

Preparado para:

**Ministerio de Ambiente y Recursos Naturales
(MARN)**

**Proyecto Minero Escobal
Informe Trimestral de Monitoreo Ambiental 20-2017**

Preparado por:



Departamento de Ambiente

San Rafael Las Flores, Santa Rosa, Guatemala

FEBRERO - ABRIL 2017

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1 Resumen ejecutivo

A continuación se presentan los resultados del informe de monitoreo ambiental del trimestre comprendido entre Febrero a Abril de 2017, el cual incluye los componentes de calidad del aire: material particulado, metales en material particulado, gases de combustión y niveles de presión sonora. Asimismo la calidad del agua, sedimentos, calidad de efluente, vibraciones, geoquímica de roca y salud y seguridad ocupacional. Lo anterior en cumplimiento a la resolución 549-2012/DIGARN/ODGR/hapc del Ministerio de Ambiente y Recursos Naturales.

1.1 Calidad del aire

Un total de nueve estaciones fueron monitoreadas para determinar la concentración de PM_{10} y niveles de presión sonora. Además se monitorearon siete estaciones para medir concentración de metales en PM_{10} , sólidos sedimentables totales y gases de combustión.

Los valores de PM_{10} registrados durante el monitoreo (13.31 a 222.22 $\mu\text{g}/\text{m}^3$), se encuentran dentro de los valores máximos permisibles, conforme a los valores establecidos por la EPA y el Banco Mundial (150 $\mu\text{g}/\text{m}^3$), a excepción de lo registrado en EA-4A. Sin embargo el valor obtenido es consistente con lo reportado en la misma estación desde el monitoreo de 2014. La concentración de metales registradas durante Febrero de 2017 se encontraron cercanos a los valores registrados durante Febrero de 2016 en todas las estaciones de monitoreo.

Los valores de partículas sedimentables totales se encuentran entre 4.30 a 33.43 $\text{g}/(\text{m}^2 \times 30 \text{ días})$, los cuales corresponden a las estaciones EA-6 y EA-4A respectivamente. Únicamente el valor para la estación EA-4A se encuentra por arriba del valor máximo registrado durante el establecimiento de la línea base.

Los valores de gases de combustión se encontraron por debajo del límite de detección del método en todas las estaciones para SO_2 (<13 $\mu\text{g}/\text{m}^3$). Los valores de NO_2 también se encontraron por debajo del límite de detección del método, a excepción de la estación EA-4A (10 $\mu\text{g}/\text{m}^3$). Todos los valores registrados de SO_2 y de NO_2 son menores a los valores guías establecidos por el Banco Mundial, la OMS, British Columbia y los valores norma establecidos por la USEPA.

Los niveles de presión sonora registrados en las estaciones ER-1, ER-2, ER-3, ER-4A, ER-5A y ER-7A presentaron valores de promedio diurno y nocturno dentro de los valores mínimos y máximos registrados en el establecimiento de la línea base, a excepción únicamente de la medición de Febrero en promedio nocturno en la estación ER-7A.

1.2 Calidad del agua

Se monitorearon 11 estaciones de agua superficial, 5 estaciones de agua subterránea (manantiales), 2 estaciones de pozos de producción y 10 estaciones de agua en pozos de monitoreo ubicadas en el AID del proyecto. Del control de calidad (blancos de campo) se obtuvieron resultados confiables tanto en la manipulación de las muestras como en los resultados de los análisis. El agua superficial (SW), subterránea (GW) y los pozos de monitoreo (MW) presentaron un pH alcalino y dentro del rango establecido por la USEPA para la salud humana. No se detectó mercurio y cianuro total en ninguna categoría de agua (SW, GW y MW). Se registraron sólidos suspendidos totales en SW, GW y MW y los resultados encontrados están por debajo de lo establecido por las guías del banco mundial (50 mg/L). Se detectó arsénico en todas las categorías de agua (SW, GW y MW) y todos los resultados se encontraron por debajo de los establecido por la USEPA (0.01 mg/L). El plomo se detectó en SW, GW y MW en concentraciones por debajo de lo sugerido por la USEPA y por debajo del rango de lo establecido durante la línea base.

1.3 Sedimentos

Se monitorearon 11 estaciones (las mismas de agua superficial). No se detectó cianuro en ninguna de las estaciones muestreadas. El mercurio se detectó en dos de once estaciones, en concentraciones por debajo de lo establecido (25 mg/kg) para la disposición de lodos en el suelo establecidos por el Acuerdo 236-2006. Las concentraciones de Cadmio, Cromo y Plomo registradas están por debajo de los valores guía. Todas las estaciones muestreadas registraron concentraciones de Arsénico menor al valor sugerido (50 mg/kg) por el acuerdo 236-2006.

1.4 Calidad del efluente

Del control de calidad (blancos de campo) se obtuvieron resultados confiables tanto en la manipulación de las muestras como en los resultados de los análisis. Los resultados obtenidos durante las descargas de la planta de tratamiento durante el trimestre cumplen con el Acuerdo Gubernativo 236-2006 para entes generadores nuevos.

1.5 Vibraciones

En total se registraron 929 voladuras en tres estaciones de monitoreo. Todas las voladuras registradas se encuentran por debajo de los límites de detección del equipo (2.5 mm/s); el cual incluso es menor al límite a partir del cual, las vibraciones inducidas por voladuras (50.8 mm/s), pueden ocasionar daños según la norma establecida por United States Bureau of Mines.

1.6 Geoquímica de roca

Se analizó el pH en pasta de 34 muestras de material extraído de los túneles. Las lecturas de pH en pasta obtenidas de las muestras de material extraídas de mina subterránea fueron alcalinas, lo que indica que no hay indicios de un potencial de generación ácida dentro los túneles.

1.7 Salud y seguridad ocupacional

Los resultados obtenidos en los niveles de presión sonora para ambientes laborales, indican que se está por debajo de los límites de nivel de sonido ponderado "A" acorde a OSHA para 24 horas (82-83 dBA) y los resultados de partículas respirables en las estaciones de monitoreo, cumplen con el rango de aceptación que el fabricante establece basado en el equipo marca 3M código 7502 y filtro 3M código 60926 Homologación NIOSH.

2 Introducción

A continuación se presenta al Ministerio de Ambiente y Recursos Naturales (**MARN**), el informe trimestral de monitoreo ambiental del Proyecto Minero Escobal (**el Proyecto**) basado en lo siguiente:

- A. Resultados obtenidos durante los monitoreos ambientales referente a la calidad del aire (material particulado, gases de combustión y niveles de presión sonora), calidad de agua, vibraciones, salud y seguridad ocupacional y geoquímica de roca llevados a cabo durante los meses de Febrero a Abril de 2017.

Esto como parte de los compromisos ambientales de Minera San Rafael, S.A. (**la Empresa**) en base a la resolución 549-2012/DIGARN/ODGR/hapc, inciso B, el cual se lee: “La entidad MINERA SAN RAFAEL, SOCIEDAD ANÓNIMA, deberá continuar realizando los monitoreos en base a lo descrito en cada una de las resoluciones citadas en el primer considerando (4590-2008/ELER/CG), (262-2011/ECM/caml), (3061-2011/DIGARN/ECM/beor), llevando su respectivo registro y presentar los resultados de los monitoreos de cada uno de los proyectos de forma trimestral”.

- ❖ Proyecto de Exploración Minera Oasis ante el MARN con base en la resolución 4590-2008/ELER/CG, compromiso número VII; el cual se lee: “llevar un monitoreo mensual de la calidad de aire y niveles de ruido en el Área de Influencia Directa (**AID**) y presentar resultados mensualmente al MARN.”
- ❖ Proyecto de Túneles de Exploración Minera Oasis ante el MARN con base en la resolución 262-2011/ECM/caml, compromiso número XII; el cual se lee: “Continuar con el programa de monitoreo de la calidad del agua y aire, implementado desde 2008.”
- ❖ Proyecto Minero Escobal ante el MARN con base en la resolución 3061-2011/DIGARN/ECM/beor, compromisos número III y número VI; los cuales se leen: “La Empresa deberá de implementar el plan de monitoreo ambiental descrito en capítulo 13 y cumplirá con los límites establecidos por el MARN, además de lineamientos internacionales como Banco Mundial, Corporación Financiera internacional (**CFI**), Agencia de Protección Ambiental de los Estados Unidos (**USEPA**), Organización Mundial de la Salud (**OMS**) y Administración de la Salud y Seguridad Ocupacional (**OSHA**), según el componente que sea monitoreado...” y “Llevar un registro documentado del caudal bombeado de los pozos de abastecimiento y del agua bombeada desde los túneles hacia las piletas, así como de las descargas y los parámetros de descarga...”.

- B.** Resultados de calidad de agua y de calidad de aire, como parte de los compromisos ambientales de la empresa ante el MARN con base en la resolución 3061-2011/DIGARN/ECM/beor, compromisos número XXXI; el cual se lee: “Presentar los informes de monitoreo de la calidad del agua de los cuerpos naturales de agua potencialmente afectados por las actividades del proyecto y de la calidad del aire a este Ministerio en forma anual.”
- C.** Copia de registro documentado del caudal bombeado desde los túneles hacia la planta de tratamiento y de su descarga hacia la Quebrada Escobal, como parte de los compromisos ambientales de la empresa ante el MARN con base en la resolución 3061-2011/DIGARN/ECM/beor, compromisos número VI; el cual se lee: “llevar un registro documentado del caudal bombeado de los pozos de abastecimiento y del agua bombeada desde los túneles hacia las piletas, así como de las descargas y los parámetros de descarga, remitiendo a este Ministerio una copia mensual de estos registros.”
- D.** Resultados del monitoreo ambiental como parte de los compromisos de la empresa ante el MARN con base en la resolución 05801-2016/DIGARN/DCA/OBT/rdor, compromiso número XIII; el cual se lee: “Cumplir fielmente y a cabalidad con los compromisos adquiridos en la Resolución Aprobatoria No. 3061-2011/DIGARN/ECM/beor, de fecha 19 de octubre de 2011, referida al proyecto original denominado Proyecto Minero Escobal...”

Todos los procedimientos y métodos analíticos presentados en el siguiente reporte, pueden consultarse en las versiones previas a estos informes trimestrales. El contenido del presente informe corresponde a la evaluación de los siguientes componentes ambientales.

- Calidad de Aire: Se monitorearon nueve estaciones ubicadas dentro del área de Influencia (AI) del proyecto para medir la concentración de material particulado igual o menor a 10 micrómetros (PM_{10}), en microgramos por metro cúbico ($\mu g/m^3$). También se monitorearon siete estaciones para medir la concentración de metales en PM_{10} , sólidos sedimentables totales (PST), y gases de combustión: dióxido de azufre (SO_2) y óxidos nitrosos (NO_x).
- Calidad de Presión Sonora: Se monitorearon nueve estaciones ubicadas dentro del ID del proyecto, para determinar los niveles de presión sonora, en decibeles escala A (dBa) y respuesta lenta.
- Calidad de Agua: Se tomaron muestras en once estaciones de agua superficial, cinco estaciones de agua subterránea (manantiales), dos estaciones de pozos de producción y once estaciones de agua en pozos de monitoreo ubicadas en el AID del proyecto.

- Sedimentos: Se tomaron muestras de sedimentos en las mismas estaciones de agua superficial ubicadas en el AI del proyecto.
- Calidad de Efluente: Se tomaron muestras mensuales en el efluente de la planta de tratamiento de aguas proveniente de túneles y del agua contenida en la pileta de cumplimiento ambiental.
- Vibraciones: De los tres sismógrafos instalados para medir la velocidad pico de partícula producto de las voladuras de avance en los túneles, se obtuvo 929 registros durante los meses de Febrero a Abril 2017.
- Geoquímica de roca estéril: Se analizó el pH en pasta de 34 muestras de material extraído de los túneles.
- Mediciones de Seguridad y Salud Ocupacional: Se analizaron seis estaciones de monitoreo de presión sonora, tres estaciones de material particulado y se presenta un extracto de las mediciones rutinarias de gases para determinar ácido sulfhídrico (H₂S).
- Copia de registro documentado del caudal bombeado de los pozos del agua bombeada desde los túneles hacia las piletas. En el anexo 12.1 se presenta copia de las lecturas diarias de flujómetros y los cálculos realizados para determinar los caudales bombeados del portal Este y el portal Oeste, durante los meses de Febrero a Abril 2017.
- Copia de registro documentado del análisis In Situ y kit de Cianuro de efluentes. En el anexo 12.2 se presenta copia de las lecturas diarias de parámetros *In Situ* (pH, temperatura, conductividad y turbidez), así como los resultados obtenidos con el Kit de Cianuro (método colorimétrico) y resultados de muestras enviadas al laboratorio ACZ para la verificación del método colorimétrico, durante los meses de Febrero a Abril 2017.

3 Condiciones Ambientales

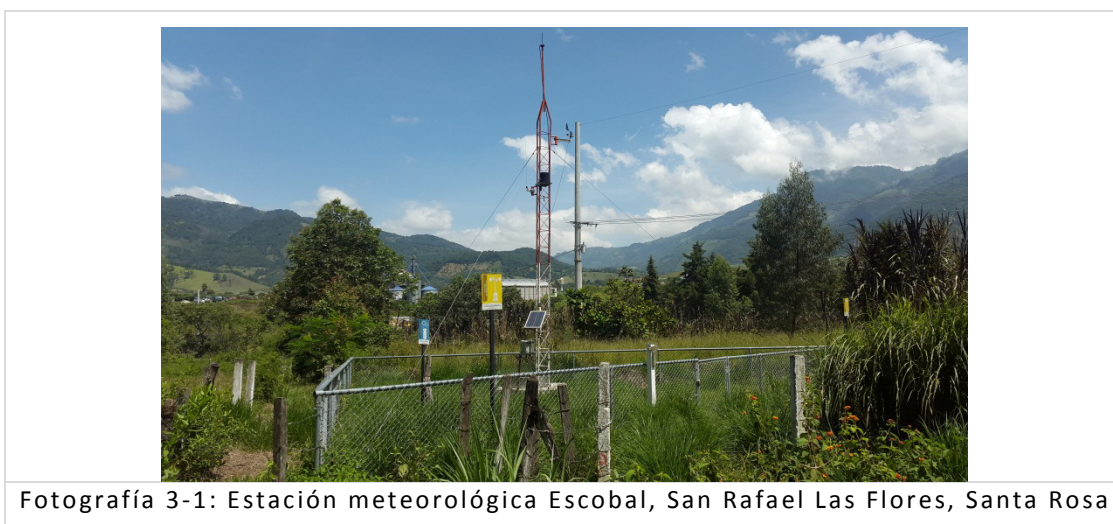
En el Cuadro 3-1 se describen algunos parámetros meteorológicos en el área del Proyecto y de la Figura 3-1 a la Figura 3-3 se representa la dirección del viento durante Febrero a Abril de 2017.

Cuadro 3-1: Condiciones meteorológicas, Proyecto Minero Escobal

Temperatura (°C)			Velocidad del viento (km/h)			Ráfagas (km/h)	Humedad relativa (%)			Precipitación (mm)
Max	Min	Media	Max	Min	Media	Max	Max	Min	Media	Total
Febrero 2017										
30.4	10.2	19.7	36.3	0.2	5.9	45.6	99.7	19.6	67.8	0.76
Marzo 2017										
30.6	12.2	20.1	43.6	0.2	10.1	50.3	99.1	22.3	62.5	4.8
Abril 2017										
31.7	10.6	21.5	25.8	0.2	4.6	42.6	100	21.7	67.4	51.6

°C = grados centígrados. Km/h = kilómetros por hora. % = porcentaje. mm = milímetros. Max = valor máximo. Min = valor mínimo. Fuente: MSR, 2017.

Durante el trimestre se registró una temperatura promedio de entre los 10.2° a los 21.5°C y en el mes de Marzo se registró la mayor precipitación con 51.6 mm. El mes que en promedio presentó la mayor humedad relativa fue Enero con 67.8% y el mes que en promedio presentó la mayor velocidad de vientos fue Febrero con 43.6 km/h. En la Fotografía 2-1 se muestra la ubicación de la estación meteorológica, donde se registran las condiciones ambientales que se reportan.

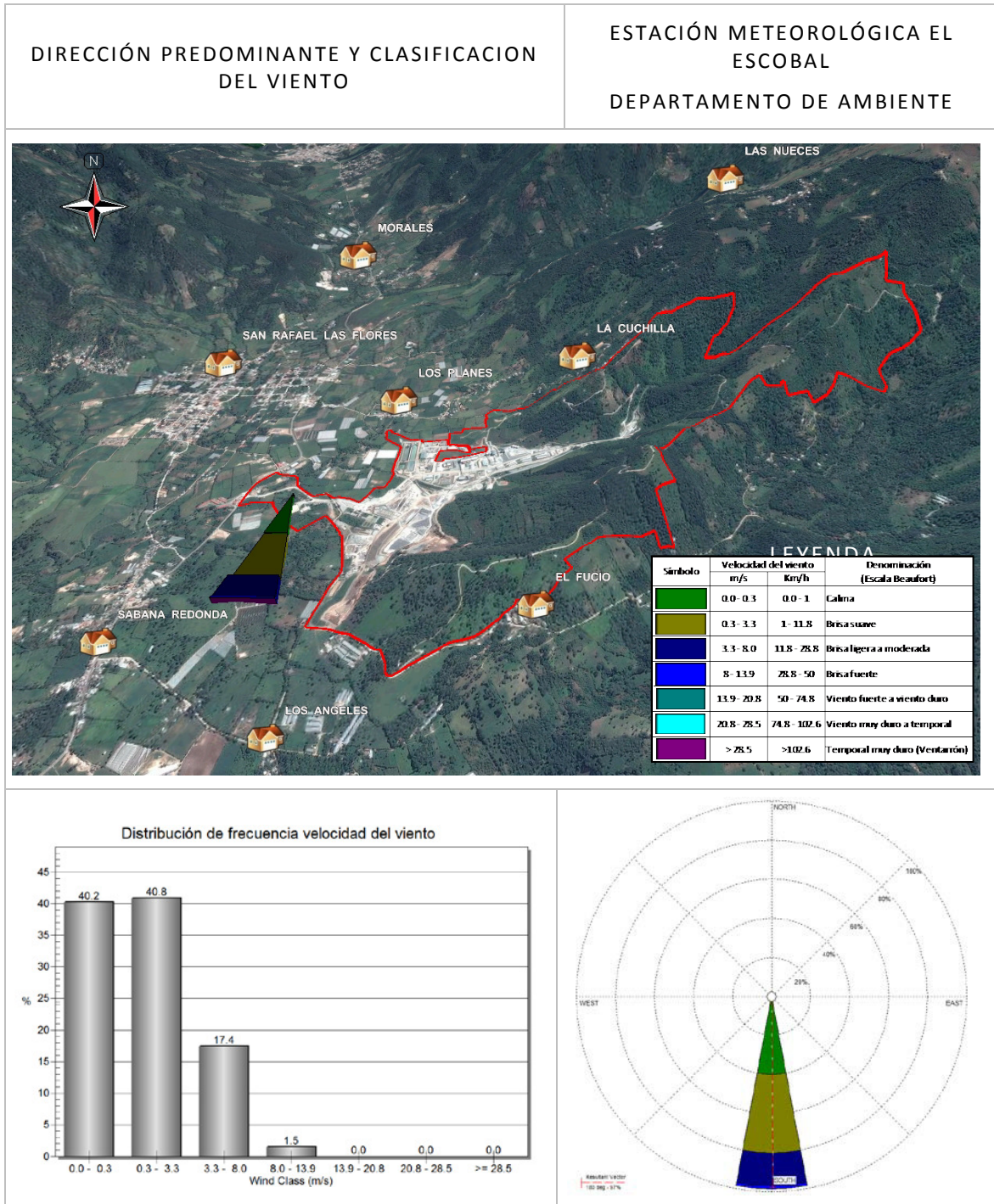


Fotografía 3-1: Estación meteorológica Escobal, San Rafael Las Flores, Santa Rosa

Fuente: MSR, 2017.

Como se puede observar en la Figura 3-1, Figura 3-2 y Figura 3-3 la predominancia de los vientos de Febrero a Abril de 2017 fue de norte a sur oeste.

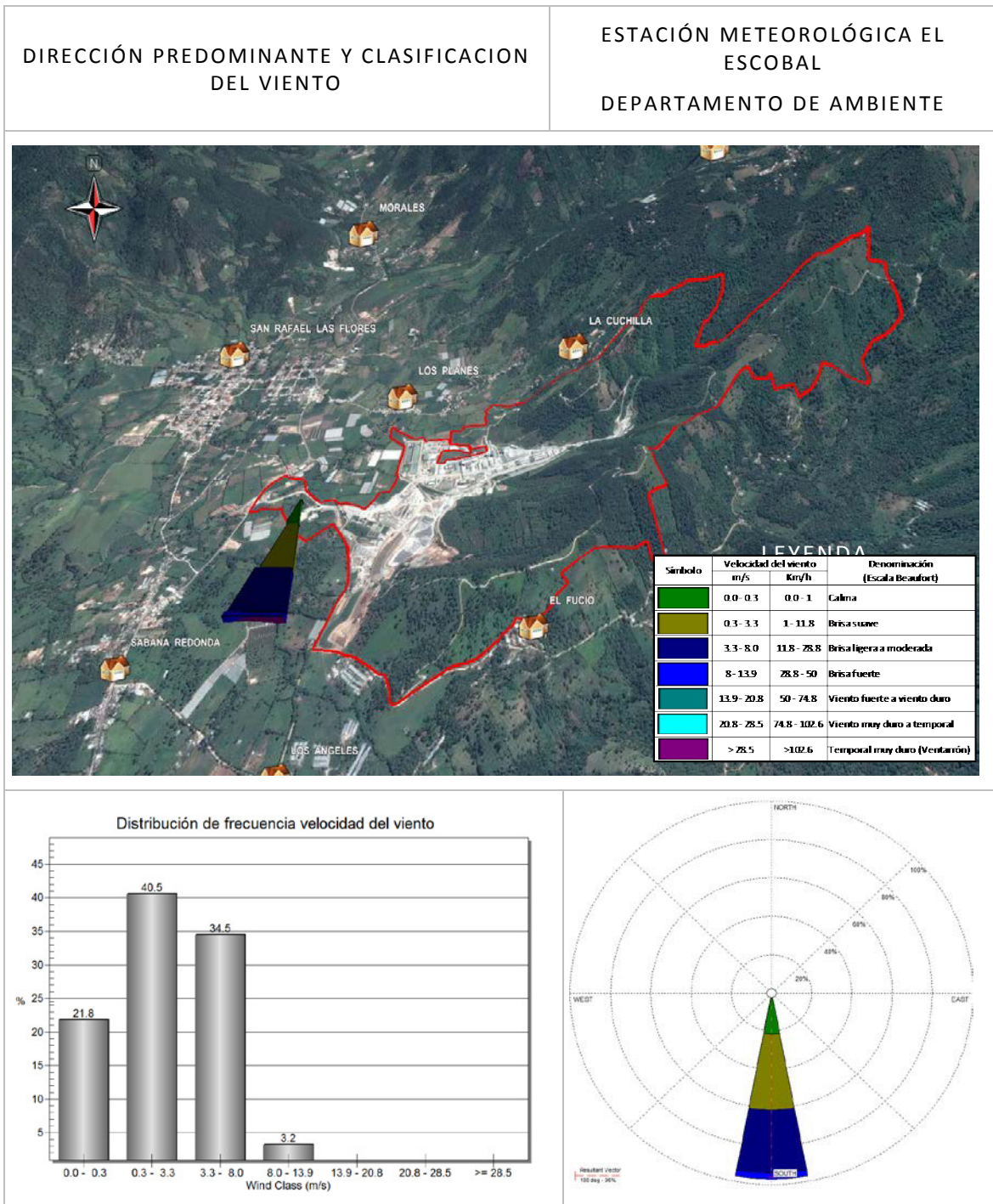
Figura 3-1: Dirección del viento Febrero 2017, Proyecto Minero Escobal



Fuente: MSR, 2017.

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Figura 3-2: Dirección del viento Marzo 2017, Proyecto Minero Escobal

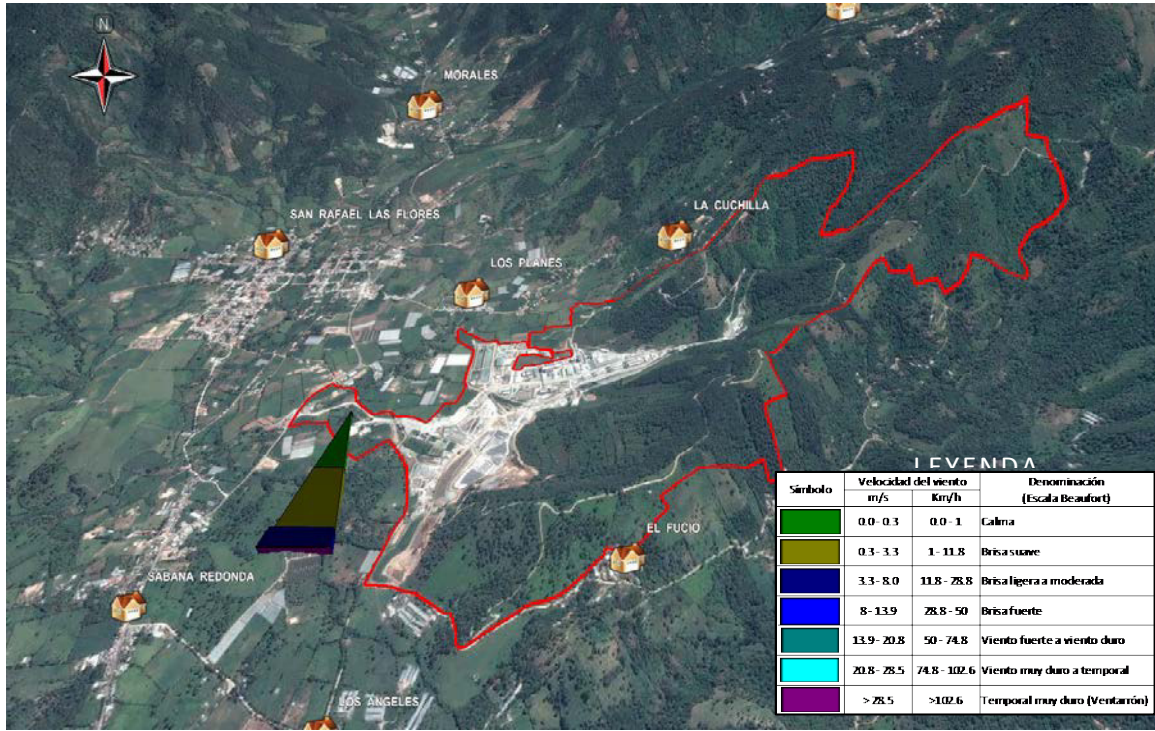


Fuente: MSR, 2017.

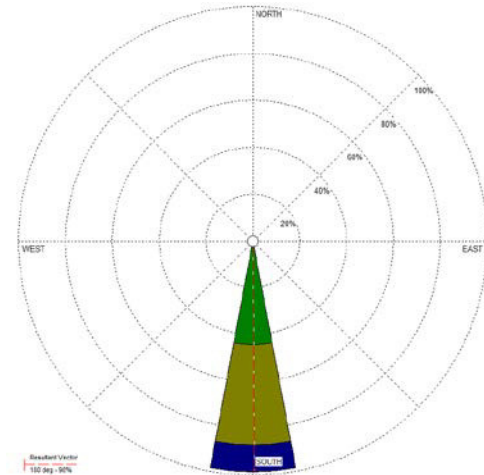
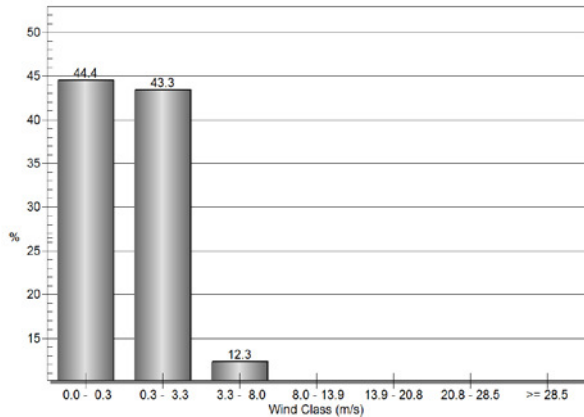
Figura 3-3: Dirección del viento Abril 2017, Proyecto Minero Escobal

DIRECCIÓN PREDOMINANTE Y CLASIFICACION DEL VIENTO

ESTACIÓN METEOROLÓGICA EL ESCOBAL
DEPARTAMENTO DE AMBIENTE



Distribución de frecuencia velocidad del viento



Fuente: MSR, 2017.

4 Calidad de Aire

4.1 Material Particulado

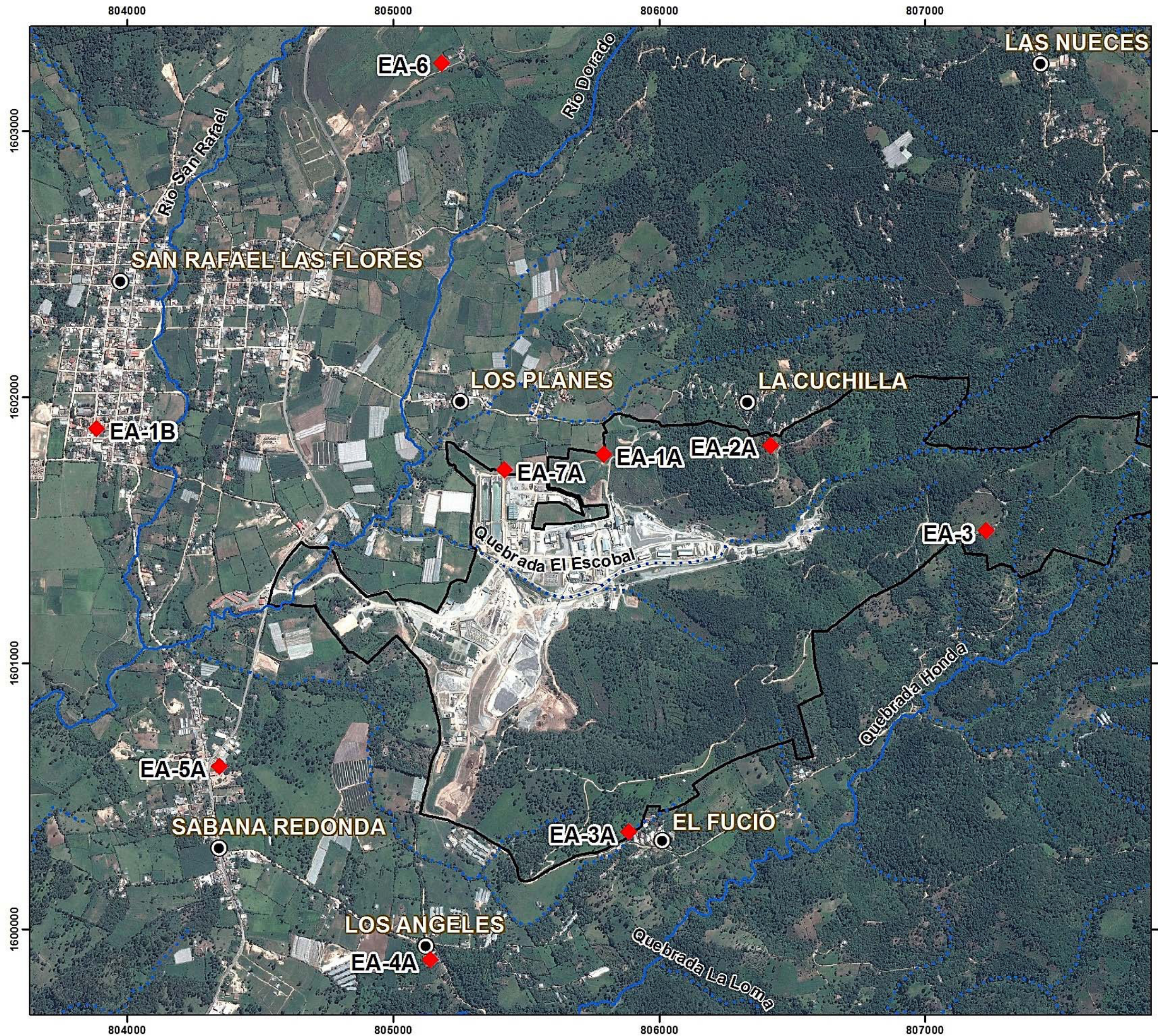
4.1.1 Sitios de Monitoreo

En el Cuadro 4-1 se enlistan las estaciones de monitoreo de material particulado (PM_{10}) menor o igual a 10 micrómetros, localizadas dentro de los terrenos de la mina y en la jurisdicción de los centros poblados ubicados en el área de influencia (AI) del Proyecto: Los Planes, La Cuchilla, El Fucío, Sabana Redonda, Portón de los Ángeles y San Rafael Las Flores. La ubicación de las estaciones de monitoreo de PM_{10} se presenta en la Figura 4-1.

Cuadro 4-1: Sitios de monitoreo de material particulado, Proyecto Minero Escobal

Estación	Coordenadas		Altitud (msnm)	Sitio	Período línea base
Periodicidad de monitoreo mensual					
EA-1A	805,797	1,601,582	1,417	Depósito de suelos, a inmediaciones de Aldea Los Planes	Febrero 2009 a Mayo 2011
EA-2A	806,427	1,601,605	1,564	Aldea La Cuchilla	
EA-3	807,165	1,601,255	1,679	Área Este del proyecto, a inmediaciones de Aldea El Fucío	
EA-7A*	805,425	1,601,523	1,320	Al noreste de pileta de agua de proceso y pileta de cumplimiento ambiental, Jurisdicción de Aldea Los Planes	No cuenta con línea base
Periodicidad de monitoreo trimestral					
EA-1B	803,894	1,601,727	1,328	Poblado San Rafael Las Flores, cercano a Escuela	No cuenta con línea base
EA-3A	806,000	1,600,108	1,416	Aldea El Fucío	
EA-4A	805,142	1,599,903	1,360	Caserío El Portón de los Ángeles	Enero 2011 a Abril 2011
EA-5A*	804,352	1,600,408	1,339	Aldea Sabana Redonda, al sur-oeste del proyecto	No cuenta con línea base
EA-6	805,168	1,603,247	1,434	Al norte del Proyecto, ruta a Mataquescuintla	Julio 2010 a Abril 2011

*Se incluye como período de línea base de Julio 2010 a Abril 2011 la información registrada en las estaciones EA-5 y EA-7. Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.



MAPA DE LOCALIZACIÓN ESTACIONES DE MONITOREO MATERIAL PARTICULADO (PM10)

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIONES DE MONITOREO (PM10)

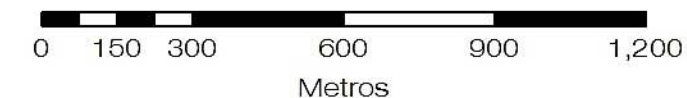
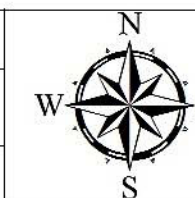
Símbolo	Estación	X	Y
	EA-1A	805791	1601785
	EA-1B	803885	1601881
	EA-2A	806419	1601819
	EA-3	807232	1601498
	EA-3A	805886	1600364
	EA-4A	805140	1599883
	EA-5A	804346	1600611
	EA-6	805181	1603257
	EA-7A	805419	1601726

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000. Hojas catográficas año 2010 Mataquesuinta (2159-1) y Laguna de Ayarza (2159-II) del IGN. Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014. datos de campo del departamento de Ambiente.

Fecha de Elaboración: **Abril 2017**

Distancia Horizontal y Vertical de Grilla: 1,000 metros

Escala 1:15,000



4.1.2 Resultados

En el Cuadro 4-2 se presentan los resultados de PM₁₀ durante los meses de Febrero a Abril de 2017 y los resultados de laboratorio del análisis gravimétrico de filtros y los cálculos realizados para determinar el PM₁₀ se presentan en el anexo electrónico adjunto a este documento.

Los valores de PM₁₀ registrados durante el monitoreo realizado en todas las localidades, se encuentran dentro de los valores máximos permisibles, conforme a los valores establecidos por la EPA y el Banco Mundial (150 µg/m³), excepto por el valor registrado durante Febrero en la estación EA-4A. Probablemente el aumento del valor de PM₁₀ estuvo afectado debido a la baja precipitación registrada durante Febrero.

Cuadro 4-2: Resultados de PM₁₀, Proyecto Minero Escobal

Estación	Norma*	Guías*		Línea Base			Resultados		
	USEPA ¹	Banco Mundial ²	OMS ³	Promedio	Máximo	Mínimo	Feb-17	Mar-17	Abr-17
				(µg/m ³)					
EA-1A	150	150**	50	24.36	89.95	3.67	74.46	16.64	66.97
EA-1B				NR	NR	NR	64.06	NA	NA
EA-2A				21.40	76.20	2.74	34.11	15.39	45.34
EA-3				25.68	78.85	1.25	35.79	13.31	42.84
EA-3A				NR	NR	NR	70.33	NA	NA
EA-4A				103.55	120.40	86.70	222.22	NA	NA
EA-5A				50.73 [¥]	104.80 [¥]	11.80 [¥]	76.12	NA	NA
EA-6				23.05	57.90	1.70	52.00	NA	NA
EA-7A				46.48 [¥]	115.90 [¥]	13.40 [¥]	57.43	16.22	64.06

µg/m³ = microgramos por metro cúbico. NR = cálculo No Realizado por falta de datos de línea base. NA = No Analizado. ¹USEPA, 2006. Normas nacionales de calidad de aire ambiental (NAAQS), 40 CFR parte 50 (US). ²Guías Generales sobre Medio Ambiente, Salud y Seguridad, Corporación Financiera Internacional, Grupo del Banco Mundial 2007. ³Guía de Calidad del Aire, OMS 2005.* Las normas de calidad de aire ambiental son los niveles de calidad del aire fijados y publicados a partir de procesos legislativos nacionales y procesos regulatorios, mientras que las guías sobre calidad del aire ambiental hacen referencia a niveles de calidad del aire obtenidos principalmente a través de datos clínicos, toxicológicos y epidemiológicos. ** este valor corresponde al límite provisional 1 dado por esta guía. ¥: Corresponde a los valores de línea base de la estación EA-5 y de la estación EA-7 respectivamente. Fuente: MSR, 2017.

Los resultados obtenidos durante los meses de Febrero a Abril de 2017 se encontraron entre los 13.31 a 222.22 µg/m³. En Marzo se registró el menor valor de PM₁₀ en la estación EA-3 (13.31 µg/m³), y el mayor valor se registró en la estación EA-4A 222.22 µg/m³ respectivamente. Todos los valores de PM₁₀ registrados durante el monitoreo trimestral, se encuentran por debajo de los límites máximos establecidos durante el levantamiento de línea base, a excepción del valor aislado de PM₁₀ de la estación EA-4A registrado durante Febrero.

4.2 Metales en Material Particulado

4.2.1 Sitios de Monitoreo

En el Cuadro 4-3 se enlistan las estaciones de monitoreo de metales en material particulado menor o igual a 10 micrómetros (PM_{10}) localizadas dentro de los terrenos de la mina, y en la jurisdicción de los centros poblados ubicados en el área de influencia (AI) del Proyecto: Los Planes, La Cuchilla, El Fucío, Sabana Redonda, Portón de los Ángeles y San Rafael Las Flores. La ubicación de las estaciones de monitoreo de metales se presenta en la Figura 4-1.

Cuadro 4-3: Sitios de monitoreo de metales en PM_{10} , Proyecto Minero Escobal

Estación	Coordenadas		Altitud (msnm)	Sitio	Período línea base
EA-1B	803,891	1,601,678	1,328	Poblado San Rafael Las Flores, cercano a Escuela	No cuenta con línea base
EA-2A	806,427	1,601,605	1,564	aledaño a Aldea La Cuchilla	Julio 2010 a Abril 2011
EA-3A	805,892	1,600,161	1,416	aledaño a Aldea El Fucío	No cuenta con línea base
EA-4A	805,146	1,599,680	1,360	Caserío El Portón de los Ángeles	Enero 2011 a Abril 2011
EA-5A*	804,352	1,600,408	1,339	Aldea Sabana Redonda, al sur-oeste del proyecto	No se cuenta con línea base.
EA-6	805,187	1,603,054	1,434	Al norte del Proyecto, ruta a Mataquescuintla	Julio 2010 a Abril 2011
EA-7A*	805,425	1,601,523	1,320	Al noreste de pileta de agua de proceso y pileta de cumplimiento ambiental, Jurisdicción de Aldea Los Planes	No se cuenta con línea base

*Se incluye como período de línea base de Julio 2010 a Abril 2011 la información registrada en las estaciones EA-5 y EA-7. Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar. Nota: 1er y 3er trimestre del año se analiza metales totales, 2do y 4to trimestre únicamente mercurio total. El análisis del laboratorio es destructivo, por tanto es imposible analizar metales y mercurio en un mismo filtro. Fuente: MSR, 2017.

4.2.2 Resultados

En el Cuadro 4-4 se presentan los resultados de concentración de metales en PM_{10} durante el mes de Febrero de 2017, los resultados de laboratorio del análisis de metales en filtros y los cálculos realizados para determinar el PM_{10} se presentan en el anexo electrónico adjunto a este documento. Como en los trimestres anteriores, la concentración de metales registradas durante Febrero de 2017 se encontraron cercanos a los valores registrados durante Febrero de 2016 en todas las estaciones de monitoreo.

Cuadro 4-4: Resultados de concentración de metales en PM₁₀, Proyecto Minero Escobal (1/2)

Parámetros	Unidades	EA-1B	EA-2A			EA-3A	EA-4A				
		feb-17	Línea Base			feb-17	feb-17	Línea Base			feb-17
		3206-0606	Promedio	Máximo	Mínimo	3200-1719	3209-0909	Promedio	Máximo	Mínimo	3204-0404
Aluminio	µg/m ³	0.9782	0.23	0.28	<0.34	0.650	0.861	1.27	1.27	1.27	1.935
Antimonio		N.D.	<0.10	<0.17	<0.04	N.D.	N.D.	<0.17	<0.17	<0.17	N.D.
Arsénico		N.D.	<0.07	<0.10	<0.03	N.D.	N.D.	<0.10	<0.10	<0.10	N.D.
Azufre		3.210	1.49	2.17	0.8	2.227	1.387	1.23	1.23	1.23	1.673
Bario		0.0236	0.01	0.01	<0.02	0.015	0.020	<0.02	<0.02	<0.02	0.050
Berilio		N.D.	NR	NR	NR	N.D.	N.D.	NR	NR	NR	N.D.
Bismuto		N.D.	<0.07	<0.10	<0.03	N.D.	N.D.	<0.1	<0.1	<0.1	N.D.
Boro		0.0354	0.27	0.5	0.03	0.036	0.032	<0.1	<0.1	<0.1	0.023
Cadmio		N.D.	<0.02	<0.03	<0.01	N.D.	N.D.	<0.03	<0.03	<0.03	N.D.
Calcio		0.9258	0.65	1.1	0.2	0.750	0.539	0.78	0.78	0.78	1.448
Cromo		N.D.	NR	NR	NR	N.D.	N.D.	NR	NR	NR	N.D.
Cobalto		N.D.				N.D.	N.D.				
Cobre		0.024				0.027	0.020				0.012
Estaño		0.1179				N.D.	N.D.				N.D.
Estroncio		0.007				0.005	0.004				0.010
Fósforo		0.4629				0.373	0.342				0.401
Hierro		0.9301				0.26	0.32				0.2
Magnesio		0.2969	0.11	0.14	<0.17	0.250	0.258	<0.33	<0.33	<0.33	0.471
Manganeso		0.038	0.01	0.01	<0.02	0.048	0.038	0.09	0.09	0.09	0.080
Molibdeno		N.D.	NR	NR	NR	N.D.	N.D.	NR	NR	NR	N.D.
Níquel		N.D.	<0.03	<0.05	<0.01	N.D.	N.D.	<0.05	<0.05	<0.05	N.D.
Plata		N.D.	NR	NR	NR	N.D.	N.D.	NR	NR	NR	N.D.
Plomo		N.D.	<0.03	<0.05	<0.01	0.037	N.D.	<0.05	<0.05	<0.05	N.D.
Potasio		0.917	0.55	0.6	0.5	0.500	0.452	0.73	0.73	0.73	0.974
Selenio		N.D.	NR	NR	NR	N.D.	N.D.	NR	NR	NR	N.D.
Silicio		0.5415	0.42	0.53	0.3	0.523	0.661	0.55	0.55	0.55	0.756
Sodio		1.559	0.53	0.6	0.46	1.168	0.852	1.4	1.4	1.4	0.858
Talio		N.D.	NR	NR	NR	N.D.	N.D.	NR	NR	NR	N.D.
Titanio		0.0576	0.02	0.02	0.02	0.042	0.059	0.09	0.09	0.09	0.108
Uranio		N.D.	NR	NR	NR	N.D.	N.D.	NR	NR	NR	N.D.
Vanadio		N.D.				N.D.	N.D.				
Zinc		0.0297				0.055	0.019				0.037
Zirconio	N.D.	<0.012	<0.02	<0.004	N.D.	N.D.	<0.01	<0.01	<0.01	N.D.	

NR = cálculo No Realizado por falta de datos de línea base. µg/m³ = microgramos por metro cúbico. Fuente: MSR, 2017.

Cuadro 4-4: Resultados de concentración de metales en PM10, Proyecto Minero Escobal (2/2)

Parámetros	Unidades	EA-5A				EA-6				EA-7A			
		Línea Base			feb-17	Línea Base			feb-17	Línea Base			feb-17
		Promedio	Máximo	Mínimo	3203-0303	Promedio	Máximo	Mínimo	3205-0505	Promedio	Máximo	Mínimo	3207-0707
Aluminio	µg/m ³	<0.33	<0.33	<0.33	0.964	0.31	0.45	<0.33	0.826	0.45	0.73	<0.33	0.949
Antimonio		<0.17	<0.17	<0.17	N.D.	<0.17	<0.17	<0.17	N.D.	<0.17	<0.17	<0.17	N.D.
Arsénico		<0.1	<0.1	<0.1	N.D.	<0.10	<0.10	<0.10	N.D.	<0.10	<0.10	<0.10	N.D.
Azufre		<0.42	<0.42	<0.42	2.045	3.02	4.73	1.3	3.170	2.28	4.35	<0.42	2.890
Bario		<0.02	<0.02	<0.02	0.026	0.01	0.01	<0.02	0.018	0.01	0.01	<0.02	0.020
Berilio		NR	NR	NR	N.D.	NR	NR	NR	N.D.	NR	NR	NR	N.D.
Bismuto		<0.1	<0.1	<0.1	N.D.	<0.10	<0.10	<0.10	N.D.	<0.10	<0.10	<0.10	N.D.
Boro		<0.1	<0.1	<0.1	0.033	<0.10	<0.10	<0.10	0.035	<0.10	<0.10	<0.10	0.035
Cadmio		<0.03	<0.03	<0.03	N.D.	<0.03	<0.03	<0.03	N.D.	<0.03	<0.03	<0.03	N.D.
Calcio		1.03	1.03	1.03	0.813	0.79	1.5	<0.17	0.826	0.28	0.48	<0.17	1.374
Cromo					N.D.				N.D.				N.D.
Cobalto					N.D.				N.D.				N.D.
Cobre					0.018				0.028				0.024
Estaño		NR	NR	NR	N.D.	NR	NR	NR	N.D.	NR	NR	NR	N.D.
Estroncio					0.005				0.005				0.007
Fósforo					0.280				0.447				0.386
Hierro		0.18	0.18	0.18	1.012	0.38	0.45	0.3	0.830	0.31	0.58	<0.08	1.012
Magnesio		<0.33	<0.33	<0.33	0.298	3.05	6.02	<0.17	0.328	0.23	0.38	<0.17	0.386
Manganeso		<0.02	<0.02	<0.02	0.041	0.02	0.02	<0.02	0.039	0.02	0.03	<0.02	0.120
Molibdeno		NR	NR	NR	N.D.	NR	NR	NR	N.D.	NR	NR	NR	N.D.
Níquel		<0.05	<0.05	<0.05	N.D.	0.25	0.48	<0.05	N.D.	0.04	0.05	<0.05	N.D.
Plata		NR	NR	NR	N.D.	NR	NR	NR	N.D.	NR	NR	NR	N.D.
Plomo		<0.05	<0.05	<0.05	0.012	<0.05	<0.05	<0.05	0.014	<0.05	<0.05	<0.05	0.105
Potasio		<0.5	<0.5	<0.5	0.512	0.83	1.05	0.6	0.894	0.8	1.43	<0.33	0.551
Selenio		NR	NR	NR	N.D.	NR	NR	NR	N.D.	NR	NR	NR	N.D.
Silicio		<0.17	<0.17	<0.17	0.684	0.49	0.58	0.4	0.553	0.43	0.78	<0.17	0.587
Sodio		<0.08	<0.08	<0.08	1.027	0.07	0.1	<0.08	1.583	1.27	2.5	<0.08	1.122
Talio		NR	NR	NR	N.D.	NR	NR	NR	N.D.	NR	NR	NR	N.D.
Titanio		<0.02	<0.02	<0.02	0.053	0.02	0.03	<0.02	0.051	0.02	0.03	<0.02	0.049
Uranio					N.D.				N.D.				N.D.
Vanadio		NR	NR	NR	N.D.	NR	NR	NR	N.D.	NR	NR	NR	N.D.
Zinc					0.030				0.037				0.133
Zirconio	<0.01	<0.01	<0.01	N.D.	0.01	0.01	<0.02	N.D.	<0.02	<0.02	<0.02	N.D.	

NR = cálculo No Realizado por falta de datos de línea base. µg/m³ = microgramos por metro cúbico. Fuente: MSR, 2017.

4.3 Partículas Sedimentables Totales (PST)

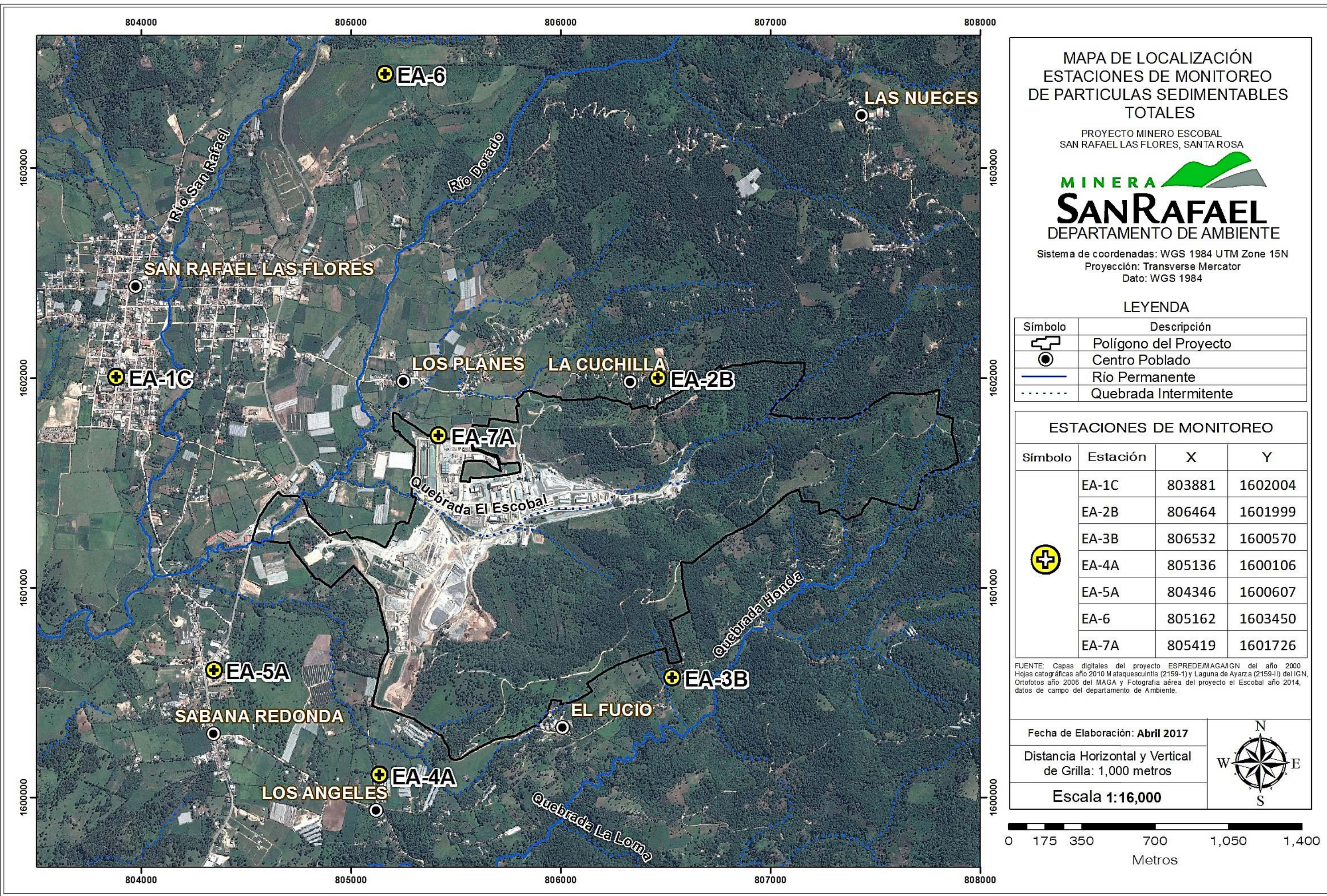
4.3.1 Sitios de Monitoreo

En el Cuadro 4-5 se enlistan las estaciones de monitoreo de PST ubicada en el área de influencia (AI) del Proyecto y su ubicación se presenta en la Figura 4-2.

Cuadro 4-5: Sitios de Monitoreo de PST, Proyecto Minero Escobal

Estación	Coordenadas		Altitud (msnm)	Sitio	Período Línea Base
EA-1C	803,887	1,601,801	1,337	Poblado San Rafael Las Flores, cercano a Escuela	No se cuenta con línea base
EA-2B	806,470	1,601,796	1,555	Aldea La Cuchilla	
EA-3B	806,538	1,600,367	1,427	Aldea El Fucío	
EA-4A	805,142	1,599,903	1,360	Caserío El Portón de los Ángeles	Diciembre 2010 a Mayo 2011
EA-5A*	804,352	1,600,408	1,339	Aldea Sabana Redonda, al sur-oeste del proyecto	No se cuenta con línea base
EA-6	805,168	1,603,247	1,434	Al norte del Proyecto, ruta a Mataquescuintla	
EA-7A	805,425	1,601,523	1,320	Noreste de pileta de agua de proceso y pileta de cumplimiento ambiental, Jurisdicción Aldea Los Planes	

*Se incluye como período de línea base de Agosto 2010 a Mayo 2011 la información registrada en la estación EA-5. Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.



MAPA DE LOCALIZACIÓN
ESTACIONES DE MONITOREO
DE PARTICULAS SEDIMENTABLES
TOTALES

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

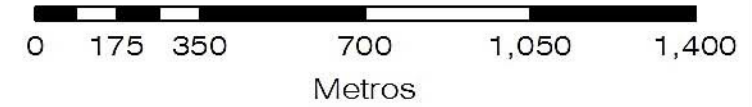
Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIONES DE MONITOREO

Símbolo	Estación	X	Y
	EA-1C	803881	1602004
	EA-2B	806464	1601999
	EA-3B	806532	1600570
	EA-4A	805136	1600106
	EA-5A	804346	1600607
	EA-6	805162	1603450
	EA-7A	805419	1601726

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000. Hojas cartográficas año 2010 Mataquesuinta (2159-1) y Laguna de Ayarza (2159-II) del IGN, Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014, datos de campo del departamento de Ambiente.

Fecha de Elaboración: **Abril 2017**
Distancia Horizontal y Vertical
de Grilla: 1,000 metros
Escala 1:16,000



4.3.2 Resultados

En el Cuadro 4-6 se presentan los resultados de Partículas Sedimentables Totales (PST) realizado durante Marzo de 2017. El resumen del informe de resultados presentado por el contratista se presenta en el anexo electrónico adjunto a este documento.

Los valores de PST se encuentran entre 4.30 a 33.43 g/(m² x 30 días), los cuales corresponden a las estaciones EA-6 y EA-4A respectivamente. Únicamente el valor para la estación EA-4A 34.54 g/(m² x 30 días) se encuentra por arriba de los valores mínimos y máximos registrados durante el establecimiento de la línea base. Sin embargo, el valor en la estación EA-4A ha tenido una tendencia descendente desde el cuarto trimestre de 2013. Las estaciones EA-1C, EA-2B, EA-3B, EA-6 y EA-7A no cuentan con línea base.

Cuadro 4-6: Resultados de partículas sedimentables totales, Proyecto Minero Escobal

Parámetro	Norma	Guías	EA-1C	EA-2B	EA-3B	EA-4A			EA-5A			EA-6	EA-7A		
	USEPA ¹	Banco Mundial ² OMS ³	Mar-17	Mar-17	Mar-17	Línea Base		Muestreo	Línea Base		Muestreo	Mar-17	Mar-17	Mar-17	
						Promedio	Mínimo	Máximo	Promedio	Mínimo	Máximo				
g/(m² x 30 días)															
Sólidos insolubles	ND	ND	18.13	14.47	21.25	6.27	2.60	10.80	31.44	6.50	0.80	16.00	21.65	2.94	8.66
Sólidos solubles			0.41	1.27	1.29	2.12	0.90	2.90	1.99	11.26	2.00	37.00	1.22	1.36	6.80
Sólidos totales			18.55	15.73	22.54	8.37	4.60	13.00	33.43	17.58	3.20	50.00	22.86	4.30	15.46

¹USEPA, 2006. Normas nacionales de calidad de aire ambiental (NAAQS), 40 CFR parte 50 (US). ²Guías Generales sobre Medio Ambiente, Salud y Seguridad, Corporación Financiera Internacional, Grupo del Banco Mundial 2007. ³Guía de Calidad del Aire, OMS 2005. ND: estas normas y guías no establecen un límite para estos parámetros. g/(m² x 30 días)= gramos por metro cuadrado durante 30 días. ND: no determinado. Fuente: MSR, 2017.

4.4 Gases de Combustión (SO₂ y NO₂)

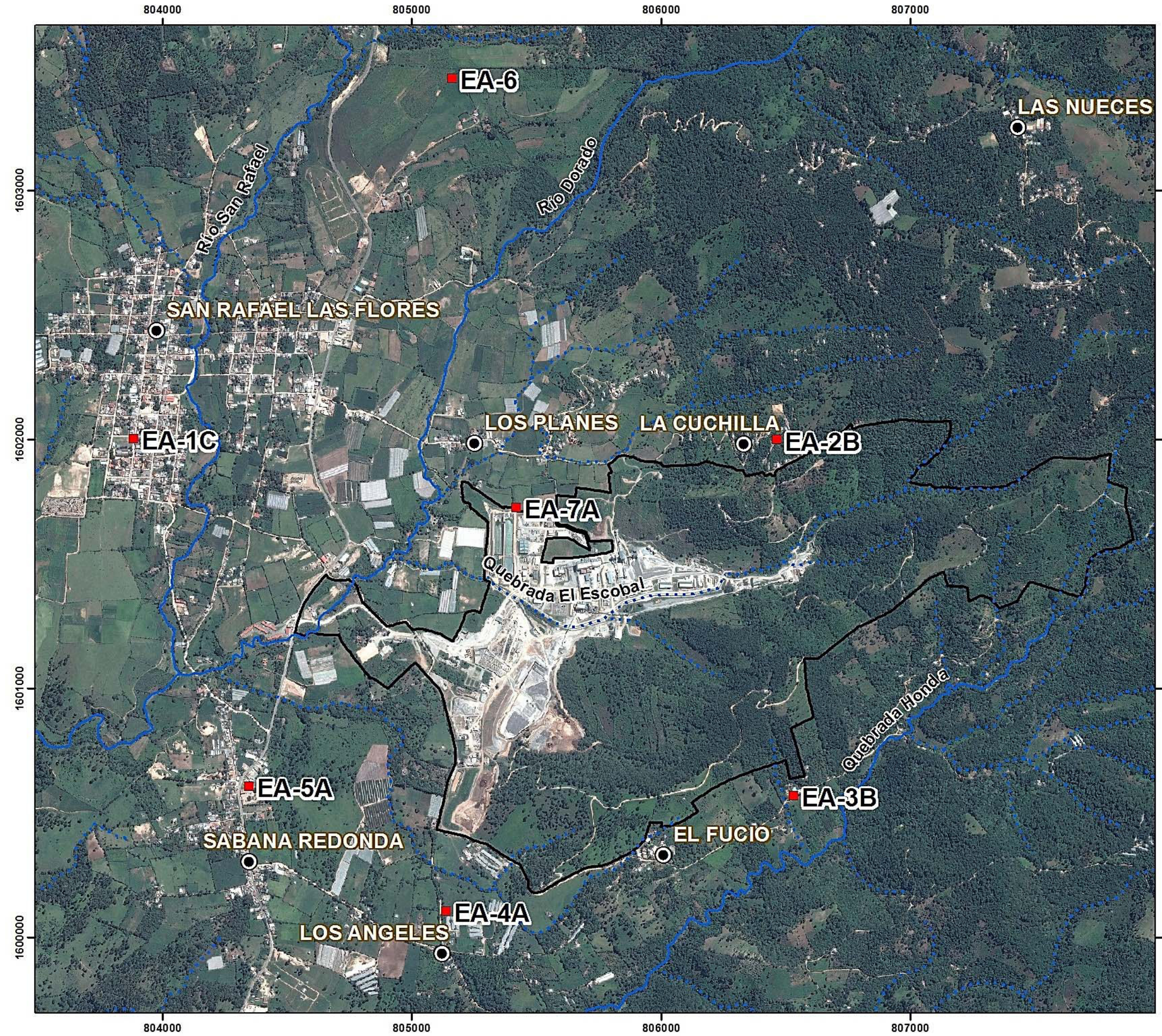
4.4.1 Sitios de Monitoreo

En el Cuadro 4-7 se enlistan las estaciones de monitoreo de dióxido de azufre (SO₂) y de dióxido de nitrógeno (NO₂) ubicada en el área de influencia (AI) del Proyecto. La ubicación de las estaciones de monitoreo de SO₂ y NO₂ se presenta en la Figura 4-3.

Cuadro 4-7: Sitios de Monitoreo de SO₂ y NO₂, Proyecto Minero Escobal

Estación	Coordenadas		Altitud (msnm)	Sitio	Período Línea Base
EA-1C	803,887	1,601,801	1,337	Poblado San Rafael Las Flores, cercano a Escuela	No se cuenta con línea base.
EA-2B	806,470	1,601,796	1,555	Aldea La Cuchilla	
EA-3B	803,887	1,601,801	1,427	Aldea El Fucío	
EA-4A	805,142	1,599,903	1,360	Caserío El Portón de los Ángeles	
EA-5A*	804,352	1,600,408	1,339	Aldea Sabana Redonda, al sur-oeste del proyecto	
EA-6	805,168	1,603,247	1,434	Al norte del Proyecto, ruta a Mataquescuintla	
EA-7A*	805,425	1,601,523	1,320	Noreste de pileta de agua de proceso y pileta de cumplimiento ambiental, Jurisdicción Aldea Los Planes	

*Se incluye como período de línea base de Julio 2010 a Abril 2011 la información registrada en las estaciones EA-5 y EA-7. Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.



MAPA DE LOCALIZACIÓN
ESTACIONES DE MONITOREO
DE GASES DE COMBUSTIÓN

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

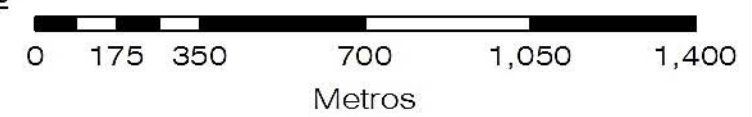
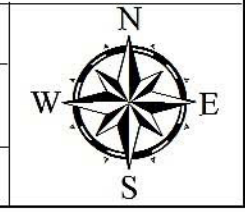
Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIONES DE MONITOREO

Símbolo	Estación	X	Y
	EA-1C	803881	1602004
	EA-2B	806464	1601999
	EA-3B	806532	1600570
	EA-4A	805136	1600106
	EA-5A	804346	1600607
	EA-6	805162	1603450
	EA-7A	805419	1601726

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000
Hojas catográficas año 2010 Mataquesuintla (2159-1) y Laguna de Ayarza (2159-II) del IGN,
Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014,
datos de campo del departamento de Ambiente.

Fecha de Elaboración: **Abril 2017**
Distancia Horizontal y Vertical
de Grilla: 1,000 metros
Escala 1:16,000



4.4.2 Resultados

En el Cuadro 3-12 se presentan los resultados de las mediciones de SO₂ y NO₂ realizadas en siete estaciones de monitoreo de Calidad de Aire. El informe de resultados presentado por el contratista se presenta en el anexo electrónico adjunto a este documento.

En las mediciones efectuadas durante este trimestre se obtuvieron valores por debajo del límite de detección del método en todas las estaciones para SO₂ (<13µg/m³). Los valores de NO₂ también se encontraron por debajo del límite de detección del método, a excepción de la estación EA-4A (10 µg/m³). Todos los valores registrados de SO₂ y de NO₂ son menores a los valores guías establecidos por el Banco Mundial, la OMS, British Columbia y los valores norma establecidos por la USEPA. Lo que indica que las actividades realizadas durante el presente período, no han originado variaciones significativas en los parámetros reportados en los trimestres anteriores.

Cuadro 4-8: Resultados de gases de combustión, Proyecto Minero Escobal

Parámetro	Norma*	Guías*			EA-1C	EA-2B	EA-3B	EA-4A	EA-5A			EA-6	EA-7A				
									Línea base**		Muestreo		Línea base**		Muestreo		
	USEPA ¹	Banco Mundial ²	OMS ³	British Columbia ⁴	Mar-17	Mar-17	Mar-17	Mar-17	Promedio	Mínimo	Máximo	Mar-17	Mar-17	Promedio	Mínimo	Máximo	Mar-17
(µg/m ³)																	
SO ₂	370	20	20	160	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13	<13
NO ₂	100 [¥]	40 [¥]	40 [¥]	200	<9	<9	<9	10	<9	<9	<9	<9	<9	<9	<9	<9	<9

Nota: µg/m³ = microgramos por metro cúbico; SO₂= dióxido de azufre, NO₂= dióxido de nitrógeno. ¹ USEPA, 2006. Normas nacionales de calidad de aire ambiental (NAAQS), 40 CFR parte 50 (US). ²Guías Generales sobre Medio Ambiente, Salud y Seguridad, Corporación Financiera Internacional, Grupo del Banco Mundial 2007. ³Guía de Calidad del Aire, OMS 2005. ⁴Guías para la calidad del aire ambiental. *Las normas de calidad de aire ambiental son los niveles de calidad del aire fijados y publicados a partir de procesos legislativos nacionales y procesos regulatorios, mientras que las guías sobre calidad del aire ambiental hacen referencia a niveles de calidad del aire obtenidos principalmente a través de datos clínicos, toxicológicos y epidemiológicos. **Corresponde a los valores de línea base de la estación EA-5 y de la estación EA-7 respectivamente. ¥ Este valor corresponde a la concentración promedio anual. Fuente: MSR, 2017.

4.5 Niveles de Presión Sonora

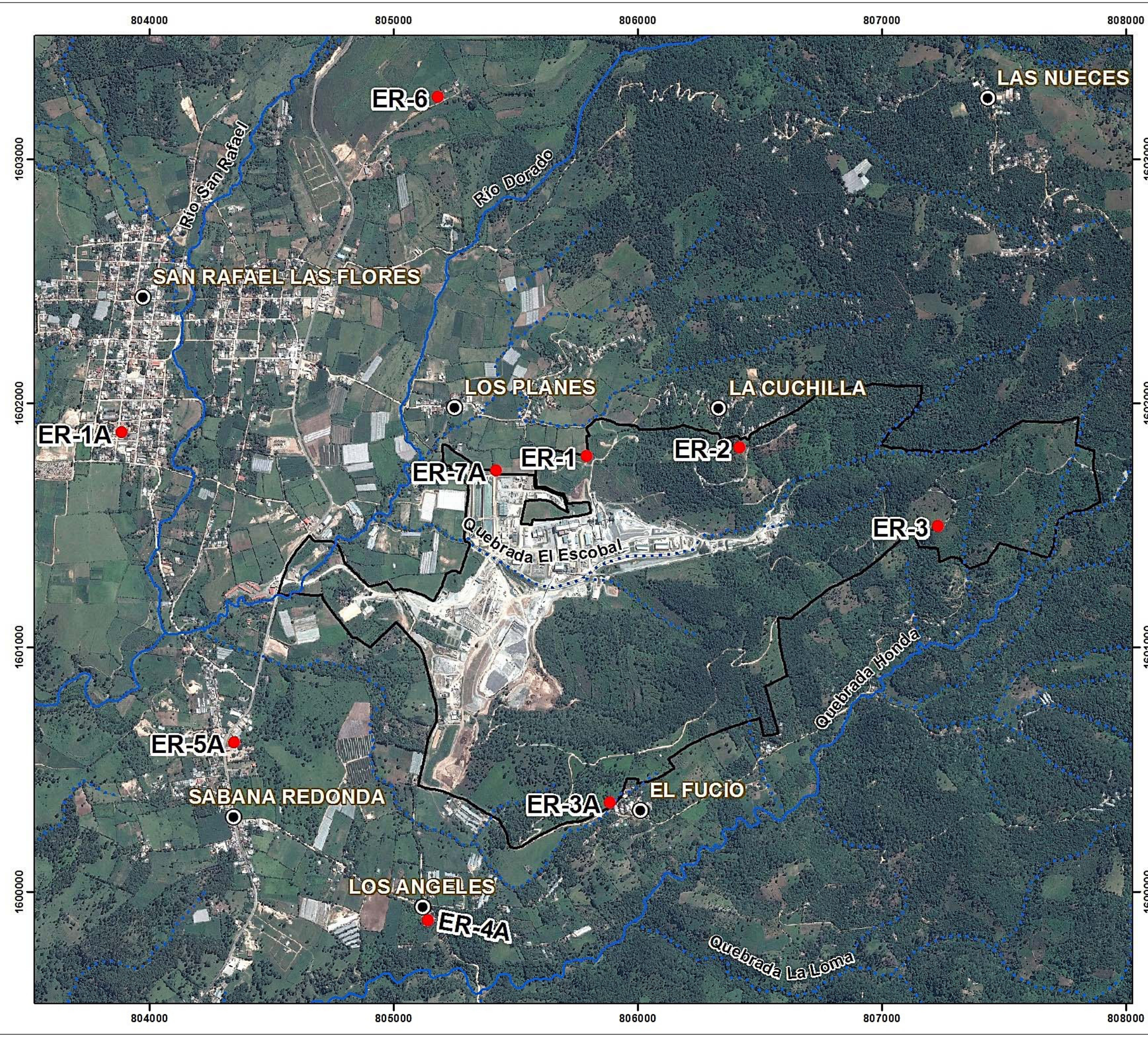
4.5.1 Sitios de Monitoreo

En el Cuadro 4-9 se enlistan las estaciones de monitoreo de presión sonora ubicados en el área de influencia (AI) del Proyecto, localizadas en la jurisdicción de los centros poblados: Los Planes, La Cuchilla, El Fucío, Sabana Redonda, Portón de los Ángeles y San Rafael Las Flores. La ubicación de las estaciones de monitoreo de presión sonora se presenta en la Figura 4-4.

Cuadro 4-9: Sitios de Monitoreo de Presión Sonora, Proyecto Minero Escobal

Estación	Coordenadas		Altitud (msnm)	Sitio
Periodicidad de monitoreo mensual				
ER-1	805,797	1,601,582	1,417	Depósito de suelos, a inmediaciones de Aldea Los Planes
ER-2	806,427	1,601,605	1,564	Aldea La Cuchilla
ER-3	807,165	1,601,255	1,679	Área este del proyecto, a inmediaciones de Aldea El Fucío
ER-7A	805,425	1,601,523	1,320	Al noreste de pileta de agua de proceso y pileta de cumplimiento ambiental, Jurisdicción de Aldea Los Planes
Periodicidad de monitoreo trimestral				
ER-1A	803,891	1,601,678	1,328	Poblado San Rafael Las Flores, cercano a Escuela
ER-3A	805,892	1,600,161	1,416	Aldea El Fucío
ER-4A	805,146	1,599,680	1,360	Caserío El Portón de los Ángeles
ER-5A	804,352	1,600,408	1,339	Aldea Sabana Redonda, al sur-oeste del proyecto
ER-6	805,187	1,603,054	1,434	Al norte del Proyecto, ruta a Mataquescuintla

Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.



MAPA DE LOCALIZACIÓN ESTACIONES DE MONITOREO NIVELES DE PRESIÓN SONORA

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

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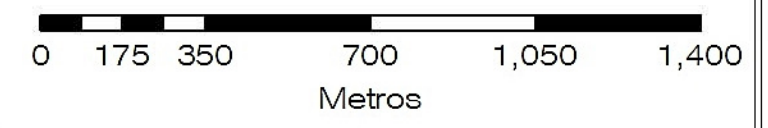
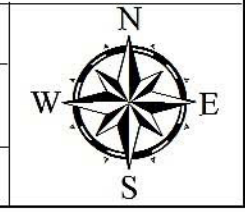
Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIONES DE MONITOREO

Símbolo	Estación	X	Y
	ER-1	805791	1601785
	ER-1A	803885	1601881
	ER-2	806419	1601819
	ER-3	807232	1601498
	ER-3A	805886	1600364
	ER-4A	805140	1599883
	ER-5A	804346	1600611
	ER-6	805181	1603257
	ER-7A	805419	1601726

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000
Hojas cartográficas año 2010 Mataquesuinta (2159-1) y Laguna de Ayarza (2159-II) del IGN,
Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014,
datos de campo del departamento de Ambiente.

Fecha de Elaboración: **Abril 2017**
Distancia Horizontal y Vertical de Grilla: 1,000 metros
Escala 1:16,000



4.5.2 Resultados

En el Cuadro 4-10 y en el Cuadro 4-11 se presentan los valores registrados de los niveles de presión sonora (**NPS**) durante los meses de Febrero a Abril de 2017. Los informes generados por los equipos de medición se presentan en el anexo electrónico adjunto a este documento.

Los resultados obtenidos de NPS en las estaciones muestreadas respecto al parámetro Leq, están dentro del rango de 40.1 dBa y 56.8 dBa, los cuales corresponden a las estaciones ER-3 y ER-1A respectivamente.

La estación ER-3 presentó el menor promedio diurno (41.2 dBa) y el menor promedio nocturno (37.4 dBa) se registró en la estación ER-3; mientras que la estación ER-1A presentó el mayor promedio diurno (57.7 dBa) y el mayor promedio nocturno (54.3 dBa) se registró en ER-2.

Las estaciones ER-1, ER-2, ER-3, ER-4A, ER-5A y ER-7A presentaron valores de promedio diurno y nocturno dentro de los valores mínimos y máximos registrados en el establecimiento de la línea base, a excepción únicamente de la medición de Febrero en promedio nocturno en la estación ER-7A. Las estaciones ER-1A, ER-3A y ER-6 no cuentan con datos de línea base.

Los promedios diurnos registrados durante los meses de Febrero a Abril de 2017 estuvieron por debajo de la guía establecida por la OMS y Banco Mundial para zonas residenciales; asimismo por debajo de la norma establecida por la USEPA. A excepción de una medición registrada en Febrero en ER-1A. Los promedios nocturnos registrados estuvieron por debajo de la norma establecida por la USEPA (55 dBa). Ninguna de las estaciones monitoreadas presentó valores promedio diurno y nocturno superiores al valor de la guía para jornada diurna y nocturna del Banco Mundial para zonas industriales (70 dBa).

Cuadro 4-10: Resultados trimestrales de los niveles de presión sonora, Proyecto Minero Escobal

Parámetro	Norma*		Guías*		ER-1						ER-2					
	USEPA ¹	OMS ²	Banco Mundial ³		Línea Base			Feb-17	Mar-17	Abr-17	Línea Base			Feb-17	Mar-17	Abr-17
			Residencial	Industrial	Promedio	Máximo	Mínimo				Promedio	Máximo	Mínimo			
			dBA													
Lmax					89.3	99.5	64.6	69.6	80.7	77.2	86.7	97.8	64.9	75.0	89.9	80.5
Lmin	NL	NL	NL	NL	32.5	37.7	27.0	35.9	44.5	36.0	35.2	42.8	26.5	46.6	42.4	42.2
Leq					49.9	57.1	41.2	45.5	51.4	47.4	49.4	58.7	39.7	53.2	52.9	51.4
PD	55	55	55	70	50.5	59.1	39.7	45.2	51.9	48.3	48.8	57.1	39.8	52.4	52.4	50.7
PN	55	50	45	70	47.6	55.7	39.3	46.2	50.4	45.4	46.6	54.5	37.9	54.3	53.8	52.4

Parámetro	Norma*		Guías*		ER-3						ER-7A					
	USEPA ¹	OMS ²	Banco Mundial		Línea Base			Feb-17	Mar-17	Abr-17	Línea Base**			Feb-17	Mar-17	Abr-17
			Residencial	Industrial	Promedio	Máximo	Mínimo				Promedio	Máximo	Mínimo			
			dBA													
Lmax					87.4	100.7	67.2	73.2	83.3	81.1	87.5	89.0	82.1	70.6	81.7	76.8
Lmin	NL	NL	NL	NL	49.4	56.2	26.9	29.1	43.6	31.2	NR	NR	NR	45.9	40.4	39.0
Leq					56.8	63.2	39.7	40.1	45.8	43.4	52.8	54.5	50.9	51.7	52.0	49.5
PD	55	55	55	70	56.5	63.1	41.0	41.2	46.2	44.3	52.1	53.5	50.4	51.6	53.1	53.1
PN	55	50	45	70	57.2	64.0	34.1	37.4	45.3	41.8	49.7	50.9	48.8	51.9	50.1	50.1

*Las normas de calidad de aire ambiental son los niveles de calidad del aire fijados y publicados a partir de procesos legislativos nacionales y procesos regulatorios, mientras que las guías sobre calidad del aire ambiental hacen referencia a niveles de calidad del aire obtenidos principalmente a través de datos clínicos, toxicológicos y epidemiológicos. ¹ USEPA, 2006. Normas nacionales de niveles de presión sonora. ² Guías sobre ruido comunitario, OMS 1999. ³ Guías Generales sobre Medio Ambiente, Salud y Seguridad, Corporación Financiera Internacional, Grupo del Banco Mundial 2007. dBA = decibeles en escala A. PD = promedio diurno (de 07:00 a 22:00)- PN = promedio nocturno (de 22:00 a 7:00). Lmax = lectura máxima registrada de dBA. Lmin= lectura mínima registrada de dBA. NL = no hay límite establecido para este parámetro. NR = cálculo No Realizado por falta de datos de línea base. ** Los valores de línea base corresponden a la estación ER-7. Fuente: MSR, 2017.

Cuadro 4-11: Resultados mensuales de los niveles de presión sonora, Proyecto Minero Escobal

Parámetro	Norma*		Guías*		ER-1A				ER-3A				ER-4A									
	USEPA ¹	OMS ²	Banco Mundial ³		Línea Base			Feb-17	Línea Base			Feb-17	Línea Base			Feb-17						
			Residencial	Industrial	Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo							
			dBA																			
Lmax	NL	NL	NL	NL	NR	NR	NR	99.1	NR	NR	NR	83.1	80.6	78.2	82.1	77.8						
Lmin																	36.8	34.3	NR	NR	NR	27.0
Leq																	56.8	49.5	50.2	49.3	50.9	46.7
PD																	57.7	49.7	49.5	48.4	50.4	47.3
PN																	54.0	49.2	48.6	48.2	48.9	45.8

Parámetro	Norma*		Guías*		ER-5A				ER-6													
	USEPA ¹	OMS ²	Banco Mundial ³		Línea Base			Feb-17	Línea Base			Feb-17										
			Residencial	Industrial	Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo											
			dBA																			
Lmax	NL	NL	NL	NL	NR	NR	NR	91.6	NR	NR	NR	91	NR	NR	NR	85.3						
Lmin																	85.1	35.4	32.0			
Leq																	67.6	51.6	51.6	44.1		
PD																	63.8	61.2	50.2	63.8	51.3	42.4
PN																	65.0	62.8	45.9	65.0	52.3	46.1

*Las normas de calidad de aire ambiental son los niveles de calidad del aire fijados y publicados a partir de procesos legislativos nacionales y procesos regulatorios, mientras que las guías sobre calidad del aire ambiental hacen referencia a niveles de calidad del aire obtenidos principalmente a través de datos clínicos, toxicológicos y epidemiológicos. ¹ USEPA, 2006. Normas nacionales de niveles de presión sonora. ² Guías sobre ruido comunitario, OMS 1999. ³ Guías Generales sobre Medio Ambiente, Salud y Seguridad, Corporación Financiera Internacional, Grupo del Banco Mundial 2007. dBA = decibeles en escala A. PD = promedio diurno (de 07:00 a 22:00)- PN = promedio nocturno (de 22:00 a 7:00). Lmax = lectura máxima registrada de dBA. Lmin= lectura mínima registrada de dBA. NL = no hay límite establecido para este parámetro. NR = cálculo No Realizado por falta de datos de línea base. Fuente: MSR, 2017.

5 Calidad del Agua

5.1 Sitios de Monitoreo

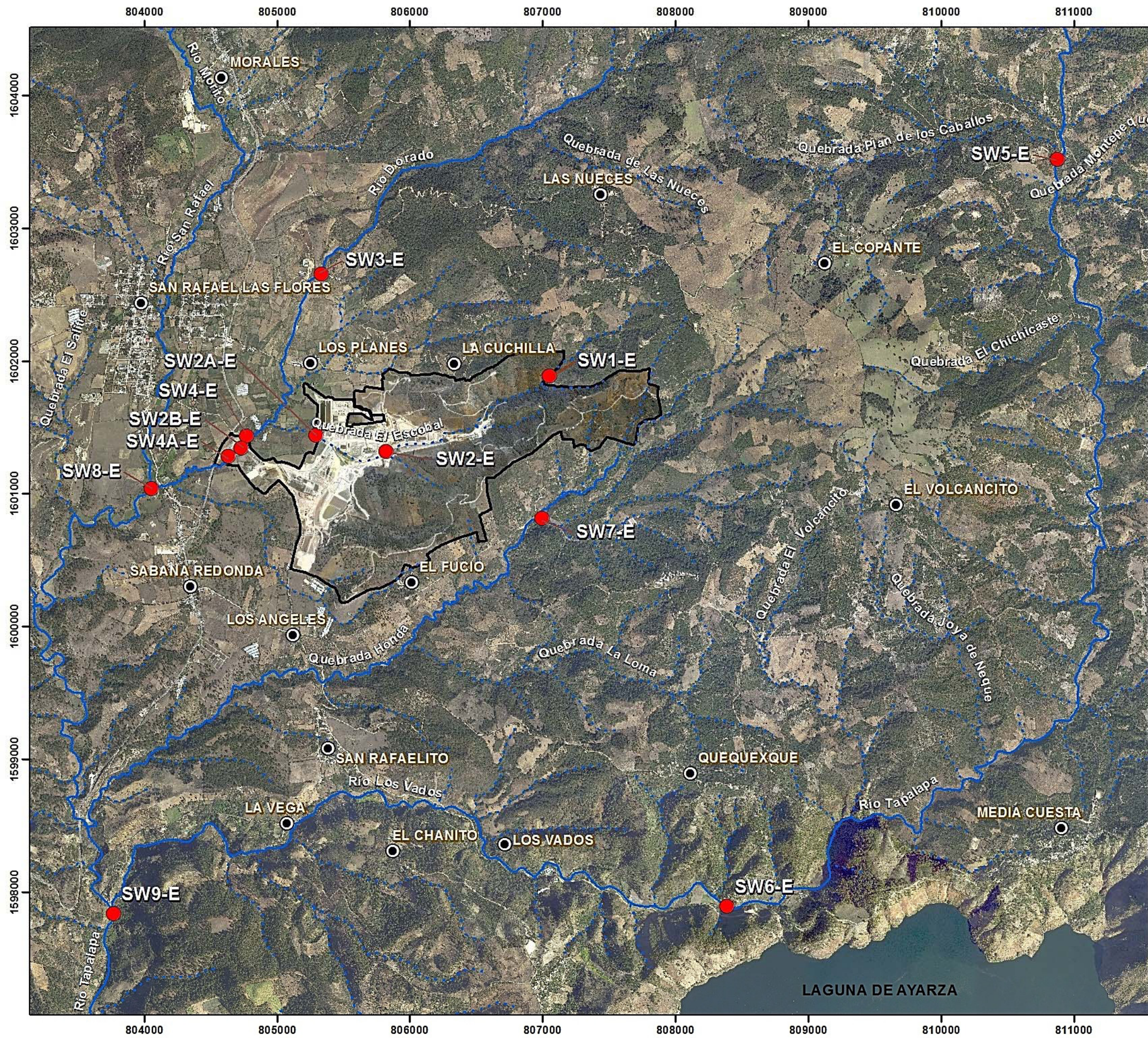
En el Cuadro 5-1 se enlistan las estaciones de monitoreo de calidad de agua superficial y subterránea localizadas en las quebradas, ríos, manantiales, pozos de monitoreo y pozos mecánicos ubicados en el área de influencia (AI) del Proyecto. La ubicación de las estaciones de monitoreo de calidad de agua superficial y subterránea se presentan en la Figura 5-1, Figura 5-2, Figura 5-3 y Figura 5-4.

Cuadro 5-1: Sitios de Monitoreo de Calidad de Agua, Proyecto Minero Escobal

Estación	Coordenadas		Sitio	Período Línea Base
Agua Superficial				
SW-1	807,053	1,601,682	Quebrada El Escobal, aguas arriba	Junio 2008 a marzo 2011
SW-2	805,811	1,601,164	Quebrada El Escobal, en medio de la propiedad	Junio 2008 a septiembre 2010
SW-2A	805,295	1,601,230	Quebrada El Escobal, salida de la propiedad	No cuenta con línea base
SW-3	805,337	1,602,453	Río El Dorado, aguas arriba	Septiembre 2008 a marzo 2011
SW-4	804,781	1,601,228	Río El Dorado, aguas abajo	
SW-4A	804,629	1,601,052	Río El Dorado, por puente de acceso al Proyecto, 30mts aguas abajo SW-4	No cuenta con línea base
SW-5	810,882	1,603,313	Río Tapalapa	Septiembre 2008 a marzo 2011
SW-6	808,391	1,597,689	Río Los Vados	
SW-7	806,989	1,600,618	Quebrada La Honda	
SW-8	804,054	1,600,834	Unión Río San Rafael y El Dorado	Noviembre 2011 a Diciembre 2012
SW-9	803,772	1,597,635	Río Tapalapa, aguas abajo (cercano a la Ceibita)	
Agua Subterránea, Nacimientos				
GW-1A	808,670	1,599,754	Nacimiento de agua permanente, Aldea El Volcancito	Diciembre 2010 a marzo 2011
GW-2	807,515	1,601,059	Nacimiento de agua permanente, Aldea El Fucío	
GW-3	806,193	1,601,194	El Mora, zona central del proyecto (frente a portal Oeste)	
GW-4	805,992	1,600,533	Aguas arriba del depósito de colas y de GW5	Diciembre 2010
GW-5	805,962	1,600,525	Aguas arriba del depósito de colas	No cuenta con línea base
Agua Subterránea, Pozos de monitoreo				
MW-2	805,206	1,600,565	Sur-oeste del depósito de colas	Diciembre 2010 a marzo 2011
MW-3	805,153	1,600,790	Al oeste del depósito de colas	
MW-4	805,186	1,601,009	Al sur de montículos (acuífero somero)	
MW-5	805,304	1,601,277	Al oeste de taller, en el límite de la propiedad de MSR	
MW-6	805,457	1,601,454	Al norte de almacén general	Diciembre 2010 a

Estación	Coordenadas		Sitio	Período Línea Base
MW-7	805,796	1,601,582	Al oeste de depósito de suelos No. 1	marzo 2011
MW-8	805,304	1,601,277	Al oeste de taller, pozo de abastecimiento de oficinas temporales	Enero 2011 a marzo 2011
MW-9	805,198	1,601,019	Al sur de montículos (Acuífero profundo)	
MW-11	805,612	1,601,064	Al norte de zona de infiltración quebrada Escobal	Marzo 2011
RW-1	804,809	1,600,972	Pozo artesanal ubicado en Finca Suandys	No cuenta con línea base
Agua Subterránea, pozo de producción				
PSA-SR	803,678	1,602,044	Pozo mecánico ubicado en las piscinas de San Rafael las Flores	Marzo 2011
PSA-1	805,212	1,601,203	Pozo mecánico ubicado a un costado de la guardería	No cuenta con línea base
Agua de grifo				
HW-1	803,888	1,601,977	Agua de grifo, casa poblado San Rafael las Flores, cercano a Escuelita	No cuenta con línea base

Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.



