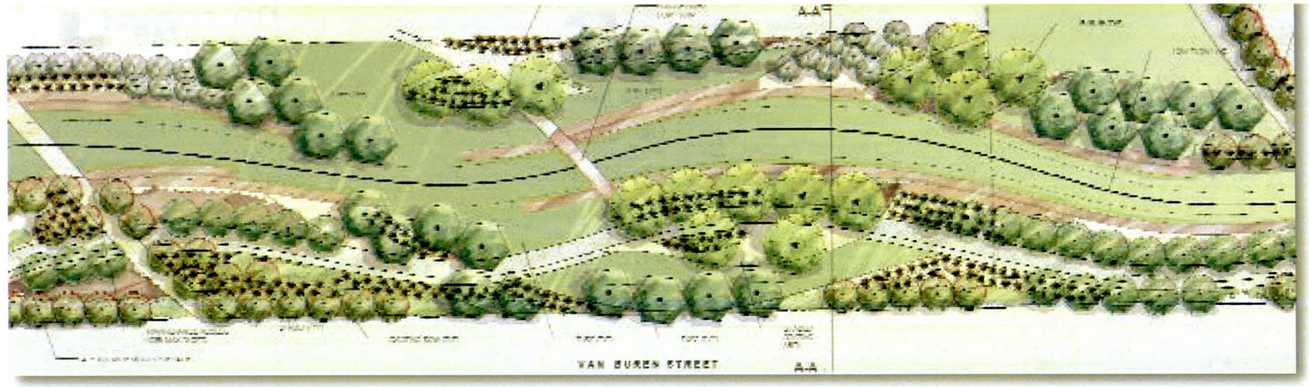

DESIGN CONCEPT REPORT

for the

VAN BUREN STREET CHANNEL
99TH AVE. TO AGUA FRIA RIVER
10-YEAR SOLUTION

FCD Contract #2010C004
Work Assignment No. 3
SEI Project Number 03700.001

August 2013

Flood Control District of Maricopa County

City of Avondale

SUNRISE ENGINEERING

DESIGN CONCEPT REPORT

FOR THE

VAN BUREN STREET CHANNEL
99TH AVENUE TO AGUA FRIA RIVER

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY & CITY OF AVONDALE

AUGUST 2013

FCD CONTRACT NO. 2010C004
WORK ASSIGNMENT NO. 3
SEI PROJECT NO. 03700.001

Prepared for:
Flood Control District of Maricopa County
2801 W Durango St
Phoenix, Arizona 85009
602.506.4592
Attn Gary Wesch, P.E.
&
Prepared for:
City of Avondale
11465 W. Civic Center Drive, Suite 120
Avondale, Arizona 85323
623.333.4216
Attn Charles Andrews, P.E.

Prepared by:
Sunrise Engineering, Inc.
2152 South Vineyard, Suite 123
Mesa, Arizona 85210
480.768.8600

Project Team Leads:
Ricky M. Holston, P.E., CFM – Project Manager

Randy Perham, E.I.T – Design Technician

Li Qi, P.E., CFM – Project Hydrologist

Registered Professional Engineer (Civil)
CERTIFICATE NO. 43301
RICKY M. HOLSTON
Date Signed 8/26/13
ARIZONA, U.S.A.
Exp 1/30/14

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EXECUTIVE SUMMARY

The Van Buren Street Channel Design Concept Report (DCR) documents the conceptual design development of the proposed Van Buren Street Channel 10-year drainage corridor from 99th Avenue to the Agua Fria River. The project will provide a regional drainage solution and has the benefits of reduced retention requirements at the City Center, trail connectivity within the city, and reduction of flows in the Durango Regional Outfall Project (DROP) channel.

The Flood Control District of Maricopa County (District) and the City of Avondale (COA) entered into an intergovernmental agreement (IGA) under the Districts Capital Project program to develop conceptual flood control solutions that satisfy the project goals. The project milestones are:

- Hydrology update of land uses in project area
- Alternative Analysis for 100-year solutions
- Hydrology update for project area to NOAA 14 rainfall.
- Alternative Analysis for 10-year solutions
- Final DCR and Conceptual plan and profiles

Initially the project analyzed three 100-year storm event solutions. The three solutions costs ranged too high to be considered feasible. As a result of these high costs, the District and COA then chose to review 10-year storm event solutions.

A second Alternatives Analysis for the 10-year storm event was performed for two alternative alignments for the proposed drainage improvements that were provided by the District and COA. Each of these alternatives provides the study area a connection to the Agua Fria River. These alternatives are briefly described as follows:

Alternative 1-3: A combination of open channel, box culverts and pipe with an alignment adjacent to Van Buren Street on the north side for the entire length of the project.

Alternative 3-2: A combination of open channel, box culverts and pipe with an alignment adjacent to Van Buren Street (north side) from the Agua Fria River to 119th Avenue and then shifting north to the future Fillmore Street alignment, through City Center and finally on the Pierce Street alignment.

Upon the completion of the Alternatives Analysis the project team selected Alternative 1-3 as the Recommended Alternative. The alternative minimizes construction conflicts, does not disrupt planned City Center drainage and keeps with the City's desires to have the conveyance parallel to Van Buren Street. This best fit the goals of the stakeholders, provides the necessary drainage improvements and accomplishes parks and trails connectivity within the City of Avondale.

This report shows the 10-year Recommended Alternative (1-3) being constructed in phases. **Phase I** extends from the Agua Fria River to 113th Avenue (the City Center area). **Phase II** is from 113rd Avenue to 99th Avenue.

The Phase I conveyance is an open channel parallel to the Van Buren Street right-of-way. The channel is trapezoidal shaped with meandering side slopes ranging from 4:1 to 8:1. Reinforced box culverts (RCB) will be used at roadway crossings and where existing development constrains the channel. RCB's are typically three to four barrels of 10-feet by 4-feet. The project will rework existing development drainage improvements and open space, where feasible, to maintain as much open channel as possible. This will also include landscape and trail features.

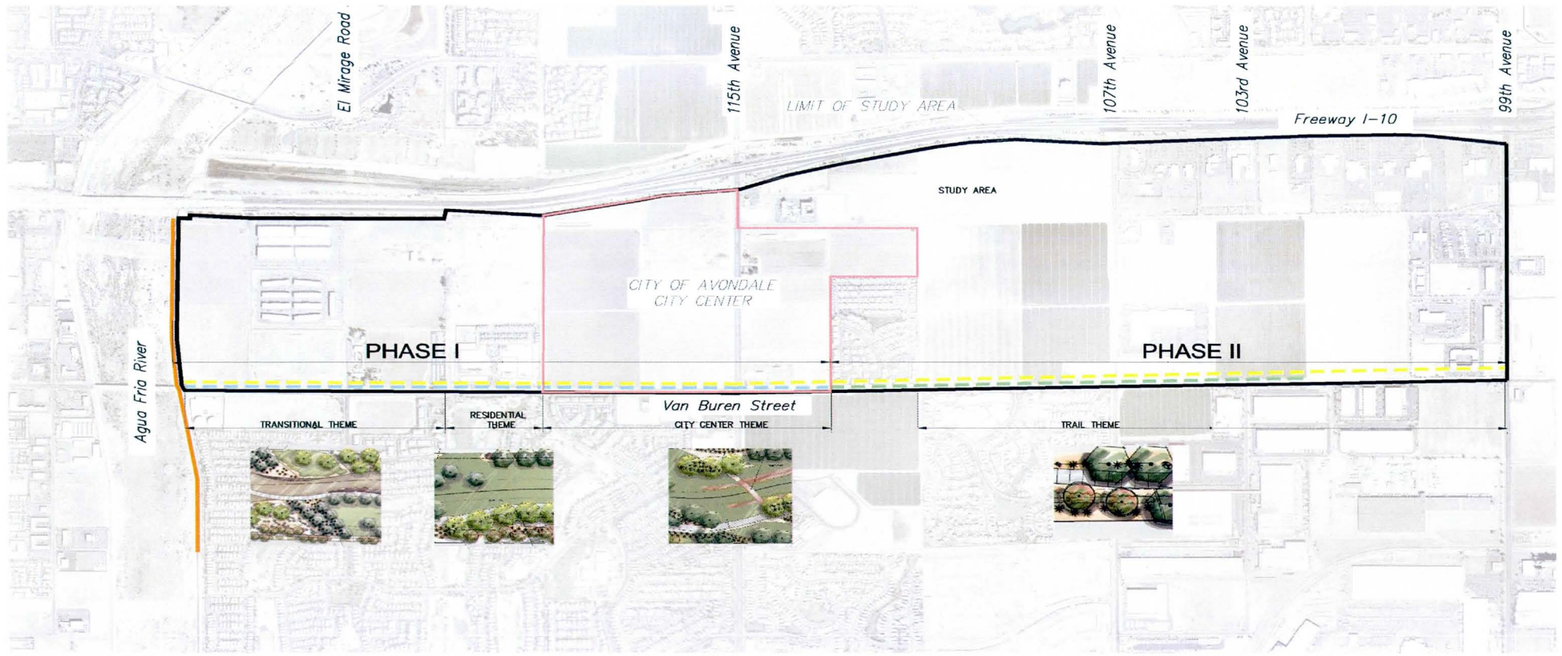
The Phase II conveyance consists of 60-inch reinforced concrete pipe. The pipe will be installed at the northern edge of the Van Buren Street right-of-way or in a 20-foot drainage easement. This will also include landscape and trail features within the easement for the pipe.

Conceptual Plans (15% level) for the Recommended Alternative (Appendix B) have been prepared as part of this report. These plans identify the alignment, proposed improvements, property/easement acquisition and utility conflicts associated with implementing this Alternative.

The Recommended Plan cost estimate has been provided based on the conceptual level Alternative 1-3 alignment with open channel for Phase I and concrete pipe for Phase II. Unit prices are median prices from recent bid prices provided by the District and COA. The total cost of the project (Phases I & II) has estimated to be $17.9 million dollars for basic construction and ultimate landscape for a 10-year level of flood protection.

The Recommended Alternative was presented at a public meeting addressed to the public, COA Parks and Recreation Board, and the COA City Council. The public meeting was held at COA City Hall on March 20, 2013 and the project was presented in an open house format. Generally the public reception of the project has been excellent.

An IGA will be entered into by the District and COA for final design and construction of the project. The District will provide a cost share of 40% of the design for Phases I and II, Phase I right-of-way-acquisition, utility relocations and construction, subject to the limitations of their policy for the aesthetic treatment and landscaping of Flood Control Projects. COA will be expected to contribute 60% cost for final design, Phase I right-of-way, utility relocations and construction. COA will be responsible for 100% of Phase II construction. It is also understood COA will be lead agency for design, right-of-way acquisition, utility relocations and construction. COA will also be responsible for operation and maintenance. The project is to be completed within 15 years.



1 INTRODUCTION

The Van Buren Design Concept Report documents the conceptual design development for the Recommended Alternative for the Van Buren Street Channel from 99th Avenue to the Agua Fria River. It has been prepared for the Flood Control District of Maricopa County (District) and the City of Avondale (COA). The Recommended Alternative provides a drainage conveyance that satisfies the project objectives. The Recommended Alternative is divided into two phases with reaches of open channel and reaches of storm drain pipe that provide a 10-year level of flood protection.

The Recommended Alternative phases are; Phase I from 113th Avenue (the City Center area) to the Agua Fria River and Phase II from 99th Avenue to 113th Avenue. Phase I is an open channel parallel to the Van Buren Street right-of-way. Phase II is a storm drain pipe in an extended Van Buren Street right-of-way.

The Recommended Alternative was selected as the preferred alignment by the COA and the District. The alternative minimizes construction conflicts, does not disrupt planned City Center drainage and is in keeping with the City's desires to have the conveyance parallel to Van Buren Street.

1.1 Objective

The project will provide a regional drainage solution through the installation of a drainage outlet to the Agua Fria River for the developing area north of Van Buren Street which will reduce retention requirements at the COA's City Center located at Avondale Boulevard. Furthermore, it will provide trail connectivity within the City of Avondale, and offer the added benefit of reduced flows in the Durango Regional Outfall Project (DROP) channel south of this project, and stay ahead of development. Staying ahead of development allows greater control of alignment and conveyance type. See **Figure 1.1.1 – Study Area** for the study area and DROP location.

1.2 Existing Data & Reports

Sunrise Engineering, Inc, (Sunrise) conducted a topographic survey of the north half of Van Buren Street from the Agua Fria River to 99th Avenue. The topographic data provided current mapping of existing retention basins, power poles, existing utilities, and street grades along the alignment. The data was collected by a GPS survey using cross sections from the centerline of Van Buren Street to approximately 200 feet north of the proposed right-of-way at 100 to 200 foot spacing. The data is on the NAVD88 datum.

An Alternatives Analysis was completed by Sunrise in December 2010 which studied three conveyances for the 100-year storm event. It was determined by the District and Avondale that the cost of all three conveyance options were too high to continue the project. Electronic copies of the December 2010 Alternatives Analysis are available through Sunrise Engineering.

A second Alternatives Analysis dated October 2012 (also available in the District's Library) was conducted for the project that analyzed two alignments and conveyance alternatives for a 10-year storm event system along Van Buren Street. Alignment Alternatives 1-3 and 3-2, and conveyance options for Alternative 1-3 were each reviewed. As well as hydrologic and hydraulic modeling and cost estimates of the alternatives. This final DCR includes the October 2012 Alternatives Analysis data and analysis.

Durango Regional Outfall Project (DROP) Channel

Prior to the December 2010 Alternatives Analysis, the area was studied in the *Durango Area Drainage Master Plan* by Dibble and Associates, FCD#99-41. The study proposed storm drain alignments and retention basins to serve the overall study area. The study limits for this project are within the larger Durango ADMP study area.

1.3 Project Coordination

Coordination amongst project stakeholders and the project consultants has occurred throughout the project. There have been the kick off meeting, project coordination meetings, informal meetings, and frequent email and telephone correspondence.

The project stakeholders consist of:

- Charles Andrews, P.E. - City of Avondale
- Jackie Keller, R.L.A. – City of Avondale
- Gary Wesch, P.E. - FCDMC
- Richard Waskowsky, P.E. - FCDMC
- Harry Cooper, R.L.A. – FCDMC

1.4 Deliverables

The project deliverables consist of:

- Electronic submittal of hydrology models
- Alternatives Analysis Technical Memorandum
- Design Concept Review Report

The technical memorandum reports were intermediate points for the District and project stakeholders to provide commentary while working towards the goal of the final DCR Report.

1.5 Acknowledgements

We would like to thank the District and the City of Avondale for their input and continued guidance throughout the project. Special thanks go to Gary Wesch, District Project Manager, and Charles Andrews, City of Avondale Project Manager.

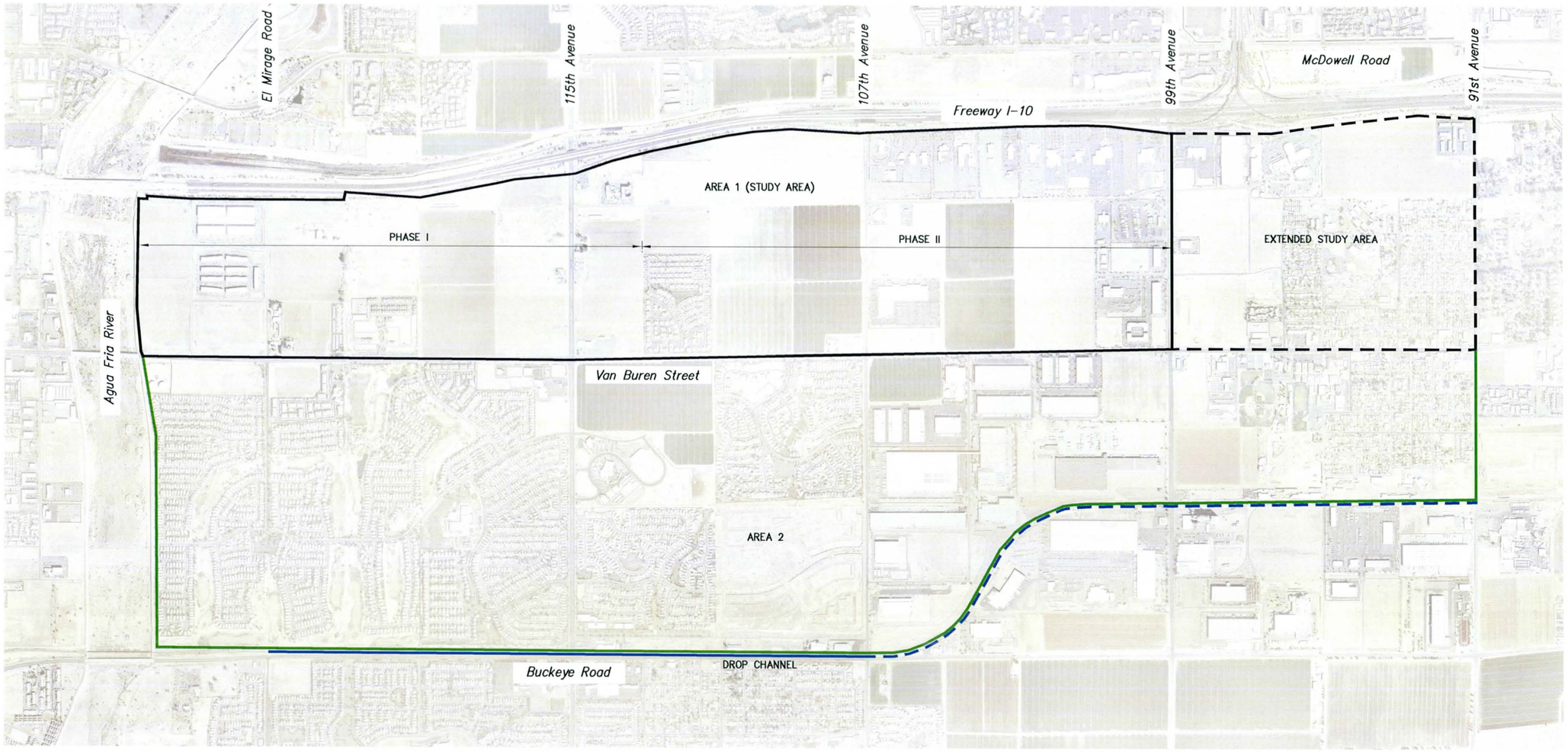
1.6 Project Consultants

Sunrise Engineering, Inc. is the prime consultant for the project. The Sunrise team consists of:

- Geoff Child, P.E. - Principal
- Ricky Holston, P.E., CFM - Project Manager
- Li Qi, P.E. CFM - Project Hydrologist
- Randy Perham, E.I.T., CFM – Design Technician
- Tony Elley, R.L.S., CFeDS – Survey Manager

Logan Simpson Design is the partner consultant providing landscape architecture for project. Their team consists of:

- Diane Simpson-Colebank, R.L.A. – Principal
- Jay Hicks, R.L.A. – Principal



LEGEND

- BOUNDARY OF AREA 1 (STUDY AREA)
- BOUNDARY OF EXTENDED STUDY AREA
- BOUNDARY OF AREA 2
- EXISTING DROP CHANNEL
- PROPOSED DROP CHANNEL

FIGURE 1.1.1 - STUDY AREA

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
www.sunrise-eng.com

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2 BACKGROUND

The project began in July 2009 when COA submitted a District Capital Project Letter of Intent for the Van Buren Street Channel Improvement Project. The District proceeded with a DCR effort for 100-year alternatives. The 100-year alternatives were deemed too costly and a second Alternatives Analysis was conducted for 10-year alternatives.

Two alternatives analyses were conducted for the project. The first was the December 2010 Alternatives Analysis which analyzed three 100-year alternatives. The second alternatives analysis was the October 2012 Alternatives Analysis which analyzed 10-year conveyances.

2.1 100-Year Alternatives Analysis

The 100-year analysis included a hydrology update, brainstorming of alternatives and the alternative analysis. Hydrology was extracted from the Durango ADMP and updated within the study areas. This update was completed in September 2010 and updated the current and future land uses for the study area. The hydrology update used the same NOAA 2 rainfall used in the Durango ADMP.

A brainstorming meeting was held at the District to develop three alternatives to analyze. The meeting was attended by District staff, COA staff, LSD, and Sunrise. Meeting objectives were met and three alternative alignments were selected to be further analyzed.

In December 2010 the alternatives analysis was completed. It analyzed the costs of constructing the three alternatives. Generally the alternatives included large retention basins at 99th Ave and the Agua Fria River, and no retention at the City Center. Costs ranged from $37.1 to $53.5 million.

The projected costs were deemed too high to continue the project. The District and COA then gave direction to study 10-year alternatives that would have lower costs.

2.2 10-Year Alternatives

The October 2012 10-year alternatives analysis used two predetermined alignments while leaving the conveyance type open for determination. The alignments were predetermined by the District and COA. The two alignments are Alternative 1-3 and Alternative 3-2. The alignments for both alternatives are on the north side of Van Buren Street, eliminating large utility crossings within Van Buren Street. All alignments and conveyance alternatives were developed by the project partners. Several conveyance alternatives were analyzed also, open channel, box culvert, U-type concrete, and pipe. All options provide the goal of reduced retention within the City Center and trail connectivity with the Agua Fria River.

The 10-year alternative also introduced phasing. Phase I is from the Agua Fria River to east of Avondale Boulevard. Phase II is from 113th Avenue to 99th Avenue.

Alternative 1-3

Alternative 1-3 alignment is a conveyance corridor on the north side of Van Buren Street. The parallel alignment begins at the Agua Fria River and ends at 103rd Avenue. The alignment will be contiguous with the 65 foot ultimate right-of-way on Van Buren Street. See **Figure 2.2.1 – Alternative 1-3, 10-Year Event** and **Figure 2.2.2 Alternative 1-3 Cross Section**.

Conveyances

The base conveyance for Alternative 1-3 is an open channel from the Agua Fria River to 113th Avenue for Phase I with reinforced box culverts at roadway crossings. Alternatives to the open channel conveyance are reinforced box culvert or an open top rectangular concrete channel. The Phase II conveyance is a 60-inch reinforced concrete pipe from 113th Avenue to 103rd Avenue. There is no need to extend the pipe all the way to 99th Avenue due to low flow rates in the initial reaches the pipe.

Phase I open channels will consist of a trapezoidal channel with varying side slopes ranging from a maximum of four to one and a minimum of eight to one. The water depth is three feet, with freeboard varying from one to four feet. Inverts were set at seven feet deep at intersection crossings to accommodate culverts. At Fairway Drive the invert was set at six feet so a positive slope could be maintained toward the Agua Fria River.

Varying side slopes will create a meandering bottom while leaving the right-of-way width and top of channel consistent. The side slopes will be covered with granite mulch and appropriate landscape plant material and trees.

The trail component will typically be on the south side of the channel adjacent to the Van Buren Street right-of-way. The trail could meander down into the channel bottom and back out to break up long, straight stretches. Maintenance and construction access will be from the Van Buren Street right-of-way.

The width of the open channel right-of-way corridor varies, depending on slope, and existing grades. Typically the channel corridor width ranges from 110 feet to approximately 190 feet.

Both alternate conveyances with reinforced box culvert and rectangular concrete channels would minimize right-of-way requirements. The first alternative conveyance option is a reinforced box culvert, ten feet wide by four feet tall with either three or four barrels, depending on location. The box culvert limits right-of-way acquisition to 80 feet wide. The box culvert is also buried so the right-of-way can be used for other uses, such as parking lots. The cost to install a box culvert is approximately three times more than an open channel.

The second alternative conveyance option is a rectangular concrete channel. The channel has the same foot print as the box culvert, but would remain open with no cover or internal walls. The cost savings over the box culvert is due to the fact that less concrete would be required by not installing the lid and divider walls. The cost is about twice as much as the open channel option.

Phase II pipes consist of 60-inch reinforced concrete pipe. The pipe will be installed at the northern edge of the Van Buren Street right-of-way or in a 20-foot drainage easement.

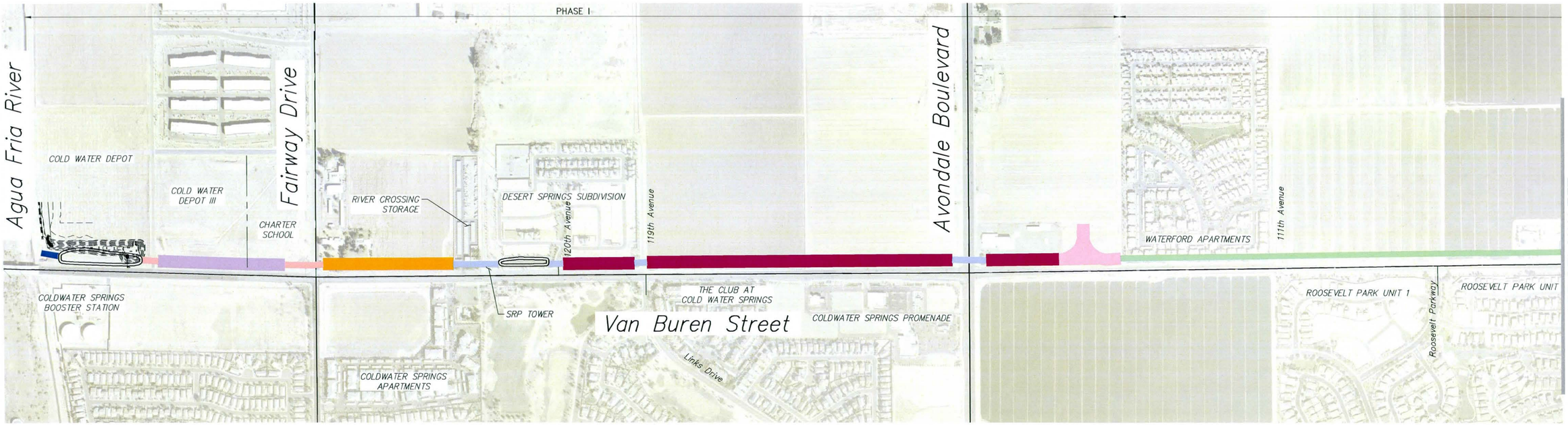
Pipe Only Alternative

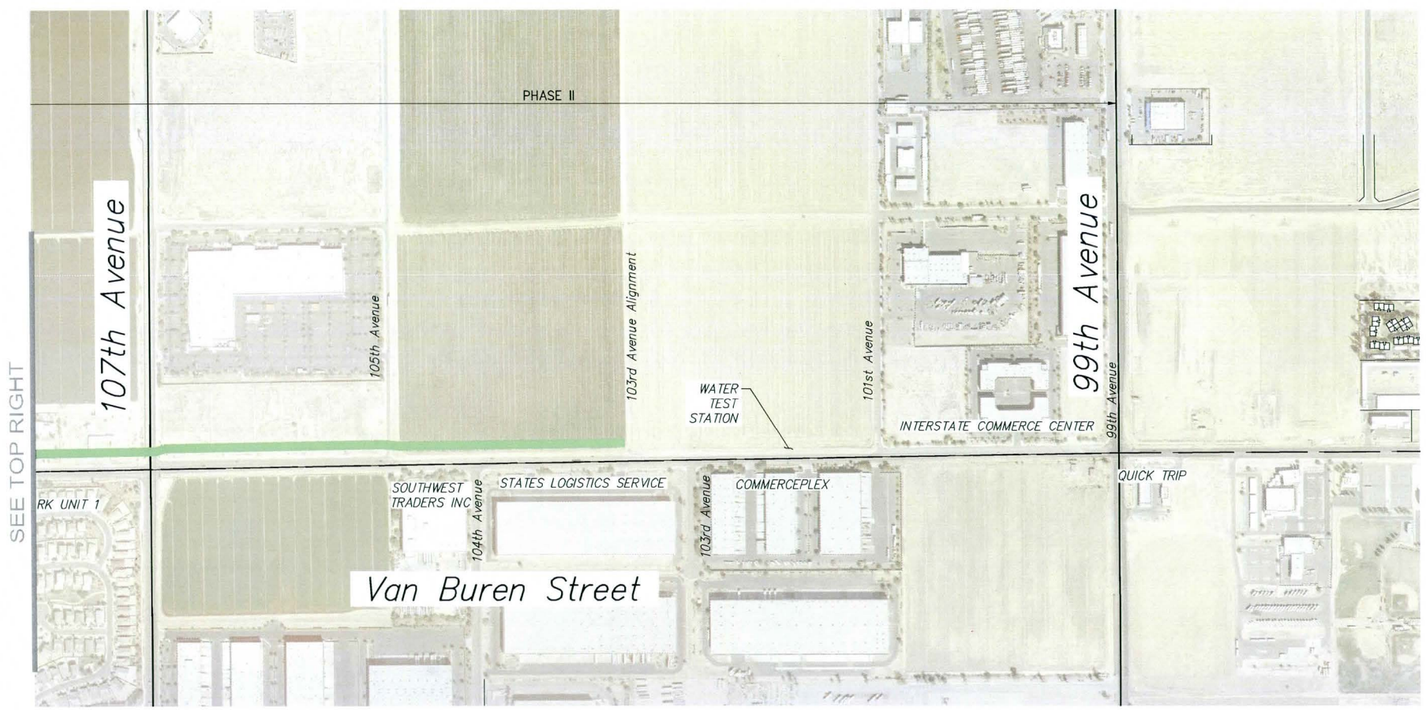
An "all pipe" conveyance alternative cost estimate was provided by the District. The all pipe alternative consists of reinforced concrete pipe for the entire length of the Alternative 1-3 alignment. Large pipe sizes are necessary to convey the required design flow. Maintaining a positive friction slope to the Agua Fria causes the top of pipe to daylight on the western end of the alignment. Therefore, this alternative was dismissed and is not a feasible option. See **Appendix H** for **Alternative Pipe Only Alternatives Analysis Cost Estimate**.

Alternative 3-2

Alternative 3-2 is a conveyance corridor that begins at the Agua Fria River and parallels the north side of the Van Buren Street right-of-way to 119th Avenue. The alignment then turns north on 119th Avenue to the future Fillmore Street alignment City Center West. In City Center East the alignment turns north on Park Avenue and then east to the Pierce Street alignment, then the alignment continues southeast to the half mile alignment and then east to 101st Avenue. See **Figure 2.2.3 – Alternative 3-2, 10-Year Event**.

The Alternative 3-2 alignment is not feasible for a number of reasons. First, the alignment through City Center would conflict with the proposed retention basin system and the channel size would be limited to the proposed median widths. Second the City of Avondale's vision for the channel is along Van Buren Street providing an overall corridor that is street, channel, and trail.





LEGEND

- AGUA FRIA OUTLET – 5' X 4' X QTY 6 RCB WITH FLAP GATES
- CHANNEL SECTION 3
- CHANNEL SECTION 2
- 60" REINFORCED CONCRETE PIPE
- REINFORCED CONCRETE BOX CULVERT – 4 BARREL 10' X 4'
- REINFORCED CONCRETE BOX CULVERT – 5 BARREL 10' X 4'
- CHANNEL SECTION 1B
- CHANNEL SECTION 1A
- EXISTING RETENTION BASINS

NORTH

SCALE
0 400' 800'
HORIZ: 1" = 400'

FIGURE 2.2.1 - ALTERNATIVE 1-3, 10-YEAR EVENT

PLAN VIEW

City of Avondale

Flood Control District of Maricopa County

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
www.sunrise-eng.com

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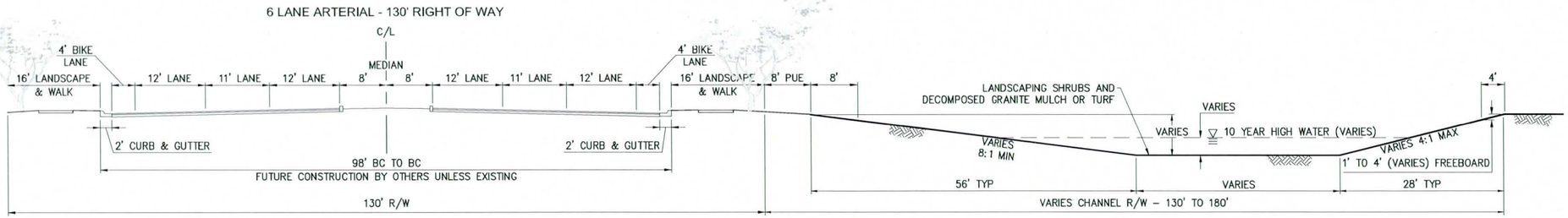
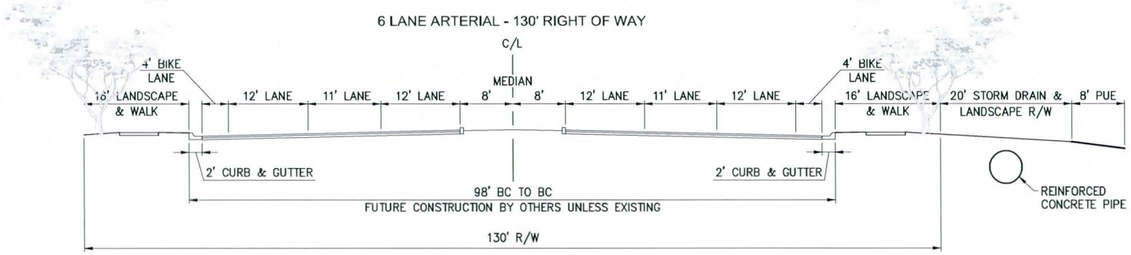


A
~
SECTION - VAN BUREN STREET
NOT TO SCALE
FAIRWAY DRIVE TO EAST OF 113TH AVENUE

CHANNEL DATA					
	SLOPE	DEPTH	BOTTOM	TYP TOTAL WIDTH	R/W WIDTH
CHANNEL 3	0.06%	3	90'	174'	180'
CHANNEL 2	0.21%	3	50'	134'	130'
CHANNEL 1B	0.45%	3	30'	114'	130', 150'
CHANNEL 1A	0.18%	2.2	10	94'	130'



B
~
SECTION - ALTERNATE PIPE SECTION
NOT TO SCALE VAN BUREN
113TH AVENUE TO 103RD AVENUE

FIGURE 2.2.2 - ALTERNATIVE 1-3
CROSS SECTION

City of Avondale

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SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
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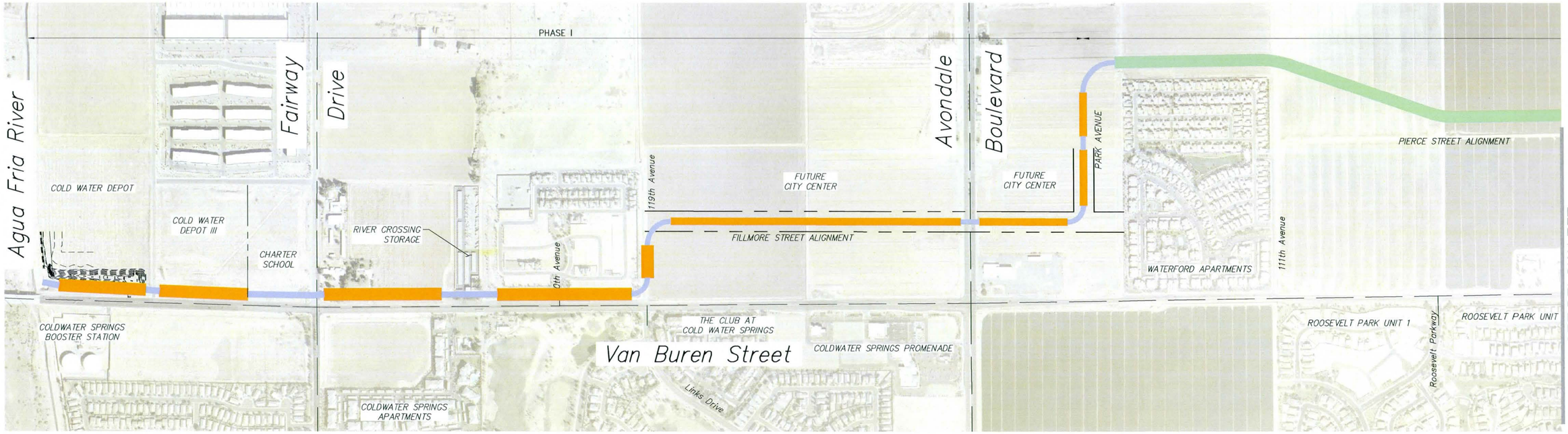

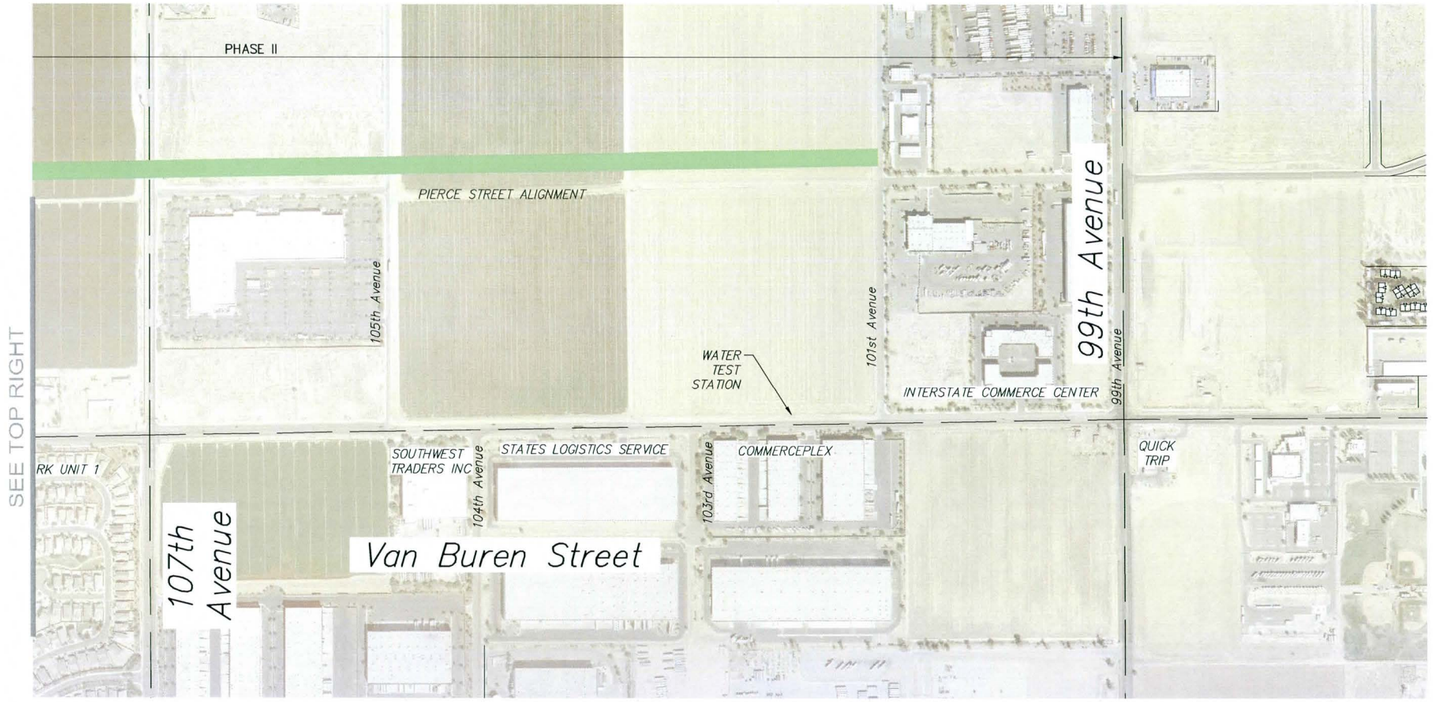

LEGEND

- SECTION – OPEN CHANNEL
- SECTION – REINFORCED CONCRETE PIPE
- REINFORCED CONCRETE BOX CULVERT – 50' X 4'

NORTH

SCALE 0 400' 800'

HORIZ: 1" = 400'

City of Avondale

Flood Control District of Maricopa County

SUNRISE ENGINEERING

2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
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FIGURE 2.2.3 - ALTERNATIVE 3-2, 10-YEAR EVENT

PLAN VIEW

3 RECOMMENDED PLAN

The Recommended Plan is Alternative 1-3 with Phase I open channel, Phase II storm drain pipe, and four landscape themes. The alignment is on the north side of Van Buren Street, eliminating large utility crossings in Van Buren Street. The Recommended Plan was chosen as the preferred alignment as it minimizes construction conflicts, does not disrupt planned City Center drainage and keeps with the City's desires to have the conveyance parallel to Van Buren Street. See **Figure 2.2.1 – Alternative 1-3, 10-Year Event** for a plan view of the alignment. Also, see **Appendix B** for conceptual **15% Plan and Profile Drawings**.

The project is expected to be constructed in two phases. Phase I is the western portion from the Agua Fria River to 113th Avenue (approx. 1200 feet east of Avondale Boulevard). Phase II is 113th Avenue east to 99th Avenue.

The 10-year design flow rate is 600 cubic feet per second for Phase I and 100 cubic feet per second for Phase II.

3.1 Description

The Recommended Plan alignment is a conveyance corridor on the north side of Van Buren Street. The parallel alignment begins at the Agua Fria River and ends at 103rd Avenue. The alignment will be contiguous with the 65-foot ultimate right-of-way along Van Buren Street.

Conveyances

The conveyance for the Recommended Plan is an open channel from the Agua Fria River to 113th Avenue for Phase I with reinforced box culverts at roadway crossings and existing constrictions. Alternatives to the open channel conveyance are reinforced box culvert or an open top rectangular concrete channel. The Phase II conveyance is a 60-inch reinforced concrete pipe from 113th Avenue to 103rd Avenue. There is no need to extend the pipe all the way to 99th Avenue due to low flow rates in the initial reaches the pipe.

Phase I open channels will consist of a trapezoidal channel with side slopes varying from a maximum of four to one and a minimum of eight to one. The water depth is three feet, with freeboard varying from one to four feet depending on existing grades. One-foot of freeboard is the minimum required per the District's freeboard equation 6.25 in the Hydraulics Manual. See **Appendix D** for freeboard calculations. Inverts were set at seven feet deep at intersection crossings to accommodate culverts. At Fairway Drive the invert was set at six feet so a positive slope could be maintained to the Agua Fria River.

Varying side slopes will create a meandering bottom while leaving the right-of-way width and top of channel consistent. The side slopes will be covered with granite mulch and appropriate landscape plant material and trees.

Landscape concepts were developed for the ultimate conditions. Final design may incorporate interim conditions including landscape and erosion control measures to meet available funds.

The trail component will typically be on the south side of the channel adjacent to the Van Buren Street right-of-way. The trail could meander down into the channel bottom and back out to break up long, straight stretches. Maintenance and construction access will be from the Van Buren Street right-of-way.

The width of the open channel right-of-way corridor varies, depending on slope, and existing grades. Typically the channel corridor width ranges from 110 feet to approximately 190 feet.

Reinforced box culvert will be used at roadway crossings and existing constrictions. The reinforced box culverts allow flow to cross under crossing roadway or other existing conflict. The reinforced box culvert is ten feet wide by four feet tall with either three or four barrels, depending on location. The box culvert limits right-of-way acquisition to 80 feet wide. The box culvert is also buried so the right-of-way can be used for other uses, such as parking lots. The cost to install a box culvert is approximately three times more than that to install an open channel.

Phase II pipes consist of 60-inch reinforced concrete pipe. The pipe will be installed at the northern edge of the Van Buren Street right-of-way or in the proposed 20-foot drainage easement. The easement area will be landscaped with a trail that provides a continuous connection from the Agua Fria River to 99th Ave.

District standards require that the first flush from all developed areas is treated prior to discharging to a downstream receiving water such as the Agua Fria River. The District will require the system to adhere to the City's NPDES permit. Furthermore, the City must demonstrate that water quality standards as required by the NPDES permit are met at the connection to the Agua Fria River.

Details have been developed for connections to the channel and the pipe. Van Buren Street runoff is conveyed to catch basins or scuppers. The catch basin or scupper conveys the runoff under the open channel or over the pipe to the adjacent retention basin that has been sized for the Van Buren half street flow. In addition, an "overflow box" is constructed in the basin with the grate at the high water level in the basin. The "overflow box" should have a snout or similar BMP to prevent oils and floating debris from entering the outgoing pipe. The catch basin is connected to the open channel or the pipe. When the basin volume exceeds the design volume it will drain to the channel or pipe. This will allow existing and future developments as well as Van Buren Street runoff to retain first flush prior to discharging into the system. See **Appendix F, Van Buren Channel Scupper and Catch Basin Connections** for suggested solutions for the future connections that provide interconnectivity .

Land Acquisitions – Phase I

Land acquisition will be required for Phase I of the alignment. A majority of the alignment is undeveloped vacant land. Five parcels of the alignment are developed or are planned to be developed. These parcels are as follows:

1. Coldwater Depot – Coldwater Industrial Associates, LLC
   Coldwater Depot is located at the northwest corner Van Buren Street and 127th Avenue to Agua Fria River and is a proposed one million square foot distribution center. The development is planning a very large and deep retention basin along Van Buren Street. The retention basin would be used as a conveyance to the Agua Fria River. The retention basin invert is below the proposed channel invert. Channel inverts through the basin were set to have positive flow from east to west with the channel invert coming into the basin being higher than the one leaving the basin.

Coldwater Depot Site and Agua Fria River - Looking South

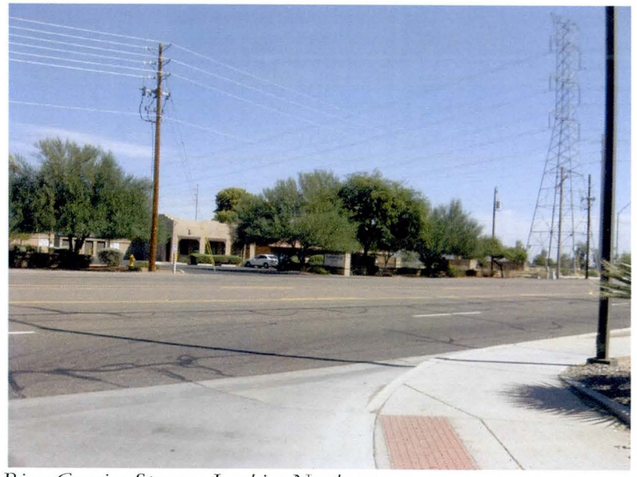
Box culverts are required to penetrate the existing Agua Fria River levee. The box culverts are proposed to have flap gates installed to prevent flow in the Agua Fria from entering the existing retention basin at the Coldwater Depot Site. A six (6) box culvert array is proposed, four culverts six inches above the invert of the Agua Fria River and two culverts two feet above the lower culverts. The upper culverts will provide an outlet for water should the lower culverts plug with sediment or river sediment builds up on the outside of the flap gate preventing them from opening.

Hydraulic calculations have been performed to estimate the water surface in the retention basin during the 100-year and 10-year event. Both hydraulic grade lines are below the finished floor level of the building. The 10-year hydraulic grade line level is near the proposed parking lot level.

2. Coldwater Depot III - Van Buren and Fairway Drive LLC
Coldwater Depot III, a planned fourteen acre distribution center, is located at the northeast corner Van Buren Street and 127th Avenue to the existing charter school. The development is planning a building and parking within the proposed conveyance corridor. The developer will have to design the project to accommodate the base open channel right-of-way. The developer has the option to fund one of the two alternate conveyances.

3. Charter School – Charter School Fund Avondale
The Charter School was constructed in 2011 and is located at the northwest corner of Van Buren Street and Fairway Drive. Its existing parking lot and retention basin are located in the conveyance corridor. However, the school is planning a future building expansion that will further limit the conveyance corridor. A Reinforced box culvert will be required to pass the channel under the existing parking lot and around the future building.

4. River Crossing Storage and RV – River Crossing LLC
River Crossing Storage is located at Van Buren Street west of 120th Avenue. This existing storage facility has a parking lot, office, and private residence within the conveyance corridor. A box culvert array is possible under the parking lot, leaving the office building and home. However, the channel alignment is in conflict with the adjacent SRP tower. The SRP tower must be relocated. If relocation is not possible then the culvert must go through the office and home or go south into the Van Buren right-of-way where many utilities currently exist. Costs estimates provide costs for on relocating the SRP tower.



River Crossing Storage - Looking Northeast

5. Desert Springs Village Subdivision – Ownership Varies
Desert Springs Village Subdivision is located at Van Buren Street and 120th Avenue. Desert Springs is an existing subdivision with retention basins that front Van Buren Street in the conveyance corridor. The west basins are currently large enough to use for the proposed conveyance. However, the basins will have to be excavated approximately one foot to match the conveyance invert. In addition, a portion of the remaining retention basin will have to be closed off with a berm to separate the basin from the channel. The retention basin may also need further regrading to accommodate the relocation of the adjacent SRP tower.

Desert Springs West Retention Basin - Looking West

The east basin is approximately one to two feet deep and is narrower than the west basin. Twelve single family home lots adjoin the basin to the north. All twelve lots and the basin are within the conveyance corridor. The lots and the retention basin will have to be purchased for the conveyance corridor. The retention basin does not have conveyance capacity in its current condition, and will have to be re-graded to the selected conveyance section.

COA has already acquired the parcels needed for the project within the Desert Springs Village Subdivision.

Fairway Drive Traffic Interchange Improvements
The City is planning a traffic interchange at I-10 and Fairway Drive. The planned interchange improvements are planned for Fairway Drive from I-10 to Van Buren Street. The channel invert was set at six feet deep at this intersection to maintain positive slope to the Agua Fria River. The City, District, and Sunrise will work with the traffic interchange designers to facilitate raising the intersection to gain seven feet from pavement to invert.

Desert Springs East Retention Basin - Looking East

Land Acquisitions – Phase II
Land acquisition will be required for Phase II of the alignment. The Phase II conveyance corridor is a twenty-foot pipe and trail easement. The corridor can also fit within the right-of-way if necessary due to existing constrictions and avoids the need for the easement. The alignment is undeveloped except for the Waterford Apartment complex at approximately 112th Avenue. The existing retention basins at the Waterford Apartments were checked for conveyance capacity and not large enough, in their current condition, to convey the design flow. It is COA's choice to acquire the required easements as development occurs or they acquire them all at once.

Utility Relocations

Utility relocations will be required at all intersection and driveway crossings for small dry utilities and waterlines. In general, the inverts of the conveyance are within the typical utility depth zones of three to five feet deep.

COA ordered potholes to locate utilities at the intersection of Avondale Boulevard in June 2013. Eight utilities were located and this data has been added to the conceptual plan and profile drawings located in **Appendix B,** also see **Appendix I** for pothole field data.

Major utility relocations include:

1. SRP 230 Kilovolt Tower
   The SRP 230 kilovolt tower is located at Van Buren Street west of 120th Avenue. The SRP 230 kilovolt tower is a double circuit tower transmission line that crosses Van Buren Street north to south. The current tower foot print is over the Van Buren Street right-of-way and is in conflict with the proposed conveyance corridor. SRP typically requires a 50-foot clear and flat area around the tower legs and clear access parallel to the power lines. SRP was given detailed topographic survey information of the area and CAD drawings so they could provide a preliminary design and cost. SRP's design moves the tower north with a cost of $230,000 to $330,000. The final cost will depend on a more detailed 3D design for the tower type.

   The existing Desert Springs Subdivision retention basin will also have to be modified to accommodate the relocated tower.

2. SRP 69 Kilovolt Power Pole
   A SRP 69 kilovolt power pole is located near Van Buren Street west of 120th Avenue, immediately east of the SRP 230 kilovolt tower. This pole is currently in conflict and will have to be moved.

3. SRP 12 Kilovolt Power Poles
   SRP 12 kilovolt power poles are currently located along Van Buren Street from Fairway Drive to the SRP 230 kilovolt tower and City Center West. The existing 12 kilovolt poles are at the back of the current Van Buren Street right-of-way. These poles would typically be moved to the back of the future right-of-way when constructed, however, because the channel will be at the back of the right-of-way these poles will have to share an easement and be located within the right-of-way, PUE and channel right-of-way.

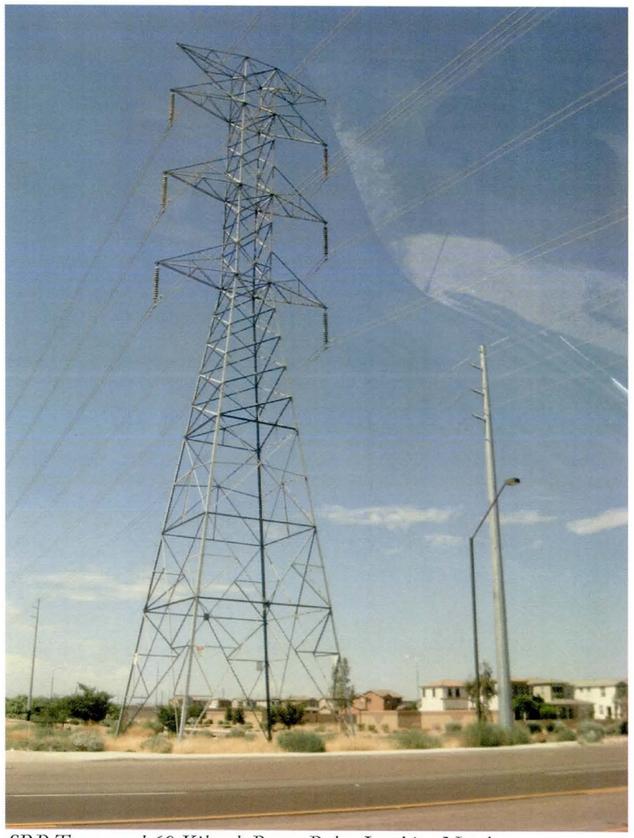
SRP 12 Kilovolt Power Pole - Looking East

4. Centurylink Fiber Optic
   Fiber optic cable is currently located parallel to the channel along the north side of Van Buren Street and runs the entire length of the project. Centurylink will have to move their facilities to a new duct bank out of the channel area or below the proposed channel invert, place the fiber and the copper into the new duct bank and then cut over to new ducts. The fiber cannot be cut at any point and can only be spliced where there is an existing splice which could be 2,000 feet or more. The cut over takes approximately two months to complete and additional time will be required for design and placing the copper and fiber. The fiber optic serves special customers which takes additional time for coordination of the cut over.

5. Kinder Morgan 20-inch Natural Gas
   A 20-inch high pressure natural gas is currently located in Avondale Boulevard. This pipe will have to be lowered below the proposed culvert invert. The culvert will need to have approximately two to three feet of cover therefore the gas line cannot be placed over the culvert. The pipe has been potholed per Kinder Morgan's request. No as-builts exist for the line as it was constructed prior to Kinder Morgan and maybe prior to El Paso Gas ownership. The pothole results are in the conceptual plan and profile drawings in **Appendix B** and see **Appendix I** for pothole field data.

6. SRP 24-inch Irrigation Pipe
   A 24-inch irrigation pipe is located along 119th Avenue and will have to be lowered below the proposed culvert invert. The culvert will have approximately two to three feet of cover, therefore the irrigation pipe cannot be placed over the culvert. The possibility of relocating the existing pipe will need to be coordinated with SRP in order to determine any relocation design constraints. The irrigation system is gravity, therefore the relocation under the proposed culvert maybe a siphon.

7. SRP 36-inch Irrigation Pipe
   A 36-inch SRP irrigation pipe is currently located along Avondale Boulevard. This concrete irrigation pipe will have to be lowered below the proposed culvert invert. The culvert will need to have approximately two to three feet of cover, therefore the irrigation pipe cannot be placed over the culvert. Coordination with SRP will need to take place in order to determine any additional relocation design constraints. The irrigation system is gravity, therefore the relocation under the proposed culvert maybe a siphon. This pipe has been potholed. The pothole results are in the conceptual plan and profile drawings in **Appendix B** and see **Appendix I** for pothole field data.



SRP Tower and 69 Kilovolt Power Pole - Looking North

3.2 Landscape Themes

Four landscape character types were developed to create a cohesive landscape theme along the Van Buren Street drainage channel that will provide an aesthetic treatment of the drainage improvement as well as adding an attractive streetscape component and multi-use path amenity to the community. The four areas are referred to as the City Center (Urban), Residential (Desert Springs), Transitional (Industrial) and Trail (Channel Piped Underground) Character Type. The primary intent of the landscape concepts is to blend the drainage improvement into the adjacent land uses along Van Buren. Each character type is designed with the same enhanced desert themed landscape palette to provide uniformity to the channel; however, the density and layout of plant material differ for each area.

The overall plant palette for the project consists of low allergenic, seasonally colorful, desert adapted plants that are sustainable in a low maintenance environment. All the plants being used are container grown nursery plants, drought tolerant, and can grow in local soil conditions that will require little water after the plant has been established. Each plant was selected for ease of regular maintenance and hardiness. Cultivars of the Native Mesquite and Palo Verde were selected to eliminate thorns and seed pods. Different sizes of rock are being used in the landscape areas for aesthetic purposes and dust/erosion control. One-half inch screened rock mulch has been selected for the perimeter landscape areas and streetscapes. Larger angular rock is recommended in the basins to provide texture to the landscape surface and to minimize erosion and sedimentation. A dark tan (Tanner Gold) color of rock has been selected to blend the landscape with the surrounding farming and natural areas.
The four landscape character types are described below:

City Center Character Type

The City Center theme is designed with a higher density and formality to blend the channel into the urbanized character within this portion of the project area adjacent to the City Center. The side slopes of the channel are terraced with gabion walls to strengthen the geometry of the adjacent landscape. The landscape outside the channel is designed in formal massing laid out in rows of evergreen shrubs, grasses, and cacti accents. Each type of plant material is separated by concrete banding that is orientated perpendicular to the channel. Even though the density of plant material is higher than the other character type areas, the simplicity of the layout of the plant material is readable from larger vantage points. To provide greater pedestrian opportunities the channel is designed with shaded seating areas, small passive lawn areas, and larger event lawn areas. See **Figure 3.2.1 – City Center Character Type.**

City Center Park Avenue Linear Retention Basin – Looking North

Residential Character Type

The Residential theme is located adjacent to the Desert Springs Community residential area. The landscape is designed with a large passive turf open space that can be utilized by the neighborhood for recreation. Larger evergreen shade trees are placed near seating nodes and along the perimeter of the open space to provide a "park type" appearance. The landscape along Van Buren Street is consistent with the City Center and Transitional concepts to maintain a uniform streetscape theme. Colorful shrub massing and cacti accents are located along Van Buren Street as part of the overall streetscape theme and to buffer the recreational amenities from the street. Overall, the simplicity and massing of plant material are consistent with the City Center theme, yet the overall quantities have been reduced to match the context of the neighborhood. See **Figure 3.2.2– Residential Character Type.**

Transitional Character Type

The Transitional theme layout and quantity of the understory plants have a more naturalistic approach typical to the Sonoran Desert landscape than the other landscape character types. Even though the plant palette does not change, there is a greater quantity of boulders, angular rock, and cacti accents and less seasonally colorful shrubs. The massing of plant material is greater with regard to the tree layout in order to screen the industrial areas located north of the channel. See **Figure 3.2.3 – Transitional Character Type.**

Desert Springs East Retention Basin - Looking East

Trail Character Type

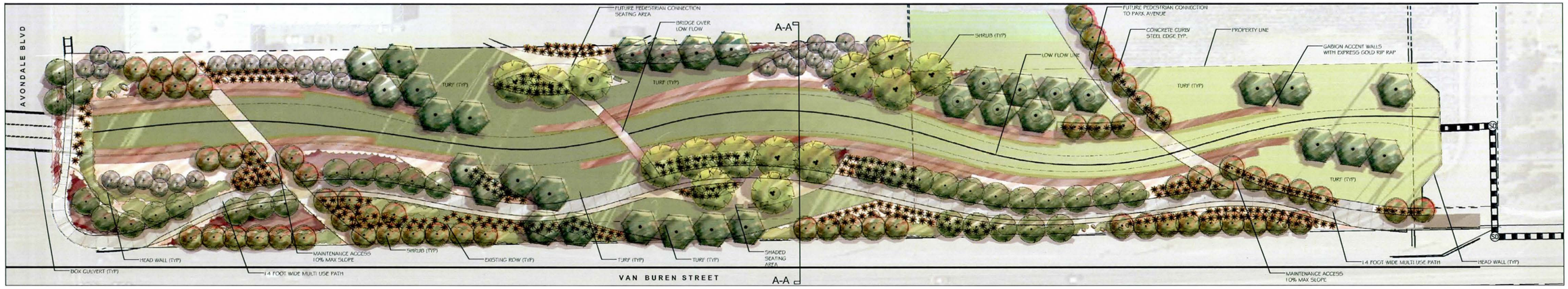
The Trail theme occurs within the Phase II areas where the channel is piped underground. The landscape concept is consistent with the characteristics of the Transitional concept, utilizing a similar layout and quantity of the understory plants as well as the boulders and cacti modified to accommodate the narrow sections. Even though the plant palette does not change, the massing of plant material will continue to pronounce the banding and the tree layout will provide dense shade along the meandering multi-use path. See **Figure 3.2.4 – Trail Character Type.**

Implementation

The proposed themes represent the ultimate landscape treatment. If funding is limited, the initial construction may be limited to that necessary to provide conveyance, erosion control, and maintenance access. After initial construction, ultimate landscaping may be implemented as funds are available.

Van Buren Street 99th to Agua Fria River

City Center Concept Plan

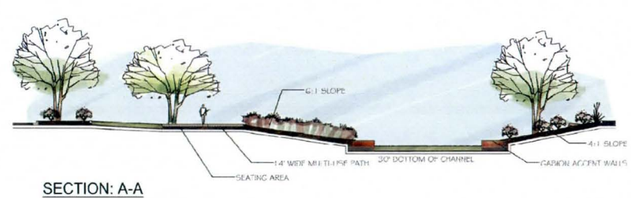


TREES	SYMBOL	BOTANICAL NAME	COMMON NAME
		PARKINSONIA x 'SONORAN EMERALD'	THORNLESS SONORAN EMERALD PALO VERDE
		OLNEYA TESOTA	IRONWOOD
		PROSOPIS x 'PHOENIX'	HYBRID PHOENIX MESQUITE
		BAUHINIA GRISSOO	GRISSOO TREE
		PITHECELLOBIUM FLEXICAULE	TEXAS EBONY
		VITEX AGNUS CASTUS	CHASTE TREE
		ACACIA FARNESIANA	SWEET ACACIA
		CHILOPSIS LINEARIS	DESERT WILLOW
		PISTACIA x 'RED PUSH'	CHINESE PISTACHE

SHRUBS	SYMBOL	BOTANICAL NAME	COMMON NAME
		BOUGAINVILLEA SPP.	BOUGAINVILLEA
		DODONAEA VISCOSA	HOP BUSH
		ERIEMOPHILA MACULATA 'VALENTINE'	VALENTINE EMU BUSH
		JUSTICIA SPICIGERA	MEXICAN HONEYSUCKLE
		MUHLENBERGIA CAPILLARIS 'REGAL MIST'	REGAL MIST
		NOLINA MICROCARPA	BEAR GRASS
		PUELLIA BRITTONIANA	BRITTON PUELLIA
		TECOMA STANS 'GOLD STAR'	GOLD STAR YELLOW BELLS
ACCENTS		AGAVE SPP.	AGAVE
		ALOE VERA	MEDICINAL ALOE
		DASYLIRION WHEELERI	DESERT SPOON
		HESPERALOE PARVIFLORA	RED YUCCA
		ECHINOCACTUS GRUSONII	GOLDEN BARREL CACTUS
		OPUNTIA BASILARIS	BEAVERTAIL PRICKLY PEAR
		PACHYCEREUS MARGINATUS	MEXICAN FENCE POST

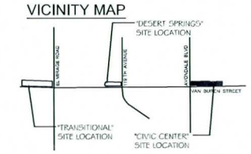
GROUND COVERS	BOTANICAL NAME	COMMON NAME
	ACACIA REDOLENS 'DESERT CARPET'	TRAILING ACACIA
	DALEA CAPITATA	LEMON DALEA
	TETRANEURIS ACAULIS	ANGELITA DAISY
	LANTANA 'GOLD MOUND'	GOLD MOUND LANTANA
	LANTANA MONTEVIDENSIS 'TRAILING PURPLE'	PURPLE LANTANA

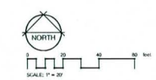
INERT MATERIALS		
	BOULDER, PIT-RUN, ANGULAR FACES	
	ROCK MULCH, 3/4" MINUS	EXPRESS GOLD
	ANGULAR RIP RAP SIZED BY CIVIL	EXPRESS GOLD



SECTION: A-A

VICINITY MAP





CHARACTER IMAGES

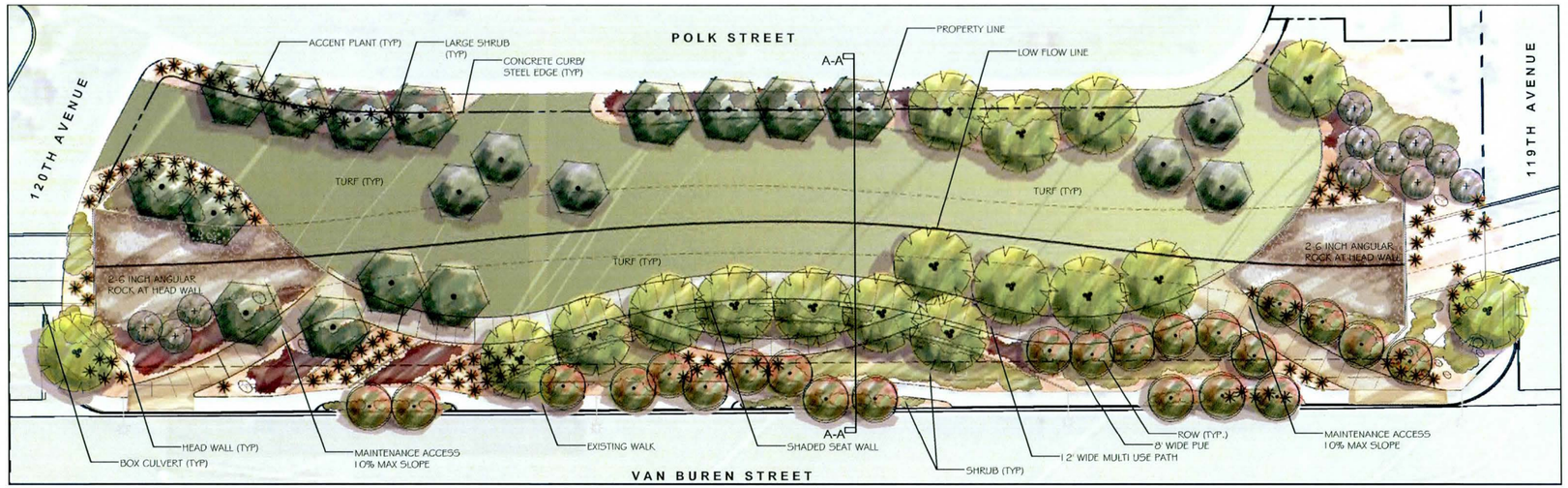
Logan Simpson Design Inc.

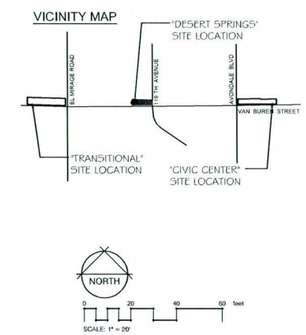
SUNRISE ENGINEERING

FIGURE 3.2.1 - CITY CENTER CHARACTER TYPE

Van Buren Street 99th to Agua Fria River

Residential Concept Plan





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		NOLINA MICROCARPA	BEAR GRASS
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ACCENTS			
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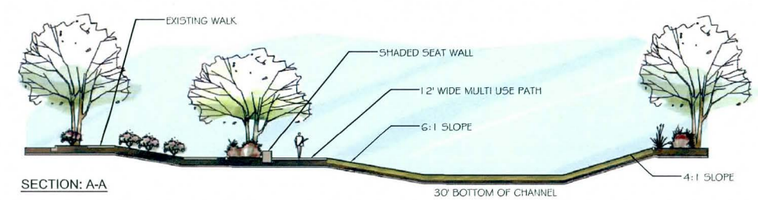

SECTION: A-A

CHARACTER IMAGES

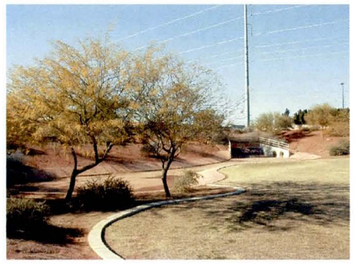

FIGURE 3.2.2 - RESIDENTIAL CHARACTER TYPE

LOGAN SIMPSON DESIGN INC.

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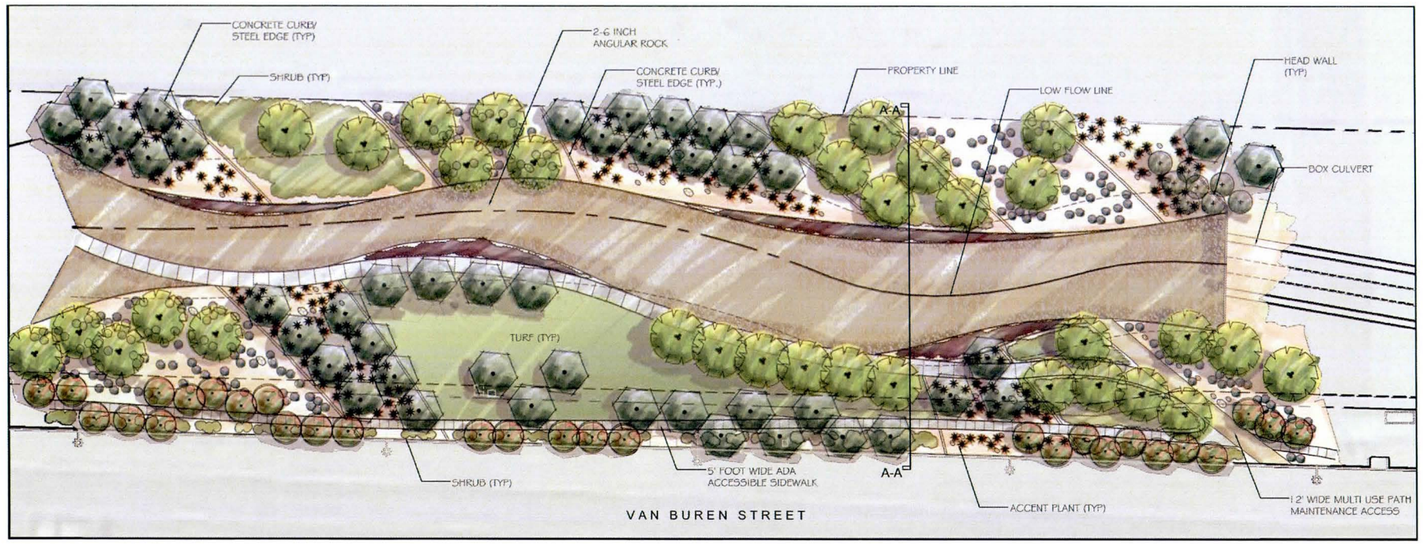
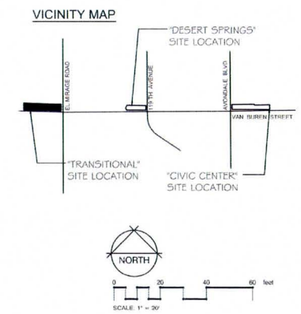
Van Buren Street 99th to Agua Fria River

Transitional Concept Plan





TREES

SYMBOL	BOTANICAL NAME	COMMON NAME
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GROUND COVERS

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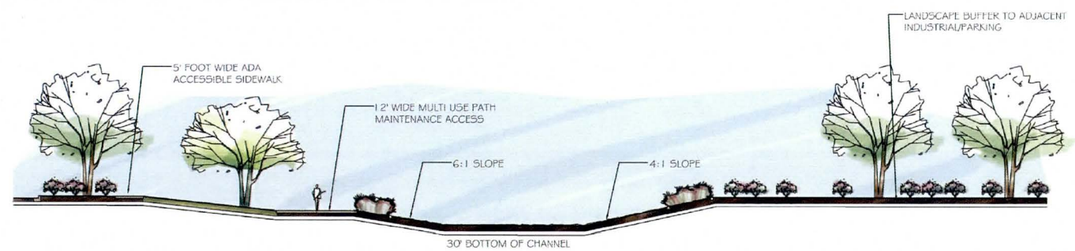
LANTANA MONTEVENDENSIS 'TRAILING PURPLE'	PURPLE LANTANA

INERT MATERIALS

BOULDER, PIT-RUN, ANGULAR FACES	
ROCK MULCH , 3/4" MINUS	EXPRESS GOLD
ANGULAR RIP RAP SIZED BY CIVIL	EXPRESS GOLD



SECTION: A-A

CHARACTER IMAGES

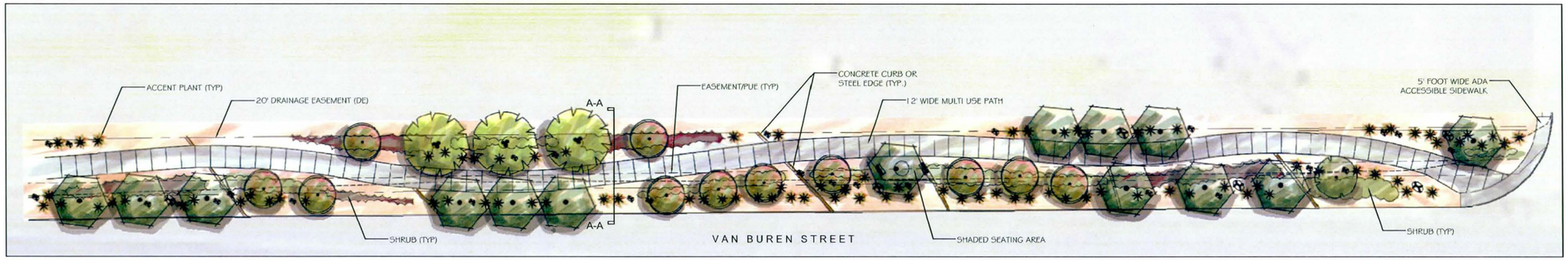
FIGURE 3.2.3 - TRANSITIONAL CHARACTER TYPE

LOGAN SIMPSON DESIGN INC.

SUNRISE ENGINEERING

Van Buren Street 99th to Agua Fria River

Trail Concept Plan



TREES

SYMBOL	BOTANICAL NAME	COMMON NAME
	PARKINSONIA x 'SONORAN EMERALD'	THORNLESS SONORAN EMERALD PALO VERDE
	OLNEYA TESOTA	IRONWOOD
	PROSOPIS x 'PHOENIX'	HYBRID PHOENIX MESQUITE
	DALBERGIA SISSOO	SISSOO TREE
	PITHECELLOBIUM FLEXICAULE	TEXAS EBONY
	VITEX AGNUS CASTUS	CHASTE TREE
	ACACIA FARNESIANA	SWEET ACACIA
	CHILOPSIS LINEARIS	DESERT WILLOW
	PISTACIA x 'RED PUSH'	CHINESE PISTACHE

SHRUBS

SYMBOL	BOTANICAL NAME	COMMON NAME
	BOUGAINVILLEA SPP.	BOUGAINVILLEA
	DODONAEA VISCOSA	HOP BUSH
	EREMOPHILA MACULATA 'VALENTINE'	VALENTINE EMU BUSH
	JUSTICIA SPICIGERA	MEXICAN HONEYSUCKLE
	MUHLENBERGIA CAPILLARIS 'REGAL MIST'	REGAL MIST
	NOLINA MICROCARPA	BEAR GRASS
	RUELLIA BRITTONIANA	BRITISH RUELLIA
	TECOMA STANS 'GOLD STAR'	GOLD STAR YELLOW BELLS

ACCENTS

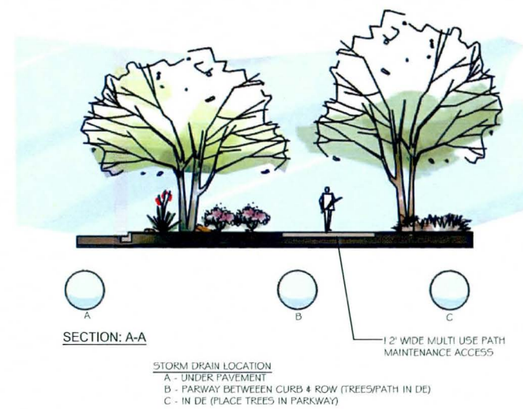
SYMBOL	BOTANICAL NAME	COMMON NAME
*	AGAVE SPP.	AGAVE
	ALOE VERA	MEDICINAL ALOE
	DASYLIRION WHEELERI	DESERT SPOON
	HESPERALOE PARVIFLORA	RED YUCCA
	ECHINOCACTUS GRUSONII	GOLDEN BARREL CACTUS
	OPUNTIA BASILARIS	BEAVERTAIL PRICKLY PEAR
	PACHYCEREUS MARGINATUS	MEXICAN FENCE POST

GROUND COVERS

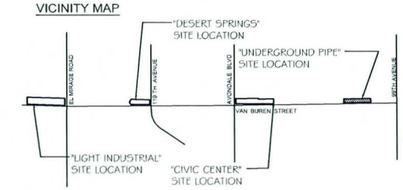
SYMBOL	BOTANICAL NAME	COMMON NAME
	ACACIA REDOLENS 'DESERT CARPET'	TRAILING ACACIA
	DALEA CAPITATA	LEMON DALEA
	TETRANEURIS ACAULIS	ANGELITA DAISY
	LANTANA 'GOLD MOUND'	GOLD MOUND LANTANA
	LANTANA MONTEVENDENSIS 'TRAILING PURPLE'	PURPLE LANTANA

INERT MATERIALS

SYMBOL	BOTANICAL NAME	COMMON NAME
	BOULDER, PIT-RUN, ANGULAR FACES	
	ROCK MULCH , 3/4" MINUS	EXPRESS GOLD
	ANGULAR RIP RAP SIZED BY CIVIL	EXPRESS GOLD



VICINITY MAP



CHARACTER IMAGES

FIGURE 3.2.4 - TRAIL CHARACTER TYPE

LOGAN SIMPSON DESIGN INC.

SUNRISE ENGINEERING

3.3 Public and COA Council Meetings

The project was presented at a public meeting addressed to the public, COA Parks and Recreation Board, and the COA City Council. The public meeting was held at COA City Hall on March 20, 2013 and the project was presented in an open house format. Generally the public reception of the project has been excellent. The public likes the idea of the trail connectivity. The trail provides the benefit of walking from their homes to the trail then to City Center or other destination.

The project was presented to the COA Parks and Recreation Board on April 10, 2013. The Parks and Recreation Board was also enthusiastic of amenities the landscape components of the project will bring to the City.

Lastly the project was presented to the COA City Council work session meeting on May 13, 2013. The City Council as whole likes the project. Nonetheless, there are questions and concerns regarding funding for the project. These concerns were calmed by advising the Council that grant money could be applied for and used for the project.

3.4 Agua Fria Levee Design & Construction

The project proposes penetration of the Agua Fria River levee. There are two federal processes the project will need to go through due to the proposed penetration of the levee.

The U.S. Army Corps of Engineers (COE) will review the project plans because the District is in the COE's Rehabilitation and Inspection Program. The COE should be informed of and given the opportunity to review levee modifications between periodic inspections.

FEMA will also need to review the project and an analysis of flooding on the land side of the levee. The District certifies the levee and will re-certify the levee for this project. FEMA accredits the levee for flood protection on the land side and will modify the accreditation based on the project plans and "interior drainage" analysis.

The "interior drainage" analysis demonstrates that during a 100-year flow in the Agua Fria River, the flooding on the land side (interior) is not worse for a 100-year event. This will require a delineation of flooding in the pre-project or existing condition and an analysis of the project for the in place condition (assuming ultimate development) with the flaps gates closed during the Agua Fria flooding event. Since the existing condition involves overflows onto Van Buren Street at various locations and at the pedestrian culvert under Van Buren Street, the project in place condition would involve overflows at the same locations, but with some anticipated differences due to re-direction of flows by the channel and no retention in the City Center. A successful project would show that with the project in place, the interior flooding impacts are not worse than existing conditions.

The final design process should include a scope that:

1. Procures flown topo along Van Buren Street for the project design as well as the interior drainage analysis. Current GIS topo may be adequate south of Van Buren Street, but this would need to be verified.
2. Provides for an existing condition 100-year flooding analysis to determine a benchmark for comparison. (for FEMA)
3. Provides for a project-in-place 100-year flooding and existing conditions analysis assuming no or limited flows into the Agua Fria River. (for FEMA)
4. Provides for a project-in-place 100-year flooding and ultimate conditions analysis assuming no or limited flows into the Agua Fria River. (for internal use)
5. Provides for a staged approach:
    a. preliminary design completed based on the new topo
    b. existing condition interior drainage analysis based on the new topo
    c. project-in-place interior drainage analysis
    d. comparison of b and c results
    e. design revision, if necessary to mitigate any adverse impacts of project-in-place 100-year flooding with existing conditions and re-analyze, or
    f. submit to FEMA existing condition and project-in-place 100-year flooding with existing conditions if no adverse impacts are identified
    g. proceed with final design if FEMA approves interior drainage analysis

3.5 Cost Estimate

The Recommended Plan costs have been estimated for the project. The costs were estimated from quantity take offs of the conceptual plan and profile drawings. Unit prices are recent bid prices provided by the District and COA. The unit prices reflect actual bidding and are the median costs of those bids.

Utility relocation costs were estimated by unit quantity to be relocated based on the size of the utility or lump sum fee. The unit pricing is from current bid pricing. Lump sum fee relocations were provided by the District and COA based on previous utility relocation experience. The utility relocation costs assumed relocations can been made within 100-feet of the conflict. The SRP tower relocation cost of $250,000 is an estimate from SRP.

Right-of-way costs were estimated by plan take off. There are three right-of-way line items, channel/trail, road, Coldwater Depot and Desert Springs West basin. All right-of-way from Van Buren Street 65-foot to the required channel/trail width are included in the channel/trail line item.

Road right-of-way is required to be purchased where the existing Van Buren Street right-of-way is not at ultimate 65-foot width. The road right-of-way quantity, quantifies the purchase from the existing right-of-way to the ultimate right-of-way.

Coldwater Depot and Desert Springs West Basin right-of-way estimated by quantity take off. These two areas are existing retention basins that will be converted into channel. The estimated right-of-way is the land required to be purchased. COA has already acquired the Desert Springs area that includes the west basin. Although already purchased the Desert Springs basin is still included in the cost estimates.

Landscape costs have also been integrated into the cost estimate. The landscape costs are based on estimates by LSD. LSD provided estimates for the four theme areas. Landscape costs were prorated from the theme estimates and applied to the actual channel areas. Value engineered items have been incorporated where possible. Value engineered items include 15 gallon trees in lieu of 24-inch box trees and sprigs in the surface treatment of non-conveyance areas in lieu of turf.

To facilitate landscape cost sharing, channel liner quantities have been divided into conveyance and non-conveyance areas. Conveyance area was found via plan takeoff. The conveyance area was added as a separate line item in the channel and subtracted from the landscape estimate proration.

A 15% construction contingency has been included to account for any unforeseen items that occasionally occur during construction.

The estimated project grand total is $17.9 million, with a Phase I cost of $12.8 million and a Phase II cost of $5.1 million. The cost estimate has been summarized by phase, sheet, construction costs, land costs, and utility relocation costs, see **Figure 3.5.1 - Grand Total by Section**. See **Figure 3.5.2 - Grand Total** for quantities of the entire project. See **Figures 3.5.3 and 3.5.4 - Grand Total Phase I** and **Grand Total Phase II.** See **Appendix A** for quantities and totals by plan sheet and cost estimate assumptions.

Reference costs estimates for the 10-yr Alternatives Analysis are included in **Appendix G** and pipe only alternative is included in **Appendix H.**

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Total Project Summary (40+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description			Total
	Phase I (40+00 to 135+00, 1.8 miles)	LF	$/FT	
	Construction: Sheet P1 - Agua Fria River to El Mirage Rd (16+80 to 35+50)	1,525	$1,454.16	$1,926,644
	Land: Sheet P1 - Agua Fria River to El Mirage Rd (16+80 to 35+50)			$869,591
	Utilities: Sheet P1 - Agua Fria River to El Mirage Rd (16+80 to 35+50)			$12,456
	Construction: Sheet P2 - El Mirage Rd to Desert Springs Village (35+50 to 60+00)	2,107	$1,047.53	$2,207,502
	Land: Sheet P2 - El Mirage Rd to Desert Springs Village (35+50 to 60+00)			$452,160
	Utilities: Sheet P2 - El Mirage Rd to Desert Springs Village (35+50 to 60+00)			$535,890
	Construction: Sheet P3 - Desert Springs Village to Fresh n Easy (60+00 to 85+00)	2,503	$609.18	$1,524,717
	Land: Sheet P3 - Desert Springs Village to Fresh n Easy (60+00 to 85+00)			$860,471
	Utilities: Sheet P3 - Desert Springs Village to Fresh n Easy (60+00 to 85+00)			$496,583
	Construction: Sheet P4 - Fresh n Easy to Versante (85+00 to 103+60)	1,759	$796.65	$1,401,299
	Land: Sheet P4 - Fresh n Easy to Versante (85+00 to 103+60)			$572,119
	Utilities: Sheet P4 - Fresh n Easy to Versante (85+00 to 103+60)			$307,275
			Phase Subtotal Construction	$7,060,163
			Phase Subtotal Land	$2,754,341
			Phase Subtotal Utilities	$1,352,205
			15 % Contingency	$1,675,006
			Phase I Total	**$12,842,000**
	Phase II (135+00 to 193+00, 1.1 miles)			
	Construction: Sheet P4 & P5 - Versante to Roosevelt Park (103+60 to 134+50)	3,470	$467.45	$1,622,107
	Land: Sheet P4 & P5 - Versante to Roosevelt Park (103+60 to 134+50)			$196,200
	Utilities: Sheet P4 & P5 - Versante to Roosevelt Park (103+60 to 134+50)			$59,320
	Construction: Sheet P6 - Roosevelt Park to 104th Ave (134+50 to 159+50)	2,523	$478.62	$1,207,794
	Land: Sheet P6 - Roosevelt Park to 104th Ave (134+50 to 159+50)			$148,657
	Utilities: Sheet P6 - Roosevelt Park to 104th Ave (134+50 to 159+50)			$38,065
	Construction: Sheet P7 - 104th Ave to 103rd Ave (159+50 to 186+75)	751	$980.53	$736,379
	Land: Sheet P7 - 104th Ave to 103rd Ave (159+50 to 186+75)			$192,870
	Utilities: Sheet P7 - 104th Ave to 103rd Ave (159+50 to 186+75)			$0
	Construction: Sheet P8 - 103rd Ave to 99th Ave (186+75 to 195+65)	890	$194.39	$173,003
	Land: Sheet P8 - 103rd Ave to 99th Ave (186+75 to 195+65)			$40,050
	Utilities: Sheet P8 - 103rd Ave to 99th Ave (186+75 to 195+65)			$0
			Phase Subtotal Construction	$3,739,282
			Phase Subtotal Land	$577,777
			Phase Subtotal Utilities	$97,385
			15 % Contingency	$662,167
			Phase II Total	**$5,077,000**
			Grand Total	**$17,900,000**

In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions compared to bid or actual costs.

Figure 3.5.1 Grand Total by Section

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Total Project - Construction Quantities (40+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total	Notes
	Construction					
	Excavation - Channel	104,254	CY	$6.00	$625,521	Includes excavation and export haul costs.
	Excavation - Box Culvert and/or 60" RGRCP	27,900	CY	$9.80	$273,513	Includes excavation and export haul costs.
	Concrete - Levee Repair	589	CY	$250.00	$147,352	
	Concrete - Box Culvert	1,823	CY	$430.00	$2,073,828	Includes concrete and steel reinforcement.
	Concrete - Headwalls	224	CY	$430.00	$96,376	Includes concrete and steel reinforcement.
	Concrete - Multi-Use Path (no existing MB path)	138,980	SF	$6.00	$833,880	
	Concrete - Multi Use Path	105,600	SF	$6.00	$633,600	
	Concrete - Pedestrian Path	2,640	SF	$6.00	$15,840	
	Concrete - Cut Off Walls	117	CY	$430.00	$192,306	Includes concrete and rebar.
	Remove and Replace Asphalt Road	10,766	SY	$22.00	$236,863	
	60" RGRCP	6,745	LF	$190.00	$1,281,468	Includes pipe and bedding.
	Flap Gates	6	EA	$8,000.00	$48,000	
	CLSM Backfill	8,584	CY	$45.00	$386,296	
	Storm Drain Manhole - MAG 521	18	EA	$4,500.00	$81,000	
	Channel Liner - Conveyance Turf (Sod w/ Irrigation)	307,430	SF	$1.25	$384,288	
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	195,288	SF	$0.67	$130,811	
	Angular Rock (D50 = 6" @ 12" Deep)	4,776	CY	$60.00	$286,556	
	Landscape Construction					
	Landscape Theme - City Center	603,430	SF	$1.19	$719,228	
	Landscape Theme - Residential (Desert Springs)	145,300	SF	$0.78	$112,872	
	Landscape Theme - Transitional	515,690	SF	$1.12	$577,368	
	Landscape Theme - Trail Only	395,780	SF	$1.58	$626,071	
	Surface Treatment - Turf (Sprigs w/ Irrigation)	125,195	SF	$0.85	$106,116	
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	638,456	SF	$0.67	$427,765	
	Lighting	335	EA	$1,500.00	$502,200	
				SubTotal	$10,799,115	
	Land					
	Land Acquisition - Channel / Trail	1,042,541	SF	$2.25	$2,345,718	
	Land Acquisition - Road	195,900	SF	$2.25	$440,775	
	Land Acquisition - CW Depot & DS West Basin	242,500	SF	$2.25	$545,625	
				SubTotal	$3,332,118	
	Utility Relocation					
	Water 8" 16"	659	LF	$105.00	$69,213	Includes an additional 10' before and after the structure.
	Water 18" and up	0	LF	$510.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water	55	LF	$105.00	$5,810	Includes an additional 10' before and after the structure.
	Reclaimed Water Vault	0	EA	$5,000.00	$0	
	Fire Hydrant	1	EA	$5,500.00	$5,500	
	Sewer Manholes	0	LF	$1,500.00	$0	Includes an additional 10' before and after the structure.
	Sewer Mains	310	LF	$80.00	$24,820	Includes an additional 10' before and after the structure.
	Storm Drain Structures	2	LF	$2,500.00	$5,000	Includes an additional 10' before and after the structure.
	Storm Drain Pipes	92	LF	$95.00	$8,764	Includes an additional 10' before and after the structure.
	Concrete Irrigation Ditch	0	LF	$20.00	$0	Includes an additional 10' before and after the structure.
	Irrigation Relocation	5	LS	$150,000.00	$750,000	
	Gas 6" Relocation	3	LS	$25,000.00	$75,000	
	Gas 20" Relocation	1	LS	$55,000.00	$55,000	
	Electric	673	LF	$130.00	$87,425	Includes an additional 10' before and after the structure.
	Electrical Pole	6	EA	$7,000.00	$42,000	
	Others (Telephone, Cable, Etc.)	321	LF	$50.00	$16,058	Includes an additional 10' before and after the structure.
	Street Lights	2	EA	$2,500.00	$5,000	
	Traffic Signals	0	EA	$150,000.00	$0	
	Traffic Conduit	0	EA	$1,000.00	$0	
	SRP Tower	1	EA	$300,000.00	$300,000	
				Subtotal	$1,449,590	

CONSTRUCTION TOTAL	**$10,799,445**
LAND TOTAL	**$3,332,118**
UTILITY RELOCATION TOTAL	**$1,449,590**
15% CONTINGENCY	**$2,337,173**
PROJECT TOTAL	**$17,900,000**

In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to accuracy of such opinions compared to bid or actual costs.

Figure 3.5.2 Grand Total

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Total Project Phase I - Construction Quantities (40+00 to 127+50)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total	Notes
	Construction					
	Excavation - Channel	104,254	CY	$6.00	$625,521	Includes excavation and export haul costs.
	Excavation - Box Culvert and/or 60" RGRCP	11,120	CY	$9.80	$111,319	Includes excavation and export haul costs
	Concrete - Levee Repair	589	CY	$250.00	$147,352	
	Concrete - Box Culvert	1,823	CY	$430.00	$2,073,828	Includes concrete and steel reinforcement.
	Concrete - Headwalls	202	CY	$430.00	$86,753	Includes concrete and steel reinforcement.
	Concrete - Multi-Use Path (no existing VB path)	82,100	SF	$6.00	$492,600	
	Concrete - Multi-Use Path	51,900	SF	$6.00	$311,400	
	Concrete - Pedestrian Path	2,640	SF	$6.00	$15,840	
	Concrete - Cut-Off Walls	147	CY	$430.00	$192,306	Includes concrete and rebar.
	Remove and Replace Asphalt Road	6,270	SY	$22.00	$137,942	
	60" RGRCP	0	LF	$190.00	$0	Includes pipe and bedding.
	Flap Gates	6	EA	$8,000.00	$48,000	
	CLSM Backfill	0	CY	$45.00	$0	
	Storm Drain Manhole - MAG 521	0	EA	$1,500.00	$0	
	Channel Liner - Conveyance Turf (Sod w/ Irrigation)	307,430	SF	$1.25	$384,288	
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	195,285	SF	$0.67	$130,811	
	Angular Rock (D50 = 6" @ 12" Deep)	4,776	CY	$60.00	$286,556	
	Landscape Construction					
	Landscape Theme - City Center	603,430	SF	$1.19	$719,228	
	Landscape Theme - Residential (Desert Springs)	145,300	SF	$0.78	$112,872	
	Landscape Theme - Transitional	515,690	SF	$1.12	$577,368	
	Landscape Theme - Trail Only	0	SF	$1.58	$0	
	Surface Treatment - Turf (Springs w/ Irrigation)	125,195	SF	$0.85	$106,116	
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	354,307	SF	$0.67	$237,386	
	Lighting	155	EA	$1,500.00	$232,350	
				SubTotal	$7,060,163	
	Land					
	Land Acquisition - Channel / Trail	890,652	SF	$2.25	$2,003,966	
	Land Acquisition - Road	91,000	SF	$2.25	$204,750	
	Land Acquisition - CW Depot & DS West Basin	242,500	SF	$2.25	$545,625	
				SubTotal	$2,754,341	
	Utility Relocation					
	Water 8" 16"	177	LF	$105.00	$50,103	Includes an additional 10' before and after the structure.
	Water 18" and up	0	LF	$510.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water	55	LF	$105.00	$5,810	Includes an additional 10' before and after the structure.
	Reclaimed Water Vault	0	EA	$5,000.00	$0	
	Fire Hydrant	1	EA	$5,500.00	$5,500	
	Sewer Manholes	0	LF	$4,500.00	$0	Includes an additional 10' before and after the structure.
	Sewer Mains	232	LF	$80.00	$18,581	Includes an additional 10' before and after the structure.
	Storm Drain Structures	2	LF	$2,500.00	$5,000	Includes an additional 10' before and after the structure.
	Storm Drain Pipes	66	LF	$95.00	$6,294	Includes an additional 10' before and after the structure.
	Concrete Irrigation Ditch	0	LF	$20.00	$0	Includes an additional 10' before and after the structure.
	Irrigation Relocation	5	LS	$150,000.00	$750,000	
	Gas 6" Relocation	2	LS	$25,000.00	$50,000	
	Gas 20" Relocation	1	LS	$55,000.00	$55,000	
	Electric	463	LF	$130.00	$60,385	Includes an additional 10' before and after the structure.
	Electrical Pole	5	EA	$7,000.00	$35,000	
	Others (Telephone, Cable, Etc.)	111	LF	$50.00	$5,533	Includes an additional 10' before and after the structure.
	Street Lights	2	EA	$2,500.00	$5,000	
	Traffic Signals	0	EA	$150,000.00	$0	
	Traffic Conduit	0	EA	$1,000.00	$0	
	SRP Tower	1	EA	$300,000.00	$300,000	
				Subtotal	$1,352,205	

CONSTRUCTION TOTAL	$7,060,163
LAND TOTAL	$2,754,341
UTILITY RELOCATION TOTAL	$1,352,205
15% CONTINGENCY	$1,675,006
PHASE I TOTAL	$12,800,000

Figure 3.5.3 Grand Total Phase I

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Total Project Phase II - Construction Quantities (127+50 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total	Notes
	Construction					
	Excavation - Channel	0	CY	$6.00	$0	Includes excavation and export haul costs.
	Excavation - Box Culvert and/or 60" RGRCP	13,189	CY	$9.80	$132,191	Includes excavation and export haul costs.
	Concrete - Box Culvert	0	CY	$430.00	$0	Includes concrete and steel reinforcement.
	Concrete - Headwalls	22	CY	$430.00	$9,623	Includes concrete and steel reinforcement.
	Concrete - Multi-Use Path (no existing VB path)	56,880	SF	$6.00	$341,280	
	Concrete - Multi-Use Path	53,700	SF	$6.00	$322,200	
	Concrete - Pedestrian Path	0	SF	$6.00	$0	
	Concrete - Cut-Off Walls	0	CY	$430.00	$0	Includes concrete and rebar.
	Remove and Replace Asphalt Road	4,196	SY	$22.00	$98,920	
	60" RGRCP	6,745	LF	$190.00	$1,281,468	Includes pipe and bedding.
	Flap Gates	0	EA	$8,000.00	$0	
	CLSM Backfill	8,584	CY	$45.00	$386,296	
	Storm Drain Manhole - MAG 521	18	EA	$4,500.00	$81,000	
	Channel Liner - Conveyance Turf (Sod w/ Irrigation)	0	SF	$1.25	$0	
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	0	SF	$0.67	$0	
	Angular Rock (D50 = 6" @ 12" Deep)	0	CY	$60.00	$0	
	Landscape Construction					
	Landscape Theme - City Center	0	SF	$1.19	$0	
	Landscape Theme - Residential (Desert Springs)	0	SF	$0.78	$0	
	Landscape Theme - Transitional	0	SF	$1.12	$0	
	Landscape Theme - Trail Only	395,780	SF	$1.58	$626,071	
	Surface Treatment - Turf (Springs w/ Irrigation)	0	SF	$0.85	$0	
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	281,118	SF	$0.67	$190,379	
	Lighting	180	EA	$1,500.00	$269,850	
				SubTotal	$3,739,282	
	Land					
	Land Acquisition - Channel / Trail	151,890	SF	$2.25	$341,752	
	Land Acquisition - Road	104,900	SF	$2.25	$236,025	
	Land Acquisition - CW Depot & DS West Basin	0	SF	$2.25	$0	
				SubTotal	$577,777	
	Utility Relocation					
	Water 8" 16"	182	LF	$105.00	$19,110	Includes an additional 10' before and after the structure.
	Water 18" and up	0	LF	$510.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water	0	LF	$105.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water Vault	0	EA	$5,000.00	$0	
	Fire Hydrant	0	EA	$5,500.00	$0	
	Sewer Manholes	0	LF	$4,500.00	$0	Includes an additional 10' before and after the structure.
	Sewer Mains	78	LF	$80.00	$6,240	Includes an additional 10' before and after the structure.
	Storm Drain Structures	0	LF	$2,500.00	$0	Includes an additional 10' before and after the structure.
	Storm Drain Pipes	26	LF	$95.00	$2,470	Includes an additional 10' before and after the structure.
	Concrete Irrigation Ditch	0	LF	$20.00	$0	Includes an additional 10' before and after the structure.
	Irrigation Relocation	0	LS	$150,000.00	$0	
	Gas 6" Relocation	1	LS	$25,000.00	$25,000	
	Gas 20" Relocation	0	LS	$55,000.00	$0	
	Electric	208	LF	$130.00	$27,040	Includes an additional 10' before and after the structure.
	Electrical Pole	1	EA	$7,000.00	$7,000	
	Others (Telephone, Cable, Etc.)	211	LF	$50.00	$10,525	Includes an additional 10' before and after the structure.
	Street Lights	0	EA	$2,500.00	$0	
	Traffic Signals	0	EA	$150,000.00	$0	
	Traffic Conduit	0	EA	$1,000.00	$0	
	SRP Tower	0	EA	$300,000.00	$0	
				Subtotal	$97,385	

CONSTRUCTION TOTAL	$3,739,282
LAND TOTAL	$577,777
UTILITY RELOCATION TOTAL	$97,385
15% CONTINGENCY	$662,167
PHASE II TOTAL	$5,100,000

Figure 3.5.4 Grand Total Phase II

4 HYDROLOGY

The hydrology model used for this study is based on the Hydrology Technical Memorandum dated September 2010, completed for the Van Buren DCR. The Hydrology Technical Memorandum extracted the project study area from the Durango Area Drainage Master Plan (Durango ADMP) by Dibble & Associates, 2001. The existing HEC-1 model input data files including slt4dur6.dat (100-year 6-hour event) and sltdur24.dat (100-year 24-hour event) were provided by the District. These models were generated for the Durango ADMP and later updated by the District using the Aspen routing.

4.1 Van Buren DCR 100-Year Hydrologic Models

The September 2010 Hydrology Technical Memorandum HEC-1 models for the 100-year storm event were extracted from the existing Durango ADMP HEC-1 models. The extracted areas of the models include the study area shown as Area 1, the extended study area shown as Area 2, and an offsite contributing area, as shown in **Figure 1.1.1 – Study Area**. These areas include 39 Durango ADMP sub-watersheds: RA through RE (Area 1), KA, KD, LE, OB, OF and OG (Area 2), RF and RG (extended study area), and RH through RJ, SA through SH, TA and TB, UA through UD, VA through VD, WA through WD, and XA (offsite contributing area). Minor adjustments were made in the models to match the existing model results.

The point rainfall depths of the 100-year 6-hour and 100-year 24-hour events used in the September 2010 Hydrology Technical Memorandum models were 3.23 and 3.99 inches respectively. These rainfall depths were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 2 for Arizona. These values are the same as the rainfall depths used in the Durango ADMP.

Soil data used in the September 2010 Hydrology Technical Memorandum models is the same as the Durango ADMP, which was determined from the SCS Soil Survey of Maricopa County (SCS, 1997).

Land uses were updated for both current and future condition land uses and retention volumes. Current land uses were obtained using current aerial photography of the study area. The future land uses were determined using the City of Avondale's General Plan. Retention volumes for the future land use were computed using City of Avondale and Maricopa County Drainage Design Standards and NOAA Atlas 2 rainfall depths. Eighty-five percent of the retention required volume was accounted for by diverting the required volume out of the model. Note the District standard is 80%. Eighty-five percent was used as the City code requires retention basins as part of its development process, so the team agreed to use 85% retention rate.

The Agriculture S-graph was used for all the five sub-watersheds in Area 1 in the Durango ADMP models. Based on the updated current land uses, the Agriculture S-graph was used for sub-watersheds RB and RC, while the Phoenix Valley S-graph was used for RA, RD and RE due to the recent development in these areas. In future condition models, Phoenix Valley S-graph was used for all the sub-watersheds in Area 1.

The channel routing procedures as related in the Durango ADMP were used in the Van Buren DCR models. The number of routing steps (NSTPS) for each channel routing was calculated by using an interactive process described in the Maricopa County Hydrology Manual. Runoff discharges cross Van Buren Street at several locations and enter the DROP channel located south of Area 1.

See the Van Buren DCR Hydrology Technical Memorandum for additional details of the current and future conditions models.

4.2 Hydrologic Model Update

Alternatives Analysis for the 10-year conveyance was built upon the September 2010 Hydrology Technical Memorandum models (base models). The HEC-1 model data sheets are included in **Appendix C**.

Effective August 6, 2003, the NOAA Atlas 2 has been superseded by Atlas 14 for Arizona and other western states. Consequently, the following point rainfall depths were obtained from NOAA Atlas 14 (NOAA 2006) and used in this study:

$D_{10\text{-year},6\text{-hour}} = 1.71$ inches;
$D_{10\text{-year},24\text{-hour}} = 2.19$ inches;
$D_{100\text{-year},6\text{-hour}} = 2.62$ inches; and
$D_{100\text{-year},24\text{-hour}} = 3.41$ inches.

Soil data is the same as the base models.

Land uses were further updated for both current and future condition land uses according to the most recent data. The required retention volumes were recalculated accordingly. The District standard of 80% retention volume of the required volume was entered into the model by diverting the required volume out of the model. Because the retention volume captures most of the flow for sub-watersheds RA, RC, RD and RE, the DI and DQ cards in the models were adjusted to allow a smaller portion (~5%) of the flow to bypass the retention area until the 80% capacity is reached, as recommended by the District. First flush runoff was retained in the City Center areas that are and/or will be located in sub-watersheds RB and RC.

S-graphs were revised for both current and future condition models accordingly.

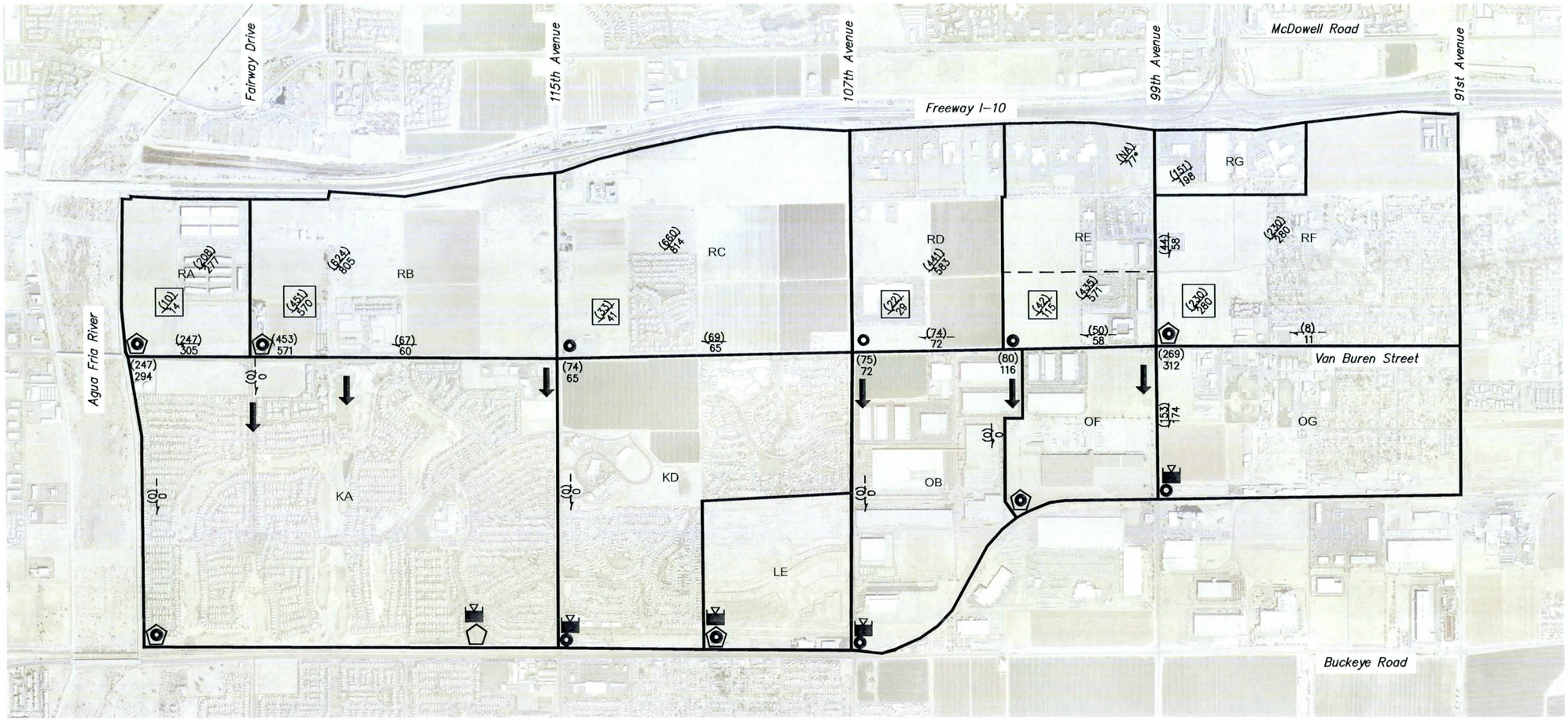
To ensure a conservative flow in the first reach of the storm drain system, the District and City requested that the 10-year, 6-hour peak flow of the initial 160 acres of sub-watershed RE be calculated with the rational method. The higher discharge generated in the initial 160 acres of RE between the 10-year rational peak and the HEC-1 10-year peak should be used in the 10-year, 6-hour future condition alternative analysis model (see **Section 4.3**). DDMSW was used to calculate a rational peak flow for the 10-year event of 386.2 cubic feet per second. The peak flow of the 10-year event modeled using HEC-1 is 382 cubic feet per second. Consequently, the rational 10-year peak discharge should be used. This was reduced down to the initial flow rate of 77.2 cubic feet per second by assuming 80% of the water was retained in retention basins in sub-watershed RE (386.2 × 20% = 77.2 cubic feet per second. The southern portion of RE was calculated to be 189 cubic feet per second by taking the total flow of RE, 571 – 382 cubic feet per second. The flow of the southern portion was reduced down 80% for retention, 189 X 20% = 38 cubic feet per second. The total flow in RE at the concentration point RETRE is therefore, 77 + 38 = 115 cubic per second.

For the 10-year, 6-hour future condition alternative analysis model, the hydrograph for the entire RE area was modeled, the portion of the initial 160 acres removed, and the rational peak flow of 77.2 cubic feet per second, was added back in for a composite hydrograph for RE. The model retention values in RE were than adjusted to reflect the composite peak flow rate of 115 cubic feet per second at the concentration point RETRE. The recommended plan models (see **Section 4.4**) used the same retention volume but, the peak was not adjusted to 115 cubic feet per second. No retention volume adjustments were necessary as the flow was added as an extra to ensure the 10-year future condition channel would have flow in the upper reaches.

All hydrographs were routed west along Van Buren Street through a conceptual channel and a conceptual storm drain pipe connected to the channel upstream. Existing flow splits to the south were also routed west. Existing flow splits, per the City, for Van Buren Street go south at 103rd Avenue, 107th Avenue, 111th Avenue, 113th Avenue, Cold Water Springs Golf Course, and Fairway Drive.

4.3 Alternatives Analysis Models

Ten-year 6-hour and 24-hour storm events (NOAA Atlas 14) were modeled for future conditions. These models were designated as "alternative analysis models". Based on the preliminary model results, a conceptual channel was sized using Flow Master. A channel routing was performed by using the conceptual channel. The model input data and results were submitted to the District for review. Based on the review comments, the models were modified and recomputed. The outputs from the modified models are included on a compact disc that is included with this DCR. **Figure 4.3.1 - HEC-1 Alternative Analysis Model Results – 10 Year Peak Flows of Future Condition Routing West through Conceptual Channels,** shows the peak flow values generated in sub-watersheds, routed or diverted, and at the hydrograph combining and diverting locations.



LEGEND

- SUB-BASIN RUNOFF BEFORE RETENTION
- SUB-BASIN RUNOFF AFTER RETENTION
- FLOW ROUTING
- DIVERT ROUTING
- HYDROGRAPH COMBINE POINT
- FLOW DIVERSION
- HYDROGRAPH COMBINE & DIVERSION POINT
- PROPOSED DETENTION BASIN
- NON-CONTRIBUTING AREA
- ADMP BASIN
- (222) 24 HOUR PEAK FLOW
  328 6 HOUR PEAK FLOW
- EXISTING FLOW SPLIT
- * RATIONAL PEAK FLOW FROM NORTH 160 ACRES (STARTING AREA) OF RE

MODELING NOTES:

1. ALL FLOWS ALONG VAN BUREN WERE MODELED WITH ROUTING TO WEST. ALL OVER FLOWS WERE ASSUMED TO CONTINUE WEST.
2. PER DURANGO ADMP MODEL, EXISTING CONDITION IS FLOWS SPLITS AT VAN BUREN DIVERT FLOW SOUTH AT 103RD, 107TH, 111TH AND 113TH AVENUES, COLD WATER SPRINGS GOLF COURSE AND EL MIRAGE ROAD. ACTUAL, CURRENT DISCHARGES TO SPLITS ARE UNKNOWN.

FIGURE 4.3.1 - HEC-1 ALTERNATIVE ANALYSIS MODEL RESULTS - 10-YEAR PEAK FLOWS OF FUTURE CONDITION
ROUTING WEST THROUGH CONCEPTUAL CHANNELS

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2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
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P:\FCDMC\03700.001VanBuren III\Dwg\Exhibits\Exhibit 4.2 - HEC-1 Model Results - 10-Year Peak Flows-Future 1.dwg Aug 26, 2013 3:22pm cchristian

4.4 Recommended Plan Models

Recommended Plan models were ran to verify that the installed channel does not adversely affect the study other than the 10-year future build-out. Based on the alternative analysis model results (10-year events) and the available Van Buren Street survey data, three sections of a conceptual trapezoidal channel (10-year event channel) and a section of reinforced concrete pipe (10-year event pipe) were sized by using an open channel computer program, Flow Master. Side slopes of the channel are between 8:1 and 4:1 (horizontal: vertical).

Four "recommended plan models" were built up using the updated rainfall, land use, retention data, and the 10-year channel. The base model was the 10-year future conditions model from **Section 4.3**. The normal-depth channel routing and kinematic wave channel routing methods were respectively used for the channel and pipe. Each model figure gives the peak flow values generated in sub-watersheds, routed or diverted, and at the hydrograph combining and diverting locations, as well as the channel routing conveyances for the modeled conditions. The following four models were run:

Figure 4.4.1 – HEC-1 Recommended Plan Model Results – 10-Year Peak Flows of Updated Current Condition Routing West Through Conceptual Channels and RCP's

Figure 4.4.2 – HEC-1 Recommended Plan Model Results – 10-Year Peak Flows of Future Condition – Modified Retention Routing West Through Conceptual Channels

Figure 4.4.3 – HEC-1 Recommended Plan Model Results – 100-Year Peak Flows of Updated Current Condition Routing West Through Conceptual Channels and RCP's

Figure 4.4.4 – HEC-1 Recommended Plan Model Results – 100-Year Peak Flows of Future Condition Routing West Through Conceptual Channels and RCP's

The model outputs are included on a compact disc that is included with this DCR.

