WATSON DRAINAGE SYSTEM PRE-DESIGN

FCD 2012C003

VOLUME II
ALTERNATIVES MEMORANDUM

Prepared For:

Flood Control District of Maricopa County

Prepared By:

Dibble Engineering

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

A211.604

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
34600
KEVIN W.
ROBERTS
Date Signed 5/3/13
ARIZONA, U.S.A.
Expires 03/31/15

epg

JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC.

OLSSON ASSOCIATES

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EXECUTIVE SUMMARY

BACKGROUND

The purpose of the Watson Drainage System Pre-Design is to refine the system as recommended by the Buckeye Area Drainage Master Plan (ADMP), and firmly establish the project alignment and features, determine design constraints, resolve unknowns, and clearly establish the final design criteria for the Project. The Pre-Design involves collection of field data, identification of potential major utility conflicts, acquisition of information to support design, refinement of hydrologic and hydraulic models, development of preliminary plans that define the project in sufficient detail such that the size, alignment, and profile of major project features are determined that will be required for completion of the final design, definition of project rights-of-way requirements, and refinement of project costs.

The Pre-Design will also provide a basis for determining the scope of FCDMC and Town of Buckeye shared implementation responsibilities, preparation of final design construction documents, subsequent required utility relocations, rights-of-way reservation and acquisition, and construction.

The Watson Drainage System, as recommended by the ADMP, includes 2 separate locations where the UPRR tracks, the ANPP 96" waterline, the BWCDD canal and the Kinder-Morgan fuel pipeline are proposed to be crossed. It is recognized that crossing each of these facilities represents a significant cost. Therefore, one of the main objectives of the Pre-Design is to evaluate the potential of consolidating the crossings into a single location.

BASE ALTERNATIVE

Description:

The Base Alternative (see **FIGURE 8** in the following memo) as proposed in the ADMP begins approximately 2/3-mile south of Beloat Road at the proposed El Rio Levee and extends north along Watson Road to the Monroe Avenue alignment where east and west branches continue to the north approximately ½ mile east and west of the Watson Road alignment. The eastern branch continues north across the BWCDD canal and the UPRR and terminates at the RID canal. The western branch also continues north from the split at Monroe Avenue and across the BWCDD canal and the UPRR to the Maricopa Road alignment, where it then turns west to Apache Road, and then continues north along Apache road to the RID canal.

The Base Alternative consists of open channels, detention basins and box culverts. The Base Alternative includes two separate crossings of the UPRR/K-M/ANPP/BWCDD facilities, and proposes to utilize the alignment of the existing Watson Drain south of the Monroe Avenue alignment as the system outfall to the Gila River.

The Watson system as recommended by the Buckeye ADMP was considered to be the Base Alternative, with a few adjustments. The adjustments included:

- Elimination of the White Tanks #4 outfall channel, which at the time of the ADMP, was planned to connect to the Watson system west of Rainbow Road. Planning subsequent to the ADMP re-routed those flows to a different outfall.
- Inclusion of Town of Buckeye Downtown storm water in the sizing of the Watson system facilities. The implementation of systems to convey the downtown storm water to the Watson drainage system is Buckeye's responsibility, but the appropriate flows from the downtown area have been accounted for in the sizing of the proposed Watson system.
- Resizing the proposed basins and channels based on the revised project hydrology, which utilizes NOAA 14 rainfall values.

Pros & Cons Summary:

Pros

+ Proposed system has been accepted by stakeholders through the ADMP process
+ Avoids impacts to existing residences south of BWCDD
+ Provides opportunities to implement the Town of Buckeye Trails System as identified in the Buckeye Trails Master Plan
+ Provides opportunity for active recreation in the Rainbow Basin, with adequate space for 4 multi-use fields

Cons

– Requires 2 separate crossings of UPRR/K-M/ANPP/BWCDD facilities
– Railroad Basin site conflicts with proposed Globe Corporation Industrial Park
– Maricopa Basin site is within a platted development with the Watson Community Facilities District

ALTERNATIVE A

Description:

Alternative A (see **FIGURE 9** in the following memo) relies on increased upstream storage volume in order to reduce the required sizes of the downstream conveyance facilities. Alternative A includes an additional basin, referred to as the Dean Basin, to capture and attenuate flows originating in the northeast quadrant of the Watson watershed.

The Maricopa basin is proposed to be relocated to the west side of Apache Road in order to minimize impacts to the planned development at the northeast corner of Apache Road and Maricopa Road, which property is within the Watson Community Facilities District. The Railroad Basin is proposed to be relocated to the north side of Southern Avenue in accordance with direction from Town leadership that the original basin location has been committed to the property owner for future development and is therefore unavailable to the project.

The east and west branches of the system are proposed to be consolidated upstream of the UPRR property in a channel, and a single crossing of the UPRR/K-M/ANPP/BWCDD facilities is proposed near the mid-point of the Wal-Mart property. This location of the crossing was selected based on the location of the existing low point on the north side of the UPRR property, and based on the location of the Country West Properties development south of the BWCDD property.

The system downstream of the UPRR/K-M/ANPP/BWCDD crossing is proposed to be located immediately east of the Country West Properties development, avoiding the need for developed property acquisition in this area.

A collection channel is proposed south of MC-85 to collect and convey flows originating in the southeast quadrant of the Watson watershed. This collection channel combines with the system crossing the UPRR/K-M/ANPP/BWCDD facilities at approximately the Monroe Avenue alignment. From there, it continues south along the alignment of the existing Watson Drain, until it discharges into the Gila River.

Pros & Cons Summary:

Pros

+ Consolidates system to a single crossing of UPRR/K-M/ANPP/BWCDD facilities.

+ Reduces flows reaching UPRR through increased upstream storage volume.
+ Avoids impacts to existing residences south of BWCDD.
+ Includes 146 acre-feet of storage that can serve as open space and view preservation, second most of the alternatives.
+ Turf channel south of the BWCDD is routed off of high value arterial alignments, within business park/industrial land use.
+ Provides opportunities to implement the Town of Buckeye Trails System as identified in the Buckeye Trails Master Plan, with 11.2 miles of trail opportunity of which 7.1 miles is along landscaped channels.
+ Provides opportunity for active recreation in the 48 acre-foot Rainbow Basin, with adequate space for 4 multi-use fields.
+ Maricopa, Railroad, and Dean Basins are located between industrial and residential land-uses where they can serve as open space buffers.

Cons

- Requires property acquisition for 5 basins.
- Requires new crossing of UPRR.
- Generates highest flow rate at Gila River outfall.
- Includes channel through the proposed Globe Corporation Industrial Park.
- Concrete channel north of railroad reduces habitat value of existing floodplain.
- 3.3 miles of channel and three basin sites will require additional cultural resource survey.

ALTERNATIVE B

Description:

Alternative B (see **FIGURE 10**) utilizes reduced storage volume upstream of the UPRR. Alternative B does not include the basin from the Base Alternative referred to as the Railroad Basin, replacing it with the Dean Basin in order to capture and attenuate flows originating in the northeast quadrant of the Watson watershed.

The Maricopa basin is proposed to be relocated to the west side of Apache Road in order to minimize impacts to the planned development at the northeast corner of Apache Road and Maricopa Road, which property is within the Watson Community Facilities District.

Alternative B includes a diversion in the east channel alignment at 231st Avenue and Southern Avenue. At this location, the channel is proposed to flow easterly to Rainbow Road, then south to the upstream side of the Railroad property. This channel diversion represents an attempt to minimize impact to the proposed Globe Corporation industrial development.

The east and west branches of the system are proposed to be consolidated upstream of the UPRR property in a channel, and a single crossing of the UPRR/K-M/ANPP/BWCDD facilities is proposed approximately at the 239th Avenue alignment. This location of the crossing was selected based on the existing division of the agricultural fields south of the UPRR, and based on the location of the Ironwood Vista Residential development south of MC-85.

The proposed consolidation point of Alternative B will require that flow be conveyed along the north side of the UPRR property for a greater distance than Alternative A. The topography in this area is fairly flat, which could make constructing a conveyance channel challenging.

The system downstream of the UPRR/K-M/ANPP/BWCDD crossing is proposed to be located immediately east of the Ironwood Vista development, avoiding the need for developed property acquisition in this area.

A collection channel is proposed south of MC-85 to collect and convey flows originating in the southeast quadrant of the Watson watershed. This collection channel combines with the system crossing the UPRR/K-M/ANPP/BWCDD facilities at approximately the Monroe Avenue alignment. From there, it continues south along the alignment of the existing Watson Drain, until it discharges into the Gila River.

Pros & Cons Summary:

Pros

+ Consolidates system to a single crossing of UPRR/K-M/ANPP/BWCDD facilities.
+ Eliminates the Railroad Basin.
+ Routes flows around the proposed Globe Corporation Industrial Park.
+ Requires the least amount of additional cultural survey, with 2.8 miles of additional channel alignment and two basin sites.
+ Turf channel south of the BWCDD could serve as a visual buffer between the existing development to the west and the business park/industrial land use area.
+ Provides opportunities to implement the Town of Buckeye Trails System as identified in the Buckeye Trails Master Plan, with 11.4 miles of trail opportunity of which 7.4 miles is along landscaped channels.
+ Provides opportunity for active recreation in the 48 acre-foot Rainbow Basin, with adequate space for 4 multi-use fields.
+ Maricopa and Dean Basins are located between industrial and residential land-uses where they can serve as open space buffers.

Cons

– Requires property acquisition for 5 basins.
– Requires new crossing of UPRR.
– Impacts existing business south of BWCDD.
– Concrete channel north of railroad reduces habitat value of existing floodplain.
– Includes the greatest amount of concrete channel.
– Includes the least opportunity for open space and view preservation through new basins, with only 112 acre-feet of storage required spread among 4 basins.
– Creates the least opportunity for creating habitat, with fewer open space basins and more concrete or turf channels than the other alternatives.

ALTERNATIVE C

Description:

Alternative C (see **FIGURE 11** in the following memo**)** represents an attempt to maximize the use of existing structures by utilizing the existing culverts crossing the UPRR to convey storm water across the UPRR facility, thus eliminating the need for a new crossing and the associated costs. Therefore, minimizing the flows reaching the UPRR is an inherent objective for Alternative C. For this reason, Alternative C relies heavily on upstream storage volume, mimicking the same basin approach as Alternative A, including both the Railroad Basin and an enlarged Dean Basin.

The Maricopa basin is proposed to be relocated to the west side of Apache Road in order to minimize impacts to the planned development at the northeast corner of Apache Road and Maricopa Road, which property is within the Watson Community Facilities District. The Railroad Basin is proposed to be relocated to the north side of Southern Avenue in accordance with direction from Town leadership that the original basin location has been committed to the property owner for future development and is therefore unavailable to the project.

Alternative C proposes to utilize a series of shallow (3-feet deep) linear storage basins located adjacent to and north of the UPRR property to collect the upstream flows. These shallow linear basins are proposed to discharge flows to the existing culverts crossing the UPRR.

South of the UPRR property (in which the Kinder-Morgan line is located), a channel will need to be created to collect these flows and consolidate them at a location for a single crossing of the ANPP/BWCDD facilities.

This crossing location is proposed approximately at the 239th Avenue alignment. This location of the crossing was selected based on the existing division of the agricultural fields south of the UPRR, and based on the location of the Ironwood Vista Residential development south of MC-85.

The system downstream of the ANPP/BWCDD crossing is proposed to be located immediately east of the Ironwood Vista development, avoiding the need for developed property acquisition in this area.

A collection channel is proposed south of MC-85 to collect and convey flows originating in the southeast quadrant of the Watson watershed. This collection channel combines with the system crossing the UPRR/K-M/ANPP/BWCDD facilities at approximately the Monroe Avenue alignment. From there, it continues south along the alignment of the existing Watson Drain, until it discharges into the Gila River.

Pros & Cons Summary:

Pros

+ Eliminates need for new crossing of UPRR and Kinder-Morgan facilities.
+ Consolidates system to a single crossing of ANPP/BWCDD facilities.
+ Reduces flows reaching UPRR through increased upstream storage volume.
+ Includes the lowest flow rate at the Gila River.
+ Creates the greatest opportunity for habitat, open space, and view restoration or preservation with 244 acre-feet of storage associated with the major basin sites.
+ Turf channel south of the BWCDD could serve as a visual buffer between the existing development to the west and the business park/industrial land use area.
+ Provides opportunities to implement the Town of Buckeye Trails System as identified in the Buckeye Trails Master Plan, with 11.6 miles of trail opportunity of which 9.7 miles is along landscaped channels. Additional trail opportunity may occur with the spreader channel and basin depending on the final configuration of that facility.
+ Provides opportunity for active recreation in the 48 acre-foot Rainbow Basin, with adequate space for 4 multi-use fields.
+ Provides opportunity for a trailhead adjacent to the BWCDD canal in the spreader basin.
+ Maricopa, Railroad and Dean Basins are located between industrial and residential land-uses where they can serve as open space buffers.
+ Includes the least amount of concrete channel, with only 0.4 miles required.

Cons

- Requires property acquisition for 5 basins.
- Impacts existing business south of BWCDD.
- Requires property acquisitions and construction of basins/channels on both the north and south sides of UPRR, representing a duplication of acquisition and construction costs.
- Requires a significant amount of additional cultural survey. While only 0.4 miles of additional channel survey is required, the 99 acre-feet UPRR linear basins plus the three major basins sites will require survey.

ALTERNATIVES COMPARISON SUMMARY TABLES

ESTIMATED PROJECT COSTS:

ITEM	BASE ALT	ALT A	ALT B	ALT C
REMOVALS/RELOCATIONS/UTILITY CROSSINGS	$ 10.38 M	$ 7.65 M	$ 7.68 M	$ 7.46 M
CHANNELS	$ 12.13 M	$ 18.77 M	$ 21.23 M	$ 11.70 M
STORM DRAINS AND CULVERTS	$ 18.27 M	$ 12.99 M	$ 14.07 M	$ 12.15 M
BASINS (EXCAVATION ONLY)	$ 1.59 M	$ 1.88 M	$ 1.45 M	$ 3.60 M
ROW ACQUISITION	$ 21.45 M	$ 23.79 M	$ 24.31 M	$ 32.29 M
LANDSCAPE	$ 10.51 M	$ 10.96 M	$ 11.25 M	$ 11.82 M
TOTAL COST	**$ 74.33 M**	**$ 76.04 M**	**$ 79.99 M**	**$ 79.02 M**

PROPOSED NEW CROSSINGS OF MAJOR FACILITIES:

ALTERNATIVE	RID	UPRR	ANPP/BWCDDD/K-M
BASE	2	2	2
A	2	1	1
B	2	1	1
C	2	0	1

SYSTEM VELOCITIES:

ALTERNATIVE	VELOCITY RANGE (fps)
BASE	2.4 – 7.7
A	2.4 – 7.7
B	2.3 – 7.8
C	1.3 – 7.6

REQUIRED DROP STRUCTURES:

ALTERNATIVE	# DROP STRUCTURES
BASE	5
A	5
B	7
C	5

NATURAL RESOURCE IMPACTS:

ALTERNATIVE	Natural Resources		
	Open Space Basins (acft)	Earthen Channel (miles)	Concrete Channel Replacing Floodplain (miles)
BASE	76	0.66	2.1
A	146	0.67	2.1
B	112	0.67	2.1
C	244	0.73	0

CULTURAL RESOURCE SURVEY NEEDS:

ALTERNATIVE	Cultural Resources
	Additional Survey Needed
BASE	-
A	3.3 Channel Miles + 3 Basins
B	2.8 Channel Miles + 2 Basins
C	0.4 Channel Miles + 4 Basins

HABITAT OPPORTUNITIES:

ALTERNATIVE	Habitat				
	Earthen Channel (miles)	Earthen Basins (acft)	Turf Channel (miles)	Turf Basins (acft)	Concrete Channel (miles)
BASE	0.66	76	2.0	48	3.2
A	0.67	99	3.0	48	2.3
B	0.67	65	3.3	48	2.2
C	0.73	225	3.1	48	0.4

RECREATION AND AESTHETIC CONSIDERATIONS:

ALTERNATIVE	Landscape Character	Parks and Trails	Views	Open Space
	Concrete Channel (miles)	Trail Opportunity (miles / Industrial miles)	Basin Viewshed (acft)	Visual Buffer in Basins (acft)
BASE	3.2	10.7/3.2	124	62
A	2.3	11.2 / 2.3	146	86
B	2.2	11.4 / 2.2	122	53
C	0.4	11.6 / 0.4	244	213

WATSON DRAINAGE SYSTEM PRE-DESIGN
FCD 2012C003
PRELIMINARY ALTERNATIVES MEMO
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I. INTRODUCTION

A. Background

This *Preliminary Alternatives Memo* is prepared for the Flood Control District of Maricopa County (FCDMC) and the Town of Buckeye (Buckeye) as part of the Watson Drainage System Pre-Design project. The FCDMC and Buckeye developed the *Buckeye Area Drainage Master Plan* (ADMP) in 2009. The ADMP identified a Recommended Plan for regional drainage improvements to alleviate existing flooding hazards, provide conveyance for runoff accumulation along irrigation canals, and provide drainage outfalls for local developments. The Watson Drainage System is one of five unique and separate north-to-south systems recommended by the ADMP.

The purpose of the Pre-Design is to refine and firmly establish the project alignment and features, determine design constraints, resolve unknowns, and clearly establish the final design criteria for the Project. The Pre-Design involves collection of field data, identification of potential major utility conflicts, acquisition of information to support design, refinement of hydrologic and hydraulic models, development of preliminary plans that define the project in sufficient detail such that the size, alignment, and profile of major project features are determined that will be required for completion of the final design, definition of project rights-of-way requirements, and refinement of project costs.

The Pre-Design will also provide a basis for determining the scope of FCDMC and Buckeye shared implementation responsibilities, preparation of final design construction documents, subsequent required utility relocations, rights-of-way reservation and acquisition, and construction.

This *Preliminary Alternatives Memo* describes the development and evaluation of potential refinements to the recommended plan from the ADMP for the Watson system. The following changed conditions that have occurred since the completion of the ADMP warrant review and refinement of the previously recommended plan:

- Newer rainfall data with the release of NOAA 14 which for the Buckeye area result in reductions in design rainfall values.
- Elimination of the White Tanks #4 outfall channel from the project due to regional planning changes which will reduce design discharges in portions of the project.
- Updates to the Town of Buckeye General Plan which impact planned land use and attendant runoff characteristics.

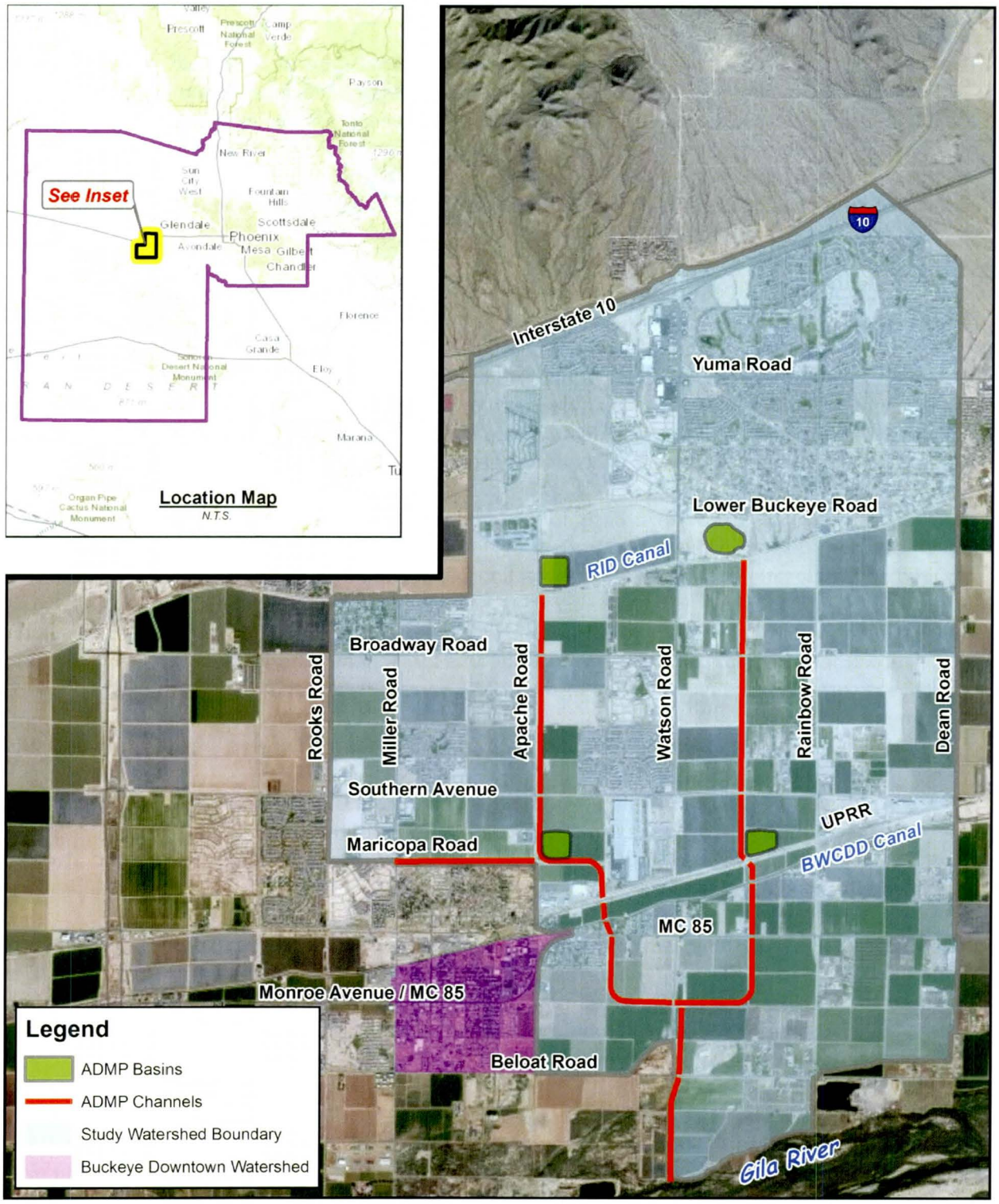
The Watson Drainage System, as recommended by the ADMP, includes 2 separate locations where the UPRR tracks, the ANPP 96" waterline, the BWCDD canal and the Kinder-Morgan fuel pipeline are proposed to be crossed. It is recognized that crossing each of these facilities represents a significant cost. Therefore, one of the main objectives of the Pre-Design is to evaluate the potential of consolidating the crossings into a single location.

B. Study Area

The study area is located within the Town of Buckeye and unincorporated Maricopa County. It is bounded by I-10 and Buckeye FRS No. 2 and 3 to the north, Miller Road to the west, Dean Road to the east and Gila River to the south. See **FIGURE 1** for Location and Study Area.

Runoff generally flows from north to south ultimately draining into the Gila River. Most of the study area is developed as agricultural fields or is in various stages of redevelopment as residential, commercial, and industrial land uses. Significant features that impact drainage patterns include the

FIGURE 1 – LOCATION AND STUDY AREA



The existing condition hydrologic sub-basins and predicted flows resulting from the 100-year, 24-hour storm event as developed by the ADMP are shown in **FIGURE 2**.

Roosevelt Irrigation District (RID) Canal and the Buckeye Water Conservation and Drainage District (BWCDD) canal which both flow from east to west and intercept runoff from the north. The two District canals split the area approximately into thirds in the north-south direction. The BWCDD canal is within a corridor that includes the Union Pacific Railroad (UPRR) and the Arizona Nuclear Power Project (ANPP) reclaimed water line that transports treated effluent to the Palo Verde Nuclear Generating Station to the west. There are other significant utilities within this corridor as well which will be described later in this memo.

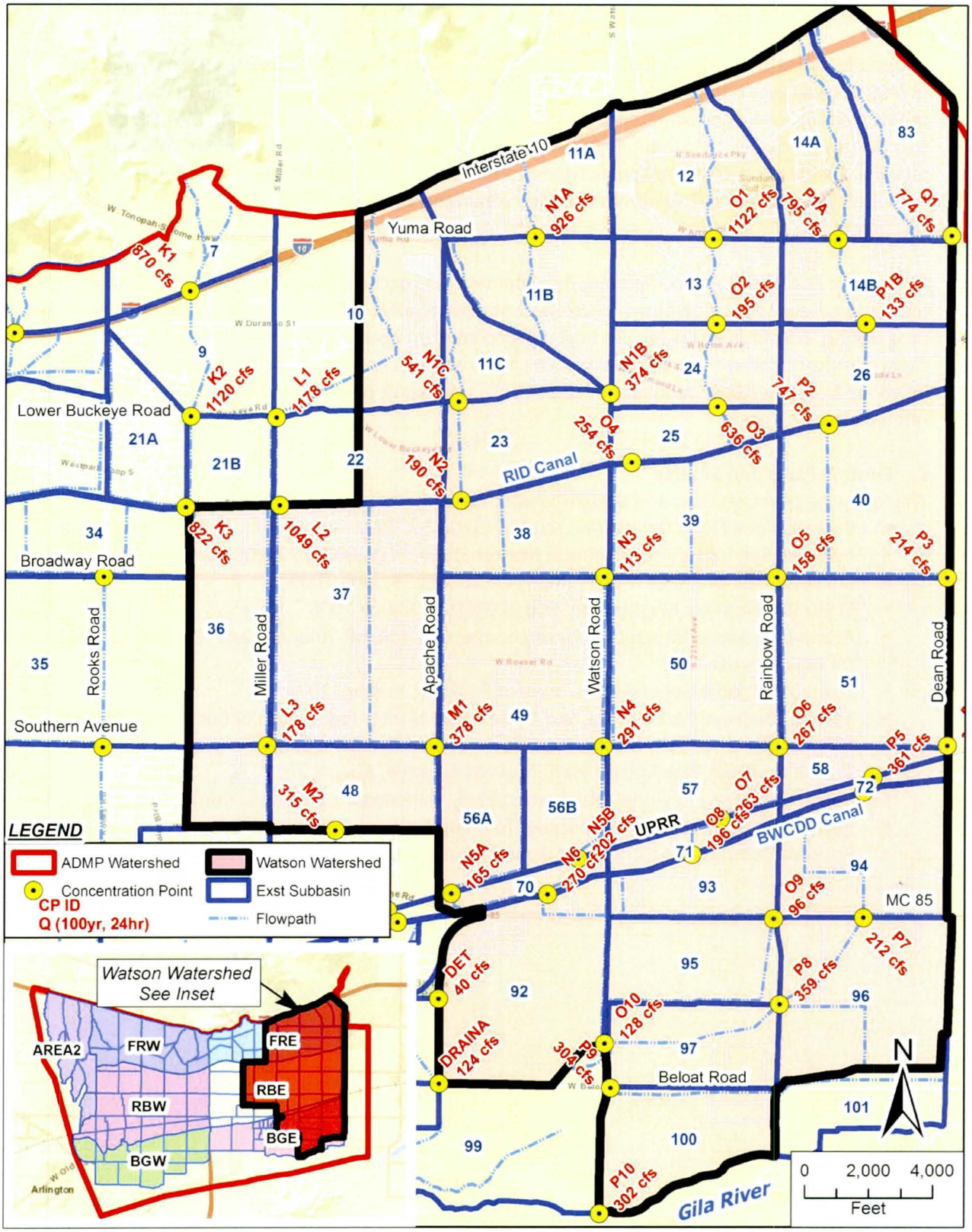
At the time the ADMP was completed, development was occurring at a rapid pace. Since that time, with the national economic downturn, development activity effectively stopped. As this Pre-Design study is progressing, development plans are beginning to start up again. The renewed development activity will likely manifest itself with changed plans which will have an impact on the selected alignments and basin locations from the ADMP recommended plan. To the extent possible, these changes are reflected in the refined alternatives.

C. Existing Plans and Studies

The following plans, studies, and designs impact the project:

- Buckeye Area Flood Delineation Study, FCD 90-69, 1992
- Buckeye/Sun Valley Area Drainage Master Study, FCD 2002C027, 2006
- Buckeye Area Drainage Master Plan, FCD 2004C058, June 2009
- El Rio Watercourse Master Plan, FCD 2001C024, March 2006
- Arizona Parkway Intersection/Interchange Operational Analysis and Design Concepts Study, MCDOT, August 2009
- Town of Buckeye General Plan, Town of Buckeye, January 2008
- Town of Buckeye Parks, Trails, and Open Space Master Plan, Town of Buckeye, November 2005
- Town of Buckeye Trails Master Plan, Town of Buckeye, June 2007
- Skyline Regional Park Master Plan, Town of Buckeye, August 2012
- Maricopa County Regional Trail System Plan, Maricopa County Trails Commission, May 2004
- Buckeye Town Lake Feasibility Study, Town of Buckeye, November 2005
- Buckeye Downtown Storm Drain, Town of Buckeye, October 2010

FIGURE 2 – ADMP EXISTING CONDITION SUB-BASINS AND FLOWS



II. PROJECT GOALS AND OBJECTIVES

A. Stakeholder Input & Coordination

Through experience with the development of many planning and design projects throughout the County, the District has identified local community participation as a key success factor for the ultimate implementation of any plan. To achieve community acceptance and support it is essential that community values and priorities are considered in plan development and reflected in the recommended plan. To this end, the community, as represented by the agency stakeholders and the public, is invited to participate in the planning process from the very beginning and is given significant deference in setting the direction for the plan.

Some of the project coordination meetings held with stakeholders are described below.

1. Discussion with Union Pacific Railroad (UPRR), August 2, 2012

A brief discussion of the Watson Pre-Design project scope and objectives was held with representatives from the Arizona Department of Transportation (ADOT) and with the UPRR. This discussion introduced the UPRR to the proposed Watson drainage system crossing of their facility, and the pre-design objective of reducing the number of crossings from two to one, or to utilize the existing culverts without the need for a new crossing.

2. Park, Trails, O&M and Planning Meeting, August 8, 2012

The Watson Pre-Design team met with Town of Buckeye representatives responsible for recreation planning and maintenance during the data collection phase of the project. This meeting served to revisit the findings of the Buckeye ADMP related to recreation and open space resources with the goal of facilitating the integration of the Town's recreation and trails planning into the Watson System. As the Town of Buckeye will assume maintenance responsibilities for the system, the meeting also served as the first step in identifying key maintenance issues in order to begin bridging the gap between the pre-design efforts through final design to implementation. The following summarizes the key meeting outcomes:

- Town of Buckeye confirmed that the drainage alignments of the Watson System should be integrated into the Town's Trails Master Plan.
- The Town's "Flood Control Channel" design guidelines from the Trails Master Plan were confirmed as the minimum standard for any O&M road intended for use as a Town of Buckeye trail.
- The Town views the 231st Avenue channel alignment as a good candidate for providing an equestrian trail route. This is due to its proximity to the Town's Skyline Regional Park which is located on the Watson Road alignment north of the I-10.
- Having a north-south equestrian trail that connects the White Tank Mountains to the Gila River is desirable to the Town. Using the channel bottom when possible would be the preferred alignment per the trails master plan design guidelines. A soft surface trail could be used where road crossings or other access issues make this unrealistic.
- The Town Parks and Recreation group confirmed that the Rainbow Basin should include active recreation as identified in the ADMP. They also prefer the location shown in the original ADMP rather than a potential location identified next to the Sundance Park site. The Town is planning for a future library and recreation center on the parcel between the Sundance Park site and the Rainbow Basin location.

- The Town confirmed that they prefer passive, natural open space multi-use in the remaining basins rather than active recreation.
- The Town also suggested they prefer basins located near the canals where the basin could help serve as a trailhead location.
- The group discussed the option of including a basin between the UPRR and the BWCDD canal.
- The Town Operations and Maintenance group expressed concern about maintaining large facilities at current staff levels. Subsequent meetings would need to identify specific maintenance concerns during alternative development.
- The group agreed that much of the Town's responsibility for facility construction will need to be implemented by the development community as they increase the demand for storm water mitigation. The Town will need to identify planning tools that might be put in place to ensure the multi-use and landscape themes are implemented consistent with the results of the Watson Pre-Design project.

3. Project Aesthetics Advisory Committee (PAAC) Meeting, October 11, 2012

A PAAC meeting was held to discuss the community preferences for the proposed aesthetic components of the Watson system. Members of the PAAC included representatives from the Town of Buckeye, Arizona Public Service (APS), the Roosevelt Irrigation District (RID) and Buckeye Water Conservation and Drainage District (BWCDD), local design professionals, and members of the project team. The following summarizes the key meeting outcomes:

- Solutions should be responsive to the adjacent land-uses rather than "one size fits all".
- Landscape themes should capture and preserve Buckeye's "agricultural and rural" character while allowing for diversity.
- Ease of maintenance is a primary concern for the Town. Designs should minimize maintenance when possible.
- O&M roads should serve as multi-use paths or trails to be integrated into the Town of Buckeye Trails System as described in the Trails Master Plan.
- Drop structures should be designed in harmony with the agricultural character of Buckeye. Small-scale structures are preferred over large-scale structures.
- The Town envisions multi-modal corridors connecting the future Buckeye Town Lake area (west of Apache Road), the Gila River, and Downtown Buckeye.
- Rainbow Basin should include active recreation as indicated in the ADMP.
- Remaining basins are not intended to include active recreation. Passive open space multi-use is preferred.
- The Town has a concern that turf channels that count towards a development's open space requirements result in linear non-functional open space. This reduces the amount of useable open space in a development. The PAAC suggested looking at options for co-locating the development's basins next to the channels where the creation of continuous turf areas would be possible.

4. Public Meeting, October 24, 2012

An open house style meeting was held at the Town of Buckeye Town Hall to present the potential alternatives for the Watson Pre-Design project. The meeting was well attended and served to remind the community of the work that was accomplished during the ADMP, and the more refined level of detail that will be included as the project progresses. Area residents and area developers attended this meeting.

5. **Meeting with Area Developers, October 30, 2012**

Through attendance of the public meeting on 10/24/12, representatives from area developers asked for a discussion with project representatives. Members of the consulting team and FCDMC met with Jeff Garrett (Garrett Development Corporation) and Heather Personne (Evergreen Development) to discuss the project goals, objectives, alternatives, and status, as well as how the Watson system may impact the proposed area developments. During this meeting, it was revealed that many of the area properties are part of the Watson Community Facilities District (CFD), which has invested over $30M in water infrastructure to serve its member parcels.

6. **Meeting with Buckeye Water Conservation and Drainage District, October 31, 2012**

Members of the project team, including representatives from FCDMC and the consulting team met with Ed Gerak, General Manager of BWCDD and Melody Zyburt of Stantec Engineering, representing the BWCDD. Melody explained how the BWCDD delivery and recovery system functions, and discussed requirements for impacting/crossing BWCDD facilities.

7. **Meeting with Roosevelt Irrigation District, October 31, 2012**

Members of the project team, including representatives from FCDMC and the consulting team met with Melody Zyburt of Stantec Engineering, representing the RID. Melody explained how the RID delivery and recovery system functions, and discussed requirements for impacting/crossing RID facilities.

8. **Discussion with UPRR, November 7, 2012**

Members of the project team, including FCDMC staff, Dibble staff and Olsson staff provided a brief update of the Watson Pre-Design project to representatives from the Arizona Department of Transportation (ADOT) and to the UPRR. The UPRR indicated general acceptance of the project alternatives, but expressed the need to comply with UPRR design requirements as the project progresses. The UPRR requested a letter from FCDMC authorizing them to invoice FCDMC for future time spent on the Watson project, including reviewing project documents, meetings, etc...

9. **Meeting with the Monte Verde development, November 15, 2012**

Members of the consulting team and FCDMC met with representatives of the Monte Verde Development, including Andrew Gasparro (Walton Development and Management), Barbara Rust (CVL) and Heidi Tilson (CVL) to discuss the project goals, objectives, alternatives, and status, as well as how the Watson system may impact the proposed Monte Verde development. Monte Verde is also a member of the Watson CFD.

10. **Meeting with APS, November 16, 2012**

Members of the project team, including FCDMC staff and Dibble Engineering met with representative from APS (Randy Butler, Mike Bouche and Dave Schlief) to discuss the ANPP 96" waterline located north of the BWCDD used to convey water to the Palo Verde Nuclear Generating Station, where it is used as cooling water. APS representatives explained the existing configuration of the pipe including size and material, and discussed the requirements for crossing this line both over and under their facility.

11. **CFD Discussion with EVERGREEN and TOB, December 11, 2012**

A more detailed discussion of the proposed Watson system and potential impacts to the Watson CFD member properties was held with Evergreen Development and Garrett Development) to further discuss the potential impacts of the proposed Watson system to the Watson CFD member parcels, particularly with respect to plat maps that have been developed and approved by the Town of Buckeye.

Representatives from the Town of Buckeye, including the Town Engineer and the Town Attorney, as well as representatives from FCDMC and the consulting team were in attendance.

12. Channel Design Charrette, January 23, 2013

A Channel Design Charrette meeting was held with representatives from the Town of Buckeye, FCDMC and the consulting team, which was focused solely on the proposed channel configurations for the Watson system. The components of the channels discussed and agreed upon at this meeting include channel lining material and roughness, side slopes, buffer widths, relationship to existing irrigation district facilities, trail and other multi-use considerations, and relationships to Town easements. The Town of Buckeye was represented by planning staff, engineering staff, parks and recreation staff, and town management staff and leadership. The following summarizes the key meeting outcomes:

- Typical channel designs were developed in this meeting through extensive discussion between the participants. These typical channel designs are included in this memo under Section III.F.
- Buckeye Planning suggested special corridor design guidelines, similar to streetscape guidelines, could be developed as a tool for guiding developer implementation of the facilities.
- The Town of Buckeye planning envisions the future of Buckeye as a great City. Current planning should not eliminate future opportunities by being short-sighted. Where current budget or staffing concerns present constraints, options should be considered that do not preclude future expansion or changes while meeting the immediate challenge.
- Related to the above point, no development plans are currently in place in the vicinity of the Watson Drain segment of the project. The Town envisions the improvements for the Watson System in this reach as temporary in order to balance minimizing near-term maintenance concerns while not precluding long range development options that may include suburban, resort or commercial development in the vicinity of the Buckeye Town Lake.
- The Maricopa Channel alignment should provide a direct multi-modal connection to Downtown Buckeye.
- The 231st Avenue Channel alignment is preferred for including an equestrian path that could become part of a connection between the Gila River and the Buckeye Skyline Regional Park.
- The Town is interested in including incentives that will encourage developer participation in implementing the Watson System within their cost-share limits.

B. Identification of Goals and Objectives

The ADMP was developed using a value-based approach to planning within the Buckeye ADMP area. This approach was based on clearly identifying the project objectives as expressed by "end-users", which in this case are the local community stakeholders. The project objectives were supplemented by opportunities to add value to the project as identified during the data collection process. The project objectives were restated as performance criteria, which were then used as a guide in developing storm water management alternatives and as a means to measure the performance, or value, of the various alternatives.

Due to the emphasis that was placed on identifying community stakeholder objectives during the ADMP and the reliance on those objectives in developing performance criteria, the goals and objectives from the ADMP are carried forward to the Watson Pre-Design project with minor modifications based on project team discussions and perceptions of changed conditions.

The project objectives expressed by the stakeholders fall into the general categories of flood protection, community enhancement, synergy, and implementation. These objectives are summarized as follows:

1. Flood Protection

The primary purpose for the project is to provide flood protection. The flood protection needs are to address existing flooding problems and to provide a regional drainage framework that can be followed by developers. There are Regulatory Floodplains along the upstream sides of the BWCDD and RID Canals and the UPRR. Flood hazards that are not identified as floodplains include canal overtopping. A large number of overtopping locations were identified in the Area Drainage Master Study (ADMS). There are no restrictions or guidelines for developing in the path of the potential overtopping flows as they make their way overland to the Gila River. A number of other localized drainage problems are identified in the ADMP Data Collection Report. When the study area was originally transformed into irrigated farm fields, the natural drainage system was obliterated. As the farm fields are now converted to residential uses, a storm drainage network needs to be reestablished. In summary, key objectives are to address overtopping flows from the canals and to develop a coordinated regional drainage network.

2. Community Enhancement

As the Buckeye area develops, the stakeholders see opportunities to enhance the community by incorporating multiple uses into the drainage elements. These multiple uses can take the form of parks or passive open space constructed within storm water storage basins, trails along channels, and habitat areas, and preservation of cultural and historic features. Incorporating aesthetics through landscaping will preserve or create a desired visual character along the drainage features that will have a unifying effect within the study area.

3. Synergy

"Synergy- the interaction of two or more agents or forces so that their combined effect is greater than the sum of their individual effects" (The American Heritage College Dictionary, 1993).

There are many entities within the Buckeye area each with their own development interests. These entities include utility providers, transportation agencies, irrigation companies, new and longtime residents, regulators from federal, state, county, and local levels, land developers, farmers, and visitors. Whenever two or more of these multiple and varied interests can be brought together in a single project the community effect is greater than if each were to work independently. An important project objective is to take advantage of opportunities for synergy in developing and implementing the flood control plan.

4. Implementation

For the objectives just described to be realized, the project must be successfully implemented. There are a host of issues relating to implementation such as constructability, funding and cost, as well as public opinion and political support. The factors impacting implementation must be considered and addressed in formulating the plan.

C. Evaluation Criteria

The project goals and objectives stated by the stakeholders were synthesized into a set of performance criteria to be used in an evaluation matrix to measure the alternatives according to how well they meet the criteria and thereby add value for the community. As part of the ADMP, the criteria were each assigned a weighting factor from one to five based on how important the criteria should be considered against the others. The scheme for assigning weights was that the default weighting would be 3 with criteria to be assigned a greater weight or influence on the outcome being raised to a 4 or 5. Similarly, criteria to be given a lesser weight or influence on the outcome would be lowered to a 2 or 1. The

performance scores assigned for each criterion are then multiplied by their weighting factor and summed for the overall performance rating for the alternative. The Performance Criteria with the ADMP assigned weighting factors are:

- Constructability (3)
- Implementation (1)
- Life Cycle Costs (2)
- Landscape Aesthetics and Land Use Compatibility (4)
- Natural & Cultural Resources (4)
- Public and Political Acceptance (2)
- Safety / Flood Hazard Reduction (5)
- Synergy and Multi-Use (4)

The "first cost" for initial implementation and construction will be considered separately from the evaluation criteria listed above. The cost information included in the evaluation criteria is limited to life cycle cost for operation and maintenance only. Before selecting a preferred alternative, the performance rating for each alternative will be compared to the first cost needed to implement the alternative. For example, a higher cost alternative may be selected as the preferred alternative if it has significantly higher performance as compared to competing alternatives to justify the additional cost.

III. FORMULATION OF ALTERNATIVES

A. "Do-Nothing" Alternative

The ADMP evaluated a "no-action" or "do-nothing" alternative. The do-nothing alternative was considered along with the other proposed ADMP alternatives. It did not receive significant support, and was therefore eliminated from further consideration. Some of the reasons given for this decision in the ADMP include:

- Without flood control measures added as development continues, the increase in surface runoff will grow and additional flooding can be expected.
- Uncontrolled flooding could potentially spread contamination from hazardous waste sites to surrounding areas.
- Uncontrolled flooding could adversely impact cultural resources through water erosion if no action is taken, causing a loss in our tangible remnants of the past.
- Wildlife habitat enhancement opportunities identified for this project would be lost with a no action alternative

As the purpose of this Pre-Design is to refine the system features as recommended in the ADMP, no additional evaluation of the do-nothing alternative was performed.

B. Base Alternative

The Watson system as recommended by the Buckeye ADMP was considered to be the Base Alternative, with a few adjustments. The adjustments included:

- Elimination of the White Tanks #4 outfall channel, which at the time of the ADMP, was planned to connect to the Watson system west of Rainbow Road. Planning subsequent to the ADMP re-routed those flows to a different outfall.
- Inclusion of Town of Buckeye Downtown storm water in the sizing of the Watson system facilities. The implementation of systems to convey the downtown storm water to the Watson drainage system is Buckeye's responsibility, but the appropriate flows from the downtown area have been accounted for in the sizing of the proposed Watson system.
- Resizing the proposed basins and channels based on the revised project hydrology, which utilizes NOAA 14 rainfall values.

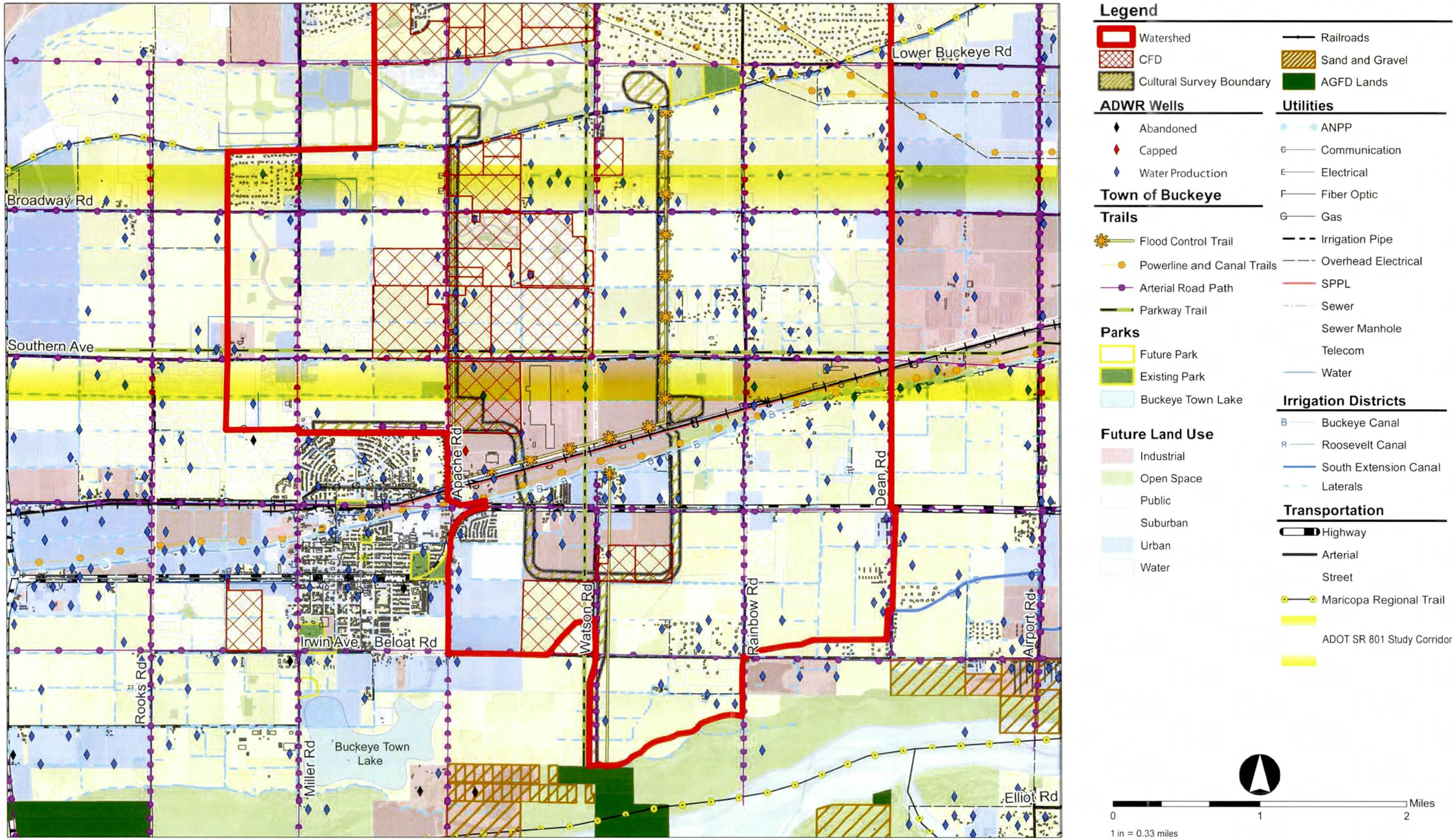
No other modifications have been made to the Base Alternative.

The impact of the revised hydrology results generally lower predicted flows and therefore smaller proposed channels and basins for the Base Alternative when compared with the ADMP proposed system. For example, the ADMP proposed system included 267 acre-ft of basin storage volume, while the revised Base Alternative system provides only 123 acre-ft of basin storage volume.

C. Opportunities and Constraints

FIGURE 3 illustrates the various features within the study area that present either opportunities for adding value into the Watson System or pose constraints that may impact implementation, cost, or public acceptance of a given facility. Together, the site opportunities and constraints help inform the development of proposed alternatives. The narrative below describes the most significant opportunities and constraints identified on the figure.

FIGURE 3 – OPPORTUNITIES AND CONSTRAINTS



1. Town of Buckeye Land-Use/Cultural Settings

The *MAG Future Land Use 2009* data was included on the figure and includes both opportunities as well as constraints on the system implementation. Areas identified for future suburban or urban development may benefit from the open space value of the channels as well as the trail connectivity opportunities they provide. But they also pose constraints on the facility dimensions where larger channel footprints and basins reduce the amount of developable land which is seen as a negative impact by the development community. Industrial sites pose even greater constraints while presenting few opportunities. Trails associated with channel alignments that traverse industrial land-uses are less appealing to most users, though the inclusion of landscape buffers can mitigate these effects. Locating channels and basins between industrial and other adjacent land-uses may also present opportunities for creating transitional buffers between uses. Locating channels and basins between residential and other, more intensive uses should be seen as an opportunity if the landscape design theme applied to the facilities is acceptable and well-executed.

2. Town of Buckeye Skyline Regional Park (off figure, north on the Watson Road alignment)

The Town of Buckeye Skyline Regional Park has recently completed planning and will begin the first phase of design in early 2013. Located north of the project area on the Watson Road alignment, this expansive open space recreation area represents a unique destination that may be connected with trails included in the Watson Drainage System.

3. Town of Buckeye Parks

The Town of Buckeye Sundance Park, on Rainbow Road near Lower Buckeye Road, is very near the location of the proposed Rainbow Basin identified in the Buckeye ADMP. The Town of Buckeye also owns the land immediately west of the park and, based on discussions during the project, intends to add a community center and library on this parcel in the future. As identified in the ADMP, this clustering of recreation facilities into a larger complex represents an opportunity for connectivity through channels and trails as well as co-locating active recreation with the proposed Rainbow Basin.

4. Town of Buckeye Trails

The Town of Buckeye Trails Master Plan (2007) included the initial Buckeye ADMP channel alignments as preferred trail corridors. Subsequent changes to the ADMP resulted in the alignments shown in the Master Plan conflicting with the final recommended alignments of the ADMP. However, the Watson Pre-Design team confirmed with the Town of Buckeye that the proposed channel alignments in the Watson System represent the preferred opportunities for providing multi-modal trails in lieu of the alignments shown in the final master plan document.

5. Maricopa Regional Trails

The Maricopa Regional Trail System has identified two segments of planned trail within the Watson System. These include a portion of Segment 33, which follows the Gila River from the confluence of the Salt River to the Robbins Butte Wildlife Area along the El Rio Levee; and a portion of Segment 69, which follows the Roosevelt Irrigation District (RID) Canal. Opportunities exist to provide local trail connections to these regional trail segments through the Watson System as well as create trailhead access points at adjacent basins.

6. Utilities

There are a number of significant utilities within the proposed channel corridors that require consideration and coordination, which pose some of the most critical constraints on alternative implementation. The most significant of these include the Arizona Nuclear Power Project (ANPP) 96"

reclaimed water line, Kinder-Morgan gas line, and fiber optic lines that run parallel to the Union Pacific Railroad and Buckeye Water Conservation and Drainage District (BWCDD) canal.

7. Union Pacific Railroad

The Union Pacific Railroad line that bisects the study area represents a significant constraint on the system. The ADMP base alternative included two crossings of the railroad – one each on the Apache Road and 231st Avenue channel alignments.

8. Irrigation District Facilities

The Roosevelt Irrigation District (RID) and the BWCDD both operate major canals with a complex network of distribution and tailwater laterals throughout the Watson System. Canal crossing restrictions, lateral displacement and/or replacement requirements, and public access control requirements pose challenges that must be recognized and addressed.

9. Watson Community Facilities District

The Watson Community Facilities District (CFD) was formed in 2005, and includes several parcels adjacent to the proposed alignments of the Watson system alternatives. To date, the CFD has invested over $30M in underground water infrastructure to serve its member parcels. Direction has been issued by the Town of Buckeye to form the alternatives to avoid impacts to the CFD parcels where feasible to do so. In cases where avoiding impact is not feasible, attempts to minimize the impacts of the proposed system have been made. If no feasible options seemed to exist to avoid or minimize impacts to CFD parcels, then these parcel were treated the same as non-CFD parcels.

10. Wells

Capping and abandoning water production wells can be very costly and extend project design or construction schedules. ADWR inventoried groundwater wells have been included on the figure in order to assist in identifying potential conflicts with a proposed alternative.

11. Gila River

The Gila River, at the outfall of the Watson System, presents both opportunities as well as constraints on the facility design. A number of sand and gravel operations are located to the west of the proposed outfall location that may be impacted by the outfall design. Arizona Game and Fish Department (AGFD) owns the land immediately at the point of discharge from the existing Watson Drain into the Gila River that will serve as the Watson System outfall. AGFD is currently in discussions with the sand and gravel owners who wish to expand their operations into this area. This site is near the location of a planned future lake. The El Rio Levee will also be located near the outfall and require coordination with the Watson System.

12. Constructed habitat (Opportunity associated with alternatives, not depicted on figure)

Vegetative cover and composition are common metrics used to gauge habitat value, though this provides only an approximate means of estimating how likely a given landscape or vegetative community will function as high-value habitat. The habitat value of a given landscape also varies between wildlife species. The Watson Pre-Design Team made the following assumptions related to the proposed alternatives when assessing the likely habitat value of a given facility:

Facilities that include opportunity for restoration with native vegetation communities will provide the highest habitat value for the greatest range of wildlife species. These include proposed natural open space basins and earthen channels with hydroseed.

- Facilities that will be landscaped with typical suburban ornamental plant material will provide habitat value to some wildlife species, though plant species diversity and density (i.e. cover) will be lower than in native-type landscapes. This includes the rock mulch channels and, to a more limited extent, the gunite channels and active recreation basin identified at the RID canal and 231st Avenue.
- While plant coverage is high in turfed landscapes, the monoculture of species coupled with common pesticide and maintenance practices associated with turf limit the value as habitat. Habitat value for turf may be higher when associated with adjacent native habitats where the turf can serve as forage areas while shelter and other habitat is readily present nearby.
- Concrete channels provide very limited or no habitat value for most wildlife species.
- The Gila River outfall presents a unique opportunity to create high value riparian habitat due to the presence of a water supply from the existing Watson Drain.

D. Consultant Seed Ideas

A number of ideas were identified by the consultant team as potential refinements to the Base Alternative which had the potential of improving system performance or reducing project costs. The repeating theme as the seed ideas emerged was to reduce the project cost by consolidating the proposed locations where the Watson Drainage System needs to cross the UPRR, the ANPP 96" waterline, the BWCDD Canal and the Kinder-Morgan fuel pipeline.

The consolidation of the crossings seemed to be realistic given the adoption by the District of the NOAA 14 precipitation values as the standard rainfall data for hydrology modeling subsequent to the completion of the ADMP. Recognizing that, in general, NOAA 14 has the effect of reducing predicted storm water runoff rates throughout Maricopa County, the idea of a single crossing of these facilities appeared to be feasible.

In addition, the required sizes of the proposed retention basins recommended in the Base Alternative may be reduced, while achieving the same hydraulic effect on the downstream system. The idea of varying the volume of retention proposed in the system basins led to the identification of two distinct approaches that warranted further evaluation- (1) maximizing retention storage, which translates to minimizing downstream conveyance facility sizes and (2) minimizing retention storage, which translates to maximizing downstream conveyance facility sizes with the potential of eliminating some of the basins.

Additional ideas included identification of additional or alternative basin sites, in order to accommodate the proposed Globe Corporation industrial development.

Exhibits depicting the seed ideas with revisions are shown on **FIGURE 4** through **FIGURE 7**.

E. Brainstorming Meeting

A brainstorming meeting was held on August 23, 2012 with representatives from FCDMC, the Town of Buckeye, W.C. Scoutten (Contract Town Engineer) and the consultant team to discuss the seed ideas and solicit input to be incorporated into the development of alternatives to be analyzed further.

A history of how the recommended Watson Drainage System was developed during the ADMP process was presented at this meeting to refresh memories of those present that were involved in the ADMP and for the benefit of those present who were not involved in the ADMP.

A discussion of the evaluation process to be applied to the project alternatives was held, and input was solicited and received from the meeting attendees. The following items were recommended by the group to be included in some form in the alternatives evaluation criteria:

- Contaminated soils
- Consolidated crossing of UPRR/K-M/ANPP/BWCDD facilities
- Lateral Migration of the Gila River – El Rio Levee considerations
- "Impacts" to adjacent existing or planned neighborhoods
- Ease of phased implementation

The group also discussed potential opportunities (o) and constraints (c) of the Watson Drainage System area. The group generated the following list of opportunities and constraints to be considered in the development of the alternatives:

- Habitat (c)
- Equestrian connection (o)
- Historically significant sites (sheep herders' quarters) (c)
- Open space for public use (o)
- Existing and proposed utilities (c)
- Lateral connections to irrigation canals (c)
- Cemetery (c)
- Mining rights (c)
- Land ownership at proposed outfall location (c)
- Existing functioning dewatering wells (c) (o)
- Groundwater levels (c)

The meeting attendees were divided into 3 smaller working groups for discussions and input on the consultant seed ideas, which were presented as large scale exhibits of proposed locations of basins and alignments of channels. Perhaps the most significant input from this exercise was the identification of the need for the proposed "Maricopa" channel to be extended to the west side of Miller Road.

