

Proyecto Minero Escobal
San Rafael Las Flores, Santa Rosa

Informe de Monitoreo Ambiental



Preparado para:



Ministerio de Ambiente y Recursos Naturales (MARN)

Informe Trimestral de Monitoreo Ambiental

Preparado por:



Departamento de Ambiente

San Rafael Las Flores, Santa Rosa, Guatemala

NOVIEMBRE 2016 - ENERO 2017

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1 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 Noviembre 2016 a Enero 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.”

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 (**PM₁₀**), en microgramos por metro cúbico (**µg/m³**). También se monitorearon siete estaciones para medir la concentración de metales en **PM₁₀**, sólidos sedimentables totales (**PST**), y gases de combustión: dióxido de azufre (**SO₂**) 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 11 estaciones de agua superficial, 5 estaciones de agua subterránea (manantiales), 2 estación de pozos de producción y 10 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 piletta de cumplimiento ambiental. En el anexo 11.2 se presenta una copia de los registros diarios.

- Vibraciones: Se instalaron tres medidores de vibraciones, los cuales registraron la velocidad de partícula durante cada una de las voladuras. En total se registraron 731 voladuras durante los meses de Noviembre de 2016 a Enero 2017.
- Geoquímica de roca estéril: Se analizó el pH en pasta de 18 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 (H_2S).
- Copia de registro documentado del caudal bombeado de los pozos del agua bombeada desde los túneles hacia las piletas. En el anexo 11.1 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 Noviembre 2016 a Enero 2017.
- Copia de registro documentado del análisis In Situ y kit de Cianuro de efluentes. En el anexo 11.2 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 Noviembre 2016 a Enero 2017.

2 Condiciones Ambientales

En el Cuadro 2-1 se describen algunos parámetros meteorológicos en el área del Proyecto y de la Figura 2-1 a la Figura 2-3 se representa la dirección del viento durante Noviembre 2016 a Enero 2017.

Cuadro 2-1: 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
Noviembre 2016										
28.23	12.59	19.78	147.08	0.31	26.53	160.92	100.00	35.19	72.16	13.41
Diciembre 2016										
30.18	10.54	19.90	160.92	0.31	25.42	160.92	100.00	19.75	69.25	1.52
Enero 2017										
29.40	7.50	18.30	45.10	0.10	9.10	48.13	100.00	10.30	65.40	0.25

°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 18.30° a los 19.90°C y en el mes de Noviembre se registró la mayor precipitación (13.41 mm). El mes que mayor humedad relativa promedio presentó fue Noviembre con 72.16% y el mes que en promedio presentó la mayor velocidad de vientos fue Enero con 26.53 km/h. En la Fotografía 2-1 se muestra la ubicación de la estación meteorológica, donde se registran las condiciones ambientales que se reportan.

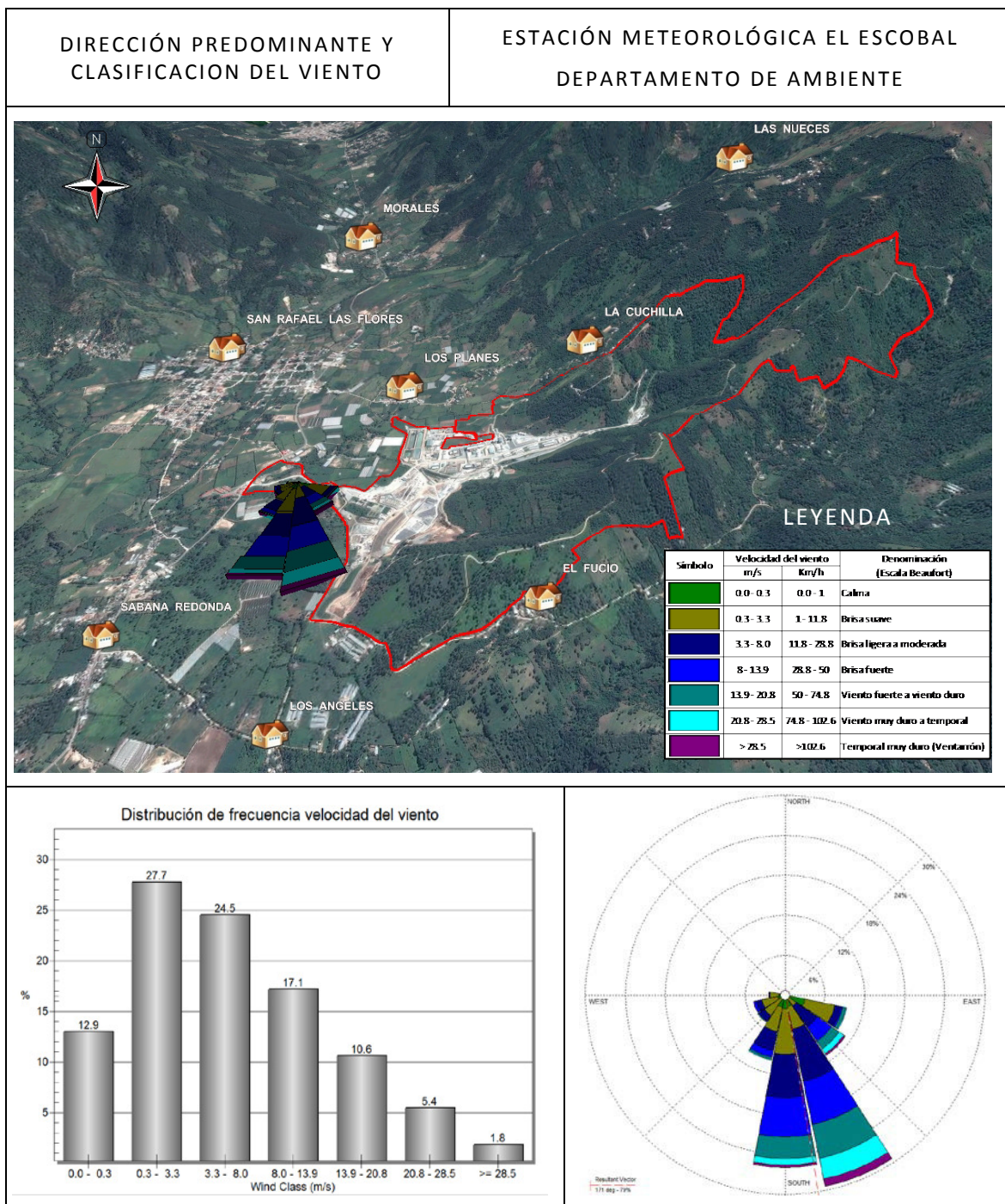


Fotografía 2-1: Estación meteorológica Escobal, San Rafael Las Flores, Santa Rosa

Fuente: MSR, 2017.

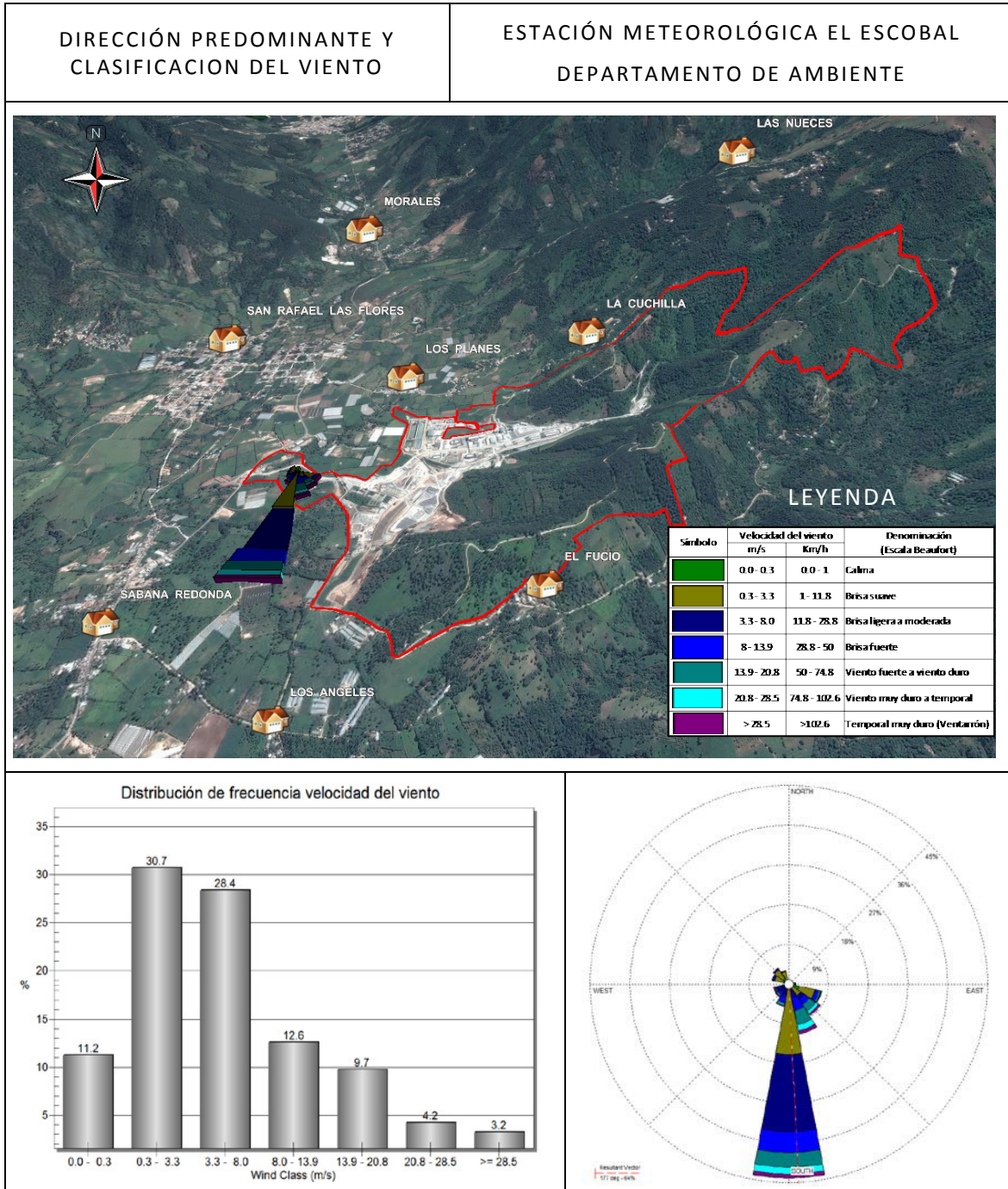
Como se puede observar en la Figura 2-1, Figura 2-2 y Figura 2-3 la predominancia de los vientos durante Noviembre de 2016 y Enero de 2017 fue de norte a sur y la mayoría de los registros están clasificados como brisa suave a brisa ligera moderada.

Figura 2-1: Dirección del viento Noviembre 2016, Proyecto Minero Escobal



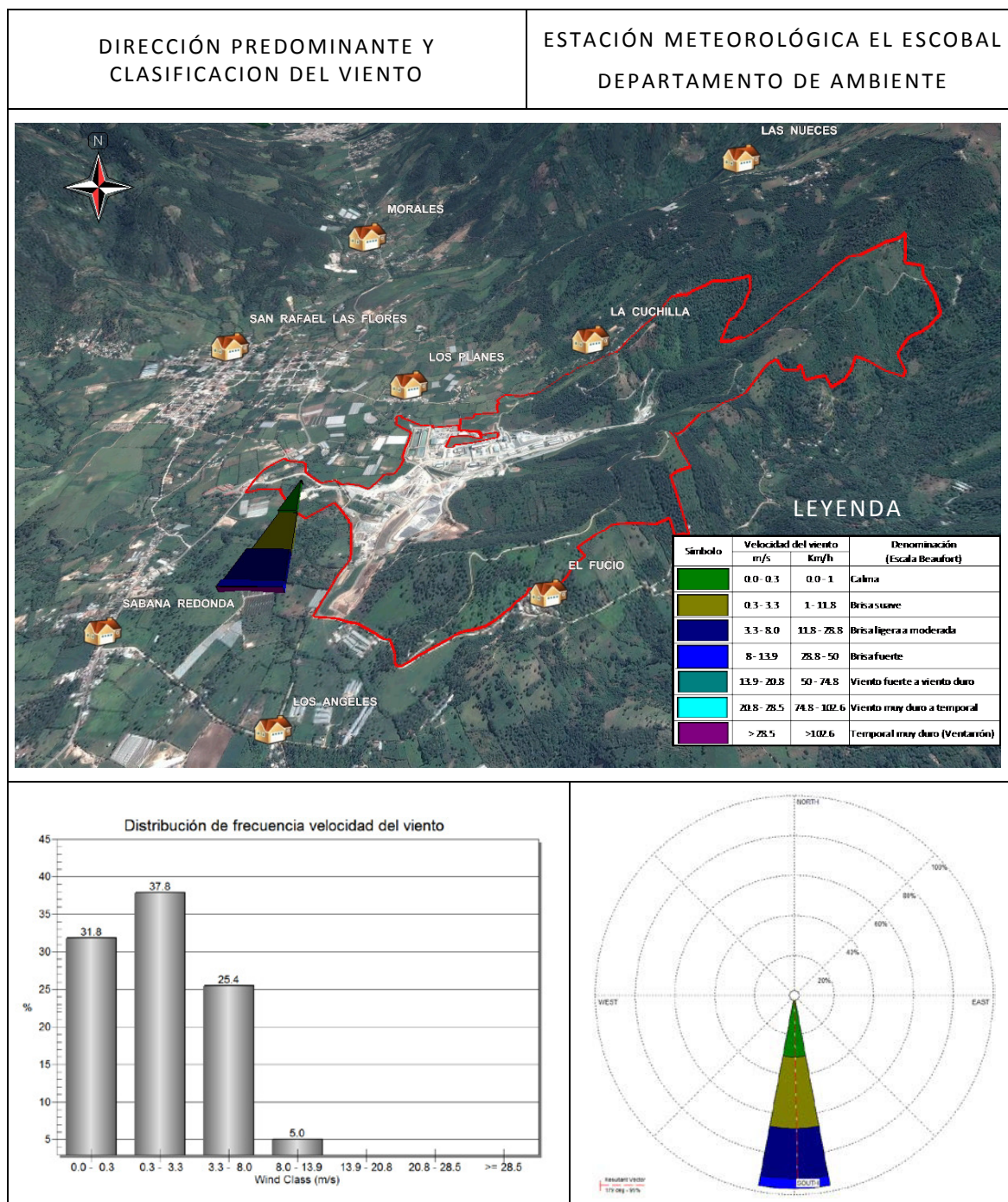
Fuente: MSR, 2017.

Figura 2-2: Dirección del viento Diciembre 2016, Proyecto Minero Escobal



Fuente: MSR, 2017.

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



Fuente: MSR, 2017.

3 Calidad de Aire

3.1 Material Particulado

3.1.1 Sitios de Monitoreo

En el Cuadro 3-1 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 3-1.

Cuadro 3-1: 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 WGS84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.

3.1.2 Metodología

En el Cuadro 3-2 se describe el procedimiento, parámetros y equipo utilizados en la medición de PM_{10} .

Cuadro 3-2: Procedimiento y equipo utilizado para medición de material particulado, Proyecto Minero Escobal

Parámetros utilizados	
PM_{10}	Material particulado igual o menor a 10 micrómetros ($\leq 10 \mu m$).
Procedimiento	
La medición se realiza haciendo pasar un flujo continuo de aire durante 24 ± 1 horas por un filtro de fibra de vidrio que ha sido pesado inicialmente en un laboratorio equipado para realizar el análisis gravimétrico correspondiente; luego de la toma de muestra, el filtro es enviado de nuevo al mismo laboratorio para determinar su peso final. Con los datos obtenidos del muestreo y del análisis gravimétrico, se determina la concentración de PM_{10} . El equipo de medición utilizado cumple con las especificaciones de la Agencia de Protección Ambiental de los Estados Unidos (EPA).	
Equipo utilizado	
Nombre	PM_{10} Air Sampler
Modelo	PQ 200
Fabricante	BGI INSTRUMENTS
Laboratorio contratado	
Nombre	Laboratorio Ambiental, S.A. Laboratorio respaldado por un Sistema de Calidad ISO 17025, otorgado por la Oficina Guatemalteca de Acreditación (OGA); y con ello los análisis acreditados (análisis gravimétrico de filtros) cuentan con validez internacional según OGA-LE 050-12.

Fuente: MSR, 2017.

3.1.3 Resultados

En el Cuadro 3-3 se presentan los resultados de PM_{10} durante los meses de Noviembre de 2016 a Enero de 2017 y los resultados de laboratorio del análisis gravimétrico de filtros y los cálculos realizados para determinar el PM_{10} se presentan en el anexo 11.3.1

Los valores de PM_{10} 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 ($150 \mu g/m^3$).

Cuadro 3-3: Resultados de PM₁₀, Proyecto Minero Escobal

Estación	Norma*	Guías*		Línea Base			Resultados		
	USEPA ¹	Banco Mundial ²	OMS ³	Promedio	Máximo	Mínimo	Nov-16	Dic-16	Ene-17
				(µg/m ³)					
EA-1A	150	150**	50	24.36	89.95	3.67	20.38	<2.10	19.55
EA-1B				NR	NR	NR	21.64	NA	NA
EA-2A				21.40	76.20	2.74	29.53	16.22	17.47
EA-3				25.68	78.85	1.25	24.88	<2.10	29.95
EA-3A				NR	NR	NR	31.2	NA	NA
EA-4A				103.55	120.40	86.70	144.76	NA	NA
EA-5A				50.73 [¥]	104.80 [¥]	11.80 [¥]	40.78	NA	NA
EA-6				23.05	57.90	1.70	12.06	NA	NA
EA-7A				46.48 [¥]	115.90 [¥]	13.40 [¥]	14.98	14.98	19.55

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 Noviembre de 2016 a Enero de 2017 se encontraron entre los 12.06 a 144.76 µg/m³. En Noviembre se registró el menor valor de PM₁₀ en la estación EA-6 (12.06 µg/m³), mientras que en Junio y Julio se registró en la estación EA-7A y EA-2A (14.98 y 17.47 µg/m³ respectivamente). Los valores más altos de PM₁₀ se registraron en la estaciones EA-4A durante Noviembre con 144.76 µg/m³, mientras que los valores más altos en Diciembre y Enero se registraron en las estaciones EA-2A y EA3 con 16.22 y 29.95 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 de lo registrado durante Noviembre en la estación EA-4A.

3.2 Metales en Material Particulado

3.2.1 Sitios de Monitoreo

En el Cuadro 3-4 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 3-1.

Cuadro 3-4: 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 WGS84. 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.

3.2.2 Metodología

En el Cuadro 3-5 se describe el procedimiento, parámetros y laboratorio empleado para la determinación de metales en PM_{10} .

Cuadro 3-5: Procedimiento y laboratorio empleado para la determinación de metales en PM_{10} , Proyecto Minero Escobal

Parámetros utilizados	
Metales en PM_{10}	Al, Sb, As, S, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Sn, Sr, P, Fe, Mg, Mn, Mo, Ni, Ag, Pb, K, Se, Si, Na, Tl, Ti, V, Zn, Zr
Procedimiento	
Los mismos filtros empleados para determinar el PM_{10} del muestreo trimestral, son enviados al laboratorio para determinar la cantidad de metales por el método analítico EPA 6010Bmod y EPA 6020mod, los resultados se dan en μg por filtro. Este peso se divide por el volumen de aire muestreado para obtener la concentración en $\mu g/m^3$. El	

análisis de laboratorio es destructivo, lo que hace imposible analizar metales y mercurio en un mismo filtro. Por tanto en el 1er y 3er trimestre del año se analizan metales totales; y en el 2do y 4to trimestre únicamente mercurio total.

Laboratorio

Nombre	Laboratorio Ambiental S.A. (parte de CTA). Laboratorio respaldado por un Sistema de Calidad ISO 17025, otorgado por la Oficina Guatemalteca de Acreditación (OGA); y con ello los análisis acreditados (análisis gravimétrico de filtros) cuentan con validez internacional según OGA-LE 050-12.
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Fuente: MSR, 2017.

3.2.3 Resultados

En el Cuadro 3-6 se presentan los resultados de concentración de mercurio en PM_{10} durante el mes de Noviembre de 2016, los resultados de laboratorio del análisis de metales en filtros y los cálculos realizados para determinar el PM_{10} se presentan en el anexo 11.3.2. La concentración de mercurio registrada durante Noviembre de 2016 estuvo por debajo de los valores registrados durante Noviembre de 2014 en todas las estaciones de monitoreo, a excepción de la estación EA-3A y EA-4A.

Cuadro 3-6: Resultados de concentración de metales en PM_{10} , Proyecto Minero Escobal

Parámetro	EA-1B	EA-2A	EA-3A	EA-4A	EA-5A	EA-6	EA-7A
Noviembre 2015 ($\mu\text{g}/\text{m}^3$)							
Mercurio	N.D.	0.00008	N.D.	N.D.	N.D.	N.D.	N.D.
Noviembre 2016($\mu\text{g}/\text{m}^3$)							
Mercurio	N.D.	N.D.	0.00008	0.00008	N.D.	N.D.	N.D.

ND: no detectado. LD: límite de detección. $\mu\text{g}/\text{m}^3$ = microgramos por metro cúbico. Fuente: MSR, 2017.

3.3 Partículas Sedimentables Totales (PST)

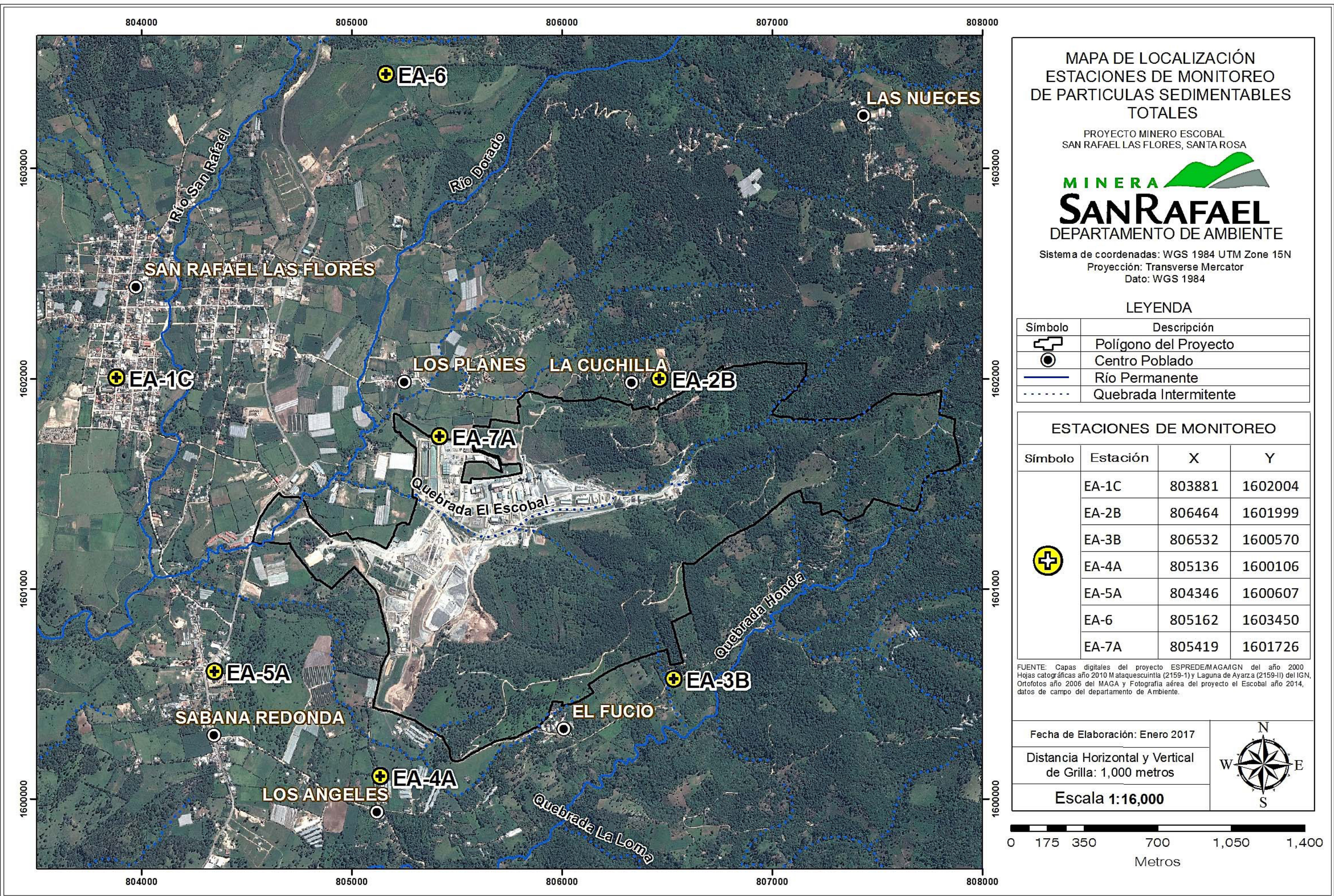
3.3.1 Sitios de Monitoreo

En el Cuadro 3-7 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 3-2.

Cuadro 3-7: 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 WGS84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.



3.3.2 Metodología

En el Cuadro 3-8 se describe el procedimiento, parámetros y equipo utilizados en la medición de PST.

Cuadro 3-8: Procedimiento y equipo utilizado para medición de PST, Proyecto Minero Escobal

Parámetros utilizados	
PST	Partículas Sedimentables Totales
Procedimiento	
Los muestreos fueron realizados por personal de la empresa Consultoría y Tecnología Ambiental (CTA), siguiendo la metodología ASTM D 1739-98 (re-aprobación 2004). La medición se realiza dejando reposar un recipiente limpio y de dimensiones conocidas en la estación de monitoreo durante un lapso de tiempo de 30 ± 2 días. El recipiente es enviado al laboratorio donde se determina los sólidos insolubles, sólidos solubles y sólidos totales que sedimentaron dentro de dicho recipiente.	
Equipo utilizado	
Nombre	High Altitude Ambient Particulate Sampler
Modelo	Diseño establecido en norma ASTM D 1739-98
Fabricante	CTA

Fuente: MSR, 2017.

3.3.3 Resultados

En el Cuadro 3-9 se presentan los resultados de Partículas Sedimentables Totales (PST) realizado durante Diciembre de 2016. El resumen del informe de resultados presentado por el contratista se presenta en el anexo 11.3.3.

Cuadro 3-9: 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
						Línea Base		Muestreo	Línea Base			Muestreo		
	USEPA ¹	Banco Mundial ² OMS ³	Dic-16	Dic-16	Dic-16	Promedio	Mínimo	Máximo	Dic-16	Promedio	Mínimo	Máximo	Dic-16	Dic-16
	g/(m ² x 30 días)													
Sólidos insolubles	ND	ND	34.15	20.51	33.04	6.27	2.60	10.80	145.94	6.50	0.80	16.00	6.70	1.32
Sólidos solubles			1.79	0.75	1.37	2.12	0.90	2.90	6.75	11.26	2.00	37.00	0.39	0.35
Sólidos totales			35.94	21.26	34.41	8.37	4.60	13.00	152.69	17.58	3.20	50.00	7.08	1.67

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. Fuente: MSR, 2017.

Los valores de PST se encuentran entre 1.67 a 152.69 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 (152.69 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, los valores de PST en la misma estación se han reportado en concentraciones similares durante los registros de Diciembre de años anteriores. Las estaciones EA-1C, EA-2B, EA-3B, EA-6 y EA-7A no cuentan con línea base.

