

State of New Mexico  
Energy, Minerals and Natural Resources Department

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Governor

**David Martin**  
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Deputy Cabinet Secretary

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Mining and Minerals Division



October 2, 2013

Mr. W. Pierce Carson  
Santa Fe Gold Corporation  
6100 Uptown Blvd., Suite 600  
Albuquerque, NM 87110

**RE: Review and Comments on Sampling and Analysis Plan, Ortiz Mine, Santa Fe Gold Corporation, Santa Fe County, New Mexico, Permit Tracking No. SF028RN**

Dear Mr. Carson,

Pursuant to §19.10.6.602.D(12) NMAC, the New Mexico Mining and Minerals Division ("MMD") has reviewed the submittal from Santa Fe Gold Corporation ("SFGC") titled *Sampling and Analysis Plan for the Ortiz Mine*, dated July 2013. The Sampling and Analysis Plan ("SAP") was submitted in support of an anticipated application for a new mine, Permit Tracking No. SF028RN, for SFGC's proposed Ortiz Mine in Santa Fe County, New Mexico.

After review of the SAP, MMD distributed the SAP, pursuant to §19.10.6.602.D(12)(b) NMAC to: the New Mexico Environment Department ("NMED"), the New Mexico Department of Game and Fish ("NMDG&F"), the New Mexico Office of the State Engineer ("NMOSE"), the New Mexico Department of Cultural Affairs Historic Preservation Division ("NMHPD"), the New Mexico State Forestry Division ("NMSFD"), and Santa Fe County ("SFC"), for their review and comments. MMD has received written comments from NMED, NMOSE, NMDG&F, NMHPD, and NMSFD, as enclosed. In addition, MMD has reviewed the SAP and MMD's comments are also enclosed with this letter.

The MMD and the agencies' review and comments have identified areas where additional information is needed in support of the SAP. Pursuant to §19.10.6.602.D(12)(b) NMAC, MMD considers the submittal and evaluation of the SAP complete. SFGC shall address the comments on the SAP in the Baseline Data Report, which is to be included in the permit application for the Ortiz Mine. Pursuant to §19.10.6.602.D(12)(c) NMAC, SFGC may request a conference with MMD to discuss the comments on the SAP. MMD recommends that SFGC take advantage of this conference opportunity to discuss the SAP comments with MMD. Experience has shown that this conference is helpful to the applicant in addressing Agency comments.

Please be aware that, depending on the results of the data collected and development of the Mining Operation and Reclamation Plan yet to be submitted, additional sampling and/or characterization of the Permit Area may be required before a permit is issued.

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Additionally, please be advised that other permits, from other state or federal agencies, will be required regarding the Ortiz Mine. The information provided by SFGC to MMD may not satisfy the requirements of the other agencies for the eventual approval of any additional permits. SFGC must contact the agencies responsible for those permits, including, but not limited to, SFC, NMED, and NMOSE.

If you have any questions, please contact me at (505) 476-3437, or David (DJ) Ennis of my staff at (505) 476-3434 or by email at david.ennis@state.nm.us.

Sincerely,



Holland Shepherd, Program Manager  
Mining Act Reclamation Program ("MARP")  
Mining and Minerals Division

Enclosures: MMD Comments, dated October 2, 2013  
NMED Comments, dated September 17, 2013  
NMDG&F Comments, dated August 20, 2013  
NMHPD Comments, dated August 21, 2013  
NMOSE Comments, dated August 23, 2013  
NMSFD Comments, dated September 12, 2013

cc: Fernando Martinez, Division Director  
David (DJ) Ennis, Permit Lead, MARP  
NMED, Keith Ehlert  
NMHPD, Michelle Ensey  
NMOSE, Alan Cuddy  
NMSFD, Danielle Roth  
Santa Fe County, Jose Larranaga  
GL Environmental, Tim Leftwich  
Mine File (Tracking No. SF028RN)

**Mining and Minerals Division Comments  
on the Ortiz Ming Sampling & Analysis Plan**

**October 2, 2013**

**General Comments**

1. Figures in multiple sections of the Sampling and Analysis Plan ("SAP") show somewhat different proposed Permit Areas, specifically on the south edge. Some figures show a "heel" protrusion of the Permit Area (e.g. Figure 1-1) and some figures show a "straight" southern edge of the Permit Area (e.g. Figure 6-1). Please clarify the proposed Permit Area boundary within the Baseline Data Report ("BDR").
2. The Permit Area for the SAP should include any future utility corridors, if any, that may be developed within and adjacent to the proposed Permit Area (e.g. electrical corridors and/or natural gas corridors) so that baseline data may be collected from any anticipated utility corridors as appropriate.
3. The SAP includes several references to GL Environmental, Inc.'s ("GL") Administrative Standard Operating Procedures ("SOPs"), e.g. Section 2.8, page 17:

*"The sampling and analysis methods proposed for climatological data acquisition for the Ortiz Project Site will be described in detail in the associated GL Environmental, Inc. Administrative Standard Operating Procedures (SOPs), Equipment SOPs, and Field SOPs."*

The SOPs are not provided in the SAP, therefore Mining and Minerals Division ("MMD") is unable to comment on the specifics of some of the sampling and analysis methods. Therefore GL's data collection under the SAP, in some cases, relies on GL's professional and scientific judgment without concurrence or input from MMD or the cooperating agencies.

4. In the BDR, please show the approximate locations of the major proposed mine facilities (e.g. the Carache pit location, waste rock disposal facility and tailings disposal facility) on all figures for ease of review and reference.
5. Little information is provided in the SAP regarding plans for the Lukas Canyon deposit, although the SAP appears to be attempting to address some baseline data collection in Lukas Canyon as evidenced by inclusion of it within the Permit Area. Review of the adequacy of the SAP relative to Lukas Canyon is difficult for MMD to assess since the surface features of a future Lukas Canyon mine (e.g. possible pit location, waste pile locations, milling facilities, etc.) are not depicted on any figures in the SAP. As such, supplemental baseline data may need to be provided prior to development of the Lukas Canyon deposit.
6. Many of the figures in the SAP are presented at small scales (less detail) on 8½" x 11" paper. The small scale and small paper size renders many of these figures illegible or difficult to interpret for technical review. For the BDR, please ensure that all figures are

presented at appropriate scales and on appropriately sized paper to show sufficient details for review.

### **Section 1: Introduction**

7. Section 1.3: the size of the tailing impoundment is estimated as 106 acres. In the BDR, please state the estimated acreage for the pit and waste rock pile areas. Also, please discuss the estimated areas of disturbance for facilities, administration buildings, roadways, and other anticipated disturbances.
8. Subsection 1.3.1, page 10, second paragraph:
  - a) describes stockpiling non-ore rock materials from Carache into an adjacent canyon southwest of the pit. The Mining Operation Plan, when prepared as part of the Permit Application Package, should describe whether this material will or will not be placed onto a engineered liner system. This conclusion should be supported by the data presented in the BDR.
  - b) The same paragraph states that “the configuration of the Carache Pit precludes any significant backfill in Carache during the commercial operation period.” When prepared, the Mining Operation and Reclamation Plan should explain and provide justification, in detail, why backfilling is precluded during the commercial period. The Mining Operation and Reclamation Plan should also describe, in detail, how the mine plan and reclamation will meet the Performance and Reclamation Standards required in 19.10.6.603 NMAC.
9. Subsection 1.3.4: states “backfilling of the Carache Pit is not contemplated in the current mining scenarios.” The Reclamation Plan, when prepared and submitted as part of the permit application package, should justify, in detail, why backfilling or partial backfilling is not contemplated at the end of mine life. The Reclamation Plan should also describe how proposed reclamation of the Carache Pit will meet the Performance and Reclamation Standards required in 19.10.6.603 NMAC.

### **Section 2: Climatological Factors**

10. The SAP should consider sampling for PM<sub>10</sub> to characterize baseline air quality for this parameter. Characterization of PM<sub>10</sub> may also be required for an NMED Air Quality Bureau air quality permit, however this should be verified with NMED.
11. Section 2.1, page 16: please describe elevation extremes in the permit area and their influence on local climate. What are the maximum and minimum elevations within the permit area as well as the range in elevations where disturbances might occur? Please describe the elevation and local topography where the met station will be installed. Please provide this information in the BDR.
12. Section 2.5, page 16: Details on the frequency of field quality assurance procedures, scheduled operational checks of the sensors, and details on the types of sensor equipment proposed for collection of data are not specified in the SAP. Presumably these details are located within GL's Field and Equipment SOPs, which was not provided with the SAP. MMD

recommends that a precipitation gauge with a device to melt ice be used, and recommends a backup gauge as well. Details on the climatological sensors should be provided in the BDR.

13. Section 2.6: In the BDR, please indicate the methodology used to calculate pan evaporation or the instrument(s) used to physically measure pan evaporation.
14. Section 2.8, page 17: states that the tower-based meteorological sensors will be audited every six months. Details of what comprises an "audit" are not specified in the SAP, however this proposed frequency of auditing seems inadequate to quickly correct any problems with the meteorological sensors. Do QA/QC procedures include regular review of weather data that might indicate equipment and sensor malfunction? Will audits and sensor calibrations be conducted by GL Environmental personnel or will this be contracted to an outside party? These details should be provided in the BDR.

### **Section 3: Topography**

15. Section 3.5. What is "annotation" in this context? This method of data collection should be explained in the BDR.

### **Section 4: Vegetation**

16. Section 4.1, Page 20, Table 4-1: The prior seed mix used to reclaim this site (in the 1990's?) included some non-native plants. The Reclamation Plan, when prepared and submitted, should attempt to mimic the surrounding and undisturbed vegetation communities.
17. Section 4.1, page 20, Pre-existing Disturbance: Please provide further details about areas within the proposed permit area that have been disturbed previously. What is the extent of disturbance, the locations and approximate dates of disturbance? How might these areas affect sampling in terms of stratification or data interpretation? These details should be provided in the BDR.
18. Section 4.2, page 21: One of the Sampling Objectives listed in this section is to "Perform a threatened or endangered species survey." Please elaborate more on how this is to be done. Is this in the form of additional transects, or to be included in the proposed transects? Is this a literature or GIS review? Is this for plants only or for wildlife too? Any of this work performed should be clearly illustrated on a map and a detailed description provided in the BDR methodology.
19. Sections 4.1, 4.4, and 4.5: In the 1990's, 50 vegetative transects were performed yielding 231 total plant species, 7 plant communities, 3 of 5 sensitive species (high %) and 3 species of noxious weeds. The proposed work increases the number of transects to 235 (x 4.5), but lists only 2 species of concern nearby, and lists only 4 vegetative communities. Please provide a detailed explanation of this differentiation and classification of data in the BDR. Perhaps the addition of a table would more clearly illustrate this information regarding past-and-proposed data collection for compare and contrast. Also, all of this information should be clearly illustrated on a map of appropriate size and scale in the BDR. The 8.5" x 11" maps can be very difficult to interpret.

