Arizona Water Protection Fund

Black Canyon City Community Association

Black Canyon Riparian Restoration Project

Task # 9: Final Report
Grant No. 09-171WPF
May 2012

Prepared By:

Fred Phillips Consulting, LLC
401 South Leroux St.
Flagstaff, Arizona 86001
Phone: 928.773.1530
Fax: 928.774.4166
dblanchard@commspeed.net

Prepared For:

Black Canyon City Community Association
P.O. Box 33
19055 E. K-Mine Road
Black Canyon City, AZ 85324

"The Arizona Water Protection Fund Commission has funded all or a portion of this report or Project."

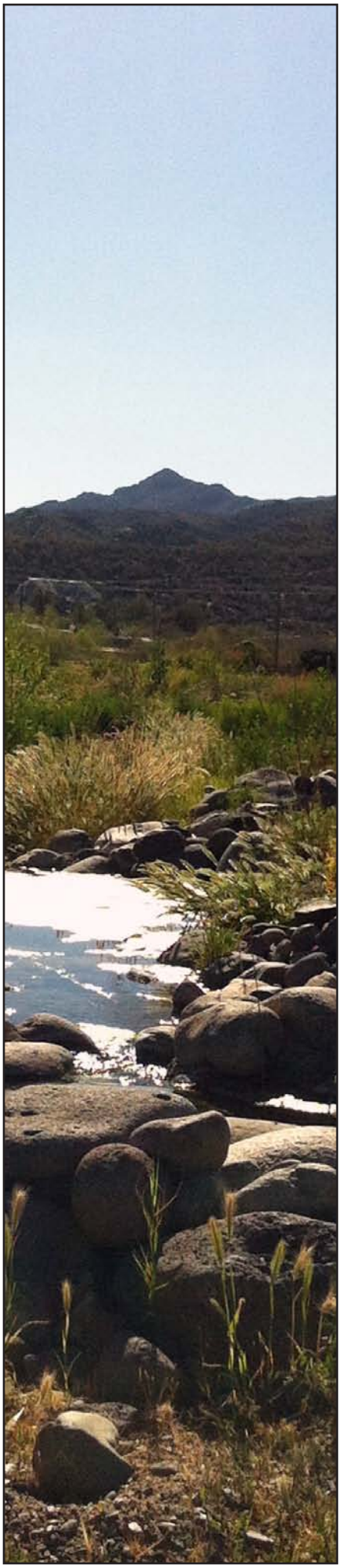
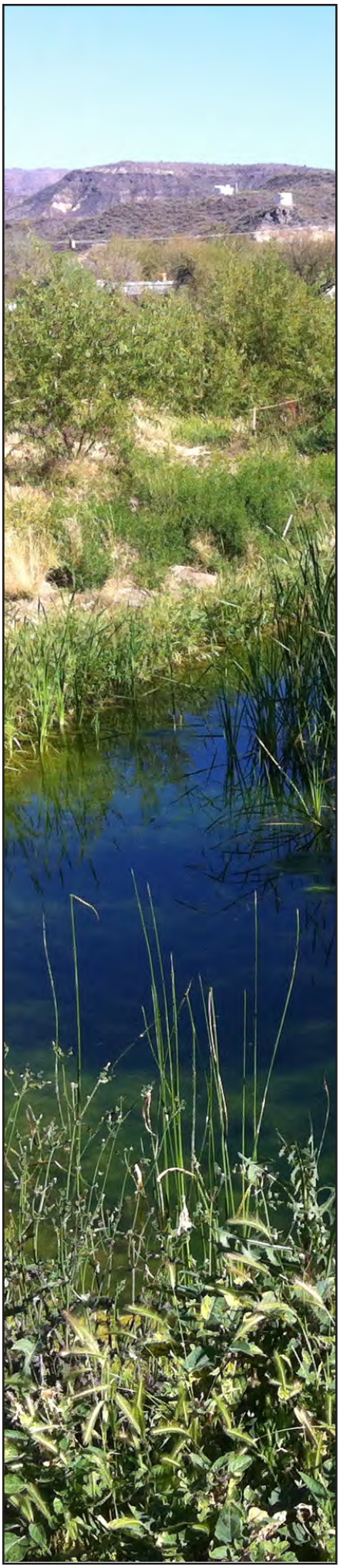


TABLE OF CONTENTS



FIGURES

TABLES

APPENDICES

All Appendices can be found on the attached CD.

EXECUTIVE SUMMARY

In order to increase the ecological integrity along the Agua Fria River Corridor, the Black Canyon Riparian Revegetation Project enhanced and restored a total of 22 acres within the Agua Fria River Corridor located in Black Canyon City, Arizona. Restoration at the site was initiated by clearing exotic species including tamarisk *(Tamarix spp.)*, Castor bean *(Ricinus communis)*, desert broom *(Baccharis sarothroides)*, and Chinese willow *(Salix matsudana)* from the 22 acre site by February 2010. Follow up spraying occurred once to remove recolonizing species prior to planting in October 2010. Once the site was cleared a site and soil analysis was completed to guide the design of the restoration plan. This included collecting soil samples at 1-foot soil depths at 32 sample locations and 5-foot soil depths at 26 locations to analyze soil salinity and prepare a comprehensive salinity map of the site. Soil samples collected 5- feet below the surface were obtained from 26 of the 32 samples due to impenetrable substrate. Soil texture was also determined at each soil collection site. The depth to water could not be measured at any of the 32 sampling points. The water table was estimated to be over 20 feet deep throughout the upper portion of the site. The soil analyses indicated that the majority of the site had low soil salinity and was appropriate for a variety of riparian and upland species. However, the water table was over 20 ft deep on average, with the exception of around the pond and channel areas, and was more suitable for upland species.

By August 2010, the channel was excavated and the pond was re-contoured to provide aquatic and wetland habitat and in November 2010 the irrigation installation was completed. After the revegetation design was complete and approved and the construction complete, native revegetation was implemented. Planting was completed in November 2010. Once the planting was complete, plant and photo monitoring were performed. Seven transects were established to monitor tree and shrub species, and ten quadrats were established to monitor grass and herbaceous species. Monitoring occurred a total of four times from November 2010- September 2011 to determine site conditions and plant growth. Monitoring indicated that the site was in healthy conditions and all species showed positive average growth (Figure A). *Salix gooddingii, Salix exigua* and *Populus fremontii* showed the highest growth, of over one meter since the baseline height was recorded in November 2010 (Figure A).

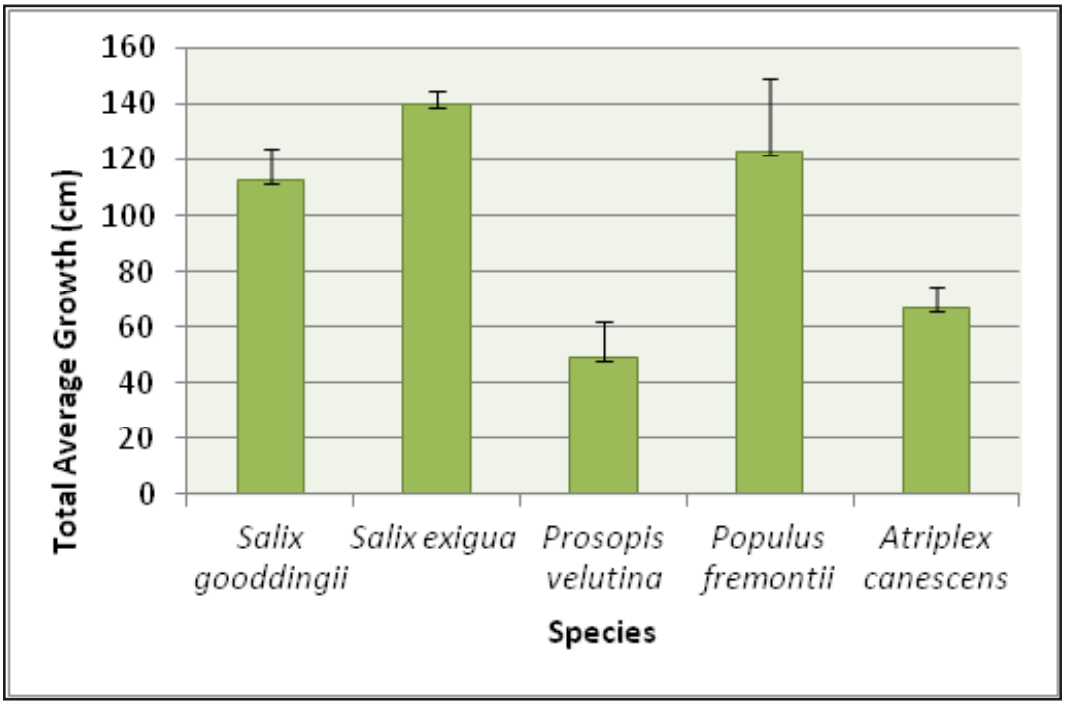


Figure A. Total average growth (cm) for *Salix gooddingii, Salix exigua, Prosopis veluntina, Populous fremontii,* and *Atriplex canescens f*or the 2011 growing season at the Black Canyon Restoration Site. Error bars signify standard error.

All herbaceous species showed positive total percent cover except for *O. hymenoides*, *P. pseudospectabilis* and *S. acutus* (Figure B). *O. hymenoides* and *P. pseudospectabilis* suffered 100% mortality in the monitored riparian quadrats, therefore showed 0% total cover. This mortality was likely a result of volunteer competition from invasive species. In the wetland quadrats, *S. acutus* experienced 100% mortality which showed 0% total cover. Between December 2010 and May 2011 the wetlands had to be drained as a result of non-native fish introduction by an unknown community member. To eliminate all non-native fish, the wetlands had to completely dry out which caused mortality in *S. acutus. S. airoides, D. spicata* and *S. pungens* showed the highest total percent cover. *A. californica* ,*B. gracilis* and *V. microstachys* were recorded just under 3% total cover.

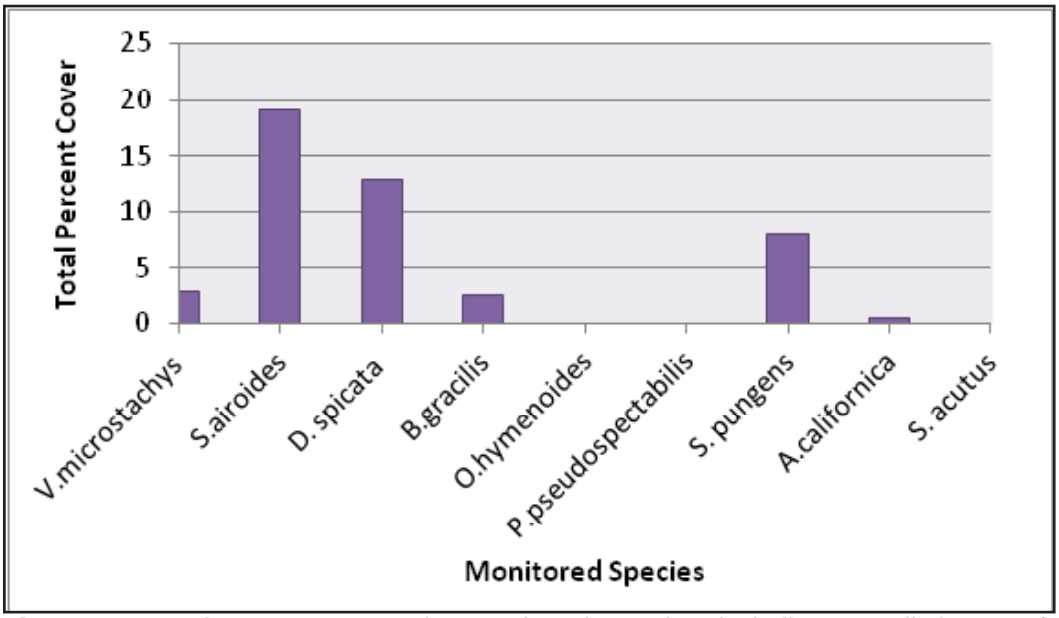


Figure B: Total percent cover for monitored species including: Small fescue *(Vulpia microstachys),* alkali sacaton *(Sporobolus airoides*), and inland saltgrass *(Distichlis spicata)*, blue Gramma *(Bouteloua gracilis)*, Indian ricegrass *(Achnatherum hymenoides),* canyon penstemon *(penstemon spp.),* threesquare *(Scirpus olneyi)*, yerba mansa *(Anemopsis californica)* and hardstem bulrush *(Scirpus acutus)* for the final monitoring session in September 2011.

The Black Canyon City Restoration Project restored 22 acres of riparian habitat and benefitted 0.5 miles of stream along the Agua Fria River in Black Canyon City. The project employed over 30 people to remove invasive species, plant native species, install irrigation, install the creek structure, and conduct site maintenance. Funds acquired to conduct the restoration from AWPF were leveraged to get funds to create the hiking trail, install native fish in the pond and purchase a solar power generator to run the irrigation. The $44,000 hiking trail was funded by Arizona State Parks. The project site created 0.56 acres of endangered fish habitat for 1,000 Gila Topminnow and 4,000 Desert Pupfish funded by the Arizona Game and Fish while improving the existing water supply on site. The U.S. Fish and Wildlife Service provided the solar pump at $25,000. The BCC Community Association is looking at alternative funding opportunities for a complete solar system to power water pumps for the pond well, the irrigation well and provide electricity for the visitor center building adjacent to the restoration site. Funding is also needed to provide displays and exhibits for the visitor center interior, interpretive signage for the nature trail and design and construction of the educational amphitheater. Through collaboration with the BCC Community Association, the National Park Service, Yavapai County and the Bureau of Land Management, the Arizona Game and Fish Department agreed to provide assistance in developing the site to support the threatened and endangered species fishery and wildlife habitat. The restoration project is successfully providing wildlife with native habitat while offering the community an inviting place to enjoy a unique riparian and wetland experience. Present wildlife inhabitants include: cottontail rabbits, Gambel's quail, doves, grackels, sandpipers, great blue herons, snowy egrets, migrating ducks and geese, bats, a swan and an occasional coyote.

Aggressive weed maintenance at the site occurred throughout 2011 and will be necessary in the future to allow the native species an advantage. The Black Canyon City Community Association has employed four local workers to perform maintenance work for 2012 that consists of working between 10 and 20 hours a week. The grant funding for this work ends in July 2012, but the Association has implemented a program for maintenance work to continue without compensation. Individuals and organizations have adopted plots within the project site to perform maintenance work. Adopters include the Lion's Club, BCC Fire Department and the BCC Community Association. Organizations that have expressed interest in adopting are the BCC Riders Equestrian Club, the Black Canyon Trail Coalition, the Black Canyon Historical Society and the Black Canyon Chamber of Commerce. A set number of hours has not been mandated for maintenance, rather the adopters are asked to check their plots on a weekly basis to determine the necessary frequency for reasonable maintenance.

The Black Canyon City Restoration Project provides various environmental education activities throughout the year and plans to hold future community functions. Earth Day is the main event with 2012 being the second annual Earth Day. The local Head Start school and a local private pre-school have held activities at the park and the local middle school will participate during the upcoming school year. The BCC Community Association plans to coordinate regular environmental education sessions with many regional schools for all grade levels. The fifth annual Veteran's Day Car Show will be held in the parking lot of the project site in November 2012. An annual sheep festival is in the planning stages to commemorate the importance of the Black Canyon Livestock Driveway in the history of the area. Other various events that have been discussed to take place on site include: Native American cultural festival related to the Agua Fria National Monument, Fourth of July celebration and an annual wildlife festival highlighting different species each year.

The project has certainly had a positive effect on the park property and surrounding properties in terms of neighborhood and community pride. Local restaurants, stores and gas stations benefit from special events and functions at the park. Although the park is not officially open to the public, on weekends people are allowed to enjoy the walking trails, pond and stream. On weekends, visitation ranges from 5 to 20 people. Park visitation will increase significantly with the permanent opening of the park.

1.0 INTRODUCTION

1.1 Project History

Riparian ecosystems are renowned for their high levels of biodiversity, productivity, and dynamism (Noss and Cooperrider 1994). In the arid southwest, these ecosystems comprise of the smallest habitat areas, but support a disproportionately higher species diversity and density than any other habitat type in the overall landscape. However, particularly in Arizona, these ecosystems are increasingly imperiled due to extensive modification and exotic species invasion. The Agua Fria River has been extensively modified by flood-control, grazing, fire and agricultural activities, which have affected the native vegetation and wildlife that depend on them. Despite this extensive modification, this reach has retained some natural features, including pockets of native riparian species. The 120 mile long Agua Fria River Corridor stretches through multiple ecological zones, initiating in the chaparral forest near Prescott and flowing down to the desert in Phoenix. It supports areas of high riparian habitat quality throughout its 120 mile course including the Agua Fria National Monument and the Black Canyon City area.

This project was initiated to enhance and restore a total of 22 acres within the Agua Fria River Corridor located in Black Canyon City, Arizona. Exotic species were removed from the site and habitat restoration occurred in 1.5 acres of open water aquatic habitat, 0.25 acres of native marsh, 8.65 acres of cottonwood and willow forest habitat and 2.5 acres of mesquite habitat. The remaining 9.1 acres interspersed throughout the project area were cleared, but no vegetation was planted in order to allow for native plant recolonization. The aquatic habitat was created for native fish habitat including the Gila chub and speckled dace, and the restored wetland and riparian habitats provides beneficial habitat for many neo-tropical migrant birds and waterfowl. The Black Canyon City Community Association (BCCCA), a non-profit organization, received a 27-acre parcel of land with 153 acre feet of water rights as a donation from the Albins Family. The Black Canyon Riparian Restoration Project (BCRRP) area is a 22 acre area within the donated portion that includes 14.1 acres of channel area and 7.9 acres of upper terrace flood plain within the Agua Fria River Corridor. Prior to project initiation, BCCCA in partnership with the National Park Service restored one-acre pilot restoration project along the Agua Fria. The pilot project included revegetation of 0.5 acres of willow habitat and 0.5 acres of mesquite revegetation on the upper floodplain terrace.

By August 2010, the channel was excavated and the pond was re-contoured to provide aquatic and wetland habitat and in November 2010 the irrigation installation was completed. After the revegetation design was complete and approved and the construction complete, native revegetation was implemented. Planting was completed in November 2010 and included planting the following species in riparian and upland areas: sandbar willow *(Salix exigua)*, velvet mesquite *(Prosopis velutina)*, Fremont cottonwood *(Populus fremontii)*, four-wing saltbush *(Atriplex canescens)*, Goodding willow *(Salix gooddingii)*, cat claw acacia *(Acacia greggii)*, blue palo verde *(Parkinsonia florida)*, brittlebush *(Encilia farinosa)* and desert ironwood *(Olneya tesota)*. In riparian and upland areas the following grass and herbaceous plugs were planted, including: blue grama *(Bouteloua gracilis)*, Indian rice grass *(Oryzopsis hymenoides*), small fescue *(Sporobolus airoides)*, canyon penstemon *(Penstemon pseudospectabilis)*, inland saltgrass *(Distichulus spicata)*, deer grass *(Muhlenbergia rigens)*, blackfoot daisy *(Melampodium leucanthum)*, and alkali sacaton *(Sporobolus airoides).* The wetland areas were planted with plugs from

the following species: yerba mansa *(Anemopsis californica)*, three-square bulrush *(Scirpus pungens)* and hardstem bulrush *(Schenoplectus acutus)* . Also, native seed mixes were spread throughout the riparian areas.

1.2 Project Goals and Objectives

The project goals and objectives of the 22-acre Black Canyon Riparian Revegetation Project were focused on removing exotic species and creating native habitat within the Agua Fria Corridor.

The project goals included:
1) Establish approximately 8.65 acres of cottonwood and willow riparian habitat to recover native wildlife communities.

2) Establish approximately 2.5 acres of native mesquite bosque to provide increased wildlife habitat, especially for the invertebrate food base.

3) Establish approximately 1.5 acres of open water habitat to provide habitat for winter migrants, resident water birds and native fish.

4) Establish approximately 0.25 acres of native marsh habitat for marsh bird species of concern.

5) Monitor the project success of the 22 acre riparian, wetland, and open water revegetation project through plant monitoring.

The project objectives included:
1) Restore approximately 22 acres of native cottonwood/willow/mesquite, open water, and marsh habitat within the Agua Fria River Corridor.

2) Obtain valuable data to apply to future restoration activities within the Agua Fria River Corridor.

2.0 TASK # 3 SITE CLEARING AND HERBICIDE SPRAYING

The clearing plan included the removal of all exotic vegetation on 17 acres of the 22 acre area. The remaining 5 acres on the upper terrace of the project had minimal exotic vegetation which was cleared during the site grading.

In non-wet areas, re-colonizing invasive tamarisk and castor bean were sprayed with Garlon 4 utilizing the cut-stump method. Tamarisk and castor bean in wet areas were treated similarly after conditions were assessed and this technique was found to be safe and suitable. This technique involved manually cutting the trees to the ground with a chainsaw then immediately applying herbicide with a backpack sprayer to the individual stumps. All standing deadwood less than 15 feet (ft) tall was mulched.

The cut tamarisk and castor bean were mulched and left on site using a heavy duty chipper. Tamarisk and castor bean which had sprouted flowers or gone to seed were burned. Desert broom was dug up with an excavator and burned as it had mostly gone to seed. The entire 17 acre site was treated with this technique. Care was given to prevent over-spraying into other areas and spray was not applied on windy days. A rolloff dumpster approximately 15-20ft long, 8ft wide, and 4ft high was delivered during the final week of clearing for site cleanup and received all plant material that was not mulched or burned. The entire property as well as the river bed and surrounding banks were cleared of all trash removable by hand or machinery when access permitted. The dumpster was removed upon completion of work.

The area surrounding the pond was cleared of all dead cattail material which was used as fuel to burn freshly thinned desert broom piles. This area was also cleared of tamarisk and Chinese willow trees using the above described method. Additional weeding and spraying of other exotic weeds was performed in this area as needed. The entire fence line and the north side property line along the neighboring trailer court were also cleared of all trash, debris and tumbleweeds. A tractor with a box scraper and a disc attachment was used to clear exotic weeds in the east field. The large existing mulch pile located on the east side of the property's garage and shop was moved next to the berm directly south of that building. The three invasive walnut and two pine trees lining the road accessing the fence were felled, bucked and also stored in the new mulch pile area along with any other lumber and firewood found on the property.

A final sweep was made of the entire property giving special attention to the terraces and berms above the wash to ensure that all trash and exotic weed stands had been addressed. All work was completed by Fred Phillips Consulting with a 10 person crew and a crew leader on February 19, 2010. The clearing /herbicide spraying map and photos can be found in Appendix A.

3.0 TASK # 4 SITE AND SOIL ANALYSIS

The site assessment determined the physical attributes of the site in order to create a successful revegetation strategy. Soil characteristics are important indicators for determining the potential success of revegetation projects by providing detail about the subsurface conditions that the plants are subject to. Soil salinity and depth to the water can often be the limiting factors for plant survival and growth, therefore it was important to determine these factors in order to have a successful revegetation project.

Salinity and soil texture data were collected and mapped across the 22 acre site using the following equipment:

- A Trimble GEO XT survey unit
- A backhoe to excavate pits for soil analyses
- Sealable plastic bags
- Permanent marker

Soil samples were taken at 1-2 data points per acre across the 22 acre site for a total of 32 sampling points and 58 samples. Sample point locations are found in Appendix B.

Soil sampling holes were dug using a backhoe to excavate approximately 5ft deep holes at all the sampling points determining the soil horizon, soil salinity at the 1ft and 5ft depths. Soil samples were taken at depths of 1ft and 5ft below the surface in randomly selected locations spread throughout the site, collected on a 150ft x 150ft grid for reference. Soil samples collected 1ft below the surface were taken from all 32 points. Soil samples collected 5ft below the surface were obtained from 26 of the 32 samples due to impenetrable substrate. A total of 58 samples were collected and tested for soil texture and salinity. Depth of water table could not be measured at any of the 32 sampling points. The water table was estimated to be over 20ft deep throughout the upper portion of the site. Of the 32 sampling points, 3 samples were collected 1ft below the surface in the bottom of the Aqua Fria River Corridor. The depth to water table and 5ft samples could not be tested at these points due to the amount of cobble in the river channel. At each data point, the Trimble Geo XT survey unit was used to obtain the GPS location. Once the soil samples were obtained, the samples were placed in sealed plastic bags and sent to Utah State University Analytical Laboratory (USUAL) in Logan, Utah for analysis. Maps showing the soil salinity at 1 and 5ft and soil texture are shown in Figures 2-5 of Appendix B. Field and lab results are shown in Figures 6 and 7 of Appendix B.

The salinity levels detected at both 1ft and 5ft depths were relatively low. The 1ft sample map showed the majority of the site below 3 mmhos/cm, which is a sufficient level to support cottonwood/willow habitat. There was one area that had salinity levels close to 7 mmhos/cm, which was too high for cottonwood/willow, but low enough to support mesquite habitat. The 5ft sample map provided similar conclusions. The majority of the site had low salinity levels supporting cottonwood/willow habitat with one area where the salinity was too high for cottonwood/willow but within the range that supported mesquite habitat. The soil texture of the site ranged mostly from sand to sandy loam. Due to the well drained soils an impenetrable liner was installed in the wetland areas that helped the soils hold water and created the desired open water and marsh habitats.

Field observations were taken while the soil samples were collected.The observations are found in Figure 6 of Appendix B. Some areas of the site contained large cobble ranging from 1 inch to 24 inches in size. The cobble areas were avoided as much as possible.

4.0 TASK #5 EXCAVATION, GRADING, & WATER STRUCTURE IMPLEMENTATION

4.1 Excavation , Grading, & Water Structure Design

The Excavation, Grading, and Water Structure Design Plan was developed by Natural Channel Design and Fred Phillips Consulting. The primary purpose of the design was to create 0.5 acres of open water used as habitat for native fish, 1.1 acres of lower wetland habitat, and 4.6 acres of cottonwood/willow/mesquite habitat. The re-contoured topography diversified habitats for terrestrial and wetland wildlife. Excavation and grading of the 6.2 acre upper terrace site created open water, wetland, and riparian areas. Excavation occurred on 0.5 acres open water and 1.1 acres of wetlands. Grading occurred on 2.3 acres of riparian area. The open water pond areas were created for an average depth of 6-8ft. The pond banks were contoured to accommodate wetland vegetation. The marsh and riparian habitat adjacent to the open water and channel areas were graded to fulfill the appropriate habitat conditions. Valuable existing native habitat (cottonwood/willow) was avoided during excavation. The established ground water pumps supplied water to fill the channels and were used to maintain optimum water levels for the establishment of habitat. The Excavation, Grading and Water Structure Plan can be found in Appendix D.

The three major elements involved in the design included:
1. Constructed a Small Stream and Pool System (STA 0+00 to STA 2+50)
Constructed stream and pools with pond-liner underlay, and constructed waterfall and spring features to provide habitat for native fish.

2. Constructed a Wetland Channel System (STA 2+50 to STA 5+15)
Constructed wetland channel with pond-liner underlay and installed a pre-cast concrete water control structure and culvert pipe to regulate water levels in the wetland channel.

3. Re-contoured the Existing Pond (STA 5+15 to STA 8+50)
Re-contoured the existing pond to provide additional wetland habitat, underlaid wetland areas with pond-liner and constructed foot trail for public access.

4.2 Excavation , Grading, & Water Structure Construction

Mulcaire & Sons Contracting and the Black Canyon City Community Association finalized and signed the Excavation and Grading contract in late June 2010 and construction began in early July 2010. In order to minimize erosion and air and water pollution straw wattles were installed as detailed in the project Storm Water Pollution Prevention Plan (SWPPP) report and as shown in the plans (Appendix C). Following completion of the SWPPP the site was cleared with a bulldozer, backhoe, and excavator by cutting and removing all brush and vegetative matter within the project work area. This material was either burned on site or removed.

Earthwork was initiated with excavating the stream and pool system. The spring feature excavation was initiated on the east end of the project site and excavation was continued westward with the six pools and waterfalls. After excavating the pools and the final waterfall excavation was initiated on the

wetland channel, cutting was initiated for the location of the stoplog structure.

The majority of this work was completed with an excavator and backhoe. Some of the smaller detailed areas were completed with shovels to accurately get the proper grade excavated. After excavation of the stream and pool system and the wetland channel, the pond was re-contoured with a motor grader and bulldozer and the soil was removed with a backhoe. All excavated native material was stockpiled and screened so it could be used for all fill operations and construction of all natural features in the project area. It was screened into 3 sizes: sand ($\leq$2 inches), cobble (3 to 7 inches), and boulders ($\geq$8 inches). On-site soils as expected were generally a range of sand to sandy loamy with more than expected cobble and boulders ranging in size from 1 inch to 48 inches. As a result of the excess amount of cobble in the ground extra soil was hauled in from a local gravel pit.

Once the project area was excavated to meet the designed elevations of the liner, the cobble and obstructions in the soil were leveled, compacted, and removed.The stoplog structure and liner were installed in strict accordance with the engineer technical specifications and the manufacturer's instructions. Since the Akwaseal liner specified for the project was heavier than most typical synthetic pond liners the installer used a front end-loader to safely unroll the liner directly onto its designated location. The liner was then anchored by burying the edge of the liner in a 1ft deep trench and bolting it to the face of the stoplog structure.

An initial backfill of 12 inches of sand was placed above the pond liner in all areas except for the waterfall and spring features. The final backfill for the pond liner installed in the stream and pool system was completed with an additional 6 inches of cobble placed on the initial sand layer. The final backfill for the wetlands channel and pond was completed with an additional 12 inches of screened sand placed on the initial sand layer, for ease of planting wetland vegetation. The screened boulders were placed throughout the stream and pool system to provide overhangs and pockets for native fish refuge. Boulders were also placed along and beyond the stream and pool edges to blend the stream edge with the undisturbed ground. A base coat mixture of cement and screened sand and cobble from the site was placed directly on the exposed pond liner for the spring and waterfall features. The base coat was installed and spread by hand to a 2 inch average thickness. Screened boulders from the site were placed on the base coat to form the waterfalls and spring feature. The boulders were held in place with a custom concrete mix. The top of the waterfalls were capped with flatter boulders to form a cantilever edge for the water to fall over into the lower stream and pool.

A 2-3ft trench was dug from the existing pump house along the north side of the property line to the spring feature. Three 2 inch PVC pipes were buried in the trench to connect the spring feature to the existing 90 gpm pump. Only one pipe connected the pump and spring and the 2 remaining pipes were used for solar pumps.

Excavation and Grading of Upland and Riparian Areas

The following design elements were included in the planting and irrigation design.

1.After the site was cleared of invasive vegetation, the pond and stream channel on the 6.2 acre upper terrace was excavated using an excavator, low-track bulldozers and land-grading equipment.

2.The pond was excavated to achieve approximately 0.5 acres of aquatic habitat suitable for native fish.

3.The stream channel was designed to function as a transitional area from a dry desert wash planting

scheme to wetland plants creating a marsh habitat. The upper portion of the stream was designed to function as a desert wash and consists of a cobble stream channel flowing into a series of pools and waterfalls. The channel was lined with a pond liner that extended about one foot on both sides of the cobble channel allowing for a 4-6 ft wide saturation zone.

4.The lower portion of the stream had a one foot wide channel of open water and approximately 25ft wide saturation zone. The saturation zone is the limit of the liner and was planted with grass and herbaceous species (see Planting Design section for details). The lower portion of the stream and pond area achieved approximately 1.1 acres of native marsh habitat.

5.The low lying areas around the stream and pond were planted with the following riparian habitat species: One gallon *Salix exigua* (Sandbar Willow) planted 10ft O.C., one gallon *Salix gooddingii* (Goodding Willow) planted 20ft O.C., and *Populus fremontii* – (Fremont Cottonwood) planted 30 ft O.C. This area was also planted with *D. spicata* and *S. airoides*.

5.0 TASK # 6 REVEGETATION PROCESS

5.1 Irrigation Construction

Once the grading was complete the irrigation system was installed prior to planting. In order to begin irrigation construction by September 2010, pre-construction tasks involved acquiring the irrigation system, laying out the irrigation design and preparing the site for irrigation construction. Construction activities began by digging trenches for the PVC mainline and PVC laterals. This was done with a walk-behind trencher and mini excavator. The PVC mainline was trenched about 18 inches deep and the PVC lateral was trenched about 8 inches deep. Once the trenching was complete the irrigation system was delivered on October 4, 2010.

The drip irrigation system was designed to tie into the existing 25 gallon per minute (GPM) pump and pressurized tank. Upon delivery of the irrigation system, the filter was installed followed by the installation of the pressurized tank and main valves that control both the north and south sides of the irrigation system. The 2 inch mainline was installed in the trenches and the 1 inch – 1.5 inch PVC laterals were connected. The mainline was glued together and flushed out with water before any valves were installed. After a complete flushing was done the valves were installed and then the PVC laterals were glued together and tied into the valves and mainline. After another flushing with water to insure a tight seal and no leaks the flush out valves were installed. The mainline, valves, and PVC laterals were completed within the first four days of work.

While the mainlines and PVC laterals were being constructed the planting design was laid out on-site to help locate where all the emitters needed to be installed. Holes for the *P.fremontii*, *S. exigua, S. goddingii,* and *P. velutina* were dug with a 12 inch auger and bobcat for ease of planting. Once the installation of the mainlines was completed and tested, valve boxes were installed on all the valves except the flush out valves. The excavated soil was then screened to remove all the cobble and boulders and the remaining sand was used to shade and bury the PVC pipe and valve boxes.

After completion of the mainline installation the PE tubing laterals were rolled out on 10 and 20ft spacing. This was done as per the irrigation design. One line was added to the island in the middle of the pond for supplemental irrigation if needed during dryer months. Once all the PE tubing laterals were installed, the timer and irrigation control box were installed in the existing pump house on the north side of the project area. The spaghetti tubing and the emitters were then installed as per the planting layout. All trees received two four gallon per hour (GPH) emitters and all grasses and shrubs received one two GPH emitter. Over 2,000 two GPH emitters and 700 four GPH emitters were installed in the last 5 days of construction.

The irrigation system was divided into six different zones determined by the six different valves that control each zone. Watering occurred twice a day when vegetation was initially installed. Zone 1 was set to start watering at 6:00 am and 4:00 pm for one hour and each zone started after the previous zone had completed its one hour watering session. Each zone was tested and all emitters checked. Irrigation construction was completed by October 2010. See Appendix E. for Irrigation Plan and construction photos.

The channel and pond were supplied with water from the existing ground water well. The 1.1 acre area of wetland and marsh habitat around the pond and lower portion of the stream were graded and leveled to just above the normal water level of the pond and stream. The 0.9 acre cottonwood and willow riparian area was graded so that some of the plants were flood irrigated when water levels were high. All of the cottonwood and willow plants were drip irrigated, supplementing the flood irrigation. The 3.2 acres of cottonwood/willow/mesquite habitat on the upper terrace were watered with drip irrigation provided from the site's groundwater pumps. This area was drip irrigated 5 days a week for 6 months (April-September 2011) and 3 days a week (October-March 2010 and 2011) until the end of the first growing season. The 15.6 acres revegetated in the Agua Fria Corridor were planted directly into the exiting water table and did not require supplemental irrigation.

5.2 Planting Design

The restoration design featured native riparian species, open water aquatic habitat, wetland, and upland habitats (Appendix G). Once vegetation matures, the desired result will be wetland and riparian habitats that are more functional and attractive to birds and wildlife. The revegetation design was developed based on the results obtained from the site assessment. The site analysis indicated that the majority of the site has a deep water table with well drained soils and low salinity levels that will support cottonwood/willow habitat. One area had high soil salinities that could not support cottonwood/willow however, the salinity was within range tolerable to support mesquite habitat. Due to the well drained soils an impenetrable pond liner was installed in the wetland areas to help the soils retain water and create the desired open water and marsh habitats.

On November 1, 2010, two weeks after the completion of the irrigation system, Mountain States Nursery delivered 1,187 one gallon plants, Signature Botanica delivered 742 grass plugs and 23 one gallon plants, and Arizona Western College provided 180 Dee Pot trees. On November 8, 2010, a total of 3,688 wetland and grass plugs were delivered by Fred Phillips Consulting. These plugs were harvested from the Yuma East Wetlands.

Planting activities began with planting the 2.3 acre upland zone, including *P. velutina* dee pots, one gallon *E. farinosa*, and one gallon *A.canescens.* All *P. velutina* were planted 30 ft on center, wrapped with tree tubes, and staked. *D.spicata* plugs were planted in each tree well with the mesquites. Some of the larger tree wells received two plugs. Crews planted the grass plugs to complete the upland plantings. The following were planted in the southwest corner of the project: *O. hymenoides* plugs, *S. airoides* plugs, one gallon *B. gracilis*, and *V. microstachys* plugs. The area of *V. microstachys* was reduced from the original planting design because poor and rocky soil conditions on the South side of the fence. The remaining *V. microstachys* plugs were planted randomly along the stream in wet areas. See planting design for plant specifications and numbers (Appendix G).

The following was planted in the 0.9 acres of low lying areas around the stream and pond to create riparian habitat: one gallon *S. exigua*, one gallon *P. fremontii*, and one gallon *S. gooddingii*. Along with the *P. fremontii, S. airoides* plugs were planted at least six feet from the base of the tree. *D. spicata* plugs were planted in each tree well with the *P. fremontii*. Some of the larger tree wells received two plugs. *D.spicata* plugs were also planted between the *S.gooddingii* as well as all the tree wells. The island in the middle of the wetland/pond was planted with one gallon *S. exigua*, one gallon *P.fremontii,* and one gallon *S.gooddingii.*

The upper portion of the stream, designed as a desert wash, was planted as per the planting design with one exception. The *Baileya multiradiata* were replaced with *Melampodium leucanthum*. The nursery had trouble keeping the *B. multiradiata* healthy until the site was ready to be planted.

The following plants were planted: one gallon *P. florida,* one gallon *O.tesota, O.humenoides* plugs, one gallon *M. leucanthum,* one gallon *Acacia greggii,* one gallon *M. rigens*, one gallon *P. pseudospectabilis,* and one gallon *E. farinosa.* Signature Botanica delivered 11 additional *O. hymenoides* plugs and these were planted in wet areas along the upper portion of the stream. Extra *D. spicata* and *S. airoides* plugs were planted in wet areas.

The wetland channel was planted as per the planting design with *S. pungens* plugs, *D. spicata* plugs, one gallon *A. californica, O. hymenoides* plugs, one gallon *P. pseudospectabilis,* one gallon *B. gracilis,* and *S. airoides* plugs. Extra *D. spicata, S. airoides, O. hymenoides*, and *B. gracilis* was planted in wet spots along the wetland channel.

The wetland/pond was the last portion of the planting to be completed. The upper portion of the transitional zone around the pond and island was planted with *D. spicata* plugs as per the planting design. Extra *D. spicata* plugs were planted in wet areas around the pond and island as well. The lower portion of the transitional zone around the pond and island was planted with *S. pungens* plugs and *S. maritimus* plugs were added to the planting scheme around the outfall of the stoplog structure. The deep marsh was planted with *S. acutus* plugs.

A seed mix of *S. airoides, B. gracilis,* and *O. hymenoides* was spread around the wetland channel, throughout the *S. gooddingii* and *P.fremontii,* on the island. *O. hymenoides* seed was spread among the area planted with the *O. hymenoides* plugs and *V. microstachys* seed was spread throughout the area planted with *V. microstachys* plugs. See Appendix G for the Upper Terrace Planting Plan and installation photos.The remaining 15.6 acres were planted in the river corridor with *S. exigua* vertical bundles/cluster plantings, *D. spicata, S. pungens,* and seeded with a native seed mix that inhibited exotic weed regeneration. See Figure 1 of Appendix F for planting details and specs. The exact locations of the bundles/clusters and plugs were determined after site clearing. All planting was planted in wet areas with suitable moisture for riparian species. See Appendix I River Corridor Planting Plan.

5.3 Maintenance Activities

When planting was complete regular maintenance of the revegetation site was conducted for two years. Throughout 2011, eleven people have been paid for maintenance services and accumulated a total of 1,210 hours. A crew from Taylorbird Enterprises provided weed maintenance on four separate occasions. Three members of the local community provided 300 hours of community service performing weed maintenance. Numerous volunteers invested 600-800 hours in weeding, irrigation system repairs and maintenance, and general landscape maintenance.

Irrigation system maintenance consisted mainly of flushing the lines and cleaning the emitters periodically, and repairing the polylines after gophers chewed through them. Adjustments were made to the timing of irrigation to accommodate the temperatures of each season, 1 hour per day during the heat of summer, 30 minutes per day in spring and fall and 15-30 minutes for 3 days a week during winter.

Replanting and stabilization of trees were performed throughout the year in areas where mortality was experienced. On April 22, 2011, six dead mesquite trees were replaced with *P. velutina* and *O. tesota* and forty *S. pungens* wetland plugs were replanted. New trees were planted that consisted of three new *P. velutina,* one *O. tesota*, and two *Platanus wrightii.* Rope, rubber cushioning, and stakes were used to stabilize three of the *P. fremontii* due to saturated ground and high winds. Irrigation lines were added to the newly planted trees.

On Earth Day April 22, 2012, the Black Canyon City Community Association held a community planting day that included planting the following: 4 *P. velutina*, 1 *P. florida,* and over 50 *S. airoides* tand *B. gracilis* grass plugs. Irrigation lines were added to the newly planted trees and shrubs. At the event, 5 sections of various sizes were adopted by individuals and organizations to do volunteer maintenance on a regular basis. Since April 2012, four people have been employed by the Black Canyon City Community Association to perform regular maintenance work. Weed maintenance will be required at the site until native vegetation can out-compete recolonizing invasive weeds.




6.0 MONITORING DATA COLLECTION METHODS

This section discusses the monitoring methods for the Black Canyon Riparian Restoration Project and includes (6.1) vegetation monitoring, (6.2) cover class monitoring and (6.3) photo point monitoring.

6.1 Vegetation Monitoring

The primary purpose of monitoring vegetation is to determine if vegetation is establishing and thriving, if conditions are suitable for the vegetation planted, document the success of the project, and help guide future revegetation efforts. Seven transects were established to measure quantitative growth parameters for tree and shrub species, and 10 quadrats were established to measure grass and herbaceous vegetation cover at the site. The final transect and quadrat locations can be found in Appendix J. Six transects were established in the upper terrace to measure *P. velutina, P. fremontii, S. gooddingii, E. farinosa* and *A. canescens* and one was established in the lower terrace to measure *S. exigua.* Transect locations were randomly selected using a computer to generate one random number within each acre of the site. The random number corresponded to a planting hole on the overall planting design for the area. These transects included the randomly selected planting hole plus the 4 consecutive holes, for a total of 5 trees per transect. The beginning of each transect was marked with a fence post wrapped in construction fence. A tree tag with the transect name was attached to the fence post. Each tree in the transect was fitted with a tree tag containing the unique identifier for that tree. A GPS location was recorded for each transect. Approximately 3% of the population was monitored, which sufficiently represented the population. The vegetation monitoring datasheets can be found in Appendix K.