Models 1, 3 and 4 were run to evaluate potential adverse effects of the proposed channel in different storm events or scenarios other than what it was designed for. Models 1, 3 and 4 assumed all flow was routed to the west even if the channel was not large enough to convey the flow. Refer to the figures previously mentioned for a table of the conveyance flow rate versus design flow rate to see where over topping of the channel occurs. Generally the channel depths given are seven feet except in a select location where the plans shows only a four and one-half-foot depth which is possible due to low existing grades. Generally the 10-year events do not over top. In some select locations the 100-year event over tops the channel.

Models 1, 3 and 4 routed all flow west including overtopping flows. It should be noted per the Durango ADMP models, existing flow splits to the south occur at 103rd Avenue, 107th Avenue, 111th Avenue, 113th Avenue, Cold Water Springs Golf Course, and Fairway Drive.

With the channel installed, there will be less flow within Van Buren Street. If over topping of the channel for a greater than 10-year event occurs, flow will enter Van Buren Street and continue in its historic path at a lower flow rate than currently occurs. Actual flow splits will be determined in final design during the interior drainage analysis.

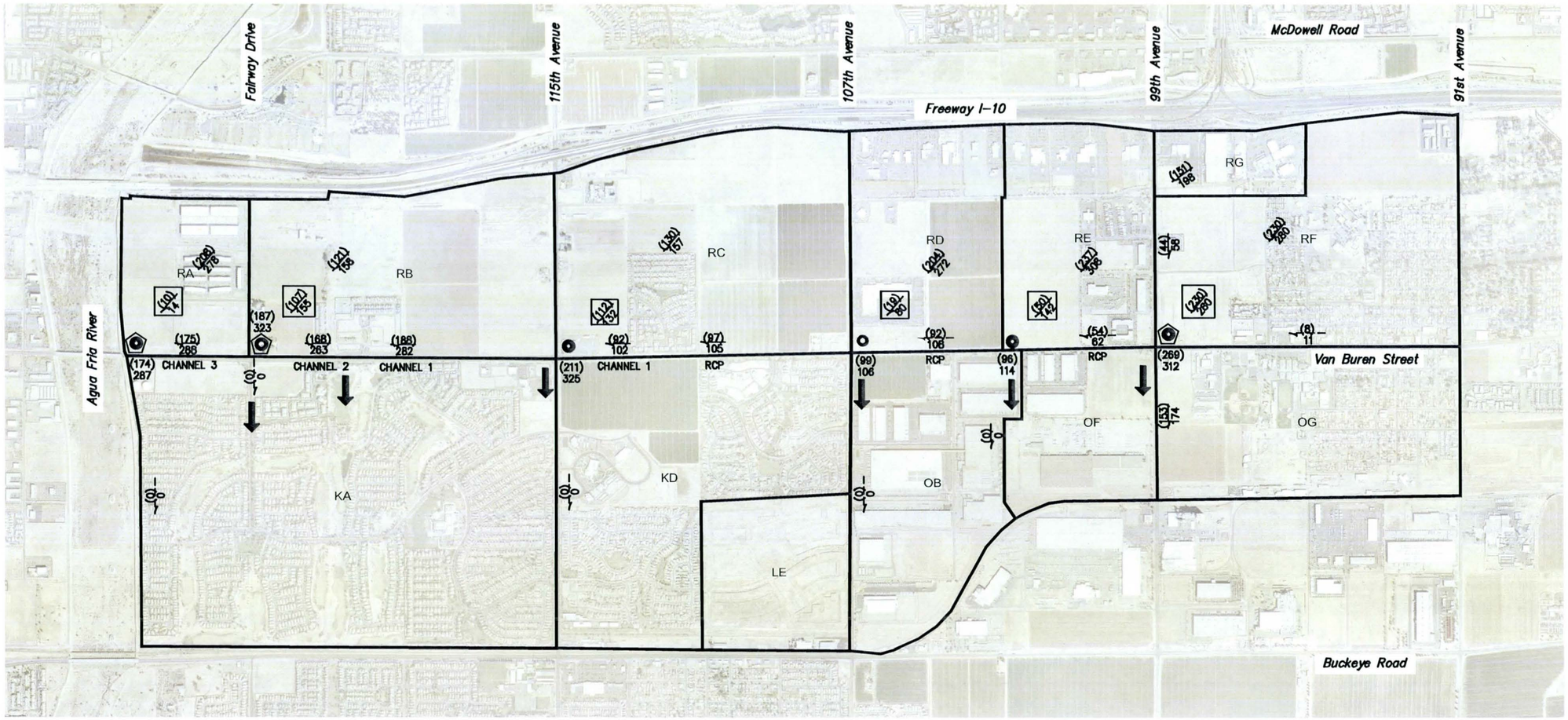
4.5 Retention

All Recommended Plan hydrology models assumed the developed conditions (except for the City Center) have retention basins that provide a least a 100-year, 2-hour retention volume except for the "future 10-year no retention model". The "future 10-year no retention model" assumed certain existing developments would not be required to retain all volume required.

In the models with retention, the volume retained was reduced to 80% per the District standards. In the City Center, first flush was modeled as the volume provided. Retention volume provided was also applied to the five developed or soon to be developed parcels that will have their basins converted to channel by this project. Models 1, 3 and 4 assumed the five parcels would have to find retention elsewhere on their parcels and not discharge into the channel.

Model 2, the future 10-year no retention model assumed lesser retention volumes from Coldwater Depot, the charter school, and Desert Springs subdivision. All these projects are existing or under construction with retention basins in the proposed channel alignment. Reduced volumes provided were estimated for each site by subtracting the plan or as-built volume from the estimated total volume required. The revised lower volumes were entered into the model.

Agua Fria River - Looking South at Van Buren Street Bridge



LEGEND

- SUB-BASIN RUNOFF BEFORE RETENTION
- SUB-BASIN RUNOFF AFTER RETENTION
- FLOW ROUTING
- DIVERT ROUTING
- HYDROGRAPH COMBINE POINT
- FLOW DIVERSION
- HYDROGRAPH COMBINE & DIVERSION POINT
- NON-CONTRIBUTING AREA
- (222) 24 HOUR PEAK FLOW
  328 6 HOUR PEAK FLOW
- EXISTING FLOW SPLIT

CHANNEL ROUTING CONVEYANCES

	SLOPE	DESIGN CAPACITY (10-YR CFS)	DESIGN DEPTH, FT	FULL FLOW CAPACITY, CFS	FULL FLOW DEPTH, FT	BY PASS FLOW, CFS
60" RCP	0.2%	100	3.7	119	5	0
CHANNEL 1	0.45%	600	3.0	1,337	4.5	0
CHANNEL 2	0.21%	600	3.0	1,926	5.5	0
CHANNEL 3	0.06%	600	3.2	1,630	5.5	0

MODELING NOTES:

1. ALL FLOWS ALONG VAN BUREN WERE MODELED WITH ROUTING TO WEST. ALL OVER FLOWS WERE ASSUMED TO CONTINUE WEST.
2. PER DURANGO ADMP MODEL, EXISTING CONDITION IS FLOWS SPLITS AT VAN BUREN DIVERT FLOW SOUTH AT 103RD, 107TH, 111TH AND 113TH AVENUES, COLD WATER SPRINGS GOLF COURSE AND EL MIRAGE ROAD. ACTUAL, CURRENT DISCHARGES TO SPLITS ARE UNKNOWN.

FIGURE 4.4.1 - HEC-1 RECOMMENDED PLAN MODEL RESULTS - 10-YEAR PEAK FLOWS OF UPDATED CURRENT CONDITION
ROUTING WEST THROUGH CONCEPTUAL CHANNELS AND RCP'S

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2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
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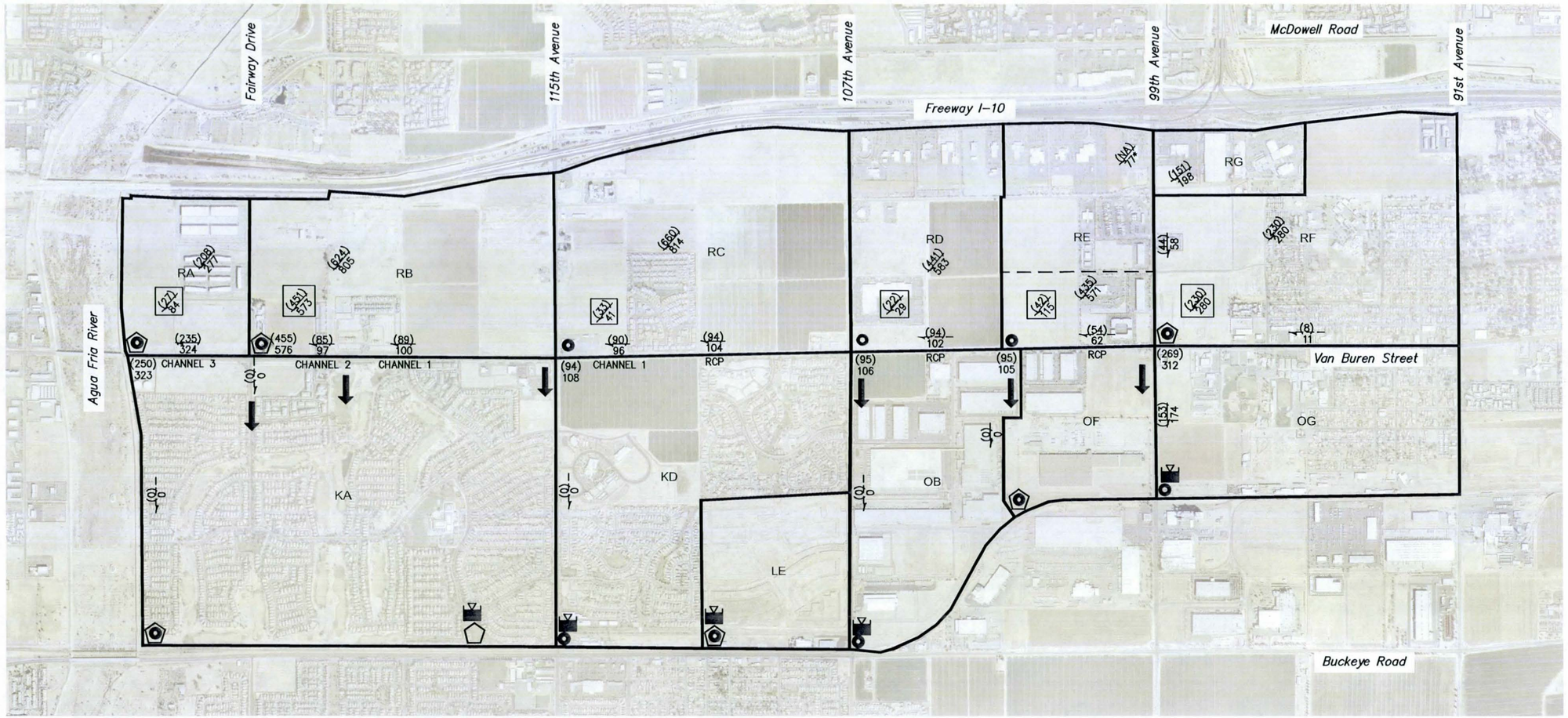
C:\Users\cchristian\appdata\local\temp\AcPublish_1432\Figure 4.4.1 - HEC1 Recommended Plan Results-10-Yr Pk Flows-Current Condition.dwg Aug 26, 2013 3:25pm cchristian



LEGEND

- SUB-BASIN RUNOFF BEFORE RETENTION
- SUB-BASIN RUNOFF AFTER RETENTION
- FLOW ROUTING
- DIVERT ROUTING
- HYDROGRAPH COMBINE POINT
- FLOW DIVERSION
- HYDROGRAPH COMBINE & DIVERSION POINT
- PROPOSED DETENTION BASIN
- NON-CONTRIBUTING AREA
- ADMP BASIN
- (222) 24 HOUR PEAK FLOW
  328 6 HOUR PEAK FLOW
- EXISTING FLOW SPLIT
- * RATIONAL PEAK FLOW FROM NORTH 160 ACRES (STARTING AREA) OF RE

MODELING NOTES:

1. ALL FLOWS ALONG VAN BUREN WERE MODELED WITH ROUTING TO WEST. ALL OVER FLOWS WERE ASSUMED TO CONTINUE WEST.
2. PER DURANGO ADMP MODEL, EXISTING CONDITION IS FLOWS SPLITS AT VAN BUREN DIVERT FLOW SOUTH AT 103RD, 107TH, 111TH AND 113TH AVENUES, COLD WATER SPRINGS GOLF COURSE AND EL MIRAGE ROAD. ACTUAL, CURRENT DISCHARGES TO SPLITS ARE UNKNOWN.
3. THIS MODEL RUN REDUCES RETENTION PROVIDED FOR COLDWATER DEPOT (RA), COLDWATER DEPOT III (RA), SCHOOL (RA), AND DESERT SPRINGS (RB). THE REDUCTION IN RETENTION IS DUE TO RETENTION BASIN BEING CONVERTED TO CHANNEL BY THE PROJECT.

FIGURE 4.4.2 - HEC-1 RECOMMENDED PLAN MODEL RESULTS - 10-YEAR PEAK FLOWS OF FUTURE CONDITION - MODIFIED RETENTION ROUTING WEST THROUGH CONCEPTUAL CHANNELS

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MESA, ARIZONA 85210
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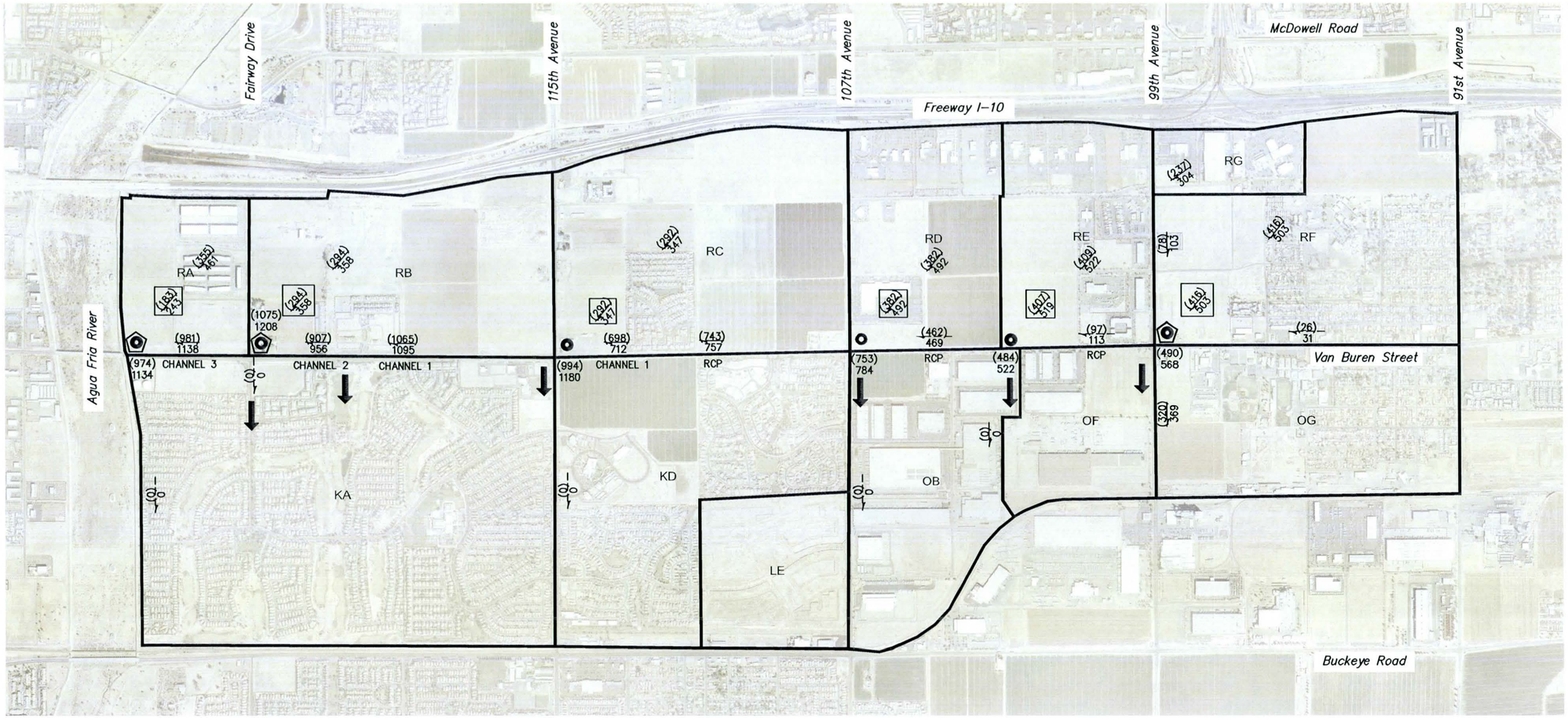
P:\FCDMC\03700.001\VanBuren III\Dwg\Exhibits\Figure 4.4.2 - HEC-1 Recommended Plan Model Results - 10-Year Peak Flows-Future - Modified Retention.dwg Aug 26, 2013 3:29pm cchristion



LEGEND

- SUB-BASIN RUNOFF BEFORE RETENTION
- SUB-BASIN RUNOFF AFTER RETENTION
- FLOW ROUTING
- DIVERT ROUTING
- HYDROGRAPH COMBINE POINT
- FLOW DIVERSION
- HYDROGRAPH COMBINE & DIVERSION POINT
- NON-CONTRIBUTING AREA
- (222) 24 HOUR PEAK FLOW
  328 6 HOUR PEAK FLOW
- EXISTING FLOW SPLIT

CHANNEL ROUTING CONVEYANCES

	SLOPE	DESIGN CAPACITY (10-YR CFS)	DESIGN DEPTH, FT	FULL FLOW CAPACITY, CFS	FULL FLOW DEPTH, FT	BY PASS FLOW, CFS
60" RCP	0.2%	100	3.7	119	5	784-119=665
CHANNEL 1	0.45%	600	3.0	1,337	4.5	0
CHANNEL 2	0.21%	600	3.0	1,926	5.5	0
CHANNEL 3	0.06%	600	3.2	1,630	5.5	0

MODELING NOTES:

1. ALL FLOWS ALONG VAN BUREN WERE MODELED WITH ROUTING TO WEST. ALL OVER FLOWS WERE ASSUMED TO CONTINUE WEST.
2. PER DURANGO ADMP MODEL, EXISTING CONDITION IS FLOWS SPLITS AT VAN BUREN DIVERT FLOW SOUTH AT 103RD, 107TH, 111TH AND 113TH AVENUES, COLD WATER SPRINGS GOLF COURSE AND EL MIRAGE ROAD. ACTUAL, CURRENT DISCHARGES TO SPLITS ARE UNKNOWN.

FIGURE 4.4.3 - HEC-1 RECOMMENDED PLAN MODEL RESULTS - 100-YEAR PEAK FLOWS OF UPDATED CURRENT CONDITION ROUTING WEST THROUGH CONCEPTUAL CHANNELS AND RCP'S

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2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
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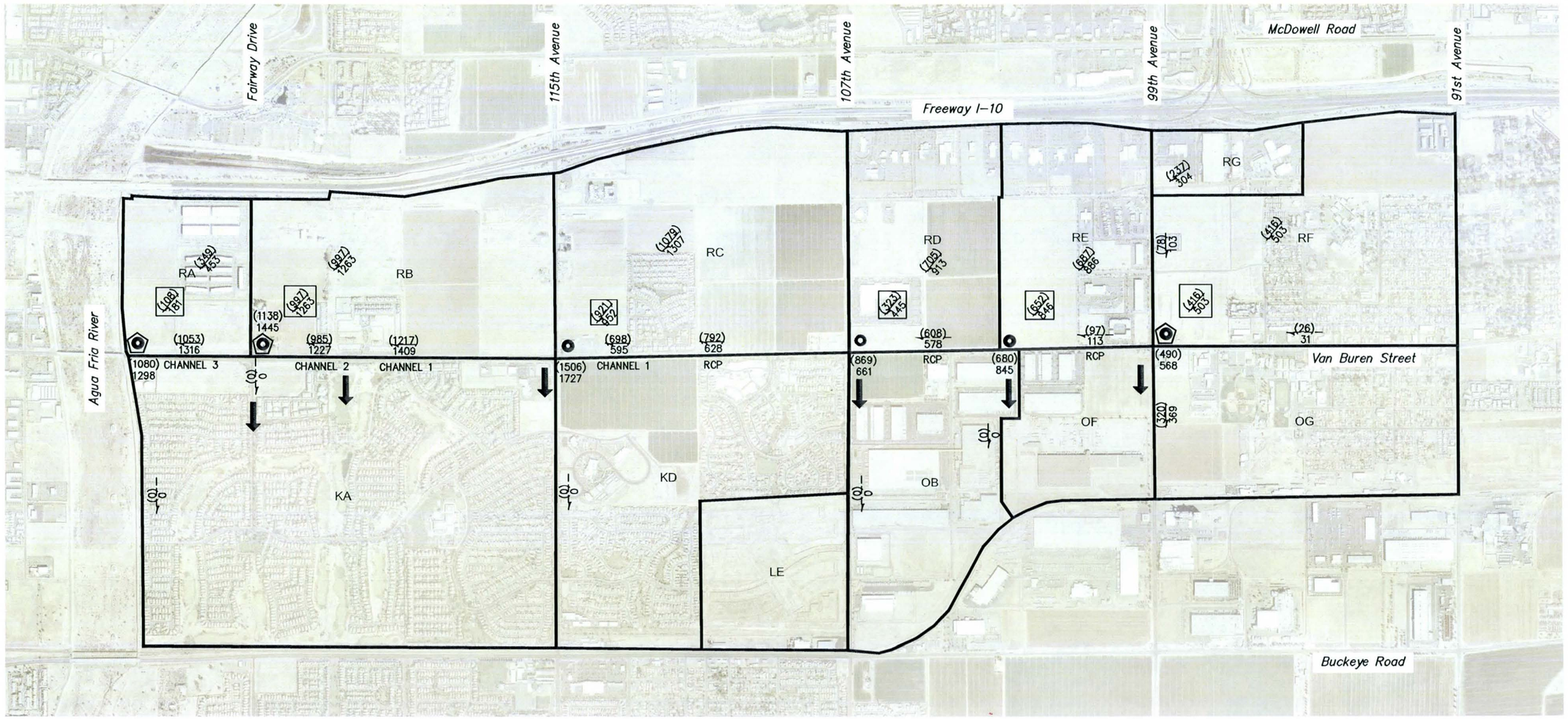
P:\FCDMC\03700.001VanBuren III\Dwg\Exhibits\Figure 4.4.3 - HEC-1 Recommended Plan Results-100-Yr Pk Flows-Current Condition Routing.dwg Aug 26, 2013 3:31pm cchristian



LEGEND

- SUB-BASIN RUNOFF BEFORE RETENTION
- SUB-BASIN RUNOFF AFTER RETENTION
- FLOW ROUTING
- DIVERT ROUTING
- HYDROGRAPH COMBINE POINT
- FLOW DIVERSION
- HYDROGRAPH COMBINE & DIVERSION POINT
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- EXISTING FLOW SPLIT

CHANNEL ROUTING CONVEYANCES

	SLOPE	DESIGN CAPACITY (10-YR CFS)	DESIGN DEPTH, FT	FULL FLOW CAPACITY, CFS	FULL FLOW DEPTH, FT	BY PASS FLOW, CFS
60" RCP	0.2%	100	3.7	119	5	869-119=750
CHANNEL 1	0.45%	600	3.0	1,337	4.5	1727-1337=390
CHANNEL 2	0.21%	600	3.0	1,926	5.5	0
CHANNEL 3	0.06%	600	3.2	1,630	5.5	0

MODELING NOTES:

1. ALL FLOWS ALONG VAN BUREN WERE MODELED WITH ROUTING TO WEST. ALL OVER FLOWS WERE ASSUMED TO CONTINUE WEST.
2. PER DURANGO ADMP MODEL, EXISTING CONDITION IS FLOWS SPLITS AT VAN BUREN DIVERT FLOW SOUTH AT 103RD, 107TH, 111TH AND 113TH AVENUES, COLD WATER SPRINGS GOLF COURSE AND EL MIRAGE ROAD. ACTUAL, CURRENT DISCHARGES TO SPLITS ARE UNKNOWN.

FIGURE 4.4.4 - HEC-1 RECOMMENDED PLAN MODEL RESULTS - 100-YEAR PEAK FLOWS OF FUTURE CONDITION
ROUTING WEST THROUGH CONCEPTUAL CHANNELS AND RCP'S

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
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P:\FCDMC\03700.001\VonBuren III\Dwg\Exhibits\Figure 4.4.4 - HEC-1 Recommended Plan Results-100-Yr Pk Flows of Future Condition.dwg Aug 26, 2013 3:32pm cchristian

5 HYDRAULICS

Hydraulic calculations were performed to size various conveyance system components. Normal depth calculations were performed for open channel flow. Culvert calculations were performed for culverts.

5.1 Open Channel Flow

The computer program, FlowMaster, was used to solve for normal depth using the Manning's equation. An n-value of 0.040 was used for granite mulch lined open channels and a value of 0.013 was used for concrete pipes.

The flow capacity of the retention basins at Desert Springs subdivision and Waterford Apartments were checked using FlowMaster. Surveyed cross section data of the existing retention was entered into FlowMaster and the normal depth solved for these areas. An n-value of 0.030 was used for the existing grass. See **Section 3.0** for discussion on use of existing retention basins as channels. See **Appendix D** for hydraulic calculations.

5.2 Culvert Flow

The computer program, CulvertMaster, was used to solve for headwater depth at culverts. Tail water conditions for the culvert calculations are the normal depth of the downstream section. An n-value of 0.013 was used for concrete, and a Ke of 0.5 for head walls was utilized.

Culvert calculations were performed for the proposed culverts at the Agua Fria River levee penetration. These culverts will have flap gates installed on the downstream end to prevent back water from the Agua Fria River from entering the culverts. The flap gates impede the flow of water through the culvert. This is measured and reported as a head loss from factory specifications. A head loss of six inches was added to the calculated headwater elevation.

Tail water conditions for the culverts were the water surface of the Agua Fria River. Per the District the Agua Fria tail water conditions are 100-year design flow for Van Buren channel, use 10-year flow in the Agua Fria, if 10-year design flow, use 100-year flow in Agua Fria. The District provided updated Agua Fria River water surface elevations for the Recommended Plan Analysis. The new Agua Fria Technical Data Notebook (TDN) estimated the 100-year water surface elevation at 971.78 feet (NAVD88) and the 10-year water surface at 968.07 feet (NAVD88).

The Agua Fria River Levee culverts are a six box array of five-foot by four-foot reinforced box culverts. Four boxes are proposed to be six inches above the Agua Fria River bottom and two boxes are proposed two feet higher. The headwater elevation for the 10-year and 100-year events were calculated using the CulvertMaster computer program. CulvertMaster allows multiple flow components at different sizes and inverts. The program calculates a rating curve for all the flow components and then calculates the headwater elevation for the given flow. The expected headwater elevation in the channel was calculated at the 10-year flow with 100-year water level in the Agua Fria, and the 100-year flow with 10-year flow in the Agua Fria. See **Appendix E** for culvert calculations.

5.3 Flap Gates

Flap gates will be installed on the outlets of the Agua Fria culverts. The flap gates specified are heavy duty high head rated gates by Hydrogate. See **Appendix E** for manufacturer's information, pamphlet and head loss curves. The flap gates have head loss associated with the flow impendence they impose on the outflowing water. The manufacturer provides empirical head loss curves for the gates with different pipe sizes. Peak head loss for a 60-inch pipe (area equivalent to the culvert) is approximately 0.26 feet for 80 cubic feet per second. Maximum flow rate of the culvert is approximately 120 cubic feet per second per barrel which equates to a head loss of 0.20 feet. A conservative head loss of 0.5 feet was added to culvert headwater calculations.

The flap gates are designed to prevent backwater from entering the pipe. Flow in the positive direction will occur as long as the water level on the backside of the gate is higher than the front side of the gate. In the case of the Agua Fria River (front side of gate), if the river is flowing high enough to cover the flap gates, then water from the channel will not flow into the Agua Fria River. Flow into the Agua Fria River will occur when the channel water level rises higher than the Agua Fria River. The calculated headwater plus flap gate head loss for the 10-year and 100-year events show positive flow occurs into the Agua Fria River.

Hydrogate provided a letter stating this application is the intended use for the flap gates. They point out that the heavy duty gates specified are for high head applications and a low head gate can be used. It is our opinion that the heavy duty gate is needed more for the maintenance and to deter vandalism. See **Appendix E** for the Hydrogate letter.

6 CONCLUSION

The Van Buren DCR Recommended Alternative is a storm water conveyance that provides the area north of Van Buren Street a direct connection to the Agua Fria River. The conveyance will reduce runoff in Van Buren Street and allow reduced retention requirements in the City Center area. Phase I is an open channel from Avondale Boulevard to the Agua Fria River with a design flow of 600 cubic-feet per second. Phase II is a 60-inch storm drain pipe form Avondale Boulevard east to 103rd Street. Both alignments are on the north side of Van Buren Street and will be enhanced with one of four landscape themes developed for the project. The landscape theming provides a continuous trail connection from the Agua Fria River to 99th Street. The estimated total cost with landscape enhancements is $17.9 million.

The Recommended Alternative was chosen based on two different Alternative Analyses that were conducted for the project. The first Alternative Analysis investigated 100-year level conveyances on three different alignments from 99th Street to the Agua Fria River. The second Alternative Analysis analyzed 10-year level conveyances. The 100-year level conveyances were determined to be too costly and the second analysis was conducted.

An IGA will be entered into by the District and COA for final design and construction of the project. The District will provide a cost share of 40% of the design for Phases I and II, Phase I right-of-way-acquisition, utility relocations and construction, subject to the limitations of their policy for aesthetic treatment and landscaping of Flood Control Projects. COA will be expected to contribute 60% cost for final design, Phase I right-of-way, utility relocations and construction. COA will be responsible for 100% of Phase II construction. It is also understood COA will be lead agency for design, right-of-way acquisition, utility relocations and construction. COA will also be responsible for operation and maintenance. The project is to be completed within 15 years.

REFERENCES

Flood Control District of Maricopa County, 2010. *Drainage Design Manual for Maricopa County, Arizona, Hydrology.*

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National Oceanic and Atmospheric Administration, 1973. *NOAA Atlas 2, Precipitation-Frequency Atlas of the Western United States, Volume VIII, Arizona.*

Soil Conservation Service, 1997. *Soil Survey of Maricopa County, Central Part.*

U.S. Army Corps of Engineers, 1974. *Gila River Basin, Arizona, New River, and Phoenix City Streams, Design Memorandum No.1, Hydrology Part 1, Los Angeles District.*

U.S. Army Corps of Engineers, 1998. *HEC-1 Flood hydrograph Package User's Manual. Hydrologic Engineering Center (HEC), 609 Second Street, Davis, California 95616-4687.*

Dibble & Associates Consulting Engineers, March 2001, *Durango Area Drainage Master Plan Alternatives Analysis Report FCD#99-41*

APPENDICES

APPENDIX A

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Total Project Summary (40+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description			Total
	Phase I (40+00 to 135+00, 1.8 miles)	LF	$/FT	
	Construction- Sheet P1 - Agua Fria River to El Mirage Rd (16+80 to 35+50)	1,325	$1,454.16	$1,926,644
	Land- Sheet P1 - Agua Fria River to El Mirage Rd (16+80 to 35+50)			$869,591
	Utilities- Sheet P1 - Agua Fria River to El Mirage Rd (16+80 to 35+50)			$12,456
	Construction- Sheet P2 - El Mirage Rd to Desert Springs Village (35+50 to 60+00)	2,107	$1,047.53	$2,207,502
	Land- Sheet P2 - El Mirage Rd to Desert Springs Village (35+50 to 60+00)			$452,160
	Utilities- Sheet P2 - El Mirage Rd to Desert Springs Village (35+50 to 60+00)			$535,890
	Construction- Sheet P3 - Desert Springs Village to Fresh n Easy (60+00 to 85+00)	2,503	$609.18	$1,524,717
	Land- Sheet P3 - Desert Springs Village to Fresh n Easy (60+00 to 85+00)			$860,471
	Utilities- Sheet P3 - Desert Springs Village to Fresh n Easy (60+00 to 85+00)			$496,583
	Construction- Sheet P4 - Fresh n Easy to Versante (85+00 to 103+60)	1,759	$796.65	$1,401,299
	Land- Sheet P4 - Fresh n Easy to Versante (85+00 to 103+60)			$572,119
	Utilities- Sheet P4 - Fresh n Easy to Versante (85+00 to 103+60)			$307,275
			Phase Subtotal Construction	$7,060,163
			Phase Subtotal Land	$2,754,341
			Phase Subtotal Utilities	$1,352,205
			15 % Contingency	$1,675,006
			Phase I Total	**$12,842,000**
	Phase II (135+00 to 193+00, 1.1 miles)			
	Construction- Sheet P4 & P5 - Versante to Roosevelt Park (103+60 to 134+50)	3,470	$467.45	$1,622,107
	Land- Sheet P4 & P5 - Versante to Roosevelt Park (103+60 to 134+50)			$196,200
	Utilities- Sheet P4 & P5 - Versante to Roosevelt Park (103+60 to 134+50)			$59,320
	Construction- Sheet P6 - Roosevelt Park to 104th Ave (134+50 to 159+50)	2,523	$478.62	$1,207,794
	Land- Sheet P6 - Roosevelt Park to 104th Ave (134+50 to 159+50)			$148,657
	Utilities- Sheet P6 - Roosevelt Park to 104th Ave (134+50 to 159+50)			$38,065
	Construction- Sheet P7 - 104th Ave to 103rd Ave (159+50 to 186+75)	751	$980.53	$736,379
	Land- Sheet P7 - 104th Ave to 103rd Ave (159+50 to 186+75)			$192,870
	Utilities- Sheet P7 - 104th Ave to 103rd Ave (159+50 to 186+75)			$0
	Construction- Sheet P8 - 103rd Ave to 99th Ave (186+75 to 195+65)	890	$194.39	$173,003
	Land- Sheet P8 - 103rd Ave to 99th Ave (186+75 to 195+65)			$40,050
	Utilities- Sheet P8 - 103rd Ave to 99th Ave (186+75 to 195+65)			$0
			Phase Subtotal Construction	$3,739,282
			Phase Subtotal Land	$577,777
			Phase Subtotal Utilities	$97,385
			15 % Contingency	$662,167
			Phase II Total	**$5,077,000**
			Grand Total	**$17,900,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions compared to bid or actual costs.

Figure 3.5.1 Grand Total by Section

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Total Project - Construction Quantities (40+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total	Notes
	Construction					
	Excavation - Channel	104,254	CY	$6.00	$625,521	Includes excavation and export haul costs.
	Excavation - Box Culvert and/or 60" RGRCP	27,909	CY	$9.80	$273,513	Includes excavation and export haul costs.
	Concrete - Levee Repair	589	CY	$250.00	$147,352	
	Concrete - Box Culvert	1,823	CY	$130.00	$2,073,828	Includes concrete and steel reinforcement.
	Concrete - Headwalls	224	CY	$430.00	$96,376	Includes concrete and steel reinforcement.
	Concrete - Multi-Use Path (no existing VB path)	138,980	SF	$6.00	$833,880	
	Concrete - Multi-Use Path	105,600	SF	$6.00	$633,600	
	Concrete - Pedestrian Path	2,640	SF	$6.00	$15,840	
	Concrete - Cut-Off Walls	447	CY	$430.00	$192,306	Includes concrete and rebar.
	Remove and Replace Asphalt Road	10,766	SY	$22.00	$236,863	
	60" RGRCP	6,745	LF	$190.00	$1,281,468	Includes pipe and bedding.
	Flap Gates	6	EA	$8,000.00	$48,000	
	CLSM Backfill	8,584	CY	$45.00	$386,296	
	Storm Drain Manhole - MAG 521	18	EA	$4,500.00	$81,000	
	Channel Liner - Conveyance Turf (Sod w/ Irrigation)	307,430	SF	$1.25	$384,288	
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	195,285	SF	$0.67	$130,811	
	Angular Rock (D50 = 6" @ 12" Deep)	4,776	CY	$60.00	$286,556	
	Landscape Construction					
	Landscape Theme - City Center	603,430	SF	$1.19	$719,228	
	Landscape Theme - Residential (Desert Springs)	145,300	SF	$0.78	$112,872	
	Landscape Theme - Transitional	515,690	SF	$1.12	$577,368	
	Landscape Theme - Trail Only	395,780	SF	$1.58	$626,071	
	Surface Treatment - Turf (Sprigs w/ Irrigation)	125,195	SF	$0.85	$106,416	
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	638,456	SF	$0.67	$427,765	
	Lighting	335	EA	$1,500.00	$502,200	
				SubTotal	$10,799,445	
	Land					
	Land Acquisition - Channel / Trail	1,042,541	SF	$2.25	$2,345,718	
	Land Acquisition - Road	195,900	SF	$2.25	$440,775	
	Land Acquisition - CW Depot & DS West Basin	242,500	SF	$2.25	$545,625	
				SubTotal	$3,332,118	
	Utility Relocation					
	Water 8" 16"	659	LF	$105.00	$69,213	Includes an additional 10' before and after the structure.
	Water 18" and up	0	LF	$510.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water	55	LF	$105.00	$5,810	Includes an additional 10' before and after the structure.
	Reclaimed Water Vault	0	EA	$5,000.00	$0	
	Fire Hydrant	1	EA	$5,500.00	$5,500	
	Sewer Manholes	0	LF	$4,500.00	$0	Includes an additional 10' before and after the structure.
	Sewer Mains	310	LF	$80.00	$24,820	Includes an additional 10' before and after the structure.
	Storm Drain Structures	2	LF	$2,500.00	$5,000	Includes an additional 10' before and after the structure.
	Storm Drain Pipes	92	LF	$95.00	$8,764	Includes an additional 10' before and after the structure.
	Concrete Irrigation Ditch	0	LF	$20.00	$0	Includes an additional 10' before and after the structure.
	Irrigation Relocation	5	LS	$150,000.00	$750,000	
	Gas 6" Relocation	3	LS	$25,000.00	$75,000	
	Gas 20" Relocation	1	LS	$55,000.00	$55,000	
	Electric	673	LF	$130.00	$87,425	Includes an additional 10' before and after the structure.
	Electrical Pole	6	EA	$7,000.00	$42,000	
	Others (Telephone, Cable, Etc.)	321	LF	$50.00	$16,058	Includes an additional 10' before and after the structure.
	Street Lights	2	EA	$2,500.00	$5,000	
	Traffic Signals	0	EA	$150,000.00	$0	
	Traffic Conduit	0	EA	$1,000.00	$0	
	SRP Tower	1	EA	$300,000.00	$300,000	
				Subtotal	$1,449,590	

CONSTRUCTION TOTAL	**$10,799,445**
LAND TOTAL	**$3,332,118**
UTILITY RELOCATION TOTAL	**$1,449,590**
15% CONTINGENCY	**$2,337,173**
PROJECT TOTAL	**$17,900,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions compared to bid or actual costs.

Figure 3.5.2 Grand Total

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Total Project Phase I - Construction Quantities (40+00 to 127+50)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total	Notes
	Construction					
	Excavation - Channel	104,254	CY	$6.00	$625,521	Includes excavation and export haul costs.
	Excavation - Box Culvert and/or 60" RGRCP	14,120	CY	$9.80	$141,319	Includes excavation and export haul costs.
	Concrete - Levee Repair	589	CY	$250.00	$147,352	
	Concrete - Box Culvert	1,823	CY	$430.00	$2,073,828	Includes concrete and steel reinforcement.
	Concrete - Headwalls	202	CY	$430.00	$86,733	Includes concrete and steel reinforcement.
	Concrete - Multi-Use Path (no existing A/B path)	82,100	SF	$6.00	$492,600	
	Concrete - Multi-Use Path	51,900	SF	$6.00	$311,400	
	Concrete - Pedestrian Path	2,640	SF	$6.00	$15,840	
	Concrete - Cut Off Walls	117	CY	$430.00	$192,306	Includes concrete and rebar.
	Remove and Replace Asphalt Road	6,270	SY	$22.00	$137,942	
	60" RGRCP	0	LF	$190.00	$0	Includes pipe and bedding.
	Flap Gates	6	EA	$8,000.00	$48,000	
	CLSM Backfill	0	CY	$45.00	$0	
	Storm Drain Manhole - MAG 521	0	EA	$1,500.00	$0	
	Channel Liner - Conveyance Turf (Sod w/ Irrigation)	307,430	SF	$1.25	$384,288	
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	195,285	SF	$0.67	$130,841	
	Angular Rock (D50 = 6" @ 12" Deep)	4,776	CY	$60.00	$286,556	
	Landscape Construction					
	Landscape Theme - City Center	603,430	SF	$1.19	$719,228	
	Landscape Theme - Residential (Desert Springs)	145,300	SF	$0.78	$112,872	
	Landscape Theme - Transitional	515,690	SF	$1.12	$577,368	
	Landscape Theme - Trail Only	0	SF	$1.58	$0	
	Surface Treatment - Turf (Springs w/ Irrigation)	125,195	SF	$0.85	$106,416	
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	354,307	SF	$0.67	$237,386	
	Lighting	155	EA	$1,500.00	$232,350	
				SubTotal	$7,060,163	
	Land					
	Land Acquisition - Channel / Trail	890,652	SF	$2.25	$2,003,966	
	Land Acquisition - Road	91,000	SF	$2.25	$204,750	
	Land Acquisition - CW Depot & DS West Basin	242,500	SF	$2.25	$545,625	
				SubTotal	$2,754,341	
	Utility Relocation					
	Water 8" 16"	477	LF	$105.00	$50,103	Includes an additional 10' before and after the structure.
	Water 18" and up	0	LF	$510.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water	55	LF	$105.00	$5,810	Includes an additional 10' before and after the structure.
	Reclaimed Water Vault	0	EA	$5,000.00	$0	
	Fire Hydrant	1	EA	$5,500.00	$5,500	
	Sewer Manholes	0	LF	$4,500.00	$0	Includes an additional 10' before and after the structure.
	Sewer Mains	232	LF	$80.00	$18,580	Includes an additional 10' before and after the structure.
	Storm Drain Structures	2	LF	$2,500.00	$5,000	Includes an additional 10' before and after the structure.
	Storm Drain Pipes	66	LF	$95.00	$6,294	Includes an additional 10' before and after the structure.
	Concrete Irrigation Ditch	0	LF	$20.00	$0	Includes an additional 10' before and after the structure.
	Irrigation Relocation	5	LS	$150,000.00	$750,000	
	Gas 6" Relocation	2	LS	$25,000.00	$50,000	
	Gas 20" Relocation	1	LS	$55,000.00	$55,000	
	Electric	463	LF	$130.00	$60,385	Includes an additional 10' before and after the structure.
	Electrical Pole	5	EA	$7,000.00	$35,000	
	Others (Telephone, Cable, Etc.)	111	LF	$50.00	$5,533	Includes an additional 10' before and after the structure.
	Street Lights	2	EA	$2,500.00	$5,000	
	Traffic Signals	0	EA	$150,000.00	$0	
	Traffic Conduit	0	EA	$1,000.00	$0	
	SRP Tower	1	EA	$300,000.00	$300,000	
				Subtotal	$1,352,205	

CONSTRUCTION TOTAL	$7,060,163
LAND TOTAL	$2,754,341
UTILITY RELOCATION TOTAL	$1,352,205
15% CONTINGENCY	$1,675,006
PHASE I TOTAL	**$12,800,000**

Figure 3.5.3 Grand Total Phase I

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Total Project Phase II - Construction Quantities (127+50 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total	Notes
	Construction					
	Excavation - Channel	0	CY	$6.00	$0	Includes excavation and export haul costs.
	Excavation - Box Culvert and/or 60" RGRCP	13,489	CY	$9.80	$132,194	Includes excavation and export haul costs.
	Concrete - Box Culvert	0	CY	$430.00	$0	Includes concrete and steel reinforcement.
	Concrete - Headwalls	22	CY	$430.00	$9,623	Includes concrete and steel reinforcement.
	Concrete - Multi-Use Path (no existing A/B path)	56,880	SF	$6.00	$341,280	
	Concrete - Multi-Use Path	53,700	SF	$6.00	$322,200	
	Concrete - Pedestrian Path	0	SF	$6.00	$0	
	Concrete - Cut Off Walls	0	CY	$430.00	$0	Includes concrete and rebar.
	Remove and Replace Asphalt Road	4,496	SY	$22.00	$98,920	
	60" RGRCP	6,745	LF	$190.00	$1,281,468	Includes pipe and bedding.
	Flap Gates	0	EA	$8,000.00	$0	
	CLSM Backfill	8,584	CY	$45.00	$386,296	
	Storm Drain Manhole - MAG 521	18	EA	$4,500.00	$81,000	
	Channel Liner - Conveyance Turf (Sod w/ Irrigation)	0	SF	$1.25	$0	
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	0	SF	$0.67	$0	
	Angular Rock (D50 = 6" @ 12" Deep)	0	CY	$60.00	$0	
	Landscape Construction					
	Landscape Theme - City Center	0	SF	$1.19	$0	
	Landscape Theme - Residential (Desert Springs)	0	SF	$0.78	$0	
	Landscape Theme - Transitional	0	SF	$1.12	$0	
	Landscape Theme - Trail Only	395,780	SF	$1.58	$626,071	
	Surface Treatment - Turf (Springs w/ Irrigation)	0	SF	$0.85	$0	
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	284,118	SF	$0.67	$190,379	
	Lighting	180	EA	$1,500.00	$269,850	
				SubTotal	$3,739,282	
	Land					
	Land Acquisition - Channel / Trail	151,890	SF	$2.25	$341,752	
	Land Acquisition - Road	104,900	SF	$2.25	$236,025	
	Land Acquisition - CW Depot & DS West Basin	0	SF	$2.25	$0	
				SubTotal	$577,777	
	Utility Relocation					
	Water 8"-16"	182	LF	$105.00	$19,110	Includes an additional 10' before and after the structure.
	Water 18" and up	0	LF	$510.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water	0	LF	$105.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water Vault	0	EA	$5,000.00	$0	
	Fire Hydrant	0	EA	$5,500.00	$0	
	Sewer Manholes	0	LF	$4,500.00	$0	Includes an additional 10' before and after the structure.
	Sewer Mains	78	LF	$80.00	$6,240	Includes an additional 10' before and after the structure.
	Storm Drain Structures	0	LF	$2,500.00	$0	Includes an additional 10' before and after the structure.
	Storm Drain Pipes	26	LF	$95.00	$2,470	Includes an additional 10' before and after the structure.
	Concrete Irrigation Ditch	0	LF	$20.00	$0	Includes an additional 10' before and after the structure.
	Irrigation Relocation	0	LS	$150,000.00	$0	
	Gas 6" Relocation	1	LS	$25,000.00	$25,000	
	Gas 20" Relocation	0	LS	$55,000.00	$0	
	Electric	208	LF	$130.00	$27,040	Includes an additional 10' before and after the structure.
	Electrical Pole	1	EA	$7,000.00	$7,000	
	Others (Telephone, Cable, Etc.)	211	LF	$50.00	$10,525	Includes an additional 10' before and after the structure.
	Street Lights	0	EA	$2,500.00	$0	
	Traffic Signals	0	EA	$150,000.00	$0	
	Traffic Conduit	0	EA	$1,000.00	$0	
	SRP Tower	0	EA	$300,000.00	$0	
				Subtotal	$97,385	

CONSTRUCTION TOTAL	$3,739,282
LAND TOTAL	$577,777
UTILITY RELOCATION TOTAL	$97,385
15% CONTINGENCY	$662,167
PHASE II TOTAL	**$5,100,000**

Figure 3.5.4 Grand Total Phase II

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Sheet P1 - Agua Fria River to El Mirage Rd (16+80 to 35+50)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	16,487	CY	$6.00	$98,922
	Excavation - Box Culvert and/or 60" RGRCP	3,628	CY	$9.80	$35,555
	Concrete - Levee Repair	589	CY	$250.00	$147,352
	Concrete - Box Culvert	1,262	CY	$430.00	$542,605
	Concrete - Headwalls	61	CY	$430.00	$26,269
	Concrete - Multi Use Path (no existing VB path)	17,760	SF	$6.00	$106,560
	Concrete - Multi Use Path	9,600	SF	$6.00	$57,600
	Concrete - Pedestrian Path	0	SF	$6.00	$0
	Concrete - Cut Off Walls	89	CY	$430.00	$38,222
	Remove and Replace Asphalt Road	1,589	SY	$22.00	$34,961
	60" RGRCP	0	LF	$190.00	$0
	Flap Gates	6	EA	$8,000.00	$48,000
	CLSM Backfill	0	CY	$45.00	$0
	Storm Drain Manhole - MAG 521	0	EA	$4,500.00	$0
	Channel Liner - Conveyance Turf (Sod)	0	SF	$1.25	$0
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	150,645	SF	$0.67	$100,932
	Angular Rock (D50 = 6" @ 12" Deep)	2,147	CY	$60.00	$128,833
	Landscape Construction				
	Landscape Theme - City Center	0	SF	$1.19	$0
	Landscape Theme - Residential (Desert Springs)	0	SF	$0.78	$0
	Landscape Theme - Transitional	376,980	SF	$1.12	$422,068
	Landscape Theme - Trail Only	0	SF	$1.58	$0
	Surface Treatment - Turf (Sprigs w/ Irrigation)	54,117	SF	$0.85	$46,000
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" Dec	56,515	SF	$0.67	$37,865
	Lighting	37	EA	$1,500.00	$54,900
				Sub Total	$1,926,644
	Land				
	Land Acquisition - Channel / Trail	186,485.00	SF	$2.25	$419,591
	Land Acquisition - Road	0	SF	$2.25	$0
	Land Acquisition - Coldwater Deport Basin	200,000	SF	$2.25	$450,000
				SubTotal	$869,591
	Utility Relocation				
	Water 8" 16"	66	LF	$105.00	$6,956
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	1	EA	$5,500.00	$5,500
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	0	LF	$80.00	$0
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	0	LS	$150,000.00	$0
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	0	LF	$130.00	$0
	Electrical Pole	0	EA	$7,000.00	$0
	Others (Telephone, Cable, Etc.)	0	LF	$50.00	$0
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$300,000.00	$0
				Subtotal	$12,456

CONSTRUCTION TOTAL	**$1,926,644**
LAND TOTAL	**$869,591**
UTILITY RELOCATION TOTAL	**$12,456**
15% CONTINGENCY	**$421,304**
SHEET P1 TOTAL	**$3,200,000**

*As prevailing opinions of probable construction cost, the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction cost provided herein are made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions compared to bids or actual costs.

SUNRISE

Proposed Design Elements:
Approximate Location: Sheet P1 (Agua Fria River to El Mirage Road)
Station Range: 16+80 to 35+50
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	$0.00
Channel 1B - 30' Bottom	0	$0.00
Channel 2 - 50' Bottom	0	
Channel 3 - 90' Bottom	982	$530.32
60" RGRCP- in asphalt	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	184	
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	0	$0.00
Reinforced 4' x 5' Concrete Box Culvert	159	
Reinforced 4' x 10' Concrete U-Channel	0	
	1,325	

Channel 2 - 50' Bottom

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
50	0.13	0.25	1	3	0	105	30.77	16.00	4	96.77	0.00	0.00	0.00	0.00	0.00
											Unit Price				
											$6.00	$0.00	$0.00	$1.19	$2.25
											$0.00	$0.00	$0.00	$0.00	**$0.00**

Channel 3 - 90' Bottom

Total: **$100,916.35** *<-Channel Only - No Land Purchase*
Total per LF: $102.82 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
90	0.13	0.25	1	3	981.5	190	30.77	16.00	4	136.77	16486.96	16,486.96	14,997.35	1,781.50	186,485.00
											Unit Price				
											$6.00	$0.00	$0.00	$1.12	$2.25
											$98,921.78	$0.00	$0.00	$1,994.57	**$419,591.25**

Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)

Total: **$330,486.14** *<-Culvert Only*
Total per LF: $1,796.12 *<-Culvert Only*

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
4	2	138	1.00	1.00	184.00	0.17	0.88	0.916666667	6.92	46.25	2180.03	2,180.03	718.89	103,316.00	31	138.00	945.56
			(beneath culvert)	(sides of culvert)							Unit Price						
											$9.80	$0.00	$430.00	$0.00	$430.00		$22.00
											$21,364.30	$0.00	$309,121.84	$0.00	$13,441.80		$20,802.22

Reinforced 4' x 5' Concrete Box Culvert

Total: **$247,674.38** *<-Culvert Only*
Total per LF: $1,553.60 *<-Culvert Only*

Element Dimensions											Bid Items							
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)	Flap Gates (EA)
6	2	138	1.00	1.00	159.42	0.17	0.79	0.67	6.75	36.33	1448.07	1,448.07	542.98	72,886.82	30	138.00	643.58	6.00
			(beneath culvert)	(sides of culvert)							Unit Price							
											$9.80	$0.00	$430.00	$0.00	$430.00		$22.00	$8,000.00
											$14,191.04	$0.00	$233,483.34	$0.00	$12,826.90		$14,158.86	$48,000.00

Reinforced 4' x 10' Concrete U-Channel

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
5	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	57.17	0.00	0.00	0.00	0.00	0	0.00
			(beneath culvert)	(sides of culvert)							Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	
											$0.00	$0.00	$0.00	$0.00	$0.00	

VB R/W and Trail

Element Dimensions					
VB Existing R/W	Length	R/W Required, SF	CW Basin Length	CW R/W, LF	CW Basn R/W Required, SF
40	0	0	800	250	200,000

Landscape Elements

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	1,830	12	450	6	0	1830.00	50.00	T	376980	21,960	5,400	0	54,117	207,160	0	150,645	54,117	56,515	37

Proposed Design Elements:
Approximate Location: Sheet P1 (Agua Fria River to El Mirage Road)
Station Range: 16+80 to 35+50

Utility Relocations

Total: **$12,456.25**

Element Dimensions			Bid Items	
Item Description	*Unit*	Quantity	Unit Price	Cost
Water 8"-16"	LF	66.25	$105.00	$6,956.25
Water 18" and up	LF	0	$510.00	$0.00
Reclaimed Water	LF	0	$105.00	$0.00
Reclaimed Water Vault	EA	0	$5,000.00	$0.00
Fire Hydrant	EA	1	$5,500.00	$5,500.00
Sewer Manholes	EA	0	$4,500.00	$0.00
Sewer Mains	LF	0.00	$80.00	$0.00
Storm Drain Structures	EA	0	$2,500.00	$0.00
Storm Drain Pipes	LF	0.00	$95.00	$0.00
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00
Irrigation Relocation	LS	0.00	$150,000.00	$0.00
Gas 6" Relocation	LS	0	$25,000.00	$0.00
Gas 20" Relocation	LS	0	$55,000.00	$0.00
Electric	LF	0.00	$130.00	$0.00
Electrical Pole	EA	0	$7,000.00	$0.00
Others (Tel, Cable, Etc.)	LF	0	$50.00	$0.00
Street lights	EA	0	$2,500.00	$0.00
Traffic Signals	EA	0	$150,000.00	$0.00
Traffic Conduit	EA	0	$1,000.00	$0.00
SRP Tower	EA	0	$300,000.00	$0.00

Landscape Themes

CC				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
154,160	74,600	55,000	0.48	0.36

R (Desert Springs)				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
81,610	37,400	28,600	0.46	0.35

T				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
174,150	25,000	95,700	0.14	0.55

ET				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
35,330	0	25,365	0.00	0.72

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 6' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.38	455	0.86	80

6	Barrels
Concrete (CY)	Steel (lbs)
10.68	855

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

4	Barrels
Concrete (CY)	Steel (lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 6' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
11.4	837	1.55	135

6	Barrels
Concrete (CY)	Steel (lbs)
19.15	1512

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

4	Barrels
Concrete (CY)	Steel (lbs)
20.07	1609

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Sheet P2 - El Mirage Rd to Desert Springs Village (35+50 to 60+00)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	13,005	CY	$60.00	$780,029
	Excavation - Box Culvert and/or 60" RGRCP	7,941	CY	$99.80	$777,823
	Concrete - Box Culvert	2,621	CY	$430.00	$1,126,856
	Concrete - Headwalls	82	CY	$430.00	$35,282
	Concrete - Multi Use Path (no existing VB path)	12,120	SF	$6.00	$72,720
	Concrete - Multi-Use Path	21,600	SF	$6.00	$129,600
	Concrete - Pedestrian Path	840	SF	$6.00	$5,040
	Concrete - Cut Off Walls	167	CY	$430.00	$71,667
	Remove and Replace Asphalt Road	3,444	SY	$22.00	$75,776
	60" RGRCP	0	LF	$190.00	$0
	Flap Gates	0	EA	$8,000.00	$0
	CLSM Backfill	0	CY	$45.00	$0
	Storm Drain Manhole - MAG 521	0	EA	$4,500.00	$0
	Channel Liner - Conveyance Turf (Sod)	22,650	SF	$1.25	$28,313
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	44,640	SF	$0.67	$29,909
	Angular Rock (D50 = 6" @ 12" Deep)	2,508	CY	$60.00	$150,500
	Landscape Construction				
	Landscape Theme - City Center	0	SF	$1.19	$0
	Landscape Theme - Residential (Desert Springs)	72,300	SF	$0.78	$56,164
	Landscape Theme - Transitional	138,710	SF	$1.12	$155,300
	Landscape Theme - Trail Only	0	SF	$1.58	$0
	Surface Treatment - Turf (Springs w/ Irrigation)	30,396	SF	$0.83	$25,836
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" De	56,922	SF	$0.67	$38,138
	Lighting	34	EA	$1,500.00	$50,550
				SubTotal	$2,207,502
	Land				
	Land Acquisition - Channel / Trail	134,710	SF	$2.25	$303,098
	Land Acquisition - Road	23,750	SF	$2.25	$53,438
	Land Acquisition - Desert Springs West Basin	42,500	SF	$2.25	$95,625
				SubTotal	$452,160
	Utility Relocation				
	Water 8"-16"	289	LF	$105.00	$30,380
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	55	LF	$105.00	$5,810
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	EA	$4,500.00	$0
	Sewer Mains	111	LF	$80.00	$8,853
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	1	LS	$150,000.00	$150,000
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	166	LF	$130.00	$21,580
	Electrical Pole	2	EA	$7,000.00	$14,000
	Others (Telephone, Cable, Etc.)	55	LF	$50.00	$2,767
	Street Lights	1	EA	$2,500.00	$2,500
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	1	EA	$300,000.00	$300,000
				Subtotal	$535,890

CONSTRUCTION TOTAL	$2,207,502
LAND TOTAL	$452,160
UTILITY RELOCATION TOTAL	$535,890
15% CONTINGENCY	$479,333
SHEET P2 TOTAL	**$3,700,000**

In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the contractor's method of pricing, and that the opinions of probable construction cost provided herein are made on the basis of the Engineer's qualified judgment and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual cost.

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Sheet P2 (El Mirage Rd to Desert Springs Village)
Station Range: 35+50 to 60+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	
Channel 1B - 30' Bottom	228	
Channel 2 - 50' Bottom	950	
Channel 3 - 90' Bottom	52	
60" RGRCP- in asphalt	0	
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	327	
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	550	
Reinforced 4' x 5' Concrete Box Culvert	0	
Reinforced 4' x 10' Concrete U-Channel	0	
	2,107	

Channel 1B - 30' Bottom

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
30	0.13	0.25	1	3	228	110	30.77	16.00	4	76.77	1,803.21	1,803.21	1,963.85	653.00	25,080.00
											Unit Price				
											$6.00			$0.78	$2.25
											$10,819.28			$507.26	$56,430.00

Channel 2 - 50' Bottom

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
50	0.13	0.25	1	3	950	105	30.77	16.00	4	96.77	10,328.21	10,328.21	10,293.81	950.00	99,750.00
											Unit Price				
											$6.00			$1.12	$2.25
											$61,969.23			$1,063.62	$224,437.50

Channel 3 - 90' Bottom

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
90	0.13	0.25	1	3	52	190	30.77	16.00	4	136.77	873.48	873.48	794.56	75.09	9,880.00
											Unit Price				
											$6.00			$1.12	$2.25
											$5,240.89			$84.07	$22,230.00

Reinforced 4' x 10' Concrete Box Culvert (3 Barrels)

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
3	2	138	1.00	1.00	327.00	0.17	0.88	0.916666667	6.92	35.33	2,959.82	2,959.82	976.75	145,972.80	27	138.00	1,283.78
			(beneath culvert)	(sides of culvert)							Unit Price						
											$9.80		$430.00		$430.00		$22.00
											$29,006.25		$420,002.07		$11,760.50		$28,243.11

Reinforced 4' x 10' Concrete Box Culvert (3 Barrels)

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
3	4	138	1.00	1.00	550.33	0.17	0.88	0.916666667	6.92	35.33	4981.31	4,981.31	1,643.85	245,669.05	55	276.00	2,160.57
			(beneath culvert)	(sides of culvert)							Unit Price						
											$9.80		$430.00		$430.00		$22.00
											$48,816.88		$706,854.36		$23,521.00		$47,532.54

Reinforced 4' x 10' Concrete U-Channel

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
			(beneath culvert)	(sides of culvert)							Unit Price					
															$430.00	
															$0.00	

VB R/W and Trail

Element Dimensions					
VB Existing R/W	Length	R/W Required, SF	Desert Springs west basin	Channel R/W, LF	DS channel R/W Required, SF
40	950	23750	425	100	42500

Landscape Elements

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	75	12	150	6	0	75.00	50.00	T	16500	900	1,800	0	2,369	9,067	0	8,550	2,369	517	2

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	1,010	12	300	6	0	1010.00	50.00	T	122210	12,120	3,600	0	17,544	67,158	0	36,090	17,544	31,068	20

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	450	12	450	6	140	450.00	50.00	R	50400	5,400	5,400	840	23,097	17,663	17,800	0	5,297	17,663	9

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	150	12	225	6	0	150.00	50.00	R	21900	1,800	2,700	0	10,036	7,675	4,850	0	5,186	7,675	3

Proposed Design Elements:
Approximate Location: Sheet P2 (El Mirage Rd to Desert Springs Village)
Station Range: 35+50 to 60+00

Utility Relocations

Total: **$535,890.00**

Element Dimensions			Bid Items		
Item Description	*Unit*	Quantity	Unit Price	Cost	
Water 8"-16"	LF	289.33	$105.00	$30,380.00	
Water 18" and up	LF	0	$510.00	$0.00	
Reclaimed Water	LF	55.33	$105.00	$5,810.00	
Reclaimed Water Vault	EA	0	$5,000.00	$0.00	
Fire Hydrant	EA	0	$5,500.00	$0.00	
Sewer Manholes	EA	0	$4,500.00	$0.00	electrical MHs
Sewer Mains	LF	110.67	$80.00	$8,853.33	
Storm Drain Structures	EA	0	$2,500.00	$0.00	
Storm Drain Pipes	LF	0.00	$95.00	$0.00	
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00	
Irrigation Relocation	LS	1.00	$150,000.00	$150,000.00	
Gas 6" Relocation	LS	0	$25,000.00	$0.00	
Gas 20" Relocation	LS	0	$55,000.00	$0.00	
Electric	LF	166	$130.00	$21,580.00	2 uge, 1 ohe
Electrical Pole	EA	2	$7,000.00	$14,000.00	
Others (Tel, Cable, Etc.)	LF	55.33	$50.00	$2,766.67	
Street lights	EA	1	$2,500.00	$2,500.00	
Traffic Signals	EA	0	$150,000.00	$0.00	
Traffic Conduit	EA	0	$1,000.00	$0.00	
SRP Tower	EA	1	$300,000.00	$300,000.00	

Landscape Themes

CC				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
154,160	74,600	55,000	0.48	0.36

R (Desert Springs)				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
81,610	37,400	28,600	0.46	0.35

T				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
174,150	25,000	95,700	0.14	0.55

ET				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
35,330	0	25,365	0.00	0.72

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

3	Barrels
Concrete (CY)	Steel (lbs)
9.79	786

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

3	Barrels
Concrete (CY)	Steel (lbs)
17.56	1389

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

3	Barrels
Concrete (CY)	Steel (lbs)
9.79	786

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

3	Barrels
Concrete (CY)	Steel (lbs)
17.56	1389

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

4	Barrels
Concrete (CY)	Steel (lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

4	Barrels
Concrete (CY)	Steel (lbs)
20.07	1609

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Sheet P3 - Desert Springs Village to Fresh n Easy (60+00 to 85+00)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	44,250	CY	$6.00	$265,498
	Excavation - Box Culvert and/or 60" RGRCP	872	CY	$9.80	$8,550
	Concrete - Box Culvert	288	CY	$430.00	$123,804
	Concrete - Headwalls	27	CY	$430.00	$11,761
	Concrete - Multi-Use Path (no existing VB path)	27,440	SF	$6.00	$164,640
	Concrete - Multi Use Path	11,700	SF	$6.00	$70,200
	Concrete - Pedestrian Path	1,320	SF	$6.00	$7,920
	Concrete - Cut-Off Walls	108	CY	$430.00	$46,583
	Remove and Replace Asphalt Road	378	SY	$22.00	$8,325
	60" RGRCP	0	LF	$190.00	$0
	Flap Gates	0	EA	$8,000.00	$0
	CLSM Backfill	0	CY	$45.00	$0
	Storm Drain Manhole - MAG 521	0	EA	$4,500.00	$0
	Channel Liner - Conveyance Turf (Sod)	162,360	SF	$1.25	$202,950
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	0	SF	$0.67	$0
	Angular Rock (D_{50} = 6" @ 12" Deep)	120	CY	$60.00	$7,222
	Landscape Construction				
	Landscape Theme - City Center	308,960	SF	$1.19	$368,249
	Landscape Theme - Residential (Desert Springs)	73,000	SF	$0.78	$56,708
	Landscape Theme - Transitional	0	SF	$1.12	$0
	Landscape Theme - Trail Only	0	SF	$1.58	$0
	Surface Treatment - Turf (Sprigs w/ Irrigation)	20,604	SF	$0.85	$17,513
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	135,811	SF	$0.67	$90,993
	Lighting	49	EA	$1,500.00	$73,800
				SubTotal	$1,524,717
	Land				
	Land Acquisition - Channel / Trail	331,182	SF	$2.25	$745,159
	Land Acquisition - Road	51,250	SF	$2.25	$115,313
				SubTotal	$860,471
	Utility Relocation				
	Water 8"-16"	55	LF	$105.00	$5,810
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	55	LF	$80.00	$4,427
	Storm Drain Structures	2	LF	$2,500.00	$5,000
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	3	LS	$150,000.00	$450,000
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	166	LF	$130.00	$21,580
	Electrical Pole	1	EA	$7,000.00	$7,000
	Others (Telephone, Cable, Etc.)	55	LF	$50.00	$2,767
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$300,000.00	$0
				Subtotal	$496,583

CONSTRUCTION TOTAL	$1,524,717
LAND TOTAL	$860,471
UTILITY RELOCATION TOTAL	$496,583
15% CONTINGENCY	$432,266
SHEET P3 TOTAL	**$3,300,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Sheet P3 (Desert Springs Village to Fresh n Easy)
Station Range: 60+00 to 85+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	$0.00
Channel 1B - 30' Bottom	2,407	$421.16
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	96	
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	
	2,503	

Channel 1B - 30' Bottom

Total:	**$268,366.02**	<-Channel Only - No Land Purchase
Total per LF:	$111.52	<-Channel Only - No Land Purchase

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width Average (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
30	0.13	0.25	1	6	2,407	133	53.85	28.00	7	111.85	44,249.62	44,249.62	30,258.00	2,406.51	331,181.60
					354.33	110					Unit Price				
					1294.13	135					$6.00	$0.00	$0.00	$1.19	$2.25
					758.05	155					$265,497.70	$0.00	$0.00	$2,868.32	$745,158.60
											$110.32				

Reinforced 4' x 10' Concrete Box Culvert (3 Barrels)

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
3	2	138	1.00	1.00	96.39	0.17	0.88	0.916666667	6.92	35.33	872.47	872.47	287.92	43,028.50	27	138.00	378.42
			(beneath culvert)	(sides of culvert)							Unit Price						
											$9.80		$430.00		$430.00		$22.00
											$8,550.19		$123,804.28		$11,760.50		$8,325.24

Reinforced 4' x 10' Concrete U-Channel

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
			(beneath culvert)	(sides of culvert)							Unit Price					
															$430.00	
															$0.00	

VB R/W and Trail

Element Dimensions					
VB Existing R/W	Length	R/W Required, SF	Trail Length	Trail R/W, LF	Trail R/W Required, SF
40	2050	51250		20	0

Landscape Elements

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	500	12	225	6	140	500.00	50.00	R	73000	6,000	2,700	840	33,454	25,583	33,000	0	454	25,583	10

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
14	1,310	12	250	6	80	1310.00	50.00	CC	197810	18,340	3,000	480	95,723	70,573	86,460	0	9,263	70,573	26

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
14	650	12	0	6	0	650.00	50.00	CC	111150	9,100	0	0	53,787	39,655	42,900	0	10,887	39,655	13

Proposed Design Elements:
Approximate Location: Sheet P3 (Desert Springs Village to Fresh n Easy)
Station Range: 60+00 to 85+00

Utility Relocations

Total: $496,583.33

Element Dimensions			Bid Items			
Item Description	*Unit*	Quantity	*Unit Price*	*Cost*		
Water 8"-16"	LF	55.33	$105.00	$5,810.00		
Water 18" and up	LF	0	$510.00	$0.00		
Reclaimed Water	LF	0	$105.00	$0.00		
Reclaimed Water Vault	EA	0	$5,000.00	$0.00		
Fire Hydrant	EA	0	$5,500.00	$0.00		
Sewer Manholes	EA	0	$4,500.00	$0.00		
Sewer Mains	LF	55.33	$80.00	$4,426.67		
Storm Drain Structures	EA	2	$2,500.00	$5,000.00		
Storm Drain Pipes	LF	0.00	$95.00	$0.00		
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00		
Irrigation Relocation	LS	3.00	$150,000.00	$450,000.00	127 lf	(24", 30", and 48")
Gas 6" Relocation	LS		$25,000.00	$0.00	1 EA	
Gas 20" Relocation	LS	0	$55,000.00	$0.00		
Electric	LF	166	$130.00	$21,580.00	2 uge, 1 ohe	
Electrical Pole	EA	1	$7,000.00	$7,000.00		
Others (Tel, Cable, Etc.)	LF	55.33	$50.00	$2,766.67		
Street lights	EA	0	$2,500.00	$0.00		
Traffic Signals	EA	0	$150,000.00	$0.00		
Traffic Conduit	EA	0	$1,000.00	$0.00		
SRP Tower	EA	0	$300,000.00	$0.00		

Landscape Themes

CC				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
154,160	74,600	55,000	0.48	0.36

R (Desert Springs)				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
81,610	37,400	28,600	0.46	0.35

T				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
174,150	25,000	95,700	0.14	0.55

ET				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
35,330	0	25,365	0.00	0.72

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0' Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

3	Barrels
Concrete (CY)	Steel (lbs)
9.79	786

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0' Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

3	Barrels
Concrete (CY)	Steel (lbs)
17.56	1389

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0' Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

4	Barrels
Concrete (CY)	Steel (lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

4	Barrels
Concrete (CY)	Steel (lbs)
20.07	1609

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Sheet P4 - Fresh n Easy to Versante (85+00 to 103+60)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	30,512	CY	$6.00	$183,073
	Excavation - Box Culvert and/or 60" RGRCP	1,979	CY	$9.80	$19,390
	Concrete - Box Culvert	652	CY	$430.00	$280,562
	Concrete - Headwalls	31	CY	$430.00	$13,442
	Concrete - Multi-Use Path (no existing VB path)	24,780	SF	$6.00	$148,680
	Concrete - Multi Use Path	9,000	SF	$6.00	$54,000
	Concrete - Pedestrian Path	480	SF	$6.00	$2,880
	Concrete - Cut-Off Walls	83	CY	$430.00	$35,833
	Remove and Replace Asphalt Road	858	SY	$22.00	$18,880
	60" RGRCP - in asphalt	0	LF	$190.00	$0
	Flap Gates	0	EA	$8,000.00	$0
	CLSM Backfill	0	CY	$45.00	$0
	Storm Drain Manhole - MAG 521	0	EA	$4,500.00	$0
	Channel Liner - Conveyance Turf (Sod)	122,420	SF	$1.25	$153,025
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	0	SF	$0.67	$0
	Angular Rock (D50 = 6" @ 12" Deep)	0	CY	$60.00	$0
	Landscape Construction				
	Landscape Theme - City Center	294,470	SF	$1.19	$350,978
	Landscape Theme - Residential (Desert Springs)	0	SF	$0.78	$0
	Landscape Theme - Transitional	0	SF	$1.12	$0
	Landscape Theme - Trail Only	0	SF	$1.58	$0
	Surface Treatment - Turf (Sprigs w/ Irrigation)	20,078	SF	$0.85	$17,066
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	105,059	SF	$0.67	$70,389
	Lighting	35	EA	$1,500.00	$53,100
				SubTotal	$1,401,299
	Land				
	Land Acquisition - Channel / Trail	238,275	SF	$2.25	$536,119
	Land Acquisition - Road	16,000	SF	$2.25	$36,000
				SubTotal	$2,636,857
	Utility Relocation				
	Water 8" 16"	66	LF	$105.00	$6,956
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	66	LF	$80.00	$5,300
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	66	LF	$95.00	$6,294
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	1	LS	$150,000.00	$150,000
	Gas 6" Relocation	2	LS	$25,000.00	$50,000
	Gas 20" Relocation	1	LS	$55,000.00	$55,000
	Electric	133	LF	$130.00	$17,225
	Electrical Pole	2	EA	$7,000.00	$14,000
	Others (Telephone, Cable, Etc.)	0	LF	$50.00	$0
	Street Lights	1	EA	$2,500.00	$2,500
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$300,000.00	$0
				Subtotal	$307,275

CONSTRUCTION TOTAL	$1,401,299
LAND TOTAL	$572,119
UTILITY RELOCATION TOTAL	$307,275
15% CONTINGENCY	$342,104
SHEET P4 TOTAL	**$2,600,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.

Van Buren DCR Recommended Plan Cost Estimate

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Sheet P4 (Fresh n Easy to Versante)
Station Range: 85+00 to 103+60
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	435	$350.41
Channel 1B - 30' Bottom	483	$460.27
Channel 2 - 50' Bottom	674	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	0	
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	167	$1,989.67
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	
	1,759	

Channel 1A - 10' Bottom

Total: **$34,976.42** <-Channel Only - No Land Purchase
Total per LF: $80.41 <-Channel Only - No Land Purchase

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
10	0.13	0.25	1	6	435	120	53.85	28.00	7	91.85	5,742.99	5,742.99	4,502.76	435.00	52,200.00
											Unit Price				
											$6.00	$0.00	$0.00	$1.19	$2.25
											$34,457.95	$0.00	$0.00	$518.48	$117,450.00

Channel 1B - 30' Bottom

Total: **$53,862.56** <-Channel Only - No Land Purchase
Total per LF: $111.52 <-Channel Only - No Land Purchase

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width Average (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (AC)
30	0.13	0.25	1	6	483	155	53.85	28.00	7	111.85	8,881.15	8,881.15	6,072.95	483.00	74,865.00
											Unit Price				
											$6.00	$0.00	$0.00	$1.19	$2.25
											$53,286.87	$0.00	$0.00	$575.69	$168,446.25

Channel 2 - 50' Bottom

Total: **$96,131.13** <-Channel Only - No Land Purchase
Total per LF: $142.63 <-Channel Only - No Land Purchase

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
50	0.13	0.25	1	6	674	165	53.85	28.00	7	131.85	15,887.97	15,887.97	9,972.24	674.00	111,210.00
											Unit Price				
											$6.00	$0.00	$0.00	$1.19	$80.00
											$95,327.79	$0.00	$0.00	$803.34	$8,896,800.00

Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)

Total: **$299,952.10** <-Culvert Only
Total per LF: $1,796.12 <-Culvert Only

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
4	2	138	1.00	1.00	167.00	0.17	0.88	0.916666667	6.92	46.25	1,978.61	1,978.61	652.47	93,770.50	31	138.00	858.19
											Unit Price						
											$9.80	$0.00	$430.00	$0.00	$430.00	$0.00	$22.00
											$19,390.43	$0.00	$280,561.67	$0.00	$13,441.80	$0.00	$18,880.28

Reinforced 4' x 10' Concrete U-Channel

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
											Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	$0.00
											$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

VB R/W and Trail

Element Dimensions					
VB Existing R/W	Length	R/W Required, SF	Trail Length	Trail R/W, LF	Trail R/W Required, SF
33	500	16000		20	0

Landscape Elements

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
14	610	12	250	6	0	610.00	50.00	CC	104310	8,540	3,000	0	50,477	37,215	40,260	0	10,217	37,215	12

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
14	720	12	250	6	80	720.00	50.00	CC	130320	10,080	3,000	480	63,064	46,495	61,920	0	1,144	46,495	14

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
14	440	12	250	6	0	440.00	50.00	CC	59840	6,160	3,000	0	28,957	21,349	20,240	0	8,717	21,349	9

Van Buren DCR Recommended Plan Cost Estimate

Proposed Design Elements:
Approximate Location: Sheet P4 (Fresh n Easy to Versante)
Station Range: 85+00 to 103+60
Utility Relocations

Total: $307,275.00

Element Dimensions			Bid Items				
Item Description	*Unit*	*Quantity*	*Unit Price*	*Cost*			
Water 8"-16"	LF	66.25	$105.00	$6,956.25			
Water 18" and up	LF	0	$510.00	$0.00			
Reclaimed Water	LF	0	$105.00	$0.00			
Reclaimed Water Vault	EA	0	$5,000.00	$0.00			
Fire Hydrant	EA	0	$5,500.00	$0.00			
Sewer Manholes	EA	0	$4,500.00	$0.00			
Sewer Mains	LF	66.25	$80.00	$5,300.00			
Storm Drain Structures	EA	0	$2,500.00	$0.00			
Storm Drain Pipes	LF	66.25	$95.00	$6,293.75			
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00	35	LF	
Irrigation Relocation	LS	1.00	$150,000.00	$150,000.00	35	LF	
Gas 6" Relocation	LS	2	$25,000.00	$50,000.00			
Gas 20" Relocation	LS	1	$55,000.00	$55,000.00	106	LF	natural gas
Electric	LF	132.5	$130.00	$17,225.00	ohe, uge		
Electrical Pole	EA	2	$7,000.00	$14,000.00			
Others (Tel, Cable, Etc.)	LF	0.00	$50.00	$0.00			
Street lights	EA	1	$2,500.00	$2,500.00			
Traffic Signals	EA	0	$150,000.00	$0.00			
Traffic Conduit	EA	0	$1,000.00	$0.00			
SRP Tower	EA	0	$300,000.00	$0.00			

Landscape Themes

CC

Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
154,160	74,600	55,000	0.48	0.36

R (Desert Springs)

Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
81,610	37,400	28,600	0.46	0.35

T

Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
174,150	25,000	95,700	0.14	0.55

ET

Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
35,330	0	25,365	0.00	0.72

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards

Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'

Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

4 Barrels	
Concrete (CY)	Steel (lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'

Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

4 Barrels	
Concrete (CY)	Steel (lbs)
20.07	1609

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'

Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

4 Barrels	
Concrete (CY)	Steel (lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'

Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

4 Barrels	
Concrete (CY)	Steel (lbs)
20.07	1609

SUNRISE ENGINEERING

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2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Sheet P4 & P5 - Versante to Roosevelt Park (103+60 to 134+50)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	0	CY	$6.00	$0
	Excavation - Box Culvert and/or 60" RGRCP	6,940	CY	$9.80	$68,014
	Concrete - Box Culvert	0	CY	$430.00	$0
	Concrete - Headwalls	11	CY	$430.00	$4,812
	Concrete - Multi-Use Path (no existing VB path)	15,600	SF	$6.00	$93,600
	Concrete - Multi Use Path	21,480	SF	$6.00	$128,880
	Concrete - Pedestrian Path	0	SF	$6.00	$0
	Concrete - Cut-Off Walls	0	CY	$430.00	$0
	Remove and Replace Asphalt Road	2,313	SY	$22.00	$50,895
	60" RGRCP - in asphalt	3,470	LF	$190.00	$659,317
	Flap Gates	0	EA	$8,000.00	$0
	CLSM Backfill	4,417	CY	$45.00	$198,750
	Storm Drain Manhole - MAG 521	11	EA	$4,500.00	$49,500
	Channel Liner - Conveyance Turf (Sod)	0	SF	$1.25	$0
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	0	SF	$0.67	$0
	Angular Rock (D50 = 6" @ 12" Deep)	0	CY	$60.00	$0
	Landscape Construction				
	Landscape Theme - City Center	0	SF	$1.19	$0
	Landscape Theme - Residential (Desert Springs)	0	SF	$0.78	$0
	Landscape Theme - Transitional	0	SF	$1.12	$0
	Landscape Theme - Trail Only	134,200	SF	$1.58	$212,287
	Surface Treatment - Turf (Sprigs w/ Irrigation)	0	SF	$0.85	$0
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	96,348	SF	$0.67	$64,553
	Lighting	61	EA	$1,500.00	$91,500
				SubTotal	$1,622,107
	Land				
	Land Acquisition - Channel / Trail	39,200	SF	$2.25	$88,200
	Land Acquisition - Road	48,000	SF	$2.25	$108,000
				SubTotal	$196,200
	Utility Relocation				
	Water 8" 16"	130	LF	$105.00	$13,650
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	52	LF	$80.00	$4,160
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	26	LF	$95.00	$2,470
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	0	LS	$150,000.00	$0
	Gas 6" Relocation	1	LS	$25,000.00	$25,000
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	78	LF	$130.00	$10,140
	Electrical Pole	0	EA	$7,000.00	$0
	Others (Telephone, Cable, Etc.)	78	LF	$50.00	$3,900
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$300,000.00	$0
				Subtotal	$59,320

CONSTRUCTION TOTAL	$1,622,107
LAND TOTAL	$196,200
UTILITY RELOCATION TOTAL	$59,320
15% CONTINGENCY	$281,644
SHEET P4-P5 TOTAL	**$2,200,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions compared to bid or actual costs.

Van Buren DCR Recommended Plan Cost Estimate

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Sheet P5 (Versante to Roosevelt Park)
Station Range: 103+60 to 134+50
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	
Channel 1B - 30' Bottom	0	$0.00
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	3,470	
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	0	$0.00
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	
	3,470	

Channel 1A - 10' Bottom

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
10	0.13	0.25	1	6	0	130	53.85	28.00	7	91.85	0.00	0.00	0.00	0.00	0.00
											Unit Price				
											$6.00			$0.78	$2.25
											$0.00			$0.00	$0.00

60" RGRCP- in asphalt

Element Dimensions											Bid Items							
Diameter of Pipe (in)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Manholes (EA)	Trench Depth (ft)	Trench Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Pipe (LF)	CLSM Backfill (CY)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)	SD Manholes (EA)
60	1	20	4.00	1.00	3470.09	11.00	5.00	5	9.00	6.00	6,940.18	6,940.18	3,470.09	4,416.66	11	10.00	2,313.39	11.00
											Unit Price							
											$9.80		$190.00	$45.00	$430.00		$22.00	$4,500.00
											$68,013.76		$659,317.10	$198,749.77	$4,811.70		$50,894.65	$49,500.00

Reinforced 4' x 10' Concrete U-Channel

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
											Unit Price					
															$430.00	
															$0.00	

VB R/W and Trail

Element Dimensions					
VB Existing R/W	Length	R/W Required, SF	Trail Length	Trail R/W, LF	Trail R/W Required, SF
33	1500	48000	1,960	20	39200

Landscape Elements

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	3,050	12	40	6	0	3050.00	50.00	ET	134200	36,600	480	0	0	96,348	0	0	0	96,348	61

Proposed Design Elements:
Approximate Location: Sheet P5 (Versante to Roosevelt Park)
Station Range: 103+60 to 134+50
Utility Relocations

Total: **$59,320.00**

Element Dimensions			Bid Items	
Item Description	*Unit*	Quantity	*Unit Price*	*Cost*
Water 8"-16"	LF	130.00	$105.00	$13,650.00
Water 18" and up	LF	0	$510.00	$0.00
Reclaimed Water	LF	0	$105.00	$0.00
Reclaimed Water Vault	EA	0	$5,000.00	$0.00
Fire Hydrant	EA	0	$5,500.00	$0.00
Sewer Manholes	EA	0	$4,500.00	$0.00
Sewer Mains	LF	52.00	$80.00	$4,160.00
Storm Drain Structures	EA	0	$2,500.00	$0.00
Storm Drain Pipes	LF	26.00	$95.00	$2,470.00
Concrete Irrigation Ditch	LF		$20.00	$0.00
Irrigation Relocation	LS	0.00	$150,000.00	$0.00
Gas 6" Relocation	LS	1	$25,000.00	$25,000.00
Gas 20" Relocation	LS	0	$55,000.00	$0.00
Electric	LF	78.00	$130.00	$10,140.00
Electrical Pole	EA	0	$7,000.00	$0.00
Others (Tel, Cable, Etc.)	LF	78	$50.00	$3,900.00
Street lights	EA	0	$2,500.00	$0.00
Traffic Signals	EA	0	$150,000.00	$0.00
Traffic Conduit	EA	0	$1,000.00	$0.00
SRP Tower	EA	0	$300,000.00	$0.00

Landscape Themes

CC				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
154,160	74,600	55,000	0.48	0.36

R (Desert Springs)				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
81,610	37,400	28,600	0.46	0.35

T				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
174,150	25,000	95,700	0.14	0.55

ET				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
35,330	0	25,365	0.00	0.72

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
6.99	526	1.4	130

4	Barrels
Concrete	Steel
(CY)	(lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
12.54	949	2.51	220

4	Barrels
Concrete	Steel
(CY)	(lbs)
20.07	1609

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR
Reach: Sheet P6 - Roosevelt Park to 104th Ave (134+50 to 159+50)
Owner: FCDMC & COA
Prepared By: RMP

8/26/13

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	0	CY	$6.00	$0
	Excavation - Box Culvert and/or 60" RCRCP	5,047	CY	$9.80	$49,460
	Concrete - Box Culvert	0	CY	$430.00	$0
	Concrete - Headwalls	0	CY	$430.00	$0
	Concrete - Multi-Use Path (no existing VB path)	13,680	SF	$6.00	$82,080
	Concrete - Multi Use Path	16,200	SF	$6.00	$97,200
	Concrete - Pedestrian Path	0	SF	$6.00	$0
	Concrete - Cut-Off Walls	0	CY	$430.00	$0
	Remove and Replace Asphalt Road	1,682	SY	$22.00	$37,011
	60" RCRCP - in asphalt	2,523	LF	$190.00	$479,461
	Flap Gates	0	EA	$8,000.00	$0
	CLSM Backfill	3,212	CY	$45.00	$144,533
	Storm Drain Manhole - MAG 521	6	EA	$4,500.00	$27,000
	Channel Liner - Conveyance Turf (Sod)	0	SF	$1.25	$0
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	0	SF	$0.67	$0
	Angular Rock (D50 = 6" @ 12" Deep)	0	CY	$60.00	$0
	Landscape Construction				
	Landscape Theme - City Center	0	SF	$1.19	$0
	Landscape Theme - Residential (Desert Springs)	0	SF	$0.78	$0
	Landscape Theme - Transitional	0	SF	$1.12	$0
	Landscape Theme - Trail Only	106,040	SF	$1.58	$167,741
	Surface Treatment - Turf (Sprigs w/ Irrigation)	0	SF	$0.85	$0
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	76,131	SF	$0.67	$51,008
	Lighting	48	EA	$1,500.00	$72,300
				SubTotal	$1,207,794
	Land				
	Land Acquisition - Channel / Trail	46,870	SF	$2.25	$105,457
	Land Acquisition - Road	19,200	SF	$2.25	$43,200
				SubTotal	$148,657
	Utility Relocation				
	Water 8" 16"	52	LF	$105.00	$5,460
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	26	LF	$80.00	$2,080
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	0	LS	$150,000.00	$0
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	130	LF	$130.00	$16,900
	Electrical Pole	1	EA	$7,000.00	$7,000
	Others (Telephone, Cable, Etc.)	133	LF	$50.00	$6,625
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$300,000.00	$0
				Subtotal	$38,065

CONSTRUCTION TOTAL	$1,207,794
LAND TOTAL	$148,657
UTILITY RELOCATION TOTAL	$38,065
15% CONTINGENCY	$209,177
SHEET P6 TOTAL	**$1,600,000**

*In providing opinions of probable construction cost, the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction cost provided herein are made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.

SUNRISE
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Proposed Design Elements:
Approximate Location: Sheet P6 (Roosevelt Park to 104th Avenue)
Station Range: 134+50 to 159+50
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	
Channel 1B - 30' Bottom	0	$0.00
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	2,523	
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	0	$0.00
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	
	2,523	

Channel 1A - 10' Bottom

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width Average (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
10	0.13	0.25	1	6	0	128	53.85	28.00	7	91.85	0.00	0.00	0.00	0.00	0.00
					1164.96	135					Unit Price				
					479.52	120					$6.00			$1.12	$2.25
											$0.00			$0.00	$0.00

60" RGRCP- in asphalt

modify overexcavation depth

Element Dimensions											Bid Items							
Diameter of Pipe (in)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Manholes (EA)	Trench Depth (ft)	Trench Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Pipe (LF)	CLSM Backfill (CY)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)	SD Manholes (EA)
60	0	20	4.00	1.00	2523.48	6.00	5.00	5	9.00	6.00	5,046.96	5,046.96	2,523.48	3,211.84	0	0.00	1,682.32	6.00
											Unit Price							
											$9.80		$190.00	$45.00	$430.00		$22.00	$4,500.00
											$49,460.21		$479,461.20	$144,532.58	$0.00		$37,011.04	$27,000.00

Reinforced 4' x 10' Concrete U-Channel

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
											Unit Price					
															$430.00	
															$0.00	

VB R/W and Trail

Element Dimensions					
VB Existing R/W	Length	R/W Required, SF	Trail Length	Trail R/W, LF	Trail R/W Required, SF
33	600	19200	2,343	20	46869.6

Landscape Elements

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	2,410	12	80	6	0	2410.00	50.00	ET	106040	28,920	960	0	0	76,131	0	0	0	76,131	48

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8601

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR 8/26/13
Reach: Sheet P8 - 103rd Ave to 99th Ave (186+75 to 195+65)
Owner: FCDMC & COA
Prepared By: RMP

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	0	CY	$6.00	$0
	Excavation - Box Culvert and/or 60" RGRCP	0	CY	$9.80	$0
	Concrete - Box Culvert	0	CY	$430.00	$0
	Concrete - Headwalls	0	CY	$430.00	$0
	Concrete - Multi-Use Path (in existing VB path)	0	SF	$6.00	$0
	Concrete - Multi Use Path	10,920	SF	$6.00	$65,520
	Concrete - Pedestrian Path	0	SF	$6.00	$0
	Concrete - Cut-Off Walls	0	CY	$430.00	$0
	Remove and Replace Asphalt Road	0	SY	$22.00	$0
	60" RGRCP - in asphalt	0	LF	$190.00	$0
	Flap Gates	0	EA	$8,000.00	$0
	CLSM Backfill	0	CY	$45.00	$0
	Storm Drain Manhole - MAG 521	0	EA	$4,500.00	$0
	Channel Liner - Conveyance Turf (Sod)	0	SF	$1.25	$0
	Channel Liner - Rock Mulch (0.5" Minus @ 2" Deep)	0	SF	$0.67	$0
	Angular Rock (D50 = 6" @ 12" Deep)	0	CY	$60.00	$0
	Landscape Construction				
	Landscape Theme - City Center	0	SF	$1.19	$0
	Landscape Theme - Residential (Desert Springs)	0	SF	$0.78	$0
	Landscape Theme - Transitional	0	SF	$1.12	$0
	Landscape Theme - Trail Only	39,160	SF	$1.58	$61,946
	Surface Treatment - Turf (Sprigs w/ Irrigation)	0	SF	$0.85	$0
	Surface Treatment - Rock Mulch (0.5" Minus @ 2" D	28,115	SF	$0.67	$18,837
	Lighting	18	EA	$1,500.00	$26,700
				SubTotal	$173,003
	Land				
	Land Acquisition - Channel / Trail	17,800	SF	$2.25	$40,050
	Land Acquisition - Road	0	SF	$2.25	$0
				SubTotal	$40,050
	Utility Relocation				
	Water 8" 16"	0	LF	$105.00	$0
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	0	LF	$80.00	$0
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	0	LS	$150,000.00	$0
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	0	LF	$130.00	$0
	Electrical Pole	0	EA	$7,000.00	$0
	Others (Telephone, Cable, Etc.)	0	LF	$50.00	$0
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$300,000.00	$0
				Subtotal	$0

CONSTRUCTION TOTAL	$173,003
LAND TOTAL	$40,050
UTILITY RELOCATION TOTAL	$0
15% CONTINGENCY	$31,958
SHEET P8 TOTAL	**$200,000**

The provided opinion of probable construction cost is the best information that the Engineer has on construction costs at the time of labor, equipment or materials or over the contractor's method of pricing, and that the opinion of probable construction cost provided herein consists of the best of the Engineer's experience and judgment. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions, supported or not supported by actual costs.

SUNRISE ENGINEERING

Proposed Design Elements:

Approximate Location: Sheet P8 (103rd Avenue to 99th Avenue)

Station Range: 186+75 to 195+65

Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	
Channel 1B - 10' Bottom	0	$0.00
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	0	$0.00
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	
	0	

Channel 1A - 10' Bottom

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (LF)	Land Purchase (SF)
10	0.13	0.25	1	6	0	120	53.85	28.00	7	91.85	0.00	0.00	0.00	0.00	0.00
											Unit Price				
											$6.00			$1.12	$2.25
											$0.00			$0.00	$0.00

Reinforced 4' x 10' Concrete U-Channel

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
											Unit Price					
															$430.00	
															$0.00	

VB R/W and Trail

Element Dimensions					
VB Existing R/W	Length	R/W Required, SF	Trail Length	Trail R/W, LF	Trail R/W Required, SF
65	0	0	890	20	17800

Landscape Elements

Element Dimensions										Bid Items									
Multi-Use Path Width (ft)	Multi-Use Path Length (ft)	Maint. Path Width (ft)	Maint. Path Length (ft)	Ped. Path Width (ft)	Ped. Path Length (ft)	Lighting Length (ft)	Lighting Spacing (ft)	Landscape Theme	Total Landscape Area (SF)	Multi-Use Path Area (SF)	Maint. Path Area (SF)	Ped. Path Area (SF)	Total Turf Area (SF)	Total Rock Mulch Area (SF)	Conveyance Turf Area (SF)	Conveyance Rock Mulch Area (SF)	Non-Conveyance Turf Area (SF)	Non-Conveyance Mulch Area (SF)	Lights (EA)
12	890	12	20	6	0	890.00	50.00	ET	39160	10,680	240	0	0	28,115	0	0	0	28,115	18

Proposed Design Elements:
Approximate Location: Sheet P8 (103rd Avenue to 99th Avenue)
Station Range: 186+75 to 195+65

Utility Relocations

Total: **$0.00**

Element Dimensions			Bid Items	
Item Description	*Unit*	Quantity	*Unit Price*	*Cost*
Water 8"-16"	LF	0.00	$105.00	$0.00
Water 18" and up	LF	0.00	$510.00	$0.00
Reclaimed Water	LF	0.00	$105.00	$0.00
Reclaimed Water Vault	EA	0.00	$5,000.00	$0.00
Fire Hydrant	EA	0.00	$5,500.00	$0.00
Sewer Manholes	EA	0.00	$4,500.00	$0.00
Sewer Mains	LF	0.00	$80.00	$0.00
Storm Drain Structures	EA	0.00	$2,500.00	$0.00
Storm Drain Pipes	LF	0.00	$95.00	$0.00
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00
Irrigation Relocation	LF	0.00	$150,000.00	$0.00
Gas 6" Relocation	EA	0.00	$25,000.00	$0.00
Gas 20" Relocation	LS	0.00	$55,000.00	$0.00
Electric	LF	0.00	$130.00	$0.00
Electrical Pole	EA	0.00	$7,000.00	$0.00
Others (Tel, Cable, Etc.)	LF	0.00	$50.00	$0.00
Street lights	EA	0.00	$2,500.00	$0.00
Traffic Signals	EA	0.00	$150,000.00	$0.00
Traffic Conduit	EA	0.00	$1,000.00	$0.00
SRP Tower	EA	0.00	$300,000.00	$0.00

Landscape Themes

CC				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
154,160	74,600	55,000	0.48	0.36

R (Desert Springs)				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
81,610	37,400	28,600	0.46	0.35

T				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
174,150	25,000	95,700	0.14	0.55

ET				
Total Vignette Area (SF)	Turf Area (SF)	Rock Mulch Area (SF)	Turf/Total	Mulch/Total
35,330	0	25,365	0.00	0.72

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
6.99	526	1.4	130

4	Barrels
Concrete	Steel
(CY)	(lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
12.54	949	2.51	220

4	Barrels
Concrete	Steel
(CY)	(lbs)
20.07	1609

CITY CENTER THEME - VALUE ENGINEERING NO. 1

Item No.	Item Description	Unit	Estimated Quantities	Unit Price	Amount	Total Amount
	IRRIGATION					$53,750
1	TURF IRRIGATION (ALL COMPONENTS)	SF	74,600	$0.75		
2	DRIP IRRIGATION (ALL ASSOCIATED COMPONENTS	SF	55,000	$0.35	$19,250	
3	IRRIGATION CONTROLLER	EA	1	$4,500.00	$4,500	
4	2" REDUCED PRESSURE BACKFLOW PREVENTER	EA	2	$3,000.00	$6,000	
5	2" WATER METER	EA	2	$12,000.00	$24,000	
	LANDSCAPE					$50,195
6	15 GAL TREE (Versus 24" Box Tree)	EA	167	$125.00	$20,875	
7	24" BOX TREE (Versus 36" Box Tree)	EA	8	$225.00	$1,800	
8	TURF (SOD) W/ SURFACE AMMENDMENTS (Versus 8	SF	74,600	$0.50		
9	1 GALLON SHRUBS/GROUNDCOVER (Versus 5 Gallor	EA	720	$8.50	$6,120	
10	1 GALLON ACCENT (Versus 5 Gallon)	EA	400	$8.50	$3,400	
11	BOULDER (3' BY' 3' BY 3')	EA	45	$200.00	$9,000	
12	ROCK MULCH (1/2" MINUS @ 2" DEEP)	SF	55,000	$0.30		
13	ANGULAR ROCK (3"-8" SCREENED @ 12 DEEP)	SF	0	$0.90		
14	90-DAY MAINTAINENCE PERIOD	EA	1	$9,000.00	$9,000	
	HARDSCAPE					$89,400
15	6" DEEP CONCRETE (DESIGNED FOR MAINTENANCI	SF	5,860	$6.00		
16	4" (6"?) DEEP CONCRETE WALK (TYP. GREY)	SF	14,500	$6.00		
17	INTEGRAL COLOR CONCRETE (4" W/COLOR) (Versus	SF	4,200	$5.50		
18	CONCRETE HEADER	LF	1,400	$6.00	$8,400	
19	SEATWALL	LF	60	$150.00	$9,000	
20	BRIDGE	LS	1	$6,000.00	$6,000	
21	TERRACED GABION WALL	CY	1,650	$40.00	$66,000	
	FURNISHINGS					$13,900
22	6' LONG BENCH	EA	5	$1,500.00	$7,500	
23	TRASH RECEPTACLE	EA	8	$800.00	$6,400	
			ESTIMATE		***$207,245***	$207,245
	PROTOTYPE LANDSCAPE:		***154,160***	***SF***	***$1.34***	***PER SF***
	PROJECT TOTAL:		***603,430***	***SF***	***$1.34***	***$811,221***

NOTE: ***Landscape elements that have been "blacked-out" have been accounted for elsewhere in the estimate, therefore are not included in the Total Cost per landscape vignette.***

RESIDENTIAL THEME VALUE ENGINEERING NO. 1

Item No.	Item Description	Unit	Estimated Quantities	Unit Price	Amount	Total Amount
	IRRIGATION					$29,510
1	TURF IRRIGATION (ALL COMPONENTS)	SF	37,400	$0.75		
2	DRIP IRRIGATION (ALL ASSOCIATED COMPONENTS	SF	28,600	$0.35	$10,010	
3	IRRIGATION CONTROLLER	EA	1	$4,500.00	$4,500	
4	2" REDUCED PRESSURE BACKFLOW PREVENTER	EA	1	$3,000.00	$3,000	
5	2" WATER METER	EA	1	$12,000.00	$12,000	
	LANDSCAPE					$24,910
6	15 GAL TREE (Versus 24" Box Tree)	EA	64	$125.00	$8,000	
7	24" BOX TREE (Versus 36" Box Tree)	EA	7	$225.00	$1,575	
8	TURF (SOD) W/ SURFACE AMMENDMENTS (Versus 8	SF	37,400	$0.50		
9	1 GALLON SHRUBS/GROUNDCOVER (Versus 5 Gallor	EA	350	$8.50	$2,975	
10	1 GALLON ACCENT (Versus 5 Gallon)	EA	160	$8.50	$1,360	
11	BOULDER (3' BY' 3' BY 3')	EA	25	$200.00	$5,000	
12	ROCK MULCH (1/2" MINUS @ 2" DEEP)	SF	28,600	$0.30		
13	ANGULAR ROCK (3"-8" SCREENED @ 12 DEEP)	SF	6,500	$0.90		
14	90-DAY MAINTAINENCE PERIOD	EA	1	$6,000.00	$6,000	
	HARDSCAPE					$17,700
15	6" DEEP CONCRETE (DESIGNED FOR MAINTENANCI	SF	3,350	$6.00		
16	4" (6"?) DEEP CONCRETE WALK (TYP. GREY)	SF	4,600	$6.00		
17	INTEGRAL COLOR CONCRETE (4" W/COLOR) (Versus	SF	1,160	$5.50		
18	CONCRETE HEADER	LF	950	$6.00	$5,700	
19	SEATWALL	LF	80	$150.00	$12,000	
	FURNISHINGS					$1,600
20	TRASH RECEPTACLE	EA	2	$800.00	$1,600	
			ESTIMATE		***$73,720***	$73,720

PROTOTYPE LANDSCAPE:	***81,610***	***SF***	***$0.90***	***PER SF***		
PROJECT TOTAL:	***145,300***	***SF***	***$0.90***	***$***	***131,252***	

NOTE: ***Landscape elements that have been "blacked-out" have been accounted for elsewhere in the estimate, therefore are not included in the Total Cost per***

landscape vignette.

TRANSITIONAL THEME VALUE ENGINEERING NO. 1

Item No.	Item Description	Unit	Estimated Quantities	Unit Price	Amount	Total Amount
	IRRIGATION					$52,995
1	TURF IRRIGATION (ALL COMPONENTS)	SF	25,000	$0.75		
2	DRIP IRRIGATION (ALL ASSOCIATED COMPONENTS	SF	95,700	$0.35	$33,495	
3	IRRIGATION CONTROLLER	EA	1	$4,500.00	$4,500	
4	2" REDUCED PRESSURE BACKFLOW PREVENTER	EA	1	$3,000.00	$3,000	
5	2" WATER METER	EA	1	$12,000.00	$12,000	
	LANDSCAPE					$48,090
6	15 GAL TREE (Versus 24" Box Tree)	EA	115	$125.00	$14,375	
7	TURF (SOD) W/ SURFACE AMMENDMENTS (Versus 8	SF	25,000	$0.50		
8	1 GALLON SHRUBS/GROUNDCOVER (Versus 5 Gallor	EA	580	$8.50	$4,930	
9	1 GALLON ACCENT (Versus 5 Gallon)	EA	210	$8.50	$1,785	
10	BOULDER (3' BY' 3' BY 3')	EA	90	$200.00	$18,000	
11	ROCK MULCH (1/2" MINUS @ 2" DEEP)	SF	95,700	$0.30		
12	ANGULAR ROCK (3"-8" SCREENED @ 12 DEEP)	SF	38,650	$0.90		
13	90-DAY MAINTAINENCE PERIOD	EA	1	$9,000.00	$9,000	
	HARDSCAPE					$19,200
14	6" DEEP CONCRETE (DESIGNED FOR MAINTENANC	SF	1,800	$6.00		
15	4" (6"?) DEEP CONCRETE WALK (TYP. GREY)	SF	13,000	$6.00		
16	INTEGRAL COLOR CONCRETE (4" W/COLOR) (Versus	SF	0	$6.50		
17	CONCRETE HEADER	LF	3,200	$6.00	$19,200	
	FURNISHINGS					$800
18	TRASH RECEPTACLE	EA	1	$800.00	$800	
			ESTIMATE		*$121,085*	$121,085

PROTOTYPE LANDSCAPE: ***174,150 SF*** ***$0.70 PER SF***

PROJECT TOTAL: ***515,690 SF*** ***$0.70 $ 358,555***

NOTE: ***Landscape elements that have been "blacked-out" have been accounted for elsewhere in the estimate, therefore are not included in the Total Cost per***

landscape vignette.

TRAIL ONLY THEME VALUE ENGINEERING NO. 1

Item No.	Item Description	Unit	Estimated Quantities	Unit Price	Amount	Total Amount
	IRRIGATION					$28,378
1	DRIP IRRIGATION (ALL ASSOCIATED COMPONENTS	SF	25,365	$0.35	$8,878	
2	IRRIGATION CONTROLLER	EA	1	$4,500.00	$4,500	
3	2" REDUCED PRESSURE BACKFLOW PREVENTER	EA	1	$3,000.00	$3,000	
4	2" WATER METER	EA	1	$12,000.00	$12,000	
	LANDSCAPE					$23,787
5	24" BOX TREE	EA	29	$225.00	$6,525	
6	1 GALLON SHRUBS/GROUNDCOVER	EA	126	$8.50	$1,071	
7	1 GALLON ACCENT	EA	93	$8.50	$791	
8	BOULDER (3' BY' 3' BY 3')	EA	32	$200.00	$6,400	
9	ROCK MULCH (1/2" MINUS @ 2" DEEP)	SF	25,365	$0.30		
10	90-DAY MAINTAINENCE PERIOD	EA	1	$9,000.00	$9,000	
	HARDSCAPE					$1,200
11	4" DEEP CONCRETE WALK (TYP. GREY)	SF	9,640	$4.00		
12	INTEGRAL COLOR CONCRETE	SF	325	$5.50		
13	CONCRETE HEADER	LF	200	$6.00	$1,200	
	FURNISHINGS					$3,800
14	TRASH RECEPTACLE	EA	1	$800.00	$800	
15	6' LONG BENCH	EA	2	$1,500.00	$3,000	
			ESTIMATE		***$57,164***	$57,164
	PROTOTYPE LANDSCAPE:		***35,330***	***SF***	***$1.62***	***PER SF***
	PROJECT TOTAL:		***395,780***	***SF***	***$1.62***	***$ 640,376***

Cost Estimate Assumptions

The final cost estimate is the result of a combined effort by professional engineers, landscape architects, and planners from Sunrise Engineering (Engineer), Logan Simpson Design (LSD), Maricopa County Flood Control District (FCD), and the City of Avondale (Avondale). The cost estimate has been through multiple iterations due to varying parameters and constraints that have arisen. The following list of assumptions is a collection of decisions, recommendations, suggestions, and review comments that were made during the design process.

1. Unit prices for the project are derived from the Engineer's project experience and from bid tabulations provided the FCD on recent projects.

2. The "Landscape Breakdown" sheet at the end of the estimate was prepared by LSD and gives a detailed list of all items included in the four "Concept Plans" (or landscape vignettes). These sheets provide the basis for determining the quantities for surface treatments and aesthetics for the overall project. While some of the items in the list are purely decorative in nature, some of the items are functional from an engineering standpoint (e.g. angular rock, rock mulch, and sod for erosion control purposes or concrete walks for maintenance of the channel). These "functional" items, although left in the "Landscape Breakdown" for reference purposes, have been calculated elsewhere in the estimate for each sheet and are considered "Construction Costs" and not "Landscape Costs."

3. The purpose of separating "Construction Costs" and "Landscape Costs" in the estimate is to determine cost sharing between project stakeholders (e.g. The Flood Control District can only allocate a certain portion of funding for aesthetic treatments like landscaping).

4. For cost saving purposes, several landscape items have been value engineered because preliminary estimates exceeded budgetary constraints. These value engineered items are reflected in the "Landscape Breakdown" sheet (e.g. 15 Gallon Tree was used versus a 24" Box Tree). In the future, if additional funding becomes available, the unit prices can be adjusted to reflect the more expensive landscape features.

5. For cost savings purposes it was decided that for non-conveyance areas of the channel, sprigs shall be used instead of sod. In the estimate, turf areas have been broken into two separate line items: Surface Treatment-Turf (uses sprigs) and Channel Liner-Conveyance Turf (uses sod). The channel's 10-year HW level, as shown in this report, will be used to delineate conveyance versus non-conveyance areas. Conveyance turf lies below the HW line, i.e. the bottom channel width plus the side slopes up to the 10-year line. While depth varies slightly throughout the length of the channel, the estimate assumes a 3' conveyance depth for the entire reach.

6. Per LSD, drip and spray zone stations are on the same irrigation controller.

7. Scuppers and catch basins shall capture street flows and convey them via storm drain to retention basins in order to hold the "first flush." All other flows will be diverted into the channel or 60" RGRCP. Final configuration and locations of these drainage features has not been determined. For the estimate, it is assumed that these features will be a part of the half street improvements (i.e. cost will be carried by the individual developments along Van Buren and are not included in the project costs).

8. Angular Rock (D50 = 6" @ 12" Deep) under the "Landscape Breakdown" sheet is for erosion protection, therefore it is considered part of the "Construction Costs." However, the color of the rock will be selected to fit with overall landscape design aesthetic.
9. Per the Concept Plans (i.e. landscape vignettes), the "Landscape Breakdown" sheets include the total width starting at the north most edge of the drainage easement to the back of walk along Van Buren (or the back of curb where no sidewalk is present).

10. Although the Concept Plans show construction of new 6' pedestrian sidewalk along VB in areas where there is no existing, this was not included in the cost estimate. The assumption is that the Avondale would prefer the 12' multi-use path and would likely construct the multi-use path in lieu of a 6' sidewalk along Van Buren in these areas.

11. The "Landscape Breakdown" sheet (derived from the four Concept Plans) was used to determine landscaping costs for the overall project. For a given landscape Concept Plan we have a given area and a given quantity of landscape elements. The logic is that for any corridor along the project with the same landscape concept, the quantity of landscape elements should be proportional to the quantity of elements in the Concept Plan. For example, in the "Transitional" concept plan you should have a set amount of 15-gallon Trees per square foot of landscaped area. This number would then be applied broadly to all of the "Transitional" sections to determine the total quantity for the project. However, in order to be efficient, the cost of the landscape elements for each concept were summed and divided by the total area of the Concept Plan. This produced a $/SF value for each concept that could then be applied to the respective types throughout the project. This is how the landscape vignettes costs are applied broadly to the overall project.

12. It was determined that a number of items in the "Landscape Breakdown" sheet needed to be separated out and calculated on a sheet by sheet basis. These items include: turf (sod), turf irrigation components, rock mulch, angular rock, and concrete walkways (maintenance and pedestrian). As shown on the landscape sheet, these items have the cost "blacked out" because they are accounted for elsewhere in the estimate. All other items (trees, shrubs, bushes, etc.) were left in the totals for the landscape prorating method described in Assumption 12.

13. Assumed linear feet of sidewalk for the Transitional vignette is as follows: 12' multiuse path - 720 lf, 12' maintenance path - 150 lf, 6' wide ADA sidewalk - 770 lf. Assumed linear feet of sidewalk of the Civic Center vignette: 14' multiuse path - 1,000 lf, 12' maintenance path - 500 lf. Assumed linear feet of sidewalk for the Residential vignette: 12' multiuse path - 400 lf, 12' maintenance path - 450 lf.

14. Assumed sidewalk design widths per the landscape Concept Plans are as follows: multi-use path and maintenance path are 12' wide (with the exception of the multi-use path at the City Center which is 14'), 6' wide ADA sidewalk where there was no existing walk along Van Buren (see Assumption 11). The dimension for the ADA sidewalk matched the dimension from the survey for existing sidewalk.

15. Although the of depth the 60" RGRCP pipe varies throughout the project, it is assumed that minimum depth of excavation required to meet cover and clearance requirements is approximately 9'.

16. Multi-use path is assumed to be a justifiable "Construction Cost" because it provides access for channel maintenance. Also, if no other pedestrian sidewalk is present along Van Buren, the multi-use path could function as the ADA route.

17. The following list gives the assumptions on what is included for items in the cost estimate:

    a. Turf irrigation costs are included in the turf costs.

    b. Bedding is included in 60" RGRCP pipe costs.

    c. Remove and replace asphalt includes base courses (select and AB material); approximately 1' of additional material beneath the asphalt course.

    d. Excavation costs for culverts and pipe includes overexcavation, i.e. an additional 6-inches on either side of the pipe/culvert and 1' beneath.

    e. Excavation costs include the cost to haul excess materials.

    f. Concrete structures include steel reinforcement.

    g. Utility relocation lengths include an additional 10' before and after the proposed structure.

18. Cut-off walls shall be constructed on both sides of the concrete path wherever required to prevent undercutting and scour. They should be applied to areas where the path goes below the 10-year HW elevation, i.e. conveyance areas. Cut-off walls are assumed to be 3' deep and 6-inches wide.

19. Cut-off walls for the multi-use path are only required within conveyance areas. However, the multi-use path meanders in and out of the conveyance area. To be conservative, cut-off walls have been applied to the entire length of the multi-use path because the ultimate layout is still uncertain. The one exception is the multi-use path that will be constructed in lieu of a 6' ADA walk. In those sections the multi-use path won't be in conveyance areas, therefore cut-off walls have been omitted.

20. Pedestrians require at least one dry path after storm events. It is assumed, in final design, wherever multi-use path is constructed in lieu of 6' wide pedestrian path, the multi-use path will not be constructed below the 10-year HW elevation.

21. Multi-use path and maintenance path have been combined into one "multi-use" path line item in the estimate total sheets. FCD doesn't distinguish the between maintenance and multi-use, and there aren't any truly dedicated maintenance paths. Pedestrians and bikers will be using the maintenance vehicle paths and vice versa. Only the pedestrian walks are considered truly "landscape costs." All multi-use paths are considered apart of "construction costs" because they can be used for maintenance purposes.

