CANDIDATE ASSESSMENT REPORT

for

McMICKEN DAM OUTLET CHANNEL REALIGNMENT

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Prepared for the

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

Project No. 68840
Contract No. 1998-11

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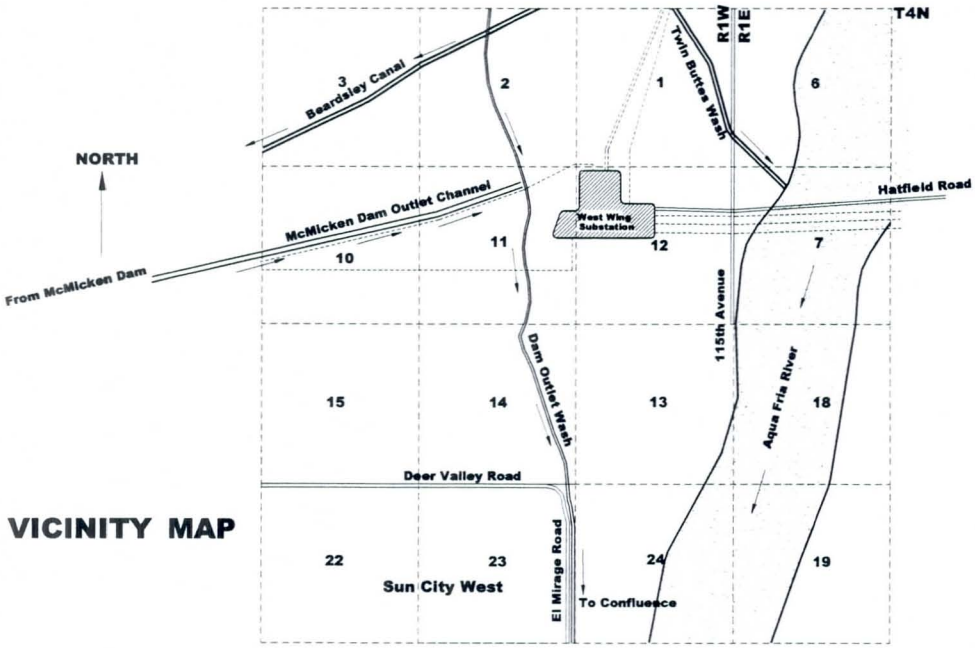
1.0 PROJECT INTRODUCTION

1.1 General Description

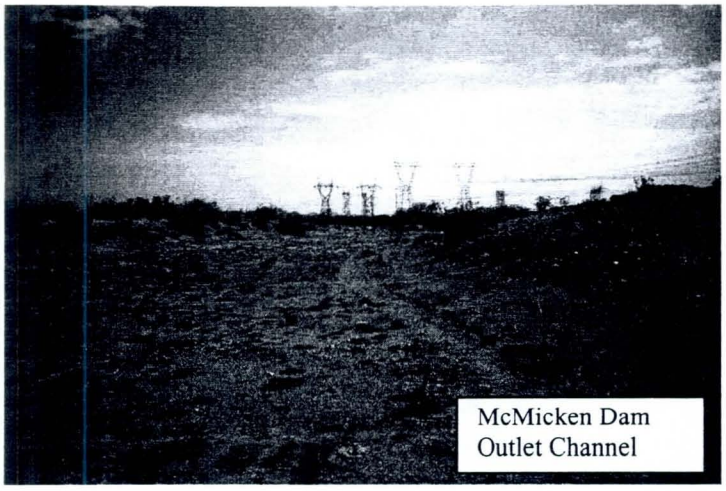
McMicken Dam 'outlet wash' is the downstream component of a flood protection structure, McMicken Dam. The earthen dam is located on the western border of the Town of Surprise, west of Grand Avenue and immediately west of, and parallel to, the Beardsley Canal. The dam is 49,500 feet long, oriented southwest to northeast, and protects Luke Air Force Base and other downstream communities from the effects of floodwaters from Trilby, Iona and McMicken Washes. The dam's origins go back to the 1950's when runway flooding problems occurred on Luke Air Force Base. The U.S. Army Corps of Engineers constructed an earthen dam to protect the base, only to replace it in the early 1970's when the dam failed and flooded Luke again. The dam and its outfall components, including the 'outlet wash', are owned and maintained by the Flood Control District of Maricopa County. During the mid 70's a portion of the outlet wash was widened, from the corner of El Mirage Road and Deer Valley Road to the Agua Fria River, to gain capacity and flood protection for the northeast corner of Del Webb's Sun City West.

The 'outlet wash' receives storm water discharge from the dam's 'outlet channel' at a point approximately one and three quarter miles north of Deer Valley Road and El Mirage Road, flows south for 3.4 miles and discharges into the Agua Fria River, north of Bell Road.

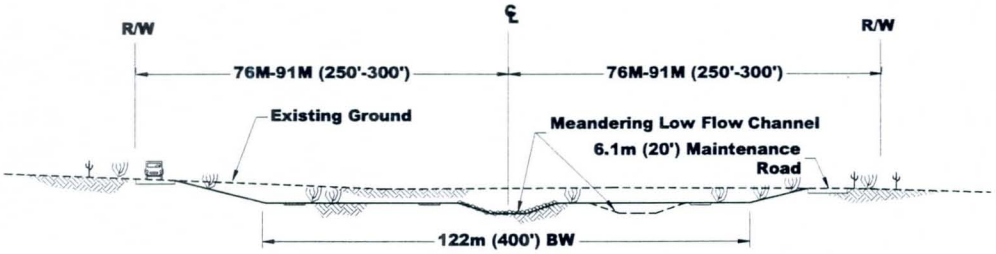


The vicinity map above shows the major existing topographical features referenced in this report. McMicken Dam is not shown, lying several miles to the west.

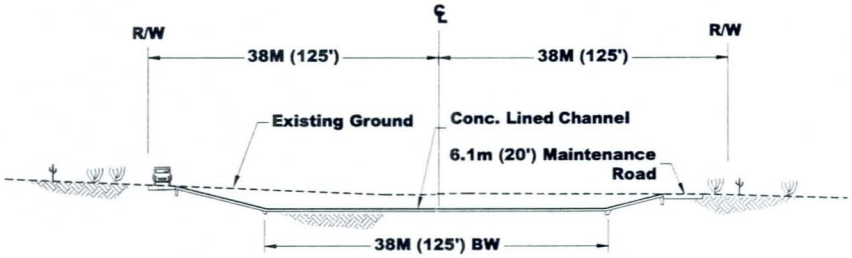
The dam 'outlet channel', looking east at its confluence with the 'outlet wash', is shown in the photo below.



This project examines the merits and costs associated with the construction of a new outlet wash and the transfer of floodwaters to a discharge point approximately four miles upstream of the current discharge point in the Agua Fria River. Four alternate routes (shown on the map figure) and a "do-nothing" alternative are evaluated in this report. Channel materials and spillway types for the build-alternative routes are also evaluated. Typical sections of earthen material and concrete-lined channel sections are shown here.



EARTHEN CHANNEL - TYPICAL SECTION



CONCRETE-LINED CHANNEL - TYPICAL SECTION

1.2 Project Purpose

This project diverts floodwaters from their present course to a discharge point nearer the Agua Fria River. This diversion and the channelization project, in general, serves the following purposes:

- Dam discharges, including damaging floodwaters, would be conveyed eastward to the Agua Fria River from the existing dam outlet channel, instead of being released into the existing natural wash (shown in photo) which has insufficient flow capacity.

- Downstream portions of the current outlet wash lies adjacent to El Mirage Road in Sun City West. Its proximity to the roadway impedes any significant improvements (widening) to the road. Dam discharges also present a potential hazard to the adjacent community, future development and the travelling public.

- The Flood Control District's current land holdings along the existing wash do not sufficiently cover the actual flooded area for the design discharge (see Section 2.1 for definition of design storms). Therefore, flood encroachments onto the adjacent properties will occur. Significant costs will be incurred by the County to acquire the necessary additional easement(s) from the Arizona State Land Trust.

- Planned El Mirage Road realignment calls for crossing the existing outlet wash two times. Diverting dam release flows from the wash would result in significant cost savings in the required drainage structures (bridges and box culverts).

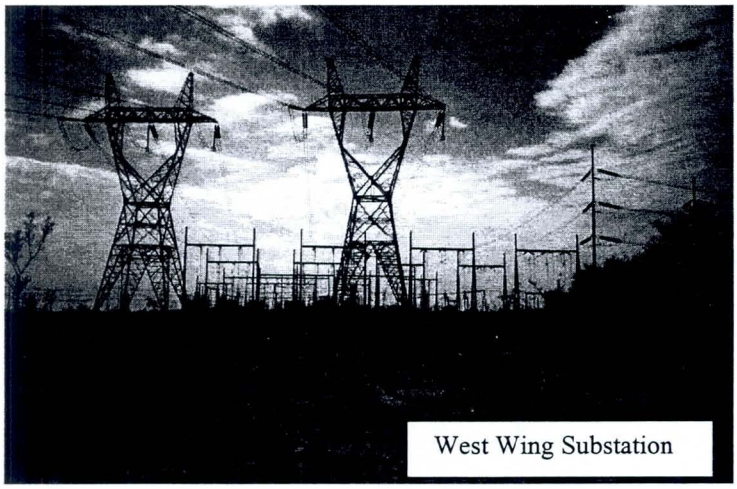
- The realigned outlet wash would provide a valuable link in the proposed Maricopa County trail system and offer a multi-use, recreational resource to nearby communities.

- Excavation of the new channel would provide a valuable, and nearby, fill material source for the Estrella Roadway (Loop 303) project and other transportation projects in the general vicinity.

1.3 Description of Project Area

The project area lies within Sections 1, 2, 11 and 12, T4N, R1W and Sections 6 and 7, T4N, R1E of the Gila and Salt River Principal Meridian, Maricopa County, Arizona.

The proposed project calls for a new outlet wash alignment to be located so as to convey flows easterly to the Agua Fria River. Directly east of the project's beginning point is a power substation facility, including the SRP Perkins Substation and the West Wing Substation, situated on land owned by Salt River Project (SRP) Power, Arizona Public Service (APS) and Tucson Gas and Electric. A view of a portion of the facility is shown here.


West Wing Substation

The two substations, their incoming-outgoing power transmission lines and towers are the major planimetric obstacles to the project alignment. Four alignment alternates were studied that go around the facility, three on the north and one on the south as shown in the map figure attached to this report. The alternate routes affect three power line owners: Salt River Project (SRP), Arizona Public Service (APS) and Western Area Power Administration (WAPA). Each of these utilities was contacted and provided with an aerial map illustrating the alternatives. The requirements of each owner to cross their power lines were similar and include:

- ✓ A written application to each group's land or right-of-way department. SRP referred to the application as a "consent request", APS referred to it as an "encroachment agreement" and WAPA may require a "joint use agreement". WAPA maintains one line out of the West Wing Substation, which is actually owned by the Bureau of Reclamation. A right-of-way agreement with the Bureau of Reclamation would also be required. An alternatives map was sent to them for their review.

- ✓ In each crossing instance, a right-of-way agreement with the underlying landowner will be necessary. The Flood Control District of Maricopa County, through the acquisition of private properties, would become the underlying landowner and only those lands owned by State Land, utility companies or federal agencies would be subject to a right-of-way agreement.

- ✓ Maintenance roads across the project channel, or other acceptable means of access, would have to be provided for each of the transmission line owners. An unpaved, dry crossing (for more frequent storm events) with pipe culverts should suffice, subject to approval of the utility. Ramps down into and out of the channel must be less than 10 percent grade, but details for these would subject to approval of the utility.

- ✓ Offset distances from transmission tower bases must be maintained. These requirements will vary per the utility.

None of the power agencies indicated any significant fee costs associated with the process of acquiring permission to cross beneath their lines and the process itself, in all cases, is not extraordinary. The Bureau of Land Management owns land within the Agua Fria River bed and an application for right-of-way must be filed with them, depending upon the route alternative selected.

The Arizona State Land Department indicated that a right-of-way application would be required and approval could take 6 to 12 months. There are varying fees applicable, dependent upon area and land use, but the fee is estimated to be 80-100% of the land's market value. An advertising fee and archaeological fee could also be assessed. Fee simple acquisition of the property would be desirable to ensure future uses. State Land has indicated that the land would not be sold but granted as right-of-way, or by easement, only.

Other real estate in the project area resides in private ownership and is largely undeveloped. The land is lightly vegetated by desert brush. The soils run from silty sand to sandy gravel. The land is level and elevation contours run roughly parallel to the alternative alignments until a pair of Agua Fria river banks are encountered. One appears to be an ancient bank just east of the power substation; the second bank is approximately one-half mile east of the first and the limit of 100-year flooding in the river. Each bank is 20 to 30 feet high.

Three of the four alternatives cross the proposed Phase 2 Estrella Roadway (Loop 303), 115th Avenue and all may be crossed by a future northerly extension of El Mirage Road. Access to the power substations is from the east via an unimproved, but well-maintained gravel-surface road on the alignment of Hatfield Road.

2.0 PROJECT DATA AND CONSTRAINTS

2.1 Channel Design Data

While the 100-year flow in the wash is 170.5 cms, or 6020 cfs, the design flow for the new channelization will be the Standard Project Flood (SPF) of 396 cms, or 14,000 cfs. For earthen channel design, the recommended maximum permissible velocity is 1.8 m/s, or 6 fps, depending upon soil conditions. For concrete lined channels, the maximum permissible velocity is 4.6 m/s, or 15 fps. To prohibit soil erosion of an earthen channel, the desirable channel slope on this project shall be in a range of 0.10 to 0.15 percent. Curves on the alternative alignments shall preferably have a minimum radii length of three times the channel bottomwidth. Minimum freeboard for subcritical flow is one foot. In those areas where sudden elevation drops must be negotiated, such as the existing Agua Fria riverbanks, rigid drop structures or spillways would be employed.

McMicken Dam is currently on the list to undergo the Flood Control District's dam assessment program. This assessment may result in the design flows being increased over what is addressed in this study. The final design configuration may require more right-of-way width than what is identified in this study.

2.2 Property Ownership

As noted earlier, property ownership within the project limits lies under both private and public ownership. Where possible, alignment alternatives shall minimize the number of private parcels crossed. It is inevitable that some privately owned parcels will be crossed and in doing so, it becomes desirable to intersect the parcel in a way that minimizes the impact of taking. The acquisition of remnant portions of certain parcels may be necessary.

Parcel maps in the project area were obtained from the Maricopa County Assessor's Office and property lines were drawn on the map figure included in this report. Horizontal control was not established on the ground for purposes of this report and it should be noted that the property lines shown reflect the closest approximation possible. Book, map and parcel numbers were obtained for properties within the project area and ownership records are readily available on the County's computerized database.

2.3 Right-of-Way

It is anticipated that acquisition by fee title of all or part of privately impacted parcels crossed will be required while right-of-way will be applied for passage through the publicly owned State Land Department parcels. In addition it will be necessary to supply applications or agreements to the power companies and government agencies to secure permission to cross their existing power line easements. This was discussed in Section 1.3.

2.4 Existing Utilities

The only known utilities within the project area are the overhead high-voltage power transmission lines. Further verification on other utilities present may be necessary if the project advances to design stage.

2.5 Groundwater and Soil Conditions

No new geotechnical information was compiled for this report. A geotechnical engineering report was prepared for the Estrella Roadway project and provides some information that is relevant to this study. The soils in the region generally are comprised of silty sand, sandy clay and trace gravels, though field observations indicate an abundance of cobbles and small stones. Test borings in the Estrella project area were rather shallow, ranging from 0.6 to 1.5 meters in depth. Soils tended to be of low to medium plasticity and of medium density. All soils were dry or nearly dry and no groundwater was encountered during the drilling.

The Estrella Roadway report recommended that permanent cut slopes in wash areas be constructed no steeper than 1V:2H. Outside of wash areas, soils may be cut no steeper than 1V:1-1/2H. Embankment fill slopes should be constructed no steeper than 1V:1-1/2H. Deeper soil borings are recommended should this project be advanced to design stage.

The Estrell Roadway report also indicates that near-surface soils in the area are suitable for fill in pavement areas, provided these soils are free of organic material, debris and rubble. Verification would be required, but there are indications that excavation waste from a channelization project would be suitable for use as roadway embankment.

2.6 Permits and Floodplain Regulations

The proposed project can impact the existing dam outlet wash, Twin Buttes Wash and the Agua Fria River, thereby falling under the Clean Water Act, Section 404. A 401 certification must be obtained from the Arizona Department of Environmental Quality prior to approval of a 404 permit application to the Corps of Engineers. A National Pollution Discharge Elimination System (NPDES) Permit issued from the EPA will be necessary due to the project being over five acres. The McMicken Dam Outlet Wash floodplain is also being altered by this project and sufficient cause will exist to amend that floodplain delineation through the map revision process which includes a Conditional Letter of Map Revision (CLOMR) and then a Letter of Map Revision (LOMR). After completion of the project, certified record drawings must be submitted to the Federal Emergency Management Agency (FEMA) to obtain an accepted LOMR and to initiate map modifications and reissue of the Flood Insurance Rate Maps (FIRMs).

This project's impact upon the Agua Fria River FIRMs will require additional analysis because the wash' 100-year flow, 170.5 cms, is significant compared the Agua Fria total flow, 878 cms. The new point of confluence with the river is shifted upstream by a

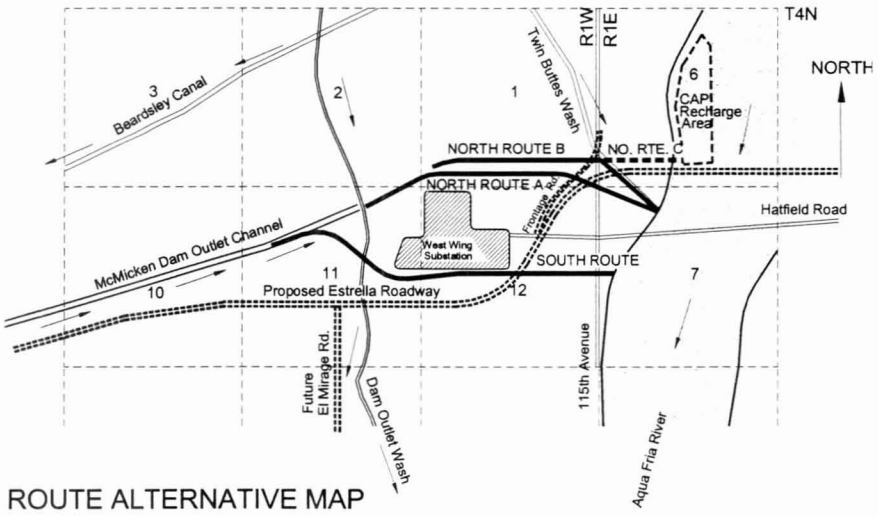
relatively short distance. The Flood Control District of Maricopa County will determine if this project warrants a modification of the Agua Fria River FIRMs.

3.0 ALIGNMENT ALTERNATIVES

Four alternative alignments for the rechannelization were studied. Three routes, labeled as North Routes A, B and C take fairly direct easterly tracks toward the river from the dam outlet channel. The other, the South Route, swings southeasterly from the existing outlet channel and curves east to the Agua Fria River. All alignments avoid the existing power substations and negotiate a significant elevation drop before reaching the river channel bottom. All routes avoid power transmission towers and all, but North Route C, have a skewed crossing of the proposed Estrella Roadway alignment. The figure below shows an approximation of those alignments. See the aerial map figure in the map pocket for more details on each alignment and the area's topography. Alternative channel profiles are included at the report's end.

3.1 North Routes

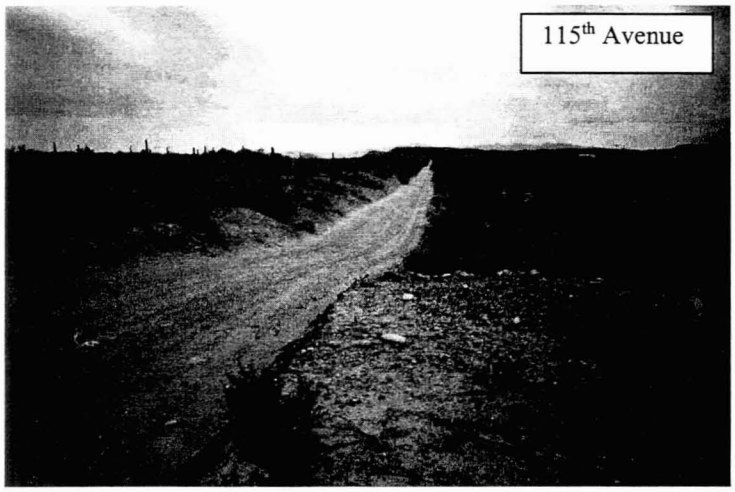
The north routes maintain the same directional line as the existing dam outlet channel, heading northeast to avoid the substations and and overhead line tower bases, then turn east. **North Route A** skews southeast to avoid Twin Buttes Wash. At the route's intersection with the proposed Estrella Roadway, a multi-barrel box culvert is the likely drainage structure recommended for the crossing. The route then continues on to the Agua Fria River, outfalling near the river's confluence with Twin Buttes Wash. **North Route B** turns east on an alignment parallel but north of North Route A, then curves southeast to align with Twin Buttes Wash upstream of the Estrella Roadway. **North Route C** follows the B alignment, but does not skew southeasterly. It continues straight east to the Agua Fria River, avoiding any crossing of Estrella Roadway.



ROUTE ALTERNATIVE MAP

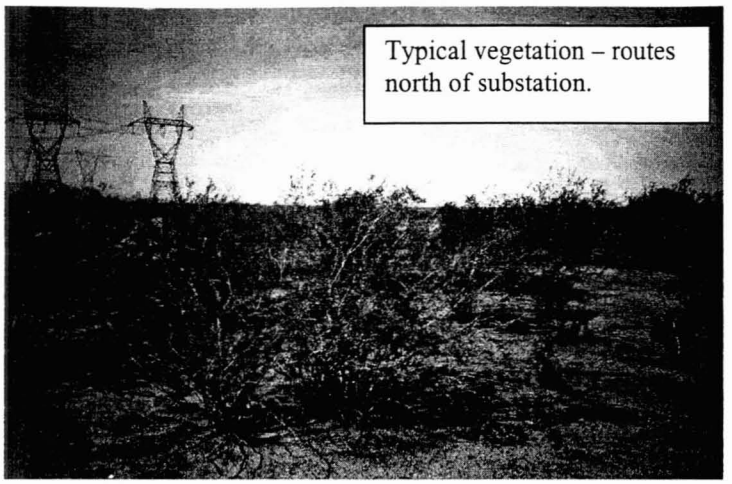
The northern routes minimize private property crossings at the west end, but unavoidably slices through a number of private parcels at their east termini, near the river's edge. More detailed discussion of each north routes follows.

North Route A avoids environmental concerns by avoiding Twin Buttes Wash, but creates a separate drainage crossing under the Estrella Roadway alignment. This crossing would also need to pass under a planned 115th Avenue frontage road, adding length to the required cross drainage structure. To be constructed under the Estrella Roadway project this frontage road (see map on previous page) ties into existing 115th Avenue north of this location, then follows southwesterly along the north side of the Estrella alignment to an intersection with Hatfield Road. Local traffic will then be able to access the Estrella Roadway at this location. The location where **North Route A** crosses 115th Avenue is shown in the photo below (looking north).



North Route B combines two drainage crossings (the new outlet wash and Twin Buttes Wash) under Estrella Roadway into one single larger, but shorter in length, structure. Under **North Route B** the outlet wash would overflow a planned 115th Avenue frontage road before crossing under Estrella Roadway. It is advisable to add low flow pipe culverts under the frontage road for more frequent storm events. This route precludes any planning of a 115th Avenue interchange with Estrella Roadway. This alignment lies north of North Route A in order to cross the Estrella Roadway at a more obtuse angle.

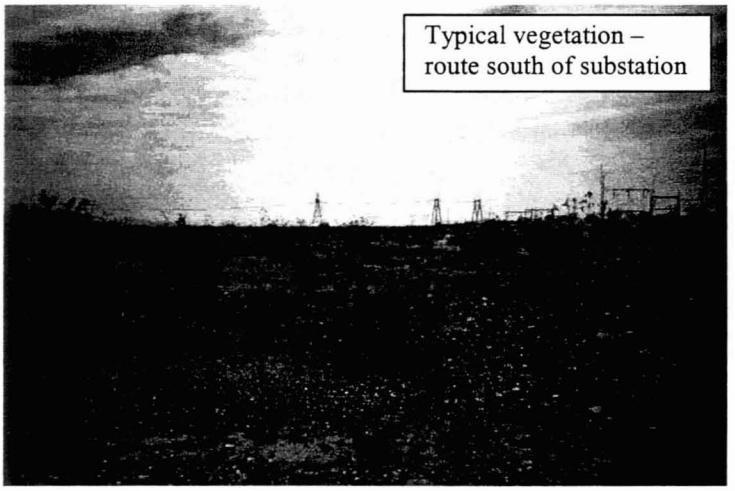
North Route C follows the B alignment but remains on an easterly course, never crossing the proposed Estrella Roadway. This eliminates a costly cross drainage structure but discharging directly into a Central Arizona Project groundwater recharge area planned in the Agua Fria riverbed reduces the viability of this alternative. Also, **North Route C** tracks through as many as four residential properties (see aerial map) on the west bank of the Agua Fria River. A typical view of the area and vegetation through which the north routes would proceed is shown on the next page.



3.2 South Route

The lone **South Route** picks up the existing outlet channel further west than the north routes, then curves southeasterly to a point where it can turn east along the south limit of the power substations. At the headwater (where the 'outlet channel' discharges to the 'outlet wash') a drop in flow line elevation will be necessary in order to shallow the channel slope. This will lower flow velocity and create sufficient depth in which to excavate the needed cross sectional area.

When the alignment turns eastward the proposed channel hugs the substation's south property line (looking upstream in the following photo) as closely as possible. The alignment continues directly east and undergoes a series of at least four drops before entering the Agua Fria River bed. See Section 4.4 for a discussion and recommendation of drop, or spillway, types.



The **South Route** crosses undeveloped private parcels and does not split any parcels into two remaining pieces, thereby minimizing devaluation to those remainders. As with the north routes, a multi-barrel box culvert crossing of the Estrella Roadway is anticipated.

All of the alternative routes will accept water from the upstream "natural portion" of the existing outlet wash which has a contributing drainage area of approximately 7.5 square miles. Realigning the natural wash to transition smoothly into the proposed outlet wash will be necessary under all of the route scenarios. This flow, estimated to be in the magnitude of several thousand cfs, could be totally diverted east to the Agua Fria River or a portion of the flow may be allowed to bypass and continue southward in the existing outlet wash.

Complete diversion of flow out of the existing outlet wash would dewater the downstream natural wash for a short distance. A pipe culvert(s) could be installed which would permit low flows to continue southward in a historical manner. Restoring flow back to the wash at truly historical levels is, of course, impossible due to development and the destruction of natural drainage patterns within the watershed. The south bank of each alternative will be embankment, or bermed, as it crosses the existing wash.

3.3 "Do Nothing" Alternative

The rationales for this project were laid out in Section 1.2. The current situation is that the outlet wash' standard project flood limits exceed the County's existing drainage easement. In addition, the 100-year and SPF flood limits impede improvements to El Mirage Road and possibly, a future Deer Valley Road extension to the east. Planned El Mirage Road improvement costs are also increased greatly by crossing the outlet wash at two locations. These costs are discussed in Section 6.2.

This project would also provide a secondary benefit due to the excess soil material generated by the channel excavation. Many projects in the area, including the Estrella Roadway, require hundreds of thousands of cubic yards of scarce imported fill material.

3.4 Hazards

This project meets the Class B classification of hazard exposure per County guidelines. This is defined as "waterways nearby or adjacent to urban areas or highways and subject to frequent visits by the public". The guidelines also state that if drainage conduits are longer than 30.5 meters, or 100 feet, in length, trash racks will be required on the entrances (such as the Estrella Roadway crossing). This criterion may not be compatible with the waterway's multi-use applications if pedestrian, horse and/or bike paths are constructed. Roadway culvert crossings will require extra height (to 3.65 meters, or 12 feet) to accommodate equestrian use and may require illumination.

