Final 2005 Five-Year Review Report

for
Rocky Mountain Arsenal
Commerce City
Adams County, Colorado

Review Period: April 1, 2000 – March 31, 2005

Volume II of III

Five-Year Review Site Inspection and Interview Checklists

November 2007

PREPARED BY:

Department of the Army
Rocky Mountain Arsenal
Commerce City, Colorado

VOLUME II of III

FIVE-YEAR REVIEW SITE INSPECTION AND INTERVIEW CHECKLISTS

CONTENTS

Section

Site	Acres	Status	RVO Condition	EPA Condition
ESL Section 1 (SSA-4)	8	Permanent seeding	Poor	Poor
Misc. Southern Tier, Section 1 (SSA-2a, P1 Soil)	3.3	Permanent seeding	Excellent	Excellent
ESL, south central Section 4 (WSA-2)	2	Permanent seeding	Excellent	Excellent
Misc. Southern Tier, Section 4 (WSA-6a)	4.25	Permanent seeding	Poor	Poor
Misc. Southern Tier, Section 3 (SSA-2c)	5	Permanent seeding	Excellent	Excellent
ESL Section 4 (WSA-5c, WSA-5a, BT4-8, 9, 10, 11)	0.3	Permanent seeding	Excellent	Excellent
Misc. Southern Tier, Section 12 (Rifle Range, Fisherman's Parking Lot, SSA-3b)	0.5	Permanent seeding	Excellent	Excellent
Secondary Basins, Section 26, west (NCSA-2b)	5	Interim seeding	Good	Good/Fair
Secondary Basins, Section 26, central (NCSA-2a)	35	Permanent seeding	Poor	Poor
Secondary Basins, Section 26, east (NCSA-2a)	75	Permanent seeding	Fair	Fair
Secondary Basins, Section 26, A-neck	2	Interim seeding	Good	Good
Misc. Northern Tier, Section 24 (NCSA-8b)	12	Permanent seeding	Poor	Poor
ESL Section 30 (ESA-2b)	18	Permanent seeding	Good	Good
BT, Section 30 (ESA-4a, BT30-1)	10	Interim seeding	Fair	Fair
Misc. Northern Tier, Section 19 (Pistol Range)	1	Permanent seeding	Excellent	Excellent
Munitions Remediation, Section 19 (ESA-1a), 20 (ESA-1b), 29 (ESA-1c, MT29-1), 30 (ESA-1d)	11	Permanent seeding	Good	Good
Munitions Remediation, Section25 (CSA-2c)	19	Interim seeding	Good	Good
BT, Section 20	11	Permanent seeding	Good	Fair
BT, Section 29 and 32 (BT29-1,-2; BT32-11)	0.3	Interim seeding	Poor	Poor

Site	Acres	Status	RVO Condition	EPA Condition
BT, Section 32 (ESA 2a-1, 2, 3)	10.5	Permanent seeding	Poor to Good	Poor to Good
BT, Section 32 (ESA 2a-4, 5, 6)	12	Permanent seeding	Fair	Fair
BT, Section 32 (BT32-1, 2, 3)	4.5	Permanent seeding	Poor	Poor
BT, Section 32 (BT32-9, 10)	1.4	Permanent seeding	Poor	Poor
ESL, Section 36 (ESA-1d)	18.5	Interim seeding plus wheat	Good	Fair
Borrow Area 1	54	Permanent seeding	Excellent	Excellent
Section 35 Soils Remediation	34	Cover crop	Good	Good
Borrow Area 3	140	Cover crop	Fair to Good	Fair to Good
Borrow Area 5 (east portion)	28	Permanent seeding	Good	Good
Borrow Area 7B (east portion)	26	Interim seeding	Fair	Fair
Borrow Area 11	80	Permanent seeding	Fair to Good	Fair to Good
TRER 1WC-1	19	Permanent seeding	(Too early to judge)	Poor
TRER 1CN-2	1	Permanent seeding	Fair	Fair
TRER 1SE-4	6	N/A	N/A	N/A
TRER 2NW-4	11	Permanent seeding	Good	Good
TRER 4EC-2	3	Permanent seeding	Poor	Poor
TRER 4SC-1	16	Permanent seeding	Excellent	Excellent
TRER 6NW-2	21	Permanent seeding	Good	Good
TRER 6NW-3	20	Permanent seeding	Fair	Fair

Site	Acres	Status	RVO Condition	EPA Condition
TRER 25CC-3, Borrow Area 6, Borrow Area 8, Misc. Northern Tier soil (NPSA-4)	74	Cover crop	Fair	Fair
TRER 26SW-1	1.5	N/A	N/A	Poor
TRER 26WC-2	1.5	Interim seeding	Good	Good
TRER 26NW-5	9	Permanent seeding	Fair	Fair
TRER 26SE-6	4	Permanent seeding	Excellent	Excellent
TRER 30SW-2	3	Permanent seeding	Good	Good
TRER 30SW-3	5	N/A	N/A	Poor
TRER 31EC-1	6	Cover crop	Good	Good
TRER 31EC-2	2	Cover crop	Good	Fair
TRER 35WC-4	17	N/A	N/A	Poor
TRER 35SW-2	14	N/A	N/A	Poor
TRER 35SW-3	5	N/A	N/A	Poor
TRER 35NC-7	18	Permanent seeding	Poor (early development)	Poor
TRER 35SE-1	9	Interim seeding	Poor	Poor
TRER 36NE-3	24.5	Interim seeding	Fair	Fair
TRER 36EC-1	3	N/A	N/A	N/A
BT Section 32 (ESA 2a-7, BT32-4, 5, 6, 7); BT Section 6 (BT6-1, BT6-2); TRER 6EC-4; Toxic Storage Yard, Section 5 (ESA-3a); Toxic Storage Yard, Section 6 (ESA-3b)			Not inspected due to Eagle Nest Area Exclusion Zone restrictions.	

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Existing Sanitary Landfill Remediation, Section 1

DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded fall 2004. Irrigated 2005.	8 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Poor seedling density at time of assessment. Copious cheatgrass cover.

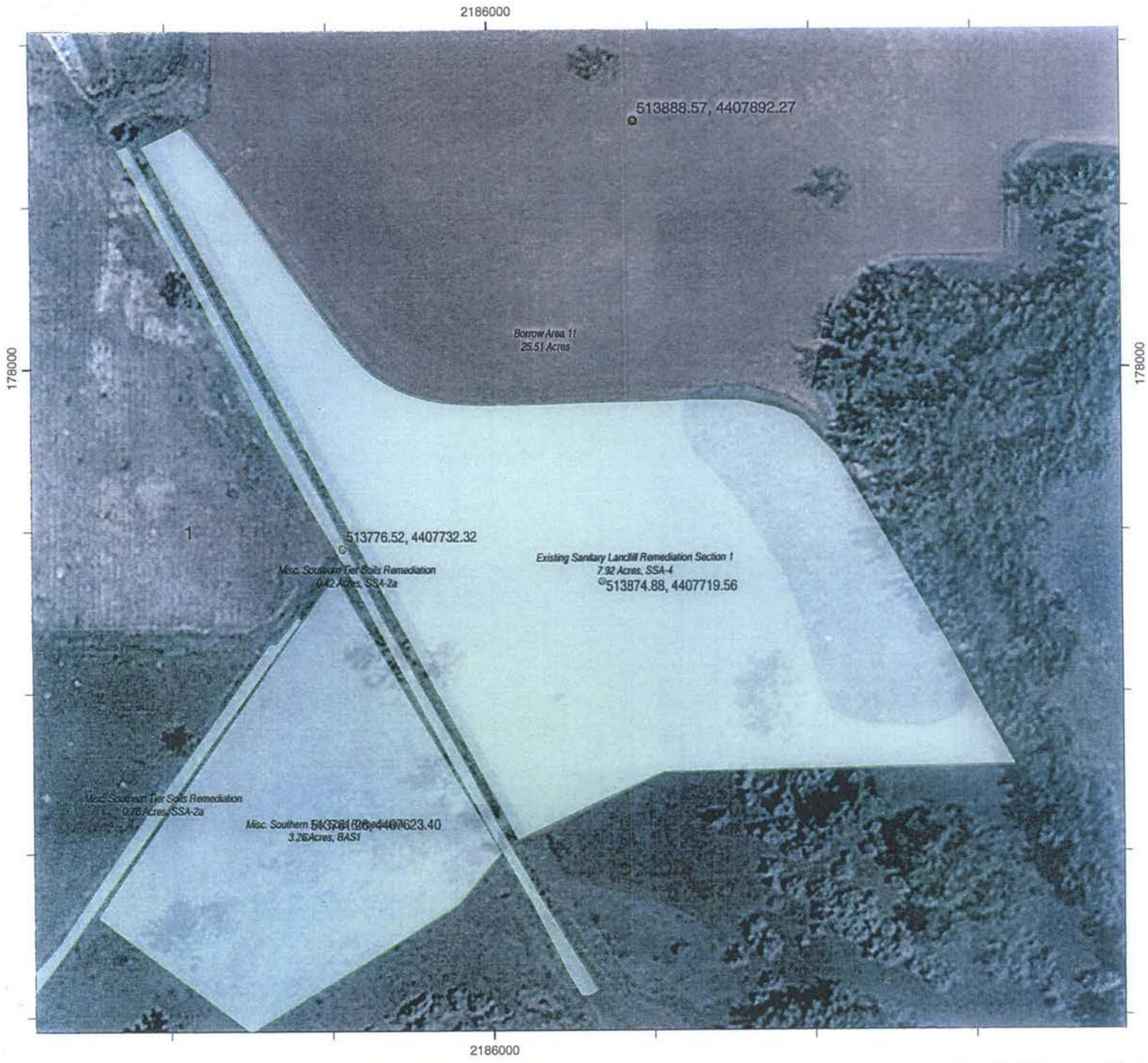
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by: [signature]

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Existing Sanitary Landfill 1

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Daulmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location:
G:\projects\rvo_delist\mxds\boundary_delineation_cm_0605_rs4fsd.mxd

REVEGETATION INSPECTION CHECKLIST

E

AREA INSPECTED Miscellaneous Southern Tier Soils Remediation (Section 1)
DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2000.	3.3 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Excellent cool season grass species establishment. About 33% cover by Western wheatgrass.

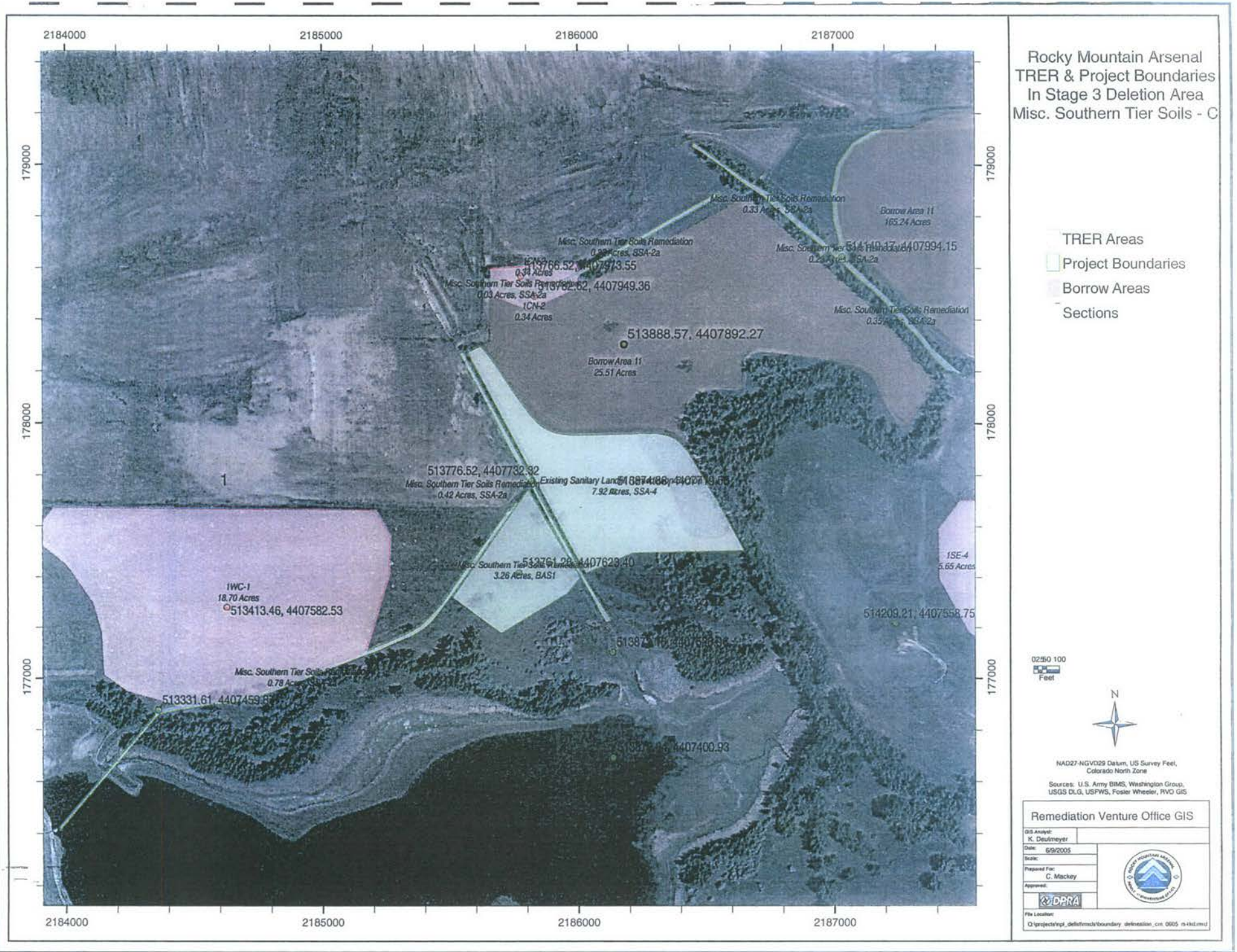
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by U. Thomas Gentner

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Misc. Southern Tier Soils - C

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 250 100
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Fosler Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deutmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	
	DPRA

File Location:
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E

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 4 Existing Sanitary Landfill (Southcentral)
DATE 6/15/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2000.	~2 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

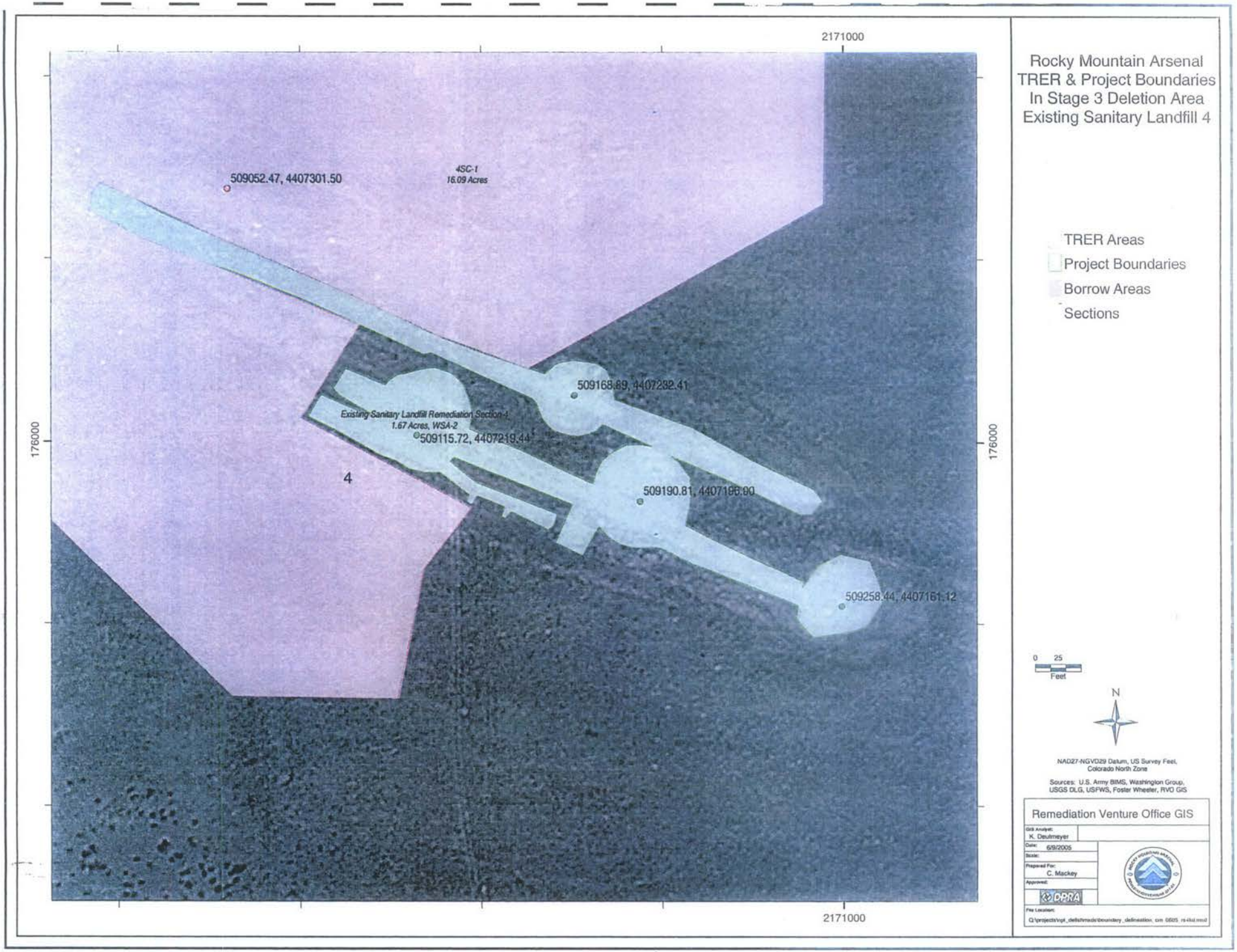
Comments: Very good native plant diversity. At least 10 of the seeded species present. Bare ground abundant, but filling in with litter and perennial plant species. Minimal problematic weedy plants.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/15/05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Existing Sanitary Landfill 4

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: Q:\projects\rvgis_data\mxds\boundary_delineation_sm_0505_rs4sl.mxd

Energy Hill Rem

REVEGETATION INSPECTION CHECKLIST Misc S. Tier Soil

AREA INSPECTED Miscellaneous Southern Tier Soil Remediation Section 4 Remed. Add Sec 4
DATE 6/21/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001.	4.25 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: It appears that the seeding failed at this site. Only small areas of the site contain sparse cover by perennial grass, i.e. Western wheatgrass. Weedy annual species, primarily kochia (~65% of the total cover) dominate the site. This area could be incorporated into a future seeding project when habitat in the area adjacent in Section 3 is restored.

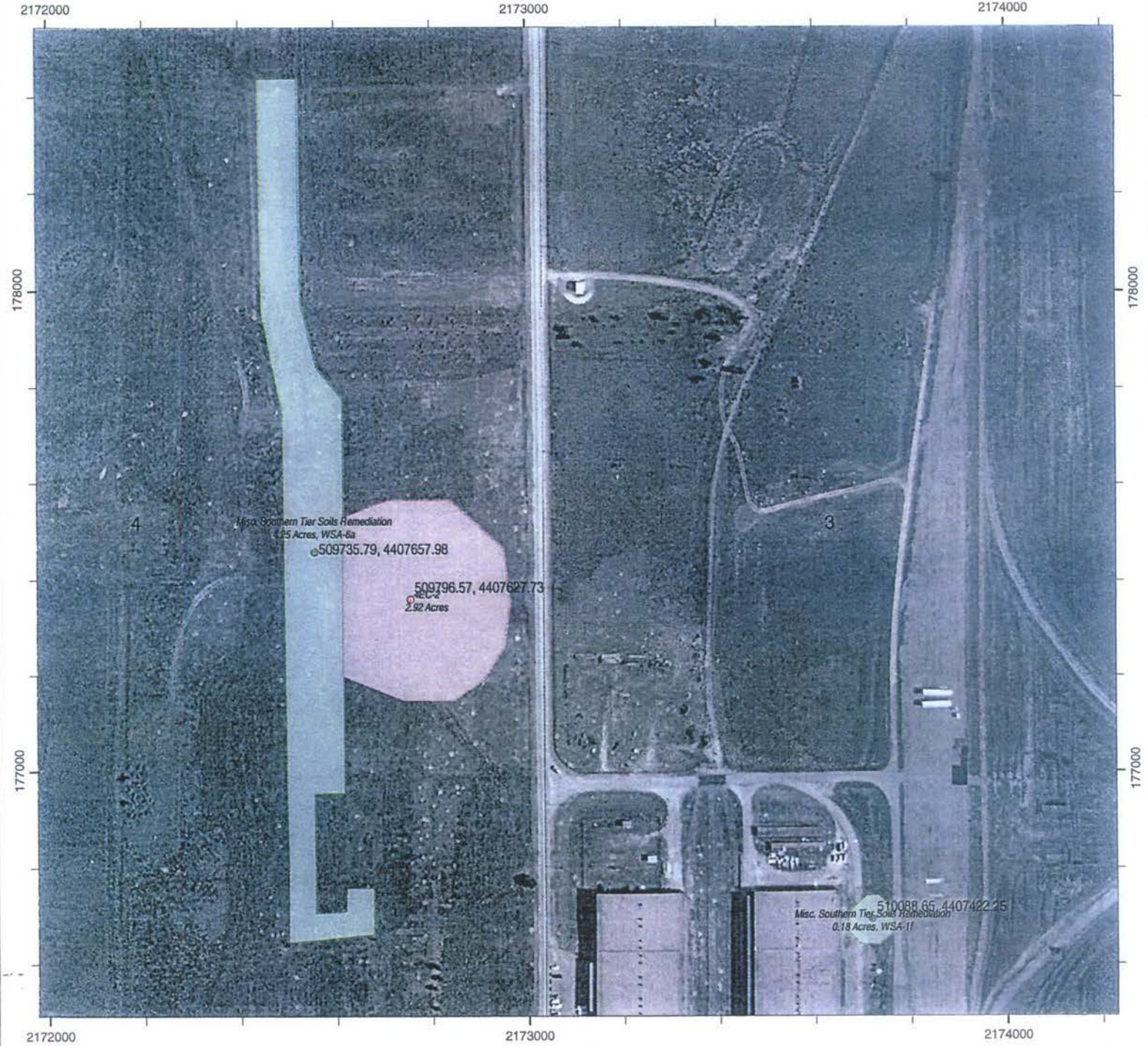
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/21/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Misc. Southern Tier Soils - A

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25 50 100
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA

File Location:
Q:\projects\npl_delis\maps\boundary_delineation cm 0605 rs-tbd.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Misc. Southern Tier Soil (west of visitor center)
DATE 6/13/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2000	Section 3, 5 Acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

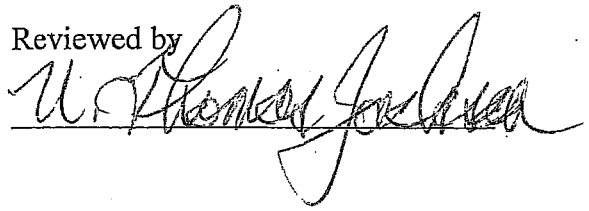
Comments: This site is located in the Irondale Gulch drainage and is primarily dominated by cool season grasses, especially Western wheatgrass, however, at least seven other native cool season grass species occur at the site. Canada thistle and smooth brome also occur and control should be considered.

Transect Data Summary: Mean litter = 38.5%
Mean bare soil = 7.5%
Mean total vegetation = 54%
Mean total cover = 92.5%

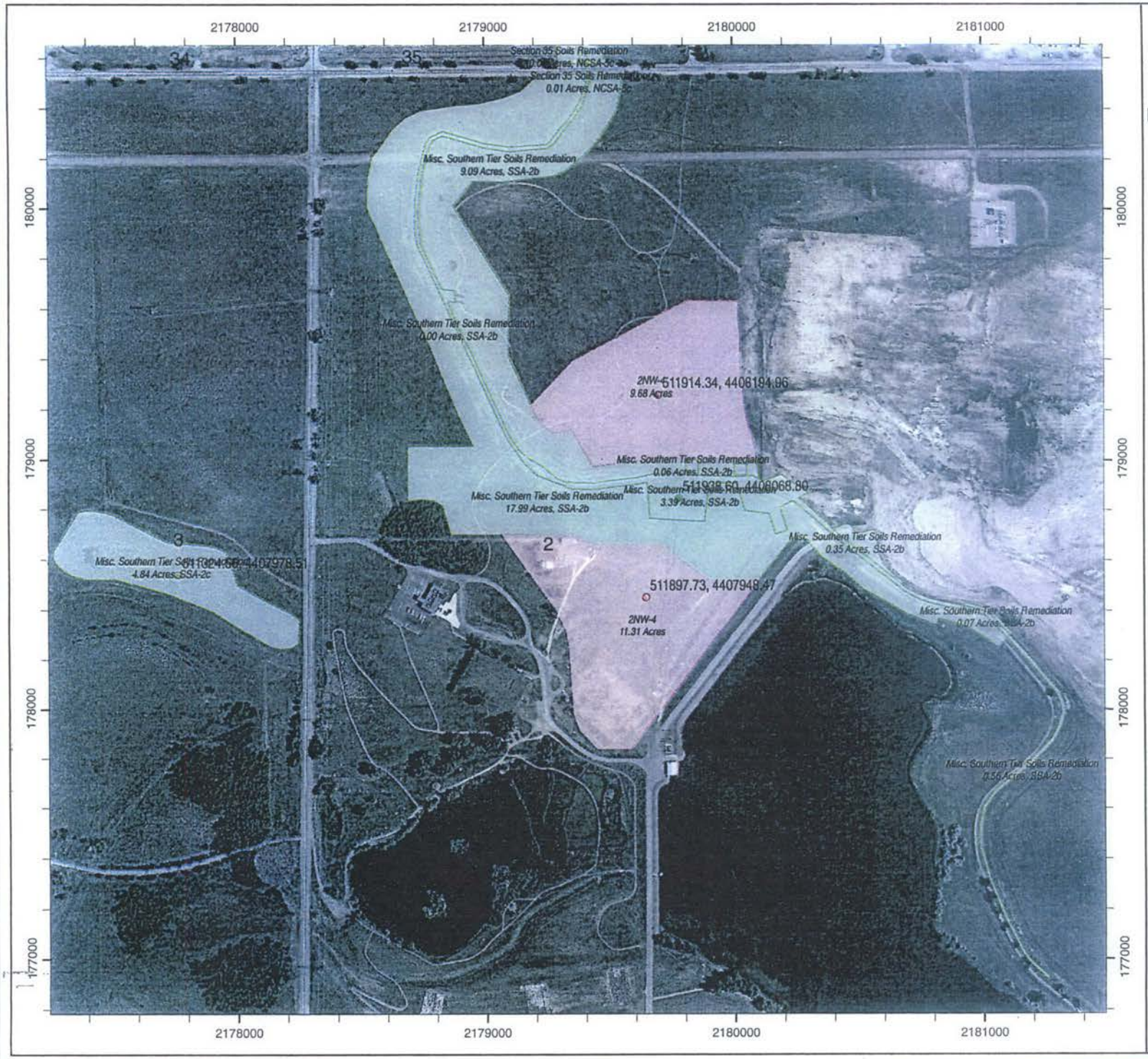
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/13/05

Denise Arthur, ESCO representing EPA

Reviewed by 

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Misc. Southern Tier Soils - B

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 250 100 150
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: Q:\projects\rvgi_delile\mxds\boundary_delineation_con_0605_rs43sl.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 4 Existing Sanitary Landfill, WSA-5c
DATE 6/22/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001.	0.3 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	This area was sampled because establishment of seeded species was much better that at adjacent locations.
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

Comments: This site is a diverse native grass stand with 6 seeded grass species and 2 shrub species present. Native perennial grasses provided 56% of the total cover. This site should be included in a lessons learned discussion to brainstorm why this area was successful while adjacent remedy areas seeded at the same time and manor were not successful.

Transect Data Summary: Mean litter = 26%
Mean bare soil = 9%
Mean total vegetation = 65%
Mean total cover = 91%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/22/05

Denise Arthur, ESCO representing EPA

Barbara Nabors, CDPHE

Reviewed by

Date 10/31/06

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Existing Sanitary Landfill, Section 4, WSA-5a (4 locations),
DATE 6/22/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001.	4 locations for WSA-5a totaled about 1.3 acres; 4 locations for WSA 5d totaled about 2 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Seeding at these locations was generally unsuccessful with only sparse establishment of seeded grasses and shrubs. However, the sites are small and are surrounded by large areas where seeding was very successful. Overseeding of the sites that was conducted in the spring of 2005 did not produce any seedlings apparent at the time of the inspection. It is possible that improvement of these sites could be encouraged by weed control followed by broadcast seeding of sand dropseed in fall or very early spring.

Transect Data Summary: Mean litter = 34%
Mean bare soil = 19.5%
Mean total vegetation = 46.5%
Mean total cover = 80.5%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/22/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson

Date 10/31/06

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 4; BT4-8,9,10,11 DATE 6/22/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001.	4 project sites totaling 0.2 acres surrounded by disturbed area that totaled about 3 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Native perennial grass seeding in this area generally failed. However, the site does contain a relatively dense shrub stand of fourwing saltbush (~21% of total cover). Interspaces are almost solely tall kochia (~62% of total cover). Diversity in this location is extremely low. However, the site is likely stabilized by the shrub establishment. Grass species surrounding the area could expand into the site over the long term. Kochia may be suppressed at this location through cool burning. Denise and Carl have a long term bet on the progress of this site.

This area should serve as a discussion point for a lessons learned meeting brainstorming reasons seeding might have failed at this site.

Transect Data Summary: Mean litter = 14%

Mean bare soil = 2%

Mean total vegetation = 84 %

Mean total cover = 98%

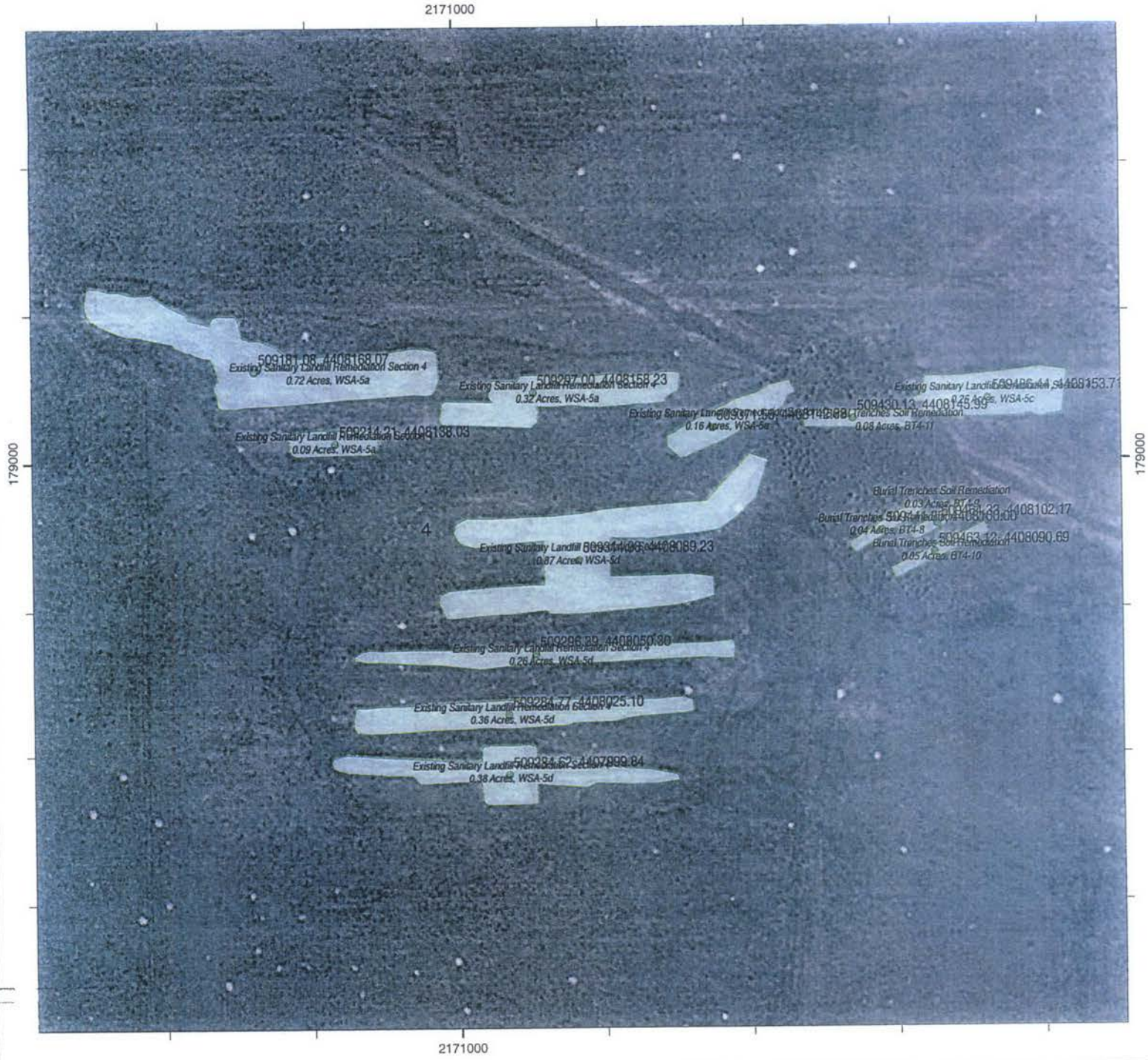
Inspection Team Members | Date

Carl Mackey, RVO team leader | 6/22/05

Denise Arthur, ESCO representing EPA

Reviewed by T. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Burial Trenches - All

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deulmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	
	DPRA

File Location:
C:\projects\rvpt_delis\mxds\boundary delineation cm 0605 rs4bd.mxd

E

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Miscelaneous Southern Tier Soils Remediation, Shooting Range Section 12 DATE 6/13/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2000.	0.5 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.		See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Diverse cool and warm season grasses established; few weeds with numerous desirable forbs. Native perennial grasses contributed 48 % of the total cover. Some Canada thistle and bindweed occurs and should be controlled before these noxious weeds spread.

Transect Data Summary: Mean litter = 19 %
Mean bare soil = 13.5 %
Mean total vegetation = 67.5 %
Mean total cover = 86.5 %

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6//05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] Date 10/31/06

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Misc. S. Tier Soils, Sec. 12, Fishermans Parking Lot
DATE 6/13/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2000	2.5 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Good cover by Western wheatgrass, but low diversity. High litter accumulation (47% cover by litter). Suitable for grazing. Continued litter build up will result in a decline in plant community productivity and may encourage greater spread of Canada thistle that currently occurs.

Transect Data Summary: Mean litter = 47%
Mean bare soil = 1%
Mean total vegetation = 52%
Mean total cover = 99%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/13/05

Denise Arthur, ESCO representing EPA — _____

Reviewed by W. Thomas Jordan — Date 10/31/06

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Misc. S. Tier Soils, Lake Sediment Disposal, Section 12
DATE 6/13/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanent seeding in 2000	~1 acre
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

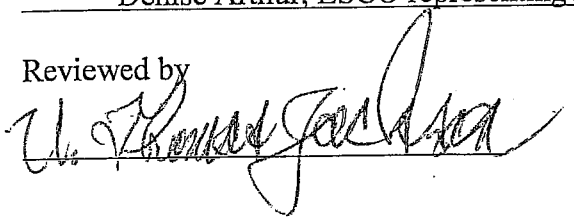
Comments: Although stable, the site remains weedy after 4 or 5 years of development. However, Western wheatgrass is filling in slowly and at least 5 other native perennial grass species occur at the site. Mowing of kochia and the numerous Scotch thistle plants at the site may aid site development and diversity.

Transect Data Summary: Mean litter = 29%
Mean bare soil = 3%
Mean total vegetation = 68%
Mean total cover = 97%

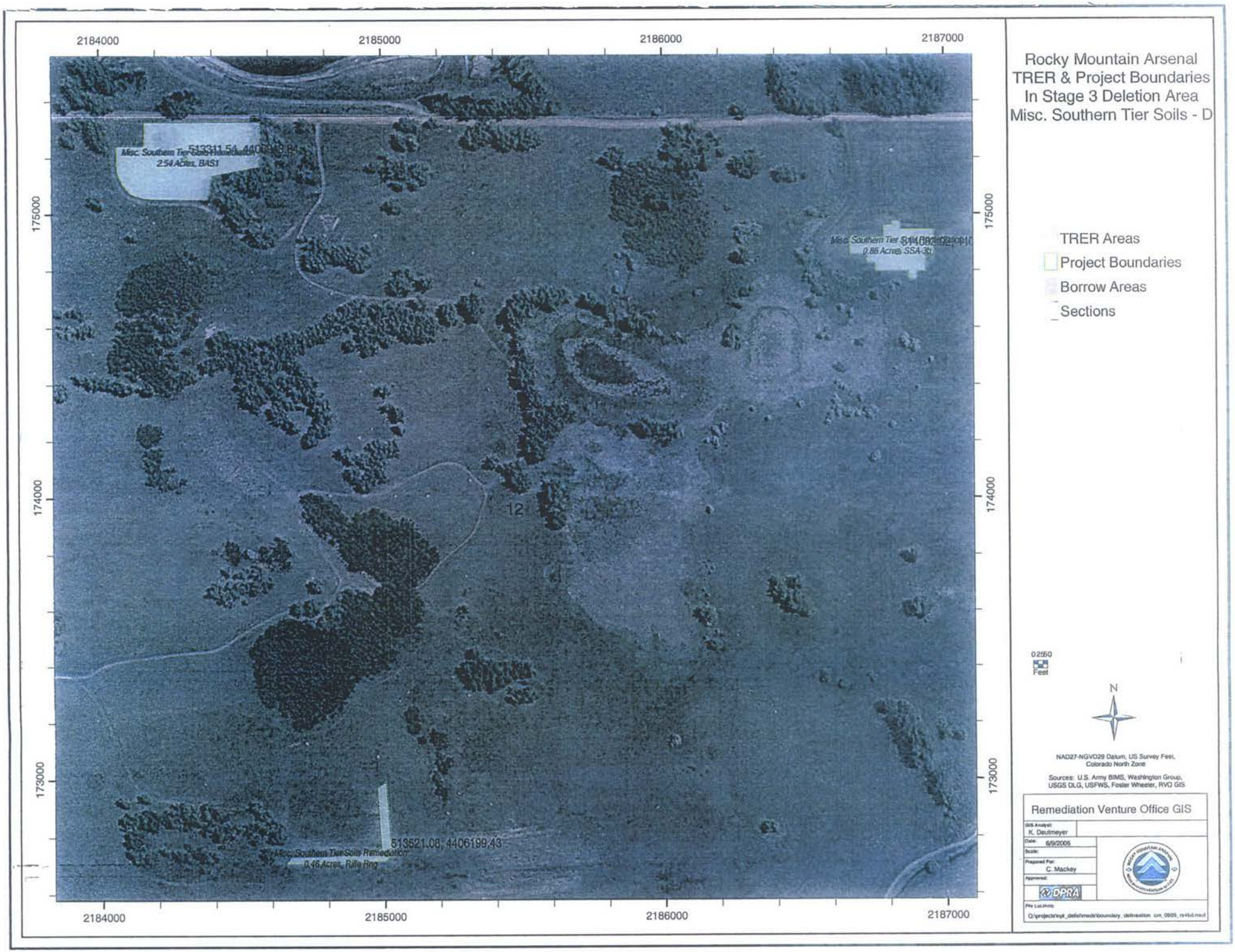
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/13/05

Denise Arthur, ESCO representing EPA

Reviewed by 

Date 10/31/06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2185000
2186000
2187000
175000
174000
173000
513311.54, 4406199.84
Misc. Southern Tier Soils Remediation
2.54 Acres, BAS1
Misc. Southern Tier Soils Remediation
0.86 Acres, SSA-3b
12
513521.08, 4406199.43
Misc. Southern Tier Soils Remediation
0.46 Acres, Rifle Rng
Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Misc. Southern Tier Soils - D
TRER Areas
Project Boundaries
Borrow Areas
Sections
0 2550
Feet
N
NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone
Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst:
K. Deutmeyer
Date:
6/9/2005
Scale:
Prepared For:
C. Mackey
Approved:
DPRA
File Location:
Q:\projects\rvpt_delist\mxds\boundary_delineation_cm_0605_rs4to5.mxd

Page 1
35AC

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Secondary Basins, Section 26 DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanent Seeded	See comments
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	4 Transects in overseeded area (75 acres)	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		Control of introduced perennial grasses may be desirable

Comments: The secondary basins project area was subdivided into 4 areas for evaluation. The area to the far west (~5 acres) was seeded to an interim cover of slender wheatgrass and is stable. However, this area should be incorporated into future seeding programs so that a diversity of prairie grasses can be established. A ~35 acre area to the east is dominated by weedy forbs, primarily kochia with considerable bare ground. This area was seeded and irrigated in 2004, but requires re-seeding. The bulk of the project area (~75 acres) is dominated by interim seeded species (i.e. slender wheatgrass and tall fesque). The fesque is an introduced grass that was likely a contaminant in the seed mix from the supplier. The last area is a small extention (2 acres) of the A-neck ground water treatment well field and has been seeded to crested wheatgrass.