For tree and shrub species, including *P. fremontii, S. gooddingii, S. exigua, P. velutina, E. farinosa,* and *A. canescens* the following parameters were measured:

Plant height (ft) –A measuring rod with interval markings was used to measure the height of the plant from the base of the trunk to the top of the tallest up-stretched leaf.
Tree condition – Overall vegetation condition was recorded for each tree in a transect and overall health will be recorded on a 0-4 scale. A score of 0 will be given to any plant that was dead; 1, for poor condition; 2, for fair condition; 3, for good condition; and 4, for excellent condition and vigorous growth. If a plant died and another plant was planted in its place no data was recorded on it to ensure accurate data collection. The survival rate will be calculated from this measurement.

Factors affecting growth:

- Mammal Browsing= MB
- Insect browsing = IB
- Volunteer competition = VC and note volunteer plant type
- Herbicide affects =H
- Hog wire rub= HWR
- Water Stress = WS
- Insect Presence = IP
- Unknown

6.2 Cover Class Monitoring

In order to quantitatively measure herbaceous vegetation cover was measured using systematic sampling of permanent quadrats located in each transect. Six quadrats were randomly established in the 6 acre upper terrace to monitor *B. gracilis* (BG), *O. hymenoides* (IRG), *S. airoides* (AS), *V. microstachys* (SF), *S. acutus* (HSB), *D. spicata* (ISG), and *S. pungens* (3SQ1). An additional 4 quadrats were established randomly in the 15 acre lower terrace to monitor *S. pungens* (3SQ2), *P. peudospectabilis* (CP), and *A. californica* (YM). A GPS location was recorded in the center of each of the quadrats, and the quadrats were marked on the northwest and southeast corners with a piece of rebar. A tree tag with the quadrat name was attached to one of the rebar. The permanent quadrat technique includes measuring all vegetation that falls within a 1 x 1.5 m area delineated by a PVC constructed quadrat. The Daubenmire cover scale was utilized to estimate cover of vegetation species, substrate, and woody debris occurring in each quadrat. Measuring and estimating cover will help determine the growth rate and success of the species that cannot be accurately measured using the techniques to measure trees and shrubs (i.e. herbs, grasses, sedges, bulrushes, and rushes). The cover plot datasheets are located in Appendix L.

Cover Class	Range of Cover	Class Midpoints (%)	Class Name
1	0 – 1%	0.5	Rare
2	1 – 5%	2.5	Occasional
3	5 – 25%	15	Uncommon
4	25 – 50%	37.5	Somewhat Common
5	50 – 75%	62.5	Common
6	75 – 95%	85	Abundant
7	95 – 100%	97.5	Dominant

Table 6.2: The Daubenmire Cover Scale

6.3 Photo Point Monitoring

Qualitative data-collection methods for vegetation included photo point monitoring. Five permanent photo point stations were located on site from a vantage point that captures the overall site growth. Photos included a landmark feature in the background for reference such as a rock outcropping or distant hill. A GPS point was recorded at each photo point and each point was marked with a fence post wrapped in construction fence. Photo monitoring datasheets are located in Appendix M.

7.0 TASK # 7 MONITORING RESULTS

The Black Canyon Riparian Revegetation project consisted of monitoring planted riparian and wetland species in order to determine site conditions and growth. Discussed below are the results of the plant and photo monitoring that occurred four times on the following dates: November 18, 2010, May 31, 2011, July 26, 2011 and September 28, 2011. The first section of the monitoring results (7.1) shows growth using 5 panorama photo points. The second section of the monitoring results (7.2) reflects the growth, condition, and survivorship results of the riparian shrubs and trees planted in the riparian area. The third section (7.3) provides the results from vegetation cover surveys of the riparian and wetland species planted in the project. The results presented below are for the first growing season in 2011.

7.1 Photo Monitoring Results

The photo monitoring results showed increased growth in the native vegetation through the 2011 growing season (Appendix N).

7.2 Species-Specific Growth Rates and Conditions

7.2.1 Goodding Willow (Salix gooddingii)

Overall, *Salix gooddingii* thrived in the Black Canyon Riparian Revegetation Project, and showed positive growth during the first growing season of 2011(Figure 7.1). The highest average increase in height (52.6cm) occurred from July to September 2011. The total average growth at the end of the 2011 monitoring season was 112.6 cm (SE=11.2).The *S. gooddingii* population exhibited a 100% survivorship rate for 2011.

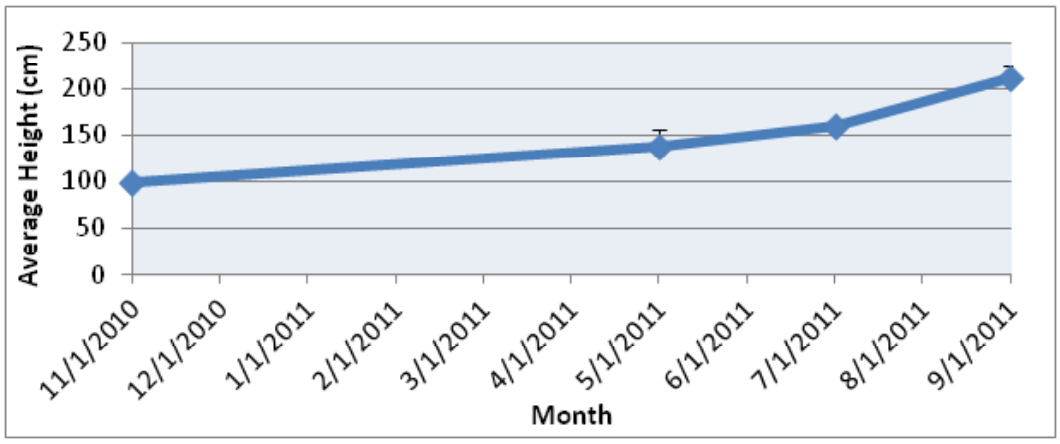


Figure 7.1: Average *Salix gooddingii* height (cm) for November 2010 to September 2011 at the Black Canyon Riparian Revegetation Project. Error bars signify standard error.

S. gooddingii was in excellent average condition throughout the 2011 growing season, (Figure 7.2). The excellent growth and survival of this species indicates the ideal site conditions, including low soil salinity. As this species matures, it will provide superb habitat for neo-tropical migrating and resident bird species.

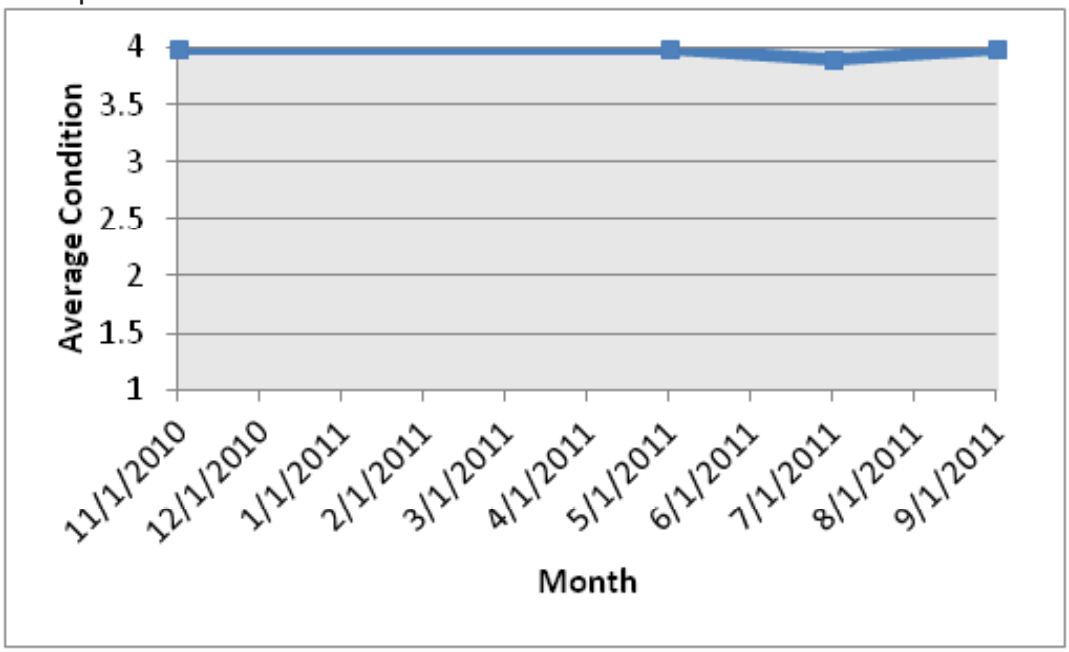


Figure 7.2: Average *Salix gooddingii* condition for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. 0=dead, 1=poor, 2=fair, 3=good, 4=excellent.

7.2.2 Sandbar Willow (Salix exigua)

S. exigua showed an overall increase in average height for the 2011 monitoring season (Figure 7.3). *S. exigua* showed a steady increase in growth throughout 2010-2011 with the total average growth at the end of the 2011 monitoring season of 139.8 cm (SE=4.84). The *S. exigua* population exhibited 100% survivorship rate for 2011.

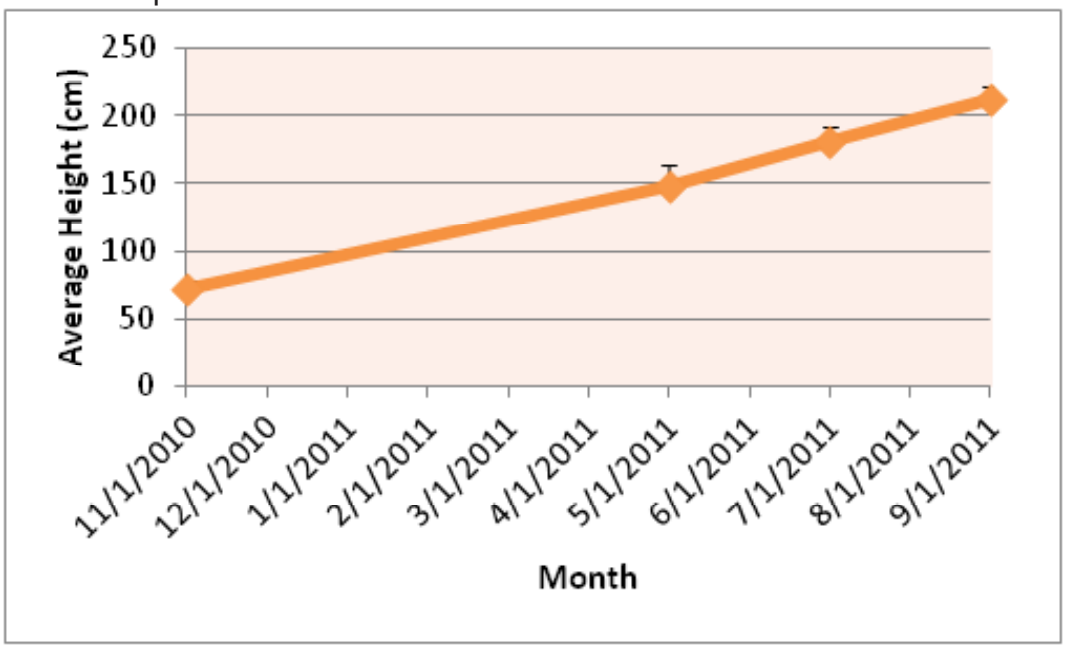


Figure 7.3: Average *Salix exigua* height (cm) for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. Error bars signify standard error.

The *S. exigua* population was in excellent average condition throughout the 2010- 2011 monitoring sessions (Figure 7.4). This species is thriving at the project site and is naturally recruiting. The shallow depth to water in the area where this species is planted indicates that it is tapped into the ground water.

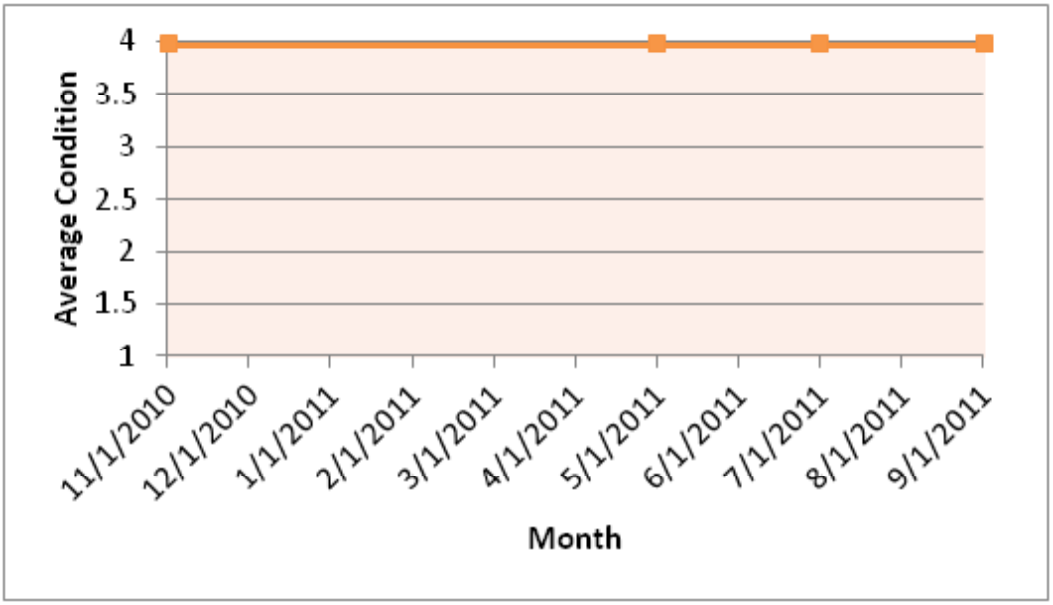


Figure 7.4: Average *Salix exigua* condition for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. 0=dead, 1=poor, 2=fair, 3=good, 4=excellent.

7.2.3 Fremont Cottonwood (Populus fremontii)

Overall, the planted *P. fremontii* individuals experienced positive growth during the 2011 monitoring season (Figure 7.5). *P. fremontii* height increased 3-fold from the baseline monitoring session (59.4cm, SE=2.7) to the final monitoring session (182.2cm, SE=24.3). The highest average increase in height (cm) occurred from May to July of 2011(44cm, SE=19.9). The total average growth at the end of the 2011 monitoring season was 122.8 cm (SE=26.3). The *P. fremontii* population experienced 100% survivorship during the 2011 monitoring season.

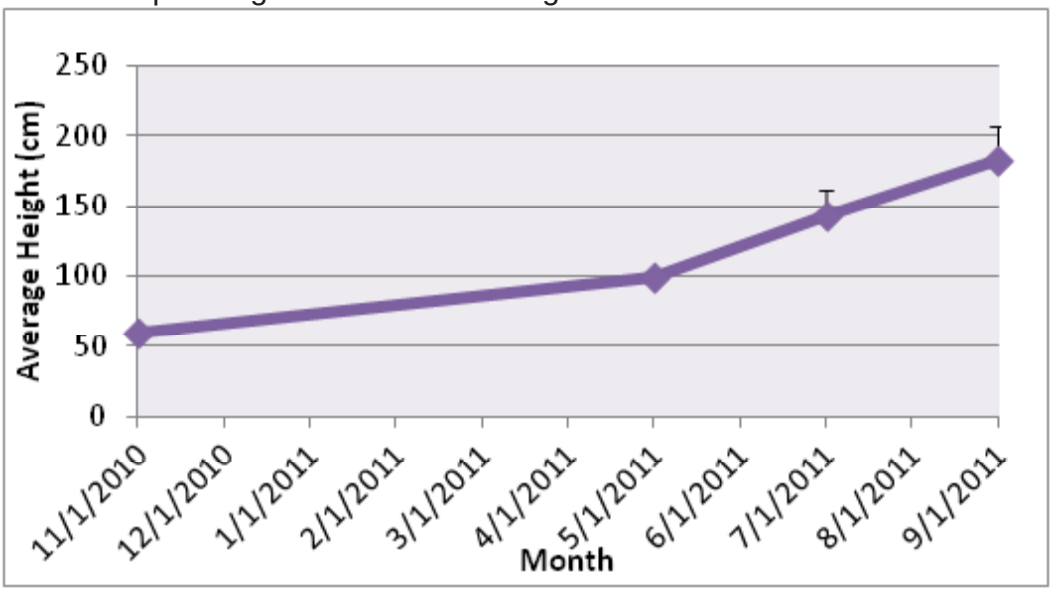


Figure 7.5: Average *P. fremontii* height (cm) for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. Error bars signify standard error.

The overall average condition of the *P. fremontii* experienced a slight decline in May 2011 from excellent to good condition (figure 7.6) which may have been due to competition from exotic weeds. During the May 2011 monitoring session exotic weeds covered 90% of the *P. fremontii* tree wells. After weed removal occurred on the site, *P. fremontii* condition increased and by the last monitoring session this species was in excellent average condition (Figure 7.6).

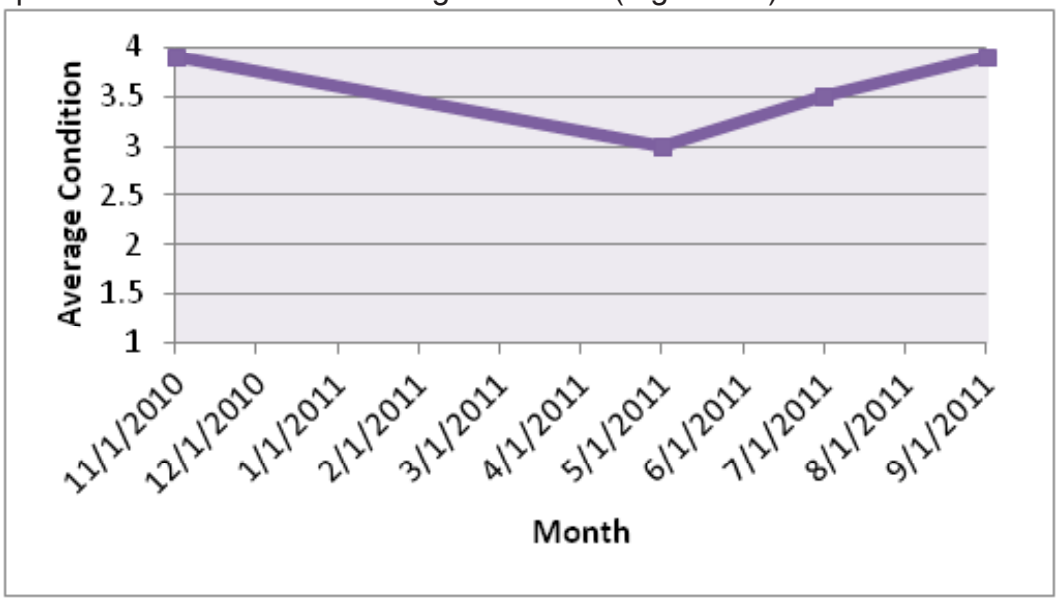


Figure 7.6: Average *P. fremontii* condition for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. 0=dead, 1=poor, 2=fair, 3=good, 4=excellent.

7.2.4 Velvet Mesquite (Prosopis velutina)

Overall, *P. velutina* showed an increase in average height (cm) for the 2011 growing season (Figure 7.7). The highest increase in average height occurred from July to September in 2011. The total average growth for *P. velutina* was 48.7 cm (SE=13.2) for the 2011 growing season. *Prosopis spp.* species typically show slower growth than the *Populus spp.* and *Salix spp.*, which is indicated by the slower growth detected in this species as compared to others.

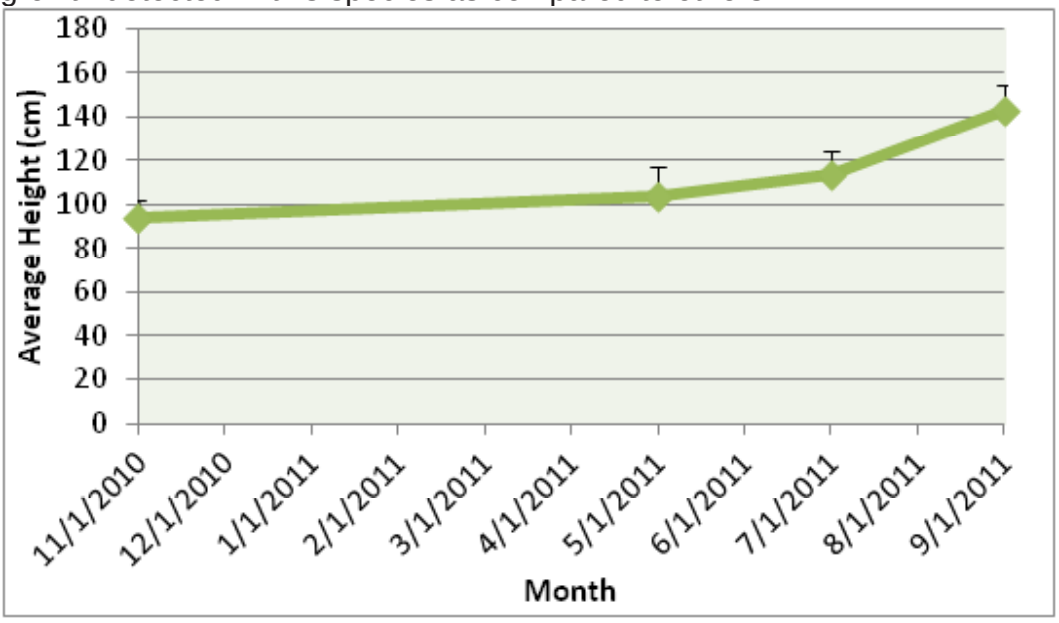


Figure 7.7: Average *Prosopis velutina* height (cm) for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. Error bars signify standard error.

On average, *P. velutina* was in good to excellent condition during the 2011 growing season (Figure 7.8).). *P. velutina* had yellow leaves and stems indicating its declined condition. This was likely due initially to planting stress and water stress during subsequent visits. Despite this declined condition, *P. velutina* population experienced 100% survivorship during 2010-2011.

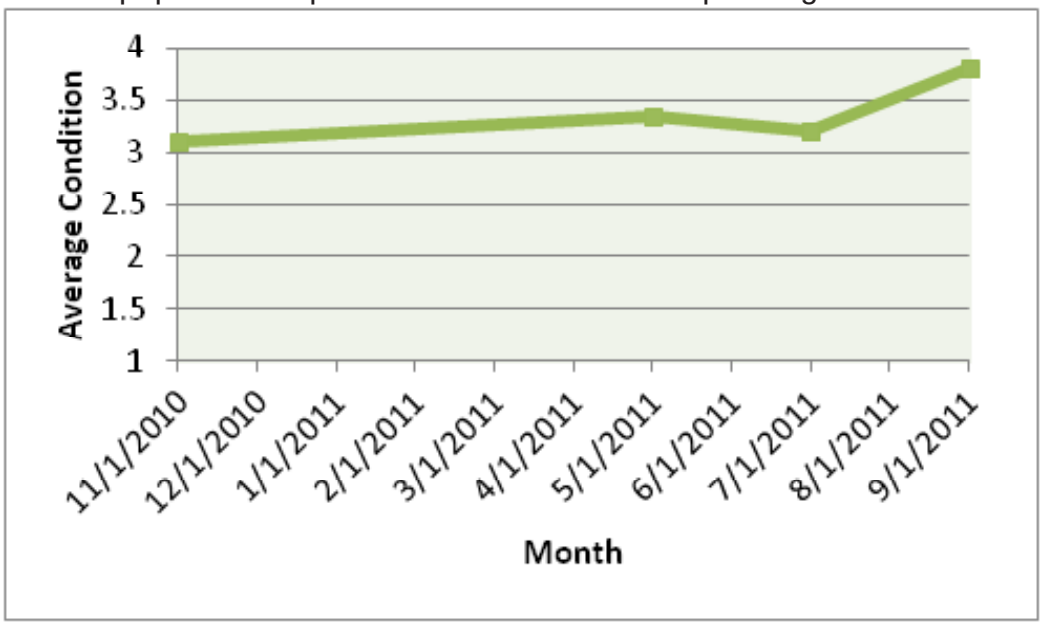


Figure 7.8: Average *P. velutina* condition for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Design. 0=dead, 1=poor, 2=fair, 3=good, 4=excellent.

7.2.5 Brittlebush (Encelia farinosa)

The monitored *Encelia farinosa* population experienced 100% mortality during the 2011 growing season (Figure 7.9 and 7.10). The high mortality rate for *E. farinosa* was likely due to a harsh freeze that occurred sometime between December 2010 and May 2011. Prior to complete mortality, the baseline monitoring found that the individuals were in excellent average condition (Figure 7.10). There was only one transect monitored for *E. farinosa* which may have misrepresented the overall growth of the species planted throughout the site. In other areas where *E. farinosa* was planted on site have experienced positive growth and continue to perform well.

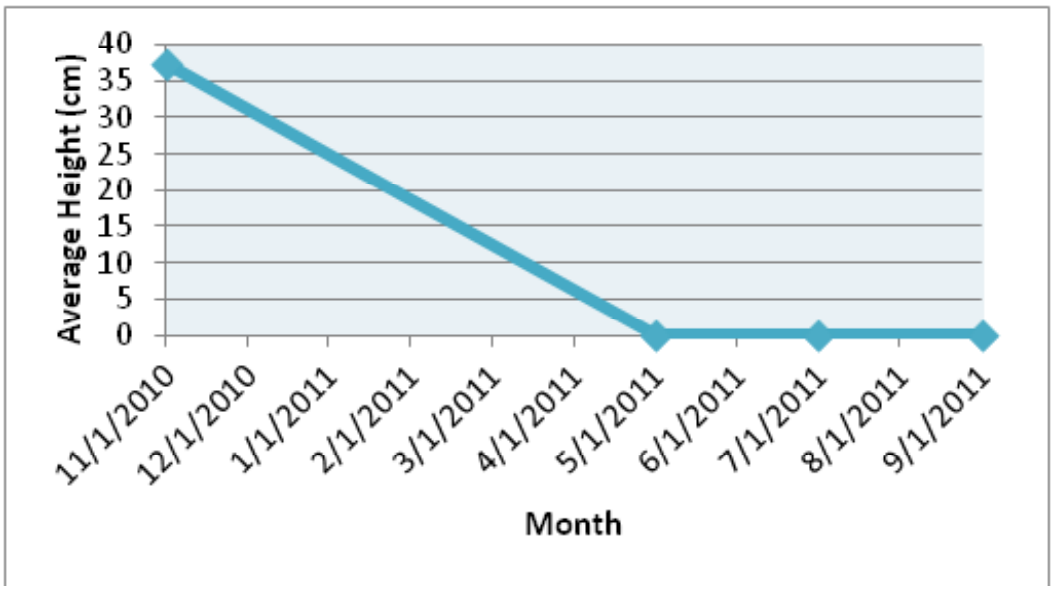


Figure 7.9: Average *Encelia farinosa* height (cm) for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project.

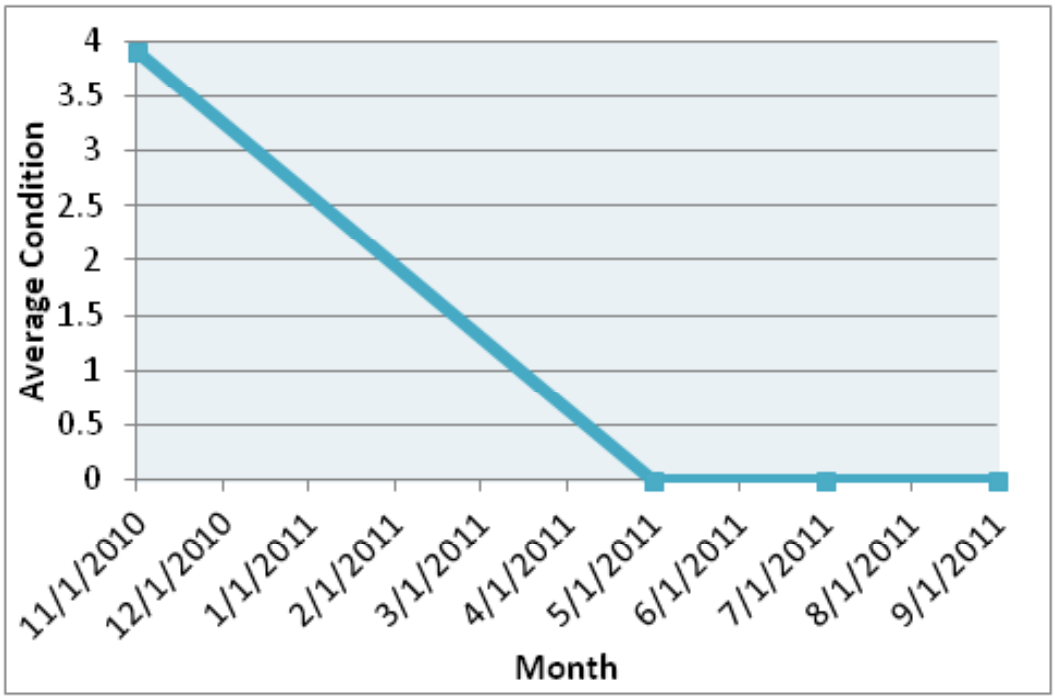


Figure 7.10: Average *Encelia farinosa* condition for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. 0=dead, 1=poor, 2=fair, 3=good, 4=excellent.

7.2.6 Four-Wing Saltbush (Atriplex canescens)

Atriplex canescens showed an overall increase in average height for the 2011 growing season (Figure 7.11). The highest average increase occurred from July to September 2011. The average growth for *A. canescens* was 66.75 cm (SE=7.7) for the 2011 growing season. The *A. canescens* population experienced 80% survivorship for the 2011 season with only one single plant mortality. The *A. canescens* mortality occurred sometime between the November 2010 and May 2011 monitoring sessions. The remaining *A. canescens* individuals experienced 100% survivorship by the end of the 2011 growing season. The *A. canescens* mortality was most likely from mammal browsing. The plant was found uprooted and bare.

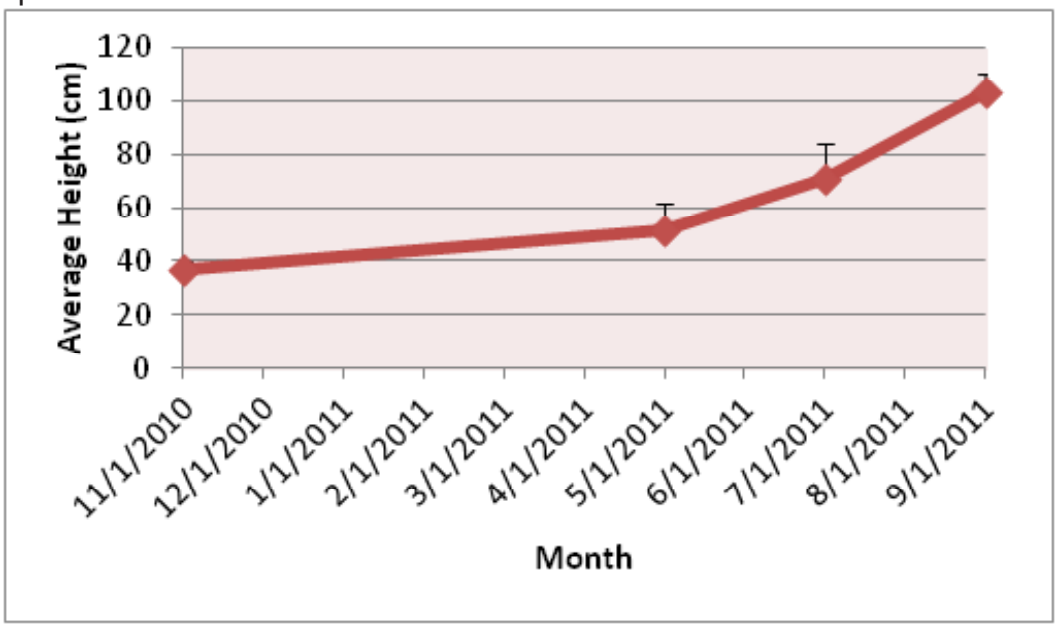


Figure 7.11: Average *Atriplex canescens* height (cm) for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. Error bars signify standard error.v

The overall average condition of *A. canescens* was very good to excellent during the 2011 growing season (Figure 7.12). This species had a slight decline in condition which was likely due to exotic weed competition. The site is receiving regular weed maintenance, and relieving the planted native species from competition. As *A. canescens* grows it will be able to out-compete the exotic weeds.

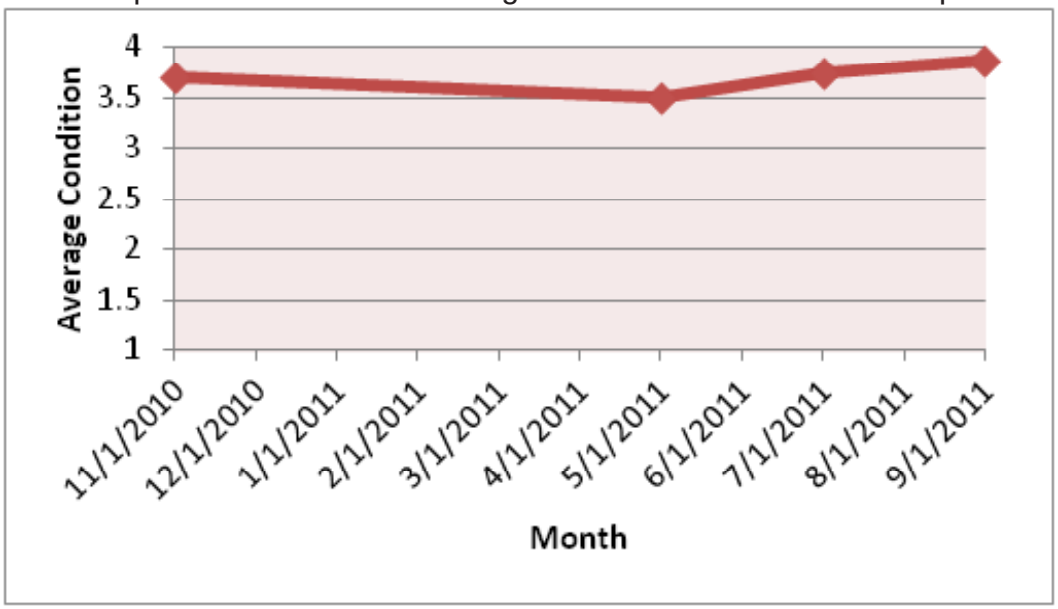


Figure 7.12: Average *Atriplex canescens* condition for November 2010 to September 2011 for the Black Canyon Riparian Revegetation Project. 0=dead, 1=poor, 2=fair, 3=good, 4=excellent.

7.3 Plant Cover

Native herbaceous and grass species were planted in both riparian and wetland areas. Monitoring was focused on the most abundantly planted herbaceous and grass species in these two habitats. The results presented below discuss the monitored riparian and wetland species separately.

During the final monitoring session in September 2011, riparian species, including: *Sporobolus airoides* (alkali sacaton), *Distichlis spicata* (inland saltgrass), *Vulpia microstachys* (small fescue) and *Bouteloua gracilis* (blue grama) showed the highest total percent cover (Figure 7.13). These species also showed the greatest frequency of occurrence including 50% for *S. airoides* and 33% for *D. spicata* and *V. microstachys.* These species have also been observed naturally colonizing in restored areas.

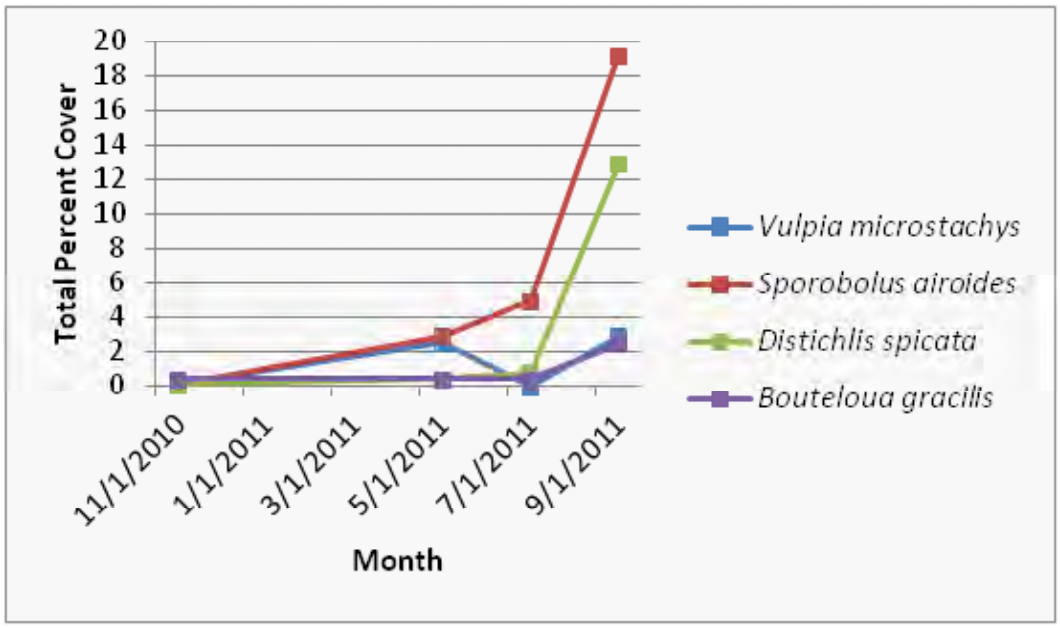


Figure 7.13: Total percent herbaceous cover for Small fescue *(Vulpia microstachys)*, Alkali sacaton *(Sporobolus airoides)*, Inland saltgrass *(Distichlis spicata)* and Blue grama *(Bouteloua gracilis)* for the final monitoring session in September 2011.

Other riparian species monitored for total percent cover included *Oryzopsis hymenoides* (Indian Rice-grass) and *Penstemon pseudospectabilis* (canyon penstemon). Both these species suffered 100% mortality in the monitored quadrats, therefore showed 0% total cover during the final monitoring session. *P. pseudospectabilis* suffered mortality between the November 2010 and May 2011 monitoring sessions, which may have been due to the cold temperatures experienced during the 2010-2011 winter. *O. hymenoides* suffered mortality between the July and September 2011 monitoring sessions.This mortality was likely a result of volunteer competition from invasive species. There was only one quadrat monitored for each species, which may have misrepresented the growth of these species. Although *O. hymenoides* and *P. pseudospectabilis* suffered mortality in the monitored quadrats, these native species performed well in other areas where they were planted on site.

The invasive species detected in the cover quadrats during the monitoring sessions included: *Cynodon dactylon* (Bermuda grass), *Portulaca oleracea* (purslane), *Trifolium spp.* (clover), *Salsola kali* (Russian thistle), *Amaranthus spp.* (pigweed), *Leptochloa panicoides* (sprangletop) and four unknown herbs. *C. dactylon, Amaranthus spp.,* and *S. kali* showed the highest baseline total percent cover of 21.7%, 7.5% and 2.5% respectively. These species have been the focus of invasive plant removal efforts at the site and by the final monitoring session their cover was reduced. Invasive plant removal will be the focus of maintenance efforts in the future to allow native species to growth without competition.

Scirpus pungens (threesquare bulrush), *Anemopsis californica* (yerba mansa) and *Scirpus acutus* (hardstem bulrush) were monitored for total percent cover in the wetland quadrats (Figure 7.14). *S. pungens* showed a slight decline in May 2011 but increased by 22% and showed the highest total percent cover (7.92%) at the end of the 2011 growing season. Two quadrats were established to measure *S. pungens*, therefore it is not unusual that this species showed the highest cover. *S. acutus* experienced 100% mortality in the monitored quadrats which resulted in 0% total cover. Mortality occurred between the November 2010 and May 2011, which may have been due to the cold temperatures experienced during the 2010- 2011 winter. In the monitored quadrat complete mortality of *S. acutus* was likely due to the draining of the pond. Between December 2010 and May 2011 the wetlands had to be drained as a result of non-native fish introduction by an unknown community member. To eliminate all non-native fish, the wetlands had to completely dry out which caused mortality in *S. acutus* and greatly depleted *S. pungens.* Even though this species experienced mortality in the monitored quadrat, it thrived in other wetland areas where it was planted. Once the water levels were restored in the pond and wetland area, native *Scirpus maritimus* (alkali rush) (2.5 % total cover) and *Typha spp.* (cattail) (0.42% total cover) were recorded during September 2011.

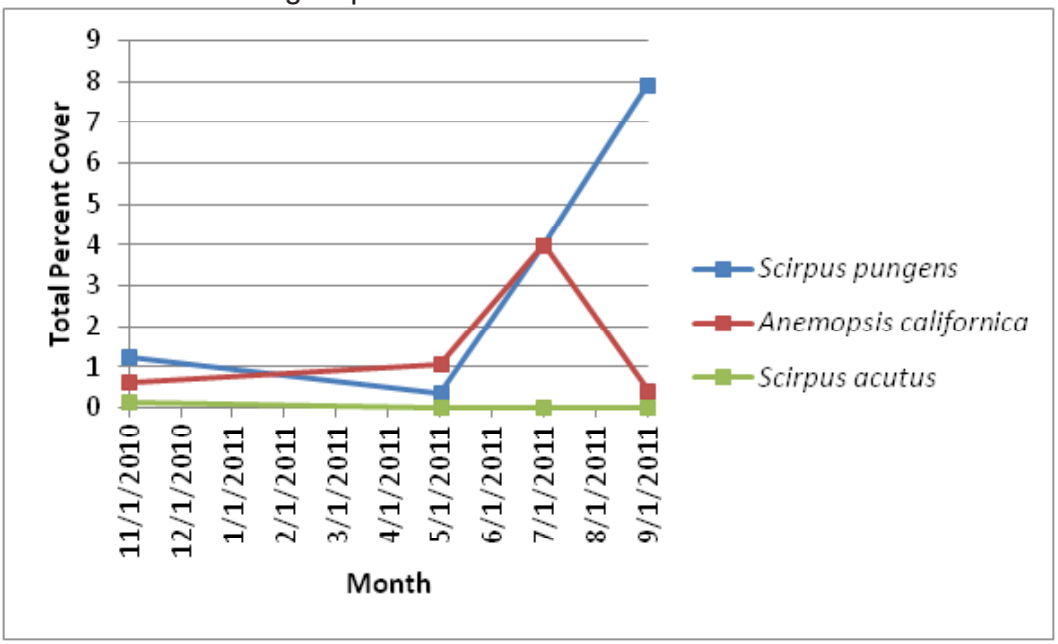


Figure 7.14: Total percent herbaceous cover for three-square (*Scirpus pungens)*, yerba mansa *(Anemopsis californica)* and hardstem bulrush *(Scirpus acutus)* for the final monitoring session in September 2011.

