PERMIT MODIFICATION 19-1 TO PERMIT NO. GR010RE
TYRONE MINE
EXISTING MINING OPERATION

MINING AND MINERALS DIVISION
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

This Permit Modification 19-1 ("Modification 19-1") to Permit No. GR010RE is issued by the Director of the Mining and Minerals Division ("MMD") of the New Mexico Energy, Minerals and Natural Resources Department to:

Freeport-McMoRan Tyrone Inc. ("Tyrone")
Whose correct address is: P.O. Box 571
Tyrone, NM 88065

("Permittee") for the Tyrone Mine, located in Grant County, New Mexico.

This Modification19-1:

A. Approves (i) the construction of the CSG stockpile at the Tyrone Mine, approximately 85 acres in size at full build-out, as shown in Figure 2 (dated October 16, 2019) of the 19-1 PMP (hereinafter defined) and (ii) the closeout plan for the CSG stockpile. The closeout plan for the CSG stockpile lowers the cost estimate amount for reclaiming the 5A stockpile, reduces the cost estimate for reclamation of the Mohawk Area of the Main Pit, and reduces the cost estimate for hauling of Gila conglomerate cover material for reclamation of the 5A, 3A/3B and 2A stockpiles leach and waste rock stockpiles. At this time, the financial assurance for the Tyrone Mine closeout plan is not revised.

In order to accomplish the approval contemplated by this Modification 19-1, the following subparagraphs are added to Permit No. GR010RE:

Section 1 (19-1). STATUTES AND REGULATIONS

A. This Permit modification is issued pursuant to the New Mexico Mining Act, NMSA 1978, §69-36-1, et seq. (1993, as amended through 2009) ("Act") and New Mexico Mining Act Rules, Title 19, Chapter 10 of the New Mexico Administrative Code ("NMAC" or "Rules" or "Regulations").

B. This Permit modification is subject to the Act, the Rules, and any other regulations which are now or hereafter in force under the Act; and all such regulations are made a part of this Permit by this reference.

Section 1a (19-1). PERMIT APPLICATION PACKAGE

A. The permit application package for Modification 19-1 ("19-1 PMP") consists of a written request from the Permittee, dated July 30, 2019, for the construction of the CSG stockpile, approximately 85 acres in size at the Tyrone Mine. The new stockpile will cover the reclaimed mill-concentrator unit and a portion of the No. 5A stockpile and the 19-1 PMP includes a closeout plan and reclamation cost estimate for the CSG stockpile.

B. Letter from FMTI, dated October 17, 2019, responding to MMD technical comments and comments from other state agencies including the New Mexico Environment Department ("NMED"), the New Mexico Department of Game and Fish ("NMDG&F"), and the New Mexico Department of Cultural Affairs ("NMDCA").

C. Memorandum from Golder Associates, titled, "Evaluation of Gila Conglomerate Samples from the Mohawk Pit Expansion" ("Technical Memorandum, 2019"), dated October 17, 2019.

D. E-mail from FMTI, dated October 24, 2019, responding to comments from the New Mexico Office of the State Engineer ("NMOSE").

Section 2 (19-1). PERMIT AREA AND DESIGN LIMITS

A. The approved pre-reclamation area of disturbance (horizontal dimension) of the CSG stockpile is delineated in Figure 2 (dated October 16, 2019) of the 19-1 PMP. The approved reclamation area (horizontal dimension) of the No. 9AX waste rock stockpile is delineated in Figure 4, CSG Stockpile – Reclaimed 5A & 3A/3B & CSG dated October 19, 2019.

Section 3 (19-1). FINDINGS OF FACT

A. The Permittee has paid the permit modification fee of $1,000.00 as required by 19.10.2.201 NMAC.

B. The application for permit modification has been reviewed in accordance with 19.10.5.505 NMAC and has been determined to be a modification. The application for permit modification is complete, accurate, and complies with the requirements for permit modifications under 19.10.5.505 NMAC.