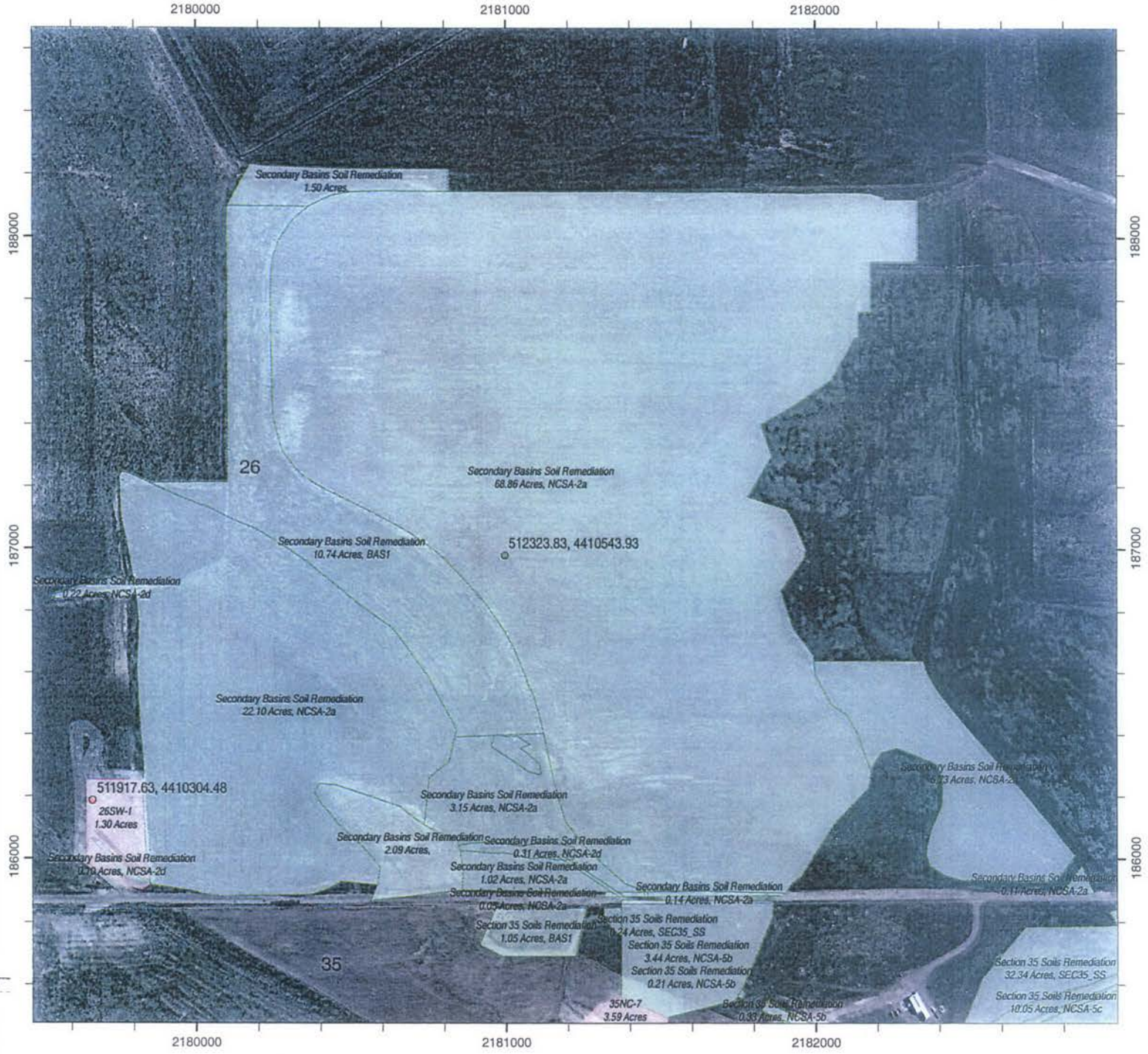
The areas outside of the section where seeding failed are stable, but provide relatively low quality habitat at this time because of low plant community diversity and preponderance of the introduced grass species tall fesque. The weedy area provides poor habitat and is subject to erosion because of the dominance by annual plant species.

Transect Data Summary: Mean Litter = 33%
Mean Bare soil = 17%
Mean total vegetation = 50%
Mean total cover = 83%

Inspection Team Members	Date
Carl Mackey, RVO	6/16/05
Denise Arthur (ESCO, representing EPA)	

Reviewed by W. Thomas Foster

Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area Secondary Basins Soil Remediation

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 250 100 150 200 250 300
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: C:\projects\rvgis_data\mxds\boundary_delineation_crm_0605_rs4bd.mxd

P

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Miscellaneous Northern Tier Soils Remediation, Section 24

DATE 6/13/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded	~12 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Very poor perennial grass establishment; area with a high percent cover by kochia and Russian thistle. Needs to be re-seeded after weed control.

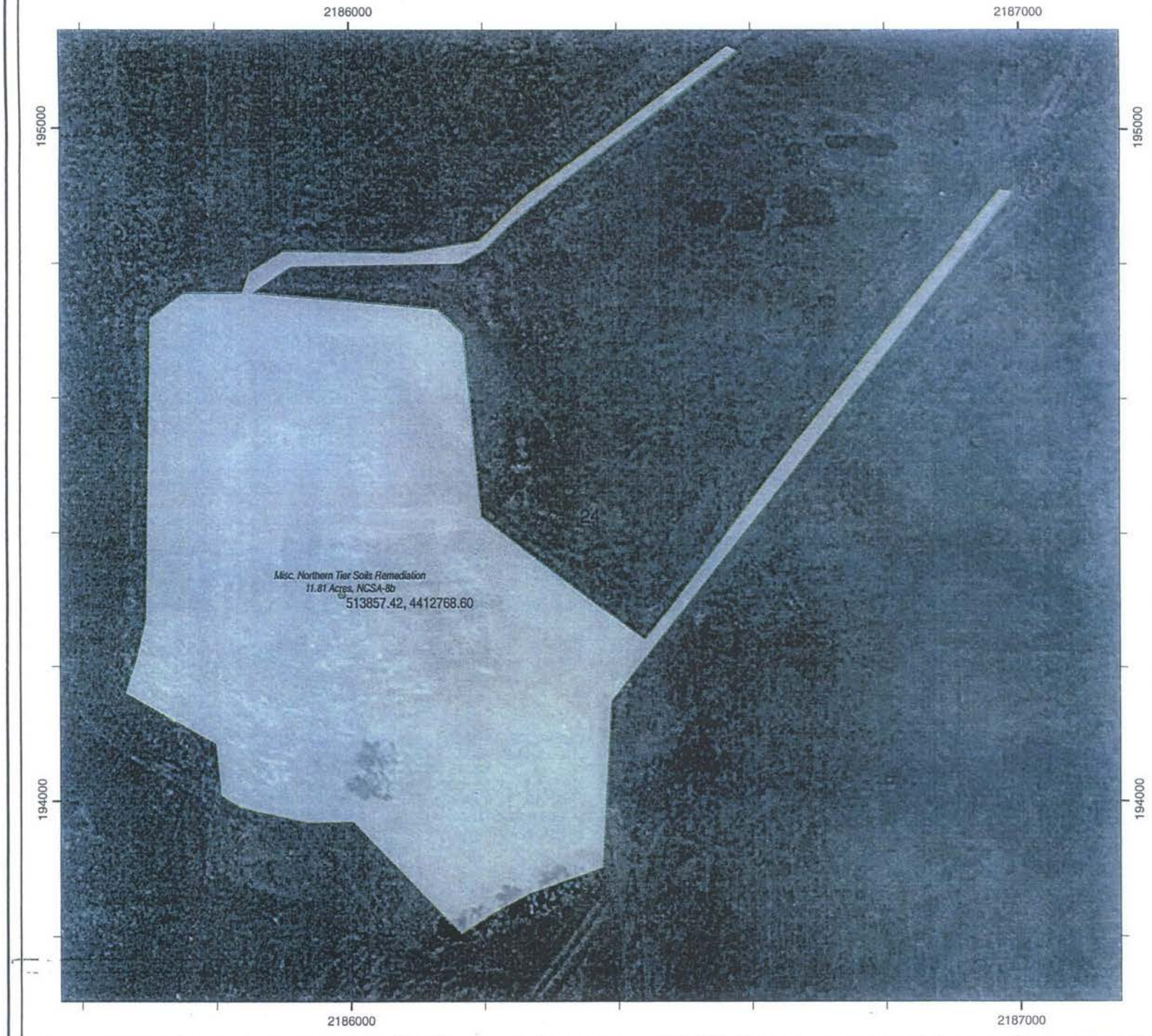
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/13/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area Misc. Northern Tier Soils - A

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25 50 100
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: O:\projects\rvo_data\vmads\boundary_delineation_cm_0505_rp49st.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 30 Existing Sanitary Landfill DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanent seeding in spring 2005; currently being irrigated	18 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; Qualitative assessment.	
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

Comments: Very good native seedling emergence with approximately 10 seedling per square foot.

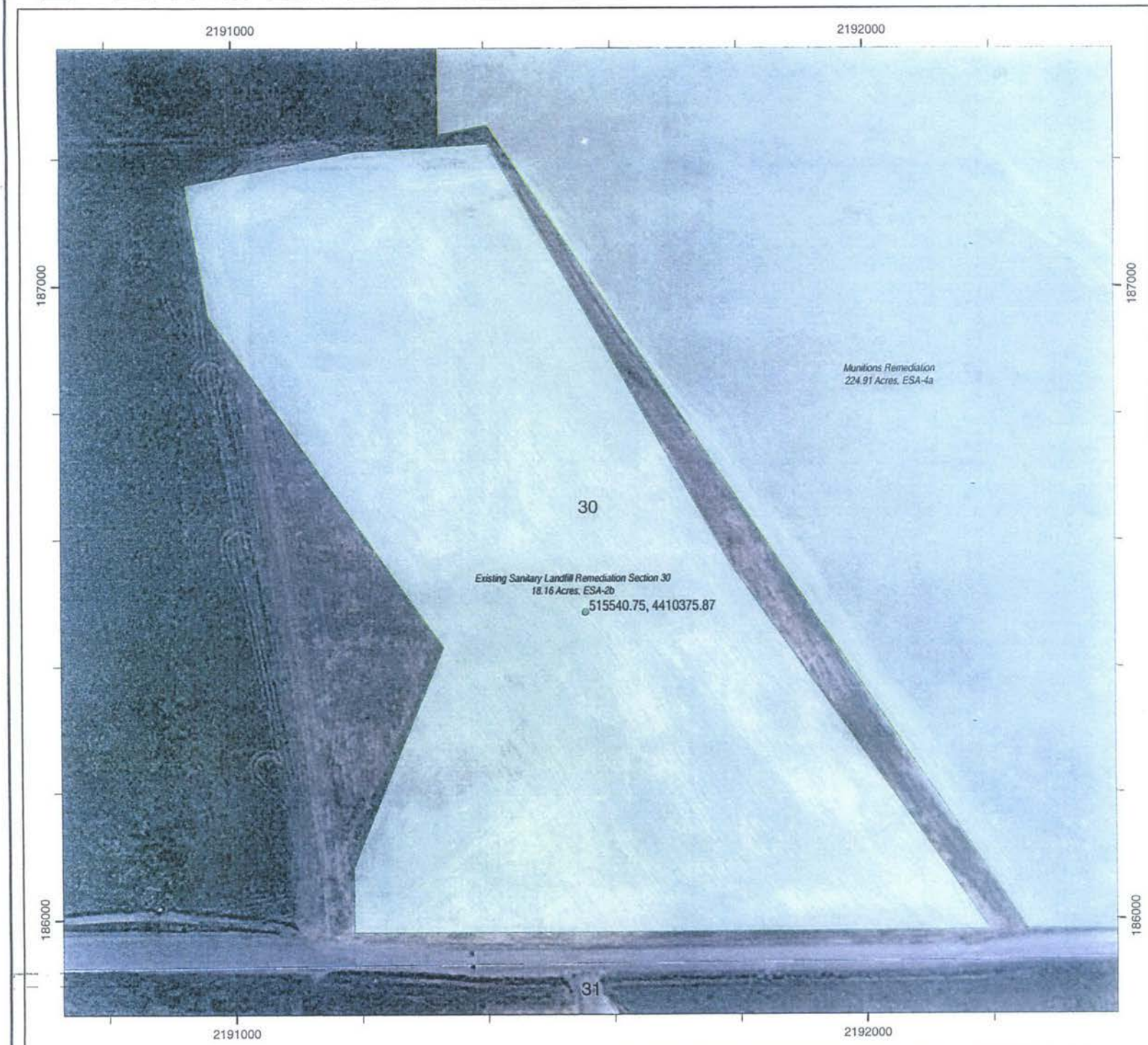
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/16/05

Denise Arthur, ESCO representing EPA — _____

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area Existing Sanitary Landfill 30

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25 50
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: Q:\projects\rvgi data\mxds\boundary delineation cm 0605 rv4to1.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Burial Trenches Section 30 DATE 6/23/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Interim seeded with slender wheatgrass	10 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

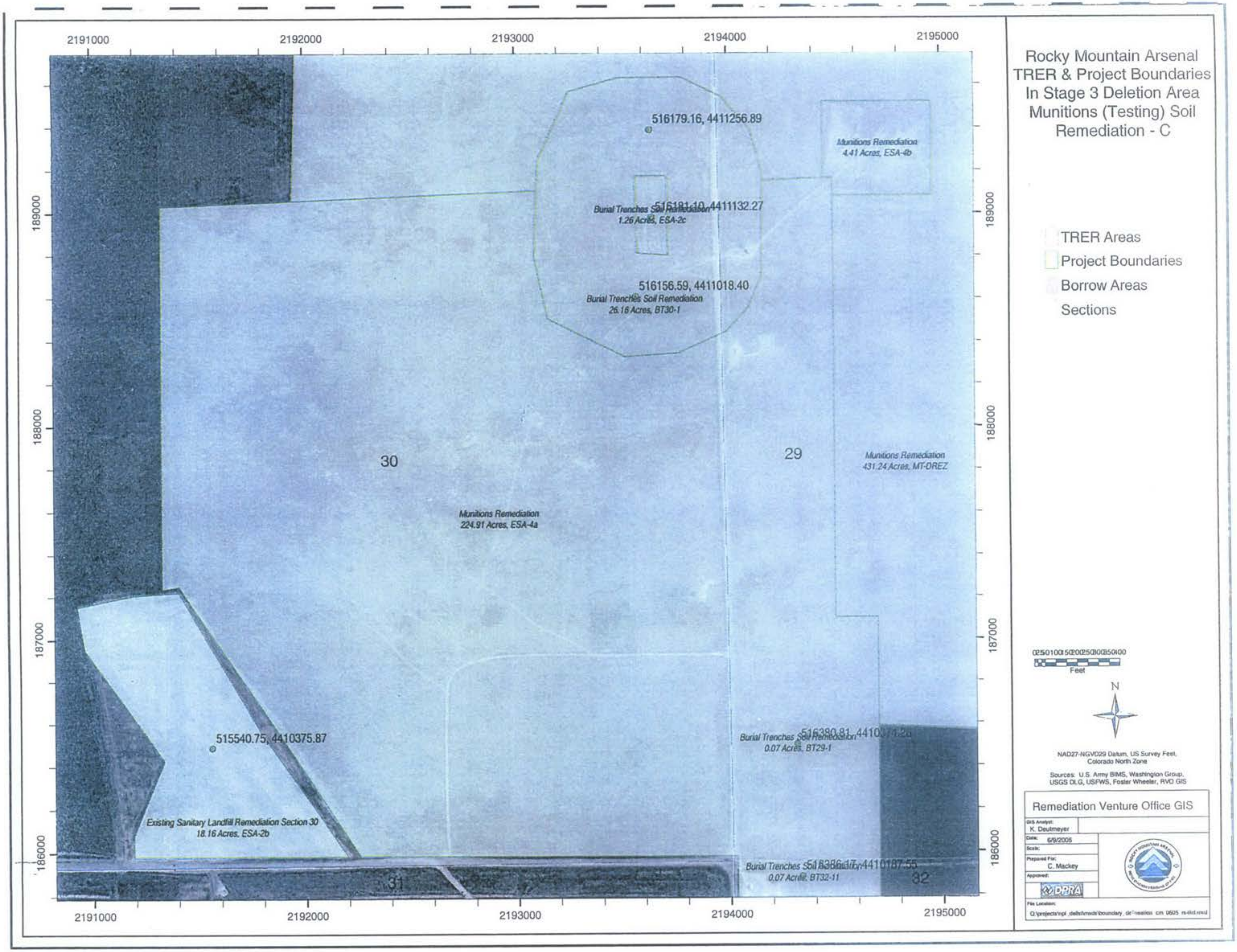
Comments: Vegetation cover about 85% weedy and 15% perennial grasses. Bare ground was relatively high (35%). Area will be incorporated into future seeding project.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/23/05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Munitions (Testing) Soil
Remediation - C
TRER Areas
Project Boundaries
Borrow Areas
Sections
Feet
N
NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone
Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location:
2191000
2192000
2193000
2194000
2195000
189000
188000
187000
186000
516179.16, 4411256.89
Munitions Remediation
4.41 Acres, ESA-4b
Burial Trenches Soil Remediation
1.26 Acres, ESA-2c
516181.10, 4411132.27
516156.59, 4411018.40
Burial Trenches Soil Remediation
26.16 Acres, BT30-1
30
29
Munitions Remediation
431.24 Acres, MT-DREZ
Munitions Remediation
224.91 Acres, ESA-4a
515540.75, 4410375.87
Burial Trenches Soil Remediation
0.07 Acres, BT29-1
Existing Sanitary Landfill Remediation Section 30
18.16 Acres, ESA-2b
Burial Trenches Soil Remediation
0.07 Acres, BT32-11
31
32

E

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Misc. Northern Tier Soils Remediation, Shooting Range, Section 19 DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2000	~1 acre
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Plant community is diverse with good establishment of both cool and warm season native grasses. Eight native perennial grasses contributed to cover data. Topsoil spreading likely positively effected this site. This site should continue to progress with little management, although grazing should be considered at a future date.

Transect Data Summary: Mean litter = 15.5%
Mean bare soil = 27%
Mean total vegetation = 57.5%
Mean total cover = 73%

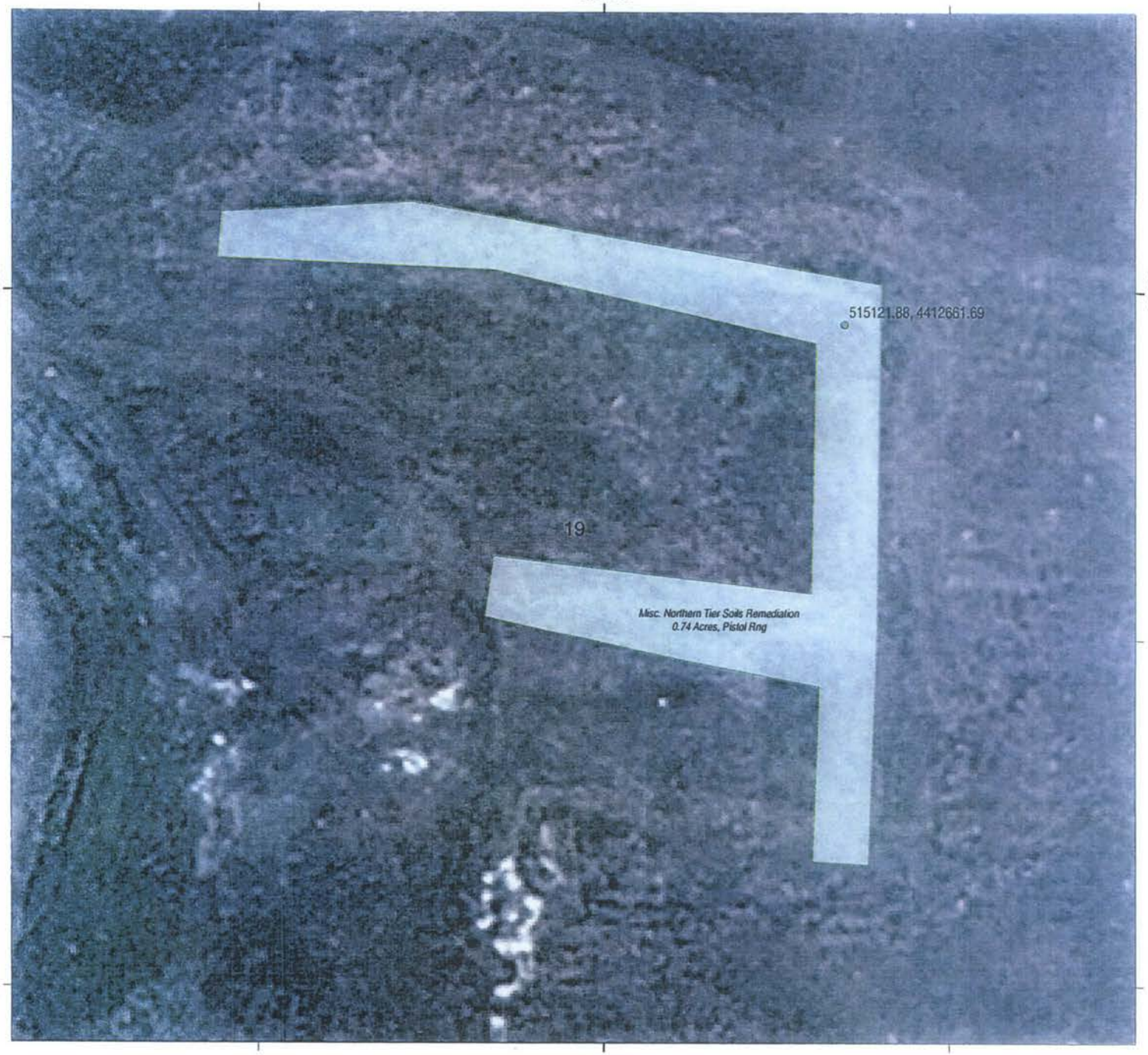
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Misc. Northern Tier Soils - B

TRER Areas

Project Boundaries

Borrow Areas

Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:
K. Deulmeyer

Date: 6/9/2005

Scale:

Prepared For:
C. Mackey

Approved:

DPRA

File Location:
Q:\projects\rvgis_data\rvmxd\boundary_deliveration_cm_0605_rs-tkd.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Munition Remediation sites in Sections 19, 20, 29, 30 DATE 6/15/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001	4 sites of about 2.5 acres each. ~11 acres total.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; qualitative assessment	See coments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Good establishment of Western wheatgrass, but with few other species established i.e. low diversity. High litter accumulation. Site would benefit from grazing (or burning.)

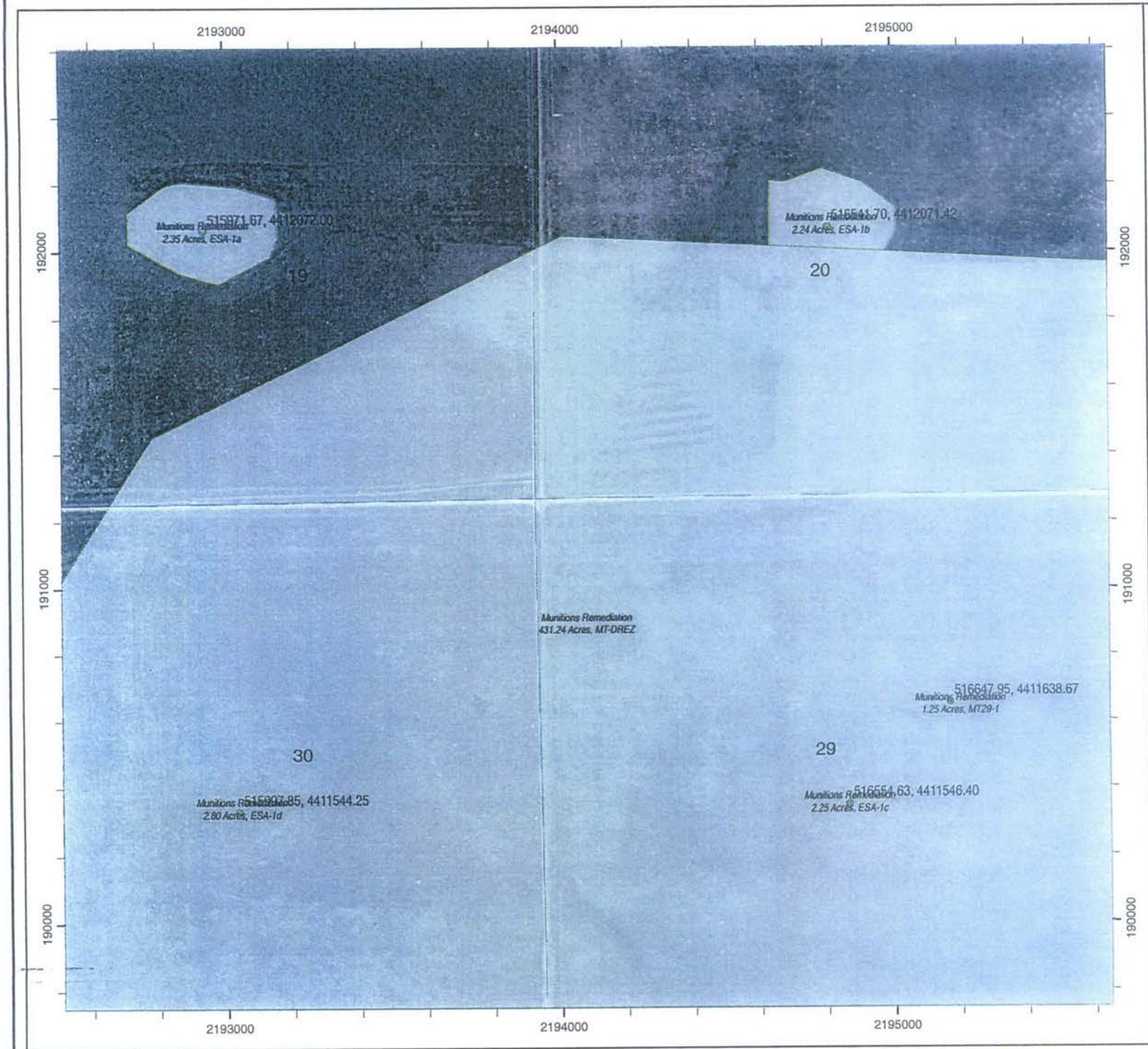
Inspection Team Members — Date

Carl Mackey, RVO team leader _____

Denise Arthur, ESCO representing EPA _____

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area Munitions (Testing) Soil Remediation - B

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 2550 100 150 200 250 300
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deulmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	
File Location:	O:\projects\vpl_defs\mxds\boundary delineation cm 0605 rs4kd.mxd

Added G

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Munitions Remediation sites in Sections 25
DATE 6/28/05

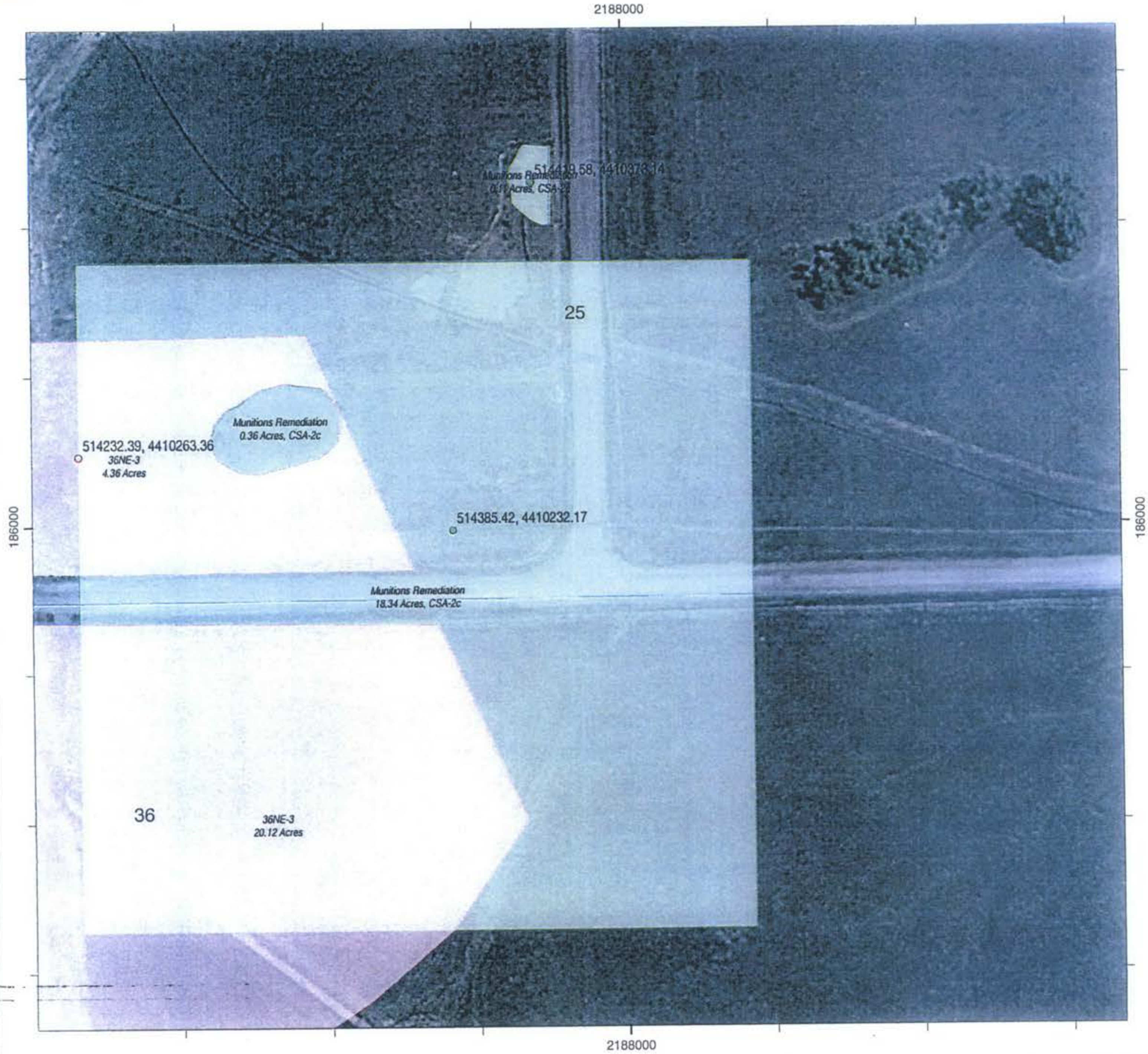
Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Interim seeded	Entire area is approximately 19 acres. A small portion ~.5 acres has been interim seeded.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; qualitative assessment	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Entire area is approximately 19 acres. A small portion ~.5 acres has been interim seeded. And has good cover by slender wheatgrass. The rest of the area has either not been disturbed (on the east side of the road) or is awaiting further remediation due to asbestos.

Inspection Team Members	Date
Carl Mackey, RVO team leader	6/28/05
Denise Arthur, ESCO representing EPA	6/28/05

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area Munitions (Testing) Soil Remediation - A

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25 50 100 150
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deulmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location:
Q:\projects\ngt_dells\mads\boundary_delineation_cm_0605 rs4kd.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Burial Trenches Soil Remediation, Section 20, Red Soil Area
DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2004	11 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Area continues to be dominated by kochia in the second growing season, however 4 native perennial grass species are represented in the cover data. Of the perennial grasses, Western wheatgrass provides the most cover at this time. Kochia and the other weedy forbs should be mowed prior to seed production to limit competition for establishing grasses.

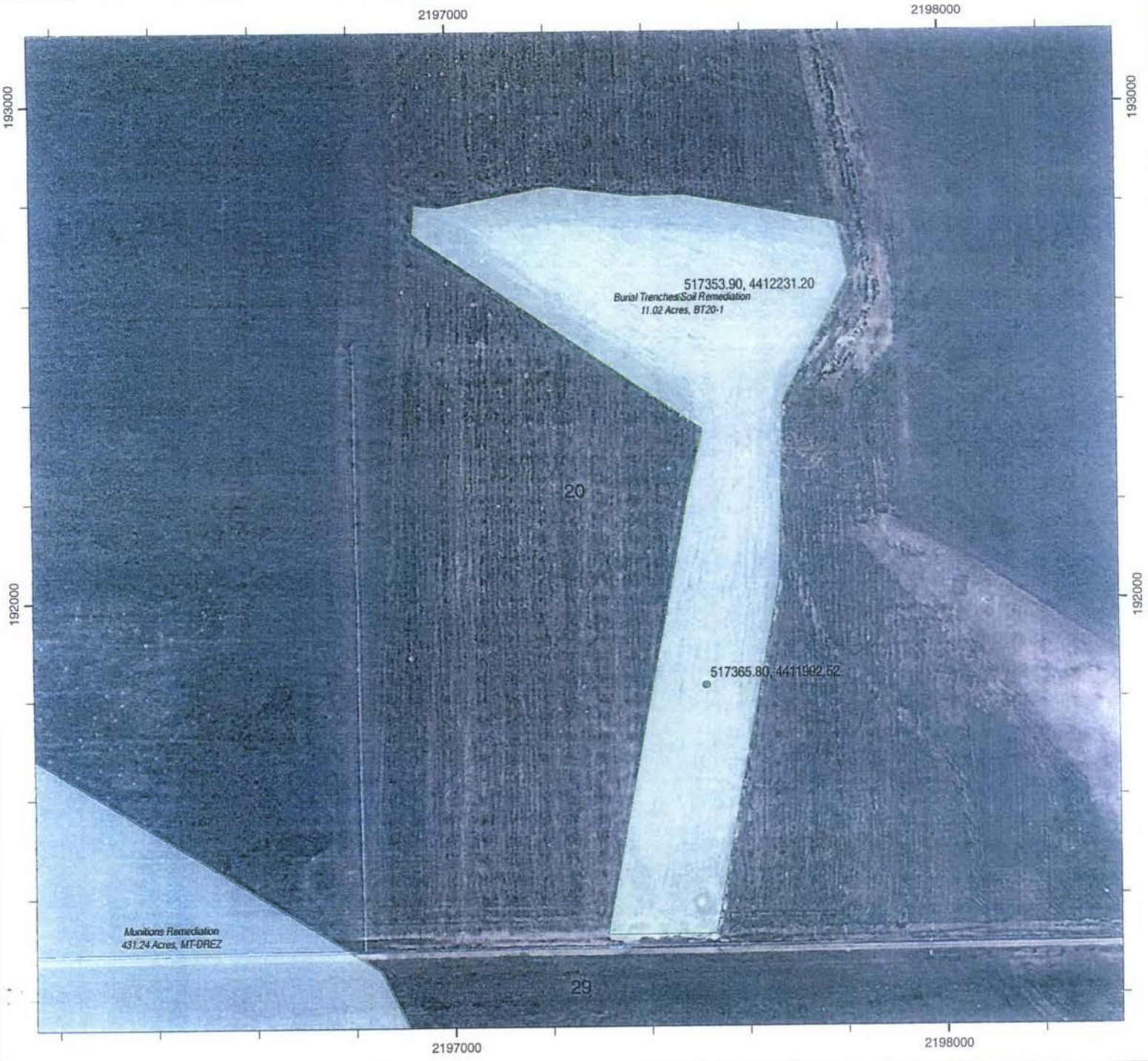
Transect Data Summary:
Mean litter = 6%
Mean bare soil = 4%
Mean total vegetation = 90%
Mean total cover = 96%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jankord — Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area Burial Trenches Soil Remediation - E

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25 50
Feet

N

NAD27-NGVD29 Datum, US Survey Feet.
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deulmeyer	
Date: 6/9/2005	
Scale:	
Prepared For: C. Mackey	
Approved:	
DPRA	

File Location:
Q:\projects\rvo_delis\mxds\boundary_delineation_cm_0505_rs4ku1.mxd

P

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 29 and 32; BT29-1,-2; BT32-11 DATE 6/28/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Interim seeded in about 2000	Each site was about 0.1 acre.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: These sites have improved from last growing season in that there is live weedy plant cover this year versus standing dead plant litter and bare soil last year. There is still no evidence of establishment of seeded species however. These sites will be reseeded during seeding of surrounding areas in future years.

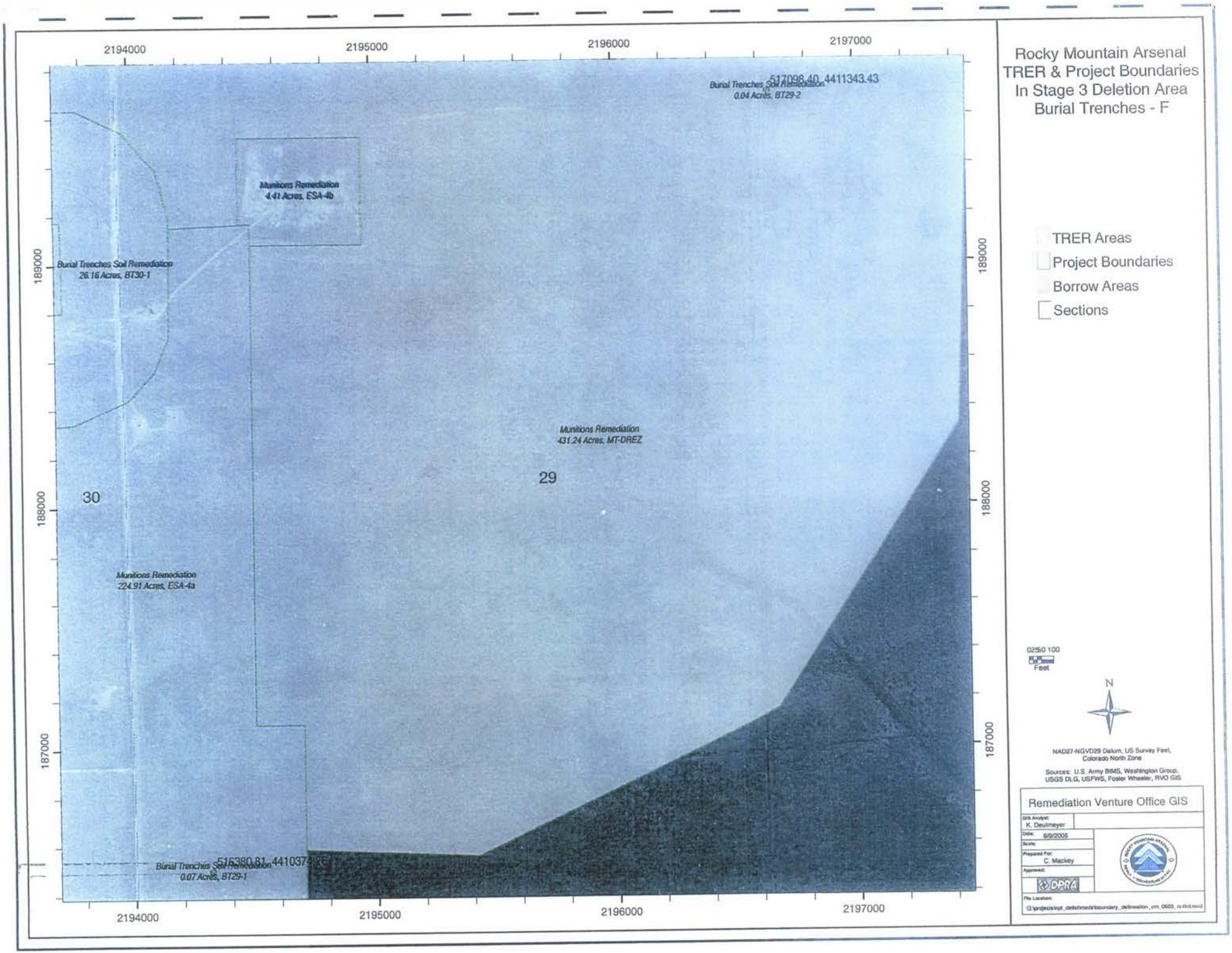
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/28/05

Denise Arthur, ESCO representing EPA

Reviewed by U. Thomas Jacobs

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Burial Trenches - F

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 250 500
Feet

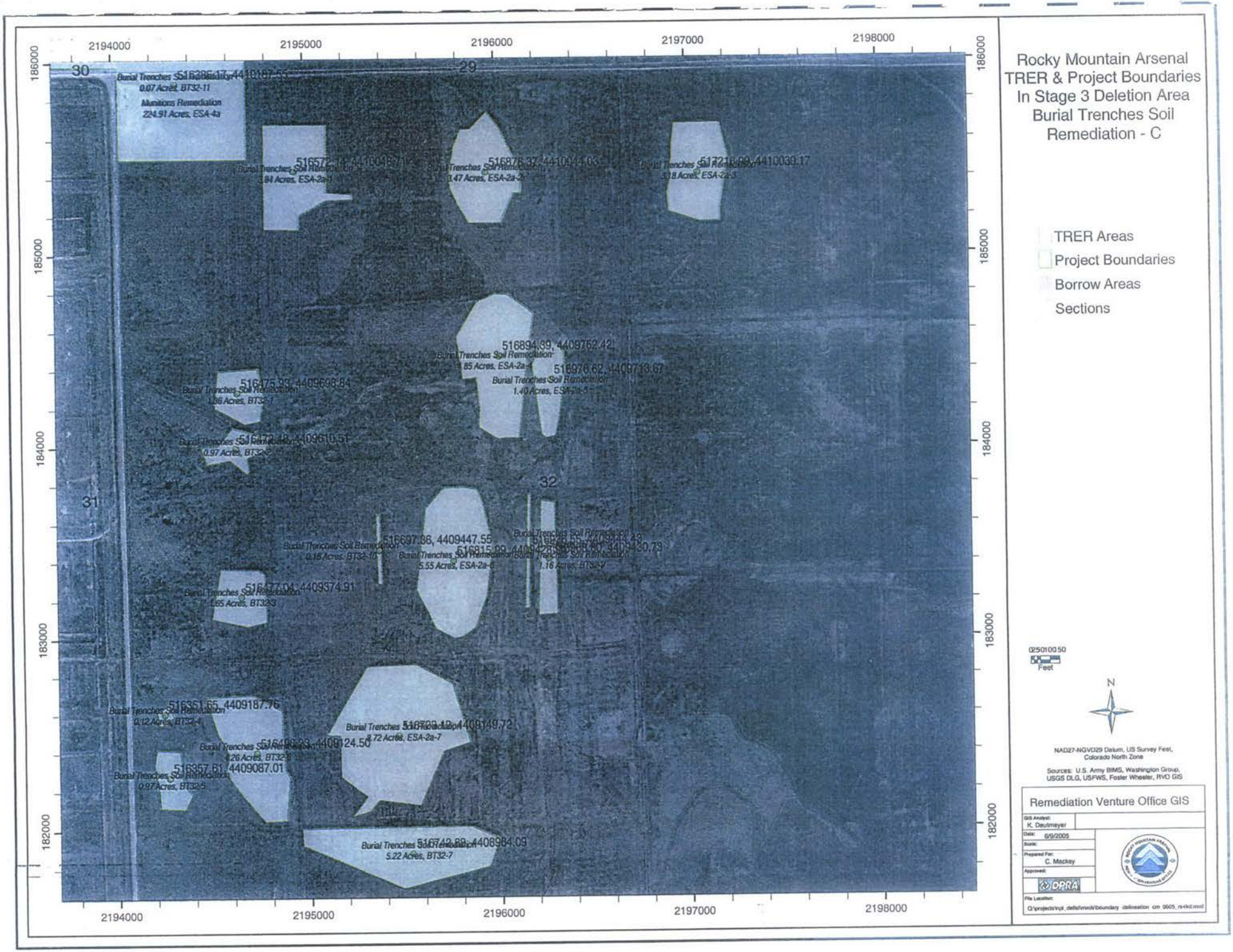
N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deulmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	DPRA
File Location:	Q:\projects\rpt_defs\mxds\boundary_delineation_cm_0605_rs-tb1.mxd


Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Burial Trenches Soil
Remediation - C
TRER Areas
Project Boundaries
Borrow Areas
Sections
2194000
2195000
2196000
2197000
2198000
186000
185000
184000
183000
182000
30
29
31
32
Munitions Remediation
224.91 Acres, ESA-4a
Burial Trenches Soil Remediation
0.07 Acres, BT32-11
Burial Trenches Soil Remediation
3.84 Acres, ESA-2a-1
Burial Trenches Soil Remediation
3.47 Acres, ESA-2a-2
Burial Trenches Soil Remediation
3.18 Acres, ESA-2a-3
516894.39, 4409752.42
Burial Trenches Soil Remediation
.85 Acres, ESA-2a-4
516976.62, 4409713.67
Burial Trenches Soil Remediation
1.40 Acres, ESA-2a-5
516475.39, 4409698.84
Burial Trenches Soil Remediation
1.56 Acres, BT32-1
Burial Trenches Soil Remediation
0.97 Acres, BT32-2
516697.86, 4409447.55
Burial Trenches Soil Remediation
0.16 Acres, BT32-10
Burial Trenches Soil Remediation
5.55 Acres, ESA-2a-6
Burial Trenches Soil Remediation
1.16 Acres, BT32-9
516477.04, 4409374.91
Burial Trenches Soil Remediation
1.65 Acres, BT32-3
516351.65, 4409187.76
Burial Trenches Soil Remediation
0.12 Acres, BT32-4
Burial Trenches Soil Remediation
8.72 Acres, ESA-2a-7
516410.23, 4409124.50
Burial Trenches Soil Remediation
1.26 Acres, BT32-8
516357.61, 4409087.01
Burial Trenches Soil Remediation
0.97 Acres, BT32-5
Burial Trenches Soil Remediation
5.22 Acres, BT32-7
025010050
Feet
N
NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone
Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location:
Q:\projects\rvo_dells\mxds\boundary delineation cm 0605_rs-ekd.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Burial Trenches Section 32 ESA 2A-1 through -3
DATE 6/20/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001	ESA 2A-1 = 4 acres ESA 2A-2 = 3.5 acres ESA 2A-3 = 3 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects conducted in site ESA 2A-2; qualitative assessment at the other 2 sites.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: The condition of these sites ranges from poor to good. Western wheatgrass is the dominant perennial grass at all sites and ranges from 23% relative cover in ESA 2A-1 to 58% relative cover in site ESA 2A-3. Diversity at all sites was low. Cheatgrass is providing significant competition to community development at all sites. As with other cheatgrass effected sites, this area could benefit from cheatgrass control, grazing and possibly some type of seeding to improve diversity.

