



WESTMORELAND SAN JUAN MINING LLC

A Subsidiary of WESTMORELAND MINING LLC

August 8, 2023

Mr. James Smith
Coal Director
New Mexico Mining and Minerals Division
1220 South Saint Francis Drive
Santa Fe, New Mexico 87505

**RE: Notice of Application for Release from Phase III Bond Liability of the
La Plata Mine Permit 2016-01**

Dear Mr. Smith,

Westmoreland San Juan Mining LLC (WSJM LLC) is submitting a bond release package for your review and approval. WSJM LLC is applying for a Phase III bond release of 777.9 acres at La Plata Mine, currently under permit #16-01, which encompasses an area of 2,896.6 acres. Of the 777.9 acres proposed for Phase III Bond Release, 281.1 had been disturbed by mining operations and then reclaimed, while the other 496.8 acres were undisturbed. Application for bond release is submitted pursuant to 19.8.14 of New Mexico's Administrative Code (NMAC).

Westmoreland San Juan Mining LLC has accomplished all work required for Phase III bond release in accordance with the requirements of Surface Mining Control and Reclamation Act and the approved reclamation plan for La Plata Mine.

If you have any questions regarding this application, please contact Derek Rawson at (505)-330-5546.

Sincerely,

Derek Rawson
General Manager
Westmoreland San Juan Mining LLC

Enc: 2023 Phase III bond release (e-copy)

19.8.14.1412 A(2)(a):

The permittee's name, address and the appropriate permit number.

Westmoreland San Juan Mining LLC, La Plata Mine, has made an application for Phase III bond release of 777.9 acres to the New Mexico Mining and Minerals Division (MMD) for a portion of the area currently under Permit #2016-01 approved January 11, 2016. Application for bond release is submitted pursuant to 19.8.14 of New Mexico's Administrative Code (NMAC).

Westmoreland San Juan Mining LLC
La Plata Mine
PO Box 561
Waterflow, NM 87421

19.8.14.1412 A(2)(b)

An accurate legal description of the land sought for bond release (either metes and bounds or precise Section, Township and Range designations).

The La Plata Mine permit area is located 16 miles north of Farmington, New Mexico. The areas requested for Phase III bond release are located within the following lands in San Juan County, New Mexico. Locations are also shown on 2023 Phase III Bond Release Areas La Plata Mine Exhibit 1, found in Appendix B.

- Township 32N, Range 13W, Sections 14, 15, 22, and 23
- Section 14 – 346.2 acres
 - Section 15 – 79.9 acres
 - Section 22 – 101.7 acres
 - Section 23 – 250.1 acres

19.8.14.1412 A(2)(c):

The location of the area proposed for bond release shown on a USGS 7.5' map, which should also show the permit boundaries.

Areas requested for bond release for the La Plata Mine permit areas are shown on a USGS 7.5' base map at a scale of 1:11,000 (2023 Phase III Bond Release Areas La Plata Mine USGS Quads) See Appendix B Exhibits.

19.8.14.1412 A(2)(d):

A brief narrative summarizing the history of the mine, the type, amount and date of the current bonding instrument, the number of acres included in the bond release application and the portion it represents of the total permit area, documentation of the type and dates of the reclamation performed with a summary of the results achieved as they relate to the approved reclamation plan, and any other pertinent information that the applicant or the Director may consider appropriate.

Application 2023 Phase III Bond Release La Plata Mine

Coal mining at La Plata Mine began on January 13, 1986. Coal was transported from La Plata Mine to San Juan Generating Station from 1986 through 2002 utilizing the La Plata Mine Transportation Corridor. Reclamation of La Plata Mine occurred primarily from 2003-2008 which consisted of backfilling, regrading, and seeding. Reclamation activities were conducted according to approved processes and procedures under Subpart 906 Reclamation Plan of the La Plata Mine Permit 2016-01. Specifically, disturbed areas were regraded consistent with the approved Final Surface Configuration (FSC), capped with topsoil/topdressing material, and revegetated according to the approved reclamation plan. Revegetation results are presented in Appendix F.

The first Surface Mining Control and Reclamation Act permit (MMD Permit 24-9P) for La Plata Mine was issued on January 10, 1986. The current permit number is La Plata Mine Permit #2016-01. A surety bond, amended on July 19, 2016, for \$16,681,640.00 is filed with MMD and the Office of Surface Mining Reclamation and Enforcement to satisfy the reclamation bond requirement.

A summary of proposed Phase III release acreage and total permit acreage is provided in the table below. The proposed 2023 Phase III release areas all have a post-mine land use designation of Wildlife Habitat Use.

Portion of Permit Area Proposed for Phase III Release	Acres
2023 Proposed Phase III Release Area	777.9
Total Permit Area	2,896.6

*Does not include La Plata Transportation Corridor

19.8.14.1412 A(2)(e):

A table listing the current names, addresses and number of acres held by each of the surface and mineral owners of record in the area proposed for bond release.

A list of names and addresses of each surface and mineral owner of record in the area proposed for Phase III bond release is provided in Appendix C Notification Mailing List.

Surface Owner	Percentage Acres in Proposed Phase III Areas	Release Acres in Proposed Phase III Areas
Bureau of Land Management	96.9%	753.9
Lane Allen	3.1%	24.0
		777.9

Mineral Owner	Percentage Acres in Proposed Phase III Areas	Release Acres in Proposed Phase III Areas
Bureau of Land Management	96.9%	753.9
Elizabeth Thomas	3.1%	24.0
		777.9

19.8.14.1412 A(2)(f):

Copies of letters sent to adjoining landowners, local governmental bodies, planning agencies, sewage and water treatment authorities, and water companies in the vicinity of the reclamation operation, notifying them of the permittee's intention to seek bond release.

Draft letters notifying landowners, local government bodies, and other planning agencies of La Plata Mine's request for bond release is in Appendix A Surface Ownership Notification Letter. Copies of letters will be submitted to MMD after draft letters have been reviewed and approved by MMD. The addresses are located in Appendix C Notification Mailing List.

19.8.14.1412 A(3)

A copy of the newspaper advertisement that will be used to provide public notification of the application for bond release.

Draft public notice for publication in the Farmington Daily Times is provided in Appendix D Draft Public Notice.

19.8.14.1412 A(2)(g):

Other maps or information required by the Director to locate or characterize the areas proposed for bond release, soils, revegetation, hydrological or other reclamation issues.

Maps of the proposed Phase III bond release areas are provided in Appendix B Exhibits. The exhibits include:

- 2023 Phase III Bond Release Areas La Plata Mine Aerial: Shows proposed Phase III bond release areas and the years that the areas were seeded as part of the revegetation process.
- 2023 Phase III Bond Release Areas La Plata Mine Exhibit 1 shows the final reconstructed topography of areas requested for Phase III bond release. Bulldozers, scrapers and motor graders were used to grade the backfill (spoil) after initial placement by truck and shovel fleet.

19.8.14.1412 A(2)(h)

Statement of certification is provided in Appendix E Statement of Certification.

Phase III Bond Release Requirements

Revegetation activities at La Plata Mine were conducted in accordance with Subpart 906.A Reclamation Plan: General Requirements of approved permit. This subpart provides a comprehensive plan to satisfy reclamation performance standards required by 19 NMAC 8.2.

Vegetation surveys were conducted to assess revegetation success at La Plata Mine. The survey and associated results are presented in Appendix F Vegetation Reports.

Successful Establishment of Vegetation

Appendix F Vegetation Reports

For Measurement of Cover, Production and Diversity

- A. Identify revegetation success standards. A description of how these standards were selected or established and all references justifying these standards should be included in the final bond release submittal.**

Appendix F Vegetation Reports

- B. Describe how you will collect the data -, i.e., the measurement techniques for cover and production, and diversity (19.8.8.808 NMAC). Include literature citations and references for the measurement techniques (19.8.5.505.C (3)NMAC). Describe how you will test data for sample adequacy and assumptions of normal distribution (19.8.5.505.C (2) & (3) NMAC).**

Appendix F Vegetation Reports

- C. Address what you will do if the data are not normally distributed. If the data are not normally distributed - most sample adequacy equations are not appropriate for use (See: Coal Mine Reclamation Program Vegetation Standards for some ideas on alternative approaches to determine sample adequacy when data are not normally distributed). If sample adequacy equations produce unreasonably large sample sizes, alternative “distribution free” methods including jackknife or bootstrapping (See: Coal Mine Reclamation Program Vegetation Standards) may be used (19.8.2.2065.A NMAC).**

Appendix F Vegetation Reports

- D. Describe the statistical analyses you will use to test the reverse null hypothesis (pp.17-19, Coal Mine Reclamation Program Vegetation Standards) stated below. $H_0: \mu_{trt} < 0.90 \mu_{con}$ $H_a: \mu_{trt} > 0.90 \mu_{con}$ where μ_{trt} is the mean of the treatment (reclaimed land), and μ_{con} is the control standard or reference area mean (19.8.20. 2065.B(5) NMAC).**

Appendix F Vegetation Reports

- E. Describe what alternative approaches you will take if the data are not normally distributed, and use of the student's t-test is inappropriate. Also note that some transformations (as listed on pp. C-8 and C-9 of the Coal Mine Reclamation**

Program Vegetation Standards) may be used to adjust data to a more normal distribution prior to statistical analysis. Use of other (nonparametric) techniques is also encouraged by MMD in these instances (pp. C-3 and C-6 of the Coal Mine Reclamation Program Vegetation Standards) (19.8.20.2065.A NMAC).

Appendix F Vegetation Reports

F. Identify the level of confidence (i.e., 90% statistical confidence, or an alpha error rate of $\alpha = 0.10$, 19.8.20.2065.B(5) NMAC) that you will use to analyze the data.

Appendix F Vegetation Reports

G. Identify the statistical software packages you will use for conducting your statistical analyses (19.8.5.505.C(3) NMAC).

Appendix F Vegetation Reports

Maximum Amount of Performance Bond that may be Released by Director

A surety bond for \$16,681,640.00 is filed with MMD and Office of Surface Mining to satisfy the reclamation bond requirement. WSJM LLC is seeking reduction to the reclamation bond according to NMAC 19.8.14.1412. Areas requested for bond release are provided, in accordance with 19.18.14.1412 NMAC. WSJM LLC is seeking reduction to \$0 per acre for the requested release area of the current bond as shown in the following table:

Total Bond Amount	\$16,681,640.00
Total Acres under Bond	2,012
Cost per Acre	\$8,291.07
2023 Phase III (acres)	281.1
Cost/Acre (After Phase III Approval)	\$0
Total bond after Phase III Approval	\$14,351,039.90
Bond Reduced by	\$2,330,600.10



WESTMORELAND SAN JUAN MINING LLC

A Subsidiary of WESTMORELAND MINING LLC

August 8, 2023

Allen & Susan Lane
4445 Bella Vista Circle
Farmington, NM 87401

Re: La Plata Mine Permit 16-01, Phase III Bond Release Application

Dear Sir or Madam,

1. Westmoreland San Juan Mining LLC (WSJM LLC), San Juan Mine, La Plata Mine has made an application for a Phase III bond release of 777.9 acres to the New Mexico Mining and Minerals Division (MMD) for a portion of the areas currently under Permit #16-01, approved January 11, 2016. Of the 777.9 acres proposed for release, 281.1 had been previously disturbed from mining operations and then reclaimed, while the other 496.9 acres were undisturbed. Application for bond release is submitted pursuant to 19.8.14 of New Mexico Administrative Code (NMAC).

Westmoreland San Juan Mining LLC
La Plata Mine
P.O. Box 561
Waterflow, NM 87421

2. The La Plata Mine permit area is located approximately 16 miles north of Farmington, New Mexico. The 777.9 acres requested for Phase III Bond Release are located within the lands of San Juan County, New Mexico, described below:

Township 32N, Range 13W, Sections 14, 15, 22, and 23

- Section 14 – 346.2 acres
- Section 15 – 79.9 acres
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- Section 23 – 250.1 acres

A map of the areas proposed for Phase III Bond Release is enclosed with this letter.

3. A surety bond for \$16,681,640.00 is filed with MMD and Office of Surface Mining to satisfy the reclamation bond requirement. The applicant is seeking a determination that the work necessary for Phase III Bond Release has been successfully completed. WSJM LLC will be seeking a bond reduction of \$2,330,600.10.
4. All lands within the requested bond release area have been graded to the designed post-mining topography consistent with approved mine plans. Bulldozers, scrapers, and graders were used to grade backfill materials after initial placement by the draglines and the truck fleet. The final grading of the spoil was completed between 2003 and 2008. Drainage control was established according with 19.8.20 NMAC. All disturbed lands have had topsoil replaced and have been seeded with a native seed mix. One permanent impoundment will be retained within the proposed Phase III bond release area of Permit #16-01.



WESTMORELAND SAN JUAN MINING LLC

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5. Copies of the application for bond release are available for public review and/or inspection at the following locations:

Farmington Public Library
2101 Farmington Ave.
Farmington, NM 87401.
(505)-599-1270

New Mexico Mining and Minerals Division
1220 South St. Francis Drive
Santa Fe, NM 87505
(505)-690-8071

The application is also available on the MMD website:

<https://www.emnrd.nm.gov/mmd/public-notice/>

6. Written comments, objections, requests for public hearing, or requests for an informational conference on the Phase III bond release application can be submitted to the MMD Director at the following address:

Director
New Mexico Mining and Minerals Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
(505)-690-8071

7. The bond release request has been filed with MMD and will be acted upon pursuant to the 19.8 NMAC rules

Sincerely,

Derek Rawson
General Manager
Westmoreland San Juan Mining LLC

Enc: Map of proposed Phase III bond release areas



WESTMORELAND SAN JUAN MINING LLC

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August 8, 2023

U.S. Dept. of the Interior Farmington District Office
6251 College Blvd Suite A
Farmington, NM 87402

Re: La Plata Mine Permit 16-01, Phase III Bond Release Application

Dear Sir or Madam,

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Westmoreland San Juan Mining LLC
La Plata Mine
P.O. Box 561
Waterflow, NM 87421

2. The La Plata Mine permit area is located approximately 16 miles north of Farmington, New Mexico. The 777.9 acres requested for Phase III Bond Release are located within the lands of San Juan County, New Mexico, described below:

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A map of the areas proposed for Phase III Bond Release is enclosed with this letter.