In those locations where concrete spillways are necessary, they should be constructed at a slope not exceeding 10 percent and an alternate path of granular or dirt surfacing is recommended for equestrian and pedestrian use. Skateboarding and the use of any motorized vehicle should be prohibited from the waterway. Fencing of the project may be advised to limit entrance from and egress to adjacent private properties. The Estrella Roadway right-of-way will be fenced and these fences will be tied into the drainage

conduit wings. Any fencing plan and details would also have to permit drainage from adjacent land to flow under or through the fencing material.

4.0 CHANNEL TYPE AND MATERIALS

4.1 Channel Type

Two channel type choices were examined for this report: earthen and lined. **Earthen channels** are designed for subcritical flow, the width to depth ratio is large, side slopes are 1:4 or flatter and grade control is critical. Longitudinal grades must be very flat to maintain non-erosive flow velocities. A low flow pilot channel, rock or concrete lined, is recommended, but not required, for very large earthen channels, per County guidelines. It is anticipated that an earthen channel would revegetate itself with plants similar to the surrounding area. This must be taken into consideration during the hydraulic design.

Lined channels can be concrete, soil cement, cement-stabilized alluvium (csa) or rock surfaced. Rock lining is not considered to be a viable alternative in this project, given the considerable breadth and length of the channel, questionable availability of sufficiently sized stone and the high maintenance nature of a rock-lined channel. In addition, a rock surface is not conducive to the potential multi-use purpose of the facility. Concrete, soil cement or csa lining would greatly increase the channel's hydraulic efficiency, reducing the necessary right-of-way and excavation requirements. Rigid lining also allows more flexibility in gradient design. Any of these materials may be used in steeper sections of the channel and for drops and spillway structures.

4.2 Right-of-Way Use

This facility has the potential for multi-purpose use since its alignment will connect an area of growing population with a major Arizona waterway, the Agua Fria River. Among the possibilities are equestrian trails, paved bike trails, picnic sites and walking paths. A draft copy of the proposed Maricopa County trail system is included in the Appendix. The earthen channel alternative permits more flexibility for multi-use and places those uses in a relatively natural surrounding. A meandering low flow channel could be included in the design section, adding aesthetic appeal to the facility. Also, the bank slopes could be varied to provide a more natural appearance. The channel project should provide sufficient room to allow twenty-foot wide maintenance roads on each side. Ramped accesses into the channel bottom may be part of the final design, but are not addressed in this report. Water reuse or recharge was not considered as a possible use.

4.3 Typical Sections

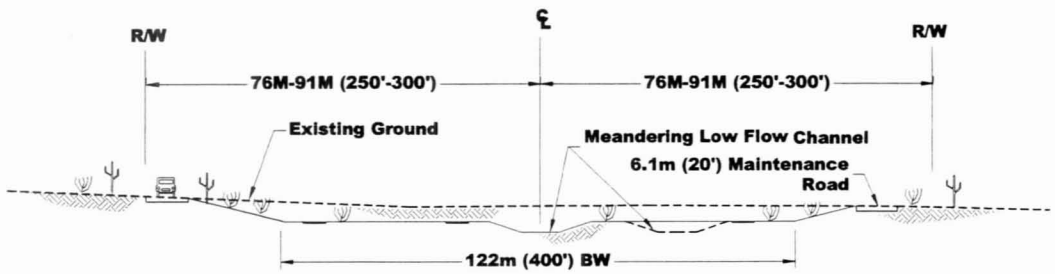
An **earthen channel** capable of conveying the SPF flow is estimated to require a 122-meter (400 feet) bottom width. 1:4 side slopes are recommended and each half of the bottom section will slope inward to a pilot channel at a 0.5% cross slope. A pilot channel, lined or not lined, would be 0.3 meters (1 foot) deep with a 9.8-meter (32 feet) bottomwidth. The typical section must produce low velocities in the channel in order to

minimize severe soil erosion during flood events. The result of this is that lesser storm runoff velocities are slow, leading to sediment deposits. A concrete pilot channel may be necessary to maintain self-cleaning low flow velocities.

The right-of-way requirements will vary depending upon the route selected, the depth of cut, the channel slope, etc. Also, total buyouts of properties, rather than partial takings, will affect the total costs of right-of-way acquisition. See the map figure (in map pocket) for property takings in addition to the typical right-of-way limits.

Essential flow characteristics (**earthen channel**) for the SPF and 100-year storms are as follows:

Q_{SPF} = 396 cms (14,000 cfs)	Q_{100yr} = 170 cms (6020 cfs)
Flow Depth = 2.17 m (7.12 ft)	Flow Depth = 1.45 m (4.76 ft)
Velocity = 1.75 m/s (5.76 fps)	Velocity = 1.30 m/s (4.27 fps)
Slope = 0.0010 m/m	Slope = 0.0010 m/m
Froude No. = 0.43, subcritical	Froude No. = 0.41, subcritical



TYPICAL SECTION
EARTHEN CHANNEL

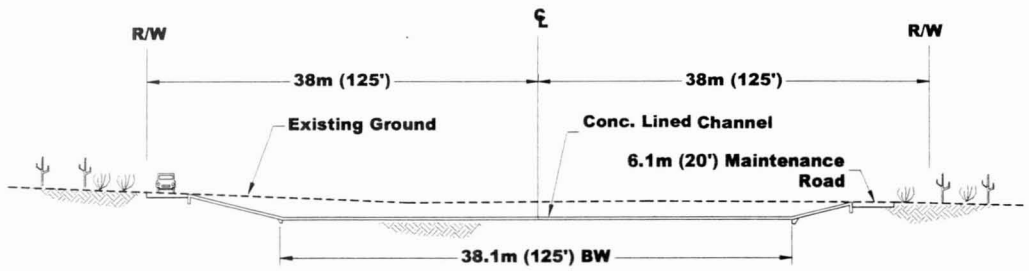
A rigid lining (concrete) alternate was also examined. A **concrete lined** section, shown on next page, would have an estimated 38.1-meter (125 feet) bottomwidth with 1:2 sideslopes. A low-flow channel is not necessary. A 1% or 2% cross slope would be integrated into the design section, but the hydraulic properties listed below are for a level bottom.

The route width for the concrete material choice is not shown on the map figure but would be approximately half the width of the one shown. Right-of-way requirements may vary based upon variables listed previously.

The SPF and 100-year flow characteristics for **concrete lined** channel are as follows:

Q_{SPF} = 396 cms (14,000 cfs)
Flow Depth = 2.35 m (7.70 ft)
Velocity = 3.95 m/s (13 fps)
Slope = 0.0010 m/m
Froude No. = 0.87, subcritical

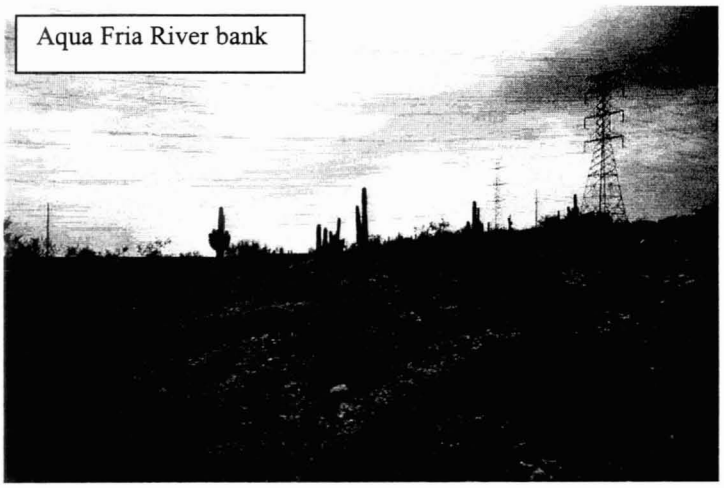
Q_{100yr} = 170 cms (6020 cfs)
Flow Depth = 1.43 m (4.68 ft)
Velocity = 2.92 m/s (9.57 fps)
Slope = 0.0010 m/m
Froude No. = 0.81, subcritical



TYPICAL SECTION
CONCRETE-LINED CHANNEL

4.4 Spillway Type

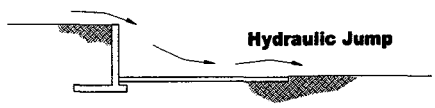
Spillways, or drops, are needed to make up grade changes encountered as the Agua Fria riverbank is approached by the channel alignment. The west riverbank is pictured here.



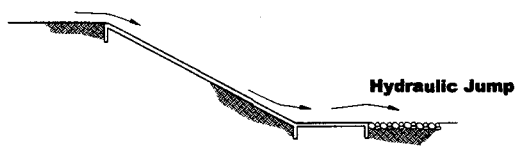
The increase in velocity, energy and turbulence created by steep grade changes requires rigid lining and energy dissipation within the spillway. The lengths of these spillways will be dictated by site specific conditions.

There are four types of spillways, or drops, to consider. Not all of these types may be appropriate for this project. The four types are:

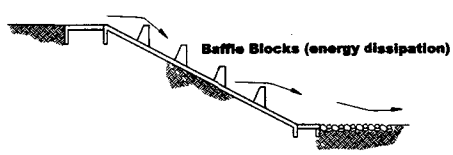
- Vertical hard basin (top)
- Vertical riprap basin (not illustrated)
- Sloping concrete (middle)
- Baffle chute (bottom)



VERTICAL DROP



SLOPING CONCRETE



BAFFLE CHUTE

The first two types listed above have very steep or **vertical drops** associated with them. County guidelines discourage vertical drops greater than 1.1 meter (3 feet) for safety reasons. Since a total grade change of up to 15 meters (50 feet) occurs near the riverbanks, a series of these types, up to 17, would be installed at a varied spacing. Or in some locations a series of 1.1 meter drops (stairstep effect) could be constructed out of formed concrete or roller-compacted concrete (RCC). Because of their frequent spacing and for hydraulic and construction considerations, the width of these drops would probably closely match the design channel width, as opposed to flows being funneled in and out of the structure.

Given the considerable SPF design flow of 396 cms (14,000 cfs) and associated flow forces, it is probable that sufficiently sized riprap is not economically available for a

vertical riprap basin. A vertical hard basin would be preferable if this type were used. This type of structure produces a jet of water that strikes a basin surface below the crest. If sufficient tailwater exists, a hydraulic jump occurs. If not, the water continues horizontally in supercritical flow until the specific force of the tailwater dissipates the energy and a hydraulic jump forms. Therefore the basin length is sized to contain the supercritical flow and hydraulic jump. Introducing some roughness to the basin, such as grouted boulders or concrete baffles helps reduce the overall length of a **vertical drop** structure.

A **sloping concrete** spillway may be an appropriate choice at many locations since drops of 2 meters or greater could be achieved over a long horizontal distance. As with the previous types a hydraulic jump is required to convert the spillway's supercritical flow into subcritical flow before transitioning back to a normal channel section. The slope gradient can vary to meet the terrain requirements, but the basin length (of the bottom hard surface) may be considerable in order to dissipate the energy. Flow velocity through this spillway can get extremely high, exceeding 7 m/s (25 fps). This type of structure may be the most expensive of the alternatives because of the overall length requirement. The use of energy dissipators, such as concrete baffles, on the slope and in the stilling basin serves to reduce the length. There are safety considerations also to this choice, as the **sloping concrete** becomes a possible attraction for bicyclists, skateboarders and roller bladers.

The **baffle chute** spillway is similar to the sloping concrete spillway except that a series of baffle blocks dominate the sloping surface in order to dissipate energy before the water reaches the bottom, thus reducing the overall length of the structure. With a sufficient number of baffles a tailwater condition is not required to induce a hydraulic jump at the bottom. County guidelines state that best performance of this system is achieved at a maximum of 1.7 cms per meter of width, or 60 cfs per foot of width. For this project that criteria translates to a total installation width of 71 meters (233 feet). The guidelines also state that this recommendation has been exceeded without significant problems. The **baffle chute** option is anticipated to be more economical than the sloping concrete type.

The choice of spillway type will be a critical element of this project because of the extensive design analysis required and the significant costs associated with it. It is conceivable that different types may be used at different locations and it must be decided whether numerous small drops are more desirable than less numerous large drops. For purposes of cost estimating purposes the baffle chute spillway was chosen as applicable installation.

5.0 ENVIRONMENTAL OVERVIEW

A March 2000 field review was conducted by an environmental specialist to document the environmental conditions of the project area including vegetation, habitat, and aquatic resources. Based on documented habitat requirements, a determination was made of the suitability of the project area to support threatened and endangered species, listed by the US Fish and Wildlife Service (USFWS), as having the potential to occur in Maricopa

County. The appropriate U.S. Geological Survey map for the project areas was examined for information about elevation and topography which are specific for certain species. Mine adits, aquatic resources, rock formations, and other potential habitats were noted. Projects that involve a federal nexus or are on private land are required to consider effects on federally listed plant and animal species and their habitats. However, it is recommended that State special status species also be considered in project planning and development. Species status designations and their implications are summarized below.

Federally Listed Species (Threatened and Endangered)

Plants and animals listed by the USFWS as threatened or endangered are protected under the Endangered Species Act (ESA). The ESA specifically prohibits the "take" of a listed species. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct."[1] The USFWS has interpreted the definition of take to also include modification of habitat that supports listed species. Projects that may affect listed species or their habitat require either consultation with the USFWS under either Section 7 or an Incidental Take Permit under Section 10(a) of the ESA.

Wildlife of Special Concern in Arizona (WC)

These are wildlife species whose occurrence in the State of Arizona is in or may be in jeopardy. These species have known or perceived threats or population declines, as described by the Arizona Game and Fish Department's (AGFD) listing of Wildlife of Special Concern in Arizona.

Protected Plants

The Arizona Native Plant Law categorizes protected plants as Highly Safeguarded and Salvage Restricted, among others. Destruction of Highly Safeguarded plants is subject to review by the Arizona Department of Agriculture (ADA). It is unlawful to collect, transport, transplant, or kill protected native plants without a permit or without following specific regulatory procedures. Such regulation also applies to protected plants on private lands. The law does not prevent the destruction of protected plants on private lands as long as (1) the plants are not transported from the land or offered for sale and (2) the landowner notifies the ADA of the intended destruction.

Landowners must notify the ADA regarding intended destruction of native plants at least 20 days before plants are destroyed over an area less than one acre, 30 days before plants are destroyed over an area less than 40 acres, and 60 days before plants are destroyed over an area of 40 acres or more.

[1]Endangered Species Act, Section 3, paragraph 19.

5.1 RESULTS

Vegetation

No species listed by the USFWS, for Maricopa County, were recorded within the project area. The predominant vegetation type within the project area is classified as Arizona Upland Division Sonoran Desertscrub. Vegetation consists of creosote bush (*Larrea tridentata*), triangle-leaf bursage (*Ambrosia deltoidea*), foothill paloverde (*Cercidium microphyllum*), ironwood (*Olneya tesota*), mesquite (*Prosopis* sp.), wolfberry (*Lycium berlandieri*), desert mistletoe (*Phoradendron californicum*), canyon ragweed (*Ambrosia ambrosioides*), and various grasses. Cacti are found throughout the project area and include hedgehog (*Echinocereus engelmannii*), and cholla (*Opuntia* sp.). Saguaros (*Carnegiea gigantea*) occur at roughly one per acre.

Wildlife

No species listed by the USFWS, for Maricopa County, were recorded within the project area. Wildlife seen during the field review included lizards and birds. A peregrine falcon (*Falco peregrinus*) was seen flying over the project area and various raptor nests were seen on the transmission towers along the project area. Signs (scat, tracks and burrows) of coyote (*Canis latrans*), rabbit (*Sylvilagus audubonii/Lepus californicus*), and Sonoran Desert tortoise (*Gopherus agassizii*) were recorded.

Aquatic Resources

No permanent surface waters are present within the project area. The outlet wash, McMicken Outlet Channel, Twin Buttes Wash and the Agua Fria River are the largest ephemeral drainages in the area. Any construction activities that may impact these jurisdictional waters of the United States will require a Clean Water Act Section 404 Permit.

5.2 CONCLUSIONS

- No federally listed species are expected to occur regularly in the project area and no species-specific surveys are recommended.

- All native shrubs, trees, and cacti are protected under the Native Plant Law. The ADA must be contacted at least 60 days prior to destruction of protected native plants.

- If Sonoran Desert tortoises or their burrows are found within the construction area, it is recommended that the AGFD's Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects be followed.

- A cultural resource survey will be required in order to obtain the necessary Section 404 Permit for this project. The costs for this work could be included under the Estrella Roadway cultural survey.

- An Environmental Assessment may be required for a project of this magnitude. A detailed description of other environmental factors such as socio-economics, water quality, geology and soils, air quality and noise are addressed in those documents.

- Fugitive dust generated from construction activities in Maricopa County must be controlled in accordance with *Rule 310 Open Fugitive Dust Sources*. This requires the preparation and submission of an earth-moving permit and fugitive dust control plan for the project site.

6.0 COSTS

6.1 Basic Construction Costs

Following are estimates of anticipated construction costs for the four route alternatives, including earthen and concrete-lined channel treatment choices. Unit costs were taken from the Estrella Roadway project. The Estrella box culvert structure (11-3000mm x 1800mm) used in the roadway plan was applied to this estimate. Box culvert lengths were based upon an interim roadway width per current roadway plans and not the ultimate roadway width. The number of barrels per installation could increase based upon a detailed hydraulic analysis of the channelization during a design process. Miscellaneous items include contractor mobilization, clearing and grubbing, engineering fees, 404 mitigation, plus minor and unforeseen items.

Right-of-way costs for undeveloped parcels, either by acquisition or dedicated easement, were estimated to be $17,000 per acre. Costs for developed parcels were estimated at $40,000 per acre. Actual right-of-way areas, shown on the map figure, for earthen alternatives were measured electronically from base mapping. Areas for lined alternatives were prorated from the earthen alternatives based upon the ratio of reduced right-of-way width.

North Route A - Earthen

Item	Unit	Quantity	Unit Cost	Cost
Excavation	cubic meters	2,544,500	4.00	$10,178,000
Concrete, spillways	square meters	6493	80.00	$519,440
Concrete, for box culvert	cubic meters	1531	300.00	$459,300
Reinforcing steel, for box culvert	kilograms	131,356	1.00	$131,356
			Sub total	*$11,288,096*
Miscellaneous items, 10%	lump sum			$1,128,810
Right-of-Way	acres	135	17,000	$2,295,000
			Total	**$14,711,906**

North Route A – Lined

Item	Unit	Quantity	Unit Cost	Cost
Excavation	cubic meters	1,007,250	4.00	$4,029,000
Concrete, spillways	square meters	4508	80.00	$360,640
Concrete lining, for channel	square meters	160,777	40.00	$6,431,080
Concrete, for box culvert	cubic meters	1531	300.00	$459,300
Reinforcing steel, for box culvert	kilograms	131,356	1.00	$131,356
			Sub total	*$11,411,376*
Miscellaneous items, 10%	lump sum			$1,141,138
Right-of-Way	acres	56*	17,000	$952,000
			Total	**$13,504,514**

*based upon ratio of lined channel R.O.W. width to earthen channel R.O.W. width

North Route B - Earthen

Item	Unit	Quantity	Unit Cost	Cost
Excavation	cubic meters	2,990,000	4.00	$11,960,000
Concrete, spillways	square meters	6494	80.00	$519,520
Concrete, for box culvert	cubic meters	1307	300.00	$392,100
Reinforcing steel, for box culvert	kilograms	112,190	1.00	$112,190
			Sub total	*$12,983,810*
Miscellaneous items, 10%	lump sum			$1,298,381
Right-of-Way	acres	138	17,000	$2,346,000
			Total	**$16,628,191**

North Route B – Lined

Item	Unit	Quantity	Unit Cost	Cost
Excavation	cubic meters	1,209,000	4.00	$4,836,000
Concrete, spillways	square meters	4515	80.00	$361,200
Concrete lining, for channel	square meters	163,873	40.00	$6,554,920
Concrete, for box culvert	cubic meters	1307	300.00	$392,100
Reinforcing steel, for box culvert	kilograms	112,190	1.00	$112,190
			Sub total	*$12,256,410*
Miscellaneous items, 10%	lump sum			$1,225,641
Right-of-way	acres	58*	17,000	$986,000
			Total	**$14,468,051**

*based upon ratio of lined channel R.O.W. width to earthen channel R.O.W. width

North Route C - Earthen

Item	Unit	Quantity	Unit Cost	Cost
Excavation	cubic meters	2,972,400	4.00	$11,889,600
Concrete, spillways	square meters	6061	80.00	$484,880
			Sub total	*$12,374,480*
Miscellaneous items, 10%	lump sum			$1,237,448
Right-of-way	acres	120	17,000	$2,040,000
Right-of-way, developed	acres	15	40,000	$600,000
			Total	**$16,251,928**

North Route C – Lined

Item	Unit	Quantity	Unit Cost	Cost
Excavation	cubic meters	1,205,200	4.00	$4,820,800
Concrete, spillways	square meters	4214	80.00	$337,120
Concrete lining, for channel	square meters	150,560	40.00	$6,022,400
			Sub total	*$11,180,320*
Miscellaneous items, 10%	lump sum			$1,118,032
Right-of-way	acres	56*	17,000	$952,000
			Total	**$13,250,352**

*based upon ratio of lined channel R.O.W. width to earthen channel R.O.W. width

South Route - Earthen

Item	Unit	Quantity	Unit Cost	Cost
Excavation	cubic meters	1,915,950	4.00	$7,663,800
Concrete, spillways	square meters	8550	80.00	$684,000
Concrete, for box culvert	cubic meters	1587	300.00	$476,100
Reinforcing steel, for box culvert	kilograms	136,044	1.00	$136,044
			Sub total	*$8,959,944*
Miscellaneous items, 10%	lump sum			$895,994
Right-of-way	acres	112	17,000	$1,904,000
			Total	**$11,759,938**

South Route - Lined

Item	Unit	Quantity	Unit Cost	Cost
Excavation	cubic meters	671,000	4.00	$2,684,000
Concrete, spillways	square meters	5870	80.00	$469,600
Concrete lining, for channel	square meters	167,450	40.00	$6,698,000
Concrete, for box culvert	cubic meters	1587	300.00	$476,100
Reinforcing steel, for box culvert	kilograms	136,044	1.00	$136,044
			Sub total	*$10,463,744*
Miscellaneous items, 10%	lump sum			$1,046,374
Right-of-way	acres	47*	17,000	$799,000
			Total	**$12,309,118**

*based upon ratio of lined channel R.O.W. width to earthen channel R.O.W. width

Do Nothing

Item	Unit	Quantity	Unit Cost	Cost
SPF drainage easement	acres	58	17,000.00	$986,000
Add'l. earth borrow costs to ultimate Estrella Roadway	cubic meters	900,000	6.00	$5,400,000
Add'l. drainage structures (2) costs to El Mirage Rd. relocation	lump sum	1	3,800,000	$3,800,000
			Total	**$10,186,000**

6.2 Cost Credits (*deductions from total construction costs*)

Much of the construction cost estimated for this project can be offset by possible savings to the Phase 2 Estrella Roadway construction budget, most notably a reduction in earth import expense. The County could also realize potential savings (discussed below) to a proposed El Mirage Road relocation project under consideration. In addition, the avoidance of buying additional right-of-way for the existing wash flooding is a potential saving. Details of the cost credits are discussed here:

Estrella Roadway Items

a. Current proposed outlet wash crossing of Estrella Roadway. The same basic structure configuration (length may vary) is transferred to North A, North B and South Routes. Cost estimated to be **$600,000**. This cost is already budgeted for the Estrella Roadway project.
b. Earthwork borrow costs. The Phase 2 Estrella (interim) Roadway earthwork borrow excavation cost is estimated to be $1.8 million for 300,000 cubic meters of dirt. The total PH 2 (ultimate) Roadway earthwork borrow excavation cost is estimated to be $5.4 million for 900,000 cubic meters. A portion of the PH 2 "per cubic meter" borrow expense can be applied as a credit to channel excavation costs, up to the limit of the quantity required by the roadway project or made available by the channel project. For purposes of this analysis, outlet wash excavation was set at $4 per cubic meter. PH 2 roadway borrow costs are $6 per cubic meter based upon an unknown haul length. If the channel excavation waste is placed for the Estrella PH 2 Roadway, an **estimated $5 per cubic meter** reduction in PH 2 borrow cost is projected because of the material's close proximity. In summary, each cubic meter excavated and wasted to the roadway project saves the PH 2 budget $5 and can be applied as a credit to the channel excavation costs.

El Mirage Road Items

c. Existing outlet wash crossing of proposed El Mirage Road (below Beardsley). The preliminary design analysis of El Mirage, from Bell to Beardsley, projects a $3.5 million bridge crossing of the existing dam outlet wash. This structure can be downsized to an estimated 4-3000mm x 1800mm x 55m box due to diversion of dam release flows. Culvert costs would be an estimated $233,000, saving **$3.3 million.**
d. Existing outlet wash crossing of proposed El Mirage Road (above Deer Valley). The preliminary design analysis of El Mirage, from Beardsley to Loop 303, shows a 16 bbl box culvert costing $600,000. This structure can be downsized to an estimated 2-2400mm x 1800mm x 55m box due to diversion of dam release flows. Culvert costs become an estimated $102,000, for a savings of $498,000, say **$0.5 million**.

Other

e. Flood Control District of Maricopa County added drainage easement costs. This assumes the necessary acquisition of additional drainage easement area from State Land to contain the existing outlet flow (SPF) floodplain. An estimated 58 acres at a cost of $17,000 per acre was applied for this study, the total cost being **$986,000**.

This area is based upon information developed for the PH 2 Estrella Roadway drainage report.

f. Land no longer required for the current wash flood boundary can be sold and the proceeds applied as a credit against the channel project costs. Details of these available parcels are provided in the Appendix. A value of $17,000 per acre was applied for this study, the total value for 164 acres being **$2,788,000**.

6.3 Adjusted Project Costs

In the table below the applicable **cost credits**, as described in the previous section, are subtracted from each alternate route's **total cost** (from in Section 6.1). The **adjusted cost** in the right hand column represents the true total cost of each channelization alternate after monetary benefits and savings to other projects are tallied.

Adjusted Cost Table

Route	Total Cost	Cost Credits	Credit Totals	Adjusted Cost
North A – earth	$14,712,000	a, b, c, d, e, f	-$12,700,000	$2,012,000
North A – lined	$13,505,000	a, b, c, d, e, f	-$12,700,000	$805,000
North B – earth	$16,628,000	a, b, c, d, e, f	-$12,700,000	$3,928,000
North B – lined	$14,468,000	a, b, c, d, e, f	-$12,700,000	$1,768,000
North C – earth	$16,252,000	a, b, c, d, e, f	-$12,700,000	$3,552,000
North C – lined	$13,250,000	a, b, c, d, e, f	-$12,700,000	$550,000
South – earth	$11,760,000	a, b, c, d, e, f	-$12,700,000	-$940,000*
South – lined	$12,309,000	a, b, c, d, e, f	-$11,555,000	$754,000

*a negative value indicates a benefit realized from this channel route that exceeds the cost of the channel project itself.

7.0 STUDY CONCLUSIONS

7.1 Preferred Route Alternative

Between the northern and southern routes, the preferred alternative is the south route for the following reasons:

- The south route is the least expensive of the channelization alternatives largely due to its requiring shallower cuts on its path to the river.

- The south route passes through fewer parcels of public and private land ownership, thus slightly simplifying the acquisition process. It also requires less right-of-way width (152 meters vs. 182 meters) than the north route.

- The south outfall location does not coincide with the Twin Buttes Wash outfall, which eliminates the need for Twin Buttes Wash flood plain amendment. It also occurs downstream of the substation's Hatfield Road access, as opposed to immediately upstream which could present occasional access problems to the substation.

- The south route is distant from the Estrella Roadway and 115th Avenue crossing and will not impact near- and long-term roadway improvements there.

- The south outfall location is further downstream from the proposed Estrella Roadway crossing of the Agua Fria River. This additional distance further reduces hydraulic impact upon the crossing.

Due to lower construction costs, flexibility of recreational use and appearance, the earthen channel section is the recommended channel material type. While it requires additional right-of-way, a softer and more natural looking channel section allows more options to multi-use and less long-term maintenance. This is the channel section width represented on the attached map figure.

The spillway type selected for use in the cost estimating was the baffle chute.

