office where no detail available	0.022	80
	410	Office Low Rise	1-4 stories	0.022	80
	420	Office Mid Rise	5-12 stories	0.025	85
	430	Office High Rise	13 stories or more	0.025	85
Other Employment - Landfill/Proving Grounds/Sand and Gravel/etc.	500	General Employment	Employment where no detail available	0.025	20
Tourist Accommodations - Motel/Hotel/Resort	510	Tourist and Visitor Accommodations	Hotels, motels and resorts	0.030	40
Education/Religious	520	Educational	Educational institutions where no detail available	0.030	50
Medical/Nursing Home	530	Institutional	Institutions where no details are available	0.030	50
Cemetery	540	Cemeteries	Cemeteries, Mausoleums, Crematoriums	0.028	10
Public/Special Event/Military	550	Public Facilities	Public Facilities where no details are available	0.030	25
	560	Special Events	Includes stadiums, sports complexes, and fairgrounds	0.030	50
Other Employment - Landfill/Proving Grounds/Sand and Gravel/etc.	570	Other Employment (low)	Other Employment (low)	0.025	40
	580	Other Employment (medium)	Other Employment (Medium)	0.025	40
	590	Other Employment (high)	Other Employment (High)	0.025	40
Transportation	600	General Transportation	Transportation where no detail available	0.018	95
	610	Transportation	Freeways/Expressways/ Highways/ Major Roads/ Arterials/ ROWs where no detail available	0.018	95
Airport	620	Airports	Public use airports	0.015	29**
Active Open Space	700	General Open Space	Open Space where no detail available	0.025	5
	710	City/Regional Active Open Space	Includes city/regional parks, playgrounds/fields	0.028	5
Golf Course	720	Golf courses	Golf Courses	0.030	5
Passive/Restricted Open Space	730	Passive Open Space	Includes mountain preserves and washes	0.030	0
Water	740	Water	Water	0.020	0
Agriculture	750	Agriculture	General Agriculture	0.100***	0****
Business Park	810	Business Park	Includes enclosed industrial, office or retail in a planned environment	0.025	80
Vacant	900	Vacant (existing land use database only)	Vacant	0.030/0.050(MB02 only)*****	0****

*du=dwelling unit
**Composite RTIMP developed based on Luke and Goodyear Airports. This RTIMP is only applicable for this area; larger airports would typically have a higher RTIMP value.
***Original Kn value of 0.150 was proposed; however, problems with UI card generation were solved by using 0.100
****Soils information may contribute additional RTIMP values. This is for land use parameters only.
*****Kn for vacant land within the mountains regions of Major Basin 02 is 0.050. MB01 is 0.030.

Kn, an estimated mean of all Manning's roughness coefficient values for the drainage pathways for the area, is calculated in this model based on the land use percentages for each subbasin. Additionally, the percent impervious is calculated similarly and based on land use percentages. These calculations are done automatically through the FCDMC's DDMSW software.

The Kn value was originally chosen at 0.150 for agricultural land. However, a problem with the UI card calculation in the DDMSW software caused the hydrograph to be truncated prematurely. In order to solve this problem, HDR was directed by the District to change the value to 0.100 which shortened the duration of the hydrograph in order to contain within the allowable UI cards. The Kn value for vacant land was different between the two major basins. Therefore, a higher Kn of 0.050 was used in the mountainous MB02 region. This helped to decrease flood wave velocities to more realistic values.

3.5.1 2017 Land Use

The 2017 model was created to estimate the conditions of the watershed in the year 2017 upstream of the Loop 303 drainage system. The model was created using the existing conditions land use with development adjacent to the west side of the Loop 303 corridor. **Figure 12** illustrates the 2017 Land Use.

3.5.2 Land Use Special Problems

3.5.2.1 Future Land Use

During the course of the project, it was discovered that the land use shown in the regional planning documents did not match existing land use types. The planned land uses were less dense than the existing land uses in many instances. While it is conceivable that localized areas are redeveloped, it is not likely that entire subdivisions would be torn down and replaced with subdivisions with lesser densities. It was recognized by the project team that this is a departure from the planning documents, but it is potentially more realistic. Therefore, future land use was created by using the existing land use, and only changing the land uses of 700, 750, and 900 to the future planned land use. **Figures 5 and 6** graphically show land uses used for the existing and future conditions models.

3.5.2.2 Verrado Area

It was discovered that a discrepancy existed between the regional MAG planning document and local planning document for the Verrado area for the MB02 watershed. Since the Verrado area is under development and an approved master plan community, a decision was made to use the local Verrado Development Plan to determine future land use.

3.5.2.3 WT FRS#3 Outfall Channel (Jackrabbit Trail) Area

Future land use differences exist between the design model for the White Tanks #3 FRS Outfall Channel (Jackrabbit Trail channel) and this model in the W21, W21A, W28 and W28A subbasins. The main difference is the assumption of the amount of development immediately adjacent to the White Tanks #3 Outfall channel. The land use in the "Future

with CIP" model associated with this project does not include a potential area of open space at the outfall. This is due to the source of the future land use data, which are the regional plans for the area. The land use plans do not indicate an area of open space, therefore one was not included.

Examples of both types of land use (open space versus complete development) directly below flood retarding structure outfalls can be found throughout the Phoenix metropolitan area. Therefore, either assumption could be considered valid. The assumption of complete development used in the future models in this project was chosen as it provides the most conservative result.

3.6 Soils

Soil characteristics were provided by the FCDMC for use on this project, and were derived from publications for the region by the USDA Soil Conservation Service. A summary of the land use for each subbasin is contained in the Figures and appendices. Agricultural land has different runoff characteristics than all other land uses. To model runoff from agricultural land, the following approach was used as summarized below in Table 3.6.1.

Table 3.6.1 – Agricultural Modeling Parameter Approach

Parameter	District Methodology Value
Flow Routing	Flow routed along roadways, until capacity is accounted for, then add the additional needed capacity from the adjacent fields.
Lag Time Equation (Kn)	0.06 < Kn < 0.15
IA	0.5 inch
DTHETA	Soils should be considered to be in a normal condition (not saturated)
PSIF	Varies, Use current District recommended values
XKSAT	Varies, Use current District recommended values
RTIMP	Use current District recommended values

3.6.1 Soil Characteristics Special Problems - RTIMP

The percent impervious (RTIMP) for each subbasin is calculated based on both soil and land use contributions to imperviousness. Impervious area may be comprised of rock outcrops, pavement, rooftops, etc. However, in the case of imperviousness associated with rock outcrops, the runoff from the outcrop must flow over pervious surfaces before reaching the associated concentration point. Therefore, if the rock outcrop is relatively small compared with the drainage area, is isolated from other impervious areas, and must travel through soils with relatively high infiltration capacities, an adjustment should be made.

This situation was discovered to exist in portions of the White Tank Mountains. The percent impervious for select subbasins was examined for potential adjustments under existing conditions, and the results are shown in Table 3.6.2. The following methodology was applied:

- Subbasins were examined for rock outcrops, and whether the outcrops were at the far end of the subbasin, flanking the sides of the subbasin, and proximity to direct connections (such as streets and pavement)

- The following reduction factors were applied: 75% reduction in rock RTIMP for location at the far end of the watershed, 50% reduction in rock RTIMP for rock flanking drainage pathways, and 25% reduction where outcrops had a closer connection to other impervious surfaces.

It is important to note that total RTIMP is calculated based on all impervious surfaces, and adjustments should only be made to rock outcropping percentages. Additionally, no adjustment was made in RTIMP values for future conditions, as development will occur and govern imperviousness in these basins.

Table 3.6.2 – Effective RTIMP Adjustments

Basin ID	Original RTIMP	Revised RTIMP	Notes
W04	21	10	Rock outcrops flanking drainage paths, 50% reduction
W12	5	3	Rock at far end of watershed. 75% reduction for rock (not for land use)
W13	5	3	Rock at far end of watershed. 75% reduction
W14	13	3	Rock at far end of watershed. 75% reduction
W18	17	8	Rock outcrops flanking, steep. 50% reduction
W19	20	No change	Topsoil stripped, grading, berms. Appears effective, no additional reduction
W25	15	8	Rock outcrops flanking drainage paths, 50% reduction
W43	61	No change	Soil borrow has exposed the bedrock.
W45	7	3	Rock outcrops flanking drainage paths, 50% reduction
W51	2	1	Rock at far end of watershed. 75% reduction
W52	17	9	Rock outcrops flanking drainage paths, 50% reduction
W53	11	7	RTIMP contribution from land use influences effectiveness. Rock outcrop now closer to drain path, most of RTIMP from land use, not rock. 25% reduction on rock RTIMP
W54	21	18	RTIMP contribution from land use influences effectiveness. Rock outcrop now closer to drain path, most of RTIMP from land use, not rock outcrop. 25% reduction on rock RTIMP

3.7 Routing

The routing of flow through the basins was estimated by preparing an 8 point cross section along the routing reach. Routing reaches were determined by using all topographic sources (as described above), aerial photography, available reports, and field verification. In many cases, specific data was not available and estimations were necessary. A GIS file was prepared and submitted as part of this project showing the routes used for both existing and future conditions.

3.7.1 Roughness Coefficients

Manning's roughness coefficients, or n-values, are used in the routing calculations. Up to three different values can be used in the eight point cross section (main channel and each overbank). N-values were chosen based on the existing or proposed channel material per Table 6.1 in the DDMMC, with some modifications. Engineering judgment was necessary in some cases to determine the appropriate channel material.

Table 3.7.1 – Roughness Coefficients

Channel Material	Value
Concrete	0.016
Soil Cement	0.020
Clean Earth, Straight	0.022
Earth with grass and forbs	0.025
Earth with sparse trees and shrubs	0.032
Shotcrete with earth bottom	0.022
Soil Cement with earth bottom	0.025
Concrete with earth bottom	0.020
Riprap with earth bottom	0.032
Natural desert wash with vegetation	0.035*
Semi-natural wash with vegetation	0.035*
Agricultural/cultivated earth	0.038
Natural desert wash with heavy vegetation	0.045

*increase to 0.040 for sheet or shallow flow

In localized instances, roughness coefficients deviate from the table above to ensure that routing results were within reasonable ranges. For instance, some of the steep slopes in the White Tank Mountains produced unreasonably high velocities using the roughness coefficients listed above, and therefore the n-values were increased to ensure reasonable flood wave velocities. These instances are documented in the comment cards in the HEC-1 model.

3.8 Storage

Several different types of storage exist within the study area. This includes local retention/detention basins, regional retention/detention basins, aggregate mining operations, and ponding behind elevated features (canals, railroad tracks and roadways). The ponding can occur due to undersized or non-existent drainage conveyance features such as culverts or bridges. As previously mentioned stock ponds and agricultural ponds are assumed to be full and disregarded in terms of storage.

Local retention/detention basin storage volumes were determined from drainage reports. If drainage reports were not available, the storage volume was estimated using aerial images. All retention basins were assumed to have 4:1 side slopes and be three feet deep. Storage calculations are summarized in the attachments.

In areas around Sun City in the northern portion of study area, a few drainage reports indicated design criteria instead of providing actual as built volumes. In these cases, retention volumes were calculated using NOAA 2 precipitation estimates (P=2.7 inches for 100-year, 2-hour event), as that was the governing precipitation estimate at the time development. The subbasins subject to these calculations are: D01, D02, D04 (only the Sun Village Portion), D06, D07, L01, and L02.

For future conditions, retention was calculated based the future land use and the standards of the regulating entity. The standard for retention within the project area is generally 100-year, 2-hour, with the exception of the City of Goodyear, which is 100-year, 6-hour. Additionally, the calculated retention was assumed at 80% effective.

3.9 Storage Investigation

Per the scope of the contract, storage volumes were compared to reported storage volume against actual as-built storage volume. Several drainage reports were pulled at random for subdivisions within the project area in order to determine reported volume. Twenty-five retention basins within five subdivisions were selected. The actual as-built volume was determined based on aerial photographs and field estimations. The results indicate that the as-built conditions either met or slightly exceeded the planned retention volumes. The results are contained in Volume 2 of the appendices.

3.10 Diversions and Flow Splits

One of the unique features of the study area is the presence of numerous flow splits. The majority of the flow splits occur at roadway intersections, where the elevated grades of the road govern the flow split characteristics. The project area was examined for potential flow splits, and the flow splits modeled in the previous ADMPU model were re-analyzed using the methodology discussed below.

3.10.1 Methodology

Two different types of flow split calculations were performed. These are termed "urban" and "weir" for ease of discussion, and are described in detail below.

- "Urban" flow split calculation methodology: This type of diversion tends to occur in urbanized areas, where a majority of the flow is carried within the street and right-of-way section. The street section tends to be lower in elevation than the surrounding improvements. The split that occurs is governed by the capacity of the downstream street sections.

- "Weir" flow split calculations methodology: This diversion is more common in the Loop 303/White Tanks basin, where the split flows are governed by an elevated feature that is modeled as a broad-crested weir, for calculation purposes. The improvements surrounding the feature tend to be lower in elevation, and some amount of ponding is expected behind the feature before the split occurs. (Major ponding behind an elevated feature is modeled with storage, as discussed above. Relatively minor ponding is disregarded.)

The weir flow split methodology has limitations in use for any other application other than this project. This is not a discretized (i.e., divided into discrete segments) weir calculation that would be balanced through iterations and therefore should not be used to determine actual flow amounts. The purpose of the calculation is to determine the percentage of flow in each direction to create a rating curve, not an actual flow amount. Caution should be exercised by the end user with this calculation methodology for any other use other than it was intended for on this project.

Instances of triple diversions exist in the watershed. Due to limitations in HEC-1 coding, a diverted flow cannot be retrieved then immediately diverted without error. Therefore, triple diverts must be coded such that both diversions must happen immediately after each other, and then retrieved later when needed.

3.10.2 Split Flow/Diversions Special Problems

3.10.2.1 Cotton Lane north of MC85/UPRR

A flow split is modeled in subbasin S21 that directs flow either east or west of Loop 303 to an existing drainage crossing of the UPRR tracks. However, the percentage of flow diversion is difficult to determine based on the unique conditions of the area, where all of the flow through the subbasin tends to be funned into the roadway section. Once in the roadway section, it will either split to the east or west as the capacity of the roadway section is exceeded. Therefore, an assumption that half of the flow goes each way was made for the purposes of this model.

This split may be important to the design of the future Loop 303 Drainage Channel, as the percentage of flow to the west at DS21SE will reach the proposed freeway channel. It may be prudent to design this future system with a more conservative assumption on the flow split than the 50-50 split used in this model.

3.11 Areal Reduction

Areal reduction is a major component in large watersheds such as this study area. The rainfall depths from the isopluvial maps in the DDMMC are point rainfalls for specified frequencies and durations. This is the depth of rainfall that is expected to occur at a point in a watershed for the

specified frequency and duration. However, this depth is not averaged to reflect the areal extents of the rainfall over the basin that would occur during a storm. This is because the intensity tends to decrease rapidly with increasing area in Maricopa County. A reduction factor is used to convert the point rainfall to an equivalent uniform depth of rainfall over the entire watershed.

For single storm simulations, the point rainfall is reduced according to the size of the watershed and introduced in the model as a fixed input parameter. When multiple storm simulations are performed, the area reduction is executed in HEC-1 using the JD records. The JD records allow for dynamic point rainfall corrections that occur at each sub-basin for which a flow hydrograph is generated.

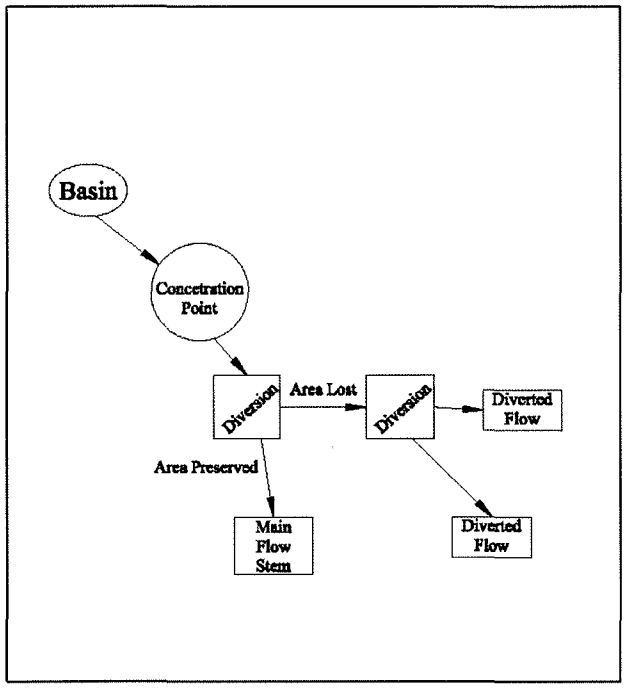

Figure 3.11.1 – Diversion Schematic

Application of areal reduction is particularly important in watersheds that have numerous flow diversions. In general, a flow diversion is modeled at a location where the inflow (described in the DI record) approaching a certain location (node) divides in two components (outflow and diversion) due to the topography or to the presence of hydraulic structures. The outflow component is the flow that continues on the same flow stem as the inflow, while the diversion component is the flow that is being diverted off the main flow stem and is described in the DQ record. Diversion simulations performed in a model using areal reduction encounter overestimated peak flows due to a "loss" of tributary area when hydrograph combines occur downstream of a diversion. The issue was corrected by manually introducing the cumulative tributary area in the second field of the hydrograph combine (HC) record.

The cumulative tributary area is determined by adding the subbasin areas upstream of the concentration point. Cumulative areas disregard diversions. In other words, the entire area is carried in both directions for the diversion and main stem because rainfall depth is reduced based on the drainage area; flow diversion percentages do not matter. Cumulative areas were calculated for each concentration point in order to avoid potential double-counting of areas where diverted flow recombines with the main stem.

3.11.1 Sensitivity Analysis

A sensitivity analysis was performed to determine if hard-coding of the upstream cumulative area could be avoided by setting up the HEC-1 tree in a certain order. The purpose of the Sensitivity Analysis was to determine the best approach for application of areal reduction in the watershed, taking several factors into consideration.