MAPA DE LOCALIZACIÓN ESTACIONES DE MONITOREO AGUA SUPERFICIAL

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

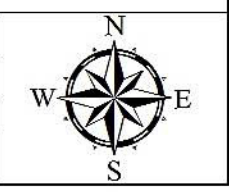
LEYENDA

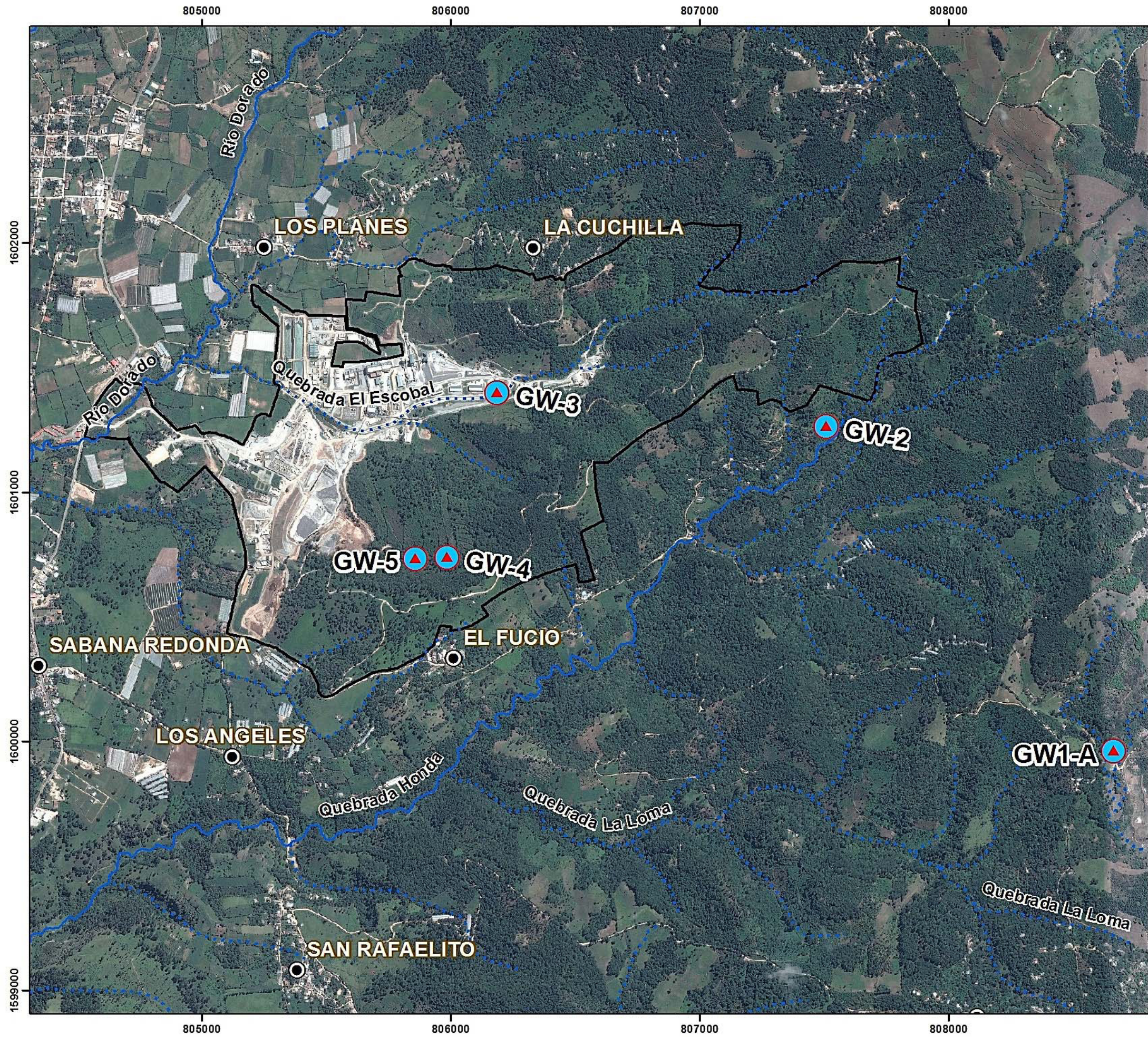
Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

Símbolo	Estación	X	Y
	SW1-E	807047	1601885
	SW2-E	805805	1601367
	SW2A-E	805289	1601433
	SW2B-E	804728	1601341
	SW3-E	805331	1602656
	SW4-E	804775	1601431
	SW4A-E	804623	1601255
	SW5-E	810876	1603516
	SW6-E	808385	1597892
	SW7-E	806995	1600815
SW8-E	804048	1601037	
SW9-E	803766	1597838	

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000
Hojas catográficas año 2010 Mataquesuinta (2159-1) y Laguna de Ayarza (2159-II) del IGN,
Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2013,
datos de campo del departamento de Ambiente.

Fecha de Elaboración: **Abril 2017**
Distancia Horizontal y Vertical de Grilla: 1,000 metros
Escala 1:30,000





MAPA DE LOCALIZACIÓN ESTACIONES DE MONITOREO CALIDAD DE AGUA SUBTERRÁNEA

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



DEPARTAMENTO DE AMBIENTE

Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIONES DE MONITOREO (POZOS)

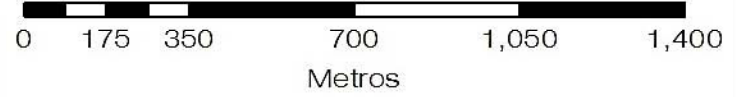
Símbolo	Estación	X	Y
	GW-1A	808664	1599957
	GW-2	807509	1601262
	GW-3	806187	1601397
	GW-4	805986	1600736
	GW-5	805858	1600731

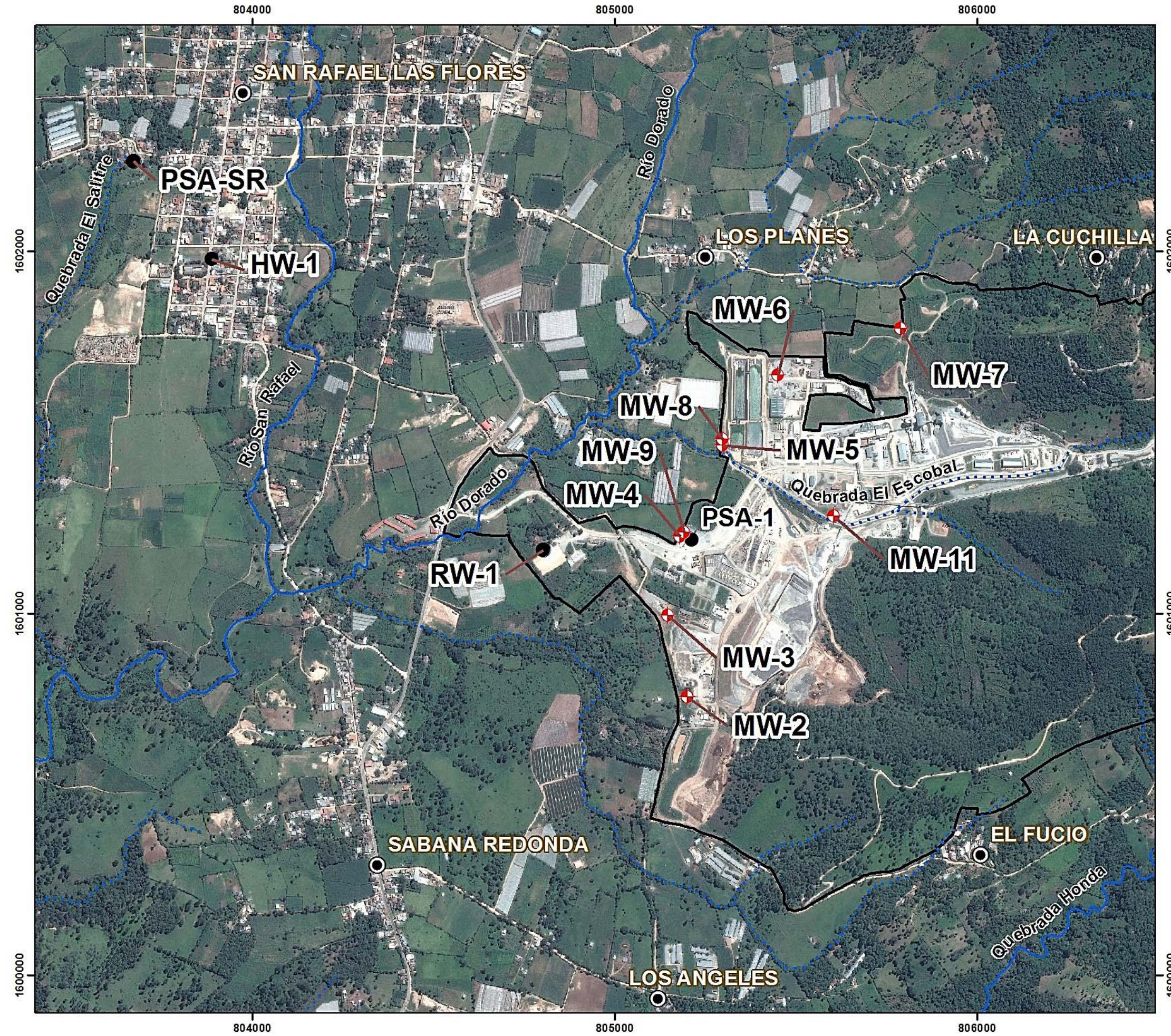
FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000. Hojas catográficas año 2010 M ataquescuintia (2159-1) y Laguna de Ayarza (2159-11) del IGN, Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014, datos de campo del departamento de Ambiente.

Fecha de Elaboración: Abril 2017

Distancia Horizontal y Vertical de Grilla: 1,000 metros

Escala 1:16,000





MAPA DE LOCALIZACIÓN ESTACIONES (POZOS) DE MONITOREO Y REFERENCIA

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



DEPARTAMENTO DE AMBIENTE
Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIONES DE MONITOREO (POZOS)

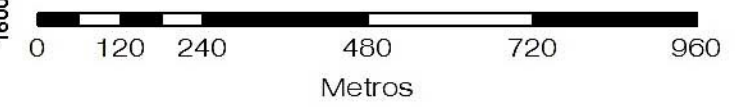
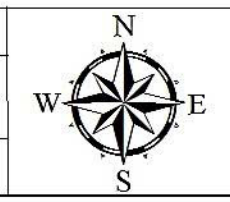
Símbolo	Estación	X	Y	
	MW-2	805201	1600768	
	MW-3	805148	1600993	
	MW-4	805181	1601212	
	MW-5	805299	1601463	
	MW-6	805452	1601657	
	MW-7	805791	1601785	
	MW-8	805298	1601480	
	MW-9	805192	1601222	
	MW-11	805607	1601267	
		RW-1	804803	1601175
		PSA-SR	803672	1602247
HW-1		803888	1601977	
PSA-1		805212	1601203	

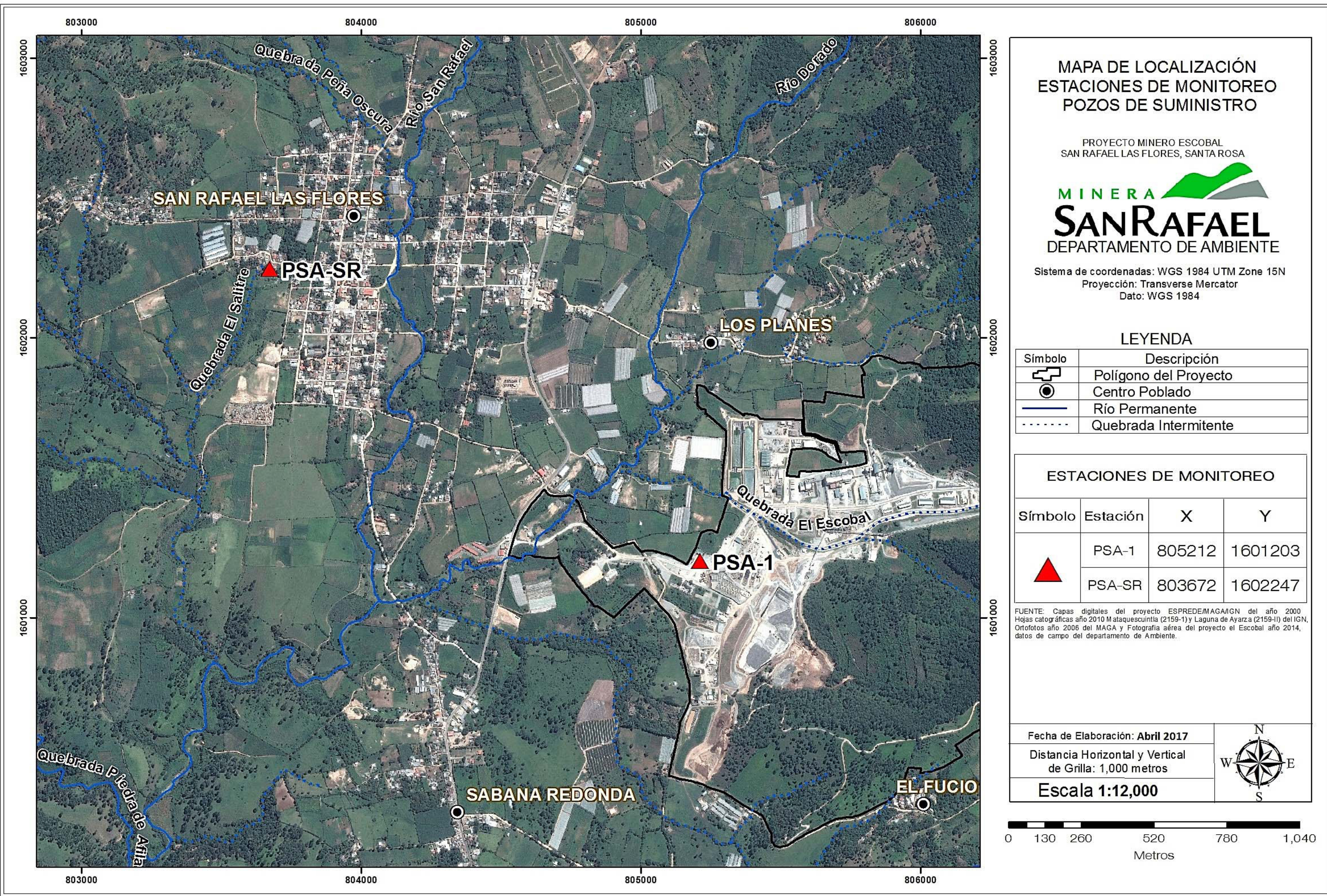
FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000
Hojas catográficas año 2010 Mataquesuinta (2159-1) y Laguna de Ayarza (2159-II) del IGN,
Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014,
datos de campo del departamento de Ambiente.

Fecha de Elaboración: **Abril 2017**

Distancia Horizontal y Vertical
de Grilla: 1,000 metros

Escala 1:11,000





MAPA DE LOCALIZACIÓN ESTACIONES DE MONITOREO POZOS DE SUMINISTRO

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIONES DE MONITOREO

Símbolo	Estación	X	Y
	PSA-1	805212	1601203
	PSA-SR	803672	1602247

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000. Hojas catastrales año 2010 Mataquescuintla (2159-1) y Laguna de Ayarza (2159-II) del IGN, Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014, datos de campo del departamento de Ambiente.

Fecha de Elaboración: **Abril 2017**

Distancia Horizontal y Vertical de Grilla: 1,000 metros

Escala 1:12,000



5.2 Resultados

5.2.1 Control de Calidad

En el monitoreo correspondiente al mes de Marzo de 2016 se emplearon muestras control para determinar la confiabilidad de los parámetros analizados por el laboratorio encargado del análisis de muestras. En total se efectuaron 3 muestras blanco y tres muestras duplicado. Los resultados obtenidos se presentan en el Cuadro 5-2.

En las tres muestras del control de calidad de los blancos de campo, se detectaron concentraciones mínimas de bario total (SW10), boro disuelto (GW10), calcio disuelto y total (SW10), estroncio total (SW10), cloruros (GW10 y MW20), fósforo total (GW10), sólidos disueltos totales (SW10), sulfatos (SW10 y MW20) y alcalinidad total (SW10). Sin embargo las concentraciones detectadas están muy cerca a los límites de detección del método, por lo que se considera que no hay un aporte significativo de estos elementos en los resultados obtenidos. Todos los demás parámetros analizados por el laboratorio son confiables tanto en manipulación de las muestras como en precisión del análisis.

Cuadro 5-2: Resultados de control de calidad, blanco y duplicado, para análisis de agua superficial y subterránea

Parámetros	Unidad	Blancos de campo			Muestras duplicado					
		Agua EMSURE (metales) y agua desmineralizada (Fisicoquímicos)			Duplicado	Original	Duplicado	Original	Duplicado	Original
		SW10	GW10	MW20	SW11	SW2A	GW11	GW3	MW21	MW9
Cr VI	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
DBO	mg/L	<10	N/A	N/A	<10	<10	N/A	N/A	N/A	N/A
Coliformes Fecales	NMP/100 ml	<1.8	<1.8	<1.8	7.0×10^2	7.0×10^2	<1.8	23	<1.8	<1.8
Color Real	U Pt/Co	<1	<1	<1	53	<1	<1	<1	6	<1
Materia flotante	U Pt/Co	NA	NA	NA	NA	Ausente	NA	Ausente	NA	Ausente
Aluminio Disuelto	mg/L	<0.03	<0.03	<0.03	0.08	0.07	0.03	<0.03	<0.03	<0.03
Aluminio Total		<0.03	NA	NA	0.09	0.1	NA	NA	NA	NA
Antimonio Disuelto		<0.0004	<0.0004	<0.0004	0.0275	0.0267	<0.0004	<0.0004	<0.0004	<0.0004
Antimonio Total		<0.0004	NA	NA	0.0316	0.0321	NA			
Arsénico Disuelto		<0.0002	<0.0002	<0.0002	0.0067	0.0064	0.0013	0.0015	0.0006	0.0006
Arsénico Total		<0.0002	NA	NA	0.008	0.0086	NA			
Bario Disuelto		<0.003	<0.003	<0.003	0.037	0.038	0.121	0.120	0.038	0.036
Bario Total		0.003	NA	NA	0.046	0.046	NA			
Berilio Disuelto		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Berilio Total		<0.01	NA	NA	<0.01	<0.01	NA			
Bismuto Disuelto		<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Bismuto Total		<0.04	NA	NA	<0.04	<0.04	NA			
Boro Disuelto		<0.01	0.01	<0.01	0.1	0.1	0.02	0.01	0.03	0.04
Boro Total		<0.01	NA	NA	0.11	0.11	NA			
Cadmio Disuelto		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cadmio Total		<0.0001	NA	NA	<0.0001	<0.0001	NA			
Calcio Disuelto		0.2	<0.1	<0.1	342	339	83.8	82.4	49.8	52.5

Parámetros	Unidad	Blancos de campo			Muestras duplicado					
		Agua EMSURE (metales) y agua desmineralizada (Fisicoquímicos)			Duplicado	Original	Duplicado	Original	Duplicado	Original
		SW10	GW10	MW20	SW11	SW2A	GW11	GW3	MW21	MW9
Calcio Total	mg/L	0.2	NA	NA	361	367	NA			
Cromo Disuelto		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cromo Total		<0.01	NA	NA	<0.01	<0.01	NA			
Cobalto Disuelto		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalto Total		<0.01	NA	NA	<0.01	<0.01	NA			
Cobre Disuelto		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobre Total		<0.01	NA	NA	<0.01	<0.01	NA			
Galio Disuelto		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Galio Total		<0.1	NA	NA	<0.1	<0.1	NA			
Hierro Disuelto		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	1.17	1.10
Hierro Total		<0.02	NA	NA	0.05	0.06	NA			
Plomo Disuelto		<0.0001	<0.0001	<0.0001	0.0021	0.002	<0.0001	<0.0001	<0.0001	<0.0001
Plomo Total		<0.0001	NA	NA	0.006	0.0064	NA			
Litio Disuelto		<0.008	<0.008	<0.008	0.089	0.089	<0.008	<0.008	0.012	0.012
Litio Total		<0.008	NA	NA	0.106	0.105	NA			
Magnesio Disuelto		<0.2	<0.2	<0.2	15.0	15.1	19.2	19.0	7.9	8.3
Magnesio Total		<0.2	NA	NA	15.7	16	NA			
Manganeso Disuelto		<0.005	<0.005	<0.005	0.051	0.052	<0.005	<0.005	0.045	0.049
Manganeso Total		<0.005	NA	NA	0.064	0.065	NA			
Mercurio Disuelto		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Mercurio Total		<0.0002	NA	NA	<0.0002	<0.0002	NA			
Molibdeno Disuelto		<0.02	<0.02	<0.02	0.06	0.06	<0.02	<0.02	<0.02	<0.02
Molibdeno Total		<0.02	NA	NA	0.05	0.06	NA			
Níquel Disuelto		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Níquel Total		<0.008	NA	NA	<0.008	<0.008	NA			
Potasio Disuelto		<0.2	<0.2	<0.2	15.4	15.4	9.6	9.4	4.2	4.5
Potasio Total		<0.2	NA	NA	15.8	16	NA			
Escandio Disuelto		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Escandio Total		<0.1	NA	NA	<0.1	<0.1	NA			
Selenio Disuelto		<0.0001	<0.0001	<0.0001	0.0008	0.0008	0.0007	0.0006	0.0004	<0.0001
Selenio Total		<0.0001	NA	NA	0.0009	0.0009	NA			
Plata Disuelta		<0.00005	<5x10 ⁻⁵	<5x10 ⁻⁵	<0.00005	<0.00005	<5x10 ⁻⁵	<5x10 ⁻⁵	<5x10 ⁻⁵	<5x10 ⁻⁵
Plata Total		<0.00005	NA	NA	0.00015	0.00014	NA			
Sodio Disuelto		<0.2	<0.2	<0.2	91.9	91.7	24.1	23.6	24.1	26.2
Sodio Total		<0.2	NA	NA	94.0	94.8	NA			
Estroncio Disuelto		<0.005	<0.005	<0.005	3.94	3.98	0.450	0.442	0.371	0.405
Estroncio Total		0.006	NA	NA	4.12	4.14	NA			
Talio Disuelto		<0.0001	<0.0001	<0.0001	0.0003	0.0003	<0.0001	<0.0001	<0.0001	<0.0001
Talio Total		<0.0001	NA	NA	0.0003	0.0003	NA			
Estaño Disuelto		<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Estaño Total	<0.04	NA	NA	<0.04	<0.04	NA				
Titanio Disuelto	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Titanio Total	<0.005	NA	NA	0.013	0.014	NA				
Uranio Disuelto	<0.0001	<0.0001	<0.0001	0.0002	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Uranio Total	<0.0001	NA	NA	0.0001	0.0001	NA				
Vanadio Disuelto	<0.005	<0.005	<0.005	0.017	0.016	<0.005	<0.005	<0.005	<0.005	
Vanadio Total	<0.005	NA	NA	0.019	0.021	NA				
Zinc Disuelto	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Zinc Total	<0.01				<0.01	<0.01				
Grasas y Aceites	<2	NA			<2.4	<2.2	NA			
DQO	<10				11	10				
Cloruros	<0.5	2.5	2.5	73.4	73.8	686	684	9.2	405	
Cianuro Total	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	

Parámetros	Unidad	Blancos de campo			Muestras duplicado					
		Agua EMSURE (metales) y agua desmineralizada (Fisicoquímicos)			Duplicado	Original	Duplicado	Original	Duplicado	Original
		SW10	GW10	MW20	SW11	SW2A	GW11	GW3	MW21	MW9
Fluoruros	mg/L	<0.05	<0.2	<0.2	1.30	1.32	288	284	0.56	165.00
Nitratos/Nitritos como N		<0.02	<0.05	<0.05	5.99	5.99	<0.05	<0.05	<0.02	<0.05
Amonio		<0.05	<0.1	<0.1	2.88	2.88	<0.1	<0.1	<0.05	<0.1
Nitrógeno Kjeldahl (TKN)		<0.1	NA	NA	2.8	4.0	NA	NA	<0.1	NA
Fosfatos		<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.16	0.19
Fósforo Disuelto (Orto)		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.06
Fósforo Total		<0.02	0.11	<0.02	0.02	0.02	<0.02	<0.02	<0.02	0.12
STD (TDS)		20	<10	<10	1680	1670	564	582	284	288
SST (TSS)		<5	<5	<5	<5	6.0	<5	<5	5.0	<5
ST (TS)		<10	<10	<10	1720	1740	582	582	292	304
Sulfatos		2.5	<1	6.4	958	978	237	240	46.7	46.7
Alcalinidad Total		2.4	<2	<2	26.1	26.2	76.8	77.5	151.0	153
Hidrocarburos totales (TPH)		<0.09	NA		0.4	0.35	NA	<0.09	0.8	0.7

u.e.: unidades exponenciales. mg/L: miligramos por litro. NMP/100ml: número más probable en 100ml. u Pt/Co: unidades platino cobalto. NA: No Analizado. Fuente: MSR, 2017.

5.2.2 Agua Superficial

En el Cuadro 5-3 se presentan los resultados de la calidad del agua superficial para el mes de Marzo de 2017 en las once estaciones de monitoreo y un resumen estadístico (promedio, valor máximo y valor mínimo) de la línea base establecida para cada estación. Los resultados del laboratorio se presentan en el anexo electrónico adjunto a este documento.

Según los parámetros fisicoquímicos analizados, todas las estaciones monitoreadas cumplen con los valores máximos permisibles dados por el Acuerdo Gubernativo 236-2006 para entes generadores nuevos.

Las estaciones muestreadas presentaron un pH levemente alcalino (7.04 a 8.27 u.e.). En ninguna de las estaciones se detectaron valores de cianuro total cumpliendo con las guías establecidas por la USEPA para la salud humana, el Banco Mundial y el Acuerdo Gubernativo 236-2006 (**Acuerdo**) para aguas residuales. La Demanda Química de Oxígeno (**DQO**) no fue detectada en ninguna de las estaciones, a excepción de las estaciones SW-2A, SW-4A y SW-8 cumpliendo con lo establecido por el Banco Mundial (125 mg/L). Únicamente en la estación SW-8 se detectó concentración de Demanda Bioquímica de Oxígeno (**DBO**).

Las estaciones muestreadas presentaron concentraciones por debajo de la directriz de la USEPA para la salud humana de Cloruros (250 mg/L), Fluoruros (4 mg/L) y concentraciones por debajo de los valores establecidos por el Acuerdo y el Banco Mundial (2 mg/L) para Fósforo total (10 mg/L)

En dos de las once estaciones se detectó sólidos suspendidos totales encontrándose por debajo de los valores establecidos por el Acuerdo (100 mg/L), por el Banco Mundial (50 mg/L) y dentro de los valores establecidos durante el levantamiento de línea base.

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Los Sulfatos Totales fueron detectados en la mayoría de las estaciones en concentraciones por debajo de los valores máximos establecidos durante la línea base, a excepción de las estaciones SW5 y SW6.

El Aluminio fue detectado en cinco estaciones en diferentes concentraciones. Sin embargo los datos se encuentran dentro de los límites establecidos durante el levantamiento de la línea base. El Antimonio fue detectado en cinco estaciones, por debajo de los límites máximos establecidos durante la línea base.

Las concentraciones de Arsénico Total se encuentran por debajo de los límites establecidos por el Acuerdo (0.1 mg/L). Respecto de las directrices de la USEPA (0.01mg/L) todas las estaciones se encontraron por debajo del valor guía. En ninguna estación de monitoreo de agua superficial fue detectado el Mercurio. Y en seis estaciones, fue detectado el Plomo Total, registrándose todas las concentraciones por debajo de los valores guía sugeridos por la USEPA (0.015 mg/L) y el Acuerdo (0.4 mg/L).

Cuadro 5-3: Resultados de la Calidad del Agua Superficial, Proyecto Minero Escobal (1/4)

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	SW1-E			SW2-E			SW2A-E					
					Quebrada Escobal-aguas arriba			Quebrada Escobal-en medio del Proyecto			Quebrada Escobal- salida del Proyecto					
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
pH de campo	u.e.	5.0-9.0	6.0-9.0	6.0-9.0	7.509	7.14	8.06	7.42	6.56	7.87				7.32		
Temperatura (campo)	°C				17.4	13	19.8	22.4	20.3	25.6				25.7		
Conductividad (campo)	µS/cm				277.9	66.3	566.6	807.3	177.3	1965				1985		
Oxígeno disuelto (campo)					3.6	0.1	6.4	4.76	3.5	5.8				5.19		
Cr VI	mg/L													<0.05		
DBO														<10		
Coliformes Fecales	NMP/100ml													7.0 x 10 ²		
Color Real	U Pt/Co				NR	NR	NR	NR	NR	NR				<1		
Materia Flotante														Ausente		
Turbidez	NTU													5.57		
Aluminio Disuelto					0.035	<0.03	0.09	0.043	<0.03	0.12				0.07		
Aluminio Total		0.2			5.02	<0.03	35.1	2.35	0.06	8.77				0.1		
Antimonio Disuelto					<0.0004	<0.0004	0.0006	<0.0004	<0.0004	<0.0004				0.0267		
Antimonio Total		0.006			<0.0004	<0.0004	0.0007	<0.0004	<0.0004	0.0005				0.0321		
Arsénico Disuelto					0.00216	0.0005	0.0034	0.00184	0.0013	0.0024				0.0064		
Arsénico Total		0.01		0.1	0.00339	0.0015	0.0094	0.00266	0.0012	0.0054				0.0086		
Bario Disuelto					0.1361	0.086	0.207	0.109	0.088	0.133				0.038		
Bario Total		1			0.186	0.1	0.434	0.131	0.096	0.186				0.046		
Berilio Disuelto					<0.002	<0.002	<0.01	<0.002	<0.002	<0.002				<0.01		
Berilio Total		0.004			<0.002	<0.002	<0.01	<0.002	<0.002	<0.002				<0.01		
Bismuto Disuelto					<0.04	<0.04	<0.04	<0.04	<0.04	0.05				<0.04		
Bismuto Total					<0.04	<0.04	<0.04	<0.04	<0.04	<0.08				<0.04		
Boro Disuelto					<0.01	<0.01	<0.01	0.114	<0.01	0.29				0.1		
Boro Total					<0.01	<0.01	0.02	0.11	<0.01	0.28				0.11		
Cadmio Disuelto					<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NA		NR	<0.0001		
Cadmio Total		0.003		0.1	<0.0001	<0.0001	0.0007	<0.0001	<0.0001	0.0001	NA	NR	NR	<0.0001		
Calcio Disuelto					45.2	18.9	74.5	144.9	20.7	333				339		
Calcio Total					45.5	20.9	70.5	144.6	20.5	331				367		
Cromo Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				<0.01		
Cromo Total		0.1		0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				<0.01		
Cobalto Disuelto					<0.01	<0.01	0.01	0.01	<0.01	0.01				<0.01		
Cobalto Total					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				<0.01		
Cobre Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				<0.01		
Cobre Total		1.3		3	<0.01	<0.01	0.01	<0.01	<0.01	0.02				<0.01		
Galio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1		
Galio Total					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1		
Hierro Disuelto					<0.02	<0.02	0.04	0.04	<0.02	0.12				<0.02		
Hierro Total		0.3			2.7	<0.02	19.5	1.3	0.06	5.19				0.06		
Plomo Disuelto					<0.0001	<0.0001	0.0003	<0.0001	<0.0001	0.0001				0.002		
Plomo Total		0.015		0.4	0.0025	<0.0001	0.0191	0.00088	<0.0001	0.0038				0.0064		
Litio Disuelto					<0.02	<0.02	<0.02	<0.02	<0.02	<0.02				0.089		
Litio Total					<0.02	<0.02	<0.02	0.02	<0.02	0.02				0.105		
Magnesio Disuelto					3.9	2.6	5.3	15.9	3.2	37.3				15.1		
Magnesio Total					4.2	2.8	5.2	15.1	3.6	32.2				16		
Manganeso Disuelto					0.0051	<0.005	0.02	0.0195	<0.005	0.07				0.052		
Manganeso Total		0.4			0.1041	<0.005	0.721	0.0602	0.007	0.174				0.065		
Mercurio Disuelto					<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002				<0.0002		
Mercurio Total		0.002		0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002				<0.0002		
Molibdeno Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				0.06		

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	SW1-E				SW2-E				SW2A-E			
					Quebrada Escobal-aguas arriba				Quebrada Escobal-en medio del Proyecto				Quebrada Escobal- salida del Proyecto			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Molibdeno Total					<0.01	<0.01	<0.01	NA	<0.01	<0.01	<0.01	NA				0.06
Níquel Disuelto					<0.01	<0.01	0.03	NA	0.013	<0.01	0.04	NA				<0.008
Níquel Total		0.61		2	<0.01	<0.01	0.04	NA	0.022	<0.01	0.04	NA				<0.008
Potasio Disuelto					4.4	3.5	5.1	NA	6.1	4.9	7.6	NA				15.4
Potasio Total					5.3	3.5	13	NA	6.3	5.2	7.4	NA				16
Escandio Disuelto					<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	NA				<0.1
Escandio Total					<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	NA				<0.1
Selenio Disuelto					<0.0001	<0.0001	0.0001	NA	0.00045	<0.0001	0.0002	NA				0.0008
Selenio Total		0.17			0.0001	<0.0001	0.0003	NA	0.00011	<0.0001	0.0002	NA				0.0009
Plata Disuelta					<0.00005	<0.00005	<0.00005	NA	<0.00005	<0.00005	<0.00005	NA				<0.00005
Plata Total					<0.00005	<0.00005	0.00015	NA	<0.00005	<0.00005	0.00006	NA				0.00014
Sodio Disuelto					9.81	8.3	11.6	NA	40.1	9.4	87.8	NA				91.7
Sodio Total					9.46	7.8	11.8	NA	39.8	9.4	85.2	NA				94.8
Estroncio Disuelto					0.17	0.09	0.26	NA	1.23	0.1	2.99	NA				3.98
Estroncio Total					0.18	0.1	0.25	NA	1.23	0.11	2.91	NA				4.14
Talio Disuelto					<0.0001	<0.0001	0.0002	NA	0.0001	<0.0001	0.0001	NA				0.0003
Talio Total		0.002			<0.0001	<0.0001	0.0004	NA	0.0001	<0.0001	0.0002	NA				0.0003
Estaño Disuelto					<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	NA				<0.04
Estaño Total					<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	NA				<0.04
Titanio Disuelto					<0.005	<0.005	<0.005	NA	<0.005	<0.005	0.007	NA				<0.005
Titanio Total					0.092	<0.005	0.591	NA	0.2715	<0.005	0.171	NA				0.014
Uranio Disuelto					0.00013	<0.0001	0.0003	NA	0.00028	<0.0001	0.0006	NA				0.0001
Uranio Total					0.00038	<0.0001	0.0011	NA	0.00024	<0.0001	0.0005	NA				0.0001
Vanadio Disuelto					<0.005	<0.005	0.007	NA	0.0065	<0.005	0.015	NA				0.016
Vanadio Total					0.0059	<0.005	0.024	NA	<0.005	<0.005	0.006	NA				0.021
Zinc Disuelto					0.053	<0.01	0.1	NA	0.046	<0.02	0.1	NA				<0.01
Zinc Total		7.4		10	0.064	<0.01	0.12	NA	0.041	<0.01	0.06	NA				<0.01
Grasas y Aceites			10	10	<2.062	<2.062	<2.248	NA	<2.04	<2.04	<2.04	NA				<2.2
DQO			125		15.7	<10	40	NA	<2.04	<2.04	<2.04	NA				10
Cloruros		250			5	4	7	NA	<2.04	<2.04	<2.04	NA				73.8
Cianuro Total		0.14		1	0.004	<0.003	0.015	NA	<0.003	<0.003	<0.003	NA				<0.003
Fluoruros		4			0.125	<0.1	0.2	NA	0.6	0.1	1.2	NA				1.32
Nitratos/Nitritos como N					1.61	0.08	4.87	NA	2.46	0.03	4.9	NA				5.99
Amonio					<0.005	<0.005	0.07	NA	<0.05	<0.05	0.07	NA				2.88
Nitrógeno Kjeldahl (TKN)					3.53	<0.1	25.9	NA	0.32	<0.1	0.8	NA				4.0
Fosfatos					0.185	0.1	0.3	NA	0.19	0.1	0.4	NA				<0.06
Fósforo Disuelto (Orto)					0.06	0.03	0.1	NA	0.06	0.02	0.13	NA				<0.02
Fósforo Total			2	10	0.37	0.04	2.51	NA	0.08	0.03	0.19	NA				0.02
STD (TDS)		500			225	170	280	NA	754	170	1620	NA				1670
SST (TSS)			50	100	163.6	<5	780	NA	67	<5	320	NA				6.0
ST (TS)					346.3	200	1080	NA	850	230	1660	NA				1740
Sulfatos		250			26.3	10	42	NA	472.6	14	1600	NA				978
Alcalinidad Total					104	38	161	NA	80	44	119	NA				26.2
Hidrocarburos totales (TPH)					<0.1	<0.09	<0.1	NA	<0.1	<0.09	<0.1	NA				0.35

Dónde: **u.e.**: unidades exponenciales; **mg/L**: miligramos por litro; **µS/cm**: micro siemens por centímetro; **°C**: grados centígrados; **NMP/100ml**: número más probable en 100ml; **u Pt/Co**: unidades platino cobalto; **NR** = Cálculo No Realizado por falta de datos de línea base. Fuente: MSR, 2017.

Cuadro 5-3: Resultados de la Calidad del Agua Superficial, Proyecto Minero Escobal (2/4)

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	SW3-E				SW4-E				SW4A-E			
					Río El Dorado – Aguas arriba				Río El Dorado – sobre camino vecinal				Río El Dorado – Aguas abajo			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
pH de campo	u.e.	5.0-9.0	6.0-9.0	6.0-9.0	7.58	7.17	8.17	7.71	7.4	6.56	7.94	7.54				7.49
Temperatura (campo)	°C				19.8	17	24	22.0	21	17.2	24	22.6				21.7
Conductividad (campo)	μS/cm				219.7	80	374.5	301.3	308.9	120	612	1858				1937
Oxígeno disuelto (campo)					3.8	0.1	6.8	6.20	4.2	0.1	7.5	6.35				5.53
Cr VI	mg/L							<0.05				<0.05				<0.05
DBO								<10				<10				<10
Coliformes Fecales	NMP/100ml							9.4 x 10 ²				1.6 x 10 ⁴				1.6 x 10 ⁴
Color Real	U Pt/Co				NR	NR	NR	<1	NR	NR	NR	<1				<1
Materia Flotante								Ausente				Presente				Ausente
Turbidez	NTU							1.32				0.70				3.33
Aluminio Disuelto					0.061	<0.03	0.15	<0.03	0.03	<0.03	0.1	0.04				0.05
Aluminio Total		0.2			3.25	<0.03	17.4	0.15	5.72	0.1	36	0.05				0.1
Antimonio Disuelto					<0.0004	<0.0004	<0.0004	<0.0004	0.0007	0	0.0011	0.0088				0.009
Antimonio Total		0.006			<0.0004	<0.0004	<0.0004	<0.0004	0.0012	0.0005	0.0037	0.0094				0.01
Arsénico Disuelto					0.00797	0.0041	0.0139	0.0104	0.00541	0.0039	0.0072	0.0055				0.0094
Arsénico Total		0.01		0.1	0.00888	0.006	0.0137	0.0114	0.00873	0.0043	0.0326	0.0075				0.0106
Bario Disuelto					0.0915	0.051	0.118	0.125	0.1645	0.08	0.234	0.072				0.086
Bario Total		1			0.12445455	0.098	0.253	0.136	0.2356	0.144	0.567	0.082				0.097
Berilio Disuelto					<0.002	<0.0002	<0.01	<0.01	<0.002	<0.002	<0.01	<0.01				<0.01
Berilio Total		0.004			<0.002	<0.0002	<0.01	<0.01	0.002	<0.002	0.003	<0.01				<0.01
Bismuto Disuelto					<0.01	<0.01	<0.04	<0.04	0.04	<0.04	0.1	<0.04				<0.04
Bismuto Total					<0.01	<0.01	<0.04	<0.04	0.04	<0.04	0.04	<0.04				<0.04
Boro Disuelto					<0.01	<0.01	0.02	<0.01	0.008	<0.01	0.02	0.09				0.1
Boro Total					<0.01	<0.01	0.02	<0.01	0.012	<0.01	0.02	0.1				0.11
Cadmio Disuelto					<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR	NR	NR	<0.0001
Cadmio Total		0.003		0.1	<0.0001	<0.0001	0.0002	<0.0001	0.00012	<0.0001	0.0005	<0.0001				<0.0001
Calcio Disuelto					27.8	11.7	39.9	40.1	37.4	18.5	61.7	321				326
Calcio Total					27.9272727	12.3	38.7	41.1	38.3	17.2	58.9	345				346
Cromo Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01				<0.01
Cromo Total	mg/L	0.1		0.1	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.01				<0.01
Cobalto Disuelto					0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01				<0.01
Cobalto Total					0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	<0.01				<0.01
Cobre Disuelto					<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01				<0.01
Cobre Total		1.3		3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01				0.06
Galio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1
Galio Total					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1
Hierro Disuelto					0.033	<0.02	0.06	0.09	0.032	<0.02	0.15	<0.02				0.02
Hierro Total		0.3			1.9	0.06	10.2	0.22	3.8	0.09	26.5	0.03				0.1
Plomo Disuelto					<0.0001	<0.0001	0.0004	<0.0001	<0.0001	<0.0001	0.0002	0.0002				0.0003
Plomo Total		0.015		0.4	0.0013	<0.0001	0.0072	<0.0001	0.003	<0.0001	0.0198	0.0002				0.0005
Litio Disuelto					<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	0.037				0.043
Litio Total					<0.02	<0.02	<0.02	<0.008	0.02	<0.02	0.02	0.05				0.053
Magnesio Disuelto					2.6	1.3	3.5	3.3	4.2	2.4	7.3	23.5				23.9
Magnesio Total					2.7	1.6	3.5	3.4	4.6	2.5	7.3	24.6				24.8
Manganeso Disuelto					0.07418182	0.01	0.381	0.148	0.116	0.011	0.26	0.108				0.147
Manganeso Total		0.4			0.14745455	0.025	0.403	0.166	0.2844	0.101	1.23	0.119				0.161
Mercurio Disuelto					<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002				<0.0002
Mercurio Total		0.002		0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002				<0.0002
Molibdeno Disuelto					0.01	<0.01	0.01	<0.02	<0.01	<0.01	<0.01	0.02				0.02

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	SW3-E				SW4-E				SW4A-E				
					Río El Dorado – Aguas arriba				Río El Dorado – sobre camino vecinal				Río El Dorado – Aguas abajo				
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		
Molibdeno Total	mg/L				0.01	<0.01	0.01	<0.02	<0.01	<0.01	<0.01	0.02				0.02	
Níquel Disuelto					<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	0.02	<0.008				<0.008	
Níquel Total		0.61		2	<0.01	<0.01	0.05	<0.008	0.01	<0.01	0.06	<0.008				<0.008	
Potasio Disuelto					4.2	3.5	5.5	5	5.8	4.2	8.7	15.4				19.5	
Potasio Total					4.5	3.6	7	5.1	6.5	4.4	11.7	16.2				19.9	
Escandio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1	
Escandio Total					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1	
Selenio Disuelto					<0.0001	<0.0001	0.0001	<0.0001	0.00014	<0.0001	0.0005	0.0004				0.0004	
Selenio Total		0.17			<0.0001	<0.0001	0.0001	<0.0001	0.0002	<0.0001	0.0002	0.0005				0.0005	
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005				<0.00005	
Plata Total					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00011	<0.00005				<0.00005	
Sodio Disuelto					12.65	7.7	16.6	15.9	12.44	9	15.6	77.7				79.7	
Sodio Total					12.17	7.5	15.4	16.1	12.13	8.6	15.2	81.4				81.6	
Estroncio Disuelto					0.19	0.06	0.3	0.215	0.22	0.09	0.36	3.07				3.22	
Estroncio Total					0.18818182	0.08	0.3	0.227	0.228	0.11	0.33	3.21				3.27	
Talio Disuelto					<0.0001	<0.0001	0.0005	<0.0001	0.0001	<0.0001	0.0001	0.0002				0.0002	
Talio Total		0.002			<0.0001	<0.0001	0.0002	<0.0001	0.00017	<0.0001	0.0007	0.0001				0.0001	
Estaño Disuelto					<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04				<0.04	
Estaño Total					<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04				<0.04	
Titanio Disuelto					<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005				<0.005	
Titanio Total					0.071	<0.005	0.307	0.01	0.127	0.005	0.534	0.014				0.016	
Uranio Disuelto					<0.0001	<0.0001	0.0002	<0.0001	0.00012	<0.0001	0.0004	0.0003		NR	NR	NR	0.0003
Uranio Total					0.00019	<0.0001	0.0005	<0.0001	0.00027	<0.0001	0.0009	0.0002				0.0002	
Vanadio Disuelto					<0.005	<0.005	0.008	<0.005	<0.005	<0.005	0.011	<0.005				0.006	
Vanadio Total					0.0051	<0.005	0.019	<0.005	0.0085	<0.005	0.04	0.006				0.006	
Zinc Disuelto					0.068	<0.01	0.14	<0.01	0.061	0.05	0.14	<0.01				<0.01	
Zinc Total		7.4		10	0.174	<0.01	1.01	<0.01	0.065	0.01	0.17	<0.01				0.01	
Grasas y Aceites				10	<2.062	<2.04	<2.326	<2.1	<2.062	<2.02	<2.084	<2.1				<2.2	
DQO			125		10.9	<10	40	<10	16.8	<10	60	<10				16	
Cloruros		250			2.7	2	3	3.6	8.5	4	16	71.3				76.1	
Cianuro Total	0.14		1	<0.003	<0.003	0.015	<0.003	<0.003	<0.003	0.014	<0.003				<0.003		
Fluoruros	4			<0.003	<0.003	0.015	0.22	0.15	0.1	0.2	0.72				0.79		
Nitratos/Nitritos como N				0.59	<0.02	1.51	<0.02	4.49	1.96	10.1	5.36				6.89		
Amonio				0.05	<0.05	0.21	<0.05	0.059	<0.05	0.15	<0.05				0.40		
Nitrógeno Kjeldahl (TKN)				0.35	<0.1	0.6	<0.1	0.58	0.1	1.3	<0.1				1.3		
Fosfatos				0.12	0.1	0.4	0.12	0.36	0.1	1.2	1.15				2.98		
Fósforo Disuelto (Orto)				0.04	0.02	0.12	0.04	0.12	0.03	0.39	0.36				0.90		
Fósforo Total		2	10	0.05	0.02	0.14	0.05	0.17	0.04	0.39	0.39				0.99		
STD (TDS)	500			183.636364	140	220	250	233.6	150	350	1650				1640		
SST (TSS)		50	100	48	5	340	<5	115	<5	880	<5				<5		
ST (TS)				231.8	140	500	262	378.2	260	1180	1650				1700		
Sulfatos	250			16.9	4	25	19.6	27.5	10	57	867.0				883		
Alcalinidad Total				83	38	118	134	80	45	102	76.7				78.9		
Hidrocarburos totales (TPH)				<0.1	<0.09	<0.2	<0.1	<0.1	<0.09	<0.1	<0.1				<0.1		

Dónde: u.e.: unidades exponenciales; mg/L: miligramos por litro; µS/cm: micro siemens por centímetro; °C: grados centígrados; NMP/100ml: número más probable en 100ml; u Pt/Co: unidades platino cobalto; NR = Cálculo No Realizado por falta de datos de línea base. Fuente: MSR, 2017.

Cuadro 5-3: Resultados de la Calidad del Agua Superficial, Proyecto Minero Escobal (3/4)

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	SW5-E				SW6-E				SW7-E			
					Río Tapalapa – Aguas arriba				Río Los Vados				Quebrada La Honda			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
pH de campo	u.e.	5.0-9.0	6.0-9.0	6.0-9.0	7.5	7.1	8	7.92	7.4	7.1	7.8	7.27	7.5	6.9	8	
Temperatura (campo)	°C				17.4	14.5	21.5	16.7	19.4	12.2	27.3	19.7	18.7	15	21.3	
Conductividad (campo)	µS/cm				72.1	0.1	160.2	285.8	259	60	948	480.2	216	120	416.2	
Oxígeno disuelto (campo)					4	0	8	7.71	4	0	8.3	8.18	3.9	0.1	7.5	
Cr VI	mg/L							<0.05				<0.05				
DBO								<10				<10				
Coliformes Fecales	NMP/100ml							5.4 x 10 ³				4.9 x 10 ²				
Color Real	U Pt/Co				NR	NR	NR	<1				<1				
Materia Flotante								Ausente				Ausente				
Turbidez	NTU							12.6				1.05				
Aluminio Disuelto					0.055	<0.03	0.14	0.08	0.031	<0.03	0.08	<0.03	0.033	<0.03	0.13	
Aluminio Total		0.2			1.09	<0.03	3.7	0.29	1.89	<0.03	8.1	<0.03	3.05	0.1	16.4	
Antimonio Disuelto					<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0013	<0.0004	<0.0004	<0.0004	0.0009	
Antimonio Total		0.006			<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0005	<0.0004	0.0007	
Arsénico Disuelto					0.00139	0.0005	0.0024	0.0012	0.0032	0.0007	0.0076	0.0066	0.00382	0.0022	0.0054	
Arsénico Total		0.01		0.1	0.00177	0.0013	0.0028	0.0012	0.00387	0.0025	0.0074	0.0072	0.00446	0.003	0.0061	
Bario Disuelto					0.0447	0.023	0.072	0.077	0.0618	0.027	0.136	0.096	0.0946	0.052	0.143	
Bario Total		1			0.0556	0.039	0.069	0.093	0.0806	0.055	0.136	0.112	0.2142	0.088	0.99	
Berilio Disuelto					<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.01	
Berilio Total		0.004			0.002	<0.002	<0.01	<0.01	<0.002	<0.002	0.003	<0.01	<0.002	<0.002	0.003	
Bismuto Disuelto					<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.1	<0.04	<0.04	<0.04	0.04	
Bismuto Total					<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Boro Disuelto					0.01	<0.01	0.01	<0.01	0.361	<0.01	1.8	0.66	<0.01	<0.01	0.01	
Boro Total					0.01	<0.01	0.02	<0.01	0.379	<0.01	1.93	0.73	0.013	<0.01	0.02	
Cadmio Disuelto					<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Cadmio Total		0.003		0.1	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0003	
Calcio Disuelto					7.9	3.4	13.7	12.3	15.1	5.4	38.9	28	23.1	11.2	38.1	
Calcio Total					7.73	3.4	13.1	13.2	14.81	5.9	37.5	29.9	23.04	11.5	36.7	
Cromo Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Cromo Total		0.1		0.1	0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	
Cobalto Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	
Cobalto Total					<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	
Cobre Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Cobre Total		1.3		3	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Galio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Galio Total					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Hierro Disuelto					0.055	0.03	0.09	0.12	0.097	<0.02	0.28	0.07	0.022	<0.02	0.07	
Hierro Total		0.3			0.7	0.16	1.8	0.32	1.3	0.33	4.8	0.17	1.8	0.08	9.5	
Plomo Disuelto					<0.0001	<0.0001	0.0001	<0.0001	0.0002	<0.0001	0.0014	<0.0001	<0.0001	<0.0001	<0.0001	
Plomo Total		0.015		0.4	0.0003	<0.0001	0.0012	0.0028	0.0007	<0.0001	0.0028	0.0003	0.0015	<0.0001	0.0083	
Litio Disuelto					<0.02	<0.02	<0.02	<0.008	0.13	<0.02	0.67	0.223	<0.02	<0.02	<0.02	
Litio Total					<0.02	<0.02	<0.02	<0.008	0.133	<0.02	0.68	0.244	<0.02	<0.02	<0.02	
Magnesio Disuelto					1.5	0.8	2.5	2.3	3	1.4	7.4	5.3	4.1	2.2	6.4	
Magnesio Total					1.5	0.9	2.5	2.5	3.1	1.8	7.5	5.6	4.3	2.6	6.5	
Manganeso Disuelto					0.025	0.006	0.047	0.037	0.114	<0.005	0.551	0.037	0.032	0.014	0.074	
Manganeso Total		0.4			0.0406	0.014	0.062	0.046	0.1482	0.04	0.543	0.048	0.0981	0.019	0.342	
Mercurio Disuelto					<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Mercurio Total		0.002		0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Molibdeno Disuelto					<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	

NA

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	SW5-E				SW6-E				SW7-E			
					Río Tapalapa – Aguas arriba				Río Los Vados				Quebrada La Honda			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Molibdeno Total					<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	
Níquel Disuelto					<0.01	<0.01	0.01	<0.008	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	
Níquel Total		0.61		2	0.013	<0.01	0.03	<0.008	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	0.04	
Potasio Disuelto					3	2.5	3.7	3.6	4.1	3.2	7.1	5.7	4.1	3.6	5.4	
Potasio Total					3	2.2	4.1	3.9	4.2	3.1	7.5	6	4.5	3.6	7	
Escandio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Escandio Total					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Selenio Disuelto					<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.0003	0.0002	<0.0001	<0.0001	<0.0001	
Selenio Total		0.17			<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0002	
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	
Plata Total					<0.00005	<0.00005	<0.00005	0.00126	<0.00005	<0.00005	<0.00005	0.00007	<0.00005	<0.00005	0.00006	
Sodio Disuelto					6.34	3.7	10.8	8.4	32.16	6	135	56.8	11.69	8.7	15.4	
Sodio Total					5.99	3.4	9.4	8.8	31.11	5.3	124	59.6	11.45	8.3	15.5	
Estroncio Disuelto					0.06	0.02	0.09	0.101	0.12	0.03	0.33	0.208	0.17	0.07	0.29	
Estroncio Total					0.057	0.02	0.08	0.114	0.122	0.04	0.35	0.228	0.174	0.09	0.28	
Talio Disuelto					<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0001	
Talio Total		0.002			<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0004	<0.0001	<0.0001	<0.0001	0.0002	
Estaño Disuelto					<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	
Estaño Total					<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	
Titanio Disuelto					<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	0.006	
Titanio Total					0.027	<0.005	0.094	0.011	0.05	<0.005	0.22	<0.005	0.069	<0.005	0.325	
Uranio Disuelto					<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Uranio Total					<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0003	<0.0001	0.00013	<0.0001	0.0005	
Vanadio Disuelto					<0.005	<0.005	0.007	<0.005	<0.005	<0.005	0.01	<0.005	<0.0005	<0.0005	0.008	
Vanadio Total					<0.005	<0.005	0.009	<0.005	<0.005	<0.005	0.005	<0.005	0.0047	<0.0005	0.018	
Zinc Disuelto					0.04	<0.01	0.1	<0.01	<0.1	<0.1	0.4	<0.01	0.131	<0.01	0.81	
Zinc Total		7.4		10	0.197	<0.01	1.6	<0.01	<0.1	<0.1	0.22	<0.01	0.339	<0.01	1.87	
Grasas y Aceites				10	<2.062	<2.02	<2.084	<2	<2.062	<2.02	<2.084	<2.4	<2.062	<2.02	<2.084	
DQO			125		6.5	<10	20	<10	<10	<10	30	<10	10	<10	40	
Cloruros		250			1.8	1	3	2.6	43.9	3	230	72	3	5	3	
Cianuro Total		0.14		1	0.003	<0.003	0.014	<0.003	<0.003	<0.003	0.014	<0.003	<0.003	0.015	<0.003	
Fluoruros		4			<0.1	<0.1	<0.1	0.10	0.11	<0.1	0.3	0.27	<0.1	0.2	0.1	
Nitratos/Nitritos como N					0.13	0.03	0.42	<0.02	0.3	<0.02	1.22	<0.02	<0.1	3.53	0.19	
Amonio					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	
Nitrógeno Kjeldahl (TKN)					0.21	<0.1	0.4	0.3	0.2	0.1	0.5	0.1	<0.1	0.7	0.4	
Fosfatos					0.04	<0.03	0.2	<0.06	0.08	<0.03	0.3	0.09	0.1	0.2	0.09	
Fósforo Disuelto (Orto)					0.15	<0.01	0.06	<0.02	0.03	<0.01	0.09	0.03	0.03	0.08	0.03	
Fósforo Total			2	10	0.02	<0.01	0.05	<0.02	0.04	0.02	0.08	0.04	0.03	0.19	0.19	
STD (TDS)		500			84	60	110	120	187	90	540	326	140	240	100	
SST (TSS)			50	100	9	<5	32	<5	21	<5	105	<5	<5	330	6	
ST (TS)					97	70	130	130	221	120	550	336	150	610	140	
Sulfatos		250			16.5	<10	47	32.1	14	<10	23	39.7	9	38	19.4	
Alcalinidad Total					25	13	43	32.2	48	22	108	85.2	30	101	54	
Hidrocarburos totales (TPH)					<0.1	<0.09	<0.09	<0.09	11.54375	<0.1	92	<0.1	<0.09	<0.1	<0.1	

NA

*Al momento de tomar la muestra el cuerpo de agua se encontraba sin agua. Dónde: **u.e.:** unidades exponenciales; **mg/L:** miligramos por litro; **µS/cm:** micro siemens por centímetro; **°C:** grados centígrados; **NMP/100ml:** número más probable en 100ml; **u Pt/Co:** unidades platino cobalto; **NA:** no analizado por no contener agua la estación de monitoreo; **NR =** Cálculo No Realizado por falta de datos de línea base. Fuente: MSR, 2017.

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Cuadro 5-3: Resultados de la Calidad del Agua Superficial, Proyecto Minero Escobal (4/4)

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	SW8-E				SW9-E			
					Aguas debajo de la confluencia del Río San Rafael Y el Río El Dorado				Río Tapalapa, aguas debajo de la confluencia del Río San Rafael Río Los Vados y Quebrada La Honda			
					Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
pH de campo	u.e.	5.0-9.0	6.0-9.0	6.0-9.0	7.49	7	9.8	7.04	7.86	7.5	10.7	8.27
Temperatura (campo)	°C				22.1	18.9	25.1	21.7	21.8	19.1	24.2	22.4
Conductividad (campo)	µS/cm				363.7	186.8	807.6	899.4	267.4	121.8	518	584.8
Oxígeno disuelto (campo)	mg/L				5.14	0.28	7.48	3.09	6.2	0.8	8.5	7.78
Cr VI					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
DBO	NMP/100ml				15	15	25	47	<10	<10	<10	<10
Coliformes Fecales					2x10 ⁶	2x10 ⁴	5x10 ⁶	5.4 x 10 ⁶	9x10 ⁴	1x10 ²	2x10 ⁵	1.3 x 10 ³
Color Real	U Pt/Co				172	19	351	<1	342	29	824	34
Materia Flotante								Presente				Presente
Turbidez	NTU				14.15	6.09	22.2	16.2	25.72	4.93	46.5	1.39
Aluminio Disuelto	mg/L				0.033	<0.03	0.06	<0.03	0.087	<0.03	0.22	<0.03
Aluminio Total		0.2			2.39	0.04	7.35	0.16	2.96	0.4	8.6	0.14
Antimonio Disuelto					0.001	<0.0004	0.0033	0.0033	0.0006	<0.0004	0.0013	0.0006
Antimonio Total		0.006			0.001	<0.0004	0.0027	0.0036	0.0007	<0.0004	0.0012	0.0011
Arsénico Disuelto					0.0043	0.0025	0.0064	0.0049	0.004	0.0023	0.0057	0.0051
Arsénico Total		0.01	0.1		0.006	0.0041	0.0096	0.0053	0.0042	0.002	0.006	0.0055
Bario Disuelto					0.107	0.074	0.143	0.114	0.094	0.056	0.135	0.094
Bario Total		1			0.136	0.102	0.185	0.128	0.121	0.09	0.154	0.107
Berilio Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Berilio Total		0.004			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bismuto Disuelto					<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Bismuto Total					<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Boro Disuelto					0.022	<0.01	0.05	0.04	0.043	<0.01	0.09	0.12
Boro Total					0.023	<0.01	0.06	0.05	0.041	<0.01	0.1	0.13
Cadmio Disuelto					<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cadmio Total		0.003	0.1		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Calcio Disuelto					50.4	17.5	156	113	35.7	18.2	78.3	66.1
Calcio Total					52.1	18.6	156	121	36.2	18.5	79.7	69.3
Cromo Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cromo Total		0.1	0.1		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalto Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalto Total					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobre Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobre Total		1.3	3		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Galio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Galio Total					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hierro Disuelto					0.06	0.02	0.11	0.12	0.09	<0.02	0.17	<0.02
Hierro Total		0.3			1.53	0.05	4.36	0.28	1	0.25	2.2	0.11
Plomo Disuelto					0.0001	<0.0001	0.0003	0.0002	0.0002	<0.0001	0.0005	<0.0001
Plomo Total		0.015	0.4		0.003	<0.0001	0.0089	0.0005	0.0022	0.0002	0.008	<0.0001
Litio Disuelto				<0.02	<0.02	0.04	0.025	<0.02	<0.02	0.04	0.035	
Litio Total				<0.02	<0.02	0.04	0.033	<0.02	<0.02	0.04	0.043	
Magnesio Disuelto				6.3	3.2	14.7	9.5	6	3.3	9.7	10.5	
Magnesio Total				6.6	3.3	14.8	10	6.2	3.4	10.1	10.8	
Manganeso Disuelto				0.095	0.009	0.118	0.229	0.057	0.023	0.148	0.015	
Manganeso Total	0.4			0.1808	0.047	0.349	0.243	0.115	0.043	0.187	0.036	
Mercurio Disuelto				<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	SW8-E				SW9-E			
					Aguas debajo de la confluencia del Río San Rafael Y el Río El Dorado				Río Tapalapa, aguas debajo de la confluencia del Río San Rafael Río Los Vados y Quebrada La Honda			
					Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Mercurio Total		0.002		0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molibdeno Disuelto					<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02
Molibdeno Total					<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02
Níquel Disuelto					<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008
Níquel Total		0.61		2	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008
Potasio Disuelto					6.5	5.8	7.4	10	6	4.5	8.1	6
Potasio Total					6.8	6.4	7.8	10.4	6.1	4.8	8.5	6.3
Escandio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Escandio Total					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Selenio Disuelto					<0.0001	<0.0001	0.0002	0.0002	<0.0001	<0.0001	0.0001	0.0001
Selenio Total		0.17			0.00011	<0.0001	0.0002	0.0002	<0.0001	<0.0001	0.0001	0.0002
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Plata Total					<0.00005	<0.00005	0.00007	<0.00005	<0.00005	<0.00005	0.00007	<0.00005
Sodio Disuelto					18.8	12.3	33.7	45	17.6	10.7	26.9	35.7
Sodio Total					18.4	12.9	34.3	47	17.4	11	28.5	37
Estroncio Disuelto					0.44	0.16	1.5	1.32	0.29	0.14	0.71	0.604
Estroncio Total					0.44	0.16	1.48	1.41	0.295	0.14	0.73	0.638
Talio Disuelto					<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Talio Total		0.002			<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Estaño Disuelto					<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04
Estaño Total					<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04
Titanio Disuelto					<0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.009	<0.005
Titanio Total					0.069	<0.005	0.195	0.013	0.084	0.015	0.237	0.011
Uranio Disuelto	mg/L				0.00014	<0.0001	0.0003	0.0001	0.00014	<0.0001	0.0002	0.0002
Uranio Total					0.00022	0.0001	0.0003	0.0001	0.00022	0.0002	0.0003	0.0001
Vanadio Disuelto					<0.005	<0.005	0.006	<0.005	<0.005	<0.005	0.006	0.005
Vanadio Total					<0.005	<0.005	0.01	<0.005	0.0054	<0.005	0.012	<0.005
Zinc Disuelto					<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.03	<0.01
Zinc Total		7.4		10	0.015	<0.01	0.04	<0.01	<0.01	<0.01	0.03	<0.01
Grasas y Aceites			10	10	<2.04	<2.02	<2.062	<2.5	<2.02	<2.02	<5	<2.4
DQO			125		20	<10	40	27	17.8	<10	35	<10
Cloruros		250			10	7	19	30.2	12	6	20	29.6
Cianuro Total		0.14		1	0.007	<0.003	0.014	<0.003	0.006	<0.003	0.013	<0.003
Fluoruros		4			0.27	0.1	0.6	0.44	0.006	<0.003	0.013	0.39
Nitratos/Nitritos como N					3.07	2.01	5.23	2.75	1.97	1.14	3.85	1.04
Amonio					0.24	<0.05	0.58	3.70	0.129	<0.05	0.22	<0.05
Nitrógeno Kjeldahl (TKN)					0.74	<0.1	1.6	4.0	0.57	0.3	0.9	<0.1
Fosfatos					0.55	0.3	1	2.51	0.49	0.22	1.3	0.43
Fósforo Disuelto (Orto)					0.18	0.08	0.33	0.73	0.18	0.09	0.49	0.15
Fósforo Total			2	10	0.27	0.12	0.51	0.95	0.25	0.09	0.58	0.14
STD (TDS)		500			312	160	750	620	255	160	440	456
SST (TSS)			50	100	34	<5	102	9.0	73	<5	340	<5
ST (TS)					362	180	750	684	310	200	450	484
Sulfatos		250			91	22	360	261	60	25	169	150
Alcalinidad Total					79	50	110	116	70	45	90	96.7
Hidrocarburos totales (TPH)					<0.01	<0.01	<0.01	0.2	70	45	90	<0.1

Dónde: u.e.: unidades exponenciales; mg/L: miligramos por litro; µS/cm: micro siemens por centímetro; °C: grados centígrados; NMP/100ml: número más probable en 100ml; u Pt/Co: unidades platino cobalto. Fuente: MSR, 2016.

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5.2.3 Agua Subterránea

En el Cuadro 5-4 se presentan los resultados de la calidad del agua subterránea (manantiales) y los resultados de laboratorio se presentan en el Anexo electrónico adjunto a este documento. En términos generales los parámetros analizados en las estaciones GW-1A, GW-2 y GW-3 cumplen con el Acuerdo 236-2006 y todos los valores se encuentran dentro del rango estadístico de la línea base.

La temperatura de las estaciones muestreadas se encontró entre 18.7 y 36.8 °C. La lectura menor de pH se obtuvo en la estación GW-3 y GW1-A (6.34 u.e.) y la mayor en la estación GW-2 (6.99 u.e.). Los Sólidos Suspendidos Totales (**SST**) se registraron únicamente en la estación GW-2. Las concentraciones registradas de Cloruros están por debajo de las guías de la USEPA (250 mg/L), a excepción de la estación GW-2.

La concentración de sulfatos está por debajo de las guías de la USEPA (250mg/L) en todas las estaciones de monitoreo. Los sólidos disueltos totales (**TDS**) están por debajo de las directrices de la USEPA (500mg/L) en todas las estaciones de monitoreo, a excepción de GW-3.

El Cadmio, Cianuro, Berilio, Bismuto, Cobalto, Cobre, Cromo, Galio, Litio, Cromo hexavalente, Mercurio, Molibdeno, Níquel, Escandio, Talio, Estaño, Titanio, Plata, Uranio cianuro y no fueron detectados en ninguna de las estaciones. El Selenio fue detectado en la estación GW-3 (0.0006 mg/L) por debajo de la guía de la USEPA (0.17mg/L). El Antimonio fue detectado en las estaciones GW-2 en concentraciones por debajo de la guía dada por la USEPA (0.01 mg/L). En todas las estaciones se registró Arsénico. Sin embargo las concentraciones registradas se encuentran por debajo de los valores máximos establecidos durante la línea base y todos por debajo de las guías sugeridas por USEPA (0.01 mg/L) y el Acuerdo (0.1 mg/L).

Cuadro 5-4: Resultados de la Calidad de Agua Subterránea (manantiales), Proyecto Minero Escobal

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	GW1-A				GW-2				GW-3				GW-4				GW-5			
					Nacimiento Aldea El Volcancito				Nacimiento Aldea El Fucío				Nacimiento – Zona central del Proyecto (frente al portal oeste)				Manantial – Aguas arriba del depósito de colas				Manantial – Aguas arriba del depósito de colas debajo de GW-4			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
pH de campo	u.e.	5.0-9.0	6.0-9.0	6.0-9.0	7.08	6.89	7.26	6.34	6.54	6.01	7.16	6.99	6.54	6.21	7.13	6.34	6.13	6.13	6.13					
Temperatura de campo	°C				15.2	14.8	15.6	18.7	21.4	19	23.7	36.8	19.4	18.5	21	24.1	18.1	18.1	18.1					
Conductividad de campo	µS/cm				229.8	223	236.5	111.7	323.4	111.3	500.5	119.8	315.3	236.7	501.1	688.9	147.3	147.3	147.3					
Oxígeno Disuelto de campo	mg/L				0.1	0.03	0.17	7.00	1.18	0.13	2.35	6.56	0.68	0.03	1.26	4.73	0.14	0.14	0.14					
Turbidez	NTU							4.93				36.8				2.59								
Materia Flotante				Ausente				NA				Presente				Ausente								
Color Aparente	u Pt/Co			500				65				437				<1								
Color Real	u Pt/Co			500	NR	NR	NR	<1	NR	NR	NR	27	NR	NR	NR	<1	NR	NR	NR					
Cr (VI)	mg/L			0.1				<0.05				<0.05				<0.05								
Coliformes Fecales	NMP/100mL			<1x10 ⁴				23				4.9 x 10 ²				23								
Aluminio Disuelto		0.2			<0.03	<0.03	<0.03	<0.03	0.075	<0.03	0.24	0.16	<0.03	<0.03	0.04	<0.03	1.42	1.42	1.42					
Antimonio Disuelto		0.01			<0.0004	<0.0004	<0.0004	<0.0004	0.00078	<0.0004	0.0011	0.0008	0.0004	<0.0004	0.001	<0.0004	<0.0004	<0.0004	<0.0004					
Arsénico Disuelto		0.01	0.1		0.001	0.0008	0.0011	0.001	0.0156	0.0043	0.0299	0.0184	0.0059	0.0037	0.0115	0.0015	0.0008	0.0008	0.0008					
Bario Disuelto		1			0.025	0.022	0.028	0.066	0.24	0.125	0.451	0.091	0.186	0.12	0.328	0.12	0.127	0.127	0.127					
Berilio Disuelto		0.004			<0.01	<0.002	<0.01	<0.01	<0.01	<0.002	<0.01	<0.01	<0.01	<0.002	<0.01	<0.01	<0.002	<0.002	<0.002					
Bismuto Disuelto					<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04					
Boro Disuelto					<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01					
Cadmio Disuelto		0.003	0.1		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					
Calcio Disuelto					5.7	5.1	6.2	6.8	33.5	9.6	65.3	12.2	31.6	25.7	43.4	82.4	4.4	4.4	4.4					
Cromo Disuelto		0.1	0.1		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Cobalto Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Cobre Disuelto		1.3	3		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Galio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
Hierro Disuelto		0.3			0.02	<0.02	0.03	0.03	0.103	0.03	0.17	0.15	0.103	<0.02	0.33	<0.02	0.74	0.74	0.74					
Plomo Disuelto		0.015	0.4		<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0009	0.0009	0.0009					
Litio Disuelto					<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	NA	NR	NR	NR	NA
Magnesio Disuelto					3.1	2.9	3.3	2.8	5.9	1.8	12	2.3	4.9	3.3	8.3	19	2.6	2.6	2.6					
Manganeso Disuelto		0.05			<0.005	<0.005	<0.005	0.083	0.123	0.02	0.356	0.213	0.057	<0.005	0.133	<0.005	0.069	0.069	0.069					
Mercurio Disuelto		0.002	0.01		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002					
Molibdeno Disuelto					<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01					
Níquel Disuelto		0.61	2		<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01					
Potasio Disuelto					7.3	5.9	8.6	5.6	2.9	1.3	4.3	2.3	3.8	2.5	5	9.4	4.6	4.6	4.6					
Escandio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
Selenio Disuelto		0.17			0.0002	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006	<0.0001	<0.0001	<0.0001					
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005					
Sodio Disuelto					17.6	16.9	18.2	8.8	13.5	7.2	22	6.2	11.5	9.3	16.4	23.6	10.3	10.3	10.3					
Estroncio Disuelto					0.03	0.03	0.03	0.062	0.26	0.08	0.56	0.098	0.2	0.12	0.37	0.442	0.03	0.03	0.03					
Talio Disuelto					<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.1	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001					
Estaño Disuelto					<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1					
Titanio Disuelto					<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.042	0.042	0.042					
Uranio Disuelto					<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0002					
Vanadio Disuelto					<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.006	0.006					
Zinc Disuelto		7.4	10		<0.01	<0.01	<0.01	0.01	<0.1	<0.1	0.1	<0.01	0.94	<0.01	3.47	<0.01	0.1	0.1	0.1					
Cloruros		250			15	14	16	129	4	2	7	121	5	3	6	684	4	4	4					
Cianuro Total		0.14	1		0.008	<0.003	0.014	<0.003	0.004	<0.003	0.012	<0.003	0.0046	<0.003	0.014	<0.003	<0.003	<0.003	<0.003					
Fluoruros					<0.1	<0.1	<0.1	29	<0.1	<0.1	<0.1	40	0.15	0.1	0.2	284	<0.1	<0.1	<0.1					
Nitratos/Nitritos como N					2.19	1.9	2.48	0.17	0.74	0.14	1.1	<0.05	1.19	0.05	3.16	<0.05	0.07	0.07	0.07					
Amonio					<0.05	<0.05	0.07	<0.1	0.059	<0.05	0.16	1.4	0.065	<0.05	0.14	<0.1	<0.05	<0.05	<0.05					
Nitrógeno Kjeldahl (TKN)					0.7	0.3	1.1		0.63	0.2	0.9		0.46	<0.05	1.2		0.3	0.3	0.3					
Fosfatos					0.2	0.1	0.2	0.16	0.4	0.1	0.7	0.12	0.3	0.1	0.5	<0.06	0.09	0.09	0.09					
Fósforo Total			2	10	0.1	0.02	0.17	0.06	0.18	0.09	0.27	<0.02	0.1	0.05	0.15	<0.02	0.03	0.03	0.03					

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	GW1-A				GW-2				GW-3				GW-4				GW-5			
					Nacimiento Aldea El Volcancito				Nacimiento Aldea El Fucío				Nacimiento – Zona central del Proyecto (frente al portal oeste)				Manantial – Aguas arriba del depósito de colas				Manantial – Aguas arriba del depósito de colas debajo de GW-4			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
STD (TDS)	mg/L	500			190	190	190	162	223	130	350	160	213	190	260	582	170	170	170	NA	NR	NR	NR	NA
SST (TSS)		50	100	6.5	6	7	<5	7.7	6	9	23.0	39	5	105	<5	206	206	206						
ST (TS)				200	180	220	178	237.5	140	380	178	217.5	170	270	582	360	360	360						
Sulfatos		250		12.5	11	14	<1	43	7	90	10.4	30	16	71	240	7	7	7						
Alcalinidad Total				31	31	31	35.4	0.18	0.09	0.27	49.4	83	71	97	77.5	35	35	35						

*Sin agua al momento del muestreo. *Al momento de tomar la muestra no había flujo suficiente para tomar la muestra. u.e.: unidades exponenciales. mg/L: miligramos por litro. µS/cm: micro siemens por centímetro. °C: grados centígrados. NMP/100ml: número más probable en 100ml. u Pt/Co: unidades platino cobalto. NA: no analizado. NR= Cálculo No Realizado por falta de datos de línea base. Fuente: MSR, 2017.

Cuadro 5-5: Resultados de la medición de calidad de agua subterránea (Pozos de Monitoreo, Producción y Artesanal), Proyecto Minero Escobal (1/3)

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW-2				MW-3				MW-4				MW-5			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
pH de campo	u.e.	5.0-9.0	6.0-9.0	6.0-9.0	6.56	6.37	6.77		6.44	6.34	6.49	6.61	6.32	6.23	6.41	6.53	6.19	6.04	6.34	6.35
Temperatura de campo	°C				24.4	23.4	25.1		24.1	23.7	24.5	25.7	23.3	22.2	24.4	24.5	23.4	23	24.6	24.4
Conductividad de campo	µS/cm				427.5	211.9	1001.3		803.9	741.6	829.1	608.0	916.9	872.1	944.8	548.1	469.7	401.4	494.1	868.2
Oxígeno Disuelto de campo	mg/L				0.75	0.3	1.21		0.65	0.11	1.44	4.95	0.97	0.48	1.93	4.83	0.82	0.19	1.77	3.81
Turbidez	NTU											0.31				4.50				0.56
Materia flotante	Visual			Ausente								Ausente				Ausente				Ausente
Color Aparente	u Pt/Co			500	NR	NR	NR		NR	NR	NR	<1	NR	NR	NR	11	NR	NR	NR	8
Color Real	u Pt/Co											<1				<1				<1
Cr (VI)	mg/L			0.1								<0.05				<0.05				<0.05
Coliformes Fecales	NMP/100mL			<1x10 ⁴								<1.8				<1.8				<1.8
Aluminio Disuelto		0.2			0.038	<0.03	0.07		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Antimonio Disuelto		0.01			<0.0004	<0.0004	<0.0004		<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0004
Arsénico Disuelto		0.01		0.1	0.0011	0.0008	0.0014		0.0023	0.0021	0.0027	0.0019	0.0023	0.0021	0.0028	0.0019	0.0013	0.001	0.0016	0.0008
Bario Disuelto		1			0.03	0.024	0.039		0.036	0.032	0.041	0.03	0.042	0.038	0.047	0.02	0.162	0.157	0.166	0.034
Berilio Disuelto		0.004			<0.002	<0.002	0.003		<0.002	<0.002	0.003	<0.01	<0.002	<0.002	0.003	<0.01	<0.002	<0.002	0.003	<0.01
Bismuto Disuelto					<0.04	<0.04	<0.04		<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Boro Disuelto					0.014	<0.01	0.04		0.06	0.05	0.07	0.07	0.078	0.06	0.09	0.05	0.015	<0.01	0.03	0.03
Cadmio Disuelto		0.003		0.1	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcio Disuelto					20.6	9.4	48.7		80.3	76.4	83.3	78.2	100	93	107	65.5	40.8	39.2	42.2	116
Cromo Disuelto		0.1		0.1	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalto Disuelto					<0.01	<0.01	<0.1		<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobre Disuelto		1.3		3	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Galio Disuelto					<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hierro Disuelto		0.3			<0.02	<0.02	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Plomo Disuelto		0.015		0.4	<0.0001	<0.0001	0.0001	NA	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Litio Disuelto					<0.02	<0.02	<0.02		<0.02	<0.02	0.02	0.013	<0.02	<0.02	0.02	0.013	<0.02	<0.02	<0.02	<0.008
Magnesio Disuelto					3.5	2.4	6.1		10.3	10.1	10.7	9.6	11.3	10.9	11.6	7.2	7.3	6.8	7.6	15.5
Manganeso Disuelto		0.05			0.108	0.03	0.308		<0.005	<0.005	0.008	<0.005	0.009	<0.005	0.021	<0.005	<0.005	<0.005	<0.005	<0.005
Mercurio Disuelto		0.002		0.01	<0.0002	<0.0002	<0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molibdeno Disuelto	mg/L				<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02
Níquel Disuelto		0.61		2	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008
Potasio Disuelto					2.2	1.9	2.4		4.2	3.9	4.6	4	4.7	4.5	5.2	3.7	6	5.5	6.5	7.1
Escandio Disuelto					<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Selenio Disuelto		0.17			0.0002	0.0001	0.0002		0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0003	0.0003	0.0004	0.0003	0.0004	0.0006
Plata Disuelta					<0.00005	<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Sodio Disuelto					22	17.4	33.6		29.5	28.2	30.9	28.2	32.3	30.4	35.8	24.1	16.9	15.6	19.1	27.9
Estroncio Disuelto					0.18	0.07	0.46		0.74	0.71	0.77	0.756	0.89	0.84	0.98	0.619	0.27	0.26	0.29	0.461
Talio Disuelto					<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Estaño Disuelto					<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04
Titanio Disuelto					<0.005	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007
Uranio Disuelto					0.00016	<0.0001	0.0005		0.0002	0.0002	0.0002	0.0002	<0.0002	<0.0002	0.0002	0.0001	0.00033	0.0001	0.001	0.0006
Vanadio Disuelto					0.0059	<0.005	0.008		0.0055	<0.005	0.009	<0.005	0.006	<0.005	0.009	0.005	<0.005	<0.005	<0.005	<0.005
Zinc Disuelto		7.4		10	0.031	<0.01	0.11		0.053	<0.01	0.1	0.03	<0.01	<0.01	0.1	0.01	<0.01	<0.01	0.1	0.02
Cloruros		250			12	3	28		16	16	17	595	20	19	21	538	9	8	9	838
Cianuro Total		0.14		1	0.0039	<0.003	0.011		0.005	<0.003	0.014	<0.003	0.005	<0.003	0.015	<0.003	0.005	<0.003	0.015	<0.003
Fluoruros					0.35	0.2	0.7		0.8	0.8	0.8	235	0.8	0.8	0.8	538	0.18	0.1	0.2	353
Nitratos/Nitritos como N					2.48	2.04	2.93		2.2	2.08	2.26	<0.05	2.13	1.98	2.32	<0.05	3.32	3	3.57	<0.05
Amonio					<0.05	<0.05	<0.05		<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.1
Nitrógeno Kjeldahl (TKN)					0.56	<0.1	1.1		<0.1	<0.1	0.2		<0.1	<0.1	0.3		<0.1	<0.1	0.3	

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW-2				MW-3				MW-4				MW-5			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Fosfatos	mg/L				0.233	0.21	0.27	NA	0.315	0.27	0.37	0.25	0.248	0.24	0.27	0.22	0.203	0.15	0.24	0.12
Fósforo Total			2	10	0.24	0.06	0.44		0.09	0.08	0.1	0.08	0.07	0.06	0.08	0.07	0.06	0.05	0.07	0.03
STD (TDS)		500			253	190	360		470	460	480	492	553	540	560	474	305	290	320	680
SST (TSS)			50	100	345.8	137	584		<5	<5	<5	<5	<5	<5	<5	5.0	<5	<5	<5	9.0
ST (TS)					597.5	350	810		487.5	450	510	514	555	520	580	474	325	280	350	744
Sulfatos		250			28.5	4	97		166	162	169	181	212.5	210	220	145	72.3	64	76	287
Alcalinidad Total					64	56	80		84	82	86	83.0	85	83	88	86.4	66	61	68	95.6

u.e.: unidades exponenciales. mg/L: miligramos por litro. μ S/cm: micro siemens por centímetro. °C: grados centígrados. NMP/100ml: número más probable en 100ml. u Pt/Co: unidades platino cobalto. NA: No Analizado por haber agua al momento del monitoreo. NA: no analizado. NR = Cálculo No Realizado por falta de datos de línea base. Fuente: MSR, 2017.

Cuadro 5-5: Resultados de la medición de calidad de agua subterránea (Pozos de Monitoreo, Producción y Artesanal), Proyecto Minero Escobal (2/3)

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW-6				MW-7				MW-8				MW-9			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
pH de campo	u.e.	5.0-9.0	6.0-9.0	6.0-9.0	6.22	6.17	6.25	6.28	6.38	6.14	6.98	6.07	6.16	6.07	6.29	6.0	7.15	6.9	7.4	7.87
Temperatura de campo	°C				22.3	21.6	22.8	24.2	22.4	22	23.1	26.3	23.3	23.2	23.4	23.6	27.5	25.9	29	27.1
Conductividad de campo	μS/cm				538.2	342.9	752.6	696.5	299.6	285.9	323.8	293.6	426.8	424.6	428.1	592.6	1595	1569	1621	431.1
Oxígeno Disuelto de campo	mg/L				0.69	0.19	1.67	4.32	0.61	0.25	1.19	2.91	0.72	0.16	1.45	4.43	0.38	0.35	0.41	2.07
Turbidez	NTU							3.17				4.39				0.66				4.73
Materia flotante	Visual			Ausente				Ausente				Ausente				Ausente				Ausente
Color Aparente	u Pt/Co			500	NR	NR	NR	12	NR	NR	NR	42	NR	NR	NR	3	NR	NR	NR	317
Color Real	u Pt/Co							<1				15				<1				10
Cr (VI)	mg/L			0.1				<0.05				<0.05				<0.05				<0.05
Coliformes Fecales	NMP/100mL			<1x10 ⁴				<1.8				<1.8				<1.8				<1.8
Aluminio Disuelto	mg/L	0.2			<0.03	<0.03	0.05	<0.03	0.053	<0.03	0.07	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Antimonio Disuelto		0.01			0.00045	<0.0004	0.0012	0.0004	0.00063	0.0005	0.0008	0.0005	0.001	0.0009	0.0011	0.0008	<0.0004	<0.0004	<0.0004	<0.0004
Arsénico Disuelto		0.01	0.1		0.0028	0.0024	0.0032	0.0022	0.0034	0.0029	0.0041	0.0024	0.0021	0.0019	0.0024	0.0013	0.003	0.0007	0.0052	0.0006
Bario Disuelto		1			0.198	0.134	0.281	0.115	0.156	0.129	0.176	0.256	0.125	0.122	0.129	0.055	0.031	0.028	0.034	0.036
Berilio Disuelto		0.004			<0.002	<0.002	0.003	<0.01	<0.002	<0.002	0.003	<0.01	<0.002	<0.002	0.003	<0.01	<0.01	<0.002	<0.01	<0.01
Bismuto Disuelto					<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.07	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Boro Disuelto					<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.03	0.09	0.08	0.1
Cadmio Disuelto			0.003	0.1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcio Disuelto					52.5	35.1	71.9	173	16.7	13.9	19.6	25.8	34.6	32.5	36.3	75.8	185.5	170	201	52.5
Cromo Disuelto			0.1	0.1	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalto Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobre Disuelto			1.3	3	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01
Galio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hierro Disuelto			0.3		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.04	<0.02	<0.02	<0.02	<0.02	5.52	1.53	9.51	1.1
Plomo Disuelto			0.015	0.4	<0.0001	<0.0001	<0.0001	<0.0001	0.00013	<0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Litio Disuelto					<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	<0.008	0.07	0.07	0.07	0.012
Magnesio Disuelto					7.5	4.9	10.5	18.6	4.8	4.6	5	7.4	6.4	6.3	6.7	12	35.8	34.4	37.2	8.3
Manganeso Disuelto			0.05		<0.005	<0.005	0.006	<0.005	0.0065	<0.005	0.012	0.009	0.019	0.012	0.029	<0.005	0.203	0.149	0.257	0.049
Mercurio Disuelto			0.002	0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molibdeno Disuelto					<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02
Níquel Disuelto			0.61	2	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008
Potasio Disuelto					5.7	5	6.5	8.6	6.2	5.4	6.8	7.4	4.8	4.6	5.1	5.5	4.8	4.6	5	4.5
Escandio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Selenio Disuelto			0.17		0.0005	0.0004	0.0005	0.0006	0.0002	0.0001	0.0002	<0.0001	0.0004	0.0003	0.0006	0.0004	<0.0001	<0.0001	<0.0001	<0.0001
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00025	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00007	<0.00005
Sodio Disuelto					14	12.3	17	39	19.1	15.4	27.5	17	15.2	15	15.6	21.1	45.1	44.7	45.4	26.2
Estroncio Disuelto					0.26	0.18	0.35	0.912	0.1	0.09	0.11	0.155	0.22	0.21	0.23	0.295	1.64	1.58	1.69	0.405
Talio Disuelto					<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Estaño Disuelto					<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04
Titanio Disuelto					<0.005	<0.005	<0.005	0.009	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranio Disuelto					0.00013	0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.00017	0.0001	0.0002	0.0002	<0.0001	<0.0001	0.0004	<0.0001
Vanadio Disuelto					<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
Zinc Disuelto			7.4	10	0.034	<0.01	0.1	0.08	0.034	<0.01	0.1	0.13	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Cloruros			250		11	6	17	1140	11	9	12	293	6	6	6	581	37	36	37	405
Cianuro Total			0.14	1	0.005	<0.003	0.015	<0.003	0.005	<0.003	0.015	<0.003	0.005	<0.003	0.015	<0.003	0.007	<0.003	0.012	<0.003
Fluoruros					0.18	0.1	0.2	509	0.13	0.1	0.2	95	0.17	0.1	0.2	239	2.55	2.5	2.6	165.00
Nitratos/Nitritos como N					5.08	4.42	6.15	<0.05	4.75	4.08	5.24	<0.05	2.76	2.63	2.83	<0.05	<0.02	<0.02	<0.02	<0.05
Amonio					<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.1
Nitrógeno Kjeldahl (TKN)					<0.1	<0.1	0.2		0.21	<0.1	0.4		0.09	<0.1	0.2		0.23	<0.1	0.4	

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW-6				MW-7				MW-8				MW-9			
					Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17	Línea Base			Mar-17
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Fosfatos	mg/L				0.173	0.15	0.21	0.16	0.113	0.09	0.18	0.09	0.23	0.21	0.24	0.16	<0.03	<0.03	<0.03	0.19
Fósforo Total			2	10	0.05	0.04	0.06	0.04	0.04	0.01	0.07	0.03	0.07	0.06	0.08	0.05	<0.01	<0.01	0.02	0.12
STD (TDS)		500			340	260	440	982	233	220	250	278	277	270	290	496	905	890	920	288
SST (TSS)			50	100	<5	<5	<5	<5	19.75	7	45	6.0	9	6	14	<5	27	25	29	<5
ST (TS)					345	240	450	1020	260	230	280	292	300	290	310	510	940	910	970	304
Sulfatos			250		85.3	33	153	482	19.3	17	23	35.5	54.7	54	55	182	440	440	440	46.7
Alcalinidad Total					65	62	68	53.7	48	41	60	86.7	68	66	70	72.6	147	136	157	153

u.e.: unidades exponenciales. mg/L: miligramos por litro. µS/cm: micro siemens por centímetro. °C: grados centígrados. NMP/100ml: número más probable en 100ml. u Pt/Co: unidades platino cobalto. NR = Cálculo No Realizado por falta de datos de línea base. Fuente: MSR, 2017.

Cuadro 5-5: Resultados de la medición de calidad de agua subterránea (Pozos de Monitoreo, Producción y Artesanal), Proyecto Minero Escobal (3/3)

Parámetros	Unidad	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW11				PSA-SR				HW-1				RW-1				PSA-1			
					Línea Base				Línea Base				Línea Base				Línea Base				Línea Base			
					Promedio	Mínimo	Máximo	Mar-17	Promedio	Mínimo	Máximo	Mar-17	Promedio	Mínimo	Máximo	Mar-17	Promedio	Mínimo	Máximo	Mar-17	Promedio	Mínimo	Máximo	Mar-17
pH de campo	u.e.	5.0-9.0	6.0-9.0	6.0-9.0	7.05	7.05	7.05	7.27	7.45	7.45	7.45	7.42	7.53									7.42		
Temperatura de campo	°C				30.4	30.4	30.4	31.7	27.8	27.8	27.8	27.8	25.8									33.7		
Conductividad de campo	µS/cm				2.243	2.243	2.243	1709	663.9	663.9	663.9	849.4	933.9									1427		
Oxígeno Disuelto de campo	mg/L				0.09	0.09	0.09	3.45	0.05	0.05	0.05	1.7	6.65									4.09		
Turbidez	NTU							1.71				0.88	1.01									8.18		
Materia flotante	Visual			Ausente				Ausente				Ausente	Ausente									Ausente		
Color aparente	u Pt/Co			500	NR	NR	NR	144	NR	NR	NR	12	16									399		
Color Real		8	<1	<0.05																				
Cr (VI)	mg/L			0.1				<0.05				<0.05	<0.05								<0.05			
Coliformes Fecales	NMP/100mL			<1x10 ⁴				<1.8				<1.8	<1.8									<1.8		
Aluminio Disuelto	mg/L	0.2			<0.03	<0.03	<0.03	<0.03	0.06	0.06	0.06	<0.03	<0.03									<0.03		
Antimonio Disuelto		0.01			0.001	0.001	0.001	0.0004	<0.0004	<0.0004	<0.0004	0.0007	0.0006										<0.0004	
Arsénico Disuelto		0.01		0.1	0.0022	0.0022	0.0022	0.0027	0.0136	0.0136	0.0136	0.0121	0.0085										0.0048	
Bario Disuelto		1			0.033	0.033	0.033	0.02	0.125	0.125	0.125	0.076	0.071										0.016	
Berilio Disuelto		0.004			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01										<0.01	
Bismuto Disuelto					<0.08	<0.08	<0.08	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04										<0.04	
Boro Disuelto					0.18	0.18	0.18	0.17	0.07	0.07	0.07	0.09	0.07										0.11	
Cadmio Disuelto		0.003		0.1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001										<0.0001	
Calcio Disuelto					271	271	271	217	47.5	47.5	47.5	95	70.7										193	
Cromo Disuelto		0.1		0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01										<0.01	
Cobalto Disuelto					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01										<0.01	
Cobre Disuelto		1.3		3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01										<0.01	
Galio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1										<0.1	
Hierro Disuelto		0.3			0.21	0.21	0.21	0.96	0.05	0.05	0.05	<0.02	<0.02		NR	NR	NR	NA	NR	NR	NR	NR	2.34	
Plomo Disuelto		0.015		0.4	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001										<0.0001	
Litio Disuelto					0.06	0.06	0.06	0.074	0.08	0.08	0.08	0.132	0.094										0.082	
Magnesio Disuelto					41.3	41.3	41.3	31.9	4.1	4.1	4.1	5.9	5.1										35.3	
Manganeso Disuelto		0.05			0.044	0.044	0.044	0.015	0.03	0.03	0.03	0.022	<0.005										0.047	
Mercurio Disuelto		0.002		0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002										<0.0002	
Molibdenu Disuelto					0.01	0.01	0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.02										<0.02	
Níquel Disuelto		0.61		2	<0.01	<0.01	<0.01	<0.008	<0.01	<0.01	<0.01	<0.008	<0.008										<0.008	
Potasio Disuelto					5	5	5	4.1	2.5	2.5	2.5	1.9	2.5										4.5	
Escandio Disuelto					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1										<0.1	
Selenio Disuelto		0.17			0.0006	0.0006	0.0006	0.0001	<0.0001	<0.0001	<0.0001	0.0005	0.0004										<0.0001	
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00012										<0.00005	
Sodio Disuelto					77.4	77.4	77.4	64.3	55.2	55.2	55.2	80.3	61										47.8	
Estroncio Disuelto					2.23	2.23	2.23	2.03	1.33	1.33	1.33	4.29	3										1.92	
Talio Disuelto					0.0002	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001										<0.0001	
Estaño Disuelto				<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.04										<0.04		
Titanio Disuelto				<0.005	<0.005	<0.005	0.010	<0.005	<0.005	<0.005	<0.005	<0.005										<0.005		
Uranio Disuelto				0.0007	0.0007	0.0007	0.0005	0.0002	0.0002	0.0002	0.0003	0.0002										0.0006		
Vanadio Disuelto				<0.005	<0.005	<0.005	<0.005	0.005	0.005	0.005	<0.005	<0.005										<0.005		
Zinc Disuelto	7.4		10	0.04	0.04	0.04	<0.01	0.12	0.12	0.12	<0.01	<0.01										<0.01		
Cloruros	250			68	68	68	57.3	32	32	32	4.0	7.2										42.4		
Cianuro Total	0.14		1	<0.003	<0.003	<0.003	<0.003	0.003	0.003	0.003	<0.003	<0.003										<0.003		
Fluoruros				2.7	2.7	2.7	2.49	0.7	0.7	0.7	0.91	0.69										2.47		
Nitratos/Nitritos como N				0.19	0.19	0.19	<0.02	<0.02	<0.02	<0.02	0.04	0.87										<0.02		
Amonio				<0.05	<0.05	<0.05	<0.05	0.06	0.06	0.06	<0.05	<0.05										0.05		

Parámetros	Unidad	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW11				PSA-SR				HW-1				RW-1				PSA-1			
					Línea Base				Línea Base				Línea Base				Línea Base				Línea Base			
					Promedio	Mínimo	Máximo	Mar-17	Promedio	Mínimo	Máximo	Mar-17	Promedio	Mínimo	Máximo	Mar-17	Promedio	Mínimo	Máximo	Mar-17	Promedio	Mínimo	Máximo	Mar-17
Nitrógeno Kjeldahl (TKN)	mg/L				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	NR	NR	NR	<0.1	NR	NR	NR	NA	NR	NR	NR	<0.1
Fosfatos					0.03	0.03	0.03	<0.06	0.06	0.06	0.06	<0.06				0.12								<0.06
Fósforo Total		2	10	0.06	0.06	0.06	0.22	0.02	0.02	0.02	<0.02	0.04				<0.02								
STD (TDS)		500		1370	1370	1370	1230	320	320	320	600	482				990								
SST (TSS)		50	100	145	145	145	<5	<5	<5	<5	<5	<5				<5								
ST (TS)				1000	1000	1000	1250	300	300	300	622	490				1040								
Sulfatos		250		700	700	700	648	45	45	45	243	188				468								
Alcalinidad Total				133	133	133	149	186	186	186	184	135				171								

u.e.: unidades exponenciales. mg/L: miligramos por litro. $\mu\text{S}/\text{cm}$: micro siemens por centímetro. °C: grados centígrados. NMP/100ml: número más probable en 100ml. u Pt/Co: unidades platino cobalto. NR = Cálculo No Realizado por falta de datos de línea base. Fuente: MSR, 2017.