20. Section 4.3, page 22: Timing. Sampling is discussed as being surveys conducted over two (2) growing seasons due to the size of the permit area. Is the second season of sampling to be used a “field validation” exercise of previously collected data, or as an extended survey of new areas not covered in the first season? Please provide a detailed explanation of the purpose for conducting the work over two growing seasons in the BDR.
21. Section 4.4, page 22: Weeds. During the August 9, 2013 field site visit, extensive distributions of dodder (*Cuscuta fasciculata* spp?) were observed across the rangelands. If the seasonal timing allows, it would be ideal to map this distribution and get a quantitative number for the number of acres (where and how much) infested. This data could then be used in the Reclamation Plan, or by the surface owner, to work with County Extension, or the NRCS to prepare a management plan to control, or possibly prevent this issue in the future. Even though this species was at one time considered to be a rare plant on the NM Rare Plants Website (<http://nmrareplants.unm.edu>), and has since been delisted, there is no conservation consideration listed with this parasitic annual. Also, the USDA/APHIS Website considers this plant to be a Noxious Weed in some states.
22. Section 4.4: For information that supplements vegetation survey data there is some discussion in the SAP about “topography, soil types and depths, average slopes, and aspects” that will be included. This information should be presented in the BDR on a map or geo-referenced overlays with soil survey information and other data.
23. Section 4.5.3, transect direction: MMD agrees with the NM Department of Game and Fish comment that transect locations and directions should be selected by a consistent method of randomization rather than haphazardly. Please provide details in the BDR as to how transect locations were determined.
24. Section 4.5.3, page 24, Production (mass per unit time):
  - a) Production is typically measured as only the biomass produced during the most recent growing season. This discussion seems to indicate all living biomass will be clipped within quadrats, which is unusual. Prior to implementation of the production methodology outlined in the SAP, MMD recommends discussion with MMD staff to verify the appropriate methodology for measurement of production.
  - b) In the BDR, please expand upon the explanation of the sampling technique employed for production measurement relative to timing, growing seasons, multiple measurements, etc.
25. In the BDR, please provide maps of appropriate size and scale with all sampling transects (vegetation and wildlife) as they relate to habitat types, vegetative communities, disturbed and undisturbed areas, etc., such as displaying the information provided in Table 4.2.
26. The SAP does not discuss whether sampling adequacy or a statistical confidence level will be determined for vegetation sampling. The BDR should include statistical analysis and/or validation, or numerical modeling, for the vegetation sampling data. Presentation of this information in tables in the BDR would be preferred.

## Section 5: Wildlife

27. Section 5, page 27: MMD agrees with NMDGF on the addition of another vegetative category to include the Pine-Oak Forest region located in the upland areas of the site, but MMD is curious why less transects are being proposed in the mixed-conifer-oak upland/mountain region of the permit area, and more transects are proposed in the piñon-juniper habitat. Acreage vs. Diversity. Previous surveys (1990's) have shown that there were greater species diversity observations in the mixed-conifer upland. Therefore, for the BDR, MMD recommends more wildlife/bird transects located in this area of potential greater diversity, where the Carache Pit is to be located. Vegetatively, there are 18 less proposed transects in the piñon-juniper woodlands, and for wildlife, there are 27 less proposed sampling stations in piñon-juniper woodlands than in the juniper savannah. All transects should also be timed for seasonally appropriate observations.
28. Section 5.1.4: Habitat features that support bats, especially those which are located in the proposed Carache pit vicinity and other areas within the permit boundary, should be mapped and population data should be collected about the bats and presented in the BDR. Since many of the bats located here may be considered "sensitive", it may be necessary to understand how many bats, and how many habitat features (shafts, adits, etc.) are being displaced, so that proper mitigation measures may be developed.
29. Section 5.5.3, page 30: Please clarify the number of "trap nights" for the BDR. Two (2) transects in four (4) habitat types, with 25 trapping stations each, and two (2) traps per station, for a three-night (3) sampling period. Is this a total of 1200 trap nights? The addition of a table in the BDR may be appropriate here too, or the addition of more tables to outline the various data collection efforts throughout the document.
30. Section 5.5.4, page 31, Volant Mammals (bats): If possible, based on the experience of the bat handlers, MMD would like to have presence/absence data presented in the BDR about White Nose Syndrome.
31. Sections 4.5.3 and 5.8, QC/QA: The SAP document makes mention of GL's SOP's, and QC/QA protocols for data collection. The BDR should provide details on the sampling methodology or the SOP's should be made available to MMD for review.
32. The SAP does not discuss whether sampling adequacy or a statistical confidence level will be determined for the wildlife data. The BDR should include statistical analysis and/or validation, or numerical modeling, for the wildlife sampling data. Presentation of this information in tables in the BDR would be preferred.

## Section 6: Topsoil

33. Soil mapping is a skill that requires an experienced practitioner for quality results. MMD strongly recommends that a certified professional soil mapper (Soil Science Society of America) with experience in mapping local soils be utilized to inventory soil resources within the permit area. The soil mapper should coordinate closely with MMD during the planning stages of the effort.
34. Section 6.1: The narrow-hue color scheme and scale of drawing for Figure 6-1 nearly renders this illustration useless for interpretation. In the BDR, please provide a larger scale

map (more details) with a more diverse color scheme to illustrate soil units and proposed sampling locations. Please illustrate areas that are proposed for disturbance as overlays within this soil map.

35. Section 6.2, Objectives: MMD does not believe that acid-forming sulfidic materials are likely to be prevalent in the soils of the permit area. In addition to soil quality MMD believes that one of the most important objectives of a soil survey is to estimate the total volume of soil within the permit area that may be practically salvageable. Also, it is important to identify the location of the salvageable material. Please revise this section to reflect these observations for the BDR.
36. Section 6.4, Sample No.: The number of sampling locations, listed as 20 within the permit area, may be more or less than is required to characterize soil resources. The number of sampling locations should be determined as the complexity of soil distribution and soil variability is revealed by the Order 1 survey. While the recent NRCS survey of the area is quite detailed compared to earlier mapping efforts, a closer inspection will provide additional information for effective sampling.
37. Section 6.4, Sampling Method: Please clarify in the BDR if sampling locations equates to samples composited across depth or if separate subsamples will be collected for testing from individual strata of a profile. MMD strongly believes that separate samples be collected from individual, targeted strata.
38. Section 6.4. From a cursory examination of the most recent NRCS survey, the prevalence of steep slopes and shallow soil profiles in the permit area, it is possible that suitable and salvageable soil volume may be a limited resource for reclamation at the Ortiz Mine. Regolith character within soil units should be described to at least 60 inches in depth, to a depth where materials unsuitable for reclamation or bedrock is encountered. Some sampling should be considered for the more limited-extent soil units such as Nos. 521 and 534. Sampling locations and the number of sampled profiles should be selected during or after an Order 1 survey.
39. Section 6.4, Data Collected, and Section 6.6, Parameters:
  - a) Please provide a specific list of sample collection, preparation and analytical methods for each sample parameter in the BDR. These should include sample size, any special handling requirements such as refrigeration and the source of methods used for laboratory tests.
  - b) While calculated sodium adsorption ratios will not be necessary from laboratory analysis,  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$  and  $\text{Na}^{+}$  ion concentrations from saturated paste extracts should be measured and reported for the BDR. Acid-base accounting will not be required, unless acid production products or low pH is found in regolith strata.
  - c) Please add calcium carbonate percentage, total organic carbon, total nitrogen (Dumas method), Fe, and Zn to the list of laboratory parameters. Plant-available Cu, Mn, Ni, Zn and hot water soluble B should also be included.
  - d) Sample splits from all sampled profiles should be retained for future analysis if warranted by the first round of laboratory results.



- e) Please indicate in the BDR if rock fragment percentage will be visually estimated or taken from some sieving method. Particle size analysis should include some sieving of gravel and sand separates as well as hydrometer analysis of fine earth fractions.
40. Section 6.5, Methods: MMD has previewed the NRCS soil survey information for the permit area as well as the information and methods proposed in the SAP. The most striking feature of the NRCS soil descriptions is the large amount of cobbles and gravels found throughout most of the soil units, with texture modifiers such as “very” (35 to 60% v/v) or “extremely” (60 to 90% v/v) used by the NRCS to describe these size fractions. Pedestrian surveys or hand auger attempts to describe most soil profiles are likely to be unsuccessful at depth. Since hand-dug pits are so laborious, MMD recommends that backhoes be used extensively to map and sample soil units.
41. Section 6.5, Sampling Depth: Estimates of soil properties and sample collection should be made from distinct pedogenic profiles rather than some pre-determined and fixed intervals of depth. Methods for description of soil horizons and properties should follow standard methods for soil survey (1993, USDA Soil Survey Manual).
42. Section 6.5, Survey and Section 6.9, Discussion Supporting the Proposed Sampling Plan: The discussion in this and preceding sections is not clear as to how the Order 1 soil survey and sampling will develop from verification of NRCS mapping. Please describe the survey strategy in greater detail and describe what is entailed in a “pedestrian survey” for the BDR.

## **Section 7: Mineralogy and Geology**

43. In the BDR, please provide a stratigraphic column of the geologic units that occur within the Permit Area. The stratigraphic column should indicate the approximate thickness of each unit and which units are anticipated to be water-bearing.
44. In the BDR, please provide detailed geologic cross-sections of the proposed Carache pit, waste rock disposal facility and tailings facility. Detailed geologic cross-sections of the Lukas Canyon deposit should also be provided in the BDR. Please show subsurface structural features such as monitoring wells and faults and the approximate potentiometric surface elevation on the cross sections in the BDR. The cross-sections should also show details of the anticipated overburden.
45. Subsection 7.2.3, page 43, paragraph 1, last sentence: describes a “dark colored, rock-flower matrix” that apparently exists within the clast-supported breccia of the Carache Canyon deposit. The term “rock-flower matrix” is unfamiliar; please provide further explanation of this description in the BDR.
46. Section 7.3, page 44, paragraph 2: describes metallurgical and geological characterization work to determine extent of potential ARD development resulting from geologic units disturbed by mining activity, including collecting/sampling tailing material from a “pilot plant.” Please provide further description in the BDR of the proposed methodology/process/location for sampling tailing material from a pilot plant or for any other metallurgical test work to characterize tailing material that may be generated from milling geologic materials in the permit area.

47. Section 7.3, page 44, paragraph 3: describes the development of “management units” to be based upon analytical results from sampling of geologic materials to be disturbed by the proposed mining activity and to characterize the materials in regard to their net acid forming or neutralizing potential. These management units should be individually delineated and shown upon a geologic base map and cross sections in the BDR that is to be accompanied by tabulated estimates showing volume of material from each management unit. Each management unit should have a Material Handling Plan that should be incorporated into the Mining Operation Plan.
48. Section 7.4, page 45, paragraph 1, second sentence: states [emp. added]: “If existing cores and surface samples are insufficient to fully characterize the geologic units, further characterization will be employed by collecting additional samples from existing cores.....” How would it be possible to ascertain any additional characterization info from existing cores, if those existing cores were already determined to be insufficient? Please clarify the methodology utilized to collect additional samples in the BDR.
49. Section 7.4, page 45: states that core and surface samples will be characterized, and that if characterization is “insufficient to characterize the geologic units” more samples will be collected. However, there’s no discussion or justification for how “frequent” and where surface samples, or “additional” samples, will be collected. The sampling frequency should be justified in the BDR. Additionally, the methodology/criteria utilized to evaluate whether the data is sufficient or insufficient to characterize mineralogical and alteration variability should be detailed in the BDR.
50. Section 7.4, page 45: The SAP does not describe what criteria will be employed to determine sample locations (vertical and spatial) and how many samples are to be collected based on this determination. Describe in the BDR how the sampling plan addresses the heterogeneity of the overburden and ore.
51. Section 7.5, page 45: provides targets for characterization such as waste rock/overburden, pit floors and walls, ore material and tailings material. This list should also include sub-grade ore characterization.
52. Section 7.5 and Section 7.6:
- a) Section 7.5, page 45, paragraph, 2, second sentence: “A total of 10 cores from boreholes completed in the deposit area are available for sample collection” however, Figure 7-3 shows only 5 core hole locations. Please explain the difference and/or show all 10 locations on a map in the BDR.
  - b) A total of 31 samples from 5 boreholes and 1 surface sample is proposed in the SAP for characterization of potential waste rock ARD generation from the Carache Canyon area. The sample size and spatial distribution of these proposed samples is inadequate to characterize the ARD potential of ~112 million tons of waste rock that is expected to be generated (note: the quantity of waste rock was calculated by MMD from tonnages stated in Section 1.3.1, page 10 of the SAP).

MMD recommends consideration of the following references that discuss geochemical sample size for prediction of ARD generation:

- o *Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials, MEND Report 1.20.1* by Price (December 2009). MEND Report 1.20.1 can be downloaded from: <http://www.mend-nedem.org/reports/categories-e.aspx>
- o *Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State-of-the-Art* by Maest, Kuipers, Travers and Atkins (2005). This reference can be downloaded from: [http://www.waterboards.ca.gov/academy/courses/acid/supporting\\_material/predicwaterqualityhardrockmines1.pdf](http://www.waterboards.ca.gov/academy/courses/acid/supporting_material/predicwaterqualityhardrockmines1.pdf)

Note: The quantity of samples needed for characterization of waste rock for ARD potential could be reduced if the Mine Operation Plan were to commit to emplacement of waste rock on an engineered liner system.