7.2 Summary Conclusion

It should be noted that the channel geometry and profile presented in this report is, of course, subject to design refinement. Certain aspects of the channel shape may be altered to fit design conditions better and the shape could vary within the project itself. In addition, the channel profile could be adjusted to create more or less earth spoil. This report favored a channel profile set at a shallower depth in order to limit right-of-way requirements. These factors and others will impact the final project costs, but the design concepts in this report offer plausible scenarios and their associated costs. Relatively minor differences in actual unit costs for earthwork or land values may have a significant impact on the project's viability.

The route alternatives all must proceed through areas of deep cut. Insufficient geotechnical data exists to identify subsurface conditions. Examination of subsurface soil conditions will be an initial task of the design stage. Unfavorable soil conditions could affect costs greatly.

County staff suggested, for future needs, that the relocated channel flowline profile be lower (say 7 or 8 feet) than what was used in this study's cost analysis. A lower profile would eliminate the need for a dike where the new alignment crosses the existing wash and permit lowering of the upstream outlet channel which continues on to the west. This lower profile was considered and it was determined that it would add from $1.1 million to $3.2 million in excavation costs, depending upon the alternative. For instance, the recommended route, South Route – Earthen, would increase in cost by approximately $2.7 million, using the same proposed cross-section. Earthwork calculations and profiles are included in the Appendix. The costs of additional right-of-way were not determined, but an extra 60-70 feet of width would be required. It is possible that a lower channel profile could be achieved at less increased cost by a modified typical cross-section, i.e.,

deeper pilot channel, short vertical walls, steeper side slopes. These measures could be examined further during the design process.

The merits of this channelization project, in terms of flood control, recreational uses, better use of the land, etc. are positive in the view of this study. Among the benefits derived are:

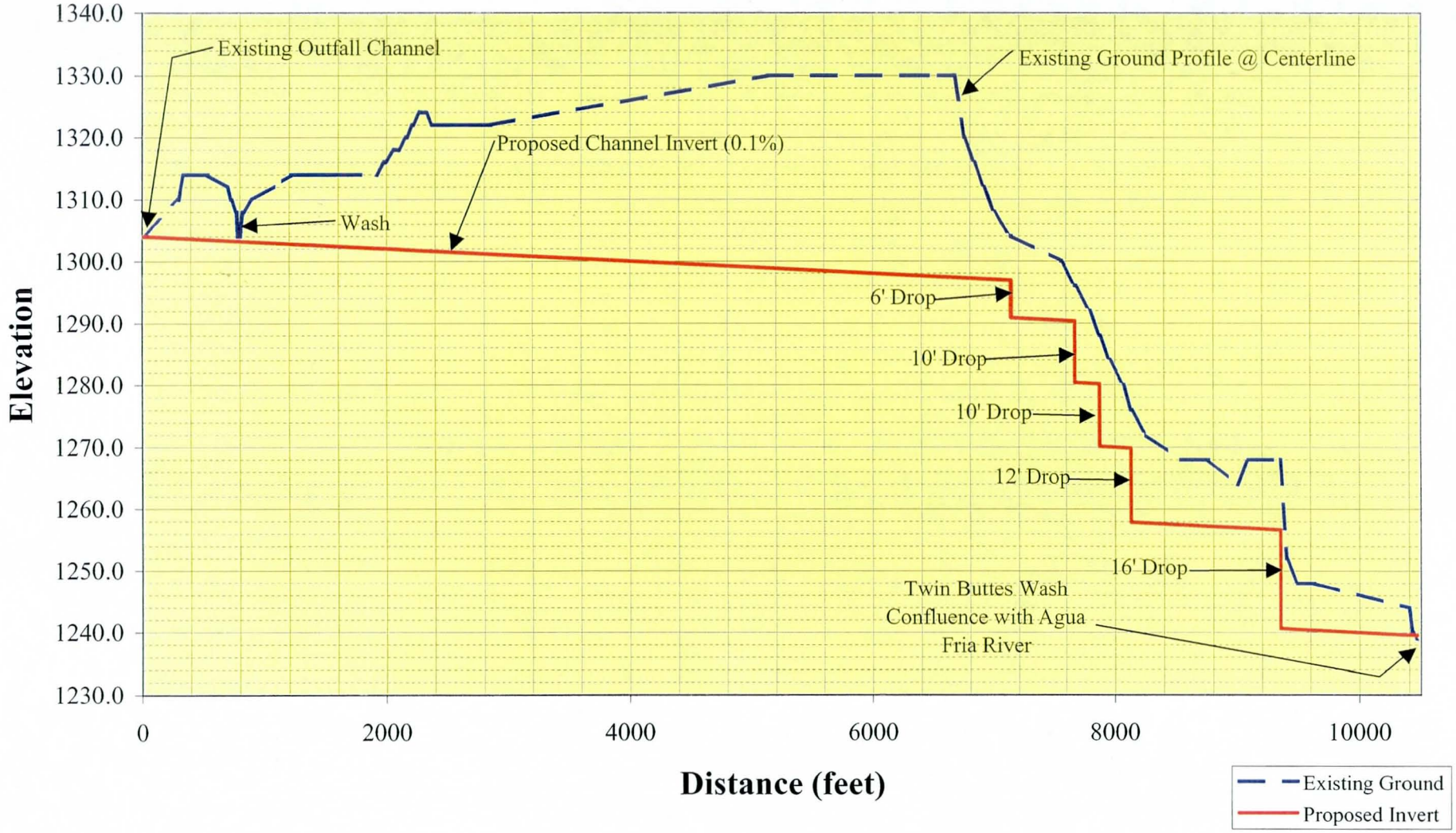
- A significant floodplain reduction in the area of El Mirage Road which would both reduce hazards to the public and add value to adjacent lands held by state, county and private owners.

- The proposed channel would provide a valuable link in the Maricopa trail system and become a recreational resource to the community at large.

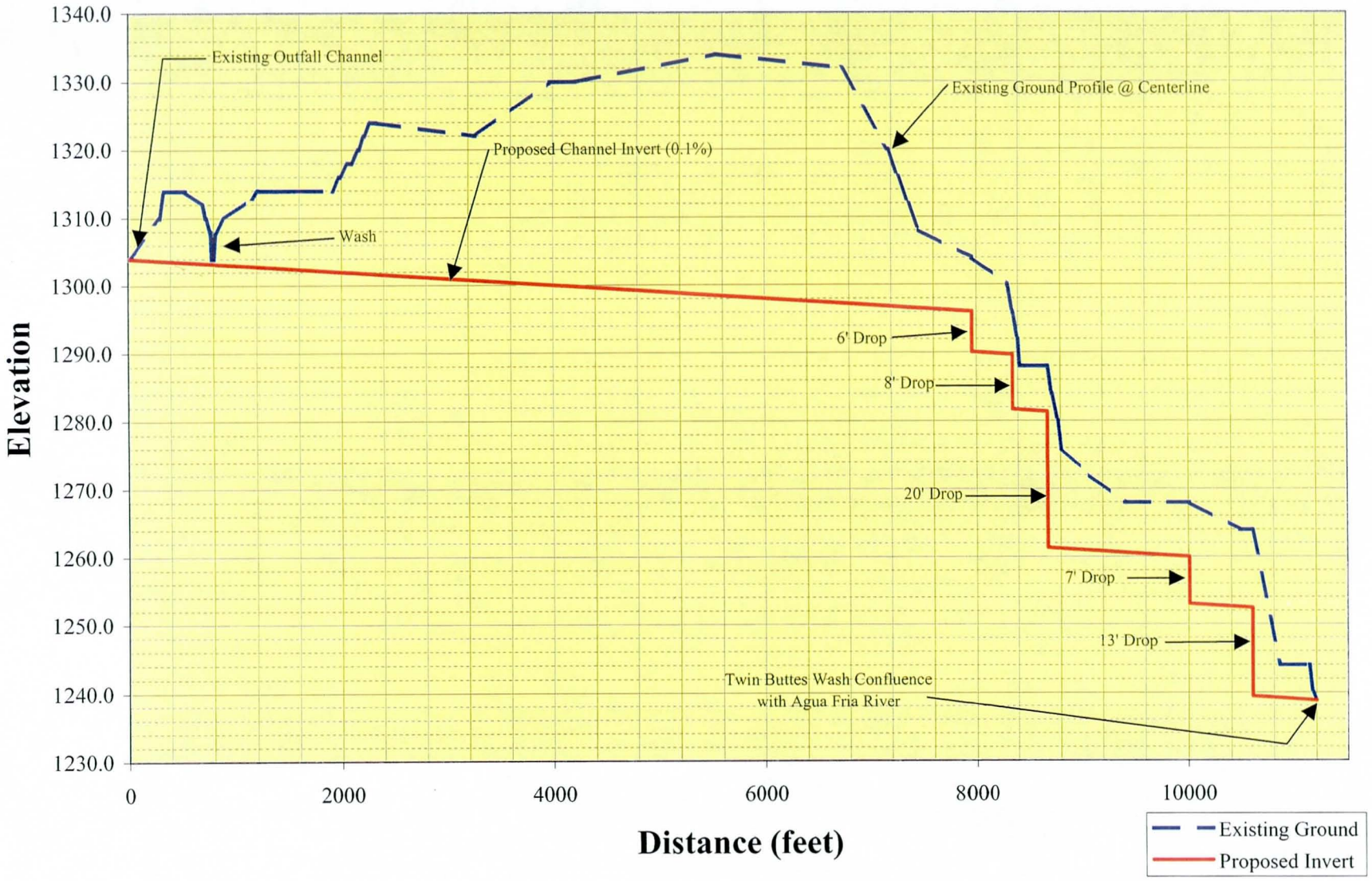
- Earth material from channel excavation will not only help reduce costs associated with the Estrella Roadway project but could reduce costs of other state, county and local construction projects in the general area.

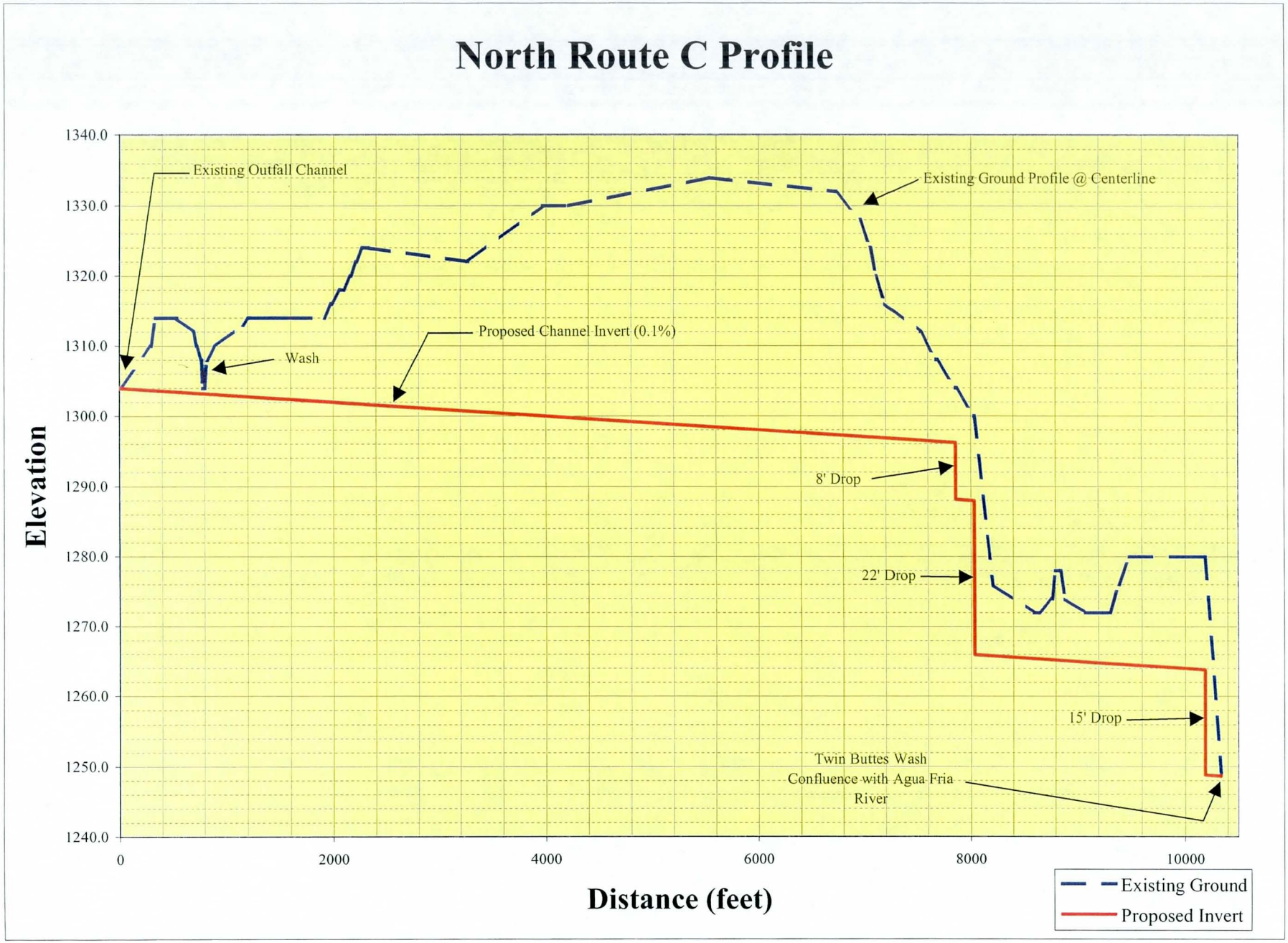
These merits are enhanced if the channel project could be completed at no or minimal cost to the County. For this reason the South – earthen alternative is recommended as having the best potential for being completed at no cost to the taxpayers and achieving the benefits listed above.

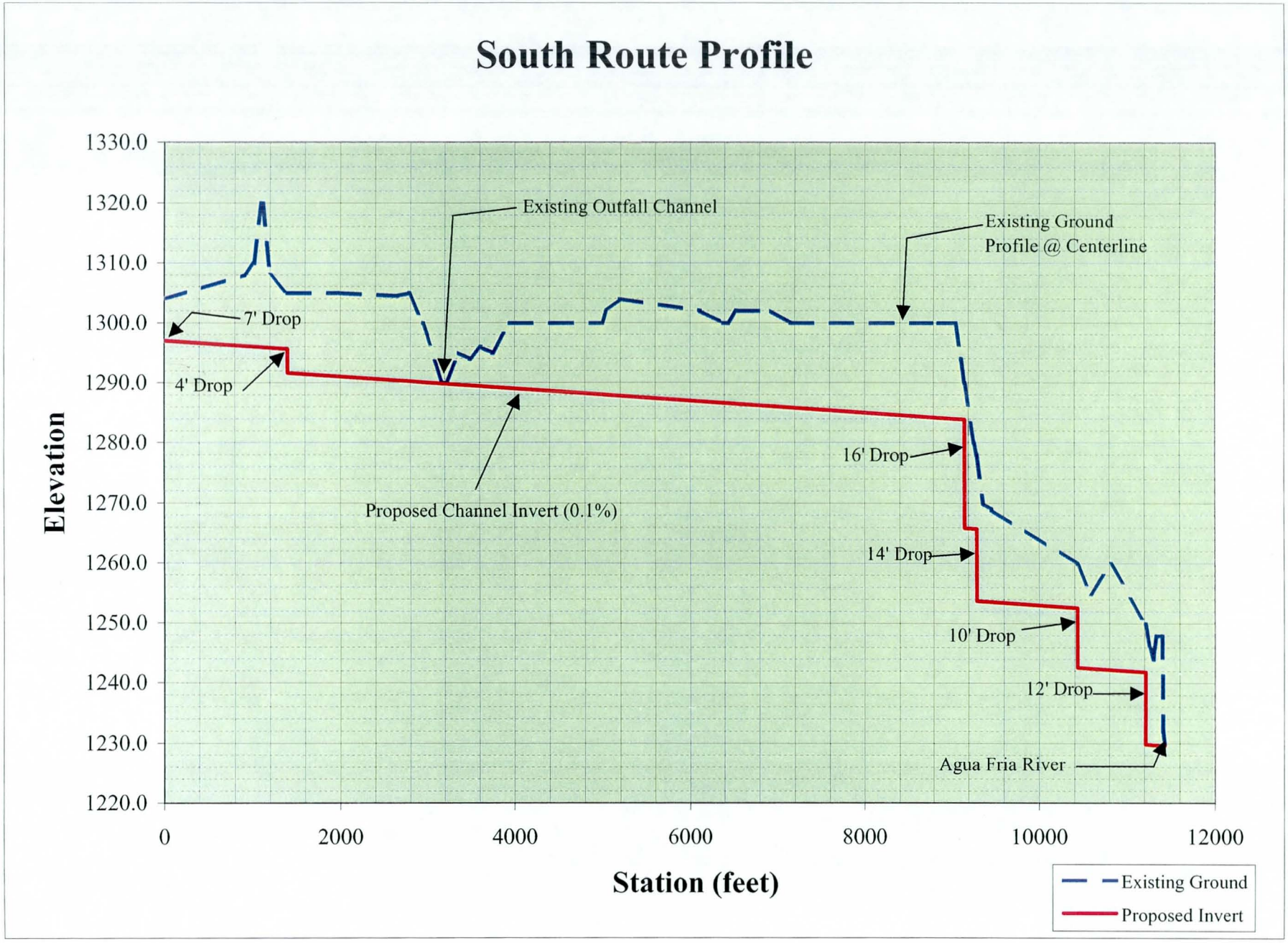
North Route A Profile



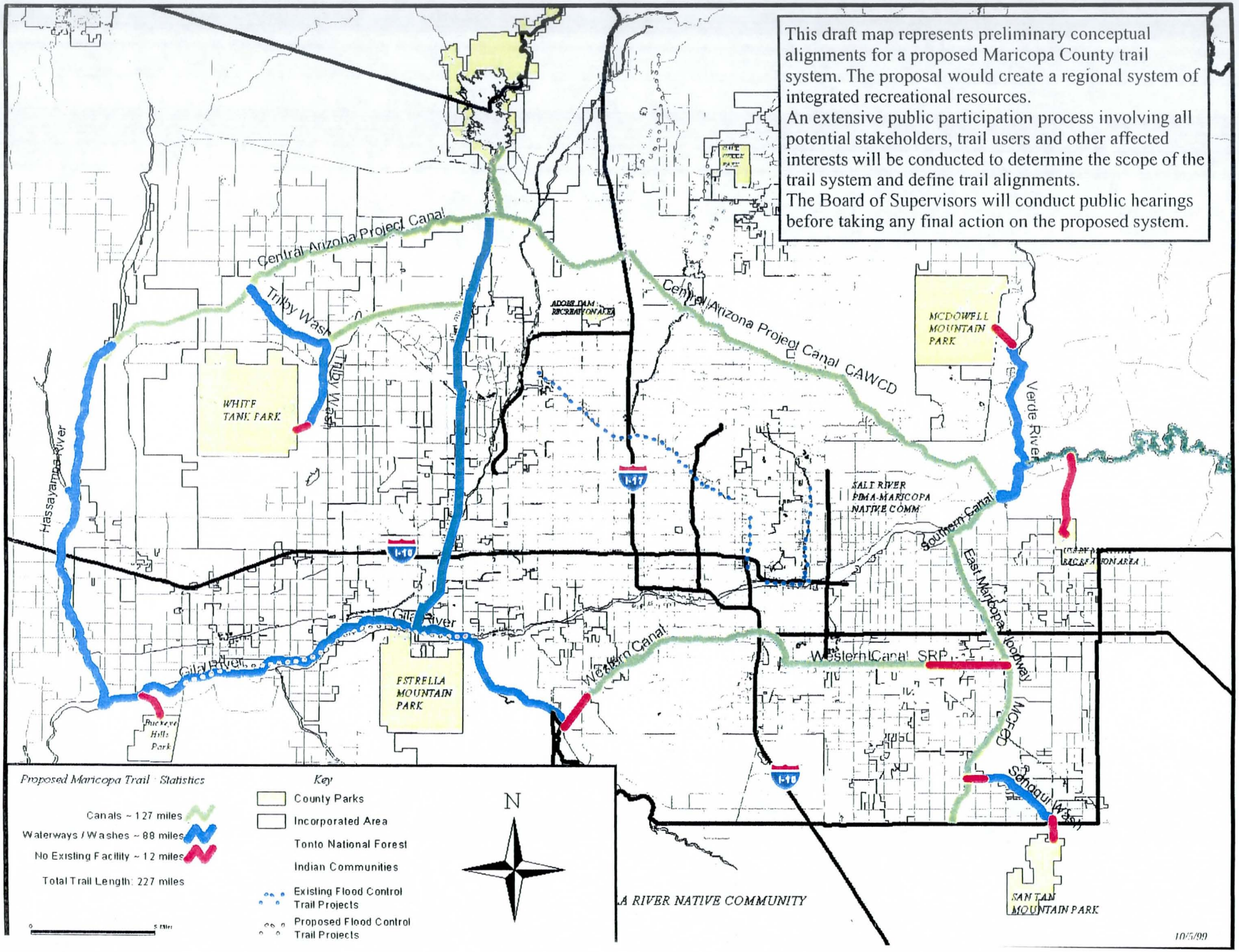
North Route B Profile




North Route C Profile
Elevation
Distance (feet)
1340.0
1330.0
1320.0
1310.0
1300.0
1290.0
1280.0
1270.0
1260.0
1250.0
1240.0
0
2000
4000
6000
8000
10000
Existing Outfall Channel
Existing Ground Profile @ Centerline
Proposed Channel Invert (0.1%)
Wash
8' Drop
22' Drop
15' Drop
Twin Buttes Wash
Confluence with Agua Fria
River
Existing Ground
Proposed Invert


South Route Profile
Elevation
1330.0
1320.0
1310.0
1300.0
1290.0
1280.0
1270.0
1260.0
1250.0
1240.0
1230.0
1220.0
0
2000
4000
6000
8000
10000
12000
Station (feet)
Existing Outfall Channel
Existing Ground
Profile @ Centerline
7' Drop
4' Drop
Proposed Channel Invert (0.1%)
16' Drop
14' Drop
10' Drop
12' Drop
Agua Fria River
Existing Ground
Proposed Invert

APPENDIX


This draft map represents preliminary conceptual alignments for a proposed Maricopa County trail system. The proposal would create a regional system of integrated recreational resources.
An extensive public participation process involving all potential stakeholders, trail users and other affected interests will be conducted to determine the scope of the trail system and define trail alignments.
The Board of Supervisors will conduct public hearings before taking any final action on the proposed system.
Central Arizona Project Canal
Central Arizona Project Canal CAWCD
Tiffany Wash
Tiffany Wash
WHITE TANK PARK
ADOBE DAM RECREATION AREA
MCDOWELL MOUNTAIN PARK
Verde River
Hassayampa River
I-17
I-10
SALT RIVER PIMA-MARICOPA NATIVE COMM
Southern Canal
East Maricopa Floodway
Gila River
Gila River
Western Canal
Western Canal SRP
McFarlane
Sonoqui Wash
ESTRELLA MOUNTAIN PARK
Buckeye Hills Park
SAN TAN MOUNTAIN PARK
A RIVER NATIVE COMMUNITY
Proposed Maricopa Trail Statistics
Canals ~ 127 miles
Waterways / Washes ~ 88 miles
No Existing Facility ~ 12 miles
Total Trail Length: 227 miles
Key
County Parks
Incorporated Area
Tonto National Forest
Indian Communities
Existing Flood Control Trail Projects
Proposed Flood Control Trail Projects
N
10/5/99

Telephone Conversation Record

HDR

Project	McMicken CAR	Project No.	
Time	1:30 pm	Date	5-26-00
Call to	Eric Lovstad	Call from	Bill Philips, SRP 236-8092
	Phone No.		Phone No.

Discussion, Agreement and/or Action

Bill left voice mail that he would be glad to look over our plan. These are typically 500kv lines. Ones going out to west and south(?) are theirs. Ones to north are not. They would need box culverts on the channel alignments for access. I'll call him back on Tuesday.

5-30

Sent Bill plan for his review.

Mailing address:

SRP
P.O. Box 52025
XCT315
Phoenix, Ariz. 85072-2025

Attn: Bill Phillips

5-31

Discussed SRP line crossings and as it is, CAR alternatives only affect SRP on the West side, 500kv line that runs parallel to the dam outlet wash. SRP operates the Perkins Substation which is the newer section on the SW corner of the site. The remaining site is called the West Wing Substation. APS is planning a new line to come out of the SE corner of Perkins and run east, but should not affect channel alignment as line should stay within substation site boundaries.

The lines to the east are a conglomeration of APS, SRP and Tucson. We don't cross them with this CAR.

Telephone Conversation Record

HDR

Project	McMicken CAR	Project No.	
Time	1:30 pm	Date	5-26-00
Call to	Eric Lovstad	Call from	Bill Philips, SRP 236-8092
	Phone No.		Phone No.

Discussion, Agreement and/or Action

Bill left voice mail that he would be glad to look over our plan. These are typically 500kv lines. Ones going out to west and south(?) are theirs. Ones to north are not. They would need box culverts on the channel alignments for access. I'll call him back on Tuesday.

Telephone Conversation Record

HDR

Project	McMicken Dam Outlet Wash CAR	Project No.	
Time	10:30 AM	Date	5-31-00
Call to	Jim Dugan, APS	602 371 7948 Phone No.	
Call from	Eric Lovstad	Phone No.	

Discussion, Agreement and/or Action

Talked to Jim concerning pair of 550kv lines leaving West Wing to the north (to Page). Engineering concerns would be addressed by Terry Moritz of his office. I am sending them a plan of our channel alternatives. I told him we would be staying several hundred feet away from any towers and he said that would probably easily satisfy APS.

They would need access across the channel. A road down into the channel may suffice but grades should be less than 10%. An "encroachment agreement" would have to be negotiated. No fee.

Mailing address:

APS
Mail Sta. 3016
P.O. Box 53933
Phoenix, Ariz. 85072-3933

Attn: Jim Dugan

Telephone Conversation Record

HDR

Project	McMicken Dam Outlet Wash CAR	Project No.	
Time	9:45 AM	Date	5-31-00
Call to	Eric Lovstad	Call from	Karen Stoker SL
Phone No.		Phone No.	542-2656

Discussion, Agreement and/or Action
STATE LAND DEPARTMENT

A right-of-way application is required. Approval may take 6 to 12 months. There are varying fees applicable and depend ultimately on area and land use. An application fee which is good for 10 years, a possible advertising fee and a possible archaeological fee could be assessed.

The process seems to be a rather routine matter. She recommended Eric Hoffman (MCDOT) at 602 506-8685 as an excellent resource concerning the process if more information is required.

Telephone Conversation Record

HDR

Project	McMicken CAR		Project No.
Time	10:00	Date 5-26-00	
Call to	Linda – SRP land dept.	602 236 5900 Phone No.	Call from E. Lovstad Phone No.

Discussion, Agreement and/or Action

Discussed right-of-way issues for crossing SRP easements. Typical process is submit "consent request" to SRP Land Dept., but right-of-way would have to be negotiated with the underlying land owner.

She also recommended I talk with Bill Philips, transmission line dept., concerning technical issues of grading around transmission towers. Phone number 236-8092.

Telephone Conversation Record

HDR

Project	McMicken Dam outlet wash CAR	Project No.	
Time	10:00 AM	Date	6-8-00
Call to	Milton Rupp, BLM 623 580 5606 (Phone No.)	Call from	Eric Lovstad 508-6644 (Phone No.)

Discussion, Agreement and/or Action

Milton is chief real estate person with Bureau of Land Management, Phoenix. He suggested I send him a copy of the alternatives map just to check if the BLM is coming into play at the Agua Fria, if no place else. BLM right-of-way is generally free but don't take automatic approval for granted.

Address is:

Milton Rupp
Bureau of Land Management
2015 W. Deer Valley Rd.
Phoenix, AZ 85027

Telephone Conversation Record

HDR

Project	McMicken Dam CAR	Project No.	
Time	8:30 AM	Date	6-8-00
Call to	Larry Koontz	602 216 3852	
		Phone No.	
Call from	Eric Lovstad		
		Phone No.	

Discussion, Agreement and/or Action

Talked with Larry Koontz at Bureau of Reclamation, Phx. concerning their existing easement which could be crossed with a north route alternative. He wasn't sure about their holdings out by the West Wing substation, but we agreed that I could send him a map and he'd take a look at it to verify their rights.