3.4 Gases de Combustión (SO₂ y NO₂)

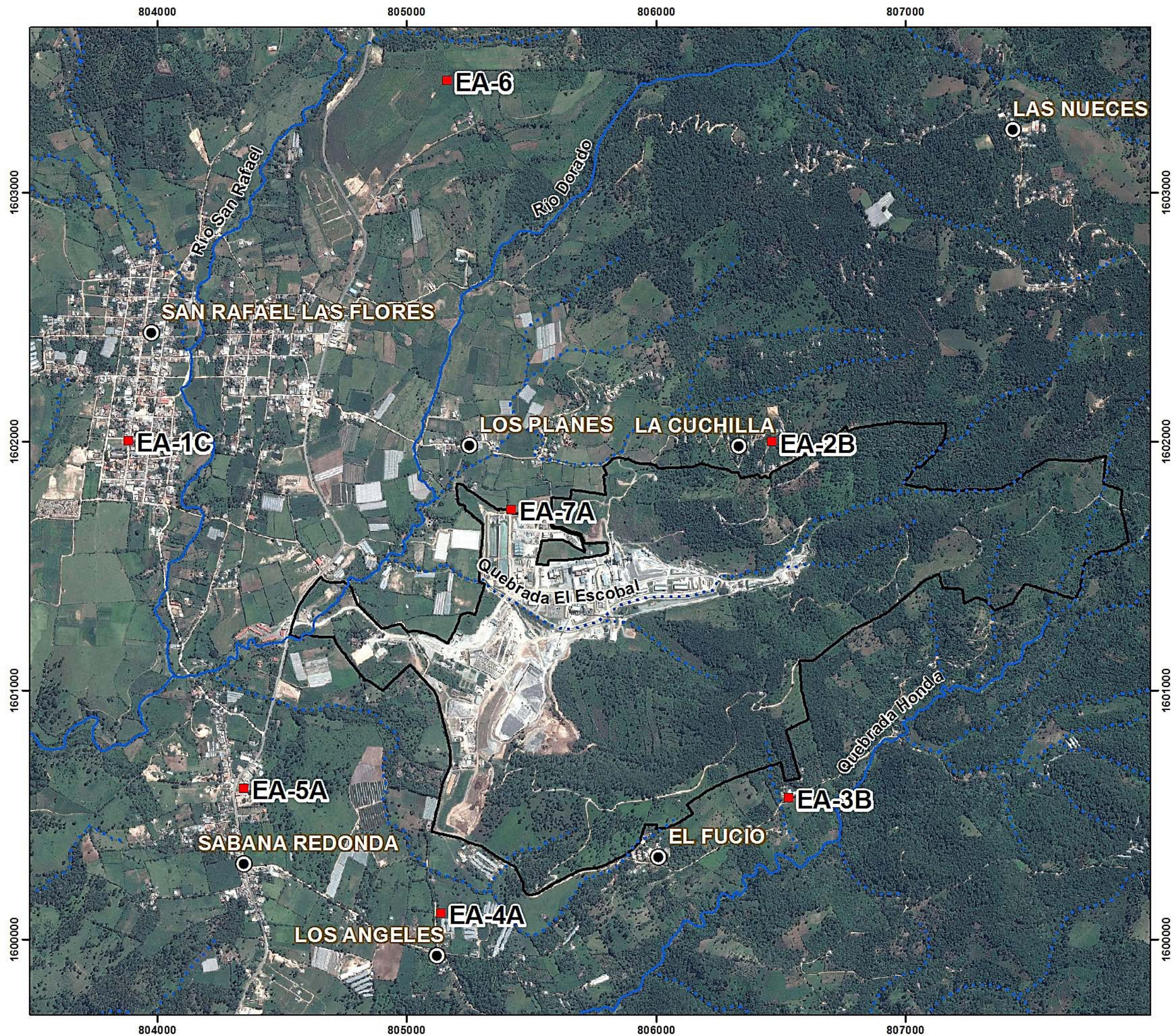
3.4.1 Sitios de Monitoreo

En el Cuadro 3-10 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 3-3.

Cuadro 3-10: Sitios de Monitoreo de gases de combustión, 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 WGS84. 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



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

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-I) 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: Enero 2017

Distancia Horizontal y Vertical
de Grilla: 1,000 metros

Escala 1:16,000



3.4.2 Metodología

En el Cuadro 3-11 se describe el procedimiento, parámetros y equipo utilizados en la medición de gases de combustión.

Cuadro 3-11: Procedimiento y equipo utilizado para la medición de gases de combustión, Proyecto Minero Escobal

Parámetros utilizados	
SO ₂	Dióxido de azufre
NO ₂	Dióxido de nitrógeno
Procedimiento	
Los muestreos fueron realizados por personal de la empresa Consultoría y Tecnología Ambiental siguiendo las metodologías: SO₂ : Metodología descrita en el CFR, del título 40, parte 50, apéndice A de la USEPA. NO₂ : Metodología descrita en el método de referencia designado por la USEPA No. EQN-1277-026.	
Equipo utilizado	
Nombre	RAC3 Gas Sampler
Modelo	209063
Fabricante	Andersen Instrument's

Fuente: MSR, 2017.

3.4.3 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 11.3.3.

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). Concentraciones de NO₂ fueron registradas en las estaciones EA-4A, EA-6 y EA-7A con 10 µg/m³ respectivamente, ligeramente por arriba del límite de detección del método. 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 anteriormente.

Cuadro 3-12: 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	Dic-16	Dic-16	Dic-16	Dic-16	Promedio	Mínimo	Máximo	Dic-16	Dic-16	Promedio	Mínimo	Máximo	Dic-16
	(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	10	<9	<9	<9	10

µg/m³ = microgramos por metro cúbico; SO₂= dióxido de azufre, NO₂= dióxido de nitrógeno. ¹Guía 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.

3.5 Niveles de Presión Sonora

3.5.1 Sitios de Monitoreo

En el Cuadro 3-13 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 3-4.

Cuadro 3-13: 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 Proyector, ruta a Mataquescuintla

Sistema de coordenadas proyectadas UTM, DATUM WGS84. Msnm: metros sobre el nivel del mar. Fuente: MSR, 2017.

3.5.2 Metodología

En el Cuadro 3-14 se describe el procedimiento, parámetros y equipo utilizado en la medición de los niveles de presión sonora ubicados dentro del AI del Proyecto.

Cuadro 3-14: Procedimiento y equipo utilizado para medición de presión sonora, Proyecto Minero Escobal

Parámetros analizados	
L_{MAX}	Dato máximo durante 24 horas.
L_{MIN}	Dato mínimo durante 24 horas.
L_{EQ}	Promedio ponderado equivalente de datos.
Promedio Diurno	Promedio ponderado equivalente de datos de 07:00 am a 10:00 pm
Promedio Nocturno	Promedio ponderado equivalente de datos de 10:00 pm a 07:00 am
Procedimiento	
La medición del nivel de presión sonora se realiza durante 24 horas, efectuando lecturas de decibeles en escala “A” en respuesta lenta en intervalo de 10 minutos. Los datos obtenidos en las mediciones son crudos y automáticamente grabados en el equipo, los cuales se descargan a una computadora utilizando el programa Quest Professional II. Solamente el promedio diurno y nocturno son calculados por separado.	
Equipo utilizado	
Nombre	Sound Pro
Modelo	SE/DL
Fabricante	Quest Technologies, Inc.

Fuente: MSR, 2017.

3.5.3 Resultados

En el Cuadro 3-15 y en el Cuadro 3-16 se presentan los valores registrados de los niveles de presión sonora (**NPS**) durante los meses de Noviembre de 2016 a Enero de 2017. Los informes generados por los equipos de medición se presentan en el anexo 11.3.4.

Los resultados obtenidos de NPS en las estaciones muestreadas respecto al parámetro L_{eq} , están dentro del rango de 39.6 dBA y 59.2 dBA, los cuales corresponden a las estaciones ER-3 y ER-1A respectivamente.

La estación ER-3 se presentó el menor promedio diurno (40.0 dBA) y el menor promedio nocturno (39.0 dBA) de todas las mediciones efectuadas durante el monitoreo; mientras que la estación ER-7A presentó el mayor promedio diurno (55.7 dBA) y la estación ER-1A el mayor promedio nocturno (62.3 dBA).

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 de las mediciones de Noviembre en promedio diurno para la estación ER-7A y las mediciones de Noviembre y Enero en promedio nocturno para la estación EA-7A. Las estaciones ER-1A, ER-3A y ER-6 no cuentan con datos de línea base.

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Los promedios diurnos registrados durante los meses de Noviembre de 2016 a Enero 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 ER-7A y ER-1A durante la medición de Noviembre. Sin embargo el valor registrado se encontró ligeramente por arriba de los valores guía y norma. Los promedios nocturnos registrados estuvieron por debajo de la norma establecida por la USEPA (55 dBa), a excepción de los registros reportados en Noviembre para ER-7A y ER-1A y Enero en ER-7A.

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 3-15: 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			Nov-16	Dic-16	Ene-17	Línea Base			Nov-16	Dic-16	Ene-17
					Promedio	Máximo	Mínimo				Promedio	Máximo	Mínimo			
			Residencial	Industrial												
	dBA															
Lmax	NL	NL	NL	NL	89.3	99.5	64.6	75.8	84.2	92.6	86.7	97.8	64.9	81.6	75.3	87.1
Lmin					32.5	37.7	27.0	37.1	33.4	37.2	35.2	42.8	26.5	34.6	41.9	42.1
Leq					49.9	57.1	41.2	56.6	45.7	54.2	49.4	58.7	39.7	48.3	49.5	51.4
PD	55	55	55	70	50.5	59.1	39.7	47.4	46.3	54.7	48.8	57.1	39.8	48.9	49.6	51.8
PN	55	50	45	70	47.6	55.7	39.3	45.9	44.5	53.2	46.6	54.5	37.9	47.1	49.6	50.8

Parámetro	Norma*	Guías*			ER-3						ER-7A					
	USEPA ¹	OMS ²	Banco Mundial		Línea Base			Nov-16	Dic-16	Ene-17	Línea Base**			Nov-16	Dic-16	Ene-17
					Promedio	Máximo	Mínimo				Promedio	Máximo	Mínimo			
			Residencial	Industrial												
	dBA															
Lmax	NL	NL	NL	NL	87.4	100.7	67.2	71.4	74.2	70.3	87.5	89.0	82.1	88.6	79.4	87.4
Lmin					49.4	56.2	26.9	31.5	39.5	30.6	NR	NR	NR	48.3	39.8	39.9
Leq					56.8	63.2	39.7	47.6	48.3	39.6	52.8	54.5	50.9	58.4	49.5	53.9
PD	55	55	55	70	56.5	63.1	41.0	47.8	48.9	40.0	52.1	53.5	50.4	55.7	50.4	53.2
PN	55	50	45	70	57.2	64.0	34.1	47.5	47.3	39.0	49.7	50.9	48.8	59.7	47.7	55.1

*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. ¹Guía USEPA, 2006. Normas nacionales de niveles de presión sonora. ²Guías sobre ruido comunitario, OMS 1999. ³Guías 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 3-16: Resultados mensuales de los niveles de presión sonora, Proyecto Minero Escobal

Parámetro	Norma*	Guías*			ER-1A				ER-3A				ER-4A			
					Línea Base			Nov-16	Línea Base			Nov-16	Línea Base			Nov-16
	USEPA ¹	OMS ²	Banco Mundial ³		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
			Residencial	Industrial												
Lmax	NL	NL	NL	NL	NR	NR	NR	102.5	NR	NR	NR	69.9	80.6	78.2	82.1	83.0
Lmin								41.9				37.3	NR	NR	NR	29.7
Leq								59.2				48.3	50.2	49.3	50.9	48.1
PD								55.3				48.6	49.5	48.4	50.4	49.4
PN	55	50	45	70				62.3				47.9	48.6	48.2	48.9	44.9

Parámetro	Norma*	Guías*			ER-5A				ER-6			
					Línea Base			Nov-16	Línea Base			Nov-16
	USEPA ¹	OMS ²	Banco Mundial ³		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
			Residencial	Industrial								
	dBA											
Lmax	NL	NL	NL	NL	91.6	85.1	92.2	76.9	NR	NR	NR	82.7
Lmin					NR	NR	NR	44.3				43.9
Leq					65.8	51.6	67.6	53.6				54.5
PD					61.2	50.2	63.8	54.4				54.8
PN					62.8	45.9	65.0	47.4				51.8

*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. ¹Guía USEPA, 2006. Normas nacionales de niveles de presión sonora. ²Guías sobre ruido comunitario, OMS 1999. ³Guías 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.

4 Calidad del Agua

4.1 Sitios de Monitoreo

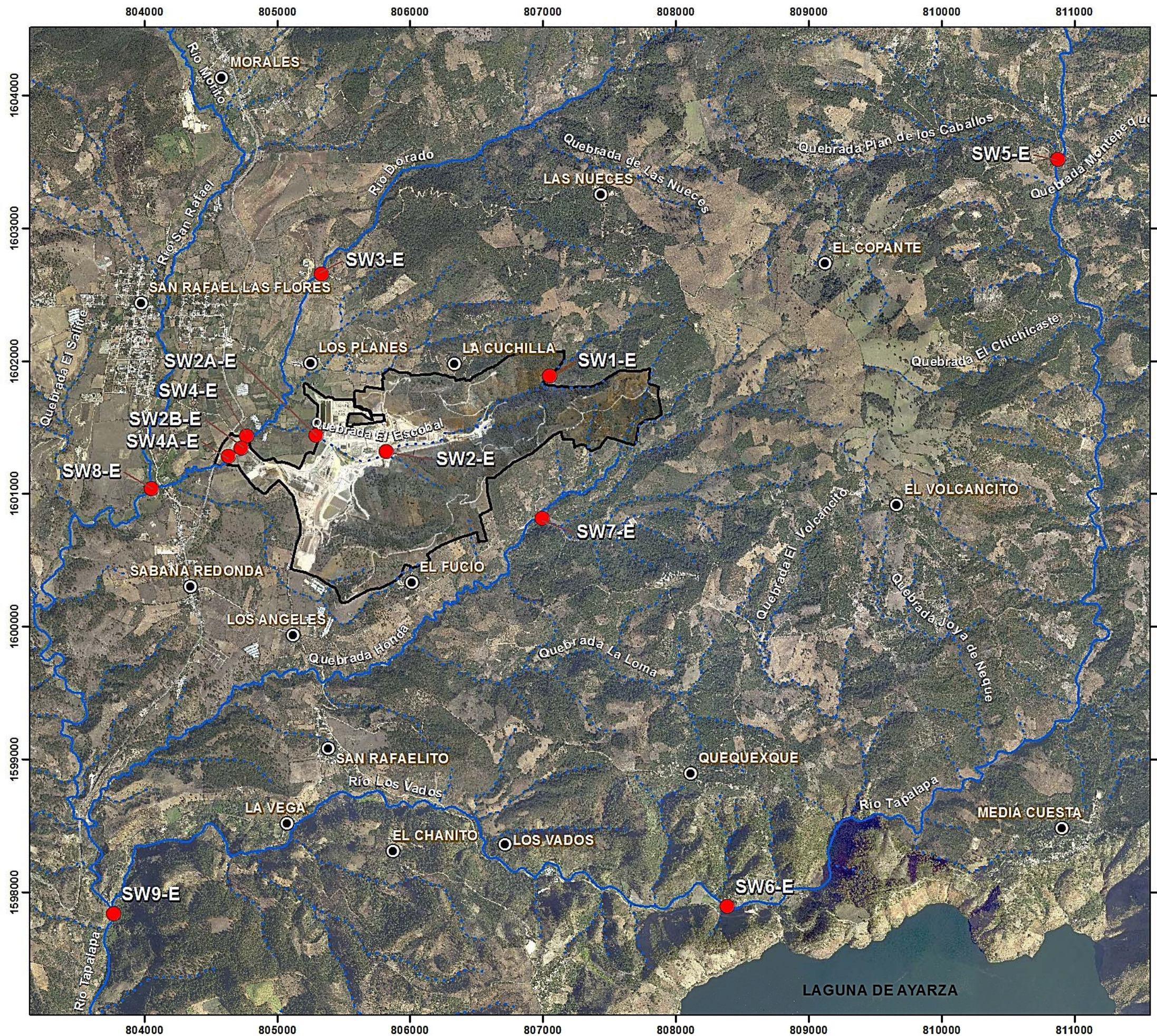
En el Cuadro 4-1 se enlistan las estaciones de monitoreo de calidad de agua superficial y subterránea localizadas en las quebradas, ríos, manantiales, pozos de monitoreo y pozos mecánicos ubicados en el área de influencia (AI) del Proyecto. La ubicación de las estaciones de monitoreo de calidad de agua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

Cuadro 4-1: 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, 30 m 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 WGS84. 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



SAN RAFAEL
DEPARTAMENTO DE AMBIENTE

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

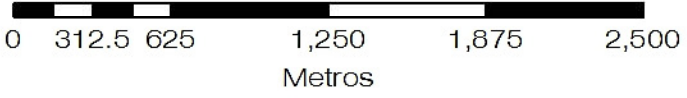
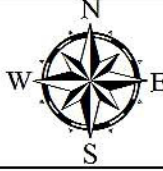
LEYENDA

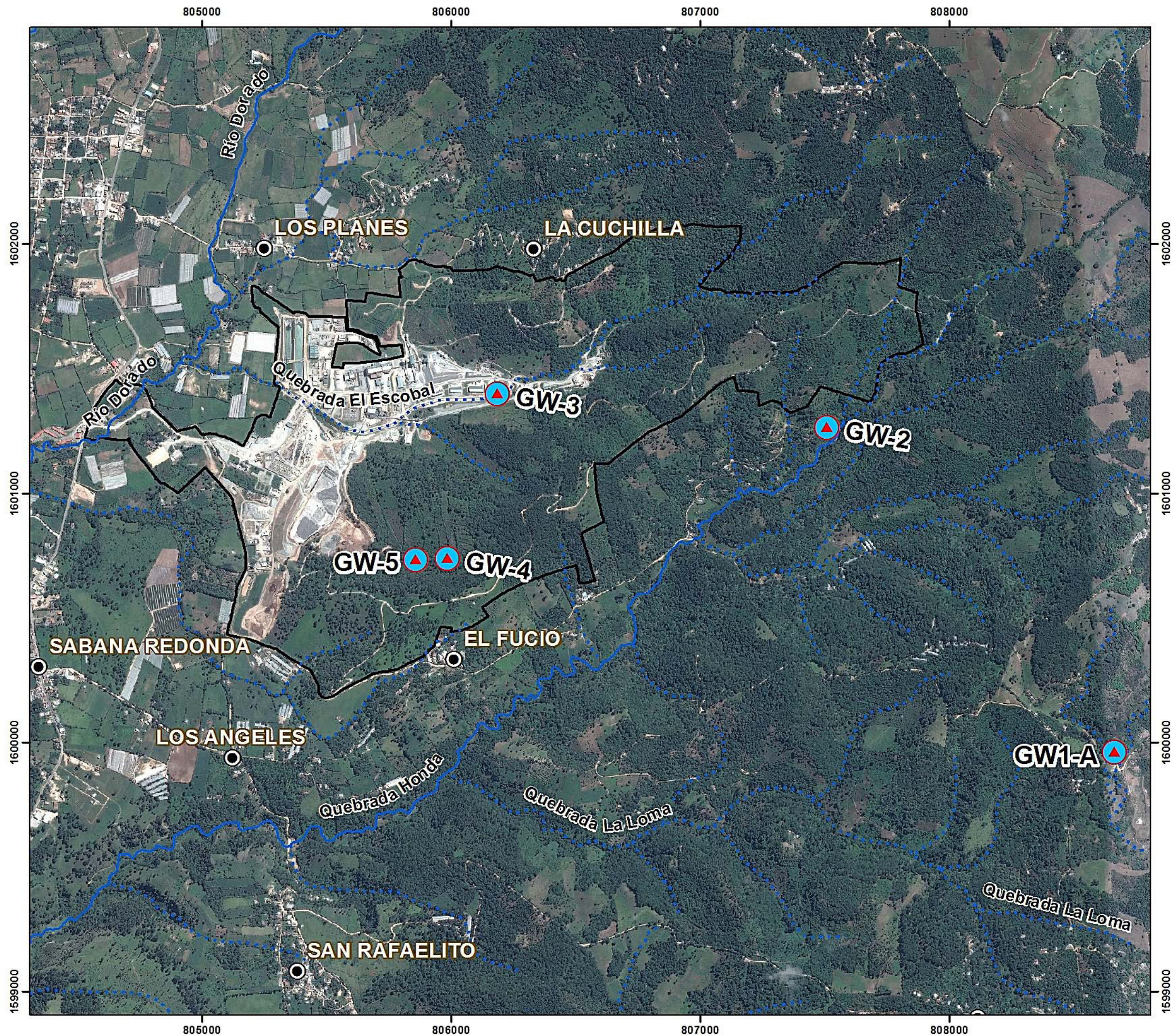
Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermittente

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 Mataquesuintla (2159-I) 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: Enero 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



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

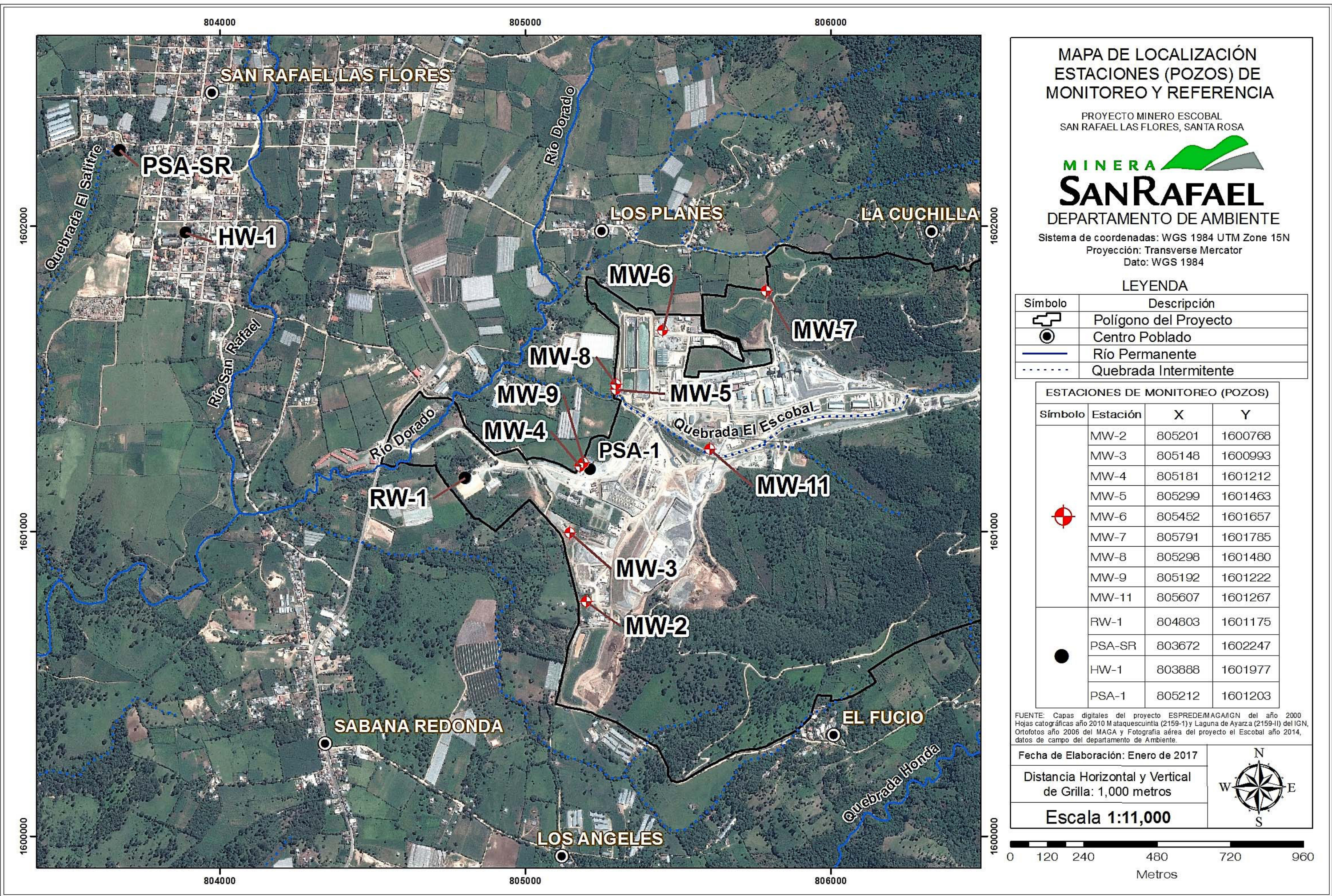
FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000
Hojas catográficas año 2010 Mataquescuintla (2159-I) y Laguna de Ayarza (2159-II) del IGN,
Ortofotos año 2006 del MAGA y Fotografía aérea del proyecto el Escobal año 2014,
datos de campo del departamento de Ambiente.

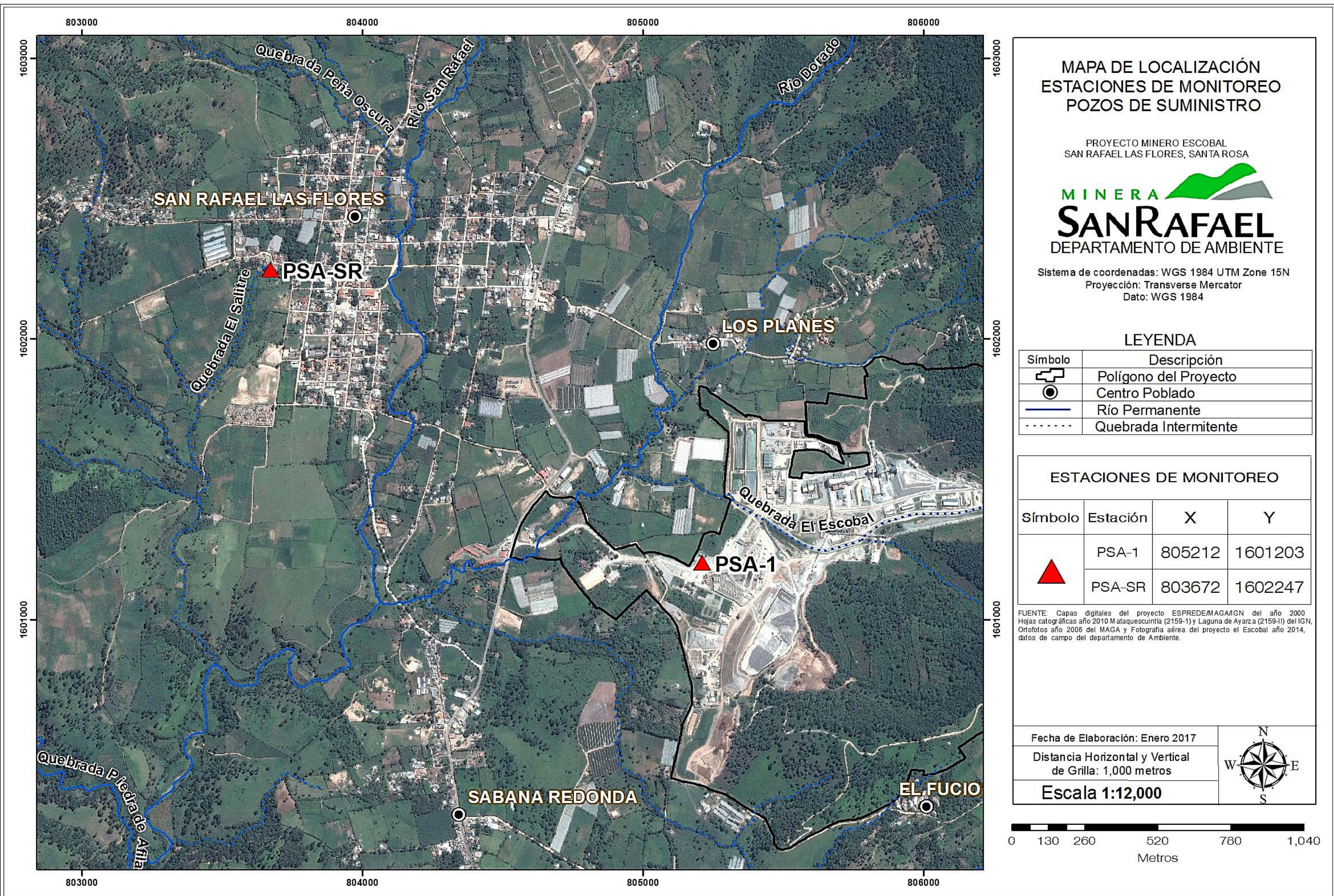
Fecha de Elaboración: Enero 2017

Distancia Horizontal y Vertical
de Grilla: 1,000 metros

Escala 1:16,000







4.2 Metodología

En el Cuadro 4-2 se describe el procedimiento y equipo utilizado para la toma de muestras de agua.

Cuadro 4-2: Procedimiento y equipo utilizado para medir parámetros *in situ* de muestras de agua, Proyecto Minero Escobal

Parámetros analizados	
<i>In Situ</i>	pH, conductividad eléctrica, oxígeno disuelto, temperatura y sólidos disueltos totales.
Laboratorio	Laboratorio ACZ: Aceites y Grasas, Hidrocarburos Totales de Petróleo, Metales Totales (solo en agua superficial); Metales Disuelto, Cationes, Aniones y demás parámetros fisicoquímicos. Laboratorio Ecosistemas: DBO, coliformes totales, color, Cromo hexavalente.
Procedimiento	
Basado en el procedimiento de toma de muestra dado por Water Management Consultants y el laboratorio ACZ para las muestras del perfil de agua superficial (SW) y agua subterránea (GW). Y en el procedimiento dado por <i>Standard Methods for the Examination of Water and Wastewater, part 1060 B</i> para las muestras de agua residual.	
Equipo utilizado	
Nombre	Multiparámetros
Modelo	PCD650
Fabricante	OAKTON

Fuente: MSR, 2017.

Laboratorio empleado y valores de referencia: Las muestras fueron analizadas en el laboratorio ACZ, 2773 Downhill Drive Steamboat Springs, Colorado USA, el cual se encuentra acreditado y avalado por la USEPA. Los análisis de color, DBO, coliformes fecales y cromo hexavalente fueron analizados en el laboratorio Ecosistemas Proyectos Ambientales, S.A., laboratorio respaldado por un Sistema de Calidad ISO 17025, otorgado por la Oficina Guatemalteca de Acreditación (OGA); y con ello los análisis acreditados cuentan con validez internacional según OGA-LE 006-04.

4.3 Resultados

4.3.1 Control de Calidad

En el monitoreo correspondiente al mes de Diciembre 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 4-3.