- c) No geochemical characterization of core or surface samples from the Lukas Canyon area is proposed in the SAP. Given the different geologic nature of the Lukas Canyon deposit compared to the Carache Canyon deposit, adequate geochemical characterization of the Lukas Canyon deposit for ARD potential is needed for the BDR.
- d) Section 7.6, page 47, last paragraph: states that tailings material will be characterized through the analysis of three samples collected from material produced during metallurgical test work. This section should provide additional emphasis on describing the metallurgical test work proposed for characterizing the tailing material, as well as justify how only three samples of this test tailing material produced from a pilot plant adequately characterize ~13 million tons of tailings that are produced from at least six different rock units in the permit area. The BDR should provide these details.
- e) The SAP states that there is sufficient core available to intercept each geologic unit, however the figures and cross sections do not support this statement. For example, the Diamond Tail formation is anticipated to be excavated from the pit boundary (Figure 7-3) as overburden, however no geochemical sampling of the ARD potential of this unit is proposed in the SAP. Similarly, Table 7-2 shows an estimated 6.65% of "other" waste rock (~7.4 million tons). The BDR should further describe the geologic units that comprise this category of waste rock (e.g. Diamond Tail formation, alluvium, brecciated units, latite porphyry, trachytic latite dikes, etc.). No geochemical sampling of these igneous units appears to be proposed in the SAP. The SAP should address characterization of these materials for potential ARD generation.
- f) Table 7-2 should include approximate estimates of the tonnage for each waste rock material type, along with the corresponding percentage, in the BDR.

53. Section 7.7, page 48, Kinetic Test Work: The SAP states that "kinetic tests will be used on materials that have been identified to be potentially acid forming or uncertain." This approach implies that kinetic testing will not be started until the static test results are evaluated. While this can be an acceptable approach, the Permittee should be aware that this approach can slow the baseline data collection timeline as well as development of the Mining and Reclamation Plan.

54. Section 7.7, page 48, Kinetic Test Work, 2<sup>nd</sup> paragraph: the SAP states "preparation of samples will take into account the liberation size for potentially ARD generating minerals." The SAP should commit to following a standardized procedure for kinetic testing, and/or provide a rationale for biasing "liberation size" in the BDR.
55. Section 7.7, page 48: references ICP parameters listed in 19.8.803.B.1.b NMAC. This reference could not be found in the New Mexico Administrative Code. MMD recommends utilization of the parameters regulated by NMED in 20.6.2.3103 NMAC ("Standards for ground water of 10,000 mg/l TDS concentration or less") or the BDR should provide justification for using the list referenced in the SAP instead of the constituents regulated by NMED.
56. Section 7.7, page 48: states that kinetic testing requires a minimum of 20 weeks although tests may be run in excess of that time. The SAP should provide a description of the criteria that will be used to trigger termination or continuation of the test duration. In the BDR, please explain the criteria used to decide whether to terminate or continue kinetic testing.
57. Section 7.7, page 49: states that analysis of rinsate from kinetic testing will utilize the Nevada Department of Environmental Protection Profile II. Are the procedures and parameters that are identified within the Nevada Profile II, consistent with standard humidity cell test methods included under ASTM Method D5744-96? In addition, detailed justification for the use of The NDEP Profile II parameter list instead of using the constituents regulated by the NMED/WQCC regulations (e.g. 20.6.2.3103 NMAC "Standards for ground water of 10,000 mg/l TDS concentration or less") should be provided in the BDR.
58. Section 7.7, page 48, last paragraph: mentions the "ASTM Procedure for kinetic testing..." please cite the ASTM Procedure or Method (i.e., ASTM Method D 5744-96) used in the BDR.
59. Figures 7-1 and 7-2:
  - a) These figures in the SAP are illegible. Please verify that all figures in the BDR are clearly legible prior to submittal.
  - b) Even if legible, the map scale of Figures 7-1 and 7-2 are too small to adequately discern specific detail and/or sampling locations and should be revised for presentation in the BDR to a larger scale (more detail) in which all features shown on the maps are adequately shown and are represented in a scale that provides enough detail to see the maps features. Figures larger than 8½" x 11" may need to be included in the BDR to provide clarity.
  - c) The proposed mine infrastructure/features should be shown and labeled on these figures, particularly the extent of the anticipated Carache Pit and the identification of the Golden Fault Zone.

60. Figure 7-3:
- a) Elevation contours should be labeled on this figure for presentation in the BDR.
  - b) The 103E cross-section line doesn't match the Figure 7-4 cross-section. For example, borehole location OC36 in Figure 7-3 is shown to be located in unit Kmf (Menefee Formation), but is shown to be located in unit Kmh (Harmon Sandstone) in Figure 7-4.
  - c) This figure should show surface structures (e.g. fault lines) for presentation in the BDR. Surface structures should be also labeled (e.g., Golden Fault Zone, Iron Vein, etc.)
  - d) This figure only shows 5 of the 10 core hole locations discussed in Section 7.5 of the SAP.
61. Figure 7-4:
- a) This cross-section should show structure (e.g. fault lines) in the BDR and surface features should be labeled.
  - b) This cross-section should show the approximate zones of gold mineralization, and approximate zones of alteration types, in the BDR.
  - c) The unit labeled Kmfl isn't shown in the legend of this figure.
62. Figure 7-5 and Figure 7-6:
- a) These cross-sections should show fault lines for presentation in the BDR and the surface features should be labeled.
  - b) These cross-sections should show approximate zone of gold mineralization, and approximate zones of alteration types, in the BDR.
63. Section 7.9, page 56, last paragraph: indicates that, for quality assurance, the use of duplicate kinetic tests and the use of blank or control samples from non-acid generating samples may be used [emp. added]. All kinetic tests should employ the use of blank or control samples for quality assurance purposes.
64. Section 7.9, page 56: The BDR should provide specific details of the SOP utilized for the sampling and analysis methods proposed for the Mineralogy and Geology section of the SAP.
65. Section 7.10: provides a discussion about how to use and interpret ABA, NNP and NAG data, however the SAP does not describe how the sample data will be used to refine cross sections, define overburden characteristics and volumetrics, and be used to develop the Mining Operation and Reclamation Plan.

## Section 8: Surface and Groundwater

### Surface Water

66. Section 8.1.1.1, page 58 states:

*“Areas north and northeast of the watershed boundary such as Cunningham Gulch, Dolores Gulch, and Galisteo Creek are not considered for this SAP because they are hydrologically separated from the proposed mine permit area.”*

- a) The Carache Canyon *pit boundary* may not extend into the watershed associated with Cunningham Gulch, Dolores Gulch or Galisteo Creek; the small scale of the drawings showing the pit provided in the SAP makes this difficult to determine. However, the *proposed permit area/boundary* does extend eastward into this watershed, as shown in Figure 8-2. As proposed, the northwest corner, eastern margin and southeast corner of the proposed permit area extend into surface watersheds that are not considered for sampling or characterization in the SAP. For example, the eastern portion of the permit area appears to drain into the Arroyo la Joya, however Arroyo la Joya is not proposed for sampling in the SAP, nor is Arroyo la Joya listed in Section 8.1.1.4 as a receiving water. The BDR should address surface water sampling in any watershed that is present within and adjacent to the proposed permit area/boundary as required by 19.10.6.602.D(13)(g) NMAC. All watersheds should be identified, illustrated and labeled on figures of an appropriate scale to discern and verify the topographic points used to delineate the watersheds.
- b) Section 8.1.1.1 should contain a table indicating the acreages of the watersheds present within the permit area. Please include a table with this information in the BDR.
67. Subsection 8.1.3.1, page 60: outlines the objectives of baseline surface-water characterization and includes an objective to meet the requirements of NMAC Title 19, Chapter 10, Part 6, but does not include any information in regard to compliance with NMED Surface Water Quality Bureau (Water Quality Control Standards) standards for baseline characterization of surface water in the permit area. This should be revised to also include objectives for complying with NMED Surface Water Quality Standards in accordance with the Water Quality Control Standards.
68. Section 8.1.3.2, page 61: incorrectly states that NMAC Title 19, Chapter 10, Part 6 requires a minimum of two sampling events over the course of a 12-month period. Part 6 does not specify the sampling frequency, however MMD's *Guidance Document for Part 6 New Mining Operation Permitting Under the New Mexico Mining Act (August 2010)* recommends a minimum of four opportunistic sampling events after storm activity for ephemeral streams over the 12 month period.
69. Section 8.1.3.3, page 61: lists 6 storm water runoff stations, however Figure 8-4 shows 7 stations. The number of proposed storm water runoff stations does not address sampling/characterization of the other potentially affected watersheds present within the proposed permit area, as noted above in Comment #66. Additionally, MMD recommends consideration of adding a storm water runoff station south of the proposed tailings facility. For figures in the BDR, please label all storm water runoff stations with

an identifying name for cross-reference to Figure 8-4. Figure 8-4 should be produced at a larger scale (more detail) for the BDR.

70. Section 8.1.3.6 and Table 8-4: the methodology that will be used to prepare the sediment samples (e.g., MWMP or SPLP) is not specified. Since MWMP is proposed for characterization of waste rock material, MMD recommends using MWMP to prepare the sediment samples in order to be consistent. MMD recommends analysis of the parameters and methods in Table 8-3 for the sediment sampling (plus the proposed field characterization of the sediment samples).

### Groundwater

71. Section 8.2, Page 65:

- a) states that historical pumping test and aquifer testing data is available and “therefore a pumping test or other aquifer testing will not be needed to better characterize the potential impact to both surface water (i.e., quantity and quality of discharged water) and groundwater (i.e., cone of depression, potential impacts to users, alteration of the regional groundwater flow direction).” When presented in the BDR, the historic pumping test and aquifer data should be presented in their entirety for agency review, if possible.
- b) Assessment of the adequacy of the historical pumping test and aquifer testing data will be made when the data is reviewed in the BDR. The possibility that this data may be insufficient and may need to be supplemented with additional groundwater studies appears to be recognized later in the SAP on page 72 in the statement “when a source of water for the proposed mine operation is identified, additional aquifer tests may be completed if necessary.” MMD agrees that additional aquifer tests may be needed. This determination depends heavily on the nature and extent of historic pump test or other aquifer data that will be presented in the BDR.

72. Section 8.2, page 65: states that “mine dewatering will not be required because the proposed mine pit is above the measured regional groundwater level elevations.” However, evidence presented in this SAP, including the Shomaker Paper included as Appendix D in this SAP, describe a 1989 effort by a former mine operator to drive a decline into the Carache deposit, but that this effort was halted after 1,719 feet of advancement due to temporary water inflow. Further, also described within the Shomaker Paper, it mentions that the previous mine operator had applied for a Mine Dewatering Permit to pump a total of 122 acre-feet from the workings of the mine during a one year period and that estimation of the inflow to the mine workings became an issue. Given this information, it appears that there is a strong possibility that mine dewatering may indeed be required. The BDR must thoroughly address the issue of probable hydrologic consequences including any uncertainties, plans or contingencies for dewatering if groundwater is encountered during mining operations.

73. Section 8.2.1.1, page 65:

- a) describes the two primary aquifers in the area as a Sedimentary Rock Aquifer and an Igneous Rock Aquifer. This may be an overly simplistic conceptual model for characterization of baseline groundwater quality. For example, well TB-12 is shallow

at 140 feet depth total depth, and has a depth-to-water of 32 feet. Well IV-TW-1 is 1,500 feet in total depth with a depth-to-water of 378 feet. It seems likely that these wells are completed in different geologic and aquifer units, yet both are characterized as the Sedimentary Rock aquifer in Table 8-5. The wells listed in Table 8-5 should specify the geologic unit(s) the wells are completed in, if known.