FIGURE 4 – ALTERNATIVE SEED IDEAS

FIGURE 5 – ALTERNATIVE A BRAINSTORM MARKUP

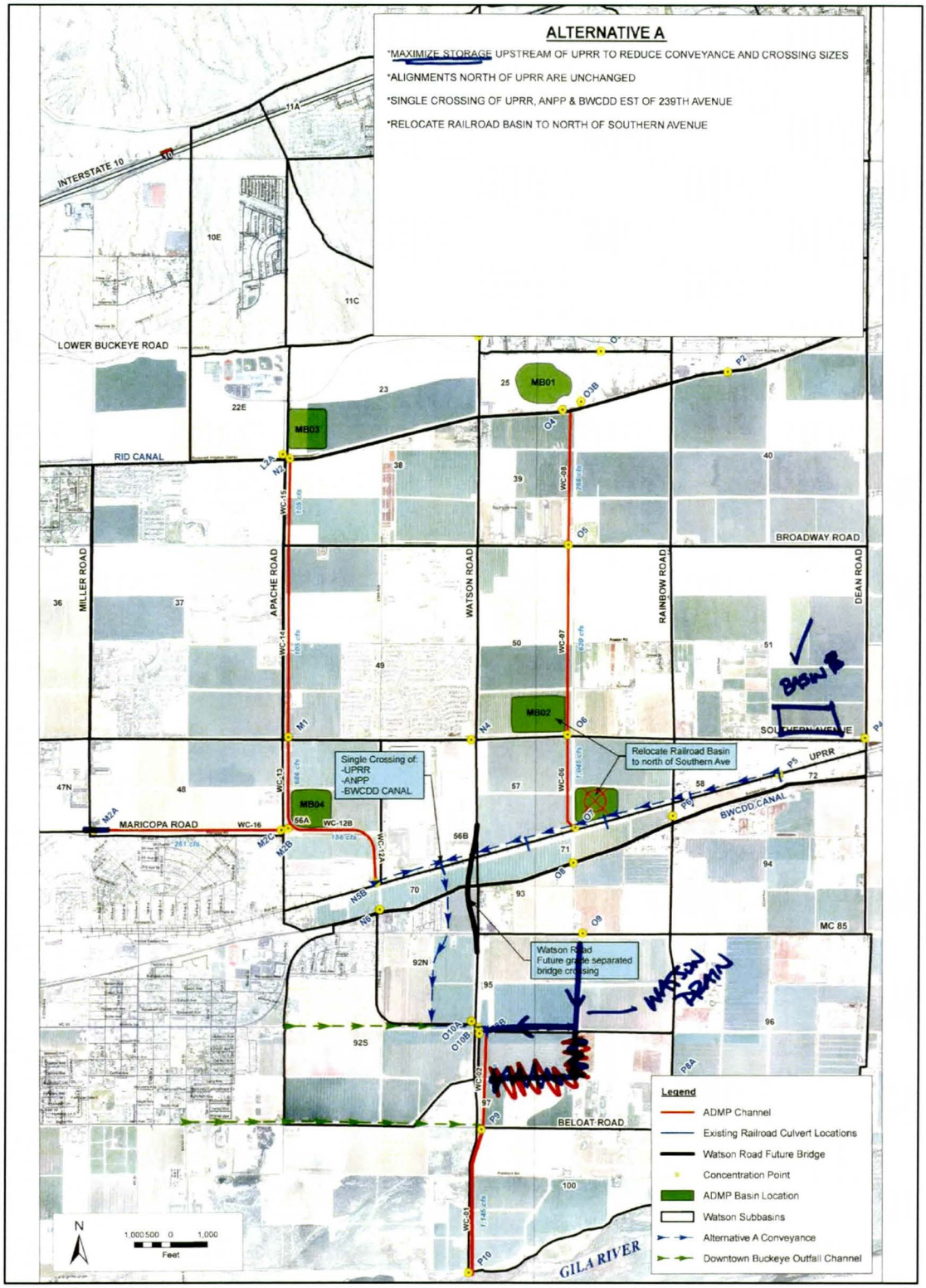


FIGURE 6 – ALTERNATIVE B BRAINSTORM MARKUP

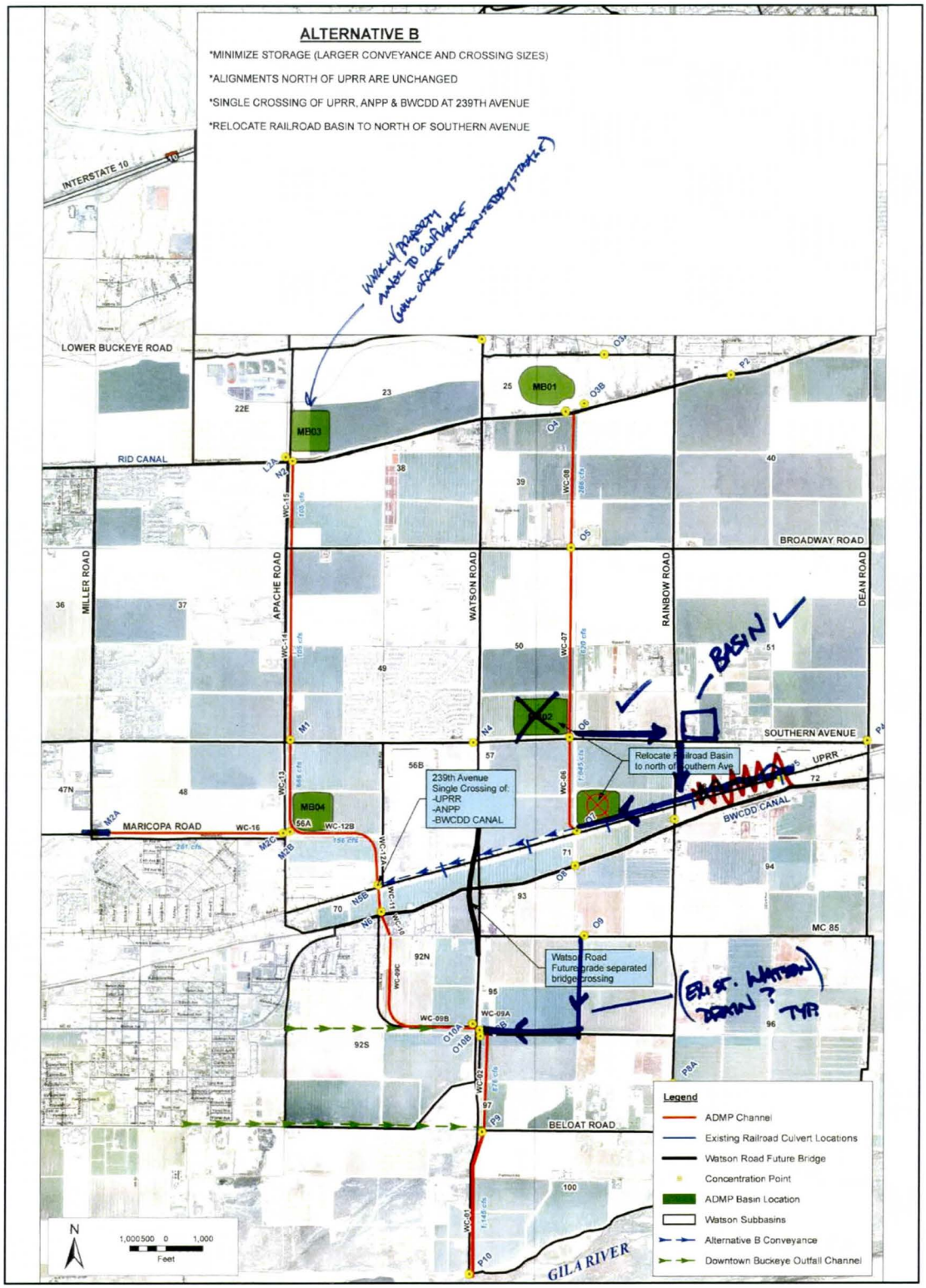
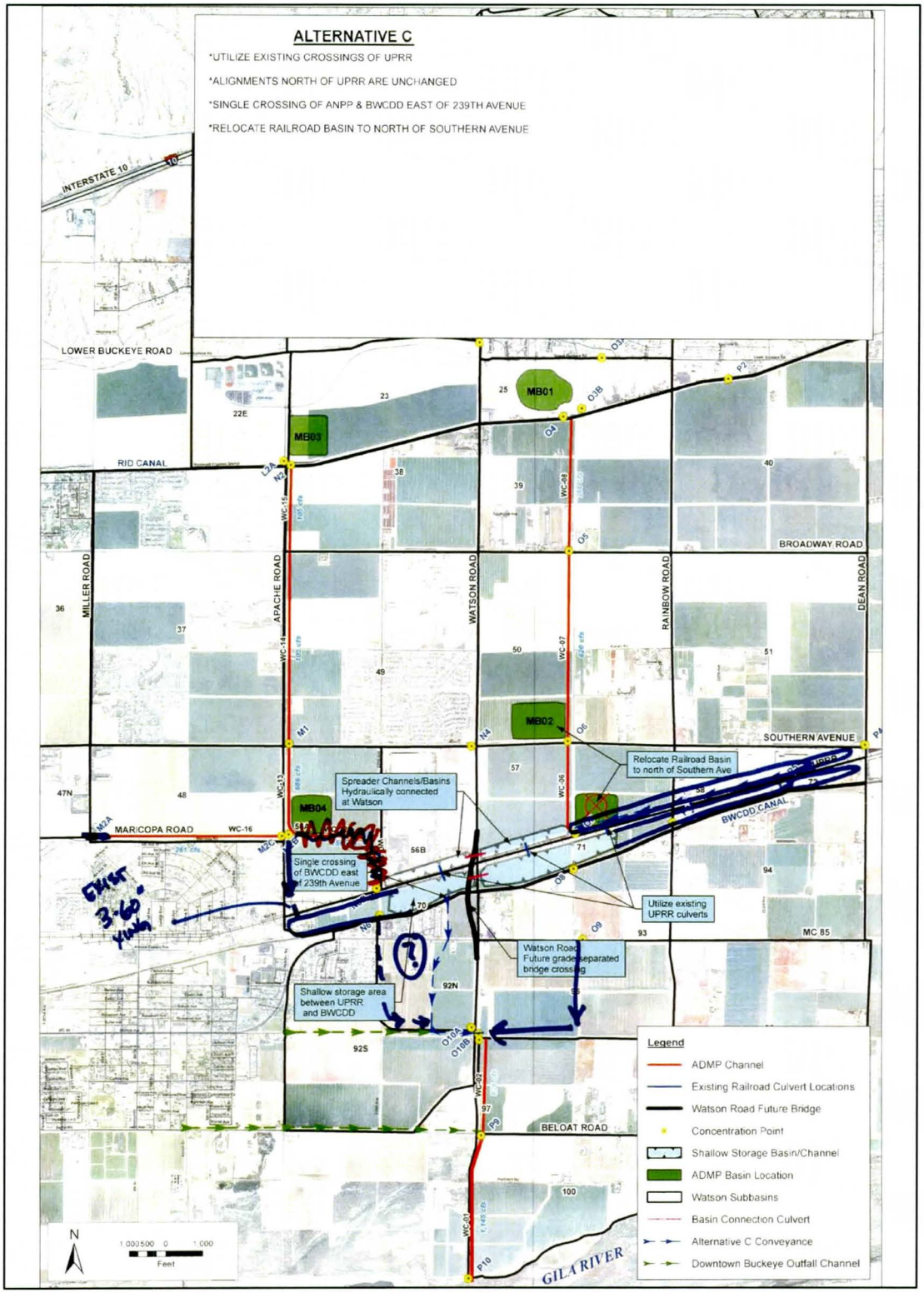


FIGURE 7 – ALTERNATIVE C BRAINSTORM MARKUP

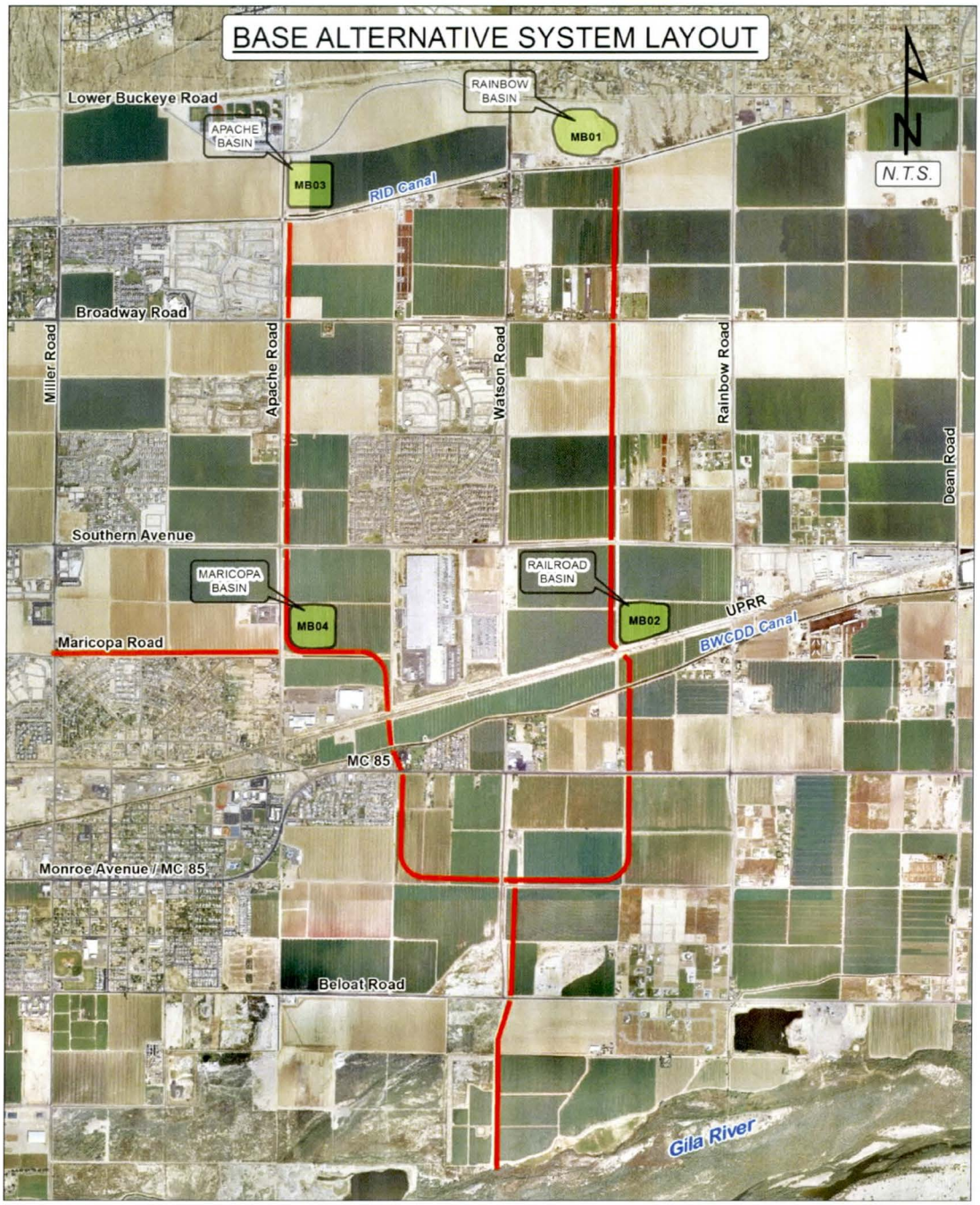


F. Preliminary Alternatives for Further Analysis

1. Base Alternative

The Base Alternative, as developed in the ADMP with revisions as described above, will be used as the measuring stick against which the other alternatives will be evaluated. The Base Alternative is shown on **FIGURE 8.**

FIGURE 8 – BASE ALTERNATIVE SYSTEM LAYOUT



2. Alternative A

Alternative A (see **FIGURE 9**) relies on increased upstream storage volume in order to reduce the required sizes of the downstream conveyance facilities. Alternative A includes an additional basin, referred to as the Dean Basin, to capture and attenuate flows originating in the northeast quadrant of the Watson watershed.

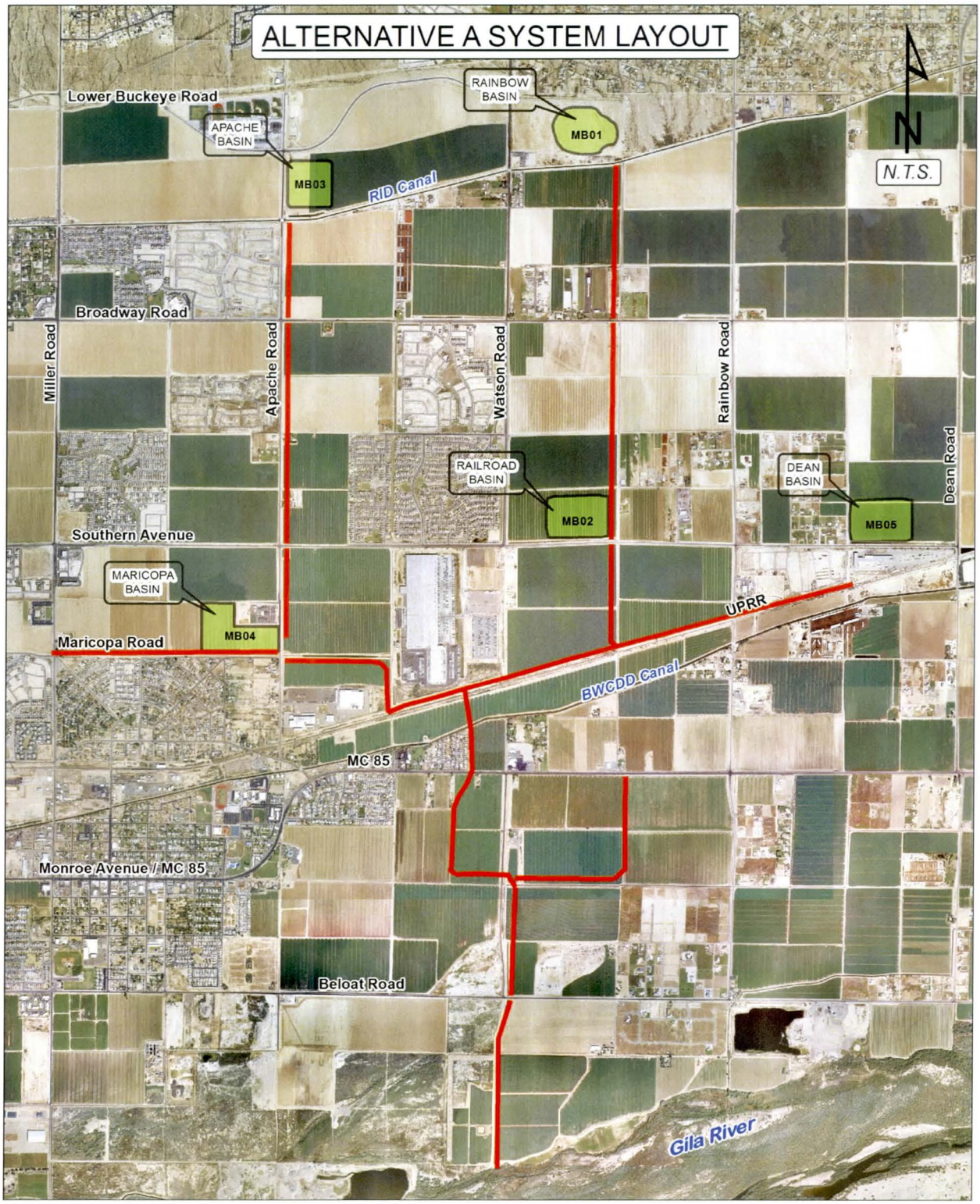
The Maricopa basin is proposed to be relocated to the west side of Apache Road in order to minimize impacts to the planned development at the northeast corner of Apache Road and Maricopa Road, which property is within the Watson Community Facilities District. The Railroad Basin is proposed to be relocated to the north side of Southern Avenue in accordance with direction from Town leadership that the original basin location has been committed to the property owner for future development and is therefore unavailable to the project.

The east and west branches of the system are proposed to be consolidated upstream of the UPRR property in a channel, and a single crossing of the UPRR/K-M/ANPP/BWCDD facilities is proposed near the mid-point of the Wal-Mart property. This location of the crossing was selected based on the location of the existing low point on the north side of the UPRR property, and based on the location of the Country West Properties development south of the BWCDD property.

The system downstream of the UPRR/K-M/ANPP/BWCDD crossing is proposed to be located immediately east of the Country West Properties development, avoiding the need for developed property acquisition in this area.

A collection channel is proposed south of MC-85 to collect and convey flows originating in the southeast quadrant of the Watson watershed. This collection channel combines with the system crossing the UPRR/K-M/ANPP/BWCDD facilities at approximately the Monroe Avenue alignment. From there, it continues south along the alignment of the existing Watson Drain, until it discharges into the Gila River.

FIGURE 9 – ALTERNATIVE A SYSTEM LAYOUT



3. Alternative B

Alternative B (see **FIGURE 10**) utilizes reduced storage volume upstream of the UPRR. Alternative B does not include the basin from the Base Alternative referred to as the Railroad Basin, replacing it with the Dean Basin in order to capture and attenuate flows originating in the northeast quadrant of the Watson watershed.

The Maricopa basin is proposed to be relocated to the west side of Apache Road in order to minimize impacts to the planned development at the northeast corner of Apache Road and Maricopa Road, which property is within the Watson Community Facilities District.

Alternative B includes a diversion in the east channel alignment at 231st Avenue and Southern Avenue. At this location, the channel is proposed to flow easterly to Rainbow Road, then south to the upstream side of the Railroad property. This channel diversion represents an attempt to minimize impact to the proposed Globe Corporation industrial development.

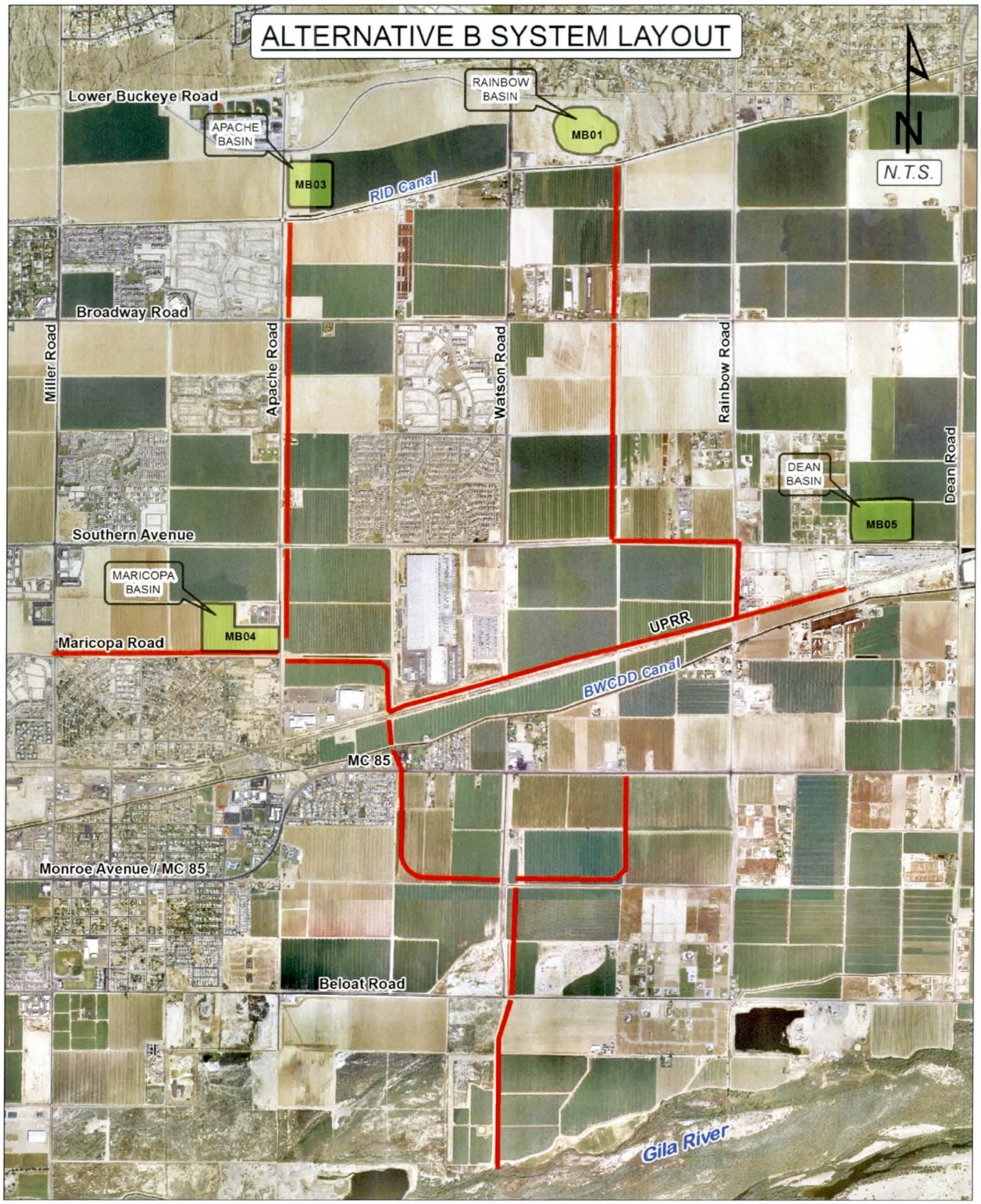
The east and west branches of the system are proposed to be consolidated upstream of the UPRR property in a channel, and a single crossing of the UPRR/K-M/ANPP/BWCDD facilities is proposed approximately at the 239th Avenue alignment. This location of the crossing was selected based on the existing division of the agricultural fields south of the UPRR, and based on the location of the Ironwood Vista Residential development south of MC-85.

The proposed consolidation point of Alternative B will require that flow be conveyed along the north side of the UPRR property for a greater distance than Alternative A. The topography in this area is fairly flat, which could make constructing a conveyance channel challenging.

The system downstream of the UPRR/K-M/ANPP/BWCDD crossing is proposed to be located immediately east of the Ironwood Vista development, avoiding the need for developed property acquisition in this area.

A collection channel is proposed south of MC-85 to collect and convey flows originating in the southeast quadrant of the Watson watershed. This collection channel combines with the system crossing the UPRR/K-M/ANPP/BWCDD facilities at approximately the Monroe Avenue alignment. From there, it continues south along the alignment of the existing Watson Drain, until it discharges into the Gila River.

FIGURE 10 – ALTERNATIVE B SYSTEM LAYOUT



4. Alternative C

Alternative C (see **FIGURE 11)** represents an attempt to maximize the use of existing structures by utilizing the existing culverts crossing the UPRR to convey storm water across the UPRR facility, thus eliminating the need for a new crossing and the associated costs. Therefore, minimizing the flows reaching the UPRR is an inherent objective for Alternative C. For this reason, Alternative C relies heavily on upstream storage volume, mimicking the same basin approach as Alternative A, including both the Railroad Basin and an enlarged Dean Basin.

The Maricopa basin is proposed to be relocated to the west side of Apache Road in order to minimize impacts to the planned development at the northeast corner of Apache Road and Maricopa Road, which property is within the Watson Community Facilities District. The Railroad Basin is proposed to be relocated to the north side of Southern Avenue in accordance with direction from Town leadership that the original basin location has been committed to the property owner for future development and is therefore unavailable to the project.

Alternative C proposes to utilize a series of shallow (3-feet deep) linear storage basins located adjacent to and north of the UPRR property to collect the upstream flows. These shallow linear basins are proposed to discharge flows to the existing culverts crossing the UPRR.

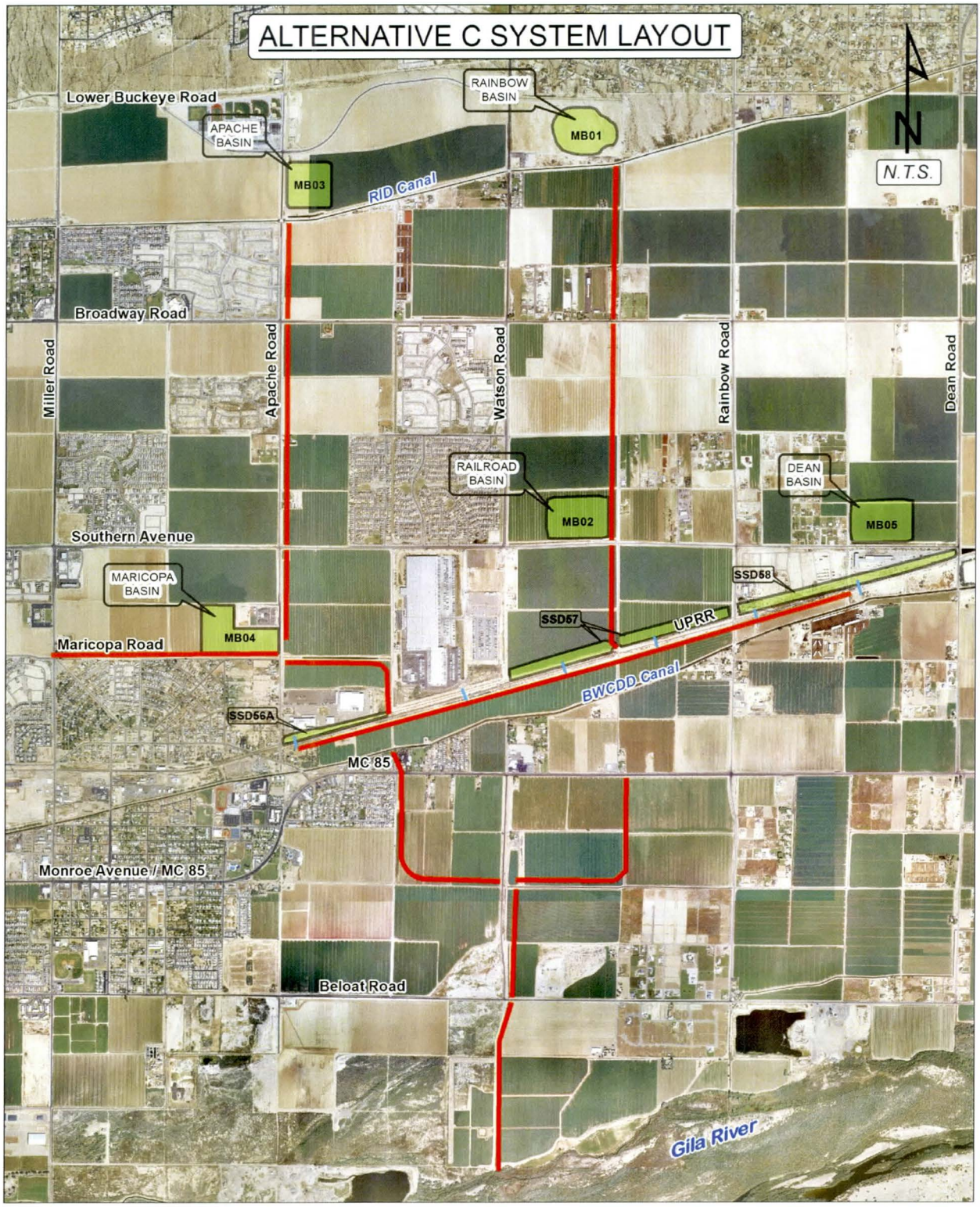
South of the UPRR property (in which the Kinder-Morgan line is located), a channel will need to be created to collect these flows and consolidate them at a location for a single crossing of the ANPP/BWCDD facilities.

This crossing location is proposed approximately at the 239th Avenue alignment. This location of the crossing was selected based on the existing division of the agricultural fields south of the UPRR, and based on the location of the Ironwood Vista Residential development south of MC-85.

The system downstream of the ANPP/BWCDD crossing is proposed to be located immediately east of the Ironwood Vista development, avoiding the need for developed property acquisition in this area.

A collection channel is proposed south of MC-85 to collect and convey flows originating in the southeast quadrant of the Watson watershed. This collection channel combines with the system crossing the UPRR/K-M/ANPP/BWCDD facilities at approximately the Monroe Avenue alignment. From there, it continues south along the alignment of the existing Watson Drain, until it discharges into the Gila River.

FIGURE 11 – ALTERNATIVE C SYSTEM LAYOUT



G. Channel Cross-Section Alternatives

During multiple meetings, the Town of Buckeye made clear to the project team that channel configurations and treatments should be responsive to the adjacent land-use rather than having a single channel type defined for the entire system. The design and stakeholder teams used this information to identify five character areas based roughly on the future land-use, probable implementation method, slope and assumed erosion potential, and relationship to existing or planned development in the Town. The five character areas identified based on this information are:

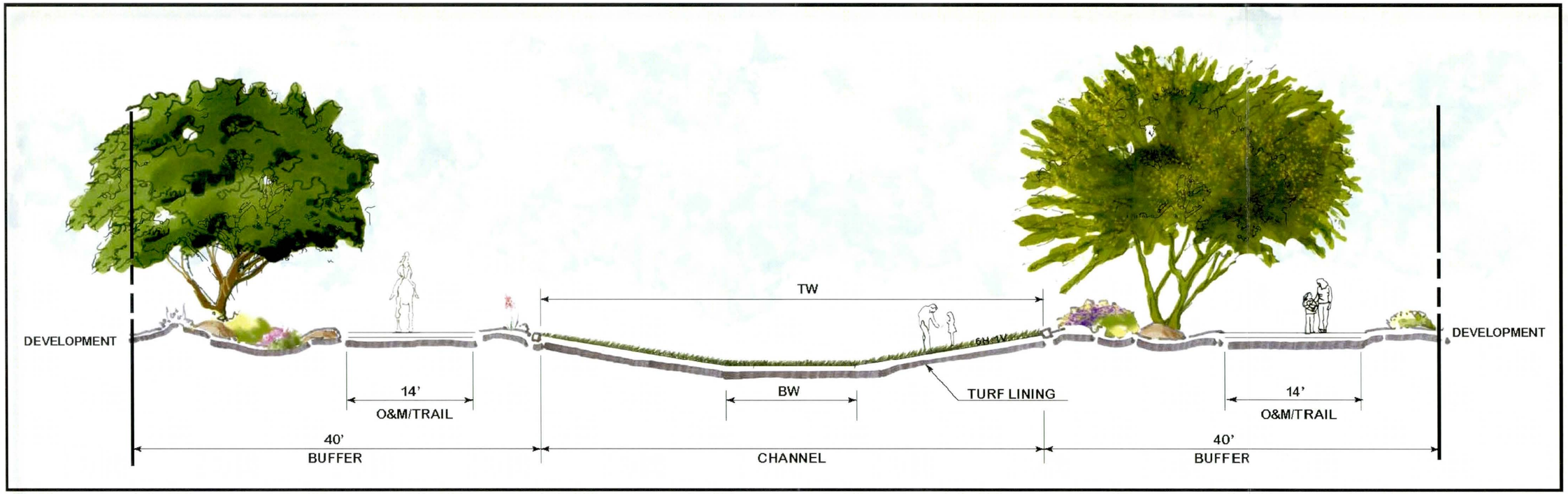
- 231st Avenue/Residential Channel
- Apache Road Channel
- Maricopa Road Channel
- Watson Drain Channel
- Industrial Conveyance

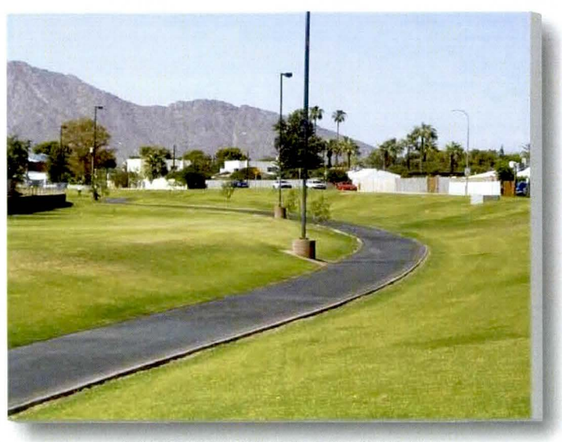
Typical channel cross-sections were developed for each character area through close collaboration between the design team and the Town of Buckeye during the Design Charrette Meeting. Channel configuration recommendations include: channel lining type and roughness, side slopes, buffer widths, relationship to existing irrigation district facilities, trail and other multi-use considerations, and relationships to Town easements. The typical requirements for these channel types are summarized in **TABLE 1**, and in **FIGURE 12** through **FIGURE 16**.

TABLE 1 – CHANNEL CONFIGURATION SUMMARY

Character Area	Lining	Street Side			Bottom Width	Inside		
		Buffer	O&M Road	Side Slope		Side Slope	O&M Road	Buffer
231st Ave	Turf	40'	(included in buffer)	6:1	As needed	6:1	(included in buffer)	40'
Apache Road	Gunite with aesthetic treatment	40' (+ 20' for R/W setback, etc.)	(included in buffer)	6:1 / 4:1	As needed	4:1 / 6:1	n/a	10'-15'
Maricopa Road	Earthen with rock mulch or turf	10' (+ 24' if irrigation reloca-tion)	n/a	6:1	As needed	6:1	n/a	40'
Watson Drain	Earthen with mowable hydroseed	40'	14'	6:1	10' (Concrete low-flow) + 10' min each side for equipment	6:1	14'	40'
Industrial Area	Concrete	20'	14' + 5' Buffer	4:1	As needed	4:1	n/a	10'

FIGURE 12 – 231st AVE CHARACTER AREA CHANNEL SECTION





TURF CHANNEL EXAMPLE

231st AVENUE CHANNEL CHARACTER AREA
TYPICAL CROSS-SECTION

Scale: 1" = 10' - 0"

CHANNEL DESCRIPTION:
The 231st Avenue Channel is intended for suburban land-use areas adjacent to residential developments, but not on a road alignment.

The turf lining was selected by the Town of Buckeye based on anticipated flow velocities and soil conditions.

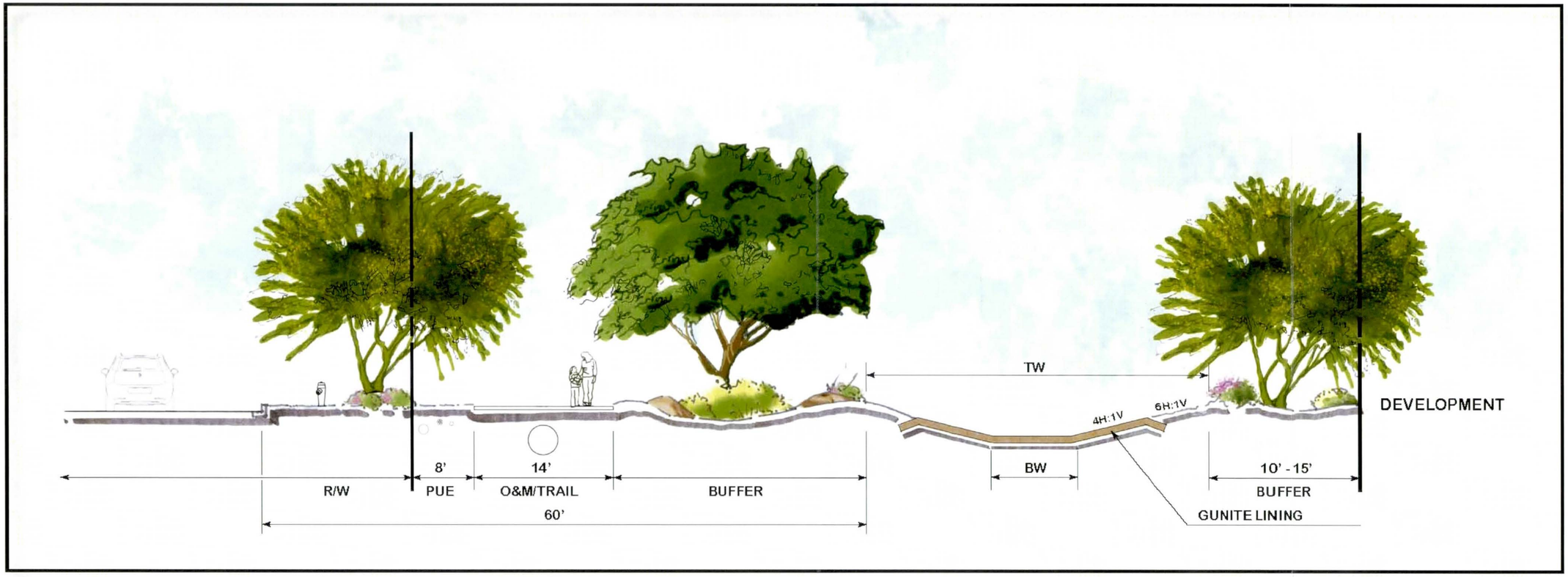
Where possible, turfed channels should be designed contiguous to active recreation areas within the development. Where this occurs, buffer reductions are permissible.

The east 14' O&M road should serve as a soft-surface equestrian trail.

Multi-use trails should be setback from the channel a min. of 5'.

The turf channel should be designed with both alignment meander as well as side slope warping. 6:1 max. side slopes are permitted for turf maintenance purposes.

FIGURE 13 – APACHE RD CHARACTER AREA CHANNEL SECTION



GUNITE CHANNEL EXAMPLE

GUNITE CLOSE-UP
AESTHETIC TREATMENTS INCLUDE
INTEGRAL COLOR, EXPOSED
AGGREGATE FINISH

APACHE CHANNEL CHARACTER AREA
TYPICAL CROSS-SECTION

Scale: 1" = 10' - 0"

CHANNEL DESCRIPTION:
The Apache Channel is intended for suburban land-use areas adjacent to residential developments.

The gunite lining was selected by the Town of Buckeye based on anticipated flow velocities and soil conditions.

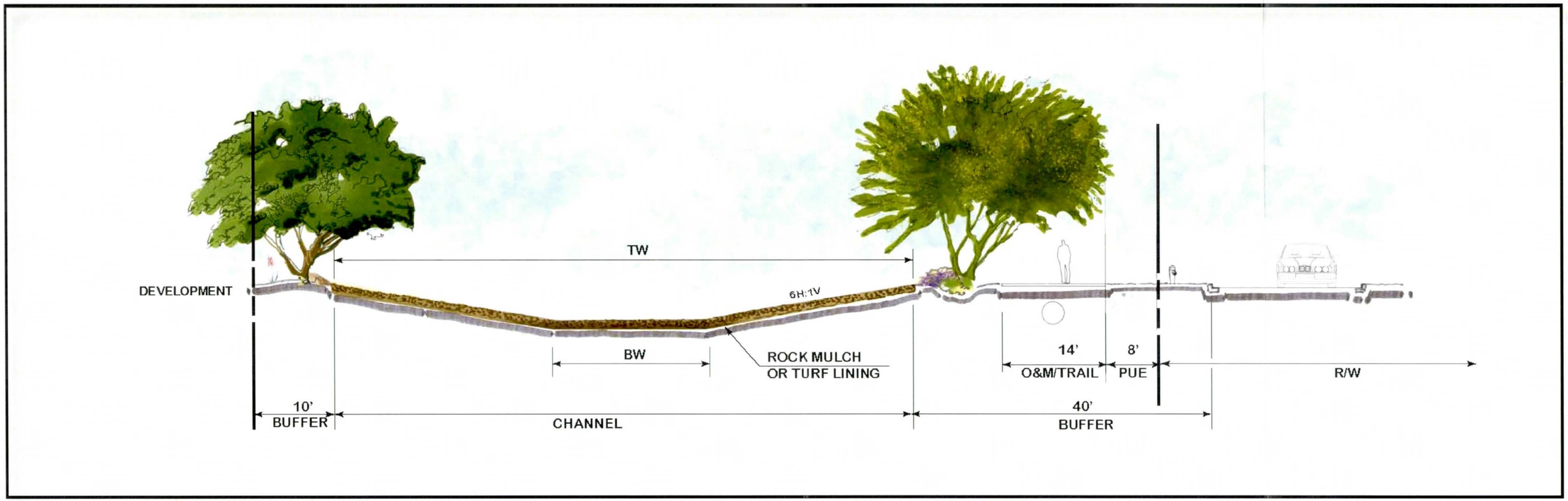
Gunite lining must include aesthetic treatments such as integral color to match the color of the adjacent decomposed granite or mulch and texturing.

Gunite is intended to extend to the channel design flow depth and have a maximum 4:1 slope.

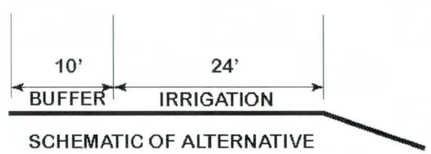
The channel freeboard may be left earthen with a max. slope of 6:1.

Off-site flows should be controlled through the creation of water collection and harvesting swales and berms that can direct flows into the channel in designated locations. This will help reduce channel maintenance requirements while maximizing water-harvesting opportunities.

FIGURE 14 – MARICOPA RD CHARACTER AREA CHANNEL SECTION



ROCK MULCH CHANNEL EXAMPLE



SCHEMATIC OF ALTERNATIVE INSIDE BUFFER AND IRRIGATION REQUIREMENT

MARICOPA CHANNEL CHARACTER AREA TYPICAL CROSS-SECTION

Scale: 1" = 15' - 0"

CHANNEL DESCRIPTION:
The Maricopa Channel is intended for suburban land-use areas adjacent to residential developments.

The rock mulch or turf lining was selected by the Town of Buckeye based on anticipated flow velocities and soil conditions.

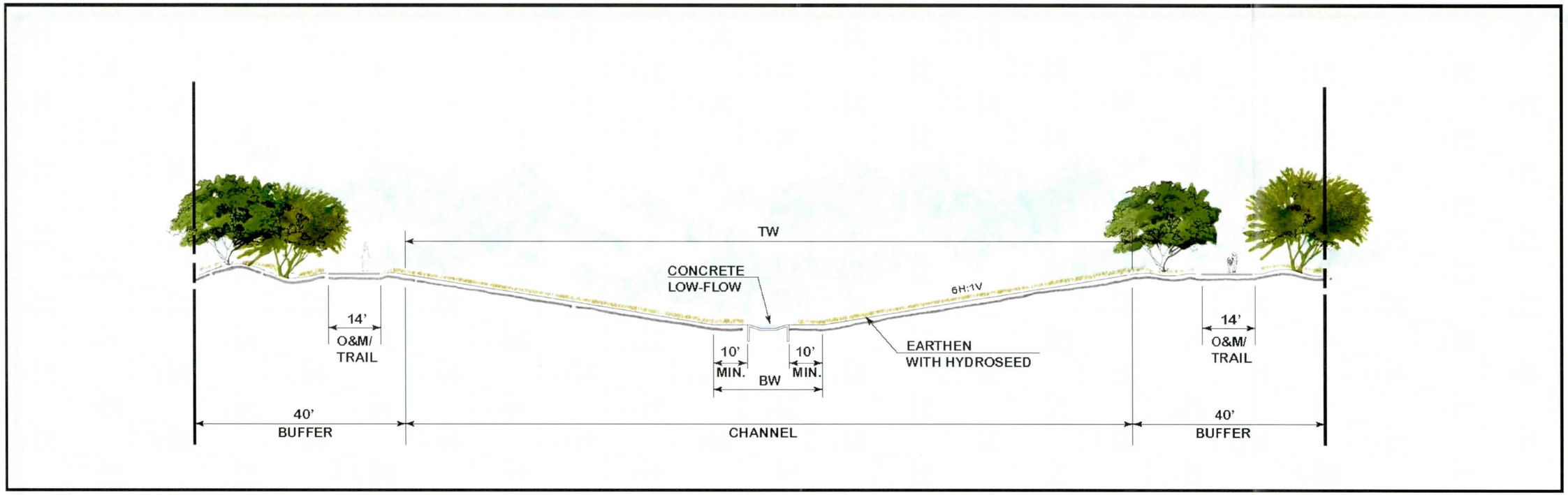
Rock mulch selected for the channel should be from the same source and same color as the decomposed granite and other rock included in the landscape areas of the channel.

The 14' O&M road will serve dual use as a multi-use trail, replacing the need for sidewalk in the right-of-way.

The 8' PUE is shown in a modified condition from the Town of Buckeye standard roadway design for Maricopa Road. This is due to the replacement of the sidewalk with the multi-use trail, and to allow for some landscape buffer between the trail and channel top of bank.

The Maricopa Channel design should include meander of the channel bottom through side-slope warping (4:1 to 8:1).

FIGURE 15 – WATSON DRAIN CHARACTER AREA CHANNEL SECTION



HYDROSEED WITH CONCRETE LOW-FLOW CHANNEL EXAMPLE

WATSON DRAIN CHANNEL CHARACTER AREA TYPICAL CROSS-SECTION

Scale: 1" = 30' - 0"

CHANNEL DESCRIPTION:
The Watson Drain Channel is intended for the area south of the BWCDD where no currently planned developments have been identified, but options for future development should not be precluded by the current channel configuration.

The hydroseed lining was selected by the Town of Buckeye in order to keep maintenance requirements low.

6:1 max. side slopes are allowed in order to keep slope at a mowable grade.

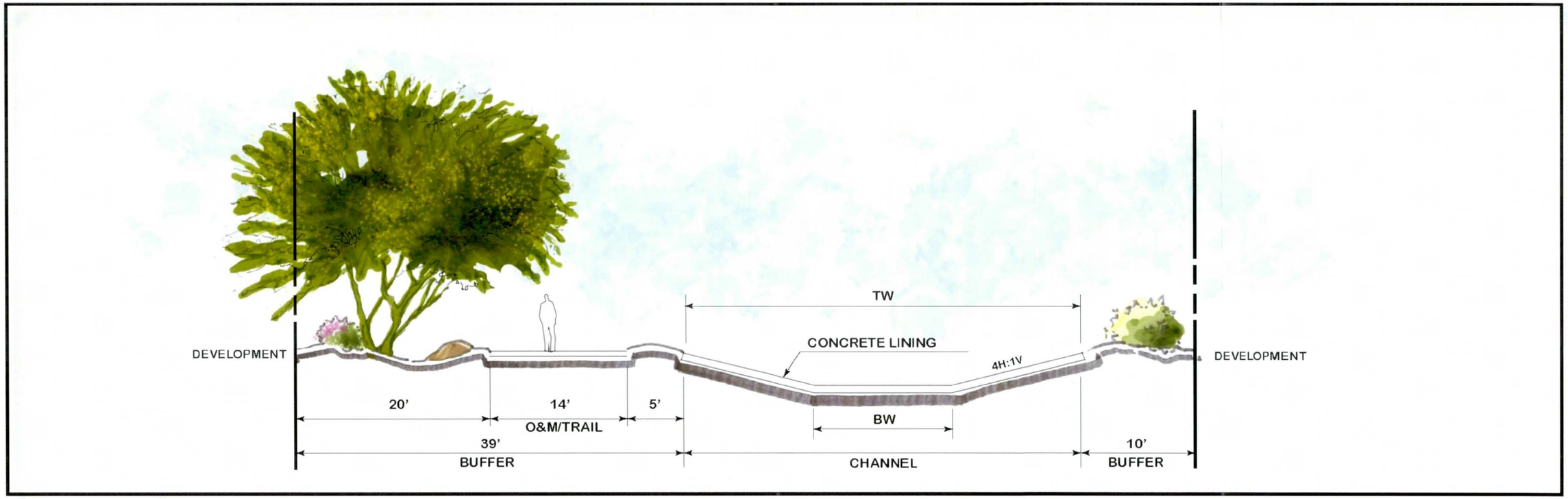
Sufficient space in the channel bottom is required for mowers and maintenance equipment.

Berms and swales should be included in the overbank area to control off-site flows and reduce erosion

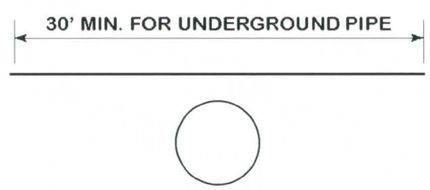
The Town of Buckeye desires the channel landscape to be simple, and not create a future regulatory restriction on reconfiguring the channel if future development so wishes.

Landscape treatments for this channel will be limited to a natural desert hydroseed mix and tall pot trees. Tall pot trees should be restricted to the channel overbank area.

FIGURE 16 – INDUSTRIAL CHARACTER AREA CHANNEL SECTION



CONCRETE CHANNEL EXAMPLE



INDUSTRIAL CHANNEL CHARACTER AREA TYPICAL CROSS-SECTION

Scale: 1" = 10' - 0"

CHANNEL DESCRIPTION:
The Industrial Channel is intended for industrial land-use areas.

The concrete lining was selected by the Town of Buckeye based on the industrial land-use and anticipated flow velocities.

4:1 max. side slopes are allowed for safety purposes and to preclude the requirement for handrail along the length of the channel.

The O&M road/multi-use trail should be set back from the top of bank a min. of 5'.

The 20' trail setback was identified based on the Town of Buckeye's Trails Master Plan recommendations.

Trees should be included in the landscape setback along the trail in order to provide some shade and help screen trail users from the adjacent industrial uses.

IV. EVALUATION OF PRELIMINARY ALTERNATIVES

A. Planning Considerations

In addition to the opportunities and constraints previously described, the following planning considerations apply to all of the alternatives:

Because of limitations by the RID & BWCDD canal companies to disallow overchutes of the canals, all alternatives will require routing flow under the canals. The RID and the BWCDD have specific requirements for crossing their facilities, including minimum clearance distances and lining of the canal system for some distance upstream and downstream of the crossing. This lining will need to be 6-inch reinforced concrete.

Since most of the major utilities run east-west along the UPRR and BWCDD canal alignments, any alternative that crosses these features will have potential utility conflicts with petroleum, fiber optic and the ANPP pipeline. Additionally, there are several water and sewer lines that may pose a conflict.

The existing system of irrigation delivery ditches and pipes fed by the RID and the BWCDD canals must remain functional. As neither the RID nor the BWCDD will allow siphons in their systems due to the potential for sediment deposition, the delivery system components will need to either be relocated to the "field side" of the proposed channels, or cross the proposed channels in a pipe spanning the top of the channel.

Any proposed crossing of the ANPP 96" waterline and the BWCDD canal presents a challenge. The BWCDD does not allow overchutes along their system, so the proposed drainage facilities must cross under the canal. The ANPP pipeline is located upstream of the BWCDD canal. The top of the ANPP pipeline appears to be below the bottom of the BWCDD canal. Crossing below both facilities would put the drainage system unnecessarily deep, and require a very long distance to daylight on the downstream side. It appears to be feasible to cross over the top of the ANPP line and under the BWCDD canal using a 4' tall box culvert system. This approach will need to be further investigated.

At each location where the system is proposed to cross an existing roadway, a box culvert will be required to safely convey the flows under the roadway corridor. Regardless of the required channel depth upstream of the roadways, it is likely that the box culvert will need to be at least 7' deep at the roadways, accounting for a minimum 4' tall box plus required cover.

There is a historically significant site located on the west side of 231st Avenue north of Broadway Road consisting of a structure that served as sheep herders' quarters. Constructing an open channel at this location would almost certainly impact this site. This alignment is common to all of the alternatives. Therefore, it is proposed that an underground storm drain be used to convey the flows through this reach, which can transition to an open channel at Broadway Road.

The Gila River and the planned El Rio levee system need to be considered for all of the alternatives. The El Rio levee is planned to extend along both sides of the Gila River from east of the project area to SR 85. Since 100-year flows in the Gila River will be higher than natural ground behind the levee, there will be the potential for Gila River flows to back up through the system and cause flooding behind the levee. This potential needs to be considered in the design of the Watson Drainage System outfall channel. For example, elevated channel banks may prevent this from occurring.

Groundwater is high in the southern portions of the Watson watershed. Dewatering wells are constantly running in the area to prevent some parcels from becoming waterlogged. Depth to groundwater may be as little as 8' in the area, which will present constructions challenges for the deeper channels in the lower end of the system.

There is an existing APS substation facility located east of Miller Road on the north side of Maricopa Road. The Town of Buckeye has requested the extension the Maricopa conveyance channel to the west side of Miller Road. Extending the channel section would impact the APS facility. Therefore, the extension to the west side of Miller Road is proposed to be accomplished in an underground pipe.

All of the alternatives are well suited for a phased implementation. The conveyance system could be constructed from downstream to upstream in phases. Construction of the proposed basins could be advanced ahead of the adjacent channels and integrated into the community as parks and recreational open space.

Environmental Considerations

Regulatory and Hazardous Waste Sites - There are no known regulatory and/or hazardous material sites identified in the ADMP in the original Watson System alignments. Based on a review of the ADMP there do not appear to be differentiating conditions between the proposed alternatives related to this consideration.

Cultural Resource Impacts – The Flood Control District completed an archeological inventory of the Watson Drainage System base alternative corridor in compliance with among others a) the National Historic Preservation Act of 1966, b) the Arizona Antiquities Act of 1960 (Arizona Revised Statute [A.R.S.] Section [§] 41-841 et seq.), and c) the State Historic Preservation Act of 1982 (A.R.S. § 41-861 et seq.). The principal concern of all three laws is the realistic protection of all important cultural properties that might otherwise be impacted or destroyed during various undertakings such as geotechnical work and project construction.

The survey corridor was based on the conceptual design plans for the Watson drainage system as proposed in the Buckeye Area Drainage Master Plan (ADMP). The proposed alignment was surveyed by Scientific Archeological Services (SAS) on behalf of the District. The results of the survey indicated that seven previously recorded cultural resource sites occurred within the Area of Potential Effects (APE) for the project. One of the sites, AZ T:10:43[ASM] was officially relocated by ASM approximately 500 meters to the west of the proposed outlet of the drain, and is no longer within the APE of the project. Two other sites, including the historic GLO roads, have been destroyed by cultivation and are no longer in jeopardy of being impacted by the proposed drainage system. The remaining four sites, the Buckeye Canal (AZ T:10:82[ASM]), the Roosevelt Canal (AZ T:10:83[ASM]), the Southern Pacific Railroad (AZ T:10:84[ASM]) and the old US 80 (AZ FF:9:17[ASM]), have been recommended for or formally determined to be eligible for nomination with the National Register of Historic Places and will be impacted by the alignment of the drainage system.

Based on SAS's recommendations, mitigation of the sites would not be necessary if it could be demonstrated that the National Register characteristic of the four structures would not be altered as a result of the impacts. Given that the proposed impacts from the drainage system will be limited to box culverts or similar architectural features constructed below and over the structures, the typical amount of alteration from such activities would not warrant future mitigation. Consequently, further work would most likely not be needed prior to implementing the recommended plan. Final approval of the

survey report by the State Historic Preservation Office (SHPO) is pending and contingent upon determination of a final alternative and processing under the section 106 of the NHPA through submittal of the Section 404 permit.

No additional previously discovered sites are identified in the alternative alignments proposed that vary from the ADMP Base Alternative. This does not preclude the potential for cultural resources in the proposed alternative locations but does limit the opportunity to compare potential impacts between alternatives. For comparison reasons, this memo estimates the facilities outside of the previously surveyed area requiring additional survey.

Biological Resource Impacts - The Watson System, regardless of alternative, would be partially constructed within potential burrowing owl habitat; therefore, an assessment of habitat suitability and possibly protocol surveys will be needed prior to construction. If nesting burrowing owls are observed prior to construction, they will likely need to be relocated.

All alternatives also include an outfall to the Gila River. There is some potential to impact riparian vegetation at the outlet depending on the final outfall design. However, this condition will be very similar regardless of which alternative is selected.

The Watson Channel outfall construction may require a Section 404 permit through the Army Corps of Engineers, Arizona Regulatory Branch. Depending on the type and quantity of vegetation and habitat impacted, an individual or nationwide permit may be required.

The Watson System may act as a dead end wildlife movement corridor from the Gila River; therefore potential nuisance wildlife issues may occur in developed areas post-construction. Wildlife safety may also be an issue if the channel attracts wildlife to the existing east-west canals.

Natural resources - Natural resources identified for the Watson Drainage System in the Buckeye ADMP include the existing riparian vegetation at the Gila River and undisturbed or naturalized open spaces not impacted by agriculture or development. Wildlife may also benefit from the creation of new open space with appropriate vegetation restoration within the facilities themselves that would increase the natural resource value of an alternative. However, the benefit of newly created natural resource areas will be limited by the number of road crossings and other hazards or obstacles to wildlife movement within the Watson System. Because all alternatives will have similar impacts at the Gila River, the remaining metric for comparing alternatives is based on which provides the greatest amount of open space preservation (i.e. – upstream of the UPRR) or creation through open space basins.

Habitat - The channels and basins proposed in a given alternative that most closely resembles native vegetative communities provide the greatest opportunity for increasing the habitat value of the landscape. This includes the earthen Watson Drain Channel proposed in every alternative as well as in the Apache and Maricopa Basins. Burrowing owl and desert tortoise habitat could also be created in these facilities with proper design.

Turf channels along the 231st Avenue, Monroe Avenue, and west of the Watson Road alignment provide habitat for a more limited range of species and will likely result in displacement of burrowing owls. The suburban landscapes likely to occur in the Maricopa Channel will displace agricultural-adapted wildlife while provide feeding and some nesting habitat for urbanized wildlife, in particular bird species. The 48

acre-feet of storage associated with the Rainbow Basin in all alternatives would also provide similar levels of turf habitat.

Recreation and Landscape Considerations

Landscape character – Cultural and interpretive multi-use opportunities identified in the ADMP include prehistoric land use, historic road crossing, historic railroad, and historic and prehistoric irrigation.

The Landscape Design Themes for the Watson System, as identified by the ADMP, varies between natural lower Sonoran Desert riparian, and semi-natural Sonoran Desert. The Design Motif varies between river/recreation, Irrigation/Canal, Combo-Railroad/Canal, Railroad, and Agriculture.

In order to ensure the channel reaches within the Watson System are designed according to the Town of Buckeye's needs and desired character, extensive work took place during alternatives development to develop typical channel types that will be very similar regardless of which alternative is selected. The Apache Road gunite channels, included in all alternatives, were identified by the Town of Buckeye as acceptable adjacent to planned residential developments when integral color and texturing is included and the gunite color is selected to match the proposed landscape rock mulch color. This also addresses engineering concerns where erodible velocities in the channels would require expensive and frequent grade control structures or rip-rap lining which was not deemed compatible with the setting or desirable by the Town.

Turf and rock mulch channels with semi-natural landscape in the buffers, proposed for the 231st and Maricopa Channels, are also desirable by Buckeye and compatible with the residential developments.

Views – As the current visually open agricultural landscape is developed, the existing panoramic views in the Watson system to the White Tank Mountains and Buckeye Hills will become restricted. Since all of the proposed alternatives include north-south oriented channels with similar widths and buffers, the primary metric used for comparing the alternatives is examining basin sizes that could provide visual breaks in development and preserve the existing views.

Open Space –Open space basins located between conflicting land-use types, such as residential and industrial, will provide higher quality open space value than if they were located within a single land-use.