Appendix C

Percolation & Drywell Calculations

Percolation and Drywell Analysis
Developed Condition: First Flush Only

Model Scenario	First Flush Retenion Scenario (Alt 1)
Description:	Percolation and Drywell Analysis
References:	City of Surprise Drainage Policies and Standards, Maricopa County Drainage Policies and Standards
Drain Rates:	Ground infiltration rate (1.4 in/hr) per Greenway Rd. perc testing.
Assumption:	**First flush basins are assumed to be square, 1' deep, Z= 4H:1V and sized to store required first flush volume.**

HEC-1 Subbasin	First Flush Volume Required (ac-ft)	First Flush Volume Required (cu.ft.)	Top Side Length (Ft.)	Basin Top Area (sq. ft.)	Basin Top Area (acres)	Basin Bottom Area (sq. ft.)	Volume Provided (cu.ft.)	Assumed Ground Infil. Rate (in/hr)	Time required to drain First Flush Volume (Hrs)
D13A	3.87	168,577	415	172,225	**3.95**	165,649	168,937	1.4	**8.7**
D13B	3.81	165,964	411	169,223	**3.88**	162,705	165,964	1.4	**8.7**
D13C	3.04	132,422	368	135,333	**3.11**	129,511	132,422	1.4	**8.8**
D13D	4.35	189,486	439	192,968	**4.43**	186,004	189,486	1.4	**8.7**
D13F	3.41	148,540	389	151,623	**3.48**	145,456	148,540	1.4	**8.8**
D13G	4.48	195,149	446	198,683	**4.56**	191,615	195,149	1.4	**8.7**

Percolation and Drywell Analysis
Developed Condition: First Flush + Detention

Model Scenario	Dentention Scenario (Alt 2)
Description:	Percolation and Drywell Analysis
References:	City of Surprise Drainage Policies and Standards, Maricopa County Drainage Policies and Standards
Drain Rates:	Ground infiltration rate (1.4 in/hr) per Greenway Rd. perc testing.
Assumption:	**Detention basins are assumed to be square, 3' deep, Z= 4H:1V and sized to store required volume.**

HEC-1 Subbasin	Deten. Basin Volume Required (ac-ft)	Deten. Basin Volume Required (cu.ft.)	Top Side Length (Ft.)	Basin Top Area (sq. ft.)	Basin Top Area (acres)	Basin Bottom Area (sq. ft.)	Volume Provided (cu.ft.)	Assumed Ground Infil. Rate (in/hr)	Time required to drain First Flush Volume (Hrs)
D13A	15.75	686,070	490	240,164	**5.51**	217,216	686,070	1.4	**27.1**
D13B	15.48	674,309	486	236,144	**5.42**	213,395	674,309	1.4	**27.1**
D13C	11.48	500,069	420	176,484	**4.05**	156,895	500,069	1.4	**27.3**
D13D	13.61	592,852	456	208,282	**4.78**	186,952	592,852	1.4	**27.2**
D13F	10.95	476,982	411	168,559	**3.87**	149,429	476,982	1.4	**27.4**
D13G	16.29	709,592	498	248,200	**5.70**	224,862	709,592	1.4	**27.0**

Model Scenario	Dentention Scenario (Alt 2)
Description:	Percolation and Drywell Analysis
References:	City of Surprise Drainage Policies and Standards, Maricopa County Drainage Policies and Standards
Drain Rates:	Ground infiltration rate (1.4 in/hr) per Greenway Rd. perc testing.
Assumption:	**Detention basins are assumed to be square, 4' deep, Z= 4H:1V. Basin footprint sized to drain in 36 hours**

HEC-1 Subbasin	Deten. Basin Volume Required (ac-ft)	Deten. Basin Volume Required (cu.ft.)	Top Side Length (Ft.)	Basin Top Area (sq. ft.)	Basin Top Area (acres)	Basin Bottom Area (sq. ft.)	Volume Provided (cu.ft.)	Assumed Ground Infil. Rate (in/hr)	Time required to drain First Flush Volume (Hrs)	Excess Volume Provided (ac-ft)
D13A	15.75	686,070	436	190,240	**4.37**	163,350	707,180	1.4	**36.0**	**0.5**
D13B	15.48	674,309	433	187,217	**4.30**	160,549	695,533	1.4	**36.0**	**0.5**
D13C	11.48	500,069	377	142,170	**3.26**	119,062	522,464	1.4	**36.0**	**0.5**
D13D	13.61	592,852	408	166,223	**3.82**	141,154	614,756	1.4	**36.0**	**0.5**
D13F	10.95	476,982	369	136,157	**3.13**	113,565	499,443	1.4	**36.0**	**0.5**
D13G	16.29	709,592	443	196,281	**4.51**	168,950	730,462	1.4	**36.0**	**0.5**

**Drywell and percolation calcs assume no bleed-off. Scenario 2 is a detention scenario which allows the basin to discharge with an outlet. The results shown here do not account for basin discharge.*

Percolation and Drywell Analysis
Developed Condition: 100-Year, 2-Hour Retention

Model Scenario	Rentention Scenario (Alt 3)
Description:	Percolation and Drywell Analysis
References:	City of Surprise Drainage Policies and Standards, Maricopa County Drainage Policies and Standards
Drain Rates:	Ground infiltration rate (1.4 in/hr) per Greenway Rd. perc testing.
Assumption:	**Retention basins are assumed to be square, 3' deep, Z= 4H:1V and sized to store required 100Y2H volume.**

HEC-1 Subbasin	Deten. Basin Volume Required (ac-ft)	Deten. Basin Volume Required (cu.ft.)	Top Side Length (Ft.)	Basin Top Area (sq. ft.)	Basin Top Area (acres)	Basin Bottom Area (sq. ft.)	Volume Provided (cu.ft.)	Assumed Ground Infil. Rate (in/hr)	Time required to drain First Flush Volume (Hrs)
D13A	16.24	707,414	497	247,456	**5.68**	224,154	707,414	1.4	**27.1**
D13B	15.99	696,524	494	243,735	**5.60**	220,614	696,524	1.4	**27.1**
D13C	12.79	557,132	443	196,049	**4.50**	175,372	557,132	1.4	**27.2**
D13D	18.21	793,228	526	276,747	**6.35**	252,072	793,228	1.4	**27.0**
D13F	14.35	625,086	468	219,313	**5.03**	197,411	625,086	1.4	**27.1**
D13G	18.85	821,106	535	286,255	**6.57**	261,149	821,106	1.4	**27.0**

Model Scenario	Rentention Scenario (Alt 3)
Description:	Percolation and Drywell Analysis
References:	City of Surprise Drainage Policies and Standards, Maricopa County Drainage Policies and Standards
Drain Rates:	Ground infiltration rate (1.4 in/hr) per Greenway Rd. perc testing.
Assumption:	**Retention basins are assumed to be square, 4' deep, Z= 4H:1V and sized to store required 100Y2H volume.**

HEC-1 Subbasin	Deten. Basin Volume Required (ac-ft)	Deten. Basin Volume Required (cu.ft.)	Top Side Length (Ft.)	Basin Top Area (sq. ft.)	Basin Top Area (acres)	Basin Bottom Area (sq. ft.)	Volume Provided (cu.ft.)	Assumed Ground Infil. Rate (in/hr)	Time required to drain First Flush Volume (Hrs)	Excess Volume Provided (ac-ft)
D13A	16.24	707,414	442	195,722	**4.49**	168,432	728,307	1.4	**36.0**	**0.5**
D13B	15.99	696,524	439	192,926	**4.43**	165,839	717,529	1.4	**36.0**	**0.5**
D13C	12.79	557,132	396	156,984	**3.60**	132,650	579,268	1.4	**36.0**	**0.5**
D13D	18.21	793,228	467	217,700	**5.00**	188,863	813,126	1.4	**36.0**	**0.5**
D13F	14.35	625,086	418	174,544	**4.01**	148,830	646,748	1.4	**36.0**	**0.5**
D13G	18.85	821,106	474	224,821	**5.16**	195,499	840,641	1.4	**36.0**	**0.4**

APPENDIX C

Excerpts from Greenway Road Basin Percolation Testing

**Used to establish 1.4 in/hr percolation rate used for study testing.*

City of Surprise

Greenway Road, Litchfield Road to Bullard Avenue

Drainage Report

November 2015

capable of retaining runoff in excess of the 10-year 2-hour storm (which is approximately 345,000 cubic feet of runoff).

3.2.4 Dissipation of Stored Runoff

Percolation testing was done at certain locations along Greenway Road between Litchfield Road and Bullard Avenue. These results are found in **Appendix F**. Based on this testing, the lower stabilized percolation rate was found to be 1.4 inches per hour. Knowing that the depth of the retention basins will be 3 feet, it was determined that it will take at most 26 hours for the retention basins to drain following a storm event. This meets the requirement from the City of Surprise Storm Water Standards, which states that all retention basins shall be designed to dissipate within a 36-hour period. Additionally, these finding indicate that drywells are not necessary for the proposed retention basins.

With the lots north of Greenway Road not being developed yet, the retention basins may experience siltation. This could lead to clogging of a drywell if it was to be installed. Additionally, the owner of the northern lots may decide to move some of the proposed basins once he develops the property. If the basins are moved, the drywells will need to be removed. It is for the reasons stated above that GHD has is requesting a variance from the standard requirement of installing drywells in the retention basins, which was granted.

3.2.5 Onsite Retention Summary

The proposed retention volume will be retained by two basins. One basin will be located east of Surprise Center Parkway, and the other will be located on the west. The volume of runoff collected by each basin is shown on **Table 7** on the next page, as well as other characteristics. Additionally, **Table 7** specifies which sub-basins from the drainage exhibit in **Appendix A** contribute to each basin.

Appendix F – Percolation Test Results

Cardno
Shaping the Future

August 26, 2015

Cardno

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Mr. Michael Janes, P.E.
GHD
4747 N 22nd Street, Suite 200,
Phoenix, AZ 85016

Re: Shallow Percolation Testing
Greenway Rd/Bullard Ave-Litchfield Rd
Surprise, AZ
Cardno Project No. 1053150062

Mr. Janes:

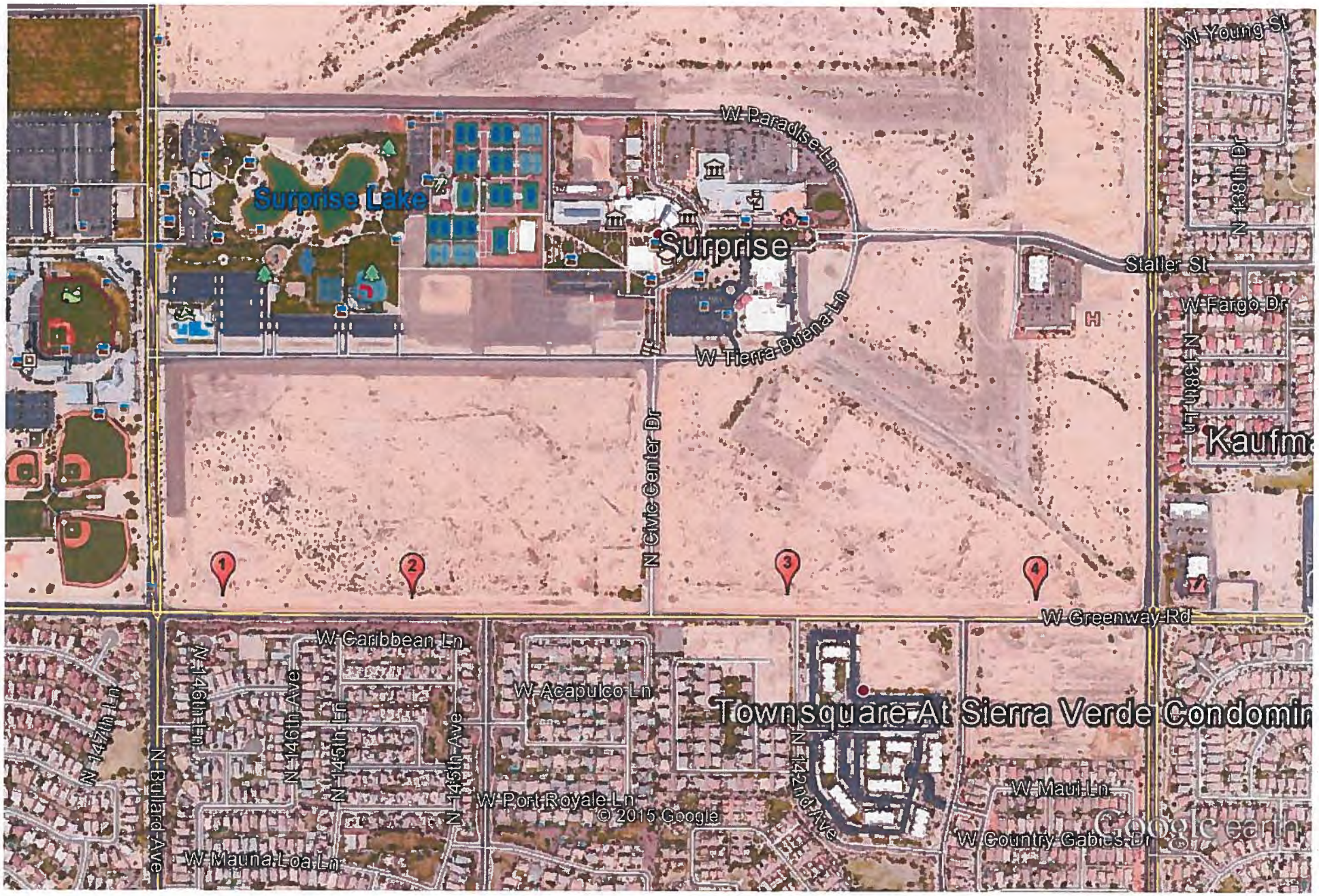
It is understood that a continuous storm water retention basin is to be constructed on the north side of Greenway Road between Litchfield and Bullard Roads as part of other improvements to Greenway Road. Based on an assumed basin depth of 3 feet below existing grade, four double ring infiltrometer percolation tests were performed, and four soil borings drilled, in accordance with City of Surprise guidelines and the Flood Control District of Maricopa County Drainage Design Manual.

The following stabilized rates (not de-rated) were achieved at each location:

Test Location	Stabilized Percolation Rate (in/hr)
P-1	1.4
P-2	2.9
P-3	2.1
P-4	2.9

At location P-3, we were unable to maintain a steady water level due to relatively rapid infiltration. Some 60 gallons of water was introduced into the test area over a relatively short period of time. Accordingly, we varied from the specified method and measured the drop in water level over time to establish a percolation rate that appears to be in line with the other tests results.

The test locations, bore logs, and percolation data field sheets are attached.



Google earth

feet 4000

km 1

Greenway Rd/Litchfield to Bullard Percolation Tests

APPENDIX C

Excerpts from City of Surprise and Maricopa County Drainage Policy Manuals regarding storage basin disposal and drywells

CHAPTER 5 – STORM WATER STANDARDS

5.1 GENERAL INFORMATION

1. The purpose of this document is to provide guidance and standards for the City of Surprise (the city) storm water system requirements in conjunction with the following documents: Maricopa Association of Governments (MAG) Standards, City of Surprise Preliminary and Final Drainage Report Guidelines as published in Appendix 5-3, City of Surprise Underground Retention/Detention Systems Standards and Specifications as published in Appendix 5-4, the Drainage Design Manuals as published by the Flood Control District of Maricopa County (FCDMC) which includes Hydrology, Hydraulics, and Erosion Control, and the FCDMC Wittmann Area Drainage Master Plan Rules of Development. Refer to Chapter 10 for additional information regarding inspection procedures.
2. Any deviation from these standards shall require prior written approval from the city following the Engineering Standards Modification Request procedures explained in Chapter 1, Section 1.5.
3. The standards contained in this section are intended to expand upon and supplement information contained in the SUDC.
4. All developments within the city shall provide such storm drainage facilities as are necessary to ensure that all structures and properties, both within the development and those located upstream and downstream of the development, shall be protected from adverse impacts of storm waters due to the proposed and constructed development.
5. Off-site historical flow must be accepted and released from developments essentially at the same locations, including depth, flows and velocities, less than or equal to those encountered under pre-development conditions.
6. In general, development within or modification of the floodplain is discouraged. Development should be located outside of the 100-year floodplain. If development within the floodplain is necessary, approval from the Flood Control District of Maricopa County for Floodplain Use Permit is required.
7. Development within the floodway is prohibited.
8. The City defers to the Maricopa County Drainage Policies and Standards for first flush retention requirements, when applicable.

5.2 DRAINAGE REPORT

1. A Preliminary Drainage Report shall be submitted in support of Preliminary Plats, Site Plans, and Conditional Use Permits.
2. A Final Drainage Report and Conditional Letter of Map Revision (CLOMR), when required, shall be submitted in support of all civil plans and final plats. Endangered Species Act compliance documentation to FEMA is required prior to the issuance of any CLOMR (see FEMA Procedure Memorandum 64).

5.7 OPEN CHANNELS

1. Where man-made channels are required, the emphasis should be placed on a "natural" appearance with non-erosive velocities or appropriate erosion protection per the Drainage Policies and Standards for Maricopa County, Arizona.
2. All channelization within regulatory floodplains must be designed so that the cumulative effect of all new development does not raise the 100-year water surface elevation by more than one foot. The one-foot rise in water surface may not occur at the sole expense of the adjacent property.
3. See Table 5-1 for allowable channel side slopes.
4. Channels shall be a minimum of eight feet wide at the bottom.
5. Channels shall not encroach into utility easements or right-of-way.

5.8 STORM INLETS

1. Catch basins or scuppers are required to convey water from a public street to a retention basin or storm system. Depressed curb shall not be utilized as a method to convey flows from a public street.
2. Catch basins are to have curb-opening inlets. Catch basins with grates are not allowed within the right-of-way. Scuppers are also not permitted within the right-of-way in conjunction with detached sidewalks.
3. Per the City of Surprise Details 5-01 to 5-02, the contractor shall identify all new catch basins, scuppers, and headwalls with a storm drain inlet marker inset into the wet concrete during construction. Two-part epoxy shall only be used to attach storm drain inlet markers to existing drainage structures.
4. Catch basins located within commercial or industrial developments that handle, store, dispense, sell, recycle, or dispose of motor vehicle fuels or lubricants shall be designed to include storm drain inlet protection best management practice devices as identified in the FCDMC Drainage Design Manual.

5.9 RETENTION / DETENTION FACILITIES

1. Storm water from a 100-year, 2-hour storm event that falls on the parcel being developed, including the respective one-half of all abutting streets, shall be retained within the boundaries of the parcel being developed.
2. The required retention volume is to be computed using the following formula:

   $V = (C \cdot P \cdot A) / 12$

   Where:

   V = volume in acre-feet
   C = average runoff coefficient per FCDMC Hydrology Manual.
   P = rainfall depth in inches, for the 100-year, 2-hour storm per FCDMC Hydrology Manual Appendix A.
   A = area in acres
3. All retention basins shall have a maximum designed depth of three feet.

4. All retention basins shall have a clearly defined positive method of outfall regardless of proposed depth. Surface percolation is explicitly not approved as a sustainable method of positive outfall.
5. All retention basins shall be designed to dissipate within a 36-hour period.
6. Turfed areas are only allowed in designated active recreation areas or within a designated bioswale.
7. Ultimate outfall from the basin must be provided for events causing flows in excess of the 100-year event flow.
8. Maximum side slopes shall be as shown in Table 5-1 below.

