

2007 U. S. Fish and Wildlife Service Biological Opinion Annual Mitigation Monitoring Reports for the Rocky Flats Site



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[East Shooting Range Remediation Project Report](#)

[Incinerator Project Report](#)

[Phytoremediation Project Report](#)

[Programmatic Biological Assessment \(PBA\) Part II Report](#)

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Programmatic Biological Assessment (PBA) Part II Report

Photomonitoring Projects:

Pond Remediation A-Series

Pond Remediation B-Series

Walnut Creek Riparian Corridor Monitoring

2007 Phytoremediation Project Report for the Rocky Flats Site



East Trenches Plume (B-1 pond)

Solar Pond

Plume Discharge Gallery

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[Report Text \(PDF Version\)](#)

[Appendix A: Photomonitoring](#)

**Preble's Meadow Jumping Mouse Mitigation Monitoring Report for the
Phytoremediation Project at the Rocky Flats Site
2007 Annual Report
Biological Opinion: ES/LK-6-CO-05-F-014 (June 16, 2005)**

Introduction

This report is being submitted to the U. S. Fish and Wildlife Service (USFWS) in order to comply with the requirements outlined their Biological Opinion (BO) on the Phytoremediation Project (USFWS BO dated June 16, 2005). The Phytoremediation Project involved the planting of several hundred coyote willow (*Salix exigua*) and plains cottonwood (*Populus deltoides*) stakes/poles to attempt to remediate contaminated groundwater plumes at different locations along North Walnut Creek and South Walnut Creek at the Rocky Flats Site (Site). The BO addresses impacts to the federally-listed Preble's meadow jumping mouse, (Preble's mouse, *Zapus hudsonius preblei*), from the Phytoremediation Project at the Site. The Biological Assessment (BA) written for the project states that the revegetation monitoring would be conducted according to the guidance provided in Part II of the Programmatic Biological Assessment (PBA), Appendix B. This report is being submitted to satisfy the conditions of the USFWS BO for 2007 and is due by December 1 after each growing season.

Methodology

The locations of the Phytoremediation Project at the Solar Ponds Plume area and East Trenches Plume area are shown on Figures 1 and 2, respectively. At the Solar Ponds Plume area, the concept was to intercept groundwater flows from the south before they reached North Walnut Creek. At the East Trenches Plume area, the purpose was to intercept the groundwater flows along the south side of the B-Ponds before they reached the ponds (i.e., South Walnut Creek). Planting was conducted in early May 2005 and was completed within a week. Final application of a soil enhancement product was made in late May 2005. Plant materials came from nearby native sources in Jefferson and Boulder Counties. At the Solar Ponds Plume area in North Walnut Creek, a total of 770 plants (stakes) were installed: 435 coyote willows and 335 cottonwoods. All of the cuttings were soaked in a root dip product (described below) and inserted into a 12- to 18-inch deep hole punched into the ground with a long, pointed steel piercing implement. The planting hole was sealed by a footstep or another plunge with the implement to ensure proper planting. At the East Trenches Plume area along Ponds B-1, B-2, and B-3 in South Walnut Creek, a total of 760 plants were planted. At Ponds B-1 and B-2, a total of 475 plants were installed: 158 willows and 317 cottonwoods. At Pond B-3, 115 willows and 170 cottonwoods were planted for a total of 285 plants. Planting techniques at the East Trenches Plume area were the same as the Solar Ponds Plume area, however, some plantings were doubled up in their planting holes to ensure survival of at least one cutting and to gain extensive localized growth. Because the planting area along the B-Ponds was steeply sloped and located in a very short transition zone from wetter soils at the pond edges to the drier adjacent upland soils, the planting strategy was to install the cuttings closer together in wet areas, and space them farther apart in dry areas.

To assist in the development of the roots and rhizosphere (soil zone), biological soil inoculants and soil conditioners were used. The products used included both a root dip product and a soil-

conditioning product. A product called DIEHARD Root Dip was used as a bare root mycorrhizal inoculant treatment to inoculate the newly forming roots with live beneficial mycorrhizal fungi. All of the cuttings were soaked in the root dip prior to planting. The mycorrhizal inoculants are a combination of humic acids, biostimulants, beneficial bacteria, soluble sea kelp, and yucca plant extracts, which help promote rapid root development. The product also contains a polyacrylamide water management gel that keeps a small amount of water in the root zone to keep roots from drying out. A product called Humega (a soil conditioner) was added to the plantings to condition the soil and help build soil structure. The Humega was added after planting as a liquid that was drenched into and around the soil at each stake/pole.