C. Pursuant to 19.10.5.505.B(1) NMAC, the proposed changes would not have a significant environmental impact, because:

1. providing for the CSG stockpile site does not authorize an expansion of design limits beyond that currently authorized by the Permit or that will have the direct impacts or be located in areas identified in 19.10.5.505.B(1) NMAC;

2. the proposed CSG stockpile will not significantly depart from the nature or scale of the permit, because:

    a) the CSG stockpile is not located on undisturbed ground; and,

    b) the CSG stockpile is reserved for temporary placement unmineralized materials that will be removed and used for reclamation.

D. MMD and the NMDG&F conducted a site inspection of the proposed CSG stockpile site at the Tyrone Mine on May 30, 2019.

E. The Director has consulted with the applicable state agencies including the New Mexico State Forestry Division, NMED, NMDCA, NMOSE and NMDG&F as required by 19.5.505.B(3) NMAC.

F. MMD provided the 19-1 PMP to the following tribal entities and requested review and comment: the Pueblo of Acoma, the Fort Sill Apache Tribe, the Hopi Tribe, the Pueblo of Isleta, the Mescalero Apache Tribe, the Navajo Nation, and the White Mountain Apache Tribe as required by 19.10.5.505.B(3) NMAC. No comments or response was received from the tribal entities contacted.

G. Pursuant to 19.10.5.505.C NMAC, the application for permit modification is in a format acceptable to the Director.

H. Pursuant to 19.10.5.505.D NMAC, the permit modification meets the requirements of 19.10.5.507 NMAC, Existing Unit Standards.

I. The approved cost estimate for reclamation of the CSG waste rock stockpile results in a cost reduction of $1,470,958.00 (from the amount proposed in the May 2019 cost estimate for the Tyrone Mine Updated Closure/Closeout Plan) due to (i) reducing the cost of reclaiming the 5A stockpile, (ii) reducing reclamation cost for the Mohawk Area of the Main Pit (by increasing the area of the open pit waiver), and (iii) reducing the cost for hauling Gila conglomerate cover material otherwise sourced from other areas of the Tyrone Mine for reclamation of the 5A, 3A/3B and 2A stockpiles leach and waste rock stockpiles. The current amount of financial assurance approved for the Tyrone Mine

($179,504,992.00) and the approved financial assurance instruments remains unchanged.

J. As explained in the previous paragraph, the proposed CSG stockpile is sited and will be constructed in a manner that facilitates, to the maximum extent practicable, contemporaneous reclamation consistent with the Tyrone Mine Updated Closure/Closeout Plan.

K. The CSG stockpile will consist of material excavated from the Mohawk Area and the 5A Stockpile Area that is non-acid generating and has similar chemical and physical characteristics as the Gila conglomerate characterized and approved as cover material for the Tyrone Mine.

Section 5 (19-1) COMPLIANCE REQUIREMENTS (Permit Modification 19-1)

A. The Permittee shall conduct mining and reclamation operations only as described in the approved 19-1 PMP, the Permit, and any revisions or modifications approved by the Director.

B. This permit modification 19-1 is issued pursuant to NMSA 1978, Section 69-36-1 et. seq. and Title 19, Chapter 10 NMAC. Permittee may be required to comply with other federal, State, county or local laws or ordinances before or while undertaking the activity that is the subject of this permit modification. MMD does not, by issuing this permit modification or otherwise, make any comment on Permittee's compliance with such other laws. It is Permittee's sole responsibility to investigate and comply with the requirements of such other laws.

C. The Permittee shall maintain all environmental permits required for the permit area, including but not limited to the Discharge Permits issued by NMED. Revocation or termination of such a permit or the forfeiture of financial assurance related to such a permit is adequate grounds for the Director to issue a cessation order pursuant to 19.10.5.509.C and 19.10.11 NMAC.

D. The approval of this permit modification 19-1 does not relieve Permittee from the responsibility of complying with other state and federal requirements and standards.

E. The permit modification 19-1 does not grant or create any water rights. Nor does MMD, by approving this permit modification or otherwise, make any comment on the water rights that the Permittee may or may not have available for use in the area covered by the permit modification. Permittee is solely responsible and obligated to comply with all state and federal laws related to water rights sufficient to support the activities contemplated by the permit modification.