Table 5-1 Side Slopes for Basins and Channels

Location Description	Side Slope
Side slopes adjacent to public or private sidewalks or where there is pedestrian-type access within ten feet of that portion of the basin	6:1
Side slopes adjacent to walls, fences, hedges, etc. (i.e., limited or no pedestrian-type access to that area)	4:1

9. The Engineer is to consider potential landscaping to account for the retention basin final volume calculations.
10. Erosion protection shall be provided at all basin inlets/outlets per FCDMC Drainage Design Manual, Erosion Control.
11. Retaining walls (i.e. vertical slopes) may be used in areas adjacent to permanent walls, fences, etc.
12. Retention/detention in parking lots is not allowed.
13. Retention/detention facilities shall not encroach into easements for private utilities without written approval of the encroachment from all companies with utilities within the easement.
14. Retention/detention facilities shall not encroach into public rights-of-way or into public easements.
15. The top of retention/detention facilities shall be at least ten horizontal feet from any building or public right-of-way.
16. The ultimate outfall of all drainage from a development must be a public street, storm drain, drainage channel, or natural watercourse. If such an outfall does not exist, the project must provide an outfall.
17. Underground retention must follow the City of Surprise Underground Retention/Detention Systems Standards and Specifications as published in Appendix 5-4.
18. Surface retention is not required on single-family residential lots under one acre in size and is discouraged on daycare playgrounds.
19. When site walls are also being used for one side of the retention basin, the frontage part of the wall can be a maximum of five feet high on the retention side.

20. Buildings adjacent to retention basins are to have finish floors a minimum of one foot above the 100-year, 2-hour water surface elevation.

21. Offsite storm runoff should not be routed into or through onsite storm water storage facilities.

22. No more than 50% of a project's primary frontage shall be utilized for retention.

23. Private utilities installed beneath retention/detention basins (if permitted) shall have a minimum of 30 inches of cover.

24. Drywells are required for any depth of retention in excess of one foot and for retention basins that have volume greater than 1,000 cubic feet. Basin bottom percolation shall not be used to reduce the volume used for drywell requirement calculations.

25. Dual chamber drywells are required for all storm water retention applications.

26. Drywells shall be installed according to ADEQ guidelines and shall also be registered with ADEQ by the property owner.

27. Drywells shall be maintained by the land owner or the association formed by the owner.

28. For drywells associated with surface retention basins, a maximum design percolation rate of 0.5 cubic feet per second (cfs) per dry well shall be used in calculating the number of dry wells required. For drywells associated with underground storage systems, a percolation rate of 0.1 cfs per drywell shall be used.

29. The drywell volume shall not be considered in the design calculations for sizing retention/detention.

30. Multi-chamber drywells such as the Envibro System or approved equal are required for fueling stations. A maximum percolation rate of 0.1 cfs may be used for these systems.

31. Drywell rim elevations shall be set a minimum of 0.3 feet above finish grade of basin bottom.

5.10 DETENTION FACILITIES

1. Natural drainage-ways convey flood water and are used for trails and open space corridors. The consideration to maintain natural vegetation and wildlife habitat is an important element that contributes to the sustainability of the land.

2. Natural drainage-ways shall remain in as natural state as is practicable with any modifications proposed, including any erosion mitigation measures.

3. New developments' pre-development and post-development storm water flows that directly outfall into natural drainage-ways shall limit peak flows from both the 10-year and 100-year storm event to the project site pre-development conditions via design of detention facilities.

4. Detention Basin Standards include:

    a. Detention basin outlet capacity shall not increase downstream channel capacities in the pre-development condition.

    b. Embankment protection of the detention basin shall be considered for each basin. See FCDMC Drainage Manual, Erosion Control for protection measures.

    c. Off-channel detention basins shall be required.

    d. Detention basins shall be designed to dissipate within 36 hours of the storm event.

    e. All detention basins shall have emergency spillways which safely pass the 100-year storm event without compromising the structural integrity of the facility or diverting flows from their historic drainage pattern.

    f. A minimum of one foot of freeboard is required above the emergency spillway.

    g. Allowable peak discharge shall be not greater than the pre-development 100-year, 2-hr storm event flows.

5.11 DRAINAGE EASEMENT

Refer to the SUDC Chapter 122 for dedication of drainage easements.

5.12 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) CHECKLIST

Owners, developers, engineers, and/or contractors are required to prepare a Storm Water Pollution Prevention Plan (SWPPP) for developments within the City of Surprise with a disturbed area of one acre or greater, or are part of a common plan of development or sale that will ultimately disturb one or more acres. Appendix 5-1 contains a checklist for the preparation of a SWPPP.

2. Drop structures having loose riprap on a sloping face are discouraged for private development and prohibited within District right-of-way due to a high failure rate and excessive maintenance costs.

3. Open channels are recommended in lieu of pipes for conveyance of low flows through drop structures. Pipes may plug or frequently overtop, leading to additional maintenance problems. Pipes, if approved for conveying low flows through drop structures, should be no smaller than 24 inches in diameter.

Standard 6.9.4 Aesthetic Treatment Requirement. Where hydraulic structures are located within or adjacent to undisturbed or naturalistic drainageways, the structures should have aesthetic treatment to match the surroundings. Trash racks should have an exterior color to match the surrounding native soil.

Standard 6.9.5 Levees. The use of levees is strongly discouraged and must be approved in concept by County/District prior to beginning design. Levees shall be designed to meet FEMA and USACE requirements for certification by both agencies.

Additional standards pertaining to hydraulic structures are listed in Section 6.2, Public Safety.

6.10 STORMWATER STORAGE

The analysis and design of stormwater storage facilities shall be to the following minimum standards:

Standard 6.10.1 Construction Plans. Construction plans for stormwater storage drainage improvements are to meet the requirements of Section 6.15 and the DDM (all three volumes).

Standard 6.10.2 Minimum Design Storm. All new developments, regardless of lot size, shall make provisions to retain the stormwater runoff from a 100-year, 2-hour duration storm falling within its boundaries. On-lot retention is permitted (but not encouraged) only if the lots are greater than one (1) acre in gross area. On-lot retention is not permitted for lots less than one (1) acre in gross area.

Standard 6.10.3 Sediment Storage Requirement. Sedimentation basins, which may be required, are to be located at the upstream (inlet) portions of stormwater storage facilities. The sediment settling basins shall be easily accessible by maintenance equipment (such as backhoes) and should have a minimum storage volume equivalent to the 2-year watershed sediment yield, in addition to the 100-year, 2-hour stormwater runoff volume required for the stormwater retention basin.

Standard 6.10.4 Detention Basin Requirements. The use of a detention basin in lieu of a retention basin is not allowed without an approved variance in accordance with the Drainage Regulations. In the special case when a variance from the requirement to retain the 100-year 2-hour runoff volume is approved, the stormwater quality requirements must still be met. In addition, post-development peak discharges may not exceed pre-development peak discharges

for the 2-, 10-, 50-, and 100-year storm events for the design of detention basins. First flush water quality criteria per Policy 3.6.6 requirements must be met. Possible special cases where detention basins may be considered are as follows:

1. A major drainageway or watercourse is available to accept runoff from the subject site that has sufficient hydraulic capacity to safely convey the 100-year pre-development peak discharge. To be approved: 1) watershed timing issues must be studied and determined to not be an issue for downstream properties, 2) system sediment balance must not be significantly affected, and 3) cumulative impacts of applying such a policy throughout the watershed must not be detrimental to public safety or property.

2. An approved Area Drainage Master Plan for the area states application of detention basins is acceptable.

3. Riparian vegetation in a downstream watercourse would be adversely affected by application of the retention basin policy.

Standard 6.10.5 Retention Volume Calculations. Retention basin volume calculation shall be by the following equation:

$$V = C\left(\frac{P}{12}\right)A \qquad (6.4)$$

where:

V = calculated volume in acre-feet,
C = Runoff coefficient (see Section 6.3.2),
P = 100-year, 2-hour rainfall depth in inches; and
A = drainage area in acres.

Standard 6.10.6 Retention Basin Design Requirements.

1. **Depth.** Stormwater retention basins should typically have a maximum water depth of 3 feet for the 100-year, 2-hour storm event. Deeper water depths for the design event should address safety issues. Refer to Section 6.2 and the Hydraulics volume.

2. **Adjacent to Streets.** The required stormwater retention volume shall not intrude upon the public road right-of-way without the written approval of the governing jurisdiction. The basin side slope should not begin closer than 2 feet from back of sidewalk. If there is no sidewalk, stormwater retention shall begin no closer than 6 feet from the back of curb.

3. **Berms.** Berms are not to be placed closer than 13 feet from the back of the curb, or 8 feet from the back of the sidewalk. Berms are not to be higher than 2-1/2 feet above grade on the downhill side. Berms higher than 2.5 feet require a maintenance agreement that is approved by County/District. Berms must have a minimum top width of 8 feet. A overflow area (emergency spillway) shall be provided in accordance with Standard 6.10.14.

4. **Side Slopes.** Side slopes of stormwater retention facilities are to be no steeper than 4:1 unless prior approval is received for a steeper slope, considering safety issues and

erosion control. Stormwater retention basin sides, edges, or top of slopes should be of irregular geometry.

5. **Revegetation.** Basins should incorporate native materials (including native stone and boulders) and be revegetated in a manner consistent with the engineering intent of the facility and conducive to maintenance activities.

Standard 6.10.7 Within Parking Lots. The maximum depth of ponded water within any parking lot location shall be 1 foot. Parking lot retention areas shall not be adjacent to buildings and not be sited in travel lanes. No more than 25% of the parking lot area may be used for stormwater storage. The minimum longitudinal slope permitted within parking lot storage facilities is 0.005 ft/ft, unless concrete valley gutters are provided. With concrete valley gutters, a minimum longitudinal slope of 0.002 ft/ft may be permitted.

Standard 6.10.8 Rooftop Storage. Rooftop storage is allowed, subject to all other applicable County Building Code requirements.

Standard 6.10.9 Underground Storage. Underground storage is allowed. It shall meet the requirements of Standard 6.10.10.

Standard 6.10.10 Basin Drain Time Requirement. The design of all stormwater storage facilities shall be such that the stored runoff shall be emptied completely from the facility within 36 hours after the runoff event has ended. The preferred method for draining retention basins is by infiltration. The next preferred method is the use of dry wells, or a combination of infiltration and dry wells. These options shall be used unless one or both are not possible due to geologic constraints and/or aquifer protection or groundwater quality permitting issues. If the use of infiltration and/or dry wells is not possible, then disposal options include pumping to an approved facility or gravity bleed-off to the existing surface drainage system. Where bleed-off pipes are to be used as the primary means of draining a retention-type stormwater storage basin, the calculated outlet diameter shall drain the 100-year (design) stormwater storage volume within 36 hours, but in no less than 24 hours. As a part of the design of the bleed-off system, the design engineer shall evaluate and show that discharge flow rate post-development times of concentration do not adversely affect downstream peak discharges. Retention systems using a bleed-off method shall meet the first flush requirements of Policy 3.6.6. The proposed diameter of a basin drain pipe should be rounded up to the nearest standard size made by pipe manufacturers. The minimum allowable pipe size for primary outlet structures is 18-inches in diameter. The maximum bleed-off rate should typically not exceed 1 cfs. To meet this criterion, a permanently attached, hinged orifice plate shall be used, in conformance with Figure 8.5 of the Hydraulics volume. Bleedoff time shall be calculated by the Modified Puls storage routing method. Refer to the Hydraulics manual for example computations.

The required basin drain time may be extended, with prior approval by the County/District, for major storage basins (> 50 acre-feet). Vector control provisions will be one of the requirements for approval of an extended drain time.

Standard 6.10.11 NPDES Requirement. Discharges from stormwater facilities must be in compliance with 40 CFR 122, the National Pollution Discharge Elimination System (NPDES), and the AZPDES.

Standard 6.10.12 Permeability Test Requirement For Retention Basins. Field investigations shall be performed and shall include percolation tests to obtain permeability rates for use in the design of the stormwater storage facility. Procedures used will be accredited methods outlined in ASTM D 3385, Double Ring Infiltrometer (shallow pit percolation testing procedures are not permissible). Such investigations will be performed in the receiving layer below the proposed basin, and will include borings at least 10 feet deep to assure that the soils underlying the basin will not impede infiltration. At least one soil boring and percolation test shall be done for each basin, and one soil boring for every 5,000 square feet of proposed basin floor percolation area. Additional percolation tests may be required if the soil borings indicate less permeable soils are present within the proposed percolation area. The test results are to be de-rated by a factor of 10 to allow for future working conditions in the completed retention facility. The tests shall be performed by a certified testing laboratory, and the results sealed by a civil or geotechnical engineer, licensed to practice in the State of Arizona.

Standard 6.10.13 Drywells. Drywells shall be designed, operated, and maintained in conformance with the most current ADEQ guidelines. ADEQ shallow pit testing procedures are to be used for determining initial design percolation rates. The accepted design disposal rate for a dry well is not to exceed 0.1 cfs per well unless a greater rate can be supported by a constant-head percolation test on a completed well at the site. Should this test reflect a higher value, the results shall be de-rated based on the in-situ soil conditions. A de-rating factor of 2 shall be applied for coarse-grained soils (cobbles, gravels and sands). A de-rating factor of 3 shall be applied for fine grained soils (silts and loams). A de-rating factor of 5 shall be applied for clay soils. These de-rating factors are required to compensate for deterioration of the percolation capacity over time in addition to providing a factor of safety for silting and grate obstruction. It shall be the owner's, or owner representative's, responsibility to clean and maintain each dry well to ensure that each remains in proper working order. Under no condition shall the regular maintenance schedule exceed 3-years. Drywells that cease to drain a retention basin with 36-hours shall be replaced or refurbished by the owner or his representative. Additionally, said maintenance requirements shall be written in the subdivision CC&R's where dry wells are used to drain retention basins. The maximum allowable rate shall not exceed 0.5 cfs per drywell in any case for design purposes. In accordance with ADEQ requirements, the installation of any subsurface drainage structure must be located into a permeable porous strata at least 10-feet above saturated soils and 100-feet away from any water supply well.

Standard 6.10.14 Emergency Spillway Requirement.

1. Emergency spillways shall be provided for all stormwater storage basins. For basins with all the design storage volume situated below existing grade (i.e. without a berm/dam), the spillway may be nothing more than grading to ensure that basin overflows will follow the downstream predevelopment drainage pattern in a safe manner. Refer to Section 3.4.

2. Emergency spillways must be designed to safely convey the peak discharge from the storm listed in Emergency Spillway Design Capacity Requirements, exclusive of the attenuation effects of the basin.

Table 6.15 Emergency Spillway Design Capacity Requirements

For an Embankment Berm/Dam that is not Regulated by ADWR	
Berm/Dam Height	**Spillway Design Capacity**
H < 6 ft.	Unattenuated 100-year inflow
6 ft. <= H < 25 ft.	½ Probable Maximum Flood

where:

Berm/Dam height is the vertical distance from the lowest point along the downstream slope to the crest of the emergency spillway.

100-year inflow is the unattenuated peak discharge from the pre- or post-development 100-year 6-hour or 24-hour storm, whichever is larger.

Refer to Section 4.6 for information regarding dams regulated by ADWR.

3. Emergency spillways shall be designed to convey the design peak discharge and provide erosion protection in accordance with the Hydraulics volume.

4. Down-gradient properties are to be protected from flow depths and velocities in excess of pre-development conditions.

5. A 1 foot minimum freeboard is required between the berm crest and the water surface elevation of the 100-year peak discharge in the emergency spillway (without attenuation from basin storage), except where the berm crest is designed to function as the emergency spillway.

6. The finished floor elevation of adjacent structures must be at least 1.0 feet above the 100-year peak water surface elevation of the flow passing through the emergency spillway.

Standard 6.10.15 Landscaping. Proposed landscaping is to be approved for the stormwater storage area prior to the issuance of a grading permit. The landscaping design should show accommodation for access by commonly used maintenance equipment. Landscaping components should not adversely affect the basin hydrologic and hydraulics functions.

Standard 6.10.16 Maintenance. Stormwater storage basins are to be privately maintained and located within a designated drainage tract.

Additional standards pertaining to stormwater storage are listed in Section 6.2, Public Safety.

6.11 PUMP STATIONS

Standard 6.11.1 Construction Plans. Construction plans for pump station drainage improvements are to meet the requirements of Section 6.15.

Standard 6.11.2 Stormwater Quality Requirement. The requirements of Section 6.4 will be met for stormwater discharge from pump stations.

Standard 6.11.3 Pump Capacity. Pump capacity shall be sufficient to empty the facility within 36 hours. The requirements of Standard 6.10.10 shall be met.

Standard 6.11.4 Clean Water Act. Pump discharges must conform to the requirements of the Clean Water Act or other applicable federal, state and local laws or regulations if discharging into a Water of the U.S., a tributary to Waters of the U.S., or into a District or County-owned structure.

6.12 SEDIMENTATION

Recognizing that sedimentation and sediment transport is either supply or transport control driven (see the Hydraulics volume, Chapter 11, Sedimentation) and that stormwater runoff may produce sedimentation or erosion, the following minimum standards are to be applied.

Standard 6.12.1 Construction Plans. Construction plans for scour and erosion protection drainage improvements are to meet the requirements of Section 6.15.

Standard 6.12.2 Culvert and Bridge Design Requirements. For arterial, collector, and all-weather access streets crossing a distributary flow area or alluvial fan, the following minimum standards shall apply for the design of culverts or bridges:

1. Culverts shall be box culverts, a minimum of 4 feet high (5 feet high is preferred), set to equilibrium grade (inverts may be buried a maximum of 6-inches for sediment continuity, but the minimum clear opening above the channel invert shall be a minimum of 4 feet) . Culverts shall be sized so that the sediment transport capacity of flow does not vary more than 5% from the existing condition.

2. For adjacent watercourses, separated by less than 100 feet, where the natural grade of the watercourses at the culvert inlets are within 12 inches vertically, an equalizer ditch shall be placed on the upgradient side of the road, between culverts. The bottom width shall be no narrower than 5 feet with side slopes no steeper than 25% (4:1).

3. Policy 3.9.7, the requirements of Table 6.7, and Section 6.7 also apply.

flow is safely released and conveyed without increasing flood hazards to adjacent properties and in the same manner and direction as would have occurred under pre-development or historic conditions. Emergency spillways must be designed to convey the unattenuated 100-year peak discharge at non-erosive velocities. For criteria regarding design of emergency spillways for embankments, refer to Section 9.3.3.

Low Flow/Low Level Outlets - For health and safety reasons, stormwater storage facilities must drain within 36 hours for the design storm runoff volume. For stormwater facilities in a series, the cumulative post storm drain time is 36 hours. In addition, the peak discharge from a low flow outlet shall be significantly less than the existing watershed peak discharge for retention facilities. These guidelines form the basis for design. Compliance with NPDES requirements often dictate a third criteria for low flow/low level outlets. Here, the outlet is often designed to retain the first flush and/or the floating hydrocarbon pollutants. In this situation, undershot weirs or inverted siphons may be used. See Section 9.7 for an additional discussion on water quality.

Subsurface Disposal

The primary methods of underground disposal of stormwater runoff at retention facilities are engineered basin floors and drywells. Infiltration rates of basin floors or drywells shall not be used in determining outflow rates in flood-routing procedures.

Engineered Basin Floors - Analysis and design of the bottom of a retention facility intended for subsurface disposal is detailed in *Underground Disposal of Stormwater Runoff Design Guidelines Manual* (USDOT, 1980); refer to that publication for specific design criteria.

