INL/EXT-09-16614

Fiscal Year 2009 Revegetation Assessment

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October 2009

The INL is a U.S. Department of Energy National Laboratory
operated by Battelle Energy Alliance

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ABSTRACT

This report summarizes the Fiscal Year 2009 Revegetation Assessment by Battelle Energy Alliance, LLC. This assessment was conducted to supplement documentation related to the Stormwater Pollution Prevention Plan for Construction Activities and to ensure that disturbed vegetation and soil at various locations are being restored. This report provides the following information for each site being monitored by the Idaho National Laboratory Environmental Support and Services:

- Summary of each site
- Assessment of vegetation status and site stabilization at each location
- Recommendation(s) for each site.

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ACRONYMS

ACOE	Army Corp of Engineers
BEA	Battelle Energy Alliance, LLC
CGP	General Permit for Stormwater Discharge from Construction Activities
DBT	Design Basis Threat
DOE-ID	U.S. Department of Energy Idaho Operations Office
ES&S	Environmental Support and Services
ft	feet
FY	Fiscal Year
GI	Geomorphic Investigations
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
MFC	Materials and Fuels Complex
NPDES	National Pollution Discharge Elimination System
NSTR	National Security Test Range
SPC	Construction Specification
std	Standard Deviation
SWPPP-CA	Stormwater Pollution Prevention Plan for Construction Activities
UAV	Unmanned Aerial Vehicle
VAM	vesicular-arbuscular mycorrhizae
VZRP	Vadose Zone Research Park

Fiscal Year 2009 Revegetation Assessment

1. Introduction

Battelle Energy Alliance, LLC (BEA) complies with the National Pollutant Discharge Elimination System (NPDES) (40 CFR 122) General Permit for Stormwater Discharges from Construction Activities (CGP) issued by the U.S. Environmental Protection Agency on July 1, 2003 (as modified, effective January 1, 2005). The Idaho National Laboratory (INL) Site currently uses the INL Site Stormwater Corridor to determine when a construction activity has the potential to impact "waters of the United States" under the CGP requirements. The Stormwater Corridor is defined "as an area that has a reasonable potential to discharge stormwater to the Big Lost River."

A letter (Stenzel 2008) was submitted to the U. S. Army Corps of Engineers (ACOE) on May 7, 2008. The letter requested the ACOE to perform a Jurisdictional Determination concerning the applicability of Section 404 of the Clean Water Act and Sections 9 and 10 of the Rivers and Harbors Act of 1899 for the Big Lost River, Little Lost River, and Birch Creek. The ACOE responded with a letter dated May 26, 2009 (Brochu 2009) that stated "Due to the workload and priorities we are unable to complete your request. If you propose a specific project which may affect wetlands, playas, streams, creeks, or other waters such as the Big Lost River, Little Lost River or Birch Creek we shall reinitiate your request." Therefore, until a specific project is initiated and ACOE performs the Jurisdictional Determination or BEA submits another request, BEA will continue to comply with the CGP requirements.

For the 2009 Revegetation Assessment, three sites were determined to be within the Stormwater Corridor. These sites are the Geomorphic Investigations for Flood Bounds, Unmanned Aerial Vehicle Airfield, and the Vadose Zone Research Park. Three additional sites not in the Stormwater Corridor were also evaluated. These included the Materials and Fuels Complex (MFC) Design Basis Threat (DBT) Equipment Enclosure and Search Station, MFC DBT Vehicle Barrier Project, and the National Security Test Range Project.

A digital camera sampling and analysis method was used to assess the three revegetation sites within the Stormater corridor. This method was used to quantitatively determine when revegetation of a disturbed area is complete. Visual observations will continue to be used on newly disturbed sites or until the sites appear to be reaching the final stabilization requirement.

Anderson and Shumar (1989) recommended using cover of perennial species as the best quantitative measure for evaluating the success of reclamation plantings, although visual observation of the area may suffice for many projects. They recommended using the point interception frame described by Floyd and Anderson (1987). Digital photography has been shown to be as accurate as traditional point-frame sampling if the information is abstracted from the images using techniques comparable to those used in point sampling. Manually specifying either plant cover of species at a few points on the images is equivalent conceptually to the fixed point-frame sampling recommended by Floyd and Anderson (1987) (Booth et. al., 2006 as cited in Schafer 2009).

1.1 Purpose

The purpose of this report is to comply with Contract Data Requirements List item number F.24 by providing this revegetation assessment to the Department of Energy, Idaho Operations Office (DOE-ID).

1.2 Organization

This report is organized by individual site and provides the following information:

- A historical background summary of each site
- An assessment of background vegetation
- An assessment of the revegetation effort and site stabilization status
- Recommendation(s) for the site.

2. Summary

Revegetation efforts for replanting and rebuilding the soil on disturbed land are an ongoing practice at the INL Site, and an annual report of these activities is submitted in accordance with BEA's contract with the DOE-ID. Revegetation sites being assessed for final stabilization in fiscal year (FY) 2009 are listed in Table 1 below.

Table 1. Sites included in the 2009 revegetation assessment.

Site Name
Geomorphic Investigations for Flood Bounds (located within INL Site Stormwater Corridor)
Materials and Fuels Complex Design Basis Threat Equipment Enclosure and Search Station
Materials and Fuels Complex Design Basis Threat Vehicle Barrier Project
National Security Test Range Project
Unmanned Aerial Vehicle Airfield (located within INL Site Stormwater Corridor)
Vadose Zone Research Park (located within INL Site Stormwater Corridor)

Currently, the INL uses the definition of final stabilization provided by the CGP to make the determination that "final stabilization" has been achieved at the three revegetation sites within the Stormwater Corridor. The CGP defines final stabilization as follows:

1. All soil disturbing activities at the site have been completed and either of the two following criteria are 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 has been established on all unpaved areas and areas not covered by permanent structures, or
   B. Equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed.

2. When background native vegetation will cover less than 100% of the ground (e.g., arid areas, beaches), the 70% coverage criteria is adjusted as follows: if the native vegetation covers 50% of the ground, 70% of 50% percent (0.70 x 0.50 = 0.35) would require 35% total cover for final stabilization.

3. In arid and semi-arid areas only, all soil disturbing activities at the site have been completed and both of the following criteria have been met:
   A. Temporary erosion control measures (e.g., degradable rolled erosion control product) are selected, designed, and installed along with an appropriate seed base to provide erosion control for at least three years without active maintenance,
   B. The temporary erosion control measures are selected, designed, and installed to achieve 70% vegetative coverage within three years.

3. Site Revegetation Assessment Summary

The Fiscal Year 2008 Revegetation Assessment states, "It appears that the CGP is referring to basal cover when determining whether 'final stabilization' requirements have been met." However, further review of the EPA vegetative stabilization requirement during the 2009 assessment did not reveal any supporting documentation for the use of basal cover. It was noted in the State of Idaho Department of Environmental Quality "Catalog of Stormwater Best Management Practices for Idaho Cities and Counties" that construction activities should maintain and preserve the vegetative canopy. In addition, Minnesota Pollution Control Agency and EPA Region V developed stormwater guidance for small construction operators to use canopy cover when determining compliance with the 70% final stabilization requirement. Based on this information, canopy cover will be used to determine final stabilization of revegetation sites at the INL.

Canopy cover is the area of the ground surface spanned by the canopy of the plant, and is used because it determines the underlying plant community. A high percentage of plant cover generally increases the soil infiltration rate, thereby reducing runoff and soil erosion. Plant cover also reduces wind erosion.

For the three revegetation sites located within the Stormwater Corridor, Environmental Support and Services (ES&S) personnel performed digital camera sampling and analysis as described in "Establishing Revegetation Performance Measures at INL" (Schafer 2009) to determine cover on disturbed sites of the assessment area. Invasive species were not included when determining percent cover. Where digital camera sampling was performed, resulting transect quadrate photos were interpreted using the program SamplePoint (discussed in Schafer, 2009), and were categorized as being grass, forb, shrub, cactus, litter, soil, rock, unknown, or invasive. Results for each quadrate are available in the archive by total count within each category. Resulting data was verified for accuracy and quality and statistical analysis was performed by Annette Schafer.

For each transect, these results are summarized as percent by category and percent by category within the background data for each site assessed. In addition to the categories previously listed, the tables include a category for "% Cover" computed as the total quadrate cover percent as the sum of counts for grass, forb, shrub, and cactus divided by the total number of quadrate points. Invasive species, rock, soil, litter, and unknown species were not considered as living plant material in the percent cover calculation. These summary tables are included in Appendix A. Appendix C contains GPS coordinates for transect photos, but due to GPS power failure, not all points are included. For sites where digital camera sampling was not conducted, this report relies on visual observations. Visual observations and photos were used to evaluate the three revegetation sites not located in the Stormwater Corridor.

It should be noted that the fall of 2008 was relatively moist followed by a cool and very wet spring. National Oceanic and Atmospheric Administration Idaho National Laboratory Mesonet data recorded June 2009 precipitation of 4.51 inches at the EBR-II weather tower at MFC. Due to the fall and spring weather conditions, desert plant growth in all surveyed areas was vigorous.

4. Geomorphic Investigations for Flood Bounds

During the Geomorphic Investigations (GI) Project, eight trenches near the Big Lost River on the INL Site were excavated for the purpose of collecting soil and geomorphic and stratigraphic data of the Holocene and Pleistocene deposits for evaluating historical river and flood information (Figure 1). The project began in May 2002 and continued through October 2002. The trenches ranged from 60 to 900 feet in length.

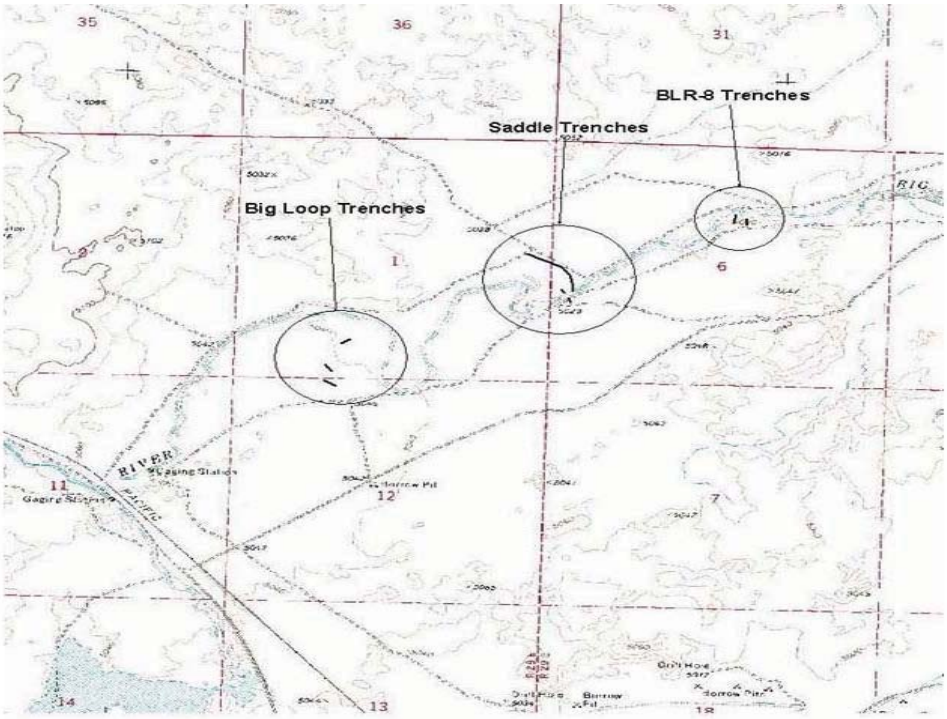


Figure 1. Map of the Geomorphic Investigations Project

The S. M. Stoller Corporation backfilled, contoured, seeded, and installed new silt fencing in September 2007. The seed mix included Wyoming big sagebrush (*Artemisia tridentata, spp. wyomingensis*), thickspike wheatgrass (*Elymus lanceolatus*), Indian ricegrass (*Achnatherum hymenoides*), needle and thread grass (*Stipa comata*), and bottlebrush squirreltail (*Elymus elymoides*). Wyoming big sagebrush seedlings were also planted. Electric fences were placed around the trenches located on the west side of the Big Lost River, and erosion fences were placed around the ends of all of the trenches.

4.1 Site Background Conditions

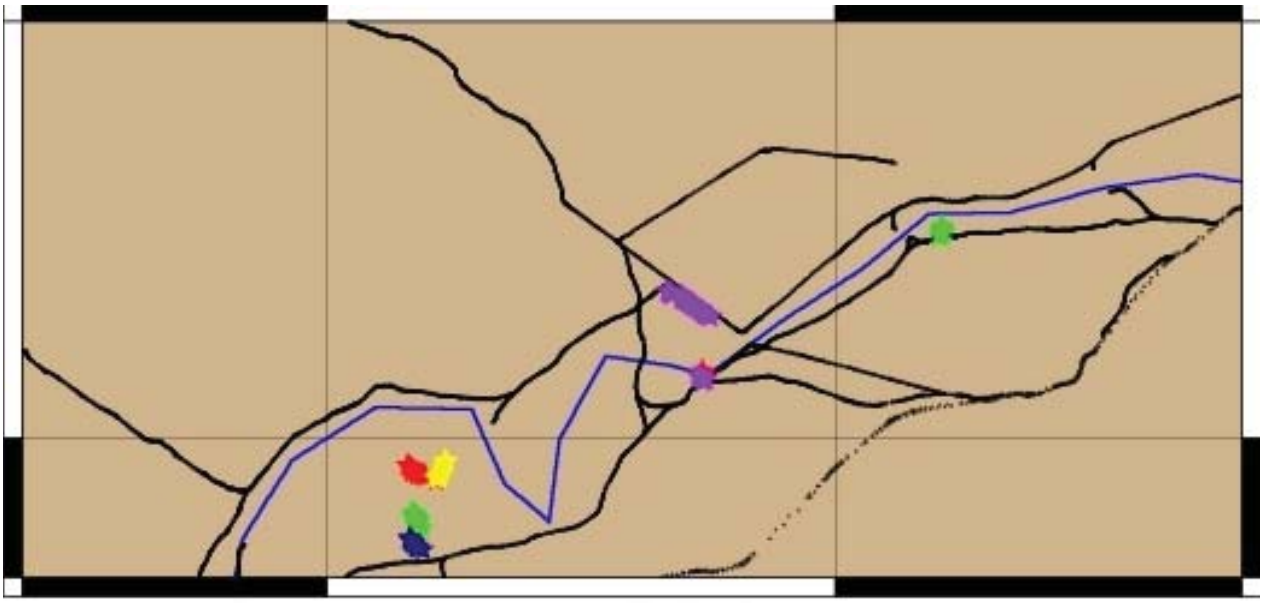
The Geomorphic Trenches are located within a sagebrush steppe community. Wyoming big sagebrush is dominant on undisturbed sites in this area, although other species of big sagebrush are codominant. Bottlebrush squirreltail is the dominant grass. Other plant species observed throughout the background include: sego lilly (*Calochortus bruneaunis*), tapertip hawksbeard (*Crepis acuminate*), cushion buckwheat (*Eriogonum ovalifolium)*, shaggy fleabane (*Erigeron pumilus)*, bluebunch wheatgrass (*Agropyron spicatum*), green rabbitbrush (*Chrysothamnus viscidiflorus)*, and Hood's phlox (*Phlox hoodii*).