Transect Data Summary:
Mean litter = 19.5%
Mean bare soil = 3%
Mean total vegetation = 77.5%
Mean total cover = 97%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/20/05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] — Date 10/31/06

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 32 ESA 2a-4,5,6 DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001	ESA 2a-4 = 4.85 ESA 2a-5 = 1.4 ESA 2a-6 = 5.55
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: These three sites can be characterized as Western wheatgrass/cheatgrass plant communities. Establishment of Western wheatgrass ranged from fair establishment, (i.e. of the total vegetation cover, approximately 50% was Western wheatgrass in ESA 2a-4 and 6) to good establishment in ESA 2a-5 where Western wheatgrass made up 90% of the cover by live vegetation. These sites could be improved by controlling cheatgrass.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/16/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson — Date 10/31/06

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Burial Trenches Soil Remediation, BT 32-1,2,3
DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001	Section 32, BT 32-1 = 1.5 acres BT 32-2 = 1 acre BT 32-3 = 2 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects conducted in BT 32-3; a qualitative assessment was conducted at the other two sites	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: These sites are excessively weedy and dominated by cheatgrass (82% of the cover by vegetation). Perennial native grass cover was only 7.5%. This site could benefit from control of cheatgrass followed by inter-seeding or potentially broadcast seeding of sand dropseed. Sand dropseed seedlings appear to compete favorably in cheatgrass dominated areas under good summer soil moisture conditions.

Transect Data Summary: Mean litter = 50%
Mean bare soil = 13%
Mean total vegetation = 37%
Mean total cover = 87%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/16/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Kent Jackson

Date 10/31/06

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 32, BT 32-9,-10 DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001	BT 32-9 =1.2 acres BT 32-10= 0.2 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Very poor establishment of seeded species with vegetation cover 98% cheatgrass and other weedy species. Sites could benefit from control of weedy vegetation.

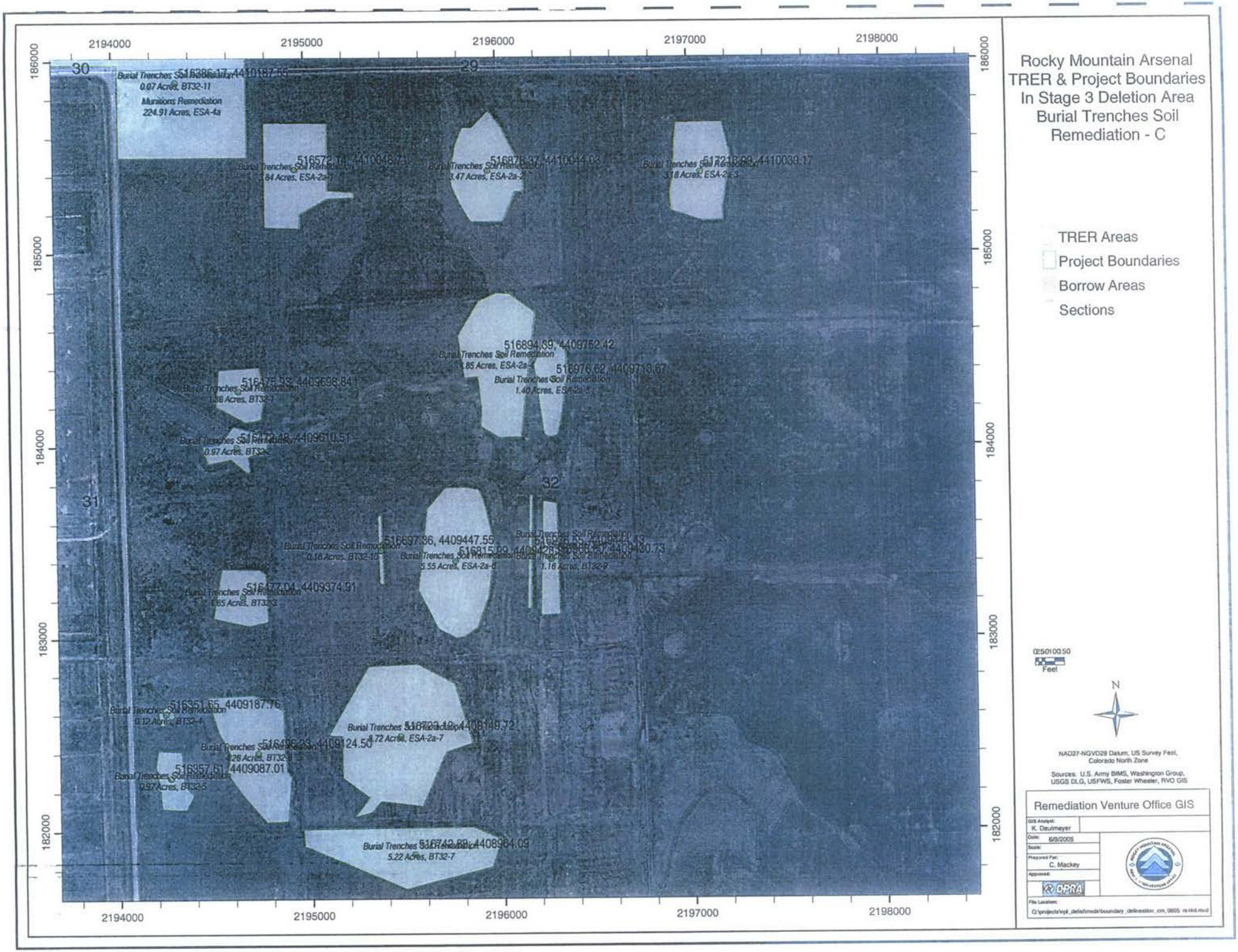
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/16/05

Denise Arthur, ESCO representing EPA

Reviewed by U. Thomas Jacobsen

Date 10/31/06


Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Burial Trenches Soil
Remediation - C
TRER Areas
Project Boundaries
Borrow Areas
Sections
2194000
2195000
2196000
2197000
2198000
186000
185000
184000
183000
182000
29
30
31
32
Burial Trenches Soil Remediation
0.07 Acres, BT32-11
Munitions Remediation
224.91 Acres, ESA-4a
516572.10, 4410048.71
3.84 Acres, ESA-2a-1
516875.37, 4410044.03
3.47 Acres, ESA-2a-2
517218.89, 4410039.17
3.18 Acres, ESA-2a-3
516894.89, 4409752.42
3.85 Acres, ESA-2a-4
516976.62, 4409719.67
1.40 Acres, ESA-2a-5
516475.58, 4409698.84
1.36 Acres, BT32-1
516479.48, 4409610.51
0.97 Acres, BT32-2
516697.86, 4409447.55
0.16 Acres, BT32-10
516815.89, 4409428.55
5.55 Acres, ESA-2a-6
1.16 Acres, BT32-7
516477.04, 4409374.91
1.65 Acres, BT32-3
516351.65, 4409187.76
0.12 Acres, BT32-4
516496.23, 4409124.50
4.26 Acres, BT32-8
516357.61, 4409087.01
0.97 Acres, BT32-5
516703.19, 4408149.72
8.72 Acres, ESA-2a-7
5.22 Acres, BT32-7
0 250 100 50
Feet
N
NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone
Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst: K. Deulmeyer
Date: 6/9/2005
Prepared For: C. Mackey
Approved:
DPRA
File Location:
Q:\projects\rvo_delis\mxds\boundary_delineation_cm_0605_rs-rkd.mxd

F

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Existing Sanitary Landfill Section 36 DATE 6/15/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Interim plus wheat	18.5 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	4 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Slender wheatgrass established as an interim seeded species, although not performing as well as in an adjacent area (6.5% vs. ~25% cover). Wheat seeded as a "nurse crop" has persisted as volunteer and is providing competition for the native grass. The wheat should be controlled. The site is relatively stable, but should be incorporated into future seeding projects to improve diversity and stability.

Transect Data Summary: Mean Litter = 33.5%
Mean Bare soil = 32.75%
Mean total vegetation = 33.75%
Mean total cover = 67.25%

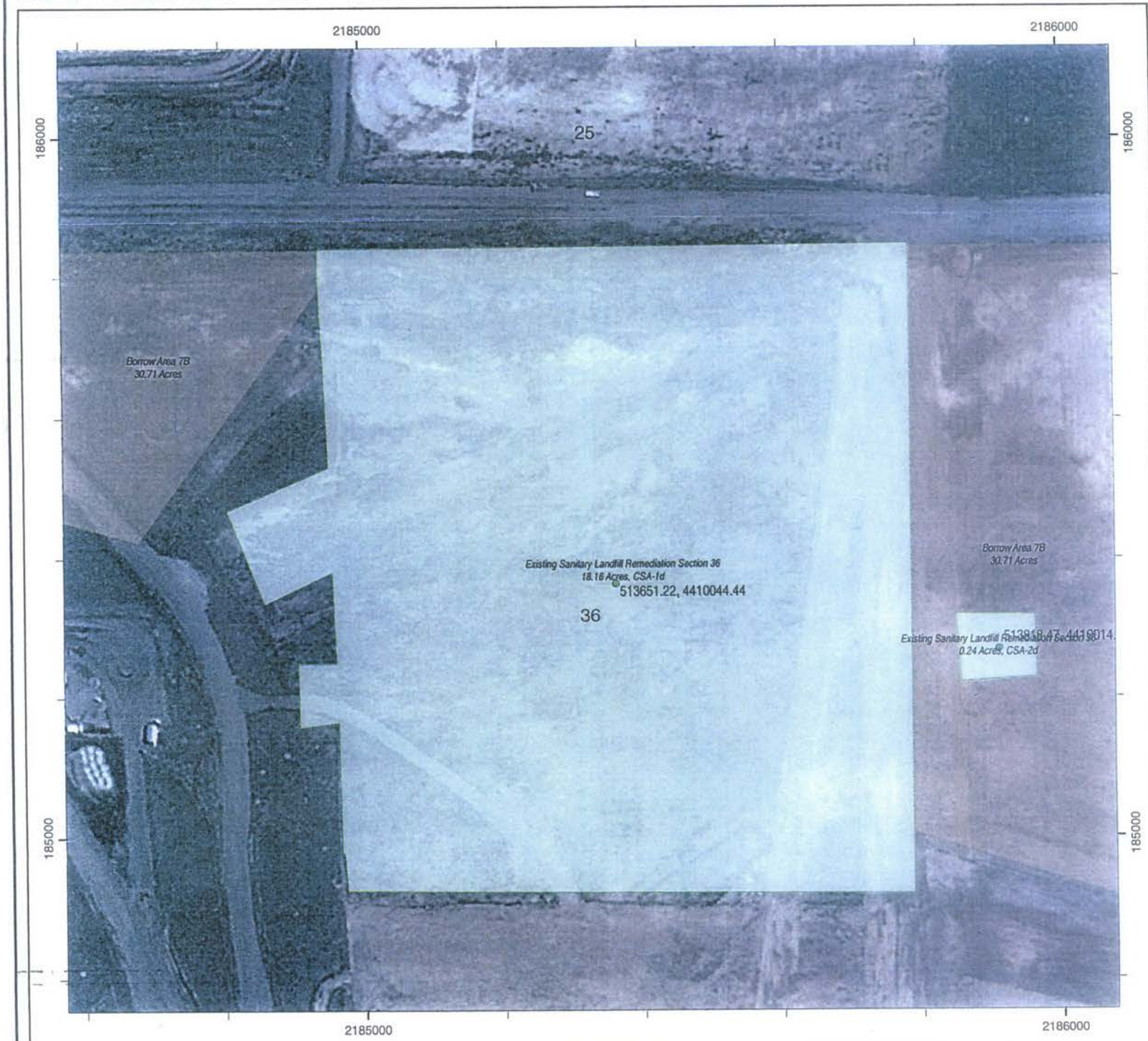
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/15/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jankowski

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Existing Sanitary Landfill 36

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer	
Date: 6/9/2005	
Scale:	
Prepared For: C. Mackey	
Approved:	
DPRA	

File Location:
Q:\projects\rvpt_delist\mxds\boundary_delineation_cm_0605_rr4ad.mxd

E

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Borrow Area 1 DATE 6/13/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded	54 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	4 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: This site is an excellent example of successful revegetation at Rocky Mountain Arsenal. Establishment by seeded species is high and diversity provided by volunteer from native forb and grass propagules in the re-spread topsoil provides near climax plant community conditions. An introduced warm season grass (*Chloris sp.*) also occurs at this site and should be monitored for invasive spread. Currently it contributes approximately 2-15% relative cover.

Transect Data Summary: Mean litter = 21.5%
Mean bare soil = 20.5%
Mean total vegetation = 58%
Mean total cover = 81.5%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/13/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jolley — Date 10/31/06

Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Borrow Area 1

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 250
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: Q:\projects\rvo\ delish\mxds\boundary_delineation_cm 0505_rs4kd.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 35 Soils Remediation; Borrow Area 3 BA 3 Fair Good
DATE 6/27/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Cover crop with a portion of interim seeding.	Sec. 35 soils remediation northern portion about 34 acres; portion along D street is ~5 acres; BA 3 ~140 acres; Sand Creek Lateral excavation.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

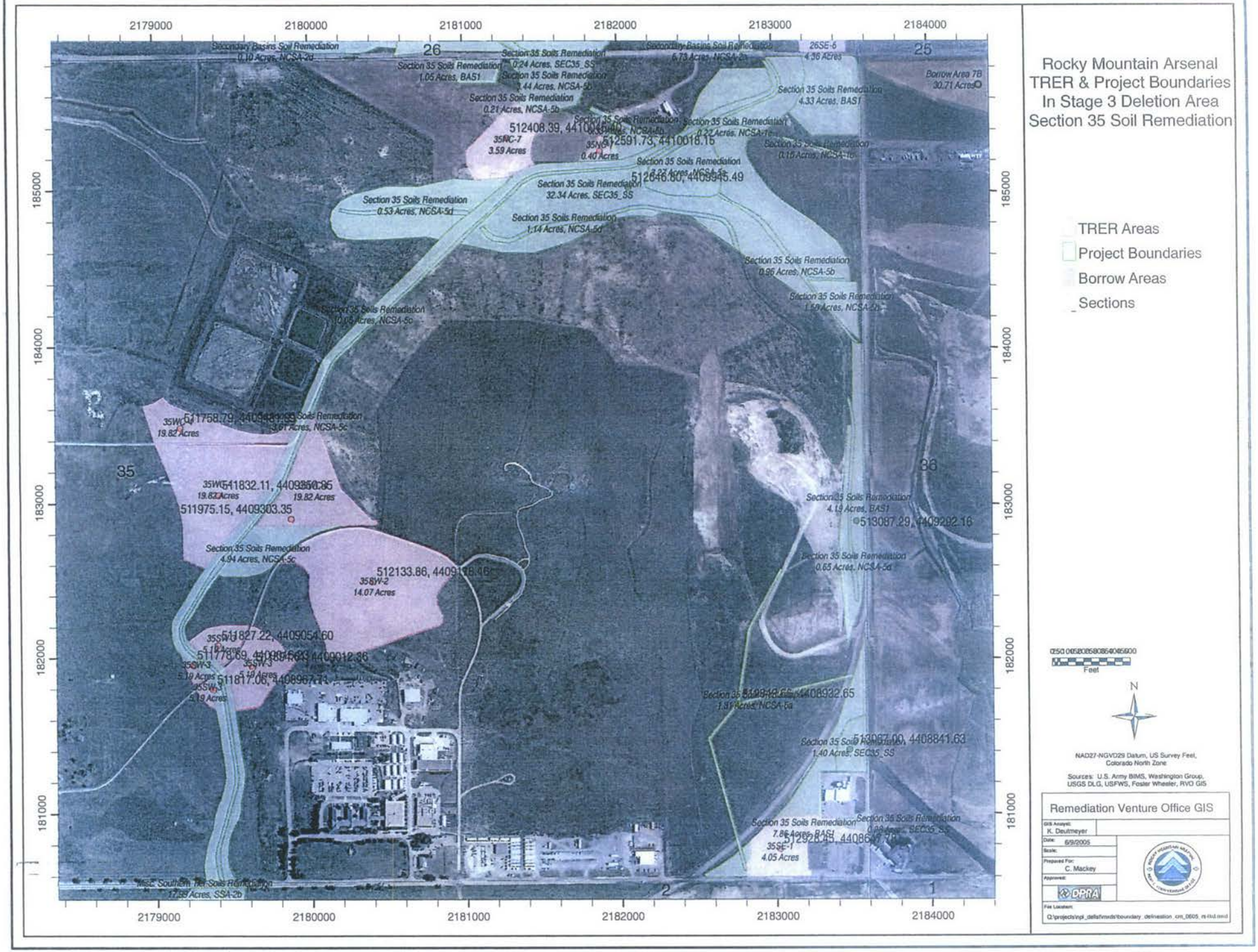
Comments: Barley cover crop with generally good emergence and growth. May be some areas of sparse production. Portion of Section 35 soils remediation project along D street with poor interim species establishment and weedy cover. All of these areas will be permanently seeded during a future project.
Sand Creek Lateral has diverse perennial grass establishment.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/27/05

Denise Arthur, ESCO representing EPA

Reviewed by U. Thomas Jacobsen — Date 10/31/06


2179000
2180000
2181000
2182000
2183000
2184000
185000
184000
183000
182000
181000
Secondary Basins Soil Remediation
0.10 Acres, NCSA-2d
Section 35 Soils Remediation
1.05 Acres, BA51
Section 35 Soils Remediation
0.24 Acres, SEC35_SS
Section 35 Soils Remediation
2.44 Acres, NCSA-5b
Section 35 Soils Remediation
0.21 Acres, NCSA-5b
Secondary Basins Soil Remediation
5.73 Acres, NCSA-2a
26SE-6
4.36 Acres
Borrow Area 7B
30.71 Acres
Section 35 Soils Remediation
4.33 Acres, BA51
512408.39, 4410044.10
35NC-7
3.59 Acres
512591.73, 4410018.15
35NC-6
0.40 Acres
Section 35 Soils Remediation
0.22 Acres, NCSA-1e
Section 35 Soils Remediation
0.16 Acres, NCSA-1e
Section 35 Soils Remediation
512646.80, 4409945.49
Section 35 Soils Remediation
32.34 Acres, SEC35_SS
Section 35 Soils Remediation
0.53 Acres, NCSA-5d
Section 35 Soils Remediation
1.14 Acres, NCSA-5d
Section 35 Soils Remediation
0.96 Acres, NCSA-5b
Section 35 Soils Remediation
1.59 Acres, NCSA-2b
Section 35 Soils Remediation
10.08 Acres, NCSA-5c
511758.79, 4409480.99
35WC-1
19.82 Acres
Section 35 Soils Remediation
3.67 Acres, NCSA-5c
35
36
511832.11, 4409350.35
35WC-2
19.82 Acres
19.82 Acres
511975.15, 4409303.35
Section 35 Soils Remediation
4.19 Acres, BA51
513087.29, 4409292.16
Section 35 Soils Remediation
0.65 Acres, NCSA-5d
Section 35 Soils Remediation
4.94 Acres, NCSA-5c
512133.86, 4409176.46
35SW-2
14.07 Acres
511827.22, 4409054.60
35SW-3
5.19 Acres
511778.69, 4409012.36
35SW-3
5.19 Acres
511817.06, 4408967.11
35SW-3
5.19 Acres
Section 35 Soils Remediation
1.91 Acres, NCSA-5a
513097.00, 4408841.63
Section 35 Soils Remediation
1.40 Acres, SEC35_SS
Section 35 Soils Remediation
7.86 Acres, BA51
512928.45, 4408647.70
35SE-1
4.05 Acres
Misc. Southern Tier Soils Remediation
17.88 Acres, SSA-2b
2
1
Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Section 35 Soil Remediation
TRER Areas
Project Boundaries
Borrow Areas
Sections
0 250 500 1,000 1,500 2,000
Feet
N
NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone
Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst:
K. Deutmeyer
Date:
6/9/2005
Scale:
Prepared For:
C. Mackey
Approved:
DPRA
File Location:
Q:\projects\rvpl_dellal\mxds\boundary_delineation_crm_0605_rtl-tlv2.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Borrow Area 5 (east) DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2002.	Section 24; ~28 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	3 Transects.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Seeded grasses are well established at this site with Western wheatgrass common and a diversity of warm season grasses. Weedy areas are scattered around the site. Native perennial grasses compose about 63% of the vegetation and 37% was composed of weedy species. Kochia and bindweed are the dominant weedy species and could be spot treated in order to protect desirable forb species.

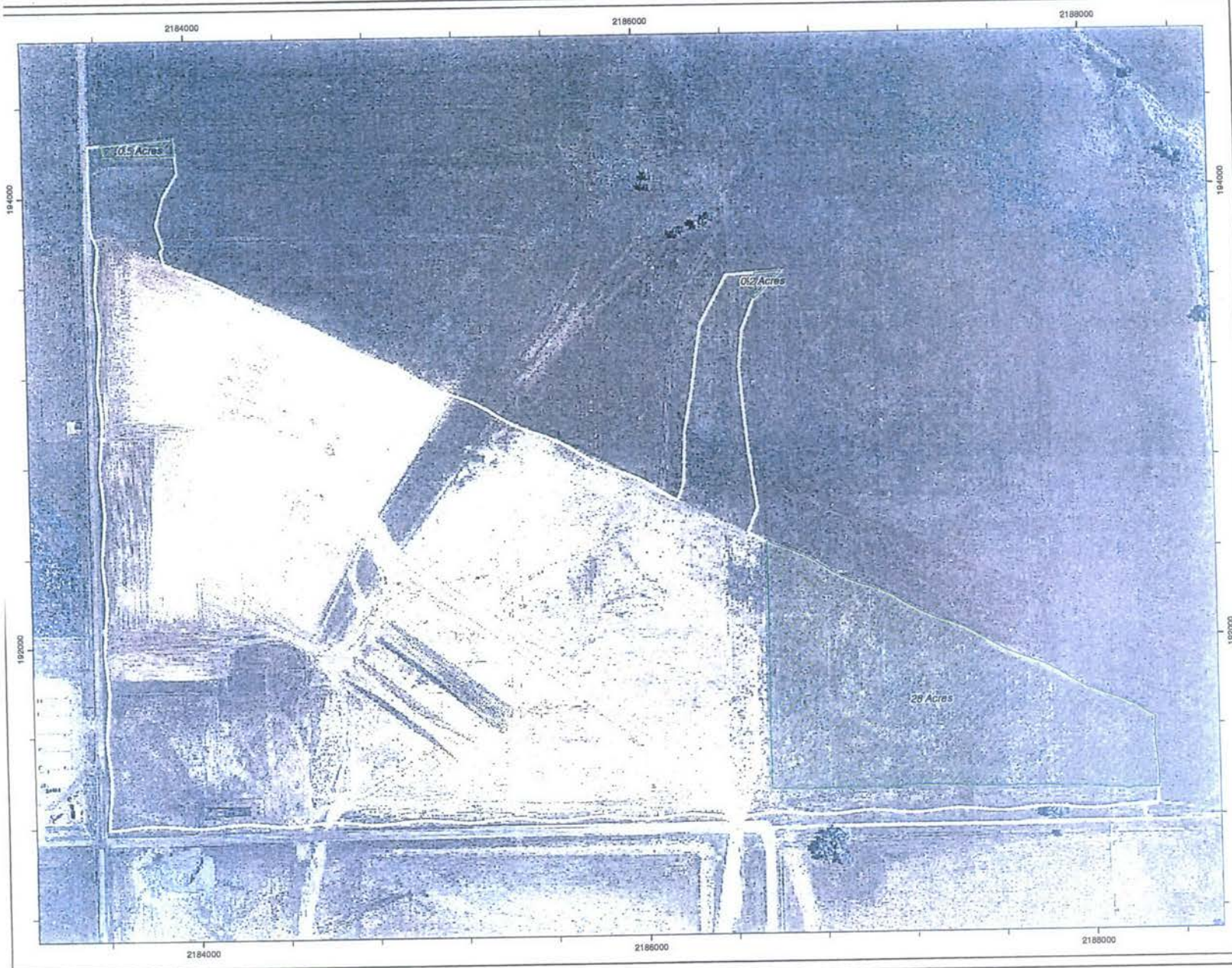
Transect Data Summary:
Mean litter = 37%
Mean bare soil = 10.33%
Mean total vegetation = 52.67%
Mean total cover = 89.67%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] Date 10/31/06



Rocky Mountain Arsenal
Borrow Area 5
Seeded Areas

Legend

Borrow Area 5

Seeded Areas

N

Scale 1:5000

0 125 250 500 750 1,000
Feet

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutsmeyer	
Date: 6/29/2005	
Scale:	
Prepared For: C. Mackey	
Approved:	
RVO/DPRA	
File Location: P:\projects\usfw\veg\mxd\ba5_reseed.mxd	

F

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Borrow area 7B (east) DATE 6/15/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Interim seeded	~26 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; Qualitative assessment only.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

Comments: The area has fair establishment of slender wheatgrass (2-20% of the total cover) with some areas dominated by cheatgrass.

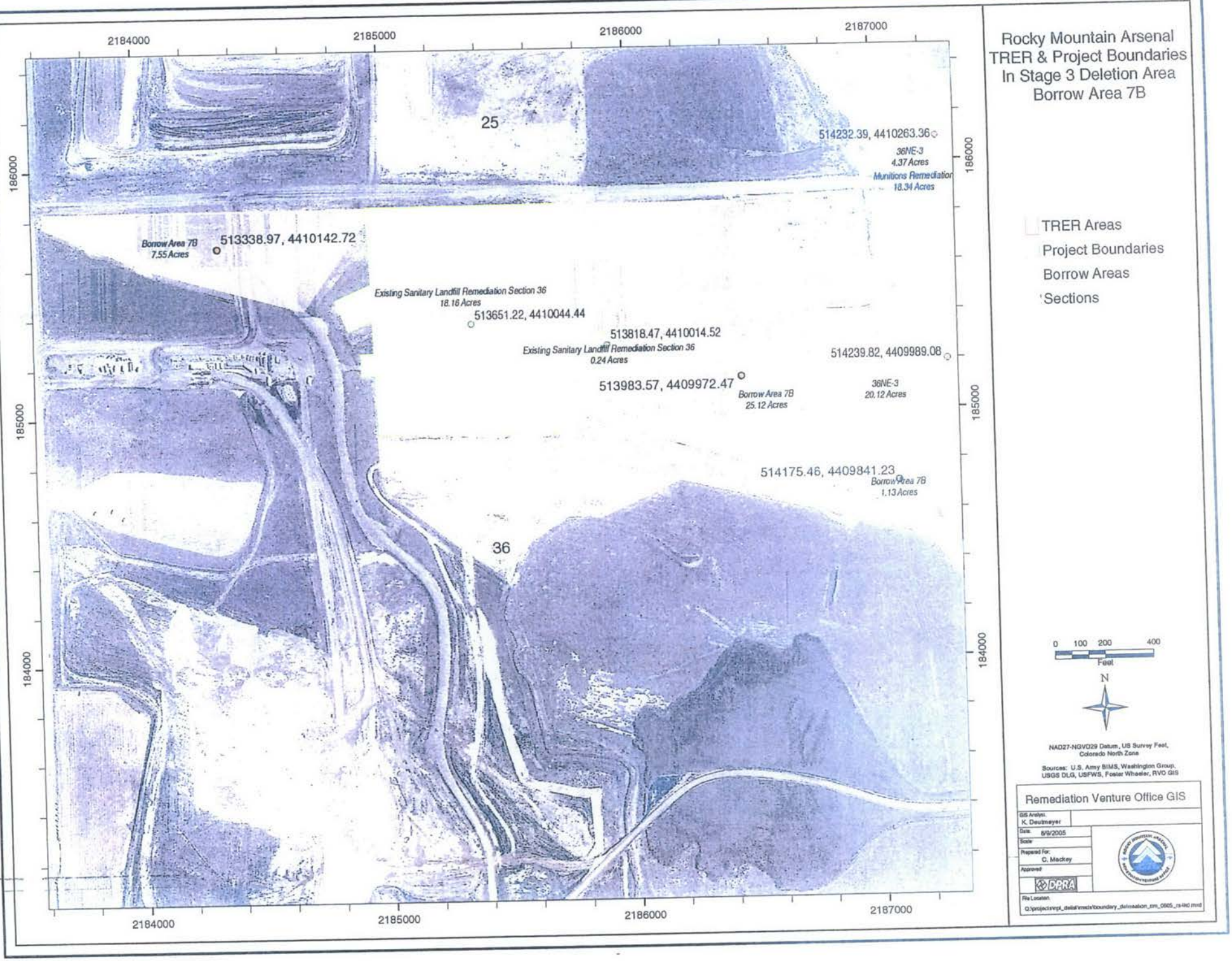
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/15/05

Denise Arthur, ESCO representing EPA

Reviewed by Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area Borrow Area 7B

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 100 200 400
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deutmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	
	DPRA
File Location:	G:\projects\rvgis_data\mxds\boundary_delineation_stm_0605_rs-tbd.mxd

F

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Borrow Area 11 DATE 6/28/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded. ~26 acres seeded in fall 2004. ~177 acres seeded in 2003.	About 80 acres of the total borrow area was excavated by project requirements.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: In the western portion permanently seeded in 2004, previously established slender wheatgrass stand has been interseeded with the permanent mix. Seedlings of permanent mix only established in areas without slender wheatgrass. Interseeding prior to removal of existing cool season perennial grass species is not recommended and has generally not been successful at this site. The eastern disturbed portion (~60 acres) was seeded in 2003, along with the un-utilized portion of the BA 11. This area has patches of good establishment of Western wheatgrass, but weedy species occur throughout and some large areas are dominated by weedy forbs.

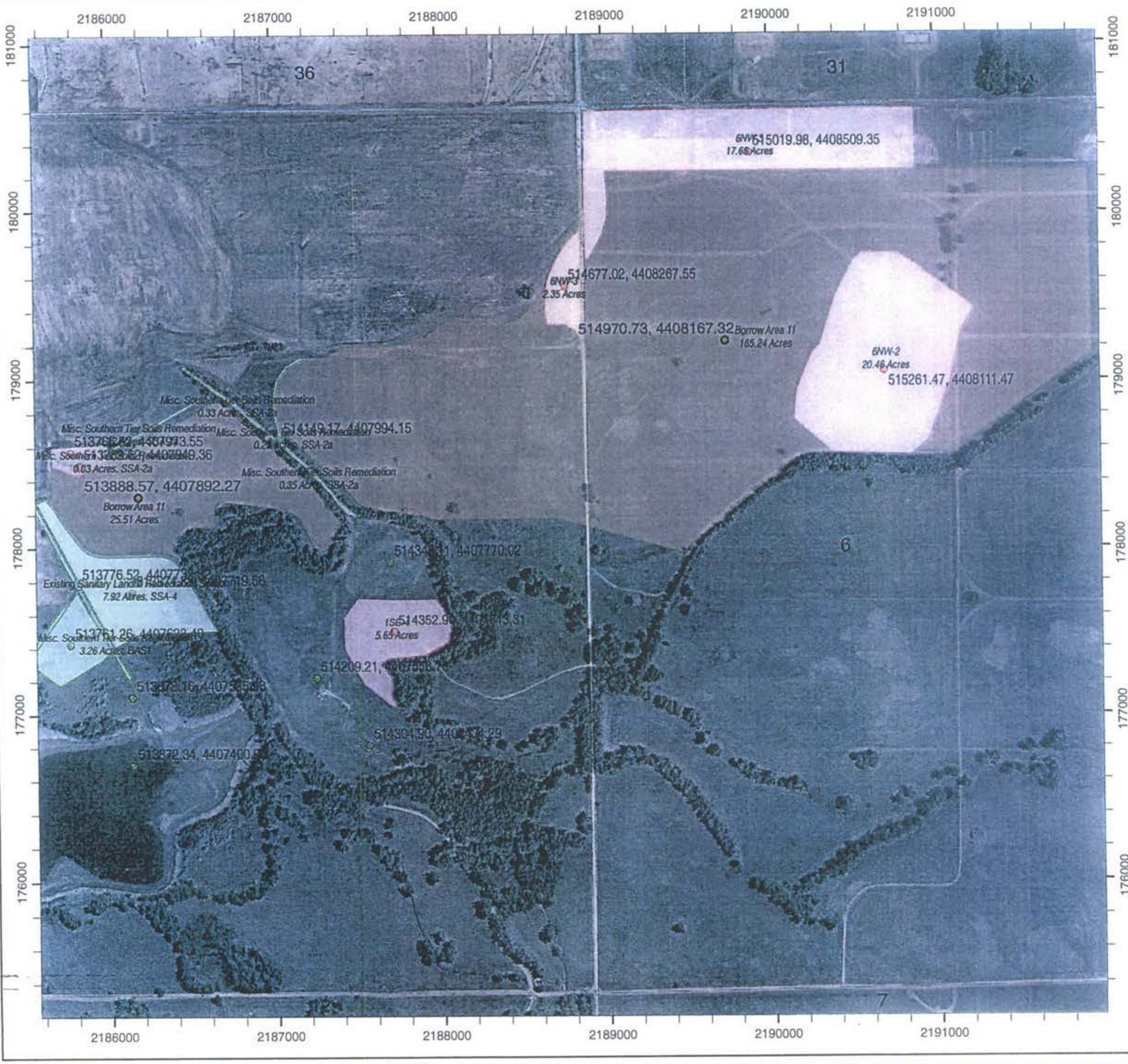
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/28/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson — Date 10/31/06

Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area Borrow Area 11



- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

250
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deulmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: Q:\projects\rvpi_delish\mxds\boundary delineation cm 0605_rs4kd.mxd

P

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 1WC-1 DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded fall 2004. Irrigated 2005.	19 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Poor seedling density at time of assessment. Copious cheatgrass cover.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by U.C. Flowers Jackson

Date 10/31/06

Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area 1WC-1

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25 50 100 150 200 250
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: Q:\projects\rvpl_dells\rmads\boundary_delineation cm 0605_rp-ltrd.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 1CN-2 DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded fall 2004. Irrigated 2005.	~1 acre.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Previously established slender wheatgrass stand has been interseeded with permanent mix. Seedlings of permanent mix only established in areas without slender wheatgrass. Interseeding prior to removal of existing cool season perennial grass species is not recommended and has generally not been successful at this site.