22. SRP tower relocation costs are derived from numbers provided by representatives from the City of Avondale and SRP. As with all the unit prices, actual costs at the time of construction may vary.

23. Design/professional services are omitted from the estimate intentionally because deriving them from a percentage of construction costs didn't seem realistic to project stakeholders and reviewers.

24. Box culvert configurations and headwalls based on ADOT B Standard details.

25. CLSM only used in pavement replacement sections

26. Stationing shown in the estimate follows the stationing on the channel/pipe not the stationing for the centerline of Van Buren.

27. Conveyance rock mulch and non-conveyance rock mulch are the same size and depth (and therefore the same cost) because the velocities are so low in the conveyance areas that larger gravel wasn't required.

28. It has been determined that a trapezoidal section of the levee structure for the Agua Fria River will be required to be removed and replaced when constructing the culvert penetrations at the outfall of the project. The concrete replacement is assumed to be Class B Concrete. The dimensions of the trapezoidal cross section are as follows; bottom width is 58', top width is 15', and height is 12'. This cross sectional area was multiplied by the length of levee replacement to determine the total volume of concrete needed.

APPENDIX B

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PLANS FOR THE CONSTRUCTION OF VAN BUREN CHANNEL

AGUA FRIA RIVER TO 103RD AVENUE

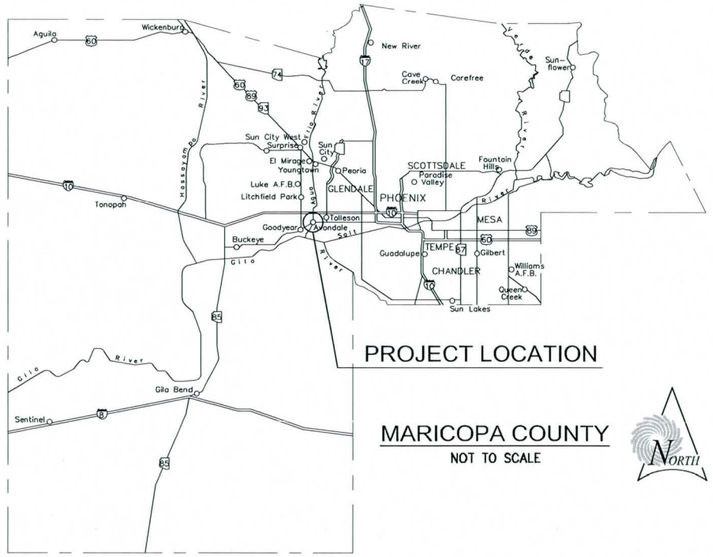
PCN 565.04.20
DESIGN CONCEPT REPORT

BENCHMARK

SECTION 1
SOUTHEAST CORNER OF SECTION 1 TOWNSHIP 1 NORTH, RANGE 1 WEST, OF THE GILA & SALT RIVER MERIDIAN BEING A BRASS CAP IN HAND HOLE (INTERSECTION OF AVONDALE BLVD & VAN BUREN ST): EL: 996.105 SFT DATUM NAVD'88

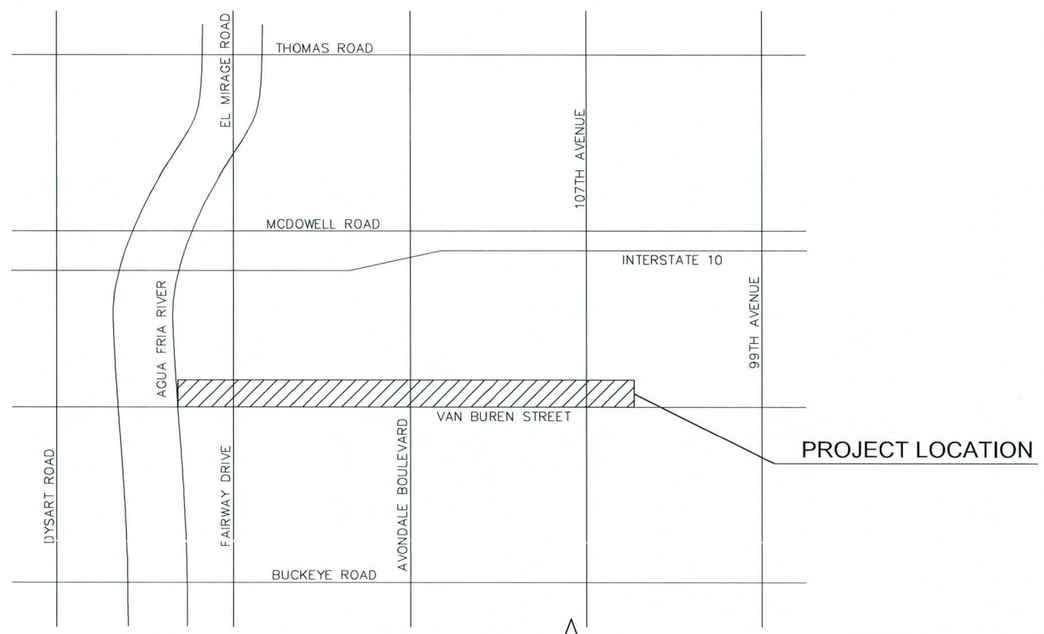
BASIS OF BEARING

THE SOUTH LINE OF THE SOUTHEAST QUARTER OF SECTION 1 TOWNSHIP 1 NORTH, RANGE 1 WEST, OF THE GILA & SALT RIVER MERIDIAN BEING S89°40'17"W AND ALSO BASED ON THE NAD'83, ARIZONA STATE PLANE, CENTRAL ZONE, INTERNATIONAL FEET.



MARICOPA COUNTY
NOT TO SCALE

NORTH



VICINITY MAP
NOT TO SCALE

NORTH

811 Know what's **below.** **Call** before you dig. 1-800-782-5348

REV NO.	COMMENT	DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 36001 FOR REVIEW AND INTERIM CONSTRUCTION ARIZONA, U.S.A. Expires 6/30/14

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
www.sunrise-eng.com

FCDMC

VAN BUREN DCR
15% PLAN AND PROFILE
COVER SHEET

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03700	RMH	SLF	RMH	1 of 12	COV

P:\FCDMC\03700.001\VanBuren III\Dwg\Sheet Sets\Van Buren - 103ft - Left Offset - Pipe\COV.dwg Aug 26, 2013 8:43am cchristian

SEI GENERAL NOTES

1. ALL SITE WORK SHALL CONFORM TO THE CURRENT EDITION OF THE MARICOPA ASSOCIATION OF GOVERNMENTS UNIFORM STANDARD SPECIFICATIONS AND DETAILS (MAG SPECIFICATIONS AND DETAILS) AND ANY SUPPLEMENTS TO THE MAG SPECIFICATIONS AND DETAILS BY THE JHA (JURISDICTION HAVING AUTHORITY) UNLESS SPECIFICALLY STATED OTHERWISE IN THESE PLANS.

2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS PRIOR TO BEGINNING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF EXISTING PERMITS, RENEWAL OF LAPSED PERMITS, AND OBTAINING ANY NEW PERMITS, INCLUDING, BUT NOT LIMITED TO A DUST CONTROL PERMIT, AND TRAFFIC CONTROL PERMITS AS REQUIRED BY THE JHA.

3. THE CONTRACTOR IS RESPONSIBLE FOR MAKING ARRANGEMENTS FOR INSPECTION AND TESTING.

4. THE CONTRACTOR SHALL NOTIFY THE JHA'S INSPECTION DEPARTMENT 24 HOURS PRIOR TO CONSTRUCTION. CONSTRUCTION CONCEALED WITHOUT THE REQUIRED INSPECTION SHALL BE SUBJECT TO EXPOSURE AT THE CONTRACTOR'S EXPENSE.

5. THE CONTRACTOR IS RESPONSIBLE FOR LOCATION OF EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. CALL BLUE STAKE AT (602) 263-1100 AT LEAST 48 HOURS BEFORE ANY CONSTRUCTION BEGINS.

6. THE CONTRACTOR SHALL FOLLOW GUIDELINES AND REGULATIONS SET FORTH BY O.S.H.A. SUNRISE ENGINEERING, INC. WILL NOT BE RESPONSIBLE FOR JOB-SITE SAFETY PROCEDURES OR CONDITIONS.

7. THE CONTRACTOR IS RESPONSIBLE FOR HIS OWN TAKEOFF QUANTITIES. QUANTITIES IF SHOWN HEREON ARE ESTIMATES ONLY AND AS SUCH ARE NOT TO BE USED FOR BID PURPOSES.

8. THE CONTRACTOR IS RESPONSIBLE FOR THE NOTIFICATION OF THE PROPER AUTHORITY(S) IF THERE ARE OBSTRUCTIONS TO PROPOSED IMPROVEMENTS AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY EXISTING ITEM REMOVED TO FACILITATE CONSTRUCTION SHALL BE REPLACED IN THE SAME OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE.

9. THE CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANIES FOR LOCATION OF SERVICE AND/OR RELOCATION OF UTILITIES IN CONFLICT WITH PROPOSED CONSTRUCTION. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR COORDINATING THE RELOCATION OF UTILITIES, POWER POLES, ETC.

10. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REMOVE AND SAFELY DISPOSE OF ALL REMOVAL MATERIAL AND DEBRIS DEEMED UNSALVAGEABLE BY THE ENGINEER PER THE PROVISIONS SET FORTH IN MAG SPECIFICATION 350.

11. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL ON AND AROUND THE CONSTRUCTION SITE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.

12. THE CONTRACTOR SHALL PROVIDE ADEQUATE MEANS FOR CLEANING TRUCKS AND/OR OTHER EQUIPMENT OF MUD PRIOR TO ENTERING PUBLIC STREETS, AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO CLEAN STREETS, AND TAKE WHATEVER MEASURES ARE NECESSARY TO INSURE THAT ALL ROADS ARE MAINTAINED IN A CLEAN, MUD AND DUST FREE CONDITION AT ALL TIMES. NO WORK WILL BE CONSIDERED COMPLETE UNTIL ALL PAVEMENTS HAVE BEEN SWEPT CLEAN OF DIRT AND DEBRIS.

13. PRIOR TO MOVING OR DESTROYING PROTECTED NATIVE PLANT SPECIES, THE CONTRACTOR SHALL FILE A FORMAL NOTICE OF INTENT WITH THE ARIZONA DEPARTMENT OF AGRICULTURE NATIVE PLANTS (602) 542-3292.

14. A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA. HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN ADVANCE OF TRENCHING. THE ENGINEER WILL NOT GUARANTEE ANY ELEVATIONS AT LOCATIONS OF THE EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS.

15. THE CONTRACTOR SHALL PROVIDE A LICENSED SURVEYOR FOR THE SURVEYING/CONSTRUCTION STAKING OF ALIGNMENT AND GRADE FOR EACH MAIN AND/OR FACILITY AS SHOWN ON THE PLANS.

16. EXACT POINT OF MATCHING, TERMINATION AND OVERLAY, IF NECESSARY, MAY BE DETERMINED IN THE FIELD BY THE ENGINEER OF RECORD OR THE RESIDENT ENGINEER OVERSEEING THE PROJECT CONSTRUCTION.

17. ANY AMBIGUITIES OR DEFICIENCIES DISCOVERED ON THESE PLANS ARE TO BE RESOLVED BY SUNRISE ENGINEERING OR ITS APPOINTED REPRESENTATIVE. ANY MODIFICATIONS TO THESE PLANS MADE BY ANYONE OTHER THAN SUNRISE ENGINEERING OR ITS APPOINTED REPRESENTATIVE IS SOLELY RESPONSIBLE FOR THOSE MODIFICATIONS.

18. THE CONTRACTOR SHALL REGRADE ALL EARTHEN DRIVEWAYS DISTURBED WITHIN THE RIGHT-OF-WAY DURING THE CONSTRUCTION AND RECOMPACT THE TOP 1-FEET OF SURFACE MATERIAL TO A MINIMUM COMPACTION OF 90% MAXIMUM DRY DENSITY. THE REGRADED DRIVEWAYS SHALL BE OVERLAID WITH A 0.5' LAYER OF HALF-INCH MINUS ROADWAY GRAVEL AND RAKED SMOOTH.

19. THE CONTRACTOR SHALL PROVIDE ALL TRAFFIC CONTROL AND BARRICADES FOR WORK IN THE RIGHT-OF-WAY PER THE STANDARDS SET FORTH BY THE JHA.

ABBREVIATIONS

ABC	AGGREGATE BASE COURSE
AC	ASPHALT CONCRETE
BC	BACK OF CURB
BCF	BRASS CAP FLUSH
BCHH	BRASS CAP IN HAND HOLE
BCR	BEGIN CURB RETURN
BM	BENCHMARK
BTM	BOTTOM
CB	CATCH BASIN
C/L	CENTERLINE
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE
CONST	CONSTRUCTION
CY	CUBIC YARD
D/W	DRIVEWAY
DWG	DRAWING
DTL	DETAIL
E	EAST
ECR	END CURB RETURN
ELEV	ELEVATION
EP	EDGE OF PAVEMENT
ESMT	EASEMENT
EX, EXIST	EXISTING
FC	FACE OF CURB
FF	FINISHED FLOOR
FG	FINISHED GROUND
FH	FIRE HYDRANT
FL	FLANGE
FND	FOUND
FO	FIBER OPTIC
G	GAS, GUTTER, GRADE
GB	GRADE BREAK
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HP	HIGH POINT
HW	HIGHWATER
INV	INVERT
IRRIG	IRRIGATION
L	LENGTH
LF	LINEAR FEET
LT	LEFT
MAG	MARICOPA ASSOCIATION OF GOVERNMENTS
MH	MANHOLE
N	NORTH
NA	NOT APPLICABLE
NIC	NOT IN CONTRACT
OHE	OVERHEAD ELECTRIC
P/L	PROPERTY LINE
PC	POINT OF CURVATURE
PCC	PORTLAND CEMENT CONCRETE
PT	POINT OF TANGENCY
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS
R/W	RIGHT-OF-WAY
RGRCP	RUBBER GASKETED REINFORCED CONCRETE PIPE
RT	RIGHT
S	SEWER, SLOPE, SOUTH
SDMH	STORM DRAIN MANHOLE
SF	SQUARE FEET
STA	STATION
STD	STANDARD
SWK	SIDEWALK
SY	SQUARE YARD
TAN	TANGENT
T, TEL	TELEPHONE
TL	TRUE LENGTH
TYP	TYPICAL
UGE	UNDERGROUND ELECTRIC
Vr	VOLUME REQUIRED
Vp	VOLUME PROVIDED
W	WATER, WEST, WITH
XFMR	TRANSFORMER

LEGEND

	EXISTING CONCRETE
	EXISTING PAVEMENT
s	EXISTING SEWER
w	EXISTING WATER LINE
uge	EXISTING UNDERGROUND ELECTRIC
ohe	EXISTING OVERHEAD ELECTRIC
g	EXISTING GAS LINE
t	EXISTING UNDERGROUND TELEPHONE
c	EXISTING CABLE LINE
irr	EXISTING IRRIGATION LINE
	EXISTING PROPERTY LINE
x	EXISTING BARBED WIRE FENCE
	EXISTING FLOWLINE
X 1443.08	EXISTING SPOT ELEVATION
1440	EXISTING CONTOUR
	EXISTING SIGN
	EXISTING AIR RELEASE VALVE
	EXISTING GATE VALVE
	EXISTING FIRE HYDRANT
	EXISTING WATER METER
	EXISTING POWER POLE
	EXISTING GUY WIRE
	EXISTING LIGHT POLE
C	EXISTING CABLE MANHOLE
E	EXISTING ELECTRIC MANHOLE
G	EXISTING GAS MANHOLE
GM	EXISTING GAS METER
	EXISTING GAS RISER
	EXISTING GAS VALVE
IR	EXISTING IRRIGATION MANHOLE
	EXISTING IRRIGATION VALVE
	EXISTING SEWER MANHOLE
	EXISTING SEWER CLEANOUT
SD	EXISTING STORM DRAIN MANHOLE
T	EXISTING TELEPHONE MANHOLE
	EXISTING TRAFFIC MANHOLE
	EXISTING WATER MANHOLE
	EXISTING UNKNOWN MANHOLE
	EXISTING CATCH BASIN
	EXISTING STORM DRAIN AND STRUCTURE
	EXISTING DRYWELL
	EXISTING VEGETATION
P	EXISTING MAILBOX
	EASEMENT
	HIGH WATERLINE
	LOT LINE
	RIGHT-OF-WAY
	ROADWAY CENTERLINE
	SECTION LINE
	SETBACK LINE

	PROPOSED CONCRETE
	PROPOSED PAVEMENT
	PROPOSED RIGHT-OF-WAY
	PROPOSED FLOWLINE
X 1443.08	PROPOSED SPOT ELEVATION
1440	PROPOSED CONTOUR
SD	PROPOSED STORM DRAIN MANHOLE
	PROPOSED CATCH BASIN
	PROPOSED STORM DRAIN AND STRUCTURE
	PROPOSED DRYWELL
	BRASS CAP MONUMENT
	GRADE BREAK (PROFILE)

B — PLAN, SECTION OR DETAIL LABEL
D2 — DRAWING TITLE/SHEET NUMBER

Flood Control District of Maricopa County

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REV NO.	COMMENT	DATE

Registered Professional Engineer (Civil) — Certificate No. 36101 — Date Signed — Expires 6/30/14 — ARIZONA, U.S.A.

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
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GENERAL NOTES, ABBREVIATIONS & LEGEND

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03700	RMH	SLF	RMH	2 of 12	GN1

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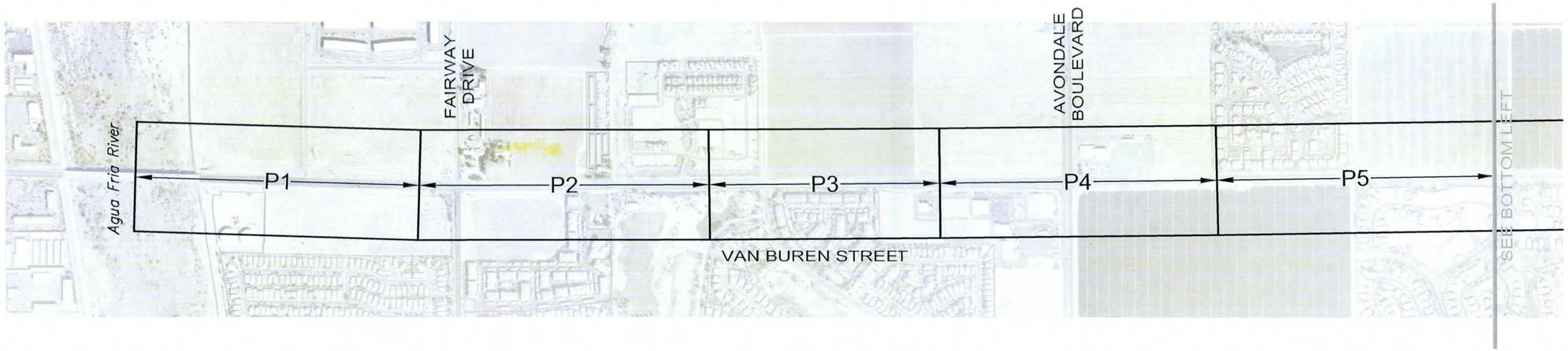

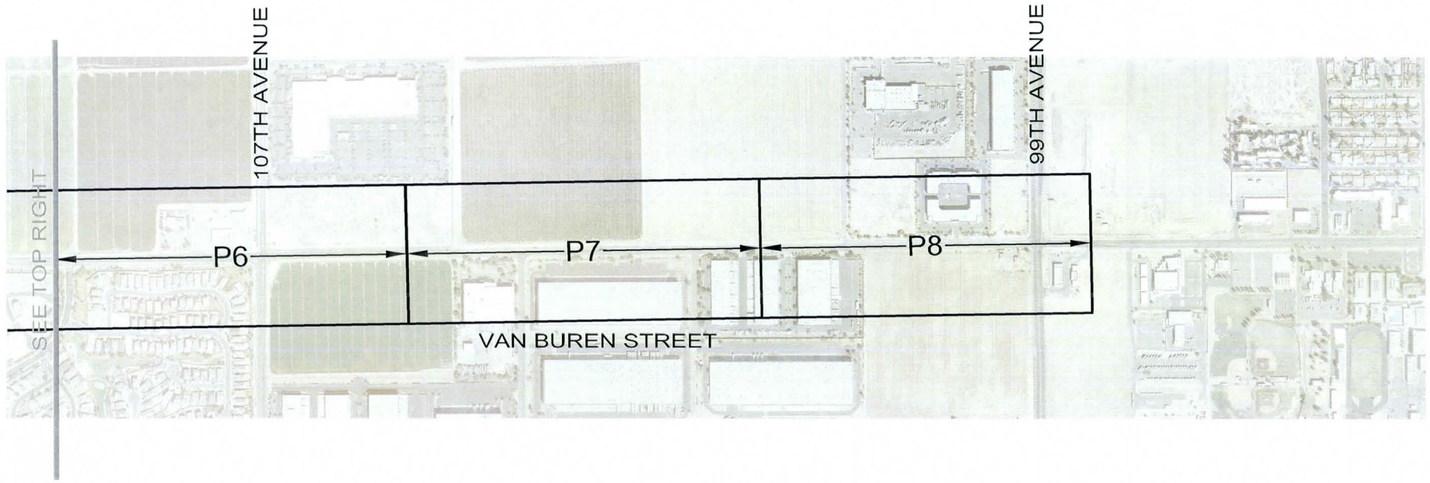

SHEET INDEX

SHEET #	DESCRIPTION	TITLE
1	COVER	COV
2	GENERAL NOTES/LEGEND & ABBREVIATIONS	GN1
3	SHEET INDEX	IND
4	SECTIONS & DETAILS	DT
5–12	PLAN & PROFILE	P1–P8

NORTH

SCALE
0 500' 1000'
HORIZ: 1" = 500'

Flood Control District of Maricopa County

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REV NO.	COMMENT	DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 43301 Ricky M. Holston Date Signed ARIZONA, U.S.A. Expires 9/30/14

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INDEX SHEET

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03700	RMH	SLF	RMH	3 of 12	IND

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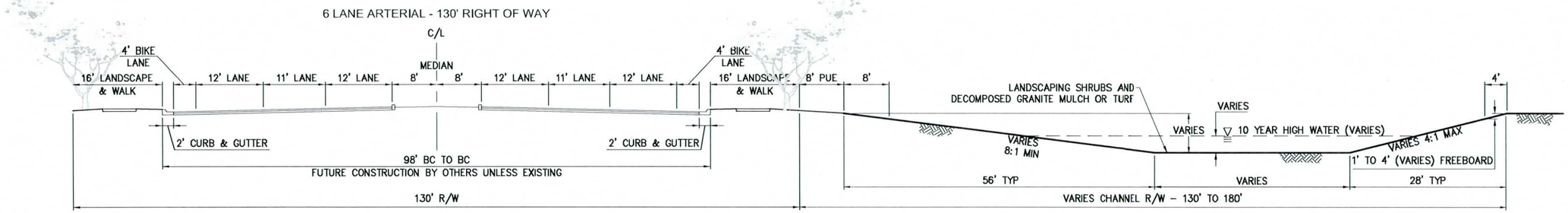
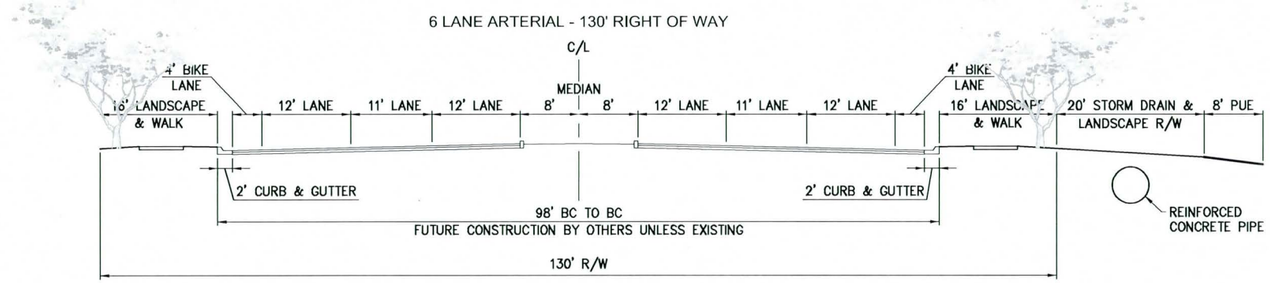
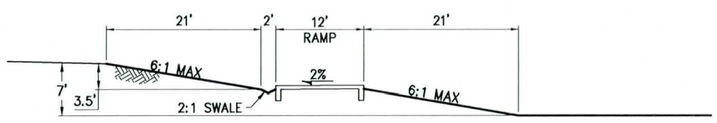


A SECTION - VAN BUREN STREET
NOT TO SCALE
FAIRWAY DRIVE TO EAST OF 113TH AVENUE

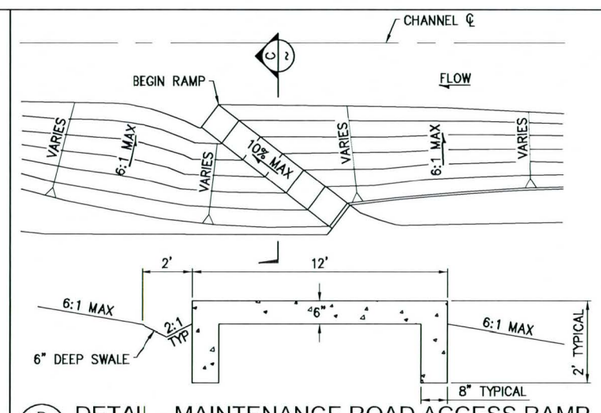
CHANNEL DATA					
	SLOPE	DEPTH	BOTTOM	TYP TOTAL WIDTH	R/W WIDTH
CHANNEL 3	0.06%	3	90'	174'	180'
CHANNEL 2	0.21%	3	50'	134'	130'
CHANNEL 1B	0.45%	3	30'	114'	130', 150'
CHANNEL 1A	0.18%	2.2	10	94'	130'



B SECTION - ALTERNATE PIPE SECTION
NOT TO SCALE VAN BUREN
113TH AVENUE TO 103RD AVENUE



C SECTION - MAINTENANCE ROAD ACCESS RAMP
NOT TO SCALE



D DETAIL - MAINTENANCE ROAD ACCESS RAMP
NOT TO SCALE

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SECTIONS & DETAILS

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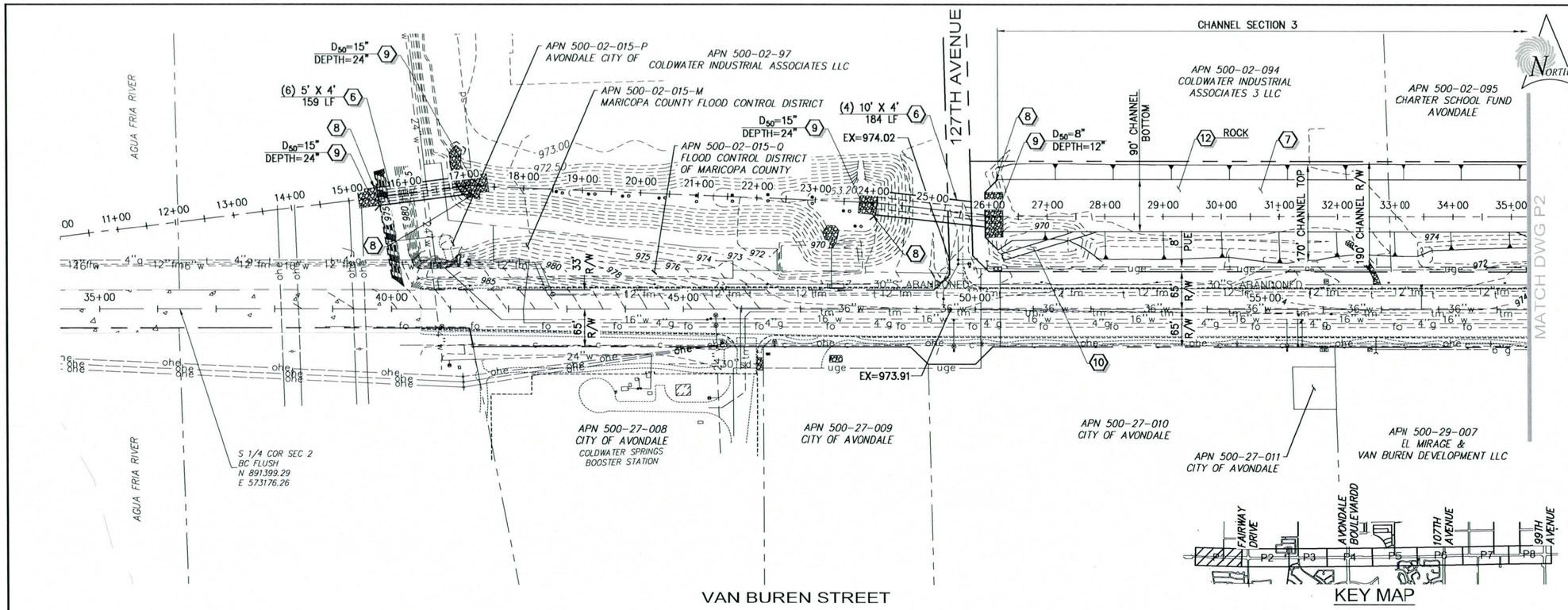

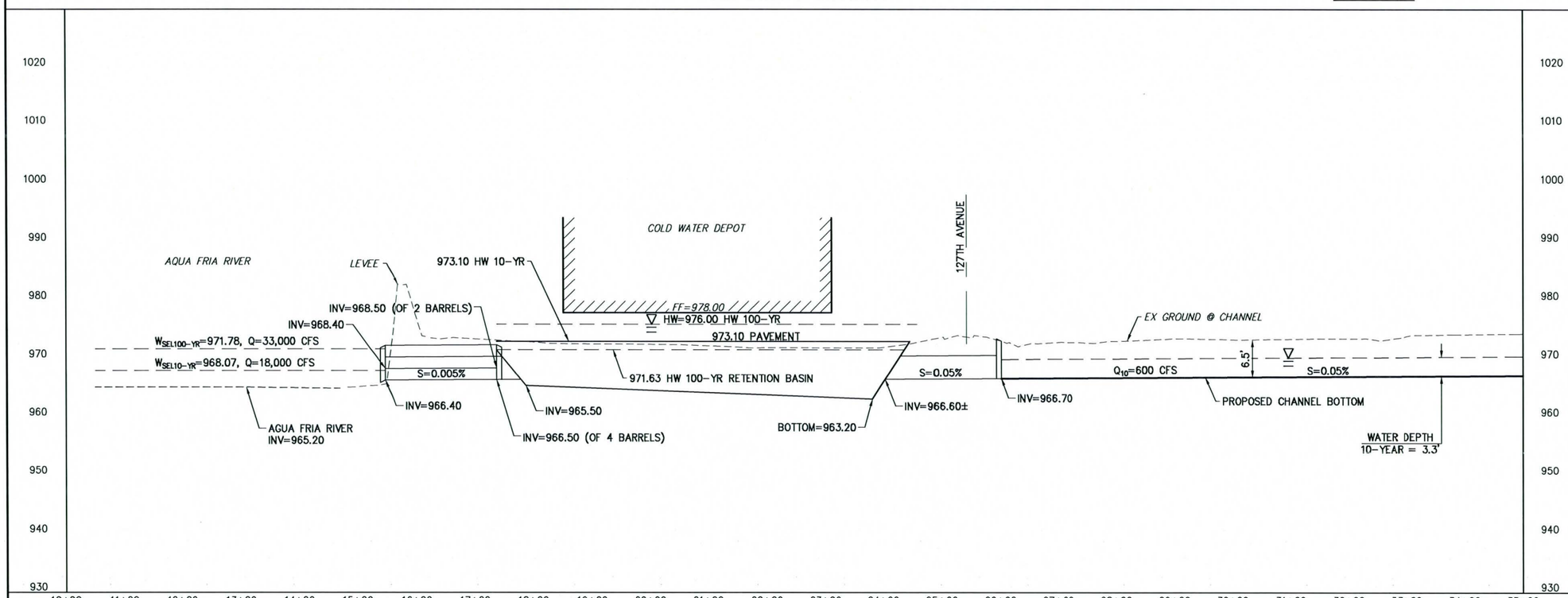

CONSTRUCTION NOTES

1. INSTALL 60" RGRCP, STORM DRAIN PIPE SDR, LENGTH AND SLOPE AS NOTED.
2. INSTALL 60" DIAMETER PRECAST CONCRETE STORM DRAIN MANHOLE AND BASE PER MAG STD DETAIL 420, TYPE A, WITH 30" WATER TIGHT FRAME AND COVER PER MAG STD DETAIL 423. INVERT AS NOTED
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9. INSTALL RIP-RAP, D_{50} AND THICKNESS PER PLAN
10. INSTALL 12' WIDE MAINTENANCE ACCESS RAMP PER DETAIL D, DWG DT
11. UTILITY TO BE RELOCATED
12. INSTALL CHANNEL LINER PER SPECIFICATION TURF, ROCK MULCH OR RIP-RAP AS NOTED
13. RELOCATE 230 KV TOWER BY SRP

NOTES:

1. TOPS AND TOES OF CHANNEL SIDE SLOPES MAY VARY TO ACHIEVE MEANDERING NOT SHOWN.
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SCALE
0 100' 200'
HORIZ: 1" = 100'
VERT: 1" = 10'

Flood Control District of Maricopa County

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Registered Professional Engineer (Civil) CERTIFICATE NO. 36 FOR REVIEW ONLY NOT FOR CONSTRUCTION Date Signed 9/30/14 ARIZONA, U.S.A. Expires 9/30/14

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03700	RMH	SLF	RMH	5 of 12	P1

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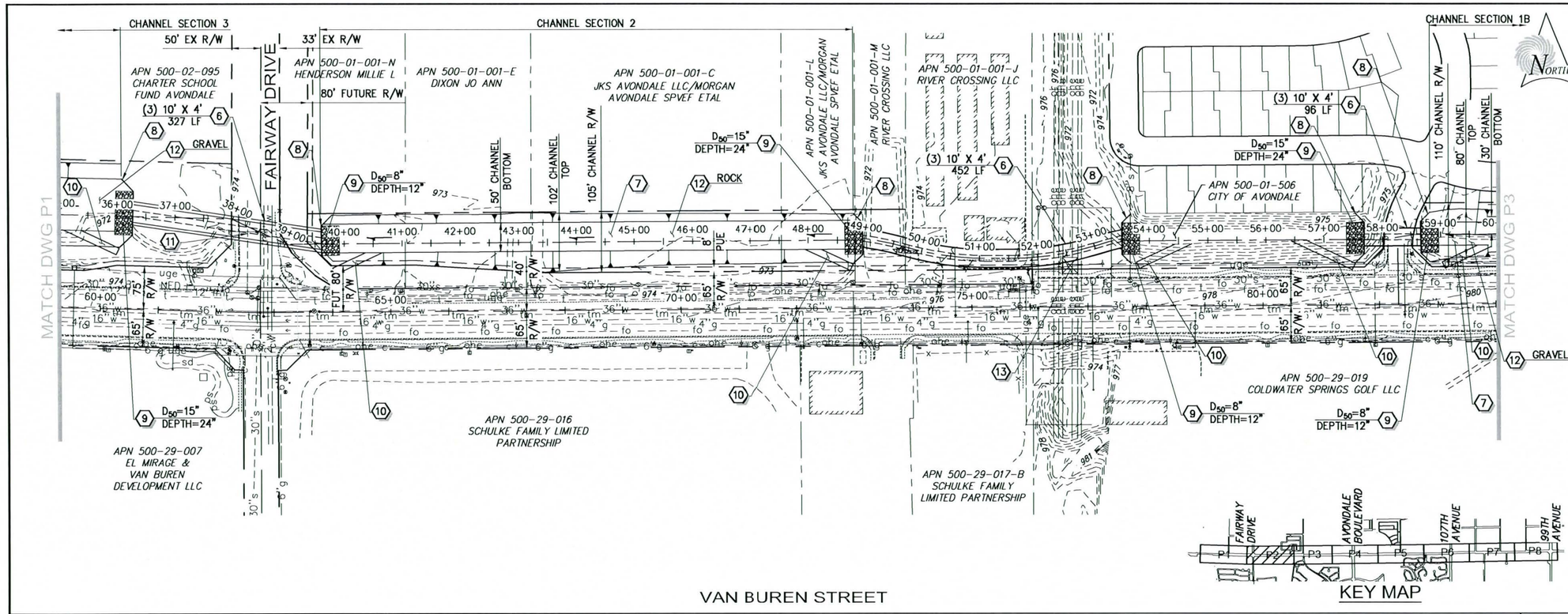
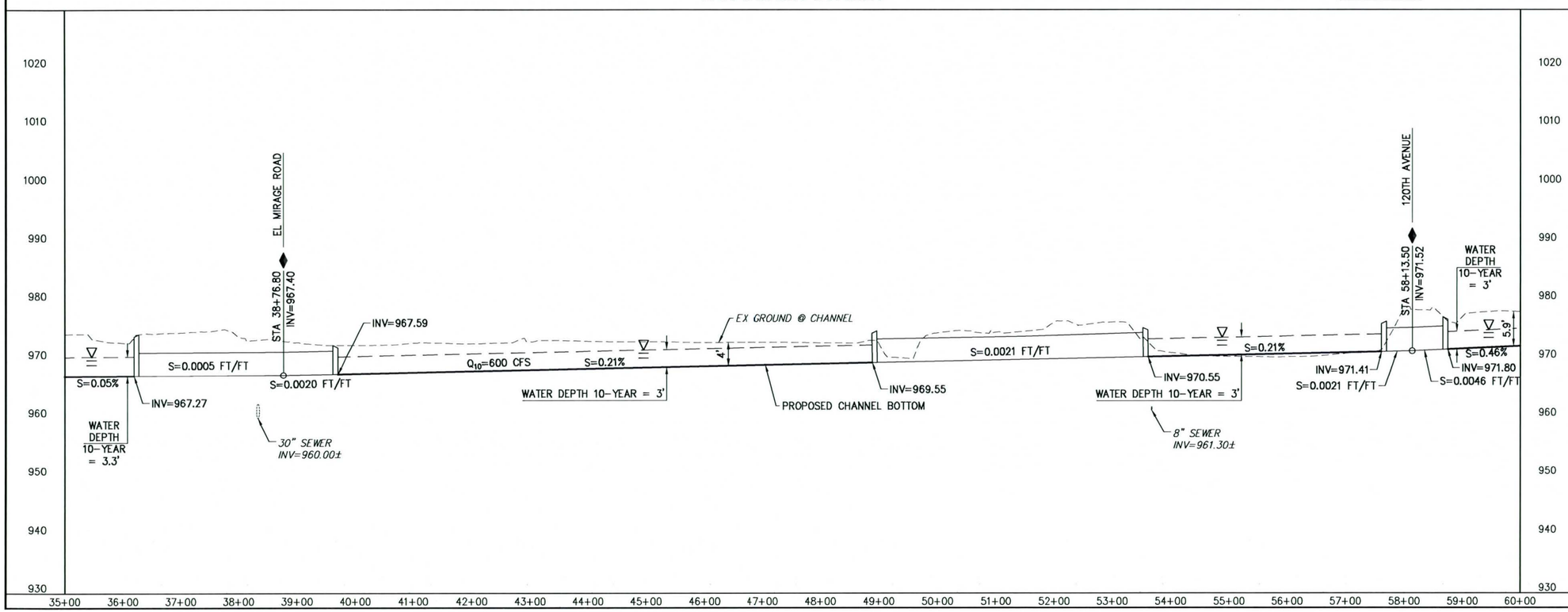


KEY MAP



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SCALE
0 100' 200'
HORIZ: 1" = 100'
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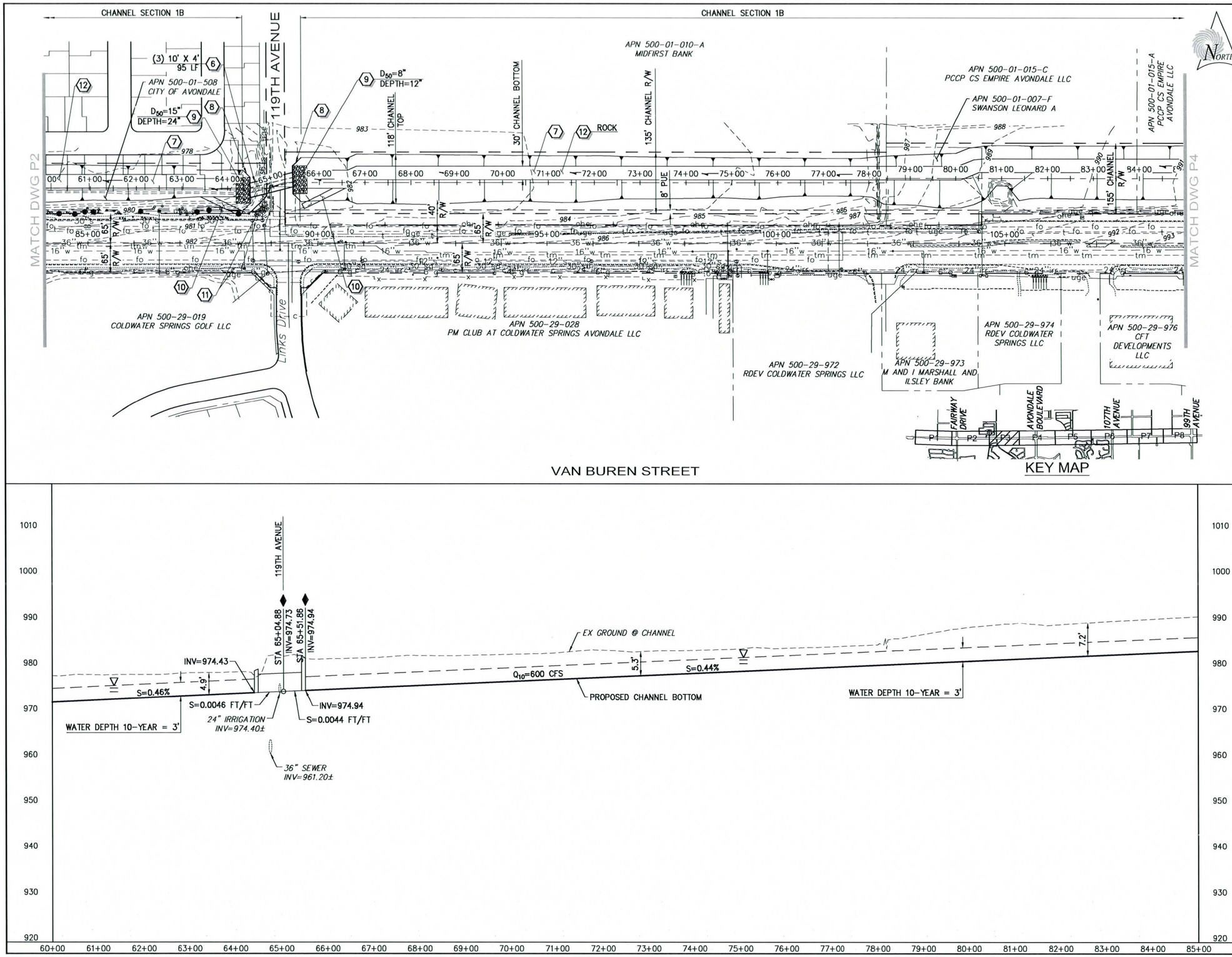

CONSTRUCTION NOTES

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SCALE
0 100' 200'
HORIZ: 1" = 100'
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Flood Control District of Maricopa County

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03700	RMH	SLF	RMH	7 of 12	P3

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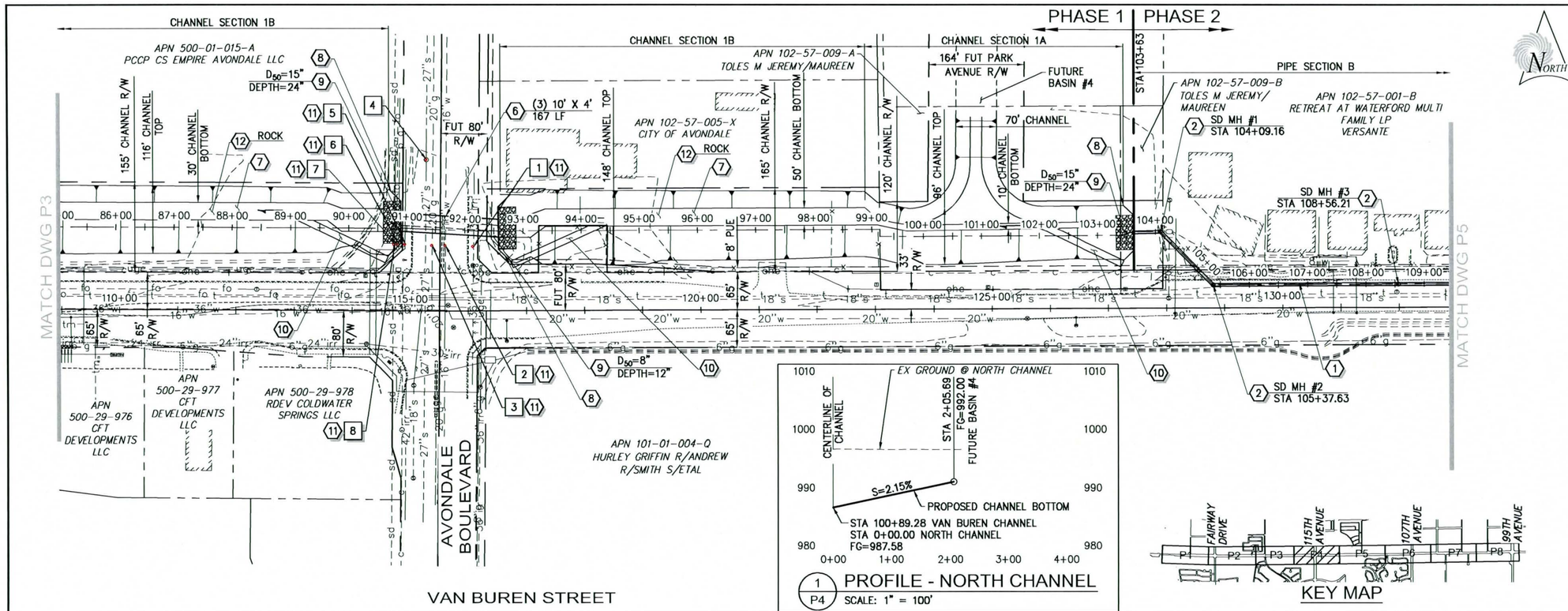

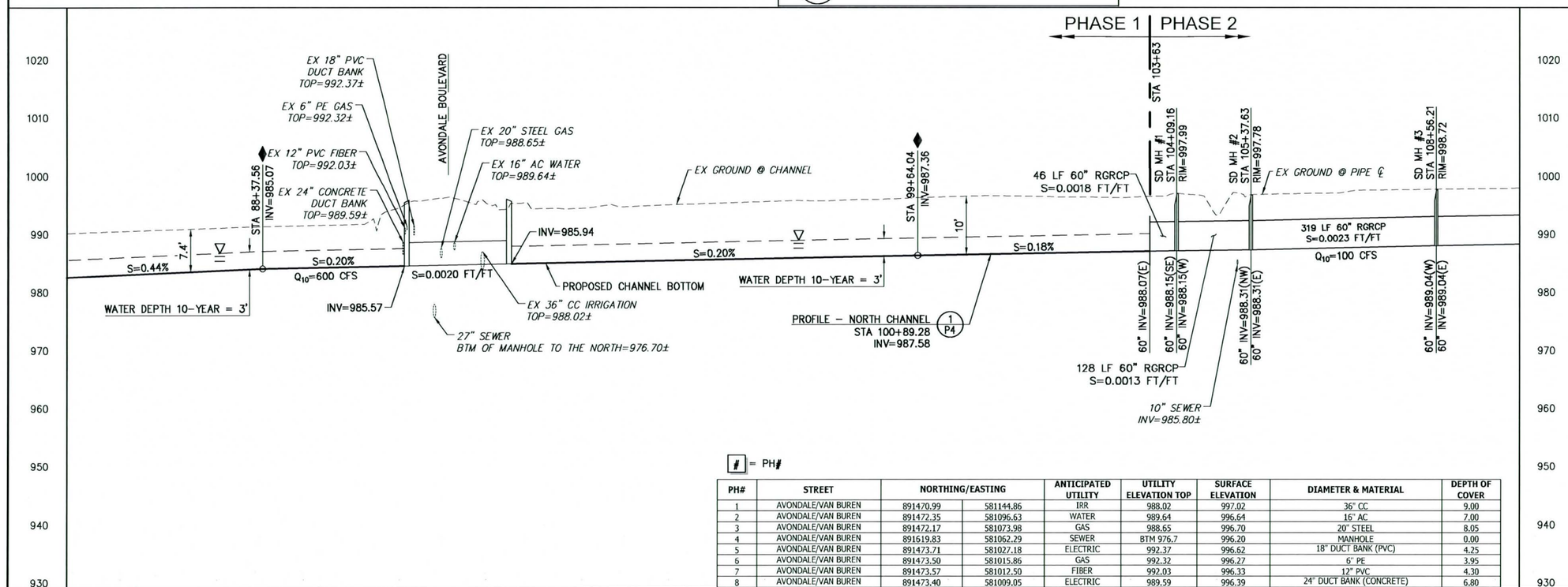

= PH#

PH#	STREET	NORTHING/EASTING		ANTICIPATED UTILITY	UTILITY ELEVATION TOP	SURFACE ELEVATION	DIAMETER & MATERIAL	DEPTH OF COVER
1	AVONDALE/VAN BUREN	891470.99	581144.86	IRR	988.02	997.02	36" CC	9.00
2	AVONDALE/VAN BUREN	891472.35	581096.63	WATER	989.64	996.64	16" AC	7.00
3	AVONDALE/VAN BUREN	891472.17	581073.98	GAS	988.65	996.70	20" STEEL	8.05
4	AVONDALE/VAN BUREN	891619.83	581062.29	SEWER	BTM 976.7	996.20	MANHOLE	0.00
5	AVONDALE/VAN BUREN	891473.71	581027.18	ELECTRIC	992.37	996.62	18" DUCT BANK (PVC)	4.25
6	AVONDALE/VAN BUREN	891473.50	581015.86	GAS	992.32	996.27	6" PE	3.95
7	AVONDALE/VAN BUREN	891473.57	581012.50	FIBER	992.03	996.33	12" PVC	4.30
8	AVONDALE/VAN BUREN	891473.40	581009.05	ELECTRIC	989.59	996.39	24" DUCT BANK (CONCRETE)	6.80

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SCALE
0 100' 200'
HORIZ: 1" = 100'
VERT: 1" = 10'

Flood Control District of Maricopa County

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REV NO.	COMMENT	DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 40401 FOR REVIEW ONLY NOT FOR CONSTRUCTION ARIZONA, U.S.A. Expires 6/30/14

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
www.sunrise-eng.com

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VAN BUREN DCR
15% PLAN & PROFILE

SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03700	RMH	SLF	RMH	8 of 12	P4

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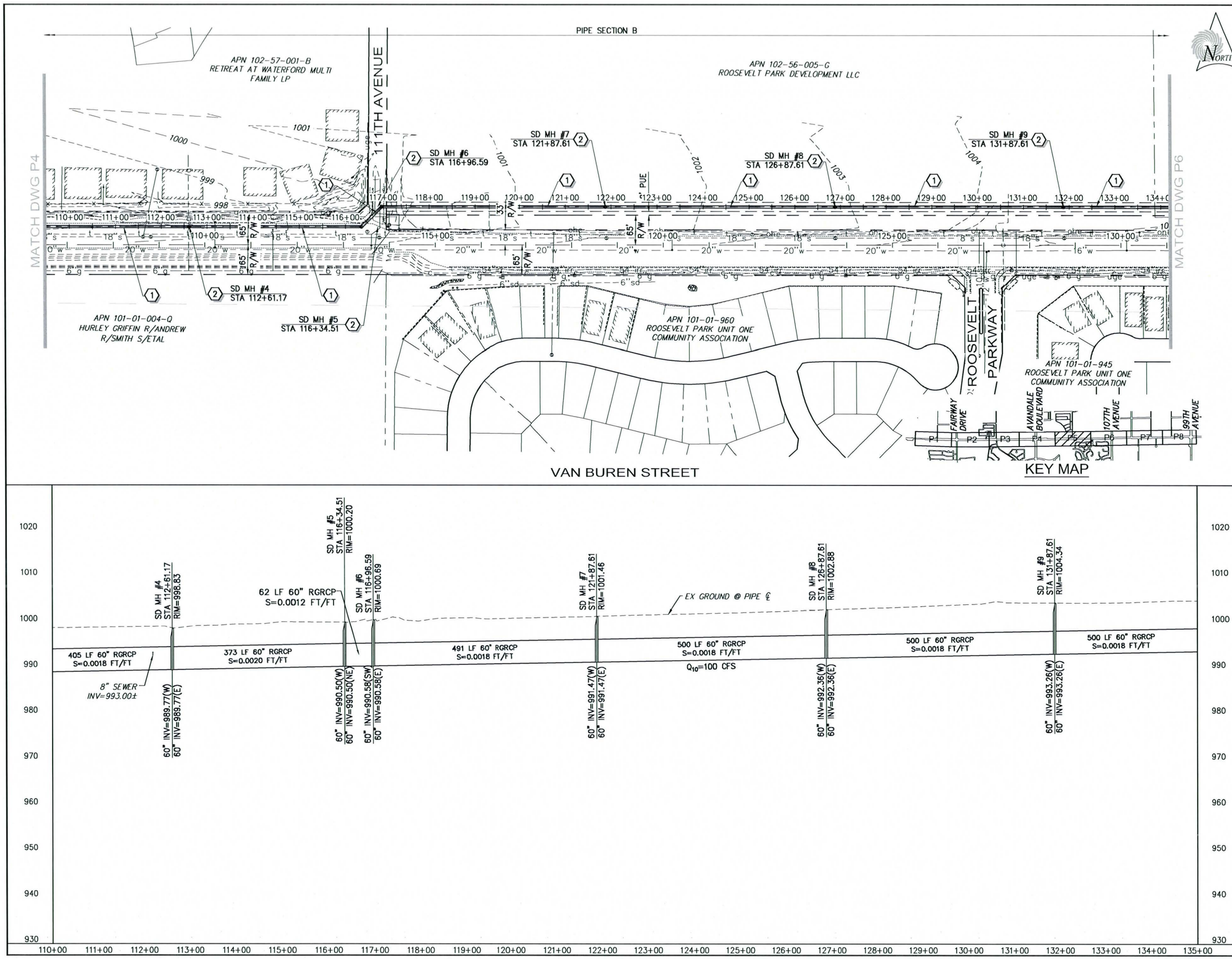

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10. INSTALL 12' WIDE MAINTENANCE ACCESS RAMP PER DETAIL D, DWG DT
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12. INSTALL CHANNEL LINER PER SPECIFICATION TURF, ROCK MULCH OR RIP-RAP AS NOTED
13. RELOCATE 230 KV TOWER BY SRP

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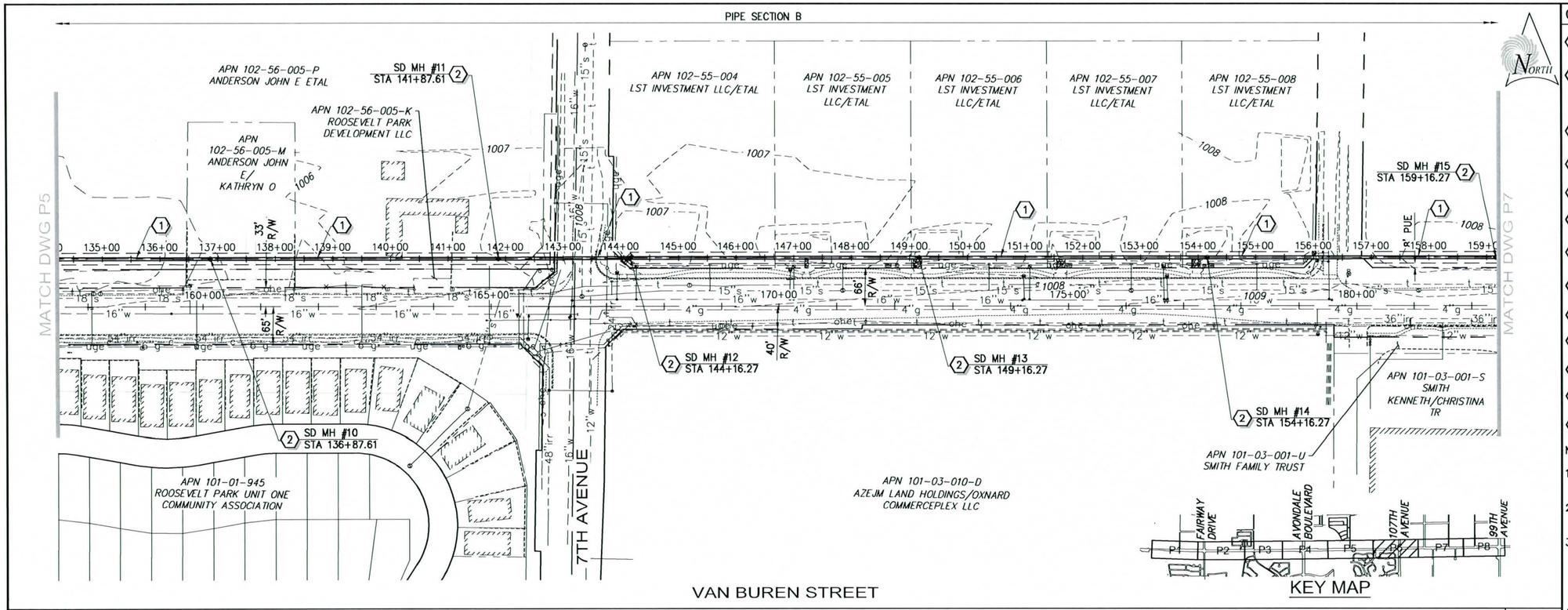

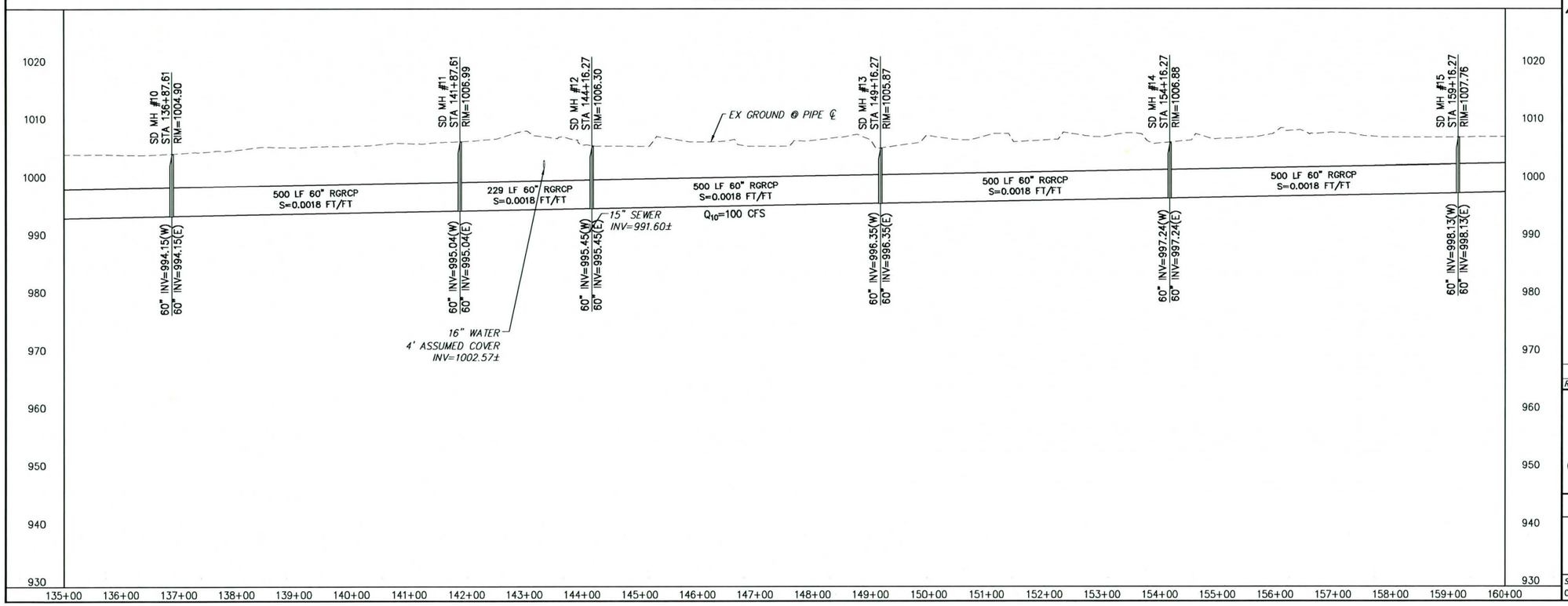

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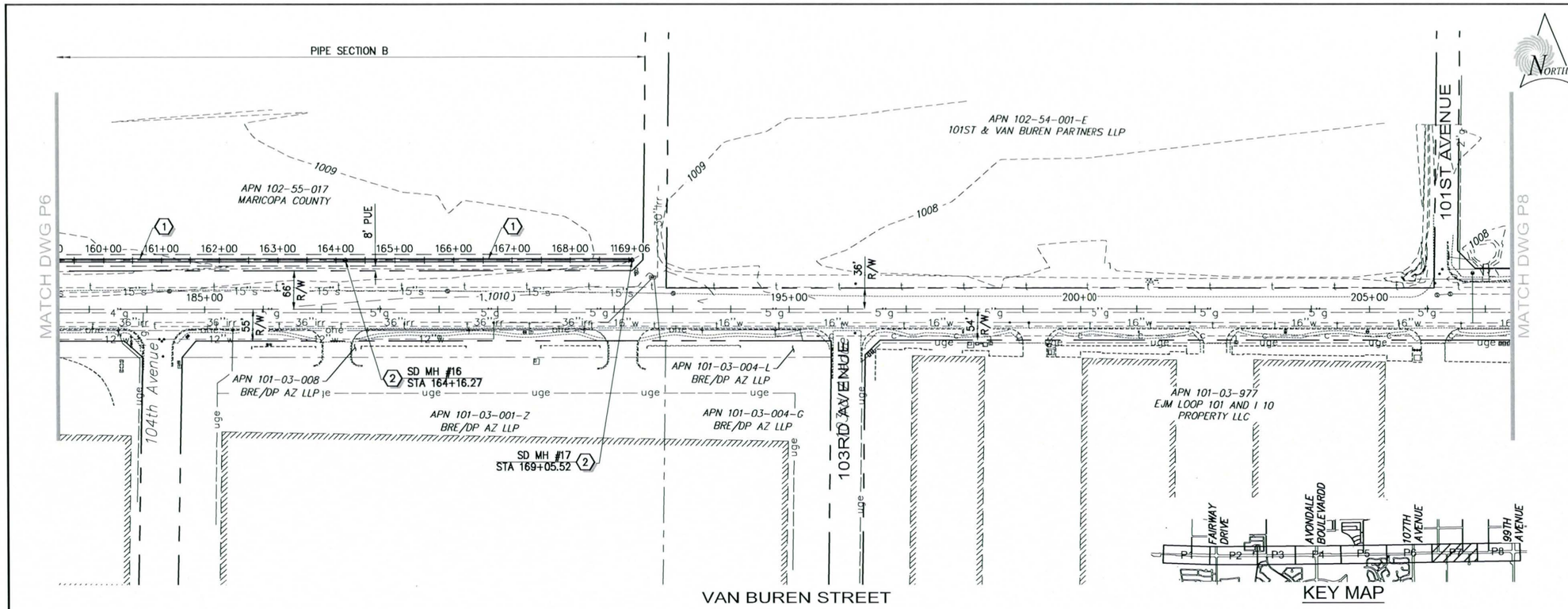

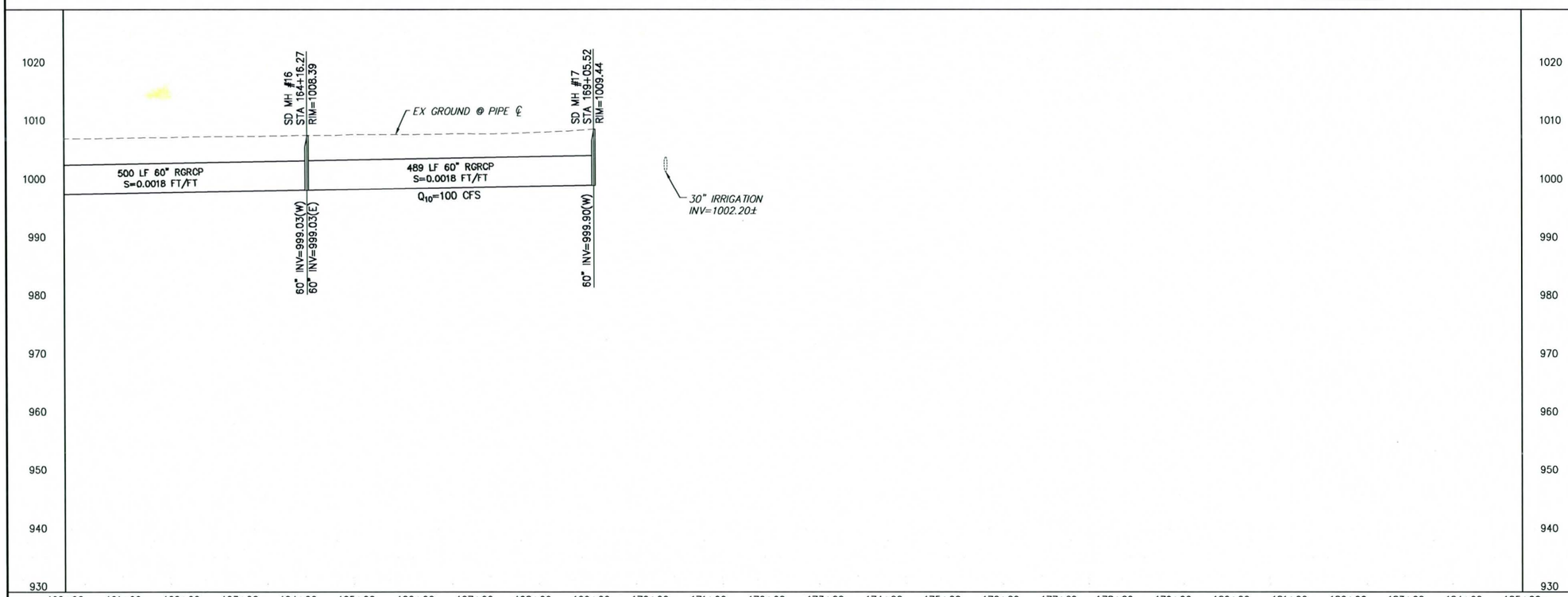

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SEI NO.	DESIGNED	DRAWN	CHECKED	SHEET NO.	
03700	RMH	SLF	RMH	11 of 12	P7

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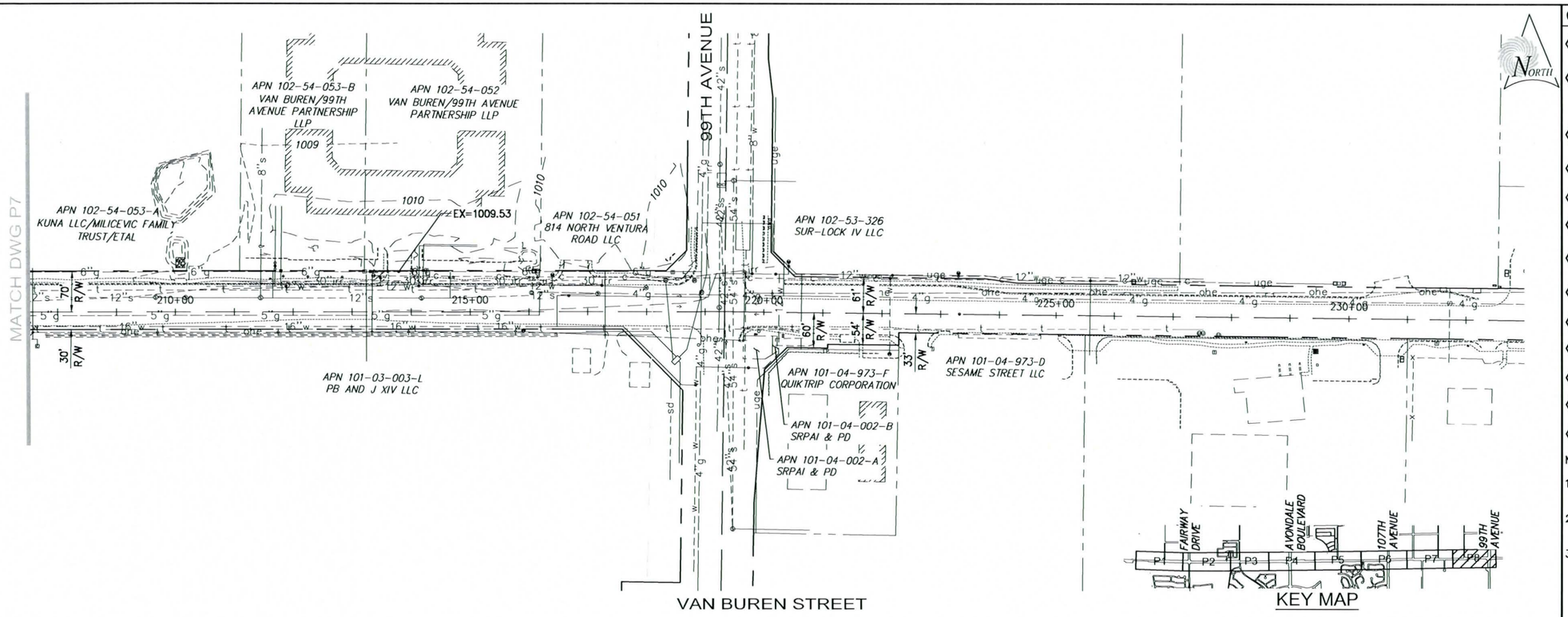

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APPENDIX C

HEC-1 INPUT FILES

CURRENT CONDITIONS

RECOMMENDED PLAN MODEL #1 & 3

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RB	0.549	1.14	19.3	0.57	0.068	1.628	0.38	0.788	47.3	0.0833	4251
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	85.0	170.1	255.1	340.1	425.1	510.2	595.2	680.2	765.3
850.3	935.3	1020.3	1105.4	1190.4	1275.4	1360.5	1445.5	1530.5	1615.5
1700.6	1785.6	1870.6	1955.7	2040.7	2125.7	2210.7	2295.8	2380.8	2465.8
2550.9	2635.9	2720.9	2805.9	2891.0	2976.0	3061.0	3146.1	3231.1	3316.1
3401.1	3486.2	3571.2	3656.2	3741.3	3826.3	3911.3	3996.3	4081.4	4166.4
4251.4									

Agricultural S-Graph Percent Lag (Table 5.5)

0.0	21.0	31.0	37.0	41.0	45.0	48.0	52.0	56.0	59.0
62.0	64.0	67.5	70.0	72.5	75.0	77.5	80.0	82.5	85.0
87.5	90.0	92.5	95.0	97.5	100.0	103.0	106.0	109.0	112.0
115.0	117.5	120.5	123.0	127.0	131.0	135.0	138.6	142.0	147.0
152.5	158.0	165.0	172.5	179.0	190.0	203.0	220.0	243.0	280.0
448.0									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	9.9	14.6	17.5	19.4	21.3	22.7	24.6	26.5	27.9
29.3	30.2	31.9	33.1	34.3	35.4	36.6	37.8	39.0	40.2
41.3	42.5	43.7	44.9	46.1	47.3	48.7	50.1	51.5	52.9
54.3	55.5	56.9	58.1	60.0	61.9	63.8	65.5	67.1	69.5
72.1	74.7	78.0	81.5	84.6	89.8	95.9	104.0	114.8	132.3
211.7									

Interpolated Q_1 (cfs) **NMIN = 5 min**

0.0	42.8	86.4	180.6	368.2	614.4	913.3	1243.6	1603.4	1963.3
2290.2	2598.0	2890.2	3121.2	3333.5	3494.8	3619.8	3748.0	3829.2	3898.4
3954.4	4004.4	4043.6	4082.2	4106.5	4130.8	4155.1	4169.3	4174.6	4180.0
4185.3	4190.7	4196.1	4201.4	4206.8	4212.1	4217.5	4222.8	4228.2	4233.5
4238.9	4244.2	4249.6							

Q_2 (Cfs) Lagged **5 min**

	0.0	42.8	86.4	180.6	368.2	614.4	913.3	1243.6	1603.4
1963.3	2290.2	2598.0	2890.2	3121.2	3333.5	3494.8	3619.8	3748.0	3829.2
3898.4	3954.4	4004.4	4043.6	4082.2	4106.5	4130.8	4155.1	4169.3	4174.6
4180.0	4185.3	4190.7	4196.1	4201.4	4206.8	4212.1	4217.5	4222.8	4228.2
4233.5	4238.9	4244.2							

Unit Hydrograph UI = Q_1 - Q_2

	43	44	94	188	246	299	330	360	360
327	308	292	231	212	161	125	128	81	69
56	50	39	39	24	24	24	14	5	5
5	5	5	5	5	5	5	5	5	5
5	5	5							

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RC	0.682	1.21	14.0	0.62	0.087	2.091	0.38	1.135	68.1	0.0833	5281
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	105.6	211.3	316.9	422.5	528.1	633.8	739.4	845.0	950.6
1056.3	1161.9	1267.5	1373.2	1478.8	1584.4	1690.0	1795.7	1901.3	2006.9
2112.6	2218.2	2323.8	2429.4	2535.1	2640.7	2746.3	2851.9	2957.6	3063.2
3168.8	3274.5	3380.1	3485.7	3591.3	3697.0	3802.6	3908.2	4013.8	4119.5
4225.1	4330.7	4436.4	4542.0	4647.6	4753.2	4858.9	4964.5	5070.1	5175.8
5281.4									

Agricultural S-Graph Percent Lag (Table 5.5)

0.0	21.0	31.0	37.0	41.0	45.0	48.0	52.0	56.0	59.0
62.0	64.0	67.5	70.0	72.5	75.0	77.5	80.0	82.5	85.0
87.5	90.0	92.5	95.0	97.5	100.0	103.0	106.0	109.0	112.0
115.0	117.5	120.5	123.0	127.0	131.0	135.0	138.6	142.0	147.0
152.5	158.0	165.0	172.5	179.0	190.0	203.0	220.0	243.0	280.0
448.0									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	14.3	21.1	25.2	27.9	30.7	32.7	35.4	38.1	40.2
42.2	43.6	46.0	47.7	49.4	51.1	52.8	54.5	56.2	57.9
59.6	61.3	63.0	64.7	66.4	68.1	70.2	72.2	74.2	76.3
78.3	80.0	82.1	83.8	86.5	89.2	92.0	94.4	96.7	100.1
103.9	107.6	112.4	117.5	121.9	129.4	138.3	149.9	165.5	190.7
305.2									

Interpolated Q_1 (cfs) **NMIN =** **5** **min**

0.0	36.9	73.8	116.4	193.9	311.6	502.8	723.1	940.9	1224.1
1516.9	1827.1	2137.2	2447.3	2738.0	2996.4	3272.1	3532.8	3726.7	3935.1
4115.4	4256.7	4383.3	4490.2	4601.6	4690.9	4760.1	4819.8	4874.6	4920.2
4965.5	4999.2	5032.9	5066.6	5088.9	5109.8	5130.8	5151.7	5172.7	5179.7
5184.3	5188.9	5193.5	5198.2	5202.8	5207.4	5212.0	5216.6	5221.2	5225.8
5230.5	5235.1	5239.7	5244.3	5248.9	5253.5	5258.2	5262.8	5267.4	5272.0
5276.6	5281.2								

Q_2 (Cfs) Lagged **5** **min**

	0.0	36.9	73.8	116.4	193.9	311.6	502.8	723.1	940.9
1224.1	1516.9	1827.1	2137.2	2447.3	2738.0	2996.4	3272.1	3532.8	3726.7
3935.1	4115.4	4256.7	4383.3	4490.2	4601.6	4690.9	4760.1	4819.8	4874.6
4920.2	4965.5	4999.2	5032.9	5066.6	5088.9	5109.8	5130.8	5151.7	5172.7
5179.7	5184.3	5188.9	5193.5	5198.2	5202.8	5207.4	5212.0	5216.6	5221.2
5225.8	5230.5	5235.1	5239.7	5244.3	5248.9	5253.5	5258.2	5262.8	5267.4
5272.0	5276.6								

Unit Hydrograph UI = Q_1 - Q_2

	37	37	43	78	118	191	220	218	283
293	310	310	310	291	258	276	261	194	208
180	141	127	107	111	89	69	60	55	46
45	34	34	34	22	21	21	21	21	7
5	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5
5	5								

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RD	0.366	0.95	10.5	0.47	0.048	1.155	0.38	0.544	32.6	0.0833	2834
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	56.7	113.4	170.1	226.7	283.4	340.1	396.8	453.5	510.2
566.9	623.5	680.2	736.9	793.6	850.3	907.0	963.7	1020.3	1077.0
1133.7	1190.4	1247.1	1303.8	1360.5	1417.1	1473.8	1530.5	1587.2	1643.9
1700.6	1757.3	1813.9	1870.6	1927.3	1984.0	2040.7	2097.4	2154.1	2210.7
2267.4	2324.1	2380.8	2437.5	2494.2	2550.9	2607.5	2664.2	2720.9	2777.6
2834.3									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	7.5	9.8	11.7	13.4	14.9	16.3	17.7	18.9	20.1
21.3	22.4	23.4	24.3	25.3	26.2	27.0	27.7	28.5	29.0
29.7	30.3	30.9	31.4	32.0	32.6	33.3	34.0	34.7	35.4
36.2	37.0	37.9	38.8	39.7	40.6	41.6	42.6	43.8	44.9
46.2	47.5	48.9	50.4	52.1	54.0	56.6	60.9	65.5	73.0
97.4									

Interpolated Q_1 (cfs) **NMIN = 5 min**

0.0	37.8	119.5	287.0	503.9	776.3	1160.2	1611.0	1946.6	2213.9
2421.0	2571.8	2652.4	2715.3	2755.2	2782.3	2793.9	2805.5	2817.1	2828.7

Q_2 (Cfs) Lagged **5 min**

	0.0	37.8	119.5	287.0	503.9	776.3	1160.2	1611.0	1946.6
2213.9	2421.0	2571.8	2652.4	2715.3	2755.2	2782.3	2793.9	2805.5	2817.1

Unit Hydrograph UI = Q_1 - Q_2

	38	82	168	217	272	384	451	336	267
207	151	81	63	40	27	12	12	12	12

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RE	0.374	0.95	6.3	0.47	0.049	1.179	0.38	0.612	36.7	0.0833	2896
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	57.9	115.8	173.8	231.7	289.6	347.5	405.5	463.4	521.3
579.2	637.2	695.1	753.0	810.9	868.9	926.8	984.7	1042.6	1100.6
1158.5	1216.4	1274.3	1332.3	1390.2	1448.1	1506.0	1564.0	1621.9	1679.8
1737.7	1795.7	1853.6	1911.5	1969.4	2027.4	2085.3	2143.2	2201.1	2259.1
2317.0	2374.9	2432.8	2490.8	2548.7	2606.6	2664.5	2722.5	2780.4	2838.3
2896.2									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	8.4	11.0	13.2	15.0	16.8	18.4	19.9	21.3	22.6
23.9	25.1	26.3	27.4	28.4	29.4	30.4	31.2	32.0	32.7
33.4	34.1	34.7	35.3	36.0	36.7	37.4	38.2	39.0	39.9
40.7	41.7	42.6	43.6	44.6	45.7	46.8	48.0	49.2	50.5
51.9	53.4	55.0	56.7	58.6	60.8	63.7	68.5	73.6	82.1
109.6									

Interpolated Q_1 (cfs) **NMIN = 5 min**

0.0	34.3	93.0	230.2	411.3	630.4	904.4	1300.1	1689.0	1989.4
2235.3	2432.1	2586.0	2680.1	2739.5	2789.8	2824.1	2844.5	2855.0	2865.5
2876.0	2886.6								

Q_2 (Cfs) Lagged **5 min**

	0.0	34.3	93.0	230.2	411.3	630.4	904.4	1300.1	1689.0
1989.4	2235.3	2432.1	2586.0	2680.1	2739.5	2789.8	2824.1	2844.5	2855.0
2865.5	2876.0								

Unit Hydrograph UI = Q_1 - Q_2

	34	59	137	181	219	274	396	389	300
246	197	154	94	59	50	34	20	11	11
11	11								

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Updated Current Retention Required
Drainage Design Manual for Maricopa County, Hydrology, Chapter 3

Sub-Basin ID	Land Use Type	Land Use Code	Area	Rational Runoff C	100-Yr 2-Hr Rainfall Depth	Retention Required	First Flush Volume	Model Retention	Comments
(-)	(-)	(-)	(ac)	(-)	(in)	(ac-ft)	(ac-ft)	(ac-ft)	(-)
RA			142.7			21.92		15.44	
	BUISNESS PARK	C2	24.1	0.95	2.25	4.29	0.95	3.43	80% of Retention Req
	MIXED USE (School)	MFR + C1	10.5	0.82	2.25	1.61	0.36	1.29	80% of Retention Req
	INDUSTRIAL	I1/I2	50.6	0.95	2.25	9.01	2.00	7.21	80% of Retention Req
	INDUSTRIAL (Distribution Center)	I1/I2	39.3	0.95	2.25	7.00	1.56	3.50	50% of Retention Req
	UNDEVELOPED	NDR	18.2	-	-	0.00	-	0.00	Not required
RB			351.4			6.52		5.21	
	AGRICULTURE	AG	192.8	-	-	0.00	-	0.00	Not required
	LOW DENSITY RESIDENTAIL	LDR	11.3	0.57	2.25	1.21	0.27	0.97	80% of Retention Req
	MEDUIM DENSITY RESIDENTAIL	MDR	33.0	0.71	2.25	4.39	0.98	3.51	80% of Retention Req
	COMMERCIAL	C2	5.2	0.95	2.25	0.92	0.20	0.73	80% of Retention Req
	UNDEVELOPED	NDR	109.2	-	-	0.00	-	0.00	Not required
RC			436.5			11.82		9.46	
	AGRICULTURE	AG	346.8	-	-	0.00	-	0.00	Not required
	LOW DENSITY RESIDENTAIL	LDR	3.2	0.57	2.25	0.34	0.08	0.27	80% of Retention Req
	MEDUIM DENSITY RESIDENTAIL	MDR	31.0	0.71	2.25	4.12	0.92	3.30	80% of Retention Req
	HIGH DENSITY RESIDENTAIL	MFR	19.2	0.88	2.25	3.17	0.70	2.54	80% of Retention Req
	COMMERCIAL	C2	12.8	0.95	2.25	2.28	0.51	1.83	80% of Retention Req
	CITY CENTER	P	10.7	0.95	2.25	1.90	0.42	1.52	80% of Retention Req
	UNDEVELOPED	NDR	12.8	-	-	0.00	-	0.00	Not required
RD			234.2			17.49		13.99	
	AGRICULTURE	AG	79.0	-	-	0.00	-	0.00	Not required
	INDUSTRIAL	I1/I2	25.4	0.95	2.25	4.52	1.00	3.62	80% of Retention Req
	COMMERCIAL	C2	72.8	0.95	2.25	12.97	2.88	10.37	80% of Retention Req
	UNDEVELOPED	NDR	57.0	-	-	0.00	-	0.00	Not required
RE			239.4			21.69		17.35	
	AGRICULTURE	AG	87.7	-	-	0.00	-	0.00	Not required
	COMMERCIAL	C2	121.7	0.95	2.25	21.69	4.82	17.35	80% of Retention Req
	UNDEVELOPED	NDR	30.0	-	-	0.00	-	0.00	Not required

Required Retention $V = C(P/12)A$ (ac-ft) (Equation 3.3)

Where, C = Rational Runoff Coefficient

P = 100-Year 2-Hour Rainfall Depth (in), NOAA Atlas 14 Rainfall Map

A = Drainage Area

HEC-1 INPUT FILES

FUTURE CONDITIONS

ALTERNATIVES ANALYSIS MODEL

AND

RECOMMENDED PLAN MODEL #4

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Soil Data
Drainage Design Manual for Maricopa County, Hydrology, Chapter 4 (Table 4.1)

Sub-Basin ID	Soil Survey	Map Unit	Area	Area Pct	XKSAT	Rock Outcrop	Effective
(-)	(-)	(-)	(mi^2)	(%)	(in/hr)	(%)	(%)
RA			0.223	100.0	0.25	0.0	0.0
	Central County	GGA	0.137	61.4	0.25	0.0	0.0
	Central County	AA	0.047	21.1	0.26	0.0	0.0
	Central County	GE	0.039	17.5	0.26	0.0	0.0
RB			0.549	100.0	0.18	0.0	0.0
	Central County	GT	0.084	15.3	0.04	0.0	0.0
	Central County	LCA	0.020	3.6	0.25	0.0	0.0
	Central County	GGA	0.188	34.2	0.25	0.0	0.0
	Central County	ABA	0.041	7.5	0.38	0.0	0.0
	Central County	LCB	0.006	1.1	0.25	0.0	0.0
	Central County	ABB	0.017	3.1	0.39	0.0	0.0
	Central County	GE	0.115	20.9	0.26	0.0	0.0
	Central County	MR	0.029	5.3	0.05	0.0	0.0
	Central County	BS	0.006	1.1	0.39	0.0	0.0
	Central County	ES	0.018	3.3	0.25	0.0	0.0
	Central County	MP	0.019	3.5	0.25	0.0	0.0
	Central County	RBA	0.006	1.1	0.26	0.0	0.0
	Central County	TW	0.000	0.0	0.05	0.0	0.0
RC			0.682	100.0	0.14	0.0	0.0
	Central County	LE	0.191	28.0	0.04	0.0	0.0
	Central County	LCA	0.451	66.1	0.25	0.0	0.0
	Central County	MR	0.035	5.1	0.05	0.0	0.0
	Central County	TW	0.005	0.7	0.05	0.0	0.0
RD			0.366	100.0	0.17	0.0	0.0
	Central County	LE	0.061	16.7	0.04	0.0	0.0
	Central County	TW	0.022	6.0	0.05	0.0	0.0
	Central County	LCA	0.283	77.3	0.25	0.0	0.0
RE			0.374	100.0	0.09	0.0	0.0
	Central County	LE	0.190	50.8	0.04	0.0	0.0
	Central County	MP	0.022	5.9	0.25	0.0	0.0
	Central County	LCA	0.147	39.3	0.25	0.0	0.0
	Central County	TT	0.015	4.0	0.04	0.0	0.0

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Future Land Use Data
Drainage Design Manual for Maricopa County, Hydrology, Chapter 4 (Table 4.2)

Sub-Basin ID	Land Use Type	Land Use Code	Area	Area Pct	DTHETA Condition	IA	RTIMP	Perv Area Vege Cover	Sub-Basin Vege Cover	K_n (P5-28)
(-)	(-)	(-)	(ac)	(%)	(-)	(in)	(%)	(%)	(%)	(-)
RA			142.72	100.0		0.15	60.7		24.3	0.029
	BUISNESS PARK	C2	24.06	16.9	Normal	0.10	80.0	75.0	15.0	0.020
	MIXED USE	MFR + C1	28.68	20.1	Normal	0.18	62.5	62.5	23.4	0.035
	INDUSTRIAL	I1/I2	89.98	63.0	Normal	0.15	55.0	60.0	27.0	0.030
RB			351.36	100.0		0.10	82.3		9.2	0.022
	BUISNESS PARK	C2	112.52	32.0	Normal	0.10	80.0	75.0	15.0	0.020
	CITY CENTER WEST	P	183.14	52.1	Normal	0.05	95.0	0.0	0.0	0.015
	HIGH DENSITY RESIDENTIAL	MFR	55.70	15.9	Normal	0.25	45.0	50.0	27.5	0.050
RC			436.48	100.0		0.15	67.3		17.5	0.025
	BUISNESS PARK CC EAST	P	21.09	4.8	Normal	0.05	95.0	0.0	0.0	0.015
	BUISNESS PARK	C2	119.17	27.3	Normal	0.10	80.0	75.0	15.0	0.020
	MIXED USE	MFR + C1	22.44	5.1	Normal	0.18	62.5	62.5	23.4	0.035
	COMMERCIAL	C1	20.96	4.8	Normal	0.10	80.0	75.0	15.0	0.020
	CITY CENTER	P	22.08	5.1	Normal	0.05	95.0	0.0	0.0	0.015
	LOW DENSITY RESIDENTIAL	LDR	21.95	5.0	Normal	0.30	15.0	50.0	42.5	0.050
	MEDUIM DENSITY RESIDENTIAL	MDR	30.00	6.9	Normal	0.25	30.0	50.0	35.0	0.040
	HIGH DENSITY RESIDENTIAL	MFR	52.87	12.1	Normal	0.25	45.0	50.0	27.5	0.030
	MEDUIM DENSITY RESIDENTIAL AC	MDR	29.34	6.7	Normal	0.25	30.0	50.0	35.0	0.040
	HIGH DENSITY RESIDENTIAL AC	MFR	20.08	4.6	Normal	0.25	45.0	50.0	27.5	0.030
	CITY CENTER EAST	P	76.50	17.5	Normal	0.05	95.0	0.0	0.0	0.015
RD			234.24	100.0		0.10	80.0		15.0	0.020
	BUISNESS PARK	C2	234.24	100.0	Normal	0.10	80.0	75.0	15.0	0.020
RE			239.36	100.0		0.10	80.0		15.0	0.020
	BUISNESS PARK	C2	239.36	100.0	Normal	0.10	80.0	75.0	15.0	0.020

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Future Rainfall Losses
Drainage Design Manual for Maricopa County, Hydrology, Chapter 4 (Tables 4.1 and 4.2)

Sub-Basin ID	Area	Area	XKSAT Before Adjustment	Sub-Basin Vege Cover	IA	DTHETA [1]	PSIF [1]	XKSAT After Adjustment	RTIMP
(-)	(ac)	(mi^2)	(in/hr)	(%)	(in)	(-)	(in)	(in/hr)	(%)
RA	142.72	0.223	0.25	24.3	0.15	0.25	4.8	0.29	60.7
RB	351.36	0.549	0.18	9.2	0.10	0.28	5.4	0.18	82.3
RC	436.48	0.682	0.14	17.5	0.15	0.23	6.2	0.15	67.3
RD	234.24	0.366	0.17	15.0	0.10	0.25	5.7	0.18	80.0
RE	239.36	0.374	0.09	15.0	0.10	0.15	7.3	0.10	80.0

1. Same as Durago ADMP, Checked

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Future S-Graph Data

Sub-Basin ID	Area	Length [1]	Slope [1]	S-Graph	L_{ca} [1]	Lag	Kn
(-)	(mi^2)	(mi)	(ft/mi)	(-)	(mi)	(min)	(-)
RA	0.223	0.76	9.2	Valley	0.37	17.1	0.029
RB	0.549	1.14	19.3	Valley	0.57	15.4	0.022
RC	0.682	1.21	14.0	Valley	0.62	19.8	0.025
RD	0.366	0.95	10.5	Valley	0.47	13.6	0.020
RE	0.374	0.95	6.3	Valley	0.47	14.9	0.020

1. Same as Durago ADMP, Checked

Unit Hydrographs - S-Graphs

Drainage Design Manual for Maricopa County, Hydrology, Chapter 5

Lag Time: Lag = $C(LL_{ca}/S^p)^m$ (Equation 5.11)
Ultimate Discharge: Q_{ult} = 645.33A/Dt (Equation 5.10)

A	Area, in square miles
S	Watershed slope, in feet/mile
L	Length of the watercourse to the hydraulically most distant point, in miles
L_{ca}	Length measured from the concentration point along L to a point on L that is perpendicular to the watershed centroid, in miles
K_n	Estimated mean Manning's n for all the channels within an area
C	$24K_n$ (USACE), $26K_n$ (USBR)
m	0.38 (USACE), 0.33 (USBR)
p	0.5
Lag	Basin lag, in hours
Dt	Duration of the 1 inch of rainfall excess, in hours
Q_{ult}	Ultimate discharge, in cfs

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RA	0.2230	0.76	9.2	0.37	0.029	0.704	0.38	0.285	17.1	0.0833	1726.9
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	34.5	69.1	103.6	138.2	172.7	207.2	241.8	276.3	310.8
345.4	379.9	414.5	449.0	483.5	518.1	552.6	587.1	621.7	656.2
690.8	725.3	759.8	794.4	828.9	863.5	898.0	932.5	967.1	1001.6
1036.1	1070.7	1105.2	1139.8	1174.3	1208.8	1243.4	1277.9	1312.4	1347.0
1381.5	1416.1	1450.6	1485.1	1519.7	1554.2	1588.8	1623.3	1657.8	1692.4
1726.9									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	3.9	5.1	6.2	7.0	7.8	8.6	9.3	9.9	10.6
11.1	11.7	12.2	12.8	13.3	13.7	14.1	14.5	14.9	15.2
15.6	15.9	16.2	16.5	16.8	17.1	17.4	17.8	18.2	18.6
19.0	19.4	19.9	20.3	20.8	21.3	21.8	22.4	22.9	23.5
24.2	24.9	25.6	26.4	27.3	28.3	29.7	31.9	34.3	38.2
51.1									

Interpolated Q_1 (cfs) **NMIN =** **5** **min**

0.0	65.3	280.8	631.6	1116.1	1421.5	1593.6	1663.9	1697.1	1710.6
1724.0									

Q_2 (Cfs) Lagged **5** **min**

0.0	0.0	65.3	280.8	631.6	1116.1	1421.5	1593.6	1663.9	1697.1
1710.6									

Unit Hydrograph UI = Q_1 - Q_2

0	65	215	351	485	305	172	70	33	13
13									

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RB	0.5490	1.14	19.3	0.57	0.022	0.532	0.38	0.257	15.4	0.0833	4251.4
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	85.0	170.1	255.1	340.1	425.1	510.2	595.2	680.2	765.3
850.3	935.3	1020.3	1105.4	1190.4	1275.4	1360.5	1445.5	1530.5	1615.5
1700.6	1785.6	1870.6	1955.7	2040.7	2125.7	2210.7	2295.8	2380.8	2465.8
2550.9	2635.9	2720.9	2805.9	2891.0	2976.0	3061.0	3146.1	3231.1	3316.1
3401.1	3486.2	3571.2	3656.2	3741.3	3826.3	3911.3	3996.3	4081.4	4166.4
4251.4									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	3.5	4.6	5.6	6.3	7.1	7.7	8.3	8.9	9.5
10.1	10.6	11.0	11.5	12.0	12.4	12.8	13.1	13.5	13.7
14.1	14.3	14.6	14.9	15.1	15.4	15.7	16.1	16.4	16.8
17.1	17.5	17.9	18.3	18.8	19.2	19.7	20.2	20.7	21.2
21.8	22.4	23.1	23.9	24.6	25.5	26.8	28.8	30.9	34.5
46.1									

Interpolated Q_1 (cfs) **NMIN = 5 min**

0.0	204.2	840.9	1999.2	3117.6	3775.8	4044.0	4170.1	4206.8	4243.6

Q_2 (Cfs) Lagged **5 min**

0.0	0.0	204.2	840.9	1999.2	3117.6	3775.8	4044.0	4170.1	4206.8

Unit Hydrograph UI = Q_1 - Q_2

0	204	637	1158	1118	658	268	126	37	37

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RC	0.6820	1.21	14.0	0.62	0.025	0.607	0.38	0.330	19.8	0.0833	5281.4
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	105.6	211.3	316.9	422.5	528.1	633.8	739.4	845.0	950.6
1056.3	1161.9	1267.5	1373.2	1478.8	1584.4	1690.0	1795.7	1901.3	2006.9
2112.6	2218.2	2323.8	2429.4	2535.1	2640.7	2746.3	2851.9	2957.6	3063.2
3168.8	3274.5	3380.1	3485.7	3591.3	3697.0	3802.6	3908.2	4013.8	4119.5
4225.1	4330.7	4436.4	4542.0	4647.6	4753.2	4858.9	4964.5	5070.1	5175.8
5281.4									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	4.5	5.9	7.1	8.1	9.0	9.9	10.7	11.5	12.2
12.9	13.6	14.2	14.8	15.3	15.9	16.4	16.8	17.3	17.6
18.0	18.4	18.7	19.1	19.4	19.8	20.2	20.6	21.0	21.5
22.0	22.5	23.0	23.5	24.1	24.6	25.2	25.9	26.5	27.2
28.0	28.8	29.7	30.6	31.6	32.8	34.3	36.9	39.7	44.2
59.1									

Interpolated Q_1 (cfs) **NMIN =** **5** **min**

0.0	140.0	647.9	1417.8	2698.8	3763.0	4475.7	4885.9	5077.5	5181.2
5216.8	5252.4								

Q_2 (Cfs) Lagged **5** **min**

0.0	0.0	140.0	647.9	1417.8	2698.8	3763.0	4475.7	4885.9	5077.5
5181.2	5216.8								

Unit Hydrograph UI = Q_1 - Q_2

0	140	508	770	1281	1064	713	410	192	104
36	36								

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RD	0.3660	0.95	10.5	0.47	0.020	0.480	0.38	0.226	13.6	0.0833	2834.3
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	56.7	113.4	170.1	226.7	283.4	340.1	396.8	453.5	510.2
566.9	623.5	680.2	736.9	793.6	850.3	907.0	963.7	1020.3	1077.0
1133.7	1190.4	1247.1	1303.8	1360.5	1417.1	1473.8	1530.5	1587.2	1643.9
1700.6	1757.3	1813.9	1870.6	1927.3	1984.0	2040.7	2097.4	2154.1	2210.7
2267.4	2324.1	2380.8	2437.5	2494.2	2550.9	2607.5	2664.2	2720.9	2777.6
2834.3									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	3.1	4.1	4.9	5.6	6.2	6.8	7.3	7.9	8.4
8.8	9.3	9.7	10.1	10.5	10.9	11.2	11.5	11.8	12.1
12.4	12.6	12.8	13.1	13.3	13.6	13.8	14.1	14.4	14.7
15.1	15.4	15.7	16.1	16.5	16.9	17.3	17.7	18.2	18.7
19.2	19.7	20.3	21.0	21.6	22.5	23.5	25.3	27.2	30.3
40.5									

Interpolated Q_1 (cfs) **NMIN =** **5** **min**

0.0	179.9	720.7	1691.4	2349.6	2654.4	2771.7	2803.7	2831.5

Q_2 (Cfs) Lagged **5** **min**

0.0	0.0	179.9	720.7	1691.4	2349.6	2654.4	2771.7	2803.7

Unit Hydrograph UI = Q_1 - Q_2

0	180	541	971	658	305	117	32	28

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RE	0.3740	0.95	6.3	0.47	0.020	0.480	0.38	0.249	14.9	0.0833	2896.2
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	57.9	115.8	173.8	231.7	289.6	347.5	405.5	463.4	521.3
579.2	637.2	695.1	753.0	810.9	868.9	926.8	984.7	1042.6	1100.6
1158.5	1216.4	1274.3	1332.3	1390.2	1448.1	1506.0	1564.0	1621.9	1679.8
1737.7	1795.7	1853.6	1911.5	1969.4	2027.4	2085.3	2143.2	2201.1	2259.1
2317.0	2374.9	2432.8	2490.8	2548.7	2606.6	2664.5	2722.5	2780.4	2838.3
2896.2									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	3.4	4.5	5.4	6.1	6.8	7.5	8.1	8.7	9.2
9.7	10.2	10.7	11.1	11.6	12.0	12.4	12.7	13.0	13.3
13.6	13.9	14.1	14.4	14.7	14.9	15.2	15.6	15.9	16.2
16.6	17.0	17.3	17.8	18.2	18.6	19.1	19.5	20.0	20.6
21.1	21.7	22.4	23.1	23.8	24.7	25.9	27.9	30.0	33.4
44.6									

Interpolated Q_1 (cfs) **NMIN =** **5** **min**

0.0	149.2	609.4	1459.1	2196.7	2618.9	2780.8	2846.5	2872.4

Q_2 (Cfs) Lagged **5** **min**

0.0	0.0	149.2	609.4	1459.1	2196.7	2618.9	2780.8	2846.5

Unit Hydrograph UI = Q_1 - Q_2

0	149	460	850	738	422	162	66	26

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Future Retention Required
Drainage Design Manual for Maricopa County, Hydrology, Chapter 3

Sub-Basin ID	Land Use Type	Land Use Code	Area	Rational Runoff C	100-Yr 2-Hr Rainfall Depth	Retention Required	First Flush Volume	Model Retention	Comments
(-)	(-)	(-)	(ac)	(-)	(in)	(ac-ft)	(ac-ft)	(ac-ft)	(-)
RA			142.72			24.72		17.68	
	BUISNESS PARK	C2	24.06	0.95	2.25	4.29	0.95	3.43	80% of Retention Req
	MIXED USE	MFR + C1	28.68	0.82	2.25	4.41	0.98	3.53	80% of Retention Req
	INDUSTRIAL	I1/I2	50.64	0.95	2.25	9.02	2.00	7.22	80% of Retention Req
	INDUSTRIAL (Distribution Center)	I1/I2	39.34	0.95	2.25	7.01	1.56	3.50	50% of Retention Req
RB			351.36			61.85		30.64	
	BUISNESS PARK	C2	112.52	0.95	2.25	20.04	4.45	16.03	80% of Retention Req
	CITY CENTER WEST	P	183.14	0.95	2.25	32.62	7.25	7.25	First Flush Retention
	HIGH DENSITY RESIDENTIAL	MFR	55.70	0.88	2.25	9.19	2.04	7.35	80% of Retention Req
RC			436.48			71.22		46.94	
	BUISNESS PARK CC EAST	P	21.09	0.95	2.25	3.76	0.83	0.83	First Flush Retention
	BUISNESS PARK	C2	119.17	0.95	2.25	21.23	4.72	16.98	80% of Retention Req
	MIXED USE	MFR + C1	22.44	0.82	2.25	3.45	0.77	2.76	80% of Retention Req
	COMMERCIAL	C1	20.96	0.75	2.25	2.95	0.66	2.36	80% of Retention Req
	CITY CENTER	P	22.08	0.95	2.25	3.93	0.87	3.15	80% of Retention Req
	LOW DENSITY RESIDENTIAL	LDR	21.95	0.57	2.25	2.35	0.52	1.88	80% of Retention Req
	MEDUIM DENSITY RESIDENTIAL	MDR	30.00	0.71	2.25	3.99	0.89	3.20	80% of Retention Req
	HIGH DENSITY RESIDENTIAL	MFR	52.87	0.88	2.25	8.72	1.94	6.98	80% of Retention Req
	MEDUIM DENSITY RESIDENTIAL AC	MDR	29.34	0.71	2.25	3.91	0.87	3.12	80% of Retention Req
	HIGH DENSITY RESIDENTIAL AC	MFR	20.08	0.88	2.25	3.31	0.74	2.65	80% of Retention Req
	CITY CENTER EAST	P	76.50	0.95	2.25	13.63	3.03	3.03	First Flush Retention
RD			234.24			41.72		33.38	
	BUISNESS PARK	C2	234.24	0.95	2.25	41.72	9.27	33.38	80% of Retention Req
RE			239.36			42.64		34.11	
	BUISNESS PARK	C2	239.36	0.95	2.25	42.64	9.47	34.11	80% of Retention Req

Required Retention $V = C(P/12)A$ (ac-ft) (Equation 3.3)
Where, C = Rational Runoff Coefficient
P = 100-Year 2-Hour Rainfall Depth (in), NOAA Atlas 14 Rainfall Map
A = Drainage Area

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Rational 100-Year 2-Hour Storm, Basin RE
NOAA Atlas 14 Rainfall

After Retention	Area (ac)	HEC-1 100-y 6-h Q	20% of HEC-1 100-y 6-h Q	20% of Rational Q	Q at RETRE
	(ac)	(cfs)	(cfs)	(cfs)	(cfs)
RE	239.36	571	114		
Starting North RE	160.00	382	76	77	
South RE	79.36	189	38		115

77 > 76 So Use Rational Q

HEC-1 INPUT FILES

FUTURE CONDITIONS

RECOMMENDED PLAN MODEL #2

Flood Control District of Maricopa County
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Soil Data
Drainage Design Manual for Maricopa County, Hydrology, Chapter 4 (Table 4.1)

Sub-Basin ID	Soil Survey	Map Unit	Area	Area Pct	XKSAT	Rock Outcrop	Effective
(-)	(-)	(-)	(mi^2)	(%)	(in/hr)	(%)	(%)
RA			0.223	100.0	0.25	0.0	0.0
	Central County	GGA	0.137	61.4	0.25	0.0	0.0
	Central County	AA	0.047	21.1	0.26	0.0	0.0
	Central County	GE	0.039	17.5	0.26	0.0	0.0
RB			0.549	100.0	0.18	0.0	0.0
	Central County	GT	0.084	15.3	0.04	0.0	0.0
	Central County	LCA	0.020	3.6	0.25	0.0	0.0
	Central County	GGA	0.188	34.2	0.25	0.0	0.0
	Central County	ABA	0.041	7.5	0.38	0.0	0.0
	Central County	LCB	0.006	1.1	0.25	0.0	0.0
	Central County	ABB	0.017	3.1	0.39	0.0	0.0
	Central County	GE	0.115	20.9	0.26	0.0	0.0
	Central County	MR	0.029	5.3	0.05	0.0	0.0
	Central County	BS	0.006	1.1	0.39	0.0	0.0
	Central County	ES	0.018	3.3	0.25	0.0	0.0
	Central County	MP	0.019	3.5	0.25	0.0	0.0
	Central County	RBA	0.006	1.1	0.26	0.0	0.0
	Central County	TW	0.000	0.0	0.05	0.0	0.0
RC			0.682	100.0	0.14	0.0	0.0
	Central County	LE	0.191	28.0	0.04	0.0	0.0
	Central County	LCA	0.451	66.1	0.25	0.0	0.0
	Central County	MR	0.035	5.1	0.05	0.0	0.0
	Central County	TW	0.005	0.7	0.05	0.0	0.0
RD			0.366	100.0	0.17	0.0	0.0
	Central County	LE	0.061	16.7	0.04	0.0	0.0
	Central County	TW	0.022	6.0	0.05	0.0	0.0
	Central County	LCA	0.283	77.3	0.25	0.0	0.0
RE			0.374	100.0	0.09	0.0	0.0
	Central County	LE	0.190	50.8	0.04	0.0	0.0
	Central County	MP	0.022	5.9	0.25	0.0	0.0
	Central County	LCA	0.147	39.3	0.25	0.0	0.0
	Central County	TT	0.015	4.0	0.04	0.0	0.0

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Future Land Use Data
Drainage Design Manual for Maricopa County, Hydrology, Chapter 4 (Table 4.2)

Sub-Basin ID	Land Use Type	Land Use Code	Area	Area Pct	DTHETA Condition	IA	RTIMP	Perv Area Vege Cover	Sub-Basin Vege Cover	K_n (P5-28)
(-)	(-)	(-)	(ac)	(%)	(-)	(in)	(%)	(%)	(%)	(-)
RA			142.72	100.0		0.15	60.7		24.3	0.029
	BUISNESS PARK	C2	24.06	16.9	Normal	0.10	80.0	75.0	15.0	0.020
	MIXED USE	MFR + C1	28.68	20.1	Normal	0.18	62.5	62.5	23.4	0.035
	INDUSTRIAL	I1/I2	89.98	63.0	Normal	0.15	55.0	60.0	27.0	0.030
RB			351.36	100.0		0.10	82.3		9.2	0.022
	BUISNESS PARK	C2	112.52	32.0	Normal	0.10	80.0	75.0	15.0	0.020
	CITY CENTER WEST	P	183.14	52.1	Normal	0.05	95.0	0.0	0.0	0.015
	HIGH DENSITY RESIDENTIAL	MFR	55.70	15.9	Normal	0.25	45.0	50.0	27.5	0.050
RC			436.48	100.0		0.15	67.3		17.5	0.025
	BUISNESS PARK CC EAST	P	21.09	4.8	Normal	0.05	95.0	0.0	0.0	0.015
	BUISNESS PARK	C2	119.17	27.3	Normal	0.10	80.0	75.0	15.0	0.020
	MIXED USE	MFR + C1	22.44	5.1	Normal	0.18	62.5	62.5	23.4	0.035
	COMMERCIAL	C1	20.96	4.8	Normal	0.10	80.0	75.0	15.0	0.020
	CITY CENTER	P	22.08	5.1	Normal	0.05	95.0	0.0	0.0	0.015
	LOW DENSITY RESIDENTIAL	LDR	21.95	5.0	Normal	0.30	15.0	50.0	42.5	0.050
	MEDUIM DENSITY RESIDENTIAL	MDR	30.00	6.9	Normal	0.25	30.0	50.0	35.0	0.040
	HIGH DENSITY RESIDENTIAL	MFR	52.87	12.1	Normal	0.25	45.0	50.0	27.5	0.030
	MEDUIM DENSITY RESIDENTIAL AC	MDR	29.34	6.7	Normal	0.25	30.0	50.0	35.0	0.040
	HIGH DENSITY RESIDENTIAL AC	MFR	20.08	4.6	Normal	0.25	45.0	50.0	27.5	0.030
	CITY CENTER EAST	P	76.50	17.5	Normal	0.05	95.0	0.0	0.0	0.015
RD			234.24	100.0		0.10	80.0		15.0	0.020
	BUISNESS PARK	C2	234.24	100.0	Normal	0.10	80.0	75.0	15.0	0.020
RE			239.36	100.0		0.10	80.0		15.0	0.020
	BUISNESS PARK	C2	239.36	100.0	Normal	0.10	80.0	75.0	15.0	0.020

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Future Rainfall Losses
Drainage Design Manual for Maricopa County, Hydrology, Chapter 4 (Tables 4.1 and 4.2)

Sub-Basin ID	Area	Area	XKSAT Before Adjustment	Sub-Basin Vege Cover	IA	DTHETA [1]	PSIF [1]	XKSAT After Adjustment	RTIMP
(-)	(ac)	(mi^2)	(in/hr)	(%)	(in)	(-)	(in)	(in/hr)	(%)
RA	142.72	0.223	0.25	24.3	0.15	0.25	4.8	0.29	60.7
RB	351.36	0.549	0.18	9.2	0.10	0.28	5.4	0.18	82.3
RC	436.48	0.682	0.14	17.5	0.15	0.23	6.2	0.15	67.3
RD	234.24	0.366	0.17	15.0	0.10	0.25	5.7	0.18	80.0
RE	239.36	0.374	0.09	15.0	0.10	0.15	7.3	0.10	80.0

1. Same as Durago ADMP, Checked

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Future S-Graph Data

Sub-Basin ID	Area	Length [1]	Slope [1]	S-Graph	L_{ca} [1]	Lag	Kn
(-)	(mi^2)	(mi)	(ft/mi)	(-)	(mi)	(min)	(-)
RA	0.223	0.76	9.2	Valley	0.37	17.1	0.029
RB	0.549	1.14	19.3	Valley	0.57	15.4	0.022
RC	0.682	1.21	14.0	Valley	0.62	19.8	0.025
RD	0.366	0.95	10.5	Valley	0.47	13.6	0.020
RE	0.374	0.95	6.3	Valley	0.47	14.9	0.020

1. Same as Durago ADMP, Checked

Unit Hydrographs - S-Graphs

Drainage Design Manual for Maricopa County, Hydrology, Chapter 5

Lag Time: Lag = $C(LL_{ca}/S^p)^m$ (Equation 5.11)
Ultimate Discharge: Q_{ult} = 645.33A/Dt (Equation 5.10)

A	Area, in square miles
S	Watershed slope, in feet/mile
L	Length of the watercourse to the hydraulically most distant point, in miles
L_{ca}	Length measured from the concentration point along L to a point on L that is perpendicular to the watershed centroid, in miles
K_n	Estimated mean Manning's n for all the channels within an area
C	$24K_n$ (USACE), $26K_n$ (USBR)
m	0.38 (USACE), 0.33 (USBR)
p	0.5
Lag	Basin lag, in hours
Dt	Duration of the 1 inch of rainfall excess, in hours
Q_{ult}	Ultimate discharge, in cfs

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RA	0.2230	0.76	9.2	0.37	0.029	0.704	0.38	0.285	17.1	0.0833	1726.9
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	34.5	69.1	103.6	138.2	172.7	207.2	241.8	276.3	310.8
345.4	379.9	414.5	449.0	483.5	518.1	552.6	587.1	621.7	656.2
690.8	725.3	759.8	794.4	828.9	863.5	898.0	932.5	967.1	1001.6
1036.1	1070.7	1105.2	1139.8	1174.3	1208.8	1243.4	1277.9	1312.4	1347.0
1381.5	1416.1	1450.6	1485.1	1519.7	1554.2	1588.8	1623.3	1657.8	1692.4
1726.9									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	3.9	5.1	6.2	7.0	7.8	8.6	9.3	9.9	10.6
11.1	11.7	12.2	12.8	13.3	13.7	14.1	14.5	14.9	15.2
15.6	15.9	16.2	16.5	16.8	17.1	17.4	17.8	18.2	18.6
19.0	19.4	19.9	20.3	20.8	21.3	21.8	22.4	22.9	23.5
24.2	24.9	25.6	26.4	27.3	28.3	29.7	31.9	34.3	38.2
51.1									