Section 9 (19-1). GENERAL OBLIGATIONS AND CONDITIONS

A. The following conditions apply to CSG stockpile and are required for the Permittee to meet certain requirements of the Rules. The specifications contained in these conditions may be modified during final design with MMD approval. The conditions are also required to reclaim the CSG stockpile to a condition that allows for re-establishment of a self-sustaining ecosystem as required by 19.10.5.507.A NMAC and to meet applicable environmental standards as required by the Secretary of the Environment Department pursuant to 19.10.5.506.J(5) NMAC.

1. **Surface Shaping and Stormwater Management**

a) At mine closeout, the Permittee shall regrade the CSG stockpile in a manner that ensures positive drainage and eliminates, to the extent practicable, ponding on the top surfaces and final cover surfaces. The Permittee shall construct the top surfaces and final cover surfaces to a final grade of 0.5% to 5% to direct stormwater to water conveyances and provide other erosion controls if required by MMD.

b) Terrace benching on the CSG stockpile slopes shall be constructed at slope intervals of no greater than 300 feet. Terrace benches shall be a maximum of 50 feet wide, inclined 1% to 5% towards the interior slope toe and have a longitudinal slope or gradient of no greater than 5%. Terrace benches shall include stormwater channels at the intersection of benches and interior slope toes to convey runoff collected to outlet channels or detention ponds located at the slope toes or beyond. Erosion controls shall be constructed between terrace benches. The Permittee shall provide MMD with detailed plans for stormwater management and best management practices for erosion control for MMD approval, at least 180 days prior to, or an acceptable time agreeable to MMD, before implementation. The Permittee shall design, construct, and maintain best management practices for erosion control identified by the U.S. Natural Resource Conservation Service or alternative equivalent standards.

c) The Permittee shall construct an alternating slope-bench configuration on the CSG stockpile. Each individual interbench slope segment shall have a slope measurement no steeper than 3:1, unless alternative regrading, cover, and revegetation designs are demonstrated through studies and field-testing to allow for re-establishment of a self-sustaining ecosystem that can meet the standards addressed in Appendix C, and the requirements of 19.10.1.7.R(1) NMAC.

d) Surface water diversion ditches shall be provided on outslopes to adequately convey stormwater to detention ponds or outlet channels located at the outslope toe or to any other retention structure. Diversion ditches, detention ponds, and outlet channels shall be lined with riprap or other MMD approved material. Diversion ditches of maximum 5% grade shall be constructed. Riprap, if used, shall consist of well-graded rock fragments.

2. **Cover Management Plan**

a) Cover material for the CSG stockpile shall consist of an MMD approved suitable plant growth medium. The CSG stockpile is a source of cover material for the CSG stockpile and the 5A, 3A/3B and 2A leach and waste rock stockpiles.

b) The CSG stockpile, shall be graded as provided by Condition 9.A.1, ripped overall minimum depth of 12 inches, prior to being revegetated according to the requirements of Appendix C.

c) The CSG stockpile shall be protected from inadvertent removal, contamination, or erosion.

3. **Construction Quality Assurance Plan**

a) The Permittee shall submit a construction quality assurance ("CQA") plan to MMD for approval not less than 180 days prior to, or an acceptable time agreed to by MMD, before regrading of slopes of the CSG stockpile for final closeout. Detailed engineering designs addressing slopes, surface erosion controls and stormwater management structures including riprap (or other approved material)-lined channels shall be submitted for MMD approval. The CQA report shall include, a description of work to be conducted, soil testing results, and laboratory analytical reports. Design specifications in may be modified during the final engineering design with MMD approval.

b) The CQA shall be supplemented to include a final report to be submitted to MMD not more than 180 days after construction completion. The final report shall include a summary of work conducted, as-built drawings and final design specifications for slopes, vegetation growth media, and for stormwater management structures. The final report shall provide a final topographic map with no greater than two-foot contour intervals for the top surfaces and no greater than ten feet for the outslopes, and construction photographs.

4. **Revegetation Plan**

Top surfaces and outslopes of the CSG stockpile, with the exception of those areas for which a conditional waiver from the self-sustaining ecosystem requirements has been granted, shall be revegetated in accordance with revegetation standards set forth in Appendix C.