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Westmoreland San Juan Mining LLC

Enc: Map of proposed Phase III bond release areas



WESTMORELAND SAN JUAN MINING LLC

A Subsidiary of WESTMORELAND MINING LLC

August 8, 2023

U.S. Dept. of the Interior BLM New Mexico State Office
301 Dinosaur Trail
Santa Fe, NM 87508

Re: La Plata Mine Permit 16-01, Phase III Bond Release Application

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General Manager
Westmoreland San Juan Mining LLC

Enc: Map of proposed Phase III bond release areas



WESTMORELAND SAN JUAN MINING LLC

A Subsidiary of WESTMORELAND MINING LLC

August 8, 2023

Elizabeth C. Thomas
1656 Plum Rd.. NE
Rio Rancho, NM 87124

Re: La Plata Mine Permit 16-01, Phase III Bond Release Application

Dear Sir or Madam,

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Enc: Map of proposed Phase III bond release areas



WESTMORELAND SAN JUAN MINING LLC

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August 8, 2023

New Mexico State Land Office
P. O. Box 1148
Santa Fe, NM 87504

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General Manager
Westmoreland San Juan Mining LLC

Enc: Map of proposed Phase III bond release areas



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August 8, 2023

San Juan County Executive Office
100 S. Oliver Dr
Aztec, NM 87410

Re: La Plata Mine Permit 16-01, Phase III Bond Release Application

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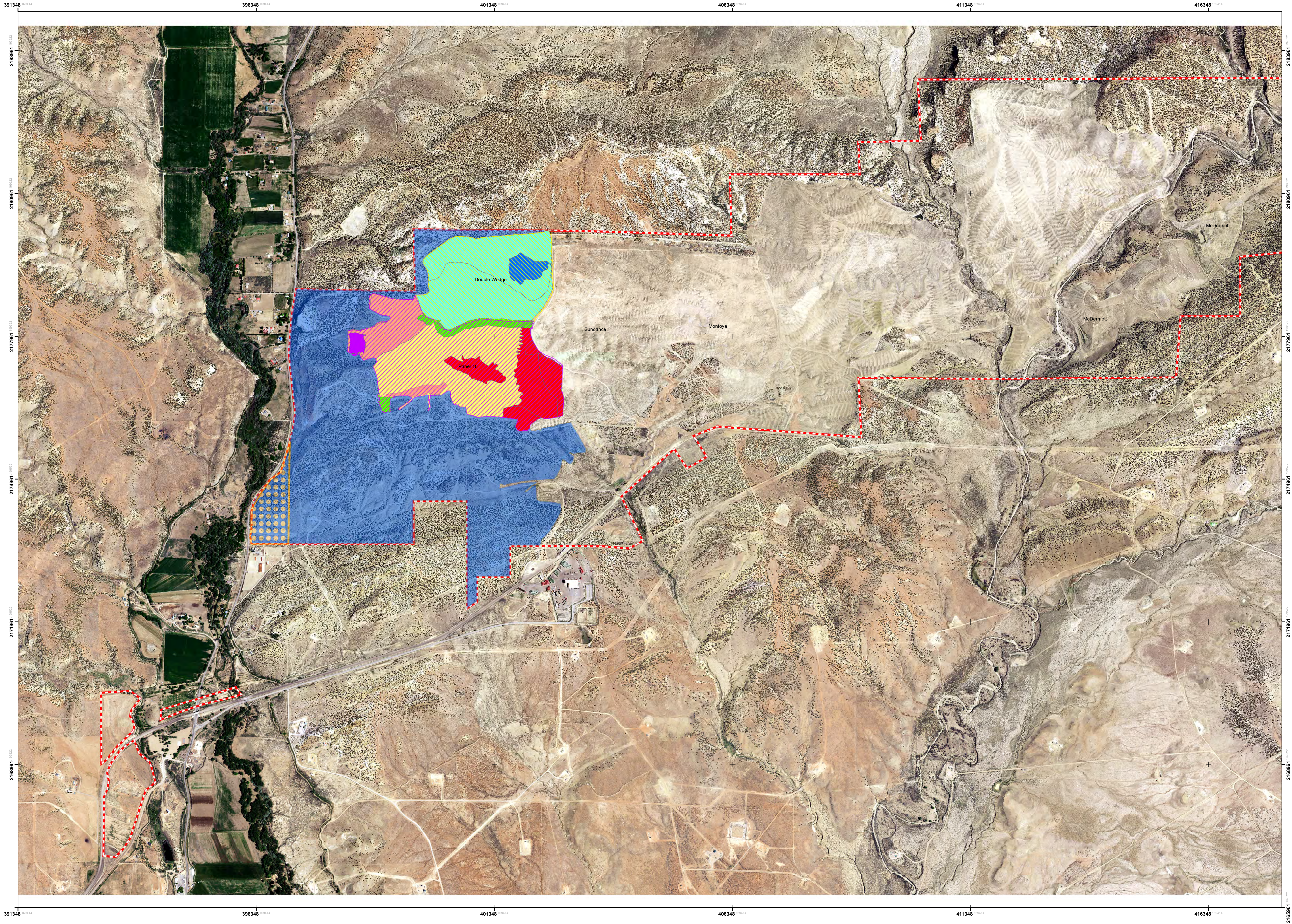
Director
New Mexico Mining and Minerals Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
(505)-690-8071

7. The bond release request has been filed with MMD and will be acted upon pursuant to the 19.8 NMAC rules

Sincerely,



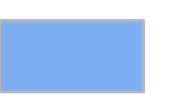


Derek Rawson
General Manager
Westmoreland San Juan Mining LLC

Enc: Map of proposed Phase III bond release areas










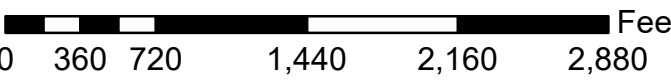
Legend

Name

-  Panel 10
-  Double Wedge
-  Native
-  Ownership Bounds
-  LPM Permit Boundary

Seeding

-  2004, Panel 10
-  2005, Double Wedge
-  2005, Panel 10
-  2009, Panel 10
-  2011, Panel 10
-  2012, Panel 10
-  2014, Double Wedge



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WESTMORELAND SAN JUAN MINING LLC

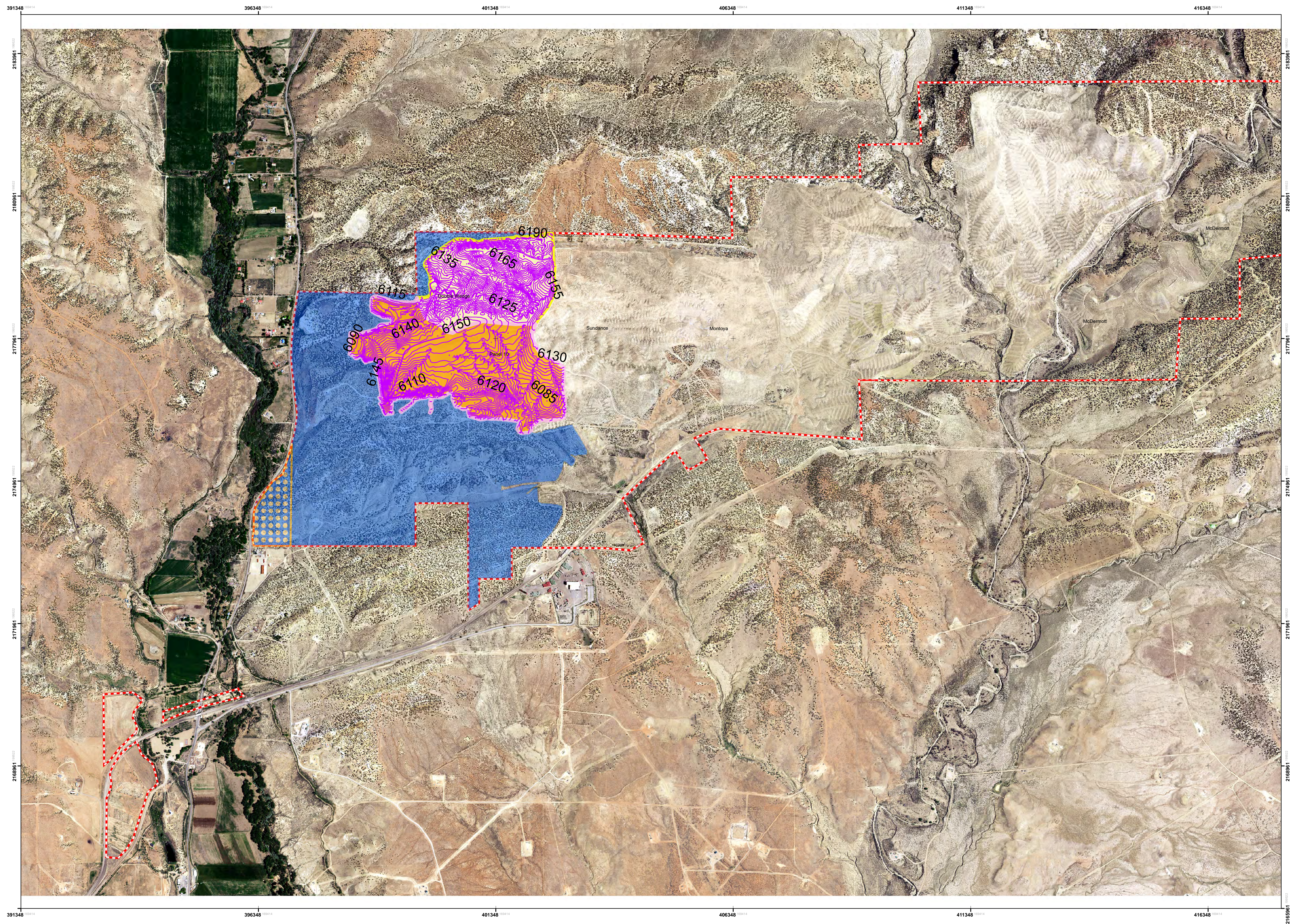


P.O. BOX 561 WATERFLOW, NEW MEXICO 87421 / PHONE 505-598-2000 / FAX 505-598-2026

2023 Phase III Bond Release Areas
La Plata Mine Exhibit 1

(Sheet 1 of 1)

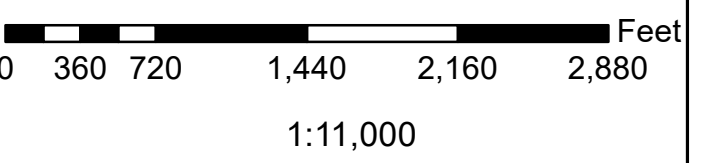
PREPARED BY: CA	DRAWN BY: CA	PAPER SIZE: ARCH D
APPROVED BY:	DATE: Aug 8, 2023	



Legend

Name

- Panel 10
- Double Wedge
- LPM Permit Boundary
- Native
- Ownership Bounds



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WESTMORELAND SAN JUAN MINING LLC

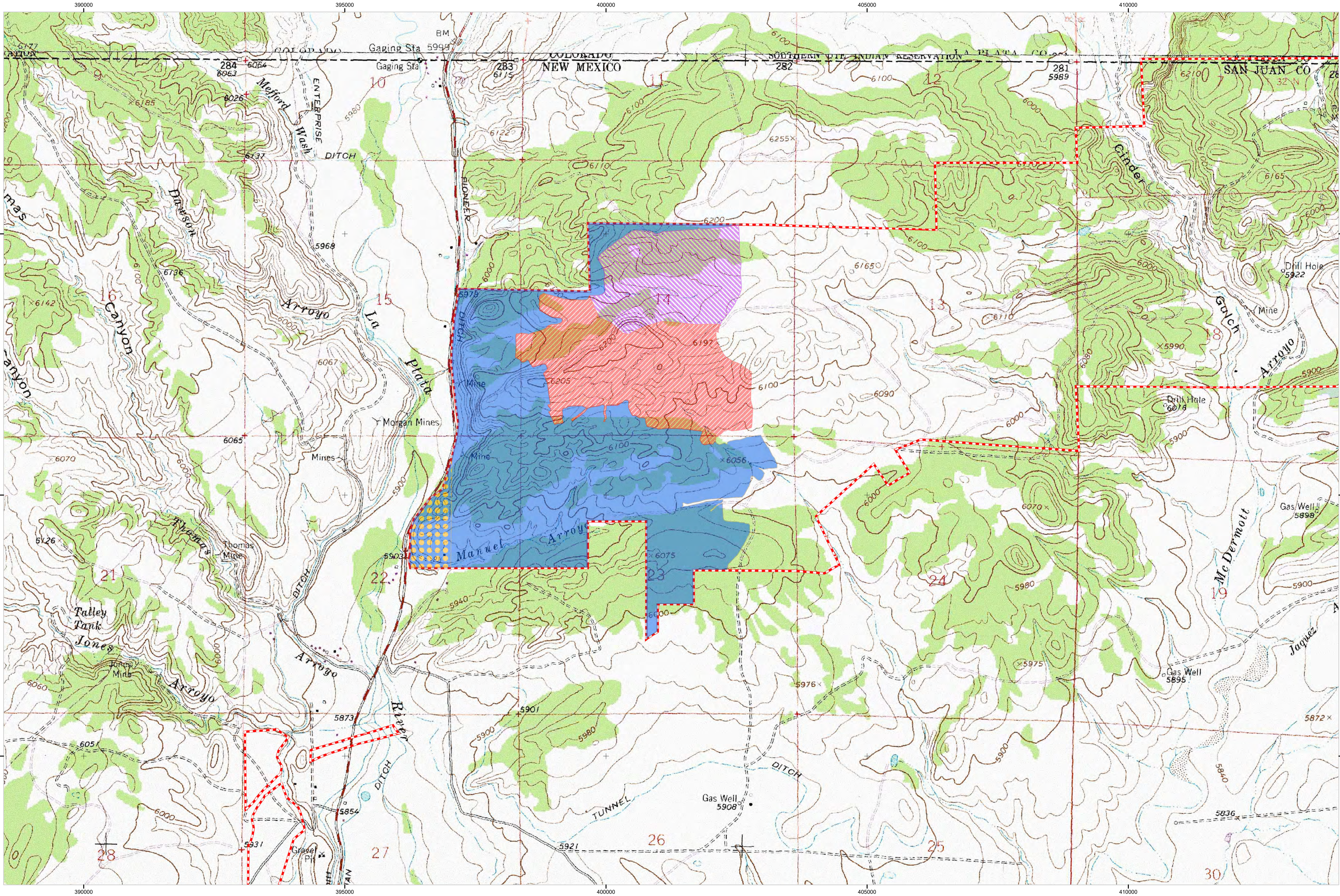


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2023 Phase III Bond Release Areas
La Plata Mine Exhibit 1