Drywells - Drywells may be used for subsurface disposal of stormwater, if approved by the jurisdictional agency, and if criteria such as subsurface strata permeability, groundwater levels and maintenance can be satisfactorily addressed. The main cause of drywell failure is clogging of the transmission media (gravel) by silt and debris. Failure can be avoided by utilizing proper design and installation guidelines, and by following recommended maintenance procedures. Figure 9.6 shows a typical drywell installation, while Figure 9.7 shows examples of surface treatments.

All drywells must be registered with the Arizona Department of Environmental Quality (ADEQ).

FIGURE 9.6
TYPICAL DRYWELL INSTALLATION
(McGuckin Drilling Inc., 1987)

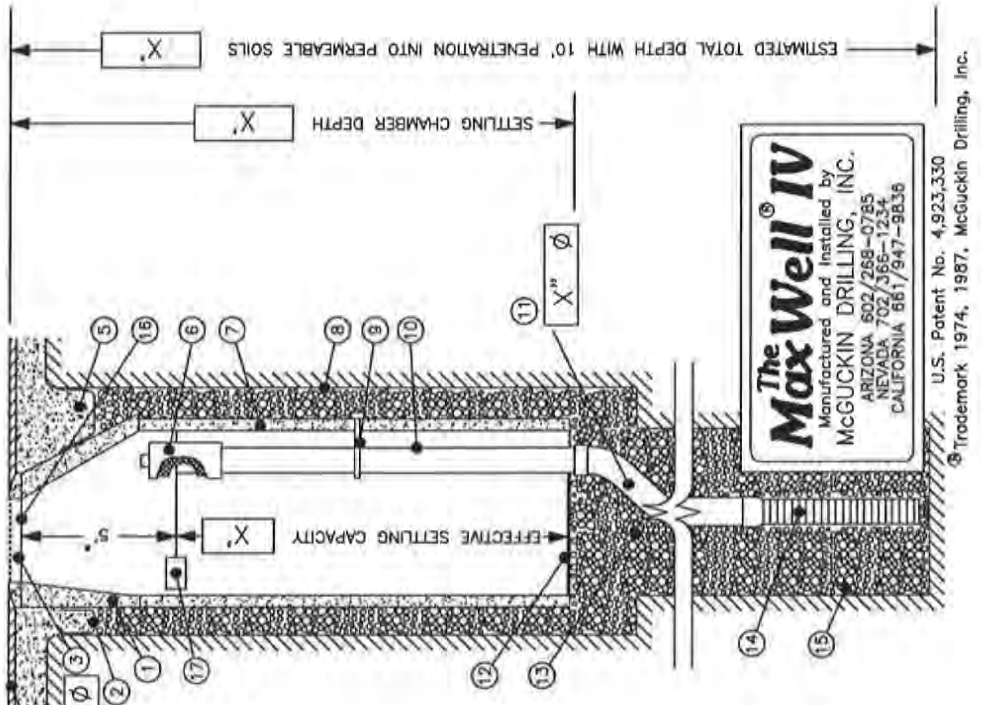
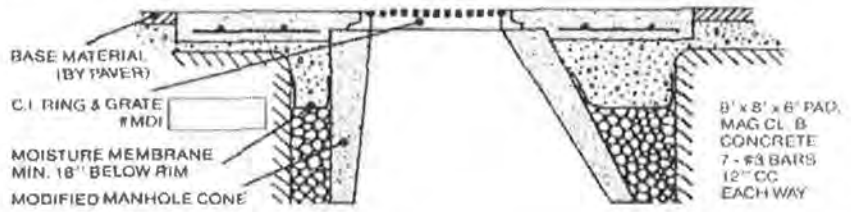


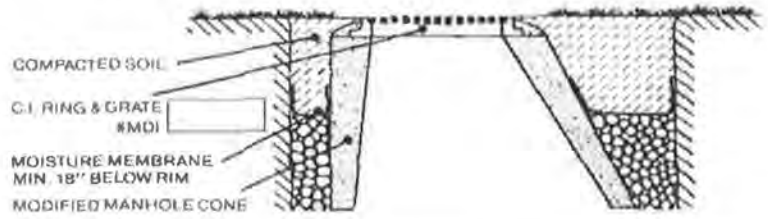
FIGURE 9.7
TYPICAL DRYWELL SURFACE TREATMENTS
(McGuckin Drilling Inc., 1987)

SURFACE TREATMENTS-DRAWING A-B-C OR D MAY BE USED IN PLACE OF THE TOP PORTION OF THE BASIC DRAWING ON PAGE 4, TO ADAPT IT TO THE VARYING SURFACE CONDITIONS SHOWN.

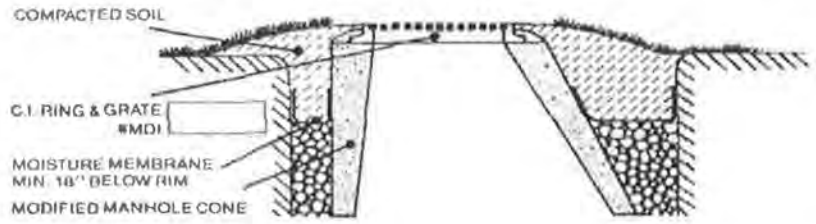
A. Adds a concrete pad for heavy traffic areas.



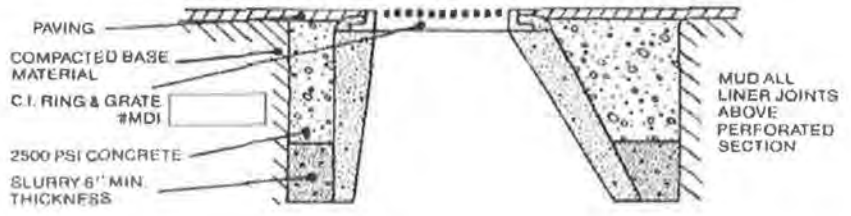
B. For landscaped retention ponds and planters. No paving or pad. In areas where silt might flow to drywell, use C.



C. Use in landscaped retention/detention basins or where heavy silt flow is anticipated. Height should be 4"±.



D. A special design where unstable soil conditions could cause surface subsidence. Also installed with connecting pipes and trenches.



The following list of general requirements and criteria shall be used in the design and construction of engineered basins and drywells (or other methods of subsurface disposal of stormwater). In addition, the engineer is referred to specific policies and standards of the applicable jurisdictional agency.

- Field investigations shall be performed and shall include soil borings and percolation tests taken at the bottom of the proposed basin to obtain percolation rates for use in the design of the stormwater storage facility. Procedures used should be one of the following two methods, listed by order of preference:

  1. ASTM D 3385-03, Double Ring Infiltrometer. If the soils present are outside the accepted range for application of ASTM D 3385-03, then method 2 shall be applied. Soils outside the acceptable range for ASTM D3385-03 are typically very pervious or very impervious with a saturated hydraulic conductivity greater than about 14 inches/hour or less than about 0.0014 inches/hour. Very impervious soils that are outside the range of applicability for ASTM D3385-03 are not suitable for stormwater percolation disposal system applications. Dry wells may be a better choice for these conditions. If there is a question regarding the applicability of this method for the soils at a particular site, ASTM D 3385-03 should be applied and the results checked against the acceptable range of values of hydrologic conductivity. ASTM D 3385-03 may also not be applicable for dry or stiff soils that will fracture when the rings are installed, or gravels that do not allow penetration by the rings.

  2. EPA Falling Head Percolation Test Procedure from *Design Manual - Onsite Wastewater Treatment and Disposal Systems* (EPA, 1980).

  A minimum of two (2) tests are required per retention basin. Refer to the Policies and Standards manual of the jurisdictional entity for the type and total number of tests required. The recommended testing frequency, based on the basin bottom area proposed for percolation, is listed in Table 9.1. Each test should include one soil log hole and one percolation test. Each soil log boring hole should extend at least 10-feet below the bottom of the proposed basin. A soil horizon log should be prepared for each boring to obtain the approximate soil texture of each soil layer (horizon) observed and to identify soil horizons that may impede percolation.

TABLE 9.1
MINIMUM QUANTITY OF SOIL LOG HOLE/PERCOLATION TESTS REQUIRED

Retention Basin Bottom Area (A_p) (sf)	Minimum Number of Tests Required
$A_p < 10,000$	2
$10,000 \leq A_p < 20,000$	3

TABLE 9.1
MINIMUM QUANTITY OF SOIL LOG HOLE/PERCOLATION TESTS REQUIRED

Retention Basin Bottom Area (A_p) (sf)	Minimum Number of Tests Required
$20,000 \le A_p < 30,000$	4
$30,000 \le A_p < 43,560$	5
$A_p > 43,560$	A minimum of 5. Additional percolation tests may be required if the soil borings indicate variation in soil texture within the proposed percolation area.
The tests should be distributed evenly throughout the retention basin using engineering judgment. For example, when 5 tests are required, the typical distribution assuming a square basin would be a test in each corner and one in the middle.	

Field percolation test values should be reduced by a safety factor when designing any percolation facility (Stahre and Urbonas, 1990). This is necessary because soils will tend to clog with time, which has proven to be a significant cause for basin failure to drain within 36-hours in Maricopa County. The de-rating factors for Method 2 (EPA, 1980) should include negation of sidewall percolation and a higher degree of uncertainty in the results when using this approach. Recommended de-rating factors are shown in Table 9.2. The selected percolation rate should then be de-rated using Equation (9.2). The tests shall be performed by a testing laboratory, and the results sealed by a civil engineer, licensed to practice in the State of Arizona. Stormwater disposal by percolation is not recommended if the percolation rate, after application of the de-rating factor, is less than 0.5 inches per hour. Stormwater disposal by percolation is also not recommended if groundwater or an impermeable layer is encountered within 4-feet below the bottom of the basin.

$$P_d = \frac{P_r}{D_r} \tag{9.2}$$

Where P_d is the design percolation rate in inches/hour, P_r is the lowest measured percolation rate in inches/hour, and D_r is the de-rating factor.

Basin drain time is estimated by using Equation (9.3).

$$T_d = \frac{V}{A_p \frac{P_d}{12}} \tag{9.3}$$

Where T_d is the retention basin drain time in hours, A_p is the percolation area of the basin bottom in acres, P_d is the design percolation rate in inches/hour, and V is the retention basin design storage volume (100-year, 2-hour) in acre-feet.

Only the bottom area of the retention basin may be used for computing the basin drain time by infiltration/percolation. The side slope areas shall not be used in the drain time computation unless the basin configuration is "V" shape without a flat bottom. For a "V" shaped basin without a flat bottom, the bottom area assumed available for percolation is recommended to be computed using Equation (9.4).

$$A_p = \frac{(D/3)(SS_L + SS_R)L}{43,560} \tag{9.4}$$

Where D is the design ponding depth in feet, L is the length of the basin in feet, and SS_L and SS_R are the left and right basin side slopes in feet horizontal per foot vertical.

TABLE 9.2
RECOMMENDED MINIMUM PERCOLATION DE-RATING FACTORS
(FOR RETENTION BASIN DESIGN)

Condition	De-Rating Factor				
		Method 2 (by test hole diameter)			
	Method 1	6-inch	8-inch	10-inch	12-inch
No groundwater or impermeable layer is encountered within 10-feet below the bottom of the basin, and the soils are of similar texture to those where the percolation test is taken. The geotechnical engineer may specify a higher de-rating factor based on analysis of the soil conditions below the basin bottom.	2	10	8	7	6
Groundwater or an impermeable layer is encountered within 4-feet to 10-feet below the bottom of the basin.	4	20	16	14	12

- Drywells shall be designed, operated, and maintained in conformance with the most current ADEQ guidelines. EPA (1980) procedures may be used for estimating initial design percolation rates. The final design rate is recommended to be based on a constant-head percolation test performed on each completed well at the site. Refer to the Policies and Standards of the jurisdictional agency for design standards for drywells. The test results for each well should be de-rated based on the in-situ soil conditions. A de-rating factor of 2 is recommended for coarse-grained soils (cobbles, gravels and sands). A de-rating factor of 3 is recommended for fine grained soils (silts and loams). A de-rating factor of 5 is recommended for clay soils. These de-rating factors are required to compensate for deterioration of the percolation capacity over time in addition to providing a factor of safety for silting and grate obstruction. The accepted design disposal rate for a dry well, after application of the de-rating factor, should not be less than 0.1 cfs per well. The maximum allowable rate, after application of the de-rating factor, is not recommended to exceed 0.5

cfs per drywell for design purposes. It is the owner's, or owner's representatives', responsibility to clean and maintain each dry well to ensure that each remains in proper working order. The regular maintenance schedule is not recommended to exceed 3-years. Drywells that cease to drain a retention basin with 36-hours should be replaced or refurbished by the owner or his representative. Maintenance requirements are to be written in the CC&R's for subdivisions where dry wells are used to drain retention basins. In accordance with ADEQ requirements, the installation of any subsurface drainage structure must be located into a permeable porous strata at least 10-feet above saturated soils and 100-feet away from any water supply well.

- A test well shall be installed for any retention facility utilizing drywells for stormwater disposal. Upon approval of performance, adjusted as presented above, this test well may then be used as one of the functioning drywells within the retention facility.

- The design of a drywell must include provisions for trapping sediment within a settling chamber. The system shall use a floating absorbent blanket or pillow to enhance the removal of petroleum-based organics floating on the water. A hydrophobic petrochemical absorbent with a minimum capacity of 100 ounces per chamber is recommended. This measure will significantly increase both the efficiency and useful life of the well. Once a year, at a minimum, the settling chamber should be inspected, and it should also be inspected after any major inflow to the drywell. Sediment shall be removed from the chamber at such time that approximately 15 to 20% of the original volume of the chamber is filled. All sediment removed from a settling chamber shall be disposed of either at an authorized sanitary landfill or at any other suitable location approved by the governing jurisdiction.

- Infiltration rates of drywells shall not be used in determining outflow rates in flood-routing procedures. Any retention facility which relies solely upon infiltration as its method of drainage shall be sized to contain the maximum storage volume that would be required without considering an outflow rate.

- Disposal methods using infiltration shall not be permitted for stormwater runoff which carries significant concentrations of sediment. This includes stormwater runoff flowing through sand bed channels, as well as stormwater runoff emanating from a predominantly natural watershed.

- During site development, all drywells shall be securely covered with filter cloth or other material to prevent the introduction of excessive sediment into the settling chamber.

- Retention of runoff emanating from industrial developments and infiltration of runoff to the subsurface will be handled on a case-by-case basis by the appropriate reviewing agency subject to water quality concerns.

- Runoff stored in a retention facility shall be completely drained from the facility within a maximum time period of 36 hours after the runoff event has ended. Drywells that cease to drain a facility within the 36-hour period shall be replaced by the owner with new ones, unless an alternate method of drainage is available.

Table 6.7 Minimum Drainage Design Criteria

Drainage Feature	Peak Frequencies	
	2-year through 50-year	100-year
STORMWATER STORAGE BASINS		
Retention Basin	N/A	100-year 2-hour storm for determining stormwater storage volume.
Detention Basins are STRONGLY discouraged and may only be used if specified by an adopted ADMP/WCMP or with special approval by the County Drainage Review Board or the District Board of Directors.	2-, 10- and 50-year peak discharge: Q_{post} reduced to < Q_{pre}	Q_{post} reduced to < Q_{pre}

6.4 STORMWATER QUALITY

The following minimum standards will be utilized for protection of stormwater quality in Maricopa County.

Standard 6.4.1 **First Flush.** Discharges into a structure owned or operated by the District must comply with Policy 3.6.6 First Flush, and County-wide all discharges may be required to meet the First Flush requirements of Policy 3.6.6 by providing stormwater runoff control (Policy 3.11.1). The First Flush requirement can be addressed by retaining the required minimum First Flush volume, treating the first flush discharge, or utilizing a combination of both approaches.

The minimum First Flush volume is calculated as follows:

$$V_{FF} = C\frac{P}{12}A \qquad (6.1)$$

where:

V_{FF} = minimum First Flush volume in ac-ft,
C = runoff coefficient (set = 1),
P = first 0.5 inches of direct runoff, and
A = area of project site, in acres.

The minimum First Flush treatment discharge is calculated as follows:

$$Q_{FF} = CIA \quad (6.2)$$

where:

Q_{FF} = minimum First Flush discharge in cfs,
C = runoff coefficient (set =1),
I = 0.5 inches/hour rainfall excess intensity (0.5 inches of direct runoff in 1st hour), and
A = area of project site, in acres.

Example: Calculate the volume for a stormwater storage basin that must be constructed to capture the first flush from a commercial site with 100 acres of developed area. Also calculate the discharge that must be treated if the storage option is not selected.

V_{FF} = 1.0*(0.5/12 ft)*100 acres

V_{FF} = 4.17 ac-ft

Q_{FF} = 1.0*(0.5 in/hr)*100 acres

Q_{FF} = 50 cfs.

6.5 STREET DRAINAGE

The conveyance of stormwater in a roadway is influenced by the typical roadway cross-section, cross-slope, longitudinal slope and roadway material. The following are standards to be used in the evaluation of roadway conveyance:

Standard 6.5.1 Construction Plans. Construction plans for street drainage improvements are to meet the requirements of Section 6.15 and the MCDOT Roadway Design Manual.

Standard 6.5.2 Building Finished Floor Elevations. Refer to Table 6.7, Section 5.2 and Section 5.3.

Standard 6.5.3 Sizing Inlets and Laterals. Runoff calculations for the sizing of inlets and lateral connection pipes shall be based on acceptable hydrologic criteria.

Standard 6.5.4 Manning's n-value. A Manning's n-value of 0.015 shall be used for paved street flow unless special conditions exist.

Standard 6.5.5 Inverted Crowns. The use of inverted crown roadways is not permitted within County/District right-of-way.

Standard 6.5.6 Valley Gutters. Valley gutters will only be allowed between intersections on local streets. The minimum slope for valley gutters shall be as defined in the MCDOT Roadway Design Manual.

Appendix D

Beck Consulting Engineers Letter, June 15, 2017

beck
consulting engineers

Memorandum

Date: June 15, 2017

To: City of Surprise

Attn: Karl Zook, P.E.

cc: Scott Phillips, Carefree Partners
Len Erie, Erie and Associates, Inc.

From: Mark W. Beck, P.E.

Re: Master Drainage Study for Surprise Civic Center Meeting Summary

---

Regarding our meeting on June 6, 2017, I appreciate your time. Per our discussion, it was recommended that we proceed with the findings and conclusions as stated in the Master Drainage Study for Surprise Civic Center prepared by Dibble Engineering dated August 26, 2016. Specifically, the City at Surprise site would be developed in accordance with Scenario 2. Scenario 2 provides for:

- retention of the first flush storage volume;
- onsite detention of approximately 90% of the typically required retention volume; and
- basin discharge cannot be greater than approximately 10% of the 100-year inflow.

Additionally, it was requested that basins be allowed to exceed three feet (3') depth in order to provide more efficient, linear basins that would provide green space and an amenity. A total eight feet (8') depth is requested. Basins in excess of three feet (3') depth will provide adequate access for pedestrians and maintenance as approved by the City Engineer.