A. californica showed an increase in average total percent cover through most of the growing season but drastically decreased by 10% in September 2011. This was likely do to invasive species competition as many weeds were present along the wetland channel where the monitored *A. californica* was planted.

Invading species detected in the quadrats, but not represented in the graph include: *C. dactylon* at 13.3% cover, *Polygogon monspeliensis* (rabbitsfoot) at 2.92% cover, *S. kali* at 2.5% cover, *L. panicoides* at 0.42%, *Trifolium spp*. at 0.42%, and *P. oleracea* at 0.17% cover.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Project Conclusions

The Black Canyon Riparian Restoration Project has successfully transformed the 22-acre project area that was dominated by invasive species into thriving wetland and riparian habitats supporting native vegetation. This project created a stream and pond that provides a freshwater input to wetland and riparian vegetation as well as providing native fish habitat. The planted riparian and wetland vegetation is thriving and recruiting. The 2011 growing season concluded with the overall health of the site in very good to excellent condition and most species experiencing 100% survivorship. The site provides excellent habitat for bird and wildlife communities, and many species use the site for stopover and nesting. Present wildlife inhabitants include: cottontail rabbits, Gambel's quail, doves, grackels, sandpipers, great blue herons, snowy egrets, migrating ducks and geese, bats, a swan and an occasional coyote.

All tree and shrub species experienced 100% survivorship, with the exception of *A. canescens* (80%) and *E. farinosa* (0%). *E. farinosa* experienced 100% mortality which was likely due to unusually cold temperatures experienced during the 2010- 2011 winter. Mortality was mitigated for these species by planting *S. airoides* and *B. gracilis* plugs, which although are not being monitored appear to be thriving. Continual weed maintenance will have to occur at the site until the native species reach a height threshold to exclude them from competition and allow native ground cover to establish across the site to have a competitive advantage.

Native riparian and wetland herbaceous and grass species, including *S. airoides, D. spicata*, and *S. pungens* showed the greatest cover in the monitoring quadrats. These species are thriving and naturally recruiting, creating larger tracts of native ground cover. *O. hymenoides* and *P. pseudospectabilis* experienced 100% mortality in the monitored riparian quadrats, which was likely due to competition from invasive species and cold temperatures experienced during the winter. Despite this mortality these species were thriving in other planted areas not being monitored. *S. acutus* experienced 100% mortality at the site, which likely occurred when the pond was drained to remove the introduced invasive fish. This species as well as other native species, including *S. maritimus* and *Typha spp.,* are naturally recruiting in other wetland areas. Invasive weed competition continues to be a stress on the growing native plants. Invasive plant species continue to be a problem in the riparian and wetland areas, and continual weed maintenance will need to occur to allow these species to thrive

The irrigation and pump system are in good condition and continue to sustain the wetland and riparian vegetation into a flourishing environment for surrounding wildlife and the community. All project tasks were completed on time and within budget. Maintenance and weeding will have to continue to limit the growth of invasive species and allow native planted species to thrive.

8.2 Recommendations for Future Projects

Vegetation monitoring has provided information to inform the adaptive management process for restoration in the Black Canyon Riparian Restoration Project. Aggressive weed maintenance should be exercised once planting is complete to give planted native species the best chance of success.

Colonized invasive weed species have made it difficult for the planted native species, particularly the herbaceous grasses to excel. The Black Canyon City Community Association will be in charge of all maintenance activities including exotic species removal and irrigation maintenance. For future replanting needs, cuttings can be harvested on site from established native plants. *S. airoides* and *B. gracilis* are grasses on site that work well from cuttings. The Black Canyon City Community Association plans to recruit more volunteers and organizations to adopt sectioned plots in the project area for regular maintenance. The Black Canyon City Community Association has employed four local workers to perform maintenance work for 2012 that consists of working between 10 and 20 hours a week. The grant funding for this work ends in July 2012, but the Association has implemented a program for maintenance work to continue without compensation. Individuals and organizations have adopted plots within the project site to perform maintenance work. Adopters include the Lion's Club, BCC Fire Department and the BCC Community Association. Organizations that have expressed interest in adopting are the BCC Riders Equestrian Club, the Black Canyon Trail Coalition, the Black Canyon Historical Society and the Black Canyon Chamber of Commerce. A set number of hours has not been mandated for maintenance, rather the adopters are asked to check their plots on a weekly basis to determine the necessary frequency for reasonable maintenance.

9.0 REFERENCES

Noss, R. and A. Cooperrider. 1994. Saving nature's legacy: protecting and restoring biodiversity. Island Press. 416 pp.

Appendix A. Clearing Plan and Photos

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON

SITE CLEARING AND HERBICIDE SPRAYING REPORT
COMPLETION MAP

BLACK CANYON CITY, AZ

SHEET TITLE :
COMPLETED WORK
LOCATION MAP
Scale: 1" = 180'

0' 45' 90' 180' 360' NORTH

DATE: MARCH 24, 2010
JOB NO.: 08005
DRAWN BY: DB
DESIGNED BY: FOP/DB
CHECKED BY: FOP

FIGURE 1

Upper bank line before and after removal of tamarisk and castor bean, thinning of desert broom and manual weeding of mustard and other invasives.

Fenceline berm before and after manual weeding and clean up.

Before and after castor bean removal, manual weeding and thinning of desert broom on upper terrace.

Access gate before and after chipping, mulching and clean up.

Old mulch pile before and after clean up and burning.

Upper terraces before and after clearing and clean up.

Mulch pile and lumber/firewood before and after locations

Berm south of buildings before and after clearing, weeding, clean up.

Pond area cleared of brush and burn piles in east field.

Manual weeding of exotic weeds on grassy berm and cutting back desert broom at the high water mark.

Burn piles in bottom of wash.

Clean up of the old mulch pile.

Appendix B. Soil Analysis

NOTES:
1. SOIL SAMPLES AT EACH POINT SHALL BE TAKEN AT 1' AND 5' DEPTHS. (27 TOTAL POINTS ONSITE AND 54 TOTAL SAMPLES TO COLLECT)
2. ALL SOIL POINTS SHALL ALSO BE RECOGNIZED AS DEPTH TO WATER TABLE POINTS (DWT). AFTER TAKING SOIL SAMPLES, CONTINUE AUGURING DOWN UNTIL REACHING THE DEPTH TO WATER TABLE. EXTENSIONS TO THE AUGER MAY BE NECESSARY. (27 DWT POINTS TOTAL ONSITE)
3. GPS AS-BUILT SURVEYS SHALL BE TAKEN DURING SOIL SURVEYS TO COLLECT CURRENT CONDITIONS.
4. FOR LABOR AND TIME EFFICIENCY, SAMPLING PROTOCOLS SHALL BE REVIEWED BEFORE ANY SAMPLES ARE TAKEN.
5. DUE TO SITE CONDITIONS, LOCATIONS FOR SOIL SAMPLE POINTS MIGHT CHANGE. KEEP IN MIND, FOR SURFER PROGRAM DATA ACCURACY, SURVEY CREWS SHALL TRY TO KEEP THE VARIOUS POINTS THAT LAY ALONG THE MAP BOUNDARY AS CLOST TO THE AS-BUILT BOUNDARY AS POSSIBLE.

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
SOIL SURVEY MAP

BLACK CANYON CITY, AZ

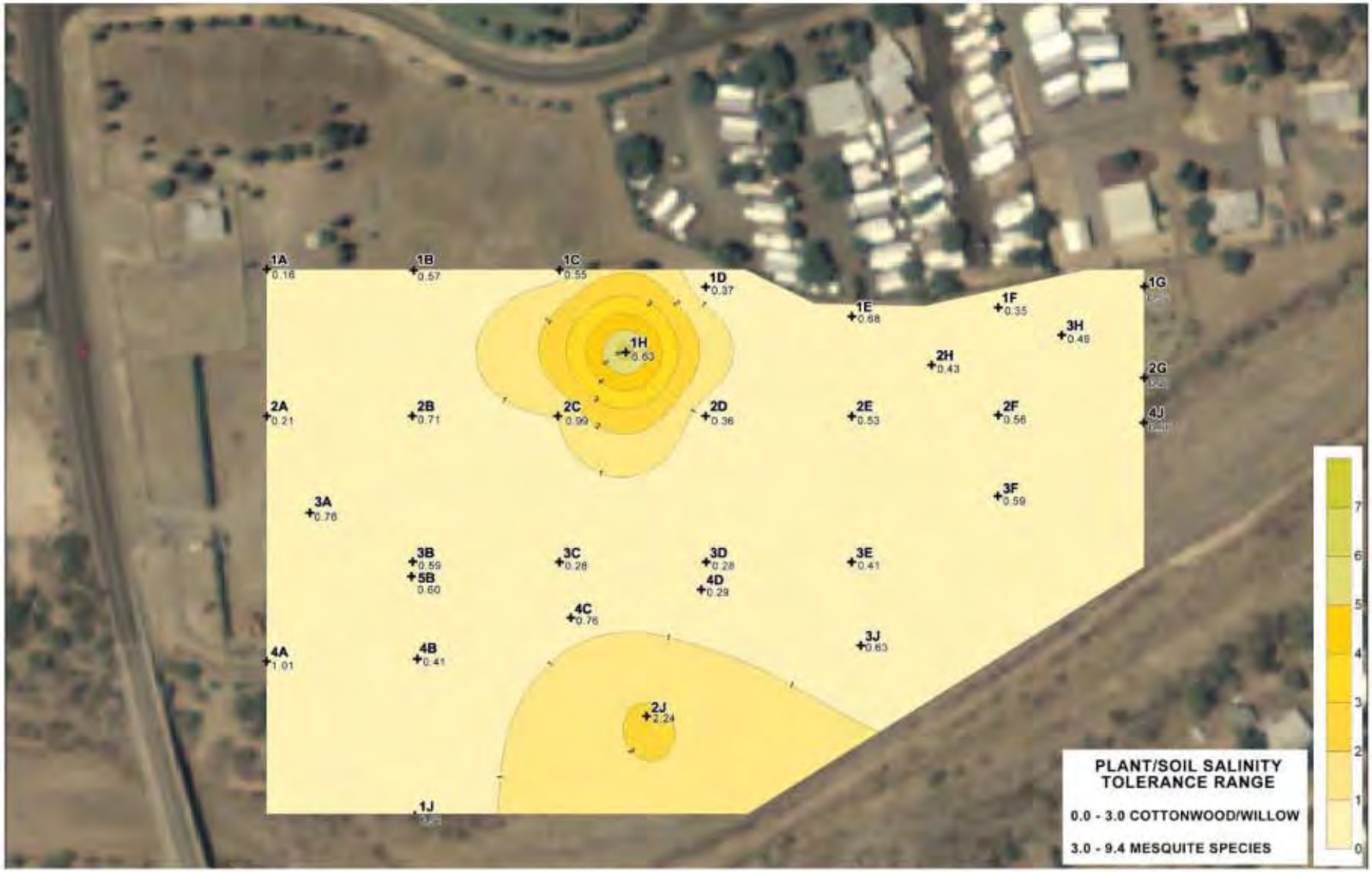
SHEET TITLE :
SITE & SOIL ANALYSIS MAP

Scale: 1" = 100'

0' 50' 100' 200' 300' NORTH

DATE: SEPTEMBER 10, 2009
JOB NO.: 08005
DRAWN BY: JF
DESIGNED BY: FOP/DB/JF
CHECKED BY: FOP

FIGURE 1



Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
SOIL ANALYSIS MAP

BLACK CANYON CITY, AZ

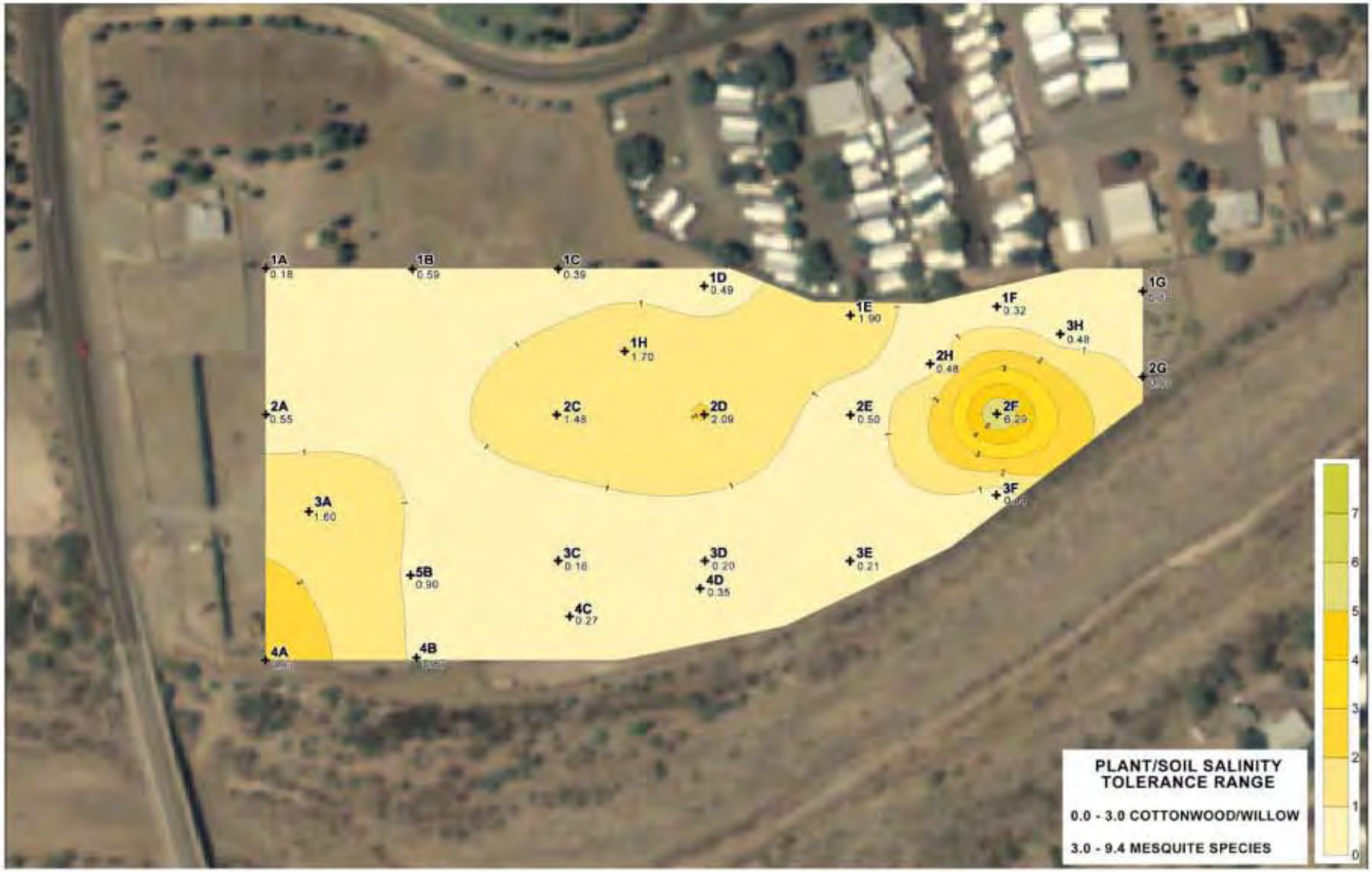
SHEET TITLE :
SOIL SALINITY LEVELS AT 1 FOOT DEPTH

Scale: 1" = 100'

0 50 100 200 300 NORTH

DATE: OCTOBER 19, 2009
JOB NO.: 08005
DRAWN BY:JF

FIGURE 2



Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
SOIL ANALYSIS MAP

BLACK CANYON CITY, AZ

SHEET TITLE :
SOIL SALINITY LEVELS AT 5 FOOT DEPTH

Scale: 1" = 100'

0' 50' 100' 200' 300' NORTH

DATE: OCTOBER 19, 2009
JOB NO.: 08005
DRAWN BY:JF

FIGURE 3

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
SOIL ANALYSIS MAP

BLACK CANYON CITY, AZ

SHEET TITLE :
SOIL TEXTURE TYPE AT 1 FOOT DEPTH

Scale: 1" = 100'

0' 50' 100' 200' 300' NORTH

DATE: OCTOBER 19, 2009
JOB NO.: 08005
DRAWN BY:JF

FIGURE 4

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
SOIL ANALYSIS MAP

BLACK CANYON CITY, AZ

SHEET TITLE :
SOIL TEXTURE TYPE AT 5 FOOT DEPTH

Scale: 1" = 100'

0' 50' 100' 200' 300' NORTH

DATE: OCTOBER 19, 2009
JOB NO.: 08005
DRAWN BY:JF

FIGURE 5

Black Canyon Heritage Park Project
Soil Salinity/Depth to Water Table Data Collection Sheet
JOB #08005

Date: 9/14/2009 Data Collector: David

Weather: 90+ Sunny, Hot Air Temperature:

Point #	Technician	1'NOTES: 5' NOTES	Soil Type Soil Type 1'	Soil Type 5'	DWT	For Tubs- End of Day Check-off (Soil bags present in tubs?) 1'	5'
1A	DB	Open on Gravel Road, Dry & Sandy Hit Layer of Cobble @ 5'	Sand	Loamy Sand	20+	x	x
2A	DB	Open on Gravel - 30-40% Big Cobble 3-6" Almost Moist & Less Cobble Further Down	Loamy Sand	Loamy Sand		x	x
3A	DB	Edge of Road & Building on Gravel, 30-40% Cobble 3-12", Trash Dry Cobble, Trash	Loamy Sand	Sandy Loam		x	x
4A	DB	Edge of Wash, Compact, 20-30% Gravel Cobble 2-6" Sandy, Dry, Less Cobble	Sandy Loam	Sand		x	x
1B	DB	Open Area, No vegetation, No Cobble, Dry Sand	Loamy Sand	Loamy Sand		x	x
2B	DB	Bottom of Pond, Top 6" Clay, Bottom Fine Sand Very Sandy with Some Cobble Below 2'	Silty Clay Loam	No Sample Taken		x	N/A
3B	DB	Pond Bottom, 20% Cobble 2-6"	Sandy Loam	No Sample Taken		x	N/A
4B	DB	Gravel Road, Edge of Wash, 20% Cobble1-12" Hard Rock Bottom	Loamy Sand	Loamy Sand		x	x
5B	DB	Ridge of pond, 10% Cobble 2-12" Less Cobble, More Sand	Sandy Loam	Loamy Sand		x	x
1C	DB	Edge of Pond, High, Dry Ground, 5-10% Cobble All sand, Less than 5% Cobble	Sand	Loamy Sand		x	x
2C	DB	Edge of Main Pond, Willows/Cottonwood, Dry Real Fine Sand	Sandy Loam	Loamy Sand		x	x
3C	DB	On Gravel Road, High spot, 20% Cobble 2-12" Dry Sand	Loamy Sand	Sandy Loam		x	x
4C	DB	Wash, Gravel, 40% Cobble 4-24" Mineral Sand	River Sand	River Sand		x	x
1D	DB	Open, Vegetated, 1-5% Cobble, Compacted Layer of Cobble, Grity	Sandy Loam	Sandy Clay Loam		x	x
2D	DB	High Spot between 2 Channels, Compact Sand Dry Sand, No Cobble	Loamy Sand	Loamy Sand		x	x
3D	DB	Open Area, Gravel Top, Cobble 40-50% 2-16" Mineral Sand	Loamy Sand	Sand		x	x
4D	DB	Edge of Gravel Road, 40-50% Cobble 2-12"	Loamy Sand	Loamy Sand		x	x
1E	DB	Edge of Gravel Road, Open Grass, Dry, Compact 1-5% Cobble 1-4" Dry Sand	Sandy Loam	Sandy Clay Loam			

Misc Field Notes:

Vegetation condition 0-Dead 1- Poor 2-fair 3-Good 4-Excellent

Soil Moisture 0-Dry 1-Semi Moist 2-Moist 3-Wet 4-Saturated

Soil Type- Gravel, Sand, Silt,etc

FIGURE 6

Black Canyon Heritage Park Project
Soil Salinity/Depth to Water Table Data Collection Shee
JOB #08005

Date:
Weather:

Data Collector
Air Temperature:

Point #	Technician	1'NOTES: 5' NOTES	Soil Type Soil Type 1'	Soil Type 5'	DWT	For Tubs- End of Day Check-off (Soil bags present in tubs?) 1'	5'
2E	DB	Open Grass Area, 15-20% Cobble 1-4" Dry Sand	Sand	Loamy Sand		x	x
3E	DB	Edge of Wash & Gravel Road, Dry, Compact,1-2% Cobble 1-2" Dry Sand, No Cobble	Loamy Sand	Loamy Sand		x	x
1F	DB	Open Grass Area, 10' from Original Point, 1-5% Cobble 1-6" Bigger Boulders at 3-4'	Sandy Loam	Sandy Loam		x	x
2F	DB	Open Grass Area, 1-3% Cobble 1-3" Dry Sand, No Cobble	Loamy Sand	Loamy Sand		x	x
3F	DB	Edge of Gravel Road, 60-70% Cobble 1-24" Boulders No More Rock After 4', Dry Sand	Too Much Rock	Loamy Sand		x	x
1G	DB	Open Grass, 30-50% 1st 2 Feet Cobble 2-6" Dry Mineral Sand, Bugs	Loamy Sand	Mineral Sand		x	x
2G	DB	Gravel Road, Dry, Compact, 5-10% Cobble 1-3" Dry Sand	Loamy Sand	Loamy Sand		x	x
1H	DB	High Ground between Ponds, Sandy Unknown Palo Verde	Sandy Loam	Sandy Clay Loam		x	x
2H	DB	Open Grass Area, Dry, Compact, 1-3% Cobble 1-4" Dry, Compact, A little Clay?	Loamy Sand	Sandy Clay Loam		x	x
3H	DB	Open Grass Area, High Point, Dry, Compact, 10-20% Cobble 1-12" Rock Layer @ 4'	Loamy Sand	Sandy Loam		x	x
1J	DB	River Bottom, Willows Tamaris	Sand	No Sample Taken		x	N/A
2J	DB	River Bottom	Sand	No Sample Taken		x	N/A
3J	DB	River Bottom	Sand	No Sample Taken		x	N/A
4J	DB	River Bottom	Sand	No Sample Taken		x	N/A

Misc Field Notes:

Vegetation condition 0-Dead 1- Poor 2-fair 3-Good 4-Excellent

Soil Moisture 0-Dry 1-Semi Moist 2-Moist 3-Wet 4-Saturated

Soil Type- Gravel, Sand, Silt,etc

Fred Phillips Consulting, LLC
BLM Confluence Reveg. Project
Contact- David Blanchard
(928) 773-1530
dblanchard@commspeed.net

Test code S1 and S3
for each sample

	USU ID	LABEL ID	BOX #	Label Info	Sample received by USU- please check off	EC (mmhos/ cm)
1	5261	1A 1'deep	1	9/14/2009 DB	x	0.16
2	5262	1A 5'deep	1	9/14/2009 DB	x	0.18
3	5263	2A 1'deep	1	9/14/2009 DB	x	0.21
4	5264	2A 5'deep	1	9/14/2009 DB	x	0.55
5	5265	3A 1'deep	1	9/14/2009 DB	x	0.76
6	5266	3A 5'deep	1	9/14/2009 DB	x	1.60
7	5267	4A 1'deep	1	9/14/2009 DB	x	1.01
8	5268	4A 5'deep	1	9/14/2009 DB	x	2.93
9	5269	1B 1'deep	1	9/14/2009 DB	x	0.57
10	5270	1B 5'deep	1	9/14/2009 DB	x	0.59
11	5271	2B 1'deep	1	9/14/2009 DB	x	0.71
12	5272	3B 1'deep	1	9/14/2009 DB	x	0.59
13	5273	4B 1'deep	1	9/14/2009 DB	x	0.41
14	5274	4B 5'deep	1	9/14/2009 DB	x	0.87
15	5275	5B 1'deep	1	9/14/2009 DB	x	0.60
16	5276	5B 5'deep	1	9/14/2009 DB	x	0.90
17	5277	1C 1'deep	1	9/14/2009 DB	x	0.55
18	5278	1C 5'deep	1	9/14/2009 DB	x	0.39
19	5279	2C 1'deep	1	9/14/2009 DB	x	0.99
20	5280	2C 5'deep	1	9/14/2009 DB	x	1.48
21	5281	3C 1'deep	1	9/14/2009 DB	x	0.28
22	5282	3C 5'deep	1	9/14/2009 DB	x	0.16
23	5283	4C 1'deep	1	9/14/2009 DB	x	0.76
24	5284	4C 5'deep	1	9/14/2009 DB	x	0.27
25	5285	1D 1'deep	1	9/14/2009 DB	x	0.37
26	5286	1D 5'deep	1	9/14/2009 DB	x	0.49
27	5287	2D 1'deep	1	9/14/2009 DB	x	0.36
28	5288	2D 5'deep	1	9/14/2009 DB	x	2.09
29	5289	3D 1'deep	1	9/14/2009 DB	x	0.28
30	5290	3D 5'deep	1	9/14/2009 DB	x	0.20
31	5291	4D 1'deep	1	9/14/2009 DB	x	0.29
32	5292	4D 5'deep	1	9/14/2009 DB	x	0.35
33	5293	1E 1'deep	1	9/18/2009 DB	x	0.68
34	5294	1E 5'deep	1	9/18/2009 DB	x	1.90
35	5295	2E 1'deep	1	9/18/2009 DB	x	0.53
36	5296	2E 5'deep	1	9/18/2009 DB	x	0.50
37	5297	3E 1'deep	1	9/18/2009 DB	x	0.41

FIGURE 7

Fred Phillips Consulting, LLC
BLM Confluence Reveg. Project
Contact- David Blanchard
(928) 773-1530
dblanchard@commspeed.net

Test code S1 and S3
for each sample

38	**5298**	**3E 5'deep**	1	9/18/2009 DB	x	0.21
39	**5299**	**1F 1'deep**	1	9/18/2009 DB	x	0.35
40	**5300**	**1F 5'deep**	1	9/18/2009 DB	x	0.32
41	**5301**	**2F 1'deep**	1	9/18/2009 DB	x	0.56
42	**5302**	**2F 5'deep**	1	9/18/2009 DB	x	6.29
43	**5303**	**3F 1'deep**	1	9/18/2009 DB	x	0.59
44	**5304**	**3F 5'deep**	1	9/18/2009 DB	x	0.44
45	**5305**	**1G 1'deep**	1	9/18/2009 DB	x	0.56
46	**5306**	**1G 5'deep**	1	9/18/2009 DB	x	0.78
47	**5307**	**2G 1'deep**	1	9/18/2009 DB	x	0.27
48	**5308**	**2G 5'deep**	1	9/18/2009 DB	x	0.90
49	**5309**	**1H 1'deep**	1	9/14/2009 DB	x	6.63
50	**5310**	**1H 5'deep**	1	9/14/2009 DB	x	1.70
51	**5311**	**2H 1'deep**	1	9/18/2009 DB	x	0.43
52	**5312**	**2H 5'deep**	1	9/18/2009 DB	x	0.48
53	**5313**	**3H 1'deep**	1	9/18/2009 DB	x	0.49
54	**5314**	**3H 5'deep**	1	9/18/2009 DB	x	0.48
55	**5315**	**1J 1'deep**	1	9/14/2009 DB	x	0.51
56	**5316**	**2J 1'deep**	1	9/14/2009 DB	x	2.24
57	**5317**	**3J 1'deep**	1	9/14/2009 DB	x	0.63
58	**5318**	**4J 1'deep**	1	9/14/2009 DB	x	0.66

Appendix C. Stormwater Pollution Prevention Report

Stormwater Pollution Prevention Plan for:

Black Canyon Riparian Restoration Project
Palm Lane / Old Black Canyon Highway SE 1/4, Sec. 3, T8N, R2E
Black Canyon City, AZ 85324
(623) 374-5553

Prepared for:

Black Canyon City Community Association
P.O. Box 33
19055 e. K-Mine Road
Black Canyon City, AZ 85324
Phone: (623) 374-5553

Responsible Contractor:

(Areas highlighted in gray are to be filled out by the contractor who is awarded the project)

_____
_____
_____
_____

SWPPP Contact(s):

Natural Channel Design, Inc.
206 S. Elden St.
Flagstaff, AZ 86001
Phone: (928) 774-2336

Fred Phillips Consulting, LLC
9730 N. Rosewood Drive
Flagstaff, AZ 86004
Phone: (928) 773-1530

SWPPP Preparation Date:

28 January 2010

Estimated Project Dates:

Project Start Date: __ __ / __ __ / __ __ __ __
Project Completion Date: __ __ / __ __ / __ __ __ __

Contents

1. SITE EVALUATION, ASSESSMENT, AND PLANNING

1.1. Project/Site Information

Project/Site Name: Black Canyon Riparian Restoration Project

Project Street/Location: Palm Lane / Old Black Canyon Highway SE 1/4, Sec. 3, T8N, R2E

City: Black Canyon City State: AZ ZIP Code: 85324

County or Similar Subdivision: Yavapai County

See Location Map on the Cover Sheet of the Construction Plans.

Latitude: 34 º 04 ' 14 " N Longitude: 112 º 09 ' 03 " W

Method for determining latitude/longitude:

☐ USGS topographic map (specify scale: _____) ☐ EPA Web site ☐ GPS

☒ Other (please specify): Google Earth 5

Is the project located in Indian country? ☐ Yes ☒ No

If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable:"

Not Applicable

Is this project considered a federal facility? ☐ Yes ☒ No

AZPDES project or permit tracking number*:

**(This is the unique identifying number assigned to your project by your permitting authority after you have applied for coverage under the appropriate National Pollutant Discharge Elimination System (NPDES) construction general permit.)*

1.2. Contact Information/Responsible Parties

Operator(s) (To be filled out be Contractor):

Project Manager(s) or Site Supervisor(s):

Fred Phillips Consulting, LLC
9730 N. Rosewood Drive
Flagstaff, AZ 86004
(928) 773-1530

SWPPP Contact(s):

Natural Channel Design, Inc.
206 S. Elden St.
Flagstaff, AZ 86001
Phone: (928) 774-2336

Fred Phillips Consulting, LLC
9730 N. Rosewood Drive
Flagstaff, AZ 86004
(928) 773-1530

This SWPPP was Prepared by:

Natural Channel Design, Inc.
206 S. Elden St.
Flagstaff, AZ 86001
Phone: (928) 774-2336

Subcontractor(s):

_____
_____
_____
_____
_____
_____
_____

Emergency 24-Hour Contact:

_____
_____
_____

1.3. Nature and Sequence of Construction Activity

General project scope of work, major phases of construction, etc:

The improvements to this site consist of: excavation of a small spring & pool feature, excavation of a small wetland channel, and re-contouring of an existing pond; installation of pond liner; re-vegetation of areas adjacent stream, channel, and pond features; construction of a footpath around newly expanded pond; and installation of irrigation lines.

What is the function of the construction activity?

☐ Residential ☐ Commercial ☐ Industrial ☐ Road Construction ☐ Linear Utility
☒ Other (please specify): Habitat Restoration

Estimated Project Start Date: ___ ___ / ___ ___ / ___ ___ ___ ___

Estimated Project Completion Date: ___ ___ / ___ ___ / ___ ___ ___ ___

1.4. Soils, Slopes, Vegetation, and Current Drainage Patterns

Soil type(s): Sandy and gravelly alluvial soil. Soil Conservation Service Soil Group A.

Slopes: Existing slopes generally trend west. There is higher ground along the southern property boundary, which prevents overland flows from entering the Agua Fria River. No significant changes to existing slopes will be made as part of this habitat restoration project.

Drainage Patterns: Under pre-construction conditions, water entering the project site, from both the upstream watershed and precipitation on the site itself, flows into the existing pond area and would continue west as sheet flow toward Old Black Canyon Highway if the pond were to become overwhelmed. Post-construction drainage patterns will be very similar to pre-construction patterns. The re-contouring and expansion of the existing pond and the construction of a wetland channel area will increase stormwater storage capacity onsite and will function as a bio-retention area for site runoff. The proposed pool and stream feature between stations 0+00 and 2+50 will have a permanent berm constructed on either side to prevent siltation in the newly constructed channel and protect fish habitat. This will divert flows around that reach of stream, and into the wetland channel and pond area. Sheet flow will continue westward as before. Please see "SWPPP Map and Details" for further information.

Vegetation: Sparse desert grasses and shrubs.

1.5. Construction Site Estimates

Total project area:	10.5 acres
Construction site area to be disturbed:	6 acres
Percentage impervious area before construction:	1%
Runoff curve number before construction: (SCS Method, open space of poor condition, grass cover on <50% of the area)	68
Percentage impervious area after construction:	1%
Runoff curve number after construction: (SCS Method, open space of good condition: grass cover on over 75% the area)	39

1.6. Receiving Waters

If the pond were to become overwhelmed in a storm event, stormwater runoff leaving the site would flow west into a ditch on the east side of Old Black Canyon Highway. It is assumed that water would then flow south down the ditch and enter the Agua Fria River near the northeast abutment of Old Black Canyon Highway bridge which spans the Agua Fria River. The Agua Fria River is an intermittent stream that flows generally south from near Prescott, AZ to Lake Pleasant near Peoria, AZ. There is no existing stormwater system in the vicinity of the project site.

1.7. Site Features and Sensitive Areas to be Protected

Unique features that are to be preserved include:

- The deepest section and side slopes of the existing pond will be preserved along with the mature pine trees, cottonwoods, and willows that are on the perimeter of the pond;
- Excavation and construction traffic will be limited in these areas to preserve these unique features;
- The southern edge of the pond will be re-contoured, expanded, and re-planted with wetland vegetation, to increase habitat along this unique feature.

1.8. Potential Sources of Pollution

Potential sources of sediment to stormwater runoff include:

- Excavated areas,
- Spoil piles,
- Zones of construction traffic.

Potential pollutants and sources, other than sediment, to stormwater runoff could include:

- Fuel, grease, and oil from equipment;
- Nutrients from revegetation fertilizer.

1.9. Endangered Species Certification

Are endangered or threatened species and critical habitats on or near the project area?

☐ Yes ☒ No

Describe how this determination was made:

Arizona Game & Fish Department surveyed the site for endangered species and critical habitat.

If yes, describe the species and/or critical habitat:

If yes, describe or refer to documentation that determines the likelihood of an impact on identified species and/or habitat and the steps taken to address that impact.

1.10. Historic Preservation

Are there any historic sites on or near the construction site?

☐ Yes ☒ No

Describe how this determination was made:

BLM archaeologists conducted the historical site clearance and found no evidence of historical activity in the area of proposed disturbance.

If yes, describe or refer to documentation that determines the likelihood of an impact on this historic site and the steps taken to address that impact.

1.11. Maps

See "Black Canyon Riparian Restoration Project" plan set for description of the site, proposed improvements, and recommended SWPPP measures.

2. EROSION AND SEDIMENT CONTROL BMPS

Inspection of the following Best Management Practices (BMPs) will be conducted by qualified personnel assigned by the contractor overseeing construction once every fourteen (14) calendar days and within twenty-four (24) hours of a rain event of 0.5 inches of precipitation or greater. Maintenance of these BMPs by qualified personnel assigned by the contractor is required upon receipt of knowledge of failing, improper, or insufficient BMPs. See "Black Canyon Riparian Restoration Project" plan set in Appendix A for design specifications and details used in the BMPs described below.

2.1. Minimize Disturbed Area and Protect Natural Features and Soil

Silt fencing will be installed around areas to be preserved, including: vegetation, utilities, fences and areas outside the area of disturbance. See "Black Canyon Riparian Restoration Project" plan set in Appendix A showing areas of disturbance, non-disturbed areas, and locations of silt fencing.

2.2. Phase Construction Activity

To be added by contractor.

Describe phase, duration of phase (start date, end date), list BMPs associated with this phase, describe stabilization methods for this phase (describe any temporary stabilization methods that will be used before final stabilization), repeat as needed. Attach additional sheets as necessary.

2.3. Control Stormwater Flowing onto and through the Project

BMP Description: Construction of berm for diversion of flows away from stream feature between stages 0+00 and 2+50	
Installation Schedule:	During construction of stream feature

BMP Description: Silt fence/straw waddle installation around the existing pond section that is not to be disturbed	
Installation Schedule:	Before commencement of construction

BMP Description: Install straw bale sediment barrier at the inlet of the water control structure that lead into the pond	
Installation Schedule:	As soon as the stream feature is built to the appropriate grade

2.4. Stabilize Soils

BMP Description: Re-vegetate irrigation line trenches with exception of access route to spoil pile	
☒ ***Permanent***	☐ ***Temporary***
Installation Schedule:	Upon completion of irrigation line installation

BMP Description: Re-vegetate access route to spoil pile	
☒ ***Permanent***	☐ ***Temporary***
Installation Schedule:	Upon completion of cut and fill operations

BMP Description: Plant native species along stream & pool system, wetland channel, and pond	
☒ ***Permanent***	☐ ***Temporary***
Installation Schedule:	Upon completion of each feature

BMP Description: Re-vegetate construction access to pumphouse	
☒ ***Permanent***	☐ ***Temporary***
Installation Schedule:	Upon completion of irrigation line installation

BMP Description: Use water spray trucks for dust abatement during construction	
☐ ***Permanent***	☒ ***Temporary***
Installation Schedule:	As needed

BMP Description: Plant native species along south expanse of project site	
☒ ***Permanent***	☐ ***Temporary***
Installation Schedule:	Upon project completion

2.5. Establish Perimeter Controls and Sediment Barriers

BMP Description: Silt fence/straw waddle installation along west end of project site, downgradient of disturbed areas	
Installation Schedule:	Before commencement of construction

2.6. Establish Stabilized Construction Exits

***BMP Description*:** Temporary stone construction entrance	
***Installation Schedule*:**	Before commencement of construction

***BMP Description*:** Temporary mountable filter berm between existing fence and hedge line	
***Installation Schedule*:**	Before commencement of construction

3. GOOD HOUSEKEEPING BMPS

Inspection of the following Best Management Practices (BMPs) will be conducted by qualified personnel assigned by the contractor overseeing construction once every fourteen (14) calendar days and within twenty-four (24) hours of a rain event of 0.5 inches of precipitation or greater. Maintenance of these BMPs by qualified personnel assigned by the contractor is required upon receipt of knowledge of failing, improper or insufficient BMPs.

- Onsite littering will not be tolerated.

- Toilet facilities shall be provided for construction workers.
- All solid waste resulting from construction shall be removed and disposed of in accordance with applicable local, state, and/or federal regulations.

3.1. Establish Proper Building Material Staging Areas

Staging areas to be determined by the contractor, and placed upstream of SWPPP control structures.

3.2. Designate Washout Areas

Washout areas (if needed) to be determined by the contractor, and placed upstream of SWPPP control structures.

3.3. Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

- Construction vehicles and equipment shall be stored where SWPPP control structures are downgradient and where leak detection is straightforward.
- Offsite vehicle and equipment refueling and maintenance is preferred.
- Any required onsite fueling or maintenance should be performed on dry, flat ground in the vicinity of the existing buildings in the southwest section of the project site.
- Fuel storage tanks must be properly labeled of its contents and flammability warning, placed at least 25 feet from other operations, surrounded by a dike that contains 125% of the tank capacity.
- The area surrounding the fuel tank must be kept free of debris and flammable vegetation and conspicuously display a “No Smoking Within 50ft” sign.
- Fuel dispensing pumps, hoses, and nozzles must be of the approved type.
- In the event of a spill of petroleum products, pesticides, fertilizers, or other hazardous waste, the spilled material must be contained and cleaned up following the provisions set forth in the Spill Prevention and Control Plan (SPCP).

3.4. Spill Prevention and Control Plan

Measures to control, prevent, and cleanup spills are described in this section. Cleanup of spills should be immediate, automatic, and routine. Only qualified personnel or a licensed cleaning company should perform cleanups. Emergency numbers are listed in this section.

Minor spills that are likely to be controlled by onsite personnel should be done by:

- Contact local emergency response agencies, if necessary, by calling 911.
- Contain the spread of the spill.
- If the spill occurs on paved or impermeable surfaces, cleanup using “dry” methods (i.e. absorbent materials, cat litter, and/or rags).

- If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
- If the spill occurs during rain, cover the impacted area to avoid runoff.
- Record all steps taken to report and contain a spill.

Onsite personnel should not attempt to control major spills until the appropriate and qualified emergency response staff has arrived at the site. Please notify the ADEQ Emergency Response Duty Office (602) 771-2330 or, toll free, at (800) 234-5677. For spills of federal reportable quantities, also notify the National Response Center at 1-(800)-424-8802. A written report should be sent to all notified authorities. Failure to report major spills can result in significant fines and penalties.

3.5. Any Additional BMPs

- The contractor shall monitor onsite precipitation by use of a commercially available rain gauge accurate to at least 0.10 inches.
- A fire extinguisher should be located not less than 25 feet and no more than 75 feet from refueling operations.
- The contractor shall place a sign at the construction access that prominently displays:
    - AZPDES Authorization number
    - Construction contact information
    - Location of this SWPPP

3.6. Allowable Non-Stormwater Discharge Management

Non-stormwater discharges are prohibited under the AZPDES General Permit. If certain construction practices are followed, non-stormwater discharges can be reduced and/or avoided. Examples of these practices are as follows:

- Wash, fuel, and maintain equipment and vehicles in designated areas
- Wash equipment and vehicles offsite where feasible.

There shall be no water discharged from the site that does not fit one or more of the following criteria:

- Discharges from fire-fighting activities
- Fire hydrant flushing
- Water used to wash vehicles where detergents are not used
- Uncontaminated groundwater or spring water
- Uncontaminated excavation dewatering
- Landscape irrigation

4. SELECTING POST-CONSTRUCTION BMPs

The re-contouring and expansion of the existing pond and the construction of a wetland channel will increase stormwater storage capacity onsite and will function as a bio-retention pond. The site will also be planted with native wetland, riparian and upland vegetation as part of the project.