5. **Post-Mining Land Use**

The PMLU for the CSG stockpile shall be wildlife habitat. Compliance with 19.10.5.507.A NMAC shall be achieved by the following:

a) vegetation in the reclaimed areas shall meet approved MMD revegetation standards of Appendix C;

b) wildlife use shall be documented by conducting wildlife surveys including, but not limited to, deer pellet count surveys and bird diversity surveys;

c) the results of the wildlife surveys shall not be a condition of or given consideration with regard to financial assurance release; and

B. During construction of the CSG stockpile, a minimum 100-foot wide "buffer zone" located between the CSG stockpile and the Mangas Wash shall be maintained where best management practices ("BMP's") are used to prevent stormwater runoff from the CSG stockpile from impacting the Mangas Wash including, but not necessarily limited to, a berm maintained at the base of the CSG stockpile capable of diverting stormwater from a 100-year, 24-hour storm event away from the Mangas Wash and preventing large boulders and sediment from eroding from the CSG stockpile to the Mangas Wash.

C. Within sixty (60) days of approval of Modification 19-1, the Permittee shall submit a sampling and analysis plan for the chemical and physical characteristics of the material that will be placed on the CSG stockpile from the areas of the Mohawk Area and the 5A stockpile that have not yet been characterized. The sampling and analysis plan shall include the same chemical and physical parameters as in the Technical Memorandum, 2019.

D. During the operational phase of the CSG stockpile, the material handling plan provided in the 19-1PMP shall be followed in order to assure that non-acid generating material is placed on the CSG stockpile.

E. The Permittee shall comply with all other state and federal requirements and standards including without limitation the Cultural Properties Act, NMSA 1978, Sections 18-6-1 to

27 and regulations promulgated pursuant thereto.

F. The Permittee shall maintain adequate financial assurance for the CSG stockpile. The amount required for the reclamation of the CSG stockpile may be modified or revised in accordance with the financial assurance cost estimate pending upon approval of Revision 09-1 to Permit No. GR010RE. At this time, the current amount of financial assurance approved for the Tyrone Mine ($179,504,992.00) and the approved financial assurance instruments remains unchanged.

G. During reclamation, measures shall be taken to provide for stabilization of the disturbances that will minimize future impact to the environment and protect air and water resources in accordance with 19.10.7.R(1) NMAC. The reclamation schedule is required pursuant to 19.10.5.506.B.1 NMAC. The reclamation schedule for the CSG stockpile shall begin in accordance with the schedule identified below in Table 1, unless earlier reclamation is required by other agencies.

Table 1: Reclamation Schedule

Unit	Anticipated or Actual Start Date for Reclamation to Begin[a]	Anticipated Duration (Years)[b] or Completion Date
CSG Stockpile	180 days following Cessation of Operation	5

Notes:
a Anticipated start dates are subject to modification based on the reclamation sequence identified in Revision 01-1 Condition 9.P to Permit No. GR010RE.
b Estimated duration for facility reclamation does not include regulatory design review and approval processes.

Section 10 (19-1). CONCLUSIONS OF LAW

A. The Director has jurisdiction over the Permittee and the subject matter of this proceeding.

B. The 19-1 PMP is complete, accurate, and complies with the requirements of the Act and Sections 19.10.5.502 NMAC and 19.10.5.503 NMAC and with conditions described in this Permit Modification document.

C. The 19-1 PMP is complete, accurate, and complies with the requirements of Section 19.10.5.505 NMAC. The Permittee, Tyrone, is permitted pursuant to the New Mexico Mining Act to conduct mining and reclamation operations at the Tyrone Mine, Grant County, New Mexico, upon the condition that the Permittee complies with the requirements of this Order, the Act, the Rules, Permit No. GR010RE, and all revisions thereof and modifications thereto.

D. Pursuant to 19.10.5.505.B NMAC, the proposed change does not require public notice or the opportunity for public hearing.

All other provisions, modifications, and revisions for mining and reclamation contained in the Tyrone Mine Permit No. GR010RE, remain unchanged.