4.2 Site Assessment

Revegetation status was assessed by transect at 7 of the geomorphic trenches. The 8th trench is the western BLR-8 Trench which is located in very close proximity to the east BLR-8 Trench. Vegetation within the trenches is nearly identical, and the presence of rattlesnakes prohibited sampling of the western trench. Background data was taken in late-seral sagebrush communities near the Big Loop Trenches and near the small Saddle Trench located on the east side of the river. The three Big Loop trenches, BLR-8, and the small Saddle Trench located on the south side of the Big Lost River were sampled on June 23, 2009 beginning with the western-most trenches and working east. Sampling was completed on the remaining two Saddle Trenches on the north side of the river on June 30, 2009, beginning with the east trench followed by the west trench. All transects were run in a roughly straight line oriented with the long

axis down the middle of each trench. Figure 2 shows the location of background area (red) and disturbed area (not red) transects.

Figure 2. Map showing location of transects at the Geomorphic Trench sites. Background transects in red.



Sampling results for each of the trench groups follows.

4.2.1 Big Loop Trenches

Cover on the southwest Big Loop Trench was determined to be roughly 28.99% of the background cover (Table A-1), and 104.76% and 79.77% for the middle (Table A-2) and northeast (Table A-3) trenches respectively. The majority of vegetation at these sites is comprised of western tansymustard (*Descurainia pinnata*) and Jim Hill tumblemustard (*Sisymbrium altissimum*). Invasive species, i.e. cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola kali*), range from 445.27% of background in the northeast trench to 906% of background levels in the southwest trench. As previously stated, invasive species were not used to determine percent cover. Quadrate photos corresponding roughly to these percentages are shown in Figures B-1 through B-3 in Appendix B, with corresponding background photos shown in Figures B-8 and B-9.

The total cover is dominated by forbs as shown in Tables A-1, A-2, and A-3. These forb counts result in forb establishment at 212.28% of background levels at the southwest trench, 981.38% for the northeast trench, and 1,118.22% for the middle trench. The predominant forb is western tansymustard, and it should be noted that very few native perennial forbs have reestablished.

During sampling, sagebrush seedlings, thickspiked wheatgrass, needle and thread grass, bottlebrush squirreltail, and bluebunch wheatgrass were perennial species observed within the disturbed area of the Big Loop Trenches. The Wyoming big sagebrush seedlings and grasses were in good condition, as measured by seed production, where they were observed.

4.2.2 Saddle Trenches

Percent cover within the disturbed area of the Saddle Trenches (Tables A-4, A-5, and A-6) was determined to be:

- Long Trench—72.20%

- West Trench—58.06%
- East Trench—77.42%.

In these trenches, the cover is composed of nearly solid stands of western tansymustard and Jim Hill tumblemustard. Invasive species, i.e. cheatgrass and Russian thistle, are also prevalent at 554.17%, 1207.50%, and 780.05% of background levels for the East, West, and Long trenches respectively. Shrub cover remains low at 7.72% of background for the long trench, but is 18.15% for the west trench and 15.12% for the east trench as depicted by Figures B-4 through B-6.

Perennial species noted within the disturbed areas of the Saddle Trenches include: prince's plume (*Stanleya viridiflora*), western wheatgrass (*Pascopyrum smithii*), crested wheatgrass (*Agropyron cristatum*), basin wildrye (*Leymus cinereus*), green rabbit brush, needle and thread grass, Indian rice grass, lupine (*Lupinus argenteus*), and Wyoming big sagebrush.

4.2.3 BLR-8 Trenches

Cover within these small trenches is 33.64% of the back ground level (Table A-7). Invasive species, mainly Russian thistle, is at 512.50% of background levels.

Perennial needle and thread grass and Indian rice grass are dominant grass species in these disturbed areas. Green rabbitbrush and sagebrush are also reestablishing. Very little cheatgrass and no Jim Hill tumble or western tansymustard were observed. Figure B-7 depicts current vegetation on the disturbed area.

4.3 Recommendations

4.3.1 Interpretation Basis

The occurrence of Jim Hill tumblemustard and western tansymustard in early sagebrush steppe succession is well documented. Researchers describe a seral continuum where Russian thistle pioneers on disturbed sagebrush steppe. Tumble mustard establishes next, followed by tansymustard (*Descurainia* spp.) and cheatgrass.

For example, a 20-year study in southern Idaho showed succession on former big sagebrush steppe was initially dominated by Russian-thistle, tumble mustard, and tansymustard. An increase in cheatgrass and bottlebrush squirreltail followed; after that, there was a temporary increase in mustards and a decrease in Russian-thistle. The community eventually stabilized as a cheatgrass-bottlebrush squirreltail cover type (Hironaka and Tisdale 1963). Brandt and Rickard (1994) reported similar results, where tumble mustard codominated recently disturbed sites along with Russian-thistle, prickly-lettuce (*Lactuca serriola*), and bur ragweed (*Ambrosia acanthicarpa*). Cheatgrass dominated slightly older seres.

Some of these communities dominated by annuals may be stable (Hironaka and Tisdale 1963). Cline and Rickard (1973) state that on the Atomic Energy Commission's Hanford Reservation in Washington, some areas have supported cheatgrass-tumble mustard-tansymustard communities for 30 or more years.

Cheatgrass is well established across the INL. Control of cheatgrass on sites across the INL and the GI is unlikely, and Goodrich and Gale (1999) noted that in similar situations, cheatgrass might have to be recognized as a component of the potential plant community.

Moreover, big sagebrush is the climax species on most of its range (Eddleman and Doescher 1978, Jensen at. al. 1988). While seedling establishment may begin immediately following a disturbance, it usually takes a decade or more before big sagebrush dominates a site (Welch and Criddle 2003), though some researchers argue that 25-45 years is typical (Watts and Wambolt 1996, Wambolt et. al. 2001). Because roots of big sagebrush species, particularly Wyoming big sagebrush, are infected with the vesicular-arbuscular mycorrhizae (VAM) *Glomus microcarpus* and *Gigaspora* spp. (Bethlenfalvay and

Dakessian 1984; Doerr, et. al. 1971; Hurley and Wicklow-Howard 1986) and VAM associated with Wyoming big sagebrush are killed by heating or chemical alteration of the soil, VAM, and thus sagebrush, take several years to recolonize after soil-altering disturbance (Wicklow-Howard 1989).

Absence of VAM probably inhibits Wyoming big sagebrush establishment on disturbed soils. For example, 2.5 years after restoration work, VAM had not yet colonized a coal-mined site in south-central Wyoming even though stockpiled topsoil was replaced. When VAM-infected and noninfected Wyoming big sagebrush seedlings were transplanted on the site, there was no significant difference in growth between the 2 groups: both showed poor establishment. However, in the greenhouse biomass gain of the infected group was significantly greater (about 1.5 times more, $p=0.05$) compared to the uninfected group. This suggests that on the disturbed site, VAM were unable to survive anywhere but inside Wyoming big sagebrush roots, and establishment of VAM and host Wyoming big sagebrush probably will not occur until the chemistry of lower soil horizons changes with succession (Stahl et. al. 1988).

Tumble mustard, western tansymustard, and most other early successional species found in sagebrush steppe communities are nonmycorrhizal (Bethlenfalvay and Dakessian 1984; Fontenla et. al. 1999), and therefore can colonize sterile sites or sites undergoing primary succession. Furthermore, western tansymustard does not usually persist in late-seral communities and may not require special control measures. Canopy closure, litter accumulation and/or growth interference from later-successional species tend to exclude tansymustard over time. Tumble mustard and tansymustards are not highly invasive in undisturbed sagebrush communities, mainly because they need an open canopy to establish.

Western tansymustard and Jim Hill tumblemustard seedlings are sensitive to most herbicides at relatively low application rates. But, because they are largely controlled by succession, and because a sagebrush climax community is unlikely to be promoted by controlling early seral species, there is little incentive to use resource money to control western tansymustard with herbicides or other treatments. Moreover, some sagebrush steppe communities maintain open light and bare ground conditions well into late succession, and controlling western tansymustard could provide a niche for further cheatgrass invasion.

4.3.2 Recommendation for the Geomorphic Trenches

For this assessment, we used a late-seral sagebrush steppe community (see Figure B-8) that appears, based on the literature, to be inappropriate for statistical comparison based on the successional status of the sites. Further comparisons, using a background established from an early sagebrush steppe community that was disturbed by natural means such as fire, may be more appropriate for the trenches. Regardless, the results of the 2009 Revegetation Assessment, as described in the above sections, indicates that the disturbed areas within the Geomorphic Trenches are recovering as expected for this type of ecosystem, and shrubs are beginning to establish within the disturbed area. Due to the lack of perennial cover, however, these sites have still not achieved final stabilization. Most of the trenches show good establishment of shrub seedlings, so allowing succession to progress may be the best course of action for the Geomorphic Trenches.

5. Unmanned Aerial Vehicle Airfield

The Unmanned Aerial Vehicle (UAV) Airfield site is located 3 miles due north of the Idaho Nuclear Technology and Engineering Center (INTEC), at the Experimental Field Station area (formerly the INL Site Dairy Farm). The UAV Airfield provides a takeoff and landing runway site for experimental INL Site robotic unmanned aircraft and routine reconnaissance/sampling unmanned aircraft for the Environmental Science Program. The site is approximately 2.3 acres (100 ft x 1,000 ft). Construction during FY 2004 consisted of graveling existing two-track roads to the location, and clearing, leveling, graveling, and asphalting the runway at the airfield. Vegetation and soil were not completely disturbed during construction activities, and a deliberate attempt was made to leave plant roots in place.

5.1 Site Background Conditions

The UAV is located within a sagebrush steppe community. Winterfat (*Krascheninnikovia lanata*) and saltbrush (*Atriplex falcate*) are other shrubs found in the area. The area surrounding the UAV appears to have been seeded with crested wheatgrass at some time in the past, and many monotypic stands of this species can be observed to the north and east of the area. Crested wheatgrass is prevalent in both the disturbed and undisturbed areas of the UAV. Other species observed include the following: green rabbitbrush, Indian rice grass, tapertip hawksbeard, western tansymustard, bottlebrush squirreltail, curvepod milkvetch (*Astragalus curvicarpus*), globemallow (*Sphaeralcea munroana*), and basin wildrye. Halogeton (*Halogeton glomeratus*) and Russian thistle are prevalent along the road accessing the west end of the runway.

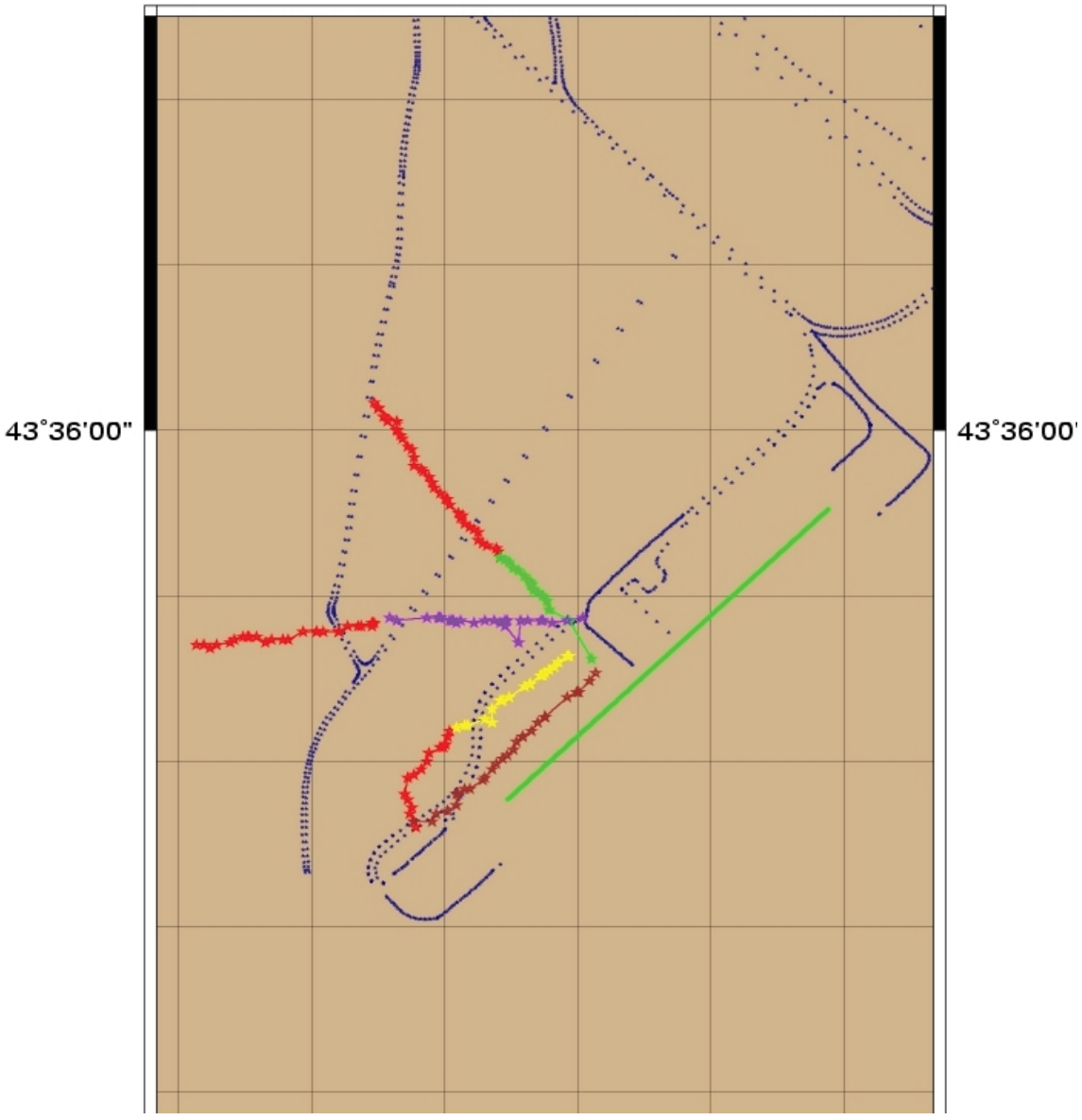
5.2 Site Assessment

Sampling was conducted on June 19, 2009, with 4 transects through the disturbed area and 3 background transects (shown in red) run as shown in Figure 3. Two of the three transects were run in a straight line (Transect 1 [T1, green]: southeast to northwest from the parking lot west of the runway, past the fence; T2 (purple): northeast to southwest, beginning in the same spot as T1, toward the concrete wall, through the disturbed area and continuing into background vegetation). Transect 3 was started near the same location as the first two transects, but runs north to southeast parallel to the runway, transitions through a background area (shown in red) sweeping south then back north through the disturbed area, again parallel to the runway (brown). Each transect was continued into the undisturbed area in order to gain data for background vegetation.