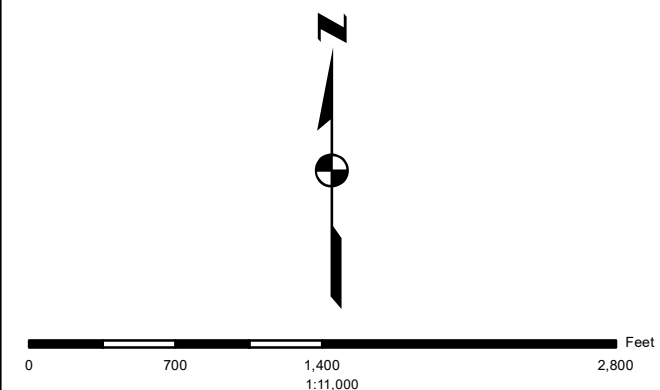
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PREPARED BY: CA	DRAWN BY: CA	PAPER SIZE: ARCH D
APPROVED BY:	DATE: Aug 8, 2023	



Name

- Panel 10
- Double Wedge
- Native
- Ownership Bounds
- LPM Permit Boundary



REV	DATE	DRAWN BY	REVISION DESCRIPTION	ENR	FOR	PC

WESTMORELAND SAN JUAN MINING LLC



2023 Phase III Bond Release Areas
La Plata Mine USGS Quads

(Sheet 1 of 1)

PREPARED BY: CA	DRAWN BY: CA	PAPER SIZE: ARCH D
APPROVED BY:	DATE: July 26, 2023	

Notification Mailing List for 2018 Phase III Bond Release La Plata Mine

Surface and Mineral Ownership:

USA, BUREAU OF LAND MANAGEMENT
301 Dinosaur Trail
Santa Fe, NM 87508

Lane & Susan Allen
4445 Bella Vista Circle
Farmington, NM 87401

Elizabeth C. Thomas
1656 Plum Rd.. NE
Rio Rancho, NM 87124

Government Agencies:

US DEPT OF INTERIOR/BLM
6251 College Blvd Suite A
Farmington, NM 87402

San Juan County
100 S. Oliver Drive
Aztec, NM 87410

STATE OF NEW MEXICO
New Mexico State Land Office
P. O. Box 1148
Santa Fe, NM 87504

Westmoreland San Juan Mining LLC (WSJM LLC) has filed an application with the New Mexico Mining and Minerals Division (MMD) for Phase III Bond Release for 777.9 acres of land located within the La Plata Mine Permit No. 2016-01 issued on January 11, 2016. Of the 777.9 acres proposed for release, 281.1 had been previously disturbed from mining operations and then reclaimed, while the other 496.8 acres were undisturbed. Application for bond release is submitted pursuant to 19.8.14 of the New Mexico Administrative Code (NMAC).

1. The Name and Business Address of the Applicant is:

Westmoreland San Juan Mining LLC
P.O. Box 561
Waterflow, NM 87421

2. The La Plata Mine permit area is located approximately 16 miles north of Farmington, New Mexico. The 777.9 acres requested for Phase III Bond Release are located within the lands of San Juan County, New Mexico described below:

Township 32N, Range 13W, Sections 14, 15, 22, and 23

- Section 14 – 346.2 acres
- Section 15 – 79.9 acres
- Section 22 – 101.7 acres
- Section 23 – 250.1 acres
-

A surety bond, amended on July 19, 2016, for \$16,681,640.00 is filed with the MMD to satisfy the reclamation bond requirement. The applicant is seeking a determination that the work necessary for Phase III Bond release has been successfully completed. WSJM LLC will be seeking a bond reduction in the amount of \$2,330,600.10.

Copies of the application are available for public review and/or inspection at the following locations:

Farmington Public Library
2101 Farmington Ave.
Farmington, NM 87401
(505)-599-1270

New Mexico Mining and Minerals Division
1220 South Saint Francis Drive
Santa Fe, New Mexico 87505
(505)-690-8071

Online on the MMD website at <https://www.emnrd.nm.gov/mmd/public-notice/>

3. Written comments, objections, requests for public hearing, or requests for an informal conference may be submitted to the following MMD representatives.

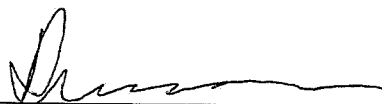
Director
New Mexico Mining and Minerals Division
1220 South Saint Francis Drive
Santa Fe, New Mexico 87505
(505)-690-8071

4. The application has been filed with MMD and will be acted upon pursuant to NMAC 19.8.14.

STATEMENT OF CERTIFICATION

WESTMORELAND SAN JUAN MINING LLC
LA PLATA MINE PERMIT 2016-01
SAN JUAN COUNTY, NEW MEXICO

I swear and affirm, under oath and in writing, that all backfilling, regrading, revegetation, and establishment of drainage control applicable for Phase III bond release on 777.9 acres of the La Plata Mine has been completed. Westmoreland San Juan Mining LLC has accomplished all required work in accordance with the requirements of Surface Mining Control and Reclamation Act and the approved reclamation plan for the La Plata Mine.



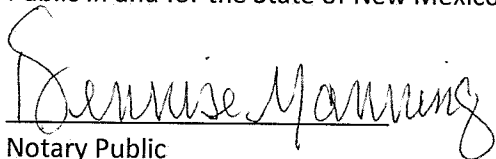
Derek Rawson
General Manager

Westmoreland San Juan Mining LLC

STATE OF NEW MEXICO

COUNTY OF SAN JUAN

SUBSCRIBED AND SWORN before me, in my presence, this 2 day of August, 2023, a Notary Public in and for the State of New Mexico.



Notary Public

My Commission Expires: 10-1-25

**STATE OF NEW MEXICO
NOTARY PUBLIC
DENNISE MANNING
COMMISSION # 1094371
MY COMMISSION EXPIRES 10/01/2025**



2022 La Plata Mine Vegetation Survey



Westmoreland San Juan Mining LLC
300 Road 6800
Waterflow, New Mexico 87421

Prepared by:



825 Sullivan Avenue
Farmington, New Mexico 87401

1	INTRODUCTION	1
1.1	Purpose.....	1
1.2	Background.....	1
1.3	Reclamation Success Standards.....	1
2	METHODS	2
2.1	Study Design.....	2
2.2	Parameters Sampled.....	2
2.3	Sample Requirement.....	2
2.4	Sampling Methods	3
2.4.1	Cover.....	3
2.4.2	Shrub Density.....	3
2.4.3	Species Diversity.....	3
2.4.4	Data Analysis	3
3	RESULTS	4
3.1	Sample Adequacy	4
3.2	Double Wedge	4
3.2.1	Perennial Cover.....	5
3.2.2	Total Relative Grass Cover	5
3.2.3	Perennial Grass Cover.....	6
3.2.4	Perennial Grass Diversity.....	6
3.2.5	Total Relative Shrub Cover.....	7
3.2.6	Shrub Diversity	7
3.2.7	Shrub Density.....	7
3.2.8	Perennial Forb Diversity	8
3.2.9	Discussion	8
3.3	McDermott.....	8
3.3.1	Perennial Cover.....	9
3.3.2	Total Relative Grass Cover	9
3.3.3	Perennial Grass Cover.....	10
3.3.4	Perennial Grass Diversity.....	10
3.3.5	Total Relative Shrub Cover.....	10
3.3.6	Shrub Diversity	11
3.3.7	Shrub Density.....	11
3.3.8	Perennial Forb Diversity	11
3.3.9	Discussion	11
3.4	Montoya	12
3.4.1	Perennial Cover.....	12
3.4.2	Total Relative Grass Cover	12
3.4.3	Perennial Grass Cover.....	13
3.4.4	Perennial Grass Diversity.....	13
3.4.5	Total Relative Shrub Cover.....	13
3.4.6	Shrub Diversity	14
3.4.7	Shrub Density.....	14
3.4.8	Perennial Forb Diversity	14
3.4.9	Discussion	15
3.5	Panel 10.....	15
3.5.1	Perennial Cover.....	15
3.5.2	Total Relative Grass Cover	16

3.5.3	Perennial Grass Cover.....	17
3.5.4	Perennial Grass Diversity.....	17
3.5.5	Total Relative Shrub Cover.....	17
3.5.6	Shrub Diversity	18
3.5.7	Shrub Density.....	18
3.5.8	Perennial Forb Diversity	18
3.5.9	Discussion	18
3.6	Sundance	19
3.6.1	Perennial Cover.....	19
3.6.2	Total Relative Grass Cover	19
3.6.3	Perennial Grass Cover.....	20
3.6.4	Perennial Grass Diversity.....	20
3.6.5	Total Relative Shrub Cover.....	20
3.6.6	Shrub Diversity	21
3.6.7	Shrub Density.....	21
3.6.8	Perennial Forb Diversity	21
3.6.9	Discussion	22
4	CONCLUSION.....	22
5	REFERENCES	24

LIST OF TABLES

Table 1	Reclamation Success Standards for La Plata Mine.....	2
Table 2	Formulas Used for Vegetation Data Analysis.....	4
Table 3	Sample Adequacy	4
Table 4	Double Wedge Vegetation and Ground Cover	5
Table 5	Double Wedge Perennial Cover T-Test.....	5
Table 6	Double Wedge Grass Cover.....	6
Table 7	Double Wedge Grass Cover T-Test.....	6
Table 8	Double Wedge Shrub Cover	7
Table 9	Double Wedge Shrub Cover T-Test	7
Table 10	Double Wedge Shrub Density	8
Table 11	Double Wedge Perennial Forb Diversity	8
Table 12	Double Wedge Reclamation Success 2019-2022	8
Table 13	McDermott Vegetation and Ground Cover.....	9
Table 14	McDermott Perennial Cover T-Test	9
Table 15	McDermott Grass Cover.....	9
Table 16	McDermott Grass Cover T-Test	10
Table 17	McDermott Shrub Cover.....	10
Table 18	McDermott Shrub Cover T-Test.....	10
Table 19	McDermott Shrub Density.....	11
Table 20	McDermott Perennial Forb Diversity	11
Table 21	McDermott Reclamation Success 2019-2022.....	12
Table 22	Montoya Vegetation and Ground Cover.....	12
Table 23	Montoya Perennial Cover T-Test.....	12
Table 24	Montoya Grass Cover	13
Table 25	Montoya Grass Cover T-Test.....	13

2022 La Plata Mine Vegetation Survey

Table 26 Montoya Shrub Cover.....	14
Table 27 Montoya Shrub Cover T-Test	14
Table 28 Montoya Shrub Density	14
Table 29 Montoya Perennial Forb Diversity.....	15
Table 30 Montoya Reclamation Success 2019-2022.....	15
Table 31 Panel 10 Vegetation and Ground Cover	16
Table 32 Panel 10 Perennial Cover T-Test	16
Table 33 Panel 10 Non-Noxious Grass Cover	16
Table 34 Panel 10 Grass Cover T-Test	17
Table 35 Panel 10 Shrub Cover	17
Table 36 Panel 10 Shrub Cover T-Test.....	17
Table 37 Panel 10 Shrub Density.....	18
Table 38 Panel 10 Perennial Forb Diversity	18
Table 39 Panel 10 Reclamation Success 2019-2022.....	19
Table 40 Sundance Vegetation and Ground Cover.....	19
Table 41 Sundance Perennial Cover T-Test	19
Table 42 Sundance Grass Cover	20
Table 43 Sundance Grass Cover T-Test	20
Table 44 Sundance Shrub Cover.....	21
Table 45 Sundance Shrub Cover T-Test.....	21
Table 46 Sundance Shrub Density	21
Table 47 Sundance Perennial Forb Diversity	21
Table 48 Sundance Reclamation Success 2019-2022.....	22
Table 49 Reclamation Area Success Summary	23

LIST OF APPENDICES

(Separate Documents)

Appendix A Transect Location Exhibits
Appendix B Extended Data Tables
Appendix C Transect Photographs

1 INTRODUCTION

1.1 Purpose

Westmoreland San Juan Mining LLC conducted a reclamation success study in 2022 at La Plata Mine (LPM), located near La Plata, New Mexico. LPM operates under the approved New Mexico Mining and Minerals Division (MMD) permit No. 16-01. The purpose of this study was to determine whether the reclamation is adequate for bond release using vegetation data collected from five reclaimed land areas.