CERTIFICATION

I certify that I have read, understand and will comply with the requirements of this Permit, this Permit Modification, the Act, the Rules, including without limitation that I will allow the Director to enter the Permit Area as required by the Permit and/or the Rules and/or as otherwise required by law.

Ron Gudes
Authorized Representative of the Permittee

Operations Manager
Title

Freeport McMoRan Tyrone Inc.
Company

Subscribed and sworn to before me this 15 day of November, 2019

Jeanie B. Gutierrez
Notary Public

My Commission Expires

December 12, 2021

Official Seal
JEANIE B GUTIERREZ
Notary Public
State of New Mexico
My Comm. Expires 12/12/21

ORDER

NOW THEREFORE, IT IS HEREBY ORDERED that the Director approves Permit Modification 19-1 to the Tyrone Mine – Freeport-McMoRan Tyrone Inc., Permit No. GR010RE, located in Grant County, New Mexico. The approval is for the construction of the CSG stockpile, approximately 85 acres in size, at the Tyrone Mine, and for the CSG stockpile closeout plan.

By Order of the Director, Mining and Minerals Division, Energy, Minerals and Natural Resources Department, of the State of New Mexico.

By: _____
for Mike Tompson, Interim Director
Mining and Minerals Division
Energy, Minerals and Natural Resources Department

TODD E LEAHY
DEPUTY CABINET SECRETARY

Date: 11/15/19

Appendix C

Seeding Methods and Revegetation Standards

Seeding Methods for CSG Stockpile Top Surfaces and Outslopes

After preparation on the CSG stockpile top surfaces in accordance with Section 9 of this modification, the Permittee shall leave the seedbed in a roughened condition to reduce overland flow and promote the infiltration of water. This soil surface configuration and the high rock fragment content of the topdressing may preclude the use of a drill seeder. In that case, the seed will be broadcast and covered using a chain- or tire-drag. Straw or native grass mulch will be applied at a rate of at least two tons/acre and stabilized using a tackifier emulsion or by crimping. Long-stem mulch is preferred over shorter materials. The mulch will be weed free and contain a minimum of viable seeds associated with the mulch source (e.g., barley or wheat seeds).

After preparation of topdressing on the CSG stockpile outslopes in accordance with Section 9 of this modification, the Permittee shall prepare the seedbed and seed in a manner appropriate for the slope grade. For a 3H:1V Interbench Slope, the Permittee shall implement erosion control measures including but not limited to those methods described in Section 9 of this modification.

The seed mix will include warm season grasses, perennial forbs and shrubs. A list of species used in the seed mix is attached at the end of this Appendix. The seed mix is designed for application prior to the summer rains and the seeding should be completed in early to mid-July. The seed mix is especially designed to provide forage and cover for deer. Therefore, woody browse species have been added to the list to provide forage for deer during winter months.

Vegetation Success Standards and Success Monitoring

Canopy Cover A proportional canopy cover standard will be determined based on quantitative vegetation data and on the interpretation of the community structure and ecological conditions in the reference area. The numerical standard derived from the proportional standard may vary over time to account for temporal differences in canopy cover associated with climatic variations. Thus, the numerical standard may increase or decrease based on reference area measurements, but the proportional standard will remain fixed. The numerical standard for canopy cover shall be 70% of the reference area.

The reference area to be used for the vegetation success standard for the Tyrone Mine site is the reference area as shown in Figure 1 of the November 30, 1999 *Interim Technical Standards for Revegetation Success Tyrone and Little Rock Mines* report.

Shrub Density The standard for shrub density will be 60% of the shrub density in the reference

area.

Plant Diversity The plant diversity standard (shown below) shall be utilized for the CSG stockpile.

Class	Seasonally	Number	Minimum occurrence (% cover)
Perennial grass	Warm	3	1
Perennial shrub	NA	2	0.5
Perennial forbs	NA	2	0.1

NA= Not applicable.

The above standards for canopy cover, shrub density, and plant diversity shall be applicable to the naturally revegetated areas as well.