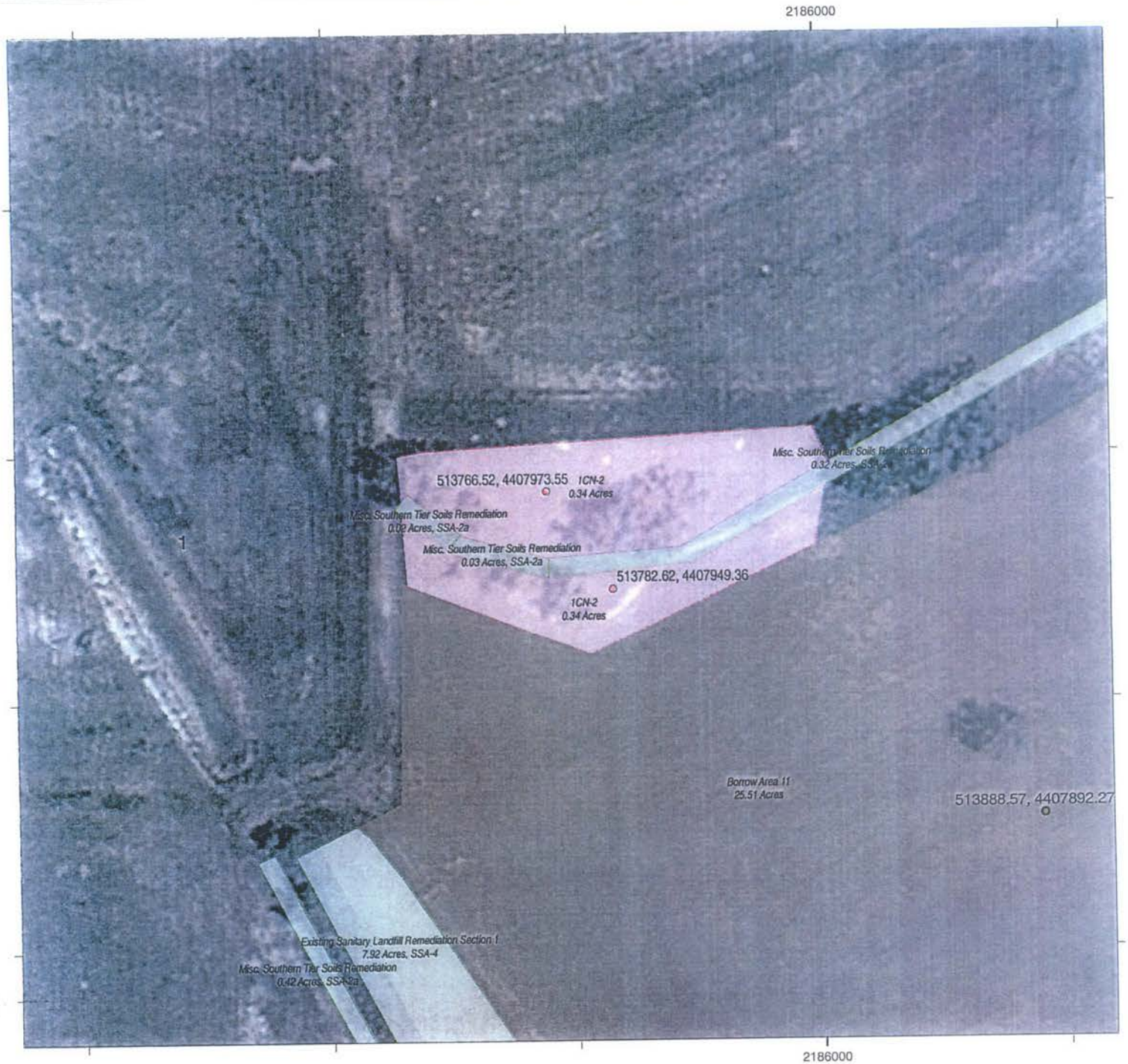
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
1CN-2

TRER Areas

Project Boundaries

Borrow Areas

Sections

0 25 50 100 150

Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer

Date: 6/9/2005

Scale:

Prepared For: C. Mackey

Approved:

DPRA

File Location: Q:\projects\rvgis_data\mxds\boundary_delineation cm. 0905_nt-4tx3.mxd

N/A

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 1SE-4 DATE 6/21/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	No terrestrial vegetation	~6 acres;
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Not assessed for vegetation because the site is currently flooded.	
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

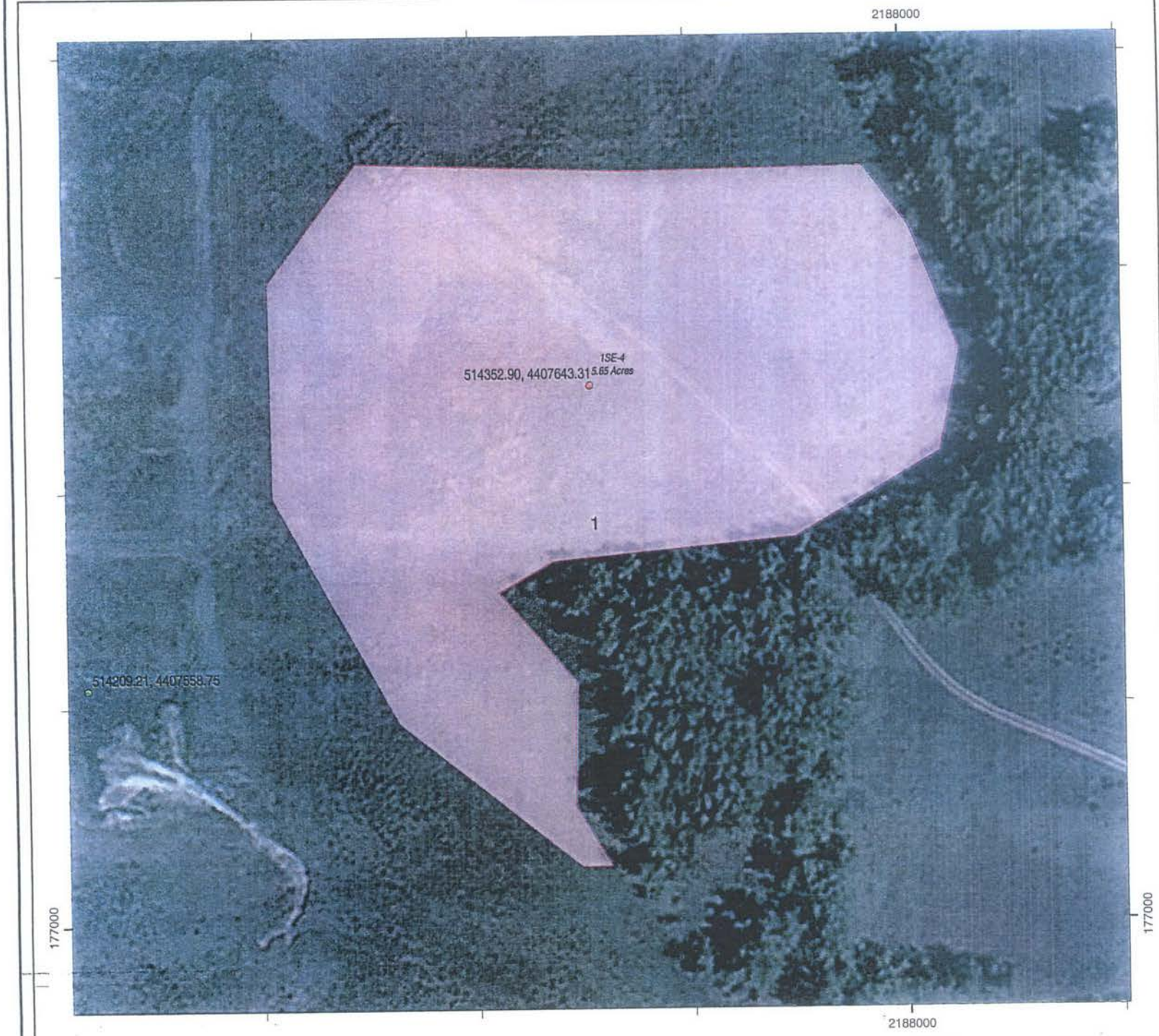
Comments: Site to be used as an intermittent wetland, so no vegetation assessment conducted.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/21/05

Denise Arthur, ESCO representing EPA

Reviewed by — Date



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area 1SE-4

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25 50 100 150
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deutmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	
File Location:	G:\projects\rvpl_delish\mxds\boundary_determination_cm_0605_rs-rkd.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 2NW-4 (north and south) DATE 6/13/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	South section permanently seeded in 2004; north section not yet addressed.	South section is 11.3 acres; north section is ~10 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects in the south section	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: The site is in the second growing season and weedy species still predominate. At least six perennial grass species are present at the site. Western wheatgrass and sand dropseed are the most common native grasses. There is spotty occurance by Scotch and musk thistle. The area may benefit from a timely mowing.

Transect Data Summary: Mean litter = 23.5%
Mean bare soil = 13%
Mean total vegetation = 63.5%
Mean total cover = 87%

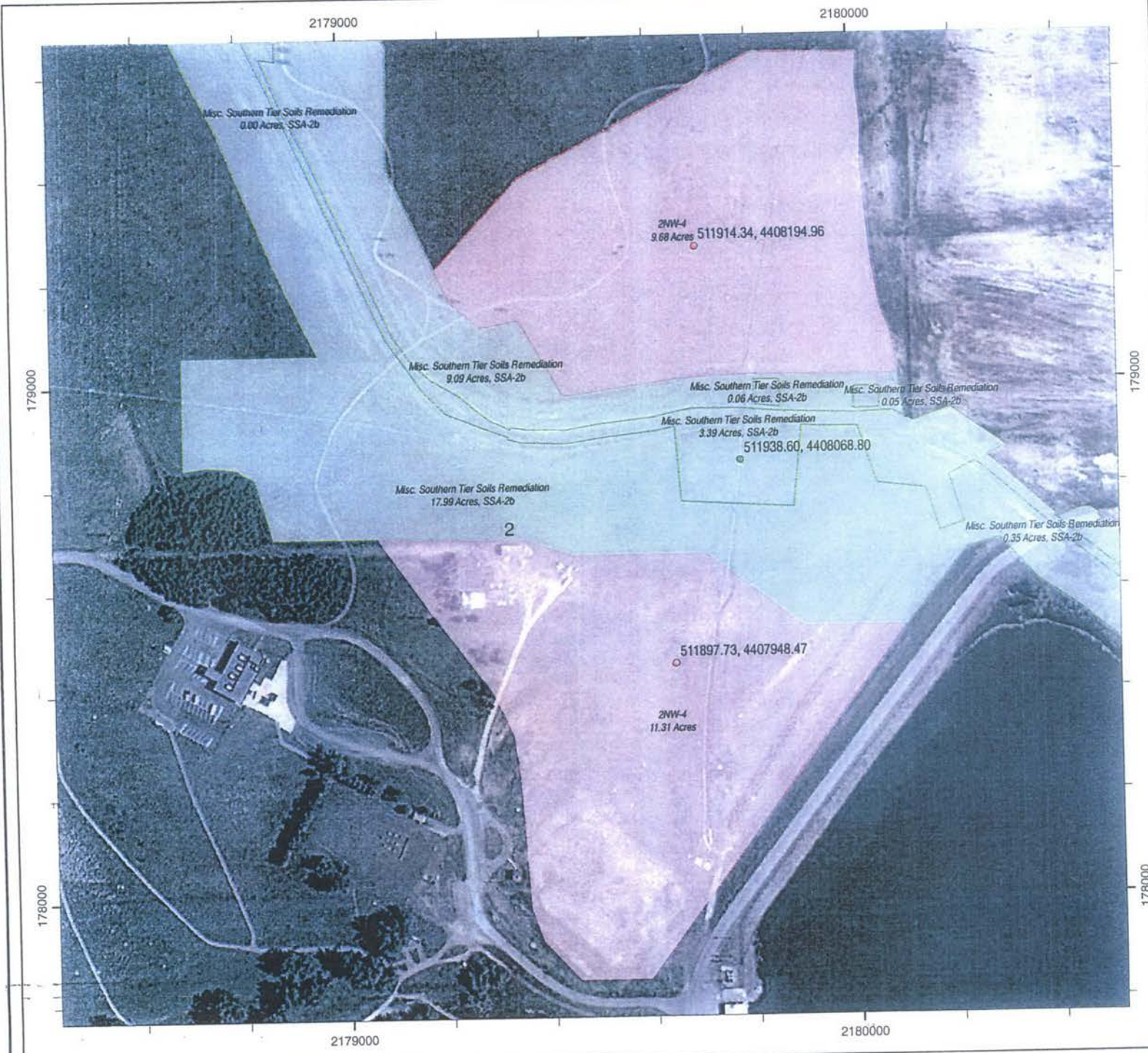
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/13/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
2NW-4

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25 50 100 150
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location:
Q:\projects\rvpl_delis\mxds\boundary_delineation_cm_0605_rs4kd.mxd

P

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 4, TRER 4EC-2 DATE 6/21/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2001.	3 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: It appears that the seeding failed at this site. Only small areas of the site contain sparse cover by perennial grass, i.e. Western wheatgrass. Weedy annual species, primarily kochia (65% of the total cover) dominate the site. This area could be incorporated into a future seeding project when habitat in the area adjacent in Section 3 is restored.

Transect Data Summary: Mean litter = 25.5%
Mean bare soil = 4%
Mean total vegetation = 70.5%
Mean total cover = 96 %

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/21/05

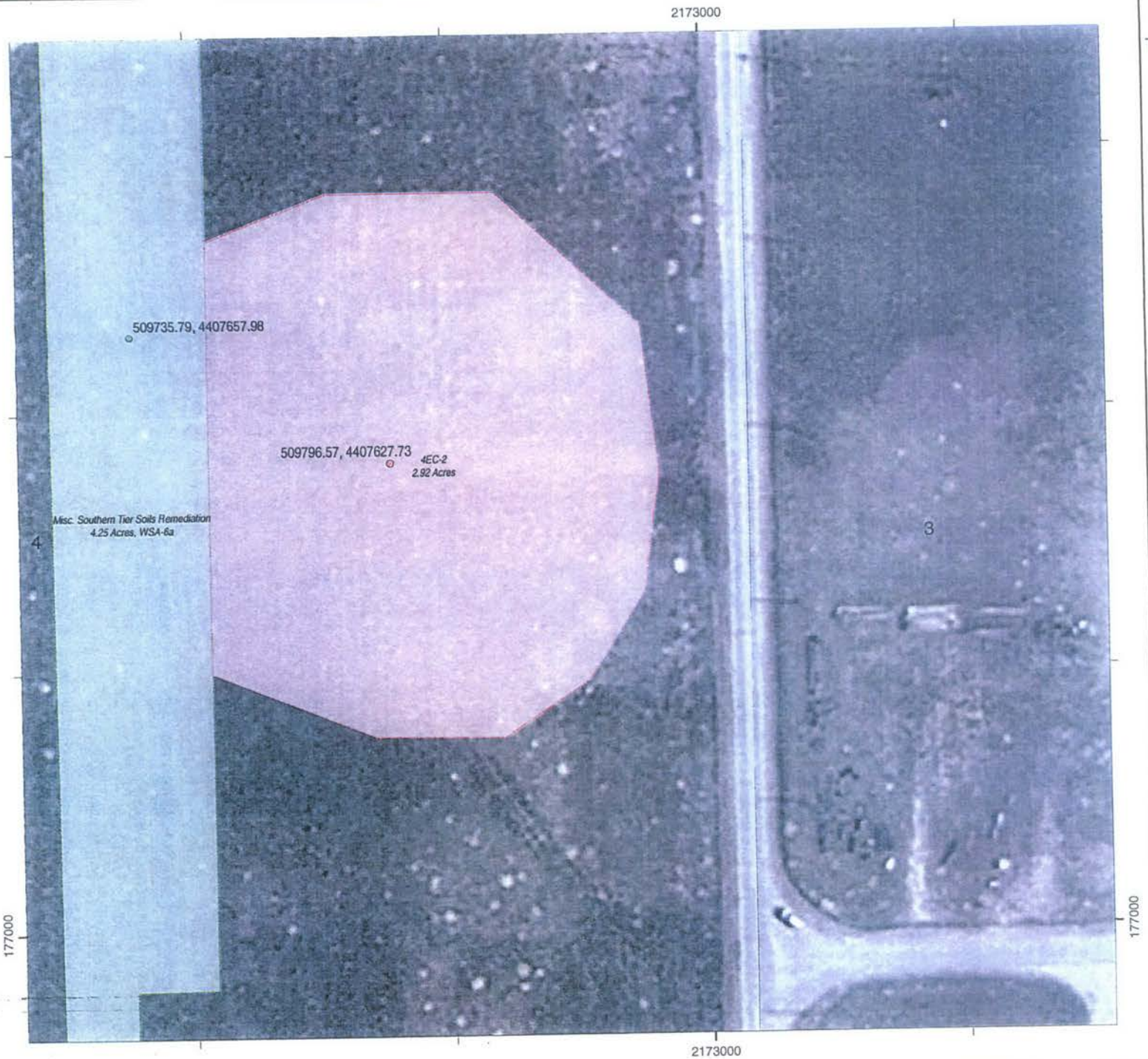
Denise Arthur, ESCO representing EPA

Katherine Roberts, EPA

John Stetson, PWT representing EPA

Reviewed by [signature]

Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area 4EC-2

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DRRA
File Location: Q:\projects\rvo_data\mxds\boundary_de...eation_crn_0805_rp4bd.mxd

E

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Section 4; TRER 4SC-1 DATE 6/15/05

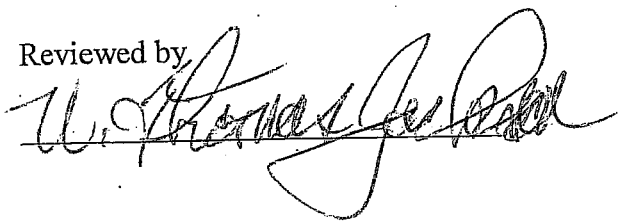
Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2000.	16 acres total; tilled area 10 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

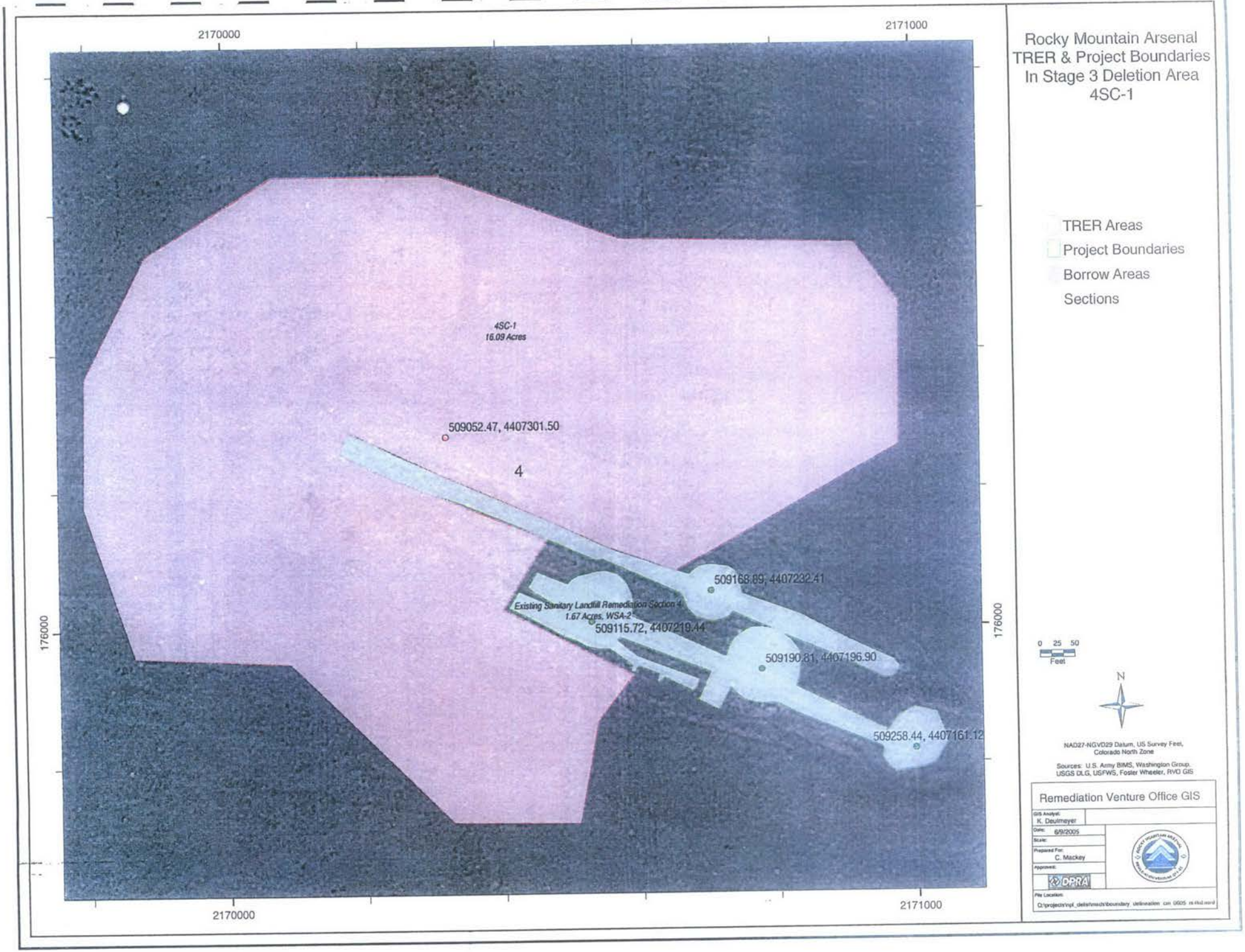
Comments: About 5 acres of the site was dominated by an almost pure stand of needle and thread grass and therefore was not tilled to preserve habitat. Because of the almost monoculture nature of this area, it would provide a good site for seed harvest (especially this year). A diverse seeded community of warm and cool season grasses and forbs, as well as scattered rabbitbrush and fourwing saltbush shrubs is established in the remainder of the site. This site can be considered a self-sustaining plant community that would provide long term erosion control with proper management.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/15/05

Denise Arthur, ESCO representing EPA

Reviewed by  Date 10/31/06


2170000
2171000
176000
4SC-1
16.09 Acres
509052.47, 4407301.50
4
509168.89, 4407232.41
Existing Sanitary Landfill Remediation Section 4
1.67 Acres, WSA-2
509115.72, 4407219.44
509190.81, 4407196.90
509258.44, 4407161.12
Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
4SC-1
TRER Areas
Project Boundaries
Borrow Areas
Sections
0 25 50
Feet
N
NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone
Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst:
K. Deutmeyer
Date:
6/9/2005
Scale:
Prepared For:
C. Mackey
Approved:
DPRA
File Location:

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 6NW-2 DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanent	20.5 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 Transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: This site is stable, but dominated by cool season grasses; primarily western wheatgrass, slender wheatgrass and Canada wildrye. Other native forbs and grasses are limited. Of the total vegetation, 50% is cool season seeded native grasses and 36% is composed of weedy forbs and grasses.

Transect Data Summary: Mean Litter = 24.5%
Mean Bare soil = 4%
Mean total vegetation = 71.5%
Mean total cover = 96%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jacobs

Date 10/31/06

F

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 6NW-3 DATE 6/14/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanent seeding	~20 acres; Section 6
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	3 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: The portion of this TRER site West of E street is occupied by prairie dogs. The northern portion along 7th Avenue is currently stable, but has likely been seeded with slender wheatgrass prior the permanent seeding and is still dominated by this cool season species (~23% cover by slender wheatgrass). Over-seeding established slender wheatgrass (or other cool season grass) stands does not yield a diverse grassland community. When interim perennial grass stands are established, the technique for diversifying the grassland community should be modified from simply over-seeding the site. Slender wheatgrass is a short lived perennial grass and as the initially established plants weaken, the community may be replaced by weedy species.

Transect Data Summary:
Mean Litter = 18.6%
Mean Bare soil = 37.6%
Mean total vegetation = 41%
Mean total cover = 62.3%
Mean rock cover = 2.6%

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/14/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Karen Jackson — Date 10/31/06

Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
6NW-2, 6NW-3

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 2550
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deulmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DRRA
File Location: C:\projects\rvo_delish\mxds\boundary_dr[illegible]cation_crn_0605_r3-4fd3.mxd

REVEGETATION INSPECTION CHECKLIST

BA 8

AREA INSPECTED TRER 25CC-3, Section 25 Miscellaneous Northern Tier Soil, Borow Area 6, Borrow Area 8 DATE 6/20/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Barley cover crop seeded 2005.	74 acres; approximately 15 acres of bare ground/weedy waiting remedy activity; BA 6 is about 62 acres; BA 8 is about 23 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Generally good barley germination with some areas of decreased germination, emergence and growth. Site should be observed for timely weed control. The southern portion of BA 8 has not been seeded due to presence of asbestos containing debris.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/20/05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] — Date 10/31/06

Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area 25CC-3

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 2550 100 150 200 250 300 350
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: Q:\projects\mpl_delist\mxds\boundary_delineation_cm_0605_rs48x44.mxd

Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Misc. Northern Tier Soils - C

TRER Areas

Project Boundaries

Borrow Areas

Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deulmeyer

Date: 6/9/2005

Scale:

Prepared For: C. Mackey

Approved:

DRRA

File Location: O:\projects\rvo_delis\vmcs\boundary_delineation_cm_0605_rs-tkd.mxd

P

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 26SW-1 DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	No re-vegetation	~1.5 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

Comments: No revegetation effort detected. Area disturbed by soil removal. Revegetation should replace existing weedy plant community and bare soil.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/16/05

Denise Arthur, ESCO representing EPA — _____

Reviewed by W. Thomas Jackson — Date 10/31/06

Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
26SW-1

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25 50
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deulmeyer
Date: 6/3/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location:

6

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 26WC-2 DATE 6/15/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Interim seeding fall 2004; slender wheatgrass	1.5 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

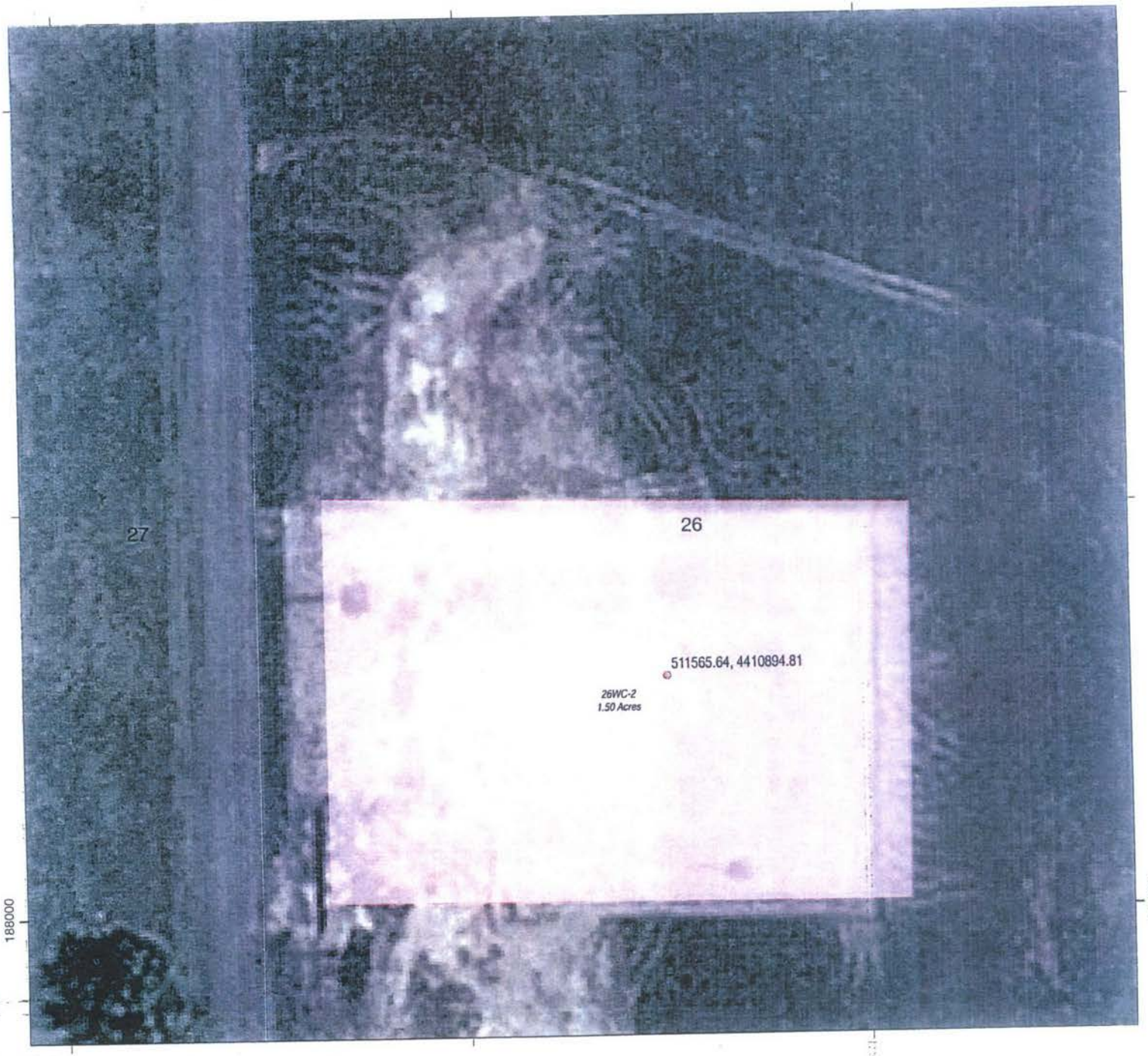
Comments: Good establishment of slender wheatgrass. Area has been soil amended and mulched. Kochia and Russian thistle should be managed, i.e. mowed.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/15/05

Denise Arthur, ESCO representing EPA —

Reviewed by W. Thomas Jacobson — Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
26WC-2

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deutmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	
	DPRA
File Location:	Q:\projects\rvpt_delist\mxds\boundary_delineation_crn_0605_os4tol.mxd

F

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 26NW-5 DATE 6/15/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded	~9 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; qualitative assessment	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: 2-3 seedling per square foot; very weedy (kochia) about 3 feet tall; weed issue should be addressed with mowing; perennial grass establishment should succeed.

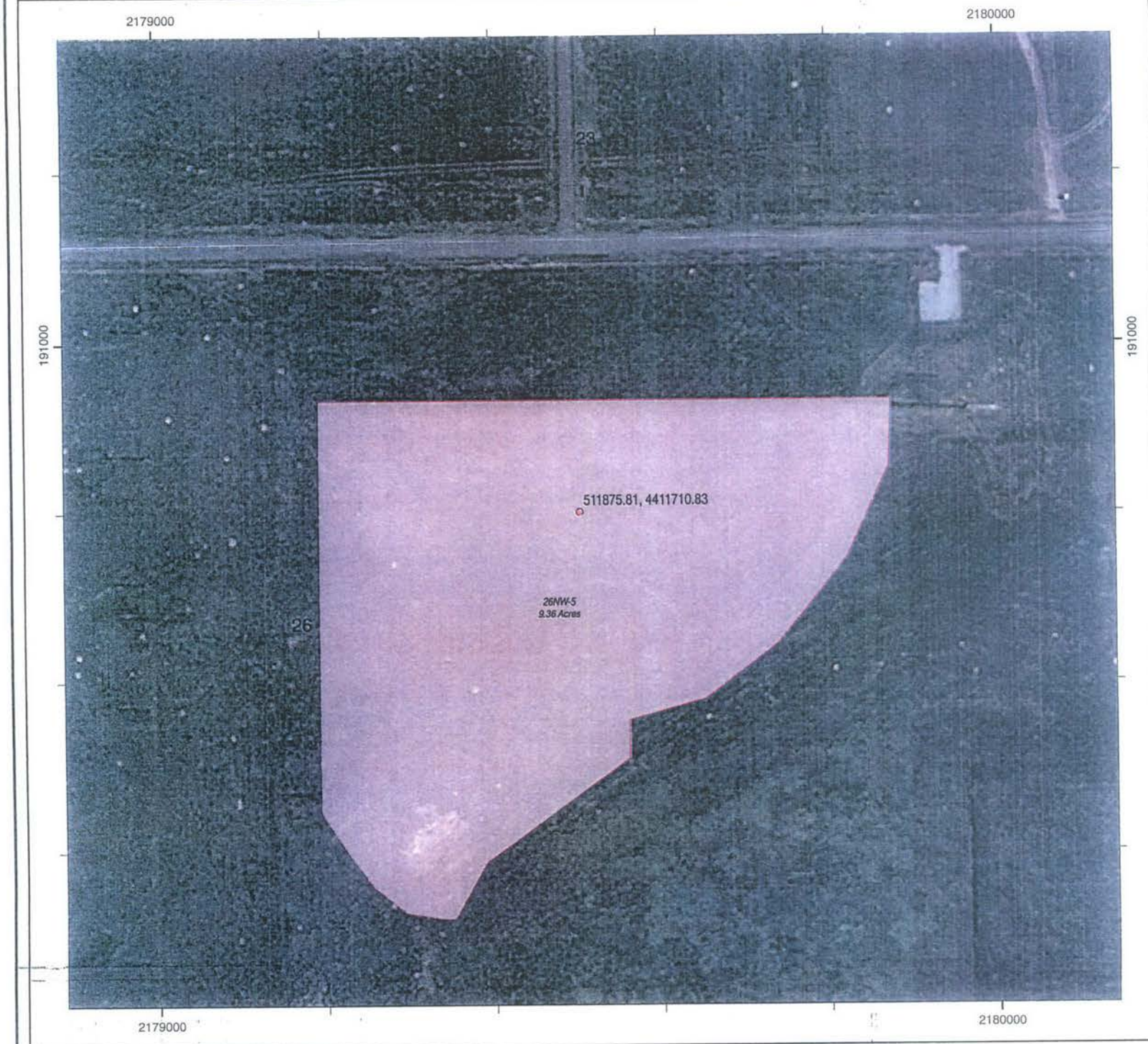
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/15/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Ahern Jackson

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
26NW-5

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25 50 100 150
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DRRA
File Location: Q:\projects\rvpl_della\mxds\boundary_delineation_cm 0605 rs-4to2.mxd

E

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 26SE-6 DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanent seeded and irrigated 2004	4.36 acres; See comments
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	2 transects	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: Diverse established grassland. Dominant species are blue grama, switch grass and Western wheatgrass. Scotch thistle and cheatgrass are problematic. The area would benefit from a weed control program.

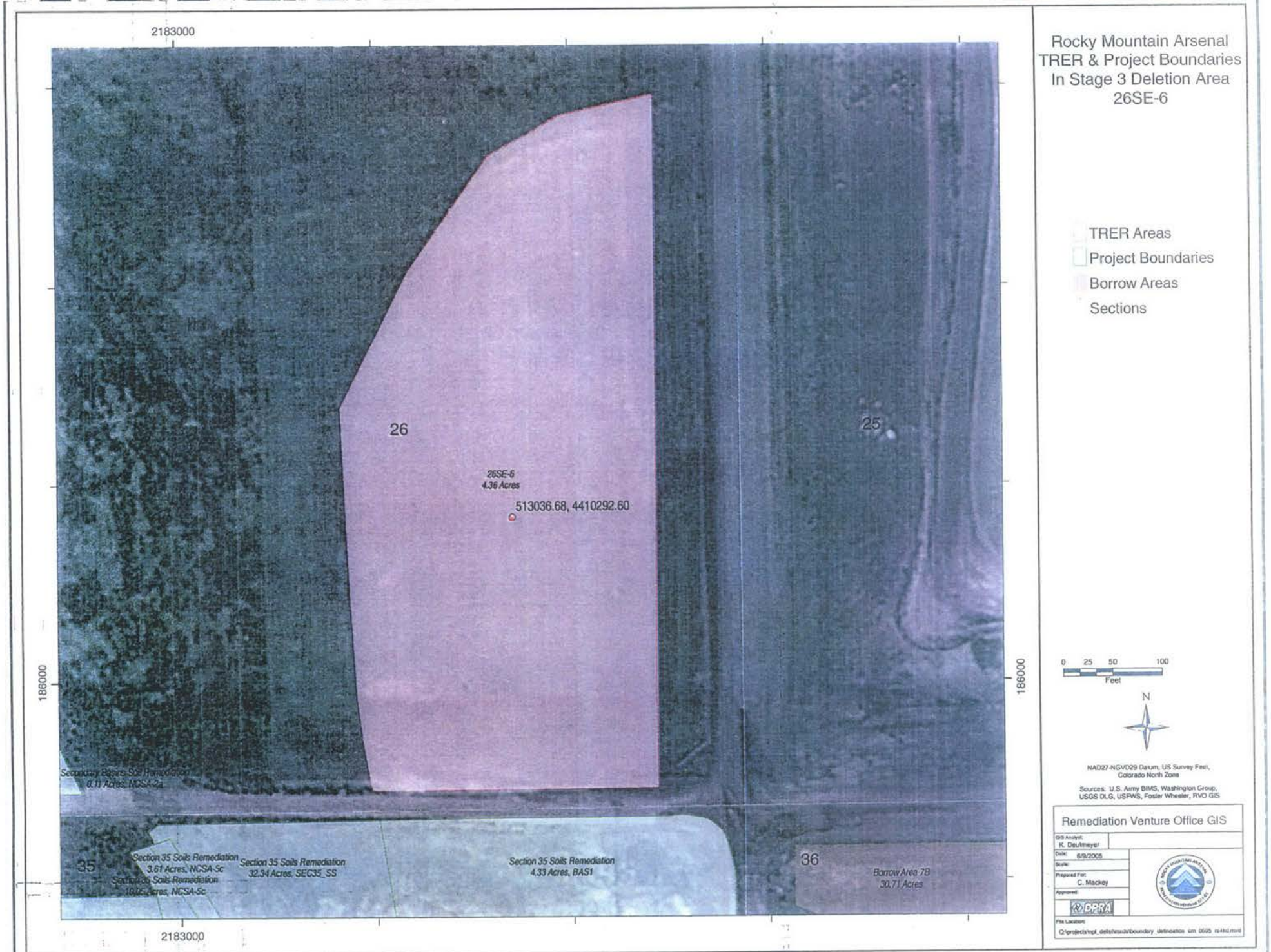
Transect Data Summary:
Mean Litter = 22%
Mean Bare soil = 15.5%
Mean total vegetation = 62.5%
Mean total cover = 84.5%
Mean native perennial grass = 42.5%
Mean weedy forbs and grasses = 14.5%

Inspection Team Members — Date

Carl Mackey, RVO — 6/16/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Ronald Jordan — Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
26SE-6

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25 50 100
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Fosler Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deufmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location: Q:\projects\rvpl_delis\maps\boundary delineation cm 0605 rs4kd.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 30SW-2 DATE 6/20/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded in 2005.	3.3 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

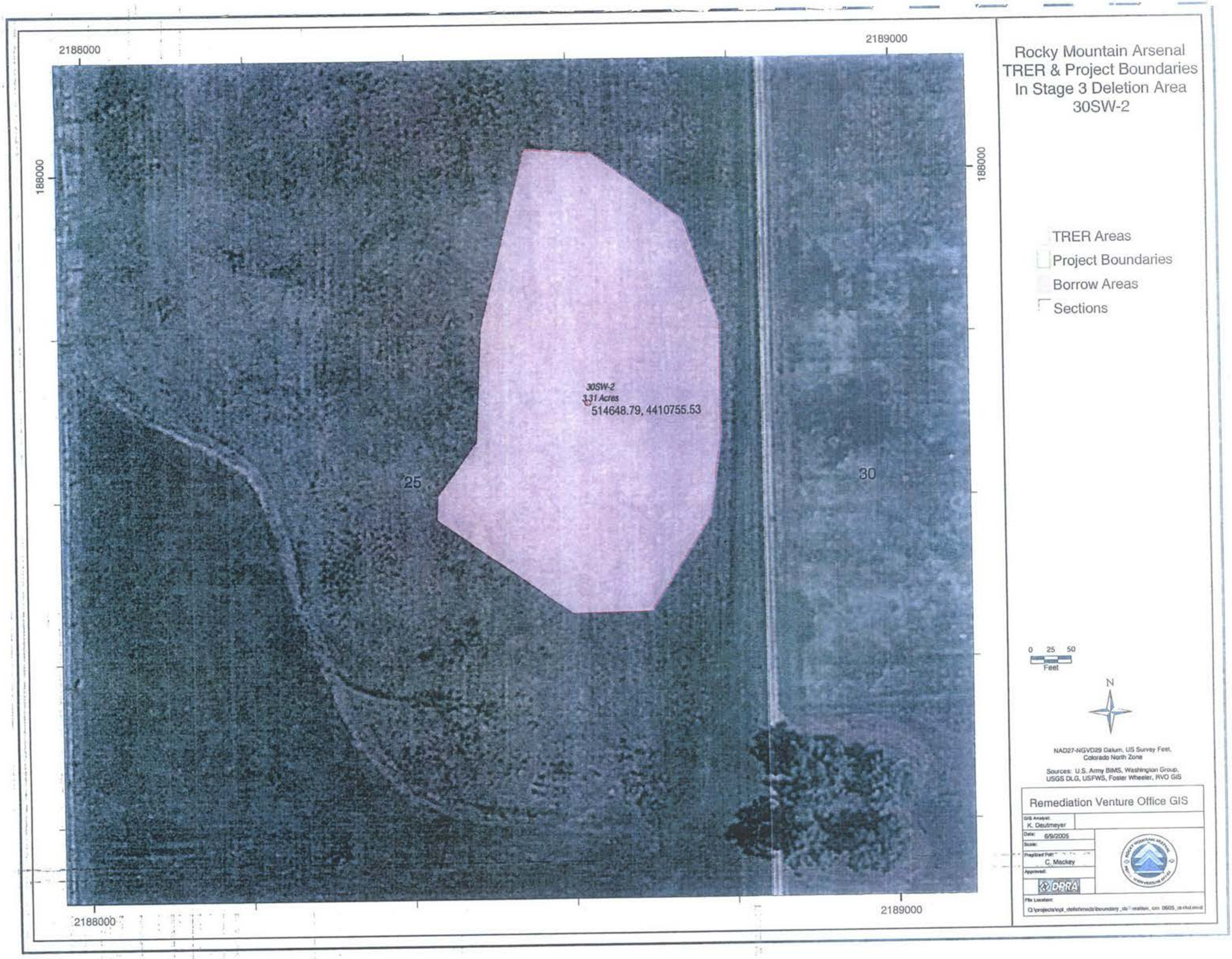
Comments: Abundant seedling emergence at time of observation. Irrigation initiated. Seedling density approximately 7 seedlings per linear foot. Area will need weed control efforts in future.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/20/05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
30SW-2
2188000
2189000
188000
30SW-2
3.31 Acres
514648.79, 4410755.53
25
30
TRER Areas
Project Boundaries
Borrow Areas
Sections
0 25 50
Feet
N
NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone
Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst:
K. Deutmeyer
Date:
6/9/2005
Scale:
C. Mackey
Approved:
DPRA
File Location:

P

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 30SW-3 DATE 6/20/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Bare soil/weedy	5 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