5. INSPECTIONS

5.1. Inspection Instructions

To be filled out by the contractor. All SWPPP control structures and areas generally downgradient of the project site, shall be performed by qualified personnel assigned by the contractor overseeing construction once every fourteen (14) calendar days and within twenty-four (24) hours of a rain event of 0.5 inches of precipitation or greater. Maintenance of these BMPs is required upon receipt of knowledge of failing, improper, or insufficient BMPs. Disturbed areas shall be inspected for: correctly installed silt fences/straw waddles; fuel, grease, and/or oil drips, leaks, and spills; and any other evidence of pollution that could include odors and/or discolored vegetation or soil.

- The inspector shall be qualified and those qualifications shall be noted on the report.
- Record the dates of the beginning and end of major grading activities.
- Record the date of the conclusion of construction activities.
- Record the date stabilization practices are initialized and reason for any delay.
- Record structural practices observed in the field and note any deficiencies and suggested improvements.
- All areas shall be inspected including disturbed areas, undisturbed areas, and the construction yard at the project site.
- The inspector shall look for evidence of, or potential for, pollutants entering the drainage system by inspecting the discharge points.
- The inspector shall observe sediment and erosion control measures from the ground.
- The inspector shall observe sediment tracking at all entrances and exits.
- The inspector will document all findings on the report form.
- If the inspector finds it necessary, the SWPPP will be modified within 7 days of an inspection. All modifications to the BMPs must be made before the next storm event or as soon as practicable.

1. ***Inspection Personnel:*** Identify the person(s) who will be responsible for conducting inspections and describe their qualifications:

   _____
   _____
   _____
   _____

2. ***Inspection Schedule and Procedures:***

Describe the general procedures for correcting problems when they are identified. Include responsible staff and time-frames for making corrections on the report.

All inspectors shall complete an inspection report and attach a copy of it in this section. Blank forms can be found in Appendix E.

5.2. Delegation of Authority

Duly Authorized Representative(s) or Position(s):

_____

_____

_____

_____

_____

_____

_____

Attach a copy of the signed Delegation of Authority form found in Appendix J.

5.3. Corrective Action Log

See Appendix F for the Corrective Action Log.

6. RECORDKEEPING AND TRAINING

6.1. Recordkeeping

Records will be retained for a minimum period of at least 3 years after the permit is terminated. Insert grading and stabilization log forms found in Appendix I in this section.

6.2. Log of Changes to the SWPPP

Log changes and updates to the SWPPP and attach all addenda to this section. Blank forms can be found in Appendix G.

6.3. Training

Log all personnel training in the SWPPP Training form found in Appendix J.

7. FINAL STABILIZATION

The nature of this project is such that increased vegetation and water retention is created, thus there are no anticipated final stabilization procedures nor associated BMPs.

8. CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I certify that I have reviewed and intend to comply with all terms and conditions stipulated in 2008 Construction General Permit No. AZG2008-001 issued by the Director.

Name: _____ Title: _____

Signature: _____ Date: _____

9. SWPPP APPENDICES

Appendix A. Black Canyon Riparian Restoration Project Plan Set

Appendix B. Construction General Permit

STATE OF ARIZONA
DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION
PHOENIX, ARIZONA 85007

ARIZONA POLLUTANT DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT FOR DISCHARGE FROM CONSTRUCTION ACTIVITIES TO WATERS OF THE UNITED STATES

This permit provides authorization to discharge under the Arizona Pollutant Discharge Elimination System (AZPDES) program, in compliance with the provisions of the Arizona Revised Statutes, Title 49, Chapter 2, Article 3.1, the Arizona Administrative Code (A.C.C.), Title 18, Chapter 9, Articles 9 and 10, and the Clean Water Act as amended (33 U.S.C. 1251 et seq.).

This general permit specifically authorizes only discharges from construction activities in Arizona by those owners and operators who meet the eligibility requirements of this permit, who submit a complete Notice of Intent (NOI) in accordance with Part II of this general permit and who comply with the general permit requirements and conditions. All discharges authorized by this general permit shall be consistent with the terms and conditions of this general permit. Permit coverage is required from the "commencement of construction activities" until "final stabilization", as these terms are defined in this permit.

This general permit becomes effective on February 29, 2008.

This general permit and the authorization to discharge expire at midnight, February 28, 2013.

Issued this 28th day of February 2008.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Joan Card, Director
Water Quality Division

TABLE OF CONTENTS

PART I. COVERAGE UNDER THIS GENERAL PERMIT

A. Permit Area. This general permit covers the state of Arizona, except for Indian Country.[1]

B. Eligibility. This general permit authorizes stormwater discharges from construction activity as defined in Part X and stormwater discharges associated with support activities from temporary plants or operations set up to produce concrete, asphalt, or other materials for the permitted construction project. These discharges are eligible for permit coverage provided the operator complies with all the requirements of this general permit and submits a Notice of Intent (NOI) in accordance with Part II of this general permit.

Any discharges that are not consistent with the eligibility conditions of this permit are not authorized by this permit. A person shall either apply for a separate Arizona Pollutant Discharge Elimination System (AZPDES) permit to cover such ineligible discharge(s), cease the discharge(s), or take necessary steps to make the discharge(s) eligible for coverage under this permit.

Individual Permit Requirements. If an operator desires, or is required by ADEQ, to obtain an individual stormwater permit, the operator cannot use an NOI for this purpose. Instead, the operator shall contact the ADEQ for the proper application procedure.

C. Authorized Discharges.

1. Allowable Stormwater Discharges. An operator may discharge pollutants in:
   a. Stormwater runoff associated with construction activities provided the discharge is conducted in compliance with this permit;
   b. Discharges designated by ADEQ as requiring a stormwater permit under 40 CFR 122.26(a)(1)(v); 40 CFR 122.26(b)(15)(ii); or under 40 CFR 122.26(a)(9);
   c. Stormwater discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:
      i. The support activity is directly related to a construction site that is required to have AZPDES permit coverage for discharges of stormwater associated with construction activity;
      ii. The support activity is not a commercial operation (serving multiple unrelated construction projects by different operators) and does not operate beyond the completion of the construction activity for which the support activity is directly associated.
      iii. The support activity is not otherwise covered by a separate AZPDES permit; and
      iv. Appropriate best management practices (BMPs) for the discharges from the support activity areas are identified in the Stormwater Pollution Prevention Plan (SWPPP) and implemented.

2. Allowable Non-Stormwater Discharges.
   a. The operator shall reduce or eliminate discharge of non-stormwaters from construction sites to the extent practicable. The following are the only non-stormwater discharges allowed under this permit, provided appropriate BMPs are in place to assure compliance with (d) below:

[1]The state of Arizona, Department of Environmental Quality, Water Quality Division, does not have permit authority for Indian Country. Construction discharge permits for Indian country within the state shall be acquired through the Environmental Protection Agency (EPA) Region IX or other appropriate permitting authority.

i. Discharges from emergency fire-fighting activities;
ii. Water used to control dust, provided reclaimed water or other wastewaters are not used;
iii. Routine external building wash down where detergents are not used;
iv. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
v. Uncontaminated air conditioning or compressor condensate;
vi. Uncontaminated groundwater or spring water;
vii. Foundation or footing drains where flows are not contaminated with process materials such as solvents;
viii. Fire hydrant flushing, potable water line or well flushing where the receiving waters are ephemeral;
ix. Water used for compacting soil, provided reclaimed water or other wastewaters are not used;
x. Water used for drilling and coring such as for evaluation of foundation materials, where flows are not contaminated with additives; and
xi. Uncontaminated waters obtained from dewatering operations/foundations in preparation for and during excavation and construction.

Note: This permit does not prohibit the use of reuse/reclaimed or potable waters on-site for dust control or for landscape irrigation. However, such activities are to be managed in a way that they are not discharged off site or applied during rain events consistent with the reuse rules. Therefore, they are not permissible 'discharges.'

b. The operator shall identify on the NOI all non-stormwater discharges listed above that are expected to be associated with the project's construction activities.
c. The operator shall address in the SWPPP all non-stormwater discharges listed above that are expected to be associated with the project's construction activities as required in Part IV.E.
d. When an allowable non-stormwater discharge listed above is unavoidable, the operator shall specify BMPs in the SWPPP and implement practices to minimize the frequency and duration of flow, and the concentration of pollutants (including sediments) in such discharges.
e. All other non-stormwater discharges (not listed above) shall be eliminated or authorized under a separate AZPDES permit, as those discharges are not authorized under this permit.
f. The operator may not discharge any non-stormwaters, except for emergency fire-fighting activities required to preserve human health or property, to impaired or unique waters under this permit.

D. Limitations of Coverage.

1. Post-Construction Discharges. This general permit does not authorize stormwater discharges that originate from the site after construction activities have been completed and the site, including any temporary support activity site, has achieved final stabilization and a Notice of Termination (NOT) has been filed. Post-construction stormwater discharges from industrial sites may need to be covered by a separate AZPDES permit.

2. Discharges Mixed with Non-Stormwater. This general permit does not authorize discharges that are mixed with sources of non-stormwater except as allowed in Part I.C.2.

3. Discharges Covered by Another AZPDES Permit. This general permit does not authorize stormwater discharges associated with construction activity that are covered under an individual permit or are required to obtain coverage under an alternative general permit.

4. Discharges to Impaired Waters. An operator is not automatically eligible to discharge under this permit if any portion of the site is within ¼ mile of receiving waters listed as impaired under 303(d) of the Clean Water Act.
   a. To receive authorization, the operator shall submit the NOI and SWPPP to ADEQ. The SWPPP shall specifically identify BMPs that will minimize the discharge of pollutants from the site which would contribute to or aggravate the receiving water's impairment. The operator shall include in the SWPPP a monitoring plan that meets the requirements of Part V of this permit.
   b. If a discharge contains pollutants for which a Total Maximum Daily Load (TMDL) has been established, the SWPPP shall specifically identify BMPs necessary to ensure the discharges will be consistent with the provisions of the TMDL.
   c. If the operator receives a notification from ADEQ that the SWPPP is incomplete or otherwise found to be deficient, the operator shall revise it to address the Department's comments. Prior to authorization, ADEQ may require specific BMPs or monitoring be implemented or specific BMP design criteria be followed.
   d. Within 32 business days of receipt of the SWPPP and a complete and accurate NOI, ADEQ will notify the operator whether: 1) it is acceptable to proceed under this general permit; 2) the SWPPP requires revisions; or 3) there is cause for eligibility denial. If notification is not received in this time-frame, the operator may assume coverage under this permit.
   e. Where the existing water quality does not meet applicable water quality standards (i.e., Tier I Waters), further degradation is not allowed under this permit. If an operator's discharge causes or contributes to non-attainment of standards, more effective and/or additional BMPs shall be added. If after the implementation of additional and/or more effective BMPs the discharge continues to contribute to nonattainment, the operator shall cease all discharges under this permit and apply for coverage under an individual permit.

5. Discharges to Unique Waters. An operator is not automatically eligible to discharge under this permit if any portion of the site is within ¼ mile of receiving a water listed as unique (a.k.a. an Outstanding Arizona Water, or OWA) in A.A.C. R18-11-112.
   a. To receive authorization, the operator shall submit the NOI and SWPPP to ADEQ. The SWPPP shall specifically identify BMPs that ensure the discharges will minimize discharge of pollutants from the site and that no degradation of the receiving water will occur. The operator shall include a monitoring plan in the SWPPP that meets the requirements of Part V of this permit.
   b. Non-stormwater discharges (except for emergency firefighting activities required to preserve human health or property) are prohibited from discharging to unique waters.
   c. If the operator receives a notification from ADEQ that the SWPPP is incomplete or otherwise determined to be deficient, the operator shall revise it addressing the Department's comments. Prior to authorization, ADEQ may require that specific BMPs or monitoring be implemented or specific BMP

design criteria be followed.

d. Within 32 business days of receipt of the SWPPP and a complete and accurate NOI, ADEQ will notify the operator whether: 1) it is acceptable to proceed under the general permit; 2) the SWPPP requires revisions; or 3) there is cause for an eligibility denial. If notification is not received in this time-frame, the operator may assume coverage under this permit.

6. Exempt Discharges. Persons performing the following activities are not required to seek coverage under this permit, unless specifically required under subsection (e) below:

a. Construction projects that disturb less than one acre, unless part of a larger common plan of development or sale;

b. Routine maintenance that disturbs less than five acres that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility or structure.

c. Construction activities associated with the oil and gas exploration, production, processing, or treatment operations or transmission facilities (e.g., drilling site preparation, crude oil pipelines, etc). This exemption does not include construction associated with distribution lines that deliver natural gas to homes, businesses, or between substations, etc., and operate at relatively low pressures, or those pipelines that transport refined petroleum product and chemicals from refineries and chemical plants.[2]

d. Construction activities covered under an Erosivity Waiver (Part I.E).

e. Additional Condition for Exemption. Persons that are not required to file for permit coverage under this section shall operate exempt construction sites in a manner that minimizes pollutants in the discharges, including effectively stabilizing the site after completion of construction. In the event discharges from the site may cause or contribute to non-attainment of water quality standards, ADEQ may require the operator to obtain permit coverage.

E. Erosivity Waivers for Small Construction Activities. A person performing construction activity which disturbs between one and five acres may be exempt from obtaining coverage under this permit based on a low potential for soil erosion for the duration of the project. However, if any discharge point from the construction site is within ¼ mile of animpaired or unique water, the site is not eligible for this waiver. This exemption is predicated on certain criteria being met and proper application procedures being followed:

1. Calculating Erosivity. Low potential for erosion is defined as a rainfall erosivity (R) factor of less than five as calculated using ADEQ's Smart NOI Web site.

The small construction project's rainfall erosivity factor calculation shall be less than five during the **entire** period of construction activity. The period of construction activity begins at initial earth disturbance (commencement of construction activities) and ends with final site stabilization.

The applicant shall certify to ADEQ that construction activity will occur only when the rainfall erosivity factor is less than five.

Note: Construction activities that disturb five acres or greater, or less than five acres but

2 On June 12, 2006, USEPA published a rule that exempts construction activities at oil and gas sites from the requirement to obtain a National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharges except in very limited instances. These amendments are consistent with the Energy Policy Act of 2005 signed by the President of the United States on August 8, 2005. This action also encourages voluntary application of best management practices (BMPs) for construction activities associated with oil and gas field activities and operations to minimize erosion and control sediment to protect surface water quality. The final rule became effective June 12, 2006.

are part of a common plan of development or sale, are not eligible for this waiver.

2. Permit Waiver Certification. The operator shall submit an AZPDES Permit Waiver Certification Form using the Smart NOI Web site to ADEQ before commencing construction activities.

   An operator of a construction activity that is eligible for a waiver based on low potential for erosion shall provide the following information on the Permit Waiver Certification Form:
   a. The name, address, and telephone number of the construction site operator(s);
   b. The name (or other identifier), address, county, and parcel or lot number as recorded by the county, of the construction project or site;
   c. An accurate (within 15 seconds) latitude and longitude (in degrees/minutes/seconds format) of the construction project or site at the point of discharge nearest to the receiving water;
   d. The project start and completion (final stabilization) dates;
   e. The total project acreage and the acreage to be disturbed by the operator submitting the NOI, to the nearest 1/2 acre;
   f. If there is potential for discharge to a municipal separate storm sewer system (including municipal streets and other improvements that can convey stormwater), the name of the municipal operator of the storm sewer;
   g. Verification that the rainfall erosivity factor calculation that applies to the active construction phase at the project site is less than five calculated using ADEQ's Smart NOI Web site; and
   h. The certification statement, signed by a qualified signatory as defined in Part VIII.J.

3. Deadline for Notification. Operator(s) of a project which qualifies for the Permit Waiver shall ensure that ADEQ receives a signed Permit Waiver Certification Form at least two business days prior to the commencement of construction activities. In the absence of a Permit Waiver Certification submittal, ADEQ will assume that the operator was required to apply for coverage under the construction general permit.

4. Projects Which Extend Past Certified Period. If the small construction project continues beyond the calculated "end date" as shown on the Permit Waiver Certification, the operator is in violation of this permit. If this occurs, the operator shall prepare a SWPPP and submit an NOI as required under Parts II and III before the end of the certified waiver period.

PART II. AUTHORIZATION UNDER THIS GENERAL PERMIT

Important: The operator shall read and understand all the conditions and requirements of this permit before submitting any of the forms described in Part II.

A. Prerequisites for Submitting a Notice of Intent (NOI). A person may be authorized to discharge under this permit only if the stormwater discharge is associated with construction activities from the project site. Prior to submission of a NOI, an applicant seeking authorization to discharge under this general permit shall:

1. Meet the eligibility requirements under Part I.B; and

2. Develop and implement a SWPPP that meets Part III of this permit and that covers either the entire site or all portions of the site for which the person is an operator.
   a. The SWPPP shall be prepared prior to submission of the NOI and shall be implemented prior to the start of construction.

b. The SWPPP is not required to be submitted to ADEQ (unless the project will discharge to an impaired or unique water as described in Part I.D.5 and I.D.6) but shall be retained and made available in accordance with Part III.G.

B. Submitting a NOI.

1. Application Required.

a. The operator shall submit separate, accurate and complete NOIs to ADEQ for each project that disturbs one or more acres of land. The operator of a common plan of development or sale that will ultimately disturb one or more acres must submit completed NOIs to the ADEQ.

b. Submission of the NOI demonstrates the operator's intent to be covered by this permit; it is not a determination by ADEQ that the operator has met the eligibility requirements for the permit. Discharges are not authorized if ADEQ notifies the operator that further evaluation is necessary, or the discharges are not eligible for coverage under this permit.

c. Whenever the operator changes or another is added during the construction project, the new operator shall also submit an NOI to be authorized under this permit before taking over operational control or commencing construction activities at the site.

2. NOI Requirements. Construction site owners or operators seeking authorization for stormwater discharges under this general permit shall submit (by photocopy/fax/email/electronically) a complete and accurate AZPDES NOI form to ADEQ. The NOI form contains, at a minimum, the following information:

a. The name, address, and telephone number of the construction site operator;
b. Whether the operator is a federal, state, tribal, private, or other public entity;
c. The type of project (including construction projects conducted by contractors on behalf of ADOT and projects requiring ADOT permits) shall be specifically identified on the NOI;
d. Whether the project is part of a greater plan of development;
e. Estimates of the total project acreage and the acreage to be disturbed by the operator submitting the NOI, to the nearest 1/2 acre;
f. The printed name (or other identifier), address, county, lot number or parcel or lot number as recorded by the county, of the construction project or site;
g. An accurate (within 15 seconds) latitude and longitude (in degrees/minutes/seconds format) of the construction project or site at the point nearest the closest receiving water. For sites which are part of a larger common plan of development, the operator shall provide the latitude and longitude of the discharge point for the portion of the site covered by that NOI;
h. Whether any part of the site is located on Indian Country;
i. Confirmation that a SWPPP meeting the requirements in Part III of this permit has been developed and will be implemented prior to commencement of construction activities. If the NOI is a late application, the operator shall certify that a SWPPP has been developed and implemented prior to submittal of the NOI;
j. The onsite location where the SWPPP may be viewed and the name and telephone number of a contact person;
k. Unless all discharges from the site go to a municipal separate storm sewer system (MS4), provide the name(s) of the closest receiving water(s) which may include unnamed washes;
l. The name of the MS4 into which there is a potential to discharge, if applicable;
m. The project's estimated start and completion dates;

n. Any non-stormwater discharges expected to be associated with construction activities at the site;

o. Whether the project has or will need any other environmental permits or approvals, including, but not limited to, subdivision approvals, air quality 404 permits (etc.), and the permit number(s), if applicable;

p. Whether any portion is within 1/4 mile of an impaired or unique water; and

q The following certification statement, signed and dated by a qualified signatory, as defined in Part VIII.J, and the name and title of the person who signs:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision, as applicable, in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, I believe the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition as an owner or operator, I certify that I have reviewed and intend to comply with all terms and conditions stipulated in 2008 Construction General Permit No. AZG2008-001 issued by the Director."

3. Where to Submit. The applicant shall submit the NOI electronically via the Smart NOI Web site or submit a paper copy to:

Arizona Department of Environmental Quality
Surface Water Section/Permits Unit/Stormwater NOIs (5415A-1)
1110 W. Washington Street
Phoenix, Arizona 85007
or fax to (602) 771-4528

*Note: The operator shall receive an Authorization Certificate (by mail, faxed, or electronically via the Smart NOI system for electronic submittals with e-signatures) assigning a permit authorization number and stating the approval date. This Authorization Certificate is **not** the permit - it merely acknowledges that the NOI has been received by the Department and the operator is authorized to discharge subject to the terms and conditions of this general permit.*

4. Notification to Municipal Separate Storm Sewer Systems/Local Authorities. If the construction site is located within municipal boundary or within Pima or Maricopa Counties for new or revised NOIs, the operator shall send a copy of the certificate authorizing permit coverage to the local authority(s).

5. Effective Date of Permit Coverage.

a. Incomplete NOI Submitted.

i. If ADEQ notifies the operator that an NOI is incomplete or incorrect, the operator shall resubmit an amended NOI if the operator still intends to obtain coverage under this permit; and

ii. Whether or not ADEQ notifies the operator of a deficiency in the NOI, discharges are not authorized under this permit if the operator submits an incomplete or incorrect NOI.

b. Discharges to Impaired or Unique Waters. Applicants proposing a site that has the potential for discharge to reach impaired or unique waters are not

authorized under this permit for a minimum of 32 business days following receipt of the signed NOI and SWPPP. ADEQ may notify operators within this time-frame that there is cause for SWPPP amendment or denial of coverage as specified in Parts I.D.5 and I.D.6 of this permit. If notification is not received in the 32 business day time period, the operator must verify with the Department that the Surface Water Section received the NOI and SWPPP prior to commencement of construction activities.

c. NOIs Requiring Additional Evaluation. ADEQ may notify an operator that authorization to discharge shall not occur for up to 32 business days in the event that review of the NOI identifies information requiring further evaluation. This notification may be made either in writing, email, by fax or phone contact. Operators receiving notice of a delay in coverage may discharge 32 business days after the date the signed NOI is received unless further notice is received from ADEQ during this time period. Such further notice may confirm authorization to discharge or deny permit coverage and require an application for an individual permit.

d. Routine Coverage. Except as provided in 5.a. through.5.c. above, an eligible operator is authorized to discharge stormwater from a construction project 7 calendar days after a signed NOI is received by ADEQ's Surface Water Section or when an authorization certificate is issued, whichever is earlier. However, in order to rely on the 7 calendar day "default" provision, the operator must submit the NOI in a manner that documents the date of ADEQ's receipt (i.e., certified mail, hand delivery, etc.).

Alternatively, applicants that submit a SMART NOI using the electronic signature feature will typically obtain immediate authorization unless the site is located near unique or impaired waters or in areas designated for review due to potential endangered species concerns.

e. Existing Construction Projects. Parts II.B.5.(b),(c), and (d) do not apply to operators of on-going construction projects that were authorized to discharge under Arizona's 2003 Construction General Permit (AZG2003-001), and that comply with the conditions of Part II.B.6.b of this permit.

f. Change in Operators. For construction projects where the operator changes, including instances where an operator is added after an NOI has been submitted, the new operator shall receive an authorization certificate before assuming operational control or commencing work on-site.

6. Deadlines for Notification.

a. New Projects. An operator of a construction project shall receive an NOI authorization or waiver certification prior to taking over operational control or the commencement of construction activities (i.e., the initial disturbance of soils associated with clearing, grading, excavation activities, or other construction activities).

b. Ongoing Construction Projects.

Operators of construction projects ongoing as of the effective date of this permit that received authorization to discharge for these projects under the expired Construction General Permit (AZG2003-001) shall:

i) For the first 120 days from the effective date of this permit, continue to comply with the terms and conditions of the expired Construction General Permit (AZG2003-001);

ii) Update the SWPPP as necessary to comply with the requirements

of Part III of this permit within 90 days of the effective date of this permit (and before submitting a new NOI as described in Part II.B.6.b.iii below); **and**

iii) Submit a complete and accurate NOI according to Part II within 120 days of the effective date of this permit. The previously issued Authorization Number (AZCON-XXXXX) must be included on the NOI for identification purposes.

Note: this is not considered a revision to the original NOI.

Note: If the operator is eligible to submit a Notice of Termination (NOT) (e.g., construction is finished and final stabilization has been achieved) before the 120th day, a new NOI is not required to be submitted, provided a NOT is submitted before the 120th day of the effective date of this permit.

7. Late Applications. The operator is only permitted for discharges that occur after a complete and accurate NOI is received by ADEQ and authorization is granted. ADEQ reserves the right to take enforcement action for any un-permitted discharges or permit noncompliance that occur between the time construction commenced and either permit authorization is granted, denied, or a complete and accurate Permit Waiver Certification for is submitted and the wavier is approved.

C. Submitting a Notice of Termination.

1. Notice Required. The operator shall submit a complete and accurate Notice of Termination (NOT) to ADEQ within 30 days after any of the following conditions have been met:
   a. Final stabilization has been achieved on all portions of the site for which the operator is responsible, unless otherwise required in the following parts. Final stabilization means that one of the following conditions (i, ii, or iii) is met:
      i. All soil disturbing activities at the site have been completed; all construction materials, waste, and temporary erosion and sediment control BMPs (including any sediment that was being retained by the temporary erosion and sediment control BMPs) have been removed and properly disposed; and either A or B below is met:
         A) A uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area is in place on all unpaved areas and areas not covered by permanent structures.

            When preconstruction native background vegetation covered less than 100% of the ground (e.g., arid areas, beaches), the 70% coverage criteria is adjusted as follows: if the native vegetation covered 50% of the ground, 70% of 50% (.70 X .50 = .35) or 35% cover density would be required, or
         B) Equivalent permanent stabilization measures (such as the use of riprap, decomposed granite, gabions, or geotextiles) have been employed.
      ii. For individual lots in residential construction, final stabilization means that the homebuilder:
         A) Has completed final stabilization as specified in Part II C.1.a.i. above, or
         B) Has established temporary stabilization, including

perimeter controls, for an individual lot prior to occupation of the home by the homeowner and has informed the homeowner of the need for, and benefits of, final stabilization.

iii. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to water of the U.S., and areas that are not being returned to their preconstruction agricultural use shall meet the final stabilization criteria above.

b. Another operator who has a valid authorization number under this general permit or an appropriate AZPDES permit has assumed control over all areas of the site that have not been finally stabilized;

c. For residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner (or a homeowner's association) in accordance with Part II.C.1.a.ii above;

d. The planned construction activity identified on the original NOI was never initiated (i.e, no grading or earthwork was ever started) and plans for construction have been permanently abandoned or indefinitely postponed.

e. The operator has obtained coverage for the site area under another AZPDES permit.

Note: NOTs can only be filed for those sites which obtained timely permit authorization by submitting a complete and accurate NOI. Sites which did not receive permit authorization have no permit coverage to terminate.

2. NOT Requirements. The operator shall submit to ADEQ a complete and accurate AZPDES NOT form (photocopy/fax/email/ electronic). The NOT form at a minimum shall include:

a. The AZPDES authorization number for the stormwater discharge;

b. The basis for submission of the NOT;

c. The name, address, and telephone number of the operator submitting the NOT;

d. The name of the project and street address (or a description of location if no street address is available) of the construction site for which the notification is submitted;

e. An accurate latitude and longitude (in degrees/minutes/seconds format) of the construction project or site at the point nearest to the receiving water; and

f. The following certification, signed by a qualified signatory as defined in Part VIII.K.2 of this permit, the printed name and title of the person who signs, and including the date of signature. For construction projects with more than one operator, the operator shall only make this certification for those portions of the construction site where he was authorized under this permit and not for areas where he was not an operator:

"I certify under penalty of law that all stormwater discharges associated with construction activity from the identified facility that are authorized by a general permit have been eliminated or that I am no longer the operator of the facility or construction site. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge stormwater associated with construction activity under this general permit, and that discharging pollutants in stormwater associated with construction activity to waters of the United States is

unlawful under the Clean Water Act where the discharge is not authorized by a NPDES or AZPDES permit. I also understand that the submittal of this Notice of Termination does not release me from liability for any violations of this permit or the Clean Water Act."

3. Where to Submit. The operator shall submit the complete and accurate NOT form electronically via the Smart NOI Web site or submit a paper copy to:

   Arizona Department of Environmental Quality
   Surface Water Section / Stormwater & General Permits
   1110 W. Washington Street, 5415A-1
   Phoenix, Arizona 85007
   or fax to (602) 771-4528

   Note: The permittee shall receive an acknowledgement letter upon ADEQ's receipt of the permittee's completed NOT form.

4. Notification to Municipal Separate Storm Sewer Systems/Local Authorities. If the construction site was located within any municipal boundary or in Pima or Maricopa Counties, the operator shall send a copy of the NOT acknowledgement letter to the local authority.

5. Effective Date of Permit Termination. Authorization to discharge terminates under this permit at midnight on the date the NOT is received by the Department.

PART III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARATION

A. General Information.

1. The operator shall prepare a SWPPP before submitting the NOI for permit coverage and prior to conducting any construction activity

   (*For projects that did not prepare a SWPPP and file an NOI before commencement of construction activity, see late filing in Part II.B.2.i*)

   At least one SWPPP must be developed for each construction project or site covered by this permit. A joint SWPPP may be developed and implemented as a cooperative effort where there is more than one operator at a site. All operators shall either implement their portion of a common SWPPP or develop and implement their own SWPPP.

2. The SWPPP shall be prepared and implemented in accordance with good engineering practices and shall:
   a. Identify all potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the construction site;
   b. Identify, describe, and ensure implementation of BMPs that will be used to reduce pollutants in stormwater discharges from the construction site;
   c. Assure compliance with the terms and conditions of this permit; and
   d. Identify the responsible party for on-site SWPPP implementation.

3. All operator(s) shall sign and certify the SWPPP they will implement in accordance with Part VIII.J.

4. The operator shall implement the SWPPP from initial commencement of construction activity until final stabilization is complete and an NOT is filed, or an NOT transferring the site to a new operator is received by ADEQ.

5. SWPPPs that do not meet all provisions of this permit are considered incomplete. Operating under an incomplete or inadequate SWPPP is a violation of the permit.

B. Types of Operators

1. Definition of Operator. Operator means any person associated with a construction project that meets one or both of the following two criteria:
   a. The person has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or
   b. The person has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

2. Operator Requirements. Either Part III.B.2.a or B.2.b, or both, will apply depending on the type of operational control a person exerts over the site. Part III.B.2.c applies to all operators who have control over only a portion of a construction site.

   a. Operators with Operational Control over Construction Plans and Specifications shall ensure that:
      i. The SWPPP indicates the areas of the project where the operator has operational control over project specifications, including the ability to make modifications in specifications;
      ii. All other operators implementing portions of the SWPPP impacted by any changes made to the SWPPP are notified of such modifications in a timely manner; and
      iii. The SWPPP indicates the name(s) of the party(ies) with day-to-day operational control of those activities necessary to ensure compliance with the SWPPP or other permit conditions.

   b. Operators with Control over Day-to-Day Activities shall ensure that:
      i. The SWPPP identifies the parties responsible for implementation of BMPs identified in the SWPPP;
      ii. The SWPPP indicates areas of the project where each operator has operational control over day-to-day activities; and
      iii. The SWPPP indicates the name(s) of the party(ies) with operational control over project specifications (including the ability to make modifications in specifications).

   c. Operators with Control over Only a Portion of a Larger Project (e.g., one of four homebuilders in a subdivision), are responsible for compliance with the terms and conditions of this permit as it relates to the activities on his/her portion of the construction site (including implementation of BMPs required by the SWPPP). Operators shall ensure either directly or through coordination with other operators, that activities do not render another party's BMP(s) ineffective.

C. Site and Activity Description

1. Identification of Operators. The SWPPP shall identify all operators, including contact information, for the project site and the areas over which each operator has control.

2. Site Description. The SWPPP shall describe the nature of the construction activity, including:
   a. A description of the project and its intended use after the NOT is filed (e.g. low density residential, shopping mall, highway, etc.);

b. A description of the intended sequence of activities that disturb soils at the site (e.g., grubbing, excavation, grading, utilities, infrastructure installation, etc.);
c. The total area of the site, and an estimate of the total area of the site expected to be disturbed by construction activities including off-site supporting activities, borrow and fill areas, staging and equipment storage areas;
d. The percentage of the site that is impervious (e.g., paved, roofed, etc.) before and after construction;
e. A description of the site's soils including potential for erosion; and
f. A general location map (e.g., USGS quadrangle map, a portion of a city or county map, or other map) with enough detail to identify:
    i. The location of the construction site and one mile radius; and
    ii. The waters of the U.S. including tributaries within one mile radius of the site.

3. Site Map. The SWPPP shall contain legible site map(s) completed to scale, showing the entire site that identifies:
    a. Drainage divides and direction of stormwater flow for all drainage areas located within the project limits (i.e., use arrows to show which way stormwater will flow);
    b. Areas of soil disturbance and areas that will not be disturbed;
    c. Locations of temporary and permanent BMPs identified in the SWPPP;
    d. Locations where stabilization BMPs are expected to occur;
    e. Locations of on-site material, waste, borrow areas, or equipment storage areas, and other supporting activities (per Part I.C.1.c);
    f. Locations of all surface water bodies (including dry/ephemeral washes and wetlands). If none exist on site, the SWPPP shall indicate so;
    g. Locations where stormwater discharges to a surface water (including wetlands, ephemeral waters and dry washes) and to a municipal separate storm sewer system (MS4) (i.e., use arrows to indicate discharge location). Where surface waters and/or MS4s receiving stormwater will not fit on the plan sheet, they shall be identified with an arrow indicating the direction and distance to the surface water and/or MS4;
    h. Locations and registration numbers of all on-site dry wells and dry wells on adjacent properties that have the potential to receive stormwater from the site (If none exist the SWPPP shall indicate so);
    i. Areas where final stabilization has been accomplished and no further construction permit requirements apply (if none, the SWPPP shall indicate so); and
    j. Location of trees and boundaries of environmentally sensitive areas and buffer zones to be preserved shall be identified.

    Note: If a marked-up site map is too full to be easily read the operator should date and fold it, put it in the SWPPP for documentation, and start a new one.

4. Receiving Waters. The SWPPP shall identify the nearest receiving water(s), including ephemeral and intermittent streams, dry washes, and arroyos. If applicable, the SWPPP shall also identify the areal extent and describe any wetlands near the site that could be disturbed or that could potentially receive discharges from disturbed areas of the project.

5. Best Management Practices.
    a. The SWPPP shall describe all BMPs as required in Part IV and that will be implemented as part of the construction project to control pollutants in stormwater discharges.

b. For each major activity identified at Part III.C.2.b in the project sequence of activities description, the SWPPP shall clearly describe:
   i. Appropriate BMPs;
   ii. The general sequence during the construction process or schedule that the BMPs will be implemented; and
   iii. Which operator is responsible for the implementation of the BMPs.

c. Standard detail drawings and/or specifications for the structural BMPs, including design or installation details, used on the project shall be included in the SWPPP.

6. Summary of Potential Pollutant Sources. The SWPPP shall identify the location and describe any pollutant sources from areas other than construction (i.e., support activities including stormwater discharges from dedicated asphalt or concrete plants and any other non-construction pollutant sources such as fueling and maintenance operations, materials stored on-site, waste piles, equipment staging yards, etc.). The operator shall implement BMPs in these areas to minimize pollutant discharges and shall detail these BMPs in the SWPPP.

   If any discharge point from the construction site is within ¼ mile of an impaired water, the SWPPP shall identify sources of the pollutants of concern listed on the 303(d) list that may potentially be discharged from the construction site and describe additional or enhanced BMPs to minimize discharges of these pollutants.

D. Permit Related Records

The operator shall include in the SWPPP:

1. A copy of this permit;
2. A copy of the NOI application that was submitted to ADEQ;
3. A copy of the authorization certificate received from ADEQ;
4. Identification of any municipality that received a copy of the authorization certificate; and
5. Copies of any other agreements (such as 404 permits, local grading permits, etc) with any state, local, or federal agencies that would affect the provisions or implementation of the SWPPP, if applicable.

E. Maintaining an Updated SWPPP

The SWPPP shall be revised as necessary during permit coverage to reflect current conditions and to maintain accuracy if there are changes in design or construction of the project, or if the SWPPP is found to be deficient. The operator shall amend the SWPPP within 15 business days whenever:

1. There is a change in design, construction, operation, or maintenance at the construction site that may have a significant effect on the discharge of pollutants to the waters of the U.S. that has not been previously addressed in the SWPPP; or

2. During inspections, monitoring if required, or investigations by the operator or by local, state, municipal separate storm sewer system, or federal officials, it is determined the discharges are causing or contributing to water quality exceedances or the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the construction site.

Changes in the revised SWPPP shall be implemented before the next rain event whenever practicable. If this is impracticable, then reason(s) shall be documented in the SWPPP and revisions implemented as soon as possible.

F. Deficiencies in the SWPPP

ADEQ may notify the operator at any time that the SWPPP does not meet one or more of the requirements of this permit. The notification shall identify the parts of this permit that are not being met and parts of the SWPPP that require modification to comply with permit. Within 15 calendar days of receipt of the notification from ADEQ (or as otherwise provided by ADEQ), the operator shall make the required changes to the SWPPP and submit to ADEQ a written certification that the changes have been made. ADEQ may require re-submittal of the SWPPP to confirm all deficiencies have been adequately addressed.

ADEQ also is not precluded from taking enforcement action for any period of time the operator was operating under a SWPPP that did not meet the minimum requirements of this permit.

G. Posting, SWPPP Review and Making SWPPPs Available

1. The operator must post the authorization number(s) in a conspicuous location near the main entrance of the construction site and retain a copy of the authorization certificate in the SWPPP. For linear projects, the authorization number(s) must be posted near the entrance where most of the construction activity is occurring.

2. A copy of the site specific SWPPP shall be made available from commencement of construction activities to the date of final stabilization and NOT submittal as follows:

   a) The SWPPP shall be on-site whenever construction or support activities are actively underway, and

   b) The SWPPP shall be locally available to the Department or any other federal, state or local authority having jurisdiction over the project at any reasonable time (generally Monday through Friday, 8:00 am to 5:00 pm).

3. The SWPPP shall be made available to the Department or any other federal, state, tribal, or local authority having jurisdiction over stormwater discharges from the project at the time of an on-site inspection.

4. Any person, including, tribal authority, state, federal or local agency may view the SWPPP or make a written request to ADEQ for access to a copy of the SWPPP. ADEQ may request, and within 7 calendar days the operator shall provide, a copy for ADEQ to make available for public review.

PART IV. BMP REQUIREMENTS FOR CONSTRUCTION ACTIVITIES

A. General Requirements. The operator shall:

1. Identify and describe all BMPs to be implemented at the construction site in the SWPPP.

2. Properly select, install, and maintain all structural BMPs per the manufacturers' specifications and good engineering practices so BMPs remain functional and effective.

3. Design and implement a combination of erosion and sediment control BMPs to keep sediment in place and to capture sediment to the extent practicable before it leaves the site.

   Note: Soil crusting from water application, a practice commonly used for dust control is not an effective or acceptable erosion control/stabilization BMP for compliance with this permit.

4. Install sediment control/perimeter control BMPs before upgradient land is disturbed. Temporary BMPs shall not be removed until final stabilization is achieved except when temporary control structures must be moved in order to allow construction activities to continue. In this instance, the operator shall implement equivalent measures to ensure the same level of protection in minimizing potential pollutant discharges.

5. Phase or sequence construction activities, as practicable, to minimize the area of disturbance at any one time.

B. Erosion Control/Stabilization BMPs

1. Description. The operator shall implement interim and permanent erosion control and stabilization BMPs on-site and shall comply with the following:

   a. Preserving Natural Vegetation. Where practicable, existing vegetationshould be preserved. If natural vegetation can be preserved, the operator shall clearly mark vegetation before clearing activities begin. Locations of trees and boundaries of environmentally sensitive areas and buffer zones to be preserved shall be identified on the SWPPP site map;

   b. Seeding/Vegetation. If revegetation plans include seeding, the SWPPP shall include seed mix and application specifications that will be used for vegetative stabilization. If the operator uses fertilizers or tackifiers on-site to establish vegetation, BMPs shall be established to minimize the presence of these chemicals in the discharge.

   c. Culvert Stabilization. If culverts are present on the site, the SWPPP shall include measures to sufficiently minimize the threat of erosion at culvert locations to prevent the formation of rills and gullies during construction; and

   d. Run-on Management. If off site areas direct flow onto the construction site, the SWPPP shall include plans to either divert run-on flows, or otherwise provide engineering controls and BMPs to account for off site contributions of stormwater and non-stormwater flow.

2. Schedule and Deadlines for Stabilization.
   The operator must provide temporary stabilization, or initiate permanent stabilization, of disturbed areas within 14 calendar days of the most recent land disturbance in areas where construction or support activities have temporarily been suspended or have permanently ceased, except as follows:

   a. Where stabilization by the 14th day is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable;
   b. When the site is using vegetative stabilization but is located in an arid area during dry or drought-type conditions, vegetative stabilization measures shall be initiated as soon as practicable, when growing conditions are best for planting or seeding;
   c. When the site is using vegetative stabilization and is located in an area of the state experiencing drought conditions (see definitions), vegetative stabilization measures shall be initiated as soon as practicable;
   d. Stabilization shall be initiated within 7 calendar days, for areas within 50 feet of an impaired or unique water.
   e. Where disturbed areas are awaiting vegetative stabilization for periods greater than 14 calendar days after the most recent disturbance, non-vegetative

methods of stabilization shall be employed. These methods shall be described in the SWPPP.

3. Records of Stabilization. The operator shall maintain the following records as part of the SWPPP:

   a. Dates when major grading activities occur;
   b. Dates when construction activities temporarily or permanently cease on any portion of the site; and
   c. Dates when stabilization measures are initiated and completed and reasons for delay, if applicable.

C. Sediment Control BMPs

The operator shall implement structural BMPs to divert flows from exposed soils, store flows, or otherwise limit run-off and the discharge of pollutants from exposed areas of the site to the degree attainable. Placement of structural BMPs within the floodplain shall be avoided to the extent practicable.

1. Perimeter Control. The operator shall use silt fences, vegetative buffer strips, sediment traps, or equivalent sediment control BMPs at all times for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin that will store either a calculated volume of runoff from a 2 year, 24 hour storm, or 3,600 cubic feet per acre drained, is provided.

2. Soil Stockpiles. The operator shall use silt fences or other effective sediment control BMPs around soil stockpiles except when stockpiles are being actively worked (i.e., controls must be in place evenings, weekends, and other down times). The operator shall not place stockpiles in washes or other surface waters, or in stormwater conveyances such as curb and gutter systems, or in streets leading to such conveyances.