En las tres muestras del control de calidad de los blancos de campo, se detectaron concentraciones mínimas de aluminio disuelto (SW10), bario disuelto (GW10), berilio total (SW1), boro disuelto (GW10), calcio disuelto (SW10), cobalto total (SW10), litio total (SW10), estroncio disuelto (SW10), zinc total (SW10), nitratos/nitritos como N (SW10), sólidos suspendidos totales (SW10 y GW10) y sólidos totales (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 4-3: 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		<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	1.3×10^3	7.0×10^2	<1.8	1.6×10^3	<1.8	<1.8
Color Real	U Pt/Co	<1	<1	<1	<1	<1	<1	<1	<1	<1
Materia Flotante		ND	ND	ND	ND	Ausente	ND	Ausente	ND	Ausente
Aluminio Disuelto	mg/L	<0.03	<0.03	<0.03	0.06	0.07	0.04	0.04	<0.03	<0.03
Aluminio Total		0.04	NA	NA	0.17	0.18	NA	NA	NA	NA
Antimonio Disuelto		<0.0004	<0.0004	<0.0004	0.0184	0.0184	<0.0004	<0.0004	0.0007	<0.0004
Antimonio Total		<0.0004	NA	NA	0.0173	0.0175	NA			
Arsénico Disuelto		<0.0002	<0.0002	<0.0002	0.0094	0.0097	0.0021	0.0021	0.0024	0.001
Arsénico Total		<0.0002	NA	NA	0.009	0.0094	NA			
Bario Disuelto		<0.003	0.004	<0.003	0.047	0.048	0.127	0.132	0.039	0.042
Bario Total		<0.003	NA	NA	0.052	0.052	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	0.15	0.15	0.02	0.02	0.07	0.02
Boro Total		<0.01	NA	NA	0.14	0.14	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		0.3	<0.1	<0.1	380	385	78.0	81.2	81.6	56.8
Calcio Total		<0.1	NA	NA	370	371	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	<0.02	0.36
Hierro Total		<0.02	NA	NA	0.03	0.06	NA			
Plomo Disuelto		<0.0001	<0.0001	<0.0001	0.0007	0.0007	<0.0001	<0.0001	<0.0001	<0.0001
Plomo Total		<0.0001	NA	NA	0.0014	0.0015	NA			

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
Litio Disuelto	mg/L	<0.008	<0.008	<0.008	0.101	0.104	<0.008	<0.008	0.015	0.0011
Litio Total		0.01	NA	NA	0.106	0.106	NA			
Magnesio Disuelto		<0.2	<0.2	<0.2	18.8	19.1	17.8	18.7	9.7	8.7
Magnesio Total		<0.2	NA	NA	19.1	19.0	NA			
Manganeso Disuelto		<0.005	<0.005	<0.005	0.058	0.059	<0.005	<0.005	<0.005	0.093
Manganeso Total		<0.005	NA	NA	0.071	0.073	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	0.03	0.03	<0.02	<0.02	<0.02	<0.02
Molibdeno Total		<0.02	NA	NA	0.05	0.05	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	12.9	13.1	9.8	10.1	4.1	4.3
Potasio Total		<0.2	NA	NA	12.7	12.8	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	0.0014	0.0013	0.0005	0.0006	0.0003	<0.0001
Selenio Total		<0.0001	NA	NA	0.0013	0.0013	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	<0.00005	<0.00005	NA			
Sodio Disuelto		<0.2	<0.2	<0.2	92.4	94.5	23.2	24.0	28.5	25.5
Sodio Total		<0.2	NA	NA	92.5	92.8	NA			
Estroncio Disuelto		0.006	<0.005	<0.005	4.330	4.43	0.406	0.422	0.766	0.398
Estroncio Total		<0.005	NA	NA	4.290	4.31	NA			
Talio Disuelto		<0.0001	<0.0001	<0.0001	0.0002	0.0003	<0.0001	<0.0001	<0.0001	<0.0001
Talio Total		<0.0001	NA	NA	0.0002	0.0002	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	<0.005	<0.005	NA			
Uranio Disuelto		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001
Uranio Total		<0.0001	NA	NA	0.0001	<0.0001	NA			
Vanadio Disuelto		<0.005	<0.005	<0.005	0.009	0.006	<0.005	<0.005	<0.005	<0.005
Vanadio Total		<0.005	NA	NA	0.011	0.011	NA			
Zinc Disuelto		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01
Zinc Total		0.01	NA		0.02	0.02	NA			
Grasas y Aceites		<2			<2	<2.1				
DQO		<10			<10	<10				
Cloruros		<0.5	<0.5	<0.5	78.9	78.8	19.2	19.4	18.4	9.0
Cianuro Total		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Fluoruros		<0.05	<0.05	<0.05	1.25	1.29	0.19	0.17	0.76	0.61
Nitratos/Nitritos como N		0.04	<0.02	<0.02	4.1	4.19	5.89	5.95	2.77	0.18
Amonio		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrógeno Kjeldahl (TKN)		<0.1	<0.1	<0.1	0.6	0.6	<0.1	<0.1	<0.1	<0.1
Fosfatos		<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.25	0.12
Fósforo Disuelto (Orto)		<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.03	0.10	0.05
Fósforo Total		<0.02	<0.02	<0.02	0.02	0.02	<0.02	<0.02	0.08	0.07
STD (TDS)		12	16	<10	1760	1770	540	536	490	340
SST (TSS)		<5	<5	<5	<5	<5	<5	<5	<5	<5
ST (TS)		12	<10	<10	1810	1800	524	528	508	350

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
Sulfatos	mg/L	<1	<1	<1	1000	952	206	214	177	56.1
Alcalinidad Total		<2	2.3	<2	37.3	37.8	75.9	75.9	81.7	164
Hidrocarburos totales (TPH)		<0.1	NA		<0.1	<0.09	NA			

u.e.: unidades exponenciales. mg/L: miligramos por litro. NMP/100ml: número más probable en 100ml. u Pt/Co: unidades platino cobalto. Fuente: MSR, 2017.

4.3.2 Agua Superficial

En el Cuadro 4-4 se presentan los resultados de la calidad del agua superficial para el mes de Diciembre 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 11.5.1.

Las estaciones muestreadas presentaron un pH levemente alcalino (7.25 a 8.33 u.e.). En ninguna de las estaciones se detectaron valores de grasas y aceites 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**) se detectó en la estación SW8 en concentración de 18 mg/L, y no sobrepasaron el valor guía establecido por el Banco Mundial (125 mg/L). En ninguna estación se detectó concentración alguna 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 muy por debajo de los valores establecidos por el Acuerdo (10 mg/L) y el Banco Mundial (2 mg/L) para Fósforo total.

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

Los Sulfatos Totales y los Sólidos Disueltos Totales (**TDS**) fueron detectados en la mayoría de las estaciones. La estación SW2A no cuenta con línea base pero se utiliza los valores registrados en la línea base de la estación SW2 como referencia para analizar su comportamiento, ya que las dos estaciones están ubicadas en la quebrada El Escobal aguas abajo y están separadas a escasos 400mts aproximadamente. El Aluminio fue detectado en todas las estaciones en

diferentes concentraciones. Sin embargo los datos se encuentran dentro de los límites establecidos durante la línea base. El Antimonio fue detectado en siete estaciones, y se detectó en un rango de concentración de 0.0004 – 0.0175 mg/L, por debajo de los límites máximos establecidos durante la línea base.

Las concentraciones de Arsénico Total se encontraron en todas las estaciones de monitoreo y por debajo de las directrices de la USEPA (0.01mg/L). En ninguna estación de monitoreo de agua superficial fue detectado el Mercurio y Cianuro Total. Y en la mayoría de las 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 4-4: 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			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					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	8.01	7.42	6.56	7.87	NA	NR	NR	NR	8.01
Temperatura (campo)	°C				17.4	13	19.8	17.8	22.4	20.3	25.6					26.8
Conductividad (campo)	µS/cm				277.9	66.3	566.6	275.3	807.3	177.3	1965					1942
Oxígeno disuelto (campo)	mg/L				3.6	0.1	6.4	7.17	4.76	3.5	5.8					7.07
Cr VI					NR	NR	NR	NR	NR	NR	<0.05					
DBO											<10					
Coliformes Fecales		NMP/100ml														23
Color Real	U Pt/Co										<1					
Materia Flotante	NTU							Ausente								Ausente
Turbidez							2.72				1.88					
Aluminio Disuelto	mg/L				0.035	<0.03	0.09	<0.03	0.043	<0.03	0.12					0.07
Aluminio Total		0.2			5.02	<0.03	35.1	0.1	2.35	0.06	8.77					0.18
Antimonio Disuelto					<0.0004	<0.0004	0.0006	0.0004	<0.0004	<0.0004	<0.0004					0.0184
Antimonio Total		0.006			<0.0004	<0.0004	0.0007	0.0004	<0.0004	<0.0004	0.0005					0.0175
Arsénico Disuelto					0.00216	0.0005	0.0034	0.0027	0.00184	0.0013	0.0024					0.0097
Arsénico Total		0.01		0.1	0.00339	0.0015	0.0094	0.0031	0.00266	0.0012	0.0054					0.0094
Bario Disuelto					0.1361	0.086	0.207	0.132	0.109	0.088	0.133					0.048
Bario Total		1			0.186	0.1	0.434	0.138	0.131	0.096	0.186					0.052
Berilio Disuelto					<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.002					<0.01
Berilio Total		0.004			<0.002	<0.002	<0.01	0.01	<0.002	<0.002	<0.002					0.01
Bismuto Disuelto					<0.04	<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	<0.04	<0.08					<0.04
Boro Disuelto					<0.01	<0.01	<0.01	<0.01	0.114	<0.01	0.29					0.15
Boro Total					<0.01	<0.01	0.02	<0.01	0.11	<0.01	0.28					0.14
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	0.0007	<0.0001	<0.0001	<0.0001	0.0001	<0.0001				
Calcio Disuelto					45.2	18.9	74.5	41.3	144.9	20.7	333	385				
Calcio Total					45.5	20.9	70.5	44.4	144.6	20.5	331	371				
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	0.02	<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					<0.02	<0.02	0.04	<0.02	0.04	<0.02	0.12	<0.02				
Hierro Total		0.3			2.7	<0.02	19.5	0.02	1.3	0.06	5.19	0.06				
Plomo Disuelto					<0.0001	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	0.0001	0.0007				
Plomo Total		0.015		0.4	0.0025	<0.0001	0.0191	<0.0001	0.00088	<0.0001	0.0038	0.0015				
Litio Disuelto					<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	0.104				
Litio Total					<0.02	<0.02	<0.02	0.013	0.02	<0.02	0.02	0.106				
Magnesio Disuelto					3.9	2.6	5.3	4.2	15.9	3.2	37.3	19.1				
Magnesio Total					4.2	2.8	5.2	4.4	15.1	3.6	32.2	19				
Manganeso Disuelto					0.0051	<0.005	0.02	<0.005	0.0195	<0.005	0.07	0.059				
Manganeso Total		0.4			0.1041	<0.005	0.721	<0.005	0.0602	0.007	0.174	0.073				
Mercurio Disuelto					<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				
Molibdeno Disuelto					<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	0.03				

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			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Molibdeno Total	mg/L	0.61		2	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	NA	NR	NR	NR	0.05
Níquel Disuelto					<0.01	<0.01	0.03	<0.008	0.013	<0.01	0.04					<0.008
Níquel Total					<0.01	<0.01	0.04	<0.008	0.022	<0.01	0.04					<0.008
Potasio Disuelto					4.4	3.5	5.1	4.6	6.1	4.9	7.6					13.1
Potasio Total					5.3	3.5	13	4.9	6.3	5.2	7.4					12.8
Escandio Disuelto		0.17			<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	0.0001	<0.0001	0.00045	<0.0001	0.0002					0.0013
Selenio Total					0.0001	<0.0001	0.0003	<0.0001	0.00011	<0.0001	0.0002					0.0013
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005					<0.00005
Plata Total		0.002			<0.00005	<0.00005	0.00015	<0.00005	<0.00005	<0.00005	0.00006					<0.00005
Sodio Disuelto					9.81	8.3	11.6	9.8	40.1	9.4	87.8					94.5
Sodio Total					9.46	7.8	11.8	10.3	39.8	9.4	85.2					92.8
Estroncio Disuelto					0.17	0.09	0.26	0.183	1.23	0.1	2.99					4.43
Estroncio Total					0.18	0.1	0.25	0.182	1.23	0.11	2.91					4.31
Talio Disuelto					<0.0001	<0.0001	0.0002	<0.0001	0.0001	<0.0001	0.0001					0.0003
Talio Total					<0.0001	<0.0001	0.0004	<0.0001	0.0001	<0.0001	0.0002					0.0002
Estaño Disuelto		7.4		10	<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	0.007					<0.005
Titanio Total					0.092	<0.005	0.591	0.007	0.2715	<0.005	0.171					<0.005
Uranio Disuelto					0.00013	<0.0001	0.0003	<0.0001	0.00028	<0.0001	0.0006					<0.0001
Uranio Total			10	10	0.00038	<0.0001	0.0011	0.0001	0.00024	<0.0001	0.0005					<0.0001
Vanadio Disuelto					<0.005	<0.005	0.007	<0.005	0.0065	<0.005	0.015					0.006
Vanadio Total					0.0059	<0.005	0.024	0.006	<0.005	<0.005	0.006					0.011
Zinc Disuelto					0.053	<0.01	0.1	<0.01	0.046	<0.02	0.1					<0.01
Zinc Total					0.064	<0.01	0.12	0.01	0.041	<0.01	0.06					0.02
Grasas y Aceites		250	125	1	<2.062	<2.062	<2.248	<2.2	<2.04	<2.04	<2.04					<2.1
DQO					15.7	<10	40	<10	<2.04	<2.04	<2.04					<10
Cloruros					5	4	7	6.0	<2.04	<2.04	<2.04					78.8
Cianuro Total					0.004	<0.003	0.015	<0.0003	<0.003	<0.003	<0.003					<0.003
Fluoruros					0.125	<0.1	0.2	0.14	0.6	0.1	1.2					1.29
Nitratos/Nitritos como N		500		10	1.61	0.08	4.87	0.2	2.46	0.03	4.9					4.19
Amonio					<0.005	<0.005	0.07	<0.05	<0.05	<0.05	0.07					<0.05
Nitrógeno Kjeldahl (TKN)					3.53	<0.1	25.9	0.1	0.32	<0.1	0.8					0.6
Fosfatos					0.185	0.1	0.3	0.19	0.19	0.1	0.4					<0.06
Fósforo Disuelto (Orto)					0.06	0.03	0.1	0.08	0.06	0.02	0.13					<0.02
Fósforo Total		250	50	100	0.37	0.04	2.51	0.06	0.08	0.03	0.19					0.02
STD (TDS)					225	170	280	222	754	170	1620					1770
SST (TSS)					163.6	<5	780	<5	67	<5	320					<5
ST (TS)					346.3	200	1080	222	850	230	1660					1800
Sulfatos					26.3	10	42	32.9	472.6	14	1600					952
Alcalinidad Total					104	38	161	104	80	44	119					37.8
Hidrocarburos totales (TPH)					<0.1	<0.09	<0.1	<0.1	<0.1	<0.09	<0.1					<0.09

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 4-4: 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			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
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	NA	7.4	6.56	7.94	7.68	NR	NR	NR	7.73
Temperatura (campo)	°C				19.8	17	24		21	17.2	24	23.5				22.5
Conductividad (campo)	µS/cm				219.7	80	374.5		308.9	120	612	1189				1348
Oxígeno disuelto (campo)	mg/L				3.8	0.1	6.8		4.2	0.1	7.5	6.68				6.36
Cr VI					NR	NR	NR		<0.05	<0.05						
DBO									<10	<10						
Coliformes Fecales	NMP/100ml			3.5 x 10 ³					920							
Color Real	U Pt/Co			<1					21							
Materia Flotante	NTU				NR	NR	NR		Ausente	Presente						
Turbidez									2.32	3.01						
Aluminio Disuelto	mg/L	0.2			0.061	<0.03	0.15	0.03	<0.03	0.1	0.05	0.07				
Aluminio Total					3.25	<0.03	17.4	5.72	0.1	36	0.17	0.21				
Antimonio Disuelto					<0.0004	<0.0004	<0.0004	0.0007	0	0.0011	0.0054	0.0079				
Antimonio Total		0.006	<0.0004	<0.0004	0.0012	0.0005	0.0037	0.0048	0.0067							
Arsénico Disuelto					0.00797	0.0041	0.0139	0.00541	0.0039	0.0072	0.0082	0.0076				
Arsénico Total		0.01		0.1	0.00888	0.006	0.0137	0.00873	0.0043	0.0326	0.0073	0.0068				
Bario Disuelto					0.0915	0.051	0.118	0.1645	0.08	0.234	0.144	0.123				
Bario Total		1			0.12445455	0.098	0.253	0.2356	0.144	0.567	0.144	0.126				
Berilio Disuelto					<0.002	<0.0002	<0.01	<0.002	<0.002	<0.01	<0.01	<0.01				
Berilio Total		0.004			<0.002	<0.0002	<0.01	0.002	<0.002	0.003	0.01	0.01				
Bismuto Disuelto					<0.01	<0.01	<0.04	0.04	<0.04	0.1	<0.04	<0.04				
Bismuto Total					<0.01	<0.01	<0.04	0.04	<0.04	0.04	<0.04	<0.04				
Boro Disuelto					<0.01	<0.01	0.02	0.008	<0.01	0.02	0.08	0.09				
Boro Total					<0.01	<0.01	0.02	0.012	<0.01	0.02	0.07	0.08				
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	0.0002	0.00012	<0.0001	0.0005	<0.0001	<0.0001				
Calcio Disuelto					27.8	11.7	39.9	37.4	18.5	61.7	206	248				
Calcio Total					27.9272727	12.3	38.7	38.3	17.2	58.9	217	243				
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	0.02	<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				
Cobalto Total					0.01	<0.01	0.01	0.01	<0.01	0.01	0.01	0.02				
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					0.033	<0.02	0.06	0.032	<0.02	0.15	0.05	0.03				
Hierro Total		0.3			1.9	0.06	10.2	3.8	0.09	26.5	0.1	0.1				
Plomo Disuelto					<0.0001	<0.0001	0.0004	<0.0001	<0.0001	0.0002	0.0003	0.0005				
Plomo Total		0.015		0.4	0.0013	<0.0001	0.0072	0.003	<0.0001	0.0198	0.0005	0.0007				
Litio Disuelto					<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.038	0.051				
Litio Total					<0.02	<0.02	<0.02	0.02	<0.02	0.02	0.045	0.056				
Magnesio Disuelto					2.6	1.3	3.5	4.2	2.4	7.3	15.2	16.8				
Magnesio Total					2.7	1.6	3.5	4.6	2.5	7.3	16	17.3				
Manganeso Disuelto					0.07418182	0.01	0.381	0.116	0.011	0.26	0.183	0.117				
Manganeso Total		0.4			0.14745455	0.025	0.403	0.2844	0.101	1.23	0.204	0.131				
Mercurio Disuelto					<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				
Molibdeno Disuelto					0.01	<0.01	0.01	<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			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Molibdeno Total	mg/L			2	0.01	<0.01	0.01	NA	<0.01	<0.01	<0.01	0.03	NR	NR	NR	0.03
Níquel Disuelto					<0.01	<0.01	<0.01		<0.01	<0.01	0.02	<0.008				<0.008
Níquel Total					<0.01	<0.01	0.05		0.01	<0.01	0.06	<0.008				<0.008
Potasio Disuelto					4.2	3.5	5.5		5.8	4.2	8.7	11.1				10.9
Potasio Total					4.5	3.6	7		6.5	4.4	11.7	11.1				11.1
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		0.17			<0.0001	<0.0001	0.0001		0.00014	<0.0001	0.0005	0.0005				0.0005
Selenio Total					<0.0001	<0.0001	0.0001		0.0002	<0.0001	0.0002	0.0004				0.0005
Plata Disuelta					<0.00005	<0.00005	<0.00005		<0.00005	<0.00005	<0.00005	<0.00005				<0.00005
Plata Total					<0.00005	<0.00005	<0.00005		<0.00005	<0.00005	0.00011	<0.00005				<0.00005
Sodio Disuelto					12.65	7.7	16.6		12.44	9	15.6	47.8				57.7
Sodio Total					12.17	7.5	15.4		12.13	8.6	15.2	49.6				57.8
Estroncio Disuelto					0.19	0.06	0.3		0.22	0.09	0.36	1.98				2.54
Estroncio Total					0.18818182	0.08	0.3		0.228	0.11	0.33	2.05				2.52
Talio Disuelto		0.002			<0.0001	<0.0001	0.0005		0.0001	<0.0001	0.0001	<0.0001				0.0001
Talio Total					<0.0001	<0.0001	0.0002		0.00017	<0.0001	0.0007	<0.0001				<0.0001
Estaño Disuelto					<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.04				<0.04
Estaño Total					<0.1	<0.1	<0.1		<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
Titanio Total					0.071	<0.005	0.307		0.127	0.005	0.534	0.007				0.007
Uranio Disuelto					<0.0001	<0.0001	0.0002		0.00012	<0.0001	0.0004	0.0002				0.0003
Uranio Total					0.00019	<0.0001	0.0005		0.00027	<0.0001	0.0009	0.0002				0.0003
Vanadio Disuelto					<0.005	<0.005	0.008		<0.005	<0.005	0.011	<0.005				<0.005
Vanadio Total					0.0051	<0.005	0.019		0.0085	<0.005	0.04	0.007				0.008
Zinc Disuelto		7.4		10	0.068	<0.01	0.14		0.061	0.05	0.14	<0.01				<0.01
Zinc Total					0.174	<0.01	1.01		0.065	0.01	0.17	0.02				0.02
Grasas y Aceites			10	10	<2.062	<2.04	<2.326		<2.062	<2.02	<2.084	<2.2				<2
DQO			125		10.9	<10	40		16.8	<10	60	<10				<10
Cloruros		250		1	2.7	2	3		8.5	4	16	47.7				54.6
Cianuro Total		0.14			<0.003	<0.003	0.015		<0.003	<0.003	0.014	<0.003				<0.003
Fluoruros		4			<0.003	<0.003	0.015		0.15	0.1	0.2	0.58				0.72
Nitratos/Nitritos como N					0.59	<0.02	1.51		4.49	1.96	10.1	6.85				6.50
Amonio					0.05	<0.05	0.21		0.059	<0.05	0.15	0.10				0.23
Nitrógeno Kjeldahl (TKN)					0.35	<0.1	0.6		0.58	0.1	1.3	0.5				0.8
Fosfatos					0.12	0.1	0.4		0.36	0.1	1.2	1.15				0.74
Fósforo Disuelto (Orto)					0.04	0.02	0.12		0.12	0.03	0.39	0.41				0.25
Fósforo Total			2	10	0.05	0.02	0.14		0.17	0.04	0.39	0.35				0.29
STD (TDS)		500	50	100	183.636364	140	220		233.6	150	350	1040				1170
SST (TSS)					48	5	340		115	<5	880	<5				<5
ST (TS)					231.8	140	500		378.2	260	1180	1050				1190
Sulfatos		250			16.9	4	25		27.5	10	57	489.0				607
Alcalinidad Total					83	38	118		80	45	102	104.3				87.9
Hidrocarburos totales (TPH)					<0.1	<0.09	<0.2		<0.1	<0.09	<0.1	0.2				<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 4-4: 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			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					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	7.56	7.4	7.1	7.8	7.52	7.5	6.9	8	NA
Temperatura (campo)	°C				17.4	14.5	21.5	18.0	19.4	12.2	27.3	17.9	18.7	15	21.3	
Conductividad (campo)	µS/cm				72.1	0.1	160.2	127.4	259	60	948	244.9	216	120	416.2	
Oxígeno disuelto (campo)	mg/L				4	0	8	7.86	4	0	8.3	8.02	3.9	0.1	7.5	
Cr VI					NR	NR	NR	<0.05	NR	NR	NR	<0.05	NR	NR		
DBO								<10				<10				
Coliformes Fecales	NMP/100ml			2.2 x 10 ³				2.2 x 10 ³								
Color Real	U Pt/Co			<1				<2								
Materia Flotante				Ausente				Presente								
Turbidez	NTU						3.05				7.94					
Aluminio Disuelto	mg/L				0.055	<0.03	0.14	0.04	0.031	<0.03	0.08	0.07	0.033	<0.03	0.13	
Aluminio Total		0.2			1.09	<0.03	3.7	0.1	1.89	<0.03	8.1	0.25	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	0.0018	0.0032	0.0007	0.0076	0.004	0.00382	0.0022	0.0054	
Arsénico Total		0.01		0.1	0.00177	0.0013	0.0028	0.0016	0.00387	0.0025	0.0074	0.0043	0.00446	0.003	0.0061	
Bario Disuelto					0.0447	0.023	0.072	0.059	0.0618	0.027	0.136	0.074	0.0946	0.052	0.143	
Bario Total		1			0.0556	0.039	0.069	0.063	0.0806	0.055	0.136	0.074	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	0.26	<0.01	<0.01	0.01	
Boro Total					0.01	<0.01	0.02	<0.01	0.379	<0.01	1.93	0.26	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	0.0003	<0.0001	<0.0001	0.0003	
Calcio Disuelto					7.9	3.4	13.7	10.7	15.1	5.4	38.9	17.8	23.1	11.2	38.1	
Calcio Total					7.73	3.4	13.1	10.8	14.81	5.9	37.5	17.8	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	0.07	0.097	<0.02	0.28	0.14	0.022	<0.02	0.07	
Hierro Total		0.3			0.7	0.16	1.8	0.15	1.3	0.33	4.8	0.26	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	0.0002	0.0007	<0.0001	0.0028	0.0001	0.0015	<0.0001	0.0083	
Litio Disuelto					<0.02	<0.02	<0.02	<0.008	0.13	<0.02	0.67	0.088	<0.02	<0.02	<0.02	
Litio Total					<0.02	<0.02	<0.02	0.012	0.133	<0.02	0.68	0.093	<0.02	<0.02	<0.02	
Magnesio Disuelto					1.5	0.8	2.5	1.9	3	1.4	7.4	3.4	4.1	2.2	6.4	
Magnesio Total					1.5	0.9	2.5	1.9	3.1	1.8	7.5	3.4	4.3	2.6	6.5	
Manganeso Disuelto					0.025	0.006	0.047	0.026	0.114	<0.005	0.551	0.044	0.032	0.014	0.074	
Manganeso Total		0.4			0.0406	0.014	0.062	0.027	0.1482	0.04	0.543	0.047	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	

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			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Molibdeno Total	mg/L			2	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	NA
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					0.013	<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	4.1	3.2	7.1	4.3	4.1	3.6	5.4	
Potasio Total		0.61			3	2.2	4.1	3.1	4.2	3.1	7.5	4.3	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	<0.0001	<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	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00006	
Sodio Disuelto					6.34	3.7	10.8	7	32.16	6	135	25.7	11.69	8.7	15.4	
Sodio Total					5.99	3.4	9.4	7.1	31.11	5.3	124	26	11.45	8.3	15.5	
Estroncio Disuelto					0.06	0.02	0.09	0.091	0.12	0.03	0.33	0.134	0.17	0.07	0.29	
Estroncio Total					0.057	0.02	0.08	0.086	0.122	0.04	0.35	0.126	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	0.006	0.05	<0.005	0.22	0.012	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	0.006	0.0047	<0.0005	0.018	
Zinc Disuelto		7.4		10	0.04	<0.01	0.1	<0.01	<0.1	<0.1	0.4	<0.01	0.131	<0.01	0.81	
Zinc Total					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					<2.062	<2.02	<2.084	<2	<2.062	<2.02	<2.084	<2.2	<2.062	<2.02	<2.084	
DQO					6.5	<10	20	<10	<10	<10	30	<10	10	<10	40	
Cloruros		250	10		1.8	1	3	2.3	43.9	3	230	31.4	3	5	3	
Cianuro Total					0.003	<0.003	0.014	<0.003	<0.003	<0.003	0.014	<0.003	<0.003	0.015	<0.003	
Fluoruros					<0.1	<0.1	<0.1	0.08	0.11	<0.1	0.3	0.15	<0.1	0.2	0.1	
Nitratos/Nitritos como N					0.13	0.03	0.42	0.09	0.3	<0.02	1.22	0.07	<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	0.1	0.2	0.1	0.5	0.2	<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		500	2	10	0.02	<0.01	0.05	<0.02	0.04	0.02	0.08	0.03	0.03	0.19	0.19	
STD (TDS)					84	60	110	104	187	90	540	202	140	240	100	
SST (TSS)					9	<5	32	<5	21	<5	105	<5	<5	330	6	
ST (TS)					97	70	130	104	221	120	550	212	150	610	140	
Sulfatos		250			16.5	<10	47	20.1	14	<10	23	25.7	9	38	19.4	
Alcalinidad Total					25	13	43	31.5	48	22	108	58.2	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	