It was further discussed that the study prepared by Erie and Associates, Inc. would be reviewed further with Maricopa County Flood Control District (MCFCD) and City Staff to address preliminary review comments and that this study would be considered for adoption as the Master Study for the City at Surprise development subject to addressing MCFCD and City Staff concerns. It is anticipated that this study would further reduce detention required from the 90% of typically required volume outlined above. Concerns expressed and items for review include but are not limited to methodology or model used and runoff coefficients. It was expressed that the methodology utilized in the Erie and Associates study is more appropriate for modelling than originally anticipated by MCFCD and may be utilized going forward to try and obtain a retention requirement in-between what was established by the Dibble Study and what has been currently established by Erie and Associates. The City has also stated that establishing further detail of the City Center that includes more specific drainage assumptions, i.e. more defined land use, major drainage pathways, etc. would help in establishing a more comprehensive drainage study to relieve the need to constantly update the study every time a new development has occurred.

beck
consulting engineers

Subject to the increased basin depth and review and consideration of the study prepared by Erie and Associates, Inc., we have no objection to the adoption of the Master Drainage Study for Surprise Civic Center as the approved study for the balance of the City at Surprise until such time as review and approval of the Erie and Associates Study is completed.

I appreciate your time and consideration with regards to this matter. If you have any questions or need additional information please do not hesitate to contact me.

Mark Beck

Mark Beck

2942 NORTH 24TH STREET #114 • PHOENIX, AZ 85016
PHONE 602.943.6200 • FAX 602.943.6201 • beckcon.com

SURPRISE
ARIZONA

Public Works Department
16000 North Civic Center Plaza
Surprise, Arizona 85374
Phone 623-222-6000

July 11, 2017

Scott Phillips
SCDC
11811 N. Tatum, suite 4052
Phoenix, 85028

Dear Scott,

The City and SCDC have come to a mutual agreement regarding the Dibble Master Drainage Study dated July 11, 2017, for the Surprise City Center. This study fulfils the requirements pertaining to a Drainage Study as outlined in the Compromise Settlement Agreement dated May 5, 2016, specifically Paragraph 7 *Drainage Study*, which provides in pertinent part that:

> *The City and SCDC agree to cooperate with regard to performance of a mutually acceptable drainage study with regard to the drainage channel and detention basins and the utilization thereof by the City and SCDC.*
>
> *The City and SCDC will work together on a master drainage plan for the Property and the property owned by the City. This will include provision for off-site and on-site water flows, including, but not limited to, retention/detention and eventual drainage flow out of the Greenway and Litchfield channels to the Aqua Fria River.*

Please acknowledge Surprise Center Development Company's acceptance of the Drainage Study and concurrence that both parties have satisfied their respective obligation under Paragraph 7 of the Compromise Settlement Agreement, as will the City, by signing below.

Thanks,

Karl F. Zook, P.E.
Assistant Director/City Engineer
16000 N. Civic Center Dr.
Surprise, AZ 85374-7470

Scott Phillips
SCDC
11811 N. Tatum, suite 4052
Phoenix, 85028

SURPRISE CENTER FISCAL IMPACT ANALYSIS

July 2017

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List of Tables

Report Considerations and Limiting Conditions

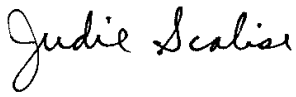
The City of Surprise retained the consulting services of ESI Corporation to prepare this report. ESI Corporation was founded in 1990 and is a multi-disciplinary real estate services and economic development consulting firm. With corporate offices in Scottsdale, Arizona, ESI offers a broad range of real estate, economic research, advisory and predevelopment planning services to a clientele consisting of both public and private sector organizations.

The founder and Principal of ESI Corporation, Judie Scalise brings more than 25 years of professional experience in the areas of economic development, fiscal impact and market analysis. She has directed numerous consulting assignments consisting of economic and fiscal impact studies, land economics research, and market feasibility. She holds a Bachelor of Science Degree in Public Management and Policy from the University of Arizona, School of Government and Public Policy and is a graduate of the Economic Development Institute at the University of Oklahoma.

This report is subject to the following considerations and limiting conditions:

- Findings of the report are based on the land use assumptions provided by SCDC.
- The findings represent the considered judgment of ESI Corporation based on the facts, analyses and methodologies described in the report.
- The study is intended to be read and used as a whole and not in parts.
- Analysis is based on currently available information and estimates and assumptions about build-out of Surprise Center.

Submitted by:



Judie Scalise Principal
ESI Corporation

Executive Summary

The City of Surprise has retained the services of ESI Corporation to conduct this fiscal analysis to estimate future tax revenues resulting from the development of the Surprise City Center development through the year 2030. An agreement between Surprise Center Development Company (SCDC) and the City of Surprise allows for cost reimbursement of installation of public infrastructure. The maximum reimbursement is 50% of the tax revenue generated from construction and retail taxes, which stem from the development of preferred land uses within City Center, as stipulated in the development agreement.

A variety of assumptions were utilized in preparing the Surprise Center fiscal impact analysis. Some of the assumptions come from SCDC's possible development schedule, while others include construction costs per square foot, retail sales per square foot, retail and office lease rates, percent of building occupancy, and lodging rates. All of the assumptions utilized in this analysis are noted in the Overview section of this report.

At the end of 2030, the Surprise Center will consist of nearly 3 million square feet of Preferred Land Uses (PLU) and Non-Preferred Land Uses (non PLU) space, within 402 acres. The mix of land uses consists of commercial, office, medical, 4,375 multi-family residential units, and 5 hotels totaling 840 rooms.

This analysis estimates construction and retail sales tax revenue through the year 2030, as well as other tax categories including occupancy, lodging and property taxes. The total tax revenue generated for all tax categories within the PLU amounts to $147.7 million. In addition, non PLU were also calculated to provide the City with an understanding of the potential tax revenue that could be generated for the entire proposed project. The non PLU generates an additional $24 million of tax revenue for a combined total of $171.8 million through 2030.

Eligible tax revenue for reimbursement of public infrastructure includes 50% of construction and retail taxes resulting from the PLU's. The table below summarizes eligible tax collections and the value of reimbursement, which totals $58.4 million. Per the development agreement, public infrastructure includes water, sewer and roads. In addition, plan review and building permit fees can be included as eligible expenses for reimbursement. The city staff has estimated the value of public infrastructure and fees at $24.8 million.

Tax Category	Total TPT Collections	50% Reimbursable		2017-2021	2022-2026	2027-2030
Construction	$22,781,666	$11,390,833		$1,558,044	$5,007,177	$4,825,612
Retail	$58,427,727	$29,213,863		$2,770,564	$11,173,146	$15,270,153
Restaurant/Bars	$14,250,150	$7,125,075		$740,268	$3,238,670	$3,146,137
Hotel Restaurant/Bars	$3,202,229	$1,601,115		$14,433	$615,490	$971,191
Hotel Spa	$482,505	$241,252		$0	$103,394	$137,859
Entertainment	$17,675,901	$8,837,951		$1,062,254	$3,755,067	$4,020,630
Totals	**$116,820,177**	**$58,410,089**		**$6,145,562**	**$23,892,945**	**$28,371,582**

When comparing the maximum amount of the eligible tax revenue of $58.4 million to the estimated value of public infrastructure and fees that can be reimbursed of $24.8 million, the City incentive is well below the maximum rebate threshold. An estimate of taxes generated within the first five years of the project

shows eligible rebate value of $6.1 million. Assuming that the proposed scenario provided by SCDC reflects their actual development activity, by the end of 2026 the project will have generated $30 million in eligible reimbursable taxes, which exceeds the estimated cost of public infrastructure and fees.

Overview

The City of Surprise is entering into an "Economic Incentive Development Agreement" with the Surprise Center Development Company (SCDC) for the Surprise City Center property. This 472 acre parcel is located between Bell Road on the north, Greenway Road on the south, Litchfield Road on the east, and Bullard Avenue on the west.

It is the desire of the City for SCDC to accelerate meaningful development at City Center. This development project will generate significant economic benefit to the City, including construction of extensive public improvements and infrastructure, generation of tax revenue, creation of jobs, and enhancement of the quality of life that residents desire by providing shopping and other amenities.

The Economic Incentive Development Agreement outlines that a maximum of 50% of construction and retail sales tax that is solely derived from a Preferred Land Use located within the City Center may be eligible for reimbursement. These PLU's include the following:

- Bio-medical
- Boutique-style Hotel
- Civic
- Convention Center
- Four (4) Year Residential University and associated development
- Full Service Hotel
- Healthcare
- Low-Rise Office Development (Class A or B)
- Midrise Office Development (Class A)
- Market Square or Center
- Medical
- Resort
- Signature Entertainment Center(s);
- Signature Retail Center
- Vertical Mixed Use Urban Development, Minimum DUA of 15

The financial incentives provided for the PLU's include:

1. Plan Review, Building Permit Fees, and Development Impact Fees:
    a. Full Waiver/Offset up to $800K Max for ALL development
    b. Continued Waiver/Offset for Preferred Land Use development

2. Construction Sales Tax
    a. For Preferred Land Use Development Only
    b. 50% Reimbursement for Public Infrastructure (Capex)

3. Retail Sales Tax
    a. For Preferred Land Use Development Only
    b. 50% Reimbursement for Pubic Infrastructure, Maintenance, and Operation (Capex, M&O)
    c. Administered by "District"

This independent fiscal analysis is provided to analyze the potential tax revenue generated to the city annually through the year 2030 resulting from the proposed Surprise Center development. In order to meet the state requirements, the proposed development must raise more revenue than the amount of the incentive provided during the duration of the Economic Incentive Development Agreement.

The City of Surprise has retained the services of ESI Corporation to prepare the Surprise Center fiscal impact analysis. This study provides an analysis of the potential tax revenue that would be generated based on SCDC's development proforma. It shows the annual development scenario by product type for both the PLU and non PLU.

Study Approach

A variety of assumptions were utilized in preparing the Surprise Center fiscal impact analysis. Some of the assumptions come from SCDC's development scenario, while others include construction costs per square foot, retail sales per square foot, retail and office lease rates, percent of building occupancy, and lodging rates. A complete list of data sources is included in Table 1.

Table 1 – Data Sources

Data	Source
Annual Absorption by Land Use	Surprise Center Development Company
Lease/Rental Rates:	
Office and Retail	CoStar
Multi Family	Rentbits.com
Medical	Colliers, 3rd Qtr. Report 2016
Class A & B Office	Colliers, 3rd Qtr. Report 2016
Vacancy/Occupancy Rates:	
Class A & B Office	Colliers, 3rd Qtr. Report 2016
Medical	Colliers, 3rd Qtr. Report 2016
Retail	Colliers, 3rd Qtr. Report 2016
Multi Family	Colliers, 3rd Qtr. Report 2016
Retail & Restaurant Sales:	
Sales per Square Foot	Dollars and Cents of Shopping Centers/the Score 2008, ULI & ICSC Shopping Center Database, Inc.
Hotel Room Rates & Occupancy:	ESI Corp (based on several impact models)
	Arizona Office of Tourism
Construction Costs:	
Office, Retail, Medical & Multi-Family	RLB, 4th Qtr. 2016 Construction Report, Phoenix
Hotel	Hilton Worldwide Development Costs & Prototype Bldg. Data, 11-13
Tax Rates:	
City of Surprise TPT rates	ADOR, Rate Table, 1/1/17
Construction Tax Factor	ADOR Tax Factors

To establish the framework for the fiscal model, ESI obtained information from SCDC on their proposed Surprise Center Development. The conceptual absorption schedule is from 2017-2030 and includes annual square feet of space, the number of hotel rooms, and the number of multi-family dwelling units by PLU and non PLU, and is included as Appendix A. The fiscal analysis estimates the tax revenue from five sources noted Table 2. There are other taxes that the City collects, including utility and franchise taxes,

and state shared revenue, however, these are not included in this analysis. Consequently, the results of the estimated revenue generated will be on the conservative side.

Table 2 – City of Surprise Tax Category and Tax Rates

Tax Revenue Source	Tax Rate
Construction TPT	3.70%
Occupancy TPT	2.20%
Retail and Entertainment TPT	2.20%
Restaurant/Bar TPT	3.20%
Hotel TPT	6.72%
Property Tax	$0.75910 per $100 of assessed valuation

The analysis is through the year 2030 and has been conducted for both the preferred land uses and non-preferred land uses. The fiscal analysis applies the City's current tax rates to estimate the annual collections by land use per year, and the findings are in today's dollars. Sales per square foot data for retail and restaurants is based on 2008 ICSC/ULI data and inflated to today's dollars.

The fiscal model evaluates the tax revenue that could be generated based on development of the preferred land uses and development of the non-preferred land uses. The model inputs for Surprise Center Preferred Land Uses are itemized in Table 3.

Table 3 – Preferred Land Uses, Model Input Assumptions

Preferred Land Uses	Sq. Ft. of Space	Number of Rooms or Units	Construction Cost per SF	Lease Rate per SF	Sales per SF	Occupancy Rate
Signature Retail	100,000	--	$125.00	$16.12	$806.81	90.4%
Signature restaurant/bar	85,000	--	$125.00	$16.12	$639.75	90.4%
Signature Entertainment	108,900	--	$250.00	$16.12	$667.65	90.4%
Market Square or Center	500,000	--	$125.00	$16.12	$404.74	90.4%
Class A Office	360,000	--	$160.00	$20.52	--	85.3%
Class B Office	350,000	--	$110.00	$17.18	--	82.7%
Medical	0	--	$142.50	$21.30	--	84.0%
Hotel (extended stay)	--	240	See hotel	--	--	--
Hotel Resort	--	400	See hotel	--	--	--
SF Restaurant	25,000	--	See hotel	--	--	--
SF Spa	10,000	--	See hotel	--	--	--
Vertical Mixed Use[1]:						
1. Office	300,000	--	$175.00	$20.52	--	85.3%
2. Retail	150,000	--	$170.00	$16.12	$807	90.4%
3. Medical	110,000	--	$142.50	$21.30	--	84.0%
4. Entertainment	50,000	--	$250.00	$16.12	$668	90.4%
5. Residential & Hospitality						
Residential	--	2,310	See residential	--	--	--
Hospitality	5,000	200	See hotel	--	--	--

[1]Per City's definition within the economic incentive development agreement

The preferred land use category includes 2,310 units of multi-family housing within a mixed use type development. The proposed residential units range in price from $250,000 to $750,000, with 60 percent of the unit's projected to be owner occupied. Table 4.

Table 4 – Preferred Land Uses, Mixed Use Residential, Model Input Assumptions

Mixed Use Residential	No. of Units	Sales Price	SF Const. Cost	Total Const. Cost
Tier 1	1,020	$250,000	$130.00	$165,750,000
Tier 2	1,140	$450,000	$230.00	$327,750,000
Tier 3	150	$750,000	$500.00	$93,750,000
Total	2,310			$587,250,000

Other Assumptions:	
Average Square Feet per Unit	1,250
Average Rental Rate	$1,090
Percent Owner Occupied	60.0%
Percent Renter Occupied	40.0%
Rental Occupancy Rate	94.3%

Planned within the preferred land use category are five hotels representing various brands from extended stay to resort hotel. Some of the hotels are included within a mixed use development, while others are free standing. The cost per room key is based on Hilton Worldwide construction cost data from 2013 and inflated to today's dollars.

Table 5 – Preferred Land Uses, Hotel Assumptions

Hotels	Number of Hotels	Rooms per Hotel	Total Number of Rooms	Room Rate	Occupancy at build out	Const. Cost Per Room Key[1]
Boutique	2	100	200	$166.55	72.0%	$93,502
Resort	1	400	400	$175.00	72.0%	$154,884
Extended Stay	2	120	240	$145.00	72.0%	$84,924
Total	5		840			

	SF of Restaurant	Sales per SF	SF Spa	Sales per SF
Boutique	5,000	$399.14	--	--
Resort	20,000	$639.75	10,000	$346.59
Extended Stay	5,000	$399.14	--	--
	30,000		10,000	

[1]Includes restaurant and spa space

Source: SCDC – number of hotels, total number of rooms, number of rooms per hotel, SF of restaurant and spa space; ESI Corp – room rates, occupancy rate, SF construction cost and sales per SF

A portion of Surprise Center will include the development of land uses that are not categorized as preferred, but will still generate tax revenue to the City, including retail, restaurant/bar, and multi-family. The fiscal analysis addresses these land uses separately, however the assumptions utilized for the non-PLU are the same for the PLU, including construction costs, and lease and occupancy rates. Sales per

square foot are reduced to reflect the non-signature level of retail. The proposed multi-family includes 2,065 dwelling units, with the owner/renter occupancy ratio the same as the PLU multi-family. Table 6 and Table 7 provide a summary of the model inputs.

Table 6 – Non-Preferred Land Uses

Non-Preferred Land Use	Sq. Ft. of Space	Const. Cost per SF	Lease Rate per SF	Sales per SF	Occupancy Rate
Retail	100,000	$125.00	$16.12	$349.83	90.4%
Restaurant/bars	45,000	$125.00	$16.12	$399.14	90.4%

Source: SCDC – SF of space; ESI Corp – construction cost per SF, lease rates, sales per SF and occupancy rates

Table 7 – Non Preferred Land Use, Multi-Family

Non PLU Multi Family	No. of Units	Sales Price	SF Const. Cost	Total Const. Cost
Tier 1	1,790	$250,000	$130	$290,875,000
Tier 2	275	$450,000	$230	$79,062,500
	2,065			$369,937,500
Other Assumptions:				
Average Square Feet per Unit	1,250			
Average Rental Rate	$1,090			
Percent Owner Occupied	60%			
Percent Renter Occupied	40%			
Rental Occupancy Rate	94%			

Source: SCDC – Number of units, sales price, construction cost per SF, average SF of space, and owner vs. renter ratio; ESI Corp – rental and occupancy rates

Findings

Fiscal Analysis

At build-out, the Surprise Center will consist of nearly 3 million square feet of PLU and non PLU space, within 402 acres. The mix of land uses consists of commercial, office, medical, 4,375 multi-family residential and 5 hotels totaling 840 rooms (Table 8).

Table 8 – Total Square Feet and Residential and Hotel Units at Build-Out

Land Use	Acres	Sq. Ft.	Number of Dwelling Units	Number of Hotel Rooms
PLU	313	2,153,900	2,310	840
Non PLU	89	145,000	2,065	0
Total	402	2,298,900	4,375	840

Following is a summary of the fiscal analysis findings. The detailed tables for each taxing category can be found in the Appendix. The analysis provides the cumulative totals through the year 2030 for each land use by taxing category. The findings are in today's dollars. Based on the annual conceptual absorption

schedule provided by SCDC, it is estimated by that the year 2030, the cumulative total all annual tax collections for PLU land uses amounts to $147.7. Of this, the one-time construction tax collections is estimated at $22.7 million.