- b) The conceptual model of a single Sedimentary Rock Aquifer also masks geochemical variability within each sedimentary unit. For example, the last sentence on page 67 states “the sections of the Mesaverde Formation tend to have the most elevated TDS content in the Sedimentary Rock Aquifer.” This implies that some knowledge of completion data for each well is available, and also demonstrates the variability of constituent concentrations within the individual units that comprise the Sedimentary Rock Aquifer. The BDR should differentiate this data so that baseline water quality can be compared spatially within each distinct geologic or aquifer unit.
  - c) This conceptual model also excludes any alluvial aquifers within the Sedimentary Rock Aquifer and excludes the Golden Fault Zone as a potentially separate and distinct aquifer within the Igneous Rock Aquifer. The BDR should address these issues.
74. If available, completion logs/diagrams depicting screened intervals should be provided for all monitoring wells and all piezometers sampled, gauged for depth-to-water, or otherwise utilized in some manner in the BDR.
75. Table 8-8, page 71: indicates that the Golden Fault aquifer is another aquifer in the region, however this aquifer is not identified as a primary aquifer in Section 8.2.1.1 of the SAP. The GFZ appears to be, at least in part, one of the major recharge zones for the area groundwater regime and was cited in various sources of the SAP as being a problem in prior mine development work when the Carache decline intersected the GFZ and encountered significant aquifer transmissivity influenced by fracture flow in or near the GFZ. Therefore, consideration should be given to the idea that the GFZ represents a distinct aquifer with distinct hydrologic properties that should be characterized to the extent that a determination can be made as to the resulting hydrologic consequences. The BDR should address how the open pit mine may affect local and regional recharge in the area and also address whether the pit will physically impede groundwater recharge or act as a groundwater sink in the area. The probable hydrologic consequences of the Carache pit intersecting the GFZ must be thoroughly addressed in the BDR.
76. Table 8-6, page 69:
- a) Table 8-6 shows some 25 mineral exploration boreholes that are reported to have been completed as piezometers into the Lukas and Carache Canyon. However, of the 25, only 8 appear functional and reported as being dry. This seems to be an inadequate amount of piezometers to characterize the depth to groundwater and flow regime in the permit area given the structural complexities of the area. Further, Table 8-6 also indicates that only 2 of the 25 total mineral exploration boreholes were completed into the Lukas Canyon area and of those one was found to be dry, and the other borehole was bridged at 230' depth. This also seems to be inadequate to characterize groundwater in the Lukas Canyon area.



- b) A figure plotting these boreholes/piezometers over a topographic map relative to the Carache pit boundary and other physical mine features should be included in the BDR.
  - c) A figure plotting these boreholes/piezometers over a map of the regional potentiometric surface should be included in the BDR.
77. Subsection 8.2.3.1, page 71, outlines the objectives of baseline groundwater characterization and includes an objective to meet the requirements of NMAC Title 19, Chapter 10, Part 6, but does not include any information in regard to compliance with NMED Groundwater Quality Bureau (Water Quality Control Standards) Discharge Permitting standards for baseline characterization of groundwater in the permit area. This should be revised in the BDR to also include objectives for complying with NMED Groundwater Quality Standards in accordance with the Water Quality Control Standards.
78. Table 8-8, page 71:
- a) A figure plotting the locations of these piezometers and wells over a topographic map should be included in the BDR.
  - b) If available, borehole logs or other completion information should be provided for these piezometers and wells in the BDR.
79. Subsection 8.2.3.1, page 72, second paragraph, indicates that measured water levels and water-quality data from existing wells will be used to determine the current condition of groundwater, and will be compared to available historical data and that these current and historical data will be evaluated to determine a range of baseline groundwater conditions for each aquifer system in the proposed mine permit area. Given that Table 8-8 indicates that most existing wells have been plugged/abandoned or are dry or not locatable, the BDR should explain how these existing wells will provide up-to-date baseline potentiometric surface maps, groundwater flow direction and hydraulic gradient data.
80. Section 8.2.3.2 incorrectly states that Part 6 of the Rules requires a minimum of two sampling events over the course of a 12-month period to acquire baseline data. MMD's *Guidance Document for Part 6 New Mining Operation Permitting Under the New Mexico Mining Act (August 2010)* recommends a minimum of two sampling events over a 12-month period.
81. Section 8.2.3.3:
- a) Two sampling locations within the igneous rock aquifer (Table 8-5, wells LC-GM-1 and CC-GM-2) appear inadequate to characterize groundwater quality within this aquifer considering the size, geologic variability and likely variable groundwater quality and quantity of this aquifer. Additionally, well CC-GM-2 looks to be located near the apex of Carache and No Name canyons, which is approximately ½ mile from the anticipated southern pit boundary. This appears inadequate to characterize groundwater quality and quantity in the immediate vicinity of the proposed Carache

pit. Further, well CC-GM-2 is listed in Table 8-5 as being completed in the "Igneous Rock/GFZ" aquifer. Consideration should be given that the GFZ may represent a distinct aquifer unit within the Permit Area.

- b) It is an incorrect statement that the MMD guidance document "lists specific groundwater quality parameters that are required for compliance with baseline characterization" Table 1 of MMD's *Guidance Document for Part 6 New Mining Operation Permitting Under the New Mexico Mining Act (August 2010)* recommends parameters that should be considered, not required, for analysis.
82. Subsection 8.2.3.4, page , third paragraph, last sentence: "Design of a pumping test is beyond the scope of this SAP." Given there is a proposed mill associated with the mine development and is proposed to be constructed in the permit area, it appears likely that a pump test will need to be completed in the future to support the future milling operation.
83. Figure 8-8 (regional potentiometric surface figure): should show the data points and groundwater elevations that were utilized to construct this figure in the BDR. This figure should also show the Golden Fault Zone and locations and total depth of dry wells relative to the potentiometric surface. This figure should show the well identification number or name in order to correlate this figure with the wells identified in Tables 8-5, 8-6, 8-7 and Table 8-8. As presented in the SAP, it is difficult to discern which wells are identified on Figure 8-8, and how they relate to those shown on Tables 8-5, 8-6, 8-7 and 8-8. Note that Figure 8-10 has all wells identified. This practice should be extended to all figures in the BDR.
84. The SAP does not state whether any predictive numerical hydrologic or water-quality modeling will be performed to evaluate the potential impact of waste rock and tailings materials to groundwater and surface water. The use of predictive modeling should be considered in order to satisfy the MMD requirement for the BDR to determine probable hydrologic consequences (19.10.6.602.D(13)(g)(v) NMAC).

## **Section 9: Historical and Cultural Properties Survey**

85. General Comments: the background information contained within this Section indicates that only certain portions of the recommended APE were surveyed during three (3) archaeological surveys that were previously conducted in the area during the late 1980's and early 1990's and goes on to further explain how any areas surveyed more than 10 years ago would potentially need to be resurveyed. The section also describes changes in the transect spacing and in the age criteria required for identifying cultural resources during those 3 prior surveys as being 25m spacing and a requirement at that time, for recording any cultural resources that are believed to be a minimum of 75 years of age. Given the significant changes in requirements by the SHPO for recording cultural resources, it is evident that the entire permit area should be intensively resurveyed (100% pedestrian coverage) using current standards for Class III pedestrian survey, that includes resurveying anything that was previously surveyed in excess of 10 years ago, using survey transect intervals spaced at no greater than 15 meters, and recording any cultural resources within the APE that are in excess of 50 years before present.

86. Section 9.3, page 87, second paragraph: indicates that sampling is not a common strategy during the location and assessment of cultural resources in the defined APE. While this may be a correct initial assumption for handling and identifying the extent of cultural resources that may be impacted by the Project, this Section of the SAP should also describe sampling and testing methods (i.e., subsurface auger probes, shovel testing, 1 meter x 1 meter test excavations, etc.) for determining the subsurface extent of any archaeological sites and should be used where applicable at certain sites to determine eligibility to the NRHP.
87. Section 9.7, page 89, first paragraph: describes utilizing guidance provided by the National Park Service ("NPS") and other methods for evaluating all cultural resources encountered during archaeological investigations in terms of their eligibility to the NRHP. Please explain the rationale behind using NPS guidance and other methods for determining eligibility to the National Register of Historic Places ("NRHP").

### **Section 10: Historic and Present Land Use**

88. Subsection 10.1, page 92: indicates that exploration roads, drill pads, pits and a decline area (approximately 9 acres) impacted during the LAC/Pegasus property evaluation period of 1989-1992 were reclaimed to industry standards. The BDR should show the location of the decline reclamation on a map and should document the reclamation performed in this area.
89. Subsection 10.5 and 10.6, page 93: includes a listing of data to be collected and describes an evaluation of structures on site and plans to evaluate environmental liabilities. The SAP does not describe how structures will be evaluated or how environmental liabilities will be determined. The BDR should detail the methodology used to collect this data.





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RYAN FLYNN  
Secretary - Designate  
BUTCH TONGATE  
Deputy Secretary

**MEMORANDUM**

**DATE:** September 17, 2013

**TO:** Holland Shepherd, Program Manager, Mining Act Reclamation Program

**FROM:** Keith Ehlert, Ground Water Quality Bureau  
David Mayerson, Ground Water Quality Bureau  
Neal Schaeffer, Surface Water Quality Bureau  
Sufi Mustafa, Air Quality Bureau

**THROUGH:** Keith Ehlert, Acting NMED Mining Act Team Leader

**RE:** **Comments on the Sampling and Analysis Plan, Ortiz Mine, Santa Fe Gold Corporation, Santa Fe County, New Mexico, Permit Tracking Number SF028RN**

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The New Mexico Environment Department (NMED) received the Santa Fe Gold Corporation Sampling and Analysis Plan (SAP) for the Ortiz Mine from the Mining Act Reclamation Program (MARF) on July 22, 2013. New Mexico Mining Act (NMMA) rules require that NMED submit comments within 30 days of the date of receipt. At the request of NMED, the comment period was extended to September 20, 2013.

NMED Ground Water Quality Bureau, Surface Water Quality Bureau, and Air Quality Bureau have reviewed the SAP and are submitting comments jointly in this memorandum.

**Site Location and Description**

The proposed Ortiz Mine will be located within the historic Ortiz Mine Grant in Santa Fe County, near Golden, New Mexico. The proposed mine will consist of a conventional open pit gold mine with 1:1 horizontal to vertical overall pit slope angles. Proposed mine facilities discussed in the SAP include a mill, waste rock pile, and a dry stacked tailing facility.

## **GROUND WATER QUALITY BUREAU COMMENTS**

### **General Comment**

NMED requests that prior to Santa Fe Gold preparing a written response to the comments, Santa Fe Gold and the agencies meet to discuss the following comments and requests for additional information.

### **Specific Comments**

#### **Section 7 - Mineralogy and Geology**

1. Figures 7-1 and 7-2 included with the SAP are not legible due to their small size. NMED obtained larger copies of the figures from MARP. NMED requests that Figures submitted in the future should be large enough to be clearly legible.
2. The Tijeras-Canoncito fault is discussed on Pages 37 and 42 of the SAP and the reader is referred to the geologic map and cross sections for its location (Figures 7-1 and 7-2), but the fault does not appear to be labeled on the Figures. NMED requests that any geologic features discussed in the text be included, and clearly labeled, on the geologic map and cross sections.
3. It is NMED's understanding that the SAP is intended to be applicable to the entire proposed mine permit area, which includes the Lukas Canyon deposit. No detailed information regarding the Lukas Canyon deposit is presented in the SAP. When more information regarding the Lukas Canyon deposit is presented, additional comments will be provided by NMED.
4. On Page 44, reference is made to Figure 3. NMED was unable to locate Figure 3 in the SAP.
5. On pages 44 and 45, the SAP indicates that the extent of sulfide mineralization in the Lucas Canyon skarn is poorly defined, but is a very small part of the deposit. NMED requests that Santa Fe Gold provide an explanation of how it is known that sulfides are a very small part of the deposit if the sulfide mineralization is poorly defined.
6. In Sections 7.3 through 7.4 (Pages 44-47) sampling objectives and sampling frequencies regarding potential acid rock drainage (ARD) are discussed. Considering the geologic complexity in the area of the Carache Canyon deposit, and apparent spatial and geologic variability of the materials, it appears that the number of samples proposed for testing (31) may be insufficient to fully characterize the geologic units with regard to ARD potential. On Page 46, it is indicated that 7,500 feet of core was obtained from 10 drill holes in the Carache deposit. However, Figure 7-3 shows only five drill holes from which selected core samples will be analyzed. It is unclear to NMED if core samples from 10 holes are available or only from five holes. Additionally, four of the five holes

shown are located in the southeasterly portion of the proposed pit, with only one in the northwesterly portion. Santa Fe Gold should indicate if more than 31 core samples from the Carache deposit are available for analysis and if so, justify why only 31 samples are being analyzed for ARD potential and how they were selected. NMED requests that Santa Fe Gold prepare a detailed geologic fence diagram of the Carache Canyon deposit, and include the 31 proposed sample locations in the fence diagram as well as an outline of the proposed pit. NMED further requests that the fence diagram be provided before the meeting requested in the General Comment. The issue of ARD potential and number of samples needed can then be further discussed and evaluated during the meeting.