En el Cuadro 5-5 se presentan los resultados de la calidad del agua subterránea (Pozos de Monitoreo, Producción y Artesanal) correspondientes al mes de Marzo de 2017. Los resultados de laboratorio se presentan en el Anexo electrónico adjunto a este documento. La mayoría de los pozos monitoreados cumplen con los valores establecidos en el Acuerdo 236-2006 para entes generadores nuevos y los valores en general se encuentran dentro del rango estadístico de la línea base.

Los valores de pH estuvieron en el rango de 6.0 a 7.87 u.e. y la temperatura en el rango de 23.6 a 33.7 °C. En los pozos MW-5, MW-6, MW-11 y PSA-1 los valores registrados de sulfatos se encuentran por encima de los valores establecidos durante el levantamiento de línea base y/o por las guías de USEPA (250 mg/L). Todos los demás pozos se encuentran por debajo de las directrices que establece la USEPA.

Se reportaron valores de Sólidos Suspendidos Totales (**SST**) en los pozos MW4, MW5 y MW7, los cuales se encuentran debajo de las guías establecidas por el Banco Mundial y el Acuerdo (50 y 100 mg/L respectivamente) y dentro de los rangos establecidos en la línea base.

El Aluminio, Berilio, Bismuto, Cadmio, Galio, Cromo, Cromo Hexavalente, Cobalto, Cobre, Mercurio, Molibdeno, Níquel, Escandio, Talio, Estaño y Cianuro total no fueron detectados en ninguno de los pozos monitoreados.

El Antimonio se detectó en siete pozos en concentraciones por debajo de la guía establecida por la USEPA (0.01 mg/L). El Bario fue detectado en todas las estaciones en concentraciones menores a la guía de la USEPA (1 mg/L).

El Arsénico fue detectado en todas las estaciones de pozos de monitoreo y las concentraciones se encuentran dentro los mínimos y máximos establecidos en la línea base y por debajo de lo estipulado por la USEPA (0.01 mg/L).

6 Sedimentos

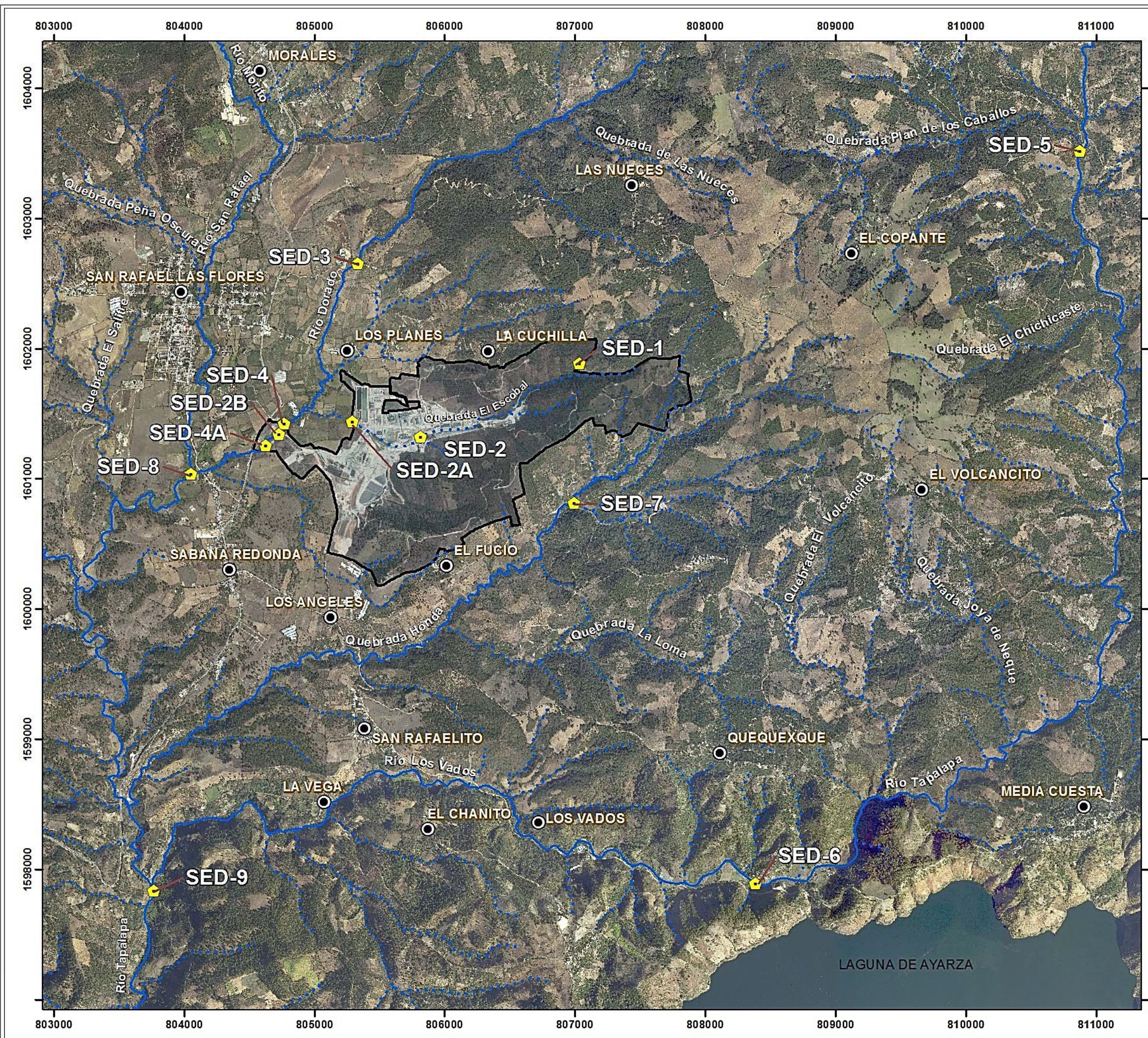
6.1 Sitios de Monitoreo

En el Cuadro 6-1 se enlistan las estaciones de monitoreo de sedimentos de las quebradas y ríos ubicados dentro o cercanas al área de influencia (AI) del Proyecto y su ubicación se presenta en la Figura 6-1.

Cuadro 6-1: Sitios de Monitoreo de Sedimento, Proyecto Minero Escobal

Estación	Coordenadas		Sitio
SED1	807,053	1,601,682	Quebrada El Escobal, aguas arriba del proyecto
SED2	805,811	1,601,164	Quebrada El Escobal, en medio del proyecto
SED2A	805,295	1,601,230	Quebrada El Escobal, Salida de la Propiedad
SED3	805,337	1,602,453	Río El Dorado, aguas arriba
SED4	804,781	1,601,228	Río El Dorado, aguas abajo
SED4A	804,629	1,601,052	Río El Dorado, por puente de acceso al Proyecto (Suandys)
SED5	810,882	1,603,313	Río Tapalapa, aguas arriba
SED6	808,391	1,597,689	Río Los Vados, aguas abajo
SED7	806,989	1,600,618	Quebrada La Honda
SED8	804,054	1,600,834	Unión Río San Rafael y El Dorado
SED9	803,772	1,597,635	Río Tapalapa, aguas abajo (cercano a la Ceibita)

Nota: en ninguna de las estaciones monitoreadas se cuenta con línea base de metales en sedimentos. Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.



MAPA DE LOCALIZACIÓN ESTACIONES DE MONITOREO DE SEDIMENTOS

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

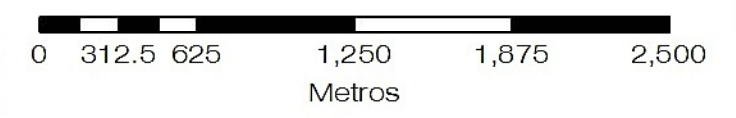
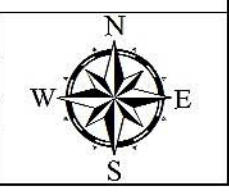
Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIONES DE MONITOREO

Símbolo	Estación	X	Y
	SED-1	807047	1601885
	SED-2	805805	1601367
	SED-2A	805289	1601433
	SED-2B	804728	1601341
	SED-3	805331	1602656
	SED-4	804775	1601431
	SED-4A	804623	1601255
	SED-5	810876	1603516
	SED-6	808385	1597892
	SED-7	806995	1600815
	SED-8	804048	1601037
	SED-9	803766	1597838

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000. Hojas catográficas año 2010 M ataquescuintla (2159-1) y Laguna de Ayarza (2159-II) del IGN, Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014, datos de campo del departamento de Ambiente.

Fecha de Elaboración: **Abril 2017**
Distancia Horizontal y Vertical de Grilla: 1,000 metros
Escala 1:30,000



6.2 Resultados

En el Cuadro 6-2 se presenta los resultados de metales registrados para el mes de Marzo de 2016. Los resultados del laboratorio se presentan en el Anexo electrónico adjunto a este documento.

El porcentaje de fósforo total se encuentra en el rango de 0.008877% (SED-5) a 0.159% (SED-8). No se detectó cianuro en ninguna de las estaciones muestreadas.

El mercurio se detectó únicamente en SED-2 y SED-5 en concentraciones por debajo de lo establecido (25 mg/kg) para la disposición de lodos en el suelo establecidos por el Acuerdo 236-2006. Las concentraciones de Cadmio, Cromo y Plomo registradas están muy por debajo de los valores guía. Todas las estaciones muestreadas registraron concentraciones de Arsénico menor al valor sugerido (50 mg/Kg).

Cuadro 6-2: Resultados de sedimentos, Proyecto Minero Escobal

Parámetro	Unidades	Acuerdo 236-2006	SED-1	SED-2	SED-2A	SED-3	SED-4	SED-4A
		Aplicación al suelo	Mar-17	Mar-17	Mar-17	Mar-17	Mar-17	Mar-17
Arsénico Total	mg/Kg**	50	NA	NA	46.4	15.1	16.0	21.5
Cadmio Total	mg/Kg**	50			7.26	0.33	0.69	1.09
Cromo Total	mg/Kg**	1500			10.8	3.2	4.7	6.7
Plomo Total	mg/Kg**	500			363	8.6	19.4	40.3
Mercurio Total	mg/Kg**	25			0.09	<0.04	<0.06	<0.05
Cianuro Total	mg/Kg**				<0.4	<0.2	<0.2	<0.2
Fósforo Total	%				0.0283	0.0159	0.0185	0.0253

Parámetro	Unidades	Acuerdo 236-2006	SED-5	SED-6	SED-7	SED-8	SED-9
		Aplicación al suelo	Mar-17	Mar-17	Mar-17	Mar-17	Mar-17
Arsénico Total	mg/Kg**	50	16.5	29.8	NA	15.2	5.5
Cadmio Total	mg/Kg**	50	0.17	0.26		1.91	0.31
Cromo Total	mg/Kg**	1500	1.5	2.5		8.6	4.7
Plomo Total	mg/Kg**	500	8.70	6.76		57.2	6.33
Mercurio Total	mg/Kg**	25	0.06	<0.04		<0.1	<0.04
Cianuro Total	mg/Kg**		<0.05	<0.2		<0.5	<0.2
Fósforo Total	%		0.008877	0.0138		0.159	0.0132

*Al momento de tomar la muestra el cuerpo de agua se encontraba sin agua. NA: No analizado. mg/Kg: miligramo por kilogramo. ** mg/kg de materia seca a 104°C. %: porcentaje. *LMP para suelos con pH < 7 unidades, en los suelos que posean pH>7 se podrán disponer lodos hasta un 50% mayor de los valores presentados como LMP. NA: No Analizado. Fuente: MSR, 2017.

7 Calidad de Efluentes

7.1 Sitios de Monitoreo

En el Cuadro 7-1 se describe la estación de monitoreo del efluente hacia la quebrada El Escobal, del agua proveniente de la planta de tratamiento de aguas especiales. Su ubicación se presenta en la Figura 7-1.

Cuadro 7-1: Sitio de Monitoreo de Calidad de Agua del Efluente de Planta de Tratamiento, Proyecto Minero Escobal

Estación	Coordenadas		Sitio
WW9	805,467	1,601,111	Dispositivo para toma de muestras de la planta de tratamiento de aguas residuales de tipo especial del proceso de minado.

Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.

805000 806000

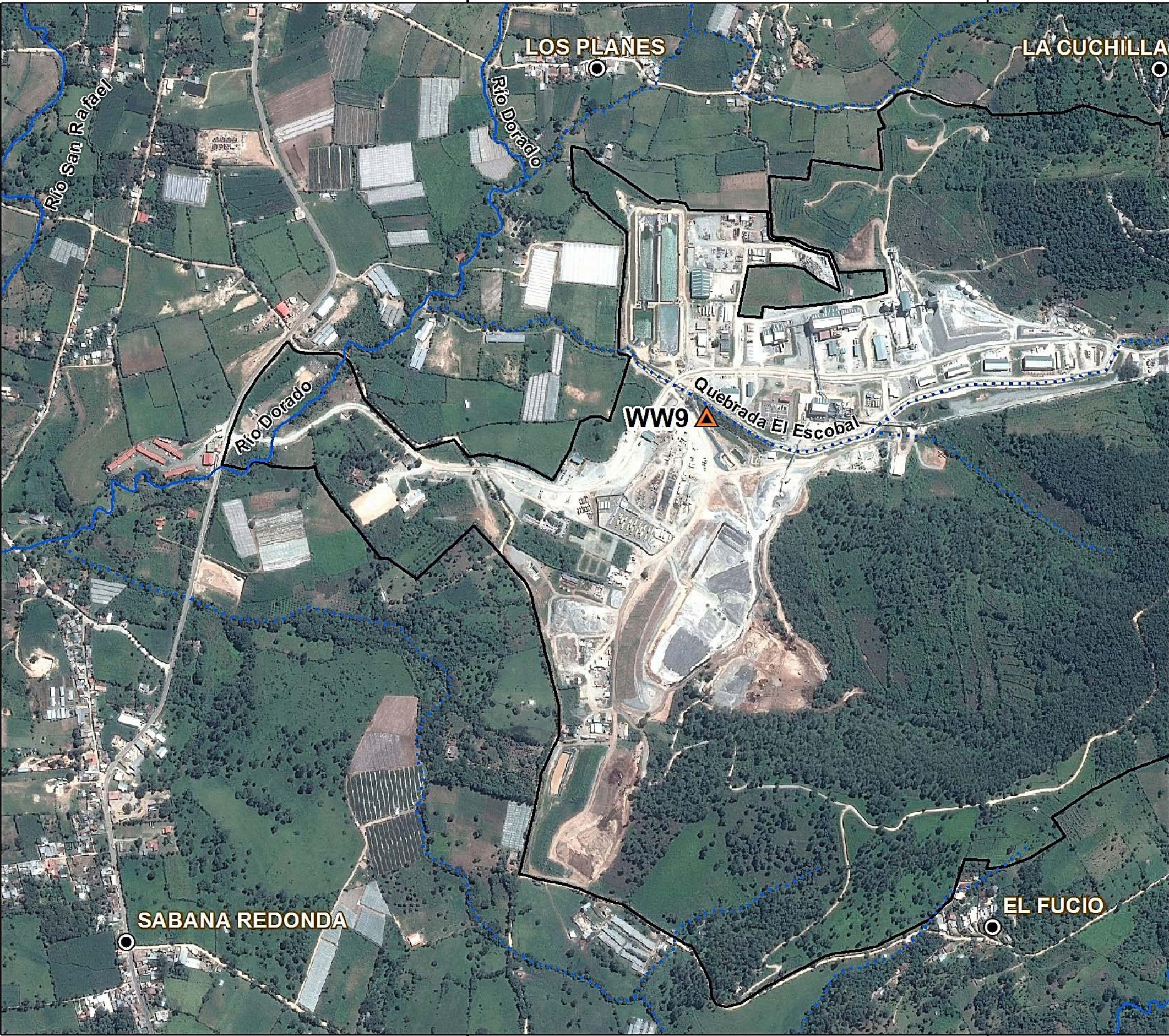
1602000

1602000

1601000

1601000

805000 806000



MAPA DE LOCALIZACIÓN
ESTACIONES DE MONITOREO
EFLUENTES PLANTA DE TRATAMIENTO
DE AGUAS RESIDUALES

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



DEPARTAMENTO DE AMBIENTE

Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

ESTACIÓN DE MONITOREO

Símbolo	Estación	X	Y
	WW9	805461	1601314

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000
Hojas catográficas año 2010 Mataquesuintia (2159-1) y Laguna de Ayarza (2159-II) del IGN,
Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014,
datos de campo del departamento de Ambiente.

Fecha de Elaboración: Abril 2017

Distancia Horizontal y Vertical
de Grilla: 1,000 metros

Escala 1:8,000



7.2 Resultados

Durante los monitoreos correspondientes, se emplearon muestras control para determinar la confiabilidad de los resultados de parámetros analizados por el laboratorio encargado del análisis de las muestras. En total se efectuaron 3 muestras blanco y una muestra duplicado; los resultados obtenidos se presentan en el Cuadro 6-3.

Cuadro 7-2: Resultados de control de calidad para muestras de Efluentes de Planta de Tratamiento, Proyecto Minero Escobal

Mes	Unidades	LMP Acuerdo 236-2006	Febrero	Marzo	Abril	Abril		
Control de Calidad			Blanco	Blanco	Blanco	Duplicado	Original	
ID Muestra			WW10	WW10	WW10	WW11	WW9	
No. Reporte Lab.			440-17	734-17	894-17	985-17	983-17	
Grasas y Aceites	mg/L	10	<5	<5	<5	<5	<5	
Materia Flotante	NL	Ausente	ausente	ausente	ausente	Ausente	Ausente	
DBO	mg/L	200	<10	<10	<10	<10	<10	
DQO		<25	<25	<25	31	32		
SST (TSS)		100	<10	<10	<10	<10	10	
Sólidos Sedimentables		< 0.1	< 0.1	< 0.1	<0.1	<0.1		
Nitrógeno Total		20	<10.9	<10.9	<10.9	11	<10.9	
Fósforo Total		10	<0.05	<0.05	<0.05	0.05	0.08	
Arsénico		0.1	<0.002	<0.002	<0.002	0.004	0.004	
Cadmio		0.1	<0.02	<0.02	<0.02	<0.02	<0.02	
Cobre		3	<0.03	<0.03	<0.03	<0.03	<0.03	
Cromo Hexavalente		0.1	<0.05	<0.05	<0.05	<0.05	<0.05	
Cianuro Total*		1	<0.003	<0.003	<0.003	<0.003	<0.003	
Mercurio		0.01	<0.004	<0.004	<0.004	<0.004	<0.004	
Níquel		2	<0.05	<0.05	<0.05	<0.05	<0.05	
Plomo		0.4	<0.05	<0.05	<0.05	<0.05	<0.05	
Zinc		10	<0.01	<0.01	<0.01	<0.01	<0.01	
Color Aparente		u Pt/Co	500	<1	22	<1	43	50
Color Real				<1	<1	<1	<1	<1
Coliformes Fecales	NMP/100ml	<1x10 ⁴	<1.8	<1.8	<1.8	23	23	

*análisis realizado por laboratorio AZC. **No analizado por fallo en el automestreador. u.e. unidades electroquímicas. °C: grados centígrados. mg/L: miligramos por litro. U Pt/Co: unidades de Platino-Cobalto. NMP/100ml: número más probable en 100 mililitros. NA: no analizado. NL = no hay límite establecido para este parámetro. Fuente: MSR, 2017.

Para la preparación de blancos analíticos de los parámetros fisicoquímicos y metales se utilizó agua desmineralizada y para los parámetros microbiológicos se utilizó agua salvavidas embotellada. Todos los parámetros analizados por los dos laboratorios son confiables en manipulación de las muestras y precisión del análisis.

En el Cuadro 7-3 se pueden observar los resultados de la calidad del efluente de la planta de tratamiento del Proyecto Minero Escobal. Los resultados de laboratorio se presentan en el Anexo electrónico adjunto a este documento.

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Los valores de pH se encontraron en el rango de 6.84 a 7.76 u.e., cumpliendo con el rango establecido en el Acuerdo 6.0-9.0 u.e.

La concentración de Cianuro Total, Grasas y Aceites, Demanda Bioquímica de Oxígeno (**DBO**), Demanda Química de Oxígeno (**DQO**), sólidos sedimentables totales (**SST**), Arsénico Total, Plomo Total, Cadmio Total, Cobre Total, Cromo Hexavalente, Mercurio Total, Níquel Total, Coliformes fecales, Zinc, Nitrógeno y Fósforo total están por debajo de los valores establecidos por el acuerdo.

Por lo tanto los resultados obtenidos durante las descargas de la planta de tratamiento cumplen con el Acuerdo Gubernativo 236-2006 para entes generadores nuevos, Banco Mundial para el sector minero y la USEPA.

Cuadro 7-3: Calidad del Efluente de la Planta de Tratamiento, Proyecto Minero Escobal

Mes	Unidades	LMP Acuerdo 236-2006	Valores Indicador Banco Mundial Sector Minero	LMP EPA CFR 440, Subparte J, 440.102, (a)	Febrero	Marzo	Abril	
Fecha Muestreo					23/02/2017	27/03/2017	24/04/2016	
ID Muestra					WW9	WW9	WW9	
No. Reporte Lab.					439-17	733-17	983-17	
pH de campo	u.e.	6.0-9.0	6.0-9.0	6.0-9.0	7.76	6.84	7.34	
Temperatura de campo	°C		+/- 3		27.8	22.7	26.8	
Temperatura. Quebrada El Escobal					23.9	NA	22.4	
Grasas y Aceites	mg/L	10	10		<5	<5	<5	
Materia Flotante		Ausente			ausente	ausente	ausente	
DBO	mg/L	200	50		< 10	10	< 10	
DQO				150		34	35	32
SST (TSS)			100	50	30	17	< 10	10
Sólidos Sedimentables						< 0.1	< 0.1	<0.1
Nitrógeno Total			20	10		<10.9	<10.9	<10.9
Fósforo Total			10	2		0.06	<0.05	0.08
Arsénico			0.1	0.1		0.01	0.011	0.004
Cadmio			0.1	0.05		<0.02	<0.02	<0.02
Cobre			3	0.3	0.3	<0.03	<0.03	<0.03
Cromo Hexavalente			0.1	0.1		<0.05	<0.05	<0.05
Cianuro Total*			1	1		<0.003	<0.003	<0.003
Mercurio			0.01	0.002	0.002	<0.004	<0.004	<0.004
Níquel			2	0.5		<0.05	<0.05	<0.05
Plomo			0.4	0.2	0.6	<0.05	<0.05	<0.05
Zinc			10	0.5	1.5	<0.01	0.01	<0.01
Color Aparente		u Pt/Co	500			174	97	50
Color Real					< 1	< 1	< 1	
Coliformes Fecales	NMP/100ml	<1x10 ⁴	400		4.9 x 10 ²	23	23	

u.e. unidades electroquímicas. °C: grados centígrados. mg/L: miligramos por litro. U Pt/Co: unidades de Platino-Cobalto. NMP/100ml: número más probable en 100 mililitros. *: análisis efectuados en laboratorio ACZ. NA: No Analizado Fuente: MSR, 2017.

8 Vibraciones

8.1 Sitios de Monitoreo

La Empresa instaló tres equipos para la medición de vibraciones por medio del equipo eXPeak Seismograph modelo eXAD-8 de la empresa Physical Measurement Technologies, Inc. Estos equipos son automatizados y registran la velocidad (mm/s) y la frecuencia (Hz) de forma constante. La ubicación de las estaciones de monitoreo se presenta en la Figura 8-1 y en el Cuadro 8-1 se presenta la descripción de cada una de las estaciones.

Cuadro 8-1: Estaciones de monitoreo de vibraciones, Proyecto Minero Escobal

Estación	Coordenadas		Sitio
BS-1	806,424	1,601,608	Colindancia con Aldea La Cuchilla
BS-2	806,366	1,601,291	Entre ambos portales
BS-3	805,798	1,601,563	Depósito de Suelo

Sistema de coordenadas proyectadas UTM, DATUM WGS-84. Msnm: metros sobre el nivel del mar.
Fuente: MSR, 2017.



MAPA DE LOCALIZACIÓN ESTACIONES DE MONITOREO DE VIBRACIONES PERMANENTE

PROYECTO MINERO ESCOBAL
SAN RAFAEL LAS FLORES, SANTA ROSA



Sistema de coordenadas: WGS 1984 UTM Zone 15N
Proyección: Transverse Mercator
Dato: WGS 1984

LEYENDA

Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Portal de Acceso
	Río Permanente
	Quebrada Intermittente

ESTACIONES DE MONITOREO

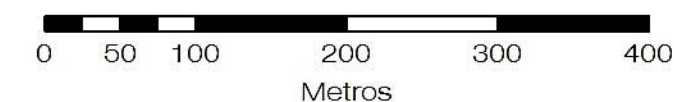
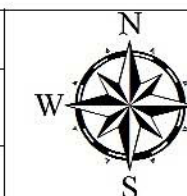
Símbolo	Estación	X	Y
	BS-1	806419	1601819
	BS-2	806361	1601492
	BS-3	805791	1601785

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000. Hojas catográficas año 2010 Mataquesuintia (2159-1) y Laguna de Ayarza (2159-II) del IGN, Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014, datos de campo del departamento de Ambiente.

Fecha de Elaboración: Abril 2017

Distancia Horizontal y Vertical de Grilla: 1,000 metros

Escala 1:5,000



8.2 Resultados

En el Cuadro 8-2 se presentan todas las mediciones de las voladuras registradas en los sismógrafos, y los resultados se encuentran por debajo del límite de detección del equipo (1.3 mm/s). Según la norma del United States Bureau of Mines, el límite a partir del cual las vibraciones inducidas por una voladura pueden ocasionar daños a estructuras es de 50.8 mm/s. Por lo que se puede determinar que las mismas no son sensibles y por lo tanto no representan un impacto para el ambiente.

Cuadro 8-2 Resultados de medición de vibraciones, Proyecto Minero Escobal

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Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1340-6890	42767	06:27	<1.3
	1390-6780	42767	06:31	<1.3
	1390-6800	42767	06:34	<1.3
	1505-RAMP	42767	06:26	<1.3
	1330-RAMP	42767	06:21	<1.3
	13340-6770	42767	06:23	<1.3
	1215-6650	42767	18:02	<1.3
	1240-6380	42767	18:10	<1.3
	1505-CFTE	42767	18:03	<1.3
	1415-6840	42767	18:13	<1.3
	1340-6590	42768	06:14	<1.3
	1200-SUMI	42768	00:00	<1.3
	1265-6900	42768	06:08	<1.3
	1445-6800	42768	06:16	<1.3
	1505-CFTO	42768	06:07	<1.3
	1365-6560	42768	06:10	<1.3
	1200-serv-oc	42768	17:53	<1.3
	1390-CFTO	42768	18:11	<1.3
	1330-RAMP	42768	18:03	<1.3
	1530-RAMP	42768	17:56	<1.3
	1505-7440	42768	17:50	<1.3
	1340-6770	42768	18:06	<1.3
	1215-6680	42769	06:05	<1.3
	1505-CFTE	42769	06:20	<1.3
1480-6340	42769	06:21	<1.3	
1305-SUMI	42769	06:16	<1.3	
1455-SUMI	42769	06:11	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1340-6890	42769	06:04	<1.3
	1240-6900	42769	06:10	<1.3
	1240-6680	42769	18:01	<1.3
	1365-6460	42769	18:12	<1.3
	1505-CFTO	42769	18:05	<1.3
	1530-RAMP	42769	18:05	<1.3
	1240-6380	42770	06:15	<1.3
	1505-7440	42770	06:20	<1.3
	1505-7460	42770	06:20	<1.3
	1200-SERV	42770	06:05	<1.3
	1330-RAMP	42770	06:35	<1.3
	1390-CTFO	42770	06:10	<1.3
	1365-6560	42770	18:03	<1.3
	1455-SUMI	42770	18:01	<1.3
	1390-6780	42770	18:05	<1.3
	1480-7340	42770	15:58	<1.3
	1415-6800	42770	18:03	<1.3
	1215-6680	42770	17:58	<1.3
	1505-RAMP	42771	06:18	<1.3
	1240-6680	42771	06:10	<1.3
	1330-RAMP	42771	06:30	<1.3
	1390-6800	42771	06:05	<1.3
	1240-6900	42771	06:05	<1.3
	1365-6460	42771	17:55	<1.3
	1340-6890	42771	17:50	<1.3
	1480-7340	42771	17:52	<1.3
	1390-CFTO	42771	18:01	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1240-6380	42772	05:55	<1.3
	1505-CFTO	42772	06:20	<1.3
	1505-7440	42772	06:20	<1.3
	1505-7420	42772	06:20	<1.3
	1305-SUMI	42772	06:08	<1.3
	1360-SUMI	42772	05:55	<1.3
	1365-6560	42772	06:15	<1.3
	1415-6840	42772	18:33	<1.3
	1455-SUMI	42772	18:23	<1.3
	1305-SUBEST	42773	06:00	<1.3
	1330-RAMP	42773	06:02	<1.3
	1365-6560	42773	18:14	<1.3
	1365-6460	42773	18:17	<1.3
	1505-7460	42773	18:15	<1.3
	1240-6780	42774	06:10	<1.3
	1215-6880	42774	06:03	<1.3
	1340-6840	42774	06:25	<1.3
	1505-7440	42774	06:11	<1.3
	1390-CFTO	42774	06:02	<1.3
	1305-RAMP	42774	18:13	<1.3
	1365-SUMI	42774	18:19	<1.3
	1530-RAMP	42774	18:10	<1.3
	1505-7440	42775	06:16	<1.3
	1480-1390	42775	06:13	<1.3
	1200-ESTE	42775	06:11	<1.3
	1330-RAMP	42775	06:07	<1.3
	1290-6750	42775	06:19	<1.3
	1505-CFTO	42775	18:08	<1.3
1390-6780	42775	18:18	<1.3	
1365-6440	42775	18:16	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1305-sub est	42775	18:06	<1.3
	1480-7380	42776	06:20	<1.3
	1215-6680	42776	06:04	<1.3
	1415-6840	42776	06:14	<1.3
	1505-CFTE	42776	05:58	<1.3
	1480-7340	42776	06:14	<1.3
	1505-RAMP	42776	18:00	<1.3
	1390-6800	42776	18:11	<1.3
	1240-6680	42776	18:06	<1.3
	1240-6640	42776	18:06	<1.3
	1415-CFTE	42777	05:58	<1.3
	1415-6800	42777	05:58	<1.3
	1505-7460	42777	05:56	<1.3
	1505-7440	42777	05:56	<1.3
	1330-acc	42777	18:03	<1.3
	1340-6890	42777	18:10	<1.3
	1190-6930	42777	18:11	<1.3
	1305-sub est	42777	18:56	<1.3
	1390-6780	42777	18:57	<1.3
	1480-7380	42777	18:54	<1.3
	1480-7340	42778	05:55	<1.3
	1365-6400	42778	05:53	<1.3
	1390-CFTO	42778	05:59	<1.3
	1505-CFTE	42778	06:04	<1.3
	1215-6680	42778	18:14	<1.3
	1240-6640	42778	18:25	<1.3
	1240-6920	42778	18:26	<1.3
	1505-RAMP	42778	18:12	<1.3
	1330-acc	42778	18:56	<1.3
	1305-SUB	42779	06:02	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1505-7460	42779	06:00	<1.3
	1240-6680	42779	06:10	<1.3
	1390-6800	42779	06:08	<1.3
	1430-7500	42779	00:10	<1.3
	1340-6520	42779	18:17	<1.3
	1530-RAMP	42779	18:06	<1.3
	1190-6930	42779	18:00	<1.3
	1240-6640	42779	18:02	<1.3
	1455-7500	42779	18:12	<1.3
	1240-6920	42780	06:02	<1.3
	1415-6840	42780	05:58	<1.3
	1415-CFTE	42780	05:58	<1.3
	1215-6360	42780	05:58	<1.3
	1215-6500	42780	06:05	<1.3
	1505-CFTO	42780	18:08	<1.3
	1530-RAMP	42780	18:08	<1.3
	1415-6800	42780	18:31	<1.3
	1340-6890	42780	18:23	<1.3
	1330-acc	42780	18:15	<1.3
	1305-sub est	42780	18:02	<1.3
	1240-6600	42781	06:41	<1.3
	1480-7480	42781	06:39	<1.3
	1505-7460	42781	06:31	<1.3
	1505-7420	42781	06:29	<1.3
	1480-7340	42781	06:37	<1.3
	1390-CFTE	42781	06:45	<1.3
1240-6640	42781	06:38	<1.3	
1240-6680	42781	06:37	<1.3	
1365-6460	42781	18:39	<1.3	
1480-CFTE	42781	18:45	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1480-7480	42781	18:45	<1.3
	1240-6600	42781	18:28	<1.3
	1190-6930	42781	18:18	<1.3
	1340-6890	42781	18:20	<1.3
	1455-7500	42781	18:27	<1.3
	1480-7380	42781	18:38	<1.3
	1290-6970	42782	06:08	<1.3
	1240-6920	42782	06:16	<1.3
	1390-6780	42782	06:11	<1.3
	1390-VENT	42782	06:09	<1.3
	1330-acc	42782	18:08	<1.3
	1240-6640	42782	18:05	<1.3
	1455-7500	42782	18:12	<1.3
	1505-7420	42782	18:25	<1.3
	1480-7340	42782	18:29	<1.3
	1505-7420	42782	18:26	<1.3
	1330-RAMP	42782	18:08	<1.3
	1505-7440	42783	06:07	<1.3
	1240-6680	42783	06:08	<1.3
	1480-GFTO	42783	06:11	<1.3
	1480-7480	42783	06:13	<1.3
	1215-6500	42783	06:03	<1.3
	1240-6600	42783	17:50	<1.3
	1240-6920	42783	17:50	<1.3
	1340-6890	42783	18:00	<1.3
	1365-6460	42783	18:15	<1.3
1390-6800	42783	17:42	<1.3	
1480-7380	42783	18:47	<1.3	
1305-7220	42784	06:16	<1.3	
1305-7200	42784	06:15	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1190-6930	42784	06:27	<1.3
	1530-ACOS	42784	06:14	<1.3
	1390-6780	42784	06:00	<1.3
	1415-6800	42784	18:00	<1.3
	1240-6640	42784	17:49	<1.3
	1480-CFTE	42784	17:58	<1.3
	1480-7340	42784	17:58	<1.3
	1215-6500	42784	17:58	<1.3
	1480-7480	42784	17:58	<1.3
	1505-CFTO	42785	06:09	<1.3
	1390-6800	42785	06:20	<1.3
	1240-6680	42785	06:24	<1.3
	1330-HCCS	42785	06:11	<1.3
	1365-6520	42785	06:15	<1.3
	1415-CFTE	42785	17:50	<1.3
	1390-VENT	42785	17:50	<1.3
	1365-6460	42785	17:57	<1.3
	1330-RAMP	42785	00:30	<1.3
	1240-6360	42785	18:03	<1.3
	1240-6920	42786	06:07	<1.3
	1340-6890	42786	06:09	<1.3
	1505-7440	42786	06:05	<1.3
	1505-CFTO	42786	06:00	<1.3
	1430-7340	42786	18:03	<1.3
	1390-6800	42786	18:09	<1.3
	1315-6590	42786	18:07	<1.3
	1305-7220	42786	17:58	<1.3
	1240-6640	42787	06:15	<1.3
1240-6680	42787	06:15	<1.3	
1390-6780	42787	06:18	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1415-CFTO	42787	18:17	<1.3
	1530-RAMP	42787	18:17	<1.3
	1415-6800	42787	18:17	<1.3
	1390-6900	42788	06:30	<1.3
	1480-7500	42788	06:45	<1.3
	1480-7480	42788	06:45	<1.3
	1240-6640	42788	06:40	<1.3
	1190-6930	42788	06:33	<1.3
	1305-RAMP	42788	06:50	<1.3
	1480-7340	42788	18:06	<1.3
	1505-7440	42788	01:26	<1.3
	1330-sub est	42788	18:03	<1.3
	1240-6920	42788	02:24	<1.3
	1505-CFTE	42789	06:27	<1.3
	1365-6460	42789	06:38	<1.3
	1305-7220	42789	06:26	<1.3
	1305-sub est	42789	06:26	<1.3
	1240-6360	42789	06:12	<1.3
	1340-6590	42789	06:30	<1.3
	1215-6680	42789	00:43	<1.3
	1240-6680	42789	18:07	<1.3
	1240-6600	42789	18:06	<1.3
	1415-CFTO	42790	06:30	<1.3
	1505-CFTO	42790	06:10	<1.3
	1480-7380	42790	06:22	<1.3
	1340-6640	42790	06:15	<1.3
	1240-6920	42790	06:15	<1.3
	1330-SUB	42790	18:55	<1.3
	1480-7480	42790	18:52	<1.3
	1480-7340	42790	18:53	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1305-RAMP	42790	18:51	<1.3
	1330-ACCS	42790	18:55	<1.3
	1190-6830	42791	06:20	<1.3
	1240-6600	42791	06:30	<1.3
	1305-7220	42791	06:40	<1.3
	1480-7500	42791	06:15	<1.3
	1505-7440	42791	18:07	<1.3
	1415-6820	42791	18:06	<1.3
	1430-7460	42791	18:10	<1.3
	1315-6970	42791	18:04	<1.3
	1305-SUB	42792	06:15	<1.3
	1530-RAMP	42792	06:14	<1.3
	1505-CFTE	42792	06:15	<1.3
	1215-6680	42792	06:05	<1.3
	1480-7480	42792	18:21	<1.3
	1415-6820	42792	18:46	<1.3
	1390-VENT	42792	18:40	<1.3
	1390-CFTO	42792	18:40	<1.3
	1305-7220	42792	18:22	<1.3
	1505-CFTE	42793	18:18	<1.3
	1480-7500	42793	18:30	<1.3
	1240-6600	42793	18:23	<1.3
	1240-6460	42793	18:19	<1.3
	1315-6970	42793	18:20	<1.3
	1480-7340	42793	18:27	<1.3
	1505-7440	42793	18:16	<1.3
1305-7240	42794	18:16	<1.3	
1215-6680	42794	18:21	<1.3	
1390-VENT	42794	18:19	<1.3	
1390-CFTO	42794	04:48	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Febrero	1315-6970	42794	18:13	<1.3
	1505-CFTE	42795	18:20	<1.3
	1505-7480	42795	18:20	<1.3
	1530-RAMP	42795	18:12	<1.3
	1165-R/E	42795	18:10	<1.3
	1190-6620	42795	06:08	<1.3
	1240-6600	42795	06:22	<1.3
	1165-RAMP	42795	06:07	<1.3
	1315-6970	42795	06:07	<1.3
	1505-CFTO	42795	06:12	<1.3
	1505-7400	42795	06:12	<1.3
	1415-CFTO	42795	06:21	<1.3
	1340-6640	42795	06:19	<1.3
	1240-6920	42796	17:50	<1.3
	Marzo	1305-DESCENDENTE	42796	18:05
1480-7500		42796	17:55	<1.3
1365-6460		42796	18:15	<1.3
1340-6590		42796	17:55	<1.3
1330-ACC		42796	06:02	<1.3
1330-SUB EST		42796	06:02	<1.3
1480-7480		42796	06:08	<1.3
1505-CFTE		42796	06:00	<1.3
1305-7260		42797	18:07	<1.3
1305-7240		42797	18:07	<1.3
1505-7480		42797	18:10	<1.3
1190-6850		42797	18:20	<1.3
1455-7460		42797	18:10	<1.3
1305-7240		42797	06:33	<1.3
1240-6640		42797	06:16	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1240-6460	42797	06:14	<1.3
	1240-6600	42797	06:16	<1.3
	1190-6620	42797	06:18	<1.3
	1240-6920	42798	18:11	<1.3
	1505-CFTO	42798	18:06	<1.3
	1190-6600	42798	17:55	<1.3
	1505-7400	42798	18:06	<1.3
	1330-RAMP	42798	17:54	<1.3
	1165-RAMP	42798	11:30	<1.3
	1190-6600	42798	06:45	<1.3
	1480-7500	42798	06:52	<1.3
	1330-ACC	42798	06:42	<1.3
	1330-SUB EST	42798	06:42	<1.3
	1415-CFTO	42798	06:58	<1.3
	1390-VENT	42799	18:15	<1.3
	1365-6460	42799	18:24	<1.3
	1455-6460	42799	18:18	<1.3
	1315-6750	42799	18:01	<1.3
	1390-6660	42799	06:20	<1.3
	1390-VENT	42799	06:15	<1.3
	1330-RAMP	42799	06:01	<1.3
	1305-SUB EST	42799	06:01	<1.3
	1240-6640	42799	06:16	<1.3
	1240-6600	42799	06:16	<1.3
	1340-6930	42799	06:08	<1.3
	1305-7260	42800	18:28	<1.3
	1305-7240	42800	18:29	<1.3
	165-RAMP	42800	18:29	<1.3
1480-7480	42800	18:45	<1.3	
1190-6620	42800	18:30	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1480-7500	42800	06:05	<1.3
	1340-6920	42800	06:08	<1.3
	1365-6460	42800	06:20	<1.3
	1455-7410	42800	06:16	<1.3
	1305-7240	42801	18:05	<1.3
	1315-6750	42801	18:08	<1.3
	1390-VENT	42801	-	<1.3
	1480-7480	42801	06:18	<1.3
	1505-7400	42801	06:05	<1.3
	1530-RAMP	42801	06:00	<1.3
	1530-ACC	42801	06:00	<1.3
	1390-VENT	42801	05:58	<1.3
	1390-6900	42801	06:18	<1.3
	1190-6620	42802	14:58	<1.3
	1130-RAMP	42802	15:12	<1.3
	1505-7480	42802	15:10	<1.3
	1505-CFTE	42802	15:10	<1.3
	1340-6930	42802	15:17	<1.3
	1215-6620	42802	06:12	<1.3
	1330-ACC	42802	06:09	<1.3
	1480-7500	42802	06:12	<1.3
	1265-6950	42802	06:15	<1.3
	1165-RAMP	42802	06:10	<1.3
	1340-6590	42803	18:23	<1.3
	1315-6750	42803	18:19	<1.3
	1305-7260	42803	18:12	<1.3
	1305-7240	42803	18:11	<1.3
	1455-7410	42803	18:17	<1.3
	1505-CFTO	42803	18:11	<1.3
	1365-6460	42803	06:08	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1315-6750	42803	06:02	<1.3
	1240-6640	42803	06:07	<1.3
	1215-6620	42803	06:03	<1.3
	1390-6500	42804	18:28	<1.3
	1240-6920	42804	18:21	<1.3
	1190-6620	42804	18:15	<1.3
	1165-RAMP	42804	17:00	<1.3
	1505-7480	42804	18:12	<1.3
	1505-CFTE	42804	18:12	<1.3
	1190-6450	42804	06:07	<1.3
	1530-ACCS	42804	06:04	<1.3
	1505-7480	42804	06:08	<1.3
	1505-CFTO	42804	06:08	<1.3
	1190-6490	42804	06:08	<1.3
	1480-7500	42804	06:10	<1.3
	1305-7240	42805	18:05	<1.3
	1305-7260	42805	18:05	<1.3
	1455-7410	42805	18:25	<1.3
	1315-6750	42805	18:15	<1.3
	1390-6900	42805	08:07	<1.3
	1530-ACCS	42805	06:38	<1.3
	1530-RAMP	42805	06:38	<1.3
	1305-RAMP	42805	06:41	<1.3
	1190-6620	42805	06:37	<1.3
	1165-RAMP	42806	10:27	<1.3
	1240-6920	42806	18:37	<1.3
	1215-6620	42806	18:25	<1.3
1480-7500	42806	18:40	<1.3	
1480-7340	42806	12:32	<1.3	
1330-RAMP	42806	18:26	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1315-6750	42806	06:09	<1.3
	1365-6460	42806	06:12	<1.3
	1455-7410	42806	06:18	<1.3
	1505-7480	42806	06:14	<1.3
	1455-7460	42806	06:08	<1.3
	1480-7500	42807	19:20	<1.3
	1505-CFTO	42807	19:20	<1.3
	1190-6620	42807	18:45	<1.3
	1480-7340	42807	19:15	<1.3
	1215-6850	42807	19:50	<1.3
	1315-6790	42807	18:58	<1.3
	1305-7260	42807	06:30	<1.3
	1305-7240	42807	06:30	<1.3
	1165-RAMP	42807	06:19	<1.3
	1390-VENT	42807	06:16	<1.3
	1240-6920	42808	18:28	<1.3
	1390-6640	42808	18:42	<1.3
	1390-6660	42808	18:42	<1.3
	1190-6490	42808	18:30	<1.3
	1190-6450	42808	18:30	<1.3
	1530-RAMP	42808	18:23	<1.3
	1530-ACCS	42808	18:23	<1.3
	14807340	42808	18:27	<1.3
	1505-SERV	42808	06:18	<1.3
	1215-6620	42808	06:27	<1.3
	1330-ACCS	42808	06:32	<1.3
	1215-6850	42808	06:26	<1.3
1215-6850	42809	18:06	<1.3	
1190-6620	42809	18:03	<1.3	
1315-6790	42809	18:12	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1505-7480	42809	18:19	<1.3
	1305-RAMP	42809	18:00	<1.3
	1505-CFTE	42809	18:19	<1.3
	1455-7410	42809	06:24	<1.3
	1480-7500	42809	06:13	<1.3
	1305-CFTE	42809	06:15	<1.3
	1240-6600	42809	06:22	<1.3
	1315-6750	42809	06:26	<1.3
	1190-6450	42810	18:28	<1.3
	1190-6490	42810	18:28	<1.3
	1165-RAMP	42810	13:48	<1.3
	1215-6620	42810	18:37	<1.3
	1505-CFTO	42810	18:32	<1.3
	1505-SERV	42810	18:32	<1.3
	1240-6460	42810	18:43	<1.3
	1505-CFTE	42810	07:40	<1.3
	1530-ACCS	42810	18:32	<1.3
	1330-ACCS	42810	06:11	<1.3
	1305-RAMP	42810	06:09	<1.3
	1530-RAMP	42810	06:11	<1.3
	1455-7410	42810	06:20	<1.3
	1530-ACCS	42810	06:09	<1.3
	1215-6850	42810	06:16	<1.3
	1455-7410	42811	18:04	<1.3
	1505-CFTE	42811	17:38	<1.3
	1190-6620	42811	18:02	<1.3
	1305-CFTE	42811	18:12	<1.3
1240-6460	42811	08:09	<1.3	
1165-RAMP	42811	06:17	<1.3	
1190-6490	42811	06:28	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1190-6450	42811	06:25	<1.3
	1390-VENT-B	42811	06:27	<1.3
	1390-VENT-C	42811	06:24	<1.3
	1340-6640	42811	06:25	<1.3
	1480-7500	42812	18:10	<1.3
	1505-CFTE	42812	18:06	<1.3
	1505-SERV	42812	18:06	<1.3
	1505-CFTO	42812	18:06	<1.3
	1315-6750	42812	17:57	<1.3
	1355-CFTE	42812	18:15	<1.3
	1415-6820	42812	18:13	<1.3
	1330-ACCS	42812	06:11	<1.3
	1455-7410	42812	06:14	<1.3
	1330-ESQ	42812	06:12	<1.3
	1415-6820	42812	06:28	<1.3
	1390-6660	42812	06:24	<1.3
	1190-6620	42813	18:15	<1.3
	1215-6620	42813	18:19	<1.3
	1530-RAMP	42813	18:13	<1.3
	1530-ACCS	42813	18:13	<1.3
	1240-6500	42813	18:36	<1.3
	1415-6820	42813	18:15	<1.3
	1305-RAMP	42813	18:31	<1.3
	1190-6490	42813	06:20	<1.3
	1390-6640	42813	06:06	<1.3
	1165-RAMP-E	42813	06:12	<1.3
	1390-VENT-B	42813	06:09	<1.3
	1290-6410	42813	06:00	<1.3
	1190-6450	42814	18:05	<1.3
	1305-CFTE	42814	18:10	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1330-ACCS	42814	18:21	<1.3
	1315-6750	42814	04:48	<1.3
	1480-7500	42814	18:10	<1.3
	1530-ACCS	42814	18:05	<1.3
	1415-6820	42814	18:03	<1.3
	1240-6920	42814	06:15	<1.3
	1390-6660	42814	06:12	<1.3
	1390-VENT	42814	06:12	<1.3
	1240-6500	42814	06:10	<1.3
	1215-6620	42815	18:00	<1.3
	1305-RAMP	42815	18:01	<1.3
	1305-7280	42815	06:12	<1.3
	1315-6790	42815	06:19	<1.3
	1530-RAMP	42815	06:17	<1.3
	1530-ACCS	42815	06:17	<1.3
	1240-6500	42815	06:05	<1.3
	1505-CFTE	42816	18:11	<1.3
	1505-SERV	42816	18:11	<1.3
	1480-7500	42816	18:19	<1.3
	1190-6620	42816	18:09	<1.3
	1265-6850	42816	18:09	<1.3
	1330-CFTE	42816	18:00	<1.3
	1165-RAMP	42816	18:03	<1.3
	1455-7410	42816	05:46	<1.3
	1315-CFTE	42816	05:42	<1.3
	1390-VENT-B	42816	05:55	<1.3
	1305-RAMP	42816	05:35	<1.3
1190-6490	42816	05:35	<1.3	
1480-7460	42816	05:40	<1.3	
1415-6820	42817	18:20	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1240-6500	42817	18:25	<1.3
	1215-6620	42817	18:22	<1.3
	1505-SERV	42817	06:12	<1.3
	1315-6750	42817	06:35	<1.3
	1290-6410	42817	06:26	<1.3
	1190-6450	42817	06:10	<1.3
	1190-6620	42817	06:10	<1.3
	1505-7420	42817	06:12	<1.3
	1505-7380	42817	06:12	<1.3
	1215-6760	42817	06:20	<1.3
	1480-7460	42818	18:38	<1.3
	1165-RAMP	42818	18:29	<1.3
	1530-ACCS	42818	18:36	<1.3
	1530-RAMP	42818	18:36	<1.3
	1455-7410	42818	18:48	<1.3
	1390-CFTO	42818	18:45	<1.3
	1390-6620	42818	18:45	<1.3
	1390-6680	42818	18:47	<1.3
	1215-6600	42818	18:30	<1.3
	1305-RAMP	42818	06:08	<1.3
	1330-CFTE	42818	06:08	<1.3
	1190-6490	42818	06:00	<1.3
	1265-7010	42818	06:12	<1.3
	1315-CFTE	42819	18:24	<1.3
	1190-6620	42819	18:17	<1.3
	1480-7460	42819	18:15	<1.3
	1430-7370	42819	18:23	<1.3
	1430-7410	42819	18:22	<1.3
	1215-6620	42819	06:06	<1.3
	1190-6450	42819	05:48	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1505-SERV	42819	05:45	<1.3
	1505-7380	42819	05:45	<1.3
	1455-7370	42819	05:55	<1.3
	1455-7410	42819	05:55	<1.3
	1530-ACCS	42820	18:22	<1.3
	1190-6490	42820	18:30	<1.3
	1165-RAMP	42820	18:20	<1.3
	1265-6410	42820	18:37	<1.3
	1530-RAMP	42820	06:08	<1.3
	1305-RAMP	42820	06:00	<1.3
	1390-6680	42820	06:15	<1.3
	1265-6410	42820	06:03	<1.3
	1315-6750	42820	06:12	<1.3
	1290-6410	42820	06:06	<1.3
	1390-SERV	42821	18:24	<1.3
	1390-CFTO	42821	18:25	<1.3
	11900-6450	42821	18:24	<1.3
	1215-6760	42821	18:29	<1.3
	1390-6780	42821	18:26	<1.3
	1330-CFTE	42821	06:26	<1.3
	1390-6620	42821	06:26	<1.3
	1455-7370	42821	06:15	<1.3
	1215-6620	42821	06:15	<1.3
	1530-RAMP	42822	18:08	<1.3
	1190-6720	42822	18:08	<1.3
	1190-6490	42822	18:14	<1.3
1415-7410	42822	18:18	<1.3	
1290-6750	42822	18:02	<1.3	
1190-6450	42822	06:00	<1.3	
1215-6760	42822	06:09	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1505-VENT	42822	06:04	<1.3
	1390-6780	42822	06:11	<1.3
	1165-RAMP	42823	18:20	<1.3
	1405-CFTO	42823	18:20	<1.3
	1390-VENT-B	42823	18:34	<1.3
	1190-6490	42823	18:35	<1.3
	1480-7460	42823	18:26	<1.3
	1505-7380	42823	18:20	<1.3
	1530-RAMP	42823	06:09	<1.3
	1530-ACCS	42823	06:09	<1.3
	1455-7410	42823	06:19	<1.3
	1305-RAMP	42823	06:11	<1.3
	1315-6750	42823	06:20	<1.3
	1215-6600	42823	06:17	<1.3
	1455-7370	42824	18:40	<1.3
	1390-6700	42824	18:55	<1.3
	1330-CFTE	42824	18:30	<1.3
	1215-6760	42824	18:32	<1.3
	1305-7280	42824	18:48	<1.3
	1305-CFTE	42824	18:48	<1.3
	1290-6950	42824	06:13	<1.3
	1215-6620	42824	06:16	<1.3
	1190-6450	42824	06:13	<1.3
	1190-6490	42824	06:13	<1.3
	1390-CFTO	42824	06:16	<1.3
	1390-VENT-B	42824	06:16	<1.3
1505-CFTO	42825	18:25	<1.3	
1505-7380	42825	18:25	<1.3	
1480-7460	42825	18:35	<1.3	
1165-RAMP	42825	18:22	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Marzo	1215-6760	42825	05:54	<1.3
	1305-RAMP	42825	06:04	<1.3
	1390-6700	42825	06:08	<1.3
	1455-7370	42825	06:02	<1.3
	1530-RAMP	42825	05:55	<1.3
Abril	1455-7410	42826	18:27	<1.3
	1315-6750	42826	08:23	<1.3
	1305-CFTE	42826	18:10	<1.3
	1530-ACCS	42826	18:10	<1.3
	1505-SERV	42826	18:18	<1.3
	1505-7380	42826	18:18	<1.3
	1480-7460	42826	06:08	<1.3
	1455-DDST	42826	06:16	<1.3
	1330-CFTE	42826	06:30	<1.3
	1190-6450	42826	06:15	<1.3
	1165-RAMP-E	42827	13:56	<1.3
	1340-6460	42827	13:12	<1.3
	1530-SUMI	42827	18:20	<1.3
	1455-7370	42827	18:39	<1.3
	1190-6700	42827	18:25	<1.3
	1305-RAMP	42827	18:13	<1.3
	1190-6490	42827	18:25	<1.3
	1365-6460	42827	18:12	<1.3
	1305-CFTE	42827	06:35	<1.3
	1390-6620	42827	06:18	<1.3
	1215-6760	42827	06:15	<1.3
	1215-6620	42828	18:03	<1.3
	1190-6450	42828	17:55	<1.3
	1240-6600	42828	18:35	<1.3
	1455-7410	42828	18:14	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1530-RAMP	42828	18:09	<1.3
	1390-6700	42828	18:23	<1.3
	1240-6920	42828	18:15	<1.3
	1305-CFTE	42828	06:10	<1.3
	1305-7280	42828	06:10	<1.3
	1190-6490	42828	06:20	<1.3
	1305-RAMP	42828	06:28	<1.3
	1455-DDST	42828	06:17	<1.3
	1390-VENT	42828	06:11	<1.3
	1505-SERV	42829	18:20	<1.3
	1390-VENT-B	42829	18:23	<1.3
	1330-CFTE	42829	18:17	<1.3
	1215-6760	42829	18:20	<1.3
	1165-RAMP-E	42829	18:17	<1.3
	1315-CFTE	42829	06:13	<1.3
	1190-6450	42829	06:17	<1.3
	1365-6460	42829	06:14	<1.3
	1315-6790	42829	06:16	<1.3
	1505-7500	42830	18:23	<1.3
	1455-7360	42830	18:26	<1.3
	1215-6620	42830	18:09	<1.3
	1530-SUMI	42830	18:08	<1.3
	1530-ACCS	42830	18:08	<1.3
	1365-6520	42830	18:28	<1.3
	1240-6920	42830	06:13	<1.3
	1315-6450	42830	06:11	<1.3
	1305-RAMP	42830	06:24	<1.3
	1315-CFTE	42830	06:10	<1.3
1505-7500	42830	06:20	<1.3	
1505-SERV	42830	06:21	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1430-CFTE	42830	06:31	<1.3
	1480-7460	42830	06:27	<1.3
	1505-CFTO	42831	18:28	<1.3
	1390-6700	42831	18:35	<1.3
	1330-CFTE	42831	18:18	<1.3
	1315-6790	42831	18:25	<1.3
	1165-RAMP-E	42831	18:15	<1.3
	1365-6520	42831	06:04	<1.3
	1390-VENT-C	42831	06:01	<1.3
	1505-7500	42831	06:03	<1.3
	1455-7360	42831	06:07	<1.3
	1305-CFTE	42832	18:10	<1.3
	1390-6700	42832	18:04	<1.3
	1390-6620	42832	18:04	<1.3
	1165-RAMP-E	42832	18:05	<1.3
	1365-6460	42832	18:05	<1.3
	1305-RAMP	42832	06:00	<1.3
	1315-6790	42832	06:07	<1.3
	1290-6890	42832	05:55	<1.3
	1165-RAMP-E	42832	-	<1.3
	1530-ACCS	42832	06:25	<1.3
	1530-SUMI	42832	06:25	<1.3
	1430-CFTE	42832	06:10	<1.3
	1430-CFTE	42833	18:05	<1.3
	1330-CFTE	42833	18:06	<1.3
	1215-6890	42833	18:53	<1.3
	1505-CFTO	42833	18:55	<1.3
	1455-7370	42833	18:00	<1.3
	1365-6520	42833	18:55	<1.3
	1390-6700	42833	06:17	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1480-7460	42833	05:57	<1.3
	1365-6800	42833	06:30	<1.3
	1315-6790	42833	06:09	<1.3
	1165-RAMP-E	42833	06:02	<1.3
	1315-CFTE	42834	17:53	<1.3
	1330-CFTE	42834	17:45	<1.3
	15005-7500	42834	17:48	<1.3
	1430-CFTE	42834	17:53	<1.3
	1365-6460	42834	17:51	<1.3
	1215-6890	42834	06:02	<1.3
	1330-CFTE	42834	06:20	<1.3
	1530-ACCS	42834	06:14	<1.3
	1530-RAMP	42834	06:14	<1.3
	1505-SERV-B	42834	06:22	<1.3
	1390-6780	42834	06:25	<1.3
	1315-6790	42835	18:27	<1.3
	1165-RAMP-E	42835	18:08	<1.3
	1390-6700	42835	18:11	<1.3
	1240-6680	42835	18:19	<1.3
	1315-CFTE	42835	18:22	<1.3
	1530-RAMP	42835	06:19	<1.3
	1480-7460	42835	06:20	<1.3
	1455-7360	42835	06:38	<1.3
	1305-RAMP	42835	06:15	<1.3
	1365-6520	42835	06:24	<1.3
	1305-CFTE	42836	18:10	<1.3
	1305-7280	42836	18:13	<1.3
	1315-CFTE	42836	18:11	<1.3
	1330-SUMI	42836	18:23	<1.3
	1315-6790	42836	06:12	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1215-6810	42836	06:00	<1.3
	1480-7460	42836	06:05	<1.3
	1430-CFTE	42837	18:20	<1.3
	1530-ACCS	42837	18:06	<1.3
	1505-7500	42837	18:15	<1.3
	1165-RAMP-E	42837	18:05	<1.3
	1215-6890	42837	18:12	<1.3
	1240-6680	42837	18:20	<1.3
	1305-RAMP	42837	05:55	<1.3
	1455-7370	42837	06:20	<1.3
	1505-CFTO	42837	05:57	<1.3
	1505-SERV	42837	05:57	<1.3
	1430-7480	42837	06:13	<1.3
	1530-ACCS	42837	05:48	<1.3
	1505-7500	42837	05:48	<1.3
	1190-6820	42837	05:45	<1.3
	1315-CFTE	42838	18:24	<1.3
	1305-CFTE	42838	18:16	<1.3
	1330-7260	42838	18:28	<1.3
	1430-CFTE	42838	18:16	<1.3
	1315-6790	42838	06:02	<1.3
	1390-6700	42838	06:12	<1.3
	1190-6510	42838	05:57	<1.3
	1330-7260	42838	05:55	<1.3
	1215-6810	42839	18:15	<1.3
	1505-SERV-B	42839	18:06	<1.3
	1505-7500	42839	17:54	<1.3
	1505-CFTO	42839	18:06	<1.3
1215-6890	42839	18:13	<1.3	
1165-RAMP-E	42839	18:05	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1480-7500	42839	06:19	<1.3
	1340-6670	42839	06:02	<1.3
	1455-7360	42839	06:08	<1.3
	1315-CFTE	42839	06:08	<1.3
	1305-CFTE	42839	06:04	<1.3
	1415-6780	42840	17:52	<1.3
	1305-RAMP	42840	17:57	<1.3
	1430-CFTE	42840	17:48	<1.3
	1315-6790	42840	17:47	<1.3
	1240-6420	42840	17:56	<1.3
	1330-7260	42840	06:15	<1.3
	1330-SUMI	42840	06:16	<1.3
	1455-7370	42840	06:00	<1.3
	1190-RMUK-RAMP-E	42840	06:00	<1.3
	1390-6700	42840	06:09	<1.3
	1505-7500	42841	18:13	<1.3
	1215-6810	42841	18:10	<1.3
	1315-CFTE	42841	18:18	<1.3
	1190-6810	42841	18:04	<1.3
	1315-6450	42841	18:18	<1.3
	1505-CFTO	42841	00:57	<1.3
	1505-SERV-B	42841	06:04	<1.3
	1315-6790	42841	06:04	<1.3
	1330-CFTO	42841	06:00	<1.3
	1240-6420	42841	14:30	<1.3
	1315-6890	42842	18:36	<1.3
	1240-6420	42842	18:33	<1.3
	1455-6370	42842	18:25	<1.3
	1415-6780	42842	18:31	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1215-6960	42842	18:15	<1.3
	1330-CFTO	42842	18:01	<1.3
	1215-6890	42842	18:15	<1.3
	1305-RAMP	42842	06:08	<1.3
	1305-CFTE	42842	06:04	<1.3
	1165-RMUK	42842	05:53	<1.3
	1305-7280	42842	00:57	<1.3
	1315-CFTE	42842	05:52	<1.3
	1290-6400	42843	18:26	<1.3
	1505-7500	42843	18:32	<1.3
	1315-6450	42843	18:32	<1.3
	1215-6810	42843	18:00	<1.3
	1390-6700	42843	18:40	<1.3
	1480-7500	42843	18:31	<1.3
	1340-6670	42843	06:45	<1.3
	1430-CFTE	42843	06:43	<1.3
	1415-6780	42843	06:48	<1.3
	1315-6890	42843	06:45	<1.3
	1505-7420	42844	18:06	<1.3
	1505-6380	42844	18:06	<1.3
	1505-CFTO	42844	18:06	<1.3
	1415-6880	42844	18:20	<1.3
	1190-6810	42844	18:07	<1.3
	1415-6760	42844	06:32	<1.3
	1315-6790	42844	06:26	<1.3
	1330-CFTO	42844	06:25	<1.3
	1215-6810	42844	06:21	<1.3
	1330-7260	42844	06:25	<1.3
	1290-6410	42844	06:23	<1.3
	1315-CFTE	42845	18:15	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1430-CFTE	42845	18:17	<1.3
	1215-6890	42845	18:04	<1.3
	1305-RAMP	42845	18:15	<1.3
	1305-RMUK	42845	18:07	<1.3
	1215-6960	42845	18:04	<1.3
	1315-6790	42845	06:15	<1.3
	1390-6700	42845	06:04	<1.3
	1165-RAMP-O	42845	06:16	<1.3
	1305-CFTE	42845	06:05	<1.3
	1305-7300	42845	06:05	<1.3
	1415-6880	42846	18:55	<1.3
	1505-7500	42846	18:36	<1.3
	1430-CFTE	42846	18:48	<1.3
	1330-CFTO	42846	18:52	<1.3
	1190-6810	42846	18:35	<1.3
	1215-6890	42846	18:41	<1.3
	1430-6590	42846	18:48	<1.3
	1480-7500	42846	18:35	<1.3
	1505-CFTO	42846	18:36	<1.3
	1505-SERV	42846	06:19	<1.3
	1505-7360	42846	06:19	<1.3
	1215-6810	42846	06:10	<1.3
	1415-6780	42846	06:31	<1.3
	1415-6760	42846	06:31	<1.3
	1480-7500	42846	06:16	<1.3
	1315-6790	42847	18:03	<1.3
	1165-RMUK	42847	18:00	<1.3
	1505-7420	42847	18:00	<1.3
	1315-CFTE	42847	18:03	<1.3
	1430-7520	42847	18:05	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1340-6590	42847	18:12	<1.3
	1390-6700	42847	06:12	<1.3
	1505-CFTO	42847	06:18	<1.3
	1415-6880	42847	06:27	<1.3
	1165-RAMP-O	42847	06:15	<1.3
	1505-7500	42848	17:55	<1.3
	1330-CFTO	42848	08:00	<1.3
	1215-6960	42848	18:00	<1.3
	1215-6810	42848	18:04	<1.3
	1480-7500	42848	17:56	<1.3
	1480-7500	42848	07:40	<1.3
	1215-LONGITUDINAL	42848	06:33	<1.3
	1305-7300	42848	06:31	<1.3
	1305-CFTE	42848	06:30	<1.3
	1165-RMUK	42848	06:35	<1.3
	1415-6780	42848	06:41	<1.3
	1430-7520	42848	06:29	<1.3
	1505-7420	42848	06:34	<1.3
	1330-7240	42849	18:01	<1.3
	1330-7260	42849	18:01	<1.3
	1190-6810	42849	17:59	<1.3
	1215-6890	42849	18:03	<1.3
	1315-CFTE	42849	06:11	<1.3
	1165-RMUK	42849	06:07	<1.3
	1190-6410	42849	06:21	<1.3
	1505-7500	42850	17:57	<1.3
	1415-6780	42850	18:07	<1.3
	1415-6880	42850	18:07	<1.3
1215-6810	42850	17:55	<1.3	

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1315-6790	42850	18:02	<1.3
	1505-SERV	42850	17:57	<1.3
	1315-CFTE	42850	06:25	<1.3
	1505-7440	42850	06:13	<1.3
	1305-RMUK	42850	05:55	<1.3
	1505-7360	42850	06:15	<1.3
	1505-CFTO	42850	06:15	<1.3
	1215-6890	42850	06:03	<1.3
	1265-6600	42851		<1.3
	1415-6760	42851		<1.3
	1165-RMUK	42851		<1.3
	1430-7520	42851		<1.3
	1430-CFTE	42851		<1.3
	1340-6600	42851	06:25	<1.3
	1265-7040	42851	06:17	<1.3
	1190-6410	42851	06:07	<1.3
	1315-6790	42851	06:16	<1.3
	1305-7300	42851	06:06	<1.3
	1305-ACCS-CFTE	42851	06:06	<1.3
	1215-6810	42852	17:45	<1.3
	1505-7500	42852	17:46	<1.3
	1330-7240	42852	17:26	<1.3
	1330-7260	42852	18:26	<1.3
	1330-CFTO	42852	18:26	<1.3
	1430-CFTE	42852	06:00	<1.3
	1430-7520	42852	06:00	<1.3
	1415-6880	42852	06:15	<1.3
	1165-RAMP-E	42852	06:02	<1.3
	1190-6810	42852	06:02	<1.3
	1290-BYPASS	42852	06:11	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1340-6540	42852	06:14	<1.3
	1315-CFTE	42853	18:24	<1.3
	1215-6890	42853	18:09	<1.3
	1305-RMUK	42853	18:08	<1.3
	1415-6760	42853	18:36	<1.3
	1415-6780	42853	18:36	<1.3
	1505-7440	42853	19:05	<1.3
	1505-SERV	42853	18:29	<1.3
	1505-CFTO	42853	06:07	<1.3
	1505-7360	42853	06:07	<1.3
	1315-6790	42853	05:57	<1.3
	1265-6600	42853	06:23	<1.3
	1165-RAMP-O	42853	06:09	<1.3
	1340-6540	42853	06:01	<1.3
	1215-6810	42854	18:32	<1.3
	1215-6960	42854	18:30	<1.3
	1330-7240	42854	18:13	<1.3
	1505-7480	42854	18:28	<1.3
	1390-6800	42854	18:10	<1.3
	1290-BYPASS	42854	18:14	<1.3

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Abril	1430-CFTO	42854	06:59	<1.3
	1430-7520	42854	06:59	<1.3
	1315-CFTE	42854	06:48	<1.3
	1505-RAMP	42854	06:47	<1.3
	1505-RMUK	42854	06:47	<1.3
	1305-7300	42855		<1.3
	1305-ACCS-CFTE	42855		<1.3
	1305-CFTE	42855		<1.3
	1505-7500	42855		<1.3
	1215-6890	42855		<1.3
	1390-6800	42855		<1.3
	1330-CFTO	42855	06:03	<1.3
	1330-7240	42855	06:03	<1.3
	1330-SUMI	42855	-	<1.3
	1505-CFTO	42855	06:20	<1.3
	1415-6780	42855	06:12	<1.3
	1265-6600	42855	06:57	<1.3
	1390-6800	42855	05:55	<1.3

Donde mm/s: milímetros por segundo; NR: no registrado
 Fuente: MSR, 2017.

9 Geoquímica de Roca Estéril

9.1 Sitios de Monitoreo

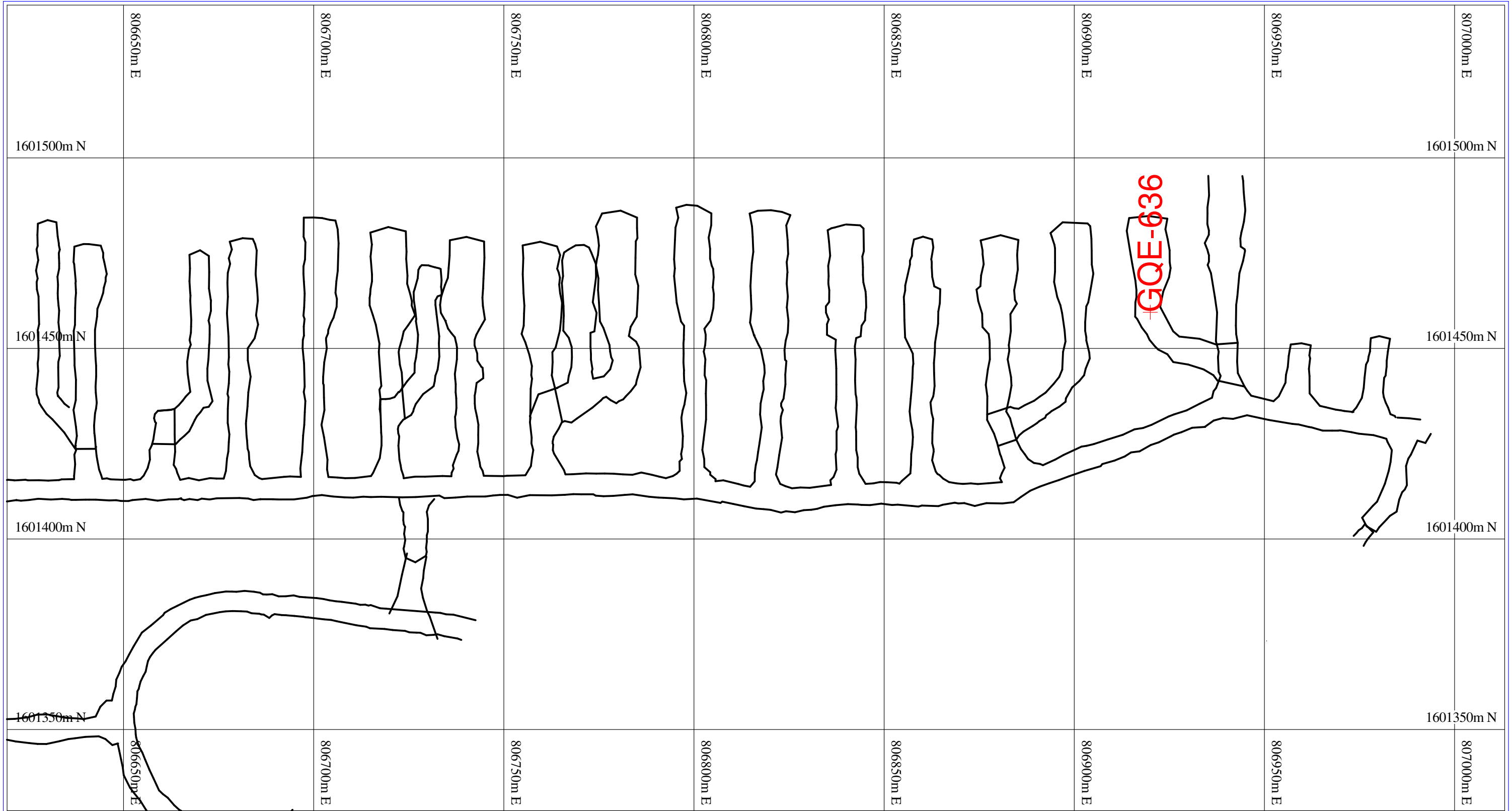
En el Cuadro 9-1 se enlistan las muestras analizadas de material extraído de los túneles del proyecto, rampa oeste y rampa este, durante los meses de Febrero a Abril de 2016. La ubicación de la extracción de las muestras se presenta en la Figura 9-1, Figura 9-2, Figura 9-3, Figura 9-4, Figura 9-5, Figura 9-6, Figura 9-7, Figura 9-8 y Figura 9-9, Figura 9-10, Figura 9-11y Figura 9-12.

Cuadro 9-1: Sitios de Material Extraído de los Túneles, Proyecto Minero Escobal

Código de Muestra	Área	Coordenadas		
		X	Y	Z
GQE-625	1305-CFTE-ZE	807268.5	1601498.5	1307
GQE-626	1415-6840-EC	806840	1601374	1416
GQE-627	1390-CFTO-EC	806619	1601348.5	1395
GQE-628	1505-7460-ZE	807460	1601643.5	1507
GQE-629	1365-6460-OC	806460	1601409.5	1366
GQE-630	1480-7340-ZE	807340	1601613.5	1481
GQE-631	1415-CFTO-EC	806757	1601366	1415
GQE-632	1305-7200-EC	807200	1601503	1306
GQE-633	1415-6800-EC	806800	1601374	1415
GQE-634	1505-CFTE-ZE	807498	1601640	1507
GQE-635	1305-7220	807220	1601507	1309
GQE-636	1240-6920	806920	1601459.5	1246
GQE-637	1390-6640-EC	806460	1601363	1394
GQE-638	1390-6660-EC	806660	1601358	1394
GQE-639	1390-6680-EC	806680	1601357	1394
GQE-640	1505-7400-ZE	807400	1601624	1507
GQE-641	1505-7480-ZE	807485	1601647	1508
GQE-642	1480-7500-ZE	807502	1601645	1508
GQE-643	1530-Ramp-ZE	807431	1601571	1535
GQE-644	1305-RAMP	807251	1601413	1325
GQE-645	1330-CFTE-ZE	807258	1601498.5	1330
GQE-646	1315-CFTE	807052.25	1601425.55	1321
GQE-647	1305-7240	807240.09	1601510.82	1308
GQE-648	1315-7260	807260	1601512.57	1307
GQE-649	1390-6640	806640	1601365.5	1395
GQE-650	1165-RAMP	806892	1601348.5	1165
GQE-651	1505-CFTO-ZE	807361	1601608	1505
GQE-652	1530-ACC	807450.5	1601636.7	1530
GQE-653	1305-7280-E	807280	1601518	1305
GQE-654	1305-CFTE	807330	1601507	1305

Código de Muestra	Área	Coordenadas		
		X	Y	Z
GQE-655	1505-7380	807379.73	1601622.15	1508
GQE-656	1505-7420	807420.65	1601628	1507
GQE-657	1505-7500	807503	1601665	1508
GQE-658	1430-CFTE-ZE	807535.5	1601636	1435

Fuente: MSR, 2017.



l_2017_ard_nivel_1240

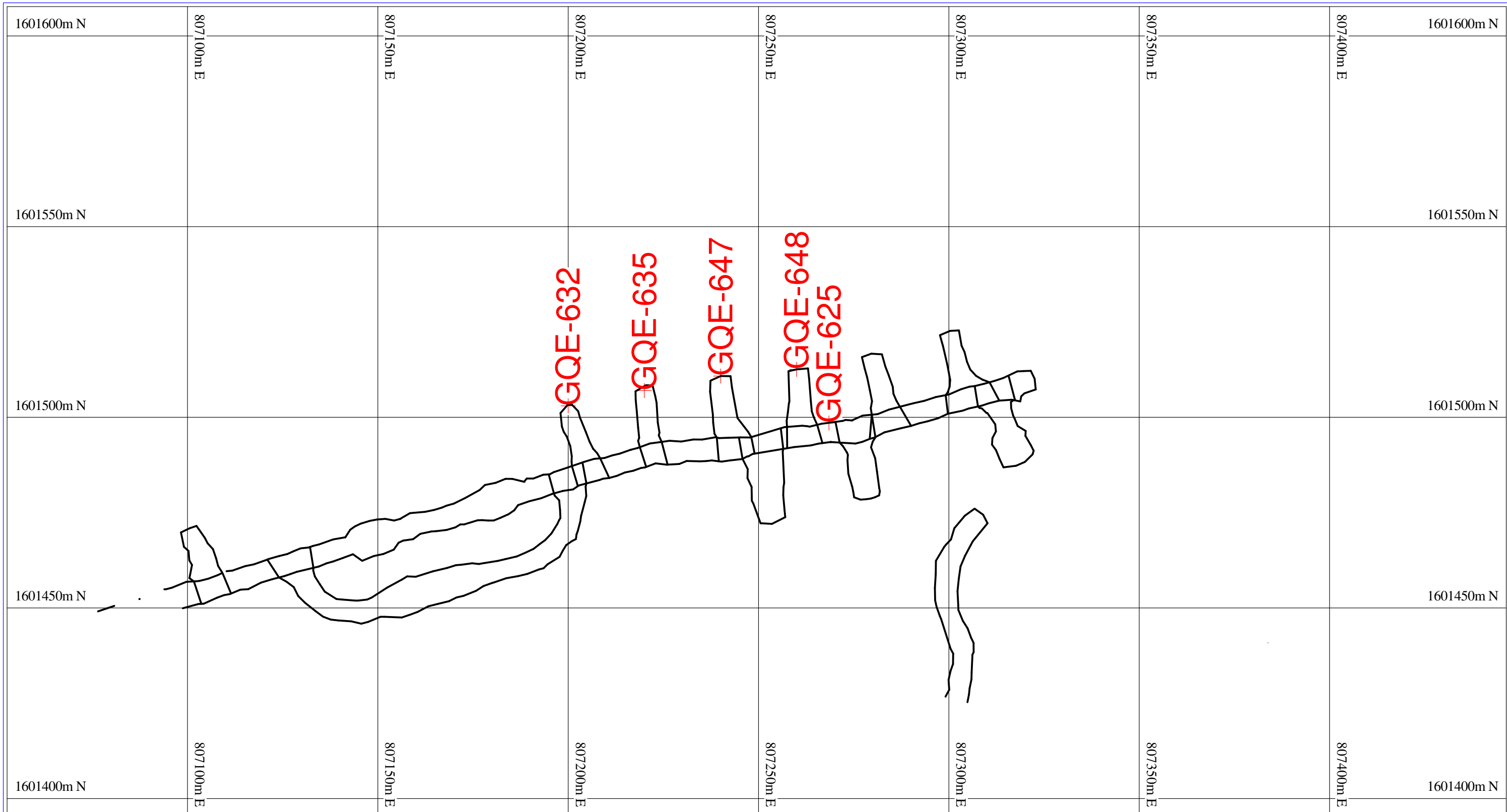


DRENAJE ACIDO DE ROCA (ARD)

Febrero_Abril_2017_Nivel_1240

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
Proyecto Escobal



l_2017_ard_nivel_1305

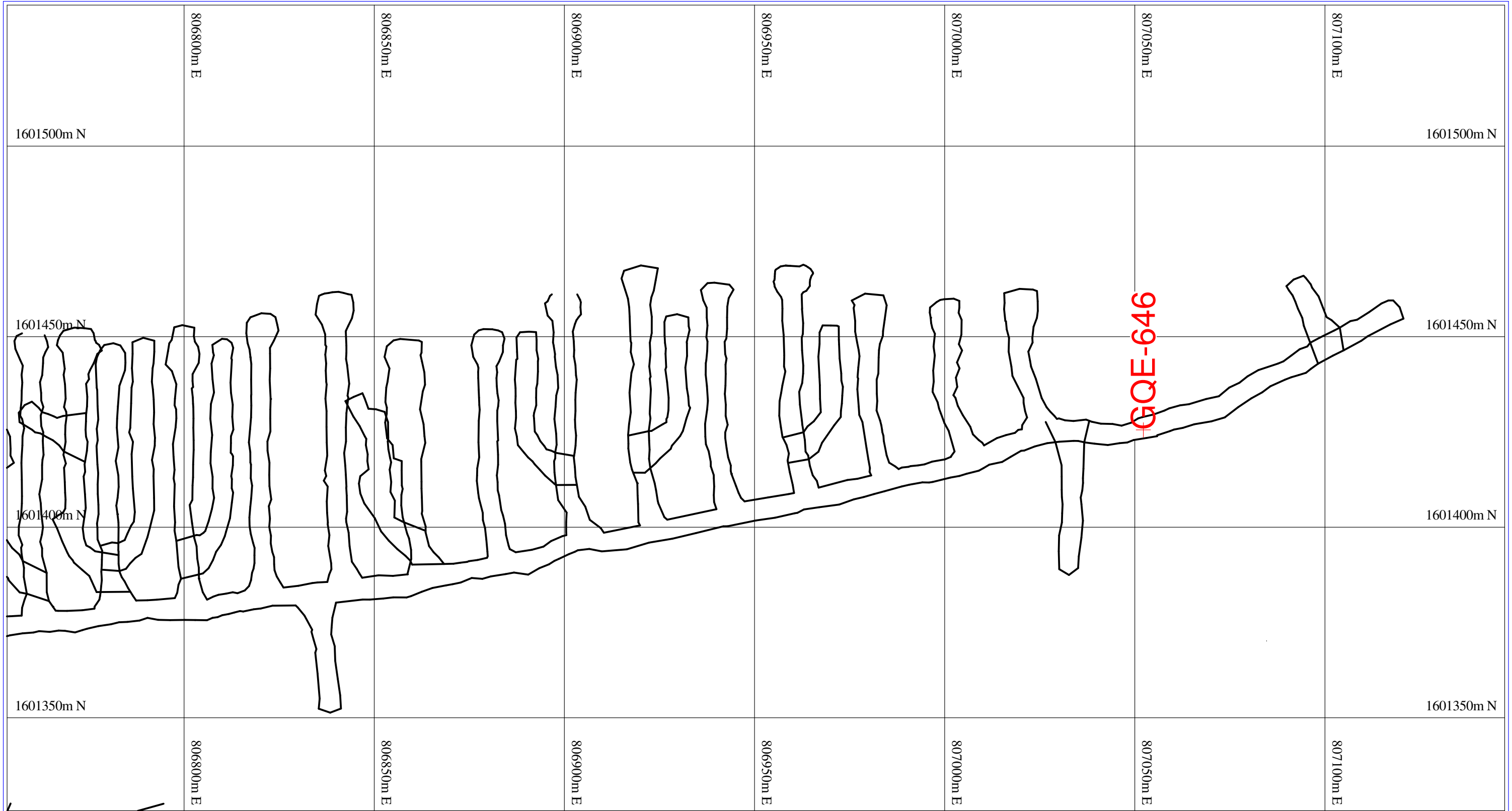


DRENAJE ACIDO DE ROCA (ARD)

Febrero_Abril_2017_Nivel_1305

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
Proyecto Escobal



l_2017_ard_nivel_1315



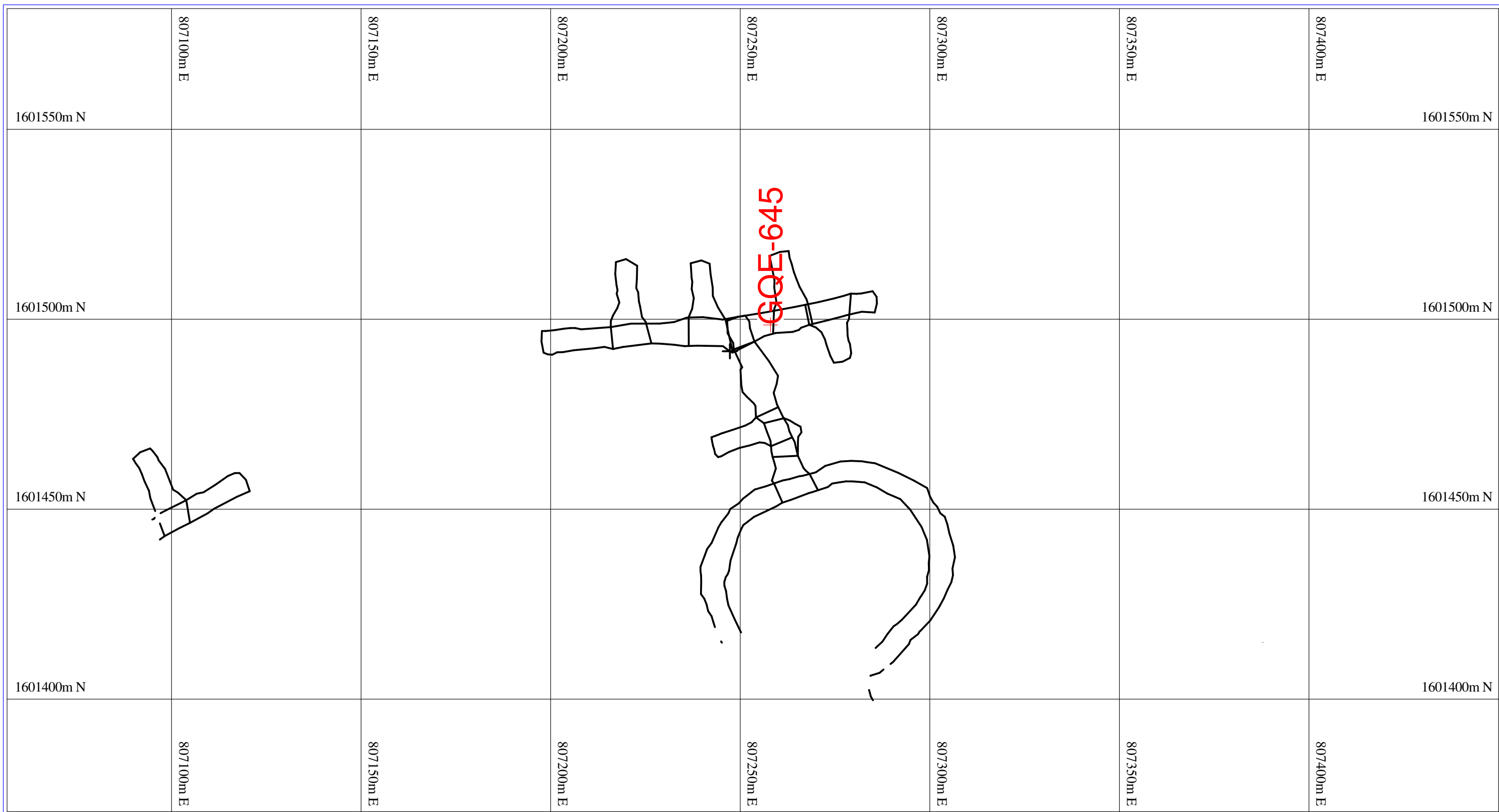
DRENAJE ACIDO DE ROCA (ARD)