Perennial vegetation reestablishing in the disturbed area includes the following: crested wheatgrass, green rabbitbrush, Indian rice grass, tapertip hawksbeard, bottlebrush squirreltail, sagebrush, winterfat, and lupine.

In 2009, both sides and both ends of the airstrip were sprayed for weeds. These areas are routinely controlled for weeds as part of the UAV operations. The weeds on the roadsides leading up to the UAV are not part of the operational control. Weeds along the roadsides recommended for spraying in the Fiscal Year 2008 Revegetation Assessment were not sprayed in 2009. However, the areas were surveyed for noxious weeds and none were identified.

Figure 3. Map showing the location of transects at the UAV. Background transects in red.



Total cover over the four transects at the UAV ranged from 82.82% to 124.35% of background as shown in Tables A-8 through A-11, and Figures B-10 through B-12. It is important to note that biological soil crusts, which can be seen in Figure B-10, appear to be reestablishing in the disturbed area. Soil crusts were not included in the data for this assessment, but they are generally regarded as indicators of healthy landscapes due to imparting resistance to erosion in the soil surface.

5.3 Recommendation for the Unmanned Aerial Vehicle Airfield Site

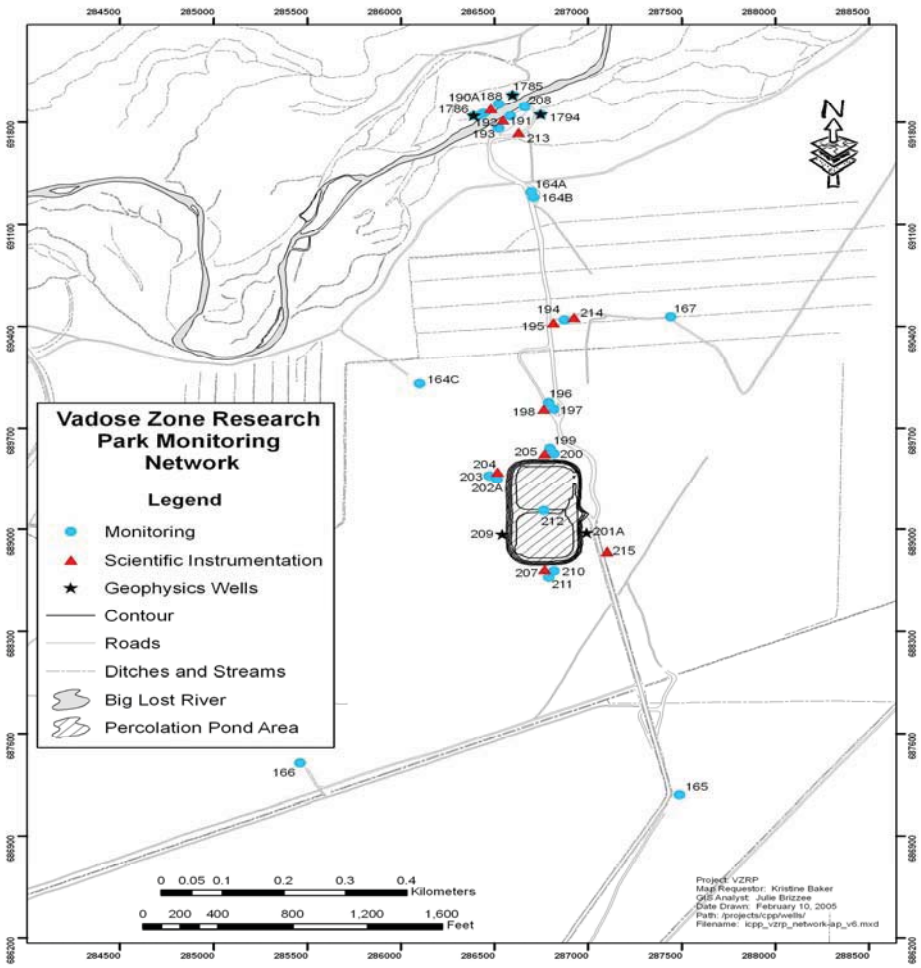
The UAV exceeds the 70% cover requirement for final stabilization defined in the CGP.

6. Vadose Zone Research Park

The Vadose Zone Research Park (VZRP) is a field-scale research facility designed to investigate the behavior of water and solute movement through the vadose zone. The site is located northwest of Central Facilities Area along the Big Lost River and adjacent to the new INTEC Percolation Ponds. An important feature of this research facility is that it established a natural baseline for subsurface conditions prior to the inception of the new INTEC Percolation Ponds. The site consists of several two-track roads, numerous well locations, and a vehicle crossing across the Big Lost River (Figure 4).

Weed control was recommended in the Fiscal Year 2008 Revegetation Assessment. However, the area was only surveyed for noxious weeds in 2009. No noxious weeds were identified, and weed control was not performed.

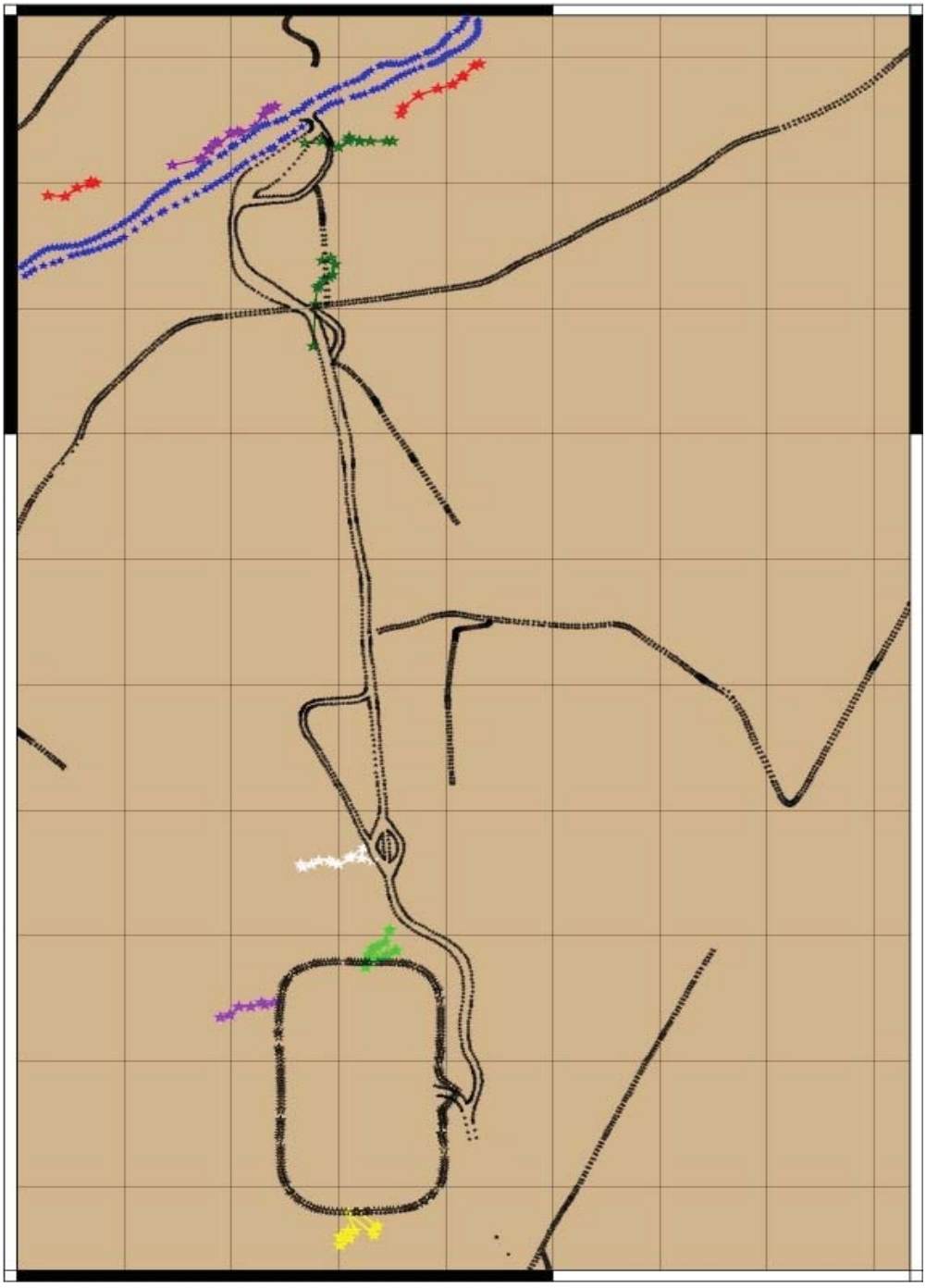
Figure 4. Map of the Vadose Zone Research Park.



6.1 Area Near the Big Lost River

Vegetation on the south side of the Big Lost River was sampled on June 19th and 30th, 2009. Due to high water levels in the Big Lost River, sampling on the north side of the river was delayed until July 7th when flow had stopped. Three background transects (red) were completed on June 19, one for the area near the river and another for the area between the river and the percolation ponds (Figure 5). Not all transects were mapped due to loss of power to the GPS unit. The VZRP is located within a large area previously burned by wildfire. Background vegetation was assumed to be represented by the reestablished burn area.

Figure 5. Map of transects at the VZRP. Background transects in red.



The following describes background and disturbed area transects at this location:

6.1.1 Site Background Conditions

A transect running roughly east to west parallel to the river was used to establish background vegetation for wells near the Big Lost River. On July 7th, a transect was completed on the north side of the river, again parallel to the river and running roughly east to west. Both Transects are shown in red in Figure 5.

Perennial vegetation observed within the background transects includes the following: rabbitbrush, shaggy fleabane, lupine, Indian rice grass, needle and thread grass, bottlebrush squirreltail, crested wheatgrass, and thickspiked wheatgrass.

6.1.2 Site Assessment

Disturbed area transects were located as follows:

- Wells 1785, 188, 190A, 1786—Transect (purple) was parallel to the river in a straight line through the disturbed area heading southwest.
- Wells 208, 191, 192, 193—Transect (not mapped due to GPS power failure) was parallel to river in a straight line through the disturbed area heading southwest.
- Wells 1784 and 213—Transect (green, near river)began near the road southwest of well 213 and continued to the northeast between the two wells and stopped at the edge of the disturbed area northeast of well 1784.

6.1.2.1 Wells 1785, 1786, 188, 190A

Wells 1785, 1786, 188, and 190A are located on the north side of the Big Lost River. Vegetation has reached final stabilization at this site. Total vegetative cover is 136.73% of background (Table A-12). Most of this cover can be attributed to prolific establishment of native grasses—far exceeding grass production in the background area. Figure B-13 shows the good grass production at this site.

Perennial species observed at this site include Indian rice grass, needle and thread grass, thickspike wheatgrass, green rabbitbrush, and bottlebrush squirreltail. Desert alyssum (*Alyssum desertorum*), Russian thistle, and cheatgrass are also present.

6.1.2.2 Wells 208, 191, 192, 193

Wells 208, 191, 192, and 193 are located on the south side of the Big Lost River parallel to the river. Vegetation has also reached final stabilization at this site with cover averaging 78.79% of background (Table A-13).

Indian rice grass, thickspike wheatgrass, green rabbitbrush, globemallow, and shaggy fleabane are some of the perennial species observed at the site. Figure B-14 shows revegetation at this location. Cheatgrass is present in the understory at this location where litter is adequate to promote germination, and Russian thistle is prolific near the two track road and should be controlled. Final stabilization has been achieved at this location.

6.1.2.3 Wells 1784 and 213

Wells 1784 and 213 have also achieved final stabilization. Cover at this location has reached 75.21% of background (Table A-14). Perennial species at the site include lupine, green rabbitbrush, shaggy fleabane, Indian rice grass, and desert paintbrush (*Castilleja angustifolia*) (Figure B-15). Russian thistle was also encountered in small amounts, and cheatgrass does not seem to be as prolific in this area as in others at the VZRP.

6.2 Area Between the Big Lost River and Percolation Ponds

6.2.1 Site Background Conditions

Two background transects were completed, but were not mapped due to GPS power failure. The first was located north of wells 164A and 164B in a southwest to northeast direction. The second was located west of wells 196, 197, and 198 approximately 400 feet north of the percolation ponds heading west.

Vegetation observed within the background area includes the following: sagebrush, rabbitbrush, cushion buckwheat, shaggy fleabane, lupine, Indian rice grass, needle and thread grass, bottlebrush squirreltail, crested wheatgrass, and thickspiked wheatgrass. Cheatgrass was also present.

As recommended in previous revegetation assessment reports, the main VZRP road from the INTEC New Percolation Ponds to the Big Lost River was graveled in August 2008.

6.2.2 Site Assessment

Vegetation in this area was sampled on June 19th, 2009. Transects were established as follows:

- Wells 164A and 164B—Two transects (not mapped due to GPS power failure) were placed in an "X" pattern through the disturbed area. The first started northwest of well 164A near the road and headed southeast to the edge of the disturbance. The second was started near the road again southwest of Well 164B and headed to the northeast, passed between the two wells and ended at the edge of the disturbed area.
- Wells 194, 195, 214—Two parallel transects (not mapped due to GPS power failure) were placed between the wells. The first was between wells 194 and 195 from southwest to northeast, beginning near the road and terminated at the edge of the disturbance. The second proceeded from the northeast to the southwest, beginning at the edge of the disturbance, continuing between wells 194 and 214, and ending near the road southwest of well 195.
- Wells 196, 197, 198—Two transects (white) were placed in a "X" pattern through the disturbed area. The first began near the road on the southeast side of well 197, continued northwest through the middle of the three wells, and terminated at the edge of the disturbance northwest of well 196. The second began southwest of well 198, proceeded through the middle of the wells to the northeast, and ended near the road slightly northeast of well 196.

6.2.2.1 Wells 164A and 164B

Wells 164A and 164B are located within a large burn area, and background vegetation was established in the revegetating burn area. Cover is 79.55% of background (Table A-15). Desert alyssum, western tansymustard, and halogeton account for the high percentage of forbs in the disturbed area (Figure B-16). The wellhead areas are not establishing well. Other species reestablishing here include sagebrush, thickspike wheatgrass, bottlebrush squirreltail, shaggy fleabane, Russian thistle, and cheatgrass.

6.2.2.2 Wells 194, 195, 214, 167

These wells are also located within the burned area, and seem to be recovering well. Species reestablishing the disturbed area around the wells include desert alyssum, shaggy fleabane, globemallow, Indian rice grass, tapertip hawksbeard), bottlebrush squirreltail, needle and thread grass, green rabbitbrush, and some tansymustard (*Descurainia Sophia*). Figure B-17 is representative of the location.