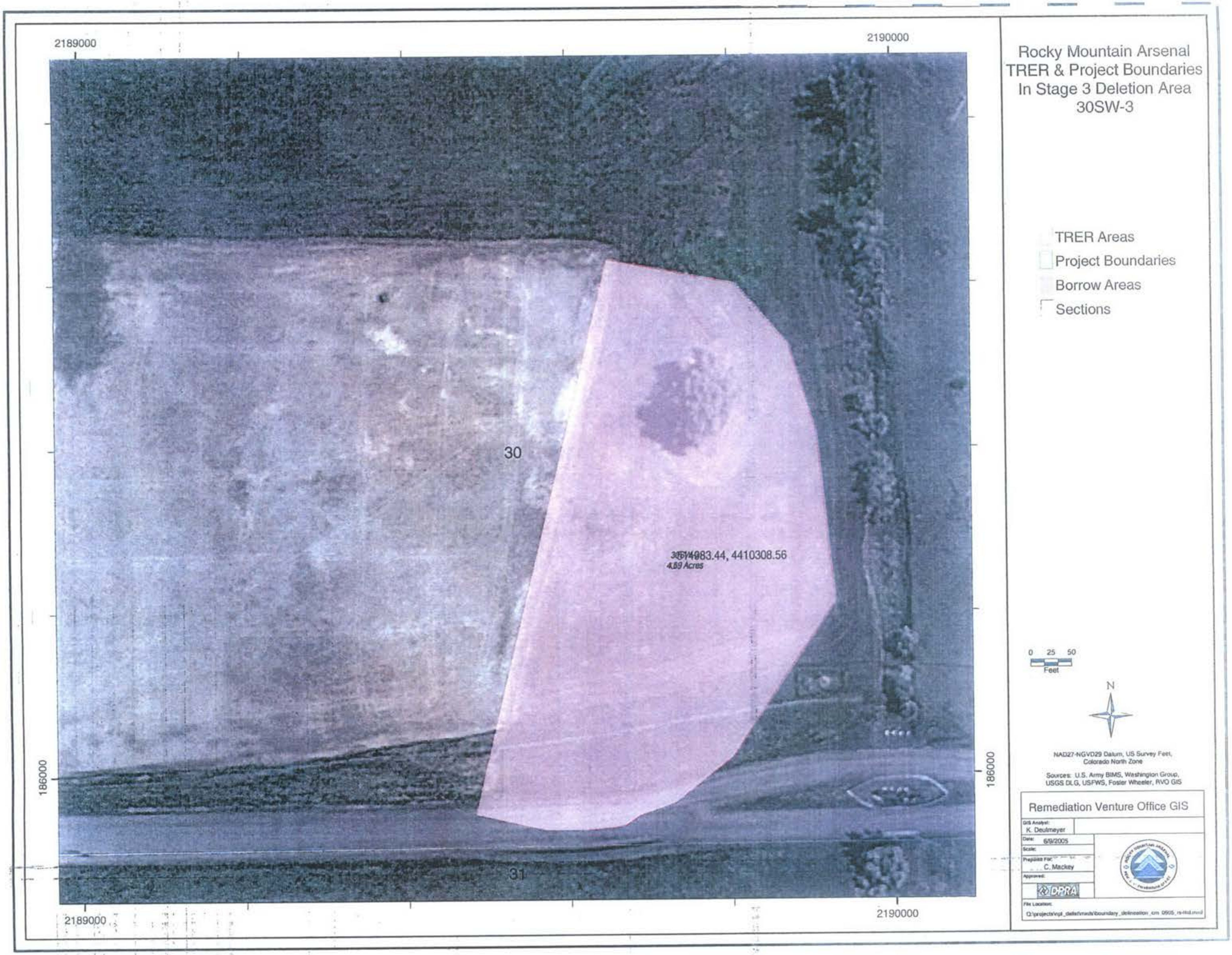
Comments: Tilled, weeds abundant growing rapidly, awaiting weed control and cover crop seeding.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/20/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson Date 10/31/06


Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
30SW-3
2189000
2190000
186000
30
31
TRER Areas
Project Boundaries
Borrow Areas
Sections
0 25 50
Feet
N
NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone
Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst:
K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For:
C. Mackey
Approved:
DPRA
File Location:

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 31EC-1 DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Temporary barley cover crop	5.75 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; qualitative assessment	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

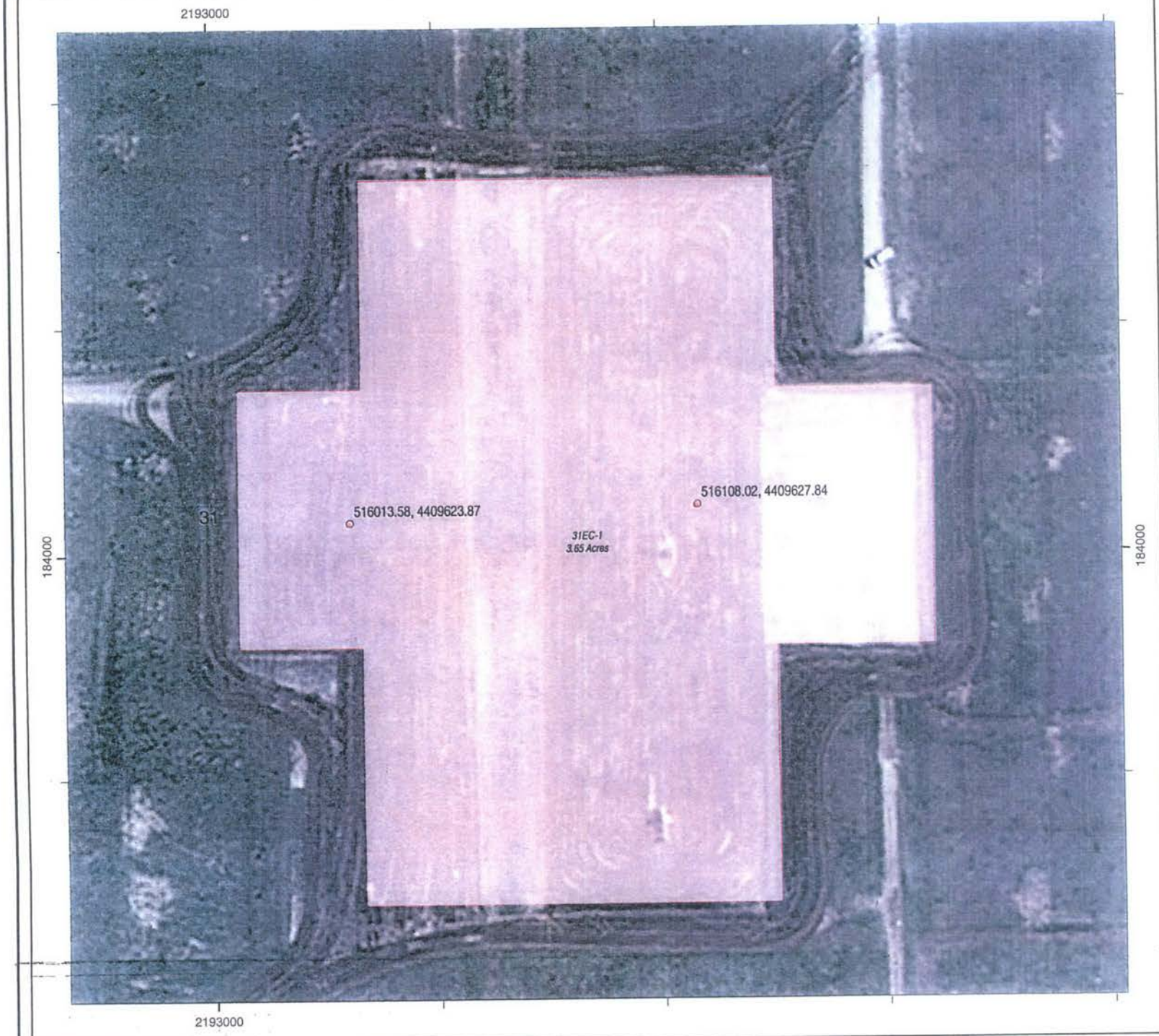
Comments: Within BA 10 good barley germination and emergence.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/16/05

Denise Arthur, ESCO representing EPA — _____

Reviewed by [signature] Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
31EC-1

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DRRA
File Location: C:\projects\rvo_delist\mxds\boundary_delineation_cm_0605_rs-tkd.mxd

F

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 31EC-2 Section 31 DATE 6/16/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Temporary cover crop barley	~2 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; qualitative assessment	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

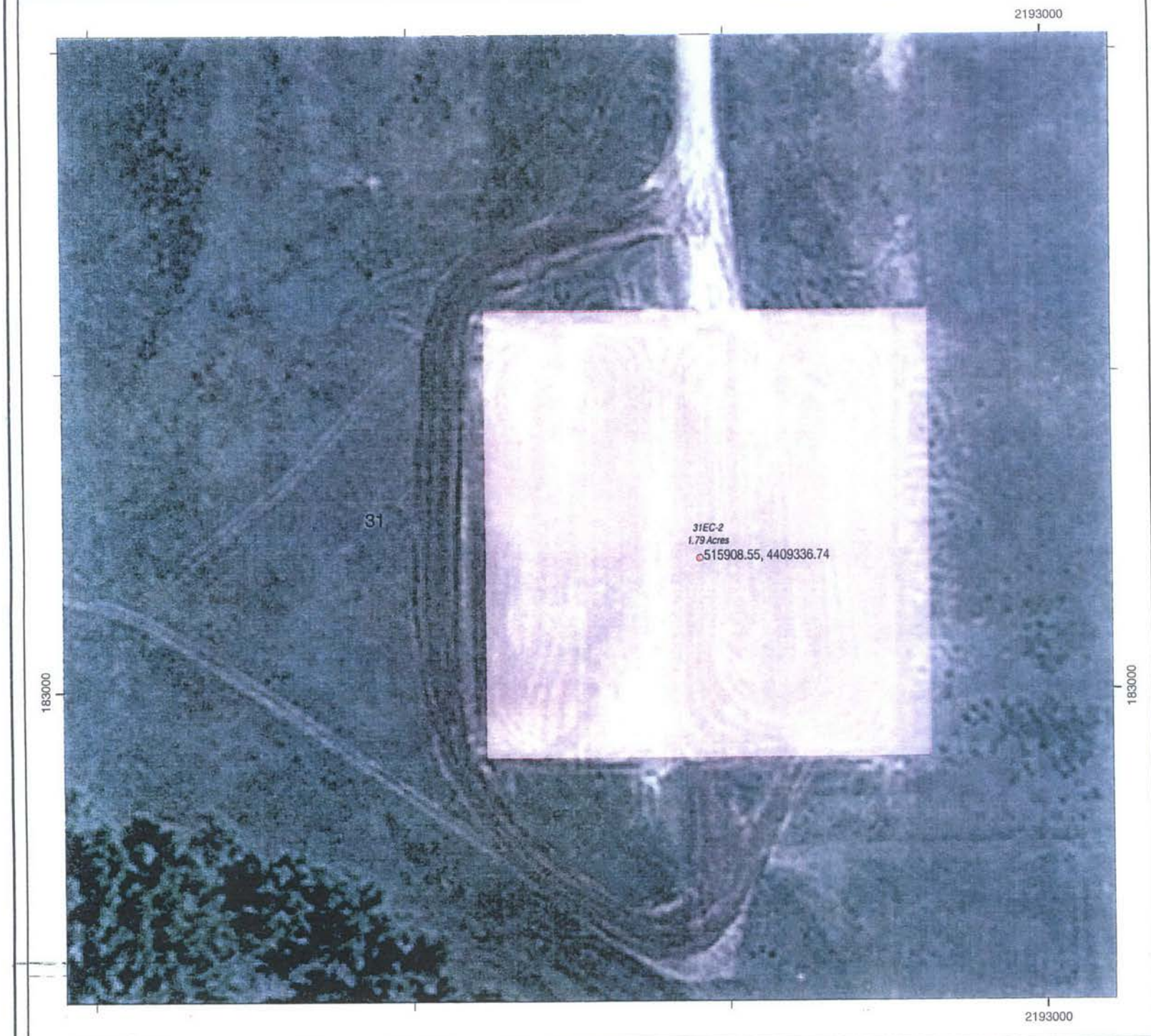
Comments: Site in BA 10. Barley emerging well; an area of about 0.5 acre is light colored soil with thinner vegetation (i.e. apparent less germination and emergence and lower production)..

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/16/05

Denise Arthur, ESCO representing EPA —

Reviewed by W. Thomas Jackson — Date 10/31/06



Rocky Mountain Arsenal TRER & Project Boundaries In Stage 3 Deletion Area 31EC-2

TRER Areas

Project Boundaries

Borrow Areas

Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer

Date: 6/9/2005

Scale:

Prepared For: C. Mackey

Approved:

DPRA

File Location: Q:\projects\rvo_data\mxds\boundary_delineation_cm_0605_rs49sl.mxd

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 35WC-4, 35SW-2,3 DATE 6/27/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Unseeded, mostly bare ground and/or weedy	35WC-4 = 17 acres 35SW-2 = 14 acres 35SW-3 = 5 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

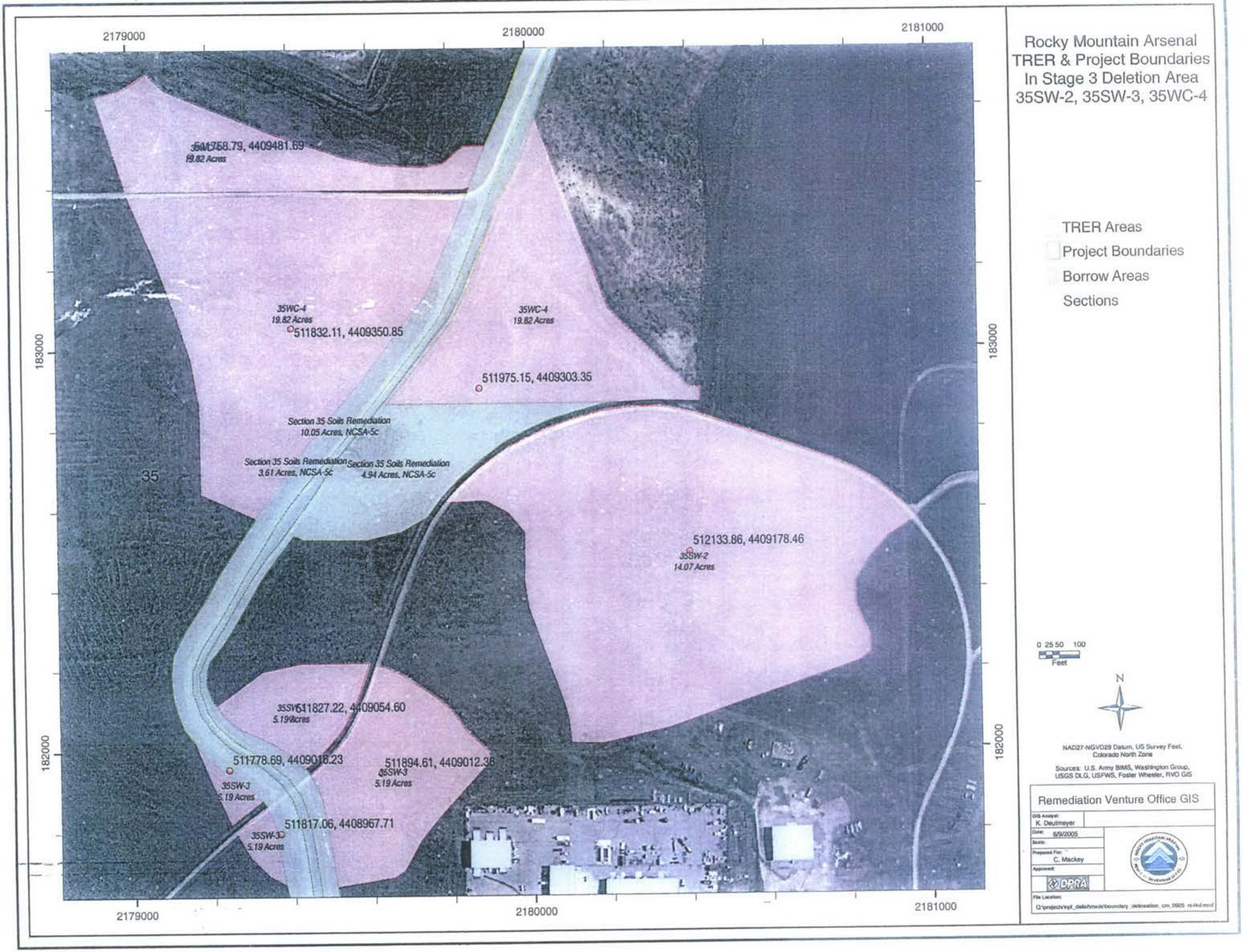
Comments: A portion of TRER 35WC-4 is a prairie dog town dominated by weedy species; no tilling conducted. Another 8 acre portion is dominated by kochia and waiting for weed control and cover crop seeding by USFWS. TRER 35SW-2 and –3 are bare ground waiting cover crop seeding.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/27/05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] Date 10/3/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
35SW-2, 35SW-3, 35WC-4

TRER Areas
Project Boundaries
Borrow Areas
Sections

0 25 50 100
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deutmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	

DPRA

File Location:
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P

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 35NC-7 DATE 6/27/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Permanently seeded 2004.	Total acres about 18.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		See comments

Comments: The site is divided into 2 parcels. The western portion is about 12.5 acres. This area has a relatively dense cover by kochia and a low grass seedling density of about 0-3 seedlings per square foot. The eastern portion had the same kochia cover, but no grass seedlings were observed. Both area should be mowed to reduce competition from kochia.

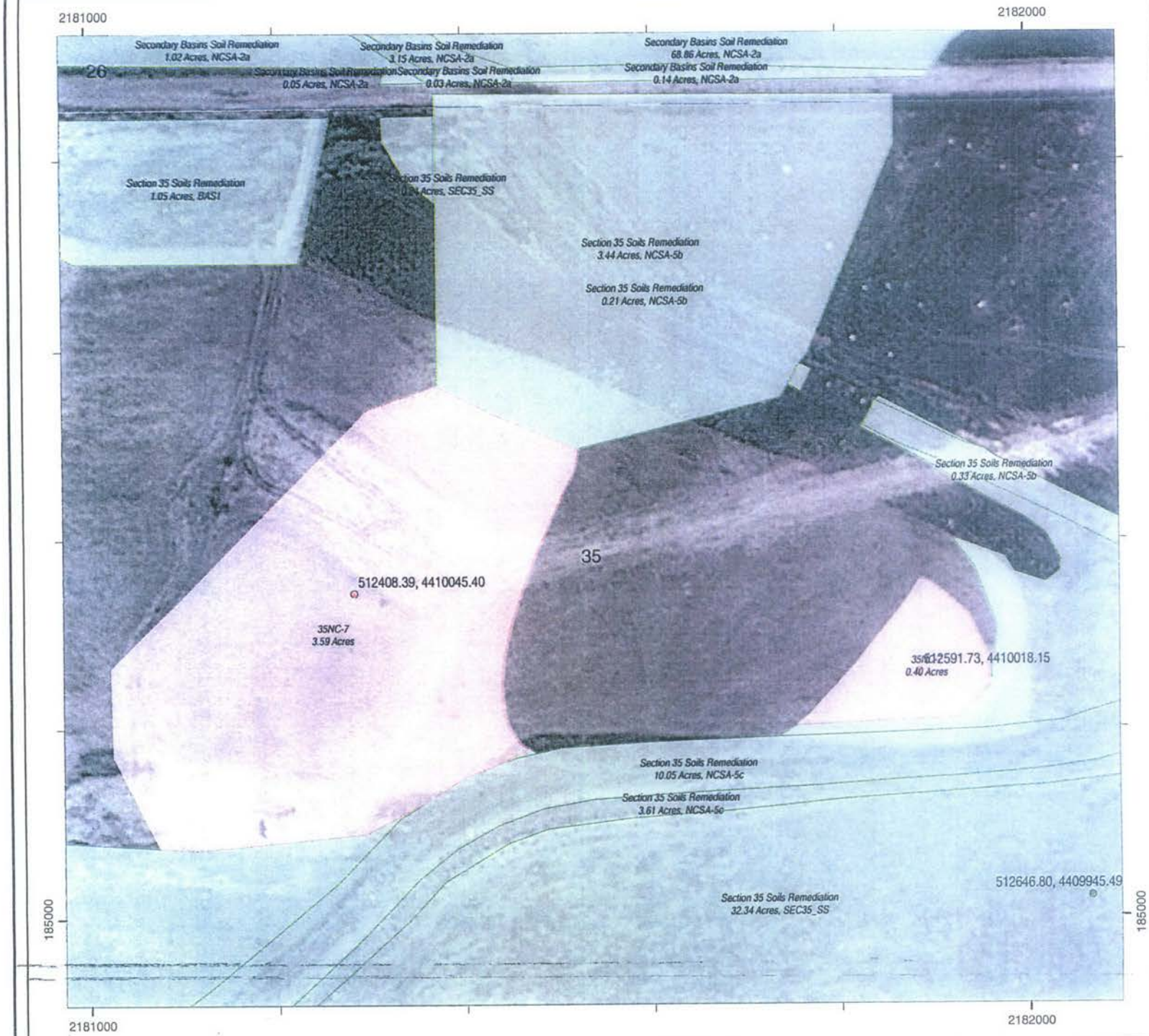
Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/27/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson

Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
35NC-7

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25 50
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deutmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	

DPRA

File Location:
Q:\projects\vgl_dellafmads\boundary_delineation_cm_0605_rs4fnd.mxd

change file name from TRER 35SE-1 to TRER35SE-1

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 35SE-1 and adjacent Section 35 Soil Remediation

DATE 6/21/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Interim seeded.	35SE-1=~12 acres Sec. 35 Soil Remediation site is ~9 acres.
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	Qualitative assessment.	Area to be used as stockpile for cover system maintenance.
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

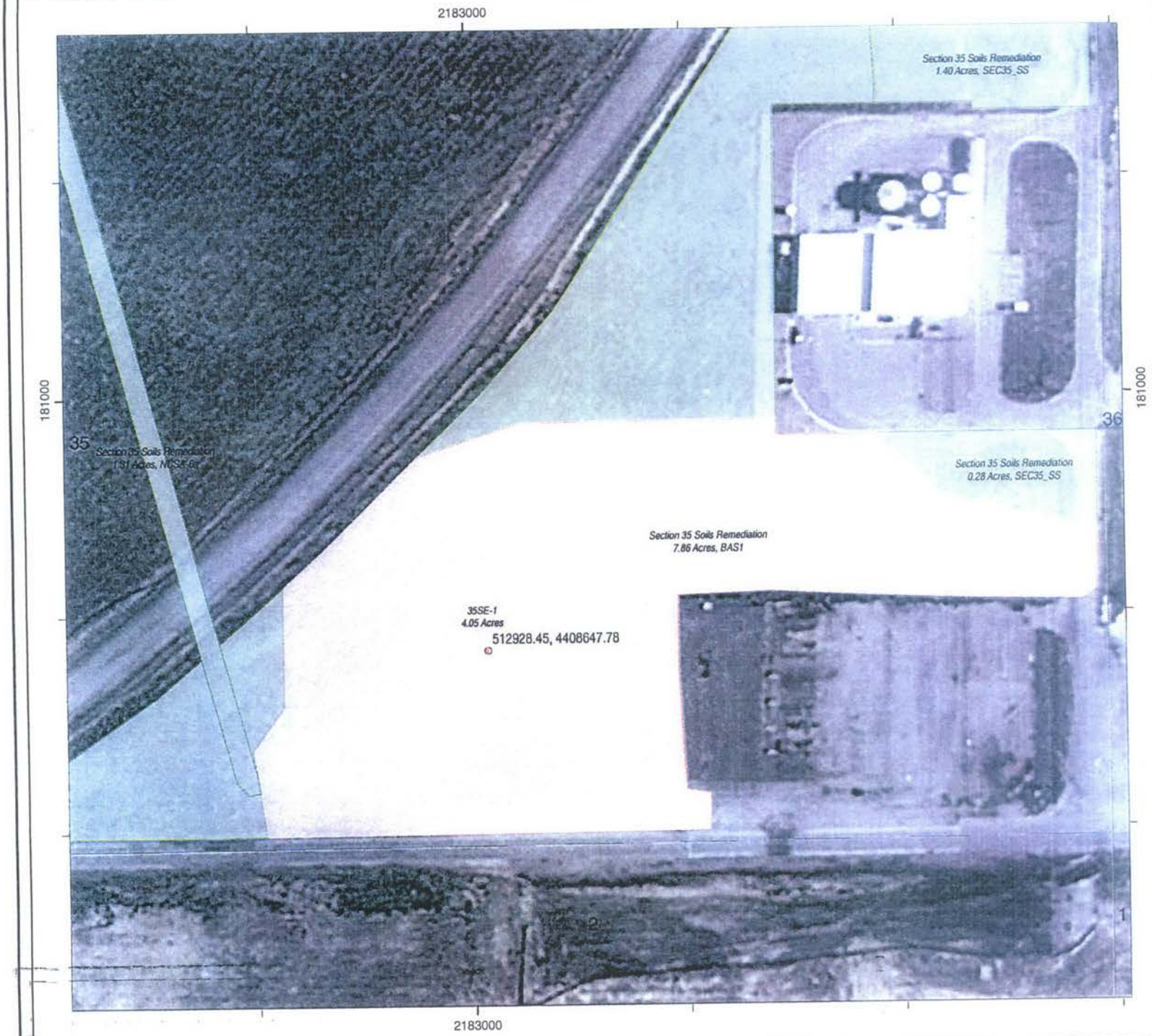
Comments: Area is weed dominated. Established slender wheatgrass is dying.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/21/05

Denise Arthur, ESCO representing EPA

Reviewed by [signature] Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
35SE-1

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA

File Location:
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F

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 36NE-3 DATE 6/15/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	Interim seeded; undisturbed	24.5 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical siting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.	No transects; Qualitative assessment only.	See comments
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

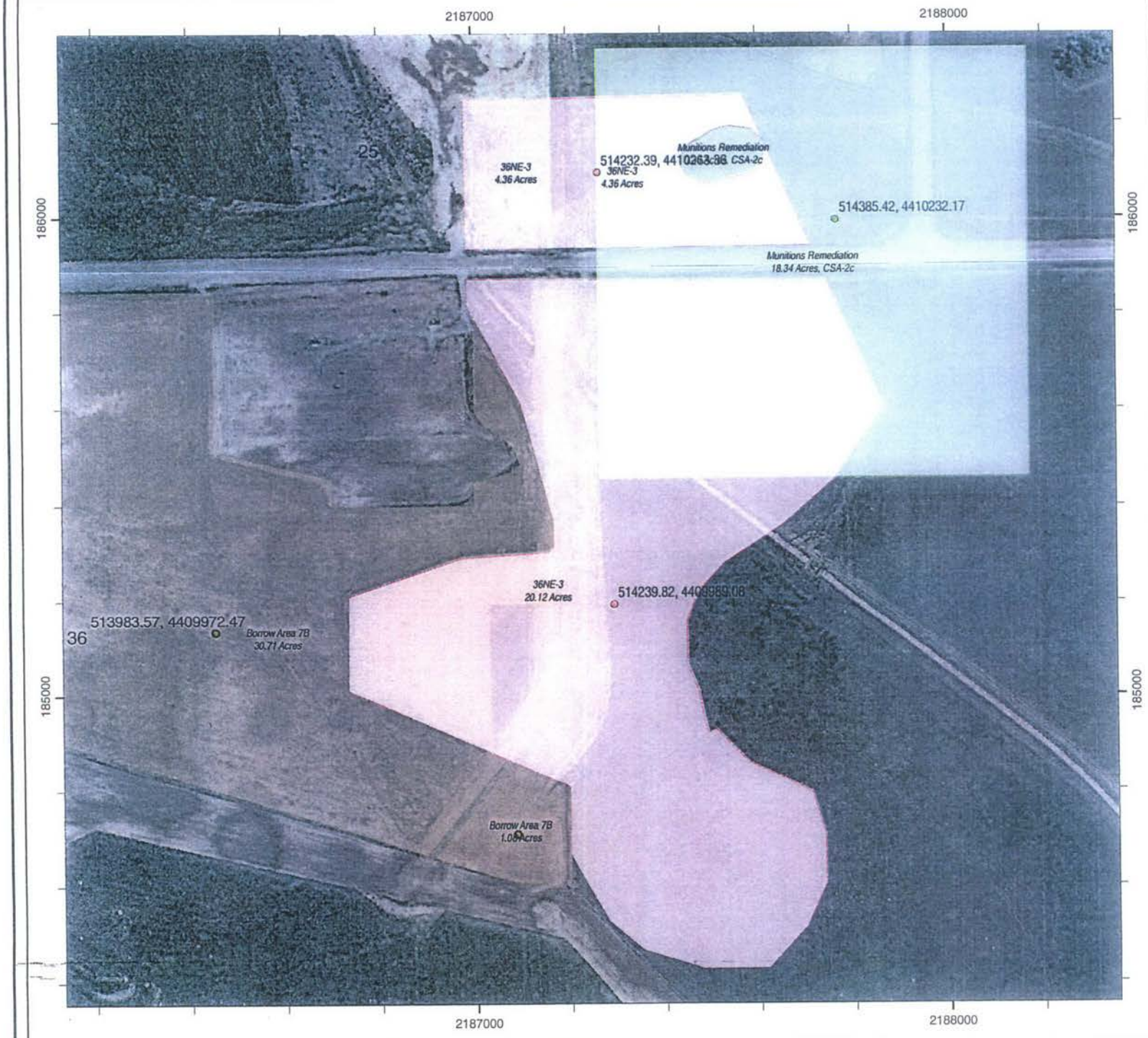
Comments: This site is divided by 8th Avenue. In the area south of 8th, a 5 acre portion was tilled and seeded with crested wheatgrass in 1991. Approximately 35% cover by vegetation in this portion. The remaining 15 acres has good establishment of slender wheatgrass (15-50% cover) with a few square meter areas dominated by cheatgrass. The area north of 8th Avenue (~4.4 acres) is mostly weedy with some grasses established. The western third of this area is bare soil. It appears that additional soil tilling is required.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/15/05

Denise Arthur, ESCO representing EPA

Reviewed by: [signature] — Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
36NE-3

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25 50 100
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deulmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	DPRA
File Location:	O:\projects\rvo_deliv\mxds\boundary_de~1~eation_cm_0605_re43d.mxd

N/A

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED TRER 36EC-1 DATE 6/21/05

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.	No veg	3 acres
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.		
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

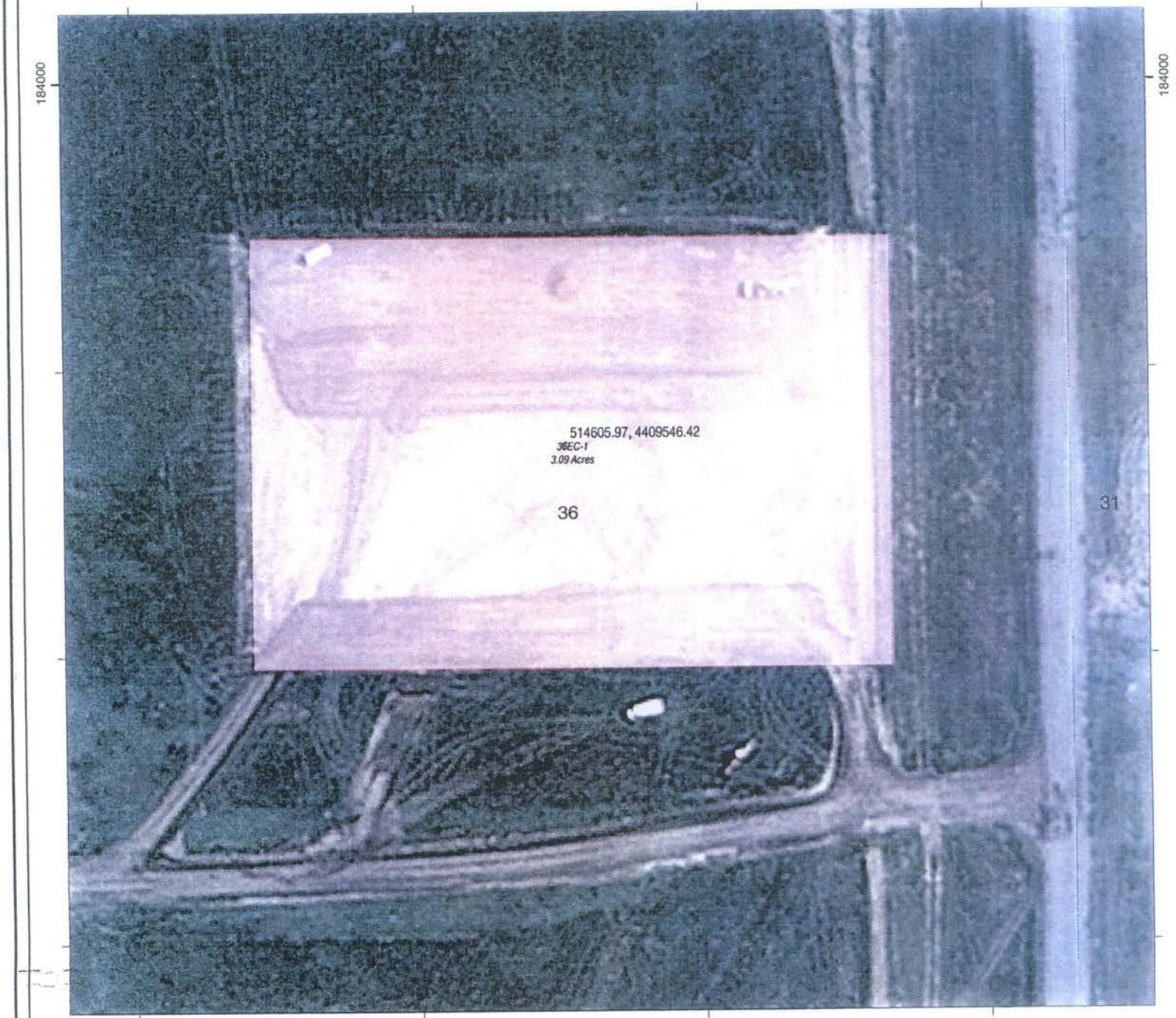
Comments: Site included in active remedy project drainage construction.

Inspection Team Members — Date

Carl Mackey, RVO team leader — 6/21/05

Denise Arthur, ESCO representing EPA

Reviewed by W. Thomas Jackson — Date 10/31/06



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
36EC-1

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25
Feet

N

NAD27-NGVD29 Datum, US Survey Feet, Colorado North Zone

Sources: U.S. Army BIMS, Washington Group, USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst: K. Deutmeyer
Date: 6/9/2005
Scale:
Prepared For: C. Mackey
Approved:
DPRA
File Location:

N/A

REVEGETATION INSPECTION CHECKLIST

AREA INSPECTED Eagle Nest Area Exclusion Zone Sites

Item Number	Specified Requirements	Status: No Veg, Interim, Permanent	Remarks
1.	Upon examination of the subject area, indicate the vegetative status of the area.		See comments
2.	If the area has been vegetated with permanent, or an interim seed mix, perform a transect evaluation of the existing vegetation. This inspection shall be performed with an optical sighting device and should include the following vegetation features: bare soil, rock, litter, standing dead, cryptograms, and a listing of live plants by species. Document the results of the transect evaluation in the comments section of this form.		
3.	Upon completion of this inspection forward the results of this 5-year inspection to the responsible FWS representative for action, if required.		

Comments: Several sites were located in the Eagle Nest Area Exclusion zone and were not inspected due to U.S. Fish and Wildlife Service protection policies for the nesting eagles and nestlings. These sites include: Section 32 BT 32-4,5,6,7; Section 32 ESA 2a-7; Section 6 Burial Trenches (~4 acres total); Section 6 Toxic Storage Yard Soil Remediation (27 acres); Section TRER 6EC-4 (~10 acres); Section 5 Toxic Storage Yard Soil Remediation (~2 acres).

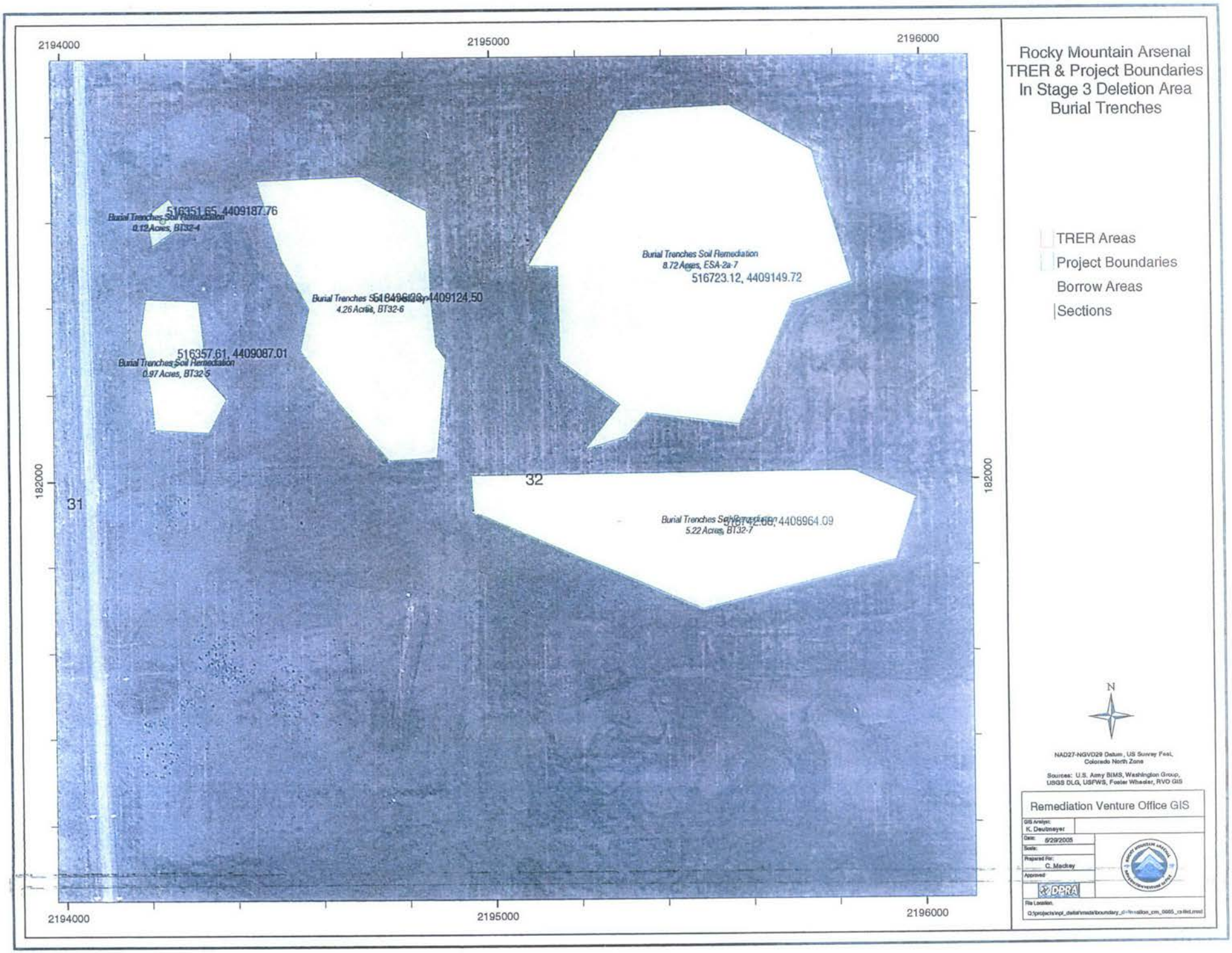
Inspection Team Members

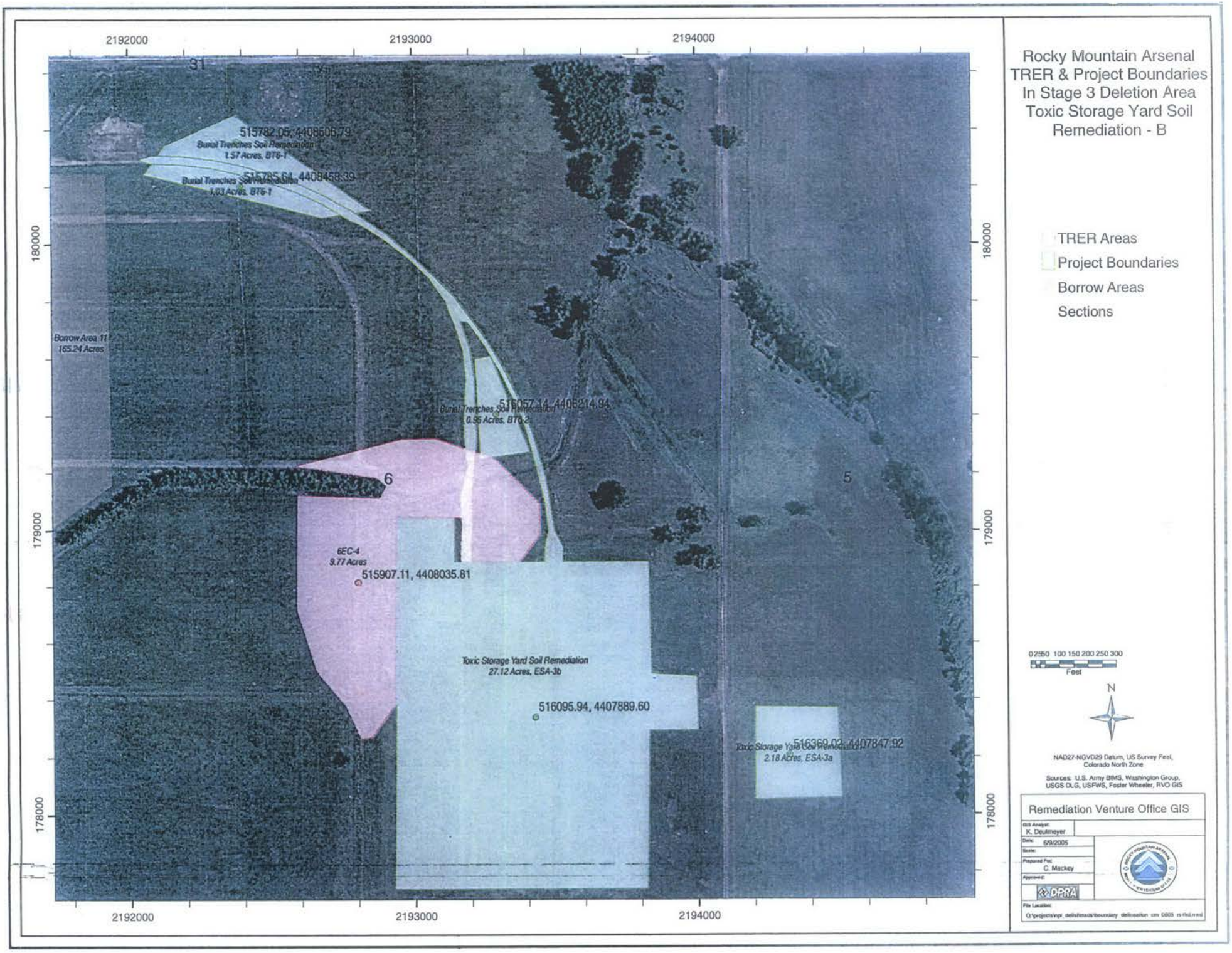
Carl Mackey, RVO team leader

Denise Arthur, ESCO representing EPA

Reviewed by

Date


2194000
2195000
2196000
182000
31
32
516351.65, 4409187.76
Burial Trenches Soil Remediation
0.12 Acres, BT32-4
Burial Trenches Soil Remediation
4.26 Acres, BT32-6
516357.61, 4409087.01
Burial Trenches Soil Remediation
0.97 Acres, BT32-5
Burial Trenches Soil Remediation
8.72 Acres, ESA-2a-7
516723.12, 4409149.72
Burial Trenches Soil Remediation
5.22 Acres, BT32-7
4408964.09
Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Burial Trenches
TRER Areas
Project Boundaries
Borrow Areas
Sections
N
NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone
Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS
Remediation Venture Office GIS
GIS Analyst:
K. Deutmeyer
Date: 5/29/2005
Scale:
Prepared For:
C. Mackey
Approved
DDRA
File Location:



Rocky Mountain Arsenal
TRER & Project Boundaries
In Stage 3 Deletion Area
Toxic Storage Yard Soil
Remediation - B

- TRER Areas
- Project Boundaries
- Borrow Areas
- Sections

0 25 50 100 150 200 250 300
Feet

N

NAD27-NGVD29 Datum, US Survey Feet,
Colorado North Zone

Sources: U.S. Army BIMS, Washington Group,
USGS DLG, USFWS, Foster Wheeler, RVO GIS

Remediation Venture Office GIS

GIS Analyst:	K. Deulmeyer
Date:	6/9/2005
Scale:	
Prepared For:	C. Mackey
Approved:	
	DPRA
File Location:	O:\projects\rvpr_delis\mxds\boundary_deliseation_cm_0605_rs-tfs1.mxd

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Rocky Mountain Arsenal	**Date of inspection:** April 27, 2005
Location and Region: Complex (Army) Trenches Slurry Wall and Extraction Trench	**EPA ID:**
Agency, office, or company leading the five-year review: United States Army	**Weather/temperature:** Windy/Dry/55°F

Remedy Includes: (Check all that apply)

~~G Landfill cover/containment~~
~~G Access controls~~
~~G Institutional controls~~
~~G Groundwater pump and treatment~~
~~G Surface water collection and treatment~~
~~G Monitored natural attenuation~~
~~G Groundwater containment~~
G Vertical barrier walls
G Other Extraction Trench and Extraction Well

Attachments: G Inspection team roster attached ~~G Site map attached~~

II. INTERVIEWS (Check all that apply)

1. ~~O&M site manager~~ Kelly Cable (Name) — RVO Construction Coordinator (Title) — April 27, 2005 (Date)
   Interviewed G at site G ~~at office~~ G ~~by phone~~ Phone no. (303) 853-3952
   Problems, suggestions; G Report attached Please see attached report.