3. Sediment Basins and Traps.
   a. Where attainable, the operator shall provide temporary (or permanent) sediment basins at sites with common drainage locations that serve an area with 10 or more acres disturbed at one time. The operator shall design and construct basins as follows:
      i. The basin shall provide storage for a calculated volume of runoff from a 2 year, 24 hour rain event from each disturbed acre drained; or
      ii. Where no calculation is performed, a sediment basin providing 3,600 cubic feet of storage per acre drained shall be provided.

   When computing the number of acres draining into a common location it is not necessary to include flows from offsite areas, if such flows are diverted around both the disturbed areas and the sediment basin. It is, however, necessary to include all sources of on-site flow that will reach the basin, including areas that are undisturbed and areas that have undergone final stabilization.

   In determining whether installing a sediment basin is attainable, the operator shall consider physical limitations at the site such as soils, slope, and available on-site area. If non-attainability is claimed, the operator shall explain in the SWPPP why a sediment basin is non-attainable. The operator shall also consider public safety, especially as it relates to children, as a design factor for sediment basin attainability and shall implement alternative

sediment control BMPs if site limitations preclude a safe design.

The SWPPP shall provide sizing and calculation requirements for sediment basin(s) and shall indicate whether the basin(s) will be temporary or permanent.

b. The operator shall use smaller sediment basins and/or sediment traps for linear projects and for drainage locations that serve 10 or more disturbed acres at one time if a sediment basin meeting the provision of Part IV C.3.a is not attainable.

c. The operator shall maintain sediment basin, ponds, and traps, and remove accumulated sediment when design capacity has been reduced by 50%. Sediment basin, ponds, and traps must be maintained until final stabilization of the site is obtained.

d. For linear projects and drainage locations serving less than 10 acres, smaller sediment basins and/or traps shall be used.

4. Discharge of Sediments During Dry Weather. The operator shall implement effective BMPs that ensure there is no discharge of sediments from construction activities to any water body including dry washes during dry weather.

Note: This is not intended to apply to blowing dust, or to track-out that is otherwise managed as required in this permit.

5. Velocity Dissipation Devices. The operator shall place velocity dissipation BMPs along the length of any outfall channel on-site, and at locations where discharges leave the construction site as necessary to provide a non-erosive flow velocity.

6. Storm Drain Inlet Protection. The operator shall at all times during construction provide effective sediment control BMPs at storm drain inlets that discharge, or could discharge, to waters of the U.S. or to a local MS4 until all sources with potential for discharging to the inlet are stabilized.

7. Construction Site Entrance and Egress. The operator shall implement effective BMPs to minimize tracking of sediments, debris and other pollutants from vehicles and equipment entering and leaving the site (e.g., stone pads, concrete or steel wash racks, or equivalent systems).

D. Non-Structural BMPs

1. Good Housekeeping BMPs. The operator shall implement good housekeeping procedures to prevent litter, construction debris, and construction chemicals exposed to stormwater from becoming a pollutant source for stormwater discharges. These procedures shall include storage practices to minimize exposure of the materials to stormwater, and spill prevention and response practices.

2. Fueling and Maintenance Areas. The operator shall implement BMPs to minimize discharges from construction equipment fueling operations and maintenance areas.

3. On-site and Offsite Material Storage. The operator shall identify and describe all material storage areas (including overburden and stockpiles of dirt, borrow areas, etc.) used for the permitted project in the SWPPP unless those areas are covered by another AZPDES permit.

4. Concrete Washout. Where possible, concrete suppliers should conduct washout

activities at their own plants or dispatch facilities.

E. Non-Stormwater Discharge BMPs

1. The operator shall not allow any non-stormwater discharges from the site unless they are specifically authorized in Part I.C.2.
2. The operator shall eliminate or reduce all non-stormwater discharges to the extent practicable. If discharges cannot be eliminated, the operator shall include the following information in the SWPPP for all non-stormwater discharge (except for flows from emergency fire fighting activities),
   i. Identification of each non-stormwater discharge expected to be associated with the project;
   ii. The location(s) where each discharge is likely to occur; and
   iii. Appropriate BMPs that the operator will use to minimize the discharge of pollutants.
3. The operator shall ensure all water from dewatering or basin draining activities is discharged in a manner that does not cause nuisance conditions, including erosion in receiving channels or on surrounding properties.
4. The operator shall retain superchlorinated wastewaters (i.e., containing chlorine above residual levels acceptable in drinking water systems) on-site until the chlorine dissipates, or shall otherwise effectively dechlorinate the water prior to discharge.

   Note. As with any non-stormwater, if acceptable to the local sanitary sewer authority, this wastewater may be discharged to the sanitary sewer. In this case, dechlorination is not required by this permit.

F. Post-Construction Stormwater Management

1. The SWPPP shall include a description of post-construction stormwater management BMPs that will be installed during the construction process to control pollutants in stormwater discharges after construction has been completed.
2. If 'temporary' sediment basins are to be used as/converted to retention or detention basins in the post-construction phase, the operator shall remove and properly dispose of all sediments accumulated in the basin during construction activities prior to filing an NOT.
3. Post-construction structural BMPs shall be placed on upland soils to the degree attainable.
4. New discharge connections or permanent stormwater outfalls to unique waters are prohibited under this permit

.

Note: The installation of these devices may also require a separate permit under section 404 of the Clean Water Act.

Note: This permit only authorizes and requires the operator to install and maintain stormwater management measures up to and including final stabilization of the site, and does not required continued maintenance after stormwater discharges associated with the construction activity have been eliminated form the site and a NOT has been filed. However, post-construction stormwater BMPs that discharge pollutants from point sources once construction is complete, may in themselves, need authorization under separate AZPDES permit.

G. Other BMPs

The SWPPP shall describe:

1. Measures to prevent the discharge of solid materials, including building materials, to waters of the US, except as authorized by a permit issued under section 404 of the Clean Water Act;
2. Specific locations of concrete and vehicle washout activities that will occur at the

construction site. The operator shall employ measures to contain and manage on-site vehicle and equipment washwater and concrete wash-out to prevent discharge (see Part IV.D.3) and consistent with applicable Aquifer Protection Program (APP) permits.

H. Inspections

The operator shall provide "qualified personnel" to perform inspections according to the selected inspection schedule identified in the SWPPP.

1. Inspection Schedule.

   a. Routine Inspection Schedule. The operator shall ensure inspections are performed at the site as indicated below to ensure BMPs are functional and that the SWPPP is being properly implemented.

      i. The site will be inspected a minimum of once every 7 calendar days, OR

      ii. The site will be inspected a minimum of once every 14 calendar days, and also within 24 hours of the end of each rain event of 0.5-inches or greater.

      *Note: The Department encourages adding inspections **before** and/or **during** predicted rain events and "spot" inspections to ensure BMPs will be effective in managing stormwater runoff and associated pollutants.*

   b. Reduced Inspection Schedule. The operator may reduce inspection If the entire site has been temporarily stabilized; or runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or frozen ground exists). In this case, the site shall be inspected at least once every 28 calendar days, and before an anticipated rain event and within 24 hours of the end of each rain event of 0.5 inches or greater in 24 hours.

   c. Inspection Schedule for Sites within ¼ mile of Impaired or Unique Waters. If any discharge point from the construction site is within ¼ mile of a unique or impaired water, the operator shall inspect the site at least once every 7 calendar days. In addition, the operator shall visually observe stormwater discharges at all discharge locations within one business day after each rain event of 0.5 inches or greater in 24 hours.

   Note: If an inspection day (except those required relative to a rainfall event) falls on a Saturday or holiday, the inspection may be conducted on the preceding workday. If the inspection day falls on a Sunday, the inspection may be conducted on the following Monday.

2. Inspector Qualifications. All Inspections shall be done by qualified personnel. "Qualified personnel" means a person (or personnel) knowledgeable in the principles and practice of erosion and sediment control BMPs, and who possesses the skills and abilities to assess conditions at the site that could impact stormwater quality and the effectiveness of the BMPs selected to control the quality of the stormwater discharges. The inspector(s) name, title and a description of his/her qualifications and a copy of his/her training certificate, if any, shall be included in the SWPPP before construction begins. Inspector information shall be updated whenever a new inspector is brought onto the project.

3. Scope of Inspections.
   a. At a minimum, the inspector shall examine each of the following during each inspection:
      i. Good housekeeping BMPS;
      ii. All erosion and sediment control BMPs identified in the SWPPP to ensure they are in place and functioning as intended;
      iii. All areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation;
      iv. Locations where vehicles and equipment enter or exit the site for evidence of tracking sediment, debris, and other pollutants onto and off the site;
      v. Site conditions for evidence of, or the potential for, pollutants entering the municipal separate storm sewer;
      vi. Accessible discharge locations or discharge points to ascertain whether erosion and sediment control BMPs are effective in preventing significant impacts to receiving waters; and
      vii. Where discharge locations are inaccessible, nearby downstream locations to the extent that the inspections are practicable.
   b. The inspector shall document all areas inspected, the presence and effectiveness of BMPs, and the conditions found at the time of inspection.
   c. All nonfunctional and underperforming BMPs shall be repaired, replaced or supplemented with functional BMPs, as specified in Part IV.I.2.

4. Inspection Report. For each inspection, the operator shall complete an inspection report which provides information that is equivalent to the sample form provided in Appendix A. Within 24 hours of completing the inspection, the corresponding inspection report shall be placed with previous reports (in chronological order) and kept with the SWPPP. At a minimum, the report shall include:
   a. The inspection date;
   b. Name(s) and title(s) of qualified person(s) making the inspection;
   c. Weather information for the period since the last inspection (or since commencement of construction activity for the first inspection) including:
      i. Best estimate of the beginning of each rain event;
      ii. Duration of each event;
      iii. Time elapsed since last rain event; and
      iv. Approximate amount of rainfall for each event (in inches).
   d. Location(s) of discharges of sediment or other pollutants from the site;
   e. For inspections occurring during or after a rain event, a description of stormwater that is discharging from the site (presence of suspended sediment, turbid water, discoloration, and/or oil sheen, as applicable), when present;
   f. Location(s) and identification of BMPs that need to be maintained, failed to operate as designed, or proved inadequate;
   g. Location(s) where additional BMPs are needed that did not exist at the time of inspection are needed;
   h. Identification of all sources of non-stormwater discharges occurring at the site and associated BMPs inplace;
   i. Identification of material storage areas and, evidence of or potential for, pollutant discharge from such areas;
   j. Corrective actions required, including any changes to SWPPP necessary, and implementation dates (of corrective actions/maintenance, and SWPPP changes);
   k. Identification of any non-compliance with the conditions of this permit, or where the inspector does not identify any incidents of non-compliance, the inspection report shall contain a certification that the construction project or site is being operated in compliance with the SWPPP and this permit; and

l. Certification statement and signature in accordance with Part VIII.J.

5. Revising the SWPPP. Based on the results of the inspection, the operator shall revise the SWPPP as needed to include additional or modified BMPs designed to correct problems identified. The operator shall complete revisions to the SWPPP within 15 business days following the inspection. The revised SWPPP shall be implemented as specified in Part III.E.

I. Maintenance of BMPs.

1. The operator shall maintain all erosion and sediment control measures (BMPs) and other protective measures identified in the SWPPP in effective operating condition.

2. If existing BMPs need to be repaired or modified or if additional BMPs are necessary, implementation shall be completed within 7 calendar days or before the next rain event (whichever is sooner), unless otherwise prescribed in a. through d. below. If implementation before the next rain event is impracticable, the reason(s) for delay shall be documented in the SWPPP and alternative BMPs shall be implemented as soon as possible. Additionally, the following maintenance activities shall be implemented as follows:

   a. Remove accumulated sediment when it reaches a maximum of one-third the height of the silt fence or one-half the height of a fiber roll.

   b. Sediment shall be removed from temporary and permanent sedimentation basins, ponds and traps when the depth of sediment collected in the basin reaches 50% of the storage capacity.

   c. Construction site egress location(s) shall be inspected for evidence of off-site tracking of sediment, debris, and other pollutants onto paved surfaces. Removal of sediment, debris, and other pollutants from all off-site paved areas shall be completed as soon as practicable, or as otherwise required by Federal, State, and local requirements.

   d . Accumulations of sediment, debris, and other pollutants observed in offsite surface waters, drainage ways, catch basins, and other drainage features shall be removed in a manner and at a frequency sufficient to minimize impacts and to ensure no adverse effects on water quality.

PART V. MONITORING REQUIREMENTS FOR DISCHARGES TO UNIQUE OR IMPAIRED WATERS

The provisions of Part V. apply only to operators with projects located within ¼ mile of an impaired or unique water. If any portion of the project area extends within this distance, the operator is subject to the requirements of this Part.

A. Monitoring Program. Operators of projects that are located within ¼ mile of impaired or unique waters shall prepare and implement a monitoring program that meets the requirements of this Part. Operators of sites that are down-gradient of these waterbodies can be exempted from monitoring if the operator provides a demonstration acceptable to ADEQ that there is no potential for discharge to reach the unique or impaired receiving water.

B. General Requirements. The operator shall develop a written site-specific monitoring program including both visual and analytical monitoring. The monitoring program shall be a part of the SWPPP as either an appendix or separate SWPPP section. The monitoring program shall include:

1. Locations of monitoring sites;
2. The name(s) and title of the person(s) who will perform the monitoring;
3. A map showing the segments or portions of the receiving water that are most likely to be impacted by the discharge of pollutant(s);
4. Water quality parameters/pollutants to be sampled;
5. The citation and description of the sampling protocols to be used;
6. Visual observation locations, visual observation procedures, and visual observation follow-up and tracking procedures; and
7. Identification of the analytical methods and related method detection limits (if applicable) for each parameter required. MDLs shall be below applicable surface water quality standards when possible.
8. Additionally, for sites within ¼ mile of an impaired water, the monitoring program shall include:
   a. An identification of the pollutant(s) of concern based on the most recent 305(b)/303(d) listing or other information available; and
   b. A description of potential source(s) of this pollutant(s) from the project, if any.

C. Visual Monitoring Requirements.

1. Visual Monitoring Schedule. At a minimum, visual monitoring activities for projects near impaired or unique waters shall consist of weekly site inspections. In addition, the operator shall visually observe stormwater discharges at all discharge locations within one business day after each 0.5 inch of precipitation from a rain event. Visual observations are only required during daylight hours (sunrise to sunset).
2. Visual Monitoring Locations. The inspector shall visually observe each drainage area for the presence of current (and indications of prior) discharges and their sources.
3. Visual Monitoring Parameters. Visual observations shall document the presence or evidence of any discharge, pollutant characteristics (floating and suspended material - clarity and solids, sheen, color, turbidity, odor, foam etc.), and source.
4. Visual Monitoring. The operator shall document conditions noted during visual monitoring. Documentation shall include photographs of site conditions including sediment loads, erosion and waste control BMPs and any discharges.

D. Analytical Monitoring Requirements.

1. Analytical Monitoring Schedule. Analytical monitoring shall be performed anytime a pollutant (including sediment) is known or suspected to discharge from the construction site. Monitoring shall continue until final stabilization for the project site is established and an NOT is filed.

2. Adverse Conditions Exception. The operator is not required to physically collect samples during dangerous weather conditions such as flooding and electrical storms; or during nighttime hours (sunset to sunrise). Information on any adverse conditions that prevented sampling shall be documented in the SWPPP.

3. Analytical Monitoring Locations.
   a. The operator shall conduct discharge sampling at locations observed or suspected to contain the greatest pollutant load resulting from the construction activities.

   b. Where the construction site is adjacent to or otherwise discharges directly to an unique or impaired stream, the operator shall sample

both immediately upstream and downstream of each discharge point. If there are two or more discharge locations from the site to the same unique or impaired stream, the operator may sample at one upstream and one downstream location in the stream. Additional monitoring points shall be located at the discharge points of the construction site. If the impaired or unique water is a lake, a site specific proposal for sampling the impact area shall be submitted.

c. If the unique or impaired water is a lake, a site-specific proposal for sampling the impact area shall be submitted. Documentation of ADEQ approval of the sampling plan shall be included in the SWPPP.

d. If the construction site is within ¼ mile of an unique or impaired water, but is not located adjacent to or does not otherwise discharge directly to the water, analytical monitoring shall be conducted at each discharge location (unless a discharge point representative of worst case discharge quality can be established as an alternative) at the construction site.

4. Analytical Monitoring Parameters.

a. The operator shall monitor for turbidity. The operator shall compare turbidity values from the sample locations referenced in Part V.D.3.b. If there is a 25% or more increase at the downstream monitoring location, the operator shall evaluate and replace, maintain, or install additional BMPs as necessary to reduce sediment transport.

b. The operator shall sample discharges to unique waters for any pollutants known, or which should be known to be present at the site.

c. The operator shall also sample discharges to impaired waters for any additional pollutants for which the water is impaired. However, if the operator can demonstrate that there is no reasonable expectation that construction activities could be an additional source of a specific pollutant, analytical monitoring for that parameter will not be required. As part of this demonstration, the operator must consider all on-site activities, as well as the potential for any pollutants (metals, nutrients, etc.) to be present in the on-site soils which will be disturbed.

5. Sample Collection, Preservation, Tracking, Handling and Analyses. The operator shall establish written procedures for sample collection, preservation, tracking, analyses, and handling, including the following:

a. Identify sample analyses and associated analytical methods (fixed base laboratory and field analyses);
b. Use of only preserved (as necessary), pre-cleaned sample containers provided by the laboratory;
c. Labeling each sample container with indelible ink noting sampler's name(s), sample identification, date and time of sample collection, sample location (discharge location), requested analyses, project name or number, and preservation (as appropriate);

d. Tracking samples using chain-of-custody (COC) forms. The COC shall include, at a minimum, sampler's name(s), phone number, date and time of sample collection, sample identification, requested analyses, and project name or number. The COC forms shall be included as part of the SWPPP;

e. Transporting and shipping samples for laboratory analyses in a manner that minimizes destruction of the sample or otherwise compromises sample integrity. Samples shall be provided to the analytical laboratory in a timeframe not exceeding analytical method hold times;

f. Designating and training personnel to collect, maintain, and ship samples in accordance with the above sample protocols and good laboratory practices.

E. Monitoring Methods. All monitoring instruments and equipment (including operators' own field instruments for measuring pH and turbidity) shall be calibrated and maintained in accordance with manufacturers' recommendations. All laboratory analyses shall be conducted according to test procedures specified in 40 CFR 136, unless other test procedures have been specified in this general permit.

All samples collected for monitoring shall be analyzed by a laboratory that is licensed by the Arizona Department of Health Service (ADHS) Office of Laboratory Licensure and Certification. This requirement does not apply to parameters that require analysis at the time of sample collection as long as the testing methods used are approved by ADHS or ADEQ. These parameters may include flow, dissolved oxygen, pH, temperature, and total residual chlorine. The operator may conduct field analysis of turbidity if the operator has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to properly perform the field analysis.

F. Records.

1. Analytical Record Submittal. The operator shall submit monitoring records twice a year. Monitoring records for the period between June 1 and October 31 shall be submitted to ADEQ by November 30th of each year or at the time of final stabilization and NOT submittal, whichever is sooner. Monitoring records for the period between November 1 and May 31 shall be submitted to ADEQ by June 30th of each year or at the time of final stabilization and NOT submittal, whichever is sooner.

   Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or other format specified by the Director, and submitted to:

   Arizona Department of Environmental Quality
   Surface Water Section
   Stormwater and General Permits Unit/NOI (5415A-1)
   1110 W. Washington Street
   Phoenix, Arizona 85007

2. Record Retention. The operator shall retain records of all stormwater monitoring information and reports as part of the SWPPP for a period of at least three years from the date the NOT was submitted to ADEQ. In addition to the requirements in Part VIII.I of this permit. These records shall include:
   a. The date, exact place and time of sampling or measurements;
   b. The name and title of the qualified person performing the visual and analytical monitoring and any related measurements;
   c. The date(s) the analyses were performed;

d. The analytical techniques or methods used;
e. The results of such analyses; and
f. The response(s) taken to reduce or prevent pollutants in discharge.

PART VI. SPECIAL CONDITIONS

A. Hazardous Substances or Oil. The operator shall prevent or otherwise minimize the discharge of hazardous substances or oil in the discharge(s) from the construction activities in accordance with the SWPPP. This permit does not relieve the operator of the reporting requirements under 40 CFR 110, 40 CFR 117 and 40 CFR 302 relating to spills or other releases of oils or hazardous substances.

B. Releases in Excess of Reportable Quantities. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR 110, 40 CFR 117, or 40 CFR 302 occurs, the operator shall:

1. Modify the SWPPP within 14 calendar days of knowledge of the release to: provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, SWPPPs shall identify measures to prevent the reoccurrence of the releases and to respond to such releases; and

2. Provide notice to the National Response Center in accordance with 40 CFR 110, 40 CFR 117, and 40 CFR 302 within a 24 hour period, or as soon as site staff have knowledge of the discharge.

C. Spills. This general permit does not authorize the discharge of any hazardous substances or oil resulting from on-site releases.

D. Compliance with surface water quality standards. The operator must select, install, implement and maintain BMPs at the construction site that minimize pollutants in the discharge as necessary to meet applicable water quality standards. At any time after authorization, ADEQ may determine that stormwater discharges may cause, have reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. If such a determination is made, ADEQ may require you to:

1. Develop a supplemental BMP action plan describing SWPPP modifications to address adequately the identified water quality concerns;
2. Submit valid and verifiable data and information that are representative of ambient conditions and indicate that the receiving water is attaining water quality standards; or
3. Cease discharges of pollutants from construction activity and submit an individual permit application.

E. Continuation of the Expired General Permit. If ADEQ does not reissue this general permit before the expiration date, it will be administratively continued and remain in force and effect. Operators granted general permit coverage before the expiration date will automatically remain covered by the continued general permit until the earlier of:

1. Reissuance or replacement of the general permit, at which time the operator shall comply with the NOI conditions of the new general permit to maintain authorization to discharge; or

2. The date ADEQ receives the operator's NOT; or

3. The date ADEQ issues an individual permit for the project's discharge; or

4. The date ADEQ issues a formal permit decision not to reissue this general permit, at which time operators shall seek coverage under an alternative general permit or an individual permit.

PART VII. RETENTION OF RECORDS

A. Documents. The operator shall retain copies of SWPPPs and all documentation required by this permit, including records of all data used to complete the NOI to be covered by this permit, for at least three years from the date of submittal of an NOT. ADEQ may extend this retention period upon request by notifying the operator in writing at any time prior to the end of the standard three year retention period.

B. Maintaining Inspection Records. The operator shall ensure the inspection report and record of any follow-up actions taken is retained as part of the SWPPP for at least three years from the date that permit coverage expires or is terminated.

PART VIII. STANDARD PERMIT CONDITIONS

A. Duty to Comply. [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(a)(1) and A.R.S. § 49-261, 262, 263.01, and 263.02.]

1. The operator shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act; A.R.S. Title 49, Chapter 2, Article 3.1; and A.A.C. Title 18, Chapter 9, Articles 9 and 10, and is grounds for enforcement action, permit termination, revocation and reissuance, or modification, or denial of a permit renewal application.

2. The issuance of this permit does not waive any federal, state, county, or local regulations or permit requirements with which a person discharging under this permit is required to comply.

3. The operator shall comply with any effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

B. Need to Halt or Reduce Activity Not a Defense. [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(c)]. It shall not be a defense for an operator in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

C. Duty to Mitigate. [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(d)] The operator shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

D. Proper Operation and Maintenance. [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(e)] The operator shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the operator to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures.

E. Permit Actions. [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(f)] This permit may be modified, revoked and reissued, or terminated for cause. The filing of a

request by the operator for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

F. **Property Rights.** [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(g)] This permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or invasion of personal rights, nor any infringement of federal, state, Indian tribe, or local laws or regulations.

G. **Duty to Provide Information**. [A.A.C.R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(h)] The operator shall furnish to ADEQ, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The operator shall also furnish to ADEQ upon request, copies of records required to be kept by this permit.

H. **Inspection and Entry.** [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(i)] The operator shall allow the Director, or an authorized representative, upon the presentation of credentials and such other documents as may be required by law, to:

1. Enter upon the operator's premises where a regulated facility or activity is located or conducted, or where records shall be kept under the conditions of this permit;
2. Have access to and copy, at reasonable times, any records that shall be kept under the terms of the permit;
3. Inspect at reasonable times any facilities, equipment (including monitoring equipment or control equipment), practices or operations regulated or required under this permit; and
4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by A.R.S. Title 49, Chapter 2, Article 3.1, and A.A.C. Title 18, Chapter 9, Articles 9 and 10, any substances or parameters at any location.

I. **Monitoring and Records**. [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(j)]

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

2. The operator shall retain records of all monitoring information, including all calibration and maintenance records, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

3. Monitoring shall be conducted according to test procedures approved under 9 A.A.C. Chapter 14, Article 6 as incorporated by reference in R18-9-A905(B); unless specific test procedures have been otherwise specified in this permit.

4. Any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained in this permit is subject to the enforcement actions established under A.R.S. Title 49, Chapter 2, Article 4, which includes the possibility of fines and/or imprisonment.

J. **Signatory Requirements.** [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(k) and (l); A.A.C. R18-9-A905(A)(1)(c) which incorporates 40 CFR 122.22]

1. NOIs. All NOIs shall be signed and certified as follows:

a. For a corporation: By a responsible corporate officer. For the purpose of this Part, a responsible corporate officer means:

i. A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

ii. The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

b. For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or

c. For a municipality, state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency is the chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g. Regional Administrators of EPA).

2. Reports and Other Information: All NOTs, SWPPPs, reports, certifications, or information required by this permit and other information requested by ADEQ shall be signed by a person described in Part VIII.J.1 or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VIII.J.1;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator, superintendent, or position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the operator. (A "duly authorized representative" may be either a named individual or any individual occupying a named position); and

c. The signed and dated written authorization is included in the SWPPP and submitted to ADEQ upon request.

3. Changes to Authorization. If the information on the NOI filed for general permit coverage is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a revised NOI shall be submitted to ADEQ prior to or together with any reports, information, or applications to be signed by the signatory or an authorized representative.

4. Certification. Any person signing documents, including inspection reports under the terms of this permit shall make the following certification:

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

K. Reporting Requirements. [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(l)]

1. Planned Changes. The operator shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

   a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b) (incorporated by reference at R18-9-A905(A)(1)(e)); or

   b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1) (incorporated by reference at R18-9-A905(A)(3)(b)).

2. Anticipated Noncompliance. The operator shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. Monitoring Reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit. If the operator monitors any pollutant more frequently than required by the permit, using test procedures approved under 9 A.A.C. Chapter 14, Article 6 or as specified in the permit, then the results of this monitoring shall be included in the calculation and reporting of the data to ADEQ.

4. Twenty-four hour Reporting.
   a. The operator shall report to ADEQ any permit noncompliance which may endanger human health or the environment. The operator shall orally notify the office listed below within 24 hours:

      Arizona Department of Environmental Quality
      1110 W. Washington, 5515B-1
      Phoenix, Arizona 85007
      Office: 602-771-2330; Fax 602-771-4505

      Note: Additional Federal, State, or Local release reporting may also be required.

   b. A written submission shall also be provided to the office identified above within five days of the time the operator becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the

anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

5. Other Noncompliance. The operator shall report all instances of noncompliance (not otherwise required to be reported as prescribed in Part VIII.K.4) in accordance with Part VIII.K.3.

6. Other Information. When the operator becomes aware that he or she failed to submit any relevant facts in the NOI or in any other report to ADEQ, the operator shall promptly submit the facts or information to the Surface Water Section of ADEQ.

L. Reopener Clause. [A.A.C. R18-9-A905(A)(3)(d), which incorporates 40 CFR 122.44(c)]. ADEQ may elect to modify the permit prior to its expiration (rather than waiting for the new permit cycle) to comply with any new statutory or regulatory requirements, such as for effluent limitation guidelines that may be promulgated in the course of the current permit cycle.

M. Other Environmental Laws. No condition of this general permit releases the operator from any responsibility or requirements under other environmental statutes or regulations. For example, this permit does not authorize the "take" of endangered or threatened species as prohibited by section 9 of the Endangered Species Act, 16 U.S.C. 1538. Information regarding the location of endangered and threatened species and guidance on what activities constitute a "take" are available from the U.S. Fish and Wildlife Service at www.fws.gov.

N. State or Tribal Law. [Pursuant to A.A.C. R18-9-A904(C)] Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the operator from any responsibilities, liabilities, or penalties established pursuant to any applicable State or Tribal law or regulation under authority preserved by Section 510 of the Clean Water Act.

O. Severability. The provisions of this general permit are severable, and if any provision of this general permit, or the application of any provision of this general permit to any circumstance, is held invalid, the application of the provision to other circumstances, and the remainder of this general permit shall not be affected.

P. Upset. [A.R.S. §§ 49-255(8) and 255.01(E), A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(n)]

1. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the operator. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

2. Effect of an Upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph (3) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

3. Conditions Necessary for a Demonstration of Upset. An operator who wishes to establish the affirmative defenses of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that operator can identify the cause(s) of the upset;
   b. The permitted facility was at the time being properly operated; and

c. The operator submitted notice of the upset as required in paragraph (K)(2)(4)(24-hour notice).

d. The operator has taken appropriate measure including all reasonable steps to minimize or prevent any discharge or sewage sludge use or disposal that is in violation of the permit and that has a reasonable likelihood of adversely affecting human health or the environment per A.R.S. § 49-255.01(E)(1)(d).

4. Burden of Proof. In any enforcement proceeding the operator seeking to establish the occurrence of an upset has the burden of proof.

Q. Bypass. [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41 (m)]

1. Definitions.
   a. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.
   b. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production,

2. Bypass not Exceeding Limitations. The operator may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of paragraphs (3) and (4) of this section.

3. Notice.
   a. Anticipated bypass. If the operator knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of bypass.
   b. Unanticipated bypass. The operator shall submit notice of an unanticipated bypass as required in paragraqph (f)(2) of section 13 (24-hour notice).

4. Prohibition of Bypass. Bypass is prohibited, and the Director may take enforcement action against an operator for bypass, unless:
   a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
   b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment down time. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
   c. The operator submitted notices as required under paragraph (3) of this section.

   The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above.

PART IX. PENALTIES FOR VIOLATIONS OF PERMIT CONDITIONS

Any permit noncompliance constitutes a violation and is grounds for an enforcement action, permit termination, revocation and reissuance, modification, or denial of a permit renewal application.

A. **Civil Penalties.** A.R.S. § 49-262(C) provides that any person who violates any provision of A.R.S. Title 49, Chapter 2, Article 2, 3 or 3.1 or a rule, permit, discharge limitation or order issued or adopted under A.R.S. Title 49, Chapter 2, Article 3.1 is subject to a civil penalty not to exceed $25,000 per day per violation.

B. **Criminal Penalties.** Any a person who violates a condition of this general permit, or violates a provision under A.R.S. Title 49, Chapter 2, Article 3.1, or A.A.C. Title 18, Chapter 2, Articles 9 and 10 is subject to the enforcement actions established under A.R.S. Title 49, Chapter 2, Article 4, which may include the possibility of fines and/or imprisonment.

PART X. DEFINITIONS

"24 hour period" means any consecutive 24-hour period.

"Anticipated rain event" for the purpose of this permit, means any storm event with at least a 30% chance of precipitation as predicted by the National Weather Service for the area local to the construction site.

"Arid areas" for purposes of this permit, means the parts of the state that receive an annual rainfall of less than 20 inches.

"Best management practices" (BMPs) means those methods, measures or practices to prevent or reduce discharges and includes structural and nonstructural BMPs and operation and maintenance procedures. Best management practices may be applied before, during and after discharges to reduce or eliminate the introduction of pollutants into receiving waters. In addition, the term shall include erosion and sediment control BMPs, stormwater conveyance, stormwater diversion, and treatment structures, and any procedure or facility used to minimize the exposure of pollutants to stormwater or to remove pollutants from stormwater.

"Business day" means Monday through Friday, except legal holidays observed by the state of Arizona.

"Commencement of construction activities" means the initial disturbance of soils associated with clearing, grading, excavating, or stockpiling of fill material activities or other construction-related activities.

"Common plan of development" means a contiguous area where multiple separate and distinct land disturbing activities may be taking place at different times, on different schedules, but under one proposed plan. A 'plan' is broadly defined to include design, permit application, advertisement or physical demarcation indicating that land-disturbing activities may occur.

"Construction activity" includes clearing, grading, excavating, stockpiling of fill material and other similar activities resulting in a land disturbance of at least one acre. Construction activity also includes clearing, grading, stockpiling, etc. that occurs in smaller areas if part of a larger common plan of development or sale that will ultimately disturb one or more acres,. This definition encompasses both large construction activities defined in 40 CFR 122.26 (b)(14)(x) and small constructions activities in 40 CFR 122.26 (b)(15)(i).

"Day" means a calendar day or any 24-hour period that reasonably represents the calendar day.

"Department" means the Arizona Department of Environmental Quality.

"Discharge" means any addition of any pollutant to waters of the United States or to a MS4 from any point source.

"Drought" means for purposes of this permit, weather conditions considered "severely" or "extremely" dry (i.e., has a value of -1.50 or less) as evaluated by the 3-month Standardized Precipitation Index (SPI) which compares current cumulative precipitation to average conditions.

"Eligible" means authorization to discharge stormwater under this general permit.

"Ephemeral" means a surface water that has a channel that is at all times above the water table, and that flows only in direct response to precipitation. [A.A.C. R18-11-101(22)]

"Erosion control" means temporary or permanent measures to prevent soil particles from detaching and being transported in stormwater.

"Impaired water" means waters that have been assessed by ADEQ, under the Clean Water Act, Section 303(d), as not attaining a water quality standard for at least one designated use, and are listed in Arizona's 2004 303(d) List and Other Impaired Waters.

"Municipal separate storm sewer" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

i. Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or a designated and approved management agency under section 208 of the Clean Water Act (33 U.S.C. 1288) that discharges to waters of the United States;
ii. Designed or used for collecting or conveying stormwater;
iii. Which is not a combined sewer; and
iv. Which is not part of a Publicly Owned Treatment Works.

"Municipal separate storm sewer system" (MS4) means all separate storm sewers defined as "large," "medium," or "small" municipal separate storm sewer systems or any municipal separate storm sewers on a system-wide or jurisdiction-wide basis as determined by the Director under A.A.C. R18-9-C902(A)(1)(g)(i) through (iv). [A.A.C. R18-9-A901(23)]. This also includes similar systems owned or operated by separate storm sewer municipal jurisdictions not required to obtain stormwater discharge authorization.

"Notice of Intent" (NOI) means the application to operate under this general permit.

"Notice of Termination" (NOT) means the application to terminate coverage under this general permit.

"Person" means an individual, employee, officer, managing body, trust, firm, joint stock company, consortium, public or private corporation, including a government corporation, partnership, association or state, a political subdivision of this state, a commission, the United States government or any federal facility, interstate body or other entity. [A.R.S. § 49-201(27)]

"Pollutant" means sediment, fluids, contaminants, toxic wastes, toxic pollutants, dredged spoil, solid waste, substances and chemicals, pesticides, herbicides, fertilizers and other agricultural chemicals, incinerator residue, sewage, garbage, sewage sludge, munitions, petroleum products, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt (e.g., overburden material), and mining, industrial, municipal and agricultural wastes or any other liquid, solid, gaseous or hazardous substances. [A.R.S. § 49-201(29)]

"Rain event" as used in this permit is defined as when rain drops (ultimately resulting in 0.5 inch accumulation) reach the ground surface of the construction site. Separate rain events are distinguished by a 24 hour period of no rain reaching the ground surface of the construction site.

"Received," for the purposes of this permit and in reference to NOIs or NOTs or Permit Waiver Certificate forms means:

1. The day the information was signed electronically via the Smart NOI system and submitted to ADEQ,

2. The day the signed form was faxed to and received by ADEQ,
3. The date of hand-delivery of the signed form to ADEQ, or
4. The date ADEQ signs for certified mail containing the signed form.

“Receiving Water” as used in this permit includes Waters of the U.S. and conveyances thereto (including MS4s).

"Reclaimed water" means water that has been treated or processed by a wastewater treatment plant or an on-site wastewater treatment facility. A.R.S. § 49-201(31).

“Sediment control” means measures designed to intercept and settle out soil particles that have become detached and transported by water. Sediment control measures complement soil stabilization measures (erosion control).

“Stabilization” refers to covering or maintaining an existing cover over soil that reduces and minimizes erosion.

“Stormwater” means stormwater runoff, snow melt runoff, and surface runoff and drainage.

“Stormwater Pollution Prevention Plan” (SWPPP) means a plan which includes narrative information describing how requirements in Permit Parts III through VIII, are met, site map(s), an identification of construction/contractor activities that could cause pollutants in the stormwater, and a description of measures or practices to control these pollutants.

“Total Maximum Daily Load” (TMDL) means an estimation of the total amount of a pollutant from all sources that may be added to a water while still allowing the water to achieve and maintain applicable surface water quality standards. Each total maximum daily load shall include allocations for sources that contribute the pollutant to the water, as required by section 303(d) of the clean water act (33 United States Code, Section 1313(d)) and regulations implementing that statute to achieve applicable surface water quality standards. [A.R.S. § 49-231(4)]

“Turbidity” means the clarity of water expressed as nephelometric turbidity units (NTU) and measured with a calibrated turbidimeter.

“Unique water” means a surface water that has been designated by ADEQ as an outstanding state resource under A.A.C. R18-11-112. ADEQ anticipates that the term ‘unique water’ will be replaced with ‘outstanding Arizona water’ within the permit term.

“Waters of the United States” (U.S.) is defined in 40 CFR 122.2.

“Wetland” means an area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. A wetland includes a swamp, marsh, bog, cienega, tinaja, and similar areas. [A.A.C. R18-11-101(49)]

PART XI. ACRONYMS

AAC- Arizona Administrative Code

ADEQ - Arizona Department of Environmental Quality

ARS - Arizona Revised Statute

AZPDES - Arizona Pollutant Discharge Elimination System

BMP - Best Management Practice

CFR - Code of Federal Regulations

CWA - Clean Water Act

DMR - Discharge Monitoring Report

EPA - Environmental Protection Agency

MS4 - Municipal Separate Storm Sewer System

NOI - Notice of Intent

NOT - Notice of Termination

NPDES - National Pollutant Discharge Elimination System

SWPPP - Stormwater Pollution Prevention Plan

TMDL - Total Maximum Daily Load

USGS - United States Geological Survey

Appendix A
Example Inspection Form

Example Sample Inspection Report

Instructions

This sample inspection report has been developed as a helpful tool to aid you in completing your site inspections. It is provided in Microsoft Word format to allow you to easily customize it for your use and the conditions at your site. You should also customize this form to help you meet the requirements in the AZPDES Construction General Permit related to inspections.

Refer to Permit Part IV.H for inspection requirements. Remember to include all areas of the site disturbed by construction activity. If a BMP has been used inappropriately or installed incorrectly, replace or modify the BMP for site situations as soon as practicable and before the next anticipated storm event. When sediment escapes the construction site, offsite accumulations of sediment must be removed at a frequency sufficient to ensure no adverse effects on water quality.

Using the Inspection Report
This inspection report is designed to be customized according to the BMPs and conditions at your site. For ease of use, you should take a copy of your site plan and number all of the stormwater BMPs and areas of your site that will be inspected. A brief description of the BMP and its location should then be listed in the site-specific section of the inspection report. For example, specific structural BMPs such as construction site entrances, sediment ponds, or specific areas with silt fence (e.g., silt fence along Main Street; silt fence along slope in NW corner, etc.) should be numbered and listed on the inspection form. You should also number specific non-structural BMPs or areas that will be inspected (such as trash areas, material storage areas, temporary sanitary waste areas, etc).

You can complete the items in the “General Information” section that will remain constant, such as the project name, AZCON authorization number, and inspector’s name and qualifications. Print out multiple copies of this customized inspection report to use during your inspections.

When conducting the inspection, walk the site by following your site map and numbered BMPs/areas for inspection. Note any required corrective actions and the date and responsible person for the correction. Also note whether any previously identified site issues have been addressed.

AZCON- _____ Inspection Date: _____

Stormwater Construction Site Inspection Report

General Information			
Project Name			
Location			
AZCON number			
Date of Inspection		**Start Time:**	**End time:**
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Qualifications	**(must attach to this report or indicate the portion of the SWPPP that documents the qualifications of the inspector by name)**		
Describe present phase of construction			
Type of Inspection **❑ Weekly ❑ Bi-weekly ❑ Monthly** **❑ Pre-storm event ❑ During storm event ❑ Post-storm event**			
Weather Information			
Has it rained since the last inspection? ❑Yes ❑No **Weather information/Time Elapsed since last inspection:** **Storm Start Date & Time: Storm Duration (hrs): Approximate Rainfall (in):**			
Weather at time of this inspection?			
Do you suspect that discharges may have occurred since the last inspection? ❑Yes ❑No			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, provide location(s) and a description of stormwater discharged from the site (presence of suspended sediment, turbid water, discoloration, and/or oil sheen**			
Non-Stormwater Discharges			
Identify all non-stormwater discharges (i.e. water, other than stormwater, directed to a watercourse, storm drain, or off of the construction site):			

AZCON- _____ Inspection Date: _____

Site-specific BMPs

Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below. ***Include all BMPs implemented to manage erosion, sediment transport, waste disposal, material and equipment storage areas, and non-stormwater discharges.*** *Carry a copy of this numbered site map with you during your inspections. This list will help ensure that you are inspecting all BMPs at your site. Customize this section as needed.*

	BMP Description and Location (indicate if associated with non-stormwater)	BMP Installed and Operating Properly?	Corrective Action Needed	Date for corrective action/responsible person	Corrective Action Implementation Date
1		❑Yes ❑No			
2		❑Yes ❑No			
3		❑Yes ❑No			
4		❑Yes ❑No			
5		❑Yes ❑No			
6		❑Yes ❑No			
7		❑Yes ❑No			
8		❑Yes ❑No			
9		❑Yes ❑No			
10		❑Yes ❑No			
11		❑Yes ❑No			
12		❑Yes ❑No			
13		❑Yes ❑No			
14		❑Yes ❑No			
15		❑Yes ❑No			
16		❑Yes ❑No			
17		❑Yes ❑No			
18		❑Yes ❑No			
19		❑Yes ❑No			
20		❑Yes ❑No			

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

Overall Site Issues

	BMP/Activity	Implemented?	Maintained?	Location/Corrective Action	Date for corrective action/responsible person	Corrective Action Implementation Date
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No			
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No			
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No			
4	Are discharge points and receiving waters free of sediment deposits? **If no, provide locations**	❑Yes ❑No	❑Yes ❑No			

AZCON- _____ **Inspection Date:** _____

5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No			
6	Is there evidence of sediment being tracked into the street?	❑Yes ❑No	❑Yes ❑No			
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No			
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No			
9	Are vehicle and equipment fueling, cleaning, material storage, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No			
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No			
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No			
12	Are there locations where additional BMPs are necessary?	❑Yes ❑No	❑Yes ❑No			
13	Are changes to the SWPPP necessary?	❑Yes ❑No	❑Yes ❑No			
14	(Other)		❑Yes ❑No			

❑ If there were no incidents of noncompliance noted during the inspection the inspector certifies that the construction project or site is being operated in compliance with the SWPPP and Permit No. AZG2008-001.