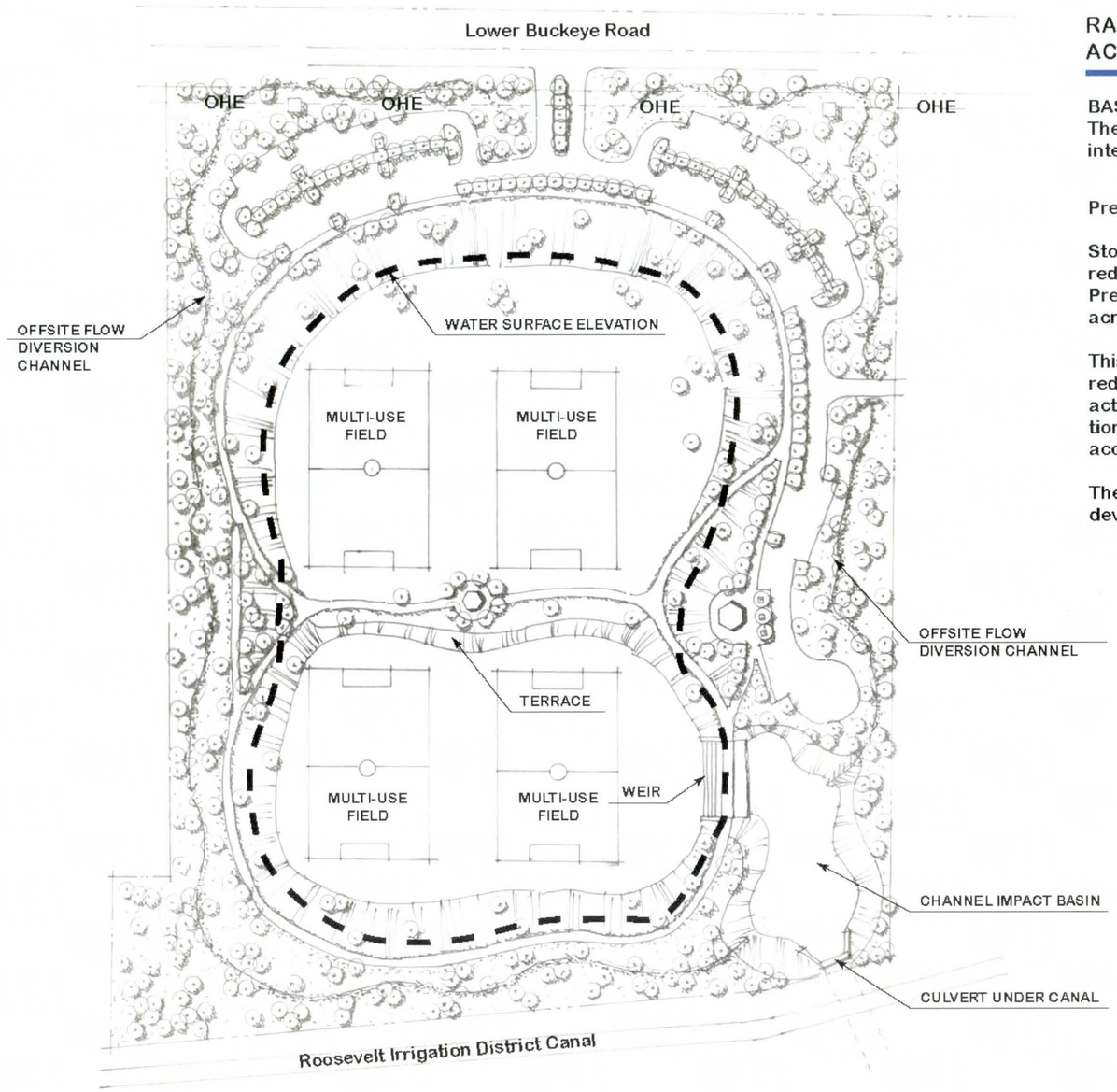
While the Apache and Rainbow Basins are located within residential land-use areas, they are also immediately adjacent to the RID canal which serves as a proposed segment of the Maricopa Regional Trail. These two basins provide identical open space opportunity under all three alternatives.

Parks and trails – All alternatives include similar trail alignments and connectivity benefits. The primary difference between the alternatives is related to the industrial areas where trail users would likely have a lower quality experience than trail users along other channel types. Trails in these industrial areas may be routed around the industrial development or follow the concrete channels, though this is likely up to the industrial developer's discretion. For this reason, industrial channel lengths are included in the memo for comparison purposes with the recognition that the opportunity exists for trails to be co-located in these areas.

Park opportunities are similar for Alternatives A and B since the storage and location of the Rainbow Basin is the same in each. As noted below, Alternative C provides an additional opportunity for parks not included in this alternative.

The Rainbow Basin that feeds into the 231st Avenue Channels is consistent in storage requirement and configuration between the three alternatives. In addition to the storm water mitigation function, this basin will include active recreation elements that will add to the Sundance Park recreation complex already constructed. A preliminary layout for the basin is included (**FIGURE 17**) to illustrate how reductions in the storage requirements will impact the recreation program. The recommended plan will further refine the basin configuration through coordination with the Town of Buckeye on the desired recreation needs.

FIGURE 17 – RAINBOW BASIN CONCEPTUAL LAYOUT



RAINBOW BASIN - PRELIMINARY CONCEPT LAYOUT
ACTIVE RECREATION MULTI-USE

Scale: 1" = 50' - 0"

BASIN DESCRIPTION:
The Rainbow Basin is intended for use as an active recreation area by the Town of Buckeye, and will be integrated into the recreation complex associated with the Sundance Park.

Preliminary Design

Storage requirements for this basin have been reduce by over 50% from the Buckeye ADMP. The Pre-Design storage requirement identified is for 48 acre-feet.

This graphic illustrates the general impacts this reduced storage requirement has on the proposed active recreation program. This included a reduction in the number of multi-use fields that could be accommodated within the basin.

The basin concept will be further refined and developed as part of the recommended plan.

Design Concept

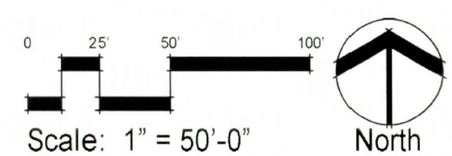
The Rainbow Basin will be an earthen basin with turf and semi-natural landscape areas. Park programming will be further defined in coordination with the Town of Buckeye's Parks and Recreation Department.

Basin side slopes average 7:1, and include curvilinear forms consistent with the semi-soft flood protection method identified in the ADMP. Transitions at the top and toe of slope shall be gradual to avoid abrupt changes that increase erosion potential and maintenance.

Basin volume will need to accommodate increased plant material and recreation facilities above the storage requirement.

Diversion channels around the basin will require additional area from that required for the basin and should be designed to resemble a natural wash with curvilinear forms and varied geometry.

The weir structure shall include aesthetic treatments and be constructed of concrete with form-liner, paint, and consideration of sculptural form. The weir structure may be designed to serve as a stepped structure that may act as seating for the nearest multi-use field.



B. Base Alternative

1. Description

The Base Alternative as proposed in the ADMP begins approximately 2/3-mile south of Beloat Road at the proposed El Rio Levee and extends north along Watson Road to the Monroe Avenue alignment where east and west branches continue to the north approximately ½ mile east and west of the Watson Road alignment. The eastern branch continues north across the BWCDD canal and the UPRR and terminates at the RID canal. The western branch also continues north from the split at Monroe Avenue and across the BWCDD canal and the UPRR to the Maricopa Road alignment, where it then turns west to Apache Road, and then continues north along Apache road to the RID canal.

The Base Alternative consists of open channels, detention basins and box culverts. The Base Alternative includes two separate crossings of the UPRR/K-M/ANPP/BWCDD facilities, and proposes to utilize the alignment of the existing Watson Drain south of the Monroe Avenue alignment as the system outfall to the Gila River.

As the Base Alternative is intended to replicate the ADMP recommended system as near as possible, it is noteworthy that, with the exceptions enumerated in Section III.B of this memo, no other modifications to the ADMP recommended system have been made. For example, the Base Alternative does not include any proposed collection, storage, or conveyance facilities to server the northeast quadrant of the project watershed (north of the UPRR and east of 231st Avenue), because the ADMP recommended system did not include those items.

FIGURE 18 shows the Base Alternative with the design flow rates for each of the conveyance system reaches. The conveyance reaches are color coded on the exhibit to indicate the typical channel section utilized for the different segments of the system.

8.8 miles of conveyance channels are needed for the Base Alternative. The proposed channel lining materials and respective lengths are summarized below:

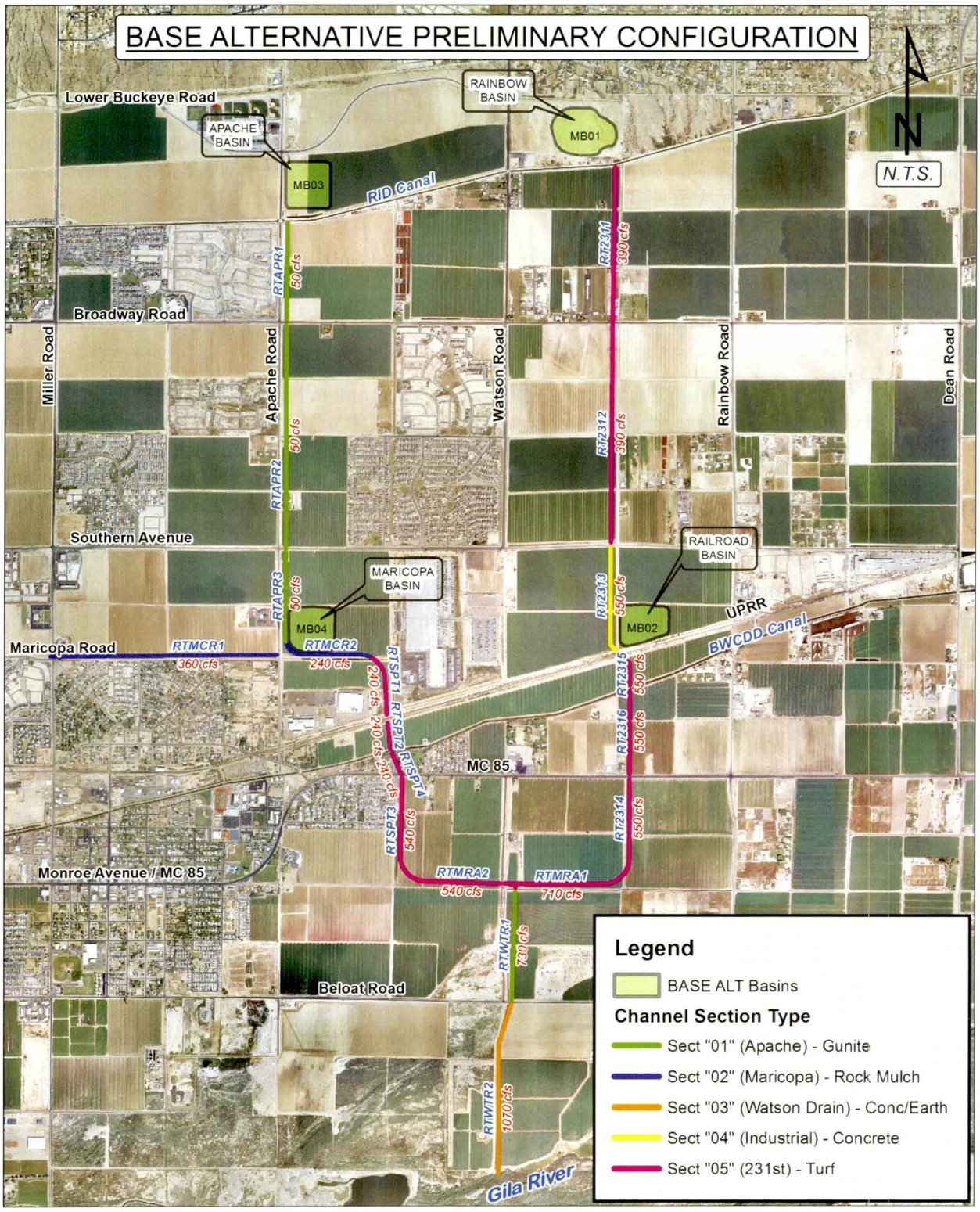
Gunite:	1.9 mi
Rock Mulch:	1.0 mi
Concrete/Earth:	0.7 mi
Concrete:	3.2 mi
Turf:	2.0 mi
Total Channel Length:	**8.8 mi**

In addition, between culvert crossings and underground reaches, Alternative A includes **1.9 miles** of underground storm drain.

The proposed basin volumes for the Base Alternative, which have been resized from the ADMP to reflect the revised hydrology, are as follows:

Rainbow Basin:	48 ac-ft
Railroad Basin:	34 ac-ft
Apache Basin:	12 ac-ft
Maricopa Basin:	29 ac-ft
Total Retention Volume:	***123 ac-ft***

FIGURE 18 – BASE ALTERNATIVE SYSTEM DETAIL



1. Projected Cost

The cost summary for the Base Alternative A is shown in **TABLE 2**. A 30% contingency was applied to all items in the cost estimate. For a more detailed description of cost derivation, please refer to **Appendix A**.

TABLE 2 – BASE ALTERNATIVE COST SUMMARY

Item	Cost
Removals/Relocations/Utility Crossings	$ 10.38 M
Channels	$ 12.13 M
Storm Drains and Culverts	$ 18.27 M
Basins (Excavation Only)	$ 1.59 M
ROW Acquisition	$ 21.45 M
Landscape	$ 10.51 M
Total	**$ 74.33 M**

2. Engineering Considerations

The Base Alternative requires 2 crossings of the RID canal, 2 crossings of the UPRR, and 2 crossings of the ANPP/BWCDD/K-M facilities. The crossing of the UPRR tracks will likely need to be accomplished with a prefabricated box culvert that can be installed in a short time. This will avoid the need for a shoo-fly track to keep the railroad operational.

The number of required crossings of the major existing facilities for the Base Alternative, as well as a comparison with the other alternatives, is shown in **TABLE 3**.

TABLE 3 – BASE ALTERNATIVE: PROPOSED NEW CROSSINGS OF MAJOR FACILITIES

ALTERNATIVE	RID	UPRR	ANPP/BWCDDD/K-M
BASE	**2**	**2**	**2**
A	2	1	1
B	2	1	1
C	2	0	1

All of the system channels have been designed to operate in a sub-critical flow regime. Flow velocities throughout the system for Alternative A vary from 2.4 fps to 7.7 fps. System velocities for the Base Alternative, as well as a comparison with the other alternatives, are shown in **TABLE 4**.

TABLE 4 – BASE ALTERNATIVE: SYSTEM VELOCITIES

ALTERNATIVE	VELOCITY RANGE (fps)
BASE	**2.4 – 7.7**
A	2.4 – 7.7
B	2.3 – 7.8
C	1.3 – 7.6

In order to achieve the desired sub-critical flow and velocity, the longitudinal slope of the channels needs to be flatter than the existing ground slope in some reaches. Drop structures will be needed in these reaches to control the slope of the channels to maintain sub-critical flow. There are 5 drop structures required for the Base Alternative, the locations of which are all along Apache Road and 231st Avenue between the UPRR and the RID facilities. The number of required drop structures for the Base Alternative, as well as a comparison with the other alternatives, is shown in Error! Not a valid bookmark self-reference..

TABLE 5 – BASE ALTERNATIVE: REQUIRED DROP STRUCTURES

ALTERNATIVE	# DROP STRUCTURES
BASE	5
A	**5**
B	7
C	5

3. Environmental Considerations

Regulatory and Hazardous Waste Sites - There are no regulatory and/or hazardous material sites identified by the ADMP for the Base Alternative.

Cultural Resource Impacts – Cultural sites identified in the ADMP for the base alternative have been surveyed.

The additional cultural resource survey needs for the Base Alternative, as well as a comparison with the other alternatives, are summarized in **Projected Cost**
The cost summary for the Base Alternative A is shown in **TABLE 2.** A 30% contingency was applied to all items in the cost estimate. For a more detailed description of cost derivation, please refer to **Appendix A**.

TABLE 2 – BASE ALTERNATIVE COST SUMMARY

Item	Cost
Removals/Relocations/Utility Crossings	$ 10.40 M
Channels	$ 12.13 M
Storm Drains and Culverts	$ 19.59 M
Basins (Excavation Only)	$ 1.59 M
ROW Acquisition	$ 21.45 M
Landscape	$ 10.51 M
Total	**$ 75.67 M**

4. Engineering Considerations

The Base Alternative requires 2 crossings of the RID canal, 2 crossings of the UPRR, and 2 crossings of the ANPP/BWCDD/K-M facilities. The crossing of the UPRR tracks will likely need to be accomplished with a prefabricated box culvert that can be installed in a short time. This will avoid the need for a shoo-fly track to keep the railroad operational.

The number of required crossings of the major existing facilities for the Base Alternative, as well as a comparison with the other alternatives, is shown in **TABLE 3.**

TABLE 3 – BASE ALTERNATIVE: PROPOSED NEW CROSSINGS OF MAJOR FACILITIES

ALTERNATIVE	RID	UPRR	ANPP/BWCDDD/K-M
BASE	**2**	**2**	**2**
A	2	1	1
B	2	1	1
C	2	0	1

All of the system channels have been designed to operate in a sub-critical flow regime. Flow velocities throughout the system for Alternative A vary from 2.4 fps to 7.7 fps. System velocities for the Base Alternative, as well as a comparison with the other alternatives, are shown in **TABLE 4.**

TABLE 4 – BASE ALTERNATIVE: SYSTEM VELOCITIES

ALTERNATIVE	VELOCITY RANGE (fps)
BASE	**2.4 – 7.7**
A	2.4 – 7.7
B	2.3 – 7.8
C	1.3 – 7.6

In order to achieve the desired sub-critical flow and velocity, the longitudinal slope of the channels needs to be flatter than the existing ground slope in some reaches. Drop structures will be needed in these reaches to control the slope of the channels to maintain sub-critical flow. There are 5 drop structures required for the Base Alternative, the locations of which are all along Apache Road and 231st Avenue between the UPRR and the RID facilities. The number of required drop structures for the Base Alternative, as well as a comparison with the other alternatives, is shown in Error! Not a valid bookmark self-reference..

TABLE 5.

TABLE 6 – BASE ALTERNATIVE: CULTURAL RESOURCES SURVEY NEEDS

ALTERNATIVE	Cultural Resources Additional Survey Needed
BASE	**-**
A	3.3 Channel Miles + 3 Basins
B	2.8 Channel Miles + 2 Basins
C	0.4 Channel Miles + 4 Basins

Biological Resource Impacts – The Base Alternative includes 3 open space basins requiring 76 acre feet of storage that provide opportunity for biological multi-use. There are approximately 2.1 miles of concrete channel within the floodplain area adjacent to the railroad.

The natural resource impacts for the Base Alternative, as well as a comparison with the other alternatives, are summarized in **TABLE 7**.

TABLE 7 – BASE ALTERNATIVE: NATURAL RESOURCE IMPACTS

ALTERNATIVE	Natural Resources		
	Open Space Basins (acft)	Earthen Channel (miles)	Concrete Channel Replacing Floodplain (miles)
BASE	**76**	**0.66**	**2.1**
A	146	0.67	2.1
B	112	0.67	2.1
C	244	0.73	0

Habitat – In this alternative, the Apache, Maricopa and Railroad Basins provide 76 acre-feet of storage that could provide habitat value.

There are 2.0 miles of turf channels along the 231st Avenue, Monroe Avenue, and west of the Watson Road alignment and 3.2 miles of concrete channel which provide reduced or no habitat value.

The habitat opportunities for the Base Alternative, as well as a comparison with the other alternatives, are summarized in **TABLE 8**.

TABLE 8 – BASE ALTERNATIVE: HABITAT OPPORTUNITIES

ALTERNATIVE	Habitat				
	Earthen Channel (miles)	Earthen Basins (acft)	Turf Channel (miles)	Turf Basins (acft)	Concrete Channel (miles)
BASE	**0.66**	**76**	**2.0**	**48**	**3.2**
A	0.67	99	3.0	48	2.3
B	0.67	65	3.3	48	2.2
C	0.73	225	3.1	48	0.4

5. Recreation & Aesthetic Considerations

Landscape character – There are 3.2 miles of concrete channel associated with this alternative.

Parks and trails – The ADMP Base Alternative includes 10.7 miles of trail opportunity, with 3.2 miles occurring along Industrial Channels.

Views – The Base Alternative includes a total of 124 acre-feet of storage that can serve as viewshed preservation areas adjacent to the channels.

Open Space – Two of the natural open space basins are located where they could serve as visual buffers between residential and industrial land-uses, meaning they will provide higher quality open space value than if they were located within a single land-use. These two basins provide 62 acre-feet of storage.

The recreation and aesthetic considerations for the Base Alternative, as well as a comparison with the other alternatives, are summarized in **TABLE 9**.

TABLE 9 – BASE ALTERNATIVE: RECREATION AND AESTHETIC CONSIDERATIONS

ALTERNATIVE	Landscape Character	Parks and Trails	Views	Open Space
	Concrete Channel (miles)	Trail Opportunity (miles / Industrial miles)	Basin Viewshed (acft)	Visual Buffer in Basins (acft)
BASE	**3.2**	**10.7/3.2**	**124**	**62**
A	2.3	11.2 / 2.3	146	86
B	2.2	11.4 / 2.2	122	53
C	0.4	11.6 / 0.4	244	213

6. Planning /Political/Other Considerations

Changed conditions have occurred since the completion of the ADMP that warrant review and refinement of the Base Alternative.

Newer rainfall data (NOAA 14) has been adopted by FCDMC as the precipitation values to use in hydrologic modeling. NOAA 14 results in reductions in design rainfall values in the Buckeye area, allowing the size of proposed system components to be reduced

FCDMC eliminated the need for the connection of the White Tanks #4 outfall channel to the Watson system as a result of regional planning changes. This change reduces design discharges in the lower portions of the project system.

Updates to the Town of Buckeye General Plan, which impact planned land use and attendant runoff characteristics, affect the predicted storm water runoff flow rates upon which development of the Base Alternative was based.

Two retention basin sites from the ADMP are in areas that are now slated for development. The Railroad Basin is within the planned Globe Corporation Industrial Park project and the Maricopa Basin is within a platted development that is part of the Watson Community Facilities District. Both of these basins are relocated or eliminated within the alternatives developed for this project.

7. Pros & Cons Summary

Pros

+ Proposed system has been accepted by stakeholders through the ADMP process.
+ Avoids impacts to existing residences south of BWCDD.
+ Provides opportunities to implement the Town of Buckeye Trails System as identified in the Buckeye Trails Master Plan.
+ Provides opportunity for active recreation in the Rainbow Basin, with adequate space for 4 multi-use fields.

Cons

– Requires 2 separate crossings of UPRR/K-M/ANPP/BWCDD facilities.
– Railroad Basin site conflicts with proposed Globe Corporation Industrial Park.
– Maricopa Basin site is within a platted development with the Watson Community Facilities District.
– Does not provide any collection, storage, or conveyance facilities to serve the northeast quadrant of the project watershed (north of UPRR and east of 231st Avenue). The addition of these facilities would represent an increase in the estimated cost for the system of several million dollars.

C. Alternative A

1. Description

FIGURE 19 shows Alternative A with the design flow rates for each of the conveyance system reaches. The conveyance reaches are color coded on the exhibit to indicate the typical channel section utilized for the different segments of the system.

The design flow rates for the channels vary throughout the system from 50 cfs at the upstream end of the Apache Channel to 1,150 cfs at the proposed outfall along the Watson Drain Channel.

9.4 miles of conveyance channels are needed for Alternative A. The proposed channel lining materials and respective lengths are summarized below:

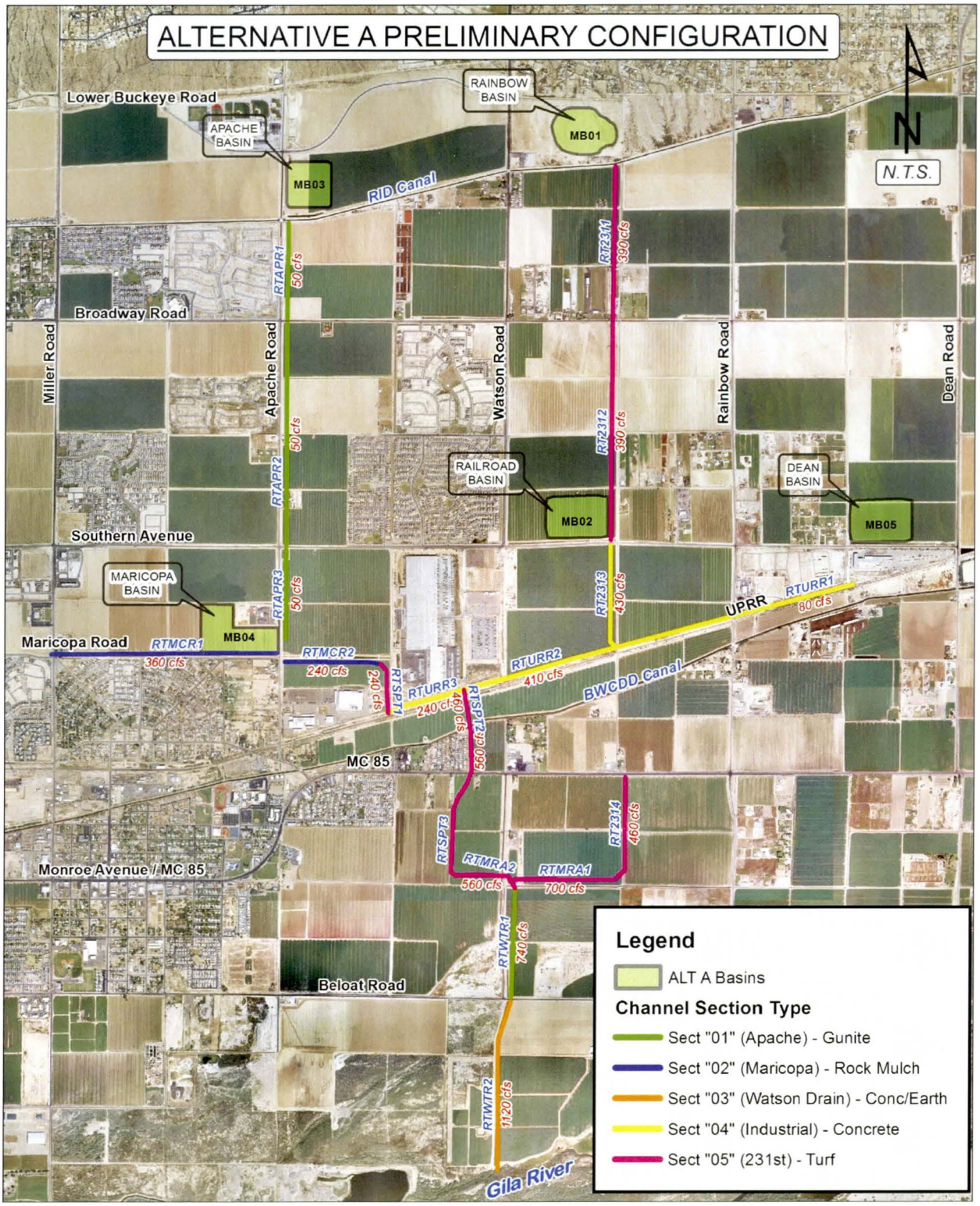
Gunite:	2.1 mi
Rock Mulch:	1.3 mi
Concrete/Earth:	0.7 mi
Concrete:	2.3 mi
Turf:	3.0 mi
Total Channel Length:	**9.4 mi**

In addition, between culvert crossings and underground reaches, Alternative A includes **1.8 miles** of underground storm drain.

The proposed basin volumes for Alternative A are as follows:

Rainbow Basin:	48 ac-ft
Railroad Basin:	34 ac-ft
Apache Basin:	12 ac-ft
Maricopa Basin:	29 ac-ft
Dean Basin:	23 ac-ft
Total Retention Volume:	***146 ac-ft***

FIGURE 19 – ALTERNATIVE A SYSTEM DETAIL



The proposed crossing of the UPRR/K-M/ANPP/BWCDD facilities needs to be sized with capacity for 460 cfs.

1. Project Costs

The cost summary for Alternative A is shown in **TABLE 10**. A 30% contingency was applied to all items in the cost estimate. For a more detailed description of cost derivation, please refer to **Appendix A**.

TABLE 10 – ALTERNATIVE A: COST SUMMARY

Item	Cost
Removals/Relocations/Utility Crossings	$ 7.65 M
Channels	$ 18.77 M
Storm Drains and Culverts	$ 12.99 M
Basins (Excavation Only)	$ 1.88 M
ROW Acquisition	$ 23.79 M
Landscape	$ 10.96 M
Total	**$ 76.04 M**

2. Engineering Considerations

Alternative A requires 2 crossings of the RID canal, 1 crossing of the UPRR, and 1 crossing of the ANPP/BWCDD/K-M facilities. The crossing of the UPRR tracks will likely need to be accomplished with a prefabricated box culvert that can be installed in a short time. This will avoid the need for a shoo-fly track to keep the railroad operational.

The number of required crossings of the major existing facilities for Alternative A, as well as a comparison with the other alternatives, is shown in **TABLE 11**.

TABLE 11 – ALTERNATIVE A: PROPOSED NEW CROSSINGSOF MAJOR FACILITIES

ALTERNATIVE	RID	UPRR	ANPP/BWCDDD/K-M
BASE	2	2	2
A	**2**	**1**	**1**
B	2	1	1
C	2	0	1

The topography north of the UPRR is fairly flat in the east-west direction. Therefore, the construction of any channel or pipe to convey flow from east to west may be challenging. Alternative A has fairly low flows (<100 cfs) for approximately half of the proposed east-west channel north of the UPRR, which would facilitate the implementation of the channel.

All of the system channels have been designed to operate in a sub-critical flow regime. Flow velocities throughout the system for Alternative A vary from 2.1 fps to 7.5 fps. System velocities for Alternative A, as well as a comparison with the other alternatives, are shown in **TABLE 12**.

TABLE 12 – ALTERNATIVE A: SYSTEM VELOCITIES

ALTERNATIVE	VELOCITY RANGE (fps)
BASE	2.4 – 7.7
A	**2.4 – 7.7**
B	2.3 – 7.8
C	1.3 – 7.6

In order to achieve the desired sub-critical flow and velocity, the longitudinal slope of the channels needs to be flatter than the existing ground slope in some reaches. Drop structures will be needed in these reaches to control the slope of the channels to maintain sub-critical flow. There are 5 drop structures required for Alternative A, the locations of which are all along Apache Road and 231st Avenue between the UPRR and the RID facilities. The number of required drop structures for Alternative A, as well as a comparison with the other alternatives, is shown in **TABLE 13**.

TABLE 13 – ALTERNATIVE A: REQUIRED DROP STRUCTURES

ALTERNATIVE	# DROP STRUCTURES
BASE	5
A	**5**
B	7
C	5

3. Environmental Considerations

Natural resources – With an estimated 1150 cfs of flow, Alternative A results in the largest discharge volume at the Gila River during the 100 year design event. This may result in slightly larger facilities being required at the outfall than with the other two alternatives with slightly greater amounts of disturbance.

This alternative provides the 2nd greatest opportunity to create open space via basins with a total of 146 acre-foot of storage required.

There are approximately 2.1 miles of concrete channel within the floodplain area adjacent to the railroad.

The natural resource impacts for the Alternative A , as well as a comparison with the other alternatives, are summarized in **TABLE 14**.

TABLE 14 – ALTERNATIVE A: NATURAL RESOURCE IMPACTS

ALTERNATIVE	Natural Resources		
	Open Space Basins (acft)	Earthen Channel (miles)	Concrete Channel Replacing Floodplain (miles)
BASE	76	0.66	2.1
A	**146**	**0.67**	**2.1**
B	112	0.67	2.1
C	244	0.73	0

Cultural resources – As illustrated in **FIGURE 20**, approximately 3.3 miles of channel as well as the Dean, Railroad, and Maricopa Basins will require additional cultural survey under this alternative.

The additional cultural resource survey needs for the Alternative A, as well as a comparison with the other alternatives, are summarized in Error! Not a valid bookmark self-reference..

TABLE 15 – ALTERNATIVE A: CULTURAL RESOURCE SURVEY NEEDS

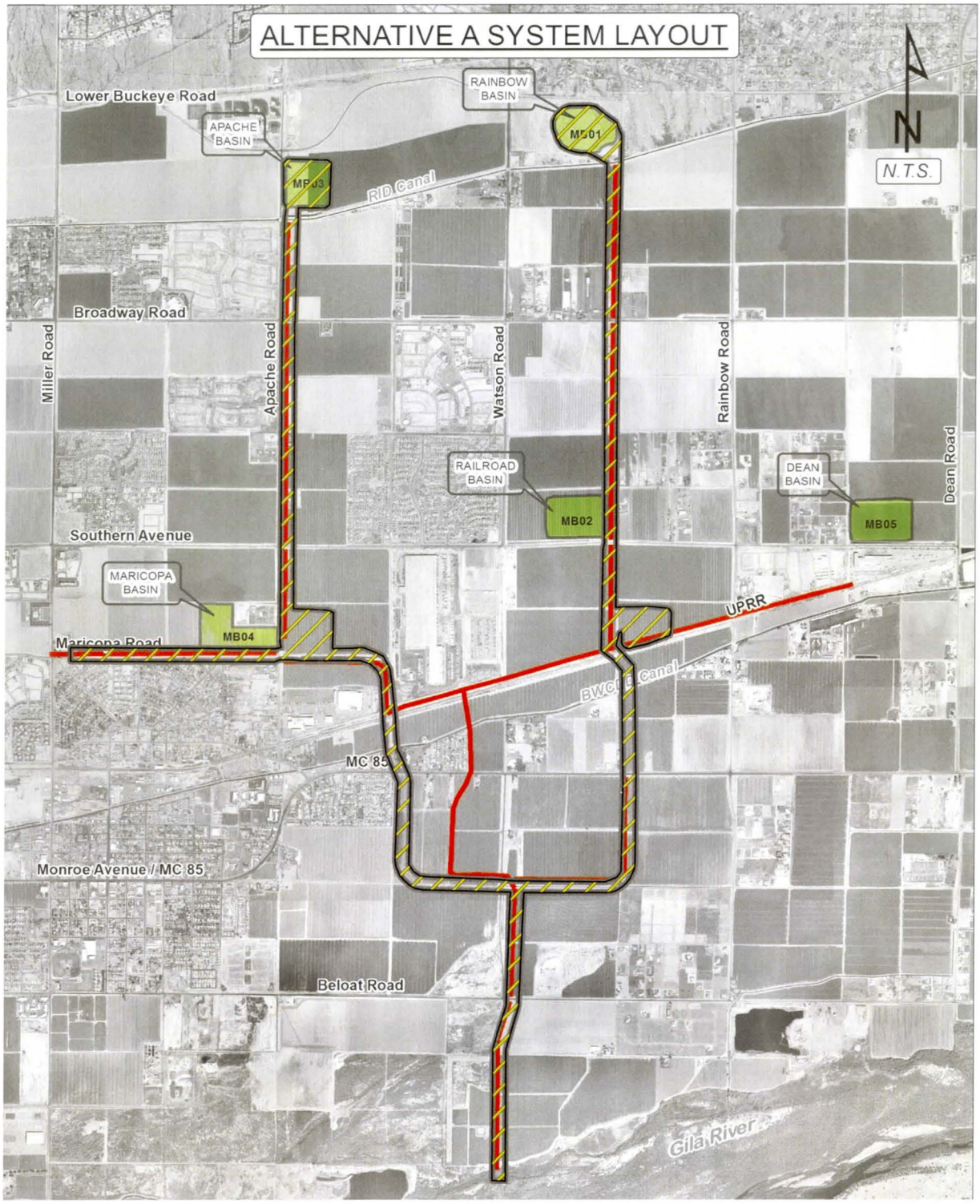
ALTERNATIVE	Cultural Resources
	Additional Survey Needed
BASE	-
A	**3.3 Channel Miles + 3 Basins**
B	2.8 Channel Miles + 2 Basins
C	0.4 Channel Miles + 4 Basins

Habitat – In this alternative, the Apache, Maricopa, Railroad, and Dean Basins provide 99 acre-feet of storage that could provide habitat value.

There are 3.0 miles of turf channels along the 231st Avenue, Monroe Avenue, and west of the Watson Road alignment and 2.3 miles of concrete channel which provide reduced or no habitat value.

As noted above, the 2.1 miles of concrete channels along the UPRR line displace disturbed but functional natural habitat areas in the existing floodplain resulting in a decrease of habitat value in these areas.

FIGURE 20 – ALT A ENVIRONMENTAL SURVEY BOUNDARY



The habitat opportunities for Alternative A, as well as a comparison with the other alternatives, are summarized in **TABLE 16**.

TABLE 16 – ALTERNATIVE A: HABITAT OPPORTUNITIES

ALTERNATIVE	Habitat				
	Earthen Channel (miles)	Earthen Basins (acft)	Turf Channel (miles)	Turf Basins (acft)	Concrete Channel (miles)
BASE	0.66	76	2.0	48	3.2
A	**0.67**	**99**	**3.0**	**48**	**2.3**
B	0.67	65	3.3	48	2.2
C	0.73	225	3.1	48	0.4

4. Recreation & Aesthetic Considerations

Landscape character – There are 2.3 miles of concrete channel associated with this alternative.

Each of the basins is located in future residential land-use areas, where natural shaped landscaped basins are considered compatible.

Parks and trails – Alternative A includes 11.2 miles of trail opportunity, with 2.3 miles occurring along Industrial Channels.

Views – Alternative A includes a total of 146 acre-feet of storage that can serve as viewshed preservation areas adjacent to the channels.

Open Space – Three of the natural open space basins are located where they could serve as visual buffers between residential and industrial land-uses, meaning they will provide higher quality open space value than if they were located within a single land-use. These three basins provide 86 acre-feet of storage.

The recreation and aesthetic considerations for the Alternative A, as well as a comparison with the other alternatives, are summarized in **TABLE 17**.

TABLE 17 – ALTERNATIVE A: RECREATION AND AESTHETIC CONSIDERATIONS

ALTERNATIVE	Landscape Character	Parks and Trails	Views	Open Space
	Concrete Channel (miles)	Trail Opportunity (miles / Industrial miles)	Basin Viewshed (acft)	Visual Buffer in Basins (acft)
BASE	3.2	10.7/3.2	124	62
A	**2.3**	**11.2 / 2.3**	**146**	**86**
B	2.2	11.4 / 2.2	122	53
C	0.4	11.6 / 0.4	244	213

5. Planning/Political/Other Considerations

The Globe Corporation has approached the Town of Buckeye with the intent to develop an industrial park between Watson Road and Rainbow Road north of the UPRR and south of Southern Avenue. In order to minimize impacts to the proposed industrial park, the location of the proposed Railroad Basin has been moved to the north side of Southern Avenue.

Similarly, the proposed Maricopa Basin has been moved to the west side of Apache Road to minimize impacts to the Watson CFD member parcels.

Alternative A will construct a channel just north of UPRR right of way. This channel will capture and convey flow to a point approximately 1,000 feet west of Watson Road. At that location, approximately 380 cfs will be passed through approximately 200 feet of UPRR ROW and under the railroad embankment. Railroad design requirements dictate a minimum of 2.5 feet from the base of rail to the top of the proposed box culvert. Additionally, conveyance will be required from ROW to ROW, so dedicated channels or conduit will need to be constructed within the ROW to and from the existing culverts.

A 4-foot high box culvert has been proposed at this location, and based on reviewing aerial topography and as-builts for the downstream facilities it appears that there may be sufficient elevation to increase the height of the box, reducing the width. This will be evaluated during final design.

UPRR will require coordination of construction activities within railroad ROW to complement freight train schedules along this route in order to avoid shipping and transit delays. This route, labeled the Phoenix Subdivision by UPRR, is estimated to handle three to five freight trains per week. This should allow for a maximum 3-day window to put the Phoenix Subdivision out of service and construct the proposed concrete box culvert crossing without having a major impact on UPRR freight train schedules. Utilizing a precast box culvert at this location will meet that scheduling requirement.

Arizona Game & Fish currently owns the property at the proposed outfall, but has had discussions with Gila River Lake, LLC (a sand and gravel mining company) regarding a potential lease or sale of those parcels. Close coordination needs to occur with these entities to establish an acceptable configuration for the outfall.

Many of the proposed channel alignments are adjacent to land that is planned for residential development in the future. Measures to reduce perceived negative impacts to these properties need to be considered as part of this pre-design project.

6. Pros & Cons Summary

<u>Pros</u>

+ Consolidates system to a single crossing of UPRR/K-M/ANPP/BWCDD facilities.
+ Reduces flows reaching UPRR through increased upstream storage volume.
+ Avoids impacts to existing residences south of BWCDD.
+ Includes 146 acre-feet of storage that can serve as open space and view preservation, second most of the alternatives.
+ Turf channel south of the BWCDD is routed off of high value arterial alignments, within business park/industrial land use.

+ Provides opportunities to implement the Town of Buckeye Trails System as identified in the Buckeye Trails Master Plan, with 11.2 miles of trail opportunity of which 7.1 miles is along landscaped channels.
+ Provides opportunity for active recreation in the 48 acre-foot Rainbow Basin, with adequate space for 4 multi-use fields.
+ Maricopa, Railroad, and Dean Basins are located between industrial and residential land-uses where they can serve as open space buffers.

Cons

– Requires property acquisition for 5 basins.
– Requires new crossing of UPRR.
– Generates highest flow rate at Gila River outfall.
– Includes channel through the proposed Globe Corporation Industrial Park.
– Concrete channel north of railroad reduces habitat value of existing floodplain.
– 3.3 miles of channel and three basin sites will require additional cultural resource survey.

D. Alternative B

1. Description

FIGURE 21 shows Alternative B with the design flow rates for each of the conveyance system reaches. The conveyance reaches are color coded on the exhibit to indicate the typical channel section utilized for the different segments of the system.

The design flow rates for the channels vary throughout the system from 50 cfs at the upstream end of the Apache Channel to 1,010 cfs at the proposed outfall along the Watson Drain Channel.

9.6 miles of conveyance channels are needed for Alternative B. The proposed channel lining materials and respective lengths are summarized below:

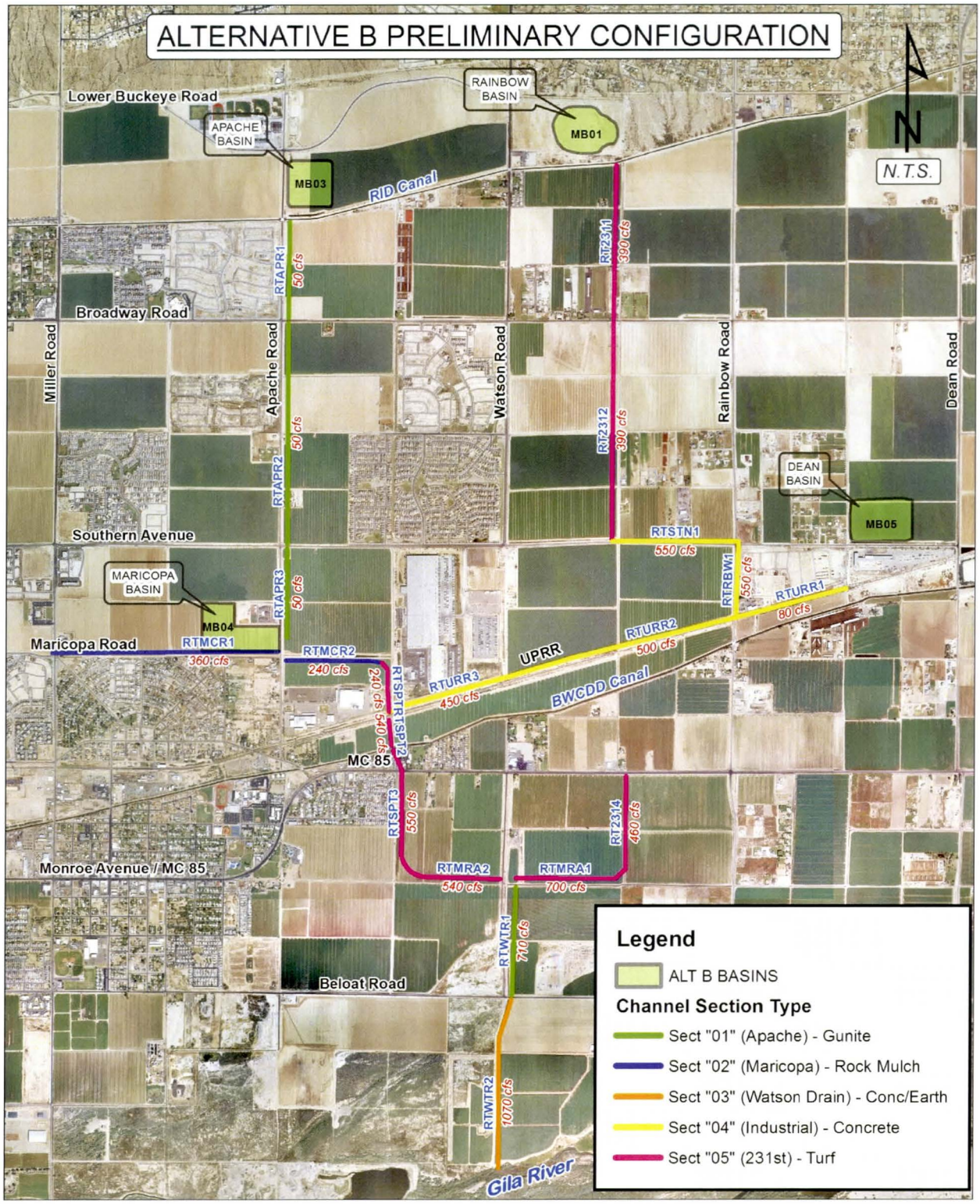
Gunite:	2.1 mi
Rock Mulch:	1.3 mi
Concrete/Earth:	0.7 mi
Concrete:	2.2 mi
Turf:	3.3 mi
Total Channel Length:	**9.6 mi**

In addition, between culvert crossings and underground reaches, Alternative A includes **1.8** miles of underground storm drain.

The proposed basin volumes for Alternative B are as follows:

Rainbow Basin:	48 ac-ft
Railroad Basin:	N/A
Apache Basin:	12 ac-ft
Maricopa Basin:	29 ac-ft
Dean Basin:	23 ac-ft
Total Retention Volume:	***112 ac-ft***

FIGURE 21 – ALTERNATIVE B SYSTEM DETAIL



The proposed crossing of the UPRR/K-M/ANPP/BWCDD facilities needs to be sized with capacity for 530 cfs.

1. Project Costs

The cost summary for Alternative B is shown in **TABLE 18**. A 30% contingency was applied to all items in the cost estimate. For a more detailed description of cost derivation, please refer to **Appendix A**.

TABLE 18 – ALTERNATIVE B: COST SUMMARY

Item	Cost
Removals/Relocations/Utility Crossings	$ 7.68 M
Channels	$ 21.23 M
Storm Drains and Culverts	$ 14.07 M
Basins (Excavation Only)	$ 1.45 M
ROW Acquisition	$ 24.31 M
Landscape	$ 11.25 M
Total	**$ 79.99 M**

2. Engineering Considerations

Alternative B requires 2 crossings of the RID canal, 1 crossing of the UPRR, and 1 crossing of the ANPP/BWCDD/K-M facilities. The crossing of the UPRR tracks will likely need to be accomplished with a prefabricated box culvert that can be installed in a short time. This will avoid the need for a shoo-fly track to keep the railroad operational.

The number of required crossings of the major existing facilities for Alternative B, as well as a comparison with the other alternatives, is shown in **TABLE 19**.

TABLE 19 – ALTERNATIVE B: PROPOSED NEW CROSSINGS OF MAJOR FACILITIES

ALTERNATIVE	RID	UPRR	ANPP/BWCDDD/K-M
BASE	2	2	2
A	2	1	1
B	**2**	**1**	**1**
C	2	0	1

The topography north of the UPRR is fairly flat in the east-west direction. Therefore, the construction of any channel or pipe to convey flow from east to west may be challenging. Predicted flows for Alternative B from Rainbow Road to the proposed UPRR crossing vary between 400 cfs and 500 cfs. Construction of a channel to convey these flows along a flat corridor may be challenging.

All of the system channels have been designed to operate in a sub-critical flow regime. Flow velocities throughout the system for Alternative B vary from 2.3 fps to 7.8 fps. System velocities for Alternative B, as well as a comparison with the other alternatives, are shown in **TABLE 20**.

TABLE 20 – ALTERNATIVE B: SYSTEM VELOCITIES

ALTERNATIVE	VELOCITY RANGE (fps)
BASE	2.4 – 7.7
A	2.4 – 7.7
B	**2.3 – 7.8**
C	1.3 – 7.6

In order to achieve the desired sub-critical flow and velocity, the longitudinal slope of the channels needs to be flatter than the existing ground slope in some reaches. Drop structures will be needed in these reaches to control the slope of the channels to maintain sub-critical flow. There are 7 drop structures required for Alternative B, the locations of which are all along Apache Road and 231st Avenue between the UPRR and the RID facilities. The number of required drop structures for Alternative B, as well as a comparison with the other alternatives, is shown in **TABLE 21**.

TABLE 21 – ALTERNATIVE B: REQUIRED DROP STRUCTURES

ALTERNATIVE	# DROP STRUCTURES
BASE	5
A	5
B	**7**
C	5

3. Environmental Considerations

Natural resources –With an estimated 1010 cfs of flow, Alternative B has the second highest discharge volume at the Gila River during the 100 year design event.

This alternative provides the least opportunity to create open space via basins with a total of 112 acre-foot of storage required.

There are approximately 2.1 miles of concrete channel within the floodplain area adjacent to the railroad.

The natural resource impacts for the Alternative B, as well as a comparison with the other alternatives, are summarized in **TABLE 22**.

TABLE 22 – ALTERNATIVE B: NATURAL RESOURCE IMPACTS

ALTERNATIVE	Natural Resources		
	Open Space Basins (acft)	Earthen Channel (miles)	Concrete Channel Replacing Floodplain (miles)
BASE	76	0.66	2.1
A	146	0.67	2.1
B	**112**	**0.67**	**2.1**
C	244	0.73	0

Cultural resources – As illustrated in **FIGURE 22**, approximately 2.8 miles of channel as well as the Dean and Maricopa Basins will require additional cultural survey under this alternative. Most of the new channel survey required is associated with the concrete channels north of the railroad.

The additional cultural resource survey needs for the Alternative A, as well as a comparison with the other alternatives, are summarized in **TABLE 23**.

TABLE 23 – ALTERNATIVE B: CULTURAL RESOURCE SURVEY NEEDS

ALTERNATIVE	Cultural Resources
	Additional Survey Needed
BASE	-
A	3.3 Channel Miles + 3 Basins
B	**2.8 Channel Miles + 2 Basins**
C	0.4 Channel Miles + 4 Basins

Habitat – The Apache, Maricopa, and Dean Basins provide 65 acre-feet of storage under this alternative that could serve as valuable habitat area.

3.3 miles of turf channels along the 231st Avenue, Monroe Avenue, and west of the Watson Road alignment provide habitat for a more limited range of species. The 2.2 miles of concrete channels provide limited to no habitat value with 2.1 miles displacing functional habitat along the UPRR line.

The habitat opportunities for Alternative B, as well as a comparison with the other alternatives, are summarized in **TABLE 24**.

FIGURE 22 – ALT B ENVIRONMENTAL SURVEY BOUNDARY

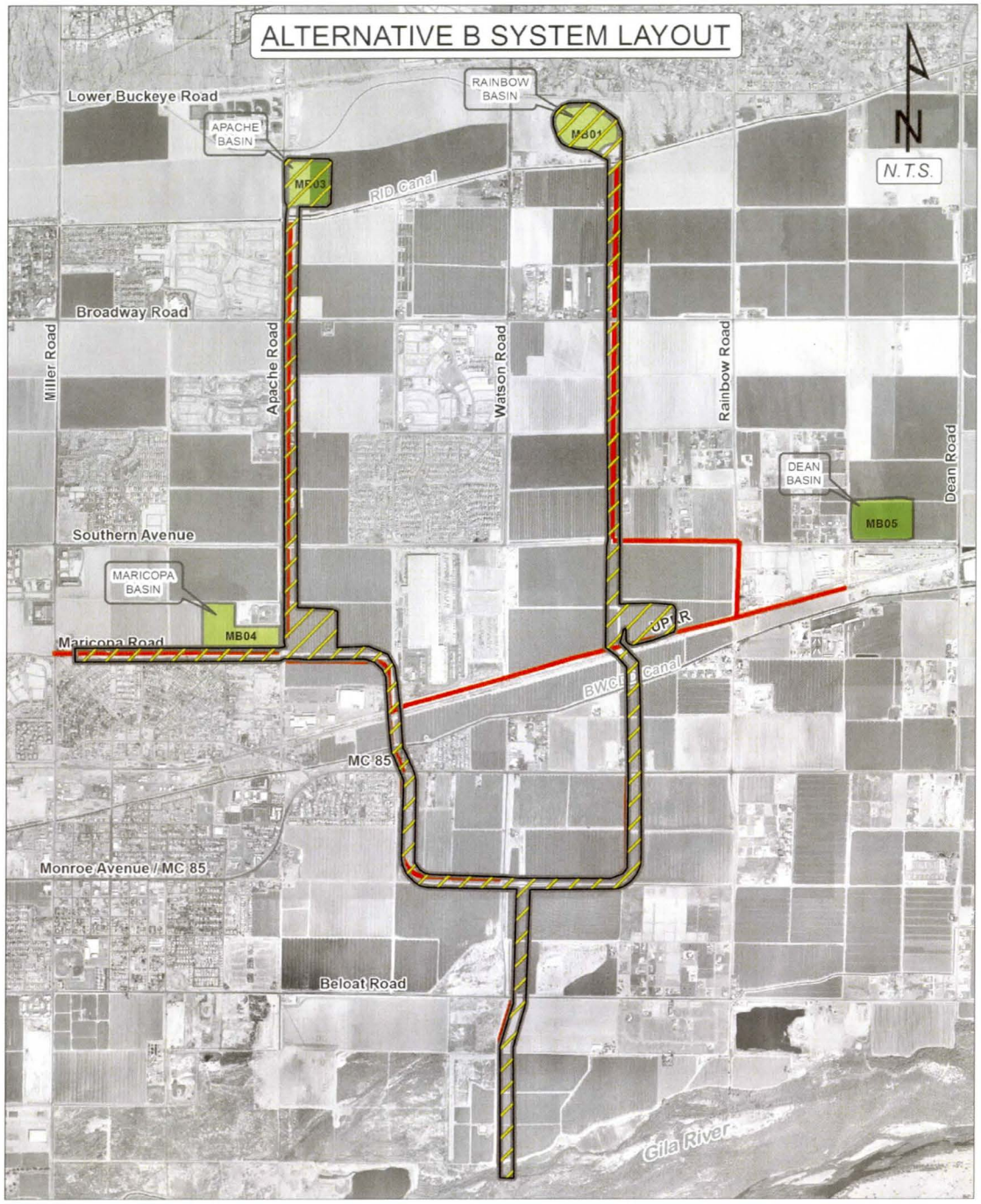


TABLE 24 – ALTERNATIVE B: HABITAT OPPORTUNITIES

ALTERNATIVE	Habitat				
	Earthen Channel (miles)	Earthen Basins (acft)	Turf Channel (miles)	Turf Basins (acft)	Concrete Channel (miles)
BASE	0.66	76	2.0	48	3.2
A	0.67	99	3.0	48	2.3
B	**0.67**	**65**	**3.3**	**48**	**2.2**
C	0.73	225	3.1	48	0.4

1. Recreation & Aesthetic Considerations

Landscape character – Unlike Alternative A, this alternative includes a turfed channel segment between the business park/industrial and residential land-uses south of the BWCDD which could serve as a visual buffer and are compatible with more types of land-uses.

There are 2.2 miles of concrete channel associated with this alternative.

Parks and trails – Alternative B includes 11.4 miles of trail opportunity, with 2.2 miles occurring along Industrial Channels.

Views – Alternative B includes 122 acre-feet of basin that are very similar in placement and scale to Alternative A except Alternative B does not include the Railroad Basin.

Open Space – Two of the natural open space basins are located where they could serve as visual buffers between residential and industrial land-uses, meaning they will provide higher quality open space value than if they were located within a single land-use. These two basins provide 53 acre-feet of storage that could serve as open space.

The recreation and aesthetic considerations for the Alternative B, as well as a comparison with the other alternatives, are summarized in **TABLE 25**.

TABLE 25 – ALTERNATIVE B: RECREATION AND AESTHETIC CONSIDERATIONS

ALTERNATIVE	Landscape Character	Parks and Trails	Views	Open Space
	Concrete Channel (miles)	Trail Opportunity (miles / Industrial miles)	Basin Viewshed (acft)	Visual Buffer in Basins (acft)
BASE	3.2	10.7/3.2	124	62
A	2.3	11.2 / 2.3	146	86
B	**2.2**	**11.4 / 2.2**	**122**	**53**
C	0.4	11.6 / 0.4	244	213

2. Planning/Political/Other Considerations

The Globe Corporation has approached the Town of Buckeye with the intent to develop an industrial park between Watson Road and Rainbow Road north of the UPRR and south of Southern Avenue. In order to minimize impacts to the proposed industrial park, the Railroad Basin has been eliminated in Alternative B. Flow reaching Southern Ave from the 231st Ave Channel will be routed first east, then south around the proposed industrial development. This approach is consistent with the Alternative B philosophy of minimizing storage throughout the sytem.

The proposed Maricopa Basin has been moved to the west side of Apache Road to minimize impacts to the Watson CFD member parcels.

Alternative B is similar to Alternative A and will construct a channel north of Union Pacific RR right of way. This channel will capture and convey flow to a point approximately 2,000 feet west of Watson Road. At that location, approximately 460 cfs will be passed through approximately 200 feet of UPRR right of way and under the railroad embankment. Railroad design requirements dictate a minimum of 2.5 feet from the base of rail to the top of the proposed box culvert. Additionally, conveyance will be required from ROW to ROW, so dedicated channels or conduit will need to be constructed within the ROW to and from the existing culverts.

A 4-foot high box culvert has been proposed at this location, and based on reviewing aerial topography and as-builts for the downstream facilities it appears that there may be sufficient elevation to increase the height of the box, reducing the width. This will be evaluated during final design to determine the most cost effective solution.

UPRR will require coordination of construction activities within railroad ROW to complement freight train schedules along this route in order to avoid shipping and transit delays. This route, labeled the Phoenix Subdivision by UPRR, is estimated to handle three to five freight trains per week. This should allow for a maximum 3-day window to put the Phoenix Subdivision out of service and construct the proposed concrete box culvert crossing without having a major impact on UPRR freight train schedules. Utilizing a precast box culvert at this location will meet that scheduling requirement.

Arizona Game & Fish currently owns the property at the proposed outfall, but has had discussions with Gila River Lake, LLC (a sand and gravel mining company) regarding a potential lease or sale of those parcels. Close coordination needs to occur with these entities to establish an acceptable configuration for the outfall.

Many of the proposed channel alignments are adjacent to land that is planned for residential development in the future. Measures to reduce perceived negative impacts to these properties need to be considered as part of this pre-design project.

3. Pros & Cons Summary

<u>Pros</u>

+ Consolidates system to a single crossing of UPRR/K-M/ANPP/BWCDD facilities.
+ Eliminates the Railroad Basin.
+ Routes flows around the proposed Globe Corporation Industrial Park.
+ Requires the least amount of additional cultural survey, with 2.8 miles of additional channel alignment and two basin sites.

+ Turf channel south of the BWCDD could serve as a visual buffer between the existing development to the west and the business park/industrial land use area.
+ Provides opportunities to implement the Town of Buckeye Trails System as identified in the Buckeye Trails Master Plan, with 11.4 miles of trail opportunity of which 7.4 miles is along landscaped channels.
+ Provides opportunity for active recreation in the 48 acre-foot Rainbow Basin, with adequate space for 4 multi-use fields.
+ Maricopa and Dean Basins are located between industrial and residential land-uses where they can serve as open space buffers.