2. ~~O&M staff~~ Brian Brow (Name) — RVO Quality (Title) — April 27, 2005 (Date)
   Interviewed G at site G ~~at office~~ G ~~by phone~~ Phone no. (303) 286-4838
   Problems, suggestions; G Report attached Please see attached report.

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Environmental Protection Agency
Contact Laura Williams (Name) Team Leader (Title) April 27, 2005 (Date) (303) 312-6660 (Phone no.)
Problems; suggestions; G Report attached Please see attached report.

Agency PWT (EPA) Contractor
Contact Phil Stark (Name) Contractor (Title) April 27, 2005 (Date) (303) 274-5400 (Phone no.)
Problems; suggestions; G Report attached Please see attached report.

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

None

VIII. VERTICAL BARRIER WALLS

G Applicable G N/A

1. **Settlement** ~~G Location shown on site map~~ G Settlement not evident
   Areal extent N/A Depth N/A
   Remarks No settlement evident.

2. **Performance Monitoring** Type of monitoring Water Level Monitoring
   G Performance not monitored
   Frequency Quarterly G Evidence of breaching
   Head differential
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G ~~N/A~~

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G ~~N/A~~

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G ~~Needs Maintenance~~ G ~~N/A~~
   Remarks _____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G ~~Needs Maintenance~~
   Remarks _____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks Not reviewed.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

See attached report.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

See attached report.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. None

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None identified.

Complex (Army) Trenches Slurry Wall Inspection
April 27, 2005

Kelly Cable

An inspection of the Complex (Army) Trenches slurry wall and extraction trench was performed on April 27, 2005. Attendees included Laura Williams, USEPA; Phil Stark, USEPA Contractor; Brian Brow, RVO Quality; Kelly Cable, RVO Construction Coordinator. The condition of the slurry wall and the extraction trench were found to be good.

The following observations were made during the inspection.

1. Debris was observed inside the Complex (Army) Trenches slurry wall.
2. An apparently outdated sign indicating an asbestos dust hazard was observed.
3. The electrical panel for the extraction trench well was secured and locked.
4. All wells associated with the slurry wall and the extraction trench were clearly labeled.
5. The section 36 manifold vault was very well organized and components were clearly labeled.

The following information was requested.

1. A request was made to identify the frequency of the water level monitoring associated with the slurry wall.
2. Determine if an assessment has been completed since the CCR to document the effectiveness of the slurry wall and extraction trench. Make the document available to the regulatory agencies if it exists.
3. Determine in which plan the O&M requirements for the slurry wall and extraction trench reside.

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Five-Year Review Site Inspection Report
Complex Army Trenches Slurry Wall and Extraction System

Date of Inspection: April 27, 2005

Attendees:
Kelly Cable, RVO
Brian Brow, RVO QA
Laura Williams, EPA
Phil Stark, PWT

Notes and Observations:

Kelly Cable led the inspection of the Complex Army Trenches (CAT) slurry wall and extraction system. The site is located in Section 36 approximately 1,000 feet directly north of the Shell Trenches slurry wall project. The numbered paragraphs below document the information obtained from Kelly and Brian during the inspection/interview.

CAT Slurry Wall and Extraction System

1) The CAT slurry wall and groundwater extraction system consists of a vertical barrier wall (slurry wall) constructed in the alluvial aquifer portion of the confined flow system surrounding the complex trenches, and two extraction wells that are designed to dewater the area within the slurry wall. The objective is to physically isolate the trenches from groundwater via the slurry wall and also by lowering the water table below the bottom of the trenches. The average extraction rate from the dewatering trench is 2.5 gpm, with a maximum recorded recovery rate of 3.5 gpm.

2) Groundwater elevations are monitored in three well pairs located inside and outside the slurry wall. These paired wells monitor head differential to verify that dewatering is effective. Two monitoring wells, 36216 and 36217, are monitored to verify that the groundwater level remains below the bottom of the trenches.

Observations: The dewatering system was operating and the electric panel was latched but not locked.

3) The extraction wells and monitoring wells were inspected. Because the slurry wall is

below grade, it could not be inspected directly.

Observations: All wells were clearly labeled. Some surface debris, i.e. discarded pipe, was noted in the area inside the slurry wall. An outdated sign indicating "asbestos dust hazard" was observed.

Follow-up Actions Recommended for RVO:

1) Identify any reports that document slurry wall/dewatering performance (i.e., water level measurements and pumping rates) that document the effectiveness of the project.

2) Identify the Operations and Maintenance Plan that governs operation of the CAT system, including frequency of monitoring, modifications to the system, or repair requirements.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Hazardous Waste Landfill	**Date of inspection: April 23, 2005**
Location and Region: Section 26/RMA	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature: Partly cloudy, 60 degrees F, ground wet after recent rain**

Remedy Includes: (Check all that apply)

G Landfill cover/containment
G Access controls
G Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Monitored natural attenuation
G Groundwater containment
G Vertical barrier walls
G Other: Plugged sanitary sewer manholes and chemical sewer lines; markers and signs indicating location of the sanitary sewer line

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ (Name) _____ (Title) _____ (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. **(See list of attendees that has been attached to document participation in the inspection.)**

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

B. Other Site Conditions

Remarks

_____

_____

VII. LANDFILL COVERS G Applicable G N/A (Note: Landfill is currently under operation and the final cap/cover to be constructed as part of its closure is pending; therefore, only portions of this section are applicable to interim drainage features.)

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
   Remarks_____
   _____

7. **Bulges** G Location shown on site map G Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8.	**Wet Areas/Water Damage**	G Wet areas/water damage not evident	
	G Wet areas	G Location shown on site map	Areal extent_____
	G Ponding	G Location shown on site map	Areal extent_____
	G Seeps	G Location shown on site map	Areal extent_____
	G Soft subgrade	G Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** G Slides	G Location shown on site map	G No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	G Applicable	G N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	G Location shown on site map	G N/A or okay
	Remarks_____		
2.	**Bench Breached**	G Location shown on site map	G N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	G Location shown on site map	G N/A or okay
	Remarks_____		
C. Letdown Channels	G Applicable	G N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	G Location shown on site map	G No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	G Location shown on site map	G No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		
3.	**Erosion**	G Location shown on site map	G No evidence of erosion
	Areal extent_____	Depth_____	
	Remarks_____		

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remark Erosion damage , if any, are routinely repaired after major storm events.

3. **Outlet Works** G Functioning G N/A
   Remarks Ponded stormwater rarely reaches outlet

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable G N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks Interim vegetation on berm exterior; permanent vegetation in drainage channels.

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The hazardous waste landfill is constructed and operated to contain the hazardous waste generated by remediation activities conducted at the Rocky Mountain Arsenal. The HWL appears to be functioning with respect to its intended purpose of hazardous waste containment. The HWL is in the operations phase and does not contain some of the final cover and monitoring elements referenced by this inspection checklist.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Other Regulatory Agency Observations noted during the 5-Year Inspection:

1. Groundwater monitoring wells associated with HWL operation were not accessible for inspection owing to the wet ground conditions.

2. Portions of the chain link at the bottom of the enclosure of the decontamination sump was observed to be mangled.

3. A piece of tire (approx. 8"x8") noted by the regulatory agencies as debris was found near the outfall of the Stormwater Detention Basin.

4. The lack of wildlife within the confines of the perimeter chain link fence was noted by the regulatory agencies.

5. The regulatory agencies noted the exemplary performance of HWL operation, particularly during the peak loading of over 700 trucks per day.

6. In addition to the above observations that were noted by the RVO, the U.S. Environmental Protection Agency also provided a listing of observations that is attached to this inspection checklist.

List of Attendees:

Name	Organization
Leo Chen	Remediation Venture Office
Trey Mangers	Tetratech Foster Wheeler
Josh Thall	Tetratech Foster Wheeler
Ian Roberts	Tetratech Foster Wheeler
Swain Skeen	Tetratech Foster Wheeler
Brad Coleman	Sentinel Engineering
Brian Hlavacek	Tri-County Health Department
Laura Williams	U.S. Environmental Protection Agency
Phil Stark	Pacific Western Technology
Steve Singer	Pacific Western Technology
John Stetson	Pacific Western Technology

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Five-Year Review Site Inspection Report
Hazardous Waste Landfill

Date of Inspection: April 21, 2005

Attendees:
Leo Chen, RVO
Trey Mangers, PMC
Josh Theall, PMC
Ian Roberts, PMC
Swain Skeen, PMC
Brad Coleman, Sentinel (CDPHE)
Brian Hlavacek, TCHD
Laura Williams, EPA
Phil Stark, PWT
Steve Singer, PWT
John Stetson, PWT

Notes and Observations:

Leo Chen led the inspection of the Hazardous Waste Landfill (HWL). The inspection team met at the HWL Operations Building at 8:30am. Leo distributed two handouts: "HWL Operations 5 Years in Review;" and three 11"x17" drawings of the HWL. Trey Mangers, Josh Theall, and Ian Roberts, all with PMC, gave a presentation of HWL operations (summarized below) using the handouts as references. There was a short question and answer period followed by the physical inspection. The numbered paragraphs below document the information obtained during the inspection/interview.

PMC Presentation and Question and Answer Period

1) The first load of waste was received at the HWL on May 1999; interim operations began in June 2004. The largest project generating waste to the HWL was the South Plants Balance of Areas which shipped 29,554 loads.

2) The HWL is currently in Phase 4 and will complete the installation of the interim cover for Phase 4 by the end of this year. The interim cover consists of 18 inches of soil placed over the compacted human health exceedance (HHE) soil (95% Modified Proctor compaction density); a geotextile layer over the soil cover; and a top layer of 6 inches of gravel that will become the landfill gas collection layer in the final cover.

3) The HWL has a design capacity of 1,796,896 bank cubic yards (bcy) and has a remaining volume of 47,610 bcy. The HWL is a double-lined, RCRA-compliant facility that will have a RCRA Subtitle C cover. Leachate, storm water, and decon water are treated at the Landfill Wastewater Treatment System (LWTS) (inspected April 21, 2005).

4) During peak operations as many as 3 to 5 trucks per minute were processed through the gate. This was possible because of the use of handheld portable PCs (Itronix tablet PCs), which were used to collect and enter field data and to plot waste loads from cradle to grave.

5) Leo explained that there are strict waste acceptance criteria: debris from contaminated structures must be sized less than 18 inches, and then is placed in 5-foot lifts for triple-pass compaction. The exception was some oversize North Plants equipment that was grouted before placement.

6) Leo stated that water from spring rains is being collected under Cell 1 via four leachate sumps, but that the volume is slowly decreasing since placement of the intermediate cover.

7) Leo provided copies of the CDPHE RCRA inspection reports for the HWL and the LWTS.

Inspection of the HWL and Associated Structures

1) Due to 0.6 inches of rainfall the previous evening, the HWL could not be inspected directly. Leo said the west ramp was too slippery for safe access by vehicles or pedestrians. Landfill operations were closed down for the day due to the rainfall.

2) The decon station located inside the HWL gate was checked by the inspection team.

Observations: The chain link fence around the sump was bent at the bottom which could allow access of debris or animals to the decon sump.

3) The inspection team drove to the detention basin, an unlined earthen structure that receives clean storm water that has been diverted around the HWL operations. It is designed for a 24-hour, 100-year storm event. The basin has not discharged since it first opened. A vegetative cover has since been established, and water collects in the area of the intake and infiltrates into the soil.

Observations: Some silt was noted in the storm water perimeter ditches leading from the ELF construction area to the detention basin. The earthen berms and the bottom of the detention basin

had a vegetative cover and there were no signs of erosion. Some debris was found in the area of the outfall structure.

4) The inspection team looked at one of the leak detection system access manholes outside the HWL fence northeast of Northern SQI Drive.

Observations: The access manhole was not locked. An identification sign was not attached to the leak detection manhole, and was found lying on the ground near the manhole. An excavation hazard warning sign was broken at the base and found lying on the ground. A monitoring well was observed in the vicinity that was capped and locked.

Follow-up Actions Recommended for RVO: None.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Landfill Wastewater Treatment System	**Date of inspection: April 23, 2005**
Location and Region: Section 25/RMA	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature: Partly cloudy, 60 degrees F, ground wet after recent rain**

Remedy Includes: (Check all that apply)

G Landfill cover/containment
G Access controls
G Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Other: Landfill leachate, stormwater and decontamination wastewater collection and treatment
G Monitored natural attenuation
G Groundwater containment
G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lammers (Name) Operations Manager (Title) April 23, 2005 (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. **(See list of attendees that has been attached to document participation in the inspection.)**

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
G Good condition G All required wells properly operating G Needs Maintenance G N/A
Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
G Good condition G Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable G N/A

1. **Collection Structures, Pumps, and Electrical**
G Good condition G Needs Maintenance
Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
G Good condition G Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**
G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks_____

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
G Metals removal G Oil/water separation G Bioremediation
G Air stripping G Carbon adsorbers
G Filters Two-stage bag filtration
G Additive (*e.g.*, chelation agent, flocculent) Hydrogen peroxide for chemical oxidation and sulfuric acid for pH adjustment
G Others UV/Oxidation, Activated Alumina Adsorption
G Good condition G Needs Maintenance
G Sampling ports properly marked and functional
G Sampling/maintenance log displayed and up to date
G Equipment properly identified
G Quantity of groundwater treated annually_____
G Quantity of ~~surface water~~ wastewater treated annually Approximately 9,000,000 gallons
Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
G N/A G Good condition G Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
G N/A G Good condition G Proper secondary containment G Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
G N/A G Good condition G Needs Maintenance
Remarks

5. **Treatment Building(s)**
G N/A G Good condition (esp. roof and doorways) G Needs repair
G Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks Two (2) wells were inspected and noted to be representative of other monitoring wells.

D. Monitoring Data

1. Monitoring Data
G Is routinely submitted on time G Is of acceptable quality

2. Monitoring data suggests:
G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The landfill wastewater treatment system is intended to treat the wastewaters generated by operation of the Hazardous Waste Landfill. The discharge from the treatment system monitored according to the requirements established under the CERCLA Compliance Document prior to its discharge to Outfall 001.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Other Regulatory Agency observations noted during the 5-Year Inspection:

1. A plastic utility marker located on the east side of the D-Street across from the SQI building was noted to be broken and laying on the ground.
2. A name plate marking a leak detection access cover was noted to be loose and not attached to the cover.
3. The Regulatory Agencies generally noted the overall excellent condition of the treatment facility.
4. In addition to the above observations that were noted by the RVO, the U.S. Environmental Protection Agency also provided a listing of observations that is attached to this inspection checklist.

List of Attendees:

Name	Organization
Leo Chen	Remediation Venture Office
Gayle Lammers	Washington Group
Trey Mangers	Tetratech Foster Wheeler
Brad Coleman	Sentinel Engineering
Brian Hlavacek	Tri-County Health Department
Laura Williams	U.S. Environmental Protection Agency
Phil Stark	Pacific Western Technology
Steve Singer	Pacific Western Technology
John Stetson	Pacific Western Technology
Levi Todd	Centinome Environmental

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Five-Year Review Site Inspection Report
Hazardous Waste Landfill Leachate Wastewater Treatment System

Date of Inspection: April 21, 2005

Attendees:
Leo Chen, RVO
Gayle Lammers, Operations Supervisor, Washington Group
Trey Mangers, PMC
Brad Coleman, Sentinel (CDPHE)
Brian Hlavacek, TCHD
Laura Williams, EPA
Phil Stark, PWT
Steve Singer, PWT
John Stetson, PWT
Levi Todd, CEI

Notes and Observations:

Leo Chen and Gayle Lammers led the inspection of the Hazardous Waste Landfill Leachate Wastewater Treatment System (LWTS) treatment plant. The numbered paragraphs below document the information obtained during the inspection/interview.

LWTS Equalization Basins

1) The LWTS treats leachate, storm water, and decon water from HWL operations in batch flow mode. The influent is held prior to treatment in a 4.2 million gallon (MG) equalization basin which is double-lined with leak detection. A floating cover on the influent basin has been installed for wildlife protection. A second, uncovered equalization basin of the same size and construction holds treated effluent until sampling results are received prior to discharge to First Creek. Samples are collected every 30,000 gallons. If treated water does not meet discharge requirements, it can be pumped into the influent basin for further treatment.

Observations: The equalization basins are enclosed in a locked fence with warning signs. Weeds were observed growing in soil/water trapped in the protective cover in the shallow part of

the influent basin. Two monitoring wells are located outside the fence between the basins and the LWTS treatment plant. Both wells had locked casings.

LWTS Treatment Plant

1) The LWTS is operated in batch mode and has piping and valving that allows the treatment train to be selected for the chemical characteristics of the influent. The LWTS treats 7 MG to 9 MG of wastewater per year during operations.

2) The treatment processes at the LWTS include:
- pH adjustment with 10% sulfuric acid. The sulfuric acid is stored in carboys within a secondary containment area.
- Two-stage bag filtration (5-μm and 1-μm) for removal of particulates.
- Ultraviolet (UV) oxidation for removal of organics. The UV oxidation unit has eight lamps and uses hydrogen peroxide as the oxidant. The lamps are cleaned automatically once per day. Hydrogen peroxide is stored in a tank outside the building and pumped into the UV oxidation system as needed.
- Air stripping for removal of volatile organics. The air stripper has five trays and the stripper exhaust is treated through two vapor phase granular activated carbon (GAC) adsorption vessels.
- Activated alumina adsorption for arsenic removal.
- Aqueous phase GAC adsorption for removal of organics. Two GAC vessels each hold 2,000 pounds of GAC and are operated in series in down flow mode. The GAC canisters are mounted on skids and are removed to the NBCS for change out of the carbon. The vessels are changed out every 2.5 MG on average.
- Oil and water separation to treat the effluent to meet oil and grease discharge limits. A single filtration unit contains 25 polypropylene filter cartridges.
- Ion exchange will be added to treat heavy metals in the storm water and decon water that will be discharged from the Enhanced Hazardous Waste Landfill (ELF). The LWTS will not treat leachate from the ELF. Leo Chen said that current plans are to truck the leachate to a licensed disposal facility as is currently done with the Basin F Wastepile leachate.

Leo stated that the air-stripping unit has not been needed and is currently off-line. The activated alumina unit was removed to a corner of the building in preparation for replacement of the activated alumina treatment media.

Observations: The treatment facility was clean and in very good condition. No leaks or spills were observed. Floor drains collect any spills and direct then to a sump where the water is pumped to the influent equalization basin.

3) Gayle Lammers demonstrated the computer-controlled process software on a desktop computer in the control room. Operation and maintenance (O&M) records were also inspected at that time.

Observations: The original O&M manual dated January 1999 was available for inspection.

Updates are documented with O&M bulletins. The LWTS daily logbook, Volume 11, start date 1/11/05, was open and available for inspection. Entries appeared to be current. Design change notices (DCNs) for changes to the physical construction of the LWTS are maintained elsewhere.

Follow-up Actions Recommended for RVQ:

1) Identify the DCNs that document changes or modification to the operation of the LWTS over the last five years.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Chemical and Sanitary Sewer Plugging Project	**Date of inspection: May 2, 2005**
Location and Region: Section 25, 35 and 36/RMA	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature: Partly cloudy, 55 degrees F, ground wet after recent rain**

Remedy Includes: (Check all that apply)

G Landfill cover/containment
G Access controls
G Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Monitored natural attenuation
G Groundwater containment
G Vertical barrier walls
G Other: Plugged sanitary sewer manholes and chemical sewer lines; markers and signs indicating location of the sanitary sewer line

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Leo Chen — Project Manager — May 2, 2005
   Kelly Cable — Construction Manager — May 2, 2005
   Name — Title — Date
   Interviewed G at site G at office G by phone Phone no. 303-853-3954 (Leo) 303-853-3952 (Kelly)
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name — Title — Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. **(See list of attendees that has been attached to document participation in the inspection.)**

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes G No G N/A

Site conditions imply ICs not being fully enforced G Yes G No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____

Frequency _____

Responsible party/agency _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date G Yes G No G N/A

Reports are verified by the lead agency G Yes G No G N/A

Specific requirements in deed or decision documents have been met G Yes G No G N/A

Violations have been reported G Yes G No G N/A

Other problems or suggestions: G Report attached

_____

_____

_____

_____

2. **Adequacy** G ICs are adequate G ICs are inadequate G N/A

Remarks _____

_____

_____

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident

Remarks _____

_____

2. **Land use changes on site** G N/A

Remarks _____

_____

3. **Land use changes off site** G N/A

Remarks _____

_____

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A

Remarks _____

_____

B. Other Site Conditions

Remarks Inspections were performed of: plugged sanitary sewer manholes and chemical sewer lines; and markers and signs indicating the location of sanitary sewer lines.

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
   Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy was implemented to plug sanitary sewer manholes and chemical sewer lines/manholes to prevent their potential for serving as contaminant migration pathways in the future.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Other regulatory agency observations noted during the 5-Year Inspection:

1. A dirt-filled cistern that was apparently unrelated to the sanitary sewer system was marked as Manhole No. 46 that duplicated the identifier given to another sanitary sewer manhole with a brass plaque.
2. A regulator agency request was made of the annual inspection work orders and reports generated by the PMC.
3. A regulatory agency request was made to document the commitment that resulted in the PMC's annual inspection of the signs and markers of the sanitary sewer manholes.
4. Manholes A, B and C could not be located in the one foot backfill area along the southwest perimeter of the 3-foot cover area. Investigations will be performed to determine whether these manholes and associated sewer lines were removed as part of the South Plants soil remediation. Above ground marking will be required if these manholes still exist and are only obscured below gradefill.
5. An investigation will be performed to verify that the appropriate ROD actions have been implemented with respect to the Process Water Sewer Manholes.

6. A regulatory agency observation was noted of an active manhole along the west side of D-Street approximately 1,000 feet south of the intersection of D-Street and 8th Avenue. The utility with which the manhole was associated could not be readily identified.

7. In addition to the above observations that were noted by the RVO, the U.S. Environmental Protection Agency also provided a listing of observations that is attached to this inspection checklist.

List of Attendees:

Name	Organization
Leo Chen	Remediation Venture Office
Kelly Cable	Remediation Venture Office
Barb Nabors	Colorado Department of Health and Environment
Marty Kosec	Sentinel Engineering
Brian Hvalacek	Tri-County Health Department
Laura Williams	U.S. Environmental Protection Agency
John Stetson	Pacific Western Technology

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http://www.epa.gov/region08

Five-Year Review Site Inspection Report
Sanitary Sewer Manhole and Chemical Sewer Plugging Project

Date of Inspection: May 2, 2005

Attendees:

Leo Chen, RVO
Kelly Cable, RVO
Barb Nabors, CDPHE
Marty Kosec, Sentinel
Brian Hvalacek, TCHD
Laura Williams, EPA
John Stetson, PWT

Notes and Observations:

Pre-Inspection Meeting: The inspection team met in the Building 111 conference room for a pre-inspection briefing. Leo Chen distributed several handouts, including:

- The site inspection checklist from the EPA guidance
- Page 9-6 and Table 9.5-1 of the On-Post ROD which describe the remedy and the remediation goals and standards for the sanitary and chemical sewers
- Section 02440 of the project specifications which describe the sanitary sewers signs and markers; and
- A set of record drawings showing the locations of the sewer manholes and details of the sewer plugging and manhole markers.

Kelly Cable stated that the maximum depth of excavation at the central processing area was five feet and that there are currently no markers pending installation of the South Plants cover. At South Plants, there should be markers for manholes outside the planned area for the 3-ft cover, but these may have been covered in grading for storm water controls. Leo identified that PMC inspects the manholes annually. The inspections are part of an operations and maintenance (O&M) program that were an outcome of the last five-year review in response to the number of broken markers discovered. The numbered paragraphs below document the information obtained during the rest of the inspection/interview.

Field Inspection:

1) The inspection team drove to the southern end of the South Plants gradefill and walked northwest in the direction of the manholes shown on the map. Monitoring wells were seen with protective posts around them, but no manholes or manhole markers were observed. Kelly speculated that a deep cut was required at the southern end of South Plants to get surface water to drain properly and that it's possible the sewers and manholes were removed.

Observations:

No manholes or above-ground markers were found.

2) The inspection team checked plugged manholes on the sanitary sewer line originating from South Plants where it crosses D Street in Section 35 to where it forms a T-junction into another sewer line in the northeast corner of Section 35.

Observations:

Manhole #79 was cemented and the brass plate was intact. The date on the plate was November 1977. The original 4-ft flexible marker was found broken off and lying on the ground. A replacement marker was installed in the ground adjacent to the manhole. Leo stated the original markers did not hold up well and many have been replaced with markers that have a more flexible base.

Manhole #78, approximately 400 feet from #79, was marked "MH #78" on the replacement 4-ft flexible marker, but the brass plate on the plugged manhole indicated #77 and #79. Leo stated upstream and downstream manhole numbers were to be used on brass markers only to mark the sewer line when there was no manhole within 1,000 feet. He also said that he thought the plate should have been labeled #78.

Manhole #77, approximately 200 feet from #78; the brass plate, cement and 4-ft replacement marker were intact and undamaged.

Manhole #76, approximately 250 feet from #77; the brass plate, cement and 4-ft replacement marker were intact and undamaged.

Manhole #75, approximately 200 feet from #76, was cemented but there was no brass plate attached. The 4-ft replacement marker was labeled "MH #75". Leo said the record drawings indicate the manhole was plugged under a previous contract, most likely a sanitary sewer plugging IRA performed in 1989 prior to the ROD. He said manholes were not required to be marked at that time.

Manhole #46 at the T-junction of the two sanitary sewer lines, approximately 200 feet from #75, had metal stakes around it to protect it during the Section 35 Soils Remediation Project. The brass plate, cement and 4-ft replacement marker were intact and undamaged. A second structure about 100 feet north of Manhole #46 also had a 4-ft marker labeled "MH #46". However, the structure wasn't shown on the record drawings, and is not similar in appearance to the other manholes.

Manhole #45, approximately 350 feet from #46; the brass plate, cement and 4-ft replacement marker were intact and labeled correctly.

The inspection team noted a manhole that was not abandoned on the west of D Street, north of where the sanitary sewer line crosses. Leo said that he was not sure, but thought it was not part of the sanitary sewer system.

3) The inspection team accessed the upstream segment of the sanitary sewer line from the back of the Hazardous Waste Landfill Leachate Wastewater Treatment System (LWTS) in Section 26, east of the Basin F Wastepile. The team walked the line from northeast to southwest.

Observations:
Manhole #25, located immediately west of the parking lot behind the LWTS; the brass plate, cement and 4-ft replacement marker were intact and undamaged.

Manhole #26, approximately 350 feet southwest of MH #25; the brass plate, cement and original 4-ft marker were intact and undamaged.

Manhole #27, approximately 350 feet west of MH #26; the brass plate, cement and 4-ft replacement marker were intact and undamaged.

Manhole #28, approximately 300 feet west of MH #27; the brass plate, cement and original 4-ft marker were intact and undamaged.

Manhole #29, approximately 300 feet southwest of MH #26; the brass plate, cement and 4-ft replacement marker were intact and undamaged.

At the location of Manhole #30 on the map, approximately 250 feet southwest of MH #29, a 4-ft replacement marker was planted in the ground and labeled "MH #30", but no manhole was found. Leo said that he thought this was in an area of tilling associated with the Basin F Exterior Soil Remediation Project, and that the manhole may be buried.

At the locations of Manholes #31, #31A and #32, located to the south of MH #30 and about 200 feet apart, 4-ft markers were observed, but there were no manholes observed.

Follow-up actions recommended for RVO:

1) For the South Plants sanitary sewer manholes, identify the final disposition of those manholes that could not be located prior to the demolition project because of their proximity to buildings or location under concrete slabs. Provide citations for the reports which document the disposition of these manholes. Verify the disposition of the manholes shown on the record drawings in the southern end of the South Plants area and east of the Basin F Wastepile.

2) Identify the unabandoned manhole on the west side of D Street north of the sewer crossing.

3) Provide a copy of the manhole inspection reports.

4) Provide the RVO's final assessment/explanation for MH #78 which was labeled as both MH #77 and #79.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Rocky Mountain Arsenal	**Date of inspection:** May 2, 2005
Location and Region: Lake Ladora Dam	**EPA ID:**
Agency, office, or company leading the five-year review: United States Army	**Weather/temperature:** 50°F/Cloudy/Calm

Remedy Includes: (Check all that apply)

~~G Landfill cover/containment~~ ~~G Monitored natural attenuation~~
~~G Access controls~~ ~~G Groundwater containment~~
~~G Institutional controls~~ ~~G Vertical barrier walls~~
~~G Groundwater pump and treatment~~
~~G Surface water collection and treatment~~
G Other Lake Ladora Dam

Attachments: ~~G Inspection team roster attached~~ ~~G Site map attached~~

II. INTERVIEWS (Check all that apply)

1. ~~**O&M site manager**~~ Kelly Cable (Name) RVO Construction Coordinator (Title) May 2, 2005 (Date)
   Interviewed G at site G ~~at office~~ G ~~by phone~~ Phone no. _____
   Problems, suggestions; G Report attached See attached form.

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA
Contact Laura Williams (Name) | EPA Team Leader (Title) | May 2, 2005 (Date) | (303) 312-6660 (Phone no.)
Problems; suggestions; G Report attached See attached report.

Agency EPA Contractor (PWT)
Contact John Stetson (Name) | _____ (Title) | May 2, 2005 (Date) | (303) 274-5400 (Phone no.)
Problems; suggestions; G Report attached See attached report.

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone no.)
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ (Name) | _____ (Title) | _____ (Date) | _____ (Phone no.)
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

An inspection of Lake Ladora Dam was performed since the dam is instrumental in ensuring that lake levels are maintained as required by the Record of Decision. Generally the Dam appeared to be in good condition with no signs of settlement, cracking or erosion. It was not apparent that the outlet structure controls were locked.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

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Five-Year Review Site Inspection Report
Lake Ladora Dam Reconstruction Project

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Date of Inspection: May 2, 2005

Attendees:

Kelly Cable, RVO
Laura Williams, EPA
John Stetson, PWT

Notes and Observations:

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The inspection team departed from Building 111 and accessed Lake Ladora from the rear of the U.S. Fish & Wildlife Visitors Center. The lake is accessible to the public from the Visitor's Center and is used for fishing. Hiking trails originating form the Visitor's Center pass below the dam and around the south side of the lake. The numbered paragraphs below document the information obtained during the rest of the inspection/interview.

1) Kelly Cable stated the original dam was rebuilt in 1997 to 1998 after the Corps of Engineers had inspected the dam and found that it didn't meet safety standards. The Army then rebuilt the earthen dam and the discharge structure and constructed an overflow channel. The inspection team examined the road across the dam and the embankments for any cracks or signs of structural damage. They then walked to the south shore of the lake and observed the overflow channel.

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Observations:

The road and dam embankments were in good condition and well maintained. There were no signs of cracks or other damage. The surface of the dam embankment is covered with riprap. No erosion problems were observed.

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The handle to the gate valve was observed lying on the floor of the discharge structure next to the valve.

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It was not apparent whether the gate to the catwalk leading out to the discharge structure was locked and properly secured. No chain or lock was observed from the road.

A utility marker labeled "Buried electrical cable" was observed lying on the ground on the south end of the dam and on the west side of the road.

Follow-up Actions for RVO:

1) Verify if the gate to the discharge structure is locked and properly secured.

2) Provide documentation of dam inspections and maintenance actions in the past five years.

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Site Inspection Checklist

I. SITE INFORMATION	
Site name: Rocky Mountain Arsenal - INSTITUTION CONTROLS	**Date of inspection: 05/10/2005**
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature: Mostly sunny, 70F**

Remedy Includes: (Check all that apply)

G Landfill cover/containment
G Access controls
G Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Monitored natural attenuation
G Groundwater containment
G Vertical barrier walls
G Other_____

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency **Tri-County Health Department**
Contact **Dan Collins** (Name) | **EH RMA Field Sup.** (Title) | **5/10/2005** (Date) | **303-288-6816** (Phone no.)
Problems; suggestions; G Report attached **See attached recommendation**

Agency **EPA**
Contact **Laura Williams** (Name) | **Team Leader** (Title) | **5/10/2005** (Date) | **303-312-6660** (Phone no.)
Problems; suggestions; G Report attached **See Attached EPA Report**

Agency **EPA**
Contact **Catherine Roberts** (Name) | **FYR Coordinator** (Title) | **5/10/2005** (Date) | **303-612-6020** (Phone no.)
Problems; suggestions; G Report attached **See Attached EPA Report**

Agency **Colorado Department of Public Health and Environment**
Contact **Barbara Nabors** (Name) | **Project Manager** (Title) | **5/10/2005** (Date) | **303-692-3393** (Phone no.)
Problems; suggestions; G Report attached **None**

4. **Other interviews** (optional) G Report attached.

Agency: **PWT/EPA**

Contact: **John Stetson** Title: **Environmental Engineer** Date: **5/10/2005** Phone no. **303-274-5400**

Problems/Suggestions/Report: **See Attached EPA Report**

Agency: **PWT/EPA**

Contact: **Dave Munger** Title: **Field Oversight Inspector** Date: **5/10/2005** Phone no. **303-881-8084**

Problems/Suggestions/Report: **See Attached EPA Report**

IV. O&M COSTS

1. **O&M Organization**

G State in-house G Contractor for State
G PRP in-house G Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other_____

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A

Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A

Remarks Some RMA Refuge boundary signs yet to be installed – work in progress; recommend consistent signage for remedy projects (e.g. Basin A, water treatment plants, etc.)

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes **G No** G N/A

Site conditions imply ICs not **in accord w/ site IICP;** **G Yes** G No G N/A

3-tiered access control uncertain

Type of monitoring (*e.g.*, self-reporting, drive by) **drive by, no specific plan**

Frequency **periodic internal monitoring**

Responsible party/agency **U.S. Army and U.S. Fish and Wildlife Service**

Contact **Tom Jackson** (Name) **Remedy Coordinator** (Title) **5/10/2005** (Date) **303-289-0538** (Phone no.)

Reporting is up-to-date G Yes G No **G N/A**

Reports are verified by the lead agency **(trespass rpts. & fence repair)** **G Yes** G No G N/A

Specific requirements in deed or decision documents have been met **G Yes** G No G N/A

Violations have been reported G Yes G No **G N/A**

Other problems or suggestions: G Report attached

See Attached EPA Report

2. **Adequacy** **G ICs are adequate** G ICs are inadequate G N/A

Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident

Remarks **Reported trespass cases are being handled by ongoing investigations by local law enforcement authorities**

2. **Land use changes on site** G N/A

Remarks **Western Tier Parcel deleted from NPL, transferred to GSA, and sold to Commerce City; RMA Refuge established officially on 4/17/2004**

3. **Land use changes off site** G N/A

Remarks **Significant residential and commercial development growth in areas south and southeast (Denver) and north and northeast (Commerce City) of the site**

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A

Remarks

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Five-Year Review Site Inspection Report
Interim Institutional Control Plan (IICP)

Date of Inspection: May 10, 2005

Attendees:
Tom Jackson – USFWS
Laura Williams, Catherine Roberts – EPA
Barb Nabors – CDPHE
Dan Collins – TCHD
John Stetson, Dave Munger – PWT (EPA Contractor)

Notes and Observations:

Pre-Inspection Meeting: A pre-inspection meeting was held in the Building 111 conference room. Tom Jackson handed out an agenda of items for the inspection that included:

Perimeter Fence
Trespassing notification
SafeRac permits
Site SSA-3b and other deep acute site locations
PMC CRA Access Control Procedures/modifications
Installation of signs per agreement for future deletions
Appendix G: Interim Plan for Weekend Visitors
- Odor Monitoring Procedures
- Emergency Response
- Gated Roads
- South Gate
- Signs
- Sand Creek Lateral
- Wildlife Management Plan

Laura Williams clarified some of the items that EPA wanted included in the inspection including the triple access controls at RMA – the perimeter fence, the Central Remediation Area (CRA) boundary, and the interior exclusion zone boundaries; and the

fence and access gates along the deleted Western Tier Parcel Boundary. Tom Jackson identified that a gate is also planned for the northwestern corner of this fence to allow construction access for installation of a new transmission line north from the Klein Water Treatment Plant and this was added to the inspection.

Catherine Roberts asked whether the RVO would use EPA's draft guidance on institutional controls and Tom confirmed that the draft guidance would be used for the FYR report. Part of the guidance includes whether self-assessments of institutional controls has been conducted in the past, Tom felt that the (computerized) SafeRac work control permits perform part of that function.

Tom indicated that a working draft Wildlife Management Plan (to be prepared by 2003 as stated in the IICP) is under review and will address the Service's concerns with controlling prairie dog intrusion on caps and covers. Current plans are to plant tall species, such as rabbit brush, at the edges of caps and covers to deter prairie dog intrusion; however, the Service will relocate populations if this is not successful. Tom said there have been discussions about introducing grazing animals, such as buffalo or cattle, to assist the establishment of short grass prairie species. The Service would prepare a specific management plan if this action were formally proposed. The FYR report should document that a Wildlife Management Plan does not presently exist.

The numbered paragraphs below document the information obtained from Tom during the rest of the inspection/interview.

Field Inspection:

1) The inspection team departed on the field inspection and stopped to question a survey crew working at the crossing of the Sand Creek Lateral and 7th Avenue about their SafeRac permit. They did not have a SafeRac permit with them; they stated they were working under the general SafeRac permit for the Sand Creek Lateral Project that is kept on file.

Observations: SafeRac permits do not appear to be issued to construction crews in a manner consistent with that described in the Interim Institutional Control Plan. Specific construction activities are issued SafeRac permits while general activities under a larger project may not be issued permits.