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 4-4: 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			Dic-16	Línea Base			Dic-16
					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	7.25	7.86	7.5	10.7	8.33
Temperatura (campo)	°C				22.1	18.9	25.1	21.6	21.8	19.1	24.2	20.8
Conductividad (campo)	µS/cm				363.7	186.8	807.6	782.8	267.4	121.8	518	434.7
Oxígeno disuelto (campo)	mg/L				5.14	0.28	7.48	4.38	6.2	0.8	8.5	7.80
Cr VI					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
DBO					15	15	25	<10	<10	<10	<10	<10
Coliformes Fecales	NMP/100ml				2x10 ⁶	2x10 ⁴	5x10 ⁶	1.6 x 10 ⁴	9x10 ⁴	1x10 ²	2x10 ⁵	9.2 x 10 ³
Color Real	U Pt/Co				172	19	351	<1	342	29	824	<1
Materia Flotante								Presente				Presente
Turbidez	NTU				14.15	6.09	22.2	4.24	25.72	4.93	46.5	5.69
Aluminio Disuelto	mg/L				0.033	<0.03	0.06	0.04	0.087	<0.03	0.22	<0.03
Aluminio Total		0.2			2.39	0.04	7.35	0.3	2.96	0.4	8.6	0.25
Antimonio Disuelto					0.001	<0.0004	0.0033	0.002	0.0006	<0.0004	0.0013	0.0012
Antimonio Total		0.006			0.001	<0.0004	0.0027	0.0018	0.0007	<0.0004	0.0012	0.0007
Arsénico Disuelto					0.0043	0.0025	0.0064	0.0044	0.004	0.0023	0.0057	0.0052
Arsénico Total		0.01		0.1	0.006	0.0041	0.0096	0.0045	0.0042	0.002	0.006	0.0049
Bario Disuelto					0.107	0.074	0.143	0.138	0.094	0.056	0.135	0.086
Bario Total		1			0.136	0.102	0.185	0.138	0.121	0.09	0.154	0.087
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	0.16
Boro Total					0.023	<0.01	0.06	0.03	0.041	<0.01	0.1	0.16
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	99.9	35.7	18.2	78.3	45.4
Calcio Total					52.1	18.6	156	102	36.2	18.5	79.7	46.7
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	0.02	<0.01	<0.01	<0.01	0.01
Cobalto Total					<0.01	<0.01	<0.01	0.02	<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	0.07	0.09	<0.02	0.17	0.03
Hierro Total		0.3			1.53	0.05	4.36	0.28	1	0.25	2.2	0.14
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	0.001	0.0022	0.0002	0.008	0.0001
Litio Disuelto					<0.02	<0.02	0.04	0.02	<0.02	<0.02	0.04	0.053
Litio Total					<0.02	<0.02	0.04	0.027	<0.02	<0.02	0.04	0.061
Magnesio Disuelto					6.3	3.2	14.7	9.1	6	3.3	9.7	7.8
Magnesio Total					6.6	3.3	14.8	9.4	6.2	3.4	10.1	8.1
Manganeso Disuelto					0.095	0.009	0.118	0.136	0.057	0.023	0.148	0.015
Manganeso Total		0.4			0.1808	0.047	0.349	0.151	0.115	0.043	0.187	0.023
Mercurio Disuelto					<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

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			Dic-16	Línea Base			Dic-16
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Molibdeno Disuelto	mg/L				<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	9.1	6	4.5	8.1	6.1
Potasio Total					6.8	6.4	7.8	9.2	6.1	4.8	8.5	6.2
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	0.0001	<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	0.0001
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	33.7	17.6	10.7	26.9	31.6
Sodio Total					18.4	12.9	34.3	34.2	17.4	11	28.5	32.5
Estroncio Disuelto					0.44	0.16	1.5	0.959	0.29	0.14	0.71	0.435
Estroncio Total					0.44	0.16	1.48	0.939	0.295	0.14	0.73	0.437
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	0.015	0.084	0.015	0.237	0.011
Uranio Disuelto					0.00014	<0.0001	0.0003	0.0001	0.00014	<0.0001	0.0002	<0.0001
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	0.007	0.0054	<0.005	0.012	0.009
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	0.02	<0.01	<0.01	0.03	0.01
Grasas y Aceites			10	10	<2.04	<2.02	<2.062	<2.2	<2.02	<2.02	<5	<2
DQO			125		20	<10	40	18	17.8	<10	35	<10
Cloruros		250			10	7	19	28.2	12	6	20	31.5
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	0.30	0.006	<0.003	0.013	0.27
Nitratos/Nitritos como N					3.07	2.01	5.23	3.93	1.97	1.14	3.85	1.49
Amonio					0.24	<0.05	0.58	1.70	0.129	<0.05	0.22	<0.05
Nitrógeno Kjeldahl (TKN)					0.74	<0.1	1.6	3.0	0.57	0.3	0.9	0.2
Fosfatos					0.55	0.3	1	1.02	0.49	0.22	1.3	0.65
Fósforo Disuelto (Orto)					0.18	0.08	0.33	0.31	0.18	0.09	0.49	0.22
Fósforo Total			2	10	0.27	0.12	0.51	0.41	0.25	0.09	0.58	0.22
STD (TDS)		500			312	160	750	520	255	160	440	356
SST (TSS)			50	100	34	<5	102	8.0	73	<5	340	<5
ST (TS)					362	180	750	556	310	200	450	360
Sulfatos		250			91	22	360	211	60	25	169	84.8
Alcalinidad Total					79	50	110	111	70	45	90	94.3
Hidrocarburos totales (TPH)					<0.01	<0.01	<0.01	0.1	70	45	90	<0.09

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, 2017.

4.3.3 Agua Subterránea

En el Cuadro 4-5 se presentan los resultados de la calidad del agua subterránea (manantiales) y los resultados de laboratorio se presentan en el Anexo 11.5.2. En términos generales los parámetros analizados en las estaciones 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, y los límites establecidos por la EPA y el acuerdo.

La temperatura de las estaciones muestreadas se encontró entre 20.3 y 23.1 °C. La lectura menor de pH se obtuvo en la estación GW-3 (6.28 u.e.) y la mayor en la estación GW-2 (6.40 u.e.). Los Sólidos Suspendidos Totales (**SST**) se registraron únicamente en la estación GW-2 (6.0 mg/L) por debajo de las guías del Acuerdo (100 mg/L) y del Banco Mundial (50 mg/L). Las concentraciones registradas de Cloruros están por debajo de las guías de la USEPA (250 mg/L).

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 la mayoría de las estaciones a excepción de GW3; se dará seguimiento a este parámetro en la presente estación en futuros muestreos para comprobar o descartar que dicho aumento se deba a las actividades realizadas dentro del Proyecto. De corroborarse que el aumento se deba a las actividades generadas dentro del proyecto, se procederá a tomar las medidas necesarias para su corrección.

El Cadmio, Cianuro, Berilio, Bismuto, Boro, Cobalto, Cobre, Cromo, Galio, Litio, Cromo hexavalente, Mercurio, Plomo, Molibdeno, Níquel, Escandio, Talio, Estaño, Plata, Uranio y Vanadio no fueron detectados en ninguna de las estaciones. El Selenio fue detectado en la estación GW3 (0.0006 mg/L) por debajo de la guía de la USEPA (0.17mg/L). El Antimonio fue detectado en la estación GW2 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 4-5: 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			Dic-16	GW-2				GW-3				GW-4			
					Nacimiento Aldea El Volcancito				Nacimiento Aldea El Fucío				Nacimiento – Zona central del Proyecto (frente al portal oeste)				Manantial – Aguas arriba del depósito de colas			
					Línea Base				Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					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	6.54	6.01	7.16	6.40	6.54	6.21	7.13	6.28	6.13	6.13	6.13		
Temperatura de campo	°C				15.2	14.8	15.6	21.4	19	23.7	20.3	19.4	18.5	21	23.1	18.1	18.1	18.1		
Conductividad de campo	µS/cm				229.8	223	236.5	323.4	111.3	500.5	296.8	315.3	236.7	501.1	662.7	147.3	147.3	147.3		
Oxígeno Disuelto de campo	mg/L				0.1	0.03	0.17	1.18	0.13	2.35	4.83	0.68	0.03	1.26	4.92	0.14	0.14	0.14		
Turbidez	NTU				NR	NR	NR	NR	NR	NR	14.2	NR	NR	NR	1.01	NR	NR	NR		
Materia Flotante			Ausente	Ausente																
Color Aparente	u Pt/Co		500	<1																
Color Real	u Pt/Co			<1																
Cr (VI)	mg/L			<0.05																
Coliformes Fecales	NMP/100mL		<1x10 ⁴	49	1.6 x 10 ³															
Aluminio Disuelto	mg/L	0.2			<0.03	<0.03	<0.03	0.075	<0.03	0.24	0.11	<0.03	<0.03	0.04	0.04	1.42	1.42	1.42		
Antimonio Disuelto		0.01			<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			
Arsénico Disuelto		0.01		0.1	0.001	0.0008	0.0011	0.0156	0.0043	0.0299	0.0059	0.0059	0.0037	0.0115	0.0021	0.0008	0.0008	0.0008		
Bario Disuelto		1			0.025	0.022	0.028	0.24	0.125	0.451	0.134	0.186	0.12	0.328	0.132	0.127	0.127	0.127		
Berilio Disuelto		0.004			<0.01	<0.002	<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		
Boro Disuelto					<0.01	<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	
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		
Calcio Disuelto					5.7	5.1	6.2	33.5	9.6	65.3	17.9	31.6	25.7	43.4	81.2	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		
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	0.103	0.03	0.17	0.02	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	<0.02	<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	<0.008	<0.02	<0.02	<0.02	
Magnesio Disuelto					3.1	2.9	3.3	5.9	1.8	12	3.2	4.9	3.3	8.3	18.7	2.6	2.6	2.6		
Manganeso Disuelto		0.05			<0.005	<0.005	<0.005	0.123	0.02	0.356	0.029	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		
Molibdeno Disuelto					<0.01	<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	
Níquel Disuelto		0.61		2	<0.01	<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	
Potasio Disuelto					7.3	5.9	8.6	2.9	1.3	4.3	1.9	3.8	2.5	5	10.1	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	13.5	7.2	22	8.3	11.5	9.3	16.4	24	10.3	10.3	10.3		
Estroncio Disuelto					0.03	0.03	0.03	0.26	0.08	0.56	0.148	0.2	0.12	0.37	0.422	0.03	0.03	0.03		
Talio Disuelto					<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.1	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	
Estaño Disuelto					<0.1	<0.1	<0.1	<0.1	<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	<0.005	<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	<0.1	<0.1	0.1	0.03	0.94	<0.01	3.47	<0.01	0.1	0.1	0.1		
Cloruros		250			15	14	16	4	2	7	4.1	5	3	6	19.4	4	4	4		
Cianuro Total		0.14		1	0.008	<0.003	0.014	0.004	<0.003	0.012	<0.003	0.0046	<0.003	0.014	<0.003	<0.003	<0.003	<0.003	<0.003	
Fluoruros					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.17	0.15	0.1	0.2	0.17	<0.1	<0.1	<0.1	
Nitratos/Nitritos como N					2.19	1.9	2.48	0.74	0.14	1.1	3.96	1.19	0.05	3.16	5.95	0.07	0.07	0.07		
Amonio					<0.05	<0.05	0.07	0.059	<0.05	0.16	<0.05	0.065	<0.05	0.14	<0.05	<0.05	<0.05	<0.05	<0.05	
Nitrógeno Kjeldahl (TKN)					0.7	0.3	1.1	0.63	0.2	0.9	0.4	0.46	<0.05	1.2	<0.1	0.3	0.3	0.3		
Fosfatos					0.2	0.1	0.2	0.4	0.1	0.7	0.09	0.3	0.1	0.5	<0.06	0.09	0.09	0.09		
Fósforo Total			2	10	0.1	0.02	0.17	0.18	0.09	0.27	0.05	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			
					Nacimiento Aldea El Volcancito			Nacimiento Aldea El Fucío				Nacimiento – Zona central del Proyecto (frente al portal oeste)				Manantial – Aguas arriba del depósito de colas			
					Línea Base			Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					Promedio	Mínimo	Máximo	Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
STD (TDS)	mg/L	500			190	190	190	223	130	350	164	213	190	260	536	170	170	170	NA
SST (TSS)			50	100	6.5	6	7	7.7	6	9	6.0	39	5	105	<5	206	206	206	
ST (TS)					200	180	220	237.5	140	380	140	217.5	170	270	528	360	360	360	
Sulfatos		250			12.5	11	14	43	7	90	14.5	30	16	71	214	7	7	7	
Alcalinidad Total					31	31	31	0.18	0.09	0.27	51.5	83	71	97	75.9	35	35	35	

GW-5 fue clausurado y no se reportan resultados para el presente informe trimestral. 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 4-6: 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			Dic-16	MW-3				MW-4				MW-5					
					Línea Base				Dic-16	Línea Base			Dic-16	Línea Base			Dic-16					
					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	NA	6.44	6.34	6.49	6.69	6.32	6.23	6.41	6.65	6.19	6.04	6.34	6.36		
Temperatura de campo	°C				24.4	23.4	25.1		24.1	23.7	24.5	24.0	23.3	22.2	24.4	23.6	23.4	23	24.6	24.9		
Conductividad de campo	µS/cm				427.5	211.9	1001.3		803.9	741.6	829.1	588.0	916.9	872.1	944.8	507.4	469.7	401.4	494.1	869.7		
Oxígeno Disuelto de campo	mg/L				0.75	0.3	1.21		0.65	0.11	1.44	5.63	0.97	0.48	1.93	5.59	0.82	0.19	1.77	3.61		
Turbidez	NTU				NR	NR	NR		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
Materia flotante	Visual		Ausente	2.47																	1.01	5.56
Color Aparente	u Pt/Co		500	Ausente																	6	11
Color Real			<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	mg/L	0.2			0.038	<0.03	0.07	<0.03	<0.03	<0.03	0.05	<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	0.0005			
Arsénico Disuelto		0.01	0.1	0.0011	0.0008	0.0014	0.0023	0.0021	0.0027	0.0024	0.0023	0.0021	0.0028	0.0025	0.0013	0.001	0.0016	0.0009	0.0009			
Bario Disuelto		1		0.03	0.024	0.039	0.036	0.032	0.041	0.038	0.042	0.038	0.047	0.021	0.162	0.157	0.166	0.166	0.042			
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	0.003	<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	<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	0.05			
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				20.6	9.4	48.7	80.3	76.4	83.3	80.5	100	93	107	70.7	40.8	39.2	42.2	42.2	137			
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	<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	<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	<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	<0.02	<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	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	<0.0001			
Litio Disuelto				<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.015	<0.02	<0.02	0.02	0.012	<0.02	<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	7.6	7.3	6.8	7.6	7.6	17.6			
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	<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	<0.0002			
Molibdeno Disuelto				<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	<0.01	<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	<0.01	<0.008			
Potasio Disuelto				2.2	1.9	2.4	4.2	3.9	4.6	4	4.7	4.5	5.2	3.9	6	5.5	6.5	6.5	7.6			
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	<0.1			
Selenio Disuelto		0.17		0.0002	0.0001	0.0002	0.0002	0.0002	0.0002	0.0003	0.0003	0.0002	0.0003	0.0003	0.0004	0.0003	0.0004	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	<0.00005			
Sodio Disuelto				22	17.4	33.6	29.5	28.2	30.9	27.7	32.3	30.4	35.8	24.8	16.9	15.6	19.1	19.1	29.8			
Estroncio Disuelto				0.18	0.07	0.46	0.74	0.71	0.77	0.75	0.89	0.84	0.98	0.623	0.27	0.26	0.29	0.29	0.516			
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	<0.1	<0.1	<0.1	<0.04	<0.1	<0.1	<0.1	<0.04	<0.1	<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	<0.005	<0.005			
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	0.001	0.0005			
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	<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	0.1	0.05			
Cloruros		250		12	3	28	16	16	17	18.5	20	19	21	15.4	9	8	9	9	26.0			
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	0.015	<0.003			
Fluoruros				0.35	0.2	0.7	0.8	0.8	0.8	0.76	0.8	0.8	0.8	0.87	0.18	0.1	0.2	0.2	0.24			
Nitratos/Nitritos como N				2.48	2.04	2.93	2.2	2.08	2.26	2.76	2.13	1.98	2.32	2.77	3.32	3	3.57	3.57	7.41			
Amonio				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			
Nitrógeno Kjeldahl (TKN)				0.56	<0.1	1.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.3	0.3	<0.1			

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW-2				MW-3				MW-4				MW-5			
					Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					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	0.09
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	484	553	540	560	438	305	290	320	748
SST (TSS)			50	100	345.8	137	584		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	7.0
ST (TS)					597.5	350	810		487.5	450	510	520	555	520	580	476	325	280	350	788
Sulfatos		250			28.5	4	97		166	162	169	179	212.5	210	220	145	72.3	64	76	336
Alcalinidad Total					64	56	80		84	82	86	82.2	85	83	88	85.1	66	61	68	97.7

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 4-6: 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			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					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	6.39	6.38	6.14	6.98	6.30	6.16	6.07	6.29	6.36	7.15	6.9	7.4	8.08
Temperatura de campo	°C				22.3	21.6	22.8	25.6	22.4	22	23.1	23.9	23.3	23.2	23.4	23.5	27.5	25.9	29	25.1
Conductividad de campo	µS/cm				538.2	342.9	752.6	1116	299.6	285.9	323.8	302.7	426.8	424.6	428.1	664.7	1595	1569	1621	437.6
Oxígeno Disuelto de campo	mg/L				0.69	0.19	1.67	5.13	0.61	0.25	1.19	2.89	0.72	0.16	1.45	4.01	0.38	0.35	0.41	2.21
Turbidez	NTU				NR	NR	NR	5.63	NR	NR	NR	4.18	NR	NR	NR	1.09	NR	NR	NR	8.21
Materia flotante	Visual		Ausente	Ausente				Ausente				Ausente				Ausente				
Color Aparente	u Pt/Co		500	11				12				<1				75				
Color Real		<1		<1				<1				<1								
Cr (VI)	mg/L		0.1	<0.05				<0.05				<0.05								
Coliformes Fecales	NMP/100mL		<1x10 ⁴	4.5				<1.8				<1.8								
Aluminio Disuelto	mg/L	0.2			<0.03	<0.03	0.05	<0.03	0.053	<0.03	0.07	0.08	<0.03	<0.03	<0.03	0.09	<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	0.0007	0.001	0.0009	0.0011	0.0009	<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	0.0014	0.003	0.0007	0.0052	0.001
Bario Disuelto		1			0.198	0.134	0.281	0.105	0.156	0.129	0.176	0.38	0.125	0.122	0.129	0.067	0.031	0.028	0.034	0.042
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	0.07	<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	0.06	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	0.04	0.09	0.08	0.1	0.02
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	184	16.7	13.9	19.6	27.9	34.6	32.5	36.3	99	185.5	170	201	56.8
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	0.36
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	0.009	0.07	0.07	0.07	0.011
Magnesio Disuelto					7.5	4.9	10.5	19.7	4.8	4.6	5	8.6	6.4	6.3	6.7	15.3	35.8	34.4	37.2	8.7
Manganeso Disuelto		0.05			<0.005	<0.005	0.006	<0.005	0.0065	<0.005	0.012	0.01	0.019	0.012	0.029	<0.005	0.203	0.149	0.257	0.093
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	9	6.2	5.4	6.8	8.1	4.8	4.6	5.1	6.3	4.8	4.6	5	4.3
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	0.0007	0.0002	0.0001	0.0002	<0.0001	0.0004	0.0003	0.0006	0.0005	<0.0001	<0.0001	<0.0001	<0.0001
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00007	<0.00005
Sodio Disuelto					14	12.3	17	39.3	19.1	15.4	27.5	17.3	15.2	15	15.6	24.3	45.1	44.7	45.4	25.5
Estroncio Disuelto					0.26	0.18	0.35	0.873	0.1	0.09	0.11	0.19	0.22	0.21	0.23	0.36	1.64	1.58	1.69	0.398
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	<0.005	<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	0.0003	<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	0.15	0.034	<0.01	0.1	0.26	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Cloruros		250			11	6	17	41.6	11	9	12	14.4	6	6	6	20.7	37	36	37	9.0
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	0.15	0.13	0.1	0.2	0.15	0.17	0.1	0.2	0.17	2.55	2.5	2.6	0.61
Nitratos/Nitritos como N					5.08	4.42	6.15	8.2	4.75	4.08	5.24	1.73	2.76	2.63	2.83	5.10	<0.02	<0.02	<0.02	0.18
Amonio					<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrógeno Kjeldahl (TKN)					<0.1	<0.1	0.2	<0.1	0.21	<0.1	0.4	<0.1	0.09	<0.1	0.2	<0.1	0.23	<0.1	0.4	<0.1

Parámetros	Unidades	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW-6				MW-7				MW-8				MW-9			
					Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Fosfatos	mg/L				0.173	0.15	0.21	0.12	0.113	0.09	0.18	<0.06	0.23	0.21	0.24	0.12	<0.03	<0.03	<0.03	0.12
Fósforo Total			2	10	0.05	0.04	0.06	0.04	0.04	0.01	0.07	<0.02	0.07	0.06	0.08	0.04	<0.01	<0.01	0.02	0.07
STD (TDS)		500			340	260	440	982	233	220	250	280	277	270	290	566	905	890	920	340
SST (TSS)			50	100	<5	<5	<5	10.0	19.75	7	45	<5	9	6	14	<5	27	25	29	<5
ST (TS)					345	240	450	1010	260	230	280	290	300	290	310	596	940	910	970	350
Sulfatos		250			85.3	33	153	486	19.3	17	23	38.6	54.7	54	55	236	440	440	440	56.1
Alcalinidad Total					65	62	68	60.9	48	41	60	103	68	66	70	75.2	147	136	157	164

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 4-6: 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			Dic-16	Línea Base			Ene-17	Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					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	7.05	7.05	7.05	7.31	7.45	7.45	7.45	7.34	NR	NR	NR	7.45	NR	NR	NR	NA	NR	NR	NR	7.53
Temperatura de campo	°C				30.4	30.4	30.4	30.7	27.8	27.8	27.8	28.9				27.3								30.9
Conductividad de campo	µS/cm				2.243	2.243	2.243	1521	663.9	663.9	663.9	898.0				721.8								1256
Oxígeno Disuelto de campo	mg/L				0.09	0.09	0.09	3.22	0.05	0.05	0.05	0.62				8.67								5.09
Turbidez	NTU			Ausente	NR	NR	NR	1.10	NR	NR	NR	0.82				NA								4.75
Materia flotante	Visual							Ausente				Ausente				Ausente								Ausente
Color Aparente	u Pt/Co							140				<1				<1								318
Color Real				500				<1				<1				<1								<1
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	0.17	0.06	0.06	0.06	<0.03				<0.03								<0.03
Antimonio Disuelto		0.01			0.001	0.001	0.001	0.0006	<0.0004	<0.0004	<0.0004	0.0008				0.0006								<0.0004
Arsénico Disuelto		0.01		0.1	0.0022	0.0022	0.0022	0.0032	0.0136	0.0136	0.0136	0.0155				0.0105								0.0062
Bario Disuelto		1			0.033	0.033	0.033	0.026	0.125	0.125	0.125	0.076				0.075								0.022
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	0.18	0.07	0.07	0.07	0.1				0.09								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	235	47.5	47.5	47.5	103				84.7								196
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	1.21	0.05	0.05	0.05	<0.02	NR	NR	NR	0.03	NR	NR	NR	NA	NR	NR	NR	2.38
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	0.08	0.08	0.08	0.08	0.147				0.119								0.085
Magnesio Disuelto					41.3	41.3	41.3	34.1	4.1	4.1	4.1	6.2				5.7								35.4
Manganeso Disuelto		0.05			0.044	0.044	0.044	0.02	0.03	0.03	0.03	0.03				<0.005								0.048
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
Molibdeno 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	4.3	2.5	2.5	2.5	1.9				2.4								4.6
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	0.0002	<0.0001	<0.0001	<0.0001	0.0004				0.0003								<0.0001
Plata Disuelta					<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005				<0.00005								<0.00005
Sodio Disuelto					77.4	77.4	77.4	68.4	55.2	55.2	55.2	86.5				71.1								46.7
Estroncio Disuelto					2.23	2.23	2.23	2.19	1.33	1.33	1.33	4.77				3.7								1.88
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	<0.005	<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				0.0003								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	62.3	32	32	32	4.3				4.3								44.2
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	2.69	0.7	0.7	0.7	0.80				0.72								2.62
Nitratos/Nitritos como N					0.19	0.19	0.19	<0.02	<0.02	<0.02	<0.02	0.05				0.56								<0.02

Parámetros	Unidad	USEPA Salud Humana	IFC Agua Residual Tratada	Acuerdo 236-2006	MW11				PSA-SR				HW-1				RW-1				PSA-1			
					Línea Base			Dic-16	Línea Base			Ene-17	Línea Base			Dic-16	Línea Base			Dic-16	Línea Base			Dic-16
					Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo		Promedio	Mínimo	Máximo	
Amonio	mg/L				<0.05	<0.05	<0.05	<0.05	0.06	0.06	0.06	<0.05	NR	NR	NR	<0.05	NR	NR	NR	NA	NR	NR	NR	<0.05
Nitrógeno Kjeldahl (TKN)					<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				<0.1								<0.1
Fosfatos					0.03	0.03	0.03	<0.06	0.06	0.06	0.06	<0.06				0.09								<0.06
Fósforo Total			2	10	0.06	0.06	0.06	<0.02	0.02	0.02	0.02	<0.02				0.03								<0.02
STD (TDS)		500			1370	1370	1370	1260	320	320	320	630				554								994
SST (TSS)			50	100	145	145	145	<5	<5	<5	<5	<5				<5								<5
ST (TS)					1000	1000	1000	1290	300	300	300	646				590								1040
Sulfatos		250			700	700	700	642	45	45	45	300				242								504
Alcalinidad Total					133	133	133	134	186	186	186	169				142								156

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. NA= no analizado. Fuente: MSR, 2017.

En el Cuadro 4-6 se presentan los resultados de la calidad del agua subterránea (Pozos de Monitoreo, Producción y Artesanal) correspondientes al mes de Diciembre. Los resultados de laboratorio se presentan en el Anexo 11.5.2. 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 6.30 a 8.08 u.e. y la temperatura en el rango de 23.5 a 30.9 °C. Las concentraciones registradas de Cloruros están por debajo de las directrices de la USEPA (250 mg/L).

En los pozos MW-5, MW-6, MW-11, PSA-SR y PSA-1 los valores registrados de sulfatos se encuentran por encima de los valores establecidos durante el levantamiento de línea base y 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 MW5 y MW6, 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 Berilio, Bismuto, Cadmio, Cromo, Galio, Cobalto, Cromo, Cromo Hexavalente, Mercurio, Molibdeno, Níquel, Escandio, Plata, Escandio, Talio, Estaño, Titanio, Cromo hexavalente y cianuro total no fueron detectados en ninguno de los pozos monitoreados.

El Antimonio se detectó en la mayoría de los 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).

5 Sedimentos

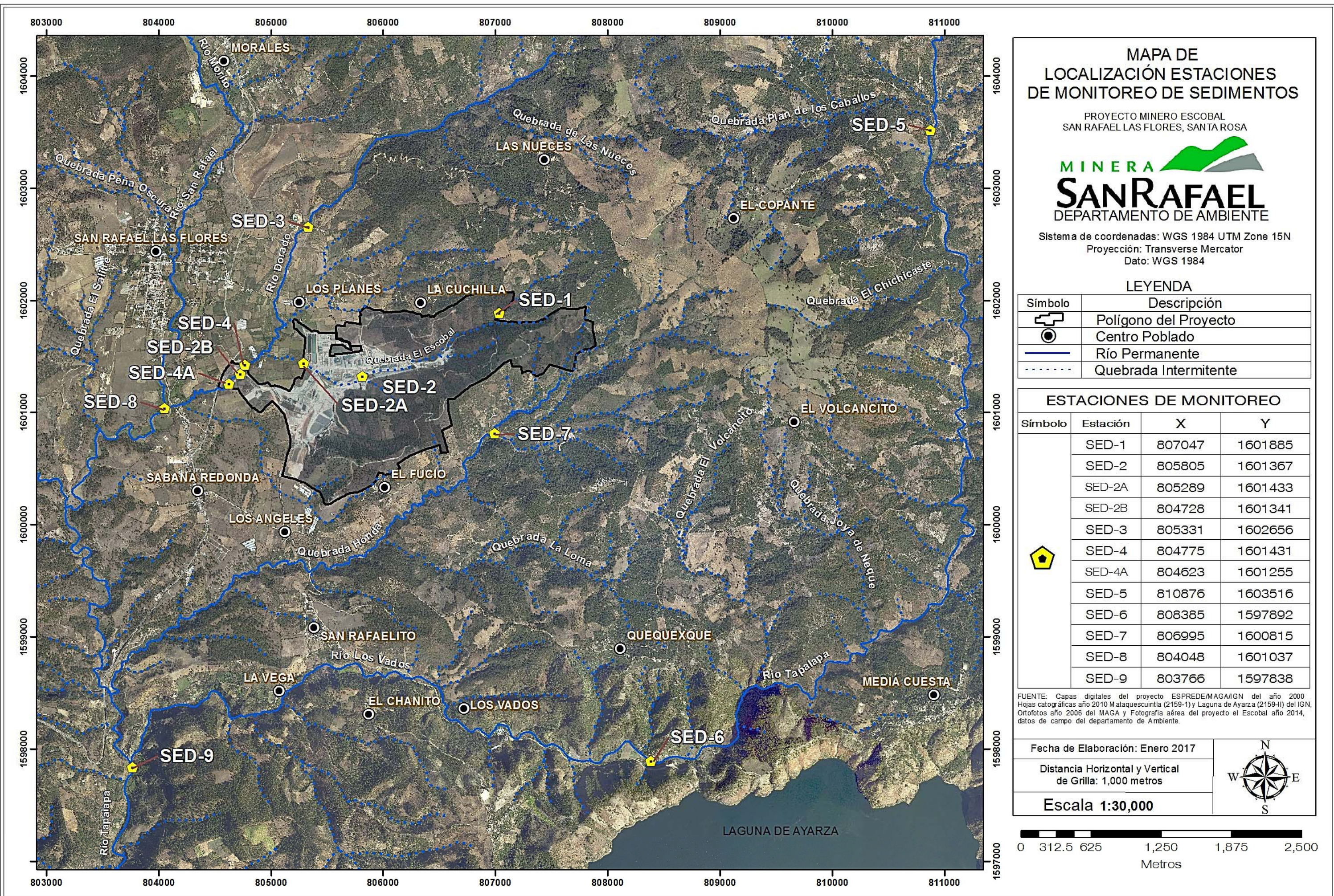
5.1 Sitios de Monitoreo

En el Cuadro 5-1 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 5-1.