Due to the poor survival of most of the coyote willow and plains cottonwood stakes that were planted in 2005, additional coyote willows were planted at the Solar Ponds Plume area (at the discharge gallery location), and at Ponds B-1, B-2, and B-3 in 2006. No plains cottonwood stakes were planted in 2006. On April 4, 2006, a total of 356 coyote willow stakes were planted along the southern edges of the Ponds B-1 (110 stakes), B-2 (128 stakes), and B-3 (118 stakes). A total of 40 coyote willow stakes were installed along the tire ruts east of the Solar Ponds discharge gallery on May 18, 2006. In spring 2007, approximately 100 additional, bare-root coyote willow plants were installed along the ruts at the Solar Ponds discharge gallery. No additional plantings were installed along the southern edges of the Ponds B-1, B-2, or B-3 in 2007.

The methodology used for the monitoring is a modification of that presented in Appendix B in Part II of the PBA. It was modified based on the fact that the project involved no revegetation and essentially no disturbance of the pre-existing habitat occurred. The project did not disturb the habitat beyond walking through the area and planting willow and cottonwood stakes/poles. After the stakes/poles had been installed it was difficult to see that anyone had been there. Therefore, monitoring in 2005 and 2006 consisted of determining the percent survival of the planted materials at the end of the growing season (September 2005). In 2007, counts were only possible at the Solar Ponds discharge gallery. The plants at the B-Ponds had become so well established and had sent up so many new stems that it was no longer possible to count the original plants. In addition, photomonitoring was conducted along the reaches of the stream where the plants were installed. Photomonitoring results are presented in Appendix A on the CD-ROM.

Results and Discussion

At the Solar Ponds Plume area, monitoring results in September 2005 showed that approximately 50% of the coyote willow had survived in the vicinity of the discharge gallery where the ground was constantly wet. Plants had been installed for a distance of approximately 50 meters (m) west (upstream) of the discharge gallery and approximately 125 m east (downstream) of the discharge gallery. Beyond 30 m or so from the discharge gallery, both upstream and downstream, only 10 to 20% of the coyote willow had survived. There was no evidence of survival of the plains cottonwood trees at the Solar Ponds Plume area. Based on the poor success rate of the 2005 plantings, an additional 40 coyote willow stakes were installed in 2006 along the tire rut where water was flowing from the Solar Ponds discharge gallery. Of the original 435 coyote willow installed in 2005, by August 2006, only nine plants were found that had survived. Of the 40 coyote willow installed in spring 2006, eight were still surviving in August 2006. The low survival rate of the 2005 plantings may have been partly due to the dry conditions, late planting, and inappropriate locations where most of the stakes were planted. Some of the low survival rate

of the 2006 plantings may also have been due to the late planting of the stakes (mid-May). An earlier timeframe for planting may greatly enhance the survivability of the plantings. Of the 100 coyote willow bare-root stock plants that were installed in spring 2007, approximately 25 were established and doing very well in late August 2007.

In 2007, abundant winter and spring moisture caused a large flush in the growth of the smooth brome grass around the Solar Ponds discharge gallery. The height of the smooth brome in the surrounding area made observation and counts of the planted willow difficult. There may have been some additional plants that were not observed and counted because they could not be found in the dense stand of smooth brome. The coyote willow planted in 2007 ranged from two to five feet tall in late August and seemed to be well established along the tire ruts where water was flowing. It is expected that these willow will continue to expand and fill in along tire ruts. Photomonitoring results are shown in Appendix A on the CD-ROM.