Cons

– Requires property acquisition for 5 basins.
– Requires new crossing of UPRR.
– Impacts existing business south of BWCDD.
– Concrete channel north of railroad reduces habitat value of existing floodplain.
– Includes the greatest amount of concrete channel.
– Includes the least opportunity for open space and view preservation through new basins, with only 112 acre-feet of storage required spread among 4 basins.
– Creates the least opportunity for creating habitat, with fewer open space basins and more concrete or turf channels than the other alternatives.

E. Alternative C

1. Description

FIGURE 23 shows Alternative C with the design flow rates for each of the conveyance system reaches. The conveyance reaches are color coded on the exhibit to indicate the typical channel section utilized for the different segments of the system.

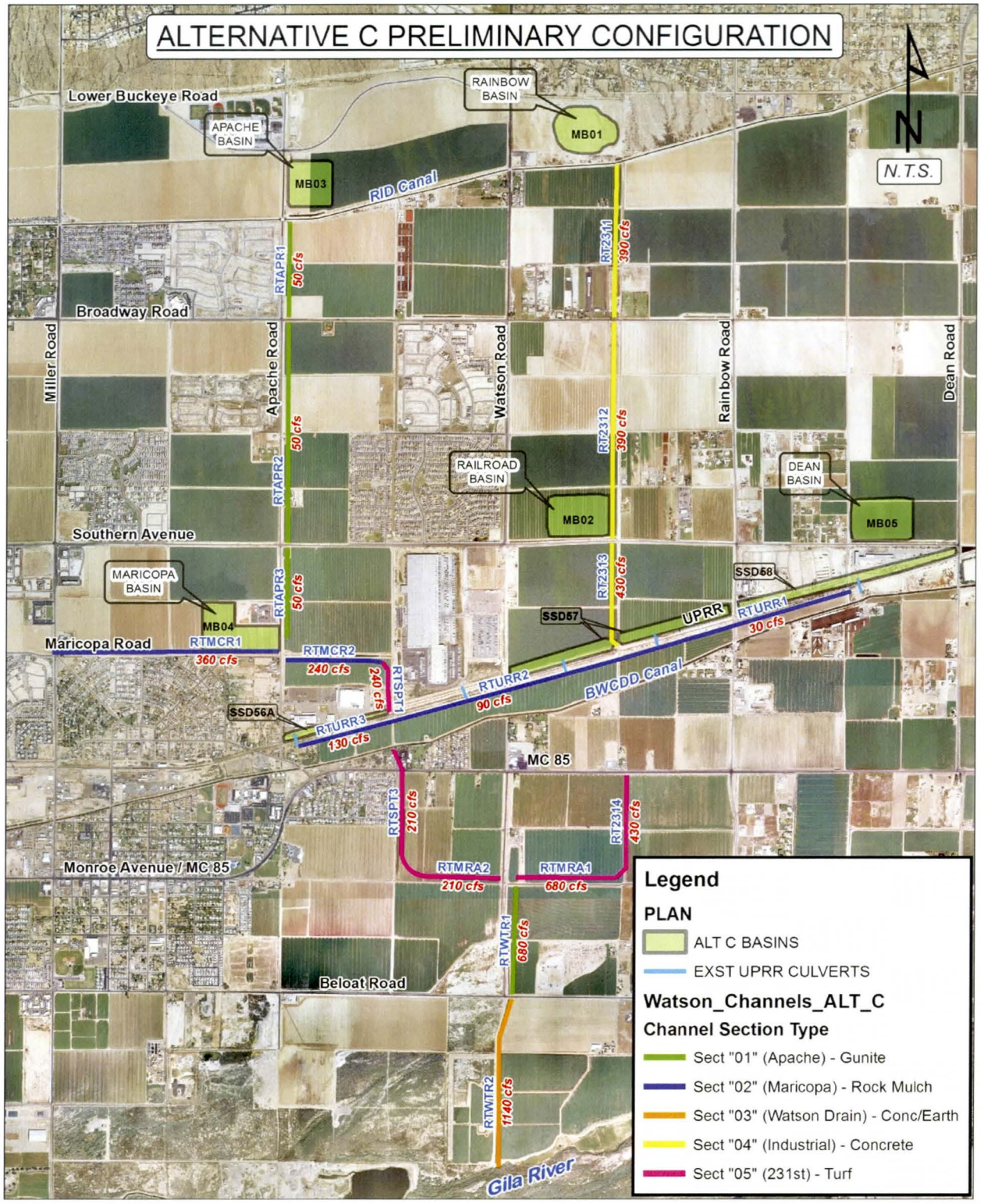
The design flow rates for the channels vary throughout the system from 50 cfs at the upstream end of the Apache Channel to 910 cfs at the proposed outfall along the Watson Drain Channel.

10.1 miles of conveyance channels are needed for Alternative C. The proposed channel lining materials and respective lengths are summarized below:

Gunite:	2.1 mi
Rock Mulch:	3.8 mi
Concrete/Earth:	0.7 mi
Concrete:	0.4 mi
Turf:	3.1 mi
Total Channel Length:	**10.1 mi**

In addition, between culvert crossings and underground reaches, Alternative A includes **1.5** miles of underground storm drain.

FIGURE 23 – ALTERNATIVE C SYSTEM DETAIL



The proposed basin volumes for Alternative C are as follows:

Rainbow Basin:	48 ac-ft
Railroad Basin:	34 ac-ft
Apache Basin:	12 ac-ft
Maricopa Basin:	29 ac-ft
Dean Basin:	51 ac-ft
Linear Basins along UPRR:	99 ac-ft
Total Retention Volume:	***244 ac-ft***

The proposed crossing of the UPRR/K-M will be accomplished through the existing UPRR culverts under the track.

The proposed crossing of the ANPP/BWCDD facilities needs to be sized with capacity for 210 cfs.

2. Project Costs

The cost summary for Alternative C is shown in **TABLE 26.** A 30% contingency was applied to all items in the cost estimate. For a more detailed description of cost derivation, please refer to **Appendix A**.

TABLE 26 – ALTERNATIVE C: COST SUMMARY

Item	Cost
Removals/Relocations/Utility Crossings	$ 7.46 M
Channels	$ 11.70 M
Storm Drains and Culverts	$ 12.15 M
Basins (Excavation Only)	$ 3.60 M
ROW Acquisition	$ 32.29 M
Landscape	$ 11.82 M
Total	**$ 79.02 M**

3. Engineering Considerations

Alternative C requires 2 crossings of the RID canal, 0 new crossings of the UPRR, and 1 crossing of the ANPP/BWCDD/K-M facilities. Alternative C utilizes the existing culvert crossings of the UPRR tracks to convey flow across UPRR property. No new crossing of the UPRR is needed in this alternative.

The number of required crossings of the major existing facilities for Alternative C, as well as a comparison with the other alternatives, is shown in **TABLE 27**.

TABLE 27 – ALTERNATIVE C: PROPOSED NEW CROSSINGS OF MAJOR FACILITIES

ALTERNATIVE	RID	UPRR	ANPP/BWCDDD/K-M
BASE	2	2	2
A	2	1	1
B	2	1	1
C	**2**	**0**	**1**

The topography north of the UPRR is fairly flat in the east-west direction. This will help facilitate the construction of the proposed linear retention basins along the north side of the UPRR intended to capture and meter flows to the existing UPRR culverts. However, the flat topography will present a challenge for the proposed collection channel on the south side of the UPRR property.

All of the system channels have been designed to operate in a sub-critical flow regime. Flow velocities throughout the system for Alternative C vary from 1.3 fps to 7.6 fps. System velocities for Alternative C, as well as a comparison with the other alternatives, are shown in **TABLE 28**.

In order to achieve the desired sub-critical flow and velocity, the longitudinal slope of the channels needs to be flatter than the existing ground slope in some reaches. Drop structures will be needed in these reaches to control the slope of the channels to maintain sub-critical flow. There are 5 drop structures required for Alternative C, the locations of which are all along Apache Road and 231st Avenue between the UPRR and the RID facilities. The number of required drop structures for Alternative C, as well as a comparison with the other alternatives, is shown in **TABLE 29**.

TABLE 28 – ALTERNATIVE C: SYSTEM VELOCITIES

ALTERNATIVE	VELOCITY RANGE (fps)
BASE	2.4 – 7.7
A	2.4 – 7.7
B	2.3 – 7.8
C	**1.3 – 7.6**

TABLE 29 – ALTERNATIVE C: REQUIRED DROP STRUCTURES

ALTERNATIVE	# DROP STRUCTURES
BASE	5
A	5
B	7
C	**5**

4. Environmental Considerations

Natural resources –With an estimated 910 cfs of flow, Alternative C has the lowest discharge volume at the Gila River during the 100 year design event, suggesting it may have the least amount of impact though the difference is likely to be negligible.

This alternative provides a significantly greater opportunity to create open space via basins than the other two alternatives with a total of 244 acre-foot of storage required for the five major basins and the UPRR linear basin corridor.

The natural resource impacts for the Alternative C, as well as a comparison with the other alternatives, are summarized in **TABLE 30**.

TABLE 30 – ALTERNATIVE C: NATURAL RESOURCE IMPACTS

ALTERNATIVE	Natural Resources		
	Open Space Basins (acft)	Earthen Channel (miles)	Concrete Channel Replacing Floodplain (miles)
BASE	76	0.66	2.1
A	146	0.67	2.1
B	112	0.67	2.1
C	**244**	**0.73**	**0**

Cultural resources – This alternative has the potential to include greatest amount of area that will require additional cultural resource survey, as illustrated in **FIGURE 24**. This includes approximately 0.4 miles of channel, the Dean, Railroad, and Maricopa Basins and the UPRR linear basins. The greatest area requiring new survey is associated with the 99 acre-feet of storage required in the UPPR linear basins.

The additional cultural resource survey needs for the Alternative B, as well as a comparison with the other alternatives, are summarized in **TABLE 31**.

TABLE 31 – ALTERNATIVE C: CULTURAL RESOURCE SURVEY NEEDS

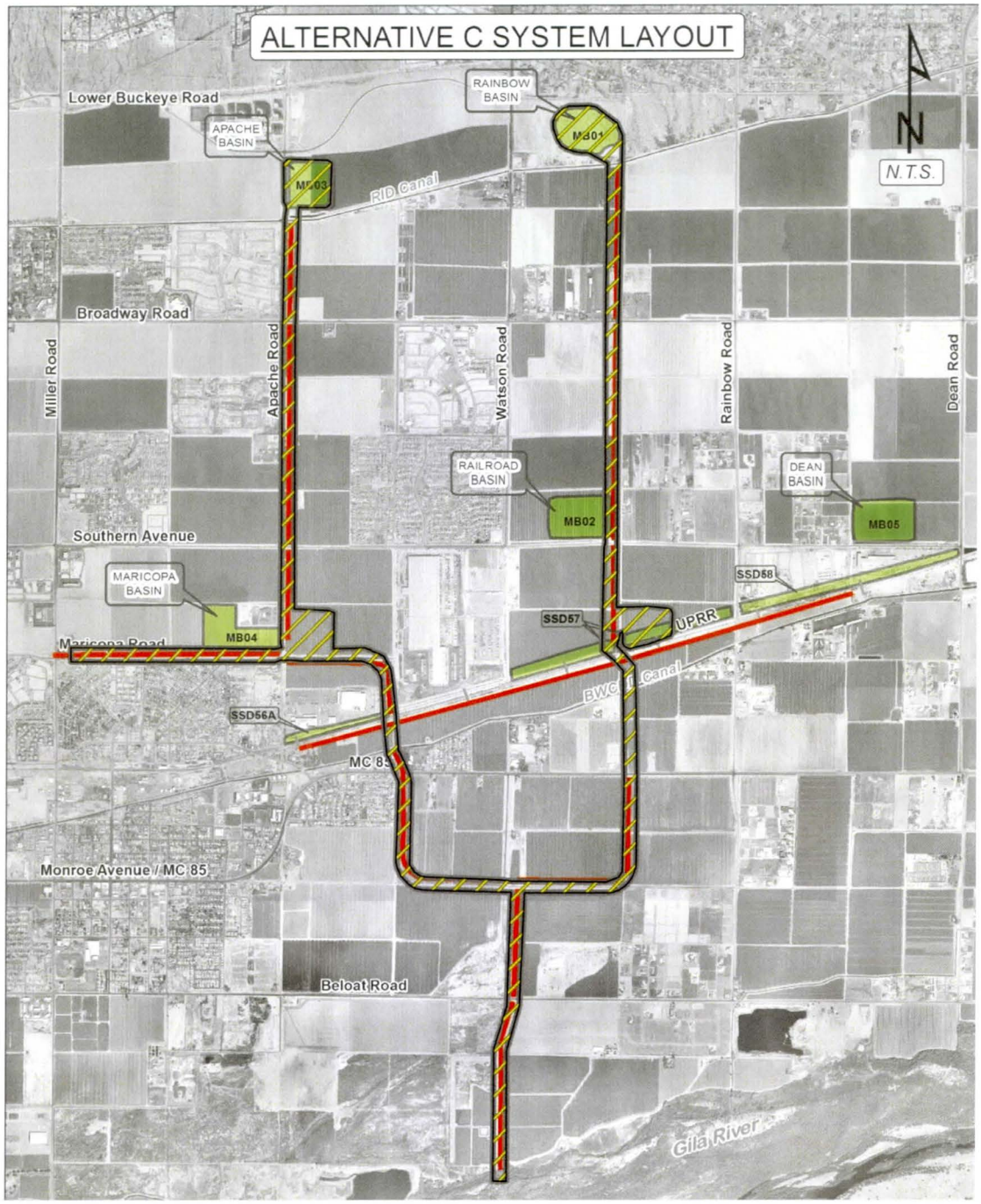
ALTERNATIVE	Cultural Resources		
	Sites Remaining	Sites Requiring Mitigation	Additional Survey Needed
BASE	4	0	-
A	-	-	3.3 Channel Miles + 3 Basins
B	-	-	2.8 Channel Miles + 2 Basins
C	**-**	**-**	**0.4 Channel Miles + 4 Basins**

Habitat – The Apache, Maricopa, Railroad, and Dean Basins which provide 126 acre-feet of storage as well as the 99 acre-feet railroad linear basins.

There is a proposed 3.1 miles of turf channels along the 231st Avenue, Monroe Avenue, and west of the Watson Road alignment that would provide habitat for a more limited range of species .

With only 0.4 miles of concrete channel from Southern Avenue to the UPRR railroad along the 231st Avenue alignment, this alternative also includes the least amount of channel that provides limited to no habitat value.

FIGURE 24 – ALT C ENVIRONMENTAL SURVEY BOUNDARY



The habitat opportunities for Alternative C, as well as a comparison with the other alternatives, are summarized in **TABLE 32**.

TABLE 32 – ALTERNATIVE C: HABITAT OPPORTUNITIES

ALTERNATIVE	Habitat				
	Earthen Channel (miles)	Earthen Basins (acft)	Turf Channel (miles)	Turf Basins (acft)	Concrete Channel (miles)
BASE	0.66	76	2.0	48	3.2
A	0.67	99	3.0	48	2.3
B	0.67	65	3.3	48	2.2
C	**0.73**	**225**	**3.1**	**48**	**0.4**

1. Recreation & Aesthetic Considerations

Landscape character – The single 0.4 mile concrete channel segment in this alternative is located in the industrial area east of the Walmart Distribution Center where is it considered compatible and desirable by the Town of Buckeye.

Parks and trails – This alternative includes the unique opportunity to create a passive recreation area between the railroad and the BWCDD in addition to the Rainbow Basin active recreation opportunity. This area could also include a trailhead for the Buckeye trail system that could connect the BWCDD trail with the flood control channel trails intended to occur with each channel reach. Alternative C includes 11.6 miles of new channel trail opportunity, with 0.4 miles occurring along Industrial Channels. This alternative may include opportunity to add an additional trail north of the BWCDD, which is a trail segment identified in the Buckeye Trails Master Plan. This opportunity will ultimately depend on the configuration and land requirement associated with the spreader basins, so no quantities are associated with this opportunity.

Views – This alternative provides the greatest opportunity for viewshed preservation with the inclusion of the spreader basin between the railroad and the BWCDD. The 244 acre-feet of major basins proposed with this alternative increase the opportunity for viewshed preservation compared with the alternatives that propose smaller basins in the same locations.

Open Space – Three of the major natural open space basins are located where they could serve as visual buffers between residential and industrial land-uses, meaning they will provide higher quality open space value than if they were located within a single land-use. These three basins provide 114 acre-feet of storage. The 99 acre-feet railroad spreader channel/basin will also increase the amount of open space.

The recreation and aesthetic considerations for the Alternative C, as well as a comparison with the other alternatives, are summarized in **TABLE 33**.

TABLE 33 – ALTERNATIVE C: RECREATION AND AESTHETIC CONSIDERATIONS

ALTERNATIVE	Landscape Character	Parks and Trails	Views	Open Space
	Concrete Channel (miles)	Trail Opportunity (miles / Industrial miles)	Basin Viewshed (acft)	Visual Buffer in Basins (acft)
BASE	3.2	10.7/3.2	124	62
A	2.3	11.2 / 2.3	146	86
B	2.2	11.4 / 2.2	122	53
C	**0.4**	**11.6 / 0.4**	**244**	**213**

2. Planning/Political/Other Considerations

The Globe Corporation has approached the Town of Buckeye with the intent to develop an industrial park between Watson Road and Rainbow Road north of the UPRR and south of Southern Avenue. In order to minimize impacts to the proposed industrial park, the location of the proposed Railroad Basin has been moved to the north side of Southern Avenue.

Similarly, the proposed Maricopa Basin has been moved to the west side of Apache Road to minimize impacts to the Watson CFD member parcels.

Alternative C will utilize existing culvert capacity throughout this reach. These culverts were recently replaced by UPRR between 2009 and 2011 as a part of the Arlington to Phoenix Subdivision culvert replacement project. Retention upstream of UPRR ROW will be provided in sufficient volume to attenuate flows to the point that they do not exceed the capacity of the existing facilities. A channel system downstream and outside of UPRR ROW will collect, convey, and manage these flows.

No new construction under the roadway embankment will be required. However, conveyance will be required from ROW to ROW, so dedicated channels or conduit will need to be constructed within the ROW to and from the existing culverts.

UPRR will require coordination of construction activities within railroad ROW to complement freight train schedules along this route in order to avoid shipping and transit delays. This route, labeled the Phoenix Subdivision by UPRR, is estimated to handle three to five freight trains per week. Since no new facilities will be required, there will be no impacts on train traffic. The major permitting requirements will be related to the safety requirements of working within UPRR ROW.

Arizona Game & Fish currently owns the property at the proposed outfall, but has had discussions with Gila River Lake, LLC (a sand and gravel mining company) regarding a potential lease or sale of those parcels. Close coordination needs to occur with these entities to establish an acceptable configuration for the outfall.

Many of the proposed channel alignments are adjacent to land that is planned for residential development in the future. Measures to reduce perceived negative impacts to these properties need to be considered as part of this pre-design project.

3. Pros & Cons Summary

Pros

+ Eliminates need for new crossing of UPRR and Kinder-Morgan facilities.
+ Consolidates system to a single crossing of ANPP/BWCDD facilities.
+ Reduces flows reaching UPRR through increased upstream storage volume.
+ Includes the lowest flow rate at the Gila River.
+ Creates the greatest opportunity for habitat, open space, and view restoration or preservation with 244 acre-feet of storage associated with the major basin sites .
+ Turf channel south of the BWCDD could serve as a visual buffer between the existing development to the west and the business park/industrial land use area.
+ Provides opportunities to implement the Town of Buckeye Trails System as identified in the Buckeye Trails Master Plan, with 11.6 miles of trail opportunity of which 9.7 miles is along landscaped channels. Additional trail opportunity may occur with the spreader channel and basin depending on the final configuration of that facility.
+ Provides opportunity for active recreation in the 48 acre-foot Rainbow Basin, with adequate space for 4 multi-use fields.
+ Provides opportunity for a trailhead adjacent to the BWCDD canal in the spreader basin.
+ Maricopa, Railroad and Dean Basins are located between industrial and residential land-uses where they can serve as open space buffers.
+ Includes the least amount of concrete channel, with only 0.4 miles required.

Cons

– Requires property acquisition for 5 basins.
– Impacts existing business south of BWCDD.
– Requires property acquisitions and construction of basins/channels on both the north and south sides of UPRR, representing a duplication of acquisition and construction costs.
– Requires a significant amount of additional cultural survey. While only 0.4 miles of additional channel survey is required, the 99 acre-feet UPRR linear basins plus the three major basins sites will require survey.

V. SELECTION OF PREFERRED ALTERNATIVE

A. Alternative Selection Meeting

The alternative concepts presented in the preceding sections were evaluated at the Alternative Selection Meeting on April 24, 2013. The performance rating resulting from the evaluation for each alternative was compared to the cost to implement that alternative as a means to assess the value received for the cost of implementation. The relationship between cost and value was illustrated on the Value-Cost Graph shown on **FIGURE 25**. A vertical bar is shown for the Base and each alternative that is positioned along the x-axis according to its implementation cost. The length of each vertical bar depicts the value assigned through its Performance Rating. The resulting graph provides a visual indicator of the value-cost relationship. The alternative deemed by the group to provide the greatest value-cost benefit is then considered as the preferred alternative. Based on review by the District and Town of Buckeye as well as discussions among the evaluators, the preferred alternative may be modified to combine beneficial features from other alternatives to form the alternative that is considered to provide the best value. This improved alternative is the preferred alternative to be developed in the preliminary design.

Prior to the Alternative Selection Meeting evaluators were asked to review this report and assign preliminary scores for each alternative according to how well they met the eight (8) evaluation criteria presented in the evaluation matrix shown on **FIGURE 26** and described below. Brief phrases are included on **FIGURE 26** under each criterion suggesting considerations that would describe the high (5) and low (1) scores at each end of the scale. The evaluators selected a score between 1 and 5 for each of the eight (8) criterions. The alternative drainage concepts and evaluation criterion were discussed during the meeting. Evaluators were given an opportunity to revise their scores during the meeting based on the discussion. The final scores from each evaluator were then tallied for each criterion and multiplied by the weighting factor. The total weighted scores for each criterion are summed for a composite performance rating for each alternative. The considerations suggested by the phrases are further described below:

1. Constructability

Groundwater- Groundwater is fairly shallow in the southern portion of the study area, near the Gila River. The BWCDD actually pumps groundwater continually with a number of wells to keep groundwater levels low enough to enable agricultural production in these areas near the river. Shallow groundwater that fills construction trenches or excavations for channels presents a challenge for construction. Constructability in areas with deep groundwater is favorable over areas with shallow groundwater that might require extra measures to de-water during construction.

Significant Utilities- There are several significant utilities within the project corridor that create challenges and costs to construction. This is true particularly along the BWCDD/UPRR/ANPP pipeline corridor. Alternatives that minimize or avoid these utilities are favorable for constructability as compared to alternatives that require multiple crossings or challenging construction to meet the design and protection requirements of the utility owners.

Complexity- Complex designs with non-standard elements, varying cross-sections, and curvilinear alignments pose additional challenges to construction as compared to straight-forward designs with uniform, straight features with standard sizes and materials that are readily available from multiple sources. Special structures with unique designs also add to complexity of construction.

Permitting- Requirements to obtain permits and comply with associated special requirements detracts from constructability. Significant permitting would be required for jurisdictional waters of the U.S. or from significant utility providers for construction within their right-of-way or crossing their facilities. Lengthy lead times to obtain permits would also detract from constructability as compared to alternatives that require no, or few, permits.

FIGURE 25 – ALTERNTATIVES VALUE-COST GRAPH

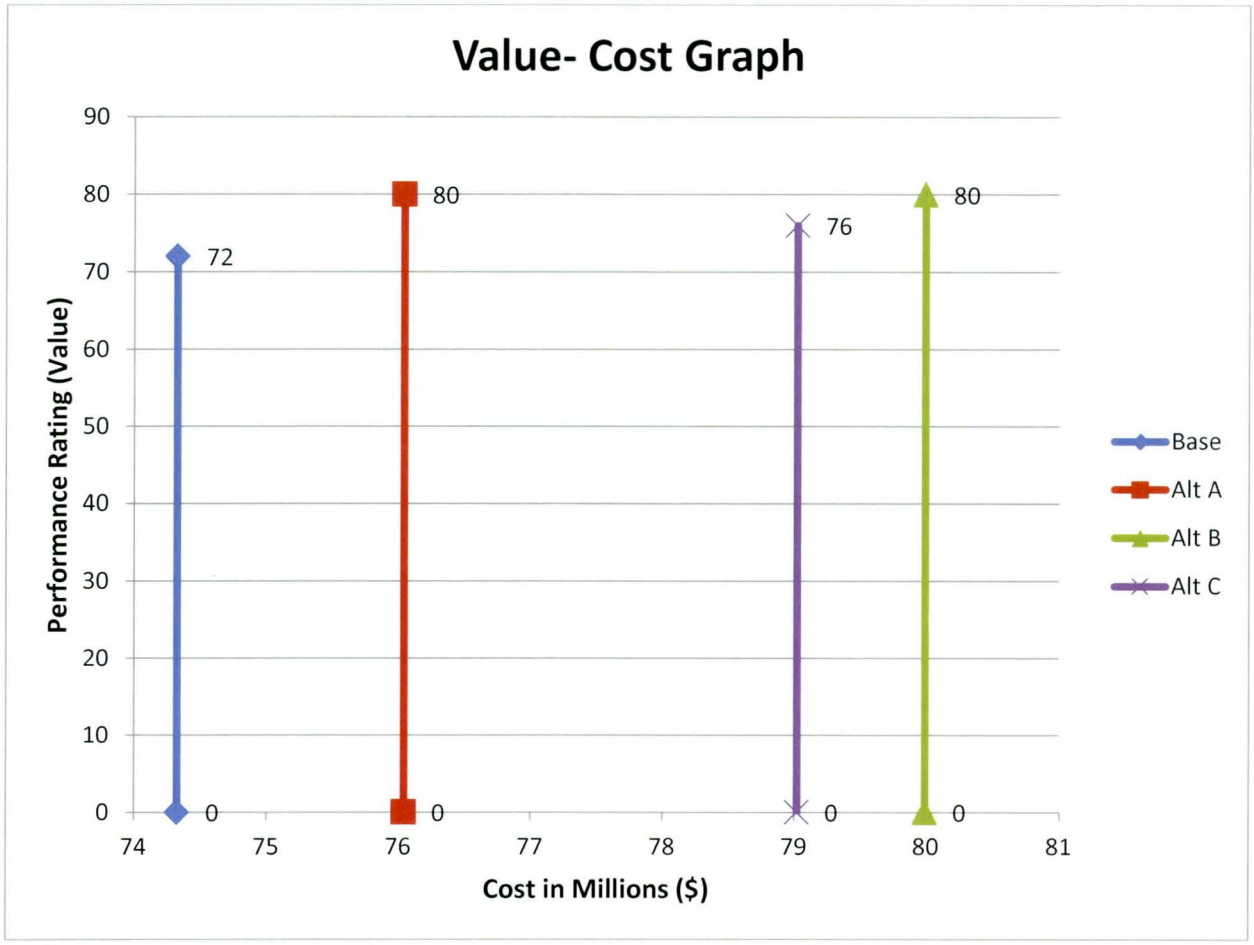


FIGURE 26 – ALTERNATIVES EVALUATION MATRIX

Constructability

1	2	3	4	5
Shallow groundwater				Deep groundwater
Significant utility impact				Avoids all significant utilities
Complex design and construction				Straight-forward design/construction
Significant permitting required				Minimal permitting required
Significant Hazardous Materials				Avoids known hazardous materials

Implementation

1	2	3	4	5
Few funding sources available				Significant funding sources available
No partnering opportunities				Multiple partnering opportunities
No phasing opportunity				Many phasing opportunities
Unfavorable cost split location				Favorable cost split location

Life Cycle Costs

1	2	3	4	5
High O&M costs				No O&M costs
High water use				Low water use

LS Aesthetics/Landuse Compatibility

1	2	3	4	5
Incompatible with future landscape character				Compatible with future landscape character
Obscures views of distinctive scenic features				Enhances views of distinctive scenic features
Increases degraded landscape				Restores degraded landscapes
Doesn't meet open space needs				Meets open space needs
No opportunity for trail and park shared use				Aligns with trail and park plans

Natural & Cultural Resources

1	2	3	4	5
Degrades natural resources				Enhances natural resources
Outside cultural resources completed survey area				Within cultural resources survey area
No new habitat				Creates significant new habitat

Public/Political Acceptance

1	2	3	4	5
Political / legal opposition				High political support
Organized legal opposition				High special interest group support
High negative impact on neighborhoods				Beneficial impacts to neighborhoods
Severe community opposition				High community support

Safety/Flood Hazard Reduction

1	2	3	4	5
Doesn't solve existing flooding problems				Solves existing flooding problems
Provides low level of flood protection				Eliminates 100-year floodplains
Supercritical flow regime				sub critical flow regime
Storm related street closures				All weather street crossings

Synergy/Multi-Use

1	2	3	4	5
Meets with no other plans				Plan matches other agency plans
No connectivity Between local and regional facilities				Optimizes local/regional connectivity
No Implementation of regional trails plan				Fully implements regional trails plan
Single use for each facility				Many uses for each facility

Hazardous Materials- Hazardous materials within the construction limits require special handling and clean-up along with the associated agency oversight and documentation. Alternatives with known hazardous material issues would detract from constructability as compared to alternatives with no known hazardous materials within the construction limits.

2. Implementation

Funding sources- Project implementation often benefits when the cost can be shared by multiple funding sources. This is often tied to partnering opportunities. The planned cost share between the District and the Town of Buckeye is an example of multiple funding sources. If utility providers, developers, or other agencies can help fund improvements then implementation is further incentivized.

Partnering opportunities- Partnering opportunities create opportunities to share cost as well as increased support and momentum for project implementation. Alternatives that can draw in multiple partners are favorable as compared to alternatives that must be implemented by a single entity.

Phasing- Project phasing allows construction in multiple contracts that can be spread over several CIP budget years. Alternatives that can be implemented in smaller phases are favorable over alternatives that require significant expenditures to implement in a short time period before they can be useful and effective.

Cost split location- The FCDMC and Town of Buckeye are partnering in the implementation of this project. The CIP prioritization request submitted by Buckeye envisions that each party will implement the project in a 50/50 cost split with the FCDMC constructing the downstream half of the project and the Town of Buckeye constructing the upstream half of the project in conjunction with the development of the northern (upstream) portion of the watershed by private developers. The CIP prioritization request envisioned the FCDMC portion extending to north of the UPRR property. It was agreed that it would be favorable for the overall project implementation if the FCDMC portion of the project, which will be constructed first, were to extend to the upstream end of the BWCDD/UPRR crossing corridor to provide an outfall for the Town of Buckeye half of the improvements.

3. Life Cycle Costs

Operation & Maintenance Costs- Alternatives that are passive and require little or no cost to operate and maintain are favorable over projects that require significant cost to operate and maintain.

Water Use- Water is a scarce and costly resource. Alternatives that require large amounts of water to support or sustain them are not favorable as compared to alternatives that do not require ongoing water use. An exception to this might be the beneficial use of the pumped groundwater from area dewatering wells that is present as base flow in the Watson Drain. If this water is available to the project for use as a water feature, then increased life cycle costs may not be experienced.

4. Landscape Aesthetics & Land Use Compatibility

Future landscape character compatibility – The Town of Buckeye prefers facilities that relate to their adjacent land-use rather than a "one size fits all" approach. The District's *Landscape Architecture Policy* also guides project design to fit into the surrounding setting through the selection of appropriate landscape design themes and compatible structure design. Basin and channels that relate well to the future land-use are favorable compared to structures that do not relate to the character of the adjacent setting.

Views – With the north-south orientation of the Watson System, alternatives have the opportunity to either enhance or obstruct views of the White Tank Mountains to the north as well as the Gila River and Buckeye Hills to the south of the system. Channels and basins that preserve or enhance views of these distinctive scenic features are favorable over facilities that restrict or obscure these same views.

Landscape degradation- The majority of the land within the Watson System has been disturbed for either agriculture or some type of development. These landscapes range from the highly disturbed and neglected areas upstream of the UPRR tracks and fallow fields to well-maintained suburban developments primarily north of Southern Avenue. The Gila River includes both degraded as well as naturalized disturbance areas near the outlet of the existing Watson Drain. Alternatives that improve or enhance degraded landscape areas are preferred over alternatives that do not enhance degraded areas or that degrade currently natural or well-maintained landscapes.

Open space – There are two major existing designated open space areas either within or adjacent to the Watson Drainage System. These include the Town of Buckeye's Skyline Regional Park/Maricopa County's White Tank Mountain Regional Park to the north of the I-10 on the Watson Road alignment, and the areas designated as "Conservation" by the Maricopa Association of Governments (MAG) *Desert Spaces Plan*. These *Desert Spaces* include the Gila River and the floodplains north of the two major canals. The Town of Buckeye and project PAAC also confirmed that the basins associated with the system should provide additional open space value, either as active open space (i.e. at the Rainbow Basin) or passive natural open space. Regarding this evaluation criteria, the preference is not for maximizing open space at all costs. Rather, alternatives are preferred that provide higher quality open space value compared to other alternatives. Examples of how this could be achieved include alternatives that preserve open space adjacent to trail locations that could serve as trailheads, or that could serve as buffers between different land-use areas such as between future industrial and future residential.

Parks and trails – The Town of Buckeye's *Parks Master Plan* (2005) and *Trails Master Plan* (2008) indicate opportunities for co-locating a park at the Rainbow Basin site north of the RID on the 231st Avenue alignment as well as a preference for including trails with any flood control channel alignment in the Watson System. In each of the alternatives, the general opportunity to accomplish these goals is the same. Instead of evaluating opportunity to implement the plans, which is consistent between the alternatives, the preference is given for alternatives that provide higher quality trail and open space user experience over alternatives that only meet minimal requirements for integrating recreation multi-use into the Watson System.

5. Natural & Cultural Resources

Natural resources - Natural resources identified for the Watson Drainage System in the Buckeye ADMP include the existing riparian vegetation at the Gila River and undisturbed or naturalized open spaces not impacted by agriculture or development. Wildlife may also benefit from the creation of new open space with appropriate vegetation restoration within the facilities themselves that would increase the natural resource value of an alternative. However, the benefit of newly created natural resource areas will be limited by the number of road crossings and other hazards or obstacles to wildlife movement within the Watson System. Because all alternatives will have similar impacts at the Gila River, preference is for alternatives that provide the greatest amount of open space preservation or creation.

Cultural Resources – Cultural resource surveys have been conducted for the channel alignments and basin locations identified as part of the Watson System in the Buckeye ADMP. Alternatives that minimize

the amount of new cultural survey required (i.e. – remain consistent with the ADMP alignments) are preferred over those that require extensive additional cultural surveys.

Habitat – This evaluation criterion differs from the natural resource criterion above in that it relates to the amount of quality habitat area created by the alternatives rather than to existing natural resource areas and their connectivity. Created habitat will benefit the greatest number of wildlife species the closer it resembles naturally occurring vegetative communities. Conversely, ornamental or turf landscaped facilities will provide habitat for fewer wildlife species. Channels and basins that are primarily rock or gunite provide limited habitat value for almost all species. For this reason, alternatives that provide earthen channels and basins with greater opportunity for restoring native vegetation communities are favorable compared to those that have greater amounts of rock, gunite, or turf landscape treatments that will benefit fewer species.

6. Public & Political Acceptance

Political Support- The Town of Buckeye elected officials and department personnel will be the primary agents to implement portions of the plan on behalf of the Town. It is anticipated that private land developers will take the lead in construction of many of the facilities in conjunction with local development projects. For successful implementation a high level of support as well as a proactive approach to working with the development community from the Town officials will be imperative.

Legal/Special Interest Groups- Organized legal opposition to the project would indicate a high lack of support and would be costly to overcome along with the potential for the project to be stopped or modified. Conversely if special interest groups speak out in favor of the project, implementation could be sped up or accomplished more easily.

Neighborhood Impacts- Projects that split established neighborhoods, create hazards for children, or create challenges for access would have negative impacts to the neighborhood which would be unfavorable as compared to projects that offer beneficial impacts to neighborhoods such as improved access to recreation facilities, aesthetics and view corridors to river and mountain natural features, as well as added flood protection for areas that have experienced floods in the past.

Community Response- Opposition to an alternative voiced at public or individual meetings would be detrimental to the project. Community members voicing support for an alternative would be a positive indication that they believe the project will be an asset to the community which would facilitate smooth project implementation.

7. Safety & Flood Hazard Reduction

Existing Flooding Problems - Existing flooding problems are identified with the current floodplain delineations as well as the potential for flooding resulting from irrigation canal overtopping with resultant downstream flooding that is not identified in the regulatory floodplain maps. Alternatives that address these flooding issues are favorable over projects that only partially address flooding problems.

100-year Floodplains - Similar to the previous item, alternatives that eliminate the 100-year floodplains are favorable over projects that provide levels of protection less than the 100-year storm.

Flow Regime - Although supercritical flows are allowed by FCDMC design criteria when designed for stable flow conditions, the higher energy and velocity characteristics of supercritical flow pose potential hazards to anyone adjacent to the channel from splashing or waves as well as hazards if someone falls

into the channel. From a safety standpoint the more tranquil flow conditions with the sub critical flow regime is more favorable.

Street Closures - Alternatives that include greater flow in or overtopping street systems are less desirable than alternatives that fully contain the flow and include provision to pass the entire flow under the street. FCDMC projects typically design road crossings for the same return period storm as the channel that contains them. This is done even in cases where the culvert sizing criteria would typically allow for a lower return period design.

8. Synergy & Multi-Use

Agency plans - There are many agencies within the Buckeye area each with their own development interests and plans. These agencies include utility providers, transportation agencies, irrigation companies, as well as regulators from federal, state, county, and local levels. Agency planning documents are identified in Section I.C and include the El Rio Watercourse Master Plan, Arizona Parkway concept study which includes plans for Watson Road, and various Town of Buckeye planning documents. Alternatives that support or are coordinated with these plans are favorable over alternatives that would create conflicts that may result in additional costs to future planned projects resulting from the Watson project.

Local and regional connectivity – Multi-modal connections to regional and local facilities increase access and the benefit these facilities provide to the community. Planned and existing regional or local facilities that may be connected via the Watson System include Downtown Buckeye, the Gila River and planned El Rio Watercourse Master Plan restoration areas, the Town of Buckeye's Skyline Regional Park, the White Tank Mountain Regional Park, the planned Buckeye Town Lake, as well as the Town of Buckeye's local park system. Alternatives that provide greater opportunities for connecting these facilities are preferred over those that have fewer opportunities for connectivity.

Regional trail plan – The Maricopa Regional Trail System has identified two segments of planned trail within the Watson System. These include a portion of Segment 33, which follows the Gila River from the confluence of the Salt River to the Robbins Butte Wildlife Area; and a portion of Segment 69, which follows the Roosevelt Irrigation District (RID) Canal. None of the alternatives include channel alignments that correspond with either segment of regional trail. The opportunity to benefit the trail system through the inclusion of trailheads in adjacent basins is also equal between alternatives.

Single use vs. multi-use facilities – Facilities that combine multiple uses within a site provide higher value than those that provide only single functions. Within the Watson System, basins are intended to include open space functions in addition to their primary storm water management function while the channels provide opportunities to implement multi-use paths and trails in conjunction with their O&M roads.

B. Preferred Alternative

The results of the evaluation are shown on FIGURE 25. Alternatives A and B had the highest performance ratings, both receiving ratings of 80. Alternative C and the Base Alternative received performance ratings of 76 and 72, respectively. Since Alternative A has a lower cost than Alternative B with the same performance, Alternative A is the apparent best value alternative. The evaluators affirmed these results and recommended a modification to Alternative A to further improve its value. It was agreed that the 231st Avenue channel would be diverted around the east property line of the Globe Land Investors LLC property, similar to the alignment shown in Alternative B. The preferred alternative with the 231st Ave modified alignment is shown on FIGURE 27. The evaluation tabulations for each

alternative are contained in APPENDIX C. The preferred alternative will be further developed as part of the project pre-design phase.

Appendix A

Alternative Cost Estimates

Watson Drainage System
Preliminary Cost Estimate - **Summary, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	800,400.00	800,400.00
205	Miscellaneous Removals	LS	1	400,200.00	400,200.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	15,792	9.40	148,444.80
215	Remove Pipe	LF	1,280	21.00	26,880.00
220	Remove Concrete Ditch	LF	12,227	30.00	366,812.79
250	Irrigation Pipe Relocation (18")	LF	1,293	96.00	124,128.00
251	Irrigation Pipe Relocation (24")	LF	1,037	102.00	105,774.00
252	Irrigation Pipe Relocation (30")	LF	10,443	109.00	1,138,333.48
258	Concrete-Lined Irrigation Ditch Relocation	LF	2,528	59.00	149,152.00
259	Earth-Lined Irrigation Ditch Relocation	LF	5,320	16.30	86,716.00
260	Relocate Headwall	EA	13	6,600.00	85,800.00
261	Relocate Irrigation Turnout Structure	EA	12	17,500.00	210,000.00
265	Relocate Chain Link Fence	LF	232	26.00	6,032.00
266	Demolish Existing Structures	SF	8,418	5.00	42,090.00
290	Kinder-Morgan 20" Gas Pipeline Crossing	LS	1	960,000.00	960,000.00
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	1	380,000.00	380,000.00
292	RID Canal Crossing	LS	2	19,200.00	38,400.00
293	BWCDD Canal Crossing	LS	1	450,000.00	450,000.00
294	Railroad Spur Replacement	LF	44	175.00	7,700.00
295	Railroad Crossing	LS	1	240,000.00	240,000.00
296	Fiber Optic Line Relocation	LS	4	30,000.00	120,000.00
				Sub-Total	***5,886,863.07***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	736,521	6.00	4,419,124.53
305	Channel Subgrade Preparation	SY	298,946	6.30	1,883,359.43
312	Rock Mulch (3" Minus, 5" Thick)	SY	53,995	3.90	210,578.86
317	Dumped Riprap (D50 = 12")	CY	837	52.00	43,506.67
319	Dumped Riprap (D50 = 18")	CY	2,510	46.00	115,460.00
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	57,818	99.00	5,723,960.00
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	29,152	44.00	1,282,669.81
335	Granular Drainage Layer (4" Thick)	SY	9,140	6.90	63,062.90
339	Weep Holes	EA	5,336	10.00	53,360.00
342	Concrete Cutoff Wall	LF	68,168	4.70	320,388.14
343	Vertical Drop Structure	LF	246	270.00	66,420.00
344	Gila River Outfall Cutoff Wall	LF	114	2,100.00	239,400.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	92,465	15.80	1,460,952.27
				Sub-Total	***15,882,242.61***

Watson Drainage System

Preliminary Cost Estimate - **Summary, Alternative A**

Milestone: Alternatives Analysis

400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	3,282	168.00	551,376.00
420	6' x 4' Concrete Box Culvert	LF	21,655	370.00	8,012,350.00
423	6' x 8' Concrete Box Culvert	LF	1,450	460.00	667,000.00
428	10' x 6' Concrete Box Culvert	LF	720	670.00	482,400.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	6	8,200.00	49,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	31	4,900.00	151,900.00
453	6' x 8' Concrete Box Culvert Wing Walls	EA	5	9,900.00	49,500.00
458	10' x 4' Concrete Box Culvert Wing Walls	EA	3	6,800.00	20,400.00
470	Storm Drain Manhole, per MAG 520	EA	3	3,600.00	10,800.00
				Sub-Total	***9,994,926.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	188,638	0.34	64,136.88
603	Decomposed Granite	SY	611,631	4.00	2,446,524.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	53,995	6.50	350,964.77
606	Turf (Sod)	SY	118,331	5.40	638,987.83
607	Turf (Sprigs)	SY	37,528	2.00	75,056.00
610	Tree (24" Box)	EA	6,468	184.00	1,190,112.00
611	Tall Pot Tree	EA	500	100.00	49,968.43
613	Container Shrubs (5 gallon)	EA	13,452	22.00	295,944.00
614	Container Shrubs (1 gallon)	EA	18,888	10.90	205,879.20
621	Drip Irrigation System	SY	611,631	3.10	1,896,056.10
622	Turf Irrigation System	SY	155,859	3.70	576,678.60
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	3,042	119.00	361,998.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	1,830	153.00	279,990.00
				Sub-Total	***8,432,295.81***
700	***RIGHT-OF-WAY ACQUISITION***				
701	Low Density Residential Property	SF	788,680	1.40	1,104,152.00
702	Medium Density Residential Property	SF	6,164,967	1.60	9,863,947.78
703	Mixed Use Property	SF	505,247	2.00	1,010,494.13
704	Commercial Property	SF	337,783	3.00	1,013,349.40
705	Industrial Property	SF	1,807,804	2.50	4,519,510.30
707	Residential Structures	SF	5,625	100.00	562,500.00
708	Agricultural Structures	SF	5,625	40.00	225,000.00
				Sub-Total	***18,298,953.61***
				Sub-Total	58,495,281.10
				Contingency	17,548,584.33
				Reach Total	76,043,865.43

Watson Drainage System
Preliminary Cost Estimate - **RT2311, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	53,300.00	53,300.00
205	Miscellaneous Removals	LS	1	26,600.00	26,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	769	9.40	7,228.60
215	Remove Pipe	LF	53	21.00	1,113.00
220	Remove Concrete Ditch	LF	75	30.00	2,250.00
250	Irrigation Pipe Relocation (18")	LF	68	96.00	6,528.00
251	Irrigation Pipe Relocation (24")	LF	30	102.00	3,060.00
258	Concrete-Lined Irrigation Ditch Relocation	LF	60	59.00	3,540.00
260	Relocate Headwall	EA	1	6,600.00	6,600.00
292	RID Canal Crossing	LS	1	19,200.00	19,200.00
				Sub-Total	***129,419.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	10,849	6.00	65,096.22
305	Channel Subgrade Preparation	SY	6,933	6.30	43,675.72
351	AC Maintenance Road (2" AC on 6" AB)	SY	5,843	15.80	92,314.13
				Sub-Total	***201,086.07***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	1,132	168.00	190,176.00
420	6' x 4' Concrete Box Culvert	LF	6,004	370.00	2,221,480.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
470	Storm Drain Manhole, per MAG 520	EA	2	3,600.00	7,200.00
				Sub-Total	***2,431,956.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	56,085	4.00	224,340.00
606	Turf (Sod)	SY	6,933	5.40	37,436.33
610	Tree (24" Box)	EA	376	184.00	69,184.00
613	Container Shrubs (5 gallon)	EA	752	22.00	16,544.00
614	Container Shrubs (1 gallon)	EA	1,128	10.90	12,295.20
621	Drip Irrigation System	SY	56,085	3.10	173,863.50
622	Turf Irrigation System	SY	6,933	3.70	25,650.82
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	188	119.00	22,372.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	113	153.00	17,289.00
				Sub-Total	***598,974.85***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	327,407	1.60	523,851.20
				Sub-Total	***523,851.20***
				Sub-Total	3,885,287.72
				Contingency	1,165,586.32
				Reach Total	5,050,874.03

Watson Drainage System
Preliminary Cost Estimate - **RT2312, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	49,200.00	49,200.00
205	Miscellaneous Removals	LS	1	24,600.00	24,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,055	9.40	9,917.00
220	Remove Concrete Ditch	LF	120	30.00	3,600.00
250	Irrigation Pipe Relocation (18")	LF	120	96.00	11,520.00
				Sub-Total	***98,837.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	43,095	6.00	258,572.44
305	Channel Subgrade Preparation	SY	30,434	6.30	191,731.33
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,115	15.80	128,222.27
				Sub-Total	***578,526.04***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,880	370.00	695,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	8	4,900.00	39,200.00
				Sub-Total	***734,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	57,629	4.00	230,516.00
606	Turf (Sod)	SY	30,434	5.40	164,341.14
610	Tree (24" Box)	EA	522	184.00	96,048.00
613	Container Shrubs (5 gallon)	EA	1,044	22.00	22,968.00
614	Container Shrubs (1 gallon)	EA	1,566	10.90	17,069.40
621	Drip Irrigation System	SY	57,629	3.10	178,649.90
622	Turf Irrigation System	SY	30,434	3.70	112,604.11
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	261	119.00	31,059.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	157	153.00	24,021.00
				Sub-Total	***877,276.55***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	812,532	1.60	1,300,051.58
				Sub-Total	***1,300,051.58***
				Sub-Total	3,589,491.18
				Contingency	1,076,847.35
				Reach Total	4,666,338.53

Watson Drainage System
Preliminary Cost Estimate - **RT2313, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	30,200.00	30,200.00
205	Miscellaneous Removals	LS	1	15,100.00	15,100.00
220	Remove Concrete Ditch	LF	30	30.00	900.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
				Sub-Total	***49,080.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	19,617	6.00	117,700.97
305	Channel Subgrade Preparation	SY	10,650	6.30	67,092.61
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	10,650	99.00	1,054,312.49
335	Granular Drainage Layer (4" Thick)	SY	1,183	6.90	8,164.70
339	Weep Holes	EA	460	10.00	4,600.00
342	Concrete Cutoff Wall	LF	6,527	4.70	30,679.06
343	Vertical Drop Structure	LF	84	270.00	22,680.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,763	15.80	59,453.64
				Sub-Total	***1,364,683.48***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	440	370.00	162,800.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***172,600.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	15,239	4.00	60,956.00
610	Tree (24" Box)	EA	242	184.00	44,528.00
613	Container Shrubs (5 gallon)	EA	484	22.00	10,648.00
614	Container Shrubs (1 gallon)	EA	726	10.90	7,913.40
621	Drip Irrigation System	SY	15,239	3.10	47,240.90
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	121	119.00	14,399.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	73	153.00	11,169.00
				Sub-Total	***196,854.30***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	260,559	1.60	416,894.21
				Sub-Total	***416,894.21***
				Sub-Total	2,200,111.98
				Contingency	660,033.60
				Reach Total	2,860,145.58

Watson Drainage System
Preliminary Cost Estimate - **RT2314, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	31,300.00	31,300.00
205	Miscellaneous Removals	LS	1	15,600.00	15,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,924	9.40	18,085.60
220	Remove Concrete Ditch	LF	114	30.00	3,420.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
251	Irrigation Pipe Relocation (24")	LF	84	102.00	8,568.00
252	Irrigation Pipe Relocation (30")	LF	30	109.00	3,270.00
				Sub-Total	***83,123.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	21,707	6.00	130,242.22
305	Channel Subgrade Preparation	SY	15,746	6.30	99,202.38
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,037	15.80	63,779.33
				Sub-Total	***293,223.93***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,436	370.00	531,320.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	4	4,900.00	19,600.00
				Sub-Total	***550,920.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	28,749	4.00	114,996.00
606	Turf (Sod)	SY	15,746	5.40	85,030.61
610	Tree (24" Box)	EA	260	184.00	47,840.00
613	Container Shrubs (5 gallon)	EA	520	22.00	11,440.00
614	Container Shrubs (1 gallon)	EA	780	10.90	8,502.00
621	Drip Irrigation System	SY	28,749	3.10	89,121.90
622	Turf Irrigation System	SY	15,746	3.70	58,261.71
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	130	119.00	15,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	78	153.00	11,934.00
				Sub-Total	***442,596.22***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	197,750	1.60	316,399.62
704	Commercial Property	SF	197,750	3.00	593,249.28
				Sub-Total	***909,648.90***
				Sub-Total	2,279,512.65
				Contingency	683,853.79
				Reach Total	2,963,366.44

Watson Drainage System
Preliminary Cost Estimate - **RTAPR1, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	23,300.00	23,300.00
205	Miscellaneous Removals	LS	1	11,700.00	11,700.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	750	9.40	7,050.00
215	Remove Pipe	LF	136	21.00	2,856.00
220	Remove Concrete Ditch	LF	3,283	30.00	98,490.00
250	Irrigation Pipe Relocation (18")	LF	985	96.00	94,560.00
252	Irrigation Pipe Relocation (30")	LF	2,332	109.00	254,188.00
260	Relocate Headwall	EA	1	6,600.00	6,600.00
261	Relocate Irrigation Turnout Structure	EA	3	17,500.00	52,500.00
292	RID Canal Crossing	LS	1	19,200.00	19,200.00
				Sub-Total	***570,444.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	11,636	6.00	69,817.88
305	Channel Subgrade Preparation	SY	2,614	6.30	16,468.70
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	2,614	44.00	115,019.52
335	Granular Drainage Layer (4" Thick)	SY	290	6.90	2,004.11
339	Weep Holes	EA	302	10.00	3,020.00
342	Concrete Cutoff Wall	LF	3,491	4.70	16,406.76
343	Vertical Drop Structure	LF	16	270.00	4,320.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,628	15.80	57,315.38
				Sub-Total	***284,372.35***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	750	168.00	126,000.00
420	6' x 4' Concrete Box Culvert	LF	70	370.00	25,900.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
470	Storm Drain Manhole, per MAG 520	EA	1	3,600.00	3,600.00
				Sub-Total	***168,600.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	29,505	4.00	118,020.00
610	Tree (24" Box)	EA	234	184.00	43,056.00
613	Container Shrubs (5 gallon)	EA	468	22.00	10,296.00
614	Container Shrubs (1 gallon)	EA	702	10.90	7,651.80
621	Drip Irrigation System	SY	29,505	3.10	91,465.50
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	117	119.00	13,923.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	70	153.00	10,710.00
				Sub-Total	***295,122.30***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	238,046	1.60	380,872.83
				Sub-Total	***380,872.83***
				Sub-Total	1,699,411.48
				Contingency	509,823.44
				Reach Total	2,209,234.92

Watson Drainage System
Preliminary Cost Estimate - **RTAPR2, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	62,600.00	62,600.00
205	Miscellaneous Removals	LS	1	31,300.00	31,300.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,322	9.40	12,426.80
215	Remove Pipe	LF	442	21.00	9,282.00
220	Remove Concrete Ditch	LF	4,879	30.00	146,370.00
252	Irrigation Pipe Relocation (30")	LF	5,288	109.00	576,392.00
260	Relocate Headwall	EA	6	6,600.00	39,600.00
261	Relocate Irrigation Turnout Structure	EA	6	17,500.00	105,000.00
266	Demolish Existing Structures	SF	6,032	5.00	30,160.00
				Sub-Total	***1,013,130.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	37,930	6.00	227,579.77
305	Channel Subgrade Preparation	SY	8,714	6.30	54,895.68
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	8,714	44.00	383,398.40
335	Granular Drainage Layer (4" Thick)	SY	968	6.90	6,680.44
339	Weep Holes	EA	1,008	10.00	10,080.00
342	Concrete Cutoff Wall	LF	11,636	4.70	54,689.20
343	Vertical Drop Structure	LF	32	270.00	8,640.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,229	15.80	130,016.44
				Sub-Total	***875,979.94***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	250	370.00	92,500.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	4	4,900.00	19,600.00
				Sub-Total	***112,100.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	64,147	4.00	256,588.00
610	Tree (24" Box)	EA	529	184.00	97,336.00
613	Container Shrubs (5 gallon)	EA	1,058	22.00	23,276.00
614	Container Shrubs (1 gallon)	EA	1,587	10.90	17,298.30
621	Drip Irrigation System	SY	64,147	3.10	198,855.70
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	265	119.00	31,535.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	159	153.00	24,327.00
				Sub-Total	***649,216.00***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	704,068	1.60	1,126,509.44
707	Residential Structures	SF	5,625	100.00	562,500.00
708	Agricultural Structures	SF	5,625	40.00	225,000.00
				Sub-Total	***1,914,009.44***
				Sub-Total	4,564,436.18
				Contingency	1,369,330.85
				Reach Total	5,933,767.03

Watson Drainage System
Preliminary Cost Estimate - **RTAPR3, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	25,100.00	25,100.00
205	Miscellaneous Removals	LS	1	12,600.00	12,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,303	9.40	12,248.20
215	Remove Pipe	LF	73	21.00	1,533.00
220	Remove Concrete Ditch	LF	2,724	30.00	81,720.00
252	Irrigation Pipe Relocation (30")	LF	2,411	109.00	262,799.00
260	Relocate Headwall	EA	3	6,600.00	19,800.00
261	Relocate Irrigation Turnout Structure	EA	2	17,500.00	35,000.00
				Sub-Total	***450,800.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	16,166	6.00	96,997.64
305	Channel Subgrade Preparation	SY	3,719	6.30	23,432.58
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	3,719	44.00	163,656.14
335	Granular Drainage Layer (4" Thick)	SY	413	6.90	2,851.56
339	Weep Holes	EA	422	10.00	4,220.00
342	Concrete Cutoff Wall	LF	4,896	4.70	23,013.27
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,038	15.80	63,803.91
				Sub-Total	***377,975.10***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	480	370.00	177,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***182,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	32,221	4.00	128,884.00
610	Tree (24" Box)	EA	260	184.00	47,840.00
613	Container Shrubs (5 gallon)	EA	520	22.00	11,440.00
614	Container Shrubs (1 gallon)	EA	780	10.90	8,502.00
621	Drip Irrigation System	SY	32,221	3.10	99,885.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	130	119.00	15,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	78	153.00	11,934.00
				Sub-Total	***323,955.10***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	310,488	1.60	496,780.16
				Sub-Total	***496,780.16***
				Sub-Total	1,832,010.56
				Contingency	549,603.17
				Reach Total	2,381,613.73

Watson Drainage System
Preliminary Cost Estimate - **RTMCR1, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	54,300.00	54,300.00
205	Miscellaneous Removals	LS	1	27,200.00	27,200.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	2,804	9.40	26,357.60
220	Remove Concrete Ditch	LF	156	30.00	4,680.00
251	Irrigation Pipe Relocation (24")	LF	231	102.00	23,562.00
265	Relocate Chain Link Fence	LF	232	26.00	6,032.00
266	Demolish Existing Structures	SF	2,386	5.00	11,930.00
				Sub-Total	***154,061.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	54,460	6.00	326,757.21
305	Channel Subgrade Preparation	SY	38,412	6.30	241,994.78
312	Rock Mulch (3" Minus, 5" Thick)	SY	38,412	3.90	149,806.29
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,512	15.80	134,489.60
				Sub-Total	***853,047.89***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	2,619	370.00	969,030.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***978,830.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	46,465	4.00	185,860.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	38,412	6.50	249,677.16
610	Tree (24" Box)	EA	548	184.00	100,832.00
613	Container Shrubs (5 gallon)	EA	1,096	22.00	24,112.00
614	Container Shrubs (1 gallon)	EA	1,644	10.90	17,919.60
621	Drip Irrigation System	SY	46,465	3.10	144,041.50
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	274	119.00	32,606.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	165	153.00	25,245.00
				Sub-Total	***780,293.26***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	748,200	1.60	1,197,120.64
				Sub-Total	***1,197,120.64***
				Sub-Total	3,963,353.38
				Contingency	1,189,006.01
				Reach Total	5,152,359.40

Watson Drainage System
Preliminary Cost Estimate - **RTMCR2, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	28,000.00	28,000.00
205	Miscellaneous Removals	LS	1	14,000.00	14,000.00
220	Remove Concrete Ditch	LF	42	30.00	1,272.79
251	Irrigation Pipe Relocation (24")	LF	122	102.00	12,444.00
252	Irrigation Pipe Relocation (30")	LF	42	109.00	4,624.48
258	Concrete-Lined Irrigation Ditch Relocation	LF	2,468	59.00	145,612.00
261	Relocate Irrigation Turnout Structure	EA	1	17,500.00	17,500.00
				Sub-Total	***223,453.27***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	23,621	6.00	141,727.47
305	Channel Subgrade Preparation	SY	15,583	6.30	98,171.07
312	Rock Mulch (3" Minus, 5" Thick)	SY	15,583	3.90	60,772.57
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,113	15.80	64,983.64
				Sub-Total	***365,654.76***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	426	370.00	157,620.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***162,520.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	23,748	4.00	94,992.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	15,583	6.50	101,287.62
610	Tree (24" Box)	EA	265	184.00	48,760.00
613	Container Shrubs (5 gallon)	EA	530	22.00	11,660.00
614	Container Shrubs (1 gallon)	EA	795	10.90	8,665.50
621	Drip Irrigation System	SY	23,748	3.10	73,618.80
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	133	119.00	15,827.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	80	153.00	12,240.00
				Sub-Total	***367,050.92***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	368,372	2.50	920,930.70
				Sub-Total	***920,930.70***
				Sub-Total	2,039,609.64
				Contingency	611,882.89
				Reach Total	2,651,492.54