1.2 Background

Reclamation began at LPM in the late 1980s, and by 2008 all areas had been seeded. Monitoring and maintenance of these areas is ongoing, including reseeding and interseeding in small areas, as needed. This survey includes the Sundance, Double Wedge, Montoya, McDermott, and Panel 10 reclamation areas (Appendix A). The reclamation areas will be considered successful if they meet the applicable success standards (Section 1.3) while sustaining the primary land use of wildlife habitat.

1.3 Reclamation Success Standards

The reclamation success standards for LPM are fixed standards and success criteria based on historic pre-mine data collected between 1981 and 1997 from undisturbed vegetation communities at LPM (Table 1). Cover standards must be met at least two out of four years while density and diversity standards must be met one out of two years.

Table 1 Reclamation Success Standards for La Plata Mine

Vegetation Parameter	Success Standard
Perennial Cover ¹	8.1% perennial cover (90% of 9%) or greater
Total Relative Grass Cover ¹	Near 50% but below 95% and above 20%
Perennial Grass Cover ¹	3 perennial grass species comprise at least 5% of the relative perennial herbaceous cover No one species comprises more than 90% of the relative perennial herbaceous cover
Perennial Grass Diversity ²	3 perennial grass species with at least 1% relative grass cover each
Total Relative Shrub Cover ¹	Near 25% on slopes $\leq 6\%$ Near 50% on slopes $> 6\%$
Shrub Diversity ²	1 shrub species with at least 1% relative shrub cover on slopes $\leq 6\%$ 3 shrub species with at least 1% relative shrub cover on slopes $> 6\%$
Shrub Density ²	100 stems per acre on slopes $\leq 6\%$ 436 stems per acre on slopes $> 6\%$
Perennial Forb Diversity ²	3 perennial forb species with at least 1% relative forb cover each

2 METHODS

2.1 Study Design

The study design and sampling methods used in 2022 follow Section 906 of LPM's approved permit No 16-01.

2.2 Parameters Sampled

Reclamation vegetation was monitored from July 25 to August 23, 2022. Habitat Management, Inc. sampled the following vegetation parameters:

- Vegetation cover by species
- Bare ground, litter, and rock cover
- Shrub density

2.3 Sample Requirement

Forty sample locations were randomly located within each of the LPM sampling areas using ArcGIS 10.8.2. A minimum of 15 locations were sampled with sample adequacy calculated for cover and shrub density after their completion. If sample adequacy was not met, additional transects were sampled until sample adequacy was reached or the maximum of 40 samples were collected. If a sample location was not suitable the sample point was shifted to the nearest suitable location. Sample locations considered not suitable for sampling may include, but are not limited to, road berms, standing water, or other features not representative of the vegetation community. The maximum of 40 samples were required in all five reclamation areas in 2022 for a total of 200 sample locations. Sample locations in each of the reclamation areas are shown on the maps in Appendix A.

2.4 Sampling Methods

2.4.1 Cover

Vegetation and ground cover were sampled by establishing a 30 meter (m) point-intercept transect (Knight 1978; Barbour *et al.* 1980) starting at the randomly generated sample location and extending in a randomly selected direction. Sample locations were identified in the field using a GPS-enabled tablet. The direction was chosen by spinning an object in the air and orienting in the way it pointed when it dropped to the ground. If a transect extended into a different vegetation community or disturbed area, an alternate direction was used to ensure that a single vegetation community was sampled along each transect.

Cover was recorded at 0.1 m intervals along the 30 m transect, resulting in a total of 300 hits per transect. A hit is defined as the first interception of a vertical projection from the tape to vegetation, litter, rock, or bare ground. A monopod mounted laser was used to eliminate bias when determining hits. Each transect was treated as one sample during analysis.

2.4.2 Shrub Density

Shrub density was estimated by counting the number of shrubs rooted within a 30 m by 2 m (60 m²) belt transect located within 1 m on each side of the cover transect. Densities are reported as the number of rooted stems per 60 m² converted to stems per acre.

2.4.3 Species Diversity

Diversity was determined by calculating the number of grass, forb, or shrub species having at least a specified amount of cover as determined by the reclamation success standards (Table 1). All diversity calculations were based on cover data.

2.4.4 Data Analysis

Data were entered into Microsoft Excel spreadsheets and the desired plant community characteristics were calculated using the formulas shown in Table 2. If the mean value for perennial cover, relative grass cover, relative shrub cover, or shrub density was less than the technical standard, then the dataset was compared to the technical standard using a one-tailed one-sample t-test with 90% confidence interval to determine if there was a statistical difference.

Table 2 Formulas Used for Vegetation Data Analysis

Parameter	Formula	Where
Absolute Vegetation Cover by Species	$\sum_i H_i$	H_i = Number of times a species was intercepted on a transect i. Total ground cover was computed using the same formula, including the number of times litter and rock were intercepted.
Relative Cover	C/AC	C = Cover of species by life form AC = Absolute Plant Cover
Mean	$\frac{\sum x}{n}$	$\sum x$ = Sum of values for variable under consideration n = Number of samples
Standard Deviation	$\sqrt{\frac{\sum (\bar{x} - x_i)^2}{n-1}}$	\bar{x} = Mean x_i = Value of variable for sample i n = Number of samples
Sample Size Adequacy	$N_{\min} \geq \frac{(ts)^2}{(dx)^2}$	N_{\min} = Minimum number of samples required for sample adequacy $t = t$ (1.684 at n = 40) for the 90% confidence level s = Standard deviation d = Amount of reduction to detect = 0.1 for 90% \bar{x} = Mean
Parametric Student t-test	$t = \frac{\bar{x} - \bar{X}_w}{s / \sqrt{n}}$	\bar{x} = Sample mean \bar{X}_w = Technical standard s = Sample standard deviation n = Number of samples

References: Bonham *et al.* (1980); Elzinga *et al.* 1998; New Mexico Mining and Minerals Division 2000; Wyoming Department of Environmental Quality 2012.

3 RESULTS

3.1 Sample Adequacy

Sample adequacy was calculated for vegetation cover and shrub density in each reclamation area (Table 3). The maximum of 40 transects were required in each area for a total of 200 transects sampled in the combined reclamation areas. One hundred of these transects were in areas with slopes >6%, and 100 were in areas with slopes ≤6%.

Table 3 Sample Adequacy

Reclamation Area	Vegetation Cover			Shrub Density			Total Sampled (Max. 40)
	Mean Vegetation Cover (%)	Standard Deviation	Minimum Sample Size	Mean Shrub Density (%)	Standard Deviation	Minimum Sample Size	
Double Wedge	27.63	14.03	73	39.60	33.28	201	40
McDermott	69.68	34.56	70	29.83	29.36	275	40
Montoya	29.18	17.17	98	54.68	45.47	196	40
Panel 10	23.80	15.30	117	22.58	18.53	191	40
Sundance	26.13	13.46	75	47.73	56.09	392	40

3.2 Double Wedge

The Double Wedge reclamation area is located in the north-west portion of LPM and covers approximately 102 acres.

3.2.1 Perennial Cover

Total vegetation cover, perennial vegetation cover, relative perennial vegetation cover, and total ground cover data are summarized in Table 4. The mean perennial cover was 6.66% which was not greater than the relevant standard of 8.1%. However, when a one-tailed t-test was applied to determine the statistical difference from the standard the Double Wedge reclamation area met the 8.1% standard (Table 5).

Table 4 Double Wedge Vegetation and Ground Cover

Reclamation Area	Total Vegetation	Perennial		Ground Cover
	Mean (%)	Mean (%)	Relative (%)	Mean (%)
Double Wedge	9.21	6.66	72.31	37.41

Table 5 Double Wedge Perennial Cover T-Test

Parameter	Double Wedge
Mean	19.98
Standard Deviation	12.29
T-Critical Value	-1.304
T-test Value	6.53
Pass?	YES

3.2.2 Total Relative Grass Cover

Nine grass species were encountered in the 2022 survey: *Achnatherum hymenoides* (Indian ricegrass), *Bouteloua gracilis* (blue grama), *Bromus tectorum* (cheatgrass), *Elymus elymoides* (squirreltail), *Pascopyrum smithii* (western wheatgrass), *Pleuraphis jamesii* (James' galleta), *Psathyrostachys juncea* (Russian wildrye), *Pseudoroegneria spicata* (bluebunch wheatgrass), and *Thinopyrum intermedium* (intermediate wheatgrass). The permit requires that relative cover of grasses will be near 50% and will not exceed 95% nor be lower than 20%. The relative cover for grass species was 24.71% above the standard minimum of 20% but less than 95% (Table 6). However, when a one-tailed t-test was applied to determine the statistical difference, the Double Wedge reclamation area did not meet the near 50% standard (Table 7).

Table 6 Double Wedge Grass Cover

Species	Relative Cover (%)	Relative Perennial Herbaceous Cover (%)	Relative Grass Cover (%)
Annual Grasses			
Total Annual Grasses	0.18	-	0.73
Perennial Grasses			
<i>Achnatherum hymenoides</i>	5.52	22.51	22.34
<i>Bouteloua gracilis</i>	0.36	1.48	1.47
<i>Elymus elymoides</i>	1.27	5.17	5.13
<i>Pascopyrum smithii</i>	6.61	26.94	26.74
<i>Pleuraphis jamesii</i>	5.97	24.35	24.18
<i>Psathyrostachys juncea</i>	0.09	0.37	0.37
<i>Pseudoroegneria spicata</i>	0.18	0.74	0.73
<i>Thinopyrum intermedium</i>	4.52	18.45	18.32
Total Perennial Grasses	24.52	100.00	99.27
Perennial Forbs			
Total Perennial Forbs	0.00	0.00	-
Total	24.71	100.00	100.00

Table 7 Double Wedge Grass Cover T-Test

Parameter	Double Wedge
Mean	27.59
Standard Deviation	22.43
T-Critical Value	-1.304
T-test Value	-4.91
Pass?	NO

3.2.3 Perennial Grass Cover

Eight of the nine observed grass species encountered were perennials. The standard requires that three species of perennial grasses comprise at least 5% of the relative perennial herbaceous cover with no one species comprising more than 90% of the relative perennial herbaceous cover. The relative perennial grass cover standard was exceeded with five species: *Pascopyrum smithii* at 26.94%, *Pleuraphis jamesii* at 24.35%, *Achnatherum hymenoides* at 22.51%, *Thinopyrum intermedium* at 18.45%, and *Elymus elymoides* at 5.17% (Table 6).

3.2.4 Perennial Grass Diversity

The permit requires that three species of perennial grasses contribute at least 1% of the relative grass cover. Six perennial grass species met the standard with greater than 1% of relative grass cover in the Double Wedge reclamation area: *Pascopyrum smithii* (26.74%), *Pleuraphis jamesii* (24.18%), *Achnatherum hymenoides* (22.34%), *Thinopyrum intermedium* (18.32%), *Elymus elymoides* (5.13%), and *Bouteloua gracilis* (1.47%) (Table 6).

3.2.5 Total Relative Shrub Cover

The permit anticipates that relative cover of shrubs may be higher in areas with greater slopes than in areas with more gentle slopes and thus states that total relative cover of shrubs should be near 25% for slopes $\leq 6\%$ and near 50% for slopes $> 6\%$. The relative cover of shrubs was 42.53% on slopes $\leq 6\%$ and 53.03% on slopes $> 6\%$ (Table 8). When a one-tailed t-test was applied, both slopes met their applicable standard (Table 9).

Table 8 Double Wedge Shrub Cover

Species	Slopes $\leq 6\%$		Slopes $> 6\%$	
	Relative Cover	Relative Shrub Cover	Relative Cover	Relative Shrub Cover
<i>Artemisia tridentata</i>	1.63	3.83	0.18	0.34
<i>Atriplex canescens</i>	34.21	80.43	51.40	96.93
<i>Ericameria nauseosa</i>	0.18	0.43	0.36	0.68
<i>Krascheninnikovia lanata</i>	6.52	15.32	1.09	2.05
Total	42.53	100.00	53.03	100.00

Table 9 Double Wedge Shrub Cover T-Test

Parameter	Slopes $\leq 6\%$	Slopes $> 6\%$
Mean	41.34	52.33
Standard Deviation	34.43	27.63
T-Critical Value	-1.328	-1.328
T-test Value	2.45	1.19
Pass?	YES	YES

3.2.6 Shrub Diversity

On $\leq 6\%$ slopes the permit requires one shrub species to have greater than 1% relative shrub cover. This standard was met with three species: *Atriplex canescens* (fourwing saltbrush, 80.43%), *Krascheninnikovia lanata* (winterfat 15.32%), and *Artemisia tridentata* (big sagebrush, 3.83%) (Table 8).

On $> 6\%$ slopes the permit requires three shrub species to have greater than 1% relative shrub cover. This standard was not met with only two species with greater than 1% relative shrub cover: *Atriplex canescens* (96.93%) and *Krascheninnikovia lanata* (2.05%) (Table 8).

3.2.7 Shrub Density

The shrub density standard is 100 stems per acre in reclamation areas with $\leq 6\%$ slopes and 436 stems per acre in areas with slopes $> 6\%$. Both slope classes surpassed the standard with 2,654 stems per acre on $\leq 6\%$ slopes and 2,688 stems per acre on $> 6\%$ slopes in the Double Wedge reclamation area (Table 10).