Febrero_Abril_2017_Nivel_1315

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
Proyecto Escobal

l_2017_ard_nivel_1330

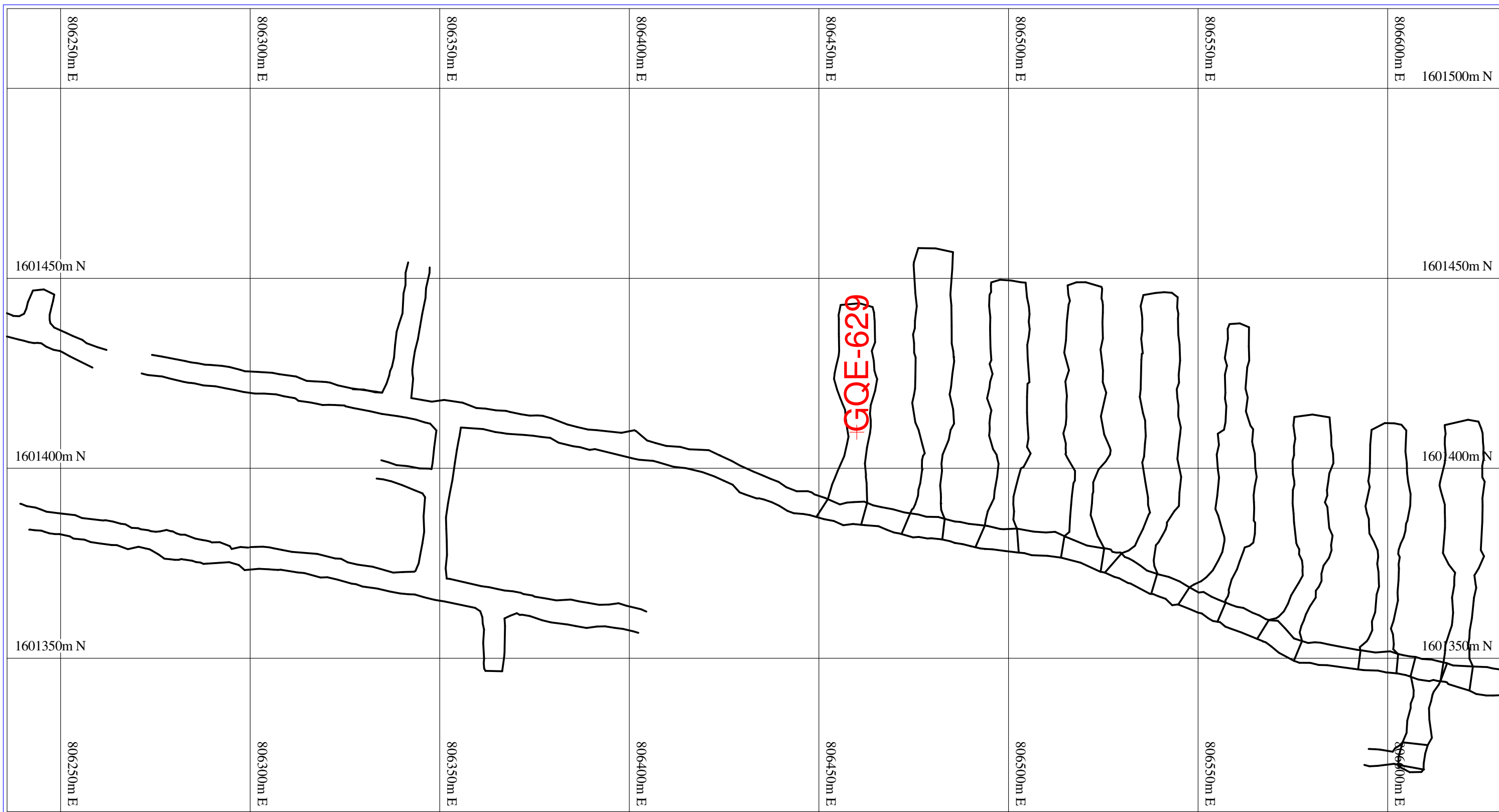


DRENAJE ACIDO DE ROCA (ARD)
 Febrero_Abril_2017_Nivel_1330

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
 Proyecto Escobal

l_2017_ard_nivel_1365

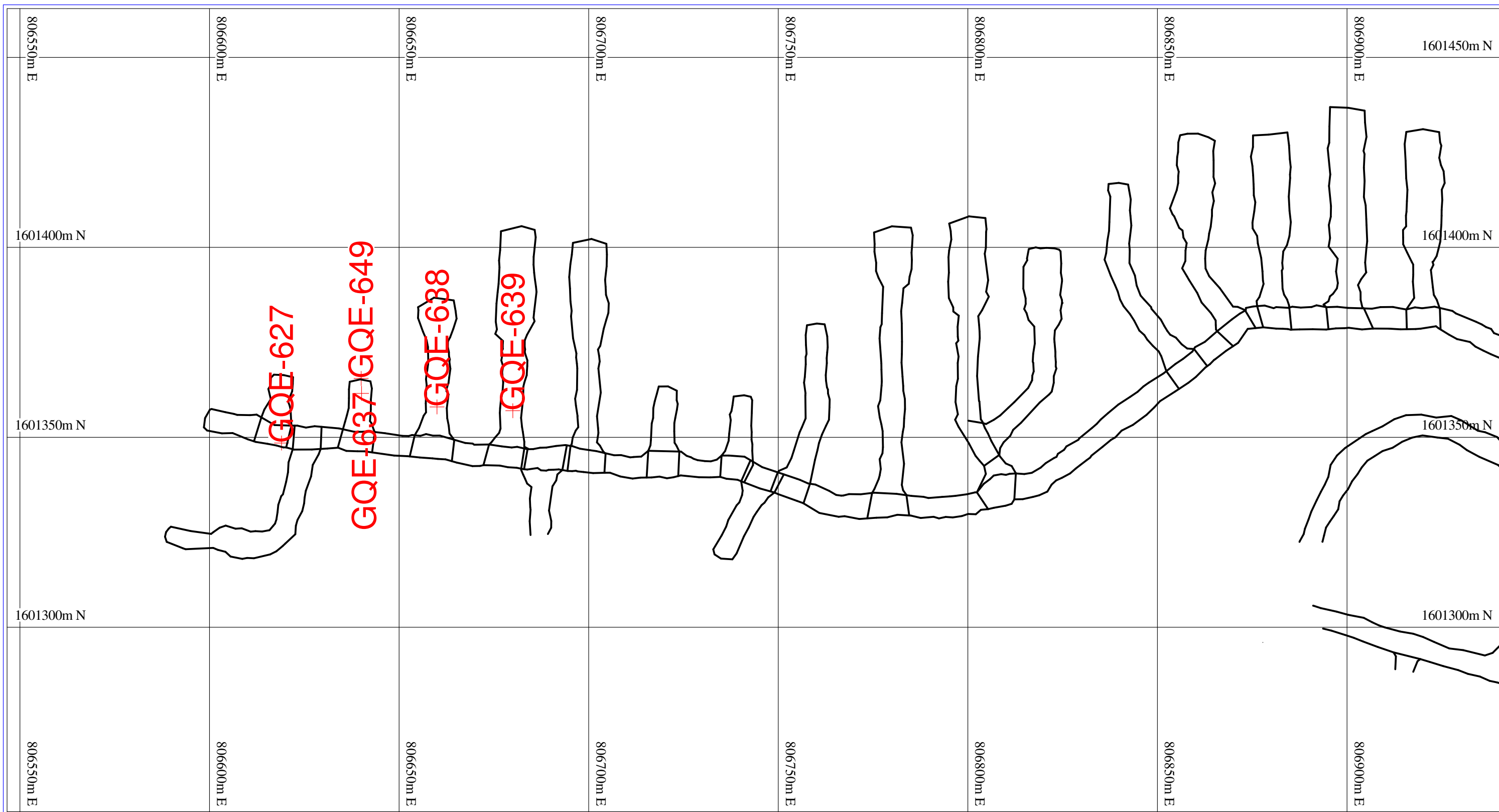


DRENAJE ACIDO DE ROCA (ARD)
 Febrero_Abril_2017_Nivel_1365

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
 Proyecto Escobal

l_2017_ard_nivel_1390



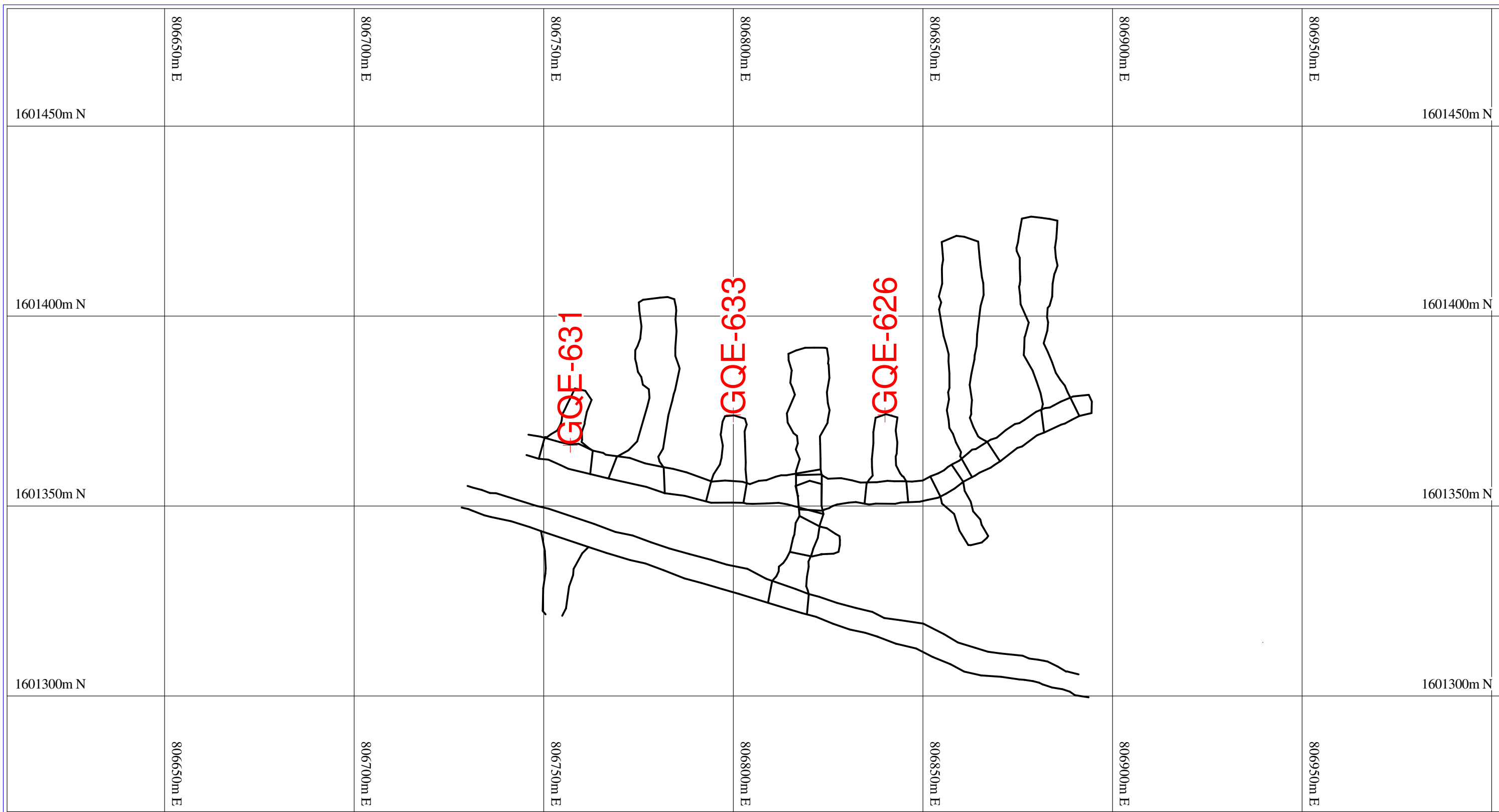
DRENAJE ACIDO DE ROCA (ARD)

Febrero_Abril_2017_Nivel_1390

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
Proyecto Escobal

l_2017_ard_nivel_1415

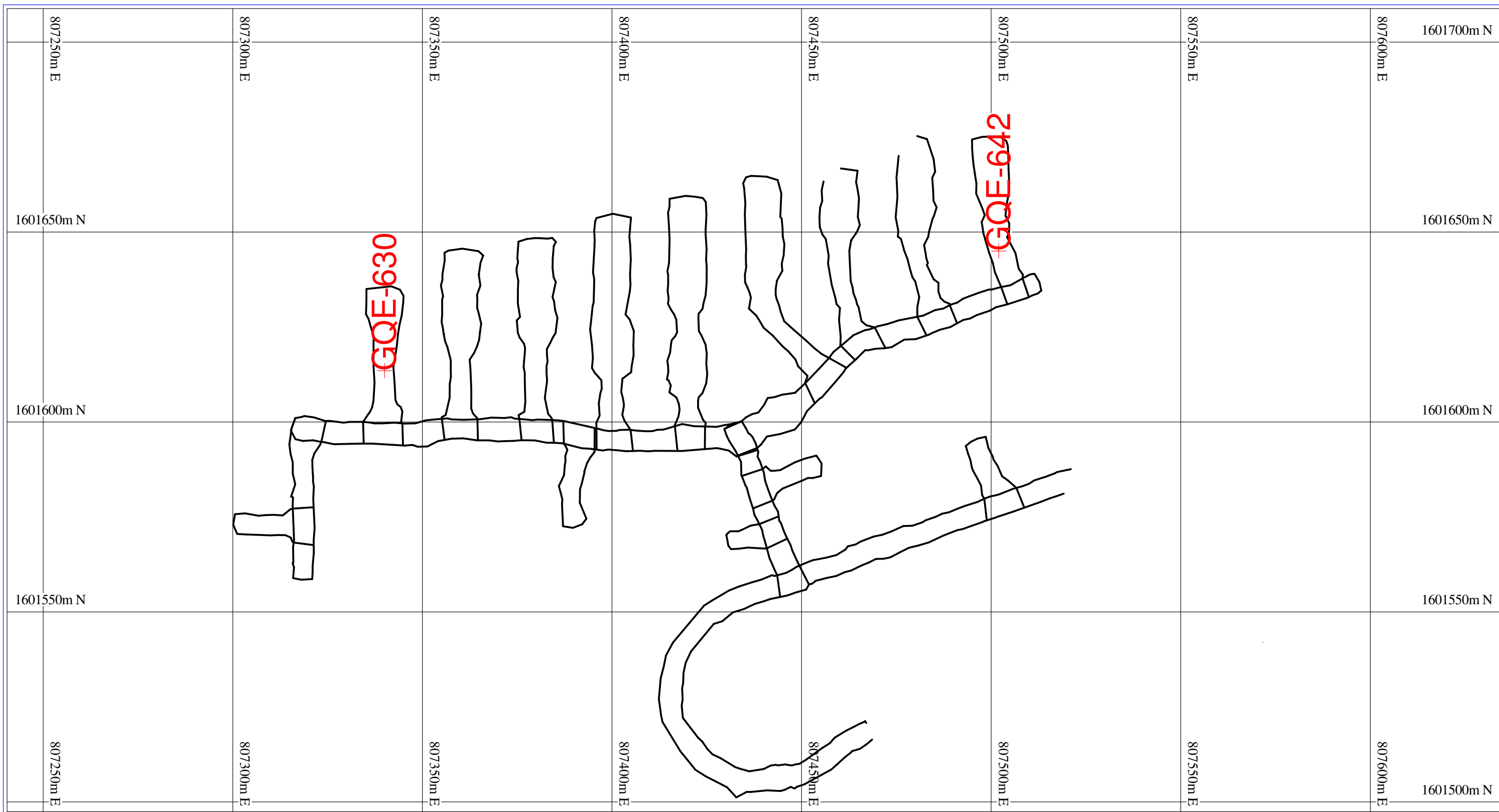


DRENAJE ACIDO DE ROCA (ARD)
 Febrero_Abril_2017_Nivel_1415

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
 Proyecto Escobal

l_2017_ard_nivel_1480



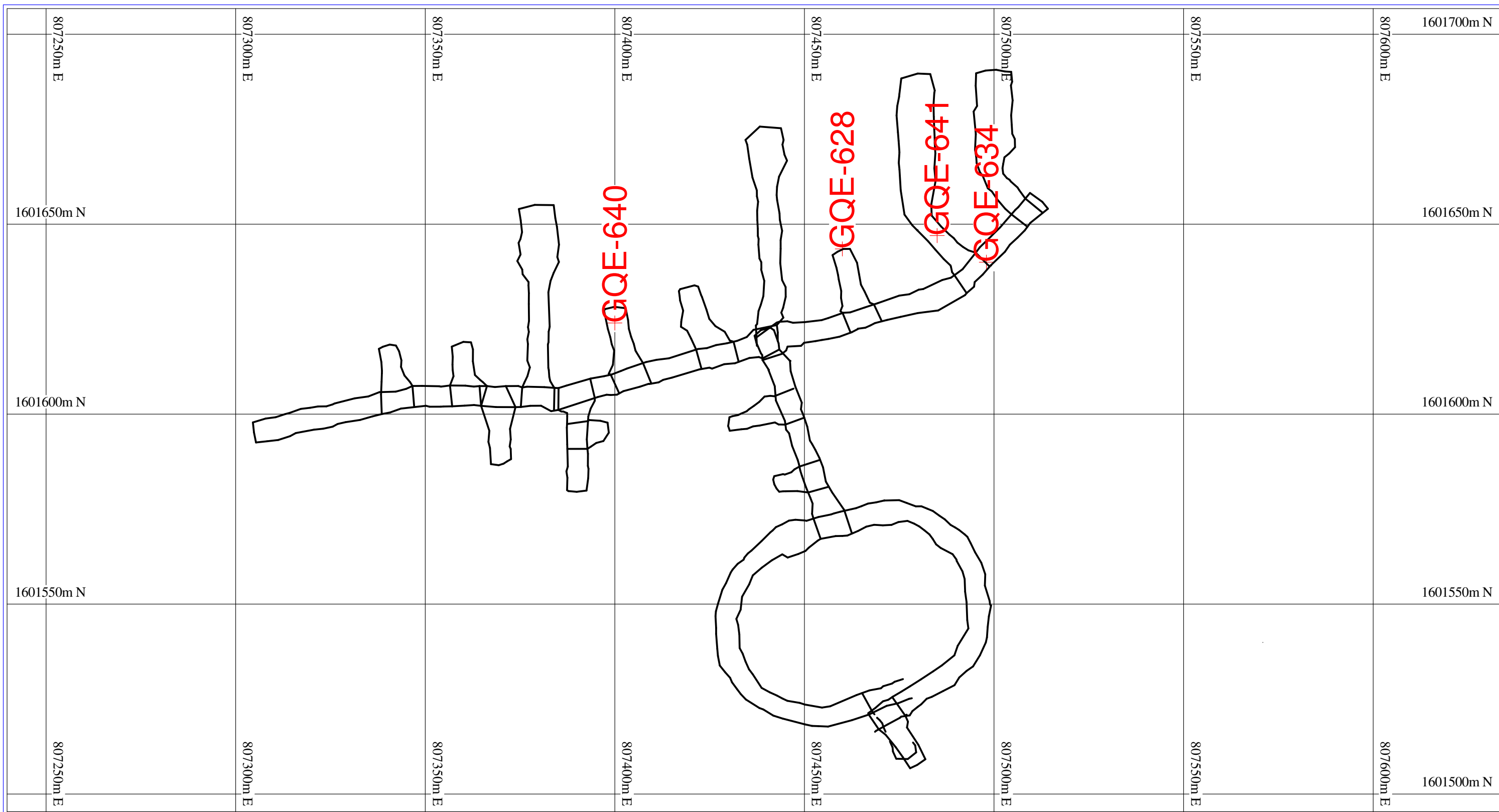
DRENAJE ACIDO DE ROCA (ARD)

Febrero_Abril_2017_Nivel_1480

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
Proyecto Escobal

l_2017_ard_nivel_1505

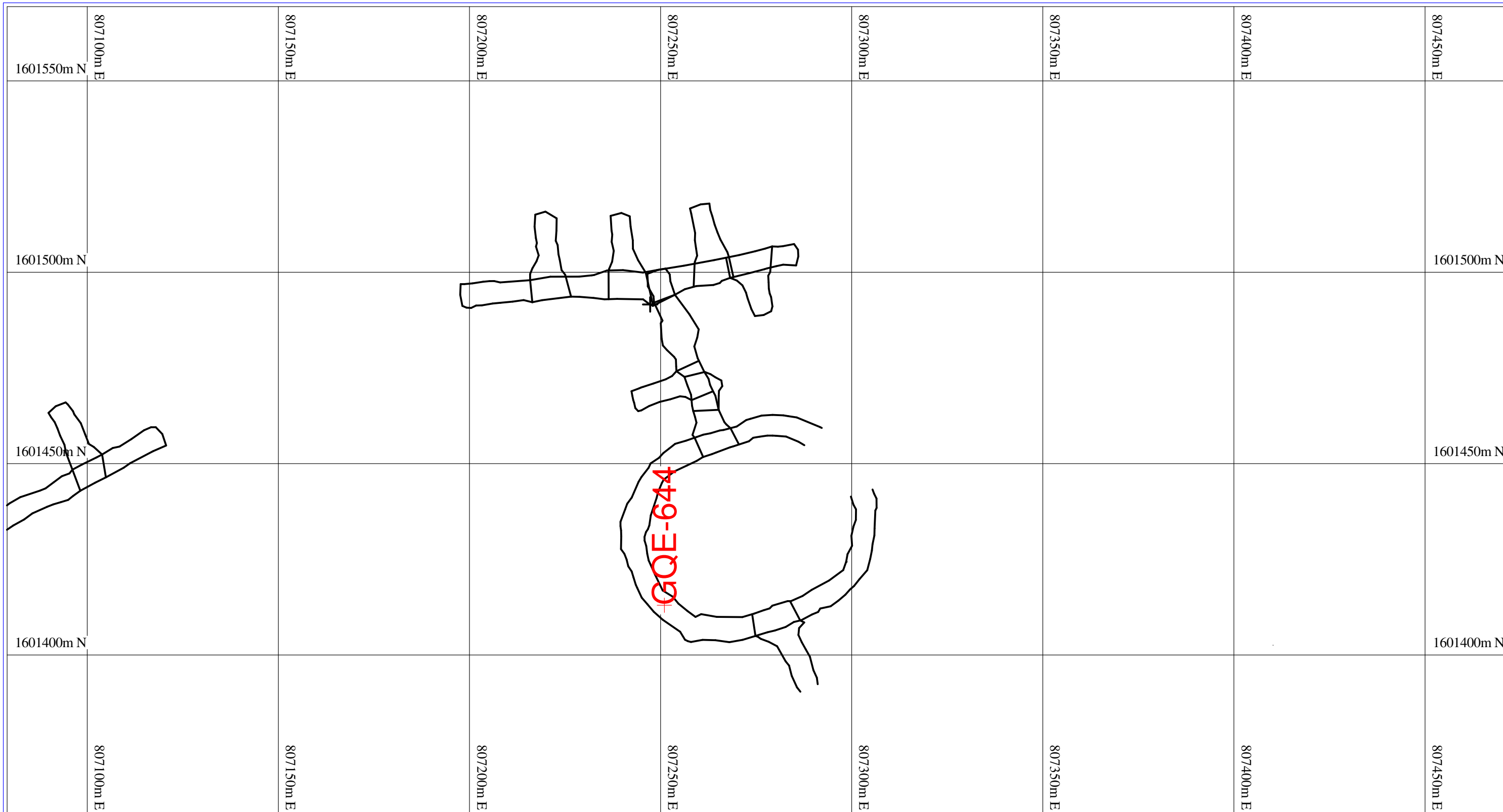


DRENAJE ACIDO DE ROCA (ARD)
 Febrero_Abril_2017_Nivel_1505

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
 Proyecto Escobal

l_2017_ard_rampa_ze_nivel_1305



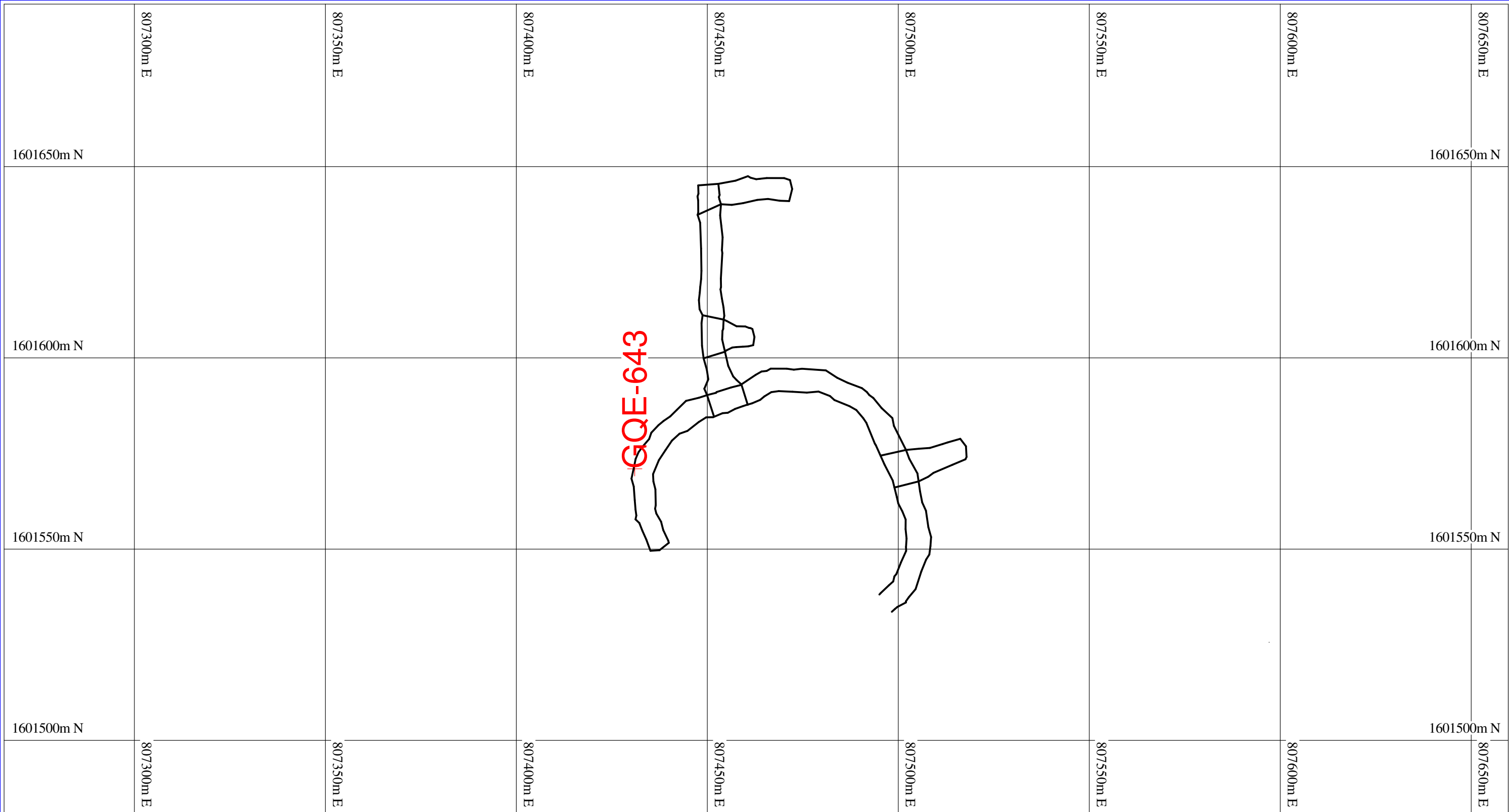
DRENAJE ACIDO DE ROCA (ARD)

Febrero_Abril_2017__Rampa_ZE_Nivel_1305

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
Proyecto Escobal

l_2017_ard_ramp_ze_nivel_1530



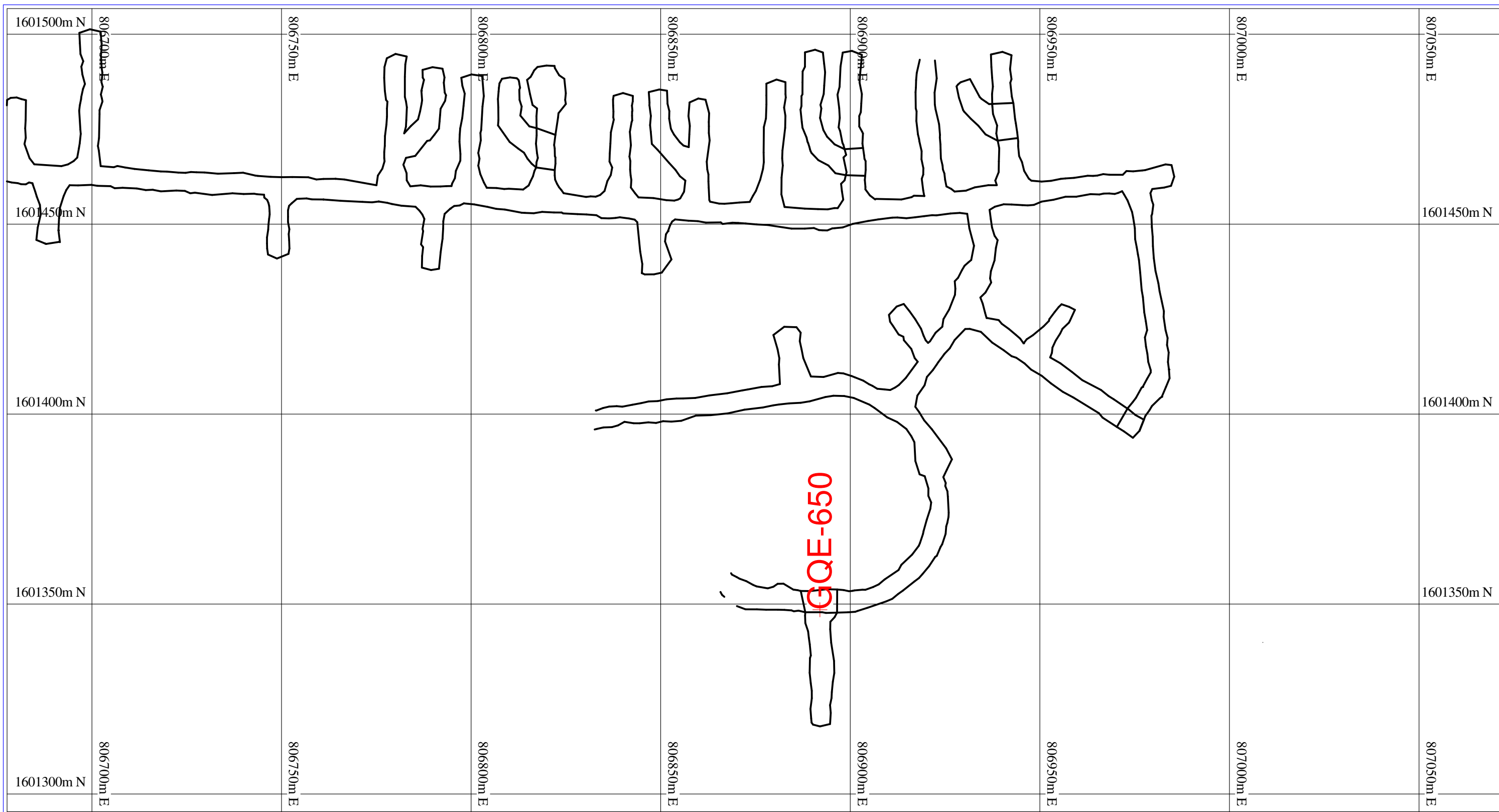
DRENAJE ACIDO DE ROCA (ARD)

Febrero_Abril_2017__Rampa_ZE_Nivel_1530

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
Proyecto Escobal

brero_abril_2017_ard_str



DRENAJE ACIDO DE ROCA (ARD)
 Febrero_Abril_2017_Rampa_Este_Nivel_1165

ESCALA:	1:1000
DISEÑO:	HCacao
AUTORIZÓ:	Richard Yancey
FECHA:	21-Jun-17

Geología de Mina
 Proyecto Escobal

9.2 Resultados

Los resultados de pH en pasta se presentan en el Cuadro 8-3. Los valores de pH se encontraron en el rango de 7.53 a 10.38 u.e. los cuales no dieron indicios de un potencial de generación ácida. Por lo que no fue necesario realizar pruebas de laboratorio para el cálculo de ácido base modificado (ABA por sus siglas en inglés) para descartar o confirmar resultados.

Cuadro 9-2: Resultados de pH en Pasta en muestras de material extraído de Túneles, Proyecto Minero Escobal

Código de Muestra	Fecha Toma de Muestra	Fecha Lectura pH	pH pasta	Temperatura (°C)
GQE-625	16/02/2017	19/02/2017	9.22	19.7
GQE-626	16/02/2017	19/02/2017	8.66	19.6
GQE-627	16/02/2017	19/02/2017	8.21	20.0
GQE-628	17/02/2017	19/02/2017	9.07	19.8
GQE-629	17/02/2017	19/02/2017	8.90	19.4
GQE-630	18/02/2017	19/02/2017	8.86	20.1
GQE-631	25/02/2017	26/02/2017	8.24	20.5
GQE-632	26/02/2017	03/03/2017	9.22	18.3
GQE-633	26/02/2017	03/03/2017	8.09	18.2
GQE-634	28/02/2017	03/03/2017	9.03	18.3
GQE-635	28/02/2017	03/03/2017	9.16	18.2
GQE-636	01/03/2017	03/03/2017	9.14	18.1
GQE-637	24/03/2017	25/03/2017	7.53	18.9
GQE-638	24/03/2017	25/03/2017	9.12	18.9
GQE-639	24/03/2017	25/03/2017	8.86	18.8
GQE-640	24/03/2017	25/03/2017	8.74	19.1
GQE-641	24/03/2017	25/03/2017	8.52	18.9
GQE-642	24/03/2017	25/03/2017	8.71	18.8
GQE-643	25/03/2017	26/03/2017	9.27	18.1
GQE-644	24/03/2017	26/03/2017	9.06	18.0
GQE-645	24/03/2017	26/03/2017	9.10	17.8
GQE-646	24/03/2017	26/03/2017	8.41	17.5
GQE-647	24/03/2017	26/03/2017	9.32	17.5
GQE-648	24/03/2017	26/03/2017	9.22	17.1
GQE-649	26/03/2017	27/03/2017	8.95	21.4
GQE-650	11/04/2017	12/04/2017	8.89	17.7

Código de Muestra	Fecha Toma de Muestra	Fecha Lectura pH	pH pasta	Temperatura (°C)
GQE-651	15/04/2017	16/04/2017	8.99	17.4
GQE-652	15/04/2017	16/04/2017	10.38	17.4
GQE-653	20/04/2017	21/04/2017	8.99	21.9
GQE-654	20/04/2017	21/04/2017	9.08	20.0
GQE-655	21/04/2017	23/04/2017	8.93	19.7
GQE-656	21/04/2017	23/04/2017	8.69	19.9
GQE-657	21/04/2017	23/04/2017	8.67	20.0
GQE-658	21/04/2017	23/04/2017	9.06	19.6

ND: no determinado. Fuente: MSR, 2017.

10 Mediciones de Seguridad Industrial y Salud Ocupacional

10.1 Presión Sonora

La medición de Presión Sonora en el trimestre de Febrero a Abril de 2017 se muestra en el Cuadro 10-1. Se hicieron monitoreos mediante el uso de dosímetros portables y posteriormente se realizan comparaciones con la norma OSHA. Los resultados muestran que se está dentro de parámetros aceptables sugeridos por la norma en los puntos evaluados. Se debe considerar que el parámetro Leq está acumulado para periodo de 10.6 para operaciones en mina subterránea y 12 horas para operaciones en superficie, lo que implica una mayor dosis recibida por efecto de acumulación. Sin embargo los datos se encuentran dentro de parámetros aceptables; lo que indica que si con 24 horas de exposición es aceptable, al estar expuesto a un periodo menor se cumple con las normas establecidas.

Cuadro 10-1: Resultados de Presión Sonora de Salud Ocupacional, Proyecto Minero Escobal

Superficie Planta de Proceso - TRITURADORA		2017		
Mes		Febrero	Marzo	Abril
Fecha		20/02/17	29/03/17	28/04/2017 29/04/2017
Hora Inicio		7:17	7:19	18:33
Duración		10:47 h	11:11 h	11:14 h
Lmax dBA		140.4	121	111.5
Lmin dBA		60.1	60.9	60.8
Prom. Diurno dBA		98.3	93.7	90.8
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*		85	85	85
Leq (Normal sin uso de EPP)		98.3	93.7	90.8
Leq ajustado (Con EPP, homologación 29 dBA a 50% = NRR 14.5 dBA)		83.8	79.2	76.3
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		Aceptable	Aceptable	Aceptable

Superficie Planta de Proceso - MOLINO		2017		
Mes		Febrero	Marzo	Abril
Fecha		20/12/17	29/03/17	28/04/2017 29/04/2017
Hora Inicio		7:17	7:39	18:25
Duración		11:05 h	11:03 h	12:00 h
Lmax dBA		137.8	117.5	136.9
Lmin dBA		60.1	60.1	60.1
Prom. Diurno dBA		86.7	89.6	94.8
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*		85	85	85
Leq (Normal sin uso de EPP)		86.7	89.6	94.8
Leq ajustado (Con EPP, homologación 29 dBA a 50% = NRR 14.5 dBA)		72.2	75.1	80.3
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		Aceptable	Aceptable	Aceptable

Superficie Planta de Proceso - FILTROS		2017		
Mes		Febrero	Marzo	Abril
Fecha		20/02/17		28/04/2017 29/04/2017
Hora Inicio		7:17		18:24
Duración		10:59 h		11:34 h
Lmax dBA		140.3		119.7
Lmin dBA		60.1		60.6
Prom. Diurno dBA		87		87.2
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*		85		85
Leq (Normal sin uso de EPP)		87		87.2
Leq ajustado (Con EPP, homologación 29 dBA a 50% = NRR 14.5 dBA)		72.5		72.7
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		Aceptable		Aceptable

Puesto de Operador de Scoop		2017		
Mes		Febrero	Marzo	Abril
Fecha		16/02/17	28/03/17	30/04/17
Hora Inicio		7:01	6:57	7:32
Duración		10:28 h	12:15 h	10:00 h
Lmax dBA		139.5	115	123.5
Lmin dBA		60.1	60.1	60.1
Prom. Diurno dBA		103.5	98.9	103.2
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*		85	85	85
Leq (Normal sin uso de EPP)		103.5	98.9	103.2
Leq ajustado (Con EPP, homologación 29 dBA a 50% = NRR 14.5 dBA)		89	84.4	88.7
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		Aceptable	Aceptable	No aceptable

Puesto de Operador de Jumbo		2017		
Mes		Febrero	Marzo	Abril
Fecha			28/03/17	30/04/17
Hora Inicio			6:57	7:31
Duración			12:15 h	09:55 h
Lmax dBA			131.8	117.6
Lmin dBA			60.1	60.7
Prom. Diurno dBA			113	99.4
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*			85	85
Leq (Normal sin uso de EPP)			113	99.4
Leq ajustado (Con EPP, homologación 29 dBA a 50% = NRR 14.5 dBA)			98.5	84.9
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)			No aceptable	Aceptable

Puesto de Operador de Boltec		2017		
Mes		Febrero	Marzo	Abril
Fecha			28/03/17	30/04/17
Hora Inicio			6:57	7:12
Duración			12:15 h	10:13 h
Lmax dBA			114.1	112.9
Lmin dBA			60.6	60.3
Prom. Diurno dBA			95.3	95.1
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*			85	85
Leq (Normal sin uso de EPP)			95.3	95.1
Leq ajustado (Con EPP, homologación 29 dBA a 50% = NRR 14.5 dBA)			80.8	80.6
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)			Aceptable	Aceptable

NOTA : Operadores utilizan doble protección Auditiva
dBA = decibeles en escala A y respuesta Lenta.
Lmax = lectura más alta durante la medición
Lmin = lectura más baja durante la medición
Leq = promedio ponderado equivalente de datos durante la medición.
Prom. Diurno = promedio logarítmico de Leq registrados de 07:00 a 18:00 horas o turno diurno Mina

Fuente: MSR, 2017.

10.2 Mediciones de Partículas Respirables

Los resultados se muestran en el Cuadro 10-2 y corresponden al área de interior mina y planta de proceso. En este trimestre los resultados fueron satisfactorios y se está dentro de parámetros aceptables, en algunos casos de manera normal y otros después de la aplicación del factor de compensación por homologación de EPP, por lo tanto se está dentro de rango y en ningún momento se excede el límite normal, que es el parámetro que refiere el fabricante para el respirador usado en las áreas de monitoreo, marca 3M código 7502 y filtro 3M código 60926 P100 Homologación NIOSH.

Cuadro 10-2: Resultados de Material Particulado de Salud Ocupacional, Proyecto Minero Escobal

Superficie Planta de Proceso - TRITURACION							2017		
Trimestre							XXI		
Mes	Unidades	NORMA DE REFERENCIA PARA SILICE/SILICONA	AJUSTE DE EXPOSICIÓN CON LA CERTIFICACION DEL FILTRO 7093C/37173 3M P100 (99.97% DE EFICIENCIA MÍNIMA) CON EPP	NORMA µg/m³	GUIA µg/m³		Febrero	Marzo	Abril
Hora Inicio					USEPA ¹	BANCO MUNDIAL ²			
Duración		OSHA	99.97%				7:00	7:00	7:00
OSHA Fracción Respirable PM ₄	mg/m ³	5	16667	150	150	50	11 h	11 h	11 h
OSHA Polvo Total @ PM ₁₀	mg/m ³	15	50000	150	150	50	2.460	0.872	0.057
							3.980		0.060

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de él (ajustando con la norma OSHA) del respirador mismo, ajuste recomendado por el fabricante, estamos dentro de parámetros, es decir que si comparamos aún la norma para fracción respirable con el resultado de Polvo Total, estamos mas que seguros de estar dentro de norma.

Superficie Planta de Proceso - MOLINO							2017		
Trimestre							XXI		
Mes	Unidades	NORMA DE REFERENCIA PARA SILICE/SILICONA	AJUSTE DE EXPOSICIÓN CON LA CERTIFICACION DEL FILTRO 7093C/37173 3M P100 (99.97% DE EFICIENCIA MÍNIMA) CON EPP	NORMA µg/m³	GUIA µg/m³		Febrero	Marzo	Abril
Hora Inicio					USEPA ¹	BANCO MUNDIAL ²			
Duración		OSHA	99.97%				7:00	7:00	7:00
OSHA Fracción Respirable PM ₄	mg/m ³	5	16667	150	150	50	11 h	11 h	11 h
OSHA Polvo Total @ PM ₁₀	mg/m ³	15	50000	150	150	50	0.930	0.085	0.097
							0.131		0.106

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de él (ajustando con la norma OSHA) del respirador mismo, ajuste recomendado por el fabricante, estamos dentro de parámetros, es decir que si comparamos aún la norma para fracción respirable con el resultado de Polvo Total, estamos mas que seguros de estar dentro de norma.

Superficie Planta de Proceso - FILTROS							2017		
Trimestre							XXI		
Mes	Unidades	NORMA DE REFERENCIA PARA SILICE/SILICONA	AJUSTE DE EXPOSICIÓN CON LA CERTIFICACION DEL FILTRO 7093C/37173 3M P100 (99.97% DE EFICIENCIA MÍNIMA) CON EPP	NORMA µg/m³	GUIA µg/m³		Febrero	Marzo	Abril
Hora Inicio					USEPA ¹	BANCO MUNDIAL ²			
Duración		OSHA	99.97%				7:00	7:00	7:00
OSHA Fracción Respirable PM ₄	mg/m ³	5	16667	150	150	50	11 h	11 h	11 h
OSHA Polvo Total @ PM ₁₀	mg/m ³	15	50000	150	150	50	0.081	0.067	0.089
							0.122		0.120

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de él (ajustando con la norma OSHA) del respirador mismo, ajuste recomendado por el fabricante, estamos dentro de parámetros, es decir que si comparamos aún la norma para fracción respirable con el resultado de Polvo Total, estamos mas que seguros de estar dentro de norma.

Interior Mina General - REZAGA							2017		
Trimestre							XXI		
Mes	Unidades	NORMA DE REFERENCIA PARA SILICE/SILICONA	AJUSTE DE EXPOSICIÓN CON LA CERTIFICACION DEL FILTRO 7093C/37173 3M P100 (99.97% DE EFICIENCIA MÍNIMA) CON EPP	NORMA µg/m³	GUIA µg/m³		Febrero	Marzo	Abril
Hora Inicio					USEPA ¹	BANCO MUNDIAL ²			
Duración		OSHA	99.97%				7:00	7:00	7:00
OSHA Fracción Respirable PM ₄	mg/m ³	5	16667	150	150	50	11 h	11 h	11 h
OSHA Polvo Total @ PM ₁₀	mg/m ³	15	50000	150	150	50	4.260	1.39	2.101
							4.920	1.470	

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de él (ajustando con la norma OSHA) del respirador mismo, ajuste recomendado por el fabricante, estamos dentro de parámetros, es decir que si comparamos aún la norma para fracción respirable con el resultado de Polvo Total, estamos mas que seguros de estar dentro de norma.

Interior Mina General - LANZADO							2017		
Trimestre							XXI		
Mes	Unidades	NORMA DE REFERENCIA PARA SILICE/SILICONA	AJUSTE DE EXPOSICIÓN CON LA CERTIFICACION DEL FILTRO 7093C/37173 3M P100 (99.97% DE EFICIENCIA MÍNIMA) CON EPP	NORMA µg/m³	GUIA µg/m³		Febrero	Marzo	Abril
Hora Inicio					USEPA ¹	BANCO MUNDIAL ²			
Duración		OSHA	99.97%				7:00		7:00
OSHA Fracción Respirable PM ₄	mg/m ³	5	16667	150	150	50	11 h		11 h
OSHA Polvo Total @ PM ₁₀	mg/m ³	15	50000	150	150	50	2.480		4.65
							3.110		

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de él (ajustando con la norma OSHA) del respirador mismo, ajuste recomendado por el fabricante, estamos dentro de parámetros, es decir que si comparamos aún la norma para fracción respirable con el resultado de Polvo Total, estamos mas que seguros de estar dentro de norma.

Fuente: MSR, 2017.

10.3 Mediciones de Gas

Las mediciones de Gas, se hacen en forma rutinaria (turno a turno) y debido a que no se ha rebasado los límites permisibles cuando se encuentra maquinaria presente trabajando en las áreas según norma OSHA (Tabla Z1 1910.100 Límites para aires contaminados), los sistemas de ventilación se mantienen trabajando de manera normal. Como se puede apreciar en el Cuadro 10-3 se siguió monitoreando la no presencia de Ácido Sulfhídrico - Sulfuro de Hidrógeno (H_2S) y se omitirá hasta detectarse la primera vez. Para el presente monitoreo, se seleccionará la primera etapa del ciclo que aparezca en las mediciones rutinarias, por lo que en los resultados se ha colocado como mínimo 3 turnos de alguno de los meses del trimestre, a fin de tener información sistematizada.

Cuadro 10-3: Extracto de las mediciones del XVII trimestre, acorde a procedimiento de tomar la primera etapa del ciclo que aparezca.

FECHA	Lugar	Maquinaria	Etapas de Ciclo	CO (PPM)	H2S (PPM)	Hora	Turno	Reportado por
				Límite Máximo Turno 25ppm, Exposición Breve 50 ppm	Límite 10ppm, Valores mayores a 1ppm alertar.			
Estandar de Seguridad		OSHA						
	ACGIH (MSHA)							
11-feb-17	1480-VENT.ZE	Ninguno.	Trabajos de obra gris.	45	0	10:00	Diurno.	José Camillo.
	1505-7460.ZE	JD-02	Perforación.	48	0	12:00		
19-feb-17	1390-6900.EC	LL-32	Rezaga.	39	0	00:10	Nocturno.	José Camillo.
	1390-VENT.EC	JD-07	Perforación.	40	0	01:50		
21-feb-17	1505-RAMP.ZE	JD-05	Perforación.	15	0	01:00	Nocturno.	José Camillo.
	1505-CFTO.ZE	ST-02	Lanzado.	29	0	02:30		
	1480-7480.ZE	RB-05	Fortificación.	20	0	04:00		
14-abr-17	1315-CFTE.EC	JD-06	Perforación.	19	0	00:10	Nocturno.	José Camillo.
	1315-7020.EC	TL-07	Instalación de servicios.	20	0	01:20		
15-abr-17	1455-7460.ZE	ST-02	Lanzado.	27	0	23:30	Nocturno.	José Camillo.
	1355-DDST.ZE	LM-75	Sondeo.	0	0	02:15		

Fuente: MSR, 2016.

11 Conclusiones

11.1 Mediciones del aire en el ambiente

- 1) Los gases de combustión (**SO₂** y **NO₂**) y los niveles de presión sonora (**NPS**) presentaron valores por debajo de las guías establecidos por la USEPA (**SO₂** y **NO₂**), Banco Mundial (**SO₂**, **NO₂** y **NPS**) y British Columbia y OMS (**SO₂** y **NO₂**). Los niveles de PM₁₀ se encontraron dentro de los valores máximos y mínimos registrados durante el establecimiento de la línea base, a excepción de la estación EA-4A y la concentración de metales registrada durante el presente trimestre, es similar a lo reportado en 2016.

11.2 Mediciones del agua, sedimentos y efluentes en el ambiente

- 2) Del control de calidad (blancos de campo) realizado a los dos laboratorios subcontratados (Laboratorio Ecosistemas Proyectos Ambientales S.A. y ACZ Laboratories, Inc.) para el análisis de agua superficial y efluentes, se obtuvieron resultados confiables tanto en la manipulación de las muestras como en los resultados de los análisis.
- 3) El agua superficial (**SW**), subterránea (**GW**) y los pozos de monitoreo (**MW**) presentaron un pH alcalino y dentro del rango establecido por la USEPA para la salud humana. No se detectó mercurio y cianuro total en ninguna categoría de agua (SW, GW y MW). Se registraron sólidos suspendidos totales en SW, GW y MW; y los resultados encontrados están por debajo de lo establecido por las guías del banco mundial (50 mg/L). Se detectó arsénico en todas las categorías de agua (SW, GW y MW) y todos los resultados se encontraron por debajo de lo establecido por la USEPA (0.01 mg/L) y dentro del rango registrado durante el establecimiento de la línea base. El plomo se detectó en SW y MW en concentraciones por debajo de lo sugerido por la USEPA y por debajo del rango de lo establecido durante la línea base.
- 4) El efluente (**WW9**) de la planta de tratamiento de aguas residuales de tipo especial del proceso de minado cumple con el Acuerdo Gubernativo 236-2006 para entes generadores nuevos para todas las muestras tomadas durante Febrero a Abril de 2017.

11.3 Vibraciones, geoquímica de roca estéril y mediciones de seguridad industrial y salud ocupacional

- 5) Las vibraciones generadas por las voladuras registradas se encuentran por debajo de los límites de detección del equipo (1.3 mm/s); el cual incluso es menor al límite a partir del cual, las vibraciones inducidas por voladuras (50.8

mm/s), pueden ocasionar daños según la norma establecida por United States Bureau of Mines.

- 6) Las lecturas de pH en pasta obtenidas de las muestras de material extraídas de mina subterránea fueron alcalinas, lo que indica que no hay indicios de un potencial de generación ácida dentro los túneles.
- 7) Los resultados obtenidos en los niveles de presión sonora para ambientes laborales, indican que se está por debajo de los límites de nivel de sonido ponderado "A" acorde a OSHA para 24 horas (82-83 dBA) y los resultados de partículas respirables en las estaciones de monitoreo, cumplen con el rango de aceptación que el fabricante establece basado en el equipo marca 3M código 7502 y filtro 3M código 60926 P100 Homologación NIOSH.

12 Anexos

Los resultados de los componentes de aire, agua (superficial, subterránea, pozos de monitoreo y suministro), sedimentos, efluente y certificados de calibración de los equipos utilizados, se presentan en el anexo electrónico adjunto a este documento.

12.1 Caudal Bombeado de Túneles a Planta de Tratamiento y su descarga hacia la Quebrada El Escobal

En las siguientes tablas se presentan las lecturas diarias realizadas a los flujómetros instalados en las cuatro tuberías provenientes de los portales (2 tuberías por portal) y el flujómetro instalado en el clarificador de la Planta de tratamiento de aguas residuales especiales, así como los cálculos del volumen bombeado durante el día de medición y el caudal proyectado por día en cada una de estas tuberías.

El volumen bombeado por día se determinó restando el volumen acumulado del día anterior al volumen acumulado de ese día. El caudal proyectado se determinó suponiendo que el bombeo de agua es constante durante las 24 horas del día (caudal = volumen/tiempo).

Los flujómetros instalados son de tipo ultrasónicos o de efecto Doppler, los cuales tienen la característica de medir el flujo en dos direcciones. Las bombas empleadas para descargar agua procedente de los sumideros ubicados en los portales trabajan a nivel, por tanto se descartan las lecturas de caudal instantáneo ya que los flujómetros instalados registran tanto el caudal instantáneo de ida (signo positivo) como el caudal instantáneo de retorno (signo negativo), lo que conllevaría a reportar caudales menores a los observados en campo.

12.2 Análisis In Situ y kit de cianuro (CN) en efluentes

		Febrero 2017																											
Parámetro	Unidades	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
		Efluente Planta de Tratamiento Agua de Túneles (WW9)																											
pH	u.e.	7.58	7.23	6.87	7.13	Sin Descarga	7.61	7.74	7.67	7.33	7.45	7.27	7.51	7.5	7.26	Sin Descarga	6.72	8.12	7.31	7.94	7.35	4.08	7.5	7.71	7.22	7.33	8.04	7.18	
Temperatura	°C	25.2	24.5	23.7	25		27.6	23.3	22.5	24.6	28.3	24.1	24.8	23.1	25.3		25.5	25.1	26	25.7	25.1	25.3	27.8	26.1	26.1	25.7	24.2	27	
Conductividad	µS/cm	2525	2045	1974	2031		1974	2109	2134	2179	2282	2038	2056	2157	1999		1872	2187	1988	1811	1874	2011	2116	2004	2113	2263	2164	2184	
Turbidez	NTU	10.6	4.48	3.92	2.85		8.47	7.81	18.2	2.84	17.8	5.63	26.1	27.2	19.1		5.67	20.6	15.8	41.1	36.4	7.37	8.1	1.57		8.7	7.56	23	
kit CN	mg/L	0.003	0.008	0.002	0.003		0.000	0.001	0.004	0.006	0.002	0.016	0.004	0.001	0.005		0.002	0.003	0.000	0.005	0.002	0.004	0.002	0.000	0.004	0.005	0.002	0.002	0.002
CN Total		NA	NA	NA	NA		NA	NA	NA	<0.003	NA	NA	NA	NA	NA		<0.003	NA	<0.003	NA	NA	NA	<0.003	NA	NA	NA	NA	NA	NA
		Pileta de Cumplimiento Ambiental (EP-3 o pileta 3)																											
pH	u.e.	8.93	8.99	9.11	9.08	9.08	9.04	9.12	8.99	9.09	8.96	9.04	8.74	Sin Descarga															
Temperatura	°C	17.8	18.4	18.3	19.1	19.1	19.2	20	20.4	21.1	19.6	19.5	14.1																
Conductividad	µS/cm	1093	1105	1192	1098	1112	1137	1133	1116	1108	1098	1101	1203																
Turbidez	NTU	8.14	6.84	7.56	8.54	8.42	7.84	8.95	8.11	9.74	10.3	9.91	14.5																
Kit CN	mg/L	0.000	0.000	0.002	0.002	0.000	0.010	0.015	0.000	0.004	0.002	0.002	0.003																
CN Total		NA	NA	NA	<0.003	NA	<0.003	NA	NA	NA	0.006	NA	<0.003																

u.e.: unidades exponenciales. mg/L: miligramos por litro. µS/cm: micro siemens por centímetro. °C: grados centígrados. NTU: unidades naftalométricas de turbidez. NA: no analizado. Fuente: MSR, 2017.

		Marzo 2017																																				
Parámetro	Unidades	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						
		Efluente Planta de Tratamiento Agua de Túneles (WW9)																																				
pH	u.e.	7.71	7.74	7.83	7.81	7.94	7.7	7.63	7.73	7.57	7.43	7.8	7.52	7.95	7.45	7.62	8.03	Sin Descarga										7.41	Sin Descarga									
Temperatura	°C	23.5	22.7	18.2	24.5	23.9	23.3	27.8	24.7	29	23.9	24.4	25.4	25.3	24	23.8	24											24.1										
Conductividad	µS/cm	2140	2174	2281	2085	2189	2062	2363	2154	2011	1989	2035	2007	2101	2185	2030	2021											2063										
Turbidez	NTU	30	94	33.4	12.1	14.8	12.8	12.1	57.8	17.4	4.2	3.43	3.89	5.2	4	4.99	4.66											22.8										
kit CN	mg/L	0.006	0.001	0.003	0.001	0.000	0.000	0.006	0.000	0.001	0.001	0.002	0.000	0.000	0.001	0.004	0.008											0.004										
CN Total		NA	NA	NA	NA	<0.003	NA	NA	NA	NA	<0.003	NA	NA	NA	<0.003	NA	NA											NA										
		Pileta de Cumplimiento Ambiental (EP-3 o pileta 3)																																				
pH	u.e.	Sin Descarga												7.26	7.97	8.17	8.02	8.2	Sin Descarga																			
Temperatura	°C													19.8	21	20.6	17	15.7																				
Conductividad	µS/cm													297.2	365.5	384.2	621.6	476.3																				
Turbidez	NTU													50.1	17.8	34	50.9	58.7																				
Kit CN	mg/L													0.001	0.004	0.000	0.007	0.001																				
CN Total														<0.003	NA	NA	NA	NA																				

u.e.: unidades exponenciales. mg/L: miligramos por litro. µS/cm: micro siemens por centímetro. °C: grados centígrados. NTU: unidades naftalométricas de turbidez. NA: no analizado. Fuente: MSR, 2017.

		Abril 2017																													
Parámetro	Unidades	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
		Efluente Planta de Tratamiento Agua de Túneles (WW9)																													
pH	u.e.	Sin Descarga						7.3	Sin Descarga	7.44	7.03	6.75	7.33	6.81	Sin Descarga	7.28	Sin Descarga	6.87	6.63	Sin Descarga	7.67	Sin Descarga	7.64	7.85	Sin Descarga	7.4	7.49				
Temperatura	°C							24.4		25	25.3	25.2	24.5	25		24.5		24.4	26.2		25.6		25	26.1		27.8	26.1				
Conductividad	µS/cm							1897		1853	1846	1910	1925	2201		2182		2138	2362		1665		1096	2155		2264	2151				
Turbidez	NTU							14.9		21.5	11.9	9.43	21.7	44.7		4.99		27	18		7.4		35.7	23.4		22.5	23.5				
kit CN	mg/L							0.014		0.000	0.003	0.004	0.001	0.000		0.001		0.001	0.001		0.004		0.003	0.008		0.007	0.005				
CN Total	mg/L							<0.003		NA	NA	<0.003	NA	NA		NA		NA	NA		NA		NA	NA		NA	NA				
		Pileta de Cumplimiento Ambiental (EP-3 o pileta 3)																													
pH	u.e.	Sin Descarga					7.38	7.33	7.62	7.66	7.67	Sin Descarga	7.78	Sin Descarga	8.42	8.01	7.52	7.31	7.76	8.68	9.15	9.31									
Temperatura	°C						23.9	22.2	19.8	18.3	18.4		18.9		20.5	20.8	21.7	23.3	25.9	24.2	26.9	25.2									
Conductividad	µS/cm						314.2	367.2	572.9	418.7	621.8		344.8		573.3	395	81.17	96.59	104.6	126.5	264.5	242.5									
Turbidez	NTU						87.4	28.8	35.9	49.9	60.2		111		71.9	98	62.4	53.2	49.4	62.1	50	44.3									
kit CN	mg/L						0.002	0.000	0.001	0.001	0.012		0.000		0.003	0.002	0.000	0.000	0.003	0.000	0.002	0.003									
CN Total	mg/L						NA	NA	<0.003	NA	NA		NA		<0.003	NA	NA	NA	NA	NA	<0.003	NA	NA								

u.e.: unidades exponenciales. mg/L: miligramos por litro. µS/cm: micro siemens por centímetro. °C: grados centígrados. NTU: unidades naftalométricas de turbidez. NA: no analizado. Fuente: MSR, 2017.

Con el objetivo de verificar si los resultados obtenidos con el método colorimétrico empleado para la determinación rápida de Cianuro (kit de CN), desde el mes de Octubre 2013 se enviaron varias muestras duplicado al laboratorio ACZ para realizar análisis de Cianuro Total.

Según los resultados obtenidos, con el kit colorimétrico se obtienen resultados no confiables debido a que presentan una gran desviación positiva con respecto a los resultados obtenidos en el laboratorio acreditado. Como medida correctiva se investigarán las fuentes de dicha desviación; entre las cuales se contemplan la contaminación cruzada, sustancias contenidas en las aguas analizadas que puedan interferir en el análisis, error humano al realizar el análisis, entre otras. Se realizarán los cambios necesarios para obtener resultados más confiables.

12.3 Resultados crudos de calidad de aire

12.3.1 Material Particulado (PM₁₀)

Cliente: Minera San Rafael, S.A.
Dirección: Boulevard Los Próceres, 18 calle 24-69 z. 10, Centro Empresarial Zona Pradera, Oficina 1406 torre IV
Proyecto: 178-089 (El Escobal)
Análisis de muestras: Marzo, 16 al 21 de 2017
Emisión de reporte: Marzo, 21 de 2017

Tipo de muestra: Filtros de cuarzo utilizados para colección de material particulado en aire.

Análisis: Gravimetría en filtros.

Método analítico: 40 CFR, Apéndice J, Parte 50, Capítulo 1, Edición 07-1-97, EPA. Reference Method for the Determination of Particulate Matter as PM₁₀ in the Atmosphere. **Acreditado ISO 17025**

Cuadro 1: resultados de filtros peso final

No.	Identificación de la muestra	Código de filtro ¹	Peso inicial* (gramos)	Peso final (gramos)
Límite de detección del método			0.00005	
1	EA-1A	3201-0101	0.14704	0.14883
2	EA-1B	3206-0606	0.14800	0.14954
3	EA-2A	3200-1719	0.14637	0.14719
4	EA-3	3208-0808	0.14701	0.14787
5	EA-3A	3209-0909	0.14718	0.14887
6	EA-4A	3204-0404	0.14719	0.15253
7	EA-5A	3203-0303	0.14834	0.15017
8	EA-6	3205-0505	0.14750	0.14875
9	EA-7A	3207-0707	0.14808	0.14946

¹: Código de filtro asignado por Laboratorio Ambiental, S.A. *: Corresponde a los pesos iniciales indicado en reportes analíticos RA-17-11671. La incertidumbre del método es de ± 0.00005 g

Anexos:

Anexo 1. Cadena de Custodia R-02-00901

Este Reporte Analítico ha sido elaborado para uso confidencial y exclusivo del cliente; se prohíbe su reproducción, sin la aprobación escrita del Laboratorio. Los resultados aquí expresados representan el mejor juicio del Laboratorio y son válidos únicamente para la porción de muestra presentada a éste. Laboratorio Ambiental, S.A. no asume ninguna responsabilidad ni garantiza la utilización final que se le dé a la información aquí presentada. Laboratorio Ambiental, S.A. no se responsabiliza por el proceso de muestreo. En caso de requerir alguna modificación en este reporte analítico, solicitarla dentro de los siguientes 30 días a partir de la fecha en que el Laboratorio envió el reporte.

Ing. Diego Silva
Ingeniero Químico, Gestor de Calidad
Colegiado 1595

MSc. BSc. Ana Gabriela Juárez
Especialista ambiental, Director de Laboratorio

Redacción:	Fecha:	Revisión:	Fecha:	Aprobación:	Fecha:	Versión cliente:
G.C.	Mar., 21/17	J.J.	Mar., 21/17	A.G.J.	Mar. 21/17	02

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:				Job Code: EA-1A																											
Job Name: EA-1A				Site Name: Los Planes (Top Soil Deposit)																											
Version: PQ100				Station Code:																											
Serial No: 2.00				Operators: EvQ																											
Pump Time:				User1: NA																											
Flags: NA				User2: NA																											
<table border="1"><thead><tr><th></th><th>Max</th><th>Min</th><th>Avg</th><th>Units</th></tr></thead><tbody><tr><td>BP</td><td>653</td><td>650</td><td>651</td><td>mmHg</td></tr><tr><td>TA</td><td>30.1</td><td>12.0</td><td>18.8</td><td>°C</td></tr><tr><td>Q</td><td>---</td><td>---</td><td>16.71</td><td>Lpm</td></tr></tbody></table>					Max	Min	Avg	Units	BP	653	650	651	mmHg	TA	30.1	12.0	18.8	°C	Q	---	---	16.71	Lpm	Timer Information:				Mass Concentration Data:			
	Max	Min	Avg	Units																											
BP	653	650	651	mmHg																											
TA	30.1	12.0	18.8	°C																											
Q	---	---	16.71	Lpm																											
QCV				Date				Filter ID: 3201-0101																							
Max overheat				Time				Final Wt: 148.830 mg																							
occured NA				dd-mmm				Initial Wt: 147.040 mg																							
				hh:mm:ss				Delta Wt: 1.790 mg																							
				Start: 16-Feb-17				Total Vol: 24.04 m ³																							
				Stop: 17-Feb-17				ET: 23:59:00																							
								Mass Conc: 74.46 µg/m ³																							
Notes 1: Depósito de Suelos, Proyecto El Escobal																															
Notes 2: Minera San Rafael, S.A.																															

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:				Job Code: EA-1B																											
Job Name: EA-1B				Site Name: San Rafael Las Flores																											
Version: PQ100				Station Code:																											
Serial No: 3.00				Operators: EvQ																											
Pump Time:				User1: NA																											
Flags: NA				User2: NA																											
<table border="1"><thead><tr><th></th><th>Max</th><th>Min</th><th>Avg</th><th>Units</th></tr></thead><tbody><tr><td>BP</td><td>651</td><td>647</td><td>649</td><td>mmHg</td></tr><tr><td>TA</td><td>29.2</td><td>15.3</td><td>20.9</td><td>°C</td></tr><tr><td>Q</td><td>---</td><td>---</td><td>16.71</td><td>Lpm</td></tr></tbody></table>					Max	Min	Avg	Units	BP	651	647	649	mmHg	TA	29.2	15.3	20.9	°C	Q	---	---	16.71	Lpm	Timer Information:				Mass Concentration Data:			
	Max	Min	Avg	Units																											
BP	651	647	649	mmHg																											
TA	29.2	15.3	20.9	°C																											
Q	---	---	16.71	Lpm																											
QCV				Date				Filter ID: 3206-0606																							
Max overheat				Time				Final Wt: 149.540 mg																							
occured NA				dd-mmm				Initial Wt: 148.000 mg																							
				hh:mm:ss				Delta Wt: 1.540 mg																							
				Start: 23-Feb-17				Total Vol: 24.04 m ³																							
				Stop: 24-Feb-17				ET: 23:59:00																							
								Mass Conc: 64.06 µg/m ³																							
Notes 1: San Rafael Las Flores, Santa Rosa.																															
Notes 2: Minera San Rafael, S.A.																															

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:				Job Code: EA-2A																											
Job Name: EA-2A				Site Name: La Cuchilla.																											
Version: PQ200				Station Code:																											
Serial No: 2.00				Operators: EvQ																											
Pump Time:				User1: NA																											
Flags: NA				User2: NA																											
<table border="1"><thead><tr><th></th><th>Max</th><th>Min</th><th>Avg</th><th>Units</th></tr></thead><tbody><tr><td>BP</td><td>635</td><td>631</td><td>632</td><td>mmHg</td></tr><tr><td>TA</td><td>29.9</td><td>14.9</td><td>20.0</td><td>°C</td></tr><tr><td>Q</td><td>---</td><td>---</td><td>16.70</td><td>Lpm</td></tr></tbody></table>					Max	Min	Avg	Units	BP	635	631	632	mmHg	TA	29.9	14.9	20.0	°C	Q	---	---	16.70	Lpm	Timer Information:				Mass Concentration Data:			
	Max	Min	Avg	Units																											
BP	635	631	632	mmHg																											
TA	29.9	14.9	20.0	°C																											
Q	---	---	16.70	Lpm																											
QCV				Date				Filter ID: 3200-1719																							
Max overheat				Time				Final Wt: 147.190 mg																							
occured NA				dd-mmm				Initial Wt: 146.370 mg																							
				hh:mm:ss				Delta Wt: 0.820 mg																							
				Start: 14-Feb-17				Total Vol: 24.04 m ³																							
				Stop: 15-Feb-17				ET: 23:59:00																							
								Mass Conc: 34.11 µg/m ³																							
Notes 1: Aldea La Cuchilla, San Rafael Las Flores, Santa Rosa.																															
Notes 2: Minera San Rafael, S.A.																															

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:

Job Name: EA-3
Version: PQ200
Serial No: 2.00
Pump Time:
Flags: NA

Job Code: EA-3
Site Name: El Fucío, zona este.
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	629	625	627	mmHg
TA	32.1	14.3	20.6	°C
Q	---	---	16.70	Lpm

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	27-Feb-17	08:35:00
Stop:	28-Feb-17	08:35:00

Mass Concentration Data:

Filter ID:	3208-0808
Final Wt:	147.870 mg
Initial Wt:	147.010 mg
Delta Wt:	0.860 mg
Total Vol:	24.03 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 35.79 µg/m³

Notes 1: Aldea El Fucío, San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:

Job Name: EA-3A
Version: PQ100
Serial No: 3.00
Pump Time:
Flags: NA

Job Code: EA-3A
Site Name: Aldea El Fucío
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	647	643	645	mmHg
TA	32.1	14.1	20.8	°C
Q	---	---	16.71	Lpm

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	27-Feb-17	09:28:00
Stop:	28-Feb-17	09:28:00

Mass Concentration Data:

Filter ID:	3209-0909
Final Wt:	148.870 mg
Initial Wt:	147.180 mg
Delta Wt:	1.690 mg
Total Vol:	24.03 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 70.33 µg/m³

Notes 1: Aldea El Fucío, San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:

Job Name: EA-4A
Version: PQ200
Serial No: 2.00
Pump Time:
Flags: NA

Job Code: EA-4A
Site Name: Aldea Los Ángeles
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	653	649	650	mmHg
TA	31.5	13.7	20.4	°C
Q	---	---	16.71	Lpm

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	21-Feb-17	10:35:00
Stop:	22-Feb-17	10:35:00

Mass Concentration Data:

Filter ID:	3204-0404
Final Wt:	152.530 mg
Initial Wt:	147.190 mg
Delta Wt:	5.340 mg
Total Vol:	24.03 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 222.22 µg/m³

Notes 1: Caserío El Portón de los Ángeles, San Rafael Las Flores, Santa Rosa

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:			Job Code: EA-5A																									
Job Name: EA-5A			Site Name: Sabana Redonda																									
Version: PQ100			Station Code:																									
Serial No: 3.00			Operators: EvQ																									
Pump Time:			User1: NA																									
Flags: NA			User2: NA																									
<table border="1"><thead><tr><th></th><th>Max</th><th>Min</th><th>Avg</th><th>Units</th></tr></thead><tbody><tr><td>BP</td><td>653</td><td>650</td><td>651</td><td>mmHg</td></tr><tr><td>TA</td><td>32.3</td><td>12.4</td><td>20.4</td><td>°C</td></tr><tr><td>Q</td><td>---</td><td>---</td><td>16.71</td><td>Lpm</td></tr></tbody></table>				Max	Min	Avg	Units	BP	653	650	651	mmHg	TA	32.3	12.4	20.4	°C	Q	---	---	16.71	Lpm	Timer Information:			Mass Concentration Data:		
	Max	Min	Avg	Units																								
BP	653	650	651	mmHg																								
TA	32.3	12.4	20.4	°C																								
Q	---	---	16.71	Lpm																								
QCV			Date			Filter ID: 3203-0303																						
Max overheat			Time			Final Wt: 150.170 mg																						
occured NA			dd-mmm			Initial Wt: 148.340 mg																						
			hh:mm:ss			Delta Wt: 1.830 mg																						
			Start: 21-Feb-17			Total Vol: 24.04 m ³																						
			Stop: 22-Feb-17			Mass Conc: 76.12 µg/m ³																						
			ET: 23:59:00																									
Notes 1: Aldea Sabana Redonda, San Rafael Las Flores, Santa Rosa																												
Notes 2: Minera San Rafael, S.A.																												

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:			Job Code: EA-6																									
Job Name: EA-6			Site Name: Carretera a Mataquesquintla																									
Version: PQ200			Station Code:																									
Serial No: 2.00			Operators: EvQ																									
Pump Time:			User1: NA																									
Flags: NA			User2: NA																									
<table border="1"><thead><tr><th></th><th>Max</th><th>Min</th><th>Avg</th><th>Units</th></tr></thead><tbody><tr><td>BP</td><td>644</td><td>640</td><td>642</td><td>mmHg</td></tr><tr><td>TA</td><td>29.4</td><td>14.8</td><td>20.2</td><td>°C</td></tr><tr><td>Q</td><td>---</td><td>---</td><td>16.71</td><td>Lpm</td></tr></tbody></table>				Max	Min	Avg	Units	BP	644	640	642	mmHg	TA	29.4	14.8	20.2	°C	Q	---	---	16.71	Lpm	Timer Information:			Mass Concentration Data:		
	Max	Min	Avg	Units																								
BP	644	640	642	mmHg																								
TA	29.4	14.8	20.2	°C																								
Q	---	---	16.71	Lpm																								
QCV			Date			Filter ID: 3205-0505																						
Max overheat			Time			Final Wt: 148.750 mg																						
occured NA			dd-mmm			Initial Wt: 147.500 mg																						
			hh:mm:ss			Delta Wt: 1.250 mg																						
			Start: 23-Feb-17			Total Vol: 24.04 m ³																						
			Stop: 24-Feb-17			Mass Conc: 52.00 µg/m ³																						
			ET: 23:59:00																									
Notes 1: Carretera a Mataquesquintla, al norte del Proyecto, San Rafael Las Flores Santa Rosa																												
Notes 2: Minera San Rafael, S.A.																												

BGI PQ200 Air Sampling System

Downloaded February 2017

Job Details:			Job Code: EA-7A																									
Job Name: EA-7A			Site Name: Los Planes																									
Version: PQ200			Station Code:																									
Serial No: 2.00			Operators: EvQ																									
Pump Time:			User1: NA																									
Flags: NA			User2: NA																									
<table border="1"><thead><tr><th></th><th>Max</th><th>Min</th><th>Avg</th><th>Units</th></tr></thead><tbody><tr><td>BP</td><td>654</td><td>649</td><td>651</td><td>mmHg</td></tr><tr><td>TA</td><td>29.0</td><td>15.1</td><td>20.8</td><td>°C</td></tr><tr><td>Q</td><td>---</td><td>---</td><td>16.71</td><td>Lpm</td></tr></tbody></table>				Max	Min	Avg	Units	BP	654	649	651	mmHg	TA	29.0	15.1	20.8	°C	Q	---	---	16.71	Lpm	Timer Information:			Mass Concentration Data:		
	Max	Min	Avg	Units																								
BP	654	649	651	mmHg																								
TA	29.0	15.1	20.8	°C																								
Q	---	---	16.71	Lpm																								
QCV			Date			Filter ID: 3207-0707																						
Max overheat			Time			Final Wt: 149.460 mg																						
occured NA			dd-mmm			Initial Wt: 148.080 mg																						
			hh:mm:ss			Delta Wt: 1.380 mg																						
			Start: 25-Feb-17			Total Vol: 24.03 m ³																						
			Stop: 26-Feb-17			Mass Conc: 57.43 µg/m ³																						
			ET: 23:59:00																									
Notes 1: Aldea Los Planes, San Rafael Las Flores, Santa Rosa.																												
Notes 2: Minera San Rafael, S.A.																												

Cliente: Minera San Rafael, S.A.
Dirección: Boulevard Los Próceres, 18 calle 24-69 z. 10, Centro Empresarial Zona Pradera, Oficina 1406 torre IV
Proyecto: 178-089 (El Escobal)
Análisis de muestras: Marzo, 21 al 23 de 2017
Emisión de reporte: Marzo, 23 de 2017

Tipo de muestra: Filtros de cuarzo utilizados para colección de material particulado en aire.

Análisis: Gravimetría en filtros.

Método analítico: 40 CFR, Apéndice J, Parte 50, Capítulo 1, Edición 07-1-97, EPA. Reference Method for the Determination of Particulate Matter as PM₁₀ in the Atmosphere. **Acreditado ISO 17025**

Cuadro 1: resultados de filtros peso final

No.	Identificación de la muestra	Código de filtro ¹	Peso inicial* (gramos)	Peso final (gramos)
Límite de detección del método			0.00005	
1	EA-1A	3228-0101	0.14618	0.14658
2	EA-2A	3210-1010	0.14732	0.14769
3	EA-3	3225-1515	0.14680	0.14712
4	EA-7A	3229-0202	0.14863	0.14902

¹: Código de filtro asignado por Laboratorio Ambiental, S.A. *: Corresponde a los pesos iniciales indicado en reportes analíticos RA-17-11679. La incertidumbre del método es de ± 0.00005 g

Anexos:

Anexo 1. Cadena de Custodia R-02-000904

Este Reporte Analítico ha sido elaborado para uso confidencial y exclusivo del cliente; se prohíbe su reproducción, sin la aprobación escrita del Laboratorio. Los resultados aquí expresados representan el mejor juicio del Laboratorio y son válidos únicamente para la porción de muestra presentada a éste. Laboratorio Ambiental, S.A. no asume ninguna responsabilidad ni garantiza la utilización final que se le dé a la información aquí presentada. Laboratorio Ambiental, S.A. no se responsabiliza por el proceso de muestreo. En caso de requerir alguna modificación en este reporte analítico, solicitarla dentro de los siguientes 30 días a partir de la fecha en que el Laboratorio envió el reporte.

Ing. Diego Silva
Ingeniero Químico, Gestor de Calidad
Colegiado 1595

MSc. BSc. Ana Gabriela Juárez
Especialista ambiental, Director de Laboratorio

Redacción:	Fecha:	Revisión:	Fecha:	Aprobación:	Fecha:	Versión cliente:
G.C.	Mar., 23/17	J.J./D.S.	Mar., 23/17	A.G.J.	Mar. 24/17	02

BGI PQ200 Air Sampling System

Downloaded March 2017

Job Details:

Job Name: EA-1A
Version: PQ200
Serial No: 1.00
Pump Time:
Flags: NA

Job Code: EA-1A
Site Name: Los Planes (Top Soil Deposit)
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	654	650	651	mmHg
TA	27.1	16.9	20.1	°C
Q	---	---	16.71	Lpm

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 15-Mar-17	11:40:00
Stop: 16-Mar-17	11:40:00

Mass Concentration Data:

Filter ID:	3228-0101
Final Wt:	146.580 mg
Initial Wt:	146.180 mg
Delta Wt:	0.400 mg
Total Vol:	24.04 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 16.64 µg/m³

Notes 1: Depósito de Suelos, Proyecto El Escobal

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded March 2017

Job Details:

Job Name: EA-2A
Version: 5.62
Serial No: 3
Pump Time:
Flags: NA

Job Code: EA-2A
Site Name: La Cuchilla.
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	634	631	632	mmHg
TA	30.5	13.8	19.4	°C
Q	---	---	16.71	Lpm

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 8-Mar-17	11:53:00
Stop: 9-Mar-17	11:53:00

Mass Concentration Data:

Filter ID:	3210-1010
Final Wt:	147.690 mg
Initial Wt:	147.320 mg
Delta Wt:	0.370 mg
Total Vol:	24.04 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 15.39 µg/m³

Notes 1: Aldea La Cuchilla, San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded March 2017

Job Details:

Job Name: EA-3
Version: 5.62
Serial No: 1
Pump Time:
Flags: NA

Job Code: EA-3
Site Name: El Fucío, zona este.
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	628	625	626	mmHg
TA	29.0	13.3	18.3	°C
Q	---	---	16.71	Lpm

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 8-Mar-17	11:03:00
Stop: 9-Mar-17	11:03:00

Mass Concentration Data:

Filter ID:	3225-1515
Final Wt:	147.120 mg
Initial Wt:	146.800 mg
Delta Wt:	0.320 mg
Total Vol:	24.04 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 13.31 µg/m³

Notes 1: Aldea El Fucío, San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded March 2017

Job Details:

Job Name: EA-7A
Version: 5.62
Serial No: 3.00
Pump Time:
Flags: NA

Job Code: EA-7A
Site Name: Los Planes
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	654	651	652	mmHg
TA	29.3	17.0	20.5	°C
Q	---	---	16.71	Lpm

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 15-Mar-17	11:55:00
Stop: 16-Mar-17	11:55:00

Mass Concentration Data:

Filter ID:	3229-0202
Final Wt:	149.020 mg
Initial Wt:	148.630 mg
Delta Wt:	0.390 mg
Total Vol:	24.04 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 16.22 µg/m³

Notes 1: Aldea Los Planes, San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

Cliente: Minera San Rafael, S.A.
Dirección: Boulevard Los Próceres, 18 calle 24-69 z. 10, Centro Empresarial Zona Pradera, Oficina 1406 torre IV
Proyecto: 178-089 (El Escobal)
Análisis de muestras: Mayo, 15 a 16 2017
Emisión de reporte: Mayo, 16 de 2017

Tipo de muestra: Filtros de cuarzo utilizados para colección de material particulado en aire.

Análisis: Gravimetría en filtros.

Método analítico: 40 CFR, Apéndice J, Parte 50, Capítulo 1, Edición 07-1-97, EPA. Reference Method for the Determination of Particulate Matter as PM₁₀ in the Atmosphere. **Acreditado ISO 17025**

Cuadro 1: resultados de filtros peso final

No.	Identificación de la muestra		Peso inicial* (gramos)	Peso final (gramos)	Incertidumbre (gramos)
Límite de detección del método			0.00005		Al 95% confianza K=2
1	EA-1A	3261-0606	0.14763	0.14924	± 0.00005
2	EA-2A	3256-0101	0.14755	0.14864	
3	EA-3	3257-0202	0.14696	0.14799	
4	EA-7A	3260-0505	0.14803	0.14957	

¹: Código de filtro asignado por Laboratorio Ambiental, S.A. *: Corresponde a los pesos iniciales indicado en reportes analíticos RA-17-11696.

Anexos:

Anexo 1. Cadena de Custodia R-02-000906

Este Reporte Analítico ha sido elaborado para uso confidencial y exclusivo del cliente; se prohíbe su reproducción, sin la aprobación escrita del Laboratorio. Los resultados aquí expresados representan el mejor juicio del Laboratorio y son válidos únicamente para la porción de muestra presentada a éste. Laboratorio Ambiental, S.A. no asume ninguna responsabilidad ni garantiza la utilización final que se le dé a la información aquí presentada. Laboratorio Ambiental, S.A. no se responsabiliza por el proceso de muestreo. En caso de requerir alguna modificación en este reporte analítico, solicitarla dentro de los siguientes 30 días a partir de la fecha en que el Laboratorio envió el reporte.

Ing. Diego Silva
Ingeniero Químico, Gestor de Calidad
Colegiado 1595

MSc. BSc. Ana Gabriela Juárez
Especialista ambiental, Director de Laboratorio

Redacción:	Fecha:	Revisión:	Fecha:	Aprobación:	Fecha:	Versión cliente:
G.C.	Mayo, 16/17	J.J.	Mayo, 16/17	A.G.J.	Mayo, 16/17	01

BGI PQ200 Air Sampling System

Downloaded April 2017

Job Details:

Job Name: EA-1A
Version: PQ200
Serial No: 3.00
Pump Time:
Flags: NA

Job Code: EA-1A
Site Name: Los Planes (Top Soil Deposit)
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	650	645	648	mmHg
TA	31.4	16.1	22.8	°C
Q	---	---	16.71	Lpm

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	28-Apr-17	15:30:00
Stop:	29-Apr-17	15:30:00

Mass Concentration Data:

Filter ID:	3261-0606
Final Wt:	149.240 mg
Initial Wt:	147.630 mg
Delta Wt:	1.610 mg
Total Vol:	24.04 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 66.97 µg/m³

Notes 1: Depósito de Suelos, Proyecto El Escobal

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded April 2017

Job Details:

Job Name: EA-2A
Version: 5.62
Serial No: 2
Pump Time:
Flags: NA

Job Code: EA-2A
Site Name: La Cuchilla.
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	634	630	632	mmHg
TA	30.7	16.5	21.8	°C
Q	---	---	16.71	Lpm

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	25-Apr-17	12:19:00
Stop:	26-Apr-17	12:19:00

Mass Concentration Data:

Filter ID:	3256-0101
Final Wt:	148.640 mg
Initial Wt:	147.550 mg
Delta Wt:	1.090 mg
Total Vol:	24.04 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 45.34 µg/m³

Notes 1: Aldea La Cuchilla, San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded April 2017

Job Details:

Job Name: EA-3
Version: 5.62
Serial No: 1
Pump Time:
Flags: NA

Job Code: EA-3
Site Name: El Fucío, zona este.
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	626	623	624	mmHg
TA	29.3	15.7	20.7	°C
Q	---	---	16.71	Lpm

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	25-Apr-17	10:50:00
Stop:	26-Apr-17	10:50:00

Mass Concentration Data:

Filter ID:	3257-0202
Final Wt:	147.990 mg
Initial Wt:	146.960 mg
Delta Wt:	1.030 mg
Total Vol:	24.04 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 42.84 µg/m³

Notes 1: Aldea El Fucío, San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded April 2017

Job Details:

Job Name: EA-7A
Version: 5.62
Serial No: 3.00
Pump Time:
Flags: NA

Job Code: EA-7A
Site Name: Los Planes
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	651	646	649	mmHg
TA	32.5	14.7	22.7	°C
Q	---	---	16.71	Lpm

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	27-Apr-17	14:15:00
Stop:	28-Apr-17	14:15:00

Mass Concentration Data:

Filter ID:	3260-0505
Final Wt:	149.570 mg
Initial Wt:	148.030 mg
Delta Wt:	1.540 mg
Total Vol:	24.04 m ³

QCV	NA	%
Max overheat	NA	°C
occured NA		

ET: 23:59:00

Mass Conc: 64.06 µg/m³

Notes 1: Aldea Los Planes, San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

12.3.2 Informe de Metales en PM10

Cliente: Minera San Rafael, S.A.
Dirección: Boulevard Los Próceres, 18 calle 24-69 z. 10, Centro Empresarial
Zona Pradera, Oficina 1406 torre IV
Proyecto: 178-090
Análisis de muestras: Marzo, 30 de 2017
Emisión del reporte: Abril, 18 de 2017

Tipo de muestras: Filtros de cuarzo utilizados para colección de material particulado en aire.

Análisis: Metales en filtros por ICP de Masas.

Método analítico: ICP Masas. EPA Total Metals 6010Cmod and Total Metals on Small Filter 6020mod.

*Parámetros	LDM (µg)	Estación			
		EA-1B	EA-2A	EA-3A	EA-4A
Código de filtro		3206-0606	3200-1719	3209-0909	3204-0404
Aluminio (Al)	5.0	22.4	14.3	26.7	83.4
Antimonio (Sb)	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Arsénico (As)	0.60	< 0.60	< 0.60	< 0.60	< 0.60
Azufre (S)	2.5	73.5	49.0	43.0	72.1
Bario (Ba)	0.10	0.54	0.33	0.63	2.17
Berilio (Be)	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bismuto (Bi)	0.60	< 0.60	< 0.60	< 0.60	< 0.60
Boro (B)	0.60	0.81	0.79	0.98	1.01
Cadmio (Cd)	0.20	< 0.20	< 0.20	< 0.20	< 0.20
Calcio (Ca)	5.0	30.5	25.8	26.0	71.7
Cobalto (Co)	0.20	< 0.20	< 0.20	< 0.20	< 0.20
Cobre (Cu)	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cromo (Cr)	0.50	1.56	1.61	1.64	1.54
Estaño (Sn)	1.0	2.7	< 1.0	< 1.0	< 1.0
Estroncio (Sr)	0.10	0.16	0.11	0.11	0.41
Fósforo (P)	2.5	19.7	17.3	19.7	26.4
Hierro (Fe)	5.0	21.3	15.8	27.8	79.4
Magnesio (Mg)	5.0	6.8	5.5	8.0	20.3

*Parámetros	LDM (µg)	Estación			
		EA-1B	EA-2A	EA-3A	EA-4A
Código de filtro		3206-0606	3200-1719	3209-0909	3204-0404
Manganeso (Mn)	0.10	0.87	1.06	1.19	3.46
Molibdeno (Mo)	0.30	< 0.30	< 0.30	< 0.30	< 0.30
Níquel (Ni)	0.30	< 0.30	< 0.30	< 0.30	< 0.30
Plata (Ag)	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Plomo (Pb)	0.30	< 0.30	0.81	< 0.30	< 0.30
Potasio (K)	10.0	21	11	14	42
Selenio (Se)	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Silicio (Si)	1.0	22.9	22.0	31.0	43.1
Sodio (Na)	5.0	62.1	52.1	52.8	63.4
Talio (Tl)	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Titanio (Ti)	0.10	1.32	0.93	1.82	4.66
Uranio (U)	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Vanadio (V)	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Zinc (Zn)	0.50	0.68	1.21	0.58	1.59
Zirconio (Zr)	0.50	< 0.50	< 0.50	< 0.50	< 0.50

*: Análisis realizados por laboratorio subcontratado (laboratorio acreditado CAN-P-1585, CAN-P-1587, CAN-P-4E (ISO/IEC 17025:2005)). µg: microgramos. <: Menor que el límite de detección del método. LDM: límite de detección del método.