7. In the discussion of kinetic testing on Page 46, it is stated “the ASTM procedures for kinetic testing requires a minimum of 20 weeks although tests may be run in excess of that time”. Based on experience with similar projects, NMED requests that the kinetic tests be run for a minimum of 52 weeks. Tables 8-3 and 8-4 (Pages 63 and 64) indicate that EPA Method 200.7 will be used for evaluating certain water and sediment parameters. NMED requests that EPA Method 200.7 be replaced with EPA Method 200.8.

#### **Section 8 – Surface and Groundwater**

8. Some of the figures provided in Section 8 are not clearly legible. For example, Figure 8-2 is labeled as a topographic map showing watershed boundaries and ephemeral streams, but the topography is not clearly legible. Figure 8-5 is an aerial photograph showing the New Mexico Office of the State Engineer (NMOSE) administrative basins, with the basins color coded. The coloring essentially obliterates features that may be visible on the air photo. Figure 8-6 is an air photo hydrogeologic map of the Ortiz Mine Grant showing various aquifers. The aquifers are color coded and, as with Figure 8-5, the coloring obliterates any air photo features that may be present. Figure 8-8 is an aerial photograph showing regional water level elevation contours. For review and interpretation purposes, any maps showing watershed boundaries, surface water sampling points, sediment sampling points, springs, or water elevation contour lines, should be presented on clearly readable properly labeled topographic maps with contour lines clearly labeled. When contour lines are overprinted on aerial photographs, the photo background makes contour lines and other features difficult to read. NMED requests that topographic maps not be presented on aerial photographs unless there is a specific reason for doing so.
9. On page 65, Section 8.2, it is indicated that mine dewatering will not be required because the proposed mine pit is above the measured regional groundwater table. The groundwater data presented in the SAP is insufficient to justify this conclusion. In Section 8.2.1.2 of the SAP, Page 67, it is indicated that all of the piezometers located in the Lucas Canyon and Carache Canyon areas were dry when measured in 2013 and depth to water is likely over 1,000 feet below ground level. It is not clear how the conclusion is reached that depth to water is likely over 1,000 feet based on the data presented in the SAP.

Table 8-6 on Page 69 of the SAP lists mineral exploration holes reported to be completed as piezometers and provides water elevations measured in 1990 and 2013 for some of the holes. None of the piezometers shown on Figure 8-8 as red squares are labeled with identification numbers. Therefore, NMED is unable to correlate the piezometers listed in Table 8-6 with the piezometers shown in Figure 8-8. Twenty three piezometers listed in Table 8-6 have the letter C at the beginning of each piezometer ID number. Although not indicated in the text of the SAP, NMED assumes the C indicates those piezometers are located in the Carache Canyon area. Of the 23 listed as apparently being in the Carache Canyon area, Table 8-6 indicates only seven were available for groundwater depth measurements in 2013. The rest are reported to have been plugged and abandoned or were not found in the 2013 investigation. All seven that were measured in 2013 were dry. However, information provided in Table 8-6 indicates that of the 23 piezometers measured in 1990, 16 had measured groundwater elevations above the elevation of the proposed pit bottom (one greater than 400 feet above the proposed pit bottom), six were not measured, and one was dry. Of all the piezometers reported to exist in 1990, only one had a reported hole bottom elevation below the proposed pit bottom and it was not measured in 1990, but was reported to be dry in 2013. Additionally, only seven piezometers are shown in Figure 8-8, and two of the seven are approximately two miles southwest of the proposed pit. The remaining 17 piezometers that were measured in 1990 do not appear to be shown in Figure 8-8.

NMED requests that Santa Fe Gold prepare a topographic map which includes 1) the outline of the proposed pit, 2) the location and identifying numbers for all piezometers, 3) water levels measured in the piezometers in 1990 and 2013, 4) ground water elevation contour lines in the area of the proposed pit, and 5) clearly shows the mapped faults in the area. NMED further requests that the map be provided before the meeting requested in the General Comment.

10. A 1995 report by John W. Shomaker titled *Hydrogeology of the Ortiz Mountains and Vicinity* (Shomaker Report) includes a groundwater contour map (Figure 5) which shows a groundwater elevation of 7,100 feet in close proximity to the proposed pit, and indicates that the Golden Fault Zone receives recharge and is saturated to an elevation of about 7200 feet at Carache Canyon. NMED plotted the approximate pit location on Figure 8-6 (the only Figure in the SAP that clearly depicts and identifies the Golden fault). It appears the Golden Fault may trend through, or in very close proximity to, the proposed pit. Considering the Golden Fault is part of a major fault system, it likely includes several splays. The geologic map included with the SAP (Figure 7-1) shows mapped fault traces trending through the proposed pit, although the Golden Fault is not identified on the geologic map. Even if the Golden Fault (or a splay of it) does not trend directly through the proposed pit, if it is relatively close to the proposed pit (which it appears to be), and if the groundwater elevation is close to 7,200 feet as indicated in the Shomaker Report, the possibility that groundwater would flow into the proposed pit cannot be ruled out, especially considering the elevation difference between the groundwater elevation reported by Shomaker and the elevation of the bottom of the proposed pit. NMED



requests that Santa Fe Gold consider this information when preparing the map requested in Comment 9 above.

11. Section 8.2.3 of the SAP indicates that background groundwater quality and elevations will be determined from some of the existing wells listed in Table 8.5. All of the wells proposed to be used for this purpose appear to be regional groundwater wells except possibly TB-12 which encountered groundwater at a depth of 32 feet. Figure 8-10 shows that the well is situated in a major alluvial drainage (Arroyo Tuerto), indicating a relatively shallow alluvial aquifer may be present down-gradient from the proposed mine facilities. NMED requests that Santa Fe Gold verify whether this is an alluvial aquifer and evaluate the possible existence of additional alluvial aquifers.
12. Figure 8-7 includes two cross sections which show the groundwater table crossing several faults, including the La Bajada and Tijeras-Canoncito Fault Systems. These fault systems are major geologic structures (the Tijeras-Canoncito Fault System is a bounding fault for the Rio Grande Rift). On Page 65 of the SAP, reference is made to a 1993 publication by Shomaker and Mahar which indicates faults associated with the Tijeras-Canoncito and La Bajada Fault Systems play a significant role in the regional hydrogeology by acting as conduits for recharge and/or barriers to groundwater flow. No groundwater elevation differences are shown across any of the faults in the cross sections. Due to the low number and wide spacing between wells in which groundwater depths were measured, it appears likely that if groundwater elevation differences are associated with some of the faults in the area, the differences have not been identified. If faults in the vicinity of the proposed pit do function as groundwater barriers or conduits for groundwater flow, this issue may have a significant impact on contaminant transport and groundwater flow during mining. Further investigation of this issue may be required prior to mining.

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In addition to baseline data collection required pursuant to the New Mexico Mining Act, it should be noted that detailed geochemical characterization and a material handling plan will be required as critical components of a discharge permit. NMED will continue to work with Santa Fe Gold and the Mining and Minerals Division (MMD) to facilitate any permitting process. Attached is a brief summary of typical components of a discharge permit.

SUMMARY OF SOME OF THE GENERAL REQUIREMENTS OF A NEW MEXICO  
ENVIRONMENT DEPARTMENT GROUNDWATER QUALITY BUREAU DISCHARGE  
PERMIT FOR A METALS MINE

**Groundwater Monitoring Wells**

Regional groundwater monitoring wells will be required down-gradient of any waste rock piles, tailing disposal facilities, ore storage facilities, the mill, and any other mine facilities that may impact groundwater. If it is determined that shallow alluvial aquifers are present down-gradient of any mine facilities, shallow alluvial monitoring wells will also be required where appropriate. Water samples shall be collected quarterly and are typically analyzed for parameters regulated pursuant to the New Mexico State Standards. [20.6.2.3103 NMAC]

**Waste Rock Characterization**

A Waste Rock Characterization and Handling Plan will be required prior to the start of mining. Characterization of pit material may include collecting and testing of samples from blast drill holes, visual evaluations of exposed pit materials, geologic mapping of the pit by a qualified geologist as it is excavated, and collection and testing of samples from the pit wall.

**Characterization of Tailings**

A tailing characterization plan will be required prior to the start of mining. The plan shall include a description of how the physical and geochemical properties of the tailings will be determined. Samples of tailing material shall be collected and analyzed quarterly when the mill is active. The monitoring may include testing for acid base accounting, acid generating potential, acid neutralizing potential, paste pH and for total and leachable concentrations of various metals.

**Impacted Storm Water Management**

Impacted Storm Water Management Plans will be required for the waste rock pile(s), tailing disposal facility, and any other mine facilities that may require impacted storm water controls. Storm water catchments that store impacted water shall be synthetically lined.

**Surface Water Monitoring**

Collection of quarterly surface water samples shall be required from any perennial or ephemeral streams or any springs that have the potential to be impacted from mining activities. Testing of seepage water and periodic testing of surface runoff from the tailing storage facility and waste rock pile shall also be required.

**Reporting**

Semi-annual monitoring reports containing information collected during the preceding six months shall be required. The reports at a minimum shall include water quality information, a summary of all activities at the mine during the preceding six months, including operational activities, well drilling, trends in water quality, etc.

**Hydrologic Conceptual Model**

A hydrologic conceptual model will be required prior to the start of mining. The model shall include, at a minimum, 1) a description of the hydrologic setting relative to both local and regional hydrology and geology, 2) potentiometric maps, surface water drainages, sources of ground water recharge and hydrologic divides, 3) cross-sections, 4) potential sources of water contaminants, 5) potential pathways for migration of contaminants, and 6) any surface waters of the state that are gaining because of inflow of groundwater that may be affected by water contaminants discharged by the mine.

**Closure Plan**

An approved closure plan shall remain in effect under the discharge permit until closure and post-closure is complete. Post-closure monitoring and maintenance will be required. A cover material characterization and cover system plan will be required for NMED approval pursuant to the discharge permit requirements.

**Financial Assurance**

Financial assurance in an amount sufficient to cover the cost of a third party to implement the closure plan shall be maintained. Financial assurance shall include the costs to cover 30 years of post-closure monitoring and maintenance.