He agreed that if we crossed their easement (without knowing the details) that it would probably be allowed without much problem.

Mailing address:

Bureau of Reclamation
Phoenix Area Office
P.O. Box 81169
Phoenix, AZ 85069-1169

United States Department of the Interior

BUREAU OF RECLAMATION
Phoenix Area Office
PO Box 81169
Phoenix, Arizona 85069-1169

IN REPLY REFER TO:
PXAO-4000 LND-3.00

JUN 20 2000

HDR

REC.: JUN 21 2000

PROJ.:
FILE:
DIST.:

HDR Engineering, Inc.
Attention: Mr. Eric Lovstad
Suite 250
2141 East Highland Avenue
Phoenix, Arizona 85016

Subject: McMicken Dam Outlet Wash Realignment, Candidate Assessment Report - Central Arizona Project - New Waddell Dam and Reservoir, Waddell - Westwing 230kV Transmission Line

Dear Mr. Lovstad:

This letter will confirm receipt of your June 8, 2000, package to Mr. Larry Koontz of my staff. Review of the materials from the package confirm that alternatives North Route A, B, and C will impact lands acquired by the Bureau of Reclamation for the subject powerline from the State of Arizona. Our powerline parallels the Arizona Public Service Company's Navajo-Westwing 500kV Transmission Line where both enter the West Wing Substation in Section 12 of Township 4 North, Range 1 West, G&SRM, Arizona.

Although we do not see any advantage to the county extending the outlet channel an additional mile and one half to meet the Agua Fria River, we will be anxiously waiting to see the explanation. If you have any questions or require additional information, please contact Mr. Koontz at 602-216-3852.

Sincerely,

Peter O. Castaneda
Chief, Water and Lands Division

cc: Ms. Sharon Hood, Land Administrator, Central Arizona Water Conservation District, PO Box 43020, Phoenix, Arizona 85080-3020

Telephone Conversation Record

HDR

Project	McMicken Dam Outlet Wash CAR	Project No.	
Time	3:30 PM	Date	6-1-00
Call to	Rob Genualdi, CAP	Phone No. 623 869 2276	Call from Eric Lovstad
			Phone No.

Discussion, Agreement and/or Action

Called Rob to ascertain status of CAP ground water recharge project which will lies north of Estrella Roadway at the Agua Fria's west bank. Rob said that permit and land acquisition problems were almost resolved (land condemnations were going on) and they were nearing letting of the contract to build. I did not get a definite schedule though.

I suggested to Rob that Ray Smith, of MCDOT, be informed of the status since he is the project manager for Estrella Roadway and had stated to me that the recharge project was dead.

Telephone Conversation Record

HDR

Project	McMicken Dam Outlet Wash CAR	Project No.	
Time	11:00 AM	Date	5-31-00
Call to	Roy Watson, WAPA 602 352 2554 Phone No.	Call from	Eric Lovstad Phone No.

Discussion, Agreement and/or Action

WAPA – Western Area Power Administration, Dept of Energy

Talked to Roy about crossing two of their power transmission lines. One leaves the north end of West Wing, to L. Pleasant (serves power needs for CAP). This 230kv line actually is owned by Bureau of Reclamation and WAPA maintains it for them. Right-of-way would have to be negotiated with Bureau.

WAPA also owns the 500kv line coming out of the s. end of Perkins. They have a 200' wide easement (centered on towers) there on State Land. Some type of joint use agreement would be necessary which Roy's office would handle.

Roy is retiring at the end of June and will be replaced by Carla Cristelly.

Mailing address:

WAPA
P.O. Box 6457
Phoenix, Ariz. 85005

Department of Energy
Western Area Power Administration
Desert Southwest Customer Service Region
P.O. Box 6457
Phoenix, AZ 85005-6457

HDR

REC.: JUN 13 2000

PROJ.:
FILE:
DIST.:

Mr. Eric Lovstad
HDR Engineering, Inc.
2141 East Highland Avenue, Suite 250
Phoenix, Arizona 85016

Dear Mr. Lovstad:

The Western Area Power Administration (Western) has reviewed your drawing for the proposed outlet channel routes near West Wing Substation. The transmission line running south and then west from Perkins Substation is a Western owned transmission line. The Bureau of Reclamation has no interest in this line. The transmission running north from the West Wing Substation belongs to the Bureau of Reclamation while it is operated and maintained by Western.

As discussed, Western would not object to the crossing of the transmission line easement with the outlet channel, provided the outlet channel did not interfere with our facilities, we have access along the transmission line easement and you entered into a License Agreement with Western. The License Agreement would be provided upon review and approval of final plans for the outlet channel.

Should you have any questions or need additional information, please call me at (602) 352-2554.

Sincerely,

Roy E. Watson

Roy E. Watson
Realty Officer

Concrete-lined channel
Worksheet for Trapezoidal Channel (English)

Project Description	
Worksheet	concrete
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

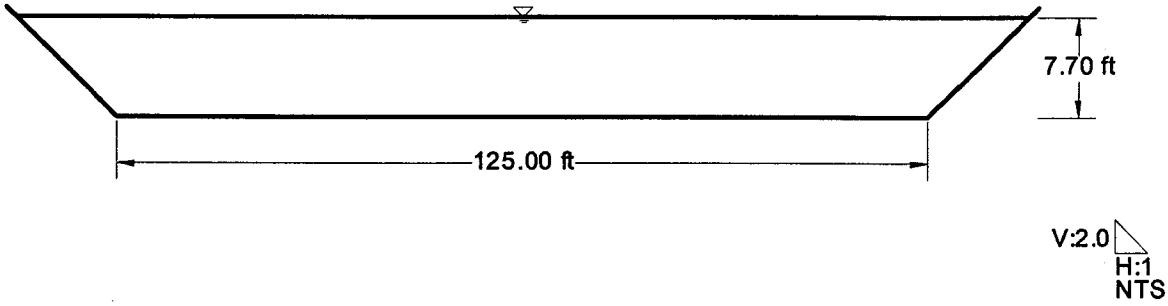
Input Data		
Mannings Coefficient	0.013	
Slope	0.001000	ft/ft
Left Side Slope	0.50	V : H
Right Side Slope	0.50	V : H
Bottom Width	125.00	ft
Discharge	14,000.00	cfs SPF

Results		
Depth	7.70	ft
Flow Area	1,081.1	ft²
Wetted Perimeter	159.44	ft
Top Width	155.80	ft
Critical Depth	7.03	ft
Critical Slope	0.001366	ft/ft
Velocity	12.95	ft/s
Velocity Head	2.61	ft
Specific Energy	10.31	ft
Froude Number	0.87	
Flow Type	Subcritical	

Cross Section
Cross Section for Trapezoidal Channel (English)

Project Description	
Worksheet	concrete
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.013	
Slope	0.001000	ft/ft
Depth	7.70	ft
Left Side Slope	0.50	V : H
Right Side Slope	0.50	V : H
Bottom Width	125.00	ft
Discharge	14,000.00	cfs SPF



Concrete-lined channel
Worksheet for Trapezoidal Channel (metric)

Project Description	
Worksheet	concrete
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.001000	m/m
Left Side Slope	0.50	V : H
Right Side Slope	0.50	V : H
Bottom Width	38.10	m
Discharge	396.4358	m^3/s SPF

Results		
Depth	2.35	m
Flow Area	100.4	m^2
Wetted Perimeter	48.60	m
Top Width	47.49	m
Critical Depth	2.14	m
Critical Slope	0.001366	m/m
Velocity	3.95	m/s
Velocity Head	0.79	m
Specific Energy	3.14	m
Froude Number	0.87	
Flow Type	Subcritical	

Concrete-lined channel
Worksheet for Trapezoidal Channel (Metric)

Project Description	
Worksheet	concrete
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.001000	ft/ft
Left Side Slope	0.50	V : H
Right Side Slope	0.50	V : H
Bottom Width	125.00	ft
Discharge	6,020.00	cfs

100 yr.

Results		
Depth	4.68	ft
Flow Area	628.9	ft²
Wetted Perimeter	145.93	ft
Top Width	143.72	ft
Critical Depth	4.07	ft
Critical Slope	0.001602	ft/ft
Velocity	9.57	ft/s
Velocity Head	1.42	ft
Specific Energy	6.10	ft
Froude Number	0.81	
Flow Type	Subcritical	

Concrete-lined channel
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	concrete
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.001000	m/m
Left Side Slope	0.50	V : H
Right Side Slope	0.50	V : H
Bottom Width	38.10	m
Discharge	170.4674	m³/s

100 yr

Results		
Depth	1.43	m
Flow Area	58.4	m²
Wetted Perimeter	44.48	m
Top Width	43.81	m
Critical Depth	1.24	m
Critical Slope	0.001602	m/m
Velocity	2.92	m/s
Velocity Head	0.43	m
Specific Energy	1.86	m
Froude Number	0.81	
Flow Type	Subcritical	

Worksheet

Worksheet for Irregular Channel (English)

(Earth)

Project Description	
Worksheet	w/lowflow
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.001000	ft/ft
Discharge	14,000.00	cfs SPF

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Method	mproved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.025	
Water Surface Elevation	999.22	ft
Elevation Range	992.10 to 1,000.00	
Flow Area	2,432.3	ft²
Wetted Perimeter	443.32	ft
Top Width	441.78	ft
Actual Depth	7.12	ft
Critical Elevation	996.76	ft
Critical Slope	0.006366	ft/ft
Velocity	5.76	ft/s
Velocity Head	0.51	ft
Specific Energy	999.74	ft
Froude Number	0.43	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	2+04	0.030
2+04	2+44	0.013
2+44	4+48	0.030

Natural Channel Points

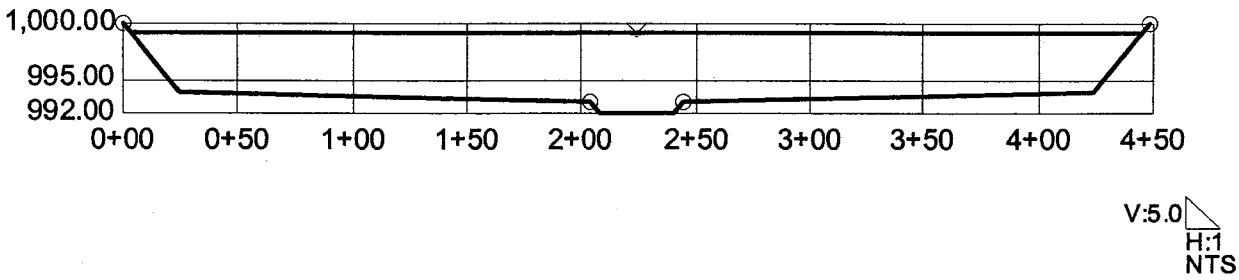
Station (ft)	Elevation (ft)
0+00	1,000.00
0+24	994.00
2+04	993.10
2+08	992.10
2+40	992.10
2+44	993.10
4+24	994.00
4+48	1,000.00

Cross Section

Cross Section for Irregular Channel (English)
(Earth)

Project Description	
Worksheet	w/lowflow
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.025	
Slope	0.001000	ft/ft
Water Surface Elevation	999.22	ft
Elevation Range	992.10 to 1,000.00	
Discharge	14,000.00	cfs SPF



Worksheet

Worksheet for Irregular Channel (Metric) (Earth)

Project Description	
Worksheet	w/lowflow
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.001000	m/m
Discharge	396.0000	m³/s SPF

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Method	mproved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.025	
Water Surface Elevation	304.56	m
Elevation Range	302.39 to 304.80	
Flow Area	225.8	m²
Wetted Perimeter	135.11	m
Top Width	134.65	m
Actual Depth	2.17	m
Critical Elevation	303.81	m
Critical Slope	0.006367	m/m
Velocity	1.75	m/s
Velocity Head	0.16	m
Specific Energy	304.72	m
Froude Number	0.43	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+62	0.030
0+62	0+74	0.013
0+74	1+37	0.030

Natural Channel Points

Station (m)	Elevation (m)
0+00	304.80
0+07	302.97
0+62	302.70
0+63	302.39
0+73	302.39
0+74	302.70
1+29	302.97
1+37	304.80

Worksheet

Worksheet for Irregular Channel (English) (Earth)

Project Description	
Worksheet	w/lowflow
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.001000	ft/ft
Discharge	6,020.00	cfs 100 yr

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Method	mproved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.025	
Water Surface Elevation	996.86	ft
Elevation Range	992.10 to 1,000.00	
Flow Area	1,409.3	ft²
Wetted Perimeter	423.81	ft
Top Width	422.85	ft
Actual Depth	4.76	ft
Critical Elevation	995.33	ft
Critical Slope	0.007101	ft/ft
Velocity	4.27	ft/s
Velocity Head	0.28	ft
Specific Energy	997.14	ft
Froude Number	0.41	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	2+04	0.030
2+04	2+44	0.013
2+44	4+48	0.030

Natural Channel Points

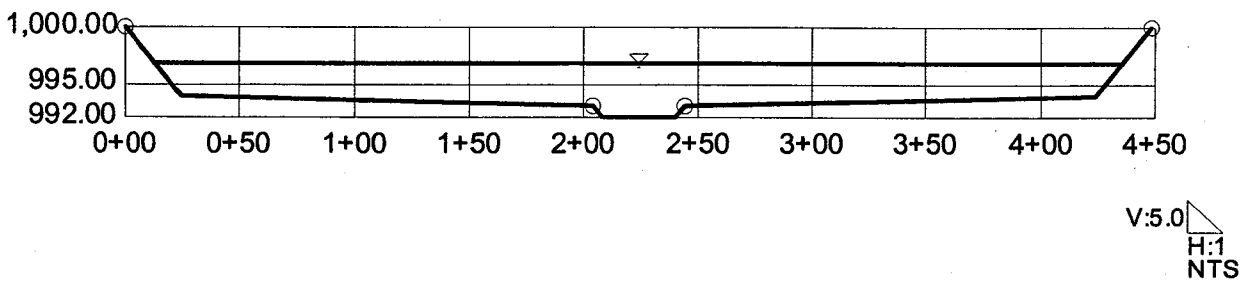
Station (ft)	Elevation (ft)
0+00	1,000.00
0+24	994.00
2+04	993.10
2+08	992.10
2+40	992.10
2+44	993.10
4+24	994.00
4+48	1,000.00

Cross Section

Cross Section for Irregular Channel (English)
(Earth)

Project Description	
Worksheet	w/lowflow
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.025	
Slope	0.001000	ft/ft
Water Surface Elevation	996.86	ft
Elevation Range	992.10 to 1,000.00	
Discharge	6,020.00	cfs



Worksheet

Worksheet for Irregular Channel (Metric) (Earth)

Project Description	
Worksheet	w/lowflow
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.001000	m/m
Discharge	170.4674	m³/s (100 yr.)

Options	
Current Roughness Method	mproved Lotter's Method
Open Channel Weighting Method	mproved Lotter's Method
Closed Channel Weighting Metho	Horton's Method

Results		
Mannings Coefficient	0.025	
Water Surface Elevation	303.84	m
Elevation Range	302.39 to 304.80	
Flow Area	130.9	m²
Wetted Perimeter	129.18	m
Top Width	128.89	m
Actual Depth	1.45	m
Critical Elevation	303.38	m
Critical Slope	0.007101	m/m
Velocity	1.30	m/s
Velocity Head	0.09	m
Specific Energy	303.93	m
Froude Number	0.41	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+62	0.030
0+62	0+74	0.013
0+74	1+37	0.030

Natural Channel Points

Station (m)	Elevation (m)
0+00	304.80
0+07	302.97
0+62	302.70
0+63	302.39
0+73	302.39
0+74	302.70
1+29	302.97
1+37	304.80

Culvert Calculator Report
El Mirage Structures (downstream)

Solve For: Headwater Elevation

4-3000x1800

Substitute Downsized Str.

Culvert Summary					
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	1.13	
Computed Headwater Elevation	106.78	ft	Discharge	1,729.00	cfs *
Inlet Control HW Elev	106.60	ft	Tailwater Elevation	0.00	ft
Outlet Control HW Elev	106.78	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	100.00	ft	Downstream Invert	98.00	ft
Length	180.00	ft	Constructed Slope	0.011111	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	2.76	ft
Slope Type	Steep		Normal Depth	2.54	ft
Flow Regime	Supercritical		Critical Depth	3.87	ft
Velocity Downstream	15.66	ft/s	Critical Slope	0.003369	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	10.00	ft
Section Size	10 x 6 ft		Rise	6.00	ft
Number Sections	4				

Outlet Control Properties					
Outlet Control HW Elev	106.78	ft	Upstream Velocity Head	1.94	ft
Ke	0.50		Entrance Loss	0.97	ft

Inlet Control Properties					
Inlet Control HW Elev	106.60	ft	Flow Control	Unsubmerged	
Inlet Type	90 and 15 ° wingwall flares		Area Full	240.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

* below outlet wash diversion

4-10'x6'

conc.: 4.246 cy/lf steel: 597.7#/lf

wingwalls, conc: 33 cy steel: 2648 #

Assumed L=180'

Cost: Conc 180 (4.246) + 33 = 797.3 ∴ 797.3 * $230 = $183,374

Steel 180 (597.7) + 2648 = 110,234 ∴ 110,234 x $0.45 = $49,605

$232,979

Project Title: McMicken Dam wash CAR
c:\haestad\cvm\car.cvm
06/05/00 11:21:26 AM

HDR Engineering

© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

CulvertMaster v1.0

Culvert Calculator Report
El Mirage upstream structure

Solve For: Headwater Elevation

2 - 2400 x 1800
Substitute Downsized Str.

Culvert Summary					
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	1.18	
Computed Headwater Elevation	107.08	ft	Discharge	739.00	cfs *
Inlet Control HW Elev	106.90	ft	Tailwater Elevation	0.00	ft
Outlet Control HW Elev	107.08	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	100.00	ft	Downstream Invert	98.00	ft
Length	180.00	ft	Constructed Slope	0.011111	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	2.97	ft
Slope Type	Steep		Normal Depth	2.76	ft
Flow Regime	Supercritical		Critical Depth	4.05	ft
Velocity Downstream	15.57	ft/s	Critical Slope	0.003925	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	8.00	ft
Section Size	8 x 6 ft		Rise	6.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev	107.08	ft	Upstream Velocity Head	2.02	ft
Ke	0.50		Entrance Loss	1.01	ft

Inlet Control Properties					
Inlet Control HW Elev	106.90	ft	Flow Control	Unsubmerged	
Inlet Type	90 and 15 ° wingwall flares		Area Full	96.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

* below outlet wash diversion

2-8'x6'
conc: 1.725 cy/lf steel: 297.6#/lf
wings conc: 24 c.y steel 1763#

Assumed L = 180'

Cost: Conc. 180(1.725) + 24 = 334.5 ∴ 334.5 * $230 = $76,935
Steel. 180 (297.6) + 1763 = 55,331 ∴ 55,331 * $0.45 = $24,899
$101,834

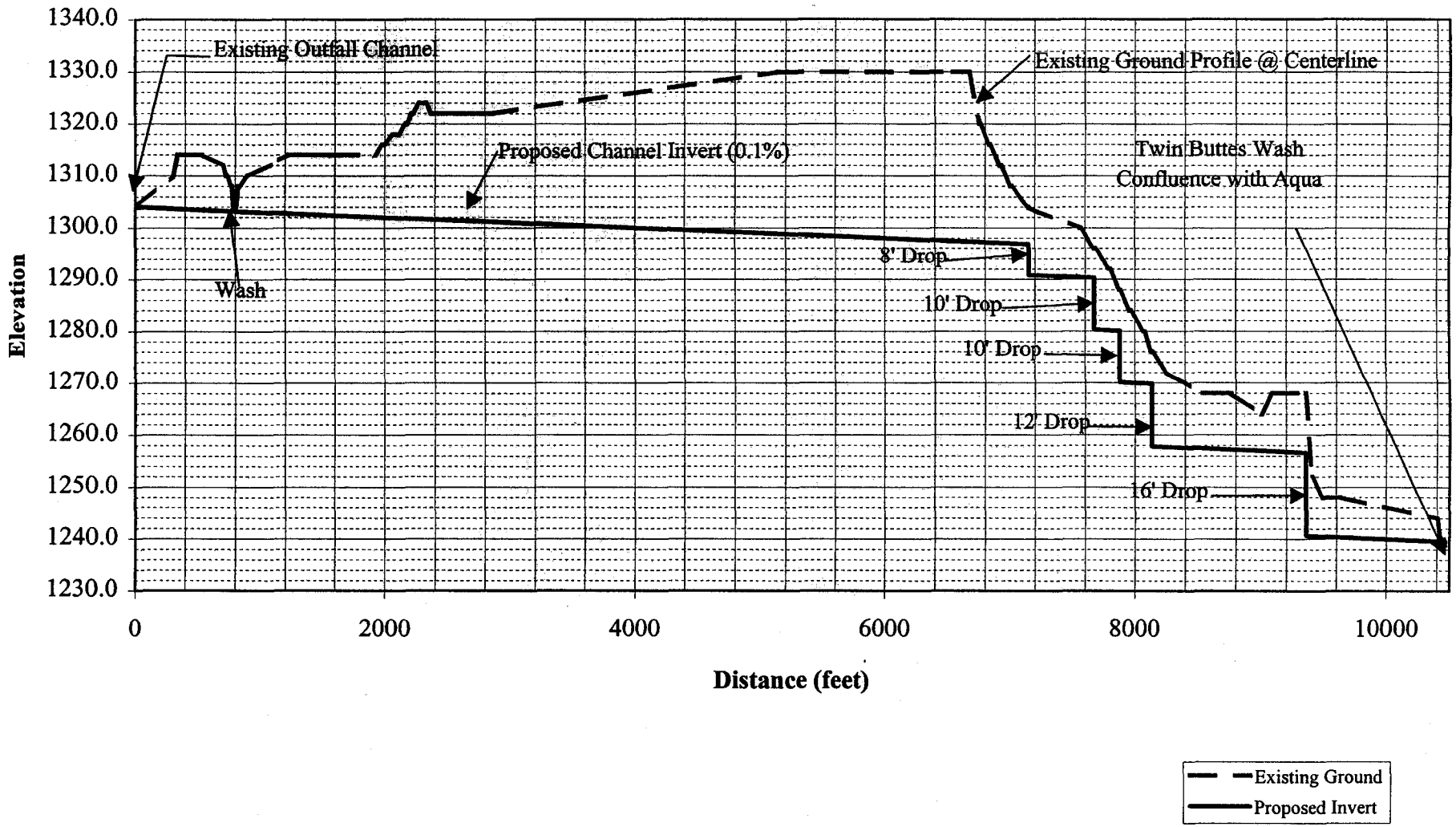
North Route A Profile Data

	Point	Distance (feet)	Station Cum. Dist (feet)	Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined Channel Option: End Area (sq. ft)	Unlined Channel Option: Volume (cu. yds.)	Unlined Channel Option: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined Channel Option: End Area (sq. ft)	Lined Channel Option: Volume (cu. yds.)	Lined Channel Option: Cumulative Volume (cu. yds.)
North Channel	POB	0	0	1304.0	1311.0	1304.0	-0.001	0.0	--	0	0	0	--	0	0	0
		300	300	1310.0	1310.7	1303.7	-0.001	6.3	--	0	0	0	--	0	0	0
		40	340	1314.0	1310.7	1303.7	-0.001	10.3	483	4564	3380	3,380	176	1517	1124	1,124
		200	540	1314.0	1310.5	1303.5	-0.001	10.5	484	4660	34163	37,544	177	1553	11370	12,494
		160	700	1312.0	1310.3	1303.3	-0.001	8.7	470	3783	25017	62,560	163	1240	8274	20,768
		30	730	1310.0	1310.3	1303.3	-0.001	6.7	454	2873	3698	66,258	157	1128	1315	22,083
		44	774	1308.0	1310.2	1303.2	-0.001	4.8	438	2001	3971	70,229	157	1128	1838	23,921
		10	784	1304.0	1310.2	1303.2	-0.001	0.8	406	316	429	70,658	157	1128	418	24,339
		20	804	1304.0	1310.2	1303.2	-0.001	0.8	406	324	237	70,895	157	1128	836	25,175
		20	824	1308.0	1310.2	1303.2	-0.001	4.8	439	2023	869	71,765	157	1128	836	26,010
		80	904	1310.0	1310.1	1303.1	-0.001	6.9	455	2952	7370	79,135	157	1128	3342	29,353
		250	1154	1313.0	1309.8	1302.8	-0.001	10.2	481	4474	34381	113,516	174	1485	12096	41,449
		60	1214	1314.0	1309.8	1302.8	-0.001	11.2	490	4989	10514	124,030	183	1674	3510	44,958
		190	1404	1314.0	1309.6	1302.6	-0.001	11.4	491	5082	35433	159,463	184	1709	11902	56,860
		180	1584	1314.0	1309.4	1302.4	-0.001	11.6	493	5170	34174	193,637	186	1742	11503	68,363
		330	1914	1314.0	1309.1	1302.1	-0.001	11.9	495	5333	64189	257,826	188	1804	21669	90,032
		70	1984	1316.0	1309.0	1302.0	-0.001	14.0	512	6376	15179	273,005	205	2211	5204	95,236
		80	2064	1318.0	1308.9	1301.9	-0.001	16.1	529	7458	20494	293,499	222	2654	7207	102,443
		30	2094	1318.0	1308.9	1301.9	-0.001	16.1	529	7474	8295	301,794	222	2661	2953	105,396
		70	2164	1320.0	1308.8	1301.8	-0.001	18.2	545	8585	20817	322,612	238	3137	7516	112,912
		50	2214	1322.0	1308.8	1301.8	-0.001	20.2	562	9720	16949	339,561	255	3642	6277	119,189
		60	2274	1324.0	1308.7	1301.7	-0.001	22.3	578	10894	22905	362,466	271	4184	8696	127,885
		50	2324	1324.0	1308.7	1301.7	-0.001	22.3	579	10923	20201	382,667	272	4198	7761	135,645
		50	2374	1322.0	1308.6	1301.6	-0.001	20.4	563	9810	19197	401,864	256	3683	7297	142,942
		160	2534	1322.0	1308.5	1301.5	-0.001	20.5	564	9900	58401	460,264	257	3724	21948	164,890
		170	2704	1322.0	1308.3	1301.3	-0.001	20.7	566	9996	62637	522,901	259	3768	23587	188,477
		150	2854	1322.0	1308.1	1301.1	-0.001	20.9	567	10081	55770	578,672	260	3807	21042	209,519
		2280	5134	1330.0	1305.9	1298.9	-0.001	31.1	649	16331	1115176	1,693,848	342	6901	452105	661,624
		1120	6254	1330.0	1304.7	1297.7	-0.001	32.3	658	17063	692612	2,386,459	351	7289	294304	955,928
		290	6544	1330.0	1304.5	1297.5	-0.001	32.5	660	17254	184295	2,570,754	353	7391	78837	1,034,765
		130	6674	1330.0	1304.3	1297.3	-0.001	32.7	661	17340	83282	2,654,036	354	7437	35697	1,070,462
		80	6754	1320.0	1304.2	1297.2	-0.001	22.8	582	11173	42241	2,696,277	275	4315	17411	1,087,873
		80	6834	1316.0	1304.2	1297.2	-0.001	18.8	551	8952	29815	2,726,092	244	3298	11279	1,099,152
		85	6919	1312.0	1304.1	1297.1	-0.001	14.9	519	6858	24887	2,750,978	212	2406	8979	1,108,131
		80	6999	1308.0	1304.0	1297.0	-0.001	11.0	488	4884	17395	2,768,373	181	1635	5986	1,114,117
		140	7139	1304.0	1303.9	1296.9	-0.001	7.1	457	3059	20593	2,788,966	157	1128	7163	1,121,280
Added Point (6' Drop)		1	7140	1304.0	1297.9	1290.9	-0.001	13.1	505	5946	167	2,789,133	198	2040	59	1,121,339
		419	7559	1300.0	1297.4	1290.4	-0.001	9.6	476	4189	78638	2,867,771	169	1382	26558	1,147,897
Added Point (0' Drop)		1	7560	1300.0	1297.4	1290.4	-0.001	9.6	476	4189	155	2,867,926	169	1382	51	1,147,948
		114	7674	1296.0	1297.3	1290.3	-0.001	5.7	445	2397	13904	2,881,830	157	1128	5300	1,153,248
Added Point (10' Drop)		1	7675	1296.0	1287.3	1280.3	-0.001	15.7	525	7251	179	2,882,009	218	2568	68	1,153,316
		124	7799	1292.0	1287.2	1280.2	-0.001	11.8	494	5275	28764	2,910,773	187	1782	9988	1,163,304
		80	7879	1288.0	1287.1	1280.1	-0.001	7.9	463	3399	12850	2,923,622	157	1128	4311	1,167,614
Added Point (10' Drop)		1	7880	1288.0	1277.1	1270.1	-0.001	17.9	543	8429	219	2,923,841	236	3069	78	1,167,692
		79	7959	1284.0	1277.0	1270.0	-0.001	14.0	512	6361	21637	2,945,478	205	2205	7715	1,175,407
		115	8074	1280.0	1276.9	1269.9	-0.001	10.1	481	4434	22988	2,968,466	174	1470	7826	1,183,233
		60	8134	1276.0	1276.9	1269.9	-0.001	6.1	449	2602	7818	2,976,284	157	1128	2887	1,186,120
Added Point (12' Drop)		1	8135	1276.0	1264.9	1257.9	-0.001	18.1	545	8567	207	2,976,491	238	3129	79	1,186,199
		124	8259	1272.0	1264.7	1257.7	-0.001	14.3	514	6514	34631	3,011,122	207	2266	12389	1,198,588