2) The inspection team turned into the Visitor Center and toured interior roads around the north side of Lake Ladora to the edge of the South Plants Remediation Area. Tom stated that visitors are prohibited on the north side of Lake Ladora. The inspection team observed four refuge boundary signs, in Spanish and English, placed on the north and east sides of the lake to warn visitors from straying past the refuge boundaries into the areas of South Plants and the Sand Creek Lateral.

Observations: Maps in the Interim Institutional Control Plan show eight refuge boundary signs on the north and east sides of Lake Ladora, but only four were observed on the tour.

3) The tour continued down the south side of the inlet stream to Lake Ladora. Two refuge boundary signs and buoy lines were suspended across the inlet to limit fishing access upstream. The tour stopped at Lower Derby Lake and Tom described the sediment removal program conducted several years ago. One area of deep acute sediments remains on the deep end of the lake. The tour continued up to 6th Avenue to Site SSA-3b, where several locations of subsurface, deep acute soil remain. The perimeter of the area was marked with refuge boundary signs reading "Area Beyond This Sign is Closed." When asked, Tom identified that the soil database that was to be developed as a record of buried contamination has not been completed.

Observations: At Site SSA-3b, the signs do not specify the nature of the hazard or that digging is prohibited.

4) The tour continued east on 6th Avenue to the East Gate and the former Bald Eagle viewing area. The east gate was locked and no breaching of the gate or fence was observed. Tom explained that USFWS law enforcement personnel patrol the refuge boundary at least once a week. If any damage is noted in the boundary fencing, RVO is notified and a work order is prepared to make the repairs. Law enforcement personnel also patrol for intruders and issue trespassing citations if necessary. Only two instances of trespassing incidents that resulted in a citation have occurred over the past five years: in one, a person scaled the east fence; in the other, an automobile drove into a ditch in Section 36. If the Service determines that there has been "willful trespassing," a citation is issued requiring appearance in Federal court.

5) The inspection team returned via 6th Avenue across D Street toward the Western Tier parcel to inspect the fence. Three gates were inspected along the Western Tier boundary fenceline up to the west gate. When the fenceline was moved back for the Western Tier Parcel partial deletion, a new automated gate was installed. Tom explained that there were initial problems with the gate that caused traffic backups for workers. RVO has been working at preventing "piggybacking" at the gate, where more than one car passes through the gate at a time. A closed circuit camera has been installed to record offenses; the camera is not monitored real-time.

Observations: At the corner of 6th Avenue and D Street, the east-west fence is approximately 6 feet high, yet the newer north-south fence at the Western Tier boundary is 8 or 9 feet high. The locks on the three gates in the Western Tier boundary fence were installed on the outside instead of the inside. The closed circuit camera is not capable of preventing pedestrians or bicyclists from coming onto the Arsenal unobserved.

6) The inspection team returned to the Visitor Center area and observed the institutional controls for visitor access. Visitors are asked to sign in and out at the desk. A trail system map is available that lists three items under rules and regulations, one of which instructs visitors to stay on designated trails and obey posted signs. Three items are mentioned under emergency response procedures that relate to weather conditions and medical attention. Tom said that Service personnel and volunteers check to see that visitors remain in authorized areas. He stated that most violations are accidental

and are resolved by a ranger or volunteer speaking with the individual. Further, most visitors are interested in the lakes and trails south and east of the Visitor Center and do not wander north toward the Sand Creek Lateral.

Observation: There is the possibility that visitors could fail to sign in at the desk and walk undetected toward the historic Egli House which is about 50 feet away from the Sand Creek Lateral.

7) The inspection team walked from the Visitor Center to the Egli House on the north. The team walked up the driveway and observed the meteorological stations set up near the Egli House. They continued north about 50 feet to the edge of the Sand Creek Lateral where white pin flags were observed marking sampling locations for the Sand Creek Lateral Soil Remediation Project. Tom was asked how the Service planned to operate the Visitor Center during the Sand Creek project and other major remediation projects planned in the future; e.g., Basin F Wastepile. Tom said that they plan to shut down the Visitor Center for 2 to 3 weeks during the initial start up of the Basin F projects to evaluate the odor monitoring results and verify that it is safe to allow visitors to return. For the Sand Creek Lateral project, the Service would close the Visitor Center until remediation was complete south of 7th Avenue, which is anticipated to last 2 or 3 weeks. The center would reopen once the project moved north of 7th Avenue.

Observations: There is a sign on each of two trails off the road past the Visitor Center indicating the trails are closed to the public. There are no physical impediments such as fences or gates preventing access.

8) The tour resumed by driving out the South Gate and guard shack then back onto RMA to observe signs and other institutional controls visible to visitors entering by the South Gate. Inside the South Gate there was a road to the right with a Bald Eagle Management Area sign and an open gate. There was an open gate immediately beyond the Visitor Center driveway on C Street. According to Tom Jackson, this gate and others along C street are closed on weekends when the Visitor Center is open.

Observations: There are no warning signs prohibiting access onto RMA until the haul road approximately a half-mile beyond the Visitor Center gate, creating a potential for confusion to visitors.

9) The inspection team drove out the west gate to observe the fence line on the west and north boundaries of RMA. At the corner of Quebec and Highway 2 there was a damaged guardrail and the fence was pushed in, apparently from an earlier auto accident. The tour continued west on 96th Avenue along the northern boundary fence line and reentered RMA at the North Gate. There was a CERCLA sign inside the fence. The tour continued around the west and south sides of the Central Remediation Area (CRA) on 9th Avenue, E Street, and 7th Avenue passing the HWL, ELF, Basin A, Lime Basins and the former south guard shack location which

restricted entrance to the CRA. The team used a GIS map prepared by RVO (dated August 2004) to verify the types of signs and their location.

Observations: The use of RVO project signs at treatment facilities and remediation projects is inconsistent. A project sign is posted at the CERCLA WWTU but not at other groundwater treatment plants. Both the HWL and ELF are identified by project signs but Basin A and Lime Basins are not. An access control sign shown on the map at the intersection of D Street and 8th Avenue is missing, or not yet installed. The institutional control plan identified the north and south guard shacks as the second layer of control access for remediation areas. These guard shacks are no longer operating and have been physically removed.

Follow-up Actions Recommended for RVO:

1) Provide a copy of the access agreement or right-of-way agreement with the construction company that will be constructing the transmission line north from the Klein Water Treatment Plant within the Western Tier Parcel.

2) Check the RVO files for the SafeRac permit that covers surveying operations associated with the Sand Creek Lateral project. Verify whether operations affiliated with a larger construction project are covered under a general SafeRac permit and where the permit should be kept.

3) Identify any changes or modifications to the interim institutional control plan and provide written documentation to the Regulatory Agencies that enacted these changes.

4) Identify actions to be taken to prevent access by workers and the public to the Sand Creek Lateral project such as remediation project signs, trained personnel stationed at the Egli House to ensure adherence with signs, changes in maps handed to the public/workers, etc.

5) Identify a schedule for revising and finalizing a Wildlife Management Plan that is accepted by the Regulatory Agencies.

OFF POST TMT. SYSTEM O+M WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: OFF POST G.W. TREATMENT PLANT	**Date of inspection:** 4/18/2005
Location and Region: RMA REG - 8 EPA	**EPA ID:** CO5210020769
Agency, office, or company leading the five-year review: RMA	**Weather/temperature:** PARTLY CLOUDY, 65%

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- (Groundwater pump and treatment)
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) MGR TRTMT & MAINT. (Title) 4/18/05 (Date)
   (Interviewed at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** GAYLE LAMMERS (Name) TMT PLT OPNS SUPV (Title) 4/18/05 (Date)
   (Interviewed at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA
Contact LAURA WILLIAMS (Name) ____ (Title) 4/18/05 (Date) ____ (Phone no.)
Problems; suggestions; Report attached ____

Agency EPA
Contact STEVE SINGER (Name) ____ (Title) 4/18/05 (Date) ____ (Phone no.)
Problems; suggestions; Report attached ____

Agency CDPHE
Contact ED LAROCK (Name) ____ (Title) 4/18/05 (Date) ____ (Phone no.)
Problems; suggestions; Report attached ____

Agency TCHD
Contact MELODY MASCARENAS (Name) ____ (Title) 4/18/05 (Date) ____ (Phone no.)
Problems; suggestions; Report attached ____

4. **Other interviews** (optional) Report attached.

RICK BRADSLEE

IX. GROUNDWATER/~~SURFACE WATER~~ REMEDIES — Applicable / N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines — (Applicable) / N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   (Good condition) (All required wells properly operating) Needs Maintenance N/A
   Remarks LIMITED # EXTRACTION & RECHARGE WELLS WERE INSPECTED DUE TO ICE/SNOW. SOME WELL COVERS DID NOT HAVE ALL BOLTS. EPA NOTED NO LOCKS ON WELLS IN NORTHERN PATHWAY.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   (Good condition) Needs Maintenance
   Remarks SOME VALVE BOXES WERE LOCKED, SOME WERE NOT.

3. **Spare Parts and Equipment**
   Readily available (Good condition) Requires upgrade Needs to be provided
   Remarks COMMON SPARES KEPT ONSITE, OTHERS PURCHASED LOCALLY FROM DISTRIBUTOR

B. Surface Water Collection Structures, Pumps, and Pipelines — Applicable / (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

1. WELL CAPS NOT HARD BOLTED, NOR LOCKED
2. NOTED RODENTS & INSECTS ON SOME FIRST CREEK WELLFIELD.
2. SOME CONCRETE PADS HAD BURROWS REFILLED UNDER NEATH.

C. Treatment System (Applicable) N/A

1. **Treatment Train** (Check components that apply)
   Metals removal — Oil/water separation — Bioremediation
   Air stripping — (Carbon adsorbers)
   Filters INFLUENT & EFFLUENT FILTERS
   Additive (e.g., chelation agent, flocculent) N/A
   Others N/A
   (Good condition) — Needs Maintenance
   Sampling ports properly marked and functional YES
   Sampling/maintenance log displayed and up to date YES
   Equipment properly identified YES
   Quantity of groundwater treated annually 140,118,880
   Quantity of surface water treated annually N/A
   Remarks EFFLORESCENCE ON SOME SAMPLE PORTS

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A — (Good condition) — Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   N/A — (Good condition) — (Proper secondary containment) — Needs Maintenance
   Remarks FLOOR UNDER CLARIFIER. MULTIPLE SPILL QUESTION
   NOTE - FLOOR DRAINS CAPTURE ANY LEAKS OR SPILLS.

4. **Discharge Structure and Appurtenances**
   N/A — (Good condition) — Needs Maintenance
   Remarks RECTANGLE STRUCTURES IN GOOD CONDITION

5. **Treatment Building(s)**
   N/A — (Good condition (esp. roof and doorways)) — Needs repair
   Chemicals and equipment properly stored
   Remarks BOTH VALVES CORRODED (RUSTED) & SHOWED SEEPAGE, WHICH WAS PIPED INTO FLOOR DRAIN.

6. **Monitoring Wells** (pump and treatment remedy)
   (Properly secured/locked NOT) — (Functioning) — (Routinely sampled) — (Good condition)
   * All required wells located — Needs Maintenance — N/A
   Remarks WELLS INSIDE FENCE WERE NOT LOCKED, HOWEVER WELLS OUTSIDE FENCED AREA WERE LOCKED - EPA NOTED INCONSISTENCY

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time — Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained — Contaminant concentrations are declining

NOTE: PLANT IN GENERALLY GOOD CONDITION

* A LIMITED NUMBER OF WELLS WERE INSPECTED

NOTE: DESIGN DRAWINGS WERE IN BLDG, INSTEAD OF AS-BUILT DWGS.

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET- SUITE 300
DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

Five-Year Review Site Inspection Report
Off Post Groundwater Intercept and Treatment System

Date of Inspection: April 18, 2005

Attendees:
Tom James, RVO
Wes Erickson, RVO
Rick Beardsley, RVO
Brian Brow, RVO QA
Gayle Lammers, Operations Supervisor, Washington Group
Ed LaRock, CDPHE
Melody Mascarenaz, TCHD
John Stetson, PWT
Steve Singer, PWT
Laura Williams, EPA
Levi Todd, CEI

Notes and Observations:

Tom James and Gayle Lammers led the inspection of the Off-Post Groundwater Interception and Treatment System (OGITS) treatment plant, the eastern and western well fields of the Northern Pathway intercept system, and the well field for the First Creek intercept system. The numbered paragraphs below document the information obtained from Tom and Gayle during the inspection/ interview.

OGITS Treatment Plant

1) The treatment plant is staffed 10 hours per day Monday through Friday. Operators are on call after hours and weekends. When the plant began operation (c. 1990), influent DIMP levels ranged from 900 to 1,200 ppb. Current DIMP levels are in the range of 25 to 30 ppb.

2) The average flow treated at the OGITS treatment plant is 200 gpm. Each extraction well has its own flow meter, the output of which is sent to the control room. Flow data is downloaded into the water management program. Total flow values from the meters at the

plant are checked against the summation of the individual extraction well flows. There are low-level alarms on the influent tank and pump failure alarms. Alarms are checked quarterly.

3) The influent is pretreated through five (5), 100-μm bag filters. Prior to discharge to the injection wells, the effluent is polished through two (2), 5-μm to 10-μm bag filters.

4) Groundwater is treated through two (2), 50,000-pound granular activated carbon (GAC) adsorption vessels piped in series with a third adsorber held in reserve. The carbon is changed out when the effluent DIMP concentration equals the influent concentration. Changes have occurred every 8 months on average. Spent and fresh GAC are stored in tanks at the plant. No treatment chemicals are used or stored on-site.

5) The operations of the GAC were changed from upflow to downflow because of problems with channeling. In conjunction with this change, the decant and backwash tanks are no longer used. However, Tom or Gayle could not recall the dates that this change occurred although they were quite sure it was more than five years ago.

6) Tom James reported that there have been no other operational problems or upsets with the treatment plant. Floor drains capture any spills or leaks and route the water to a sump in the basin where it is pumped into a clarifier and sent back to the head of the plant.

Observations: The basement floor was stained black near the clarifier.

7) Discharge pressures and flows have remained relatively constant.

Observations: A flow meter on one of the pumps was pegged at 5 gpm, but the pump associated with that line was not running. Noted encrustation on influent bag filters and corrosion on the Roth valves for all three influent pump systems. Also noted that the weep lines from the Roth valves are leaving water on the floor. Scaling was also observed on the discharge pumps.

8) Sampling is conducted at intermediate points (such as between carbon vessels) and at the effluent once per month.

Observations: Scaling was observed on some sampling tubing, such as the tubing from the effluent of the bag filters.

9) A spill kit consisting of a barrel and list of supplies was located in a corner of the plant.

Observations: The barrel was clamped shut and the supplies were not immediately available.

10) A set of treatment plant plans and specifications were on site.

Observations: The plans had dates from 1991, but were not labeled as 'as-builts.'

Northern Pathway Intercept System

1) The wells at the east and west well fields of the Northern Pathway Intercept System (NPS) are inspected weekly and checked as needed for any abnormal operations. There are low level/high level alarms, pump off alarms, individual well flow meters readable at treatment plant.

2) The extraction pipeline for east and west well fields are currently double-lined with a leak detection system.

Note: The relocation of the NPS well fields was discussed and RVO's proposal to replace the extraction pipeline with a single pipe system.

3) The electrical panel for the west well field was inspected and found in good condition. Extraction wells 7, 8, 9, and 10 in the west well field have been shut down because CSRGs were met. All recharge wells remain operational.

4) A subset of extraction, discharge, and monitoring wells was inspected.

Observations: Extraction, discharge, and monitoring wells were not locked. Tom indicated that they were not locked because they are within a locked fence.

5) Modifications to the extraction system included an upgrade to the control system that helped to keep the pumps running during fluctuating power conditions.

6) Well head piping and valve controls are located below ground in heated vaults. Flow control on the extraction and discharge wells has been changed from automatic/ electronic-controlled to manual controlled. Ultrasonic and magmeters were tried, but high tech solutions were found to be less reliable than the Haliburton oil field flow meters with manual valving that are currently in use. The manual flow control on the extraction wells is set to keep the extraction wells running more or less continuously, in Tom's word's, "set to turn off once a month".

Observations:
Vaults – The vaults at NPS were clean and functional. There were no locks on the vault doors. The vaults at NPS were all in good condition with intact pads and labeled with an identification number, had functioning doors, and the vaults were clean inside, although EW-12 pit had standing water. A pressure gauge at EW-12 was pegged to the maximum above 160 psi. All of the NPS vaults qualify as confined space and have been tagged accordingly.

Extraction Wells – NPS Well 37815 showed the sampling tube to be discolored with possible algal growth in tubing. Also, the tubing in use did not look to be Teflon tubing. NPS Well 37816 had standing water in the vault bottom but not enough to trip a leak detection sensor. However, the valve reading the water pressure was pegged, which may suggest that the well is being pumped at a greater capacity than it was designed for. Well 37805 had missing bolts on the pump housing and others were hanging loose with the nuts missing.

Recharge Wells – Three recharge wells were inspected at NPS. The recharge wells did not have locks. The recharge well vaults were in good condition, labeled with an identification number, and showed no evidence of corrosion or leaks.

Monitoring wells – Observed ten monitoring wells at NPS. All monitoring wells observed had no locks. The monitoring wells at NPS were labeled with individual identification numbers, had protective casings with lids and were free of vegetation and debris. All NPS wells had well caps, but three of the wells observed had well caps that were sitting upside down on top of the casing.

First Creek Intercept System

1) One extraction well vault was inspected at First Creek.

Observations: At FE-3, the sampling tube connection appeared to be broken off in the sampling ball valve. The First Creek vault observed was locked. The vault was tilted and showed evidence of ground settlement. The well vault for 37802 had significant rodent infestation and evidence of mice chewing on the vault insulation. A backfill scar was observed where a leak in the extraction well piping occurred in the summer of 2003, according to Tom James. Excess soil was excavated and the pipe was repaired.

2) One recharge well was inspected at First Creek.

Observations: The well vault for 37049 had minor evidence of mice chewing on the vault insulation. This vault was labeled adequately. A number of other vaults showed evidence of tilting from possible ground settling.

3) Four monitoring wells were inspected at First Creek.

Observations: All wells were labeled and had well caps in place, but well 37050 had no protective casing lid.

4) The First Creek gauging station was inspected. This station is operated by the U.S. Geological Survey. Apparently First Creek has been flowing since October 2004 because a spring has started flowing again. This spring is south of the Arsenal at approximately 41st Avenue and Piccadilly Street. One of the DIMP exceedances in First Creek was at this gauging system. Tom James thought the DIMP was due to a rising groundwater table that leached DIMP from the soil. Water quality and flow are measured at this station. The water quality data are entered into the RMAED, but it is uncertain whether the flow data are entered into the database.

Follow-up Actions Recommended for RVO:

1) RVO should identify any repairs, such as the leak in the extraction piping at the First Creek intercept system, and provide reports that document the repairs were made. RVO should identify the amount of downtime and whether the intercept of the plume was compromised during this period. Did the timing of the DIMP exceedance in First Creek correspond to the time of the repairs to the extraction system?

2) RVO should identify any changes or modification to the operation of the OGITS treatment plant and the extraction well fields over the last five years and provide reports that document these changes.

NORTHWEST BOUNDARY SYSTEM O+M WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: NORTHWEST BOUNDARY TMT SYS	**Date of inspection:** 4/20/05
Location and Region:	**EPA ID:** GO 521 002 0769
Agency, office, or company leading the five-year review:	**Weather/temperature:** CLOUDY, WINDY, COLD, 50° MAX

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- → Access controls
- Institutional controls
- → Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- → Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) MGR TRMT & MON. (Title) 4/20/05 (Date)
   (Interviewed) (at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** GAYLE LAMMERS (Name) OPERATIONS SUPV. (Title) 4/20/05 (Date)
   (Interviewed) (at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA
Contact LAURA WILLIAMS (Name) ____ (Title) 4/20/05 (Date) ____ (Phone no.)
Problems; suggestions; Report attached ____

Agency EPA
Contact STEVE SINGER (Name) ____ (Title) 4/20/05 (Date) ____ (Phone no.)
Problems; suggestions; Report attached ____

Agency EPA
Contact LEVI TODD (Name) ____ (Title) 4/20/05 (Date) ____ (Phone no.)
Problems; suggestions; Report attached ____

Agency EPA
Contact CATHERINE ROBERTS (Name) ____ (Title) 4/20/05 (Date) ____ (Phone no.)
Problems; suggestions; Report attached ____

4. **Other interviews** (optional) Report attached.

IX. GROUNDWATER/~~SURFACE~~ WATER REMEDIES (Applicable) N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines (Applicable) N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition (All required wells properly operating) Needs Maintenance N/A
   Remarks DW 3 (SWE) BROKEN LIQUIDTITE INSUL, D731B small cap missing
   ELECT. DIST. PANELS LOOK GREAT

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks DW/RCW VAULTS HAVE LOOSE INSULATION
   SOME HEATERS RUSTY, RC-23, 24 ABANDONED WIRING.

3. **Spare Parts and Equipment**
   Readily available (Good condition) Requires upgrade Needs to be provided
   Remarks STATISTICAL NUMBER OF SPARES ON SITE, OTHER PARTS
   PURCHASED FROM LOCAL DISTRIBUTOR.

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

NOTE: RODENTS DIGGING UNDER SOME WELL CONCRETE PADS

C. Treatment System (Applicable) N/A

1. **Treatment Train** (Check components that apply)
   Metals removal — Oil/water separation — Bioremediation
   Air stripping — (Carbon adsorbers)
   (Filters) LIQUID / EFF PARTICULATE FILTERS
   Additive (e.g., chelation agent, flocculent) N/A
   Others
   (Good condition) — Needs Maintenance
   Sampling ports properly marked and functional YES
   Sampling/maintenance log displayed and up to date YES
   Equipment properly identified YES
   Quantity of groundwater treated annually 500,568,704 GALLONS
   Quantity of surface water treated annually
   Remarks OVERALL OUTSTANDING FACILITY
   WASTE SUMP IS OUTSIDE

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A (Good condition) Needs Maintenance
   Remarks ALL EXT. WELLS SECURE BUT NO LOCKS

3. **Tanks, Vaults, Storage Vessels**
   N/A (Good condition) Proper secondary containment Needs Maintenance
   Remarks CLEAN + DRY INFLUENT SUMP

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks CLEAN + DRY EFFLUENT SUMP

5. **Treatment Building(s)**
   N/A (Good condition (esp. roof and doorways)) Needs repair
   Chemicals and equipment properly stored
   Remarks GUTTER REPAIR IN PROGRESS

6. **Monitoring Wells** (pump and treatment remedy)
   (Properly secured/locked) Not Functioning (Routinely sampled) (Good condition)
   All required wells located N/A Needs Maintenance
   Remarks A LIMITED NUMBER OF WELLS INSPECTED, A NUMBER OF WELLS NOT LOCKED, SOME MISSING CAPS, 1 WELL BROKEN, SOME PROT. CASINGS - NO LIDS

D. Monitoring Data N/A

1. Monitoring Data
   Is routinely submitted on time — Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained — Contaminant concentrations are declining

D. Monitored Natural Attenuation NA

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
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DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

Five-Year Review Site Inspection Report
Northwest Boundary Containment System

Date of Inspection: April 20, 2005

Attendees:
Tom James, RVO
Rick Beardsley, RVO
Gayle Lammers, Operations Supervisor, Washington Group
Laura Williams, EPA
Catherine Roberts, EPA
Steve Singer, PWT
Levi Todd, CEI

Notes and Observations:

Tom James and Gayle Lammers led the inspection of the Northwest Boundary Containment System (NWBCS) treatment plant and the extraction well field. The numbered paragraphs below document the information obtained from Tom and Gayle during the inspection/interview.

NWBCS Treatment Plant

1) The NWBCS treatment plant is housed in two buildings, the main treatment plant and a separate building for influent and effluent sumps, valves and pumps. The plant began operation in 1983. Since then there has been a wholesale repair/replacement of all valves and pumps.

Observations: The two buildings were inspected. A note on the door identified that the gutters need repair. Secondary containment is outside of the building, thus open to freezing and infiltration of dust and dirt. The influent and effluent pumps enclosed in the separate building were found to be functional.

2) RVO conducts annual inspections with an internal team of inspectors and compliance people. Housekeeping, safety, and waste management issues are reviewed. CDPHE conducts annual compliance inspections at the HWL leachate wastewater treatment system and the groundwater treatment plants.

Observations: Inspected the O&M manual and daily operation log and found the documentation to be in place and current. Start-up procedures are documented in the O&M manual and are edited and reviewed. A field procedures manual documents sampling, waste management, and well maintenance procedures and is reviewed once per year. As-built drawings are kept in Building 132.

3) The average flow treated at the NWBCS treatment plant is currently 950 gpm. Flow is measured with totalizer flow meters in the effluent sump building.

4) Similar to the other treatment plants, the influent is pretreated through 100-μm bag filters. Prior to discharge to the injection wells, the effluent is polished through 5-μm to 10-μm bag filters. The filters were changed from automatic backwash to manual filter replacement in 1993.

5) Groundwater is treated through two (2) granular activated carbon (GAC) adsorption vessels piped in parallel with a third adsorber held in reserve. Each unit is pulsed once per month by adding about 3,000 pounds of fresh carbon. This is done more for compaction of the adsorption bed than for water treatment purposes. The carbon systems were originally operated in an up flow mode, but were changed to down flow operation. Every five years the carbon vessels are emptied and inspected. All vessels have a plastite liner. Minor galvanic pitting has been noticed and repaired with epoxide. Gayle Lammers stated that the expectation is for these carbon vessels to have an infinite life.

Extraction/Recharge Well Field

1) The NWBCS extraction/recharge well field consists of a 2,100-ft slurry wall and a series of extraction and injection wells. Both extraction wells and recharge wells are contained in vaults.

Observations: The extraction/recharge wells appeared to be functional; however, the insulation on the walls of the vaults was falling off in many cases. The electric boxes supporting the extraction/recharge wells were latched but not locked. In the southwest extension area, some of the extraction wells were being undermined by rodent activity, and the probe monitoring caps were missing from extraction well covers. At two recharge wells there was an electrical cord, which did not have an identified function, wrapped around the well casing and continuing down the well.

Monitoring Wells

1) A subset of monitoring wells was inspected.

Observations: Some monitoring wells were found to be missing protective casing, and some did not have well caps on the inner casing. In some cases the caps were sitting upside down on the inner casing. All wells were labeled with individual identification numbers. Wells were not locked. One well was found to be broken off at the ground surface but had not been abandoned.

Follow-up Actions Recommended for RVO:

1) Identify any changes or modification to the operation of the NWBCS treatment plant and well field over the last five years and provide reports that document these changes.

BASIN A NECK SYSTEM

O+M WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: BASIN A NECK, BR RIDGE	**Date of inspection:** 4/21/05
Location and Region: RMA R-8	**EPA ID:** CO 5210020769
Agency, office, or company leading the five-year review: RMA	**Weather/temperature:** SUNNY 55°

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- ✓ Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- ✓ Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) MGR TRMT SYSTEMS (Title) 4/21/05 (Date)
   (Interviewed at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** GAYLE LAMMERS (Name) TMT OPNS SUPV (Title) 4/21/05 (Date)
   (Interviewed at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

IX. GROUNDWATER/~~SURFACE~~ WATER REMEDIES — Applicable / N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines — (Applicable) / N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   (Good condition) (All required wells properly operating) Needs Maintenance N/A
   Remarks TEMPORARY TEST WELL PIPING AT B.R. RINKE HAS NO SECONDARY PIPING.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   (Good condition) Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks COMMON SPARES ON SITE, OTHERS PURCHASED LOCALLY

B. Surface Water Collection Structures, Pumps, and Pipelines — Applicable / (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

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Five-Year Review Site Inspection Report
Basin A Neck Containment System/Bedrock Ridge

Date of Inspection: April 21, 2005

Attendees:
Tom James, RVO
Rick Beardslee, RVO
Gayle Lammers, Operations Supervisor, Washington Group
John Stetson, PWT
Steve Singer, PWT
Laura Williams, EPA
Dan Collins, TCHD
Levi Todd, CEI

Notes and Observations:

Tom James and Gayle Lammers led the inspection of the Basin A Neck Containment System (BANCS) treatment plant, extraction well fields, and recharge trenches. The numbered paragraphs below document the information obtained from Tom and Gayle during the inspection/interview.

BANCS Treatment Plant

1) The BANCS treatment plant was started up in 1991. The BANCS treatment plant receives groundwater from three extraction well fields: Basin A Neck, Complex Army Trenches, and Bedrock Ridge. Similar to the other groundwater treatment plants at RMA, the plant is staffed 10 hours per day Monday through Friday. Operators are on call after hours and weekends.

Observations: Inspected the operations and maintenance (O&M) manual and daily operation log. The O&M manual was updated and revised in 2003. EPA found the documentation to be in place and current.

2) The average flow treated at the BANCS treatment plant is currently 20 gpm. The plant is designed to treat up to 30 gpm. The quantity of groundwater treated annually averages 9.2 million gallons. Each extraction well has a flow meter and the output is read in the control room.

3) Groundwater from the extraction wells first enters an influent equalization sump. From there the water is pumped to the head of the plant. The influent is pretreated through 100-µm bag filters. Prior to discharge to recharge trenches, the treated effluent is polished through 5-µm to 10-µm bag filters.

4) Groundwater is treated through an air stripper with five (5) stacked shallow trays to remove volatile organics. The trays are cleaned out about once per month. The stripper exhaust is treated through two (2) vapor phase granular activated carbon (GAC) adsorption vessels. A portable gas chromatograph is used to measure the treated air. The carbon is changed out every 5 to 6 months based on chloroform concentrations. Tom James explained that all of the water from the wells now goes though the air stripper as of Spring 2004 when the Section 36 wells were brought on-line. The air-stripping unit was switched from a packed tower to the shallow tray unit approximately two years ago. The packed tower had been located in the back room of the treatment plant.

5) The air stripper effluent is polished through two (2) aqueous phase GAC vessels in series operated in down flow mode. Dithiane is the indicator chemical for detecting carbon breakthrough. The GAC effluent drains to a storage tank. The treated water is pumped through 5-µm to 10-µm bag filters before discharging to the Basin A Neck recharge trenches.

Observations: The treatment vessels were within a secondary containment area. Floor drains discharge to an enclosed sump located outside. A flocculent system in the waste sump is no longer used. Wastewater in the sump is recycled to the head of the plant. Some staining was noted on the floor of the back room where the packed tower air stripping unit was formerly located.

Extraction Well Fields

1) Several extraction wells were inspected in the BANCS well field. The valves and flow meters are located inside the treatment building. There are no vaults. Tom James indicated that this was a design improvement over the older treatment plants.

Observations: The extraction wells at BANCS were functional and the electric panels at each well were latched but not locked. One standby extraction well was found to have a detached ground wire and a broken metering wire at the well. The light was out on one of the active extraction well-control panels.

2) The inspection of the extraction wells at the Complex Army Trenches was postponed to coincide with inspection of the Complex Trenches slurry wall project.

3) All three extraction wells at Bedrock Ridge were inspected. The wells pump less than 1 gpm, and a fourth extraction well is planned to improve groundwater recovery. A pump test was in progress at the time of the inspection. The extracted groundwater was being discharged to a vault where the Bedrock Ridge and Complex Army Trenches pipelines meet.

Observations: The extraction wells at Bedrock Ridge were functional and the electrical panels were latched but not locked. The extraction wells were labeled with a barcode on a paper label unlike all other wells visited on post, which have permanent markings.

Recharge Trenches

1) Tom James pointed out the location of Recharge Trenches A, B and C. Because they are below grade, they could not be inspected. Tom explained that the trenches also receive treated effluent from the CERCLA wastewater treatment plant. The CERCLA effluent is monitored for chloride. When the chloride concentrations have exceeded the CSRGs (twice historically), permission from the Regulatory Agencies had been sought and received to divert the CERCLA effluent to the zero discharge facility; i.e., the sanitary wastewater solar evaporation ponds.

Monitoring Wells

1) A subset of monitoring wells at BANCS was inspected.

Observations: All monitoring wells were found to have protective casing and proper labeling. In some wells the caps were sitting upside down on the casing. Wells were not locked. One well was found to be broken off at the ground surface but had not been abandoned. Two other wells were not locked and did not have a protective casing.

2) All monitoring wells at Bedrock Ridge were inspected.

Observations: All monitoring wells were marked with an adhesive paper label only. No permanent marking was found on these wells. Some wells had a protective casing but some did not. One well was found bent over and did not have a cap on the inner casing. At another monitoring well, the inner casing cap was found lying on the ground next to the well. In some wells the caps were sitting upside down on the casing. One well was found broken off at the ground surface but had not been abandoned. None of the monitoring wells were locked.

Follow-up Actions Recommended for RVO:

1) Identify any changes or modification to the operation of the BANCS treatment plant and the three extraction/recharge well fields over the last five years and provide reports that document these changes.

RAIL YARD SYSTEM OTM WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: RAIL YARD TMT SYSTEM	**Date of inspection:** 4/20/05
Location and Region: ROCKY MTN ARS R8	**EPA ID:** CO5210020769
Agency, office, or company leading the five-year review: RMA	**Weather/temperature:** CLOUDY, WINDY 50°

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- ✓ Access controls
- Institutional controls
- ✓ Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) — MGR, TMT SYSTEMS (Title) — 4/20/05 (Date)
   Interviewed at site at office by phone Phone no. 303 287 0244
   Problems, suggestions; Report attached _____

2. **O&M staff** CAYLIE CAMMARATA (Name) — TMT PLANT OPS SUPV (Title) — 4/20/05 (Date)
   Interviewed at site at office by phone Phone no. 303 853 3983
   Problems, suggestions; Report attached _____

IX. GROUNDWATER/SURFACE WATER REMEDIES — Applicable / N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines — (Applicable) / N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   (Good condition) (All required wells properly operating) Needs Maintenance N/A
   Remarks SOME FIELD INDICATOR LIGHTS INOP.
   STANDBY WELLS NEED HOUSEKEEPING (LOOSE HANGING CONDUITS)
   LOCK OUT/TAG OUT IN PLACE

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available (Good condition) Requires upgrade Needs to be provided
   Remarks STATISTICAL NUMBER AVAILABLE ON SITE, OTHERS AVAILABLE FROM LOCAL SUPPLY DISTRIBUTOR. ALSO ON SITE REPAIRS

B. Surface Water Collection Structures, Pumps, and Pipelines — Applicable / (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

NOTED SUBSURFACE DEBRIS NEAR MOTOR POOL WELLS.

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

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Five-Year Review Site Inspection Report
Motor Pool and Railyard Extraction Facility

Date of Inspection: April 20, 2005

Attendees:
Tom James, RVO
Rick Beardslee, RVO
Gayle Lammers, Operations Supervisor, Washington Group
Steve Singer, PWT
Laura Williams, EPA
Dan Collins, TCHD
Levi Todd, CEI

Notes and Observations:

Tom James and Gayle Lammers led the inspection of the Railyard Extraction Facility treatment plant and the extraction well field. The numbered paragraphs below document the information obtained Tom and Gayle during the inspection/interview.

Motor Pool and Railyard Extraction Facility Treatment Plant

1) Groundwater is treated through a small two-tank granular activated carbon (GAC) adsorption system. Groundwater is pumped through the treatment plant by the extraction well pumps. There are no influent or effluent filtration systems.

Observations: The carbon adsorption vessels were inspected and found to be operable. The effluent sample ports were in good condition. The electrical control panels were also in good condition. The O&M manual and the daily operation log were inspected and the documentation was found to be in place and current.

2) The secondary containment is outside the building in a small vault and is not open to the elements.

Extraction/Recharge Wells

1) Several extraction and recharge wells were inspected. There were two extraction wells and two recharge wells in operation. The extraction pumps drive the whole system.

Observations: Some extraction wells have been converted to recharge wells. There are two extraction wells operating and two recharge wells in operation. The extraction wells were functional and the electric panels at each well were latched but not locked. However, the control panels for extraction wells that were not in use were locked out and tagged out. One standby extraction well was found to have a detached ground wire and a broken metering wire at the well. The light was out on one of the extraction well control panels.

2) The former Motor Pool Extraction System was visited. The two extraction wells in this area were said to still be in standby mode.

Observations: The electric panels for the extraction wells in standby mode have been removed.

Monitoring Wells

1) A subset of monitoring wells in the Railyard Extraction well field were inspected.

Observations: Some monitoring wells were found to be missing protective casings and some did not have well caps on the inner casing. In some wells the caps were sitting upside down on the casing. All wells were labeled. Wells were not locked.

2) A subset of monitoring wells in the former Motor Pool Extraction well field were inspected.

Observations: Some monitoring wells were found to be missing protective casings and some did not have well caps on the inner casing. In some wells, the caps were sitting upside down on the casing. All wells were labeled. Wells were not locked. One well was found to be broken off at the ground surface but had not been abandoned. The two remaining wells were not locked and did not have a protective casing.

Follow-up Actions Recommended for RVO:

1) Identify any changes or modification to the operation of the Motorpool and Railyard treatment plant and well fields over the last five years and provide reports that document these changes.

NORTH BOUNDARY TREATMENT SYSTEM O+M WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: NORTH BOUNDARY TMT SYSTEM	**Date of inspection:**
Location and Region: RMA R-8	**EPA ID:** CO 5210020769
Agency, office, or company leading the five-year review: RMA	**Weather/temperature:** PARTLY CLOUDY 68°

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- (Access controls)
- Institutional controls
- (Groundwater pump and treatment)
- Surface water collection and treatment
- Other _____

- Monitored natural attenuation
- (Groundwater containment)
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) TMT & MONITORING MGR (Title) 4/19/05 (Date)
   (Interviewed) (at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** GAYLE LAMMERS (Name) TMT OPNS SUPV (Title) 4/19/05 (Date)
   (Interviewed at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA
Contact LAURA WILLIAMS (Name) _____ (Title) 4/19/05 (Date) _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency EPA
Contact STEVE SINGER (Name) _____ (Title) 4/19/05 (Date) _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency TCHD
Contact DAN COLLINS (Name) _____ (Title) 4/19/05 (Date) _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency EPA
Contact LEVI TODD (Name) _____ (Title) 4/19/05 (Date) _____ (Phone no.)
Problems; suggestions; Report attached _____

4. **Other interviews** (optional) Report attached.

EPA - JOHN STETSON 4/19/05

IX. GROUNDWATER/~~SURFACE~~ WATER REMEDIES Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines (Applicable) N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks LIMITED NUMBER OF WELLS INSP. SOME STANDBY WELL PUMPS WERE DETERIORATING
   ELECTRICAL BOXES NOT TAGGED OR ~~LOCKED~~ ON BOTH ACTIVE & STBY WELLS

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks DW-22 VALVE LEAKING.
   EXTRACTION WELL PUMP/PIPING LEFT ON GROUND WHILE SERVICING

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks SPARE PARTS FOR COMMON EQUIP. KEPT ONSITE
   OTHER PARTS PURCHASED LOCALLY

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

QUESTIONS:

1. CAN LEAKS BE DETECTED PRIOR TO SURFACE PONDING?
2. WHAT IS FREQUENCY OF EXTRACTION WELL INSPECTIONS?

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers
   Filters INF & EFF
   Additive (*e.g.*, chelation agent, flocculent) N/A
   Others UV TREATMENT
   Good condition Needs Maintenance
   Sampling ports properly marked and functional YES
   Sampling/maintenance log displayed and up to date YES
   Equipment properly identified YES
   Quantity of groundwater treated annually 109,809,571
   Quantity of surface water treated annually N/A
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks PIEZOMETERS REMOVED FROM SERVICE - READOUT STILL INDICATING.

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks BLACK CARBON SPLASH MARK ON CEILING ABOVE FRESH TANK. POST FILTER POD GAGES NOT CONSISTENT W/GAGES PER VESSEL.

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks

5. **Treatment Building(s)**
   N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks N/A LIMITED TIME WELLS INSPECTED, SOME HAVE NO CAPS 4 MON. WELLS OUTSIDE NORTH GATE HAD NO LOCKS, 2 CASINGS WERE BROKEN # 24006/24161

D. Monitoring Data NA

1. Monitoring Data
   Is routinely submitted on time Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

NOTE: MISC. DEBRIS NEAR OW-24, AND AT BOG AREA.

3. FLOOR COLLECTION SUMP IS OUTSIDE AND SUSCEPTIBLE TO FREEZING AND DEBRIS.

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. N/A

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

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Five-Year Review Site Inspection Report
Northern Boundary Containment System

Date of Inspection: April 19, 2005

Attendees:
Tom James, RVO
Rick Beardsley, RVO
Gayle Lammers, Operations Supervisor, Washington Group
John Stetson, PWT
Steve Singer, PWT
Laura Williams, EPA
Dan Collins, TCHD
Levi Todd, CEI

Notes and Observations:

Tom James and Gayle Lammers led the inspection of the Northern Boundary Containment System (NBCS) treatment plant and the extraction well field. The numbered paragraphs below document the information obtained from Tom and Gayle during the inspection/interview.

NBCS Treatment Plant

1) The NBCS treatment plant was the first groundwater treatment plant at RMA. The slurry wall was installed in 1980 and the plant began operation in 1981. Similar to the OGITS plant and other groundwater plants at RMA, the plant is staffed 10 hours per day Monday through Friday. Operators are on call after hours and weekends.

Observations: Inspected the O&M manual and daily operation log and found the documentation to be in place and current.