Table 10 Double Wedge Shrub Density

Parameter	Slopes ≤6%	Slopes >6%
Stems per Acre	2,654	2,688

3.2.8 Perennial Forb Diversity

The permit requires three perennial forb species with at least 1% relative forb cover each. This standard was not met in the Double Wedge reclamation area with no perennial forb species meeting the standard (Table 11).

Table 11 Double Wedge Perennial Forb Diversity

Species	Relative Forb Cover
Annual & Biennial Forbs	
Annual & Biennial Forbs Total	100.00
Perennial Forbs	
Perennial Forbs Total	0.00
Total	100.00

3.2.9 Discussion

This was the fourth year of vegetation monitoring on the Double Wedge reclamation area. Cover success standards are required to be met for two out of four years while density and diversity standards are to be met one out of two years. The Double Wedge reclamation area has met all eleven standards demonstrating that it is developing into a stable vegetation community for the post-mining land-use of wildlife habitat (Table 12). The Double Wedge reclamation area is eligible for release.

Table 12 Double Wedge Reclamation Success 2019-2022

Standard	2019	2020	2021	2022	Standard Met?
Perennial Cover	PASS	PASS	PASS	PASS	YES
Total Relative Grass Cover	PASS	PASS	PASS	FAIL	YES
Perennial Grass Cover	PASS	PASS	PASS	PASS	YES
Perennial Grass Diversity	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover ≤6%	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover >6%	PASS	PASS	PASS	PASS	YES
Shrub Diversity ≤6% Slope	PASS	PASS	PASS	PASS	YES
Shrub Diversity >6% Slope	FAIL	PASS	PASS	FAIL	YES
Shrub Density ≤6% Slope	PASS	PASS	PASS	PASS	YES
Shrub Density >6% Slope	PASS	PASS	PASS	PASS	YES
Perennial Forb Diversity	FAIL	PASS	FAIL	FAIL	YES

3.3 McDermott

The McDermott reclamation area is located in the east portion of LPM and covers approximately 153 acres.

3.3.1 Perennial Cover

Total vegetation cover, perennial vegetation cover, relative perennial vegetation cover, and total ground cover data are summarized in Table 13. The mean perennial cover was 7.92% which was not greater than the relevant standard of 8.1%. However, when a one-tailed t-test was applied to determine the statistical difference from the standard the McDermott reclamation area met the 8.1% standard (Table 14).

Table 13 McDermott Vegetation and Ground Cover

Reclamation Area	Total Vegetation	Perennial		Ground Cover
	Mean	Mean	Relative	Mean
McDermott	23.06	7.92	34.33	44.58

Table 14 McDermott Perennial Cover T-Test

Parameter	McDermott
Mean	23.75
Standard Deviation	18.54
T-Critical Value	-1.304
T-test Value	5.61
Pass?	YES

3.3.2 Total Relative Grass Cover

Seven grass species were encountered in the 2022 survey: *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, and *Sporobolus airoides* (alkali dropseed). The relative cover for grass species was 11.42% not meeting the minimum of 20% (Table 15). A one-tailed t-test was applied and the McDermott reclamation area did not meet the near 50% standard (Table 16).

Table 15 McDermott Grass Cover

Species	Relative Cover	Relative Perennial Herbaceous Cover	Relative Grass Cover
Annual Grasses			
Total Annual Grasses	0.00	-	0.00
Perennial Grasses			
<i>Achnatherum hymenoides</i>	1.19	10.44	10.44
<i>Bouteloua gracilis</i>	0.29	2.53	2.53
<i>Elymus elymoides</i>	0.36	3.16	3.16
<i>Pascopyrum smithii</i>	0.90	7.91	7.91
<i>Pleuraphis jamesii</i>	7.91	69.30	69.30
<i>Pseudoroegneria spicata</i>	0.18	1.58	1.58
<i>Sporobolus airoides</i>	0.58	5.06	5.06
Total Perennial Grasses	11.42	100.00	100.00
Perennial Forbs			
Total Perennial Forbs	0.00	0.00	-
Total	11.42	100.00	100.00

Table 16 McDermott Grass Cover T-Test

Parameter	McDermott
Mean	12.22
Standard Deviation	17.48
T-Critical Value	-1.304
T-test Value	-11.86
Pass?	NO

3.3.3 Perennial Grass Cover

All seven of the observed grass species encountered were perennials. The relative perennial grass cover standard was exceeded with four species: *Pleuraphis jamesii* at 69.30%, *Achnatherum hymenoides* at 10.44%, *Pascopyrum smithii* at 7.91%, and *Sporobolus airoides* at 5.06% (Table 15).

3.3.4 Perennial Grass Diversity

All seven of the perennial grass species met the diversity standard with greater than 1% relative grass cover in the McDermott reclamation area: *Pleuraphis jamesii* (69.30%), *Achnatherum hymenoides* (10.44%), *Pascopyrum smithii* (7.91%), *Sporobolus airoides* (5.06%), *Elymus elymoides* (3.16%), *Bouteloua gracilis* (2.53%), and *Pseudoroegneria spicata* (1.58%) (Table 15).

3.3.5 Total Relative Shrub Cover

The relative cover of shrubs was 26.82% on slopes $\leq 6\%$ slopes and 19.01% on slopes $> 6\%$ (Table 17). When a one-tailed t-test was applied, slopes $\leq 6\%$ met the standard but slopes $> 6\%$ did not (Table 18).

Table 17 McDermott Shrub Cover

Species	Slopes $\leq 6\%$		Slopes $> 6\%$	
	Relative Cover	Relative Shrub Cover	Relative Cover	Relative Shrub Cover
<i>Atriplex canescens</i>	21.68	80.86	13.44	70.72
<i>Atriplex obovata</i>	0.36	1.35	0.00	0.00
<i>Ericameria nauseosa</i>	2.67	9.97	0.87	4.56
<i>Gutierrezia sarothrae</i>	0.07	0.27	0.00	0.00
<i>Krascheninnikovia lanata</i>	0.94	3.50	3.47	18.25
<i>Sarcobatus vermiculatus</i>	1.08	4.04	1.23	6.46
Total	26.82	100.00	19.01	100.00

Table 18 McDermott Shrub Cover T-Test

Parameter	Slopes $\leq 6\%$	Slopes $> 6\%$
Mean	29.74	33.30
Standard Deviation	26.50	34.67
T-Critical Value	-1.328	-1.328
T-test Value	1.22	-1.51
Pass?	YES	NO

3.3.6 Shrub Diversity

The shrub diversity standard on $\leq 6\%$ slopes was met with five species: *Atriplex canescens* (80.86%), *Ericameria nauseosa* (rubber rabbitbrush, 9.97%), *Sarcobatus vermiculatus* (greasewood, 4.04%), *Krascheninnikovia lanata* (3.50%), and *A. obovata* (mound saltbrush, 3.96%) (Table 17). The shrub diversity standard on $> 6\%$ slopes was met with four species: *Atriplex canescens* (70.72%), *Krascheninnikovia lanata* (18.25%), *Sarcobatus vermiculatus* (6.46%), and *Ericameria nauseosa* (4.56%) (Table 17).

3.3.7 Shrub Density

Both reclamation areas, $\leq 6\%$ slopes and slopes $> 6\%$, surpassed the shrub density standard. There was an average of 2,114 stems per acre on $\leq 6\%$ slopes and 1,909 stems per acre on $> 6\%$ slopes (Table 19).

Table 19 McDermott Shrub Density

Parameter	Slopes $\leq 6\%$	Slopes $> 6\%$
Stems per Acre	2,114	1,909

3.3.8 Perennial Forb Diversity

The perennial forb diversity standard was not met in the McDermott reclamation areas with no perennial forb species meeting the standard (Table 20).

Table 20 McDermott Perennial Forb Diversity

Species	Relative Forb Cover
Annual & Biennial Forbs	
Annual & Biennial Forbs Total	100.00
Perennial Forbs	
Perennial Forbs Total	0.00
Total	100.00

3.3.9 Discussion

This was the fourth year of vegetation monitoring on the McDermott reclamation area. The McDermott reclamation area has met ten of the eleven standards (Table 21) demonstrating that it is developing into a stable vegetation community for the post-mining land-use of wildlife habitat. The perennial forb diversity standard has not been met during any of the last four years and it is recommended that interseeding be performed to increase perennial forb diversity. Vegetation monitoring will be required for at least one more year on the McDermott reclamation area.

Table 21 McDermott Reclamation Success 2019-2022

Standard	2019	2020	2021	2022	Standard Met?
Perennial Cover	PASS	PASS	PASS	PASS	YES
Total Relative Grass Cover	PASS	PASS	FAIL	FAIL	YES
Perennial Grass Cover	PASS	PASS	PASS	PASS	YES
Perennial Grass Diversity	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover ≤6%	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover >6%	PASS	PASS	PASS	FAIL	YES
Shrub Diversity ≤6% Slope	PASS	PASS	PASS	PASS	YES
Shrub Diversity >6% Slope	PASS	PASS	PASS	PASS	YES
Shrub Density ≤6% Slope	PASS	PASS	PASS	PASS	YES
Shrub Density >6% Slope	PASS	PASS	PASS	PASS	YES
Perennial Forb Diversity	FAIL	FAIL	FAIL	FAIL	NO

3.4 Montoya

The Montoya reclamation area is located in the central mid-east portion of LPM and covers approximately 179 acres.

3.4.1 Perennial Cover

Total vegetation cover, perennial vegetation cover, relative perennial vegetation cover, and total ground cover data are summarized in Table 22. The mean perennial cover was 6.52% which was not greater than the relevant standard of 8.1%. However, when a one-tailed t-test was applied to determine the statistical difference from the standard the Montoya reclamation area met the 8.1% standard (Table 23).

Table 22 Montoya Vegetation and Ground Cover

Reclamation Area	Total Vegetation	Perennial		Ground Cover
	Mean	Mean	Relative	Mean
Montoya	9.60	6.52	67.88	34.39

Table 23 Montoya Perennial Cover T-Test

Parameter	Montoya
Mean	19.55
Standard Deviation	11.31
T-Critical Value	-1.304
T-test Value	6.85
Pass?	YES

3.4.2 Total Relative Grass Cover

Seven grass species were encountered in the 2022 survey: *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, and *Sporobolus airoides*. The relative cover for grass species was 9.38% not meeting the minimum 20% standard (Table 24). When a one-tailed t-test was applied to determine the statistical difference from the 50% standard the Montoya reclamation area did not pass (Table 25).

Table 24 Montoya Grass Cover

Species	Relative Cover	Relative Perennial Herbaceous Cover	Relative Grass Cover
Annual Grasses			
Total Annual Grasses	0.00	-	0.00
Perennial Grasses			
<i>Achnatherum hymenoides</i>	1.65	17.12	17.59
<i>Bouteloua gracilis</i>	0.35	3.60	3.70
<i>Elymus elymoides</i>	0.78	8.11	8.33
<i>Pascopyrum smithii</i>	1.22	12.61	12.96
<i>Pleuraphis jamesii</i>	3.99	41.44	42.59
<i>Pseudoroegneria spicata</i>	0.69	7.21	7.41
<i>Sporobolus airoides</i>	0.69	7.21	7.41
Total Perennial Grasses	9.38	97.30	100.00
Perennial Forbs			
Total Perennial Forbs	0.26	2.70	-
Total	9.64	100.00	100.00

Table 25 Montoya Grass Cover T-Test

Parameter	Montoya
Mean	10.84
Standard Deviation	21.74
T-Critical Value	-1.304
T-test Value	-9.94
Pass?	NO

3.4.3 Perennial Grass Cover

All seven of the observed grass species encountered were perennials. The relative perennial grass cover standard was exceeded with six species: *Pleuraphis jamesii* at 41.44%, *Achnatherum hymenoides* at 17.12%, *Pascopyrum smithii* at 12.61%, *Elymus elymoides* at 8.11%, and *Pseudoroegneria spicata* and *Sporobolus airoides* both at 7.21% (Table 24).

3.4.4 Perennial Grass Diversity

All seven perennial grass species met the diversity standard with greater than 1% of relative grass cover in the Montoya reclamation area: *Pleuraphis jamesii* (42.59%), *Achnatherum hymenoides* (17.59%), *Pascopyrum smithii* (12.96%), *Elymus elymoides* (8.33%), *Pseudoroegneria spicata* (7.41%), *Sporobolus airoides* (7.41%), and *Bouteloua gracilis* (3.70%)(Table 24).

3.4.5 Total Relative Shrub Cover

The relative cover of shrubs was 62.15% on slopes $\leq 6\%$ and 54.34% on slopes $> 6\%$ (Table 26). When a one-tailed t-test was applied to slopes $\leq 6\%$ and slopes $> 6\%$, both slopes met the standard (Table 27).

Table 26 Montoya Shrub Cover

Species	Slopes ≤6%		Slopes >6%	
	Relative Cover	Relative Shrub Cover	Relative Cover	Relative Shrub Cover
<i>Artemisia tridentata</i>	1.22	1.96	0.00	0.00
<i>Atriplex canescens</i>	58.68	94.41	36.46	67.09
<i>Atriplex confertifolia</i>	0.87	1.40	0.00	0.00
<i>Krascheninnikovia lanata</i>	1.39	2.23	17.71	32.59
<i>Sarcobatus vermiculatus</i>	0.00	0.00	0.17	0.32
Total	62.15	100.00	54.34	100.00

Table 27 Montoya Shrub Cover T-Test

Parameter	Slopes ≤6%	Slopes >6%
Mean	63.76	70.14
Standard Deviation	31.37	37.96
T-Critical Value	-1.328	-1.328
T-test Value	5.88	2.96
Pass?	YES	YES

3.4.6 Shrub Diversity

The shrub diversity standard was met on ≤6% slopes with four species: *Atriplex canescens* (94.41%), *Krascheninnikovia lanata* (2.23%), *Artemisia tridentata* (1.96%), and *A. confertifolia* (1.40%) (Table 26). On >6% slopes the permit requires three shrub species to have greater than 1% relative shrub cover. This standard was not met with only two species meeting the standard: *Atriplex canescens* (67.09%) and *Krascheninnikovia lanata* (32.59%) (Table 26).