Table 9 – Surprise Center Fiscal Analysis, Tax Collection Summary by Land Use

Land Use	Total Tax Collections	Construction TPT	Occupancy-Lodging TPT	Retail TPT	Property Tax
Preferred Land Uses					
Signature Retail	$17,196,910	$281,311	$328,609	$16,446,935	$140,054
Signature restaurant/bar	$14,841,333	$239,114	$246,858	$14,250,150	$105,211
Signature Entertainment	$15,019,712	$306,348	$343,421	$14,223,577	$146,367
Market Square or Center	$33,732,319	$1,406,556	$1,218,259	$30,588,280	$519,224
Class A Office	$2,841,813	$1,296,282	$1,062,816	--	$482,715
Class B Office	$1,775,349	$866,438	$656,403	--	$252,507
Hotels	$18,979,767	$1,852,952	$13,262,780	$3,222,886	$641,149
Vertical Mixed Use:					
Office	$2,017,246	$1,181,507	$558,364	--	$277,375
Retail	$12,325,946	$573,875	$227,622	$11,392,511	$131,938
Medical	$624,713	$352,764	$194,844	--	$77,105
Entertainment	$3,888,042	$281,311	$83,355	$3,452,324	$71,052
Boutique Hotel	$6,340,567	$420,848	$5,294,339	$461,848	$163,531
Multi-Family	$17,501,721	$13,215,999	$1,265,612	--	$3,020,110
Structured Parking	$678,524	$506,360	--	--	$172,164
Sub-Total PLU	**$147,763,960**	**$22,781,666**	**$24,743,283**	**$94,038,512**	**$6,200,501**
Non-Preferred Land Uses					
Retail	$7,399,323	$281,311	$307,771	$6,679,069	$131,172
Restaurant/Bar	$5,168,030	$126,590	$134,650	$4,849,402	$57,388
Multi Family	$11,501,394	$8,325,404	$138,664	--	$3,037,326
Sub-Total Non-PLU	**$24,068,747**	**$8,733,305**	**$581,084**	**$11,528,471**	**$3,225,887**
GRAND TOTAL PLU AND NON-PLU	**$171,832,707**	**$31,514,971**	**$25,324,367**	**$105,566,983**	**$9,426,387**

When examining the fiscal impact to the City relative to non-PLU, an additional $24 million in annual tax collections is estimated from all taxing categories. These funds, however, are not eligible for reimbursement per the economic incentive development agreement, but do add to the overall value of the development. The grand total for both PLU and non-PLU is estimated at $171.8 million.

Incentive Distribution

The Economic Development Agreement stipulates that any financial incentive shall only be used for public infrastructure that's tied directly to the preferred land uses (noted in the overview section of this report). Revenue generated from construction and retail sales taxes go into a fund to reimburse any public infrastructure up to 50%. All incentives are to be paid post performance. City revenues that are eligible for reimbursement include:

- Plan Review and Building Permit Fees (not to exceed $800,000)
- Development Impact Fees (credit given at the time of building permit issuance)
- Construction Sales Tax (up to 50% resulting from PLU)
- Retail Sales Tax (50% resulting from PLU)

Based on the Economic Incentive Development Agreement, only those taxes generated from the PLU for new construction, retail, restaurant/bar and entertainment are eligible for a 50% tax rebate. Eligible TPT collections sums $116.8 million.

The findings of the fiscal analysis show that a maximum of $58.4 million is eligible for reimbursement, (Table 10). The reimbursement schedule is as follows:

- 50% of the construction tax can be reimbursed for capital expenditures on public infrastructure. The maximum amount that could be reimbursed is $11,390,833.
- 50% of retail/restaurant/bar and entertainment tax can be reimbursed for capital expenditures on infrastructure and maintenance and operation. The maximum that could be reimbursed amounts to $47,019,256.

Table 10 – Surprise Center Eligible Tax Reimbursement at 50% of Total Collections

Tax Category	Total TPT Collections	50% Reimbursable		2017-2021	2022-2026	2027-2030
Construction	$22,781,666	$11,390,833		$1,558,044	$5,007,177	$4,825,612
Retail	$58,427,727	$29,213,863		$2,770,564	$11,173,146	$15,270,153
Restaurant/Bars	$14,250,150	$7,125,075		$740,268	$3,238,670	$3,146,137
Hotel Restaurant/Bars	$3,202,229	$1,601,115		$14,433	$615,490	$971,191
Hotel Spa	$482,505	$241,252		$0	$103,394	$137,859
Entertainment	$17,675,901	$8,837,951		$1,062,254	$3,755,067	$4,020,630
Totals	**$116,820,177**	**$58,410,089**		**$6,145,562**	**$23,892,945**	**$28,371,582**

When comparing the maximum amount of the eligible tax revenue of $58.4 million to the estimated value of public infrastructure and fees that can be reimbursed of $24.8 million (Table 11), the City incentive is well below the maximum rebate threshold. An estimate of taxes generated within the first five years of the project shows eligible rebate value of $6.1 million. Assuming that the proposed conceptual absorption schedule provided by SCDC reflects their actual development, by the end of 2026 the project will have generated $30 million in reimbursable taxes, which exceeds the estimated cost of public infrastructure and fees.

Table 11 – Estimated Value of Tax Reimbursement

Public Infrastructure and Fees	Reimbursement Value
Water	$10,597,350
Sewer	$3,259,525
Roads	$10,199,923
Subtotal	$24,056,798
Plan Review and Building Permit Fees	$800,000
Total	**$24,856,798**

There are other eligible expenses for reimbursement that have not been included in this fiscal analysis, which no doubt will increase the value of the incentive reimbursement. These other eligible expenses include development impact fees, landscaping, lighting systems, traffic control systems, and drainage and flood control systems.

Project-by-Project Incentive Justification

Arizona State Statute 9-500.11 requires that for each proposed project there be a fiscal impact analysis to demonstrate the rebate justification, as well as document that in the absence of an incentive, the project would not locate in the City of Surprise.

The methodology for preparing the justification report will depend upon the nature of the proposed project. The fiscal impact analysis will commence with communication with the developer and/or end user of the project to obtain background and financial information on the activity. This could include a combination of construction costs, payroll and number of employees, equipment expenditures, retail/restaurant/bar sales revenue, lease revenue, lodging revenue and other data as applicable to the project. A fiscal impact analysis will be prepared that mirrors the timeframe of the proposed development agreement. The value of the proposed incentive will be compared to the estimated fiscal impact that the proposed project would generate.

Secondly, a discussion about the rebate justification will center on whether the project would have located in the City of Surprise absent the incentive. The findings will be primarily qualitative derived through conversations with the developer and/or end user to identify the user's site location criteria, other communities under consideration, and a discussion about the operating cost deficiencies that needed to be overcome through the City's incentive. To the extent that data is available from the developer or end user, a gap analysis will be prepared to document the incentive justification.

A written report summarizing the type of project, the methodology used in the analysis, the fiscal impact analysis and the incentive justification findings will be prepared.

Appendix A – Surprise Center Annual Absorption Schedule

APPENDIX A - SURPRISE CENTER ANNUAL ABSORPTION SCHEDULE (2017-2030)

Preferred Land Uses

	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Signature Retail	100,000	15,000	0	40,000	10,000	10,000	0	0	0	0	25,000	0	0	0	0
Signature Restaurants/Bars	85,000	0	5,000	20,000	0	0	15,000	20,000	20,000	5,000	0	0	0	0	0
Signature Entertainment	108,900	0	0	50,000	0	0	0	58,900	0	0	0	0	0	0	0
Market Square Center	500,000	0	0	0	0	200,000	100,000	0	0	0	100,000	100,000	0	0	0
Class A Office	360,000	0	0	0	120,000	0	0	120,000	0	0	0	120,000	0	0	0
Class B Office	350,000	0	0	50,000	0	0	50,000	0	50,000	0	100,000	0	0	100,000	0
Total SF	**1,503,900**	**15,000**	**5,000**	**160,000**	**130,000**	**210,000**	**165,000**	**198,900**	**70,000**	**5,000**	**225,000**	**220,000**	**0**	**100,000**	**0**
Extended Stay Hotel Rooms	240	0	0	0	0	0	120	0	0	120	0	0	0	0	0
Hotel Resort	400	0	0	0	0	0	0	0	400	0	0	0	0	0	0
SF Restaurant	25,000	0	0	0	0	0	5,000	0	20,000	0	0	0	0	0	0
SF Spa	10,000	0	0	0	0	0	0	0	10,000	0	0	0	0	0	0
Total Rooms	640	0	0	0	0	0	120	0	400	120	0	0	0	0	0
Total Sq. Ft. Restaurant/Spa	35,000	0	0	0	0	0	5,000	0	30,000	0	0	0	0	0	0
Vertical Mixed Use:															
Office	300,000	0	0	0	0	50,000	0	0	50,000	0	0	100,000	0	100,000	0
Retail	150,000	0	0	0	0	20,000	0	0	30,000	0	0	50,000	0	50,000	0
Medical	110,000	0	0	0	0	15,000	0	0	15,000	0	0	40,000	0	40,000	0
Entertainment	50,000	0	0	0	0	10,000	0	0	10,000	0	0	15,000	0	15,000	0
Total SF	**610,000**	**0**	**0**	**0**	**0**	**95,000**	**0**	**0**	**105,000**	**0**	**0**	**205,000**	**0**	**205,000**	**0**
Bouteque Hotel Rooms	200	0	0	0	0	100	0	0	0	100	0	0	0	0	0
SF Restaurant	5,000	0	0	0	0	2,500	0	0	0	2,500	0	0	0	0	0
Multi Family	**Total**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Tier 1 ($250,000)	1,020	0	0	0	0	100	100	120	100	100	100	100	100	100	100
Tier 2 ($450,000)	1,140	0	0	0	0	70	90	100	100	120	120	120	140	140	140
Tier 3 ($750,000)	150	0	0	0	0	0	0	0	0	0	10	20	30	40	50
Total Units	**2,310**	**0**	**0**	**0**	**0**	**170**	**190**	**220**	**200**	**220**	**230**	**240**	**270**	**280**	**290**
Parking Structures	**$22,500,000**	$0	$0	$0	$0	$7,500,000	$0	$0	$7,500,000	$0	$0	$7,500,000	$0	$0	$0
														0	

Non-Preferred Land Uses

Retail	100,000	20,000	0	20,000	0	20,000	0	20,000	0	0	0	20,000	0	0	0
Restaurant/Bar	45,000	7,500	0	10,000	0	7,500		10,000	0	0	0	10,000	0	0	0
Totals	**145,000**	**27,500**	**0**	**30,000**	**0**	**27,500**	**0**	**30,000**	**0**	**0**	**0**	**30,000**	**0**	**0**	**0**
Multi Family:															
Tier 1 ($250,000)	1,790	0	30	120	140	140	300	300	120	120	120	100	100	100	100
Tier 2 ($450,000)	275	0	0	0	0	50	75	75	75	0	0	0	0	0	0
Tier 3 ($750,000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	**2,065**	**0**	**30**	**120**	**140**	**190**	**375**	**375**	**195**	**120**	**120**	**100**	**100**	**100**	**100**

Appendix B – Fiscal Analysis Project Proforma Tables

PREFERRED LAND USES - CONSTRUCTION

Construction Value	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Signature Retail	$12,500,000	$1,875,000	$0	$5,000,000	$1,250,000	$1,250,000	$0	$0	$0	$0	$3,125,000	$0	$0	$0	$0
Signature Restaurants/Bars	$10,625,000	$0	$625,000	$2,500,000	$0	$0	$1,875,000	$2,500,000	$2,500,000	$625,000	$0	$0	$0	$0	$0
Signature Entertainment	$13,612,500	$0	$0	$6,250,000	$0	$0	$0	$7,362,500	$0	$0	$0	$0	$0	$0	$0
Market Square Center	$62,500,000	$0	$0	$0	$0	$25,000,000	$12,500,000	$0	$0	$0	$12,500,000	$12,500,000	$0	$0	$0
Class A Office	$57,600,000	$0	$0	$0	$19,200,000	$0	$0	$19,200,000	$0	$0	$0	$19,200,000	$0	$0	$0
Class B Office	$38,500,000	$0	$0	$5,500,000	$0	$0	$5,500,000	$0	$5,500,000	$0	$11,000,000	$0	$0	$11,000,000	$0
Extended Stay Hotel	$20,381,756	$0	$0	$0	$0	$0	$10,190,878	$0	$0	$10,190,878	$0	$0	$0	$0	$0
Hotel Resort	$61,953,753	$0	$0	$0	$0	$0	$0	$0	$61,953,753	$0	$0	$0	$0	$0	$0
Vertical Mixed Use:															
Office	$52,500,000	$0	$0	$0	$0	$8,750,000	$0	$0	$8,750,000	$0	$0	$17,500,000	$0	$17,500,000	$0
Retail	$25,500,000	$0	$0	$0	$0	$3,400,000	$0	$0	$5,100,000	$0	$0	$8,500,000	$0	$8,500,000	$0
Medical	$15,675,000	$0	$0	$0	$0	$2,137,500	$0	$0	$2,137,500	$0	$0	$5,700,000	$0	$5,700,000	$0
Entertainment	$12,500,000	$0	$0	$0	$0	$2,500,000	$0	$0	$2,500,000	$0	$0	$3,750,000	$0	$3,750,000	$0
Boutique Hotel	$18,700,306	$0	$0	$0	$0	$9,350,153	$0	$0	$0	$9,350,153	$0	$0	$0	$0	$0
Multi Family															
Tier 1 ($250,000)	$165,750,000	$0	$0	$0	$0	$16,250,000	$16,250,000	$19,500,000	$16,250,000	$16,250,000	$16,250,000	$16,250,000	$16,250,000	$16,250,000	$16,250,000
Tier 2 ($450,000)	$327,750,000	$0	$0	$0	$0	$20,125,000	$25,875,000	$28,750,000	$28,750,000	$34,500,000	$34,500,000	$34,500,000	$40,250,000	$40,250,000	$40,250,000
Tier 3 ($750,000)	$93,750,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$6,250,000	$12,500,000	$18,750,000	$25,000,000	$31,250,000
Parking Structures	$22,500,000	$0	$0	$0	$0	$7,500,000	$0	$0	$7,500,000	$0	$0	$7,500,000	$0	$0	$0
City Construction Tax															
Signature Retail	$281,311	$42,197	$0	$112,524	$28,131	$28,131	$0	$0	$0	$0	$70,328	$0	$0	$0	$0
Signature Restaurants/Bars	$239,114	$0	$14,066	$56,262	$0	$0	$42,197	$56,262	$56,262	$14,066	$0	$0	$0	$0	$0
Signature Entertainment	$306,348	$0	$0	$140,656	$0	$0	$0	$165,692	$0	$0	$0	$0	$0	$0	$0
Market Square Center	$1,406,556	$0	$0	$0	$0	$562,622	$281,311	$0	$0	$0	$281,311	$281,311	$0	$0	$0
Class A Office	$1,296,282	$0	$0	$0	$432,094	$0	$0	$432,094	$0	$0	$0	$432,094	$0	$0	$0
Class B Office	$866,438	$0	$0	$123,777	$0	$0	$123,777	$0	$123,777	$0	$247,554	$0	$0	$247,554	$0
Extended Stay Hotel	$458,689	$0	$0	$0	$0	$0	$229,345	$0	$0	$229,345	$0	$0	$0	$0	$0
Hotel Resort	$1,394,263	$0	$0	$0	$0	$0	$0	$0	$1,394,263	$0	$0	$0	$0	$0	$0
Vertical Mixed Use:															
Office	$1,181,507	$0	$0	$0	$0	$196,918	$0	$0	$196,918	$0	$0	$393,836	$0	$393,836	$0
Retail	$573,875	$0	$0	$0	$0	$76,517	$0	$0	$114,775	$0	$0	$191,292	$0	$191,292	$0
Medical	$352,764	$0	$0	$0	$0	$48,104	$0	$0	$48,104	$0	$0	$128,278	$0	$128,278	$0
Entertainment	$281,311	$0	$0	$0	$0	$56,262	$0	$0	$56,262	$0	$0	$84,393	$0	$84,393	$0
Boutique Hotel	$420,848	$0	$0	$0	$0	$210,424	$0	$0	$0	$210,424	$0	$0	$0	$0	$0
Multi Family															
Tier 1 ($250,000)	$3,730,186	$0	$0	$0	$0	$365,705	$365,705	$438,845	$365,705	$365,705	$365,705	$365,705	$365,705	$365,705	$365,705
Tier 2 ($450,000)	$7,375,979	$0	$0	$0	$0	$452,911	$582,314	$647,016	$647,016	$776,419	$776,419	$776,419	$905,822	$905,822	$905,822
Tier 3 ($750,000)	$2,109,834	$0	$0	$0	$0	$0	$0	$0	$0	$0	$140,656	$281,311	$421,967	$562,622	$703,278
Parking Structures	$506,360	$0	$0	$0	$0	$168,787	$0	$0	$168,787	$0	$0	$168,787	$0	$0	$0
TOTAL CONSTRUCTION TAX	**$22,781,666**	**$42,197**	**$14,066**	**$433,219**	**$460,225**	**$2,166,381**	**$1,624,648**	**$1,739,910**	**$3,171,868**	**$1,595,958**	**$1,881,972**	**$3,103,425**	**$1,693,493**	**$2,879,501**	**$1,974,804**