Interpolated Q_1 (cfs) **NMIN =** **5** **min**

0.0	65.3	280.8	631.6	1116.1	1421.5	1593.6	1663.9	1697.1	1710.6
1724.0									

Q_2 (Cfs) Lagged **5** **min**

0.0	0.0	65.3	280.8	631.6	1116.1	1421.5	1593.6	1663.9	1697.1
1710.6									

Unit Hydrograph UI = Q_1 - Q_2

0	65	215	351	485	305	172	70	33	13
13									

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RB	0.5490	1.14	19.3	0.57	0.022	0.532	0.38	0.257	15.4	0.0833	4251.4
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	85.0	170.1	255.1	340.1	425.1	510.2	595.2	680.2	765.3
850.3	935.3	1020.3	1105.4	1190.4	1275.4	1360.5	1445.5	1530.5	1615.5
1700.6	1785.6	1870.6	1955.7	2040.7	2125.7	2210.7	2295.8	2380.8	2465.8
2550.9	2635.9	2720.9	2805.9	2891.0	2976.0	3061.0	3146.1	3231.1	3316.1
3401.1	3486.2	3571.2	3656.2	3741.3	3826.3	3911.3	3996.3	4081.4	4166.4
4251.4									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	3.5	4.6	5.6	6.3	7.1	7.7	8.3	8.9	9.5
10.1	10.6	11.0	11.5	12.0	12.4	12.8	13.1	13.5	13.7
14.1	14.3	14.6	14.9	15.1	15.4	15.7	16.1	16.4	16.8
17.1	17.5	17.9	18.3	18.8	19.2	19.7	20.2	20.7	21.2
21.8	22.4	23.1	23.9	24.6	25.5	26.8	28.8	30.9	34.5
46.1									

Interpolated Q_1 (cfs) **NMIN = 5 min**

0.0	204.2	840.9	1999.2	3117.6	3775.8	4044.0	4170.1	4206.8	4243.6

Q_2 (Cfs) Lagged **5 min**

0.0	0.0	204.2	840.9	1999.2	3117.6	3775.8	4044.0	4170.1	4206.8

Unit Hydrograph UI = Q_1 - Q_2

0	204	637	1158	1118	658	268	126	37	37

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RC	0.6820	1.21	14.0	0.62	0.025	0.607	0.38	0.330	19.8	0.0833	5281.4
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	105.6	211.3	316.9	422.5	528.1	633.8	739.4	845.0	950.6
1056.3	1161.9	1267.5	1373.2	1478.8	1584.4	1690.0	1795.7	1901.3	2006.9
2112.6	2218.2	2323.8	2429.4	2535.1	2640.7	2746.3	2851.9	2957.6	3063.2
3168.8	3274.5	3380.1	3485.7	3591.3	3697.0	3802.6	3908.2	4013.8	4119.5
4225.1	4330.7	4436.4	4542.0	4647.6	4753.2	4858.9	4964.5	5070.1	5175.8
5281.4									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	4.5	5.9	7.1	8.1	9.0	9.9	10.7	11.5	12.2
12.9	13.6	14.2	14.8	15.3	15.9	16.4	16.8	17.3	17.6
18.0	18.4	18.7	19.1	19.4	19.8	20.2	20.6	21.0	21.5
22.0	22.5	23.0	23.5	24.1	24.6	25.2	25.9	26.5	27.2
28.0	28.8	29.7	30.6	31.6	32.8	34.3	36.9	39.7	44.2
59.1									

Interpolated Q_1 (cfs) **NMIN =** **5** **min**

0.0	140.0	647.9	1417.8	2698.8	3763.0	4475.7	4885.9	5077.5	5181.2
5216.8	5252.4								

Q_2 (Cfs) Lagged **5** **min**

0.0	0.0	140.0	647.9	1417.8	2698.8	3763.0	4475.7	4885.9	5077.5
5181.2	5216.8								

Unit Hydrograph UI = Q_1 - Q_2

0	140	508	770	1281	1064	713	410	192	104
36	36								

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RD	0.3660	0.95	10.5	0.47	0.020	0.480	0.38	0.226	13.6	0.0833	2834.3
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	56.7	113.4	170.1	226.7	283.4	340.1	396.8	453.5	510.2
566.9	623.5	680.2	736.9	793.6	850.3	907.0	963.7	1020.3	1077.0
1133.7	1190.4	1247.1	1303.8	1360.5	1417.1	1473.8	1530.5	1587.2	1643.9
1700.6	1757.3	1813.9	1870.6	1927.3	1984.0	2040.7	2097.4	2154.1	2210.7
2267.4	2324.1	2380.8	2437.5	2494.2	2550.9	2607.5	2664.2	2720.9	2777.6
2834.3									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	3.1	4.1	4.9	5.6	6.2	6.8	7.3	7.9	8.4
8.8	9.3	9.7	10.1	10.5	10.9	11.2	11.5	11.8	12.1
12.4	12.6	12.8	13.1	13.3	13.6	13.8	14.1	14.4	14.7
15.1	15.4	15.7	16.1	16.5	16.9	17.3	17.7	18.2	18.7
19.2	19.7	20.3	21.0	21.6	22.5	23.5	25.3	27.2	30.3
40.5									

Interpolated Q_1 (cfs) **NMIN = 5 min**

0.0	179.9	720.7	1691.4	2349.6	2654.4	2771.7	2803.7	2831.5

Q_2 (Cfs) Lagged **5 min**

0.0	0.0	179.9	720.7	1691.4	2349.6	2654.4	2771.7	2803.7

Unit Hydrograph UI = Q_1 - Q_2

0	180	541	971	658	305	117	32	28

Sub-Basin	A	L	S	L_{ca}	K_n	C	m	Lag	Lag	Dt	Q_{ult}
(-)	(mi^2)	(mi)	(ft/mi)	(mi)	(-)	(-)	(-)	(hr)	(min)	(hr)	(cfs)
RE	0.3740	0.95	6.3	0.47	0.020	0.480	0.38	0.249	14.9	0.0833	2896.2
					(Land use)	(USACE)	(USACE)				

Percent Ultimate Discharge (%) (Table 5.5)

0%	2%	4%	6%	8%	10%	12%	14%	16%	18%
20%	22%	24%	26%	28%	30%	32%	34%	36%	38%
40%	42%	44%	46%	48%	50%	52%	54%	56%	58%
60%	62%	64%	66%	68%	70%	72%	74%	76%	78%
80%	82%	84%	86%	88%	90%	92%	94%	96%	98%
100%									

Accumulated Ultimate Discharge (cfs) = Percent Ultimate Discharge Times Q_{ult}

0.0	57.9	115.8	173.8	231.7	289.6	347.5	405.5	463.4	521.3
579.2	637.2	695.1	753.0	810.9	868.9	926.8	984.7	1042.6	1100.6
1158.5	1216.4	1274.3	1332.3	1390.2	1448.1	1506.0	1564.0	1621.9	1679.8
1737.7	1795.7	1853.6	1911.5	1969.4	2027.4	2085.3	2143.2	2201.1	2259.1
2317.0	2374.9	2432.8	2490.8	2548.7	2606.6	2664.5	2722.5	2780.4	2838.3
2896.2									

Phoenix Valley S-Graph Percent Lag (Table 5.5)

0.0	23.0	30.0	36.0	41.0	45.7	50.0	54.1	58.0	61.7
65.2	68.5	71.6	74.6	77.5	80.2	82.7	85.0	87.2	89.0
91.1	92.9	94.6	96.3	98.1	100.0	102.0	104.1	106.3	108.6
111.0	113.5	116.1	118.8	121.6	124.5	127.5	130.7	134.1	137.7
141.5	145.5	149.9	154.6	159.6	165.6	173.6	186.6	200.6	223.6
298.6									

Accumulated Time (min) = Time Percent Lag x Lag

0.0	3.4	4.5	5.4	6.1	6.8	7.5	8.1	8.7	9.2
9.7	10.2	10.7	11.1	11.6	12.0	12.4	12.7	13.0	13.3
13.6	13.9	14.1	14.4	14.7	14.9	15.2	15.6	15.9	16.2
16.6	17.0	17.3	17.8	18.2	18.6	19.1	19.5	20.0	20.6
21.1	21.7	22.4	23.1	23.8	24.7	25.9	27.9	30.0	33.4
44.6									

Interpolated Q_1 (cfs) **NMIN =** **5** **min**

0.0	149.2	609.4	1459.1	2196.7	2618.9	2780.8	2846.5	2872.4

Q_2 (Cfs) Lagged **5** **min**

0.0	0.0	149.2	609.4	1459.1	2196.7	2618.9	2780.8	2846.5

Unit Hydrograph UI = Q_1 - Q_2

0	149	460	850	738	422	162	66	26

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Future Retention Required
Drainage Design Manual for Maricopa County, Hydrology, Chapter 3

Sub-Basin ID	Land Use Type	Land Use Code	Area	Rational Runoff C	100-Yr 2-Hr Rainfall Depth	Retention Required	First Flush Volume	Model Retention	Comments
(-)	(-)	(-)	(ac)	(-)	(in)	(ac-ft)	(ac-ft)	(ac-ft)	(-)
RA			142.72			24.94		11.47	
	BUISNESS PARK (Distribution Center)	C2	24.06	0.95	2.25	4.29	0.95	0.00	Remaining Basins
	MIXED USE	MFR + C1	3.38	0.82	2.25	0.52	0.12	0.42	80% of Retention Req
	MIXED USE (Coldwater Depot III)	MFR + C1	14.80	0.90	2.25	2.50	0.56	0.56	First Flush Retention
	MIXED USE (School)	MFR + C1	10.50	0.82	2.25	1.61	0.36	1.29	80% of Retention Req
	INDUSTRIAL	I1/I2	50.64	0.95	2.25	9.02	2.00	7.22	80% of Retention Req
	INDUSTRIAL (Distribution Center)	I1/I2	39.34	0.95	2.25	7.01	1.56	1.99	Remaining Basins
RB			319.96			56.67		29.29	
	BUISNESS PARK	C2	112.52	0.95	2.25	20.04	4.45	16.03	80% of Retention Req
	CITY CENTER WEST	P	183.14	0.95	2.25	32.62	7.25	7.25	First Flush Retention
	HIGH DENSITY RESIDENTIAL	MFR	24.30	0.88	2.25	4.01	0.89	3.21	80% of Retention Req
	MEDIUM DENSITY RESIDENTIAL (Desert Springs)	MDR	31.40	0.71	2.25	4.18	0.93	2.80	Remaining Basins
RC			436.48			71.22		46.94	
	BUISNESS PARK CC EAST	P	21.09	0.95	2.25	3.76	0.83	0.83	First Flush Retention
	BUISNESS PARK	C2	119.17	0.95	2.25	21.23	4.72	16.98	80% of Retention Req
	MIXED USE	MFR + C1	22.44	0.82	2.25	3.45	0.77	2.76	80% of Retention Req
	COMMERCIAL	C1	20.96	0.75	2.25	2.95	0.66	2.36	80% of Retention Req
	CITY CENTER	P	22.08	0.95	2.25	3.93	0.87	3.15	80% of Retention Req
	LOW DENSITY RESIDENTIAL	LDR	21.95	0.57	2.25	2.35	0.52	1.88	80% of Retention Req
	MEDUIM DENSITY RESIDENTIAL	MDR	30.00	0.71	2.25	3.99	0.89	3.20	80% of Retention Req
	HIGH DENSITY RESIDENTIAL	MFR	52.87	0.88	2.25	8.72	1.94	6.98	80% of Retention Req
	MEDUIM DENSITY RESIDENTIAL AC	MDR	29.34	0.71	2.25	3.91	0.87	3.12	80% of Retention Req
	HIGH DENSITY RESIDENTIAL AC	MFR	20.08	0.88	2.25	3.31	0.74	2.65	80% of Retention Req
	CITY CENTER EAST	P	76.50	0.95	2.25	13.63	3.03	3.03	First Flush Retention
RD			234.24			41.72		33.38	
	BUISNESS PARK	C2	234.24	0.95	2.25	41.72	9.27	33.38	80% of Retention Req
RE			239.36			42.64		34.11	
	BUISNESS PARK	C2	239.36	0.95	2.25	42.64	9.47	34.11	80% of Retention Req

Required Retention $V = C(P/12)A$ (ac-ft) (Equation 3.3)
Where, C = Rational Runoff Coefficient
P = 100-Year 2-Hour Rainfall Depth (in), NOAA Atlas 14 Rainfall Map
A = Drainage Area

Flood Control District of Maricopa County
Van Buren Street 99th Avenue to Agua Fria River Design Concept Report
Contract FCD 2010C004

Rational 100-Year 2-Hour Storm, Basin RE
NOAA Atlas 14 Rainfall

After Retention	Area (ac)	HEC-1 100-y 6-h Q	20% of HEC-1 100-y 6-h Q	20% of Rational Q	Q at RETRE
	(ac)	(cfs)	(cfs)	(cfs)	(cfs)
RE	239.36	571	114		
Starting North RE	160.00	382	76	77	
South RE	79.36	189	38		115

77 > 76 So Use Rational Q

APPENDIX D

Worksheet for VB 10-yr Channel 115th to AFR, S=0.05%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.00050	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	8.00	ft/ft (H:V)
Bottom Width	90.00	ft
Discharge	600.00	ft^3/s

Results

Normal Depth	3.31	ft
Flow Area	364.19	ft^2
Wetted Perimeter	130.39	ft
Hydraulic Radius	2.79	ft
Top Width	129.77	ft
Critical Depth	1.09	ft
Critical Slope	0.02324	ft/ft
Velocity	1.65	ft/s
Velocity Head	0.04	ft
Specific Energy	3.36	ft
Froude Number	0.17	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.31	ft
Critical Depth	1.09	ft
Channel Slope	0.00050	ft/ft

Worksheet for VB 10-yr Channel 115th to AFR, S=0.05%

GVF Output Data

Critical Slope	0.02324	ft/ft

Worksheet for VB 10-yr Channel 115th to AFR, S=0.21%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.00210	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	8.00	ft/ft (H:V)
Bottom Width	50.00	ft
Discharge	600.00	ft^3/s

Results

Normal Depth	2.96	ft
Flow Area	200.53	ft^2
Wetted Perimeter	86.06	ft
Hydraulic Radius	2.33	ft
Top Width	85.52	ft
Critical Depth	1.54	ft
Critical Slope	0.02129	ft/ft
Velocity	2.99	ft/s
Velocity Head	0.14	ft
Specific Energy	3.10	ft
Froude Number	0.34	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	2.96	ft
Critical Depth	1.54	ft
Channel Slope	0.00210	ft/ft

Worksheet for VB 10-yr Channel 115th to AFR, S=0.21%

GVF Output Data

Critical Slope	0.02129	ft/ft

Worksheet for VB 10-yr Channel 115th to AFR, S=0.45%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.00450	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	8.00	ft/ft (H:V)
Bottom Width	30.00	ft
Discharge	600.00	ft^3/s

Results

Normal Depth	3.00	ft
Flow Area	143.95	ft^2
Wetted Perimeter	66.55	ft
Hydraulic Radius	2.16	ft
Top Width	65.99	ft
Critical Depth	2.01	ft
Critical Slope	0.02027	ft/ft
Velocity	4.17	ft/s
Velocity Head	0.27	ft
Specific Energy	3.27	ft
Froude Number	0.50	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.00	ft
Critical Depth	2.01	ft
Channel Slope	0.00450	ft/ft

Worksheet for VB 10-yr Channel 115th to AFR, S=0.45%

GVF Output Data

Critical Slope	0.02027	ft/ft

Worksheet for VB 10-yr Pipe 99th to 115th

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00180	ft/ft
Diameter	5.00	ft
Discharge	100.00	ft^3/s

Results

Normal Depth	3.73	ft
Flow Area	15.69	ft^2
Wetted Perimeter	10.42	ft
Hydraulic Radius	1.51	ft
Top Width	4.36	ft
Critical Depth	2.85	ft
Percent Full	74.5	%
Critical Slope	0.00385	ft/ft
Velocity	6.37	ft/s
Velocity Head	0.63	ft
Specific Energy	4.36	ft
Froude Number	0.59	
Maximum Discharge	118.86	ft^3/s
Discharge Full	110.49	ft^3/s
Slope Full	0.00147	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

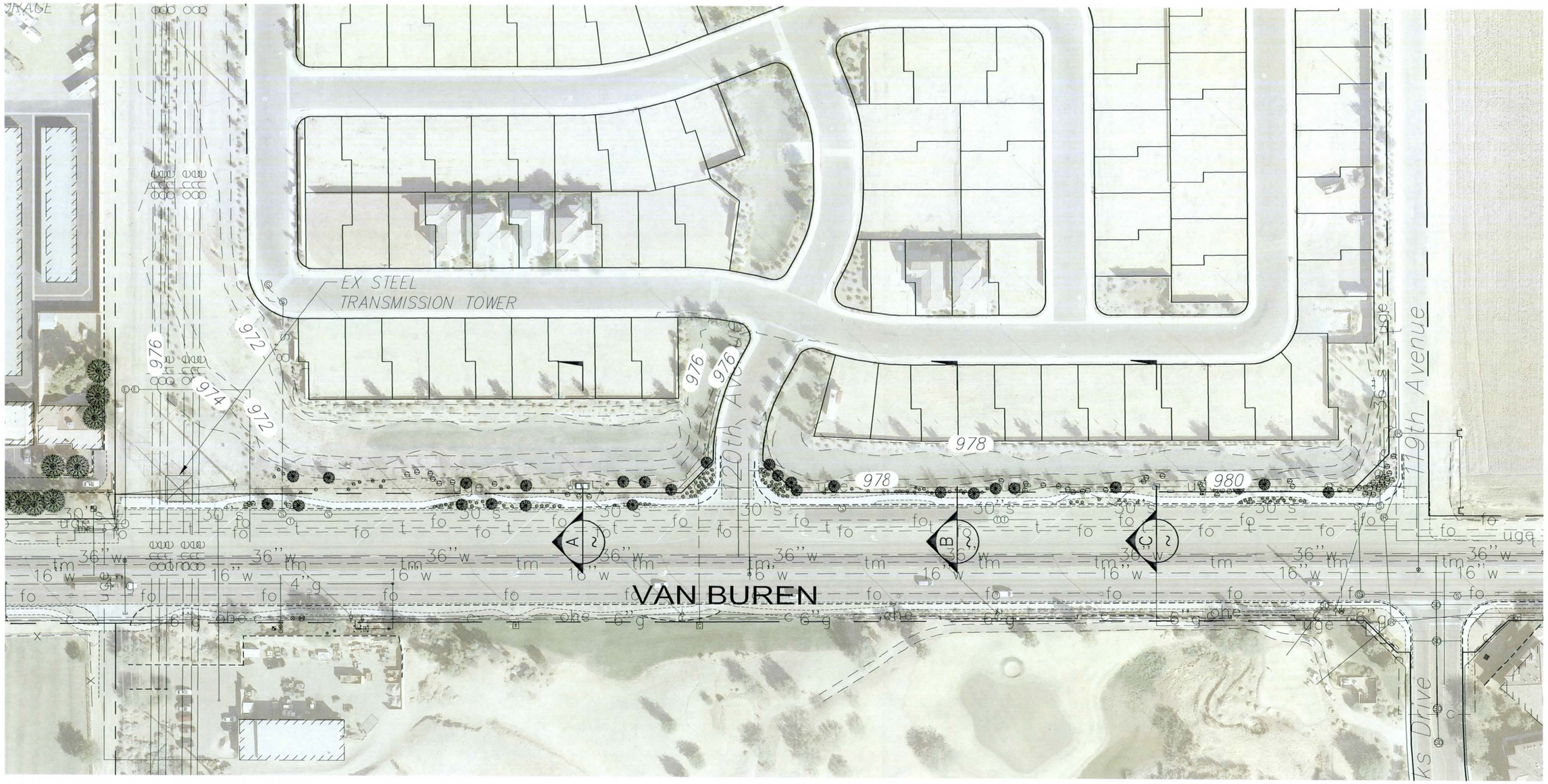
Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	74.52	%
Downstream Velocity	Infinity	ft/s

Worksheet for VB 10-yr Pipe 99th to 115th

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.73	ft
Critical Depth	2.85	ft
Channel Slope	0.00180	ft/ft
Critical Slope	0.00385	ft/ft

DESERT SPRINGS VILLAGE
BASIN CROSS SECTIONS



SCALE
0 100' 200'
HORIZ: 1" = 100'

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
www.sunrise-eng.com

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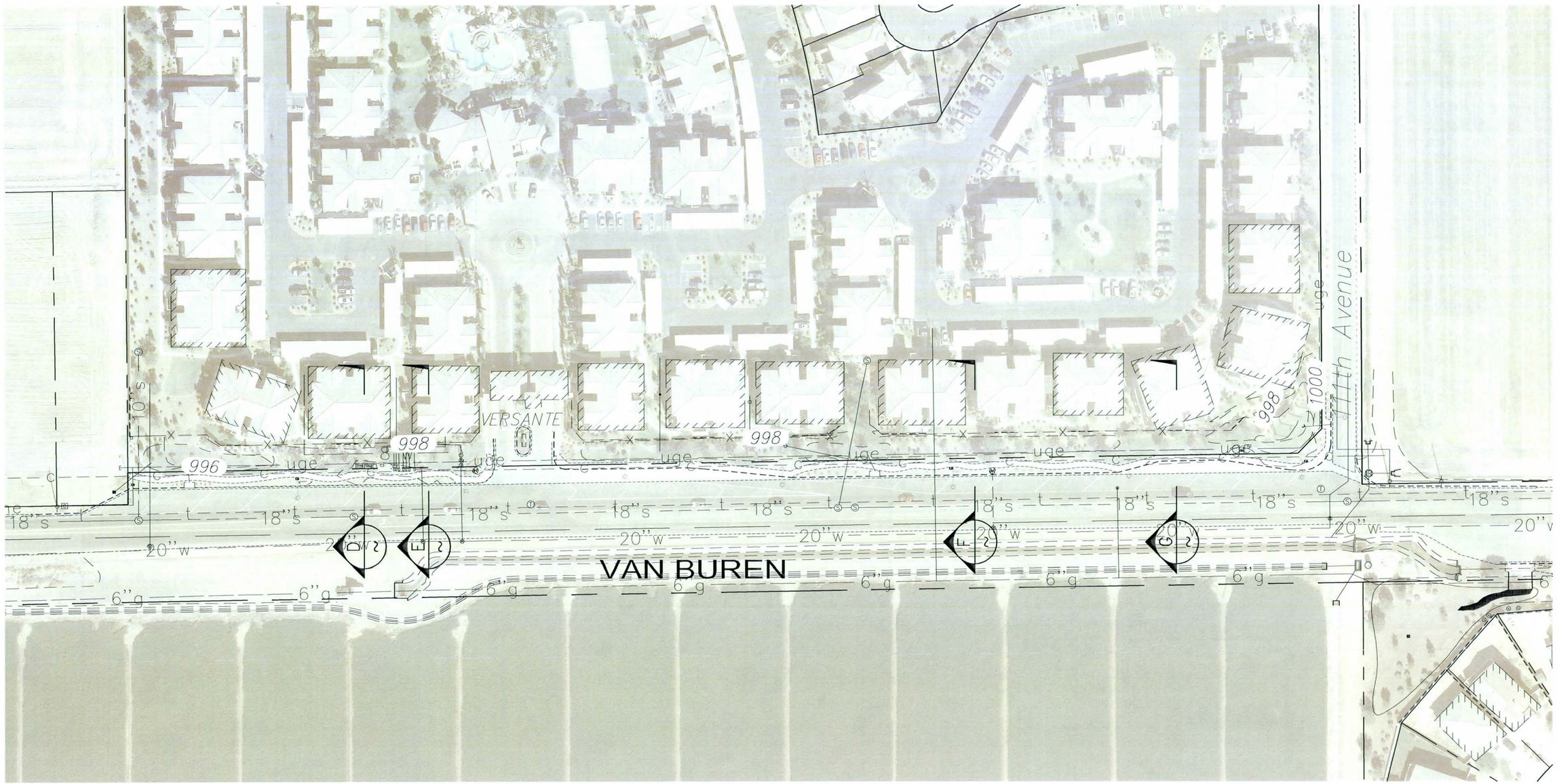
WATERFORD
BASIN CROSS SECTIONS



SCALE
0 100' 200'
HORIZ: 1" = 100'

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TEL 480.768.8600 · FAX 480.768.8609
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Irregular Section (Van Buren DCR #3.fm8) Report

Label	Solve For	Friction Method	Roughness Coefficient	Channel Slope (ft/ft)	Water Surface Elevation (ft)	Elevation Range	Discharge (ft³/s)	Flow Area (ft²)	Wetted Perimeter (ft)	Hydraulic Radius (ft)
DSV-West - Section A	Normal Depth	Manning Formula	0.030	0.00240	974.70	970.81 to 977.90 ft	600.00	134.95	54.41	2.48
DSV-East - Section B	Discharge	Manning Formula	0.030	0.00314	978.50	976.20 to 979.60 ft	263.34	67.68	40.77	1.66
DSV-East - Section B, s=1.0%	Discharge	Manning Formula	0.030	0.01000	978.50	976.20 to 979.60 ft	469.95	67.68	40.77	1.66
DSV-East - Section C	Discharge	Manning Formula	0.030	0.00314	978.50	976.57 to 980.85 ft	132.64	39.84	30.33	1.31
Waterford-West - Section D	Discharge	Manning Formula	0.030	0.01000	998.16	997.00 to 999.00 ft	42.14	14.47	32.11	0.45
Waterford-West - Section E	Discharge	Manning Formula	0.030	0.01000	998.10	996.49 to 998.35 ft	136.42	27.68	27.89	0.99
Waterford-East - Section F	Discharge	Manning Formula	0.030	0.00410	998.60	996.38 to 999.20 ft	53.27	19.54	24.53	0.80
Waterford-East - Section G	Discharge	Manning Formula	0.030	0.00410	999.50	998.83 to 1000.12 ft	14.90	11.79	46.86	0.25

Top Width (ft)	Normal Depth (ft)	Critical Depth (ft)	Critical Slope (ft/ft)	Velocity (ft/s)	Velocity Head (ft)	Specific Energy (ft)	Froude Number	Flow Type
53.59	3.89	2.68	0.01086	4.45	0.31	4.19	0.49	Subcritical
40.10	2.30	1.57	0.01234	3.89	0.24	2.54	0.53	Subcritical
40.10	2.30	2.21	0.01125	6.94	0.75	3.05	0.94	Subcritical
29.91	1.93	1.34	0.01345	3.33	0.17	2.10	0.51	Subcritical
31.49	1.16	0.97	0.01671	2.91	0.13	1.29	0.76	Subcritical
27.63	1.61	1.50	0.01355	4.93	0.38	1.99	0.87	Subcritical
23.39	2.22	1.53	0.01476	2.73	0.12	2.34	0.53	Subcritical
46.80	0.57	0.51	0.02134	1.26	0.02	0.69	0.44	Subcritical

Cross Section for DSV-West - Section A

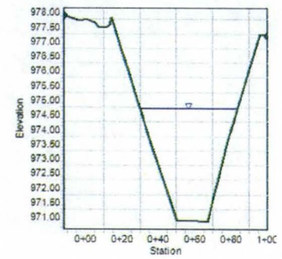
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00240	ft/ft
Normal Depth	3.89	ft
Discharge	600.00	ft³/s

Cross Section Image



Cross Section for DSV-East - Section B

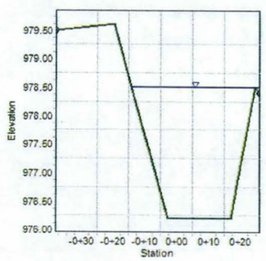
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00314	ft/ft
Normal Depth	2.30	ft
Discharge	263.34	ft³/s

Cross Section Image



Cross Section for DSV-East - Section C

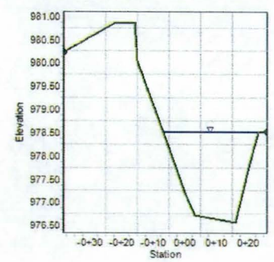
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00314	ft/ft
Normal Depth	1.93	ft
Discharge	132.64	ft³/s

Cross Section Image



Cross Section for Waterford-West - Section D

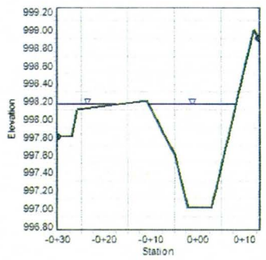
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	1.16	ft
Discharge	42.14	ft³/s

Cross Section Image



Cross Section for Waterford-West - Section E

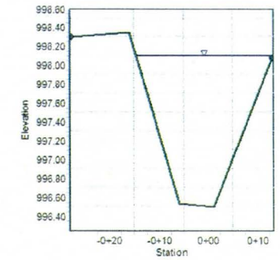
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.01000	ft/ft
Normal Depth	1.61	ft
Discharge	136.42	ft³/s

Cross Section Image



Cross Section for Waterford-East - Section F

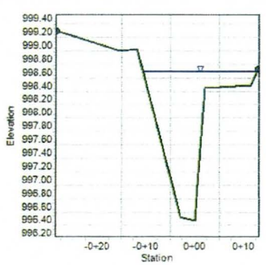
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00410	ft/ft
Normal Depth	2.22	ft
Discharge	53.27	ft³/s

Cross Section Image



Cross Section for Waterford-East - Section G

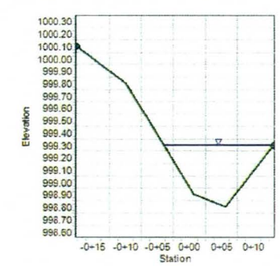
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.00410	ft/ft
Normal Depth	0.50	ft
Discharge	6.96	ft³/s

Cross Section Image



SUNRISE ENGINEERING

Van Buren DCR - Freeboard Calculation

Freeboard calculated using Hydraulics Manual Equation 6.25

Section	Slope %	Depth ft	Velocity ft/sec	FB Calc'd ft	FB - Use* ft
1B	0.05	3.31	1.65	0.84	**1**
2	0.21	2.96	2.99	0.77	**1**
3	0.45	3.00	4.17	0.82	**1**

* Freeboard is 1-foot minimum per Hydraulics Manaul Section 6.5.4

APPENDIX E

Culvert Designer/Analyzer Report
Agua Fria River

Comments: Agua Fria Water Surfaces per District TDN
100-yr = 971.78 ft NAVD88
10-yr=968.07 NAVD88

Use 100-yr level for 10-yr incoming event
Use 10-yr level for 100-yr incoming event

Analysis Component			
Storm Event	Design	Discharge	600.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	600.00 cfs	Check Discharge	1,300.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	971.78 ft

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	4-Box 5 x 4 ft Box	438.23 cfs	972.57 ft	5.48 ft/s
Culvert-2	2-Box 5 x 4 ft Box	161.96 cfs	972.57 ft	4.79 ft/s
Weir	Not Considered	N/A	N/A	N/A
Total	----------	600.19 cfs	972.57 ft	N/A

Add 6" for Flap Gate Headloss
972.57+0.5= **973.1 ft**

Culvert Designer/Analyzer Report
Agua Fria River

Component:Culvert-1

Culvert Summary			
Computed Headwater Elev	972.65 ft	Discharge	438.23 cfs
Inlet Control HW Elev.	971.78 ft	Tailwater Elevation	971.78 ft
Outlet Control HW Elev.	972.65 ft	Control Type	Outlet Control
Headwater Depth/Height	1.54		

Grades			
Upstream Invert	966.50 ft	Downstream Invert	966.40 ft
Length	47.62 ft	Constructed Slope	0.000500 ft/ft

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	5.38 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	2.46 ft
Velocity Downstream	5.48 ft/s	Critical Slope	0.004549 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.00 ft
Section Size	Box 5 x 4 ft	Rise	4.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev.	972.65 ft	Upstream Velocity Head	0.47 ft
Ke	0.50	Entrance Loss	0.23 ft

Inlet Control Properties			
Inlet Control HW Elev.	971.78 ft	Flow Control	Unsubmerged
Inlet Type	30 to 75° wingwall flares	Area Full	80.0 ft²
K	0.02600	HDS 5 Chart	8
M	1.00000	HDS 5 Scale	1
C	0.03470	Equation Form	1
Y	0.86000		

Culvert Designer/Analyzer Report
Agua Fria River

Component:Culvert-2

Culvert Summary			
Computed Headwater Eleva	972.57 ft	Discharge	161.96 cfs
Inlet Control HW Elev.	971.93 ft	Tailwater Elevation	971.78 ft
Outlet Control HW Elev.	972.57 ft	Control Type	Outlet Control
Headwater Depth/Height	1.02		

Grades			
Upstream Invert	968.50 ft	Downstream Invert	968.40 ft
Length	200.00 ft	Constructed Slope	0.000500 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	3.38 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	2.01 ft
Velocity Downstream	4.79 ft/s	Critical Slope	0.004287 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.00 ft
Section Size	Box 5 x 4 ft	Rise	4.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	972.57 ft	Upstream Velocity Head	0.33 ft
Ke	0.70	Entrance Loss	0.23 ft

Inlet Control Properties			
Inlet Control HW Elev.	971.93 ft	Flow Control	Unsubmerged
Inlet Type	0° wingwall flares	Area Full	40.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Designer/Analyzer Report
Agua Fria River

Comments: Agua Fria Water Surfaces per District TDN
100-yr = 971.78 ft NAVD88
10-yr=968.07 NAVD88

Use 100-yr level for 10-yr incoming event
Use 10-yr level for 100-yr incoming event

Analysis Component			
Storm Event	Check	Discharge	1,300.00 cfs

Peak Discharge Method: User-Specified			
Design Discharge	600.00 cfs	Check Discharge	1,300.00 cfs

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	968.07 ft

Name	Description	Discharge	HW Elev.	Velocity
Culvert-1	4-Box 5 x 4 ft Box	963.80 cfs	974.98 ft	12.05 ft/s
Culvert-2	2-Box 5 x 4 ft Box	336.11 cfs	974.98 ft	10.26 ft/s
Weir	Not Considered	N/A	N/A	N/A
Total	----------	1,299.92 cfs	974.98 ft	N/A

Add 6" for Flap Gate Headloss
974.98+0.5= **976.0 ft**

Culvert Designer/Analyzer Report
Agua Fria River

Component:Culvert-1

Culvert Summary			
Computed Headwater Elev	974.98 ft	Discharge	963.80 cfs
Inlet Control HW Elev.	974.98 ft	Tailwater Elevation	968.07 ft
Outlet Control HW Elev.	974.32 ft	Control Type	Inlet Control
Headwater Depth/Height	2.12		

Grades			
Upstream Invert	966.50 ft	Downstream Invert	966.40 ft
Length	47.62 ft	Constructed Slope	0.000500 ft/ft

Hydraulic Profile			
Profile	PressureProfile	Depth, Downstream	4.00 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	4.00 ft
Velocity Downstream	12.05 ft/s	Critical Slope	0.009653 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.00 ft
Section Size	Box 5 x 4 ft	Rise	4.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev.	974.32 ft	Upstream Velocity Head	2.26 ft
Ke	0.50	Entrance Loss	1.13 ft

Inlet Control Properties			
Inlet Control HW Elev.	974.98 ft	Flow Control	Submerged
Inlet Type	30 to 75° wingwall flares	Area Full	80.0 ft²
K	0.02600	HDS 5 Chart	8
M	1.00000	HDS 5 Scale	1
C	0.03470	Equation Form	1
Y	0.86000		

Culvert Designer/Analyzer Report
Agua Fria River

Component:Culvert-2

Culvert Summary			
Computed Headwater Elev	974.98 ft	Discharge	336.11 cfs
Inlet Control HW Elev.	974.77 ft	Tailwater Elevation	968.07 ft
Outlet Control HW Elev.	974.98 ft	Control Type	Outlet Control
Headwater Depth/Height	1.62		

Grades			
Upstream Invert	968.50 ft	Downstream Invert	968.40 ft
Length	200.00 ft	Constructed Slope	0.000500 ft/ft

Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	3.27 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	3.27 ft
Velocity Downstream	10.26 ft/s	Critical Slope	0.005064 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.00 ft
Section Size	Box 5 x 4 ft	Rise	4.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev.	974.98 ft	Upstream Velocity Head	1.10 ft
Ke	0.70	Entrance Loss	0.77 ft

Inlet Control Properties			
Inlet Control HW Elev.	974.77 ft	Flow Control	Submerged
Inlet Type	0° wingwall flares	Area Full	40.0 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Culvert Calculator Report
VB 10-yr Culvert 115th to AFR. s=0.0005

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	103.48 ft	Headwater Depth/Height	0.92
Computed Headwater Elev	103.69 ft	Discharge	600.00 cfs
Inlet Control HW Elev.	103.09 ft	Tailwater Elevation	103.09 ft
Outlet Control HW Elev.	103.69 ft	Control Type	Outlet Control

Grades			
Upstream Invert	100.00 ft	Downstream Invert	99.95 ft
Length	100.00 ft	Constructed Slope	0.000500 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	3.14 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	1.91 ft
Velocity Downstream	4.78 ft/s	Critical Slope	0.003056 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	4		

Outlet Control Properties			
Outlet Control HW Elev.	103.69 ft	Upstream Velocity Head	0.35 ft
Ke	0.50	Entrance Loss	0.17 ft

Inlet Control Properties			
Inlet Control HW Elev.	103.09 ft	Flow Control	Unsubmerged
Inlet Type	30 to 75° wingwall flares	Area Full	160.0 ft²
K	0.02600	HDS 5 Chart	8
M	1.00000	HDS 5 Scale	1
C	0.03470	Equation Form	1
Y	0.86000		

Culvert Calculator Report
VB 10-yr Culvert 115th to AFR. s=0.0021

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	105.00 ft	Headwater Depth/Height	1.02
Computed Headwater Elev	104.06 ft	Discharge	600.00 cfs
Inlet Control HW Elev.	103.73 ft	Tailwater Elevation	103.00 ft
Outlet Control HW Elev.	104.06 ft	Control Type	Outlet Control

Grades			
Upstream Invert	100.00 ft	Downstream Invert	99.79 ft
Length	100.00 ft	Constructed Slope	0.002100 ft/ft

Hydraulic Profile			
Profile	M1	Depth, Downstream	3.21 ft
Slope Type	Mild	Normal Depth	2.65 ft
Flow Regime	Subcritical	Critical Depth	2.32 ft
Velocity Downstream	6.23 ft/s	Critical Slope	0.003092 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev.	104.06 ft	Upstream Velocity Head	0.66 ft
Ke	0.50	Entrance Loss	0.33 ft

Inlet Control Properties			
Inlet Control HW Elev.	103.73 ft	Flow Control	Unsubmerged
Inlet Type	30 to 75° wingwall flares	Area Full	120.0 ft²
K	0.02600	HDS 5 Chart	8
M	1.00000	HDS 5 Scale	1
C	0.03470	Equation Form	1
Y	0.86000		

Culvert Calculator Report
VB 10-yr Culvert 115th to AFR. s=0.0045

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	105.00 ft	Headwater Depth/Height	1.00
Computed Headwater Eleva	104.01 ft	Discharge	600.00 cfs
Inlet Control HW Elev.	103.73 ft	Tailwater Elevation	103.00 ft
Outlet Control HW Elev.	104.01 ft	Control Type	Outlet Control

Grades			
Upstream Invert	100.00 ft	Downstream Invert	99.55 ft
Length	100.00 ft	Constructed Slope	0.004500 ft/ft

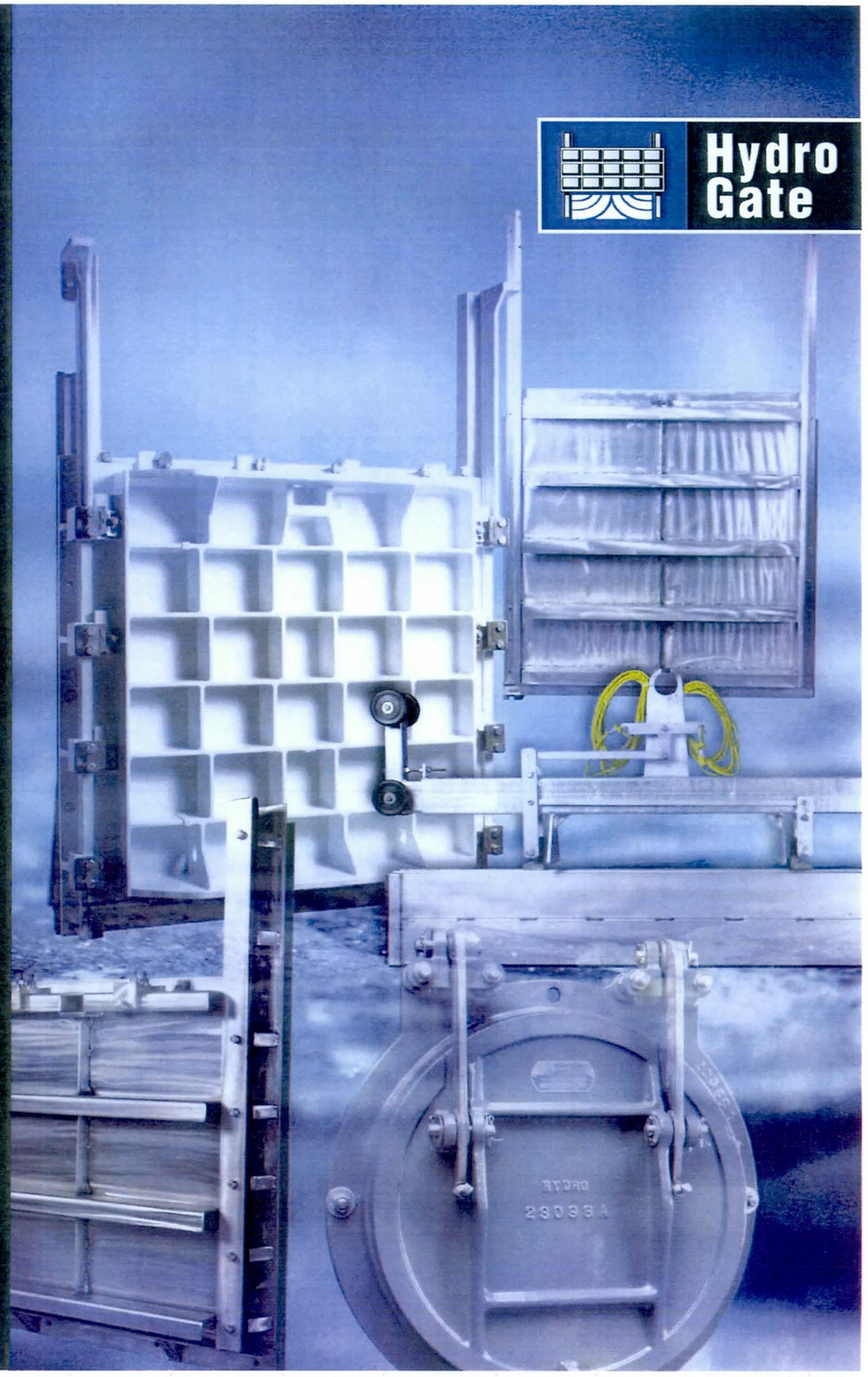
Hydraulic Profile			
Profile	S1	Depth, Downstream	3.45 ft
Slope Type	Steep	Normal Depth	2.04 ft
Flow Regime	Subcritical	Critical Depth	2.32 ft
Velocity Downstream	5.80 ft/s	Critical Slope	0.003092 ft/ft

Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	10.00 ft
Section Size	10 x 4 ft	Rise	4.00 ft
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev.	104.01 ft	Upstream Velocity Head	0.73 ft
Ke	0.50	Entrance Loss	0.37 ft

Inlet Control Properties			
Inlet Control HW Elev.	103.73 ft	Flow Control	Unsubmerged
Inlet Type	30 to 75° wingwall flares	Area Full	120.0 ft²
K	0.02600	HDS 5 Chart	8
M	1.00000	HDS 5 Scale	1
C	0.03470	Equation Form	1
Y	0.86000		

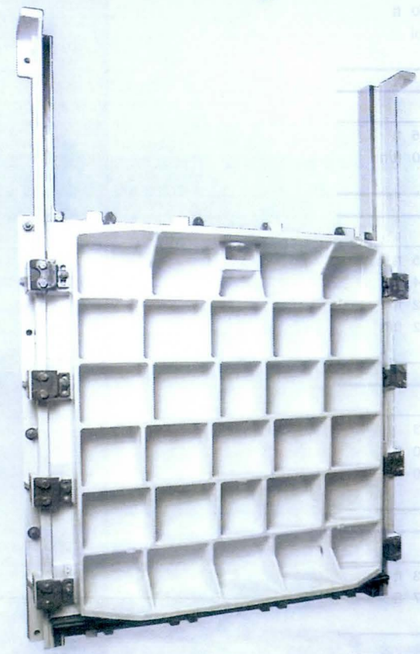
Flap Gates



Pioneers in Gate Design

Hydro Gate

3888 E. 45th Ave.
#120
Denver, CO 80216



With more than 100 years of experience in gate design, Hydro Gate has built a long-standing reputation of providing superior quality water control gates for a variety of industries. Our manufacturing expertise revolves around making big, heavy-duty gates that are 100% custom-built to match specific applications.

Commitment to You... Our Customer

At Hydro Gate, customer satisfaction is our top priority. Bring your special requirements to our engineers who have years of experience in gate design. Our dedicated customer service staff is accustomed to custom requests, because that is what we do best. From your first contact through final delivery, our team of engineers and service experts are here to make sure you have the right gates to suit your needs.

Your Source for Water Control Gates

No matter what type of gates your project demands, chances are excellent Hydro Gate has the right gates for your specific application. Our product offering is vast and can suit applications for a wide variety of industries. Choose from cast iron slide or flap gates, fabricated slide or flap gates, rectangular butterfly gates, stop logs, wall thimbles, lifts and accessories.

Industries We Serve

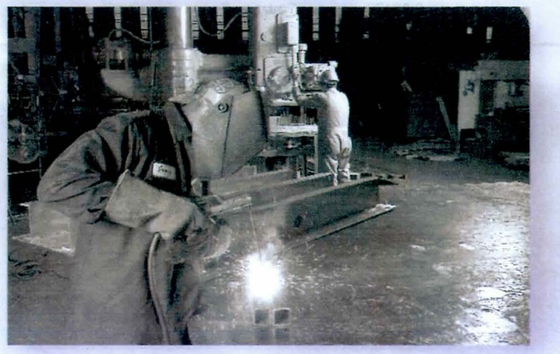
Whether you need gates for flood control, wastewater treatment, environmental water treatment, irrigation, dam projects or hydroelectric plants, we can help. From standard configurations to custom designs, Hydro Gate offers a wide variety of water control gates as well as a full complement of actuators to meet your specific application.

Service Well Beyond Shipment

Our services extend beyond manufacturing. Hydro Gate's experienced field service technicians can help you with repair and refurbishment projects. If you have existing, yet serviceable gates, we can perform a retrofit that will extend their life and durability.

Focus on Quality

Hydro Gates expansive 90,000 square foot manufacturing facility utilizes precision equipment that allows us to merge time-tested gate design with cutting edge technology. We offer large scale manufacturing capabilities with the ability to produce cast iron gates up to 14' x 16' in size, and fabricated gates up to and over 20' in width or height.



Flap Gates

Hydro Gate

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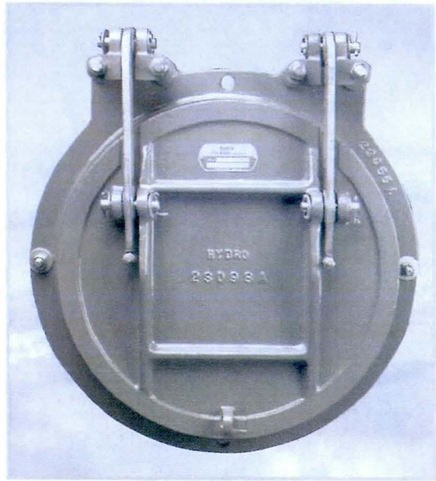
Flap Gates



24" Heavy Duty Flap Gate

Applications

- Flood Control
- Municipal Projects
- Farm Levees
- Sewer Outfalls
- Industrial Waste Lines
- Water and Sewage Treatment Plants
- Tidal Drainage
- Irrigation Systems
- Pump Discharge Control

Description

Hydro Gate flap gates are made of cast iron or ductile iron, depending on the type of service. A small differential pressure on the back of the gate causes it to open automatically to allow discharge through levees, sewer lines or drainage conduits. When water on the face side of the gate rises above water on the back side, the gate closes automatically to prevent backflow.

Flap gates are equipped with flat-back seats for attaching to wall thimbles, new concrete headwalls, existing walls or pipe flanges. The seat or frame of the flap gate is attached to a wall or pipe flange and forms the opening through which water passes. Since the gate opens or closes automatically, a mechanical lifting device is not necessary.

Automatic drainage gates must be kept clean if they are to function correctly. The hinged flap acts as a natural skimmer to cause timber, logs or trash to catch between the flap and the seat at low flow. Periodic inspection and cleaning should be scheduled when the water flowing through the flap gate carries floating material.

To make the gate more self-cleaning, it should be mounted 12 to 18 in. above the apron in front of the gate. This allows room at the bottom for floating material to work its way out and makes the gate flap somewhat self-cleaning.

Seat (Frames)

A seat (or frame) is a one-piece casting. The seating face is cast and machined at an angle off vertical so that the hinged cover has a horizontal force component to completely seat the gate by gravity.

Corrosion-resistant seating faces are pneumatically impacted into dovetail grooves for heavy-duty gates. All seating faces (above 4" diameter) are machined flat and to a 63 micro-inch finish.

When rubber seats are specified, the gumdrop cross-section rubber seal is locked into a deep dovetail groove in the seat.

Flaps (Covers)

Flaps are iron castings of reinforced flat plate design. Reinforcing ribs (both horizontal and vertical) are cast integrally along with bosses for the hinges.

Corrosion-resistant seating faces are attached as described in the previous section for frames.

Double-Hinge Action

For proper seating of a flap gate, double-hinge action is necessary. The main hinge action on any flap gate is about its upper pivot points. However, flexibility is required at the bottom pivot points to allow seating of the flap against the seat. All Hydro Gate flap gates have this double action with bushings at each pivot point.

It is necessary that bottom hinge action be limited. Otherwise, the flap can turn completely over on itself and wedge back in the opening of the gate seat, rendering the gate useless. Heavy-duty circular opening flap gates are provided with hinge arms extending beyond the bottom pivot point. This limits the double-hinge action and prevents the flap from being rotated outward at the bottom. In addition, the bottom end of each hinge arm has a fine adjustment bolt to further limit the double-hinge action. Square or rectangular opening flap gates are also provided with extended links for fine adjustment even though the bottom of the flap cannot be turned into the gate opening as in the round gates.

Lubrication of Pivot Points

Lubrication of pivot points on flap gates is usually not necessary. The construction of the hinge assembly permits only a few degrees of rotation at the bottom pivot points. The gate cover rotates about the upper pivot points through an arc of 90° or less. With this limited rotation, lubrication of bushings is usually not justified nor is it normally recommended by Hydro Gate. When lubrication of flap gate pivot points is desired, two methods can be used:

1. A permanently lubricated bushing is installed at the factory. If lubrication of pivot points is desired, Hydro Gate recommends the permanently lubricated bronze bushing; or
2. Links or hinge arms can be drilled for zerk-type grease fittings for use with ordinary grease guns.

Loss of Head Through Flap Gates

Tests conducted on flap gates show that the loss of head due to the flap riding on the water is very small compared with other losses in the hydraulic structure. Of these head losses, the entrance loss is usually considerably more critical than loss at the flap gate on the outlet end of the conduit.

The Hydraulic Laboratory of the State University of Iowa conducted a series of tests to determine the amount of head lost by water discharging through Model 10C flap gates (formerly Armco-Calco). The gates — 18, 24 and 30 in. in diameter — were supplied from commercial stock.

The following passage is excerpted from the report of Floyd A. Nagler, associate professor of mechanics and hydraulics, who supervised the tests.

"Based on these experiments the following empirical formula was derived to express the loss in head through Calco Gates of varying sizes and with different velocities of flow:
L = loss of head in feet
v = velocity of flow through gate in feet per second
d = diameter of outlet in feet
e = base of natural logarithms
g = acceleration of gravity, 32 ft/sec/sec

$$L = \left(\frac{4v^2}{g}\right) e^{\left(\frac{-1.15v}{\sqrt{d}}\right)}$$

"It may be concluded from these experiments that the Calco gate in its hydraulic characteristics is all that the manufacturers have claimed for it. The small loss in head obtained through these gates demonstrates that their installation has little effect on the discharged capacity of drainage outlets."

Heavy-duty flap gates have heavier flaps or covers than the gate model tested. As a result, head losses through these gates may be slightly more than those indicated by the tests.

Attachment to Concrete Wall or Pipe Flange

Since flap gates open when subjected to a back pressure, only a small unseating force is encountered. When a flap gate is under face or seating head, the force of the water pushes against the cover and only the weight of the gate itself is on the attaching bolts or anchors. For this reason, fasteners are needed only to hold the gate on the wall or flange. There is no hydrostatic force tending to separate the gate from the wall or flange.

In attaching a round heavy-duty flap gate to a pipe flange, the gate is partially drilled to match a 125 lb. ASME bolt circle with only a portion of the holes being used. The cost to full drill the gate seat, mate every hole in the flange, and furnish the additional corrosion-resistant bolts and install them is not justified.

Flanges must be installed perfectly flat. Any warpage of a flange is transferred to the gate seat, preventing the flap to seat properly, particularly at low differential head. (Perfectly flat is generally defined as within plus or minus 1/64 in. of a true theoretical flat plane.)

Adjustable Top Pivot Points

For the adjustable pivot point on Hydro Gate heavy-duty and medium-duty flap gates, four holes are drilled and tapped – two per side – in the flat ears at the top of the gate seat (see Figure 6-1). Threaded studs are screwed into these holes and are securely locked in position.

A double-eared adjustable pivot lug is then placed on these two studs, and hex nuts are placed on both sides of the bosses. Another double set of ears projects to the top of the pivot lug for mounting of the hinge arms. A bushing in the hinge arm works on the body of the assembly pin. This arrangement allows the assembly pins through all pivot points to be in double shear for added strength and also provides for minimum lateral movement of the flap during gate operation.

With the double-nut arrangement on each stud, the top pivot lug can be moved in and out from the wall to vary the location of the top pivot point with respect to the seating face of the gate. All adjusting can be accomplished without removing the gate flap cover from the gate, as is necessary for other pivot arrangements.

The force required to open the gate increases as the pivot lug is moved back toward the wall. When the gate is in a tidal zone or when the gate is partially submerged, the pivot lug can be moved back as far as possible so that the weight of the flap keeps the gate closed. Where less pressure is needed to operate the gate, the pivot lugs are moved farther away from the wall.

Stainless Steel Bumper (Optional)

Gates mounted on a pump discharge pipe (not mounted on a head wall) or mounted in an area where excessive velocities occur should be specified to have a spring bumper (swing) to prevent the cover from being thrown over center over top of gate thus preventing the gate from closing automatically. It also prevents personal injury caused by a flap that is balanced or teetering over center. Designed for gate seat or wall mounting, depending on application or gate size.

Anti-Sway Bar

The anti-sway bar creates a uniform and rigid hinging operation of the gate by tying together all four hinge points. This prevents the gate components from "shaking themselves" loose and progression to failure.

Leakage

Leakage through flap gates decreases as head increases. At very low heads, there may be insufficient force to fully effect a tight, intimate fit of the seats, and somewhat greater leakage is likely.

Opening Pressure

Any significant depth of water behind the gate will cause the cover to unseat a crack and allow drainage. The pivot lug can be adjusted for more or less sensitivity. When adjusted for less sensitivity, greater depth of water (back pressure) will be needed to crack the gate open. Generally, flap gates cannot hold more than a few inches of backwater for an extended length of time.

Safety Notice

Gates (particularly smaller gates) in public areas should be fenced since children playing on or around them can lift the covers and be injured at the cover's pinch points.

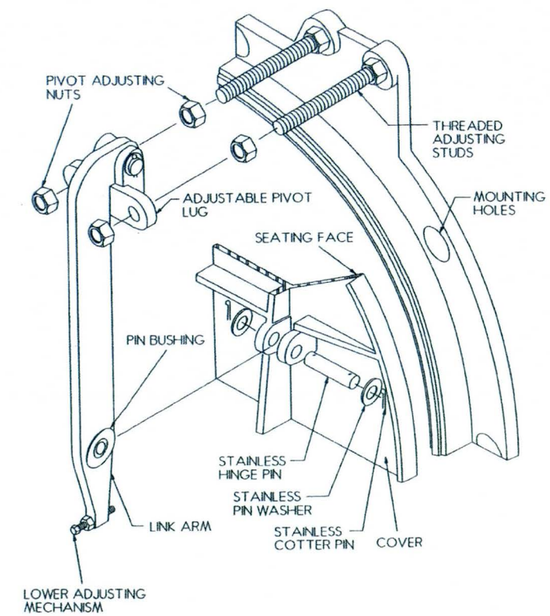
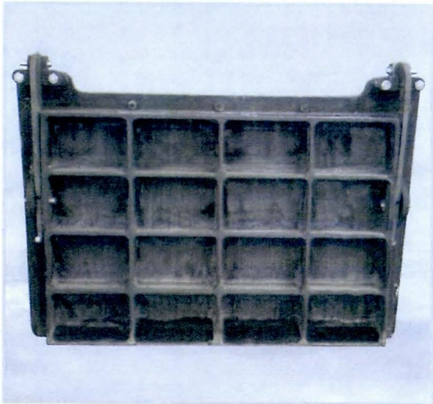


Figure 6-1
Adjustable Top Pivot and Link Assembly

Heavy-Duty Flap Gates



60"x36" Rectangular flap gate installation

Features

- Model 50C (Circular)
- Model 50 (Square or Rectangular)
- Seating heads to 50 ft
- Round, square or rectangular opening
- Flat-back, corrosion-resistant fasteners
- Ductile iron links and lugs

Description

Flat-back seats are for attaching the gate to a concrete wall pipe flange or wall thimble. The back of this gate seat is machined to a plane and drilled. Studs or anchor bolts should be of the same material as gate assembly bolts.

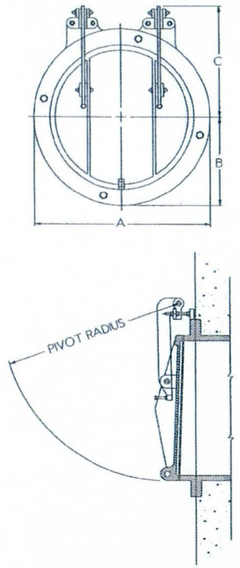
Heavy-duty flap gates have fully adjustable top pivot points. Through the use of two threaded studs, the top pivot point can be moved laterally from the wall to adjust the sensitivity of the gate or to compensate for slight misalignment in installation. The threaded studs with double-locking nuts allow adjustment to be accomplished without disassembly of the gate. By moving the top pivot point back, additional head is required to open the gate as the weight of the flap keeps the gate closed and reduces fluttering action caused by waves. Links or hinge arms are ductile iron and holes at pivot points are bronze bushed. The hinge pins through the links are in double shear due to double-eared pivot lugs at the top of the link and double bosses on the flap at the bottom. All fasteners are furnished in Type 316 stainless steel, for all environmental applications.

A lifting eye is cast integrally with the flap cover to permit manual operation or to hold the gate open. A rubber seating face is recommended in the gate seat if the gate is attached to the discharge end of a pump where slamming action will occur. The seating face on the cover is bronze. This corrosion-resistant face is machined to a plane and makes contact with the rubber on the seat when the gate is closed. The rubber face on the seat is set in a machined dovetail groove that holds it firmly in position without the aid of bolts, pins or adhesive. The rubber face acts as a cushion for the flap as it closes under moderate slamming action. These gates are exceptionally watertight under higher face pressures because of slight deformation of the rubber faces.

Fabricated Heavy Duty Flap Gates

Hydro Gate has the capability to provide a fabricated version of the Heavy Duty Flap Gate for special applications. This type of gate can accommodate odd size requirements or enhanced corrosion resistance than the cast iron line. Fabricated Flap Gates are offered in aluminum, stainless steel, or carbon steel and are designed with rubber seating faces. The fabricated version of the flap gate is designed to have the same functionality and performance as the cast iron version.

Dimensional Data



Model 50C Round Opening for Heads to 50 Ft

Opening Size Dia. (In.)	Dimensions (In.)			Pivot Radius (In.)
	A	B	C	
4	9.00	4.50	5.25	7.31
6	11.00	5.50	8.25	11.75
8	13.50	6.75	9.50	14.00
10	16.00	8.00	9.75	15.25
12	19.00	9.50	10.25	16.75
14	21.25	10.63	12.50	19.75
15	22.25	11.13	12.50	20.31
16	23.50	11.75	13.00	21.25
18	24.75	12.50	15.75	25.00
20	27.50	13.75	16.25	26.25
21	28.00	14.00	16.50	27.38
24	32.00	16.00	19.25	31.25
27	34.75	17.38	21.25	36.00

Opening Size Dia. (In.)	Dimensions (In.)			Pivot Radius (In.)
	A	B	C	
30	38.75	19.38	23.25	38.50
36	46.00	23.00	27.50	45.50
42	53.00	26.50	32.50	53.50
48	59.50	29.75	37.75	61.75
54	66.25	33.25	39.75	67.25
60	73.00	36.50	46.00	76.00
66	80.00	40.00	50.00	83.00
72	86.50	43.25	54.25	90.00
78	93.50	46.75	58.25	97.00
84	100.00	50.00	62.25	104.25
90	106.50	53.25	65.50	111.25
96	113.25	56.63	65.50	117.25
108	125.00	62.50	75.13	129.75

Figure 6-2
Heavy-Duty Flap Gate (Model 50C)

Model 50 Square and Rectangular Openings for Heads to 50 Ft

Opening Dia. (In.)	Dimensions (In.)			Pivot Radius (In.)
	A	B	C	
12 x 12	18.00	9.00	11.25	18.25
18 x 18	25.00	12.50	15.75	25.00
24 x 24	32.00	15.00	19.25	31.25
30 x 18	37.00	12.50	15.75	25.00
30 x 30	40.50	18.75	25.75	40.25
36 x 24	44.00	16.00	21.00	31.25
36 x 36	44.00	22.00	27.50	45.25
42 x 30	52.00	19.25	23.25	38.25
42 x 42	52.00	25.00	32.50	53.25
48 x 24	56.00	16.00	19.00	29.25
48 x 36	56.00	22.00	27.50	46.50
48 x 48	58.00	29.00	37.75	61.75
54 x 36	63.00	22.50	27.50	47.50
54 x 54	64.00	32.00	39.75	66.75
60 x 30	68.00	19.00	24.25	39.75

Opening Dia. (In.)	Dimensions (In.)			Pivot Radius (In.)
	A	B	C	
60 x 36	70.00	23.00	29.00	48.75
60 x 48	70.00	29.00	37.75	61.75
60 x 60	70.00	35.00	45.75	75.75
66 x 42	76.00	26.00	32.75	53.50
66 x 66	76.00	38.00	52.00	85.00
72 x 48	82.00	29.00	37.75	61.75
72 x 60	82.00	35.00	45.75	75.75
72 x 72	82.00	41.00	54.75	90.50
84 x 60	94.00	35.00	46.00	75.75
84 x 84	94.00	47.00	62.25	104.00
96 x 60	108.00	36.00	46.00	76.00
96 x 84	108.00	48.00	62.50	104.00
96 x 96	108.00	54.00	69.00	117.00
108 x 108	120.00	60.00	76.00	138.00
120 x 120	132.00	60.00	81.00	149.00

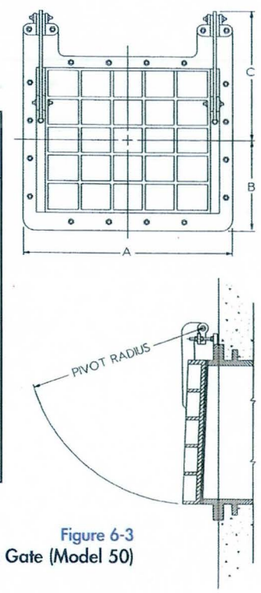


Figure 6-3
Heavy-Duty Flap Gate (Model 50)

Specifications for Heavy-Duty Flap Gates

General

Flap gates and accessories shall be of the size, material and construction shown on the drawings and specified herein. They shall be Hydro Gate heavy-duty flap gates or approved equal, with circular, square or rectangular openings. Similar installations shall have operated successfully for five years or more. All component parts shall be of the type material shown in the "Materials" section of this specification. The Material Combination Number applicable to each gate shall be shown in the "Gate Schedule."

Seat

The seat shall be flat back and shall be cast in one piece with a raised section around the perimeter of the waterway opening to mount the seating faces. The raised section shall provide a seating plane diverging top to bottom from the plane of the mounting flange to assist in positive closure of the cover. The seat shall be shaped to provide two bosses extended above the top of the waterway opening for mounting the pivot lugs. Pivot lug bosses shall be drilled and tapped for mounting studs. The back of the seat shall be machined to a plane and drilled to mate the anchor or stud layout. Gates attached to concrete shall be mounted on anchor bolts and grouted in place.

Cover

The cover shall be cast in one piece with necessary reinforcing ribs, a lifting eye for manual operation, and with bosses to provide a pivot point connection with the links. Bosses shall be designed to place the hinge pins in double shear when the gate is assembled.

Seating Faces

A full-width, dovetail slot shall be machined around the perimeter of the cover and the seat. Corrosion-resistant dovetail seating faces shall be mounted in the slot and held securely without use of screws or other fasteners. The seating faces shall be machined to a plane with a minimum 63 micro-inch finish.

Flap gates subjected to pump discharge slamming action shall have a rubber seating face on the seat. Rubber seating faces shall be mounted in a dovetail slot and held securely without use of pins or screws. The seating face on the cover shall be as specified in the previous section.

Pivot Lugs

Each pivot lug shall be cast in one piece. Lugs shall have double bosses to place the top hinge pins in double shear when they are assembled through the link. The lugs shall be adjustable in the horizontal plane without removal of the cover from the gate links. The adjustment shall allow the top pivot point to be moved toward the gate seat for reduced sensitivity of the cover, or moved away from the gate seat to provide opening with minimum differential head. Two corrosion-resistant studs shall be used to connect each pivot lug to the gate seat.

Links

The links connecting the cover and pivot lugs shall be heavy duty and cast in one piece. Each link shall be provided with commercial grade, corrosion-resistant bushings at each pivot point. The bottom of the links shall be provided with an adjusting screw to properly align seating faces on the cover with respect to the seat. The links shall be designed to limit the double hinge action, preventing the cover from rotating sufficiently to become wedged in the open position.

Fasteners

All anchor bolts, assembly bolts, screws, studs and nuts shall be of ample size to safely withstand the forces created by operation of the gate under the heads shown in the "Gate Schedule". Quantity and size of the fasteners shall be recommended by the manufacturer. Anchor bolts shall be furnished with two nuts each to facilitate installation and alignment of the gates when attached to concrete.

Painting

Machined surfaces shall be coated with a water-resistant, rust-preventive compound. All cast iron parts shall be shop cleaned and painted in accordance with the manufacturer's standard practice.

Drawings for Approval

Drawings showing the dimensions and details required to locate and install the component assemblies shall be submitted for the engineer's approval prior to fabrication.

Installation

Installation of all parts shall be done by the contractor in a workmanlike manner and in accordance with the manufacturer's instructions. It shall be the contractor's responsibility to handle, store and install the gate in strict accord with the manufacturer's drawings and recommendations.

Materials

Hydro Gate Flap Gates are manufactured in one standard material combination, as listed below. Various components of the flap gate are available in other materials when absolutely required by the customer. Any material variations are subject to additional costs. Optional materials listed below are not necessarily all inclusive. Please contact Hydro Gate engineering for any additional clarification on optional materials.

Seat and Cover
Standard Material: Cast Iron, ASTM A126, Class B
Optional Materials: Austenitic Gray Iron (Ni-Resist), ASTM A436
Ductile Iron, ASTM A536 Grade 80-55-06

Seating Faces
Standard Material: Silicon Bronze, ASTM B98, Alloy 651
Optional Materials: Neoprene, ASTM D2000, Grade 1BE625

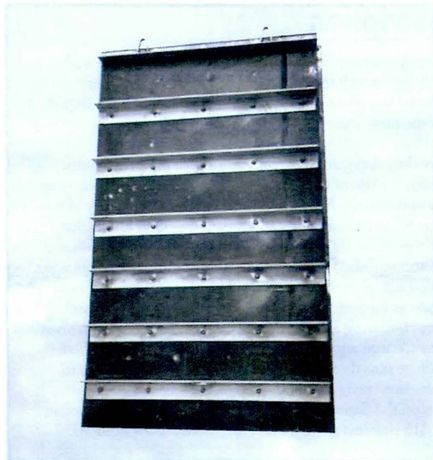
Pivot Lugs
Standard Material: Ductile Iron, ASTM A536 Grade 80-55-06
Optional Materials: Austenitic Gray Iron (Ni-Resist), ASTM A436

Links
Standard Material: Ductile Iron, ASTM A536 Grade 80-55-06
Optional Materials: Austenitic Gray Iron (Ni-Resist), ASTM A436
Stainless Steel, ASTM A276, Type 304 or 316

Bushings
Standard Material: Bronze, ASTM B584, Alloy 932
Optional Materials: Self-Lubricating Bronze, (various)
Stainless Steel, ASTM A276, Type 304 or 316

Fasteners
Standard Material: Stainless Steel, ASTM F593 (Bolts), Alloy Group 2, Type 316

Flexible (Rubber) Flap Gates



Applications

- Very low unseating head requirements
- Pump discharge
- Coastal tide basin drainage
- Combined sewage overflow requirements

Description

Flexible Flap Gates are manufactured with a stainless steel frame and a reinforced neoprene cover. To aid in the sealing of the gate, a flexible neoprene seal is mounted to the stainless steel frame.

These gates are quiet operating and require very little maintenance. Should debris collect behind the cover it is easily removed or flushed out. These gates are ideally suited for pump discharge and wave action. There are no hinge pins to wear out and they never need painting. The Flexible Flap Gate can be mounted to a fabricated wall thimble or to a concrete wall with the incorporation of a grout pad.

These gates are available in a variety of sizes. For the minimum and maximum gate sizes available, please consult Hydro Gate's Engineering staff.

When specifying Hydro Gate's Flexible Flap Gate be sure to consider the characteristics of the water, the gate's function, the opening size and the maximum head requirements. Hydro Gate's Engineering staff is experienced in answering any of the questions you may have concerning the design and use of the Flexible Flap Gate.

Features

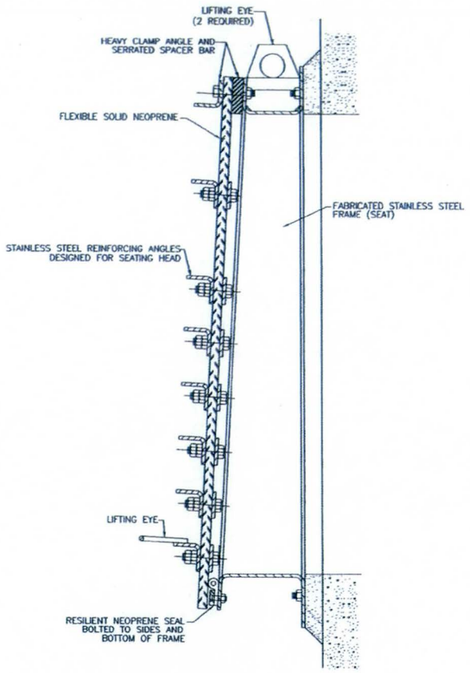
- Stainless steel frame (seat)
- Flexible fiber reinforced neoprene cover (flap), one inch thick for most applications
- Stainless steel reinforcing angles bolted to cover with full width stainless steel backer bar
- Resilient neoprene hollow bulb seal bolted to frame for seating seal
- Flexible continuous hinge integral with neoprene cover

Design and application features:

- Simple rugged design
- Low head loss, low cracking pressure, self draining
- Quiet operation, no slamming metal to metal
- Withstands pump discharge and reverse flow slamming and wave action
- Tolerates debris, cover molds around objects
- Corrosion resistant to most water born contaminates, resistant to algae and marine growth
- No painting, no lubrication, no broken hinges, links or worn pins
- Smooth design for easy flushing

Hydro Gate rubber flap gates are best suited for wall mounting on anchor bolts and grout pad. They can also be mounted on a fabricated or cast iron thimble; however, the back flange is un-machined which requires heavy layer of mastic or a thick soft gasket to seal the flange joint.

Gates larger (width or height) than 42 inches may require seaming and bonding of the rubber flap due to available rubber sheet width. Multiple gate openings or multiple gates may be used in lieu of a seamed rubber cover. Multiple gate openings prevent debris from catching in the frame members. Contact Hydro Gate Engineering Department for recommendation for your specific application.



Rubber Flap Gate — Section View

Specification for Flexible (Rubber) Flap Gate

Flexible flap gates shall be of size and material grades as specified herein and as shown on drawings and gate schedule. They shall be Hydro Gate Flexible Flap Gate or approved equal. They shall be square or rectangular or multiple opening style.

Frame

Frame shall be fabricated from stainless steel type 304. The frame shall have a diverging face top to bottom to assist in positive closure of the flap. The frame shall be provided with a rear attaching flange, holes to mount, and a concrete structure with a grout pad. Two lifting lugs shall be provided on the frame for handling and installation hanging.

Cover (Flap)

The cover shall be fabricated from fabric reinforced neoprene rubber and type 304 stainless steel reinforcing angles attached to the rubber sheet with stainless steel through bolts and backing bars. The bolts shall be caulked or sealed to prevent leakage through the boltholes. The size and quantity of reinforcing beams shall be designed to withstand the maximum hydrostatic force applied to the gate. The hinge end of the cover shall be securely bolted to the frame with heaving clamping bars and bolts.

The rubber cover sheet shall be one piece without seams. The rubber thickness shall be sufficient to prevent excessive "ballooning" under hydrostatic pressure. Gate widths greater than available rubber sheet shall be furnished with multiple (side by side) openings.

The flap cover shall have a lifting lug at its lower end to facilitate lifting for cleaning.

Hinge

The hinge shall be flexible type integral with the flexible rubber cover.

Seating Surfaces

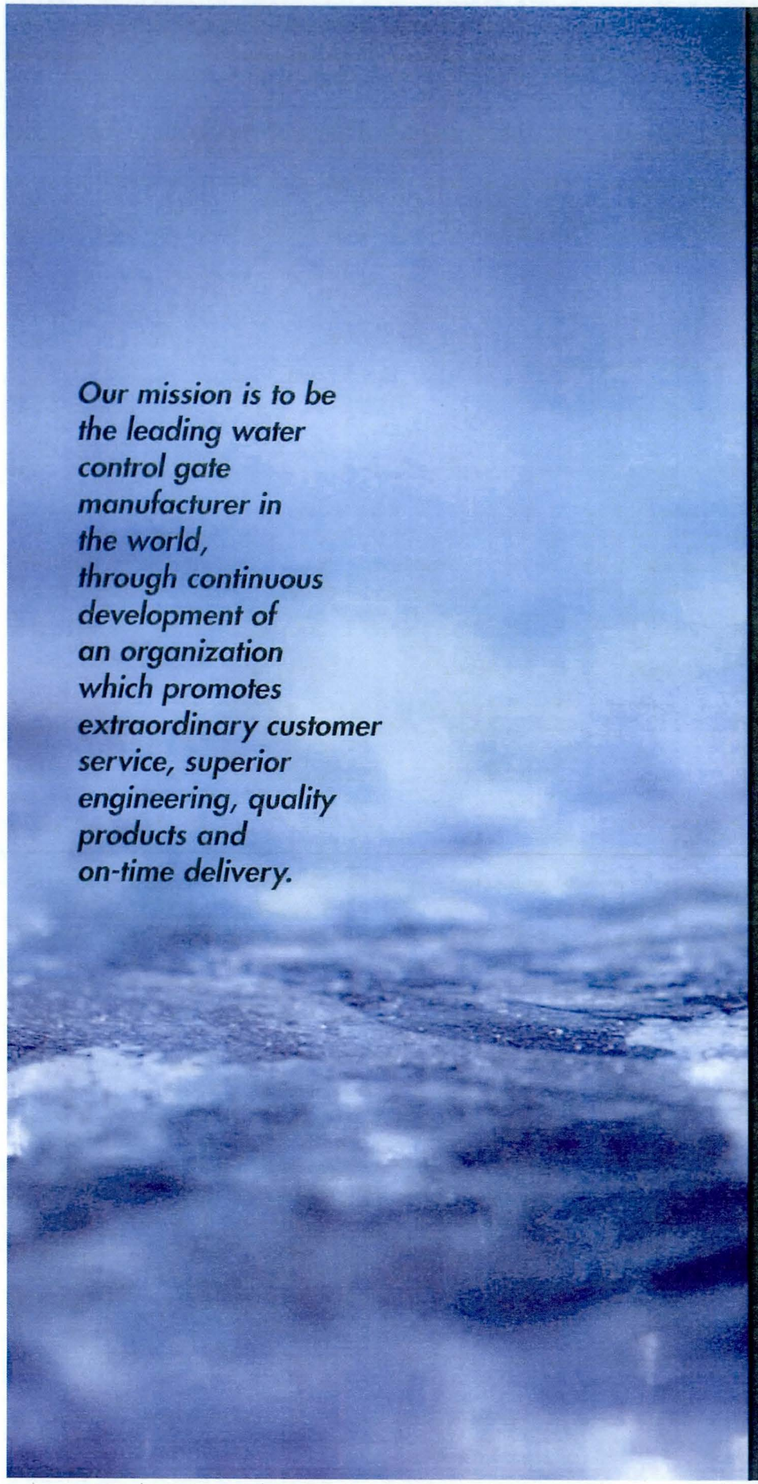
Resilient hollow section or lip type rubber seals shall be attached to the divergent face of the gate frame with bolts and stainless steel retainer bars. The resilient seals shall provide a high degree of water tightness.

Limitations

Hydro Gate wants to be sure that flexible flap gates will meet the requirements of the project. Before specifying gates wider than 60" and head pressures more than twice the gate height, contact Hydro Gate Engineering Department for design and material limits. Provide information about the type of service, type of water, maximum seating heads and mounting information.

Gate Schedule

Quantity Required	Size of Opening (In.)	Back Type	Seating Head (Ft)	Remarks



Hydro Gate

Your Source for Water Control Gates

Hydro Gate

Toll Free 800-678-8228
303-287-8531 (fax)
www.hydrogate.com

FLAP1106

Ricky Holston

From: Justin Baker <jbaker@hydrogate.com>
Sent: Friday, October 12, 2012 4:02 PM
To: Ricky Holston
Cc: 'Gary Wesch - FCDX'
Subject: RE: Van Buren DCR Flap Gates

Hi Ricky,

Sorry for the delayed response.

This is to confirm that the Hydro Gate flap gates in question are appropriate for the structure and implied usage requirements. Hydro Gate's standard 50c cast iron flap gates are designed to seat and remain in the closed position under up to 50 feet of seating head pressure. The gates are designed to open under any positive unbalanced unseating head condition. This is achieved through shop adjustment of the pivot lugs and arms. There is no industry specified leakage rate for flap gates, but under sufficient seating head pressure, the gates are typically water tight. The Armtec head loss charts are representative of the Hydro Gate model, as they both come from the same root manufacturer, Armco. I use the same interpolative approach to calculating head loss for square or rectangular gates as you have described below. For light duty, low head applications with minimal adjustability requirements, you may want to take a look at the model 10c gates available from Fresno Valves (http://www.fresnovalves.com/flapgate.htm). These gates are also derived from the same core product as our 50c gates.

Thanks,

Justin Baker
Engineering Manager
303-288-7873 ext. 230

From: Ricky Holston [mailto:rholston@sunrise-eng.com]
Sent: Tuesday, September 18, 2012 10:22 AM
To: jbaker@hydrogate.com
Cc: Gary Wesch - FCDX
Subject: Van Buren DCR Flap Gates

Justin,

Thanks for taking my call this morning. We are looking for a letter or email to give the Flood Control District of Maricopa County that says the flaps gates we are specifying are appropriate for the design, the assumptions we made for the headloss are appropriate, and some words about low flow conditions.

I've attached the culvert calculations for the box culvert array we designed. Its 3 5'x4' boxes just above river invert and another 2 box 2ft above river invert. The plans attached give invert profile and water surface elevation data.

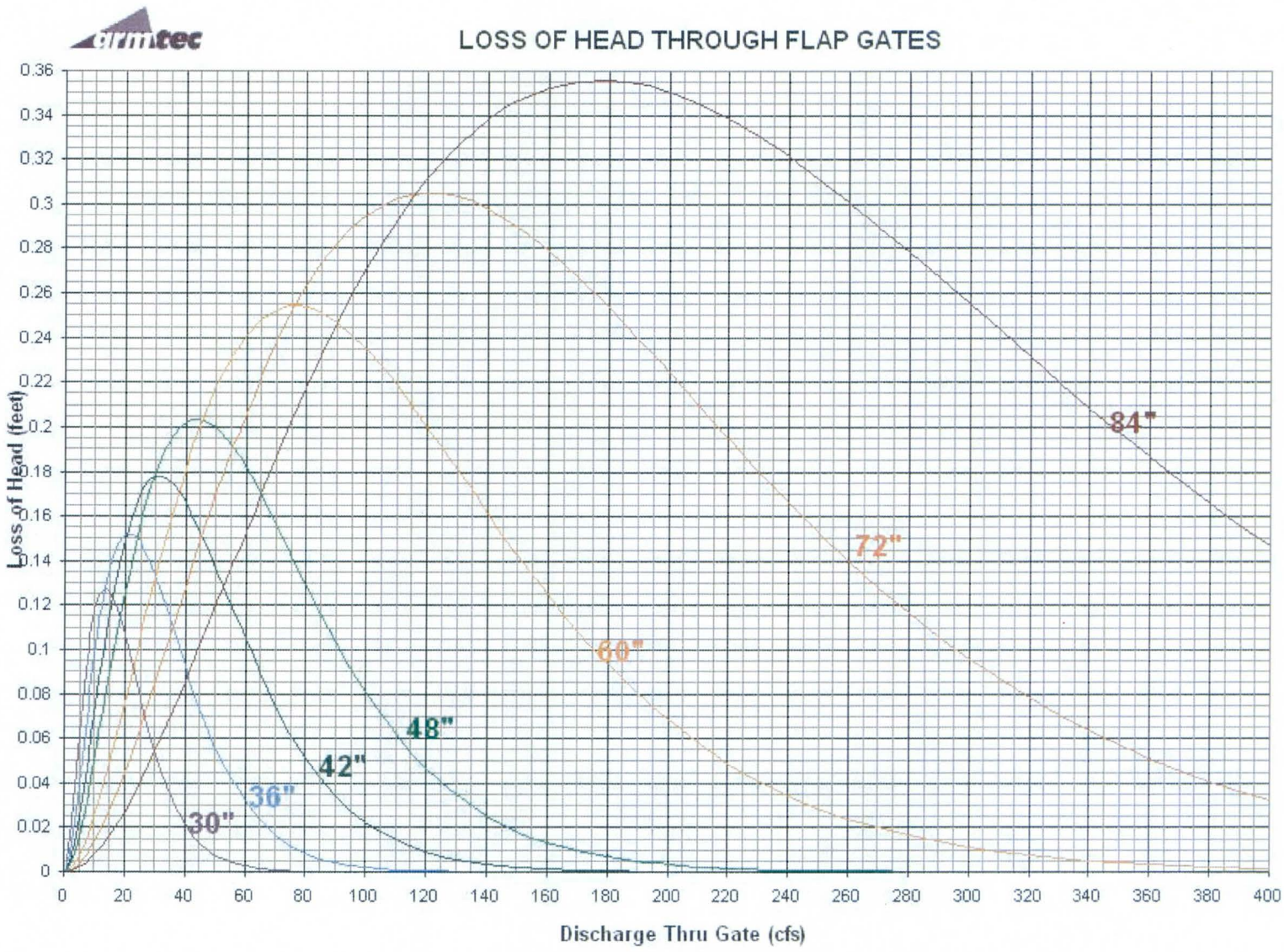
It's our understanding the Armtec Headloss charts are good for your gates. To convert from round pipe in the charts to square, use equivalent flow area.

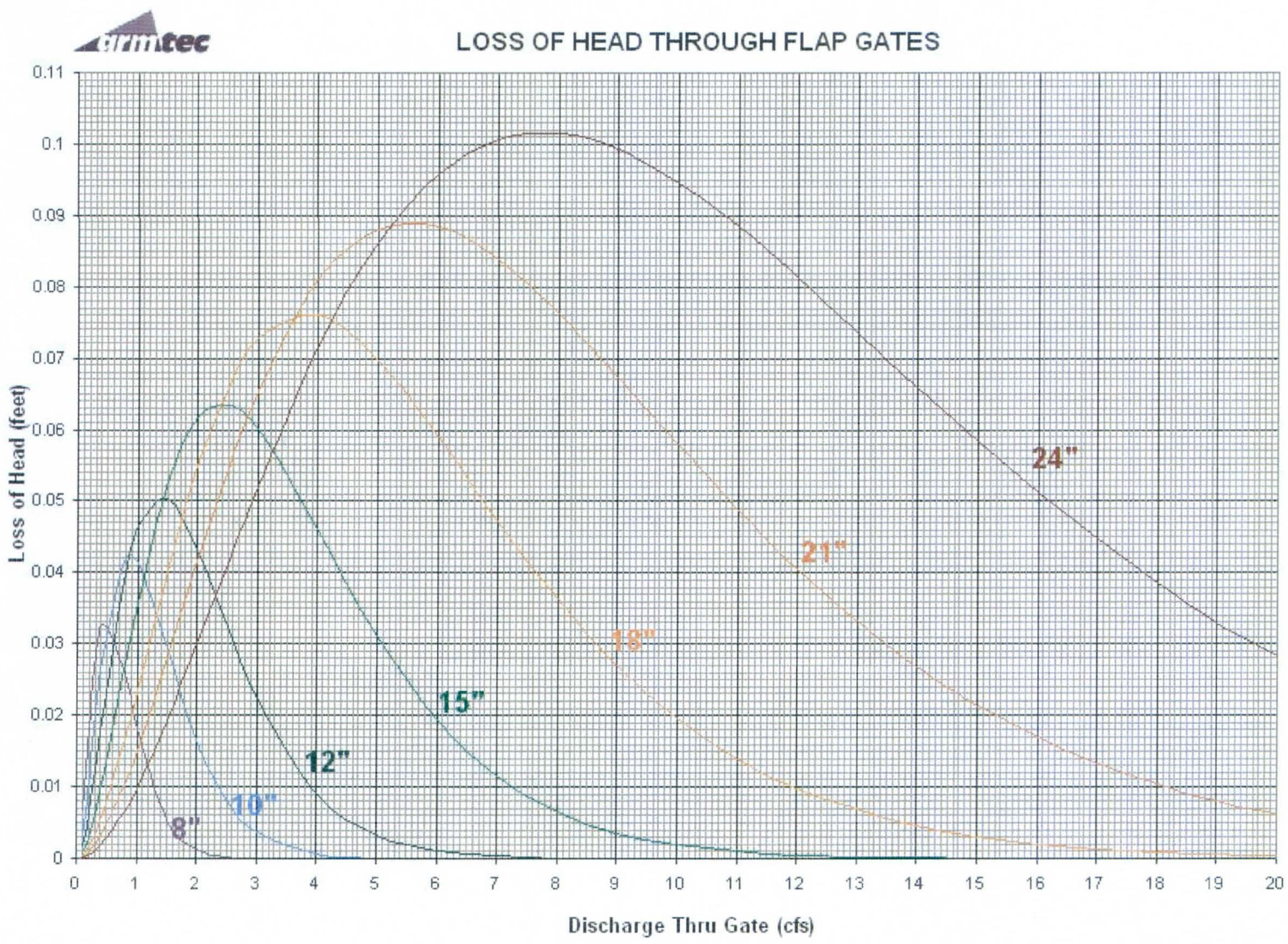
Please review and let me know what you think.

Thanks
-Ricky

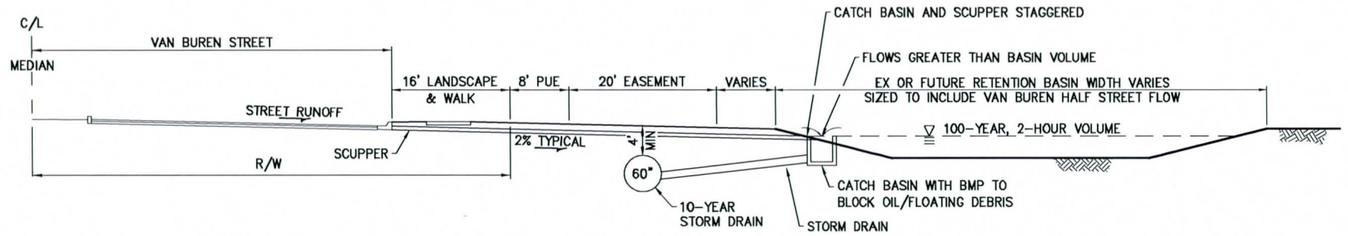
SUNRISE ENGINEERING, INC.

RICKY M. HOLSTON, P.E., CFM, LEED AP
CIVIL ENGINEER / PROJECT MANAGER

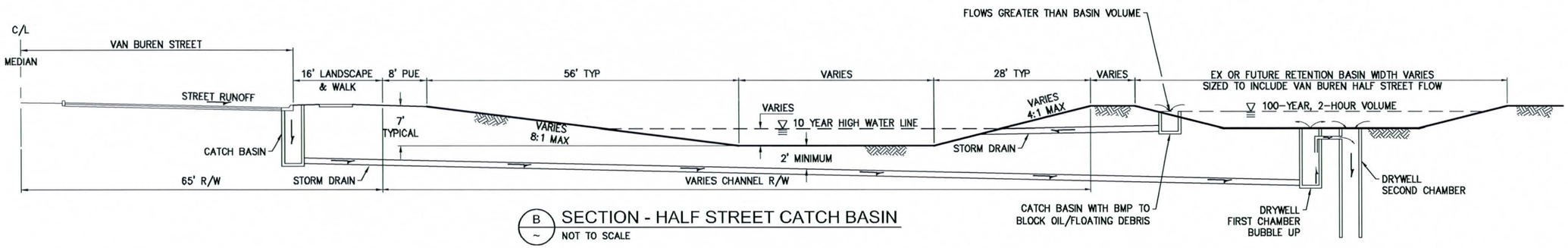

LOSS OF HEAD THROUGH FLAP GATES
Loss of Head (feet)
Discharge Thru Gate (cfs)
84"
72"
60"
48"
42"
36"
30"


LOSS OF HEAD THROUGH FLAP GATES
Loss of Head (feet)
Discharge Thru Gate (cfs)
24"
21"
18"
15"
12"
10"
8"

APPENDIX F



A ~ DETAIL - HALF STREET SCUPPER DRAINAGE
NOT TO SCALE



B ~ SECTION - HALF STREET CATCH BASIN
NOT TO SCALE

VAN BUREN CHANNEL SCUPPER AND CATCH BASIN CONNECTIONS

Flood Control District of Maricopa County

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
www.sunrise-eng.com

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APPENDIX G

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Total Project Summary (Sta 40+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description			Total
Phase I	(40+00 to 135+00, 1.8 miles)	LF	$/FT	
Construction-	Sheet P1 - Agua Fria River to El Mirage Rd (Sta 40+00 to 60+00)	1,271	$865.15	$1,099,535
Land-	Sheet P1 - Agua Fria River to El Mirage Rd (Sta 40+00 to 60+00)			$419,591
Utilities-	Sheet P1 - Agua Fria River to El Mirage Rd (Sta 40+00 to 60+00)			$13,603
Construction-	Sheet P2 - El Mirage Rd to Desert Springs Village (Sta 60+00 to 85+00)	1,925	$1,105.35	$2,127,607
Land-	Sheet P2 - El Mirage Rd to Desert Springs Village (Sta 60+00 to 85+00)			$303,039
Utilities-	Sheet P2 - El Mirage Rd to Desert Springs Village (Sta 60+00 to 85+00)			$502,483
Construction-	Sheet P3 - Desert Springs Village to Fresh n Easy (Sta 85+00 to 110+00)	2,477	$340.24	$842,602
Land-	Sheet P3 - Desert Springs Village to Fresh n Easy (Sta 85+00 to 110+00)			$745,159
Utilities-	Sheet P3 - Desert Springs Village to Fresh n Easy (Sta 85+00 to 110+00)			$503,406
Construction-	Sheet P4 - Fresh n Easy to Versante (Sta 110+00 to 135+00)	2,591	$413.89	$1,072,302
Land-	Sheet P4 - Fresh n Easy to Versante (Sta 110+00 to 135+00)			$505,782
Utilities-	Sheet P4 - Fresh n Easy to Versante (Sta 110+00 to 135+00)			$330,155
			Phase Subtotal Construction	$5,142,047
			Phase Subtotal Land	$1,973,571
			Phase Subtotal Utilities	$1,349,647
			Phase I Total	**$8,465,265**
Phase II	(135+00 to 193+00, 1.1 miles)			
Construction-	Sheet P5 - Versante to Roosevelt Park (Sta 135+00 to 160+00)	2,623	$253.13	$663,855
Land-	Sheet P5 - Versante to Roosevelt Park (Sta 135+00 to 160+00)			$543,050
Utilities-	Sheet P5 - Versante to Roosevelt Park (Sta 135+00 to 160+00)			$36,440
Construction-	Sheet P6 - Roosevelt Park to 104th Ave (Sta 160+00 to 185+00)	2,523	$257.37	$649,476
Land-	Sheet P6 - Roosevelt Park to 104th Ave (Sta 160+00 to 185+00)			$483,327
Utilities-	Sheet P6 - Roosevelt Park to 104th Ave (Sta 160+00 to 185+00)			$38,065
Construction-	Sheet P7 - 104th Ave to 103rd Ave (Sta 185+00 to 193+00)	751	$208.98	$156,875
Land-	Sheet P7 - 104th Ave to 103rd Ave (Sta 185+00 to 193+00)			$202,678
Utilities-	Sheet P7 - 104th Ave to 103rd Ave (Sta 185+00 to 193+00)			$0
			Phase Subtotal Construction	$1,470,205
			Phase Subtotal Land	$1,229,055
			Phase Subtotal Utilities	$74,505
			Phase II Total	**$2,773,765**
			Grand Total	**$11,239,030**

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Total Project - Construction Quantities (Sta 40+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	Unit	Unit Price	Total	Notes
	Construction					
	Excavation - Channel	159,394	CY	$6.00	$956,362	Includes excavation and export haul costs.
	Excavation - Box Culvert and 60" RGRCP	18,327	CY	$9.80	$179,608	Includes excavation and export haul costs.
	Excavation - "U" Channel	0	CY	$9.80	$0	Includes excavation and export haul costs.
	Channel Liner, rock mulch	123,624	SY	$7.25	$896,277	
	Box Culvert - Concrete	5,012	CY	$430.00	$2,155,284	Includes concrete and steel reinforcement.
	"U" Channel - Concrete	0	CY	$430.00	$0	Includes concrete and steel reinforcement.
	Headwalls	292	CY	$430.00	$125,711	Includes concrete and steel reinforcement.
	RIP RAP (@ Downstream Headwall)	1,026	CY	$45.00	$46,170	
	Landscape	1,112,619	SF	$0.10	$111,262	
	Remove and Replace Asphalt Road	8,185	SY	$22.00	$180,069	
	60" RGRCP	2,492.51	LF	$190.00	$473,577	Includes pipe and bedding.
	Flap Gates	6	EA	$8,000.00	$48,000	
	CSLM Backfill	1,511	CY	$45.00	$67,983	
	Storm Drain Manhole - MAG 521	11	EA	$4,500.00	$49,500	
				SubTotal	$5,289,802	
	25% Construction Contingency (Traffic Control and Mobilization)				$1,322,450	
				Total Construction Cost	$6,612,252	
	Land					
	Land Acquisition	1,423,389	SF	$2.25	$3,202,626	
	Utility Relocation					
	Water 8"-16"	747	LF	$105.00	$78,383	Includes an additional 10' before and after the structure.
	Water 18" and up	0	LF	$510.00	$0	Includes an additional 10' before and after the structure.
	Reclaimed Water	77	LF	$105.00	$8,103	Includes an additional 10' before and after the structure.
	Reclaimed Water Vault	0	EA	$5,000.00	$0	
	Fire Hydrant	1	EA	$5,500.00	$5,500	
	Sewer Manholes	0	EA	$4,500.00	$0	Includes an additional 10' before and after the structure.
	Sewer Mains	354	LF	$80.00	$28,313	Includes an additional 10' before and after the structure.
	Storm Drain Structures	2	LF	$2,500.00	$5,000	Includes an additional 10' before and after the structure.
	Storm Drain Pipes	92	LF	$95.00	$8,764	Includes an additional 10' before and after the structure.
	Concrete Irrigation Ditch	0	LF	$20.00	$0	Includes an additional 10' before and after the structure.
	Irrigation Relocation	5	LS	$150,000.00	$750,000	
	Gas 6" Relocation	3	LS	$25,000.00	$75,000	
	Gas 20" Relocation	1	LS	$55,000.00	$55,000	
	Electric	738	LF	$130.00	$95,940	Includes an additional 10' before and after the structure.
	Electrical Pole	6	EA	$7,000.00	$42,000	
	Others (Telephone, Cable, Etc.)	343	LF	$50.00	$17,150	Includes an additional 10' before and after the structure.
	Street Lights	2	EA	$2,500.00	$5,000	
	Traffic Signals	0	EA	$150,000.00	$0	
	Traffic Conduit	0	EA	$1,000.00	$0	
	SRP Tower	1	EA	$250,000.00	$250,000	
				Subtotal	$1,424,152	
				CONSTRUCTION TOTAL	**$6,612,252**	
				LAND TOTAL	**$3,202,626**	
				UTILITY RELOCATION TOTAL	**$1,424,152**	
				PROJECT TOTAL	**$11,200,000**	

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

Van Buren DCR Alternative 1-3 Cost Estimate

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Project Totals Per Sheet Including Land and Appurtenances (Sta 40+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	P1	P2	P3	P4	P5	P6	P7	Unit	Average Unit Price	Total
	Construction											
	Channel 1A - 10' Bottom	4,687	0	0	0	435	1,857	1,644	751	LF	$448.79	$2,103,419
	Channel 1B - 30' Bottom	3,791	0	228	2,407	1,157	0	0	0	LF	$481.64	$1,825,982
	Channel 2 - 50' Bottom	950	0	950	0	0	0	0	0	LF	$391.44	$371,895
	Channel 3 - 90' Bottom	1,033	982	52	0	0	0	0	0	LF	$654.47	$676,337
	60" RGRCP- in asphalt	2,493	0	0	0	848	766	879	0	LF	$277.86	$692,579
	Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	415	130	285	0	0	0	0	0	LF	$2,478.34	$1,028,513
	Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	631	0	410	70	151	0	0	0	LF	$2,078.03	$1,311,655
	Reinforced 4' x 5' Concrete Box Culvert	159	159	0	0	0	0	0	0	LF	$2,062.92	$328,870
	Reinforced 4' x 10' Concrete U-Channel	0	0	0	0	0	0	0	0	LF	$1,209.08	$0
											SubTotal	$8,339,250
	Utility Relocation											
	Water 8"-16"	747	77	355	66	144	52	52	0	LF	$120.00	$89,580
	Water 18" and up	0	0	0	0	0	0	0	0	LF	$510.00	$0
	Reclaimed Water	77	0	77	0	0	0	0	0	LF	$120.00	$9,260
	Reclaimed Water Vault	0	0	0	0	0	0	0	0	EA	$5,000.00	$0
	Fire Hydrant	1	1	0	0	0	0	0	0	EA	$3,000.00	$3,000
	Sewer Manholes	0	0	0	0	0	0	0	0	LF	$4,000.00	$0
	Sewer Mains	354	0	143	66	118	0	26	0	LF	$250.00	$88,479
	Storm Drain Structures	2	0	0	2	0	0	0	0	LF	$2,500.00	$5,000
	Storm Drain Pipes	92	0	0	0	92	0	0	0	LF	$95.00	$8,764
	Concrete Irrigation Ditch	0	0	0	0	0	0	0	0	LF	$20.00	$0
	Irrigation Relocation	5	0	1	3	1	0	0	0	LS	$200,000.00	$1,000,000
	Gas 6" Relocation	3	0	0	0	2	1	0	0	LS	$40,000.00	$120,000
	Gas 20" Relocation	1	0	0	0	1	0	0	0	LS	$150,000.00	$150,000
	Electric	738	0	199	199	185	26	130	0	LF	$200.00	$147,600
	Electrical Pole	6	0	2	1	2	0	1	0	EA	$10,000.00	$60,000
	Others (Telephone, Cable, Etc.)	343	0	66	66	26	52	133	0	LF	$100.00	$34,300
	Street Lights	2	0	1	0	1	0	0	0	EA	$2,500.00	$5,000
	Traffic Signals	0	0	0	0	0	0	0	0	EA	$150,000.00	$0
	Traffic Conduit	0	0	0	0	0	0	0	0	EA	$1,000.00	$0
	SRP Tower	1	0	1	0	0	0	0	0	EA	$250,000.00	$250,000
											Subtotal	$1,970,983

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy of such opinions compared to bid or actual costs.