3.4.7 Shrub Density

Both the ≤6% slope areas and the >6% slope areas surpassed their respective standards with 2,627 stems per acre on ≤6% slopes and 4,748 stems per acre on >6% slopes in the Montoya reclamation area (Table 28).

Table 28 Montoya Shrub Density

Parameter	Slopes ≤6%	Slopes >6%
Stems per Acre	2,627	4,748

3.4.8 Perennial Forb Diversity

The perennial forb diversity standard was not met in the Montoya reclamation area with no forb species meeting the standard (Table 29).

Table 29 Montoya Perennial Forb Diversity

Species	Relative Forb Cover
Annual & Biennial Forbs	
Annual & Biennial Forbs Total	99.20
Perennial Forbs	
<i>Astragalus lonchocarpus</i>	0.80
Perennial Forbs Total	0.80
Total	100.00

3.4.9 Discussion

This was the fourth year of vegetation monitoring on the Montoya reclamation area. The Montoya reclamation area has met ten of the eleven standards (Table 30) demonstrating that it is developing into a stable vegetation community for the post-mining land-use of wildlife habitat. The perennial forb diversity standard has not been met during the last four years. Thus, monitoring will be required for at least one more year on the Montoya reclamation area. It is recommended that interseeding be performed in the area to boost diversity.

Table 30 Montoya Reclamation Success 2019-2022

Standard	2019	2020	2021	2022	Standard Met?
Perennial Cover	PASS	PASS	PASS	PASS	YES
Total Relative Grass Cover	PASS	PASS	FAIL	FAIL	YES
Perennial Grass Cover	PASS	PASS	PASS	PASS	YES
Perennial Grass Diversity	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover $\leq 6\%$	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover $> 6\%$	PASS	PASS	PASS	PASS	YES
Shrub Diversity $\leq 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Shrub Diversity $> 6\%$ Slope	PASS	FAIL	FAIL	FAIL	YES
Shrub Density $\leq 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Shrub Density $> 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Perennial Forb Diversity	FAIL	FAIL	FAIL	FAIL	NO

3.5 Panel 10

The Panel 10 reclamation area is located in the south-west portion of LPM and covers approximately 179 acres.

3.5.1 Perennial Cover

Total vegetation cover, perennial vegetation cover, relative perennial vegetation cover, and total ground cover data are summarized in Table 31. The mean perennial cover was 5.92% which was not greater than the relevant standard of 8.1%. However, when a one-tailed t-test was applied to determine the statistical difference from the standard the Panel 10 reclamation area met the 8.1% standard (Table 32).

Table 31 Panel 10 Vegetation and Ground Cover

Reclamation Area	Total Vegetation	Perennial		Ground Cover
	Mean	Mean	Relative	Mean
Panel 10	7.93	5.92	74.66	39.08

Table 32 Panel 10 Perennial Cover T-Test

Parameter	Panel 10
Mean	17.75
Standard Deviation	10.71
T-Critical Value	-1.304
T-test Value	6.17
Pass?	YES

3.5.2 Total Relative Grass Cover

Ten grass species were encountered in the 2022 survey: *Achnatherum hymenoides*, *Bouteloua curtipendula* (sideoats grama), *B. gracilis*, *Bromus tectorum*, *Elymus elymoides*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Pseudoroegneria spicata*, *Sporobolus cryptandrus* (sand dropseed), and *Thinopyrum intermedium*. The relative cover for grass species was 41.64% exceeding the minimum of 20% but less than 95% maximum (Table 33). When a one-tailed t-test was applied to determine the statistical difference from the 50% standard the Panel 10 reclamation area met the standard (Table 34).

Table 33 Panel 10 Non-Noxious Grass Cover

Species	Relative Cover	Relative Perennial Herbaceous Cover	Relative Grass Cover
Annual Grasses			
Total Annual Grasses	0.32	-	0.76
Perennial Grasses			
<i>Achnatherum hymenoides</i>	6.52	15.78	15.66
<i>Bouteloua curtipendula</i>	0.53	1.27	1.26
<i>Bouteloua gracilis</i>	0.21	0.51	0.51
<i>Elymus elymoides</i>	0.21	0.51	0.51
<i>Pascopyrum smithii</i>	4.94	11.96	11.87
<i>Pleuraphis jamesii</i>	20.82	50.38	50.00
<i>Pseudoroegneria spicata</i>	1.05	2.54	2.53
<i>Sporobolus cryptandrus</i>	0.32	0.76	0.76
<i>Thinopyrum intermedium</i>	6.73	16.28	16.16
Total Perennial Grasses	41.32	100.00	99.24
Perennial Forbs			
Total Perennial Forbs	0.00	0.00	-
Total	41.64	100.00	100.00

Table 34 Panel 10 Grass Cover T-Test

Parameter	Panel 10
Mean	50.14
Standard Deviation	35.14
T-Critical Value	-1.304
T-test Value	0.93
Pass?	YES

3.5.3 Perennial Grass Cover

Nine of the observed grass species encountered were perennials. The relative perennial grass cover standard was exceeded with four of these species: *Pleuraphis jamesii* at 50.38%, *Thinopyrum intermedium* at 16.28%, *Achnatherum hymenoides* at 15.78%, and *Pascopyrum smithii* at 11.96% (Table 33).

3.5.4 Perennial Grass Diversity

Six perennial grass species met the diversity standard with greater than 1% relative grass cover in the Panel 10 reclamation area: *Pleuraphis jamesii* (50.00%), *Thinopyrum intermedium* (16.16%), *Achnatherum hymenoides* (15.66%), *Pascopyrum smithii* (11.87%), *Pseudoroegneria spicata* (2.53%), and *Bouteloua curtipendula* (1.26%) (Table 33).

3.5.5 Total Relative Shrub Cover

The relative cover of shrubs was 45.43% on slopes $\leq 6\%$ slopes and 21.24% on slopes $> 6\%$ (Table 35). When a one-tailed t-test was applied to both slopes, slopes $\leq 6\%$ met the standard but slopes $> 6\%$ did not (Table 36).

Table 35 Panel 10 Shrub Cover

Species	Slopes $\leq 6\%$		Slopes $> 6\%$	
	Relative Cover	Relative Shrub Cover	Relative Cover	Relative Shrub Cover
<i>Artemisia tridentata</i>	0.21	0.46	0.00	0.00
<i>Atriplex canescens</i>	43.74	96.30	17.67	83.17
<i>Ericameria nauseosa</i>	0.00	0.00	0.63	2.97
<i>Krascheninnikovia lanata</i>	1.47	3.24	2.94	13.86
Total	45.43	100.00	21.24	100.00

Table 36 Panel 10 Shrub Cover T-Test

Parameter	Slopes $\leq 6\%$	Slopes $> 6\%$
Mean	36.80	31.89
Standard Deviation	26.87	33.12
T-Critical Value	-1.328	-1.328
T-test Value	2.38	-1.77
Pass?	YES	NO

3.5.6 Shrub Diversity

On $\leq 6\%$ slopes, the shrub diversity standard was met with two species: *Atriplex canescens* (96.30%) and *Krascheninnikovia lanata* (3.24%) (Table 35). On $> 6\%$ slopes the standard was met with three species: *Atriplex canescens* (83.17%), *Krascheninnikovia lanata* (13.86%), and *Ericameria nauseosa* (2.97%) (Table 35).

3.5.7 Shrub Density

Shrub density on both $\leq 6\%$ slopes and slopes $> 6\%$ surpassed their respective standards with 1,835 stems per acre on $\leq 6\%$ slopes and 1,211 stems per acre on $> 6\%$ slopes in the Panel 10 reclamation area (Table 37).

Table 37 Panel 10 Shrub Density

Parameter	Slopes $\leq 6\%$	Slopes $> 6\%$
Stems per Acre	1,835	1,211

3.5.8 Perennial Forb Diversity

The perennial forb diversity standard was not met in the Panel 10 reclamation area with no perennial forb species with relative forb cover (Table 38).

Table 38 Panel 10 Perennial Forb Diversity

Species	Relative Forb Cover
Annual & Biennial Forbs	
Annual & Biennial Forbs Total	25.03
Perennial Forbs	
Perennial Forbs Total	0.00
Total	100.00

3.5.9 Discussion

This was the fourth year of vegetation monitoring on the Panel 10 reclamation area. The Panel 10 reclamation area has met all eleven standards demonstrating that it is developing into a stable vegetation community for the post-mining land-use of wildlife habitat (Table 39). The Panel 10 reclamation area is eligible for release.

Table 39 Panel 10 Reclamation Success 2019-2022

Standard	2019	2020	2021	2022	Standard Met?
Perennial Cover	PASS	PASS	PASS	PASS	YES
Total Relative Grass Cover	PASS	PASS	PASS	PASS	YES
Perennial Grass Cover	PASS	PASS	PASS	PASS	YES
Perennial Grass Diversity	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover $\leq 6\%$	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover $> 6\%$	PASS	FAIL	PASS	FAIL	YES
Shrub Diversity $\leq 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Shrub Diversity $> 6\%$ Slope	PASS	PASS	FAIL	PASS	YES
Shrub Density $\leq 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Shrub Density $> 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Perennial Forb Diversity	FAIL	PASS	PASS	FAIL	YES

3.6 Sundance

The Sundance reclamation area is located in the central mid-west portion of LPM and covers approximately 230 acres.

3.6.1 Perennial Cover

Total vegetation cover, perennial vegetation cover, relative perennial vegetation cover, and total ground cover data are summarized in Table 40. The mean perennial cover was 7.87% which was not greater than the relevant standard of 8.1%. However, when a one-tailed t-test was applied to determine the statistical difference from the standard the Panel 10 reclamation area met the 8.1% standard (Table 41).

Table 40 Sundance Vegetation and Ground Cover

Reclamation Area	Total Vegetation	Perennial		Ground Cover
	Mean	Mean	Relative	Mean
Sundance	8.65	7.87	90.94	44.95

Table 41 Sundance Perennial Cover T-Test

Parameter	Sundance
Mean	23.60
Standard Deviation	13.21
T-Critical Value	-1.304
T-test Value	7.81
Pass?	YES

3.6.2 Total Relative Grass Cover

Eight grass species were encountered in the 2022 survey: *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, *Pascopyrum smithii*, *Pleuraphis jamesii*, *Psathyrostachys juncea*, *Sporobolus cryptandrus*, and *Thinopyrum intermedium*. The relative cover of grass species was 17.15% falling short of the minimum of 20% (Table 42). Additionally, a one-tailed t-test was applied to determine the

statistical difference from the near 50% standard and the Sundance reclamation area did not meet the standard (Table 43).

Table 42 Sundance Grass Cover

Species	Relative Cover	Relative Perennial Herbaceous Cover	Relative Grass Cover
Annual Grasses			
Total Annual Grasses	0.00	-	0.00
Perennial Grasses			
<i>Achnatherum hymenoides</i>	3.37	19.66	19.66
<i>Bouteloua gracilis</i>	0.48	2.81	2.81
<i>Elymus elymoides</i>	0.48	2.81	2.81
<i>Pascopyrum smithii</i>	1.06	6.18	6.18
<i>Pleuraphis jamesii</i>	10.60	61.80	61.80
<i>Psathyrostachys juncea</i>	0.39	2.25	2.25
<i>Sporobolus cryptandrus</i>	0.39	2.25	2.25
<i>Thinopyrum intermedium</i>	0.39	2.25	2.25
Total Perennial Grasses	17.15	100.00	100.00
Perennial Forbs			
Total Perennial Forbs	0.00	0.00	-
Total	17.15	100.00	100.00

Table 43 Sundance Grass Cover T-Test

Parameter	Sundance
Mean	24.32
Standard Deviation	31.09
T-Critical Value	-1.304
T-test Value	-4.21
Pass?	NO

3.6.3 Perennial Grass Cover

All eight of the observed grass species encountered were perennials. The relative perennial grass cover standard was met with three species: *Pleuraphis jamesii* at 61.80%, *Achnatherum hymenoides* at 19.66%, and *Pascopyrum smithii* at 6.18% (Table 42).

3.6.4 Perennial Grass Diversity

Eight perennial grass species met the diversity standard with greater than 1% of relative grass cover in the Sundance reclamation area: *Pleuraphis jamesii* (61.80%), *Achnatherum hymenoides* (19.66%), *Pascopyrum smithii* (6.18%); *Bouteloua gracilis* and *Elymus elymoides* (2.81%); and *Psathyrostachys juncea*, *Sporobolus cryptandrus*, and *Thinopyrum intermedium* (2.25%) (Table 42).

3.6.5 Total Relative Shrub Cover

The relative cover of shrubs was 74.95% on slopes $\leq 6\%$ slopes and 72.64% on slopes $> 6\%$ (Table 44). When a one-tailed t-test was applied to slopes $\leq 6\%$ and $> 6\%$, both slopes met their standard (Table 45).