2) The average flow treated at the NBCS treatment plant is currently 220 gpm. Flow rates are fairly constant, depending on the water level in First Creek. When the plant opened, flows were higher, around 280 gpm, as the area within the slurry wall was dewatered. Influent pumps are alternated monthly. Each extraction well has its own flow meter and the output is read in the control room.

3) The influent is pretreated through two (2), 100-μm bag filters. Prior to discharge to the injection wells, the effluent is polished through five (5), 5-μm to 10-μm bag filters.

Observations: Noted encrustation on influent bag filters. Also, effluent bag filter BF-102B showed streaks on the side of the filter housing. Tom James stated that the high calcium content of the groundwater is the source of the calcium precipitate observed on the vessels.

4) Groundwater is treated through two (2) granular activated carbon (GAC) adsorption vessels piped in series with a third adsorber held in reserve. A GAC vessel is taken off-line and the carbon is changed out when the effluent DIMP concentration equals the influent concentration. Fresh carbon is stored in open-topped tanks.

Observations: The roof above the fresh carbon storage tanks was stained black. Tom stated upsets had occurred when loading fresh carbon.

5) The operation of the GAC system was changed from upflow to downflow about 7 to 8 years ago because of problems with channeling.

6) Tom James reported that there have been no other operational problems or upsets with the treatment plant. Floor drains capture any spills or leaks and route the water to a sump outside the building.

Observations: The secondary containment sump is constructed outside the treatment building, and the water is subject to possible freezing in the winter and to the addition of particulate matter through the grating. The influent and effluent pumps are also outside the building and subject to possible freezing.

7) Sampling is conducted at intermediate points (such as between carbon vessels) and at the effluent once per month.

Observations: Sampling ports were in good condition.

8) In 1996, an ultraviolet (UV) oxidation system was installed to treat n-nitrosodimethylamine (NDMA), which was added as a COC at the time of the On-Post ROD. A unit with 12 UV lamps was purchased, and has since been optimized to operate on only 4 lamps. The lamps are cleaned automatically every 3 hours, and changed out every 3,000 hours of operation. If the UV system shuts down due to lamp failure or if power is lost to the plant, a battery-operated interlock on the UV system prevents untreated water from discharging by gravity to the effluent sump.

Extraction/Recharge Well Field

1) Tom stated the NBCS recharge wells were replaced by trenches in the 1988 timeframe due to biological fouling of the extraction wells. Originally 10 recharge trenches were installed in 1988. Tom said 5 trenches were in use a couple of years later. The trenches are designed to release treated water on the downgradient side of the slurry wall while

maintaining a reverse hydraulic gradient. The reverse gradient is checked in monitoring well pairs, one downgradient and one upgradient. Currently five monitoring well pairs are measured regularly along the entire length of the slurry wall, and have been found to be representative of water levels measured manually.

2) Several of the extraction wells have been shut down over the years due either to concentrations dropping below the CSRGs, or to groundwater levels declining below the extraction wells. These wells are monitored once per year for water quality and water levels. When asked what RVO would do if DIMP concentrations were to increase to above the CSRGs for any of these wells, Tom James replied that if the water level monitoring shows that the plume has been hydraulically captured, then they don't restart the well.

3) The extraction wells are enclosed in small surface vaults. The vaults for inactive extraction wells are left open to reduce rodent infestation. The vaults for the active extraction wells are closed but unlocked.

Observations: The vaults for active wells were in fair condition and appear to be functioning properly. There is some evidence that rodents are getting into the vaults, which could cause damage to electrical connections. Electric boxes supporting these wells are not always latched and are not locked.

Well vault #22 had a valve that was leaking slightly.

The open vaults for inactive extraction wells leave the piping and electrical connections exposed to potential corrosion and freezing. The electrical conduit boxes supporting these standby wells were not latched, were not locked, and most of them were not tagged out. It is not known whether these electric boxes are live or not. Also, the well openings themselves were covered by a rubber cap; however, in some wells the rubber cap was cracked and broken and the clamp that is supposed to hold the cap in place was not being used.

Monitoring Wells

1) A subset of monitoring wells was inspected in the well field, including several wells located outside the RMA perimeter fence.

Observations: Some monitoring wells were found to be missing protective casings and some did not have well caps on the inner casing or the caps were sitting upside down on the casing. All wells were individually labeled with identification numbers. Wells on-post were not locked. Two wells were located in an active tilling area but did not have protective casings. Four wells were inspected outside of the North Entrance gate. Two wells were found to be broken off at the ground surface but had not been abandoned. The two remaining wells were not locked and did not have protective casings.

Follow-up Actions Recommended for RVO:

1) Identify any changes or modification to the operation of the NBCS treatment plant and well field over the last five years and provide reports that document these changes.

CERCLA O&M WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: CERCLA TREATMENT FACILITY	**Date of inspection:** 4/26/2005
Location and Region: RMA REG 8 EPA	**EPA ID:** CO 5210020769
Agency, office, or company leading the five-year review: RMA	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls
- Other WASTEWATER / GROUNDWATER TREATMENT - 5 PROCESSES

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) MGR TMT SYSTEM OPNS (Title) 4/26/05 (Date)
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** PAT GUSTAFSON (Name) TRT PLT OPER. (Title) 4/26/05 (Date)
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

O&M STAFF, CAYLE CAMMENS TMT PLT OPNS SPV.
O&M STAFF, TOYA AUTRY TMT PLT OPNS.

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA REG 8
Contact LAURA WILLIAMS (Name) — EPA TEAM LEAD, RPM (Title) — 4/26/05 (Date) — _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency EPA REG 8
Contact STEVE SINGER (Name) — EPA SCIENTIST (Title) — 4/26/05 (Date) — _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency EPA REG 8
Contact LEE TODD (Name) — ENGINEER (Title) — 4/26/05 (Date) — _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency _____
Contact _____ (Name) — _____ (Title) — _____ (Date) — _____ (Phone no.)
Problems; suggestions; Report attached _____

4. **Other interviews** (optional) Report attached.

NEVILLE GAGLIANI

TOM JAMES

EPA REQUEST: DOCUMENT APPROVALS FOR CERCLA DISCHARGE TO SANITARY ZERO DISCHARGE FACILITY.

IX. GROUNDWATER/SURFACE WATER REMEDIES

Applicable (N/A)

A. Groundwater Extraction Wells, Pumps, and Pipelines

Applicable (N/A)

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines

Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System (Applicable) N/A

1. **Treatment Train** (Check components that apply) BATCH TREATMENT FACILITY
   - Metals removal
   - Oil/water separation
   - Bioremediation
   - Air stripping
   - Carbon adsorbers – LIQUID & VAPOR PHASE
   - Filters
   - Additive (e.g., chelation agent, flocculent) LIQUID POLYMER, & PH ADJUSTMENTS
   - Others

   Good condition Needs Maintenance
   Sampling ports properly marked and functional YES
   Sampling/maintenance log displayed and up to date YES
   Equipment properly identified YES
   Quantity of groundwater treated annually 20,300 CALENDER YR '04
   Quantity of surface water treated annually N/A
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A (Good condition) Needs Maintenance
   Remarks ONE OF SEVERAL GROUND STRAPS NOT CONNECTED AT OUTSIDE HOT WATER TANK. FAULTY GAGE ON PIPING.

3. **Tanks, Vaults, Storage Vessels**
   N/A (Good condition) (Proper secondary containment) Needs Maintenance
   Remarks INSULATION ON OUTSIDE TANK DETERIORATED IN SOME AREAS

4. **Discharge Structure and Appurtenances**
   N/A (Good condition) Needs Maintenance
   Remarks OBSERVE DISCHARGE PIPING AT B.A.N. ON PREVIOUS INSPECTION

5. **Treatment Building(s)**
   N/A (Good condition (esp. roof and doorways)) Needs repair
   (Chemicals and equipment properly stored)
   Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance (N/A)
   Remarks

D. Monitoring Data N/A

1. Monitoring Data
   Is routinely submitted on time Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET- SUITE 300
DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

Five-Year Review Site Inspection Report
CERCLA Wastewater Treatment Unit

Date of Inspection: April 26, 2005

Attendees:
Tom James, RVO
Gayle Lammers, Operations Supervisor, Washington Group
Laura Williams, EPA
Steve Singer, PWT

Notes and Observations:

Tom James and Gayle Lammers led the inspection of the CERCLA Wastewater Treatment Unit (WWTU). The numbered paragraphs below document the information obtained from Tom and Gayle during the inspection/interview.

1) The CERCLA WWTU accepts contaminated water from numerous waste streams including decon water, laboratory sump water, and incidental waters from cleanup projects. . Decon water comes either from the truck washing facility or is delivered in tanker trucks. The plant is currently operating in batch mode and is not treating much water at present. The plant will be preparing to handle contaminated groundwater from the Lime Basins and South Tank Farm in the near future.

2) The inside of the treatment building was inspected. The treatment processes at the CERCLA WWTU include:
   - pH adjustment between most treatment processes
   - Influent filtration with bag filters for removal of particulates
   - Chemical precipitation to remove suspended solids
   - Ultraviolet (UV) oxidation for removal of organics
   - Air stripping with vapor phase granulated activated carbon (GAC) adsorption for removal of volatile organics;
   - Activated alumina adsorption for arsenic removal
   - Aqueous phase GAC adsorption for removal of organics
   - Oil and water separation to treat the effluent to meet oil and grease discharge limits

Observations: The inside of the treatment plant was found to be clean and all equipment was operable. Inspected O&M manual and daily operation log and found the documentation to be in place and current. The O&M manual was dated 1995 and based on responses from the operators, there have not been any major modifications since that time.

3) The exterior of the treatment building was inspected.

Observations: The plant has many influent and effluent tanks, which are located inside and outside of the building. The building exterior was in good condition. The hot water system, located outside of the building, was inspected. Two ground wires were discovered unattached and a hot water gauge was found broken. One oil water separator is located outside the building and was in good condition. The influent sump is in a concrete vault outside the building. The floor drains discharge to a second sump in the truck wash area. Both sumps appeared to be functional.

4) The water from the CERCLA Plant is pumped to the recharge trenches at Basin A Neck. The water going to BANCS must meet the BANCS CSRGs prior to discharge. If high chloride concentrations are encountered in the water, it has occasionally been pumped to the Zero Discharge Facility; i.e. the sanitary wastewater solar evaporation ponds. Special exemptions have been granted for this water from the agencies.

Follow-up Actions Recommended for RVO:

1) RVO should identify any changes or modification to the operation of the CERCLA WWTU over the last five years and provide reports that document these changes

2) EPA requested a copy of the special exemptions which have allowed high chloride concentrations of water to be discharged into the Zero Discharge Facility.

CONFINED WELLS

O+M WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: CONFINE AQUIFER WELL CLOSURE	**Date of inspection:** 4/26/05
Location and Region: RMA REG 8	**EPA ID:** CO 5210020769
Agency, office, or company leading the five-year review: RMA	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls
- Other CLOSED CONFINED AQUIFER (DENVER) WELL SITES USGS # 23225 AMD # 34012

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) MGR. TINT SYST + MON. (Title) 4/26/05 (Date)
   Interviewed ~~at site~~ at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** NEVILLE CAGGIANI (Name) USGS HYDROLOGIST (Title) 4/26/05 (Date)
   (Interviewed at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA REG 8
Contact LAURA WILLIAMS (Name) — EPA TEAM LEAD RPM (Title) — 4/26/05 (Date) — _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency EPA
Contact STEVE SINGER (Name) — EPA SCIENTIST (Title) — 4/26/05 (Date) — _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency EPA
Contact LEVI TODD (Name) — ENGINEER (Title) — 4/26/05 (Date) — _____ (Phone no.)
Problems; suggestions; Report attached _____

Agency _____
Contact _____ (Name) — _____ (Title) — _____ (Date) — _____ (Phone no.)
Problems; suggestions; Report attached _____

4. **Other interviews** (optional) Report attached.

IX. GROUNDWATER/SURFACE WATER REMEDIES

Applicable (N/A)

A. Groundwater Extraction Wells, Pumps, and Pipelines

Applicable (N/A)

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines

Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System (Applicable) N/A

1. **Treatment Train** (Check components that apply) N/A
   Metals removal — Oil/water separation — Bioremediation
   Air stripping — Carbon adsorbers
   Filters_____
   Additive (*e.g.*, chelation agent, flocculent)_____
   Others_____
   Good condition — Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually_____
   Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional) N/A
   N/A — Good condition — Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels** N/A
   N/A — Good condition — Proper secondary containment — Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances** N/A
   N/A — Good condition — Needs Maintenance
   Remarks_____

5. **Treatment Building(s)** N/A
   N/A — Good condition (esp. roof and doorways) — Needs repair
   Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked — Functioning — Routinely sampled — (Good condition) N/A
   (All required wells located) — Needs Maintenance
   Remarks VIEWED SITE OF PREVIOUS WELL CLOSURES

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time — Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained — Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

DAMAGED WELLS

O+M WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: DAMAGED WELLS	**Date of inspection:** MAY 3, 2005
Location and Region: RMA, EPA REG 8	**EPA ID:** CO 5 21 00 20 769
Agency, office, or company leading the five-year review: RMA	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls
- Other MONITORING WELLS

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) MGR TREATMENT SYS & MAINT (Title) 05/03/05 (Date)
   Interviewed (at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** NEVILLE GARGIANI (Name) USGS HYDROLOGIST (Title) 05/03/05 (Date)
   Interviewed (at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA REG 8
Contact LAURA WILLIAMS — Title — Date — Phone no.
Name
Problems; suggestions; Report attached

Agency EPA REG 8
Contact STEVE SINGER — Title — Date — Phone no.
Name
Problems; suggestions; Report attached

Agency TCHD
Contact DAN COLLINS — Title — Date — Phone no.
Name
Problems; suggestions; Report attached

Agency
Contact — Title — Date — Phone no.
Name
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

site_id	well_status	swwccomm	wellcomm
03001	OPEN	no cap, NBCS	
06002	OPEN	broken stick up	
22077	OPEN	casing is loose-no protective casing	
23125	OPEN	NBCS, no well cap	
23502	OPEN	tag fell off (possibly in well), well buried to TOC with dirt, not well marked-site	
23512	OPEN	Steel Well Protective casing slightly dented, needs new steel cap	
23517	OPEN	NBCS, need steel cap for protective casing	
23518	OPEN	missing steel cap for well and protective casing. NBCS	
24178	OPEN	casing loose, nbcs, confirmed	
27091	OPEN	crack in well pad	
27501	OPEN	confirmed,pad is broken	
27504	OPEN	confirmed,well pad is cracked also well 27503 pad is cracked.	
27505	OPEN	confirmed,well pad is cracked in three places.	
37011	OPEN	well under water cap in ground	
37323	OPEN	steel protective casing severely damaged. No well cap	
37327	OPEN	casing and protective casing damaged by plows	
37337	OPEN	Well found under a manhole cover on North shoulder of 96th Ave by Ron Fun	
37349	OPEN	casing and cap damaged	
37374	OPEN	casing broken bls	
37403	OPEN	Flush mounted well buried under asphalt road just inside of the shoulder of th	

IX. GROUNDWATER/SURFACE WATER REMEDIES — Applicable — N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines — Applicable — N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition — All required wells properly operating — Needs Maintenance — N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition — Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available — Good condition — Requires upgrade — Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines — Applicable — (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition — Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition — Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available — Good condition — Requires upgrade — Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers
   Filters_____
   Additive (*e.g.*, chelation agent, flocculent)_____
   Others_____
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually_____
   Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

O+M WATER

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: OFF POST PRIVATE WELLS	**Date of inspection:** MAY 6, 2005
Location and Region: RMA REG 8	**EPA ID:** CO5210020769
Agency, office, or company leading the five-year review: RMA	**Weather/temperature:** 70°

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls
- Other PRIVATE WELLS SAMPLED BY TCHD IN PLUME AREAS, SOME DOMESTIC WELLS, & SOME WELLS USED FOR IRRIGATION

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** TOM JAMES (Name) MGR DMT SYS & MON (Title) MAY 6, 05 (Date)
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** MELODIE MASCARENAS (Name) _____ (Title) MAY 6, 05 (Date)
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA REGION 8
Contact LAURA WILLIAMS — TEAM LEAD, RMA — MAY 6, 05 — _____
Name / Title / Date / Phone no.
Problems; suggestions; Report attached _____

Agency EPA, REGION 8 (PWT)
Contact STEVE SINGER — SCIENTIST — MAY 6, 05 — _____
Name / Title / Date / Phone no.
Problems; suggestions; Report attached _____

Agency EPA, REGION 8 (PWT)
Contact JOHN STETSON — _____ — MAY 6, 05 — _____
Name / Title / Date / Phone no.
Problems; suggestions; Report attached _____

Agency TCHD
Contact MELODIE MASCARENAS — _____ — MAY 6, 05 — _____
Name / Title / Date / Phone no.
Problems; suggestions; Report attached _____

4. **Other interviews** (optional) Report attached.

WELL NUMBERS THAT WERE INSPECTED?

986 B	1185 B	548 A	409 A	544 A
359 C	1185 C	396 B	413 A	549 A

IX. GROUNDWATER/SURFACE WATER REMEDIES

Applicable (N/A)

A. Groundwater Extraction Wells, Pumps, and Pipelines

Applicable (N/A)

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines

Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal
   - Oil/water separation
   - Bioremediation
   - Air stripping
   - Carbon adsorbers
   - Filters_____
   - Additive (*e.g.*, chelation agent, flocculent)_____
   - Others_____
   - Good condition
   - Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually_____
   - Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A

   Remarks WELLS ARE USED AS DOMESTIC OR IRRIGATION, AND ARE MONITORED BY TRI-COUNTY HEALTH DEPT FOR RMA.

D. Monitoring Data N/A

1. Monitoring Data
   Is routinely submitted on time Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET- SUITE 300
DENVER, CO 80202-2466
Phone 800-227-8917
http://www.epa.gov/region08

Five-Year Review Site Inspection Report
On-Post and Off-Post Wells/CFS Well Closure

1. Monitoring Wells Associated with Treatment Systems

Dates Inspected: April 18, 19, 20, 21, 22 and 26, 2005

Attendees:
Rick Beardsley, Tom James, Kelly Cable, Brian Brow, Leo Chen – RVO
Gayle Lammers – Washington Group
Laura Williams, Catherine Roberts – EPA
Barb Nabors, Ed LaRock – CDPHE
Dan Collins, Brian Hlavacek, Melody Mascarenaz – TCHD
Brad Coleman – Sentinel (CDPHE Contractor)
Steve Singer, Phil Stark, John Stetson – PWT (EPA Contractor)
Levi Todd – CEI (PWT/EPA Contractor)

Notes and Observations:

Monitoring wells associated with the treatment plants were examined during the five-year review site inspections for the treatment facilities and extraction well fields. Not all attendees from RVO and the regulatory agencies were present for every site inspection; however, RVO and EPA were represented at all inspections. General observations were recorded in the EPA five-year site inspection reports for the treatment facilities. Detailed and summary observations are presented below:

Detailed Observations: Table 1 presents the detailed observations by individual monitoring well. The table is derived from the RVO monitoring well database and includes information on well ID, the operational status of the well, the dates of operation for the well, justification for the well, how the well is used (e.g. water levels, water quality), the frequency of data collection, and EPA observations during the five-year review site inspections. Note that some monitoring wells changed operational status during the past five years and hence may appear more than once in the table.

Summary Observations: The monitoring wells do not appear to be maintained in a consistent manner. Some wells have protective casing while others do not. Some wells are bent over or broken. In some cases, protective casing caps and inner casing caps are missing or not properly attached. There does not appear to be a consistent policy on the use of well locks. For example, off-post wells outside the security fence around the

Northern Pathway System well field have locks, but some wells outside the Arsenal boundary fence were found without locks. Monitoring wells at most treatment systems inside the RMA boundary are not locked, yet wells at the hazardous waste landfill (HWL) and the HWL leachate wastewater treatment system (LWTS) were locked.

2. Confined Well Closure Program

Date Inspected: April 26, 2005

Attendees:
Tom James – RVO
Neville Gaggiana – USGS
Laura Williams – EPA
Steve Singer – PWT (EPA Contractor)

Notes and Observations:

The site inspection team visited the former locations of three wells that were closed under the Confined Well Closure Program. Former confined wells 34012, 23224, and 23225 were confirmed as abandoned.

3. Damaged Monitoring Wells

Date Inspected: May 3, 2005

Attendees:
Tom James – RVO
Neville Gaggiana – USGS
Laura Williams – EPA
Steve Singer – PWT (EPA Contractor)

Notes and Observations: A systematic method for inspecting damaged wells was developed by the RMA Water Team using information in the monitoring well database. A search of the database revealed 32 wells that were noted as damaged. The site inspection team used this information to visit the subject wells. Table 2 presents the detailed observations by individual monitoring well and includes information on well ID, the operational status of the well, the dates of operation, justification for using the monitoring well, monitoring well use (e.g. water levels, water quality), the frequency of data collection, and EPA observations on well condition during the five-year review site inspection. As in Table 1, note that some monitoring wells changed operational status during the past five years and hence may appear more than once in the table.

4. Off-Post Private Wells

Date Inspected: May 6, 2005

Attendees:
Tom James – RVO
Laura Williams – EPA
Barb Nabors – CDPHE
Melody Mascarenaz – TCHD
Steve Singer, John Stetson – PWT (EPA Contractor)

Notes and Observations: The inspection team visited the locations of 12 off-post private wells used by RVO to identify the extent of the DIMP plume off post. Tri-County Health Department (TCHD) performs sampling of private wells and presented the inspection team with a table of wells from their database. TCHD obtained permission to inspect all but one of these wells. EPA observations on these wells are summarized in Table 3. The table contains information on the well ID, the owner name and the physical address of the well, the well use and the date last sampled, the aquifer that the well is completed in, and EPA observations during the five-year site inspection. The wells were of various types and uses, including irrigation and domestic. Only two of the wells, wells 409A and 413A on Shell property, were constructed specifically as monitoring wells. While inspecting the domestic well at 11691 Brighton Road (well 544A), the inspection team observed a Denver Water employee taking water level in two monitoring wells on the property. Denver water is the owner of this property and is in the process of purchasing several adjacent properties. A total of 6 monitoring wells are located in the vicinity. TCHD obtained contact information and will attempt to schedule these monitoring wells for future sampling.

TABLE 1 -- Monitoring Wells Observed During Five-Year Review Site Inspections of Treatment Plants

Well ID	Operational Status	Dates of Operation		Justification	Use *	Frequency **	EPA Observations
24186	O	1999-12-01	2003-09-30		WL	Q	OK. No protective Casing
24186	P	2003-06-01			TBD	N/A	OK. No protective Casing
24186	O	2003-10-01		in WY04 O&M	WL	S	OK. No protective Casing
24041	P	2003-06-01			TBD	N/A	No well cap
24041	O	2003-10-01		in WY04 O&M	WL	S	No well cap
24161	O	1999-12-01	2003-06-01	100 ft setback	WL	Q	No well cap. Not locked
24161	O	2003-10-01		in WY04 O&M	WL	S	No well cap. Not locked
24006	O	2003-06-01			WQ	A	No well cap. Not locked
24006	P	2003-06-01			TBD	N/A	No well cap. Not locked
24006	T	1999-12-01			WL	A	No well cap. Not locked
24006	O	2003-10-01		in WY04 O&M	WL	S	No well cap. Not locked
24006	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	No well cap. Not locked
24006	C	1999-12-01		Substitute for 37311	WQ	A	No well cap. Not locked
27086	O	1999-12-01			WL	Q	Cap sitting upside down on well
27086	P	2003-06-01			TBD	N/A	Cap sitting upside down on well
27011	P	2003-06-01			TBD	N/A	Pad cracked. Cap on
22069	O	2003-06-01		in WY03 O&M	WL	M	OK.
22069	P	2003-06-01			TBD	N/A	OK.
22069	O	1999-12-01		in WY03 O&M	WL	Q	OK.
22070	P	2003-06-01			TBD	N/A	OK, No protective Casing
22070	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	OK. No protective Casing
22070	O	2003-10-01		in WY04 O&M	WL	S	OK. No protective Casing
22072	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	No cover on protective casing
22072	P	2003-06-01			TBD	N/A	No cover on protective casing

22072	O	2003-10-01		in WY04 O&M	WL	S	No cover on protective casing
22071	O	1999-12-01		in WY03 O&M	WL	Q	OK
22071	O	2003-06-01		in WY03 O&M	WL	M	OK
22071	P	2003-06-01			TBD	N/A	OK
22073	P	2003-06-01			TBD	N/A	Casing broken off at ground surface
22073	O	2003-10-01		in WY04 O&M	WL	S	Casing broken off at ground surface
22073	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	Casing broken off at ground surface
22504	P	2003-06-01			TBD	N/A	No protective casing cover
22504	O	2003-10-01		in WY04 O&M	WL	S	No protective casing cover
22504	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	No protective casing cover
22505	T	1999-12-01			WL	A	OK
22505	O	1999-12-01		in WY03 O&M	WL	Q	OK
22505	O	2003-06-01		in WY03 O&M	WL	M	OK
22505	P	2003-06-01			TBD	N/A	OK
22508	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	OK
22508	O	2003-10-01		in WY04 O&M	WL	S	OK
22508	O	1999-12-01		Downgradient of system; in WY03 O&M	WQ	A	OK
22508	P	2003-06-01			TBD	N/A	OK
27510	O	1999-12-01			WL	Q	OK
27510	O	2003-06-01			WQ	Q	OK
27510	P	2003-06-01			TBD	N/A	OK
27510	O	2003-10-01			WQ	A	OK
03528	P	2003-06-01			TBD	N/A	OK
03528	O	1999-12-01			WL	Q	OK
27509	O	1999-12-01			WL	Q	OK
27509	P	2003-06-01			TBD	N/A	OK
27511	O	2003-10-01			WQ	A	OK
27511	P	2003-06-01			TBD	N/A	OK

27511	O	2003-06-01	2003-09-30		WQ	S	OK
27511	O	1999-12-01			WL	Q	OK
27531	P	2003-06-01			TBD	N/A	OK
27531	O	1999-12-01			WL	Q	OK
27516	O	2003-06-01	2003-09-30		WQ	S	OK
27516	O	1999-12-01	2003-06-01		WQ	Q	OK
27516	P	2003-06-01			TBD	N/A	OK
27516	O	1999-12-01			WL	Q	OK
27516	O	2003-10-01			WQ	A	OK
03537	O	1999-12-01			WL	Q	OK
03537	O	1999-12-01	2003-06-01	Near Rail Yard extraction wells	WQ	S	OK
03537	P	2003-06-01			TBD	N/A	OK
03532	P	2003-06-01			TBD	N/A	Well cap upside down
03532	O	1999-12-01			WL	Q	Well cap upside down
03532	O	1999-12-01	2003-06-01	Downgradient from Rail Yard extraction wells	WQ	S	Well cap upside down
03513	P	2003-06-01			TBD	N/A	OK
03513	O	1999-12-01			WL	Q	OK
03534	O	1999-12-01			WL	Q	OK
03534	P	2003-06-01			TBD	N/A	OK
03534	O	1999-12-01	2003-06-01	Upgradient from Rail Yard extraction wells	WQ	S	OK
25018	CAMU	1999-12-01			WL	Q	No protective casing
25019	CAMU	1999-12-01			WL	Q	No protective casing
25020	CAMU	1999-12-01			WL	Q	No protective casing
35514	P	2003-06-01			TBD	N/A	OK
35514	O	2003-10-01		in WY04 O&M	WL	S	OK
35514	O	1999-12-01	2003-09-30		WL	Q	OK
35515	O	1999-12-01	2003-09-30		WL	Q	OK
35515	P	2003-06-01			TBD	N/A	OK
35515	O	2003-10-01		in WY04 O&M	WL	S	OK
36557	O	1999-12-01			WL	Q	Well cap missing. Broken protective casing lid

36557	P	2003-06-01			TBD	N/A	Well cap missing. Broken protective casing lid
36560	P	2003-06-01			TBD	N/A	Well hit and bent over. Well cap is upside down
36560	O	1999-12-01	2003-06-01	BC Recn	WL	Q	Well hit and bent over. Well cap is upside down
36564	O	1999-12-01			WL	Q	Well cap missing.
36564	P	2003-06-01			TBD	N/A	Well cap missing.
36567	P	2003-06-01			TBD	N/A	No metal label or painted numbers on casing
36567	O	1999-12-01			WL	Q	No metal label or painted numbers on casing
36569	O	1999-12-01			WL	Q	Well cap missing.
36569	P	2003-06-01			TBD	N/A	Well cap missing.
36568	O	1999-12-01			WL	Q	No metal label or painted numbers on casing
36568	P	2003-06-01			TBD	N/A	No metal label or painted numbers on casing
37353	E	1999-12-01		First Creek Pathway	WQ		Protective Casing cover open and well cap ajar
37353	T	1999-12-01			WL		Protective Casing cover open and well cap ajar
37422	O	1999-12-01			WL	Q	No lock
37422	P	2003-06-01			TBD	N/A	No lock
37105	P	2003-06-01			TBD	N/A	No lock
37105	O	1999-12-01			WL	Q	No lock
37133	P	2003-06-01			TBD	N/A	No lock
37133	O	1999-12-01			WL	Q	No lock
37050	P	2003-06-01			TBD	N/A	No lid or lock
37050	O	1999-12-01			WL	Q	No lid or lock
37023	O	1999-12-01			WL	Q	No lock
37023	P	2003-06-01			TBD	N/A	No lock

37030	O	1999-12-01			WL	Q	No lock. Cap upside down on top of casing
37030	P	2003-06-01			TBD	N/A	No lock. Cap upside down on top of casing
37027	T	1999-12-01			WL	A	No lock
37027	P	2003-06-01		South end of NPS	TBD	N/A	No lock
37027	O	1999-12-01			WQ	A	No lock
37027	O	1999-12-01		South end of NPS	WL	Q	No lock
37027	E	1999-12-01			WQ	2X	No lock
37038	O	1999-12-01			WL	Q	No lock
37038	P	2003-06-01			TBD	N/A	No lock
37098	P	2003-06-01			TBD	N/A	No lock
37098	O	1999-12-01			WL	Q	No lock
37111	P	2003-06-01			TBD	N/A	No lock
37111	O	1999-12-01			WL	Q	No lock
37115	O	1999-12-01			WL	Q	No lock
37115	P	2003-06-01			TBD	N/A	No lock
37026	O	1999-12-01			WL	Q	No lock. Cap upside down on top of casing
37026	P	2003-06-01			TBD	N/A	No lock. Cap upside down on top of casing
37004	P	2003-06-01			TBD	N/A	Lock is unlocked
37014	O	1999-12-01			WL	Q	No lock
37014	P	2003-06-01			TBD	N/A	No lock

* Operational Status: O = Operational; P = Potentially Operational; T = Tracking; E = Exceedance; C = Conformance; CAMU = Corrective Action Management Unit
* Well Use: WL = Water Levels; WQ = Water Quality; TBD = To Be Determined
** Monitoring Frequency: M = Monthly; Q = Quarterly; S = Semiannually; A = Annually; 2X = Twice in Five Years

TABLE 2 -- Five-Year Review Site Inspection of Damaged Monitoring Wells

Well ID	Status *	Dates of Operation		Justification	Use **	Freq ***	EPA Observations
02522							Casing broken off at ground surface and no cap in place. Well is left open to elements. No protective casing
03001	P	2003-06-01			TBD	N/A	Casing is grooved and uneven. The WL measurement point is also grooved and uneven. A Plastic sleeve used to cover the well is broken and laying on ground.
03001	O	1999-12-01			WL	Q	Casing is grooved and uneven. The WL measurement point is also grooved and uneven. A Plastic sleeve used to cover the well is broken and laying on ground.
04023	P	2003-06-01			TBD	TBD	Casing broken off at ground surface but cap is in place. No protective casing.
04029	P	2003-06-01			TBD	TBD	Casing broken off at ground surface but has a cap in place. No protective casing
04039	P	2003-06-01			TBD	TBD	Well pad still cracked. Protective casing ok and well cap is on
06002	T	1999-12-01			WL	A	Confirmed casing broken off at ground surface and cap is laying upside down in the dirt. There is no protective casing and the fence post locator is also on ground
22077	O	1999-12-01		in WY03 O&M	WL	Q	Found to be ok. There is no protective casing.
22077	O	2003-06-01		in WY03 O&M	WL	M	Found to be ok. There is no protective casing.
22077	P	2003-06-01			TBD	N/A	Found to be ok. There is no protective casing.
23009	P	2003-06-01			TBD	N/A	Casing has been repaired.
23011	P	2003-06-01			TBD	N/A	Well destroyed (possibly abandoned)
23125	O	2003-10-01		in WY04 O&M	WL	S	No well cap and no protective casing.
23125	P	2003-06-01			TBD	N/A	No well cap and no protective casing.
23125	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	No well cap and no protective casing.

23502	P	2003-06-01			TBD	N/A	Well partially covered by road. Well tag is intact. No well cap in place.
23502	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	Well partially covered by road. Well tag is intact. No well cap in place.
23502	O	2003-10-01		in WY04 O&M	WL	S	Well partially covered by road. Well tag is intact. No well cap in place.
23512	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	Protective casing bent on top with no cover. There is no cap on the inner casing.
23512	O	2003-10-01		in WY04 O&M	WL	S	Protective casing bent on top with no cover. There is no cap on the inner casing.
23512	P	2003-06-01			TBD	N/A	Protective casing bent on top with no cover. There is no cap on the inner casing.
23517	P	2003-06-01			TBD	N/A	Steel cover has been replaced but there is no inner cap on well.
23517	O	2003-10-01		in WY04 O&M	WL	S	Steel cover has been replaced but there is no inner cap on well.
23517	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	Steel cover has been replaced but there is no inner cap on well.
23518	P	2003-06-01			TBD	N/A	Steel cover still not replaced and there is no inner cap.
23518	O	2003-10-01		in WY04 O&M	WL	S	Steel cover still not replaced and there is no inner cap.
23518	O	1999-12-01	2003-09-30	in WY03 O&M	WL	Q	Steel cover still not replaced and there is no inner cap.
24105	P	2003-06-01			TBD	N/A	Protective casing and inner casing destroyed.
24152	P	2003-06-01			TBD	N/A	Casing broken off at ground surface.
24178	O	2003-10-01		in WY04 O&M	WL	S	Casing broken below ground surface. No protective casing.
24178	O	1999-12-01	2003-09-30		WL	Q	Casing broken below ground surface. No protective casing.
24178	P	2003-06-01			TBD	N/A	Casing broken below ground surface. No protective casing.
27091	O	1999-12-01	2003-09-30		WL	Q	Well pad still cracked and undermined by burrowing. Protective casing ok and well cap is on

27091	P	2003-06-01			TBD	TBD	Well pad still cracked and undermined by burrowing. Protective casing ok and well cap is on
27091	O	1999-12-01		West edge of plume	WQ	A	Well pad still cracked and undermined by burrowing. Protective casing ok and well cap is on
27091	T	1999-12-01			WL	A	Well pad still cracked and undermined by burrowing. Protective casing ok and well cap is on
27091	O	2003-10-01		in WY04 O&M	WL	S	Well pad still cracked and undermined by burrowing. Protective casing ok and well cap is on
27501	O	1999-12-01			WL	Q	Well pad is still cracked and well cap is sitting upside down in well.
27501	P	2003-06-01			TBD	N/A	Well pad is still cracked and well cap is sitting upside down in well.
27504	O	1999-12-01			WL	Q	Well pad is still cracked. So is Well 27503
27504	P	2003-06-01			TBD	N/A	Well pad is still cracked. So is Well 27503
27505	O	1999-12-01			WL	Q	Well pad still cracked. Protective casing ok and well cap is on
27505	P	2003-06-01			TBD	N/A	Well pad still cracked. Protective casing ok and well cap is on
37011	O	1999-12-01			WL	Q	Well not in location to be under water but pad is cracked.
37011	O	2003-06-01		Downgradient from Northern Pathway Intercept	WQ	2X	Well not in location to be under water but pad is cracked.
37011	T	1999-12-01			WL	Annual	Well not in location to be under water but pad is cracked.
37011	E	1999-12-01		Downgradient from Northern Pathway Intercept	WQ	2X	Well not in location to be under water but pad is cracked.
37011	O	1999-12-01	2003-06-01		WQ	2X	Well not in location to be under water but pad is cracked.
37011	O	1999-12-01			WQ	A	Well not in location to be under water but pad is cracked.
37011	P	2003-06-01			TBD	N/A	Well not in location to be under water but pad is cracked.

37047	P	2003-06-01		Retain while 37139 in use; shared borehole	TBD	N/A	37047 is not fixed. Well 37139 is in same casing but does not have a well cap. No lock.
37091	P	2003-06-01			TBD	N/A	Flush mount well. Well has been fixed per Neville Gaggiani.
37323	T	1999-12-01			WL	A	Well has been repaired.
37323	O	2003-10-01			WL	A	Well has been repaired.
37327	O	2003-10-01			WL	A	Protective casing and inner casing damaged. Cover can't be put on protective casing and cap can't be put on well casing. No lock.
37327	T	1999-12-01			WL	A	Protective casing and inner casing damaged. Cover can't be put on protective casing and cap can't be put on well casing. No lock.
37337	T	1999-12-01			WL	A	Confirmed well location under manhole cover. Apparently not measured due to large cover. Also no well number on outside.
37349	T	1999-12-01			WL	A	Protective casing damaged and cover not functioning.
37349	O	2003-10-01			WL	A	Protective casing damaged and cover not functioning.
37349	E	1999-12-01		First Creek Pathway	WQ	2X	Protective casing damaged and cover not functioning.
37374	E	1999-12-01		Southwest of Northern Pathway Intercept	WQ	2X	Flush mount well. Well has been fixed per Neville Gaggiani.
37374	T	1999-12-01			WL	A	Flush mount well. Well has been fixed per Neville Gaggiani.
37374	O	2003-10-01			WL	A	Flush mount well. Well has been fixed per Neville Gaggiani.
37403	O	2003-10-01			WL	A	Well has been located and repaired.
37403	E	1999-12-01		E 104 Ave plume transect upgradient from Northern Pathway Intercept	WQ	2X	Well has been located and repaired.

37403	T	1999-12-01		E 104 Ave plume transect upgradient from Northern Pathway Intercept	WL	A	Well has been located and repaired.

* Operational Status: O = Operational; P = Potentially Operational; T = Tracking; E = Exceedance

** Well Use: WL = Water Levels; WQ = Water Quality; TBD = To Be Determined

*** Monitoring Frequency: M = Monthly; Q = Quarterly; S = Semiannually; A = Annually; 2X = Twice in Five Years; N/A = Not Applicable

TABLE 3 -- Five-Year Review Site Inspection of Off-Post Private Wells

Well ID	Owner	Address	Well Use; Last Sampled	EPA Observations	Aquifer
986A	Thomas	10720 Brighton Road	nf irrigation; sampled 2004	Well located on south side of house and is 60' deep. Sample port is a faucet near the pump. No issues or concerns.	Alluvial
986B	Thomas	10720 Brighton Road	nf irrigation; sampled 2004	Well located on south side of house and is 300' deep. Sample port is a faucet near the pump. No issues or concerns.	Arapaho
1185A	Green Acres	10801 Havana Street	nf irrigation; sampled 2004 (2X)	In pumphouse near garage and other buildings. Sample port is a faucet outside garage. No issues or concerns.	Alluvial
1185B	Green Acres	10801 Havana Street	nf irrigation; sampled 2004 (2X)	Pump is located in SE corner of property. Samples are collected from sprinkler pipe with single pump running. No issues or concerns.	Alluvial
1185C	Green Acres	10801 Havana Street	nf irrigation; sampled 2004 (2X)	Well is in a vault at NW end of field. TCHD sampled a leak in the pipe on one occasion but usually samples at sprinkler head with single pump running. No issues or concerns.	Alluvial
548A	Wilhelm	11671 Brighton Road	domestic and irrigation sampled 2004	Well located in pumphouse on side of house. Sample port is faucet on back of house. No issues or concerns.	Arapaho
548B	Wilhelm	11651 Brighton Road	in use domestic	Well located on side of house next to 548A. Sample port is a faucet in back of house. USGS last sampled a small spigot in pumphouse. Mrs. Wilhelm claims shallow wells went dry when gravel mining started nearby. No issues or concerns.	Alluvial
359C	Heckart	10850 Brighton Road	irrigation; sampled 2004	Did not obtain permission to visit per TCHD.	Alluvial

396B	Sturgeon Elec.	12150 E. 112th Ave.	irrigation; not available to sample	Well used for irrigation of lawns at property. Above ground pump replaced by two pumps at different depths (company employee [Joel] did not know depths) TCHD tried to sample sprinkler head in 2004 but were unsuccessful. They said they haven't sampled well since 1998. The pump depths should be established as well as whether the two pump locations are sealed off from each other.	Alluvial
409A	Shell Oil	11605 E. 96th Ave	used for irrigation	Protective casing in place, labeled and locked.	Arapaho
413A	Shell Oil	9925 Peoria Street	used for irrigation	Water supply well for former homesite. Well appears to be in good condition but did not see the sampling port or outlet location. T. James believes the well is still used for irrigation at times.	Arapaho
544A	Laing	11691 Brighton Road	domestic	Well located in back yard. Sample port is a faucet on south side of house. Discovered that Denver Water has installed two monitoring wells on property. Denver Water employee was collecting water levels at the time. No issues or concerns.	Arapaho
549A	Wilhelm	11651 Brighton Road	in use domestic	Well located in front of house. Sample port is a faucet on front of house. No issues or concerns.	Arapaho