North Route A Profile Data

									Unlined Channel Option				Lined Channel Option			
Point	Distance (feet)	Station Cum. Dist (feet)	Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Channel Topwidth (feet)	End Area (sq. ft)	Volume (cu. yds.)	Cumulative Volume (cu. yds.)	Channel Topwidth (feet)	End Area (sq. ft)	Volume (cu. yds.)	Cumulative Volume (cu. yds.)
	280	8539	1268.0	1264.5	1257.5	-0.001	10.5	484	4657	57928	3,069,049	177	1552	19796	1,218,384
	50	8589	1268.0	1264.4	1257.4	-0.001	10.6	485	4682	8647	3,077,697	178	1560	2881	1,221,266
	175	8764	1268.0	1264.2	1257.2	-0.001	10.8	486	4767	30620	3,108,316	179	1592	10215	1,231,480
	235	8999	1264.0	1264.0	1257.0	-0.001	7.0	456	2993	33770	3,142,086	157	1128	11835	1,243,316
	90	9089	1268.0	1263.9	1256.9	-0.001	11.1	489	4925	13197	3,155,283	182	1650	4630	1,247,946
	265	9354	1268.0	1263.7	1256.7	-0.001	11.3	491	5055	48975	3,204,258	184	1699	16434	1,264,380
Added Point (16' Drop)	1	9355	1268.0	1247.7	1240.7	-0.001	27.3	619	13931	352	3,204,610	312	5663	136	1,264,517
	49	9404	1252.0	1247.6	1240.6	-0.001	11.4	491	5079	17250	3,221,860	184	1708	6688	1,271,205
	90	9494	1248.0	1247.5	1240.5	-0.001	7.5	460	3219	13831	3,235,691	157	1128	4726	1,275,931
	140	9634	1248.0	1247.4	1240.4	-0.001	7.6	461	3284	16861	3,252,551	157	1128	5849	1,281,780
	765	10399	1244.0	1246.6	1239.6	-0.001	4.4	435	1834	72510	3,325,061	157	1128	31960	1,313,740
	30	10429	1240.0	1246.6	1239.6	-0.001	0.4	403	170	1114	3,326,175	157	1128	1253	1,314,994
Aqua Fria Floodway Boundary	40	10469	1239.0	1246.5	1239.5	-0.001	-0.5	396	-214	-32	3,326,142	157	1128	1671	1,316,665
		10469									2,544,499 M^3				1,007,249 M^3

North Route A Profile

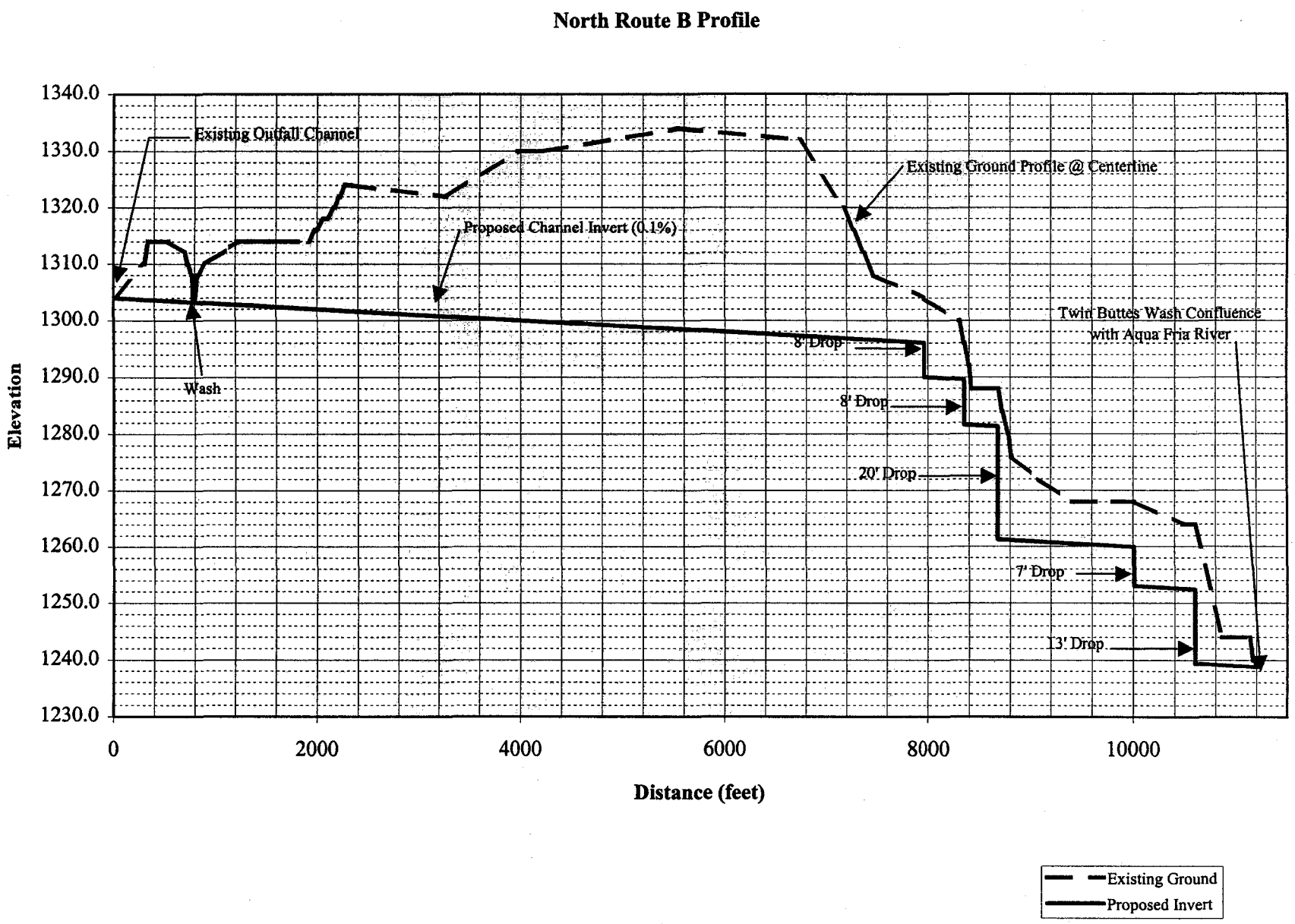


North Route B Profile Data

	Point	Distance (feet)	Station Cum. Dist (feet)	Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined Channel Option: End Area (sq. ft)	Unlined Channel Option: Volume (cu. yds.)	Unlined Channel Option: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined Channel Option: End Area (sq. ft)	Lined Channel Option: Volume (cu. yds.)	Lined Channel Option: Cumulative Volume (cu. yds.)
North Channel	POB	0	0	1304.0	1311.0	1304.0	-0.001	0.0	--	0	0	0	--	0	0	0
		300	300	1310.0	1310.7	1303.7	-0.001	6.3	--	0	0	0	--	0	0	0
		40	340	1314.0	1310.7	1303.7	-0.001	10.3	483	4564	3380	3,380	176	1517	1124	1,124
		200	540	1314.0	1310.5	1303.5	-0.001	10.5	484	4660	34163	37,544	177	1553	11370	12,494
		160	700	1312.0	1310.3	1303.3	-0.001	8.7	470	3783	25017	62,560	163	1240	8274	20,768
		30	730	1310.0	1310.3	1303.3	-0.001	6.7	454	2873	3698	66,258	157	1128	1315	22,083
		44	774	1308.0	1310.2	1303.2	-0.001	4.8	438	2001	3971	70,229	157	1128	1838	23,921
		10	784	1304.0	1310.2	1303.2	-0.001	0.8	406	316	429	70,658	157	1128	418	24,339
		20	804	1304.0	1310.2	1303.2	-0.001	0.8	406	324	237	70,895	157	1128	836	25,175
		20	824	1308.0	1310.2	1303.2	-0.001	4.8	439	2023	869	71,765	157	1128	836	26,010
		80	904	1310.0	1310.1	1303.1	-0.001	6.9	455	2952	7370	79,135	157	1128	3342	29,353
		250	1154	1313.0	1309.8	1302.8	-0.001	10.2	481	4474	34381	113,516	174	1485	12096	41,449
		60	1214	1314.0	1309.8	1302.8	-0.001	11.2	490	4989	10514	124,030	183	1674	3510	44,958
		190	1404	1314.0	1309.6	1302.6	-0.001	11.4	491	5082	35433	159,463	184	1709	11902	56,860
		180	1584	1314.0	1309.4	1302.4	-0.001	11.6	493	5170	34174	193,637	186	1742	11503	68,363
		330	1914	1314.0	1309.1	1302.1	-0.001	11.9	495	5333	64189	257,826	188	1804	21669	90,032
		70	1984	1316.0	1309.0	1302.0	-0.001	14.0	512	6376	15179	273,005	205	2211	5204	95,236
		80	2064	1318.0	1308.9	1301.9	-0.001	16.1	529	7458	20494	293,499	222	2654	7207	102,443
		30	2094	1318.0	1308.9	1301.9	-0.001	16.1	529	7474	8295	301,794	222	2661	2953	105,396
		70	2164	1320.0	1308.8	1301.8	-0.001	18.2	545	8585	20817	322,612	238	3137	7516	112,912
		50	2214	1322.0	1308.8	1301.8	-0.001	20.2	562	9720	16949	339,561	255	3642	6277	119,189
		60	2274	1324.0	1308.7	1301.7	-0.001	22.3	578	10894	22905	362,466	271	4184	8696	127,885
		50	2324	1324.0	1308.7	1301.7	-0.001	22.3	579	10923	20201	382,667	272	4198	7761	135,645
		945	3269	1322.0	1307.7	1300.7	-0.001	21.3	570	10317	371702	754,369	263	3915	141979	277,624
		700	3969	1330.0	1307.0	1300.0	-0.001	30.0	640	15580	335705	1,090,074	333	6508	135115	412,740
		250	4219	1330.0	1306.8	1299.8	-0.001	30.2	642	15740	145002	1,235,076	335	6591	60643	473,382
		1320	5539	1334.0	1305.5	1298.5	-0.001	35.5	684	19268	855752	2,090,828	377	8485	368532	841,915
		1190	6729	1332.0	1304.3	1297.3	-0.001	34.7	678	18716	837048	2,927,876	371	8182	367301	1,209,215
		440	7169	1320.0	1303.8	1296.8	-0.001	23.2	585	11415	245510	3,173,387	278	4430	102766	1,311,981
		100	7269	1316.0	1303.7	1296.7	-0.001	19.3	554	9193	38162	3,211,549	247	3405	14509	1,326,490
		100	7369	1312.0	1303.6	1296.6	-0.001	15.4	523	7092	30158	3,241,707	216	2502	10940	1,337,430
		100	7469	1308.0	1303.5	1296.5	-0.001	11.5	492	5114	22604	3,264,311	185	1721	7820	1,345,250
		490	7959	1304.0	1303.0	1296.0	-0.001	8.0	464	3437	77590	3,341,901	157	1128	25850	1,371,100
Added Point (6' Drop)		1	7960	1304.0	1297.0	1290.0	-0.001	14.0	512	6363	181	3,342,082	205	2206	62	1,371,162
		339	8299	1300.0	1296.7	1289.7	-0.001	10.3	482	4543	68468	3,410,550	175	1510	23325	1,394,487
Added Point (0' Drop)		1	8300	1300.0	1296.7	1289.7	-0.001	10.3	482	4543	168	3,410,718	175	1510	56	1,394,543
		49	8349	1296.0	1296.7	1289.7	-0.001	6.3	451	2700	6573	3,417,291	157	1128	2394	1,396,936
Added Point (8' Drop)		1	8350	1296.0	1288.7	1281.7	-0.001	14.3	515	6562	172	3,417,463	208	2286	63	1,397,000
		49	8399	1292.0	1288.6	1281.6	-0.001	10.4	483	4591	10120	3,427,583	176	1527	3460	1,400,459
		20	8419	1288.0	1288.6	1281.6	-0.001	6.4	451	2731	2712	3,430,295	157	1128	983	1,401,443
		259	8678	1288.0	1288.3	1281.3	-0.001	6.7	453	2848	26760	3,457,054	157	1128	10820	1,412,263
Added Point (20' Drop)		1	8679	1288.0	1268.3	1261.3	-0.001	26.7	613	13516	301	3,457,355	306	5455	122	1,412,385
		39	8718	1284.0	1268.3	1261.3	-0.001	22.7	582	11149	17814	3,475,169	275	4304	7048	1,419,433
Added Point (0' Drop)		1	8719	1284.0	1268.3	1261.3	-0.001	22.7	582	11149	413	3,475,582	275	4304	159	1,419,593
		60	8779	1280.0	1268.2	1261.2	-0.001	18.8	550	8919	22299	3,497,881	243	3284	8431	1,428,024
		30	8809	1276.0	1268.2	1261.2	-0.001	14.8	518	6798	8732	3,506,613	211	2381	3147	1,431,171
Added Point (0' Drop)		1	8810	1276.0	1268.2	1261.2	-0.001	14.8	518	6798	252	3,506,865	211	2381	88	1,431,259
		270	9080	1272.0	1267.9	1260.9	-0.001	11.1	489	4920	58592	3,565,457	182	1648	20149	1,451,408
		330	9410	1268.0	1267.6	1260.6	-0.001	7.4	459	3181	49506	3,614,963	157	1128	16967	1,468,375

North Route B Profile Data

Point	Distance (feet)	Station Cum. Dist (feet)	Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined: End Area (sq. ft)	Unlined: Volume (cu. yds.)	Unlined: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined: End Area (sq. ft)	Lined: Volume (cu. yds.)	Lined: Cumulative Volume (cu. yds.)
	400	9810	1268.0	1267.2	1260.2	-0.001	7.8	462	3365	48490	3,663,452	157	1128	16711	1,485,086
	200	10010	1268.0	1267.0	1260.0	-0.001	8.0	464	3458	25271	3,688,723	157	1129	8358	1,493,444
Added Point (7' Drop)	1	10011	1268.0	1260.0	1253.0	-0.001	15.0	520	6902	192	3,688,915	213	2424	66	1,493,510
	470	10481	1264.0	1259.5	1252.5	-0.001	11.5	492	5116	104604	3,793,518	185	1722	36082	1,529,592
	119	10600	1264.0	1259.4	1252.4	-0.001	11.6	493	5175	22678	3,816,197	186	1744	7637	1,537,229
Added Point (13' Drop)	1	10601	1264.0	1246.4	1239.4	-0.001	24.6	597	12256	323	3,816,520	290	4834	122	1,537,350
	260	10861	1244.0	1246.1	1239.1	-0.001	4.9	439	2035	68813	3,885,332	157	1128	28708	1,566,058
	275	11136	1244.0	1245.9	1238.9	-0.001	5.1	441	2156	21347	3,906,679	157	1128	11489	1,577,547
	30	11166	1240.0	1245.8	1238.8	-0.001	1.2	409	469	1458	3,908,138	157	1128	1253	1,578,800
Aqua Fria Floodway Boundary	40	11206	1239.0	1245.8	1238.8	-0.001	0.2	402	79	406	3,908,543	157	1128	1671	1,580,472
		11206									2,990,036 M^3				1,209,061 M^3


North Route B Profile
Existing Outfall Channel
Existing Ground Profile @ Centerline
Proposed Channel Invert (0.1%)
Twin Buttes Wash Confluence
with Aqua Fria River
Wash
8' Drop
8' Drop
20' Drop
7' Drop
13' Drop
Elevation
1340.0
1330.0
1320.0
1310.0
1300.0
1290.0
1280.0
1270.0
1260.0
1250.0
1240.0
1230.0
0
2000
4000
6000
8000
10000
Distance (feet)
Existing Ground
Proposed Invert

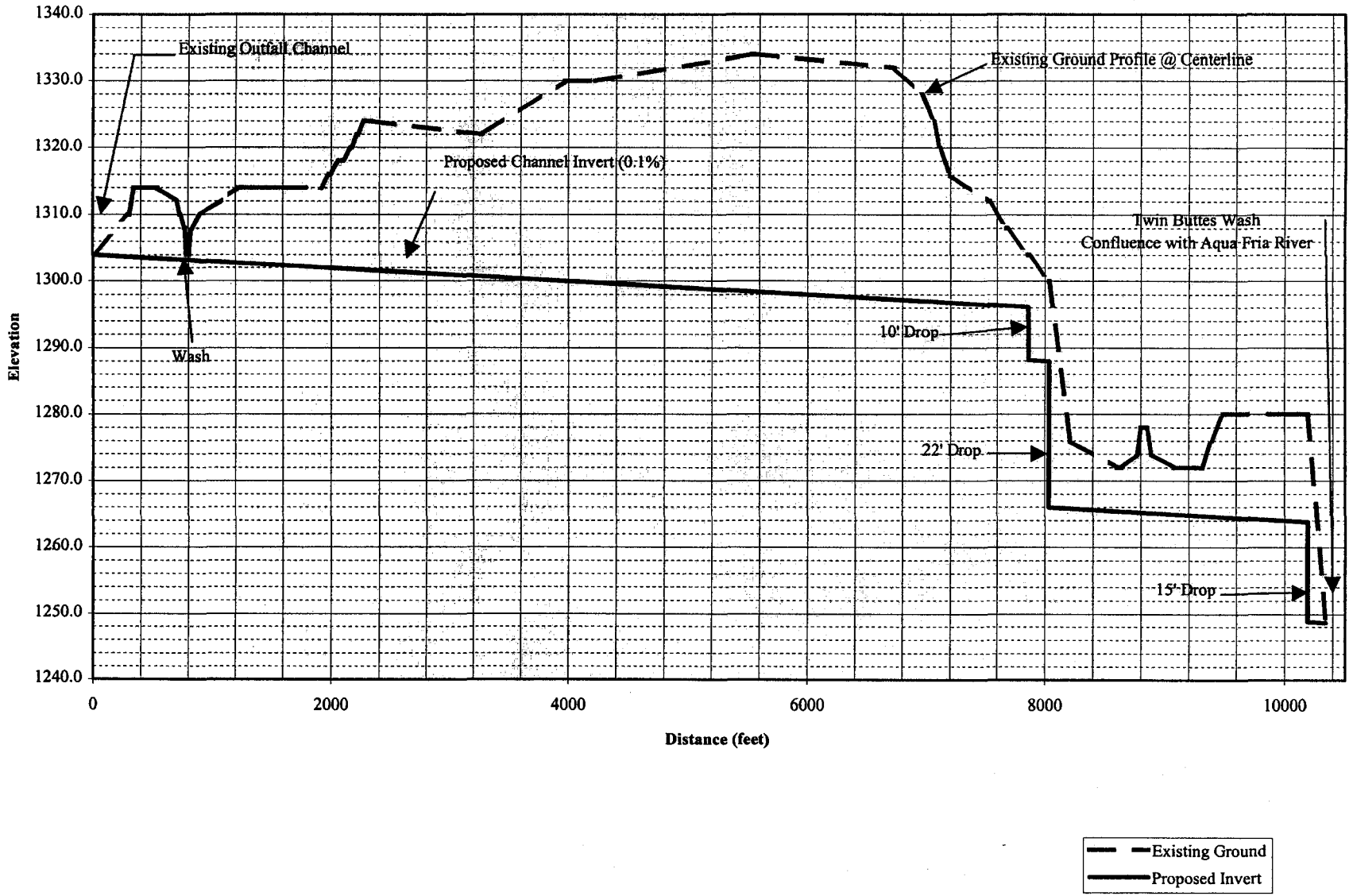
North Route C Profile Data

	Point	Distance (feet)	Station Cum. Dist (feet)	Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined: End Area (sq. ft)	Unlined: Volume (cu. yds.)	Unlined: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined: End Area (sq. ft)	Lined: Volume (cu. yds.)	Lined: Cumulative Volume (cu. yds.)
North Channel	POB	0	0	1304.0	1311.0	1304.0	-0.001	0.0	--	0	0	0	--	0	0	0
		300	300	1310.0	1310.7	1303.7	-0.001	6.3	--	0	0	0	--	0	0	0
		40	340	1314.0	1310.7	1303.7	-0.001	10.3	483	4564	3380	3,380	176	1517	1124	1,124
		200	540	1314.0	1310.5	1303.5	-0.001	10.5	484	4660	34163	37,544	177	1553	11370	12,494
		160	700	1312.0	1310.3	1303.3	-0.001	8.7	470	3783	25017	62,560	163	1240	8274	20,768
		30	730	1310.0	1310.3	1303.3	-0.001	6.7	454	2873	3698	66,258	157	1128	1315	22,083
		44	774	1308.0	1310.2	1303.2	-0.001	4.8	438	2001	3971	70,229	157	1128	1838	23,921
		10	784	1304.0	1310.2	1303.2	-0.001	0.8	406	316	429	70,658	157	1128	418	24,339
		20	804	1304.0	1310.2	1303.2	-0.001	0.8	406	324	237	70,895	157	1128	836	25,175
		20	824	1308.0	1310.2	1303.2	-0.001	4.8	439	2023	869	71,765	157	1128	836	26,010
		80	904	1310.0	1310.1	1303.1	-0.001	6.9	455	2952	7370	79,135	157	1128	3342	29,353
		250	1154	1313.0	1309.8	1302.8	-0.001	10.2	481	4474	34381	113,516	174	1485	12096	41,449
		60	1214	1314.0	1309.8	1302.8	-0.001	11.2	490	4989	10514	124,030	183	1674	3510	44,958
		190	1404	1314.0	1309.6	1302.6	-0.001	11.4	491	5082	35433	159,463	184	1709	11902	56,860
		180	1584	1314.0	1309.4	1302.4	-0.001	11.6	493	5170	34174	193,637	186	1742	11503	68,363
		330	1914	1314.0	1309.1	1302.1	-0.001	11.9	495	5333	64189	257,826	188	1804	21669	90,032
		70	1984	1316.0	1309.0	1302.0	-0.001	14.0	512	6376	15179	273,005	205	2211	5204	95,236
		80	2064	1318.0	1308.9	1301.9	-0.001	16.1	529	7458	20494	293,499	222	2654	7207	102,443
		30	2094	1318.0	1308.9	1301.9	-0.001	16.1	529	7474	8295	301,794	222	2661	2953	105,396
		70	2164	1320.0	1308.8	1301.8	-0.001	18.2	545	8585	20817	322,612	238	3137	7516	112,912
		50	2214	1322.0	1308.8	1301.8	-0.001	20.2	562	9720	16949	339,561	255	3642	6277	119,189
		60	2274	1324.0	1308.7	1301.7	-0.001	22.3	578	10894	22905	362,466	271	4184	8696	127,885
		50	2324	1324.0	1308.7	1301.7	-0.001	22.3	579	10923	20201	382,667	272	4198	7761	135,645
		945	3269	1322.0	1307.7	1300.7	-0.001	21.3	570	10317	371702	754,369	263	3915	141979	277,624
		700	3969	1330.0	1307.0	1300.0	-0.001	30.0	640	15580	335705	1,090,074	333	6508	135115	412,740
		250	4219	1330.0	1306.8	1299.8	-0.001	30.2	642	15740	145002	1,235,076	335	6591	60643	473,382
		1320	5539	1334.0	1305.5	1298.5	-0.001	35.5	684	19268	855752	2,090,828	377	8485	368532	841,915
		1190	6729	1332.0	1304.3	1297.3	-0.001	34.7	678	18716	837048	2,927,876	371	8182	367301	1,209,215
		230	6959	1328.0	1304.0	1297.0	-0.001	31.0	648	16217	148791	3,076,667	341	6841	63988	1,273,203
		100	7059	1324.0	1303.9	1296.9	-0.001	27.1	616	13752	55500	3,132,167	309	5573	22989	1,296,192
		50	7109	1320.0	1303.9	1296.9	-0.001	23.1	585	11380	23270	3,155,437	278	4413	9247	1,305,439
		90	7199	1316.0	1303.8	1296.8	-0.001	19.2	554	9154	34223	3,189,660	247	3388	13002	1,318,441
		330	7529	1312.0	1303.5	1296.5	-0.001	15.5	524	7176	99796	3,289,456	217	2537	36207	1,354,648
Added Point (0' Drop)		1	7530	1312.0	1303.5	1296.5	-0.001	15.5	524	7176	266	3,289,721	217	2537	94	1,354,742
		149	7679	1308.0	1303.3	1296.3	-0.001	11.7	493	5217	34195	3,323,917	186	1760	11855	1,366,596
Added Point (0' Drop)		1	7680	1308.0	1303.3	1296.3	-0.001	11.7	493	5217	193	3,324,110	186	1760	65	1,366,662
		179	7859	1304.0	1303.1	1296.1	-0.001	7.9	463	3390	28529	3,352,638	157	1128	9572	1,376,233
Added Point (10' Drop)		1	7860	1304.0	1295.1	1288.1	-0.001	15.9	527	7349	199	3,352,837	220	2608	69	1,376,302
		173	8033	1300.0	1295.0	1288.0	-0.001	12.0	496	5391	40813	3,393,651	189	1826	14206	1,390,508
Added Point (22' Drop)		1	8034	1300.0	1273.0	1266.0	-0.001	34.0	672	18244	438	3,394,088	365	7925	181	1,390,689
		175	8209	1276.0	1272.8	1265.8	-0.001	10.2	482	4499	73703	3,467,792	175	1494	30523	1,421,212
		390	8599	1272.0	1272.4	1265.4	-0.001	6.6	453	2812	52798	3,520,590	157	1128	18934	1,440,146
		40	8639	1272.0	1272.4	1265.4	-0.001	6.6	453	2830	4179	3,524,769	157	1128	1671	1,441,817
		130	8769	1274.0	1272.2	1265.2	-0.001	8.8	470	3813	15993	3,540,763	163	1250	5726	1,447,543
		30	8799	1278.0	1272.2	1265.2	-0.001	12.8	502	5773	5326	3,546,088	195	1973	1791	1,449,334
		50	8849	1278.0	1272.2	1265.2	-0.001	12.8	503	5798	10714	3,556,802	196	1983	3662	1,452,996
		40	8889	1274.0	1272.1	1265.1	-0.001	8.9	471	3870	7161	3,563,963	164	1270	2409	1,455,405
		190	9079	1272.0	1271.9	1264.9	-0.001	7.1	457	3030	24278	3,588,241	157	1128	8438	1,463,843
		230	9309	1272.0	1271.7	1264.7	-0.001	7.3	458	3135	26261	3,614,502	157	1128	9609	1,473,452