PREFERRED LAND USES - TPT TAX

Sales Revenue	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Signature Retail	$747,587,970	$10,940,312	$10,940,312	$40,114,476	$47,408,018	$54,701,559	$54,701,559	$54,701,559	$54,701,559	$54,701,559	$72,935,412	$72,935,412	$72,935,412	$72,935,412	$72,935,412
Signature Restaurants/Bars	$445,317,180	$0	$2,891,670	$14,458,350	$14,458,350	$14,458,350	$23,133,360	$34,700,040	$46,266,720	$49,158,390	$49,158,390	$49,158,390	$49,158,390	$49,158,390	$49,158,390
Signature Entertainment	$646,526,212	$0	$0	$30,177,661	$30,177,661	$30,177,661	$30,177,661	$65,726,946	$65,726,946	$65,726,946	$65,726,946	$65,726,946	$65,726,946	$65,726,946	$65,726,946
Market Square Center	$1,390,376,359	$0	$0	$0	$0	$73,177,703	$109,766,555	$109,766,555	$109,766,555	$109,766,555	$146,355,406	$182,944,258	$182,944,258	$182,944,258	$182,944,258
Extended Stay Restaurant	$16,236,838	$0	$0	$0	$0	$0	$1,804,093	$1,804,093	$1,804,093	$1,804,093	$1,804,093	$1,804,093	$1,804,093	$1,804,093	$1,804,093
Resort Restaurant	$69,400,080	$0	$0	$0	$0	$0	$0	$0	$0	$11,566,680	$11,566,680	$11,566,680	$11,566,680	$11,566,680	$11,566,680
Resort Spa	$21,932,044	$0	$0	$0	$0	$0	$0	$0	$3,133,149	$3,133,149	$3,133,149	$3,133,149	$3,133,149	$3,133,149	$3,133,149
Vertical Mixed Use:															
Retail	$517,841,423	$0	$0	$0	$0	$14,587,082	$14,587,082	$14,587,082	$36,467,706	$36,467,706	$36,467,706	$72,935,412	$72,935,412	$109,403,118	$109,403,118
Entertainment	$156,923,838	$0	$0	$0	$0	$6,035,532	$6,035,532	$6,035,532	$12,071,064	$12,071,064	$12,071,064	$21,124,363	$21,124,363	$30,177,661	$30,177,661
Boutique Hotel Restaurant	$14,432,745	$0	$0	$0	$0	$902,047	$902,047	$902,047	$902,047	$1,804,093	$1,804,093	$1,804,093	$1,804,093	$1,804,093	$1,804,093
City TPT															
Signature Retail	$16,446,935	$240,687	$240,687	$882,518	$1,042,976	$1,203,434	$1,203,434	$1,203,434	$1,203,434	$1,203,434	$1,604,579	$1,604,579	$1,604,579	$1,604,579	$1,604,579
Signature Restaurants/Bars	$14,250,150	$0	$92,533	$462,667	$462,667	$462,667	$740,268	$1,110,401	$1,480,535	$1,573,068	$1,573,068	$1,573,068	$1,573,068	$1,573,068	$1,573,068
Signature Entertainment	$14,223,577	$0	$0	$663,909	$663,909	$663,909	$663,909	$1,445,993	$1,445,993	$1,445,993	$1,445,993	$1,445,993	$1,445,993	$1,445,993	$1,445,993
Market Square Center	$30,588,280	$0	$0	$0	$0	$1,609,909	$2,414,864	$2,414,864	$2,414,864	$2,414,864	$3,219,819	$4,024,774	$4,024,774	$4,024,774	$4,024,774
Extended Stay Restaurant	$519,579	$0	$0	$0	$0	$0	$57,731	$57,731	$57,731	$57,731	$57,731	$57,731	$57,731	$57,731	$57,731
Resort Restaurant	$2,220,803	$0	$0	$0	$0	$0	$0	$0	$0	$370,134	$370,134	$370,134	$370,134	$370,134	$370,134
Resort Spa	$482,505	$0	$0	$0	$0	$0	$0	$0	$68,929	$68,929	$68,929	$68,929	$68,929	$68,929	$68,929
Vertical Mixed Use:															
Retail	$11,392,511	$0	$0	$0	$0	$320,916	$320,916	$320,916	$802,290	$802,290	$802,290	$1,604,579	$1,604,579	$2,406,869	$2,406,869
Entertainment	$3,452,324	$0	$0	$0	$0	$132,782	$132,782	$132,782	$265,563	$265,563	$265,563	$464,736	$464,736	$663,909	$663,909
Boutique Hotel Restaurant	$461,848	$0	$0	$0	$0	$28,865	$28,865	$28,865	$28,865	$57,731	$57,731	$57,731	$57,731	$57,731	$57,731
TOTAL SALES TAX	**$94,038,512**	**$240,687**	**$333,220**	**$2,009,094**	**$2,169,552**	**$4,422,483**	**$5,562,769**	**$6,714,987**	**$7,768,205**	**$8,259,738**	**$9,465,837**	**$11,272,254**	**$11,272,254**	**$12,273,716**	**$12,273,716**

PREFERRED LAND USES - OCCUPANCY TAX

Lease Revenue	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Signature Retail	$14,936,792	$218,587	$218,587	$801,486	$947,211	$1,092,936	$1,092,936	$1,092,936	$1,092,936	$1,092,936	$1,457,248	$1,457,248	$1,457,248	$1,457,248	$1,457,248
Signature Restaurants/Bars	$11,220,810	$0	$72,862	$364,312	$364,312	$364,312	$582,899	$874,349	$1,165,798	$1,238,661	$1,238,661	$1,238,661	$1,238,661	$1,238,661	$1,238,661
Signature Entertainment	$15,610,041	$0	$0	$728,624	$728,624	$728,624	$728,624	$1,586,943	$1,586,943	$1,586,943	$1,586,943	$1,586,943	$1,586,943	$1,586,943	$1,586,943
Market Square Center	$55,375,424	$0	$0	$0	$0	$2,914,496	$4,371,744	$4,371,744	$4,371,744	$4,371,744	$5,828,992	$7,286,240	$7,286,240	$7,286,240	$7,286,240
Class A Office	$48,309,826	$0	$0	$0	$2,100,427	$2,100,427	$2,100,427	$4,200,854	$4,200,854	$4,200,854	$4,200,854	$6,301,282	$6,301,282	$6,301,282	$6,301,282
Class B Office	$29,836,506	$0	$0	$710,393	$710,393	$710,393	$1,420,786	$1,420,786	$2,131,179	$2,131,179	$3,551,965	$3,551,965	$3,551,965	$4,972,751	$4,972,751
Vertical Mixed Use:															
Office	$25,380,162	$0	$0	$0	$0	$875,178	$875,178	$875,178	$1,750,356	$1,750,356	$1,750,356	$3,500,712	$3,500,712	$5,251,068	$5,251,068
Retail	$10,346,461	$0	$0	$0	$0	$291,450	$291,450	$291,450	$728,624	$728,624	$728,624	$1,457,248	$1,457,248	$2,185,872	$2,185,872
Medical	$8,856,540	$0	$0	$0	$0	$268,380	$268,380	$268,380	$536,760	$536,760	$536,760	$1,252,440	$1,252,440	$1,968,120	$1,968,120
Entertainment	$3,788,845	$0	$0	$0	$0	$145,725	$145,725	$145,725	$291,450	$291,450	$291,450	$510,037	$510,037	$728,624	$728,624
Multi Family:															
Tier 1 ($250,000)	$27,925,172	$0	$0	$0	$0	$493,378	$986,755	$1,578,808	$2,072,186	$2,565,564	$3,058,941	$3,552,319	$4,045,696	$4,539,074	$5,032,452
Tier 2 ($450,000)	$27,875,834	$0	$0	$0	$0	$345,364	$789,404	$1,282,782	$1,776,159	$2,368,212	$2,960,266	$3,552,319	$4,243,047	$4,933,776	$5,624,505
Tier 3 ($750,000)	$1,726,822	$0	$0	$0	$0	$0	$0	$0	$0	$0	$49,338	$148,013	$296,027	$493,378	$740,066
City Occupancy Tax															
Signature Retail	$328,609	$4,809	$4,809	$17,633	$20,839	$24,045	$24,045	$24,045	$24,045	$24,045	$32,059	$32,059	$32,059	$32,059	$32,059
Signature Restaurants/Bars	$246,858	$0	$1,603	$8,015	$8,015	$8,015	$12,824	$19,236	$25,648	$27,251	$27,251	$27,251	$27,251	$27,251	$27,251
Signature Entertainment	$343,421	$0	$0	$16,030	$16,030	$16,030	$16,030	$34,913	$34,913	$34,913	$34,913	$34,913	$34,913	$34,913	$34,913
Market Square Center	$1,218,259	$0	$0	$0	$0	$64,119	$96,178	$96,178	$96,178	$96,178	$128,238	$160,297	$160,297	$160,297	$160,297
Class A Office	$1,062,816	$0	$0	$0	$46,209	$46,209	$46,209	$92,419	$92,419	$92,419	$92,419	$138,628	$138,628	$138,628	$138,628
Class B Office	$656,403	$0	$0	$15,629	$15,629	$15,629	$31,257	$31,257	$46,886	$46,886	$78,143	$78,143	$78,143	$109,401	$109,401
Vertical Mixed Use:															
Office	$558,364	$0	$0	$0	$0	$19,254	$19,254	$19,254	$38,508	$38,508	$38,508	$77,016	$77,016	$115,523	$115,523
Retail	$227,622	$0	$0	$0	$0	$6,412	$6,412	$6,412	$16,030	$16,030	$16,030	$32,059	$32,059	$48,089	$48,089
Medical	$194,844	$0	$0	$0	$0	$5,904	$5,904	$5,904	$11,809	$11,809	$11,809	$27,554	$27,554	$43,299	$43,299
Entertainment	$83,355	$0	$0	$0	$0	$3,206	$3,206	$3,206	$6,412	$6,412	$6,412	$11,221	$11,221	$16,030	$16,030
Multi Family:															
Tier 1 ($250,000)	$614,354	$0	$0	$0	$0	$10,854	$21,709	$34,734	$45,588	$56,442	$67,297	$78,151	$89,005	$99,860	$110,714
Tier 2 ($450,000)	$613,268	$0	$0	$0	$0	$7,598	$17,367	$28,221	$39,076	$52,101	$65,126	$78,151	$93,347	$108,543	$123,739
Tier 3 ($750,000)	$37,990	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,085	$3,256	$6,513	$10,854	$16,281
TOTAL OCCUPANCY TAX	**$6,186,163**	**$4,809**	**$6,412**	**$57,306**	**$106,721**	**$227,275**	**$300,395**	**$395,779**	**$477,510**	**$502,992**	**$599,289**	**$778,699**	**$808,006**	**$944,747**	**$976,224**

PREFERRED LAND USES - HOTEL LODGING TAX

Lodging Receipts	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Extended Stay Hotel	$68,590,800	$0	$0	$0	$0	$0	$4,572,720	$4,572,720	$4,572,720	$9,145,440	$9,145,440	$9,145,440	$9,145,440	$9,145,440	$9,145,440
Resort Hotel	$128,772,000	$0	$0	$0	$0	$0	$0	$0	$18,396,000	$18,396,000	$18,396,000	$18,396,000	$18,396,000	$18,396,000	$18,396,000
Boutique Hotel	$78,784,812	$0	$0	$0	$0	$0	$5,252,321	$5,252,321	$5,252,321	$10,504,642	$10,504,642	$10,504,642	$10,504,642	$10,504,642	$10,504,642
Lodging Sales Tax															
Extended Stay Hotel	$4,609,302	$0	$0	$0	$0	$0	$307,287	$307,287	$307,287	$614,574	$614,574	$614,574	$614,574	$614,574	$614,574
Resort Hotel	$8,653,478	$0	$0	$0	$0	$0	$0	$0	$1,236,211	$1,236,211	$1,236,211	$1,236,211	$1,236,211	$1,236,211	$1,236,211
Boutique Hotel	$5,294,339	$0	$0	$0	$0	$0	$352,956	$352,956	$352,956	$705,912	$705,912	$705,912	$705,912	$705,912	$705,912
TOTAL LODGING TAX	**$18,557,120**	**$0**	**$0**	**$0**	**$0**	**$0**	**$660,243**	**$660,243**	**$1,896,454**	**$2,556,697**	**$2,556,697**	**$2,556,697**	**$2,556,697**	**$2,556,697**	**$2,556,697**

PREFERRED LAND USES - PROPERTY TAX

Assessed Value (Cumulative)	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Signature Retail	$102,500,000	$1,500,000	$1,500,000	$5,500,000	$6,500,000	$7,500,000	$7,500,000	$7,500,000	$7,500,000	$7,500,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000
Signature Restaurants/Bars	$77,000,000	$0	$500,000	$2,500,000	$2,500,000	$2,500,000	$4,000,000	$6,000,000	$8,000,000	$8,500,000	$8,500,000	$8,500,000	$8,500,000	$8,500,000	$8,500,000
Signature Entertainment	$107,120,000	$0	$0	$5,000,000	$5,000,000	$5,000,000	$5,000,000	$10,890,000	$10,890,000	$10,890,000	$10,890,000	$10,890,000	$10,890,000	$10,890,000	$10,890,000
Market Square Center	$380,000,000	$0	$0	$0	$0	$20,000,000	$30,000,000	$30,000,000	$30,000,000	$30,000,000	$40,000,000	$50,000,000	$50,000,000	$50,000,000	$50,000,000
Class A Office	$353,280,000	$0	$0	$0	$15,360,000	$15,360,000	$15,360,000	$30,720,000	$30,720,000	$30,720,000	$30,720,000	$46,080,000	$46,080,000	$46,080,000	$46,080,000
Class B Office	$184,800,000	$0	$0	$4,400,000	$4,400,000	$4,400,000	$8,800,000	$8,800,000	$13,200,000	$13,200,000	$22,000,000	$22,000,000	$22,000,000	$30,800,000	$30,800,000
Extended Stay Hotel	$122,290,535	$0	$0	$0	$0	$0	$8,152,702	$8,152,702	$8,152,702	$16,305,405	$16,305,405	$16,305,405	$16,305,405	$16,305,405	$16,305,405
Hotel Resort	$346,941,017	$0	$0	$0	$0	$0	$0	$0	$49,563,002	$49,563,002	$49,563,002	$49,563,002	$49,563,002	$49,563,002	$49,563,002
Vertical Mixed Use:															
Office	$203,000,000	$0	$0	$0	$0	$7,000,000	$7,000,000	$7,000,000	$14,000,000	$14,000,000	$14,000,000	$28,000,000	$28,000,000	$42,000,000	$42,000,000
Retail	$96,560,000	$0	$0	$0	$0	$2,720,000	$2,720,000	$2,720,000	$6,800,000	$6,800,000	$6,800,000	$13,600,000	$13,600,000	$20,400,000	$20,400,000
Medical	$56,430,000	$0	$0	$0	$0	$1,710,000	$1,710,000	$1,710,000	$3,420,000	$3,420,000	$3,420,000	$7,980,000	$7,980,000	$12,540,000	$12,540,000
Entertainment	$52,000,000	$0	$0	$0	$0	$2,000,000	$2,000,000	$2,000,000	$4,000,000	$4,000,000	$4,000,000	$7,000,000	$7,000,000	$10,000,000	$10,000,000
Boutique Hotel	$119,681,957	$0	$0	$0	$0	$7,480,122	$7,480,122	$7,480,122	$7,480,122	$14,960,245	$14,960,245	$14,960,245	$14,960,245	$14,960,245	$14,960,245
Multi Family															
Tier 1 ($250,000)	$735,800,000	$0	$0	$0	$0	$13,000,000	$26,000,000	$41,600,000	$54,600,000	$67,600,000	$80,600,000	$93,600,000	$106,600,000	$119,600,000	$132,600,000
Tier 2 ($450,000)	$1,299,500,000	$0	$0	$0	$0	$16,100,000	$36,800,000	$59,800,000	$82,800,000	$110,400,000	$138,000,000	$165,600,000	$197,800,000	$230,000,000	$262,200,000
Tier 3 ($750,000)	$175,000,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5,000,000	$15,000,000	$30,000,000	$50,000,000	$75,000,000
Parking Structures	$126,000,000	$0	$0	$0	$0	$6,000,000	$6,000,000	$6,000,000	$12,000,000	$12,000,000	$12,000,000	$18,000,000	$18,000,000	$18,000,000	$18,000,000

PREFERRED LAND USES - PROPERTY TAX

Property Tax Receipts	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Signature Retail	$140,054	$2,050	$2,050	$7,515	$8,881	$10,248	$10,248	$10,248	$10,248	$10,248	$13,664	$13,664	$13,664	$13,664	$13,664
Signature Restaurants/Bars	$105,211	$0	$683	$3,416	$3,416	$3,416	$5,466	$8,198	$10,931	$11,614	$11,614	$11,614	$11,614	$11,614	$11,614
Signature Entertainment	$146,367	$0	$0	$6,832	$6,832	$6,832	$6,832	$14,880	$14,880	$14,880	$14,880	$14,880	$14,880	$14,880	$14,880
Market Square Center	$519,224	$0	$0	$0	$0	$27,328	$40,991	$40,991	$40,991	$40,991	$54,655	$68,319	$68,319	$68,319	$68,319
Class A Office	$482,715	$0	$0	$0	$20,988	$20,988	$20,988	$41,975	$41,975	$41,975	$41,975	$62,963	$62,963	$62,963	$62,963
Class B Office	$252,507	$0	$0	$6,012	$6,012	$6,012	$12,024	$12,024	$18,036	$18,036	$30,060	$30,060	$30,060	$42,085	$42,085
Extended Stay Hotel	$167,095	$0	$0	$0	$0	$0	$11,140	$11,140	$11,140	$22,279	$22,279	$22,279	$22,279	$22,279	$22,279
Hotel Resort	$474,053	$0	$0	$0	$0	$0	$0	$0	$67,722	$67,722	$67,722	$67,722	$67,722	$67,722	$67,722
Vertical Mixed Use:															
Office	$277,375	$0	$0	$0	$0	$9,565	$9,565	$9,565	$19,129	$19,129	$19,129	$38,259	$38,259	$57,388	$57,388
Retail	$131,938	$0	$0	$0	$0	$3,717	$3,717	$3,717	$9,291	$9,291	$9,291	$18,583	$18,583	$27,874	$27,874
Medical	$77,105	$0	$0	$0	$0	$2,337	$2,337	$2,337	$4,673	$4,673	$4,673	$10,904	$10,904	$17,134	$17,134
Entertainment	$71,052	$0	$0	$0	$0	$2,733	$2,733	$2,733	$5,466	$5,466	$5,466	$9,565	$9,565	$13,664	$13,664
Boutique Hotel	$163,531	$0	$0	$0	$0	$10,221	$10,221	$10,221	$10,221	$20,441	$20,441	$20,441	$20,441	$20,441	$20,441
Multi Family															
Tier 1 ($250,000)	$1,005,382	$0	$0	$0	$0	$17,763	$35,526	$56,841	$74,604	$92,367	$110,130	$127,893	$145,656	$163,419	$181,182
Tier 2 ($450,000)	$1,775,611	$0	$0	$0	$0	$21,999	$50,283	$81,710	$113,136	$150,848	$188,560	$226,273	$270,270	$314,267	$358,265
Tier 3 ($750,000)	$239,117	$0	$0	$0	$0	$0	$0	$0	$0	$0	$6,832	$20,496	$40,991	$68,319	$102,479
Parking Structures	$172,164	$0	$0	$0	$0	$8,198	$8,198	$8,198	$16,397	$16,397	$16,397	$24,595	$24,595	$24,595	$24,595
TOTAL PROPERTY TAX	**$6,200,501**	**$2,050**	**$2,733**	**$23,775**	**$46,129**	**$151,354**	**$230,266**	**$314,777**	**$468,840**	**$546,359**	**$637,770**	**$788,509**	**$870,765**	**$1,010,627**	**$1,106,547**
GRAND TOTAL	**$147,763,960**	**$289,742**	**$356,431**	**$2,523,394**	**$2,782,627**	**$6,967,492**	**$8,378,320**	**$9,825,694**	**$13,782,877**	**$13,461,743**	**$15,141,564**	**$18,499,584**	**$17,201,215**	**$19,665,288**	**$18,887,989**