Watson Drainage System
Preliminary Cost Estimate - **RTMRA1, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	21,700.00	21,700.00
205	Miscellaneous Removals	LS	1	10,900.00	10,900.00
				Sub-Total	***32,600.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	33,477	6.00	200,864.30
305	Channel Subgrade Preparation	SY	25,504	6.30	160,674.61
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,660	15.80	57,831.51
				Sub-Total	***419,370.41***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	18,272	4.00	73,088.00
606	Turf (Sod)	SY	25,504	5.40	137,721.09
610	Tree (24" Box)	EA	236	184.00	43,424.00
613	Container Shrubs (5 gallon)	EA	472	22.00	10,384.00
614	Container Shrubs (1 gallon)	EA	708	10.90	7,717.20
621	Drip Irrigation System	SY	18,272	3.10	56,643.20
622	Turf Irrigation System	SY	25,504	3.70	94,364.45
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	118	119.00	14,042.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	71	153.00	10,863.00
				Sub-Total	***448,246.94***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	426,928	1.60	683,085.31
				Sub-Total	***683,085.31***
				Sub-Total	1,583,302.66
				Contingency	474,990.80
				Reach Total	2,058,293.46

Watson Drainage System
Preliminary Cost Estimate - **RTMRA2, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	16,500.00	16,500.00
205	Miscellaneous Removals	LS	1	8,200.00	8,200.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	833	9.40	7,830.20
220	Remove Concrete Ditch	LF	30	30.00	900.00
252	Irrigation Pipe Relocation (30")	LF	30	109.00	3,270.00
				Sub-Total	***36,700.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	14,893	6.00	89,358.00
305	Channel Subgrade Preparation	SY	11,470	6.30	72,259.36
351	AC Maintenance Road (2" AC on 6" AB)	SY	2,142	15.80	33,843.60
				Sub-Total	***195,460.96***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	700	370.00	259,000.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***268,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	13,218	4.00	52,872.00
606	Turf (Sod)	SY	11,470	5.40	61,936.59
610	Tree (24" Box)	EA	138	184.00	25,392.00
613	Container Shrubs (5 gallon)	EA	276	22.00	6,072.00
614	Container Shrubs (1 gallon)	EA	414	10.90	4,512.60
621	Drip Irrigation System	SY	13,218	3.10	40,975.80
622	Turf Irrigation System	SY	11,470	3.70	42,438.03
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	69	119.00	8,211.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	42	153.00	6,426.00
				Sub-Total	***248,836.02***
700	***RIGHT-OF-WAY ACQUISITION***				
703	Mixed Use Property	SF	225,180	2.00	450,360.64
				Sub-Total	***450,360.64***
				Sub-Total	1,200,157.82
				Contingency	360,047.35
				Reach Total	1,560,205.16

Watson Drainage System
Preliminary Cost Estimate - **RTSPT1, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	8,700.00	8,700.00
205	Miscellaneous Removals	LS	1	4,300.00	4,300.00
				Sub-Total	***13,000.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	7,668	6.00	46,008.67
305	Channel Subgrade Preparation	SY	5,343	6.30	33,660.90
351	AC Maintenance Road (2" AC on 6" AB)	SY	1,400	15.80	22,120.00
				Sub-Total	***101,789.57***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	9,569	4.00	38,276.00
606	Turf (Sod)	SY	5,343	5.40	28,852.20
610	Tree (24" Box)	EA	90	184.00	16,560.00
613	Container Shrubs (5 gallon)	EA	180	22.00	3,960.00
614	Container Shrubs (1 gallon)	EA	270	10.90	2,943.00
621	Drip Irrigation System	SY	9,569	3.10	29,663.90
622	Turf Irrigation System	SY	5,343	3.70	19,769.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	45	119.00	5,355.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	27	153.00	4,131.00
				Sub-Total	***149,510.20***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	146,808	2.50	367,020.00
				Sub-Total	***367,020.00***
				Sub-Total	631,319.77
				Contingency	189,395.93
				Reach Total	820,715.70

Watson Drainage System
Preliminary Cost Estimate - **RTSPT2, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	68,200.00	68,200.00
205	Miscellaneous Removals	LS	1	34,100.00	34,100.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,724	9.40	16,205.60
220	Remove Concrete Ditch	LF	30	30.00	900.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
290	Kinder-Morgan 20" Gas Pipeline Crossing	LS	1	960,000.00	960,000.00
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	1	380,000.00	380,000.00
293	BWCDD Canal Crossing	LS	1	450,000.00	450,000.00
295	Railroad Crossing	LS	1	240,000.00	240,000.00
296	Fiber Optic Line Relocation	LS	4	30,000.00	120,000.00
				Sub-Total	***2,272,285.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	6,945	6.00	41,670.15
305	Channel Subgrade Preparation	SY	4,728	6.30	29,783.32
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,069	15.80	48,491.96
				Sub-Total	***119,945.42***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	5,172	370.00	1,913,640.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***1,918,540.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	29,041	4.00	116,164.00
606	Turf (Sod)	SY	4,728	5.40	25,528.56
610	Tree (24" Box)	EA	198	184.00	36,432.00
613	Container Shrubs (5 gallon)	EA	396	22.00	8,712.00
614	Container Shrubs (1 gallon)	EA	594	10.90	6,474.60
621	Drip Irrigation System	SY	29,041	3.10	90,027.10
622	Turf Irrigation System	SY	4,728	3.70	17,491.79
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	99	119.00	11,781.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	60	153.00	9,180.00
				Sub-Total	***321,791.05***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	184,019	2.50	460,048.00
				Sub-Total	***460,048.00***
				Sub-Total	5,092,610.07
				Contingency	1,527,783.02
				Reach Total	6,620,393.10

Watson Drainage System
Preliminary Cost Estimate - **RTSPT3, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	27,600.00	27,600.00
205	Miscellaneous Removals	LS	1	13,800.00	13,800.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	922	9.40	8,666.80
220	Remove Concrete Ditch	LF	30	30.00	900.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
				Sub-Total	***53,846.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	24,674	6.00	148,042.07
305	Channel Subgrade Preparation	SY	18,174	6.30	114,498.20
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,950	15.80	62,402.98
				Sub-Total	***324,943.25***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	550	370.00	203,500.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***213,300.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,914	4.00	103,656.00
606	Turf (Sod)	SY	18,174	5.40	98,141.32
610	Tree (24" Box)	EA	254	184.00	46,736.00
613	Container Shrubs (5 gallon)	EA	508	22.00	11,176.00
614	Container Shrubs (1 gallon)	EA	762	10.90	8,305.80
621	Drip Irrigation System	SY	25,914	3.10	80,333.40
622	Turf Irrigation System	SY	18,174	3.70	67,244.98
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	127	119.00	15,113.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	77	153.00	11,781.00
				Sub-Total	***442,487.49***
700	***RIGHT-OF-WAY ACQUISITION***				
703	Mixed Use Property	SF	280,067	2.00	560,133.49
704	Commercial Property	SF	140,033	3.00	420,100.12
				Sub-Total	***980,233.61***
				Sub-Total	2,014,811.16
				Contingency	604,443.35
				Reach Total	2,619,254.51

Watson Drainage System
Preliminary Cost Estimate - **RTURR1, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	62,100.00	62,100.00
205	Miscellaneous Removals	LS	1	31,100.00	31,100.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	894	9.40	8,403.60
220	Remove Concrete Ditch	LF	15	30.00	450.00
251	Irrigation Pipe Relocation (24")	LF	15	102.00	1,530.00
259	Earth-Lined Irrigation Ditch Relocation	LF	2,714	16.30	44,238.20
294	Railroad Spur Replacement	LF	44	175.00	7,700.00
				Sub-Total	***155,521.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	31,678	6.00	190,070.83
305	Channel Subgrade Preparation	SY	15,579	6.30	98,147.81
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	15,579	99.00	1,542,322.65
335	Granular Drainage Layer (4" Thick)	SY	1,731	6.90	11,943.90
339	Weep Holes	EA	880	10.00	8,800.00
342	Concrete Cutoff Wall	LF	11,611	4.70	54,571.89
351	AC Maintenance Road (2" AC on 6" AB)	SY	9,042	15.80	142,870.62
				Sub-Total	***2,048,727.70***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,408	370.00	520,960.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***525,860.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	43,119	4.00	172,476.00
610	Tree (24" Box)	EA	582	184.00	107,088.00
613	Container Shrubs (5 gallon)	EA	1,164	22.00	25,608.00
614	Container Shrubs (1 gallon)	EA	1,746	10.90	19,031.40
621	Drip Irrigation System	SY	43,119	3.10	133,668.90
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	291	119.00	34,629.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	175	153.00	26,775.00
				Sub-Total	***519,276.30***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	512,629	2.50	1,281,573.50
				Sub-Total	***1,281,573.50***
				Sub-Total	4,530,959.30
				Contingency	1,359,287.79
				Reach Total	5,890,247.09

Watson Drainage System
Preliminary Cost Estimate - **RTURR2, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	55,100.00	55,100.00
205	Miscellaneous Removals	LS	1	27,500.00	27,500.00
215	Remove Pipe	LF	56	21.00	1,176.00
220	Remove Concrete Ditch	LF	15	30.00	450.00
251	Irrigation Pipe Relocation (24")	LF	15	102.00	1,530.00
259	Earth-Lined Irrigation Ditch Relocation	LF	2,606	16.30	42,477.80
				Sub-Total	***128,233.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	34,804	6.00	208,826.80
305	Channel Subgrade Preparation	SY	19,891	6.30	125,315.93
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	19,891	99.00	1,969,250.25
335	Granular Drainage Layer (4" Thick)	SY	2,210	6.90	15,250.10
339	Weep Holes	EA	738	10.00	7,380.00
342	Concrete Cutoff Wall	LF	10,927	4.70	51,356.20
351	AC Maintenance Road (2" AC on 6" AB)	SY	5,833	15.80	92,166.67
				Sub-Total	***2,469,545.94***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	220	370.00	81,400.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***86,300.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	21,142	4.00	84,568.00
610	Tree (24" Box)	EA	375	184.00	69,000.00
613	Container Shrubs (5 gallon)	EA	750	22.00	16,500.00
614	Container Shrubs (1 gallon)	EA	1,125	10.90	12,262.50
621	Drip Irrigation System	SY	21,142	3.10	65,540.20
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	188	119.00	22,372.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	113	153.00	17,289.00
				Sub-Total	***287,531.70***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	418,529	2.50	1,046,321.50
				Sub-Total	***1,046,321.50***
				Sub-Total	4,017,932.94
				Contingency	1,205,379.88
				Reach Total	5,223,312.82

Watson Drainage System
Preliminary Cost Estimate - **RTURR3, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	20,400.00	20,400.00
205	Miscellaneous Removals	LS	1	10,200.00	10,200.00
				Sub-Total	***30,600.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	12,863	6.00	77,176.87
305	Channel Subgrade Preparation	SY	6,984	6.30	44,001.66
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	6,984	99.00	691,454.61
335	Granular Drainage Layer (4" Thick)	SY	776	6.90	5,354.68
339	Weep Holes	EA	330	10.00	3,300.00
342	Concrete Cutoff Wall	LF	4,568	4.70	21,471.34
351	AC Maintenance Road (2" AC on 6" AB)	SY	2,581	15.80	40,774.53
				Sub-Total	***883,533.68***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	10,151	4.00	40,604.00
610	Tree (24" Box)	EA	166	184.00	30,544.00
613	Container Shrubs (5 gallon)	EA	332	22.00	7,304.00
614	Container Shrubs (1 gallon)	EA	498	10.90	5,428.20
621	Drip Irrigation System	SY	10,151	3.10	31,468.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	83	119.00	9,877.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	50	153.00	7,650.00
				Sub-Total	***132,875.30***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	177,447	2.50	443,616.60
				Sub-Total	***443,616.60***
				Sub-Total	1,490,625.58
				Contingency	447,187.68
				Reach Total	1,937,813.26

Watson Drainage System
Preliminary Cost Estimate - **RTWTR1, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	36,600.00	36,600.00
205	Miscellaneous Removals	LS	1	18,300.00	18,300.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	533	9.40	5,010.20
215	Remove Pipe	LF	56	21.00	1,176.00
220	Remove Concrete Ditch	LF	60	30.00	1,800.00
251	Irrigation Pipe Relocation (24")	LF	120	102.00	12,240.00
260	Relocate Headwall	EA	2	6,600.00	13,200.00
				Sub-Total	***88,326.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	26,664	6.00	159,982.51
305	Channel Subgrade Preparation	SY	14,104	6.30	88,858.03
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	14,104	44.00	620,595.75
335	Granular Drainage Layer (4" Thick)	SY	1,567	6.90	10,813.40
339	Weep Holes	EA	490	10.00	4,900.00
342	Concrete Cutoff Wall	LF	7,441	4.70	34,971.43
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,265	15.80	67,392.27
				Sub-Total	***987,513.39***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
423	6' x 8' Concrete Box Culvert	LF	1,450	460.00	667,000.00
453	6' x 8' Concrete Box Culvert Wing Walls	EA	5	9,900.00	49,500.00
				Sub-Total	***716,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,234	4.00	100,936.00
610	Tree (24" Box)	EA	275	184.00	50,600.00
613	Container Shrubs (5 gallon)	EA	550	22.00	12,100.00
614	Container Shrubs (1 gallon)	EA	825	10.90	8,992.50
621	Drip Irrigation System	SY	25,234	3.10	78,225.40
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	138	119.00	16,422.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	83	153.00	12,699.00
				Sub-Total	***279,974.90***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	370,940	1.60	593,504.38
				Sub-Total	***593,504.38***
				Sub-Total	2,665,818.88
				Contingency	799,745.66
				Reach Total	3,465,564.54

Watson Drainage System
Preliminary Cost Estimate - **RTWTR2, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	49,400.00	49,400.00
205	Miscellaneous Removals	LS	1	24,700.00	24,700.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	959	9.40	9,014.60
215	Remove Pipe	LF	464	21.00	9,744.00
220	Remove Concrete Ditch	LF	157	30.00	4,710.00
252	Irrigation Pipe Relocation (30")	LF	310	109.00	33,790.00
				Sub-Total	***131,358.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	62,531	6.00	375,184.51
305	Channel Subgrade Preparation	SY	44,364	6.30	279,494.78
317	Dumped Riprap (D50 = 12")	CY	837	52.00	43,506.67
319	Dumped Riprap (D50 = 18")	CY	2,510	46.00	115,460.00
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	4,713	99.00	466,620.00
339	Weep Holes	EA	706	10.00	7,060.00
342	Concrete Cutoff Wall	LF	7,070	4.70	33,229.00
343	Vertical Drop Structure	LF	114	270.00	30,780.00
344	Gila River Outfall Cutoff Wall	LF	114	2,100.00	239,400.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	6,246	15.80	98,679.78
				Sub-Total	***1,689,414.73***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
428	10' x 6' Concrete Box Culvert	LF	720	670.00	482,400.00
458	10' x 4' Concrete Box Culvert Wing Walls	EA	3	6,800.00	20,400.00
				Sub-Total	***502,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	91,899	0.34	31,245.66
610	Tree (24" Box)	EA	402	184.00	73,968.00
613	Container Shrubs (5 gallon)	EA	804	22.00	17,688.00
614	Container Shrubs (1 gallon)	EA	1,206	10.90	13,145.40
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	201	119.00	23,919.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	121	153.00	18,513.00
				Sub-Total	***178,479.06***
700	***RIGHT-OF-WAY ACQUISITION***				
701	Low Density Residential Property	SF	788,680	1.40	1,104,152.00
				Sub-Total	***1,104,152.00***
				Sub-Total	3,606,204.39
				Contingency	1,081,861.32
				Reach Total	4,688,065.70

Watson Drainage System
Preliminary Cost Estimate - **XMB01, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	38,800.00	38,800.00
205	Miscellaneous Removals	LS	1	19,400.00	19,400.00
				Sub-Total	***58,200.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	80,483	6.00	482,900.00
				Sub-Total	***482,900.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	200	168.00	33,600.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***41,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	62,183	4.00	248,732.00
607	Turf (Sprigs)	SY	37,528	2.00	75,056.00
610	Tree (24" Box)	EA	516	184.00	94,944.00
613	Container Shrubs (5 gallon)	EA	1,548	22.00	34,056.00
614	Container Shrubs (1 gallon)	EA	1,032	10.90	11,248.80
621	Drip Irrigation System	SY	62,183	3.10	192,767.30
622	Turf Irrigation System	SY	37,528	3.70	138,853.60
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	64	119.00	7,616.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	38	153.00	5,814.00
				Sub-Total	***809,087.70***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	897,399	1.60	1,435,838.40
				Sub-Total	***1,435,838.40***
				Sub-Total	2,827,826.10
				Contingency	848,347.83
				Reach Total	3,676,173.93

Watson Drainage System
Preliminary Cost Estimate - **XMB02, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200		***REMOVALS AND RELOCATIONS***			
201	Clear and Grub	LS	1	11,900.00	11,900.00
205	Miscellaneous Removals	LS	1	6,000.00	6,000.00
				Sub-Total	***17,900.00***
300		***CHANNEL & BASIN CONSTRUCTION ITEMS***			
301	Excavation	CY	55,349	6.00	332,096.00
				Sub-Total	***332,096.00***
600		***LANDSCAPING CONSTRUCTION ITEMS***			
602	Hydroseed	SY	34,089	0.34	11,590.22
611	Tall Pot Tree	EA	176	100.00	17,607.90
				Sub-Total	***29,198.12***
700		***RIGHT-OF-WAY ACQUISITION***			
702	Medium Density Residential Property	SF	306,800	1.60	490,880.00
				Sub-Total	***490,880.00***
				Sub-Total	870,074.12
				Contingency	261,022.24
				Reach Total	1,131,096.36

Watson Drainage System
Preliminary Cost Estimate - **XMB03, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	4,200.00	4,200.00
205	Miscellaneous Removals	LS	1	2,100.00	2,100.00
				Sub-Total	***6,300.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	20,472	6.00	122,833.33
				Sub-Total	***122,833.33***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	200	168.00	33,600.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***41,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	8,878	0.34	3,018.44
611	Tall Pot Tree	EA	46	100.00	4,585.63
				Sub-Total	***7,604.07***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	79,900	1.60	127,840.00
				Sub-Total	***127,840.00***
				Sub-Total	306,377.41
				Contingency	91,913.22
				Reach Total	398,290.63

Watson Drainage System
Preliminary Cost Estimate - **XMB04, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	10,600.00	10,600.00
205	Miscellaneous Removals	LS	1	5,300.00	5,300.00
				Sub-Total	***15,900.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	47,116	6.00	282,696.00
				Sub-Total	***282,696.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	100	168.00	16,800.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***25,000.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	29,506	0.34	10,031.89
611	Tall Pot Tree	EA	152	100.00	15,240.47
				Sub-Total	***25,272.36***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	265,550	1.60	424,880.00
				Sub-Total	***424,880.00***
				Sub-Total	773,748.36
				Contingency	232,124.51
				Reach Total	1,005,872.87

Watson Drainage System
Preliminary Cost Estimate - **XMB05, Alternative A**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	11,400.00	11,400.00
205	Miscellaneous Removals	LS	1	5,700.00	5,700.00
220	Remove Concrete Ditch	LF	467	30.00	14,000.00
251	Irrigation Pipe Relocation (24")	LF	420	102.00	42,840.00
				Sub-Total	***73,940.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	37,820	6.00	226,922.67
				Sub-Total	***226,922.67***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	900	168.00	151,200.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***159,400.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	24,267	0.34	8,250.67
611	Tall Pot Tree	EA	125	100.00	12,534.44
				Sub-Total	***20,785.10***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	218,400	1.60	349,440.00
				Sub-Total	***349,440.00***
				Sub-Total	830,487.77
				Contingency	249,146.33
				Reach Total	1,079,634.10

Watson Drainage System
Preliminary Cost Estimate - **Summary, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	843,700.00	843,700.00
205	Miscellaneous Removals	LS	1	421,900.00	421,900.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	15,792	9.40	148,444.80
215	Remove Pipe	LF	1,280	21.00	26,880.00
220	Remove Concrete Ditch	LF	12,427	30.00	372,812.79
250	Irrigation Pipe Relocation (18")	LF	1,263	96.00	121,248.00
251	Irrigation Pipe Relocation (24")	LF	1,382	102.00	140,964.00
252	Irrigation Pipe Relocation (30")	LF	10,443	109.00	1,138,333.48
258	Concrete-Lined Irrigation Ditch Relocation	LF	2,528	59.00	149,152.00
259	Earth-Lined Irrigation Ditch Relocation	LF	6,386	16.30	104,091.80
260	Relocate Headwall	EA	13	6,600.00	85,800.00
261	Relocate Irrigation Turnout Structure	EA	13	17,500.00	227,500.00
265	Relocate Chain Link Fence	LF	232	26.00	6,032.00
266	Demolish Existing Structures	SF	8,418	5.00	42,090.00
290	Kinder-Morgan 20" Gas Pipeline Crossing	LS	1	960,000.00	960,000.00
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	1	380,000.00	380,000.00
292	RID Canal Crossing	LS	2	19,200.00	38,400.00
293	BWCDD Canal Crossing	LS	1	450,000.00	450,000.00
294	Railroad Spur Replacement	LF	44	175.00	7,700.00
295	Railroad Crossing	LS	1	240,000.00	240,000.00
				Sub-Total	***5,905,048.87***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	723,721	6.00	4,342,325.93
305	Channel Subgrade Preparation	SY	331,103	6.30	2,085,950.16
312	Rock Mulch (3" Minus, 5" Thick)	SY	53,545	3.90	208,825.11
317	Dumped Riprap (D50 = 12")	CY	830	52.00	43,183.11
319	Dumped Riprap (D50 = 18")	CY	2,491	46.00	114,601.33
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	72,183	99.00	7,146,139.66
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	28,792	44.00	1,266,846.24
335	Granular Drainage Layer (4" Thick)	SY	10,696	6.90	73,800.68
339	Weep Holes	EA	5,198	10.00	51,980.00
342	Concrete Cutoff Wall	LF	69,297	4.70	325,695.57
343	Vertical Drop Structure	LF	162	270.00	43,740.00
344	Gila River Outfall Cutoff Wall	LF	114	2,100.00	239,400.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	95,105	15.80	1,502,660.76
				Sub-Total	***17,445,148.55***

Watson Drainage System

Preliminary Cost Estimate - **Summary, Alternative B**

Milestone: Alternatives Analysis

400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	3,282	168.00	551,376.00
420	6' x 4' Concrete Box Culvert	LF	25,700	370.00	9,509,000.00
423	6' x 8' Concrete Box Culvert	LF	-	460.00	-
428	10' x 6' Concrete Box Culvert	LF	720	670.00	482,400.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	6	8,200.00	49,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	41	4,900.00	200,900.00
453	6' x 8' Concrete Box Culvert Wing Walls	EA	-	9,900.00	-
458	10' x 4' Concrete Box Culvert Wing Walls	EA	3	6,800.00	20,400.00
470	Storm Drain Manhole, per MAG 520	EA	3	3,600.00	10,800.00
				Sub-Total	***10,824,076.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	154,103	0.34	52,395.02
603	Decomposed Granite	SY	614,071	4.00	2,456,284.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	53,545	6.50	348,041.85
606	Turf (Sod)	SY	137,262	5.40	741,215.49
607	Turf (Sprigs)	SY	37,528	2.00	75,056.00
610	Tree (24" Box)	EA	6,640	184.00	1,221,760.00
611	Tall Pot Tree	EA	324	100.00	32,360.54
613	Container Shrubs (5 gallon)	EA	13,796	22.00	303,512.00
614	Container Shrubs (1 gallon)	EA	19,404	10.90	211,503.60
621	Drip Irrigation System	SY	614,071	3.10	1,903,620.10
622	Turf Irrigation System	SY	174,790	3.70	646,723.47
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	3,130	119.00	372,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	1,880	153.00	287,640.00
				Sub-Total	***8,652,582.07***
700	***RIGHT-OF-WAY ACQUISITION***				
701	Low Density Residential Property	SF	783,705	1.40	1,097,187.00
702	Medium Density Residential Property	SF	5,764,439	1.60	9,223,101.76
703	Mixed Use Property	SF	790,588	2.00	1,581,176.72
704	Commercial Property	SF	278,506	3.00	835,517.52
705	Industrial Property	SF	2,071,518	2.50	5,178,794.40
707	Residential Structures	SF	5,625	100.00	562,500.00
708	Agricultural Structures	SF	5,625	40.00	225,000.00
				Sub-Total	***18,703,277.40***
				Sub-Total	61,530,132.89
				Contingency	18,459,039.87
				Reach Total	79,989,172.76

Watson Drainage System
Preliminary Cost Estimate - **RT2311, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	53,300.00	53,300.00
205	Miscellaneous Removals	LS	1	26,600.00	26,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	769	9.40	7,228.60
215	Remove Pipe	LF	53	21.00	1,113.00
220	Remove Concrete Ditch	LF	75	30.00	2,250.00
250	Irrigation Pipe Relocation (18")	LF	68	96.00	6,528.00
251	Irrigation Pipe Relocation (24")	LF	30	102.00	3,060.00
258	Concrete-Lined Irrigation Ditch Relocation	LF	60	59.00	3,540.00
260	Relocate Headwall	EA	1	6,600.00	6,600.00
292	RID Canal Crossing	LS	1	19,200.00	19,200.00
				Sub-Total	***129,419.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	10,849	6.00	65,096.22
305	Channel Subgrade Preparation	SY	6,933	6.30	43,675.72
351	AC Maintenance Road (2" AC on 6" AB)	SY	5,843	15.80	92,314.13
				Sub-Total	***201,086.07***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	1,132	168.00	190,176.00
420	6' x 4' Concrete Box Culvert	LF	6,004	370.00	2,221,480.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
470	Storm Drain Manhole, per MAG 520	EA	2	3,600.00	7,200.00
				Sub-Total	***2,431,956.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	56,085	4.00	224,340.00
606	Turf (Sod)	SY	6,933	5.40	37,436.33
610	Tree (24" Box)	EA	376	184.00	69,184.00
613	Container Shrubs (5 gallon)	EA	752	22.00	16,544.00
614	Container Shrubs (1 gallon)	EA	1,128	10.90	12,295.20
621	Drip Irrigation System	SY	56,085	3.10	173,863.50
622	Turf Irrigation System	SY	6,933	3.70	25,650.82
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	188	119.00	22,372.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	113	153.00	17,289.00
				Sub-Total	***598,974.85***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	327,407	1.60	523,851.20
				Sub-Total	***523,851.20***
				Sub-Total	3,885,287.72
				Contingency	1,165,586.32
				Reach Total	5,050,874.03

Watson Drainage System
Preliminary Cost Estimate - **RT2312, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	48,000.00	48,000.00
205	Miscellaneous Removals	LS	1	24,000.00	24,000.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,055	9.40	9,917.00
220	Remove Concrete Ditch	LF	120	30.00	3,600.00
250	Irrigation Pipe Relocation (18")	LF	120	96.00	11,520.00
				Sub-Total	***97,037.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	43,704	6.00	262,226.44
305	Channel Subgrade Preparation	SY	30,882	6.30	194,558.63
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,115	15.80	128,222.27
				Sub-Total	***585,007.34***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,600	370.00	592,000.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	7	4,900.00	34,300.00
				Sub-Total	***626,300.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	57,181	4.00	228,724.00
606	Turf (Sod)	SY	30,882	5.40	166,764.54
610	Tree (24" Box)	EA	522	184.00	96,048.00
613	Container Shrubs (5 gallon)	EA	1,044	22.00	22,968.00
614	Container Shrubs (1 gallon)	EA	1,566	10.90	17,069.40
621	Drip Irrigation System	SY	57,181	3.10	177,261.10
622	Turf Irrigation System	SY	30,882	3.70	114,264.59
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	261	119.00	31,059.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	157	153.00	24,021.00
				Sub-Total	***878,179.63***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	820,437	1.60	1,312,698.62
				Sub-Total	***1,312,698.62***
				Sub-Total	3,499,222.60
				Contingency	1,049,766.78
				Reach Total	4,548,989.38

Watson Drainage System
Preliminary Cost Estimate - **RT2314, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	31,300.00	31,300.00
205	Miscellaneous Removals	LS	1	15,600.00	15,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,924	9.40	18,085.60
220	Remove Concrete Ditch	LF	114	30.00	3,420.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
251	Irrigation Pipe Relocation (24")	LF	84	102.00	8,568.00
252	Irrigation Pipe Relocation (30")	LF	30	109.00	3,270.00
				Sub-Total	***83,123.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	21,707	6.00	130,242.22
305	Channel Subgrade Preparation	SY	15,746	6.30	99,202.38
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,037	15.80	63,779.33
				Sub-Total	***293,223.93***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,436	370.00	531,320.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	4	4,900.00	19,600.00
				Sub-Total	***550,920.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	28,749	4.00	114,996.00
606	Turf (Sod)	SY	15,746	5.40	85,030.61
610	Tree (24" Box)	EA	260	184.00	47,840.00
613	Container Shrubs (5 gallon)	EA	520	22.00	11,440.00
614	Container Shrubs (1 gallon)	EA	780	10.90	8,502.00
621	Drip Irrigation System	SY	28,749	3.10	89,121.90
622	Turf Irrigation System	SY	15,746	3.70	58,261.71
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	130	119.00	15,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	78	153.00	11,934.00
				Sub-Total	***442,596.22***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	197,750	1.60	316,399.62
704	Commercial Property	SF	197,750	3.00	593,249.28
				Sub-Total	***909,648.90***
				Sub-Total	2,279,512.65
				Contingency	683,853.79
				Reach Total	2,963,366.44

Watson Drainage System
Preliminary Cost Estimate - **RTAPR1, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	23,300.00	23,300.00
205	Miscellaneous Removals	LS	1	11,700.00	11,700.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	750	9.40	7,050.00
215	Remove Pipe	LF	136	21.00	2,856.00
220	Remove Concrete Ditch	LF	3,283	30.00	98,490.00
250	Irrigation Pipe Relocation (18")	LF	985	96.00	94,560.00
252	Irrigation Pipe Relocation (30")	LF	2,332	109.00	254,188.00
260	Relocate Headwall	EA	1	6,600.00	6,600.00
261	Relocate Irrigation Turnout Structure	EA	3	17,500.00	52,500.00
292	RID Canal Crossing	LS	1	19,200.00	19,200.00
				Sub-Total	***570,444.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	11,636	6.00	69,817.88
305	Channel Subgrade Preparation	SY	2,614	6.30	16,468.70
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	2,614	44.00	115,019.52
335	Granular Drainage Layer (4" Thick)	SY	290	6.90	2,004.11
339	Weep Holes	EA	302	10.00	3,020.00
342	Concrete Cutoff Wall	LF	3,491	4.70	16,406.76
343	Vertical Drop Structure	LF	16	270.00	4,320.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,628	15.80	57,315.38
				Sub-Total	***284,372.35***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	750	168.00	126,000.00
420	6' x 4' Concrete Box Culvert	LF	70	370.00	25,900.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
470	Storm Drain Manhole, per MAG 520	EA	1	3,600.00	3,600.00
				Sub-Total	***168,600.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	29,505	4.00	118,020.00
610	Tree (24" Box)	EA	234	184.00	43,056.00
613	Container Shrubs (5 gallon)	EA	468	22.00	10,296.00
614	Container Shrubs (1 gallon)	EA	702	10.90	7,651.80
621	Drip Irrigation System	SY	29,505	3.10	91,465.50
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	117	119.00	13,923.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	70	153.00	10,710.00
				Sub-Total	***295,122.30***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	238,046	1.60	380,872.83
				Sub-Total	***380,872.83***
				Sub-Total	1,699,411.48
				Contingency	509,823.44
				Reach Total	2,209,234.92

Watson Drainage System
Preliminary Cost Estimate - **RTAPR2, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	62,600.00	62,600.00
205	Miscellaneous Removals	LS	1	31,300.00	31,300.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,322	9.40	12,426.80
215	Remove Pipe	LF	442	21.00	9,282.00
220	Remove Concrete Ditch	LF	4,879	30.00	146,370.00
252	Irrigation Pipe Relocation (30")	LF	5,288	109.00	576,392.00
260	Relocate Headwall	EA	6	6,600.00	39,600.00
261	Relocate Irrigation Turnout Structure	EA	6	17,500.00	105,000.00
266	Demolish Existing Structures	SF	6,032	5.00	30,160.00
				Sub-Total	***1,013,130.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	37,930	6.00	227,579.77
305	Channel Subgrade Preparation	SY	8,714	6.30	54,895.68
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	8,714	44.00	383,398.40
335	Granular Drainage Layer (4" Thick)	SY	968	6.90	6,680.44
339	Weep Holes	EA	1,008	10.00	10,080.00
342	Concrete Cutoff Wall	LF	11,636	4.70	54,689.20
343	Vertical Drop Structure	LF	32	270.00	8,640.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,229	15.80	130,016.44
				Sub-Total	***875,979.94***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	250	370.00	92,500.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	4	4,900.00	19,600.00
				Sub-Total	***112,100.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	64,147	4.00	256,588.00
610	Tree (24" Box)	EA	529	184.00	97,336.00
613	Container Shrubs (5 gallon)	EA	1,058	22.00	23,276.00
614	Container Shrubs (1 gallon)	EA	1,587	10.90	17,298.30
621	Drip Irrigation System	SY	64,147	3.10	198,855.70
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	265	119.00	31,535.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	159	153.00	24,327.00
				Sub-Total	***649,216.00***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	704,068	1.60	1,126,509.44
707	Residential Structures	SF	5,625	100.00	562,500.00
708	Agricultural Structures	SF	5,625	40.00	225,000.00
				Sub-Total	***1,914,009.44***
				Sub-Total	4,564,436.18
				Contingency	1,369,330.85
				Reach Total	5,933,767.03

Watson Drainage System
Preliminary Cost Estimate - **RTAPR3, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	25,100.00	25,100.00
205	Miscellaneous Removals	LS	1	12,600.00	12,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,303	9.40	12,248.20
215	Remove Pipe	LF	73	21.00	1,533.00
220	Remove Concrete Ditch	LF	2,724	30.00	81,720.00
252	Irrigation Pipe Relocation (30")	LF	2,411	109.00	262,799.00
260	Relocate Headwall	EA	3	6,600.00	19,800.00
261	Relocate Irrigation Turnout Structure	EA	2	17,500.00	35,000.00
				Sub-Total	***450,800.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	16,166	6.00	96,997.64
305	Channel Subgrade Preparation	SY	3,719	6.30	23,432.58
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	3,719	44.00	163,656.14
335	Granular Drainage Layer (4" Thick)	SY	413	6.90	2,851.56
339	Weep Holes	EA	422	10.00	4,220.00
342	Concrete Cutoff Wall	LF	4,896	4.70	23,013.27
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,038	15.80	63,803.91
				Sub-Total	***377,975.10***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	480	370.00	177,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***182,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	32,221	4.00	128,884.00
610	Tree (24" Box)	EA	260	184.00	47,840.00
613	Container Shrubs (5 gallon)	EA	520	22.00	11,440.00
614	Container Shrubs (1 gallon)	EA	780	10.90	8,502.00
621	Drip Irrigation System	SY	32,221	3.10	99,885.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	130	119.00	15,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	78	153.00	11,934.00
				Sub-Total	***323,955.10***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	310,488	1.60	496,780.16
				Sub-Total	***496,780.16***
				Sub-Total	1,832,010.56
				Contingency	549,603.17
				Reach Total	2,381,613.73

Watson Drainage System
Preliminary Cost Estimate - **RTMCR1, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	54,400.00	54,400.00
205	Miscellaneous Removals	LS	1	27,200.00	27,200.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	2,804	9.40	26,357.60
220	Remove Concrete Ditch	LF	156	30.00	4,680.00
251	Irrigation Pipe Relocation (24")	LF	231	102.00	23,562.00
265	Relocate Chain Link Fence	LF	232	26.00	6,032.00
266	Demolish Existing Structures	SF	2,386	5.00	11,930.00
				Sub-Total	***154,161.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	54,538	6.00	327,228.51
305	Channel Subgrade Preparation	SY	37,962	6.30	239,161.80
312	Rock Mulch (3" Minus, 5" Thick)	SY	37,962	3.90	148,052.54
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,512	15.80	134,489.60
				Sub-Total	***848,932.45***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	2,619	370.00	969,030.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***978,830.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	47,425	4.00	189,700.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	37,962	6.50	246,754.24
610	Tree (24" Box)	EA	548	184.00	100,832.00
613	Container Shrubs (5 gallon)	EA	1,096	22.00	24,112.00
614	Container Shrubs (1 gallon)	EA	1,644	10.90	17,919.60
621	Drip Irrigation System	SY	47,425	3.10	147,017.50
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	274	119.00	32,606.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	165	153.00	25,245.00
				Sub-Total	***784,186.34***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	752,064	1.60	1,203,301.70
				Sub-Total	***1,203,301.70***
				Sub-Total	3,969,412.08
				Contingency	1,190,823.62
				Reach Total	5,160,235.71

Watson Drainage System
Preliminary Cost Estimate - **RTMCR2, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	28,000.00	28,000.00
205	Miscellaneous Removals	LS	1	14,000.00	14,000.00
220	Remove Concrete Ditch	LF	42	30.00	1,272.79
251	Irrigation Pipe Relocation (24")	LF	122	102.00	12,444.00
252	Irrigation Pipe Relocation (30")	LF	42	109.00	4,624.48
258	Concrete-Lined Irrigation Ditch Relocation	LF	2,468	59.00	145,612.00
261	Relocate Irrigation Turnout Structure	EA	1	17,500.00	17,500.00
				Sub-Total	***223,453.27***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	23,621	6.00	141,727.47
305	Channel Subgrade Preparation	SY	15,583	6.30	98,171.07
312	Rock Mulch (3" Minus, 5" Thick)	SY	15,583	3.90	60,772.57
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,113	15.80	64,983.64
				Sub-Total	***365,654.76***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	426	370.00	157,620.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***162,520.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	23,748	4.00	94,992.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	15,583	6.50	101,287.62
610	Tree (24" Box)	EA	265	184.00	48,760.00
613	Container Shrubs (5 gallon)	EA	530	22.00	11,660.00
614	Container Shrubs (1 gallon)	EA	795	10.90	8,665.50
621	Drip Irrigation System	SY	23,748	3.10	73,618.80
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	133	119.00	15,827.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	80	153.00	12,240.00
				Sub-Total	***367,050.92***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	368,372	2.50	920,930.70
				Sub-Total	***920,930.70***
				Sub-Total	2,039,609.64
				Contingency	611,882.89
				Reach Total	2,651,492.54

Watson Drainage System
Preliminary Cost Estimate - **RTMRA1, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	21,700.00	21,700.00
205	Miscellaneous Removals	LS	1	10,900.00	10,900.00
				Sub-Total	***32,600.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	33,477	6.00	200,864.30
305	Channel Subgrade Preparation	SY	25,504	6.30	160,674.61
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,660	15.80	57,831.51
				Sub-Total	***419,370.41***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	18,272	4.00	73,088.00
606	Turf (Sod)	SY	25,504	5.40	137,721.09
610	Tree (24" Box)	EA	236	184.00	43,424.00
613	Container Shrubs (5 gallon)	EA	472	22.00	10,384.00
614	Container Shrubs (1 gallon)	EA	708	10.90	7,717.20
621	Drip Irrigation System	SY	18,272	3.10	56,643.20
622	Turf Irrigation System	SY	25,504	3.70	94,364.45
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	118	119.00	14,042.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	71	153.00	10,863.00
				Sub-Total	***448,246.94***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	426,928	1.60	683,085.31
				Sub-Total	***683,085.31***
				Sub-Total	1,583,302.66
				Contingency	474,990.80
				Reach Total	2,058,293.46

Watson Drainage System
Preliminary Cost Estimate - **RTMRA2, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	29,800.00	29,800.00
205	Miscellaneous Removals	LS	1	14,900.00	14,900.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	833	9.40	7,830.20
220	Remove Concrete Ditch	LF	30	30.00	900.00
252	Irrigation Pipe Relocation (30")	LF	30	109.00	3,270.00
				Sub-Total	***56,700.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	31,543	6.00	189,260.52
305	Channel Subgrade Preparation	SY	24,352	6.30	153,417.61
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,295	15.80	67,859.24
				Sub-Total	***410,537.38***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	700	370.00	259,000.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***268,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,113	4.00	100,452.00
606	Turf (Sod)	SY	24,352	5.40	131,500.81
610	Tree (24" Box)	EA	277	184.00	50,968.00
613	Container Shrubs (5 gallon)	EA	554	22.00	12,188.00
614	Container Shrubs (1 gallon)	EA	831	10.90	9,057.90
621	Drip Irrigation System	SY	25,113	3.10	77,850.30
622	Turf Irrigation System	SY	24,352	3.70	90,102.41
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	139	119.00	16,541.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	83	153.00	12,699.00
				Sub-Total	***501,359.42***
700	***RIGHT-OF-WAY ACQUISITION***				
703	Mixed Use Property	SF	467,564	2.00	935,128.08
				Sub-Total	***935,128.08***
				Sub-Total	2,172,525.08
				Contingency	651,757.52
				Reach Total	2,824,282.60

Watson Drainage System
Preliminary Cost Estimate - **RTRBW1, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	30,300.00	30,300.00
205	Miscellaneous Removals	LS	1	15,200.00	15,200.00
220	Remove Concrete Ditch	LF	230	30.00	6,900.00
251	Irrigation Pipe Relocation (24")	LF	230	102.00	23,460.00
261	Relocate Irrigation Turnout Structure	EA	1	17,500.00	17,500.00
				Sub-Total	***93,360.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	10,465	6.00	62,792.59
305	Channel Subgrade Preparation	SY	5,717	6.30	36,014.31
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	5,717	99.00	565,939.22
335	Granular Drainage Layer (4" Thick)	SY	635	6.90	4,382.67
339	Weep Holes	EA	222	10.00	2,220.00
342	Concrete Cutoff Wall	LF	3,247	4.70	15,262.40
351	AC Maintenance Road (2" AC on 6" AB)	SY	2,559	15.80	40,430.44
				Sub-Total	***727,041.65***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	2,640	370.00	976,800.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	3	4,900.00	14,700.00
				Sub-Total	***991,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	12,342	4.00	49,368.00
610	Tree (24" Box)	EA	165	184.00	30,360.00
613	Container Shrubs (5 gallon)	EA	330	22.00	7,260.00
614	Container Shrubs (1 gallon)	EA	495	10.90	5,395.50
621	Drip Irrigation System	SY	12,342	3.10	38,260.20
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	83	119.00	9,877.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	50	153.00	7,650.00
				Sub-Total	***148,170.70***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	157,498	1.60	251,996.16
				Sub-Total	***251,996.16***
				Sub-Total	2,212,068.51
				Contingency	663,620.55
				Reach Total	2,875,689.06

Watson Drainage System
Preliminary Cost Estimate - **RTSTN1, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	26,400.00	26,400.00
205	Miscellaneous Removals	LS	1	13,200.00	13,200.00
251	Irrigation Pipe Relocation (24")	LF	115	102.00	11,730.00
				Sub-Total	***51,330.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	23,215	6.00	139,288.15
305	Channel Subgrade Preparation	SY	16,922	6.30	106,611.23
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,783	15.80	59,773.16
				Sub-Total	***305,672.54***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	350	370.00	129,500.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***134,400.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,016	4.00	100,064.00
606	Turf (Sod)	SY	16,922	5.40	91,381.06
610	Tree (24" Box)	EA	244	184.00	44,896.00
613	Container Shrubs (5 gallon)	EA	488	22.00	10,736.00
614	Container Shrubs (1 gallon)	EA	732	10.90	7,978.80
621	Drip Irrigation System	SY	25,016	3.10	77,549.60
622	Turf Irrigation System	SY	16,922	3.70	62,612.95
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	122	119.00	14,518.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	73	153.00	11,169.00
				Sub-Total	***420,905.40***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	403,780	2.50	1,009,451.00
				Sub-Total	***1,009,451.00***
				Sub-Total	1,921,758.94
				Contingency	576,527.68
				Reach Total	2,498,286.62

Watson Drainage System
Preliminary Cost Estimate - **RTSPT1, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	31,300.00	31,300.00
205	Miscellaneous Removals	LS	1	15,700.00	15,700.00
				Sub-Total	***47,000.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	10,465	6.00	62,792.59
305	Channel Subgrade Preparation	SY	5,717	6.30	36,014.31
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	5,717	99.00	565,939.22
335	Granular Drainage Layer (4" Thick)	SY	635	6.90	4,382.67
339	Weep Holes	EA	222	10.00	2,220.00
342	Concrete Cutoff Wall	LF	3,247	4.70	15,262.40
351	AC Maintenance Road (2" AC on 6" AB)	SY	2,559	15.80	40,430.44
				Sub-Total	***727,041.65***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	2,640	370.00	976,800.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	3	4,900.00	14,700.00
				Sub-Total	***991,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	12,342	4.00	49,368.00
610	Tree (24" Box)	EA	165	184.00	30,360.00
613	Container Shrubs (5 gallon)	EA	330	22.00	7,260.00
614	Container Shrubs (1 gallon)	EA	495	10.90	5,395.50
621	Drip Irrigation System	SY	12,342	3.10	38,260.20
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	83	119.00	9,877.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	50	153.00	7,650.00
				Sub-Total	***148,170.70***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	148,174	2.50	370,434.00
				Sub-Total	***370,434.00***
				Sub-Total	2,284,146.35
				Contingency	685,243.90
				Reach Total	2,969,390.25

Watson Drainage System
Preliminary Cost Estimate - **RTSPT2, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	60,400.00	60,400.00
205	Miscellaneous Removals	LS	1	30,200.00	30,200.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,724	9.40	16,205.60
220	Remove Concrete Ditch	LF	30	30.00	900.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
290	Kinder-Morgan 20" Gas Pipeline Crossing	LS	1	960,000.00	960,000.00
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	1	380,000.00	380,000.00
293	BWCDD Canal Crossing	LS	1	450,000.00	450,000.00
295	Railroad Crossing	LS	1	240,000.00	240,000.00
				Sub-Total	***2,140,585.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	10,465	6.00	62,792.59
305	Channel Subgrade Preparation	SY	5,717	6.30	36,014.31
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	5,717	99.00	565,939.22
335	Granular Drainage Layer (4" Thick)	SY	635	6.90	4,382.67
339	Weep Holes	EA	222	10.00	2,220.00
342	Concrete Cutoff Wall	LF	3,247	4.70	15,262.40
351	AC Maintenance Road (2" AC on 6" AB)	SY	2,559	15.80	40,430.44
				Sub-Total	***727,041.65***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	2,640	370.00	976,800.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	3	4,900.00	14,700.00
				Sub-Total	***991,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	12,342	4.00	49,368.00
610	Tree (24" Box)	EA	165	184.00	30,360.00
613	Container Shrubs (5 gallon)	EA	330	22.00	7,260.00
614	Container Shrubs (1 gallon)	EA	495	10.90	5,395.50
621	Drip Irrigation System	SY	12,342	3.10	38,260.20
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	83	119.00	9,877.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	50	153.00	7,650.00
				Sub-Total	***148,170.70***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	157,608	2.50	394,019.00
				Sub-Total	***394,019.00***
				Sub-Total	4,401,316.95
				Contingency	1,320,395.08
				Reach Total	5,721,712.03

Watson Drainage System
Preliminary Cost Estimate - **RTSPT3, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	24,700.00	24,700.00
205	Miscellaneous Removals	LS	1	12,300.00	12,300.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	922	9.40	8,666.80
220	Remove Concrete Ditch	LF	30	30.00	900.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
				Sub-Total	***49,446.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	23,215	6.00	139,288.15
305	Channel Subgrade Preparation	SY	16,922	6.30	106,611.23
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,783	15.80	59,773.16
				Sub-Total	***305,672.54***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	350	370.00	129,500.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***134,400.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,016	4.00	100,064.00
606	Turf (Sod)	SY	16,922	5.40	91,381.06
610	Tree (24" Box)	EA	244	184.00	44,896.00
613	Container Shrubs (5 gallon)	EA	488	22.00	10,736.00
614	Container Shrubs (1 gallon)	EA	732	10.90	7,978.80
621	Drip Irrigation System	SY	25,016	3.10	77,549.60
622	Turf Irrigation System	SY	16,922	3.70	62,612.95
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	122	119.00	14,518.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	73	153.00	11,169.00
				Sub-Total	***420,905.40***
700	***RIGHT-OF-WAY ACQUISITION***				
703	Mixed Use Property	SF	323,024	2.00	646,048.64
704	Commercial Property	SF	80,756	3.00	242,268.24
				Sub-Total	***888,316.88***
				Sub-Total	1,798,741.62
				Contingency	539,622.49
				Reach Total	2,338,364.10

Watson Drainage System
Preliminary Cost Estimate - **RTURR1, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	13,000.00	13,000.00
205	Miscellaneous Removals	LS	1	6,500.00	6,500.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	894	9.40	8,403.60
220	Remove Concrete Ditch	LF	15	30.00	450.00
251	Irrigation Pipe Relocation (24")	LF	15	102.00	1,530.00
259	Earth-Lined Irrigation Ditch Relocation	LF	1,486	16.30	24,221.80
294	Railroad Spur Replacement	LF	44	175.00	7,700.00
				Sub-Total	***61,805.40***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	512	6.00	3,069.63
351	AC Maintenance Road (2" AC on 6" AB)	SY	2,302	15.80	36,375.11
				Sub-Total	***39,444.74***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,480	370.00	547,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***552,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	15,010	4.00	60,040.00
610	Tree (24" Box)	EA	148	184.00	27,232.00
613	Container Shrubs (5 gallon)	EA	296	22.00	6,512.00
614	Container Shrubs (1 gallon)	EA	444	10.90	4,839.60
621	Drip Irrigation System	SY	15,010	3.10	46,531.00
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	74	119.00	8,806.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	45	153.00	6,885.00
				Sub-Total	***160,845.60***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	53,225	2.50	133,062.50
				Sub-Total	***133,062.50***
				Sub-Total	947,658.24
				Contingency	284,297.47
				Reach Total	1,231,955.71

Watson Drainage System
Preliminary Cost Estimate - **RTURR2, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	104,900.00	104,900.00
205	Miscellaneous Removals	LS	1	52,500.00	52,500.00
215	Remove Pipe	LF	56	21.00	1,176.00
220	Remove Concrete Ditch	LF	15	30.00	450.00
251	Irrigation Pipe Relocation (24")	LF	15	102.00	1,530.00
259	Earth-Lined Irrigation Ditch Relocation	LF	4,900	16.30	79,870.00
				Sub-Total	***240,426.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	69,556	6.00	417,338.85
305	Channel Subgrade Preparation	SY	40,313	6.30	253,970.42
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	40,313	99.00	3,990,963.79
335	Granular Drainage Layer (4" Thick)	SY	4,479	6.90	30,906.48
339	Weep Holes	EA	1,274	10.00	12,740.00
342	Concrete Cutoff Wall	LF	19,976	4.70	93,887.72
351	AC Maintenance Road (2" AC on 6" AB)	SY	9,999	15.80	157,985.96
				Sub-Total	***4,957,793.21***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	275	370.00	101,750.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***106,650.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	33,366	4.00	133,464.00
610	Tree (24" Box)	EA	643	184.00	118,312.00
613	Container Shrubs (5 gallon)	EA	1,286	22.00	28,292.00
614	Container Shrubs (1 gallon)	EA	1,929	10.90	21,026.10
621	Drip Irrigation System	SY	33,366	3.10	103,434.60
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	322	119.00	38,318.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	193	153.00	29,529.00
				Sub-Total	***472,375.70***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	749,906	2.50	1,874,764.20
				Sub-Total	***1,874,764.20***
				Sub-Total	7,652,009.11
				Contingency	2,295,602.73
				Reach Total	9,947,611.85

Watson Drainage System
Preliminary Cost Estimate - **RTURR3, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	25,600.00	25,600.00
205	Miscellaneous Removals	LS	1	12,800.00	12,800.00
				Sub-Total	***38,400.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	17,135	6.00	102,807.25
305	Channel Subgrade Preparation	SY	10,007	6.30	63,046.98
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	10,007	99.00	990,738.21
335	Granular Drainage Layer (4" Thick)	SY	1,112	6.90	7,672.39
339	Weep Holes	EA	330	10.00	3,300.00
342	Concrete Cutoff Wall	LF	5,110	4.70	24,014.98
351	AC Maintenance Road (2" AC on 6" AB)	SY	2,581	15.80	40,774.53
				Sub-Total	***1,232,354.33***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	8,573	4.00	34,292.00
610	Tree (24" Box)	EA	166	184.00	30,544.00
613	Container Shrubs (5 gallon)	EA	332	22.00	7,304.00
614	Container Shrubs (1 gallon)	EA	498	10.90	5,428.20
621	Drip Irrigation System	SY	8,573	3.10	26,576.30
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	83	119.00	9,877.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	50	153.00	7,650.00
				Sub-Total	***121,671.50***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	190,453	2.50	476,133.00
				Sub-Total	***476,133.00***
				Sub-Total	1,868,558.83
				Contingency	560,567.65
				Reach Total	2,429,126.48

Watson Drainage System
Preliminary Cost Estimate - **RTWTR1, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	35,500.00	35,500.00
205	Miscellaneous Removals	LS	1	17,800.00	17,800.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	533	9.40	5,010.20
215	Remove Pipe	LF	56	21.00	1,176.00
220	Remove Concrete Ditch	LF	60	30.00	1,800.00
251	Irrigation Pipe Relocation (24")	LF	120	102.00	12,240.00
260	Relocate Headwall	EA	2	6,600.00	13,200.00
				Sub-Total	***86,726.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	26,144	6.00	156,866.65
305	Channel Subgrade Preparation	SY	13,745	6.30	86,592.38
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	13,745	44.00	604,772.18
335	Granular Drainage Layer (4" Thick)	SY	1,527	6.90	10,537.68
339	Weep Holes	EA	490	10.00	4,900.00
342	Concrete Cutoff Wall	LF	7,376	4.70	34,667.44
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,265	15.80	67,392.27
				Sub-Total	***965,728.59***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,740	370.00	643,800.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	5	4,900.00	24,500.00
				Sub-Total	***668,300.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,435	4.00	101,740.00
610	Tree (24" Box)	EA	275	184.00	50,600.00
613	Container Shrubs (5 gallon)	EA	550	22.00	12,100.00
614	Container Shrubs (1 gallon)	EA	825	10.90	8,992.50
621	Drip Irrigation System	SY	25,435	3.10	78,848.50
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	138	119.00	16,422.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	83	153.00	12,699.00
				Sub-Total	***281,402.00***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	368,505	1.60	589,608.32
				Sub-Total	***589,608.32***
				Sub-Total	2,591,765.11
				Contingency	777,529.53
				Reach Total	3,369,294.64

Watson Drainage System
Preliminary Cost Estimate - **RTWTR2, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	49,200.00	49,200.00
205	Miscellaneous Removals	LS	1	24,600.00	24,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	959	9.40	9,014.60
215	Remove Pipe	LF	464	21.00	9,744.00
220	Remove Concrete Ditch	LF	157	30.00	4,710.00
252	Irrigation Pipe Relocation (30")	LF	310	109.00	33,790.00
				Sub-Total	***131,058.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	61,483	6.00	368,896.51
305	Channel Subgrade Preparation	SY	44,034	6.30	277,416.20
317	Dumped Riprap (D50 = 12")	CY	830	52.00	43,183.11
319	Dumped Riprap (D50 = 18")	CY	2,491	46.00	114,601.33
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	4,713	99.00	466,620.00
339	Weep Holes	EA	706	10.00	7,060.00
342	Concrete Cutoff Wall	LF	7,070	4.70	33,229.00
343	Vertical Drop Structure	LF	114	270.00	30,780.00
344	Gila River Outfall Cutoff Wall	LF	114	2,100.00	239,400.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	6,246	15.80	98,679.78
				Sub-Total	***1,679,865.92***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
428	10' x 6' Concrete Box Culvert	LF	720	670.00	482,400.00
458	10' x 4' Concrete Box Culvert Wing Walls	EA	3	6,800.00	20,400.00
				Sub-Total	***502,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	91,453	0.34	31,094.02
610	Tree (24" Box)	EA	402	184.00	73,968.00
613	Container Shrubs (5 gallon)	EA	804	22.00	17,688.00
614	Container Shrubs (1 gallon)	EA	1,206	10.90	13,145.40
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	201	119.00	23,919.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	121	153.00	18,513.00
				Sub-Total	***178,327.42***
700	***RIGHT-OF-WAY ACQUISITION***				
701	Low Density Residential Property	SF	783,705	1.40	1,097,187.00
				Sub-Total	***1,097,187.00***
				Sub-Total	3,589,238.94
				Contingency	1,076,771.68
				Reach Total	4,666,010.63

Watson Drainage System
Preliminary Cost Estimate - **XMB01, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	38,800.00	38,800.00
205	Miscellaneous Removals	LS	1	19,400.00	19,400.00
				Sub-Total	***58,200.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	80,483	6.00	482,900.00
				Sub-Total	***482,900.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	200	168.00	33,600.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***41,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	62,183	4.00	248,732.00
607	Turf (Sprigs)	SY	37,528	2.00	75,056.00
610	Tree (24" Box)	EA	516	184.00	94,944.00
613	Container Shrubs (5 gallon)	EA	1,548	22.00	34,056.00
614	Container Shrubs (1 gallon)	EA	1,032	10.90	11,248.80
621	Drip Irrigation System	SY	62,183	3.10	192,767.30
622	Turf Irrigation System	SY	37,528	3.70	138,853.60
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	64	119.00	7,616.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	38	153.00	5,814.00
				Sub-Total	***809,087.70***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	897,399	1.60	1,435,838.40
				Sub-Total	***1,435,838.40***
				Sub-Total	2,827,826.10
				Contingency	848,347.83
				Reach Total	3,676,173.93

Watson Drainage System
Preliminary Cost Estimate - **XMB03, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	4,200.00	4,200.00
205	Miscellaneous Removals	LS	1	2,100.00	2,100.00
				Sub-Total	***6,300.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	20,472	6.00	122,833.33
				Sub-Total	***122,833.33***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	200	168.00	33,600.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***41,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	8,878	0.34	3,018.44
611	Tall Pot Tree	EA	46	100.00	4,585.63
				Sub-Total	***7,604.07***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	79,900	1.60	127,840.00
				Sub-Total	***127,840.00***
				Sub-Total	306,377.41
				Contingency	91,913.22
				Reach Total	398,290.63

Watson Drainage System
Preliminary Cost Estimate - **XMB04, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	10,600.00	10,600.00
205	Miscellaneous Removals	LS	1	5,300.00	5,300.00
				Sub-Total	***15,900.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	47,116	6.00	282,696.00
				Sub-Total	***282,696.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	100	168.00	16,800.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***25,000.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	29,506	0.34	10,031.89
611	Tall Pot Tree	EA	152	100.00	15,240.47
				Sub-Total	***25,272.36***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	265,550	1.60	424,880.00
				Sub-Total	***424,880.00***
				Sub-Total	773,748.36
				Contingency	232,124.51
				Reach Total	1,005,872.87

Watson Drainage System
Preliminary Cost Estimate - **XMB05, Alternative B**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	11,400.00	11,400.00
205	Miscellaneous Removals	LS	1	5,700.00	5,700.00
220	Remove Concrete Ditch	LF	467	30.00	14,000.00
251	Irrigation Pipe Relocation (24")	LF	420	102.00	42,840.00
				Sub-Total	***73,940.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	37,820	6.00	226,922.67
				Sub-Total	***226,922.67***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	900	168.00	151,200.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***159,400.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	24,267	0.34	8,250.67
611	Tall Pot Tree	EA	125	100.00	12,534.44
				Sub-Total	***20,785.10***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	218,400	1.60	349,440.00
				Sub-Total	***349,440.00***
				Sub-Total	830,487.77
				Contingency	249,146.33
				Reach Total	1,079,634.10