At the East Trenches Plume area, plants were originally installed in 2005 along the southern edges of Ponds B-1, B-2, and B-3 ponds after completion of the pond remediation activities. The success rate for survival of the coyote willow planted in 2005 at Pond B-1 was approximately 60% at the end of the first growing season, while none of the plains cottonwoods survived at this pond. By August 2006, none of the plantings installed in 2005 had survived at Pond B-1 due to the drought conditions; however, along the south edge of the pond where coyote willow was present prior to the cleanup activities, a large amount of regeneration from the rootstock had occurred. In spring 2006, an additional 110 coyote willow stakes were planted on the bottom of the Pond B-1 wetland area along the stream and oxbow areas on the southern side of the pond. By August 2006, only 30 coyote willow stakes planted earlier in spring 2006 were still surviving. The loss of 2006 planted materials was due primarily to the lack of water in the pond resulting from the drought. In 2007, the above-average precipitation received during winter and spring filled the pond completely. Water remained throughout much of the summer and hence drowned the plants that had survived on the bottom from 2006. No new plants were installed on the south side of Pond B-1 in 2007. The coyote willow stand that had originally been growing along the south side of Pond B-1 pond prior to the cleanup project has grown back completely and was 5–7 feet tall in 2007.

At Pond B-2, approximately 60% of the coyote willow and only one plains cottonwood tree survived the first growing season in 2005. By summer 2006, 45 of the originally planted coyote willow (planted in 2005) had survived and were increasing in size. In spring 2006, an additional 128 coyote willow stakes were planted along the south edge of Pond B-2. In August 2006, 74 of the 2006 planted materials were still alive and were increasing in size. In August 2007, the plants had increased in size and numerous new stems had come up between the original plantings making it impossible to count individuals at this time. The coyote willow along the south side of Pond A-2 are well established and ranged in heights from five to seven feet tall in 2007.

At Pond B-3, after the first growing season in 2005, the coyote willow had a survival rate of approximately 70%, while none of the plains cottonwoods survived. In August 2006, 57 of the coyote willow were alive and filling in an area along the south edge of the pond. An additional 118 coyote willow stakes were planted along the south edge of Pond B-3 in spring 2006, and by August, 84 were still alive and increasing in size. In 2007, the entire south side of Pond B-3 was filling in with coyote willow. The plants were too numerous to count and ranged in height up to six feet tall.

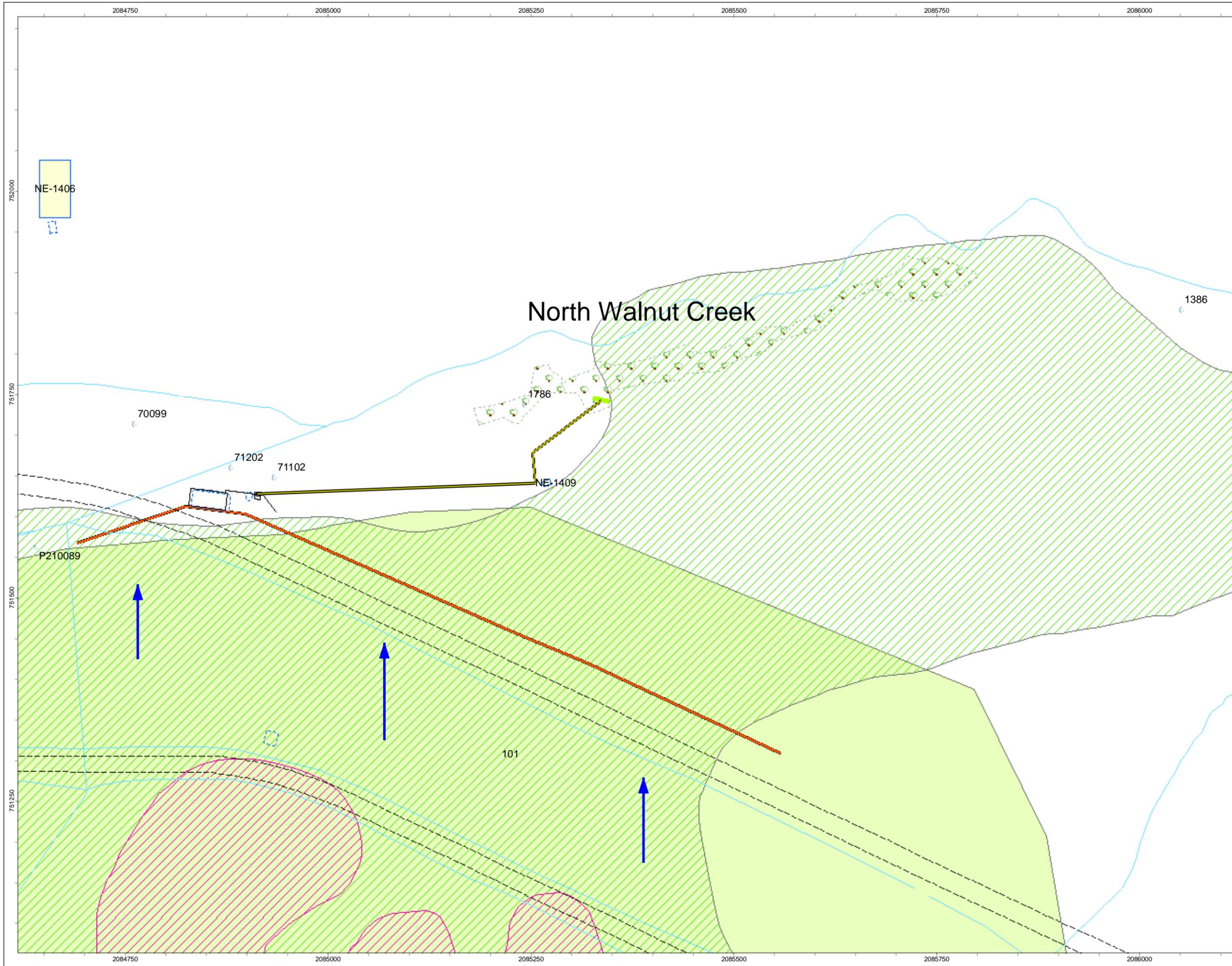
In general, the overall survival of the originally planted coyote willow and plains cottonwood at the Solar Ponds Plume Area was poor due to the lack of available water at many of the locations where they were installed. Along the south edge of North Walnut Creek at this location, only a few small shrubs and a handful of stunted cottonwood trees are found naturally beyond the south edge of the riparian habitat. General observations would indicate that given the time this area has been undisturbed, if sufficient water were available for shrub/tree growth southward from the narrow woody riparian corridor, the growth would have occurred by now through natural spreading and regeneration of the woody species. Only since spring 2006 has the water from the Solar Ponds discharge gallery been re-routed to the east down the old tire ruts. The additional coyote willow plantings that were installed in spring 2007 have begun to establish and should continue to grow. Thus the willow should survive and spread along the tire ruts where the appropriate hydrologic conditions exist. However, throughout most of the area where the original plants were installed conditions were not suitable for a project such as this. Therefore, for all practical purposes pertaining to the original phytoremediation objective, the project is complete at the Solar Ponds discharge gallery. The willows planted along the tire ruts east of the discharge gallery should survive and continue to spread where conditions are suitable.