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Project Totals Per Sheet (40+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	P1	P2	P3	P4	P5	P6	P7	Unit	Unit Price	Total
	Construction											
	Excavation - Channel	159,394	16,576	13,115	44,922	27,461	25,029	22,170	10,120	CY	$6.00	$956,362
	Excavation - Box Culvert and 60" RGRCP	18,327	3,352	9,031	829	2,921	1,021	1,172	0	CY	$9.80	$179,608
	Excavation - "U" Channel	0	0	0	0	0	0	0	0	CY	$9.80	$0
	Channel Liner, rock mulch	123,624	15,130	13,217	30,829	19,428	19,659	17,413	7,948	SY	$7.25	$896,277
	Box Culvert - Concrete	5,012	1,170	2,978	273	591	0	0	0	CY	$430.00	$2,155,284
	"U" Channel - Concrete	0	0	0	0	0	0	0	0	CY	$430.00	$0
	Headwalls	292	65	98	31	42	22	34	0	CY	$430.00	$125,711
	RIP RAP (@ Downstream Headwall)	1,026	276	414	138	148	20	30	0	CY	$45.00	$46,170
	Landscape	1,112,619	136,174	118,954	277,464	174,851	176,927	156,714	71,536	SF	$0.10	$111,262
	Remove and Replace Asphalt Road	8,185	1,469	3,917	360	1,342	511	586	0	SY	$22.00	$180,069
	60" RGRCP	2,493	0	0	0	848	766	879	0	LF	$190.00	$473,577
	Flap Gates	6	6	0	0	0	0	0	0	EA	$8,000.00	$48,000
	CSLM Backfill	1,511	0	0	0	514	464	333	0	CY	$45.00	$67,983
	Storm Drain Manhole - MAG 521	11	0	0	0	3	5	3	0	EA	$4,500.00	$49,500
											SubTotal	$5,289,802
											25% Construction Contingency	$1,322,450
											Total Construction Cost	$6,612,252
	Land											
	Land Acquisition	1,423,389	186,485	134,684	331,182	224,792	241,355	214,812	90,079	SF	$3.83	$5,451,581
	Utility Relocation											
	Water 8"-16"	747	77	355	66	144	52	52	0	LF	$105.00	$78,383
	Water 18" and up	0	0	0	0	0	0	0	0	LF	$510.00	$0
	Reclaimed Water	77	0	77	0	0	0	0	0	LF	$105.00	$8,103
	Reclaimed Water Vault	0	0	0	0	0	0	0	0	EA	$5,000.00	$0
	Fire Hydrant	1	1	0	0	0	0	0	0	EA	$5,500.00	$5,500
	Sewer Manholes	0	0	0	0	0	0	0	0	LF	$4,500.00	$0
	Sewer Mains	354	0	143	66	118	0	26	0	LF	$80.00	$28,313
	Storm Drain Structures	2	0	0	2	0	0	0	0	LF	$2,500.00	$5,000
	Storm Drain Pipes	92	0	0	0	92	0	0	0	LF	$95.00	$8,764
	Concrete Irrigation Ditch	0	0	0	0	0	0	0	0	LF	$20.00	$0
	Irrigation Relocation	5	0	1	3	1	0	0	0	LS	$150,000.00	$750,000
	Gas 6" Relocation	3	0	0	0	2	1	0	0	LS	$25,000.00	$75,000
	Gas 20" Relocation	1	0	0	0	1	0	0	0	LS	$55,000.00	$55,000
	Electric	738	0	199	199	185	26	130	0	LF	$130.00	$95,940
	Electrical Pole	6	0	2	1	2	0	1	0	EA	$7,000.00	$42,000
	Others (Telephone, Cable, Etc.)	343	0	66	66	26	52	133	0	LF	$50.00	$17,150
	Street Lights	2	0	1	0	1	0	0	0	EA	$2,500.00	$5,000
	Traffic Signals	0	0	0	0	0	0	0	0	EA	$150,000.00	$0
	Traffic Conduit	0	0	0	0	0	0	0	0	EA	$1,000.00	$0
	SRP Tower	1	0	1	0	0	0	0	0	EA	$250,000.00	$250,000
											Subtotal	$1,424,152

CONSTRUCTION TOTAL	**$6,612,252**
LAND TOTAL	**$5,451,581**
UTILITY RELOCATION TOTAL	**$1,424,152**
PROJECT TOTAL	**$13,500,000**

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P:\Buckeye\0423-Skyline Wash DCR\Admin\Cost Estimate\Van Buren Drainage Channel Estimate - Agua Fria to I-10 Ave.xlsx

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Sheet P1 - Agua Fria River to El Mirage Rd (Sta 40+00 to 60+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	16,576	CY	$6.00	$99,459
	Excavation - Box Culvert	3,352	CY	$9.80	$32,848
	Excavation - "U" Channel	0	CY	$9.80	$0
	Channel Liner	15,130	SY	$7.25	$109,696
	Box Culvert - Concrete	1,170	CY	$430.00	$503,313
	"U" Channel - Concrete	0	CY	$430.00	$0
	Headwalls	65	CY	$430.00	$27,950
	RIP RAP (@ Downstream Headwall)	276	CY	$45.00	$12,420
	Landscape	136,174	SF	$0.10	$13,617
	Remove and Replace Asphalt Road	1,469	SY	$22.00	$32,325
	Flap Gates	6.00	EA	$8,000.00	$48,000
				SubTotal	$879,628
	25% Construction Contingency (Traffic Control and Mobilization)				$219,907
				Total Construction Cost	$1,099,535
	Land				
	Land Acquisition	186,485.00	SF	$2.25	$419,591
	Utility Relocation				
	Water 8"-16"	77	LF	$105.00	$8,103
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	1	EA	$5,500.00	$5,500
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	0	LF	$80.00	$0
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	0	LS	$150,000.00	$0
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	0	LF	$130.00	$0
	Electrical Pole	0	EA	$7,000.00	$0
	Others (Telephone, Cable, Etc.)	0	LF	$50.00	$0
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$250,000.00	$0
				Subtotal	$13,603

CONSTRUCTION TOTAL	**$1,099,535**
LAND TOTAL	**$419,591**
UTILITY RELOCATION TOTAL	**$13,603**
REACH TOTAL	**$1,533,000**

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SUNRISE ENGINEERING

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Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Sheet P2 - El Mirage Rd to Desert Springs Village (Sta 60+00 to 85+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	13,115	CY	$6.00	$78,690
	Excavation - Box Culvert	9,031	CY	$9.80	$88,507
	Excavation - "U" Channel	0	CY	$9.80	$0
	Channel Liner	13,217	SY	$7.25	$95,824
	Box Culvert - Concrete	2,978	CY	$430.00	$1,280,353
	"U" Channel - Concrete	0	CY	$430.00	$0
	Headwalls	98	CY	$430.00	$42,007
	RIP RAP (@ Downstream Headwall)	414	CY	$45.00	$18,630
	Landscape	118,954	SF	$0.10	$11,895
	Remove and Replace Asphalt Road	3,917	SY	$22.00	$86,179
				SubTotal	$1,702,086
	25% Construction Contingency (Traffic Control and Mobilization)				$425,521
				Total Construction Cost	$2,127,607
	Land				
	Land Acquisition	134,684	SF	$2.25	$303,039
	Utility Relocation				
	Water 8"-16"	355	LF	$105.00	$37,258
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	77	LF	$105.00	$8,103
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	143	LF	$80.00	$11,473
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	1	LS	$150,000.00	$150,000
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	199	LF	$130.00	$25,838
	Electrical Pole	2	EA	$7,000.00	$14,000
	Others (Telephone, Cable, Etc.)	66	LF	$50.00	$3,313
	Street Lights	1	EA	$2,500.00	$2,500
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	1	EA	$250,000.00	$250,000
				Subtotal	$502,483

CONSTRUCTION TOTAL	**$2,127,607**
LAND TOTAL	**$303,039**
UTILITY RELOCATION TOTAL	**$502,483**
REACH TOTAL	**$2,933,000**

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Van Buren DCR Alternative 1-3 Cost Estimate

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Alt 1-3 - Sheet P1 (Agua Fria River to El Mirage Road)
Station Range: 40+00 to 60+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	$0.00
Channel 1B - 30' Bottom	0	$0.00
Channel 2 - 50' Bottom	0	#DIV/0!
Channel 3 - 90' Bottom	982	$654.47
60" RGRCP- in asphalt	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (5 Barre	130	$2,522.97
Reinforced 4' x 10' Concrete Box Culvert (4 Barre	0	$0.00
Reinforced 4' x 5' Concrete Box Culvert	159	$2,062.92
Reinforced 4' x 10' Concrete U-Channel	0	#DIV/0!
	1,271	

Channel 2 - 50' Bottom

Total: $0.00 *<-Channel Only - No Land Purchase*
Total per LF: #DIV/0! *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
50	0.13	0.25	1	3	0	105	32.00	16.00	4	98.00	0.00	0.00	0.00	0.00	0.00
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$0.00	$0.00	$0.00	$0.00	**$0.00**

Channel 3 - 90' Bottom

Total: **$222,772.23** *<-Channel Only - No Land Purchase*
Total per LF: $226.97 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
90	0.13	0.25	1	3	981.5	190	32.00	16.00	4	138.00	16576.44	16,576.44	15,130.50	136,174.49	186,485.00
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$99,458.67	$0.00	$109,696.11	$13,617.45	**$419,591.25**

Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)

127th Avenue

Total: **$288,486.45** *<-Culvert Only*
Total per LF: $2,219.13 *<-Culvert Only*

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
5	2	138	1.00	1.00	130.00	0.17	0.88	0.916666667	6.92	57.17	1903.79	1,903.79	627.51	92,079.00	35	138.00	825.74
			(beneath culvert)	(sides of culvert)							Unit Price						
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00	$22.00
											$18,657.15	$0.00	$269,829.30	$0.00	$15,123.10	$6,210.00	$18,166.30

Reinforced 4' x 5' Concrete Box Culvert

Agua Fria

Total: **$247,674.38** *<-Culvert Only*
Total per LF: $1,553.60 *<-Culvert Only*

Element Dimensions											Bid Items							
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)	Flap Gates (EA)
6	2	138	1.00	1.00	159.42	0.17	0.79	0.67	6.75	36.33	1448.07	1,448.07	542.98	72,886.82	30	138.00	643.58	6.00
			(beneath culvert)	(sides of culvert)							Unit Price							
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00	$22.00	$8,000.00
											$14,191.04	$0.00	$233,483.34	$0.00	$12,826.90	$6,210.00	$14,158.86	$48,000.00

Reinforced 4' x 10' Concrete U-Channel

Total: **$0.00** *<-Culvert Only*
Total per LF: #DIV/0! *<-Culvert Only*

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
5	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	57.17	0.00	0.00	0.00	0.00	0	0.00
			(beneath culvert)	(sides of culvert)							Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00
											$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Utility Relocations

Total: **$13,602.50**

Element Dimensions			Bid Items	
Item Description	Unit	Quantity	Unit Price	Cost
Water 8"-16"	LF	77.17	$105.00	$8,102.50
Water 18" and up	LF	0	$510.00	$0.00
Reclaimed Water	LF	0	$105.00	$0.00
Reclaimed Water Vault	EA	0	$5,000.00	$0.00
Fire Hydrant	EA	1	$5,500.00	$5,500.00
Sewer Manholes	EA	0	$4,500.00	$0.00
Sewer Mains	LF	0.00	$80.00	$0.00
Storm Drain Structures	EA	0	$2,500.00	$0.00
Storm Drain Pipes	LF	0.00	$95.00	$0.00
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00
Irrigation Relocation	LS	0.00	$150,000.00	$0.00
Gas 6" Relocation	LS	0	$25,000.00	$0.00
Gas 20" Relocation	LS	0	$55,000.00	$0.00
Electric	LF	0.00	$130.00	$0.00
Electrical Pole	EA	0	$7,000.00	$0.00
Others (Tel, Cable, Etc.)	LF	0	$50.00	$0.00
Street lights	EA	0	$2,500.00	$0.00
Traffic Signals	EA	0	$150,000.00	$0.00
Traffic Conduit	EA	0	$1,000.00	$0.00
SRP Tower	EA	0	$250,000.00	$0.00

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Stee	Thickness "T"	Wall Width "W	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 6' x 4'				6	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
6.38	455	0.86	80	10.68	855

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'				5	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
6.99	526	1.4	130	12.59	1046

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 6' x 4'				6	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
11.4	837	1.55	135	19.15	1512

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'				5	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
12.54	949	2.51	220	22.58	1829

Van Buren DCR Alternative 1-3 Cost Estimate

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Alt 1-3 - Sheet P2 (El Mirage Rd to Desert Springs Village)
Station Range: 60+00 to 85+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	$0.00
Channel 1B - 30' Bottom	228	$366.80
Channel 2 - 50' Bottom	950	$391.44
Channel 3 - 90' Bottom	52	$654.47
60" RGRCP- in asphalt	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	285	$2,433.72
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	410	$2,005.04
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	#DIV/0!
	1,925	

Channel 1B - 30' Bottom

Total: **$27,184.73** *<-Channel Only - No Land Purchase*
Total per LF: $119.30 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
30	0.13	0.25	1	3	228	110	32.00	16.00	4	78.00	1,822.88	1,822.88	1,993.55	17,941.97	25,064.60
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$10,937.28	$0.00	$14,453.25	$1,794.20	$56,395.35

Channel 2 - 50' Bottom

Total: **$147,443.06** *<-Channel Only - No Land Purchase*
Total per LF: $155.19 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
50	0.13	0.25	1	3	950	105	32.00	16.00	4	98.00	10,415.47	10,415.47	10,423.34	93,810.06	99,756.30
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$62,492.84	$0.00	$75,569.22	$9,381.01	$224,451.68

Channel 3 - 90' Bottom

Total: **$11,782.07** *<-Channel Only - No Land Purchase*
Total per LF: $226.97 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
90	0.13	0.25	1	3	52	190	32.00	16.00	4	138.00	876.70	876.70	800.23	7,202.06	9,862.90
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$5,260.21	$0.00	$5,801.66	$720.21	$22,191.53

Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)

Charter School

Total: **$632,451.07** *<-Culvert Only*
Total per LF: $2,219.13 *<-Culvert Only*

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
5	2	138	1.00	1.00	285.00	0.17	0.88	0.916666667	6.92	57.17	4,173.70	4,173.70	1,375.70	201,865.50	35	138.00	1,810.28
			(beneath culvert)	(sides of culvert)							Unit Price						
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00	$22.00
											$40,902.22	$0.00	$591,548.85	$0.00	$15,123.10	$6,210.00	$39,826.11

Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)

Storage Place & crossing at 120th Drive (Desert Springs)

Total: **$736,409.34** *<-Culvert Only*
Total per LF: $1,796.12 *<-Culvert Only*

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
4	4	138	1.00	1.00	410.00	0.17	0.88	0.916666667	6.92	46.25	4857.68	4,857.68	1,601.87	230,215.00	63	276.00	2,106.94
			(beneath culvert)	(sides of culvert)							Unit Price						
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00	$22.00
											$47,605.24	$0.00	$688,804.10	$0.00	$26,883.60	$12,420.00	$46,352.78

Reinforced 4' x 10' Concrete U-Channel

Total: **$0.00** *<-Culvert Only*
Total per LF: #DIV/0! *<-Culvert Only*

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
			(beneath culvert)	(sides of culvert)							Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00
											$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Utility Relocations

Total: **$502,483.33**

Element Dimensions			Bid Items		
Item Description	Unit	Quantity	Unit Price	Cost	
Water 8"-16"	LF	354.83	$105.00	$37,257.50	
Water 18" and up	LF	0	$510.00	$0.00	
Reclaimed Water	LF	77.17	$105.00	$8,102.50	
Reclaimed Water Vault	EA	0	$5,000.00	$0.00	
Fire Hydrant	EA	0	$5,300.00	$0.00	
Sewer Manholes	EA	0	$4,500.00	$0.00	electrical MHs
Sewer Mains	LF	143.42	$80.00	$11,473.33	
Storm Drain Structures	EA	0	$2,500.00	$0.00	
Storm Drain Pipes	LF	0.00	$95.00	$0.00	
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00	
Irrigation Relocation	LS	1.00	$150,000.00	$150,000.00	
Gas 6" Relocation	LS	0	$25,000.00	$0.00	
Gas 20" Relocation	LS	0	$55,000.00	$0.00	
Electric	LF	198.75	$130.00	$25,837.50	2 uge, 1 ohe
Electrical Pole	EA	2	$7,000.00	$14,000.00	
Others (Tel, Cable, Etc.)	LF	66.25	$50.00	$3,312.50	
Street lights	EA	1	$2,500.00	$2,500.00	
Traffic Signals	EA	0	$150,000.00	$0.00	
Traffic Conduit	EA	0	$1,000.00	$0.00	
SRP Tower	EA	1	$250,000.00	$250,000.00	

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Stee	Thickness "T"	Wall Width "W	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
6.99	526	1.4	130

5	Barrels
Concrete	Steel
(CY)	(lbs)
12.59	1046

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
12.54	949	2.51	220

5	Barrels
Concrete	Steel
(CY)	(lbs)
22.58	1829

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
6.99	526	1.4	130

4	Barrels
Concrete	Steel
(CY)	(lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
12.54	949	2.51	220

4	Barrels
Concrete	Steel
(CY)	(lbs)
20.07	1609

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
6.99	526	1.4	130

4	Barrels
Concrete	Steel
(CY)	(lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
12.54	949	2.51	220

4	Barrels
Concrete	Steel
(CY)	(lbs)
20.07	1609

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Sheet P3 - Desert Springs Village to Fresh n Easy (Sta 85+00 to 110+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	44,922	CY	$6.00	$269,529
	Excavation - Box Culvert	829	CY	$9.80	$8,128
	Excavation - "U" Channel	0	CY	$9.80	$0
	Channel Liner	30,829	SY	$7.25	$223,512
	Box Culvert - Concrete	273	CY	$430.00	$117,601
	"U" Channel - Concrete	0	CY	$430.00	$0
	Headwalls	31	CY	$430.00	$13,442
	RIP RAP (@ Downstream Headwall)	138	CY	$45.00	$6,210
	Landscape	277,464	SF	$0.10	$27,746
	Remove and Replace Asphalt Road	360	SY	$22.00	$7,914
				SubTotal	$674,082
	25% Construction Contingency (Traffic Control and Mobilization)				$168,520
				Total Construction Cost	$842,602
	Land				
	Land Acquisition	331,181.60	SF	$2.25	$745,159
	Utility Relocation				
	Water 8"-16"	66	LF	$105.00	$6,956
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	66	LF	$80.00	$5,300
	Storm Drain Structures	2	LF	$2,500.00	$5,000
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	3	LS	$150,000.00	$450,000
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	199	LF	$130.00	$25,838
	Electrical Pole	1	EA	$7,000.00	$7,000
	Others (Telephone, Cable, Etc.)	66	LF	$50.00	$3,313
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$250,000.00	$0
				Subtotal	$503,406

CONSTRUCTION TOTAL	**$842,602**
LAND TOTAL	**$745,159**
UTILITY RELOCATION TOTAL	**$503,406**
REACH TOTAL	**$2,091,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Sheet P4 - Fresh n Easy to Versante (Sta 110+00 to 135+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	27,461	CY	$6.00	$164,766
	Excavation - Box Culvert and 60" RGRCP	2,921	CY	$9.80	$28,631
	Excavation - "U" Channel	0	CY	$9.80	$0
	Channel Liner	19,428	SY	$7.25	$140,852
	Box Culvert - Concrete	591	CY	$430.00	$254,018
	"U" Channel - Concrete	0	CY	$430.00	$0
	Headwalls	42	CY	$430.00	$18,254
	RIP RAP (@ Downstream Headwall)	148	CY	$45.00	$6,660
	Landscape	174,851	SF	$0.10	$17,485
	Remove and Replace Asphalt Road	1,342	SY	$22.00	$29,525
	60" RGRCP- in asphalt	847.55	LF	$190.00	$161,035
	Slurry Backfill	513.71	CY	$45.00	$23,117
	Storm Drain Manhole - MAG 521	3.00	EA	$4,500.00	$13,500
				SubTotal	$857,841
	25% Construction Contingency (Traffic Control and Mobilization)				$214,460
				Total Construction Cost	$1,072,302
	Land				
	Land Acquisition	224,792.20	SF	$2.25	$505,782
	Utility Relocation				
	Water 8"-16"	144	LF	$105.00	$15,146
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	118	LF	$80.00	$9,460
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	92	LF	$95.00	$8,764
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	1	LS	$150,000.00	$150,000
	Gas 6" Relocation	2	LS	$25,000.00	$50,000
	Gas 20" Relocation	1	LS	$55,000.00	$55,000
	Electric	185	LF	$130.00	$23,985
	Electrical Pole	2	EA	$7,000.00	$14,000
	Others (Telephone, Cable, Etc.)	26	LF	$50.00	$1,300
	Street Lights	1	EA	$2,500.00	$2,500
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$250,000.00	$0
				Subtotal	$330,155

CONSTRUCTION TOTAL	**$1,072,302**
LAND TOTAL	**$505,782**
UTILITY RELOCATION TOTAL	**$330,155**
REACH TOTAL	**$1,908,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

P:\Buckeye\04234Skyline Wash DCR\Admin\Cost Estimate\Van Buren Drainage Channel Estimate - Agua Fria to 103 Ave.xlsx

Van Buren DCR Alternative 1-3 Cost Estimate

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Alt 1-3 - Sheet P3 (Desert Springs Village to Fresh n Easy)
Station Range: 85+00 to 110+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	0	$0.00
Channel 1B - 30' Bottom	2,407	$526.05
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (5 Barrel	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrel	70	$2,189.92
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	#DIV/0!
	2,477	

Channel 1B - 30' Bottom

Total: **$520,787.84** *<-Channel Only - No Land Purchase*
Total per LF: $216.41 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width Average (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
30	0.13	0.25	1	6	2,407	133	56.00	28.00	7	114.00	44,921.52	44,921.52	30,829.29	277,463.62	331,181.60
					354.33	110					Unit Price				
					1294.13	135					$6.00	$0.00	$7.25	$0.10	$2.25
					758.05	155					$269,529.12	$0.00	$223,512.36	$27,746.36	$745,158.60
											$112.00				

Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)

119th Avenue

Total: **$125,728.42** *<-Culvert Only*
Total per LF: $1,796.12 *<-Culvert Only*

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
4	2	138	1.00	1.00	70.00	0.17	0.88	0.916666667	6.92	46.25	829.36	829.36	273.49	39,305.00	31	138.00	359.72
			(beneath culvert)	(sides of culvert)							Unit Price						
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00	$22.00
											$8,127.72	$0.00	$117,600.70	$0.00	$13,441.80	$6,210.00	$7,913.89

Reinforced 4' x 10' Concrete U-Channel

Total: **$0.00** *<-Culvert Only*
Total per LF: #DIV/0! *<-Culvert Only*

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
			(beneath culvert)	(sides of culvert)							Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00
											$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Utility Relocations

Total: **$503,406.25**

Element Dimensions			Bid Items			
Item Description	Unit	Quantity	Unit Price	Cost		
Water 8"-16"	LF	66.25	$105.00	$6,956.25		
Water 18" and up	LF	0	$510.00	$0.00		
Reclaimed Water	LF	0	$105.00	$0.00		
Reclaimed Water Vault	EA	0	$5,000.00	$0.00		
Fire Hydrant	EA	0	$5,500.00	$0.00		
Sewer Manholes	EA	0	$4,500.00	$0.00		
Sewer Mains	LF	66.25	$80.00	$5,300.00		
Storm Drain Structures	EA	2	$2,500.00	$5,000.00		
Storm Drain Pipes	LF	0.00	$95.00	$0.00		
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00		
Irrigation Relocation	LS	3.00	$150,000.00	$450,000.00	127 lf	(24", 30", and 48")
Gas 6" Relocation	LS		$25,000.00	$0.00	1 EA	
Gas 20" Relocation	LS	0	$55,000.00	$0.00		
Electric	LF	198.75	$130.00	$25,837.50	2 uge, 1 ohe	
Electrical Pole	EA	1	$7,000.00	$7,000.00		
Others (Tel, Cable, Etc.)	LF	66.25	$50.00	$3,312.50		
Street lights	EA	0	$2,500.00	$0.00		
Traffic Signals	EA	0	$150,000.00	$0.00		
Traffic Conduit	EA	0	$1,000.00	$0.00		
SRP Tower	EA	0	$250,000.00	$0.00		

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Stee	Thickness "T"	*Wall Width "W"	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'				4	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Conc. (per Barr (CY)	Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
6.99	526	1.4	130	11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'				4	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Conc. (per Barr (CY)	Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
12.54	949	2.51	220	20.07	1609

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'				4	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Conc. (per Barr (CY)	Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
6.99	526	1.4	130	11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'				4	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Conc. (per Barr (CY)	Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
12.54	949	2.51	220	20.07	1609

Van Buren DCR Alternative 1-3 Cost Estimate

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Alt 1-3 - Sheet P4 (Fresh n Easy to Versante)
Station Range: 110+00 to 135+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	435	$437.19
Channel 1B - 30' Bottom	1,157	$552.05
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	848	$267.14
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	151	$2,039.15
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	#DIV/0!
	2,591	

Channel 1A - 10' Bottom

Total: **$72,754.20** *<-Channel Only - No Land Purchase*
Total per LF: $167.19 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
10	0.13	0.25	1	6	435	120	56.00	28.00	7	94.00	5,866.74	5,866.74	4,607.83	41,470.44	52,220.40
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$35,200.42	$0.00	$33,406.74	$4,147.04	$117,495.90

Channel 1B - 30' Bottom

Total: **$250,349.35** *<-Channel Only - No Land Purchase*
Total per LF: $216.41 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width Average (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (AC)
30	0.13	0.25	1	6	1,157	150	56.00	28.00	7	114.00	21,594.35	21,594.35	14,820.03	133,380.29	172,571.80
					483	155					Unit Price				
					673.84	145					$6.00	$0.00	$7.25	$0.10	$2.25
											$129,566.08	$0.00	$107,445.24	$13,338.03	$388,286.55

60" RGRCP- in asphalt

Total: **$195,226.17** *<-Pipe Only*
Total per LF: $230.34 *<-Pipe Only*

Element Dimensions											Bid Items							
Diameter of Pipe (in)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Manholes (EA)	Trench Depth (ft)	Trench Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Pipe (LF)	CLSM Backfill (CY)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)	SD Manholes (EA)
60	1	20	1.00	1.00	847.55	3.00	5.00	5	6.00	6.00	1,130.07	1,130.07	847.55	513.71	11	10.00	565.03	3.00
											Unit Price							
											$9.80	$0.00	$190.00	$45.00	$430.00	$45.00	$22.00	$4,500.00
											$11,074.65	$0.00	$161,034.50	$23,117.01	$4,811.70	$450.00	$12,430.73	$13,500.00

Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)

Total: **$271,573.40** *<-Culvert Only*
Total per LF: $1,796.12 *<-Culvert Only*

Element Dimensions											Bid Items						
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)
4	2	138	1.00	1.00	151.20	0.17	0.88	0.916666667	6.92	46.25	1,791.42	1,791.42	590.74	84,898.80	31	138.00	777.00
											Unit Price						
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00	$22.00
											$17,555.88	$0.00	$254,017.51	$0.00	$13,441.80	$6,210.00	$17,094.00

Reinforced 4' x 10' Concrete U-Channel

Total: **$0.00** *<-Culvert Only*
Total per LF: #DIV/0! *<-Culvert Only*

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
											Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00
											$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Utility Relocations

Total: **$330,155.00**

Element Dimensions			Bid Items				
Item Description	Unit	Quantity	Unit Price	Cost			
Water 8"-16"	LF	144.25	$105.00	$15,146.25			
Water 18" and up	LF	0	$510.00	$0.00			
Reclaimed Water	LF	0	$105.00	$0.00			
Reclaimed Water Vault	EA	0	$5,000.00	$0.00			
Fire Hydrant	EA	0	$5,500.00	$0.00			
Sewer Manholes	EA	0	$4,500.00	$0.00			
Sewer Mains	LF	118.25	$80.00	$9,460.00			
Storm Drain Structures	EA	0	$2,500.00	$0.00			
Storm Drain Pipes	LF	92.25	$95.00	$8,763.75			
Concrete Irrigation Ditch	LF		$20.00	$0.00	35	LF	
Irrigation Relocation	LS	1.00	$150,000.00	$150,000.00	35	LF	
Gas 6" Relocation	LS	2	$25,000.00	$50,000.00			
Gas 20" Relocation	LS	1	$55,000.00	$55,000.00	106	LF	natural gas
Electric	LF	184.5	$130.00	$23,985.00	ohe, uge		
Electrical Pole	EA	2	$7,000.00	$14,000.00			
Others (Tel, Cable, Etc.)	LF	26.00	$50.00	$1,300.00			
Street lights	EA	1	$2,500.00	$2,500.00			
Traffic Signals	EA	0	$150,000.00	$0.00			
Traffic Conduit	EA	0	$1,000.00	$0.00			
SRP Tower	EA	0	$250,000.00	$0.00			

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	Additional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'				4	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Conc. (per Barre (CY)	Δ Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
6.99	526	1.4	130	11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'				4	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Conc. (per Barre (CY)	Δ Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
12.54	949	2.51	220	20.07	1609

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'				4	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Conc. (per Barre (CY)	Δ Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
6.99	526	1.4	130	11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'				4	Barrels
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Conc. (per Barre (CY)	Δ Stl. (per Barrel) (lbs)	Concrete (CY)	Steel (lbs)
12.54	949	2.51	220	20.07	1609

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Sheet P5 - Versante to Roosevelt Park (Sta 135+00 to 160+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	25,029	CY	$6.00	$150,177
	Excavation - Box Culvert and 60" RGRCP	1,021	CY	$9.80	$10,009
	Excavation - "U" Channel	0	CY	$9.80	$0
	Channel Liner	19,659	SY	$7.25	$142,524
	Box Culvert - Concrete	0	CY	$430.00	$0
	"U" Channel - Concrete	0	CY	$430.00	$0
	Headwalls	22	CY	$430.00	$9,623
	RIP RAP (@ Downstream Headwall)	20	CY	$45.00	$900
	Landscape	176,927	SF	$0.10	$17,693
	Remove and Replace Asphalt Road	511	SY	$22.00	$11,234
	60" RGRCP- in asphalt	765.96	LF	$190.00	$145,532
	Slurry Backfill	464.26	CY	$45.00	$20,892
	Storm Drain Manhole - MAG 521	5.00	EA	$4,500.00	$22,500
				SubTotal	$531,084
	25% Construction Contingency (Traffic Control and Mobilization)				$132,771
				Total Construction Cost	$663,855
	Land				
	Land Acquisition	241,355.40	SF	$2.25	$543,050
	Utility Relocation				
	Water 8"-16"	52	LF	$105.00	$5,460
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	0	LF	$80.00	$0
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	0	LS	$150,000.00	$0
	Gas 6" Relocation	1	LS	$25,000.00	$25,000
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	26	LF	$130.00	$3,380
	Electrical Pole	0	EA	$7,000.00	$0
	Others (Telephone, Cable, Etc.)	52	LF	$50.00	$2,600
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$250,000.00	$0
				Subtotal	$36,440
				CONSTRUCTION TOTAL	**$663,855**
				LAND TOTAL	**$543,050**
				UTILITY RELOCATION TOTAL	**$36,440**
				REACH TOTAL	**$1,243,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

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Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3
Reach: Sheet P6 - Roosevelt Park to 104th Ave (Sta 160+00 to 185+00)
Owner: FCDMC & COA
Prepared By: RMP

10/25/12

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	22,170	CY	$6.00	$133,020
	Excavation - Box Culvert and 60" RGRCP	1,172	CY	$9.80	$11,486
	Excavation - "U" Channel	0	CY	$9.80	$0
	Channel Liner	17,413	SY	$7.25	$126,242
	Box Culvert - Concrete	0	CY	$430.00	$0
	"U" Channel - Concrete	0	CY	$430.00	$0
	Headwalls	34	CY	$430.00	$14,435
	RIP RAP (@ Downstream Headwall)	30	CY	$45.00	$1,350
	Landscape	156,714	SF	$0.10	$15,671
	Remove and Replace Asphalt Road	586	SY	$22.00	$12,892
	60" RGRCP- in asphalt	879.00	LF	$190.00	$167,010
	Slurry Backfill	532.77	CY	$45.00	$23,975
	Storm Drain Manhole - MAG 521	3.00	EA	$4,500.00	$13,500
				SubTotal	$519,581
	25% Construction Contingency (Traffic Control and Mobilization)				$129,895
				Total Construction Cost	$649,476
	Land				
	Land Acquisition	214,812.00	SF	$2.25	$483,327
	Utility Relocation				
	Water 8"-16"	52	LF	$105.00	$5,460
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	26	LF	$80.00	$2,080
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	0	LS	$150,000.00	$0
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	130	LF	$130.00	$16,900
	Electrical Pole	1	EA	$7,000.00	$7,000
	Others (Telephone, Cable, Etc.)	133	LF	$50.00	$6,625
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$250,000.00	$0
				Subtotal	$38,065
				CONSTRUCTION TOTAL	**$649,476**
				LAND TOTAL	**$483,327**
				UTILITY RELOCATION TOTAL	**$38,065**
				REACH TOTAL	**$1,171,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Alt 1-3 - Sheet P5 (Versante to Roosevelt Park)
Station Range: 135+00 to 160+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	1,857	$459.69
Channel 1B - 30' Bottom	0	$0.00
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	766	$288.12
Reinforced 4' x 10' Concrete Box Culvert :5 Barre	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert :4 Barre	0	$0.00
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	#DIV/0!
	2,623	

Channel 1A - 10' Bottom

Total: **$310,393.63** *<-Channel Only - No Land Purchase*
Total per LF: $167.19 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	*Stream Left Side Slope (ft/ft)*	*Stream Right Side Slope (ft/ft)*	*Freeboard (ft)*	*Water Depth (ft)*	*Length (ft)*	*R/W Width (ft)*	*Stream Left Width (ft)*	*Stream Right Width (ft)*	*Total Depth (ft)*	*Total Width (ft)*	*Excavation (CY)*	*Haul Export (CY)*	*Liner (SY)*	*Landscape (SF)*	*Land Purchase (SF)*
10	0.13	0.25	1	6	1,857	130	56.00	28.00	7	94.00	25,029.45	25,029.45	19,658.52	176,926.68	241,355.40
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$150,176.69	$0.00	$142,524.27	$17,692.67	$543,049.65

60" RGRCP- in asphalt

Total: **$176,432.58** *<-Pipe Only*
Total per LF: $230.34 *<-Pipe Only*

Element Dimensions											Bid Items							
Diameter of Pipe (in)	*Headwalls (EA)*	*Rip Rap per Downstream Headwall (CY)*	*Over Excavation Depth (ft)*	*Over Excavation Width (ft)*	*Length (ft)*	*Manholes (EA)*	*Trench Depth (ft)*	*Trench Width (ft)*	*Total Depth (ft)*	*Total Width (ft)*	*Excavation (CY)*	*Haul Export (CY)*	*Pipe (LF)*	*CLSM Backfill (CY)*	*Headwalls Concret (CY)*	*Rip Rap (CY)*	*R&R Asphalt (SY)*	*SD Manholes (EA)*
60	2	20	1.00	1.00	765.96	5.00	5.00	5	6.00	6.00	1,021.28	1,021.28	765.96	464.26	22	20.00	510.64	5.00
											Unit Price							
											$9.80	$0.00	$190.00	$45.00	$430.00	$45.00	$22.00	$4,500.00
											$10,008.54	$0.00	$145,532.40	$20,891.64	$9,623.40	$900.00	$11,234.08	$22,500.00

Reinforced 4' x 10' Concrete U-Channel

Total: **$0.00** *<-Culvert Only*
Total per LF: #DIV/0! *<-Culvert Only*

Element Dimensions											Bid Items					
Number of Barrels (EA)	*Headwalls (EA)*	*Rip Rap per Downstream Headwall (CY)*	*Over Excavation Depth (ft)*	*Over Excavation Width (ft)*	*Length (ft)*	*Additional Bottom Slab Thickness (ft)*	*Thickness "T" (ft)*	*Wall Width "W" (ft)*	*Total Depth (ft)*	*Total Width (ft)*	*Excavation (CY)*	*Haul Export (CY)*	*Culvert Concrete (CY)*	*Culvert Steel (lbs)*	*Headwalls Concret (CY)*	*Rip Rap (CY)*
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
											Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00
											$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Utility Relocations

Total: **$36,440.00**

Element Dimensions			Bid Items	
Item Description	*Unit*	Quantity	*Unit Price*	*Cost*
Water 8"-16"	LF	52.00	$105.00	$5,460.00
Water 18" and up	LF	0	$510.00	$0.00
Reclaimed Water	LF	0	$105.00	$0.00
Reclaimed Water Vault	EA	0	$5,000.00	$0.00
Fire Hydrant	EA	0	$5,500.00	$0.00
Sewer Manholes	EA	0	$4,500.00	$0.00
Sewer Mains	LF	0.00	$80.00	$0.00
Storm Drain Structures	EA	0	$2,500.00	$0.00
Storm Drain Pipes	LF	0.00	$95.00	$0.00
Concrete Irrigation Ditch	LF		$20.00	$0.00
Irrigation Relocation	LS	0.00	$150,000.00	$0.00
Gas 6" Relocation	LS	1	$25,000.00	$25,000.00
Gas 20" Relocation	LS	0	$55,000.00	$0.00
Electric	LF	26.00	$130.00	$3,380.00
Electrical Pole	EA	0	$7,000.00	$0.00
Others (Tel, Cable, Etc.)	LF	52	$50.00	$2,600.00
Street lights	EA	0	$2,500.00	$0.00
Traffic Signals	EA	0	$150,000.00	$0.00
Traffic Conduit	EA	0	$1,000.00	$0.00
SRP Tower	EA	0	$250,000.00	$0.00

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards

Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	Wall Width "W	ditional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
6.99	526	1.4	130

4	Barrels
Concrete	Steel
(CY)	(lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0" Skew - 10' x 4'			
Concrete (1 Barrel)	Steel (1 Barrel)	Δ Conc. (per Barrel)	Δ Stl. (per Barrel)
(CY)	(lbs)	(CY)	(lbs)
12.54	949	2.51	220

4	Barrels
Concrete	Steel
(CY)	(lbs)
20.07	1609

Van Buren DCR Alternative 1-3 Cost Estimate

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Alt 1-3 - Sheet P6 (Roosevelt Park to 104th Avenue)
Station Range: 160+00 to 185+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	1,644	$461.09
Channel 1B - 30' Bottom	0	$0.00
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	879	$278.32
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	0	$0.00
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	#DIV/0!
	2,523	

Channel 1A - 10' Bottom

Total: **$274,933.55** *<-Channel Only - No Land Purchase*
Total per LF: $167.19 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	Stream Left Side Slope (ft/ft)	Stream Right Side Slope (ft/ft)	Freeboard (ft)	Water Depth (ft)	Length (ft)	R/W Width Average (ft)	Stream Left Width (ft)	Stream Right Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Liner (SY)	Landscape (SF)	Land Purchase (SF)
10	0.13	0.25	1	6	1,644	128	56.00	28.00	7	94.00	22,170.03	22,170.03	17,412.69	156,714.17	214,812.00
					1164.96	135									
					479.52	120									
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$133,020.16	$0.00	$126,241.97	$15,671.42	$483,327.00

60" RGRCP- in asphalt

Total: **$202,470.42** *<-Pipe Only*
Total per LF: $230.34 *<-Pipe Only*

Element Dimensions											Bid Items							
Diameter of Pipe (in)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Manholes (EA)	Trench Depth (ft)	Trench Width (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Pipe (LF)	CLSM Backfill (CY)	Headwalls Concrete (CY)	Rip Rap (CY)	R&R Asphalt (SY)	SD Manholes (EA)
60	3	20	1.00	1.00	879.00	3.00	5.00	5	6.00	6.00	1,172.00	1,172.00	879.00	532.77	34	30.00	586.00	3.00
											Unit Price							
											$9.80	$0.00	$190.00	$45.00	$430.00	$45.00	$22.00	$4,500.00
											$11,485.60	$0.00	$167,010.00	$23,974.82	$14,435.10	$1,350.00	$12,892.00	$13,500.00

Reinforced 4' x 10' Concrete U-Channel

Total: **$0.00** *<-Culvert Only*
Total per LF: #DIV/0! *<-Culvert Only*

Element Dimensions											Bid Items					
Number of Barrels (EA)	Headwalls (EA)	Rip Rap per Downstream Headwall (CY)	Over Excavation Depth (ft)	Over Excavation Width (ft)	Length (ft)	Additional Bottom Slab Thickness (ft)	Thickness "T" (ft)	Wall Width "W" (ft)	Total Depth (ft)	Total Width (ft)	Excavation (CY)	Haul Export (CY)	Culvert Concrete (CY)	Culvert Steel (lbs)	Headwalls Concrete (CY)	Rip Rap (CY)
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
											Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00
											$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Utility Relocations

Total: **$38,065.00**

Element Dimensions			Bid Items	
Item Description	Unit	Quantity	Unit Price	Cost
Water 8"-16"	LF	52.00	$105.00	$5,460.00
Water 18" and up	LF	0.00	$510.00	$0.00
Reclaimed Water	LF	0.00	$105.00	$0.00
Reclaimed Water Vault	EA	0.00	$5,000.00	$0.00
Fire Hydrant	EA	0.00	$5,500.00	$0.00
Sewer Manholes	EA	0.00	$4,500.00	$0.00
Sewer Mains	LF	26.00	$80.00	$2,080.00
Storm Drain Structures	EA	0.00	$2,500.00	$0.00
Storm Drain Pipes	LF	0.00	$95.00	$0.00
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00
Irrigation Relocation	LS	0.00	$150,000.00	$0.00
Gas 6" Relocation	LS	0.00	$25,000.00	$0.00
Gas 20" Relocation	LS	0.00	$55,000.00	$0.00
Electric	LF	130.00	$130.00	$16,900.00 4 uge and 1 ohe
Electrical Pole	EA	1.00	$7,000.00	$7,000.00
Others (Tel, Cable, Etc.)	LF	132.50	$50.00	$6,625.00
Street lights	EA	0.00	$2,500.00	$0.00
Traffic Signals	EA	0.00	$150,000.00	$0.00
Traffic Conduit	EA	0.00	$1,000.00	$0.00
SRP Tower	EA	0.00	$250,000.00	$0.00

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	ditional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

4	Barrels
Concrete (CY)	Steel (lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

4	Barrels
Concrete (CY)	Steel (lbs)
20.07	1609

SUNRISE ENGINEERING

SUNRISE ENGINEERING, INC.
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Engineer's Opinion of Probable Cost *

Project: Van Buren DCR - Alternative 1-3 — 10/25/12
Reach: Sheet P7 - 104th Ave to 103rd Ave (Sta 185+00 to 193+00)
Owner: FCDMC & COA
Prepared By: RMP

No.	Item Description	Total	Unit	Unit Price	Total
	Construction				
	Excavation - Channel	10,120	CY	$6.00	$60,720
	Excavation - Box Culvert and 60" RGRCP	0	CY	$9.80	$0
	Excavation - "U" Channel	0	CY	$9.80	$0
	Channel Liner	7,948	SY	$7.25	$57,626
	Box Culvert - Concrete	0	CY	$430.00	$0
	"U" Channel - Concrete	0	CY	$430.00	$0
	Headwalls	0	CY	$430.00	$0
	RIP RAP (@ Downstream Headwall)	0	CY	$45.00	$0
	Landscape	71,536	SF	$0.10	$7,154
	Remove and Replace Asphalt Road	0	SY	$22.00	$0
	60" RGRCP- in asphalt	0.00	LF	$190.00	$0
	Slurry Backfill	0.00	CY	$45.00	$0
	Storm Drain Manhole - MAG 521	0.00	EA	$4,500.00	$0
				SubTotal	$125,500
	25% Construction Contingency (Traffic Control and Mobilization)				$31,375
				Total Construction Cost	$156,875
	Land				
	Land Acquisition	90,079.20	SF	$2.25	$202,678
	Utility Relocation				
	Water 8"-16"	0	LF	$105.00	$0
	Water 18" and up	0	LF	$510.00	$0
	Reclaimed Water	0	LF	$105.00	$0
	Reclaimed Water Vault	0	EA	$5,000.00	$0
	Fire Hydrant	0	EA	$5,500.00	$0
	Sewer Manholes	0	LF	$4,500.00	$0
	Sewer Mains	0	LF	$80.00	$0
	Storm Drain Structures	0	LF	$2,500.00	$0
	Storm Drain Pipes	0	LF	$95.00	$0
	Concrete Irrigation Ditch	0	LF	$20.00	$0
	Irrigation Relocation	0	LS	$150,000.00	$0
	Gas 6" Relocation	0	LS	$25,000.00	$0
	Gas 20" Relocation	0	LS	$55,000.00	$0
	Electric	0	LF	$130.00	$0
	Electrical Pole	0	EA	$7,000.00	$0
	Others (Telephone, Cable, Etc.)	0	LF	$50.00	$0
	Street Lights	0	EA	$2,500.00	$0
	Traffic Signals	0	EA	$150,000.00	$0
	Traffic Conduit	0	EA	$1,000.00	$0
	SRP Tower	0	EA	$250,000.00	$0
				Subtotal	$0
				CONSTRUCTION TOTAL	**$156,875**
				LAND TOTAL	**$202,678**
				UTILITY RELOCATION TOTAL	**$0**
				REACH TOTAL	**$360,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

Van Buren DCR Alternative 1-3 Cost Estimate

SUNRISE ENGINEERING

Proposed Design Elements:
Approximate Location: Alt 1-3 - Sheet P7 (104th Avenue to 103rd Avenue)
Station Range: 185+00 to 193+00
Automated Calculation:

Elements w/ Land & Appurtenances	Length (ft)	Cost ($/ft)
Channel 1A - 10' Bottom	751	$437.19
Channel 1B - 30' Bottom	0	$0.00
Channel 2 - 50' Bottom	0	$0.00
Channel 3 - 90' Bottom	0	$0.00
60" RGRCP- in asphalt	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (5 Barrels)	0	$0.00
Reinforced 4' x 10' Concrete Box Culvert (4 Barrels)	0	$0.00
Reinforced 4' x 5' Concrete Box Culvert	0	$0.00
Reinforced 4' x 10' Concrete U-Channel	0	#DIV/0!
	751	

Channel 1A - 10' Bottom

Total: **$125,499.62** *<-Channel Only - No Land Purchase*
Total per LF: $167.19 *<-Channel Only - No Land Purchase*

Element Dimensions											Bid Items				
Bottom Width (ft)	*Stream Left Side Slope (ft/ft)*	*Stream Right Side Slope (ft/ft)*	*Freeboard (ft)*	*Water Depth (ft)*	*Length (ft)*	*R/W Width (ft)*	*Stream Left Width (ft)*	*Stream Right Width (ft)*	*Total Depth (ft)*	*Total Width (ft)*	*Excavation (CY)*	*Haul Export (CY)*	*Liner (SY)*	*Landscape (SF)*	*Land Purchase (SF)*
10	0.13	0.25	1	6	751	120	56.00	28.00	7	94.00	10,120.01	10,120.01	7,948.41	71,535.72	90,079.20
											Unit Price				
											$6.00	$0.00	$7.25	$0.10	$2.25
											$60,720.05	$0.00	$57,626.00	$7,153.57	$202,678.20

Reinforced 4' x 10' Concrete U-Channel

Total: **$0.00** *<-Culvert Only*
Total per LF: #DIV/0! *<-Culvert Only*

Element Dimensions											Bid Items					
Number of Barrels (EA)	*Headwalls (EA)*	*Rip Rap per Downstream Headwall (CY)*	*Over Excavation Depth (ft)*	*Over Excavation Width (ft)*	*Length (ft)*	*Additional Bottom Slab Thickness (ft)*	*Thickness "T" (ft)*	*Wall Width "W" (ft)*	*Total Depth (ft)*	*Total Width (ft)*	*Excavation (CY)*	*Haul Export (CY)*	*Culvert Concrete (CY)*	*Culvert Steel (lbs)*	*Headwalls Concrete (CY)*	*Rip Rap (CY)*
4	0	138	1.00	1.00	0.00	0.17	0.88	0.916666667	6.92	46.25	0.00	0.00	0.00	0.00	0	0.00
											Unit Price					
											$9.80	$0.00	$430.00	$0.00	$430.00	$45.00
											$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Utility Relocations

Total: **$0.00**

Element Dimensions			Bid Items	
Item Description	*Unit*	Quantity	*Unit Price*	*Cost*
Water 8"-16"	LF	0.00	$105.00	$0.00
Water 18" and up	LF	0.00	$510.00	$0.00
Reclaimed Water	LF	0.00	$105.00	$0.00
Reclaimed Water Vault	EA	0.00	$5,000.00	$0.00
Fire Hydrant	EA	0.00	$5,500.00	$0.00
Sewer Manholes	EA	0.00	$4,500.00	$0.00
Sewer Mains	LF	0.00	$80.00	$0.00
Storm Drain Structures	EA	0.00	$2,500.00	$0.00
Storm Drain Pipes	LF	0.00	$95.00	$0.00
Concrete Irrigation Ditch	LF	0.00	$20.00	$0.00
Irrigation Relocation	LF	0.00	$150,000.00	$0.00
Gas 6" Relocation	EA	0.00	$25,000.00	$0.00
Gas 20" Relocation	LS	0.00	$55,000.00	$0.00
Electric	LF	0.00	$130.00	$0.00
Electrical Pole	EA	0.00	$7,000.00	$0.00
Others (Tel, Cable, Etc.)	LF	0.00	$50.00	$0.00
Street lights	EA	0.00	$2,500.00	$0.00
Traffic Signals	EA	0.00	$150,000.00	$0.00
Traffic Conduit	EA	0.00	$1,000.00	$0.00
SRP Tower	EA	0.00	$250,000.00	$0.00

Culvert Quantities for 4' x 10' Reinforced Box Culvert - ADOT B Standards					
Number of Barrels	Concrete	Reinforced Steel	Thickness "T"	*Wall Width "W"	ditional Thickness
(EA)	(CY)	(lbs)	(in)	(in)	(in)
1	1.102	160.4	13.000	12.0	0.000
2	2.067	310.0	10.500	11.0	2.000
3	2.987	446.4	10.500	11.0	2.000
4	3.907	561.5	10.500	11.0	2.000
5	4.827	708.3	10.500	11.0	2.000
6	5.747	842.6	10.500	11.0	2.000

*All box culverts have an additional 4" of width on either side of the bottom slab

Inlet Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
6.99	526	1.4	130

4	Barrels
Concrete (CY)	Steel (lbs)
11.19	916

Outlett Wings

Per ADOT B Standards - 4:1 Slope - 0° Skew - 10' x 4'			
Concrete (1 Barrel) (CY)	Steel (1 Barrel) (lbs)	Δ Conc. (per Barrel) (CY)	Δ Stl. (per Barrel) (lbs)
12.54	949	2.51	220

4	Barrels
Concrete (CY)	Steel (lbs)
20.07	1609

APPENDIX H

ESTIMATE FOR PIPE IN VAN BUREN
AGUA FRIA TO 103RD

Item	Description	Unit	Unit Price	Total Quantity	COST	REACH Agua Fria to El Mirage PP1	El Mirage to 120th PP2	120th to 117th PP3	117th to 113th PP4	113th to 109th PP5	109th to 105th PP6	105th to 101st PP7	101st to 99th PP8	COMMENT
	96" RGRCP IN EXISTING PAVEMENT W/ SHORING	LF	$ 550.00	830	$ 456,500				830					
	84" RGRCP OUTSIDE EXISTING PAVEMENT	LF	$ 325.00	14,550	$ 4,728,750	5,850	6,600	2,100						IN DRAINAGE EASEMENT OUSTSIDE ROAD R/W
	96" RGRCP OUTSIDE EXISTING PAVEMENT	LF	$ 350.00	2,550	$ 892,500			1,500	1,050					
	60" RGRCP	LF	$ 275.00	7,400	$ 2,035,000				950	2,400	2,400	1,650		
	CATCH BASINS + 20 FT 18" LATERAL	EA	$ 5,000.00	12	$ 60,000	1	2	2	1	2	2	2		
	CLSM SLURRY BACKFILL TO SUBGRADE	CY	$ 50.00	15,230	$ 761,481	963	4,000	444	4,111	2,667	2,267	778		PIPE INVERT 16 FEET, TOP OF PIPE 8.5 FT, 1.5 FT PAVEMENT SECTION, 7'X10' VOL ABOVE PIPE + 7'X2' EA SIDE=3.11CY/FT
	PAVEMENT REMOVAL & RESTORATION	SF	$ 5.00	82,240	$ 411,200	5,200	21,600	2,400	22,200	14,400	12,240	4,200		LANE WIDTH 12 FT OVER PIPE
	HEADWALL	EA	$ 25,000.00	1	$ 25,000	1								
	FLAP GATE	EA	$ 10,000.00	3	$ 30,000	3								
	MANHOLE MAG 521	EA	$ 6,500.00	44	$ 286,000	12	12	6	4	4	3	3		AT 600 FT SPACING PLUS LATERAL JCT
	RELOCATE WATER MAIN 36"	EA	$ 100,000.00	-	$ -									
	RELOCATE WATER MAIN 12"/16"	EA	$ 55,000.00	3	$ 165,000		1		1		1			
	RELOCATE WATER MAIN 8"	EA	$ 35,000.00	5	$ 175,000	1	1	1		1		1		PER SNQ III BID
	PROTECT IN PLACE 12" SEWER FORCE MAIN	LS	$ 10,000.00	1	$ 10,000	1								
	RELOCATE 230 KV SRP TOWER	LS	$ 250,000.00	1	$ 250,000		1							
	RELOCATE UNDERGROUND ELECTRIC PUE	EA	$ 128,000.00	4	$ 512,000		2	1			1			
	RELOCATE 6" GAS (SW GAS)	EA	$ 40,000.00	1	$ 40,000				1					$35-40K PER SW GAS
	RELOCATE 20" GAS (EL PASO NG)	EA	$ 150,000.00	1	$ 150,000				1					
	RELOCATE 36" IRRIGATION	LS	$ 200,000.00	1	$ 200,000				1					BUILD NEW BYPASS, THEN CONNECT & REMOVE EXISTING DURING DRYUP
	RELOCATE 30" IRRIGATION	LS	$ 200,000.00	1	$ 200,000								1	
	CONSTRUCTION SUBTOTAL				$ 11,388,431									
	CONTINGENCY 15%				$ 1,708,265									
	CONSTRUCTION TOTAL				$ 13,096,696									
	RIGHT OF WAY-DRAINAGE EASEMENT	AC	$ 167,000.00	8.23	$ 1,373,648	2.24	3.08	1.51	0.22	0.55	0.63			
	TOTAL				**$ 14,470,344**									

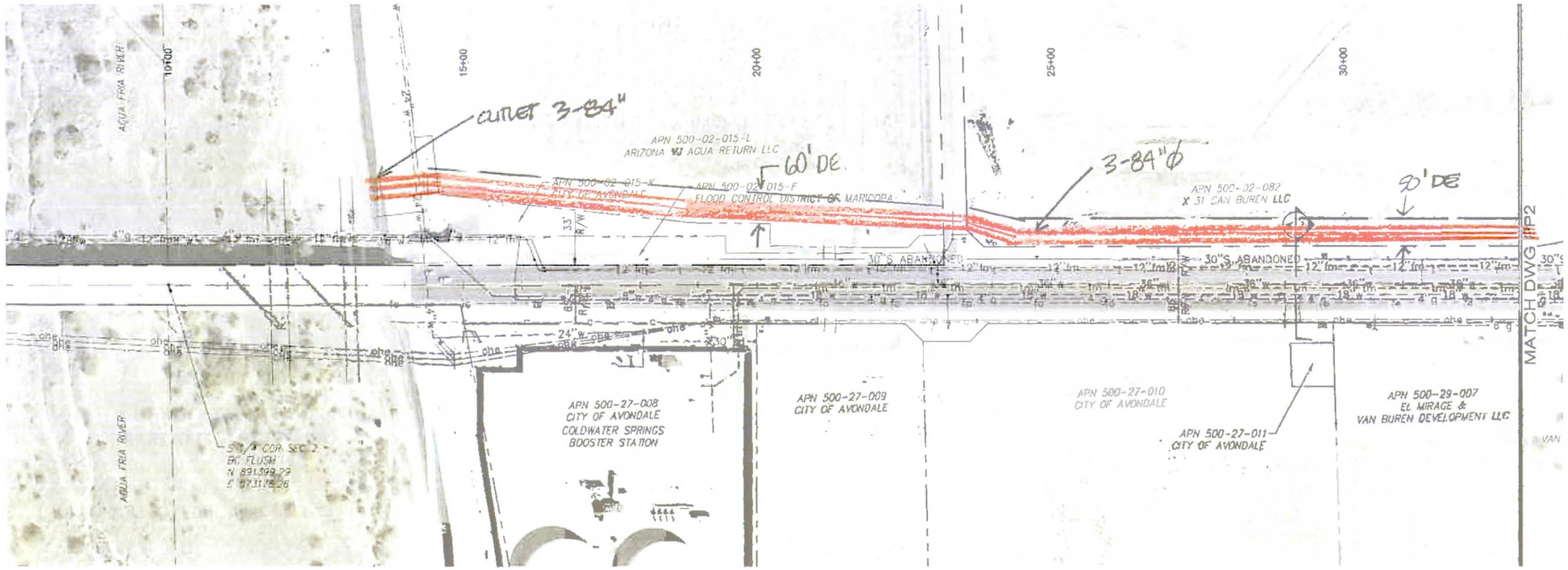
	CONSTRUCTION	CONTINGE	ROW	TOTAL
AGUA FRIA TO 113TH	8,626,926	1,294,039	1,175,824	11,096,789
113TH TO 103RD	2,761,506	414,226	197,824	3,373,555
				14,470,344

ESTIMATE FOR PIPE IN VAN BUREN
AGUA FRIA TO 113TH

Item	Description	Unit	Unit Price	Total Quantity	COST	REACH Agua Fria to El Mirage PP1	El Mirage to 120th PP2	120th to 117th PP3	117th to 113th PP4	113th to 109th PP5	109th to 105th PP6	105th to 101st PP7	101st to 99th PP8	COMMENT
	96" RGRCP IN EXISTING PAVEMENT W/ SHORING	LF	$ 550.00	830	$ 456,500				830					
	84" RGRCP OUTSIDE EXISTING PAVEMENT	LF	$ 325.00	14,550	$ 4,728,750	5,850	6,600	2,100						IN DRAINAGE EASEMENT OUSTSIDE ROAD R/W
	96" RGRCP OUTSIDE EXISTING PAVEMENT	LF	$ 350.00	2,550	$ 892,500			1,500	1,050					
	60" RGRCP	LF	$ 275.00	950	$ 261,250				950					
	CATCH BASINS + 20 FT 18" LATERAL	EA	$ 5,000.00	6	$ 30,000	1	2	2	1					
	CLSM SLURRY BACKFILL TO SUBGRADE	CY	$ 50.00	9,519	$ 475,926	963	4,000	444	4,111					PIPE INVERT 16 FEET, TOP OF PIPE 8.5 FT, 1.5 FT PAVEMENT SECTION, 7'X10' VOL ABOVE PIPE + 7'X2' EA SIDE=3.11CY/FT
	PAVEMENT REMOVAL & RESTORATION	SF	$ 5.00	51,400	$ 257,000	5,200	21,600	2,400	22,200					LANE WIDTH 12 FT OVER PIPE
	HEADWALL	EA	$ 25,000.00	1	$ 25,000	1								
	FLAP GATE	EA	$ 10,000.00	3	$ 30,000	3								
	MANHOLE MAG 521	EA	$ 6,500.00	34	$ 221,000	12	12	6	4					AT 600 FT SPACING PLUS LATERAL JCT
	RELOCATE WATER MAIN 36"	EA	$ 100,000.00	-	$ -									
	RELOCATE WATER MAIN 12"/16"	EA	$ 55,000.00	2	$ 110,000		1		1					
	RELOCATE WATER MAIN 8"	EA	$ 35,000.00	3	$ 105,000	1	1	1						PER SNQ III BID
	PROTECT IN PLACE 12" SEWER FORCE MAIN	LS	$ 10,000.00	1	$ 10,000	1								
	RELOCATE 230 KV SRP TOWER	LS	$ 250,000.00	1	$ 250,000		1							
	RELOCATE UNDERGROUND ELECTRIC PUE	EA	$ 128,000.00	3	$ 384,000		2	1						
	RELOCATE 6" GAS (SW GAS)	EA	$ 40,000.00	1	$ 40,000				1					$35-40K PER SW GAS
	RELOCATE 20" GAS (EL PASO NG)	EA	$ 150,000.00	1	$ 150,000				1					
	RELOCATE 36" IRRIGATION	LS	$ 200,000.00	1	$ 200,000				1					BUILD NEW BYPASS, THEN CONNECT & REMOVE EXISTING DURING DRYUP
	RELOCATE 30" IRRIGATION	LS	$ 200,000.00	-	$ -									
	CONSTRUCTION SUBTOTAL				$ 8,626,926									
	CONTINGENCY 15%				$ 1,294,039									
	CONSTRUCTION TOTAL				$ 9,920,965									
	RIGHT OF WAY-DRAINAGE EASEMENT	AC	$ 167,000.00	7.04	$ 1,175,824	2.24	3.08	1.51	0.22					
	TOTAL				**$ 11,096,789**									
	RIGHT OF WAY-DRAINAGE EASEMENT	AC	$ 200,000.00	7.04	$ 1,408,173									
	TOTAL				**$ 11,329,137**									

ESTIMATE FOR PIPE IN VAN BUREN
113TH TO 103RD

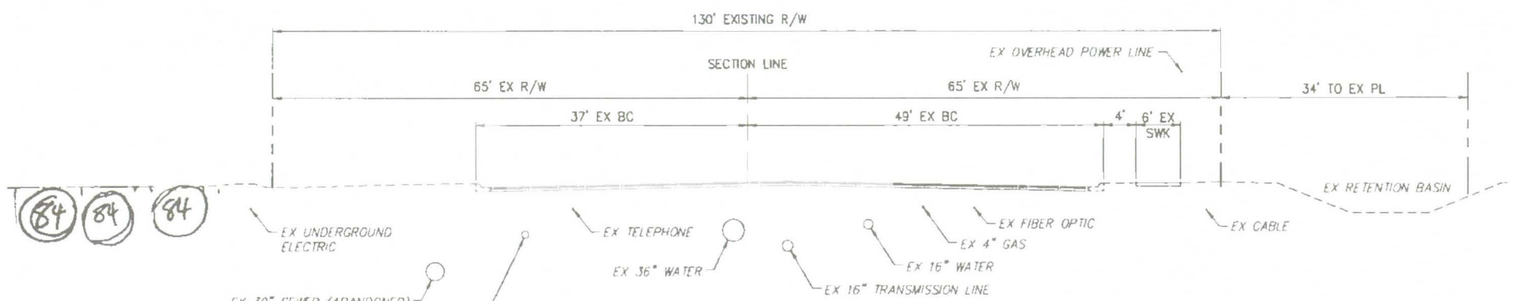
Item	Description	Unit	Unit Price	Total Quantity	COST	REACH Agua Fria to El Mirage PP1	El Mirage to 120th PP2	120th to 117th PP3	117th to 113th PP4	113th to 109th PP5	109th to 105th PP6	105th to 101st PP7	101st to 99th PP8	COMMENT
	96" RGRCP IN EXISTING PAVEMENT W/ SHORING	LF	$ 550.00	-	$ -									
	84" RGRCP OUTSIDE EXISTING PAVEMENT	LF	$ 325.00	-	$ -									IN DRAINAGE EASEMENT OUSTSIDE ROAD R/W
	96" RGRCP OUTSIDE EXISTING PAVEMENT	LF	$ 350.00	-	$ -									
	60" RGRCP	LF	$ 275.00	6,450	$ 1,773,750					2,400	2,400	1,650		
	CATCH BASINS + 20 FT 18" LATERAL	EA	$ 5,000.00	6	$ 30,000					2	2	2		
	CLSM SLURRY BACKFILL TO SUBGRADE	CY	$ 50.00	5,711	$ 285,556					2,667	2,267	778		AVG 12FT X 5 FT X LENGTH
	PAVEMENT REMOVAL & RESTORATION	SF	$ 5.00	30,840	$ 154,200					14,400	12,240	4,200		LANE WIDTH 12 FT OVER PIPE
	HEADWALL	EA	$ 25,000.00	-	$ -									
	FLAP GATE	EA	$ 10,000.00	-	$ -									
	MANHOLE MAG 521	EA	$ 6,500.00	10	$ 65,000					4	3	3		AT 600 FT SPACING PLUS LATERAL JCT
	RELOCATE WATER MAIN 36"	EA	$ 100,000.00	-	$ -									
	RELOCATE WATER MAIN 12"/16"	EA	$ 55,000.00	1	$ 55,000						1			
	RELOCATE WATER MAIN 8"	EA	$ 35,000.00	2	$ 70,000					1		1		PER SNQ III BID
	PROTECT IN PLACE 12" SEWER FORCE MAIN	LS	$ 10,000.00	-	$ -									
	RELOCATE 230 KV SRP TOWER	LS	$ 250,000.00	-	$ -									
	RELOCATE UNDERGROUND ELECTRIC PUE	EA	$ 128,000.00	1	$ 128,000						1			
	RELOCATE 6" GAS (SW GAS)	EA	$ 40,000.00	-	$ -									$35-40K PER SW GAS
	RELOCATE 20" GAS (EL PASO NG)	EA	$ 150,000.00	-	$ -									
	RELOCATE 36" IRRIGATION	LS	$ 200,000.00	-	$ -									BUILD NEW BYPASS, THEN CONNECT & REMOVE EXISTING DURING DRYUP
	RELOCATE 30" IRRIGATION	LS	$ 200,000.00	1	$ 200,000							1		
	CONSTRUCTION SUBTOTAL				$ 2,761,506									
	CONTINGENCY 15%				$ 414,226									
	CONSTRUCTION TOTAL				$ 3,175,731									
	RIGHT OF WAY-DRAINAGE EASEMENT	AC	$ 167,000.00	1.18	$ 197,824					0.55	0.63			
	TOTAL				**$ 3,373,555**									



VAN BUREN STREET

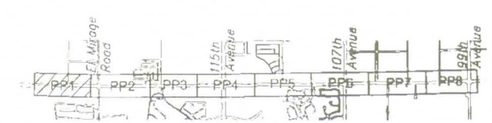
NOTE:

ALL UTILITY LOCATIONS PER UTILITY PROVIDER RECORD DRAWINGS. DEPTHS ASSUMED.



A — SECTION - STA 29+19

SCALE: 1" = 10' LOOKING EAST



KEY MAP

SCALE
0 100' 200'
HORIZ 1" = 100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

REV NO	COMMENT	DATE

43501 Ricky W Holston

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.759.8600 • FAX 480.768.8609
www.sunrise-eng.com

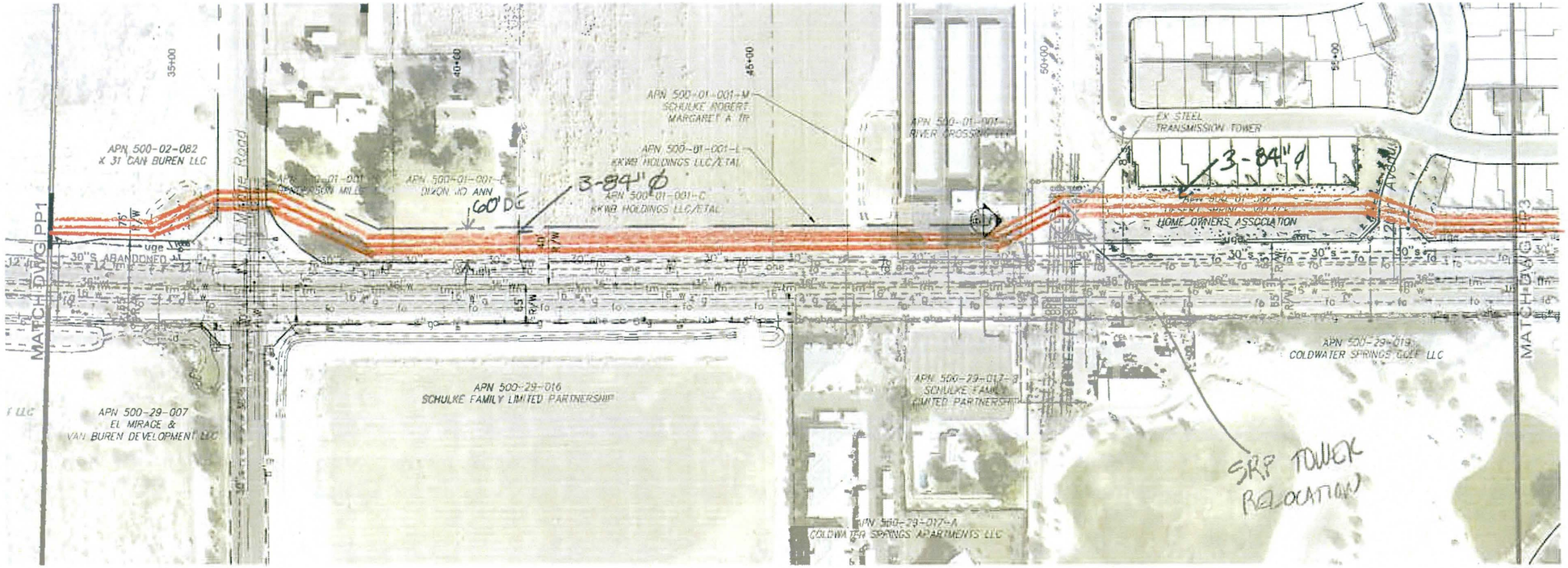
FCDMC

VAN BUREN DCR
TOPOGRAPHIC SURVEY AND CROSS SECTIONS

SET NO	DESIGNED	DRAWN	CHECKED	SHEET NO	
03700	RWH	SET	RWH	1 of 8	PP1

P:\FCDMC\03700VanBuren\Dwg C3D\Sheets\PP1.dwg Oct 20, 2010 9:59am sfuller

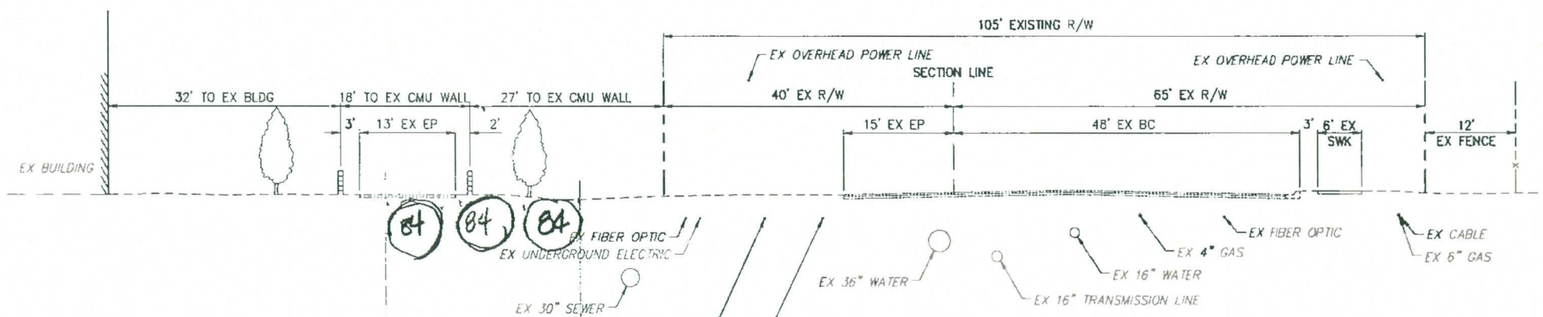
PIPE



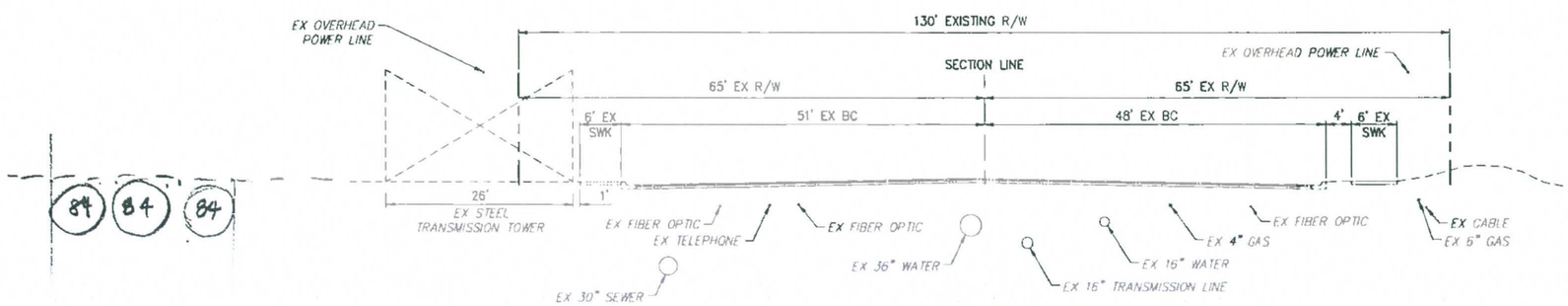
VAN BUREN STREET

NOTE:

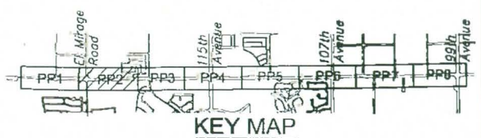
ALL UTILITY LOCATIONS PER UTILITY PROVIDER RECORD DRAWINGS. DEPTHS ASSUMED.



B
–
SECTION - STA 48+94
SCALE: 1" = 10' LOOKING EAST



C
–
SECTION - STA 50+30
SCALE: 1" = 10' LOOKING EAST



KEY MAP

SCALE
0 100' 200'
HORIZ: 1" = 100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

REV NO	COMMENT	DATE

43301
Ricky M Halston
ARIZONA U.S.A.
REGISTERED NATIVE

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480 768 8600 · FAX 480 768 8609
WWW.SUNRISE-ENG.COM

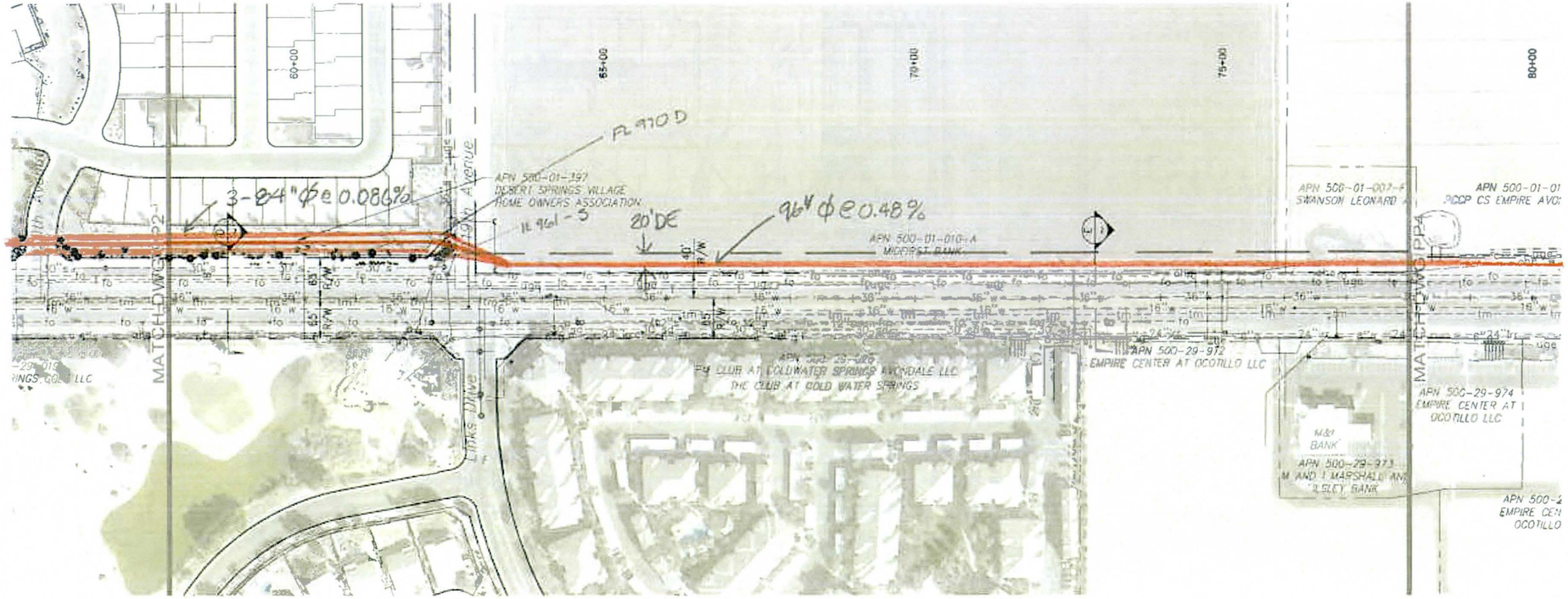
FCDMC

VAN BUREN DCR
TOPOGRAPHIC SURVEY AND CROSS SECTIONS

REV NO	DESIGNED	DRAWN	CHECKED	SHEET NO	
33100	RMH	SLF	RMH	2 of 8	PP2

P:\FCDMC\Q370\VanBuren\Dwg C50\Sheets\PP2.dwg Oct 20, 2010 10:00am sfuller

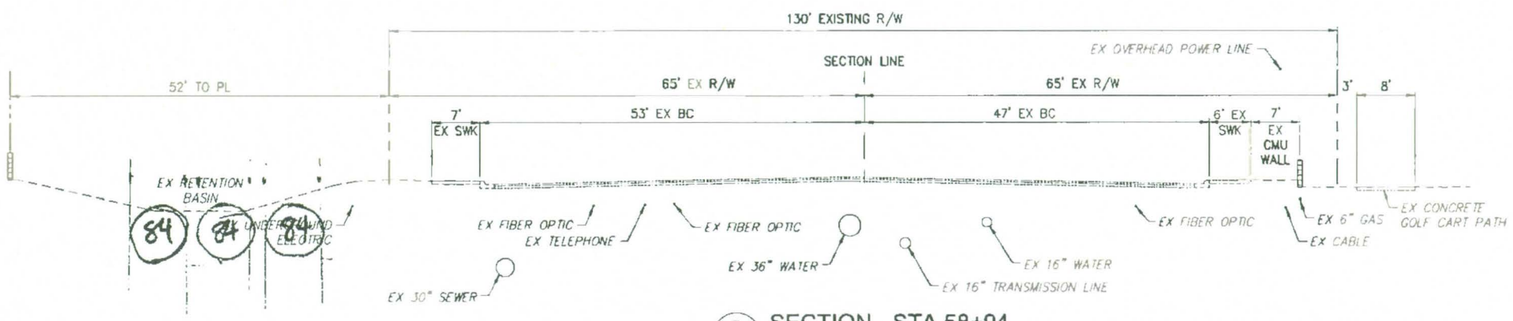
PPE



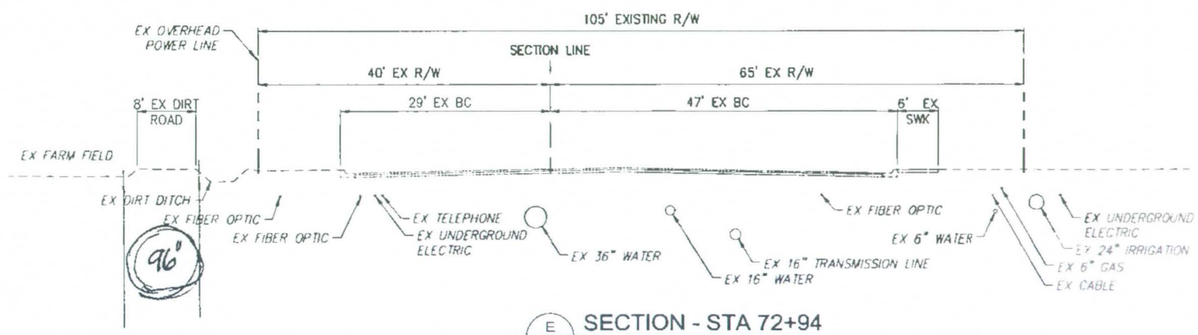
VAN BUREN STREET

NOTE:

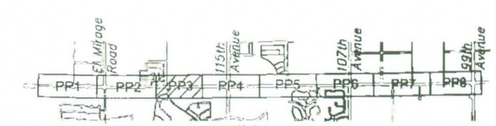
ALL UTILITY LOCATIONS PER UTILITY PROVIDER RECORD DRAWINGS. DEPTHS ASSUMED.



D SECTION - STA 58+94
SCALE: 1" = 10' LOOKING EAST



E SECTION - STA 72+94
SCALE: 1" = 10' LOOKING EAST



KEY MAP

SCALE
0 100' 200'
HORIZ: 1" = 100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

REV NO	COMMENT	DATE

Flood Control District of Maricopa County

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
WWW.SUNRISEENG.COM

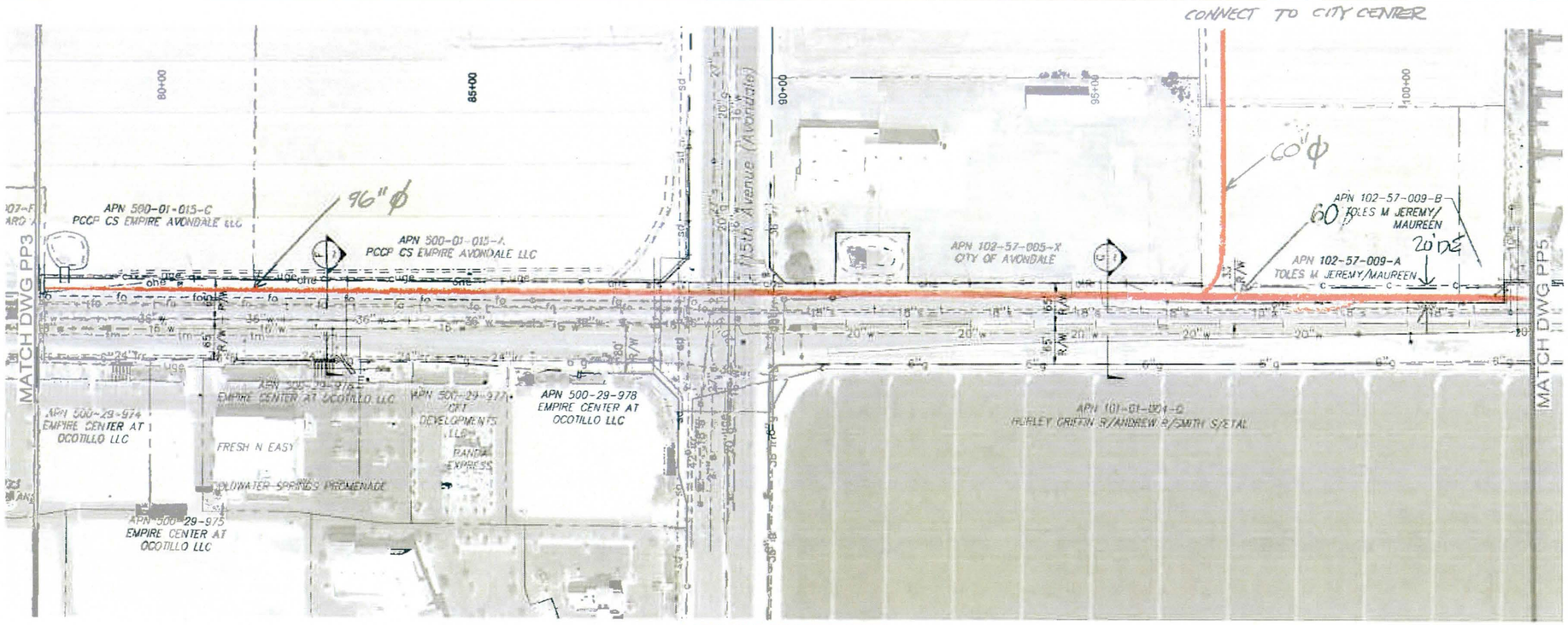
FCDMC

VAN BUREN DCR
TOPOGRAPHIC SURVEY AND CROSS SECTIONS

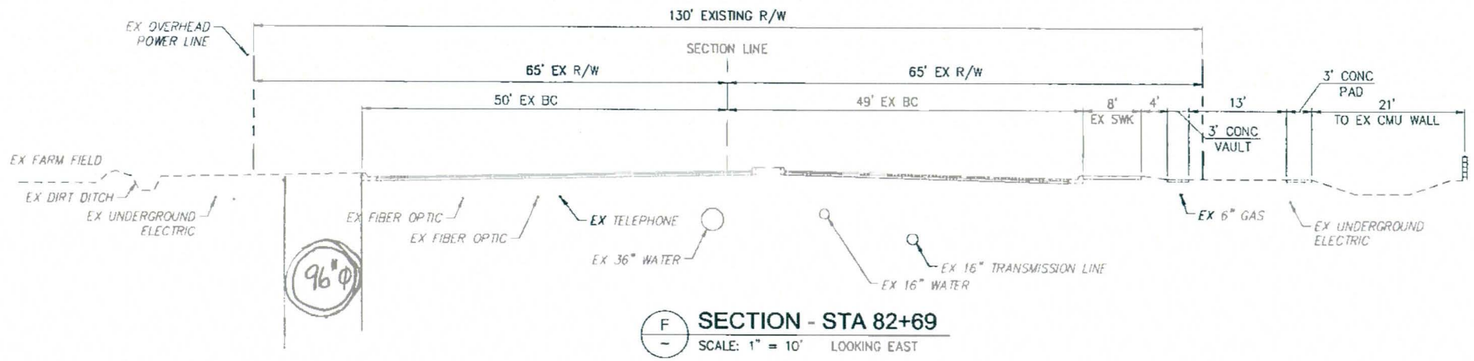
SET NO	DESIGNED	DRAWN	CHECKED	SHEET NO	
03700	MMH	SLF	MMH	3 of 8	PP3

P:\FCDMC\03700VanBuren\Dwg C3D\Sheets\PP3.dwg Oct 20, 2010 10:01am sfuller

PIPE

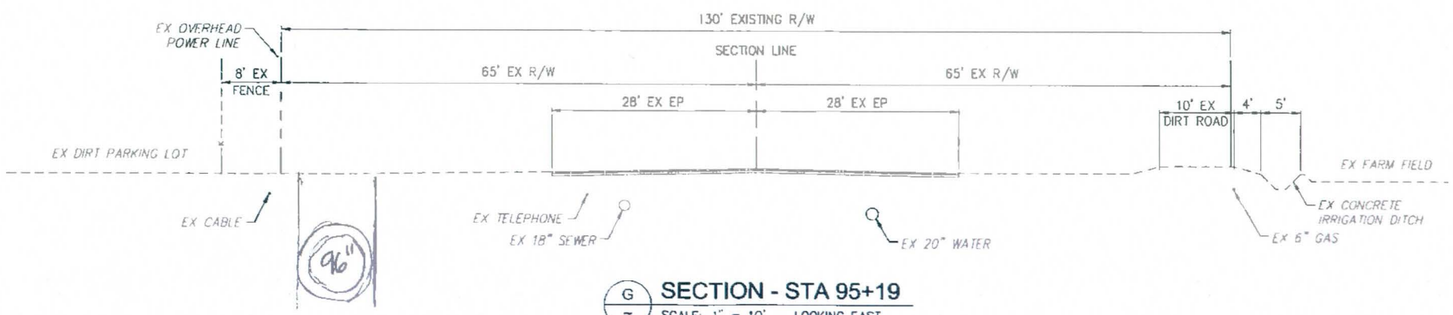


VAN BUREN STREET



F ~ SECTION - STA 82+69

SCALE: 1" = 10' LOOKING EAST



G ~ SECTION - STA 95+19

SCALE: 1" = 10' LOOKING EAST

NOTE:

ALL UTILITY LOCATIONS PER UTILITY PROVIDER RECORD DRAWINGS. DEPTHS ASSUMED.

KEY MAP

SCALE
0 100' 200'
HORIZ: 1" = 100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

REV NO.	COMMENT	DATE

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480 768 8600 • FAX 480 768 8609
www.sunrise-eng.com

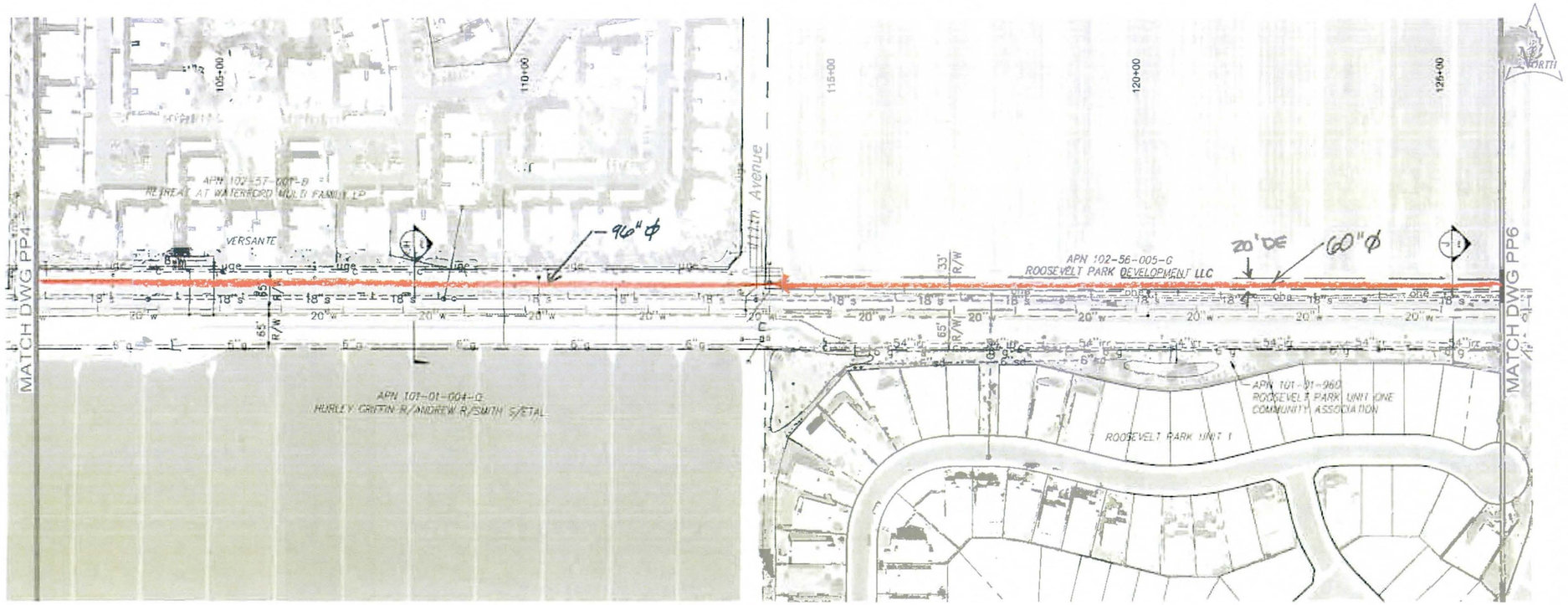
FCDMC

VAN BUREN DCR
TOPOGRAPHIC SURVEY AND CROSS SECTIONS

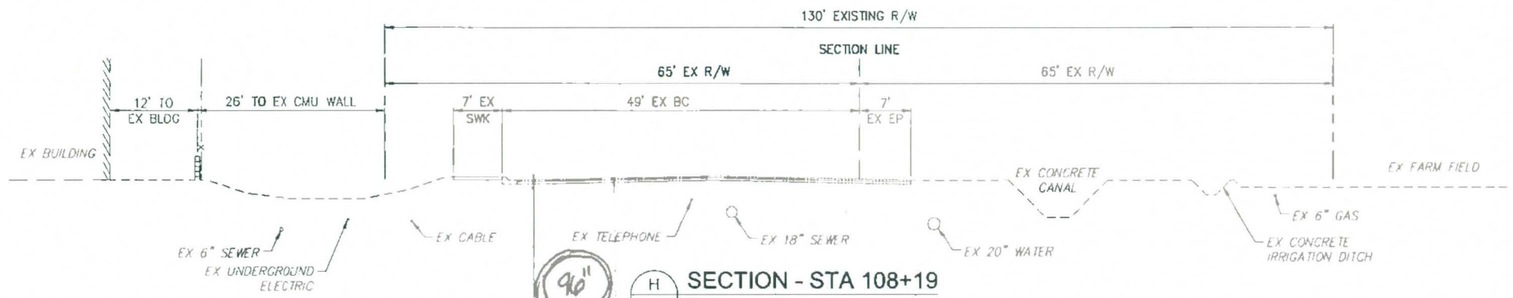
REV NO	DESIGNED	DRAWN	CHECKED	SHEET NO	
0	RBH	SLF	RBH	4 of 8	PP4

P:\FCDMC\037CVBurenWrg C3D\Sheets\PP4.dwg Oct 20, 2010 10:01am sfuller

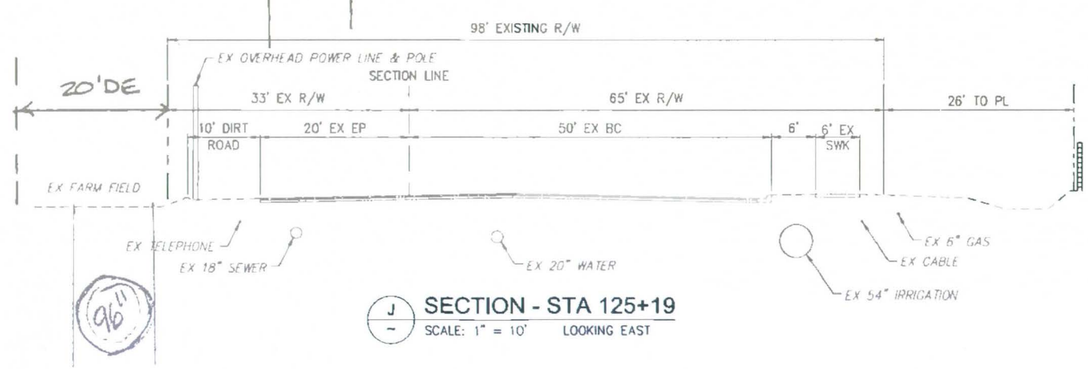
PIPE



VAN BUREN STREET



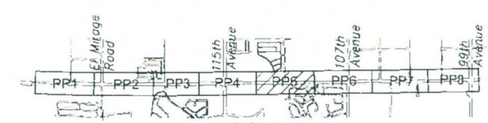
H
SECTION - STA 108+19
SCALE: 1" = 10' LOOKING EAST



J
SECTION - STA 125+19
SCALE: 1" = 10' LOOKING EAST

NOTE:

ALL UTILITY LOCATIONS PER UTILITY PROVIDER RECORD DRAWINGS. DEPTHS ASSUMED.



KEY MAP

SCALE
0 100' 200'
HORIZ: 1" = 100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE IT
(OUTSIDE MARICOPA COUNTY)

REV NO	COMMENT	DATE

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 - FAX 480.768.8609
www.sunrise-eng.com

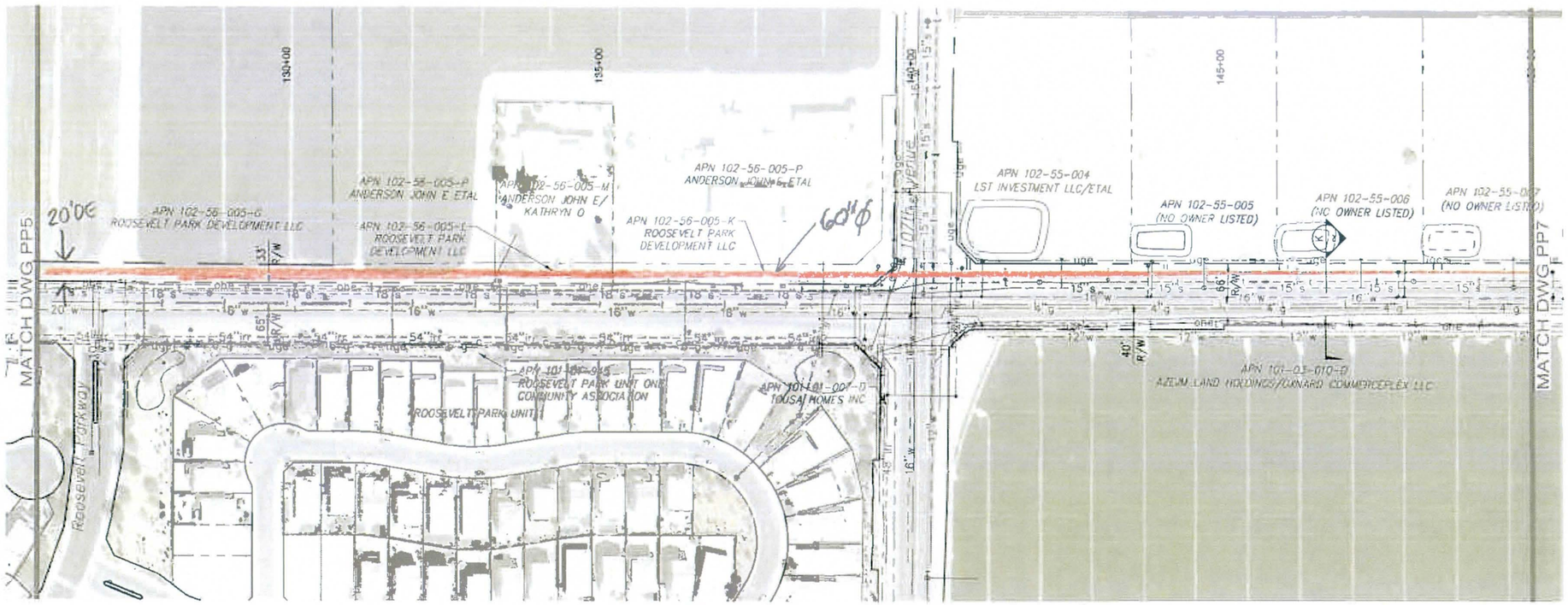
FCDMC

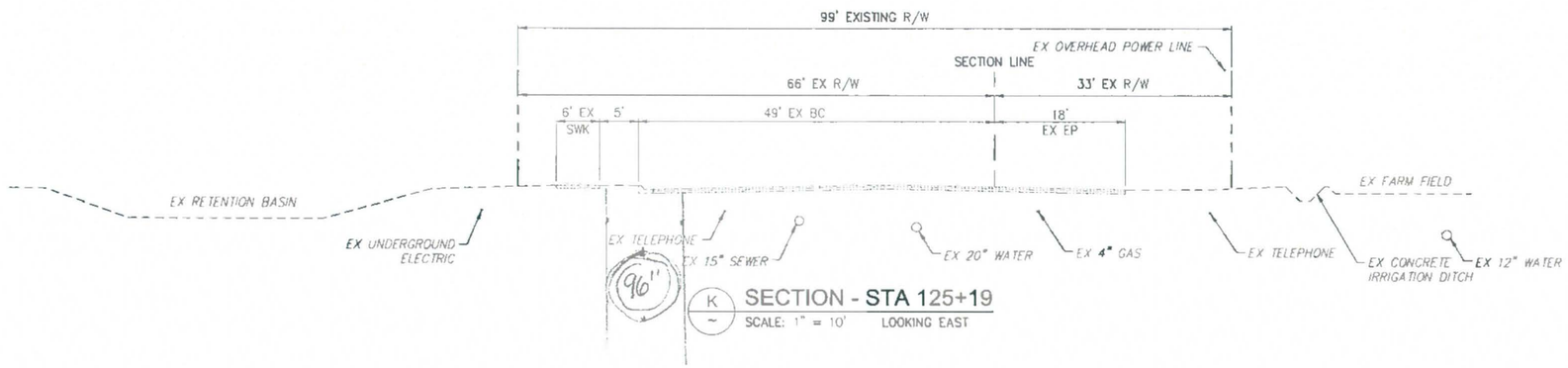
VAN BUREN DCR
TOPOGRAPHIC SURVEY AND CROSS SECTIONS

DESIGNED	DRAWN	CHECKED	SHEET NO	
RMH	SLT	RMH	5 of 8	PP5

P:\FCDMC\03700VanBuren\Dwg C3D\Sheets\PP5.dwg Oct 20, 2010 10:02am slutter

PIPE

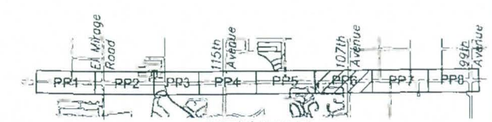




K SECTION - STA 125+19
SCALE: 1" = 10' LOOKING EAST

NOTE:

ALL UTILITY LOCATIONS PER UTILITY PROVIDER RECORD DRAWINGS. DEPTHS ASSUMED.



KEY MAP

SCALE
0 100' 200'
HORIZ: 1" = 100'

CALL ONE WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

REV NO	COMMENT	DATE

43501
Rory M Holston

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 • FAX 480.768.8609
WWW.sunrise-eng.com

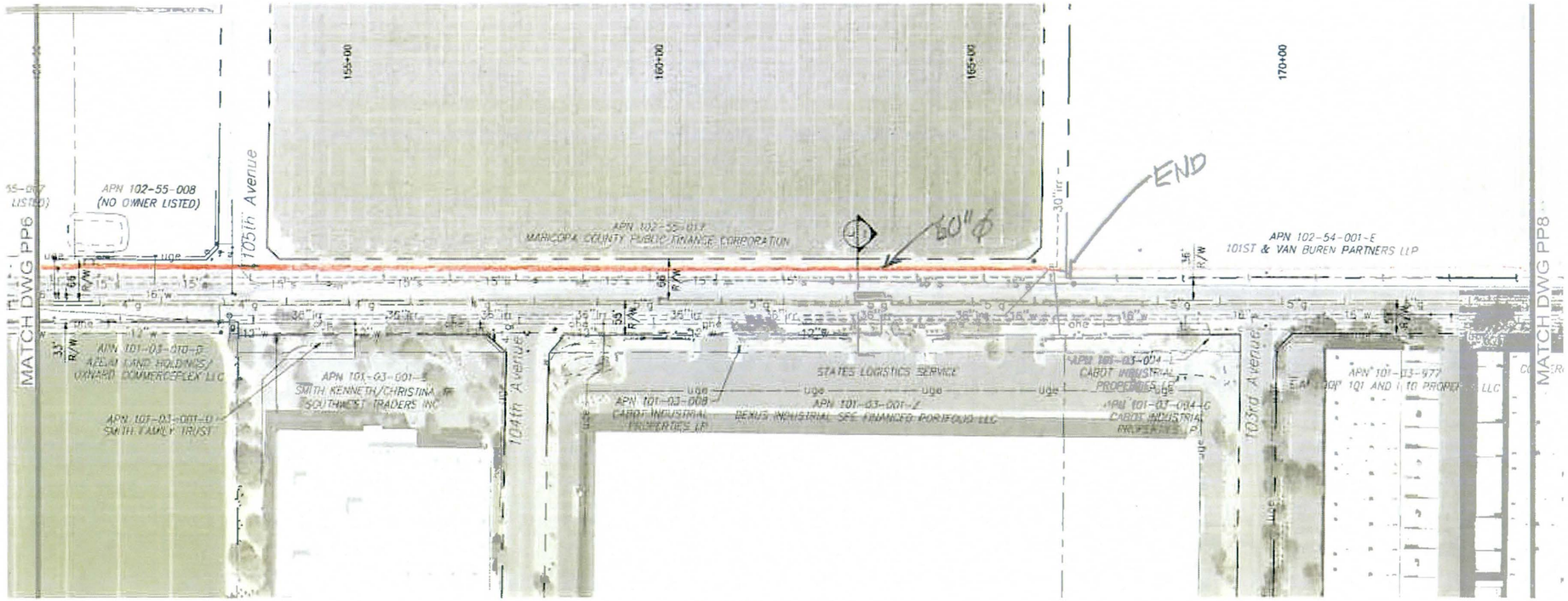
FCDMC

VAN BUREN DCR
TOPOGRAPHIC SURVEY AND CROSS SECTIONS

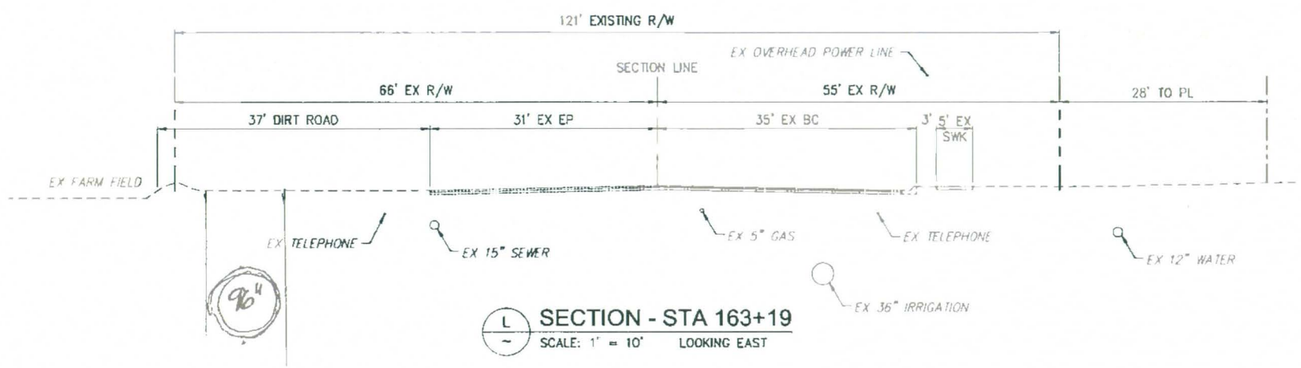
REF NO	DESIGNED	DRAWN	CHECKED	SHEET NO	
03700	RMH	SLF	RMH	6 of 8	PP6

P:\FCDMC\03700VanBuren\Dwg C3D\Sheets\PP6 dwg Oct 20, 2010 10:04am sfuller

PIPE



VAN BUREN STREET

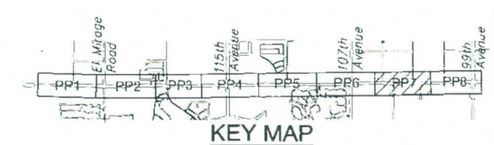


L / ~ SECTION - STA 163+19

SCALE: 1" = 10' LOOKING EAST

NOTE:

ALL UTILITY LOCATIONS PER UTILITY PROVIDER RECORD DRAWINGS. DEPTHS ASSUMED.



KEY MAP

SCALE
0 100' 200'
HORIZ: 1" = 100'

CALL TWO WORKING DAYS BEFORE YOU DIG
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

REV NO	COMMENT	DATE

45931
Ricky M Hobson
CERTIFIED SURVEYOR

SUNRISE ENGINEERING
2152 SOUTH VINEYARD, SUITE 123
MESA, ARIZONA 85210
TEL 480.768.8600 · FAX 480.768.8609
WWW.SUNRISE-ENG.COM

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VAN BUREN DCR
TOPOGRAPHIC SURVEY AND CROSS SECTIONS

REV NO	DESIGNED	DRAWN	CHECKED	SHEET NO	
03-P00	RMH	SLF	RMH	7 of 8	PP7

P:\FCDMC\037COVanBuren\Dwg C3D\Sheets\PP7.dwg Oct 20, 2010 10:05am sfuller

PIPE

CONSULTANT REGISTERED SURVEYING INC.
CARL SITTERLEY, R.L.S.

MAILING ADDRESS: 3370 N. Hayden, Suite #123, P.M.B. 567
Scottsdale, Arizona 85251
OFFICE ADDRESS: 8732 E. Piccadilly Rd.
Scottsdale, Arizona 85251
PHONE: (480) 620-1382
E-mail: csitterley-crs@cox.net

Attn: Charles Andrews, P.E., Senior Engineering Project Manager June 19, 2013
CITY OF AVONDALE
11465 W. Civic Center Drive
Avondale, AZ 85323

RE: Report of Survey Service, Utility Bore Hole Locations, Avondale Blvd. at of Van Buren. Survey, Arizona Central Zone State Plane Coordinates (Grid) and NAVD88 vert. datum.

The following utility location depths were bore holed by KC Locate, Inc. The horizontal locations are Arizona Central Zone State Plane Coordinates as requested by Sunrise Engineering, Inc. and have not been raised to ground distance values. CRS uses a combined grid-to-ground scale factor of 1.000126616 scaled from an origin of N=0, E=0 in this project area to convert grid coordinates to ground coordinates for other local projects. The sectional brass cap monument for the intersection of Avondale Blvd. and Van Buren is provided by Sunrise Engineering to have Grid (state plane) coordinates of N=891359.421, E=581087.365, NAVD88 elevation of 996.11 (CRS also used engineers station 10+00.00). The Avondale Blvd. centerline alignment was referenced by CRS to a City of Avondale brass cap in hand hole at the intersection of City Center Drive at engineers station 23+13.5.

Utility Location Data as follows:

	Bore Hole	(Grid) Northing	(Grid) Easting	NAVD88 Utility Elev.	Surface Elevation	Station	Offset
72+16.30	1	891470.99	581144.86	988.02	997.02	11+11.8	57.6 Rt
71+68.05	2 (26.89)	891472.35	581096.63	989.64	996.64	11+13.2	09.3 Rt
71+45.42	3 (27.66)	891472.17	581073.98	988.65	996.70	11+13.0	13.3 Lt
	4	891619.83	581062.29	976.70 (top)	996.20	12+60.7	24.9 Lt
	^-----(man hole)						
90+98.59	5 (27.39)	891473.71	581027.18	992.37 (top) 991.67 (btm)	996.62	11+14.6	60.1 Lt
90+86.34	6 (27.70)	891473.50	581015.86	992.32	996.27	11+14.4	71.5 Lt
90+82.98 27.61	7	891473.57	581012.50	992.03 (top) 991.33 (btm)	996.33	11+14.5	74.8 Lt
90+79.53 27.75	8	891473.40	581009.05	989.59 (top) 987.39 (btm)	996.39	11+14.3	78.3 Lt

Thank you for this continuing opportunity to provide surveying services to the City of Avondale. Please call with questions.

Submitted,
CONSULTANT REGISTERED SURVEYING, INC.
Carl Sitterley, RLS, President

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
28742
CARL
SITTERLEY
6/19/13
ARIZONA U.S.A.
Expires 3/31/16

SAE

KC LOCATE LLC
25440 N. 93rd Ave Peoria, AZ 85383
(623)825-0230 MBL: (602) 702-2582

Utility Survey Report

Task ID: 201300051 Date Located: 6/14/2013
Project: Van Buren DCR
Client Name: City of Avondale Ref: 03700
Work Site: Avondale Blvd & Van Buren
Truck: 21 Crew Names: Ken, Jesus

Client Hole#: 1 Client Plan Sheet: Map Grid: KC Hole#: 1

BM Desc.: BCHH AVONDALE & VAN BUREN Status: GIVEN B.M. Elev.: 996.11 (feet)

Station/Offset/Dir: (feet) Requested
Station/Offset/Dir: Surveyed 11+11.8 57.6 RT

Survey Remarks:
SURVEY INFORMATION COLLECTED BY CRS

Profile View (not to scale)

Pavement & Soils Informaiton
Marker: WHISKER Marker/Surf. Elevation: 997.02 (feet)
Upper: OR (feet)
Lower:
Soils Code: CH

Utility Elevation TOP: 988.02 (feet)
Measured Distance From Surface:
TOP: 9.00 (feet)
BOTTOM: (feet)

Visual Utility Identification Information
Size/Width: 36.00 (in)
Type Code: IR
Structure: P
Material: CC

Physical SWING TIE Information

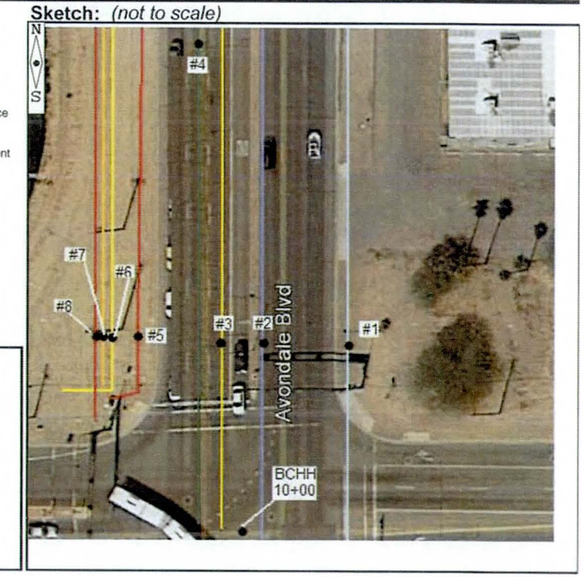
	Dist. (ft)	Dir.	from PERMANENT existing fixture
A:	33.40	N	SRP MANHOLE
B:	8.80	E	FACE OF CURB
C:	40.70	SW	STORM DRAIN GRATE

TERMS:
UKN - Unknown
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road (Dirt)
E - Electrical
G - Gas/Petro/LP
IR - Irrigation
TV - Cable TV
FO - Fiber Optics
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water
CH - Chemical
ABS - Plastic Pipe
ACP - Asbes. Cement
CIP - Cast Iron Pipe
CIPP- Cast in Place
CAP - Corrugated Alum
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - PolyVinal Chlor.
RC - Reinforced Conc.
SL - Slurry
STL - Steel
STLC- Steel Coated
STLW- Steel Wrapped
TR - Transite
VCP - Vitrified Clay Pipe
WD - Wood
C - Cable
D - Duct bank
P - Pipe
V - Vault Box
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
F/C - Face of Curb
F/H - Fire Hydrant
IN - Inspection Hole
M/H - ManHole
P/P - Power Pole
S/W - Side Walk
WM - Water Meter
WV - Water Valve
BM - Benchmark
BCF - Brass Cap Flush
BCHH- Brass Cap HandHole
CL - Center Line
PL - Property Line
R/W - Right of Way
BaseLine

Comments/Remarks:
We located a pipe running N/S.

N:891470.99/ E:581144.86

Sketch: *(not to scale)*



SAE

Utility Survey Report

KC LOCATE LLC
25440 N. 93rd Ave Peoria, AZ 85383
(623)825-0230 MBL: (602) 702-2582

Task ID: 201300051 **Date Located:** 6/14/2013
Project: Van Buren DCR
Client Name: City of Avondale **Ref:** 03700
Work Site: Avondale Blvd & Van Buren
Truck: 21 **Crew Names:** Ken, Jesus

Client Hole#: 2 **Client Plan Sheet:** **Map Grid:** **KC Hole#:** 2

BM Desc.: BCHH AVONDALE & VAN BUREN **Status:** GIVEN **B.M. Elev.:** 996.11 (feet)

Station/Offset/Dir: (feet) *Requested*
Station/Offset/Dir: *Surveyed* 11+13.2 | 9.3 | RT

Survey Remarks:
SURVEY INFORMATION COLLECTED BY CRS

Profile View (not to scale)

Pavement & Soils Informaiton **Marker:** PK NAIL **Marker/Surf. Elevation:** 996.64 (feet)

Upper: AC 0.45 (feet)
Lower:
Soils Code: GC

Utility Elevation TOP: 989.64 (feet)
Measured Distance From Surface:
TOP: 7.00 (feet)
BOTTOM: (feet)

Visual Utility Identification Information
Size/Width: 16.00 (in)
Type Code: W
Structure: P
Material: AC

Physical SWING TIE Information

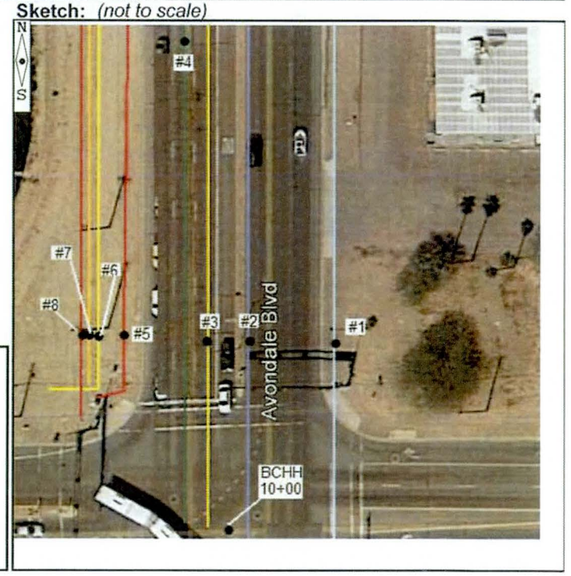
	Dist. (ft)	Dir.	from PERMANENT existing fixture
A:	2.30	E	FACE OF CURB
B:	39.40	W	FACE OF CURB
C:	14.80	NE	STREET LIGHT BASE

TERMS:
UKN - Unknown
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road (Dirt)
E - Electrical
G - Gas/Petro/LP
IR - Irrigation
TV - Cable TV
FO - Fiber Optics
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water
CH - Chemical
ABS - Plastic Pipe
ACP - Asbes. Cement
CIP - Cast Iron Pipe
CIPP- Cast in Place
CAP - Corrugated Alum
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - PolyVinal Chlor.
RC - Reinforced Conc.
SL - Slurry
STL - Steel
STLC- Steel Coated
STLW- Steel Wrapped
TR - Transite
VCP - Vitrified Clay Pipe
WD - Wood
C - Cable
D - Duct bank
P - Pipe
V - Vault Box
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
F/C - Face of Curb
F/H - Fire Hydrant
IN - Inspection Hole
M/H - ManHole
P/P - Power Pole
S/W - Side Walk
WM - Water Meter
WV - Water Valve
BM - Benchmark
BCF - Brass Cap Flush
BCHH- Brass Cap HandHole
CL - Center Line
PL - Property Line
R/W - Right of Way
BaseLine

Comments/Remarks:
We located a pipe running N/S.

N:891472.35 / E:581096.63

Sketch: *(not to scale)*



SAE

Utility Survey Report

KC LOCATE LLC
25440 N. 93rd Ave Peoria, AZ 85383
(623)825-0230 MBL: (602) 702-2582

Task ID: 201300051 **Date Located:** 6/14/2013
Project: Van Buren DCR
Client Name: City of Avondale **Ref:** 03700
Work Site: Avondale Blvd & Van Buren
Truck: 21 **Crew Names:** Ken, Jesus

Client Hole#: 3 **Client Plan Sheet:** **Map Grid:** **KC Hole#:** 3

BM Desc.: BCHH AVONDALE & VAN BUREN **Status:** GIVEN **B.M. Elev.:** 996.11 (feet)

Station/Offset/Dir: (feet) *Requested*
Station/Offset/Dir: *Surveyed* 11+13 | 13.3 | LT

Survey Remarks:
SURVEY INFORMATION COLLECTED BY CRS

Profile View (not to scale)

Pavement & Soils Informaiton **Marker:** PK NAIL **Marker/Surf. Elevation:** 996.70 (feet)

Upper: AC 0.45 (feet)
Lower:
Soils Code: GW

Utility Elevation TOP: 988.65 (feet)
Measured Distance From Surface:
TOP: 8.05 (feet)
BOTTOM: (feet)

Visual Utility Identification Information
Size/Width: 20.00 (in)
Type Code: G
Structure: P
Material: STL

Physical SWING TIE Information

	Dist. (ft)	Dir.	from PERMANENT existing fixture
A:	16.30	W	FACE OF CURB
B:	35.20	E	FACE OF CURB
C:	23.00	NW	STREET LIGHT BASE

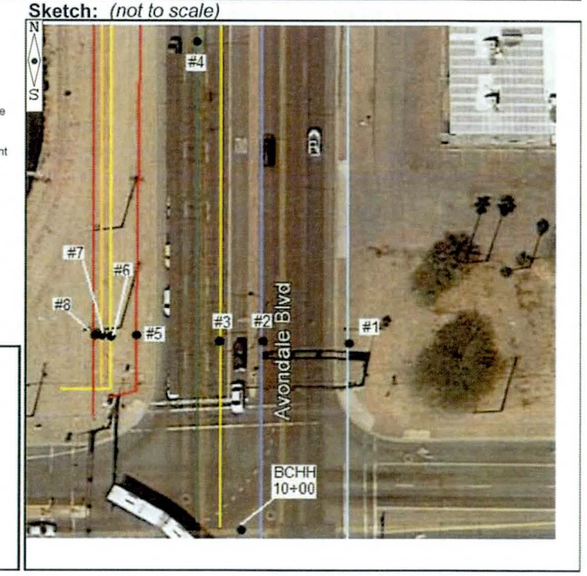
TERMS:
UKN - Unknown
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road (Dirt)
E - Electrical
G - Gas/Petro/LP
IR - Irrigation
TV - Cable TV
FO - Fiber Optics
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water
CH - Chemical
ABS - Plastic Pipe
ACP - Asbes. Cement
CIP - Cast Iron Pipe
CIPP- Cast in Place
CAP - Corrugated Alum
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - PolyVinal Chlor.
RC - Reinforced Conc.
SL - Slurry
STL - Steel
STLC- Steel Coated
STLW- Steel Wrapped
TR - Transite
VCP - Vitrified Clay Pipe
WD - Wood
C - Cable
D - Duct bank
P - Pipe
V - Vault Box
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
F/C - Face of Curb
F/H - Fire Hydrant
IN - Inspection Hole
M/H - ManHole
P/P - Power Pole
S/W - Side Walk
WM - Water Meter
WV - Water Valve
BM - Benchmark
BCF - Brass Cap Flush
BCHH- Brass Cap HandHole
CL - Center Line
PL - Property Line
R/W - Right of Way
BaseLine

Comments/Remarks:
We located a black pipe running N/S.

Note KM Inspector on site: Rick Maxwell 602-980-0158

N:891472.17 / E:581073.98

Sketch: *(not to scale)*



SAE

Utility Survey Report

KC LOCATE LLC
25440 N. 93rd Ave Peoria, AZ 85383
(623)825-0230 MBL: (602) 702-2582

Task ID: 201300051 **Date Located:** 6/14/2013
Project: Van Buren DCR
Client Name: City of Avondale **Ref:** 03700
Work Site: Avondale Blvd & Van Buren
Truck: 21 **Crew Names:** Ken, Jesus

Client Hole#: 4 **Client Plan Sheet:** **Map Grid:** **KC Hole#:** 4

BM Desc.: BCHH AVONDALE & VAN BUREN **Status:** GIVEN **B.M. Elev.:** 996.11 (feet)

Station/Offset/Dir: (feet) *Requested*
Station/Offset/Dir: *Surveyed* 12+60.7 | 24.9 | LT

Survey Remarks:
SURVEY INFORMATION COLLECTED BY CRS

Profile View (not to scale)

Pavement & Soils Informaiton
Marker: SEE COMMEN **Marker/Surf. Elevation:** 996.20 (feet)
Upper: (feet)
Lower:
Soils Code:
Utility Elevation TOP: 976.70 (feet)
Measured Distance From Surface:
TOP: (feet)
BOTTOM: (feet)

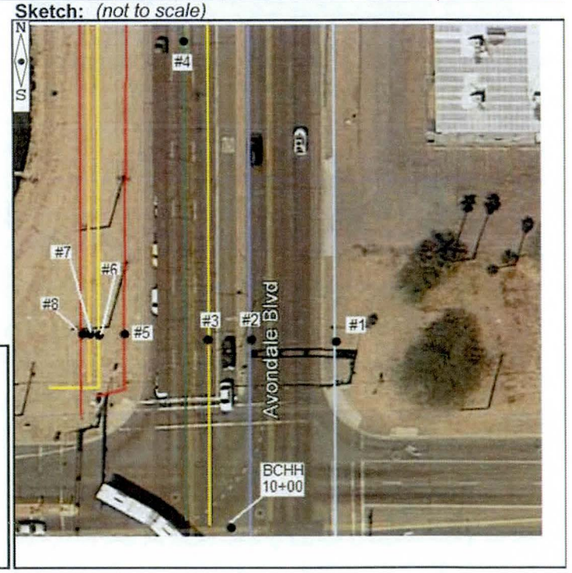
Visual Utility Identification Information
Size/Width: 27.00 (in)
Type Code: SS
Structure: O
Material:

Physical SWING TIE Information

	Dist. (ft)	Dir.	from PERMANENT existing fixture
A:			
B:			
C:			

TERMS:
UKN - Unknown
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road (Dirt)
E - Electrical
G - Gas/Petro/LP
IR - Irrigation
TV - Cable TV
FO - Fiber Optics
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water
CH - Chemical
ABS - Plastic Pipe
ACP - Asbes. Cement
CIP - Cast Iron Pipe
CIPP- Cast in Place
CAP - Corrugated Alum
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - PolyVinal Chlor.
RC - Reinforced Conc.
SL - Slurry
STL - Steel
STLC- Steel Coated
STLW- Steel Wrapped
TR - Transite
VCP - Vitrified Clay Pipe
WD - Wood
C - Cable
D - Duct bank
P - Pipe
V - Vault Box
B/C - Back of Curb
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
F/C - Face of Curb
F/H - Fire Hydrant
IN - Inspection Hole
M/H - ManHole
P/P - Power Pole
S/W - Side Walk
WM - Water Meter
WV - Water Valve
BM - Benchmark
BCF - Brass Cap Flush
BCHH- Brass Cap HandHole
_CL - Center Line
_PL - Property Line
R/W - Right of Way
_BaseLine

Sketch: *(not to scale)*



Comments/Remarks:
We measured the top of the pipe in the manhole at 19.5ft deep.

N:891619.83 / E:581062.29

SAE

Utility Survey Report

KC LOCATE LLC
25440 N. 93rd Ave Peoria, AZ 85383
(623)825-0230 MBL: (602) 702-2582

Task ID: 201300051 **Date Located:** 6/14/2013
Project: Van Buren DCR
Client Name: City of Avondale **Ref:** 03700
Work Site: Avondale Blvd & Van Buren
Truck: 21 **Crew Names:** Ken, Jesus

Client Hole#: 5 **Client Plan Sheet:** **Map Grid:** **KC Hole#:** 5

BM Desc.: BCHH AVONDALE & VAN BUREN **Status:** GIVEN **B.M. Elev.:** 996.11 (feet)

Station/Offset/Dir: (feet) *Requested*
Station/Offset/Dir: *Surveyed* 11+14.6 | 60.1 | LT

Survey Remarks:
SURVEY INFORMATION COLLECTED BY CRS

Profile View (not to scale)

Pavement & Soils Informaiton
Marker: WHISKER **Marker/Surf. Elevation:** 996.62 (feet)
Upper: OR (feet)
Lower:
Soils Code: CH
Utility Elevation TOP: 992.37 (feet)
Measured Distance From Surface:
TOP: 4.25 (feet)
BOTTOM: 4.95 (feet)

Visual Utility Identification Information
Size/Width: 18.00 (in)
Type Code: E
Structure: D
Material: PVC

Physical SWING TIE Information

	Dist. (ft)	Dir.	from PERMANENT existing fixture
A:	11.50	W	FACE OF CURB
B:	34.70	NW	GAS VALVE
C:	48.70	SE	POWER POLE

TERMS:
UKN - Unknown
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road (Dirt)
E - Electrical
G - Gas/Petro/LP
IR - Irrigation
TV - Cable TV
FO - Fiber Optics
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water
CH - Chemical
ABS - Plastic Pipe
ACP - Asbes. Cement
CIP - Cast Iron Pipe
CIPP- Cast in Place
CAP - Corrugated Alum
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - PolyVinal Chlor.
RC - Reinforced Conc.
SL - Slurry
STL - Steel
STLC- Steel Coated
STLW- Steel Wrapped
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VCP - Vitrified Clay Pipe
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C - Cable
D - Duct bank
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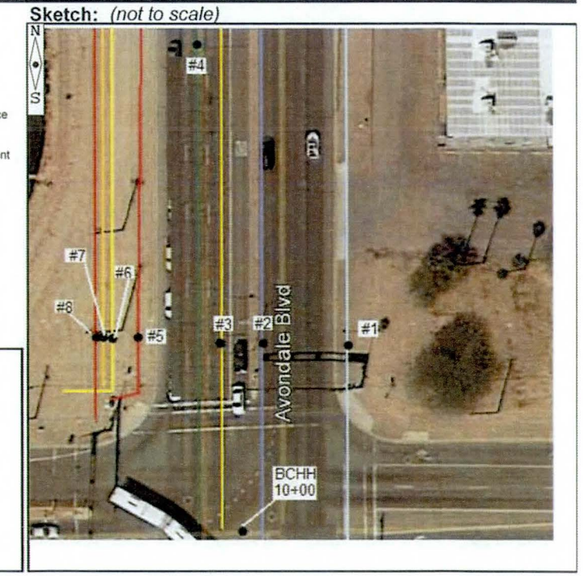
CB - Catch Basin
CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
F/C - Face of Curb
F/H - Fire Hydrant
IN - Inspection Hole
M/H - ManHole
P/P - Power Pole
S/W - Side Walk
WM - Water Meter
WV - Water Valve
BM - Benchmark
BCF - Brass Cap Flush
BCHH- Brass Cap HandHole
_CL - Center Line
_PL - Property Line
R/W - Right of Way
_BaseLine

Sketch: *(not to scale)*



Comments/Remarks:
We locate 3 - 4in gray pipes running N/S.