NON-PREFERRED LAND USES - CONSTRUCTION

Construction Value	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Retail	$12,500,000	$2,500,000	$0	$2,500,000	$0	$2,500,000	$0	$2,500,000	$0	$0	$0	$2,500,000	$0	$0	$0
Restaurant/Bar	$5,625,000	937,500	0	1,250,000	0	937,500	0	1,250,000	0	0	0	1,250,000	0	0	0
Multi Family:															
Tier 1 ($250,000)	$290,875,000	$0	$4,875,000	$19,500,000	$22,750,000	$22,750,000	$48,750,000	$48,750,000	$19,500,000	$19,500,000	$19,500,000	$16,250,000	$16,250,000	$16,250,000	$16,250,000
Tier 2 ($450,000)	$79,062,500	$0	$0	$0	$0	$14,375,000	$21,562,500	$21,562,500	$21,562,500	$0	$0	$0	$0	$0	$0
City Construction Tax															
Retail	$281,311	$56,262	$0	$56,262	$0	$56,262	$0	$56,262	$0	$0	$0	$56,262	$0	$0	$0
Restaurant/Bar	$126,590	$21,098	$0	$28,131	$0	$21,098	$0	$28,131	$0	$0	$0	$28,131	$0	$0	$0
Multi Family:															
Tier 1 ($250,000)	$6,546,111	$0	$109,711	$438,845	$511,986	$511,986	$1,097,114	$1,097,114	$438,845	$438,845	$438,845	$365,705	$365,705	$365,705	$365,705
Tier 2 ($450,000)	$1,779,293	$0	$0	$0	$0	$323,508	$485,262	$485,262	$485,262	$0	$0	$0	$0	$0	$0
TOTAL CONSTRUCTION TAX	**$8,733,305**	**$77,361**	**$109,711**	**$523,239**	**$511,986**	**$912,855**	**$1,582,375**	**$1,666,769**	**$924,107**	**$438,845**	**$438,845**	**$450,098**	**$365,705**	**$365,705**	**$365,705**

NON-PREFERRED LAND USES - TPT TAX

Sales Revenue	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Retail	$303,594,033	$6,324,876	$6,324,876	$12,649,751	$12,649,751	$18,974,627	$18,974,627	$25,299,503	$25,299,503	$25,299,503	$25,299,503	$31,624,378	$31,624,378	$31,624,378	$31,624,378
Restaurant/Bar	$151,543,825	$2,706,140	$2,706,140	$6,314,326	$6,314,326	$9,020,466	$9,020,466	$12,628,652	$12,628,652	$12,628,652	$12,628,652	$16,236,838	$16,236,838	$16,236,838	$16,236,838
City TPT															
Retail	$6,679,069	$139,147	$139,147	$278,295	$278,295	$417,442	$417,442	$556,589	$556,589	$556,589	$556,589	$695,736	$695,736	$695,736	$695,736
Restaurant/Bar	$4,849,402	$86,596	$86,596	$202,058	$202,058	$288,655	$288,655	$404,117	$404,117	$404,117	$404,117	$519,579	$519,579	$519,579	$519,579
TOTAL SALES TAX	**$11,528,471**	**$225,744**	**$225,744**	**$480,353**	**$480,353**	**$706,097**	**$706,097**	**$960,706**	**$960,706**	**$960,706**	**$960,706**	**$1,215,315**	**$1,215,315**	**$1,215,315**	**$1,215,315**

NON-PREFERRED LAND USES - OCCUPANCY TAX

Lease Revenue															
Retail	$13,989,581	$291,450	$291,450	$582,899	$582,899	$874,349	$874,349	$1,165,798	$1,165,798	$1,165,798	$1,165,798	$1,457,248	$1,457,248	$1,457,248	$1,457,248
Restaurant/Bar	$6,120,442	$109,294	$109,294	$255,018	$255,018	$364,312	$364,312	$510,037	$510,037	$510,037	$510,037	$655,762	$655,762	$655,762	$655,762
Multi Family:															
Tier 1 ($250,000)	$5,357,258	$0	$12,334	$61,672	$119,233	$176,794	$300,138	$423,482	$472,820	$522,158	$571,496	$612,611	$653,725	$694,840	$735,955
Tier 2 ($450,000)	$945,640	$0	$0	$0	$0	$20,557	$51,394	$82,230	$113,066	$113,066	$113,066	$113,066	$113,066	$113,066	$113,066
City Occupancy Tax															
Retail	$307,771	$6,412	$6,412	$12,824	$12,824	$19,236	$19,236	$25,648	$25,648	$25,648	$25,648	$32,059	$32,059	$32,059	$32,059
Restaurant/Bar	$134,650	$2,404	$2,404	$5,610	$5,610	$8,015	$8,015	$11,221	$11,221	$11,221	$11,221	$14,427	$14,427	$14,427	$14,427
Multi Family:															
Tier 1 ($250,000)	$117,860	$0	$271	$1,357	$2,623	$3,889	$6,603	$9,317	$10,402	$11,487	$12,573	$13,477	$14,382	$15,286	$16,191
Tier 2 ($450,000)	$20,804	$0	$0	$0	$0	$452	$1,131	$1,809	$2,487	$2,487	$2,487	$2,487	$2,487	$2,487	$2,487
TOTAL OCCUPANCY TAX	**$581,084**	**$8,816**	**$9,088**	**$19,791**	**$21,057**	**$31,592**	**$34,984**	**$47,994**	**$49,758**	**$50,843**	**$51,929**	**$62,451**	**$63,356**	**$64,260**	**$65,165**

NON-PREFERRED LAND USES - PROPERTY TAX

Assessed Value (Cumulative)	Total	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Retail	$96,000,000	$2,000,000	$2,000,000	$4,000,000	$4,000,000	$6,000,000	$6,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000
Restaurant/Bar	$42,000,000	$750,000	$750,000	$1,750,000	$1,750,000	$2,500,000	$2,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$4,500,000	$4,500,000	$4,500,000	$4,500,000
Multi Family:															
Tier 1 ($250,000)	$1,693,900,000	$0	$3,900,000	$19,500,000	$37,700,000	$55,900,000	$94,900,000	$133,900,000	$149,500,000	$165,100,000	$180,700,000	$193,700,000	$206,700,000	$219,700,000	$232,700,000
Tier 2 ($450,000)	$529,000,000	$0	$0	$0	$0	$11,500,000	$28,750,000	$46,000,000	$63,250,000	$63,250,000	$63,250,000	$63,250,000	$63,250,000	$63,250,000	$63,250,000
Property Tax															
Retail	$131,172	$2,733	$2,733	$5,466	$5,466	$8,198	$8,198	$10,931	$10,931	$10,931	$10,931	$13,664	$13,664	$13,664	$13,664
Restaurant/Bar	$57,388	$1,025	$1,025	$2,391	$2,391	$3,416	$3,416	$4,782	$4,782	$4,782	$4,782	$6,149	$6,149	$6,149	$6,149
Multi Family:															
Tier 1 ($250,000)	$2,314,511	$0	$5,329	$26,644	$51,513	$76,381	$129,669	$182,958	$204,274	$225,589	$246,905	$264,668	$282,431	$300,194	$317,957
Tier 2 ($450,000)	$722,815	$0	$0	$0	$0	$15,713	$39,283	$62,853	$86,424	$86,424	$86,424	$86,424	$86,424	$86,424	$86,424
TOTAL PROPERTY TAX	**$3,225,887**	**$3,758**	**$9,086**	**$34,501**	**$59,369**	**$103,708**	**$180,567**	**$261,525**	**$306,411**	**$327,726**	**$349,042**	**$370,904**	**$388,667**	**$406,430**	**$424,193**
GRAND TOTAL	**$24,068,747**	**$315,678**	**$353,629**	**$1,057,884**	**$1,072,766**	**$1,754,252**	**$2,504,023**	**$2,936,994**	**$2,240,982**	**$1,778,121**	**$1,800,522**	**$2,098,768**	**$2,033,042**	**$2,051,710**	**$2,070,377**

When recorded return to:
City Clerk
City of Surprise, Arizona
16000 N. Civic Center Plaza
Surprise, AZ 85374-7470

Exempt from filing an
Affidavit of legal value
A.R.S. §11-1134(A)(3)

SPECIAL WARRANTY DEED
(WITH DEED RESTRICTIONS)

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, SURPRISE CENTER DEVELOPMENT COMPANY L.L.C., an Arizona limited liability company ("Grantor"), hereby conveys to the CITY OF SURPRISE, an Arizona municipal corporation ("Grantee"), the following real property situated in Maricopa County, Arizona (the "Property"):

> see **Exhibit A** attached hereto and by this reference made a part hereof;

including any and all water rights and all other rights, easements and privileges appurtenant to such Property.

Subject to all taxes and other assessments, patent reservations, easements, rights-of-way, encumbrances, liens, covenants, conditions, restrictions, declarations, obligations, liabilities or other matters of record or to which reference is made in the public record and any and all conditions, easements, encroachments, rights of way, or other restrictions which a physical inspection, or accurate survey of the Property would reveal and further expressly subject to those Deed Restrictions set forth in Exhibit "B" attached hereto and made a part hereof.

And the Grantor, hereby binds itself and its successors to warrant and defend the title, as against all acts of Grantor herein and none other, subject to the matters above set forth.

The person executing this document on behalf of a corporation, trust or other organization warrants his or her authority to do so and that all persons necessary to bind Grantor have joined in this document.

IN WITNESS WHEREOF, the Grantor ~~has~~ caused this Special Warranty Deed to be executed this 2nd day of February, 2023.

SURPRISE CENTER DEVELOPMENT COMPANY. L.L.C.,
an Arizona limited liability company

By: AIRFIELD CAPITAL PARTNERS L.L.C.,
an Arizona limited liability
company Its: Managing Member

By: Airfield Management Associates L.L.C.,
an Arizona limited liability company
Its: Managing Member

By: TRW Partners LLC,
an Arizona limited liability company
Its: Member

By: West Management Limited Partnership,
an Arizona limited partnership
Its: Managing Member

By: The Richard West Co.,
an Arizona corporation,
Its: ~~General Manager~~

By: R. Richard B. West

Richard B. West, III,

Grantor's address:
C/O Carefree Partners Investment, LLC
11811 North Tatum Blvd., Suite 4052
Phoenix, AZ 85028

STATE OF ARIZONA)
) ss.
County of Maricopa)

The foregoing instrument was acknowledged before me this 2nd day of February, 2018, by Richard B. West, III, President of The Richard West Co., an Arizona corporation.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission Expires:
December 2, 2020

Cristine Reynolds
Notary Public

CRISTINE REYNOLDS
Notary Public - State of Arizona
MARICOPA COUNTY
My Commission Expires
December 2, 2020

EXHIBIT "A"

DESCRIPTION

20 ACRE PARCEL

A portion of the southwest quarter of Section 4, Township 3 North, Range 1 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona described as follows:

COMMENCING at the south quarter corner of said Section 4 from which the southwest corner of said Section 4 lies North 89°09'02" West 2636.03 feet;

Thence along the North-South midsection line of said Section 4 being also the centerline of North Civic Center Drive North 00°12'57" East 115.01 feet;

Thence departing said midsection line North 89°09'02" West 55.00 feet to a point on the west right-of-way line of said North Civic Center Drive to the POINT OF BEGINNING;

Thence on a line parallel with and 115.00 feet north, measured at right angles, of the south line of the southwest quarter of said Section 4 North 89°09'02" West 752.96 feet;

Thence parallel to said North Civic Center Drive North 00°12'57" East 1158.25 feet to a point on the south right-of-way line of Tierra Buena Lane;

Thence along said south right-of-way line South 89°05'13" East 719.99 feet;

Thence continuing along said south right-of-way line South 44°26'09" East 46.92 feet to a point on said west right-of-way line of North Civic Center Drive;

Thence along said west right-of-way line South 00°12'57" East 1124.44 feet to the POINT OF BEGINNING.

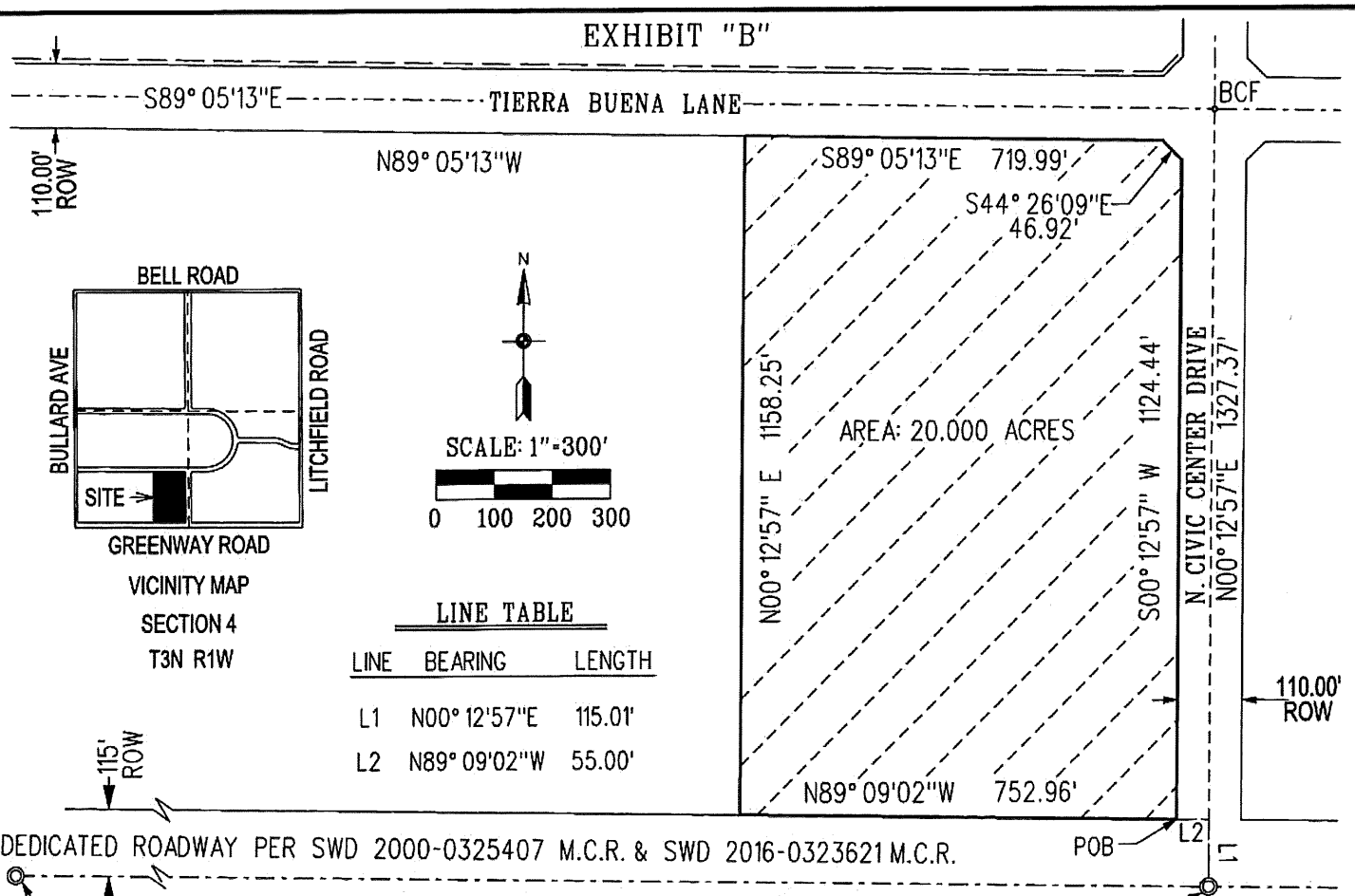
Containing 871,207 square feet or 20.000 acres, more or less.

Attached is EXHIBIT "B" and by this reference is made a part hereof.

End of description

EXPIRES 09-30-2020

EXHIBIT "B"



LINE TABLE

LINE	BEARING	LENGTH
L1	N00° 12'57"E	115.01'
L2	N89° 09'02"W	55.00'

LEGEND

M.C.R.	MARICOPA COUNTY RECORDER
POC	POINT OF COMMENCEMENT
POB	POINT OF BEGINNING
COS	CITY OF SURPRISE
BC	BRASS CAPPED SURVEY MONUMENT
HH	HANDHOLE
BCF	BRASS CAP FLUSH WITH ROAD SURFACE
	20 ACRE PARK PARCEL
SEC	SECTION
◎	SURVEY MONUMENT
-·-·-	SECTION LINE
- - - -	MID-SECTION LINE
———	ROADWAY RIGHT OF WAY LINE
----	TIE LINE

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
19820
RON DRY
Date Signed 01-09-18
ARIZONA, U.S.A.

EXPIRES 09/30/20

BEARING BASE: THE SOUTH LINE OF THE SOUTHWEST QUARTER OF SECTION 4 AS SHOWN ON PAGE 30 OF 54 OF ORDINANCE NO. 01-12 OF THE CITY OF SURPRISE, ARIZONA AS RECORDED IN INSTRUMENT 2001-1090773, RECORDS OF MARICOPA COUNTY, CITED AS NORTH 89° 09'02" WEST

20 ACRE PARCEL	SURPRISE ARIZONA	CITY OF SURPRISE LAND SURVEY DEPARTMENT	
PROJECT # 15029	DRAWN BY RCD	DATE 03-27-17	SHEET 1 OF 1

Exhibit B

DEED RESTRICTIONS

The Property shall be used solely for the following purposes and no others: (i) higher educational uses; and/or (ii) civic and/or governmental uses. "{H}igher educational uses" shall be strictly limited to public or private colleges and universities. "Civic and/or governmental uses" shall be strictly limited to all Civic and/or governmental uses (except for staging areas, corporation yards, police and fire stations and public utility facilities used to generate, treat, dispose of, or recycle any water, wastewater, or refuse) together with such parking facilities as may be necessary to support the same. The foregoing restricted uses shall be defined for all purposes as the **"Deed Restrictions"** which shall attach to and run with the Property and remain in place in perpetuity. The Deed Restrictions may be enforced only by Grantor (or its corporate or other entity successor, by merger or otherwise). The Deed Restrictions may be amended only by a recorded instrument signed by Grantor (or its corporate or other entity successor, by merger or otherwise) and by Grantee or the successor fee owner or fee owners of the Property or the portion of the Property affected by any such amendment. The Deed Restrictions shall be enforceable by injunctive relief.

CITY OF SURPRISE
Regular City Council Work Session

April 17, 2018 @ 4:00:00 PM

Back Print

Council Meeting Date:	April 17, 2018	Contact Person:	Lindsey Duncan, Finance Director and Holly Osborn, Assistant Finance Director
Submitting Department:	Finance Dept	District:	Citywide
Staff Recommendations:	None		

Consent	Regular	Public Hearing	Report/Discussion

Agenda Wording:

Discussion and presentation regarding the City Manager's FY2019 Recommended Budget.

Motion:

None, discussion only.

Background:

Guided by discussion with the Mayor and Council over the last couple of months during work sessions, the City Manager completed his Recommended Budget for the upcoming fiscal year. This presentation will review the recommendations and the discussion will influence the Tentative Budget that will be brought forward for future Council Action.

Objective Analysis:

None; presentation only

Policy Compliant:

This action is consistent with City policies and procedures.

Financial Impact:

None; however, items discussed may have an impact on future operations.

Budget Impact:

None; however, items discussed will influence the final FY2019 budget.

FTE Impact:

None; however, items discussed will influence the total FTE included as a part of the final FY2019

budget.

ATTACHMENTS:

Click to download

No Attachments Available