At the B-Ponds, coyote willow is present along the south edge of each of the ponds. The willow will continue to expand and fill in over the next few years in these locations, thus helping intercept any ground water bypassing the East Trenches Plume Groundwater Treatment System which is uphill of the ponds on the south side. Therefore, these plantings have been a success and at this point the project is complete.

In accordance with the BA, no mitigation measures or success criteria were stipulated because it was acknowledged from the outset that successful establishment would be limited and no replanting of the stakes was planned for failed survival. Additional stakes were, however, installed on a limited basis at locations that seemed most suitable for potential survival. These willow have established and developed into good stands at the B-Ponds and are forming a stand of willow at the Solar Ponds discharge gallery outlet. The 2007 monitoring completes the three years of monitoring that were planned for the project.

Conclusions

The shrub and tree plantings of the Phytoremediation Project were monitored per the requirements of the USFWS BO dated June 16, 2005, to evaluate the survival status of the planted material. Poor survival of the material planted in 2005 resulted from inappropriate placement of the plants, lateness in planting, and dry conditions in the ponds. Greater survival of the 2006 and 2007 material is a result of the more saturated conditions at the locations where the stakes were installed and the better re-establishment of the seeps at the ponds in 2007 versus 2005. The willow have established and developed into good stands at the B-Ponds and are forming a stand at the Solar Ponds discharge gallery outlet. It is expected that the vegetation that has already established will continue to develop and mature on its own. The 2007 monitoring completes the three years of monitoring that were planned for the project. Therefore, DOE requests concurrence from USFWS that this project is complete based on the establishment of the coyote willow at the Solar Ponds Plume area and East Trenches Plume area (B-Ponds) and that future monitoring and reporting for this project are no longer required.