N:891473.71 / E:581027.18

Bottom Elev. 991.67

SAE

Utility Survey Report

KC LOCATE LLC
25440 N. 93rd Ave Peoria, AZ 85383
(623)825-0230 MBL: (602) 702-2582

Task ID: 201300051 **Date Located:** 6/14/2013
Project: Van Buren DCR
Client Name: City of Avondale **Ref:** 03700
Work Site: Avondale Blvd & Van Buren
Truck: 21 **Crew Names:** Ken, Jesus

Client Hole#: 6 **Client Plan Sheet:** **Map Grid:** **KC Hole#:** 6

BM Desc.: BCHH AVONDALE & VAN BUREN **Status:** GIVEN **B.M. Elev.:** 996.11 (feet)

Station/Offset/Dir: (feet) *Requested*
Station/Offset/Dir: *Surveyed* 11+14.4 71.5 LT

Survey Remarks:
SURVEY INFORMATION COLLECTED BY CRS

Profile View (not to scale)

Pavement & Soils Informaiton
Marker: WHISKER **Marker/Surf. Elevation:** 996.27 (feet)
Upper: OR (feet)
Lower:
Soils Code: CH
Utility Elevation TOP: 992.32 (feet)
Measured Distance From Surface:
TOP: 3.95 (feet)
BOTTOM: (feet)

Visual Utility Identification Information
Size/Width: 6.00 (in)
Type Code: G
Structure: P
Material: PE

Physical SWING TIE Information

	Dist. (ft)	Dir.	from PERMANENT existing fixture
A:	22.80	W	FACE OF CURB
B:	29.60	SW	GAS VALVE
C:	49.00	SW	POWER POLE

TERMS:

UKN - Unknown
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road (Dirt)

E - Electrical
G - Gas/Petro/LP
IR - Irrigation
TV - Cable TV
FO - Fiber Optics
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water
CH - Chemical

ABS - Plastic Pipe
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CIP - Cast Iron Pipe
CIPP- Cast in Place
CAP - Corrugated Alum
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - PolyVinal Chlor.
RC - Reinforced Conc.
SL - Slurry
STL - Steel
STLC- Steel Coated
STLW- Steel Wrapped
TR - Transite
VCP - Vitrified Clay Pipe
WD - Wood

C - Cable
D - Duct bank
P - Pipe
V - Vault Box

B/C - Back of Curb
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CLF - Chain Link Fence
CMU - Conc. Mason Wall
E/P - Edge of Pavement
F/C - Face of Curb
F/H - Fire Hydrant
IN - Inspection Hole
M/H - ManHole
P/P - Power Pole
S/W - Side Walk
WM - Water Meter
WV - Water Valve

BM - Benchmark
BCF - Brass Cap Flush

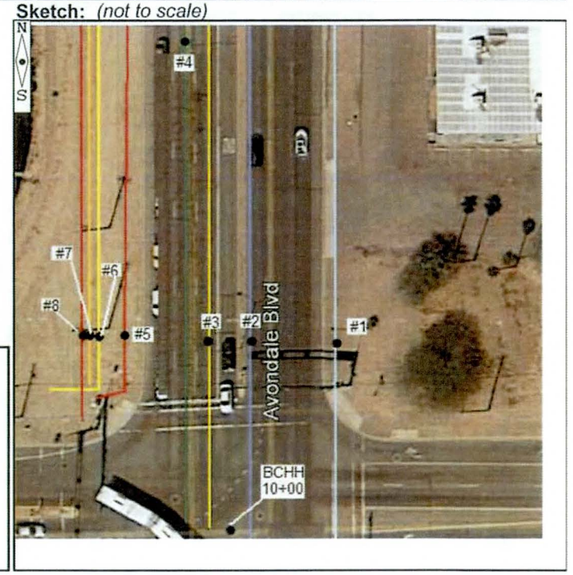
BCHH- Brass Cap
HandHole

CL - Center Line
PL - Property Line
R/W - Right of Way
BaseLine

Comments/Remarks:
We exposed a yellow pipe running N/S.

N:891473.50 / E:581015.86

Sketch: *(not to scale)*



SAE

Utility Survey Report

KC LOCATE LLC
25440 N. 93rd Ave Peoria, AZ 85383
(623)825-0230 MBL: (602) 702-2582

Task ID: 201300051 **Date Located:** 6/14/2013
Project: Van Buren DCR
Client Name: City of Avondale **Ref:** 03700
Work Site: Avondale Blvd & Van Buren
Truck: 21 **Crew Names:** Ken, Jesus

Client Hole#: 7 **Client Plan Sheet:** **Map Grid:** **KC Hole#:** 7

BM Desc.: BCHH AVONDALE & VAN BUREN **Status:** GIVEN **B.M. Elev.:** 996.11 (feet)

Station/Offset/Dir: (feet) *Requested*
Station/Offset/Dir: *Surveyed* 11+14.5 74.8 LT

Survey Remarks:
SURVEY INFORMATION COLLECTED BY CRS

Profile View (not to scale)

Pavement & Soils Informaiton
Marker: WHISKER **Marker/Surf. Elevation:** 996.33 (feet)
Upper: OR (feet)
Lower:
Soils Code: CH
Utility Elevation TOP: 992.03 (feet)
Measured Distance From Surface:
TOP: 4.30 (feet)
BOTTOM: 5.00 (feet)

Visual Utility Identification Information
Size/Width: 12.00 (in)
Type Code: FO
Structure: D
Material: PVC

Physical SWING TIE Information

	Dist. (ft)	Dir.	from PERMANENT existing fixture
A:	26.10	W	FACE OF CURB
B:	28.80	NE	GAS VALVE
C:	49.50	SW	POWER POLE

TERMS:

UKN - Unknown
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road (Dirt)

E - Electrical
G - Gas/Petro/LP
IR - Irrigation
TV - Cable TV
FO - Fiber Optics
SD - Storm Drain
SS - Sanitary Sewer
TEL - Telephone
TS - Traffic Signal
W - Water
CH - Chemical

ABS - Plastic Pipe
ACP - Asbes. Cement
CIP - Cast Iron Pipe
CIPP- Cast in Place
CAP - Corrugated Alum
GIP - Galvanized Iron
GSP - Galvanized Steel
PE - Poly Ethylene
PVC - PolyVinal Chlor.
RC - Reinforced Conc.
SL - Slurry
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F/H - Fire Hydrant
IN - Inspection Hole
M/H - ManHole
P/P - Power Pole
S/W - Side Walk
WM - Water Meter
WV - Water Valve

BM - Benchmark
BCF - Brass Cap Flush

BCHH- Brass Cap
HandHole

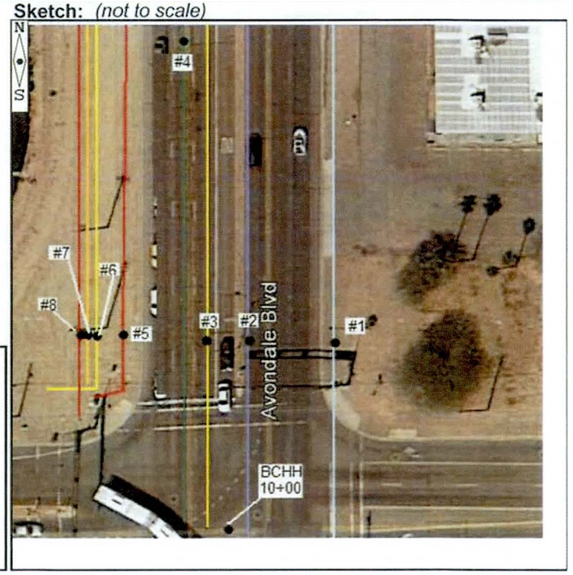
CL - Center Line
PL - Property Line
R/W - Right of Way
BaseLine

Comments/Remarks:
We exposed 2 - 3in white pipes running N/S.

N:891473.57 / E:581012.50

Bottom Elev. 991.33

Sketch: *(not to scale)*



SAE

Utility Survey Report

KC LOCATE LLC
25440 N. 93rd Ave Peoria, AZ 85383
(623)825-0230 MBL: (602) 702-2582

Task ID: 201300051 **Date Located:** 6/14/2013
Project: Van Buren DCR
Client Name: City of Avondale **Ref:** 03700
Work Site: Avondale Blvd & Van Buren
Truck: 21 **Crew Names:** Ken, Jesus

Client Hole#: 8 **Client Plan Sheet:** **Map Grid:** **KC Hole#:** 8

BM Desc.: BCHH AVONDALE & VAN BUREN **Status:** GIVEN **B.M. Elev.:** (feet) 996.11

Station/Offset/Dir: (feet) *Requested*
Station/Offset/Dir: *Surveyed* 11+13.4 78.3 LT

Survey Remarks:
SURVEY INFORMATION COLLECTED BY CRS

Profile View (not to scale)

Pavement & Soils Informaiton

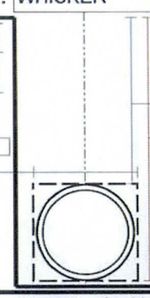
Marker: WHISKER **Marker/Surf. Elevation:** 996.39 (feet)

Upper: OR (feet)
Lower:
Soils Code: CH

Utility Elevation TOP: 989.59 (feet)

Measured Distance From Surface:
TOP: 6.80 (feet)
BOTTOM: 9.00 (feet)

Visual Utility Identification Information
Size/Width: 24.00 (in)
Type Code: E
Structure: D
Material: EN



Physical SWING TIE Information

	Dist. (ft)	Dir.	from PERMANENT existing fixture
A:	29.70	W	FACE OF CURB
B:	28.30	N	GAS VALVE
C:	50.50	SW	POWER POLE

TERMS:

UKN - Unknown
AC - Asphalt/Concrete
AB - Aggregate Base
CC - Cement/Concrete
OR - Off Road (Dirt)

E - Electrical
G - Gas/Petro/LP
IR - Irrigation
TV - Cable TV
FO - Fiber Optics
SD - Storm Drain
SS - Sanitary Sewer
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TS - Traffic Signal
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IN - Inspection Hole
M/H - ManHole
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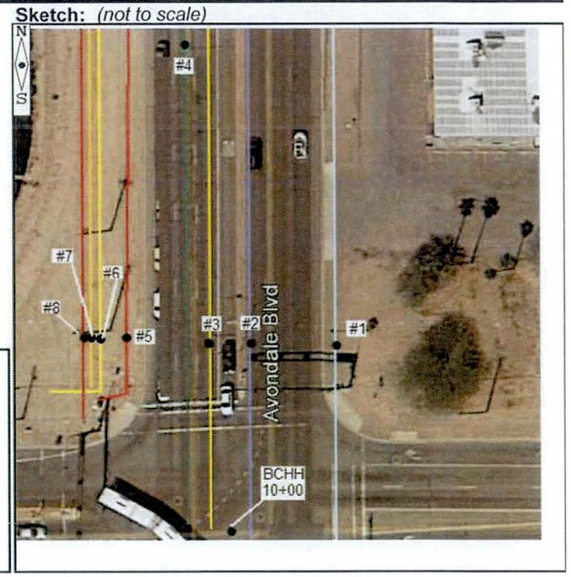
BM - Benchmark
BCF - Brass Cap Flush
BCHH- Brass Cap HandHole

CL - Center Line
PL - Property Line
R/W - Right of Way
BaseLine

Sketch: *(not to scale)*



Comments/Remarks:
We exposed a concrete encasement running N/S.

N:891473.40 / E:581009.05

Bottom Elev. 987.39

APPENDIX J

PRS41584C	862709.4	485245.4	900.34	
CG025	891603.6	578440.5	982.832	HLIP B
CG026	891603.5	578438.6	983.262	HTBC B
CG027	891604.6	578438.5	983.219	HTBW B
CG028	891608.8	578433.6	983.266	HTBW
CG029	891554.1	578434	983.202	HTBW
CG030	891554.2	578438.9	983.114	HTBC
CG031	891554.1	578440.8	982.697	HLIP
CG032	891562.8	578431.2	983.199	EJB
CG033	891564.5	578432.3	983.028	ELP
CG034	891524	578434.2	982.998	HTBW
CG035	891522.1	578433.3	983.088	HTBW
CG036	891522.1	578439.2	983.008	HTBC
CG037	891522.2	578441.1	982.572	HLIP
CG038	891500.1	578433.5	982.97	HTBW
CG039	891498.2	578434.4	982.992	HTBW
CG040	891498.1	578439.3	982.951	HTBC
CG041	891498.3	578441.3	982.505	HLIP
CG042	891450.9	578441.6	982.229	HLIP
CG043	891450.8	578439.7	982.692	HTBC
CG044	891450.6	578434.8	982.775	HTBW
CG045	891483.6	578432.9	982.868	EPP
CG046	891465.5	578436.3	982.631	MHU-SRP-IRRIGATION
CG047	891426	578439.8	982.455	HTBC BC
CG048	891405.1	578432.1	981.793	HTBC
CG049	891395.6	578411.4	981.824	HTBC EC
CG050	891392.4	578395.9	981.465	MHS
CG051	891392.5	578417.8	981.596	MHS
CG052	891402.2	578417.2	981.916	ELP
CG053	891404.2	578414.5	982.228	EJB
CG054	891381	578422	981.774	MHU-SRP-IRRIGATION
CG055	891400.9	578442	981.739	HLIP
CG056	891401.3	578468	981.846	HLIP
CG057	891394.3	578468.2	981.848	HLIP
CG058	891393.9	578442.4	981.716	HLIP
8060	891393.6	578411.7	981.388	HLIP
8061	891426	578434.9	982.595	HTBW BC
8062	891421.3	578434.8	982.498	HTBW
8063	891417.4	578433.8	982.422	HTBW EC
8064	891401.7	578418.6	982.2	HTBW
8065	891400.5	578411.4	982.106	HTBW
8066	891400.7	578359.1	981.696	HTBW BC
8067	891395	578359.3	981.518	HTBC
8068	891393	578359.3	981.136	HLIP
8069	891401.7	578349.6	981.62	HTBW
8070	891406.1	578335	981.715	HTBW
8071	891392.5	578305.4	980.871	HLIP
8072	891394.6	578305.1	981.177	HTBW
8073	891392.2	578254.3	980.586	HLIP
8074	891394.2	578254.5	980.964	HTBC
8075	891405.9	578289	981.43	HTBW
8076	891401.1	578272.8	981.173	HTBW
8077	891400.2	578264.4	981.062	HTBC EC
8078	891401.6	578243.2	981.02	ELP
8079	891403.1	578238.1	981.038	EJB
8080	891400	578244.7	980.82	HTBW
8081	891399.7	578199.5	980.694	HTBW BC
8082	891393.6	578199.5	980.593	HTBC
8083	891391.7	578199.5	980.207	HLIP
8084	891391.3	578147.9	979.982	HLIP
8085	891393.3	578147.7	980.343	HTBC
8086	891405.1	578143.6	980.628	HTBW
8087	891399.4	578084.6	980.201	HTBW
8088	891398.8	578079.8	980.248	HTBC EC
8089	891392.9	578089.5	980.159	HTBC
8090	891390.9	578089.5	979.745	HLIP
8091	891390.5	578040.2	979.596	HLIP
8092	891392.5	578040.1	979.982	HTBC
8093	891398.4	578040	980.071	HTBW
8094	891399.5	578032.4	979.889	ELP
8095	891401.7	578026.7	979.913	EJB
8096	891390.2	577990.5	979.251	HLIP
8097	891392.1	577990.4	979.669	HTBC
8098	891398	577990.4	979.838	HTBW
8099	891398	577985.5	979.742	HTBW BC
8100	891399.5	577969.9	979.732	HTBW
8101	891401.9	577945.3	979.608	HTBW
8102	891390.1	577938.9	979.003	HLIP
8103	891391.9	577938.3	979.4	HTBC
8104	891390	577890.3	978.804	HLIP
8105	891391.8	577890.4	979.208	HTBC
8106	891398.5	577890	979.348	HTBW
8107	891397.9	577880.1	979.326	HTBC EC
8108	891387.4	577872.6	978.904	MHS
8109	891389.9	577841.6	978.725	HLIP
8110	891391.8	577841.6	979.182	HTBC
8111	891397.6	577841.5	979.214	HTBW
8112	891398.8	577821.9	979.161	ELP
8113	891400.4	577817.2	979.282	EJB
8114	891389.8	577816.7	978.677	HLIP
8115	891389.6	577784.8	978.488	HLIP
8116	891421.1	577784.3	978.937	HLIP BC
8117	891391.7	577816.8	979.132	HTBC BC
8118	891399.5	577796.7	978.855	HTBC

8119	891421.4	577786.4	979.447	HTBC
8120	891423	577779.7	978.95	UWV
8121	891423.7	577791.8	979.181	UWFH
8122	891397.4	577817.7	979.213	HTBW BC
8123	891398.1	577812.7	979.269	HTBW
8124	891399.1	577808.7	979.38	HTBW EC
8125	891413	577792.6	979.462	HTBW BC
8126	891455.8	577791.8	978.936	HTBW
8127	891456	577787.8	978.833	HTBC
8128	891456.3	577785.8	978.475	HLIP
8129	891501.4	577798.8	976.983	HLIP
8130	891500.7	577800.6	977.491	HTBC
8131	891499.1	577804.2	977.549	HTBW
8132	891542.5	577826.9	976.553	HTBW
8133	891544.8	577823.5	976.628	HTBC
8134	891545.8	577821.9	976.277	HLIP EC
8135	891563.4	577831.5	975.888	HLIP
8136	891556.4	577848.1	975.968	HLIP BC
8137	891550.1	577868.2	976.076	HLIP
8138	891543.9	577897.6	976.111	HLIP EC E
8139	891544.7	577823.6	976.657	HTBC
8140	891542.7	577827	976.718	HTBW
8141	891550.6	577836	976.156	HTBW
8142	891554.5	577834.8	976.099	HTBC
8143	891554.5	577847.6	976.372	HTBC
8144	891550.7	577846.5	976.418	HTBW
8145	891545	577864.1	976.434	HTBW
8146	891548.8	577865.4	976.323	HTBC
8147	891544.1	577884.3	976.467	HTBC EC E
8148	891540.3	577883.6	976.55	HTBW EC E
8149	891580.4	577830.9	976.014	CBCF
8150	891583.4	577823.9	975.987	CBCF
8151	891580.9	577814.1	975.876	MHS
8152	891561	577830	975.82	HEC B
8153	891563.6	577831.3	975.853	HEC
8154	891574.7	577801.5	975.651	HEC
8155	891572.1	577800	975.728	HEC C
8156	891604	577717.2	975.43	CBCF
8157	891581	577707.9	975.846	ELP
8158	891587.6	577683.8	975.659	HLIP B
8159	891585.7	577684.1	975.865	HTBC B
8160	891585.6	577683.1	975.875	HTBW B
8161	891581.7	577683.7	975.967	HTBW
8162	891582	577712.4	976.121	HTBW BC
8163	891586	577712.8	975.92	HTBC BC
8164	891588	577712.7	975.458	HLIP BC
8165	891586.4	577747.9	974.901	HLIP
8166	891584.5	577747.6	975.484	HTBC
8167	891580.6	577747.4	975.555	HTBW
8168	891576.6	577771.8	975.932	HTBW
8169	891580.5	577772.7	975.79	HTBC
8170	891582.3	577773.1	975.362	HLIP EC
8171	891574.7	577801.2	975.594	HLIP
8172	891550.3	577788.1	976.344	HLIP BC
8173	891546.8	577777.6	976.792	ELP
8174	891545	577775.6	977.011	EJB
8175	891567.6	577783.4	975.915	HTBW
8176	891569.3	577786.9	975.875	HTBC
8177	891551.5	577786.4	976.823	HTBC
8178	891553.2	577782.9	976.911	HTBW
8179	891502.2	577758.1	977.912	HTBW
8180	891500.8	577761.7	977.877	HTBC
8181	891500.2	577763.4	977.458	HLIP
8182	891441.8	577752.3	978.818	HLIP EC
8183	891441.8	577750.5	979.254	HTBC EC
8184	891441.8	577746.5	979.305	HTBW EC
8185	891440	577738.8	978.672	ECTP
8186	891436.9	577742.5	979.388	EJB
8187	891436.1	577744.8	979.464	ELP
8188	891422	577746.6	979.499	HTBW BC
8189	891416.6	577746.2	979.431	HTBW
8190	891411.9	577745.2	979.322	HTBW EC
8191	891421.9	577750.6	979.376	HTBC BC
8192	891421.8	577752.5	978.929	HLIP
8193	891434.4	577768.4	978.947	CBCF
8194	891389.5	577752.8	978.618	HLIP
8195	891389.1	577721.3	978.143	HLIP
8196	891398.5	577728.5	978.969	HTBW
8197	891397	577720.6	978.725	HTBW
8198	891398.7	577740.9	978.771	HTBC
8199	891391	577721	978.591	HTBC EC
8200	891387.5	577680.8	978.133	HLIP
8201	891389.5	577681	978.497	HTBC
8202	891396.3	577700.7	978.653	HTBW BC
8203	891396.5	577688.5	978.59	HTBW
8204	891400.2	577677.7	978.444	ETJ
8205	891398	577664.5	978.54	HTBW
8206	891396.1	577637.9	978.183	ELP
8207	891397.2	577633.1	978.474	EJB
8208	891394.2	577633.3	978.458	HTBW
8209	891387.5	577630.8	978.38	HTBC
8210	891385.6	577630.9	977.995	HLIP
8211	891393.3	577612.3	978.423	HTBW
8212	891397.7	577573.9	978.304	HTBW

8213	891386.8	577573.2	978.141	HTBC
8214	891384.9	577573.5	977.82	HLIP
8215	891396.7	577543.7	978.215	HTBW
8216	891400	577506.7	978.064	HTBW
8217	891386.3	577506.1	977.855	HTBC
8218	891384.4	577506.5	977.421	HLIP
8219	891383.9	577444.4	977.209	HLIP
8220	891385.9	577444.5	977.638	HTBC
8221	891391.9	577444.4	977.742	HTBW EC
8222	891393.3	577441.7	977.707	ELP
8223	891395	577436.8	977.842	EJB
8224	891383.6	577394.1	977.034	HLIP
8225	891385.5	577394.2	977.397	HTBC
8226	891391.5	577393.9	977.486	HTBW
8227	891391.3	577369.3	977.25	HTBW BC
8228	891391.6	577359.2	977.316	HTBW
8229	891379.2	577355.1	976.917	MHS
8230	891383.2	577342.4	976.838	HLIP
8231	891385.2	577342.2	977.237	HTBC
8232	891379	577309.2	976.835	MHS
8233	891382.9	577309.2	976.76	HLIP
8234	891385	577309.1	977.131	HTBC
8235	891398.7	577308	977.266	HTBW
8236	891393	577249.8	976.846	HTBW
8237	891390.9	577242.4	976.925	HTBW
8238	891390.4	577236.8	976.919	HTBW EC
8239	891391.8	577240.8	976.246	ELP
8240	891393.2	577237.2	977.013	EJB
8241	891384.4	577236.9	976.785	HTBC
8242	891382.4	577236.7	976.411	HLIP
8243	891382	577182.2	976.291	HLIP E
8244	891383.9	577182	976.591	HTBC E
8245	891390	577191.9	976.673	HTBW
8246	891384.2	577182.4	976.623	HTBW E
8247	891390.9	577191.9	976.794	EPP-LEG
8248	891391.1	577218.7	976.89	EPP-LEG
8249	891418.3	577218.8	976.849	EPP-LEG
8250	891418.4	577192.2	976.852	EPP-LEG
8251	891410.1	577259.7	976.077	EPP
8252	891372	577317.3	976.998	MHT
8253	891384.6	577371.5	976.648	O-SCUPPER B
8254	891384.8	577391.9	976.813	O-SCUPPER E
8255	891428.7	577375.9	975.239	WHW B
8256	891427.3	577374.4	975.207	WHW
8257	891427.4	577372	975.221	WHW
8258	891428.8	577370.5	975.208	WHW E
8259	891428.2	577373.3	972.241	PRCP-FL
8260	891457.8	577372	971.038	UDW
8261	891585.1	577355.5	974.443	HLIP B
8262	891583.2	577355.6	974.683	HTBC B
8263	891583.1	577356.5	974.693	HTBW B
8264	891579.2	577356.6	974.827	HTBW
8265	891578.8	577326.2	974.535	HTBW BC
8266	891582.8	577325.9	974.561	HTBC BC
8267	891584.8	577326	974.176	HLIP BC
8268	891596.9	577295.6	973.83	HLIP
8269	891595.8	577294.1	974.431	HTBC
8270	891592.3	577290.5	974.514	HTBW
8271	891626	577277.8	974.726	HTBW EC
8272	891626.2	577281.8	974.591	HTBC EC
8273	891626.2	577283.6	974.104	HLIP EC
8274	891609.8	577294.8	974.124	MHS
8275	891593.9	577309.7	974.137	MHS
8276	891600.7	577299.7	973.949	CBCF
8277	891590.8	577301.1	973.821	O- SCUPPER B BC
8278	891595.9	577294.8	973.646	O- SCUPPER
8279	891602.1	577289.5	973.807	O- SCUPPER EC E
8280	891598.7	577284.7	974.543	HEC B
8281	891589.7	577277.9	973.631	HEC
8282	891575.5	577264	971.98	HEC
8283	891565.4	577274.6	972.122	HEC
8284	891579	577288.5	973.602	HEC
8285	891585.7	577297.7	974.576	HEC E
8286	891676	577283.3	974.344	HLIP
8287	891676	577281.3	974.737	HTBC
8288	891675.9	577277.4	974.853	HTBW
8289	891725.9	577277	975.01	HTBW
8290	891726	577280.9	974.899	HTBC
8291	891726	577282.9	974.541	HLIP
8292	891775.8	577282.5	974.675	HLIP
8293	891775.8	577280.6	975.109	HTBC
8294	891775.9	577276.7	975.201	HTBW
8295	891801.5	577280.4	975.174	VOID
8296	891802	577275	975.252	ELP
8297	891799.6	577275.3	975.195	EJB
8298	891804.8	577298.3	974.801	CBCF
8299	891805.3	577276.4	975.233	HTBW
8300	891805.5	577280.3	975.079	HTBC
8301	891805.6	577282.3	974.641	HLIP
8302	891857.5	577281.9	974.757	HLIP
8303	891857.5	577279.9	975.147	HTBC
8304	891857.4	577276	975.308	HTBW
8305	891923	577275.4	975.036	HTBW
8306	891927.2	577279.3	974.969	HTBW E

8307	891923.3	577279.4	974.958	HTBC E
8308	891923.2	577281.4	974.558	HLIP E
8309	891926.9	577262.4	975.685	TOP B
8310	891926.6	577245.4	972.762	TOE B
8311	891926.7	577203	972.186	TOE1 B
8312	891928.2	577180.1	976.261	TOP1 B
8313	891927.6	577157	975.974	TNG
8314	891874.3	577156.5	975.938	TNG
8315	891872.7	577180.2	976.22	TOP1
8316	891871.6	577203.7	971.959	TOE1
8317	891867.4	577244.6	972.523	TOE
8318	891866.7	577262.9	975.756	TOP
8319	891802.2	577262.3	975.403	EPP
8320	891789.3	577263.4	975.197	TOP
8321	891787.9	577246.2	972.343	TOE
8322	891785.7	577204.1	971.701	TOE1
8323	891785.8	577180.6	975.974	TOP1
8324	891784.6	577160.1	975.928	TNG
8325	891717.1	577160	975.966	TNG
8326	891714.9	577180.2	976.009	TOP1
8327	891713.4	577205.5	971.09	TOE1
8328	891712.7	577245.6	972.039	TOE
8329	891711.8	577264.1	975.024	TOP
8330	891658.1	577264.5	975.135	TOP
8331	891655.4	577245.5	971.673	TOE
8332	891657.2	577206.3	971.208	TOE1
8333	891657.7	577180.9	976.006	TOP1
8334	891656.9	577161.4	976.015	TNG
8335	891599.5	577162.2	976.215	TNG
8336	891601.5	577179.9	975.979	TOP1
8337	891604.1	577207.9	970.955	TOE1
8338	891606.3	577250.1	971.756	TOE
8339	891609.3	577264.7	974.208	TOP
8340	891570.7	577299.1	975.319	TOP
8341	891551.3	577279.9	971.571	TOE
8342	891527.6	577295.1	971.731	TOE
8343	891533.4	577317.2	975.851	TOP
8344	891552.2	577325	976.784	WBLK B
8345	891531.8	577324.9	976.629	WBLK
8346	891531.9	577335	976.772	WBLK
8347	891493.1	577334.9	976.386	WBLK
8348	891493.8	577339.1	976.89	WBLK
8349	891495.1	577329.7	976.899	TOP
8350	891484.5	577310.8	971.05	TOE
8351	891470.3	577329.1	971.004	TOE
8352	891490.6	577337.4	976.49	TOP
8353	891532.3	577239.3	971.309	TOE1
8354	891510.6	577214.2	974.805	TOP1
8355	891503.1	577181.6	976.089	TNG
8356	891462.3	577227.8	976.121	TNG
8357	891474.4	577245.2	975.608	TOP1
8358	891499.8	577276	971.503	TOE1
8359	891453.9	577309	971.54	TOE1
8360	891442.8	577322.7	971.603	TOE1
8361	891432.4	577285.6	976.7	TOP1
8362	891412.3	577274	976.848	TNG
8363	891402.3	577330.7	977.127	TNG
8364	891411.1	577334.2	976.841	TOP1
8365	891442.7	577338.8	971.31	TOE1
8366	891406.9	577388.7	976.96	TOP1
8367	891443.3	577391.4	970.608	TOE1
8368	891467.9	577394.5	970.731	TOE
8369	891493.1	577394.7	976.653	TOP
8370	891494.3	577397.3	976.889	WBLK
8371	891494.8	577453.5	976.896	WBLK
8372	891494.6	577450.7	976.955	TOP
8373	891467.7	577451	970.866	TOE
8374	891446.5	577451.3	970.545	TOE1
8375	891408.8	577452.1	977.204	TOP1
8376	891407	577516.8	977.678	TOP1
8377	891446.8	577518.8	970.457	TOE1
8378	891466.6	577520.1	970.679	TOE
8379	891494.7	577521.2	977.107	TOP
8380	891495.4	577525.2	977.222	WBLK
8381	891495.9	577584.2	977.478	WBLK
8382	891494.6	577581.2	977.319	TOP
8383	891467.8	577581.1	970.649	TOE
8384	891448.6	577581.8	970.576	TOE1
8385	891414.8	577581.4	977.222	TOP1
8386	891408.8	577598	977.428	HEC B
8387	891405.3	577598.3	977.575	HEC
8388	891405.6	577601.7	977.498	HEC RECT
8389	891406.8	577599.9	977.116	ETRN-P1419
8390	891405.9	577607.2	977.402	HEC B
8391	891412	577607	977.439	HEC
8392	891412.2	577611	977.421	HEC RECT
8393	891408.8	577609.4	977.281	ETRN-PD1411
8394	891412.2	577614	977.494	HEC B
8395	891406	577614.2	977.553	HEC
8396	891406.2	577618.2	977.401	HEC RECT
8397	891408.4	577616.1	977.112	ETRN-PD1410
8398	891412.4	577637	978.223	TOP1
8399	891448.5	577637.9	971.03	TOE1
8400	891464.5	577639.7	970.921	TOE

8401	891494.6	577641.4	977.186	TOP
8402	891496.3	577645.1	977.373	WBLK
8403	891496.6	577691.7	977.451	WBLK
8404	891495.5	577689.6	977.396	TOP
8405	891469.4	577689.9	971.246	TOE
8406	891472.4	577704.2	971.254	TOE
8407	891457.4	577708.8	971.617	TOE
8408	891456.5	577709	971.907	TOE1
8409	891448.5	577703.6	971.814	TOE1
8410	891448	577689.2	971.138	TOE1
8411	891462.2	577681.3	970.975	UDW
8412	891415.9	577678.5	977.809	TOP1
8413	891419.7	577713.2	977.883	TOP1
8414	891446.7	577735.7	977.867	TOP1
8415	891480.4	577744.2	977.591	TOP1
8416	891511	577753.4	977.631	TOP1
Buckeye	862709.4	485245.4	900.34	
8417	891550.9	577771.3	976.719	TOP1
8418	891564.9	577768.9	975.848	TOP1
8419	891567.3	577752.7	975.112	TOP1
8420	891566.4	577745.6	975.263	TOP1
8421	891569.5	577721.1	977.215	TOP1
8422	891545.2	577722.4	977.446	TOP1
8423	891496.2	577715.3	976.389	TOP1 E
8424	891490.3	577726.3	974.731	TOE3 B
8425	891488.9	577731.9	974.955	TOE3
8426	891519.5	577742	974.664	TOE3
8427	891556.2	577759.3	974.441	TOE3
8428	891558.6	577745.6	974.196	TOE3
8429	891515.9	577729.5	974.687	TOE3 C
8430	891477.1	577733.3	976.347	TNG
8431	891478.9	577727.9	975.679	TNG
8432	891487.1	577719.4	975.795	TNG
8433	891520.2	578432.8	983.066	HEC B
8434	891520.2	578423.2	981.962	HEC
8435	891520	578402.7	978.583	HEC
8436	891501.2	578402.8	978.422	HEC
8437	891501.9	578432.9	982.951	HEC C
8438	891573.9	578411.6	983.661	WBLK B
8439	891555.9	578411.5	983.079	WBLK
8440	891555.6	578417.5	983.563	TOP3 B
8441	891555.7	578400.6	979.327	TOE3 B
8442	891555.5	578386.8	979.304	TOE4 B
8443	891555.7	578364.5	979.555	WBLK
8444	891554.5	578365.4	979.385	TOP4 B
8445	891519.8	578366.1	979.208	TOP4
8446	891521	578381.4	978.925	TOE4
8447	891522.2	578397.3	978.46	TOE3
8448	891523.9	578430.8	982.704	TOP3
8449	891458.4	578410.9	982.455	TOP3
8450	891460.8	578397.4	978.451	TOE3
8451	891462.3	578386.6	977.899	TOE4
8452	891463.2	578378.5	978.758	TOP4
8453	891491.3	578365.4	978.977	WBLK
8454	891491.7	578375.2	979.011	WBLK
8455	891461	578375.3	979.079	WBLK
8456	891457.9	578371.6	979.253	WBLK
8457	891455.5	578372.5	979.077	TOP4
8458	891448.8	578376.7	977.377	TOE4
8459	891443.1	578387.2	977.941	TOE3
8460	891423.6	578396	982.254	TOP3
8461	891415.2	578375.2	982.094	TOP3
8462	891432.7	578371.4	977.828	TOE3
8463	891447.1	578369.4	977.101	TOE4
8464	891457.4	578311.6	979.067	WBLK
8465	891456.3	578309.5	978.889	TOP4
8466	891446.6	578309.3	976.231	TOE4
8467	891435.1	578310.2	976.606	TOE3
8468	891411.7	578312.2	981.3	TOP3
8469	891415.3	578241.2	980.301	TOP3
8470	891434.5	578239.8	976.422	TOE3
8471	891447.3	578239.3	976.432	TOE4
8472	891454.6	578238.7	978.824	TOP4
8473	891457	578238.4	978.971	WBLK
8474	891456.4	578178.2	978.857	WBLK
8475	891453.8	578176.3	978.437	TOP4
8476	891446.8	578175.8	976.611	TOE4
8477	891433.1	578175.7	976.793	TOE3
8478	891416.1	578174.4	979.933	TOP3
8479	891415	578189.6	980.865	HEC B
8480	891408.5	578189	980.842	HEC
8481	891408	578195.3	980.841	HEC RECT
8482	891411.5	578192.1	980.174	ETRN
8483	891411.4	578120.7	980.079	TOP4
8484	891429.7	578118.5	976.625	TOE4
8485	891445.8	578113.5	976.499	TOE3
8486	891454.3	578111.3	978.484	TOP3
8487	891455.8	578108.9	978.58	WBLK
8488	891455.4	578047.9	978.407	WBLK
8489	891453.9	578046	978.398	TOP4
8490	891447	578045.5	976.086	TOE4
8491	891428.1	578044.2	976.198	TOE3
8492	891413.6	578043.7	979.736	TOP3
8493	891409.9	577989.5	979.581	TOP3

8494	891426.6	577989.9	976.186	TOE3
8495	891446.5	577991.8	976.176	TOE4
8496	891454.3	577992.2	978.474	TOP4
8497	891454.8	577990.5	978.524	WBLK
8498	891454.7	577956.1	978.444	WBLK
8499	891453.5	577958	978.15	TOP4
8500	891447.2	577957.1	976.482	TOE4
8501	891425.8	577954.7	976.245	TOE3
8502	891409.1	577954.7	979.487	TOP3
8503	891408.7	577890.6	979.121	TOP3
8504	891425.9	577894.7	976.164	TOE3
8505	891446.2	577900.6	976.275	TOE4
8506	891455.6	577905.6	978.39	TOP4
8507	891456.7	577902.7	978.412	WBLK
8508	891458.9	577845.8	978.069	WBLK
8509	891457.9	577846.6	977.929	TOP4
8510	891451	577845.7	976.418	TOE4
8511	891424.8	577842.4	976.215	TOE3
8512	891411.3	577840.6	978.715	TOP3
8513	891429.6	577800.2	978.571	TOP3
8514	891437.6	577815.6	976.676	TOE3
8515	891449.3	577830.4	976.187	TOE4
8516	891468.3	577829.7	976.235	TOE4
8517	891469.4	577845.3	978.011	TOP4
8518	891464.8	577845.8	978.142	WBLK
8519	891512.2	577858.3	978.161	WBLK E
8520	891512.7	577856.5	977.722	TOP4
8521	891511	577847.6	976.738	TOE4
8522	891483.1	577819	976.067	TOE3
8523	891520.3	577835.5	976.126	TOE3
8524	891530.1	577840	976.414	TOE3
8525	891531.5	577845.3	976.384	TOE3 E
8526	891530.8	577847.3	976.517	TOE4 E
8527	891532.6	577854.5	977.238	TOP4
8528	891539	577848.1	976.948	TOP4 E
8529	891539.1	577842.2	976.853	TOP3 E
8530	891560	583538.6	1000.855	HLIP B
8531	891560.1	583536.7	1001.243	HTBC B
8532	891479.3	583537.6	1000.353	O-SCUPPER B
8533	891493.1	583537.6	1000.419	O-SCUPPER E
8534	891497.4	583534.8	1001.014	ELP
8535	891499	583532.4	1001.04	EJB
8536	891557.1	583526.6	1001.234	TOP5 B
8537	891557.8	583516.5	999.266	TOE5 B
8538	891558	583512.8	999.525	TOE6 B
8539	891558.2	583508.6	1000.089	TOP6 B
8540	891454.3	583563	1000.997	VOID
8541	891439.3	586180.3	1007.32	CBCHH
8542	891397.6	583567.5	999.969	CBCHH
8543	891359.4	581087.4	996.105	CBCHH
8544	891344.4	578467	981.994	CBCHH
8545	891324.5	575813.7	973.061	CBCHH
8546	891456.5	583519.8	1000.68	C-SET-CONTROL
8547	891440.8	583196.9	999.292	C-SET-CONTROL
8548	891446.8	582792.4	998.596	C-SET-CONTROL
8549	891431.9	582622.7	998.303	C-SET-CONTROL
8550	891427.9	582364	997.755	C-SET-CONTROL
PRS414777	721820.3	823054.7	1436.085	

9546	891456.5	583519.8	1000.68	C-SET-CONTROL
9547	891440.8	583196.9	999.292	C-SET-CONTROL
9548	891446.8	582792.4	998.596	C-SET-CONTROL
9549	891431.9	582622.7	998.303	C-SET-CONTROL
9550	891427.9	582364	997.755	C-SET-CONTROL
9551	891460.8	582695.1	999.437	HTBC B
9552	891460.9	582697	999.017	HLIP B
9553	891449.2	582695.2	998.749	HTBC BC
9554	891437.6	582691.1	998.607	HTBC
9555	891432.8	582680.8	998.421	HTBC EC
9556	891445.1	582677.1	998.492	UWFH
9557	891436.1	582664.6	998.44	UWV
9558	891442.6	582663.5	998.214	EJB
9559	891440.9	582666.9	998.517	ELP
9560	891430.3	582630.6	997.879	HLIP
9561	891432.2	582630.7	998.291	HTBC
9562	891446.4	582616.8	998.304	UWM
9563	891446.5	582611.4	998.314	UWM
9564	891446.6	582608.4	998.36	UWM
9565	891446.6	582605.7	998.278	UWM
9566	891446.4	582601	998.374	UWM
9567	891446.4	582598	998.304	UWM
9568	891446.5	582596.3	998.34	UWM
9569	891443.8	582591.8	998.378	UWM
9570	891450.9	582590.3	998.299	ECV
9571	891449	582598.3	998.161	HEC B
9572	891451.5	582598.4	998.258	HEC
9573	891451.5	582593.1	998.284	HEC RECT
9574	891450.4	582595.2	997.999	E-ALPHA
9575	891450.9	582584.1	997.754	ECTP
9576	891448.2	582578.2	998.328	HEC B
9577	891451.6	582578.3	998.286	HEC
9578	891451.6	582574.9	998.266	HEC RECT
9579	891450.3	582576.5	997.966	ETRN
9580	891451	582569.3	998.427	ETRN
9581	891448.8	582571.6	998.37	HEC B
9582	891453.4	582571.6	998.416	HEC
9583	891453.5	582565.9	998.365	HEC RECT
9584	891452	582560.1	998.332	ECTP
9585	891454.9	582561.7	998.528	HEC B
9586	891448.9	582561.8	998.482	HEC
9587	891448.9	582557.7	998.438	HEC RECT
9588	891429.2	582560.8	997.775	HLIP
9589	891431.1	582560.8	998.187	HTBC
9590	891428.4	582505.9	997.675	HLIP
9591	891430.3	582505.9	998.035	HTBC
9592	891429.5	582455.9	997.919	HTBC
9593	891427.6	582455.9	997.548	HLIP
9594	891426.8	582405.7	997.381	HLIP
9595	891428.7	582405.8	997.818	HTBC
9596	891428	582394.6	997.177	O-SCUPPER B
9597	891427.8	582388.1	997.171	O-SCUPPER E
9598	891426.4	582379.6	997.344	HLIP
9599	891428.3	582379.2	997.781	HTBC
9600	891427.6	582333.1	997.603	HTBC E
9601	891425.7	582332.9	997.262	HLIP E
9602	891431.4	582331.7	997.75	ELP
9603	891431.4	582333.9	997.764	EJB
9604	891458	582358.8	997.335	VOID
9605	891479.5	582354.7	997.59	FCL B
9606	891479.4	582358.8	997.632	TOP8 B
9607	891479	582358.8	997.585	TOP9 B
9608	891464.9	582360.7	997.293	TOP9
9609	891451.6	582365.1	997.206	TOP9
9610	891445	582373.4	997.674	TOP9
9611	891479.6	582374.2	994.055	TOE8 B
9612	891466	582373.4	994.182	TOE8
9613	891458.4	582374.2	994.319	TOE8
9614	891457.8	582374.5	994.401	TOE9 B
9615	891456.3	582390.1	993.592	PRCP-18"
9616	891472.6	582397.6	994.318	TOE8
9617	891478.1	582402.8	995.785	TOP8
9618	891470	582436.9	996.958	TOP8
9619	891470.3	582438.8	997.085	FCL
9620	891458.1	582433	995.496	TOE8
9621	891450.4	582432.8	995.551	TOE9
9622	891441.9	582433.3	997.566	TOP9
9623	891444.5	582483.9	997.895	TOP9
9624	891451.2	582482.8	996.116	TOE9
9625	891461	582484.9	996.379	TOE8
9626	891471.1	582480.8	998.192	TOP8
9627	891471.3	582479.3	998.289	FCL
9628	891471.9	582532.1	998.02	VOID
9629	891471.9	582532.1	998.919	TOP8
9630	891461.2	582529.7	996.45	TOE8
9631	891451.9	582530	996.206	TOE9
9632	891443.8	582530.1	997.922	TOP9
9633	891447.9	582552.8	998.041	TOP9
9634	891455.2	582557.3	997.953	TOP9
9635	891453.7	582547.4	996.763	TOE9
9636	891459.2	582556.9	997.075	TOE9
9637	891462.8	582557.1	997.147	TOE8
9638	891471.6	582557.5	998.974	TOP8
9639	891472.4	582567	998.931	TOP8

9640	891465.3	582568.6	997.359	TOE8
9641	891457.5	582569.2	997.279	TOE9
9642	891455.1	582569.1	997.855	TOP9
9643	891451.7	582597.6	997.847	TOP9
9644	891454.7	582598.2	996.862	TOE9
9645	891464.3	582598.2	996.89	TOE8
9646	891472.6	582601.4	998.077	TOP8
9647	891427.9	582364	997.781	9550
9648	891434.3	582500.3	997.948	ELP
9649	891437.2	582499	998.023	EJB
9650	891456.3	582595.6	996.73	UWBFV
9651	891456.3	582597.9	996.894	UWBFV
9652	891456.4	582600.7	996.824	UWBFV
9653	891456.4	582604.8	996.691	UWBFV
9654	891456.5	582607.6	996.615	UWBFV
9655	891456.6	582610.8	996.514	UWBFV
9656	891456.7	582616.1	996.619	UWBFV
9657	891466.3	582622.8	997.755	UWV
9658	891473.2	582627.7	998.075	TOP8
9659	891473.1	582626.4	998.164	FCL
9660	891461.9	582628.4	996.47	TOE8
9661	891455	582627.1	996.496	TOE9
9662	891444.8	582628.2	998.356	TOP9
9663	891445.2	582654	998.237	TOP9
9664	891448	582663.7	998.235	TOP9
9665	891460.1	582668.5	998.296	TOP9
9666	891471.2	582662.3	998.126	TOP9
9667	891473.2	582660.6	998.284	TOP8
9668	891461.7	582653.7	997.019	TOE8
9669	891456.1	582656.8	997.002	TOE8
9670	891451.7	582644.5	996.745	TOE9
9671	891453.9	582656.9	997.017	TOE9
9672	891463.1	582662.9	998	UWBFV-8"
9673	891446.8	582792.3	998.729	9548
9674	891473.9	582668.3	998.421	FCL E
9675	891431.9	582622.7	998.179	9549
9676	891460.7	582756.1	998.737	HTBC B BC
9677	891449.6	582761.7	998.612	HTBC
9678	891446.6	582770.9	998.554	HTBC EC
9679	891447	582817	998.551	HTBC
9680	891447.7	582866.7	998.741	HTBC
9681	891448.1	582896	998.861	HTBC
9682	891443.1	582944.4	998.826	HTBC
9683	891437.7	582995.5	998.826	HTBC
9684	891438.5	583047.4	998.931	HTBC
9685	891438.4	583074.5	998.374	O-SCUPPER B
9686	891438.5	583081.2	998.398	O-SCUPPER E
9687	891439.2	583088.5	999.02	HTBC
9688	891439.9	583138	999.136	HTBC
9689	891440.6	583192.8	999.211	HTBC
9690	891444.2	583196.9	999.024	UWFH
9691	891444.3	583157.9	999.2	ELP
9692	891446.7	583157.1	999.163	EJB
9693	891446.3	582982.4	999.038	EJB
9694	891446.8	582984.4	998.639	ELP
9695	891455.1	582826.6	998.276	ELP
9696	891454.4	582824.6	998.788	EJB
9697	891479.5	582768.7	999.615	TOP10 B
9698	891475.2	582769.1	999.366	TOP10
9699	891466.7	582776.7	999.038	TOP10
9700	891456.6	582780.9	998.637	TOP10
9701	891452.7	582787.6	998.472	TOP10
9702	891479.2	582771.1	999.447	TOP11 B
9703	891474.5	582777.6	998.512	TOP11
9704	891475	582784.2	998.167	TOP11
9705	891475.4	582789.2	998.235	TOP11
9706	891475.4	582783.6	998.149	FCL B
9707	891462	582787.6	997.183	TOE11 B
9708	891461.7	582787.6	997.242	TOE10 B
9709	891458.8	582791	997.106	TOE10
9710	891466.7	582791.8	997.126	TOE11
9711	891476.2	582812.8	998.15	FCL
9712	891476.3	582815.1	998.244	TOP11
9713	891466.9	582814.5	996.664	TOE11
9714	891459.1	582813.3	996.561	TOE10
9715	891453	582813.4	998.486	TOP10
9716	891453.5	582852	998.611	TOP10
9717	891460.4	582854.4	996.547	TOE10
9718	891466.7	582853	996.47	TOE11
9719	891477.1	582854.1	998.343	TOP11
9720	891477.6	582906.1	998.112	TOP11
9721	891467	582904.2	996.309	TOE11
9722	891463.4	582904.4	996.462	TOE10
9723	891453.5	582903.1	998.826	TOP10
9724	891451.5	582950.7	998.625	TOP10
9725	891462.4	582949.9	996.368	TOE10
9726	891468.2	582952	996.339	TOE11
9727	891478.7	582945.2	998.235	TOP11
9728	891478.7	582945.5	998.207	FCL
9729	891478.9	582997.4	998.078	TOP11
9730	891476.4	582994.3	998.022	USC
9731	891468.4	582996.8	996.569	TOE11
9732	891463.4	582995.9	996.704	TOE10
9733	891454.2	582995.7	998.554	TOP10

9734	891454.8	583045.5	998.894	TOP10	
9735	891466.7	583038.5	996.561	TOE10	
9736	891472.3	583039.7	996.842	TOE11	
9737	891479	583030	998.438	TOP11	
9738	891480.5	583041.5	997.925	TOP11	
9739	891470.9	583043.8	996.445	TOE11	
9740	891479.1	583049.8	996.061	TOE11	
9741	891481.9	583050.4	996.266	TOE11	
9742	891484.1	583066.4	996.153	TOE11	
9743	891485.1	583071.8	997.949	TOP11	
9744	891475.9	583076.3	997.83	TOP11	
9745	891473.7	583069.7	996.55	TOE11	
9746	891469.8	583072.9	996.931	TOE11	
9747	891471.2	583083.7	996.888	TOE11	
9748	891480	583083	998.159	TOP11	
9749	891463.1	583082.5	996.77	TOE10	
9750	891454.4	583082.1	998.819	TOP10	
9751	891455.6	583134.6	998.81	TOP10	
9752	891465.3	583134.2	996.517	TOE10	
9753	891470.5	583138.2	996.41	TOE11	
9754	891481.5	583135.6	998.3	TOP11	
9755	891481.7	583137.3	998.319	FCL	
9756	891482.4	583187.6	998.769	TOP11	
9757	891470.4	583189.8	996.347	TOE11	
9758	891466.4	583190.4	996.412	TOE10	
9759	891457.5	583191.4	998.871	TOP10	
9760	891456.5	583519.7	1000.532		9546
9761	891454.4	583511.8	1000.135	EJB	
9762	891454.4	583508.5	1000.213	ELP	
9763	891454.3	583508.3	1000.241	ELP	
9764	891469.4	583455.3	999.824	ECV	
9765	891468.8	583446.8	1000.457	HEC B	
9766	891468.9	583442.8	1000.515	HEC	
9767	891462.7	583442.7	1000.537	HEC RECT	
9768	891464.6	583446.4	1000.852	ETRN	
9769	891455	583333.9	999.832	ELP	
9770	891454.2	583331.4	999.913	EJB	
9771	891457.7	583240.3	998.947	TOP10	
9772	891467.7	583239.8	996.819	TOE10	
9773	891473.6	583240.6	996.918	TOE11	
9774	891483.5	583240.9	998.923	TOP11	
9775	891483.5	583243.8	999.003	FCL	
9776	891483.5	583291.4	999.112	TOP11	
9777	891474.8	583288.8	996.869	TOE11	
9778	891469.9	583289	996.728	TOE10	
9779	891458.6	583290.6	999.276	TOP10	
9780	891458.8	583321.4	999.349	TOP10	
9781	891461.5	583326	999.194	TOP10	
9782	891468.8	583329.8	998.853	TOP10	
9783	891474.8	583329.4	998.886	TOP10	
9784	891470	583312.4	996.788	TOE10	
9785	891470.4	583319.7	997.567	TOE10	
9786	891472.5	583322.2	997.672	TOE10	
9787	891477	583319	997.488	TOE10	
9788	891476.7	583313.8	997.106	TOE10	
9789	891476.6	583311.1	996.987	TOE11	
9790	891482.5	583323.3	998.929	TOP11	
9791	891462.7	583330.7	999.247	TNG	
9792	891475.4	583333.1	999.132	TNG	
9793	891476.5	583355.7	999.417	TNG	
9794	891463.9	583361.4	999.527	TNG	
9795	891462.2	583382.2	999.834	TNG	
9796	891470.6	583376.7	999.198	TNG	
9797	891481.8	583370.9	999.294	TNG	
9798	891485.1	583378	999.336	TOP13 B	
9799	891477.6	583379.6	998.827	TOE13 B	
9800	891473.3	583380.5	998.84	TOE14 B	
9801	891463.7	583381.6	999.711	TOP14 B	
9802	891463.8	583408.6	999.641	TOP14	
9803	891471.8	583406.7	998.39	TOE14	
9804	891477.4	583406.1	998.182	TOE13	
9805	891484.5	583407.3	999.053	TOP13	
9806	891486	583425.4	997.416	TOP13	
9807	891480.8	583426.6	996.983	TOE13	
9808	891475.9	583428.2	997.21	TOE14	
9809	891464.1	583429.5	999.722	TOP14	
9810	891469.3	583448.5	999.885	TOP14	
9811	891467.1	583471.7	999.322	TOP14	
9812	891469	583495.8	999.207	TOP14	
9813	891476.6	583515.7	999.74	TOP14	
9814	891478.3	583443.2	996.482	TOE14	
9815	891480.9	583467	996.16	TOE14	
9816	891485.9	583500.7	996.511	TOE14	
9817	891440.8	583197	999.406		9547
9818	891441.6	583236	999.511	HTBC	
9819	891442.4	583289.5	999.604	HTBC	
9820	891443	583323	999.678	HTBC	
9821	891454.2	583361.4	1000.133	HTBC	
9822	891455.4	583426.9	1000.071	HTBC	
9823	891449.4	583469.6	1000.057	HTBC	
9824	891445.5	583496.8	1000.107	HTBC	
9825	891445.9	583510.3	1000.237	HTBC BC	
9826	891454.6	583528.4	1000.278	HTBC	
9827	891476.3	583537	1001.03	HTBC EC	

9828	891479.2	583537.5	1000.432	O-SCUPPER B
9829	891493.2	583537.5	1000.506	O-SCUPPER E
9830	891497.1	583534.1	1000.9	ELP
9831	891515.8	583536.9	1001.186	HTBC
9832	891565.7	583536.6	1001.388	HTBC E
9833	891503.4	583522.3	1000.758	TOP14
9834	891533.5	583524.4	1000.87	TOP14
9835	891566.1	583525	1001.079	TOP14
9836	891501.1	583509.8	996.763	TOE14
9837	891515.8	583510	997.259	TOE14
9838	891537.2	583513	998.224	TOE14
9839	891561.1	583517.1	999.496	TOE14
9840	891558.3	583511.4	999.68	TOE14
9841	891542.9	583510.4	998.661	TOE14
9842	891529.3	583505.8	997.779	TOE14
9843	891517.9	583498.5	997.072	TOE14
9844	891487.7	583397.6	999.903	TOP13
9845	891497.1	583424.2	1000.057	TOP13
9846	891515	583448.1	999.977	TOP13
9847	891527.4	583494.4	999.948	TOP13
9848	891544.7	583494.1	1002.201	TOP13
9849	891507.9	583471.4	998.106	TOE13

289001	891399.6	573176.1	993.896	CBCHH
289002	891394.9	573339.2	992.514	ROCL
289003	891428.9	573343.4	992	TOP-BRIDGE B
289004	891425.7	573449.6	990.691	TOP-BRIDGE
289005	891423.6	573528.3	989.741	TOP-BRIDGE
289006	891389.4	573528.8	990.415	ROCL
289007	891422.3	573587.6	988.528	TOP-BRIDGE E
289008	891421.2	573589.5	988.451	HLIP B
289009	891423.1	573589.8	988.858	HTBC B
289010	891422.4	573587.8	988.349	WBR B
289011	891387.8	573588.6	989.023	ROCL
289012	891421.6	573657.1	986.959	WBR
289013	891420.4	573657.7	987.112	HLIP
289014	891422.3	573657.6	987.212	HTBC
289015	891426	573663.7	987.255	HTBC
289016	891426.1	573707.2	986.338	HTBC
289017	891421.5	573724.6	985.873	HTBC
289018	891419.7	573724.5	985.701	HLIP
289019	891422.5	573709	985.941	WBR E
289020	891427.8	573605.2	988.397	EJB
289021	891428	573602.2	988.641	ELP
289022	891425.2	573589.2	988.121	FW B
289023	891440.9	573617.6	984.97	FW
289024	891455.7	573618.3	984.728	FW
289025	891475.7	573619.7	977.522	WHW B
289026	891475.2	573619.4	976.121	FSTL-TUBULAR B
289027	891459.5	573635	984.962	FSTL-TUBULAR
289028	891459.1	573653.7	985.326	FSTL-TUBULAR
289029	891459.6	573635.6	985.284	WHW
289030	891459.4	573653.2	985.32	WHW
289031	891476.9	573658.6	976.364	WHW E
289032	891476.6	573659.2	976.201	FSTL-TUBULAR E
289033	891473.7	573646.9	972.37	HEC B
289034	891490.9	573642.5	973.07	HEC BC
289035	891503.7	573647.6	973.051	HEC
289036	891512.5	573633.5	972.943	HEC
289037	891499.1	573624.2	972.969	HEC
289038	891490.4	573630.4	973.052	HEC EC
289039	891470.9	573635.3	972.207	HEC E
289040	891481.5	573618.7	972.471	FW
289041	891498.8	573619.3	972.91	FW
289042	891600	573610.5	973.348	FW E
289043	891606.1	573637.1	972.728	FCL B
289044	891543.1	573641.9	973.291	CRBR-CAP-ILLEG
289045	891543.3	573642	973.295	FCL
289046	891540.5	573658	972.972	FCL
289047	891491.5	573660.6	972.984	TOE B

289048	891505.7	573713.5	973.597	TOE
289049	891455.5	573619	984.733	TOP B
289050	891457.2	573658.5	984.923	TOP
289051	891452.1	573723.5	983.309	TOP
289052	891423.1	573615.2	987.827	TOP1 B
289053	891440.6	573618.6	984.84	TOE1 B
289054	891439.9	573657.1	985.091	TOE1
289055	891428.4	573657.8	986.992	TOP1
289056	891426.5	573723.1	985.527	TOP1
289057	891438.4	573723.2	983.632	TOE1
289058	891382.6	573794.1	984.771	ROCL
289059	891407.4	573814.6	983.761	MHT
289060	891424	573797.8	984.423	EJB
289061	891424.6	573795.5	984.609	ELP
289062	891417.6	573796.6	984.042	HLIP
289063	891419.6	573796.7	984.39	HTBC
289064	891423.6	573799.7	984.002	TOP1
289065	891437.7	573798.1	981.276	TOE1
289066	891451	573799.3	981	TOP
289067	891515.4	573799.3	972.813	TOE
289068	891520.7	573800.2	972.77	FCL
289069	891506.6	573903.4	972.226	FCL
289070	891502.6	573903.2	972.498	TOE
289071	891449	573899.1	978.137	TOP
289072	891435.3	573899.2	978.456	TOE1
289073	891419.3	573899.9	981.596	TOP1
289074	891416.6	573899.9	981.871	HTBC
289075	891414.6	573900.1	981.483	HLIP
289076	891419	573990.1	979.482	EJB
289077	891419.4	573986.6	979.439	ELP
289078	891377	573990.7	979.578	ROCL
289079	891418.5	573993.8	978.842	TOP1
289080	891430.8	573994.3	977.062	TOE1
289081	891445.3	573995.2	976.796	TOP
289082	891490.5	574000.9	972.358	TOE
289083	891492.4	574001.2	972.066	FCL
289084	891482.2	574068	972.346	CRBR
289085	891481.7	574069.9	972.333	TOE
289086	891444.1	574068	975.578	TOP
289087	891428.8	574068.4	975.766	TOE1
289088	891414.7	574068.9	976.914	TOP1
289089	891416.2	574092.1	976.428	HEC B
289090	891418.1	574092.2	976.441	HEC
289091	891418.1	574096	976.372	HEC RECT
289092	891417	574094.2	976.359	UWBO
289093	891417	574100.9	976.237	UWV
289094	891413.1	574183.6	974.427	EJB
289095	891413.6	574180.9	974.409	ELP
289096	891406.5	574185.2	973.854	HLIP
289097	891408.4	574185.6	974.236	HTBC
289098	891371.7	574186.4	974.551	ROCL
289099	891413.8	574188	973.944	TOP1 E
289100	891425.2	574187.5	973.484	TOE1 E
289101	891425.5	574187.4	973.534	TOP E
289102	891464.9	574187.6	971.863	TOE E
289103	891477.5	574188.4	971.865	FCL
289104	891476.2	574203.3	971.005	CRBR-33315
289105	891476.9	574203.6	971.025	FCL
289106	891438.3	574202.2	971.486	CRBR-33315
289107	891421.3	574201.7	973.255	FCL
289108	891421.3	574201.5	973.256	TOP B
289109	891488.2	574203.9	971.643	TOP
289110	891488.1	574292.3	971.607	TOP
289111	891486.9	574349.5	971.584	TOP
289112	891428.1	574353	972.122	TOP
289113	891434.1	574311.4	969.7	HTBC1 B
289114	891424.5	574311	972.186	HTBC1
289115	891434.7	574292.5	969.688	HTBC2 B
289116	891432.8	574292.4	970.493	HTBC2
289117	891425.1	574292.1	972.1	HTBC2
289118	891474	574328.4	968.943	TOE B
289119	891434.4	574339	969.627	TOE
289120	891421.4	574265.6	972.743	TOP C
289121	891434.5	574209.2	969.875	TOE
289122	891475.4	574211	969.392	TOE C
289123	891604.4	574231.3	972.274	TNG
289124	891608.9	574104.5	972.213	TNG
289125	891610.4	573990	972.648	TNG
289126	891612.4	573796	972.745	TNG
289127	891682.5	573767.6	973.039	TNG
289128	891664	574005.3	972.451	TNG
289129	891656.3	574106.9	972.173	TNG
289130	891652.4	574218.2	972.361	TNG
289131	891656.4	574385	972.612	TNG
289132	891412	574310.5	973.299	HTBC1 E
289133	891412.5	574291.5	973.325	HTBC2 E
289134	891403.5	574286.6	972.847	HLIP
289135	891405.5	574286.6	973.174	HTBC
289136	891405.6	574287	973.186	HEC B
289137	891411.5	574287.2	973.368	HEC
289138	891412.5	574289.7	973.338	HEC
289139	891411.8	574312.1	973.355	HEC
289140	891410.8	574314.7	973.373	HEC
289141	891404.9	574314.5	973.266	HEC E

289142	891409.4	574319.9	973.4	EJB
289143	891409.8	574317.8	973.304	ELP
289144	891404.4	574300.7	972.617	O-CL-20_-SCUPPER
289145	891419.5	574340	972.733	FCL
289146	891431.1	574371.2	972.285	FCL
289147	891430.6	574370.6	972.348	CRBR-33315
289148	891428.9	574436.4	973.931	FCL E
289149	891428.7	574436.3	973.882	CRBR-33315
289150	891332.4	575221	973.903	ROCL
289151	891376.9	575222.9	973.298	HLIP B
289152	891398.7	574457.2	973.22	HLIP
289153	891400.6	574457.4	973.63	HTBC BC
289154	891410.2	574482.8	974.091	HTBC
289155	891435.3	574493.5	974.399	HTBC EC E
289156	891396.9	574507.1	973.6	HLIP
289157	891395.6	574558	973.747	HLIP E
289158	891380.5	574484.7	973.644	UWV
289159	891362.2	574490.5	973.911	ROCL
289160	891362.1	574494.9	973.271	CBCHH
289161	891360.3	574557.1	974.158	ROCL
289162	891378.7	575222.9	973.815	HTBC B
289163	891378.9	575222.9	973.827	HEC B
289164	891383.7	575223	973.883	HEC
289165	891384.7	575225.2	973.92	HEC
289166	891384.3	575238	973.899	HEC
289167	891383.3	575240	973.869	HEC
289168	891378.3	575239.8	973.706	HEC E
289169	891377.9	575231.3	972.863	O-CL-8_-SCUPPER
289170	891378.3	575239.9	973.713	HTBW B
289171	891383.3	575240.1	973.898	HTBW
289172	891386.5	575251.1	973.814	EJB
289173	891384.5	575252.4	973.833	ELP
289174	891453.3	575220.5	972.696	TNG
289175	891531	575221.2	973.533	TNG
289176	891584.8	575222	974.556	TNG
289177	891590.1	575258.5	974.352	FCL B
289178	891522.6	575258.4	974.07	FCL
289179	891473.2	575258.3	973.749	FCL
289180	891457.2	575267.7	973.851	UWV
289181	891454.9	575290.1	974.14	UWV
289182	891450.7	575290.3	973.615	UWFH
289183	891442.1	575308.3	971.919	HEC B
289184	891445.6	575312.1	971.991	HEC
289185	891443.2	575314.3	972.038	HEC RECT
289186	891442.6	575311.5	972.003	O-CATCH-BASIN
289187	891382.7	575256.1	973.703	HTBW
289188	891388.5	575264.9	973.788	HTBW
289189	891388.1	575284.5	973.808	HTBW
289190	891377.6	575259.5	973.69	HTBC
289191	891377.5	575264.5	973.293	HTBC
289192	891377	575284.4	973.38	HTBC
289193	891376.8	575289.6	973.823	HTBC
289194	891374.8	575289.6	973.32	HLIP
289195	891378.2	575307.9	973.841	HEC B
289196	891381.9	575307.9	973.814	HEC
289197	891382	575310.7	973.775	HEC RECT
289198	891380.1	575309.6	973.8	UWBO
289199	891394	575316.7	973.752	HTBW
289200	891409.8	575314.1	973.214	TOP B
289201	891417.4	575302.7	973.412	TOP
289202	891419.4	575316.3	972.035	TOE B
289203	891446.3	575312.2	972.009	TOE
289204	891463.5	575301	974.001	TOP
289205	891470.9	575393.3	974.505	FCL
289206	891465.1	575393.9	974.181	TOP
289207	891447.4	575395	971.822	TOE
289208	891443.6	575493.4	971.582	TOE
289209	891446.8	575510.6	971.51	TOE
289210	891463.1	575494.3	974.061	TOP
289211	891469	575494.6	974.483	FCL
289212	891532.6	575497.7	974.81	FCL
289213	891519.1	575508.4	974.574	TNG
289214	891525	575547.9	975.432	FCL E
289215	891518.4	575550.8	975.44	MHS
289216	891492.1	575504.8	974.493	TOP
289217	891498	575511.8	974.355	TOP
289218	891484.9	575515.8	972.387	TOE
289219	891486.2	575572.9	971.718	TOE
289220	891479.6	575582.7	972.028	TOE
289221	891496.4	575582.1	974.109	TOP
289222	891495.7	575586.4	974.413	TOP BC
289223	891501.7	575587.4	974.564	WBLK B BC
289224	891461.1	575607.8	974.068	WBLK
289225	891457.2	575608.2	973.975	ELP
289226	891453.9	575612.5	973.867	TOP
289227	891453.2	575594.3	971.79	TOE
289228	891434.9	575616.7	971.564	TOE
289229	891423.5	575657.1	972.008	TOE
289230	891432.6	575659.4	973.713	TOP
289231	891434.5	575660.2	973.842	WBLK
289232	891421.9	575687.3	971.649	TOE
289233	891429.1	575713.3	971.948	TOE
289234	891441.2	575706.2	973.976	ELP
289235	891444.7	575712	974.283	TOP

289236	891446.1	575711.6	974.428	WBLK
289237	891443	575727.2	972.079	TOE
289238	891465.3	575740.9	972.339	TOE
289239	891475	575740.1	974.652	WBLK E
289240	891474.5	575740.6	974.456	TOP EC
289241	891470.3	575754.7	973.502	UWBFV-4"
289242	891464.8	575754.6	973.058	UWBFV-8"
289243	891461.3	575763.8	973.663	TOP E
289244	891451.6	575767.4	971.982	TOE
289245	891435.3	575767.1	971.503	TOE
289246	891430.4	575766.5	973.349	TOP B
289247	891445.3	575746.3	973.123	TOP
289248	891451.6	575744.3	972.154	TOE
289249	891421.8	575718.2	971.947	TOE
289250	891410.2	575724	974.439	TOP
289251	891403.3	575694.9	974.056	TOP
289252	891372.7	575701.5	973.165	TOP E
289253	891383.8	575699.6	974.178	MHE
289254	891394	575702	974.559	HEC B
289255	891394.2	575697.9	974.603	HEC
289256	891400.3	575698.1	974.64	HEC RECT
289257	891393.9	575708.9	974.546	HEC B
289258	891394	575704.8	974.538	HEC
289259	891400.3	575704.9	974.574	HEC RECT
289260	891393.8	575715.4	974.635	HEC B
289261	891393.9	575711.4	974.613	HEC
289262	891400.2	575711.5	974.576	HEC RECT
289263	891396.3	575713.1	974.226	ETRN-PD1605
289264	891396.3	575706.7	974.269	ETRN-PD1604
289265	891396.4	575699.9	974.19	ETRN-PD1603
289266	891419.3	575716.1	971.991	TOE
289267	891413.8	575686	971.7	TOE
289268	891373.1	575695.3	971.888	TOE
289269	891373.3	575691.2	971.871	TOE
289270	891373	575686.6	973.214	TOP B
289271	891391.7	575685.8	972.438	TOE
289272	891414.7	575677	971.909	TOE
289273	891406.3	575671.8	973.374	TOP
289274	891411.1	575640.9	973.381	TOP
289275	891417.9	575641.6	971.93	TOE
289276	891422.3	575571.2	971.771	TOE
289277	891413.4	575571.7	973.13	TOP
289278	891417.5	575509.1	971.884	TOE
289279	891405.9	575510.5	973.506	TOP
289280	891407.1	575509.9	973.47	O-PVC-RISER-4"
289281	891406.4	575496.2	974.763	HEC B
289282	891400.2	575495.7	974.652	HEC
289283	891400.4	575491.5	974.589	HEC RECT
289284	891402.6	575493.7	974.135	ETRN-PD1627
289285	891407.1	575413	972.819	TOP
289286	891416.8	575407.6	971.658	TOE C
289287	891410.3	575325.5	972.918	TOP E
289288	891390.3	575449.9	973.985	HTBW
289289	891380.4	575451.7	974.114	EJB
289290	891378.9	575454.1	974.005	ELP
289291	891377.7	575474.4	974.366	HTBW
289292	891371.7	575475.2	974.269	HTBC
289293	891369.7	575475.2	973.783	HLIP
289294	891322.1	575475.1	974.273	ROCL
289295	891383.9	575501.1	974.473	HTBW
289296	891378.4	575502.6	974.43	HTBW E
289297	891378.4	575502.6	974.414	H-BRICK-WALK B
289298	891383.9	575501.2	974.474	H-BRICK-WALK
289299	891385.1	575506	974.471	H-BRICK-WALK
289300	891393.6	575506.3	974.525	H-BRICK-WALK
289301	891395.6	575515.1	974.571	H-BRICK-WALK
289302	891394.8	575540.7	974.524	H-BRICK-WALK
289303	891386.9	575540.7	974.483	H-BRICK-WALK
289304	891386.6	575545.6	974.462	H-BRICK-WALK
289305	891380.8	575545.6	974.39	H-BRICK-WALK
289306	891381.6	575515.8	974.477	H-BRICK-WALK C
289307	891381.1	575515.9	974.479	HTBC
289308	891379.5	575516.1	973.979	HLIP
289309	891395.7	575506	974.955	EJB
289310	891395.3	575543.6	974.404	EJB
289311	891380.9	575545.7	974.353	HTBW B
289312	891370.2	575733.3	973.748	HEC B
289313	891373.6	575733.4	973.702	HEC
289314	891373.6	575730.6	973.766	HEC RECT
289315	891372	575731.9	973.682	UWBO
289316	891365.7	575709.4	973.285	EJB
289317	891364.6	575693.4	972.512	O-CL-4_-SCUPPER
289318	891372.9	575654.1	973.689	ELP
289319	891374.8	575651.6	973.564	EJB
289320	891374.7	575651.6	973.516	EJB
289321	891359.2	575614.2	973.396	MHT
289322	891386.6	575545.8	974.412	HTBW
289323	891385.6	575581.4	974.296	HTBW
289324	891379.7	575581.1	974.196	HTBC
289325	891377.8	575581	973.678	HLIP
289326	891364.7	575650.6	973.209	HLIP
289327	891366.6	575650.8	973.488	HTBC
289328	891372.6	575651.1	973.69	HTBW
289329	891371.6	575687.6	973.444	HTBW

289330	891372.5	575688.7	973.419	HTBW
289331	891372.1	575699.1	973.455	HTBW
289332	891371.3	575700	973.438	HTBW
289333	891370.3	575733.4	973.521	HTBW
289334	891364	575740.4	973.237	HTBC BC
289335	891362.1	575740.5	972.933	HLIP BC
289336	891320.9	575743.1	973.53	ROCL
289337	891375.2	575757.5	973.093	ETSP
289338	891372.7	575767.4	973.153	HLIP
289339	891374.2	575765.8	973.017	HTBC
289340	891382.6	575764.9	973.349	EJB
289341	891371.7	575753.6	973.661	HTBW
289342	891379.5	575758.3	973.301	HTBW
289343	891383	575761.5	973.314	HTBW
289344	891386.3	575768.6	973.584	HTBW
289345	891401.1	575768.6	973.64	HTBW
289346	891404	575771.7	973.652	HTBW
289347	891406.2	575771.6	973.687	HTBW
289348	891408.9	575768.8	973.662	HTBW
289349	891405.3	575769.8	973.501	UWFH
289350	891399.2	575778.7	972.993	HLIP EC
289351	891399	575776.7	973.487	HTBC EC
289352	891412.9	575755.7	973.789	EV B
289353	891416.7	575756.3	973.584	EV
289354	891417.2	575753.7	973.56	EV
289355	891413.3	575753	973.642	EV C
289356	891419.2	575745.8	973.706	O-SIGN B
289357	891418.1	575747.2	973.759	O-SIGN
289358	891411.8	575741.4	973.934	O-SIGN RECT
289359	891423.5	575753.9	972.556	ETJ
289360	891431.1	575768.8	973.686	HTBW
289361	891432.1	575767.8	973.667	HTBW
289362	891457	575767.6	973.816	HTBW
289363	891444.1	575777.5	972.652	O-CL-20_-SUPPER
289364	891468.6	575775.8	973.89	UWM
289365	891468.7	575773.8	973.937	UWM
289366	891485.9	575770.5	974.034	ELP
289367	891479.9	575755.7	974.838	HTBW
289368	891481.2	575746.5	975.135	HTBW
289369	891476.6	575737.7	975.299	HTBW BC
289370	891486	575742.4	975.31	HTBW
289371	891494.8	575745.8	975.307	HTBW EC
289372	891488.7	575749.7	975.018	HTBW
289373	891488.1	575755.7	974.855	HTBW
289374	891492.3	575755.7	974.869	HTBW
289375	891521.8	575763.1	974.126	HTBW
289376	891568.7	575763.2	974.249	HTBW
289377	891568.9	575771.2	974.163	HTBW E
289378	891569	575777.3	973.968	HTBC E
289379	891569	575779	973.601	HLIP E
289380	891567.3	575736.2	975.225	HEC B
289381	891567.3	575726.2	975.358	HEC
289382	891557.5	575726.2	975.516	HEC RECT
289383	891560.9	575729.8	975.822	ETRN-P1633
289384	891570.9	575739.2	974.628	HTBC B
289385	891570.6	575723.4	975.051	HTBC BC
289386	891568.8	575720.2	975.079	HTBC
289387	891560.9	575718	975.098	HTBC
289388	891552.1	575710.9	975.412	HTBC
289389	891544.3	575711.5	975.453	HTBC
289390	891536.4	575715.9	975.356	HTBC
289391	891536.5	575717.3	975.365	HTBC EC
289392	891542.9	575734.4	975.474	HTBC BC
289393	891505	575738.6	975.175	HTBC
289394	891472.5	575723.3	975.059	HTBC EC
289395	891482.1	575711.1	974.863	HTBC BC
289396	891481.6	575704.1	974.901	HTBC
289397	891475	575703.7	974.965	HTBC EC
289398	891457.8	575705.8	974.466	UWV
289399	891462.7	575713.7	974.987	HTBC BC
289400	891448	575654.6	974.664	HTBC
289401	891457.4	575618.5	974.476	UWV
289402	891492.4	575602.7	974.556	HTBC EC
289403	891498.9	575619.5	974.439	HTBC BC
289404	891502.3	575620.7	974.494	HTBC
289405	891504.5	575617.9	974.505	HTBC EC
289406	891502	575617.7	974.361	UWFH
289407	891500.2	575600.4	974.756	HTBC
289408	891505.3	575599.3	974.361	HTBC E
289409	891503.3	575590	974.461	HTBW B
289410	891505.4	575599.7	974.329	HTBW BC
289411	891560.2	575613.4	974.932	HTBW
289412	891587.1	575671.1	974.894	HTBW EC
289413	891597.1	575671.1	974.82	HTBW E
289414	891591.4	575678.7	974.276	ELP
289415	891541.4	575672.5	974.977	HRLC B BC
289416	891519.3	575693.3	975.078	HRLC
289417	891492.5	575668	974.701	HRLC
289418	891513.2	575644.3	974.594	HRLC
289419	891541.2	575663.2	974.873	HRLC EC E
289420	891372.3	576318.5	974.895	MHS
289421	891342.2	576299.5	974.602	ROEA B
289422	891391.9	576295.9	973.94	TNG
289423	891442.2	576294.4	973.376	TNG

289424	891505.6	576293.1	973.401	TNG
289425	891563.2	576291.8	973.518	TNG
289426	891570.4	576394.5	973.312	TNG
289427	891486.8	576394.1	973.082	TNG
289428	891404.7	576395.1	973.166	TNG
289429	891369.8	576395.5	973.332	TNG
289430	891343.1	576395.9	974.419	ROEA
289431	891315.7	576395.5	974.715	ROCL
289432	891356.1	576537.6	974.871	EPP
289433	891343.9	576545	974.808	ROEA
289434	891355.7	576544.8	974.75	TNG
289435	891369.6	576543.3	973.201	TNG
289436	891404.4	576541.2	972.787	TNG
289437	891480	576541.1	973.108	TNG
289438	891517.4	576542.6	973.028	TNG
289439	891625.7	576540.9	973.22	TNG
289440	891634.8	576655.3	973.35	TNG
289441	891578.6	576654.3	973.217	TNG
289442	891526.2	576653.3	973.151	TNG
289443	891453.8	576652.2	973.041	TNG
289444	891398.7	576652.8	972.886	TNG
289445	891368.2	576652.4	973.383	TNG
289446	891356.6	576652.5	974.761	TNG
289447	891345.5	576652.3	975.001	ROEA
289448	891317	576651.9	975.196	ROCL
289449	891345.9	576777.9	975.246	ROEA
289450	891360.2	576779.1	974.776	EPP
289451	891356.4	576788.5	975.2	S-SCHOOL-XING
289452	891346.3	576821	975.54	ROCL
289453	891363.1	576821.6	975.382	TNG
289454	891375.9	576835.2	974.869	MHS
289455	891381.3	576817	973.52	TNG
289456	891395.1	576817.8	972.846	TNG
289457	891503.3	576820.4	972.89	TNG
289458	891618.6	576819.6	973.141	TNG
289459	891632.2	576934.2	974.433	WBLK B
289460	891626.5	576924.2	973.528	TOP B
289461	891607.7	576907.7	970.935	TOE B
289462	891609.1	576870	970.84	TOE
289463	891628.8	576866.2	973.576	TOP
289464	891613.8	576853.4	973.387	TOP
289465	891613.6	576853.4	973.378	TOP
289466	891505	576849.2	972.916	TOP
289467	891416.9	576850.6	973.563	TOP
289468	891434.7	576867.2	970.473	TOE
289469	891439.7	576911.3	970.226	TOE C
289470	891417.9	576921.2	973.552	TOP
289471	891485.1	576924.9	972.91	TOP C
289472	891468.4	576934.1	973.515	WBLK
289473	891469.1	576993.2	974.7	WBLK E
289474	891389.6	577003.3	974.878	UWV
289475	891388.5	576978.7	975.196	UWFH
289476	891383.7	576986.6	975.241	HXC B
289477	891398.3	576986.1	974.982	HXC BC
289478	891407.7	576982.4	974.983	HXC
289479	891410.6	576972.7	974.876	HXC EC
289480	891410.1	576945.1	974.587	HXC
289481	891425.6	576944.6	974.526	HXC E
289482	891429.6	576944.5	974.54	HXC B
289483	891454	576943.9	974.865	HXC
289484	891455.1	576987.1	975.21	HXC
289485	891447	576987.8	975.138	HXC BC
289486	891444.5	576990.5	975.166	HXC
289487	891445.8	576992.7	975.272	HXC EC
289488	891466.2	576991.8	975.255	HXC E
289489	891416.5	576924.6	973.435	WBLK B
289490	891397.9	576924.4	973.947	WBLK
289491	891381.9	576894.8	974.247	TNG
289492	891360.8	576894	975.379	TNG
289493	891347.1	576897.9	975.494	ROEA
289494	891347.6	576965.2	975.877	ROEA BC
289495	891356.5	576981.1	975.567	ROEA
289496	891381.7	576986.6	974.731	ROEA EC E
289497	891360.9	576980.1	975.182	EGW
289498	891360.7	576968.1	975.46	EPP
289499	891361.6	576971.9	975.406	ET-MARKER-FIBER
5788001	891631.4	573533.6	983.129	TOP
5788002	891632.6	573537.9	982.962	HEC B ROED B
5788003	891633.5	573548.2	982.86	TOP1 B ROED1 B
5788004	891626.5	573515.7	965.56	TOE
5788005	891623.7	573483.6	965.492	TNG
5788006	891622.2	573452.6	965.132	TNG
5788007	891527.3	573457.9	965.235	TNG
5788008	891533.4	573496.8	965.384	TNG
5788009	891538.6	573527.2	965.927	TOE
5788010	891442.9	573539.8	965.471	TOE E
5788011	891444.3	573508.6	965.455	TNG
5788012	891447.5	573457.5	964.638	TNG
5788013	891471.7	573547.1	971.05	IRCP-36IN B
5788014	891539.4	573546.3	982.517	TOP
5788015	891539.9	573549.5	982.625	HEC ROED
5788016	891541.4	573559.7	982.828	TOP1 ROED1
5788017	891489.6	573568.3	982.452	TOP1 ROED1
5788018	891472	573573.9	982.485	TOP1 BC ROED1 BC

5788019	891459.1	573581	982.62	TOP1 ROED1
5788020	891455.7	573596.6	983.581	TOP1 EC ROED1 EC
5788021	891455.3	573613.3	984.576	TOP1 E ROED1 E
5788022	891479.5	573557.2	982.157	ROED BC HEC
5788023	891478.7	573554.1	982.039	TOP
5788024	891463.8	573562.6	982.206	ROED
5788025	891452.7	573570.8	982.512	ROED
5788026	891446	573581.6	982.996	ROED
5788027	891443.2	573599.1	984.008	ROED EC
5788028	891442.1	573614.8	984.769	ROED E
5788029	891427.2	573564.4	981.439	HEC E
5788030	891426.8	573560.7	981.338	TOP E
5788031	891425.6	573572.2	981.873	TOE B
5788032	891434.5	573576	982.2	TOE
5788033	891439.5	573583.7	982.706	TOE
5788034	891441.2	573593	983.411	TOE
5788035	891441.7	573604.7	984.058	TOE
5788036	891441.1	573615	984.802	TOE E
5788037	891486.3	573588.3	975.739	WHW-8IN-CL B
5788038	891486	573588.4	975.921	WHW-8IN-CL
5788039	891478.5	573589.9	975.904	WHW-8IN-CL
5788040	891471.3	573591.3	975.909	WHW-8IN-CL
5788041	891471.2	573591.3	975.788	WHW-8IN-CL E
5788042	891479.2	573590.7	971.993	IRCP-36IN E
5788043	891477.9	573590.8	972.391	TOE B
5788044	891478.8	573604	972.004	TOE
5788045	891479.3	573617.3	972.747	TOE E
5788046	891492.4	573604.9	972.695	TNG
5788047	891549.9	573597.4	973.585	TNG
5788048	891480.7	573590.2	972.196	TOE B
5788049	891484.4	573589.2	973.519	TOE
5788050	891489.6	573591.2	973.524	TOE
5788051	891548.9	573585.7	973.748	TOE
5788052	891635	573574.9	974.316	TOE E
5788053	891637.5	573593.4	973.786	TNG
5788054	891640.4	573603.9	973.745	CPC-LS33315-RED
5788055	891397.4	574494.6	973.525	HLIP B ROEA B
5788056	891596.3	574471.4	973.603	HTBC B
5788057	891596.4	574473.4	973.23	HLIP1 B
5788058	891596.1	574495.8	973.771	ROEA1 B
5788059	891596.8	574520.7	973.277	ROEA2 B HLIP2 B
5788060	891597.1	574522.7	973.73	HTBC2 B
5788061	891595.7	574546.2	973.425	TNG
5788062	891594.4	574565.5	972.921	TOP B
5788063	891595.2	574579	971.589	TFL B
5788064	891596.5	574591.5	973.316	TOP1 B
5788065	891572.9	574531.4	973.898	EJB
5788066	891574.4	574529.2	974.269	ELP
5788067	891555.2	574573.6	973.18	TOP
5788068	891519.1	574582.2	972.895	TOP
5788069	891511.8	574578	972.733	TOP
5788070	891497.9	574565.3	973.116	TOP
5788071	891477.3	574562.5	973.099	TOP
5788072	891455.4	574565.5	972.968	TOP
5788073	891443	574579.8	973.257	TOP
5788074	891434.7	574604.6	973.487	TOP
5788075	891553.8	574589.1	971.799	TFL
5788076	891532.4	574596.1	972.1	TFL
5788077	891518.9	574597.3	972.186	TFL
5788078	891495.4	574600.4	969.282	TFL E TOE B TOE1 B
5788079	891488.6	574595.2	969.094	TOE
5788080	891474.7	574592.1	969.013	TOE
5788081	891461.9	574594.6	968.945	TOE
5788082	891456.2	574604.8	969.245	TOE
5788083	891474.9	574605.7	968.843	TNG
5788084	891494.9	574608.5	969.127	TOE1
5788085	891558.9	574599.7	973.246	TOP1
5788086	891537.2	574609.8	973.37	TOP1
5788087	891521	574622.6	973.134	TOP1
5788088	891546	574623.4	973.375	TNG
5788089	891586.6	574618.1	973.629	TNG
5788090	891578.9	574714.9	973.767	TNG
5788091	891529.8	574713.6	973.29	TNG
5788092	891514.6	574701.7	972.86	TOP1
5788093	891509.9	574721.5	972.634	TOP1
5788094	891497.1	574735.7	972.813	TOP1
5788095	891487.2	574755.8	972.415	TOP1
5788096	891483.2	574778.5	972.528	TOP1
5788097	891503.4	574778	972.988	TNG
5788098	891546.6	574777.7	973.624	TNG
5788099	891580.1	574779	973.636	TNG
5788100	891432.3	574674	972.82	TOP
5788101	891432	574706	972.914	TOP
5788102	891432	574725	972.78	TOP
5788103	891435.5	574737.6	972.805	TOP
5788104	891465.7	574745.9	972.739	TOP
5788105	891460.6	574760	973.289	TOP
5788106	891459.5	574775.5	973.315	TOP
5788107	891455.8	574676.4	968.915	TOE
5788108	891473.9	574678.7	968.656	TNG
5788109	891494	574680.2	968.745	TOE1
5788110	891492.6	574698.1	968.914	TOE1
5788111	891491	574710.8	969.319	TOE1
5788112	891454.4	574700.8	968.989	TOE

5788113	891457.8	574714.8	968.959	TOE
5788114	891477.8	574717.3	969.448	TFL B TOE E TOE1 E
5788115	891476.3	574728.2	970.078	TFL
5788116	891475.3	574743.4	970.917	TFL
5788117	891475.2	574777.6	971.687	TFL
5788118	891432.9	574774.1	973.092	TNG
5788119	891404.4	574773.6	973.305	TNG
5788120	891406.6	574720.1	973.399	TNG
5788121	891408.4	574653.4	973.576	TNG
5788122	891415.6	574652.4	974.153	EJB
5788123	891410.7	574609.6	973.762	TNG
5788124	891414.8	574545.9	973.991	TNG
5788125	891427	574571.2	974.731	HEC8 B
5788126	891427.1	574571.2	974.688	HEC8 B
5788127	891426.7	574575.2	974.647	HEC8
5788128	891432.9	574575.7	974.633	HEC8
5788129	891433.3	574571.7	974.688	HEC8 C
5788130	891433	574578.7	974.552	HEC8 B
5788131	891432.9	574582.7	974.57	HEC8
5788132	891426.6	574582.7	974.63	HEC8
5788133	891426.6	574578.6	974.583	HEC8 C
5788134	891429.1	574580.7	972.958	ECSB DNC
5788135	891429.2	574573.5	972.86	ECSB DNC
5788136	891442.4	574579.1	973.386	ECR-4-4IN-POWER-?
5788137	891440.7	574569.9	973.441	ECR-4-4IN-POWER-?
5788138	891442.2	574560.3	973.652	TNG
5788139	891468.1	574542.6	973.583	TNG
5788140	891445.6	574545.4	974.395	UWM
5788141	891431.5	574539.8	974.041	ETPED
5788142	891428	574536.2	974.101	TNG
5788143	891439.1	574528.8	974.805	UWFH
5788144	891461.9	574529.4	973.994	TNG
5788145	891496	574521.9	974.272	HTBC2
5788146	891496	574520	973.857	HLIP2 ROEA2
5788147	891498	574494.9	974.269	ROEA1
5788148	891497.1	574472.7	973.636	HLIP1
5788149	891497.2	574470.8	973.994	HTBC
5788150	891435.5	574470.4	974.136	HTBC E
5788151	891435.5	574472.4	973.75	HLIP1 E
5788152	891435.5	574493.4	974.005	ROEA1
5788153	891435.1	574495.5	974.05	HLIP1 B ROEA1
5788154	891404.4	574494.7	973.584	HLIP1 ROEA1
5788155	891403.7	574519.5	973.643	HLIP1 ROEA1
5788156	891433	574519.6	974.191	HLIP1 E ROEA1 E HLP2 E ROEA2 E
5788157	891433.1	574521.5	974.582	HTBC2 BC
5788158	891408.3	574531.5	974.379	HTBC2
5788159	891397.7	574558.2	974.196	HTBC2 EC
5788160	891395.6	574558.1	973.769	HLIP ROEA
5788161	891439.2	574511.1	974.326	UWV
5788162	891446.6	574511.3	974.264	UWV
5788163	891425.1	574565.2	973.988	CPC-LS37936-ORANGE
5788164	891447.9	574495.5	974.253	CPK-LS33315-WASHER
5788165	891362.1	574494.9	973.253	CBCHH-VAN-BUREN-127TH
5788166	891362	574497.2	973.966	ROCL B
5788167	891360.3	574554.7	974.173	ROCL
5788168	891357.4	574654.2	974.434	ROCL
5788169	891392.8	574656.2	973.911	ROEA E HLIP
5788170	891394.9	574656.2	974.317	HTBC2 E HTBC B
5788171	891391.6	574769.2	974.608	HTBC
5788172	891389.7	574769.3	974.169	HLIP
5788173	891354.3	574769	974.674	ROCL
5788174	891351.3	574869.8	974.753	ROCL
5788175	891386.7	574871.8	974.181	HLIP
5788176	891388.7	574871.9	974.655	HTBC
5788177	891398.1	574852.6	974.685	EJB
5788178	891396.5	574853.9	974.56	ELP
5788179	891397.4	574872.6	974.096	TNG
5788180	891419.5	574872.1	973.272	TNG
5788181	891455.8	574872.6	973.338	TOP
5788182	891471.4	574872.7	971.857	TFL
5788183	891481.4	574872.9	973.48	TOP1
5788184	891509.9	574874.8	973.577	TNG
5788185	891593.7	574873.1	973.553	TNG
5788186	891593.2	574977.5	973.632	TNG
5788187	891510.7	574980.5	973.377	TNG
5788188	891477.5	574979.9	973.282	TOP1
5788189	891468.2	574979.3	971.973	TFL
5788190	891452.7	574978.1	972.995	TOP
5788191	891417	574977.3	972.974	TNG
5788192	891389.9	574977.4	974.059	TNG
5788193	891385.7	574977.2	974.431	HTBC
5788194	891383.7	574977.2	974.006	HLIP
5788195	891348.2	574977.2	974.451	ROCL
5788196	891345.5	575074.2	974.185	ROCL
5788197	891380.9	575075.5	973.683	HLIP
5788198	891382.8	575075.5	974.128	HTBC
5788199	891392.1	575075.5	973.411	TNG
5788200	891390.7	575053.5	974.388	ELP
5788201	891392.4	575051.8	974.343	EJB
5788202	891420.9	575068.4	974.497	HEC B
5788203	891420.7	575072.5	974.508	HEC
5788204	891427	575072.7	974.573	HEC
5788205	891427.2	575068.7	974.526	HEC C
5788206	891423.4	575070.6	972.41	ECSB DNC

5788207	891413.8	575113.2	972.318	ECSB DNC
5788208	891417.7	575111.3	974.469	HEC B
5788209	891417.5	575115.4	974.532	HEC
5788210	891411.3	575115	974.445	HEC RECT
5788211	891411	575118.5	974.209	HEC B
5788212	891414.4	575118.8	974.176	HEC
5788213	891414.1	575122.2	974.244	HEC RECT
5788214	891412.5	575120.5	976.23	ETRN DNC
5788215	891381.7	575154.2	974.186	U-CP-TEST-HANDHOLE
5788216	891424.1	575088.7	974.211	TNG
5788217	891446	575088.3	972.854	TOP
5788218	891461.7	575089	971.879	TFL
5788219	891472.4	575089.4	972.719	TOP1
5788220	891503.1	575091.3	973.523	TNG
5788221	891590.3	575093.3	973.962	TNG
5788222	891591.1	575190.7	974.088	TNG
5788223	891492.6	575195.6	973.535	TNG
5788224	891467.5	575164.9	972.482	TOP1
5788225	891465.1	575180.3	972.597	TOP1
5788226	891455.7	575196.1	972.964	TOP1
5788227	891445.9	575164.2	972.773	TOP
5788228	891460.5	575164.3	972.027	TFL
5788229	891458.8	575179.7	972.17	TFL
5788230	891452.1	575178.5	972.648	TOP
5788231	891447.8	575186	972.765	TOP
5788232	891452.5	575190.2	972.591	TFL
5788233	891435.1	575213.3	973.028	TOP1
5788234	891431	575208.5	972.623	TFL
5788235	891426.8	575202.1	972.964	TOP
5788236	891392.9	575223	973.342	TOP
5788237	891385.1	575223.1	973.402	TOP E
5788238	891392.5	575231.5	972.764	TFL
5788239	891384.8	575231.6	972.827	TFL E
5788240	891393.2	575238.4	973.204	TOP1
5788241	891384.7	575239.1	973.452	TOP1 E
5788242	891416.4	575194.1	973.113	TNG
5788243	891416.8	575189.9	973.289	ECR-4-4IN-POWER-?
5788244	891416	575180.8	972.596	ECR-4-4IN-POWER-?
5788245	891399.1	575189.9	973.277	TNG
5788246	891379.6	575191	973.872	HTBC E
5788247	891377.7	575190.9	973.436	HLIP E
5788248	891340.1	575190.1	974.016	ROCL E
5788249	891359.5	575792.2	973.163	MHS
5788250	891350.8	575800	973.352	MHS
5788251	891349.7	575809.6	973.418	MHS
5788252	891368	575810.3	973.287	MHS
5788253	891324.5	575813.5	973.267	CBCHH-EL-MIRAGE-VAN-BUREN
5788254	891324.5	575815.6	973.758	ROCL B
5788255	891318.3	575819.5	973.617	UWV
5788256	891332.5	575826.4	973.71	UWV
5788257	891373.6	575842.4	973.287	U-CP-TEST-HANDHOLE
5788258	891387.5	575837.5	973.171	U-CP-TEST-HANDHOLE
5788259	891405.9	575856	973.164	UWM-RECLAIMED
5788260	891406.4	575840	973.05	UWV-RECLAIMED
5788261	891417.2	575825.3	973.096	UWV
5788262	891556.4	575812.7	973.887	ROCL1 B
5788263	891556.5	575839.6	973.478	ROEA
5788264	891556.3	575844	973.383	TNG
5788265	891556.4	575847.2	973.669	FTS B
5788266	891561.5	575851.7	972.8	TOE B
5788267	891553	575847.1	973.917	OMB
5788268	891485.1	575847	973.45	FTS
5788269	891485.5	575842.5	973.273	TNG
5788270	891485.4	575839.4	973.283	ROEA
5788271	891484.6	575812.1	973.671	ROCL1
5788272	891432.8	575812.8	973.428	ROCL1
5788273	891390	575813.9	973.376	ROCL1 E
5788274	891454.4	575842.1	973.153	ROEA
5788275	891454.4	575844.6	973.235	TNG
5788276	891454.9	575846.7	973.728	FTS
5788277	891431.8	575866.8	973.915	FTS
5788278	891425.1	575873.7	973.89	FTS
5788279	891423.3	575871.8	973.165	TNG
5788280	891413.8	575864.6	972.832	TNG
5788281	891388.6	575895.3	972.848	TNG
5788282	891395.9	575902.9	972.683	TNG
5788283	891398.8	575904.7	973.485	FTS
5788284	891382.7	575876.9	972.741	ETSB
5788285	891379.2	575881.5	973.27	HTBW B
5788286	891381	575872.2	973.335	HTBC B HTBW
5788287	891381.2	575871.6	973.326	HTBW
5788288	891388.3	575868.6	973.059	HTBW
5788289	891388.8	575869.2	973.577	HTBC
5788290	891392.8	575864.9	973.466	HTBC
5788291	891392.4	575864.5	973.201	HTBW
5788292	891394.5	575857.9	973.334	HTBW
5788293	891395.3	575857.8	973.449	HTBC E HTBW
5788294	891399	575856.7	973.438	HTBW
5788295	891402.9	575856.1	973.438	HTBW E
5788296	891424.6	575847	973.048	ROEA
5788297	891407.5	575849.9	972.982	ROEA
5788298	891407.5	575848.8	973.033	ROEA E HLIP B
5788299	891407.6	575850.8	972.922	HTBC B
5788300	891402.7	575851.1	973.483	HTBC BC

5788301	891402.6	575849	973.055	HLIP BC
5788302	891392.9	575851.1	973.011	HLIP
5788303	891393.6	575853	973.381	HTBC
5788304	891385.7	575857.3	972.995	HTBC
5788305	891384.5	575855.7	972.889	HLIP
5788306	891378.5	575862	972.83	HLIP
5788307	891380.1	575863.1	972.797	HTBC
5788308	891376.2	575871.3	973.238	HTBC
5788309	891374.4	575870.7	972.871	HLIP
5788310	891372.5	575880.5	972.82	HLIP EC
5788311	891374.4	575880.8	973.234	HTBC EC
5788312	891365.8	575943.4	973.737	FTS
5788313	891361.8	575942.7	972.941	TNG
5788314	891373.9	575884.8	972.74	HTBC E
5788315	891371.9	575884.7	972.803	HLIP E ROEA B
5788316	891372.6	575884.8	972.775	ROEA
5788317	891371.7	575890.1	972.683	ROEA
5788318	891358.2	575943.7	973.184	ROEA
5788319	891388.1	575865.2	973.214	ETSP
5788320	891378.1	575899.1	972.684	TNG
5788321	891326.5	575899.6	973.718	UWV
5788322	891327.1	575905.5	973.737	MHW
5788323	891326.4	575914.6	973.838	UWV
5788324	891327.3	575942.7	973.843	ROCL
5788325	891328.3	576040.2	974.081	ROCL
5788326	891341.9	576010.3	973.923	ROEA
5788327	891339.9	576010.4	973.844	ROEA
5788328	891355.2	575999.2	973.62	EPP EOH B
5788329	891354.3	576018.1	973.499	EGW
5788330	891354.5	576046.2	973.681	EPP EOH
5788331	891340.1	576041.3	973.99	ROEA
5788332	891358.5	576041.3	973.459	TNG
5788333	891366.3	576041.7	973.394	FTS
5788334	891361.5	576136.8	972.714	TNG
5788335	891347.3	576137.9	973.76	TNG
5788336	891340.9	576138.1	974.108	ROEA
5788337	891354.9	576103.7	974.11	ET-MARKER-FIBER
5788338	891329.4	576139.6	974.293	ROCL
5788339	891329.9	576237.5	974.557	ROCL
5788340	891341.9	576237.5	974.37	ROEA
5788341	891351.5	576237.3	974.296	TNG
5788342	891359.2	576224.9	973.607	TNG
5788343	891356.2	576156.9	973.402	U-CP-TEST-HANDHOLE
5788344	891368.2	576236	973.798	ROED B
5788345	891367.8	576248.6	973.814	ROED1 B
5788346	891438.1	576246.8	973.723	ROED1
5788347	891437.6	576238.4	973.533	ROED
5788348	891512.9	576239.9	973.882	ROED E
5788349	891513.1	576248.4	973.843	ROED1 E
5788350	891514.3	576252.3	973.53	TOE1 B
5788351	891515.3	576269.8	973.472	TOE2 B
5788352	891516.1	576273.9	974.205	FW B
5788353	891515.6	576260.9	973.284	TNG
5788354	891519.1	576275.9	974.356	EOH2 B
5788355	891495.9	576276.3	974.168	EPP EOH2
5788356	891449	576274.1	974.231	FW
5788357	891449	576270.4	973.338	TOE2
5788358	891448.1	576260.1	973.073	TNG
5788359	891446	576250.1	973.209	TOE1
5788360	891371.1	576255.2	973.41	TOE1
5788361	891373.5	576269.9	973.419	TOE1 E TOE2 E
5788362	891379.7	576262.8	973.137	TNG
5788363	891368.2	576273.8	973.875	FW
5788364	891374.2	576274.5	973.737	EGW
5788365	891388.3	576275.4	973.911	EPP EOH2
5788366	891367.9	576250.6	973.787	FW
5788367	891385.3	576250.8	973.629	FW E FGP B
5788368	891385.9	576234.7	973.62	FGP E FW B
5788369	891367.7	576234.5	973.804	FW
5788370	891355.4	576275.7	974.335	EOH EOH2 E
5788371	891352.2	576277.6	974.434	ETPED
5788372	891355.5	576284.6	974.594	EPP EOH E
5788373	891367.9	576278.2	973.976	CPC-LS33880-ORANGE
5788374	891365.1	576277.1	973.939	ECR-1IN
5788375	891361.7	576278.7	973.769	ECR-1IN
5788376	891505.5	576225.3	972.923	TOE2 B
5788377	891440.4	576226.7	972.97	TOE2
5788378	891377.9	576228.1	973.192	TOE2
5788379	891371.7	576217.8	973.186	TOE2
5788380	891370.4	576143	972.858	TOE2
5788381	891436.7	576144	972.763	TNG
5788382	891498.9	576143.7	972.781	TNG
5788383	891367	576146.9	973.22	FW
5788384	891369.6	576065.2	973.095	TOE2
5788385	891366.7	576062.4	973.512	FW
5788386	891366.5	576061.4	973.569	FTS
5788387	891417.4	576065.9	972.919	TOE2
5788388	891417.3	576062.4	973.578	FW
5788389	891477.7	576062.8	973.443	FW E
5788390	891478.5	576066.4	973.103	TOE2 E
5788391	891478.7	576060.1	972.924	TOE2 B
5788392	891411.8	576059.3	972.929	TOE2
5788393	891369.4	576059	973.241	TOE2
5788394	891341.9	576275.1	974.482	ROEA E

5788395	891329.6	576275.8	974.601	ROCL E
5788396	891368.7	576009.5	972.456	TOE2
5788397	891367.9	575944.9	973.036	TOE2
5788398	891410.2	575896.5	972.616	TOE2
5788399	891456.2	575850.2	972.934	TOE2 E TOE E
5788400	891508.3	575852.4	972.728	TNG
5788401	891503.9	575897.6	972.422	TNG
5788402	891537.1	575885.8	972.553	TNG
5788403	891443	575907.9	972.539	TNG
5788404	891442	575972.4	972.544	TNG
5788405	891439.7	576021	972.601	TNG
5788406	891394.5	576045.8	972.669	TNG
5788407	891522.6	575991	972.762	TNG

289001	891399.6	573176.1	993.896	CBCHH
289002	891394.9	573339.2	992.514	ROCL
289003	891428.9	573343.4	992	TOP-BRIDGE B
289004	891425.7	573449.6	990.691	TOP-BRIDGE
289005	891423.6	573528.3	989.741	TOP-BRIDGE
289006	891389.4	573528.8	990.415	ROCL
289007	891422.3	573587.6	988.528	TOP-BRIDGE E
289008	891421.2	573589.5	988.451	HLIP B
289009	891423.1	573589.8	988.858	HTBC B
289010	891422.4	573587.8	988.349	WBR B
289011	891387.8	573588.6	989.023	ROCL
289012	891421.6	573657.1	986.959	WBR
289013	891420.4	573657.7	987.112	HLIP
289014	891422.3	573657.6	987.212	HTBC
289015	891426	573663.7	987.255	HTBC
289016	891426.1	573707.2	986.338	HTBC
289017	891421.5	573724.6	985.873	HTBC
289018	891419.7	573724.5	985.701	HLIP
289019	891422.5	573709	985.941	WBR E
289020	891427.8	573605.2	988.397	EJB
289021	891428	573602.2	988.641	ELP
289022	891425.2	573589.2	988.121	FW B
289023	891440.9	573617.6	984.97	FW
289024	891455.7	573618.3	984.728	FW
289025	891475.7	573619.7	977.522	WHW B
289026	891475.2	573619.4	976.121	FSTL-TUBULAR B
289027	891459.5	573635	984.962	FSTL-TUBULAR
289028	891459.1	573653.7	985.326	FSTL-TUBULAR
289029	891459.6	573635.6	985.284	WHW
289030	891459.4	573653.2	985.32	WHW
289031	891476.9	573658.6	976.364	WHW E
289032	891476.6	573659.2	976.201	FSTL-TUBULAR E
289033	891473.7	573646.9	972.37	HEC B
289034	891490.9	573642.5	973.07	HEC BC
289035	891503.7	573647.6	973.051	HEC
289036	891512.5	573633.5	972.943	HEC
289037	891499.1	573624.2	972.969	HEC
289038	891490.4	573630.4	973.052	HEC EC
289039	891470.9	573635.3	972.207	HEC E
289040	891481.5	573618.7	972.471	FW
289041	891498.8	573619.3	972.91	FW
289042	891600	573610.5	973.348	FW E
289043	891606.1	573637.1	972.728	FCL B
289044	891543.1	573641.9	973.291	CRBR-CAP-ILLEG
289045	891543.3	573642	973.295	FCL
289046	891540.5	573658	972.972	FCL
289047	891491.5	573660.6	972.984	TOE B

289048	891505.7	573713.5	973.597	TOE
289049	891455.5	573619	984.733	TOP B
289050	891457.2	573658.5	984.923	TOP
289051	891452.1	573723.5	983.309	TOP
289052	891423.1	573615.2	987.827	TOP1 B
289053	891440.6	573618.6	984.84	TOE1 B
289054	891439.9	573657.1	985.091	TOE1
289055	891428.4	573657.8	986.992	TOP1
289056	891426.5	573723.1	985.527	TOP1
289057	891438.4	573723.2	983.632	TOE1
289058	891382.6	573794.1	984.771	ROCL
289059	891407.4	573814.6	983.761	MHT
289060	891424	573797.8	984.423	EJB
289061	891424.6	573795.5	984.609	ELP
289062	891417.6	573796.6	984.042	HLIP
289063	891419.6	573796.7	984.39	HTBC
289064	891423.6	573799.7	984.002	TOP1
289065	891437.7	573798.1	981.276	TOE1
289066	891451	573799.3	981	TOP
289067	891515.4	573799.3	972.813	TOE
289068	891520.7	573800.2	972.77	FCL
289069	891506.6	573903.4	972.226	FCL
289070	891502.6	573903.2	972.498	TOE
289071	891449	573899.1	978.137	TOP
289072	891435.3	573899.2	978.456	TOE1
289073	891419.3	573899.9	981.596	TOP1
289074	891416.6	573899.9	981.871	HTBC
289075	891414.6	573900.1	981.483	HLIP
289076	891419	573990.1	979.482	EJB
289077	891419.4	573986.6	979.439	ELP
289078	891377	573990.7	979.578	ROCL
289079	891418.5	573993.8	978.842	TOP1
289080	891430.8	573994.3	977.062	TOE1
289081	891445.3	573995.2	976.796	TOP
289082	891490.5	574000.9	972.358	TOE
289083	891492.4	574001.2	972.066	FCL
289084	891482.2	574068	972.346	CRBR
289085	891481.7	574069.9	972.333	TOE
289086	891444.1	574068	975.578	TOP
289087	891428.8	574068.4	975.766	TOE1
289088	891414.7	574068.9	976.914	TOP1
289089	891416.2	574092.1	976.428	HEC B
289090	891418.1	574092.2	976.441	HEC
289091	891418.1	574096	976.372	HEC RECT
289092	891417	574094.2	976.359	UWBO
289093	891417	574100.9	976.237	UWV
289094	891413.1	574183.6	974.427	EJB
289095	891413.6	574180.9	974.409	ELP
289096	891406.5	574185.2	973.854	HLIP
289097	891408.4	574185.6	974.236	HTBC
289098	891371.7	574186.4	974.551	ROCL
289099	891413.8	574188	973.944	TOP1 E
289100	891425.2	574187.5	973.484	TOE1 E
289101	891425.5	574187.4	973.534	TOP E
289102	891464.9	574187.6	971.863	TOE E
289103	891477.5	574188.4	971.865	FCL
289104	891476.2	574203.3	971.005	CRBR-33315
289105	891476.9	574203.6	971.025	FCL
289106	891438.3	574202.2	971.486	CRBR-33315
289107	891421.3	574201.7	973.255	FCL
289108	891421.3	574201.5	973.256	TOP B
289109	891488.2	574203.9	971.643	TOP
289110	891488.1	574292.3	971.607	TOP
289111	891486.9	574349.5	971.584	TOP
289112	891428.1	574353	972.122	TOP
289113	891434.1	574311.4	969.7	HTBC1 B
289114	891424.5	574311	972.186	HTBC1
289115	891434.7	574292.5	969.688	HTBC2 B
289116	891432.8	574292.4	970.493	HTBC2
289117	891425.1	574292.1	972.1	HTBC2
289118	891474	574328.4	968.943	TOE B
289119	891434.4	574339	969.627	TOE
289120	891421.4	574265.6	972.743	TOP C
289121	891434.5	574209.2	969.875	TOE
289122	891475.4	574211	969.392	TOE C
289123	891604.4	574231.3	972.274	TNG
289124	891608.9	574104.5	972.213	TNG
289125	891610.4	573990	972.648	TNG
289126	891612.4	573796	972.745	TNG
289127	891682.5	573767.6	973.039	TNG
289128	891664	574005.3	972.451	TNG
289129	891656.3	574106.9	972.173	TNG
289130	891652.4	574218.2	972.361	TNG
289131	891656.4	574385	972.612	TNG
289132	891412	574310.5	973.299	HTBC1 E
289133	891412.5	574291.5	973.325	HTBC2 E
289134	891403.5	574286.6	972.847	HLIP
289135	891405.5	574286.6	973.174	HTBC
289136	891405.6	574287	973.186	HEC B
289137	891411.5	574287.2	973.368	HEC
289138	891412.5	574289.7	973.338	HEC
289139	891411.8	574312.1	973.355	HEC
289140	891410.8	574314.7	973.373	HEC
289141	891404.9	574314.5	973.266	HEC E