Watson Drainage System

Preliminary Cost Estimate - **Summary, Alternative C**

Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	833,500.00	833,500.00
205	Miscellaneous Removals	LS	1	416,700.00	416,700.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	13,174	9.40	123,835.60
215	Remove Pipe	LF	1,246	21.00	26,166.00
220	Remove Concrete Ditch	LF	24,162	30.00	724,846.13
250	Irrigation Pipe Relocation (18")	LF	1,263	96.00	121,248.00
251	Irrigation Pipe Relocation (24")	LF	4,054	102.00	413,508.00
252	Irrigation Pipe Relocation (30")	LF	10,443	109.00	1,138,333.48
258	Concrete-Lined Irrigation Ditch Relocation	LF	11,481	59.00	677,379.00
259	Earth-Lined Irrigation Ditch Relocation	LF	120	16.30	1,956.00
260	Relocate Headwall	EA	13	6,600.00	85,800.00
261	Relocate Irrigation Turnout Structure	EA	15	17,500.00	262,500.00
265	Relocate Chain Link Fence	LF	232	26.00	6,032.00
266	Demolish Existing Structures	SF	8,418	5.00	42,090.00
290	Kinder-Morgan 20" Gas Pipeline Crossing	LS	-	960,000.00	-
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	1	380,000.00	380,000.00
292	RID Canal Crossing	LS	2	19,200.00	38,400.00
293	BWCDD Canal Crossing	LS	1	450,000.00	450,000.00
294	Railroad Spur Replacement	LF	-	175.00	-
295	Railroad Crossing	LS	-	240,000.00	-
				Sub-Total	***5,742,294.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	877,314	6.00	5,263,886.05
305	Channel Subgrade Preparation	SY	290,473	6.30	1,829,977.40
312	Rock Mulch (3" Minus, 5" Thick)	SY	53,545	3.90	208,825.11
317	Dumped Riprap (D50 = 12")	CY	849	52.00	44,157.63
319	Dumped Riprap (D50 = 18")	CY	2,548	46.00	117,187.56
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	10,675	99.00	1,056,852.39
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	28,669	44.00	1,261,451.84
335	Granular Drainage Layer (4" Thick)	SY	4,372	6.90	30,164.18
339	Weep Holes	EA	3,448	10.00	34,480.00
342	Concrete Cutoff Wall	LF	41,579	4.70	195,422.71
343	Vertical Drop Structure	LF	248	270.00	66,960.00
344	Gila River Outfall Cutoff Wall	LF	116	2,100.00	243,600.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	89,239	15.80	1,409,977.96
				Sub-Total	***11,762,942.82***

Watson Drainage System

Preliminary Cost Estimate - **Summary, Alternative C**

Milestone: Alternatives Analysis

400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	2,382	168.00	400,176.00
420	6' x 4' Concrete Box Culvert	LF	22,169	370.00	8,202,530.00
423	6' x 8' Concrete Box Culvert	LF	-	460.00	-
428	10' x 6' Concrete Box Culvert	LF	720	670.00	482,400.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	5	8,200.00	41,000.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	39	4,900.00	191,100.00
453	6' x 8' Concrete Box Culvert Wing Walls	EA	-	9,900.00	-
458	10' x 4' Concrete Box Culvert Wing Walls	EA	3	6,800.00	20,400.00
470	Storm Drain Manhole, per MAG 520	EA	3	3,600.00	10,800.00
				Sub-Total	***9,348,406.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	403,270	0.34	137,111.69
603	Decomposed Granite	SY	650,601	4.00	2,602,404.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	53,545	6.50	348,041.85
606	Turf (Sod)	SY	148,734	5.40	803,161.92
607	Turf (Sprigs)	SY	37,528	2.00	75,056.00
610	Tree (24" Box)	EA	6,260	184.00	1,151,840.00
611	Tall Pot Tree	EA	1,604	100.00	160,371.21
613	Container Shrubs (5 gallon)	EA	13,036	22.00	286,792.00
614	Container Shrubs (1 gallon)	EA	18,264	10.90	199,077.60
621	Drip Irrigation System	SY	650,601	3.10	2,016,863.10
622	Turf Irrigation System	SY	186,262	3.70	689,168.25
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	2,940	119.00	349,860.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	1,768	153.00	270,504.00
				Sub-Total	***9,090,251.62***
700	***RIGHT-OF-WAY ACQUISITION***				
701	Low Density Residential Property	SF	860,910	1.40	1,205,274.00
702	Medium Density Residential Property	SF	6,412,957	1.60	10,260,731.14
703	Mixed Use Property	SF	752,405	2.00	1,504,810.75
704	Commercial Property	SF	275,256	3.00	825,767.23
705	Industrial Property	SF	4,101,829	2.50	10,254,572.30
707	Residential Structures	SF	5,625	100.00	562,500.00
708	Agricultural Structures	SF	5,625	40.00	225,000.00
				Sub-Total	***24,838,655.42***
				Sub-Total	60,782,550.06
				Contingency	18,234,765.02
				Reach Total	79,017,315.08

Watson Drainage System
Preliminary Cost Estimate - **RT2311, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	53,300.00	53,300.00
205	Miscellaneous Removals	LS	1	26,600.00	26,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	769	9.40	7,228.60
215	Remove Pipe	LF	53	21.00	1,113.00
220	Remove Concrete Ditch	LF	75	30.00	2,250.00
250	Irrigation Pipe Relocation (18")	LF	68	96.00	6,528.00
251	Irrigation Pipe Relocation (24")	LF	30	102.00	3,060.00
258	Concrete-Lined Irrigation Ditch Relocation	LF	60	59.00	3,540.00
260	Relocate Headwall	EA	1	6,600.00	6,600.00
292	RID Canal Crossing	LS	1	19,200.00	19,200.00
				Sub-Total	***129,419.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	10,849	6.00	65,096.22
305	Channel Subgrade Preparation	SY	6,933	6.30	43,675.72
351	AC Maintenance Road (2" AC on 6" AB)	SY	5,843	15.80	92,314.13
				Sub-Total	***201,086.07***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	1,132	168.00	190,176.00
420	6' x 4' Concrete Box Culvert	LF	6,004	370.00	2,221,480.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
470	Storm Drain Manhole, per MAG 520	EA	2	3,600.00	7,200.00
				Sub-Total	***2,431,956.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	56,085	4.00	224,340.00
606	Turf (Sod)	SY	6,933	5.40	37,436.33
610	Tree (24" Box)	EA	376	184.00	69,184.00
613	Container Shrubs (5 gallon)	EA	752	22.00	16,544.00
614	Container Shrubs (1 gallon)	EA	1,128	10.90	12,295.20
621	Drip Irrigation System	SY	56,085	3.10	173,863.50
622	Turf Irrigation System	SY	6,933	3.70	25,650.82
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	188	119.00	22,372.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	113	153.00	17,289.00
				Sub-Total	***598,974.85***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	327,407	1.60	523,851.20
				Sub-Total	***523,851.20***
				Sub-Total	3,885,287.72
				Contingency	1,165,586.32
				Reach Total	5,050,874.03

Watson Drainage System
Preliminary Cost Estimate - **RT2312, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	49,200.00	49,200.00
205	Miscellaneous Removals	LS	1	24,600.00	24,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,055	9.40	9,917.00
220	Remove Concrete Ditch	LF	120	30.00	3,600.00
250	Irrigation Pipe Relocation (18")	LF	120	96.00	11,520.00
				Sub-Total	***98,837.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	43,095	6.00	258,572.44
305	Channel Subgrade Preparation	SY	30,434	6.30	191,731.33
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,115	15.80	128,222.27
				Sub-Total	***578,526.04***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,880	370.00	695,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	8	4,900.00	39,200.00
				Sub-Total	***734,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	57,629	4.00	230,516.00
606	Turf (Sod)	SY	30,434	5.40	164,341.14
610	Tree (24" Box)	EA	522	184.00	96,048.00
613	Container Shrubs (5 gallon)	EA	1,044	22.00	22,968.00
614	Container Shrubs (1 gallon)	EA	1,566	10.90	17,069.40
621	Drip Irrigation System	SY	57,629	3.10	178,649.90
622	Turf Irrigation System	SY	30,434	3.70	112,604.11
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	261	119.00	31,059.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	157	153.00	24,021.00
				Sub-Total	***877,276.55***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	812,532	1.60	1,300,051.58
				Sub-Total	***1,300,051.58***
				Sub-Total	3,589,491.18
				Contingency	1,076,847.35
				Reach Total	4,666,338.53

Watson Drainage System
Preliminary Cost Estimate - **RT2313, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	30,200.00	30,200.00
205	Miscellaneous Removals	LS	1	15,100.00	15,100.00
220	Remove Concrete Ditch	LF	30	30.00	900.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
				Sub-Total	***49,080.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	19,676	6.00	118,053.29
305	Channel Subgrade Preparation	SY	10,675	6.30	67,254.24
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	10,675	99.00	1,056,852.39
335	Granular Drainage Layer (4" Thick)	SY	1,186	6.90	8,184.37
339	Weep Holes	EA	460	10.00	4,600.00
342	Concrete Cutoff Wall	LF	6,532	4.70	30,700.68
343	Vertical Drop Structure	LF	84	270.00	22,680.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,763	15.80	59,453.64
				Sub-Total	***1,367,778.61***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	440	370.00	162,800.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***172,600.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	15,192	4.00	60,768.00
610	Tree (24" Box)	EA	242	184.00	44,528.00
613	Container Shrubs (5 gallon)	EA	484	22.00	10,648.00
614	Container Shrubs (1 gallon)	EA	726	10.90	7,913.40
621	Drip Irrigation System	SY	15,192	3.10	47,095.20
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	121	119.00	14,399.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	73	153.00	11,169.00
				Sub-Total	***196,520.60***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	260,374	1.60	416,598.66
				Sub-Total	***416,598.66***
				Sub-Total	2,202,577.87
				Contingency	660,773.36
				Reach Total	2,863,351.23

Watson Drainage System
Preliminary Cost Estimate - **RT2314, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	31,000.00	31,000.00
205	Miscellaneous Removals	LS	1	15,500.00	15,500.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,924	9.40	18,085.60
220	Remove Concrete Ditch	LF	114	30.00	3,420.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
251	Irrigation Pipe Relocation (24")	LF	84	102.00	8,568.00
252	Irrigation Pipe Relocation (30")	LF	30	109.00	3,270.00
				Sub-Total	***82,723.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	21,058	6.00	126,348.22
305	Channel Subgrade Preparation	SY	15,374	6.30	96,854.58
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,037	15.80	63,779.33
				Sub-Total	***286,982.13***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,436	370.00	531,320.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	4	4,900.00	19,600.00
				Sub-Total	***550,920.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	28,684	4.00	114,736.00
606	Turf (Sod)	SY	15,374	5.40	83,018.21
610	Tree (24" Box)	EA	260	184.00	47,840.00
613	Container Shrubs (5 gallon)	EA	520	22.00	11,440.00
614	Container Shrubs (1 gallon)	EA	780	10.90	8,502.00
621	Drip Irrigation System	SY	28,684	3.10	88,920.40
622	Turf Irrigation System	SY	15,374	3.70	56,882.85
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	130	119.00	15,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	78	153.00	11,934.00
				Sub-Total	***438,743.45***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	196,050	1.60	313,680.64
704	Commercial Property	SF	196,050	3.00	588,151.20
				Sub-Total	***901,831.84***
				Sub-Total	2,261,201.03
				Contingency	678,360.31
				Reach Total	2,939,561.33

Watson Drainage System
Preliminary Cost Estimate - **RTAPR1, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	23,300.00	23,300.00
205	Miscellaneous Removals	LS	1	11,700.00	11,700.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	750	9.40	7,050.00
215	Remove Pipe	LF	136	21.00	2,856.00
220	Remove Concrete Ditch	LF	3,283	30.00	98,490.00
250	Irrigation Pipe Relocation (18")	LF	985	96.00	94,560.00
252	Irrigation Pipe Relocation (30")	LF	2,332	109.00	254,188.00
260	Relocate Headwall	EA	1	6,600.00	6,600.00
261	Relocate Irrigation Turnout Structure	EA	3	17,500.00	52,500.00
292	RID Canal Crossing	LS	1	19,200.00	19,200.00
				Sub-Total	***570,444.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	11,636	6.00	69,817.88
305	Channel Subgrade Preparation	SY	2,614	6.30	16,468.70
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	2,614	44.00	115,019.52
335	Granular Drainage Layer (4" Thick)	SY	290	6.90	2,004.11
339	Weep Holes	EA	302	10.00	3,020.00
342	Concrete Cutoff Wall	LF	3,491	4.70	16,406.76
343	Vertical Drop Structure	LF	16	270.00	4,320.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,628	15.80	57,315.38
				Sub-Total	***284,372.35***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	750	168.00	126,000.00
420	6' x 4' Concrete Box Culvert	LF	70	370.00	25,900.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
470	Storm Drain Manhole, per MAG 520	EA	1	3,600.00	3,600.00
				Sub-Total	***168,600.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	29,505	4.00	118,020.00
610	Tree (24" Box)	EA	234	184.00	43,056.00
613	Container Shrubs (5 gallon)	EA	468	22.00	10,296.00
614	Container Shrubs (1 gallon)	EA	702	10.90	7,651.80
621	Drip Irrigation System	SY	29,505	3.10	91,465.50
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	117	119.00	13,923.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	70	153.00	10,710.00
				Sub-Total	***295,122.30***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	238,046	1.60	380,872.83
				Sub-Total	***380,872.83***
				Sub-Total	1,699,411.48
				Contingency	509,823.44
				Reach Total	2,209,234.92

Watson Drainage System
Preliminary Cost Estimate - **RTAPR2, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	62,600.00	62,600.00
205	Miscellaneous Removals	LS	1	31,300.00	31,300.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,322	9.40	12,426.80
215	Remove Pipe	LF	442	21.00	9,282.00
220	Remove Concrete Ditch	LF	4,879	30.00	146,370.00
252	Irrigation Pipe Relocation (30")	LF	5,288	109.00	576,392.00
260	Relocate Headwall	EA	6	6,600.00	39,600.00
261	Relocate Irrigation Turnout Structure	EA	6	17,500.00	105,000.00
266	Demolish Existing Structures	SF	6,032	5.00	30,160.00
				Sub-Total	***1,013,130.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	37,930	6.00	227,579.77
305	Channel Subgrade Preparation	SY	8,714	6.30	54,895.68
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	8,714	44.00	383,398.40
335	Granular Drainage Layer (4" Thick)	SY	968	6.90	6,680.44
339	Weep Holes	EA	1,008	10.00	10,080.00
342	Concrete Cutoff Wall	LF	11,636	4.70	54,689.20
343	Vertical Drop Structure	LF	32	270.00	8,640.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,229	15.80	130,016.44
				Sub-Total	***875,979.94***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	250	370.00	92,500.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	4	4,900.00	19,600.00
				Sub-Total	***112,100.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	64,147	4.00	256,588.00
610	Tree (24" Box)	EA	529	184.00	97,336.00
613	Container Shrubs (5 gallon)	EA	1,058	22.00	23,276.00
614	Container Shrubs (1 gallon)	EA	1,587	10.90	17,298.30
621	Drip Irrigation System	SY	64,147	3.10	198,855.70
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	265	119.00	31,535.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	159	153.00	24,327.00
				Sub-Total	***649,216.00***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	704,068	1.60	1,126,509.44
707	Residential Structures	SF	5,625	100.00	562,500.00
708	Agricultural Structures	SF	5,625	40.00	225,000.00
				Sub-Total	***1,914,009.44***
				Sub-Total	4,564,436.18
				Contingency	1,369,330.85
				Reach Total	5,933,767.03

Watson Drainage System
Preliminary Cost Estimate - **RTAPR3, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	25,100.00	25,100.00
205	Miscellaneous Removals	LS	1	12,600.00	12,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,303	9.40	12,248.20
215	Remove Pipe	LF	73	21.00	1,533.00
220	Remove Concrete Ditch	LF	2,724	30.00	81,720.00
252	Irrigation Pipe Relocation (30")	LF	2,411	109.00	262,799.00
260	Relocate Headwall	EA	3	6,600.00	19,800.00
261	Relocate Irrigation Turnout Structure	EA	2	17,500.00	35,000.00
				Sub-Total	***450,800.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	16,166	6.00	96,997.64
305	Channel Subgrade Preparation	SY	3,719	6.30	23,432.58
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	3,719	44.00	163,656.14
335	Granular Drainage Layer (4" Thick)	SY	413	6.90	2,851.56
339	Weep Holes	EA	422	10.00	4,220.00
342	Concrete Cutoff Wall	LF	4,896	4.70	23,013.27
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,038	15.80	63,803.91
				Sub-Total	***377,975.10***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	480	370.00	177,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***182,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	32,221	4.00	128,884.00
610	Tree (24" Box)	EA	260	184.00	47,840.00
613	Container Shrubs (5 gallon)	EA	520	22.00	11,440.00
614	Container Shrubs (1 gallon)	EA	780	10.90	8,502.00
621	Drip Irrigation System	SY	32,221	3.10	99,885.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	130	119.00	15,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	78	153.00	11,934.00
				Sub-Total	***323,955.10***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	310,488	1.60	496,780.16
				Sub-Total	***496,780.16***
				Sub-Total	1,832,010.56
				Contingency	549,603.17
				Reach Total	2,381,613.73

Watson Drainage System
Preliminary Cost Estimate - RTMCR1, Alternative C
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	54,400.00	54,400.00
205	Miscellaneous Removals	LS	1	27,200.00	27,200.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	2,804	9.40	26,357.60
220	Remove Concrete Ditch	LF	156	30.00	4,680.00
251	Irrigation Pipe Relocation (24")	LF	231	102.00	23,562.00
265	Relocate Chain Link Fence	LF	232	26.00	6,032.00
266	Demolish Existing Structures	SF	2,386	5.00	11,930.00
				Sub-Total	***154,161.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	54,538	6.00	327,228.51
305	Channel Subgrade Preparation	SY	37,962	6.30	239,161.80
312	Rock Mulch (3" Minus, 5" Thick)	SY	37,962	3.90	148,052.54
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,512	15.80	134,489.60
				Sub-Total	***848,932.45***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	2,619	370.00	969,030.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***978,830.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	47,425	4.00	189,700.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	37,962	6.50	246,754.24
610	Tree (24" Box)	EA	548	184.00	100,832.00
613	Container Shrubs (5 gallon)	EA	1,096	22.00	24,112.00
614	Container Shrubs (1 gallon)	EA	1,644	10.90	17,919.60
621	Drip Irrigation System	SY	47,425	3.10	147,017.50
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	274	119.00	32,606.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	165	153.00	25,245.00
				Sub-Total	***784,186.34***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	752,064	1.60	1,203,301.70
				Sub-Total	***1,203,301.70***
				Sub-Total	3,969,412.08
				Contingency	1,190,823.62
				Reach Total	5,160,235.71

Watson Drainage System
Preliminary Cost Estimate - **RTMCR2, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	28,000.00	28,000.00
205	Miscellaneous Removals	LS	1	14,000.00	14,000.00
220	Remove Concrete Ditch	LF	42	30.00	1,272.79
251	Irrigation Pipe Relocation (24")	LF	122	102.00	12,444.00
252	Irrigation Pipe Relocation (30")	LF	42	109.00	4,624.48
258	Concrete-Lined Irrigation Ditch Relocation	LF	2,468	59.00	145,612.00
261	Relocate Irrigation Turnout Structure	EA	1	17,500.00	17,500.00
				Sub-Total	***223,453.27***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	23,621	6.00	141,727.47
305	Channel Subgrade Preparation	SY	15,583	6.30	98,171.07
312	Rock Mulch (3" Minus, 5" Thick)	SY	15,583	3.90	60,772.57
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,113	15.80	64,983.64
				Sub-Total	***365,654.76***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	426	370.00	157,620.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***162,520.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	23,748	4.00	94,992.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	15,583	6.50	101,287.62
610	Tree (24" Box)	EA	265	184.00	48,760.00
613	Container Shrubs (5 gallon)	EA	530	22.00	11,660.00
614	Container Shrubs (1 gallon)	EA	795	10.90	8,665.50
621	Drip Irrigation System	SY	23,748	3.10	73,618.80
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	133	119.00	15,827.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	80	153.00	12,240.00
				Sub-Total	***367,050.92***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	368,372	2.50	920,930.70
				Sub-Total	***920,930.70***
				Sub-Total	2,039,609.64
				Contingency	611,882.89
				Reach Total	2,651,492.54

Watson Drainage System
Preliminary Cost Estimate - **RTMRA1, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	21,500.00	21,500.00
205	Miscellaneous Removals	LS	1	10,700.00	10,700.00
				Sub-Total	***32,200.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	32,708	6.00	196,250.30
305	Channel Subgrade Preparation	SY	25,182	6.30	158,648.67
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,660	15.80	57,831.51
				Sub-Total	***412,730.48***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	18,102	4.00	72,408.00
606	Turf (Sod)	SY	25,182	5.40	135,984.58
610	Tree (24" Box)	EA	236	184.00	43,424.00
613	Container Shrubs (5 gallon)	EA	472	22.00	10,384.00
614	Container Shrubs (1 gallon)	EA	708	10.90	7,717.20
621	Drip Irrigation System	SY	18,102	3.10	56,116.20
622	Turf Irrigation System	SY	25,182	3.70	93,174.62
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	118	119.00	14,042.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	71	153.00	10,863.00
				Sub-Total	***444,113.59***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	422,505	1.60	676,007.49
				Sub-Total	***676,007.49***
				Sub-Total	1,565,051.56
				Contingency	469,515.47
				Reach Total	2,034,567.03

Watson Drainage System
Preliminary Cost Estimate - **RTMRA2, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	24,900.00	24,900.00
205	Miscellaneous Removals	LS	1	12,500.00	12,500.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	833	9.40	7,830.20
220	Remove Concrete Ditch	LF	30	30.00	900.00
252	Irrigation Pipe Relocation (30")	LF	30	109.00	3,270.00
				Sub-Total	***49,400.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	23,475	6.00	140,852.52
305	Channel Subgrade Preparation	SY	17,677	6.30	111,366.29
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,295	15.80	67,859.24
				Sub-Total	***320,078.05***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	280	370.00	103,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***113,400.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	28,339	4.00	113,356.00
606	Turf (Sod)	SY	17,677	5.40	95,456.82
610	Tree (24" Box)	EA	277	184.00	50,968.00
613	Container Shrubs (5 gallon)	EA	554	22.00	12,188.00
614	Container Shrubs (1 gallon)	EA	831	10.90	9,057.90
621	Drip Irrigation System	SY	28,339	3.10	87,850.90
622	Turf Irrigation System	SY	17,677	3.70	65,405.60
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	139	119.00	16,541.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	83	153.00	12,699.00
				Sub-Total	***463,523.22***
700	***RIGHT-OF-WAY ACQUISITION***				
703	Mixed Use Property	SF	435,584	2.00	871,168.00
				Sub-Total	***871,168.00***
				Sub-Total	1,817,569.47
				Contingency	545,270.84
				Reach Total	2,362,840.31

Watson Drainage System
Preliminary Cost Estimate - **RTSPT1, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	8,700.00	8,700.00
205	Miscellaneous Removals	LS	1	4,300.00	4,300.00
				Sub-Total	***13,000.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	7,668	6.00	46,008.67
305	Channel Subgrade Preparation	SY	5,343	6.30	33,660.90
351	AC Maintenance Road (2" AC on 6" AB)	SY	1,400	15.80	22,120.00
				Sub-Total	***101,789.57***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	9,569	4.00	38,276.00
606	Turf (Sod)	SY	5,343	5.40	28,852.20
610	Tree (24" Box)	EA	90	184.00	16,560.00
613	Container Shrubs (5 gallon)	EA	180	22.00	3,960.00
614	Container Shrubs (1 gallon)	EA	270	10.90	2,943.00
621	Drip Irrigation System	SY	9,569	3.10	29,663.90
622	Turf Irrigation System	SY	5,343	3.70	19,769.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	45	119.00	5,355.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	27	153.00	4,131.00
				Sub-Total	***149,510.20***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	146,808	2.50	367,020.00
				Sub-Total	***367,020.00***
				Sub-Total	631,319.77
				Contingency	189,395.93
				Reach Total	820,715.70

Watson Drainage System
Preliminary Cost Estimate - **RTSPT3, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	43,100.00	43,100.00
205	Miscellaneous Removals	LS	1	21,600.00	21,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	922	9.40	8,666.80
220	Remove Concrete Ditch	LF	30	30.00	900.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	1	380,000.00	380,000.00
293	BWCDD Canal Crossing	LS	1	450,000.00	450,000.00
				Sub-Total	***907,146.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	18,310	6.00	109,859.33
305	Channel Subgrade Preparation	SY	11,948	6.30	75,271.19
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,774	15.80	75,429.20
				Sub-Total	***260,559.72***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,636	370.00	605,320.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***615,120.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	38,084	4.00	152,336.00
606	Turf (Sod)	SY	11,948	5.40	64,518.16
610	Tree (24" Box)	EA	307	184.00	56,488.00
613	Container Shrubs (5 gallon)	EA	614	22.00	13,508.00
614	Container Shrubs (1 gallon)	EA	921	10.90	10,038.90
621	Drip Irrigation System	SY	38,084	3.10	118,060.40
622	Turf Irrigation System	SY	11,948	3.70	44,206.89
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	154	119.00	18,326.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	93	153.00	14,229.00
				Sub-Total	***491,711.35***
700	***RIGHT-OF-WAY ACQUISITION***				
703	Mixed Use Property	SF	316,821	2.00	633,642.75
704	Commercial Property	SF	79,205	3.00	237,616.03
				Sub-Total	***871,258.78***
				Sub-Total	3,145,796.66
				Contingency	943,739.00
				Reach Total	4,089,535.65

Watson Drainage System
Preliminary Cost Estimate - **RTWTR1, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	35,400.00	35,400.00
205	Miscellaneous Removals	LS	1	17,700.00	17,700.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	533	9.40	5,010.20
215	Remove Pipe	LF	56	21.00	1,176.00
220	Remove Concrete Ditch	LF	60	30.00	1,800.00
251	Irrigation Pipe Relocation (24")	LF	120	102.00	12,240.00
260	Relocate Headwall	EA	2	6,600.00	13,200.00
				Sub-Total	***86,526.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	25,905	6.00	155,432.29
305	Channel Subgrade Preparation	SY	13,622	6.30	85,820.00
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	13,622	44.00	599,377.78
335	Granular Drainage Layer (4" Thick)	SY	1,514	6.90	10,443.70
339	Weep Holes	EA	490	10.00	4,900.00
342	Concrete Cutoff Wall	LF	7,354	4.70	34,563.80
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,265	15.80	67,392.27
				Sub-Total	***957,929.84***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,740	370.00	643,800.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	5	4,900.00	24,500.00
				Sub-Total	***668,300.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,436	4.00	101,744.00
610	Tree (24" Box)	EA	275	184.00	50,600.00
613	Container Shrubs (5 gallon)	EA	550	22.00	12,100.00
614	Container Shrubs (1 gallon)	EA	825	10.90	8,992.50
621	Drip Irrigation System	SY	25,436	3.10	78,851.60
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	138	119.00	16,422.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	83	153.00	12,699.00
				Sub-Total	***281,409.10***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	367,524	1.60	588,039.04
				Sub-Total	***588,039.04***
				Sub-Total	2,582,204.18
				Contingency	774,661.25
				Reach Total	3,356,865.43

Watson Drainage System
Preliminary Cost Estimate - **RTWTR2, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	45,500.00	45,500.00
205	Miscellaneous Removals	LS	1	22,700.00	22,700.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	959	9.40	9,014.60
215	Remove Pipe	LF	464	21.00	9,744.00
220	Remove Concrete Ditch	LF	157	30.00	4,710.00
252	Irrigation Pipe Relocation (30")	LF	310	109.00	33,790.00
				Sub-Total	***125,458.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	69,708	6.00	418,247.83
305	Channel Subgrade Preparation	SY	48,849	6.30	307,751.08
317	Dumped Riprap (D50 = 12")	CY	849	52.00	44,157.63
319	Dumped Riprap (D50 = 18")	CY	2,548	46.00	117,187.56
339	Weep Holes	EA	766	10.00	7,660.00
342	Concrete Cutoff Wall	LF	7,670	4.70	36,049.00
343	Vertical Drop Structure	LF	116	270.00	31,320.00
344	Gila River Outfall Cutoff Wall	LF	116	2,100.00	243,600.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	6,246	15.80	98,679.78
				Sub-Total	***1,304,652.87***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
428	10' x 6' Concrete Box Culvert	LF	720	670.00	482,400.00
458	10' x 4' Concrete Box Culvert Wing Walls	EA	3	6,800.00	20,400.00
				Sub-Total	***502,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	92,791	0.34	31,548.94
610	Tree (24" Box)	EA	402	184.00	73,968.00
613	Container Shrubs (5 gallon)	EA	804	22.00	17,688.00
614	Container Shrubs (1 gallon)	EA	1,206	10.90	13,145.40
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	201	119.00	23,919.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	121	153.00	18,513.00
				Sub-Total	***178,782.34***
700	***RIGHT-OF-WAY ACQUISITION***				
701	Low Density Residential Property	SF	860,910	1.40	1,205,274.00
				Sub-Total	***1,205,274.00***
				Sub-Total	3,316,967.81
				Contingency	995,090.34
				Reach Total	4,312,058.15

Watson Drainage System
Preliminary Cost Estimate - **RTURR1, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	49,200.00	49,200.00
205	Miscellaneous Removals	LS	1	24,600.00	24,600.00
220	Remove Concrete Ditch	LF	1,718	30.00	51,540.00
258	Concrete-Lined Irrigation Ditch Relocation	LF	1,718	59.00	101,362.00
				Sub-Total	***226,702.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	18,310	6.00	109,859.33
305	Channel Subgrade Preparation	SY	11,948	6.30	75,271.19
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,774	15.80	75,429.20
				Sub-Total	***260,559.72***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,636	370.00	605,320.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***615,120.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	38,084	4.00	152,336.00
606	Turf (Sod)	SY	11,948	5.40	64,518.16
610	Tree (24" Box)	EA	307	184.00	56,488.00
613	Container Shrubs (5 gallon)	EA	614	22.00	13,508.00
614	Container Shrubs (1 gallon)	EA	921	10.90	10,038.90
621	Drip Irrigation System	SY	38,084	3.10	118,060.40
622	Turf Irrigation System	SY	11,948	3.70	44,206.89
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	154	119.00	18,326.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	93	153.00	14,229.00
				Sub-Total	***491,711.35***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	797,056	2.50	1,992,640.60
				Sub-Total	***1,992,640.60***
				Sub-Total	3,586,733.67
				Contingency	1,076,020.10
				Reach Total	4,662,753.78

Watson Drainage System
Preliminary Cost Estimate - **RTURR2, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	59,600.00	59,600.00
205	Miscellaneous Removals	LS	1	29,800.00	29,800.00
215	Remove Pipe	LF	22	21.00	462.00
220	Remove Concrete Ditch	LF	8,548	30.00	256,440.00
251	Irrigation Pipe Relocation (24")	LF	3,097	102.00	315,894.00
258	Concrete-Lined Irrigation Ditch Relocation	LF	5,451	59.00	321,609.00
261	Relocate Irrigation Turnout Structure	EA	2	17,500.00	35,000.00
				Sub-Total	***1,018,805.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	18,310	6.00	109,859.33
305	Channel Subgrade Preparation	SY	11,948	6.30	75,271.19
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,774	15.80	75,429.20
				Sub-Total	***260,559.72***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,636	370.00	605,320.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***615,120.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	38,084	4.00	152,336.00
606	Turf (Sod)	SY	11,948	5.40	64,518.16
610	Tree (24" Box)	EA	307	184.00	56,488.00
613	Container Shrubs (5 gallon)	EA	614	22.00	13,508.00
614	Container Shrubs (1 gallon)	EA	921	10.90	10,038.90
621	Drip Irrigation System	SY	38,084	3.10	118,060.40
622	Turf Irrigation System	SY	11,948	3.70	44,206.89
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	154	119.00	18,326.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	93	153.00	14,229.00
				Sub-Total	***491,711.35***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	783,634	2.50	1,959,085.10
				Sub-Total	***1,959,085.10***
				Sub-Total	4,345,281.17
				Contingency	1,303,584.35
				Reach Total	5,648,865.53

Watson Drainage System
Preliminary Cost Estimate - **RTURR3, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	33,400.00	33,400.00
205	Miscellaneous Removals	LS	1	16,700.00	16,700.00
220	Remove Concrete Ditch	LF	1,784	30.00	53,520.00
258	Concrete-Lined Irrigation Ditch Relocation	LF	1,784	59.00	105,256.00
261	Relocate Irrigation Turnout Structure	EA	1	17,500.00	17,500.00
				Sub-Total	***226,376.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	18,310	6.00	109,859.33
305	Channel Subgrade Preparation	SY	11,948	6.30	75,271.19
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,774	15.80	75,429.20
				Sub-Total	***260,559.72***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,636	370.00	605,320.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***615,120.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	38,084	4.00	152,336.00
606	Turf (Sod)	SY	11,948	5.40	64,518.16
610	Tree (24" Box)	EA	307	184.00	56,488.00
613	Container Shrubs (5 gallon)	EA	614	22.00	13,508.00
614	Container Shrubs (1 gallon)	EA	921	10.90	10,038.90
621	Drip Irrigation System	SY	38,084	3.10	118,060.40
622	Turf Irrigation System	SY	11,948	3.70	44,206.89
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	154	119.00	18,326.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	93	153.00	14,229.00
				Sub-Total	***491,711.35***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	336,150	2.50	840,375.90
				Sub-Total	***840,375.90***
				Sub-Total	2,434,142.97
				Contingency	730,242.89
				Reach Total	3,164,385.87

Watson Drainage System
Preliminary Cost Estimate - **XMB01, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	38,800.00	38,800.00
205	Miscellaneous Removals	LS	1	19,400.00	19,400.00
				Sub-Total	***58,200.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	80,483	6.00	482,900.00
				Sub-Total	***482,900.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	200	168.00	33,600.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***41,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	62,183	4.00	248,732.00
607	Turf (Sprigs)	SY	37,528	2.00	75,056.00
610	Tree (24" Box)	EA	516	184.00	94,944.00
613	Container Shrubs (5 gallon)	EA	1,548	22.00	34,056.00
614	Container Shrubs (1 gallon)	EA	1,032	10.90	11,248.80
621	Drip Irrigation System	SY	62,183	3.10	192,767.30
622	Turf Irrigation System	SY	37,528	3.70	138,853.60
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	64	119.00	7,616.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	38	153.00	5,814.00
				Sub-Total	***809,087.70***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	897,399	1.60	1,435,838.40
				Sub-Total	***1,435,838.40***
				Sub-Total	2,827,826.10
				Contingency	848,347.83
				Reach Total	3,676,173.93

Watson Drainage System
Preliminary Cost Estimate - **XMB02, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	11,900.00	11,900.00
205	Miscellaneous Removals	LS	1	6,000.00	6,000.00
				Sub-Total	***17,900.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	55,349	6.00	332,096.00
				Sub-Total	***332,096.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	34,089	0.34	11,590.22
611	Tall Pot Tree	EA	176	100.00	17,607.90
				Sub-Total	***29,198.12***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	306,800	1.60	490,880.00
				Sub-Total	***490,880.00***
				Sub-Total	870,074.12
				Contingency	261,022.24
				Reach Total	1,131,096.36

Watson Drainage System
Preliminary Cost Estimate - **XMB03, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200		***REMOVALS AND RELOCATIONS***			
201	Clear and Grub	LS	1	4,200.00	4,200.00
205	Miscellaneous Removals	LS	1	2,100.00	2,100.00
				Sub-Total	***6,300.00***
300		***CHANNEL & BASIN CONSTRUCTION ITEMS***			
301	Excavation	CY	20,472	6.00	122,833.33
				Sub-Total	***122,833.33***
400		***STORM DRAIN CONSTRUCTION ITEMS***			
415	48" Storm Drain Pipe	LF	200	168.00	33,600.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***41,800.00***
600		***LANDSCAPING CONSTRUCTION ITEMS***			
602	Hydroseed	SY	8,878	0.34	3,018.44
611	Tall Pot Tree	EA	46	100.00	4,585.63
				Sub-Total	***7,604.07***
700		***RIGHT-OF-WAY ACQUISITION***			
702	Medium Density Residential Property	SF	79,900	1.60	127,840.00
				Sub-Total	***127,840.00***
				Sub-Total	306,377.41
				Contingency	91,913.22
				Reach Total	398,290.63

Watson Drainage System
Preliminary Cost Estimate - **XMB04, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	10,700.00	10,700.00
205	Miscellaneous Removals	LS	1	5,400.00	5,400.00
				Sub-Total	***16,100.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	47,576	6.00	285,456.00
				Sub-Total	***285,456.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	100	168.00	16,800.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***25,000.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	29,767	0.34	10,120.67
611	Tall Pot Tree	EA	154	100.00	15,375.34
				Sub-Total	***25,496.01***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	267,900	1.60	428,640.00
				Sub-Total	***428,640.00***
				Sub-Total	780,692.01
				Contingency	234,207.60
				Reach Total	1,014,899.61

Watson Drainage System
Preliminary Cost Estimate - **XMB05, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200		***REMOVALS AND RELOCATIONS***			
201	Clear and Grub	LS	1	19,000.00	19,000.00
205	Miscellaneous Removals	LS	1	9,500.00	9,500.00
220	Remove Concrete Ditch	LF	411	30.00	12,333.33
251	Irrigation Pipe Relocation (24")	LF	370	102.00	37,740.00
				Sub-Total	***78,573.33***
300		***CHANNEL & BASIN CONSTRUCTION ITEMS***			
301	Excavation	CY	84,998	6.00	509,989.33
				Sub-Total	***509,989.33***
600		***LANDSCAPING CONSTRUCTION ITEMS***			
602	Hydroseed	SY	52,211	0.34	17,751.78
611	Tall Pot Tree	EA	270	100.00	26,968.55
				Sub-Total	***44,720.33***
700		***RIGHT-OF-WAY ACQUISITION***			
702	Medium Density Residential Property	SF	469,900	1.60	751,840.00
				Sub-Total	***751,840.00***
				Sub-Total	1,385,122.99
				Contingency	415,536.90
				Reach Total	1,800,659.89

Watson Drainage System
Preliminary Cost Estimate - **X56A, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	5,400.00	5,400.00
205	Miscellaneous Removals	LS	1	2,700.00	2,700.00
				Sub-Total	***8,100.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	7,734	6.00	46,401.00
				Sub-Total	***46,401.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	14,604	0.34	4,965.25
611	Tall Pot Tree	EA	75	100.00	7,543.22
				Sub-Total	***12,508.46***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	131,433	2.50	328,582.50
				Sub-Total	***328,582.50***
				Sub-Total	395,591.96
				Contingency	118,677.59
				Reach Total	514,269.55

Watson Drainage System
Preliminary Cost Estimate - **X57, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200		***REMOVALS AND RELOCATIONS***			
201	Clear and Grub	LS	1	35,800.00	35,800.00
205	Miscellaneous Removals	LS	1	17,900.00	17,900.00
				Sub-Total	***53,700.00***
300		***CHANNEL & BASIN CONSTRUCTION ITEMS***			
301	Excavation	CY	70,918	6.00	425,507.33
				Sub-Total	***425,507.33***
600		***LANDSCAPING CONSTRUCTION ITEMS***			
602	Hydroseed	SY	91,244	0.34	31,023.07
611	Tall Pot Tree	EA	471	100.00	47,130.34
				Sub-Total	***78,153.41***
700		***RIGHT-OF-WAY ACQUISITION***			
705	Industrial Property	SF	821,199	2.50	2,052,997.50
				Sub-Total	***2,052,997.50***
				Sub-Total	2,610,358.24
				Contingency	783,107.47
				Reach Total	3,393,465.72

Watson Drainage System
Preliminary Cost Estimate - **X58, Alternative C**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	29,300.00	29,300.00
205	Miscellaneous Removals	LS	1	14,700.00	14,700.00
259	Earth-Lined Irrigation Ditch Relocation	LF	120	16.30	1,956.00
				Sub-Total	***45,956.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	38,509	6.00	231,052.67
				Sub-Total	***231,052.67***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	79,686	0.34	27,093.32
611	Tall Pot Tree	EA	412	100.00	41,160.24
				Sub-Total	***68,253.55***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	717,176	2.50	1,792,940.00
				Sub-Total	***1,792,940.00***
				Sub-Total	2,138,202.22
				Contingency	641,460.67
				Reach Total	2,779,662.89

Watson Drainage System

Preliminary Cost Estimate - **Summary, Base Alternative**

Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	784,000.00	784,000.00
205	Miscellaneous Removals	LS	1	392,000.00	392,000.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	16,565	9.40	155,711.00
215	Remove Pipe	LF	1,224	21.00	25,704.00
220	Remove Concrete Ditch	LF	13,382	30.00	401,472.79
250	Irrigation Pipe Relocation (18")	LF	1,993	96.00	191,328.00
251	Irrigation Pipe Relocation (24")	LF	1,569	102.00	160,038.00
252	Irrigation Pipe Relocation (30")	LF	10,413	109.00	1,135,063.48
258	Concrete-Lined Irrigation Ditch Relocation	LF	2,528	59.00	149,152.00
260	Relocate Headwall	EA	13	6,600.00	85,800.00
261	Relocate Irrigation Turnout Structure	EA	12	17,500.00	210,000.00
265	Relocate Chain Link Fence	LF	232	26.00	6,032.00
266	Demolish Existing Structures	SF	8,418	5.00	42,090.00
290	Kinder-Morgan 20" Gas Pipeline Crossing	LS	2	960,000.00	1,920,000.00
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	2	380,000.00	886,666.67
292	RID Canal Crossing	LS	2	19,200.00	38,400.00
293	BWCDD Canal Crossing	LS	2	450,000.00	900,000.00
294	Railroad Spur Replacement	LF	109	175.00	19,075.00
295	Railroad Crossing	LS	2	240,000.00	480,000.00
				Sub-Total	***7,982,532.94***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	632,032	6.00	3,792,193.29
305	Channel Subgrade Preparation	SY	266,514	6.30	1,679,039.94
312	Rock Mulch (3" Minus, 5" Thick)	SY	53,545	3.90	208,825.11
317	Dumped Riprap (D50 = 12")	CY	814	52.00	42,316.44
319	Dumped Riprap (D50 = 18")	CY	2,441	46.00	112,301.33
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	16,235	99.00	1,607,289.09
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	29,094	44.00	1,280,152.43
335	Granular Drainage Layer (4" Thick)	SY	4,513	6.90	31,139.08
339	Weep Holes	EA	3,388	10.00	33,880.00
342	Concrete Cutoff Wall	LF	41,208	4.70	193,675.44
343	Vertical Drop Structure	LF	250	270.00	67,500.00
344	Gila River Outfall Cutoff Wall	LF	110	2,100.00	231,000.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	80,677	15.80	1,274,701.87
				Sub-Total	***10,554,014.02***

Watson Drainage System

Preliminary Cost Estimate - **Summary, Base Alternative**

Milestone: Alternatives Analysis

400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	2,382	168.00	400,176.00
420	6' x 4' Concrete Box Culvert	LF	33,099	370.00	12,246,630.00
423	6' x 8' Concrete Box Culvert	LF	1,450	460.00	667,000.00
428	10' x 6' Concrete Box Culvert	LF	720	670.00	482,400.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	5	8,200.00	41,000.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	28	4,900.00	137,200.00
453	6' x 8' Concrete Box Culvert Wing Walls	EA	5	9,900.00	49,500.00
458	10' x 4' Concrete Box Culvert Wing Walls	EA	3	6,800.00	20,400.00
470	Storm Drain Manhole, per MAG 520	EA	3	3,600.00	10,800.00
				Sub-Total	***14,055,106.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	163,033	0.34	55,431.30
603	Decomposed Granite	SY	590,931	4.00	2,363,724.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	53,545	6.50	348,041.85
606	Turf (Sod)	SY	129,203	5.40	697,693.64
607	Turf (Sprigs)	SY	37,528	2.00	75,056.00
610	Tree (24" Box)	EA	5,712	184.00	1,051,008.00
611	Tall Pot Tree	EA	374	100.00	37,434.00
613	Container Shrubs (5 gallon)	EA	11,940	22.00	262,680.00
614	Container Shrubs (1 gallon)	EA	16,620	10.90	181,158.00
621	Drip Irrigation System	SY	590,931	3.10	1,831,886.10
622	Turf Irrigation System	SY	166,731	3.70	616,902.94
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	2,666	119.00	317,254.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	1,602	153.00	245,106.00
				Sub-Total	***8,083,375.83***
700	***RIGHT-OF-WAY ACQUISITION***				
701	Low Density Residential Property	SF	776,635	1.40	1,087,289.00
702	Medium Density Residential Property	SF	5,379,067	1.60	8,606,506.43
703	Mixed Use Property	SF	531,927	2.00	1,063,854.53
704	Commercial Property	SF	282,930	3.00	848,789.08
705	Industrial Property	SF	1,642,386	2.50	4,105,964.20
707	Residential Structures	SF	5,625	100.00	562,500.00
708	Agricultural Structures	SF	5,625	40.00	225,000.00
				Sub-Total	***16,499,903.25***
				Sub-Total	57,174,932.02
				Contingency	17,152,479.61
				Reach Total	74,327,411.63

Watson Drainage System

Preliminary Cost Estimate - **RT2311, Base Alternative**

Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	53,300.00	53,300.00
205	Miscellaneous Removals	LS	1	26,600.00	26,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	769	9.40	7,228.60
215	Remove Pipe	LF	53	21.00	1,113.00
220	Remove Concrete Ditch	LF	75	30.00	2,250.00
250	Irrigation Pipe Relocation (18")	LF	68	96.00	6,528.00
251	Irrigation Pipe Relocation (24")	LF	30	102.00	3,060.00
258	Concrete-Lined Irrigation Ditch Relocation	LF	60	59.00	3,540.00
260	Relocate Headwall	EA	1	6,600.00	6,600.00
292	RID Canal Crossing	LS	1	19,200.00	19,200.00
				Sub-Total	***129,419.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	10,849	6.00	65,096.22
305	Channel Subgrade Preparation	SY	6,933	6.30	43,675.72
351	AC Maintenance Road (2" AC on 6" AB)	SY	5,843	15.80	92,314.13
				Sub-Total	***201,086.07***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	1,132	168.00	190,176.00
420	6' x 4' Concrete Box Culvert	LF	6,004	370.00	2,221,480.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
470	Storm Drain Manhole, per MAG 520	EA	2	3,600.00	7,200.00
				Sub-Total	***2,431,956.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	56,085	4.00	224,340.00
606	Turf (Sod)	SY	6,933	5.40	37,436.33
610	Tree (24" Box)	EA	376	184.00	69,184.00
613	Container Shrubs (5 gallon)	EA	752	22.00	16,544.00
614	Container Shrubs (1 gallon)	EA	1,128	10.90	12,295.20
621	Drip Irrigation System	SY	56,085	3.10	173,863.50
622	Turf Irrigation System	SY	6,933	3.70	25,650.82
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	188	119.00	22,372.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	113	153.00	17,289.00
				Sub-Total	***598,974.85***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	327,407	1.60	523,851.20
				Sub-Total	***523,851.20***
				Sub-Total	3,885,287.72
				Contingency	1,165,586.32
				Reach Total	5,050,874.03

Watson Drainage System
Preliminary Cost Estimate - **RT2312, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	49,200.00	49,200.00
205	Miscellaneous Removals	LS	1	24,600.00	24,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,055	9.40	9,917.00
220	Remove Concrete Ditch	LF	120	30.00	3,600.00
250	Irrigation Pipe Relocation (18")	LF	120	96.00	11,520.00
				Sub-Total	***98,837.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	43,095	6.00	258,572.44
305	Channel Subgrade Preparation	SY	30,434	6.30	191,731.33
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,115	15.80	128,222.27
				Sub-Total	***578,526.04***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,880	370.00	695,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	8	4,900.00	39,200.00
				Sub-Total	***734,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	57,629	4.00	230,516.00
606	Turf (Sod)	SY	30,434	5.40	164,341.14
610	Tree (24" Box)	EA	522	184.00	96,048.00
613	Container Shrubs (5 gallon)	EA	1,044	22.00	22,968.00
614	Container Shrubs (1 gallon)	EA	1,566	10.90	17,069.40
621	Drip Irrigation System	SY	57,629	3.10	178,649.90
622	Turf Irrigation System	SY	30,434	3.70	112,604.11
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	261	119.00	31,059.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	157	153.00	24,021.00
				Sub-Total	***877,276.55***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	812,532	1.60	1,300,051.58
				Sub-Total	***1,300,051.58***
				Sub-Total	3,589,491.18
				Contingency	1,076,847.35
				Reach Total	4,666,338.53

Watson Drainage System
Preliminary Cost Estimate - **RT2313, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	32,400.00	32,400.00
205	Miscellaneous Removals	LS	1	16,200.00	16,200.00
220	Remove Concrete Ditch	LF	145	30.00	4,350.00
251	Irrigation Pipe Relocation (24")	LF	145	102.00	14,790.00
				Sub-Total	***67,740.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	20,823	6.00	124,940.27
305	Channel Subgrade Preparation	SY	11,522	6.30	72,588.03
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	11,522	99.00	1,140,669.09
335	Granular Drainage Layer (4" Thick)	SY	1,280	6.90	8,833.45
339	Weep Holes	EA	460	10.00	4,600.00
342	Concrete Cutoff Wall	LF	6,684	4.70	31,414.14
343	Vertical Drop Structure	LF	92	270.00	24,840.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,763	15.80	59,453.64
				Sub-Total	***1,467,338.62***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	550	370.00	203,500.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***213,300.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	14,808	4.00	59,232.00
610	Tree (24" Box)	EA	242	184.00	44,528.00
613	Container Shrubs (5 gallon)	EA	484	22.00	10,648.00
614	Container Shrubs (1 gallon)	EA	726	10.90	7,913.40
621	Drip Irrigation System	SY	14,808	3.10	45,904.80
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	121	119.00	14,399.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	73	153.00	11,169.00
				Sub-Total	***193,794.20***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	265,006	1.60	424,009.02
				Sub-Total	***424,009.02***
				Sub-Total	2,366,181.85
				Contingency	709,854.55
				Reach Total	3,076,036.40

Watson Drainage System
Preliminary Cost Estimate - **RT2314, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	50,400.00	50,400.00
205	Miscellaneous Removals	LS	1	25,200.00	25,200.00
220	Remove Concrete Ditch	LF	109	30.00	3,270.00
251	Irrigation Pipe Relocation (24")	LF	109	102.00	11,118.00
290	Kinder-Morgan 20" Gas Pipeline Crossing	LS	1	960,000.00	960,000.00
294	Railroad Spur Replacement	LF	109	175.00	19,075.00
295	Railroad Crossing	LS	1	240,000.00	240,000.00
				Sub-Total	***1,309,063.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	22,767	6.00	136,602.22
305	Channel Subgrade Preparation	SY	16,713	6.30	105,291.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,037	15.80	63,779.33
				Sub-Total	***305,672.56***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,795	370.00	664,150.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	4	4,900.00	19,600.00
				Sub-Total	***683,750.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	28,382	4.00	113,528.00
606	Turf (Sod)	SY	16,713	5.40	90,249.43
610	Tree (24" Box)	EA	260	184.00	47,840.00
613	Container Shrubs (5 gallon)	EA	520	22.00	11,440.00
614	Container Shrubs (1 gallon)	EA	780	10.90	8,502.00
621	Drip Irrigation System	SY	28,382	3.10	87,984.20
622	Turf Irrigation System	SY	16,713	3.70	61,837.57
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	130	119.00	15,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	78	153.00	11,934.00
				Sub-Total	***448,785.21***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	201,152	1.60	321,843.52
704	Commercial Property	SF	201,152	3.00	603,456.60
				Sub-Total	***925,300.12***
				Sub-Total	3,672,570.89
				Contingency	1,101,771.27
				Reach Total	4,774,342.15

Watson Drainage System
Preliminary Cost Estimate - **RT2315, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	34,400.00	34,400.00
205	Miscellaneous Removals	LS	1	17,200.00	17,200.00
220	Remove Concrete Ditch	LF	242	30.00	7,260.00
251	Irrigation Pipe Relocation (24")	LF	242	102.00	24,684.00
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	1	380,000.00	506,666.67
293	BWCDD Canal Crossing	LS	1	450,000.00	450,000.00
				Sub-Total	***1,040,210.67***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	239	6.00	1,431.11
351	AC Maintenance Road (2" AC on 6" AB)	SY	1,073	15.80	16,958.67
				Sub-Total	***18,389.78***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	3,450	370.00	1,276,500.00
				Sub-Total	***1,276,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	11,902	4.00	47,608.00
610	Tree (24" Box)	EA	69	184.00	12,696.00
613	Container Shrubs (5 gallon)	EA	138	22.00	3,036.00
614	Container Shrubs (1 gallon)	EA	207	10.90	2,256.30
621	Drip Irrigation System	SY	11,902	3.10	36,896.20
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	35	119.00	4,165.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	21	153.00	3,213.00
				Sub-Total	***109,870.50***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	41,400	1.60	66,240.00
				Sub-Total	***66,240.00***
				Sub-Total	2,511,210.94
				Contingency	753,363.28
				Reach Total	3,264,574.23

Watson Drainage System
Preliminary Cost Estimate - **RT2316, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	58,200.00	58,200.00
205	Miscellaneous Removals	LS	1	29,100.00	29,100.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,924	9.40	18,085.60
220	Remove Concrete Ditch	LF	114	30.00	3,420.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
251	Irrigation Pipe Relocation (24")	LF	84	102.00	8,568.00
252	Irrigation Pipe Relocation (30")	LF	30	109.00	3,270.00
				Sub-Total	***123,523.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	668	6.00	4,007.11
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,005	15.80	47,484.27
				Sub-Total	***51,491.38***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	9,660	370.00	3,574,200.00
				Sub-Total	***3,574,200.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	33,574	4.00	134,296.00
610	Tree (24" Box)	EA	194	184.00	35,696.00
613	Container Shrubs (5 gallon)	EA	388	22.00	8,536.00
614	Container Shrubs (1 gallon)	EA	582	10.90	6,343.80
621	Drip Irrigation System	SY	33,574	3.10	104,079.40
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	97	119.00	11,543.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	58	153.00	8,874.00
				Sub-Total	***309,368.20***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	115,920	1.60	185,472.00
				Sub-Total	***185,472.00***
				Sub-Total	4,244,055.18
				Contingency	1,273,216.55
				Reach Total	5,517,271.73

Watson Drainage System
Preliminary Cost Estimate - **RTAPR1, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	17,500.00	17,500.00
205	Miscellaneous Removals	LS	1	8,800.00	8,800.00
220	Remove Concrete Ditch	LF	300	30.00	9,000.00
251	Irrigation Pipe Relocation (24")	LF	300	102.00	30,600.00
				Sub-Total	***65,900.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	17,009	6.00	102,052.04
305	Channel Subgrade Preparation	SY	3,911	6.30	24,637.70
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	3,911	44.00	172,072.85
335	Granular Drainage Layer (4" Thick)	SY	435	6.90	2,998.26
339	Weep Holes	EA	452	10.00	4,520.00
342	Concrete Cutoff Wall	LF	5,224	4.70	24,553.74
343	Vertical Drop Structure	LF	16	270.00	4,320.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,628	15.80	57,315.38
				Sub-Total	***392,469.97***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	70	370.00	25,900.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***30,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	28,209	4.00	112,836.00
610	Tree (24" Box)	EA	234	184.00	43,056.00
613	Container Shrubs (5 gallon)	EA	468	22.00	10,296.00
614	Container Shrubs (1 gallon)	EA	702	10.90	7,651.80
621	Drip Irrigation System	SY	28,209	3.10	87,447.90
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	117	119.00	13,923.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	70	153.00	10,710.00
				Sub-Total	***285,920.70***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	314,516	1.60	503,224.83
				Sub-Total	***503,224.83***
				Sub-Total	1,278,315.50
				Contingency	383,494.65
				Reach Total	1,661,810.16

Watson Drainage System
Preliminary Cost Estimate - **RTAPR2, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	56,000.00	56,000.00
205	Miscellaneous Removals	LS	1	28,000.00	28,000.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	750	9.40	7,050.00
215	Remove Pipe	LF	136	21.00	2,856.00
220	Remove Concrete Ditch	LF	3,283	30.00	98,490.00
250	Irrigation Pipe Relocation (18")	LF	985	96.00	94,560.00
252	Irrigation Pipe Relocation (30")	LF	2,332	109.00	254,188.00
260	Relocate Headwall	EA	1	6,600.00	6,600.00
261	Relocate Irrigation Turnout Structure	EA	3	17,500.00	52,500.00
292	RID Canal Crossing	LS	1	19,200.00	19,200.00
				Sub-Total	***619,444.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	32,558	6.00	195,345.61
305	Channel Subgrade Preparation	SY	7,417	6.30	46,726.68
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	7,417	44.00	326,345.07
335	Granular Drainage Layer (4" Thick)	SY	824	6.90	5,686.29
339	Weep Holes	EA	858	10.00	8,580.00
342	Concrete Cutoff Wall	LF	9,903	4.70	46,542.22
343	Vertical Drop Structure	LF	32	270.00	8,640.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,229	15.80	130,016.44
				Sub-Total	***767,882.31***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	750	168.00	126,000.00
420	6' x 4' Concrete Box Culvert	LF	250	370.00	92,500.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	4	4,900.00	19,600.00
470	Storm Drain Manhole, per MAG 520	EA	1	3,600.00	3,600.00
				Sub-Total	***249,900.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	65,444	4.00	261,776.00
610	Tree (24" Box)	EA	529	184.00	97,336.00
613	Container Shrubs (5 gallon)	EA	1,058	22.00	23,276.00
614	Container Shrubs (1 gallon)	EA	1,587	10.90	17,298.30
621	Drip Irrigation System	SY	65,444	3.10	202,876.40
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	265	119.00	31,535.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	159	153.00	24,327.00
				Sub-Total	***658,424.70***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	627,598	1.60	1,004,157.44
707	Residential Structures	SF	5,625	100.00	562,500.00
708	Agricultural Structures	SF	5,625	40.00	225,000.00
				Sub-Total	***1,791,657.44***
				Sub-Total	4,087,308.45
				Contingency	1,226,192.54

Reach Total	5,313,500.99

Watson Drainage System
Preliminary Cost Estimate - **RTAPR3, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	36,100.00	36,100.00
205	Miscellaneous Removals	LS	1	18,100.00	18,100.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,322	9.40	12,426.80
215	Remove Pipe	LF	442	21.00	9,282.00
220	Remove Concrete Ditch	LF	4,879	30.00	146,370.00
252	Irrigation Pipe Relocation (30")	LF	5,288	109.00	576,392.00
260	Relocate Headwall	EA	6	6,600.00	39,600.00
261	Relocate Irrigation Turnout Structure	EA	6	17,500.00	105,000.00
266	Demolish Existing Structures	SF	6,032	5.00	30,160.00
				Sub-Total	***973,430.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	16,166	6.00	96,997.64
305	Channel Subgrade Preparation	SY	3,719	6.30	23,432.58
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	3,719	44.00	163,656.14
335	Granular Drainage Layer (4" Thick)	SY	413	6.90	2,851.56
339	Weep Holes	EA	422	10.00	4,220.00
342	Concrete Cutoff Wall	LF	4,896	4.70	23,013.27
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,038	15.80	63,803.91
				Sub-Total	***377,975.10***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	480	370.00	177,600.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***182,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	32,221	4.00	128,884.00
610	Tree (24" Box)	EA	260	184.00	47,840.00
613	Container Shrubs (5 gallon)	EA	520	22.00	11,440.00
614	Container Shrubs (1 gallon)	EA	780	10.90	8,502.00
621	Drip Irrigation System	SY	32,221	3.10	99,885.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	130	119.00	15,470.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	78	153.00	11,934.00
				Sub-Total	***323,955.10***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	310,488	2.50	776,219.00
				Sub-Total	***776,219.00***
				Sub-Total	2,634,080.00
				Contingency	790,224.00
				Reach Total	3,424,304.01