Cuadro 5-1: 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 WGS84. Fuente: MSR, 2017.



5.2 Metodología

En el Cuadro 5-2 se describe los parámetros analizados en las muestras de sedimentos.

Cuadro 5-2: Parámetros analizados en sedimentos, Proyecto Minero Escobal

Parámetros utilizados	
Análisis	Metales Totales, Cianuro Total, Fósforo Total.
Laboratorio contratado	
Nombre	Las muestras fueron analizadas en el laboratorio ACZ, 2773 Downhill Drive Steamboat Springs, Colorado USA, el cual se encuentra acreditado y avalado por la USEPA.

Fuente: MSR, 2017.

5.3 Resultados

En el Cuadro 5-3 se presenta los resultados de metales registrados para el mes de Diciembre. Los resultados del laboratorio se presentan en el Anexo 11.6.

El porcentaje de fósforo total se encuentra en el rango de 0.00877% (SED-5) a 0.0443% (SED-8). No se detectó cianuro en ninguna de las estaciones muestreadas, a excepción de SED-2A y SED-4.

El mercurio se detectó en una 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).

Cuadro 5-3: 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	Dic-16	Dic-16	Dic-16	Dic-16	Dic-16	Dic-16
Arsénico Total	mg/Kg**	50	9.8	NA	35.7	NA	15.5	10.4
Cadmio Total	mg/Kg**	50	0.25		6.02		0.87	0.24
Cromo Total	mg/Kg**	1500	3.1		8.1		6.3	3.3
Plomo Total	mg/Kg**	500	10.4		290		34.1	13.1
Mercurio Total	mg/Kg**	25	<0.04		<0.06		<0.07	<0.03
Cianuro Total	mg/Kg**		<0.06		0.23		0.11	<0.06
Fósforo Total	%		0.0242		0.0250		0.0365	0.0136

Parámetro	Unidades	Acuerdo 236-2006	SED-5	SED-6	SED-7	SED-8	SED-9
		Aplicación al suelo	Dic-16	Dic-16	Dic-16	Dic-16	Dic-16
Arsénico Total	mg/Kg**	50	16.5	5.7	NA	11.6	5.8
Cadmio Total	mg/Kg**	50	0.17	0.16		0.77	0.19
Cromo Total	mg/Kg**	1500	1.5	4.3		4.6	3.9
Plomo Total	mg/Kg**	500	8.70	6.09		35.3	6.05
Mercurio Total	mg/Kg**	25	0.06	<0.05		<0.06	<0.04
Cianuro Total	mg/Kg**		<0.05	<0.04		<0.07	<0.05
Fósforo Total	%		0.00877	0.00942		0.0443	0.0105

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. Fuente: MSR, 2017.

6 Calidad de Efluentes

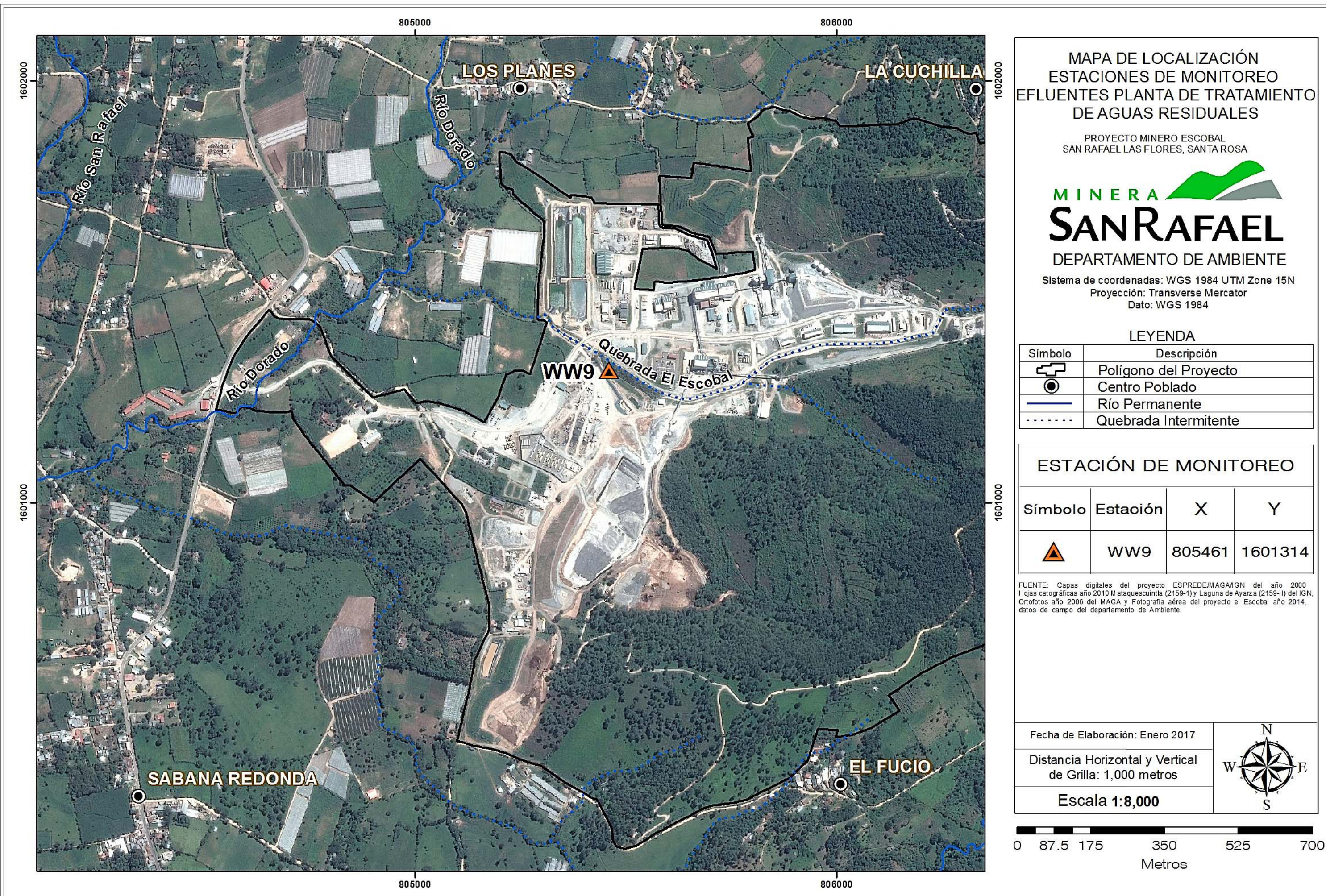
6.1 Sitios de Monitoreo

En el Cuadro 6-1 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 6-1.

Cuadro 6-1: 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 WGS84. Fuente: MSR, 2017.



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

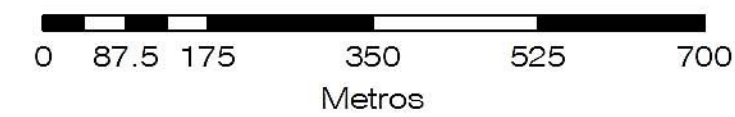
Símbolo	Descripción
	Polígono del Proyecto
	Centro Poblado
	Río Permanente
	Quebrada Intermitente

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 Mataquesuintla (2159-I) 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: Enero 2017
Distancia Horizontal y Vertical
de Grilla: 1,000 metros
Escala 1:8,000



6.2 Metodología

En el Cuadro 6-2 se describe el procedimiento y equipo utilizado para la toma de muestras de agua.

Cuadro 6-2: Procedimiento y equipo utilizado para medir parámetros *in situ* de muestras de agua residual, Proyecto Minero Escobal

Parámetros analizados	
<i>In Situ</i>	pH y temperatura
Laboratorio	Metales pesados Totales y Disueltos, Aceites y Grasas, DQO, DBO, Coliformes totales, Color, Sólidos Disueltos, Sólidos Sedimentables, Cianuro Total.
Procedimiento	
Basado en el procedimiento de toma de muestra dado por Water Management Consultants y el laboratorio ACZ para el análisis de Cianuro y en el procedimiento dado por <i>Standard Methods for the Examination of Water and Wastewater, part 1060 B</i> para los demás parámetros.	
Equipo utilizado	
Nombre	Automuestreador
Modelo	6712 Full-size con módulo integrado 701 para medición continua de pH y temperatura.
Fabricante	ISCO

Fuente: MSR, 2017.

Laboratorio empleado y valores de referencia: Las muestras de cianuro fueron analizadas en el laboratorio ACZ, 2773 Downhill Drive Steamboat Springs, Colorado USA, el cual se encuentra acreditado y avalado por la USEPA. Las muestras de agua residual fueron analizadas en el laboratorio Ecosistemas Proyectos Ambientales, S.A., laboratorio respaldado por un Sistema de Calidad ISO 17025, otorgado por la Oficina Guatemalteca de Acreditación (OGA); y con ello los análisis acreditados cuentan con validez internacional según OGA-LE 006-04.

6.3 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 6-3: Resultados de control de calidad para muestras de Efluentes de Planta de Tratamiento, Proyecto Minero Escobal

Mes	Unidades	LMP Acuerdo 236-2006	Noviembre	Diciembre		Enero	
Control de Calidad			Blanco	Blanco	Duplicado	Blanco	Original
ID Muestra			WW10	WW10	WW11	WW10	WW9
No. Reporte Lab.			2135-16	011-17	012-17	142-17	143-17
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	<25	<25
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	<10.9	<10.9
Fósforo Total		10	<0.05	<0.05	<0.1	<0.05	<0.05
Arsénico		0.1	<0.002	<0.002	0.002	<0.002	0.010
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	0.06	<0.03	<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	0.10
Color Aparente	u Pt/Co	500	<1	<1	12	<1	60
Color Real			<1	<1	<1	<1	4
Coliformes Fecales	NMP/100ml	<1x10 ⁴	4.5	<1.8	220	<1.8	130

*análisis realizado por laboratorio AZC. 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. 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 6-4 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 11.7.

Los valores de pH se encontraron en el rango de 6.91 a 7.78 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 y Coliformes fecales están por debajo de los valores establecidos por el acuerdo. Asimismo los parámetros de materia flotante, sólidos sedimentables, nitrógeno y fósforo total, zinc y color real y aparente se encuentran también por debajo de lo establecido 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 6-4: 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)	Noviembre	Diciembre	Enero
Fecha Muestreo					10/11/2016	19-20/12/2016	09/01/2017
ID Muestra					WW9	WW9	WW9
No. Reporte Lab.					2136-16	010-17	143-17
pH de campo	u.e.	6.0-9.0	6.0-9.0	6.0-9.0	7.78	7.24	7.51
Temperatura de campo	°C		+/- 3		27.4	21.0	20.5
Temperatura. Quebrada El Escobal					22.8	21.6	N.D.
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		<25	<25	<25
SST (TSS)		100	50	30	<10	<10	10
Sólidos Sedimentables					<0.1	<0.1	<0.1
Nitrógeno Total		20	10		<10.9	<10.9	<10.9
Fósforo Total		10	2		0.36	<0.05	<0.05
Arsénico		0.1	0.1		0.008	0.002	0.010
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		<0.03	0.05	<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	0.10
Color Aparente	u Pt/Co	500			<1	26	60
Color Real					<1	<1	4
Coliformes Fecales	NMP/100ml	<1x10 ⁴	400		22	110	130

N.D.: No determinado. 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. Fuente: MSR, 2017.

7 Vibraciones

7.1 Sitios de Monitoreo

La Empresa tiene instalados 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 7-1 y en el Cuadro 7-1 se presenta la descripción de cada una de las estaciones.

Cuadro 7-1: 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 norte

Sistema de coordenadas proyectadas UTM, DATUM WGS84. 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 Intermitente

ESTACIONES DE MONITOREO

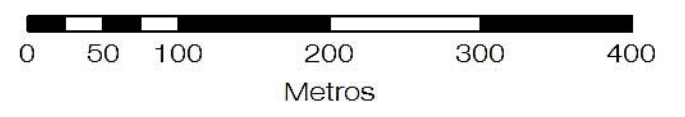
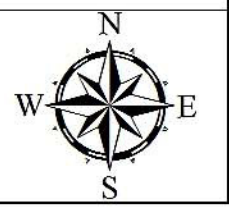
Símbolo	Estación	X	Y
	BS-1	806419	1601819
	BS-2	806361	1601492
	BS-3	805791	1601785

FUENTE: Capas digitales del proyecto ESPREDE/MAGA/IGN del año 2000
Hojas catográficas año 2010 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: Enero 2017

Distancia Horizontal y Vertical
de Grilla: 1,000 metros

Escala 1:5,000



7.2 Metodología

En el Cuadro 7-2 se describe el procedimiento y equipo utilizado para el registro de vibraciones.

Cuadro 7-2: Procedimiento y equipo utilizado para medir vibraciones, Proyecto Minero Escobal

PARAMETROS ANALIZADOS	
Velocidad	Velocidad de partícula
PROCEDIMIENTO	
Se registraron todas las voladuras realizadas en ambos portales durante los meses de noviembre de 2016 a enero de 2017. Y se enlistan las velocidades de partículas registrados por los equipos de vibraciones.	
EQUIPO UTILIZADO	
Equipo	eXPeak Seismograph modelo eXAD-8
Fabricante	Physical Measurement Technologies, Inc.

Fuente: MSR, 2017.

7.3 Resultados

En el Cuadro 7-3 se presentan todas las mediciones de las voladuras registradas en los instrumentos, y los resultados se encuentran por debajo del límite de detección del equipo (2.5 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 7-3 Resultados de medición de vibraciones, Proyecto Minero Escobal