Certification statement:
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print Inspector's Name: _____

Signature: _____

Date: _____

Appendix C. NOI and Acknowledgement Letter from EPA/State

Appendix D. Inspection Reports

Inspection Report Instructions

This inspection report has been developed as a helpful tool to aid you in completing your site inspections. This sample inspection report was created consistent with EPA's Developing Your Stormwater Pollution Prevention Plan. You can find both the guide and the sample inspection report (formatted in Microsoft Word) at www.epa.gov/npdes/swpppguide

Using the Inspection Report
This inspection report is designed to be customized according to the BMPs and conditions at your site. For ease of use, you should take a copy of your site plan and number all of the stormwater BMPs and areas of your site that will be inspected. A brief description of the BMP or area should then be listed in the site-specific section of the inspection report. For example, specific structural BMPs such as construction site entrances, sediment ponds, or specific areas with silt fence (e.g., silt fence along Main Street; silt fence along slope in NW corner, etc.) should be numbered and listed. You should also number specific non-structural BMPs or areas that will be inspected (such as trash areas, material storage areas, temporary sanitary waste areas, etc).

You can complete the items in the "General Information" section that will remain constant, such as the project name, AZPDES authorization number, and inspector's name and qualifications. Print out multiple copies of this customized inspection report to use during your inspections.

When conducting the inspection, walk the site by following your site map and numbered BMPs/areas for inspection. Also note whether the overall site issues have been addressed. Note any required corrective actions and the date and responsible person for the correction in the Corrective Action Log.

Stormwater Construction Site Inspection Report

General Information			
Project Name			
AZDPES Authorization No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			

Type of Inspection: ❑ Weekly ❑ Bi-weekly ❑ Monthly
❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event

Weather Information

Has there been a storm event since the last inspection? ❑Yes ❑No
If yes, provide:
Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):

Weather at time of this inspection?
❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds
❑ Other: Temperature:

Do you suspect any discharges have occurred since the last inspection? ❑Yes ❑No
If yes, describe:

Are there any discharges at the time of inspection? ❑Yes ❑No
If yes, describe:

Identify all non-stormwater discharges (i.e. water, other than stormwater, directed to a watercourse, storm drain, or off of the construction site):

Site-specific BMPs

Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below. ***Include all BMPs implemented to manage erosion, sediment transport, waste disposal, material and equipment storage areas, and non-stormwater discharges.*** *Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1		❑Yes ❑No	❑Yes ❑No	
2		❑Yes ❑No	❑Yes ❑No	
3		❑Yes ❑No	❑Yes ❑No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
4		❑Yes ❑No	❑Yes ❑No	
5		❑Yes ❑No	❑Yes ❑No	
6		❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	
8		❑Yes ❑No	❑Yes ❑No	
9		❑Yes ❑No	❑Yes ❑No	
10		❑Yes ❑No	❑Yes ❑No	
11		❑Yes ❑No	❑Yes ❑No	
12		❑Yes ❑No	❑Yes ❑No	
13		❑Yes ❑No	❑Yes ❑No	
14		❑Yes ❑No	❑Yes ❑No	
15		❑Yes ❑No	❑Yes ❑No	
16		❑Yes ❑No	❑Yes ❑No	
17		❑Yes ❑No	❑Yes ❑No	
18		❑Yes ❑No	❑Yes ❑No	
19		❑Yes ❑No	❑Yes ❑No	
20		❑Yes ❑No	❑Yes ❑No	

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
6	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
7	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
8	Are materials that are potential stormwater	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
	contaminants stored inside or under cover?			
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

☐ If there were no incidents of noncompliance noted during the inspection, the inspector certifies that the construction project or site is being operated in compliance with the SWPPP and Permit No. AZG2008-001

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature:_____ Date:_____

Appendix E. Corrective Action Log

Project Name: _____
SWPPP Contact: _____

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

Appendix F. Stormwater Pollution Prevention Plan Amendment Log

Project Name: _____
SWPPP Contact: _____

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Appendix G. Subcontractor Certifications/Agreements

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the BMPs and practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date:

Appendix H. Grading and Stabilization Activities Log

Project Name: _____
SWPPP Contact: _____

Date Grading Activity Initiated	Description of Grading Activity	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures are Initiated	Description of Stabilization Measure and Location

Appendix I. Stormwater Pollution Prevention Plan Training Log

Project Name:

Project Location:

Instructor's Name(s):

Instructor's Title(s):

Course Location: _____ Date: _____

Course Length (hours): _____

Stormwater Training Topic: *(check as appropriate)*

- ❑ Erosion Control BMPs
- ❑ Sediment Control BMPs
- ❑ Non-Stormwater BMPs
- ❑ Emergency Procedures
- ❑ Good Housekeeping BMPs

Specific Training Objective:_____

_____

Attendee Roster: *(attach additional pages as necessary)*

No.	Name of Attendee	Company
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Appendix J. Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix G, Subsection 11.A of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix G, Subsection 11.B (1-3).

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

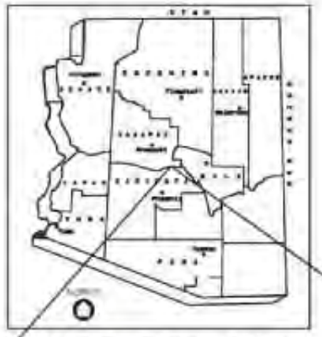
Signature: _____

Date: _____

Appendix D. Grading, Excavation, Water Control Structure Plan and Construction Photos

BLACK CANYON RIPARIAN RESTORATION PROJECT

Arizona Water Protection Fund
Grant No. 09-171WPF



LOCATION MAP

Arizona, Gila & Salt River Meridian
NW1/4, Sec.3, T8N,R2E (Black Canyon City Quadrangle)
Black Canyon City, Yavapai County, Arizona

Project Manager:
Arizona Water Protection Fund
Arizona Department of Water Resources
3550 North Central Avenue
Phoenix, AZ 85012
Phone: 602-771-8531

Landowner:
Black Canyon City Community Association
P.O. Box 33
19055 e. K-Mine Road
Black Canyon City, AZ 85324
Phone: 623-374-5553

Project Coordinator/Designer:
Fred Phillips Consulting, LLC.
9730 N. Rosewood Drive
Flagstaff, AZ 86004
Phone: 928-773-1530

Fred Phillips Consulting

Project Engineer:
Natural Channel Design, Inc.
206 S. Elden Street
Flagstaff, AZ 86001
Phone: 928-774-2336

Natural Channel Design, Inc

Project Associates:
National Park Service
Rivers, Trails & Conservation Assistance Program
255 N. Commerce Park Loop
Tuscon, AZ 85745

Ancon Associates, Inc.
1338 E. Indigo Circle
Mesa, AZ 85203
Phone: 480-969-0150

INDEX OF DRAWINGS

MATERIAL LIST

GENERAL
1.) (1 L.S.) MOBILIZE AND DE-MOBILIZE EQUIPMENT
2.) (1 L.S.) PREPARE SITE
3.) (1 L.S.) SUPPLY AND INSTALL SWPPP BMP'S

CONSTRUCT STREAM & POOL SYSTEM (0+00 TO 2+50)
4.) (300 C.Y.) EXCAVATE AND SCREEN NATIVE MATERIALS
5.) (5,200 S.F.) FURNISH AND INSTALL POND LINER
6.) (210 C.Y.) PLACE MISCELLANEOUS FILL
7.) (6 EA.) CONSTRUCT WATERFALL FEATURE
8.) (1 EA.) CONSTRUCT SPRING FEATURE

CONSTRUCT WETLAND CHANNEL SYSTEM (2+50 TO 5+15)
9.) (560 C.Y.) EXCAVATE AND SCREEN NATIVE MATERIALS
10.) (9,080 S.F.) FURNISH AND INSTALL POND LINER
11.) (870 C.Y.) PLACE MISCELLANEOUS FILL
12.) (1 EA.) FURNISH AND INSTALL WATER CONTROL STRUCTURE (WCS)

RE-CONTOUR EXISTING POND (5+15 TO 8+50)
13.) (2,650 C.Y.) EXCAVATE AND SCREEN NATIVE MATERIALS
14.) (37,270 S.F.) FURNISH AND INSTALL POND LINER
15.) (2,570 C.Y.) PLACE MISCELLANEOUS FILL
16.) (50 C.Y.) FURNISH AND PLACE AGGREGATE BASE FOR FOOT TRAIL

CALL TWO WORKING DAYS BEFORE YOU DIG
263-1100
1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

NO REPRESENTATION IS MADE AS TO THE EXISTENCE OR NON-EXISTENCE OF ANY UTILITIES, PUBLIC OR PRIVATE. ABSENCE OF UTILITIES ON THESE DRAWINGS IS NOT ASSURANCE THAT NO UTILITIES ARE PRESENT. THE EXISTENCE, LOCATION AND DEPTH OF ANY UTILITY MUST BE DETERMINED BY THE CONTRACTOR PRIOR TO ANY EXCAVATION. CALL BEFORE YOU DIG, 1-800-STAKE-IT

Natural Channel Design, Inc

Fred Phillips Consulting

DRAWN BY: M.Wirtanen, R.Lyman
DESIGNED BY: G.Cathey, M.Wirtanen, F.Phillips

REV	DATE	BY	REVISION

COVER SHEET: LOCATION, DRAWING INDEX & MATERIAL LIST

Black Canyon Riparian Restoration Project
Black Canyon City, AZ

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 26889
STEPHANIE N. YARD
Date Signed
ARIZONA, U.S.A.

Expires 3-31-2011

FILE NAME: Black Canyon.Pro
DATE: 1-29-10
PROJECT NO: 09-158AZ
SHEET: 1 of 7

Survey Notes:
- Topographic information used for the design was obtained from field data surveyed by Natural Channel Design. All units are in Feet.
- Parcel lines shown on this sheet are approximate only, and do not represent the results of a boundary survey.

Point #	Northing	Easting	Elev.	Description
CP1	1117008.56	629019.98	1000.00	1/2" Rebar, Yellow NCD Cap
CP2	1116834.89	628943.56	1001.38	1/2" Rebar, Yellow NCD Cap
CP3	1117280.67	628890.10	1002.08	1/2" Rebar, Yellow NCD Cap
CP4	1117002.13	629499.16	1003.01	1/2" Rebar, Yellow NCD Cap
CP5	1117202.23	629637.44	1007.90	1/2" Rebar, Yellow NCD Cap

Adjacent Landowners:

1. Deborah Ann Sewder
   19061 E. Palm Lane 85324
   Phone: 623-374-9123
2. Linda Tomecsko
   19081 E. Palm Lane 85324
3. Richard & Eleanor Borg
   19101 E. Palm Lane 85324
   Phone: 623-374-5611

Adjacent Parcel Lines (approximate)
Existing Fence
Power Pole
Existing Deciduous
Existing Pine
Control Point

CALL TWO WORKING DAYS BEFORE YOU DIG
263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

Natural Channel Design, Inc
Fred Phillips Consulting

DRAWN BY: M.Wirtanen, R.Lyman
DESIGNED BY: G.Cathey, M.Wirtanen, F.Phillips

REV	DATE	BY	REVISION

OVERALL PROJECT SITE: EXISTING CONDITIONS & CONTROL POINTS

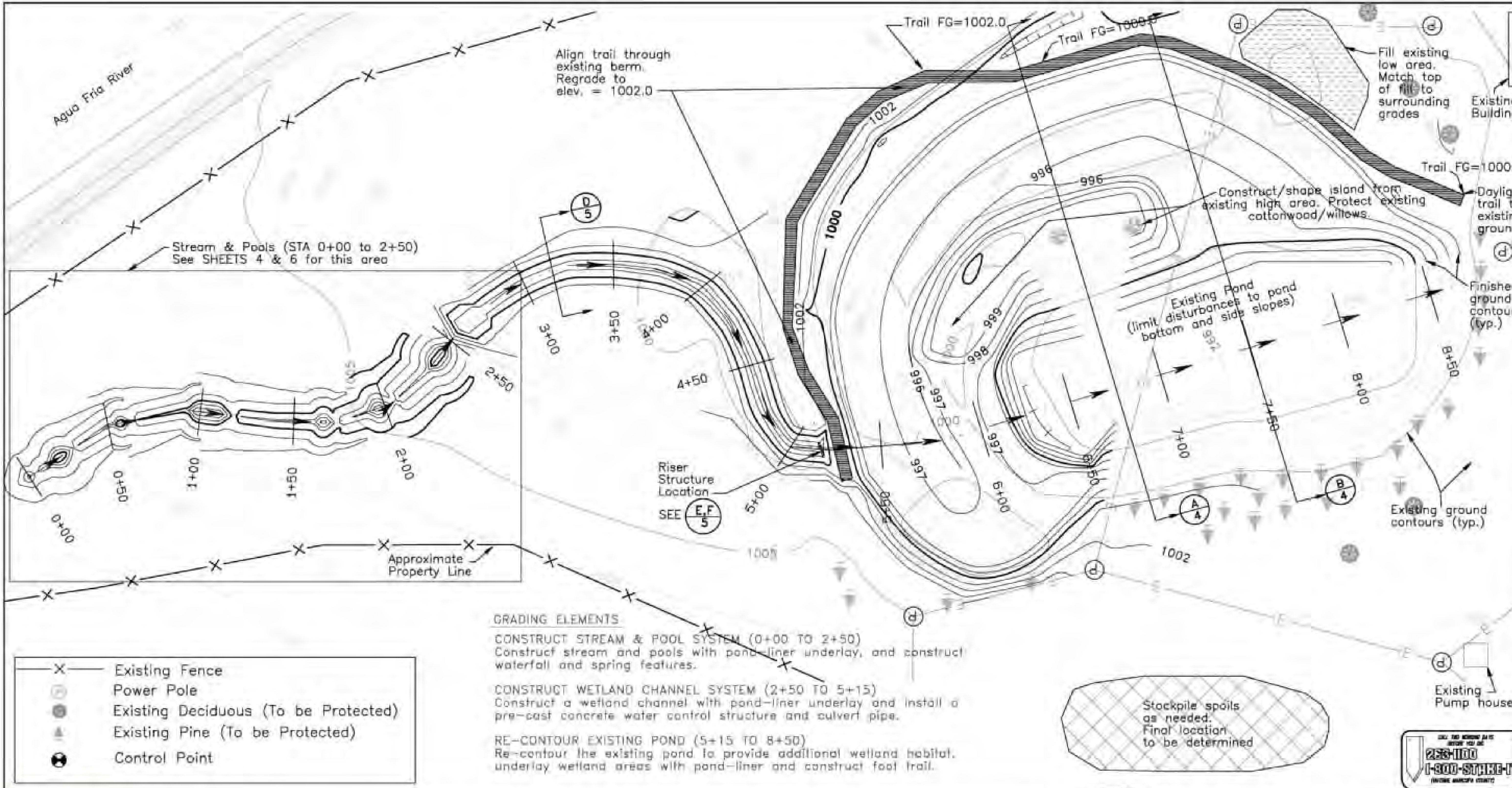
Black Canyon Riparian Restoration Project
Black Canyon City, AZ

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 26889 STEPHANIE N. YARD Date Signed 1-29-10 ARIZONA, U.S.A.
Expires 3-31-2011

HORIZ SCALE: 1" = 100'
Contour Interval = 1 ft
100 0 100

N W E S

FILE NAME: Black Canyon.Pro
DATE: 1-29-10
PROJECT NO: 09-168AZ
SHEET: 2 of 7



GRADING ELEMENTS

CONSTRUCT STREAM & POOL SYSTEM (0+00 TO 2+50)
Construct stream and pools with pond-liner underlay, and construct waterfall and spring features.

CONSTRUCT WETLAND CHANNEL SYSTEM (2+50 TO 5+15)
Construct a wetland channel with pond-liner underlay and install a pre-cast concrete water control structure and culvert pipe.

RE-CONTOUR EXISTING POND (5+15 TO 8+50)
Re-contour the existing pond to provide additional wetland habitat, underlay wetland areas with pond-liner and construct foot trail.

Symbol	Legend
—X—	Existing Fence
	Power Pole
	Existing Deciduous (To be Protected)
	Existing Pine (To be Protected)
	Control Point

Natural Channel Design, Inc

Fred Phillips Consulting

DRAWN BY: M.Wirtanen, R.Lyman

DESIGNED BY: G.Cathey, M.Wirtanen, F.Phillips

REV	DATE	BY	REVISION

PROJECT GRADING PLAN

Black Canyon Riparian Restoration Project
Black Canyon City, AZ

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 26889 STEPHANIE N. YARD ARIZONA, U.S.A.
Expires 3-31-2011

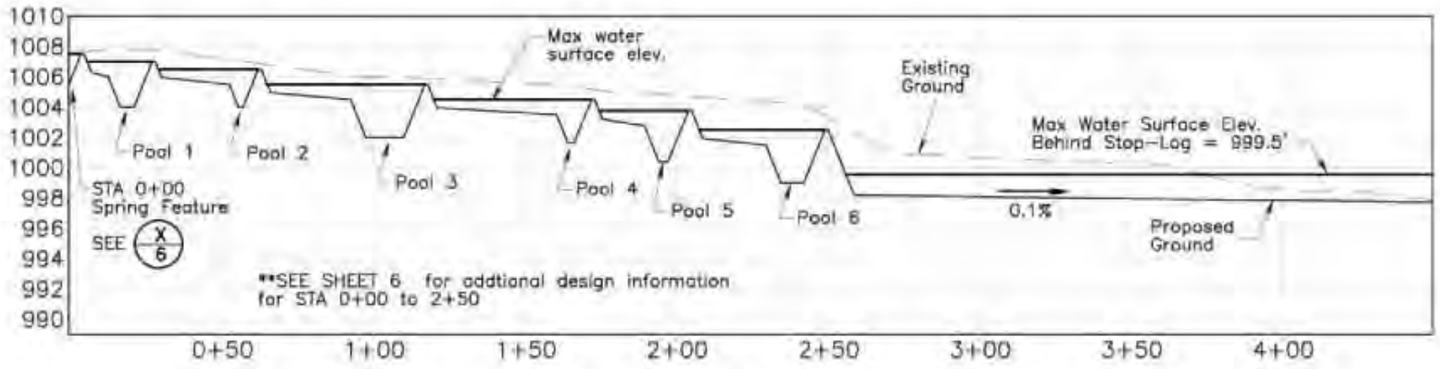
HORIZ SCALE: 1" = 50'
Contour Interval = 1'
50 0 50

FILE NAME: Black Canyon.Pro

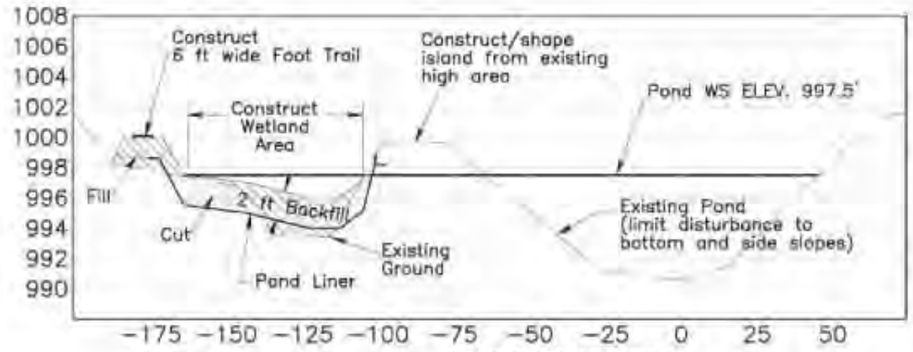
DATE: 1-29-10

PROJECT NO: 09-158AZ

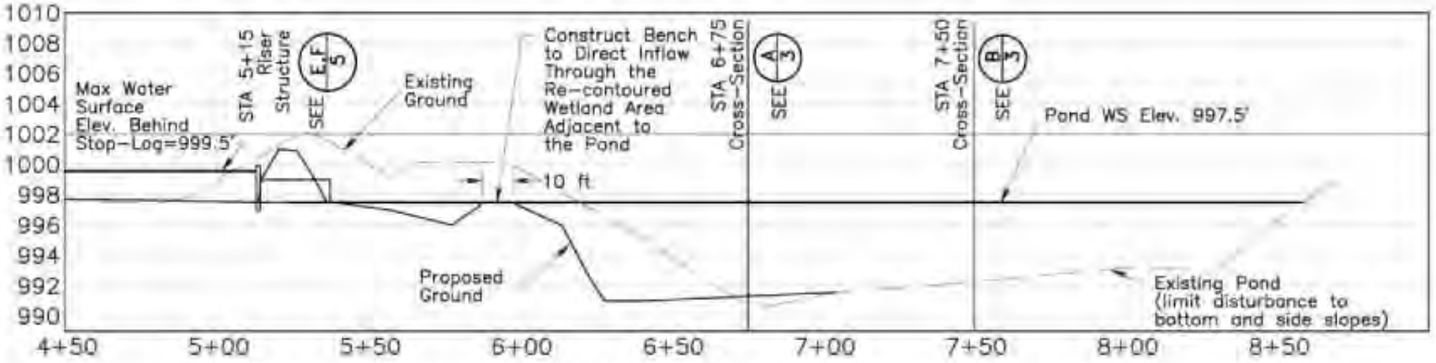
SHEET: 3 of 7



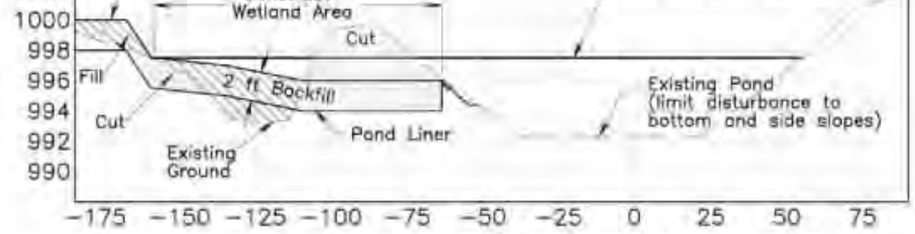
PROJECT PROFILE: STA 0+00 to 4+50
* Pond liner not shown for clarity



POND RE-CONTOURING CROSS-SECTION STATION 6+75 (A / 3)



PROJECT PROFILE: STA 4+50 to 8+50
* Pond liner not shown for clarity



POND RE-CONTOURING CROSS-SECTION STATION 7+50 (B / 3)

Natural Channel Design, Inc

Fred Phillips Consulting

DRAWN BY: M.Wirtanen, R.Lyman

DESIGNED BY: G.Cathey, M.Wirtanen, F.Phillips

REV	DATE	BY	REVISION

PROJECT PROFILE & POND RE-CONTOURING CROSS-SECTIONS

Black Canyon Riparian Restoration Project
Black Canyon City, AZ

REGISTERED PROFESSIONAL ENGINEER — CERTIFICATE NO. 26889 — STEPHANIE N. YARD — Date Signed — ARIZONA, U.S.A.

Expires 3-31-2011

HORIZ SCALE: 1" = 50'
VERT SCALE: 1" = 10'

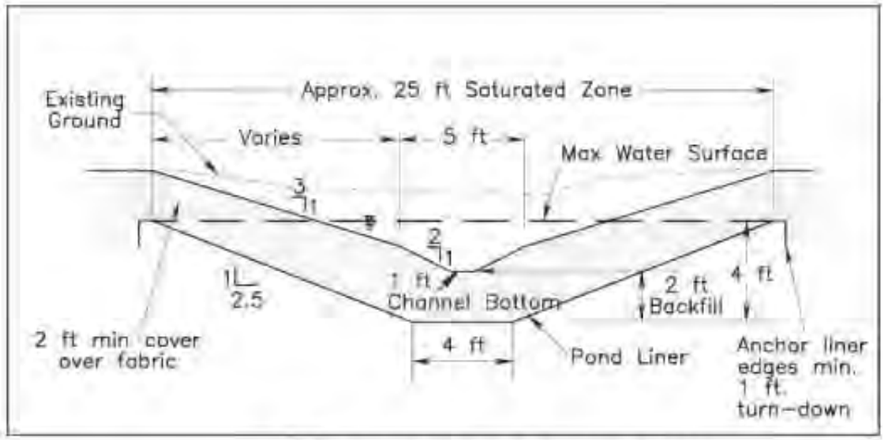
50 0 50

FILE NAME: Black Canyon.Pro

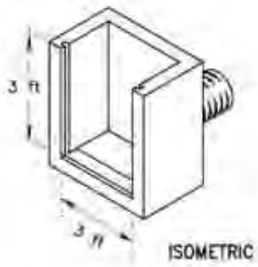
DATE: 1-29-10

PROJECT NO: 09-168AZ

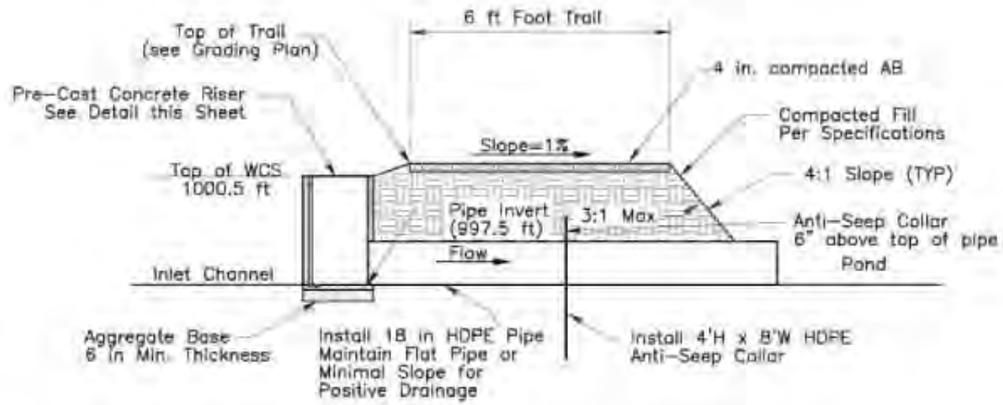
SHEET: 4 of 7



D / 3 **TYPICAL WETLAND CHANNEL SECTION**
STA 2+50 to 5+15 (not to scale)



E / 3 **TYPICAL DETAIL**
PRECAST CONCRETE RISER (not to scale)



F / 3 **TYPICAL SECTION**
PRECAST CONCRETE (not to scale)
STRUCTURE & FOOT TRAIL

Natural Channel Design, Inc

Fred Phillips Consulting

DRAWN BY: M.Wirtanen, R.Lyman

DESIGNED BY: G.Cathey, M.Wirtanen, F.Phillips

REV	DATE	BY	REVISION

WETLAND CHANNEL, RISER STRUCTURE & FOOT TRAIL CROSS SECTIONS

Black Canyon Riparian Restoration Project
Black Canyon City, AZ

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 26889 STEPHANIE N. YARD Date Signed ARIZONA, U.S.A.

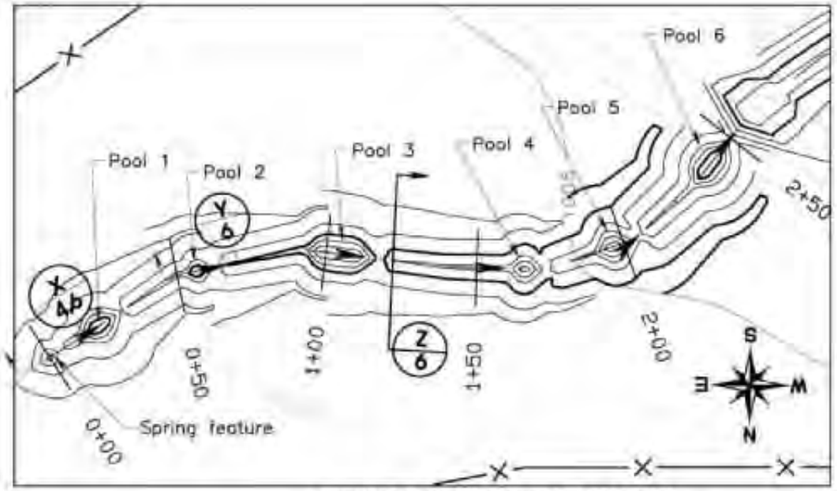
Expires 3-31-2011

FILE NAME: Black Canyon.Pro

DATE: 1-29-10

PROJECT NO: 09-158AZ

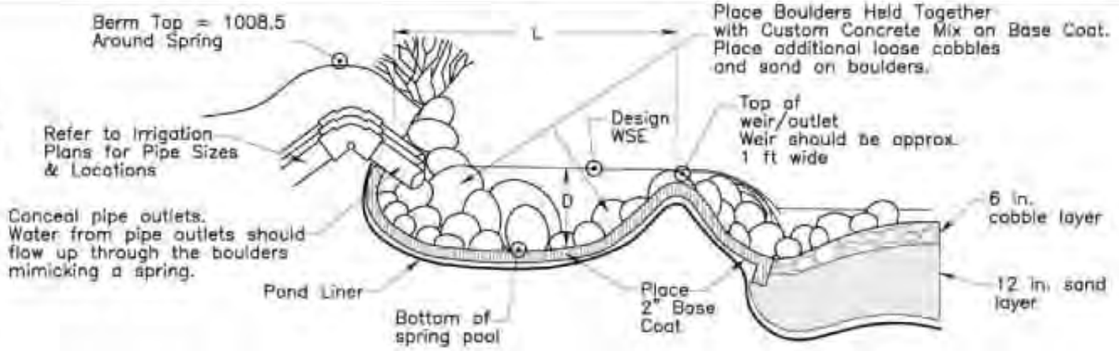
SHEET: 5 of 7



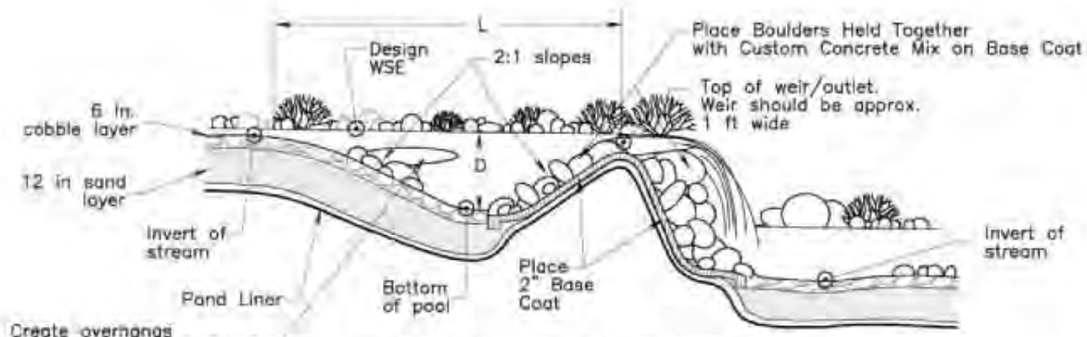
STREAM & POOL SYSTEM PLAN VIEW
STA 0+00 to 2+50 (1" = 50' scale)

1. SEE SHEET 4 for Profile of this section
2. SEE table below for detailed construction data

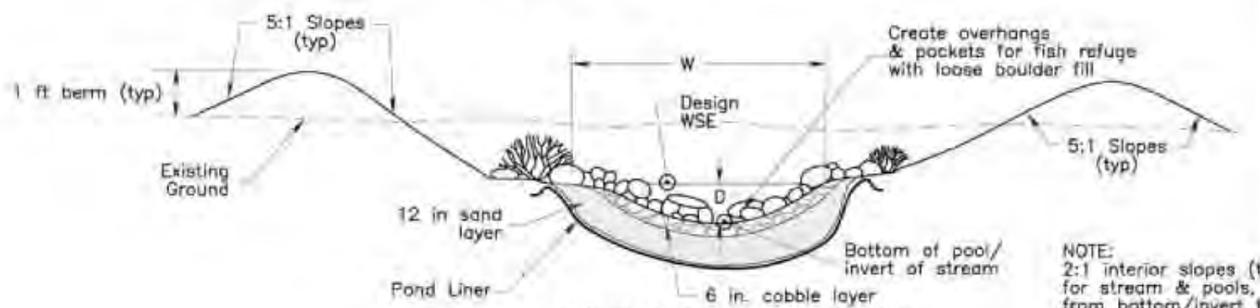
The Stream & Pool System design and layout shown here is based on information and sketches provided by Ancon Associates, Inc.



X / 4.6 **Spring Feature**
(not to scale)



Y / 6 **Typical Stream & Pool Profile Detail**
(not to scale)



Z / 6 **Typical Stream & Pool Section**
(not to scale)

NOTE:
2:1 interior slopes (typ) for stream & pools, from bottom/invert to waterline

DESCRIPTION	BEGIN STA	END STA	LENGTH (L) (FT)	WIDTH (W) (FT)	DEPTH (D) (FT)	DESIGN WSE	POOL DATA: BOTTOM OF POOL	POOL DATA: TOP OF WEIR/OUTLET	STREAM DATA: BEGIN INVERT	STREAM DATA: END INVERT
SPRING	-0+04	0+04	8.0	8.0	2.0	1007.5	1005.5	1007.3		
STREAM	0+07.5	0+13	5.5	2.8 - 4.0	0.7 - 1.0	1007.0			1006.3	1006.0
POOL 1	0+13	0+27.5	14.5	12.0	3.0	1007.0	1004.0	1006.8		
STREAM	0+30.5	0+53.0	22.5	2.4 - 4.0	0.6 - 1.0	1006.5			1005.9	1005.5
POOL 2	0+53.0	0+62.5	9.5	10.0	2.5	1006.5	1004.0	1006.3		
STREAM	0+66.5	0+93	26.5	2.4 - 4.0	0.6 - 1.0	1005.5			1004.9	1004.5
POOL 3	0+93	1+17.5	24.5	14.0	3.5	1005.5	1002.0	1005.3		
STREAM	1+21.5	1+61	39.5	2.0 - 4.0	0.5 - 1.0	1004.5			1004.0	1003.5
POOL 4	1+61	1+72.5	11.5	11.5	2.9	1004.5	1001.6	1004.3		
STREAM	1+76	1+90	14.0	2.4 - 4.0	0.6 - 1.0	1003.8			1003.2	1002.8
POOL 5	1+90	2+04.5	14.5	13.5	3.4	1003.8	1000.4	1003.6		
STREAM	2+09	2+30	21.0	2.4 - 4.0	0.6 - 1.0	1002.5			1001.9	1001.5
POOL 6	2+30	2+49.5	19.5	14.0	3.5	1002.5	999.0	1002.3		

Stream & Pool System Table*

* Dimensions and elevations are approximate. Adding slight variations to the lines and grades is encouraged to mimic natural channel features.

Natural Channel Design, Inc

Fred Phillips Consulting

DRAWN BY: M.Wirtanen, R.Lyman

DESIGNED BY: G.Cathey, M.Wirtanen, F.Phillips

REV	DATE	BY	REVISION

STREAM & POOL SYSTEM CROSS SECTIONS & DETAILS

Black Canyon Riparian Restoration Project
Black Canyon City, AZ

REGISTERED PROFESSIONAL ENGINEER — CERTIFICATE NO. 26889 — STEPHANIE N. YARD — Date Signed — ARIZONA, U.S.A.

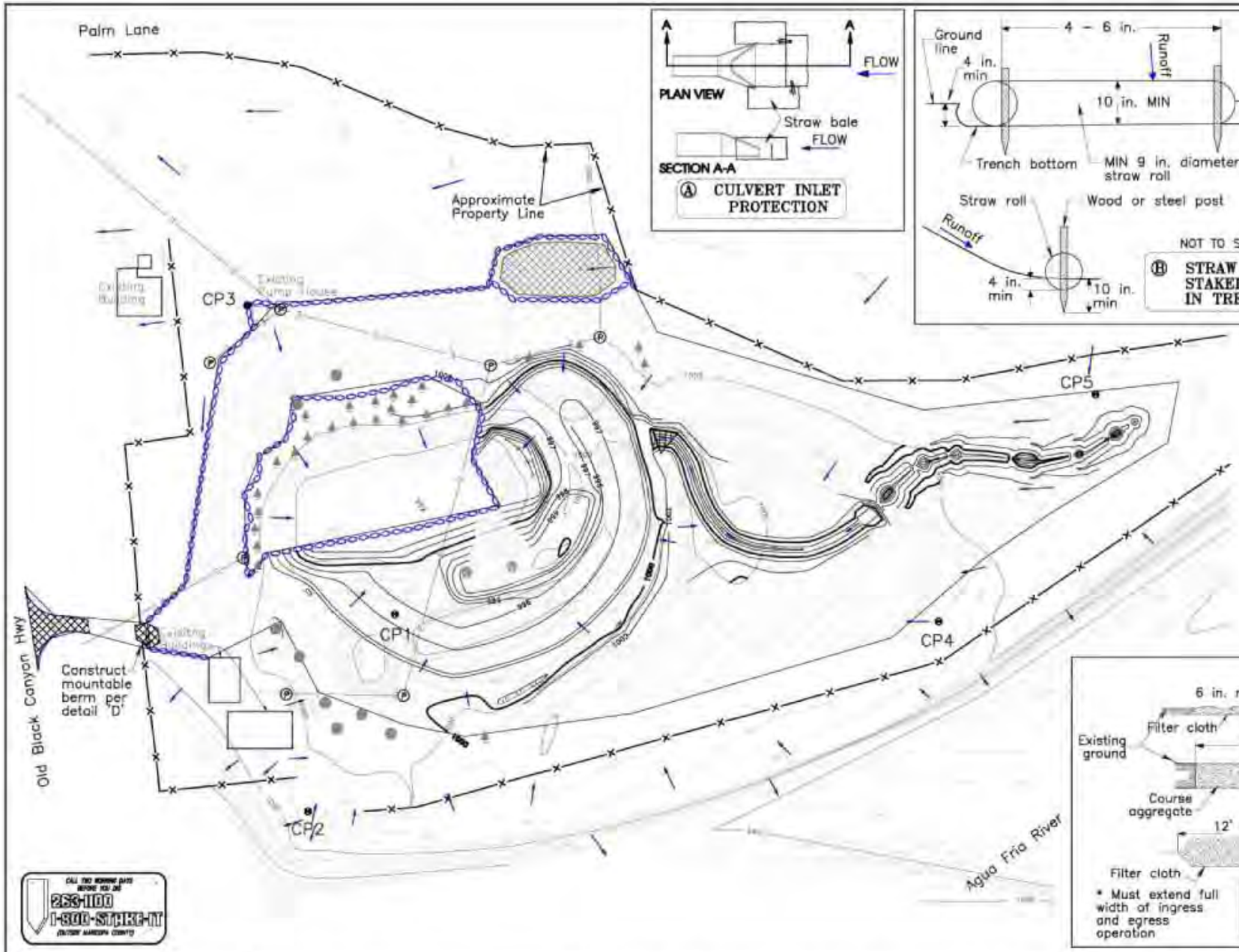
Expires 3-31-2011

FILE NAME: Black Canyon.Pro

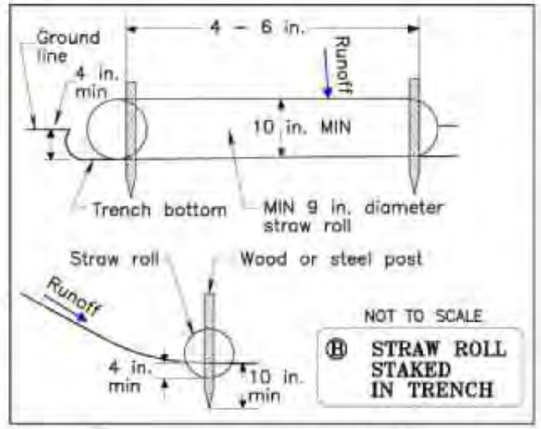
DATE: 1-29-10

PROJECT NO: 09-168AZ

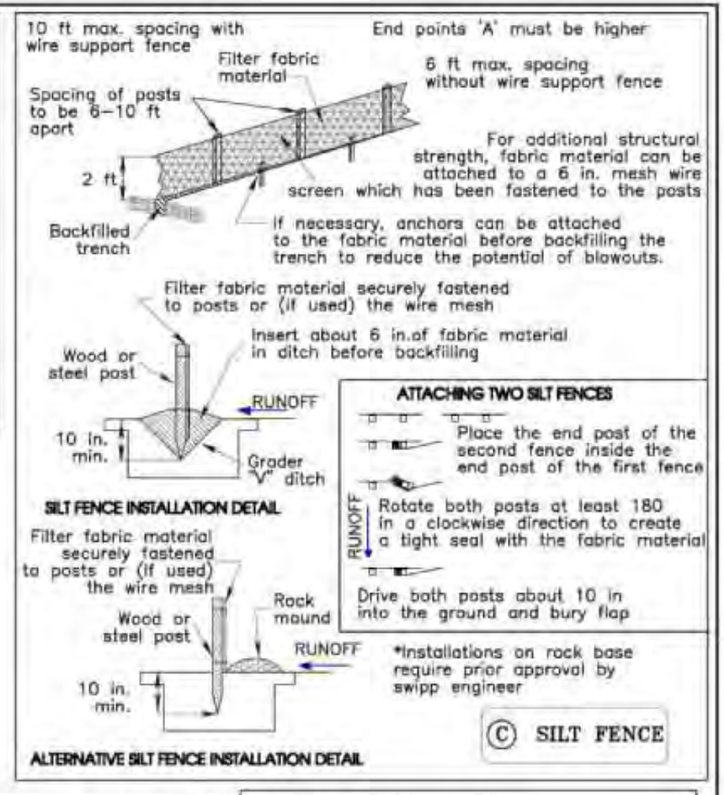
SHEET: 6 of 7



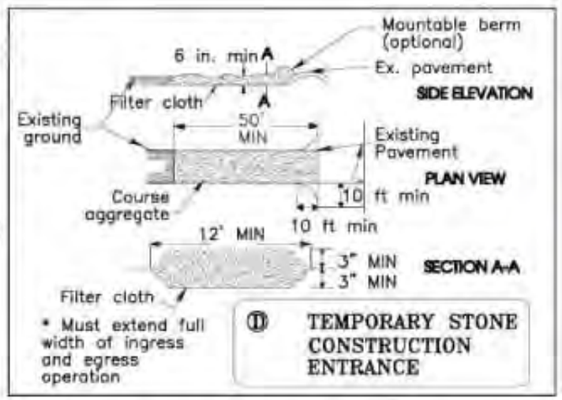
Ⓐ CULVERT INLET PROTECTION



Ⓑ STRAW ROLL STAKED IN TRENCH



Ⓒ SILT FENCE



Ⓓ TEMPORARY STONE CONSTRUCTION ENTRANCE

- Existing Fence
- Power Pole
- Existing Deciduous
- Existing Pine
- Control Point
- Drainage Flow
- Culvert Inlet Protection per Detail A
- Silt Fence or Straw Waddle per Detail B or C
- Temporary Stone Construction Entrance per Detail D
- Approximate Area of Disturbance

CALL TWO WORKING DAYS BEFORE YOU DIG
263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

Natural Channel Design, Inc

Fred Phillips Consulting

DRAWN BY: M.Wirtanen, R.Lyman

DESIGNED BY: G.Cathey, M.Wirtanen, F.Phillips

REV	DATE	BY	REVISION

STORMWATER POLLUTION PREVENTION PLAN MAP AND DETAILS

Black Canyon Riparian Restoration Project
Black Canyon City, AZ

REGISTERED PROFESSIONAL ENGINEER, CERTIFICATE NO. 26889, STEPHANIE N. YARD, Date Signed, ARIZONA, U.S.A.