Watson Drainage System
Preliminary Cost Estimate - **RTMCR1, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	59,200.00	59,200.00
205	Miscellaneous Removals	LS	1	29,600.00	29,600.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,303	9.40	12,248.20
215	Remove Pipe	LF	73	21.00	1,533.00
220	Remove Concrete Ditch	LF	2,724	30.00	81,720.00
252	Irrigation Pipe Relocation (30")	LF	2,411	109.00	262,799.00
260	Relocate Headwall	EA	3	6,600.00	19,800.00
261	Relocate Irrigation Turnout Structure	EA	2	17,500.00	35,000.00
				Sub-Total	***501,900.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	54,538	6.00	327,228.51
305	Channel Subgrade Preparation	SY	37,962	6.30	239,161.80
312	Rock Mulch (3" Minus, 5" Thick)	SY	37,962	3.90	148,052.54
351	AC Maintenance Road (2" AC on 6" AB)	SY	8,512	15.80	134,489.60
				Sub-Total	***848,932.45***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	2,619	370.00	969,030.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***978,830.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	47,425	4.00	189,700.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	37,962	6.50	246,754.24
610	Tree (24" Box)	EA	548	184.00	100,832.00
613	Container Shrubs (5 gallon)	EA	1,096	22.00	24,112.00
614	Container Shrubs (1 gallon)	EA	1,644	10.90	17,919.60
621	Drip Irrigation System	SY	47,425	3.10	147,017.50
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	274	119.00	32,606.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	165	153.00	25,245.00
				Sub-Total	***784,186.34***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	752,064	1.60	1,203,301.70
				Sub-Total	***1,203,301.70***
				Sub-Total	4,317,150.68
				Contingency	1,295,145.20
				Reach Total	5,612,295.89

Watson Drainage System
Preliminary Cost Estimate - **RTMCR2, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	23,900.00	23,900.00
205	Miscellaneous Removals	LS	1	11,900.00	11,900.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	2,804	9.40	26,357.60
220	Remove Concrete Ditch	LF	156	30.00	4,680.00
251	Irrigation Pipe Relocation (24")	LF	231	102.00	23,562.00
265	Relocate Chain Link Fence	LF	232	26.00	6,032.00
266	Demolish Existing Structures	SF	2,386	5.00	11,930.00
				Sub-Total	***108,361.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	23,621	6.00	141,727.47
305	Channel Subgrade Preparation	SY	15,583	6.30	98,171.07
312	Rock Mulch (3" Minus, 5" Thick)	SY	15,583	3.90	60,772.57
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,113	15.80	64,983.64
				Sub-Total	***365,654.76***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	426	370.00	157,620.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	1	4,900.00	4,900.00
				Sub-Total	***162,520.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	23,748	4.00	94,992.00
605	Rock Mulch (3" Minus, 5" Thick)	SY	15,583	6.50	101,287.62
610	Tree (24" Box)	EA	265	184.00	48,760.00
613	Container Shrubs (5 gallon)	EA	530	22.00	11,660.00
614	Container Shrubs (1 gallon)	EA	795	10.90	8,665.50
621	Drip Irrigation System	SY	23,748	3.10	73,618.80
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	133	119.00	15,827.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	80	153.00	12,240.00
				Sub-Total	***367,050.92***
700	***RIGHT-OF-WAY ACQUISITION***				
703	Mixed Use Property	SF	368,372	2.00	736,744.56
				Sub-Total	***736,744.56***
				Sub-Total	1,740,331.83
				Contingency	522,099.55
				Reach Total	2,262,431.38

Watson Drainage System
Preliminary Cost Estimate - **RTMRA1, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	34,800.00	34,800.00
205	Miscellaneous Removals	LS	1	17,400.00	17,400.00
220	Remove Concrete Ditch	LF	42	30.00	1,272.79
251	Irrigation Pipe Relocation (24")	LF	122	102.00	12,444.00
252	Irrigation Pipe Relocation (30")	LF	42	109.00	4,624.48
258	Concrete-Lined Irrigation Ditch Relocation	LF	2,468	59.00	145,612.00
261	Relocate Irrigation Turnout Structure	EA	1	17,500.00	17,500.00
				Sub-Total	***233,653.27***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	39,900	6.00	239,399.85
305	Channel Subgrade Preparation	SY	30,564	6.30	192,550.53
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,365	15.80	68,965.24
				Sub-Total	***500,915.62***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	21,491	4.00	85,964.00
606	Turf (Sod)	SY	30,564	5.40	165,043.31
610	Tree (24" Box)	EA	281	184.00	51,704.00
613	Container Shrubs (5 gallon)	EA	562	22.00	12,364.00
614	Container Shrubs (1 gallon)	EA	843	10.90	9,188.70
621	Drip Irrigation System	SY	21,491	3.10	66,622.10
622	Turf Irrigation System	SY	30,564	3.70	113,085.23
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	141	119.00	16,779.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	85	153.00	13,005.00
				Sub-Total	***533,755.34***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	507,774	2.50	1,269,434.40
				Sub-Total	***1,269,434.40***
				Sub-Total	2,537,758.63
				Contingency	761,327.59
				Reach Total	3,299,086.22

Watson Drainage System
Preliminary Cost Estimate - **RTMRA2, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	28,700.00	28,700.00
205	Miscellaneous Removals	LS	1	14,300.00	14,300.00
				Sub-Total	***43,000.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	26,427	6.00	158,559.11
305	Channel Subgrade Preparation	SY	20,367	6.30	128,309.25
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,719	15.80	58,765.47
				Sub-Total	***345,633.83***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	700	370.00	259,000.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***268,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	22,225	4.00	88,900.00
606	Turf (Sod)	SY	20,367	5.40	109,979.36
610	Tree (24" Box)	EA	240	184.00	44,160.00
613	Container Shrubs (5 gallon)	EA	480	22.00	10,560.00
614	Container Shrubs (1 gallon)	EA	720	10.90	7,848.00
621	Drip Irrigation System	SY	22,225	3.10	68,897.50
622	Turf Irrigation System	SY	20,367	3.70	75,356.23
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	120	119.00	14,280.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	72	153.00	11,016.00
				Sub-Total	***430,997.08***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	400,654	2.50	1,001,635.80
				Sub-Total	***1,001,635.80***
				Sub-Total	2,090,066.71
				Contingency	627,020.01
				Reach Total	2,717,086.73

Watson Drainage System
Preliminary Cost Estimate - **RTSPT1, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	32,000.00	32,000.00
205	Miscellaneous Removals	LS	1	16,000.00	16,000.00
220	Remove Concrete Ditch	LF	760	30.00	22,800.00
250	Irrigation Pipe Relocation (18")	LF	760	96.00	72,960.00
290	Kinder-Morgan 20" Gas Pipeline Crossing	LS	1	960,000.00	960,000.00
295	Railroad Crossing	LS	1	240,000.00	240,000.00
				Sub-Total	***1,343,760.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	12,814	6.00	76,883.41
305	Channel Subgrade Preparation	SY	8,929	6.30	56,251.10
351	AC Maintenance Road (2" AC on 6" AB)	SY	2,340	15.80	36,964.98
				Sub-Total	***170,099.49***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	15,991	4.00	63,964.00
606	Turf (Sod)	SY	8,929	5.40	48,215.23
610	Tree (24" Box)	EA	151	184.00	27,784.00
613	Container Shrubs (5 gallon)	EA	302	22.00	6,644.00
614	Container Shrubs (1 gallon)	EA	453	10.90	4,937.70
621	Drip Irrigation System	SY	15,991	3.10	49,572.10
622	Turf Irrigation System	SY	8,929	3.70	33,036.36
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	76	119.00	9,044.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	46	153.00	7,038.00
				Sub-Total	***250,235.39***
700	***RIGHT-OF-WAY ACQUISITION***				
703	Mixed Use Property	SF	163,555	2.00	327,109.97
704	Commercial Property	SF	81,777	3.00	245,332.48
				Sub-Total	***572,442.45***
				Sub-Total	2,336,537.34
				Contingency	700,961.20
				Reach Total	3,037,498.54

Watson Drainage System
Preliminary Cost Estimate - **RTSPT2, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	20,500.00	20,500.00
205	Miscellaneous Removals	LS	1	10,200.00	10,200.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	1,724	9.40	16,205.60
291	ANPP 96" Reclaimed Water Pipeline Crossing	LS	1	380,000.00	380,000.00
293	BWCDD Canal Crossing	LS	1	450,000.00	450,000.00
				Sub-Total	***876,905.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	207	6.00	1,244.44
351	AC Maintenance Road (2" AC on 6" AB)	SY	933	15.80	14,746.67
				Sub-Total	***15,991.11***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,200	370.00	444,000.00
				Sub-Total	***444,000.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	9,853	4.00	39,412.00
610	Tree (24" Box)	EA	60	184.00	11,040.00
613	Container Shrubs (5 gallon)	EA	120	22.00	2,640.00
614	Container Shrubs (1 gallon)	EA	180	10.90	1,962.00
621	Drip Irrigation System	SY	9,853	3.10	30,544.30
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	30	119.00	3,570.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	18	153.00	2,754.00
				Sub-Total	***91,922.30***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	25,200	2.50	63,000.00
				Sub-Total	***63,000.00***
				Sub-Total	1,491,819.01
				Contingency	447,545.70
				Reach Total	1,939,364.71

Watson Drainage System
Preliminary Cost Estimate - **RTSPT3, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	30,600.00	30,600.00
205	Miscellaneous Removals	LS	1	15,300.00	15,300.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	922	9.40	8,666.80
220	Remove Concrete Ditch	LF	30	30.00	900.00
250	Irrigation Pipe Relocation (18")	LF	30	96.00	2,880.00
				Sub-Total	***58,346.80***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	20,806	6.00	124,836.89
305	Channel Subgrade Preparation	SY	15,265	6.30	96,166.98
351	AC Maintenance Road (2" AC on 6" AB)	SY	3,673	15.80	58,028.13
				Sub-Total	***279,032.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	1,505	370.00	556,850.00
450	6' x 4' Concrete Box Culvert Wing Walls	EA	2	4,900.00	9,800.00
				Sub-Total	***566,650.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,659	4.00	102,636.00
606	Turf (Sod)	SY	15,265	5.40	82,428.84
610	Tree (24" Box)	EA	237	184.00	43,608.00
613	Container Shrubs (5 gallon)	EA	474	22.00	10,428.00
614	Container Shrubs (1 gallon)	EA	711	10.90	7,749.90
621	Drip Irrigation System	SY	25,659	3.10	79,542.90
622	Turf Irrigation System	SY	15,265	3.70	56,479.02
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	119	119.00	14,161.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	71	153.00	10,863.00
				Sub-Total	***407,896.66***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	368,150	2.50	920,375.00
				Sub-Total	***920,375.00***
				Sub-Total	2,232,300.46
				Contingency	669,690.14
				Reach Total	2,901,990.60

Watson Drainage System

Preliminary Cost Estimate - **RTSPT4, Base Alternative**

Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	16,000.00	16,000.00
205	Miscellaneous Removals	LS	1	8,000.00	8,000.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	2,500	9.40	23,500.00
220	Remove Concrete Ditch	LF	186	30.00	5,580.00
251	Irrigation Pipe Relocation (24")	LF	186	102.00	18,972.00
				Sub-Total	***72,052.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	174	6.00	1,041.19
351	AC Maintenance Road (2" AC on 6" AB)	SY	781	15.80	12,338.04
				Sub-Total	***13,379.23***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
420	6' x 4' Concrete Box Culvert	LF	2,510	370.00	928,700.00
				Sub-Total	***928,700.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	8,701	4.00	34,804.00
610	Tree (24" Box)	EA	51	184.00	9,384.00
613	Container Shrubs (5 gallon)	EA	102	22.00	2,244.00
614	Container Shrubs (1 gallon)	EA	153	10.90	1,667.70
621	Drip Irrigation System	SY	8,701	3.10	26,973.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	26	119.00	3,094.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	16	153.00	2,448.00
				Sub-Total	***80,614.80***
700	***RIGHT-OF-WAY ACQUISITION***				
705	Industrial Property	SF	30,120	2.50	75,300.00
				Sub-Total	***75,300.00***
				Sub-Total	1,170,046.03
				Contingency	351,013.81
				Reach Total	1,521,059.84

Watson Drainage System
Preliminary Cost Estimate - **RTWTR1, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	36,600.00	36,600.00
205	Miscellaneous Removals	LS	1	18,300.00	18,300.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	533	9.40	5,010.20
215	Remove Pipe	LF	56	21.00	1,176.00
220	Remove Concrete Ditch	LF	60	30.00	1,800.00
251	Irrigation Pipe Relocation (24")	LF	120	102.00	12,240.00
260	Relocate Headwall	EA	2	6,600.00	13,200.00
				Sub-Total	***88,326.20***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	26,694	6.00	160,161.91
305	Channel Subgrade Preparation	SY	14,047	6.30	88,497.58
334	Shotcrete Channel Lining (4" Thick, 0.55% Steel)	SY	14,047	44.00	618,078.36
335	Granular Drainage Layer (4" Thick)	SY	1,561	6.90	10,769.52
339	Weep Holes	EA	490	10.00	4,900.00
342	Concrete Cutoff Wall	LF	7,430	4.70	34,923.07
351	AC Maintenance Road (2" AC on 6" AB)	SY	4,265	15.80	67,392.27
				Sub-Total	***984,722.71***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
423	6' x 8' Concrete Box Culvert	LF	1,450	460.00	667,000.00
453	6' x 8' Concrete Box Culvert Wing Walls	EA	5	9,900.00	49,500.00
				Sub-Total	***716,500.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	25,401	4.00	101,604.00
610	Tree (24" Box)	EA	275	184.00	50,600.00
613	Container Shrubs (5 gallon)	EA	550	22.00	12,100.00
614	Container Shrubs (1 gallon)	EA	825	10.90	8,992.50
621	Drip Irrigation System	SY	25,401	3.10	78,743.10
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	138	119.00	16,422.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	83	153.00	12,699.00
				Sub-Total	***281,160.60***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	371,823	1.60	594,916.74
				Sub-Total	***594,916.74***
				Sub-Total	2,665,626.25
				Contingency	799,687.88
				Reach Total	3,465,314.13

Watson Drainage System
Preliminary Cost Estimate - **RTWTR2, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	48,600.00	48,600.00
205	Miscellaneous Removals	LS	1	24,300.00	24,300.00
207	Sawcut, Remove and Replace Pavement per MAG 200-B	SF	959	9.40	9,014.60
215	Remove Pipe	LF	464	21.00	9,744.00
220	Remove Concrete Ditch	LF	157	30.00	4,710.00
252	Irrigation Pipe Relocation (30")	LF	310	109.00	33,790.00
				Sub-Total	***130,158.60***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	59,257	6.00	355,540.51
305	Channel Subgrade Preparation	SY	43,151	6.30	271,848.57
317	Dumped Riprap (D50 = 12")	CY	814	52.00	42,316.44
319	Dumped Riprap (D50 = 18")	CY	2,441	46.00	112,301.33
331	Channel Invert CRCP (8" Thick, 0.8% Steel)	SY	4,713	99.00	466,620.00
339	Weep Holes	EA	706	10.00	7,060.00
342	Concrete Cutoff Wall	LF	7,070	4.70	33,229.00
343	Vertical Drop Structure	LF	110	270.00	29,700.00
344	Gila River Outfall Cutoff Wall	LF	110	2,100.00	231,000.00
351	AC Maintenance Road (2" AC on 6" AB)	SY	6,246	15.80	98,679.78
				Sub-Total	***1,648,295.63***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
428	10' x 6' Concrete Box Culvert	LF	720	670.00	482,400.00
458	10' x 4' Concrete Box Culvert Wing Walls	EA	3	6,800.00	20,400.00
				Sub-Total	***502,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	90,561	0.34	30,790.74
610	Tree (24" Box)	EA	402	184.00	73,968.00
613	Container Shrubs (5 gallon)	EA	804	22.00	17,688.00
614	Container Shrubs (1 gallon)	EA	1,206	10.90	13,145.40
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	201	119.00	23,919.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	121	153.00	18,513.00
				Sub-Total	***178,024.14***
700	***RIGHT-OF-WAY ACQUISITION***				
701	Low Density Residential Property	SF	776,635	1.40	1,087,289.00
				Sub-Total	***1,087,289.00***
				Sub-Total	3,546,567.37
				Contingency	1,063,970.21
				Reach Total	4,610,537.58

Watson Drainage System
Preliminary Cost Estimate - **XMB01, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	38,800.00	38,800.00
205	Miscellaneous Removals	LS	1	19,400.00	19,400.00
				Sub-Total	***58,200.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	80,483	6.00	482,900.00
				Sub-Total	***482,900.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	200	168.00	33,600.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***41,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
603	Decomposed Granite	SY	62,183	4.00	248,732.00
607	Turf (Sprigs)	SY	37,528	2.00	75,056.00
610	Tree (24" Box)	EA	516	184.00	94,944.00
613	Container Shrubs (5 gallon)	EA	1,548	22.00	34,056.00
614	Container Shrubs (1 gallon)	EA	1,032	10.90	11,248.80
621	Drip Irrigation System	SY	62,183	3.10	192,767.30
622	Turf Irrigation System	SY	37,528	3.70	138,853.60
630	Landscape Boulder (3.5' x 2.5' x 2')	EA	64	119.00	7,616.00
631	Landscape Boulder (4' x 3' x 2.5')	EA	38	153.00	5,814.00
				Sub-Total	***809,087.70***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	897,399	1.60	1,435,838.40
				Sub-Total	***1,435,838.40***
				Sub-Total	2,827,826.10
				Contingency	848,347.83
				Reach Total	3,676,173.93

Watson Drainage System
Preliminary Cost Estimate - **XMB02, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	11,900.00	11,900.00
205	Miscellaneous Removals	LS	1	6,000.00	6,000.00
				Sub-Total	***17,900.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	55,349	6.00	332,096.00
				Sub-Total	***332,096.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	34,089	0.34	11,590.22
611	Tall Pot Tree	EA	176	100.00	17,607.90
				Sub-Total	***29,198.12***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	306,800	1.60	490,880.00
				Sub-Total	***490,880.00***
				Sub-Total	870,074.12
				Contingency	261,022.24
				Reach Total	1,131,096.36

Watson Drainage System

Preliminary Cost Estimate - **XMB03, Base Alternative**

Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	4,200.00	4,200.00
205	Miscellaneous Removals	LS	1	2,100.00	2,100.00
				Sub-Total	***6,300.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	20,472	6.00	122,833.33
				Sub-Total	***122,833.33***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	200	168.00	33,600.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***41,800.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	8,878	0.34	3,018.44
611	Tall Pot Tree	EA	46	100.00	4,585.63
				Sub-Total	***7,604.07***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	79,900	1.60	127,840.00
				Sub-Total	***127,840.00***
				Sub-Total	306,377.41
				Contingency	91,913.22
				Reach Total	398,290.63

Watson Drainage System
Preliminary Cost Estimate - **XMB04, Base Alternative**
Milestone: Alternatives Analysis

ID	Construction Item Description	Unit	Quantity	Unit Price	Total Cost
200	***REMOVALS AND RELOCATIONS***				
201	Clear and Grub	LS	1	10,600.00	10,600.00
205	Miscellaneous Removals	LS	1	5,300.00	5,300.00
				Sub-Total	***15,900.00***
300	***CHANNEL & BASIN CONSTRUCTION ITEMS***				
301	Excavation	CY	47,116	6.00	282,696.00
				Sub-Total	***282,696.00***
400	***STORM DRAIN CONSTRUCTION ITEMS***				
415	48" Storm Drain Pipe	LF	100	168.00	16,800.00
445	48" Storm Drain Headwall, per MAG 501-3	EA	1	8,200.00	8,200.00
				Sub-Total	***25,000.00***
600	***LANDSCAPING CONSTRUCTION ITEMS***				
602	Hydroseed	SY	29,506	0.34	10,031.89
611	Tall Pot Tree	EA	152	100.00	15,240.47
				Sub-Total	***25,272.36***
700	***RIGHT-OF-WAY ACQUISITION***				
702	Medium Density Residential Property	SF	265,550	1.60	424,880.00
				Sub-Total	***424,880.00***
				Sub-Total	773,748.36
				Contingency	232,124.51
				Reach Total	1,005,872.87

Appendix B

Hydrology Model Output

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                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   27          12
                .
                .
   37           .------->   12RET
   35        12-O
                V
                V
   40       O1-O2
                .
                .
   46           .          13
                .           .
                .           .
   56           .           .------->   13RET
   54           .        13-O
                .           .
                .           .
   59          O2............
                V
                V
   62      O2-O3A
                .
                .
   68           .          24
                .           .
                .           .
   78           .           .------->   24RET
   76           .        24-O
                .           .
                .           .
   81         O3A............
                V
                V
   84      O3AO3B
                .
                .
   90           .          25
                .           .
                .           .
  100           .           .------->   25RET
   98           .        25-O
                .           .
                .           .
  103         O3B............
                .
                .
  106           .         14A
                .           .
                .           .
  116           .           .------->  14ARET
  114           .       14A-O
                .           V
                .           V
  119           .      P1AP1B
                .           .
                .           .
  125           .           .          83
                .           .           .
                .           .           .
  135           .           .           .------->   83RET
  133           .           .        83-O
                .           .           .
                .           .           .
  138           .           .           .         14B
                .           .           .           .
                .           .           .           .
  148           .           .           .           .------->  14BRET
  146           .           .           .       14B-O
                .           .           .           .
                .           .           .           .
  151           .         P1B........................
                .           V
                .           V
  154           .      P1B-P2
                .           .
                .           .
  160           .           .          26
                .           .           .
                .           .           .
  170           .           .           .------->   26RET
  168           .           .        26-O
                .           .           .
                .           .           .
  173           .          P2............
                .           V
                .           V
  176           .       P2-O4
                .           .
                .           .
  182           .           .         11A
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              .          .          .
              .          .          .
192           .          .          .-------> 11ARET
190           .          .      11A-O
              .          .          V
              .          .          V
195           .          .     N1A-1B
              .          .          .
              .          .          .
201           .          .          .         11B
              .          .          .           .
              .          .          .           .
211           .          .          .           .-------> 11BRET
209           .          .          .      11B-O
              .          .          .           .
              .          .          .           .
214           .          .        N1B............
              .          .          V
              .          .          V
217           .          .      N1BO4
              .          .          .
              .          .          .
223         O4........................
              .
              .
229           .-------> DIMB01
226       MB01
            V
            V
232     RT2311
              .
              .
239           .         39
              .          .
              .          .
249           .          .------->  39RET
247           .       39-O
              .          .
              .          .
252         O5............
            V
            V
255     RT2312
              .
              .
262           .         38
              .          .
              .          .
272           .          .------->  38RET
270           .       38-O
              .          V
              .          V
275           .      N3-N4
              .          .
              .          .
281           .          .         49
              .          .          .
              .          .          .
291           .          .          .------->  49RET
289           .          .       49-O
              .          .          .
              .          .          .
294           .         N4............
              .          V
              .          V
297           .      N4-O6
              .          .
              .          .
303           .          .         50
              .          .          .
              .          .          .
313           .          .          .------->  50RET
311           .          .       50-O
              .          .          .
              .          .          .
316         O6A........................
            V
            V
319     RT2313
              .
              .
326           .         40
              .          .
              .          .
336           .          .------->  40RET
334           .       40-O
              .          V
              .          V
339           .      P3-P4
              .          .
              .          .
345           .          .         51
              .          .          .
              .          .          .
355           .          .          .------->  51RET
353           .          .       51-O
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358             .         P4...........
                .          V
                .          V
361             .       P4-P5
                .          .
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367             .          .          58
                .          .           .
                .          .           .
377             .          .           .-------->   58RET
375             .          .       58-O
                .          .           .
                .          .           .
380             .         P5...........
                .          .
                .          .
383             .          .          57
                .          .           .
                .          .           .
393             .          .           .-------->   57RET
391             .          .       57-O
                .          .           .
                .          .           .
398             .          .           .-------->    DT57
396             .          .       DV57
                .          .           .
                .          .           .
401             .         P6...........
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406             .          .-------->  DIMB02
403             .       MB02
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                .          .
410             .          .           .<--------    DT57
409             .          .       RT57
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411            O7........................
                V
                V
414        RT2315
                .
                .
421             .         71
                .          .
                .          .
431             .          .-------->   71RET
429             .       71-O
                .          .
                .          .
434            O8............
                V
                V
437        RT2316
                .
                .
444             .         93
                .          .
                .          .
454             .          .-------->   93RET
452             .       93-O
                .          .
                .          .
457            O9............
                V
                V
460        RT2314
                .
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467             .         95
                .          .
                .          .
477             .          .-------->   95RET
475             .       95-O
                .          .
                .          .
480           P8B............
                V
                V
483        RTMRA1
                .
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490             .        10E
                .          .
                .          .
500             .          .-------->  10ERET
498             .      10E-O
                .          V
                .          V
503             .     L1AL2A
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509             .          .        22E
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                .          .          .
519             .          .          .-------> 22ERET
517             .          .      22E-O
                .          .          .
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522             .        L2A...........
                .          .
                .          .
525             .          .       11C
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                .          .          .
535             .          .          .-------> 11CRET
533             .          .      11C-O
                .          .          V
                .          .          V
538             .          .     N1C-N2
                .          .          .
                .          .          .
544             .          .          .         23
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                .          .          .          .
554             .          .          .          .-------> 23RET
552             .          .          .       23-O
                .          .          .          .
                .          .          .          .
557             .         N2........................
                .          .
                .          .
563             .          .-------> DIMB03
560             .       MB03
                .          V
                .          V
566             .     RTAPR1
                .          V
                .          V
573             .     RTAPR2
                .          V
                .          V
580             .     RTAPR3
                .          .
                .          .
587             .          .         37
                .          .          .
                .          .          .
597             .          .          .-------> 37RET
595             .          .       37-O
                .          .          V
                .          .          V
600             .          .     37-M2B
                .          .          .
                .          .          .
606             .          .          .         36
                .          .          .          .
                .          .          .          .
616             .          .          .          .-------> 36RET
614             .          .          .       36-O
                .          .          .          V
                .          .          .          V
619             .          .          .     L3-M2A
                .          .          .          .
                .          .          .          .
625             .          .          .          .        47N
                .          .          .          .          .
                .          .          .          .          .
635             .          .          .          .          .-------> 47NRET
633             .          .          .          .      47N-O
                .          .          .          .          .
                .          .          .          .          .
638             .          .          .        M2A...........
                .          .          .          V
                .          .          .          V
641             .          .          .     RTMCR1
                .          .          .          .
                .          .          .          .
648             .          .          .          .         48
                .          .          .          .          .
                .          .          .          .          .
658             .          .          .          .          .-------> 48RET
656             .          .          .          .       48-O
                .          .          .          .          .
                .          .          .          .          .
661             .          .        M2B........................
                .          .          .
                .          .          .
667             .          .          .-------> DIMB04
664             .          .       MB04
                .          .          .
                .          .          .
670             .          .          .        56A
                .          .          .          .
                .          .          .          .
680             .          .          .          .-------> 56ARET
678             .          .          .      56A-O
                .          .          .          .
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685          .           .           .           .-------->   DT56A
683          .           .           .       DV56A
             .           .           .           .
             .           .           .           .
688          .         M2C.......................
             .           V
             .           V
691          .      RTMCR2
             .           V
             .           V
698          .      RTSPT1
             .           .
             .           .
705          .           .         56B
             .           .           .
             .           .           .
715          .           .           .-------->  56BRET
713          .           .      56B-O
             .           .           .
             .           .           .
718          .       CP56B............
             .           V
             .           V
721          .      RTSPT2
             .           .
             .           .
728          .           .          70
             .           .           .
             .           .           .
738          .           .           .-------->   70RET
736          .           .       70-O
             .           .           .
             .           .           .
743          .           .           .           .<--------   DT56A
741          .           .           .       RT56A
             .           .           .           .
             .           .           .           .
744          .          N6.......................
             .           V
             .           V
747          .      RTSPT4
             .           V
             .           V
754          .      RTSPT3
             .           .
             .           .
761          .           .         92N
             .           .           .
             .           .           .
771          .           .           .-------->  92NRET
769          .           .      92N-O
             .           .           .
             .           .           .
774          .        O10A............
             .           V
             .           V
777          .      RTMRA2
             .           .
             .           .
784          .           .      DET24
             .           .           .
             .           .           .
823          .      TOBINF............
             .           .
             .           .
826       O10B............
             V
             V
829     RTWTR1
             .
             .
836          .      DRAN24
             .           .
             .           .
892          .           .         92S
             .           .           .
             .           .           .
902          .           .           .-------->  92SRET
900          .           .      92S-O
             .           .           .
             .           .           .
905          .      TOB92S............
             .           .
             .           .
908          .           .          72
             .           .           .
             .           .           .
918          .           .           .-------->   72RET
916          .           .       72-O
             .           .           .
             .           .           .
921          .           .           .          94
             .           .           .           .
             .           .           .           .
931          .           .           .           .-------->   94RET
929          .           .           .       94-O
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                .          .          .          .
                .          .          .          .
  934           .          .         P7...........
                .          .          V
                .          .          V
  937           .          .     94-P8A
                .          .          .
                .          .          .
  943           .          .          .         96
                .          .          .          .
                .          .          .          .
  953           .          .          .          .-------->   96RET
  951           .          .          .       96-O
                .          .          .          .
                .          .          .          .
  956           .          .        P8A...........
                .          .          V
                .          .          V
  959           .          .     P8A-P9
                .          .          .
                .          .          .
  965           .          .          .         97
                .          .          .          .
                .          .          .          .
  975           .          .          .          .-------->   97RET
  973           .          .          .       97-O
                .          .          .          .
                .          .          .          .
  978           .       P9.................................
                .        V
                .        V
  981           .    RTWTR2
                .
                .
  988           .          .        100
                .          .          .
                .          .          .
  998           .          .-------->  100RET
  996           .          .      100-O
                .          .          .
                .          .          .
 1001           .       P10...........
```

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin 01								
12	Hydrograph	0.740						1,156
12RET	Diversion	0.740						1,156
12-O	Hydrograph	0.740						
O1-O2	Routed	0.740						
13	Hydrograph	0.500						919
13RET	Diversion	0.500						919
13-O	Hydrograph	0.500						
O2	Combined	1.240						
O2-O3A	Routed	1.240						
24	Hydrograph	0.490						746
24RET	Diversion	0.490						2
24-O	Hydrograph	0.490						746
O3A	Combined	1.730						739
O3AO3B	Routed	1.730						671
25	Hydrograph	0.270						235
25RET	Diversion	0.270						235
25-O	Hydrograph	0.270						18
O3B	Combined	2.000						671
14A	Hydrograph	0.690						712
14ARET	Diversion	0.690						712
14A-O	Hydrograph	0.690						31
P1AP1B	Routed	0.690						24
83	Hydrograph	0.680						672
83RET	Diversion	0.680						672
83-O	Hydrograph	0.680						204
14B	Hydrograph	0.500						729
14BRET	Diversion	0.500						729
14B-O	Hydrograph	0.500						
P1B	Combined	1.870						204
P1B-P2	Routed	1.870						103
26	Hydrograph	0.520						621
26RET	Diversion	0.520						9
26-O	Hydrograph	0.520						621
P2	Combined	2.390						610
P2-O4	Routed	2.390						479
11A	Hydrograph	0.570						1,075
11ARET	Diversion	0.570						1,075
11A-O	Hydrograph	0.570						6
N1A-1B	Routed	0.570						6
11B	Hydrograph	0.580						586
11BRET	Diversion	0.580						586
11B-O	Hydrograph	0.580						12
N1B	Combined	1.150						11
N1BO4	Routed	1.150						11
O4	Combined	5.550						767
DIMB01	Diversion	5.550						717
MB01	Hydrograph	5.550						50
RT2311	Routed	5.550						50
39	Hydrograph	0.730						610
39RET	Diversion	0.730						610
39-O	Hydrograph	0.730						339
O5	Combined	0.730						389
RT2312	Routed	0.730						260
38	Hydrograph	0.540						465
38RET	Diversion	0.540						465
38-O	Hydrograph	0.540						214
N3-N4	Routed	0.540						109
49	Hydrograph	1.010						737
49RET	Diversion	1.010						737
49-O	Hydrograph	1.010						21
N4	Combined	1.550						109
N4-O6	Routed	1.550						74
50	Hydrograph	1.000						758
50RET	Diversion	1.000						758
50-O	Hydrograph	1.000						402

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
O6A	Combined	3.280						548
RT2313	Routed	3.280						499
40	Hydrograph	0.980						787
40RET	Diversion	0.980						787
40-O	Hydrograph	0.980						326
P3-P4	Routed	0.980						328
51	Hydrograph	1.000						765
51RET	Diversion	1.000						765
51-O	Hydrograph	1.000						394
P4	Combined	1.980						527
P4-P5	Routed	1.980						460
58	Hydrograph	0.190						416
58RET	Diversion	0.190						416
58-O	Hydrograph	0.190						72
P5	Combined	0.190						546
57	Hydrograph	0.490						1,008
57RET	Diversion	0.490						1,008
57-O	Hydrograph	0.490						
DT57	Diversion	0.490						
DV57	Hydrograph	0.490						
P6	Combined	0.680						546
DIMB02	Diversion	0.680						542
MB02	Hydrograph	0.680						
RT57	Hydrograph	0.490						
O7	Combined	3.960						499
RT2315	Routed	3.960						487
71	Hydrograph	0.160						357
71RET	Diversion	0.160						357
71-O	Hydrograph	0.160						69
O8	Combined	4.120						497
RT2316	Routed	4.120						453
93	Hydrograph	0.380						527
93RET	Diversion	0.380						527
93-O	Hydrograph	0.380						422
O9	Combined	4.490						483
RT2314	Routed	4.490						460
95	Hydrograph	0.520						532
95RET	Diversion	0.520						532
95-O	Hydrograph	0.520						483
P8B	Combined	5.020						704
RTMRA1	Routed	5.020						554
10E	Hydrograph	0.590						615
10ERET	Diversion	0.590						615
10E-O	Hydrograph	0.590						241
L1AL2A	Routed	0.590						149
22E	Hydrograph	0.290						358
22ERET	Diversion	0.290						358
22E-O	Hydrograph	0.290						130
L2A	Combined	0.880						179
11C	Hydrograph	0.340						437
11CRET	Diversion	0.340						437
11C-O	Hydrograph	0.340						22
N1C-N2	Routed	0.340						15
23	Hydrograph	0.520						448
23RET	Diversion	0.520						448
23-O	Hydrograph	0.520						161
N2	Combined	1.750						293
DIMB03	Diversion	1.750						243
MB03	Hydrograph	1.750						50
RTAPR1	Routed	1.750						50
RTAPR2	Routed	1.750						50
RTAPR3	Routed	1.750						50
37	Hydrograph	1.420						1,031
37RET	Diversion	1.420						1,031
37-O	Hydrograph	1.420						453
37-M2B	Routed	1.420						347

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
36	Hydrograph	0.680						553
36RET	Diversion	0.680						553
36-O	Hydrograph	0.680						184
L3-M2A	Routed	0.680						105
47N	Hydrograph	0.230						225
47NRET	Diversion	0.230						225
47N-O	Hydrograph	0.230						107
M2A	Combined	0.920						125
RTMCR1	Routed	0.920						85
48	Hydrograph	0.500						505
48RET	Diversion	0.500						505
48-O	Hydrograph	0.500						245
M2B	Combined	2.840						360
DIMB04	Diversion	2.840						310
MB04	Hydrograph	2.840						50
56A	Hydrograph	0.410						761
56ARET	Diversion	0.410						761
56A-O	Hydrograph	0.410						392
DT56A	Diversion	0.410						157
DV56A	Hydrograph	0.410						235
M2C	Combined	0.410						235
RTMCR2	Routed	0.410						142
RTSPT1	Routed	0.410						116
56B	Hydrograph	0.330						708
56BRET	Diversion	0.330						708
56B-O	Hydrograph	0.330						
CP56B	Combined	0.740						116
RTSPT2	Routed	0.740						116
70	Hydrograph	0.140						248
70RET	Diversion	0.140						248
70-O	Hydrograph	0.140						65
RT56A	Hydrograph	0.410						157
N6	Combined	0.880						165
RTSPT4	Routed	0.880						166
RTSPT3	Routed	0.880						157
92N	Hydrograph	0.330						609
92NRET	Diversion	0.330						598
92N-O	Hydrograph	0.330						524
O10A	Combined	1.210						539
RTMRA2	Routed	1.210						385
DET24	Hydrograph	0.160						153
TOBINF	Combined	1.370						385
O10B	Combined	6.390						730
RTWTR1	Routed	6.390						713
DRAN24	Hydrograph	0.750						535
92S	Hydrograph	0.690						1,004
92SRET	Diversion	0.690						990
92S-O	Hydrograph	0.690						907
TOB92S	Combined	1.440						907
72	Hydrograph	0.090						175
72RET	Diversion	0.090						175
72-O	Hydrograph	0.090						9
94	Hydrograph	0.720						875
94RET	Diversion	0.720						875
94-O	Hydrograph	0.720						712
P7	Combined	0.810						721
94-P8A	Routed	0.810						529
96	Hydrograph	0.910						833
96RET	Diversion	0.910						833
96-O	Hydrograph	0.910						559
P8A	Combined	1.720						968
P8A-P9	Routed	1.720						601
97	Hydrograph	0.500						463
97RET	Diversion	0.500						463
97-O	Hydrograph	0.500						369
P9	Combined	10.040						1,066

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
RTWTR2	Routed	10.040						1,048
100	Hydrograph	0.580						506
100RET	Diversion	0.580						506
100-O	Hydrograph	0.580						279
P10	Combined	10.630						1,097

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                SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   27          12
                .
                .
   37           .------->   12RET
   35        12-O
                V
                V
   40       O1-O2
                .
                .
   46           .          13
                .           .
                .           .
   56           .           .------->   13RET
   54           .        13-O
                .           .
                .           .
   59          O2............
                V
                V
   62      O2-O3A
                .
                .
   68           .          24
                .           .
                .           .
   78           .           .------->   24RET
   76           .        24-O
                .           .
                .           .
   81         O3A............
                V
                V
   84      O3AO3B
                .
                .
   90           .          25
                .           .
                .           .
  100           .           .------->   25RET
   98           .        25-O
                .           .
                .           .
  103         O3B............
                .
                .
  106           .         14A
                .           .
                .           .
  116           .           .------->  14ARET
  114           .       14A-O
                .           V
                .           V
  119           .      P1AP1B
                .           .
                .           .
  125           .           .          83
                .           .           .
                .           .           .
  135           .           .           .------->   83RET
  133           .           .        83-O
                .           .           .
                .           .           .
  138           .           .           .         14B
                .           .           .           .
                .           .           .           .
  148           .           .           .           .------->  14BRET
  146           .           .           .       14B-O
                .           .           .           .
                .           .           .           .
  151           .         P1B........................
                .           V
                .           V
  154           .      P1B-P2
                .           .
                .           .
  160           .           .          26
                .           .           .
                .           .           .
  170           .           .           .------->   26RET
  168           .           .        26-O
                .           .           .
                .           .           .
  173           .          P2............
                .           V
                .           V
  176           .       P2-O4
                .           .
                .           .
  182           .           .         11A
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            .           .           .
            .           .           .
192         .           .           .-------> 11ARET
190         .           .      11A-O
            .           .          V
            .           .          V
195         .           .     N1A-1B
            .           .           .
            .           .           .
201         .           .           .        11B
            .           .           .          .
            .           .           .          .
211         .           .           .          .-------> 11BRET
209         .           .           .      11B-O
            .           .           .          .
            .           .           .          .
214         .           .        N1B............
            .           .          V
            .           .          V
217         .           .      N1BO4
            .           .           .
            .           .           .
223        O4........................
            .
            .
229         .-------> DIMB01
226       MB01
           V
           V
232     RT2311
            .
            .
239         .         39
            .           .
            .           .
249         .           .------->   39RET
247         .       39-O
            .           .
            .           .
252        O5............
           V
           V
255     RT2312
            .
            .
262         .         38
            .           .
            .           .
272         .           .------->   38RET
270         .       38-O
            .          V
            .          V
275         .      N3-N4
            .           .
            .           .
281         .           .         49
            .           .          .
            .           .          .
291         .           .          .------->   49RET
289         .           .       49-O
            .           .          .
            .           .          .
294         .         N4............
            .          V
            .          V
297         .      N4-O6
            .           .
            .           .
303         .           .         50
            .           .          .
            .           .          .
313         .           .          .------->   50RET
311         .           .       50-O
            .           .          .
            .           .          .
318         .           .          .------->    DT50
316         .           .       DV50
            .           .          .
            .           .          .
321         .        O6A............
            .           .
            .           .
327         .           .-------> DIMB02
324         .       MB02
            .           .
            .           .
332         .           .          .<-------    DT50
330         .           .       RT50
            .           .          .
            .           .          .
333        O6B........................
           V
           V
336     RT2313
            .
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343          .          40
             .           .
             .           .
353          .           .-------->   40RET
351          .        40-O
             .           V
             .           V
356          .       P3-P4
             .           .
             .           .
362          .           .          51
             .           .           .
             .           .           .
372          .           .           .-------->   51RET
370          .           .        51-O
             .           .           .
             .           .           .
375          .          P4............
             .           .
             .           .
381          .           .-------->  DIMB05
378          .        MB05
             .           V
             .           V
384          .       P4-P5
             .           .
             .           .
390          .           .          58
             .           .           .
             .           .           .
400          .           .           .-------->   58RET
398          .           .        58-O
             .           .           .
             .           .           .
403          .          P5............
             .           V
             .           V
406          .      RTURR1
             .           .
             .           .
413          .           .          57
             .           .           .
             .           .           .
423          .           .           .-------->   57RET
421          .           .        57-O
             .           .           .
             .           .           .
426         O7........................
             V
             V
429      RTURR2
             .
             .
436          .         10E
             .           .
             .           .
446          .           .-------->  10ERET
444          .       10E-O
             .           V
             .           V
449          .      L1AL2A
             .           .
             .           .
455          .           .         22E
             .           .           .
             .           .           .
465          .           .           .-------->  22ERET
463          .           .       22E-O
             .           .           .
             .           .           .
468          .         L2A............
             .           .
             .           .
471          .           .         11C
             .           .           .
             .           .           .
481          .           .           .-------->  11CRET
479          .           .       11C-O
             .           .           V
             .           .           V
484          .           .      N1C-N2
             .           .           .
             .           .           .
490          .           .           .          23
             .           .           .           .
             .           .           .           .
500          .           .           .           .-------->   23RET
498          .           .           .        23-O
             .           .           .           .
             .           .           .           .
503          .          N2........................
             .           .
             .           .
509          .           .-------->  DIMB03
506          .        MB03
             .           V
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                .          V
512             .      RTAPR1
                .          V
                .          V
519             .      RTAPR2
                .          V
                .          V
526             .      RTAPR3
                .          .
                .          .
533             .          .          37
                .          .           .
                .          .           .
543             .          .           .-------->   37RET
541             .          .        37-O
                .          .           V
                .          .           V
546             .          .      37-M2B
                .          .           .
                .          .           .
552             .          .           .          36
                .          .           .           .
                .          .           .           .
562             .          .           .           .-------->   36RET
560             .          .           .        36-O
                .          .           .           V
                .          .           .           V
565             .          .           .      L3-M2A
                .          .           .           .
                .          .           .           .
571             .          .           .           .         47N
                .          .           .           .           .
                .          .           .           .           .
581             .          .           .           .           .-------->  47NRET
579             .          .           .           .       47N-O
                .          .           .           .           .
                .          .           .           .           .
584             .          .           .         M2A............
                .          .           .           V
                .          .           .           V
587             .          .           .      RTMCR1
                .          .           .           .
                .          .           .           .
594             .          .           .           .          48
                .          .           .           .           .
                .          .           .           .           .
604             .          .           .           .           .-------->   48RET
602             .          .           .           .        48-O
                .          .           .           .           .
                .          .           .           .           .
607             .          .         M2B........................
                .          .           .
                .          .           .
613             .          .           .-------->  DIMB04
610             .          .        MB04
                .          .           .
                .          .           .
616             .          .           .         56A
                .          .           .           .
                .          .           .           .
626             .          .           .           .-------->  56ARET
624             .          .           .       56A-O
                .          .           .           .
                .          .           .           .
631             .          .           .           .-------->   DT56A
629             .          .           .       DV56A
                .          .           .           .
                .          .           .           .
634             .         M2C........................
                .          V
                .          V
637             .      RTMCR2
                .          V
                .          V
644             .      RTSPT1
                .          .
                .          .
651             .          .         56B
                .          .           .
                .          .           .
661             .          .           .-------->  56BRET
659             .          .       56B-O
                .          .           .
                .          .           .
664             .       CP56B............
                .          V
                .          V
667             .      RTURR3
                .          .
                .          .
674             .  N5B............
                .    V
                .    V
677             .RTSPT2
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684          .          70
             .           .
             .           .
694          .           .-------->   70RET
692          .        70-O
             .           .
             .           .
699          .           .           .<-------   DT56A
697          .           .       RT56A
             .           .           .
             .           .           .
700         N6.......................
             V
             V
703     RTSPT3
             .
             .
710          .         92N
             .           .
             .           .
720          .           .-------->  92NRET
718          .       92N-O
             .           .
             .           .
723       O10A............
             V
             V
726     RTMRA2
             .
             .
733          .          71
             .           .
             .           .
743          .           .-------->   71RET
741          .        71-O
             .           .
             .           .
746          .           .          93
             .           .           .
             .           .           .
756          .           .           .-------->   93RET
754          .           .        93-O
             .           .           .
             .           .           .
759          .          O9............
             .           V
             .           V
762          .      RT2314
             .           .
             .           .
769          .           .          95
             .           .           .
             .           .           .
779          .           .           .-------->   95RET
777          .           .        95-O
             .           .           .
             .           .           .
782          .         P8B............
             .           V
             .           V
785          .      RTMRA1
             .           .
             .           .
792       O10B............
             .
             .
795          .       DET24
             .           .
             .           .
834     TOBINF............
             V
             V
837     RTWTR1
             .
             .
844          .      DRAN24
             .           .
             .           .
900          .           .         92S
             .           .           .
             .           .           .
910          .           .           .-------->  92SRET
908          .           .       92S-O
             .           .           .
             .           .           .
913          .      TOB92S............
             .           .
             .           .
916          .           .          72
             .           .           .
             .           .           .
926          .           .           .-------->   72RET
924          .           .        72-O
             .           .           .
             .           .           .
929          .           .           .          94
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                .           .           .           .
                .           .           .           .
  939           .           .           .           .-------->   94RET
  937           .           .           .        94-O
                .           .           .           .
                .           .           .           .
  942           .           .          P7............
                .           .           V
                .           .           V
  945           .           .      94-P8A
                .           .           .
                .           .           .
  951           .           .           .          96
                .           .           .           .
                .           .           .           .
  961           .           .           .           .-------->   96RET
  959           .           .           .        96-O
                .           .           .           .
                .           .           .           .
  964           .           .         P8A............
                .           .           V
                .           .           V
  967           .           .      P8A-P9
                .           .           .
                .           .           .
  973           .           .           .          97
                .           .           .           .
                .           .           .           .
  983           .           .           .           .-------->   97RET
  981           .           .           .        97-O
                .           .           .           .
                .           .           .           .
  986          P9.................................
                V
                V
  989      RTWTR2
                .
                .
  996           .         100
                .           .
                .           .
 1006           .           .-------->  100RET
 1004           .       100-O
                .           .
                .           .
 1009         P10............
```

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin 01								
12	Hydrograph	0.740						1,156
12RET	Diversion	0.740						1,156
12-O	Hydrograph	0.740						
O1-O2	Routed	0.740						
13	Hydrograph	0.500						919
13RET	Diversion	0.500						919
13-O	Hydrograph	0.500						
O2	Combined	1.240						
O2-O3A	Routed	1.240						
24	Hydrograph	0.490						746
24RET	Diversion	0.490						2
24-O	Hydrograph	0.490						746
O3A	Combined	1.730						739
O3AO3B	Routed	1.730						671
25	Hydrograph	0.270						235
25RET	Diversion	0.270						235
25-O	Hydrograph	0.270						18
O3B	Combined	2.000						671
14A	Hydrograph	0.690						712
14ARET	Diversion	0.690						712
14A-O	Hydrograph	0.690						31
P1AP1B	Routed	0.690						24
83	Hydrograph	0.680						672
83RET	Diversion	0.680						672
83-O	Hydrograph	0.680						204
14B	Hydrograph	0.500						729
14BRET	Diversion	0.500						729
14B-O	Hydrograph	0.500						
P1B	Combined	1.870						204
P1B-P2	Routed	1.870						103
26	Hydrograph	0.520						621
26RET	Diversion	0.520						9
26-O	Hydrograph	0.520						621
P2	Combined	2.390						610
P2-O4	Routed	2.390						479
11A	Hydrograph	0.570						1,075
11ARET	Diversion	0.570						1,075
11A-O	Hydrograph	0.570						6
N1A-1B	Routed	0.570						6
11B	Hydrograph	0.580						586
11BRET	Diversion	0.580						586
11B-O	Hydrograph	0.580						12
N1B	Combined	1.150						11
N1BO4	Routed	1.150						11
O4	Combined	5.550						767
DIMB01	Diversion	5.550						717
MB01	Hydrograph	5.550						50
RT2311	Routed	5.550						50
39	Hydrograph	0.730						610
39RET	Diversion	0.730						610
39-O	Hydrograph	0.730						339
O5	Combined	0.730						389
RT2312	Routed	0.730						260
38	Hydrograph	0.540						465
38RET	Diversion	0.540						465
38-O	Hydrograph	0.540						214
N3-N4	Routed	0.540						109
49	Hydrograph	1.010						737
49RET	Diversion	1.010						737
49-O	Hydrograph	1.010						21
N4	Combined	1.550						109
N4-O6	Routed	1.550						74
50	Hydrograph	1.000						758
50RET	Diversion	1.000						758
50-O	Hydrograph	1.000						402

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
DT50	Diversion	1.000						201
DV50	Hydrograph	1.000						201
O6A	Combined	2.550						167
DIMB02	Diversion	2.550						167
MB02	Hydrograph	2.550						
RT50	Hydrograph	1.000						201
O6B	Combined	0.730						421
RT2313	Routed	0.730						397
40	Hydrograph	0.980						787
40RET	Diversion	0.980						787
40-O	Hydrograph	0.980						326
P3-P4	Routed	0.980						328
51	Hydrograph	1.000						765
51RET	Diversion	1.000						765
51-O	Hydrograph	1.000						394
P4	Combined	1.980						527
DIMB05	Diversion	1.980						477
MB05	Hydrograph	1.980						50
P4-P5	Routed	1.980						50
58	Hydrograph	0.190						416
58RET	Diversion	0.190						416
58-O	Hydrograph	0.190						72
P5	Combined	0.190						72
RTURR1	Routed	0.190						59
57	Hydrograph	0.490						1,008
57RET	Diversion	0.490						1,008
57-O	Hydrograph	0.490						
O7	Combined	1.410						408
RTURR2	Routed	1.410						362
10E	Hydrograph	0.590						615
10ERET	Diversion	0.590						615
10E-O	Hydrograph	0.590						241
L1AL2A	Routed	0.590						149
22E	Hydrograph	0.290						358
22ERET	Diversion	0.290						358
22E-O	Hydrograph	0.290						130
L2A	Combined	0.880						179
11C	Hydrograph	0.340						437
11CRET	Diversion	0.340						437
11C-O	Hydrograph	0.340						22
N1C-N2	Routed	0.340						15
23	Hydrograph	0.520						448
23RET	Diversion	0.520						448
23-O	Hydrograph	0.520						161
N2	Combined	1.750						293
DIMB03	Diversion	1.750						243
MB03	Hydrograph	1.750						50
RTAPR1	Routed	1.750						50
RTAPR2	Routed	1.750						50
RTAPR3	Routed	1.750						50
37	Hydrograph	1.420						1,031
37RET	Diversion	1.420						1,031
37-O	Hydrograph	1.420						453
37-M2B	Routed	1.420						347
36	Hydrograph	0.680						553
36RET	Diversion	0.680						553
36-O	Hydrograph	0.680						184
L3-M2A	Routed	0.680						105
47N	Hydrograph	0.230						225
47NRET	Diversion	0.230						225
47N-O	Hydrograph	0.230						107
M2A	Combined	0.920						125
RTMCR1	Routed	0.920						86
48	Hydrograph	0.500						505
48RET	Diversion	0.500						505
48-O	Hydrograph	0.500						245

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
M2B	Combined	2.840						359
DIMB04	Diversion	2.840						309
MB04	Hydrograph	2.840						50
56A	Hydrograph	0.410						761
56ARET	Diversion	0.410						761
56A-O	Hydrograph	0.410						392
DT56A	Diversion	0.410						157
DV56A	Hydrograph	0.410						235
M2C	Combined	0.410						235
RTMCR2	Routed	0.410						142
RTSPT1	Routed	0.410						130
56B	Hydrograph	0.330						708
56BRET	Diversion	0.330						708
56B-O	Hydrograph	0.330						
CP56B	Combined	0.740						130
RTURR3	Routed	0.740						116
N5B	Combined	2.150						452
RTSPT2	Routed	2.150						437
70	Hydrograph	0.140						248
70RET	Diversion	0.140						248
70-O	Hydrograph	0.140						65
RT56A	Hydrograph	0.410						157
N6	Combined	2.290						455
RTSPT3	Routed	2.290						445
92N	Hydrograph	0.330						609
92NRET	Diversion	0.330						598
92N-O	Hydrograph	0.330						524
O10A	Combined	2.620						560
RTMRA2	Routed	2.620						462
71	Hydrograph	0.160						357
71RET	Diversion	0.160						357
71-O	Hydrograph	0.160						69
93	Hydrograph	0.380						527
93RET	Diversion	0.380						527
93-O	Hydrograph	0.380						422
O9	Combined	0.530						451
RT2314	Routed	0.530						354
95	Hydrograph	0.520						532
95RET	Diversion	0.520						532
95-O	Hydrograph	0.520						483
P8B	Combined	1.050						696
RTMRA1	Routed	1.050						586
O10B	Combined	3.670						742
DET24	Hydrograph	0.160						153
TOBINF	Combined	3.830						743
RTWTR1	Routed	3.830						728
DRAN24	Hydrograph	0.750						535
92S	Hydrograph	0.690						1,004
92SRET	Diversion	0.690						990
92S-O	Hydrograph	0.690						907
TOB92S	Combined	1.440						907
72	Hydrograph	0.090						175
72RET	Diversion	0.090						175
72-O	Hydrograph	0.090						9
94	Hydrograph	0.720						875
94RET	Diversion	0.720						875
94-O	Hydrograph	0.720						712
P7	Combined	0.810						721
94-P8A	Routed	0.810						529
96	Hydrograph	0.910						833
96RET	Diversion	0.910						833
96-O	Hydrograph	0.910						559
P8A	Combined	1.720						968
P8A-P9	Routed	1.720						601
97	Hydrograph	0.500						463
97RET	Diversion	0.500						463

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
97-O	Hydrograph	0.500						369
P9	Combined	7.490						1,095
RTWTR2	Routed	7.490						1,072
100	Hydrograph	0.580						506
100RET	Diversion	0.580						506
100-O	Hydrograph	0.580						279
P10	Combined	8.070						1,155