289142	891409.4	574319.9	973.4	EJB
289143	891409.8	574317.8	973.304	ELP
289144	891404.4	574300.7	972.617	O-CL-20_-SCUPPER
289145	891419.5	574340	972.733	FCL
289146	891431.1	574371.2	972.285	FCL
289147	891430.6	574370.6	972.348	CRBR-33315
289148	891428.9	574436.4	973.931	FCL E
289149	891428.7	574436.3	973.882	CRBR-33315
289150	891332.4	575221	973.903	ROCL
289151	891376.9	575222.9	973.298	HLIP B
289152	891398.7	574457.2	973.22	HLIP
289153	891400.6	574457.4	973.63	HTBC BC
289154	891410.2	574482.8	974.091	HTBC
289155	891435.3	574493.5	974.399	HTBC EC E
289156	891396.9	574507.1	973.6	HLIP
289157	891395.6	574558	973.747	HLIP E
289158	891380.5	574484.7	973.644	UWV
289159	891362.2	574490.5	973.911	ROCL
289160	891362.1	574494.9	973.271	CBCHH
289161	891360.3	574557.1	974.158	ROCL
289162	891378.7	575222.9	973.815	HTBC B
289163	891378.9	575222.9	973.827	HEC B
289164	891383.7	575223	973.883	HEC
289165	891384.7	575225.2	973.92	HEC
289166	891384.3	575238	973.899	HEC
289167	891383.3	575240	973.869	HEC
289168	891378.3	575239.8	973.706	HEC E
289169	891377.9	575231.3	972.863	O-CL-8_-SCUPPER
289170	891378.3	575239.9	973.713	HTBW B
289171	891383.3	575240.1	973.898	HTBW
289172	891386.5	575251.1	973.814	EJB
289173	891384.5	575252.4	973.833	ELP
289174	891453.3	575220.5	972.696	TNG
289175	891531	575221.2	973.533	TNG
289176	891584.8	575222	974.556	TNG
289177	891590.1	575258.5	974.352	FCL B
289178	891522.6	575258.4	974.07	FCL
289179	891473.2	575258.3	973.749	FCL
289180	891457.2	575267.7	973.851	UWV
289181	891454.9	575290.1	974.14	UWV
289182	891450.7	575290.3	973.615	UWFH
289183	891442.1	575308.3	971.919	HEC B
289184	891445.6	575312.1	971.991	HEC
289185	891443.2	575314.3	972.038	HEC RECT
289186	891442.6	575311.5	972.003	O-CATCH-BASIN
289187	891382.7	575256.1	973.703	HTBW
289188	891388.5	575264.9	973.788	HTBW
289189	891388.1	575284.5	973.808	HTBW
289190	891377.6	575259.5	973.69	HTBC
289191	891377.5	575264.5	973.293	HTBC
289192	891377	575284.4	973.38	HTBC
289193	891376.8	575289.6	973.823	HTBC
289194	891374.8	575289.6	973.32	HLIP
289195	891378.2	575307.9	973.841	HEC B
289196	891381.9	575307.9	973.814	HEC
289197	891382	575310.7	973.775	HEC RECT
289198	891380.1	575309.6	973.8	UWBO
289199	891394	575316.7	973.752	HTBW
289200	891409.8	575314.1	973.214	TOP B
289201	891417.4	575302.7	973.412	TOP
289202	891419.4	575316.3	972.035	TOE B
289203	891446.3	575312.2	972.009	TOE
289204	891463.5	575301	974.001	TOP
289205	891470.9	575393.3	974.505	FCL
289206	891465.1	575393.9	974.181	TOP
289207	891447.4	575395	971.822	TOE
289208	891443.6	575493.4	971.582	TOE
289209	891446.8	575510.6	971.51	TOE
289210	891463.1	575494.3	974.061	TOP
289211	891469	575494.6	974.483	FCL
289212	891532.6	575497.7	974.81	FCL
289213	891519.1	575508.4	974.574	TNG
289214	891525	575547.9	975.432	FCL E
289215	891518.4	575550.8	975.44	MHS
289216	891492.1	575504.8	974.493	TOP
289217	891498	575511.8	974.355	TOP
289218	891484.9	575515.8	972.387	TOE
289219	891486.2	575572.9	971.718	TOE
289220	891479.6	575582.7	972.028	TOE
289221	891496.4	575582.1	974.109	TOP
289222	891495.7	575586.4	974.413	TOP BC
289223	891501.7	575587.4	974.564	WBLK B BC
289224	891461.1	575607.8	974.068	WBLK
289225	891457.2	575608.2	973.975	ELP
289226	891453.9	575612.5	973.867	TOP
289227	891453.2	575594.3	971.79	TOE
289228	891434.9	575616.7	971.564	TOE
289229	891423.5	575657.1	972.008	TOE
289230	891432.6	575659.4	973.713	TOP
289231	891434.5	575660.2	973.842	WBLK
289232	891421.9	575687.3	971.649	TOE
289233	891429.1	575713.3	971.948	TOE
289234	891441.2	575706.2	973.976	ELP
289235	891444.7	575712	974.283	TOP

289236	891446.1	575711.6	974.428	WBLK
289237	891443	575727.2	972.079	TOE
289238	891465.3	575740.9	972.339	TOE
289239	891475	575740.1	974.652	WBLK E
289240	891474.5	575740.6	974.456	TOP EC
289241	891470.3	575754.7	973.502	UWBFV-4"
289242	891464.8	575754.6	973.058	UWBFV-8"
289243	891461.3	575763.8	973.663	TOP E
289244	891451.6	575767.4	971.982	TOE
289245	891435.3	575767.1	971.503	TOE
289246	891430.4	575766.5	973.349	TOP B
289247	891445.3	575746.3	973.123	TOP
289248	891451.6	575744.3	972.154	TOE
289249	891421.8	575718.2	971.947	TOE
289250	891410.2	575724	974.439	TOP
289251	891403.3	575694.9	974.056	TOP
289252	891372.7	575701.5	973.165	TOP E
289253	891383.8	575699.6	974.178	MHE
289254	891394	575702	974.559	HEC B
289255	891394.2	575697.9	974.603	HEC
289256	891400.3	575698.1	974.64	HEC RECT
289257	891393.9	575708.9	974.546	HEC B
289258	891394	575704.8	974.538	HEC
289259	891400.3	575704.9	974.574	HEC RECT
289260	891393.8	575715.4	974.635	HEC B
289261	891393.9	575711.4	974.613	HEC
289262	891400.2	575711.5	974.576	HEC RECT
289263	891396.3	575713.1	974.226	ETRN-PD1605
289264	891396.3	575706.7	974.269	ETRN-PD1604
289265	891396.4	575699.9	974.19	ETRN-PD1603
289266	891419.3	575716.1	971.991	TOE
289267	891413.8	575686	971.7	TOE
289268	891373.1	575695.3	971.888	TOE
289269	891373.3	575691.2	971.871	TOE
289270	891373	575686.6	973.214	TOP B
289271	891391.7	575685.8	972.438	TOE
289272	891414.7	575677	971.909	TOE
289273	891406.3	575671.8	973.374	TOP
289274	891411.1	575640.9	973.381	TOP
289275	891417.9	575641.6	971.93	TOE
289276	891422.3	575571.2	971.771	TOE
289277	891413.4	575571.7	973.13	TOP
289278	891417.5	575509.1	971.884	TOE
289279	891405.9	575510.5	973.506	TOP
289280	891407.1	575509.9	973.47	O-PVC-RISER-4"
289281	891406.4	575496.2	974.763	HEC B
289282	891400.2	575495.7	974.652	HEC
289283	891400.4	575491.5	974.589	HEC RECT
289284	891402.6	575493.7	974.135	ETRN-PD1627
289285	891407.1	575413	972.819	TOP
289286	891416.8	575407.6	971.658	TOE C
289287	891410.3	575325.5	972.918	TOP E
289288	891390.3	575449.9	973.985	HTBW
289289	891380.4	575451.7	974.114	EJB
289290	891378.9	575454.1	974.005	ELP
289291	891377.7	575474.4	974.366	HTBW
289292	891371.7	575475.2	974.269	HTBC
289293	891369.7	575475.2	973.783	HLIP
289294	891322.1	575475.1	974.273	ROCL
289295	891383.9	575501.1	974.473	HTBW
289296	891378.4	575502.6	974.43	HTBW E
289297	891378.4	575502.6	974.414	H-BRICK-WALK B
289298	891383.9	575501.2	974.474	H-BRICK-WALK
289299	891385.1	575506	974.471	H-BRICK-WALK
289300	891393.6	575506.3	974.525	H-BRICK-WALK
289301	891395.6	575515.1	974.571	H-BRICK-WALK
289302	891394.8	575540.7	974.524	H-BRICK-WALK
289303	891386.9	575540.7	974.483	H-BRICK-WALK
289304	891386.6	575545.6	974.462	H-BRICK-WALK
289305	891380.8	575545.6	974.39	H-BRICK-WALK
289306	891381.6	575515.8	974.477	H-BRICK-WALK C
289307	891381.1	575515.9	974.479	HTBC
289308	891379.5	575516.1	973.979	HLIP
289309	891395.7	575506	974.955	EJB
289310	891395.3	575543.6	974.404	EJB
289311	891380.9	575545.7	974.353	HTBW B
289312	891370.2	575733.3	973.748	HEC B
289313	891373.6	575733.4	973.702	HEC
289314	891373.6	575730.6	973.766	HEC RECT
289315	891372	575731.9	973.682	UWBO
289316	891365.7	575709.4	973.285	EJB
289317	891364.6	575693.4	972.512	O-CL-4_-SCUPPER
289318	891372.9	575654.1	973.689	ELP
289319	891374.8	575651.6	973.564	EJB
289320	891374.7	575651.6	973.516	EJB
289321	891359.2	575614.2	973.396	MHT
289322	891386.6	575545.8	974.412	HTBW
289323	891385.6	575581.4	974.296	HTBW
289324	891379.7	575581.1	974.196	HTBC
289325	891377.8	575581	973.678	HLIP
289326	891364.7	575650.6	973.209	HLIP
289327	891366.6	575650.8	973.488	HTBC
289328	891372.6	575651.1	973.69	HTBW
289329	891371.6	575687.6	973.444	HTBW

289330	891372.5	575688.7	973.419	HTBW
289331	891372.1	575699.1	973.455	HTBW
289332	891371.3	575700	973.438	HTBW
289333	891370.3	575733.4	973.521	HTBW
289334	891364	575740.4	973.237	HTBC BC
289335	891362.1	575740.5	972.933	HLIP BC
289336	891320.9	575743.1	973.53	ROCL
289337	891375.2	575757.5	973.093	ETSP
289338	891372.7	575767.4	973.153	HLIP
289339	891374.2	575765.8	973.017	HTBC
289340	891382.6	575764.9	973.349	EJB
289341	891371.7	575753.6	973.661	HTBW
289342	891379.5	575758.3	973.301	HTBW
289343	891383	575761.5	973.314	HTBW
289344	891386.3	575768.6	973.584	HTBW
289345	891401.1	575768.6	973.64	HTBW
289346	891404	575771.7	973.652	HTBW
289347	891406.2	575771.6	973.687	HTBW
289348	891408.9	575768.8	973.662	HTBW
289349	891405.3	575769.8	973.501	UWFH
289350	891399.2	575778.7	972.993	HLIP EC
289351	891399	575776.7	973.487	HTBC EC
289352	891412.9	575755.7	973.789	EV B
289353	891416.7	575756.3	973.584	EV
289354	891417.2	575753.7	973.56	EV
289355	891413.3	575753	973.642	EV C
289356	891419.2	575745.8	973.706	O-SIGN B
289357	891418.1	575747.2	973.759	O-SIGN
289358	891411.8	575741.4	973.934	O-SIGN RECT
289359	891423.5	575753.9	972.556	ETJ
289360	891431.1	575768.8	973.686	HTBW
289361	891432.1	575767.8	973.667	HTBW
289362	891457	575767.6	973.816	HTBW
289363	891444.1	575777.5	972.652	O-CL-20_-SUPPER
289364	891468.6	575775.8	973.89	UWM
289365	891468.7	575773.8	973.937	UWM
289366	891485.9	575770.5	974.034	ELP
289367	891479.9	575755.7	974.838	HTBW
289368	891481.2	575746.5	975.135	HTBW
289369	891476.6	575737.7	975.299	HTBW BC
289370	891486	575742.4	975.31	HTBW
289371	891494.8	575745.8	975.307	HTBW EC
289372	891488.7	575749.7	975.018	HTBW
289373	891488.1	575755.7	974.855	HTBW
289374	891492.3	575755.7	974.869	HTBW
289375	891521.8	575763.1	974.126	HTBW
289376	891568.7	575763.2	974.249	HTBW
289377	891568.9	575771.2	974.163	HTBW E
289378	891569	575777.3	973.968	HTBC E
289379	891569	575779	973.601	HLIP E
289380	891567.3	575736.2	975.225	HEC B
289381	891567.3	575726.2	975.358	HEC
289382	891557.5	575726.2	975.516	HEC RECT
289383	891560.9	575729.8	975.822	ETRN-P1633
289384	891570.9	575739.2	974.628	HTBC B
289385	891570.6	575723.4	975.051	HTBC BC
289386	891568.8	575720.2	975.079	HTBC
289387	891560.9	575718	975.098	HTBC
289388	891552.1	575710.9	975.412	HTBC
289389	891544.3	575711.5	975.453	HTBC
289390	891536.4	575715.9	975.356	HTBC
289391	891536.5	575717.3	975.365	HTBC EC
289392	891542.9	575734.4	975.474	HTBC BC
289393	891505	575738.6	975.175	HTBC
289394	891472.5	575723.3	975.059	HTBC EC
289395	891482.1	575711.1	974.863	HTBC BC
289396	891481.6	575704.1	974.901	HTBC
289397	891475	575703.7	974.965	HTBC EC
289398	891457.8	575705.8	974.466	UWV
289399	891462.7	575713.7	974.987	HTBC BC
289400	891448	575654.6	974.664	HTBC
289401	891457.4	575618.5	974.476	UWV
289402	891492.4	575602.7	974.556	HTBC EC
289403	891498.9	575619.5	974.439	HTBC BC
289404	891502.3	575620.7	974.494	HTBC
289405	891504.5	575617.9	974.505	HTBC EC
289406	891502	575617.7	974.361	UWFH
289407	891500.2	575600.4	974.756	HTBC
289408	891505.3	575599.3	974.361	HTBC E
289409	891503.3	575590	974.461	HTBW B
289410	891505.4	575599.7	974.329	HTBW BC
289411	891560.2	575613.4	974.932	HTBW
289412	891587.1	575671.1	974.894	HTBW EC
289413	891597.1	575671.1	974.82	HTBW E
289414	891591.4	575678.7	974.276	ELP
289415	891541.4	575672.5	974.977	HRLC B BC
289416	891519.3	575693.3	975.078	HRLC
289417	891492.5	575668	974.701	HRLC
289418	891513.2	575644.3	974.594	HRLC
289419	891541.2	575663.2	974.873	HRLC EC E
289420	891372.3	576318.5	974.895	MHS
289421	891342.2	576299.5	974.602	ROEA B
289422	891391.9	576295.9	973.94	TNG
289423	891442.2	576294.4	973.376	TNG

289424	891505.6	576293.1	973.401	TNG
289425	891563.2	576291.8	973.518	TNG
289426	891570.4	576394.5	973.312	TNG
289427	891486.8	576394.1	973.082	TNG
289428	891404.7	576395.1	973.166	TNG
289429	891369.8	576395.5	973.332	TNG
289430	891343.1	576395.9	974.419	ROEA
289431	891315.7	576395.5	974.715	ROCL
289432	891356.1	576537.6	974.871	EPP
289433	891343.9	576545	974.808	ROEA
289434	891355.7	576544.8	974.75	TNG
289435	891369.6	576543.3	973.201	TNG
289436	891404.4	576541.2	972.787	TNG
289437	891480	576541.1	973.108	TNG
289438	891517.4	576542.6	973.028	TNG
289439	891625.7	576540.9	973.22	TNG
289440	891634.8	576655.3	973.35	TNG
289441	891578.6	576654.3	973.217	TNG
289442	891526.2	576653.3	973.151	TNG
289443	891453.8	576652.2	973.041	TNG
289444	891398.7	576652.8	972.886	TNG
289445	891368.2	576652.4	973.383	TNG
289446	891356.6	576652.5	974.761	TNG
289447	891345.5	576652.3	975.001	ROEA
289448	891317	576651.9	975.196	ROCL
289449	891345.9	576777.9	975.246	ROEA
289450	891360.2	576779.1	974.776	EPP
289451	891356.4	576788.5	975.2	S-SCHOOL-XING
289452	891346.3	576821	975.54	ROCL
289453	891363.1	576821.6	975.382	TNG
289454	891375.9	576835.2	974.869	MHS
289455	891381.3	576817	973.52	TNG
289456	891395.1	576817.8	972.846	TNG
289457	891503.3	576820.4	972.89	TNG
289458	891618.6	576819.6	973.141	TNG
289459	891632.2	576934.2	974.433	WBLK B
289460	891626.5	576924.2	973.528	TOP B
289461	891607.7	576907.7	970.935	TOE B
289462	891609.1	576870	970.84	TOE
289463	891628.8	576866.2	973.576	TOP
289464	891613.8	576853.4	973.387	TOP
289465	891613.6	576853.4	973.378	TOP
289466	891505	576849.2	972.916	TOP
289467	891416.9	576850.6	973.563	TOP
289468	891434.7	576867.2	970.473	TOE
289469	891439.7	576911.3	970.226	TOE C
289470	891417.9	576921.2	973.552	TOP
289471	891485.1	576924.9	972.91	TOP C
289472	891468.4	576934.1	973.515	WBLK
289473	891469.1	576993.2	974.7	WBLK E
289474	891389.6	577003.3	974.878	UWV
289475	891388.5	576978.7	975.196	UWFH
289476	891383.7	576986.6	975.241	HXC B
289477	891398.3	576986.1	974.982	HXC BC
289478	891407.7	576982.4	974.983	HXC
289479	891410.6	576972.7	974.876	HXC EC
289480	891410.1	576945.1	974.587	HXC
289481	891425.6	576944.6	974.526	HXC E
289482	891429.6	576944.5	974.54	HXC B
289483	891454	576943.9	974.865	HXC
289484	891455.1	576987.1	975.21	HXC
289485	891447	576987.8	975.138	HXC BC
289486	891444.5	576990.5	975.166	HXC
289487	891445.8	576992.7	975.272	HXC EC
289488	891466.2	576991.8	975.255	HXC E
289489	891416.5	576924.6	973.435	WBLK B
289490	891397.9	576924.4	973.947	WBLK
289491	891381.9	576894.8	974.247	TNG
289492	891360.8	576894	975.379	TNG
289493	891347.1	576897.9	975.494	ROEA
289494	891347.6	576965.2	975.877	ROEA BC
289495	891356.5	576981.1	975.567	ROEA
289496	891381.7	576986.6	974.731	ROEA EC E
289497	891360.9	576980.1	975.182	EGW
289498	891360.7	576968.1	975.46	EPP
289499	891361.6	576971.9	975.406	ET-MARKER-FIBER
5788001	891631.4	573533.6	983.129	TOP
5788002	891632.6	573537.9	982.962	HEC B ROED B
5788003	891633.5	573548.2	982.86	TOP1 B ROED1 B
5788004	891626.5	573515.7	965.56	TOE
5788005	891623.7	573483.6	965.492	TNG
5788006	891622.2	573452.6	965.132	TNG
5788007	891527.3	573457.9	965.235	TNG
5788008	891533.4	573496.8	965.384	TNG
5788009	891538.6	573527.2	965.927	TOE
5788010	891442.9	573539.8	965.471	TOE E
5788011	891444.3	573508.6	965.455	TNG
5788012	891447.5	573457.5	964.638	TNG
5788013	891471.7	573547.1	971.05	IRCP-36IN B
5788014	891539.4	573546.3	982.517	TOP
5788015	891539.9	573549.5	982.625	HEC ROED
5788016	891541.4	573559.7	982.828	TOP1 ROED1
5788017	891489.6	573568.3	982.452	TOP1 ROED1
5788018	891472	573573.9	982.485	TOP1 BC ROED1 BC

5788019	891459.1	573581	982.62	TOP1 ROED1
5788020	891455.7	573596.6	983.581	TOP1 EC ROED1 EC
5788021	891455.3	573613.3	984.576	TOP1 E ROED1 E
5788022	891479.5	573557.2	982.157	ROED BC HEC
5788023	891478.7	573554.1	982.039	TOP
5788024	891463.8	573562.6	982.206	ROED
5788025	891452.7	573570.8	982.512	ROED
5788026	891446	573581.6	982.996	ROED
5788027	891443.2	573599.1	984.008	ROED EC
5788028	891442.1	573614.8	984.769	ROED E
5788029	891427.2	573564.4	981.439	HEC E
5788030	891426.8	573560.7	981.338	TOP E
5788031	891425.6	573572.2	981.873	TOE B
5788032	891434.5	573576	982.2	TOE
5788033	891439.5	573583.7	982.706	TOE
5788034	891441.2	573593	983.411	TOE
5788035	891441.7	573604.7	984.058	TOE
5788036	891441.1	573615	984.802	TOE E
5788037	891486.3	573588.3	975.739	WHW-8IN-CL B
5788038	891486	573588.4	975.921	WHW-8IN-CL
5788039	891478.5	573589.9	975.904	WHW-8IN-CL
5788040	891471.3	573591.3	975.909	WHW-8IN-CL
5788041	891471.2	573591.3	975.788	WHW-8IN-CL E
5788042	891479.2	573590.7	971.993	IRCP-36IN E
5788043	891477.9	573590.8	972.391	TOE B
5788044	891478.8	573604	972.004	TOE
5788045	891479.3	573617.3	972.747	TOE E
5788046	891492.4	573604.9	972.695	TNG
5788047	891549.9	573597.4	973.585	TNG
5788048	891480.7	573590.2	972.196	TOE B
5788049	891484.4	573589.2	973.519	TOE
5788050	891489.6	573591.2	973.524	TOE
5788051	891548.9	573585.7	973.748	TOE
5788052	891635	573574.9	974.316	TOE E
5788053	891637.5	573593.4	973.786	TNG
5788054	891640.4	573603.9	973.745	CPC-LS33315-RED
5788055	891397.4	574494.6	973.525	HLIP B ROEA B
5788056	891596.3	574471.4	973.603	HTBC B
5788057	891596.4	574473.4	973.23	HLIP1 B
5788058	891596.1	574495.8	973.771	ROEA1 B
5788059	891596.8	574520.7	973.277	ROEA2 B HLIP2 B
5788060	891597.1	574522.7	973.73	HTBC2 B
5788061	891595.7	574546.2	973.425	TNG
5788062	891594.4	574565.5	972.921	TOP B
5788063	891595.2	574579	971.589	TFL B
5788064	891596.5	574591.5	973.316	TOP1 B
5788065	891572.9	574531.4	973.898	EJB
5788066	891574.4	574529.2	974.269	ELP
5788067	891555.2	574573.6	973.18	TOP
5788068	891519.1	574582.2	972.895	TOP
5788069	891511.8	574578	972.733	TOP
5788070	891497.9	574565.3	973.116	TOP
5788071	891477.3	574562.5	973.099	TOP
5788072	891455.4	574565.5	972.968	TOP
5788073	891443	574579.8	973.257	TOP
5788074	891434.7	574604.6	973.487	TOP
5788075	891553.8	574589.1	971.799	TFL
5788076	891532.4	574596.1	972.1	TFL
5788077	891518.9	574597.3	972.186	TFL
5788078	891495.4	574600.4	969.282	TFL E TOE B TOE1 B
5788079	891488.6	574595.2	969.094	TOE
5788080	891474.7	574592.1	969.013	TOE
5788081	891461.9	574594.6	968.945	TOE
5788082	891456.2	574604.8	969.245	TOE
5788083	891474.9	574605.7	968.843	TNG
5788084	891494.9	574608.5	969.127	TOE1
5788085	891558.9	574599.7	973.246	TOP1
5788086	891537.2	574609.8	973.37	TOP1
5788087	891521	574622.6	973.134	TOP1
5788088	891546	574623.4	973.375	TNG
5788089	891586.6	574618.1	973.629	TNG
5788090	891578.9	574714.9	973.767	TNG
5788091	891529.8	574713.6	973.29	TNG
5788092	891514.6	574701.7	972.86	TOP1
5788093	891509.9	574721.5	972.634	TOP1
5788094	891497.1	574735.7	972.813	TOP1
5788095	891487.2	574755.8	972.415	TOP1
5788096	891483.2	574778.5	972.528	TOP1
5788097	891503.4	574778	972.988	TNG
5788098	891546.6	574777.7	973.624	TNG
5788099	891580.1	574779	973.636	TNG
5788100	891432.3	574674	972.82	TOP
5788101	891432	574706	972.914	TOP
5788102	891432	574725	972.78	TOP
5788103	891435.5	574737.6	972.805	TOP
5788104	891465.7	574745.9	972.739	TOP
5788105	891460.6	574760	973.289	TOP
5788106	891459.5	574775.5	973.315	TOP
5788107	891455.8	574676.4	968.915	TOE
5788108	891473.9	574678.7	968.656	TNG
5788109	891494	574680.2	968.745	TOE1
5788110	891492.6	574698.1	968.914	TOE1
5788111	891491	574710.8	969.319	TOE1
5788112	891454.4	574700.8	968.989	TOE

5788113	891457.8	574714.8	968.959	TOE
5788114	891477.8	574717.3	969.448	TFL B TOE E TOE1 E
5788115	891476.3	574728.2	970.078	TFL
5788116	891475.3	574743.4	970.917	TFL
5788117	891475.2	574777.6	971.687	TFL
5788118	891432.9	574774.1	973.092	TNG
5788119	891404.4	574773.6	973.305	TNG
5788120	891406.6	574720.1	973.399	TNG
5788121	891408.4	574653.4	973.576	TNG
5788122	891415.6	574652.4	974.153	EJB
5788123	891410.7	574609.6	973.762	TNG
5788124	891414.8	574545.9	973.991	TNG
5788125	891427	574571.2	974.731	HEC8 B
5788126	891427.1	574571.2	974.688	HEC8 B
5788127	891426.7	574575.2	974.647	HEC8
5788128	891432.9	574575.7	974.633	HEC8
5788129	891433.3	574571.7	974.688	HEC8 C
5788130	891433	574578.7	974.552	HEC8 B
5788131	891432.9	574582.7	974.57	HEC8
5788132	891426.6	574582.7	974.63	HEC8
5788133	891426.6	574578.6	974.583	HEC8 C
5788134	891429.1	574580.7	972.958	ECSB DNC
5788135	891429.2	574573.5	972.86	ECSB DNC
5788136	891442.4	574579.1	973.386	ECR-4-4IN-POWER-?
5788137	891440.7	574569.9	973.441	ECR-4-4IN-POWER-?
5788138	891442.2	574560.3	973.652	TNG
5788139	891468.1	574542.6	973.583	TNG
5788140	891445.6	574545.4	974.395	UWM
5788141	891431.5	574539.8	974.041	ETPED
5788142	891428	574536.2	974.101	TNG
5788143	891439.1	574528.8	974.805	UWFH
5788144	891461.9	574529.4	973.994	TNG
5788145	891496	574521.9	974.272	HTBC2
5788146	891496	574520	973.857	HLIP2 ROEA2
5788147	891498	574494.9	974.269	ROEA1
5788148	891497.1	574472.7	973.636	HLIP1
5788149	891497.2	574470.8	973.994	HTBC
5788150	891435.5	574470.4	974.136	HTBC E
5788151	891435.5	574472.4	973.75	HLIP1 E
5788152	891435.5	574493.4	974.005	ROEA1
5788153	891435.1	574495.5	974.05	HLIP1 B ROEA1
5788154	891404.4	574494.7	973.584	HLIP1 ROEA1
5788155	891403.7	574519.5	973.643	HLIP1 ROEA1
5788156	891433	574519.6	974.191	HLIP1 E ROEA1 E HLP2 E ROEA2 E
5788157	891433.1	574521.5	974.582	HTBC2 BC
5788158	891408.3	574531.5	974.379	HTBC2
5788159	891397.7	574558.2	974.196	HTBC2 EC
5788160	891395.6	574558.1	973.769	HLIP ROEA
5788161	891439.2	574511.1	974.326	UWV
5788162	891446.6	574511.3	974.264	UWV
5788163	891425.1	574565.2	973.988	CPC-LS37936-ORANGE
5788164	891447.9	574495.5	974.253	CPK-LS33315-WASHER
5788165	891362.1	574494.9	973.253	CBCHH-VAN-BUREN-127TH
5788166	891362	574497.2	973.966	ROCL B
5788167	891360.3	574554.7	974.173	ROCL
5788168	891357.4	574654.2	974.434	ROCL
5788169	891392.8	574656.2	973.911	ROEA E HLIP
5788170	891394.9	574656.2	974.317	HTBC2 E HTBC B
5788171	891391.6	574769.2	974.608	HTBC
5788172	891389.7	574769.3	974.169	HLIP
5788173	891354.3	574769	974.674	ROCL
5788174	891351.3	574869.8	974.753	ROCL
5788175	891386.7	574871.8	974.181	HLIP
5788176	891388.7	574871.9	974.655	HTBC
5788177	891398.1	574852.6	974.685	EJB
5788178	891396.5	574853.9	974.56	ELP
5788179	891397.4	574872.6	974.096	TNG
5788180	891419.5	574872.1	973.272	TNG
5788181	891455.8	574872.6	973.338	TOP
5788182	891471.4	574872.7	971.857	TFL
5788183	891481.4	574872.9	973.48	TOP1
5788184	891509.9	574874.8	973.577	TNG
5788185	891593.7	574873.1	973.553	TNG
5788186	891593.2	574977.5	973.632	TNG
5788187	891510.7	574980.5	973.377	TNG
5788188	891477.5	574979.9	973.282	TOP1
5788189	891468.2	574979.3	971.973	TFL
5788190	891452.7	574978.1	972.995	TOP
5788191	891417	574977.3	972.974	TNG
5788192	891389.9	574977.4	974.059	TNG
5788193	891385.7	574977.2	974.431	HTBC
5788194	891383.7	574977.2	974.006	HLIP
5788195	891348.2	574977.2	974.451	ROCL
5788196	891345.5	575074.2	974.185	ROCL
5788197	891380.9	575075.5	973.683	HLIP
5788198	891382.8	575075.5	974.128	HTBC
5788199	891392.1	575075.5	973.411	TNG
5788200	891390.7	575053.5	974.388	ELP
5788201	891392.4	575051.8	974.343	EJB
5788202	891420.9	575068.4	974.497	HEC B
5788203	891420.7	575072.5	974.508	HEC
5788204	891427	575072.7	974.573	HEC
5788205	891427.2	575068.7	974.526	HEC C
5788206	891423.4	575070.6	972.41	ECSB DNC

5788207	891413.8	575113.2	972.318	ECSB DNC
5788208	891417.7	575111.3	974.469	HEC B
5788209	891417.5	575115.4	974.532	HEC
5788210	891411.3	575115	974.445	HEC RECT
5788211	891411	575118.5	974.209	HEC B
5788212	891414.4	575118.8	974.176	HEC
5788213	891414.1	575122.2	974.244	HEC RECT
5788214	891412.5	575120.5	976.23	ETRN DNC
5788215	891381.7	575154.2	974.186	U-CP-TEST-HANDHOLE
5788216	891424.1	575088.7	974.211	TNG
5788217	891446	575088.3	972.854	TOP
5788218	891461.7	575089	971.879	TFL
5788219	891472.4	575089.4	972.719	TOP1
5788220	891503.1	575091.3	973.523	TNG
5788221	891590.3	575093.3	973.962	TNG
5788222	891591.1	575190.7	974.088	TNG
5788223	891492.6	575195.6	973.535	TNG
5788224	891467.5	575164.9	972.482	TOP1
5788225	891465.1	575180.3	972.597	TOP1
5788226	891455.7	575196.1	972.964	TOP1
5788227	891445.9	575164.2	972.773	TOP
5788228	891460.5	575164.3	972.027	TFL
5788229	891458.8	575179.7	972.17	TFL
5788230	891452.1	575178.5	972.648	TOP
5788231	891447.8	575186	972.765	TOP
5788232	891452.5	575190.2	972.591	TFL
5788233	891435.1	575213.3	973.028	TOP1
5788234	891431	575208.5	972.623	TFL
5788235	891426.8	575202.1	972.964	TOP
5788236	891392.9	575223	973.342	TOP
5788237	891385.1	575223.1	973.402	TOP E
5788238	891392.5	575231.5	972.764	TFL
5788239	891384.8	575231.6	972.827	TFL E
5788240	891393.2	575238.4	973.204	TOP1
5788241	891384.7	575239.1	973.452	TOP1 E
5788242	891416.4	575194.1	973.113	TNG
5788243	891416.8	575189.9	973.289	ECR-4-4IN-POWER-?
5788244	891416	575180.8	972.596	ECR-4-4IN-POWER-?
5788245	891399.1	575189.9	973.277	TNG
5788246	891379.6	575191	973.872	HTBC E
5788247	891377.7	575190.9	973.436	HLIP E
5788248	891340.1	575190.1	974.016	ROCL E
5788249	891359.5	575792.2	973.163	MHS
5788250	891350.8	575800	973.352	MHS
5788251	891349.7	575809.6	973.418	MHS
5788252	891368	575810.3	973.287	MHS
5788253	891324.5	575813.5	973.267	CBCHH-EL-MIRAGE-VAN-BUREN
5788254	891324.5	575815.6	973.758	ROCL B
5788255	891318.3	575819.5	973.617	UWV
5788256	891332.5	575826.4	973.71	UWV
5788257	891373.6	575842.4	973.287	U-CP-TEST-HANDHOLE
5788258	891387.5	575837.5	973.171	U-CP-TEST-HANDHOLE
5788259	891405.9	575856	973.164	UWM-RECLAIMED
5788260	891406.4	575840	973.05	UWV-RECLAIMED
5788261	891417.2	575825.3	973.096	UWV
5788262	891556.4	575812.7	973.887	ROCL1 B
5788263	891556.5	575839.6	973.478	ROEA
5788264	891556.3	575844	973.383	TNG
5788265	891556.4	575847.2	973.669	FTS B
5788266	891561.5	575851.7	972.8	TOE B
5788267	891553	575847.1	973.917	OMB
5788268	891485.1	575847	973.45	FTS
5788269	891485.5	575842.5	973.273	TNG
5788270	891485.4	575839.4	973.283	ROEA
5788271	891484.6	575812.1	973.671	ROCL1
5788272	891432.8	575812.8	973.428	ROCL1
5788273	891390	575813.9	973.376	ROCL1 E
5788274	891454.4	575842.1	973.153	ROEA
5788275	891454.4	575844.6	973.235	TNG
5788276	891454.9	575846.7	973.728	FTS
5788277	891431.8	575866.8	973.915	FTS
5788278	891425.1	575873.7	973.89	FTS
5788279	891423.3	575871.8	973.165	TNG
5788280	891413.8	575864.6	972.832	TNG
5788281	891388.6	575895.3	972.848	TNG
5788282	891395.9	575902.9	972.683	TNG
5788283	891398.8	575904.7	973.485	FTS
5788284	891382.7	575876.9	972.741	ETSB
5788285	891379.2	575881.5	973.27	HTBW B
5788286	891381	575872.2	973.335	HTBC B HTBW
5788287	891381.2	575871.6	973.326	HTBW
5788288	891388.3	575868.6	973.059	HTBW
5788289	891388.8	575869.2	973.577	HTBC
5788290	891392.8	575864.9	973.466	HTBC
5788291	891392.4	575864.5	973.201	HTBW
5788292	891394.5	575857.9	973.334	HTBW
5788293	891395.3	575857.8	973.449	HTBC E HTBW
5788294	891399	575856.7	973.438	HTBW
5788295	891402.9	575856.1	973.438	HTBW E
5788296	891424.6	575847	973.048	ROEA
5788297	891407.5	575849.9	972.982	ROEA
5788298	891407.5	575848.8	973.033	ROEA E HLIP B
5788299	891407.6	575850.8	972.922	HTBC B
5788300	891402.7	575851.1	973.483	HTBC BC

5788301	891402.6	575849	973.055	HLIP BC
5788302	891392.9	575851.1	973.011	HLIP
5788303	891393.6	575853	973.381	HTBC
5788304	891385.7	575857.3	972.995	HTBC
5788305	891384.5	575855.7	972.889	HLIP
5788306	891378.5	575862	972.83	HLIP
5788307	891380.1	575863.1	972.797	HTBC
5788308	891376.2	575871.3	973.238	HTBC
5788309	891374.4	575870.7	972.871	HLIP
5788310	891372.5	575880.5	972.82	HLIP EC
5788311	891374.4	575880.8	973.234	HTBC EC
5788312	891365.8	575943.4	973.737	FTS
5788313	891361.8	575942.7	972.941	TNG
5788314	891373.9	575884.8	972.74	HTBC E
5788315	891371.9	575884.7	972.803	HLIP E ROEA B
5788316	891372.6	575884.8	972.775	ROEA
5788317	891371.7	575890.1	972.683	ROEA
5788318	891358.2	575943.7	973.184	ROEA
5788319	891388.1	575865.2	973.214	ETSP
5788320	891378.1	575899.1	972.684	TNG
5788321	891326.5	575899.6	973.718	UWV
5788322	891327.1	575905.5	973.737	MHW
5788323	891326.4	575914.6	973.838	UWV
5788324	891327.3	575942.7	973.843	ROCL
5788325	891328.3	576040.2	974.081	ROCL
5788326	891341.9	576010.3	973.923	ROEA
5788327	891339.9	576010.4	973.844	ROEA
5788328	891355.2	575999.2	973.62	EPP EOH B
5788329	891354.3	576018.1	973.499	EGW
5788330	891354.5	576046.2	973.681	EPP EOH
5788331	891340.1	576041.3	973.99	ROEA
5788332	891358.5	576041.3	973.459	TNG
5788333	891366.3	576041.7	973.394	FTS
5788334	891361.5	576136.8	972.714	TNG
5788335	891347.3	576137.9	973.76	TNG
5788336	891340.9	576138.1	974.108	ROEA
5788337	891354.9	576103.7	974.11	ET-MARKER-FIBER
5788338	891329.4	576139.6	974.293	ROCL
5788339	891329.9	576237.5	974.557	ROCL
5788340	891341.9	576237.5	974.37	ROEA
5788341	891351.5	576237.3	974.296	TNG
5788342	891359.2	576224.9	973.607	TNG
5788343	891356.2	576156.9	973.402	U-CP-TEST-HANDHOLE
5788344	891368.2	576236	973.798	ROED B
5788345	891367.8	576248.6	973.814	ROED1 B
5788346	891438.1	576246.8	973.723	ROED1
5788347	891437.6	576238.4	973.533	ROED
5788348	891512.9	576239.9	973.882	ROED E
5788349	891513.1	576248.4	973.843	ROED1 E
5788350	891514.3	576252.3	973.53	TOE1 B
5788351	891515.3	576269.8	973.472	TOE2 B
5788352	891516.1	576273.9	974.205	FW B
5788353	891515.6	576260.9	973.284	TNG
5788354	891519.1	576275.9	974.356	EOH2 B
5788355	891495.9	576276.3	974.168	EPP EOH2
5788356	891449	576274.1	974.231	FW
5788357	891449	576270.4	973.338	TOE2
5788358	891448.1	576260.1	973.073	TNG
5788359	891446	576250.1	973.209	TOE1
5788360	891371.1	576255.2	973.41	TOE1
5788361	891373.5	576269.9	973.419	TOE1 E TOE2 E
5788362	891379.7	576262.8	973.137	TNG
5788363	891368.2	576273.8	973.875	FW
5788364	891374.2	576274.5	973.737	EGW
5788365	891388.3	576275.4	973.911	EPP EOH2
5788366	891367.9	576250.6	973.787	FW
5788367	891385.3	576250.8	973.629	FW E FGP B
5788368	891385.9	576234.7	973.62	FGP E FW B
5788369	891367.7	576234.5	973.804	FW
5788370	891355.4	576275.7	974.335	EOH EOH2 E
5788371	891352.2	576277.6	974.434	ETPED
5788372	891355.5	576284.6	974.594	EPP EOH E
5788373	891367.9	576278.2	973.976	CPC-LS33880-ORANGE
5788374	891365.1	576277.1	973.939	ECR-1IN
5788375	891361.7	576278.7	973.769	ECR-1IN
5788376	891505.5	576225.3	972.923	TOE2 B
5788377	891440.4	576226.7	972.97	TOE2
5788378	891377.9	576228.1	973.192	TOE2
5788379	891371.7	576217.8	973.186	TOE2
5788380	891370.4	576143	972.858	TOE2
5788381	891436.7	576144	972.763	TNG
5788382	891498.9	576143.7	972.781	TNG
5788383	891367	576146.9	973.22	FW
5788384	891369.6	576065.2	973.095	TOE2
5788385	891366.7	576062.4	973.512	FW
5788386	891366.5	576061.4	973.569	FTS
5788387	891417.4	576065.9	972.919	TOE2
5788388	891417.3	576062.4	973.578	FW
5788389	891477.7	576062.8	973.443	FW E
5788390	891478.5	576066.4	973.103	TOE2 E
5788391	891478.7	576060.1	972.924	TOE2 B
5788392	891411.8	576059.3	972.929	TOE2
5788393	891369.4	576059	973.241	TOE2
5788394	891341.9	576275.1	974.482	ROEA E

5788395	891329.6	576275.8	974.601	ROCL E
5788396	891368.7	576009.5	972.456	TOE2
5788397	891367.9	575944.9	973.036	TOE2
5788398	891410.2	575896.5	972.616	TOE2
5788399	891456.2	575850.2	972.934	TOE2 E TOE E
5788400	891508.3	575852.4	972.728	TNG
5788401	891503.9	575897.6	972.422	TNG
5788402	891537.1	575885.8	972.553	TNG
5788403	891443	575907.9	972.539	TNG
5788404	891442	575972.4	972.544	TNG
5788405	891439.7	576021	972.601	TNG
5788406	891394.5	576045.8	972.669	TNG
5788407	891522.6	575991	972.762	TNG

BT10000	891412.7	585188.7	1005.665	UWV
BT10001	891437.9	585052.2	1005.141	MHS
BT10002	891448.6	584940.9	1004.911	ETJ
BT10003	891448.2	584920.4	1004.249	EPP EOHV
BT10004	891450.4	584911.8	1005.608	WHW B
BT10005	891451.2	584911.9	1005.692	WHW
BT10006	891451.5	584908.2	1005.608	WHW
BT10007	891456.5	584908.4	1005.643	WHW
BT10008	891456.1	584912.3	1005.61	WHW
BT10009	891456.8	584912.4	1005.601	WHW E
BT10010	891418.5	584873.9	1005.131	CBCF
BT10011	891406.4	584887	1004.999	UWV
BT10012	891404.5	584882.4	1004.898	UWV
BT10013	891439.7	584871.7	1004.779	ROEA
BT10014	891441.6	584871.6	1004.575	ROGD B
BT10015	891440.4	584897.3	1004.753	ROGD1 B
BT10016	891439.6	584902.1	1004.876	ROEA
BT10017	891466.8	584904	1004.495	ROGD1
BT10018	891478.2	584886.4	1004.375	ROGD
BT10019	891511.5	584927	1004.657	ROGD1
BT10020	891523.5	584904	1004.162	ROGD
BT10021	891594.6	584915.3	1004.435	ROGD
BT10022	891596.4	584928.4	1004.779	ROGD1
BT10023	891699.9	584928.3	1004.839	ROGD1 E
BT10024	891701	584915.5	1004.649	ROGD1 E
BT10025	891704.3	584904.2	1004.268	TNG
BT10026	891599.2	584904.8	1004.132	TNG
BT10027	891496.9	584884.7	1004.116	TNG
BT10028	891456.8	584912.6	1005.799	WHW B
BT10029	891456.8	584912.3	1005.793	WHW
BT10030	891456.1	584912.3	1005.8	WHW
BT10031	891456.3	584908.4	1005.791	WHW
BT10032	891451.5	584908.1	1005.814	WHW
BT10033	891451.2	584911.9	1005.871	WHW
BT10034	891450.5	584911.9	1005.86	WHW E
BT10035	891448.4	584917.6	1005.204	EPP EOHV
BT10036	891440.5	584942.1	1004.879	ROEA
BT10037	891448.8	584941	1004.995	ETJ
BT10038	891451.6	585111.9	1005.12	EPP EOHV
BT10039	891443.5	585116.8	1005.128	ROEA
BT10040	891446.7	585310.9	1005.513	ROEA
BT10041	891453.1	585311.9	1005.544	EPP EOHV E
BT10042	891455	585339.2	1005.494	MHT
BT10043	891454	585330	1005.391	TNG
BT10044	891463.8	585329.4	1004.48	TNG
BT10045	891447.2	585379.8	1005.662	ROEA E
BT10046	891717.1	586229.6	1008.257	ELP

BT10047	891717.9	586231.9	1008.235	EJB
BT10048	891715	586218.3	1008.196	HTBW B
BT10049	891715	586224	1008.254	HTBW
BT10050	891715.2	586218.2	1008.207	HTBC B
BT10051	891714.8	586216.1	1007.826	HLIP B
BT10052	891706.5	586216.1	1007.777	HLIP BC
BT10053	891701.5	586216.1	1007.774	HLIP
BT10054	891696.6	586216.9	1007.735	HLIP EC
BT10055	891703.6	586218.1	1008.188	HTBC BC
BT10056	891700.8	586218.2	1008.142	HTBC
BT10057	891697.3	586218.8	1008.101	HTBC EC
BT10058	891704	586223.9	1008.238	HTBW BC
BT10059	891700.8	586224.2	1008.235	HTBW
BT10060	891698	586224.9	1008.233	HTBW EC
BT10061	891700.4	586216.1	1007.717	HEC B
BT10062	891675.3	586231	1008.302	HTBW
BT10063	891673.6	586225.4	1008.269	HTBW E
BT10064	891673.5	586225.3	1008.27	HEC-BRICK B
BT10065	891675.2	586230.9	1008.334	HEC-BRICK
BT10066	891668.9	586232.7	1008.378	HEC-BRICK
BT10067	891670.4	586238.9	1008.381	HEC-BRICK
BT10068	891661.2	586241.6	1008.36	HEC-BRICK
BT10069	891635.3	586241.4	1008.228	HEC-BRICK
BT10070	891635.4	586235.1	1008.185	HEC-BRICK
BT10071	891628.3	586235.1	1008.196	HEC-BRICK
BT10072	891628.2	586229.2	1008.205	HEC-BRICK E
BT10073	891661.9	586228.5	1008.254	HTBC BC
BT10074	891659	586228.9	1008.239	HTBC
BT10075	891656.3	586229.1	1008.23	HTBC EC
BT10076	891661.2	586226.6	1007.902	HLIP BC
BT10077	891659.4	586226.9	1007.883	HLIP
BT10078	891656.6	586227.1	1008.003	HLIP EC
BT10079	891631.3	586216.1	1007.6	HEC
BT10080	891598.6	586227	1007.777	HLIP BC
BT10081	891596.2	586227	1007.75	HLIP
BT10082	891592.8	586226.6	1007.731	HLIP EC
BT10083	891598.5	586228.9	1008.094	HTBC BC
BT10084	891596.2	586229	1008.174	HTBC
BT10085	891592.5	586228.6	1008.14	HTBC EC
BT10086	891628.1	586229.1	1008.182	HTBW B
BT10087	891628.2	586234.9	1008.254	HTBW
BT10088	891598.4	586235	1008.146	HTBW BC
BT10089	891595.3	586234.9	1008.173	HTBW
BT10090	891592.2	586234.6	1008.401	HTBW EC
BT10091	891529.2	586216.5	1007.556	HEC E
BT10092	891529.1	586216.9	1007.59	HLIP BC
BT10093	891528.7	586218.7	1007.865	HTBC BC
BT10094	891528	586224.6	1007.945	HTBW BC
BT10095	891500	586228.3	1007.33	HTBC
BT10096	891498.7	586227	1007.279	HLIP
BT10097	891505.3	586234.1	1007.425	HTBW
BT10098	891507.6	586238.4	1007.281	ETSP
BT10099	891499.7	586242.6	1007.641	ETSB
BT10100	891498.2	586246.4	1006.735	ELP
BT10101	891500.5	586249	1007.323	EJB
BT10102	891496.6	586253.5	1007.426	UWFH
BT10103	891495.6	586258.1	1007.236	HTBW EC
BT10104	891489.8	586258.5	1007.237	HTBC EC
BT10105	891487.8	586258.5	1006.805	HLIP EC
BT10106	891489.2	586265.4	1006.527	O-CL-4_-SCUPPER
BT10107	891452.4	586254.6	1007.065	UWV
BT10108	891453.1	586288.1	1007.577	UWV
BT10109	891497.7	586267.8	1006.378	HEC B
BT10110	891513.8	586267.5	1006.181	HEC
BT10111	891518.6	586262.6	1006.2	HEC
BT10112	891497.3	586262.7	1006.514	HEC C
BT10113	891506.9	586287.3	1006.971	UWM
BT10114	891507.4	586289.7	1007.038	UWM
BT10115	891501.9	586324.5	1007.538	EJB
BT10116	891498.3	586323.7	1007.158	ELP
BT10117	891490.8	586329.5	1007.392	HTBC
BT10118	891488.8	586329.5	1007.1	HLIP
BT10119	891496.5	586321.9	1007.578	HTBW BC
BT10120	891503.4	586363.7	1007.75	HTBW
BT10121	891479.1	586380.4	1007.513	MHT
BT10122	891507.6	586401.6	1007.773	HTBW EC
BT10123	891496.3	586410.3	1007.322	S-RIGHT-TURN
BT10124	891501.2	586489	1007.612	EJB
BT10125	891500.7	586491.6	1007.55	ELP
BT10126	891509.1	586508.9	1007.789	HTBW BC
BT10127	891507.8	586528.2	1007.705	HTBW
BT10128	891505.9	586543.6	1007.561	HTBW EC
BT10129	891506.4	586552.1	1007.255	UWFH
BT10130	891494.7	586564.4	1007.387	HTBC
BT10131	891492.7	586564.7	1006.991	HLIP
BT10132	891457.1	586555.7	1007.751	UWV
BT10133	891457.5	586561.3	1007.743	UWV
BT10134	891494.3	586583.8	1006.8	O-CL-4_-SCUPPER
BT10135	891501	586577	1007.3	HTBW
BT10136	891501.9	586578.9	1007.352	HTBW
BT10137	891502	586588.3	1007.444	HTBW
BT10138	891501.2	586589.4	1007.253	HTBW
BT10139	891502.7	586586.3	1006.498	HEC B
BT10140	891510.7	586585.9	1006.374	HEC

BT10141	891510.9	586580.7	1006.433	HEC
BT10142	891502.4	586581.1	1006.57	HEC C
BT10143	891495.3	586599.6	1007.452	HTBC
BT10144	891493.3	586599.6	1007.073	HLIP
BT10145	891505	586605.1	1007.661	HTBW BC
BT10146	891503.7	586650.1	1007.455	ELP
BT10147	891503.7	586654.6	1007.574	EJB
BT10148	891474.4	586646.9	1007.614	MHS
BT10149	891511.9	586669.5	1007.778	HTBW
BT10150	891504	586763.7	1007.651	HTBW EC
BT10151	891498	586763.9	1007.645	HTBC
BT10152	891496	586763.8	1007.181	HLIP
BT10153	891518.4	586739.5	1006.847	ETJ
BT10154	891519.9	586729.9	1008.291	HEC B
BT10155	891520	586720.3	1008.34	HEC
BT10156	891517.2	586720.3	1008.235	HEC RECT
BT10157	891518.3	586725	1007.303	ETRN-PDT1311
BT10158	891505	586765.7	1007.594	HTBW
BT10159	891505.3	586783.2	1007.81	HTBW
BT10160	891504.3	586785.2	1007.698	HTBW
BT10161	891506.1	586795.8	1007.448	ELP
BT10162	891509.1	586797.3	1007.588	EJB
BT10163	891505.3	586805	1007.938	HTBW BC
BT10164	891498.7	586805.3	1007.768	HTBC
BT10165	891496.7	586805.6	1007.35	HLIP
BT10166	891514.6	586870.7	1008.146	HTBW
BT10167	891503.4	586912.3	1007.616	S-MERGE-LEFT
BT10168	891502.8	586957.9	1007.818	UWFH
BT10169	891462.2	586956.9	1008.102	UWV
BT10170	891464.1	586960	1008.034	UWV
BT10171	891464.2	586969.7	1008.077	UWV
BT10172	891489.6	586983.7	1007.825	MHT
BT10173	891509.2	586973.3	1008.065	EJB
BT10174	891508.7	586971.3	1007.712	ELP
BT10175	891520	586967.8	1008.039	UWM
BT10176	891519.4	586962.5	1007.911	UWM
BT10177	891516.5	586960.2	1008.224	HTBW
BT10178	891501.4	586973.3	1007.952	HTBC
BT10179	891499.4	586973.5	1007.516	HLIP
BT10180	891508.1	587011.3	1008.186	HTBW EC
BT10181	891509.1	587013.5	1008.194	HTBW
BT10182	891509.3	587031	1008.206	HTBW
BT10183	891508.4	587033.3	1008.197	HTBW BC
BT10184	891502.5	587038.1	1008.169	HTBC
BT10185	891500.5	587038	1007.785	HLIP
BT10186	891522	587038.6	1008.582	HEC B
BT10187	891521.8	587034.6	1008.536	HEC
BT10188	891528	587034.4	1008.512	HEC RECT
BT10189	891523.4	587036.4	1008.278	ETRN-PD1308
BT10190	891517.8	587080.3	1008.366	HTBW
BT10191	891512.2	587129.1	1008.115	ELP
BT10192	891512.5	587133.1	1008.306	EJB
BT10193	891519.6	587133.4	1008.422	HTBW
BT10194	891504.3	587144.7	1008.303	HTBC
BT10195	891502.2	587144.9	1007.922	HLIP
BT10196	891482.5	587145.8	1008.287	MHS
BT10197	891519.8	587186.9	1008.469	HTBW
BT10198	891507.7	587207.9	1007.887	UWFH
BT10199	891468.2	587202.8	1008.539	UWV
BT10200	891468.3	587208.3	1008.58	UWV
BT10201	891512	587246.9	1008.573	HTBW EC
BT10202	891513	587248.9	1008.575	HTBW
BT10203	891505.9	587246.9	1008.484	HTBC
BT10204	891503.9	587246.7	1008.051	HLIP
BT10205	891517.1	587273.7	1008.464	EJB
BT10206	891513.9	587273	1007.99	ELP
BT10207	891526.7	587272.8	1007.733	ETJ
BT10208	891525.9	587279.3	1008.746	HEC B
BT10209	891528.5	587279.2	1008.763	HEC
BT10210	891529	587288.8	1008.826	HEC RECT
BT10211	891527.1	587283.9	1008.132	ETRN-PDT1310
BT10212	891513.2	587264.5	1008.534	HTBW
BT10213	891512.3	587268	1008.564	HTBW
BT10214	891512.6	587278.1	1008.606	HTBW BC
BT10215	891506.4	587278.7	1008.508	HTBC
BT10216	891504.5	587278.7	1008.095	HLIP
BT10217	891515.9	587297.5	1008.635	HTBW
BT10218	891522.8	587337.2	1008.743	HTBW
BT10219	891507.7	587358.4	1008.698	HTBC
BT10220	891505.7	587358.5	1008.252	HLIP
BT10221	891523.4	587378.1	1008.92	HTBW
BT10222	891515.8	587437.6	1009.003	HTBW EC E
BT10223	891509	587437.8	1008.912	HTBC E
BT10224	891507.1	587438	1008.418	HLIP E
BT10225	891473	587488.7	1009.663	UWV
BT10226	891471.2	587493.5	1009.69	UWV
BT10227	891461.1	587502.2	1009.826	CBCF
BT10228	891540.1	588797	1010.132	OWELL B
BT10229	891540.1	588797	1010.117	OWELL B
BT10230	891540.1	588806	1009.946	OWELL
BT10231	891534.9	588805.9	1010.275	OWELL RECT
BT10232	891511.4	588787.9	1010.327	ROEA B
BT10233	891510.5	588837.2	1010.25	MHS
BT10234	891543.8	588773.1	1009.632	OBOLLARD

BT10235	891546.5	588772.5	1010.006	MHW
BT10236	891548.6	588772.1	1009.45	UWBO
BT10237	891559	588788.8	1009.639	ROGD B
BT10238	891561.6	588814.2	1009.548	ROGD1 B
BT10239	891615.8	588813.3	1009.018	ROGD1
BT10240	891618.8	588790.8	1009.064	ROGD
BT10241	891733.1	588789.4	1009.588	ROGD E
BT10242	891734.8	588812.6	1009.345	ROGD1 E
BT10243	891736.6	588823	1009.195	TNG
BT10244	891621.4	588824.3	1008.867	TNG
BT10245	891563.9	588827.9	1008.786	TNG
BT10246	891542.8	588828.4	1010.264	TNG
BT10247	891510.4	588829.5	1010.2	ROEA
BT10248	891508.3	588842.7	1010.377	ROEA
BT10249	891483	588824	1010.225	CBCHH-37174
BT10250	891522.6	588955.7	1009.13	MHT
BT10251	891508.1	588956.2	1009.708	ROEA
BT10252	891508.2	589011.6	1009.264	ROEA
BT10253	891520.5	589011.2	1008.624	TNG
BT10254	891543.4	589010.8	1008.371	TNG
BT10255	891567.3	589010	1008.101	TNG
BT10256	891612.3	589011	1008.28	TNG
BT10257	891727.3	589010.6	1008.619	TNG
BT10258	891730.8	589211.7	1008.325	TNG
BT10259	891621.9	589213.9	1007.941	TNG
BT10260	891575.5	589215.5	1007.81	TNG
BT10261	891554.3	589215.7	1007.843	TNG
BT10262	891540.3	589216.8	1008.451	TNG
BT10263	891512.3	589218.1	1008.277	ROEA
BT10264	891516.3	589176.6	1008.517	MHS
BT10265	891488.4	589135.8	1009.014	CBCF
BT10266	891532.6	589142.8	1008.504	UWV
BT10267	891534.4	589153.5	1008.722	UWV
BT10268	891553.5	589153.7	1007.432	UW-2"-PIPE
BT10269	891514.6	589394.8	1008.145	ROEA
BT10270	891539.3	589402.2	1008.221	TNG
BT10271	891551	589402.3	1007.774	TNG
BT10272	891558.4	589402.5	1007.649	TNG
BT10273	891569.6	589403.6	1007.463	TNG
BT10274	891625	589402.8	1007.699	TNG
BT10275	891748.2	589403.3	1007.975	TNG
BT10276	891749.2	589595.4	1007.9	TNG
BT10277	891651.4	589595.3	1007.579	TNG
BT10278	891589.2	589595.5	1007.392	TNG
BT10279	891569.4	589597.6	1007.37	TNG
BT10280	891561.6	589599.5	1008.002	TNG
BT10281	891518.2	589598.8	1008.222	ROEA
BT10282	891552.5	589601.3	1008.315	OBOLLARD
BT10283	891546.3	589580.8	1008.279	OBOLLARD
BT10284	891546.7	589564.4	1008.109	OBOLLARD
BT10285	891554.9	589552.2	1008.092	OBOLLARD
BT10286	891558.3	589557.2	1007.942	E-METER
BT10287	891558.1	589561.8	1008.099	ELP
BT10288	891558.5	589563.7	1008.635	HEC B
BT10289	891560.5	589563.8	1008.58	HEC
BT10290	891560.7	589565.6	1008.555	HEC RECT
BT10291	891557.5	589566.1	1008.58	HEC B
BT10292	891557.8	589570.9	1008.606	HEC
BT10293	891552.7	589571.2	1008.717	HEC RECT
BT10294	891555	589568.5	1008.706	O-VAULT
BT10295	891558.8	589573.6	1008.152	U-UNKNOWN
BT10296	891560.9	589581.5	1008.599	HEC B
BT10297	891561	589583.4	1008.564	HEC
BT10298	891559	589583.6	1008.568	HEC RECT
BT10299	891556.7	589590.3	1008.588	HEC B
BT10300	891560.5	589590.3	1008.593	HEC
BT10301	891560.6	589597	1008.614	HEC RECT
BT10302	891558.5	589593.5	1007.76	U-AC-UNIT
BT10303	891520.6	589787.7	1008.167	ROEA
BT10304	891552.2	589787.9	1008.295	TNG
BT10305	891563.8	589787.6	1007.24	TNG
BT10306	891580.5	589787.4	1007.225	TNG
BT10307	891635	589787.2	1007.393	TNG
BT10308	891755.3	589788.6	1007.656	TNG
BT10309	891755.2	590005.1	1007.586	TNG
BT10310	891638.9	590004.8	1007.28	TNG
BT10311	891590.6	590004.9	1007.193	TNG
BT10312	891564.6	590005.8	1007.092	TNG
BT10313	891552.7	590006.4	1008.609	TNG
BT10314	891524.4	590006.8	1008.276	ROEA
BT10315	891538.5	589937.8	1008.279	MHT
BT10316	891526.2	590097.1	1008.493	ROEA
BT10317	891532	590123.3	1008.528	ROEA BC
BT10318	891539.2	590135.8	1008.381	ROEA
BT10319	891554.3	590146	1008.171	ROEA EC E
BT10320	891574.6	590161.3	1008.267	UWV
BT10321	891566.7	590156.3	1008.147	UWV
BT10322	891550.4	590149.2	1008.143	UWV
BT10323	891530.6	590152.6	1008.583	MHS
BT10324	891533	590175.4	1008.471	MHS
BT10325	891559.8	590139.7	1008.533	STOP
BT10326	891553.4	590203.1	1007.877	HLIP B
BT10327	891555.3	590203.4	1008.335	HTBC B
BT10328	891555.4	590203.1	1008.356	HTBW B

BT10329	891561.4	590203.5	1008.213	HTBW
BT10330	891563.3	590216.6	1008.363	ELP
BT10331	891568.7	590220.5	1008.525	UWV
BT10332	891571.3	590217.3	1008.409	UWFH
BT10333	891571.3	590215.9	1008.538	CRBR-34399-SPRINGER
BT10334	891571.4	590216.1	1008.508	CRBR-34399-TAG
BT10335	891561.9	590230.8	1008.498	HTBW
BT10336	891555.2	590237.6	1007.769	O-CL-8_-SCUPER
BT10337	891564.4	590232.8	1007.621	HEC B
BT10338	891583.6	590232.4	1005.981	HEC
BT10339	891583.7	590240.6	1006.106	HEC RECT
BT10340	891561.9	590235.5	1008.65	HTBW BC
BT10341	891564.5	590284.1	1008.539	HTBW
BT10342	891556.8	590288.8	1008.43	HTBC
BT10343	891554.9	590289.5	1008.062	HLIP
BT10344	891564.1	590357.2	1008.722	HTBW
BT10345	891565.2	590362.4	1008.696	ELP
BT10346	891566	590367.6	1008.594	EJB
BT10347	891558.2	590373.1	1008.674	HTBC
BT10348	891556.2	590374.3	1008.28	HLIP
BT10349	891567.5	590417.7	1008.839	HTBW
BT10350	891536.9	590502.5	1009.342	MHS
BT10351	891566.7	590525.7	1009.218	HTBW EC
BT10352	891568.2	590533.2	1009.142	EJB
BT10353	891567.9	590530.2	1009.268	ELP
BT10354	891572.9	590525.7	1009.377	UWV
BT10355	891573.8	590516	1009.285	UWFH
BT10356	891566.8	590534.4	1009.211	HTBW
BT10357	891568.7	590535.4	1009.2	HTBW
BT10358	891569.1	590552.9	1009.288	HTBW
BT10359	891567.2	590554.8	1009.217	HTBW
BT10360	891567.2	590559.6	1009.2	HTBW BC
BT10361	891560.3	590543.9	1008.591	O-CL-20_-CUPPER
BT10362	891537.3	590552.4	1009.439	MHS
BT10363	891569.6	590552.6	1008.308	HEC B
BT10364	891569.4	590535.3	1008.24	HEC
BT10365	891588.8	590535.1	1007.377	HEC
BT10366	891589.2	590552.6	1007.536	HEC C
BT10367	891561.5	590569.7	1009.164	HTBC
BT10368	891559.4	590569.6	1008.778	HLIP
BT10369	891572	590623.7	1009.464	HTBW
BT10370	891588.5	590656.1	1009.712	ECTP
BT10371	891606.3	590654	1009.259	WBLK B
BT10372	891591.9	590700.5	1009.502	UWBFV-8" B
BT10373	891585.1	590700.5	1009.668	UWBFV-8" E
BT10374	891575.7	590701	1009.678	UWV
BT10375	891574.3	590693.2	1009.714	UWV
BT10376	891571.3	590696.2	1009.328	EJB
BT10377	891571.1	590693.4	1009.243	ELP
BT10378	891570	590697.2	1009.384	HTBW
BT10379	891577.8	590712.8	1009.521	UWM
BT10380	891577.8	590715.3	1009.451	UWM
BT10381	891585	590712.8	1009.673	UWBFV-2"
BT10382	891585.3	590714.9	1009.686	UWBFV-1"
BT10383	891559.3	590723	1009.061	UWV
BT10384	891572.2	590727.6	1009.354	HTBW
BT10385	891606.7	590725.9	1009.746	WBLK
BT10386	891604.8	590725.9	1009.737	WBLK
BT10387	891574.8	590776.6	1009.627	HTBW
BT10388	891565	590780	1009.359	HTBC
BT10389	891562.9	590780.4	1008.881	HLIP
BT10390	891604.9	590806.1	1009.437	WBLK
BT10391	891606.8	590806.1	1009.173	WBLK
BT10392	891573.8	590860.1	1009.353	ELP
BT10393	891579.5	590870.5	1009.556	UWFH
BT10394	891578.6	590879	1009.577	UWV
BT10395	891587.2	590856.2	1009.561	ETJ
BT10396	891588.8	590861.1	1009.661	ECTP
BT10397	891585.4	590868.6	1010.084	HEC B
BT10398	891585.4	590864.5	1010.01	HEC
BT10399	891591.7	590864.5	1010.164	HEC RECT
BT10400	891587.4	590866.3	1009.767	ETRN-PD1606
BT10401	891587.4	590873.3	1010.108	ETRN-PD1605
BT10402	891585.7	590871.5	1009.931	HEC B
BT10403	891585.7	590875.6	1010.058	HEC
BT10404	891591.9	590875.5	1010.108	HEC RECT
BT10405	891572.3	590861.2	1009.451	HTBW EC
BT10406	891573.2	590875.2	1009.608	HTBW
BT10407	891566.4	590868.5	1009.308	HTBC BC
BT10408	891564.4	590868.4	1008.935	HLIP BC
BT10409	891573.7	590887.7	1009.202	HTBC
BT10410	891589.4	590894.8	1010.003	HTBC EC
BT10411	891585.9	590888.5	1010.059	HTBW
BT10412	891607.7	590888.9	1010.449	HTBW
BT10413	891625.6	590888.9	1009.977	HTBW BC
BT10414	891621.1	590893.1	1009.982	HTBW
BT10415	891614.2	590894.7	1009.883	HTBW EC E
BT10416	891614	590894.8	1010.332	HTBC E
BT10417	891622.9	590882.6	1010.191	ELP
BT10418	891589.3	590896.8	1009.64	HEC B
BT10419	891567.8	590896.9	1008.965	HEC
BT10420	891568.4	590934.1	1008.997	HEC
BT10421	891592.4	590934	1009.655	HEC E
BT10422	891592.5	590936	1010.067	HTBC B BC

BT10423	891592.4	590936.1	1010.065	HTBW B
BT10424	891592.7	590941.9	1010.164	HTBW
BT10425	891588.2	590942.7	1010.05	HTBW
BT10426	891574.2	590956.7	1009.535	HTBW BC
BT10427	891575.1	590943.3	1009.317	HTBC
BT10428	891568	590958	1009.412	HTBC EC
BT10429	891566	590958.1	1008.994	HLIP
BT10430	891543.6	590952.7	1009.551	MHS
BT10431	891573.9	590959.3	1009.526	HTBW
BT10432	891578.9	590966.9	1009.601	HTBW
BT10433	891579.2	590973.4	1009.558	HTBW
BT10434	891625.6	590952.6	1009.771	WBLK1 B
BT10435	891592.6	590946.7	1009.895	S B
BT10436	891592.3	590943.9	1010.22	S
BT10437	891605.5	590943.5	1009.624	S RECT
BT10438	891607.5	590952.7	1008.326	WBLK1
BT10439	891598.7	590978.9	1009.564	UWBFV-8" B
BT10440	891592.2	590979	1009.611	UWBFV-8" E
BT10441	891593	590990.1	1009.466	UWBFV-2"
BT10442	891584.8	590990.3	1009.64	UWM
BT10443	891575.1	591030.5	1009.368	HTBW
BT10444	891576.5	591030.3	1009.307	ELP
BT10445	891569.4	591036.4	1009.156	HTBC
BT10446	891567.3	591037.7	1008.781	HLIP
BT10447	891607.7	591024.6	1007.054	WBLK1
BT10448	891605.7	591024.7	1007.084	WBLK1
BT10449	891578.2	591071.6	1009.35	HTBW
BT10450	891571.3	591075.6	1009.137	S-MERGE-LEFT
BT10451	891576.5	591106.5	1009.342	HTBW EC
BT10452	891576.5	591115.2	1009.272	HTBW
BT10453	891578.6	591117.2	1009.324	HTBW
BT10454	891578.7	591130.2	1009.31	HTBW
BT10455	891576.7	591132	1009.284	HTBW
BT10456	891570	591124	1008.615	O-CL-15_-SCUPPER
BT10457	891579	591117.1	1008.565	HEC B
BT10458	891579.2	591130	1008.435	HEC
BT10459	891598.8	591128.8	1007.637	HEC RECT
BT10460	891606.2	591104.7	1006.701	WBLK1
BT10461	891608	591104.8	1006.813	WBLK1
BT10462	891608.4	591140.1	1007.031	WBLK1 E
BT10463	891596.3	591141.1	1009.309	HEC B
BT10464	891596.4	591145	1009.333	HEC
BT10465	891590.2	591145	1009.373	HEC RECT
BT10466	891592.1	591142.8	1009.029	ETRN-PD1603
BT10467	891593.3	591149.3	1009.467	ETRN-PD1604
BT10468	891590.5	591147.9	1009.497	HEC B
BT10469	891596.6	591147.9	1009.488	HEC
BT10470	891596.6	591152	1009.409	HEC RECT
BT10471	891591.8	591133	1009.289	ETJ
BT10472	891578.1	591133.6	1009.244	S-BUS-STOP
BT10473	891555.5	591140.6	1009.288	MHU-CATV
BT10474	891571.3	591160.7	1009.382	HTBC BC
BT10475	891569.4	591160.9	1008.945	HLIP
BT10476	891577.2	591160.9	1009.353	HTBW BC
BT10477	891582.6	591165.3	1009.387	UWV
BT10478	891581.1	591169.2	1009.216	ELP
BT10479	891585.4	591177.2	1009.189	UWFH
BT10480	891584.1	591183.9	1009.726	UWV
BT10481	891581.5	591184.8	1009.64	HTBC
BT10482	891585.9	591181	1009.63	HTBW
BT10483	891589.1	591163	1009.498	EV B
BT10484	891591.5	591162.9	1009.355	EV
BT10485	891592	591159.2	1009.459	EV RECT
BT10486	891606.4	591189.3	1010.132	HTBW EC
BT10487	891611.5	591189.4	1010.055	HTBW
BT10488	891606.8	591195.3	1010	HTBC EC E
BT10489	891606.7	591195.4	1009.999	HEC B
BT10490	891607.5	591235.6	1010.1	HEC
BT10491	891612.6	591242.1	1010.177	HTBW
BT10492	891607.7	591242.1	1010.172	HTBW BC
BT10493	891607.5	591236.2	1010.087	HTBC B BC
BT10494	891588.8	591240.1	1009.897	HTBC
BT10495	891584.6	591215.3	1009.383	UWV
BT10496	891550.6	591203.5	1009.564	UGV
BT10497	891556.2	591252.2	1009.528	MHS
BT10498	891597.2	591243.3	1009.597	HTBW
BT10499	891590.1	591248.8	1009.431	HTBW EC
BT10500	891583.8	591248.7	1009.729	HTBC EC
BT10501	891570.8	591250.6	1008.968	HLIP
BT10502	891584.9	591314.5	1009.826	HTBC
BT10503	891590.8	591314.3	1010.067	HTBW
BT10504	891569.8	591332.8	1009.334	UWV
BT10505	891570.7	591352.8	1009.4	MHW
BT10506	891580.6	591366	1009.727	MHU-IRRIGATION
BT10507	891588.8	591355.2	1009.9	ELP
BT10508	891582.5	591376.2	1009.11	ETSP
BT10509	891574.9	591384.4	1009.835	HTBC BC
BT10510	891573.1	591384.5	1009.413	HLIP BC
BT10511	891581	591389.2	1009.937	HTBW
BT10512	891587.2	591391.6	1010.094	HTBW BC
BT10513	891589.4	591393.2	1009.983	ETSB
BT10514	891600.6	591372.7	1010.495	UGV
BT10515	891591.6	591398	1010.051	HTBW
BT10516	891591.7	591398	1009.974	HTBW

BT10517	891609.1	591406.5	1010.074	HTBW EC
BT10518	891615.8	591412.2	1010.125	HTBW
BT10519	891616.4	591418.9	1010.009	HTBW E
BT10520	891587.2	591410.9	1009.808	HTBC
BT10521	891571.7	591410.6	1009.564	MHU-IRRIGATION
BT10522	891560.6	591429.6	1009.936	MHU-IRRIGATION
BT10523	891598.9	591407.6	1009.852	ETSP
BT10524	891605.1	591410.1	1010.098	EJB
BT10525	891609	591410.9	1013.792	ELP DNC
BT10526	891610.8	591419.1	1009.925	HTBC EC E
BT10527	891611.1	591421	1009.621	HLIP EC E
BT9001	891399.6	573176.1	993.896	CBCHH
BT9002	891394.9	573339.2	992.514	ROCL
BT9003	891428.9	573343.4	992	TOP-BRIDGE B
BT9004	891425.7	573449.6	990.691	TOP-BRIDGE
BT9005	891423.6	573528.3	989.741	TOP-BRIDGE
BT9006	891389.4	573528.8	990.415	ROCL
BT9007	891422.3	573587.6	988.528	TOP-BRIDGE E
BT9008	891421.2	573589.5	988.451	HLIP B
BT9009	891423.1	573589.8	988.858	HTBC B
BT9010	891422.4	573587.8	988.349	WBR B
BT9011	891387.8	573588.6	989.023	ROCL
BT9012	891421.6	573657.1	986.959	WBR
BT9013	891420.4	573657.7	987.112	HLIP
BT9014	891422.3	573657.6	987.212	HTBC
BT9015	891426	573663.7	987.255	HTBC
BT9016	891426.1	573707.2	986.338	HTBC
BT9017	891421.5	573724.6	985.873	HTBC
BT9018	891419.7	573724.5	985.701	HLIP
BT9019	891422.5	573709	985.941	WBR E
BT9020	891427.8	573605.2	988.397	EJB
BT9021	891428	573602.2	988.641	ELP
BT9022	891425.2	573589.2	988.121	FW B
BT9023	891440.9	573617.6	984.97	FW
BT9024	891455.7	573618.3	984.728	FW
BT9025	891475.7	573619.7	977.522	WHW B
BT9026	891475.2	573619.4	976.121	FSTL-TUBULAR B
BT9027	891459.5	573635	984.962	FSTL-TUBULAR
BT9028	891459.1	573653.7	985.326	FSTL-TUBULAR
BT9029	891459.6	573635.6	985.284	WHW
BT9030	891459.4	573653.2	985.32	WHW
BT9031	891476.9	573658.6	976.364	WHW E
BT9032	891476.6	573659.2	976.201	FSTL-TUBULAR E
BT9033	891473.7	573646.9	972.37	HEC B
BT9034	891490.9	573642.5	973.07	HEC BC
BT9035	891503.7	573647.6	973.051	HEC
BT9036	891512.5	573633.5	972.943	HEC
BT9037	891499.1	573624.2	972.969	HEC
BT9038	891490.4	573630.4	973.052	HEC EC
BT9039	891470.9	573635.3	972.207	HEC E
BT9040	891481.5	573618.7	972.471	FW
BT9041	891498.8	573619.3	972.91	FW
BT9042	891600	573610.5	973.348	FW E
BT9043	891606.1	573637.1	972.728	FCL B
BT9044	891543.1	573641.9	973.291	CRBR-CAP-ILLEG
BT9045	891543.3	573642	973.295	FCL
BT9046	891540.5	573658	972.972	FCL
BT9047	891491.5	573660.6	972.984	TOE B
BT9048	891505.7	573713.5	973.597	TOE
BT9049	891455.5	573619	984.733	TOP B
BT9050	891457.2	573658.5	984.923	TOP
BT9051	891452.1	573723.5	983.309	TOP
BT9052	891423.1	573615.2	987.827	TOP1 B
BT9053	891440.6	573618.6	984.84	TOE1 B
BT9054	891439.9	573657.1	985.091	TOE1
BT9055	891428.4	573657.8	986.992	TOP1
BT9056	891426.5	573723.1	985.527	TOP1
BT9057	891438.4	573723.2	983.632	TOE1
BT9058	891382.6	573794.1	984.771	ROCL
BT9059	891407.4	573814.6	983.761	MHT
BT9060	891424	573797.8	984.423	EJB
BT9061	891424.6	573795.5	984.609	ELP
BT9062	891417.6	573796.6	984.042	HLIP
BT9063	891419.6	573796.7	984.39	HTBC
BT9064	891423.6	573799.7	984.002	TOP1
BT9065	891437.7	573798.1	981.276	TOE1
BT9066	891451	573799.3	981	TOP
BT9067	891515.4	573799.3	972.813	TOE
BT9068	891520.7	573800.2	972.77	FCL
BT9069	891506.6	573903.4	972.226	FCL
BT9070	891502.6	573903.2	972.498	TOE
BT9071	891449	573899.1	978.137	TOP
BT9072	891435.3	573899.2	978.456	TOE1
BT9073	891419.3	573899.9	981.596	TOP1
BT9074	891416.6	573899.9	981.871	HTBC
BT9075	891414.6	573900.1	981.483	HLIP
BT9076	891419	573990.1	979.482	EJB
BT9077	891419.4	573986.6	979.439	ELP
BT9078	891377	573990.7	979.578	ROCL
BT9079	891418.5	573993.8	978.842	TOP1
BT9080	891430.8	573994.3	977.062	TOE1
BT9081	891445.3	573995.2	976.796	TOP
BT9082	891490.5	574000.9	972.358	TOE
BT9083	891492.4	574001.2	972.066	FCL

BT9084	891482.2	574068	972.346	CRBR
BT9085	891481.7	574069.9	972.333	TOE
BT9086	891444.1	574068	975.578	TOP
BT9087	891428.8	574068.4	975.766	TOE1
BT9088	891414.7	574068.9	976.914	TOP1
BT9089	891416.2	574092.1	976.428	HEC B
BT9090	891418.1	574092.2	976.441	HEC
BT9091	891418.1	574096	976.372	HEC RECT
BT9092	891417	574094.2	976.359	UWBO
BT9093	891417	574100.9	976.237	UWV
BT9094	891413.1	574183.6	974.427	EJB
BT9095	891413.6	574180.9	974.409	ELP
BT9096	891406.5	574185.2	973.854	HLIP
BT9097	891408.4	574185.6	974.236	HTBC
BT9098	891371.7	574186.4	974.551	ROCL
BT9099	891413.8	574188	973.944	TOP1 E
BT9100	891425.2	574187.5	973.484	TOE1 E
BT9101	891425.5	574187.4	973.534	TOP E
BT9102	891464.9	574187.6	971.863	TOE E
BT9103	891477.5	574188.4	971.865	FCL
BT9104	891476.2	574203.3	971.005	CRBR-33315
BT9105	891476.9	574203.6	971.025	FCL
BT9106	891438.3	574202.2	971.486	CRBR-33315
BT9107	891421.3	574201.7	973.255	FCL
BT9108	891421.3	574201.5	973.256	TOP B
BT9109	891488.2	574203.9	971.643	TOP
BT9110	891488.1	574292.3	971.607	TOP
BT9111	891486.9	574349.5	971.584	TOP
BT9112	891428.1	574353	972.122	TOP
BT9113	891434.1	574311.4	969.7	HTBC1 B
BT9114	891424.5	574311	972.186	HTBC1
BT9115	891434.7	574292.5	969.688	HTBC2 B
BT9116	891432.8	574292.4	970.493	HTBC2
BT9117	891425.1	574292.1	972.1	HTBC2
BT9118	891474	574328.4	968.943	TOE B
BT9119	891434.4	574339	969.627	TOE
BT9120	891421.4	574265.6	972.743	TOP C
BT9121	891434.5	574209.2	969.875	TOE
BT9122	891475.4	574211	969.392	TOE C
BT9123	891604.4	574231.3	972.274	TNG
BT9124	891608.9	574104.5	972.213	TNG
BT9125	891610.4	573990	972.648	TNG
BT9126	891612.4	573796	972.745	TNG
BT9127	891682.5	573767.6	973.039	TNG
BT9128	891664	574005.3	972.451	TNG
BT9129	891656.3	574106.9	972.173	TNG
BT9130	891652.4	574218.2	972.361	TNG
BT9131	891656.4	574385	972.612	TNG
BT9132	891412	574310.5	973.299	HTBC1 E
BT9133	891412.5	574291.5	973.325	HTBC2 E
BT9134	891403.5	574286.6	972.847	HLIP
BT9135	891405.5	574286.6	973.174	HTBC
BT9136	891405.6	574287	973.186	HEC B
BT9137	891411.5	574287.2	973.368	HEC
BT9138	891412.5	574289.7	973.338	HEC
BT9139	891411.8	574312.1	973.355	HEC
BT9140	891410.8	574314.7	973.373	HEC
BT9141	891404.9	574314.5	973.266	HEC E
BT9142	891409.4	574319.9	973.4	EJB
BT9143	891409.8	574317.8	973.304	ELP
BT9144	891404.4	574300.7	972.617	O-CL-20_-SCUPPER
BT9145	891419.5	574340	972.733	FCL
BT9146	891431.1	574371.2	972.285	FCL
BT9147	891430.6	574370.6	972.348	CRBR-33315
BT9148	891428.9	574436.4	973.931	FCL E
BT9149	891428.7	574436.3	973.882	CRBR-33315
BT9150	891398.7	574457.2	973.22	HLIP
BT9151	891400.6	574457.4	973.63	HTBC BC
BT9152	891410.2	574482.8	974.091	HTBC
BT9153	891435.3	574493.5	974.399	HTBC EC E
BT9154	891396.9	574507.1	973.6	HLIP
BT9155	891395.6	574558	973.747	HLIP E
BT9156	891380.5	574484.7	973.644	UWV
BT9157	891362.2	574490.5	973.911	ROCL
BT9158	891362.1	574494.9	973.271	CBCHH
BT9159	891360.3	574557.1	974.158	ROCL
BT9160	891378.7	575222.9	973.815	HTBC B
BT9161	891378.9	575222.9	973.827	HEC B
BT9162	891383.7	575223	973.883	HEC
BT9163	891384.7	575225.2	973.92	HEC
BT9164	891384.3	575238	973.899	HEC
BT9165	891383.3	575240	973.869	HEC
BT9166	891378.3	575239.8	973.706	HEC E
BT9167	891377.9	575231.3	972.863	O-CL-8_-SCUPPER
BT9168	891378.3	575239.9	973.713	HTBW B
BT9169	891383.3	575240.1	973.898	HTBW
BT9170	891386.5	575251.1	973.814	EJB
BT9171	891384.5	575252.4	973.833	ELP
BT9172	891453.3	575220.5	972.696	TNG
BT9173	891531	575221.2	973.533	TNG
BT9174	891584.8	575222	974.556	TNG
BT9175	891590.1	575258.5	974.352	FCL B
BT9176	891522.6	575258.4	974.07	FCL
BT9177	891473.2	575258.3	973.749	FCL

BT9178	891457.2	575267.7	973.851	UWV
BT9179	891454.9	575290.1	974.14	UWV
BT9180	891450.7	575290.3	973.615	UWFH
BT9181	891442.1	575308.3	971.919	HEC B
BT9182	891445.6	575312.1	971.991	HEC
BT9183	891443.2	575314.3	972.038	HEC RECT
BT9184	891442.6	575311.5	972.003	O-CATCH-BASIN
BT9185	891382.7	575256.1	973.703	HTBW
BT9186	891388.5	575264.9	973.788	HTBW
BT9187	891388.1	575284.5	973.808	HTBW
BT9188	891377.6	575259.5	973.69	HTBC
BT9189	891377.5	575264.5	973.293	HTBC
BT9190	891377	575284.4	973.38	HTBC
BT9191	891376.8	575289.6	973.823	HTBC
BT9192	891374.8	575289.6	973.32	HLIP
BT9193	891378.2	575307.9	973.841	HEC B
BT9194	891381.9	575307.9	973.814	HEC
BT9195	891382	575310.7	973.775	HEC RECT
BT9196	891380.1	575309.6	973.8	UWBO
BT9197	891394	575316.7	973.752	HTBW
BT9198	891409.8	575314.1	973.214	TOP B
BT9199	891417.4	575302.7	973.412	TOP
BT9200	891419.4	575316.3	972.035	TOE B
BT9201	891446.3	575312.2	972.009	TOE
BT9202	891463.5	575301	974.001	TOP
BT9203	891470.9	575393.3	974.505	FCL
BT9204	891465.1	575393.9	974.181	TOP
BT9205	891447.4	575395	971.822	TOE
BT9206	891443.6	575493.4	971.582	TOE
BT9207	891446.8	575510.6	971.51	TOE
BT9208	891463.1	575494.3	974.061	TOP
BT9209	891469	575494.6	974.483	FCL
BT9210	891532.6	575497.7	974.81	FCL
BT9211	891519.1	575508.4	974.574	TNG
BT9212	891525	575547.9	975.432	FCL E
BT9213	891518.4	575550.8	975.44	MHS
BT9214	891492.1	575504.8	974.493	TOP
BT9215	891498	575511.8	974.355	TOP
BT9216	891484.9	575515.8	972.387	TOE
BT9217	891486.2	575572.9	971.718	TOE
BT9218	891479.6	575582.7	972.028	TOE
BT9219	891496.4	575582.1	974.109	TOP
BT9220	891495.7	575586.4	974.413	TOP BC
BT9221	891501.7	575587.4	974.564	WBLK B BC
BT9222	891461.1	575607.8	974.068	WBLK
BT9223	891457.2	575608.2	973.975	ELP
BT9224	891453.9	575612.5	973.867	TOP
BT9225	891453.2	575594.3	971.79	TOE
BT9226	891434.9	575616.7	971.564	TOE
BT9227	891423.5	575657.1	972.008	TOE
BT9228	891432.6	575659.4	973.713	TOP
BT9229	891434.5	575660.2	973.842	WBLK
BT9230	891421.9	575687.3	971.649	TOE
BT9231	891429.1	575713.3	971.948	TOE
BT9232	891441.2	575706.2	973.976	ELP
BT9233	891444.7	575712	974.283	TOP
BT9234	891446.1	575711.6	974.428	WBLK
BT9235	891443	575727.2	972.079	TOE
BT9236	891465.3	575740.9	972.339	TOE
BT9237	891475	575740.1	974.652	WBLK E
BT9238	891474.5	575740.6	974.456	TOP EC
BT9239	891470.3	575754.7	973.502	UWBFV-4"
BT9240	891464.8	575754.6	973.058	UWBFV-8"
BT9241	891461.3	575763.8	973.663	TOP E
BT9242	891451.6	575767.4	971.982	TOE
BT9243	891435.3	575767.1	971.503	TOE
BT9244	891430.4	575766.5	973.349	TOP B
BT9245	891445.3	575746.3	973.123	TOP
BT9246	891451.6	575744.3	972.154	TOE
BT9247	891421.8	575718.2	971.947	TOE
BT9248	891410.2	575724	974.439	TOP
BT9249	891403.3	575694.9	974.056	TOP
BT9250	891372.7	575701.5	973.165	TOP E
BT9251	891383.8	575699.6	974.178	MHE
BT9252	891394	575702	974.559	HEC B
BT9253	891394.2	575697.9	974.603	HEC
BT9254	891400.3	575698.1	974.64	HEC RECT
BT9255	891393.9	575708.9	974.546	HEC B
BT9256	891394	575704.8	974.538	HEC
BT9257	891400.3	575704.9	974.574	HEC RECT
BT9258	891393.8	575715.4	974.635	HEC B
BT9259	891393.9	575711.4	974.613	HEC
BT9260	891400.2	575711.5	974.576	HEC RECT
BT9261	891396.3	575713.1	974.226	ETRN-PD1605
BT9262	891396.3	575706.7	974.269	ETRN-PD1604
BT9263	891396.4	575699.9	974.19	ETRN-PD1603
BT9264	891419.3	575716.1	971.991	TOE
BT9265	891413.8	575686	971.7	TOE
BT9266	891373.1	575695.3	971.888	TOE
BT9267	891373.3	575691.2	971.871	TOE
BT9268	891373	575686.6	973.214	TOP B
BT9269	891391.7	575685.8	972.438	TOE
BT9270	891414.7	575677	971.909	TOE
BT9271	891406.3	575671.8	973.374	TOP

BT9272	891411.1	575640.9	973.381	TOP
BT9273	891417.9	575641.6	971.93	TOE
BT9274	891422.3	575571.2	971.771	TOE
BT9275	891413.4	575571.7	973.13	TOP
BT9276	891417.5	575509.1	971.884	TOE
BT9277	891405.9	575510.5	973.506	TOP
BT9278	891407.1	575509.9	973.47	O-PVC-RISER-4"
BT9279	891406.4	575496.2	974.763	HEC B
BT9280	891400.2	575495.7	974.652	HEC
BT9281	891400.4	575491.5	974.589	HEC RECT
BT9282	891402.6	575493.7	974.135	ETRN-PD1627
BT9283	891407.1	575413	972.819	TOP
BT9284	891416.8	575407.6	971.658	TOE C
BT9285	891410.3	575325.5	972.918	TOP E
BT9286	891390.3	575449.9	973.985	HTBW
BT9287	891380.4	575451.7	974.114	EJB
BT9288	891378.9	575454.1	974.005	ELP
BT9289	891377.7	575474.4	974.366	HTBW
BT9290	891371.7	575475.2	974.269	HTBC
BT9291	891369.7	575475.2	973.783	HLIP
BT9292	891322.1	575475.1	974.273	ROCL
BT9293	891383.9	575501.1	974.473	HTBW
BT9294	891378.4	575502.6	974.43	HTBW E
BT9295	891378.4	575502.6	974.414	H-BRICK-WALK B
BT9296	891383.9	575501.2	974.474	H-BRICK-WALK
BT9297	891385.1	575506	974.471	H-BRICK-WALK
BT9298	891393.6	575506.3	974.525	H-BRICK-WALK
BT9299	891395.6	575515.1	974.571	H-BRICK-WALK
BT9300	891394.8	575540.7	974.524	H-BRICK-WALK
BT9301	891386.9	575540.7	974.483	H-BRICK-WALK
BT9302	891386.6	575545.6	974.462	H-BRICK-WALK
BT9303	891380.8	575545.6	974.39	H-BRICK-WALK
BT9304	891381.6	575515.8	974.477	H-BRICK-WALK C
BT9305	891381.1	575515.9	974.479	HTBC
BT9306	891379.5	575516.1	973.979	HLIP
BT9307	891395.7	575506	974.955	EJB
BT9308	891395.3	575543.6	974.404	EJB
BT9309	891380.9	575545.7	974.353	HTBW B
BT9310	891370.2	575733.3	973.748	HEC B
BT9311	891373.6	575733.4	973.702	HEC
BT9312	891373.6	575730.6	973.766	HEC RECT
BT9313	891372	575731.9	973.682	UWBO
BT9314	891365.7	575709.4	973.285	EJB
BT9315	891364.6	575693.4	972.512	O-CL-4_-SCUPPER
BT9316	891372.9	575654.1	973.689	ELP
BT9317	891374.8	575651.6	973.564	EJB
BT9318	891374.7	575651.6	973.516	EJB
BT9319	891359.2	575614.2	973.396	MHT
BT9320	891386.6	575545.8	974.412	HTBW
BT9321	891385.6	575581.4	974.296	HTBW
BT9322	891379.7	575581.1	974.196	HTBC
BT9323	891377.8	575581	973.678	HLIP
BT9324	891364.7	575650.6	973.209	HLIP
BT9325	891366.6	575650.8	973.488	HTBC
BT9326	891372.6	575651.1	973.69	HTBW
BT9327	891371.6	575687.6	973.444	HTBW
BT9328	891372.5	575688.7	973.419	HTBW
BT9329	891372.1	575699.1	973.455	HTBW
BT9330	891371.3	575700	973.438	HTBW
BT9331	891370.3	575733.4	973.521	HTBW
BT9332	891364	575740.4	973.237	HTBC BC
BT9333	891362.1	575740.5	972.933	HLIP BC
BT9334	891320.9	575743.1	973.53	ROCL
BT9335	891375.2	575757.5	973.093	ETSP
BT9336	891372.7	575767.4	973.153	HLIP
BT9337	891374.2	575765.8	973.017	HTBC
BT9338	891382.6	575764.9	973.349	EJB
BT9339	891371.7	575753.6	973.661	HTBW
BT9340	891379.5	575758.3	973.301	HTBW
BT9341	891383	575761.5	973.314	HTBW
BT9342	891386.3	575768.6	973.584	HTBW
BT9343	891401.1	575768.6	973.64	HTBW
BT9344	891404	575771.7	973.652	HTBW
BT9345	891406.2	575771.6	973.687	HTBW
BT9346	891408.9	575768.8	973.662	HTBW
BT9347	891405.3	575769.8	973.501	UWFH
BT9348	891399.2	575778.7	972.993	HLIP EC
BT9349	891399	575776.7	973.487	HTBC EC
BT9350	891412.9	575755.7	973.789	EV B
BT9351	891416.7	575756.3	973.584	EV
BT9352	891417.2	575753.7	973.56	EV
BT9353	891413.3	575753	973.642	EV C
BT9354	891419.2	575745.8	973.706	O-SIGN B
BT9355	891418.1	575747.2	973.759	O-SIGN
BT9356	891411.8	575741.4	973.934	O-SIGN RECT
BT9357	891423.5	575753.9	972.556	ETJ
BT9358	891431.1	575768.8	973.686	HTBW
BT9359	891432.1	575767.8	973.667	HTBW
BT9360	891457	575767.6	973.816	HTBW
BT9361	891444.1	575777.5	972.652	O-CL-20_-SUPPER
BT9362	891468.6	575775.8	973.89	UWM
BT9363	891468.7	575773.8	973.937	UWM
BT9364	891485.9	575770.5	974.034	ELP
BT9365	891479.9	575755.7	974.838	HTBW

BT9366	891481.2	575746.5	975.135	HTBW
BT9367	891476.6	575737.7	975.299	HTBW BC
BT9368	891486	575742.4	975.31	HTBW
BT9369	891494.8	575745.8	975.307	HTBW EC
BT9370	891488.7	575749.7	975.018	HTBW
BT9371	891488.1	575755.7	974.855	HTBW
BT9372	891492.3	575755.7	974.869	HTBW
BT9373	891521.8	575763.1	974.126	HTBW
BT9374	891568.7	575763.2	974.249	HTBW
BT9375	891568.9	575771.2	974.163	HTBW E
BT9376	891569	575777.3	973.968	HTBC E
BT9377	891569	575779	973.601	HLIP E
BT9378	891567.3	575736.2	975.225	HEC B
BT9379	891567.3	575726.2	975.358	HEC
BT9380	891557.5	575726.2	975.516	HEC RECT
BT9381	891560.9	575729.8	975.822	ETRN-P1633
BT9382	891570.9	575739.2	974.628	HTBC B
BT9383	891570.6	575723.4	975.051	HTBC BC
BT9384	891568.8	575720.2	975.079	HTBC
BT9385	891560.9	575718	975.098	HTBC
BT9386	891552.1	575710.9	975.412	HTBC
BT9387	891544.3	575711.5	975.453	HTBC
BT9388	891536.4	575715.9	975.356	HTBC
BT9389	891536.5	575717.3	975.365	HTBC EC
BT9390	891542.9	575734.4	975.474	HTBC BC
BT9391	891505	575738.6	975.175	HTBC
BT9392	891472.5	575723.3	975.059	HTBC EC
BT9393	891482.1	575711.1	974.863	HTBC BC
BT9394	891481.6	575704.1	974.901	HTBC
BT9395	891475	575703.7	974.965	HTBC EC
BT9396	891457.8	575705.8	974.466	UWV
BT9397	891462.7	575713.7	974.987	HTBC BC
BT9398	891448	575654.6	974.664	HTBC
BT9399	891457.4	575618.5	974.476	UWV
BT9400	891492.4	575602.7	974.556	HTBC EC
BT9401	891498.9	575619.5	974.439	HTBC BC
BT9402	891502.3	575620.7	974.494	HTBC
BT9403	891504.5	575617.9	974.505	HTBC EC
BT9404	891502	575617.7	974.361	UWFH
BT9405	891500.2	575600.4	974.756	HTBC
BT9406	891505.3	575599.3	974.361	HTBC E
BT9407	891503.3	575590	974.461	HTBW B
BT9408	891505.4	575599.7	974.329	HTBW BC
BT9409	891560.2	575613.4	974.932	HTBW
BT9410	891587.1	575671.1	974.894	HTBW EC
BT9411	891597.1	575671.1	974.82	HTBW E
BT9412	891591.4	575678.7	974.276	ELP
BT9413	891541.4	575672.5	974.977	HRLC B BC
BT9414	891519.3	575693.3	975.078	HRLC
BT9415	891492.5	575668	974.701	HRLC
BT9416	891513.2	575644.3	974.594	HRLC
BT9417	891541.2	575663.2	974.873	HRLC EC E
BT9418	891372.3	576318.5	974.895	MHS
BT9419	891342.2	576299.5	974.602	ROEA B
BT9420	891391.9	576295.9	973.94	TNG
BT9421	891442.2	576294.4	973.376	TNG
BT9422	891505.6	576293.1	973.401	TNG
BT9423	891563.2	576291.8	973.518	TNG
BT9424	891570.4	576394.5	973.312	TNG
BT9425	891486.8	576394.1	973.082	TNG
BT9426	891404.7	576395.1	973.166	TNG
BT9427	891369.8	576395.5	973.332	TNG
BT9428	891343.1	576395.9	974.419	ROEA
BT9429	891315.7	576395.5	974.715	ROCL
BT9430	891356.1	576537.6	974.871	EPP
BT9431	891343.9	576545	974.808	ROEA
BT9432	891355.7	576544.8	974.75	TNG
BT9433	891369.6	576543.3	973.201	TNG
BT9434	891404.4	576541.2	972.787	TNG
BT9435	891480	576541.1	973.108	TNG
BT9436	891517.4	576542.6	973.028	TNG
BT9437	891625.7	576540.9	973.22	TNG
BT9438	891634.8	576655.3	973.35	TNG
BT9439	891578.6	576654.3	973.217	TNG
BT9440	891526.2	576653.3	973.151	TNG
BT9441	891453.8	576652.2	973.041	TNG
BT9442	891398.7	576652.8	972.886	TNG
BT9443	891368.2	576652.4	973.383	TNG
BT9444	891356.6	576652.5	974.761	TNG
BT9445	891345.5	576652.3	975.001	ROEA
BT9446	891317	576651.9	975.196	ROCL
BT9447	891345.9	576777.9	975.246	ROEA
BT9448	891360.2	576779.1	974.776	EPP
BT9449	891356.4	576788.5	975.2	S-SCHOOL-XING
BT9450	891346.3	576821	975.54	ROCL
BT9451	891363.1	576821.6	975.382	TNG
BT9452	891375.9	576835.2	974.869	MHS
BT9453	891381.3	576817	973.52	TNG
BT9454	891395.1	576817.8	972.846	TNG
BT9455	891503.3	576820.4	972.89	TNG
BT9456	891618.6	576819.6	973.141	TNG
BT9457	891632.2	576934.2	974.433	WBLK B
BT9458	891626.5	576924.2	973.528	TOP B
BT9459	891607.7	576907.7	970.935	TOE B

BT9460	891609.1	576870	970.84	TOE
BT9461	891628.8	576866.2	973.576	TOP
BT9462	891613.8	576853.4	973.387	TOP
BT9463	891613.6	576853.4	973.378	TOP
BT9464	891505	576849.2	972.916	TOP
BT9465	891416.9	576850.6	973.563	TOP
BT9466	891434.7	576867.2	970.473	TOE
BT9467	891439.7	576911.3	970.226	TOE C
BT9468	891417.9	576921.2	973.552	TOP
BT9469	891485.1	576924.9	972.91	TOP C
BT9470	891468.4	576934.1	973.515	WBLK
BT9471	891469.1	576993.2	974.7	WBLK E
BT9472	891389.6	577003.3	974.878	UWV
BT9473	891388.5	576978.7	975.196	UWFH
BT9474	891383.7	576986.6	975.241	HXC B
BT9475	891398.3	576986.1	974.982	HXC BC
BT9476	891407.7	576982.4	974.983	HXC
BT9477	891410.6	576972.7	974.876	HXC EC
BT9478	891410.1	576945.1	974.587	HXC
BT9479	891425.6	576944.6	974.526	HXC E
BT9480	891429.6	576944.5	974.54	HXC B
BT9481	891454	576943.9	974.865	HXC
BT9482	891455.1	576987.1	975.21	HXC
BT9483	891447	576987.8	975.138	HXC BC
BT9484	891444.5	576990.5	975.166	HXC
BT9485	891445.8	576992.7	975.272	HXC EC
BT9486	891466.2	576991.8	975.255	HXC E
BT9487	891416.5	576924.6	973.435	WBLK B
BT9488	891397.9	576924.4	973.947	WBLK
BT9489	891381.9	576894.8	974.247	TNG
BT9490	891360.8	576894	975.379	TNG
BT9491	891347.1	576897.9	975.494	ROEA
BT9492	891347.6	576965.2	975.877	ROEA BC
BT9493	891356.5	576981.1	975.567	ROEA
BT9494	891381.7	576986.6	974.731	ROEA EC E
BT9495	891360.9	576980.1	975.182	EGW
BT9496	891360.7	576968.1	975.46	EPP
BT9497	891361.6	576971.9	975.406	ET-MARKER-FIBER
BT9510	891398.3	576973.1	974.419	WBLK E
BT9511	891383.2	577020.9	975.134	ROEA B
BT9512	891384.4	577020.7	975.593	HXC B
BT9513	891366.9	577021.9	975.537	ROEA BC
BT9514	891354.4	577029.9	976.018	ROEA
BT9515	891348.3	577043	976.321	ROEA EC
BT9516	891398.6	577027.9	974.61	WBLK B
BT9517	891398.9	577020.6	975.632	HXC BC
BT9518	891400.6	577021.6	974.718	HXC
BT9519	891401.4	577023.6	974.327	HXC EC
BT9520	891401.7	577029.5	975.141	HXC E
BT9521	891401.6	577030.7	974.508	ROEA1 B
BT9522	891401.8	577114.3	974.858	ROEA1 BC
BT9523	891408.3	577127.4	975.095	ROEA1
BT9524	891424	577131.5	975.275	ROEA1 EC
BT9525	891438	577130.8	975.272	ROEA1
BT9526	891439.3	577118	974.998	ROEA1
BT9527	891415.8	577117.9	975.071	ROEA1
BT9528	891414.6	577062.9	974.556	ROEA1
BT9529	891419.1	577058.4	974.843	ROEA1
BT9530	891440	577057.2	974.787	ROEA1 E
BT9531	891400.3	577139.4	975.231	WBLK
BT9532	891417.4	577139.1	975.287	WBLK E
BT9533	891396.7	577131.8	975.65	EPP
BT9534	891397.9	577131.7	975.562	EOHV B
BT9535	891364.9	577116.8	976.304	EOHV
BT9536	891363.4	577117.5	976.529	EPP
BT9537	891364.5	577143.3	977.605	EPP
BT9538	891363.7	577135.4	976.12	EGW
BT9539	891315.9	577116.1	976.653	EOHV E
BT9540	891314.5	577149.2	976.614	UWV
BT9541	891312.5	577154.5	976.542	UWV
BT9542	891361.6	577109.8	975.8	ETJ
BT9543	891361.9	577111.7	976.085	ETJ
BT9544	891362.5	577107.5	976.155	E-REPEATOR
BT9545	891348.2	577144.2	976.715	ROEA
BT9546	891381.6	577141.3	976.009	ROEA E
BT9547	891551.1	577865	976.122	HLIP B BC
BT9548	891549.1	577864.6	976.509	HTBC B BC
BT9549	891549	577864.5	976.533	HTBW B
BT9550	891545.1	577863.7	976.621	HTBW BC
BT9551	891531.9	577906.8	977.019	ECTV
BT9552	891533	577905.5	976.969	UWM
BT9553	891532.6	577917.1	976.921	UWM
BT9554	891534.1	577913.8	977.283	EJB
BT9555	891535.1	577912.5	976.892	ELP
BT9556	891532.5	577910	977.061	ETRN
BT9557	891551.3	577918.8	976.625	MHS
BT9558	891542.5	577909.3	976.394	HLIP
BT9559	891540.4	577910.2	976.938	HTBC
BT9560	891536.4	577909.9	976.998	HTBW
BT9561	891534.9	577954	977.228	HTBW EC
BT9562	891538.9	577953.9	977.083	HTBC EC
BT9563	891540.7	577944.2	976.65	HLIP EC
BT9564	891556.7	577944.5	976.879	CBCF
BT9565	891529.9	577988.3	977.277	ECTP

BT9566	891531.9	577991	977.881	HEC B
BT9567	891528.5	577991.1	977.91	HEC
BT9568	891528.5	577994.4	977.915	HEC RECT
BT9569	891529.1	577996	977.388	ETJ
BT9570	891532.2	577997.5	977.112	UWM
BT9571	891530.4	577992.6	977.073	ETRN-P1446
BT9572	891541.6	578063	977.296	HLIP
BT9573	891539.8	578063	977.494	HTBC
BT9574	891535.7	578063	977.552	HTBW
BT9575	891533.2	578072.5	977.745	HTBW
BT9576	891530.5	578069.9	977.686	UWM
BT9577	891529.9	578081.7	977.644	UWM
BT9578	891530.6	578073.2	977.761	EJB
BT9579	891531.5	578075.8	977.403	ELP
BT9580	891533.4	578094.5	977.734	HTBW
BT9581	891536	578105.5	977.689	HTBW
BT9582	891552.2	578098.5	977.501	MHS
BT9583	891557.9	578105.5	977.597	CBCF
BT9584	891533.3	578153.6	977.75	UWM
BT9585	891533.3	578166	977.871	UWM
BT9586	891533.8	578235.8	978.122	UWM
BT9587	891533.5	578238	978.156	EJB
BT9588	891531.2	578239.3	978.106	ECTV
BT9589	891535.5	578240.7	978.037	ELP
BT9590	891533	578242.4	978.74	HEC B
BT9591	891529.6	578242.6	978.621	HEC
BT9592	891529.7	578245.9	978.65	HEC RECT
BT9593	891530.7	578247.7	978.183	ETJ
BT9594	891533.8	578249.1	978.181	UWM
BT9595	891532	578244.3	978.1	ETRN-P1445
BT9596	891537.2	578281.2	978.16	HTBW BC
BT9597	891534.1	578286.4	978.092	UWM
BT9598	891541.2	578281.3	978.193	HTBC BC
BT9599	891543.2	578281.2	977.916	HLIP BC
BT9600	891552.2	578309.9	978.028	HLIP
BT9601	891550.8	578311.2	978.387	HTBC
BT9602	891548.2	578314.3	978.361	HTBW
BT9603	891558.7	578326.9	978.304	UWM
BT9604	891585.6	578331.3	978.692	HTBW EC
BT9605	891585.8	578327.3	978.614	HTBW E
BT9606	891585.5	578327.3	978.633	HTBC EC E
BT9607	891585.6	578325.4	978.337	HLIP EC E
BT9608	891559.4	578309.5	978.166	CBCF
BT9609	891553.4	578303	978.169	MHS
BT9610	891544.6	578341.1	978.836	TNG
BT9611	891486.2	578340.9	978.925	TNG
BT9612	891485	578244	978.741	TNG
BT9613	891491.6	578080.2	978.035	TNG
BT9614	891489.8	577973.5	977.954	TNG
BT9615	891492.4	577879.8	978.009	TNG
BT9616	891558.3	578465.6	983.355	ROEA B
BT9617	891558.1	578468.7	983.078	TNG
BT9618	891558.1	578494.6	981.874	TNG
BT9619	891484.2	578496.2	981.772	TNG
BT9620	891482.7	578470	982.719	TNG
BT9621	891482.3	578466.4	982.828	ROEA
BT9622	891469.4	578499.9	984.464	WHW B
BT9623	891467.9	578500	984.517	WHW
BT9624	891467.9	578496.1	984.5	WHW
BT9625	891463	578496	984.474	WHW
BT9626	891463	578499.7	984.477	WHW
BT9627	891461.5	578499.8	984.493	WHW E
BT9628	891465.5	578496.9	979.755	PRCP-30"
BT9629	891463.5	578497.7	979.655	PRCP-24"
BT9630	891455.3	578466.8	982.666	ROEA
BT9631	891401.9	578468	981.922	ROEA
BT9632	891370.4	578468.9	982.333	ROEA
BT9633	891358.6	578480.5	982.719	ROEA
BT9634	891383.3	578501.8	984.103	WHW B
BT9635	891384.8	578501.7	984.114	WHW
BT9636	891384.8	578497.3	984.029	WHW
BT9637	891391	578497.1	984.086	WHW
BT9638	891391	578501.6	984.006	WHW
BT9639	891392.5	578501.6	984.082	WHW E
BT9640	891390.4	578498.9	979.361	PRCP-24"
BT9641	891548	578619.4	982.099	TNG
BT9642	891419.1	578542.9	981.761	TNG
BT9643	891397.7	578553	982.855	TNG
BT9644	891346.1	578582.4	983.451	UWV
BT9645	891346.1	578597.9	983.48	UWV
BT9646	891346.9	578588.6	983.538	MHW
BT9647	891358.9	578604.9	983.373	ROEA
BT9648	891382.8	578656.5	983.056	EGW
BT9649	891383.4	578685.7	983.527	EPP
BT9650	891383.6	578682.7	983.315	EOHV B
BT9651	891378.7	578693	983.734	TNG
BT9652	891385.6	578931.1	984.599	EPP
BT9653	891360.7	578928.9	984.465	ROEA
BT9654	891360.8	578955.4	984.635	ROEA
BT9655	891363.1	578957.4	984.544	ROEA E
BT9656	891363.2	578958	984.578	HLIP B
BT9657	891365	578958	985.076	HTBC B
BT9658	891384.4	578954.3	984.721	TNG
BT9659	891382.4	578978.7	984.958	MHT

BT9660	891365.8	578985.1	985.152	HTBC BC
BT9661	891365.9	578985.5	985.128	HTBC
BT9662	891366.2	578985.5	985.075	HTBC EC
BT9663	891367.9	578985.6	984.89	HTBC E
BT9664	891368.2	578989.5	985.004	HTBC B
BT9665	891366.3	578989.7	985.195	HTBC BC
BT9666	891365.9	578989.8	985.207	HTBC
BT9667	891365.9	578990.1	985.201	HTBC EC
BT9668	891368.3	579089.9	985.421	HTBC
BT9669	891366.3	579090.2	984.956	HLIP
BT9670	891370.6	579185	985.691	HTBC BC
BT9671	891370.7	579185.4	985.667	HTBC
BT9672	891371	579185.5	985.654	HTBC EC
BT9673	891372.5	579185.4	985.548	HTBC E
BT9674	891372.8	579189.4	985.62	HTBC B
BT9675	891371.3	579189.5	985.732	HTBC BC
BT9676	891370.8	579189.7	985.763	HTBC
BT9677	891370.6	579190.2	985.746	HTBC EC
BT9678	891368.7	579187.7	985.339	HLIP
BT9679	891385.2	579194.4	985.934	TNG
BT9680	891386.9	579181.7	985.436	EPP
BT9681	891373	579285	986.084	HTBC
BT9682	891371.2	579285.1	985.657	HLIP
BT9683	891375.4	579385.1	986.66	HTBC BC
BT9684	891375.6	579385.6	986.605	HTBC
BT9685	891376	579385.8	986.638	HTBC EC
BT9686	891377.4	579385.7	986.591	HTBC E
BT9687	891377.5	579389.6	986.719	HTBC B
BT9688	891376.2	579389.6	986.755	HTBC BC
BT9689	891375.8	579389.7	986.767	HTBC
BT9690	891375.6	579390.3	986.758	HTBC EC
BT9691	891373.6	579387.6	986.244	HLIP
BT9692	891378.2	579382.6	986.26	S-CTR-LANE-TURN
BT9693	891384.7	579379.9	986.426	TNG
BT9694	891387.6	579396.3	986.349	EGW
BT9695	891388.8	579430.2	985.804	EGW
BT9696	891386.3	579439.3	986.804	TNG
BT9697	891373.9	579516.4	987.095	MHE
BT9698	891376.8	579516.1	986.936	HLIP
BT9699	891378.7	579516	987.363	HTBC
BT9700	891387.5	579532.3	987.32	TNG
BT9701	891378.5	579587.4	987.396	HLIP
BT9702	891380.3	579585	987.77	HTBC BC
BT9703	891380.5	579585.3	987.734	HTBC
BT9704	891381	579585.5	987.774	HTBC EC
BT9705	891382.3	579585.5	987.696	HTBC E
BT9706	891382.5	579589.4	987.784	HTBC B
BT9707	891381	579589.4	987.785	HTBC BC
BT9708	891380.7	579589.6	987.761	HTBC
BT9709	891380.5	579590.2	987.777	HTBC EC
BT9710	891387.5	579612.7	987.204	TNG
BT9711	891390	579672.9	986.959	EPP
BT9712	891383.8	579724.7	988.729	HTBC
BT9713	891381.8	579724.8	988.286	HLIP
BT9714	891388.2	579741.5	988.075	TNG
BT9715	891406.1	579735.7	986.426	TNG
BT9716	891448.9	579729.5	985.029	TNG
BT9717	891403.8	579587.4	985.353	TNG
BT9718	891432.8	579585.1	984.314	TNG
BT9719	891404.3	579519	985.265	TNG
BT9720	891401.4	579430.8	985.193	TNG
BT9721	891424	579429.4	984.118	TNG
BT9722	891399.5	579298.5	984.993	TNG
BT9723	891425.6	579295.1	983.748	TNG
BT9724	891399.2	579187.9	984.265	TNG
BT9725	891425.9	579185.3	983.251	TNG
BT9726	891398.3	579064	983.965	TNG
BT9727	891399.1	578952.9	983.814	TNG
BT9728	891424.6	578952.4	982.847	TNG
BT9729	891395.9	578813.5	983.132	TNG
BT9730	891395.6	578676	982.928	TNG
BT9731	891424	578675.9	982.22	TNG
BT9732	891436.5	579751.9	984.716	TNG
BT9733	891384.1	579763.4	988.928	HEC B
BT9734	891388.9	579763.3	988.956	HEC
BT9735	891389.1	579788.3	989.196	HEC
BT9736	891384.2	579788.4	989.113	HEC C
BT9737	891384.3	579788.4	988.912	HTBC E
BT9738	891384.2	579788.5	988.915	HTBC E
BT9739	891382.2	579788.7	988.604	HLIP E
BT9740	891398.3	579767.3	987.753	HIC B
BT9741	891398.6	579767.4	987.721	HIC1 B
BT9742	891401.4	579767.2	987.565	HIC1
BT9743	891403.7	579763.1	986.539	HIC1
BT9744	891395.2	579766.9	987.906	HIC
BT9745	891396.7	579757.8	986.867	HIC
BT9746	891403.7	579757.1	986.386	HIC
BT9747	891405.2	579759.8	984.269	HIC-FL
BT9748	891476.5	579756.6	986.508	HIC
BT9749	891478.2	579762.2	986.036	HIC1
BT9750	891479.2	579759.4	984.001	HIC-FL
BT9751	891484.2	579740.8	984.921	TNG
BT9752	891484.1	579752.5	984.604	TNG
BT9753	891552.4	579756.8	986.316	HIC