*Parámetros	LDM (µg)	Estación		
		EA-5A	EA-6	EA-7
Código de filtro		3203-0303	3205-0505	3207-0707
Aluminio (Al)	5.0	32.0	19.4	24.1
Antimonio (Sb)	1.0	< 1.0	< 1.0	< 1.0
Arsénico (As)	0.60	< 0.60	< 0.60	< 0.60
Azufre (S)	2.5	67.9	74.5	73.4
Bario (Ba)	0.10	0.87	0.43	0.50
Berilio (Be)	0.10	< 0.10	< 0.10	< 0.10
Bismuto (Bi)	0.60	< 0.60	< 0.60	< 0.60
Boro (B)	0.60	1.09	0.83	0.89
Cadmio (Cd)	0.20	< 0.20	< 0.20	< 0.20
Calcio (Ca)	5.0	36.3	28.7	44.2
Cobalto (Co)	0.20	< 0.20	< 0.20	< 0.20
Cobre (Cu)	0.50	< 0.50	< 0.50	< 0.50
Cromo (Cr)	0.50	1.62	1.67	1.61
Estaño (Sn)	1.0	< 1.0	< 1.0	< 1.0
Estroncio (Sr)	0.10	0.17	0.12	0.18
Fósforo (P)	2.5	18.4	19.6	18.9
Hierro (Fe)	5.0	33.6	19.5	25.7
Magnesio (Mg)	5.0	9.9	7.7	9.8
Manganeso (Mn)	0.10	1.37	0.92	3.05
Molibdeno (Mo)	0.30	< 0.30	< 0.30	< 0.30
Níquel (Ni)	0.30	< 0.30	< 0.30	< 0.30
Plata (Ag)	0.50	< 0.50	< 0.50	< 0.50
Plomo (Pb)	0.30	0.39	0.34	2.67
Potasio (K)	10.0	17	21	14
Selenio (Se)	1.0	< 1.0	< 1.0	< 1.0
Silicio (Si)	1.0	33.2	23.5	25.4
Sodio (Na)	5.0	60.5	63.6	54.9
Talio (Tl)	1.0	< 1.0	< 1.0	< 1.0
Titanio (Ti)	0.10	1.76	1.20	1.24

*Parámetros	LDM (µg)	Estación		
		EA-5A	EA-6	EA-7
Código de filtro		3203-0303	3205-0505	3207-0707
Uranio (U)	0.10	< 0.10	< 0.10	< 0.10
Vanadio (V)	0.50	< 0.50	< 0.50	< 0.50
Zinc (Zn)	0.50	0.98	0.88	3.38
Zirconio (Zr)	0.50	< 0.50	< 0.50	< 0.50

*: Análisis realizados por laboratorio subcontratado (laboratorio acreditado CAN-P-1585, CAN-P-1587, CAN-P-4E (ISO/IEC 17025:2005)). **µg**: microgramos. **<**: Menor que el límite de detección del método. **LDM**: límite de detección del método.

Anexos:

Anexo 1. Cadena de Custodia R-02-000901

Anexo 2. Reporte de laboratorio subcontratado

Este Reporte Analítico ha sido elaborado para uso confidencial y exclusivo del cliente; se prohíbe su reproducción, sin la aprobación escrita del Laboratorio. Los resultados aquí expresados representan el mejor juicio del Laboratorio y son válidos únicamente para la porción de muestra presentada a éste. Laboratorio Ambiental, S.A. no asume ninguna responsabilidad ni garantiza la utilización final que se le dé a la información aquí presentada. Laboratorio Ambiental, S.A. no se responsabiliza por el proceso de muestreo. En caso de requerir alguna modificación en este reporte analítico, solicitarla dentro de los siguientes 30 días a partir de la fecha en que el Laboratorio envió el reporte

Ing. Diego Silva

Ing. Químico, Gestor de Calidad
Colegiado 1595

MSc. BSc. Ana Gabriela Juárez

Especialista ambiental, Director de Laboratorio

Redacción:	Fecha:	Revisión:	Fecha:	Aprobación:	Fecha:	Versión cliente:
D.S.	Abril, 18/17	J.J.	Abril, 18/17	A.G.J.	Abril, 18/17	01



Your P.O. #: 6326
 Your Project #: 178-090
 Site Location: MSR
 Your C.O.C. #: na

Attention:Diego Silva

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
 Av. Insurgentes Sur 1763
 Piso 5 Col.Guadalupe INN C.P.
 Del.Alvaro Obregon D.F.Mexico CP., --
 Mexico 01020

Report Date: 2017/04/03
 Report #: R4411300
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B759571

Received: 2017/03/24, 15:16

Sample Matrix: Filter
 # Samples Received: 7

Analyses	Quantity	Date	Date	Laboratory Method	Reference
		Extracted	Analyzed		
Total Metals (6010Cmod)	7	2017/03/28	2017/03/28	CAM SOP-00408 / BRL SOP-00102	EPA 6010C m
Total Uranium on a Small Filter	7	2017/03/28	2017/03/30	BRL SOP-00103 / BRL SOP-EPA 6020A m	00102

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not reported corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



Your P.O. #: 6326
 Your Project #: 178-090
 Site Location: MSR
 Your C.O.C. #: na

Attention:Diego Silva

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
 Av. Insurgentes Sur 1763
 Piso 5 Col.Guadalupe INN C.P.
 Del.Alvaro Obregon D.F.Mexico CP., --
 Mexico 01020

Report Date: 2017/04/03
 Report #: R4411300
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B759571

Received: 2017/03/24, 15:16

Encryption Key


 Clayton Johnson
 Project Manager - Air Toxics, Source Evaluation
 03-Apr-2017 15:16:16

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
 Clayton Johnson, Project Manager - Air Toxics, Source Evaluation
 Email: CJohnson@maxxam.ca
 Phone# (905)817-5769

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Job #: B759571
Report Date: 2017/04/03

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6326

RESULTS OF ANALYSES OF FILTER

Maxxam ID		ECO329	ECO330	ECO331	ECO332	ECO333	ECO334	ECO335		
Sampling Date		2017/02/23	2017/02/14	2017/02/21	2017/02/27	2017/02/21	2017/02/23	2017/02/25		
COC Number		na	na	na	na	na	na	na		
	UNITS	3206-0606	3200-1719	3204-0404	3209-0909	3203-0303	3205-0505	3207-0707	RDL	QC Batch
Metals										
Total Uranium (U)	ug	ND	ND	ND	ND	ND	ND	ND	0.10	4916038
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected										



Maxxam Job #: B759571
Report Date: 2017/04/03

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6326

MISCELLANEOUS (FILTER)

Maxxam ID		ECO329	ECO330	ECO331	ECO332	ECO333	ECO334	ECO335		
Sampling Date		2017/02/23	2017/02/14	2017/02/21	2017/02/27	2017/02/21	2017/02/23	2017/02/25		
COC Number		na	na	na	na	na	na	na		
	UNITS	3206-0606	3200-1719	3204-0404	3209-0909	3203-0303	3205-0505	3207-0707	RDL	QC Batch
Metals										
Aluminum (Al)	ug	22.4	14.3	83.4	26.7	32.0	19.4	24.1	5.0	4916037
Antimony (Sb)	ug	ND	ND	ND	ND	ND	ND	ND	1.0	4916037
Arsenic (As)	ug	ND	ND	ND	ND	ND	ND	ND	0.60	4916037
Barium (Ba)	ug	0.54	0.33	2.17	0.63	0.87	0.43	0.50	0.10	4916037
Beryllium (Be)	ug	ND	ND	ND	ND	ND	ND	ND	0.10	4916037
Bismuth (Bi)	ug	ND	ND	ND	ND	ND	ND	ND	0.60	4916037
Boron (B)	ug	0.81	0.79	1.01	0.98	1.09	0.83	0.89	0.60	4916037
Cadmium (Cd)	ug	ND	ND	ND	ND	ND	ND	ND	0.20	4916037
Calcium (Ca)	ug	30.5	25.8	71.7	26.0	36.3	28.7	44.2	5.0	4916037
Chromium (Cr)	ug	1.56	1.61	1.54	1.64	1.62	1.67	1.61	0.50	4916037
Cobalt (Co)	ug	ND	ND	ND	ND	ND	ND	ND	0.20	4916037
Copper (Cu)	ug	ND	ND	ND	ND	ND	ND	ND	0.50	4916037
Iron (Fe)	ug	21.3	15.8	79.4	27.8	33.6	19.5	25.7	5.0	4916037
Lead (Pb)	ug	ND	0.81	ND	ND	0.39	0.34	2.67	0.30	4916037
Magnesium (Mg)	ug	6.8	5.5	20.3	8.0	9.9	7.7	9.8	5.0	4916037
Manganese (Mn)	ug	0.87	1.06	3.46	1.19	1.37	0.92	3.05	0.10	4916037
Molybdenum (Mo)	ug	ND	ND	ND	ND	ND	ND	ND	0.30	4916037
Nickel (Ni)	ug	ND	ND	ND	ND	ND	ND	ND	0.30	4916037
Phosphorus (P)	ug	19.7	17.3	26.4	19.7	18.4	19.6	18.9	2.5	4916037
Potassium (K)	ug	21	11	42	14	17	21	14	10	4916037
Selenium (Se)	ug	ND	ND	ND	ND	ND	ND	ND	1.0	4916037
Silicon (Si)	ug	22.9	22.0	43.1	31.0	33.2	23.5	25.4	1.0	4916037
Silver (Ag)	ug	ND	ND	ND	ND	ND	ND	ND	0.50	4916037
Sodium (Na)	ug	62.1	52.1	63.4	52.8	60.5	63.6	54.9	5.0	4916037
Strontium (Sr)	ug	0.16	0.11	0.41	0.11	0.17	0.12	0.18	0.10	4916037
Sulphur (S)	ug	73.5	49.0	72.1	43.0	67.9	74.5	73.4	2.5	4916037
Thallium (Tl)	ug	ND	ND	ND	ND	ND	ND	ND	1.0	4916037
Tin (Sn)	ug	2.7	ND	ND	ND	ND	ND	ND	1.0	4916037
Titanium (Ti)	ug	1.32	0.93	4.66	1.82	1.76	1.20	1.24	0.10	4916037
Vanadium (V)	ug	ND	ND	ND	ND	ND	ND	ND	0.50	4916037
Zinc (Zn)	ug	0.68	1.21	1.59	0.58	0.98	0.88	3.38	0.50	4916037
Zirconium (Zr)	ug	ND	ND	ND	ND	ND	ND	ND	0.50	4916037
RDL = Reportable Detection Limit QC Batch = Quality Control Batch ND = Not detected										



Maxxam Job #: B759571
Report Date: 2017/04/03

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6326

TEST SUMMARY

Maxxam ID: ECO329
Sample ID: 3206-0606
Matrix: Filter

Collected: 2017/02/23
Shipped: 2017/03/24
Received: 2017/03/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals (6010Cmod)	ICPX	4916037	2017/03/28	2017/03/28	Archana Patel
Total Uranium on a Small Filter	ICP1/MS	4916038	2017/03/28	2017/03/30	Nan Raykha

Maxxam ID: ECO330
Sample ID: 3200-1719
Matrix: Filter

Collected: 2017/02/14
Shipped: 2017/03/24
Received: 2017/03/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals (6010Cmod)	ICPX	4916037	2017/03/28	2017/03/28	Archana Patel
Total Uranium on a Small Filter	ICP1/MS	4916038	2017/03/28	2017/03/30	Nan Raykha

Maxxam ID: ECO331
Sample ID: 3204-0404
Matrix: Filter

Collected: 2017/02/21
Shipped: 2017/03/24
Received: 2017/03/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals (6010Cmod)	ICPX	4916037	2017/03/28	2017/03/28	Archana Patel
Total Uranium on a Small Filter	ICP1/MS	4916038	2017/03/28	2017/03/30	Nan Raykha

Maxxam ID: ECO332
Sample ID: 3209-0909
Matrix: Filter

Collected: 2017/02/27
Shipped: 2017/03/24
Received: 2017/03/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals (6010Cmod)	ICPX	4916037	2017/03/28	2017/03/28	Archana Patel
Total Uranium on a Small Filter	ICP1/MS	4916038	2017/03/28	2017/03/30	Nan Raykha

Maxxam ID: ECO333
Sample ID: 3203-0303
Matrix: Filter

Collected: 2017/02/21
Shipped: 2017/03/24
Received: 2017/03/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals (6010Cmod)	ICPX	4916037	2017/03/28	2017/03/28	Archana Patel
Total Uranium on a Small Filter	ICP1/MS	4916038	2017/03/28	2017/03/30	Nan Raykha

Maxxam ID: ECO334
Sample ID: 3205-0505
Matrix: Filter

Collected: 2017/02/23
Shipped: 2017/03/24
Received: 2017/03/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals (6010Cmod)	ICPX	4916037	2017/03/28	2017/03/28	Archana Patel
Total Uranium on a Small Filter	ICP1/MS	4916038	2017/03/28	2017/03/30	Nan Raykha



Maxxam Job #: B759571
Report Date: 2017/04/03

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6326

TEST SUMMARY

Maxxam ID: ECO335
Sample ID: 3207-0707
Matrix: Filter

Collected: 2017/02/25
Shipped: 2017/03/24
Received: 2017/03/24

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Metals (6010Cmod)	ICPX	4916037	2017/03/28	2017/03/28	Archana Patel
Total Uranium on a Small Filter	ICP1/MS	4916038	2017/03/28	2017/03/30	Nan Raykha



Maxxam Job #: B759571
Report Date: 2017/04/03

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6326

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	13.0°C
-----------	--------

RESULTS OF ANALYSES OF FILTER

Total Uranium on a Small Filter : Post digestion duplicate and spike were done on sample ECO291.

Results relate only to the items tested.



Maxxam Job #: B759571
Report Date: 2017/04/03

QUALITY ASSURANCE REPORT

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6326

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4916037	Aluminum (Al)	2017/03/28			99	85 - 115	ND, RDL=5.0	ug	1.5	20
4916037	Antimony (Sb)	2017/03/28			85	85 - 115	ND, RDL=1.0	ug	3.4	20
4916037	Arsenic (As)	2017/03/28			100	85 - 115	ND, RDL=0.60	ug	1.2	20
4916037	Barium (Ba)	2017/03/28			97	85 - 115	ND, RDL=0.10	ug	0.92	20
4916037	Beryllium (Be)	2017/03/28			101	85 - 115	ND, RDL=0.10	ug	1.3	20
4916037	Bismuth (Bi)	2017/03/28			100	85 - 115	ND, RDL=0.60	ug	1.3	20
4916037	Boron (B)	2017/03/28			98	85 - 115	ND, RDL=0.60	ug	2.6	20
4916037	Cadmium (Cd)	2017/03/28			102	85 - 115	ND, RDL=0.20	ug	1.3	20
4916037	Calcium (Ca)	2017/03/28			100	85 - 115	ND, RDL=5.0	ug	1.8	20
4916037	Chromium (Cr)	2017/03/28			99	85 - 115	ND, RDL=0.50	ug	1.7	20
4916037	Cobalt (Co)	2017/03/28			100	85 - 115	ND, RDL=0.20	ug	1.3	20
4916037	Copper (Cu)	2017/03/28			99	85 - 115	ND, RDL=0.50	ug	2.1	20
4916037	Iron (Fe)	2017/03/28			100	85 - 115	ND, RDL=5.0	ug	2.1	20
4916037	Lead (Pb)	2017/03/28			101	85 - 115	ND, RDL=0.30	ug	0.99	20
4916037	Magnesium (Mg)	2017/03/28			100	85 - 115	ND, RDL=5.0	ug	1.8	20
4916037	Manganese (Mn)	2017/03/28			101	85 - 115	ND, RDL=0.10	ug	1.5	20
4916037	Molybdenum (Mo)	2017/03/28			100	85 - 115	ND, RDL=0.30	ug	1.0	20
4916037	Nickel (Ni)	2017/03/28			101	85 - 115	ND, RDL=0.30	ug	1.1	20
4916037	Phosphorus (P)	2017/03/28			104	85 - 115	ND, RDL=2.5	ug	0.77	20
4916037	Potassium (K)	2017/03/28			100	85 - 115	ND, RDL=10	ug	1.5	20
4916037	Selenium (Se)	2017/03/28			103	85 - 115	ND, RDL=1.0	ug	0.68	20
4916037	Silicon (Si)	2017/03/28			98	85 - 115	ND, RDL=1.0	ug	1.5	20
4916037	Silver (Ag)	2017/03/28			100	85 - 115	ND, RDL=0.50	ug	1.2	20
4916037	Sodium (Na)	2017/03/28			105	85 - 115	7.2, RDL=5.0 [1]	ug	1.3	20
4916037	Strontium (Sr)	2017/03/28			100	85 - 115	ND, RDL=0.10	ug	1.5	20
4916037	Sulphur (S)	2017/03/28			105	85 - 115	ND, RDL=2.5	ug	1.5	20
4916037	Thallium (Tl)	2017/03/28			100	85 - 115	ND, RDL=1.0	ug	0.80	20
4916037	Tin (Sn)	2017/03/28			101	85 - 115	ND, RDL=1.0	ug	1.3	20
4916037	Titanium (Ti)	2017/03/28			100	85 - 115	ND, RDL=0.10	ug	1.4	20
4916037	Vanadium (V)	2017/03/28			99	85 - 115	ND, RDL=0.50	ug	2.5	20
4916037	Zinc (Zn)	2017/03/28			100	85 - 115	ND, RDL=0.50	ug	1.4	20



Maxxam Job #: B759571
Report Date: 2017/04/03

QUALITY ASSURANCE REPORT(CONT'D)

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6326

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4916037	Zirconium (Zr)	2017/03/28			99	85 - 115	ND, RDL=0.50	ug	1.6	20
4916038	Total Uranium (U)	2017/03/30	96	70 - 130	89	85 - 115	ND, RDL=0.10	ug	NC	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
 Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
 Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
 Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
 NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).
 [1] Metals Analysis: Analyte was detected in the method blank at a level marginally above the detection limit. Sample results have not been blank corrected. Those results at or near the detection limit may be biased high.



Maxxam Job #: B759571
Report Date: 2017/04/03

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6326

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brenda Moore

Brenda Moore, Team Lead

Ralph Siebert

Ralph Siebert, Operations Manager - Inorganic Analyses

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

12.3.3 Informe sobre PST y Gases de Combustión



**MONITOREO DE NO₂, SO₂ Y PARTÍCULAS
SEDIMENTABLES TOTALES
EN LA MINA EL ESCOBAL**

Marzo – Abril 2017

San Rafael Las Flores, Santa Rosa, Guatemala

Mayo de 2017

Este resumen presenta los resultados del monitoreo de calidad de aire, realizado para la Mina El Escobal (**la Mina**), por Consultoría y Tecnología Ambiental (**CTA**), en San Rafael Las Flores, Santa Rosa (localización de la Mina).

El propósito del monitoreo fue determinar la calidad de aire ambiental en las comunidades aledañas mediante la medición de la concentración de:

- Gases de combustión (**SO₂** y **NO₂**); y
- Partículas Sedimentables Totales (**PST**).

Las estaciones de medición se presentan en el Cuadro 1 y la metodología utilizada en el Cuadro 2.

Cuadro 1: Estaciones de monitoreo de SO₂ y NO₂ y PST

Estación	Ubicación	Coordenadas
EA-1C	Frente a Escuela San Rafael	E (m): 803,878.32 N (m): 1,601,997.36
EA-2B	Aldea La Cuchilla	E (m): 806,461.34 N (m): 1,601,992.37
EA-3B	Aldea El Fucío	E (m): 806,529.34 N (m): 1,600,563.36
EA-4A	Aldea La Puerta de Los Ángeles	E (m): 805,133.33 N (m): 1,599,867.84
EA-5A	Aldea Sabana Redonda	E (m): 804,343.33 N (m): 1,600,600.36
EA-6	Norte de la Mina, ruta a Mataquesuintla	E (m): 805,159.33 N (m): 1,603,443.37
EA-7A	Perímetro de la Mina colindante con aldea Los Planes	E (m): 805,416.33 N (m): 1,601,719.36

Coordenadas en metros (**m**). Datum: WGS84 UTM zona 15N. Fuente: CTA, 2017.

Cuadro 2: Metodologías utilizadas para SO₂ y NO₂ y PST

Gases de Combustión	SO₂ : Análisis espectrofotométrico, descrito en el Título 40, Parte 50, Apéndice A de la USEPA.
	NO₂ : Análisis espectrofotométrico. Método de referencia designado por la USEPA: No. EQN-1277-026.
PST	ASTM D 1739-98 (re-aprobación 2004).

Fuente: CTA, 2017.

Los resultados obtenidos para los gases de combustión se compararon con los valores guía reportados en Corporación Financiera Internacional (**CFI**)¹.

Los resultados de Partículas Sedimentables Totales (**PST**) se compararon con los valores guía reportados en el Ministerio de Ambiente de la provincia canadiense British Columbia (**BC**)² con respecto a las partículas sedimentables totales para industrias mineras, de fundición y relacionadas.

En el Cuadro 3 se presentan los resultados obtenidos de la medición de gases de combustión realizada en Marzo de 2017; y en el Cuadro 4 se presentan los resultados de la medición de PST para el período de 30 días de 15 Marzo a 17 de Abril de 2017 (el período promedio de medición es de 30 ± 2 días, por lo que se cumple lo estipulado por la BC).

Cuadro 3: Resultados de la medición de gases de combustión (en µg/m³)

Estaciones de Muestreo	EA-1C	EA-2B	EA-3B	EA-4A	EA-5A	EA-6	EA-7A	Guías del CFI
SO₂	<13	<13	<13	<13	<13	<13	<13	20
NO₂	<9	<9	<9	10	<9	<9	<9	*40

SO₂: dióxido de azufre. NO₂: dióxido de nitrógeno. *: Promedio anual.¹: LDM: Límite de detección del método. µg/m³: microgramos sobre metros cúbicos.

Fuente: Laboratorio Ambiental, S. A., 2017.

¹ International Finance Corporation (IFC) Industry Sector Guidelines for Mining, December 10, 2007: www.ifc.org/ifcext/EnvironmentalGuidelines

² Air Quality Objectives for Total Suspended Particulates and Dust Fall, August 12, 2013: <http://www.bcairquality.ca/reports/pdfs/aqotable.pdf>

Cuadro 4: Resultados de la medición de PST (g / (m² x 30 días))

Parámetros	EA-1C	EA-2B	EA-3B	EA-4A	EA-5A	EA-6	EA-7A	Guía de BC
Sólidos Insolubles	18.134	14.468	21.254	31.442	21.645	2.943	8.656	NA
Sólidos Solubles	0.414	1.266	1.285	1.986	1.217	1.359	6.799	
Sólidos Totales	18.548	15.734	22.539	33.428	22.862	4.301	15.456	
Partículas sedimentables totales mg/(dm ² *día) ²	6.183	5.245	7.513	11.143	7.621	1.434	5.152	2.90 ¹

g: gramos. m²: metro cuadrado. mg: miligramos. dm²: decímetro cuadrado. ¹: valor referido para un período promedio 30 ± 2 días. ²: Las estaciones fueron muestreadas dentro del período promedio de 30 ± 2 días aprobado por la BC.

Fuente: Laboratorio Ambiental, S. A., 2017.

Gases de Combustión

SO₂:

Como se puede apreciar en el Cuadro 3, las concentraciones se encuentran por debajo del límite de detección del método analítico utilizado en todas las estaciones monitoreadas (**20 µg/m³**)

NO₂:

En todas las estaciones de muestreo se obtuvieron resultados menores establecido por el CFI (**40 µg/m³**).

Partículas Sedimentables Totales

Seis de las siete estaciones, presentan valores de PST que superan el valor guía. La estación que presentó la mayor concentración de PST fue la EA-4A (11.143 mg / (dm² x día), esto puede atribuirse en gran medida a que esta estación de muestreo se encuentra cerca de un camino de terracería con una alta carga vehicular de tránsito pesado (camiones, pickups y buses) que generan cantidades significativas de polvo. La estación EA-5A presenta un valor

de 7.621 mg / (dm² x día), el cual puede estar influenciado por los vientos del sector, la proximidad a la carretera principal y al paso de vehículos.

Las estaciones que presentaron la menor concentración de PST durante el período de monitoreo, fueron la EA-6 y EA-7A con 1.434 mg / (dm² x día) y 5.152 mg / (dm² x día) respectivamente. En el caso de la estación EA-7A la alta concentración de PST se puede atribuir a trabajos realizados en el sector, que involucraron movimiento de tierras. La estación EA-6 es una estación de control que se encuentra alejada de la carretera y cuya influencia por tránsito, actividades agrícolas y humanas es mínima.

Las estaciones EA-3B, EA-2B y EA-1C presentan valores de 7.513 mg / (dm² x día), 5.245 mg / (dm² x día) y 6.183 mg / (dm² x día) respectivamente. Las primeras dos estaciones se encuentran en lugares con caminos de terracería con tránsito vehicular de bajo a medio, pero en ambos casos se han realizado trabajos en dichos caminos. La estación EA-1C, se encuentra cerca de un campo de terracería utilizado para actividades recreativas (football).



Anexos

Anexo 1-1: Reportes analíticos

Cliente: Minera San Rafael, S.A.
Dirección: Boulevard Los Próceres, 18 calle 24-69 z. 10, Centro Empresarial Zona Pradera, Oficina 1406 torre IV
Proyecto: 178-092 (CTA)
Fecha de muestreo: Marzo, 14 al 17 de 2017
Fecha de análisis: Marzo, 18 de 2017
Emisión del reporte: Abril, 03 de 2017

Tipo de muestras: Soluciones absorbentes para análisis de dióxido de azufre (SO₂) y dióxido de nitrógeno (NO₂).

Análisis: Determinación espectrofotométrica de SO₂ y de NO₂ en la atmósfera.

Métodos analíticos:

- SO₂: 40 CFR, parte 50, Apéndice A-2, EPA. Reference Method for the determination of Sulfur Dioxide in the atmosphere (Pararosaniline Method).
- NO₂: EPA Designated Equivalent Method No. EQN-1277-026. Sodium Arsenite method for the determination of Nitrogen Dioxide in the atmosphere.

Cuadro 1: Ubicación de estaciones de muestreo

Estación	Ubicación	Coordenadas	Fotografía	Factores ambientales *
EA-1C	Frente a Escuela San Rafael	N: 1,601,801 E: 803,887		Casa dentro del pueblo, caminos pavimentados. Campo de foot ball de tierra frente a la casa.
EA-2B	Aldea La Cuchilla	N: 1,601,796 E: 806,470		Camino de terracería poco tráfico vehicular, transitan especialmente motos. Construcción de casas con adobe en los alrededores.

Estación	Ubicación	Coordenadas	Fotografía	Factores ambientales *
EA-3B	Aldea El Fucio	N: 1,600,367 E: 806,538		Camino de terracería cercano al terreno, tráfico vehicular moderado.
EA-4A	Aldea La Puerta de Los Ángeles	N: 1,599,903 E: 805,142		Camino de terracería cercano al terreno, tráfico vehicular alto, los vehículos levantan cantidades considerables de polvo. Evidencia de quema de leña para cocinar.
EA-5A	Aldea Sabana Redonda	N: 1,600,404 E: 804,352		El terreno está cerca de la carretera principal (asfaltada), está en campo abierto y cercano a una fábrica de block.
EA-6	Norte del proyecto, ruta a Mataquescuintla	N: 1,603,247 E: 805,168		Camino de terracería, poco tráfico vehicular, presencia de ganado vacuno en el terreno.
EA-7A	Perímetro del Proyecto colindante con aldea Los Planes	N: 1,601,523 E: 805,425		Camino de terracería, hay movimientos de tierra próximos al punto, el tráfico de vehículos es alto.

Coordenadas en metros (m). Datum: NAD27 UTM zona 16 N. Fuente: LAMSA, 2016. *: Factores ambientales que pueden influir en los resultados.

Cuadro 2: Resultados gases de combustión SO₂ y NO₂

Parámetro	Unidades	LDM	Identificación de las muestras						
			EA-1C	EA-2B	EA-3B	EA-4A	EA-5A	EA-6	EA-7A
Fecha de muestreo (Marzo, 2017)			14 - 15	14 - 15	14 - 15	15 - 16	16 - 17	16 - 17	15 - 16
SO ₂	µg/m ³	13	< 13	< 13	< 13	< 13	< 13	< 13	< 13
	ppm	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
NO ₂	µg/m ³	9	< 9	< 9	< 9	10	< 9	< 9	< 9
	ppm	0.005	< 0.005	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005

LDM: límite de detección del método, µg/m³: microgramos por metro cúbico, ppm: partes por millón.

Cuadro 3: Concentraciones de SO₂ y NO₂ en controles de laboratorio

Parámetro	Control con duplicado		Incertidumbre Al 95% confianza, k=2	CDL		
	Unidades	DEA-4A		Unidades	Teórica	Real
SO ₂	µg/m ³	< 13	± 0.60	µg	1.00	1.03
	ppm	< 0.005	± 0.00023			
NO ₂	µg/m ³	10	± 2.00	µg/mL	15.7	15.4
	ppm	0.005	± 0.00112			

CDL: controles de laboratorio. µg: microgramo. µg/mL: microgramo por mililitro. Según los métodos analíticos, la diferencia entre las concentraciones teóricas y reales de los controles no deben ser mayores a 1 µg de SO₂ y a 0.1 µg/mL de NO₂, respectivamente. NA: No Aplica. DEA-4A: duplicado de la estación EA-4A.

Anexos:

Anexo 1. Cadena de custodia R-02-000894

Este Reporte Analítico ha sido elaborado para uso confidencial y exclusivo del cliente; se prohíbe su reproducción, sin la aprobación escrita del Laboratorio. Los resultados aquí expresados representan el mejor juicio del Laboratorio y son válidos únicamente para la porción de muestra presentada a éste. Laboratorio Ambiental, S.A. no asume ninguna responsabilidad ni garantiza la utilización final que se le dé a la información aquí presentada. En caso de requerir alguna modificación en este reporte analítico, solicitarla dentro de los siguientes 30 días a partir de la fecha en que el Laboratorio envió el reporte.



Ing. Diego Silva
Ing. Químico, Gestor de Calidad
Colegiado 1595



MSc. Ana Gabriela Juárez
Especialista ambiental, Director de Laboratorio

Redacción:	Fecha:	Revisión:	Fecha:	Aprobación:	Fecha:	Versión cliente:
G.C.	Mar., 18/17	D.S.	Mar. 31/17	A.G.J.	Mar. 31/17	01

Cliente: Minera San Rafael
Dirección: Boulevard Los Próceres, 18 calle 24-69 z. 10, Centro Empresarial Zona Pradera, Oficina 1406 torre IV
Proyecto: 178-092 (CTA)
Fecha de muestreo: Marzo 17 a Abril 18, de 2017
Lugar de muestreo: San Rafael las Flores, Santa Rosa, Guatemala
Fecha de análisis: Abril, 20 al 21 de 2017
Emisión del reporte: Abril, 27 de 2017



Tipo de muestras: Partículas sedimentables en aire durante un período de 30 días.
Análisis: Muestreo y determinación de material particulado total sedimentable en el aire (tasa de sedimentación).
Método analítico: ASTM D1739-98 (Reapproved 2004) Standard Test Method for Collection and Measurement of Dustfall (Settleable Particulate Matter)¹.
***Acreditado ISO 17025**

Cuadro 1: Ubicación de estaciones de muestreo

Estación	Ubicación	Fotografía	Factores ambientales
EA-1C	Frente a Escuela San Rafael		Casa dentro del pueblo, caminos pavimentados, vientos fuertes. Campo de foot ball de tierra frente a la casa.

¹ Como complemento del método se agrega sulfato de cobre para evitar el crecimiento de algas durante el periodo de muestreo, según IT-ATM-09 inspecciones reglamentarias de emisiones fugitivas de partículas sedimentables y en suspensión. Consejería de medio ambiente de Andalucía.

Estación	Ubicación	Fotografía	Factores ambientales
EA-2B	Aldea La Cuchilla		Camino de terracería poco tráfico vehicular, transitan especialmente motos. Construcción de casas con adobe en los alrededores.
EA-3B	Aldea El Fucío		Camino de terracería cercano al terreno, tráfico vehicular moderado. Se realizan trabajos de introducción de drenajes y construcción.
EA-4A	Aldea La Puerta de Los Ángeles		Camino de terracería cercano al terreno, tráfico vehicular alto, los vehículos levantan cantidades considerables de polvo. Evidencia de quema de leña para cocinar.
EA-5A	Aldea Sabana Redonda		El terreno está cerca de la carretera principal (asfaltada), está en campo abierto y cercano a una fábrica de block.

Estación	Ubicación	Fotografía	Factores ambientales
EA-6	Norte del proyecto, ruta a Mataquescuintla		Camino de terracería, poco tráfico vehicular, presencia de ganado vacuno en el terreno.
	Perímetro del Proyecto colindante con aldea Los Planes		Camino de terracería, poco tráfico vehicular, se realizaban trabajos en las piletas de sedimentación, tránsito de tractores y camiones de volteo.

²: Factores ambientales que pueden influir en los resultados. El tiempo de muestreo fue de 30 ± 2 días, de acuerdo a método analítico empleado.

Cuadro 2: Resultados Partículas Sedimentables Totales (PST)

No.	Identificación de la muestra	Tasa de sedimentación ¹			
		Material insoluble en agua [g/(m ² ·30 días)]	Material soluble en agua [g/(m ² ·30 días)]	Total* para un periodo de 30 días [g/(m ² ·30 días)].	Total* para un periodo de 1 día [mg/(dm ² · día)].
	LDM	0.0019	0.017	0.019	0.006
1	EA-1C	18.1340	0.4140	18.548	6.183
2	EA-2B	14.4680	1.266	15.734	5.245
3	EA-3B	21.2540	1.285	22.539	7.513
4	EA-4A	31.4420	1.986	33.428	11.143
5	EA-5A	21.6450	1.217	22.862	7.621
6	EA-6	2.9430	1.359	4.301	1.434
7	EA-7A	8.6560	6.799	15.456	5.152

LDM: límite de detección del método. **g:** gramos; **mg:** miligramos. **m²:** metros cuadrados. **dm²:** decímetro cuadrado. ¹: las fuentes de incertidumbre para el método de análisis han sido establecidos por el laboratorio y se encuentran descritas en su respectivo procedimiento analítico.

Anexos:

Anexo 1. Cadena de Custodia R-02-000935

Este Reporte Analítico ha sido elaborado para uso confidencial y exclusivo del cliente; se prohíbe su reproducción, sin la aprobación escrita del Laboratorio. Los resultados aquí expresados representan el mejor juicio del Laboratorio y son válidos únicamente para la porción de muestra presentada a éste. Laboratorio Ambiental, S.A. no asume ninguna responsabilidad ni garantiza la utilización final que se le dé a la información aquí presentada. En caso de requerir alguna modificación en este reporte analítico, solicitarla dentro de los siguientes 30 días a partir de la fecha en que el Laboratorio envió el reporte.



Ing. Diego Silva
Ing. Químico, Gestor de Calidad
Colegiado 1595



MSc. BSc. Ana Gabriela Juárez
Especialista ambiental, Director de Laboratorio

Redacción:	Fecha:	Revisión:	Fecha:	Aprobación:	Fecha:	Versión cliente:
G.C.	Abril, 27/17	D.S.	Abril, 28/17	A.G.J.	Abril, 28/17	01

CADENA DE CUSTODIA

Laboratorio Ambiental, S.A.
Tronco 1, Sector E, Lote 14 El Encinal, zona 7 de Mixco, Guatemala, Guatemala.
Teléfono: 24318187, Fax 24318108 ext. 102
www.laboratorio-ambiental.com

Información General				Información para el Reporte	
Empresa	Consultoría y Tecnología Ambiental S.A.			Reportar a:	Dr. Adrian Juárez
Contacto	Dr. Ing. Adrian Juárez			Proyecto:	172-092
Dirección	Tronco 1, Sector E, lote 14, Final de la Bobanda El Encinal zona 7 de Mixco			Formato para reporte ²	.PDF
Ciudad	Guatemala	Tel. / Cel.	2431-8102	Dirección reporte:	correo Dr. Adrian Juárez
País	Guatemala			Observaciones:	
e-mail	adrian.juarez@acta-consultoria.com				

Plazo de entrega de Reporte (PER) ²	
PER Regular:	<input checked="" type="checkbox"/> 6 a 8 días Laborales
PER agilizado: (previa aprobación vía e-mail)	<input type="checkbox"/> 48 a 72 horas
	<input type="checkbox"/> 72 a 96 horas
Otro:	

Cadena de Custodia No.	
R-02-	00935
Pág. <u>1</u>	de <u>1</u>

Instrucciones

Completar la información solicitada con letra legible.

- Para uso exclusivo de Laboratorio Ambiental, dejar en blanco
- Indicar si se requiere en formato de reporte: **Word, PDF ó Electrónico**
- Colocar el número de recipientes que correspondan a la descripción del encabezado.

No.	Identificación de las Muestra	Identificación laboratorio ¹	Fecha del muestreo	No. Total recipiente	Parámetros a analizar ²																				Observaciones																													
					Descripción recipiente ³			Tipo de Matriz ³							Preservante ³							Físico-químico de Agua				Microb	Filtros	Aire	Biología	Varios																								
					Vidrio	Plástico	Otros	Agua	Aire	Filtros	Macroinvertebrados	Peces	Fauna y Flora	Otros	Fito	HNO3	H2SO4	HCl	NaOH	Etanol	Otro	Alcalinidad	Dureza Total	DQO / DBO 5	Nitrogeno total	Fósforo Total	Cromo hexavalente	Color	Acetatos & Grasas / TPH	Metales / Cianuro/Hg	Sólidos totales	Sólidos Disueltos Totales	Sólidos Suspendedos Totales	Coliformes totales	Coliformes fecales	E-Coli	Pesado Inicial	Pesado final	Si, C, Hg o Metales	PM10	NO2 y SO2	Id. Tax. Macroinvertebrados	Id. Tax. Peces	Id. Tax. Herpetofauna	Ecotoxicidad	Descarga/Análisis de datos	Otro:							
1	EA-1C	1969-17-04	17.04.17			1		1													1																										X	TSP						
2	EA-2B	1970-17-04	17.04.17			1		1													1																											X	TSP					
3	EA-3B	1971-17-04	17.04.17			1		1													1																										X	TSP						
4	EA-4A	1972-17-04	17.04.17			1		1													1																										X	TSP						
5	EA-5A	1973-17-04	17.04.17			1		1													1																										X	TSP						
6	EA-6	1974-17-04	17.04.17			1		1													1																										X	TSP						
7	EA-7A	1975-17-04	17.04.17			1		1													1																										X	TSP						
8																																																						
9																																																						
10																																																						
11																																																						
12																																																						
13																																																						
14																																																						
15																																																						
Ingreso	Material Entregado por / Firma		Fecha	18.04.17	Hora	07:45	Para Uso Exclusivo del laboratorio ¹															Estado de las muestras		Bueno	<input checked="" type="checkbox"/>	Malo	<input type="checkbox"/>	(especificar en observaciones)																										
Egreso	Material Recibido por / Firma		Fecha	18.04.17	Hora	07:45																Temperatura de muestras:				pH:																												
	Material Entregado por / Firma		Fecha		Hora																	Observaciones:																																

12.3.4 Presión Sonora

ER-1

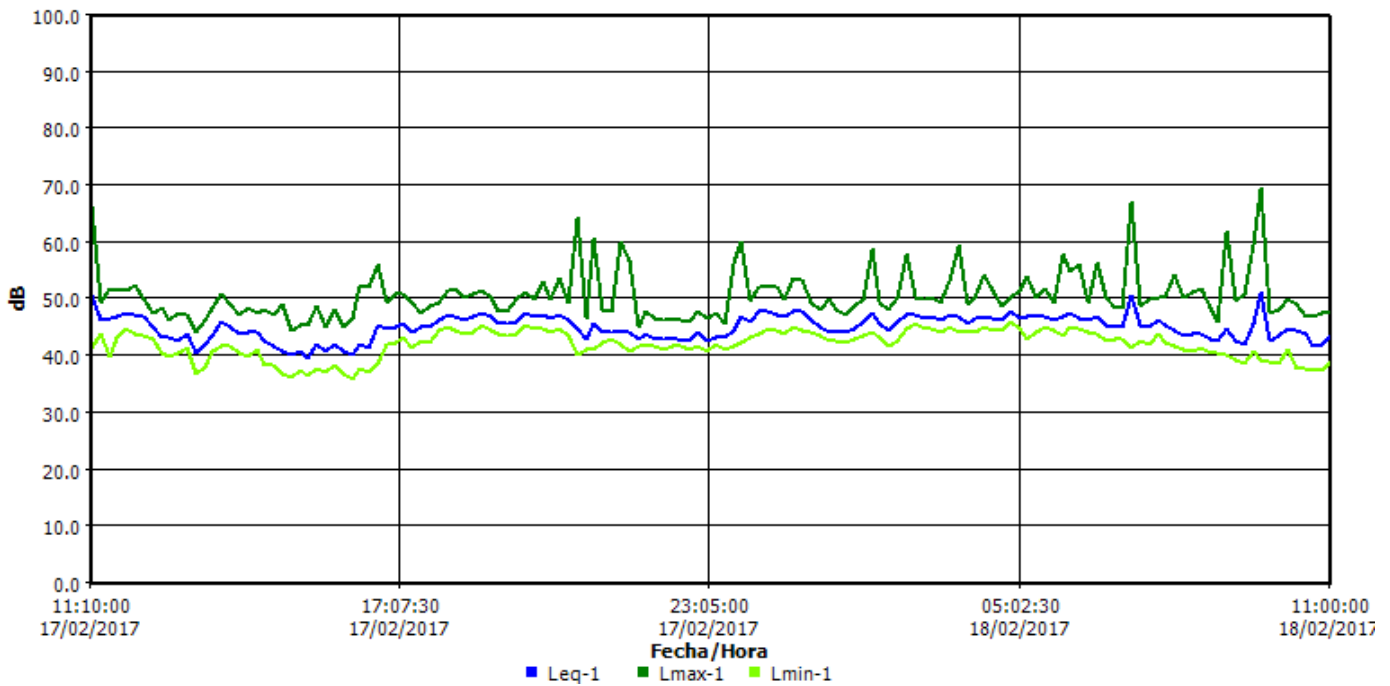
Panel de información

Ubicación Depósito de suelos norte, a inmediaciones de Aldea Los Planes
Nombre ER-1
Sesión padre S182
Hora de inicio Viernes, 17 de Febrero de 2017 11:00:00
Hora de paro Sábado, 18 de Febrero de 2017 11:00:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	35.9 dB	Lmax	1	69.6 dB
Lpk	1	98.1 dB	Leq	1	45.5 dB

Gráfica de datos de registro



ER-2

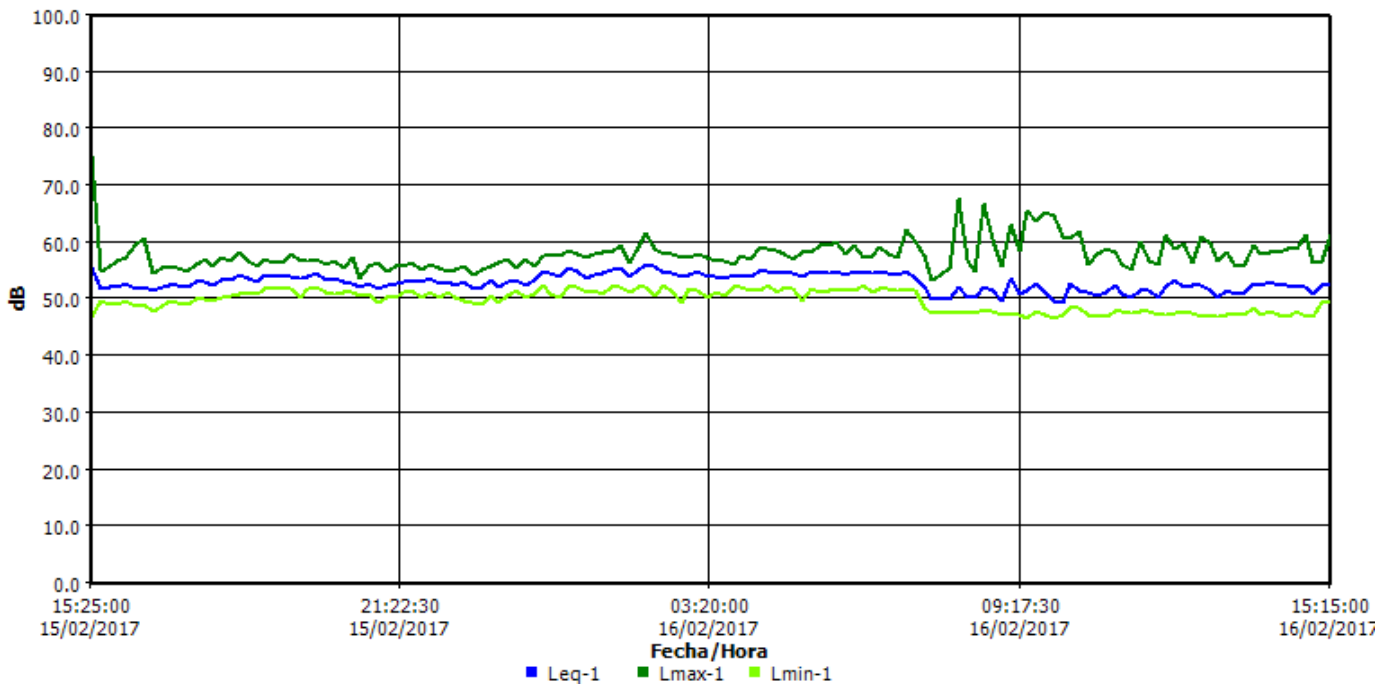
Panel de información

Ubicación Aldea La Cuchilla
Nombre ER-2
Sesión padre S045
Hora de inicio Miércoles, 15 de Febrero de 2017 15:15:00
Hora de paro Jueves, 16 de Febrero de 2017 15:15:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	46.6 dB	Lmax	1	75 dB
Lpk	1	96.9 dB	Leq	1	53.2 dB

Gráfica de datos de registro



ER-3

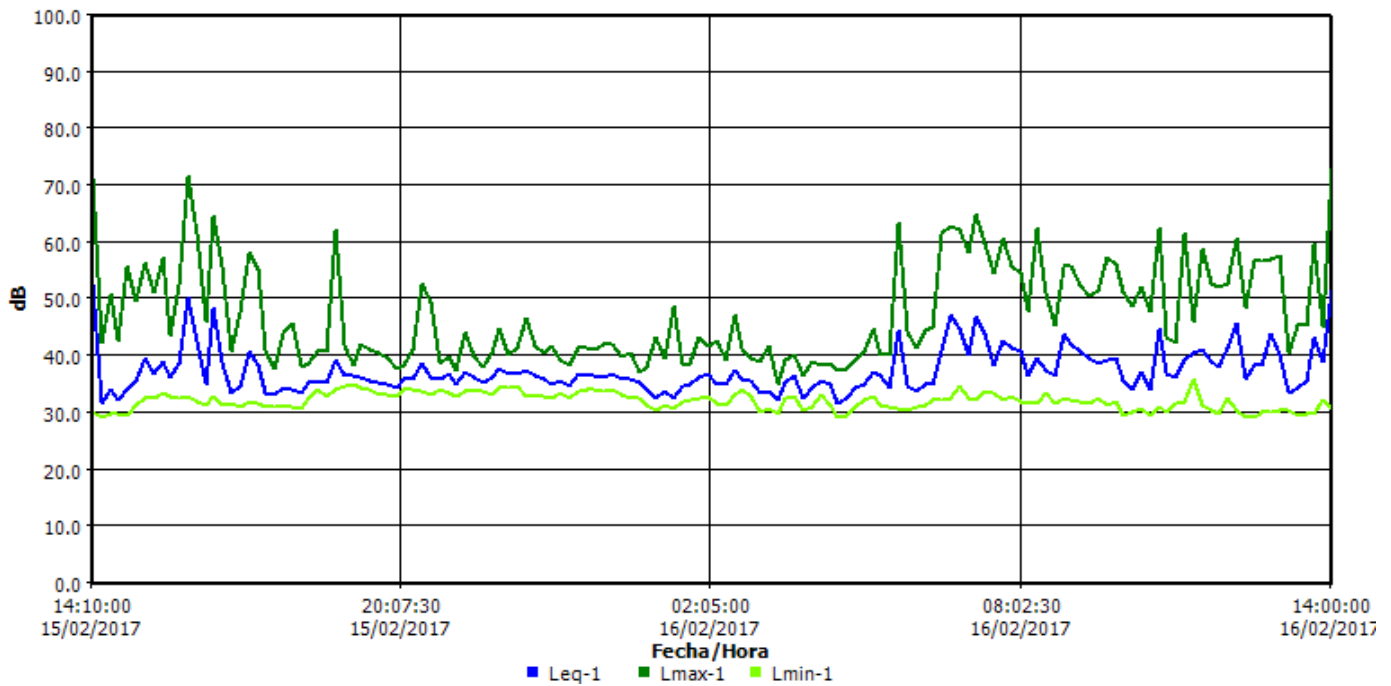
Panel de información

Ubicación Aledaño a Aldea El Fucio
Nombre ER-3
Sesión padre S181
Hora de inicio Miércoles, 15 de Febrero de 2017 14:00:00
Hora de paro Jueves, 16 de Febrero de 2017 14:00:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	29.1 dB	Lmax	1	73.2 dB
Lpk	1	97.3 dB	Leq	1	40.1 dB

Gráfica de datos de registro



ER-7A

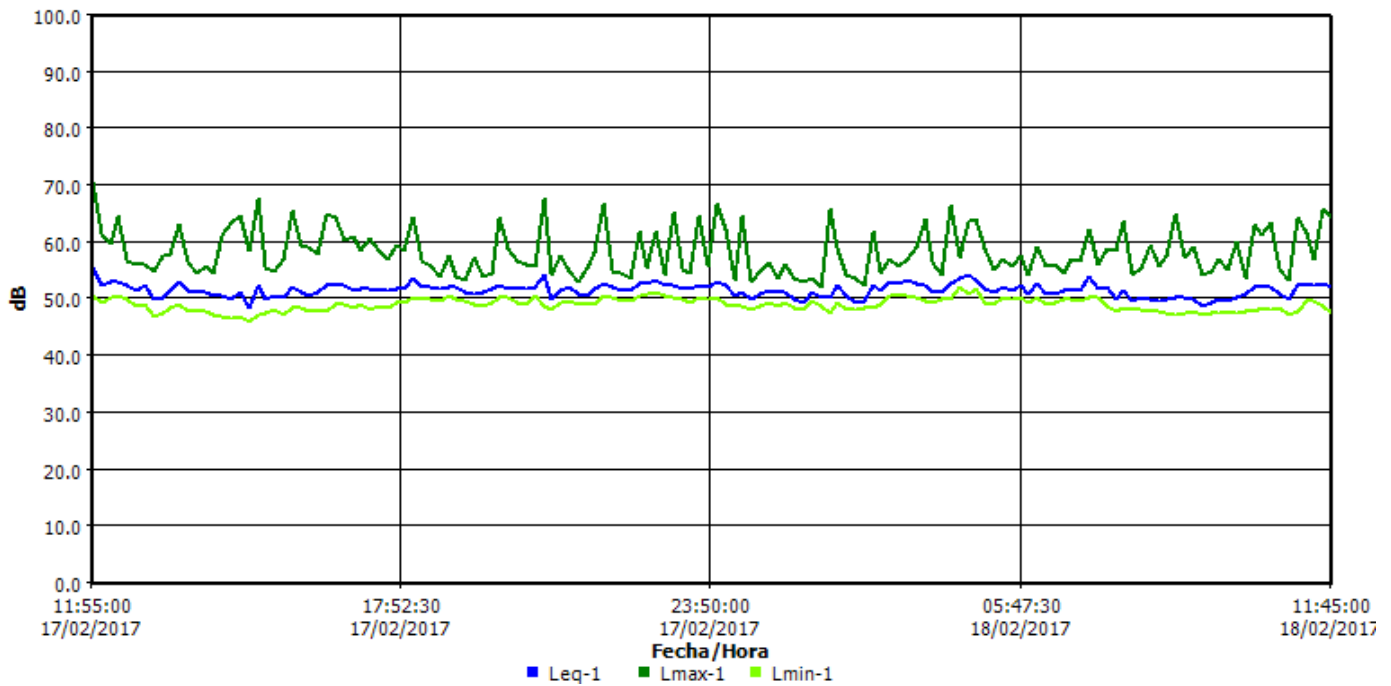
Panel de información

Ubicación Aledaño a Aldea Los Planes
Nombre ER-7A
Sesión padre S046
Hora de inicio Viernes, 17 de Febrero de 2017 11:45:00
Hora de paro Sábado, 18 de Febrero de 2017 11:45:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	45.9 dB	Lmax	1	70.6 dB
Lpk	1	98.1 dB	Leq	1	51.7 dB

Gráfica de datos de registro



ER-1A

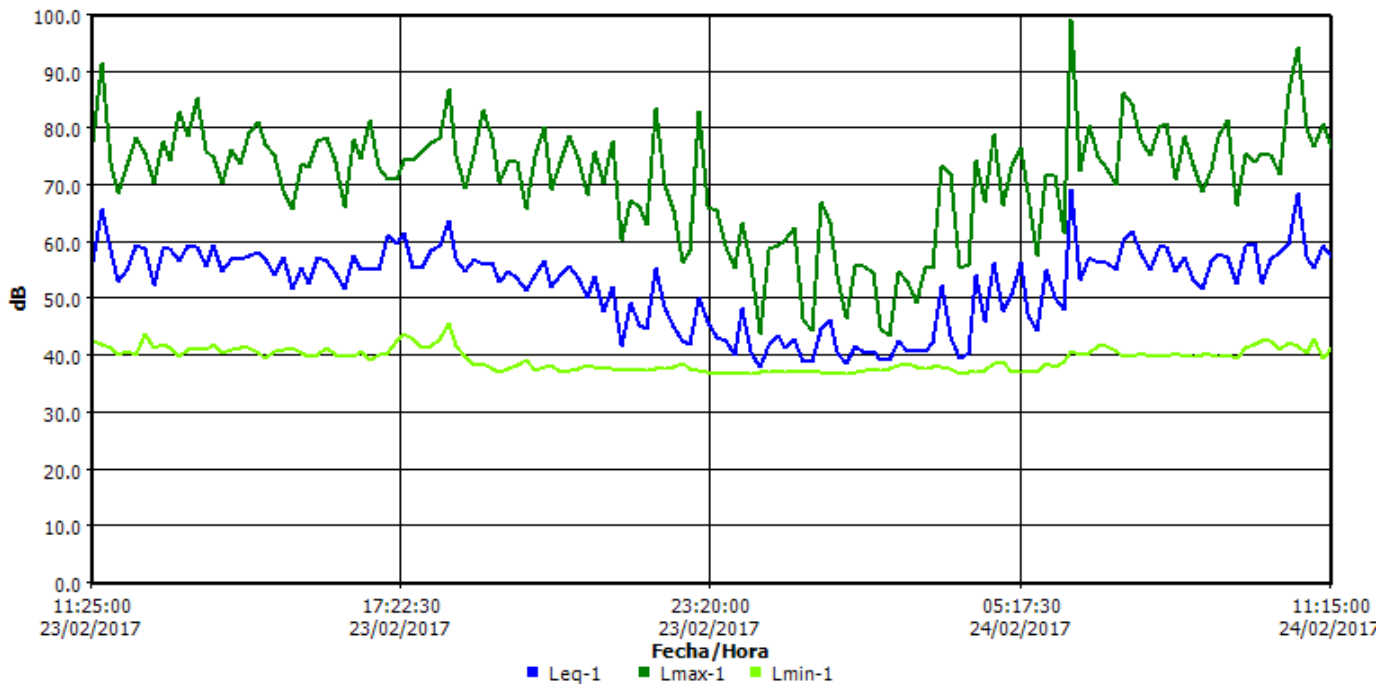
Panel de información

Ubicación San Rafael las Flores
Nombre ER-1A
Sesión padre S270
Hora de inicio Jueves, 23 de Febrero de 2017 11:15:00
Hora de paro Viernes, 24 de Febrero de 2017 11:15:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	FAST
Lmin	1	36.8 dB	Lmax	1	99.1 dB
Lpk	1	110.9 dB	Leq	1	56.8 dB

Gráfica de datos de registro



ER-3A

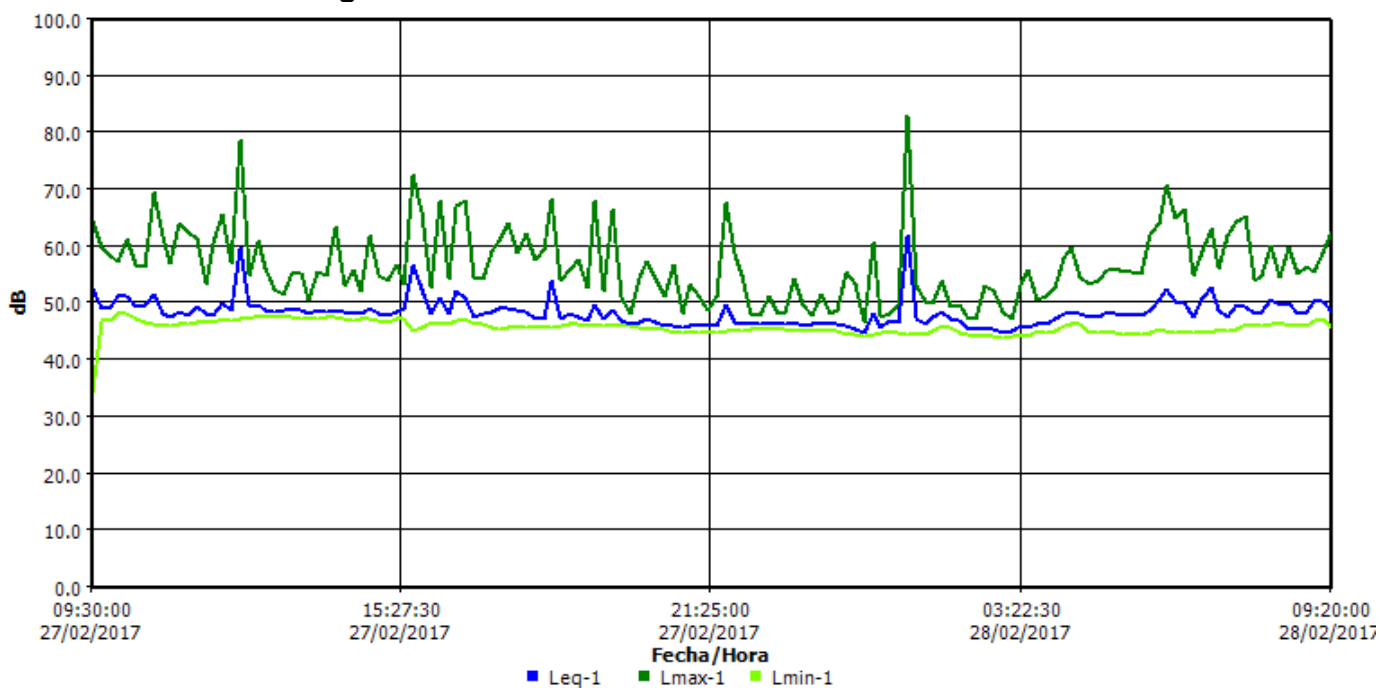
Panel de información

Ubicación Aldea Sabana Redonda
Nombre ER-3A
Sesión padre S185
Hora de inicio Lunes, 27 de Febrero de 2017 09:20:00
Hora de paro Martes, 28 de Febrero de 2017 09:20:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	34.3 dB	Lmax	1	83.1 dB
Lpk	1	109.9 dB	Leq	1	49.5 dB

Gráfica de datos de registro



ER-4A

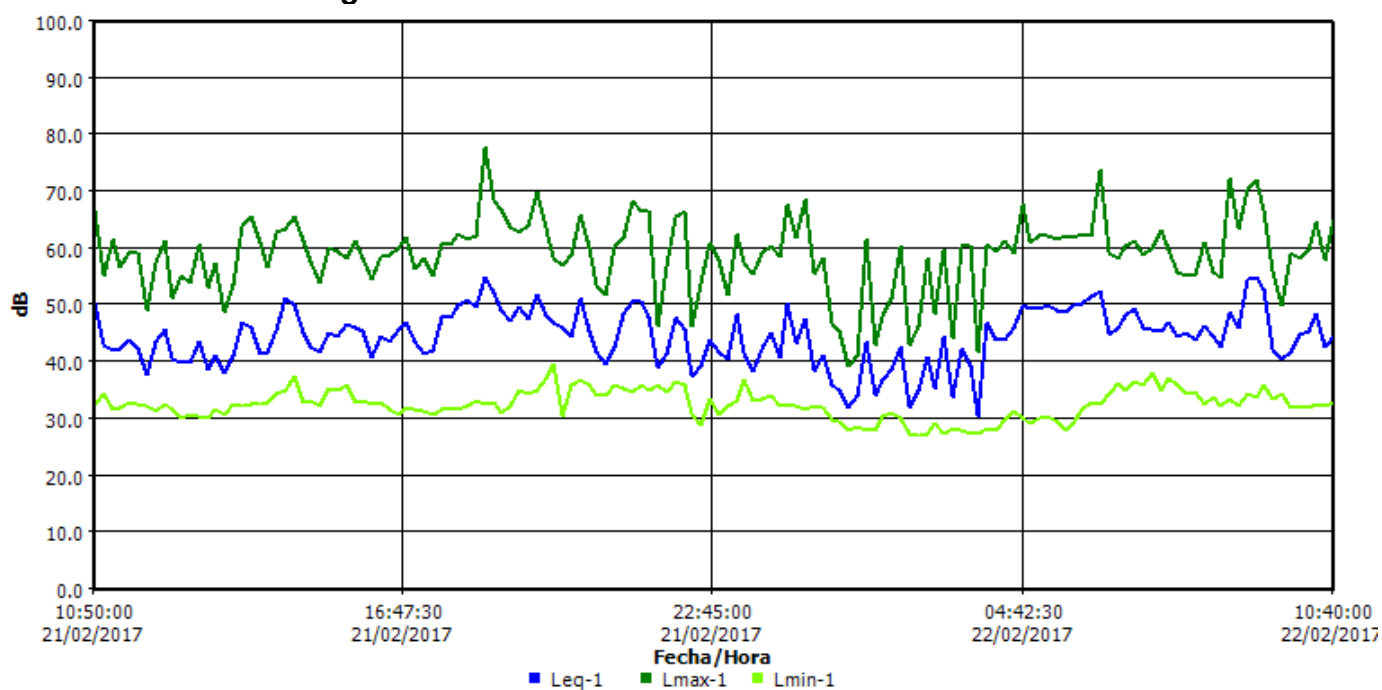
Panel de información

Ubicación Caserío El Portón de los Ángeles
Nombre ER-4A
Sesión padre S183
Hora de inicio Martes, 21 de Febrero de 2017 10:40:00
Hora de paro Miércoles, 22 de Febrero de 2017 10:40:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	27 dB	Lmax	1	77.8 dB
Lpk	1	97.1 dB	Leq	1	46.7 dB

Gráfica de datos de registro



ER-5A

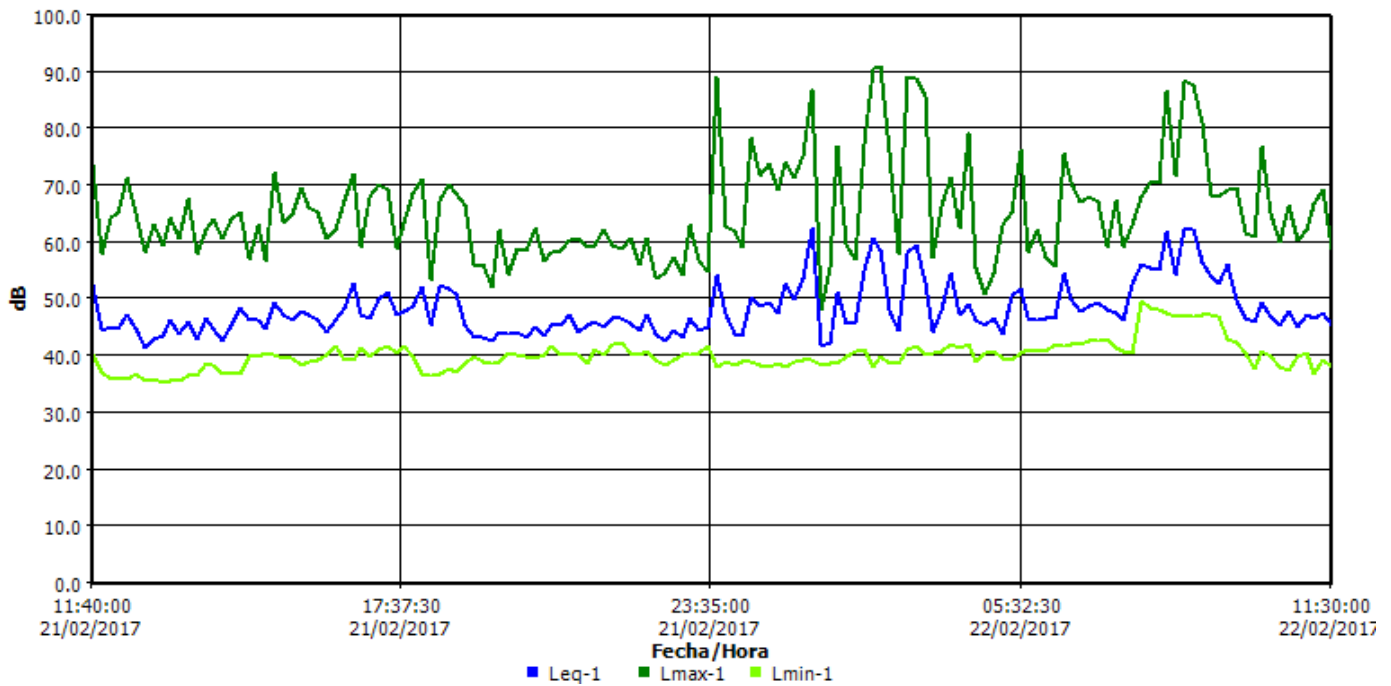
Panel de información

Ubicación Aldea Sabana Redonda
Nombre ER-5A
Sesión padre S269
Hora de inicio Martes, 21 de Febrero de 2017 11:30:00
Hora de paro Miércoles, 22 de Febrero de 2017 11:30:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	FAST
Lmin	1	35.4 dB	Lmax	1	91 dB
Lpk	1	115.5 dB	Leq	1	51.6 dB

Gráfica de datos de registro



ER-6

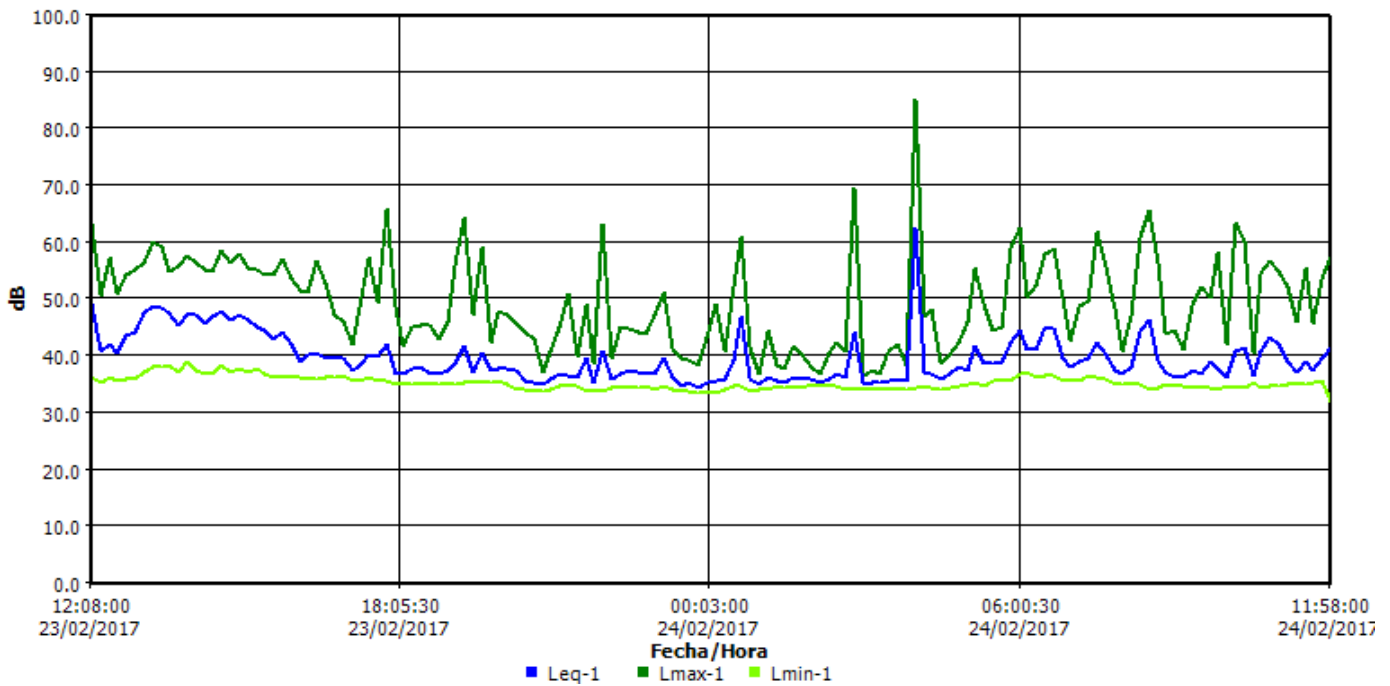
Panel de información

Ubicación Al norte del proyecto, ruta a Mataquescuintla
Nombre ER-6
Sesión padre S184
Hora de inicio Jueves, 23 de Febrero de 2017 11:58:00
Hora de paro Viernes, 24 de Febrero de 2017 11:58:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	32 dB	Lmax	1	85.3 dB
Lpk	1	101.6 dB	Leq	1	44.1 dB

Gráfica de datos de registro



ER-1

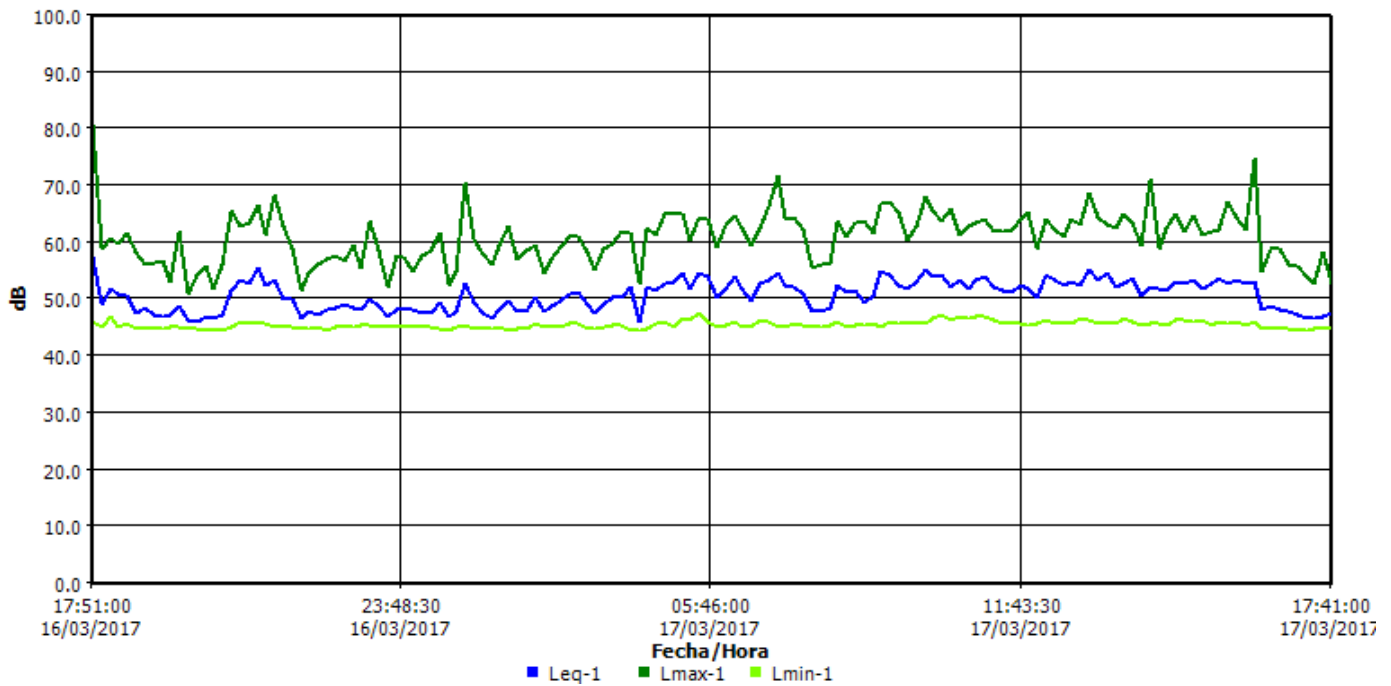
Panel de información

Ubicación Depósito de suelos norte, a inmediaciones de Aldea Los Planes
Nombre ER-1
Sesión padre S050
Hora de inicio Jueves, 16 de Marzo de 2017 17:41:00
Hora de paro Viernes, 17 de Marzo de 2017 17:41:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	FAST
Lmin	1	44.5 dB	Lmax	1	80.7 dB
Lpk	1	98.1 dB	Leq	1	51.4 dB

Gráfica de datos de registro



ER-2

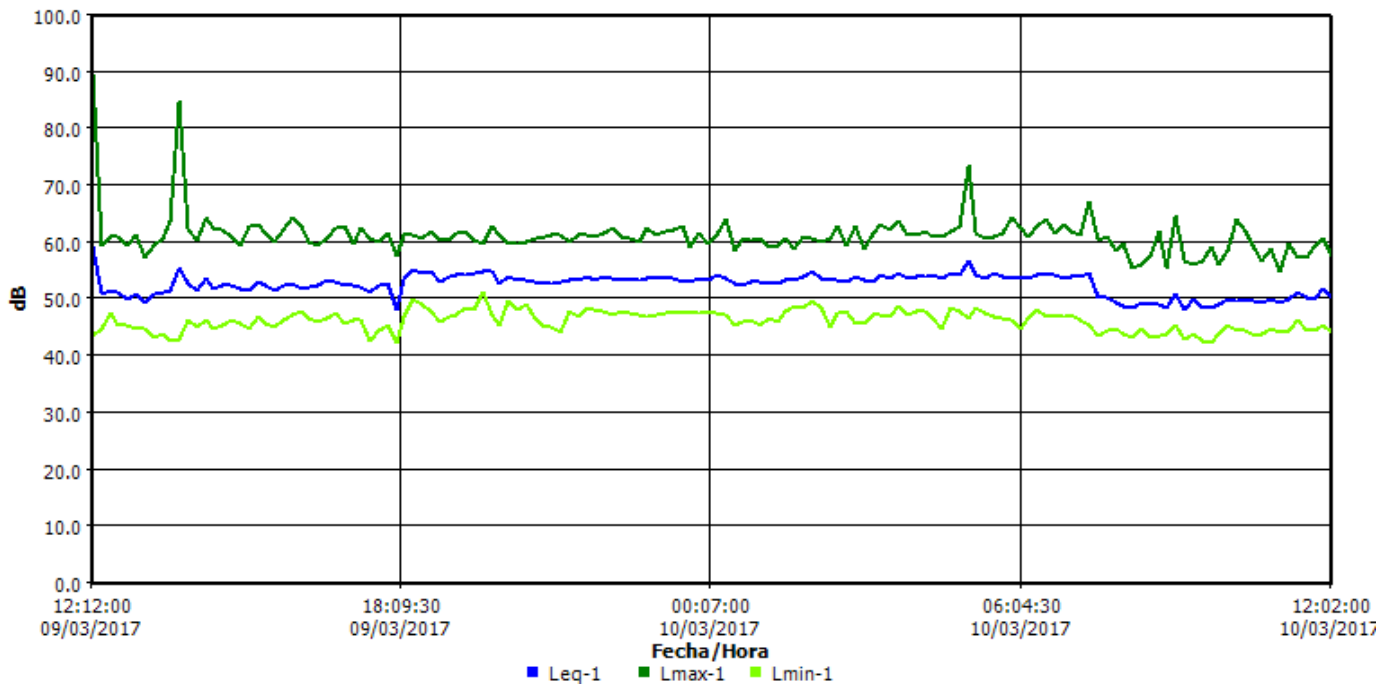
Panel de información

Ubicación Aldea La Cuchilla
Nombre ER-2
Sesión padre S271
Hora de inicio Jueves, 09 de Marzo de 2017 12:02:00
Hora de paro Viernes, 10 de Marzo de 2017 12:02:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	FAST
Lmin	1	42.4 dB	Lmax	1	89.9 dB
Lpk	1	108.1 dB	Leq	1	52.9 dB

Gráfica de datos de registro



ER-3

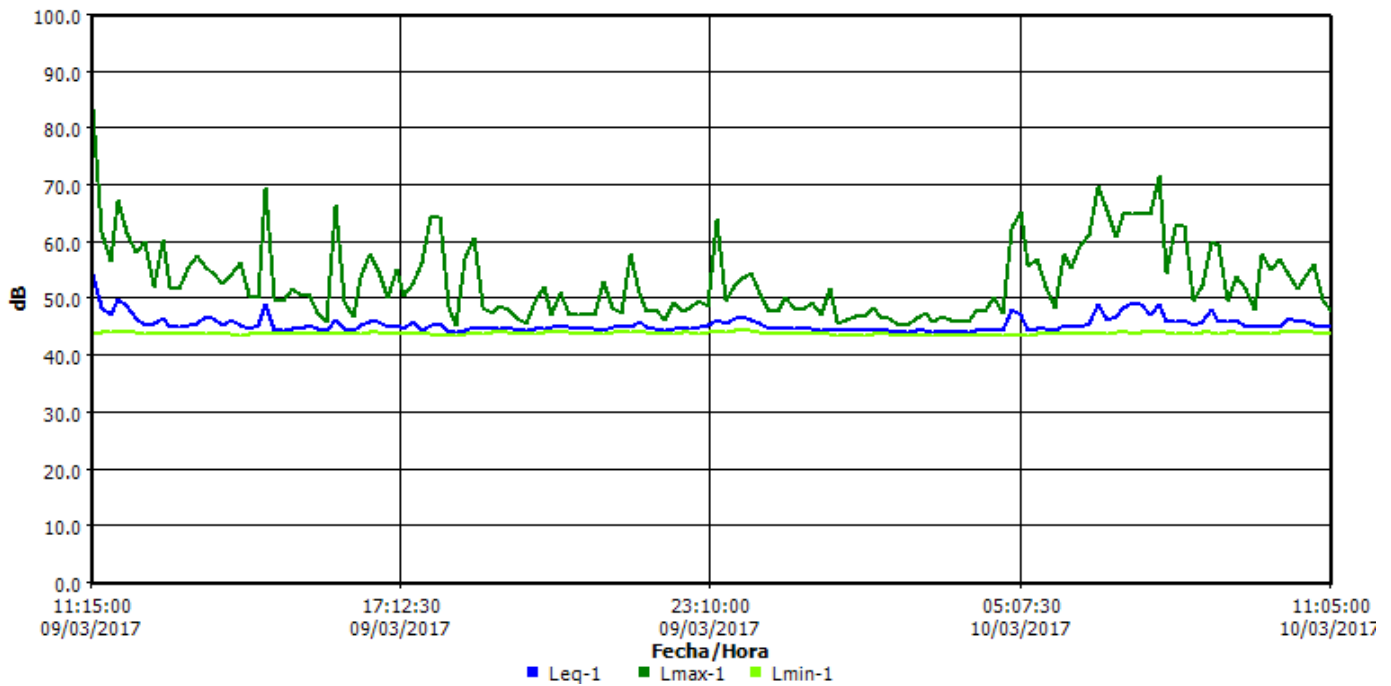
Panel de información

Ubicación Aledaño a Aldea El Fucio
Nombre ER-3
Sesión padre S048
Hora de inicio Jueves, 09 de Marzo de 2017 11:05:00
Hora de paro Viernes, 10 de Marzo de 2017 11:05:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	FAST
Lmin	1	43.6 dB	Lmax	1	83.3 dB
Lpk	1	102.6 dB	Leq	1	45.8 dB

Gráfica de datos de registro



ER-7A

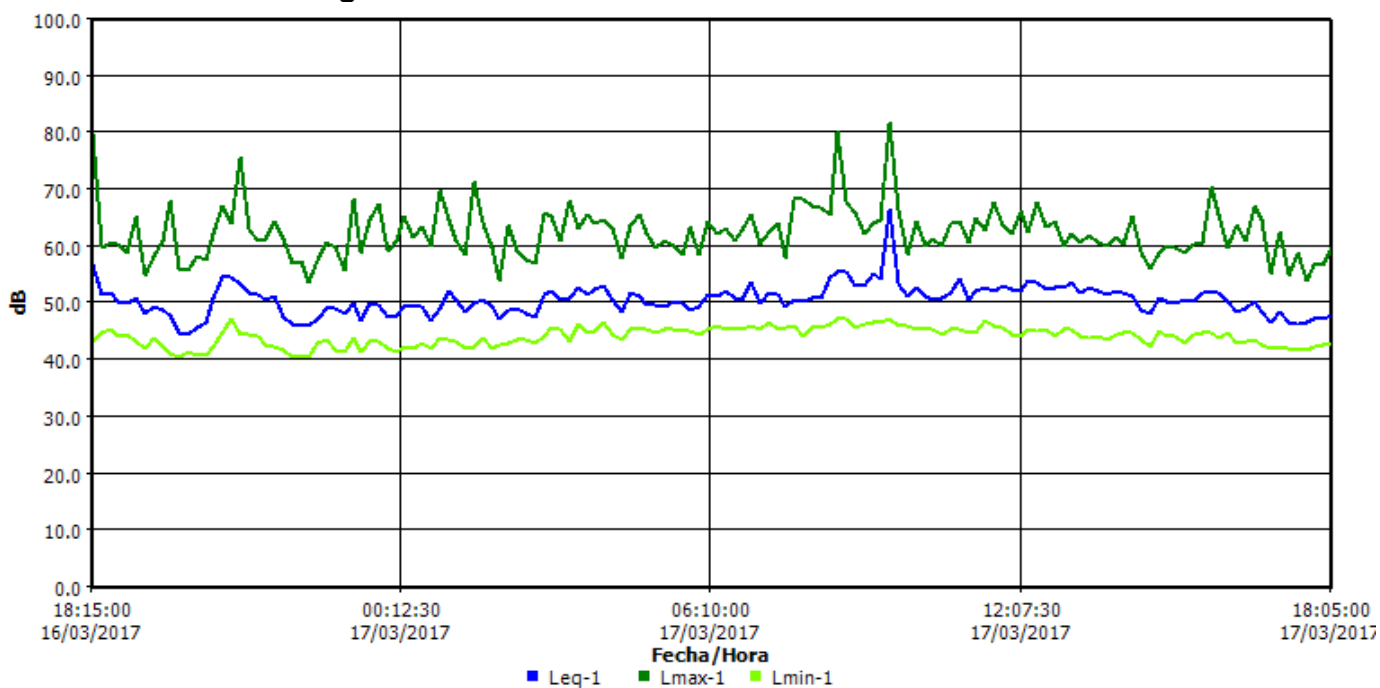
Panel de información

Ubicación Aledaño a Aldea Los Planes
Nombre ER-7A
Sesión padre S272
Hora de inicio Jueves, 16 de Marzo de 2017 18:05:00
Hora de paro Viernes, 17 de Marzo de 2017 18:05:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	FAST
Lmin	1	40.4 dB	Lmax	1	81.7 dB
Lpk	1	101.5 dB	Leq	1	52 dB

Gráfica de datos de registro



ER-1

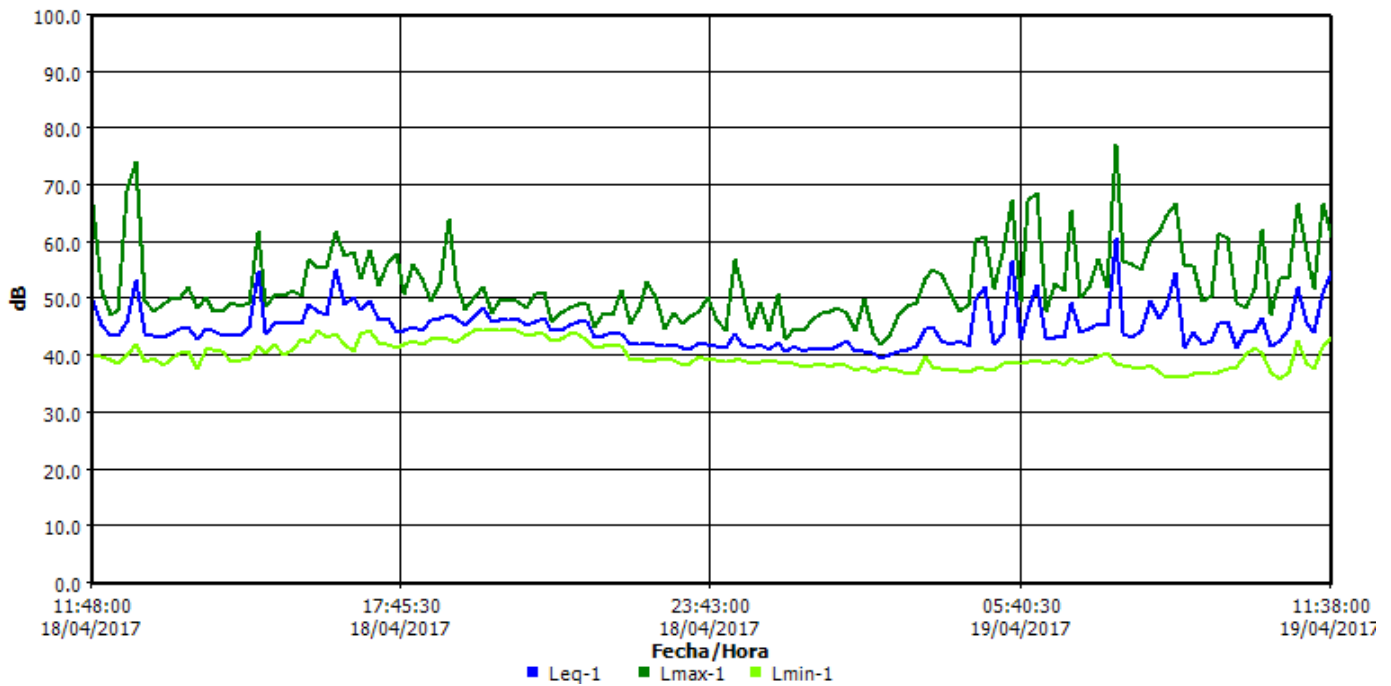
Panel de información

Ubicación Depósito de suelos norte, inmediaciones de Aldea Los Planes
Nombre ER-1
Sesión padre S190
Hora de inicio Martes, 18 de Abril de 2017 11:38:00
Hora de paro Miércoles, 19 de Abril de 2017 11:38:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	36 dB	Lmax	1	77.2 dB
Lpk	1	95.2 dB	Leq	1	47.4 dB

Gráfica de datos de registro



ER-2

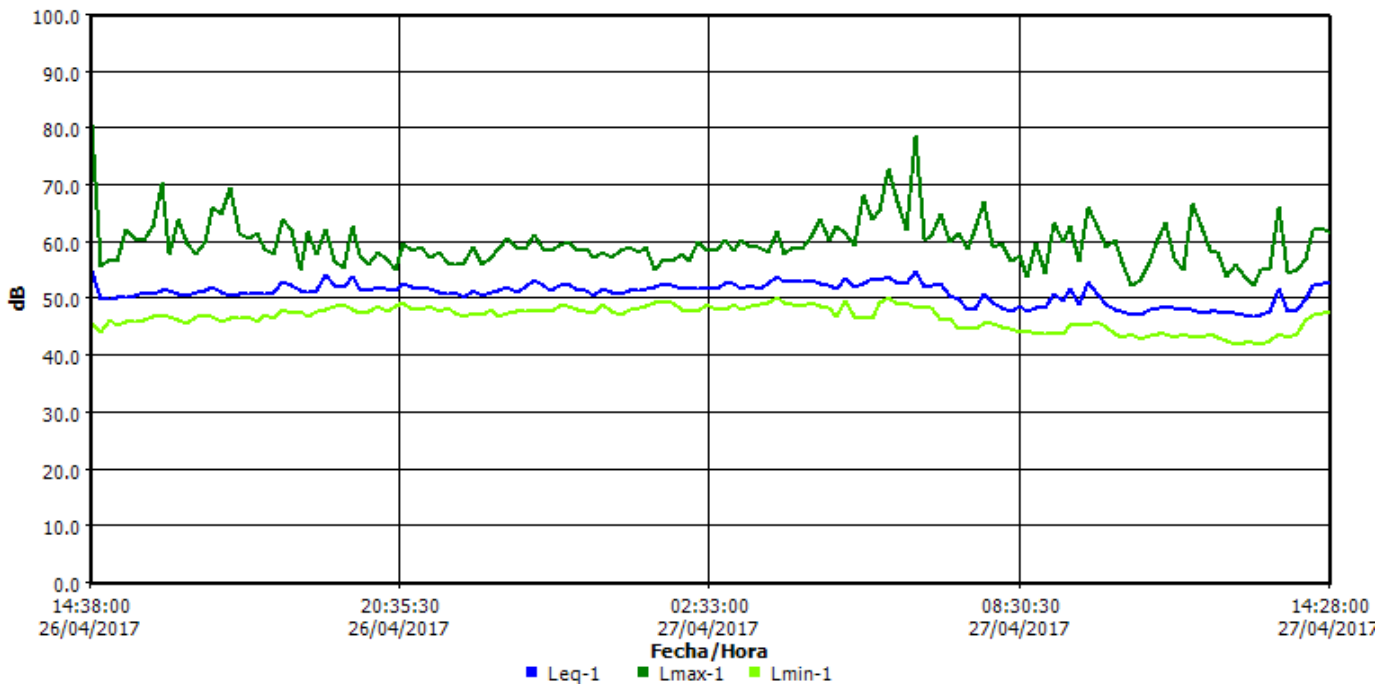
Panel de información

Ubicación Aldea La Cuchilla
Nombre ER-2
Sesión padre S274
Hora de inicio Miércoles, 26 de Abril de 2017 14:28:00
Hora de paro Jueves, 27 de Abril de 2017 14:28:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	FAST
Lmin	1	42.2 dB	Lmax	1	80.5 dB
Lpk	1	97.6 dB	Leq	1	51.4 dB

Gráfica de datos de registro



ER-3

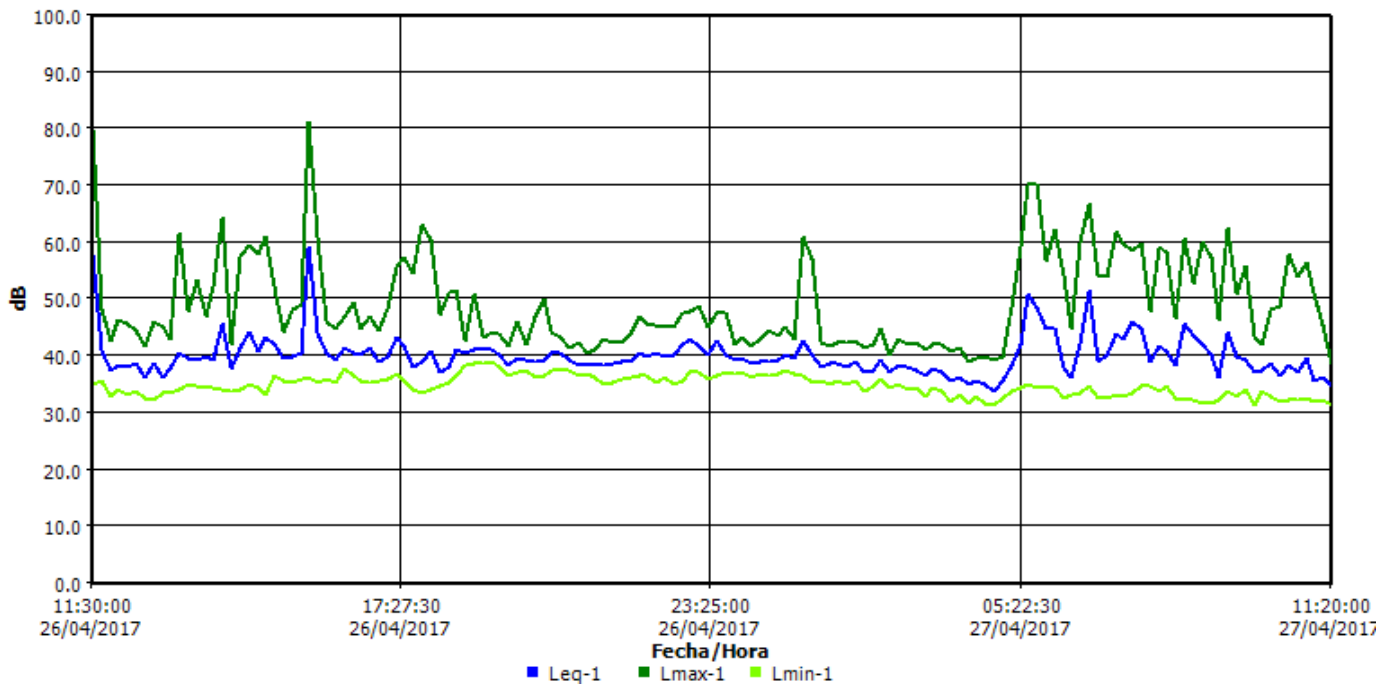
Panel de información

Ubicación Área Este del proyecto, a inmediaciones de Aldea El Fucio
Nombre ER-3
Sesión padre S192
Hora de inicio Miércoles, 26 de Abril de 2017 11:20:00
Hora de paro Jueves, 27 de Abril de 2017 11:20:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	31.2 dB	Lmax	1	81.1 dB
Lpk	1	108.1 dB	Leq	1	43.4 dB

Gráfica de datos de registro



ER-7A

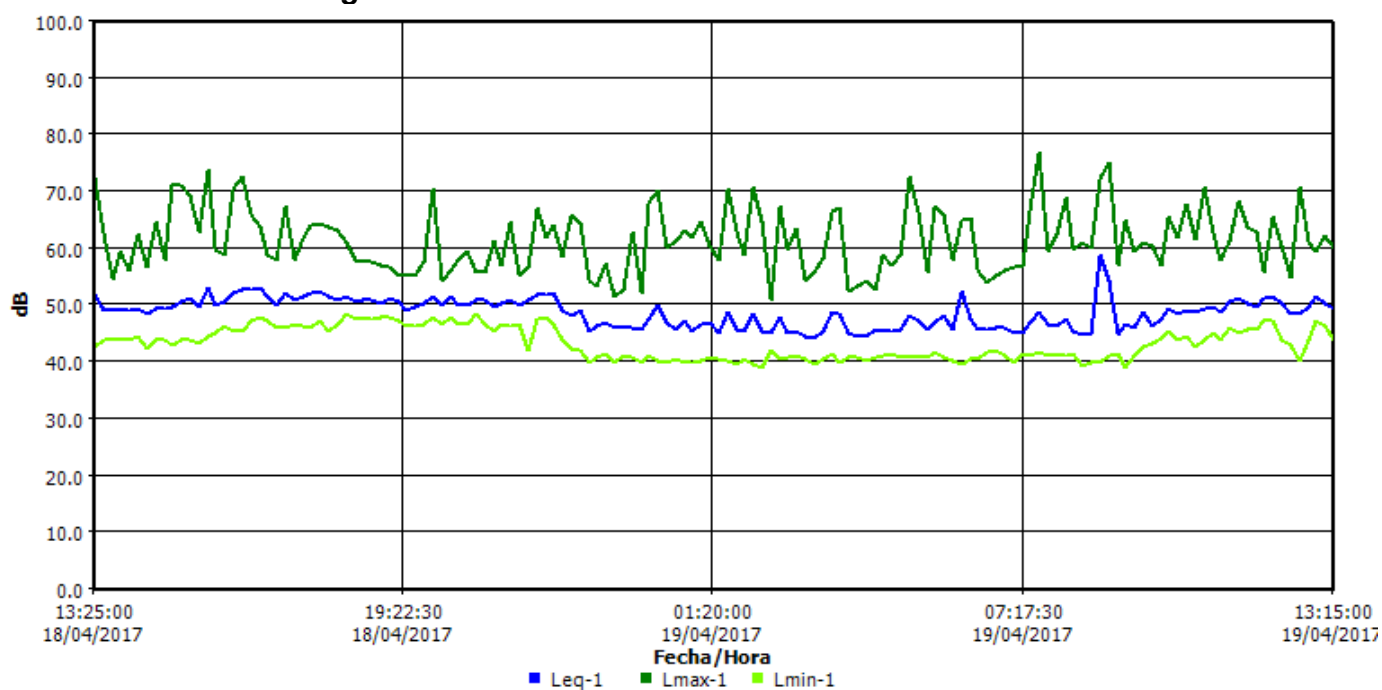
Panel de información

Ubicación Aledaño a Aldea Los Planes
Nombre ER-7A
Sesión padre S273
Hora de inicio Martes, 18 de Abril de 2017 13:15:00
Hora de paro Miércoles, 19 de Abril de 2017 13:15:00
Nombre del usuario

Panel general de datos

<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>	<u>Descripción</u>	<u>Medidor/Sensor</u>	<u>Valor</u>
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	FAST
Lmin	1	39 dB	Lmax	1	76.8 dB
Lpk	1	94.2 dB	Leq	1	49.5 dB

Gráfica de datos de registro



12.4 Certificados de verificación de los equipos utilizados

12.4.1 Material Particulado (PM_{10}) y Presión Sonora

**CERTIFICADO DE VERIFICACIÓN DE CALIBRACIÓN DE EQUIPOS
PARA MEDICIÓN DE TSP, PM_{2.5} Y PM₁₀**

oct-16

Certificado Numero: 1936

Características del Equipo

Nombre de equipo: Ambient Particulate Sampler
Modelo: PQ200 BGI Instruments
Fabricante: BGI Incorporated
Unidades de medición: Litros Por Minuto (LPM)
Rango de flujo: De 1.00 a 25.00 LPM



Descripción: Se utiliza el Calibrador BGI "Trical - Nist", el proceso de calibración consiste en hacer pasar por el equipo PQ200 un flujo de aire, el cual es ajustado a un valor específico bajo condiciones estándar de presión y temperatura (1 Atm y 25 °C) para obtener el valor de flujo real.