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Noviembre	1215-LONG.	1	06:00	<2.5
	1390-6820	1	06:05	<2.5
	1240-6500	1	18:00	<2.5
	1365-6980	1	18:05	<2.5
	1365-6900	2	06:00	<2.5
	1190-6580	2	06:05	<2.5
	1215-6580	2	06:10	<2.5
	1240-6420	2	06:15	<2.5
	1240-6900	2	06:20	<2.5
	1340-6930	2	06:25	<2.5
	1330-RAMPA	2	18:00	<2.5
	1505-RAMPA	2	18:05	<2.5
	1190-6380	2	18:10	<2.5
	1290-6790	2	18:15	<2.5
	1390-6780	3	06:00	<2.5
	1390-6820	3	06:05	<2.5
	1390-CFTO	3	06:10	<2.5
	1240-6460	3	06:15	<2.5
	1390-6740	3	06:20	<2.5
	1480-7360	3	06:25	<2.5
	1365-6580	10	18:00	<2.5
	1340-6930	10	18:05	<2.5
	1215-LONG.	11	06:00	<2.5
	1330-RAMPA	11	06:05	<2.5
	1240-6360	11	18:00	<2.5
	1215-6580	11	18:05	<2.5
	1290-6790	11	18:10	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Noviembre	1240-6900	12	06:00	<2.5
	1190-6580	12	06:05	<2.5
	1390-6820	12	06:10	<2.5
	1190-6820requema	12	06:15	<2.5
	1390-6740	12	18:00	<2.5
	1240-6500	12	18:05	<2.5
	1365-6980	12	18:10	<2.5
	1505-RAMPA	13	06:00	<2.5
	1390-6740	13	06:05	<2.5
	1340-6930	13	06:10	<2.5
	1240-6420	13	06:15	<2.5
	1240-6460	13	06:20	<2.5
	1190-6410	13	06:25	<2.5
	1390-CFTO	13	18:00	<2.5
	1365-6900	13	18:05	<2.5
	1240-6790	13	18:10	<2.5
	1190-6890	14	06:00	<2.5
	1240-6900	14	06:05	<2.5
	1390-6820	14	06:10	<2.5
	1340-7000	14	06:15	<2.5
	1215-6940	16	18:00	<2.5
	1365-6900	17	06:00	<2.5
	1340-7000	17	06:05	<2.5
	1390-6920	18	18:00	<2.5
	1340-7000	18	06:00	<2.5
	1390-6920	19	18:00	<2.5
	1365-6900	19	18:05	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Noviembre	1430-7340	20	06:00	<2.5
	1455-7340	20	18:00	<2.5
	1390-6920	20	18:05	<2.5
	1455-7340	21	18:00	<2.5
	1190-6580	22	06:00	<2.5
	1290-6790	22	18:00	<2.5
	1240-6360	22	18:05	<2.5
	1215-LONG.	22	18:10	<2.5
	1390-6820	23	06:00	<2.5
	1365-6910	23	06:05	<2.5
	1240-6460	23	06:10	<2.5
	1240-6420	23	06:15	<2.5
	1455-7340	23	06:20	<2.5
	1390-6920	23	18:00	<2.5
	1240-6500	23	18:05	<2.5
	1215-6580	23	18:10	<2.5
	1215-6850	23	18:15	<2.5
	1290-6930	23	18:20	<2.5
	1340-6590	23	18:25	<2.5
	1340-6930	23	18:30	<2.5
	1190-6410	24	06:05	<2.5
	1240-6900	24	06:10	<2.5
	1290-6790	24	06:15	<2.5
	1315-6490	24	06:20	<2.5
	1215-6850	24	06:25	<2.5
	1305-RAMPA	24	06:30	<2.5
	1315-6930	24	06:35	<2.5
	1305-PORTONES	24	18:00	<2.5
	1365-6560	24	18:05	<2.5
	1190-6580	24	18:10	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Noviembre	1390-6720	24	18:15	<2.5
	1390-CFTO	24	18:20	<2.5
	1505-RAMPA	25	06:00	<2.5
	1215-LONG.	25	06:05	<2.5
	1390-6820	25	06:10	<2.5
	1340-6770	25	06:15	<2.5
	1340-6930	25	18:00	<2.5
	1240-6360	25	18:05	<2.5
	1240-6900	26	06:00	<2.5
	1240-6460	26	06:05	<2.5
	1190-6890	26	06:10	<2.5
	1505-REMUK	26	06:15	<2.5
	1240-6500	26	06:20	<2.5
	1190-6580	26	06:25	<2.5
	1240-6420	26	18:00	<2.5
	1215-6580	26	18:05	<2.5
	1290-6790	26	18:10	<2.5
	1215-LONG.	27	06:00	<2.5
	1215-6850	27	06:05	<2.5
	1190-6850	27	06:10	<2.5
	1340-6930	27	06:15	<2.5
	1315-6930	27	06:20	<2.5
	1240-6900	27	18:00	<2.5
	1390-6820	27	18:05	<2.5
	1290-BYPASS	27	18:10	<2.5
	1190-6410	28	06:00	<2.5
	1190-6890	28	06:05	<2.5
	1240-6360	28	06:10	<2.5
	1340-6590	28	06:15	<2.5
	1290-6790	28	06:20	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Noviembre	1315-6930	28	06:25	<2.5
	1240-6500	28	18:00	<2.5
	1340-6930	28	18:05	<2.5
	1240-6420	28	18:10	<2.5
	1215-6580	28	18:15	<2.5
	1190-6580	29	06:00	<2.5
	1240-6460	29	06:05	<2.5
	1240-6900	29	06:10	<2.5
	1365-6560	29	06:00	<2.5
	1215- LONG.	29	06:05	<2.5
	1390-6820	29	06:10	<2.5
	1365-6920	30	06:00	<2.5
	1390-CFTO	30	06:05	<2.5
	1390-6720	30	06:10	<2.5
	1340-6930	30	06:15	<2.5
	1215-6850	30	06:20	<2.5
	1190-6890	30	18:00	<2.5
	1190-6410	30	18:05	<2.5
	1290-6790	30	18:10	<2.5
	1415-CFTE	30	18:15	<2.5
	1240-6900	30	18:20	<2.5
Diciembre	1240-6460	1	06:00	<2.5
	1190-6640	1	06:05	<2.5
	1240-6590	1	06:10	<2.5
	1190-6460	1	06:15	<2.5
	1315-6930	1	06:20	<2.5
	1390-6820	1	18:00	<2.5
	1340-6930	1	18:05	<2.5
	1290-BIPASS	1	18:10	<2.5
	1215-6580	1	18:15	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1190-6580	1	18:20	<2.5
	1215-6460	1	18:25	<2.5
	1240-6360	1	18:30	<2.5
	1190-6890	2	06:00	<2.5
	1215-6850	2	06:05	<2.5
	1290-6790	2	06:10	<2.5
	1190-6410	2	06:15	<2.5
	1390-VENT(CHIMENEA)	2	06:20	<2.5
	1240-6900	2	18:00	<2.5
	1415-CFTE	2	18:05	<2.5
	1340-6590	2	18:10	<2.5
	1240-6360	2	18:15	<2.5
	1505-RAMPA	3	06:00	<2.5
	1505-REMUK	3	06:05	<2.5
	1240-6420	3	06:10	<2.5
	1240-6460	3	06:15	<2.5
	1340-6930	3	06:20	<2.5
	1190-6640	3	18:00	<2.5
	1190-6580	3	18:05	<2.5
	1290-BYPASS	3	18:10	<2.5
	1430-7460	3	18:15	<2.5
	1430-7480	3	18:20	<2.5
	1315-6630	4	06:00	<2.5
	1240-6540	4	06:05	<2.5
	1215-6850	4	18:00	<2.5
	1215-6580	4	18:05	<2.5
	1505-REMUK	4	18:10	<2.5
	1390-6820	4	18:15	<2.5
	1340-6630	4	18:20	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1390-CTFO	5	06:00	<2.5
	1390-6720	5	06:05	<2.5
	1190-6410	5	06:10	<2.5
	1240-6760	5	06:15	<2.5
	1240-6740	5	06:20	<2.5
	1240-6540	5	06:25	<2.5
	1215-6460	5	06:30	<2.5
	1190-6890	5	18:00	<2.5
	1415-CFTE	5	18:05	<2.5
	1240-6900	5	18:10	<2.5
	1340-6590	5	18:15	<2.5
	1340-6930	5	18:20	<2.5
	1430-7460	5	18:25	<2.5
	1190-6380	5	18:30	<2.5
	1240-6460	6	06:00	<2.5
	1290-6790	6	06:05	<2.5
	1390-6820	6	06:10	<2.5
	1290-BYPASS	6	18:00	<2.5
	1190-6890	6	18:05	<2.5
	1240-6420	6	18:10	<2.5
	1240-6740	6	18:15	<2.5
	1340-6630	6	18:20	<2.5
	1430-7480	7	06:00	<2.5
	1240-6760	7	06:05	<2.5
	1215-6850	7	06:10	<2.5
	1240-6540	7	06:15	<2.5
	1340-6590	7	18:00	<2.5
	1505-rampa	7	18:05	<2.5
	1505-remuk	7	18:10	<2.5
	1190-6410	7	18:15	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1190-6500	7	18:20	<2.5
	1215-6460	8	06:00	<2.5
	1215-6580	8	06:05	<2.5
	1390-CFTO	8	06:10	<2.5
	1390-6720	8	06:15	<2.5
	1415-SUB	8	06:20	<2.5
	1340-6930	8	18:00	<2.5
	1240-6900	8	18:05	<2.5
	1190-SUMI	8	18:10	<2.5
	1430-7460	8	18:15	<2.5
	1290-6790	9	06:00	<2.5
	1430-7480	9	06:05	<2.5
	1240-6460	9	06:10	<2.5
	1240-6420	9	06:15	<2.5
	1215-6850	9	06:20	<2.5
	1240-6740	9	18:00	<2.5
	1240-6760	9	18:05	<2.5
	1505-RAMPA	9	18:10	<2.5
	1505-RMUK	9	18:15	<2.5
	1240-6400	9	18:20	<2.5
	1430-7460	10	06:00	<2.5
	1430-7480	10	06:05	<2.5
	1240-6900	10	06:10	<2.5
	1340-6930	10	06:15	<2.5
	1290-6790	10	06:20	<2.5
	1215-6580	10	06:25	<2.5
	1240-6400	10	06:30	<2.5
	1190-6890	10	18:00	<2.5
	1290-BYPASS	10	18:05	<2.5
	1330-RAMPA	10	18:10	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1340-6590	10	18:15	<2.5
	1190-6890	10	18:20	<2.5
	1215-6580	11	06:00	<2.5
	1240-6900	11	06:05	<2.5
	1340-6930	11	06:10	<2.5
	1290-6790	11	06:15	<2.5
	1430-7460	11	06:20	<2.5
	1430-7480	11	06:25	<2.5
	1240-6400	11	06:30	<2.5
	1505-RAMPA	11	18:00	<2.5
	1390-6720	11	18:05	<2.5
	1415-SUB.	11	18:10	<2.5
	1190-6410	11	18:15	<2.5
	1340-6630	11	18:20	<2.5
	1215-6460	12	06:00	<2.5
	1240-6540	12	06:05	<2.5
	1215-6850	12	06:10	<2.5
	1190-6840	12	06:15	<2.5
	1240-6760	12	06:20	<2.5
	1315-6730	12	06:25	<2.5
	1340-6400	12	06:30	<2.5
	1390-C/F.O.	12	18:00	<2.5
	1240-6740	12	18:05	<2.5
	1240-6460	12	18:10	<2.5
	1190-SUMI	12	18:15	<2.5
	1340-6630	12	18:20	<2.5
	1430-7460	13	06:00	<2.5
	1215-6580	13	06:05	<2.5
	1330-RAMPA	13	06:10	<2.5
	1240-6900	13	18:00	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1290-6790	13	18:05	<2.5
	1340-6630	13	18:10	<2.5
	1340-6590	15	06:00	<2.5
	1340-6930	15	06:05	<2.5
	1505-RAMPA	15	06:10	<2.5
	1505-REMUK	15	06:15	<2.5
	1340-6400	15	06:20	<2.5
	1190-6540	15	06:25	<2.5
	1265-6850	15	06:30	<2.5
	1240-6400	15	18:00	<2.5
	1215-6850	15	18:05	<2.5
	1430-7480	15	18:10	<2.5
	1415-SUB	15	18:15	<2.5
	1415-CFTE	15	18:20	<2.5
	1290-BYPASS	16	06:00	<2.5
	1330-RAMPA	16	06:05	<2.5
	1455-7420	16	06:10	<2.5
	1290-6750	16	06:15	<2.5
	1190-6410	16	06:20	<2.5
	1190-6530	16	06:25	<2.5
	1240-6400	16	18:00	<2.5
	1215-6850	16	18:05	<2.5
	1430-7480	16	18:10	<2.5
	1415-SUB	16	18:15	<2.5
	1415-CFTE	16	18:20	<2.5
	1430-7460	17	06:00	<2.5
	1215-6580	17	06:05	<2.5
	1240-6900	17	06:10	<2.5
	1240-6740	17	06:15	<2.5
	1215-6850	17	18:00	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1340-6930	17	18:05	<2.5
	1390-CFTO	17	18:10	<2.5
	1290-6790	17	18:15	<2.5
	1330-RAMPA	18	06:00	<2.5
	1430-7480	18	06:05	<2.5
	1365-6960	18	06:10	<2.5
	1340-6630	18	06:15	<2.5
	1505-RAMPA	18	06:20	<2.5
	1190-6410	18	18:00	<2.5
	1340-6400	18	18:05	<2.5
	1305-CFTE	18	18:10	<2.5
	1305-7200	18	18:15	<2.5
	1340-6590	19	06:00	<2.5
	1240-6760	19	06:05	<2.5
	1415-CFTE	19	06:10	<2.5
	1415-SUB	19	06:15	<2.5
	1365-6960	19	06:20	<2.5
	1315-6970	19	06:25	<2.5
	1480-7460	19	18:00	<2.5
	1240-6400	19	18:05	<2.5
	1190-6530	19	18:10	<2.5
	1215-6850	19	18:15	<2.5
	1430-7480	19	18:20	<2.5
	1240-6740	19	18:25	<2.5
	1290-6790	20	06:00	<2.5
	1330-REMUK	20	06:05	<2.5
	1505-RAMPA	20	06:10	<2.5
	1340-6400	20	18:00	<2.5
	1305-CFTE	20	18:05	<2.5
	1305-7200	20	18:10	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1365-6960	20	18:15	<2.5
	1340-6540	21	06:00	<2.5
	1430-7460	21	06:05	<2.5
	1240-6740	21	06:10	<2.5
	1240-6900	21	06:15	<2.5
	1215-6580	21	06:20	<2.5
	1365-6540	21	06:25	<2.5
	1315-6970	21	18:00	<2.5
	1390-CFTO	21	18:05	<2.5
	1240-6760	21	18:10	<2.5
	1430-7500	21	18:15	<2.5
	1240-6740	22	06:00	<2.5
	1415-C/F.E.	22	06:05	<2.5
	1415-BUS	22	06:10	<2.5
	1365-6960	22	06:15	<2.5
	1455-7500	22	18:00	<2.5
	1455-7460	22	18:05	<2.5
	1215-6850	22	18:10	<2.5
	1190-6530	22	18:15	<2.5
	1215-LONG.	22	18:20	<2.5
	1305-CFTE	22	18:25	<2.5
	1505-RAMPA	22	18:30	<2.5
	1480-7420	22	18:35	<2.5
	1190-6410	23	06:00	<2.5
	1290-6750	23	06:05	<2.5
	1330-RAMPA	23	06:10	<2.5
	1330-RMUK	23	06:15	<2.5
	1390-6700	23	06:20	<2.5
	1340-6590	23	18:00	<2.5
	1505-RAMPA	23	18:05	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1240-6720	23	18:10	<2.5
	1240-6900	23	18:15	<2.5
	1305 C/F.E.	24	06:00	<2.5
	1240-6760	24	06:05	<2.5
	1480-7460	24	06:10	<2.5
	1315-6970	25	06:00	<2.5
	1430-7500	25	06:05	<2.5
	1415-C/F.E	25	06:10	<2.5
	1455-7500	25	06:15	<2.5
	1505-RAMPA	25	18:00	<2.5
	1330-RAMPA	25	18:05	<2.5
	1330-REMUK	25	18:10	<2.5
	1190-6530	25	18:15	<2.5
	1190-6410	26	06:00	<2.5
	1240-6740	26	06:05	<2.5
	1455-7460	26	06:10	<2.5
	1340-6730	26	06:15	<2.5
	1340-6590	26	18:00	<2.5
	1240-6720	26	18:05	<2.5
	1290-6750	26	18:10	<2.5
	1305-CFTE	26	18:15	<2.5
	1480-7420	26	18:20	<2.5
	1215-LONG.	27	06:00	<2.5
	1190-6530	27	06:05	<2.5
	1390-C/F.O.	27	06:10	<2.5
	1455-7500	27	18:00	<2.5
	1390-6700	27	18:05	<2.5
	1505-CFTE	27	18:10	<2.5
	1290-6900	27	18:15	<2.5
	1240-6760	27	18:20	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Diciembre	1430-7500	28	06:00	<2.5
	1315-6970	28	06:05	<2.5
	1305-C/F.E.	28	06:10	<2.5
	1530-RAMPA	28	18:00	<2.5
	1330-RAMPA	28	18:05	<2.5
	1330-REMUK	28	18:10	<2.5
	1290-6750	28	18:15	<2.5
	1240-6740	28	18:20	<2.5
	1415-CFTE	29	06:00	<2.5
	1455-7500	29	06:05	<2.5
	1240-CFTO	29	06:10	<2.5
	1365-6820	29	06:15	<2.5
	1315-6970	29	06:20	<2.5
	1340-6590	29	18:00	<2.5
	1430-7500	29	18:05	<2.5
	1240-6900	29	18:10	<2.5
	1240-6720	29	18:15	<2.5
	1240-6760	29	18:20	<2.5
	1340-6730	29	18:25	<2.5
	1455-7460	30	06:00	<2.5
	1330-RAMPA	30	06:05	<2.5
	1390-6700	30	06:10	<2.5
	1315-6970	30	06:15	<2.5
	1215-6500	30	06:20	<2.5
	1390-CFTO	30	18:00	<2.5
	1455-7500	30	18:05	<2.5
	1415-6860 DES	30	18:10	<2.5
	1290-6750	31	06:00	<2.5
	1430-7500	31	06:05	<2.5
	1240-CFTO	31	06:10	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1240-6720	1	06:00	<2.5
	1340-6590	1	06:05	<2.5
	1505-AC. CFTE	1	06:10	<2.5
	1530-RAMPA	1	06:15	<2.5
	1340-6730	1	06:20	<2.5
	1330-REMUK	1	18:00	<2.5
	1330-RAMPA	1	18:05	<2.5
	1455-7460	1	18:10	<2.5
	1455-7500	2	06:00	<2.5
	1190-6530	2	06:05	<2.5
	1190-6410	2	06:10	<2.5
	1240-6760	2	06:15	<2.5
	1305-RAMPA	2	06:20	<2.5
	1365-6540	2	06:25	<2.5
	1240-6900	2	18:00	<2.5
	1430-7500	2	18:05	<2.5
	1215-6500	2	18:10	<2.5
	1415-6860	3	06:00	<2.5
	1240-6720	3	06:05	<2.5
	1315-6970	3	06:10	<2.5
	1340-6590	3	18:00	<2.5
	1530-RAMPA	3	18:05	<2.5
	1505-C./F.E.	3	18:10	<2.5
	1330-REMUK	3	18:15	<2.5
	1365-6540	3	18:20	<2.5
	1305-CFTE	4	06:00	<2.5
	1455-7460	4	06:05	<2.5
	1290-6750	4	06:10	<2.5
	1290-6790	4	06:15	<2.5
	1215-6580	4	18:00	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1190-6410	4	18:05	<2.5
	1390-C/F.O.	4	18:10	<2.5
	1430-7500	4	18:15	<2.5
	1240-6900	4	18:20	<2.5
	1390-6700	4	18:25	<2.5
	1240-6760	5	06:00	<2.5
	1305-CFTE	5	06:05	<2.5
	1455-7480	5	06:10	<2.5
	1430-7500	5	06:15	<2.5
	1505-CFTE	5	06:20	<2.5
	1330-RAMPA	5	18:00	<2.5
	1315-6970	5	18:05	<2.5
	1340-6590	5	18:10	<2.5
	1240-6720	5	18:15	<2.5
	1455-7460	5	18:20	<2.5
	1240-6760	6	06:00	<2.5
	1305-CFTE	6	06:05	<2.5
	1455-7480	6	06:10	<2.5
	1430-7500	6	06:15	<2.5
	1505-CFTE	6	06:20	<2.5
	1190-6410	6	18:00	<2.5
	1190-6530	6	18:05	<2.5
	1530-RAMP	6	18:10	<2.5
	1290-6750	6	18:15	<2.5
	1455-7460	7	06:00	<2.5
	1290-6790	7	06:05	<2.5
	1330-RAMP	7	06:10	<2.5
	1315-6770	7	06:15	<2.5
	1430-7500	7	06:20	<2.5
	1305-(REQUEMA)	7	06:25	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1455-7500	7	18:00	<2.5
	1415-CFTE	7	18:05	<2.5
	1415-6860	7	18:10	<2.5
	1240-6720	7	18:15	<2.5
	1305-CFTE	7	18:20	<2.5
	1315-6970	7	18:25	<2.5
	1390-CFTO	8	06:00	<2.5
	1505-CFTE	8	06:05	<2.5
	1390-6700	8	06:10	<2.5
	1455-7480	8	06:15	<2.5
	1290-6750	8	06:20	<2.5
	1340-6590	8	06:25	<2.5
	1315-6970	8	18:00	<2.5
	1365-6540	8	18:05	<2.5
	1530-RAMPA	8	18:10	<2.5
	1330-RAMPA	8	18:15	<2.5
	1190-6410	8	18:20	<2.5
	1305-CFTE	8	18:25	<2.5
	1190-6530	9	06:00	<2.5
	1315-6970	9	06:05	<2.5
	1505-CFTE	9	06:10	<2.5
	1415-6860	9	06:15	<2.5
	1290-6790	9	06:20	<2.5
	1365-6540	9	06:25	<2.5
	1340-6490	9	06:30	<2.5
	1455-7500	9	18:00	<2.5
	1455-7480	9	18:05	<2.5
	1530-RAMPA	9	18:10	<2.5
	1340-6590	9	18:15	<2.5
	1240-6720	9	18:20	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1365-6540	9	18:25	<2.5
	1330-RAMPA	10	06:00	<2.5
	1290-6790	10	06:05	<2.5
	1240-CFTO	10	06:10	<2.5
	1530-RAMPA	10	06:15	<2.5
	1480-7440	10	06:20	<2.5
	1340-6480	10	18:00	<2.5
	1190-6410	10	18:05	<2.5
	1190-6530	10	18:10	<2.5
	1415-6560	10	18:15	<2.5
	1340-6930	10	18:20	<2.5
	1455-7460	11	06:00	<2.5
	1305-CFTE	11	06:05	<2.5
	1330-RAMPA	11	06:10	<2.5
	1290-6750	11	06:15	<2.5
	1530-RAMPA	11	06:20	<2.5
	1265-6850	11	18:00	<2.5
	1390-6780	11	18:05	<2.5
	1390-CFTO	11	18:10	<2.5
	1340-6590	11	18:15	<2.5
	1455-7480	11	18:20	<2.5
	1315-6970	11	18:25	<2.5
	1365-6900	11	18:30	<2.5
	1455-7500	11	18:35	<2.5
	1505-C/F.E.	12	06:00	<2.5
	1415-6820	12	06:05	<2.5
	1415-C/F.O.	12	06:10	<2.5
	1305-C/F.E.	12	06:15	<2.5
	1330-RAMPA	12	06:20	<2.5
	1340-6490	12	06:25	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1340-6400	12	06:30	<2.5
	1390-6800	12	18:00	<2.5
	1390-6780	12	18:05	<2.5
	1240-6380	12	18:10	<2.5
	1240-6720	12	18:15	<2.5
	1190-6530	12	18:20	<2.5
	1305-CFTE	12	18:25	<2.5
	1340-6490	12	18:30	<2.5
	1480-7440	12	18:35	<2.5
	1455-7480	13	06:00	<2.5
	1340-6590	13	06:05	<2.5
	1330 RAMPA	13	06:10	<2.5
	1305-CFTE	13	06:15	<2.5
	1290-6750	13	06:20	<2.5
	1215 C/F.O.	13	06:25	<2.5
	1455-7460	13	18:00	<2.5
	1415-C/F.O.	14	06:00	<2.5
	1455-7500	14	06:05	<2.5
	1505 RAMPA	14	06:10	<2.5
	1240-6380	14	06:15	<2.5
	1455-7480	14	06:20	<2.5
	1240-6720	14	18:00	<2.5
	1190-6530	14	18:05	<2.5
	1455-7480	14	18:10	<2.5
	1290-6780	14	18:15	<2.5
	1330 RAMPA	14	18:20	<2.5
	1505-RAMPA	15	06:00	<2.5
	1505-C/F.E.	15	06:05	<2.5
	1390-6800	15	06:10	<2.5
	1340-6590	15	06:15	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1305-C/F.E	15	06:20	<2.5
	1240-6380	15	18:00	<2.5
	1415-6820	15	18:05	<2.5
	1505-7440	15	18:10	<2.5
	1330-RAMPA	15	18:15	<2.5
	1390-6900	15	18:20	<2.5
	1190-6530	16	06:00	<2.5
	1305-C/F.E	16	06:05	<2.5
	1415-C/F.O.	16	06:10	<2.5
	1455-7480	16	06:15	<2.5
	1455-7460	16	06:20	<2.5
	1290-6750	16	06:25	<2.5
	1390-6900	16	06:30	<2.5
	1480-7440	16	06:35	<2.5
	1390-6780	16	18:00	<2.5
	1240-6720	16	18:05	<2.5
	1505-7440	16	18:10	<2.5
	1365-6900	17	06:00	<2.5
	1190-6530	17	06:05	<2.5
	1305-C/F.E.	17	06:10	<2.5
	1340-6890	17	06:15	<2.5
	1415-6820	17	18:00	<2.5
	1505-CFTE	17	18:05	<2.5
	1505-CFTO	17	18:10	<2.5
	1330-RAMPA	18	06:00	<2.5
	1340-6590	18	06:05	<2.5
	1390-6800	18	06:10	<2.5
	1240-6680	18	06:15	<2.5
	1240-6380	18	06:20	<2.5
	1305-C/F.E.	18	06:25	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1505-RAMPA	18	18:00	<2.5
	1415-CFTO	18	18:05	<2.5
	1305-RAMPA	18	18:10	<2.5
	1390-6780	18	18:15	<2.5
	1240-6720	18	18:20	<2.5
	1190-6530	19	06:00	<2.5
	1455-7460	19	06:05	<2.5
	1505-RAMPA	19	06:10	<2.5
	1505-DDST	19	06:15	<2.5
	1330-RAMPA	19	06:20	<2.5
	1265-6900	19	18:00	<2.5
	1455-7480	19	18:05	<2.5
	1340-6890	19	18:10	<2.5
	1215-6380	19	18:15	<2.5
	1305-RAMPA	20	06:00	<2.5
	1265-6900	20	06:05	<2.5
	1330-RAMPA	20	06:10	<2.5
	1240-6380	20	06:15	<2.5
	1390-CFTE	20	06:20	<2.5
	1390-6780	20	06:25	<2.5
	1390-6680	20	06:30	<2.5
	1390-6800	20	18:00	<2.5
	1240-6720	20	18:05	<2.5
	1190-6530	20	18:10	<2.5
	1340-6890	20	18:15	<2.5
	1305-cfte	21	06:00	<2.5
	1505-DDST	21	06:05	<2.5
	1505-7440	21	06:10	<2.5
	1505-CFTO	21	06:15	<2.5
	1505-CFTE	21	06:20	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1505-RAMPA	21	06:25	<2.5
	1215-6720	21	06:30	<2.5
	1265-6900	21	18:00	<2.5
	1330-RAMPA	21	18:05	<2.5
	1455-7480	21	18:10	<2.5
	1240-6380	21	18:15	<2.5
	1190-6530	21	18:20	<2.5
	1415-CFT	22	06:00	<2.5
	1390-6800	22	06:05	<2.5
	1340-6890	22	06:10	<2.5
	1415-6820	23	18:00	<2.5
	1330-RAMPA	23	18:05	<2.5
	1390-6780	23	18:10	<2.5
	1390-C/F.O.	23	18:15	<2.5
	1265-6900	23	18:20	<2.5
	1305-CFTE	23	18:25	<2.5
	1505-RAMPA	23	18:30	<2.5
	1480-7420	23	18:35	<2.5
	1305-CFTE	24	06:00	<2.5
	1455-7480	24	06:05	<2.5
	1315-6930	23	18:00	<2.5
	1215-6380	23	18:05	<2.5
	1240-6940	23	18:10	<2.5
	1523-DDST	23	18:15	<2.5
	1530-RAMPA	23	18:20	<2.5
	1240-6380	23	18:25	<2.5
	1505-CFTE	24	06:00	<2.5
	1505-CFTO	24	06:05	<2.5
	1330-RAMPA	24	06:10	<2.5
	1390-6680	24	06:15	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1340-6920	24	06:20	<2.5
	1265-6900	24	18:00	<2.5
	1415-6820	24	18:05	<2.5
	1530-DDST	24	18:10	<2.5
	1390-6800	25	06:00	<2.5
	1390-6780	25	06:05	<2.5
	1340-6890	25	06:10	<2.5
	1240-6680	25	06:15	<2.5
	1455-7480	25	06:20	<2.5
	1240-CFTO	25	06:25	<2.5
	1415-C/F.E.	25	18:00	<2.5
	1415-C/F.O.	25	18:05	<2.5
	1530-RAMPA	25	18:10	<2.5
	1530-DDST	25	18:15	<2.5
	1330-RAMPA	25	18:20	<2.5
	1505-6440	25	18:25	<2.5
	1240-6940	25	18:30	<2.5
	1215-6790	26	06:00	<2.5
	1215-6680	26	06:05	<2.5
	1305-CFTE	26	06:10	<2.5
	1240-6380	26	06:15	<2.5
	1390-CFTO	26	06:20	<2.5
	1240-6940	26	06:25	<2.5
	1330-RAMPA	26	18:00	<2.5
	1340-6890	26	18:05	<2.5
	1390-6800	26	18:10	<2.5
	1390-6780	26	18:15	<2.5
	1265-6900	26	18:20	<2.5
	1340-6930	26	18:25	<2.5
	1240-CFTO	27	06:00	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1505-CFTO	27	06:05	<2.5
	1505-CFTE	27	06:10	<2.5
	1505-7440	27	06:15	<2.5
	1305-CFTE	27	18:00	<2.5
	1240-6680	27	18:05	<2.5
	1215-6780	27	18:10	<2.5
	1455-7480	27	18:15	<2.5
	1530-RAMP	27	18:20	<2.5
	1523-DDST	27	18:25	<2.5
	1390-CFTO	28	06:00	<2.5
	1390-6780	28	06:05	<2.5
	1390-6800	28	06:10	<2.5
	1330-RAMP	28	06:15	<2.5
	1305-SUMI	28	06:20	<2.5
	1200-ACCS-OC	28	06:25	<2.5
	1415-CFTE	28	18:00	<2.5
	1415-CFTO	28	18:05	<2.5
	1340-6560	28	18:10	<2.5
	1215-6650	28	18:15	<2.5
	1340-6890	28	18:20	<2.5
	1265-6900	28	18:25	<2.5
	1240-6380	29	06:00	<2.5
	1240-CFTO	29	06:05	<2.5
	1215-6790	29	06:10	<2.5
	1330-RAMPA	29	06:15	<2.5
	1530-RAMPA	29	06:20	<2.5
	1365-6560	29	06:25	<2.5
	1505-CFTE	29	18:00	<2.5
	1505-CFTO	29	18:05	<2.5
	1200-OESTE	29	18:10	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1240-6680	29	18:15	<2.5
	1305-SUMI	29	18:20	<2.5
	1265-6900	29	18:25	<2.5
	1505-RAMPA	30	06:00	<2.5
	1330-RAMPA	30	06:05	<2.5
	1390-CFTO	30	06:10	<2.5
	1215-6680	30	18:00	<2.5
	1215-6790	30	18:05	<2.5
	1340-6590	30	18:10	<2.5
	1240-CFTO	31	06:00	<2.5

Mes	Sitio	Día	HORA	Velocidad de Partícula (mm/s)
Enero	1415-CFTE	31	06:05	<2.5
	1505-7440	31	06:10	<2.5
	1505-CFTO	31	06:15	<2.5
	1505-CFTE	31	06:20	<2.5
	1415-CFTO	31	06:25	<2.5
	1305-SUMI	31	18:00	<2.5
	1265-6900	31	18:05	<2.5
	1390-CFTO	31	18:10	<2.5

Donde mm/s: milímetros por segundo; Fuente: MSR, 2017.

8 Geoquímica de Roca Estéril

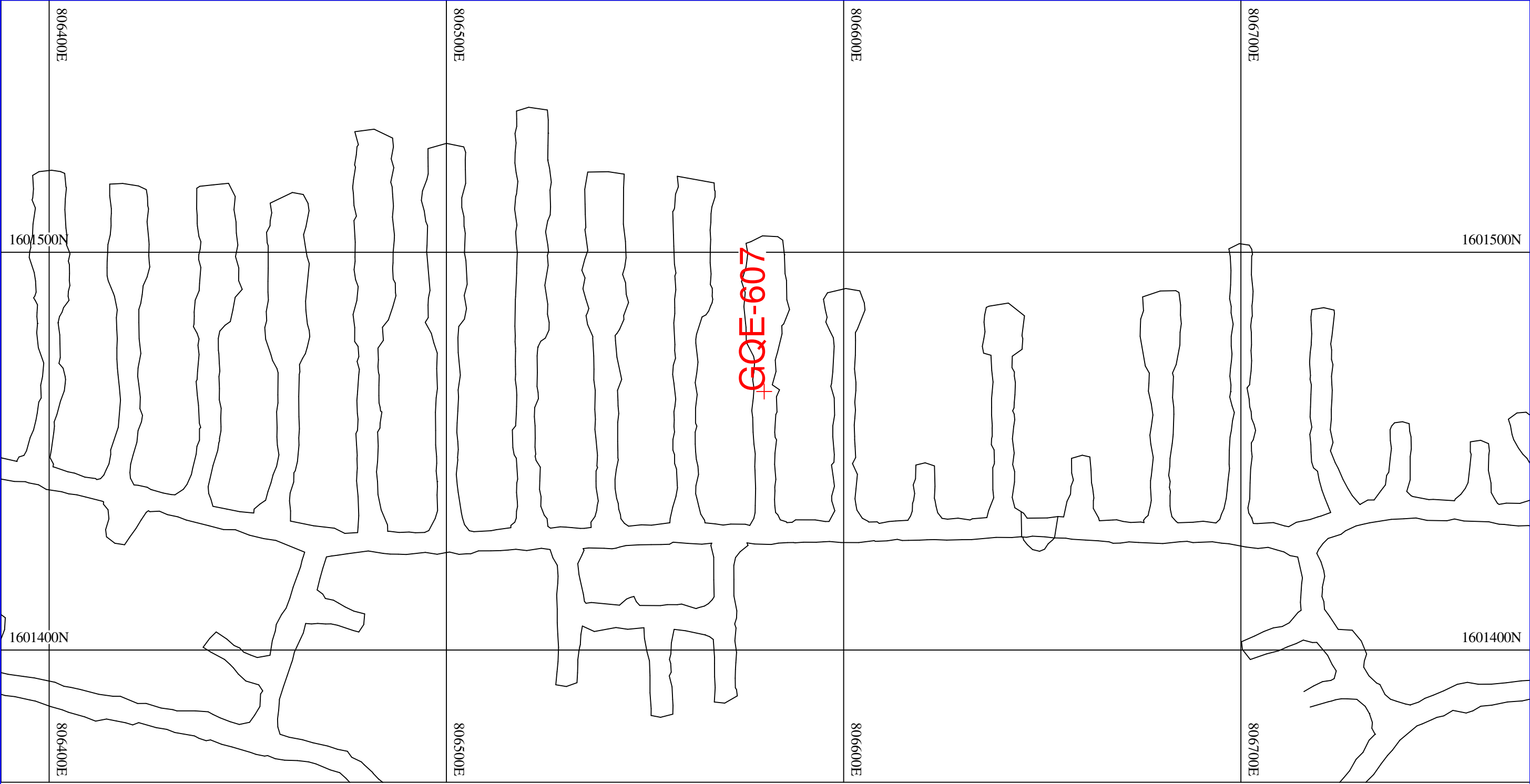
8.1 Sitios de Monitoreo

En el Cuadro 8-1 se enlistan las muestras analizadas de material extraído de los túneles del proyecto, rampa oeste y rampa este, durante los meses de Noviembre de 2016 a Enero de 2017. La ubicación de la extracción de las muestras se presenta en la Figura 8-1, Figura 8-2, Figura 8-3, Figura 8-4, Figura 8-5, Figura 8-6 y Figura 8-7.

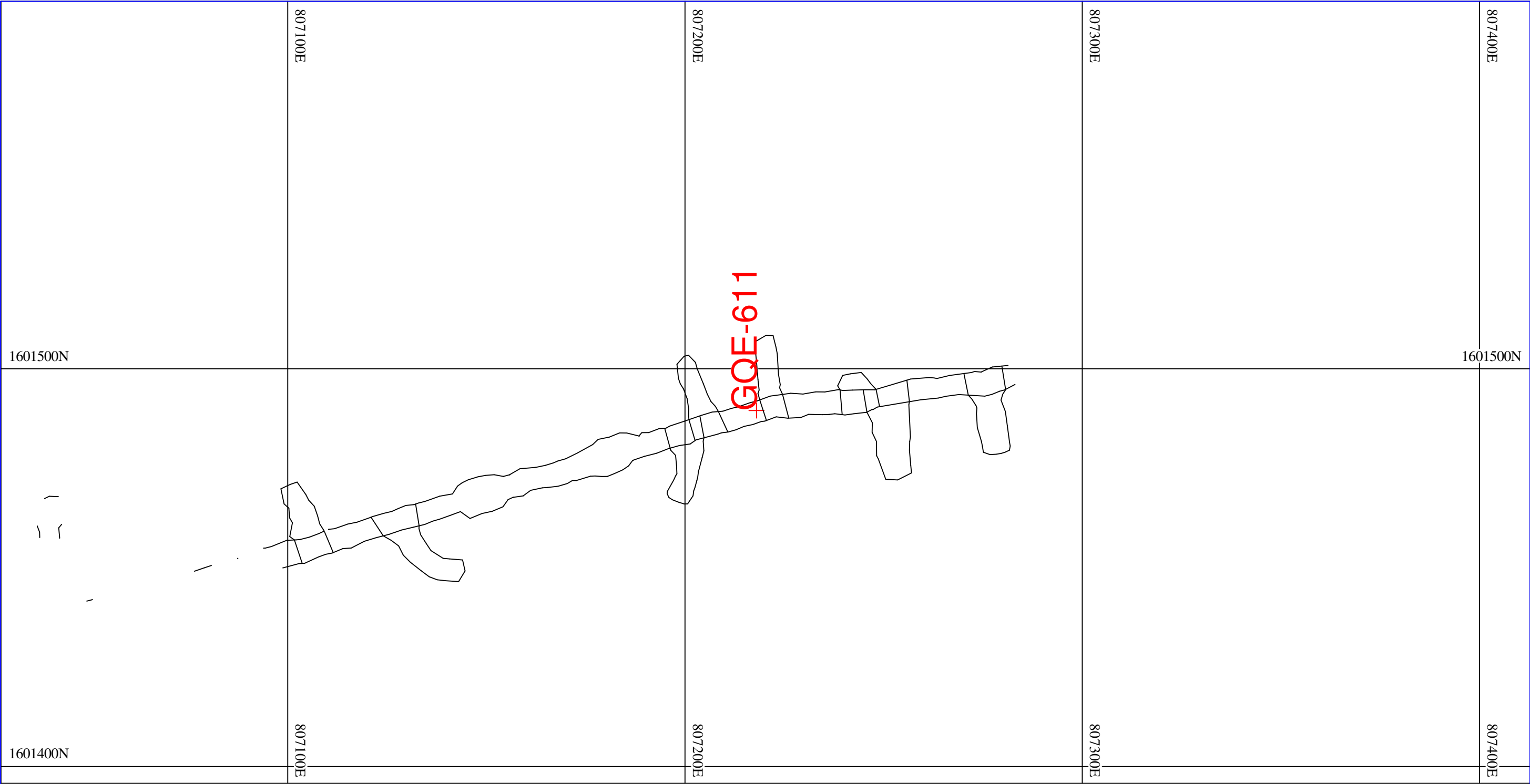
Cuadro 8-1: Sitios de Material Extraído de los Túneles, Proyecto Minero Escobal


Código de Muestra	Área	Coordenadas		
		X	Y	Z
GQE-607	1215-6580-OC	806580	1601465	1219
GQE-608	1390-6780-EC	806780	1601350	ND
GQE-609	1240-6900-OC	806895	1601437.5	1244
GQE-610	1390-6740-EC	806740	1601362	1394
GQE-611	1305-CFTE	807218	1601489.5	1305
GQE-612	1390-CFTO-EC	806682	1601346	1394
GQE-613	1330-RAMP-ZE	807281	1601408	1343
GQE-614	1505-RAMP-ZE	807487.5	1601534.2	1517
GQE-615	1415-CFTE-EC	806862.7	1601557	1415
GQE-616	1415-6860-EC	806860	1601375	1415
GQE-617	1390-6700-EC	806700	1601361	1394
GQE-618	1390-6700-EC	806700	1601362	1394
GQE-619	1415-6820-EC	806820	1601373	1414
GQE-620	1390-6680-Desq	806800	1601348	1395
GQE-621	1240-6380	806377.89	1601470	1244
GQE-622	1505-7440	807441	1601634.5	1507
GQE-623	1530-Ramp	807495	1601588	ND
GQE-624	1330-RAMP-ZE	807285	1601462.5	ND

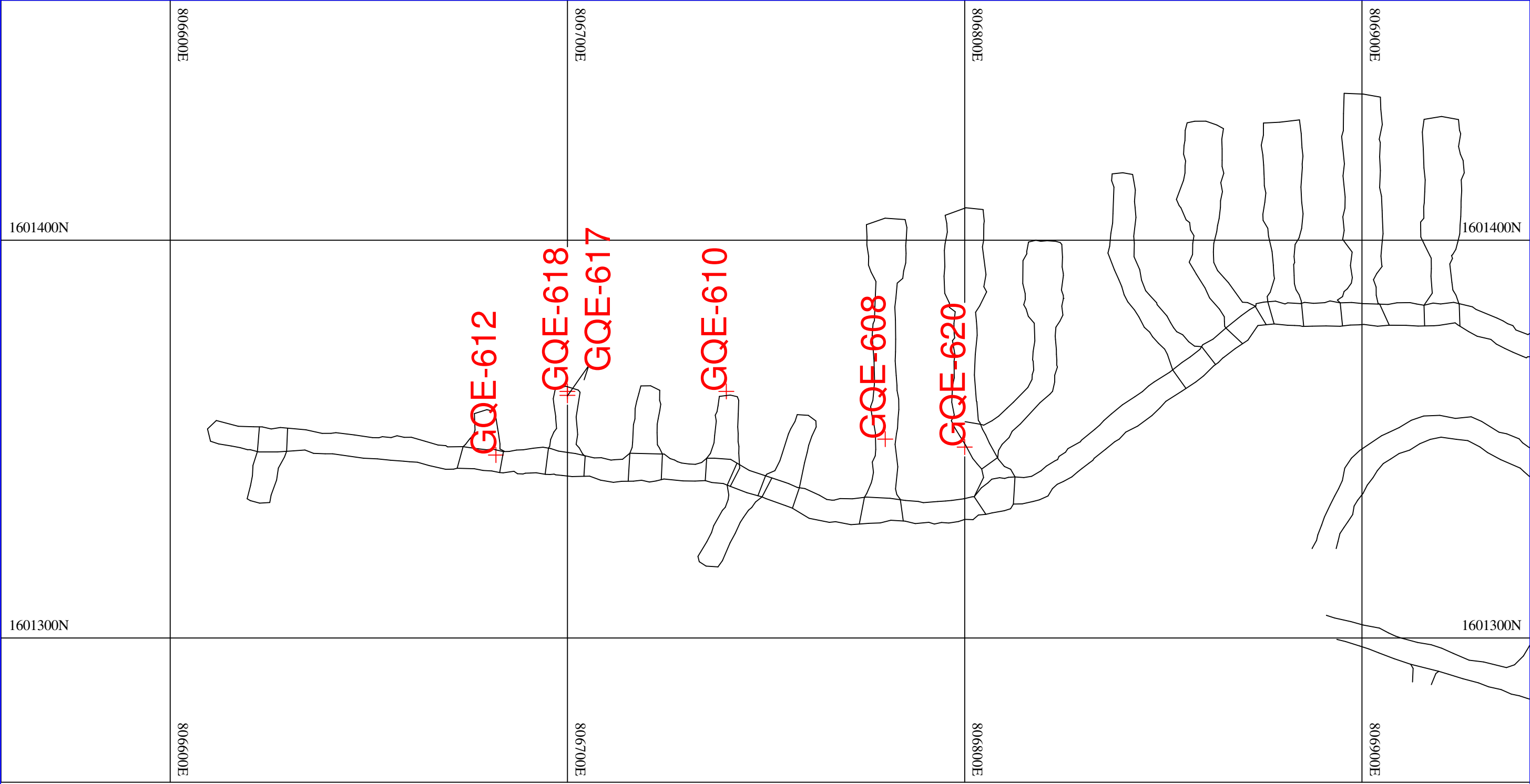
Sistema de coordenadas proyectadas UTM, DATUM WGS84. Fuente: MSR, 2017.