Total cover at these wells is 84.15% of background (Table A-16), and shrub cover has reached 85.92% of background. Final stabilization has been achieved at this location.

6.2.2.3 Wells 196, 197, 198

The disturbed area of these wells is nearly indistinguishable from background, and the site has reached final stabilization. Cover here is 184.62% of background. Grass and forb cover also exceed background levels (Table A-17). Species observed include green rabbitbrush, Indian rice grass, crested wheatgrass, needle and thread grass, bottlebrush squirreltail, shaggy fleabane, and thickspike wheatgrass. Mushrooms were observed in the understory. Figure B-18 depicts the vegetation that is characteristic of the location.

6.3 Area Near the Percolation Ponds

6.3.1 Site Background Conditions

Two background transects were completed. The first was located north of wells 164A and 164B in a southwest to northeast direction. The second was located west of wells 196, 197, and 198 approximately 400 feet north of the percolation ponds heading west. These transects are not included in Figure 5 due to loss of power to the GPS unit.

Vegetation observed within the background transects includes the following: sagebrush, rabbitbrush, cushion buckwheat, shaggy fleabane, lupine), Indian rice grass, needle and thread grass, bottlebrush squirreltail, crested wheatgrass, and thickspiked wheatgrass. Cheatgrass, western tansymustard, and Jim Hill tumblemustard were also present.

6.3.2 Site Assessment

Vegetation on the south side of the Big Lost River was sampled on June 19th and 30th, 2009. Transects for these locations (see Figure 5) were placed as follows:

- Wells 199, 200, and 205—Transects (lime green) at this location were placed in an "X" pattern. The first began near the road between wells 199 and 200 and headed almost due west before terminating at the edge of disturbance between wells 200 and 205. The second began at the edge of the disturbed northwest of well 205, headed southeast, between wells 205 and 209, and was completed near the road east of well 200.
- Wells 202A, 203, 204—Transect (purple) was run from the top of the percolation pond berm, down the side of the berm to the west through the disturbed area around the wells.
- Wells 207, 210, and 211—Transect (yellow) was run in an "X" pattern. The first started near the old road along the berm heading southwest between wells 207 and 211. The second ran between wells 211 and 210, again starting at the road and ending at the edge of the disturbed area.

6.3.2.1 Wells 199, 200, 205

The disturbed area at this location has achieved final stabilization. Cover in the disturbed area is 85.52% of background (Table A-18). Thickspike wheatgrass, green rabbitbrush, sagebrush, and fleabane have colonized the site. Western tansymustard and cheatgrass are also present. Figure B-19 shows vegetation typical of the location.

6.3.2.2 Wells 202A, 203, 204

These wells are located on the northwest corner of the INTEC percolation ponds. Cover here is 115.85% of background (Table A-19). Cheatgrass, bottlebrush squirreltail and green rabbitbrush are present within the disturbed area. However, the dominant cover types are western tansymustard, tumble mustard, and cheatgrass. Figure B-20 is representative of vegetation at this location.

6.3.2.3 Wells 207, 210, 211

Wells 207, 210, and 211 have achieved final stabilization. Cover here is 82.69% of background (Table A-20). The area is gravelly and similar to that surrounding wells 202A, 203, and 204, although there is less western tansymustard and tumblemustard. Bottlebrush squirreltail is abundant and accounts for the high percentage (124.19) of grass at this location as compared to background. Figure B-21 depicts a typical revegetation plot on this location

6.4 Recommendations for the Vadose Zone Research Park

The following have achieved final stabilization:

- Wells 1785, 1786, 188, and 190A
- Wells 208, 1991, 192, and 193
- Wells 1784 and 213
- Wells 194, 195, 214, and 167
- Wells 196, 197, and 198
- Wells 199, 200, and 205
- Wells 207, 210, and 211

The disturbed area around Wells 202A, 203, and 204 exhibits a high concentration of annual species such as tansymustard and cheatgrass. This site can be expected to recover as succession progresses.

Sign density near wells 208, 191, 192, 193, wells 1784 and 213, and wells 164A and 164B needs to be increased to prevent vehicle excursion off road. Thick accumulation of wood chips appears to be retarding plant establishment and the chips should be rescattered.

Vegetation reestablishment in the area surrounding wells 164A and 164B appears to be impeded partially due to off-road vehicle use. Russian thistle should be controlled adjacent to the road, and signs prohibiting the use of the area as a vehicle turn-around, accompanied by better vehicle barriers, e.g. fencing, are needed.

7. Materials and Fuels Complex Design Basis Threat Equipment Enclosure and Search Station

7.1 Site Background Conditions

The Design Basis Threat (DBT) Equipment Enclosure and Search Station project at the Materials and Fuels Complex (MFC) included construction of a check point and guard booth (MFC-734), security gatehouse (MFC-735), and equipment enclosure and search station (MFC-736). In addition, a septic tank system for MFC-735 was installed, and power cables run underground from the southern end of MFC to the new buildings.

A total of approximately 9 acres were reseeded by the project, including approximately 3 acres around the equipment enclosure, search station, and security guardhouse (including the septic tank drainfield location) and another 6 acres for the power cable installation portion of the project (a corridor approximately one mile long and 40 feet wide). The disturbed areas were reseeded on November 18, 2008 in accordance with Construction Specification SPC-979, Section 32 9219. Table 2 shows the recommended seed mixture that was specified in SPC-979.

Table 2. DBT Equipment Enclosure and Search Station project seed mixture.

Species	Rate of Application (pounds per acre pure live seed)
Indian Rice Grass "Rimrock"	2
Thickspike wheatgrass "Bannock"	2
Bottlebrush Squirreltail	2
Green Rabbitbrush	1
Silverleaf Lupine	1

7.2 Site Assessment

The vegetation assessment was performed on July 8, 2009 by visual observation.

7.2.1 Power Cable Corridor

Vigorous plant growth in both the disturbed and undisturbed areas was evident. Several bare spots exist along the corridor (Figure B-22). Grass along the power cable corridor is predominantly crested wheatgrass, which dominates the surrounding area. Other grasses observed include thickspike wheatgrass, bottlebrush squirreltail, and cheatgrass.

Predominant forbs include kochia (*Kochia scoparia*), tansymustard, and Jim Hill tumble mustard. All three of which are commonly found in disturbed areas of the INL. Halogeton and globemallow are also present, although in much smaller numbers.

7.2.2 Equipment Enclosure, Search Station, and Security Guardhouse

There are large bare areas inside and outside the fenced area between buildings MFC-735 and MFC-736 (Figures B-23 and B-24). This area is approximately 350 ft x 120 ft. Kochia and Jim Hill tumble mustard are the dominant forbs. Grass growth is spotty (Figure B-25) and the plants are not as vigorous as those in other areas disturbed by the project, e.g., the power cable corridor. No shrubs were observed.

In the fenced exclusion area (approximately 350 ft. by 180 ft.) on the east side of MFC-736 (Figure B-26), heavy gravel extends out from the east side of the building approximately 45 feet, running about ¾ the length of the site (Figure B-27). Forbs are dominant with halogeton being the most prevalent on graveled and bare areas. Kochia and Jim Hill tumble mustard are the most prevalent forbs throughout the rest of the site (Figure B-28). Crested wheatgrass, cheatgrass, and Russian thistle are also present. Crested wheatgrass is scattered throughout the site but is more prevalent on the east side of the disturbed area. No shrubs were observed.

7.2.3 Septic Tank Drain Field

The septic tank drain field is approximately 58 ft x 105 ft. Forbs include kochia, Jim Hill tumble mustard and halogeton (Figures-B-29 and B-30). Crested wheatgrass is the dominant grass at this site. No shrubs were observed.

7.3 Recommendations

Desirable perennial plant species are few or absent on many of the disturbed sites. Because the area surrounding the project is dominated by crested wheatgrass, it is expected that crested wheatgrass will eventually become the dominant species on the disturbed sites.

Perform a visual evaluation in 2010. It is recommended that crested wheatgrass be allowed to become re-established on the disturbed sites and be used to determine final stabilization.

8. Materials and Fuels Complex Design Basis Threat Vehicle Barrier Project

8.1 Site Background Conditions

The MFC DBT Vehicle Barrier project included installation of vehicle gate barriers, Delta vehicle crash barriers, and precast concrete vehicle barriers. The precast concrete vehicle barriers were placed around the south and approximately half way up the east side of the MFC facility. An area approximately 10 ft wide was disturbed. The barriers were placed in the middle of the disturbed areas.

Seeding was performed in accordance with Construction Specification SPC-1000, Section 32 9219. Table 3 shows the seed mixture that was specified in SPC-1000; the same seed mixture recommended for MFC DBT Equipment Enclosure and Search Station project. A seed drill was used to plant the seeds, and wood chips were added once the seeding was completed. The work was performed during the week of October 12, 2008.

Table 3. DBT Equipment Vehicle Barrier project seed mixture.

Species	Rate of Application (pounds per acre pure live seed)
Indian Rice Grass “Rimrock”	2
Thickspike wheatgrass “Bannock”	2
Bottlebrush Squirreltail	2
Green Rabbitbrush	1
Silverleaf Lupine	1

8.2 Site Assessment

The vegetation assessment was performed on July 8, 2009 by visual observation. Due to the fall and spring weather conditions, desert plant growth in the area was vigorous (Figures B-31 and B-32). Dominant forbs are kochia and Jim Hill tumble mustard (Figures B-31 and B-32). Tansymustard and halogeton are also present in lesser numbers. Grasses include crested wheatgrass, cheatgrass, and bottlebrush squirreltail. Crested wheatgrass was the most prominent grass species. No shrubs were observed.

There is a musk thistle (*Carduus nutans*) infestation located south of the gravel road that runs along the south side of the southern barriers. It is approximately 0.2 miles east of the west end of the barriers.

A soil pile is located on the south side of the road that runs east and west along the southern barriers. The soil pile has not been seeded. The MFC DBT project turned the soil pile over to the Laboratory Support Complex organization last fall.

8.3 Recommendations

Desirable perennial plant species are few or absent on many of the disturbed sites. Because the area surrounding the project is dominated by crested wheatgrass, it is expected that crested wheatgrass will eventually become the dominant species on the disturbed sites.

A visual evaluation should be performed in 2010. It is recommended that crested wheatgrass be allowed to become re-established on the disturbed sites and used to determine final stabilization. Musk thistle (*Carduus nutan*) is a noxious weed and should be eradicated. The Laboratory Support Complex organization that provides INL weed control has been notified of the location.

The soil pile should be used and the area seeded. If there are no plans to use the soil within a year, the soil should be moved to a central location such as a gravel pit. Once the soil has been moved, the disturbed area should be seeded.

9. National Security Test Range Project

9.1 Site Background Conditions

On September 9, 2008, a survey of the T-25 Road sites disturbed by the National Security Test Range (NSTR) project was performed by NSTR personnel and the S. M. Stoller Corporation (Saupe 2009). The survey identified seven locations that required seeding (Table 4). Several other areas were identified with recommendations to gravel or to allow natural revegetation.

Table 4. Table showing T-25 Road sites where seeding was recommended.

Location	Comments
Wide spot north of power pole 138	A large mud rick has been bladed at an angle and should be revegetated.
Across from power pole 146	There is an area that appears to have been backed into during construction. This area needs to be seeded.
North of power pole 170	Disturbed during construction, reseed.
Power pole 176	Truck turn around area. Revegetate on the west side of the pole.
Power pole 179	Disturbed during construction, reseed.
North of power pole 181	Disturbed during construction, reseed.
Turn-off on east end of range access road	Reseed south half.

Table 5 shows the seed mix recommended by the S. M. Stoller Corporation for reseeding the seven disturbed sites near the T-25 Road. Disturbed sites were seeded late fall 2008.

Table 5. Recommended seed mixture for T-25 Road disturbed sites.

Species	Rate of Application (pounds per acre pure live seed)
Indian Rice Grass “Rimrock”	2
Thickspike wheatgrass “Bannock”	2
Bottlebrush Squirreltail	2
Green Rabbitbrush	1

9.2 Site Assessment

This revegetation assessment was performed on July 22, 2009 by ES&S personnel. The following discussion details conditions at sites listed in Table 4:

9.2.1 Wide spot north of power pole 138

This reseeded area could not be located by NSTR personnel who had been part of the September 9, 2008 survey. All previously disturbed sites near the suspected location appear the same as surrounding areas with similar vegetation and growth.

9.2.2 Across from power pole 146

This reseeded area could not be located by NSTR personnel who had been part of the September 9, 2008 survey. All previously disturbed sites near the suspected location appear the same as surrounding areas with similar vegetation and growth.

9.2.3 North of power pole 170

This site is located on a slope approximately 100 ft north of power pole 170 on the west side of the T-25 Road. The disturbed area is approximately 30 ft x 40 ft (Figures B-33). Soils are fine textured with scattered small rocks and some gravel. Some of the wood chips that were applied after the area was seeded have piled up, yet this does not appear to have impacted plant growth.

Globemallow is the most abundant forb. Cheat grass, Indian ricegrass, bottlebrush squirreltail, thickspike wheatgrass, and needle and thread grass are grasses found within the disturbed area. There appears to be a good mixture of desirable perennial grasses with Indian ricegrass being the most common (Figure B-34). Several young green rabbitbrush plants have also established within the disturbed site. Similar to the four other seeded sites along the T-25 Road, this site is reestablishing very well with desirable perennial species.

9.2.4 Power pole 176

This site was used as a turnaround for large trucks. Entry was from the T-25 Road on both the north and south sides of power pole 176. The turnaround curves around the west side of power pole 176 (Figure B-35). The project did not disturb the area located between the power poles (Figure B-36); therefore that area was not included in the assessment. Soils are fine to sandy textured with scattered small rocks and some gravel. Wood chips were applied after the area was seeded. Figure B-37 shows where wood chips were applied too heavily and are having a negative impact on plant growth.

Globemallow is the most abundant forb. Grasses include cheatgrass, Indian ricegrass, bottlebrush squirreltail, thickspike wheatgrass, and needle and thread grass. There is a good mixture of desirable perennial grasses with Indian ricegrass, bottlebrush squirreltail, and needle and thread grass the most common (Figure B-38). Green rabbitbrush seedlings are reestablishing within the disturbed site. Overall, this site is reestablishing very well with desirable perennial species. There are areas within the disturbed site where wood chips have inhibited plant growth and should be reduced to allow for new plants to sprout.

9.2.5 Power pole 179

This site is located between the T-25 Road and power pole 179. It is approximately 120 ft x 12 ft (Figure B-39). Soils are fine to sandy textured with scattered small rocks and some gravel. Wood chips were applied after the area was seeded.