Nota: El fabricante establece que el equipo no requiere Re-calibración de fabrica, por lo tanto se utiliza el calendario establecido por CTA para el mantenimiento y calibración.

Información de la Calibración

Equipo No.:	2	Fecha de Verificación de Calibración:	12/10/2016
Número de Serie :	877	Vigencia:	30 Días

Valores Ambientales	
Temperatura (°C)	22.10
Presión (Pulg.Hg)	24.41
Humedad Relativa (%)	65.00

Parámetro	Lectura Calibración PQ200	Lectura Patrón
Flujo (LPM)	16.71	16.70*
Temperatura Ambiente (°C)	22.30	22.30*
Temperatura Filtro (°C)	22.30	22.30*
Barómetro (Pulg.Hg)	24.41	24.41*

Test de vacio		
SP (cm H ₂ O) ₂	33.00	SP < 33
Pi - Vacio inicial (cm H O)	97.00	ΔP < 5
Pf - Vacio final (cm H O)	96.00	

Estado del Equipo: CALIBRADO

(*)Multimetro ambiental 1227U10 traceable. NIST (National Institute of Standards and Technology).

Patrón Utilizado

Nombre el Equipo: TriCal Nist
No. Serie 000103-3
Rango de Flujo: 0.1-30 LPM
Rango de Temperatura: -40 a 50 °C
Rango de Presión Barométrica: 400-800 mm Hg
No. Método: RFPS-1298-124
Fecha de Calibración del Patrón Utilizado: 10/05/2016

Responsables:

Luis Rey
Responsable

Ing. Hasan Zolata
Supervisor

Falla reportada

Ciente solicita revisión y mantenimiento general.

Observaciones

1 empaque del impactor dañado

Diagnostico

Después de cargar al 100% el equipo, se procedió a correr una prueba de 24 hrs. configurado a 16.7 LPM, encontrando que el equipo no llega al tiempo programado, batería y empaque de impactor seran reemplazados.

Trabajos realizados

Mantenimiento de los siguientes componentes:

- Bomba de vacío (diafragmas, válvulas, ejes)
- Motor eléctrico
- Sensor de flujo másico
- Conexiones del circuito de vacío
- Sistema mecánico de Porta filtro
- Mantenimiento de tarjeta electrónica.
- Ventilador
- Sensor de temperatura externa y interna
- Barómetro atmosférico
- Pantalla Anti-Radiación

Al finalizar el mantenimiento se efectuaron las siguientes verificaciones:

- Prueba de fuga de cada sección del circuito
- Calibración de flujo con patrón trazable ante el NIST
- Calibración de presión barométrica y temperatura con patrón trazable ante el NIST.
- Test final: 1 corridas de más de 24 horas exitosas.

Repuestos utilizados

1 empaque área de impactor
1 batería 12V24AH

Responsables:



Luis Rey
Responsable



Ing. Hasan Zolata
Supervisor

BGI PQ200 Air Sampling System

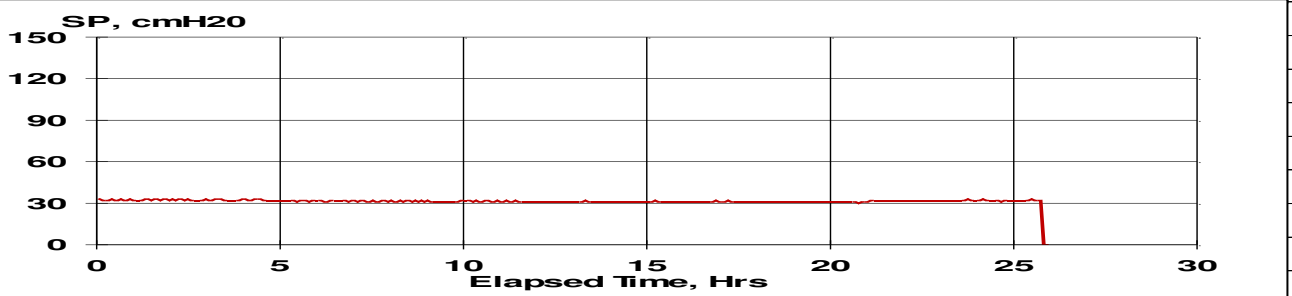
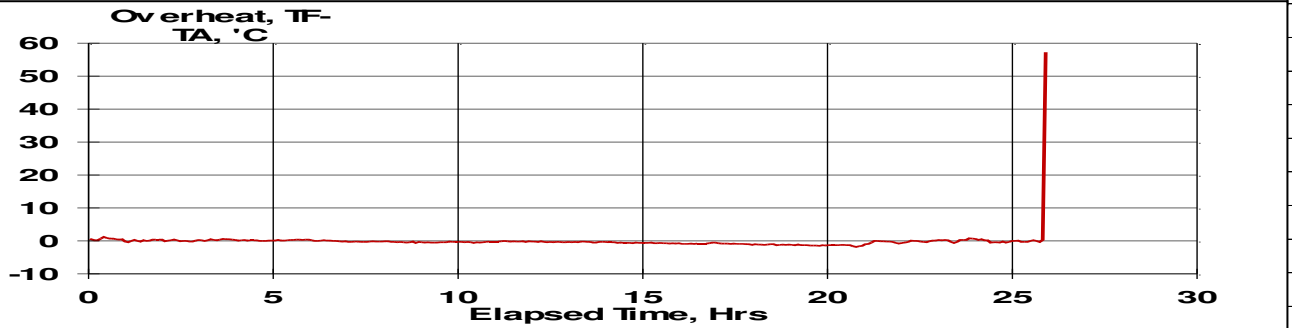
Downloaded 2016 14 oct 07:46:49

Job Details:				Job Code: 1			
Job Name:				Site Name: CTA			
Version: 5.62		Serial No: 877		Station Code: LABEL		Operators: LREY	
Pump Time: 4296:23		Flags:		User1: _98		User2:	

Max	Min	Avg	Units	Timer Information:			Mass Concentration Data:		
BP	622	619	620 mmHg	Date	Time		Filter ID:		
TA	23.7	13.3	17.8 °C	dd-mmm	hh:mm:ss		Final Wt:	mg	
Q	---	---	16.71 Lpm	Start: 16-12-oct	11:35:08		Initial Wt:	mg	
QCV	0.67 %			Stop: 16-13-oct	13:35:05		Delta Wt:	0.000 mg	
Max overheat			25.5 °C	ET: 25:59:00			Total Vol:	26.046 m ³	
occured			14-oct 07:08:47				Mass Conc:	0 µg/m ³	

Notes 1: BATT NUEVA INSTALADA 12.10.2016

Notes 2:



Hourly Averaged Data							
Date	Start Hour	BP	AmbT	Filt T	Delta T	SP	Flow
yy-dd-mmm	hh:mm:ss	mmHg	°C	°C	°C	cmH2O	aLpm
16-12-oct	11:40:08	620	22.5	23.0	0.5	32	16.72
16-12-oct	12:40:08	620	23.0	23.1	0.1	33	16.72
16-12-oct	13:40:08	619	22.5	22.5	0.1	32	16.72
16-12-oct	14:40:08	619	21.5	21.9	0.3	32	16.71
16-12-oct	15:40:08	620	20.6	20.7	0.1	32	16.72
16-12-oct	16:40:08	620	19.2	19.4	0.3	32	16.72
16-12-oct	17:40:08	620	18.1	18.1	0.0	32	16.71
16-12-oct	18:40:08	620	17.6	17.4	-0.2	32	16.71
16-12-oct	19:40:08	621	17.1	16.8	-0.3	32	16.71
16-12-oct	20:40:08	621	16.8	16.4	-0.4	31	16.72
16-12-oct	21:40:08	621	16.1	15.8	-0.4	32	16.72
16-12-oct	22:40:08	621	15.1	14.9	-0.2	31	16.71
16-12-oct	23:40:08	621	14.5	14.2	-0.3	31	16.71
16-13-oct	00:40:08	621	13.9	13.6	-0.3	31	16.71
16-13-oct	01:40:08	620	13.6	13.1	-0.5	31	16.72
16-13-oct	02:40:08	620	13.5	12.8	-0.7	31	16.72
16-13-oct	03:40:08	620	13.7	12.9	-0.8	31	16.72
16-13-oct	04:40:08	620	13.7	12.8	-0.8	31	16.73
16-13-oct	05:40:08	621	14.4	13.3	-1.1	31	16.71
16-13-oct	06:40:08	621	15.5	14.2	-1.3	31	16.71
16-13-oct	07:40:08	622	17.0	15.6	-1.4	31	16.70
16-13-oct	08:40:08	622	18.9	18.5	-0.5	32	16.72
16-13-oct	09:40:08	622	19.4	19.2	-0.3	32	16.71
16-13-oct	10:40:08	621	20.4	20.6	0.1	32	16.72
16-13-oct	11:40:08	621	21.0	21.0	0.0	32	16.72
16-13-oct	12:40:08	620	21.7	21.6	-0.1	32	16.72

Mesa Labs 10 Park Place Butler, NJ 07405
NIST Traceable Calibration Facility, ISO 9001:2008 Registered



CERTIFICATE OF CALIBRATION - NIST TRACEABILITY

(Refer to instruction manual for further details of calibration)

tetraCal Serial Number: 508

DATE: 14-Jun-2017

Calibration Operator: E. Albuja

Critical Venturi Flow Meter: Max Uncertainty = 0.346%

Serial Number: 1A CEESI NVLAP NIST Data File 07BGI-0001

Serial Number: 2A CEESI NVLAP NIST Data File 07BGI-0003

Serial Number: 3A CEESI NVLAP NIST Data File 07BGI-0004

Serial Number: 4A CEESI NVLAP NIST Data File 07BGI-0002

Room Temperature: $\pm 0.03^{\circ}\text{C}$ from -5°C - 70°C	Room Temperature:	23.9 $^{\circ}\text{C}$
Brand: Telatemp	Serial Number:	358654
Std Cal Date	18-Oct-16	Std Cal Due Date 18-Oct-17

tetraCal:

Ambient Temperature (set): 23.9 $^{\circ}\text{C}$

Aux (filter) Temperature (set): $^{\circ}\text{C}$

Barometric Pressure and Absolute Pressure

Vaisala Model PTB330(50-1100) Digital Accuracy: 0.03371%

Serial Number:	C4310002		
Std Cal Date	27-Mar-17	Std Cal Due Date	27-Mar-18

tetraCal:

Barometric pressure (set): 751.5 mm of Hg

Results of Venturi Calibration

Flow Rate (Q) vs. Pressure Drop (ΔP).

Where: Q=Lpm, ΔP = Cm of H₂O

No. 1 C 5.87896 ΔP ^ 0.52266

No. 2 C 1.15426 ΔP ^ 0.52451

No. 3 C 0.34293 ΔP ^ 0.54594

Overall Uncertainty: 0.35%

Date Placed In Service _____

(To be filled in by operator upon receipt)

Recommended Recalibration Date _____

(12 months from date placed in service)

Revised: March 2016
Cal102-03T1 Rev B

To Check a Tetra Cal

14-Jun-2017 E. Albuja

6 - 30.00 Lpm

BP= 751.5 mm of Hg

VER.

3.41P

Maximum allowable error at any flow rate is .75%.

Serial No.

508

Reading		CV	Qa		% Error	Average %
Abs. P	Room	Flow	TriCal	Indicated		
Crit. Vent.	TEMP	Lpm				
mm of Hg						
189.06	23.9	7.44	7.48	0.57		
494.73	23.9	19.79	19.76	-0.14		
727.2	23.9	29.18	29.23	0.19		0.20

To Check a Tetra Cal

BP= 751.5 mm of Hg

1.20 - 6.00 Lpm

Reading		CV	Qa		% Error	Average %
Abs. P	Room	Flow	Tri Cal	Indicated		
Crit. Vent.	TEMP	Lpm				
mm of Hg						
138.0	23.8	1.54	1.55	0.39		
330.3	23.8	3.76	3.76	-0.02		
519.2	23.8	5.93	5.94	0.16		0.18

To Check a Tetra Cal

BP= 751.5 mm of Hg

0.10 - 1.20 Lpm

Reading		CV	Qa		% Error	Average %
Abs. P	Room	Flow	TriCal	Indicated		
Crit. Vent.	TEMP	Lpm				
mm of Hg						
171.53	23.9	0.305	0.307	0.63		
434.15	23.9	0.818	0.816	-0.26		
626.38	23.9	1.194	1.197	0.28		0.22

To Check a Tetra Cal
 6 - 30.00 Lpm
 VER.

14-Jun-2017 E. Albuja Pre recert

BP= 748.5 mm of Hg

3.41P

Maximum allowable error at any flow rate is .75%.

Serial No. 508

Reading		CV	Qa		% Error	Average %
Abs. P	Room	Flow	TriCal	Indicated		
Crit. Vent.	TEMP	Lpm				
mm of Hg						
199.19	26.4	7.94	7.94		-0.06	
409.11	26.4	16.53	16.40		-0.80	
699.83	26.4	28.42	28.70		0.97	0.04

To Check a Tetra Cal
 1.20 - 6.00 Lpm

BP= 748.5 mm of Hg

Reading		CV	Qa		% Error	Average %
Abs. P	Room	Flow	Tri Cal	Indicated		
Crit. Vent.	TEMP	Lpm				
mm of Hg						
140.0	26.3	1.58	1.58		-0.04	
303.4	26.3	3.49	3.45		-1.07	
480.2	26.3	5.55	5.55		-0.08	-0.40

To Check a Tetra Cal
 0.10 - 1.20 Lpm

BP= 748.5 mm of Hg

Reading		CV	Qa		% Error	Average %
Abs. P	Room	Flow	TriCal	Indicated		
Crit. Vent.	TEMP	Lpm				
mm of Hg						
234.7	26.4	0.434	0.432		-0.42	
440.95	26.4	0.842	0.85		0.98	
614.46	26.4	1.185	1.189		0.34	0.30

CERTIFICADO DE CALIBRACION

CERTIFICADO No.: 001270516

CLIENTE: MINERA SAN RAFAEL

INSTRUMENTO: MEDIDOR MULTIPARAMETRICO

MODELO: STAR A329

NÚMERO DE SERIE: G03757

FECHA: 27 de Mayo del 2016

En la siguiente tabla, aparecen las diferentes pruebas realizadas al equipo con los estándares correspondientes, como también los resultados obtenidos por el instrumento y la tolerancia aceptada, para pasar satisfactoriamente las pruebas.

Valor Esperado	Valor Promedio del Equipo	Incertidumbre	Condición
PH			
4.01 ± 0.01 pH	4.01 pH	± 0.01 pH	PASA
7.00 ± 0.01 pH	6.99 pH	± 0.01 pH	PASA
10.01 ± 0.02 pH	10.02 pH	± 0.02 Ph	PASA
% de Pendiente	98.2%	N/A	PASA
CONDUCTIVIDAD			
147µS	146 µS	±5 µS	PASA
100 µS	100 µS	±5 µS	PASA
1 µS	1 µS	±5 µS	PASA
OXIGENO DISUELTO			
100% Sat	100% sat	±5 sat	PASA

Control Ambiente : Temperatura : 28.0 °C

Estándares Utilizados:

Buffer 4	Marca: THERMO	Catálogo: 910410-WA	Lote: TR2A
Buffer 7	Marca: THERMO	Catálogo: 910725	Lote: TT1B
Buffer 10	Marca: THERMO	Catálogo: 911025-WA	Lote: TS1A

CONDUCTIVITY CALIBRATION KIT Marca: THERMO Serie: 0816

CONDUCTIVITY STANDARD 147 µS Marca: THERMO Lote: TU1A

La incertidumbre se calculó según la Guía para la Evaluación y Expresión de la Incertidumbre para la Medición de los Resultados del NIST de los Estados Unidos de Norteamérica, nota técnica No. 1297.

La Incertidumbre Expandida está calculada para un intervalo de confianza de no menos del 95% (el cual da un factor de cobertura de K=2).

Los resultados aquí presentados son válidos únicamente para el momento de la calibración.

Certificate of Analysis

For Conductivity Calibration Kit

I certify the 1010001 Conductivity Calibration Kit, Serial number 0816 was inspected and tested on 9/10/2015 and has met or exceeded Thermo Fisher Scientific, Water and Lab Products' specifications.

Tolerances of 0.1 % are met by the following results:

Specification	A	B	C	D	E	F
Nominal Resistance	1,000.000 K Ω	100.000 K Ω	10.000 K Ω	1.000 K Ω	100.000 Ω	10.000 Ω
Nominal Conductance	1.0000 μ S	10.0000 μ S	100.0000 μ S	1,000.0000 μ S	10.0000 mS	100.0000 mS

New Kit Calibration	A	B	C	D	E	F
Actual Resistance	999.920 K Ω	100.001 K Ω	10.004 K Ω	1.000 K Ω	100.031 Ω	9.999 Ω
Actual Conductance	1.0001 μ S	9.9999 μ S	99.9600 μ S	1000.0000 μ S	9.9969 mS	100.0100 mS

Recommended calibration interval for this kit is 1 year from the date it is put into service.

Thermo Fisher Scientific, Environmental Instruments Division, Water Analysis Instrument's test equipment is traceable to NIST and meets the requirements of ANSI/NCSL/Z540-1.

Thermo Fisher is certified to be in compliance with the requirements of ISO 9001: 2008 and is registered under QMI File #001911. Calibration vendors for our test equipment are chosen for their expertise in different aspects of metrology and process certification, which may include (but are not limited to) ISO 9001: 2008 and, ISO/IEC 17025: 2005.

Meter Used: Fluke 8840A QC#307

Calibration Due: 9/16/2016

Certified by:
Thermo Fisher Scientific
Water and Lab Products
Quality Assurance
Date: 9/10/2015

thermoscientific.com/water

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Tel: (91) 22-4157-8876
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A Thermo Fisher Scientific brand

Certificate Of Analysis

Product Information:

Part Number	910410-WA
Description	PH 4.01 BUFFER, COLOR-RED, 10 POUCHES
Lot Number	TR2A
Expiration Date	05/31/2017
Method Of Analysis	POTENTIOMETRIC

Actual Analysis:

<u>Acceptance Range</u>	<u>Results</u>	<u>Unit Of Measure</u>
4.01 +/- 0.01 PH UNITS AT 25 C	4.01	PH UNITS AT 25 C

Traceability:

<u>N.I.S.T Chemical</u>	<u>SRM#</u>
DISODIUM HYDROGEN PHOSPHATE	186 II g
POTASSIUM DIHYDROGEN PHOSPHATE	186 I g
POTASSIUM HYDROGEN PHTHALATE	185 i

Certificate Date:05/26/2015

Approved By:



Quality Representative

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Certificate Of Analysis

Product Information:

Part Number	910710
Description	PH 7.00 BUFFER, COLOR-YELLOW, 10 POUCHES
Lot Number	TT1B
Expiration Date	05/31/2017
Method Of Analysis	POTENTIOMETRIC

Actual Analysis:

<u>Acceptance Range</u>	<u>Results</u>	<u>Unit Of Measure</u>
7.00 +/- 0.01 PH UNITS AT 25 C	7.01	PH UNITS AT 25 C

Traceability:

<u>N.I.S.T Chemical</u>	<u>SRM#</u>
DISODIUM HYDROGEN PHOSPHATE	186 II g
POTASSIUM DIHYDROGEN PHOSPHATE	186 I g
SODIUM BICARBONATE	191d-I
SODIUM CARBONATE	191d-II

Certificate Date:05/26/2015

Approved By:



Quality Representative

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Product Information:

Part Number	911010
Description	PH 10.01 BUFFER, COLOR-BLUE, 10 POUCHES
Lot Number	TS1A
Expiration Date	05/31/2017
Method Of Analysis	POTENTIOMETRIC

Actual Analysis:

<u>Acceptance Range</u>	<u>Results</u>	<u>Unit Of Measure</u>
10.01 + /- 0.02 PH UNITS AT 25 C	10.02	PH UNITS AT 25 C

Traceability:

<u>N.I.S.T Chemical</u>	<u>SRM#</u>
DISODIUM HYDROGEN PHOSPHATE	186 II g
POTASSIUM DIHYDROGEN PHOSPHATE	186 I g
SODIUM BICARBONATE	191d-I
SODIUM CARBONATE	191d-II

Certificate Date:05/26/2015

Approved By:



Quality Representative

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Certificate Of Analysis

Product Information:

Part Number	01100910
Description	147 uS/CM CONDUCTIVITY STD, 10 POUCHES
Lot Number	TU1A
Expiration Date	06/30/2016
Method Of Analysis	CONDUCTIVITY

Actual Analysis:

<u>Acceptance Range</u>	<u>Results</u>	<u>Unit Of Measure</u>
147 US/CM +/- 10 US/CM AT 25 C	142	US/CM AT 25 C

Traceability:

<u>N.I.S.T Chemical</u> POTASSIUM CHLORIDE	<u>SRM#</u> 918b
---	---------------------

Certificate Date:06/04/2015

Approved By:



Quality Representative

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COMENTARIOS: De acuerdo con estos resultados, el instrumento pasa a satisfacción con todas las pruebas realizadas, por lo que **cumple** con los requerimientos detallados en la hoja de especificaciones del fabricante.



Jordy Orlando Paz López
DPTO. DE SERVICIO TECNICO

March 3, 2015

A QUIEN PUEDA INTERESAR

Por la presente comunicación queremos hacer constar que la empresa

Analitica Quimica Internacional, S.A.
Molino de las Flores 3
52 Avenida 1-80 Zona 2 Mixco
Guatemala

Es distribuidor autorizado de los productos Thermo Fisher Scientific, Laboratory Products Group, Water Analysis Instruments, Orion Products en Guatemala. Los productos que se incluyen bajo esta autorización son los siguientes:

- 1) PH Electrodes, Meter and Accessories
- 2) Ion Selective Electrodes, Meter and Accessories
- 3) Dissolved Oxygen Electrodes, Meter and Accessories
- 4) Conductivity Electrodes, Meters and Accessories
- 5) Turbidez
- 6) Colorimetría
- 7) Espectrofotometria
- 8) Orion On-Line Process Monitoring
- 9) AquaSensor Water-Waste Water Systems

Por la tanto Analitica Quimica Internacional Anaqui cuenta con el personal tecnico debidamente capacitado para prestar el servicio tecnico y de reparación de nuestros productos. Igualmente la empresa esta autorizada a presentar ofertas y cotizaciones tanto a entes privados y públicos. La presente carta de distribución tiene una validez de dos (2) años contado a partir de la presente fecha y se renovara automáticamente por un (1) año más al menos que alguna de las partes notifique por escrito lo contrario.

Atentamente,



Delfy Ramones
Sales Manager, Latin America
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12.5 Informe Original de los Resultados Analíticos obtenidos de muestras de agua del Laboratorio ACZ Laboratories, INC. Correspondiente al Monitoreo de Marzo 2017

12.5.1 Muestras de Agua Superficial (SW)

April 03, 2017

Report to:

Miguel Berganza
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Miguel Berganza
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Luisa Fernanda Barrios

Project ID: Escobal

ACZ Project ID: L36058

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 17, 2017. This project has been assigned to ACZ's project number, L36058. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L36058. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 03, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

April 03, 2017

Project ID: Escobal

ACZ Project ID: L36058

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 12 miscellaneous samples from Tahoe Resources, Inc. on March 17, 2017. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L36058. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for parameters flagged with an "H3", received after the hold time had expired.

Sample Analysis

These samples were analyzed for inorganic, organic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

1. For samples with a TDS ratio over 1.2 and a TDS value greater than 150 mg/L, the samples were not retested based on historical re-analysis data and the sample matrix.
2. Nitrogen, Total Kjeldahl (N1) - Sample L36058-08 displayed negative dip peak shape and zero percent recovery of associated spike L36058-08LFM when prepped at 1X and was redigested. All associated samples with this spike were redigested as well as a result of the zero percent recovery. L36058-08 was again spiked at prep, however the sample was prepped on a 5X dilution to see if less of the interfering sample matrix used at prep would result in better spike recovery. 5X dilution runs again displayed the same negative dip peak shape and zero percent recovery of the spike, attributed to some matrix interference. All other instrument and batch QC associated with this sample is in expected ranges, and all other samples associated with this spike displayed normal peak shape or a flat baseline (L35993-01, L35993-02, L35993-03, L35993-04, L35993-05, L36058-09/DUP, L36058-10, L36058-11, L36058-12).

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW4-E

ACZ Sample ID: **L36058-01**
Date Sampled: 03/14/17 14:35
Date Received: 03/17/17
Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 11:43	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 11:50	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 12:25	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 14:57	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 14:55	spl
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 13:24	scp
Total Hot Plate Digestion	M200.2 ICP								03/20/17 13:21	jss/scp

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW4-E

ACZ Sample ID: **L36058-01**

Date Sampled: 03/14/17 14:35

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.04	B		mg/L	0.03	0.2	03/23/17 14:02	gss
Aluminum, total	M200.7 ICP	1	0.05	B		mg/L	0.03	0.2	03/21/17 21:30	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0088			mg/L	0.0004	0.002	03/29/17 16:35	mfm
Antimony, total	M200.8 ICP-MS	1	0.0094			mg/L	0.0004	0.002	03/27/17 18:53	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0055			mg/L	0.0002	0.001	03/28/17 11:10	mfm
Arsenic, total	M200.8 ICP-MS	1	0.0075			mg/L	0.0002	0.001	03/27/17 18:53	enb
Barium, dissolved	M200.7 ICP	1	0.072			mg/L	0.003	0.02	03/23/17 14:02	gss
Barium, total	M200.7 ICP	1	0.082			mg/L	0.003	0.02	03/21/17 21:30	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:02	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:30	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:02	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 21:30	gss
Boron, dissolved	M200.7 ICP	1	0.09			mg/L	0.01	0.05	03/23/17 14:02	gss
Boron, total	M200.7 ICP	1	0.10			mg/L	0.01	0.05	03/21/17 21:30	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 16:35	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 18:53	enb
Calcium, dissolved	M200.7 ICP	1	321			mg/L	0.1	0.5	03/23/17 14:02	gss
Calcium, total	M200.7 ICP	1	345			mg/L	0.1	0.5	03/21/17 21:30	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:02	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:30	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:02	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:30	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:02	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:30	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:02	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 21:30	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/23/17 14:02	gss
Iron, total	M200.7 ICP	1	0.03	B		mg/L	0.02	0.05	03/21/17 21:30	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	03/29/17 16:35	mfm
Lead, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	03/27/17 18:53	enb
Lithium, dissolved	M200.7 ICP	1	0.037	B		mg/L	0.008	0.04	03/23/17 14:02	gss
Lithium, total	M200.7 ICP	1	0.050			mg/L	0.008	0.04	03/21/17 21:30	gss
Magnesium, dissolved	M200.7 ICP	1	23.5			mg/L	0.2	1	03/23/17 14:02	gss
Magnesium, total	M200.7 ICP	1	24.6			mg/L	0.2	1	03/21/17 21:30	gss
Manganese, dissolved	M200.7 ICP	1	0.108			mg/L	0.005	0.03	03/23/17 14:02	gss
Manganese, total	M200.7 ICP	1	0.119			mg/L	0.005	0.03	03/21/17 21:30	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:16	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 11:38	pta
Molybdenum, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.02	0.1	03/23/17 14:02	gss
Molybdenum, total	M200.7 ICP	1	0.02	B		mg/L	0.02	0.1	03/21/17 21:30	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:02	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 21:30	gss
Potassium, dissolved	M200.7 ICP	1	15.4			mg/L	0.2	1	03/23/17 14:02	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW4-E

ACZ Sample ID: **L36058-01**
 Date Sampled: 03/14/17 14:35
 Date Received: 03/17/17
 Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	16.2		mg/L	0.2	1	03/21/17 21:30	gss
Scandium, dissolved	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/23/17 14:02	gss
Scandium, total	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/21/17 21:30	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0004		mg/L	0.0001	0.0003	03/28/17 11:10	mfm
Selenium, total	M200.8 ICP-MS	1	0.0005		mg/L	0.0001	0.0003	03/27/17 18:53	enb
Silver, dissolved	M200.8 ICP-MS	1		U *	mg/L	0.00005	0.0003	03/28/17 11:10	mfm
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	03/27/17 18:53	enb
Sodium, dissolved	M200.7 ICP	1	77.7		mg/L	0.2	1	03/23/17 14:02	gss
Sodium, total	M200.7 ICP	1	81.4		mg/L	0.2	1	03/21/17 21:30	gss
Strontium, dissolved	M200.7 ICP	1	3.07		mg/L	0.005	0.03	03/23/17 14:02	gss
Strontium, total	M200.7 ICP	1	3.21		mg/L	0.005	0.03	03/21/17 21:30	gss
Thallium, dissolved	M200.8 ICP-MS	1	0.0002	B	mg/L	0.0001	0.0005	03/29/17 16:35	mfm
Thallium, total	M200.8 ICP-MS	1	0.0001	B	mg/L	0.0001	0.0005	03/27/17 18:53	enb
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	03/23/17 14:02	gss
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	03/21/17 21:30	gss
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:02	gss
Titanium, total	M200.7 ICP	1	0.014	B	mg/L	0.005	0.03	03/21/17 21:30	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0003	B	mg/L	0.0001	0.0005	03/29/17 16:35	mfm
Uranium, total	M200.8 ICP-MS	1	0.0002	B	mg/L	0.0001	0.0005	03/27/17 18:53	enb
Vanadium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:02	gss
Vanadium, total	M200.7 ICP	1	0.006	B	mg/L	0.005	0.03	03/21/17 21:30	gss
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	03/23/17 14:02	gss
Zinc, total	M200.7 ICP	1		U	mg/L	0.01	0.05	03/21/17 21:30	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW4-E

ACZ Sample ID: **L36058-01**

Date Sampled: 03/14/17 14:35

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	76.7		*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	76.7		*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			04/03/17 0:00	calc
Sum of Anions			22			meq/L			04/03/17 0:00	calc
Sum of Cations			22			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	03/28/17 10:31	emk
Chloride	SM4500Cl-E	1	71.3		*	mg/L	0.5	2	03/30/17 9:22	bce
Conductivity @25C	SM2510B	1	1770		*	umhos/cm	1	10	03/18/17 5:16	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:14	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:58	pjb
Fluoride	SM4500F-C	1	0.72		*	mg/L	0.05	0.3	03/24/17 10:50	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		898			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	5.36		*	mg/L	0.06	0.3	03/28/17 23:55	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/23/17 15:47	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/23/17 23:55	pjb
pH (lab)	SM4500H+ B									
pH		1	8.2	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.7		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus		1.15			mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.37		*	mg/L	0.02	0.05	03/28/17 22:40	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.36	H	*	mg/L	0.02	0.05	03/18/17 14:11	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.39		*	mg/L	0.02	0.05	03/29/17 0:41	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	1650		*	mg/L	10	20	03/17/17 17:03	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 13:38	keh
Residue, Total (TS) @105C	SM2540B	1	1650		*	mg/L	10	20	03/20/17 16:57	sck
Sulfate	D516-02/-07 - Turbidimetric	50	867		*	mg/L	50	250	03/29/17 9:56	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 13:31	emk
TDS (calculated)	Calculation		1430			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.15						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW3-E

ACZ Sample ID: **L36058-02**
Date Sampled: 03/14/17 15:06
Date Received: 03/17/17
Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 11:56	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 11:58	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 12:34	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:04	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:03	spl
Total Hot Plate Digestion	M200.2 ICP								03/20/17 13:36	jss/scp
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 13:36	scp

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW3-E

ACZ Sample ID: **L36058-02**

Date Sampled: 03/14/17 15:06

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/23/17 14:05	gss
Aluminum, total	M200.7 ICP	1	0.15	B		mg/L	0.03	0.2	03/21/17 21:33	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/29/17 16:38	mfm
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/27/17 18:56	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0104			mg/L	0.0002	0.001	03/28/17 11:13	mfm
Arsenic, total	M200.8 ICP-MS	1	0.0114			mg/L	0.0002	0.001	03/27/17 18:56	enb
Barium, dissolved	M200.7 ICP	1	0.125			mg/L	0.003	0.02	03/23/17 14:05	gss
Barium, total	M200.7 ICP	1	0.136			mg/L	0.003	0.02	03/21/17 21:33	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:05	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:33	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:05	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 21:33	gss
Boron, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:05	gss
Boron, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:33	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 16:38	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 18:56	enb
Calcium, dissolved	M200.7 ICP	1	40.1			mg/L	0.1	0.5	03/23/17 14:05	gss
Calcium, total	M200.7 ICP	1	41.1			mg/L	0.1	0.5	03/21/17 21:33	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:05	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:33	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:05	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:33	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:05	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:33	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:05	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 21:33	gss
Iron, dissolved	M200.7 ICP	1	0.09			mg/L	0.02	0.05	03/23/17 14:05	gss
Iron, total	M200.7 ICP	1	0.22			mg/L	0.02	0.05	03/21/17 21:33	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 16:38	mfm
Lead, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 18:56	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:05	gss
Lithium, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 21:33	gss
Magnesium, dissolved	M200.7 ICP	1	3.3			mg/L	0.2	1	03/23/17 14:05	gss
Magnesium, total	M200.7 ICP	1	3.4			mg/L	0.2	1	03/21/17 21:33	gss
Manganese, dissolved	M200.7 ICP	1	0.148			mg/L	0.005	0.03	03/23/17 14:05	gss
Manganese, total	M200.7 ICP	1	0.166			mg/L	0.005	0.03	03/21/17 21:33	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:17	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 11:39	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/23/17 14:05	gss
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	03/21/17 21:33	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:05	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 21:33	gss
Potassium, dissolved	M200.7 ICP	1	5.0			mg/L	0.2	1	03/23/17 14:05	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW3-E

ACZ Sample ID: **L36058-02**
 Date Sampled: 03/14/17 15:06
 Date Received: 03/17/17
 Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	5.1		mg/L	0.2	1	03/21/17 21:33	gss
Scandium, dissolved	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/23/17 14:05	gss
Scandium, total	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/21/17 21:33	gss
Selenium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	03/28/17 11:13	mfm
Selenium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	03/27/17 18:56	enb
Silver, dissolved	M200.8 ICP-MS	1		U *	mg/L	0.00005	0.0003	03/28/17 11:13	mfm
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	03/27/17 18:56	enb
Sodium, dissolved	M200.7 ICP	1	15.9		mg/L	0.2	1	03/23/17 14:05	gss
Sodium, total	M200.7 ICP	1	16.1		mg/L	0.2	1	03/21/17 21:33	gss
Strontium, dissolved	M200.7 ICP	1	0.215		mg/L	0.005	0.03	03/23/17 14:05	gss
Strontium, total	M200.7 ICP	1	0.227		mg/L	0.005	0.03	03/21/17 21:33	gss
Thallium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/29/17 16:38	mfm
Thallium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/27/17 18:56	enb
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	03/23/17 14:05	gss
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	03/21/17 21:33	gss
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:05	gss
Titanium, total	M200.7 ICP	1	0.010	B	mg/L	0.005	0.03	03/21/17 21:33	gss
Uranium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/29/17 16:38	mfm
Uranium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/27/17 18:56	enb
Vanadium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:05	gss
Vanadium, total	M200.7 ICP	1		U	mg/L	0.005	0.03	03/21/17 21:33	gss
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	03/23/17 14:05	gss
Zinc, total	M200.7 ICP	1		U	mg/L	0.01	0.05	03/21/17 21:33	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW3-E

ACZ Sample ID: **L36058-02**

Date Sampled: 03/14/17 15:06

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	128		*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1	6.5	B	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	134		*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-1.6			%			04/03/17 0:00	calc
Sum of Anions			3.2			meq/L			04/03/17 0:00	calc
Sum of Cations			3.1			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	03/28/17 10:40	emk
Chloride	SM4500Cl-E	1	3.6		*	mg/L	0.5	2	03/30/17 9:22	bce
Conductivity @25C	SM2510B	1	302		*	umhos/cm	1	10	03/18/17 5:26	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:16	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:59	pjb
Fluoride	SM4500F-C	1	0.22	B	*	mg/L	0.05	0.3	03/24/17 10:58	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		114			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/28/17 23:08	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/23/17 14:49	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/23/17 23:58	pjb
pH (lab)	SM4500H+ B									
pH		1	8.4	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.6		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus		0.12	B		mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	03/28/17 22:41	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.04	BH	*	mg/L	0.02	0.05	03/18/17 14:13	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.05		*	mg/L	0.02	0.05	03/29/17 0:19	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	250		*	mg/L	10	20	03/17/17 17:05	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 13:40	keh
Residue, Total (TS) @ 105C	SM2540B	1	262		*	mg/L	10	20	03/20/17 16:58	sck
Sulfate	D516-02/-07 - Turbidimetric	1	19.6		*	mg/L	1	5	03/29/17 9:56	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 13:39	emk
TDS (calculated)	Calculation		170			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.47						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW4A-E

ACZ Sample ID: **L36058-03**

Date Sampled: 03/14/17 16:40

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 12:09	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 12:07	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 12:43	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:12	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:10	spl
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 13:48	scp
Total Hot Plate Digestion	M200.2 ICP								03/20/17 14:19	jss/scp

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW4A-E

ACZ Sample ID: **L36058-03**

Date Sampled: 03/14/17 16:40

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.05	B		mg/L	0.03	0.2	03/23/17 14:14	gss
Aluminum, total	M200.7 ICP	1	0.10	B		mg/L	0.03	0.2	03/21/17 21:43	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.009			mg/L	0.0004	0.002	03/29/17 16:42	mfm
Antimony, total	M200.8 ICP-MS	1	0.010			mg/L	0.0004	0.002	03/27/17 18:59	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0094			mg/L	0.0002	0.001	03/28/17 11:16	mfm
Arsenic, total	M200.8 ICP-MS	1	0.0106			mg/L	0.0002	0.001	03/27/17 18:59	enb
Barium, dissolved	M200.7 ICP	1	0.086			mg/L	0.003	0.02	03/23/17 14:14	gss
Barium, total	M200.7 ICP	1	0.097			mg/L	0.003	0.02	03/21/17 21:43	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:14	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:43	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:14	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 21:43	gss
Boron, dissolved	M200.7 ICP	1	0.10			mg/L	0.01	0.05	03/23/17 14:14	gss
Boron, total	M200.7 ICP	1	0.11			mg/L	0.01	0.05	03/21/17 21:43	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 16:42	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 18:59	enb
Calcium, dissolved	M200.7 ICP	1	326			mg/L	0.1	0.5	03/23/17 14:14	gss
Calcium, total	M200.7 ICP	1	346			mg/L	0.1	0.5	03/21/17 21:43	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:14	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:43	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:14	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:43	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:14	gss
Copper, total	M200.7 ICP	1	0.06			mg/L	0.01	0.05	03/21/17 21:43	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:14	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 21:43	gss
Iron, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.02	0.05	03/23/17 14:14	gss
Iron, total	M200.7 ICP	1	0.10			mg/L	0.02	0.05	03/21/17 21:43	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	03/29/17 16:42	mfm
Lead, total	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0005	03/27/17 18:59	enb
Lithium, dissolved	M200.7 ICP	1	0.043			mg/L	0.008	0.04	03/23/17 14:14	gss
Lithium, total	M200.7 ICP	1	0.053			mg/L	0.008	0.04	03/21/17 21:43	gss
Magnesium, dissolved	M200.7 ICP	1	23.9			mg/L	0.2	1	03/23/17 14:14	gss
Magnesium, total	M200.7 ICP	1	24.8			mg/L	0.2	1	03/21/17 21:43	gss
Manganese, dissolved	M200.7 ICP	1	0.147			mg/L	0.005	0.03	03/23/17 14:14	gss
Manganese, total	M200.7 ICP	1	0.161			mg/L	0.005	0.03	03/21/17 21:43	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:18	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 11:40	pta
Molybdenum, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.02	0.1	03/23/17 14:14	gss
Molybdenum, total	M200.7 ICP	1	0.02	B		mg/L	0.02	0.1	03/21/17 21:43	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:14	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 21:43	gss
Potassium, dissolved	M200.7 ICP	1	19.5			mg/L	0.2	1	03/23/17 14:14	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW4A-E

ACZ Sample ID: **L36058-03**

Date Sampled: 03/14/17 16:40

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Potassium, total	M200.7 ICP	1	19.9		mg/L	0.2	1	03/21/17 21:43	gss
Scandium, dissolved	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/23/17 14:14	gss
Scandium, total	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/21/17 21:43	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0004		mg/L	0.0001	0.0003	03/28/17 11:16	mfm
Selenium, total	M200.8 ICP-MS	1	0.0005		mg/L	0.0001	0.0003	03/27/17 18:59	enb
Silver, dissolved	M200.8 ICP-MS	1		U *	mg/L	0.00005	0.0003	03/28/17 11:16	mfm
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	03/27/17 18:59	enb
Sodium, dissolved	M200.7 ICP	1	79.7		mg/L	0.2	1	03/23/17 14:14	gss
Sodium, total	M200.7 ICP	1	81.6		mg/L	0.2	1	03/21/17 21:43	gss
Strontium, dissolved	M200.7 ICP	1	3.22		mg/L	0.005	0.03	03/23/17 14:14	gss
Strontium, total	M200.7 ICP	1	3.27		mg/L	0.005	0.03	03/21/17 21:43	gss
Thallium, dissolved	M200.8 ICP-MS	1	0.0002	B	mg/L	0.0001	0.0005	03/29/17 16:42	mfm
Thallium, total	M200.8 ICP-MS	1	0.0001	B	mg/L	0.0001	0.0005	03/27/17 18:59	enb
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	03/23/17 14:14	gss
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	03/21/17 21:43	gss
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:14	gss
Titanium, total	M200.7 ICP	1	0.016	B	mg/L	0.005	0.03	03/21/17 21:43	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0003	B	mg/L	0.0001	0.0005	03/29/17 16:42	mfm
Uranium, total	M200.8 ICP-MS	1	0.0002	B	mg/L	0.0001	0.0005	03/27/17 18:59	enb
Vanadium, dissolved	M200.7 ICP	1	0.006	B	mg/L	0.005	0.03	03/23/17 14:14	gss
Vanadium, total	M200.7 ICP	1	0.006	B	mg/L	0.005	0.03	03/21/17 21:43	gss
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	03/23/17 14:14	gss
Zinc, total	M200.7 ICP	1	0.01	B	mg/L	0.01	0.05	03/21/17 21:43	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW4A-E

ACZ Sample ID: **L36058-03**

Date Sampled: 03/14/17 16:40

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	78.9		*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	78.9		*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			04/03/17 0:00	calc
Sum of Anions			22			meq/L			04/03/17 0:00	calc
Sum of Cations			22			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1	16	B	*	mg/L	10	20	03/28/17 10:49	emk
Chloride	SM4500Cl-E	1	76.1		*	mg/L	0.5	2	03/30/17 9:22	bce
Conductivity @25C	SM2510B	1	1780		*	umhos/cm	1	10	03/18/17 5:34	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:18	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:00	pjb
Fluoride	SM4500F-C	1	0.79		*	mg/L	0.05	0.3	03/24/17 11:02	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		912			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	4	6.89		*	mg/L	0.08	0.4	03/28/17 23:57	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1	0.40		*	mg/L	0.05	0.2	03/23/17 14:51	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	1.3		*	mg/L	0.1	0.5	03/23/17 23:59	pjb
pH (lab)	SM4500H+ B									
pH		1	8.1	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.6		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus		2.98			mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.96		*	mg/L	0.02	0.05	03/28/17 22:45	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.90	H	*	mg/L	0.02	0.05	03/18/17 14:15	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.99		*	mg/L	0.02	0.05	03/29/17 0:20	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	1640		*	mg/L	10	20	03/17/17 17:08	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 13:43	keh
Residue, Total (TS) @105C	SM2540B	1	1700		*	mg/L	10	20	03/20/17 16:59	sck
Sulfate	D516-02/-07 - Turbidimetric	50	883		*	mg/L	50	250	03/29/17 9:56	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 13:46	emk
TDS (calculated)	Calculation		1460			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.12						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW2A-E

ACZ Sample ID: **L36058-04**
Date Sampled: 03/14/17 17:15
Date Received: 03/17/17
Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 12:16	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 12:15	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 12:53	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:19	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:18	spl
Total Hot Plate Digestion	M200.2 ICP								03/20/17 14:33	jss/scp
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 14:00	scp

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW2A-E

ACZ Sample ID: **L36058-04**

Date Sampled: 03/14/17 17:15

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.07	B		mg/L	0.03	0.2	03/23/17 14:17	gss
Aluminum, total	M200.7 ICP	1	0.10	B		mg/L	0.03	0.2	03/21/17 21:46	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0267			mg/L	0.0004	0.002	03/29/17 16:45	mfm
Antimony, total	M200.8 ICP-MS	1	0.0321			mg/L	0.0004	0.002	03/27/17 19:02	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0064			mg/L	0.0002	0.001	03/28/17 11:19	mfm
Arsenic, total	M200.8 ICP-MS	1	0.0086			mg/L	0.0002	0.001	03/27/17 19:02	enb
Barium, dissolved	M200.7 ICP	1	0.038			mg/L	0.003	0.02	03/23/17 14:17	gss
Barium, total	M200.7 ICP	1	0.046			mg/L	0.003	0.02	03/21/17 21:46	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:17	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:46	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:17	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 21:46	gss
Boron, dissolved	M200.7 ICP	1	0.10			mg/L	0.01	0.05	03/23/17 14:17	gss
Boron, total	M200.7 ICP	1	0.11			mg/L	0.01	0.05	03/21/17 21:46	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 16:45	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:02	enb
Calcium, dissolved	M200.7 ICP	1	339			mg/L	0.1	0.5	03/23/17 14:17	gss
Calcium, total	M200.7 ICP	1	367			mg/L	0.1	0.5	03/21/17 21:46	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:17	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:46	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:17	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:46	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:17	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:46	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:17	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 21:46	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/23/17 14:17	gss
Iron, total	M200.7 ICP	1	0.06			mg/L	0.02	0.05	03/21/17 21:46	gss
Lead, dissolved	M200.8 ICP-MS	1	0.002			mg/L	0.0001	0.0005	03/29/17 16:45	mfm
Lead, total	M200.8 ICP-MS	1	0.0064			mg/L	0.0001	0.0005	03/27/17 19:02	enb
Lithium, dissolved	M200.7 ICP	1	0.089			mg/L	0.008	0.04	03/23/17 14:17	gss
Lithium, total	M200.7 ICP	1	0.105			mg/L	0.008	0.04	03/21/17 21:46	gss
Magnesium, dissolved	M200.7 ICP	1	15.1			mg/L	0.2	1	03/23/17 14:17	gss
Magnesium, total	M200.7 ICP	1	16.0			mg/L	0.2	1	03/21/17 21:46	gss
Manganese, dissolved	M200.7 ICP	1	0.052			mg/L	0.005	0.03	03/23/17 14:17	gss
Manganese, total	M200.7 ICP	1	0.065			mg/L	0.005	0.03	03/21/17 21:46	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:19	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 11:41	pta
Molybdenum, dissolved	M200.7 ICP	1	0.06	B		mg/L	0.02	0.1	03/23/17 14:17	gss
Molybdenum, total	M200.7 ICP	1	0.06	B		mg/L	0.02	0.1	03/21/17 21:46	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:17	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 21:46	gss
Potassium, dissolved	M200.7 ICP	1	15.4			mg/L	0.2	1	03/23/17 14:17	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW2A-E

ACZ Sample ID: **L36058-04**
 Date Sampled: 03/14/17 17:15
 Date Received: 03/17/17
 Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	16.0		mg/L	0.2	1	03/21/17 21:46	gss
Scandium, dissolved	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/23/17 14:17	gss
Scandium, total	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/21/17 21:46	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0008		mg/L	0.0001	0.0003	03/28/17 11:19	mfm
Selenium, total	M200.8 ICP-MS	1	0.0009		mg/L	0.0001	0.0003	03/27/17 19:02	enb
Silver, dissolved	M200.8 ICP-MS	1		U *	mg/L	0.00005	0.0003	03/28/17 11:19	mfm
Silver, total	M200.8 ICP-MS	1	0.00014	B	mg/L	0.00005	0.0003	03/27/17 19:02	enb
Sodium, dissolved	M200.7 ICP	1	91.7		mg/L	0.2	1	03/23/17 14:17	gss
Sodium, total	M200.7 ICP	1	94.8		mg/L	0.2	1	03/21/17 21:46	gss
Strontium, dissolved	M200.7 ICP	1	3.98		mg/L	0.005	0.03	03/23/17 14:17	gss
Strontium, total	M200.7 ICP	1	4.14		mg/L	0.005	0.03	03/21/17 21:46	gss
Thallium, dissolved	M200.8 ICP-MS	1	0.0003	B	mg/L	0.0001	0.0005	03/29/17 16:45	mfm
Thallium, total	M200.8 ICP-MS	1	0.0003	B	mg/L	0.0001	0.0005	03/27/17 19:02	enb
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	03/23/17 14:17	gss
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	03/21/17 21:46	gss
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:17	gss
Titanium, total	M200.7 ICP	1	0.014	B	mg/L	0.005	0.03	03/21/17 21:46	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0001	B	mg/L	0.0001	0.0005	03/29/17 16:45	mfm
Uranium, total	M200.8 ICP-MS	1	0.0001	B	mg/L	0.0001	0.0005	03/27/17 19:02	enb
Vanadium, dissolved	M200.7 ICP	1	0.016	B	mg/L	0.005	0.03	03/23/17 14:17	gss
Vanadium, total	M200.7 ICP	1	0.021	B	mg/L	0.005	0.03	03/21/17 21:46	gss
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	03/23/17 14:17	gss
Zinc, total	M200.7 ICP	1		U	mg/L	0.01	0.05	03/21/17 21:46	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW2A-E

ACZ Sample ID: **L36058-04**
Date Sampled: 03/14/17 17:15
Date Received: 03/17/17
Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	26.2		*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	26.2		*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			04/03/17 0:00	calc
Sum of Anions			23			meq/L			04/03/17 0:00	calc
Sum of Cations			23			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1	10	B	*	mg/L	10	20	03/28/17 10:59	emk
Chloride	SM4500Cl-E	1	73.8		*	mg/L	0.5	2	03/30/17 9:22	bce
Conductivity @25C	SM2510B	1	1840		*	umhos/cm	1	10	03/18/17 5:43	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:19	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:01	pjb
Fluoride	SM4500F-C	1	1.32		*	mg/L	0.05	0.3	03/24/17 11:07	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		909			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	5.99		*	mg/L	0.06	0.3	03/28/17 23:58	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1	2.88		*	mg/L	0.05	0.2	03/23/17 14:53	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	4.0		*	mg/L	0.1	0.5	03/24/17 0:00	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.5		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/28/17 22:46	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/18/17 14:16	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.02	B	*	mg/L	0.02	0.05	03/29/17 0:21	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	1670		*	mg/L	10	20	03/17/17 17:11	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1	6.0	B	*	mg/L	5	20	03/17/17 13:45	keh
Residue, Total (TS) @ 105C	SM2540B	1	1740		*	mg/L	10	20	03/20/17 17:00	sck
Sulfate	D516-02/-07 - Turbidimetric	50	978		*	mg/L	50	250	03/29/17 9:56	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 13:54	emk
TDS (calculated)	Calculation		1540			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.08						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW11-E

ACZ Sample ID: **L36058-05**

Date Sampled: 03/14/17 17:15

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 12:22	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 12:24	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 13:02	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:26	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:26	spl
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 14:12	scp
Total Hot Plate Digestion	M200.2 ICP								03/20/17 14:48	jss/scp

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW11-E

ACZ Sample ID: **L36058-05**

Date Sampled: 03/14/17 17:15

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.08	B		mg/L	0.03	0.2	03/23/17 14:26	gss
Aluminum, total	M200.7 ICP	1	0.09	B		mg/L	0.03	0.2	03/21/17 21:56	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0275			mg/L	0.0004	0.002	03/29/17 16:48	mfm
Antimony, total	M200.8 ICP-MS	1	0.0316			mg/L	0.0004	0.002	03/27/17 19:06	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0067			mg/L	0.0002	0.001	03/28/17 11:28	mfm
Arsenic, total	M200.8 ICP-MS	1	0.008			mg/L	0.0002	0.001	03/27/17 19:06	enb
Barium, dissolved	M200.7 ICP	1	0.037			mg/L	0.003	0.02	03/23/17 14:26	gss
Barium, total	M200.7 ICP	1	0.046			mg/L	0.003	0.02	03/21/17 21:56	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:26	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:56	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:26	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 21:56	gss
Boron, dissolved	M200.7 ICP	1	0.10			mg/L	0.01	0.05	03/23/17 14:26	gss
Boron, total	M200.7 ICP	1	0.11			mg/L	0.01	0.05	03/21/17 21:56	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 16:48	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:06	enb
Calcium, dissolved	M200.7 ICP	1	342			mg/L	0.1	0.5	03/23/17 14:26	gss
Calcium, total	M200.7 ICP	1	361			mg/L	0.1	0.5	03/21/17 21:56	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:26	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:56	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:26	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:56	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:26	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:56	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:26	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 21:56	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/23/17 14:26	gss
Iron, total	M200.7 ICP	1	0.05			mg/L	0.02	0.05	03/21/17 21:56	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0021			mg/L	0.0001	0.0005	03/29/17 16:48	mfm
Lead, total	M200.8 ICP-MS	1	0.006			mg/L	0.0001	0.0005	03/27/17 19:06	enb
Lithium, dissolved	M200.7 ICP	1	0.089			mg/L	0.008	0.04	03/23/17 14:26	gss
Lithium, total	M200.7 ICP	1	0.106			mg/L	0.008	0.04	03/21/17 21:56	gss
Magnesium, dissolved	M200.7 ICP	1	15.0			mg/L	0.2	1	03/23/17 14:26	gss
Magnesium, total	M200.7 ICP	1	15.7			mg/L	0.2	1	03/21/17 21:56	gss
Manganese, dissolved	M200.7 ICP	1	0.051			mg/L	0.005	0.03	03/23/17 14:26	gss
Manganese, total	M200.7 ICP	1	0.064			mg/L	0.005	0.03	03/21/17 21:56	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:22	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 11:42	pta
Molybdenum, dissolved	M200.7 ICP	1	0.06	B		mg/L	0.02	0.1	03/23/17 14:26	gss
Molybdenum, total	M200.7 ICP	1	0.05	B		mg/L	0.02	0.1	03/21/17 21:56	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:26	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 21:56	gss
Potassium, dissolved	M200.7 ICP	1	15.4			mg/L	0.2	1	03/23/17 14:26	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW11-E

ACZ Sample ID: **L36058-05**

Date Sampled: 03/14/17 17:15

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Potassium, total	M200.7 ICP	1	15.8			mg/L	0.2	1	03/21/17 21:56	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:26	gss
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 21:56	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0008			mg/L	0.0001	0.0003	03/28/17 11:28	mfm
Selenium, total	M200.8 ICP-MS	1	0.0009			mg/L	0.0001	0.0003	03/27/17 19:06	enb
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	03/28/17 11:28	mfm
Silver, total	M200.8 ICP-MS	1	0.00015	B		mg/L	0.00005	0.0003	03/27/17 19:06	enb
Sodium, dissolved	M200.7 ICP	1	91.9			mg/L	0.2	1	03/23/17 14:26	gss
Sodium, total	M200.7 ICP	1	94.0			mg/L	0.2	1	03/21/17 21:56	gss
Strontium, dissolved	M200.7 ICP	1	3.94			mg/L	0.005	0.03	03/23/17 14:26	gss
Strontium, total	M200.7 ICP	1	4.12			mg/L	0.005	0.03	03/21/17 21:56	gss
Thallium, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	03/29/17 16:48	mfm
Thallium, total	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	03/27/17 19:06	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/23/17 14:26	gss
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	03/21/17 21:56	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:26	gss
Titanium, total	M200.7 ICP	1	0.013	B		mg/L	0.005	0.03	03/21/17 21:56	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	03/29/17 16:48	mfm
Uranium, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	03/27/17 19:06	enb
Vanadium, dissolved	M200.7 ICP	1	0.017	B		mg/L	0.005	0.03	03/23/17 14:26	gss
Vanadium, total	M200.7 ICP	1	0.019	B		mg/L	0.005	0.03	03/21/17 21:56	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:26	gss
Zinc, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:56	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW11-E

ACZ Sample ID: **L36058-05**

Date Sampled: 03/14/17 17:15

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	26.1		*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	26.1		*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			04/03/17 0:00	calc
Sum of Anions			23			meq/L			04/03/17 0:00	calc
Sum of Cations			23			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1	11	B	*	mg/L	10	20	03/28/17 11:08	emk
Chloride	SM4500Cl-E	1	73.4		*	mg/L	0.5	2	03/30/17 9:22	bce
Conductivity @25C	SM2510B	1	1840		*	umhos/cm	1	10	03/18/17 5:52	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:20	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:03	pjb
Fluoride	SM4500F-C	1	1.30		*	mg/L	0.05	0.3	03/24/17 11:22	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		916			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	5.99		*	mg/L	0.06	0.3	03/28/17 23:59	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1	2.88		*	mg/L	0.05	0.2	03/23/17 14:54	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	2.8		*	mg/L	0.1	0.5	03/24/17 0:02	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.5		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/28/17 22:47	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/18/17 14:17	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.02	B	*	mg/L	0.02	0.05	03/29/17 0:22	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	1680		*	mg/L	10	20	03/17/17 17:13	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 13:48	keh
Residue, Total (TS) @ 105C	SM2540B	1	1720		*	mg/L	10	20	03/20/17 17:01	sck
Sulfate	D516-02/-07 - Turbidimetric	50	958		*	mg/L	50	250	03/29/17 9:56	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 14:02	emk
TDS (calculated)	Calculation		1520			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.11						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW10-E

ACZ Sample ID: **L36058-07**

Date Sampled: 03/14/17 12:00

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 12:36	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 12:40	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 13:20	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:33	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:34	spl
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 14:24	scp
Total Hot Plate Digestion	M200.2 ICP								03/20/17 15:02	jss/scp

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW10-E

ACZ Sample ID: **L36058-07**

Date Sampled: 03/14/17 12:00

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/23/17 14:32	gss
Aluminum, total	M200.7 ICP	1		U		mg/L	0.03	0.2	03/21/17 21:59	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/29/17 16:57	mfm
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/27/17 19:09	enb
Arsenic, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	03/28/17 11:31	mfm
Arsenic, total	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	03/27/17 19:09	enb
Barium, dissolved	M200.7 ICP	1		U		mg/L	0.003	0.02	03/23/17 14:32	gss
Barium, total	M200.7 ICP	1	0.003	B		mg/L	0.003	0.02	03/21/17 21:59	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:32	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:59	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:32	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 21:59	gss
Boron, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:32	gss
Boron, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:59	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 16:57	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:09	enb
Calcium, dissolved	M200.7 ICP	1	0.2	B		mg/L	0.1	0.5	03/23/17 14:32	gss
Calcium, total	M200.7 ICP	1	0.2	B		mg/L	0.1	0.5	03/21/17 21:59	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:32	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:59	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:32	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:59	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:32	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 21:59	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:32	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 21:59	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/23/17 14:32	gss
Iron, total	M200.7 ICP	1		U		mg/L	0.02	0.05	03/21/17 21:59	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 16:57	mfm
Lead, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:09	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:32	gss
Lithium, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 21:59	gss
Magnesium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	03/23/17 14:32	gss
Magnesium, total	M200.7 ICP	1		U		mg/L	0.2	1	03/21/17 21:59	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:32	gss
Manganese, total	M200.7 ICP	1		U		mg/L	0.005	0.03	03/21/17 21:59	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:24	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 11:45	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/23/17 14:32	gss
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	03/21/17 21:59	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:32	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 21:59	gss
Potassium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	03/23/17 14:32	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW10-E

ACZ Sample ID: **L36058-07**

Date Sampled: 03/14/17 12:00

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Potassium, total	M200.7 ICP	1		U	mg/L	0.2	1	03/21/17 21:59	gss
Scandium, dissolved	M200.7 ICP	1		U	mg/L	0.1	0.5	03/23/17 14:32	gss
Scandium, total	M200.7 ICP	1		U	mg/L	0.1	0.5	03/21/17 21:59	gss
Selenium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	03/28/17 11:31	mfm
Selenium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	03/27/17 19:09	enb
Silver, dissolved	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	03/28/17 11:31	mfm
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	03/27/17 19:09	enb
Sodium, dissolved	M200.7 ICP	1		U	mg/L	0.2	1	03/23/17 14:32	gss
Sodium, total	M200.7 ICP	1		U	mg/L	0.2	1	03/21/17 21:59	gss
Strontium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:32	gss
Strontium, total	M200.7 ICP	1	0.006	B	mg/L	0.005	0.03	03/21/17 21:59	gss
Thallium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/29/17 16:57	mfm
Thallium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/27/17 19:09	enb
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	03/23/17 14:32	gss
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	03/21/17 21:59	gss
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:32	gss
Titanium, total	M200.7 ICP	1		U	mg/L	0.005	0.03	03/21/17 21:59	gss
Uranium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/29/17 16:57	mfm
Uranium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/27/17 19:09	enb
Vanadium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:32	gss
Vanadium, total	M200.7 ICP	1		U	mg/L	0.005	0.03	03/21/17 21:59	gss
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	03/23/17 14:32	gss
Zinc, total	M200.7 ICP	1		U	mg/L	0.01	0.05	03/21/17 21:59	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW10-E

ACZ Sample ID: **L36058-07**

Date Sampled: 03/14/17 12:00

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	2.4	B	*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	2.4	B	*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			n/a			%			04/03/17 0:00	calc
Sum of Anions			0.1	B		meq/L			04/03/17 0:00	calc
Sum of Cations				U		meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	03/28/17 11:17	emk
Chloride	SM4500Cl-E	1		U	*	mg/L	0.5	2	03/30/17 9:23	bce
Conductivity @25C	SM2510B	1	5.7	B	*	umhos/cm	1	10	03/18/17 6:09	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:23	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:05	pjb
Fluoride	SM4500F-C	1		U	*	mg/L	0.05	0.3	03/24/17 11:35	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		0.499	B		mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/28/17 23:18	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/23/17 14:56	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/24/17 0:04	pjb
pH (lab)	SM4500H+ B									
pH		1	7.0	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.4		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/28/17 22:48	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/18/17 14:20	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/29/17 0:24	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	20		*	mg/L	10	20	03/17/17 17:19	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 13:53	keh
Residue, Total (TS) @ 105C	SM2540B	1		U	*	mg/L	10	20	03/20/17 17:03	sck
Sulfate	D516-02/-07 - Turbidimetric	1	2.5	B	*	mg/L	1	5	03/29/17 9:34	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 14:18	emk
TDS (calculated)	Calculation		4.16			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		4.81						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW5-E

ACZ Sample ID: **L36058-09**

Date Sampled: 03/14/17 08:40

Date Received: 03/17/17

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 12:49	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 12:57	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/27/17 11:57	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:40	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:49	spl
Total Hot Plate Digestion	M200.2 ICP								03/20/17 15:16	jss/scp
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 15:00	scp

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW5-E

ACZ Sample ID: **L36058-09**

Date Sampled: 03/14/17 08:40

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.08	B		mg/L	0.03	0.2	03/23/17 14:39	gss
Aluminum, total	M200.7 ICP	1	0.29			mg/L	0.03	0.2	03/21/17 22:02	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/29/17 17:00	mfm
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/27/17 19:25	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0012			mg/L	0.0002	0.001	03/28/17 11:41	mfm
Arsenic, total	M200.8 ICP-MS	1	0.0012			mg/L	0.0002	0.001	03/29/17 15:02	enb
Barium, dissolved	M200.7 ICP	1	0.077			mg/L	0.003	0.02	03/23/17 14:39	gss
Barium, total	M200.7 ICP	1	0.093			mg/L	0.003	0.02	03/21/17 22:02	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:39	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:02	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:39	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 22:02	gss
Boron, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:39	gss
Boron, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:02	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:00	mfm
Cadmium, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	03/27/17 19:25	enb
Calcium, dissolved	M200.7 ICP	1	12.3		*	mg/L	0.1	0.5	03/23/17 14:39	gss
Calcium, total	M200.7 ICP	1	13.2			mg/L	0.1	0.5	03/21/17 22:02	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:39	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:02	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:39	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:02	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:39	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:02	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:39	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 22:02	gss
Iron, dissolved	M200.7 ICP	1	0.12			mg/L	0.02	0.05	03/23/17 14:39	gss
Iron, total	M200.7 ICP	1	0.32			mg/L	0.02	0.05	03/21/17 22:02	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:00	mfm
Lead, total	M200.8 ICP-MS	1	0.0028			mg/L	0.0001	0.0005	03/29/17 15:02	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:39	gss
Lithium, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 22:02	gss
Magnesium, dissolved	M200.7 ICP	1	2.3			mg/L	0.2	1	03/23/17 14:39	gss
Magnesium, total	M200.7 ICP	1	2.5			mg/L	0.2	1	03/21/17 22:02	gss
Manganese, dissolved	M200.7 ICP	1	0.037			mg/L	0.005	0.03	03/23/17 14:39	gss
Manganese, total	M200.7 ICP	1	0.046			mg/L	0.005	0.03	03/21/17 22:02	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:26	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 11:48	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/23/17 14:39	gss
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	03/21/17 22:02	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:39	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 22:02	gss
Potassium, dissolved	M200.7 ICP	1	3.6			mg/L	0.2	1	03/23/17 14:39	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW5-E

ACZ Sample ID: **L36058-09**

Date Sampled: 03/14/17 08:40

Date Received: 03/17/17

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	3.9			mg/L	0.2	1	03/21/17 22:02	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:39	gss
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 22:02	gss
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/29/17 17:00	mfm
Selenium, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0003	03/27/17 19:25	enb
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	03/28/17 11:41	mfm
Silver, total	M200.8 ICP-MS	1	0.00126			mg/L	0.00005	0.0003	03/27/17 19:25	enb
Sodium, dissolved	M200.7 ICP	1	8.4			mg/L	0.2	1	03/23/17 14:39	gss
Sodium, total	M200.7 ICP	1	8.8			mg/L	0.2	1	03/21/17 22:02	gss
Strontium, dissolved	M200.7 ICP	1	0.101		*	mg/L	0.005	0.03	03/23/17 14:39	gss
Strontium, total	M200.7 ICP	1	0.114			mg/L	0.005	0.03	03/21/17 22:02	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:00	mfm
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:25	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/23/17 14:39	gss
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	03/21/17 22:02	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:39	gss
Titanium, total	M200.7 ICP	1	0.011	B		mg/L	0.005	0.03	03/21/17 22:02	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:00	mfm
Uranium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:25	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:39	gss
Vanadium, total	M200.7 ICP	1		U		mg/L	0.005	0.03	03/21/17 22:02	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:39	gss
Zinc, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:02	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW5-E

ACZ Sample ID: **L36058-09**

Date Sampled: 03/14/17 08:40

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	32.2		*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	32.2		*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-3.7			%			04/03/17 0:00	calc
Sum of Anions			1.4			meq/L			04/03/17 0:00	calc
Sum of Cations			1.3			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	03/28/17 11:26	emk
Chloride	SM4500Cl-E	1	2.6		*	mg/L	0.5	2	03/30/17 9:23	bce
Conductivity @25C	SM2510B	1	147		*	umhos/cm	1	10	03/18/17 6:29	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:25	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:07	pjb
Fluoride	SM4500F-C	1	0.10	B	*	mg/L	0.05	0.3	03/24/17 11:51	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		40			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/28/17 23:23	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/23/17 14:57	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.3	B	*	mg/L	0.1	0.5	03/29/17 22:45	pjb
pH (lab)	SM4500H+ B									
pH		1	8.1	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.3		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/28/17 22:49	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/18/17 14:24	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/29/17 0:26	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	120		*	mg/L	10	20	03/17/17 17:24	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 14:01	keh
Residue, Total (TS) @ 105C	SM2540B	1	130		*	mg/L	10	20	03/20/17 17:05	sck
Sulfate	D516-02/-07 - Turbidimetric	1	32.1		*	mg/L	1	5	03/29/17 9:35	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 14:49	emk
TDS (calculated)	Calculation		81.4			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.47						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW6-E

ACZ Sample ID: **L36058-10**

Date Sampled: 03/14/17 11:37

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation		-						03/23/17 12:55	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 13:14	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/27/17 12:13	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 15:55	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 16:05	spl
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 15:12	scp
Total Hot Plate Digestion	M200.2 ICP								03/20/17 15:31	jss/scp

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW6-E

ACZ Sample ID: **L36058-10**

Date Sampled: 03/14/17 11:37

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/23/17 14:42	gss
Aluminum, total	M200.7 ICP	1		U		mg/L	0.03	0.2	03/21/17 22:05	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/29/17 17:09	mfm
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/27/17 19:28	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0066			mg/L	0.0002	0.001	03/28/17 11:44	mfm
Arsenic, total	M200.8 ICP-MS	1	0.0072			mg/L	0.0002	0.001	03/29/17 15:06	enb
Barium, dissolved	M200.7 ICP	1	0.096			mg/L	0.003	0.02	03/23/17 14:42	gss
Barium, total	M200.7 ICP	1	0.112			mg/L	0.003	0.02	03/21/17 22:05	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:42	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:05	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:42	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 22:05	gss
Boron, dissolved	M200.7 ICP	1	0.66			mg/L	0.01	0.05	03/23/17 14:42	gss
Boron, total	M200.7 ICP	1	0.73			mg/L	0.01	0.05	03/21/17 22:05	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:09	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:28	enb
Calcium, dissolved	M200.7 ICP	1	28.0		*	mg/L	0.1	0.5	03/23/17 14:42	gss
Calcium, total	M200.7 ICP	1	29.9			mg/L	0.1	0.5	03/21/17 22:05	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:42	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:05	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:42	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:05	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:42	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:05	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:42	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 22:05	gss
Iron, dissolved	M200.7 ICP	1	0.07			mg/L	0.02	0.05	03/23/17 14:42	gss
Iron, total	M200.7 ICP	1	0.17			mg/L	0.02	0.05	03/21/17 22:05	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:09	mfm
Lead, total	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	03/29/17 15:06	enb
Lithium, dissolved	M200.7 ICP	1	0.223			mg/L	0.008	0.04	03/23/17 14:42	gss
Lithium, total	M200.7 ICP	1	0.244			mg/L	0.008	0.04	03/21/17 22:05	gss
Magnesium, dissolved	M200.7 ICP	1	5.3			mg/L	0.2	1	03/23/17 14:42	gss
Magnesium, total	M200.7 ICP	1	5.6			mg/L	0.2	1	03/21/17 22:05	gss
Manganese, dissolved	M200.7 ICP	1	0.037			mg/L	0.005	0.03	03/23/17 14:42	gss
Manganese, total	M200.7 ICP	1	0.048			mg/L	0.005	0.03	03/21/17 22:05	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:27	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 15:59	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/23/17 14:42	gss
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	03/21/17 22:05	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:42	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 22:05	gss
Potassium, dissolved	M200.7 ICP	1	5.7			mg/L	0.2	1	03/23/17 14:42	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW6-E

ACZ Sample ID: **L36058-10**

Date Sampled: 03/14/17 11:37

Date Received: 03/17/17

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	6.0			mg/L	0.2	1	03/21/17 22:05	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:42	gss
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 22:05	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0003	03/29/17 17:09	mfm
Selenium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/27/17 19:28	enb
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	03/28/17 11:44	mfm
Silver, total	M200.8 ICP-MS	1	0.00007	B		mg/L	0.00005	0.0003	03/27/17 19:28	enb
Sodium, dissolved	M200.7 ICP	1	56.8			mg/L	0.2	1	03/23/17 14:42	gss
Sodium, total	M200.7 ICP	1	59.6			mg/L	0.2	1	03/21/17 22:05	gss
Strontium, dissolved	M200.7 ICP	1	0.208		*	mg/L	0.005	0.03	03/23/17 14:42	gss
Strontium, total	M200.7 ICP	1	0.228			mg/L	0.005	0.03	03/21/17 22:05	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:09	mfm
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:28	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/23/17 14:42	gss
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	03/21/17 22:05	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:42	gss
Titanium, total	M200.7 ICP	1		U		mg/L	0.005	0.03	03/21/17 22:05	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:09	mfm
Uranium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:28	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:42	gss
Vanadium, total	M200.7 ICP	1		U		mg/L	0.005	0.03	03/21/17 22:05	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:42	gss
Zinc, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:05	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW6-E

ACZ Sample ID: **L36058-10**

Date Sampled: 03/14/17 11:37

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	85.2		*	mg/L	2	20	03/21/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/21/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/21/17 0:00	abd
Total Alkalinity		1	85.2		*	mg/L	2	20	03/21/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-1.1			%			04/03/17 0:00	calc
Sum of Anions			4.6			meq/L			04/03/17 0:00	calc
Sum of Cations			4.5			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	03/28/17 11:54	emk
Chloride	SM4500Cl-E	10	72		*	mg/L	5	20	03/30/17 10:00	bce
Conductivity @25C	SM2510B	1	504		*	umhos/cm	1	10	03/21/17 17:02	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:26	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:09	pjb
Fluoride	SM4500F-C	1	0.27	B	*	mg/L	0.05	0.3	03/24/17 11:59	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		92			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/28/17 23:24	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/23/17 15:01	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.1	B	*	mg/L	0.1	0.5	03/29/17 22:50	pjb
pH (lab)	SM4500H+ B									
pH		1	8.2	H	*	units	0.1	0.1	03/21/17 0:00	abd
pH measured at		1	23.0		*	C	0.1	0.1	03/21/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		0.09	B		mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	03/28/17 22:52	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.03	BH	*	mg/L	0.02	0.05	03/18/17 14:25	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	03/29/17 0:28	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	326		*	mg/L	10	20	03/20/17 10:34	keh
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 14:04	keh
Residue, Total (TS) @ 105C	SM2540B	1	336		*	mg/L	10	20	03/20/17 17:06	sck
Sulfate	D516-02/-07 - Turbidimetric	5	39.7		*	mg/L	5	25	03/29/17 9:42	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 15:12	emk
TDS (calculated)	Calculation		260			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.25						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW8-E

ACZ Sample ID: **L36058-11**
Date Sampled: 03/14/17 10:30
Date Received: 03/17/17
Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 13:02	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 13:31	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/27/17 12:22	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 16:09	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 16:13	spl
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 15:24	scp
Total Hot Plate Digestion	M200.2 ICP								03/20/17 15:45	jss/scp

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW8-E

ACZ Sample ID: **L36058-11**

Date Sampled: 03/14/17 10:30

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/23/17 14:45	gss
Aluminum, total	M200.7 ICP	1	0.16	B		mg/L	0.03	0.2	03/21/17 22:08	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0033			mg/L	0.0004	0.002	03/29/17 17:13	mfm
Antimony, total	M200.8 ICP-MS	1	0.0036			mg/L	0.0004	0.002	03/27/17 19:31	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0049			mg/L	0.0002	0.001	03/28/17 11:47	mfm
Arsenic, total	M200.8 ICP-MS	1	0.0053			mg/L	0.0002	0.001	03/29/17 15:09	enb
Barium, dissolved	M200.7 ICP	1	0.114			mg/L	0.003	0.02	03/23/17 14:45	gss
Barium, total	M200.7 ICP	1	0.128			mg/L	0.003	0.02	03/21/17 22:08	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:45	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:08	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:45	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 22:08	gss
Boron, dissolved	M200.7 ICP	1	0.04	B		mg/L	0.01	0.05	03/23/17 14:45	gss
Boron, total	M200.7 ICP	1	0.05			mg/L	0.01	0.05	03/21/17 22:08	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:13	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:31	enb
Calcium, dissolved	M200.7 ICP	1	113		*	mg/L	0.1	0.5	03/23/17 14:45	gss
Calcium, total	M200.7 ICP	1	121			mg/L	0.1	0.5	03/21/17 22:08	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:45	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:08	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:45	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:08	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:45	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:08	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:45	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 22:08	gss
Iron, dissolved	M200.7 ICP	1	0.12			mg/L	0.02	0.05	03/23/17 14:45	gss
Iron, total	M200.7 ICP	1	0.28			mg/L	0.02	0.05	03/21/17 22:08	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	03/29/17 17:13	mfm
Lead, total	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0005	03/29/17 15:09	enb
Lithium, dissolved	M200.7 ICP	1	0.025	B		mg/L	0.008	0.04	03/23/17 14:45	gss
Lithium, total	M200.7 ICP	1	0.033	B		mg/L	0.008	0.04	03/21/17 22:08	gss
Magnesium, dissolved	M200.7 ICP	1	9.5			mg/L	0.2	1	03/23/17 14:45	gss
Magnesium, total	M200.7 ICP	1	10.0			mg/L	0.2	1	03/21/17 22:08	gss
Manganese, dissolved	M200.7 ICP	1	0.229			mg/L	0.005	0.03	03/23/17 14:45	gss
Manganese, total	M200.7 ICP	1	0.243			mg/L	0.005	0.03	03/21/17 22:08	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:28	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 16:00	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/23/17 14:45	gss
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	03/21/17 22:08	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:45	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 22:08	gss
Potassium, dissolved	M200.7 ICP	1	10.0			mg/L	0.2	1	03/23/17 14:45	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW8-E

ACZ Sample ID: **L36058-11**

Date Sampled: 03/14/17 10:30

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Potassium, total	M200.7 ICP	1	10.4			mg/L	0.2	1	03/21/17 22:08	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:45	gss
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 22:08	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0003	03/29/17 17:13	mfm
Selenium, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0003	03/27/17 19:31	enb
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	03/28/17 11:47	mfm
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/27/17 19:31	enb
Sodium, dissolved	M200.7 ICP	1	45.0			mg/L	0.2	1	03/23/17 14:45	gss
Sodium, total	M200.7 ICP	1	47.0			mg/L	0.2	1	03/21/17 22:08	gss
Strontium, dissolved	M200.7 ICP	1	1.32		*	mg/L	0.005	0.03	03/23/17 14:45	gss
Strontium, total	M200.7 ICP	1	1.41			mg/L	0.005	0.03	03/21/17 22:08	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:13	mfm
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:31	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/23/17 14:45	gss
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	03/21/17 22:08	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:45	gss
Titanium, total	M200.7 ICP	1	0.013	B		mg/L	0.005	0.03	03/21/17 22:08	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	03/29/17 17:13	mfm
Uranium, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	03/27/17 19:31	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:45	gss
Vanadium, total	M200.7 ICP	1		U		mg/L	0.005	0.03	03/21/17 22:08	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:45	gss
Zinc, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:08	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW8-E

ACZ Sample ID: **L36058-11**

Date Sampled: 03/14/17 10:30

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	116		*	mg/L	2	20	03/21/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/21/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/21/17 0:00	abd
Total Alkalinity		1	116		*	mg/L	2	20	03/21/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			1.7			%			04/03/17 0:00	calc
Sum of Anions			8.7			meq/L			04/03/17 0:00	calc
Sum of Cations			9			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1	27		*	mg/L	10	20	03/28/17 12:03	emk
Chloride	SM4500Cl-E	1	30.2		*	mg/L	0.5	2	03/30/17 9:33	bce
Conductivity @25C	SM2510B	1	861		*	umhos/cm	1	10	03/21/17 17:11	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:27	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:10	pjb
Fluoride	SM4500F-C	1	0.44		*	mg/L	0.05	0.3	03/24/17 12:06	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		321			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	2.75		*	mg/L	0.02	0.1	03/28/17 23:26	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1	3.70		*	mg/L	0.05	0.2	03/23/17 15:03	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	4.0		*	mg/L	0.1	0.5	03/29/17 22:51	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	03/21/17 0:00	abd
pH measured at		1	22.9		*	C	0.1	0.1	03/21/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		2.51			mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.81		*	mg/L	0.02	0.05	03/28/17 22:54	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	3	0.73	H	*	mg/L	0.06	0.2	03/18/17 14:45	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.95		*	mg/L	0.02	0.05	03/29/17 0:29	pjb
Residue, Filterable (TDS) @180C	SM2540C	5	620		*	mg/L	50	100	03/20/17 10:36	keh
Residue, Non-Filterable (TSS) @105C	SM2540D	1	9.0	B	*	mg/L	5	20	03/17/17 14:06	keh
Residue, Total (TS) @ 105C	SM2540B	2	684		*	mg/L	20	40	03/20/17 17:08	sck
Sulfate	D516-02/-07 - Turbidimetric	10	261		*	mg/L	10	50	03/29/17 9:50	bce
Sulfide as S	SM4500S2-D	1	0.27		*	mg/L	0.02	0.1	03/21/17 15:20	emk
TDS (calculated)	Calculation		545			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.14						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW9-E

ACZ Sample ID: **L36058-12**

Date Sampled: 03/14/17 12:30

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 13:15	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 13:39	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/27/17 12:30	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 16:16	spl
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/27/17 16:21	spl
Total Hot Plate Digestion	M200.2 ICP-MS								03/24/17 15:36	scp
Total Hot Plate Digestion	M200.2 ICP								03/20/17 16:00	jss/scp

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW9-E

ACZ Sample ID: **L36058-12**

Date Sampled: 03/14/17 12:30

Date Received: 03/17/17

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/23/17 14:48	gss
Aluminum, total	M200.7 ICP	1	0.14	B		mg/L	0.03	0.2	03/21/17 22:11	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0006	B		mg/L	0.0004	0.002	03/29/17 17:16	mfm
Antimony, total	M200.8 ICP-MS	1	0.0011	B		mg/L	0.0004	0.002	03/27/17 19:34	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0051			mg/L	0.0002	0.001	03/28/17 11:50	mfm
Arsenic, total	M200.8 ICP-MS	1	0.0055			mg/L	0.0002	0.001	03/29/17 15:13	enb
Barium, dissolved	M200.7 ICP	1	0.094			mg/L	0.003	0.02	03/23/17 14:48	gss
Barium, total	M200.7 ICP	1	0.107			mg/L	0.003	0.02	03/21/17 22:11	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:48	gss
Beryllium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:11	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:48	gss
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/21/17 22:11	gss
Boron, dissolved	M200.7 ICP	1	0.12			mg/L	0.01	0.05	03/23/17 14:48	gss
Boron, total	M200.7 ICP	1	0.13			mg/L	0.01	0.05	03/21/17 22:11	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:16	mfm
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:34	enb
Calcium, dissolved	M200.7 ICP	1	66.1		*	mg/L	0.1	0.5	03/23/17 14:48	gss
Calcium, total	M200.7 ICP	1	69.3			mg/L	0.1	0.5	03/21/17 22:11	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:48	gss
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:11	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:48	gss
Cobalt, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:11	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:48	gss
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	03/21/17 22:11	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:48	gss
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/21/17 22:11	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/23/17 14:48	gss
Iron, total	M200.7 ICP	1	0.11			mg/L	0.02	0.05	03/21/17 22:11	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 17:16	mfm
Lead, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/29/17 15:13	enb
Lithium, dissolved	M200.7 ICP	1	0.035	B		mg/L	0.008	0.04	03/23/17 14:48	gss
Lithium, total	M200.7 ICP	1	0.043			mg/L	0.008	0.04	03/21/17 22:11	gss
Magnesium, dissolved	M200.7 ICP	1	10.5			mg/L	0.2	1	03/23/17 14:48	gss
Magnesium, total	M200.7 ICP	1	10.8			mg/L	0.2	1	03/21/17 22:11	gss
Manganese, dissolved	M200.7 ICP	1	0.015	B		mg/L	0.005	0.03	03/23/17 14:48	gss
Manganese, total	M200.7 ICP	1	0.036			mg/L	0.005	0.03	03/21/17 22:11	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:29	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 16:01	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/23/17 14:48	gss
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	03/21/17 22:11	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:48	gss
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	03/21/17 22:11	gss
Potassium, dissolved	M200.7 ICP	1	6.0			mg/L	0.2	1	03/23/17 14:48	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW9-E

ACZ Sample ID: **L36058-12**

Date Sampled: 03/14/17 12:30

Date Received: 03/17/17

Sample Matrix: *Surface Water*

Potassium, total	M200.7 ICP	1	6.3		mg/L	0.2	1	03/21/17 22:11	gss
Scandium, dissolved	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/23/17 14:48	gss
Scandium, total	M200.7 ICP	1		U *	mg/L	0.1	0.5	03/21/17 22:11	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0001	B	mg/L	0.0001	0.0003	03/29/17 17:16	mfm
Selenium, total	M200.8 ICP-MS	1	0.0002	B	mg/L	0.0001	0.0003	03/27/17 19:34	enb
Silver, dissolved	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	03/28/17 11:50	mfm
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	03/27/17 19:34	enb
Sodium, dissolved	M200.7 ICP	1	35.7		mg/L	0.2	1	03/23/17 14:48	gss
Sodium, total	M200.7 ICP	1	37.0		mg/L	0.2	1	03/21/17 22:11	gss
Strontium, dissolved	M200.7 ICP	1	0.604		mg/L	0.005	0.03	03/23/17 14:48	gss
Strontium, total	M200.7 ICP	1	0.638		mg/L	0.005	0.03	03/21/17 22:11	gss
Thallium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/29/17 17:16	mfm
Thallium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	03/27/17 19:34	enb
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	03/23/17 14:48	gss
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	03/21/17 22:11	gss
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	03/23/17 14:48	gss
Titanium, total	M200.7 ICP	1	0.011	B	mg/L	0.005	0.03	03/21/17 22:11	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B	mg/L	0.0001	0.0005	03/29/17 17:16	mfm
Uranium, total	M200.8 ICP-MS	1	0.0001	B	mg/L	0.0001	0.0005	03/27/17 19:34	enb
Vanadium, dissolved	M200.7 ICP	1	0.005	B	mg/L	0.005	0.03	03/23/17 14:48	gss
Vanadium, total	M200.7 ICP	1		U	mg/L	0.005	0.03	03/21/17 22:11	gss
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	03/23/17 14:48	gss
Zinc, total	M200.7 ICP	1		U	mg/L	0.01	0.05	03/21/17 22:11	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW9-E

ACZ Sample ID: **L36058-12**

Date Sampled: 03/14/17 12:30

Date Received: 03/17/17

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	93.3		*	mg/L	2	20	03/21/17 0:00	abd
Carbonate as CaCO3		1	3.4	B	*	mg/L	2	20	03/21/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/21/17 0:00	abd
Total Alkalinity		1	96.7		*	mg/L	2	20	03/21/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			04/03/17 0:00	calc
Sum of Anions			5.9			meq/L			04/03/17 0:00	calc
Sum of Cations			5.9			meq/L			04/03/17 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	03/28/17 12:31	emk
Chloride	SM4500Cl-E	1	29.6		*	mg/L	0.5	2	03/30/17 9:33	bce
Conductivity @25C	SM2510B	1	571		*	umhos/cm	1	10	03/21/17 17:20	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:28	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:11	pjb
Fluoride	SM4500F-C	1	0.39		*	mg/L	0.05	0.3	03/24/17 12:10	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		208			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	1.04		*	mg/L	0.02	0.1	03/28/17 23:31	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/23/17 15:04	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/29/17 22:52	pjb
pH (lab)	SM4500H+ B									
pH		1	8.4	H	*	units	0.1	0.1	03/21/17 0:00	abd
pH measured at		1	23.1		*	C	0.1	0.1	03/21/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		0.43			mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.14		*	mg/L	0.02	0.05	03/28/17 22:55	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.15	H	*	mg/L	0.02	0.05	03/18/17 14:29	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.14		*	mg/L	0.02	0.05	03/29/17 0:33	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	456		*	mg/L	10	20	03/20/17 10:39	keh
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 14:09	keh
Residue, Total (TS) @ 105C	SM2540B	1	484		*	mg/L	10	20	03/20/17 17:09	sck
Sulfate	D516-02/-07 - Turbidimetric	5	150		*	mg/L	5	25	03/29/17 10:15	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 15:28	emk
TDS (calculated)	Calculation		358			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.27						04/03/17 0:00	calc

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-01	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419607	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419611	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG420152	Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-02	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419607	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419611	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG420152	Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-03	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419607	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419611	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG420152	Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-04	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419607	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419611	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG420152	Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-05	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419607	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419611	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG420152	Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.