North Route C Profile Data

									Unlined Channel Option				Lined Channel Option			
Point	Distance (feet)	Station Cum. Dist (feet)	Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Channel Topwidth (feet)	End Area (sq. ft)	Volume (cu. yds.)	Cumulative Volume (cu. yds.)	Channel Topwidth (feet)	End Area (sq. ft)	Volume (cu. yds.)	Cumulative Volume (cu. yds.)
	80	9389	1276.0	1271.6	1264.6	-0.001	11.4	491	5072	12160	3,626,662	184	1705	4197	1,477,649
	100	9489	1280.0	1271.5	1264.5	-0.001	15.5	524	7153	22640	3,649,302	217	2527	7838	1,485,487
	600	10089	1280.0	1270.9	1263.9	-0.001	16.1	529	7469	162467	3,811,770	222	2659	57623	1,543,110
	99	10188	1280.0	1270.8	1263.8	-0.001	16.2	529	7521	27482	3,839,252	222	2681	9789	1,552,900
	1	10189	1280.0	1255.8	1248.8	-0.001	31.2	649	16363	442	3,839,694	342	6918	178	1,553,077
Aqua Fria Floodway Boundary	150	10339	1249.0	1255.7	1248.7	-0.001	0.3	403	134	45826	3,885,520	157	1128	22350	1,575,427
											2,972,423 M^3				1,205,202 M^3
		10339													

North Route C Profile



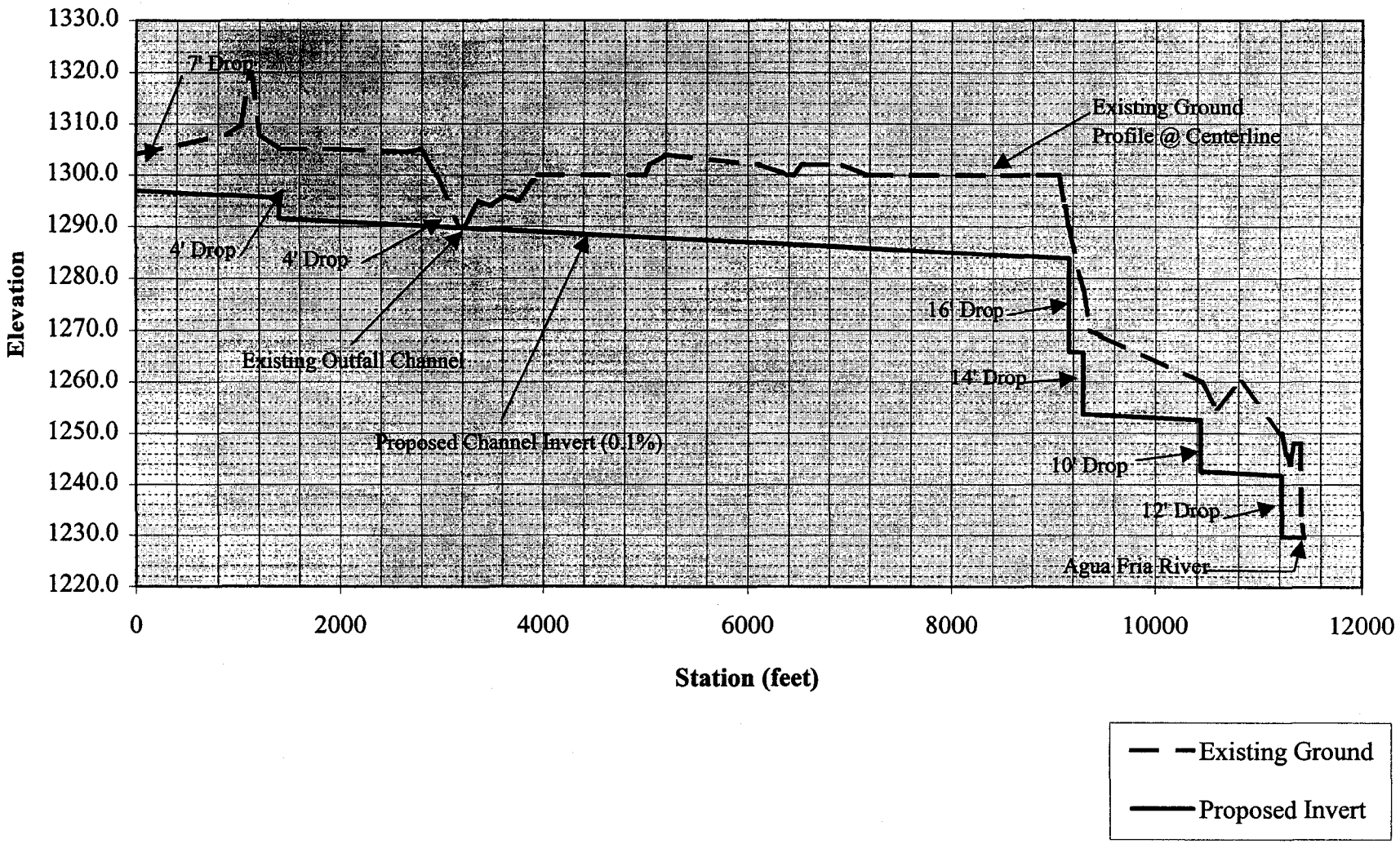
South Route Profile Data

Point	Distance (feet)	Station Cum. Dist) (feet)	Exst. Gnd. Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined Channel Option: End Area (sq. ft)	Unlined Channel Option: Volume (cu. yds.)	Unlined Channel Option: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined Channel Option: End Area (sq. ft)	Lined Channel Option: Volume (cu. yds.)	Lined Channel Option: Cumulative Volume (cu. yds.)
South Channel (7' Drop)POB	0	0	1304.0	1304.0	1297.0	-0.001	7.0	--	2996	0	0	--	0	0	0
	900	900	1308.0	1303.1	1296.1	-0.001	11.9	495	5326	138707	138,707	188	1801	30019	30,019
	120	1020	1310.0	1303.0	1296.0	-0.001	14.0	512	6394	26046	164,753	205	2218	8932	38,951
	80	1100	1320.0	1302.9	1295.9	-0.001	24.1	593	11963	27196	191,950	286	4693	10238	49,189
	20	1120	1320.0	1302.9	1295.9	-0.001	24.1	593	11975	8866	200,816	286	4698	3478	52,667
	80	1200	1308.0	1302.8	1295.8	-0.001	12.2	498	5475	25853	226,668	191	1858	9713	62,380
	199	1399	1305.0	1302.6	1295.6	-0.001	9.4	475	4113	35335	262,003	168	1355	11842	74,222
Added Point (4' Drop)	1	1400	1305.0	1298.6	1291.6	-0.001	13.4	507	6078	189	262,192	200	2092	64	74,286
	575	1975	1305.0	1298.0	1291.0	-0.001	14.0	512	6371	132553	394,744	205	2209	45797	120,082
	680	2655	1304.5	1297.3	1290.3	-0.001	14.2	513	6463	161609	556,353	206	2246	56092	176,174
	130	2785	1305.0	1297.2	1290.2	-0.001	14.8	518	6788	31900	588,253	211	2377	11129	187,303
	159	2944	1300.0	1297.1	1290.1	-0.001	9.9	480	4373	32862	621,115	173	1448	11263	198,567
Added Point (4' Drop)	1	2945	1300.0	1297.1	1290.1	-0.001	9.9	480	4373	162	621,277	173	1448	54	198,620
	230	3175	1290.0	1296.8	1289.8	-0.001	0.2	401	69	18920	640,196	157	1128	10972	209,593
	40	3215	1290.0	1296.8	1289.8	-0.001	0.2	402	85	115	640,311	157	1128	1671	211,264
	150	3365	1295.0	1296.6	1289.6	-0.001	5.4	443	2260	6516	646,826	157	1128	6267	217,530
	120	3485	1294.0	1296.5	1289.5	-0.001	4.5	436	1874	9186	656,013	157	1128	5013	222,544
	130	3615	1296.0	1296.4	1289.4	-0.001	6.6	453	2820	11300	667,312	157	1128	5431	227,975
	130	3745	1295.0	1296.3	1289.3	-0.001	5.7	446	2429	12637	679,949	157	1128	5431	233,406
*	200	3945	1300.0	1296.1	1289.1	-0.001	10.9	488	4856	26983	706,932	181	1625	10195	243,601
	1050	4995	1300.0	1295.0	1288.0	-0.001	12.0	496	5373	198892	905,824	189	1819	66954	310,556
	50	5045	1302.0	1295.0	1288.0	-0.001	14.0	512	6406	10906	916,730	205	2223	3742	314,298
	150	5195	1304.0	1294.8	1287.8	-0.001	16.2	530	7526	38700	955,430	223	2683	13627	327,924
	920	6115	1302.0	1293.9	1286.9	-0.001	15.1	521	6959	246779	1,202,209	214	2447	87399	415,323
	270	6385	1300.0	1293.6	1286.6	-0.001	13.4	507	6070	65142	1,267,352	200	2089	22681	438,004
	50	6435	1300.0	1293.6	1286.6	-0.001	13.4	507	6095	11264	1,278,615	200	2099	3878	441,882
	100	6535	1302.0	1293.5	1286.5	-0.001	15.5	524	7178	24580	1,303,195	217	2538	8587	450,468
	400	6935	1302.0	1293.1	1286.1	-0.001	15.9	527	7389	107903	1,411,098	220	2625	38244	488,712
	220	7155	1300.0	1292.8	1285.8	-0.001	14.2	513	6462	56430	1,467,529	206	2245	19843	508,555
	1700	8855	1300.0	1291.1	1284.1	-0.001	15.9	527	7346	434725	1,902,253	220	2608	152781	661,337
Added Point (0' Drop)	1	8856	1300.0	1291.1	1284.1	-0.001	15.9	527	7346	272	1,902,525	220	2608	97	661,433
	199	9055	1300.0	1290.9	1283.9	-0.001	16.1	528	7451	54533	1,957,059	221	2652	19381	680,814
Interpolated Point	60	9115	1294.0	1290.9	1283.9	-0.001	10.1	481	4454	13228	1,970,287	174	1477	4588	685,402
Added Point (16' Drop)	1	9116	1294.0	1290.9	1283.9	-0.001	10.1	481	4454	165	1,970,452	174	1477	55	685,457
	39	9155	1290.0	1290.8	1283.8	-0.001	6.2	449	2612	5103	1,975,555	157	1128	1882	687,338
Added Point (0' Drop)	1	9156	1290.0	1272.8	1265.8	-0.001	24.2	593	11993	270	1,975,825	286	4707	108	687,446
	109	9265	1280.0	1272.7	1265.7	-0.001	14.3	514	6517	37365	2,013,190	207	2268	14079	701,525
Interpolated Point	30	9295	1278.0	1272.7	1265.7	-0.001	12.3	498	5520	6688	2,019,877	191	1875	2302	703,826
Added Point (14' Drop)	1	9296	1278.0	1260.7	1253.7	-0.001	24.3	594	12076	326	2,020,203	287	4747	123	703,949
	69	9365	1270.0	1260.6	1253.6	-0.001	16.4	531	7614	25160	2,045,363	224	2720	9541	713,490
	100	9465	1269.0	1260.5	1253.5	-0.001	15.5	524	7140	27321	2,072,684	217	2522	9706	723,196
	969	10434	1260.0	1259.6	1252.6	-0.001	7.4	459	3192	185392	2,258,076	157	1128	65490	788,687
Added Point (10' Drop)	1	10435	1260.0	1249.6	1242.6	-0.001	17.4	539	8186	211	2,258,286	232	2964	76	788,762
	150	10585	1255.0	1249.4	1242.4	-0.001	12.6	501	5664	38473	2,296,759	194	1931	13595	802,358
	230	10815	1260.0	1249.2	1242.2	-0.001	17.8	542	8392	59867	2,356,626	235	3053	21225	823,583
	400	11215	1250.0	1248.8	1241.8	-0.001	8.2	466	3553	88477	2,445,103	159	1161	31211	854,793
Added Point (12' Drop)	1	11216	1250.0	1236.8	1229.8	-0.001	20.2	562	9717	246	2,445,349	255	3641	89	854,882
	49	11265	1246.0	1236.7	1229.7	-0.001	16.3	530	7560	15677	2,461,026	223	2697	5751	860,633

South Route Profile Data

	Point	Distance (feet)	Station Cum. Dist) (feet)	Exst. Gnd. Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined: End Area (sq. ft)	Unlined: Volume (cu. yds.)	Unlined: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined: End Area (sq. ft)	Lined: Volume (cu. yds.)	Lined: Cumulative Volume (cu. yds.)
		40	11305	1244.0	1236.7	1229.7	-0.001	14.3	514	6536	10442	2,471,467	207	2275	3683	864,317
		15	11320	1246.0	1236.7	1229.7	-0.001	16.3	530	7589	3924	2,475,391	223	2709	1385	865,701
		20	11340	1248.0	1236.7	1229.7	-0.001	18.3	547	8677	6025	2,481,416	240	3177	2180	867,881
		65	11405	1248.0	1236.6	1229.6	-0.001	18.4	547	8713	20932	2,502,348	240	3193	7667	875,549
		10	11415	1232.0	1236.6	1229.6	-0.001	2.4	419	986	1796	2,504,144	157	1128	800	876,349
Agua Fria River	POE	20	11435	1230.0	1236.6	1229.6	-0.001	0.0	400	0	365	2,504,509	157	1128	836	877,184
												1,915,949 M^3				671,046 M^3
			11435		1230											

South Route Profile



North Route A Profile Data

	Point	Distance (feet)	Station Cum. Dist) (feet)	enterline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined: End Area (sq. ft)	Unlined: Volume (cu. yds.)	Unlined: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined: End Area (sq. ft)	Lined: Volume (cu. yds.)	Lined: Cumulative Volume (cu. yds.)
North Channel	POB	0	0	1304.0	1305.0	1298.0	-0.001	6.0	--	2544	0	0	--	0	0	0
		300	300	1310.0	1304.7	1297.7	-0.001	12.3	--	0	14133	14133	--	0	0	0
		40	340	1314.0	1304.7	1297.7	-0.001	16.3	531	7604	5633	19,766	224	2716	2012	2,012
		200	540	1314.0	1304.5	1297.5	-0.001	16.5	532	7710	56720	76,485	225	2761	20282	22,293
		160	700	1312.0	1304.3	1297.3	-0.001	14.7	518	6744	42829	119,314	211	2359	15170	37,464
		30	730	1310.0	1304.3	1297.3	-0.001	12.7	502	5740	6936	126,250	195	1960	2400	39,863
		44	774	1308.0	1304.2	1297.2	-0.001	10.8	486	4774	8567	134,817	179	1594	2896	42,760
		10	784	1304.0	1304.2	1297.2	-0.001	6.8	454	2898	1421	136,238	157	1128	504	43,264
		20	804	1304.0	1304.2	1297.2	-0.001	6.8	454	2907	2150	138,387	157	1128	836	44,099
		20	824	1308.0	1304.2	1297.2	-0.001	10.8	487	4798	2854	141,241	180	1603	1012	45,111
		80	904	1310.0	1304.1	1297.1	-0.001	12.9	503	5828	15742	156,983	196	1994	5329	50,440
		250	1154	1313.0	1303.8	1296.8	-0.001	16.2	529	7505	61727	218,710	222	2674	21612	72,053
		60	1214	1314.0	1303.8	1296.8	-0.001	17.2	538	8071	17307	236,017	231	2914	6209	78,262
		190	1404	1314.0	1303.6	1296.6	-0.001	17.4	539	8173	57155	293,172	232	2958	20662	98,924
		180	1584	1314.0	1303.4	1296.4	-0.001	17.6	541	8270	54812	347,984	234	3000	19861	118,785
		330	1914	1314.0	1303.1	1296.1	-0.001	17.9	543	8449	102176	450,160	236	3078	37142	155,927
		70	1984	1316.0	1303.0	1296.0	-0.001	20.0	560	9591	23386	473,545	253	3584	8635	164,562
		80	2064	1318.0	1302.9	1295.9	-0.001	22.1	577	10773	30169	503,714	270	4127	11424	175,986
		30	2094	1318.0	1302.9	1295.9	-0.001	22.1	577	10790	11979	515,694	270	4135	4590	180,576
Lowered Profile Option		70	2164	1320.0	1302.8	1295.8	-0.001	24.2	593	12001	29544	545,238	286	4711	11467	192,044
		50	2214	1322.0	1302.8	1295.8	-0.001	26.2	610	13234	23366	568,604	303	5315	9283	201,326
		60	2274	1324.0	1302.7	1295.7	-0.001	28.3	626	14507	30824	599,428	319	5955	12522	213,848
		50	2324	1324.0	1302.7	1295.7	-0.001	28.3	627	14539	26894	626,323	320	5971	11043	224,891
		50	2374	1322.0	1302.6	1295.6	-0.001	26.4	611	13332	25806	652,129	304	5363	10495	235,386
		160	2534	1322.0	1302.5	1295.5	-0.001	26.5	612	13430	79294	731,423	305	5412	31926	267,312
		170	2704	1322.0	1302.3	1295.3	-0.001	26.7	614	13534	84886	816,309	307	5464	34239	301,550
		150	2854	1322.0	1302.1	1295.1	-0.001	26.9	615	13626	75445	891,754	308	5510	30483	332,033
		2280	5134	1330.0	1299.9	1292.9	-0.001	37.1	697	20369	1435365	2,327,119	390	9097	616747	948,780
		1120	6254	1330.0	1298.7	1291.7	-0.001	38.3	706	21155	861247	3,188,366	399	9539	386531	1,335,311
		290	6544	1330.0	1298.5	1291.5	-0.001	38.5	708	21360	228323	3,416,688	401	9655	103080	1,438,391
		130	6674	1330.0	1298.3	1291.3	-0.001	38.7	709	21452	103067	3,519,755	402	9707	46614	1,485,005
		80	6754	1320.0	1298.2	1291.2	-0.001	28.8	630	14809	53720	3,573,475	323	6109	23432	1,508,437
		80	6834	1316.0	1298.2	1291.2	-0.001	24.8	599	12401	40310	3,613,786	292	4904	16317	1,524,754
		85	6919	1312.0	1298.1	1291.1	-0.001	20.9	567	10118	35446	3,649,231	260	3824	13739	1,538,493
		80	6999	1308.0	1298.0	1291.0	-0.001	17.0	536	7955	26776	3,676,007	229	2865	9909	1,548,402
		140	7139	1304.0	1297.9	1290.9	-0.001	13.1	505	5946	36041	3,712,048	198	2040	12717	1,561,119
Added Point (8' Drop)		1	7140	1304.0	1297.9	1290.9	-0.001	13.1	505	5946	220	3,712,268	198	2040	76	1,561,195
		419	7559	1300.0	1297.4	1290.4	-0.001	9.6	476	4189	78638	3,790,906	169	1382	26558	1,587,753
Added Point (0' Drop)		1	7560	1300.0	1297.4	1290.4	-0.001	9.6	476	4189	155	3,791,062	169	1382	51	1,587,804
		114	7674	1296.0	1297.3	1290.3	-0.001	5.7	445	2397	13904	3,804,966	157	1128	5300	1,593,104
Added Point (10' Drop)		1	7675	1296.0	1287.3	1280.3	-0.001	15.7	525	7251	179	3,805,144	218	2568	68	1,593,172
		124	7799	1292.0	1287.2	1280.2	-0.001	11.8	494	5275	28764	3,833,908	187	1782	9988	1,603,160
		80	7879	1288.0	1287.1	1280.1	-0.001	7.9	463	3399	12850	3,846,758	157	1128	4311	1,607,470
Added Point (10' Drop)		1	7880	1288.0	1277.1	1270.1	-0.001	17.9	543	8429	219	3,846,977	236	3069	78	1,607,548

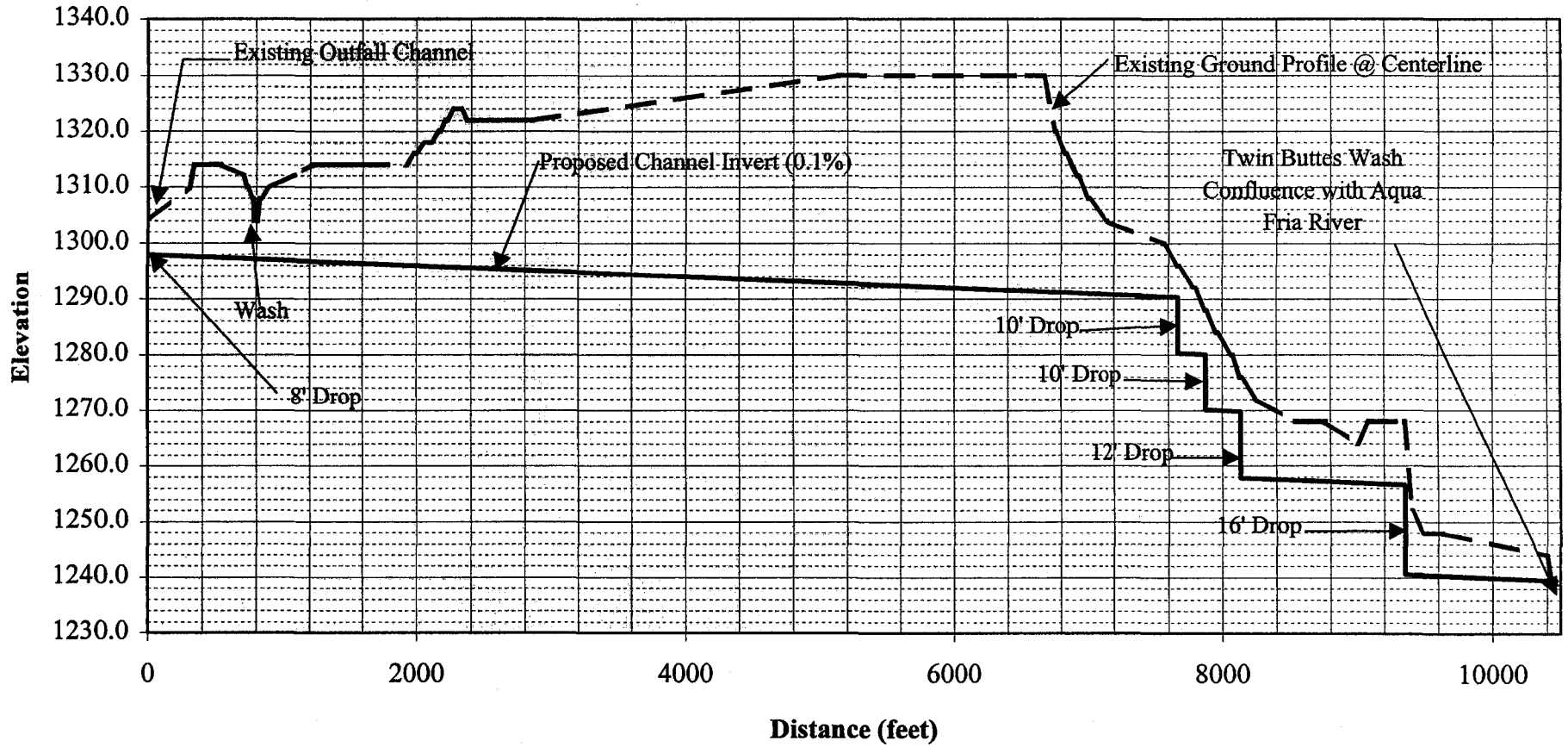
North Route A Profile Data

Point	Distance (feet)	Station Cum. Dist) (feet)	enterline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined Channel Option: End Area (sq. ft)	Unlined Channel Option: Volume (cu. yds.)	Unlined Channel Option: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined Channel Option: End Area (sq. ft)	Lined Channel Option: Volume (cu. yds.)	Lined Channel Option: Cumulative Volume (cu. yds.)
	79	7959	1284.0	1277.0	1270.0	-0.001	14.0	512	6361	21637	3,868,613	205	2205	7715	1,615,263
	115	8074	1280.0	1276.9	1269.9	-0.001	10.1	481	4434	22988	3,891,602	174	1470	7826	1,623,089
	60	8134	1276.0	1276.9	1269.9	-0.001	6.1	449	2602	7818	3,899,420	157	1128	2887	1,625,976
Added Point (12' Drop)	1	8135	1276.0	1264.9	1257.9	-0.001	18.1	545	8567	207	3,899,626	238	3129	79	1,626,055
	124	8259	1272.0	1264.7	1257.7	-0.001	14.3	514	6514	34631	3,934,257	207	2266	12389	1,638,444
	280	8539	1268.0	1264.5	1257.5	-0.001	10.5	484	4657	57928	3,992,185	177	1552	19796	1,658,240
	50	8589	1268.0	1264.4	1257.4	-0.001	10.6	485	4682	8647	4,000,832	178	1560	2881	1,661,121
	175	8764	1268.0	1264.2	1257.2	-0.001	10.8	486	4767	30620	4,031,452	179	1592	10215	1,671,336
	235	8999	1264.0	1264.0	1257.0	-0.001	7.0	456	2993	33770	4,065,222	157	1128	11835	1,683,172
	90	9089	1268.0	1263.9	1256.9	-0.001	11.1	489	4925	13197	4,078,419	182	1650	4630	1,687,802
	265	9354	1268.0	1263.7	1256.7	-0.001	11.3	491	5055	48975	4,127,394	184	1699	16434	1,704,236
Added Point (16' Drop)	1	9355	1268.0	1247.7	1240.7	-0.001	27.3	619	13931	352	4,127,745	312	5663	136	1,704,373
	49	9404	1252.0	1247.6	1240.6	-0.001	11.4	491	5079	17250	4,144,995	184	1708	6688	1,711,061
	90	9494	1248.0	1247.5	1240.5	-0.001	7.5	460	3219	13831	4,158,826	157	1128	4726	1,715,787
	140	9634	1248.0	1247.4	1240.4	-0.001	7.6	461	3284	16861	4,175,687	157	1128	5849	1,721,636
	765	10399	1244.0	1246.6	1239.6	-0.001	4.4	435	1834	72510	4,248,197	157	1128	31960	1,753,596
	30	10429	1240.0	1246.6	1239.6	-0.001	0.4	403	170	1114	4,249,310	157	1128	1253	1,754,850
Aqua Fria Floodway Boundary	40	10469	1239.0	1246.5	1239.5	-0.001	-0.5	396	-214	-32	4,249,278	157	1128	1671	1,756,521