Forbs within the disturbed area include Jim Hill tumble mustard, large flower skeleton weed (*Lygodesmia grandiflora*), and silvery lupine. Grasses include cheatgrass, Indian ricegrass, and thickspike wheatgrass. Indian ricegrass is the most abundant grass. Green rabbitbrush seedlings plants were also observed within the disturbed area (Figure B-40). Similar to the four other seeded sites along the T-25 Road, this site is reestablishing very well with desirable perennial species.

9.2.6 North of power pole 181

This site is located approximately 150 ft north of power pole 181 on the west side of the T-25 road. The disturbed area runs parallel with the T-25 road and is approximately 12 ft x 65 ft (Figure B-41). Soils are sandy with scattered small rocks. Wood chips were applied after the area was seeded.

Forbs observed included largeflower skeletonweed (*Lygodesmia grandiflora*) and silverleaf phacelia (*Phacelia hastate*). Indian rice grass is the dominant grass at this location, but scattered cheatgrass and needle and thread grass have also established in the disturbed area (Figure B-42). Green rabbitbrush was absent within the disturbed area even though it is present in nearby undisturbed areas. Similar to the four other seeded sites along the T-25 Road, this site is reestablishing very well with desirable perennial species.

9.2.7 Turn-off east end of range access road

This site is located on the south side of the turn-off at the east end of the range access road. The disturbed area is approximately 60 ft x 220 ft (Figure B-44). Soils are fine to sandy textured with scattered small rocks. Wood chips were applied after the area was seeded, and in some areas application was too heavy and has hampered plant growth (Figure B-43).

Lanceleaf scurfpea (*Psoralidium lanceolatum*) appears to be the most abundant forb, but globemallow, silvery lupine, and textile onion (*Allium textile*) have also established. There appears to be a good mixture of desirable perennial grasses with Indian ricegrass and thickspike wheatgrass the most common. Cheat grass, bottlebrush squirreltail, and needle and thread grass are also present (Figure B-45). Green rabbitbrush is also re-establishing. Overall, this site is reestablishing very well with desirable perennial species. There are areas within the disturbed site where wood chips have inhibited plant growth and should be reduced to allow for new plants to sprout.

9.3 Recommendations

It is recommended that the wide spot north of power pole 138 and the area across from power pole 146 be allowed to revegetate naturally. This would be similar to other disturbed locations on the T-25 Road where the September 9, 2008 survey recommended natural revegetation.

Wood chips on the disturbed site near power pole 176 and the turn-off at the east end of the range access road should be redistributed from locations where they are hampering vegetation growth and spread to areas where they are lacking. A preliminary visual evaluation should be performed next spring to determine if these two sites and the disturbed areas near power poles 170, north of 179, and 181 are nearing 70% of background. If the preliminary evaluation determines the sites are nearing 70% of background, the digital camera sampling method should be used.

10. References

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Appendix A
Assessment Summary Tables

Table A-1. Comparison of revegetation in the southwest Big Loop Trench to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	39.63 (4.27)	11.49 (1.51)	28.99
Grass% (std)	15.56 (1.74)	4.41 (0.50)	28.36
Forb% (std)	3.07 (0.46)	6.53 (1.29)	212.28
Shrub% (std)	21.00 (2.97)	0.55 (0.10)	2.63
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	22.15 (2.40)	12.13 (1.41)	54.78
Soil% (std)	18.59 (1.97)	38.14 (3.22)	205.15
Rock% (std)	15.07 (1.75)	8.73 (0.97)	57.92
Unknown% (std)	1.37 (0.21)	0.64 (0.08)	46.95
Invasive% (std)	3.19 (0.71)	28.86 (2.62)	906.08
# of Quadrates Used for Background 27 # of Total Sample Points Used for Background 2700 # of Quadrates Used for Disturbed Area 17 # of Total Sample Points Used for Disturbed Area 1088 Disturbed Area and Background Directories) BIG LOOP TRENCHES: TRENCH_1_SW, BGLOOP_BKGR			

Table A-2. Comparison of revegetation in the middle Big Loop Trench to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	39.63 (4.27)	41.52 (3.66)	104.76
Grass% (std)	15.56 (1.74)	4.69 (0.75)	30.13
Forb% (std)	3.07 (0.46)	34.38 (3.22)	1118.22
Shrub% (std)	21.00 (2.97)	2.46 (0.40)	11.69
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	22.15 (2.40)	23.77 (2.29)	107.33
Soil% (std)	18.59 (1.97)	15.74 (1.43)	84.64
Rock% (std)	15.07 (1.75)	3.01 (0.30)	19.99
Unknown% (std)	1.37 (0.21)	1.00 (0.10)	73.30
Invasive% (std)	3.19 (0.71)	14.96 (1.35)	469.53
# of Quadrates Used for Background 27 # of Total Sample Points Used for Background 2700 # of Quadrates Used for Disturbed Area 17 # of Total Sample Points Used for Disturbed Area 1088 Disturbed Area and Background Directories) BIG LOOP TRENCHES: TRENCH_2_MIDDLE, BGLOOP_BKGR			

Table A-3. Comparison of revegetation in the northeast Big Loop Trench to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	39.63 (4.27)	31.61 (3.06)	79.77
Grass% (std)	15.56 (1.74)	0.96 (0.14)	6.18
Forb% (std)	3.07 (0.46)	30.17 (3.01)	981.38
Shrub% (std)	21.00 (2.97)	0.48 (0.14)	2.29
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	22.15 (2.40)	18.87 (2.12)	85.20
Soil% (std)	18.59 (1.97)	26.56 (2.34)	142.87
Rock% (std)	15.07 (1.75)	8.41 (0.76)	55.81
Unknown% (std)	1.37 (0.21)	0.36 (0.06)	26.31
Invasive% (std)	3.19 (0.71)	14.18 (1.22)	445.27
# of Quadrates Used for Background 27 # of Total Sample Points Used for Background 2700 # of Quadrates Used for Disturbed Area 17 # of Total Sample Points Used for Disturbed Area 1088 Disturbed Area and Background Directories) BIG LOOP TRENCHES: TRENCH_3_NE, BGLOOP_BKGR			

Table A-4. Comparison of revegetation in the long Saddle Trench to background vegetation

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	48.44 (4.04)	34.97 (3.25)	72.20
Grass% (std)	33.04 (3.12)	5.92 (0.93)	17.91
Forb% (std)	3.35 (0.35)	28.12 (2.83)	840.00
Shrub% (std)	12.05 (1.32)	0.93 (0.29)	7.72
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	20.31 (1.82)	7.95 (0.79)	39.12
Soil% (std)	24.78 (2.34)	34.34 (3.03)	138.60
Rock% (std)	3.35 (0.37)	8.24 (0.89)	246.24
Unknown% (std)	1.34 (0.16)	0.57 (0.07)	42.20
Invasive% (std)	1.79 (0.21)	13.93 (1.39)	780.05
# of Quadrates Used for Background 7 # of Total Sample Points Used for Background 448 # of Quadrates Used for Disturbed Area 47 # of Total Sample Points Used for Disturbed Area 3008 Disturbed Area and Background Directories) Saddle Trenches: Long Trench, Saddle_Bkgr			

Table A-5. Comparison of revegetation in the west Saddle Trench to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	48.44 (4.04)	28.12 (2.60)	58.06
Grass% (std)	33.04 (3.12)	18.12 (1.98)	54.86
Forb% (std)	3.35 (0.35)	7.81 (0.65)	233.33
Shrub% (std)	12.05 (1.32)	2.19 (0.29)	18.15
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	20.31 (1.82)	2.19 (0.23)	10.77
Soil% (std)	24.78 (2.34)	43.44 (3.86)	175.32
Rock% (std)	3.35 (0.37)	4.06 (0.42)	121.33
Unknown% (std)	1.34 (0.16)	0.62 (0.08)	46.67
Invasive% (std)	1.79 (0.21)	21.56 (2.09)	1207.50
# of Quadrates Used for Background 7 # of Total Sample Points Used for Background 448 # of Quadrates Used for Disturbed Area 5 # of Total Sample Points Used for Disturbed Area 320 Disturbed Area and Background Directories) Saddle Trenches: Small West, Saddle_Bkgr			

Table A-6. Comparison of revegetation in the east Saddle Trench to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	48.44 (4.04)	37.50 (3.24)	77.42
Grass% (std)	33.04 (3.12)	20.57 (1.82)	62.27
Forb% (std)	3.35 (0.35)	15.10 (1.98)	451.11
Shrub% (std)	12.05 (1.32)	1.82 (0.20)	15.12
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	20.31 (1.82)	14.84 (1.36)	73.08
Soil% (std)	24.78 (2.34)	36.72 (3.12)	148.20
Rock% (std)	3.35 (0.37)	0.78 (0.09)	23.33
Unknown% (std)	1.34 (0.16)	0.26 (0.05)	19.44
Invasive% (std)	1.79 (0.21)	9.90 (0.96)	554.17
# of Quadrates Used for Background 7 # of Total Sample Points Used for Background 448 # of Quadrates Used for Disturbed Area 6 # of Total Sample Points Used for Disturbed Area 384 Disturbed Area and Background Directories) Saddle Trenches: East, Saddle_Bkgr			

Table A-7. Comparison of revegetation in the BLR-8 Trenches to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	48.44 (4.04)	16.29 (1.76)	33.64
Grass% (std)	33.04 (3.12)	14.29 (1.63)	43.24
Forb% (std)	3.35 (0.35)	0.45 (0.07)	13.33
Shrub% (std)	12.05 (1.32)	1.56 (0.29)	12.96
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	20.31 (1.82)	27.01 (2.60)	132.97
Soil% (std)	24.78 (2.34)	35.04 (2.95)	141.44
Rock% (std)	3.35 (0.37)	6.70 (0.91)	200.00
Unknown% (std)	1.34 (0.16)	5.80 (0.77)	433.33
Invasive% (std)	1.79 (0.21)	9.15 (0.99)	512.50
# of Quadrates Used for Background 7 # of Total Sample Points Used for Background 448 # of Quadrates Used for Disturbed Area 7 # of Total Sample Points Used for Disturbed Area 448 Disturbed Area and Background Directories) BLR-8 TRENCHES:, Saddle_Bkgr			

Table A-8. Comparison of revegetation in UAV transect T1 to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	52.69 (5.55)	43.64 (3.58)	82.82
Grass% (std)	38.94 (4.31)	33.26 (2.93)	85.42
Forb% (std)	3.72 (0.52)	10.04 (0.93)	270.11
Shrub% (std)	10.03 (1.65)	0.33 (0.10)	3.34
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	10.75 (1.21)	8.04 (0.72)	74.75
Soil% (std)	36.03 (4.03)	41.63 (3.38)	115.54
Rock% (std)	0.53 (0.08)	4.13 (0.45)	777.31
Unknown% (std)	0.00 (0.00)	0.00 (0.00)	---
Invasive% (std)	0.00 (0.00)	2.57 (0.55)	---
# of Quadrates Used for Background 32 # of Total Sample Points Used for Background 3200 # of Quadrates Used for Disturbed Area 14 # of Total Sample Points Used for Disturbed Area 896 Disturbed Area and Background Directories) UAV: EW_T1, UAV_T1_BACKGROUND			

Table A-9. Comparison of revegetation in UAV transect T2 to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	41.08 (4.23)	51.08 (4.17)	124.35
Grass% (std)	21.44 (2.46)	31.25 (2.85)	145.76
Forb% (std)	14.20 (1.67)	13.76 (1.34)	96.92
Shrub% (std)	5.36 (1.01)	6.07 (0.95)	113.24
Cactus% (std)	0.08 (0.04)	0.00 (0.00)	0.00
Litter% (std)	20.80 (2.30)	16.29 (1.49)	78.30
Soil% (std)	34.08 (3.65)	30.11 (2.57)	88.35
Rock% (std)	2.56 (0.54)	1.92 (0.24)	75.12
Unknown% (std)	0.00 (0.00)	0.00 (0.00)	---
Invasive% (std)	1.48 (0.27)	0.60 (0.15)	40.61
# of Quadrates Used for Background 25 # of Total Sample Points Used for Background 2500 # of Quadrates Used for Disturbed Area 26 # of Total Sample Points Used for Disturbed Area 1664 Disturbed Area and Background Directories)UAV: NESW_T2, DISTURBED_UAV_T2_DISTURBED, UAV_T2_BACKGROUND			

Table A-10. Comparison of revegetation in UAV transect T3-1 to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	45.70 (3.81)	54.14 (5.62)	118.47
Grass% (std)	14.75 (1.53)	32.24 (3.79)	218.62
Forb% (std)	10.35 (1.09)	11.90 (1.61)	115.00
Shrub% (std)	20.61 (2.30)	10.00 (1.55)	48.53
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	12.01 (1.27)	5.29 (0.61)	44.00
Soil% (std)	41.11 (3.43)	35.10 (3.64)	85.36
Rock% (std)	1.17 (0.16)	4.38 (1.03)	373.84
Unknown% (std)	0.00 (0.00)	0.00 (0.00)	---
Invasive% (std)	0.00 (0.00)	1.10 (0.50)	---
# of Quadrates Used for Background 16 # of Total Sample Points Used for Background 1024 # of Quadrates Used for Disturbed Area 21 # of Total Sample Points Used for Disturbed Area 2100 Disturbed Area and Background Directories)UAV: NS_T3, UAV_TS3_DISTURBED1, UAV_T3_BACKGROUND			

Table A-11. Comparison of revegetation in UAV transect T3-2 to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	45.70 (3.81)	53.39 (5.48)	116.83
Grass% (std)	14.75 (1.53)	39.89 (4.44)	270.53
Forb% (std)	10.35 (1.09)	9.46 (1.24)	91.43
Shrub% (std)	20.61 (2.30)	4.04 (0.90)	19.59
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	12.01 (1.27)	13.50 (1.57)	112.39
Soil% (std)	41.11 (3.43)	27.46 (3.03)	66.80
Rock% (std)	1.17 (0.16)	3.57 (0.85)	304.76
Unknown% (std)	0.00 (0.00)	0.00 (0.00)	---
Invasive% (std)	0.00 (0.00)	2.07 (0.90)	---
# of Quadrates Used for Background 16 # of Total Sample Points Used for Background 1024 # of Quadrates Used for Disturbed Area 29 # of Total Sample Points Used for Disturbed Area 2800 Disturbed Area and Background Directories) UAV: NS_T3, UAV_TS3_DISTURBED2, UAV_T3_BACKGROUND			

Table A-12. Comparison of revegetation wells 1785, 1786, 188, and 190A to background vegetation