**SURFACE WATER QUALITY BUREAU COMMENTS**

1. The SAP states that all watercourses are ephemeral, but does not describe how intermittent streams were identified. The vegetation survey should discuss any presence of riparian vegetation on the project site. Within a channel or lowland, the presence of vegetation different from the uplands can indicate the presence of more water than just direct storm runoff (i.e., an intermittent watercourse). The Wildlife section mentions such a habitat type (intermittent stream) located near the project site, but this survey apparently is over 20 years old. Such a habitat type is "riparian", but the Surface Water section implies that riparian areas only occur in the vicinity of Galisteo Creek. This section also mentions "several stock tanks that contain seasonally captured storm-water runoff in the proposed mine permit area", and these features often have riparian vegetation. There is no indication that the project site was recently surveyed for the presence of riparian vegetation.
2. The SAP states that the nearest perennial watercourse is the Rio Grande. However, reaches of Galisteo Creek are perennial, interrupted by intermittent reaches.
3. The Surface Water section does not describe available water quality data from nearby the proposed project site. In particular, stream samples from Galisteo Creek downstream of the proposed mining site have reported mercury. SWQB suspects that fugitive mercury from historic mining activities may sporadically mobilize into water courses; and the proposed mining might disturb such historic contamination and increase this impact. SWQB recommends a careful review of historic operations and other available information, in an effort to identify where mercury-contaminated soils are most likely to occur on the proposed project site. Those soils should be sampled for mercury.
4. The proposed surface water sampling involves the use of staged sample bottles and crest gages rather than autosamplers. Autosamplers can collect more reliable samples, as well as document flow stages better than crest gages. The SAP should describe why staged samplers were selected instead of using autosamplers.
5. The SAP states that samples of old, stagnant water may be submitted: "if water is present in sample bottles at the time of quarterly staff-gage measurements...". But water samples more than a few hours old should be disqualified, especially given typical rates of evaporation and the volatility of some analytes of interest like mercury. Another section of the SAP describes field-checking the samplers "after a 24-hour precipitation event of 1 inch or greater." This should be amended to read that the samples will be collected immediately after any flow event, as indicated by observed rain or runoff anywhere on the project site. Data collection also should include a description of the storm (location, time, duration, and intensity), based on all available information such as radar data, as well as an estimate of the time samples were left exposed to the atmosphere and not cooled to 4C.
6. Flow/stage data should be collected with any water samples, not just quarterly. This is necessary to correlate water quality data with flow characteristics, such as to calculate loads

rather than just intrinsic water concentrations. The SAP states that "real-time precipitation data will be monitored", but does not describe the nature or location of this monitoring equipment.

7. The SAP mentions that stream sediment samples may be utilized in lieu of water samples, but such samples often do not serve as a proxy for water quality data. Instead, the SAP should describe more rigorous attempts to collect water samples, as described above.

8. Stream surveying should include pebble counts to estimate channel roughness (especially when estimating discharge from water stage) and sediment transport. The Sediment Analysis section approaches this, but in a different context and without reference to hydrologic modeling.

**AIR QUALITY BUREAU COMMENTS**

DATE: August 19, 2013

TO: Kurt Vollbrecht,  
Mining Act Team Leader  
Ground Water Quality Bureau

THROUGH: Richard Goodyear,  
Bureau Chief, Air Quality Bureau

FROM: Sufi Mustafa,  
Manager Air Dispersion Modeling Section

**RE: Proposed Ortiz Mine, Request for Comments on the Sampling and Analysis Plan,  
Santa Fe County, Permit Tracking Number SF028PN**

The New Mexico Air Quality Bureau (AQB) has completed its review of the above mentioned mining project.

Pursuant to 19 NMAC 10.2, Subpart 302.G of the New Mexico Mining Act Rules, the AQB has the following comments:

The Air Quality Bureau has no objection to the sampling plan in general. Applicant may want to consult with AQB monitoring staff if the collected meteorological data will be used for air dispersion modeling.

If you have any questions, please contact me at (505) 476-4318.

GOVERNOR  
Susana Martinez



DIRECTOR AND SECRETARY  
TO THE COMMISSION  
James S. Lane, Jr.

Daniel E. Brooks, Deputy Director

STATE OF NEW MEXICO  
DEPARTMENT OF GAME & FISH

One Wildlife Way  
Santa Fe, NM 87507  
Post Office Box 25112  
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Phone (505) 476-8008  
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Visit our website at [www.wildlife.state.nm.us](http://www.wildlife.state.nm.us)  
For information call (888) 248-6866

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RALPH RAMOS  
Las Cruces, NM

August 20, 2013

David Ennis, Permit Lead  
EMNRD Mining & Minerals Division  
1220 South St. Francis Drive  
Santa Fe NM 87505



**RE: Ortiz Mine, Sampling & Analysis Plan, Permit No. SF028RN; NMDGF Project No.15752**

Dear Mr. Ennis:

In response to your letter dated July 22, 2013, the New Mexico Department of Game and Fish (Department) has reviewed the above referenced document. The Sampling and Analysis Plan (SAP) describes procedures that will be used to collect data for a Baseline Data Report (BDR). The BDR is required as part of a permit application for the planned Ortiz Mine, an open pit gold mine and mill. The project is located on the Ortiz Mine Grant in the Ortiz Mountains of Santa Fe County, NM. A site inspection was conducted on August 9, 2013, with representatives from EMNRD Mining and Minerals Division, the Department, the NM Environment Department, the Office of the State Engineer, GL Environmental Consulting, Santa Fe Gold (the project proponent), and Lone Mountain Ranch (the surface landowner). We have reviewed SAP chapters which address data collection for vegetation and wildlife.

Vegetation

A vegetation survey of the project area was conducted in the early 1990s. Please provide a copy of that survey report as part of the BDR. Due to the amount of time that has elapsed since the previous survey, a new vegetation survey will be necessary. The Department concurs with the proposed stratification of the site into two vegetation types, Juniper Savanna and Pinyon-Juniper Woodland, with further subdivision into undisturbed and previously disturbed locations. Observations made on the August 9 site inspection indicate it would also be appropriate to add a category for Pine-Oak Forest. The proposed open pit location is within the latter habitat type. Please update Figure 4-1, Vegetation Communities, to show the date of most recent disturbance and reclamation on the disturbed locations. We also concur with the number of transects proposed on Table 4-2. The transect locations and directions the tape will be laid out should be selected by a consistent method of randomization, rather than "haphazardly" (p. 24). Line and belt transect methods are acceptable as described. Productivity quadrats should all be clipped and weighed. Methods involving visual estimation are not recommended for compliance or permitting purposes.

David Ennis  
August 20, 2013  
Page -2-

Please use the current NM Rare Plant Technical Council Santa Fe County list (enclosed) for special status plant species. Please use the current NM Department of Agriculture Noxious Weed List (enclosed) for species to be documented on weed surveys.

#### Wildlife

A wildlife survey of the project area was conducted in the early 1990s. Please provide a copy of that survey report as part of the BDR. Due to the amount of time elapsed since the previous survey, a complete new wildlife survey will be necessary. Please use the current Santa Fe County list of state and federal special status wildlife species (enclosed).

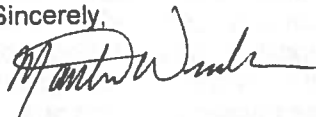
The SAP proposes winter and breeding season point count surveys. The SAP should include additional detail as to the survey methods that are being proposed. Consult the Baseline Wildlife Study Guideline on the Department's on-line Environmental Habitat Handbook at [wildlife.state.nm.us/conservation/habitat\\_handbook/index.htm](http://wildlife.state.nm.us/conservation/habitat_handbook/index.htm) for suggested survey methods. Please specify the location of bird survey transects and explain how they were selected. Please indicate how many days the surveys will be repeated. The gray vireo is a NM State Threatened species that has been documented to occur in the Ortiz Mountains, and for which suitable habitat occurs on the project area. Breeding season surveys should be conducted for gray vireo (protocol available on request from the Department). Suitable raptor nesting habitat within one mile of any proposed disturbance should be surveyed for nests.

The project area includes important habitat for mule deer, black bear and mountain lions. The Department concurs with the use of motion sensor wildlife cameras to supplement formal observation/sign surveys for medium-large mammals. Please state in the SAP the number, location, and sampling frequency of survey transects, and indicate any special wildlife habitat features that have been identified. We recommend trapping arrays for reptiles as well as for small mammals.

The BDR should include a map showing all known historic mine features. Each feature should be evaluated for potential and actual occupancy by bats, in particular the presence or absence of significant hibernation or maternity colonies. Exit observations, at the appropriate time of year, can be used to supplement internal inspection, or where internal inspection is unsafe or technically not feasible. Information about evaluating abandoned mines for bats is provided in the enclosed Natural Resources Conservation Service/ Bat Conservation International brochure *Bats and Mines*.

Thank you for the opportunity to comment on this permit document. If there are any questions, please contact Rachel Jankowitz, Habitat Specialist at 505-476-8159 or [rjankowitz@state.nm.us](mailto:rjankowitz@state.nm.us).

Sincerely,



Matthew Wunder, Chief  
Ecological and Environmental Planning Division

cc: USFWS NMES Field Office  
Kurt Vollbrecht, NMED Groundwater Quality Bureau





April 1, 2009

**New Mexico Department of Agriculture**

Office of the Director/Secretary  
MSC 3189  
New Mexico State University  
P.O. Box 30005  
Las Cruces, NM 88003-8005  
Phone: (575) 646-3007

MEMORANDUM

TO: General Public  
FROM: I. Miley Gonzales, Ph.D.  
SUBJECT: New Mexico Noxious Weed List Update

The Director of the New Mexico Department of Agriculture has selected the following plant species (*see attached New Mexico Noxious Weed List*) to be targeted as noxious weeds for control or eradication pursuant to the Noxious Weed Management Act of 1998.

Petitions to add new plant species to the state noxious weed list were solicited and received by the New Mexico Department of Agriculture (NMDA) from Cooperative Weed Management Areas, individuals, agencies and organizations. The petitions were reviewed by the New Mexico Weed List Advisory Committee using ecological, distribution, impact, and legal status criteria within the State of New Mexico and adjoining states.

During its review the committee recommended the establishment of a new "watch list" category. This category contains plant species that have the potential to be problematic. More data is needed in order to determine if the species should be listed. Placing a plant species on the watch list will raise awareness of the species, and promote data collection and reporting efforts statewide. This will provide the data needed to determine if the plant should be listed.

This list does not include every plant species with the potential to negatively impact the state's environment or economy. Landowners and land managers are encouraged to recognize plant species listed on the federal noxious weed list and other western states' noxious weed lists as potentially having negative impacts and to manage them accordingly.

attachment: New Mexico Noxious Weed List

IMG/jm/jw

# New Mexico Noxious Weed List

Update April 2009

## Class A Species

Class A species are currently not present in New Mexico, or have limited distribution. Preventing new infestations of these species and eradicating existing infestations is the highest priority.

<u>Common Name</u>	<u>Scientific Name</u>
Alfombrilla	<i>Drymaria arenariodes</i>
Black henbane	<i>Hyoscyamus niger</i>
Camelthorn	<i>Alhagi psuedalhagi</i>
Canada thistle	<i>Cirsium arvense</i>
Dalmation toadflax	<i>Linaria dalmatica</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Dyer's woad	<i>Isatis tinctoria</i>
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Giant salvinia	<i>Salvinia molesta</i>
Hoary cress	<i>Cardaria spp.</i>
Hydrilla	<i>Hydrilla verticillata</i>
Leafy spurge	<i>Euphorbia esula</i>
Oxeye daisy	<i>Leucanthemum vulgare</i>
Parrotfeather	<i>Myriophyllum aquaticum</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Purple starthistle	<i>Centaurea calcitrapa</i>
Ravenna grass	<i>Saccharum ravennae</i>
Scotch thistle	<i>Onopordum acanthium</i>
Spotted knapweed	<i>Centaurea biebersteinii</i>
Yellow starthistle	<i>Centaurea solstitialis</i>
Yellow toadflax	<i>Linaria vulgaris</i>

## Class B Species

Class B Species are limited to portions of the state. In areas with severe infestations, management should be designed to contain the infestation and stop any further spread.

<u>Common Name</u>	<u>Scientific Name</u>
African rue	<i>Peganum harmala</i>
Chicory	<i>Cichorium intybus</i>
Halogeton	<i>Halogeton glomeratus</i>
Malta starthistle	<i>Centaurea melitensis</i>
Musk thistle	<i>Carduus nutans</i>
Perennial pepperweed	<i>Lepidium latifolium</i>

Russian knapweed  
Poison hemlock  
Teasel  
Tree of heaven

*Acroptilon repens*  
*Conium maculatum*  
*Dipsacus fullonum*  
*Ailanthus altissima*

### **Class C Species**

Class C species are wide-spread in the state. Management decisions for these species should be determined at the local level, based on feasibility of control and level of infestation.