Rocky Flats Environmental Technology Site

**Proposed
Phyto-remediation
Enhancement of
Groundwater Quality
at the Solar Ponds Plume**

- GW Flow Direction
- Groundwater Wells
- Discharge Gallery
- Transmission Pipe
- Treatment Cells
- Collection Trench
- Individual Hazardous Substance Site
- Potential Area of Concern
- No Further Action PACs in 1992
- Under Building Contamination
- Nitrate Plumes**
- >Tier I GW AL
- >SW Standard
- Proposed Phyto-remediation
- Standard Map Features**
- Road
- Facility
- Pond
- Stream or Drainage Feature

Figure 1



1:1,389
1 inch equals 120 feet

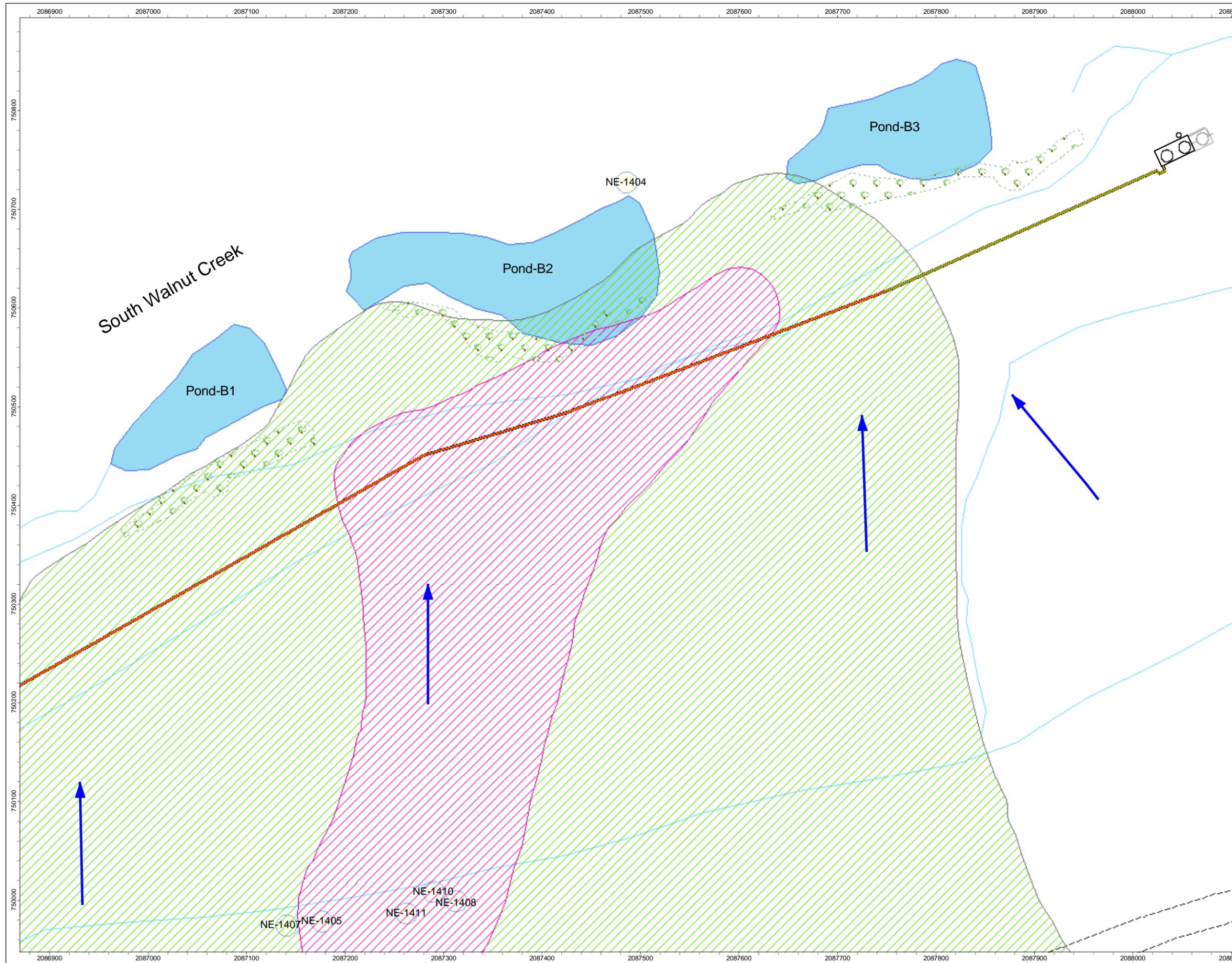
State Plane Coordinate Projection
Colorado Central Zone (3476)
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared By:

MAP ID: GIS Dept. (303) 966-7707 June 20, 2005

PATH: W:\Projects\FY2005\05-0248\Phyto_SEP_Trenches.mxd



Rocky Flats Environmental Technology Site

Proposed Phyto-remediation Enhancement of Groundwater Quality at the East Trenches Plume

- GW Flow Direction
- Treatment Infrastructure**
 - Possible Future Cell
 - Treatment Cell
 - Transmission Pipe
 - Collection Trench
 - Former OU2 IHSS
 - Potential Area of Concern
 - No Further Action PACs in 1992
- TCE Plumes**
 - >Tier I GW AL
 - >SW Standard
 - Proposed Phyto-remediation
- Standard Map Feature**
 - Facility
 - Road
 - Pond
 - Stream or Drainage Feature

Figure 2

Ⓜ

1:1,142
1 inch equals 95 feet

State Plane Coordinate Projection
Colorado Central Zone (3476)
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared By: Prepared For:

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Phytoremediation Project

(Clicking on any photopoint on the maps will take you to the corresponding monitoring photos, then clicking on any photo will enlarge that photo)

East Trenches Plume Treatment Area



Solar Pond Plume Treatment Area



B-Series Pond Remediation

Photopoint 141

6/28/2004

8/26/2005



8/08/2006

8/08/2007



B-Series Pond Remediation

Photopoint 142

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 143

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 144

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 145

6/28/2004

8/26/2005



8/08/2006

8/7/2007



B-Series Pond Remediation

Photopoint 146

6/28/2004

8/26/2005



8/08/2006

8/7/2007



6/28/2004

8/26/2005



8/08/2006

8/7/2007





6/28/2004

8/26/2005



8/08/2006



8/7/2007



B-Series Pond Remediation

Photopoint 147

6/28/2004

8/26/2005



8/08/2006

8/7/2007



6/28/2004

8/29/2005



8/08/2006



8/7/2007



6/28/2004

8/26/2005



8/08/2006



8/7/2007



B-Series Pond Remediation

Photopoint 148

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 149

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 150

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 151

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 152

6/28/2004

8/26/2005



8/08/2006

8/07/2007



6/28/2004

8/26/2005



8/08/2006

8/07/2007



6/28/2004

8/26/2005



8/08/2006



8/07/2007



B-Series Pond Remediation

Photopoint 153

6/28/2004

8/26/2005



8/08/2006

8/07/2007



6/28/2004

8/26/2005



8/08/2006



8/07/2007



6/29/2004

8/26/2005



8/08/2006



8/07/2007



B-Series Pond Remediation

Photopoint 154

6/28/2004

8/26/2005



8/7/2007



B-Series Pond Remediation

Photopoint 155

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 156

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 157

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 158

6/28/2004

8/26/2005



8/08/2006

8/07/2007



B-Series Pond Remediation

Photopoint 159

6/28/2004

8/26/2005



8/08/2006

8/07/2007



6/28/2004

8/26/2005



8/08/2006

8/07/2007



6/28/2004

8/26/2005



8/08/2006



8/07/2007



6/28/2004

8/26/2005



8/08/2006

8/07/2007



A-Series Pond Remediation

Photopoint 94

6/29/2004

8/26/2005



8/08/2006

8/07/2007



A-Series Pond Remediation

Photopoint 95

6/29/2004

8/26/2005



8/08/2006

8/07/2007



A-Series Pond Remediation

Photopoint 96

6/29/2004

8/26/2005



8/08/2006

8/07/2007



A-Series Pond Remediation

Photopoint 97

6/29/2004

8/26/2005



8/08/2006

8/07/2007



A-Series Pond Remediation

Photopoint 98

6/29/2004

8/26/2005



8/08/2006

8/07/2007



A-Series Pond Remediation

Photopoint 99

6/29/2004

8/26/2005



8/08/2006

8/07/2007



A-Series Pond Remediation

Photopoint 100

6/29/2004

8/26/2005



8/08/2006

8/07/2007



A-Series Pond Remediation

Photopoint 101

6/29/2004

8/26/2005



8/08/2006

8/07/2007