Revegetation Success Monitoring

The reclaimed and reference areas will be monitored periodically after the final grading and the initial establishment of vegetation on the reclaimed lands. Regular inspections will be made to determine the initial success of the seeding. Thereafter, vegetation monitoring will be conducted periodically starting three years after initial establishment of vegetation on the reclaimed lands. Vegetation will be monitored more frequently in the years prior to financial assurance release determination than in the mid-term period. At a minimum, the vegetation will be monitored for two years out of the last four years prior to bond release and meet statistical adequacy.

Seed Mix

The primary reclamation seed mix proposed for the Tyrone Mine include warm season grasses, perennial shrubs, and forbs (Table 2). A list of alternate or substitute species that might be used at Tyrone is included in Table 3. The species selected for the Tyrone Mine have been successfully used in mine reclamation and range improvement projects in many parts of New Mexico. The seed mix was selected to provide early establishment of ground cover, erosion control, and diversity in growth forms.

The seed mix is designed for application prior to the summer rains and the seeding should be completed in early- to mid-July.

Table 2. Proposed interim seed mix and seeding rates for Tyrone

Species[a]	Life-form	Duration	Seasonality	Rate[ab]
Blue grama (*Bouteloua gracilis*)	Grass	Perennial	Warm	0.50
Side-oats grama (*Bouteloua curtipendula*)	Grass	Perennial	Warm	1.50
Black grama (*Bouteloua eriopoda*)	Grass	Perennial	Warm	0.10
Green sprangletop (*Leptochloa dubia*)	Grass	Perennial	Warm	0.25
Plains lovegrass (*Eragrostis intermedia*)	Grass	Perennial	Intermediate	0.05
Apache plume (*Fallugia pardoxa*)	Shrub	Perennial	NA	0.10
Mountain mahogany (*Cercocarpus montanus*)	Shrub	Perennial	NA	1.50
Winterfat (*Eurotia lanata*)	Shrub	Perennial	NA	1.00
White prairie clover (*Dalia candida*)	Forb	Perennial	NA	0.25
Globe mallow (*Sphaeralcea* sp.)	Forb	Perennial	NA	0.10
Blue flax (*Linum lewisii*)	Forb	Perennial	NA	0.25
Total PLS (lbs/ac)				**5.60**

[a]Seed mix and rates are subject to change based on future investigations.
[b]Rate is in pounds of pure live seed (PLS) per acre; Substitutions may change seeding rates.
NA = not applicable.

[a]Seed mix and rates are subject to change based on future investigations.
[b]Rate is in pounds of pure live seed (PLS) per acre; Substitutions may change seeding rates.
NA = not applicable.
ND= not determined.

Table 3. Alternate or substitute species list for the proposed seed mix

Species	Life-Form	Duration	Seasonality
Big bluestem (*Andropogon gerardii)*	Grass	Perennial	Warm
Sand bluestem (*Andropogon hallii)*	Grass	Perennial	Warm
Silver bluestem (*Andropogon saccharoides)*	Grass	Perennial	Warm
Purple three-awn (*Aristida purpurea)*	Grass	Perennial	Warm
Cane beardgrass (*Bothriochloa barbinodis)*	Grass	Perennial	Warm
Yellow bluestem (*Bothriochloa ischaemum)*	Grass	Perennial	Warm
Buffalograss (*Buchloe dactyloides)*	Grass	Perennial	Warm
Arizona cottontop (*Digitaria californica)*	Grass	Perennial	Warm
Tanglehead (*Heterotheca contortus)*	Grass	Perennial	Warm
Curly mesquite (*Hilaria belangeri)*	Grass	Perennial	Warm