#### **Common Name**

#### **Scientific Name**

Bull thistle  
Cheatgrass  
Jointed goatgrass  
Russian olive  
Saltcedar  
Siberian elm

*Cirsium vulgare*  
*Bromus tectorum*  
*Aegilops cylindrica*  
*Elaeagnus angustifolia*  
*Tamarix spp.*  
*Ulmus pumila*

### **Watch List Species**

Watch List species are species of concern in the state. These species have the potential to become problematic. More data is needed to determine if these species should be listed. When these species are encountered please document their location and contact appropriate authorities.

#### **Common Name**

#### **Scientific Name**

Crimson fountaingrass  
Giant cane  
Meadow knapweed  
Pampas grass  
Quackgrass  
Sahara mustard  
Spiny cocklebur  
Wall rocket

*Pennisetum setaceum*  
*Arundo donax*  
*Centaurea pratensis*  
*Cortaderia sellonana*  
*Elytrigia repens*  
*Brassica tournefortii*  
*Xanthium spinosum*  
*Diplotaxis tenuifolia*



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- Species Considered, but dropped
- Photographers, Illustrators and Authors
- Image Usage Guidelines
- Sponsors
- Discussion Group
- Useful Literature
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## Results of County Search

SANTA FE	
Scientific name	County-NM
<i>Abronia bigelovii</i>	Rio Arriba, Sandoval, Santa Fe
<i>Astragalus cyaneus</i>	Rio Arriba, Santa Fe, Taos
<i>Astragalus feensis</i>	Bernalillo, Hidalgo, Sandoval, Santa Fe, Torraine
<i>Astragalus siliceus</i>	Guadalupe, Santa Fe, Torraine
<i>Cuscuta fasciculata</i> (Not NMRPTC Rare)	Santa Fe
<i>Delphinium sapellonis</i>	Bernalillo, Los Alamos, Mora, San Miguel, Sandoval, Santa Fe
<i>Hackelia hirsuta</i>	Colfax, Mora, Rio Arriba, San Miguel, Santa Fe, Taos, Union
<i>Mentzelia springeri</i>	Los Alamos, Sandoval, Santa Fe
<i>Mentzelia todiltoensis</i>	Bernalillo, Cibola, Santa Fe, Socorro
<i>Muhlenbergia arsenei</i>	Mckinley, Sandoval, Santa Fe
<i>Opuntia viridiflora</i>	Santa Fe
<i>Rubus aliceae</i>	Santa Fe

Photo credits in header *Peniocereus greggii* var. *greggii* © T. Todsén,  
*Lepidospartum burgessii* © M. Howard, *Argemone pleiacantha* ssp. *pinnatisecta* © R. Sivinski  
 ©2005 New Mexico Rare Plant Technical Council

## NEW MEXICO WILDLIFE OF CONCERN SANTA FE COUNTY

For complete up-dated information on federal-listed species, including plants, see the US Fish & Wildlife Service NM Ecological Services Field Office website at <http://www.fws.gov/southwest/es/NewMexico/SBC.cfm>. For information on state-listed plants, contact the NM Energy, Minerals and Natural Resources Department, Division of Forestry, or go to <http://nmrareplants.unm.edu/>. If your project is on Bureau of Land Management, contact the local BLM Field Office for information on species of particular concern. If your project is on a National Forest, contact the Forest Supervisor's office for species information. E = Endangered; T = Threatened; s = sensitive; SOC = Species of Concern; C = Candidate; Exp = Experimental non-essential population; P = Proposed

<u>Common Name</u>	<u>Scientific Name</u>	<u>NMGF</u>	<u>US FWS</u>	<u>critical habitat</u>
Rio Grande Chub	<i>Gila pandora</i>	s		
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T		
Northern Goshawk	<i>Accipiter gentilis</i>	s	SOC	
Peregrine Falcon	<i>Falco peregrinus</i>	T	SOC	
White-tailed Ptarmigan	<i>Lagopus leucurus</i>	E		
Mountain Plover	<i>Charadrius montanus</i>	s	SOC	
Least Tern	<i>Sterna antillarum</i>	E	E	
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	s	P	
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	s	T	Y
Boreal Owl	<i>Aegolius funereus</i>	T		
Burrowing Owl	<i>Athene cucularia</i>		SOC	
Black Swift	<i>Cypseloides niger</i>	s		
Violet-crowned Hummingbird	<i>Amazilia violiceps</i>	T		
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	E	E	Y
Loggerhead Shrike	<i>Lanius ludovicianus</i>	s		
Gray Vireo	<i>Vireo vicinior</i>	T		
Baird's Sparrow	<i>Ammodramus bairdii</i>	T	SOC	
Western Small-footed Myotis Bat	<i>Myotis ciliolabrum melanorhinus</i>	s		
Yuma Myotis Bat	<i>Myotis yumanensis yumanensis</i>	s		
Long-legged Myotis Bat	<i>Myotis volans interior</i>	s		
Fringed Myotis Bat	<i>Myotis thysanodes thysanodes</i>	s		
Pale Townsend's Big-eared Bat	<i>Corynorhinus townsendii pallescens</i>	s	SOC	
Yellow-bellied Marmot	<i>Marmota flaviventris</i>	s		
Gunnison's Prairie Dog (prairie)	<i>Cynomys gunnisoni</i>	s		
Gunnison's Prairie Dog (montane)	<i>Cynomys gunnisoni</i>	s	C	
Heather Vole	<i>Phenacomys intermedius intermedius</i>	s		
Red Fox	<i>Vulpes vulpes</i>	s		
Ringtail	<i>Bassariscus astutus</i>	s		
American Marten	<i>Martes americana origenes</i>	T		
Black-footed Ferret	<i>Mustela nigripes</i>		E	
Western Spotted Skunk	<i>Spilogale gracilis</i>	s		
Lilljeborg's Peaclam	<i>Pisidium lilljeborgi</i>	T		
Socorro Mountainsnail	<i>Oreohelix neomexicana</i>	s		



# Bats

*and*

# Mines

**EVALUATING ABANDONED MINES FOR BATS:  
RECOMMENDATIONS FOR SURVEY AND CLOSURE**



**BAT CONSERVATION  
INTERNATIONAL**

## Background

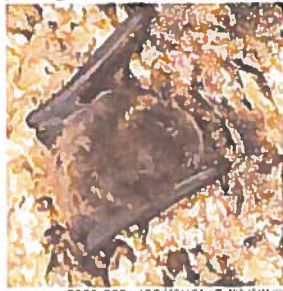
Abandoned underground mines provide important roosting habitat for more than half of the 45 bat species in the United States. And their use of abandoned mines is as complex as the varied environments the mines provide. Bats use mines for rearing young in the summer, hibernating, gathering for social activities such as courtship and mating, night roosting, and for crucial rest stops during spring and fall migrations. The process of determining whether bats are using a specific mine is not simple, but it can be accomplished reliably by following these recommendations.

The assessment begins with a preliminary survey to describe all mine openings and record all information that can be gathered at each opening without underground entry. These data should include: entrance dimensions; elevation relative to other openings; airflow direction and temperature; ambient air temperature; obstacles such as rocks, vegetation, limbs, trash, portal or headframe timbers in the opening; potential hazards; estimated vertical or horizontal depth; presence of internal complexity, such as drifts, crosscuts, raises, winzes, or stopes; and observations of any wildlife or wildlife sign. If a mine cannot be eliminated as wildlife habitat by the initial survey, an external and/or internal survey is warranted.

A field crew collects preliminary survey data at an abandoned mine shaft in California's Joshua Tree National Park.



© SHERRYL DUCHONOV BCI \ 916-5406



Stained roosting surfaces -often provide important clues regarding bat use in mines.

© MERLIN D. TUTTLE BCI \ 853-6302

## INTERNAL SURVEYS MAY BE NEEDED WHERE:

- ◆ Large, complex underground mines may have multiple openings.
- ◆ Areas with many scattered openings may have unknown underground interconnections.
- ◆ Time or funding is too limited for multiple external surveys.
- ◆ An understanding of interconnections is essential to maintaining the airflow required by

## EXTERNAL SURVEYS MAY ALSO BE NECESSARY TO:

- ◆ Determine which entrances bats are using.
- ◆ Conduct counts for monitoring population size or trends.
- ◆ Minimize disturbances to resident colonies.
- ◆ Augment incomplete internal inspections.

Acquiring complete knowledge of bat use of abandoned mines often requires a combination of external and internal surveys. The following simplified guide suggests approaches that have proven effective for conditions and situations typically encountered when surveying abandoned mines. It can be used as a starting point to develop a specific program that suits local conditions. (When a statement applies to your situation, proceed to the indicated section.)

## CONDUCTING A BAT SURVEY

### Complete Internal Survey Possible

An internal survey should cover most of the mine before concluding that neither bats nor signs are present. Generally, however, if bat use of a mine is significant, bats or evidence of bat use will be encountered well before the entire mine has been evaluated. It is seldom possible to survey all areas of a large and complex mine, but it is also seldom necessary. Proceed to Section A

### Complete Internal Survey Not Possible

If no evidence of bats is apparent, but the mine has potentially important inaccessible areas (such as large stopes or dangerous shafts), or authorities will not permit internal evaluation, additional external observations at entrances may be required. Proceed to Section B

## SECTION A: INTERNAL SURVEYS

### A.1 WINTER SURVEY

No guano, other sign, or resident bats	C.2
Guano or other sign	A.2, C.1
Resident bats	C.1
Internal conditions (e.g., water) obscure sign	A.2
All, or enough, of the mine cannot be seen	B.1

### A.2 SUMMER SURVEY

No residents (possible night roost, migratory use, specialized reproductive behavior, undocumented use)	A.3
Residents	C.1

### A.3 FALL OR SPRING SURVEY

No residents or sign of bat use	C.2
Residents and/or sign	C.1

## SECTION B: EXTERNAL SURVEYS

### B.1 SUMMER, FALL, OR SPRING SURVEY

All entrances observed; no activity found (multiple surveys performed)	C.2
Bats observed	C.1

## SECTION C: CONSERVATION RECOMMENDATIONS

### C.1 DECISION TO CONSTRUCT A BAT GATE

- Is a threatened or endangered species involved?
- Is use significant (as determined regionally)?
- Are alternative roosting features nearby and used in the same way?
- How feasible is bat-compatible gating?
- Will preservation of an abandoned roost provide habitat or mitigate habitat destruction elsewhere?
- Is it likely the survey missed evidence of periodic use?

### C.2 CLOSURE by Any MEANS

- Was the survey method adequate?
- Could the survey have missed periodic use?
- If closure is based only on external surveys, their limitations must be understood. For example, while multiple external surveys may be required to detect the presence of bats, a single internal survey might be enough to confirm their presence.
- If there is any concern that bats might be present, conduct a final internal inspection. Schedule exclusions and mine closures when the fewest bats would be using the mine; avoid maternity and hibernation seasons.



## RECOMMENDATIONS

### INTERNAL SURVEYS

- Anyone entering an abandoned mine must have appropriate training and experience.
- When properly conducted, internal surveys are the most reliable and least labor-intensive type of survey for evaluating roost presence and quality.
- Internal surveys allow better-informed decisions than external observations in choosing appropriate mine-closure strategies.

### Cold Season Surveys

- Unless pre-hibernation swarming (when bats first appear at hibernation sites) is witnessed, internal surveys are the only way to detect hibernating bats.
- Hibernating bats must be identified with minimal disturbance. Repeated arousal causes bats to use fat reserves they need to survive the winter.
- Inspecting even tiny cracks and crevices may be required to find hibernating bats. Guano, roost staining, bat remains, and insect parts indicate use during other seasons.