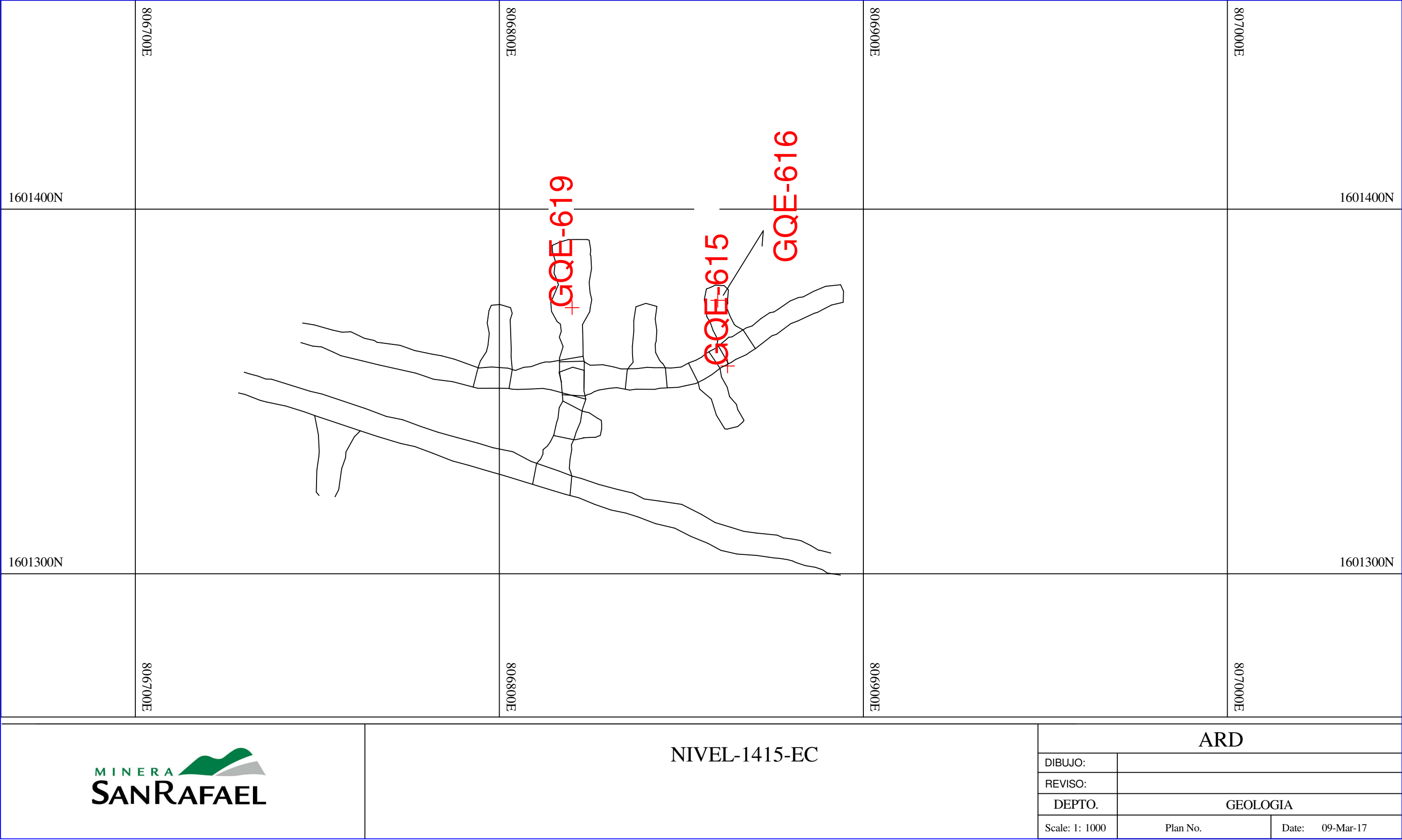
	NIVEL-1215-EC		ARD		
			DIBUJO:		
			REVISO:		
			DEPTO.	GEOLOGIA	
			Scale: 1: 1000	Plan No.	Date: 09-Mar-17

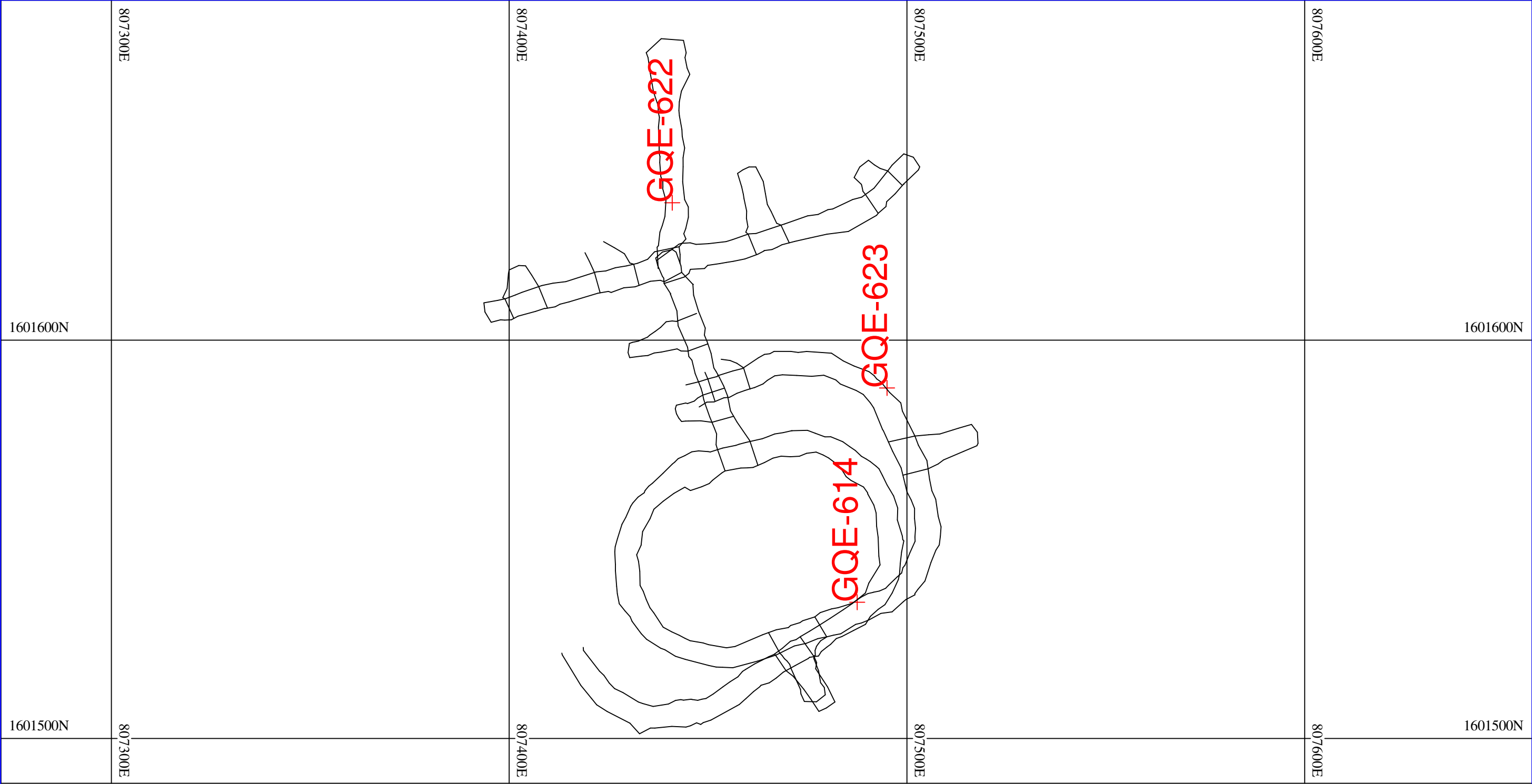


	NIVEL_1305-ZE		ARD		
			DIBUJO:		
			REVISO:		
			DEPTO.	GEOLOGIA	
		Scale: 1: 1000	Plan No.	Date: 09-Mar-17	



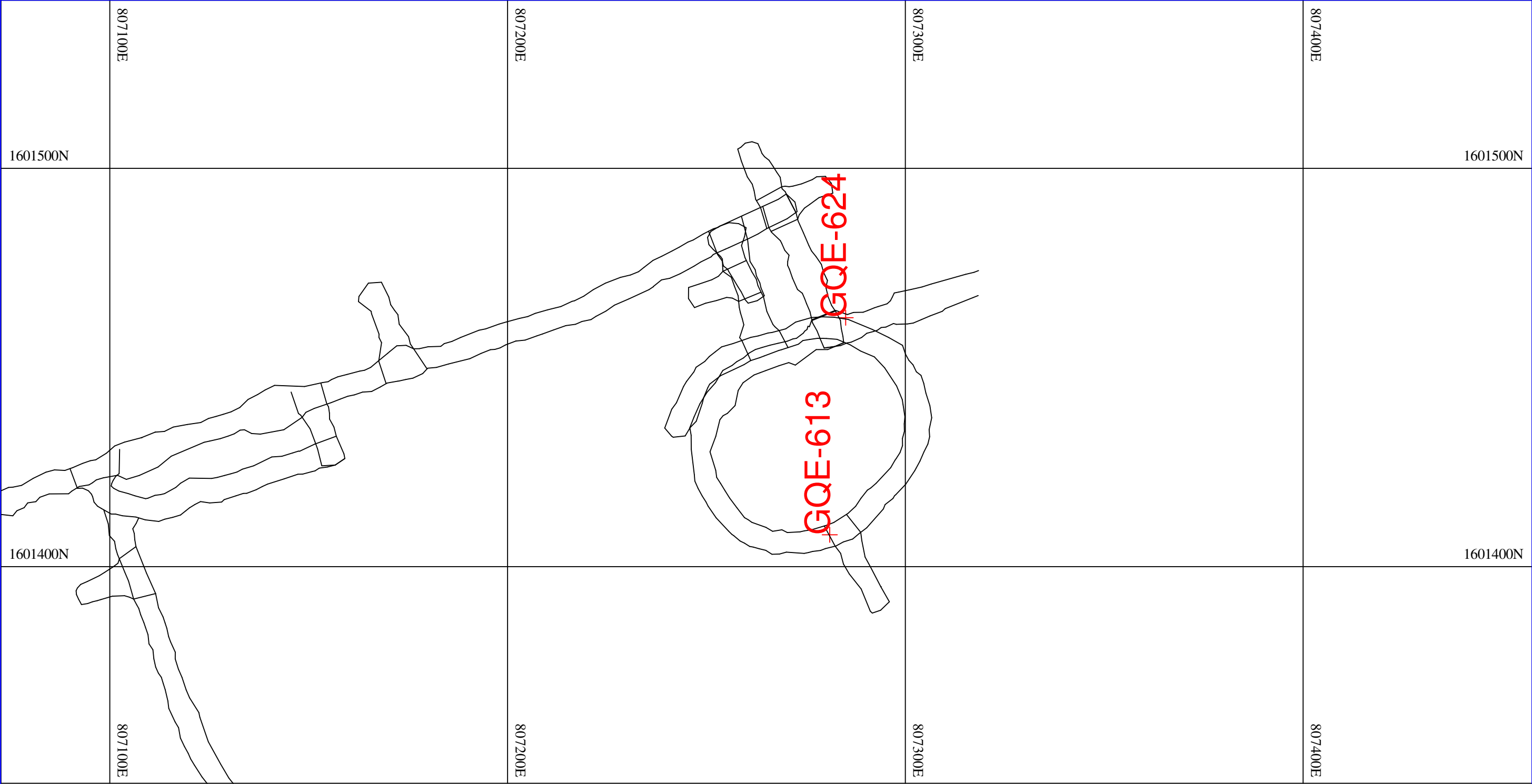
	NIVEL-1390-EC		ARD		
			DIBUJO:		
			REVISO:		
			DEPTO.	GEOLOGIA	
			Scale: 1: 1000	Plan No.	Date: 09-Mar-17





NIVEL 1505 Y RAMPA 1530

ARD		
DIBUJO:		
REVISO:		
DEPTO.	GEOLOGIA	
Scale: 1: 1000	Plan No.	Date: 09-Mar-17



RAMPA-1330-ZE

ARD		
DIBUJO:		
REVISO:		
DEPTO.	GEOLOGIA	
Scale: 1: 1000	Plan No.	Date: 09-Mar-17

8.2 Metodología

En el Cuadro 8-2 se describe el procedimiento y equipo utilizado para la toma de muestras en pasta de material extraído en túneles.

Cuadro 8-2: Procedimiento y equipo utilizado para monitorear pH en pasta de material extraído de los túneles, Proyecto Minero Escobal

Parámetros analizados	
pH	pH en pasta.
Procedimiento	
Basados en el método ASTM D4972-01(2007) Standard Test Method for pH of Soils. Se determinó el pH en suspensión de Roca-Agua 1:1 p/v: esto se logró tomando 50 gramos de roca pulverizada y agregándole 50 ml de agua desmineralizada, se agita por 10 minutos y se deja reposar por 10 minutos más, luego se hace lectura directa de pH sobre la suspensión con la ayuda de un potenciómetro previamente calibrado.	
Equipo utilizado	
Nombre	Potenciómetro pH & EC
Modelo	H-series H170G
Fabricante	HACH

Fuente: MSR, 2017.

8.3 Resultados

Los resultados de pH en pasta se presentan en el Cuadro 8-3. Los valores de pH se encontraron en el rango de 7.71 a 10.06 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 8-3: 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-607	11/11/2016	14/11/2016	8.67	19.5
GQE-608	19/11/2016	21/11/2016	8.44	19.9
GQE-609	27/11/2016	01/12/2016	8.85	24.0
GQE-610	28/11/2016	01/12/2016	10.06	24.0
GQE-611	15/12/2016	20/12/2016	9.71	19.7
GQE-612	16/12/2016	20/12/2016	9.14	19.7
GQE-613	17/12/2016	20/12/2016	9.18	19.9
GQE-614	18/12/2016	21/12/2016	9.09	21.2
GQE-615	18/12/2016	21/12/2016	9.19	22.3
GQE-616	10/01/2017	11/01/2017	8.76	21.0

Código de Muestra	Fecha Toma de Muestra	Fecha Lectura pH	pH pasta	Temperatura (°C)
GQE-617	10/01/2017	11/01/2017	7.71	21.0
GQE-618	13/01/2017	13/01/2017	9.96	17.7
GQE-619	13/01/2017	13/01/2017	8.96	20.0
GQE-620	13/01/2017	13/01/2017	9.07	20.0
GQE-621	14/01/2017	13/01/2017	8.82	21.3
GQE-622	22/01/2017	23/01/2017	9.07	19.3
GQE-623	27/01/2017	28/01/2017	8.89	22.2
GQE-624	27/01/2017	28/01/2017	8.91	22.1

Fuente: MSR, 2017.

9 Mediciones de Seguridad Industrial y Salud Ocupacional

9.1 Presión Sonora

La medición de Presión Sonora en el trimestre de Noviembre de 2016 a Enero de 2017 se muestra en el Cuadro 9-1. Se hicieron monitoreos mediante el uso de dosímetros portables y posteriormente se realizan comparaciones con base al Acuerdo Gubernativo 229. Los resultados muestran que se está dentro de parámetros aceptables 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 9-1: Resultados de Presión Sonora de Salud Ocupacional, Proyecto Minero Escobal

Superficie Planta de Proceso - TRITURADORA		2016		2017
Mes		Noviembre	Diciembre	Enero
Fecha		24/11/16	15/12/16	23/01/17
Hora Inicio		7:36	7:42	6:18
Duración		10:10 h	10:17 h	12:00 h
Lmax dBA		142.2	123.7	136
Lmin dBA		60.1	60.1	60.4
Prom. Diurno dBA		103.5	94.4	97.7
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*		83	83	83
Leq (Normal sin uso de EPP)		103.5	94.4	97.7
Leq ajustado (Con EPP, homologación 33gff dBA a 50% = NRR 16.5 dBA)		83	73.9	77.2
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		Aceptable	Aceptable	Aceptable

Superficie Planta de Proceso - MOLINO		2016		2017
Mes		Noviembre	Diciembre	Enero
Fecha		24/11/16	20/12/16 21/12/16	23/01/17
Hora Inicio		7:33	7:00	6:01
Duración		10:10 h	11:12 h	12:00 h
Lmax dBA		119.7	123.8	126.6
Lmin dBA		60.5	60.2	60.1
Prom. Diurno dBA		94	94.5	88.9
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*		83	83	83
Leq (Normal sin uso de EPP)		94	94.5	88.9
Leq ajustado (Con EPP, homologación 33 dBA a 50% = NRR 16.5 dBA)		77.5	78	72.4
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		Aceptable	Aceptable	Aceptable

Puesto de Operador de Scoop		2016		2017
Mes		Noviembre	Diciembre	Enero
Fecha		23/11/16	15/12/16	24/01/2017 25/01/2017
Hora Inicio		6:54	7:06	10:06
Duración		10:47 h	10:43 h	10:06 h
Lmax dBA		124.9	114.3	112.7
Lmin dBA		60.2	60.5	60.1
Prom. Diurno dBA		97.8	96.5	98.7
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*		83	83	83
Leq (Normal sin uso de EPP)		97.8	96.5	98.7
Leq ajustado (Con EPP, Tapón Auditivo=homologación 33 dBA a 50% = NRR 16.5 dBA)				
(Orejera= Homologación 27 dB a 50%= NRR 13.5dB)		77.3	76	78.2
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		Aceptable	Aceptable	Aceptable

Puesto de Operador de Jumbo		2016		2017
Mes		Noviembre	Diciembre	Enero
Fecha		23/11/16	19/12/16	24/01/2017 25/01/2017
Hora Inicio		7:40	7:04	7:40
Duración		10:29 h	10:36 h	10:08 h
Lmax dBA		119.2	117.5	127.6
Lmin dBA		60.4	60.5	60.1
Prom. Diurno dBA		99.8	102.3	110.2
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-2014, para 12 horas (12.1 horas y 10.6 horas)*		83	83	83
Leq (Normal sin uso de EPP)		99.8	102.3	110.2
Leq ajustado (Con EPP, Tapón Auditivo=homologación 33 dBA a 50% = NRR 16.5 dBA)				
(Orejera= Homologación 27 dB a 50%= NRR 13.5dB)		79.3	81.8	89.7
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		Aceptable	Aceptable	No Aceptable

Puesto de Operador de Boltec		2016		2017
Mes		Noviembre	Diciembre	Enero
Fecha		23/11/16	15/12/16	24/01/2017 25/01/2017
Hora Inicio		6:59	7:09	7:40
Duración		10:40 h	10:17 h	10:08 h
Lmax dBA		125.2	119.7	115
Lmin dBA		60.1	60.5	60.5
Prom. Diurno dBA		101.9	97.8	96.8
Límite Nivel de Sonido Ponderado-A dBA acorde a Acuerdo Gubernativo 229-		83	83	83
Leq (Normal sin uso de EPP)		101.9	97.8	96.8
Leq ajustado (Con EPP, Tapón Auditivo=homologación 33 dBA a 50% = NRR 16.5 dBA)				
(Orejera= Homologación 27 dB a 50%= NRR 13.5dB)		81.4	77.3	76.3
Resultado (Leq ajustado ≤ Límite, entonces es Aceptable)		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.

9.2 Mediciones de Partículas Respirables

Los resultados se muestran en el Cuadro 9-2 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 9-2: Resultados de Material Particulado de Salud Ocupacional, Proyecto Minero Escobal

Superficie Planta de Proceso - TRITURACION							2016	2017	
Trimestre							XX		
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		Noviembre	Diciembre	Enero
Fecha							25/11/2016	29/12/2016	25/01/2017
Hora Inicio				USEPA¹	BANCO MUNDIAL²	OMS³	7:00	7:00	7:00
Duración							11 h	11 h	11 h
OSHA Fraccion Respirable PM₄	mg/m³	5	16667	150	150	50	0.405	0.012	0.1
OSHA Polvo Total @ PM₁₀	mg/m³	15	50000	150	150	50	0.704	0.012	0.13

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de el (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							2016	2017			
Trimestre							XX				
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		Noviembre	Diciembre	Enero		
Fecha							25/11/2016	29/12/2016	25/01/2017		
Hora Inicio						USEPA¹	BANCO MUNDIAL²	OMS³	7:00	7:00	7:00
Duración					OSHA	99.97%			11 h	11 h	11 h
OSHA Fraccion Respirable PM₄	mg/m³	5	16667	150	150	50	0.074	0.098	0.64		
OSHA Polvo Total @ PM₁₀	mg/m³	15	50000	150	150	50	0.090	0.117	0.068		

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de el (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							2016	2017		
Trimestre							XX			
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		Noviembre	Diciembre	Enero	
Fecha							24/11/2016	29/12/2016	25/01/2017	
Hora Inicio				OSHA	USEPA¹	BANCO MUNDIAL²	OMS³	7:00	7:00	7:00
Duración								11 h	11 h	11 h
OSHA Fraccion Respirable PM₄	mg/m³	5	16667	150	150	50	0.087	0.011	0.03	
OSHA Polvo Total @ PM₁₀	mg/m³	15	50000	150	150	50	0.148	0.012	0.042	

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de el (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							2016	2017	
Trimestre							XX		
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		Noviembre	Diciembre	Enero
Fecha							21/11/2016	21/12/2016	23/01/2017
Hora Inicio							7:00	7:00	7:00
Duración							11 h	11 h	11 h
OSHA Fraccion Respirable PM ₄							0.555	0.372	0.653
OSHA Polvo Total @ PM ₁₀	mg/m ³	15	50000	150	150	50	0.638	0.410	0.788

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de el (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							2016	2017			
Trimestre							XX				
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		Noviembre	Diciembre	Enero		
Fecha								21/12/2016	27/01/2017		
Hora Inicio											
Duración				OSHA	99.97%	USEPA¹	BANCO MUNDIAL²	OMS³	7:00	7:00	7:00
									11 h	11 h	11 h
OSHA Fraccion Respirable PM₄	mg/m³	5	16667	150	150	50		5.63	6.83		
OSHA Polvo Total @ PM₁₀	mg/m³	15	50000	150	150	50		6.93	10.5		

Nota: OSHA Fracción respirable no fue tomado en esta ocasión, sin embargo sea con el uso de EPP o sin el uso de el (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.

9.3 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), es la razón por la que se ha mantenido los sistemas de ventilación de manera normal. Como se puede apreciar en el Cuadro 9-3 se siguió monitoreando la no presencia de Ácido Sulphídrico - Sulfuro de Hidrógeno (H_2S) y se omitirá hasta detectarse la primera vez. De igual forma, para efectos de publicación de informes, 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 9-3: Extracto de las mediciones del XX 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.			
14-nov-16							Diurno	José Camillo.
	1365-6980.EC	RB-01	Fortificación.	5	0	10:00		
	1240-6890.EC	JD-02	Perforación.	0	0	12:50		
27-dic-16							Diurno	José Camillo.
	1190-6580.OC	JD-06	Perforación.	6	0	10:50		
	1215-Taller.OC.	LL-31	Rezaga.	20	0	12:30		

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.			
16-ene-17	1390-6780.EC	JD-01	Perforación.	0	0	07:51	Nocturno	José Camillo.
	1305-RAMP.EC	RB-01	Fortificación.	0	0	07:56		
	22-ene-17	1340-6820.EC	JD-07	Perforación.	7	0	11:00	Diurno
1340-6930.EC		LH-02	Reparación de simba.	10	0	14:30		

Fuente: MSR, 2017.

10 Conclusiones

10.1 Mediciones del aire en el ambiente

- 1) El material particulado (**PM₁₀**), los gases de combustión (**SO₂** y **NO₂**) y los niveles de presión sonora (**NPS**) presentaron valores por debajo de las guías establecidas por la USEPA (**PM₁₀**, **SO₂** y **NO₂**), Banco Mundial (**PM₁₀**, **SO₂**, **NO₂** y **NPS**), OMS (**SO₂** y **NO₂**) y British Columbia (**SO₂** y **NO₂**). Los niveles de **PM₁₀** se encontraron dentro de los valores máximos y mínimos registrados durante el establecimiento de la línea base del Proyecto a excepción de lo registrado en EA-4A y el mercurio en **PM₁₀** se detectó únicamente en EA-3A y EA-4A, encontrándose ligeramente arriba del límite de detección del método.

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10.2 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 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 detectaron cloruros en **SW**, **GW** y **MW**, todos los valores por debajo de lo sugerido por la USEPA (250 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). 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.
- 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 Noviembre de 2016 a Enero 2017.

10.3 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 (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.

- 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 Homologación NIOSH.

11 Anexos

11.1 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.

Enero 2017																																
Descarga/fecha	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	
LECTURA FLUJÓMETRO (m ³)																																
Portal Este (tubería 6")	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	191514	
Total Este (tubería 8")	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	281587	
Portal Oeste (tubería 6")	717189	718860	720562	721518	721754	723433	723955	725596	727308	728934	730559	732290	734043	735788	737589	739404	741147	742914	744459	746175	747903	749645	751435	753068	754923	756793	758576	759521	759599	760394	762156	
Portal Oeste (tubería 8")	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Clarificador	91505	95170	98865	101734	105314	109441	113453	117525	121273	124759	128515	132221	135827	139730	143445	146530	149265	152367	155170	158625	162371	166213	169874	173528	177106	180655	184067	187383	190477	193981	197822	
VOLUMEN BOMBEADO (m ³)																																
Portal Este (tubería 6")	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Este (tubería 8")	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Portal Oeste (tubería 6")	1688	1671	1702	956	236	1679	521	1641	1713	1626	1625	1731	1753	1745	1801	1816	1743	1767	1545	1716	1728	1742	1791	1633	1855	1870	1782	945	79	794	1762	
Portal Oeste (tubería 8")	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Clarificador	1904	3665	3695	2869	3580	4127	4012	4072	3748	3486	3756	3706	3606	3903	3715	3085	2735	3102	2803	3455	3746	3842	3661	3654	3578	3549	3412	3316	3094	3504	3841	
CAUDAL PROYECTADO (gpm)																																
Portal Este (tubería 6")	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total Este (tubería 8")	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Portal Oeste (tubería 6")	309	306	312	175	43	308	96	301	314	298	298	317	321	320	330	333	320	324	283	315	317	319	328	299	340	343	327	173	14	146	323	
Portal Oeste (tubería 8")	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Clarificador	349	672	677	526	656	757	736	747	687	639	689	679	661	716	681	566	501	569	514	633	687	704	671	670	656	651	626	608	567	642	704	

m³: metro cúbico. Gpm: galones por minuto. Celeste: Flujómetro presentó fallos al registrar el volumen acumulado. Fuente: MSR, 2017.