BT9754	891554.2	579762.2	986.081	HIC1
BT9755	891554.4	579759.4	984.132	HIC-FL
BT9756	891556.2	579751.6	984.584	TNG
BT9757	891558.8	579731.3	984.803	TNG
BT9758	891610.6	579756.8	986.276	HIC E
BT9759	891611.6	579762.3	986.183	HIC1 E
BT9760	891612.4	579759.4	984.274	HIC-FL E
BT9761	891601.3	579752	985.348	TNG
BT9762	891611.5	579663	984.418	TNG
BT9763	891613.5	579590.5	984.448	TNG
BT9764	891612.7	579352.5	983.813	TNG
BT9765	891608.4	579196.5	983.528	TNG
BT9766	891527.5	579220.8	983.471	TNG
BT9767	891527	579328.6	983.561	TNG
BT9768	891527.3	579442.2	983.855	TNG
BT9769	891438.2	581090.5	997.458	HTBC B BC
BT9770	891432.5	581092.1	996.836	HTBC
BT9771	891438	581093.8	997.011	HTBC EC
BT9772	891435.9	581092.7	997.083	EJB
BT9773	891439.8	581091.9	997.254	S-MERGE
BT9774	891443.6	581092.2	997.182	EJB
BT9775	891457.4	581092.2	997.392	ELP
BT9776	891461.8	581092.3	997.356	EJB
BT9777	891524.4	581093.7	997.369	HTBC
BT9778	891619.7	581093.7	997.082	HTBC
BT9779	891619.4	581090.6	997.28	HTBC
BT9780	891524.6	581090.6	997.453	HTBC C
BT9781	891606.5	581134.4	995.864	HLIP B
BT9782	891606.8	581136.4	996.359	HTBC B
BT9783	891558.2	581136.4	996.525	HTBC
BT9784	891552.1	581136.4	996.09	HTBC
BT9785	891558.1	581136.5	996.463	HEC B
BT9786	891558	581141.3	996.71	HEC
BT9787	891506.5	581141.3	996.841	HEC
BT9788	891506.3	581136.4	996.654	HEC E
BT9789	891512.3	581136.3	996.185	HTBC
BT9790	891506.2	581136.3	996.6	HTBC
BT9791	891529.2	581134.3	996.095	HLIP
BT9792	891511.9	581141.4	996.59	ROEA B
BT9793	891510.9	581156.2	994.77	O-CATCH-BASIN-COR
BT9794	891510.9	581158.9	994.89	O-CATCH-BASIN-COR
BT9795	891508.2	581159	994.792	O-CATCH-BASIN-COR RECT
BT9796	891511.7	581211.6	995.14	ROEA
BT9797	891513.4	581304	995.27	ROEA
BT9798	891552.4	581304.2	995.503	ROEA E
BT9799	891509.1	581326.7	995.778	FCL B
BT9800	891508.5	581273.2	995.347	FCL E
BT9801	891509	581216.8	995.2	TOE B
BT9802	891485.5	581245.4	995.647	TOE
BT9803	891499.6	581256.4	995.44	FCL B
BT9804	891466.6	581246.7	995.548	TOE
BT9805	891428.5	581236	996.325	TOE
BT9806	891417.3	581223.2	996.281	TOE
BT9807	891417.5	581168.8	996.052	TOE
BT9808	891432.3	581151.8	996.667	TOE
BT9809	891485	581151.5	997.096	TOE
BT9810	891506.7	581153.3	995.673	TOE
BT9811	891505.8	581168.7	995.168	TOE
BT9812	891465.4	581187.8	995.404	TOE
BT9813	891472.1	581199.4	995.442	TOE
BT9814	891508	581185	995.255	TOE C
BT9815	891490.7	581225.6	997.545	TOP B
BT9816	891470.9	581231	998.282	TOP
BT9817	891429.1	581228.8	997.851	TOP
BT9818	891426.3	581217.5	997.957	TOP
BT9819	891459.1	581217.2	998.443	TOP
BT9820	891484.6	581205.5	997.83	TOP C
BT9821	891479.5	581158.8	998.501	TOP B
BT9822	891480.2	581166.4	998.266	TOP
BT9823	891456.4	581169.8	999.039	TOP
BT9824	891427.7	581184.9	998.312	TOP
BT9825	891425.7	581177.2	999.202	CRBR-21081-ROPE
BT9826	891428	581166	999.199	TOP
BT9827	891435.9	581160.1	999.251	TOP
BT9828	891457.5	581157.1	998.626	TOP C
BT9829	891441.9	581167.5	998.977	ETJ
BT9830	891433.2	581164.7	999.235	ETJ
BT9831	891438.2	581152.2	997.139	ETSP ELP
BT9832	891437.7	581144	997.011	MHU-IRRIGATION
BT9833	891445.9	581134.7	996.139	HLIP BC
BT9834	891446	581136.4	996.58	HTBC BC
BT9835	891423.1	581144	996.124	HTBC
BT9836	891421.7	581142.8	996.196	HLIP
BT9837	891425.7	581148.1	996.414	ETSB
BT9838	891410.1	581171.6	996.278	HTBC EC
BT9839	891408.2	581171.7	995.894	HLIP EC
BT9840	891399.5	581174.8	995.883	MHSD
BT9841	891410.2	581171.7	996.263	HEC B
BT9842	891410.3	581185.8	996.13	HEC
BT9843	891415.1	581185.8	996.083	HEC RECT
BT9844	891409.3	581179	995.776	O-CL-15_-SCUPPER
BT9845	891420.5	581157	996.9	HEC B
BT9846	891414.6	581154.7	996.523	HEC BC
BT9847	891422.4	581144.6	996.127	HEC

BT9848	891434.5	581138.3	996.861	HEC EC
BT9849	891435.9	581145	996.699	HEC C
BT9850	891425.5	581225.4	998.15	EPP EOHV1 B
BT9851	891435.8	581256.8	996.177	FCL
BT9852	891401.3	581252.2	995.767	MHSD
BT9853	891411.2	581259	996.111	HTBC
BT9854	891409.2	581259.3	995.688	HLIP
BT9855	891430.1	581290.8	995.708	ETJ
BT9856	891427.8	581292.5	996.127	HEC B
BT9857	891427.7	581297.4	996.102	HEC
BT9858	891432.6	581297.6	996.111	HEC RECT
BT9859	891429.9	581294.9	995.783	ESAI-11499-W-VAN-BUREN
BT9860	891417.1	581307.1	996.327	ROEA B
BT9861	891425	581307	996.354	ROEA
BT9862	891425.8	581324.3	996.444	ROEA
BT9863	891417.3	581325	996.404	ROEA C
BT9864	891417.3	581329.9	996.444	HEC B
BT9865	891412.4	581330.1	996.4	HEC
BT9866	891412	581302.2	996.348	HEC
BT9867	891416.8	581302.1	996.404	HEC C
BT9868	891411.9	581302.1	996.319	HTBC
BT9869	891412	581308.1	995.954	HTBC
BT9870	891410.2	581316	995.996	HLIP
BT9871	891412.3	581324.1	996.047	HTBC
BT9872	891412.2	581330.1	996.429	HTBC
BT9873	891415.6	581350.8	996.291	EJB
BT9874	891420.4	581383.2	996.55	E-PVC-RISERS
BT9875	891436.7	581373.8	996.341	FCL
BT9876	891429.3	581472.1	996.398	EPP OHV1
BT9877	891414.4	581473.4	997.117	HTBC E
BT9878	891412.6	581473.7	996.741	HLIP E
BT9879	891412.5	581474.1	996.704	ROEA B
BT9880	891422.8	581497	996.202	S-RIGHT-TURN
BT9881	891421	581504.7	995.939	TNG
BT9882	891424.5	581571.3	996.201	TNG
BT9883	891402	581626.4	997.051	ROEA
BT9884	891439	581635.4	996.657	ROEA
BT9885	891440.7	581634.9	996.545	FCL E
BT9886	891439.3	581635.6	996.658	HEC B
BT9887	891449	581635.5	996.649	HEC
BT9888	891449.6	581682.1	996.644	HEC RECT
BT9889	891439.3	581682.3	996.682	ROEA
BT9890	891441.3	581682.8	996.704	FCL B
BT9891	891417.8	581680.6	996.416	ROEA
BT9892	891395.9	581689.3	997.653	ROEA
BT9893	891434	581718.5	996.55	EPP OHV1
BT9894	891441.5	581723.2	996.464	EGW
BT9895	891432.7	581757.9	996.546	EGW
BT9896	891404.7	581757.7	997.439	EGW
BT9897	891404	581765.1	997.454	EGW
BT9898	891391.1	581762.7	997.741	ROEA
BT9899	891404.8	581788.1	997.672	EPP EOHV1
BT9900	891416.9	581788.6	996.588	TNG
BT9901	891442.9	581783.6	996.245	FCL
BT9902	891435.5	581773.1	996.583	HEC B
BT9903	891432.7	581772.5	996.579	HEC
BT9904	891433.2	581769.8	996.531	HEC RECT
BT9905	891423.6	581814.2	996.695	TNG
BT9906	891404.2	581844.5	997.721	ETJ
BT9907	891392	581847.8	997.908	ROEA E
BT9908	891403.8	581854.8	997.59	EOHV1 E
BT9909	891444.4	581842.1	996.915	FCL
BT9910	891514.5	581840.4	997.245	FCL E
BT9911	891475	583578.5	1001.932	WHW B
BT9912	891475	583577.1	1001.937	WHW
BT9913	891471.9	583577.1	1001.926	WHW
BT9914	891471.7	583572.3	1001.926	WHW
BT9915	891474.9	583572.1	1001.895	WHW
BT9916	891474.9	583570.6	1001.912	WHW E
BT9917	891472.3	583574.4	999.537	PRCP-30"
BT9918	891443	583575.1	1000.808	MHU-IRRIGATION
BT9919	891458.2	583563.7	1000.623	ROGDR B
BT9920	891525.9	583562.3	1001.13	ROGDR
BT9921	891627	583561.9	1001.719	ROGDR E
BT9922	891630.5	583562.5	1001.75	ROEA B
BT9923	891630.7	583565.2	1001.267	TOP B
BT9924	891526.2	583565.8	1000.834	TOP
BT9925	891526	583562.9	1001.059	ROEA
BT9926	891461.1	583564.4	1000.186	ROEA E
BT9927	891459.7	583563.1	1000.637	HTBC B BC
BT9928	891459.5	583561.2	1000.591	HLIP B
BT9929	891442.8	583561.4	1000.44	HLIP
BT9930	891435.2	583561.7	1000.233	HLIP
BT9931	891428.5	583578.6	1000.381	HLIP
BT9932	891428.5	583593.6	1000.5	HLIP
BT9933	891437.7	583573.6	1000.27	HTBC
BT9934	891430.5	583593.6	1000.856	HTBC EC
BT9935	891434.2	583594.8	1001.346	EPP EOHV1 B
BT9936	891440.1	583601.7	1002.779	WHW B
BT9937	891441.4	583601.6	1002.633	WHW
BT9938	891441.4	583598.6	1002.655	WHW
BT9939	891444.9	583598.5	1002.61	WHW
BT9940	891445	583601.6	1002.701	WHW
BT9941	891446.5	583601.6	1002.623	WHW E

BT9942	891486.7	583566.8	1000.505	TOP E
BT9943	891480	583579.7	1000.771	TOP B
BT9944	891548.2	583580.3	1001.342	TOP
BT9945	891626.1	583578.5	1001.754	TOP E
BT9946	891634.8	583595.5	1001.54	ROGD B
BT9947	891635.6	583605.5	1000.855	TNG
BT9948	891541.4	583605.4	1000.651	TNG
BT9949	891540.4	583596.7	1001.132	ROGD
BT9950	891467.2	583601.8	1001.348	ROGD
BT9951	891436.3	583582.7	1000.913	ROGD E
BT9952	891460	583612.9	1000.635	TNG
BT9953	891434.7	583621.7	1000.895	EGW
BT9954	891434.6	583647.5	1001.201	EPP EOHV
BT9955	891430.2	583653.1	1000.995	HTBC
BT9956	891428.2	583653.5	1000.371	HLIP
BT9957	891436.5	583654.3	1000.822	TNG
BT9958	891442.7	583654.9	1000.328	TNG
BT9959	891536.7	583655.6	1000.553	TNG
BT9960	891641.6	583655.4	1000.701	TNG
BT9961	891642.2	583800.5	1001.017	TNG
BT9962	891538.4	583801.5	1000.875	TNG
BT9963	891440.8	583802.8	1000.882	TNG
BT9964	891436	583793.9	1001.333	EPP EOHV
BT9965	891429.5	583743.7	1001.472	HTBC E
BT9966	891427.6	583743.6	1000.924	HLIP E
BT9967	891429	583743.9	1000.973	ROEA B
BT9968	891428.4	583800.4	1001.163	ROEA
BT9969	891434.3	583800.7	1000.936	TNG
BT9970	891434.8	584016.7	1001.937	EPP EOHV
BT9971	891427.9	584020.1	1001.956	ROEA
BT9972	891422	584052.5	1002.111	MHS
BT9973	891433.4	584021.5	1001.687	TNG
BT9974	891445.7	584021.3	1001.321	TNG
BT9975	891532.9	584021	1001.428	TNG
BT9976	891637.2	584020.5	1001.603	TNG
BT9977	891648.6	584243.5	1002.075	TNG
BT9978	891546	584243.4	1001.934	TNG
BT9979	891443.8	584241.6	1002.001	TNG
BT9980	891438.1	584242.5	1002.397	EPP EOHV
BT9981	891433.7	584242.4	1002.301	TNG
BT9982	891429.8	584245.1	1002.497	ROEA
BT9983	891437.6	584193.2	1002.073	UWFH
BT9984	891398.2	584195.1	1002.884	UWV
BT9985	891440	584432.8	1002.597	MHT
BT9986	891440.3	584466.5	1003.179	EPP EOHV
BT9987	891433.3	584472.8	1003.329	ROEA
BT9988	891438.6	584472.5	1002.78	TNG
BT9989	891450.8	584472.3	1002.565	TNG
BT9990	891538.7	584472.6	1002.684	TNG
BT9991	891645.5	584472.2	1002.94	TNG
BT9992	891655.9	584701.2	1003.689	TNG
BT9993	891550.6	584701.4	1003.376	TNG
BT9994	891455.2	584701.3	1003.339	TNG
BT9995	891442.8	584701.4	1003.73	TNG
BT9996	891436.9	584701.3	1004.077	ROEA
BT9997	891444.5	584694.3	1003.722	EPP EOHV
BT9998	891429.8	584551	1003.776	MHS
BT9999	891453.3	585187.8	1005.18	UWFH
CG0AK45G	891332.4	575221	973.903	ROCL
CG0AK45G	891376.9	575222.9	973.298	HLIP B
KR88001	891631.4	573533.6	983.129	TOP
KR88002	891632.6	573537.9	982.962	HEC B ROED B
KR88003	891633.5	573548.2	982.86	TOP1 B ROED1 B
KR88004	891626.5	573515.7	965.56	TOE
KR88005	891623.7	573483.6	965.492	TNG
KR88006	891622.2	573452.6	965.132	TNG
KR88007	891527.3	573457.9	965.235	TNG
KR88008	891533.4	573496.8	965.384	TNG
KR88009	891538.6	573527.2	965.927	TOE
KR88010	891442.9	573539.8	965.471	TOE E
KR88011	891444.3	573508.6	965.455	TNG
KR88012	891447.5	573457.5	964.638	TNG
KR88013	891471.7	573547.1	971.05	IRCP-36IN B
KR88014	891539.4	573546.3	982.517	TOP
KR88015	891539.9	573549.5	982.625	HEC ROED
KR88016	891541.4	573559.7	982.828	TOP1 ROED1
KR88017	891489.6	573568.3	982.452	TOP1 ROED1
KR88018	891472	573573.9	982.485	TOP1 BC ROED1 BC
KR88019	891459.1	573581	982.62	TOP1 ROED1
KR88020	891455.7	573596.6	983.581	TOP1 EC ROED1 EC
KR88021	891455.3	573613.3	984.576	TOP1 E ROED1 E
KR88022	891479.5	573557.2	982.157	ROED BC HEC
KR88023	891478.7	573554.1	982.039	TOP
KR88024	891463.8	573562.6	982.206	ROED
KR88025	891452.7	573570.8	982.512	ROED
KR88026	891446	573581.6	982.996	ROED
KR88027	891443.2	573599.1	984.008	ROED EC
KR88028	891442.1	573614.8	984.769	ROED E
KR88029	891427.2	573564.4	981.439	HEC E
KR88030	891426.8	573560.7	981.338	TOP E
KR88031	891425.6	573572.2	981.873	TOE B
KR88032	891434.5	573576	982.2	TOE
KR88033	891439.5	573583.7	982.706	TOE
KR88034	891441.2	573593	983.411	TOE

KR88035	891441.7	573604.7	984.058	TOE
KR88036	891441.1	573615	984.802	TOE E
KR88037	891486.3	573588.3	975.739	WHW-8IN-CL B
KR88038	891486	573588.4	975.921	WHW-8IN-CL
KR88039	891478.5	573589.9	975.904	WHW-8IN-CL
KR88040	891471.3	573591.3	975.909	WHW-8IN-CL
KR88041	891471.2	573591.3	975.788	WHW-8IN-CL E
KR88042	891479.2	573590.7	971.993	IRCP-36IN E
KR88043	891477.9	573590.8	972.391	TOE B
KR88044	891478.8	573604	972.004	TOE
KR88045	891479.3	573617.3	972.747	TOE E
KR88046	891492.4	573604.9	972.695	TNG
KR88047	891549.9	573597.4	973.585	TNG
KR88048	891480.7	573590.2	972.196	TOE B
KR88049	891484.4	573589.2	973.519	TOE
KR88050	891489.6	573591.2	973.524	TOE
KR88051	891548.9	573585.7	973.748	TOE
KR88052	891635	573574.9	974.316	TOE E
KR88053	891637.5	573593.4	973.786	TNG
KR88054	891640.4	573603.9	973.745	CPC-LS33315-RED
KR88055	891397.4	574494.6	973.525	HLIP B ROEA B
KR88056	891596.3	574471.4	973.603	HTBC B
KR88057	891596.4	574473.4	973.23	HLIP1 B
KR88058	891596.1	574495.8	973.771	ROEA1 B
KR88059	891596.8	574520.7	973.277	ROEA2 B HLIP2 B
KR88060	891597.1	574522.7	973.73	HTBC2 B
KR88061	891595.7	574546.2	973.425	TNG
KR88062	891594.4	574565.5	972.921	TOP B
KR88063	891595.2	574579	971.589	TFL B
KR88064	891596.5	574591.5	973.316	TOP1 B
KR88065	891572.9	574531.4	973.898	EJB
KR88066	891574.4	574529.2	974.269	ELP
KR88067	891555.2	574573.6	973.18	TOP
KR88068	891519.1	574582.2	972.895	TOP
KR88069	891511.8	574578	972.733	TOP
KR88070	891497.9	574565.3	973.116	TOP
KR88071	891477.3	574562.5	973.099	TOP
KR88072	891455.4	574565.5	972.968	TOP
KR88073	891443	574579.8	973.257	TOP
KR88074	891434.7	574604.6	973.487	TOP
KR88075	891553.8	574589.1	971.799	TFL
KR88076	891532.4	574596.1	972.1	TFL
KR88077	891518.9	574597.3	972.186	TFL
KR88078	891495.4	574600.4	969.282	TFL E TOE B TOE1 B
KR88079	891488.6	574595.2	969.094	TOE
KR88080	891474.7	574592.1	969.013	TOE
KR88081	891461.9	574594.6	968.945	TOE
KR88082	891456.2	574604.8	969.245	TOE
KR88083	891474.9	574605.7	968.843	TNG
KR88084	891494.9	574608.5	969.127	TOE1
KR88085	891558.9	574599.7	973.246	TOP1
KR88086	891537.2	574609.8	973.37	TOP1
KR88087	891521	574622.6	973.134	TOP1
KR88088	891546	574623.4	973.375	TNG
KR88089	891586.6	574618.1	973.629	TNG
KR88090	891578.9	574714.9	973.767	TNG
KR88091	891529.8	574713.6	973.29	TNG
KR88092	891514.6	574701.7	972.86	TOP1
KR88093	891509.9	574721.5	972.634	TOP1
KR88094	891497.1	574735.7	972.813	TOP1
KR88095	891487.2	574755.8	972.415	TOP1
KR88096	891483.2	574778.5	972.528	TOP1
KR88097	891503.4	574778	972.988	TNG
KR88098	891546.6	574777.7	973.624	TNG
KR88099	891580.1	574779	973.636	TNG
KR88100	891432.3	574674	972.82	TOP
KR88101	891432	574706	972.914	TOP
KR88102	891432	574725	972.78	TOP
KR88103	891435.5	574737.6	972.805	TOP
KR88104	891465.7	574745.9	972.739	TOP
KR88105	891460.6	574760	973.289	TOP
KR88106	891459.5	574775.5	973.315	TOP
KR88107	891455.8	574676.4	968.915	TOE
KR88108	891473.9	574678.7	968.656	TNG
KR88109	891494	574680.2	968.745	TOE1
KR88110	891492.6	574698.1	968.914	TOE1
KR88111	891491	574710.8	969.319	TOE1
KR88112	891454.4	574700.8	968.989	TOE
KR88113	891457.8	574714.8	968.959	TOE
KR88114	891477.8	574717.3	969.448	TFL B TOE E TOE1 E
KR88115	891476.3	574728.2	970.078	TFL
KR88116	891475.3	574743.4	970.917	TFL
KR88117	891475.2	574777.6	971.687	TFL
KR88118	891432.9	574774.1	973.092	TNG
KR88119	891404.4	574773.6	973.305	TNG
KR88120	891406.6	574720.1	973.399	TNG
KR88121	891408.4	574653.4	973.576	TNG
KR88122	891415.6	574652.4	974.153	EJB
KR88123	891410.7	574609.6	973.762	TNG
KR88124	891414.8	574545.9	973.991	TNG
KR88125	891427	574571.2	974.731	HEC8 B
KR88126	891427.1	574571.2	974.688	HEC8 B
KR88127	891426.7	574575.2	974.647	HEC8
KR88128	891432.9	574575.7	974.633	HEC8

KR88129	891433.3	574571.7	974.688	HEC8 C
KR88130	891433	574578.7	974.552	HEC8 B
KR88131	891432.9	574582.7	974.57	HEC8
KR88132	891426.6	574582.7	974.63	HEC8
KR88133	891426.6	574578.6	974.583	HEC8 C
KR88134	891429.1	574580.7	972.958	ECSB DNC
KR88135	891429.2	574573.5	972.86	ECSB DNC
KR88136	891442.4	574579.1	973.386	ECR-4-4IN-POWER-?
KR88137	891440.7	574569.9	973.441	ECR-4-4IN-POWER-?
KR88138	891442.2	574560.3	973.652	TNG
KR88139	891468.1	574542.6	973.583	TNG
KR88140	891445.6	574545.4	974.395	UWM
KR88141	891431.5	574539.8	974.041	ETPED
KR88142	891428	574536.2	974.101	TNG
KR88143	891439.1	574528.8	974.805	UWFH
KR88144	891461.9	574529.4	973.994	TNG
KR88145	891496	574521.9	974.272	HTBC2
KR88146	891496	574520	973.857	HLIP2 ROEA2
KR88147	891498	574494.9	974.269	ROEA1
KR88148	891497.1	574472.7	973.636	HLIP1
KR88149	891497.2	574470.8	973.994	HTBC
KR88150	891435.5	574470.4	974.136	HTBC E
KR88151	891435.5	574472.4	973.75	HLIP1 E
KR88152	891435.5	574493.4	974.005	ROEA1
KR88153	891435.1	574495.5	974.05	HLIP1 B ROEA1
KR88154	891404.4	574494.7	973.584	HLIP1 ROEA1
KR88155	891403.7	574519.5	973.643	HLIP1 ROEA1
KR88156	891433	574519.6	974.191	HLIP1 E ROEA1 E HLP2 E ROEA2 E
KR88157	891433.1	574521.5	974.582	HTBC2 BC
KR88158	891408.3	574531.5	974.379	HTBC2
KR88159	891397.7	574558.2	974.196	HTBC2 EC
KR88160	891395.6	574558.1	973.769	HLIP ROEA
KR88161	891439.2	574511.1	974.326	UWV
KR88162	891446.6	574511.3	974.264	UWV
KR88163	891425.1	574565.2	973.988	CPC-LS37936-ORANGE
KR88164	891447.9	574495.5	974.253	CPK-LS33315-WASHER
KR88165	891362.1	574494.9	973.253	CBCHH-VAN-BUREN-127TH
KR88166	891362	574497.2	973.966	ROCL B
KR88167	891360.3	574554.7	974.173	ROCL
KR88168	891357.4	574654.2	974.434	ROCL
KR88169	891392.8	574656.2	973.911	ROEA E HLIP
KR88170	891394.9	574656.2	974.317	HTBC2 E HTBC B
KR88171	891391.6	574769.2	974.608	HTBC
KR88172	891389.7	574769.3	974.169	HLIP
KR88173	891354.3	574769	974.674	ROCL
KR88174	891351.3	574869.8	974.753	ROCL
KR88175	891386.7	574871.8	974.181	HLIP
KR88176	891388.7	574871.9	974.655	HTBC
KR88177	891398.1	574852.6	974.685	EJB
KR88178	891396.5	574853.9	974.56	ELP
KR88179	891397.4	574872.6	974.096	TNG
KR88180	891419.5	574872.1	973.272	TNG
KR88181	891455.8	574872.6	973.338	TOP
KR88182	891471.4	574872.7	971.857	TFL
KR88183	891481.4	574872.9	973.48	TOP1
KR88184	891509.9	574874.8	973.577	TNG
KR88185	891593.7	574873.1	973.553	TNG
KR88186	891593.2	574977.5	973.632	TNG
KR88187	891510.7	574980.5	973.377	TNG
KR88188	891477.5	574979.9	973.282	TOP1
KR88189	891468.2	574979.3	971.973	TFL
KR88190	891452.7	574978.1	972.995	TOP
KR88191	891417	574977.3	972.974	TNG
KR88192	891389.9	574977.4	974.059	TNG
KR88193	891385.7	574977.2	974.431	HTBC
KR88194	891383.7	574977.2	974.006	HLIP
KR88195	891348.2	574977.2	974.451	ROCL
KR88196	891345.5	575074.2	974.185	ROCL
KR88197	891380.9	575075.5	973.683	HLIP
KR88198	891382.8	575075.5	974.128	HTBC
KR88199	891392.1	575075.5	973.411	TNG
KR88200	891390.7	575053.5	974.388	ELP
KR88201	891392.4	575051.8	974.343	EJB
KR88202	891420.9	575068.4	974.497	HEC B
KR88203	891420.7	575072.5	974.508	HEC
KR88204	891427	575072.7	974.573	HEC
KR88205	891427.2	575068.7	974.526	HEC C
KR88206	891423.4	575070.6	972.41	ECSB DNC
KR88207	891413.8	575113.2	972.318	ECSB DNC
KR88208	891417.7	575111.3	974.469	HEC B
KR88209	891417.5	575115.4	974.532	HEC
KR88210	891411.3	575115	974.445	HEC RECT
KR88211	891411	575118.5	974.209	HEC B
KR88212	891414.4	575118.8	974.176	HEC
KR88213	891414.1	575122.2	974.244	HEC RECT
KR88214	891412.5	575120.5	976.23	ETRN DNC
KR88215	891381.7	575154.2	974.186	U-CP-TEST-HANDHOLE
KR88216	891424.1	575088.7	974.211	TNG
KR88217	891446	575088.3	972.854	TOP
KR88218	891461.7	575089	971.879	TFL
KR88219	891472.4	575089.4	972.719	TOP1
KR88220	891503.1	575091.3	973.523	TNG
KR88221	891590.3	575093.3	973.962	TNG
KR88222	891591.1	575190.7	974.088	TNG

KR88223	891492.6	575195.6	973.535	TNG
KR88224	891467.5	575164.9	972.482	TOP1
KR88225	891465.1	575180.3	972.597	TOP1
KR88226	891455.7	575196.1	972.964	TOP1
KR88227	891445.9	575164.2	972.773	TOP
KR88228	891460.5	575164.3	972.027	TFL
KR88229	891458.8	575179.7	972.17	TFL
KR88230	891452.1	575178.5	972.648	TOP
KR88231	891447.8	575186	972.765	TOP
KR88232	891452.5	575190.2	972.591	TFL
KR88233	891435.1	575213.3	973.028	TOP1
KR88234	891431	575208.5	972.623	TFL
KR88235	891426.8	575202.1	972.964	TOP
KR88236	891392.9	575223	973.342	TOP
KR88237	891385.1	575223.1	973.402	TOP E
KR88238	891392.5	575231.5	972.764	TFL
KR88239	891384.8	575231.6	972.827	TFL E
KR88240	891393.2	575238.4	973.204	TOP1
KR88241	891384.7	575239.1	973.452	TOP1 E
KR88242	891416.4	575194.1	973.113	TNG
KR88243	891416.8	575189.9	973.289	ECR-4-4IN-POWER-?
KR88244	891416	575180.8	972.596	ECR-4-4IN-POWER-?
KR88245	891399.1	575189.9	973.277	TNG
KR88246	891379.6	575191	973.872	HTBC E
KR88247	891377.7	575190.9	973.436	HLIP E
KR88248	891340.1	575190.1	974.016	ROCL E
KR88249	891359.5	575792.2	973.163	MHS
KR88250	891350.8	575800	973.352	MHS
KR88251	891349.7	575809.6	973.418	MHS
KR88252	891368	575810.3	973.287	MHS
KR88253	891324.5	575813.5	973.267	CBCHH-EL-MIRAGE-VAN-BUREN
KR88254	891324.5	575815.6	973.758	ROCL B
KR88255	891318.3	575819.5	973.617	UWV
KR88256	891332.5	575826.4	973.71	UWV
KR88257	891373.6	575842.4	973.287	U-CP-TEST-HANDHOLE
KR88258	891387.5	575837.5	973.171	U-CP-TEST-HANDHOLE
KR88259	891405.9	575856	973.164	UWM-RECLAIMED
KR88260	891406.4	575840	973.05	UWV-RECLAIMED
KR88261	891417.2	575825.3	973.096	UWV
KR88262	891556.4	575812.7	973.887	ROCL1 B
KR88263	891556.5	575839.6	973.478	ROEA
KR88264	891556.3	575844	973.383	TNG
KR88265	891556.4	575847.2	973.669	FTS B
KR88266	891561.5	575851.7	972.8	TOE B
KR88267	891553	575847.1	973.917	OMB
KR88268	891485.1	575847	973.45	FTS
KR88269	891485.5	575842.5	973.273	TNG
KR88270	891485.4	575839.4	973.283	ROEA
KR88271	891484.6	575812.1	973.671	ROCL1
KR88272	891432.8	575812.8	973.428	ROCL1
KR88273	891390	575813.9	973.376	ROCL1 E
KR88274	891454.4	575842.1	973.153	ROEA
KR88275	891454.4	575844.6	973.235	TNG
KR88276	891454.9	575846.7	973.728	FTS
KR88277	891431.8	575866.8	973.915	FTS
KR88278	891425.1	575873.7	973.89	FTS
KR88279	891423.3	575871.8	973.165	TNG
KR88280	891413.8	575864.6	972.832	TNG
KR88281	891388.6	575895.3	972.848	TNG
KR88282	891395.9	575902.9	972.683	TNG
KR88283	891398.8	575904.7	973.485	FTS
KR88284	891382.7	575876.9	972.741	ETSB
KR88285	891379.2	575881.5	973.27	HTBW B
KR88286	891381	575872.2	973.335	HTBC B HTBW
KR88287	891381.2	575871.6	973.326	HTBW
KR88288	891388.3	575868.6	973.059	HTBW
KR88289	891388.8	575869.2	973.577	HTBC
KR88290	891392.8	575864.9	973.466	HTBC
KR88291	891392.4	575864.5	973.201	HTBW
KR88292	891394.5	575857.9	973.334	HTBW
KR88293	891395.3	575857.8	973.449	HTBC E HTBW
KR88294	891399	575856.7	973.438	HTBW
KR88295	891402.9	575856.1	973.438	HTBW E
KR88296	891424.6	575847	973.048	ROEA
KR88297	891407.5	575849.9	972.982	ROEA
KR88298	891407.5	575848.8	973.033	ROEA E HLIP B
KR88299	891407.6	575850.8	972.922	HTBC B
KR88300	891402.7	575851.1	973.483	HTBC BC
KR88301	891402.6	575849	973.055	HLIP BC
KR88302	891392.9	575851.1	973.011	HLIP
KR88303	891393.6	575853	973.381	HTBC
KR88304	891385.7	575857.3	972.995	HTBC
KR88305	891384.5	575855.7	972.889	HLIP
KR88306	891378.5	575862	972.83	HLIP
KR88307	891380.1	575863.1	972.797	HTBC
KR88308	891376.2	575871.3	973.238	HTBC
KR88309	891374.4	575870.7	972.871	HLIP
KR88310	891372.5	575880.5	972.82	HLIP EC
KR88311	891374.4	575880.8	973.234	HTBC EC
KR88312	891365.8	575943.4	973.737	FTS
KR88313	891361.8	575942.7	972.941	TNG
KR88314	891373.9	575884.8	972.74	HTBC E
KR88315	891371.9	575884.7	972.803	HLIP E ROEA B
KR88316	891372.6	575884.8	972.775	ROEA

KR88317	891371.7	575890.1	972.683	ROEA
KR88318	891358.2	575943.7	973.184	ROEA
KR88319	891388.1	575865.2	973.214	ETSP
KR88320	891378.1	575899.1	972.684	TNG
KR88321	891326.5	575899.6	973.718	UWV
KR88322	891327.1	575905.5	973.737	MHW
KR88323	891326.4	575914.6	973.838	UWV
KR88324	891327.3	575942.7	973.843	ROCL
KR88325	891328.3	576040.2	974.081	ROCL
KR88326	891341.9	576010.3	973.923	ROEA
KR88327	891339.9	576010.4	973.844	ROEA
KR88328	891355.2	575999.2	973.62	EPP EOH B
KR88329	891354.3	576018.1	973.499	EGW
KR88330	891354.5	576046.2	973.681	EPP EOH
KR88331	891340.1	576041.3	973.99	ROEA
KR88332	891358.5	576041.3	973.459	TNG
KR88333	891366.3	576041.7	973.394	FTS
KR88334	891361.5	576136.8	972.714	TNG
KR88335	891347.3	576137.9	973.76	TNG
KR88336	891340.9	576138.1	974.108	ROEA
KR88337	891354.9	576103.7	974.11	ET-MARKER-FIBER
KR88338	891329.4	576139.6	974.293	ROCL
KR88339	891329.9	576237.5	974.557	ROCL
KR88340	891341.9	576237.5	974.37	ROEA
KR88341	891351.5	576237.3	974.296	TNG
KR88342	891359.2	576224.9	973.607	TNG
KR88343	891356.2	576156.9	973.402	U-CP-TEST-HANDHOLE
KR88344	891368.2	576236	973.798	ROED B
KR88345	891367.8	576248.6	973.814	ROED1 B
KR88346	891438.1	576246.8	973.723	ROED1
KR88347	891437.6	576238.4	973.533	ROED
KR88348	891512.9	576239.9	973.882	ROED E
KR88349	891513.1	576248.4	973.843	ROED1 E
KR88350	891514.3	576252.3	973.53	TOE1 B
KR88351	891515.3	576269.8	973.472	TOE2 B
KR88352	891516.1	576273.9	974.205	FW B
KR88353	891515.6	576260.9	973.284	TNG
KR88354	891519.1	576275.9	974.356	EOH2 B
KR88355	891495.9	576276.3	974.168	EPP EOH2
KR88356	891449	576274.1	974.231	FW
KR88357	891449	576270.4	973.338	TOE2
KR88358	891448.1	576260.1	973.073	TNG
KR88359	891446	576250.1	973.209	TOE1
KR88360	891371.1	576255.2	973.41	TOE1
KR88361	891373.5	576269.9	973.419	TOE1 E TOE2 E
KR88362	891379.7	576262.8	973.137	TNG
KR88363	891368.2	576273.8	973.875	FW
KR88364	891374.2	576274.5	973.737	EGW
KR88365	891388.3	576275.4	973.911	EPP EOH2
KR88366	891367.9	576250.6	973.787	FW
KR88367	891385.3	576250.8	973.629	FW E FGP B
KR88368	891385.9	576234.7	973.62	FGP E FW B
KR88369	891367.7	576234.5	973.804	FW
KR88370	891355.4	576275.7	974.335	EOH EOH2 E
KR88371	891352.2	576277.6	974.434	ETPED
KR88372	891355.5	576284.6	974.594	EPP EOH E
KR88373	891367.9	576278.2	973.976	CPC-LS33880-ORANGE
KR88374	891365.1	576277.1	973.939	ECR-1IN
KR88375	891361.7	576278.7	973.769	ECR-1IN
KR88376	891505.5	576225.3	972.923	TOE2 B
KR88377	891440.4	576226.7	972.97	TOE2
KR88378	891377.9	576228.1	973.192	TOE2
KR88379	891371.7	576217.8	973.186	TOE2
KR88380	891370.4	576143	972.858	TOE2
KR88381	891436.7	576144	972.763	TNG
KR88382	891498.9	576143.7	972.781	TNG
KR88383	891367	576146.9	973.22	FW
KR88384	891369.6	576065.2	973.095	TOE2
KR88385	891366.7	576062.4	973.512	FW
KR88386	891366.5	576061.4	973.569	FTS
KR88387	891417.4	576065.9	972.919	TOE2
KR88388	891417.3	576062.4	973.578	FW
KR88389	891477.7	576062.8	973.443	FW E
KR88390	891478.5	576066.4	973.103	TOE2 E
KR88391	891478.7	576060.1	972.924	TOE2 B
KR88392	891411.8	576059.3	972.929	TOE2
KR88393	891369.4	576059	973.241	TOE2
KR88394	891341.9	576275.1	974.482	ROEA E
KR88395	891329.6	576275.8	974.601	ROCL E
KR88396	891368.7	576009.5	972.456	TOE2
KR88397	891367.9	575944.9	973.036	TOE2
KR88398	891410.2	575896.5	972.616	TOE2
KR88399	891456.2	575850.2	972.934	TOE2 E TOE E
KR88400	891508.3	575852.4	972.728	TNG
KR88401	891503.9	575897.6	972.422	TNG
KR88402	891537.1	575885.8	972.553	TNG
KR88403	891443	575907.9	972.539	TNG
KR88404	891442	575972.4	972.544	TNG
KR88405	891439.7	576021	972.601	TNG
KR88406	891394.5	576045.8	972.669	TNG
KR88407	891522.6	575991	972.762	TNG
KR88408	891419.1	577191.2	975.917	TNG
KR88409	891406.6	577189.3	975.667	TNG
KR88410	891391.5	577190.2	976.586	TNG

KR88411	891409.5	577257.8	976.383	EOH B EOH1 B
KR88412	891383.6	577141.4	976.453	HTBC B HTBW B
KR88413	891388.5	577141.2	976.597	HTBW
KR88414	891388.7	577146.4	976.608	TC B HTBW
KR88415	891394.6	577146.4	976.692	HTBW
KR88416	891395	577183.5	976.863	HTBW
KR88417	891390.1	577191.8	976.682	HTBW E
KR88418	891388.9	577176.6	976.727	TC E
KR88419	891384.1	577191.8	976.645	HTBC E
KR88420	891395	577173.5	976.756	ROED B
KR88421	891394.9	577153.9	976.679	ROED1 B
KR88422	891462.9	577134.5	975.712	FTS B
KR88423	891463	577141.9	975.106	FTS
KR88424	891463.9	577182.5	975.462	FTS
KR88425	891464.2	577189.5	975.912	FTS
KR88426	891480.7	577206.9	975.938	FTS E
KR88427	891442.9	577133.2	975.331	WBLK B
KR88428	891462.6	577133.3	975.717	WBLK E
KR88429	891581.4	577130	976.803	WBLK B DNC
KR88430	891474.7	577171.6	976.519	ROED
KR88431	891474.7	577153.8	976.68	ROED1
KR88432	891523.8	577161.3	976.499	ROED1
KR88433	891523.7	577176.1	976.415	ROED
KR88434	891510	577180.4	976.352	MHE
KR88435	891502.1	577188.7	975.731	TNG
KR88436	891479.3	577187.6	975.897	TNG
KR88437	891476.1	577178.3	975.175	TNG
KR88438	891484.8	577147.5	975.617	ECSB DNC
KR88439	891504	577149.2	975.301	TNG
KR88440	891523.1	577148.1	975.239	TNG
KR88441	891558.3	577131.3	975.366	TNG
KR88442	891581.7	577131.4	975.528	TNG
KR88443	891582.6	577151	975.287	TNG
KR88444	891583.2	577161.9	976.394	ROED1
KR88445	891584.1	577178.2	976.459	ROED
KR88446	891657.8	577178.8	976.276	ROED
KR88447	891657.5	577162.5	976.082	ROED1
KR88448	891657.4	577155.6	975.252	TNG
KR88449	891658.2	577130.2	975.558	TNG
KR88450	891747.7	577130.6	975.362	TNG
KR88451	891747.6	577129.6	976.384	WBLK DNC
KR88452	891747.2	577154	975.147	TNG
KR88453	891747.2	577161.1	975.989	ROED1
KR88454	891747.6	577179.1	976.055	ROED
KR88455	891841.5	577178.7	976.2	ROED
KR88456	891841	577161	976.119	ROED1
KR88457	891840.7	577155	975.493	TNG
KR88458	891840.2	577130.3	975.579	TNG
KR88459	891800.3	577259.1	975.06	EOH
KR88460	891927.7	577177.9	976.363	ROED E
KR88461	891927	577159.9	976.153	ROED1 E
KR88462	891927.1	577152.3	975.756	TNG
KR88463	891927.7	577130.4	975.697	TNG
KR88464	891927.7	577129.2	976.515	WBLK E
KR88465	892195.6	577262.9	976.645	EPP EOH
KR88466	892200.9	577273.4	975.539	EOH E
KR88467	892292.3	577219.7	977.001	EPP-LEG
KR88468	892317.8	577219.8	976.678	EPP-LEG
KR88469	892317.8	577194.3	977.165	EPP-LEG
KR88470	892292.4	577194.3	977.206	EPP-LEG
KR88471	892304.2	577191	975.324	EOH B
KR88472	892305.1	577222.8	975.43	EOH2 B
KR88473	891406.8	577221.8	975.595	EOH2
KR88474	891404.5	577189.1	975.875	EOH
KR88475	891286.6	577289.7	977.026	HTBC B
KR88476	891280.1	577290	977.212	HEC B
KR88477	891274.2	577291	977.367	HTBW B
KR88478	891272.8	577268.3	977.183	HTBW
KR88479	891278.6	577268.7	977.194	HEC
KR88480	891279.5	577249.6	977.131	HEC
KR88481	891273.6	577249	977.174	HTBW
KR88482	891277.3	577219.5	976.958	HTBW BC
KR88483	891283.2	577220	976.851	HEC BC
KR88484	891283.3	577210.3	976.816	HEC
KR88485	891277.5	577211.1	976.89	HTBW
KR88486	891273.2	577198.8	976.8	HTBW EC
KR88487	891278.7	577196.3	976.712	HEC EC
KR88488	891272.2	577183	976.653	HEC BC
KR88489	891266.9	577185.6	976.807	HTBW BC
KR88490	891262.3	577172.6	976.737	HTBW
KR88491	891267.7	577171.6	976.572	HEC
KR88492	891266.2	577160.9	976.624	HEC EC
KR88493	891260.4	577160.8	976.84	HTBW EC
KR88494	891285.5	577180.1	976.516	HTBC BC
KR88495	891281	577165	976.548	HTBC
KR88496	891267.8	577155.9	976.531	HTBC EC
KR88497	891266.3	577155.6	976.608	HTBC E HEC E TC B
KR88498	891260.4	577155.6	976.753	HXC B HTBW
KR88499	891260.4	577155	976.794	ROEA B HTBW
KR88500	891260.4	577124.3	976.252	ROEA1 B HTBW E
KR88501	891259.4	577155.4	977.146	HXC
KR88502	891231.8	577155.7	975.586	HXC BC
KR88503	891231.7	577155.1	975.2	ROEA BC
KR88504	891227.5	577156.6	975.223	ROEA

KR88505	891227.9	577157.1	975.355	HXC
KR88506	891226.5	577160.6	975.215	HXC EC
KR88507	891226	577160.6	974.849	ROEA EC
KR88508	891225.9	577205.9	972.735	ROEA
KR88509	891226.5	577205.9	973.12	HXC
KR88510	891226.4	577268.1	973.655	HXC
KR88511	891226.4	577269.2	973.429	HXC E
KR88512	891225.8	577269.2	973.285	ROEA E
KR88513	891202.5	577269.1	973.546	ROEA B
KR88514	891198.5	577269.4	973.615	ROEA
KR88515	891174.1	577269.5	974.097	ROEA
KR88516	891174.1	577268.1	974.185	ROEA BC
KR88517	891172.7	577265.4	974.047	ROEA
KR88518	891169.9	577264.8	974.028	ROEA EC
KR88519	891132.8	577264.7	974.006	ROEA
KR88520	891132.1	577264	974.084	ROEA
KR88521	891127.1	577245.4	976.676	ETRN DNC
KR88522	891132.1	577205.7	972.504	ROEA
KR88523	891132.7	577205	972.473	ROEA
KR88524	891163.9	577205	972.235	ROEA
KR88525	891198.3	577205.1	972.478	ROEA BC
KR88526	891201.6	577203.9	972.353	ROEA
KR88527	891202.7	577200.7	972.389	ROEA EC
KR88528	891202.7	577158.8	974.658	ROEA BC
KR88529	891201.5	577156.5	974.838	ROEA
KR88530	891199.9	577155.4	974.965	ROEA EC
KR88531	891199.3	577155.3	974.971	ROEA
KR88532	891193.2	577150.6	974.949	ROEA ROED B
KR88533	891193.8	577125.6	975.197	ROEA1 E ROED1 B
KR88534	891121.5	577128.7	976.093	ROED1 BC
KR88535	891105.9	577121.4	975.785	ROED1
KR88536	891094.3	577103.6	975.427	ROED1 EC
KR88537	891091.8	577087.8	975.295	ROED1 E
KR88538	891122.5	577142.7	976.688	ROED
KR88539	891051.9	577163.2	977.583	ROED E
KR88540	891052.7	577145.3	977.033	ROED B
KR88541	891062.3	577143.4	976.903	ROED BC
KR88542	891070.9	577136.4	976.74	ROED
KR88543	891074.7	577125.4	976.208	ROED EC
KR88544	891074	577086.9	975.487	ROED E
KR88545	891045.2	577181.4	980.553	TOP B TOP2 B
KR88546	891046.3	577176	980.413	TOP
KR88547	891046.9	577164.7	977.798	TOE B
KR88548	891077.8	577163.8	977.541	TOE
KR88549	891080.2	577172.2	979.831	TOP
KR88550	891124.7	577144.9	977.027	TOE
KR88551	891090.3	577169.1	979.615	TOP1 B TOP
KR88552	891125.2	577151.7	979.135	TOP
KR88553	891171.6	577146.6	976.179	TOE
KR88554	891170.3	577152	977.752	TOP
KR88555	891198	577155.7	975.287	TOE E
KR88556	891195.9	577158.4	976.446	TOP E
KR88557	891175.8	577186.2	971.94	TOE B
KR88558	891155.5	577181.8	971.336	TOE
KR88559	891138.9	577190.3	971.365	TOE
KR88560	891119.5	577201.4	972.234	TOE
KR88561	891121.6	577227.1	973.624	TOE
KR88562	891127	577266.2	974.946	TOE E
KR88563	891114.1	577270.7	978.283	ROED B
KR88564	891104.5	577272.2	978.332	ROED1 B
KR88565	891097.5	577260.4	980.176	EPP
KR88566	891096	577256.1	979.734	EOH1
KR88567	891096.3	577250.9	979.449	ROED
KR88568	891106.4	577244.9	979.318	ROED
KR88569	891080.3	577192.1	980.476	TOP1
KR88570	891088.9	577221.5	979.992	ROED TOP1
KR88571	891066.3	577203	980.078	ROED
KR88572	891069.8	577199.1	981.191	TOP1
KR88573	891059.2	577212.3	979.693	ROED1
KR88574	891038.7	577200.3	979.178	ROED1 E
KR88575	891041.6	577188.5	978.975	ROED E
KR88576	891049.6	577186.4	980.584	TOP1 E TOP2 E
KR88577	891043	577208.3	980.137	TOP B
KR88578	891061.9	577230.6	981.451	TOP
KR88579	891079.2	577249.1	982.841	TOP
KR88580	891081.6	577257.2	983.297	TOP
KR88581	891085.1	577270.2	984.363	TOP E
KR88582	890813.3	577260.6	975.623	EPP
KR88583	890812.4	577256.5	975.603	EOH1
KR88584	890527.4	577256.8	976.615	EOH1 E
KR88585	890528.5	577260.8	976.441	EPP
KR88586	890527	577222	976.45	EOH2 E
KR88587	890514.3	577218.4	978.071	EPP-LEG
KR88588	890539.7	577218.3	977.795	EPP-LEG
KR88589	890514.4	577193.1	978.113	EPP-LEG
KR88590	890525	577189.6	977.129	EOH E
KR88591	890539.8	577192.9	978.484	EPP-LEG
KR88592	890933.9	577242.9	975.431	TNG
KR88593	890934.8	577233.7	974.993	TNG
KR88594	890938.2	577207.4	976.948	TNG
KR88595	890986.3	577204.7	976.522	TNG
KR88596	890988.9	577228.1	975.882	TNG
KR88597	890992	577248	977.032	TNG
KR88598	891036.1	577247.5	977.097	TNG

KR88599	891036.2	577221.9	977.681	TNG
KR88600	891018	577198.6	977.075	TNG
KR88601	891014.3	577178.4	977.8	TNG
KR88602	890978.2	577175.5	977.615	TNG
KR88603	890940.7	577177.4	977.428	TNG
KR88604	891131	577285.4	979.594	OBC B DNC
KR88605	891131	577270.3	979.32	OBC DNC
KR88606	891171.5	577270.3	979.589	OBC E WBLK B DNC
KR88607	891202.6	577270	973.847	WBLK E DNC
KR88608	891225.8	577270	973.824	WBLK B DNC
KR88609	891257.2	577269.9	984.27	WBLK DNC
KR88610	891257.4	577296.3	977.173	WBLK E
KR88611	891265.3	577295.2	977.57	TOP B
KR88612	891288.6	577293.5	976.609	HLIP B
KR88613	891264.6	577245.1	979.072	TOP
KR88614	891261.8	577212.2	979.869	TOP
KR88615	891287.7	577180	976.106	HLIP
KR88616	891251.2	577176.8	978.885	TOP E
KR88617	891287.2	577099.4	975.796	HLIP E
KR88618	891274.6	577104.8	976.151	EOH B
KR88619	891190.8	577243.9	973.125	USC
KR88620	891155	577244.6	973.368	USC
KR88621	891274.2	577296.2	977.233	EOH E
KR88622	891391.6	579891.4	990.046	EPP EOH B
KR88623	891382.8	579892.4	989.278	HLIP B
KR88624	891384.7	579892.6	989.744	HTBC B
KR88625	891402.4	579892.8	989.205	TNG
KR88626	891496.9	579895.4	988.302	TNG
KR88627	891599.9	579895.9	988.096	TNG
KR88628	891603.5	579999.4	988.724	TNG
KR88629	891498.7	580001.7	989.189	TNG
KR88630	891488.2	580000.9	989.698	TOP B
KR88631	891493	580008.3	989.564	TOP
KR88632	891491.9	580037.4	989.716	TOP
KR88633	891479.9	580053.3	989.68	TOP
KR88634	891433.8	580055.1	990.185	TOP
KR88635	891431	580027.6	989.258	TOP
KR88636	891434.4	580025.2	989.145	TOP HTBC2 B HEC B
KR88637	891434.5	580011.4	989.147	TOP HTBC1 B HEC E
KR88638	891450.1	579999	989.104	TOP C
KR88639	891452	580011.3	985.772	TOE B
KR88640	891480.6	580011.3	985.425	TOE
KR88641	891477.4	580042.8	985.591	TOE
KR88642	891447.7	580043.1	985.918	TOE
KR88643	891441.4	580043.1	986.43	TOE
KR88644	891443.4	580031	985.951	TOE
KR88645	891450.3	580025	985.831	TOE C
KR88646	891431.8	580025.3	989.643	HTBC2
KR88647	891415.8	580025.5	989.941	HTBC2
KR88648	891431.6	580011.4	989.754	HTBC1
KR88649	891415.6	580011.6	989.995	HTBC1
KR88650	891409.9	580012.4	989.506	TC
KR88651	891409.7	580025	989.463	TC
KR88652	891385.3	579989.8	990.528	HTBC E
KR88653	891383.4	579989.9	990.136	HLIP E ROEA B
KR88654	891385.4	579989.8	990.18	ROEA
KR88655	891400.3	579992.9	989.928	ROEA E HLIP B
KR88656	891402.2	579992.9	989.927	HTBC B
KR88657	891402.2	579998	990.37	HTBC
KR88658	891409.3	579988.4	989.961	EC-J-BOX-FLAT
KR88659	891392.7	579986.1	989.506	EPP EOH
KR88660	891378.3	579979.9	990.134	MHE
KR88661	891402.3	580010.4	990.406	HTBC HEC B
KR88662	891408.3	580010.3	990.479	HEC
KR88663	891409.6	580011.8	990.54	HTBC1 E HEC
KR88664	891409.4	580025.7	990.496	HTBC2 E HEC
KR88665	891408.5	580027.6	990.521	HEC
KR88666	891402.4	580027.7	990.483	HEC E HTBC
KR88667	891401.8	580018.7	989.773	HFL E
KR88668	891400.4	580019.2	990.09	HLIP
KR88669	891464.3	580028.9	985.489	TNG
KR88670	891400.6	580101.5	990.497	HLIP
KR88671	891402.6	580101.9	990.982	HTBC
KR88672	891411.8	580102.1	990.833	TNG
KR88673	891428.4	580101.8	989.231	TNG
KR88674	891408.6	580139	991.189	UW-CP-TEST-HANDHOLE
KR88675	891501.7	580099.4	989.126	TNG
KR88676	891605.8	580093.5	989.085	TNG
KR88677	891610.5	580233.7	989.794	TNG
KR88678	891503.9	580230.2	990.025	TNG
KR88679	891435.9	580228.9	990.165	TNG
KR88680	891419.3	580226.4	990.884	EPP EOH
KR88681	891411.8	580227.9	991.568	TNG
KR88682	891403.3	580228.3	991.662	HTBC
KR88683	891401.4	580228.3	991.206	HLIP
KR88684	891355	580291.9	992.585	ROCL E
KR88685	891402.9	580477.6	992.918	HLIP
KR88686	891404.8	580477.5	993.324	HTBC
KR88687	891357	580478.3	993.847	ROCL E
KR88688	891420.2	580473.4	992.795	EPP EOH
KR88689	891415.2	580480.4	993.235	TNG
KR88690	891440.6	580475.1	991.307	TNG
KR88691	891509.3	580470.8	991.326	TNG
KR88692	891614.7	580467.4	990.949	TNG

KR88693	891622.8	580725.6	991.932	TNG
KR88694	891517	580726.3	992.168	TNG
KR88695	891444.3	580725.8	992.294	TNG
KR88696	891414.6	580727.1	995.007	TNG
KR88697	891406.3	580727	994.95	HTBC
KR88698	891404.3	580727.1	994.475	HLIP
KR88699	891420.7	580724.8	994.141	EPP EOH
KR88700	891370.8	580727.7	995.384	TA
KR88701	891392.9	580772.6	994.857	MHT
KR88702	891413.9	580781.4	995.195	SSL-45
KR88703	891417.9	580958.9	995.935	ECV
KR88704	891416.1	580978	996.361	UWBO
KR88705	891417.9	580979.8	996.434	HEC B
KR88706	891417.8	580976.1	996.568	HEC
KR88707	891414.9	580976.1	996.495	HEC
KR88708	891414.9	580979.8	996.57	HEC C
KR88709	891416.1	580985.7	996.627	UW-CP-TEST-HANDHOLE
KR88710	891407.8	580976.3	996.363	HTBC
KR88711	891405.9	580976.3	995.919	HLIP
KR88712	891374	580977.1	996.194	TA
KR88713	891422.3	580976.1	996.204	EPP EOH
KR88714	891420.7	580998.5	996.845	ETSB
KR88715	891424.6	581016.1	996.763	ETSB
KR88716	891420.2	581016.3	996.788	ETSB
KR88717	891428.1	581019.7	996.91	HEC B
KR88718	891428.2	581011.8	996.89	HEC
KR88719	891432.2	581011.9	996.863	HEC
KR88720	891432	581019.8	996.843	HEC C
KR88721	891429.9	581015.5	996.842	ETS-CNTL-CAB
KR88722	891445.2	581023.7	997.09	HEC B
KR88723	891447.2	581023.8	997.143	HEC
KR88724	891447.2	581028.6	996.899	HEC
KR88725	891445.3	581028.7	996.933	HEC C
KR88726	891442.8	581032.4	996.926	ECV-FIBER
KR88727	891446.1	581025.3	996.906	E-METER
KR88728	891415.8	581016.4	996.783	ETSP
KR88729	891408.1	581002.6	996.599	HTBC BC
KR88730	891406.1	581002.7	996.115	HLIP BC
KR88731	891411.5	581017.1	996.625	HTBC HTBW B
KR88732	891416.9	581013.5	996.915	HTBW
KR88733	891431.4	581029.7	996.987	HTBW
KR88734	891416.9	581029.1	996.512	HLIP
KR88735	891415.6	581024.7	996.466	HTBC
KR88736	891420.7	581030.4	996.522	HTBC
KR88737	891428.9	581035.1	996.902	HTBC
KR88738	891444.5	581038	996.849	HTBC EC
KR88739	891444.2	581039.9	996.388	HLIP EC
KR88740	891467.4	581011.2	996.389	ECV-QWEST
KR88741	891445.5	581007.5	996.867	UGV
KR88742	891441.6	581014.5	997.047	TNG
KR88743	891441	580974.6	996.091	TNG
KR88744	891476.1	580973.2	995.562	TNG
KR88745	891480.9	581024.4	996.815	TNG
KR88746	891421.2	580913.4	995.568	TNG
KR88747	891432.4	580902.2	993.514	TOP B TOP1 B
KR88748	891428.1	580899.9	994.372	TOP
KR88749	891424.5	580903.5	995.065	TOP
KR88750	891427	580910.1	995.068	TOP
KR88751	891432.1	580906.5	992.706	TFL B
KR88752	891446.4	580903.6	992.794	TNG
KR88753	891456.3	580931.7	991.737	TFL
KR88754	891459	580928.6	993.472	TOP1
KR88755	891453.3	580936.5	994.61	TOP
KR88756	891483.7	580960.5	994.389	TOP
KR88757	891487.8	580955.6	991.556	TFL
KR88758	891490.1	580952.2	993.713	TOP1
KR88759	891523.5	580971.2	993.621	TOP1
KR88760	891521	580975.8	991.553	TFL
KR88761	891518.7	580980.7	994.303	TOP
KR88762	891551.6	580994.6	994.541	TOP
KR88763	891553.2	580987.9	991.746	TFL
KR88764	891554.4	580982.9	993.46	TOP1
KR88765	891580.2	580986.8	993.69	TOP1
KR88766	891580.6	580991.1	991.943	TFL
KR88767	891581.1	580996	994.102	TOP
KR88768	891575.9	580977.7	992.765	TNG
KR88769	891532.2	580964.3	992.674	TNG
KR88770	891636.9	580977.3	992.79	TNG
KR88771	891638.4	580986.7	993.703	TOP1 E
KR88772	891638.6	580991.3	991.612	TFL
KR88773	891639.2	580995.9	993.482	TOP E
KR88774	891640.2	581021.3	995.814	EPP EOH2 B
KR88775	891639.7	581013.2	995.353	TNG
KR88776	891640.8	581038.2	996.088	HTBC2 B
KR88777	891640.8	581040.1	995.748	HLIP2 B
KR88778	891560.9	581040.1	996.066	HLIP2 E HLP E
KR88779	891560.7	581038.1	996.463	HTBC E HTBC2 E
KR88780	891560.1	581026.5	996.246	TNG
KR88781	891559.2	581012.5	996.045	TNG
KR88782	891523.5	581021.7	996.715	EPP EOH2
KR88783	891493.1	581021.1	996.544	EGW
KR88784	891469.8	581021.6	996.647	EPP EOH2
KR88785	891424.8	581021.3	996.654	EOH EOH2 E
KR88786	891424.7	581036.4	996.471	EOH E

KR88787	891404.7	581757.7	997.708	EGW
KR88788	891403.9	581764.7	997.652	EGW
KR88789	891432.5	581757.9	996.725	EGW
KR88790	891441.8	581723.5	996.498	EGW
KR88791	891439.1	581723.8	996.4	EGA
KR88792	891431.9	581704.6	996.294	EOH B
KR88793	891433.3	581724.4	996.286	EPP EOH
KR88794	891404.8	581790.7	997.961	EPP EOH
KR88795	891403.8	581845	997.797	ETPED
KR88796	891375.8	581862.7	998.395	ROCL B
KR88797	891392.5	581862.8	997.91	ROEA B
KR88798	891420.4	581862.6	997.443	TNG
KR88799	891452.1	581862.5	997.175	TNG
KR88800	891536.5	581850.8	997.145	TNG
KR88801	891613.5	581848.5	996.921	TNG
KR88802	891699.7	581857.6	997.266	TNG
KR88803	891715.9	581973.2	997.467	TNG
KR88804	891715.3	582031	997.569	TNG
KR88805	891717.2	582128.5	997.983	TNG
KR88806	891718.9	582251.9	998.059	TNG
KR88807	891726.7	582323.7	998.605	TNG
KR88808	891726.1	582330.1	998.32	WBLK B
KR88809	891639.2	582322.1	998.293	TNG
KR88810	891639.1	582330.7	997.912	WBLK
KR88811	891638.2	582299.6	997.529	TNG
KR88812	891542.6	582299.2	997.289	TNG
KR88813	891541.6	582331	997.831	WBLK
KR88814	891540.5	582315.6	997.972	TNG
KR88815	891477.3	582314.2	997.765	TNG
KR88816	891479.4	582331.3	998.505	WBLK E DNC
KR88817	891477.7	582330.8	998.076	TNG
KR88818	891459.6	582331.3	998.2	TNG
KR88819	891438.3	582331.1	998.11	HEC B HTBW B
KR88820	891444	582332.5	998.039	HTBW
KR88821	891438.8	582362.7	997.845	HTBW
KR88822	891432.9	582362.1	997.792	HEC
KR88823	891433.1	582325.9	996.998	UDCB
KR88824	891427.7	582332.2	997.44	HEC1 B
KR88825	891433.7	582328.4	997.255	HEC1 BC
KR88826	891435.2	582327.2	997.29	HEC1
KR88827	891435.7	582326	997.282	HEC1
KR88828	891435.3	582324.7	997.314	HEC1
KR88829	891434	582323.6	997.304	HEC1
KR88830	891431.9	582323.7	997.398	HEC1 EC
KR88831	891425.3	582327.4	997.676	HEC C
KR88832	891424.6	582305.6	998.183	TNG
KR88833	891409.1	582286.8	998.654	EGW
KR88834	891410.2	582266	998.497	EC-JBOX-FLAT
KR88835	891438.3	582267.5	997.824	TNG
KR88836	891459.8	582264.8	997.817	TNG
KR88837	891412.7	582176.9	997.929	TNG
KR88838	891458.2	582169.5	997.26	TNG
KR88839	891451.7	582040.4	997.459	TNG
KR88840	891531	582030.3	997.664	TNG
KR88841	891584.9	582029.5	997.65	TNG
KR88842	891438.6	581938.3	997.519	TNG
KR88843	891407.6	581941.4	997.677	TNG
KR88844	891393.7	581941.8	997.904	ROEA
KR88845	891405.7	582004.2	997.723	ETPED
KR88846	891397.4	582013.8	998.113	MHT
KR88847	891397.9	582021.2	998.153	MHT
KR88848	891395.2	582038.6	997.959	ROEA
KR88849	891405.9	582039.1	998.4	EPP EOH
KR88850	891391	582057.4	998.116	MHS
KR88851	891378.7	582040	998.503	ROCL
KR88852	891412.6	582036.2	997.913	TNG
KR88853	891400.5	582162.4	998.115	ROEA
KR88854	891402.8	582238.1	998.521	ROEA
KR88855	891400.1	582239.8	998.55	HLIP B ROEA E
KR88856	891402	582239.8	998.793	HTBC B
KR88857	891408.1	582259.7	998.504	EPP EOH E
KR88858	891403.3	582282.7	999.022	HTBC
KR88859	891401.4	582283	998.686	HLIP
KR88860	891383.9	582283.1	999.001	ROCL
KR88861	891396.1	582340.6	998.188	MHS
KR88862	891424.9	582326.8	998.113	HTBC
KR88863	891425.4	582327.6	997.655	HTBC E HEC2 B
KR88864	891425.7	582332.6	997.454	HLIP E
KR88865	891427.6	582332.2	997.561	HTBC B HEC2 E
KR88866	891427.6	582333.1	997.826	HTBC E
KR88867	891435.8	582391.3	998.076	HEC
KR88868	891441.6	582391.4	998.152	HTBW
KR88869	891428.6	582396.6	998.046	HEC3 B
KR88870	891433.6	582396.4	998.02	HEC3
KR88871	891433.4	582386.1	998.085	HEC3
KR88872	891428.5	582386.2	998.082	HEC3 E
KR88873	891430.2	582389.9	998.069	MHSD
KR88874	891439	582433.4	998.26	HTBW
KR88875	891433.1	582433.1	998.226	HEC
KR88876	891439.2	582495.2	998.445	HEC
KR88877	891445	582495.4	998.509	HTBW
KR88878	891440.2	582534.8	998.601	HTBW
KR88879	891434.4	582534.3	998.449	HEC
KR88880	891438.7	582559.5	998.534	HEC

KR88881	891444.6	582560.1	998.617	HTBW
KR88882	891441.2	582596.3	998.715	HTBW
KR88883	891435.3	582596.4	998.629	HEC
KR88884	891439.8	582642.1	998.758	HEC
KR88885	891445.7	582641.9	998.923	HTBW
KR88886	891442	582657.5	998.706	HTBW
KR88887	891437.1	582654	998.655	HEC
KR88888	891432.7	582658.5	998.666	HEC E
KR88889	891439.4	582664	998.835	HTBW
KR88890	891438.8	582670.1	998.612	HTBW
KR88891	891438.7	582680.6	998.769	HTBW
KR88892	891449.2	582689.2	999.055	HTBW
KR88893	891461.4	582688.6	999.305	HTBW E
KR88894	891467.9	582718.7	999.387	HTBC B
KR88895	891482.2	582718.6	999.659	HTBC BC
KR88896	891489.2	582725.1	999.948	HTBC
KR88897	891482.8	582731.7	999.621	HTBC EC
KR88898	891467.9	582731.8	999.514	HTBC BC
KR88899	891461	582725.7	999.203	HTBC C
KR88900	891462.4	582762.2	999.125	HTBW B
KR88901	891460.8	582762	999.052	HTBW
KR88902	891452.7	582770.7	998.865	HTBW
KR88903	891454.2	582896.9	999.132	HTBW
KR88904	891444.4	582991	999.118	HTBW
KR88905	891444.2	582993	999.202	HTBW
KR88906	891445.4	582995.6	999.233	HTBW
KR88907	891437.8	582995.7	999.137	HEC B
KR88908	891439.6	582996.3	999.172	HEC
KR88909	891448.2	583032.7	999.408	HEC
KR88910	891453.9	583032.5	999.059	HTBW
KR88911	891439.2	583072.7	999.269	HEC3 B
KR88912	891444	583072.7	999.235	HEC 3
KR88913	891444.3	583082.6	999.292	HEC3
KR88914	891439.4	583082.7	999.293	HEC3 E
KR88915	891440.9	583076.2	999.275	MHSD
KR88916	891443.4	583098.5	999.435	HEC
KR88917	891449.2	583097.8	999.488	HTBW
KR88918	891454	583156.4	999.706	HTBW
KR88919	891448.1	583156.7	999.644	HEC
KR88920	891449	583221.6	999.755	HEC
KR88921	891454.7	583221.2	999.989	HTBW
KR88922	891451.9	583265.7	999.893	HTBW
KR88923	891446	583265.6	999.828	HEC
KR88924	891447.9	583296.2	999.873	HEC
KR88925	891453.7	583296.2	999.955	HTBW
KR88926	891443.1	583322.9	999.904	HEC E
KR88927	891449.6	583323.8	1000.025	HTBW
KR88928	891460.3	583360.7	1000.37	HTBW
KR88929	891402.3	583405.2	1000.518	ROCL
KR88930	891461.3	583427.1	1000.381	HTBW
KR88931	891451.5	583497.1	1000.246	HTBW
KR88932	891451.8	583510.1	1000.479	HTBW
KR88933	891453.8	583517.5	1000.602	HTBW
KR88934	891466.3	583529.8	1001.012	HTBW
KR88935	891476.4	583531.9	1001.136	HTBW
KR88936	891486.3	583531.7	1001.129	HTBW
KR88937	891486.5	583529.6	1001.155	HTBW
KR88938	891487.7	583527.9	1001.117	HTBW
KR88939	891489.9	583526.9	1001.184	HTBW
KR88940	891517.9	583526.7	1001.294	HTBW
KR88941	891572.1	583526.6	1001.584	HTBW E
KR88942	891571.9	583531.5	1001.449	HEC B
KR88943	891498.2	583531.8	1001.084	HEC
KR88944	891496	583533.6	1001.148	HEC
KR88945	891496	583536.9	1001.113	HEC E
KR88946	891424.3	585499.3	1006.341	ROCL B
KR88947	891449.8	585500	1005.692	ROEA
KR88948	891455.9	585503.7	1005.65	EPP EOH B
KR88949	891462.3	585509.4	1005.099	WBLK B
KR88950	891476.5	585509.3	1004.828	WBLK FTS B
KR88951	891476.6	585498.6	1004.465	TNG
KR88952	891543.3	585508.5	1005.272	WBLK
KR88953	891553.6	585495.4	1004.892	TNG
KR88954	891653.2	585507	1005.581	WBLK E
KR88955	891653	585494.6	1005.074	TNG
KR88956	891445	585551.1	1005.975	MHS
KR88957	891478.7	585610.1	1005.216	FTS E HEC B
KR88958	891484.9	585612.3	1005.07	HEC
KR88959	891531.8	585611.8	1005.369	HEC E
KR88960	891533	585577.2	1005.153	TNG
KR88961	891533.2	585627.6	1005.574	HEC B
KR88962	891534	585650.1	1005.357	TNG
KR88963	891561.2	585695.1	1005.409	WBLK B
KR88964	891483.8	585628.2	1005.235	HEC
KR88965	891478.8	585630.1	1005.314	HEC E FTS B
KR88966	891479.7	585695.1	1005.898	FTS
KR88967	891479	585696	1005.93	FTS E WBLK
KR88968	891464.8	585696.1	1005.98	WBLK
KR88969	891464.8	585699	1006.087	WBLK E FCL B
KR88970	891460.9	585694.8	1006.009	EPP EOH
KR88971	891459.1	585625.4	1005.94	TNG
KR88972	891451.7	585625	1006.113	ROEA
KR88973	891427	585698	1006.821	ROCL
KR88974	891452.9	585698.2	1006.211	ROEA

KR88975	891459.6	585699.7	1005.935	SSL-45
KR88976	891460.7	585717.5	1006.134	EGW
KR88977	891461.2	585726.4	1006.176	EGW
KR88978	891466.2	585768.9	1006.295	FCL
KR88979	891454.1	585770.4	1006.264	ROEA
KR88980	891455.3	585849.3	1006.786	ROEA
KR88981	891467.1	585850.1	1006.317	FCL
KR88982	891467.7	585902.6	1006.822	FCL DNC
KR88983	891467.5	585903	1006.552	TNG
KR88984	891463.1	585903.1	1006.867	EPP EOH E
KR88985	891456.4	585905.4	1006.827	ROEA
KR88986	891430.8	585906.4	1007.289	ROCL
KR88987	891482.8	585903.1	1007.013	FCL DNC
KR88988	891482.1	585903.8	1006.637	TNG
KR88989	891469.5	585968.2	1007.215	WBLK B FRI B
KR88990	891483.3	585968.3	1007.127	FCL E WBLK
KR88991	891465.6	585969.5	1007.144	ETPED
KR88992	891470.4	586016.3	1007.438	FRI
KR88993	891458.3	586016.4	1007.164	ROEA
KR88994	891431.9	586018.1	1007.355	ROCL
KR88995	891454	586053.3	1007.442	MHS
KR88996	891466.8	586070.6	1007.534	ETPED
KR88997	891471.9	586097.6	1007.847	FRI
KR88998	891473.7	586104.8	1006.814	TNG
KR88999	891498.1	586122.5	1008.262	ETSP
KR89000	891543.1	585981.8	1006.634	TNG
KR89001	891547.1	585969.7	1007.243	WBLK
KR89002	891548.4	586031.1	1007.157	TNG
KR89003	891628.1	586030.4	1006.922	TNG
KR89004	891631.5	586099.2	1006.916	TNG
KR89005	891577.6	586117.5	1008.193	HEC B
KR89006	891573.6	586117.7	1008.136	HEC
KR89007	891573.9	586123.9	1008.304	HEC RECT
KR89008	891575.7	586121.5	1006.868	ECSB DNC
KR89009	891577.3	586135.7	1007.121	TNG
KR89010	891633.1	586134.2	1007.181	TNG
KR89011	891637.6	586151.5	1008.515	TOP B
KR89012	891636.7	586149	1008.282	EOH B
KR89013	891618	586148.8	1008.474	EPP EOH
KR89014	891588.2	586148.8	1008.731	EGW
KR89015	891587.8	586151.6	1008.591	TOP
KR89016	891583.3	586138.6	1007.3	TNG
KR89017	891541.1	586148.5	1009.531	EPP EOH
KR89018	891537.4	586148.6	1008.545	EC-4-2IN
KR89019	891517.9	586151.5	1008.698	TOP
KR89020	891514	586149.5	1008.553	TOP
KR89021	891512.5	586149.7	1008.497	TOP E
KR89022	891512	586149.6	1009.721	WHW-CL-12 B
KR89023	891511.9	586151.7	1009.737	WHW-CL-12
KR89024	891503	586151.8	1009.768	WHW-CL-12
KR89025	891502.8	586163.4	1009.734	WHW-CL-12
KR89026	891511.8	586163.4	1009.785	WHW-CL-12
KR89027	891511.8	586165.3	1009.762	WHW-CL-12 E
KR89028	891512.5	586165.6	1008.504	TOP B
KR89029	891515.4	586165.4	1008.674	TOP
KR89030	891518.5	586163.8	1008.873	TOP
KR89031	891579.3	586163.5	1008.574	TOP
KR89032	891631.5	586163.5	1008.515	TOP E
KR89033	891632.4	586178.6	1008.114	ROEA1 B
KR89034	891579	586177.7	1008.126	ROEA1
KR89035	891502.2	586175.9	1008.004	ROEA1 BC
KR89036	891490.9	586173.3	1007.959	UWV
KR89037	891478.1	586165.7	1007.691	ROEA1
KR89038	891463	586143.1	1007.565	ROEA1 EC
KR89039	891459.6	586125	1007.338	ROEA E ROEA1 E
KR89040	891409.7	586138	1007.456	EOH E
KR89041	891504.3	586149.8	1008.47	FGP
KR89042	891503.5	586119.6	1007.419	FRI E
KR89043	891503.5	586121.2	1007.345	FGP
KR89044	891491.3	586153.2	1008.662	TNG
KR89045	891493.9	586142.3	1008.118	WHW-CL-8IN B
KR89046	891476.2	586142.5	1007.938	WHW-CL-8IN E
KR89047	891578.2	585920.1	1006.777	TNG
KR89048	891595.8	585876.8	1009.94	OBC B DNC
KR89049	891524.3	585877.3	1009.558	OBC DNC
KR89050	891524.1	585849.9	1009.417	OBC DNC
KR89051	891622.7	585849.1	1010.712	OBC E DNC
KR89052	891593.2	585838.3	1006.816	TNG
KR89053	891592.2	585771.9	1006.083	TNG
KR89054	891605.4	585747.5	1006.399	OBC B
KR89055	891605.7	585733.6	1006.412	OBC
KR89056	891551.7	585732.3	1006.418	OBC
KR89057	891551.4	585746.2	1006.384	OBC C
KR89058	891573.3	585708.7	1005.947	TNG
KR89059	891497.2	585706.8	1005.801	UWM
KR89060	891497.5	585779.3	1005.955	TNG
KR89061	891470.1	585783.2	1005.793	ELP
KR89062	891489.7	585867	1006.028	TNG
KR89063	891503.8	585936.4	1006.698	TNG
KR89064	891496.8	585969.4	1007.243	ELP
KR89065	891489.5	585982.4	1006.522	TNG
KR89066	891484.9	586036.8	1006.673	TNG
KR89067	891479.9	584943.1	1004.36	TNG
KR89068	891580.6	584944.1	1004.5	TNG

KR89069	891678.4	584943.7	1004.617	TNG
KR89070	891681.2	585105.7	1004.638	TNG
KR89071	891584.2	585110.1	1004.458	TNG
KR89072	891488	585113	1004.282	TNG
KR89073	891488.4	585210.9	1004.416	TNG
KR89074	891587.2	585209.7	1004.521	TNG
KR89075	891684	585208.8	1004.676	TNG
KR89076	891685.9	585306.7	1005.064	TNG
KR89077	891585.6	585309.6	1004.927	TNG
KR89078	891488.2	585310	1004.778	TNG
KR89079	891481.6	585390.7	1004.716	TNG
KR89080	891457	585392.1	1005.355	TNG
KR89081	891447.9	585392.4	1005.732	ROEA E
KR89082	891422.5	585393.6	1006.151	ROCL E
KR89083	891581.7	585396.9	1004.92	TNG
KR89084	891682.4	585400.5	1005.15	TNG
KR89085	891541.9	586258.3	1006.588	WBLK-8IN-CMU-WEST-LINE B
KR89086	891534.4	586261.5	1006.648	WBLK-8IN-CMU-WEST-LINE
KR89087	891527.9	586266.2	1006.214	WBLK-8IN-CMU-WEST-LINE
KR89088	891523.1	586271	1005.714	WBLK-8IN-CMU-WEST-LINE
KR89089	891519.1	586276.5	1006.284	WBLK-8IN-CMU-WEST-LINE
KR89090	891516.1	586284.1	1006.198	WBLK-8IN-CMU-WEST-LINE E
KR89091	891583.2	586245.3	1008.153	O-12INX12IN-SQUARE-PLATE
KR89092	891583.3	586240.3	1008.119	O-12INX12IN-SQUARE-PLATE
KR89093	891647.9	586239.8	1008.293	OMB
KR89094	891718.2	586250	1007.308	TNG
KR89095	891723.4	586372.1	1006.997	TNG
KR89096	891726.7	586466.1	1007.107	TNG
KR89097	891728.5	586581.8	1007.187	TNG
KR89098	891732.6	586702.6	1007.274	TNG
KR89099	891734.3	586826.2	1007.288	TNG
KR89100	891743.4	586949.3	1007.341	TNG
KR89101	891749.9	587076.6	1007.692	TNG
KR89102	891756.9	587200.1	1007.98	TNG
KR89103	891760.9	587323.6	1008.087	TNG
KR89104	891762.7	587448.3	1008.488	TNG
KR89105	891763	587469.7	1009.174	HTBW B
KR89106	891763.2	587475.7	1009.068	HTBC B
KR89107	891763.5	587477.8	1008.7	HLIP B
KR89108	891763.8	587502.3	1009.006	ROEA B
KR89109	891764.4	587517.4	1008.025	TOE1 B
KR89110	891764.5	587528.2	1008.925	TNG
KR89111	891765.6	587555.3	1008.818	TNG
KR89112	891652.5	587555.4	1008.533	TNG
KR89113	891652.9	587525.9	1008.786	TNG
KR89114	891653.4	587518	1007.909	TOE1
KR89115	891653.4	587502.3	1009.079	ROEA
KR89116	891705.7	587469.8	1009.059	HTBW
KR89117	891703.7	587468.8	1009.038	HTBW
KR89118	891695.3	587468.8	1009.158	HTBW
KR89119	891693.2	587469.8	1009.117	HTBW
KR89120	891703	587468.7	1008.705	FRI B
KR89121	891695.9	587468.7	1008.66	FRI E
KR89122	891696.9	587468.4	1008.529	HEC B
KR89123	891696.9	587462.3	1008.081	HEC
KR89124	891701.8	587461.8	1007.958	HEC
KR89125	891701.9	587468.5	1008.491	HEC E
KR89126	891701.4	587468.5	1008.099	TC
KR89127	891697.6	587468.4	1008.181	TC
KR89128	891699.3	587476.3	1008.395	HFL-SCUPPER-CL-5FT
KR89129	891652.9	587477.6	1008.686	HLIP
KR89130	891653.2	587475.7	1009.097	HTBC
KR89131	891653.1	587469.7	1009.192	HTBW
KR89132	891659.5	587455.1	1008.57	TOP B
KR89133	891663.3	587448.9	1007.262	TOE B
KR89134	891660.5	587406.7	1006.673	TOE
KR89135	891654.2	587397.8	1007.894	TOP
KR89136	891757	587396.4	1007.924	TOP
KR89137	891751.9	587402.6	1006.881	TOE
KR89138	891747.7	587446.3	1006.941	TOE C
KR89139	891756.4	587454.8	1008.547	TOP C
KR89140	891651	587445.8	1008.167	TNG
KR89141	891648.5	587319.9	1007.903	TNG
KR89142	891643.7	587195.5	1007.399	TNG
KR89143	891593.9	587230.2	1008.51	TOP B
KR89144	891586	587239.3	1007.04	TOE B
KR89145	891588.2	587309.1	1006.915	TOE
KR89146	891597.8	587320.9	1008.435	TOP
KR89147	891537.5	587321.6	1008.321	TOP
KR89148	891541.4	587314.7	1007.253	TOE
KR89149	891539.4	587265.7	1006.786	TOE
KR89150	891539.1	587247.1	1006.595	TOE
KR89151	891527.2	587246.1	1006.954	TOE
KR89152	891526.8	587236.2	1007.169	TOE C
KR89153	891531.7	587279	1008.417	TOP
KR89154	891521.8	587271.9	1008.058	TOP
KR89155	891524.2	587227.9	1008.181	TOP C
KR89156	891513.2	587249.6	1008.295	FRI B
KR89157	891513.5	587250.6	1008.315	HEC B
KR89158	891513.5	587251.1	1007.936	TC
KR89159	891522	587250.5	1007.768	HEC
KR89160	891522.2	587264.5	1007.768	HEC
KR89161	891513.7	587264.6	1008.325	HEC E
KR89162	891513.7	587264.1	1007.867	TC

KR89163	891505.6	587257.7	1008.041	HFL-SCUPPER-CL-13.5FT
KR89164	891529.6	587092.4	1008.634	TOP B
KR89165	891535.7	587082.7	1007.38	TOE B
KR89166	891535.3	587005.9	1006.929	TOE
KR89167	891529.1	586997.3	1008.301	TOP
KR89168	891585.1	587000.8	1008.697	TOP
KR89169	891575.7	587008.6	1007.044	TOE
KR89170	891575.5	587080.6	1006.788	TOE C
KR89171	891585.8	587089.8	1008.446	TOP C
KR89172	891609.9	587079.5	1007.336	TNG
KR89173	891509.6	587030.4	1007.993	FRI B
KR89174	891509.8	587029.3	1007.883	HEC B
KR89175	891510	587028.8	1007.383	TC
KR89176	891518.4	587028.9	1007.248	HEC
KR89177	891518.1	587015.1	1007.284	HEC
KR89178	891509.4	587015.3	1007.858	HEC E
KR89179	891509.6	587015.8	1007.375	TC
KR89180	891509.3	587014.3	1007.925	FRI E
KR89181	891501.7	587022.6	1007.624	HFL-SCUPPER-CL-13.5FT
KR89182	891605.2	586958.8	1007.436	TNG
KR89183	891606.4	586836	1007.493	TNG
KR89184	891603.6	586714	1006.736	TNG
KR89185	891581.4	586762.8	1007.99	TOP B
KR89186	891574.1	586772	1006.83	TOE B
KR89187	891574.2	586839	1006.394	TOE
KR89188	891583.2	586851.5	1008.489	TOP
KR89189	891525.3	586855.1	1007.97	TOP
KR89190	891532.8	586845	1006.855	TOE
KR89191	891532.8	586769.2	1005.772	TOE C
KR89192	891523.7	586759.1	1007.15	TOP C
KR89193	891505.2	586766.3	1007.552	FRI B
KR89194	891505.4	586767.6	1007.459	HEC B
KR89195	891505.5	586768.2	1006.961	TC
KR89196	891513.9	586767.4	1006.868	HEC
KR89197	891514.2	586781.4	1006.889	HEC
KR89198	891505.7	586781.5	1007.467	HEC E
KR89199	891505.8	586780.9	1007.019	TC
KR89200	891505.5	586782.5	1007.508	FRI E
KR89201	891497.5	586774.7	1007.065	HFL-SCUPPER-CL-13.5FT
KR89202	891521.6	586627	1007.063	TOP B
KR89203	891524.4	586619.2	1006.197	TOE B
KR89204	891530.5	586531.3	1006.19	TOE
KR89205	891523.6	586524.5	1007.34	TOP
KR89206	891571	586525.5	1007.638	TOP
KR89207	891565.4	586533.2	1006.086	TOE
KR89208	891570.3	586617.5	1005.953	TOE C
KR89209	891576.6	586624.7	1007.483	TOP C
KR89210	891597.4	586593.8	1006.649	TNG
KR89211	891596.4	586470.7	1006.197	TNG
KR89212	891595.4	586415.2	1006.595	TNG
KR89213	891622.7	586416.7	1006.408	TNG
KR89214	891626	586347.1	1006.754	TNG
KR89215	891625.2	586256	1007.225	TNG
KR89216	891597.8	586244.7	1007.998	TOP B
KR89217	891591	586254.7	1006.731	TOE B
KR89218	891601.1	586269.4	1006.214	TOE
KR89219	891609.7	586260.9	1007.53	TOP
KR89220	891607.8	586398.7	1007.688	TOP
KR89221	891601	586389.9	1006.214	TOE
KR89222	891520.5	586374.5	1006.196	TOE
KR89223	891519.3	586388.1	1007.94	TOP
KR89224	891507.5	586380.8	1007.527	TOP
KR89225	891508	586275.3	1007.105	TOP
KR89226	891513.3	586284.4	1006.217	TOE
KR89227	891532.7	586254.3	1006.582	TOE C
KR89228	891529.9	586244.5	1007.383	TOP C
KR89229	891538.2	586469.7	1006.498	TNG
KR89230	891546.6	586686.5	1007.052	TNG
KR89231	891540.8	586925.9	1007.048	TNG
KR89232	891544.8	587152.3	1007.649	TNG
KR89233	891544.6	587354.2	1007.331	TNG
KR89234	891542.6	587425.4	1007.794	TNG
KR89235	891556.1	587452.8	1007.921	TNG
KR89236	891560.3	587469.7	1009.386	HTBW
KR89237	891560.3	587475.8	1009.262	HTBC
KR89238	891560.4	587477.8	1008.913	HLIP
KR89239	891560.5	587502.5	1009.109	ROEA
KR89240	891560.6	587518.4	1007.868	TOE1
KR89241	891541.7	587518.9	1008.329	TOE1 E
KR89242	891559.9	587527.2	1008.79	TNG
KR89243	891563.3	587566.4	1008.443	TNG
KR89244	891519.7	587503	1008.889	ROEA
KR89245	891514.6	587504.5	1008.887	ROEA
KR89246	891500.6	587528.3	1008.974	ROEA
KR89247	891491	587529.8	1009.175	ROEA
KR89248	891513.9	587522.3	1008.692	O BOLLARD
KR89249	891517.2	587522.4	1009.184	MHW
KR89250	891520	587522.7	1009.171	UWBO
KR89251	891546.6	587487	1008.917	UWV
KR89252	891537.8	587486.7	1008.948	UWV
KR89253	891540.2	587475.9	1009.35	HTBC BC
KR89254	891529.8	587474.3	1009.362	HTBC
KR89255	891521	587469.8	1008.823	HTBC
KR89256	891515.3	587464.3	1008.573	HTBC

KR89257	891510.8	587456.1	1008.98	HTBC
KR89258	891509.1	587446.5	1008.884	HTBC EC
KR89259	891508.9	587433.3	1008.852	HTBC E
KR89260	891540.1	587469.9	1009.35	HTBW
KR89261	891538.9	587467.8	1009.113	UWFH
KR89262	891535.9	587469.6	1009.257	HTBW
KR89263	891530.5	587468	1009.256	HEC B HTBW
KR89264	891530.9	587467.7	1009.287	HEC
KR89265	891533.1	587467.7	1009.361	ELP
KR89266	891532.7	587465.1	1009.281	EJB
KR89267	891527.4	587454.3	1009.249	EJB
KR89268	891520.2	587447	1008.941	EJB
KR89269	891517	587447.6	1009.114	ELP
KR89270	891517	587453.4	1009.121	HEC
KR89271	891526.2	587463.6	1008.995	HTBW
KR89272	891521.3	587458.6	1008.905	HTBW
KR89273	891516.7	587453.8	1009.073	HEC E HTBW
KR89274	891515.3	587450	1008.945	HTBW
KR89275	891514.9	587446.8	1009.003	HTBW
KR89276	891515.8	587436.9	1008.999	HTBW
KR89277	891516.3	587433.7	1009.052	HTBW E
KR89278	891518.8	587444.3	1008.928	TNG
KR89279	891524.8	587459.1	1008.993	TNG
KR89280	891542.1	587464.9	1009.066	TNG
KR89281	891547.2	587462.4	1008.908	UWM
KR89282	891551.3	587461.6	1008.819	UWM
KR89283	891539.3	587446.7	1008.309	ETPED
KR89284	891514.4	587478	1008.717	HLIP
KR89285	891514.8	587502.3	1008.871	HLIP
KR89286	891507.8	587502.3	1008.848	HLIP
KR89287	891507.1	587446.4	1008.513	HLIP
KR89288	891506.9	587433.2	1008.549	HLIP E
KR89289	891548.9	587467.9	1009.072	STOP
KR89290	891468.2	587533.8	1009.574	ROCL B
KR89291	891494.7	587649.1	1008.619	ROEA
KR89292	891490.8	587643.9	1008.739	MHS
KR89293	891468.9	587645	1009.248	ROCL
KR89294	891535	587644.2	1007.71	TNG
KR89295	891592.8	587641.1	1007.935	TNG
KR89296	891661.1	587640	1008.213	TNG
KR89297	891740.8	587639.1	1008.329	TNG
KR89298	891536	587775.7	1007.69	TNG
KR89299	891517.2	587776.3	1008.379	TNG
KR89300	891498.5	587776.7	1008.718	ROEA
KR89301	891470.6	587777.2	1009.382	ROCL
KR89302	891472.3	587903.3	1009.613	ROCL
KR89303	891500.4	587902.1	1008.817	ROEA
KR89304	891468.7	587956.9	1009.587	CBCF-VAN-104TH
KR89305	891522.5	587914.5	1008.466	TNG
KR89306	891540.6	587913.7	1007.73	TNG
KR89307	891592.7	587911.3	1008.196	TNG
KR89308	891660.2	587910.3	1008.406	TNG
KR89309	891782.1	587908.5	1008.583	TNG
KR89310	891541.5	588048.1	1007.973	TNG
KR89311	891525.4	588049.1	1008.745	TNG
KR89312	891502.8	588049.5	1009.087	ROEA
KR89313	891499	588145.6	1009.438	MHS
KR89314	891477.8	588185.6	1009.979	ROCL
KR89315	891504.9	588184.6	1009.286	ROEA
KR89316	891529.3	588184.8	1008.873	TNG
KR89317	891548.5	588184.1	1008.101	TNG
KR89318	891589.2	588181.4	1008.576	TNG
KR89319	891646.2	588180.2	1008.752	TNG
KR89320	891794.6	588178.7	1009.169	TNG
KR89321	891547.2	588313.1	1008.336	TNG
KR89322	891531.2	588313.2	1008.812	TNG
KR89323	891508.5	588314.7	1009.541	ROEA
KR89324	891481.5	588454.9	1010.47	ROCL
KR89325	891508.8	588454.6	1009.663	ROEA
KR89326	891505.2	588489.7	1009.91	MHS
KR89327	891533.6	588453.8	1008.894	TNG
KR89328	891550.9	588453.1	1008.334	TNG
KR89329	891583.3	588450.6	1008.873	TNG
KR89330	891690.9	588449.2	1009.103	TNG
KR89331	891834.6	588447.4	1009.332	TNG
KR89332	891552.1	588585.1	1008.561	TNG
KR89333	891533.6	588585.5	1009.487	TNG
KR89334	891508.5	588585.7	1009.838	ROEA
KR89335	891510.5	588716.7	1010.247	ROEA E
KR89336	891485.5	588717.3	1010.892	ROCL E
KR89337	891556.2	588723.4	1009.132	TNG
KR89338	891580.9	588722.2	1009.083	TNG
KR89339	891629.9	588719.3	1009.122	TNG
KR89340	891733.6	588718.4	1009.468	TNG
KR89341	891870.7	588717.4	1009.856	TNG
KR89342	891540.5	588752.1	1009.388	TNG
KR89343	891821.8	590145.9	1009.208	ROEA B
KR89344	891822	590137.1	1008.881	TOP B
KR89345	891822.7	590131.9	1006.528	TOE B
KR89346	891822.4	590129.6	1006.627	TOE1 B
KR89347	891822.3	590127.1	1008.404	TOP1 B
KR89348	891822.2	590110.2	1007.927	TNG
KR89349	891822.9	590170	1008.703	HLIP B
KR89350	891823.1	590172	1009.137	HTBC B

KR89351	891823.2	590174.3	1009.135	HEC B
KR89352	891823.3	590179.2	1009.291	HTBW B
KR89353	891824.3	590196	1008.892	TNG
KR89354	891788.9	590181	1009.262	HTBW
KR89355	891789.1	590176.1	1009.162	HEC
KR89356	891737.5	590173.8	1008.903	HEC
KR89357	891737.6	590178.7	1008.995	HTBW
KR89358	891736.9	590179.8	1008.964	ELP
KR89359	891741.3	590180	1008.802	EJB
KR89360	891724.7	590185.8	1008.817	UWM
KR89361	891737.9	590196.4	1008.738	TNG
KR89362	891736.9	590172.3	1008.905	HTBC
KR89363	891736.9	590170.3	1008.525	HLIP
KR89364	891736.1	590161.9	1008.646	UWV
KR89365	891736.8	590145.9	1009.086	ROEA
KR89366	891736.9	590138.6	1008.713	TOP
KR89367	891736.9	590133.6	1006.588	TOE
KR89368	891736.9	590128.6	1006.313	TOE1
KR89369	891736.8	590126.6	1008.257	TOP1
KR89370	891736.7	590110.5	1007.73	TNG
KR89371	891632.7	590110	1007.424	TNG
KR89372	891597.3	590111.4	1007.37	TNG
KR89373	891573.3	590091.6	1007.22	TNG
KR89374	891631.1	590124.3	1007.775	TOP1
KR89375	891631.2	590126.8	1006.195	TOE1
KR89376	891631	590130.7	1006.194	TOE
KR89377	891655.6	590138.2	1008.542	TOP
KR89378	891625.2	590133.8	1008.511	TOP
KR89379	891590.2	590134.8	1008.512	TOP
KR89380	891572.6	590131.1	1009.287	TOP
KR89381	891564.1	590124	1009.688	TOP
KR89382	891562.2	590115.4	1009.195	TOP
KR89383	891560.2	590113.7	1009.243	WHW-CL-6IN B
KR89384	891559.2	590113.8	1009.224	WHW-CL-6IN
KR89385	891559.2	590117.7	1009.231	WHW-CL-6IN
KR89386	891554.1	590117.8	1009.233	WHW-CL-6IN
KR89387	891554	590113.9	1009.234	WHW-CL-6IN
KR89388	891552.9	590113.9	1009.235	WHW-CL-6IN E
KR89389	891559.7	590114.3	1008.899	TOP E
KR89390	891552.2	590114.3	1009.164	TOP B
KR89391	891552.4	590094.2	1009.391	TOP
KR89392	891558.7	590089.6	1009.22	TOP E
KR89393	891587.7	590121.9	1008.677	TOP1
KR89394	891578.2	590115.6	1008.976	TOP1
KR89395	891566.5	590097.5	1008.865	TOP1 E
KR89396	891587.4	590129.5	1006.086	TOE
KR89397	891587.6	590126.6	1005.976	TOE1
KR89398	891576.8	590120.9	1006.086	TOE1
KR89399	891570.3	590112.7	1005.95	TOE1
KR89400	891561.9	590098.6	1005.721	TOE1
KR89401	891564.5	590093.3	1006.889	TOE1 E
KR89402	891574.9	590127.9	1005.9	TOE
KR89403	891567.3	590124.6	1005.886	TOE
KR89404	891564.9	590118.9	1005.787	TOE
KR89405	891566	590114.8	1005.869	TOE
KR89406	891560.7	590106.7	1005.702	TOE
KR89407	891558.5	590113.8	1005.463	TOE E
KR89408	891554.1	590111.9	1005.457	TOE B
KR89409	891553.3	590101.6	1006.024	TOE
KR89410	891553.7	590097.3	1005.816	TOE
KR89411	891558.3	590093.7	1005.931	TOE
KR89412	891562.5	590091	1007.009	TOE E
KR89413	891558.7	590139.7	1008.462	STOP
KR89414	891615	590145.8	1008.537	ROEA
KR89415	891579.6	590146	1008.294	ROEA
KR89416	891562.7	590145.8	1008.121	ROEA E
KR89417	891592.7	590172	1007.728	HFL-SCUPPER-CL-13.5FT
KR89418	891615.3	590170.6	1008.112	HLIP
KR89419	891615.3	590172.4	1008.498	HTBC
KR89420	891670.2	590176.6	1008.647	HEC
KR89421	891670.6	590181.5	1008.778	HTBW
KR89422	891672.3	590194.7	1008.997	TNG
KR89423	891605.3	590178	1008.591	HTBW
KR89424	891605.4	590172.7	1008.48	HEC E HTBC
KR89425	891600	590177.6	1008.687	HTBW
KR89426	891585.1	590177.5	1008.635	HTBW
KR89427	891581.2	590178.8	1008.679	HTBW
KR89428	891577.5	590181.1	1008.674	HEC B HTBW
KR89429	891577.8	590181.4	1008.705	HEC
KR89430	891573.1	590185	1008.307	HTBW
KR89431	891567.4	590190.3	1008.237	HTBW
KR89432	891563.6	590194.5	1008.414	HEC
KR89433	891563.3	590194.2	1008.333	HEC E HTBW
KR89434	891561.8	590198.4	1008.38	HTBW
KR89435	891561.4	590203.2	1008.331	HTBW E
KR89436	891585.4	590172.6	1008.548	HTBC BC
KR89437	891585.4	590170.6	1008.118	HLIP BC
KR89438	891574.4	590172.9	1008.06	HLIP
KR89439	891575	590174.6	1008.47	HTBC
KR89440	891567.1	590178.8	1008.036	HTBC
KR89441	891566	590177.1	1008.028	HLIP
KR89442	891559.6	590182.7	1007.88	HLIP
KR89443	891561	590184.1	1007.893	HTBC
KR89444	891556.7	590192	1008.307	HTBC

KR89445	891554.8	590191.3	1007.89	HLIP
KR89446	891553.4	590202.9	1007.998	HLIP EC
KR89447	891555.3	590202.8	1008.387	HTBC EC
KR89448	891555.5	590212.9	1008.405	HTBC E
KR89449	891553.5	590212.8	1007.953	HLIP E
KR89450	891588.5	590216.8	1007.448	WHW-6IN-CL B
KR89451	891589.2	590214.9	1007.453	WHW-6IN-CL
KR89452	891591.6	590214.6	1007.484	WHW-6IN-CL
KR89453	891594.1	590215.6	1007.523	WHW-6IN-CL E
KR89454	891590.3	590215.2	1004.426	IRCP-18IN E
KR89455	891594.4	590205.1	1008.282	TOP B TOP1 B
KR89456	891612	590202.6	1007.725	TOP
KR89457	891626	590212.2	1008.119	TOP
KR89458	891629.9	590249.3	1007.695	TOP
KR89459	891617.8	590265	1008.063	TOP
KR89460	891588.4	590260.3	1008.143	TOP
KR89461	891581	590248.4	1008.036	TOP E
KR89462	891576.7	590224.7	1008.071	TOP1 E
KR89463	891588.7	590228.5	1005.637	TOE B
KR89464	891596.5	590219.7	1005.008	TOE
KR89465	891610.3	590219.7	1005.063	TOE
KR89466	891614.7	590244	1005.024	TOE
KR89467	891601.9	590248.2	1005.222	TOE
KR89468	891589.6	590241.5	1005.864	TOE C
KR89469	891571.8	590204.2	1008.481	TNG
KR89470	891586.9	590186.9	1008.455	TNG
KR89471	891580.2	590284.7	1008.597	TNG
KR89472	891612.6	590286.2	1008.434	TNG
KR89473	891673	590289.7	1008.341	TNG
KR89474	891735.6	590291.6	1008.269	TNG
KR89475	891819	590293.9	1008.587	TNG
KR89476	891812.3	590422.6	1008.464	TNG
KR89477	891742	590419.6	1008.153	TNG
KR89478	891650.1	590421.3	1008.128	TNG
KR89479	891582.8	590423.8	1008.539	TNG
KR89480	891586.1	590522.1	1008.926	TOP B
KR89481	891600.4	590532.7	1005.928	TOE B
KR89482	891599.4	590515.1	1008.585	TOP
KR89483	891636.5	590520.5	1008.312	TOP
KR89484	891645	590525.7	1009.005	TOP
KR89485	891642.4	590552	1008.809	TOP
KR89486	891630.3	590558.9	1008.663	TOP
KR89487	891624.5	590534.4	1005.093	TOE
KR89488	891624.1	590542.1	1005.413	TOE
KR89489	891601.7	590546.8	1005.988	TOE
KR89490	891598.4	590550	1006.295	TOE C
KR89491	891602.5	590559.9	1008.765	TOP
KR89492	891589.2	590557.7	1009.014	TOP E
KR89493	891593	590618.2	1009.261	TNG
KR89494	891593.3	590653.1	1009.826	TNG
KR89495	891628.7	590651.5	1009.352	TNG
KR89496	891621.2	590659.4	1009.078	TNG
KR89497	891651	590634.9	1008.858	TNG
KR89498	891711.1	590632.7	1008.701	TNG
KR89499	891806.3	590617.7	1008.108	TNG
KR89500	891788.6	590590.9	1008.95	TOE B
KR89501	891778.4	590585.7	1011.582	TOP B
KR89502	891725.8	590583.8	1012.497	TOP
KR89503	891715	590601.2	1008.71	TOE
KR89504	891662.2	590543.4	1008.981	TOE
KR89505	891677.7	590540.6	1012.216	TOP
KR89506	891681.7	590522.5	1012.53	TOP
KR89507	891668.3	590504	1008.536	TOE
KR89508	891694.9	590477.3	1008.65	TOE
KR89509	891708.7	590485.2	1008.73	TOE
KR89510	891707.9	590494.1	1008.734	TOE
KR89511	891714.2	590506.6	1013.538	TOP
KR89512	891734.2	590504.4	1013.86	TOP
KR89513	891747.4	590507.7	1013.765	TOP
KR89514	891758.2	590518.1	1014.049	TOP C
KR89515	891735.4	590536.1	1013.139	TNG
KR89516	891728.5	590489.9	1008.345	TOE
KR89517	891763.8	590502.6	1008.577	TOE C
KR89518	891800.3	590509.6	1008.465	TNG
KR89519	891829	590624.4	1008.659	TNG
KR89520	891700.5	590655.5	1009.064	HTBC B
KR89521	891700.6	590657.4	1008.646	HLIP B
KR89522	891665.8	590653.4	1009.03	ELP
KR89523	891628.7	590655.9	1009.456	HTBC
KR89524	891629.3	590657.8	1009.004	HLIP E
KR89525	891628.4	590675.5	1009.89	HTBC BC
KR89526	891627.6	590677.1	1010.068	HTBC
KR89527	891626	590677.9	1010.125	HTBC
KR89528	891628.8	590678.4	1009.69	TA
KR89529	891613.8	590677.8	1009.525	HTBC E
KR89530	891609.6	590678.4	1009.462	HTBC B
KR89531	891611.5	590678.3	1008.909	HLIP B
KR89532	891613.6	590669.6	1008.174	UDCB
KR89533	891628.2	590711.8	1009.501	MHSD
KR89534	891637.7	590711.9	1009.615	MHSD
KR89535	891655.1	590699.7	1010.029	TA
KR89536	891689.3	590693.6	1010.024	TA
KR89537	891667.2	590735.1	1010.553	TA
KR89538	891610.2	590771.8	1009.886	HTBC

KR89539	891612.1	590776.4	1009.43	HLIP
KR89540	891612.5	590768.7	1009.871	HXC B
KR89541	891625.5	590768.7	1010.11	HXC BC
KR89542	891627.3	590769.4	1010.178	HXC
KR89543	891628.2	590771.2	1010.207	HXC EC
KR89544	891628.2	590773.1	1010.207	HXC BC
KR89545	891627.3	590775.1	1010.152	HXC
KR89546	891625.7	590775.7	1010.115	HXC EC
KR89547	891612.6	590775.7	1009.885	HXC C
KR89548	891612.2	590768.1	1009.458	TA
KR89549	891628.9	590768.3	1009.816	TA
KR89550	891628.7	590776.5	1009.812	TA
KR89551	891630.1	590832.9	1009.909	MHSD
KR89552	891638.9	590833	1010.103	MHSD
KR89553	891632.8	590850.3	1009.725	UDCB
KR89554	891634.5	590867.7	1010.021	MHSD
KR89555	891659.5	590866.1	1010.516	TA
KR89556	891610.5	590855.3	1010.057	HTBC E
KR89557	891612.3	590855.1	1009.68	HLIP E
KR89558	891616.2	590865.9	1009.732	TA
KR89559	891625.8	590875.7	1010.517	HXC B
KR89560	891627	590875.7	1010.505	HXC BC
KR89561	891628.2	590876.5	1010.481	HXC
KR89562	891628.7	590878.6	1010.476	HXC EC
KR89563	891628.4	590882.6	1010.443	HXC
KR89564	891627.5	590885.6	1010.436	HXC
KR89565	891626	590888.4	1010.448	HXC E
KR89566	891640.8	590889.6	1010.187	TA
KR89567	891660.4	590898.8	1010.472	TA
KR89568	891651.9	590937.6	1009.987	MHSD
KR89569	891603.3	590935.8	1010.387	HXC B
KR89570	891603.4	590935.1	1009.935	TA
KR89571	891616.4	590935.8	1010.321	HXC BC
KR89572	891619.6	590936.2	1010.14	HXC
KR89573	891622.1	590937.5	1010.055	HXC EC
KR89574	891628.2	590945	1009.941	HXC
KR89575	891628.7	590947.9	1009.865	HXC
KR89576	891628.9	590953.3	1009.811	HXC
KR89577	891628.3	590954.4	1009.822	HXC
KR89578	891627.3	590954.8	1009.815	HXC
KR89579	891629.3	590955.1	1009.369	TA
KR89580	891632.6	590936.9	1009.673	TA
KR89581	891614.8	590954.9	1009.697	HXC E
KR89582	891610.9	590955.4	1009.55	HTBC B
KR89583	891612.7	590955.5	1009.204	HLIP B
KR89584	891639.1	590972.1	1009.691	MHSD
KR89585	891650.3	590972.1	1010.105	MHSD
KR89586	891653.4	590954.3	1009.989	UDCB
KR89587	891660.8	590956.5	1010.324	TA
KR89588	891660.9	590991.8	1010.344	TA
KR89589	891661.9	591025.5	1010.431	TA
KR89590	891661.7	591066.2	1010.356	TA
KR89591	891649.1	591076.5	1010.161	MHSD
KR89592	891640.9	591076.5	1009.896	MHSD
KR89593	891611	591018.8	1010.029	HTBC E
KR89594	891609.6	591011.2	1009.56	ELP
KR89595	891612.7	591018.1	1009.724	HLIP E
KR89596	891645.5	591020.6	1010.038	TA
KR89597	891629.1	591021.5	1010.265	HXC B
KR89598	891629.1	591023.4	1010.359	HXC E
KR89599	891611	591025.8	1010.239	HTBC B
KR89600	891613	591026.4	1009.766	HLIP B
KR89601	891613.2	591072.8	1009.649	HLIP
KR89602	891611.3	591072.9	1010.016	HTBC
KR89603	891628.9	591074.1	1009.88	TA
KR89604	891630.9	591116.4	1009.844	TA
KR89605	891613.5	591116.4	1009.319	HLIP E
KR89606	891611.5	591116.3	1009.68	HTBC E
KR89607	891615.6	591116.8	1009.809	HXC B
KR89608	891628	591116.7	1010.306	HXC BC
KR89609	891629.6	591117.5	1010.22	HXC
KR89610	891630.4	591119.4	1010.219	HXC EC
KR89611	891630.3	591138.5	1009.792	HXC E HTBC B
KR89612	891630.9	591136.7	1009.404	HLIP B
KR89613	891619	591127.7	1007.069	UDCB
KR89614	891666.6	591140.4	1009.552	ELP
KR89615	891667.8	591138.4	1009.809	HTBC
KR89616	891667.8	591136.4	1009.362	HLIP
KR89617	891710.5	591138.2	1009.652	HTBC E
KR89618	891710.5	591136.3	1009.246	HLIP E
KR89619	891705.4	591120.9	1009.85	UDCB
KR89620	891709.5	591115.4	1009.92	TA
KR89621	891708.2	591096	1010.607	TA
KR89622	891681.5	591106.5	1010.202	MHSD
KR89623	891674.9	591101.2	1010.225	TA
KR89624	891695.4	591143.3	1009.354	TNG
KR89625	891697.5	591158.6	1010.73	TNG
KR89626	891785.6	591163.1	1010.196	TNG
KR89627	891785	591148.6	1009.288	TNG
KR89628	891672.8	591160.5	1010.524	TNG
KR89629	891675	591147.8	1009.377	TNG
KR89630	891596.6	591135.5	1009.225	TOP B
KR89631	891599	591150.5	1009.275	TOP
KR89632	891607.1	591158.1	1009.424	TOP

KR89633	891621.9	591157.4	1009.58	TOP
KR89634	891629.1	591139.6	1009.42	TOP
KR89635	891628.8	591122.2	1010.148	TOP
KR89636	891623.9	591118	1010.062	TOP
KR89637	891618.3	591117.9	1009.699	TOP E
KR89638	891609.1	591127.7	1007.638	TOE B
KR89639	891618.1	591124.8	1007.268	TOE
KR89640	891620.9	591127.3	1007.193	TOE
KR89641	891620.1	591137.9	1007.072	TOE
KR89642	891605.5	591143.9	1007.388	TOE
KR89643	891601.7	591134.5	1007.293	TOE E
KR89644	891609.6	591281	1009.591	TNG
KR89645	891662.8	591279.6	1010.334	TNG
KR89646	891713.7	591279.6	1010.397	TNG
KR89647	891784.2	591282.2	1010.232	TNG
KR89648	891778.3	591388.4	1009.972	TNG
KR89649	891777.3	591407.8	1010.155	UWV
KR89650	891781.9	591411.1	1010.62	HTBW B
KR89651	891782.2	591417	1010.532	HEC B
KR89652	891782.3	591418.6	1010.492	HTBC B
KR89653	891782.5	591420.5	1010.043	HLIP B
KR89654	891764.9	591410.2	1010.362	EJB
KR89655	891762.5	591411	1010.565	ELP
KR89656	891710	591420.7	1009.828	HLIP
KR89657	891709.9	591418.7	1010.241	HTBC
KR89658	891710.1	591416.5	1010.281	HEC
KR89659	891709.9	591410.5	1010.344	HTBW
KR89660	891710.3	591394.4	1009.616	TNG
KR89661	891639.1	591392.7	1009.633	TNG
KR89662	891639.4	591410.1	1010.156	HTBW
KR89663	891639.6	591416	1010.126	HEC
KR89664	891639.7	591419	1010.016	HTBC
KR89665	891639.7	591421	1009.634	HLIP
KR89666	891616.8	591421	1009.593	HLIP E
KR89667	891616.5	591418.1	1009.983	HEC
KR89668	891616.6	591419	1009.971	HEC E HTBC E
KR89669	891615.9	591412.2	1010.126	HTBW B
KR89670	891615.7	591400.9	1010.153	TNG
KR89671	891596.4	591384.5	1010.195	TNG
KR89672	891616.1	591369.4	1009.439	WBLK B DNC
KR89673	891627.4	591380.7	1010.04	WBLK E
KR89674	891632.6	591433	1009.752	MHU-IRR