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                 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE       (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   27          12
                .
                .
   37           .------->   12RET
   35        12-O
                V
                V
   40       O1-O2
                .
                .
   46           .          13
                .           .
                .           .
   55           .           .------->   13RET
   54           .        13-O
                .           .
                .           .
   58          O2............
                V
                V
   61      O2-O3A
                .
                .
   67           .          24
                .           .
                .           .
   77           .           .------->   24RET
   75           .        24-O
                .           .
                .           .
   80         O3A............
                V
                V
   83      O3AO3B
                .
                .
   89           .          25
                .           .
                .           .
   99           .           .------->   25RET
   97           .        25-O
                .           .
                .           .
  102         O3B............
                .
                .
  105           .         14A
                .           .
                .           .
  115           .           .------->  14ARET
  113           .       14A-O
                .          V
                .          V
  118           .      P1AP1B
                .           .
                .           .
  124           .           .          83
                .           .           .
                .           .           .
  134           .           .           .------->   83RET
  132           .           .        83-O
                .           .           .
                .           .           .
  137           .           .           .         14B
                .           .           .           .
                .           .           .           .
  147           .           .           .           .------->  14BRET
  145           .           .           .       14B-O
                .           .           .           .
                .           .           .           .
  150           .         P1B........................
                .          V
                .          V
  153           .      P1B-P2
                .           .
                .           .
  159           .           .          26
                .           .           .
                .           .           .
  169           .           .           .------->   26RET
  167           .           .        26-O
                .           .           .
                .           .           .
  172           .          P2............
                .           V
                .           V
  175           .       P2-O4
                .           .
                .           .
  181           .           .         11A
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              .           .           .
              .           .           .
191           .           .           .-------> 11ARET
189           .           .      11A-O
              .           .          V
              .           .          V
194           .           .     N1A-1B
              .           .           .
              .           .           .
200           .           .           .        11B
              .           .           .          .
              .           .           .          .
210           .           .           .          .-------> 11BRET
208           .           .           .      11B-O
              .           .           .          .
              .           .           .          .
213           .           .        N1B............
              .           .          V
              .           .          V
216           .           .      N1BO4
              .           .           .
              .           .           .
222         O4......................
              .
              .
228           .-------> DIMB01
225       MB01
            V
            V
231     RT2311
              .
              .
238           .         39
              .           .
              .           .
248           .           .------->   39RET
246           .       39-O
              .           .
              .           .
251         O5............
            V
            V
254     RT2312
              .
              .
261           .         38
              .           .
              .           .
271           .           .------->   38RET
269           .       38-O
              .          V
              .          V
274           .      N3-N4
              .           .
              .           .
280           .           .         49
              .           .          .
              .           .          .
290           .           .          .------->   49RET
288           .           .       49-O
              .           .          .
              .           .          .
293           .         N4............
              .          V
              .          V
296           .      N4-O6
              .           .
              .           .
302           .           .         50
              .           .          .
              .           .          .
312           .           .          .------->   50RET
310           .           .       50-O
              .           .          .
              .           .          .
315           .        O6A............
              .           .
              .           .
318         O6B............
            V
            V
321     RTSTN1
            V
            V
328     RTRBW1
              .
              .
335           .         40
              .           .
              .           .
345           .           .------->   40RET
343           .       40-O
              .          V
              .          V
348           .      P3-P4
              .           .
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354             .           .          51
                .           .           .
                .           .           .
364             .           .           .-------->   51RET
362             .           .        51-O
                .           .           .
                .           .           .
367             .          P4............
                .           .
                .           .
373             .           .-------->  DIMB05
370             .        MB05
                .           V
                .           V
376             .       P4-P5
                .           .
                .           .
382             .           .          58
                .           .           .
                .           .           .
392             .           .           .-------->   58RET
390             .           .        58-O
                .           .           .
                .           .           .
395             .          P5............
                .           V
                .           V
398             .      RTURR1
                .           .
                .           .
405           O7............
              V
              V
408       RTURR2
                .
                .
415             .          57
                .           .
                .           .
425             .           .-------->   57RET
423             .        57-O
                .           .
                .           .
428          N5B............
              V
              V
431       RTURR3
                .
                .
438             .         56B
                .           .
                .           .
448             .           .-------->  56BRET
446             .       56B-O
                .           .
                .           .
451        CP56B............
                .
                .
454             .         10E
                .           .
                .           .
464             .           .-------->  10ERET
462             .       10E-O
                .           V
                .           V
467             .      L1AL2A
                .           .
                .           .
473             .           .         22E
                .           .           .
                .           .           .
483             .           .           .-------->  22ERET
481             .           .       22E-O
                .           .           .
                .           .           .
486             .         L2A............
                .           .
                .           .
489             .           .         11C
                .           .           .
                .           .           .
499             .           .           .-------->  11CRET
497             .           .       11C-O
                .           .           V
                .           .           V
502             .           .      N1C-N2
                .           .           .
                .           .           .
508             .           .           .          23
                .           .           .           .
                .           .           .           .
518             .           .           .           .-------->   23RET
516             .           .           .        23-O
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                .          .          .
521             .       N2.......................
                .          .
                .          .
527             .          .-------> DIMB03
524             .     MB03
                .          V
                .          V
530             .   RTAPR1
                .          V
                .          V
537             .   RTAPR2
                .          V
                .          V
544             .   RTAPR3
                .          .
                .          .
551             .          .         37
                .          .          .
                .          .          .
561             .          .          .-------> 37RET
559             .          .      37-O
                .          .          V
                .          .          V
564             .          .   37-M2B
                .          .          .
                .          .          .
570             .          .          .         36
                .          .          .          .
                .          .          .          .
580             .          .          .          .-------> 36RET
578             .          .          .      36-O
                .          .          .          V
                .          .          .          V
583             .          .          .   L3-M2A
                .          .          .          .
                .          .          .          .
589             .          .          .          .        47N
                .          .          .          .          .
                .          .          .          .          .
599             .          .          .          .          .-------> 47NRET
597             .          .          .          .      47N-O
                .          .          .          .          .
                .          .          .          .          .
602             .          .          .       M2A...........
                .          .          .          V
                .          .          .          V
605             .          .          .   RTMCR1
                .          .          .          .
                .          .          .          .
612             .          .          .          .         48
                .          .          .          .          .
                .          .          .          .          .
622             .          .          .          .          .-------> 48RET
620             .          .          .          .      48-O
                .          .          .          .          .
                .          .          .          .          .
625             .          .       M2B........................
                .          .          .
                .          .          .
631             .          .          .-------> DIMB04
628             .          .      MB04
                .          .          .
                .          .          .
634             .          .          .       56A
                .          .          .          .
                .          .          .          .
644             .          .          .          .-------> 56ARET
642             .          .          .     56A-O
                .          .          .          .
                .          .          .          .
649             .          .          .          .-------> DT56A
647             .          .          .     DV56A
                .          .          .          .
                .          .          .          .
652             .       M2C........................
                .          V
                .          V
655             .   RTMCR2
                .          V
                .          V
662             .   RTSPT1
                .          .
                .          .
669         CP56A...........
                V
                V
672         RTSPT2
                .
                .
679             .       70
                .          .
                .          .
689             .          .-------> 70RET
687             .     70-O
                .          .
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                .           .
694             .           .           .<-------   DT56A
692             .           .       RT56A
                .           .           .
                .           .           .
695           N6.......................
               V
               V
698        RTSPT3
                .
                .
705             .       DET24
                .           .
                .           .
744        TOBINF............
               V
               V
747        RTMRA2
                .
                .
754             .         92N
                .           .
                .           .
764             .           .-------> 92NRET
762             .       92N-O
                .           .
                .           .
767          O10A............
                .
                .
770             .          71
                .           .
                .           .
780             .           .------->  71RET
778             .        71-O
                .           .
                .           .
783             .           .          93
                .           .           .
                .           .           .
793             .           .           .------->  93RET
791             .           .        93-O
                .           .           .
                .           .           .
796             .          O9............
                .           V
                .           V
799             .      RT2314
                .           .
                .           .
806             .           .          95
                .           .           .
                .           .           .
816             .           .           .------->  95RET
814             .           .        95-O
                .           .           .
                .           .           .
819             .         P8B............
                .           V
                .           V
822             .      RTMRA1
                .           .
                .           .
829          O10B............
               V
               V
832        RTWTR1
                .
                .
839             .      DRAN24
                .           .
                .           .
895             .           .         92S
                .           .           .
                .           .           .
905             .           .           .-------> 92SRET
903             .           .       92S-O
                .           .           .
                .           .           .
908             .      TOB92S............
                .           .
                .           .
911             .           .          72
                .           .           .
                .           .           .
921             .           .           .------->  72RET
919             .           .        72-O
                .           .           .
                .           .           .
924             .           .           .          94
                .           .           .           .
                .           .           .           .
934             .           .           .           .------->  94RET
932             .           .           .        94-O
                .           .           .           .
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 937          .           .          P7............
              .           .           V
              .           .           V
 940          .           .      94-P8A
              .           .           .
              .           .           .
 946          .           .           .          96
              .           .           .           .
              .           .           .           .
 956          .           .           .           .-------->   96RET
 954          .           .           .        96-O
              .           .           .           .
              .           .           .           .
 959          .           .         P8A............
              .           .           V
              .           .           V
 962          .           .      P8A-P9
              .           .           .
              .           .           .
 968          .           .           .          97
              .           .           .           .
              .           .           .           .
 978          .           .           .           .-------->   97RET
 976          .           .           .        97-O
              .           .           .           .
              .           .           .           .
 981        P9.....................................
            V
            V
 984     RTWTR2
            .
            .
 991        .         100
            .           .
            .           .
1001        .           .-------->  100RET
 999        .       100-O
            .           .
            .           .
1004       P10............
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ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin 01								
12	Hydrograph	0.740						1,156
12RET	Diversion	0.740						1,156
12-O	Hydrograph	0.740						
O1-O2	Routed	0.740						
13	Hydrograph	0.500						919
13RET	Diversion	0.500						919
13-O	Hydrograph	0.500						
O2	Combined	1.240						
O2-O3A	Routed	1.240						
24	Hydrograph	0.490						746
24RET	Diversion	0.490						2
24-O	Hydrograph	0.490						746
O3A	Combined	1.730						739
O3AO3B	Routed	1.730						671
25	Hydrograph	0.270						235
25RET	Diversion	0.270						235
25-O	Hydrograph	0.270						18
O3B	Combined	2.000						671
14A	Hydrograph	0.690						712
14ARET	Diversion	0.690						712
14A-O	Hydrograph	0.690						31
P1AP1B	Routed	0.690						24
83	Hydrograph	0.680						672
83RET	Diversion	0.680						672
83-O	Hydrograph	0.680						204
14B	Hydrograph	0.500						729
14BRET	Diversion	0.500						729
14B-O	Hydrograph	0.500						
P1B	Combined	1.870						204
P1B-P2	Routed	1.870						103
26	Hydrograph	0.520						621
26RET	Diversion	0.520						9
26-O	Hydrograph	0.520						621
P2	Combined	2.390						610
P2-O4	Routed	2.390						479
11A	Hydrograph	0.570						1,075
11ARET	Diversion	0.570						1,075
11A-O	Hydrograph	0.570						6
N1A-1B	Routed	0.570						6
11B	Hydrograph	0.580						586
11BRET	Diversion	0.580						586
11B-O	Hydrograph	0.580						12
N1B	Combined	1.150						11
N1BO4	Routed	1.150						11
O4	Combined	5.550						767
DIMB01	Diversion	5.550						717
MB01	Hydrograph	5.550						50
RT2311	Routed	5.550						50
39	Hydrograph	0.730						610
39RET	Diversion	0.730						610
39-O	Hydrograph	0.730						339
O5	Combined	0.730						389
RT2312	Routed	0.730						260
38	Hydrograph	0.540						465
38RET	Diversion	0.540						465
38-O	Hydrograph	0.540						214
N3-N4	Routed	0.540						109
49	Hydrograph	1.010						737
49RET	Diversion	1.010						737
49-O	Hydrograph	1.010						21
N4	Combined	1.550						109
N4-O6	Routed	1.550						74
50	Hydrograph	1.000						758
50RET	Diversion	1.000						758
50-O	Hydrograph	1.000						402

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
O6A	Combined	2.550						334
O6B	Combined	3.280						548
RTSTN1	Routed	3.280						470
RTRBW1	Routed	3.280						462
40	Hydrograph	0.980						787
40RET	Diversion	0.980						787
40-O	Hydrograph	0.980						326
P3-P4	Routed	0.980						328
51	Hydrograph	1.000						765
51RET	Diversion	1.000						765
51-O	Hydrograph	1.000						394
P4	Combined	1.980						527
DIMB05	Diversion	1.980						477
MB05	Hydrograph	1.980						50
P4-P5	Routed	1.980						50
58	Hydrograph	0.190						416
58RET	Diversion	0.190						416
58-O	Hydrograph	0.190						72
P5	Combined	0.190						72
RTURR1	Routed	0.190						60
O7	Combined	3.470						494
RTURR2	Routed	3.470						441
57	Hydrograph	0.490						1,008
57RET	Diversion	0.490						1,008
57-O	Hydrograph	0.490						
N5B	Combined	3.960						441
RTURR3	Routed	3.960						426
56B	Hydrograph	0.330						708
56BRET	Diversion	0.330						708
56B-O	Hydrograph	0.330						
CP56B	Combined	4.300						426
10E	Hydrograph	0.590						615
10ERET	Diversion	0.590						615
10E-O	Hydrograph	0.590						241
L1AL2A	Routed	0.590						149
22E	Hydrograph	0.290						358
22ERET	Diversion	0.290						358
22E-O	Hydrograph	0.290						130
L2A	Combined	0.880						179
11C	Hydrograph	0.340						437
11CRET	Diversion	0.340						437
11C-O	Hydrograph	0.340						22
N1C-N2	Routed	0.340						15
23	Hydrograph	0.520						448
23RET	Diversion	0.520						448
23-O	Hydrograph	0.520						161
N2	Combined	1.750						293
DIMB03	Diversion	1.750						243
MB03	Hydrograph	1.750						50
RTAPR1	Routed	1.750						50
RTAPR2	Routed	1.750						50
RTAPR3	Routed	1.750						50
37	Hydrograph	1.420						1,031
37RET	Diversion	1.420						1,031
37-O	Hydrograph	1.420						453
37-M2B	Routed	1.420						347
36	Hydrograph	0.680						553
36RET	Diversion	0.680						553
36-O	Hydrograph	0.680						184
L3-M2A	Routed	0.680						105
47N	Hydrograph	0.230						225
47NRET	Diversion	0.230						225
47N-O	Hydrograph	0.230						107
M2A	Combined	0.920						125
RTMCR1	Routed	0.920						85
48	Hydrograph	0.500						505

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
48RET	Diversion	0.500						505
48-O	Hydrograph	0.500						245
M2B	Combined	2.840						360
DIMB04	Diversion	2.840						310
MB04	Hydrograph	2.840						50
56A	Hydrograph	0.410						761
56ARET	Diversion	0.410						761
56A-O	Hydrograph	0.410						392
DT56A	Diversion	0.410						157
DV56A	Hydrograph	0.410						235
M2C	Combined	0.410						235
RTMCR2	Routed	0.410						142
RTSPT1	Routed	0.410						130
CP56A	Combined	4.710						536
RTSPT2	Routed	4.710						530
70	Hydrograph	0.140						248
70RET	Diversion	0.140						248
70-O	Hydrograph	0.140						65
RT56A	Hydrograph	0.410						157
N6	Combined	4.850						545
RTSPT3	Routed	4.850						540
DET24	Hydrograph	0.160						153
TOBINF	Combined	5.010						540
RTMRA2	Routed	5.010						525
92N	Hydrograph	0.330						609
92NRET	Diversion	0.330						598
92N-O	Hydrograph	0.330						524
O10A	Combined	5.330						536
71	Hydrograph	0.160						357
71RET	Diversion	0.160						357
71-O	Hydrograph	0.160						69
93	Hydrograph	0.380						527
93RET	Diversion	0.380						527
93-O	Hydrograph	0.380						422
O9	Combined	0.530						451
RT2314	Routed	0.530						354
95	Hydrograph	0.520						532
95RET	Diversion	0.520						532
95-O	Hydrograph	0.520						483
P8B	Combined	1.050						696
RTMRA1	Routed	1.050						586
O10B	Combined	6.390						705
RTWTR1	Routed	6.390						688
DRAN24	Hydrograph	0.750						535
92S	Hydrograph	0.690						1,004
92SRET	Diversion	0.690						990
92S-O	Hydrograph	0.690						907
TOB92S	Combined	1.440						907
72	Hydrograph	0.090						175
72RET	Diversion	0.090						175
72-O	Hydrograph	0.090						9
94	Hydrograph	0.720						875
94RET	Diversion	0.720						875
94-O	Hydrograph	0.720						712
P7	Combined	0.810						721
94-P8A	Routed	0.810						529
96	Hydrograph	0.910						833
96RET	Diversion	0.910						833
96-O	Hydrograph	0.910						559
P8A	Combined	1.720						968
P8A-P9	Routed	1.720						601
97	Hydrograph	0.500						463
97RET	Diversion	0.500						463
97-O	Hydrograph	0.500						369
P9	Combined	10.040						1,065
RTWTR2	Routed	10.040						945

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
100	Hydrograph	0.580						506
100RET	Diversion	0.580						506
100-O	Hydrograph	0.580						279
P10	Combined	10.630						1,060

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                 SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE       (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   27          12
                .
                .
   37           .------->   12RET
   35        12-O
                V
                V
   40       O1-O2
                .
                .
   45           .          13
                .           .
                .           .
   55           .           .------->   13RET
   53           .        13-O
                .           .
                .           .
   58          O2............
                V
                V
   61      O2-O3A
                .
                .
   67           .          24
                .           .
                .           .
   77           .           .------->   24RET
   75           .        24-O
                .           .
                .           .
   80         O3A............
                V
                V
   83      O3AO3B
                .
                .
   89           .          25
                .           .
                .           .
   99           .           .------->   25RET
   97           .        25-O
                .           .
                .           .
  102         O3B............
                .
                .
  105           .         14A
                .           .
                .           .
  115           .           .------->  14ARET
  113           .       14A-O
                .           V
                .           V
  118           .      P1AP1B
                .           .
                .           .
  124           .           .          83
                .           .           .
                .           .           .
  134           .           .           .------->   83RET
  132           .           .        83-O
                .           .           .
                .           .           .
  137           .           .           .         14B
                .           .           .           .
                .           .           .           .
  147           .           .           .           .------->  14BRET
  145           .           .           .       14B-O
                .           .           .           .
                .           .           .           .
  150           .         P1B........................
                .           V
                .           V
  153           .      P1B-P2
                .           .
                .           .
  159           .           .          26
                .           .           .
                .           .           .
  169           .           .           .------->   26RET
  167           .           .        26-O
                .           .           .
                .           .           .
  172           .          P2............
                .           V
                .           V
  175           .       P2-O4
                .           .
                .           .
  181           .           .         11A
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                .          .          .
                .          .          .
191             .          .          .-------> 11ARET
189             .          .      11A-O
                .          .          V
                .          .          V
194             .          .     N1A-1B
                .          .          .
                .          .          .
200             .          .          .         11B
                .          .          .           .
                .          .          .           .
210             .          .          .           .-------> 11BRET
208             .          .          .      11B-O
                .          .          .           .
                .          .          .           .
213             .          .        N1B...........
                .          .          V
                .          .          V
216             .          .      N1BO4
                .          .          .
                .          .          .
222           O4......................
                .
                .
228             .-------> DIMB01
225         MB01
              V
              V
231       RT2311
                .
                .
237             .         39
                .          .
                .          .
247             .          .------->  39RET
245             .       39-O
                .          .
                .          .
250           O5...........
              V
              V
253       RT2312
                .
                .
259             .         38
                .          .
                .          .
269             .          .------->  38RET
267             .       38-O
                .          V
                .          V
272             .      N3-N4
                .          .
                .          .
278             .          .         49
                .          .          .
                .          .          .
288             .          .          .------->  49RET
286             .          .       49-O
                .          .          .
                .          .          .
291             .         N4...........
                .          V
                .          V
294             .      N4-O6
                .          .
                .          .
300             .          .         50
                .          .          .
                .          .          .
310             .          .          .------->  50RET
308             .          .       50-O
                .          .          .
                .          .          .
315             .          .          .------->   DT50
313             .          .       DV50
                .          .          .
                .          .          .
318             .        O6A...........
                .          .
                .          .
324             .          .-------> DIMB02
321             .       MB02
                .          .
                .          .
329             .          .          .<-------   DT50
327             .          .       RT50
                .          .          .
                .          .          .
330           O6B......................
              V
              V
333       RT2313
                .
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339          .          57
             .           .
             .           .
349          .           .-------->   57RET
347          .        57-O
             .           .
             .           .
352          .       O7............
             .        V
             .        V
355          .     SSD57
             .
             .
362          .          40
             .           .
             .           .
372          .           .-------->   40RET
370          .        40-O
             .           V
             .           V
375          .       P3-P4
             .           .
             .           .
381          .           .          51
             .           .           .
             .           .           .
391          .           .           .-------->   51RET
389          .           .        51-O
             .           .           .
             .           .           .
394          .          P4............
             .           .
             .           .
400          .           .-------->  DIMB05
397          .        MB05
             .           .
             .           .
403          .           .          58
             .           .           .
             .           .           .
413          .           .           .-------->   58RET
411          .           .        58-O
             .           .           .
             .           .           .
416          .          P5............
             .           V
             .           V
419          .       SSD58
             .           .
             .           .
426          .           .          72
             .           .           .
             .           .           .
436          .           .           .-------->   72RET
434          .           .        72-O
             .           .           .
             .           .           .
439          .          P6............
             .           .
             .           .
442          .           .          71
             .           .           .
             .           .           .
452          .           .           .-------->   71RET
450          .           .        71-O
             .           .           .
             .           .           .
455          .       O8........................
             .
             .
458          .         10E
             .           .
             .           .
468          .           .-------->  10ERET
466          .       10E-O
             .           V
             .           V
471          .      L1AL2A
             .           .
             .           .
477          .           .         22E
             .           .           .
             .           .           .
487          .           .           .-------->  22ERET
485          .           .       22E-O
             .           .           .
             .           .           .
490          .         L2A............
             .           .
             .           .
493          .           .         11C
             .           .           .
             .           .           .
503          .           .           .-------->  11CRET
501          .           .       11C-O
             .           .           V
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                 .          .          V
506              .          .     N1C-N2
                 .          .          .
                 .          .          .
512              .          .          .          23
                 .          .          .           .
                 .          .          .           .
522              .          .          .           .-------->   23RET
520              .          .          .       23-O
                 .          .          .           .
                 .          .          .           .
525              .         N2.......................
                 .          .
                 .          .
531              .          .-------->  DIMB03
528              .        MB03
                 .          V
                 .          V
534              .      RTAPR1
                 .          V
                 .          V
540              .      RTAPR2
                 .          V
                 .          V
546              .      RTAPR3
                 .          .
                 .          .
552              .          .          37
                 .          .           .
                 .          .           .
562              .          .           .-------->   37RET
560              .          .        37-O
                 .          .           V
                 .          .           V
565              .          .     37-M2B
                 .          .           .
                 .          .           .
571              .          .           .          36
                 .          .           .           .
                 .          .           .           .
581              .          .           .           .-------->   36RET
579              .          .           .       36-O
                 .          .           .           V
                 .          .           .           V
584              .          .           .      L3-M2A
                 .          .           .           .
                 .          .           .           .
590              .          .           .           .         47N
                 .          .           .           .           .
                 .          .           .           .           .
600              .          .           .           .           .-------->  47NRET
598              .          .           .           .       47N-O
                 .          .           .           .           .
                 .          .           .           .           .
603              .          .           .         M2A............
                 .          .           .           V
                 .          .           .           V
606              .          .           .      RTMCR1
                 .          .           .           .
                 .          .           .           .
612              .          .           .           .          48
                 .          .           .           .           .
                 .          .           .           .           .
622              .          .           .           .           .-------->   48RET
620              .          .           .           .        48-O
                 .          .           .           .           .
                 .          .           .           .           .
625              .          .         M2B........................
                 .          .           .
                 .          .           .
631              .          .           .-------->  DIMB04
628              .          .        MB04
                 .          .           .
                 .          .           .
634              .          .           .         56A
                 .          .           .           .
                 .          .           .           .
644              .          .           .           .-------->  56ARET
642              .          .           .      56A-O
                 .          .           .           .
                 .          .           .           .
649              .          .           .           .-------->   DT56A
647              .          .           .      DV56A
                 .          .           .           .
                 .          .           .           .
652              .         M2C........................
                 .          V
                 .          V
655              .      RTMCR2
                 .          V
                 .          V
662              .      RTSPT1
                 .          .
                 .          .
671              .          .           .<--------   DT56A
669              .          .       RT56A
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672             .         N5...........
                .          V
                .          V
675             .      SSD56A
                .          .
                .          .
682             .          .         70
                .          .          .
                .          .          .
692             .          .          .-------->   70RET
690             .          .       70-O
                .          .          .
                .          .          .
695             .          .          .         56B
                .          .          .           .
                .          .          .           .
705             .          .          .           .-------->  56BRET
703             .          .          .      56B-O
                .          .          .           V
                .          .          .           V
708             .          .          .     SSD56B
                .          .          .           .
                .          .          .           .
715           N6.................................
               V
               V
718       RTSPT3
                .
                .
725             .       DET24
                .          .
                .          .
764       TOBINF...........
               V
               V
767       RTMRA2
                .
                .
774             .         92N
                .          .
                .          .
784             .          .-------->  92NRET
782             .       92N-O
                .          .
                .          .
787         O10A...........
                .
                .
790             .          93
                .          .
                .          .
800             .          .-------->   93RET
798             .        93-O
                .          V
                .          V
803             .      RT2314
                .          .
                .          .
810             .          .         95
                .          .          .
                .          .          .
820             .          .          .-------->   95RET
818             .          .       95-O
                .          .          .
                .          .          .
823             .         P8B...........
                .          V
                .          V
826             .      RTMRA1
                .          .
                .          .
833         O10B...........
               V
               V
836       RTWTR1
                .
                .
843             .      DRAN24
                .          .
                .          .
899             .          .         92S
                .          .          .
                .          .          .
909             .          .          .-------->  92SRET
907             .          .       92S-O
                .          .          .
                .          .          .
912             .      TOB92S...........
                .          .
                .          .
915             .          .         94
                .          .          .
                .          .          .
925             .          .          .-------->   94RET
```

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923          .           .        94-O
             .           .           V
             .           .           V
928          .           .      94-P8A
             .           .           .
             .           .           .
934          .           .           .          96
             .           .           .           .
             .           .           .           .
944          .           .           .           .-------->   96RET
942          .           .           .        96-O
             .           .           .           .
             .           .           .           .
947          .           .         P8A............
             .           .           V
             .           .           V
950          .           .      P8A-P9
             .           .           .
             .           .           .
956          .           .           .          97
             .           .           .           .
             .           .           .           .
966          .           .           .           .-------->   97RET
964          .           .           .        97-O
             .           .           .           .
             .           .           .           .
969          P9.....................................
             V
             V
972      RTWTR2
             .
             .
979          .         100
             .           .
             .           .
989          .           .-------->  100RET
987          .       100-O
             .           .
             .           .
992        P10............
```

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
Major Basin 01								
12	Hydrograph	0.740						1,156
12RET	Diversion	0.740						1,156
12-O	Hydrograph	0.740						
O1-O2	Routed	0.740						
13	Hydrograph	0.500						919
13RET	Diversion	0.500						919
13-O	Hydrograph	0.500						
O2	Combined	1.240						
O2-O3A	Routed	1.240						
24	Hydrograph	0.490						746
24RET	Diversion	0.490						2
24-O	Hydrograph	0.490						746
O3A	Combined	1.730						739
O3AO3B	Routed	1.730						671
25	Hydrograph	0.270						235
25RET	Diversion	0.270						235
25-O	Hydrograph	0.270						18
O3B	Combined	2.000						671
14A	Hydrograph	0.690						712
14ARET	Diversion	0.690						712
14A-O	Hydrograph	0.690						31
P1AP1B	Routed	0.690						24
83	Hydrograph	0.680						672
83RET	Diversion	0.680						672
83-O	Hydrograph	0.680						204
14B	Hydrograph	0.500						729
14BRET	Diversion	0.500						729
14B-O	Hydrograph	0.500						
P1B	Combined	1.870						204
P1B-P2	Routed	1.870						103
26	Hydrograph	0.520						621
26RET	Diversion	0.520						9
26-O	Hydrograph	0.520						621
P2	Combined	2.390						610
P2-O4	Routed	2.390						479
11A	Hydrograph	0.570						1,075
11ARET	Diversion	0.570						1,075
11A-O	Hydrograph	0.570						6
N1A-1B	Routed	0.570						6
11B	Hydrograph	0.580						586
11BRET	Diversion	0.580						586
11B-O	Hydrograph	0.580						12
N1B	Combined	1.150						11
N1BO4	Routed	1.150						11
O4	Combined	5.550						767
DIMB01	Diversion	5.550						717
MB01	Hydrograph	5.550						50
RT2311	Routed	5.550						50
39	Hydrograph	0.730						610
39RET	Diversion	0.730						610
39-O	Hydrograph	0.730						339
O5	Combined	0.730						389
RT2312	Routed	0.730						260
38	Hydrograph	0.540						465
38RET	Diversion	0.540						465
38-O	Hydrograph	0.540						214
N3-N4	Routed	0.540						109
49	Hydrograph	1.010						737
49RET	Diversion	1.010						737
49-O	Hydrograph	1.010						21
N4	Combined	1.550						109
N4-O6	Routed	1.550						74
50	Hydrograph	1.000						758
50RET	Diversion	1.000						758
50-O	Hydrograph	1.000						402

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
DT50	Diversion	1.000						201
DV50	Hydrograph	1.000						201
O6A	Combined	2.550						167
DIMB02	Diversion	2.550						167
MB02	Hydrograph	2.550						
RT50	Hydrograph	1.000						201
O6B	Combined	0.730						421
RT2313	Routed	0.730						397
57	Hydrograph	0.490						1,008
57RET	Diversion	0.490						1,008
57-O	Hydrograph	0.490						
O7	Combined	1.220						397
SSD57	Routed	1.220						69
40	Hydrograph	0.980						787
40RET	Diversion	0.980						787
40-O	Hydrograph	0.980						326
P3-P4	Routed	0.980						328
51	Hydrograph	1.000						765
51RET	Diversion	1.000						765
51-O	Hydrograph	1.000						394
P4	Combined	1.980						527
DIMB05	Diversion	1.980						527
MB05	Hydrograph	1.980						
58	Hydrograph	0.190						416
58RET	Diversion	0.190						416
58-O	Hydrograph	0.190						72
P5	Combined	0.190						72
SSD58	Routed	0.190						14
72	Hydrograph	0.090						175
72RET	Diversion	0.090						175
72-O	Hydrograph	0.090						9
P6	Combined	0.280						22
71	Hydrograph	0.160						357
71RET	Diversion	0.160						357
71-O	Hydrograph	0.160						69
O8	Combined	1.650						84
10E	Hydrograph	0.590						615
10ERET	Diversion	0.590						615
10E-O	Hydrograph	0.590						241
L1AL2A	Routed	0.590						149
22E	Hydrograph	0.290						358
22ERET	Diversion	0.290						358
22E-O	Hydrograph	0.290						130
L2A	Combined	0.880						179
11C	Hydrograph	0.340						437
11CRET	Diversion	0.340						437
11C-O	Hydrograph	0.340						22
N1C-N2	Routed	0.340						15
23	Hydrograph	0.520						448
23RET	Diversion	0.520						448
23-O	Hydrograph	0.520						161
N2	Combined	1.750						293
DIMB03	Diversion	1.750						243
MB03	Hydrograph	1.750						50
RTAPR1	Routed	1.750						50
RTAPR2	Routed	1.750						50
RTAPR3	Routed	1.750						50
37	Hydrograph	1.420						1,031
37RET	Diversion	1.420						1,031
37-O	Hydrograph	1.420						453
37-M2B	Routed	1.420						347
36	Hydrograph	0.680						553
36RET	Diversion	0.680						553
36-O	Hydrograph	0.680						184
L3-M2A	Routed	0.680						105
47N	Hydrograph	0.230						225

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
47NRET	Diversion	0.230						225
47N-O	Hydrograph	0.230						107
M2A	Combined	0.920						125
RTMCR1	Routed	0.920						85
48	Hydrograph	0.500						505
48RET	Diversion	0.500						505
48-O	Hydrograph	0.500						245
M2B	Combined	2.840						360
DIMB04	Diversion	2.840						310
MB04	Hydrograph	2.840						50
56A	Hydrograph	0.410						761
56ARET	Diversion	0.410						761
56A-O	Hydrograph	0.410						392
DT56A	Diversion	0.410						157
DV56A	Hydrograph	0.410						235
M2C	Combined	0.410						235
RTMCR2	Routed	0.410						142
RTSPT1	Routed	0.410						130
RT56A	Hydrograph	0.410						157
N5	Combined	0.410						161
SSD56A	Routed	0.410						128
70	Hydrograph	0.140						248
70RET	Diversion	0.140						248
70-O	Hydrograph	0.140						65
56B	Hydrograph	0.330						708
56BRET	Diversion	0.330						708
56B-O	Hydrograph	0.330						
SSD56B	Routed	0.330						
N6	Combined	2.530						207
RTSPT3	Routed	2.530						205
DET24	Hydrograph	0.160						153
TOBINF	Combined	2.690						207
RTMRA2	Routed	2.690						206
92N	Hydrograph	0.330						609
92NRET	Diversion	0.330						598
92N-O	Hydrograph	0.330						524
O10A	Combined	3.020						520
93	Hydrograph	0.380						527
93RET	Diversion	0.380						527
93-O	Hydrograph	0.380						422
RT2314	Routed	0.380						315
95	Hydrograph	0.520						532
95RET	Diversion	0.520						532
95-O	Hydrograph	0.520						483
P8B	Combined	0.900						678
RTMRA1	Routed	0.900						563
O10B	Combined	3.920						673
RTWTR1	Routed	3.920						656
DRAN24	Hydrograph	0.750						535
92S	Hydrograph	0.690						1,004
92SRET	Diversion	0.690						990
92S-O	Hydrograph	0.690						907
TOB92S	Combined	1.440						907
94	Hydrograph	0.720						875
94RET	Diversion	0.720						875
94-O	Hydrograph	0.720						712
94-P8A	Routed	0.720						521
96	Hydrograph	0.910						833
96RET	Diversion	0.910						833
96-O	Hydrograph	0.910						559
P8A	Combined	1.630						963
P8A-P9	Routed	1.630						597
97	Hydrograph	0.500						463
97RET	Diversion	0.500						463
97-O	Hydrograph	0.500						369
P9	Combined	7.490						1,140

ID	Type	Area (sq mi)	Discharge cfs 2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
RTWTR2	Routed	7.490						945
100	Hydrograph	0.580						506
100RET	Diversion	0.580						506
100-O	Hydrograph	0.580						279
P10	Combined	8.070						1,034

Appendix C

Evaluation Tabulations

WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 16

NAME GARY SHARPE

	BASE	ALT A	ALT B	ALT C	
Constructability	1	2	2	4	3
Implementation	3	3	2	3	3
Life Cycle Costs	4	2	3	1	1
LS Aesthetics/Landuse Compatibility	1	3	2	1	3
Natural & Cultural Resources	1	3	2	1	3
Public/Political Acceptance	1	3	2	1	
Safety/Flood Hazard Reduction	1	1	1	2	
Synergy/Multi-Use	1	3	2	1	3
	14	24	20	26	22

Constructability

1	2	3	4	5
Shallow groundwater				Deep groundwater
Significant utility impact				Avoids all significant utilities
Complex design and construction				Straight-forward design/construction
Significant permitting required				Minimal permitting required
Significant Hazardous Materials				Avoids known hazardous materials

Implementation

1	2	3	4	5
Few funding sources available				Significant funding sources available
No partnering opportunities				Multiple partnering opportunities
No phasing opportunity				Many phasing opportunities
Unfavorable cost split location				Favorable cost split location

Life Cycle Costs

1	2	3	4	5
High O&M costs				No O&M costs
High water use				Low water use

LS Aesthetics/Landuse Compatibility

1	2	3	4	5
Incompatible with future landscape character				Compatible with future landscape character
Obscures views of distinctive scenic features				Enhances views of distinctive scenic features
Increases degraded landscape				Restores degraded landscapes
Doesn't meet open space needs				Meets open space needs
No opportunity for trail and park shared use				Aligns with trail and park plans

Natural & Cultural Resources

1	2	3	4	5
Degrades natural resources				Enhances natural resources
Outside cultural resources completed survey area				Within cultural resources survey area
No new habitat				Creates significant new habitat

Public/Political Acceptance

1	2	3	4	5
Political / legal opposition				High political support
Organized legal opposition				High special interest group support
High negative impact on neighborhoods				Beneficial impacts to neighborhoods
Severe community opposition				High community support

Safety/Flood Hazard Reduction

1	2	3	4	5
Doesn't solve existing flooding problems				Solves existing flooding problems
Provides low level of flood protection				Eliminates 100-year floodplains
supercritical flow regime				sub critical flow regime
Storm related street closures				All weather street crossings

Synergy/Multi-Use

1	2	3	4	5
Meets with no other plans				Plan matches other agency plans
No connectivity Between local and regional facilities				Optimizes local/regional connectivity
No Implementation of regional trails plan				Fully implements regional trails plan
Single use for each facility				Many uses for each facility

COMMENTS

BASE 74 m → 76 m
A 76 m
B 80 m
C 79 m

DEAD BASIN 2 m

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WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 1

NAME Adam Copeland

	BASE	ALT A	ALT B	ALT C
Constructability				
Implementation	3	3	3	2
Life Cycle Costs				
LS Aesthetics/Landuse Compatibility	2	3	3	1
Natural & Cultural Resources				
Public/Political Acceptance	2	3	3	1
Safety/Flood Hazard Reduction				
Synergy/Multi-Use	3	3	4	1

Constructability

1	2	3	4	5
Shallow groundwater				Deep groundwater
Significant utility impact				Avoids all significant utilities
Complex design and construction				Straight-forward design/construction
Significant permitting required				Minimal permitting required
Significant Hazardous Materials				Avoids known hazardous materials

Implementation

1	2	3	4	5
Few funding sources available				Significant funding sources available
No partnering opportunities				Multiple partnering opportunities
No phasing opportunity				Many phasing opportunities
Unfavorable cost split location				Favorable cost split location

Life Cycle Costs

1	2	3	4	5
High O&M costs				No O&M costs
High water use				Low water use

LS Aesthetics/Landuse Compatibility

1	2	3	4	5
Incompatible with future landscape character				Compatible with future landscape character
Obscures views of distinctive scenic features				Enhances views of distinctive scenic features
Increases degraded landscape				Restores degraded landscapes
Doesn't meet open space needs				Meets open space needs
No opportunity for trail and park shared use				Aligns with trail and park plans

Natural & Cultural Resources

1	2	3	4	5
Degrades natural resources				Enhances natural resources
Outside cultural resources completed survey area				Within cultural resources survey area
No new habitat				Creates significant new habitat

Public/Political Acceptance

1	2	3	4	5
Political / legal opposition				High political support
Organized legal opposition				High special interest group support
High negative impact on neighborhoods				Beneficial impacts to neighborhoods
Severe community opposition				High community support

Safety/Flood Hazard Reduction

1	2	3	4	5
Doesn't solve existing flooding problems				Solves existing flooding problems
Provides low level of flood protection				Eliminates 100-year floodplains
supercritical flow regime				sub critical flow regime
Storm related street closures				All weather street crossings

Synergy/Multi-Use

1	2	3	4	5
Meets with no other plans				Plan matches other agency plans
No connectivity Between local and regional facilities				Optimizes local/regional connectivity
No Implementation of regional trails plan				Fully implements regional trails plan
Single use for each facility				Many uses for each facility

COMMENTS

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WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 2

NAME Bob Wisener

		BASE	ALT A	ALT B	ALT C	1	2	3	4	5
3	Constructability	1	2	2	3	Shallow groundwater	Significant utility impact	Complex design and construction	Significant permitting required	Significant Hazardous Materials	Deep groundwater	Avoids all significant utilities	Straight-forward design/construction	Minimal permitting required	Avoids known hazardous materials
1	Implementation	1	3	3	3	Few funding sources available	No partnering opportunities	No phasing opportunity	Unfavorable cost split location	Significant funding sources available	Multiple partnering opportunities	Many phasing opportunities	Favorable cost split location
		2 crossings								
2	Life Cycle Costs	4	3	3	1	High O&M costs	High water use	No O&M costs	Low water use
4	LS Aesthetics/Landuse Compatibility	2	4	3	1	Incompatible with future landscape character	Obscures views of distinctive scenic features	Increases degraded landscape	Doesn't meet open space needs	No opportunity for trail and park shared use	Compatible with future landscape character	Enhances views of distinctive scenic features	Restores degraded landscapes	Meets open space needs	Aligns with trail and park plans
4	Natural & Cultural Resources	3	2	3	1	Degrades natural resources	Outside cultural resources completed survey area	No new habitat	Enhances natural resources	Within cultural resources survey area	Creates significant new habitat
2	Public/Political Acceptance	3	3	3	3	Political / legal opposition	Organized legal opposition	High negative impact on neighborhoods	Severe community opposition	High political support	High special interest group support	Beneficial impacts to neighborhoods	High community support
5	Safety/Flood Hazard Reduction	3	3	3	3	Doesn't solve existing flooding problems	Provides low level of flood protection	supercritical flow regime	Storm related street closures	Solves existing flooding problems	Eliminates 100-year floodplains	sub critical flow regime	All weather street crossings
4	Synergy/Multi-Use	2	2	4	1	Meets with no other plans	No connectivity Between local and regional facilities	No Implementation of regional trails plan	Single use for each facility	Plan matches other agency plans	Optimizes local/regional connectivity	Fully implements regional trails plan	Many uses for each facility
		19	22	24	16								

COMMENTS

natural re source surveys vs impacts

WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 3

NAME Fred Sanchez

	BASE	ALT A	ALT B	ALT C
Constructability	1	2	2	3
Implementation	3	3	3	3
Life Cycle Costs	3	2	2	1
LS Aesthetics/Landuse Compatibility	2	4	3	1
Natural & Cultural Resources	3	2	3	1
Public/Political Acceptance	3	3	3	3
Safety/Flood Hazard Reduction	3	3	3	3
Synergy/Multi-Use	2	2	4	1
	18	21	23	16

1	2	3	4	5
Shallow groundwater				Deep groundwater
Significant utility impact				Avoids all significant utilities
Complex design and construction				Straight-forward design/construction
Significant permitting required				Minimal permitting required
Significant Hazardous Materials				Avoids known hazardous materials

1	2	3	4	5
Few funding sources available				Significant funding sources available
No partnering opportunities				Multiple partnering opportunities
No phasing opportunity				Many phasing opportunities
Unfavorable cost split location				Favorable cost split location

1	2	3	4	5
High O&M costs				No O&M costs
High water use				Low water use

1	2	3	4	5
Incompatible with future landscape character				Compatible with future landscape character
Obscures views of distinctive scenic features				Enhances views of distinctive scenic features
Increases degraded landscape				Restores degraded landscapes
Doesn't meet open space needs				Meets open space needs
No opportunity for trail and park shared use				Aligns with trail and park plans

1	2	3	4	5
Degrades natural resources				Enhances natural resources
Outside cultural resources completed survey area				Within cultural resources survey area
No new habitat				Creates significant new habitat

1	2	3	4	5
Political / legal opposition				High political support
Organized legal opposition				High special interest group support
High negative impact on neighborhoods				Beneficial impacts to neighborhoods
Severe community opposition				High community support

1	2	3	4	5
Doesn't solve existing flooding problems				Solves existing flooding problems
Provides low level of flood protection				Eliminates 100-year floodplains
supercritical flow regime				sub critical flow regime
Storm related street closures				All weather street crossings

1	2	3	4	5
Meets with no other plans				Plan matches other agency plans
No connectivity Between local and regional facilities				Optimizes local/regional connectivity
No Implementation of regional trails plan				Fully implements regional trails plan
Single use for each facility				Many uses for each facility

COMMENTS

WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 9

NAME Shimin Li

	BASE	ALT A	ALT B	ALT C	1	2	3	4	5
Constructability	2	3	3	4	Shallow groundwater	Significant utility impact	Complex design and construction	Significant permitting required	Significant Hazardous Materials	Deep groundwater	Avoids all significant utilities	Straight-forward design/construction	Minimal permitting required	Avoids known hazardous materials
Implementation	3	3	3	3	Few funding sources available	No partnering opportunities	No phasing opportunity	Unfavorable cost split location	Significant funding sources available	Multiple partnering opportunities	Many phasing opportunities	Favorable cost split location
Life Cycle Costs	3	2	2	3	High O&M costs	High water use	No O&M costs	Low water use
LS Aesthetics/Landuse Compatibility	3	3	2	4	Incompatible with future landscape character	Obscures views of distinctive scenic features	Increases degraded landscape	Doesn't meet open space needs	No opportunity for trail and park shared use	Compatible with future landscape character	Enhances views of distinctive scenic features	Restores degraded landscapes	Meets open space needs	Aligns with trail and park plans
Natural & Cultural Resources	3	2	3	2	Degrades natural resources	Outside cultural resources completed survey area	No new habitat	Enhances natural resources	Within cultural resources survey area	Creates significant new habitat
Public/Political Acceptance	4	3	3	2	Political / legal opposition	Organized legal opposition	High negative impact on neighborhoods	Severe community opposition	High political support	High special interest group support	Beneficial impacts to neighborhoods	High community support
Safety/Flood Hazard Reduction	2	3	3	4	Doesn't solve existing flooding problems	Provides low level of flood protection	supercritical flow regime	Storm related street closures	Solves existing flooding problems	Eliminates 100-year floodplains	sub critical flow regime	All weather street crossings
Synergy/Multi-Use	3	3	3	3	Meets with no other plans	No connectivity Between local and regional facilities	No Implementation of regional trails plan	Single use for each facility	Plan matches other agency plans	Optimizes local/regional connectivity	Fully implements regional trails plan	Many uses for each facility

COMMENTS

WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 14

NAME GARY WESCH

	BASE	ALT A	ALT B	ALT C	1	2	3	4	5	COMMENTS
Constructability (3)	2	3	4	4	Shallow groundwater Significant utility impact Complex design and construction Significant permitting required Significant Hazardous Materials				Deep groundwater Avoids all significant utilities Straight-forward design/construction Minimal permitting required Avoids known hazardous materials	BASE - REQUIRES 2 CROSSINGS V. CONNECTOR (-) A - Adds 5th basin (-) ONE XING + B - 4 basins + C - ADD CHANNEL, 5th BASIN (-) , NO UPPR X ING
Implementation (1)	1	3	3	2	Few funding sources available No partnering opportunities No phasing opportunity Unfavorable cost split location				Significant funding sources available Multiple partnering opportunities Many phasing opportunities Favorable cost split location	BASE - POSSIBLE DELAY FOR 2 BWCW XINGS A - C - ADDED CHL BOTH SIDES UPRR, NO FUNDING BY DCWL
Life Cycle Costs (2)	4	3	4	2	High O&M costs High water use				No O&M costs Low water use	BASE, B - 4 BASINS INSTEAD OF 5 (+) C - INCREASED CHANNEL LENGTH (-)
LS Aesthetics/Landuse Compatibility (4)	3	4	3	3	Incompatible with future landscape character Obscures views of distinctive scenic features Increases degraded landscape Doesn't meet open space needs No opportunity for trail and park shared use				Compatible with future landscape character Enhances views of distinctive scenic features Restores degraded landscapes Meets open space needs Aligns with trail and park plans	BASE A - BETTER TRAIL CONNECTIVITY THRU CORRIDOR (+)
Natural & Cultural Resources (4)	2	4	3	5	Degrades natural resources Outside cultural resources completed survey area No new habitat				Enhances natural resources Within cultural resources survey area Creates significant new habitat	C - lots more area for habitat
Public/Political Acceptance (2)	1	5	4	3	Political / legal opposition Organized legal opposition High negative impact on neighborhoods Severe community opposition				High political support High special interest group support Beneficial impacts to neighborhoods High community support	BASE - BASIN 4 CONFLICTS WITH CFD (-), BASIN 2 CONFLICTS W/ND ST. B. 4 basins instead of 5 (+) comm'l property impact, Base, B, C, (-)
Safety/Flood Hazard Reduction (5)	4	4	4	3	Doesn't solve existing flooding problems Provides low level of flood protection supercritical flow regime Storm related street closures				Solves existing flooding problems Eliminates 100-year floodplains sub critical flow regime All weather street crossings	C - uncertain flood mitigation (-) w/ EXIST UPRR x-ing
Synergy/Multi-Use (4)	3	3	3	3	Meets with no other plans No connectivity Between local and regional facilities No Implementation of regional trails plan Single use for each facility				Plan matches other agency plans Optimizes local/regional connectivity Fully implements regional trails plan Many uses for each facility	B - 1 less basin
	20	29	28	25						

	CHL LENGTH
BASE	52,445
A	58,926
B	61,235
C	63,542
	67,537

WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 8

NAME Harry R. Cooper

		BASE	ALT A	ALT B	ALT C	1	2	3	4	5	COMMENTS
3	Constructability	2	3	3	2	Shallow groundwater				Deep groundwater	
						Significant utility impact				Avoids all significant utilities	
						Complex design and construction				Straight-forward design/construction	
						Significant permitting required				Minimal permitting required	
						Significant Hazardous Materials				Avoids known hazardous materials	
(↑) 1	Implementation	2	3	3	4	Few funding sources available				Significant funding sources available	
						No partnering opportunities				Multiple partnering opportunities	
						No phasing opportunity				Many phasing opportunities	
						Unfavorable cost split location				Favorable cost split location	
(↑) 2	Life Cycle Costs	3	3	3	2	High O&M costs				No O&M costs	
						High water use				Low water use	
4	LS Aesthetics/Landuse Compatibility	2	3	2	5	Incompatible with future landscape character				Compatible with future landscape character	
						Obscures views of distinctive scenic features				Enhances views of distinctive scenic features	
						Increases degraded landscape				Restores degraded landscapes	
						Doesn't meet open space needs				Meets open space needs	
						No opportunity for trail and park shared use				Aligns with trail and park plans	
(↓) 4	Natural & Cultural Resources	2	3	2	5	Degrades natural resources				Enhances natural resources	
						Outside cultural resources completed survey area				Within cultural resources survey area	
						No new habitat				Creates significant new habitat	
(↑) 2	Public/Political Acceptance	2	3	3	2	Political / legal opposition				High political support	
						Organized legal opposition				High special interest group support	
						High negative impact on neighborhoods				Beneficial impacts to neighborhoods	
						Severe community opposition				High community support	
5	Safety/Flood Hazard Reduction	5	5	5	5	Doesn't solve existing flooding problems				Solves existing flooding problems	
		"all work"				Provides low level of flood protection				Eliminates 100-year floodplains	
						supercritical flow regime				sub critical flow regime	
						Storm related street closures				All weather street crossings	
4	Synergy/Multi-Use	4	2	4	5	Meets with no other plans				Plan matches other agency plans	
						No connectivity Between local and regional facilities				Optimizes local/regional connectivity	
						No Implementation of regional trails plan				Fully implements regional trails plan	
						Single use for each facility				Many uses for each facility	

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WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 6

NAME Larry Harmer

	BASE	ALT A	ALT B	ALT C
Constructability	3	3	3	4
Implementation	3	3	3	4
Life Cycle Costs	3	3	3	3
LS Aesthetics/Landuse Compatibility	3	3	3	2
Natural & Cultural Resources	2	2	2	2
Public/Political Acceptance	3	4	3	2
Safety/Flood Hazard Reduction	5	5	5	5
Synergy/Multi-Use	3	3	3	3

Constructability

1	2	3	4	5
Shallow groundwater				Deep groundwater
Significant utility impact				Avoids all significant utilities
Complex design and construction				Straight-forward design/construction
Significant permitting required				Minimal permitting required
Significant Hazardous Materials				Avoids known hazardous materials

Implementation

1	2	3	4	5
Few funding sources available				Significant funding sources available
No partnering opportunities				Multiple partnering opportunities
No phasing opportunity				Many phasing opportunities
Unfavorable cost split location				Favorable cost split location

Life Cycle Costs

1	2	3	4	5
High O&M costs				No O&M costs
High water use				Low water use

LS Aesthetics/Landuse Compatibility

1	2	3	4	5
Incompatible with future landscape character				Compatible with future landscape character
Obscures views of distinctive scenic features				Enhances views of distinctive scenic features
Increases degraded landscape				Restores degraded landscapes
Doesn't meet open space needs				Meets open space needs
No opportunity for trail and park shared use				Aligns with trail and park plans

Natural & Cultural Resources

1	2	3	4	5
Degrades natural resources				Enhances natural resources
Outside cultural resources completed survey area				Within cultural resources survey area
No new habitat				Creates significant new habitat

Public/Political Acceptance

1	2	3	4	5
Political / legal opposition				High political support
Organized legal opposition				High special interest group support
High negative impact on neighborhoods				Beneficial impacts to neighborhoods
Severe community opposition				High community support

Safety/Flood Hazard Reduction

1	2	3	4	5
Doesn't solve existing flooding problems				Solves existing flooding problems
Provides low level of flood protection				Eliminates 100-year floodplains
supercritical flow regime				sub critical flow regime
Storm related street closures				All weather street crossings

Synergy/Multi-Use

1	2	3	4	5
Meets with no other plans				Plan matches other agency plans
No connectivity Between local and regional facilities				Optimizes local/regional connectivity
No Implementation of regional trails plan				Fully implements regional trails plan
Single use for each facility				Many uses for each facility

COMMENTS

equal in general — each have their own advantages

minimal crossings of UPRR increasing constraint w. implans

limited crossings beneficial

impact to entitled projects — Apache/Rainbow Basins

any use of turf will increase long term maintenance

El Rio Interface important throughout

√ KWR

WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 18

NAME Bob Stevens

	BASE	ALT A	ALT B	ALT C	1	2	3	4	5	COMMENTS
Constructability	2	4	3	5	Shallow groundwater				Deep groundwater	
					Significant utility impact				Avoids all significant utilities	
					Complex design and construction				Straight-forward design/construction	
					Significant permitting required				Minimal permitting required	
					Significant Hazardous Materials				Avoids known hazardous materials	
Implementation	2	5	3	4	Few funding sources available				Significant funding sources available	
					No partnering opportunities				Multiple partnering opportunities	
					No phasing opportunity				Many phasing opportunities	
					Unfavorable cost split location				Favorable cost split location	
Life Cycle Costs	1	3	5	2	High O&M costs				No O&M costs	
					High water use				Low water use	
LS Aesthetics/Landuse Compatibility	2	4	3	5	Incompatible with future landscape character				Compatible with future landscape character	
					Obscures views of distinctive scenic features				Enhances views of distinctive scenic features	
					Increases degraded landscape				Restores degraded landscapes	
					Doesn't meet open space needs				Meets open space needs	
					No opportunity for trail and park shared use				Aligns with trail and park plans	
Natural & Cultural Resources	3	4	2	5	Degrades natural resources				Enhances natural resources	Cultural resource impacts will be the same for all alternatives.
					Outside cultural resources completed survey area				Within cultural resources survey area	
					No new habitat				Creates significant new habitat	
Public/Political Acceptance	5	3	2	4	Political / legal opposition				High political support	
					Organized legal opposition				High special interest group support	
					High negative impact on neighborhoods				Beneficial impacts to neighborhoods	
					Severe community opposition				High community support	
Safety/Flood Hazard Reduction	5	4	2	3	Doesn't solve existing flooding problems				Solves existing flooding problems	
					Provides low level of flood protection				Eliminates 100-year floodplains	
					supercritical flow regime				sub critical flow regime	
					Storm related street closures				All weather street crossings	
Synergy/Multi-Use	4	3		5	Meets with no other plans				Plan matches other agency plans	
					No connectivity Between local and regional facilities				Optimizes local/regional connectivity	
					No Implementation of regional trails plan				Fully implements regional trails plan	
					Single use for each facility				Many uses for each facility	

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WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 17

NAME Richard Harris

	BASE	ALT A	ALT B	ALT C	1	2	3	4	5
Constructability	3	3	3	4	Shallow groundwater				Deep groundwater
					Significant utility impact				Avoids all significant utilities
					Complex design and construction				Straight-forward design/construction
					Significant permitting required				Minimal permitting required
					Significant Hazardous Materials				Avoids known hazardous materials
Implementation	3	4	4	3	Few funding sources available				Significant funding sources available
					No partnering opportunities				Multiple partnering opportunities
					No phasing opportunity				Many phasing opportunities
					Unfavorable cost split location				Favorable cost split location
Life Cycle Costs	3	3	4	3	High O&M costs				No O&M costs
					High water use				Low water use
LS Aesthetics/Landuse Compatibility	3	3	2	4	Incompatible with future landscape character				Compatible with future landscape character
					Obscures views of distinctive scenic features				Enhances views of distinctive scenic features
					Increases degraded landscape				Restores degraded landscapes
					Doesn't meet open space needs				Meets open space needs
					No opportunity for trail and park shared use				Aligns with trail and park plans
Natural & Cultural Resources	3	4	4	3	Degrades natural resources				Enhances natural resources
					Outside cultural resources completed survey area				Within cultural resources survey area
					No new habitat				Creates significant new habitat
Public/Political Acceptance	3	3	2	4	Political / legal opposition				High political support
					Organized legal opposition				High special interest group support
					High negative impact on neighborhoods				Beneficial impacts to neighborhoods
					Severe community opposition				High community support
Safety/Flood Hazard Reduction	3	4	3	4	Doesn't solve existing flooding problems				Solves existing flooding problems
					Provides low level of flood protection				Eliminates 100-year floodplains
					supercritical flow regime				sub critical flow regime
					Storm related street closures				All weather street crossings
Synergy/Multi-Use	3	3	4	3	Meets with no other plans				Plan matches other agency plans
					No connectivity Between local and regional facilities				Optimizes local/regional connectivity
					No Implementation of regional trails plan				Fully implements regional trails plan
					Single use for each facility				Many uses for each facility

COMMENTS

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WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 15

NAME SCOTT LOWE

	BASE	ALT A	ALT B	ALT C
Constructability			"4"	"4"
3	2	3	4	4
Implementation				"2"
1	1	3	3	2
Life Cycle Costs				
2	4	3	3	1
LS Aesthetics/Landuse Compatibility				
4	3	3	3	3
Natural & Cultural Resources				
4	3	3	3	3
Public/Political Acceptance				
2	4	3	3	1
Safety/Flood Hazard Reduction				
5	3	3	3	3
Synergy/Multi-Use				
4	2	3	4	1

1	2	3	4	5
Shallow groundwater				Deep groundwater
Significant utility impact				Avoids all significant utilities
Complex design and construction				Straight-forward design/construction
Significant permitting required				Minimal permitting required
Significant Hazardous Materials				Avoids known hazardous materials

1	2	3	4	5
Few funding sources available				Significant funding sources available
No partnering opportunities				Multiple partnering opportunities
No phasing opportunity				Many phasing opportunities
Unfavorable cost split location				Favorable cost split location

1	2	3	4	5
High O&M costs				No O&M costs
High water use				Low water use

1	2	3	4	5
Incompatible with future landscape character				Compatible with future landscape character
Obscures views of distinctive scenic features				Enhances views of distinctive scenic features
Increases degraded landscape				Restores degraded landscapes
Doesn't meet open space needs				Meets open space needs
No opportunity for trail and park shared use				Aligns with trail and park plans

1	2	3	4	5
Degrades natural resources				Enhances natural resources
Outside cultural resources completed survey area				Within cultural resources survey area
No new habitat				Creates significant new habitat

1	2	3	4	5
Political / legal opposition				High political support
Organized legal opposition				High special interest group support
High negative impact on neighborhoods				Beneficial impacts to neighborhoods
Severe community opposition				High community support

1	2	3	4	5
Doesn't solve existing flooding problems				Solves existing flooding problems
Provides low level of flood protection				Eliminates 100-year floodplains
supercritical flow regime				sub critical flow regime
Storm related street closures				All weather street crossings

1	2	3	4	5
Meets with no other plans				Plan matches other agency plans
No connectivity Between local and regional facilities				Optimizes local/regional connectivity
No Implementation of regional trails plan				Fully implements regional trails plan
Single use for each facility				Many uses for each facility

COMMENTS

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WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 11

NAME Scott Z

	BASE	ALT A	ALT B	ALT C	1	2	3	4	5	COMMENTS
Constructability (3)	1	4	4	5	Shallow groundwater				Deep groundwater	
					Significant utility impact				Avoids all significant utilities	
					Complex design and construction				Straight-forward design/construction	
					Significant permitting required				Minimal permitting required	
					Significant Hazardous Materials				Avoids known hazardous materials	
Implementation (1)	1	4	3	2	Few funding sources available				Significant funding sources available	
					No partnering opportunities				Multiple partnering opportunities	
					No phasing opportunity				Many phasing opportunities	
					Unfavorable cost split location				Favorable cost split location	
Life Cycle Costs (2)	3	4	4	1	High O&M costs				No O&M costs	
					High water use				Low water use	
LS Aesthetics/Landuse Compatibility (4)	2	3	3	2	Incompatible with future landscape character				Compatible with future landscape character	
					Obscures views of distinctive scenic features				Enhances views of distinctive scenic features	
					Increases degraded landscape				Restores degraded landscapes	
					Doesn't meet open space needs				Meets open space needs	
					No opportunity for trail and park shared use				Aligns with trail and park plans	
Natural & Cultural Resources (4)	4	4	4	4	Degrades natural resources				Enhances natural resources	
					Outside cultural resources completed survey area				Within cultural resources survey area	
					No new habitat				Creates significant new habitat	
Public/Political Acceptance (2)	3	4	3	5	Political / legal opposition				High political support	
					Organized legal opposition				High special interest group support	
					High negative impact on neighborhoods				Beneficial impacts to neighborhoods	
					Severe community opposition				High community support	
Safety/Flood Hazard Reduction (5)	5	5	4	2	Doesn't solve existing flooding problems				Solves existing flooding problems	
					Provides low level of flood protection				Eliminates 100-year floodplains	
					supercritical flow regime				sub critical flow regime	
					Storm related street closures				All weather street crossings	
Synergy/Multi-Use (4)	2	4	3	2	Meets with no other plans				Plan matches other agency plans	
					No connectivity Between local and regional facilities				Optimizes local/regional connectivity	
					No Implementation of regional trails plan				Fully implements regional trails plan	
					Single use for each facility				Many uses for each facility	

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WATSON DRAINAGE SYSTEM PREDESIGN

ALTERNATIVES EVALUATION MATRIX
APRIL 24, 2013

ALTERNATIVE SELECTION MEETING

No.: 13

NAME Rob Sachs

	BASE	ALT A	ALT B	ALT C	1	2	3	4	5
Constructability	2	4	3	4	Shallow groundwater				Deep groundwater
					Significant utility impact				Avoids all significant utilities
					Complex design and construction				Straight-forward design/construction
					Significant permitting required				Minimal permitting required
					Significant Hazardous Materials				Avoids known hazardous materials
Implementation	2	4	3	3	Few funding sources available				Significant funding sources available
					No partnering opportunities				Multiple partnering opportunities
					No phasing opportunity				Many phasing opportunities
					Unfavorable cost split location				Favorable cost split location
Life Cycle Costs	2	3	3	2	High O&M costs				No O&M costs
					High water use				Low water use
LS Aesthetics/Landuse Compatibility	2	4	2	4	Incompatible with future landscape character				Compatible with future landscape character
					Obscures views of distinctive scenic features				Enhances views of distinctive scenic features
					Increases degraded landscape				Restores degraded landscapes
					Doesn't meet open space needs				Meets open space needs
					No opportunity for trail and park shared use				Aligns with trail and park plans
Natural & Cultural Resources	2	3	2	4	Degrades natural resources				Enhances natural resources
					Outside cultural resources completed survey area				Within cultural resources survey area
					No new habitat				Creates significant new habitat
Public/Political Acceptance	4	4	2	2	Political / legal opposition				High political support
					Organized legal opposition				High special interest group support
					High negative impact on neighborhoods				Beneficial impacts to neighborhoods
					Severe community opposition				High community support
Safety/Flood Hazard Reduction	3	4	3	3	Doesn't solve existing flooding problems				Solves existing flooding problems
					Provides low level of flood protection				Eliminates 100-year floodplains
					supercritical flow regime				sub critical flow regime
					Storm related street closures				All weather street crossings
Synergy/Multi-Use	3	2	2	4	Meets with no other plans				Plan matches other agency plans
					No connectivity Between local and regional facilities				Optimizes local/regional connectivity
					No Implementation of regional trails plan				Fully implements regional trails plan
					Single use for each facility				Many uses for each facility

COMMENTS underground/culvert
1) ... Park
2) Drainage Acq. [illegible]
3) Park Area