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	10.74 (1.01)	14.69 (1.64)	136.73
Grass% (std)	0.20 (0.04)	12.58 (1.59)	6440.00
Forb% (std)	2.73 (0.25)	2.03 (0.29)	74.29
Shrub% (std)	7.62 (0.85)	0.08 (0.03)	1.03
Cactus% (std)	0.20 (0.04)	0.00 (0.00)	0.00
Litter% (std)	6.45 (0.57)	45.70 (4.18)	709.09
Soil% (std)	16.80 (1.68)	12.73 (1.71)	75.81
Rock% (std)	64.06 (5.13)	8.20 (1.15)	12.80
Unknown% (std)	1.17 (0.11)	0.62 (0.08)	53.33
Invasive% (std)	0.78 (0.11)	18.05 (1.84)	2310.00
# of Quadrates Used for Background 8 # of Total Sample Points Used for Background 512 # of Quadrates Used for Disturbed Area 20 # of Total Sample Points Used for Disturbed Area 1280 Disturbed Area and Background Directories) VZRP: WELLS1785_1786_188_190A, Background_North			

Table A-13. Comparison of revegetation of wells 208, 191, 192, 193 to background vegetation

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	42.35 (3.51)	33.37 (2.92)	78.79
Grass% (std)	29.11 (2.68)	29.35 (2.75)	100.83
Forb% (std)	13.24 (1.44)	1.56 (0.18)	11.80
Shrub% (std)	0.00 (0.00)	2.46 (0.53)	---
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	33.39 (2.87)	43.53 (3.69)	130.37
Soil% (std)	18.91 (1.81)	11.94 (1.35)	63.14
Rock% (std)	1.89 (0.35)	2.90 (0.46)	153.42
Unknown% (std)	0.00 (0.00)	0.78 (0.09)	---
Invasive% (std)	3.45 (0.73)	7.48 (1.11)	216.50
# of Quadrates Used for Background 19 # of Total Sample Points Used for Background 1216 # of Quadrates Used for Disturbed Area 14 # of Total Sample Points Used for Disturbed Area 896 Disturbed Area and Background Directories) VZRP: WELLS208_191_193, VZRP_BKGD_RVR			

Table A-14. Comparison of revegetation of wells 1784 and 213 to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	42.35 (3.51)	31.85 (3.21)	75.21
Grass% (std)	29.11 (2.68)	21.75 (2.58)	74.73
Forb% (std)	13.24 (1.44)	3.37 (0.53)	25.42
Shrub% (std)	0.00 (0.00)	6.73 (1.19)	---
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	33.39 (2.87)	29.69 (2.80)	88.92
Soil% (std)	18.91 (1.81)	26.20 (2.88)	138.53
Rock% (std)	1.89 (0.35)	10.10 (1.35)	533.78
Unknown% (std)	0.00 (0.00)	0.72 (0.08)	---
Invasive% (std)	3.45 (0.73)	1.44 (0.21)	41.76
# of Quadrates Used for Background 19 # of Total Sample Points Used for Background 1216 # of Quadrates Used for Disturbed Area 13 # of Total Sample Points Used for Disturbed Area 832 Disturbed Area and Background Directories) VZRP: WELLS1784_213, VZRP_BKGD_RVR			

Table A-15. Comparison of revegetation of wells 164A and 164B to background vegetation

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	51.56 (4.16)	41.02 (3.44)	79.55
Grass% (std)	36.91 (3.08)	17.38 (2.26)	47.09
Forb% (std)	4.30 (0.57)	22.85 (2.28)	531.82
Shrub% (std)	10.35 (1.47)	0.78 (0.16)	7.55
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	23.24 (1.96)	35.35 (3.00)	152.10
Soil% (std)	20.90 (1.76)	17.97 (1.81)	85.98
Rock% (std)	4.10 (0.44)	3.52 (0.43)	85.71
Unknown% (std)	0.00 (0.00)	0.00 (0.00)	---
Invasive% (std)	0.20 (0.04)	2.15 (0.30)	1100.00
# of Quadrates Used for Background 8 # of Total Sample Points Used for Background 512 # of Quadrates Used for Disturbed Area 16 # of Total Sample Points Used for Disturbed Area 1024 Disturbed Area and Background Directories) VZRP: WELLS164 A & B, BACKGROUND_RVR_TO_POND_ T1			

Table A-16. Comparison of revegetation of wells 194, 195, 214, and 167 to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	51.56 (4.16)	43.39 (3.67)	84.15
Grass% (std)	36.91 (3.08)	17.55 (2.01)	47.54
Forb% (std)	4.30 (0.57)	16.95 (1.52)	394.41
Shrub% (std)	10.35 (1.47)	8.89 (1.53)	85.92
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	23.24 (1.96)	15.38 (1.40)	66.19
Soil% (std)	20.90 (1.76)	22.00 (1.96)	105.25
Rock% (std)	4.10 (0.44)	9.38 (0.94)	228.57
Unknown% (std)	0.00 (0.00)	0.00 (0.00)	---
Invasive% (std)	0.20 (0.04)	9.86 (1.59)	5046.15
# of Quadrates Used for Background 8 # of Total Sample Points Used for Background 512 # of Quadrates Used for Disturbed Area 13 # of Total Sample Points Used for Disturbed Area 832 Disturbed Area and Background Directories) VZRP: WELLS194_195_214_167, BACKGROUND_RVR_TO_POND_T1			

Table A-17. Comparison of revegetation of wells 196, 197, and 198 to background vegetation

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	13.54 (1.28)	25.00 (2.11)	184.62
Grass% (std)	7.94 (0.87)	15.10 (1.51)	190.16
Forb% (std)	1.56 (0.20)	4.17 (0.50)	266.67
Shrub% (std)	4.04 (0.58)	5.73 (0.86)	141.94
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	30.47 (2.68)	33.75 (2.93)	110.77
Soil% (std)	29.17 (2.40)	6.67 (0.67)	22.86
Rock% (std)	16.93 (1.51)	6.46 (0.68)	38.15
Unknown% (std)	0.78 (0.09)	0.00 (0.00)	0.00
Invasive% (std)	9.11 (0.83)	28.12 (2.51)	308.57
# of Quadrates Used for Background 12 # of Total Sample Points Used for Background 768 # of Quadrates Used for Disturbed Area 15 # of Total Sample Points Used for Disturbed Area 960 Disturbed Area and Background Directories) VZRP: WELLS196_197_198, BACKGROUND_RVR_TO_POND_T2			

Table A-18. Comparison of revegetation of wells 199, 200, and 205 to background vegetation.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	30.99 (2.82)	26.50 (2.63)	85.52
Grass% (std)	16.41 (1.49)	14.41 (1.87)	87.86
Forb% (std)	8.59 (1.08)	9.31 (1.03)	108.33
Shrub% (std)	5.99 (1.49)	2.78 (0.69)	46.38
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	16.02 (1.44)	17.94 (1.82)	112.03
Soil% (std)	29.95 (2.61)	25.08 (2.41)	83.73
Rock% (std)	11.59 (1.02)	12.01 (1.24)	103.65
Unknown% (std)	0.52 (0.11)	0.15 (0.04)	28.83
Invasive% (std)	10.94 (1.57)	18.32 (2.49)	167.48
# of Quadrates Used for Background 12 # of Total Sample Points Used for Background 768 # of Quadrates Used for Disturbed Area 18 # of Total Sample Points Used for Disturbed Area 1332 Disturbed Area and Background Directories) VZRP: WELLS199_200_205, BACKGROUND_NEAR_POND_TWELLS_199_200_205			

Table A-19. Comparison of revegetation of wells 202A, 203, and 204.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	30.99 (2.82)	35.90 (4.10)	115.85
Grass% (std)	16.41 (1.49)	5.10 (0.87)	31.09
Forb% (std)	8.59 (1.08)	30.50 (3.90)	354.91
Shrub% (std)	5.99 (1.49)	0.30 (0.05)	5.01
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	16.02 (1.44)	15.50 (1.88)	96.78
Soil% (std)	29.95 (2.61)	11.30 (1.32)	37.73
Rock% (std)	11.59 (1.02)	13.00 (1.84)	112.18
Unknown% (std)	0.52 (0.11)	0.10 (0.03)	19.20
Invasive% (std)	10.94 (1.57)	24.20 (2.79)	221.26
# of Quadrates Used for Background 12 # of Total Sample Points Used for Background 768 # of Quadrates Used for Disturbed Area 10 # of Total Sample Points Used for Disturbed Area 1000 Disturbed Area and Background Directories) VZRP: WELLS202A_203_204, BACKGROUND_NEAR_POND_TWELLS_199_200_205			

Table A-20. Comparison of revegetation of wells 207, 210, and 211.

Category	% in Backgound	% in Disturbed Area	Disturbed Percentageof Background
Cover% (std)	30.99 (2.82)	25.62 (2.73)	82.69
Grass% (std)	16.41 (1.49)	20.38 (2.17)	124.19
Forb% (std)	8.59 (1.08)	4.88 (0.62)	56.73
Shrub% (std)	5.99 (1.49)	0.38 (0.11)	6.26
Cactus% (std)	0.00 (0.00)	0.00 (0.00)	---
Litter% (std)	16.02 (1.44)	7.12 (0.91)	44.49
Soil% (std)	29.95 (2.61)	25.62 (2.69)	85.57
Rock% (std)	11.59 (1.02)	26.37 (2.87)	227.60
Unknown% (std)	0.52 (0.11)	1.12 (0.14)	216.00
Invasive% (std)	10.94 (1.57)	14.12 (1.60)	129.14
# of Quadrates Used for Background 12 # of Total Sample Points Used for Background 768 # of Quadrates Used for Disturbed Area 8 # of Total Sample Points Used for Disturbed Area 800 Disturbed Area and Background Directories) VZRP: WELLS207_210_211, BACKGROUND_NEAR_POND_TWELLS_199_200_205			

Appendix B

FY 2009 Revegetation Photographs

Figure B-1. Revegetation plot in the southwest Big Loop Trench showing native grass, forbs and cheatgrass.

Figure B-2. Revegetation plot in the middle Big Loop Trench showing sagebrush seedlings and forb establishment.

Figure B-3. Revegetation plot on the northeast Big Loop Trench showing tansymustard and Russian thistle.

Figure B-4. Revegetation plot on the long Saddle Trench showing Indian rice grass production.

Figure B-5. Revegetation plot on west Saddle Trench depicting native grass and Russian thistle.

Figure B-6. Revegetation on east Saddle Trench showing grass and shrub establishment.

Figure B-7. Revegetation on BLR-8 Trench showing sagebrush establishment.

Figure B-8. Wide-angle view of area containing background vegetation for the GI.

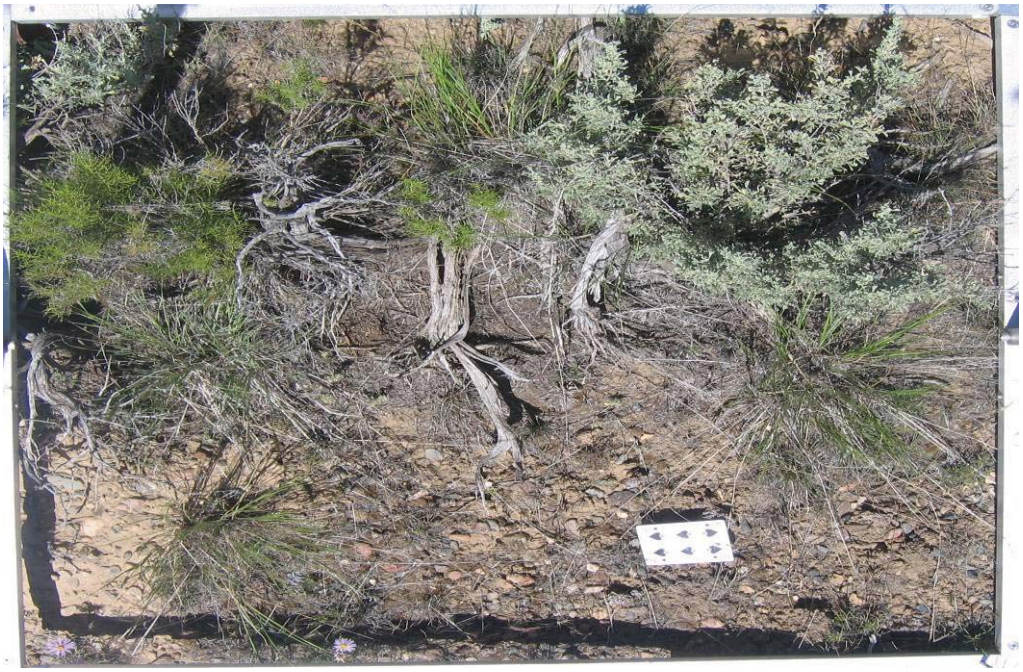

Figure B-9. Background vegetation plot at Geomorphic Trenches.

Figure B-10. Revegetation plot on UAV transect T1 showing grass and shrub establishment.

Figure B-11. Revegetation plot on UAV transect T2 showing grass and shrub establishment.

Figure B-12. Revegetation plot on UAV transect T3 showing grass, shrub and biological soil crust establishment.

Figure B-13. Plot at VZRP wells 1785, 1786, 188, and 190A showing grass regeneration.

Figure B-14. Plot at VZRP wells 208, 191, and 193 showing grass, forb, and shrub establishment.

Figure B-15. Plot at VZRP wells 1784 and 213 showing grass, forb, and shrub establishment.

Figure B-16. Plot at VZRP wells 164A and 164B showing grass and forb production and western tansymustard.

Figure B-17. Plot at VZRP wells 194, 195, 214, and 167 with grass and forb establishment.

Figure B-18. Plot at VZRP wells 196, 197, and 198 showing shrub, forb, and grass establishment.

Figure B-19. Revegetation plot at VZRP wells 199, 200, and 205.

Figure B-20. Revegetation at VZRP wells 202A, 203, and 204.

Figure B-21, Revegetation plot at VZRP wells 207, 210, and 211.

Figure B-22 Photo shows cable corridor with bare spots looking south towards the Equipment Enclosure and Search Station building.

Figure B-23 Photo shows bare spots in disturbed area between buildings MFC-735 and MFC-736.

Figure B-24. General view of disturbed area between MFC-735 and MFC-736 looking north towards MFC.

Figure B-25. Photo shows spotty grass growth in area located between buildings MFC-735 and MFC-736.

Figure B-26. Photo shows disturbed area located east of building MFC-736.

Figure B-27. Graveled area within the disturbed site located on the east side of MFC-736. Halogeton was the most common species growing in the gravel area.

Figure B-28. Photo shows Jim Hill tumble mustard, kochia, and halogeton on the north end of the disturbed area located east of building MFC-736.

Figure B-29. View of septic drain field (for building MFC-735) showing kochia and Jim Hill tumble mustard.

Figure B-30. View of west side of the septic drain field (for building MFC-735) where halogeton is more prevalent.

Figure B-31. Photo showing MFC DBT vehicle barrier on the south side of MFC and running east and west.

Figure B-32. Photo showing MFC DBT vehicle barrier on the east side of MFC running north and south.

Figure B-33. Photo showing seeded area north of power pole 170 on the west side of the T-25 road.

Figure B-34. Photo shows good grass re-establishment occurring at the disturbed area north of power pole 170 and west of the T-25 road.