Expires 3-31-2011

HORIZ SCALE: 1" = 100'
Contour Interval = 1 ft

100 0 100

N W E S

FILE NAME: Black Canyon.Pro

DATE: 1-29-10

PROJECT NO: 09-168AZ

SHEET: 7 of 7

Recontouring of the existing the ponds

Screening excavated native material

Location of the water control structure

Construction of the stream and wetland channel

Liner covering the re-contoured pond area

Liner covering the stream and pool system

Outfall of the stop log structure

Stop log structure at the bottom of the wetland channel

Appendix E. Irrigation Design Map and Installation Photos

Existing Pump

Filter Connetion

new irrigation mainline

new irrigation mainline

Zone #1
Start:
6:00 A.M
4:00 P.M.

Zone #2
Start:
7:00 A.M
5:00 P.M.

Zone #3
Start:
8:00 A.M
6:00 P.M.

Zone #4
Start:
9:00 A.M.
7:00 P.M.

Zone #5
Start:
10:00 A.M.
8:00 P.M.

Zone #6
Start:
11:00 A.M.
9:00 P.M.

PIPE LEGEND

6"PVC Pipe CL200

2"PVC Pipe CL200

1-1/2"PVC Pipe Sch40

1-1/4"PVC Pipe Sch40

1"PVC Pipe Sch40

1/2" PE Tubing Lateral

TOTAL PLANTS NEEDED OUTSIDE STREAM	SIZE	TOTAL QTY PLANTS
DESERT BROOM *Baccharis sarothroides*	1 GALLON	400
FOUR WING SALTBUSH *Atriplex canescens*	1 GALLON	420
BLUE GRAMA *Bouteloua gracilis*	3" PLUGS	226
COTTONWOOD *Populus fremontii*	1 GALLON	46
GOODDING WILLOW *Salix gooddingii*	1 GALLON	35
VELVET MESQUITE *Prosopis velutina*	1 GALLON	135
INDIAN RICEGRASS *Oryzopsis hymenoides*	3" PLUGS	187
INLAND SALTGRASS *Distichlis spicata*	4" PLUGS	279
ALKALI SACATON *Sporobolus airoides*	4" PLUGS	237
SANDBAR WILLOW *Salix exigua*	1 GALLON	90
SMALL FESCUE *Vulpia microstachys*	3" PLUGS	488
TOTAL PLANTS NEEDED FOR STREAM		
BRITTLEBUSH *Encelia farinosa*	1 GALLON	15
CANYON PENSTEMON *Penstemon pseudospectabilis*	4" PLUGS	10
DEER GRASS *Muhlenbergia rigens*	4" PLUGS	60
DESERT BROOM *Baccharis sarothroides*	1 GALLON	12
DESERT MARIGOLD *Baileya multiradiata*	3" PLUGS	17
INDIAN RICEGRASS *Oryzopsis hymenoides*	3" PLUGS	19
DESERT IRONWOOD *Olneya tesota*	1 GALLON	8
BLUE PALO VERDE *Parkinsonia florida*	1 GALLON	6

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
RIPARIAN RESTORATION

BLACK CANYON CITY, AZ

SHEET TITLE :
IRRIGATION "AS-BUILT"
& ZONE MAP
Scale: 1" = 60'

0' 15' 30' 60' 90' NORTH

DATE: oCOTBER 18, 2010
JOB NO.: 08005-14
DRAWN BY: DB/KI
DESIGNED BY: FOP/DB
CHECKED BY: FOP

FIGURE 1

Y:\2008\08005 (Black Canyon Design)\Maps\AutoCAD\Black Canyon Irrigation AS BUILT 10-18-10.dwg, 10/18/2010 3:39:34 PM, PostScript Level 2.pc3

Irrigation main line connection to control valve and pressurized tank

Irrigation Main control valves and filter setup

Irrigation timer for scheduling

Electrical conduit for irrigation timer

Flush out valve

Flush out valve & valve boxes to access main line

Irrigation PVC lateral lines and emitters next to wetland channel to water cootonwood/willow habitat

Irrigation PVC lateral lines with emitters around the wetland and pond to water cottonwood/ willow habitat

Upper Terrace irrigation lines to water mesquite habitat

Irrigation lateral lines at the entrance to water grass meadow

Irrigation lines next to wetland channel

Irrigation lines next to stream & pools

Appendix F. Overall Planting Design

NOTES:

Within the river corridor the following planting will take place:

VERTICAL BUNDLES

Each bundle will have 3 poles at least 7' in length with a minimum diameter of 1/2". Plant vertical bundles of sandbar willow along the bankline in specified areas. Poles will be planted in trenches along the bankline as vertical bundles on 10' centers. These poles will also be secured with wood stakes to provide good soil to stem contact. The above ground portion of the pole will be cut at a maximum height of 2' high and a minimum height of 18".

CLUSTER PLANTINGS

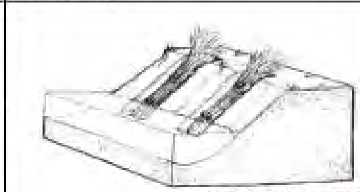
Each cluster will have 3 poles at least 7' in length with a minimum diameter of 1/2". Holes will be augured at a 6" diameter to the lower water table of the year. All poles will be planted at the bottom of the lowest water table of the year. The above ground portion of the pole will be cut at a maximum height of 2' high and a minimum height of 18". When planted all poles will be slurried in with a water auger leaving no air gaps between pole and soil. To maintain maximum soil to stem contact.

All willow pole plantings will be soaked for a minimum of 7 days prior to planting. The entire pole will be under water while being soaked.

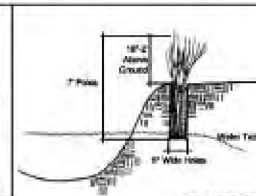
Once poles are removed from water they will not spend more than 6 hours out of water before planting. All poles will be cut locally during plant dormancy. The tops of all poles will be sealed with latex paint to seal in moisture.

The exact locations of the bundles/clusters & plugs will be determined after site clearing. Seed mix and all plantings will be planted in wet areas with suitable moisture for riparian species.

DETAILS



VERTICAL BUNDLE



CLUSTER

*TOTAL PLANTS NEEDED	SIZE	TOTAL QTY PLANTS
VERTICLE BUNDLES (Sandbar Willow)	7' POLES	240 POLES
CLUSTER PLANTINGS (Sandbar Willow)	7' POLES	1500 POLES
INLAND SALTGRASS *Distichlis spicata*	3"-4" PLUGS	250
THREE-SQUARE *Schoenoplectus americanus*	3"-4" PLUGS	250
SEED MIX (See Below)	X	12 LBS

Seed Mix

Weight (lb)	Mix Percentage	Common Name	Scientific Name	Price (lb)	Germination Rate
	30%	Blue Grama	*Bouteloua gracilis*	$19.00	98%
	20%	Indian Ricegrass	*Oryzopsis hymenoides*	$25.00	90%
	10%	Salt Heliotrope	*Heliotropium curassavicum*	$78.00	60%
	40%	Alkali sacaton	*Sporobolus airoides*	$20.00	67%

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
RIPARIAN RESTORATION

BLACK CANYON CITY, AZ

SHEET TITLE :

OVERALL PLANTING PLAN

Scale: 1" = 200'

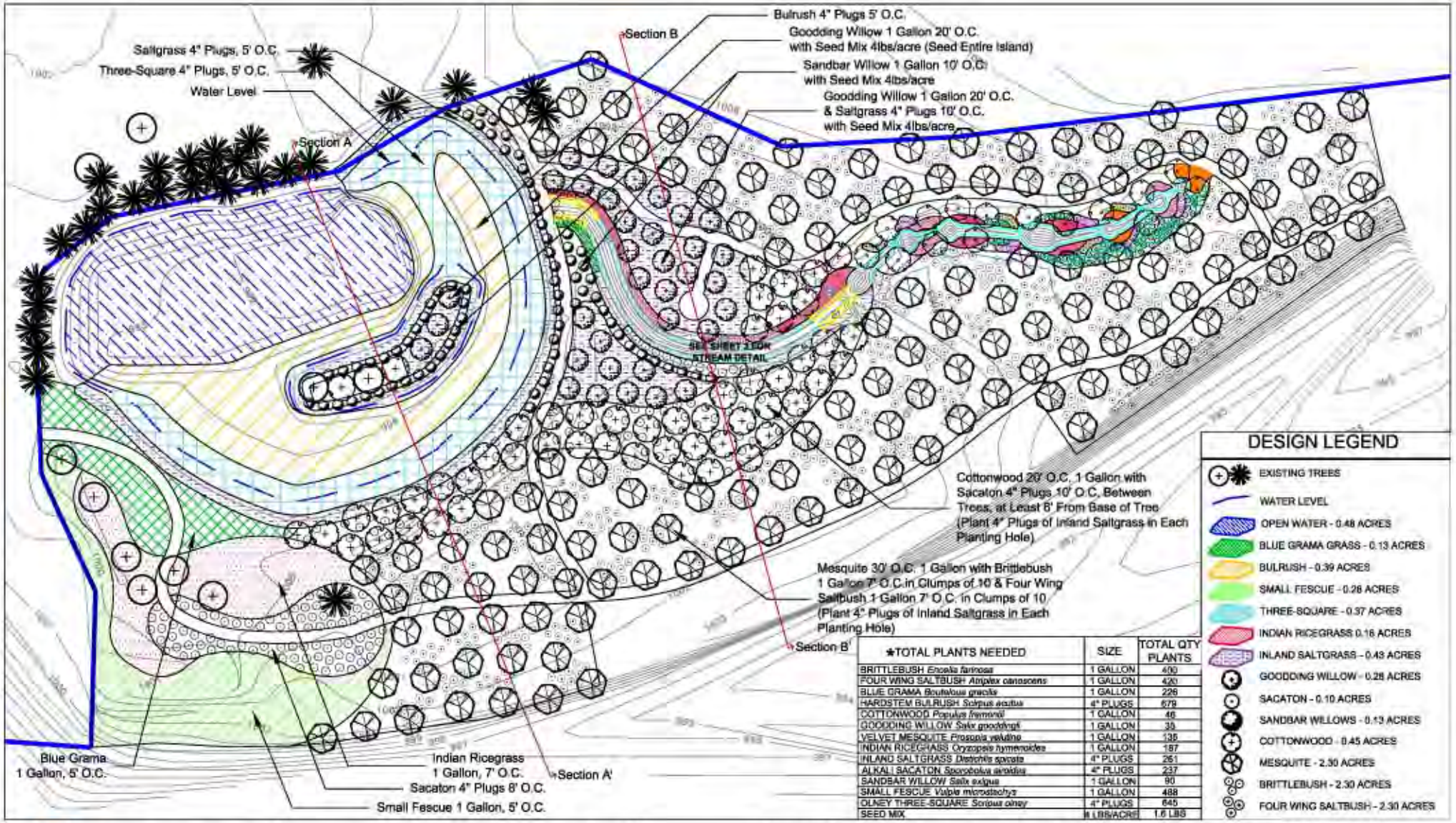
0' 50' 100' 200' 300' NORTH

DATE: NOVEMBER 16, 2009

JOB NO.: 08005-4
DRAWN BY: JF
DESIGNED BY: FOP/DB
CHECKED BY: FOP

FIGURE 1

Appendix G. Upper Terrace Planting Schedule



DESIGN LEGEND

- EXISTING TREES
- WATER LEVEL
- OPEN WATER - 0.48 ACRES
- BLUE GRAMA GRASS - 0.13 ACRES
- BULRUSH - 0.39 ACRES
- SMALL FESCUE - 0.26 ACRES
- THREE-SQUARE - 0.37 ACRES
- INDIAN RICEGRASS 0.16 ACRES
- INLAND SALTGRASS - 0.43 ACRES
- GOODDING WILLOW - 0.28 ACRES
- SACATON - 0.10 ACRES
- SANDBAR WILLOWS - 0.13 ACRES
- COTTONWOOD - 0.45 ACRES
- MESQUITE - 2.30 ACRES
- BRITTLEBUSH - 2.30 ACRES
- FOUR WING SALTBUSH - 2.30 ACRES

★TOTAL PLANTS NEEDED	SIZE	TOTAL QTY PLANTS
BRITTLEBUSH *Encelia farinosa*	1 GALLON	400
FOUR WING SALTBUSH *Atriplex canescens*	1 GALLON	420
BLUE GRAMA *Bouteloua gracilis*	1 GALLON	226
HARDSTEM BULRUSH *Scirpus acutus*	4" PLUGS	678
COTTONWOOD *Populus fremontii*	1 GALLON	46
GOODDING WILLOW *Salix gooddingii*	1 GALLON	39
VELVET MESQUITE *Prosopis velutina*	1 GALLON	135
INDIAN RICEGRASS *Oryzopsis hymenoides*	1 GALLON	187
INLAND SALTGRASS *Distichlis spicata*	4" PLUGS	261
ALKALI SACATON *Sporobolus airoides*	4" PLUGS	237
SANDBAR WILLOW *Salix exigua*	1 GALLON	90
SMALL FESCUE *Vulpia microstachys*	1 GALLON	488
OLNEY THREE-SQUARE *Scirpus olneyi*	4" PLUGS	645
SEED MIX	8 LBS/ACRE	1.6 LBS

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4185
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
RIPARIAN RESTORATION

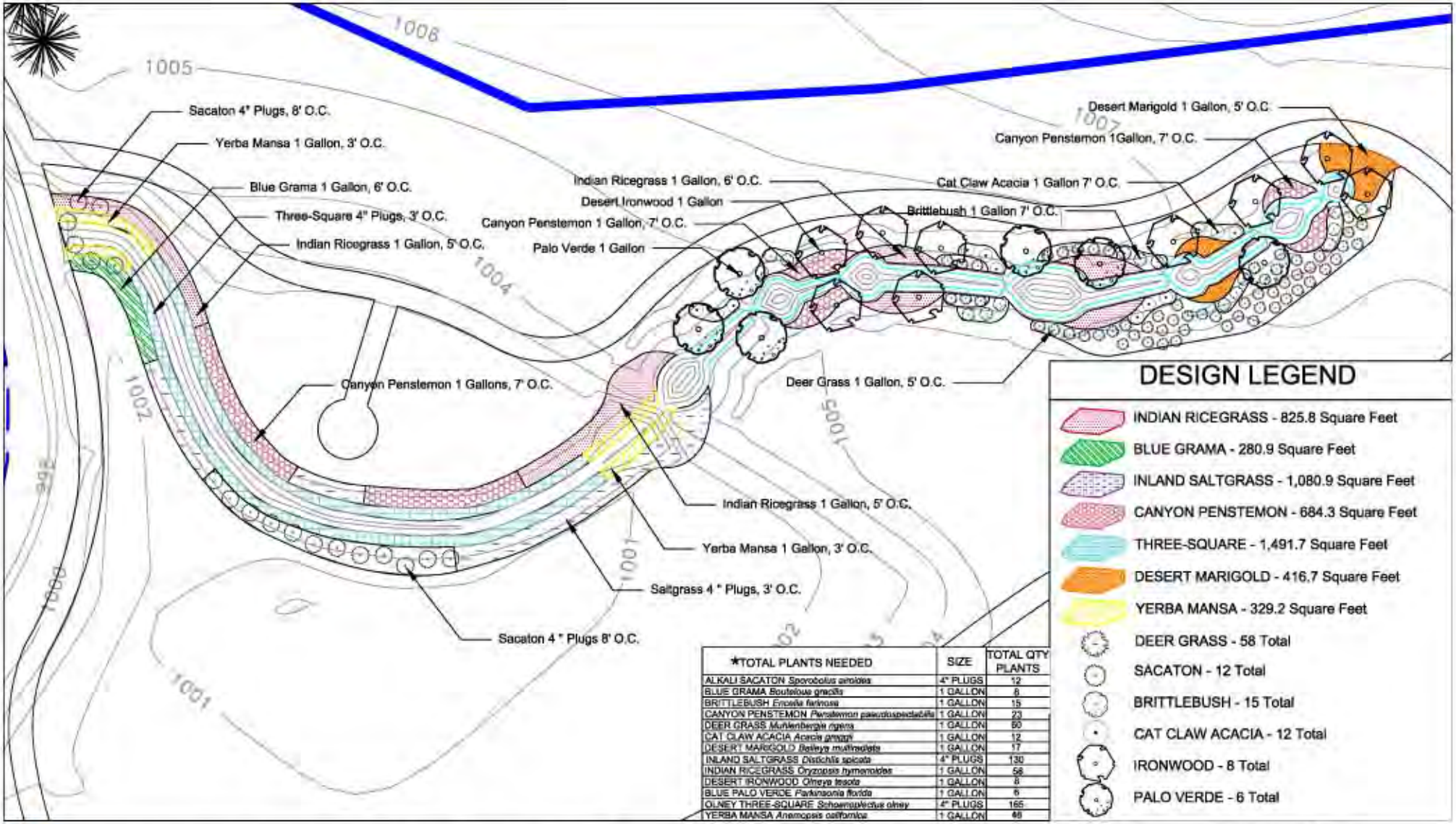
BLACK CANYON CITY, AZ

SHEET TITLE :
UPPER TERRACE PLANTING PLAN
Scale: 1" = 60'

0' 15' 30' 60' 90' NORTH

DATE: NOVEMBER 16, 2009
JOB NO.: 08005-4
DRAWN BY: JF
DESIGNED BY: FDP/DB
CHECKED BY: FDP

FIGURE 2



DESIGN LEGEND

- INDIAN RICEGRASS - 825.8 Square Feet
- BLUE GRAMA - 280.9 Square Feet
- INLAND SALTGRASS - 1,080.9 Square Feet
- CANYON PENSTEMON - 684.3 Square Feet
- THREE-SQUARE - 1,491.7 Square Feet
- DESERT MARIGOLD - 416.7 Square Feet
- YERBA MANSA - 329.2 Square Feet
- DEER GRASS - 58 Total
- SACATON - 12 Total
- BRITTLEBUSH - 15 Total
- CAT CLAW ACACIA - 12 Total
- IRONWOOD - 8 Total
- PALO VERDE - 6 Total

*TOTAL PLANTS NEEDED	SIZE	TOTAL QTY PLANTS
ALKALI SACATON *Sporobolus airoides*	4" PLUGS	12
BLUE GRAMA *Bouteloua gracilis*	1 GALLON	8
BRITTLEBUSH *Encelia farinosa*	1 GALLON	15
CANYON PENSTEMON *Penstemon pseudospectabilis*	1 GALLON	23
DEER GRASS *Muhlenbergia rigens*	1 GALLON	58
CAT CLAW ACACIA *Acacia greggii*	1 GALLON	12
DESERT MARIGOLD *Baileya multiradiata*	1 GALLON	17
INLAND SALTGRASS *Distichlis spicata*	4" PLUGS	130
INDIAN RICEGRASS *Oryzopsis hymenoides*	1 GALLON	56
DESERT IRONWOOD *Olneya tesota*	1 GALLON	8
BLUE PALO VERDE *Parkinsonia florida*	1 GALLON	6
OLNEY THREE-SQUARE *Schoenoplectus olneyi*	4" PLUGS	165
YERBA MANSA *Anemopsis californica*	1 GALLON	46

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
RIPARIAN RESTORATION

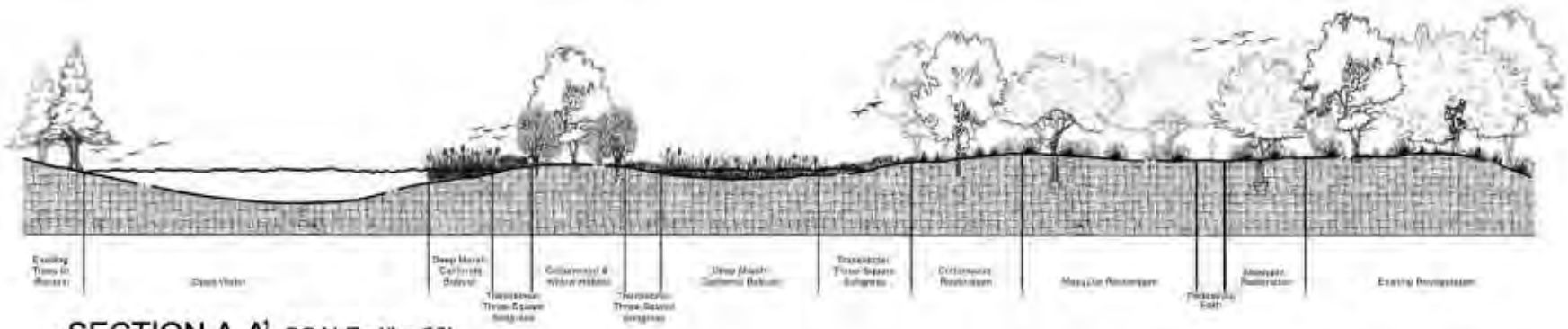
BLACK CANYON CITY, AZ

SHEET TITLE :
STREAM DETAIL
PLANTING PLAN
Scale: 1" = 30'

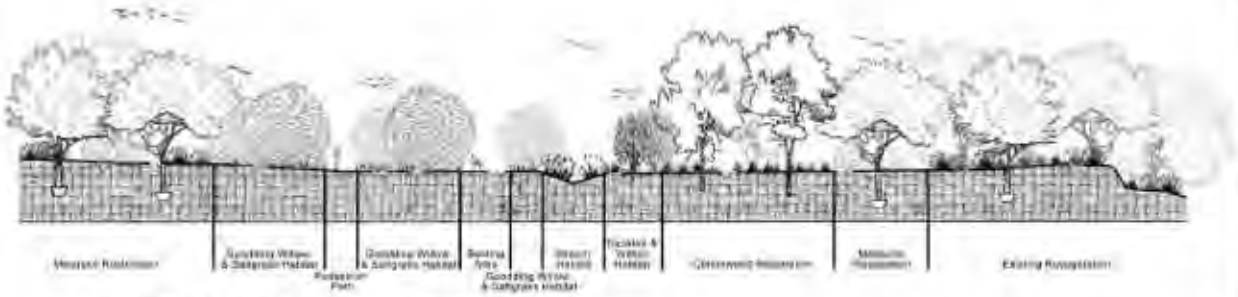
0 7.5 15 30 45 NORTH

DATE: NOVEMBER 16, 2009
JOB NO.: 08005-4
DRAWN BY: JF
DESIGNED BY: FDP/DB
CHECKED BY: FDP

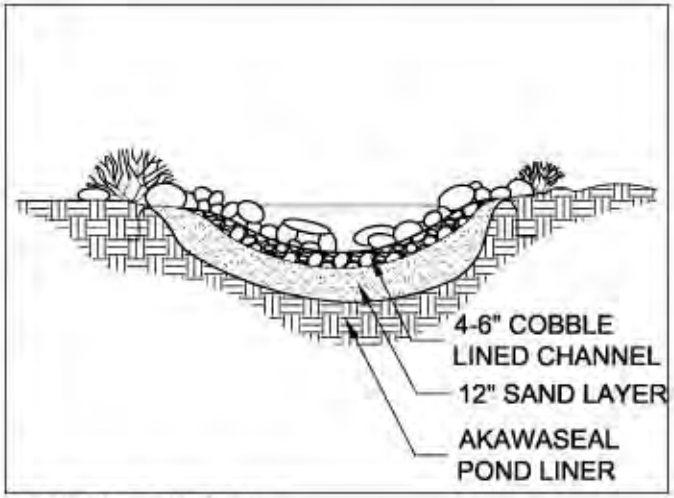
FIGURE 3



SECTION A-A' SCALE: 1" = 30'



SECTION B-B' SCALE: 1" = 30'



STREAM DETAIL

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4168
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
RIPARIAN RESTORATION

BLACK CANYON CITY, AZ

SHEET TITLE :
SECTION & DETAILS

DATE: JANUARY 18, 2010
JOB NO.: 08005-4
DRAWN BY: JF
DESIGNED BY: FDP/DB
CHECKED BY: FDP

FIGURE 4

Unloading plant deliveries

Counting and checking plant quality

Planting the upland plants and around the upper portion of the stream

Planting grasses along the stream

Planting the wetland channel

Planting the wetland/pond

Completed plantings around the stoplog structure

Completed plantings around the outfall of the stoplog structure

Wetland channel after planting

Completed wetland channel and waterfall

Completed plantings along the upper portion of the channel

Completed plantings around the spring feature

Completed planting of riparian zone around stream

Completed planting of riparian zone around the wetland/pond

Completed planting of upland zone on the south side of the stream

Completed planting of upland zone on the north side of the stream

Completed planting of wetland and transitional zone on the north side of the pond

Completed planting of wetland and transitional zone on the south side of the pond

Appendix H. Upper Terrace Planting Schedule

Black Canyon City
Plant Schedule

Polygon	Acreages	# MAIN PLANTS	Alkalai Sacaton 1 Gallon	Brittlebush 1 Gallon	Four-Wing Saltbush 1 Gallon	Inland Saltgrass 4" Plugs	Seed Mix LBS/ACRE	Planting Description
Velvet Mesquite - 1 Gallon								
ME-1	0.26	17		40.00	40.00			VELVET MESQUITE 1 GALLON 30' O.C. WITH BRITTLEBUSH 7' O.C. IN CLUMPS OF 10 & FOUR-WING SALTBUSH 7' O.C. IN CLUMPS OF 10 (PLANT 4"PLUGSOF INLAND SALTGRASS IN EACH PLANTING HOLE)
ME-2	0.20	12		30.00	40.00			VELVET MESQUITE 1 GALLON 30' O.C. WITH BRITTLEBUSH 7' O.C. IN CLUMPS OF 10 & FOUR-WING SALTBUSH 7' O.C. IN CLUMPS OF 10 (PLANT 4"PLUGSOF INLAND SALTGRASS IN EACH PLANTING HOLE)
ME-3	0.89	51		160.00	160.00			VELVET MESQUITE 1 GALLON 30' O.C. WITH BRITTLEBUSH 7' O.C. IN CLUMPS OF 10 & FOUR-WING SALTBUSH 7' O.C. IN CLUMPS OF 10 (PLANT 4"PLUGSOF INLAND SALTGRASS IN EACH PLANTING HOLE)
ME-4	0.75	45		130.00	140.00			VELVET MESQUITE 1 GALLON 30' O.C. WITH BRITTLEBUSH 7' O.C. IN CLUMPS OF 10 & FOUR-WING SALTBUSH 7' O.C. IN CLUMPS OF 10 (PLANT 4"PLUGSOF INLAND SALTGRASS IN EACH PLANTING HOLE)
ME-5	0.20	10		40.00	40.00			VELVET MESQUITE 1 GALLON 30' O.C. WITH BRITTLEBUSH 7' O.C. IN CLUMPS OF 10 & FOUR-WING SALTBUSH 7' O.C. IN CLUMPS OF 10 (PLANT 4"PLUGSOF INLAND SALTGRASS IN EACH PLANTING HOLE)
	2.30	**135**	**0**	**400**	**420**	**0.00**		**TOTAL MESQUITE & FOUR-WING SALTBUSH 1 GALLON PLANTS & LBS SEED**
Cottonwood - 1 Gallon								
CW-1	0.10	11						COTTONWOOD 1 GALLON 20' O.C.
CW-2	0.02	2	38			10		COTTONWOOD 1 GALLON 20' O.C. AND SACATON 4" PLUGS 10' O.C. BETWEEN TREES AT LEAST 6' FROM BASE OF TREE (PLANT 4" PLUGS OF INLAND SALTGRASS IN TREE WELLS)
CW-3	0.21	23	86			115		COTTONWOOD 1 GALLON 20' O.C. AND SACATON 4" PLUGS 10' O.C. BETWEEN TREES AT LEAST 6' FROM BASE OF TREE (PLANT 4" PLUGS OF INLAND SALTGRASS IN TREE WELLS)
CW-4	0.06	7	21			35		COTTONWOOD 1 GALLON 20' O.C. AND SACATON 4" PLUGS 10' O.C. BETWEEN TREES AT LEAST 6' FROM BASE OF TREE (PLANT 4" PLUGS OF INLAND SALTGRASS IN TREE WELLS)
CW-5	0.03	3	7			15		COTTONWOOD 1 GALLON 20' O.C. AND SACATON 4" PLUGS 10' O.C. BETWEEN TREES AT LEAST 6' FROM BASE OF TREE (PLANT 4" PLUGS OF INLAND SALTGRASS IN TREE WELLS)
	0.42	**46**	**152**	**0**	**0**	**175**		**TOTAL COTTONWOOD & SACATON 1 GALLON PLANTS & LBS SEED**
Goodding Willow - 1 GALLON								
GO-1	0.02	3					0.16	GOODINGWILLOW 1 GALLON 20' O.C. WITH SEED MIX 4LBS/ACRE (SEED ENTIRE ISLAND)
GO-2	0.08	10				35	0.32	GOODINGWILLOW 1 GALLON 20' O.C. & SALTGRASS 4" PLUGS 10' O.C. WITH SEED MIX 4LBS/ACRE
GO-3	0.11	16				48	0.44	GOODINGWILLOW 1 GALLON 20' O.C. & SALTGRASS 4" PLUGS 10' O.C. WITH SEED MIX 4LBS/ACRE
GO-4	0.05	6				22	0.20	GOODINGWILLOW 1 GALLON 20' O.C. & SALTGRASS 4" PLUGS 10' O.C. WITH SEED MIX 4LBS/ACRE
	0.26	**35**	**0**	**0**	**0**	**104**	**1.12**	**TOTAL YERBA MANSA 1 GALLON PLANTS**
Sandbar Willow - 1 Gallon								
SB-1	0.03	28					0.12	SANDBAR WILLOW 1 GALLON 10' O.C. WITH SEED MIX 4LBS/ACRE
SB-2	0.04	27					0.16	SANDBAR WILLOW 1 GALLON 10' O.C. WITH SEED MIX 4LBS/ACRE
SB-3	0.03	20					0.12	SANDBAR WILLOW 1 GALLON 10' O.C. WITH SEED MIX 4LBS/ACRE
SB-4	0.01	8					0.04	SANDBAR WILLOW 1 GALLON 10' O.C. WITH SEED MIX 4LBS/ACRE
SB-5	0.01	7					0.04	SANDBAR WILLOW 1 GALLON 10' O.C. WITH SEED MIX 4LBS/ACRE
	0.11	**90**	**0**	**0**	**0**	**0.00**	**0.48**	**TOTAL SANDBAR WILLOW POLES & LBS SEED**

Black Canyon City
Plant Schedule

Blue Grama Grass - 1 Gallon								
BG-1	0.06	105						BLUE GRAMA GRASS 1 GALLONS PLANTED 3' O.C.
BG-2	0.07	122						BLUE GRAMA GRASS 1 GALLONS PLANTED 3' O.C.
	0.13	**226**	**0**	**0**	**0**	**0**		**TOTAL BLUE GRAMA 1 GALLONS**
Indian Rice Grass - 1 Gallon								
IR-1	0.09	80						INDIAN RICE GRASS 1 GALLONS PLANTED 7' O.C.
IR-2	0.12	107						INDIAN RICE GRASS 1 GALLONS PLANTED 7' O.C.
	0.21	**187**	**0**	**0**	**0**	**0**		**TOTAL INDIAN RICEGRASS 1 GALLONS**
Sacaton - 4" Plugs								
SA-1	0.06	51						SACATON 4" PLUGS 8' O.C.
SA-2	0.05	34						SACATON 4" PLUGS 8' O.C.
	0.11	**85**	**0**	**0**	**0**	**0**		**TOTAL SACATON PLUGS**
Small Fescue - 1 Gallon								
SF-1	0.28	488						SMALL FESCUE 1 GALLONS PLANTED 5' O.C.
	0.28	**488**	**0.00**	**0**	**0**	**0**		**TOTAL SMALL FESCUE 1 GALLONS**
Hardstem Bulrush - 4" Plugs								
BR-1	0.39	679						HARDSTEM BULRUSH 4"PLUGS 5' O.C.
	0.39	**679**	**0.00**	**0**	**0**	**0**		**TOTAL BULRUSH PLUGS**
Inland Saltgrass - 4" Plugs								
SG-1	0.15	261						INLAND SALTGRASS 4" PLUGS 5' O.C.
	0.15	**261**	**0.00**	**0**	**0**	**0**		**TOTAL SALTGRASS PLUGS**
Olney Three-Square - 4" Plugs								
SG-1	0.37	645						THREE-SQUARE 4' PLUS 5' O.C.
	0.37	**645**	**0.00**	**0**	**0**	**0**		**TOTAL THREE-SQUARE PLUGS & LBS SEED**
Polygon	**Acreages**	**# MAIN PLANTS**	**Alkalai Sacaton 1 Gallon**	**Brittlebush 1 Gallon**	**Four-Wing Saltbush 1 Gallon**	**Inland Saltgrass 4" Plugs**	**Seed Mix LBS/ACRE**	**Planting Description**
Totals	**4.73**	**2877**	**152**	**400**	**420**	**279**	**1.60**	**TOTAL PLANTS & LBS OF SEED**

Polygon	Acreages	# MAIN PLANTS	Planting Description
Blue Grama - 1 Gallon			
BG-3	0.0063	8	BLUE GRAMA 1 GALLONS PLANTED 6' O.C.
	0.0063	**8**	**TOTAL BLUE GRAMA 1 GALLONS**
Indian Ricegrass - 1 Gallons			
IR-3	0.0088	15	INDIAN RICEGRASS 1 GALLONS PLANTED 5' O.C.
IR-4	0.0130	23	INDIAN RICEGRASS 1 GALLONS PLANTED 5' O.C.
IR-5	0.0023	4	INDIAN RICEGRASS 1 GALLONS PLANTED 5' O.C.
IR-6	0.0030	5	INDIAN RICEGRASS 1 GALLONS PLANTED 5' O.C.
IR-7	0.0031	5	INDIAN RICEGRASS 1 GALLONS PLANTED 5' O.C.
IR-8	0.0030	5	INDIAN RICEGRASS 1 GALLONS PLANTED 5' O.C.
	0.0331	**58**	**TOTAL INDIAN RICEGRASS 1 GALLONS**
Inland Saltgrass - 4" Plugs			
SG-3	0.0051	25	INLAND SALTGRASS 4' PLUGS PLANTED 3' O.C.
SG-4	0.0031	15	INLAND SALTGRASS 4' PLUGS PLANTED 3' O.C.
SG-5	0.0168	81	INLAND SALTGRASS 4' PLUGS PLANTED 3' O.C.
	0.0250	**121**	**TOTAL INLAND SALTGRASS PLUGS**
Onley Three-Square - 4" Plugs			
TH-2	0.0158	77	ONLEY THREE-SQUARE 4' PLUGS PLANTED 3' O.C.
TH-3	0.0182	88	ONLEY THREE-SQUARE 4' PLUGS PLANTED 3' O.C.
	0.0341	**165**	**TOTAL ONLEY THREE-SQUARE PLUGS**
Alkali Sacaton - 4" Plugs			

SA-3	0.0151	12	ALKALI SACATON 4' PLUGS PLANTED 8' O.C.
No Section	x	4	ALKALI SACATON 4' PLUGS PLANTED 8' O.C. WHERE SPECIFIED AT END OF STREAM ON PLANTING PLAN
	0.02	**16**	**TOTAL ALKALI SACATON PLUGS**

Yerba Mansa - 1 Gallon			
YM-1	0.0026	13	YERBA MANSE 1 GALLONS PLANTED 3' O.C.
YM-2	0.0016	8	YERBA MANSE 1 GALLONS PLANTED 3' O.C.
YM-3	0.0018	9	YERBA MANSE 1 GALLONS PLANTED 3' O.C.
YM-4	0.0019	9	YERBA MANSE 1 GALLONS PLANTED 3' O.C.
	0.0079	**38**	**TOTAL YERBA MANSA 1 GALLONS**

Canyon Penstemon - 1 Gallon			
CP-1	0.0082	7	CANYON PENSTEMON 1 GALLONS PLANTED 7' O.C.
CP-2	0.0078	7	CANYON PENSTEMON 1 GALLONS PLANTED 7' O.C.
CP-3	0.0031	3	CANYON PENSTEMON 1 GALLONS PLANTED 7' O.C.
CP-4	0.0030	3	CANYON PENSTEMON 1 GALLONS PLANTED 7' O.C.
CP-5	0.0021	2	CANYON PENSTEMON 1 GALLONS PLANTED 7' O.C.
CP-6	0.0018	2	CANYON PENSTEMON 1 GALLONS PLANTED 7' O.C.
	0.0260	**23**	**TOTAL CANYON PENSTEMON 1 GALLONS**

Cat Claw Acacia - 1 Gallon			
DB-1	0.0016	3	CAT CLAW ACACIA 1 GALLONS PLANTED 7' O.C.

DB-2	0.0019	3	CAT CLAW ACACIA 1 GALLONS PLANTED 7' O.C.
DB-3	0.0017	3	CAT CLAW ACACIA 1 GALLONS PLANTED 7' O.C.
DB-4	0.0019	3	CAT CLAW ACACIA 1 GALLONS PLANTED 7' O.C.
	0.0016	**12**	**TOTAL CAT CLAW ACACIA 1 GALLONS**

Brittlebush - 1 Gallon			
BB-1	0.0020	3	BRITTLEBUSH 1 GALLONS PLANTED 7' O.C.
BB-2	0.0022	3	BRITTLEBUSH 1 GALLONS PLANTED 7' O.C.
BB-3	0.0019	3	BRITTLEBUSH 1 GALLONS PLANTED 7' O.C.
BB-4	0.0016	3	BRITTLEBUSH 1 GALLONS PLANTED 7' O.C.
BB-5	0.0018	3	BRITTLEBUSH 1 GALLONS PLANTED 7' O.C.
	0.0020	**15**	**TOTAL BRITTLEBUSH 1 GALLONS**

Deer Grass - 1 Gallon			
DG-1	0.0014	3	DEER GRASS 1 GALLONS PLANTED 5' O.C.
DG-2	0.0012	3	DEER GRASS 1 GALLONS PLANTED 5' O.C.
DG-3	0.0025	5	DEER GRASS 1 GALLONS PLANTED 5' O.C.
DG-4	0.0347	49	DEER GRASS 1 GALLONS PLANTED 5' O.C.
	0.0014	**60**	**TOTAL DEER GRASS 1 GALLONS**

Desert Marigold - 1 Gallon			
DM-1	0.0017	3	DESERT MARIGOLD 1 GALLONS PLANTED 5' O.C.
DM-2	0.0017	3	DESERT MARIGOLD 1 GALLONS PLANTED 5' O.C.
DM-3	0.0065	11	DESERT MARIGOLD 1 GALLONS PLANTED 5' O.C.
	0.0017	**17**	**TOTAL DESERT MARIGOLD 1 GALLONS**

Blue Palo Verde - 1 Gallon			
No Section	X	6	BLUE PALO VERDE 1 GALLONS PLANTED WHERE SPECIFIED ON PLANTING PLAN
		6	**TOTAL BLUE PALO VERDE 1 GALLONS**

Desert Ironwood - 1 Gallon			
No Section	X	8	DESERT IRONWOOD 1 GALLONS PLANTED WHERE SPECIFIED ON PLANTING PLAN
		8	**TOTAL DESERT IRONWOOD 1 GALLONS**

Polygon	**Acreages**	**# MAIN PLANTS**	**Planting Description**
Totals	**0.15**	**546**	**TOTAL PLANTS**

Appendix I. River Corridor Planting Plan and Photos

NOTES:

Within the river corridor the following planting will take place:

VERTICAL BUNDLES

Each bundle will have 4 poles at least 5' in length with a minimum diameter of 1/2". Plant vertical bundles of sandbar willow along the bankline in specified areas. Poles will be planted in trenches along the bankline as vertical bundles on 7' centers. These poles will also be secured with wood stakes to provide good soil to stem contact. The above ground portion of the pole will be cut at a maximum height of 2' high and a minimum height of 18".

CLUSTER PLANTINGS

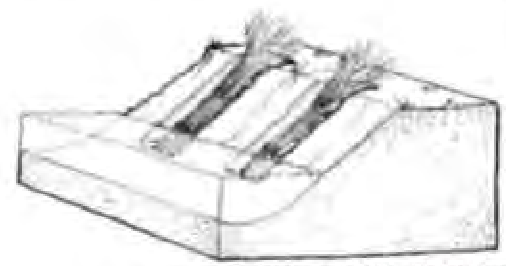
Each cluster will have 1 pole at least 5' in length with a minimum diameter of 1/2". Holes will be augured at a 6" diameter to the lowest water table of the year. All poles will be planted at the bottom of the lowest water table of the year. The above ground portion of the pole will be cut at a maximum height of 2' high and a minimum height of 18". When planted all poles will be slurried in with a water auger leaving no air gaps between pole and soil. To maintain maximum soil to stem contact.

All willow pole plantings will be soaked for a minimum of 7 days prior to planting. The entire pole will be under water while being soaked.