### WARM SEASON SURVEYS

- The timing of warm season surveys varies by local climate, but they are generally conducted during May through June in southern states and July through August in the north.
- Mine must be explored quietly because many bat species cannot tolerate disturbances at roost sites, especially when they are giving birth or caring for pups.
- Maternity colonies may use multiple roosts during a single season, so do not assume that because bats are not present at one roost, a mine is not being used.
- Guano containing discarded insect remains can indicate night roosting, even if no bats are seen in daytime surveys. If night roosting is suspected, the mine can be checked at night to observe the species and numbers.
- Identifying other kinds of use, such as courtship or migratory stopovers, can be difficult, but multiple visits to the site or using drop cloths (a light-colored sheet or piece of plastic) to collect guano may help clarify use.

### EXTERNAL SURVEYS

- External surveys are especially useful when combined with internal surveys at large, complex mines.
- Set up quietly at least 30 minutes before dark and continue observations for at least two hours after sunset. Observers should be as far from the entrance as feasible to minimize disturbance.
- All entrances to a complex mine should be surveyed on the same night, and surveys should be conducted on nights without rain or heavy wind.
- Specialized equipment (night-vision goggles or infrared cameras) may be needed. If not available, position observers toward the setting sun so exiting bats are silhouetted or shine a light with a red filter across the mine entrance.
- When conducting external evaluations, remember that an absence of evidence should not automatically be interpreted to mean that bats do not use the site at other times of the year.
- With external survey techniques, significant kinds of use — hibernation, reproductive behavior, migratory stopover — are often missed. This is a severe limitation that must be considered if mine closures are to be based on external surveys.

### CONSIDERATIONS FOR CLOSURE

- Are threatened or endangered species affected so, a bat-friendly closure is probably warranted?
- Is the bats' use of the mine especially significant within the geographical region? Maternal or important bachelor colonies of any specie justify installation of bat-compatible closure.
- Are suitable alternative habitats available nearby? These may be good candidates for mitigation and bat-compatible closure.
- Could the site become an acceptable habitat in the future? If so, a bat-compatible closure would be warranted.
- All closures must be weighed against the complexity, feasibility, cost, and reliability of comparable, more easily gated features nearby.
- Destructive closure activities should be coordinated with local bat biologists to avoid trapping unseen bats.
- Bat-compatible closures should minimize disturbance to bat residents. For example, a bat gate should not be built during the maternity period.
- The timing of a mine closure must take into account the type of use, species present, and region of the country.

## CONTACT INFORMATION



Wildlife Habitat Management Institute  
100 Webster Circle, Suite 3  
Madison, MS 39110  
(601) 607-3131  
[www.whmi.nrcs.usda.gov](http://www.whmi.nrcs.usda.gov)



P.O. Box 162603  
Austin, Texas 78716  
(512) 327-9721  
[www.batcon.org](http://www.batcon.org)



Townsend's big-eared bats (*Corynorhinus townsendii*) are frequent occupants of abandoned mines throughout the western United States and rely on them year-round.



STATE OF NEW MEXICO  
**DEPARTMENT OF CULTURAL AFFAIRS**  
**HISTORIC PRESERVATION DIVISION**

Susana Martinez  
Governor

BATAAN MEMORIAL BUILDING  
407 GALISTEO STREET, SUITE 236  
SANTA FE, NEW MEXICO 87501  
PHONE (505) 827-6320 FAX (505) 827-6338

August 21, 2013

David J. Ennis, P.G.  
Permit Lead  
Mining Act Reclamation Program  
Mining and Minerals Division  
1220 South St. Francis Drive  
Santa Fe, NM 87505

Re: Request for Review and Comment on the Sampling and Analysis Plan, Santa Fe Gold Corporation, Ortiz Mine, Santa Fe County, New Mexico Permit No. SF028RN

Dear Mr. Ennis:

This letter is in response to sampling and analysis plan for the proposed Ortiz Mine located in Santa Fe County. According to 19.10.6.602 NMAC, a sampling and analysis plan shall include a list and accompanying map indicating all sites on or eligible for listing on the National Register of Historic Places and/or the State Registers of Cultural Properties and known cemeteries and human burials within the proposed permit area. Included in this list shall be a description of effects the proposed mining operations may have on these sites and any proposed mitigation measures.

Although Section 9 of the SAP, Historical and Cultural Properties Survey, summarizes the previous surveys that have been conducted within the proposed permit area, it does not specifically state whether there are any cultural properties listed on or eligible for listing on either the National Register of Historic Places and/or the State Registers of Cultural Properties. The SAP should definitively state whether there are any properties listed on the National or State Register within the permit area and include table that lists by LA site number the previously recorded sites and any eligibility determinations that have been made.

Under Section 9.3, Sampling Objectives, the SAP states that the project area is subject to review under Section 106 of the National Historic Preservation Act because the project area entails land modification activities. It is my understanding that the surface and the minerals is privately owned, thus there would be no federal involvement. Section 106 of the National Historic Preservation Act only applies when there is federal land; federal funding or a federal license or permit is required. If my understanding is correct, then this statement should be deleted.

Section 9.3 also states that the APE and any potential sampling strategy will be defined in consultation with the SHPO. It appears however, that the entire permit area is considered the APE and the survey will follow the rule outlined in 4.10.15 NMAC. There has been, to my knowledge, no consultation on this matter with the SHPO but if the entire permit area will be surveyed at 15 meter intervals, the SHPO has no concerns. A better way to describe the cultural resources survey in this section would be to simply state that the APE is the entire permit area and the entire APE will be surveyed at a width of no more than 15 m intervals except in the instance where slopes are steeper than 30 degrees.

Under Section 9.5, List of Data Collected, the SAP states that in-use historical buildings, structures and objects will be recorded using the Historic Cultural Properties Inventory (HCPI) form (page 89). Any building or structure that is standing and has a roof must be recorded on an HCPI form, regardless of whether it is in-use. In addition, we are transitioning to an electronic HCPI form, similar to our Laboratory of Anthropology (LA) site record for archaeological sites. The contractor must obtain an HCPI number for each building, structure, object or acequia and complete the on-line Base Form. Along with the on-line form, the contractor must complete the Detail Form which is currently accessible only in paper. The "Detail Form" will be electronic soon and made part of the Base Form so that we have a seamless HCPI Form, but in the meantime, the contractor must complete both forms. We no longer want contractors to complete Form 2 only for properties recommended as eligible. If the contractor needs assistance or guidance on how to obtain a HCPI number or complete the form, I will be happy to help. The contractor can also contact our Archaeological Records Management Section for assistance.

On page 90, under section 9.7, Parameters to be Analyzed, the SAP states that human remains and associated funerary objects will be treated in accordance with the Native American Graves and Repatriation Act (NAGPRA). Please delete this reference to NAGPRA and cite Section 18-6-11.2 of the Cultural Properties Act, NMSA and 4.10.11 NMAC. NAGPRA only applies on federal land. The Cultural Properties Act and implementing regulation applies to state and private land in New Mexico.

If you have any questions regarding these comments, please do not hesitate to contact me at (505) 827-4064. I look forward to receiving a revised SAP that addresses the comments above.

Sincerely,



Michelle M. Ensey  
Archaeologist

Log: 97334

## Ennis, David, EMNRD

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**From:** cuddy, alan, OSE  
**Sent:** Friday, August 23, 2013 7:41 AM  
**To:** Ennis, David, EMNRD  
**Subject:** Ortiz Mine Sampling and Analysis Plan, SF028RN

DJ,

On July 23, 2013, the Hydrology Bureau of the Office of the State Engineer (OSE) received *Request for Review and Comment on the Sampling and Analysis Plan, Santa Fe Gold Corporation, Ortiz Mine, Santa Fe County, New Mexico, Permit Tracking Number SF028RN* submitted by Santa Fe Gold Corporation. The Sampling and Analysis (SAP) plan describes procedures for collecting baseline data in the vicinity of the mine permit area. The mine operations will consist of, among other things, an open pit mine and a mill for processing ore.

At this time, Santa Fe Gold Corporation does not expect that dewatering will be required at the open pit mine. Should mine dewatering be required, Santa Fe Gold will be required to obtain a mine dewatering permit from the OSE. The OSE will evaluate the permit application and determine if existing water rights would be impaired as a result of the mine dewatering.

Although water will be required for mine operations, no source for that water was identified in the SAP. A permit from the OSE would be required to obtain water rights for the mining operations.

Because no mine dewatering is anticipated and a source of water for mining operations has not been identified, the Hydrology Bureau has no comments on the SAP.

Please contact me if you have any further questions.

Alan S. Cuddy  
Hydrology Bureau  
Office of the State Engineer  
P.O. Box 25102  
Santa Fe, NM 87504-5102  
Phone: (505) 476-7400  
Fax: (505) 476-0220  
[alan.cuddy@state.nm.us](mailto:alan.cuddy@state.nm.us)

**Ennis, David, EMNRD**

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**From:** Roth, Daniela, EMNRD  
**Sent:** Thursday, September 12, 2013 11:11 AM  
**To:** Ennis, David, EMNRD  
**Subject:** RE: Request for comment and review on the Sampling and Analysis Plan, Santa Fe Gold Corporation, Ortiz Mine, Santa Fe County

Dear David Ennis:

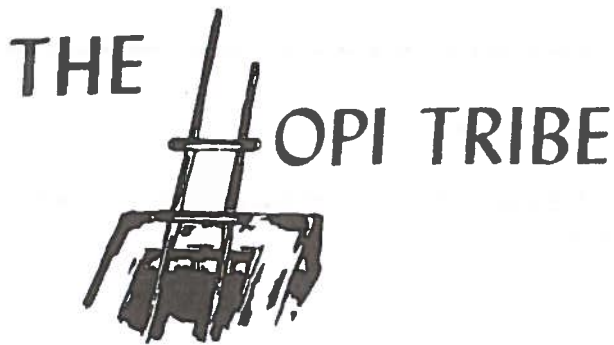
Thank you for giving me the opportunity to review and comment on the on the Sampling and Analysis Plan, Santa Fe Gold Corporation, Ortiz Mine, in Santa Fe County, NM (Permit Tracking No SF028RN).

I do not anticipate any impacts to state listed endangered plants from the proposed Sampling and Analysis Plan.

Please let me know if I can be of further help.

Daniela Roth

BOTANY PROGRAM COORDINATOR  
EMNRD-Forestry Division  
1220 S. St. Francis Dr.  
Santa Fe, NM 87505  
(505)476-3347 (Phone)  
(505)476-3330 (Fax)  
<http://www.emnrd.state.nm.us/SFD/>



LeRoy N. Shingoitewa  
CHAIRMAN

Herman G. Honanie  
VICE-CHAIRMAN

September 17, 2013

Fernando Martinez, Director, Mining and Minerals Division  
Attention: David Ennis  
New Mexico Energy, Minerals, and Natural Resources Department  
1220 South St. Francis Drive  
Santa Fe, New Mexico 87505

Dear Mr. Martinez,

This letter is in response to your correspondence dated August 30, 2013, regarding the Santa Fe Gold Corporation Ortiz Mine in Santa Fe County, Permit Tracking No. SF028RN. The Hopi Tribe claims cultural affiliation to prehistoric cultural groups in New Mexico. The Hopi Cultural Preservation Office supports identification and avoidance of prehistoric archaeological sites and Traditional Cultural Properties, and we consider the archaeological sites that are habitations of our ancestors to be "footprints" and Hopi Traditional Cultural Properties. Therefore, we appreciate your continuing solicitation of our input and your efforts to address our concerns.

The Hopi Cultural Preservation Office is interested in consulting on any proposal in New Mexico with the potential to adversely affect prehistoric sites. We understand the proponent has submitted a Sampling and analysis Plan for a proposed new gold mine operation. Therefore, to enable us to determine if this application may affect cultural resources significant to the Hopi Tribe, please provide us with a copy of the cultural resources survey report of the area of potential effect for review and comment.

Should you have any questions or need additional information, please contact Terry Morgart at [tmorgart@hopi.nsn.us](mailto:tmorgart@hopi.nsn.us). Thank you for your consideration.

Respectfully,



Leigh A. Kuwanwisiwma, Director  
Hopi Cultural Preservation Office

xc: New Mexico State Historic Preservation Office