Figure B-35. Power pole 176 truck turn around area.

Figure B-36. Photo shows area between power poles that was not disturbed by the National Security Test Range project.

Figure B-37. Photo showing heavy application of wood chips at the power pole 176 turn around site.

Figure B-38. Photo shows new grass growth and small green rabbit brush plants at the turn around located near power pole 176.

Figure B-39. Disturbed site located between the T-25 road and power pole 179.

Figure B-40. Photos shows vegetation growth at the power pole 179 disturbed site.

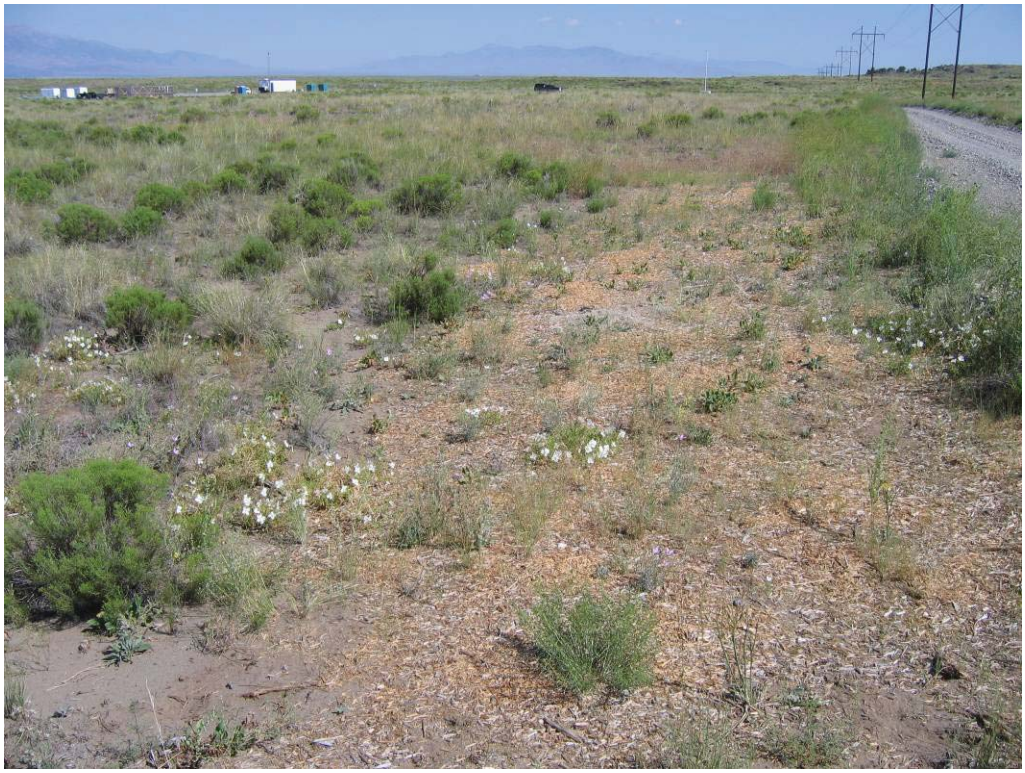

Figure B-41. Disturbed site north of power pole 181 on the west side of the T-25 road.

Figure B-42. Vegetation growth at the disturbed site north of power pole 181 on the west side of the T-25 road.

Figure B-43. Photo shows heavy application of wood chips at the disturbed area located south side of the turn-off at the east end of the National Security Test Range access road.

Figure B-44. Disturbed area located south side of the turn-off at the east end of the National Security Test Range access road.

Figure B-45. Photo shows grass production occurring at the disturbed area located south side of the turn-off at the east end of the National Security Test Range access road.

Appendix C

GPS Coordinates

Waypoint Number	Coordinates	Elevation
42	N43 35.931 W112 54.364	4883 ft
43	N43 35.932 W112 54.366	4897 ft
44	N43 35.932 W112 54.368	4894 ft
45	N43 35.933 W112 54.369	4882 ft
46	N43 35.934 W112 54.371	4880 ft
47	N43 35.936 W112 54.372	4883 ft
48	N43 35.938 W112 54.374	4891 ft
49	N43 35.938 W112 54.374	4887 ft
50	N43 35.938 W112 54.376	4879 ft
51	N43 35.941 W112 54.378	4887 ft
52	N43 35.942 W112 54.379	4886 ft
53	N43 35.945 W112 54.381	4896 ft
54	N43 35.947 W112 54.383	4886 ft
55	N43 35.949 W112 54.385	4894 ft
56	N43 35.950 W112 54.386	4898 ft
57	N43 35.952 W112 54.387	4904 ft
58	N43 35.953 W112 54.389	4909 ft
59	N43 35.954 W112 54.391	4903 ft
60	N43 35.956 W112 54.393	4895 ft
61	N43 35.957 W112 54.394	4881 ft
62	N43 35.950 W112 54.400	4884 ft
63	N43 35.947 W112 54.401	4884 ft
64	N43 35.874 W112 54.448	4892 ft
65	N43 35.883 W112 54.458	4892 ft
66	N43 35.964 W112 54.401	4896 ft
67	N43 35.965 W112 54.403	4888 ft
68	N43 35.968 W112 54.407	4883 ft
69	N43 35.969 W112 54.408	4891 ft
70	N43 35.971 W112 54.410	4891 ft
71	N43 35.969 W112 54.411	4855 ft
72	N43 35.972 W112 54.413	4857 ft
73	N43 35.975 W112 54.415	4881 ft
74	N43 35.978 W112 54.417	4887 ft
75	N43 35.980 W112 54.420	4893 ft
76	N43 35.982 W112 54.422	4898 ft
77	N43 35.984 W112 54.425	4894 ft
78	N43 35.987 W112 54.428	4898 ft
79	N43 35.931 W112 54.364	4913 ft
80	N43 35.931 W112 54.366	4893 ft
81	N43 35.930 W112 54.369	4906 ft
82	N43 35.930 W112 54.371	4913 ft
83	N43 35.930 W112 54.374	4914 ft
84	N43 35.930 W112 54.377	4913 ft
85	N43 35.930 W112 54.381	4912 ft
86	N43 35.930 W112 54.384	4916 ft
87	N43 35.930 W112 54.385	4915 ft
88	N43 35.931 W112 54.388	4913 ft
89	N43 35.932 W112 54.391	4915 ft
90	N43 35.933 W112 54.394	4909 ft
91	N43 35.933 W112 54.397	4910 ft
92	N43 35.933 W112 54.401	4914 ft

93	N43 35.933 W112 54.404	4915 ft
94	N43 35.932 W112 54.408	4917 ft
95	N43 35.933 W112 54.412	4924 ft
96	N43 35.933 W112 54.415	4920 ft
97	N43 35.933 W112 54.418	4917 ft
98	N43 35.933 W112 54.421	4913 ft
99	N43 35.934 W112 54.425	4913 ft
100	N43 35.933 W112 54.429	4912 ft
101	N43 35.935 W112 54.431	4917 ft
102	N43 35.935 W112 54.435	4913 ft
103	N43 35.935 W112 54.439	4904 ft
104	N43 35.935 W112 54.442	4915 ft
105	N43 35.934 W112 54.445	4913 ft
106	N43 35.935 W112 54.448	4914 ft
107	N43 35.936 W112 54.450	4913 ft
108	N43 35.936 W112 54.454	4922 ft
109	N43 35.936 W112 54.463	5022 ft
110	N43 35.935 W112 54.463	5022 ft
111	N43 35.933 W112 54.464	5022 ft
112	N43 35.936 W112 54.468	4925 ft
113	N43 35.935 W112 54.471	4920 ft
114	N43 35.934 W112 54.474	4913 ft
115	N43 35.934 W112 54.477	4915 ft
116	N43 35.934 W112 54.480	4914 ft
117	N43 35.934 W112 54.484	4913 ft
118	N43 35.933 W112 54.488	4920 ft
119	N43 35.934 W112 54.489	4916 ft
120	N43 35.899 W112 54.472	4789 ft
121	N43 35.892 W112 54.470	4789 ft
122	N43 35.932 W112 54.499	4891 ft
123	N43 35.932 W112 54.505	4903 ft
124	N43 35.933 W112 54.509	4894 ft
125	N43 35.933 W112 54.513	4899 ft
126	N43 35.933 W112 54.517	4911 ft
127	N43 35.932 W112 54.520	4913 ft
128	N43 35.932 W112 54.520	4914 ft
129	N43 35.931 W112 54.524	4910 ft
130	N43 35.930 W112 54.527	4911 ft
131	N43 35.930 W112 54.529	4917 ft
132	N43 35.929 W112 54.535	4918 ft
133	N43 35.929 W112 54.538	4914 ft
134	N43 35.930 W112 54.541	4914 ft
135	N43 35.929 W112 54.546	4914 ft
136	N43 35.929 W112 54.549	4911 ft
137	N43 35.923 W112 54.362	4901 ft
138	N43 35.926 W112 54.363	4904 ft
139	N43 35.922 W112 54.365	4896 ft
140	N43 35.920 W112 54.368	4890 ft
141	N43 35.917 W112 54.372	4891 ft
142	N43 35.915 W112 54.376	4893 ft
143	N43 35.912 W112 54.381	4893 ft
144	N43 35.911 W112 54.382	4882 ft

145	N43 35.909 W112 54.388	4882 ft
146	N43 35.908 W112 54.389	4883 ft
147	N43 35.907 W112 54.388	4864 ft
148	N43 35.903 W112 54.394	4874 ft
149	N43 35.900 W112 54.401	4881 ft
150	N43 35.897 W112 54.405	4881 ft
151	N43 35.893 W112 54.412	4889 ft
152	N43 35.891 W112 54.414	4898 ft
153	N43 35.889 W112 54.417	4900 ft
154	N43 35.888 W112 54.421	4902 ft
155	N43 35.887 W112 54.423	4917 ft
156	N43 35.885 W112 54.427	4912 ft
157	N43 35.882 W112 54.432	4913 ft
158	N43 35.881 W112 54.435	4910 ft
159	N43 35.881 W112 54.439	4902 ft
160	N43 35.878 W112 54.440	4903 ft
161	N43 35.877 W112 54.444	4904 ft
162	N43 35.875 W112 54.448	4904 ft
163	N43 35.871 W112 54.410	4913 ft
164	N43 35.873 W112 54.407	4913 ft
165	N43 35.875 W112 54.403	4913 ft
166	N43 35.878 W112 54.399	4913 ft
167	N43 35.882 W112 54.396	4912 ft
168	N43 35.884 W112 54.394	4909 ft
169	N43 35.887 W112 54.391	4905 ft
170	N43 35.890 W112 54.388	4910 ft
171	N43 35.892 W112 54.385	4904 ft
172	N43 35.895 W112 54.382	4905 ft
173	N43 35.898 W112 54.379	4909 ft
174	N43 35.898 W112 54.375	4910 ft
175	N43 35.900 W112 54.371	4911 ft
176	N43 35.905 W112 54.367	4909 ft
177	N43 35.909 W112 54.361	4908 ft
178	N43 35.912 W112 54.361	4911 ft
179	N43 35.916 W112 54.356	4909 ft
180	N43 35.918 W112 54.354	4907 ft
181	N43 35.917 W112 54.354	
182	N43 35.931 W112 54.364	4910 ft
183	N43 35.935 W112 54.373	4889 ft
184	N43 35.938 W112 54.374	4898 ft
185	N43 35.940 W112 54.376	4901 ft
186	N43 35.941 W112 54.378	4902 ft
187	N43 35.942 W112 54.380	4902 ft
188	N43 35.944 W112 54.381	4902 ft
189	N43 35.944 W112 54.381	4902 ft
190	N43 35.945 W112 54.382	4903 ft
191	N43 35.947 W112 54.384	4903 ft
192	N43 35.949 W112 54.387	4902 ft
193	N43 35.950 W112 54.389	4902 ft
194	N43 35.952 W112 54.391	4902 ft
195	N43 35.953 W112 54.393	4902 ft
196	N43 35.954 W112 54.395	4903 ft

197	N43 35.954 W112 54.395	4905 ft
198	N43 35.957 W112 54.397	4902 ft
199	N43 35.956 W112 54.396	4901 ft
200	N43 35.958 W112 54.401	4915 ft
201	N43 35.959 W112 54.403	4906 ft
202	N43 35.960 W112 54.405	4905 ft
203	N43 35.963 W112 54.405	4906 ft
204	N43 35.964 W112 54.407	4910 ft
205	N43 35.965 W112 54.409	4906 ft
206	N43 35.966 W112 54.411	4907 ft
207	N43 35.968 W112 54.413	4908 ft
208	N43 35.969 W112 54.412	4903 ft
209	N43 35.970 W112 54.414	4903 ft
210	N43 35.973 W112 54.418	4906 ft
211	N43 35.975 W112 54.419	4907 ft
212	N43 35.975 W112 54.420	4893 ft
213	N43 35.977 W112 54.422	4895 ft
214	N43 35.979 W112 54.425	4902 ft
215	N43 35.981 W112 54.426	4905 ft
216	N43 35.983 W112 54.427	4901 ft
217	N43 35.985 W112 54.430	4903 ft
218	N43 35.986 W112 54.431	4902 ft
219	N43 35.987 W112 54.434	4900 ft
220	N43 35.990 W112 54.434	4902 ft
221	N43 35.993 W112 54.435	4903 ft
222	N43 35.994 W112 54.437	4906 ft
223	N43 35.997 W112 54.439	4906 ft
224	N43 35.998 W112 54.440	4905 ft
225	N43 36.000 W112 54.442	4906 ft
226	N43 36.000 W112 54.442	4902 ft
227	N43 36.003 W112 54.446	4909 ft
228	N43 36.005 W112 54.448	4909 ft
229	N43 36.003 W112 54.442	4913 ft
230	N43 36.008 W112 54.450	4913 ft
231	N43 36.008 W112 54.450	4913 ft
232	N43 36.010 W112 54.452	4909 ft
233	N43 35.932 W112 54.358	4907 ft
234	N43 35.931 W112 54.365	4903 ft
235	N43 35.930 W112 54.372	4906 ft
236	N43 35.931 W112 54.376	4912 ft
237	N43 35.931 W112 54.377	4908 ft
238	N43 35.931 W112 54.383	4906 ft
239	N43 35.931 W112 54.386	4909 ft
240	N43 35.923 W112 54.387	4902 ft
241	N43 35.929 W112 54.393	4902 ft
242	N43 35.930 W112 54.395	4909 ft
243	N43 35.931 W112 54.393	4882 ft
244	N43 35.931 W112 54.392	4889 ft
245	N43 35.931 W112 54.398	4885 ft
246	N43 35.931 W112 54.402	4896 ft
247	N43 35.930 W112 54.407	4896 ft
248	N43 35.931 W112 54.413	4900 ft