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			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-07	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
			SM4500Cl-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419607	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419611	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG420152	Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-09	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419921	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419607	Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420293	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	N1	See Case Narrative.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419611	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data

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					validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
WG419722		Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
WG420152		Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
WG419921		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
WG420236		Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
WG419767		Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
WG419607		Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-10	WG419780	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419921	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419780	Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG419780	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG419780	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420293	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	N1	See Case Narrative.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419780	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
			pH measured at	SM4500H+ B	Q6
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419654	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data

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					validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
WG419722		Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
WG420152		Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
WG419921		Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
WG420236		Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
WG419767		Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
WG419780		Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.
			SM2320B - Titration	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-11	WG419780	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419921	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419780	Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	Q6	Sample was received above recommended temperature.
			M410.4	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420317	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG419780	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG419780	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420293	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	N1	See Case Narrative.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419780	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419654	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG420152	Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M200.8 ICP-MS	RF	Relative Percent Difference (RPD) for Ag in spiked samples exceeded limit. In the absence of HCl, precipitation of Ag may occur at different rates.
	WG419921	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
			D516-02/-07 - Turbidimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419780	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.
			SM2320B - Titration	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-12	WG419780	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419921	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419780	Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420149	Chemical Oxygen Demand	M410.4	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M410.4	Q6	Sample was received above recommended temperature.
	WG420317	Chloride	SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419780	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG419780	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419945	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420293	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	N1	See Case Narrative.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419780	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG420215	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420218	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419654	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.

REPAD.15.06.05.01

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419921	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
			D516-02/-07 - Turbidimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419780	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.
			SM2320B - Titration	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4-E

ACZ Sample ID: **L36058-01**

Date Sampled: 03/14/17 14:35

Date Received: 03/17/17

Sample Matrix: *Surface Water***Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419924

Analyst: mmn

Extract Date: 03/21/17 14:37

Analysis Date: 03/22/17 19:56

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.97	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	77		0.97	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4-E

ACZ Sample ID: **L36058-01**

Date Sampled: 03/14/17 14:35

Date Received: 03/17/17

Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 11:28

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.03	*	mg/L	2.1	10.3

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW3-E

ACZ Sample ID: **L36058-02**

Date Sampled: 03/14/17 15:06

Date Received: 03/17/17

Sample Matrix: *Surface Water***Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419924

Analyst: mmn

Extract Date: 03/21/17 14:40

Analysis Date: 03/22/17 20:20

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.96	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	76.8		0.96	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW3-E

ACZ Sample ID: **L36058-02**

Date Sampled: 03/14/17 15:06

Date Received: 03/17/17

Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 11:43

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.03	*	mg/L	2.1	10.3

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW4A-E

ACZ Sample ID: **L36058-03**
Date Sampled: 03/14/17 16:40
Date Received: 03/17/17
Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419924

Analyst: mmn
Extract Date: 03/21/17 14:43
Analysis Date: 03/22/17 20:43

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1.27	*	mg/L	0.1	0.6
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	86.6		1.27	*	%	70	130

Tahoe Resources, Inc.Project ID: Escobal
Sample ID: SW4A-EACZ Sample ID: **L36058-03**
Date Sampled: 03/14/17 16:40
Date Received: 03/17/17
Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**
Extract Method:**Workgroup:** WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 11:58

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.1	*	mg/L	2.2	11

Tahoe Resources, Inc.Project ID: Escobal
Sample ID: SW2A-EACZ Sample ID: **L36058-04**
Date Sampled: 03/14/17 17:15
Date Received: 03/17/17
Sample Matrix: *Surface Water***Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**
Extract Method: **M3520****Workgroup: WG419924**Analyst: mmn
Extract Date: 03/21/17 14:46
Analysis Date: 03/22/17 21:06

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.35	J	0.94	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	86		0.94	*	%	70	130

Tahoe Resources, Inc.Project ID: Escobal
Sample ID: SW2A-EACZ Sample ID: **L36058-04**
Date Sampled: 03/14/17 17:15
Date Received: 03/17/17
Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**
Extract Method:**Workgroup:** WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 12:12

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.09	*	mg/L	2.2	10.9

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW11-E

ACZ Sample ID: **L36058-05**

Date Sampled: 03/14/17 17:15

Date Received: 03/17/17

Sample Matrix: *Surface Water***Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419924

Analyst: mmn

Extract Date: 03/21/17 14:49

Analysis Date: 03/22/17 21:30

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.4	J	1.05	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	86.2		1.05	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW11-E

ACZ Sample ID: **L36058-05**

Date Sampled: 03/14/17 17:15

Date Received: 03/17/17

Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 12:27

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.21	*	mg/L	2.4	12.1

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW10-E

ACZ Sample ID: **L36058-07**

Date Sampled: 03/14/17 12:00

Date Received: 03/17/17

Sample Matrix: *Surface Water***Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419924

Analyst: mmn

Extract Date: 03/21/17 14:55

Analysis Date: 03/22/17 22:16

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.93	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	84.9		0.93	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW10-E

ACZ Sample ID: **L36058-07**

Date Sampled: 03/14/17 12:00

Date Received: 03/17/17

Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 12:42

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	0.99	*	mg/L	2	9.9

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW5-E

ACZ Sample ID: **L36058-09**

Date Sampled: 03/14/17 8:40

Date Received: 03/17/17

Sample Matrix: *Surface Water***Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419924

Analyst: mmn

Extract Date: 03/21/17 15:01

Analysis Date: 03/22/17 23:27

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.93	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	85.2		0.93	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW5-E

ACZ Sample ID: **L36058-09**

Date Sampled: 03/14/17 8:40

Date Received: 03/17/17

Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 12:57

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1	*	mg/L	2	10

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW6-E

ACZ Sample ID: **L36058-10**

Date Sampled: 03/14/17 11:37

Date Received: 03/17/17

Sample Matrix: *Surface Water***Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419924

Analyst: mmn

Extract Date: 03/21/17 15:04

Analysis Date: 03/22/17 23:52

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1.01	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	85.6		1.01	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW6-E

ACZ Sample ID: **L36058-10**

Date Sampled: 03/14/17 11:37

Date Received: 03/17/17

Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 13:11

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.19	*	mg/L	2.4	11.9

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW8-E

ACZ Sample ID: **L36058-11**

Date Sampled: 03/14/17 10:30

Date Received: 03/17/17

Sample Matrix: *Surface Water***Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419924

Analyst: mmn

Extract Date: 03/21/17 15:07

Analysis Date: 03/23/17 0:16

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.2	J	1.1	*	mg/L	0.1	0.6
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	57.3		1.1	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW8-E

ACZ Sample ID: **L36058-11**

Date Sampled: 03/14/17 10:30

Date Received: 03/17/17

Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 13:26

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.25	*	mg/L	2.5	12.5

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW9-E

ACZ Sample ID: **L36058-12**
Date Sampled: 03/14/17 12:30
Date Received: 03/17/17
Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419924

Analyst: mmn
Extract Date: 03/21/17 15:10
Analysis Date: 03/23/17 0:39

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1.19	*	mg/L	0.1	0.6
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	82.8		1.19	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW9-E

ACZ Sample ID: **L36058-12**

Date Sampled: 03/14/17 12:30

Date Received: 03/17/17

Sample Matrix: *Surface Water***Oil & Grease, Total Recoverable**Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: WG419983

Analyst: ITM

Extract Date:

Analysis Date: 03/24/17 13:41

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.21	*	mg/L	2.4	12.1

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>LCL</i>	Lower Control Limit
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #4) Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>UCL</i>	Upper Control Limit
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>SURR</i>	Surrogate	<i>LFM</i>	Laboratory Fortified Matrix
<i>INTS</i>	Internal Standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>MS/MSD</i>	Matrix Spike/Matrix Spike Duplicate
<i>LCSW</i>	Laboratory Control Sample - Water	<i>PBS</i>	Prep Blank - Soil
<i>LFB</i>	Laboratory Fortified Blank	<i>PBW</i>	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
O	Analyte concentration is estimated due to result exceeding calibration range.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
J	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/4-90/020. Methods for the Determination of Organic Compounds in Drinking Water (I), July 1990.
- (3) EPA 600/R-92/129. Methods for the Determination of Organic Compounds in Drinking Water (II), July 1990.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Excluding Oil & Grease, solid & biological matrices for organic analyses are reported on a wet weight basis.
- (3) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (4) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-01	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-02	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-03	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-04	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-05	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-06	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L36058-07	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-08	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L36058-09	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-10	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-11	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	SA	Surrogate recovery was outside acceptance limits due to matrix interference.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-12	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Bismuth, dissolved	M200.7 ICP
Bismuth, total	M200.7 ICP
Gallium, dissolved	M200.7 ICP
Gallium, total	M200.7 ICP
Scandium, dissolved	M200.7 ICP
Scandium, total	M200.7 ICP

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L36058
 Date Received: 03/17/2017 09:49
 Received By:
 Date Printed: 3/17/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples? A change was made in the Invoice to, (COC1-4), Sample I.D. Line 1 (COC 1) section prior to ACZ custody.	X		

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time? Some parameters were received past hold time.		X	

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
2313	10.9	<=6.0	13	N/A
3914	8.3	<=6.0	13	N/A
4336	14	<=6.0	13	N/A
4612	12.7	<=6.0	14	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L36058
Date Received: 03/17/2017 09:49
Received By:
Date Printed: 3/17/2017

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc. C36058

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Blvd Los Próceres 18 calle 74-69 zona 14
Company: Minera San Rafael	Empresarial, Z Pradera Torre W Oficina 406
E-mail: MBerganza@sanrafael.com.gt	Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa Fernanda Barrios	E-mail: LBarrios@sanrafael.com.gt
Company: Minera San Rafael	Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza U Barrios	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Quote #:																			
PO#: El Escobal																			
Reporting state for compliance testing:																			
Check box if samples include NRC licensed material?																			
SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	SW															
SW12	14-03-17 16:30	SW	10	✓															
SW4-E	14-03-17 14:35	SW	10	-															
SW3-E	14-03-17 15:06	SW	10	-															
SW4A-E	14/03/17 16:40	SW	10	✓															

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC #1/4 Please present the results of all numbered COCs in one report.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Luisa Fernanda Barrios	15/03/17 08:00		15/3/17
Juan Aguilar	15-03-2017 08:50	Subyuy	10:40
			31/7/17 0949

36058 Chain of Custody



Laboratories, Inc. C36058

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza
Company: Minera San Rafael
E-mail: M.Berganza@sanrafael.com.gt

Address: Blvd los Proceres 13 calle 24-69 zona 16
Empresarial, 2 Pradera, Torre IV oficina 1406
Telephone: (502) 5951 52 48

Copy of Report to:

Name: Luisa Fernanda Barrios
Company: Minera San Rafael

E-mail: L.Barrios@sanrafael.com.gt
Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza LF Bamol
Company:
E-mail:

Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: [Signature] I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Table with columns: Quote #, PO#, Reporting state, Check box, SAMPLE IDENTIFICATION, DATE:TIME, Matrix, # of Containers, and analysis columns (SW, GWT, TPH).

4
5
6

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC# 2/4

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

Table with columns: RELINQUISHED BY, DATE:TIME, RECEIVED BY, DATE:TIME. Includes signatures and dates for Luisa Fernanda Barrios and Juan Aguilera.



Laboratories, Inc. L36058

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Blvd los Próceros B.calle 24-69 Z 10
Company: Minera San Rafael	Empresarial, 2 Pradera, Torre IV oficina 406
E-mail: M.Berganza@sanrafael.com.gt	Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa fernanda Barrios	E-mail: L.Barrios@sanrafael.com.gt
Company: Minera San Rafael	Telephone: (502) 5696-4268

Invoice to:

Name: Miguel Berganza LF Barrios	Address:
Company:	Telephone:
E-mail:	

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Barrios Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: *I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

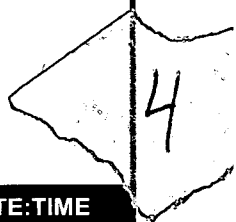
Quote #:	# of Containers	SW	GW	TPH																
PO#: 81 Escobal																				
Reporting state for compliance testing:																				
Check box if samples include NRC licensed material? <input type="checkbox"/>																				
SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	SW	GW	TPH														
SW10-E	14-03-17 12:00	SW	10	/																
PS17-SR	14-03-17 09:45	GW	8		/															
SW5-E	14-03-17 08:40	SW	10	/																

7
8
9

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC # 3/4



Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Luisa fernanda Barrios	15/03/17 08:00		15/3/17
Juan Aguilera	15-03-2017 08:50		10:40



Laboratories, Inc. C36058

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berquinza
Company: J Minera San Rafael
E-mail: M.Berquinza@sanrafael.com.gt

Address: Blvd los Pinos 18 calle 24-69 Z 10
Impresaria, 2 Piedad Torre U oficina 1406
Telephone: (502) 5951-5740

Copy of Report to:

Name: Luisa Fernanda Barrios
Company: Minera San Rafael

E-mail: L.Barrios@sanrafael.com.gt
Telephone: (502) 5696-4748

Invoice to:

Name: Miguel Berquinza LF Barrios
Company: J
E-mail:

Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Table with columns: Quote #, PO#, Reporting state, Check box, SAMPLE IDENTIFICATION, DATE:TIME, Matrix, # of Containers, and analysis results columns.

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC # 414

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

Table with columns: RELINQUISHED BY, DATE:TIME, RECEIVED BY, DATE:TIME. Includes signatures and dates for Luisa Fernanda Barrios and Subuyuj.



Guatemala March ¹⁵~~14~~th 2017

To whom it may concern:

Minera San Rafael, S.A is sending a case with samples of water, which is not contaminated, that are going to be analyzed by the ACZ Laboratories in Steamboat Springs, Colorado, USA.

If you have any question or doubt, please contact Miguel Berganza at Minera San Rafael, S.A. (502 - 5951-5248) or Sue Webber at ACZ Laboratories (970-879-6590).

Sincerely yours,

Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.

REG 016 Resultados de Análisis

Muestra: 5 muestras de agua

Análisis solicitado por: Ing. Miguel Berganza

Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa

Procedencia de la muestra: Proyecto Escobal

Fecha de muestreo: 140317

Fecha de ingreso de muestra: 140317

Fecha de análisis: 140317-230317

Fecha del informe: 230317

Resultados:

Correlativo Ecosistemas	Identificación de la Muestra	Color Aparente (UC HZ equiv. Unid. Pt-Co)	Color Real (UC HZ equiv. Unid. Pt-Co)	Demanda Bioquímica de Oxígeno DBO ₅ mg/l	* Demanda Química de Oxígeno DQO mg/l	* Cromo Hexavalente Cr(VI) mg/l	** Coliformes Fecales (NMP/100ml)
7632	SW10-E	5	< 1	< 10	< 25	N.D.	< 1.8
7633	SW5-E	101	< 1	< 10	< 25	N.D.	5.4 x 10 ³
7634	SW6-E	28	< 1	< 10	< 25	N.D.	4.9 x 10 ²
7635	SW8-E	215	< 1	21	47	N.D.	5.4 x 10 ⁶
7636	SW9-E	34	< 1	< 10	< 25	N.D.	1.3 x 10 ³

Notas:

Captación de muestras: Las muestras fueron captadas por personal ajeno a Ecosistemas Proyectos Ambientales.

Transporte y preservación de la muestra: Refrigeración.

Metodología: Espectrofotométricos / SMWW: Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977.

Fotométricos Merck. NMP: Número más probable.

N.D. No detectable. Debajo del límite de detección.

Límites de detección: Cromo hexavalente (0.05 mg/l).

Los resultados obtenidos corresponden únicamente a las muestras recibidas por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

* Análisis acreditado COGUANOR NGR/COPANT/ISO/IEC 17025 según OGA LE 006-04

** Análisis referidos a laboratorio acreditado.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

REG 016 Resultados de Análisis

Ref 661-17

Pág 1/1

Muestra: 5 muestras de agua

Análisis solicitado por: Ing. Miguel Berganza

Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores, Santa Rosa

Procedencia de la muestra: Proyecto Escobal

Fecha de muestreo: 140317

Fecha de ingreso de muestra: 150317

Fecha de análisis: 150317-240317

Fecha del informe: 240317

Resultados:

Correlativo Ecosistemas	Identificación de la Muestra	Color Aparente (UC HZ equiv. Unid. Pt-Co)	Color Real (UC HZ equiv. Unid. Pt-Co)	Demanda Bioquímica de Oxígeno DBO ₅ mg/l	* Demanda Química de Oxígeno DQO mg/l	* Cromo Hexavalente Cr(VI) mg/l	** Coliformes Fecales (NMP/100ml)
7642	SW2A-E	73	< 1	< 10	27	N.D.	7.0 x 10 ²
7643	SW11-E	53	< 1	< 10	< 25	N.D.	7.0 x 10 ²
7644	SW4A-E	63	< 1	< 10	27	N.D.	1.6 x 10 ⁴
7645	SW4-E	48	< 1	< 10	< 25	N.D.	1.6 x 10 ⁴
7646	SW3-E	39	< 1	< 10	< 25	N.D.	9.4 x 10 ²

Notas:

Captación de muestras: Las muestras fueron captadas por personal ajeno a Ecosistemas Proyectos Ambientales.

Transporte y preservación de la muestra: Refrigeración.

Metodología: Espectrofotométricos / SMWW: Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977.

Fotométricos Merck. NMP: Número más probable.

N.D. No detectable. Debajo del límite de detección.

Límites de detección: Cromo hexavalente (0.05 mg/l).

Los resultados obtenidos corresponden únicamente a las muestras recibidas por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

* Análisis acreditado COGUANOR NGR/COPANT/ISO/IEC 17025 según OGA LE 006-04

** Análisis referidos a laboratorio acreditado.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

12.5.2 Muestras de Agua Subterránea (GW) pozos de monitoreo y suministro

March 23, 2017

Report to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Luisa Fernanda Barrios

Project ID: Escobal

ACZ Project ID: L35931

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 10, 2017. This project has been assigned to ACZ's project number, L35931. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L35931. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

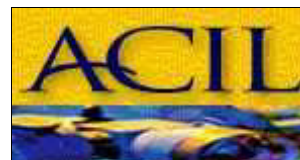
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 22, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

March 23, 2017

Project ID: Escobal

ACZ Project ID: L35931

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 4 ground water samples from Tahoe Resources, Inc. on March 10, 2017. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L35931. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for parameters flagged with an "H3", received after the hold time had expired.

Sample Analysis

These samples were analyzed for inorganic, organic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

1. For samples with a TDS ratio over 1.2 and a TDS value greater than 150 mg/L, the samples were not retested based on historical re-analysis data and the sample matrix.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 2

ACZ Sample ID: **L35931-01**
Date Sampled: 03/06/17 14:20
Date Received: 03/10/17
Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 10:19	bce
Cyanide, WAD	SM4500-CN I- distillation								03/14/17 14:04	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/15/17 16:15	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:07	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/13/17 17:45	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.16	B		mg/L	0.03	0.2	03/15/17 14:01	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0008	B		mg/L	0.0004	0.002	03/21/17 14:40	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0184			mg/L	0.0002	0.001	03/21/17 14:40	enb
Barium, dissolved	M200.7 ICP	1	0.091			mg/L	0.003	0.02	03/15/17 14:01	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:01	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:01	aeb
Boron, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	03/15/17 14:01	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:40	enb
Calcium, dissolved	M200.7 ICP	1	12.2			mg/L	0.1	0.5	03/15/17 14:01	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:01	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 12:57	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:01	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:01	aeb
Iron, dissolved	M200.7 ICP	1	0.15			mg/L	0.02	0.05	03/15/17 14:01	aeb
Lead, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	03/21/17 14:40	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:01	aeb
Magnesium, dissolved	M200.7 ICP	1	2.3			mg/L	0.2	1	03/15/17 14:01	aeb
Manganese, dissolved	M200.7 ICP	1	0.213			mg/L	0.005	0.03	03/15/17 14:01	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:03	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:01	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:01	aeb
Potassium, dissolved	M200.7 ICP	1	2.3			mg/L	0.2	1	03/15/17 14:01	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:01	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/21/17 14:40	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 14:40	enb
Sodium, dissolved	M200.7 ICP	1	6.2		*	mg/L	0.2	1	03/15/17 14:01	aeb
Strontium, dissolved	M200.7 ICP	1	0.098			mg/L	0.005	0.03	03/15/17 14:01	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:40	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:01	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:01	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:40	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:01	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:01	aeb

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: GW 2

ACZ Sample ID: **L35931-01**
 Date Sampled: 03/06/17 14:20
 Date Received: 03/10/17
 Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	49.4		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	49.4		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-4.0			%			03/23/17 0:00	calc
Sum of Anions			1.3			meq/L			03/23/17 0:00	calc
Sum of Cations			1.2			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	2.7		*	mg/L	0.5	2	03/20/17 11:47	spl
Conductivity @25C	SM2510B	1	121		*	umhos/cm	1	10	03/11/17 0:20	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 14:57	bsu
Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/14/17 16:30	bsu
Fluoride	SM4500F-C	1	0.21	B	*	mg/L	0.05	0.3	03/16/17 12:51	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		40			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/18/17 13:34	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/13/17 14:05	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	1.4		*	mg/L	0.1	0.5	03/16/17 11:25	spl
pH (lab)	SM4500H+ B									
pH		1	8.0	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.8		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		0.12	B		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	03/16/17 16:57	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.03	BH	*	mg/L	0.02	0.05	03/10/17 20:35	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 16:17	bce
Residue, Filterable (TDS) @180C	SM2540C	1	160		*	mg/L	10	20	03/11/17 12:34	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1	23.0		*	mg/L	5	20	03/10/17 14:22	keh
Residue, Total (TS) @ 105C	SM2540B	1	178		*	mg/L	10	20	03/11/17 12:13	emk
Sulfate	D516-02/-07 - Turbidimetric	1	10.4		*	mg/L	1	5	03/21/17 13:26	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 16:25	emk
TDS (calculated)	Calculation		67.1			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		2.38						03/23/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 10

ACZ Sample ID: **L35931-02**
Date Sampled: 03/06/17 12:00
Date Received: 03/10/17
Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 10:26	bce
Cyanide, WAD	SM4500-CN I- distillation								03/14/17 14:14	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/15/17 16:30	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:13	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/13/17 17:50	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 14:04	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/21/17 14:42	enb
Arsenic, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	03/21/17 14:42	enb
Barium, dissolved	M200.7 ICP	1		U		mg/L	0.003	0.02	03/15/17 14:04	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:04	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:04	aeb
Boron, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	03/15/17 14:04	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:42	enb
Calcium, dissolved	M200.7 ICP	1		U		mg/L	0.1	0.5	03/15/17 14:04	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:04	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 13:00	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:04	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:04	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/15/17 14:04	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:42	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:04	aeb
Magnesium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	03/15/17 14:04	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:04	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:06	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:04	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:04	aeb
Potassium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	03/15/17 14:04	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:04	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/21/17 14:42	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 14:42	enb
Sodium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	03/15/17 14:04	aeb
Strontium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:04	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:42	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:04	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:04	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:42	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:04	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:04	aeb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 10

ACZ Sample ID: **L35931-02**
Date Sampled: 03/06/17 12:00
Date Received: 03/10/17
Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			n/a			%			03/23/17 0:00	calc
Sum of Anions			N/A			meq/L			03/23/17 0:00	calc
Sum of Cations				U		meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1		U	*	mg/L	0.5	2	03/20/17 11:47	spl
Conductivity @25C	SM2510B	1	2.5	B	*	umhos/cm	1	10	03/11/17 0:28	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 14:58	bsu
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/14/17 16:31	bsu
Fluoride	SM4500F-C	1		U	*	mg/L	0.05	0.3	03/16/17 12:59	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation			U		mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/18/17 13:35	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/13/17 14:07	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/16/17 11:26	spl
pH (lab)	SM4500H+ B									
pH		1	6.7	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.7		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 16:58	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/10/17 20:37	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.11		*	mg/L	0.02	0.05	03/16/17 16:37	bce
Residue, Filterable (TDS) @180C	SM2540C	1		U	*	mg/L	10	20	03/11/17 12:36	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/10/17 14:24	keh
Residue, Total (TS) @ 105C	SM2540B	1		U	*	mg/L	10	20	03/11/17 12:15	emk
Sulfate	D516-02/-07 - Turbidimetric	1		U	*	mg/L	1	5	03/21/17 13:26	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 16:33	emk
TDS (calculated)	Calculation					mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		n/a						03/23/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 3

ACZ Sample ID: **L35931-03**
Date Sampled: 03/06/17 15:15
Date Received: 03/10/17
Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 10:33	bce
Cyanide, WAD	SM4500-CN I- distillation								03/14/17 14:23	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/20/17 10:20	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:18	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/13/17 17:55	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 14:07	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/21/17 14:44	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0015			mg/L	0.0002	0.001	03/21/17 14:44	enb
Barium, dissolved	M200.7 ICP	1	0.120			mg/L	0.003	0.02	03/15/17 14:07	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:07	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:07	aeb
Boron, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	03/15/17 14:07	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:44	enb
Calcium, dissolved	M200.7 ICP	1	82.4			mg/L	0.1	0.5	03/15/17 14:07	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:07	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 13:03	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:07	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:07	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/15/17 14:07	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:44	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:07	aeb
Magnesium, dissolved	M200.7 ICP	1	19.0			mg/L	0.2	1	03/15/17 14:07	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:07	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:07	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:07	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:07	aeb
Potassium, dissolved	M200.7 ICP	1	9.4			mg/L	0.2	1	03/15/17 14:07	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:07	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0006			mg/L	0.0001	0.0003	03/21/17 14:44	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 14:44	enb
Sodium, dissolved	M200.7 ICP	1	23.6			mg/L	0.2	1	03/15/17 14:07	aeb
Strontium, dissolved	M200.7 ICP	1	0.442			mg/L	0.005	0.03	03/15/17 14:07	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:44	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:07	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:07	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:44	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:07	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:07	aeb

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: GW 3

ACZ Sample ID: **L35931-03**
 Date Sampled: 03/06/17 15:15
 Date Received: 03/10/17
 Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	77.5		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	77.5		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-1.4			%			03/23/17 0:00	calc
Sum of Anions			7.2			meq/L			03/23/17 0:00	calc
Sum of Cations			7			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	22.8		*	mg/L	0.5	2	03/20/17 11:47	spl
Conductivity @25C	SM2510B	1	684		*	umhos/cm	1	10	03/11/17 0:37	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 15:00	bsu
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/14/17 16:32	bsu
Fluoride	SM4500F-C	1	0.19	B	*	mg/L	0.05	0.3	03/16/17 13:06	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		284			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	5.09		*	mg/L	0.06	0.3	03/18/17 14:15	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/13/17 14:08	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/22/17 23:49	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.5		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 16:59	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/10/17 20:38	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 16:21	bce
Residue, Filterable (TDS) @180C	SM2540C	1	582		*	mg/L	10	20	03/11/17 12:39	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/10/17 14:27	keh
Residue, Total (TS) @ 105C	SM2540B	1	582		*	mg/L	10	20	03/11/17 12:18	emk
Sulfate	D516-02/-07 - Turbidimetric	10	240		*	mg/L	10	50	03/21/17 13:47	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 16:57	emk
TDS (calculated)	Calculation		445			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.31						03/23/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 11

ACZ Sample ID: **L35931-04**
Date Sampled: 03/06/17 15:15
Date Received: 03/10/17
Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 10:40	bce
Cyanide, WAD	SM4500-CN I- distillation								03/14/17 14:33	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/20/17 10:40	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:24	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/13/17 18:00	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.03	0.2	03/15/17 14:16	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/21/17 14:46	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0013			mg/L	0.0002	0.001	03/21/17 14:46	enb
Barium, dissolved	M200.7 ICP	1	0.121			mg/L	0.003	0.02	03/15/17 14:16	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:16	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:16	aeb
Boron, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	03/15/17 14:16	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:46	enb
Calcium, dissolved	M200.7 ICP	1	83.8			mg/L	0.1	0.5	03/15/17 14:16	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:16	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 13:12	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:16	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:16	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/15/17 14:16	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:46	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:16	aeb
Magnesium, dissolved	M200.7 ICP	1	19.2			mg/L	0.2	1	03/15/17 14:16	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:16	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:07	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:16	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:16	aeb
Potassium, dissolved	M200.7 ICP	1	9.6			mg/L	0.2	1	03/15/17 14:16	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:16	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0007			mg/L	0.0001	0.0003	03/21/17 14:46	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 14:46	enb
Sodium, dissolved	M200.7 ICP	1	24.1			mg/L	0.2	1	03/15/17 14:16	aeb
Strontium, dissolved	M200.7 ICP	1	0.450			mg/L	0.005	0.03	03/15/17 14:16	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:46	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:16	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:16	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:46	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:16	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:16	aeb

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: GW 11

ACZ Sample ID: **L35931-04**

Date Sampled: 03/06/17 15:15

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	76.8		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	76.8		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-0.7			%			03/23/17 0:00	calc
Sum of Anions			7.2			meq/L			03/23/17 0:00	calc
Sum of Cations			7.1			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	22.5		*	mg/L	0.5	2	03/20/17 11:47	spl
Conductivity @25C	SM2510B	1	686		*	umhos/cm	1	10	03/11/17 0:46	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 15:04	bsu
Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/14/17 16:33	bsu
Fluoride	SM4500F-C	1	0.17	B	*	mg/L	0.05	0.3	03/16/17 13:30	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		288			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	5.12		*	mg/L	0.06	0.3	03/18/17 14:16	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/13/17 14:10	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/22/17 23:52	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.4		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 17:03	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/10/17 20:39	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 16:22	bce
Residue, Filterable (TDS) @180C	SM2540C	1	564		*	mg/L	10	20	03/11/17 12:41	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/10/17 14:29	keh
Residue, Total (TS) @ 105C	SM2540B	1	582		*	mg/L	10	20	03/11/17 12:20	emk
Sulfate	D516-02/-07 - Turbidimetric	10	237		*	mg/L	10	50	03/21/17 13:47	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 17:05	emk
TDS (calculated)	Calculation		444			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.27						03/23/17 0:00	calc



Report Header Explanations

Table with 2 columns: Term (Batch, Found, Limit, Lower, MDL, PCN/SCN, PQL, QC, Rec, RPD, Upper, Sample) and Description.

QC Sample Types

Table with 4 columns: Code (AS, ASD, CCB, CCV, DUP, ICB, ICV, ICSAB, LCSS, LCSSD, LCSW), Description, Code (LCSWD, LFB, LFM, LFMD, LRB, MS, MSD, PBS, PBW, PQV, SDL), and Description.

QC Sample Type Explanations

Table with 2 columns: Type (Blanks, Control Samples, Duplicates, Spikes/Fortified Matrix, Standard) and Explanation.

ACZ Qualifiers (Qual)

Table with 2 columns: Qualifier (B, H, L, U) and Description.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35931-01	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
	WG419411	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419319	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419511	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
			pH measured at	SM4500H+ B	Q6
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419544	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
	WG419288	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419456	Sodium, dissolved	M200.7 ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG419778	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419266	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	QD	Reported value is the background-corrected concentration, as described by the method.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35931-02	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419411	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419319	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419511	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419544	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
	WG419288	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
WG419289		Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
WG419778		Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
WG419266		Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
WG419276		Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35931-03	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
	WG419411	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419319	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419883	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
			pH measured at	SM4500H+ B	Q6
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419544	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
	WG419288	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	sample is too low for accurate evaluation (< 10x MDL). Sample was received above recommended temperature.
	WG419778	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419266	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35931-04	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419411	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419319	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419883	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419544	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
	WG419288	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419778	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419266	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 2

ACZ Sample ID: **L35931-01**
Date Sampled: 03/06/17 14:20
Date Received: 03/10/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419484

Analyst: MMN
Extract Date: 03/13/17 9:54
Analysis Date: 03/14/17 22:05

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.1	J	0.95	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	72.8		0.95	*	%	70	130

Tahoe Resources, Inc.Project ID: Escobal
Sample ID: GW 10ACZ Sample ID: **L35931-02**
Date Sampled: 03/06/17 12:00
Date Received: 03/10/17
Sample Matrix: Ground Water**Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**
Extract Method: **M3520****Workgroup:** WG419484Analyst: MMN
Extract Date: 03/13/17 9:56
Analysis Date: 03/14/17 22:28

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.93	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	76.3		0.93	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 3

ACZ Sample ID: **L35931-03**
Date Sampled: 03/06/17 15:15
Date Received: 03/10/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419484

Analyst: MMN
Extract Date: 03/13/17 9:57
Analysis Date: 03/14/17 22:52

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.94	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	77.1		0.94	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 11

ACZ Sample ID: **L35931-04**
Date Sampled: 03/06/17 15:15
Date Received: 03/10/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419484

Analyst: MMN
Extract Date: 03/13/17 9:59
Analysis Date: 03/14/17 23:15

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.95	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	64.2		0.95	*	%	70	130

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>LCL</i>	Lower Control Limit
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #4) Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>UCL</i>	Upper Control Limit
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>SURR</i>	Surrogate	<i>LFM</i>	Laboratory Fortified Matrix
<i>INTS</i>	Internal Standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>MS/MSD</i>	Matrix Spike/Matrix Spike Duplicate
<i>LCSW</i>	Laboratory Control Sample - Water	<i>PBS</i>	Prep Blank - Soil
<i>LFB</i>	Laboratory Fortified Blank	<i>PBW</i>	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
O	Analyte concentration is estimated due to result exceeding calibration range.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
J	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/4-90/020. Methods for the Determination of Organic Compounds in Drinking Water (I), July 1990.
- (3) EPA 600/R-92/129. Methods for the Determination of Organic Compounds in Drinking Water (II), July 1990.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Excluding Oil & Grease, solid & biological matrices for organic analyses are reported on a wet weight basis.
- (3) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (4) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

ACZ Project ID: **L35931**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35931-01	WG419484	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35931-02	WG419484	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35931-03	WG419484	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35931-04	WG419484	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	S7	Surrogate recovery was below laboratory and method acceptance limits. Unable to confirm matrix effect.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.

ACZ Project ID: **L35931**

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Bismuth, dissolved	M200.7 ICP
Gallium, dissolved	M200.7 ICP
Scandium, dissolved	M200.7 ICP

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L35931
 Date Received: 03/10/2017 09:53
 Received By:
 Date Printed: 3/10/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples? A change was made in the Sample I.D. Line 1 section prior to ACZ custody.	X		

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time? Some parameters were received past hold time.		X	

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4269	11.1	<=6.0	13	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L35931
Date Received: 03/10/2017 09:53
Received By:
Date Printed: 3/10/2017

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc. L35931

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Blvd Los Proceres 18 calle 24-69 zona 10
Company: Minera San Rafael	Empresarial, 2 Pradera Torre 14 oficina 1406
E-mail: M.Berganza@sanrafael.com.gt	Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa Fernanda Barrios	E-mail: L.Barrios@sanrafael.com.gt
Company: Minera San Rafael	Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: IF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: [Signature] *I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Quote #:																			
PO#: C1 Escoba!																			
Reporting state for compliance testing:																			
Check box if samples include NRC licensed material?																			
SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	SW	GW+TPH														
UGS-16-052	04-03-17 10:15	GW	10																
GW 2	06-03-17 14:20	GW	8		-														
GW 10	06-03-17 12:00	GW	8		-														
GW 3	06-03-17 15:15	GW	8		-														
GW 11	06-03-17 15:15	GW	8		-														

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

EMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Luisa Fernanda Barrios	07/05/17 08:00	[Signature]	07/13/17
[Signature]	07-03-2017 08:00	[Signature]	10:00 AM
			3/10/17 0955

135931 Chain of Custody

MINERA 
SAN RAFAEL

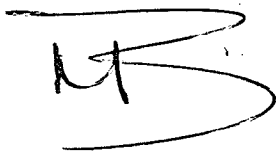
Guatemala March 7th 2017

To whom it may concern:

Minera San Rafael, S.A is sending a case with samples of water, which is not contaminated, that are going to be analyzed by the ACZ Laboratories in Steamboat Springs, Colorado, USA.

If you have any question or doubt, please contact Miguel Berganza at Minera San Rafael, S.A. (502 - 5951-5248) or Sue Webber at ACZ Laboratories (970-879-6590).

Sincerely yours,



Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.



ECOSISTEMAS
PROYECTOS AMBIENTALES

LABORATORIO AMBIENTAL E INDUSTRIAL

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REG 016 Resultados de Análisis

Ref 529-17

Pág 1/1

Muestras: 4 muestras de agua
Análisis solicitado por: Ing. Miguel Berganza
Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa
Procedencia de la muestra: Proyecto Escobal
Fecha de muestreo: 060317
Fecha de ingreso de muestra: 070317
Fecha de análisis: 070317-160317
Fecha del informe: 160317

Resultados:

Correlativo Ecosistemas	Identificación de la Muestra	Color Aparente (UC HZ equiv. Unid. Pt-Co)	Color Real (UC HZ equiv. Unid. Pt-Co)	* Cromo Hexavalente Cr(VI) mg/l	** Coliformes Fecales (NMP/100ml)
7460	GW-2	437	27	N.D.	4.9×10^2
7462	GW-3	< 1	< 1	N.D.	23
7463	GW-11	< 1	< 1	N.D.	< 1.8
7465	GW-10	< 1	< 1	N.D.	< 1.8

Notas:

Captación de muestras: Las muestras fueron captadas por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración.

Metodología: Espectrofotométricos / SMWW: Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977.

Fotométricos Merck. NMP: Número más probable.

N.D. No detectable. Debajo del límite de detección.

Límites de detección: Cromo hexavalente (0.05 mg/l)

Los resultados obtenidos corresponden únicamente a las muestras recibidas por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

* Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04

** Análisis referidos a laboratorio acreditado.

Ing. Oscar Páez
Gerente Técnico

VoBo Ing. Fernando Fuentes
Gerente de Calidad

March 23, 2017

Report to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Luisa Fernanda Barrios

Project ID: Escobal

ACZ Project ID: L35930

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 10, 2017. This project has been assigned to ACZ's project number, L35930. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L35930. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

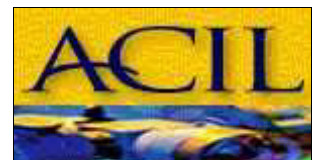
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 22, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-20

ACZ Sample ID: **L35930-01**

Date Sampled: 03/07/17 12:00

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 9:57	bce
Cyanide, WAD	SM4500-CN I- distillation		-						03/14/17 13:17	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/15/17 15:30	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 15:40	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/13/17 17:30	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/14/17 16:43	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/20/17 17:02	mfm
Arsenic, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	03/20/17 17:02	mfm
Barium, dissolved	M200.7 ICP	1		U		mg/L	0.003	0.02	03/14/17 16:43	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:43	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/14/17 16:43	aeb
Boron, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:43	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:02	mfm
Calcium, dissolved	M200.7 ICP	1		U		mg/L	0.1	0.5	03/14/17 16:43	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:43	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 11:54	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:43	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/14/17 16:43	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/14/17 16:43	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:02	mfm
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/14/17 16:43	aeb
Magnesium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	03/14/17 16:43	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/14/17 16:43	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:00	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/14/17 16:43	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/14/17 16:43	aeb
Potassium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	03/14/17 16:43	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/14/17 16:43	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/20/17 17:02	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 17:33	mfm
Sodium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	03/14/17 16:43	aeb
Strontium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/14/17 16:43	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:02	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/14/17 16:43	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/14/17 16:43	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:02	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/14/17 16:43	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:43	aeb

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-20

ACZ Sample ID: **L35930-01**
 Date Sampled: 03/07/17 12:00
 Date Received: 03/10/17
 Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1		U		mg/L	2	20	03/10/17 0:00	abd
Carbonate as CaCO3		1		U		mg/L	2	20	03/10/17 0:00	abd
Hydroxide as CaCO3		1		U		mg/L	2	20	03/10/17 0:00	abd
Total Alkalinity		1		U		mg/L	2	20	03/10/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			n/a			%			03/23/17 0:00	calc
Sum of Anions			0.134	B		meq/L			03/23/17 0:00	calc
Sum of Cations				U		meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1		U	*	mg/L	0.5	2	03/20/17 11:47	spl
Conductivity @25C	SM2510B	1	2.5	B		umhos/cm	1	10	03/10/17 23:52	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 14:53	bsu
Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/14/17 16:24	bsu
Fluoride	SM4500F-C	1		U	*	mg/L	0.05	0.3	03/16/17 12:37	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation			U		mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/18/17 13:28	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/13/17 14:34	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/16/17 11:44	spl
pH (lab)	SM4500H+ B									
pH		1	6.6	H		units	0.1	0.1	03/10/17 0:00	abd
pH measured at		1	23.3			C	0.1	0.1	03/10/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 16:52	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/10/17 20:30	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/22/17 22:47	pjb
Residue, Filterable (TDS) @180C	SM2540C	1		U		mg/L	10	20	03/11/17 12:44	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/10/17 14:11	keh
Residue, Total (TS) @105C	SM2540B	1		U		mg/L	10	20	03/11/17 12:05	emk
Sulfate	D516-02/-07 - Turbidimetric	1	6.4		*	mg/L	1	5	03/21/17 13:26	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 16:01	emk
TDS (calculated)	Calculation		6.4			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		n/a						03/23/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-21

ACZ Sample ID: **L35930-02**

Date Sampled: 03/07/17 15:10

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 10:04	bce
Cyanide, WAD	SM4500-CN I- distillation								03/14/17 13:26	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/15/17 15:45	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 15:51	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/13/17 17:35	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/14/17 16:53	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/20/17 17:11	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0006	B		mg/L	0.0002	0.001	03/20/17 17:11	mfm
Barium, dissolved	M200.7 ICP	1	0.038			mg/L	0.003	0.02	03/14/17 16:53	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:53	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/14/17 16:53	aeb
Boron, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.01	0.05	03/14/17 16:53	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:11	mfm
Calcium, dissolved	M200.7 ICP	1	49.8			mg/L	0.1	0.5	03/14/17 16:53	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:53	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 12:04	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:53	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/14/17 16:53	aeb
Iron, dissolved	M200.7 ICP	1	1.17			mg/L	0.02	0.05	03/14/17 16:53	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:11	mfm
Lithium, dissolved	M200.7 ICP	1	0.012	B		mg/L	0.008	0.04	03/14/17 16:53	aeb
Magnesium, dissolved	M200.7 ICP	1	7.9			mg/L	0.2	1	03/14/17 16:53	aeb
Manganese, dissolved	M200.7 ICP	1	0.045			mg/L	0.005	0.03	03/14/17 16:53	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:01	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/14/17 16:53	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/14/17 16:53	aeb
Potassium, dissolved	M200.7 ICP	1	4.2			mg/L	0.2	1	03/14/17 16:53	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/14/17 16:53	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/20/17 17:11	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 17:36	mfm
Sodium, dissolved	M200.7 ICP	1	24.1			mg/L	0.2	1	03/14/17 16:53	aeb
Strontium, dissolved	M200.7 ICP	1	0.371			mg/L	0.005	0.03	03/14/17 16:53	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:11	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/14/17 16:53	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/14/17 16:53	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:11	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/14/17 16:53	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:53	aeb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-21

ACZ Sample ID: **L35930-02**

Date Sampled: 03/07/17 15:10

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	146			mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1	5.6	B		mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U		mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	151			mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			1.1			%			03/23/17 0:00	calc
Sum of Anions			4.3			meq/L			03/23/17 0:00	calc
Sum of Cations			4.4			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	9.2		*	mg/L	0.5	2	03/20/17 11:47	spl
Conductivity @25C	SM2510B	1	406			umhos/cm	1	10	03/11/17 0:01	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 14:54	bsu
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/14/17 16:25	bsu
Fluoride	SM4500F-C	1	0.56		*	mg/L	0.05	0.3	03/16/17 12:45	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		157			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/18/17 13:30	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/13/17 14:00	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/16/17 11:23	spl
pH (lab)	SM4500H+ B									
pH		1	8.4	H		units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.5			C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		00.16	B		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.05		*	mg/L	0.02	0.05	03/16/17 16:54	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.06	H	*	mg/L	0.02	0.05	03/10/17 20:32	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 16:15	bce
Residue, Filterable (TDS) @180C	SM2540C	2	284			mg/L	20	40	03/11/17 12:47	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1	5.0	B	*	mg/L	5	20	03/10/17 14:16	keh
Residue, Total (TS) @ 105C	SM2540B	2	292			mg/L	20	40	03/11/17 12:07	emk
Sulfate	D516-02/-07 - Turbidimetric	5	46.7		*	mg/L	5	25	03/21/17 13:32	spl
Sulfide as S	SM4500S2-D	1	0.04	B	*	mg/L	0.02	0.1	03/10/17 16:09	emk
TDS (calculated)	Calculation		236			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.20						03/23/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-11

ACZ Sample ID: **L35930-03**

Date Sampled: 03/07/17 16:20

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 10:12	bce
Cyanide, WAD	SM4500-CN I- distillation								03/14/17 13:45	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/15/17 16:00	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:02	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/13/17 17:40	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/14/17 16:56	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0004	0.002	03/20/17 17:14	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0027			mg/L	0.0002	0.001	03/20/17 17:14	mfm
Barium, dissolved	M200.7 ICP	1	0.020			mg/L	0.003	0.02	03/14/17 16:56	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:56	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/14/17 16:56	aeb
Boron, dissolved	M200.7 ICP	1	0.17			mg/L	0.01	0.05	03/14/17 16:56	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:14	mfm
Calcium, dissolved	M200.7 ICP	1	217			mg/L	0.1	0.5	03/14/17 16:56	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:56	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 12:07	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:56	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/14/17 16:56	aeb
Iron, dissolved	M200.7 ICP	1	0.96			mg/L	0.02	0.05	03/14/17 16:56	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:14	mfm
Lithium, dissolved	M200.7 ICP	1	0.074			mg/L	0.008	0.04	03/14/17 16:56	aeb
Magnesium, dissolved	M200.7 ICP	1	31.9			mg/L	0.2	1	03/14/17 16:56	aeb
Manganese, dissolved	M200.7 ICP	1	0.015	B		mg/L	0.005	0.03	03/14/17 16:56	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:02	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/14/17 16:56	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/14/17 16:56	aeb
Potassium, dissolved	M200.7 ICP	1	4.1			mg/L	0.2	1	03/14/17 16:56	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/14/17 16:56	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0003	03/20/17 17:14	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 17:39	mfm
Sodium, dissolved	M200.7 ICP	1	64.3			mg/L	0.2	1	03/14/17 16:56	aeb
Strontium, dissolved	M200.7 ICP	1	2.03			mg/L	0.005	0.03	03/14/17 16:56	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/20/17 17:14	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/14/17 16:56	aeb
Titanium, dissolved	M200.7 ICP	1	0.010	B		mg/L	0.005	0.03	03/14/17 16:56	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0005	03/20/17 17:14	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/14/17 16:56	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/14/17 16:56	aeb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-11

ACZ Sample ID: **L35930-03**

Date Sampled: 03/07/17 16:20

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	149			mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U		mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U		mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	149			mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-2.9			%			03/23/17 0:00	calc
Sum of Anions			18			meq/L			03/23/17 0:00	calc
Sum of Cations			17			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	57.3		*	mg/L	0.5	2	03/20/17 11:47	spl
Conductivity @25C	SM2510B	1	1450			umhos/cm	1	10	03/11/17 0:11	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 14:57	bsu
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/14/17 16:27	bsu
Fluoride	SM4500F-C	1	2.49		*	mg/L	0.05	0.3	03/16/17 12:48	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		673			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/18/17 13:33	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/13/17 14:04	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/16/17 11:47	spl
pH (lab)	SM4500H+ B									
pH		1	8.2	H		units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.7			C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 16:56	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/10/17 20:34	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.22		*	mg/L	0.02	0.05	03/16/17 16:16	bce
Residue, Filterable (TDS) @180C	SM2540C	1	1230			mg/L	10	20	03/11/17 12:49	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/10/17 14:19	keh
Residue, Total (TS) @105C	SM2540B	1	1250			mg/L	10	20	03/11/17 12:10	emk
Sulfate	D516-02/-07 - Turbidimetric	20	648		*	mg/L	20	100	03/21/17 13:54	spl
Sulfide as S	SM4500S2-D	1	0.10		*	mg/L	0.02	0.1	03/10/17 16:17	emk
TDS (calculated)	Calculation		1120			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.10						03/23/17 0:00	calc



Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L35930**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35930-01	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419411	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419319	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419511	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419881	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419778	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419266	Sulfide as S	SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L35930**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35930-02	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419411	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419319	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419511	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419544	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419778	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419266	Sulfide as S	SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L35930**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35930-03	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419411	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419319	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419511	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419544	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419778	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419266	Sulfide as S	SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-20

ACZ Sample ID: **L35930-01**
Date Sampled: 03/07/17 12:00
Date Received: 03/10/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419484

Analyst: MMN
Extract Date: 03/13/17 9:49
Analysis Date: 03/14/17 20:55

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.99	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	76.3		0.99		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-21

ACZ Sample ID: **L35930-02**

Date Sampled: 03/07/17 15:10

Date Received: 03/10/17

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419484

Analyst: MMN

Extract Date: 03/13/17 9:51

Analysis Date: 03/14/17 21:18

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.8		1.05	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	451.4		1.05	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-11

ACZ Sample ID: **L35930-03**

Date Sampled: 03/07/17 16:20

Date Received: 03/10/17

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419484

Analyst: MMN

Extract Date: 03/13/17 9:52

Analysis Date: 03/14/17 21:42

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1.02	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	76.7		1.02		%	70	130

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>LCL</i>	Lower Control Limit
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #4) Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>UCL</i>	Upper Control Limit
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>SURR</i>	Surrogate	<i>LFM</i>	Laboratory Fortified Matrix
<i>INTS</i>	Internal Standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>MS/MSD</i>	Matrix Spike/Matrix Spike Duplicate
<i>LCSW</i>	Laboratory Control Sample - Water	<i>PBS</i>	Prep Blank - Soil
<i>LFB</i>	Laboratory Fortified Blank	<i>PBW</i>	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
O	Analyte concentration is estimated due to result exceeding calibration range.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
J	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/4-90/020. Methods for the Determination of Organic Compounds in Drinking Water (I), July 1990.
- (3) EPA 600/R-92/129. Methods for the Determination of Organic Compounds in Drinking Water (II), July 1990.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Excluding Oil & Grease, solid & biological matrices for organic analyses are reported on a wet weight basis.
- (3) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (4) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

ACZ Project ID: **L35930**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35930-01	WG419484	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35930-02	WG419484	OTP	M8015D GC/FID	SA	Surrogate recovery was outside acceptance limits due to matrix interference.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35930-03	WG419484	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.

ACZ Project ID: **L35930**

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Bismuth, dissolved	M200.7 ICP
Gallium, dissolved	M200.7 ICP
Scandium, dissolved	M200.7 ICP

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L35930
 Date Received: 03/10/2017 09:53
 Received By:
 Date Printed: 3/10/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples? A change was made in the Invoice to: section prior to ACZ custody.	X		

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time? Some parameters were received past hold time.		X	

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4359	3.6	<=6.0	14	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L35930
Date Received: 03/10/2017 09:53
Received By:
Date Printed: 3/10/2017

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc.

435930

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza
 Company: J Minera San Rafael
 E-mail: MBerganza@sanrafael.com.gt

Address: Blvd Los Próceres 18 Calle 24-69 Z 10
 Empresarial, 2 Pradera, Torre V oficina 406
 Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa Fernanda Barrios
 Company: Minera San Rafael

E-mail: LBarrios@sanrafael.com.gt
 Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza LF Barrios
 Company: J Minera San Rafael
 E-mail: MBerganza@sanrafael.com.gt

Address:
 Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: [Signature] I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	GW	TPH								
MW-20	07-03-17 12:00	GW	8	/									
MW-21	07-03-17 15:10	GW	8	/									
MW-11	07-03-17 16:20	GW	8	/									

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Luisa Fernanda Barrios	08/03/17 08:00	[Signature]	08/31/17
Juan Aguilera	08/03/2017 08:00	[Signature]	10:15
			3/10/17 09:53

35930 Chain of Custody

MINERA 
SAN RAFAEL

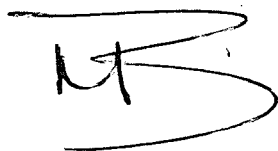
Guatemala March 8th 2017

To whom it may concern:

Minera San Rafael, S.A is sending a case with samples of water, which is not contaminated, that are going to be analyzed by the ACZ Laboratories in Steamboat Springs, Colorado, USA.

If you have any question or doubt, please contact Miguel Berganza at Minera San Rafael, S.A. (502 - 5951-5248) or Sue Webber at ACZ Laboratories (970-879-6590).

Sincerely yours,



Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.

March 23, 2017

Report to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Luisa Fernanda Barrios

Project ID: Escobal

ACZ Project ID: L35934

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 10, 2017. This project has been assigned to ACZ's project number, L35934. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L35934. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

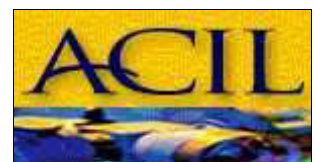
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 22, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

March 23, 2017

Project ID: Escobal

ACZ Project ID: L35934

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 4 ground water samples from Tahoe Resources, Inc. on March 10, 2017. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L35934. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for parameters flagged with an "H3", received after the hold time had expired.

Sample Analysis

These samples were analyzed for inorganic, organic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

1. For samples with a TDS ratio over 1.2 and a TDS value greater than 150 mg/L, the samples were not retested based on historical re-analysis data and the sample matrix.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-7

ACZ Sample ID: **L35934-01**

Date Sampled: 03/07/17 12:20

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 11:31	bce
Cyanide, WAD	SM4500-CN I- distillation								03/16/17 11:50	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/20/17 11:20	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:34	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:18	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 14:31	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0005	B		mg/L	0.0004	0.002	03/21/17 14:48	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0024			mg/L	0.0002	0.001	03/21/17 14:48	enb
Barium, dissolved	M200.7 ICP	1	0.256			mg/L	0.003	0.02	03/15/17 14:31	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:31	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:31	aeb
Boron, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:31	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:48	enb
Calcium, dissolved	M200.7 ICP	1	25.8			mg/L	0.1	0.5	03/15/17 14:31	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:31	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 13:27	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:31	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:31	aeb
Iron, dissolved	M200.7 ICP	1	0.04	B		mg/L	0.02	0.05	03/15/17 14:31	aeb
Lead, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	03/21/17 14:48	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:31	aeb
Magnesium, dissolved	M200.7 ICP	1	7.4			mg/L	0.2	1	03/15/17 14:31	aeb
Manganese, dissolved	M200.7 ICP	1	0.009	B		mg/L	0.005	0.03	03/15/17 14:31	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:10	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:31	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:31	aeb
Potassium, dissolved	M200.7 ICP	1	7.4			mg/L	0.2	1	03/15/17 14:31	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:31	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/21/17 14:48	enb
Silver, dissolved	M200.8 ICP-MS	1	0.00025	B		mg/L	0.00005	0.0003	03/21/17 14:48	enb
Sodium, dissolved	M200.7 ICP	1	17.0			mg/L	0.2	1	03/15/17 14:31	aeb
Strontium, dissolved	M200.7 ICP	1	0.155			mg/L	0.005	0.03	03/15/17 14:31	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:48	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:31	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:31	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	03/21/17 14:48	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:31	aeb
Zinc, dissolved	M200.7 ICP	1	0.13			mg/L	0.01	0.05	03/15/17 14:31	aeb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-7

ACZ Sample ID: **L35934-01**

Date Sampled: 03/07/17 12:20

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	86.7		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	86.7		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			03/23/17 0:00	calc
Sum of Anions			2.9			meq/L			03/23/17 0:00	calc
Sum of Cations			2.9			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	13.7		*	mg/L	0.5	2	03/20/17 11:48	spl
Conductivity @25C	SM2510B	1	293		*	umhos/cm	1	10	03/11/17 1:11	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 15:12	bsu
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 21:30	pjb
Fluoride	SM4500F-C	1	0.12	B	*	mg/L	0.05	0.3	03/16/17 13:46	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		95			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	2.19		*	mg/L	0.02	0.1	03/18/17 13:45	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/14/17 16:05	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/22/17 23:56	pjb
pH (lab)	SM4500H+ B									
pH		1	7.4	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.5		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		0.09	B		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	03/16/17 17:05	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.04	BH	*	mg/L	0.02	0.05	03/10/17 21:16	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	03/17/17 10:29	bce
Residue, Filterable (TDS) @180C	SM2540C	1	278		*	mg/L	10	20	03/11/17 12:52	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1	6.0	B	*	mg/L	5	20	03/10/17 14:37	keh
Residue, Total (TS) @105C	SM2540B	1	292		*	mg/L	10	20	03/11/17 12:28	emk
Sulfate	D516-02/-07 - Turbidimetric	1	35.5		*	mg/L	1	5	03/21/17 13:28	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 14:16	emk
TDS (calculated)	Calculation		160			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.74						03/23/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-8

ACZ Sample ID: **L35934-02**

Date Sampled: 03/07/17 10:20

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 11:38	bce
Cyanide, WAD	SM4500-CN I- distillation								03/16/17 11:58	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/20/17 11:30	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:40	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:24	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 14:34	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0008	B		mg/L	0.0004	0.002	03/21/17 14:50	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0013			mg/L	0.0002	0.001	03/21/17 14:50	enb
Barium, dissolved	M200.7 ICP	1	0.055			mg/L	0.003	0.02	03/15/17 14:34	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:34	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:34	aeb
Boron, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.01	0.05	03/15/17 14:34	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:50	enb
Calcium, dissolved	M200.7 ICP	1	75.8			mg/L	0.1	0.5	03/15/17 14:34	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:34	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 13:30	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:34	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:34	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/15/17 14:34	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:50	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:34	aeb
Magnesium, dissolved	M200.7 ICP	1	12.0			mg/L	0.2	1	03/15/17 14:34	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:34	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:11	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:34	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:34	aeb
Potassium, dissolved	M200.7 ICP	1	5.5			mg/L	0.2	1	03/15/17 14:34	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:34	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0004			mg/L	0.0001	0.0003	03/21/17 14:50	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 14:50	enb
Sodium, dissolved	M200.7 ICP	1	21.1			mg/L	0.2	1	03/15/17 14:34	aeb
Strontium, dissolved	M200.7 ICP	1	0.295			mg/L	0.005	0.03	03/15/17 14:34	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:50	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:34	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:34	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	03/21/17 14:50	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:34	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:34	aeb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-8

ACZ Sample ID: **L35934-02**

Date Sampled: 03/07/17 10:20

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	72.6		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	72.6		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			1.7			%			03/23/17 0:00	calc
Sum of Anions			5.7			meq/L			03/23/17 0:00	calc
Sum of Cations			5.9			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	16.0		*	mg/L	0.5	2	03/20/17 11:48	spl
Conductivity @25C	SM2510B	1	581		*	umhos/cm	1	10	03/11/17 1:28	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 15:13	bsu
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 21:31	pjb
Fluoride	SM4500F-C	1	0.16	B	*	mg/L	0.05	0.3	03/16/17 13:50	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		239			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	5	4.6		*	mg/L	0.1	0.5	03/18/17 14:19	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/14/17 16:06	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/22/17 23:57	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.7		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		00.16	B		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.05		*	mg/L	0.02	0.05	03/16/17 17:06	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.07	H	*	mg/L	0.02	0.05	03/10/17 20:46	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.05		*	mg/L	0.02	0.05	03/17/17 10:33	bce
Residue, Filterable (TDS) @180C	SM2540C	1	496		*	mg/L	10	20	03/11/17 12:54	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/10/17 14:40	keh
Residue, Total (TS) @105C	SM2540B	1	510		*	mg/L	10	20	03/11/17 12:34	emk
Sulfate	D516-02/-07 - Turbidimetric	5	182		*	mg/L	5	25	03/17/17 9:51	krh
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 14:28	emk
TDS (calculated)	Calculation		357			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.39						03/23/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-9

ACZ Sample ID: **L35934-03**

Date Sampled: 03/07/17 15:10

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/16/17 11:45	bce
Cyanide, WAD	SM4500-CN I- distillation								03/16/17 12:07	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/20/17 11:40	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:45	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:29	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 14:37	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/21/17 14:52	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0006	B		mg/L	0.0002	0.001	03/21/17 14:52	enb
Barium, dissolved	M200.7 ICP	1	0.036			mg/L	0.003	0.02	03/15/17 14:37	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:37	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:37	aeb
Boron, dissolved	M200.7 ICP	1	0.04	B		mg/L	0.01	0.05	03/15/17 14:37	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:52	enb
Calcium, dissolved	M200.7 ICP	1	52.5			mg/L	0.1	0.5	03/15/17 14:37	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:37	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 13:33	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:37	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:37	aeb
Iron, dissolved	M200.7 ICP	1	1.10			mg/L	0.02	0.05	03/15/17 14:37	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:52	enb
Lithium, dissolved	M200.7 ICP	1	0.012	B		mg/L	0.008	0.04	03/15/17 14:37	aeb
Magnesium, dissolved	M200.7 ICP	1	8.3			mg/L	0.2	1	03/15/17 14:37	aeb
Manganese, dissolved	M200.7 ICP	1	0.049			mg/L	0.005	0.03	03/15/17 14:37	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:12	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:37	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:37	aeb
Potassium, dissolved	M200.7 ICP	1	4.5			mg/L	0.2	1	03/15/17 14:37	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:37	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/21/17 14:52	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 14:52	enb
Sodium, dissolved	M200.7 ICP	1	26.2			mg/L	0.2	1	03/15/17 14:37	aeb
Strontium, dissolved	M200.7 ICP	1	0.405			mg/L	0.005	0.03	03/15/17 14:37	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:52	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:37	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:37	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:52	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:37	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:37	aeb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-9

ACZ Sample ID: **L35934-03**

Date Sampled: 03/07/17 15:10

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	146		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1	6.8	B	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	153		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			4.4			%			03/23/17 0:00	calc
Sum of Anions			4.3			meq/L			03/23/17 0:00	calc
Sum of Cations			4.7			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	9.3		*	mg/L	0.5	2	03/20/17 12:14	spl
Conductivity @25C	SM2510B	1	405		*	umhos/cm	1	10	03/11/17 1:38	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 15:14	bsu
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 21:32	pjb
Fluoride	SM4500F-C	1	0.57		*	mg/L	0.05	0.3	03/16/17 13:55	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		165			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/18/17 13:49	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/14/17 16:11	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/23/17 0:01	pjb
pH (lab)	SM4500H+ B									
pH		1	8.5	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.8		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		00.19	B		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.06		*	mg/L	0.02	0.05	03/16/17 17:16	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.06	H	*	mg/L	0.02	0.05	03/10/17 20:48	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.12		*	mg/L	0.02	0.05	03/17/17 10:34	bce
Residue, Filterable (TDS) @180C	SM2540C	2	288		*	mg/L	20	40	03/11/17 12:57	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/10/17 14:42	keh
Residue, Total (TS) @105C	SM2540B	2	304		*	mg/L	20	40	03/11/17 12:36	emk
Sulfate	D516-02/-07 - Turbidimetric	5	46.7		*	mg/L	5	25	03/17/17 9:51	krh
Sulfide as S	SM4500S2-D	1	0.03	B	*	mg/L	0.02	0.1	03/10/17 14:39	emk
TDS (calculated)	Calculation		243			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.19						03/23/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: PSA-1

ACZ Sample ID: **L35934-04**

Date Sampled: 03/07/17 14:35

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation		-						03/16/17 11:52	bce
Cyanide, WAD	SM4500-CN I- distillation								03/16/17 12:15	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/20/17 11:50	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:56	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:34	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 14:40	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/21/17 14:58	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0048			mg/L	0.0002	0.001	03/21/17 14:58	enb
Barium, dissolved	M200.7 ICP	1	0.016	B		mg/L	0.003	0.02	03/15/17 14:40	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:40	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:40	aeb
Boron, dissolved	M200.7 ICP	1	0.11			mg/L	0.01	0.05	03/15/17 14:40	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:58	enb
Calcium, dissolved	M200.7 ICP	1	193			mg/L	0.1	0.5	03/15/17 14:40	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:40	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 13:36	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:40	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:40	aeb
Iron, dissolved	M200.7 ICP	1	2.34			mg/L	0.02	0.05	03/15/17 14:40	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:58	enb
Lithium, dissolved	M200.7 ICP	1	0.082			mg/L	0.008	0.04	03/15/17 14:40	aeb
Magnesium, dissolved	M200.7 ICP	1	35.3			mg/L	0.2	1	03/15/17 14:40	aeb
Manganese, dissolved	M200.7 ICP	1	0.047			mg/L	0.005	0.03	03/15/17 14:40	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:13	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:40	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:40	aeb
Potassium, dissolved	M200.7 ICP	1	4.5			mg/L	0.2	1	03/15/17 14:40	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:40	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	03/21/17 14:58	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 14:58	enb
Sodium, dissolved	M200.7 ICP	1	47.8			mg/L	0.2	1	03/15/17 14:40	aeb
Strontium, dissolved	M200.7 ICP	1	1.92			mg/L	0.005	0.03	03/15/17 14:40	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:58	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:40	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:40	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0006			mg/L	0.0001	0.0005	03/21/17 14:58	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:40	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:40	aeb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: PSA-1

ACZ Sample ID: **L35934-04**

Date Sampled: 03/07/17 14:35

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	167		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1	3.1	B	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	171		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			03/23/17 0:00	calc
Sum of Anions			15			meq/L			03/23/17 0:00	calc
Sum of Cations			15			meq/L			03/23/17 0:00	calc
Chloride	SM4500Cl-E	1	42.4		*	mg/L	0.5	2	03/20/17 12:14	spl
Conductivity @25C	SM2510B	1	1250		*	umhos/cm	1	10	03/11/17 1:48	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 15:15	bsu
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 21:33	pjb
Fluoride	SM4500F-C	1	2.47		*	mg/L	0.05	0.3	03/16/17 14:00	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		627			mg/L	0.2	5	03/23/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	03/18/17 13:52	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/14/17 16:12	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/23/17 0:02	pjb
pH (lab)	SM4500H+ B									
pH		1	8.3	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.7		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	03/23/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/16/17 17:09	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/10/17 20:50	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/17/17 10:35	bce
Residue, Filterable (TDS) @180C	SM2540C	1	990		*	mg/L	10	20	03/14/17 15:14	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/10/17 14:45	keh
Residue, Total (TS) @105C	SM2540B	1	1040		*	mg/L	10	20	03/11/17 12:39	emk
Sulfate	D516-02/-07 - Turbidimetric	50	468		*	mg/L	50	250	03/17/17 9:55	krh
Sulfide as S	SM4500S2-D	1	0.18		*	mg/L	0.02	0.1	03/10/17 14:51	emk
TDS (calculated)	Calculation		902			mg/L			03/23/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.10						03/23/17 0:00	calc

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35934-01	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419613	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419384	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
	WG419883	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419580	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419291	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419778	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419267	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35934-02	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419613	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419384	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
	WG419883	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419580	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419291	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419561	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419267	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	sample is too low for accurate evaluation (< 10x MDL). Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35934-03	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419613	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419384	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
	WG419883	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419580	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419291	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419561	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
			SM4500S2-D	Q6	Sample was received above recommended temperature.
	WG419267	Sulfide as S	SM4500S2-D	QD	Reported value is the background-corrected concentration, as described by the method.
			SM4500S2-D	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35934-04	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419605	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419613	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419384	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
	WG419883	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419580	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419391	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419262	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419561	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419267	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	sample is too low for accurate evaluation (< 10x MDL). Sample was received above recommended temperature.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-7

ACZ Sample ID: **L35934-01**
Date Sampled: 03/07/17 12:20
Date Received: 03/10/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419484

Analyst: MMN
Extract Date: 03/13/17 10:04
Analysis Date: 03/15/17 0:51

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.5		1.04	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	71		1.04	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-8

ACZ Sample ID: **L35934-02**

Date Sampled: 03/07/17 10:20

Date Received: 03/10/17

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419484

Analyst: MMN

Extract Date: 03/13/17 10:05

Analysis Date: 03/15/17 1:14

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1.01	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	78.1		1.01	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-9

ACZ Sample ID: **L35934-03**

Date Sampled: 03/07/17 15:10

Date Received: 03/10/17

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419484

Analyst: MMN

Extract Date: 03/13/17 10:07

Analysis Date: 03/15/17 1:38

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.7		0.99	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	433		0.99	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: PSA-1

ACZ Sample ID: **L35934-04**

Date Sampled: 03/07/17 14:35

Date Received: 03/10/17

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419484

Analyst: MMN

Extract Date: 03/13/17 10:08

Analysis Date: 03/15/17 2:01

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1.14	*	mg/L	0.1	0.6
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	67.3		1.14	*	%	70	130

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>LCL</i>	Lower Control Limit
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #4) Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>UCL</i>	Upper Control Limit
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>SURR</i>	Surrogate	<i>LFM</i>	Laboratory Fortified Matrix
<i>INTS</i>	Internal Standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>MS/MSD</i>	Matrix Spike/Matrix Spike Duplicate
<i>LCSW</i>	Laboratory Control Sample - Water	<i>PBS</i>	Prep Blank - Soil
<i>LFB</i>	Laboratory Fortified Blank	<i>PBW</i>	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
O	Analyte concentration is estimated due to result exceeding calibration range.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
J	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/4-90/020. Methods for the Determination of Organic Compounds in Drinking Water (I), July 1990.
- (3) EPA 600/R-92/129. Methods for the Determination of Organic Compounds in Drinking Water (II), July 1990.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Excluding Oil & Grease, solid & biological matrices for organic analyses are reported on a wet weight basis.
- (3) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (4) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

ACZ Project ID: **L35934**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35934-01	WG419484	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35934-02	WG419484	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35934-03	WG419484	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	SA	Surrogate recovery was outside acceptance limits due to matrix interference.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35934-04	WG419484	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	S7	Surrogate recovery was below laboratory and method acceptance limits. Unable to confirm matrix effect.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.

ACZ Project ID: **L35934**

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Bismuth, dissolved	M200.7 ICP
Gallium, dissolved	M200.7 ICP
Scandium, dissolved	M200.7 ICP

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L35934
 Date Received: 03/10/2017 09:53
 Received By:
 Date Printed: 3/10/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples? A change was made in the Invoice to section prior to ACZ custody.	X		

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time? Some parameters were received past hold time.		X	

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4400	12.6	<=6.0	15	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L35934
Date Received: 03/10/2017 09:53
Received By:
Date Printed: 3/10/2017

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc.

L35934

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza
Company: Minera San Rafael
E-mail: MBerganza@sanrafael.com.gt

Address: Blvd Los Próceres 18 Calle 74-69 Z10
Empresarial 7 Piedad, Torre IV Oficina 406
Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa Fernanda Barrios
Company: Minera San Rafael

E-mail: LBarrios@sanrafael.com.gt
Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza LF Barrios
Company:
E-mail:

Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Table with columns: Quote #, PO#, Reporting state, Check box, SAMPLE IDENTIFICATION, DATE:TIME, Matrix, # of Containers, and 10 columns for ANALYSES REQUESTED. Includes handwritten entries for MW-7, MW-8, MW-9, PSA-1 and GW+TPH.

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

Table with columns: RELINQUISHED BY, DATE:TIME, RECEIVED BY, DATE:TIME. Includes signatures and dates for Luisa Fernanda Barrios and another person.

L35934 Chain of Custody



Guatemala March 8th 2017

To whom it may concern:

Minera San Rafael, S.A is sending a case with samples of water, which is not contaminated, that are going to be analyzed by the ACZ Laboratories in Steamboat Springs, Colorado, USA.

If you have any question or doubt, please contact Miguel Berganza at Minera San Rafael, S.A. (502 - 5951-5248) or Sue Webber at ACZ Laboratories (970-879-6590).

Sincerely yours,

Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.

March 24, 2017

Report to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Luisa Fernanda Barrios

Project ID: Escobal

ACZ Project ID: L35935

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 10, 2017. This project has been assigned to ACZ's project number, L35935. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L35935. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

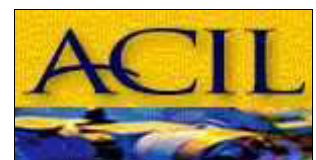
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 23, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

March 24, 2017

Project ID: Escobal

ACZ Project ID: L35935

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 4 ground water samples from Tahoe Resources, Inc. on March 10, 2017. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L35935. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for parameters flagged with "H" flags (H3, H1), received either after the hold time expired or too close to the hold time.

Sample Analysis

These samples were analyzed for inorganic, organic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

1. For samples with a TDS ratio over 1.2 and a TDS value greater than 150 mg/L, the samples were not retested based on historical re-analysis data and the sample matrix.
2. Nitrogen, Total Kjeldahl (N1) - Sample L35935-03 has shown a negative bias to analyte recovery and is interfering with L35935-03LFM spike recovery. Sample has displayed this characteristic in two separate prep and analysis workgroups, being spiked both times, where all other batch and instrument QC has shown to be recovered within normally acceptable ranges. Other samples associated with this LFM also exhibiting negative dips as peak shapes include: L35935-04, L35936-01, L35936-02, L35936-03, and L35936-04. All other samples associated with this LFM exhibit normal peak shapes or flat baseline.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-3

ACZ Sample ID: **L35935-01**

Date Sampled: 03/07/17 11:35

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/17/17 11:28	bsu
Cyanide, WAD	SM4500-CN I- distillation								03/16/17 12:24	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/20/17 12:00	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 17:07	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:40	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 14:43	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/21/17 14:59	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0019			mg/L	0.0002	0.001	03/21/17 14:59	enb
Barium, dissolved	M200.7 ICP	1	0.030			mg/L	0.003	0.02	03/15/17 14:43	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:43	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 14:43	aeb
Boron, dissolved	M200.7 ICP	1	0.07			mg/L	0.01	0.05	03/15/17 14:43	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:59	enb
Calcium, dissolved	M200.7 ICP	1	78.2			mg/L	0.1	0.5	03/15/17 14:43	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:43	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/16/17 13:39	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 14:43	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:43	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/15/17 14:43	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:59	enb
Lithium, dissolved	M200.7 ICP	1	0.013	B		mg/L	0.008	0.04	03/15/17 14:43	aeb
Magnesium, dissolved	M200.7 ICP	1	9.6			mg/L	0.2	1	03/15/17 14:43	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:43	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:14	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 14:43	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 14:43	aeb
Potassium, dissolved	M200.7 ICP	1	4.0			mg/L	0.2	1	03/15/17 14:43	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 14:43	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0003	03/21/17 14:59	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 14:59	enb
Sodium, dissolved	M200.7 ICP	1	28.2			mg/L	0.2	1	03/15/17 14:43	aeb
Strontium, dissolved	M200.7 ICP	1	0.756			mg/L	0.005	0.03	03/15/17 14:43	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 14:59	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 14:43	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:43	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	03/21/17 14:59	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 14:43	aeb
Zinc, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.01	0.05	03/15/17 14:43	aeb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-3

ACZ Sample ID: **L35935-01**

Date Sampled: 03/07/17 11:35

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	83.0		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	83.0		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.8			%			03/24/17 0:00	calc
Sum of Anions			6			meq/L			03/24/17 0:00	calc
Sum of Cations			6.1			meq/L			03/24/17 0:00	calc
Chloride	SM4500Cl-E	1	17.5		*	mg/L	0.5	2	03/20/17 12:14	spl
Conductivity @25C	SM2510B	1	595		*	umhos/cm	1	10	03/11/17 1:56	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 23:06	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 22:17	pjb
Fluoride	SM4500F-C	1	0.73		*	mg/L	0.05	0.3	03/16/17 14:04	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		235			mg/L	0.2	5	03/24/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	2.65		*	mg/L	0.02	0.1	03/18/17 13:57	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/14/17 16:14	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/23/17 0:03	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.7		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		00.25			mg/L	0.06	0.2	03/24/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.08		*	mg/L	0.02	0.05	03/16/17 17:18	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.09	H	*	mg/L	0.02	0.05	03/10/17 20:51	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.08		*	mg/L	0.02	0.05	03/17/17 10:53	bce
Residue, Filterable (TDS) @180C	SM2540C	1	492		*	mg/L	10	20	03/14/17 15:17	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/11/17 13:08	emk
Residue, Total (TS) @105C	SM2540B	1	514		*	mg/L	10	20	03/11/17 12:41	emk
Sulfate	D516-02/-07 - Turbidimetric	5	181		*	mg/L	5	25	03/17/17 9:55	krh
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 15:02	emk
TDS (calculated)	Calculation		371			mg/L			03/24/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.33						03/24/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-4

ACZ Sample ID: **L35935-02**

Date Sampled: 03/07/17 14:10

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/17/17 11:41	bsu
Cyanide, WAD	SM4500-CN I- distillation								03/16/17 12:32	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/20/17 12:10	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 17:12	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:45	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 15:09	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	03/21/17 15:01	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0019			mg/L	0.0002	0.001	03/21/17 15:01	enb
Barium, dissolved	M200.7 ICP	1	0.020			mg/L	0.003	0.02	03/15/17 15:09	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:09	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 15:09	gss
Boron, dissolved	M200.7 ICP	1	0.05			mg/L	0.01	0.05	03/15/17 15:09	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 15:01	enb
Calcium, dissolved	M200.7 ICP	1	65.5			mg/L	0.1	0.5	03/15/17 15:09	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:09	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:09	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:09	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 15:09	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/15/17 15:09	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 15:01	enb
Lithium, dissolved	M200.7 ICP	1	0.013	B		mg/L	0.008	0.04	03/15/17 15:09	gss
Magnesium, dissolved	M200.7 ICP	1	7.2			mg/L	0.2	1	03/15/17 15:09	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 15:09	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:17	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 15:09	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 15:09	gss
Potassium, dissolved	M200.7 ICP	1	3.7			mg/L	0.2	1	03/15/17 15:09	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 15:09	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0003			mg/L	0.0001	0.0003	03/21/17 15:01	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 15:01	enb
Sodium, dissolved	M200.7 ICP	1	24.1			mg/L	0.2	1	03/15/17 15:09	gss
Strontium, dissolved	M200.7 ICP	1	0.619		*	mg/L	0.005	0.03	03/15/17 15:09	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 15:01	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 15:09	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 15:09	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	03/21/17 15:01	enb
Vanadium, dissolved	M200.7 ICP	1	0.005	B		mg/L	0.005	0.03	03/15/17 15:09	gss
Zinc, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	03/15/17 15:09	gss

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-4

ACZ Sample ID: **L35935-02**

Date Sampled: 03/07/17 14:10

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	86.4		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	86.4		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-2.0			%			03/24/17 0:00	calc
Sum of Anions			5.2			meq/L			03/24/17 0:00	calc
Sum of Cations			5.0			meq/L			03/24/17 0:00	calc
Chloride	SM4500Cl-E	1	14.2		*	mg/L	0.5	2	03/20/17 12:14	spl
Conductivity @25C	SM2510B	1	538		*	umhos/cm	1	10	03/11/17 2:05	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 23:08	pjb
Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 22:18	pjb
Fluoride	SM4500F-C	1	0.82		*	mg/L	0.05	0.3	03/16/17 14:08	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		193			mg/L	0.2	5	03/24/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	2.56		*	mg/L	0.02	0.1	03/18/17 13:58	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/14/17 16:15	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/23/17 0:04	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.7		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		00.22			mg/L	0.06	0.2	03/24/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.07		*	mg/L	0.02	0.05	03/16/17 17:19	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.08	H	*	mg/L	0.02	0.05	03/10/17 20:52	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.07		*	mg/L	0.02	0.05	03/17/17 10:37	bce
Residue, Filterable (TDS) @180C	SM2540C	1	454		*	mg/L	10	20	03/14/17 15:19	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1	5.0	B	*	mg/L	5	20	03/11/17 13:12	emk
Residue, Total (TS) @ 105C	SM2540B	1	474		*	mg/L	10	20	03/11/17 12:44	emk
Sulfate	D516-02/-07 - Turbidimetric	5	145		*	mg/L	5	25	03/17/17 9:55	krh
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 15:14	emk
TDS (calculated)	Calculation		314			mg/L			03/24/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.45						03/24/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-5

ACZ Sample ID: **L35935-03**

Date Sampled: 03/07/17 10:40

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/17/17 11:54	bsu
Cyanide, WAD	SM4500-CN I- distillation								03/16/17 12:40	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 10:16	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 17:18	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 16:56	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 15:12	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0004	0.002	03/21/17 15:07	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0008	B	*	mg/L	0.0002	0.001	03/21/17 15:07	enb
Barium, dissolved	M200.7 ICP	1	0.034			mg/L	0.003	0.02	03/15/17 15:12	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:12	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 15:12	gss
Boron, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.01	0.05	03/15/17 15:12	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 15:07	enb
Calcium, dissolved	M200.7 ICP	1	116			mg/L	0.1	0.5	03/15/17 15:12	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:12	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:12	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:12	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 15:12	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/15/17 15:12	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 15:07	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 15:12	gss
Magnesium, dissolved	M200.7 ICP	1	15.5		*	mg/L	0.2	1	03/15/17 15:12	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 15:12	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:18	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 15:12	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 15:12	gss
Potassium, dissolved	M200.7 ICP	1	7.1			mg/L	0.2	1	03/15/17 15:12	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 15:12	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0006		*	mg/L	0.0001	0.0003	03/21/17 15:07	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 15:07	enb
Sodium, dissolved	M200.7 ICP	1	27.9			mg/L	0.2	1	03/15/17 15:12	gss
Strontium, dissolved	M200.7 ICP	1	0.461			mg/L	0.005	0.03	03/15/17 15:12	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/21/17 15:07	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 15:12	gss
Titanium, dissolved	M200.7 ICP	1	0.007	B		mg/L	0.005	0.03	03/15/17 15:12	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0006			mg/L	0.0001	0.0005	03/21/17 15:07	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 15:12	gss
Zinc, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	03/15/17 15:12	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-5

ACZ Sample ID: **L35935-03**

Date Sampled: 03/07/17 10:40

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	95.6		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	95.6		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-0.6			%			03/24/17 0:00	calc
Sum of Anions			8.6			meq/L			03/24/17 0:00	calc
Sum of Cations			8.5			meq/L			03/24/17 0:00	calc
Chloride	SM4500Cl-E	1	22.0		*	mg/L	0.5	2	03/20/17 12:14	spl
Conductivity @25C	SM2510B	1	838		*	umhos/cm	1	10	03/11/17 2:14	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 23:10	pjb
Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 22:18	pjb
Fluoride	SM4500F-C	1	0.22	B	*	mg/L	0.05	0.3	03/16/17 14:23	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		353			mg/L	0.2	5	03/24/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	4	6.94		*	mg/L	0.08	0.4	03/18/17 14:21	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/14/17 16:17	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/23/17 23:37	pjb
pH (lab)	SM4500H+ B									
pH		1	7.6	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.6		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		0.12	B		mg/L	0.06	0.2	03/24/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	03/16/17 17:20	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.05	H	*	mg/L	0.02	0.05	03/10/17 20:56	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	03/17/17 10:39	bce
Residue, Filterable (TDS) @180C	SM2540C	1	680		*	mg/L	10	20	03/14/17 15:22	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1	9.0	B	*	mg/L	5	20	03/11/17 13:17	emk
Residue, Total (TS) @105C	SM2540B	1	744		*	mg/L	10	20	03/11/17 12:47	emk
Sulfate	D516-02/-07 - Turbidimetric	10	287		*	mg/L	10	50	03/17/17 10:02	krh
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 15:26	emk
TDS (calculated)	Calculation		535			mg/L			03/24/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.27						03/24/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-6

ACZ Sample ID: **L35935-04**

Date Sampled: 03/07/17 10:00

Date Received: 03/10/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/17/17 12:01	bsu
Cyanide, WAD	SM4500-CN I- distillation		-						03/16/17 12:49	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 10:34	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 17:23	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/14/17 17:07	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/15/17 15:15	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0004	0.002	03/21/17 15:09	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0022			mg/L	0.0002	0.001	03/22/17 16:22	mfm
Barium, dissolved	M200.7 ICP	1	0.115			mg/L	0.003	0.02	03/15/17 15:15	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:15	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/15/17 15:15	gss
Boron, dissolved	M200.7 ICP	1	0.04	B		mg/L	0.01	0.05	03/15/17 15:15	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/22/17 16:22	mfm
Calcium, dissolved	M200.7 ICP	1	173			mg/L	0.1	0.5	03/15/17 15:15	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:15	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:15	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/15/17 15:15	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 15:15	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/15/17 15:15	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/22/17 16:22	mfm
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 15:15	gss
Magnesium, dissolved	M200.7 ICP	1	18.6		*	mg/L	0.2	1	03/15/17 15:15	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 15:15	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/13/17 18:21	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/15/17 15:15	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/15/17 15:15	gss
Potassium, dissolved	M200.7 ICP	1	8.6			mg/L	0.2	1	03/15/17 15:15	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/15/17 15:15	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0006		*	mg/L	0.0001	0.0003	03/21/17 15:09	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/21/17 15:09	enb
Sodium, dissolved	M200.7 ICP	1	39.0			mg/L	0.2	1	03/15/17 15:15	gss
Strontium, dissolved	M200.7 ICP	1	0.912			mg/L	0.005	0.03	03/15/17 15:15	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/22/17 16:22	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/15/17 15:15	gss
Titanium, dissolved	M200.7 ICP	1	0.009	B		mg/L	0.005	0.03	03/15/17 15:15	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/22/17 16:22	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/15/17 15:15	gss
Zinc, dissolved	M200.7 ICP	1	0.08			mg/L	0.01	0.05	03/15/17 15:15	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-6

ACZ Sample ID: **L35935-04**

Date Sampled: 03/07/17 10:00

Date Received: 03/10/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	53.7		*	mg/L	2	20	03/11/17 0:00	abd
Carbonate as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/11/17 0:00	abd
Total Alkalinity		1	53.7		*	mg/L	2	20	03/11/17 0:00	abd
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			03/24/17 0:00	calc
Sum of Anions			12			meq/L			03/24/17 0:00	calc
Sum of Cations			12			meq/L			03/24/17 0:00	calc
Chloride	SM4500Cl-E	1	42.5		*	mg/L	0.5	2	03/20/17 12:14	spl
Conductivity @25C	SM2510B	1	1140		*	umhos/cm	1	10	03/11/17 2:22	abd
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 23:11	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/17/17 22:19	pjb
Fluoride	SM4500F-C	1	0.14	B	*	mg/L	0.05	0.3	03/16/17 14:33	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		509			mg/L	0.2	5	03/24/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	5.59		*	mg/L	0.06	0.3	03/18/17 14:22	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/14/17 16:19	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/23/17 23:39	pjb
pH (lab)	SM4500H+ B									
pH		1	7.5	H	*	units	0.1	0.1	03/11/17 0:00	abd
pH measured at		1	23.6		*	C	0.1	0.1	03/11/17 0:00	abd
Phosphate	Calculation based on dissolved Phosphorus		00.16	B		mg/L	0.06	0.2	03/24/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.05		*	mg/L	0.02	0.05	03/16/17 17:21	bce
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.06	H	*	mg/L	0.02	0.05	03/10/17 20:57	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	03/17/17 10:42	bce
Residue, Filterable (TDS) @180C	SM2540C	1	982		*	mg/L	10	20	03/14/17 15:24	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/11/17 13:21	emk
Residue, Total (TS) @105C	SM2540B	1	1020		*	mg/L	10	20	03/14/17 15:40	emk
Sulfate	D516-02/-07 - Turbidimetric	20	482		*	mg/L	20	100	03/17/17 10:45	krh
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/10/17 15:37	emk
TDS (calculated)	Calculation		798			mg/L			03/24/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.23						03/24/17 0:00	calc



Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L35935**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35935-01	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419617	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419613	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419384	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
	WG419883	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419580	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419391	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419290	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419561	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
			SM4500S2-D	Q6	Sample was received above recommended temperature.
	WG419267	Sulfide as S	SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated

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ACZ Project ID: **L35935**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	sample is too low for accurate evaluation (< 10x MDL). Sample was received above recommended temperature.