Tobosa *(Pleuraphis mutica)*	Grass	Perennial	Warm
Mountain muhly (*Muhlenbergia montana)*	Grass	Perennial	Warm
Bush muhly (*Muhlenbergia porteri)*	Grass	Perennial	Warm
Deergrass (*Muhlenbergia rigens)*	Grass	Perennial	Warm
Ring muhly (*Muhlenbergia torreyi)*	Grass	Perennial	Warm
Spike muhly (*Muhlenbergia wrightii)*	Grass	Perennial	Warm
Vine mesquite (*Panicum obtusum)*	Grass	Perennial	Warm
Switchgrass (*Panicum virgatum)*	Grass	Perennial	Warm
Galleta grass (*Pleuraphis jamesii)*	Grass	Perennial	Warm
Little bluestem (*Schizachyrium scoparium)*	Grass	Perennial	Warm
Plains bristlegrass (*Setaria vulpiseta)*	Grass	Perennial	Warm
Indiangrass (*Sorgastrum nutans)*	Grass	Perennial	Warm
Alkali sacaton (*Sporobolus airoides)*	Grass	Perennial	Warm
Sand dropseed (*Sporobolus cryptandrus)*	Grass	Perennial	Intermed.
Giant dropseed (*Sporobolus giganteus)*	Grass	Perennial	Warm
Sacaton *(Sporobolus wrightii)*	Grass	Perennial	Warm
Western yarrow (*Achillea millefolium)*	Forb	Perennial	NA
Desert marigold (*Baileya multiradiata)*	Forb	Annual	NA
Chocolate flower (*Berlandiera lyrata)*	Forb	Perennial	NA
Desert mariposa lily (*Calochortus ambiguus)*	Forb	Perennial	NA
Lavenderleaf primrose (*Calylophus hartwegii)*	Forb	Perennial	NA
Indian paintbrush (*Castilleja integra)*	Forb	Perennial	NA
Downy paintbrush (*Castilleja sessiliflora)*	Forb	Perennial	NA
Lanceleaf tickseed (*Coreopsis lanceolata)*	Forb	Perennial	NA
Plains tickseed (*Coreopsis tinctoria)*	Forb	Perennial	NA
White prairie clover (*Dalea candida)*	Forb	Perennial	NA
James' dalea (*Dalea jamesii)*	Forb	Perennial	NA
Blanket flower (*Gaillardia aristata)*	Forb	Perennial	NA
Firewheel (*Gaillardia pulchella)*	Forb	Perennial	NA
Bird's eyes (*Gilia tricolor)*	Forb	Perennial	NA
Desert verbena (*Glandularia gooddingii)*	Forb	Perennial	NA
Showy goldeneye (*Heliomeris multiflora)*	Forb	Perennial	NA
Scarlet gilia (*Ipomopsis aggregata)*	Forb	Perennial	NA
Gordon bladderpod (*Lesquerella gordonii)*	Forb	Perennial	NA
Arizona lupine (*Lupinus arizonicus)*	Forb	Perennial	NA
Perennial lupine (*Lupinus perennis)*	Forb	Perennial	NA
Bigelow's tansyaster (*Machaeranthera bigelovii var. bigelovii)*	Forb	Perennial	NA
Tanseyleaf tansyaster (*Machaeranthera tanacetifolia)*	Forb	Perennial	NA
White sweet clover *(Melilotus alba)*	Forb	Perennial	NA