Table 44 Sundance Shrub Cover

Species	Slopes ≤6%		Slopes >6%	
	Relative Cover	Relative Shrub Cover	Relative Cover	Relative Shrub Cover
<i>Artemisia tridentata</i>	4.24	5.66	0.19	0.27
<i>Atriplex canescens</i>	61.66	82.26	63.58	87.53
<i>Ericameria nauseosa</i>	1.93	2.57	0.00	0.00
<i>Krascheninnikovia lanata</i>	7.13	9.51	7.32	10.08
<i>Sarcobatus vermiculatus</i>	0.00	0.00	1.54	2.12
Total	74.95	100.00	72.64	100.00

Table 45 Sundance Shrub Cover T-Test

Parameter	Slopes ≤6%	Slopes >6%
Mean	68.24	69.15
Standard Deviation	35.25	33.22
T-Critical Value	-1.328	-1.328
T-test Value	5.80	3.25
Pass?	YES	YES

3.6.6 Shrub Diversity

On ≤6% slopes the shrub diversity standard was met with four species: *Atriplex canescens* (82.26%), *Krascheninnikovia lanata* (9.51%), *Artemisia tridentata* (5.66%), and *Ericameria nauseosa* (2.57%) (Table 44). On >6% slopes the standard was met with *Atriplex canescens* (87.53%), *Krascheninnikovia lanata* (10.08%), and *Sarcobatus vermiculatus* (2.12%) (Table 44).

3.6.7 Shrub Density

Both ≤6% slopes and slopes >6% surpassed their respective shrub density standards with 3,646 stems per acre on ≤6% slopes and 2,792 stems per acre on >6% slopes in the Sundance reclamation area (Table 46).

Table 46 Sundance Shrub Density

Parameter	Slopes ≤6%	Slopes >6%
Stems per Acre	3,646	2,792

3.6.8 Perennial Forb Diversity

The perennial forb diversity standard was not met in the Sundance reclamation area with no perennial forb species with relative forb cover (Table 47).

Table 47 Sundance Perennial Forb Diversity

Species	Relative Forb Cover
Annual & Biennial Forbs	
Annual & Biennial Forbs Total	100.00
Perennial Forbs	
Perennial Forbs Total	0.00
Total	100.00

3.6.9 Discussion

This was the fourth year of vegetation monitoring on the Sundance reclamation area. The Sundance reclamation area has met ten of the eleven standards (Table 48) demonstrating that it is developing into a stable vegetation community for the post-mining land-use of wildlife habitat. The perennial forb diversity standard has not been met during the last four years. Thus, monitoring will be required for at least one more year on the Sundance reclamation area. It is recommended that interseeding be performed to increase perennial forb diversity.

Table 48 Sundance Reclamation Success 2019-2022

Standard	2019	2020	2021	2022	Standard Met?
Perennial Cover	PASS	PASS	FAIL	PASS	YES
Total Relative Grass Cover	PASS	PASS	FAIL	FAIL	YES
Perennial Grass Cover	PASS	PASS	PASS	PASS	YES
Perennial Grass Diversity	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover $\leq 6\%$	PASS	PASS	PASS	PASS	YES
Total Relative Shrub Cover $> 6\%$	PASS	PASS	PASS	PASS	YES
Shrub Diversity $\leq 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Shrub Diversity $> 6\%$ Slope	FAIL	PASS	PASS	PASS	YES
Shrub Density $\leq 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Shrub Density $> 6\%$ Slope	PASS	PASS	PASS	PASS	YES
Perennial Forb Diversity	FAIL	FAIL	FAIL	FAIL	NO

4 CONCLUSION

This was the fourth year of monitoring on the five LPM reclamation areas. While the vegetation is developing into a stable community capable of sustaining wildlife habitat on all reclamation areas, only the Double Wedge and Panel 10 areas have met all of the reclamation success standards (Table 49). The McDermott, Montoya, and Sundance areas will each require at least one more year of monitoring. It is recommended that interseeding be performed on the McDermott, Montoya, and Sundance areas to increase perennial forb diversity.

Table 49 Reclamation Area Success Summary

Standard	Years Out of Four When Standard Passed				
	Double Wedge	McDermott	Montoya	Panel 10	Sundance
Perennial Cover	4	4	4	4	3
Total Relative Grass Cover	3	2	2	4	2
Perennial Grass Cover	4	4	4	4	4
Perennial Grass Diversity	4	4	4	4	4
Total Relative Shrub Cover $\leq 6\%$	4	4	4	4	4
Total Relative Shrub Cover $> 6\%$	4	3	4	2	4
Shrub Diversity $\leq 6\%$ Slope	4	4	4	4	4
Shrub Diversity $> 6\%$ Slope	2	4	1	3	3
Shrub Density $\leq 6\%$ Slope	4	4	4	4	4
Shrub Density $> 6\%$ Slope	4	4	4	4	4
Perennial Forb Diversity	1	0	0	2	0
Additional Years of Monitoring	0	1	1	0	1

5 REFERENCES

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Appendix A

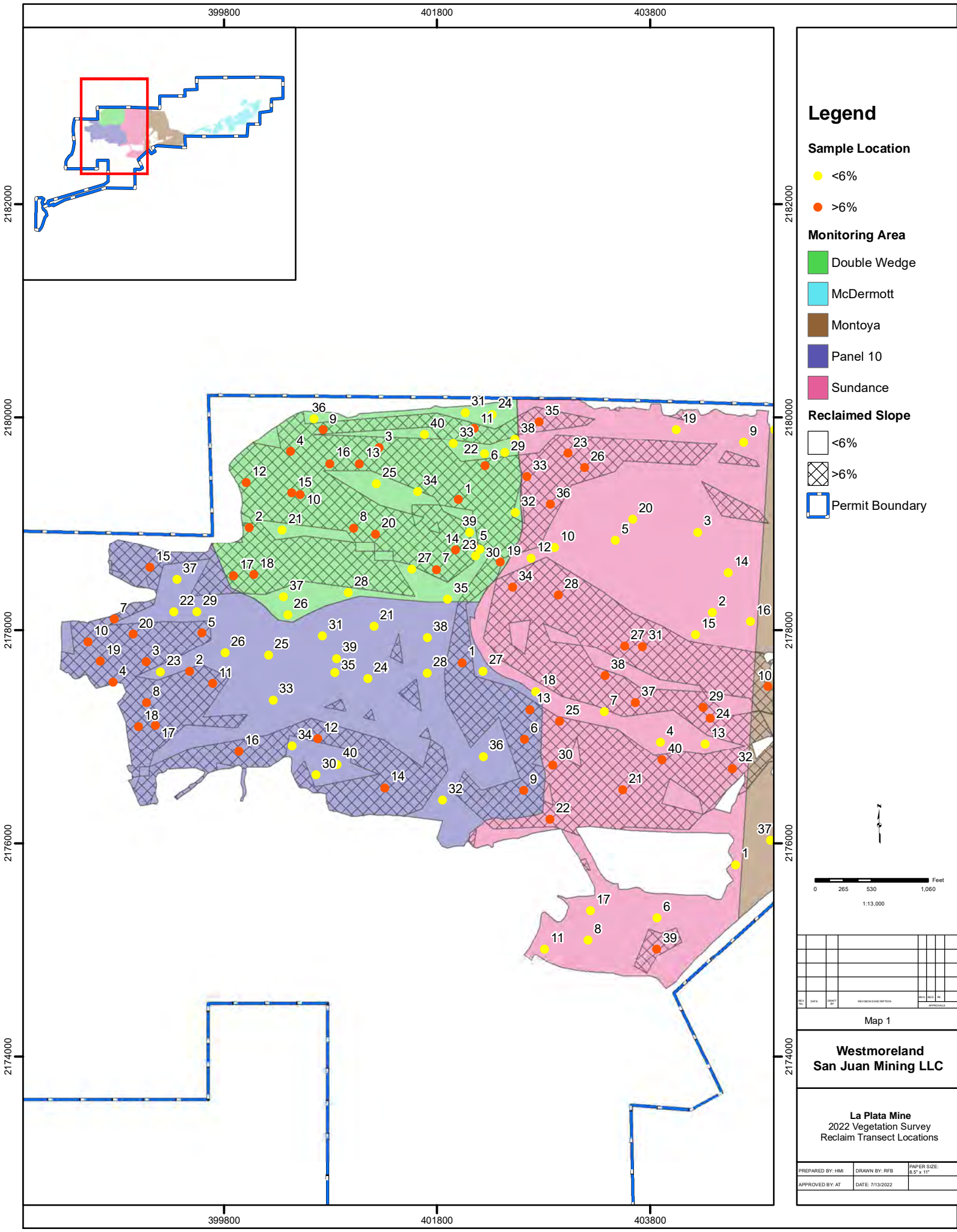
Transect Location Exhibits

Appendix B

Extended Data Tables

Appendix C

Transect Photographs



Legend

Sample Location

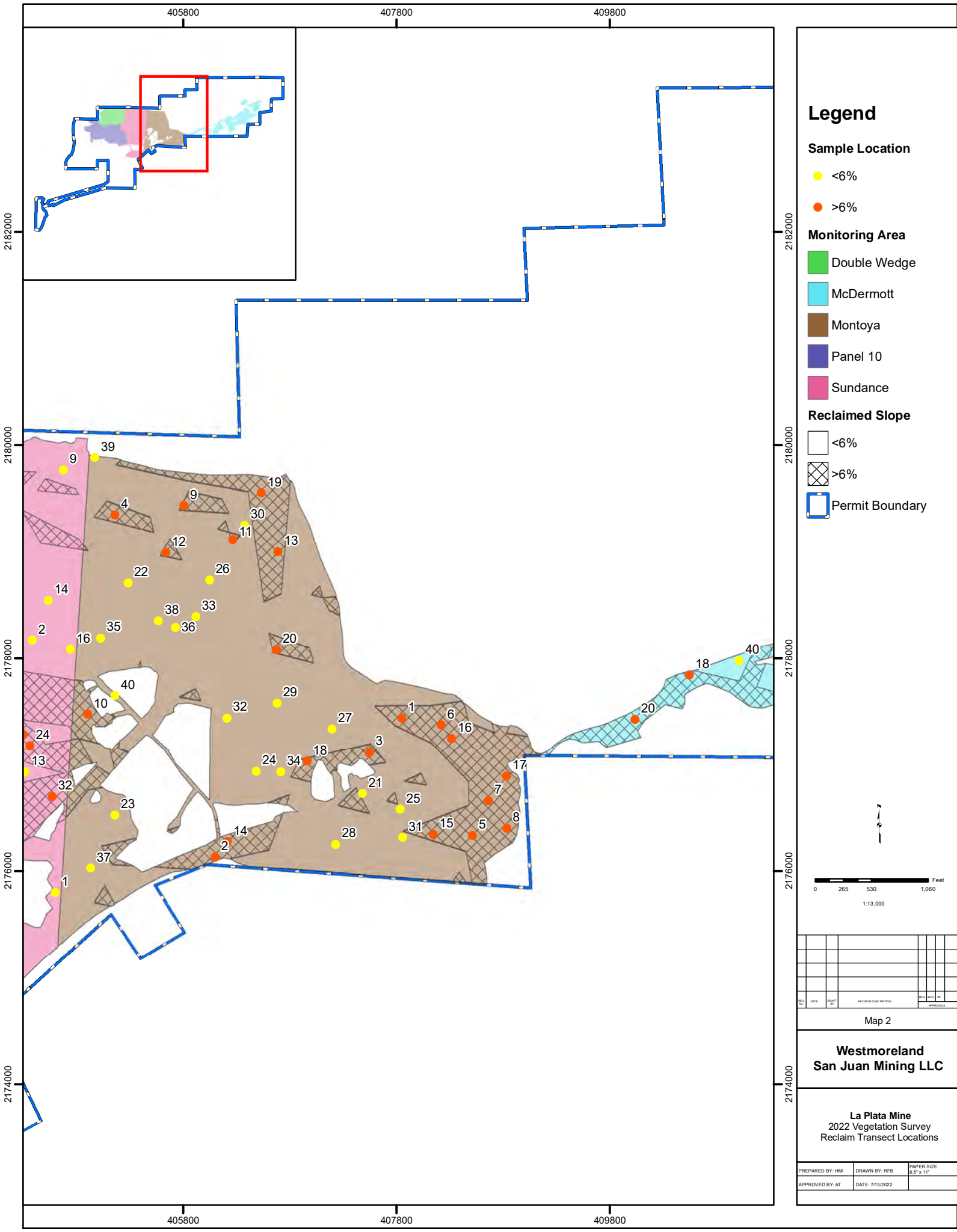
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- >6%