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ACZ Project ID: **L35935**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35935-02	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419617	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419613	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419384	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
	WG419883	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419580	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419391	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419290	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419460	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419561	Sulfate	D516-02/-07 - Turbidimetric	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419267	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L35935**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35935-03	WG419704	Arsenic, dissolved	M200.8 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419617	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419613	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419460	Magnesium, dissolved	M200.7 ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419384	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	N1	See Case Narrative.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419580	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419391	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419290	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated

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ACZ Project ID: **L35935**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
					sample is too low for accurate evaluation (< 10x MDL).
	WG419289	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419704	Selenium, dissolved	M200.8 ICP-MS	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419561	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419267	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

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ACZ Project ID: **L35935**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35935-04	WG419276	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419675	Chloride	SM4500CI-E	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG419276	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG419617	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419613	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419500	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419460	Magnesium, dissolved	M200.7 ICP	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG419622	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419384	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	N1	See Case Narrative.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419547	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419283	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419580	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419391	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419290	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L35935**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419404	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419704	Selenium, dissolved	M200.8 ICP-MS	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419561	Sulfate	D516-02/-07 - Turbidimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419267	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419276	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-3

ACZ Sample ID: **L35935-01**
Date Sampled: 03/07/17 11:35
Date Received: 03/10/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419589

Analyst: mmn
Extract Date: 03/15/17 13:45
Analysis Date: 03/16/17 18:14

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.4	JH	1.01	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	63.7		1.01	*	%	70	130

Tahoe Resources, Inc.Project ID: Escobal
Sample ID: MW-4ACZ Sample ID: **L35935-02**
Date Sampled: 03/07/17 14:10
Date Received: 03/10/17
Sample Matrix: Ground Water**Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**
Extract Method: **M3520****Workgroup:** WG419589Analyst: mmn
Extract Date: 03/15/17 13:50
Analysis Date: 03/16/17 18:37

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.4	JH	1.05	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	66		1.05	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-5

ACZ Sample ID: **L35935-03**
Date Sampled: 03/07/17 10:40
Date Received: 03/10/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419589

Analyst: mmn
Extract Date: 03/15/17 13:55
Analysis Date: 03/16/17 19:00

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.38	JH	0.94	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	65.9		0.94	*	%	70	130

Tahoe Resources, Inc.Project ID: Escobal
Sample ID: MW-6ACZ Sample ID: **L35935-04**
Date Sampled: 03/07/17 10:00
Date Received: 03/10/17
Sample Matrix: Ground Water**Diesel Range Organics (C10-C28)**Analysis Method: **M8015D GC/FID**
Extract Method: **M3520****Workgroup:** WG419589Analyst: mmn
Extract Date: 03/15/17 14:00
Analysis Date: 03/16/17 19:24

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.4	JH	0.99	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	63.6		0.99	*	%	70	130

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>LCL</i>	Lower Control Limit
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #4) Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>UCL</i>	Upper Control Limit
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>SURR</i>	Surrogate	<i>LFM</i>	Laboratory Fortified Matrix
<i>INTS</i>	Internal Standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>MS/MSD</i>	Matrix Spike/Matrix Spike Duplicate
<i>LCSW</i>	Laboratory Control Sample - Water	<i>PBS</i>	Prep Blank - Soil
<i>LFB</i>	Laboratory Fortified Blank	<i>PBW</i>	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
O	Analyte concentration is estimated due to result exceeding calibration range.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
J	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/4-90/020. Methods for the Determination of Organic Compounds in Drinking Water (I), July 1990.
- (3) EPA 600/R-92/129. Methods for the Determination of Organic Compounds in Drinking Water (II), July 1990.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Excluding Oil & Grease, solid & biological matrices for organic analyses are reported on a wet weight basis.
- (3) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (4) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

ACZ Project ID: **L35935**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35935-01	WG419589	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	SA	Surrogate recovery was outside acceptance limits due to matrix interference.
		TPH C10 to C28	M8015D GC/FID	H1	Sample prep or analysis performed past holding time. See case narrative.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35935-02	WG419589	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	SA	Surrogate recovery was outside acceptance limits due to matrix interference.
		TPH C10 to C28	M8015D GC/FID	H1	Sample prep or analysis performed past holding time. See case narrative.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35935-03	WG419589	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	SA	Surrogate recovery was outside acceptance limits due to matrix interference.
		TPH C10 to C28	M8015D GC/FID	H1	Sample prep or analysis performed past holding time. See case narrative.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L35935-04	WG419589	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	SA	Surrogate recovery was outside acceptance limits due to matrix interference.
		TPH C10 to C28	M8015D GC/FID	H1	Sample prep or analysis performed past holding time. See case narrative.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.

ACZ Project ID: **L35935**

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Bismuth, dissolved	M200.7 ICP
Gallium, dissolved	M200.7 ICP
Scandium, dissolved	M200.7 ICP

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L35935
 Date Received: 03/10/2017 09:54
 Received By:
 Date Printed: 3/10/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4520	11.4	<=6.0	14	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L35935
Date Received: 03/10/2017 09:54
Received By:
Date Printed: 3/10/2017

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc.

L35935

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Blvd 103 Proceres 18 calle 24-69 200910
Company: Minera San Rafael	Empresarial: 2 Pradera Torre IV oficina 1406
E-mail: M Berganza @ sanrafael.com.gt	Telephone: (502) 59 51 5248

Copy of Report to:

Name: Luisa Fernanda Barrios	E-mail: LBarrios@santofael.com.gt
Company: Minera San Rafael	Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza LF Bambos	Address:
Company:	Telephone:
E-mail:	

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: *I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Quote #:		# of Containers	GW+TPH																			
PO#:	Escobal																					
Reporting state for compliance testing:																						
Check box if samples include NRC licensed material?																						
SAMPLE IDENTIFICATION	DATE:TIME	Matrix																				
MW-3	07-03-17 11:35	GW	8	/																		
MW-4	07-03-17 14:10	GW	8	/																		
MW-5	07-03-17 10:40	GW	8	/																		
MW-6	07-03-17 10:00	GW	8	/																		

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please present all of the results of this shipment in one report.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY: DATE:TIME RECEIVED BY: DATE:TIME

Luisa Fernanda Barrios	08/03/17 08:00		08/03/17
Juan Aguilera	08-03-2017 08:00		10:15
			3/10/17 0954

MINERA 
SAN RAFAEL

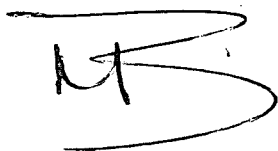
Guatemala March 8th 2017

To whom it may concern:

Minera San Rafael, S.A is sending a case with samples of water, which is not contaminated, that are going to be analyzed by the ACZ Laboratories in Steamboat Springs, Colorado, USA.

If you have any question or doubt, please contact Miguel Berganza at Minera San Rafael, S.A. (502 - 5951-5248) or Sue Webber at ACZ Laboratories (970-879-6590).

Sincerely yours,



Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.



ECOSISTEMAS
PROYECTOS AMBIENTALES

LABORATORIO AMBIENTAL E INDUSTRIAL

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laboratorio@ecosistemas.com.gt | info@ecosistemas.com.gt | www.ecosistemas.com.gt

Ref 563-17

Pág 1/1

REG 016 Resultados de Análisis

Muestras: 11 muestras de agua
Análisis solicitado por: Ing. Miguel Berganza
Dirección: Km. 97.5 carretera Mataquescuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa
Procedencia de la muestra: Proyecto Escobal
Fecha de muestreo: 070317
Fecha de ingreso de muestra: 080317
Fecha de análisis: 080317-160317
Fecha del informe: 160317

Resultados:

Correlativo Ecosistemas	Identificación de la Muestra	Color Aparente (UC HZ equiv. Unid. Pt-Co)	Color Real (UC HZ equiv. Unid. Pt-Co)	* Cromo Hexavalente Cr(VI) mg/l	** Coliformes Fecales (NMP/100ml)
7528	MW-3	< 1	< 1	N.D.	< 1.8
7529	MW-4	11	< 1	N.D.	< 1.8
7530	MW-5	8	< 1	N.D.	< 1.8
7531	MW-6	12	< 1	N.D.	< 1.8
7532	MW-7	42	15	N.D.	< 1.8
7533	MW-8	3	< 1	N.D.	< 1.8
7534	MW-9	317	10	N.D.	< 1.8
7535	PSA-1	399	18	N.D.	< 1.8
7536	MW-20	< 1	< 1	N.D.	< 1.8
7537	MW-21	385	6	N.D.	< 1.8
7538	MW-11	144	8	N.D.	< 1.8

Notas:

Captación de muestras: Las muestras fueron captadas por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración.

Metodología: Espectrofotométricos / SMWW: Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977.

Fotométricos Merck. NMP: Número más probable.

N.D. No detectable. Debajo del límite de detección.

Límites de detección: Cromo hexavalente (0.05 mg/l).

Los resultados obtenidos corresponden únicamente a las muestras recibidas por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

** Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04*

*** Análisis referidos a laboratorio acreditado.*

Ing. Oscar Páez
Gerente Técnico

VoBo Ing. Fernando Fuentes
Gerente de Calidad

April 03, 2017

Report to:

Miguel Berganza
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Miguel Berganza
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Luisa Fernanda Barrios

Project ID: Escobal

ACZ Project ID: L36058

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 17, 2017. This project has been assigned to ACZ's project number, L36058. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L36058. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

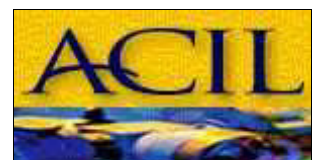
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 03, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

April 03, 2017

Project ID: Escobal

ACZ Project ID: L36058

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 12 miscellaneous samples from Tahoe Resources, Inc. on March 17, 2017. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L36058. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for parameters flagged with an "H3", received after the hold time had expired.

Sample Analysis

These samples were analyzed for inorganic, organic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The following required further explanation not provided by the Extended Qualifier Report:

1. For samples with a TDS ratio over 1.2 and a TDS value greater than 150 mg/L, the samples were not retested based on historical re-analysis data and the sample matrix.
2. Nitrogen, Total Kjeldahl (N1) - Sample L36058-08 displayed negative dip peak shape and zero percent recovery of associated spike L36058-08LFM when prepped at 1X and was redigested. All associated samples with this spike were redigested as well as a result of the zero percent recovery. L36058-08 was again spiked at prep, however the sample was prepped on a 5X dilution to see if less of the interfering sample matrix used at prep would result in better spike recovery. 5X dilution runs again displayed the same negative dip peak shape and zero percent recovery of the spike, attributed to some matrix interference. All other instrument and batch QC associated with this sample is in expected ranges, and all other samples associated with this spike displayed normal peak shape or a flat baseline (L35993-01, L35993-02, L35993-03, L35993-04, L35993-05, L36058-09/DUP, L36058-10, L36058-11, L36058-12).

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: HW-1

ACZ Sample ID: **L36058-06**

Date Sampled: 03/15/17 07:55

Date Received: 03/17/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 12:29	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 12:32	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								03/23/17 13:11	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/22/17 16:09	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/22/17 16:12	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/23/17 14:29	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0006	B		mg/L	0.0004	0.002	03/27/17 19:18	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0085			mg/L	0.0002	0.001	03/28/17 13:47	msh
Barium, dissolved	M200.7 ICP	1	0.071			mg/L	0.003	0.02	03/23/17 14:29	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:29	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:29	gss
Boron, dissolved	M200.7 ICP	1	0.07			mg/L	0.01	0.05	03/23/17 14:29	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:18	mfm
Calcium, dissolved	M200.7 ICP	1	70.7			mg/L	0.1	0.5	03/23/17 14:29	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:29	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:29	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:29	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:29	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/23/17 14:29	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:18	mfm
Lithium, dissolved	M200.7 ICP	1	0.094			mg/L	0.008	0.04	03/23/17 14:29	gss
Magnesium, dissolved	M200.7 ICP	1	5.1			mg/L	0.2	1	03/23/17 14:29	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:29	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:23	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/23/17 14:29	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:29	gss
Potassium, dissolved	M200.7 ICP	1	2.5			mg/L	0.2	1	03/23/17 14:29	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:29	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0004			mg/L	0.0001	0.0003	03/27/17 19:18	mfm
Silver, dissolved	M200.8 ICP-MS	1	0.00012	B		mg/L	0.00005	0.0003	03/27/17 19:18	mfm
Sodium, dissolved	M200.7 ICP	1	61.0			mg/L	0.2	1	03/23/17 14:29	gss
Strontium, dissolved	M200.7 ICP	1	3.03			mg/L	0.005	0.03	03/23/17 14:29	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:18	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/23/17 14:29	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:29	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	03/27/17 19:18	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:29	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:29	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: HW-1

ACZ Sample ID: **L36058-06**

Date Sampled: 03/15/17 07:55

Date Received: 03/17/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	130		*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1	5.0	B	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	135		*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-0.7			%			04/03/17 0:00	calc
Sum of Anions			6.9			meq/L			04/03/17 0:00	calc
Sum of Cations			6.8			meq/L			04/03/17 0:00	calc
Chloride	SM4500Cl-E	1	7.2		*	mg/L	0.5	2	03/30/17 9:23	bce
Conductivity @25C	SM2510B	1	635		*	umhos/cm	1	10	03/18/17 6:01	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:20	pjb
Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:04	pjb
Fluoride	SM4500F-C	1	0.69		*	mg/L	0.05	0.3	03/24/17 11:29	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		198			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	0.87		*	mg/L	0.02	0.1	03/28/17 23:17	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/23/17 14:11	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	03/24/17 0:03	pjb
pH (lab)	SM4500H+ B									
pH		1	8.4	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.5		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus		0.12	B		mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	03/22/17 19:23	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.04	BH	*	mg/L	0.02	0.05	03/18/17 14:19	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	03/24/17 20:24	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	482		*	mg/L	10	20	03/17/17 15:36	keh
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 13:51	keh
Residue, Total (TS) @105C	SM2540B	1	490		*	mg/L	10	20	03/20/17 17:02	sck
Sulfate	D516-02/-07 - Turbidimetric	5	188		*	mg/L	5	25	03/29/17 9:40	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 14:10	emk
TDS (calculated)	Calculation		421			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.14						04/03/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: PSA-SR

ACZ Sample ID: **L36058-08**

Date Sampled: 03/14/17 09:45

Date Received: 03/17/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/23/17 12:42	bce
Cyanide, WAD	SM4500-CN I- distillation								03/24/17 12:49	spl
Nitrogen, total Kjeldahl	M351.2 - Block Digestor				*				03/27/17 11:41	spl
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								03/22/17 16:16	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								03/22/17 16:24	bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	03/23/17 14:36	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0007	B		mg/L	0.0004	0.002	03/27/17 19:21	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0121			mg/L	0.0002	0.001	03/28/17 13:49	msh
Barium, dissolved	M200.7 ICP	1	0.076			mg/L	0.003	0.02	03/23/17 14:36	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:36	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	03/23/17 14:36	gss
Boron, dissolved	M200.7 ICP	1	0.09			mg/L	0.01	0.05	03/23/17 14:36	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:21	mfm
Calcium, dissolved	M200.7 ICP	1	95.0		*	mg/L	0.1	0.5	03/23/17 14:36	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:36	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:36	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:36	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:36	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	03/23/17 14:36	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:21	mfm
Lithium, dissolved	M200.7 ICP	1	0.132			mg/L	0.008	0.04	03/23/17 14:36	gss
Magnesium, dissolved	M200.7 ICP	1	5.9			mg/L	0.2	1	03/23/17 14:36	gss
Manganese, dissolved	M200.7 ICP	1	0.022	B		mg/L	0.005	0.03	03/23/17 14:36	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	03/28/17 12:25	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	03/23/17 14:36	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	03/23/17 14:36	gss
Potassium, dissolved	M200.7 ICP	1	1.9			mg/L	0.2	1	03/23/17 14:36	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	03/23/17 14:36	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0003	03/27/17 19:21	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	03/27/17 19:21	mfm
Sodium, dissolved	M200.7 ICP	1	80.3			mg/L	0.2	1	03/23/17 14:36	gss
Strontium, dissolved	M200.7 ICP	1	4.29		*	mg/L	0.005	0.03	03/23/17 14:36	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	03/27/17 19:21	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	03/23/17 14:36	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:36	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	03/27/17 19:21	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	03/23/17 14:36	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	03/23/17 14:36	gss

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: PSA-SR

ACZ Sample ID: **L36058-08**

Date Sampled: 03/14/17 09:45

Date Received: 03/17/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	176		*	mg/L	2	20	03/18/17 0:00	emk
Carbonate as CaCO3		1	7.1	B	*	mg/L	2	20	03/18/17 0:00	emk
Hydroxide as CaCO3		1		U	*	mg/L	2	20	03/18/17 0:00	emk
Total Alkalinity		1	184		*	mg/L	2	20	03/18/17 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			04/03/17 0:00	calc
Sum of Anions			8.9			meq/L			04/03/17 0:00	calc
Sum of Cations			8.9			meq/L			04/03/17 0:00	calc
Chloride	SM4500Cl-E	1	4.0		*	mg/L	0.5	2	03/30/17 9:23	bce
Conductivity @25C	SM2510B	1	799		*	umhos/cm	1	10	03/18/17 6:20	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 0:24	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/25/17 1:06	pjb
Fluoride	SM4500F-C	1	0.91		*	mg/L	0.05	0.3	03/24/17 11:39	sck
Hardness as CaCO3 (dissolved)	SM2340B - Calculation		262			mg/L	0.2	5	04/03/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	0.04	B	*	mg/L	0.02	0.1	03/28/17 23:21	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	03/23/17 13:10	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	5		U	*	mg/L	0.5	3	03/29/17 22:43	pjb
pH (lab)	SM4500H+ B									
pH		1	8.4	H	*	units	0.1	0.1	03/18/17 0:00	emk
pH measured at		1	20.3		*	C	0.1	0.1	03/18/17 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	04/03/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/22/17 19:24	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	03/18/17 14:23	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	03/24/17 20:27	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	600		*	mg/L	10	20	03/17/17 17:21	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	03/17/17 13:59	keh
Residue, Total (TS) @ 105C	SM2540B	1	622		*	mg/L	10	20	03/20/17 17:04	sck
Sulfate	D516-02/-07 - Turbidimetric	10	243		*	mg/L	10	50	03/29/17 9:50	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	03/21/17 14:25	emk
TDS (calculated)	Calculation		547			mg/L			04/03/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.10						04/03/17 0:00	calc



Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: <http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-06	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420317	Chloride	SM4500CI-E	Q6	Sample was received above recommended temperature.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
			SM4500F-C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
	WG419928	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419966	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
	WG419607	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419879	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420040	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419604	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419607	Total Alkalinity	SM2320B - Titration	Q6	validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL). Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-08	WG419607	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG419921	Calcium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG419607	Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420317	Chloride	SM4500CI-E	Q6	Sample was received above recommended temperature.
			SM4500CI-E	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG420046	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420047	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419927	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG419607	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG420216	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
			M353.2 - H2SO4 preserved	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419928	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
			M350.1 Auto Salicylate w/gas diffusion	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420080	Nitrogen, total Kjeldahl	M351.2 - Block Digester	D1	Sample required dilution due to matrix.
			M351.2 - Block Digester	DB	Sample required dilution due to low bias result.
	WG420293		M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M351.2 - TKN by Block Digester	N1	See Case Narrative.
			M351.2 - TKN by Block Digester	Q6	Sample was received above recommended temperature.
			M351.2 - TKN by Block Digester	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG419879	Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419623	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
			M365.1 - Automated Ascorbic Acid	Q6	Sample was received above recommended temperature.
			M365.1 - Automated Ascorbic Acid	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG420040	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	Q6	Sample was received above recommended temperature.
			M365.1 - Auto Ascorbic Acid (digest)	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG419611	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG419600	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419722	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG419921	Strontium, dissolved	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420236	Sulfate	D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG419767	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.
			SM4500S2-D	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG419607	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: HW-1

ACZ Sample ID: **L36058-06**
Date Sampled: 03/15/17 7:55
Date Received: 03/17/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**
Extract Method: **M3520**

Workgroup: WG419924

Analyst: mmn
Extract Date: 03/21/17 14:52
Analysis Date: 03/22/17 21:53

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	0.93	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	82		0.93	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: PSA-SR

ACZ Sample ID: **L36058-08**

Date Sampled: 03/14/17 9:45

Date Received: 03/17/17

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)Analysis Method: **M8015D GC/FID**Extract Method: **M3520****Workgroup:** WG419924

Analyst: mmn

Extract Date: 03/21/17 14:58

Analysis Date: 03/22/17 23:04

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1.05	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	85		1.05	*	%	70	130

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>LCL</i>	Lower Control Limit
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #4) Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>UCL</i>	Upper Control Limit
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>SURR</i>	Surrogate	<i>LFM</i>	Laboratory Fortified Matrix
<i>INTS</i>	Internal Standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>MS/MSD</i>	Matrix Spike/Matrix Spike Duplicate
<i>LCSW</i>	Laboratory Control Sample - Water	<i>PBS</i>	Prep Blank - Soil
<i>LFB</i>	Laboratory Fortified Blank	<i>PBW</i>	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
O	Analyte concentration is estimated due to result exceeding calibration range.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
J	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/4-90/020. Methods for the Determination of Organic Compounds in Drinking Water (I), July 1990.
- (3) EPA 600/R-92/129. Methods for the Determination of Organic Compounds in Drinking Water (II), July 1990.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Excluding Oil & Grease, solid & biological matrices for organic analyses are reported on a wet weight basis.
- (3) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (4) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-01	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-02	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-03	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-04	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-05	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-06	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L36058-07	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-08	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L36058-09	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-10	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.

ACZ Project ID: **L36058**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36058-11	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		OTP	M8015D GC/FID	SA	Surrogate recovery was outside acceptance limits due to matrix interference.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.
L36058-12	WG419924	*All Compounds*	M8015D GC/FID	Q6	Sample was received above recommended temperature.
		TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
	WG419983	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
			1664A - Gravimetric	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.

ACZ Project ID: **L36058**

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Bismuth, dissolved	M200.7 ICP
Bismuth, total	M200.7 ICP
Gallium, dissolved	M200.7 ICP
Gallium, total	M200.7 ICP
Scandium, dissolved	M200.7 ICP
Scandium, total	M200.7 ICP

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L36058
 Date Received: 03/17/2017 09:49
 Received By:
 Date Printed: 3/17/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples? A change was made in the Invoice to, (COC1-4), Sample I.D. Line 1 (COC 1) section prior to ACZ custody.	X		

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time? Some parameters were received past hold time.		X	

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
2313	10.9	<=6.0	13	N/A
3914	8.3	<=6.0	13	N/A
4336	14	<=6.0	13	N/A
4612	12.7	<=6.0	14	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L36058
Date Received: 03/17/2017 09:49
Received By:
Date Printed: 3/17/2017

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc. C36058

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza
Company: Minera San Rafael
E-mail: M.Berganza@sanrafael.com.gt

Address: Blvd los Proceres 18 calle 24-69 zona 16
Empresarial, 2 Pradera, Torre IV oficina 1406
Telephone: (502) 5951 52 48

Copy of Report to:

Name: Luisa Fernanda Barrios
Company: Minera San Rafael

E-mail: L.Barrios@sanrafael.com.gt
Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza LF Bamol
Company:
E-mail:

Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: [Signature] I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Table with columns: Quote #, PO#, Reporting state, Check box, SAMPLE IDENTIFICATION, DATE:TIME, Matrix, # of Containers, and analysis columns (SW, GWT, TPH, etc.).

4
5
6

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC# 2/4

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

Table with columns: RELINQUISHED BY, DATE:TIME, RECEIVED BY, DATE:TIME. Includes signatures and dates for Luisa Fernanda Barrios and Juan Aguilera.



Laboratories, Inc. L36058

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza
Company: Minera San Rafael
E-mail: M.Berganza@sanrafael.com.gt

Address: Blvd los Próceros B.calle 24-69 Z 10
Empresarial, 2 Pradera, Torre IV oficina 406
Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa fernanda Barrios
Company: Minera San Rafael

E-mail: L.Barrios@sanrafael.com.gt
Telephone: (502) 5696-4268

Invoice to:

Name: Miguel Berganza LF Barrios
Company:
E-mail:

Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Barrios Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: [Signature] I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

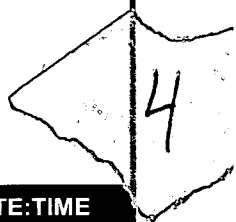
Table with columns: Quote #, PO#, Reporting state, Check box, SAMPLE IDENTIFICATION, DATE:TIME, Matrix, # of Containers, SW, GW, TPH, and 10 empty columns for analyses.

789

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC # 3/4



Please refer to ACZ's terms & conditions located on the reverse side of this COC.

Table with columns: RELINQUISHED BY, DATE:TIME, RECEIVED BY, DATE:TIME. Includes signatures and dates for Luisa Fernanda Barrios and Juan Aguilera.



Guatemala March ¹⁵~~14~~th 2017

To whom it may concern:

Minera San Rafael, S.A is sending a case with samples of water, which is not contaminated, that are going to be analyzed by the ACZ Laboratories in Steamboat Springs, Colorado, USA.

If you have any question or doubt, please contact Miguel Berganza at Minera San Rafael, S.A. (502 - 5951-5248) or Sue Webber at ACZ Laboratories (970-879-6590).

Sincerely yours,

Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.

REG 016 Resultados de Análisis

Muestras: 1 muestra de agua
Análisis solicitado por: Ing. Miguel Berganza
Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa
Procedencia de la muestra: Proyecto Escobal
Fecha de muestreo: 150317
Fecha de ingreso de muestra: 150317
Fecha de análisis: 150317-240317
Fecha del informe: 240317

Resultados:

Correlativo Ecosistemas	Identificación de la Muestra	Color Aparente (UC HZ equiv. Unid. Pt-Co)	Color Real (UC HZ equiv. Unid. Pt-Co)	* Cromo Hexavalente Cr(VI) mg/l	** Coliformes Fecales (NMP/100ml)
7647	HW-1	16	< 1	N.D.	< 1.8

Notas:

Captación de muestras: La muestra fue captada por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración.

Metodología: Espectrofotométricos / SMWW: Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977.

Fotométricos Merck. NMP: Número más probable.

La muestra contiene bisulfito de sodio para el análisis microbiológico según información del cliente.

N.D. No detectable. Debajo del límite de detección.

Límites de detección: Cromo hexavalente (0.05 mg/l).

Los resultados obtenidos corresponden únicamente a la muestra recibida por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

** Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04*

*** Análisis referido a laboratorio acreditado.*



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

REG 016 Resultados de Análisis

Muestras: 1 muestra de agua
Análisis solicitado por: Ing. Miguel Berganza
Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa
Procedencia de la muestra: Proyecto Escobal
Fecha de muestreo: 140317
Fecha de ingreso de muestra: 140317
Fecha de análisis: 140317-230317
Fecha del informe: 230317

Resultados:

Correlativo Ecosistemas	Identificación de la Muestra	Color Aparente (UC HZ equiv. Unid. Pt-Co)	Color Real (UC HZ equiv. Unid. Pt-Co)	* Cromo Hexavalente Cr(VI) mg/l	** Coliformes Fecales (NMP/100ml)
7630	PSA-SR	12	< 1	N.D.	< 1.8

Notas:

Captación de muestras: La muestra fue captada por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración.

Metodología: Espectrofotométricos / SMWW: Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977 .

Fotométricos Merck. NMP: Número más probable.

N.D. No detectable. Debajo del limite de detección.

Limites de detección: Cromo hexavalente (0.05 mg/l).

Los resultados obtenidos corresponden únicamente a la muestra recibida por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

* **Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04**

** **Análisis referido a laboratorio acreditado.**



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

12.6 Informes Originales de los Resultados Analíticos obtenidos del muestreo de sedimentos, Marzo de 2017

April 24, 2017

Report to:

Luisa Fernanda
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Luisa Fernanda
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Eric von Quednow, Fernando Samayoa

Project ID: Escobal

ACZ Project ID: L36355

Luisa Fernanda:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 03, 2017. This project has been assigned to ACZ's project number, L36355. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L36355. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

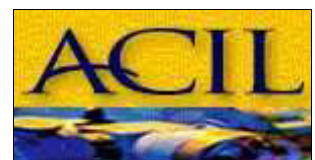
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 24, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

April 24, 2017

Project ID: Escobal

ACZ Project ID: L36355

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 9 sediment samples from Tahoe Resources, Inc. on April 3, 2017. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L36355. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times except for parameters flagged with "H" flags (H3, H1), received either after the hold time expired or too close to the hold time.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-2A

ACZ Sample ID: **L36355-01**

Date Sampled: 03/14/17 17:15

Date Received: 04/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 10:23	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/10/17 17:03	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20400	36900		*	mg/Kg	20	100	04/19/17 20:08	mfm
Antimony, total (3050)	M6020 ICP-MS	510	5.3		*	mg/Kg	0.2	1	04/21/17 14:10	mfm
Arsenic, total (3050)	M6020 ICP-MS	510	46.4			mg/Kg	0.1	0.5	04/17/17 15:40	enb
Barium, total (3050)	M6020 ICP-MS	510	292		*	mg/Kg	0.3	1	04/21/17 14:10	mfm
Boron, total (3050)	M6010B ICP	102	4	B		mg/Kg	1	5	04/13/17 16:01	aeb
Cadmium, total (3050)	M6020 ICP-MS	510	7.26			mg/Kg	0.05	0.3	04/17/17 15:40	enb
Calcium, total (3050)	M6010B ICP	102	12000			mg/Kg	10	50	04/12/17 19:10	aeb
Chromium, total (3050)	M6020 ICP-MS	510	10.8			mg/Kg	0.3	1	04/17/17 15:40	enb
Copper, total (3050)	M6020 ICP-MS	510	49.0			mg/Kg	0.3	1	04/17/17 15:40	enb
Iron, total (3050)	M6010B ICP	102	21300		*	mg/Kg	2	5	04/13/17 16:01	aeb
Lead, total (3050)	M6020 ICP-MS	510	363			mg/Kg	0.05	0.3	04/17/17 15:40	enb
Magnesium, total (3050)	M6010B ICP	102	3410			mg/Kg	20	100	04/12/17 19:10	aeb
Manganese, total (3050)	M6020 ICP-MS	20400	4920		*	mg/Kg	10	50	04/19/17 20:08	mfm
Mercury, total	M7471A CVAA	350	0.09	B	*	mg/Kg	0.07	0.4	04/10/17 17:17	pta
Molybdenum, total (3050)	M6010B ICP	102	2	B		mg/Kg	2	10	04/12/17 19:10	aeb
Nickel, total (3050)	M6020 ICP-MS	510	8.6			mg/Kg	0.3	2	04/17/17 15:40	enb
Potassium, total (3050)	M6010B ICP	102	1920			mg/Kg	20	100	04/12/17 19:10	aeb
Selenium, total (3050)	M6020 ICP-MS	510	0.59		*	mg/Kg	0.05	0.1	04/17/17 15:40	enb
Silver, total (3050)	M6020 ICP-MS	20400	24			mg/Kg	1	5	04/19/17 20:08	mfm
Zinc, total (3050)	M6020 ICP-MS	510	609			mg/Kg	1	3	04/17/17 15:40	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	38.3		*	%	0.1	0.5	04/05/17 12:04	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 8:55	dbt
Digestion - Hot Plate	M3050B ICP								04/11/17 13:06	jlw
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 13:06	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 9:13	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	64.8		UH	*	mg/Kg	0.4	1	04/18/17 16:32	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	105	0.0283	H	*	%	0.00105	0.00525	04/13/17 16:57	spl

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-3

ACZ Sample ID: **L36355-02**

Date Sampled: 03/14/17 15:06

Date Received: 04/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 10:46	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/10/17 18:51	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20200	8780		*	mg/Kg	20	100	04/19/17 20:11	mfm
Antimony, total (3050)	M6020 ICP-MS	505	1.1		*	mg/Kg	0.2	1	04/21/17 14:12	mfm
Arsenic, total (3050)	M6020 ICP-MS	505	15.1			mg/Kg	0.1	0.5	04/17/17 15:44	enb
Barium, total (3050)	M6020 ICP-MS	505	201		*	mg/Kg	0.3	1	04/21/17 14:12	mfm
Boron, total (3050)	M6010B ICP	101	1	B		mg/Kg	1	5	04/13/17 16:04	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.33			mg/Kg	0.05	0.3	04/17/17 15:44	enb
Calcium, total (3050)	M6010B ICP	101	3100			mg/Kg	10	50	04/12/17 19:13	aeb
Chromium, total (3050)	M6020 ICP-MS	505	3.2			mg/Kg	0.3	1	04/17/17 15:44	enb
Copper, total (3050)	M6020 ICP-MS	505	4.4			mg/Kg	0.3	1	04/17/17 15:44	enb
Iron, total (3050)	M6010B ICP	101	14000		*	mg/Kg	2	5	04/13/17 16:04	aeb
Lead, total (3050)	M6020 ICP-MS	505	8.60			mg/Kg	0.05	0.3	04/17/17 15:44	enb
Magnesium, total (3050)	M6010B ICP	101	780			mg/Kg	20	100	04/12/17 19:13	aeb
Manganese, total (3050)	M6020 ICP-MS	505	418		*	mg/Kg	0.3	1	04/17/17 15:44	enb
Mercury, total	M7471A CVAA	175		U	*	mg/Kg	0.04	0.2	04/10/17 17:18	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	04/12/17 19:13	aeb
Nickel, total (3050)	M6020 ICP-MS	505	2.5			mg/Kg	0.3	2	04/17/17 15:44	enb
Potassium, total (3050)	M6010B ICP	101	1640			mg/Kg	20	100	04/12/17 19:13	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.22		*	mg/Kg	0.05	0.1	04/17/17 15:44	enb
Silver, total (3050)	M6020 ICP-MS	20200		U		mg/Kg	1	5	04/19/17 20:11	mfm
Zinc, total (3050)	M6020 ICP-MS	505	41			mg/Kg	1	3	04/17/17 15:44	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	76.1		*	%	0.1	0.5	04/05/17 14:13	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 9:00	dbt
Digestion - Hot Plate	M3050B ICP								04/11/17 14:08	jlw
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 14:08	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 9:20	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	32.7		UH	*	mg/Kg	0.2	0.7	04/18/17 16:34	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	43.1	0.0159	H	*	%	0.00043	0.00216	04/13/17 14:53	spl

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-4

ACZ Sample ID: **L36355-03**

Date Sampled: 03/14/17 14:35

Date Received: 04/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 11:09	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/10/17 20:39	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20200	9940		*	mg/Kg	20	100	04/19/17 20:15	mfm
Antimony, total (3050)	M6020 ICP-MS	505	1.6		*	mg/Kg	0.2	1	04/21/17 14:16	mfm
Arsenic, total (3050)	M6020 ICP-MS	505	16.0			mg/Kg	0.1	0.5	04/17/17 15:47	enb
Barium, total (3050)	M6020 ICP-MS	505	143		*	mg/Kg	0.3	1	04/21/17 14:16	mfm
Boron, total (3050)	M6010B ICP	101	2	B		mg/Kg	1	5	04/13/17 16:07	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.69			mg/Kg	0.05	0.3	04/17/17 15:47	enb
Calcium, total (3050)	M6010B ICP	101	2940			mg/Kg	10	50	04/12/17 19:16	aeb
Chromium, total (3050)	M6020 ICP-MS	505	4.7			mg/Kg	0.3	1	04/17/17 15:47	enb
Copper, total (3050)	M6020 ICP-MS	505	10.5			mg/Kg	0.3	1	04/17/17 15:47	enb
Iron, total (3050)	M6010B ICP	101	13900		*	mg/Kg	2	5	04/13/17 16:07	aeb
Lead, total (3050)	M6020 ICP-MS	505	19.4			mg/Kg	0.05	0.3	04/17/17 15:47	enb
Magnesium, total (3050)	M6010B ICP	101	900			mg/Kg	20	100	04/12/17 19:16	aeb
Manganese, total (3050)	M6020 ICP-MS	505	583		*	mg/Kg	0.3	1	04/17/17 15:47	enb
Mercury, total	M7471A CVAA	294		U	*	mg/Kg	0.06	0.3	04/10/17 17:19	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	04/12/17 19:16	aeb
Nickel, total (3050)	M6020 ICP-MS	505	2.9			mg/Kg	0.3	2	04/17/17 15:47	enb
Potassium, total (3050)	M6010B ICP	101	1580			mg/Kg	20	100	04/12/17 19:16	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.33		*	mg/Kg	0.05	0.1	04/17/17 15:47	enb
Silver, total (3050)	M6020 ICP-MS	505	0.53			mg/Kg	0.03	0.1	04/17/17 15:47	enb
Zinc, total (3050)	M6020 ICP-MS	505	70			mg/Kg	1	3	04/17/17 15:47	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	63.8		*	%	0.1	0.5	04/05/17 15:18	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 9:05	dbt
Digestion - Hot Plate	M3050B ICP								04/11/17 15:10	jlw
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 15:10	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 9:27	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	34.1		UH	*	mg/Kg	0.2	0.7	04/18/17 16:36	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	67	0.0185	H	*	%	0.00067	0.00335	04/13/17 16:48	spl

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-4A

ACZ Sample ID: **L36355-04**

Date Sampled: 03/14/17 16:40

Date Received: 04/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 11:21	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/10/17 21:33	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20200	12800		*	mg/Kg	20	100	04/19/17 20:17	mfm
Antimony, total (3050)	M6020 ICP-MS	505	3.5		*	mg/Kg	0.2	1	04/21/17 14:18	mfm
Arsenic, total (3050)	M6020 ICP-MS	505	21.5			mg/Kg	0.1	0.5	04/17/17 15:50	enb
Barium, total (3050)	M6020 ICP-MS	505	160		*	mg/Kg	0.3	1	04/21/17 14:18	mfm
Boron, total (3050)	M6010B ICP	101	2	B		mg/Kg	1	5	04/13/17 16:10	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	1.09			mg/Kg	0.05	0.3	04/17/17 15:50	enb
Calcium, total (3050)	M6010B ICP	101	4260			mg/Kg	10	50	04/12/17 19:19	aeb
Chromium, total (3050)	M6020 ICP-MS	505	6.7			mg/Kg	0.3	1	04/17/17 15:50	enb
Copper, total (3050)	M6020 ICP-MS	505	13.4			mg/Kg	0.3	1	04/17/17 15:50	enb
Iron, total (3050)	M6010B ICP	101	13600		*	mg/Kg	2	5	04/13/17 16:10	aeb
Lead, total (3050)	M6020 ICP-MS	505	40.3			mg/Kg	0.05	0.3	04/17/17 15:50	enb
Magnesium, total (3050)	M6010B ICP	101	1280			mg/Kg	20	100	04/12/17 19:19	aeb
Manganese, total (3050)	M6020 ICP-MS	20200	1770		*	mg/Kg	10	50	04/19/17 20:17	mfm
Mercury, total	M7471A CVAA	255		U	*	mg/Kg	0.05	0.3	04/10/17 17:20	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	04/12/17 19:19	aeb
Nickel, total (3050)	M6020 ICP-MS	505	4.3			mg/Kg	0.3	2	04/17/17 15:50	enb
Potassium, total (3050)	M6010B ICP	101	1780			mg/Kg	20	100	04/12/17 19:19	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.36		*	mg/Kg	0.05	0.1	04/17/17 15:50	enb
Silver, total (3050)	M6020 ICP-MS	505	2.03			mg/Kg	0.03	0.1	04/17/17 15:50	enb
Zinc, total (3050)	M6020 ICP-MS	505	117			mg/Kg	1	3	04/17/17 15:50	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	54.4		*	%	0.1	0.5	04/05/17 16:22	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 9:10	dbt
Digestion - Hot Plate	M3050B ICP								04/11/17 16:12	jlw
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 16:12	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 9:33	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	40.3		UH	*	mg/Kg	0.2	0.8	04/18/17 16:36	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	74.9	0.0253	H	*	%	0.00075	0.00375	04/13/17 16:49	spl

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-5

ACZ Sample ID: **L36355-05**

Date Sampled: 03/14/17 08:40

Date Received: 04/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 11:32	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/10/17 22:28	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20200	11700		*	mg/Kg	20	100	04/19/17 20:19	mfm
Antimony, total (3050)	M6020 ICP-MS	505	0.8	B	*	mg/Kg	0.2	1	04/21/17 14:20	mfm
Arsenic, total (3050)	M6020 ICP-MS	505	23.0			mg/Kg	0.1	0.5	04/17/17 16:00	enb
Barium, total (3050)	M6020 ICP-MS	505	234		*	mg/Kg	0.3	1	04/21/17 14:20	mfm
Boron, total (3050)	M6010B ICP	101		U		mg/Kg	1	5	04/13/17 16:19	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.50			mg/Kg	0.05	0.3	04/17/17 16:00	enb
Calcium, total (3050)	M6010B ICP	101	1470			mg/Kg	10	50	04/12/17 19:35	aeb
Chromium, total (3050)	M6020 ICP-MS	505	6.3			mg/Kg	0.3	1	04/17/17 16:00	enb
Copper, total (3050)	M6020 ICP-MS	505	7.5			mg/Kg	0.3	1	04/17/17 16:00	enb
Iron, total (3050)	M6010B ICP	101	19100		*	mg/Kg	2	5	04/13/17 16:19	aeb
Lead, total (3050)	M6020 ICP-MS	505	11.8			mg/Kg	0.05	0.3	04/17/17 16:00	enb
Magnesium, total (3050)	M6010B ICP	101	800			mg/Kg	20	100	04/12/17 19:35	aeb
Manganese, total (3050)	M6020 ICP-MS	505	682		*	mg/Kg	0.3	1	04/17/17 16:00	enb
Mercury, total	M7471A CVAA	214	0.06	B	*	mg/Kg	0.04	0.2	04/10/17 17:26	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	04/12/17 19:35	aeb
Nickel, total (3050)	M6020 ICP-MS	505	3.0			mg/Kg	0.3	2	04/17/17 16:00	enb
Potassium, total (3050)	M6010B ICP	101	1490			mg/Kg	20	100	04/12/17 19:35	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.23		*	mg/Kg	0.05	0.1	04/17/17 16:00	enb
Silver, total (3050)	M6020 ICP-MS	505	0.09	B		mg/Kg	0.03	0.1	04/17/17 16:00	enb
Zinc, total (3050)	M6020 ICP-MS	505	46			mg/Kg	1	3	04/17/17 16:00	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	75.4		*	%	0.1	0.5	04/05/17 17:27	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 9:15	dbt
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 19:17	jlw
Digestion - Hot Plate	M3050B ICP								04/11/17 19:17	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 9:40	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	28.6		UH	*	mg/Kg	0.2	0.6	04/18/17 16:37	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	63.9	0.0105	H	*	%	0.00064	0.0032	04/13/17 14:57	spl

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-6

ACZ Sample ID: **L36355-06**

Date Sampled: 03/14/17 11:37

Date Received: 04/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 11:44	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/10/17 23:22	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20200	5630		*	mg/Kg	20	100	04/19/17 20:21	mfm
Antimony, total (3050)	M6020 ICP-MS	505	0.3	B	*	mg/Kg	0.2	1	04/21/17 14:22	mfm
Arsenic, total (3050)	M6020 ICP-MS	505	29.8			mg/Kg	0.1	0.5	04/17/17 16:03	enb
Barium, total (3050)	M6020 ICP-MS	505	103		*	mg/Kg	0.3	1	04/21/17 14:22	mfm
Boron, total (3050)	M6010B ICP	101	4	B		mg/Kg	1	5	04/13/17 16:28	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.26	B		mg/Kg	0.05	0.3	04/17/17 16:03	enb
Calcium, total (3050)	M6010B ICP	101	1340			mg/Kg	10	50	04/12/17 19:38	aeb
Chromium, total (3050)	M6020 ICP-MS	505	2.5			mg/Kg	0.3	1	04/17/17 16:03	enb
Copper, total (3050)	M6020 ICP-MS	505	4.3			mg/Kg	0.3	1	04/17/17 16:03	enb
Iron, total (3050)	M6010B ICP	101	11000		*	mg/Kg	2	5	04/13/17 16:28	aeb
Lead, total (3050)	M6020 ICP-MS	505	6.76			mg/Kg	0.05	0.3	04/17/17 16:03	enb
Magnesium, total (3050)	M6010B ICP	101	710			mg/Kg	20	100	04/12/17 19:38	aeb
Manganese, total (3050)	M6020 ICP-MS	20200	480		*	mg/Kg	10	50	04/19/17 20:21	mfm
Mercury, total	M7471A CVAA	204		U	*	mg/Kg	0.04	0.2	04/10/17 17:27	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	04/12/17 19:38	aeb
Nickel, total (3050)	M6020 ICP-MS	505	1.6	B		mg/Kg	0.3	2	04/17/17 16:03	enb
Potassium, total (3050)	M6010B ICP	101	1130			mg/Kg	20	100	04/12/17 19:38	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.18		*	mg/Kg	0.05	0.1	04/17/17 16:03	enb
Silver, total (3050)	M6020 ICP-MS	505	0.14			mg/Kg	0.03	0.1	04/17/17 16:03	enb
Zinc, total (3050)	M6020 ICP-MS	20200	40	B		mg/Kg	40	100	04/19/17 20:21	mfm

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	75.5		*	%	0.1	0.5	04/05/17 18:31	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 9:20	dbt
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 20:19	jlw
Digestion - Hot Plate	M3050B ICP								04/11/17 20:19	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 9:47	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	30.2		UH	*	mg/Kg	0.2	0.6	04/18/17 16:38	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	66.1	0.0138	H	*	%	0.00066	0.00331	04/13/17 16:50	spl

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-8

ACZ Sample ID: **L36355-07**
Date Sampled: 03/14/17 10:30
Date Received: 04/03/17
Sample Matrix: Sediment

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 11:55	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/11/17 0:16	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20400	21200		*	mg/Kg	20	100	04/19/17 20:27	mfm
Antimony, total (3050)	M6020 ICP-MS	510	1.6		*	mg/Kg	0.2	1	04/21/17 14:28	mfm
Arsenic, total (3050)	M6020 ICP-MS	510	15.2			mg/Kg	0.1	0.5	04/17/17 16:06	enb
Barium, total (3050)	M6020 ICP-MS	510	243		*	mg/Kg	0.3	1	04/21/17 14:28	mfm
Boron, total (3050)	M6010B ICP	102	3	B		mg/Kg	1	5	04/13/17 16:31	aeb
Cadmium, total (3050)	M6020 ICP-MS	510	1.91			mg/Kg	0.05	0.3	04/17/17 16:06	enb
Calcium, total (3050)	M6010B ICP	102	6090			mg/Kg	10	50	04/12/17 19:41	aeb
Chromium, total (3050)	M6020 ICP-MS	510	8.6			mg/Kg	0.3	1	04/17/17 16:06	enb
Copper, total (3050)	M6020 ICP-MS	510	30.7			mg/Kg	0.3	1	04/17/17 16:06	enb
Iron, total (3050)	M6010B ICP	102	16300		*	mg/Kg	2	5	04/13/17 16:31	aeb
Lead, total (3050)	M6020 ICP-MS	510	57.2			mg/Kg	0.05	0.3	04/17/17 16:06	enb
Magnesium, total (3050)	M6010B ICP	102	1470			mg/Kg	20	100	04/12/17 19:41	aeb
Manganese, total (3050)	M6020 ICP-MS	510	686		*	mg/Kg	0.3	1	04/17/17 16:06	enb
Mercury, total	M7471A CVAA	662		U	*	mg/Kg	0.1	0.7	04/10/17 17:28	pta
Molybdenum, total (3050)	M6010B ICP	102		U		mg/Kg	2	10	04/12/17 19:41	aeb
Nickel, total (3050)	M6020 ICP-MS	510	4.7			mg/Kg	0.3	2	04/17/17 16:06	enb
Potassium, total (3050)	M6010B ICP	102	1850			mg/Kg	20	100	04/12/17 19:41	aeb
Selenium, total (3050)	M6020 ICP-MS	510	0.88		*	mg/Kg	0.05	0.1	04/17/17 16:06	enb
Silver, total (3050)	M6020 ICP-MS	510	3.87			mg/Kg	0.03	0.1	04/17/17 16:06	enb
Zinc, total (3050)	M6020 ICP-MS	510	221			mg/Kg	1	3	04/17/17 16:06	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	26.9		*	%	0.1	0.5	04/05/17 19:36	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 9:25	dbt
Digestion - Hot Plate	M3050B ICP								04/11/17 21:20	jlw
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 21:20	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 9:54	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	85.5		UH	*	mg/Kg	0.5	2	04/18/17 16:41	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	373	0.159	H	*	%	0.00373	0.0187	04/13/17 16:28	spl

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-9

ACZ Sample ID: **L36355-08**

Date Sampled: 03/14/17 12:30

Date Received: 04/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 12:07	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/11/17 1:10	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20200	6730		*	mg/Kg	20	100	04/19/17 20:29	mfm
Antimony, total (3050)	M6020 ICP-MS	505	0.5	B	*	mg/Kg	0.2	1	04/21/17 14:30	mfm
Arsenic, total (3050)	M6020 ICP-MS	505	5.5			mg/Kg	0.1	0.5	04/17/17 16:13	enb
Barium, total (3050)	M6020 ICP-MS	505	123		*	mg/Kg	0.3	1	04/21/17 14:30	mfm
Boron, total (3050)	M6010B ICP	101	1	B		mg/Kg	1	5	04/13/17 16:34	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.31			mg/Kg	0.05	0.3	04/17/17 16:13	enb
Calcium, total (3050)	M6010B ICP	101	1470			mg/Kg	10	50	04/12/17 19:44	aeb
Chromium, total (3050)	M6020 ICP-MS	505	4.7			mg/Kg	0.3	1	04/17/17 16:13	enb
Copper, total (3050)	M6020 ICP-MS	505	5.4			mg/Kg	0.3	1	04/17/17 16:13	enb
Iron, total (3050)	M6010B ICP	101	12600		*	mg/Kg	2	5	04/13/17 16:34	aeb
Lead, total (3050)	M6020 ICP-MS	505	6.33			mg/Kg	0.05	0.3	04/17/17 16:13	enb
Magnesium, total (3050)	M6010B ICP	101	1060			mg/Kg	20	100	04/12/17 19:44	aeb
Manganese, total (3050)	M6020 ICP-MS	505	396		*	mg/Kg	0.3	1	04/17/17 16:13	enb
Mercury, total	M7471A CVAA	193		U	*	mg/Kg	0.04	0.2	04/10/17 17:29	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	04/12/17 19:44	aeb
Nickel, total (3050)	M6020 ICP-MS	505	2.3			mg/Kg	0.3	2	04/17/17 16:13	enb
Potassium, total (3050)	M6010B ICP	101	1090			mg/Kg	20	100	04/12/17 19:44	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.14		*	mg/Kg	0.05	0.1	04/17/17 16:13	enb
Silver, total (3050)	M6020 ICP-MS	505	0.10			mg/Kg	0.03	0.1	04/17/17 16:13	enb
Zinc, total (3050)	M6020 ICP-MS	505	42			mg/Kg	1	3	04/17/17 16:13	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	75.0		*	%	0.1	0.5	04/05/17 20:40	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 9:30	dbt
Digestion - Hot Plate	M3050B ICP								04/11/17 22:22	jlw
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 22:22	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 10:00	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	28.1		UH	*	mg/Kg	0.2	0.6	04/18/17 16:42	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	55.4	0.0132	H	*	%	0.00055	0.00277	04/13/17 16:29	spl

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED-11

ACZ Sample ID: **L36355-09**

Date Sampled: 03/14/17 17:15

Date Received: 04/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								04/18/17 12:19	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								04/11/17 2:04	krh

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	20400	36000		*	mg/Kg	20	100	04/19/17 20:31	mfm
Antimony, total (3050)	M6020 ICP-MS	510	5.5		*	mg/Kg	0.2	1	04/21/17 14:32	mfm
Arsenic, total (3050)	M6020 ICP-MS	510	51.6			mg/Kg	0.1	0.5	04/17/17 16:16	enb
Barium, total (3050)	M6020 ICP-MS	510	278		*	mg/Kg	0.3	1	04/21/17 14:32	mfm
Boron, total (3050)	M6010B ICP	102	4	B		mg/Kg	1	5	04/13/17 16:38	aeb
Cadmium, total (3050)	M6020 ICP-MS	510	7.79			mg/Kg	0.05	0.3	04/17/17 16:16	enb
Calcium, total (3050)	M6010B ICP	102	12800			mg/Kg	10	50	04/12/17 19:48	aeb
Chromium, total (3050)	M6020 ICP-MS	510	12.2			mg/Kg	0.3	1	04/17/17 16:16	enb
Copper, total (3050)	M6020 ICP-MS	510	50.6			mg/Kg	0.3	1	04/17/17 16:16	enb
Iron, total (3050)	M6010B ICP	102	21100		*	mg/Kg	2	5	04/13/17 16:38	aeb
Lead, total (3050)	M6020 ICP-MS	510	407			mg/Kg	0.05	0.3	04/17/17 16:16	enb
Magnesium, total (3050)	M6010B ICP	102	3650			mg/Kg	20	100	04/12/17 19:48	aeb
Manganese, total (3050)	M6020 ICP-MS	20400	5430		*	mg/Kg	10	50	04/19/17 20:31	mfm
Mercury, total	M7471A CVAA	336	0.09	B	*	mg/Kg	0.07	0.3	04/10/17 17:30	pta
Molybdenum, total (3050)	M6010B ICP	102	3	B		mg/Kg	2	10	04/12/17 19:48	aeb
Nickel, total (3050)	M6020 ICP-MS	510	9.2			mg/Kg	0.3	2	04/17/17 16:16	enb
Potassium, total (3050)	M6010B ICP	102	1920			mg/Kg	20	100	04/12/17 19:48	aeb
Selenium, total (3050)	M6020 ICP-MS	510	0.47		*	mg/Kg	0.05	0.1	04/17/17 16:16	enb
Silver, total (3050)	M6020 ICP-MS	20400	25			mg/Kg	1	5	04/19/17 20:31	mfm
Zinc, total (3050)	M6020 ICP-MS	510	643			mg/Kg	1	3	04/17/17 16:16	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	39.5		*	%	0.1	0.5	04/05/17 21:45	dbt

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees	C USDA No. 1, 1972								04/05/17 9:35	dbt
Digestion - Hot Plate	M3050B ICP								04/11/17 23:24	jlw
Digestion - Hot Plate	M3050B ICP-MS								04/11/17 23:24	jlw
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								04/10/17 10:07	dbt

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	60.4		UH	*	mg/Kg	0.4	1	04/18/17 16:43	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	73.8	0.0291	H	*	%	0.00074	0.00369	04/13/17 16:30	spl

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-01	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421433	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-02	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421257	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-03	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421257	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-04	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421433	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-05	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421257	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-06	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421433	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-07	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421257	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-08	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421257	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36355-09	WG421433	Aluminum, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421577	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Barium, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG421352	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	Q6	Sample was received above recommended temperature.
			M9012B - Automated Colorimetric	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG421109	Iron, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG421433	Manganese, total (3050)	M6020 ICP-MS	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG420848	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG421130	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.
			M365.1 - Auto Ascorbic Acid (digest)	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M365.1 - Auto Ascorbic Acid (digest)	RD	For a solid matrix, the duplicate RPD (spike or matrix) exceeded the control limit, which is attributable to the non-homogeneity of the sample.
	WG421257	Selenium, total (3050)	M6020 ICP-MS	ZG	The ICP or ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 50 times the MDL.

Tahoe Resources, Inc.

ACZ Project ID: **L36355**

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Solids, Percent	D2216-80
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Wet Chemistry

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)
-------------------	--------------------------------------

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L36355
 Date Received: 04/03/2017 10:11
 Received By:
 Date Printed: 4/3/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	X		
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
NA25779	13.4	<=6.0	13	N/A

Was ice present in the shipment container(s)?

No - Wet or gel ice was not present in the shipment container(s).

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L36355
Date Received: 04/03/2017 10:11
Received By:
Date Printed: 4/3/2017

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc.

236355

CHAIN of CUSTODY

73 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

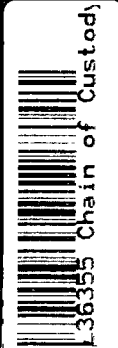
Name: Miguel Berganza
 Company: Minera San Rafael
 Email:

Address: Blvd Los Pinos 18 Calle 24-69 Z10
 Empresarial, Z. Piedra Blanca Oficina 1406
 Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa Fernanda Barriga
 Company: Minera San Rafael

E-mail: LBarriga@sanrafael.com.gt
 Telephone: (502) 5696 4268



Name: Miguel Berganza

Address:
 Telephone:

Received past holding time (HT), or if insufficient HT remains to complete
 the expiration, shall ACZ proceed with requested short HT analyses? YES
 NO

Contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

For SDWA Compliance Monitoring? Yes No

Include state forms. Results will be reported to PQL for Colorado.

Name: LF Sampler's Site Information State Zip code Time Zone

Sampler's Signature:

I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Sample #	Reporting state for compliance testing	Check box if samples include NRC licensed material?	SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers											
SED-2A			SED-2A	14-03-17 17:15	SO	1	/										
SED-3			SED-3	14-03-17 15:06	SO	1	/										
SED-4			SED-4	14-03-17 14:35	SO	1	/										
SED-4A			SED-4A	14-03-17 16:40	SO	1	/										
SED-5			SED-5	14-03-17 08:40	SO	1	/										
SED-6			SED-6	14-03-17 11:37	SO	1	/										
SED-8			SED-8	14-03-17 10:30	SO	1	/										
SED-9			SED-9	14-03-17 12:30	SO	1	/										
SED-WW9			SED-WW9	13-03-17 15:35	SO	1	/										
SED-11			SED-11	14-03-17 17:15	SO	1	/										

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

REMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Luisa Fernanda Barriga	28/03/17 08:00	SUBITOJ / ML	28/3/17
Juan Aguirre	28-03-2017 08:10		10:20
		WMS	4/3/17 10:11

12.7 Informes Originales de los Resultados Analíticos obtenidos del Efluente en los meses de Febrero a Abril de 2017



ECOSISTEMAS
PROYECTOS AMBIENTALES

LABORATORIO AMBIENTAL E INDUSTRIAL

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502 + 2437 7224 | 2437 4455

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Ref 439-17

Pág 1/2

REG 016 Resultados de Análisis

Muestra: 1 muestra de agua compuesta (según información del cliente)

Alicuota 1: 02:00 horas

Alicuota 2: 05:00 horas

Alicuota 3: 08:00 horas

Alicuota 4: 11:00 horas

Análisis solicitado por: Ing. Miguel Berganza

Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa

Procedencia de la muestra: Proyecto Escobal

Fecha de muestreo: 230217

Fecha de ingreso de muestra: 230217

Fecha de análisis: 230217-060317

Fecha del informe: 060317

Identificación de la muestra: WW9-A

Correlativo Ecosistemas: 7387

Acuerdo Gubernativo 236-2006 (excepto cianuros)

Limites Máximos Permisibles Entes
Generadores Nuevos
Acuerdo 236-2006

PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Potencial de Hidrogeno pH (Laboratorio)	unidades	1	7.48	SMWW 4500H-B	6 a 9
* Aceites y Grasas	mg/l	5	N.D.	EPA 1664	10
Materia Flotante	---	---	ausente ***	Visual	ausente
Demanda Bioquímica de Oxígeno DBO ₅	mg/l	10	< 10	Oxitop-Merck Análogo SMWW 5210D	ver nota
* Demanda Química de Oxígeno DQO	mg/l	25	34	Reflujo Cerrado, Merck, análogo SMWW 5220D	no especificado
Relación DBO ₅ /DQO	---	---	---	---	---
Relación DQO/DBO ₅	---	---	---	---	---
* Sólidos Suspendidos	mg/l	10	17	SMWW 2540D	100
* Sólidos Sedimentables	ml/l	0.1	< 0.1	SMWW 2540F	no especificado
* Nitrógeno Total	mg/l	10.9	N.D.	Digestión alcalina persulfato colorimétrico HACH	20
* Fósforo Total	mg/l	0.05	0.06	Spectroquant Merck Análogo EPA 365.2+3, SMWW 4500-P E, ISO 6978/1, DIN EN 1189 D11	10
* Arsénico As	mg/l	0.002	0.010	UNICAM AN40177_E10/03C	0.1
* Cadmio Cd	mg/l	0.02	N.D.	SMWW 3111B	0.1
* Cobre Cu	mg/l	0.03	N.D.	SMWW 3111B	3
* Cromo Hexavalente Cr(VI)	mg/l	0.05	N.D.	Colorimétrico Merck, análogo SMWW 3500-Cr	0.1
* Mercurio Hg	mg/l	0.004	N.D.	UNICAM AN40181_E10/03C	0.01
* Niquel Ni	mg/l	0.05	N.D.	SMWW 3111B	2

PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	Límites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
					descarga a cuerpo receptor
* Plomo Pb	mg/l	0.05	N.D.	SMWW 3111B	0.4
* Zinc Zn	mg/l	0.01	N.D.	SMWW 3111B	10
Color Aparente	UC HZ equiv. Unid. Pt-Co	1	174	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	500
Color Real	UC HZ equiv. Unid. Pt-Co	1	< 1	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	
** Coliformes Fecales	NMP/100ml	1.8	4.9×10^2	NMP	$< 1 \times 10^4$

Notas:

Captación de muestras: La muestra fue captada por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración. pH < 2 en muestra para análisis de metales y Aceites y Grasas

Metodología: Espectrofotométricos / Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977. EPA 1664

N.D. No detectable. Debajo del límite de detección.

NMP: Número más probable

El valor DQO/DBO₅ y DBO₅/DQO no se ha determinado porque el resultado se encuentra abajo de nuestros límites de detección.

Respecto a la DBO el acuerdo 236-2006 la relaciona como "carga" junto al caudal y como meta de cumplimiento

un valor de DBO de 200 mg/l (ver Acuerdo Artículo 21).

Los resultados obtenidos corresponden únicamente a la muestra recibida por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

*** Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04**

**** Análisis referido a laboratorio acreditado.**

***** El resultado se basa en el análisis visual de la muestra enviada por el cliente al laboratorio.**

Comparación de descarga según información del cliente.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

Luis Fernando Fuentes Méndez
Ingeniero Químico
Colegiado 876



REG 016 Resultados de Análisis

Muestra: 1 muestra de agua
Análisis solicitado por: Ing. Miguel Berganza
Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa
Procedencia de la muestra: Proyecto Escobal
Fecha de muestreo: 230217
Fecha de ingreso de muestra: 230217
Fecha de análisis: 230217-060317
Fecha del informe: 060317

Identificación de la muestra: WW10

Correlativo Ecosistemas: 7388

Acuerdo Gubernativo 236-2006 (excepto cianuros)					Limites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Potencial de Hidrogeno pH (Laboratorio)	unidades	1	6.26	SMWW 4500H-B	6 a 9
* Aceites y Grasas	mg/l	5	N.D.	EPA 1664	10
Materia Flotante	---	---	ausente ***	Visual	ausente
Demanda Bioquímica de Oxígeno DBO ₅	mg/l	10	< 10	Oxitop-Merck Análogo SMWW 5210D	ver nota
* Demanda Química de Oxígeno DQO	mg/l	25	< 25	Reflujo Cerrado, Merck, análogo SMWW 5220D	no especificado
Relación DBO ₅ /DQO	---	---	---	---	---
Relación DQO/DBO ₅	---	---	---	---	---
* Sólidos Suspendidos	mg/l	10	< 10	SMWW 2540D	100
* Sólidos Sedimentables	ml/l	0.1	< 0.1	SMWW 2540F	no especificado
* Nitrógeno Total	mg/l	10.9	N.D.	Digestión alcalina persulfato colorimétrico HACH	20
* Fósforo Total	mg/l	0.05	N.D.	Spectroquant Merck Análogo EPA 365.2+3, SMWW 4500-P E, ISO 6978/1, DIN EN 1189 D11	10
* Arsénico As	mg/l	0.002	N.D.	UNICAM AN40177_E10/03C	0.1
* Cadmio Cd	mg/l	0.02	N.D.	SMWW 3111B	0.1
* Cobre Cu	mg/l	0.03	N.D.	SMWW 3111B	3
* Cromo Hexavalente Cr(VI)	mg/l	0.05	N.D.	Colorimétrico Merck, análogo SMWW 3500- Cr	0.1
* Mercurio Hg	mg/l	0.004	N.D.	UNICAM AN40181_E10/03C	0.01
* Niquel Ni	mg/l	0.05	N.D.	SMWW 3111B	2

					Límites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Plomo Pb	mg/l	0.05	N.D.	SMWW 3111B	0.4
* Zinc Zn	mg/l	0.01	N.D.	SMWW 3111B	10
Color Aparente	UC HZ equiv. Unid. Pt-Co	1	< 1	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	500
Color Real	UC HZ equiv. Unid. Pt-Co	1	< 1	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	
** Coliformes Fecales	NMP/100ml	1.8	< 1.8	NMP	< 1 x 10 ⁴

Notas:

Captación de muestras: La muestra fue captada por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración. pH < 2 en muestra para análisis de metales y Aceites y Grasas

Metodología: Espectrofotométricos / Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977. EPA 1664

N.D. No detectable. Debajo del límite de detección.

NMP: Número más probable

El valor DQO/DBO₅ y DBO₅/DQO no se ha determinado porque el resultado se encuentra abajo de nuestros límites de detección.

Respecto a la DBO el acuerdo 236-2006 la relaciona como "carga" junto al caudal y como meta de cumplimiento un valor de DBO de 200 mg/l (ver Acuerdo Artículo 21).

Los resultados obtenidos corresponden únicamente a la muestra recibida por el personal de Ecosistemas Proyectos Ambientales.

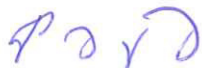
Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

*** Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04**

**** Análisis referido a laboratorio acreditado.**

***** El resultado se basa en el análisis visual de la muestra enviada por el cliente al laboratorio.**

Comparación de descarga según información del cliente.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

Luis Fernando Fuentes Méndez
Ingeniero Químico
Colegiado 876

March 08, 2017

Report to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Miguel Berganza

Tahoe Resources, Inc.

Boulevard Los Proceres 18 c. 24-69 zona 10

Centro

Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Luisa Fernanda Barrios

Project ID: Escobal

ACZ Project ID: L35792

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 02, 2017. This project has been assigned to ACZ's project number, L35792. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L35792. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

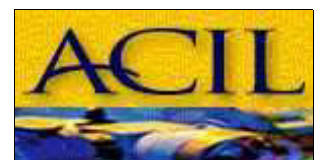
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after April 07, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.Project ID: Escobal
Sample ID: WW 9-AACZ Sample ID: **L35792-01**
Date Sampled: 02/23/17 11:00
Date Received: 03/02/17
Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/06/17 12:24	bce

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/07/17 22:46	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW 10

ACZ Sample ID: **L35792-02**

Date Sampled: 02/23/17 12:00

Date Received: 03/02/17

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								03/06/17 12:30	bce

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	03/07/17 22:47	pjb



Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L35792**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35792-01	WG419054	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
L35792-02	WG419054	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L35792**

No certification qualifiers associated with this analysis

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L35792
 Date Received: 03/02/2017 10:31
 Received By:
 Date Printed: 3/2/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4810	10.4	<=6.0	15	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L35792
Date Received: 03/02/2017 10:31
Received By:
Date Printed: 3/2/2017

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc.

635792

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Bernabez
 Company: Municipal Sanitation
 E-mail: M.Bernabez@sanitation.gov

Address: P.O. Box 12345678901234567890
 Telephone: (702) 555-1234

Copy of Report to:

Name: Luisa Fernanda Bernabez
 Company: Municipal Sanitation

E-mail: L.Bernabez@sanitation.gov
 Telephone: (702) 555-1234

Invoice to:

Name: Miguel Bernabez / Luisa F. Bernabez
 Company: Municipal Sanitation
 E-mail:

Address:
 Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: ERQ Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: I attest to the authenticity and validity of this sample. I understand that intentionally mistabelling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Quote #:	PO#:	Reporting state for compliance testing:	Check box if samples include NRC licensed material?	SAMPLE IDENTIFICATION	DATE-TIME	Matrix	# of Containers	SW	CW Total
	17000000			WW 9-A	23-02-17 02:00-11:00	WW	10	/	
				Piletadeproseso	23-02-17 08:30	WW	10	/	
				WW-10	23-02-17 12:00	SW	10	/	
				WW 9-A	23-02-17 2:00-11:00	WW	1	/	
				WW10	23/02/17 12:00	SW	1	/	

COPY

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

EMARKS

Please report both cyanide samples in a different report.
 The rest of the samples to be reported with the remaining samples of this 3-cooler shipment.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE-TIME	RECEIVED BY:	DATE-TIME
Luisa F. Bernabez	28/02/17 09:00	Otto Subuyo	10:23
Juni Aguilera	28-02-2017 08:00	[Signature]	28/02/17
		[Signature]	2/2/17



Guatemala February 28th 2017

To whom it may concern:

Minera San Rafael, S.A is sending a case with samples of water, which is not contaminated, that are going to be analyzed by the ACZ Laboratories in Steamboat Springs, Colorado, USA.

If you have any question or doubt, please contact Miguel Berganza at Minera San Rafael, S.A. (502 - 5951-5248) or Sue Webber at ACZ Laboratories (970-879-6590).

Sincerely yours,

Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.



ECOSISTEMAS
PROYECTOS AMBIENTALES

LABORATORIO AMBIENTAL E INDUSTRIAL

17 avenida 2-39 zona 4 Mixco | Guatemala | Ofibodegas Zaragoza 2 | Bodega 2
502 + 2437 7224 | 2437 4455

laboratorio@ecosistemas.com.gt | info@ecosistemas.com.gt | www.ecosistemas.com.gt

REG 016 Resultados de Análisis

Ref 733-17

Pág 1/2

Muestra: 1 muestra de agua compuesta (según información del cliente)

Alicuota 1: 08:00 horas

Alicuota 2: 11:00 horas

Alicuota 3: 14:00 horas

Alicuota 4: 17:00 horas

Análisis solicitado por: Ing. Miguel Berganza

Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa

Procedencia de la muestra: Proyecto Escobal

Fecha de muestreo: 270317

Fecha de ingreso de muestra: 280317

Fecha de análisis: 280317-060417

Fecha del informe: 060417

Identificación de la muestra: WW9A

Correlativo Ecosistemas: 7822

Acuerdo Gubernativo 236-2006 (excepto cianuros)

Límites Máximos Permisibles Entes
Generadores Nuevos
Acuerdo 236-2006

PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Potencial de Hidrogeno pH (Laboratorio)	unidades	1	7.49	SMWW 4500H-B	6 a 9
* Aceites y Grasas	mg/l	5	N.D.	EPA 1664	10
Materia Flotante	---	---	ausente ***	Visual	ausente
Demanda Bioquímica de Oxígeno DBO ₅	mg/l	10	10	Oxitop-Merck Análogo SMWW 5210D	ver nota
* Demanda Química de Oxígeno DQO	mg/l	25	35	Reflujo Cerrado, Merck, análogo SMWW 5220D	no especificado
Relación DBO ₅ /DQO	---	---	0.29	---	---
Relación DQO/DBO ₅	---	---	3.5	---	---
* Sólidos Suspendidos	mg/l	10	< 10	SMWW 2540D	100
* Sólidos Sedimentables	ml/l	0.1	< 0.1	SMWW 2540F	no especificado
* Nitrógeno Total	mg/l	10.9	N.D.	Digestión alcalina persulfato colorimétrico HACH	20
* Fósforo Total	mg/l	0.05	N.D.	Spectroquant Merck Análogo EPA 365.2+3, SMWW 4500-P E, ISO 6978/1, DIN EN 1189 D11	10
* Arsénico As	mg/l	0.002	0.011	UNICAM AN40177_E10/03C	0.1
* Cadmio Cd	mg/l	0.02	N.D.	SMWW 3111B	0.1
* Cobre Cu	mg/l	0.03	N.D.	SMWW 3111B	3
* Cromo Hexavalente Cr(VI)	mg/l	0.05	N.D.	Colorimétrico Merck, análogo SMWW 3500-Cr	0.1
* Mercurio Hg	mg/l	0.004	N.D.	UNICAM AN40181_E10/03C	0.01
* Níquel Ni	mg/l	0.05	N.D.	SMWW 3111B	2

					Límites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Plomo Pb	mg/l	0.05	N.D.	SMWW 3111B	0.4
* Zinc Zn	mg/l	0.01	0.01	SMWW 3111B	10
Color Aparente	UC HZ equiv. Unid. Pt-Co	1	97	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	500
Color Real	UC HZ equiv. Unid. Pt-Co	1	< 1	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	
** Coliformes Fecales	NMP/100ml	1.8	23	NMP	< 1 x 10 ⁴

Notas:

Captación de muestras: La muestra fue captada por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración. pH < 2 en muestra para análisis de metales y Aceites y Grasas.

Metodología: Espectrofotométricos / Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977. EPA 1664

N.D. No detectable. Debajo del límite de detección.

NMP: Número más probable.

Respecto a la DBO el acuerdo 236-2006 la relaciona como "carga" junto al caudal y como meta de cumplimiento un valor de DBO de 200 mg/l (ver Acuerdo Artículo 21).

Los resultados obtenidos corresponden únicamente a la muestra recibida por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

*** Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04**

**** Análisis referido a laboratorio acreditado.**

***** El resultado se basa en el análisis visual de la muestra enviada por el cliente al laboratorio.**

Comparación de descarga según información del cliente.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

Luis Fernando Fuentes Méndez
Ingeniero Químico
Colegiado 876



ECOSISTEMAS
PROYECTOS AMBIENTALES

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laboratorio@ecosistemas.com.gt | info@ecosistemas.com.gt | www.ecosistemas.com.gt

Ref 734-17

Pág 1/2

REG 016 Resultados de Análisis

Muestra: 1 muestra de agua
Análisis solicitado por: Ing. Miguel Berganza
Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa
Procedencia de la muestra: Proyecto Escobal
Fecha de muestreo: 270317
Fecha de ingreso de muestra: 280317
Fecha de análisis: 280317-060417
Fecha del informe: 060417

Identificación de la muestra: WW10

Correlativo Ecosistemas: 7823

Acuerdo Gubernativo 236-2006 (excepto cianuros)

Límites Máximos Permisibles Entes
Generadores Nuevos
Acuerdo 236-2006

PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Potencial de Hidrogeno pH (Laboratorio)	unidades	1	6.96	SMWW 4500H-B	6 a 9
* Aceites y Grasas	mg/l	5	N.D.	EPA 1664	10
Materia Flotante	---	---	ausente ***	Visual	ausente
Demanda Bioquímica de Oxígeno DBO ₅	mg/l	10	< 10	Oxitop-Merck Análogo SMWW 5210D	ver nota
* Demanda Química de Oxígeno DQO	mg/l	25	< 25	Reflujo Cerrado, Merck, análogo SMWW 5220D	no especificado
Relación DBO ₅ /DQO	---	---	---	---	---
Relación DQO/DBO ₅	---	---	---	---	---
* Sólidos Suspendidos	mg/l	10	< 10	SMWW 2540D	100
* Sólidos Sedimentables	ml/l	0.1	< 0.1	SMWW 2540F	no especificado
* Nitrógeno Total	mg/l	10.9	N.D.	Digestión alcalina persulfato colorimétrico HACH	20
* Fósforo Total	mg/l	0.05	N.D.	Spectroquant Merck Análogo EPA 365.2+3, SMWW 4500-P E, ISO 6978/1, DIN EN 1189 D11	10
* Arsénico As	mg/l	0.002	N.D.	UNICAM AN40177_E10/03C	0.1
* Cadmio Cd	mg/l	0.02	N.D.	SMWW 3111B	0.1
* Cobre Cu	mg/l	0.03	N.D.	SMWW 3111B	3
* Cromo Hexavalente Cr(VI)	mg/l	0.05	N.D.	Colorimétrico Merck, análogo SMWW 3500-Cr	0.1
* Mercurio Hg	mg/l	0.004	N.D.	UNICAM AN40181_E10/03C	0.01
* Níquel Ni	mg/l	0.05	N.D.	SMWW 3111B	2

					Limites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Plomo Pb	mg/l	0.05	N.D.	SMWW 3111B	0.4
* Zinc Zn	mg/l	0.01	N.D.	SMWW 3111B	10
Color Aparente	UC HZ equiv. Unid. Pt-Co	1	22	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	500
Color Real	UC HZ equiv. Unid. Pt-Co	1	< 1	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	
** Coliformes Fecales	NMP/100ml	1.8	< 1.8	NMP	< 1 x 10 ⁴

Notas:

Captación de muestras: La muestra fue captada por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración. pH < 2 en muestra para análisis de metales y Aceites y Grasas.

Metodología: Espectrofotométricos / Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977. EPA 1664

N.D. No detectable. Debajo del límite de detección.

NMP: Número más probable.

El valor DQO/DBO₅ y DBO₅/DQO no se ha determinado porque el resultado se encuentra abajo de nuestros límites de detección.

Respecto a la DBO el acuerdo 236-2006 la relaciona como "carga" junto al caudal y como meta de cumplimiento

un valor de DBO de 200 mg/l (ver Acuerdo Artículo 21).

Los resultados obtenidos corresponden únicamente a la muestra recibida por el personal de Ecosistemas Proyectos Ambientales.

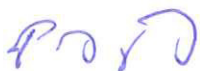
Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

* Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04

** Análisis referido a laboratorio acreditado.

*** El resultado se basa en el análisis visual de la muestra enviada por el cliente al laboratorio.

Comparación de descarga según información del cliente.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

Luis Fernando Fuentes Méndez
Ingeniero Químico
Colegiado 876

April 11, 2017

Report to:

Luisa Fernanda
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Luisa Fernanda
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Eric von Quednow, Fernando Samayoa

Project ID: Escobal

ACZ Project ID: L36324

Luisa Fernanda:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on March 30, 2017. This project has been assigned to ACZ's project number, L36324. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L36324. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

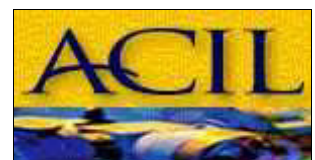
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 11, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW9A

ACZ Sample ID: **L36324-01**

Date Sampled: 03/27/17 17:00

Date Received: 03/30/17

Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								04/06/17 12:24	krh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	04/10/17 17:09	bce

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW10

ACZ Sample ID: **L36324-02**

Date Sampled: 03/27/17 12:00

Date Received: 03/30/17

Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								04/06/17 12:31	krh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	04/10/17 17:10	bce

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW11

ACZ Sample ID: **L36324-03**

Date Sampled: 03/27/17 17:00

Date Received: 03/30/17

Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								04/06/17 12:38	krh

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	04/10/17 17:11	bce



Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L36324**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36324-01	WG420898	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
L36324-02	WG420898	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
L36324-03	WG420898	Cyanide, total	M335.4 - Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L36324**

No certification qualifiers associated with this analysis

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L36324
 Date Received: 03/30/2017 10:32
 Received By:
 Date Printed: 3/30/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?		X	

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4253	5.1	<=6.0	15	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L36324
Date Received: 03/30/2017 10:32
Received By:
Date Printed: 3/30/2017

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc. 636324

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza
Company: Minera San Rafael
E-mail: M.Berganza@santafaci.com.gt

Address: Blvd los Proceres 18 calle 24-69 zona 10
Empresarial, 2 planta Torre IV oficina 1406
Telephone: (502) 59515248

Copy of Report to:

Name: Luisa Fernanda Barrrios
Company: Minera San Rafael

E-mail: L.Barrrios@santafaci.com.gt
Telephone: (502) 56964268

Invoice to:

Name: Miguel Berganza
Company:
E-mail:

Address:
Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES NO

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes No

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF Sampler's Site Information State Zip code Time Zone

*Sampler's Signature: [Signature] I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Table with columns: Quote #, PO#, Reporting state, Check box, SAMPLE IDENTIFICATION, DATE TIME, Matrix, # of Containers, SW, total CN. Includes handwritten entries for samples WW9A, WW10, WW9A, WW10, WW11.

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

for cyanide results, please report them in a different document.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

Table with columns: RELINQUISHED BY, DATE TIME, RECEIVED BY, DATE TIME. Includes handwritten signatures and dates.

Chain of Custody 36324



ECOSISTEMAS
PROYECTOS AMBIENTALES

LABORATORIO AMBIENTAL E INDUSTRIAL

17 avenida 2-39 zona 4 Mixco | Guatemala | Ofibodegas Zaragoza 2 | Bodega 2
502 + 2437 7224 | 2437 4455

laboratorio@ecosistemas.com.gt | info@ecosistemas.com.gt | www.ecosistemas.com.gt

REG 016 Resultados de Análisis

Ref 983-17

Pág 1/2

Muestra: 1 muestra de agua compuesta (según información del cliente)

Alicuota 1: 07:40 horas

Alicuota 2: 10:40 horas

Alicuota 3: 13:40 horas

Alicuota 4: 16:40 horas

Análisis solicitado por: Ing. Miguel Berganza

Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa

Procedencia de la muestra: Proyecto Escobal

Fecha de muestreo: 240417

Fecha de ingreso de muestra: 250417

Fecha de análisis: 250417-050517

Fecha del informe: 050517

Identificación de la muestra: WW-9

Correlativo Ecosistemas: 8168

Acuerdo Gubernativo 236-2006 (excepto cianuros)

Límites Máximos Permisibles Entes
Generadores Nuevos
Acuerdo 236-2006

PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Potencial de Hidrogeno pH (Laboratorio)	unidades	1	7.68	SMWW 4500H-B	6 a 9
* Aceites y Grasas	mg/l	5	N.D.	EPA 1664	10
Materia Flotante	---	---	ausente ***	Visual	ausente
Demanda Bioquímica de Oxígeno DBO ₅	mg/l	10	< 10	Oxitop-Merck Análogo SMWW 5210D	ver nota
* Demanda Química de Oxígeno DQO	mg/l	25	32	Reflujo Cerrado, Merck, análogo SMWW 5220D	no especificado
Relación DBO ₅ /DQO	---	---	---	---	---
Relación DQO/DBO ₅	---	---	---	---	---
* Sólidos Suspendidos	mg/l	10	10	SMWW 2540D	100
* Sólidos Sedimentables	ml/l	0.1	< 0.1	SMWW 2540F	no especificado
* Nitrógeno Total	mg/l	10.9	N.D.	Digestión alcalina persulfato colorimétrico HACH	20
* Fósforo Total	mg/l	0.05	0.08	Spectroquant Merck Análogo EPA 365.2+3, SMWW 4500-P E, ISO 6978/1, DIN EN 1189 D11	10
* Arsénico As	mg/l	0.002	0.004	UNICAM AN40177_E10/03C	0.1
* Cadmio Cd	mg/l	0.02	N.D.	SMWW 3111B	0.1
* Cobre Cu	mg/l	0.03	N.D.	SMWW 3111B	3
* Cromo Hexavalente Cr(VI)	mg/l	0.05	N.D.	Colorimétrico Merck, análogo SMWW 3500-Cr	0.1
* Mercurio Hg	mg/l	0.004	N.D.	UNICAM AN40181_E10/03C	0.01
* Níquel Ni	mg/l	0.05	N.D.	SMWW 3111B	2

PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	Límites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
					descarga a cuerpo receptor
* Plomo Pb	mg/l	0.05	N.D.	SMWW 3111B	0.4
* Zinc Zn	mg/l	0.01	N.D.	SMWW 3111B	10
Color Aparente	UC HZ equiv. Unid. Pt-Co	1	50	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	500
Color Real	UC HZ equiv. Unid. Pt-Co	1	< 1	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	
** Coliformes Fecales	NMP/100ml	1.8	23	NMP	< 1 x 10 ⁴

Notas:

Captación de muestras: La muestra fue captada por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración. pH < 2 en muestra para análisis de metales y Aceites y Grasas.

Metodología: Espectrofotométricos / Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977. EPA 1664

N.D. No detectable. Debajo del límite de detección.

NMP: Número más probable.

El valor DQO/DBO₅ y DBO₅/DQO no se ha determinado porque el resultado se encuentra abajo de nuestros límites de detección.

Respecto a la DBO el acuerdo 236-2006 la relaciona como "carga" junto al caudal y como meta de cumplimiento un valor de DBO de 200 mg/l (ver Acuerdo Artículo 21).

Los resultados obtenidos corresponden únicamente a la muestra recibida por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

** Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04*

*** Análisis referido a laboratorio acreditado.*

**** El resultado se basa en el análisis visual de la muestra enviada por el cliente al laboratorio.*

Comparación de descarga según información del cliente.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

Luis Fernando Fuentes Méndez
Ingeniero Químico
Colegiado 876



ECOSISTEMAS
PROYECTOS AMBIENTALES

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Ref 984-17

Pág 1/2

REG 016 Resultados de Análisis

Muestra: 1 muestra de agua

Análisis solicitado por: Ing. Miguel Berganza

Dirección: Km. 97.5 carretera Mataquesuintla, Aldea Sabana Redonda, San Rafael Las Flores, Santa Rosa

Procedencia de la muestra: Proyecto Escobal

Fecha de muestreo: 240417

Fecha de ingreso de muestra: 250417

Fecha de análisis: 250417-050517

Fecha del informe: 050517

Identificación de la muestra: WW-10

Correlativo Ecosistemas: 8169

Acuerdo Gubernativo 236-2006 (excepto cianuros)

Limites Máximos Permisibles Entes
Generadores Nuevos
Acuerdo 236-2006

PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Potencial de Hidrogeno pH (Laboratorio)	unidades	1	6.76	SMWW 4500H-B	6 a 9
* Aceites y Grasas	mg/l	5	N.D.	EPA 1664	10
Materia Flotante	---	---	ausente ***	Visual	ausente
Demanda Bioquímica de Oxígeno DBO ₅	mg/l	10	< 10	Oxitop-Merck Análogo SMWW 5210D	ver nota
* Demanda Química de Oxígeno DQO	mg/l	25	< 25	Reflujo Cerrado, Merck, análogo SMWW 5220D	no especificado
Relación DBO ₅ /DQO	---	---	---	---	---
Relación DQO/DBO ₅	---	---	---	---	---
* Sólidos Suspendidos	mg/l	10	< 10	SMWW 2540D	100
* Sólidos Sedimentables	ml/l	0.1	< 0.1	SMWW 2540F	no especificado
* Nitrógeno Total	mg/l	10.9	N.D.	Digestión alcalina persulfato colorimétrico HACH	20
* Fósforo Total	mg/l	0.05	N.D.	Spectroquant Merck Análogo EPA 365.2+3, SMWW 4500-P E, ISO 6978/1, DIN EN 1189 D11	10
* Arsénico As	mg/l	0.002	N.D.	UNICAM AN40177_E10/03C	0.1
* Cadmio Cd	mg/l	0.02	N.D.	SMWW 3111B	0.1
* Cobre Cu	mg/l	0.03	N.D.	SMWW 3111B	3
* Cromo Hexavalente Cr(VI)	mg/l	0.05	N.D.	Colorimétrico Merck, análogo SMWW 3500-Cr	0.1
* Mercurio Hg	mg/l	0.004	N.D.	UNICAM AN40181_E10/03C	0.01
* Niquel Ni	mg/l	0.05	N.D.	SMWW 3111B	2

PARAMETRO	DIMENSIONAL	LIMITE DE DETECCION	RESULTADO	METODOLOGIA	Límites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
					descarga a cuerpo receptor
* Plomo Pb	mg/l	0.05	N.D.	SMWW 3111B	0.4
* Zinc Zn	mg/l	0.01	N.D.	SMWW 3111B	10
Color Aparente	UC HZ equiv. Unid. Pt-Co	1	< 1	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	500
Color Real	UC HZ equiv. Unid. Pt-Co	1	< 1	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	
** Coliformes Fecales	NMP/100ml	1.8	< 1.8	NMP	< 1 x 10 ⁴

Notas:

Captación de muestras: La muestra fue captada por personal ajeno a Ecosistemas.

Transporte y preservación de la muestra: Refrigeración. pH < 2 en muestra para análisis de metales y Aceites y Grasas.

Metodología: Espectrofotométricos / Standard Methods for water and wastewater APHA, AWWA, 22 edic.

Organic Reagents for Trace Analysis. J.Fries/H. Getrost. E. Merck Darmstadt. 1977. EPA 1664

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NMP: Número más probable.

El valor DQO/DBO₅ y DBO₅/DQO no se ha determinado porque el resultado se encuentra abajo de nuestros límites de detección.

Respecto a la DBO el acuerdo 236-2006 la relaciona como "carga" junto al caudal y como meta de cumplimiento un valor de DBO de 200 mg/l (ver Acuerdo Artículo 21).

Los resultados obtenidos corresponden únicamente a la muestra recibida por el personal de Ecosistemas Proyectos Ambientales.

Se prohíbe la reproducción total o parcial de este informe sin la autorización escrita de Ecosistemas Proyectos Ambientales.

** Análisis acreditado COGUANOR NTG/ISO/IEC 17025:2005 según OGA LE 006-04*

*** Análisis referido a laboratorio acreditado.*

**** El resultado se basa en el análisis visual de la muestra enviada por el cliente al laboratorio.*

Comparación de descarga según información del cliente.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

Luis Fernando Fuentes Méndez
Ingeniero Químico
Colegiado 876

May 09, 2017

Report to:

Luisa Fernanda
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

Bill to:

Luisa Fernanda
Tahoe Resources, Inc.
Boulevard Los Proceres 18 c. 24-69 zona 10
Centro
Corporativo Zona Pradera, Torre 4 Of. 1408 Guatemala

cc: Eric von Quednow, Fernando Samayoa

Project ID: Escobal

ACZ Project ID: L36815

Luisa Fernanda:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 27, 2017. This project has been assigned to ACZ's project number, L36815. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L36815. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

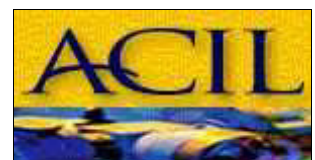
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after June 08, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Sue Webber has reviewed and approved this report.



Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: WW-10

ACZ Sample ID: **L36815-01**
 Date Sampled: 04/24/17 12:00
 Date Received: 04/27/17
 Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								05/05/17 11:24	jsu/wtc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	05/05/17 22:17	pjb

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: WW-9

ACZ Sample ID: **L36815-02**
 Date Sampled: 04/24/17 16:40
 Date Received: 04/27/17
 Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								05/05/17 11:48	osu/wtc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	05/05/17 22:18	pjb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: WW-11

ACZ Sample ID: **L36815-03**
Date Sampled: 04/24/17 16:40
Date Received: 04/27/17
Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								05/05/17 12:12	jsu/wtc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	05/05/17 22:20	pjb



Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<http://www.acz.com/public/extquallist.pdf>

Tahoe Resources, Inc.

ACZ Project ID: **L36815**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L36815-01	WG422379	Cyanide, total	M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
L36815-02	WG422379	Cyanide, total	M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
L36815-03	WG422379	Cyanide, total	M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L36815**

No certification qualifiers associated with this analysis

Tahoe Resources, Inc.
 Escobal

ACZ Project ID: L36815
 Date Received: 04/27/2017 10:02
 Received By:
 Date Printed: 4/27/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples? A change was made in the Sample I.D. Line 1-2, Analyses Requested section prior to ACZ custody.	X		

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹			X
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4318	5.6	<=6.0	15	N/A

Was ice present in the shipment container(s)?

Yes - Gel ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L36815
Date Received: 04/27/2017 10:02
Received By:
Date Printed: 4/27/2017

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).



Laboratories, Inc. 030815

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza, Company: U Minera San Rafael, E-mail: M.Berganza@sanrafael.com.gt, Address: Blvd las Pintas 18 calle 24-69 Z 10, Empresa 2 Pradera Torre W oficina 1406, Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa Fernanda Barrios, Company: Minera San Rafael, E-mail: LBarrios@sanrafael.com.gt, Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza, Company: U Minera San Rafael, E-mail: M.Berganza@sanrafael.com.gt, Address: , Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [] NO []

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes [] No []

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: LF, Sampler's Site Information, State, Zip code, Time Zone

*Sampler's Signature: [Signature] I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

ANALYSES REQUESTED: (attach list or use quote number)

Table with columns: Quote #, PO#, Reporting state, Check box, SAMPLE IDENTIFICATION, DATE-TIME, Matrix, # of Containers, and analysis results. Includes handwritten entries like 'WW-10', 'WW-9', 'WW-11', 'WW-6', 'PO20 PP', 'Pileta 1', 'Pileta 3'.

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please present the three indicated upside results in one report.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

Table with columns: RELINQUISHED BY, DATE-TIME, RECEIVED BY, DATE-TIME. Includes signatures and dates like 'Luisa Fernanda Barrios', '25/04/17 09:00'.

1-888-155-1505

FRMAD050.06.14.14

White - Return with sample. Yellow - Retain for your records.

36815 Chain of Custody

1. 2. 3.

COPY II