3,248,806 cm 1,342,957 cm

Lowered Profile Option

North Route A Profile



Lowered Profile Option

Existing Ground
Proposed Invert

North Route B Profile Data

	Point	Distance (feet)	Station Cum. Dist) (feet)	enterline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined Channel Option: End Area (sq. ft)	Unlined Channel Option: Volume (cu. yds.)	Unlined Channel Option: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined Channel Option: End Area (sq. ft)	Lined Channel Option: Volume (cu. yds.)	Lined Channel Option: Cumulative Volume (cu. yds.)
North Channel	POB	0	0	1304.0	1305.0	1298.0	-0.001	6.0	--	2544	0	0	--	0	0	0
		300	300	1310.0	1304.7	1297.7	-0.001	12.3	--	0	14133	14133	--	0	0	0
		40	340	1314.0	1304.7	1297.7	-0.001	16.3	531	7604	5633	19,766	224	2716	2012	2,012
		200	540	1314.0	1304.5	1297.5	-0.001	16.5	532	7710	56720	76,485	225	2761	20282	22,293
		160	700	1312.0	1304.3	1297.3	-0.001	14.7	518	6744	42829	119,314	211	2359	15170	37,464
		30	730	1310.0	1304.3	1297.3	-0.001	12.7	502	5740	6936	126,250	195	1960	2400	39,863
		44	774	1308.0	1304.2	1297.2	-0.001	10.8	486	4774	8567	134,817	179	1594	2896	42,760
		10	784	1304.0	1304.2	1297.2	-0.001	6.8	454	2898	1421	136,238	157	1128	504	43,264
		20	804	1304.0	1304.2	1297.2	-0.001	6.8	454	2907	2150	138,387	157	1128	836	44,099
		20	824	1308.0	1304.2	1297.2	-0.001	10.8	487	4798	2854	141,241	180	1603	1012	45,111
		80	904	1310.0	1304.1	1297.1	-0.001	12.9	503	5828	15742	156,983	196	1994	5329	50,440
		250	1154	1313.0	1303.8	1296.8	-0.001	16.2	529	7505	61727	218,710	222	2674	21612	72,053
		60	1214	1314.0	1303.8	1296.8	-0.001	17.2	538	8071	17307	236,017	231	2914	6209	78,262
		190	1404	1314.0	1303.6	1296.6	-0.001	17.4	539	8173	57155	293,172	232	2958	20662	98,924
		180	1584	1314.0	1303.4	1296.4	-0.001	17.6	541	8270	54812	347,984	234	3000	19861	118,785
		330	1914	1314.0	1303.1	1296.1	-0.001	17.9	543	8449	102176	450,160	236	3078	37142	155,927
Lowered Profile Option		70	1984	1316.0	1303.0	1296.0	-0.001	20.0	560	9591	23386	473,545	253	3584	8635	164,562
		80	2064	1318.0	1302.9	1295.9	-0.001	22.1	577	10773	30169	503,714	270	4127	11424	175,986
		30	2094	1318.0	1302.9	1295.9	-0.001	22.1	577	10790	11979	515,694	270	4135	4590	180,576
		70	2164	1320.0	1302.8	1295.8	-0.001	24.2	593	12001	29544	545,238	286	4711	11467	192,044
		50	2214	1322.0	1302.8	1295.8	-0.001	26.2	610	13234	23366	568,604	303	5315	9283	201,326
		60	2274	1324.0	1302.7	1295.7	-0.001	28.3	626	14507	30824	599,428	319	5955	12522	213,848
		50	2324	1324.0	1302.7	1295.7	-0.001	28.3	627	14539	26894	626,323	320	5971	11043	224,891
		945	3269	1322.0	1301.7	1294.7	-0.001	27.3	618	13882	497360	1,123,683	311	5638	203167	428,058
		700	3969	1330.0	1301.0	1294.0	-0.001	36.0	688	19563	433542	1,557,225	381	8648	185197	613,255
		250	4219	1330.0	1300.8	1293.8	-0.001	36.2	690	19735	181933	1,739,158	383	8744	80518	693,773
		1320	5539	1334.0	1299.5	1292.5	-0.001	41.5	732	23518	1057281	2,796,439	425	10893	480009	1,173,781
		1190	6729	1332.0	1298.3	1291.3	-0.001	40.7	726	22927	1023500	3,819,940	419	10551	472568	1,646,350
		440	7169	1320.0	1297.8	1290.8	-0.001	29.2	633	15071	309613	4,129,553	326	6244	136850	1,783,200
		100	7269	1316.0	1297.7	1290.7	-0.001	25.3	602	12662	51357	4,180,909	295	5032	20882	1,804,081
		100	7369	1312.0	1297.6	1290.6	-0.001	21.4	571	10374	42659	4,223,568	264	3942	16618	1,820,700
		100	7469	1308.0	1297.5	1290.5	-0.001	17.5	540	8208	34412	4,257,980	233	2973	12806	1,833,506
		490	7959	1304.0	1297.0	1290.0	-0.001	14.0	512	6363	132221	4,390,201	205	2206	46994	1,880,499
Added Point (8' Drop)		1	7960	1304.0	1297.0	1290.0	-0.001	14.0	512	6363	236	4,390,437	205	2206	82	1,880,581
		339	8299	1300.0	1296.7	1289.7	-0.001	10.3	482	4543	68468	4,458,905	175	1510	23325	1,903,906
Added Point (0' Drop)		1	8300	1300.0	1296.7	1289.7	-0.001	10.3	482	4543	168	4,459,073	175	1510	56	1,903,962
		49	8349	1296.0	1296.7	1289.7	-0.001	6.3	451	2700	6573	4,465,645	157	1128	2394	1,906,356
Added Point (8' Drop)		1	8350	1296.0	1288.7	1281.7	-0.001	14.3	515	6562	172	4,465,817	208	2286	63	1,906,419
		49	8399	1292.0	1288.6	1281.6	-0.001	10.4	483	4591	10120	4,475,937	176	1527	3460	1,909,879
		20	8419	1288.0	1288.6	1281.6	-0.001	6.4	451	2731	2712	4,478,649	157	1128	983	1,910,862
		259	8678	1288.0	1288.3	1281.3	-0.001	6.7	453	2848	26760	4,505,409	157	1128	10820	1,921,682
Added Point (20' Drop)		1	8679	1288.0	1268.3	1261.3	-0.001	26.7	613	13516	301	4,505,710	306	5455	122	1,921,804
		39	8718	1284.0	1268.3	1261.3	-0.001	22.7	582	11149	17814	4,523,524	275	4304	7048	1,928,853
Added Point (0' Drop)		1	8719	1284.0	1268.3	1261.3	-0.001	22.7	582	11149	413	4,523,937	275	4304	159	1,929,012

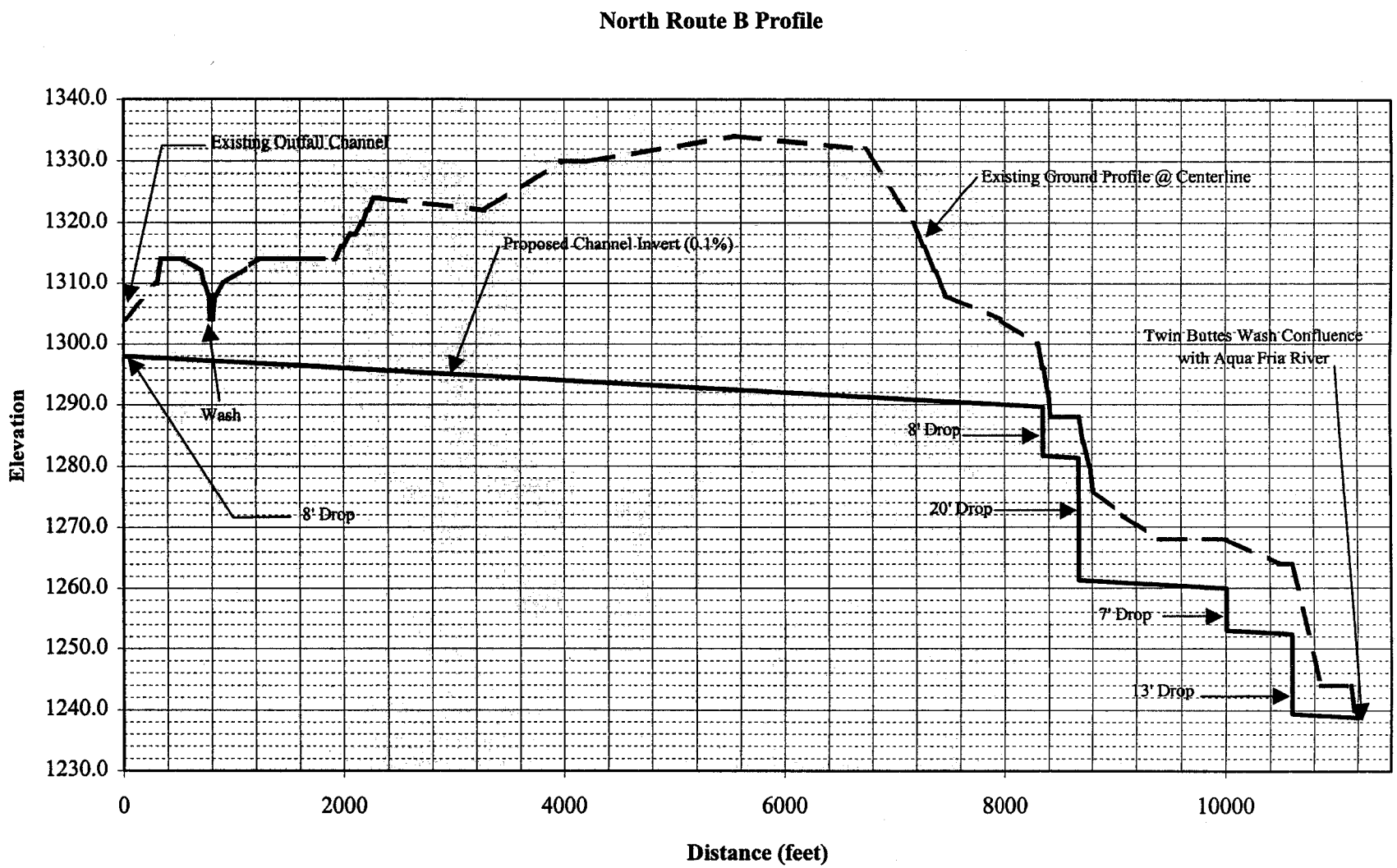
North Route B Profile Data

Point	Distance (feet)	Station Cum. Dist) (feet)	enterline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined Channel Option: End Area (sq. ft)	Unlined Channel Option: Volume (cu. yds.)	Unlined Channel Option: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined Channel Option: End Area (sq. ft)	Lined Channel Option: Volume (cu. yds.)	Lined Channel Option: Cumulative Volume (cu. yds.)
	60	8779	1280.0	1268.2	1261.2	-0.001	18.8	550	8919	22299	4,546,235	243	3284	8431	1,937,443
	30	8809	1276.0	1268.2	1261.2	-0.001	14.8	518	6798	8732	4,554,967	211	2381	3147	1,940,590
Added Point (0' Drop)	1	8810	1276.0	1268.2	1261.2	-0.001	14.8	518	6798	252	4,555,219	211	2381	88	1,940,679
	270	9080	1272.0	1267.9	1260.9	-0.001	11.1	489	4920	58592	4,613,811	182	1648	20149	1,960,828
	330	9410	1268.0	1267.6	1260.6	-0.001	7.4	459	3181	49506	4,663,317	157	1128	16967	1,977,795
	400	9810	1268.0	1267.2	1260.2	-0.001	7.8	462	3365	48490	4,711,807	157	1128	16711	1,994,506
	200	10010	1268.0	1267.0	1260.0	-0.001	8.0	464	3458	25271	4,737,077	157	1129	8358	2,002,864
Added Point (7' Drop)	1	10011	1268.0	1260.0	1253.0	-0.001	15.0	520	6902	192	4,737,269	213	2424	66	2,002,929
	470	10481	1264.0	1259.5	1252.5	-0.001	11.5	492	5116	104604	4,841,873	185	1722	36082	2,039,011
	119	10600	1264.0	1259.4	1252.4	-0.001	11.6	493	5175	22678	4,864,551	186	1744	7637	2,046,648
Added Point (13' Drop)	1	10601	1264.0	1246.4	1239.4	-0.001	24.6	597	12256	323	4,864,874	290	4834	122	2,046,770
	260	10861	1244.0	1246.1	1239.1	-0.001	4.9	439	2035	68813	4,933,687	157	1128	28708	2,075,478
	275	11136	1244.0	1245.9	1238.9	-0.001	5.1	441	2156	21347	4,955,034	157	1128	11489	2,086,966
	30	11166	1240.0	1245.8	1238.8	-0.001	1.2	409	469	1458	4,956,492	157	1128	1253	2,088,220
Aqua Fria Floodway Boundary	40	11206	1239.0	1245.8	1238.8	-0.001	0.2	402	79	406	4,956,898	157	1128	1671	2,089,891

3,789,320 cm

1,597,836 cm

Lowered Profile Option



Lowered Profile Option

Existing Ground
Proposed Invert

North Route C Profile Data

	Point	Distance (feet)	Station Cum. Dist) (feet)	enterline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined Channel Option: End Area (sq. ft)	Unlined Channel Option: Volume (cu. yds.)	Unlined Channel Option: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined Channel Option: End Area (sq. ft)	Lined Channel Option: Volume (cu. yds.)	Lined Channel Option: Cumulative Volume (cu. yds.)
North Channel	POB	0	0	1304.0	1305.0	1298.0	-0.001	6.0	--	2544	0	0	--	0	0	0
		300	300	1310.0	1304.7	1297.7	-0.001	12.3	--	0	14133	14133	--	0	0	0
		40	340	1314.0	1304.7	1297.7	-0.001	16.3	531	7604	5633	19,766	224	2716	2012	2,012
		200	540	1314.0	1304.5	1297.5	-0.001	16.5	532	7710	56720	76,485	225	2761	20282	22,293
		160	700	1312.0	1304.3	1297.3	-0.001	14.7	518	6744	42829	119,314	211	2359	15170	37,464
		30	730	1310.0	1304.3	1297.3	-0.001	12.7	502	5740	6936	126,250	195	1960	2400	39,863
		44	774	1308.0	1304.2	1297.2	-0.001	10.8	486	4774	8567	134,817	179	1594	2896	42,760
		10	784	1304.0	1304.2	1297.2	-0.001	6.8	454	2898	1421	136,238	157	1128	504	43,264
		20	804	1304.0	1304.2	1297.2	-0.001	6.8	454	2907	2150	138,387	157	1128	836	44,099
		20	824	1308.0	1304.2	1297.2	-0.001	10.8	487	4798	2854	141,241	180	1603	1012	45,111
		80	904	1310.0	1304.1	1297.1	-0.001	12.9	503	5828	15742	156,983	196	1994	5329	50,440
		250	1154	1313.0	1303.8	1296.8	-0.001	16.2	529	7505	61727	218,710	222	2674	21612	72,053
		60	1214	1314.0	1303.8	1296.8	-0.001	17.2	538	8071	17307	236,017	231	2914	6209	78,262
		190	1404	1314.0	1303.6	1296.6	-0.001	17.4	539	8173	57155	293,172	232	2958	20662	98,924
Lowered Profile Option		180	1584	1314.0	1303.4	1296.4	-0.001	17.6	541	8270	54812	347,984	234	3000	19861	118,785
		330	1914	1314.0	1303.1	1296.1	-0.001	17.9	543	8449	102176	450,160	236	3078	37142	155,927
		70	1984	1316.0	1303.0	1296.0	-0.001	20.0	560	9591	23386	473,545	253	3584	8635	164,562
		80	2064	1318.0	1302.9	1295.9	-0.001	22.1	577	10773	30169	503,714	270	4127	11424	175,986
		30	2094	1318.0	1302.9	1295.9	-0.001	22.1	577	10790	11979	515,694	270	4135	4590	180,576
		70	2164	1320.0	1302.8	1295.8	-0.001	24.2	593	12001	29544	545,238	286	4711	11467	192,044
		50	2214	1322.0	1302.8	1295.8	-0.001	26.2	610	13234	23366	568,604	303	5315	9283	201,326
		60	2274	1324.0	1302.7	1295.7	-0.001	28.3	626	14507	30824	599,428	319	5955	12522	213,848
		50	2324	1324.0	1302.7	1295.7	-0.001	28.3	627	14539	26894	626,323	320	5971	11043	224,891
		945	3269	1322.0	1301.7	1294.7	-0.001	27.3	618	13882	497360	1,123,683	311	5638	203167	428,058
		700	3969	1330.0	1301.0	1294.0	-0.001	36.0	688	19563	433542	1,557,225	381	8648	185197	613,255
		250	4219	1330.0	1300.8	1293.8	-0.001	36.2	690	19735	181933	1,739,158	383	8744	80518	693,773
		1320	5539	1334.0	1299.5	1292.5	-0.001	41.5	732	23518	1057281	2,796,439	425	10893	480009	1,173,781
		1190	6729	1332.0	1298.3	1291.3	-0.001	40.7	726	22927	1023500	3,819,940	419	10551	472568	1,646,350
		230	6959	1328.0	1298.0	1291.0	-0.001	37.0	696	20247	183891	4,003,831	389	9029	83397	1,729,747
		100	7059	1324.0	1297.9	1290.9	-0.001	33.1	664	17595	70079	4,073,910	357	7574	30747	1,760,493
		50	7109	1320.0	1297.9	1290.9	-0.001	29.1	633	15033	30211	4,104,121	326	6224	12776	1,773,270
		90	7199	1316.0	1297.8	1290.8	-0.001	25.2	602	12620	46087	4,150,209	295	5011	18727	1,791,996
		330	7529	1312.0	1297.5	1290.5	-0.001	21.5	572	10466	141076	4,291,285	265	3984	54973	1,846,970
Added Point (0' Drop)		1	7530	1312.0	1297.5	1290.5	-0.001	21.5	572	10466	388	4,291,672	265	3984	148	1,847,117
		149	7679	1308.0	1297.3	1290.3	-0.001	17.7	541	8321	51838	4,343,510	234	3022	19332	1,866,450
Added Point (0' Drop)		1	7680	1308.0	1297.3	1290.3	-0.001	17.7	541	8321	308	4,343,818	234	3022	112	1,866,562
		179	7859	1304.0	1297.1	1290.1	-0.001	13.9	511	6311	48503	4,392,321	204	2185	17260	1,883,821
Added Point (0' Drop)		1	7860	1304.0	1297.1	1290.1	-0.001	13.9	511	6311	234	4,392,555	204	2185	81	1,883,902
		173	8033	1300.0	1297.0	1290.0	-0.001	10.0	480	4414	34361	4,426,915	173	1463	11687	1,895,589
Added Point (22' Drop)		1	8034	1300.0	1275.0	1268.0	-0.001	32.0	656	16916	395	4,427,310	349	7210	161	1,895,750
		175	8209	1276.0	1274.8	1267.8	-0.001	8.2	466	3551	66328	4,493,638	159	1160	27128	1,922,878
		390	8599	1272.0	1274.4	1267.4	-0.001	4.6	437	1922	39533	4,533,171	157	1128	16527	1,939,405
		40	8639	1272.0	1274.4	1267.4	-0.001	4.6	437	1940	2861	4,536,032	157	1128	1671	1,941,076
		130	8769	1274.0	1274.2	1267.2	-0.001	6.8	454	2889	11625	4,547,657	157	1128	5431	1,946,507

North Route C Profile Data

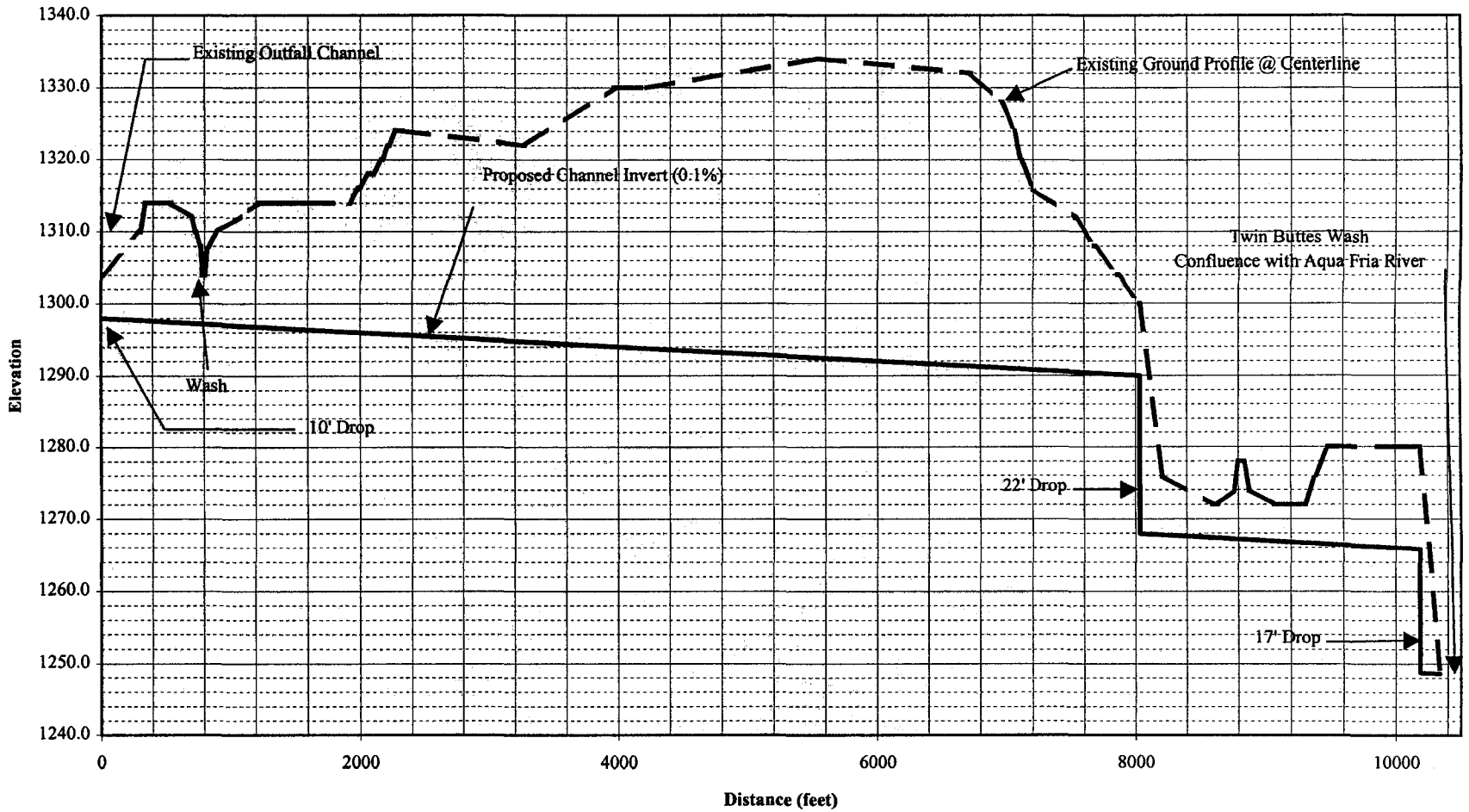
								Unlined Channel Option				Lined Channel Option			
Point	Distance (feet)	Station Cum. Dist) (feet)	enterline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Channel Topwidth (feet)	End Area (sq. ft)	Volume (cu. yds.)	Cumulative Volume (cu. yds.)	Channel Topwidth (feet)	End Area (sq. ft)	Volume (cu. yds.)	Cumulative Volume (cu. yds.)
	30	8799	1278.0	1274.2	1267.2	-0.001	10.8	486	4784	4263	4,551,920	179	1598	1514	1,948,021
	50	8849	1278.0	1274.2	1267.2	-0.001	10.8	487	4808	8882	4,560,802	180	1607	2968	1,950,989
	40	8889	1274.0	1274.1	1267.1	-0.001	6.9	455	2944	5742	4,566,545	157	1128	2026	1,953,015
	190	9079	1272.0	1273.9	1266.9	-0.001	5.1	441	2133	17862	4,584,407	157	1128	7938	1,960,953
	230	9309	1272.0	1273.7	1266.7	-0.001	5.3	442	2235	18603	4,603,010	157	1128	9609	1,970,562
	80	9389	1276.0	1273.6	1266.6	-0.001	9.4	475	4106	9394	4,612,403	168	1353	3676	1,974,237
	100	9489	1280.0	1273.5	1266.5	-0.001	13.5	508	6121	18940	4,631,344	201	2109	6412	1,980,650
	600	10089	1280.0	1272.9	1265.9	-0.001	14.1	513	6428	139433	4,770,776	206	2231	48233	2,028,882
	99	10188	1280.0	1272.8	1265.8	-0.001	14.2	513	6478	23661	4,794,437	206	2252	8219	2,037,102
Added Point (20' Drop)	1	10189	1280.0	1255.8	1248.8	-0.001	31.2	649	16363	423	4,794,860	342	6918	170	2,037,271
Aqua Fria Floodway Boundary	150	10339	1249.0	1255.7	1248.7	-0.001	0.3	403	134	45826	4,840,686	157	1128	22350	2,059,621

3,700,970 cm

1,574,693 cm

Lowered Profile Option

North Route C Profile



Lowered Profile Option

Existing Ground
Proposed Invert

South Route Profile Data

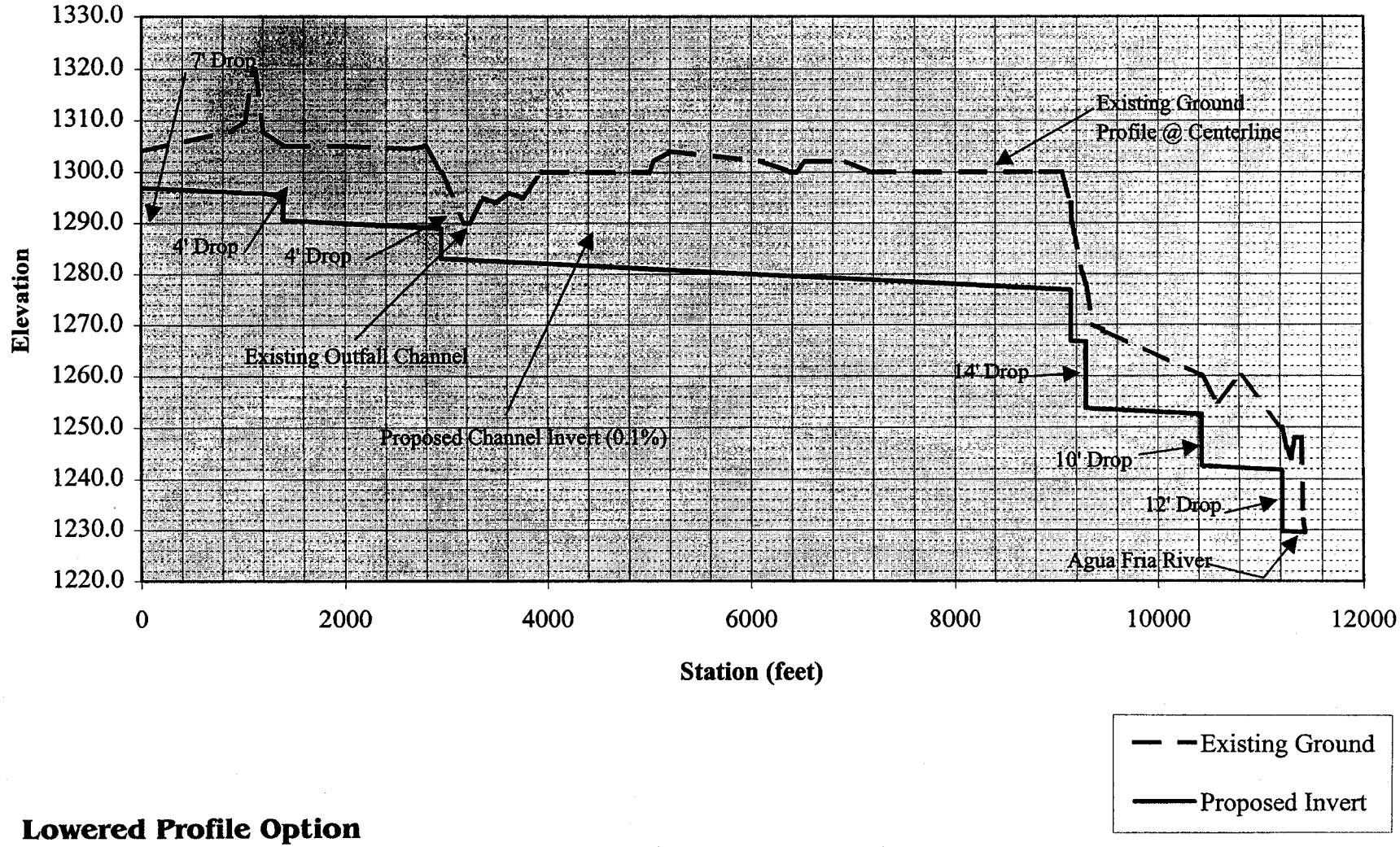
Point	Distance (feet)	Station (Cum. Dist) (feet)	Exst. Gnd. Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Unlined Channel Option: Channel Topwidth (feet)	Unlined Channel Option: End Area (sq. ft)	Unlined Channel Option: Volume (cu. yds.)	Unlined Channel Option: Cumulative Volume (cu. yds.)	Lined Channel Option: Channel Topwidth (feet)	Lined Channel Option: End Area (sq. ft)	Lined Channel Option: Volume (cu. yds.)	Lined Channel Option: Cumulative Volume (cu. yds.)
South Channel (7' Drop) POB	0	0	1304.0	1304.0	1297.0	-0.001	7.0	--	2996	0	0	--	0	0	0
	900	900	1308.0	1303.1	1296.1	-0.001	11.9	495	5326	138707	138,707	188	1801	30019	30,019
	120	1020	1310.0	1303.0	1296.0	-0.001	14.0	512	6394	26046	164,753	205	2218	8932	38,951
	80	1100	1320.0	1302.9	1295.9	-0.001	24.1	593	11963	27196	191,950	286	4693	10238	49,189
	20	1120	1320.0	1302.9	1295.9	-0.001	24.1	593	11975	8866	200,816	286	4698	3478	52,667
	80	1200	1308.0	1302.8	1295.8	-0.001	12.2	498	5475	25853	226,668	191	1858	9713	62,380
	199	1399	1305.0	1302.6	1295.6	-0.001	9.4	475	4113	35335	262,003	168	1355	11842	74,222
Added Point (4' Drop)	1	1400	1305.0	1297.6	1290.6	-0.001	14.4	515	6589	198	262,201	208	2296	68	74,289
	575	1975	1305.0	1297.0	1290.0	-0.001	15.0	520	6886	143488	405,689	213	2417	50194	124,484
	680	2655	1304.5	1296.3	1289.3	-0.001	15.2	521	6980	174617	580,306	214	2456	61368	185,852
	130	2785	1305.0	1296.2	1289.2	-0.001	15.8	526	7310	34403	614,709	219	2592	12153	198,005
	159	2944	1300.0	1296.1	1289.1	-0.001	10.9	488	4856	35823	650,532	181	1625	12417	210,422
Added Point (4' Drop)	1	2945	1300.0	1290.1	1283.1	-0.001	16.9	536	7925	237	650,769	229	2852	83	210,505
	230	3175	1290.0	1289.8	1282.8	-0.001	7.2	457	3075	46854	697,623	157	1128	16952	227,457
	40	3215	1290.0	1289.8	1282.8	-0.001	7.2	458	3093	4569	702,192	157	1128	1671	229,128
	150	3365	1295.0	1289.6	1282.6	-0.001	12.4	499	5557	24027	726,219	192	1889	8381	237,509
	120	3485	1294.0	1289.5	1282.5	-0.001	11.5	492	5121	23727	749,946	185	1723	8028	245,537
	130	3615	1296.0	1289.4	1282.4	-0.001	13.6	509	6186	27221	777,167	202	2135	9289	254,826
	130	3745	1295.0	1289.3	1282.3	-0.001	12.7	502	5747	28728	805,895	195	1963	9865	264,691
Lowered Profile Option	200	3945	1300.0	1289.1	1282.1	-0.001	17.9	544	8465	52636	858,531	237	3085	18693	283,385
	1050	4995	1300.0	1288.0	1281.0	-0.001	19.0	552	9040	340378	1,198,909	245	3337	124868	408,253
	50	5045	1302.0	1288.0	1281.0	-0.001	21.0	568	10188	17804	1,216,713	261	3856	6661	414,913
	150	5195	1304.0	1287.8	1280.8	-0.001	23.2	586	11429	60048	1,276,761	279	4437	23036	437,949
	920	6115	1302.0	1286.9	1279.9	-0.001	22.1	577	10801	378733	1,655,495	270	4140	146128	584,077
	270	6385	1300.0	1286.6	1279.6	-0.001	20.4	563	9815	103081	1,758,576	256	3685	39130	623,206
	50	6435	1300.0	1286.6	1279.6	-0.001	20.4	563	9843	18202	1,776,778	256	3698	6837	630,043
	100	6535	1302.0	1286.5	1279.5	-0.001	22.5	580	11044	38680	1,815,458	273	4255	14727	644,771
	400	6935	1302.0	1286.1	1279.1	-0.001	22.9	583	11277	165341	1,980,799	276	4364	63844	708,615
	220	7155	1300.0	1285.8	1278.8	-0.001	21.2	569	10251	87706	2,068,505	262	3885	33609	742,224
	1700	8855	1300.0	1284.1	1277.1	-0.001	22.9	583	11230	676261	2,744,766	276	4342	259011	1,001,234
Added Point (0' Drop)	1	8856	1300.0	1284.1	1277.1	-0.001	22.9	583	11230	416	2,745,182	276	4342	161	1,001,395
	199	9055	1300.0	1283.9	1276.9	-0.001	23.1	584	11346	83199	2,828,381	277	4397	32208	1,033,603
Interpolated Point	90	9145	1294.0	1283.9	1276.9	-0.001	17.1	537	8032	32298	2,860,679	230	2898	12158	1,045,761
Added Point (16' Drop)	1	9146	1294.0	1273.9	1266.9	-0.001	27.1	617	13804	404	2,861,083	310	5599	157	1,045,919
	9	9155	1290.0	1273.8	1266.8	-0.001	23.2	585	11404	4201	2,865,285	278	4425	1671	1,047,589
Added Point (0' Drop)	1	9156	1290.0	1273.8	1266.8	-0.001	23.2	585	11404	422	2,865,707	278	4425	164	1,047,753
	109	9265	1280.0	1273.7	1266.7	-0.001	13.3	506	6007	35146	2,900,853	199	2064	13099	1,060,852
Interpolated Point	30	9295	1278.0	1273.7	1266.7	-0.001	11.3	490	5026	6130	2,906,982	183	1688	2085	1,062,937
Added Point (14' Drop)	1	9296	1278.0	1260.7	1253.7	-0.001	24.3	594	12076	317	2,907,299	287	4747	119	1,063,056
	69	9365	1270.0	1260.6	1253.6	-0.001	16.4	531	7614	25160	2,932,458	224	2720	9541	1,072,597
	100	9465	1269.0	1260.5	1253.5	-0.001	15.5	524	7140	27321	2,959,780	217	2522	9706	1,082,303
	969	10434	1260.0	1259.6	1252.6	-0.001	7.4	459	3192	185392	3,145,172	157	1128	65490	1,147,794
Added Point (10' Drop)	1	10435	1260.0	1249.6	1242.6	-0.001	17.4	539	8186	211	3,145,382	232	2964	76	1,147,869
	150	10585	1255.0	1249.4	1242.4	-0.001	12.6	501	5664	38473	3,183,855	194	1931	13595	1,161,465
	230	10815	1260.0	1249.2	1242.2	-0.001	17.8	542	8392	59867	3,243,722	235	3053	21225	1,182,689