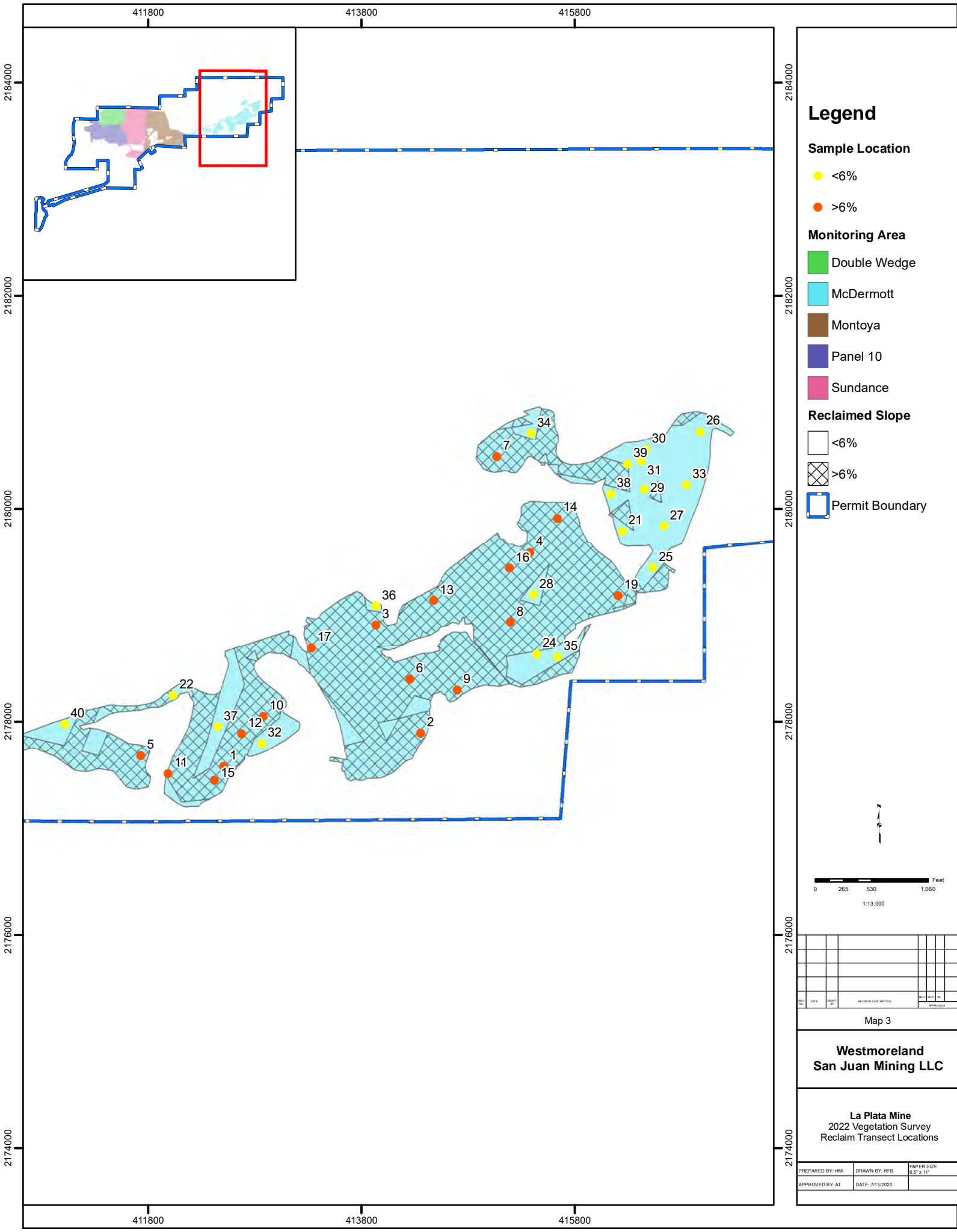
Monitoring Area

- Double Wedge
- McDermott
- Montoya
- Panel 10
- Sundance

Reclaimed Slope

- <6%
- >6%
- Permit Boundary





Legend

Sample Location

- <6%
- >6%

Monitoring Area

- Double Wedge
- McDermott
- Montoya
- Panel 10
- Sundance

Reclaimed Slope

- <6%
- >6%

Permit Boundary

0 265 530 1,060 Feet

1:13,000

REVISIONS									
NO.	DATE	BY	REASON	APPROVED BY	DATE	BY	REASON	APPROVED BY	DATE

Map 3

**Westmoreland
San Juan Mining LLC**

La Plata Mine
2022 Vegetation Survey
Reclaim Transect Locations

PREPARED BY: HMI	DRAWN BY: RFB	PAPER SIZE: 8.5" x 11"
APPROVED BY: AT	DATE: 7/13/2022	

Double Wedge



Double Wedge 1



Double Wedge 4



Double Wedge 2



Double Wedge 5



Double Wedge 3



Double Wedge 6



Double Wedge 7



Double Wedge 10



Double Wedge 8



Double Wedge 11



Double Wedge 9



Double Wedge 12



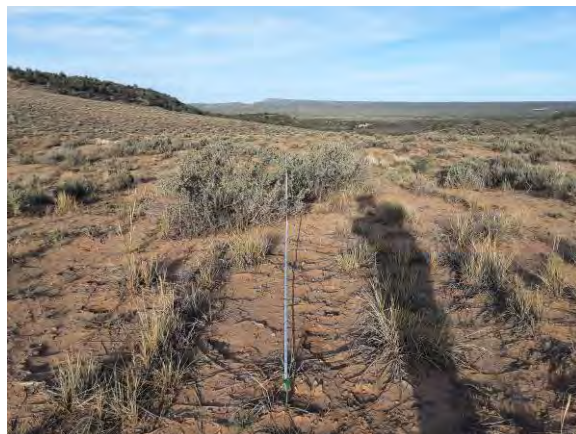
Double Wedge 13



Double Wedge 16



Double Wedge 14



Double Wedge 17



Double Wedge 15



Double Wedge 18



Double Wedge 19



Double Wedge 22



Double Wedge 20



Double Wedge 23



Double Wedge 21



Double Wedge 24



Double Wedge 25



Double Wedge 28



Double Wedge 26



Double Wedge 29



Double Wedge 27



Double Wedge 30



Double Wedge 31



Double Wedge 34



Double Wedge 32



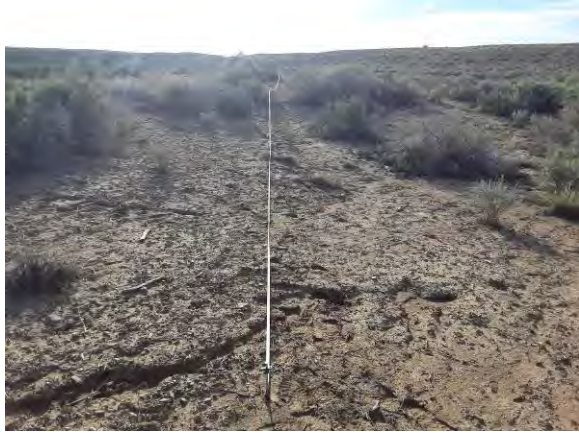
Double Wedge 35



Double Wedge 33



Double Wedge 36



Double Wedge 37



Double Wedge 40



Double Wedge 38



Double Wedge 39

McDermott



McDermott 1



McDermott 4



McDermott 2



McDermott 5



McDermott 3



McDermott 6



McDermott 7



McDermott 10



McDermott 8



McDermott 11



McDermott 9



McDermott 12



McDermott 13



McDermott 16



McDermott 14



McDermott 17



McDermott 15



McDermott 18



McDermott 19



McDermott 22



McDermott 20



McDermott 24



McDermott 21



McDermott 25



McDermott 26



McDermott 29



McDermott 27



McDermott 30



McDermott 28



McDermott 31



McDermott 32



McDermott 35



McDermott 33



McDermott 36



McDermott 34



McDermott 37



McDermott 38



McDermott 39



McDermott 40

Montoya



Montoya 1



Montoya 4



Montoya 2



Montoya 5



Montoya 3



Montoya 6



Montoya 7



Montoya 10



Montoya 8



Montoya 11



Montoya 9



Montoya 12



Montoya 13



Montoya 16



Montoya 14



Montoya 17



Montoya 15



Montoya 18



Montoya 19



Montoya 22



Montoya 20



Montoya 23



Montoya 21



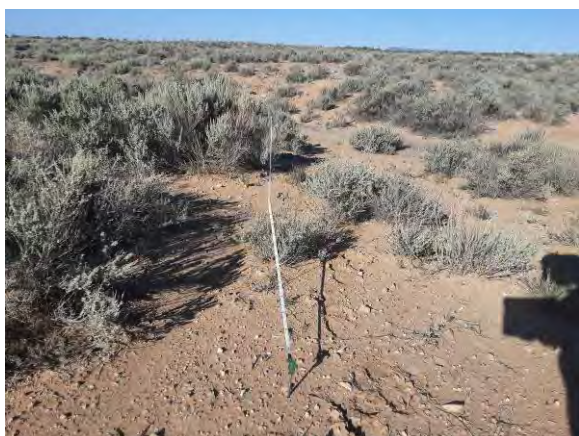
Montoya 24



Montoya 25



Montoya 28



Montoya 26



Montoya 29



Montoya 27



Montoya 30



Montoya 31



Montoya 34



Montoya 32



Montoya 35



Montoya 33



Montoya 36



Montoya 37



Montoya 40



Montoya 38



Montoya 39

Panel 10



Panel 10 1



Panel 10 4



Panel 10 2



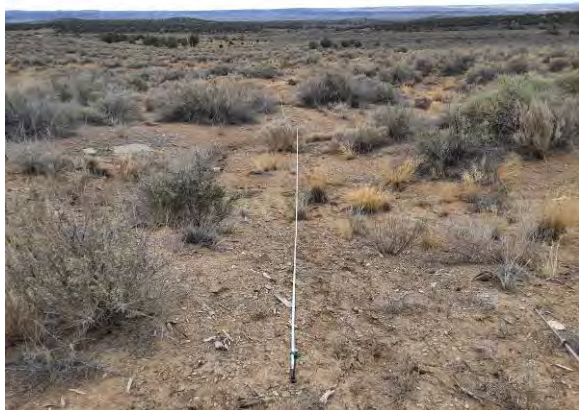
Panel 10 5



Panel 10 3



Panel 10 6



Panel 10 7



Panel 10 10



Panel 10 8



Panel 10 11



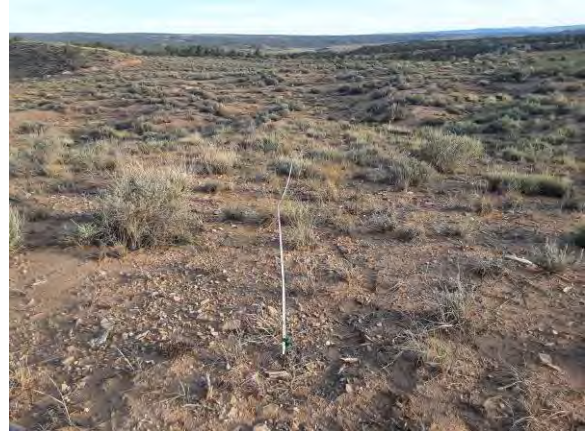
Panel 10 9



Panel 10 12



Panel 10 13



Panel 10 16



Panel 10 14



Panel 10 17



Panel 10 15



Panel 10 18



Panel 10 19



Panel 10 22



Panel 10 20



Panel 10 23



Panel 10 21



Panel 10 24



Panel 10 25



Panel 10 28



Panel 10 26



Panel 10 29



Panel 10 27



Panel 10 30



Panel 10 31



Panel 10 34



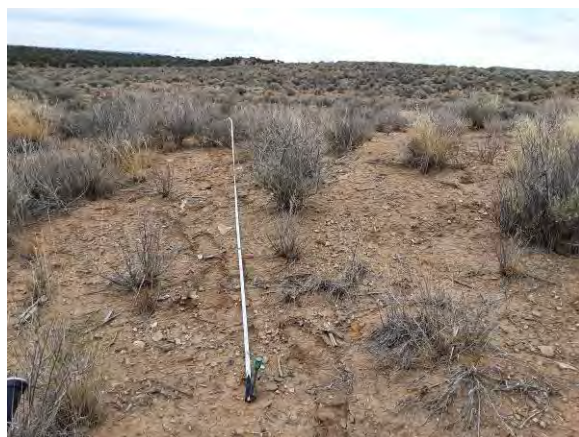
Panel 10 32



Panel 10 35



Panel 10 33



Panel 10 36



Panel 10 37



Panel 10 40



Panel 10 38



Panel 10 39

Sundance



Sundance 1



Sundance 4



Sundance 2



Sundance 5



Sundance 3



Sundance 6



Sundance 7



Sundance 10



Sundance 8



Sundance 11



Sundance 9



Sundance 12



Sundance 13



Sundance 16



Sundance 14



Sundance 17



Sundance 15



Sundance 18



Sundance 19



Sundance 22



Sundance 20



Sundance 23



Sundance 21



Sundance 24



Sundance 25



Sundance 28



Sundance 26



Sundance 29



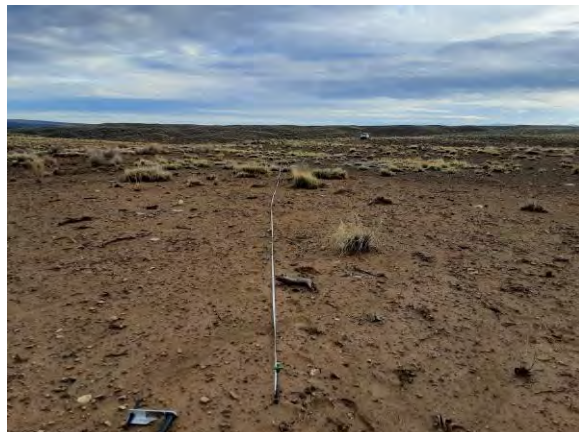
Sundance 27



Sundance 30



Sundance 31



Sundance 34



Sundance 32



Sundance 35



Sundance 33



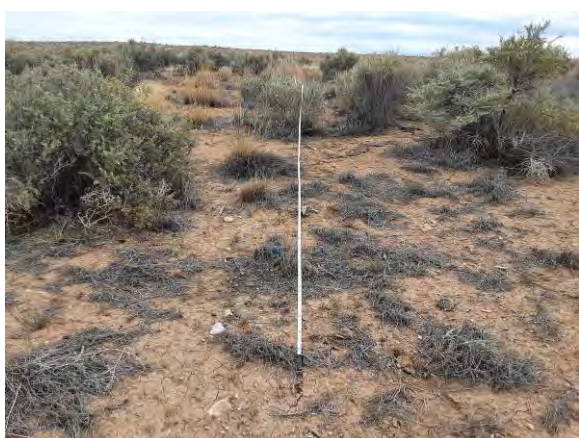
Sundance 36



Sundance 37



Sundance 40



Sundance 38



Sundance 39