249	N43 35.930 W112 54.415	4903 ft
250	N43 35.931 W112 54.416	4902 ft
251	N43 35.931 W112 54.417	4903 ft
252	N43 35.931 W112 54.418	4896 ft
253	N43 35.932 W112 54.422	4888 ft
254	N43 35.932 W112 54.422	4881 ft
255	N43 35.932 W112 54.423	4880 ft
256	N43 35.932 W112 54.428	4878 ft
257	N43 35.931 W112 54.442	4900 ft
258	N43 35.932 W112 54.445	4899 ft
259	N43 35.930 W112 54.453	4916 ft
260	N43 35.930 W112 54.452	4921 ft
261	N43 35.929 W112 54.459	4908 ft
262	N43 35.929 W112 54.453	4914 ft
263	N43 35.929 W112 54.458	4912 ft
264	N43 35.929 W112 54.464	4909 ft
265	N43 35.927 W112 54.468	4913 ft
266	N43 35.927 W112 54.468	4913 ft
267	N43 35.927 W112 54.475	4902 ft
268	N43 35.927 W112 54.478	4898 ft
269	N43 35.927 W112 54.478	4898 ft
270	N43 35.927 W112 54.484	4902 ft
271	N43 35.924 W112 54.491	4924 ft
272	N43 35.924 W112 54.493	4924 ft
273	N43 35.924 W112 54.498	4928 ft
274	N43 35.923 W112 54.501	4934 ft
275	N43 35.925 W112 54.505	4921 ft
276	N43 35.925 W112 54.508	4919 ft
277	N43 35.925 W112 54.509	4913 ft
278	N43 35.925 W112 54.511	4910 ft
279	N43 35.924 W112 54.515	4910 ft
280	N43 35.923 W112 54.517	4908 ft
281	N43 35.922 W112 54.523	4932 ft
282	N43 35.921 W112 54.526	4925 ft
283	N43 35.922 W112 54.529	4918 ft
284	N43 35.922 W112 54.532	4920 ft
285	N43 35.918 W112 54.364	4910 ft
286	N43 35.918 W112 54.365	4916 ft
287	N43 35.916 W112 54.369	4919 ft
288	N43 35.914 W112 54.371	4924 ft
289	N43 35.913 W112 54.373	4916 ft
290	N43 35.912 W112 54.375	4918 ft
291	N43 35.911 W112 54.377	4913 ft
292	N43 35.911 W112 54.376	4909 ft
293	N43 35.911 W112 54.377	4909 ft
294	N43 35.908 W112 54.382	4900 ft
295	N43 35.908 W112 54.382	4902 ft
296	N43 35.907 W112 54.384	4902 ft
297	N43 35.903 W112 54.391	4902 ft
298	N43 35.902 W112 54.394	4900 ft
299	N43 35.902 W112 54.395	4890 ft
300	N43 35.899 W112 54.399	4893 ft

301	N43 35.894 W112 54.399	4887 ft
302	N43 35.895 W112 54.402	4883 ft
303	N43 35.893 W112 54.410	4900 ft
304	N43 35.893 W112 54.411	4901 ft
305	N43 35.892 W112 54.415	4909 ft
306	N43 35.891 W112 54.418	4900 ft
307	N43 35.889 W112 54.419	4902 ft
308	N43 35.886 W112 54.420	4895 ft
309	N43 35.885 W112 54.422	4891 ft
310	N43 35.885 W112 54.421	4896 ft
311	N43 35.883 W112 54.427	4898 ft
312	N43 35.880 W112 54.428	4896 ft
313	N43 35.877 W112 54.431	4899 ft
314	N43 35.875 W112 54.434	4900 ft
315	N43 35.874 W112 54.437	4900 ft
316	N43 35.868 W112 54.438	4905 ft
317	N43 35.866 W112 54.437	4907 ft
318	N43 35.863 W112 54.435	4906 ft
319	N43 35.861 W112 54.436	4912 ft
320	N43 35.858 W112 54.434	4908 ft
321	N43 35.856 W112 54.433	4904 ft
322	N43 35.858 W112 54.434	4905 ft
323	N43 35.858 W112 54.426	4909 ft
324	N43 35.861 W112 54.424	4909 ft
325	N43 35.862 W112 54.419	4908 ft
326	N43 35.864 W112 54.415	4902 ft
327	N43 35.868 W112 54.414	4904 ft
328	N43 35.868 W112 54.415	4906 ft
329	N43 35.870 W112 54.411	4903 ft
330	N43 35.870 W112 54.409	4898 ft
331	N43 35.873 W112 54.403	4910 ft
332	N43 35.874 W112 54.402	4909 ft
333	N43 35.877 W112 54.399	4911 ft
334	N43 35.879 W112 54.397	4909 ft
335	N43 35.881 W112 54.394	4906 ft
336	N43 35.882 W112 54.392	4905 ft
337	N43 35.884 W112 54.389	4903 ft
338	N43 35.887 W112 54.388	4902 ft
339	N43 35.889 W112 54.385	4904 ft
340	N43 35.889 W112 54.385	4906 ft
341	N43 35.891 W112 54.381	4901 ft
342	N43 35.894 W112 54.378	4903 ft
343	N43 35.896 W112 54.375	4908 ft
344	N43 35.896 W112 54.375	4900 ft
345	N43 35.896 W112 54.375	4901 ft
346	N43 35.903 W112 54.365	4912 ft
347	N43 35.905 W112 54.361	4906 ft
348	N43 35.905 W112 54.360	4906 ft
349	N43 35.905 W112 54.360	4906 ft
350	N43 35.909 W112 54.355	4910 ft
351	N43 35.912 W112 54.352	4908 ft
352	N43 33.739 W112 58.339	4958 ft

353	N43 33.739 W112 58.325	4972 ft
354	N43 33.740 W112 58.329	4969 ft
355	N43 33.737 W112 58.320	4969 ft
356	N43 33.740 W112 58.315	4978 ft
357	N43 33.741 W112 58.314	4976 ft
358	N43 33.742 W112 58.314	4975 ft
359	N43 33.740 W112 58.308	4967 ft
360	N43 33.740 W112 58.308	4967 ft
361	N43 33.740 W112 58.302	4968 ft
362	N43 33.740 W112 58.293	4969 ft
363	N43 33.740 W112 58.290	4966 ft
364	N43 33.753 W112 58.285	4956 ft
365	N43 33.756 W112 58.284	4942 ft
366	N43 33.762 W112 58.275	4941 ft
367	N43 33.765 W112 58.264	4947 ft
368	N43 33.767 W112 58.256	4948 ft
369	N43 33.771 W112 58.251	4954 ft
370	N43 33.771 W112 58.250	4962 ft
371	N43 33.776 W112 58.244	4960 ft
372	N43 33.777 W112 58.241	4957 ft
373	N43 33.642 W112 58.334	4943 ft
374	N43 33.662 W112 58.333	4968 ft
375	N43 33.670 W112 58.332	4973 ft
376	N43 33.671 W112 58.331	4974 ft
377	N43 33.674 W112 58.328	4973 ft
378	N43 33.675 W112 58.325	4973 ft
379	N43 33.676 W112 58.323	4971 ft
380	N43 33.681 W112 58.322	4972 ft
381	N43 33.683 W112 58.329	4969 ft
382	N43 33.684 W112 58.324	4959 ft
383	N43 33.396 W112 58.301	4974 ft
384	N43 33.397 W112 58.307	4974 ft
385	N43 33.402 W112 58.306	4957 ft
386	N43 33.398 W112 58.313	4968 ft
387	N43 33.397 W112 58.314	4976 ft
388	N43 33.394 W112 58.320	4974 ft
389	N43 33.395 W112 58.323	4976 ft
390	N43 33.396 W112 58.325	4978 ft
391	N43 33.396 W112 58.331	4978 ft
392	N43 33.394 W112 58.335	4975 ft
393	N43 33.393 W112 58.340	4974 ft
394	N43 33.394 W112 58.341	4972 ft
395	N43 33.363 W112 58.291	4973 ft
396	N43 33.357 W112 58.294	4972 ft
397	N43 33.355 W112 58.298	4971 ft
398	N43 33.354 W112 58.301	4972 ft
399	N43 33.351 W112 58.303	4973 ft
400	N43 33.348 W112 58.305	4975 ft
401	N43 33.345 W112 58.305	4968 ft
402	N43 33.349 W112 58.298	4965 ft
403	N43 33.351 W112 58.293	4966 ft
404	N43 33.353 W112 58.288	4965 ft

405	N43 33.353 W112 58.288	4968 ft
406	N43 33.331 W112 58.339	4966 ft
407	N43 33.328 W112 58.356	4967 ft
408	N43 33.230 W112 58.530	4969 ft
409	N43 33.327 W112 58.361	4966 ft
410	N43 33.328 W112 58.363	4952 ft
411	N43 33.326 W112 58.369	4948 ft
412	N43 33.326 W112 58.376	4947 ft
413	N43 33.322 W112 58.381	4958 ft
414	N43 33.321 W112 58.386	4962 ft
415	N43 33.228 W112 58.309	4984 ft
416	N43 33.221 W112 58.298	4984 ft
417	N43 33.219 W112 58.301	4982 ft
418	N43 33.217 W112 58.300	4979 ft
419	N43 33.228 W112 58.315	4987 ft
420	N43 33.219 W112 58.311	4979 ft
421	N43 33.215 W112 58.314	4983 ft
422	N43 33.212 W112 58.319	4984 ft
423	N43 33.216 W112 58.319	4982 ft
424	N43 33.216 W112 58.318	4981 ft
425	N43 33.219 W112 58.315	4988 ft
426	N43 31.409 W113 04.178	5056 ft
427	N43 31.418 W113 04.209	5065 ft
428	N43 31.422 W113 04.214	5067 ft
429	N43 31.422 W113 04.218	5067 ft
430	N43 31.422 W113 04.219	5065 ft
431	N43 31.422 W113 04.231	5058 ft
432	N43 31.424 W113 04.233	5054 ft
433	N43 31.429 W113 04.243	5061 ft
434	N43 31.428 W113 04.244	5064 ft
435	N43 31.430 W113 04.248	5062 ft
436	N43 31.434 W113 04.252	5061 ft
437	N43 31.438 W113 04.251	5060 ft
438	N43 31.441 W113 04.257	5063 ft
439	N43 31.443 W113 04.262	5062 ft
440	N43 31.413 W113 04.170	5037 ft
441	N43 31.415 W113 04.182	5057 ft
442	N43 31.418 W113 04.174	5059 ft
443	N43 31.422 W113 04.171	5062 ft
444	N43 31.422 W113 04.172	5060 ft
445	N43 31.423 W113 04.161	5059 ft
446	N43 31.435 W113 04.160	5066 ft
447	N43 31.444 W113 04.155	5072 ft
448	N43 31.450 W113 04.150	5067 ft
449	N43 31.453 W113 04.149	5063 ft
450	N43 31.454 W113 04.149	5065 ft
451	N43 31.320 W113 04.229	5071 ft
452	N43 31.323 W113 04.232	5076 ft
453	N43 31.323 W113 04.233	5076 ft
454	N43 31.329 W113 04.236	5073 ft
455	N43 31.330 W113 04.238	5072 ft
456	N43 31.330 W113 04.238	5068 ft

457	N43 31.333 W113 04.240	5070 ft
458	N43 31.333 W113 04.241	5070 ft
459	N43 31.338 W113 04.245	5065 ft
460	N43 31.338 W113 04.245	5066 ft
461	N43 31.339 W113 04.247	5068 ft
462	N43 31.306 W113 04.219	5038 ft
463	N43 31.262 W113 04.229	5067 ft
464	N43 31.266 W113 04.233	5067 ft
465	N43 31.267 W113 04.235	5062 ft
466	N43 31.269 W113 04.239	5065 ft
467	N43 31.273 W113 04.244	5067 ft
468	N43 31.275 W113 04.245	5066 ft
469	N43 31.276 W113 04.247	5059 ft
470	N43 31.278 W113 04.250	5062 ft
471	N43 31.281 W113 04.252	5063 ft
472	N43 31.283 W113 04.256	5063 ft
473	N43 31.284 W113 04.256	5065 ft
474	N43 31.285 W113 04.257	5067 ft
475	N43 31.260 W113 04.218	5066 ft
476	N43 31.630 W113 03.383	5043 ft
477	N43 31.631 W113 03.385	5050 ft
478	N43 31.635 W113 03.387	5051 ft
479	N43 31.638 W113 03.389	5067 ft
480	N43 31.647 W113 03.392	5062 ft
481	N43 31.628 W113 03.382	5041 ft
482	N43 31.622 W113 03.392	5045 ft
483	N43 31.630 W113 03.397	5047 ft
484	N43 31.635 W113 03.398	5047 ft
485	N43 31.634 W113 03.398	5051 ft
486	N43 31.636 W113 03.399	5046 ft
487	N43 31.636 W113 03.405	5044 ft
488	N43 31.626 W113 03.383	5050 ft
489	N43 31.943 W113 02.685	5036 ft
490	N43 31.945 W113 02.680	5027 ft
491	N43 31.949 W113 02.682	5038 ft
492	N43 31.951 W113 02.685	5047 ft
493	N43 31.956 W113 02.685	5048 ft
494	N43 31.956 W113 02.684	5043 ft
495	N43 31.958 W113 02.685	5037 ft
496	N43 31.937 W113 02.692	5047 ft
497	N43 31.820 W113 03.495	5047 ft
498	N43 31.818 W113 03.493	5040 ft
499	N43 31.816 W113 03.493	5052 ft
500	N43 31.814 W113 03.490	5019 ft
501	N43 31.812 W113 03.485	5025 ft
502	N43 31.812 W113 03.481	5033 ft
503	N43 31.811 W113 03.480	5032 ft
504	N43 31.809 W113 03.451	5046 ft
505	N43 31.804 W113 03.453	5057 ft
506	N43 31.800 W113 03.450	5061 ft
507	N43 31.801 W113 03.446	5047 ft
508	N43 31.799 W113 03.445	5057 ft

509	N43 31.797 W113 03.442	5056 ft
510	N43 31.797 W113 03.435	5052 ft
511	N43 31.794 W113 03.431	5063 ft
512	N43 31.791 W113 03.424	5062 ft
513	N43 31.789 W113 03.421	5055 ft
514	N43 31.789 W113 03.421	5055 ft
515	N43 31.787 W113 03.416	5061 ft
516	N43 31.785 W113 03.412	5058 ft
517	N43 31.780 W113 03.405	5071 ft
518	N43 31.778 W113 03.401	5066 ft
519	N43 31.776 W113 03.393	5067 ft
520	N43 31.775 W113 03.391	5058 ft
521	N43 31.769 W113 03.386	5058 ft
522	N43 31.769 W113 03.386	5060 ft
523	N43 31.767 W113 03.381	5059 ft
524	N43 31.766 W113 03.377	5062 ft
525	N43 31.764 W113 03.368	5062 ft
526	N43 31.765 W113 03.369	5060 ft