South Route Profile Data

									Unlined Channel Option				Lined Channel Option			
	Point	Distance (feet)	Station (Cum. Dist) (feet)	Exst. Gnd. Centerline Elevation	Flow Depth + Feeboard Elevation	Proposed Invert Elevation	Proposed Slope (feet/foot)	Centerline Chan. Depth (feet)	Channel Topwidth (feet)	End Area (sq. ft)	Volume (cu. yds.)	Cumulative Volume (cu. yds.)	Channel Topwidth (feet)	End Area (sq. ft)	Volume (cu. yds.)	Cumulative Volume (cu. yds.)
		400	11215	1250.0	1248.8	1241.8	-0.001	8.2	466	3553	88477	3,332,199	159	1161	31211	1,213,900
Added Point (12' Drop)		1	11216	1250.0	1236.8	1229.8	-0.001	20.2	562	9717	246	3,332,445	255	3641	89	1,213,989
		49	11265	1246.0	1236.7	1229.7	-0.001	16.3	530	7560	15677	3,348,121	223	2697	5751	1,219,740
		40	11305	1244.0	1236.7	1229.7	-0.001	14.3	514	6536	10442	3,358,563	207	2275	3683	1,223,424
		15	11320	1246.0	1236.7	1229.7	-0.001	16.3	530	7589	3924	3,362,487	223	2709	1385	1,224,808
		20	11340	1248.0	1236.7	1229.7	-0.001	18.3	547	8677	6025	3,368,512	240	3177	2180	1,226,988
		65	11405	1248.0	1236.6	1229.6	-0.001	18.4	547	8713	20932	3,389,444	240	3193	7667	1,234,656
		10	11415	1232.0	1236.6	1229.6	-0.001	2.4	419	986	1796	3,391,240	157	1128	800	1,235,456
Agua Fria River	POE	20	11435	1230.0	1236.6	1229.6	-0.001	0.0	400	0	365	3,391,605	157	1128	836	1,236,291
												2,593,063 cm				945,212 cm

Lowered Profile Option

South Route Profile



Lowered Profile Option

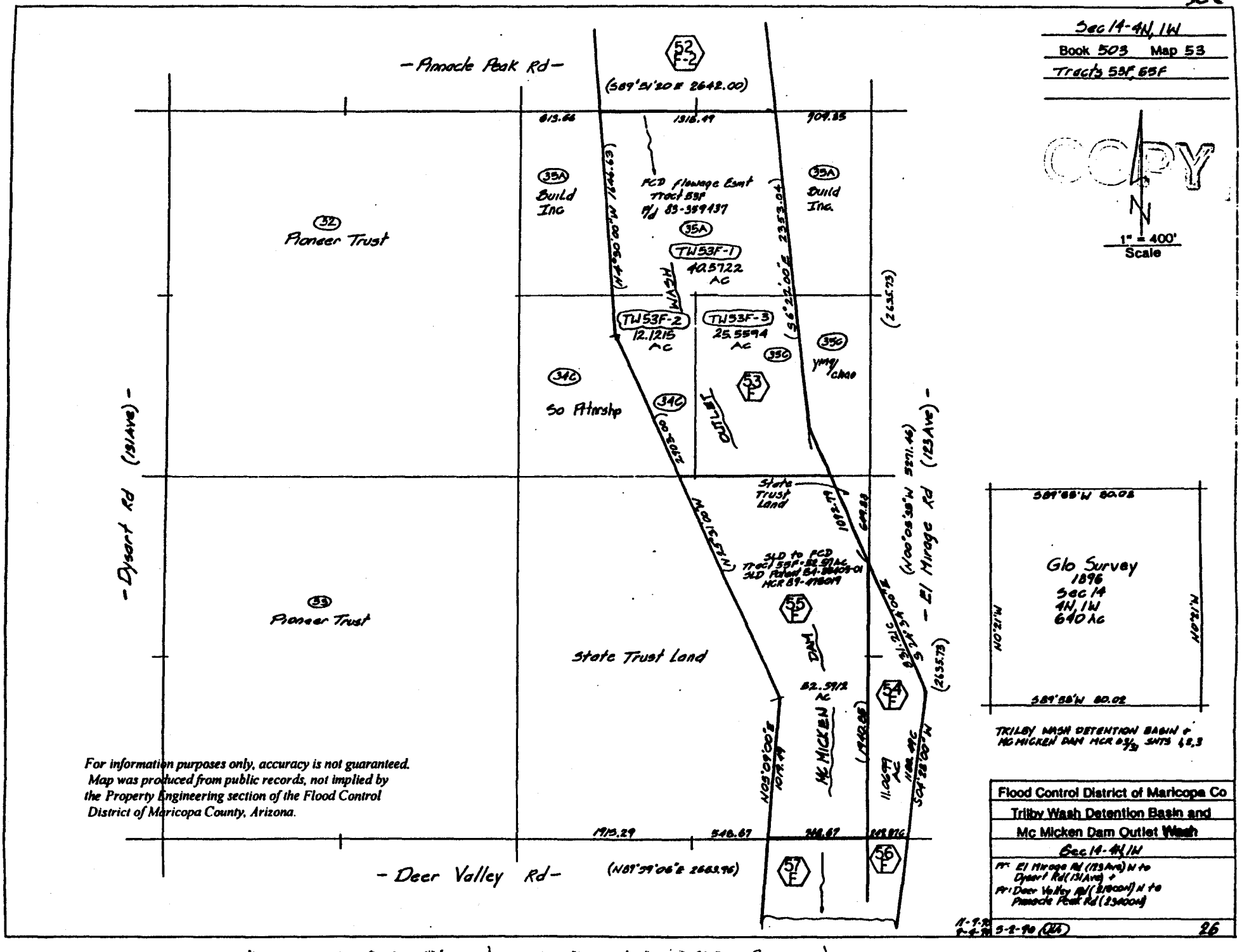
McMicken Dam Outlet Wash									
Cost credit calculations									
Route					Route				
Alternative	Item	Value($)	Comment		Alternative	Item	Value($)	Comment	
North - A earth	a	600,000			North - C lined	a	600,000		
	b	4,500,000	900k cm @ $5.00			b	4,500,000	900k cm @ $5.00	
	c	3,300,000				c	3,300,000		
	d	500,000				d	500,000		
	e	1,000,000				e	1,000,000		
	f	2,800,000				f	2,800,000		
	Total	12,700,000				Total	12,700,000		
North - A lined	a	600,000			South - earth	a	600,000		
	b	4,500,000	900k cm @ $5.00			b	4,500,000	900k cm @ $5.00	
	c	3,300,000				c	3,300,000		
	d	500,000				d	500,000		
	e	1,000,000				e	1,000,000		
	f	2,800,000				f	2,800,000		
	Total	12,700,000				Total	12,700,000		
North - B earth	a	600,000			South - lined	a	600,000		
	b	4,500,000	900k cm @ $5.00			b	3,355,000	671k cm @ $5.00	
	c	3,300,000				c	3,300,000		
	d	500,000				d	500,000		
	e	1,000,000				e	1,000,000		
	f	2,800,000				f	2,800,000		
	Total	12,700,000				Total	11,555,000		
North - B lined	a	600,000							
	b	4,500,000	900k cm @ $5.00						
	c	3,300,000							
	d	500,000							
	e	1,000,000							
	f	2,800,000							
	Total	12,700,000							
North - C earth	a	600,000							
	b	4,500,000	900k cm @ $5.00						
	c	3,300,000							
	d	500,000							
	e	1,000,000							
	f	2,800,000							
	Total	12,700,000							

Summary of land tracts with potential resale following redirection of					
McMicken Dam Outlet flows.					
		Gross	% of area	Net	
Location	Tract No.	Area (ac.)	sellable	Area (ac.)	
Between Pinnacle Peak Rd. alignment	35A	40.57	80	32.46	
and Deer Valley Rd. - map no. 26	34C	12.12	80	9.70	
	53F	25.56	80	20.45	
	55F	52.59	80	42.07	
	54F	11.07	80	8.86	
Between Deer Valley Rd. and	56F	21.20	80	16.96	
Beardsley Rd - map no. 29	59F	16.10	80	12.88	
South of Beardsley Rd. - map no. 31	61F	81.45	25	20.36	
	Total	260.66		163.73	acres
Notes:					
1. See tracts maps attached.					
2. Percentage of land not resellable					
is wash area to be retained by County.					
3. Percentages used are not based					
upon any detailed analysis of the					
tracts.					

Sec 14-4N, 1W

Book 503 Map 53

Tracts 53F, 55F

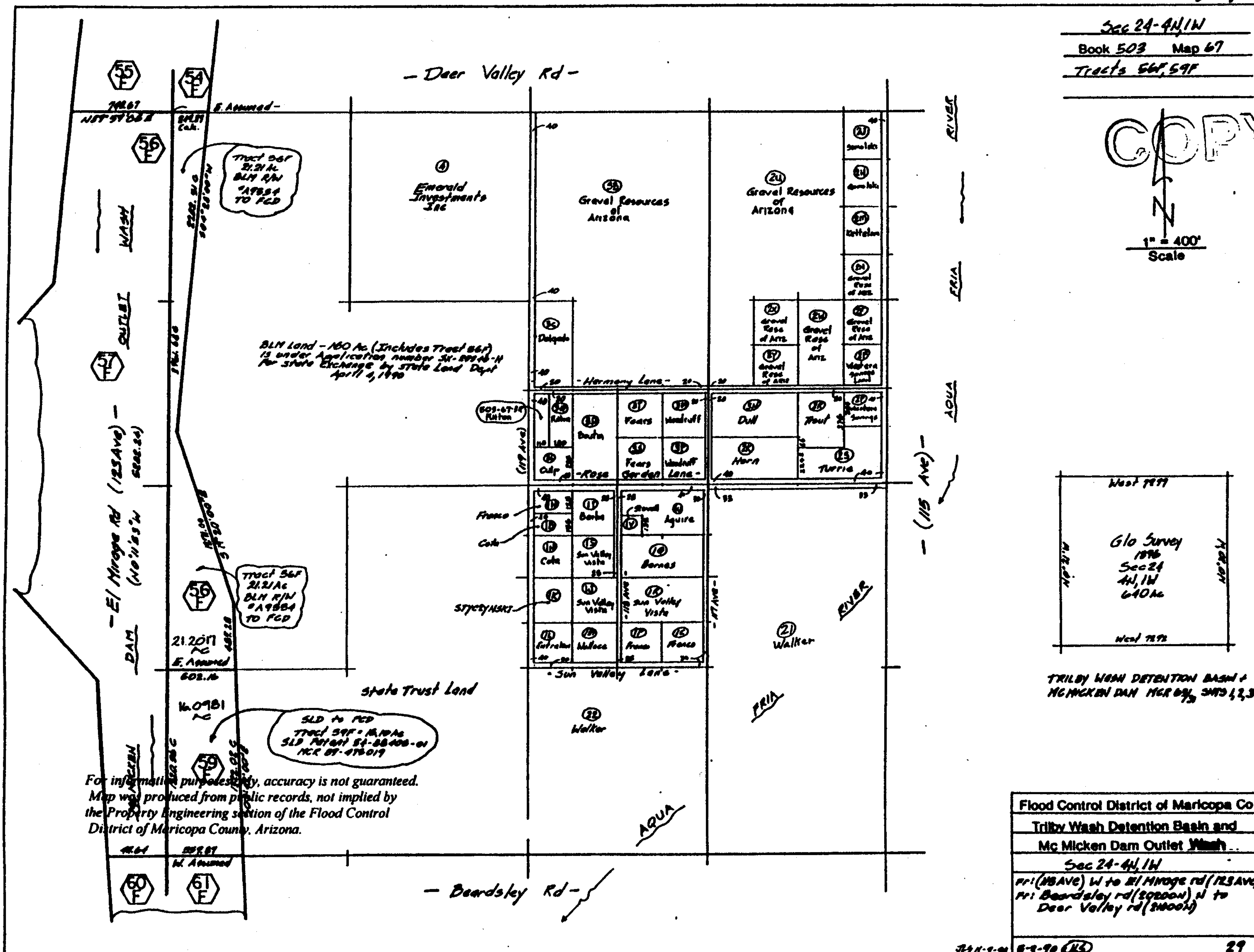


1" = 400'
Scale

TRILBY WASH DETENTION BASIN & MC MICKEN DAM HCR 83/39 SHTS 1,2,3

For information purposes only, accuracy is not guaranteed. Map was produced from public records, not implied by the Property Engineering section of the Flood Control District of Maricopa County, Arizona.

Flood Control District of Maricopa Co
Trilby Wash Detention Basin and
Mc Micken Dam Outlet Wash
Sec 14-4N/1W
Pr: El Mirage Rd (123 Ave) N to Dysart Rd (131 Ave) + Pr: Deer Valley Rd (2390011) N to Pinnacle Peak Rd (2390004)
11-7-90 5-2-90 (QA) 26


Sec 24-4N,1W
Book 503 Map 67
Tracts 56F, 59F
COPY
N
1" = 400'
Scale
- Deer Valley Rd -
- Beardsley Rd -
Emerald Investments Inc
Gravel Resources of Arizona
Gravel Resources of Arizona
Tract 56F 21.21 Ac BLM R/W #A9884 TO FCD
BLM Land - 160 Ac (Includes Tract 56F) is under Application number for state Exchange by State Land Dept April 4, 1990
- Harmony Lane -
- Sun Valley Lane -
State Trust Land
SLD to FCD Tract 59F - 16.10 Ac MCR 89-476019
Walker
Walker
AQUA FRIA RIVER
- (115 Ave) -
- El Mirage Rd (123 Ave) -
DAM OUTLET WASH
Glo Survey 1896 Sec 24 4N,1W 640 Ac
TRILBY WASH DETENTION BASIN & MC MICKEN DAM MCR 8/91 SHTS 1,2,3
For information purposes only, accuracy is not guaranteed. Map was produced from public records, not implied by the Property Engineering section of the Flood Control District of Maricopa County, Arizona.
Flood Control District of Maricopa Co
Trilby Wash Detention Basin and Mc Micken Dam Outlet Wash
Sec 24-4N,1W
Fr: (115 Ave) W to El Mirage rd (123 Ave)
Fr: Beardsley rd (20200N) N to Deer Valley rd (21600N)
8-3-90
29

Sec 25-4N/1W

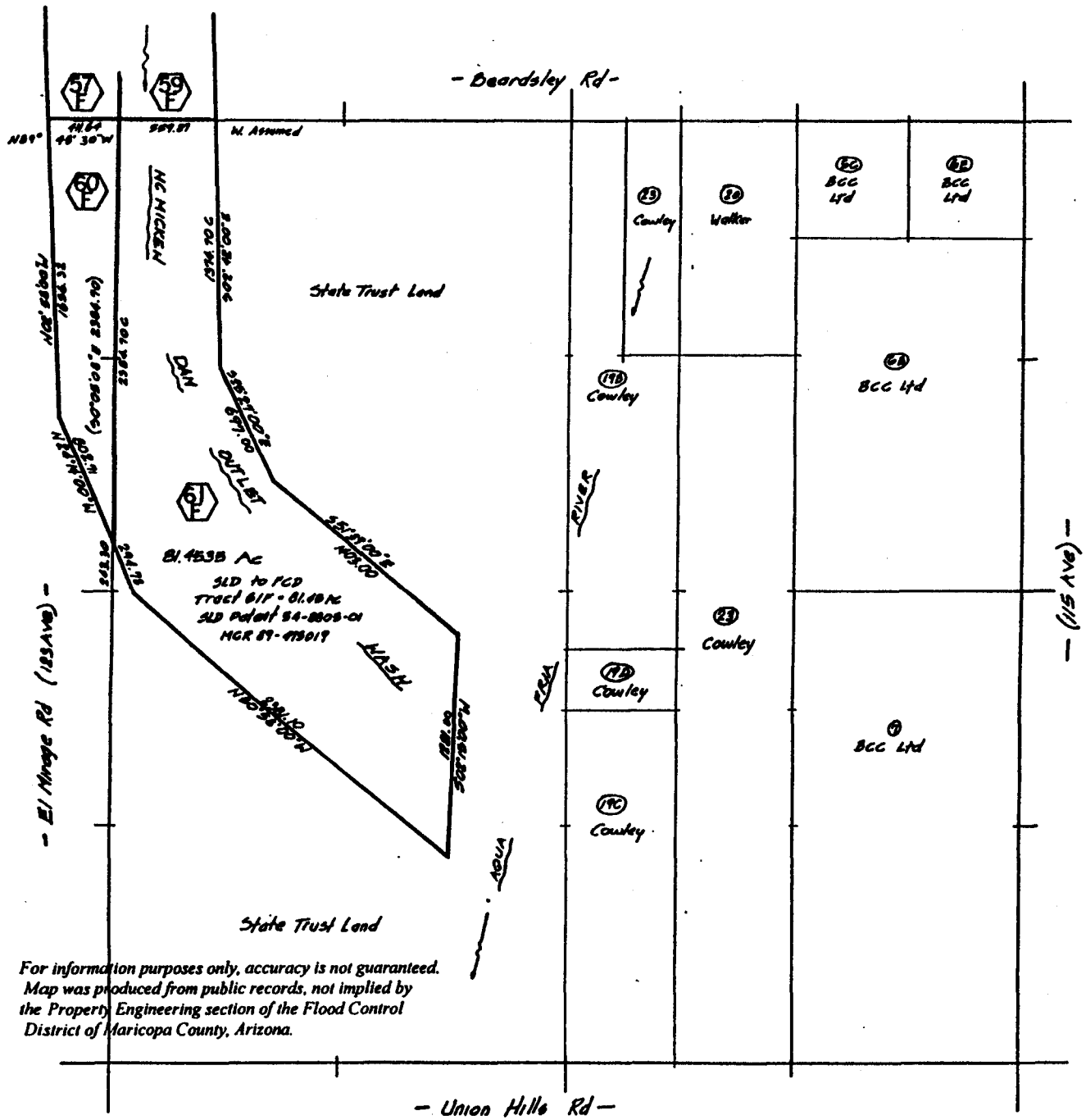
Book 503 Map 67

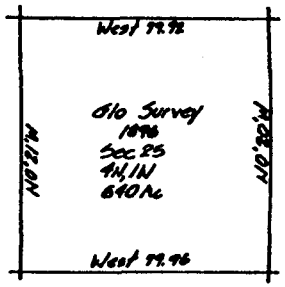
Tract 61F

COPY

N

1" = 400'
Scale



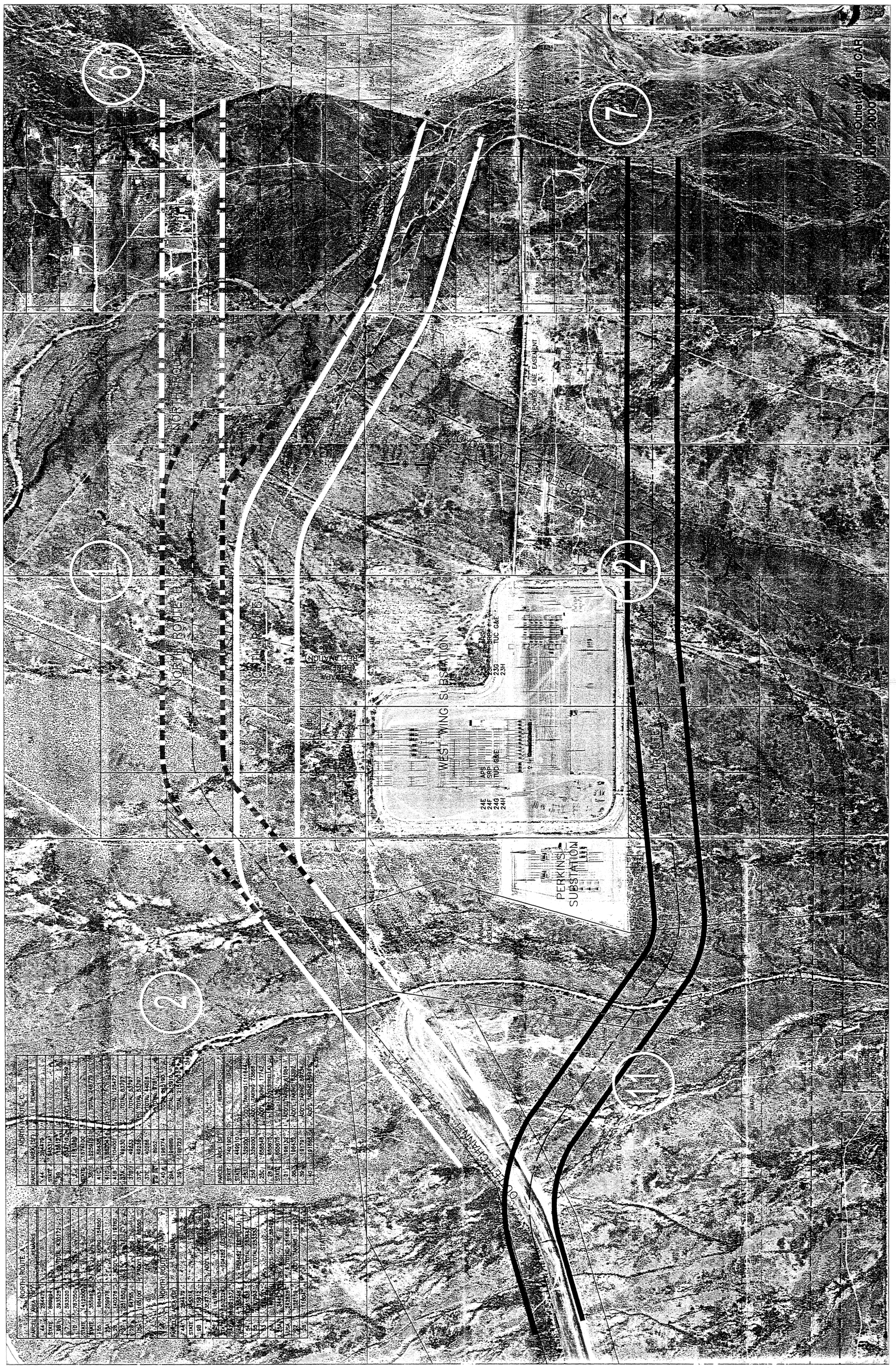


TRILBY WASH DETENTION BASIN &
MC MICKEN DAM MCR 89/419 §2,3

For information purposes only, accuracy is not guaranteed. Map was produced from public records, not implied by the Property Engineering section of the Flood Control District of Maricopa County, Arizona.

Flood Control District of Maricopa Co
Trilby Wash Detention Basin and
Mc Micken Dam Outlet Wash
Sec 25-4N/1W
Fr: (115 AVE) W to El Mirage rd (183 AVE)
Fr: Union Hills rd (N) N to Beardsley rd (N)
5-9-90 (JLB) 31

JLB 11-9-90
9-5-90


McMillan Dam Outlet Work GAB
June 2000
NORTH ROUTE B
NORTH ROUTE A
WEST WING SUBSTATION
PERKINS SUBSTATION
NORTH ROUTE
STATE LAND
FEE LANDS
INTERCHANGE
RANCHE EASEMENT
POWER LINE EASEMENT
ROAD
MAP
NORTH ROUTE A
NORTH ROUTE B
NORTH ROUTE C