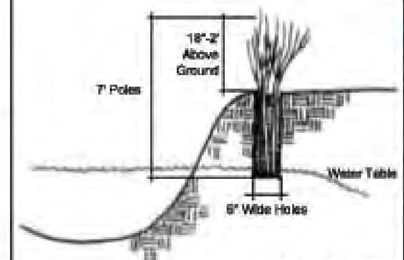
Once poles are removed from water they will not spend more than 6 hours out of water before planting. All poles will be cut locally during plant dormancy. The tops of all poles will be sealed with latex paint to seal in moisture.

The exact locations of the bundles/clusters & plugs will be determined after site clearing. Seed mix and all plantings will be planted in wet areas with suitable moisture for riparian species.

DETAILS



VERTICAL BUNDLE



CLUSTER

TOTAL PLANTS NEEDED	SIZE	TOTAL QTY PLANTS
VERTICLE BUNDLES (Sandbar Willow)	10' POLES	240 POLES
CLUSTER PLANTINGS (Sandbar Willow)	10' POLES	1000 POLES
INLAND SALTGRASS *Distichlis spicata*	3"-4" PLUGS	250
THREE-SQUARE *Schoenoplectus americanus*	3"-4" PLUGS	250
SEED MIX (See Below)	X	12 LBS
SANDBAR WILLOWS	1 GALLON	500

Seed Mix

Weight (lb)	Mix Percentage	Common Name	Scientific Name	Price (lb)	Germination Rate
	30%	Blue Gramma	*Bouteloua gracilis*	$19.00	86%
	20%	Indian Ricegrass	*Oryzopsis hymenoides*	$25.00	90%
	50%	Alkali sacaton	*Sporobolus airoides*	$28.00	93%

Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR:
BLACK CANYON CITY
COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
RIPARIAN RESTORATION

BLACK CANYON CITY, AZ

SHEET TITLE :
RIVER CORRIDOR RESTORATION

Scale: 1" = 200'

0' 50' 100' 200' 300' NORTH

DATE: MAY 8, 2010

JOB NO.:08005-9
DRAWN BY: RC
DESIGNED BY: FOP/DB
CHECKED BY: FOP

FIGURE 1

Before and after pole plantings on primary sandbar with vertical bundles installed in the toe of bank line.

Three square and salt grass plugs in slough of primary sandbar and vertical bundles immediately downstream of sandbar.

Before and after pole plantings.

Vertical bundles surrounding swimming hole.

Vertical bundles staked into bank line approximately 150 yards upstream of bridge.

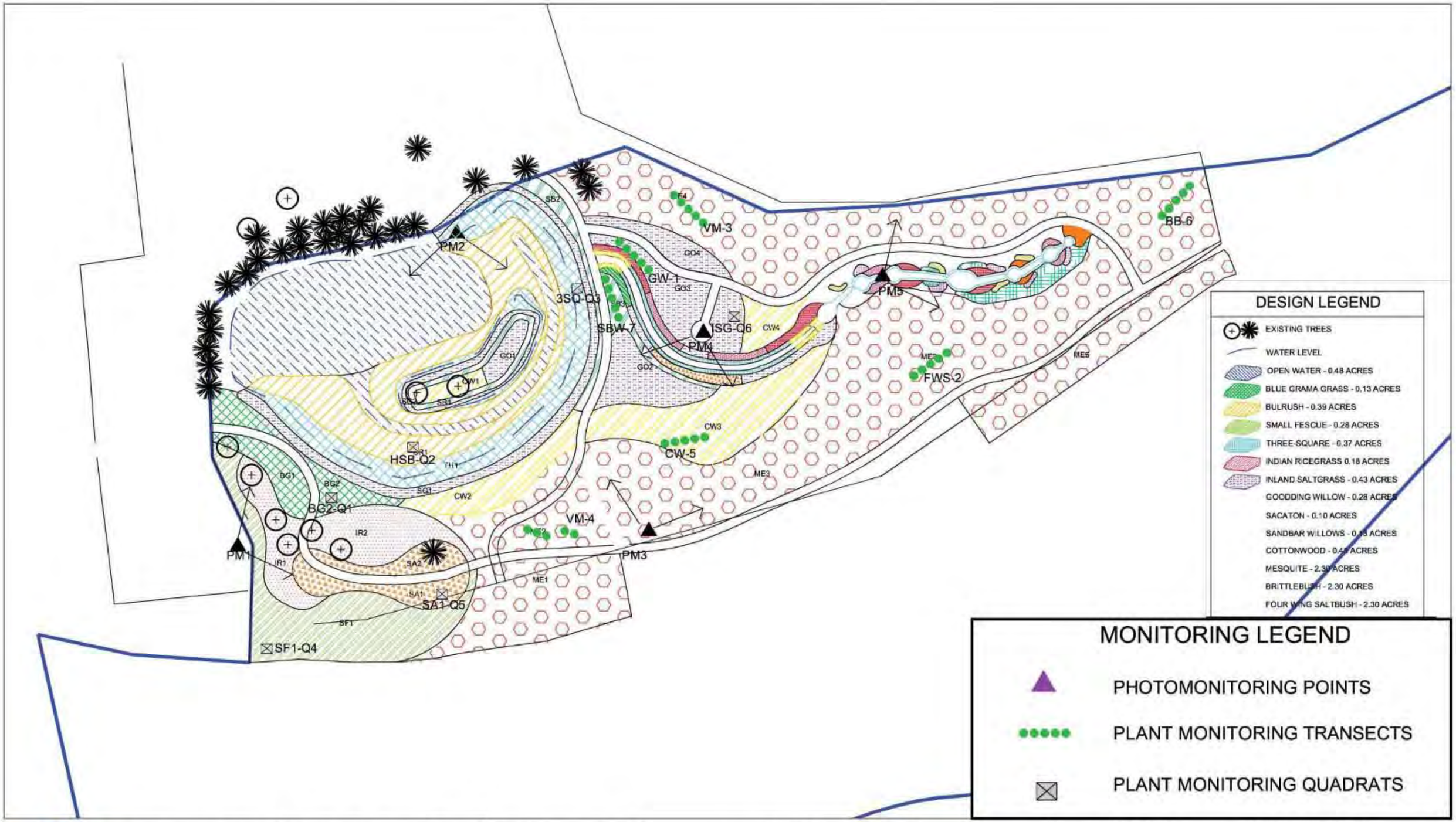
Upstream sandbars before and after planting with 1 gallon willows.

Sandbars with 1 gallon willow plantings at upstream terminus of project.

Removing Desert Broom on upper terrace and (at right) transplanted 3-square plugs from existing colonies.

Fred Phillips Consulting, LLC
Landscape Design, Land Planning
Ecosystem Restoration
fredphillipsconsulting.com
(928) 773-1530

Appendix J. Final Monitoring Design



Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

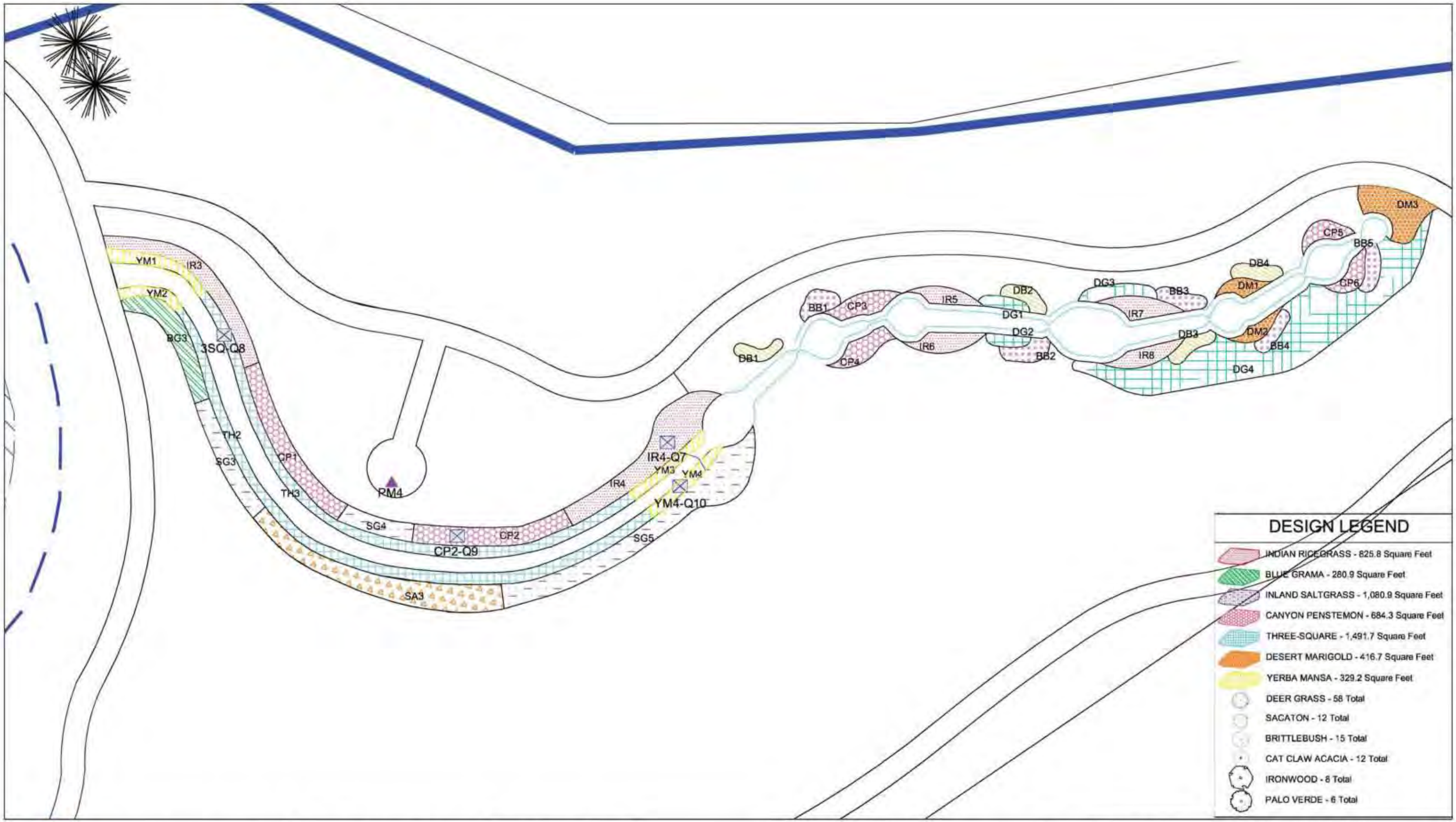
BLACK CANYON
RIPARIAN RESTORATION

BLACK CANYON CITY, AZ

SHEET TITLE :
PLANTING SCHEDULE
& MONITORING PLAN
Scale: 1" = 80'
0' 20' 40' 80' 120' NORTH

DATE: JANUARY 21, 2010
JOB NO.: 08005-4
DRAWN BY: JF
DESIGNED BY: FOP/DB
CHECKED BY: FOP

Figure 1



Fred Phillips Consulting, LLC
401 SOUTH LEROUX STREET
FLAGSTAFF, AZ
86001
TEL 928 773 1530
FAX 928 774 4166
Ecosystem Restoration Land Planning

PREPARED FOR: BLACK CANYON CITY COMMUNITY ASSOCIATION

REV.	COMMENT	DATE

BLACK CANYON
RIPARIAN RESTORATION

BLACK CANYON CITY, AZ

SHEET TITLE :
STREAM PLANTING SCHEDULE
& MONITORING PLAN
Scale: 1" = 30'

0' 7.5' 15' 30' 45' NORTH

DATE: JANUARY 21, 2010
JOB NO.: 08005-4
DRAWN BY: JF
DESIGNED BY: FOP/DB
CHECKED BY: FOP

Figure 2

Appendix K. Plant Monitoring Datasheets

Appendix C. Vegetation Monitoring Datasheets

Black Canyon Riparian Restoration Project Figure 10

Session # & Date: Baseline Monitoring 1 11/18/10

Weather and Time: clear, breezy

Participants: K. IVY, H. Trathen

Polygon	Transect #	Plant Number	Species	Height (cm)	Condition	Effects	Comments
GW	GW-1	1	Goodding Willow	85	4	IB	
GW	GW-1	2	Goodding Willow	102	4		
GW	GW-1	3	Goodding Willow	102	4		
GW	GW-1	4	Goodding Willow	104	4		
GW	GW-1	5	Goodding Willow	105	4		
FWS	FWS-2	6	Four-Wing Salt	47	4		
FWS	FWS-2	7	Four-Wing Salt	38	3.5	PS	yellow leaves
FWS	FWS-2	8	Four-Wing Salt	24	4		
FWS	FWS-2	9	Four-Wing Salt	38	3.5	PS	
FWS	FWS-2	10	Four-Wing Salt	36	3.5		
VM	VM-3	11	Velvet Mesquite	123	3	PS	dry, brown leaves
VM	VM-3	12	Velvet Mesquite	94	4		
VM	VM-3	13	Velvet Mesquite	90	3	PS	dry leaves, turning yellow
VM	VM-3	14	Velvet Mesquite	124	2.5	PS	no leaves
VM	VM-3	15	Velvet Mesquite	108	3.5	PS	
VM	VM-4	16	Velvet Mesquite	65	~~3.5~~ 3	PS	(Planting stress)
VM	VM-4	17	Velvet Mesquite	75	~~3~~ 2.5	PS	no leaves
VM	VM-4	18	Velvet Mesquite	54	3.5	PS	little yellow on lower leaves
VM	VM-4	19	Velvet Mesquite	80	2.5	PS	
VM	VM-4	20	Velvet Mesquite	127	2.5	PS	
CW	CW-5	21	Cottonwood	63	4		
CW	CW-5	22	Cottonwood	60	4		
CW	CW-5	23	Cottonwood	52	~~4~~ 3.5	~~IB~~, PS	some brown
CW	CW-5	24	Cottonwood	55	4		
CW	CW-5	25	Cottonwood	67	4		
BB	BB-6	26	Brittlebush	38	4		
BB	BB-6	27	Brittlebush	35	4		
BB	BB-6	28	Brittlebush	33	3.5	PS	yellow leaves on bottom
BB	BB-6	29	Brittlebush	48	4		
BB	BB-6	30	Brittlebush	33	4		
SBW	SBW-7	31	Sandbar Willow	95	4		
SBW	SBW-7	32	Sandbar Willow	74	4		
SBW	SBW-7	33	Sandbar Willow	60	4		
SBW	SBW-7	34	Sandbar Willow	75	4		
SBW	SBW-7	35	Sandbar Willow	56	4		

Black Canyon Riparian Restoration Project Figure 10

Session # & Date: 5/31/11

Weather and Time: Clear, [illegible] wind 8

Participants: B Chambers & K Ley

Polygon	Transect #	Plant Number	Species	Height	Condition	Effects	Comments
GW	GW-1	1	Goodding Willow	95	4		
GW	GW-1	2	Goodding Willow	200	4		
GW	GW-1	3	Goodding Willow	130	4		
GW	GW-1	4	Goodding Willow	132	4		
GW	GW-1	5	Goodding Willow	135	4		
FWS	FWS-2	6	Four-Wing Salt	80	4		
FWS	FWS-2	7	Four-Wing Salt	41	2		VC weeds
FWS	FWS-2	8	Four-Wing Salt	29	4		
FWS	FWS-2	9	Four-Wing Salt	57	4		
FWS	FWS-2	10	Four-Wing Salt	42	0	DEAD	
VM	VM-[illegible]	[illegible]	Velvet Mesquite	112cm	4	VL	[illegible]
VM	VM-[illegible]	[illegible]	Velvet Mesquite	76	4		
VM	VM-[illegible]	[illegible]	Velvet Mesquite	60	3	IB	same leaves [illegible]
VM	VM-[illegible]	[illegible]	Velvet Mesquite	81	2.5	VG	" "
VM	VM-[illegible]	[illegible]	Velvet Mesquite	125	0	VC	Dead
VM	VM-[illegible]	[illegible]	Velvet Mesquite	202	4		
VM	VM-[illegible]	[illegible]	Velvet Mesquite	96	4		
VM	VM-[illegible]	[illegible]	Velvet Mesquite	90	4		
VM	VM-[illegible]	[illegible]	Velvet Mesquite	114	2	VC	
VM	VM-[illegible]	[illegible]	Velvet Mesquite	109	35		
CW	CW-5	21	Cottonwood	112	35	IB	
CW	CW-5	22	Cottonwood	95	2	V C/B	weeds on 90% of [illegible]
CW	CW-5	23	Cottonwood	91	3.5	VC	
CW	CW-5	24	Cottonwood	89	2	VC/B	weeds [illegible] trunk!
CW	CW-5	25	Cottonwood	105	4		
BB	BB-6	26	Brittlebush	37	0	DEAD	- Freeze
BB	BB-6	27	Brittlebush	27	0	DEAD	- " "
BB	BB-6	28	Brittlebush	0	0	DEAD	" "
BB	BB-6	29	Brittlebush	0	0	DEAD	" "
BB	BB-6	30	Brittlebush	31	0	DEAD	" "
SBW	SBW-7	31	Sandbar Willow	210	4		
SBW	SBW-7	32	Sandbar Willow	136	4		
SBW	SBW-7	33	Sandbar Willow	135	4		
SBW	SBW-7	34	Sandbar Willow	135	4		
SBW	SBW-7	35	Sandbar Willow	124	4		

Date: 26-Jul-11

Polygon	Transect #	Plant Number	Species	Height (cm)	Condition	Effects	Comments
GW	GW-1	1	Goodding Willow	135	3.5		
GW	GW-1	2	Goodding Willow	156	4		
GW	GW-1	3	Goodding Willow	168	4		
GW	GW-1	4	Goodding Willow	168	4		
GW	GW-1	5	Goodding Willow	171	4		
FWS	FWS-2	6	Four-Wing Salt	101	4		
FWS	FWS-2	7	Four-Wing Salt	43	3		- not much change but doing good
FWS	FWS-2	8	Four-Wing Salt	51	4		
FWS	FWS-2	9	Four-Wing Salt	84	4		
FWS	FWS-2	10	Four-Wing Salt	DEAD			- same as last time
VM	VM-3	11	Velvet Mesquite	160	4		
VM	VM-3	12	Velvet Mesquite	106	4		
VM	VM-3	13	Velvet Mesquite	121	3.5		- some leaves - yellow
VM	VM-3	14	Velvet Mesquite	115	2.5	NA	leaves yellow, stems yellow - not many leaves present 3554
VM	VM-3	15	Velvet Mesquite	108	3	N/A	- some leaves yellow but most green
VM	VM-4	16	Velvet Mesquite	154 cm	3.5		- some yellow leaves, getting plenty of water
VM	VM-4	17	Velvet Mesquite	124 cm	3.5		" "
VM	VM-4	18	Velvet Mesquite	65	3	N/A	- stunted growth, yellow leaves stumped [illegible] 3552-51
VM	VM-4	19	Velvet Mesquite	51	2	N/A	- yellow leaves, stunted growth - new resprout healthy
VM	VM-4	20	Velvet Mesquite	127	3	N/A	- some yellow leaves
CW	CW-5	21	Cottonwood	170	4		
CW	CW-5	22	Cottonwood	148	3	IB	- some insect [illegible] [illegible] [illegible]
CW	CW-5	23	Cottonwood	168	3.5		
CW	CW-5	24	Cottonwood	155	4		
CW	CW-5	25	Cottonwood	71	3	P	- a branch was ~~[illegible]~~ - foliar issues, some leaf edges were black 3553
BB	BB-6	26	Brittlebush	DEAD			
BB	BB-6	27	Brittlebush	" "			
BB	BB-6	28	Brittlebush				
BB	BB-6	29	Brittlebush				
BB	BB-6	30	Brittlebush				
SBW	SBW-7	31	Sandbar Willow	220	4		
SBW	SBW-7	32	Sandbar Willow	172	4		
SBW	SBW-7	33	Sandbar Willow	182	4		

				Height (cm)	condition	effects	comments
SBW	SBW-7	34	Sandbar Willow	180	4		
SBW	SBW-7	35	Sandbar Willow	151	4		

Black Canyon Riparian Restoration Project Plant Database

			Date:	28-Sep-11				26-Jul-11
Polygon	Transect #	Plant Number	Species	Height (cm)	Condition	Effects	Comments	Height (cm)
GW	GW-1	1	Goodding Willow	180	4			135
GW	GW-1	2	Goodding Willow	188	4			156
GW	GW-1	3	Goodding Willow	250	4			168
GW	GW-1	4	Goodding Willow	231	4			168
GW	GW-1	5	Goodding Willow	212	4			171
FWS	FWS-2	6	Four-Wing Salt	102	3.5			101
FWS	FWS-2	7	Four-Wing Salt	88	4			43
FWS	FWS-2	8	Four-Wing Salt	99	4			51
FWS	FWS-2	9	Four-Wing Salt	125	4			89
FWS	FWS-2	10	Four-Wing Salt	DEAD				Dead
VM	VM-3	11	Velvet Mesquite	200	4			160
VM	VM-3	12	Velvet Mesquite	139	4			106
VM	VM-3	13	Velvet Mesquite	149	4			121
VM	VM-3	14	Velvet Mesquite	123	[illegible]3	VC	Russian thistle covering/taller than tree	115
VM	VM-3	15	Velvet Mesquite	117	4			109
VM	VM-4	16	Velvet Mesquite	176	3.5			154
VM	VM-4	17	Velvet Mesquite	190	4			128
VM	VM-4	18	Velvet Mesquite	97	4			65
VM	VM-4	19	Velvet Mesquite	88	3.5			51
VM	VM-4	20	Velvet Mesquite	148	4			127
CW	CW-5	21	Cottonwood	198	4			170
CW	CW-5	22	Cottonwood	182	4		minor, insect boring	148
CW	CW-5	23	Cottonwood	192	4			168
CW	CW-5	24	Cottonwood	244	4			155
CW	CW-5	25	Cottonwood	95	3.5			71
BB	BB-6	26	Brittlebush	—				DEAD

BB	BB-6	27	Brittlebush	—				DEAD
BB	BB-6	28	Brittlebush	—				DEAD
BB	BB-6	29	Brittlebush	—				DEAD
BB	BB-6	30	Brittlebush	—				DEAD
SBW	SBW-7	31	Sandbar Willow	251	4			220
SBW	SBW-7	32	Sandbar Willow	200	4			172
SBW	SBW-7	33	Sandbar Willow	200	4			182
SBW	SBW-7	34	Sandbar Willow	211	4			180
SBW	SBW-7	35	Sandbar Willow	197	4			151

Appendix L. Vegetation Cover Datasheets

Appendix D. Cover Class Monitoring Datasheets

Project Name: Black Canyon Restoration Project Date: 11/18/10 Collector: K. Ivy, H. Trathegg Page ___ of ___

Plant Species	Polygon / Strata Class	Quadrat Cover Class BG2 Q1	HSB1 Q2	3SQ1 Q3	SF1 Q4	AS1 Q5	ISG3 Q6	IRG4 Q7	3SQ3 Q8	CP2 Q9	YM4 Q10	Comments	Unknown Species Description	Unknown Species Collected
Blue Grama	herb	2			3							long side N-S		
Bare Ground	herb	7	7	6	6	7	7	7	4	5	6			
Small Fescue	herb				1							long side N-S		
Woody Materia	shr				2		1							
Hardstem Bulrush	herb		1		0							long side N-S		
Geranium	herb		1		0					2	1			
Alkali Sacaton	herb					1						long side N-S		
Yerba Mansa	herb										2	long side E-W		
unknown herb	herb										1			
bermuda grass	herb			1			1			1	1			
Indian Rice grass	herb							1				laid longside E-W		
Canyon Penstemon	herb									2		laid longside E-W		
unknown herb 2	herb						1			1				
purslane ?	herb									1				
clover	herb									1				
Inland salt grass	herb						L					laid longside E-W		
3-square	herb			2					2			laid longside N-S		

The Daubenmire Cover Scale

Strata Class	Height	Cover Class	Range of Cover (%)	Class Midpoints (%)	Class Name	Cover Class	Range of Cover (%)	Class Midpoints (%)	Class Name
Tree Tall Canopy	>10 m	1	0 -1%	0.5	Rare	4	25 -50%	37.5	Somewhat common
Tree Middle Canopy	4 - 10 m	2	1 -5%	2.5	Occasional	5	50 -75%	62.5	Common
Shrub	0 -4 m	3	5 -25%	15	Uncommon	6	75- 95%	85	Abundant
Herbaceous & Surface Cover	<0.5 m					7	95- 100%	97.5	Dominant

Project Name: Black Canyon Restoration Project Date: 5/31/11 Collector: [illegible] Page ___ of ___

Plant Species	Polygon / Strata Class	Quadrat Cover Class BG2 Q1	HSB1 Q2	3SQ1 Q3	SF1 Q4	AS1 Q5	ISG3 Q6	IRG4 Q7	3SQ3 Q8	CP2 Q9	YM4 Q10	Comments	Unknown Species Description	Unknown Species Collected
BLUE GRAMA	GRASS	2										PICS 33		
PIGWEED	HERB	2	1	2	1	1	3		1	3		32		
UNKNOWN 1		1	1	1	2				1		2	Q1 3427 / 3440		
UNKNOWN 2	HERB	2	1	2					4			3428		
WOODY MATERIAL		3	1	3	4	2	5		1	6	1			
BARE GROUND		5	6	6	4	6	3	5	5	3	6			
BULLRUSH														
3 SQUARE			3			3			3			PIC #		
SACATON				2				3						
UNKNOWN 3								1				UNKNOWN 8 : 3436		
SMALL FESCUE	DEAD				1		3					" 7 : 3437		
UNKNOWN 4	MALLOW				5	2	3					" 9 3438		
FOXTAIL					2		1			3		" 10 : 3439		
YERBA MANZA											3	11 : 3441		
UNKNOWN 5											2	12 : 3442 → (same as Unknown 3)?		
UNKNOWN 6											1	3435		
RICE GRASS								2						
UNKNOWN 7							1			2				
UNKNOWN 8								3				UNKNOWN 1 3427		
UNKNOWN 9	THISTLE						2			2		" 2 : 3428		
INLAND SALT GRASS							2					" 3 : 3429-3430		
UNKNOWN 10										1		" 4 : 3431		
UNKNOWN 11										2		5 : 3433		
UNKNOWN 12												6 3434		

The Daubenmire Cover Scale

Strata Class	Height	Cover Class	Range of Cover (%)	Class Midpoints (%)	Class Name	Cover Class	Range of Cover (%)	Class Midpoints (%)	Class Name
Tree Tall Canopy	>10 m	1	0 -1%	0.5	Rare	4	25 -50%	37.5	Somewhat common
Tree Middle Canopy	4- 10 m	2	1 -5%	2.5	Occasional	5	50 -75%	62.5	Common
Shrub	0 -4 m	3	5 -25%	15	Uncommon	6	75- 95%	85	Abundant
Herbaceous & Surface Cover	<0.5 m					7	95- 100%	97.5	Dominant

ct Name: Black Canyon Restoration Project Date: 7/26/11 Collector: B. Chambers, K. W Page ___ of ___

Plant Species	Polygon / Strata Class	BG2 Q1	HSB1 Q2	3SQ1 Q3	SF1 Q4	AS1 Q5	ISG3 Q6	IRG4 Q7	3SQ3 Q8	CP2 Q9	YM4 Q10	Comments	Unknown Species Description	Unknown Species Collected
Inland saltgrass		2									2			
Blue grama		2												
Pigweed		1			2	3	3	3	2	3				
Bareground		6	7	6	4	6	3	3	4	2	5			
Woody material		3	2	3	4	3	5	3	3	5	4			
Unknown 1		0	2		4				2			PICS: 3836		
Unknown 2					1			1		1		PIC. 3837		
horse weed			1											1
Bermuda grass			1	1					0					
Alkali saccaton						3	3							
Baccharis Spp					0	1			1					
Three square				3					4					
Purslane				3			2	3		2	1			
Sprangletop				1								darkon bottom of stems	pic 3855 - 3858	
Unknown 3									3			3840		
Indian ricegrass								3	2					
Unknown 4									2		2	3841		
Unknown 5							3					3842-3843		
Unknown 6	(thistle)						3					3844		
Unknown 7										4		3845		
Unknown 8								1				heartshaped leaves pic 3848		
Yerba manca											2			
~~Yellow sweet clover~~ Unknown 9											1	3850		

The Daubenmire Cover Scale

Class	Height	Cover Class	Range of Cover (%)	Class Midpoints (%)	Class Name	Cover Class	Range of Cover (%)	Class Midpoints (%)	Class Name
all Canopy	>10 m	1	0-1%	0.5	Rare	4	25-50%	37.5	Somewhat common
iddle Canopy	4-10 m	2	1-5%	2.5	Occasional	5	50-75%	62.5	Common
	0-4 m	3	5-25%	15	Uncommon	6	75-95%	85	Abundant
eous & Surface Cover	<0.5 m					7	95-100%	97.5	Dominant

Project Name: Black Canyon Restoration Project **Date:** 9/28/11 **Collector:** Kilby . D.Blanchard

Plant Species	Polygon / Strata Class	BG2 Q1	HSB1 Q2	3SQ1 Q8 (Q3)	SF1 Q4	AS1 Q5	ISG3 Q6	IRG4 Q7	3SQ3 Q3 (Q8)	CP2 Q9	YM4 Q10	Comments	Unknown Species Description	Unknown Species Collected
saltgrass	H	3						5			2			
~~unknown grass~~	H	3			2				3			Pic 149-151 / ~~[illegible]~~ small fescue		
Blue gramma	H	3												
Purslane	H	1	1						2					
Bareground	H	6	6			5	4		3	1				
woddy material		2	1			1	2							
unknown 1	H				5							Pics 152-154		
Russian-thistle	H		3		3									
Pigweed	H				3	3				3				
Bermuda grass			2		3		3	4	5	5	3			
Three square	H		2	3					3		3			
Sacaton	H			5		4	5			3				
yerba mansa	H										2			
sprangle top	H							2			2			
Sweet clover	H							2			2			
Cattail	H										2			
Unknown 2	H			3							2	rabbits foot		
unknown 3							3					Pic 174-175 unknown vine		
invasive Palo Verde										2				
unknown 4										3		Pic 186 bushy spreading	marijuana leaf	
Unknown 5				2								vine w/ blue flowers, ~~[illegible]~~ shap		
Alkali rush									3					

The Daubenmire Cover Scale

Strata Class	Height	Cover Class	Range of Cover (%)	Class Midpoints (%)	Class Name	Cover Class	Range of Cover (%)	Class Midpoints (%)	Class Name
Tree Tall Canopy	>10 m	1	0 -1%	0.5	Rare	4	25 -50%	37.5	Somewhat common
Tree Middle Canopy	4- 10 m	2	1 -5%	2.5	Occasional	5	50 -75%	62.5	Common
Shrub	0 -4 m	3	5 -25%	15	Uncommon	6	75- 95%	85	Abundant
Herbaceous & Surface Cover	<0.5 m					7	95- 100%	97.5	Dominant

Appendix M. Photo Monitoring Datasheets

Photo Monitoring Data Collection Sheet

NAME of SITE Black Canyon

Photo Monitoring Data Collection Sheet								
	Photo # 1	Photo # 2	Photo # 3	Photo # 4	Photo # 5	Photo #	Photo #	Photo #
Date 11	11/18/10	—						→
Time	10:07	10:25	10:35	10:43	10:50			
Weather	Slight breeze [illegible]	→						→
Location	West of site	[illegible] trail S. side of property	Adjacent to stream	Off N. trail looking S.	BC pond			
Subject and purpose of photo	PM point	PM 3	PM5	PM4	PM2			
Camera	Pentax [illegible]	→						→
Frame #'s	0320-0322	0323-0325	0326-0328	0329-0331	0332-0334			
Photo Label (what you want this to be called for office files	PM1 looking East at the site	PM3 looking SE-NE of site	PM5 looking NE-SE over stream	PM4 looking South from N stream bank	PM2 looking S. over pond			
f-stop	—	—	—	—	—			
Speed	—	—	—	—	—			
Lens	—	—	—	—	—			
Filter	—	—	—	—	—			
Tripod/ Camera Height	62"	62"	62"	62"	62"			
Marker	Green Fence Post	→						→
Compass Bearing	North East 52°	N East 79	NE 52	S 168	S 158			
Latitude	1116924.74N	1116943.73N	1117143.37N	1117095.74N	1117200.04N			
Longitude	628924.58E	629179.66E	629511.35E	629354.02E	629104.74E			
error	[illegible]							
Photographer	K. Ivy	→					→	
Note Taker	H. [illegible]	→						→
Description of Location (How to find spot)	Adjacent [illegible] and [illegible] post on west side	On N running trail south side of site.	S. between [illegible] post on S. bank of stream	On N. side of stream [illegible] trail on side [illegible] on lookout	On N. side of pond [illegible] (east) of pine trees			
Reference photos	None		—					

Photo Monitoring Data Collection Sheet

	Photo # 1	Photo #2	Photo #3	Photo #4	Photo #5
Date	5/31/11	5/31/11	5/31/11	5/31/11	5/31/11
Time	8:10	8:15	8:22	8:31	8:35
Weather	slight breeze	" "	" "	" "	" "
Location	West of site	Off of N running trail on South side of property	Adjacent to stream	Off north trail looking south	BC Pond
Subject and Purpose of photo	PM Point 1	PM Point 3	PM Point 5	PM Point 4	PM Point 2
Camera	Canon SD1200	" "	" "	" "	" "
Frame #'s	3401-3405	3406-3410	3411-3415	3416-3420	3421-3425
Photo Label	PM 1 Looking East at the site	PM 3 Looking SE- NE over site	PM 5 Looking NE SE over stream	PM 4 Looking south from the north stream bank	PM 2 Looking south over pond from north bank
f-stop	N/A	N/A	N/A	N/A	N/A
Speed	N/A	N/A	N/A	N/A	N/A
Lens	N/A	N/A	N/A	N/A	N/A
Filter	N/A	N/A	N/A	N/A	N/A
Tripod/Camera Height	62"	62"	62"	62"	62"
Marker	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence
Compass Bearing	NE 52	E 79	NE 52	S 168	S 158
Latitude	1116924.74N	1116943.93N	1117143.37N	1117095.94N	1117200.04N
Longitude	628924.58E	69179.66E	629511.35E	629354.02E	629104.74E
error	N/A	N/A	N/A	N/A	N/A
Photographer	B. Lawless	" "	" "	" "	" "
Note Taker	K. Ivy	" "	" "	" "	" "
Description of Location (How to find the spot)	Adjacent to shop and electrical post on west side	On north running trail South side of site	in between second and third pool on south bank of stream	On north side of stream off main trail on lookout trail	On north side of pond at east end of pine trees
Reference Photos	none	none	none	none	none

Photo Monitoring Data Collection Sheet

	Photo # 1	Photo #2	Photo #3	Photo #4	Photo #5
Date	7/24/11	7/24/11	7/24/11	7/24/11	7/24/11
Time	8:30	8:47	8:35	9:45	8:38
Weather	partly cloudy	" "	" "	" "	" "
Location	West of site	Off of N running trail on South side of property	Adjacent to stream	Off north trail looking south	BC Pond
Subject and Purpose of photo	PM Point 1	PM Point 3	PM Point 5	PM Point 4	PM Point 2
Camera	Canon PowerShot SD1200	" "	" "	" "	" "
Frame #'s	3802-3806	3826-3830	3807-3812	3820-3825	3813-3817
Photo Label	PM 1 Looking East at the site	PM 3 Looking SE NE over site	PM 5 Looking NE SE over stream	PM 4 Looking south from the north stream bank	PM 2 Looking south over pond from north bank
f-stop	N/A	N/A	N/A	N/A	N/A
Speed	N/A	N/A	N/A	N/A	N/A
Lens	N/A	N/A	N/A	N/A	N/A
Filter	N/A	N/A	N/A	N/A	N/A
Tripod/Camera Height	62"	62"	62"	62"	62"
Marker	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence
Compass Bearing	NE 52	E 78°	NE 52°	S 168°	S 158°
Latitude	1116924.74N	1116943.93N	1117143.37N	1117095.94N	1117200.04N
Longitude	628924.58E	69179.66E	629511.35E	629354.02E	629104.74E
error	N/A	N/A	N/A	N/A	N/A
Photographer	B. Chambers	" "	" "	" "	" "
Note Taker	K. Ivey	" "	" "	" "	" "
Description of Location (How to find the spot)	Adjacent to shop and electrical post on west side	On north running trail South side of site	In between second and third pool on south bank of stream	On north side of stream off main trail on lookout trail	On north side of pond at east end of pine trees
Reference Photos	none	none	none	none	none

Photo Monitoring Data Collection Sheet

	Photo # 1	Photo #2	Photo #3	Photo #4	Photo #5
Date	9/28/11	9/28/11	9/28/11	9/28/11	
Time	8:36 AM	9:55 AM	9:00 AM	9:36 AM	9:17 AM
Weather	Sunny clear	sunny, clear	sunny, clear	sunny, clear	sunny, clear
Location	West of site	Off of N running trail on South side of property	Adjacent to stream	Off north trail looking south	BC Pond
Subject and Purpose of photo	PM Point 1	PM Point 3	PM Point 5	PM Point 4	PM Point 2
Camera	Olympus 6020	olympus 6020	olympus SW-6020	olympus stylus	
Frame #'s	155 - 160	196 - 200	167 - 172	189 - 194	178 - 183
Photo Label	PM 1. Looking East at the site	PM 3. Looking SE- NE over site	PM 5. Looking NE-SE over stream	PM 4. Looking south from the north stream bank	PM 2. Looking south over pond from north bank
f-stop	N/A	N/A	N/A	N/A	N/A
Speed	N/A	N/A	N/A	N/A	N/A
Lens	N/A	N/A	N/A	N/A	N/A
Filter	N/A	N/A	N/A	N/A	N/A
Tripod/Camera Height	62"	62"	62"	62"	62"
Marker	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence	Green fence post with fluorescent construction fence
Compass Bearing	NE 52'	E 79'	NE 52'	S 168'	S 158'
Latitude	1116924.74N	1116943.93N	1117143.37N	1117095.94N	1117200.04N
Longitude	628924.58E	69179.66E	629511.35E	629354.02E	629104.74E
error	N/A	N/A	N/A	N/A	N/A
Photographer					
Note Taker					
Description of Location (How to find the spot)	Adjacent to shop and electrical post on west side	On north running trail. South side of site	in between second and third pool on south bank of stream	On north side of stream off main trail on lookout trail	On north side of pond at east end of pine trees
Reference Photos	none	none	none	none	none

Appendix N. Photo Monitoring Results

Description: PM1 looking East at Site. Adjacent to shop and electrical post on West side of Site. November 18, 2010
Latitude: 116924.74 N; Longitude: 628924.58E

Description: PM1 looking East at Site. Adjacent to shop and electrical post on West side of Site. May 31, 2011
Latitude: 1116928.0781N ; Longitude: 628926.5653E

Description: PM1 looking East at Site. Adjacent to shop and electrical post on West side of Site. July 26, 2011
Latitude: 1116928.0781N ; Longitude: 628926.5653E

Description: PM1 looking East at Site. Adjacent to shop and electrical post on West side of Site.September 28, 2011
Latitude: 1116928.0781N ; Longitude: 628926.5653E

Black Canyon Riparian Restoration Project

Photo Monitoring Point 1

Date: December, 2011

Description: PM2 looking South over pond. On the North side of pond at the end of the pine trees(east). November 18, 2010
Latitude: 1117200.04 N; Longitude: 629104.74 E

Description: PM2 looking South over pond. On the North side of pond at the end of the pine trees(east). May 31, 2011
Latitude: 1117138.5240N ; Longitude: 629511.7442E

Black Canyon Riparian Restoration Project

Photo Monitoring Point 2

Date: June 2, 2011

Description: PM2 looking south over pond. On the north side of pond at the end of the pine trees(east). July 26, 2011
Latitude: 1117200.04 N ; Longitude: 629104.74 E

Description: PM2 looking south over pond. On the north side of pond at the end of the pine trees(east). September 28, 2011
Latitude: 1117200.04 N ; Longitude: 629104.74 E

Black Canyon Riparian Restoration Project

Photo Monitoring Point 2

Date: December, 2011

Description: PM3 Looking South East- North East of site. On North walking trail south side of site. November 18, 2010

Latitude: 1116943.93N; Longitude: 629179.66E

Description: PM3 Looking South East- North East of site. On North walking trail south side of site.

Latitude: 1117192.5266N; Longitude: 629101.8993E

Fred Phillips Consulting

Black Canyon Riparian Restoration Project

Photo Monitoring Point 3

Date: June 2, 2011

Description: PM3 Looking southeast, northeast of site. On North walking trail south side of site. July 26, 2011
Latitude: 1116943.93 N ; Longitude: 629179.66 E

Description: PM3 Looking southeast, northeast of site. On North walking trail south side of site. September 28, 2011
Latitude: 1116943.93 N ; Longitude: 629179.66 E

Black Canyon Riparian Restoration Project

Photo Monitoring Point 3

Date: December, 2011

Description: PM4 looking South on North Side of stream off main trail on side of trail. November 18, 2010

Latitude: 1117095.94N Longitude: 629354.02 E

Description: PM4 looking South on North Side of stream off main trail on side of trail. May 31, 2011

Latitude: 1117095.1529N; Longitude: 629355.3899E

Black Canyon Riparian Restoration Project

Photo Monitoring Point 4

Date: June 2, 2011

Description: PM4 Looking south of north side of stream off main trail on side of trail. July 26, 2011
Latitude: 1117095.94 N ; Longitude: 629354.02 E

Description: PM4 Looking south of north side of stream off main trail on side of trail. September 28, 2011
Latitude: 1117095.94 N ; Longitude: 629354.02 E

Black Canyon Riparian Restoration Project

Photo Monitoring Point 4

Date: December, 2011

Description: PM5 looking Northeast-Southeast over stream. In between 2nd and 3rd pool of water on the south bank of stream. November 18, 2010
Latitude: 1117143.37N; Longitude: 629511.35E

Description: PM5 looking Northeast-Southeast over stream. In between 2nd and 3rd pool of water on the south bank of stream. May 31, 2011
Latitude: 1116940.3604N ; Longitude: 629177.6333E

Fred Phillips Consulting

Black Canyon Riparian Restoration Project

Photo Monitoring Point 5

Date: June 2, 2011

Description: PM5 Looking northeast from southeast of stream. In between 2nd & 3rd pool of water. July 26, 2011
Latitude: 1117143.37 N ; Longitude: 629511.35 E

Description: PM5 Looking northeast from southeast of stream. In between 2nd & 3rd pool of water. September 28, 2011
Latitude: 1117143.37 N ; Longitude: 629511.35 E

Fred Phillips Consulting

Black Canyon Riparian Restoration Project

Photo Monitoring Point 5

Date: December, 2011