Wild Four 'O Clock (*Mirabilis multiflora)*	Forb	Perennial	NA
Lemon beebalm (*Monarda citriodora)*	Forb	Perennial	NA
Wild bergamot (*Monarda fistulosa)*	Forb	Perennial	NA
Hooker evening primrose (*Oenothera elata)*	Forb	Perennial	NA
Missouri evening primrose (*Oenothera macrocarpa)*	Forb	Perennial	NA
Sand penstemon (*Penstemon ambiguus)*	Forb	Perennial	NA
Scarlet bulger (*Penstemon barbatus)*	Forb	Perennial	NA
Firecracker penstemon (*Penstemon eatonii)*	Forb	Perennial	NA
Fendler's penstemon (*Penstemon fendleri)*	Forb	Perennial	NA
Palmer penstemon (*Penstemon palmeri)*	Forb	Perennial	NA
Desert penstemon (*Penstemon pseudospectabilis)*	Forb	Perennial	NA
Superb penstemon (*Penstemon superbus)*	Forb	Perennial	NA
Wandbloom penstemon (*Penstemon virgatus)*	Forb	Perennial	NA
Bluebells (*Phacelia campanularia)*	Forb	Perennial	NA
Desert bluebells (*Phacelia crenulata)*	Forb	Perennial	NA
Mexican hat (*Ratibida columnifera)*	Forb	Perennial	NA
Blackeyed Susan (*Rudbeckia hirta)*	Forb	Perennial	NA
Silver groundsel *(Senecio longilobus)*	Forb	Perennial	NA
Desert senna (*Senna covesii)*	Forb	Perennial	NA
Canada goldenrod (*Solidago canadensis)*	Forb	Perennial	NA
Desert globemallow (*Sphaeralcea ambigua)*	Forb	Perennial	NA
Scarlet globemallow (*Sphaeralcea coccinea)*	Forb	Perennial	NA
Gooseberry globemallow (*Sphaeralcea grossulariifolia)*	Forb	Perennial	NA
Greenthread (*Thelesperma filifolium)*	Forb	Perennial	NA
Parry's agave (*Agave parryi)*	Shrub	Perennial	NA
False indigo-bush (*Amorpha fruticosa)*	Shrub	Perennial	NA
White sagebrush (*Artemisia ludoviciana)*	Shrub	Perennial	NA
Fourwing saltbush (*Atriplex canescens)*	Shrub	Perennial	NA
Canyon bricklebush (*Brickellia californica)*	Shrub	Perennial	NA
Fairy duster (*Calliandra eriphylla)*	Shrub	Perennial	NA
Desert willow (*Chilopsis linearis)*	Shrub	Perennial	NA
Feather dalea (*Dalea formosa)*	Shrub	Perennial	NA
Sotol (*Dasylirion wheeleri)*	Shrub	Perennial	NA
Rubber rabbitbrush (*Chrysothamnus nauseosus)*	Shrub	Perennial	NA
Wolfberry (*Lycium pallidum)*	Shrub	Perennial	NA
Creeping Oregon grape (*Mahonia repens)*	Shrub	Perennial	NA
Beargrass (*Nolina microcarpa)*	Shrub	Perennial	NA
Skunkbush sumac (*Rhus trilobata)*	Shrub	Perennial	NA
Canyon gooseberry (*Ribes leptanthum)*	Shrub	Perennial	NA
NM locust (*Robinia neomexicana)*	Shrub	Perennial	NA

Broadleaf yucca (*Yucca baccata)*	Shrub	Perennial	NA
Soap tree yucca (*Yucca elata)*	Shrub	Perennial	NA
Spanish bayonet (*Yucca glauca)*	Shrub	Perennial	NA

NA = not applicable.

Table 4. Functions and Attributes of the Primary Plant Species Proposed for the Tyrone Mine Reclamation Sites

Species	Character[a]	Attributes and Function
Blue grama (*Bouteloua gracilis*)	N,P,W,G	Sod and bunch grass providing ground over and forage
Side-oats grama (*Bouteloua curtipendula)*	N,P,W,G	Bunch grass providing ground cover and forage
Black grama (*Bouteloua eriopoda*)	N,P,W,G	Bunch grass providing ground cover and forage
Green sprangletop (*Leptochloa dubia)*	N,P,W,G	Erect bunchgrass; aggressive short-lived nurse plant with forage value
Plains lovegrass (*Eragrostis intermedia)*	N,P,I,G	Bunch grass providing ground cover and early spring forage
Apache plume (*Fallugia pardoxa*)	N,P,S	Mid-height shrub providing browse, cover, and erosion control
Mountain mahogany (Cercocarpus montanus)	N,P,S	Mid-height to tall shrub providing browse and cover
Winterfat (*Eurotia lanata*)	N,P,HS	Low shrub providing winter browse
Whire prairie clover *(Dalea candida*)	N,P,S	N-fixing forb providing forage and ground cover
Globe mallow (Sphaeralcea sp.)	N,P,F	Persistent mid-height forb providing browse
Rubber rabbitbush (*Chrysothamnus nauseosus)*	N,P,S	Mid-height shrub providing cover and erosion control
Blue flax (*Linum lewisii*)	N,P,F	Persistent forb with a pretty blue flower

[a]N = Native
P = Perennial
W = Warm season
G = Grass
S = Shrub
HS = Half shrub
F = Forb
I = Intermediate