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

Noviembre 2016																															
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.	7.58	7.40	7.26	7.48	7.32	7.52	7.47	7.52	7.56	7.92	7.65	7.37	6.96	7.56	7.72	7.73	7.72	7.78	Sin descarga	7.83	7.10	7.47	7.78	7.59	7.47	7.61	7.68	7.35	7.01	Sin descarga
Temperatura	°C	26.00	25.50	27.80	27.50	27.30	27.60	27.80	28.10	28.60	24.10	25.60	25.50	24.70	26.30	26.20	25.50	24.20	26.00		24.40	24.70	27.40	26.70	24.80	22.10	26.60	24.10	27.10	25.30	
Conductividad	µS/cm	2131	2400	2215	2043	2035	2021	2025	1957	NA	2040	2022	2139	2154	2158	2246	2247	997	2235		2316	1890	1939.00	1866	1963	2025	2020	1908.00	1851	1867	
Turbidez	NTU	7.11	10.40	14.90	5.94	3.27	3.19	5.93	4.73	NA	2.94	6.01	3.26	6.20	12.80	15.10	23.90	17.90	6.67		9.59	5.76	11.90	7.76	5.29	3.41	6.88	3.72	10.90	NA	
kit CN	mg/L	0.005	0.003	0.007	No analizado						0.004	0.007	0.023	0.025	0.000	0.001	0.001	0.001	0.001		0.003	0.007	0.00	0.002	0.001	0.002	0.005	0.002	0.012	0.000	
CN Total		NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.003	NA	NA	NA	NA	NA	NA	0.007	NA		NA	NA	NA	0.006	NA	<0.003	NA	NA	NA	NA	
Pileta de Cumplimiento Ambiental (EP-3 o pileta 3)																															
pH	u.e.	8.49	8.72	8.82	NA	NA	NA	NA	NA	NA	8.80	8.37	8.69	8.60	8.52	8.43	8.45	8.40	8.44	8.59	8.33	8.36	8.37	8.63	8.51	8.37	8.49	8.58	8.67	8.60	8.81
Temperatura	°C	250.2	21.4	22.9	NA	NA	NA	NA	NA	NA	21.7	21.3	20.8	20.8	20.8	25.0	20.2	19.8	19.4	19.7	17.4	16.2	16.0	18.60	18.70	18.00	19.90	17.40	19.2	20.9	20.9
Conductividad	µS/cm	652	639	629	NA	NA	NA	NA	NA	NA	638	709	701	653	712	851	785	731	749	850	1120	952	1244	766.40	781.70	805.10	847.10	822.90	803	839	835
Turbidez	NTU	4.26	4.75	3.11	NA	NA	NA	NA	NA	NA	2.22	21.30	4.01	4.62	5.22	5.04	8.12	2.23	3.81	2.44	5.92	7.22	3.83	3.49	3.74	3.89	5.70	4.41	3.92	4.93	4.13
Kit CN	mg/L	0.006	0.002	0.001	NA	NA	NA	NA	NA	NA	0.003	0.000	0.001	0.003	0.001	0.002	0.002	0.000	0.000	0.002	0.003	0.012	0.000	0.000	0.001	0.001	0.001	0.005	0.003	0.003	0.005
CN Total		NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.003	<0.003	NA	0.003	NA	NA	NA	<0.003	NA	NA	<0.003	NA	NA	NA	NA	NA	NA	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.

Diciembre 2016																																
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.	7.03	7.49	Sin descarga	6.95	7.59	7.50	Sin descarga	6.94	Sin descarga	Sin descarga	Sin descarga	7.27	Sin descarga	Sin descarga	Sin descarga	Sin descarga	6.87	7.40	7.62	7.41	7.33	7.66	7.36	7.74	7.71	8.38	7.25	7.36	7.43	7.37	6.89
Temperatura	°C	25.5	27.5		24.5	27.9	26.7		25.70				22.2					25.8	25.9	25.8	21.4	23.8	23.2	24.1	24.0	24.6	25.4	24.1	23.9	25.2	24.7	24.5
Conductividad	μS/cm	1951	1994		1980	2010	1942		223.00				2445					2334	2257	1720	2275	1965	1852	1815	1733	1882	1926	1906	1878	1832	1854	1847
Turbidez	NTU	4.18	2.80		9.10	11.50	11.90		10.40				4.65					1.42	1.45	0.81	1.37	3.36	0.98	1.17	0.70	1.33	0.86	1.56	0.98	0.66	24.00	1.08
kit CN	mg/L	0.000	0.006		0.005	0.005	0.004		0.00				0.007					0.006	0.006	0.000	0.009	0.005	0.006	0.000	0.000	0.002	0.007	0.002	0.002	0.002	0.001	0.001
CN Total		0.004	NA		NA	<0.003	NA		NA				NA					NA	NA	<0.003	NA	<0.003	NA	NA	NA	0.005	NA	NA	NA	0.005	NA	NA
Pileta de Cumplimiento Ambiental (EP-3 o pileta 3)																																
pH	u.e.	8.87	9.01	9	8.99	9.02	9.06	8.96	8.65	8.57	8.6	8.64	8.52	8.81	8.6	8.75	8.7	8.78	8.79	8.84	8.59	8.41	8.44	8.48	8.36	8.37	8.65	8.66	8.59	8.85	8.85	8.77
Temperatura	°C	20.8	22	21.3	20.5	22.9	24.2	25.5	22.1	20	18.4	23.1	18.4	19.6	23.1	21.7	19.1	20.2	19.5	20.7	19	20.7	18.3	16.7	17.3	25	19.6	20.5	18.5	19.7	18.8	18.3
Conductividad	μS/cm	825.5	820.3	804.3	828.8	800.2	807.4	816	883.4	907	906.1	1003	1156	1093	1460	1136	976.1	930.9	926.2	1004	1409	965.4	908.4	918.8	942.4	2252	952.2	913.6	925.3	914.6	917.4	943
Turbidez	NTU	4.61	12.00	4.53	4.75	4.48	4.58	5.45	4.35	4.46	6.83	4.31	4.56	6.45	4.76	1.17	0.77	1.81	2.59	1.30	1.56	1.38	1.24	2.76	1.91	0.90	2.45	2.85	3.86	2.69	2.44	2.97
Kit CN	mg/L	0.007	0.001	0.001	0.002	0.002	0.007	0.001	0.003	0.001	0.004	0.001	0.003	0.004	0.002	0.002	0.000	0.009	0.005	0.010	0.011	0.008	0.000	0.009	0.000	0.001	0.000	0.001	0.005	0.001	0.000	0.003
CN Total		0.003	NA	NA	NA	<0.003	NA	NA	NA	NA	<0.003	NA	NA	<0.003	NA	NA	NA	NA	NA	NA	NA	NA	<0.003	NA	NA	NA	0.004	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.

Enero 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.	7.25	7.48	6.91	6.87	6.69	7.24	6.97	7.38	7.62	7.51	7.09	7.30	7.25	7.19	7.66	7.35	7.64	7.55	7.24	7.11	7.17	7.06	7.28	7.54	7.24	7.33	8.06	7.68	7.76	7.69	7.76
Temperatura	°C	29.5	25.1	25.0	22.90	24.9	24.60	28.50	25.0	14.10	23.0	22.2	24.4	24.40	24.9	24.00	22.10	18.1	23.6	22.7	22.3	25.3	24.5	24.3	23.2	24.9	24.00	23.1	22.3	24.1	25.0	18.2
Conductividad	µS/cm	1916	1977	1980	2287.00	1920	1866.00	1890.00	2003	1977.00	2148	2422	2674	2249.00	2413	2490.00	2298.00	2223	2180	2428	2209	2114	2491	2247	2520	2172	2126.00	2233	2571	2015	2039	2235
Turbidez	NTU	1.19	1.00	2.21	5.03	2.90	4.14	5.52	5.53	6.72	3.89	1.16	9.13	10.30	6.13	5.13	15.30	15.30	5.31	21.70	10.40	2.37	27.40	29.90	43.80	16.80	11.20	6.52	4.40	6.89	6.40	13.50
kit CN	mg/L	0.000	0.000	0.002	0.001		0.002	0.010	0.018	0.001	0.000	0.000	0.001	0.003	0.003	0.003	0.000	0.002	0.000	0.000	0.004	0.002	0.002	0.007	0.002	0.000	0.002	0.003	0.000	0.000	0.001	0.005
CN Total		NA	0.005	NA	NA	<0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.003	NA	NA	NA	NA	NA	NA	NA	NA	0.100	NA	NA	NA	NA	NA	0.003
Pileta de Cumplimiento Ambiental (EP-3 o pileta 3)																																
pH	u.e.	8.77	8.73	9.03	8.58	8.71	8.76	8.43	8.82	8.8	8.68	8.77	8.79	8.81	8.81	8.88	8.77	8.99	8.79	8.88	8.93	8.94	8.83	8.94	8.99	8.93	8.86	8.97	8.97	8.99	8.88	8.94
Temperatura	°C	18.3	19.5	19.8	19.7	20	25	20.1	19.6	15.4	15	16.4	17.4	18.1	16.8	17	17.2	21.7	19.4	19.4	18.4	20.4	20.3	19.4	18	18.4	18.3	18.6	19	19.9	18.4	17
Conductividad	µS/cm	943	993.5	1013	1024	998.8	2223	992.5	1017	1024	1372	1062	1025	1236	1449	1062	1064	1048	1077	1053	1065	1050	1088	1425	1227	1131	1084	1088	1090	1089	1124	1301
Turbidez	NTU	3.59	4.34	3.50	3.98	3.79	3.88	3.44	5.99	6.59	6.46	5.82	5.12	5.40	5.44	7.47	6.04	5.80	5.03	5.24	4.98	5.57	5.53	6.92	9.46	8.86	6.13	6.05	5.61	6.71	9.36	7.54
kit CN	mg/L	0.000	0.004	0.003	0.004	0.001	0.007	0.000	0.006	0.003	0.027	0.011	0.003	0.003	0.003	0.000	0.004	0.008	0.001	0.003	0.004	0.001	0.001	0.001	0.000	0.001	0.000	0.004	0.000	0.009	0.001	0.003
CN Total		NA	<0.003	NA	NA	<0.003	NA	NA	<0.003	<0.003	NA	NA	<0.003	NA	NA	NA	NA	<0.003	0.004	<0.003	NA	NA	<0.003	NA	NA	NA	NA	NA	NA	NA	<0.003	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.

11.3 Resultados crudos de calidad de aire

11.3.1 Material Particulado (PM_{10})

BGI PQ200 Air Sampling System

Downloaded November 2016

Job Details:

Job Name: EA-1A
Version: PQ100
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	651	647	649	mmHg
TA	27.5	15.8	21.0	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date Time
dd-mmm hh:mm:ss

Start: 23-Nov-16 10:06:00
Stop: 24-Nov-16 10:06:00

ET: 23:59:00

Mass Concentration Data:

Filter ID: 3149-1313
Final Wt: 151.560 mg
Initial Wt: 151.070 mg
Delta Wt: 0.490 mg
Total Vol: 24.04 m³

Mass Conc: 20.38 µg/m³

Notes 1: Depósito de Suelos, Proyecto El Escobal

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded November 2016

Job Details:

Job Name: EA-1B
Version: PQ100
Serial No: 2.00
Pump Time:
Flags: NA

Job Code: EA-1B
Site Name: San Rafael Las Flores
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	654	648	652	mmHg
TA	24.8	18.0	20.8	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date Time
dd-mmm hh:mm:ss

Start: 18-Nov-16 16:10:00
Stop: 19-Nov-16 16:10:00

ET: 23:59:00

Mass Concentration Data:

Filter ID: 3150-1414
Final Wt: 151.570 mg
Initial Wt: 151.050 mg
Delta Wt: 0.520 mg
Total Vol: 24.03 m³

Mass Conc: 21.64 µg/m³

Notes 1: San Rafael Las Flores, Santa Rosa.

Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded November 2016

Job Details:

Job Name: EA-2A
Version: PQ200
Serial No: 3.00
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	632	629	630	mmHg
TA	28.8	16.9	20.2	°C
Q	---	---	16.70	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date Time
dd-mmm hh:mm:ss

Start: 28-Nov-16 11:40:00
Stop: 29-Nov-16 11:40:00

ET: 23:59:00

Mass Concentration Data:

Filter ID: 3151-1515
Final Wt: 152.670 mg
Initial Wt: 151.960 mg
Delta Wt: 0.710 mg
Total Vol: 24.04 m³

Mass Conc: 29.53 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 November 2016

Job Details:

Job Name: EA-3
Version: PQ200
Serial No: 1.00
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	626	623	624	mmHg
TA	28.8	16.7	19.8	°C
Q	---	---	16.70	Lpm

QCV NA %

Max overheat NA °C
occured NA

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	28-Nov-16	10:35:00
Stop:	29-Nov-16	10:35:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3152-1616
Final Wt:	151.970 mg
Initial Wt:	151.470 mg
Delta Wt:	0.500 mg
Total Vol:	20.10 m ³

Mass Conc: 24.88 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 November 2016

Job Details:

Job Name: EA-3A
Version: PQ100
Serial No: 2.00
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	27.8	16.1	20.2	°C
Q	---	---	16.71	Lpm

QCV NA %

Max overheat NA °C
occured NA

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	23-Nov-16	10:45:00
Stop:	24-Nov-16	10:45:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3153-1718
Final Wt:	151.010 mg
Initial Wt:	150.260 mg
Delta Wt:	0.750 mg
Total Vol:	24.04 m ³

Mass Conc: 31.20 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 November 2016

Job Details:

Job Name: EA-4A
Version: PQ200
Serial No: 1.00
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	651	647	649	mmHg
TA	28.4	17.3	20.7	°C
Q	---	---	16.71	Lpm

QCV NA %

Max overheat NA °C
occured NA

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	16-Nov-16	11:53:00
Stop:	17-Nov-16	11:53:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3154-0101
Final Wt:	154.700 mg
Initial Wt:	151.220 mg
Delta Wt:	3.480 mg
Total Vol:	24.04 m ³

Mass Conc: 144.76 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 November 2016

Job Details:

Job Name: EA-5A
Version: PQ100
Serial No: 2.00
Pump Time:
Flags: NA

Job Code: EA-5A
Site Name: Sabana Redonda
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	654	649	651	mmHg
TA	28.9	18.0	21.3	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	16-Nov-16	13:57:00
Stop:	17-Nov-16	13:57:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3155-0202
Final Wt:	153.840 mg
Initial Wt:	152.860 mg
Delta Wt:	0.980 mg
Total Vol:	24.03 m ³

Mass Conc: 40.78 µg/m³

Notes 1: Aldea Sabana Redonda, San Rafael Las Flores, Santa Rosa
Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded November 2016

Job Details:

Job Name: EA-6
Version: PQ200
Serial No: 2.00
Pump Time:
Flags: NA

Job Code: EA-6
Site Name: Carretera a Mataquesquintla
Station Code:
Operators: EvQ
User1: NA
User2: NA

	Max	Min	Avg	Units
BP	645	640	643	mmHg
TA	25.1	16.6	19.2	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	18-Nov-16	15:22:00
Stop:	19-Nov-16	15:22:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3156-0303
Final Wt:	151.800 mg
Initial Wt:	151.510 mg
Delta Wt:	0.290 mg
Total Vol:	24.04 m ³

Mass Conc: 12.06 µg/m³

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 November 2016

Job Details:

Job Name: EA-7A
Version: PQ200
Serial No: 2.00
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	653	649	651	mmHg
TA	26.5	17.5	20.0	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

	Date	Time
	dd-mmm	hh:mm:ss
Start:	24-Nov-16	14:42:00
Stop:	25-Nov-16	14:42:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3157-0404
Final Wt:	152.070 mg
Initial Wt:	151.710 mg
Delta Wt:	0.360 mg
Total Vol:	24.03 m ³

Mass Conc: 14.98 µg/m³

Notes 1: Aldea Los Planes, San Rafael Las Flores, Santa Rosa.
Notes 2: Minera San Rafael, S.A.

Reporte Analítico RA-16-11653

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:	Diciembre, 14 al 16 de 2016
Emisión de reporte:	Diciembre, 19 de 2016

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 PM ₁₀ 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	3149-1313	0.15107	0.15156
2	EA-1B	3150-1414	0.15105	0.15157
3	EA-2A	3151-1515	0.15196	0.15267
4	EA-3	3152-1616	0.15147	0.15197
5	EA-3A	3153-1718	0.15026	0.15101
6	EA-4A	3154-0101	0.15122	0.15470
7	EA-5A	3155-0202	0.15286	0.15384
8	EA-6	3156-0303	0.15151	0.15180
9	EA-7A	3157-0404	0.15171	0.15207

¹: Código de filtro asignado por Laboratorio Ambiental, S.A. *: Corresponde a los pesos iniciales indicado en reportes analíticos RA-16-11624.

Anexos:

Anexo 1. Cadena de Custodia R-02-000795

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:
D.S.	Dic., 19/16	J.J.	Dic., 19/16	A.G.J.	Dic. 19/16	01

BGI PQ200 Air Sampling System

Downloaded December 2016

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	652	646	650	mmHg
TA	26.9	17.9	20.9	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 13-Oct-16	14:08:00
Stop: 14-Oct-16	14:08:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3186-0330
Final Wt:	145.500 mg
Initial Wt:	145.530 mg
Delta Wt:	-0.030 mg
Total Vol:	24.04 m ³

Mass Conc: -1.25 µg/m³

Notes 1: Depósito de Suelos, Proyecto El Escobal
Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded December 2016

Job Details:

Job Name: EA-2A
Version: PQ200
Serial No: 2.00
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	636	632	634	mmHg
TA	30.1	15.4	20.3	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 8-Dec-16	10:35:00
Stop: 9-Dec-16	10:35:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3185-0220
Final Wt:	147.740 mg
Initial Wt:	147.350 mg
Delta Wt:	0.390 mg
Total Vol:	24.04 m ³

Mass Conc: 16.22 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 December 2016

Job Details:

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

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

	Max	Min	Avg	Units
BP	628	625	626	mmHg
TA	26.7	14.0	18.7	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 8-Dec-16	11:18:00
Stop: 9-Dec-16	11:18:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3184-0101
Final Wt:	146.650 mg
Initial Wt:	146.950 mg
Delta Wt:	-0.300 mg
Total Vol:	24.03 m ³

Mass Conc: -12.48 µg/m³

Notes 1: Aldea El Fucio, San Rafael Las Flores, Santa Rosa.
Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded December 2016

Job Details:

Job Name: EA-7A
Version: PQ200
Serial No: 1.00
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	649	652	mmHg
TA	26.8	16.2	20.3	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 18-Oct-16	16:17:00
Stop: 19-Oct-16	16:17:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3187-0404
Final Wt:	145.210 mg
Initial Wt:	144.850 mg
Delta Wt:	0.360 mg
Total Vol:	24.04 m ³

Mass Conc: 14.98 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:	Enero, 06 al 10 de 2017
Emisión de reporte:	Enero, 10 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 PM ₁₀ 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	3186-0330	0.14553	0.14550
2	EA-2A	3185-0220	0.14735	0.14774
3	EA-3	3184-0101	0.14695	0.14665
4	EA-7A	3187-0404	0.14485	0.14521

¹: Código de filtro asignado por Laboratorio Ambiental, S.A. *: Corresponde a los pesos iniciales indicado en reportes analíticos RA-16-11649.

Anexos:

Anexo 1. Cadena de Custodia R-02-000798

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:
D.S.	Enero, 10/17	J.J.	Enero, 10/17	A.G.J.	Enero, 12/17	01

BGI PQ200 Air Sampling System

Downloaded January 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	653	650	651	mmHg
TA	27.0	15.2	19.5	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 12-Jan-17	10:35:00
Stop: 13-Jan-17	10:35:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3193-1010
Final Wt:	146.950 mg
Initial Wt:	146.480 mg
Delta Wt:	0.470 mg
Total Vol:	24.04 m ³

Mass Conc: 19.55 µg/m³

Notes 1: Depósito de Suelos, Proyecto El Escobal
 Notes 2: Minera San Rafael, S.A.

BGI PQ200 Air Sampling System

Downloaded January 2017

Job Details:

Job Name: EA-2A
 Version: 5.62
 Serial No: 938
 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	629	632	mmHg
TA	27.8	14.2	18.7	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 18-Jan-17	15:10:00
Stop: 19-Jan-17	15:10:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3195-1235
Final Wt:	147.640 mg
Initial Wt:	147.220 mg
Delta Wt:	0.420 mg
Total Vol:	24.04 m ³

Mass Conc: 17.47 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 January 2017

Job Details:

Job Name: EA-3
 Version: 5.62
 Serial No: 877
 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	624	626	mmHg
TA	28.6	14.4	18.5	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 18-Jan-17	14:18:00
Stop: 19-Jan-17	14:18:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3194-1111
Final Wt:	147.120 mg
Initial Wt:	146.400 mg
Delta Wt:	0.720 mg
Total Vol:	24.04 m ³

Mass Conc: 29.95 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 January 2017

Job Details:

Job Name: EA-7A
 Version: 5.62
 Serial No: 877.00
 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	655	651	653	mmHg
TA	27.3	15.5	19.7	°C
Q	---	---	16.71	Lpm

QCV	NA	%
Max overheat	NA	°C
occured	NA	

Timer Information:

Date	Time
dd-mmm	hh:mm:ss
Start: 12-Jan-17	10:08:00
Stop: 13-Jan-17	10:08:00

ET: 23:59:00

Mass Concentration Data:

Filter ID:	3192-0909
Final Wt:	145.900 mg
Initial Wt:	145.430 mg
Delta Wt:	0.470 mg
Total Vol:	24.04 m ³

Mass Conc: 19.55 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:	Febrero, 14 al 15 de 2017
Emisión de reporte:	Febrero, 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 PM ₁₀ 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	3193-1010	0.14648	0.14695
2	EA-2A	3195-1235	0.14722	0.14764
3	EA-3	3194-1111	0.14640	0.14712
4	EA-7A	3192-0909	0.14543	0.14590

¹: Código de filtro asignado por Laboratorio Ambiental, S.A. *: Corresponde a los pesos iniciales indicado en reportes analíticos RA-17-11662.

Anexos:

Anexo 1. Cadena de Custodia R-02-000800

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.	Febrero, 16/17	J.J.	Febrero, 16/17	A.G.J.	Enero, 12/17	01

11.3.2 Informe de Metales en PM₁₀

Reporte Analítico

RA-16-11654

Cliete: Minera San Rafael
Dirección: Boulevard Los Próceres, 18 calle 24-69 z. 10, Centro Empresarial
Zona Pradera, Oficina 1406 torre IV
Proyecto: 178-090
Análisis de muestras: Enero, 09 de 2017
Emisión del reporte: Enero, 12 de 2017

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

Análisis: Mercurio en filtros por ICP de Masas.

Método analítico: ICP Masas. EPA 7470 Mercury by CV/AA

*Parámetros	LDM (µg)	Estación						
		EA-1B	EA-2A	EA-3A	EA-4A	EA-5A	EA-6	EA-7A
Código de filtro		3150-1414	3151-1515	3153-1718	3154-0101	3155-0202	3156-0303	3157-0404
Mercurio (Hg)	0.002	<0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002

*: 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. Cadenas de Custodia R-02-000795

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:
J.J.	Enero, 30/17	D.S.	Enero, 30/17	A.G.J.	Enero, 30/17	02



Your P.O. #: 6203
Your Project #: 178-090
Site Location: MSR
Your C.O.C. #: na

Attention: Ana Gabriela Juarez

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: 2017/01/09
Report #: R4316964
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B6R7873

Received: 2016/12/21, 17:07

Sample Matrix: Filter
Samples Received: 7

Analyses	Quantity Extracted	Date Analyzed	Date Analyzed	Laboratory Method	Reference
Mercury	7	2017/01/09	2017/01/09	BRL SOP-00104	EPA 7470 m

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 recovery corrected except for isotope dilution methods. Results relate to samples tested.

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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.

Encryption Key

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

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Total Cover Pages : 1
Page 1 of 6

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campbell Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca



Maxxam Job #: B6R7873
Report Date: 2017/01/09

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6203

ELEMENTS BY ATOMIC SPECTROSCOPY (FILTER)

Maxxam ID		DQZ452	DQZ453	DQZ454	DQZ455	DQZ456	DQZ457	DQZ458		
Sampling Date		2016/11/18	2016/11/18	2016/11/23	2016/11/16	2016/11/16	2016/11/18	2016/11/24		
COC Number		na	na	na	na	na	na	na		
	UNITS	3150-1414	3151-1515	3153-1718	3154-0101	3155-0202	3156-0303	3157-0404	RDL	QC Batch
Metals										
Acid Extractable Mercury (Hg)	ug	ND	0.002	0.002	ND	ND	ND	ND	0.002	4817836
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										
ND = Not detected										

Page 2 of 6

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campbell Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca



Maxxam Job #: B6R7873
Report Date: 2017/01/09

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6203

TEST SUMMARY

Maxxam ID: DQZ452
Sample ID: 3150-1414
Matrix: Filter

Collected: 2016/11/18
Shipped:
Received: 2016/12/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury	CV/AA	4817836	2017/01/09	2017/01/09	Faye Sabet

Maxxam ID: DQZ453
Sample ID: 3151-1515
Matrix: Filter

Collected: 2016/11/18
Shipped:
Received: 2016/12/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury	CV/AA	4817836	2017/01/09	2017/01/09	Faye Sabet

Maxxam ID: DQZ454
Sample ID: 3153-1718
Matrix: Filter

Collected: 2016/11/23
Shipped:
Received: 2016/12/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury	CV/AA	4817836	2017/01/09	2017/01/09	Faye Sabet

Maxxam ID: DQZ455
Sample ID: 3154-0101
Matrix: Filter

Collected: 2016/11/16
Shipped:
Received: 2016/12/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury	CV/AA	4817836	2017/01/09	2017/01/09	Faye Sabet

Maxxam ID: DQZ456
Sample ID: 3155-0202
Matrix: Filter

Collected: 2016/11/16
Shipped:
Received: 2016/12/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury	CV/AA	4817836	2017/01/09	2017/01/09	Faye Sabet

Maxxam ID: DQZ457
Sample ID: 3156-0303
Matrix: Filter

Collected: 2016/11/18
Shipped:
Received: 2016/12/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury	CV/AA	4817836	2017/01/09	2017/01/09	Faye Sabet

Maxxam ID: DQZ458
Sample ID: 3157-0404
Matrix: Filter

Collected: 2016/11/24
Shipped:
Received: 2016/12/21

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury	CV/AA	4817836	2017/01/09	2017/01/09	Faye Sabet



Maxxam Job #: B6R7873
Report Date: 2017/01/09

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6203

GENERAL COMMENTS

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

Package 1	14.0°C
-----------	--------

Samples have been corrected for desorption efficiencies if average percent recoveries are less than 80% (does not apply to gravimetric and inorganic analysis).

Results relate only to the items tested.



Maxxam Job #: B6R7873
Report Date: 2017/01/09

QUALITY ASSURANCE REPORT

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6203

QC Batch	Parameter	Date	SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
4817836	Acid Extractable Mercury (Hg)	2017/01/09	101	90 - 110	ND, RDL=0.002	ug	0.59	20
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.								
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.								



Maxxam Job #: B6R7873
Report Date: 2017/01/09

CTA Consultoria y Tecnologia Ambiental Mexico, S.A. de C.V.
Client Project #: 178-090
Site Location: MSR
Your P.O. #: 6203

VALIDATION SIGNATURE PAGE

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

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.

11.3.3 Informe sobre PST y Gases de Combustión



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

Diciembre 2016 – Enero 2017

San Rafael Las Flores, Santa Rosa, Guatemala

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

Coordenadas en metros (**m**). Datum: WGS84 UTM zona 15N. Fuente: CTA, 2016.

Cuadro 2: Metodologías utilizadas para SO₂ y NO₂ y PST

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

Fuente: CTA, 2016.

Los resultados obtenidos para los gases de combustión se compararon con los valores guía reportados en: Corporación Financiera Internacional (CFI)¹, 2007: Guías Generales de ambiente, salud y seguridad, Sección: Emisiones al Aire y Calidad del aire ambiental.

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 (BC objetivos de calidad del aire para partículas totales suspendidas y caída de polvo, Agosto 12, 2013).

En el Cuadro 3 se presentan los resultados obtenidos de la medición de gases de combustión realizada en Diciembre de 2016; y en el Cuadro 4 se presentan los resultados de la medición de PST para el período de 30 días de 13 Diciembre de 2016 a 13 de Enero 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 $\mu\text{g}/\text{m}^3$

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 $\mu\text{g}/\text{m}^3$
NO₂	<9	9	<9	<9	<9	10	10	*40 $\mu\text{g}/\text{m}^3$

SO₂: dióxido de azufre. NO₂: dióxido de nitrógeno. *: Promedio anual.¹: LDM: Límite de detección del método. $\mu\text{g}/\text{m}^3$: microgramos sobre metros cúbicos.

Fuente: Laboratorio Ambiental, S. A., 2016.

Cuadro 4: Resultados de la medición de PST g/ ($\text{m}^2 \times 30$ días)

Parámetros	EA-1C	EA-2B	EA-3B	EA-4A	EA-5A	EA-6	EA-7A	Guía de BC
Sólidos Insolubles	34.15	20.51	33.04	145.94	6.70	1.32	4.19	NA
Sólidos Solubles	1.79	0.75	1.37	6.75	0.39	0.35	0.40	

¹Guías del CFI: www.ifc.org/ifcext/EnvironmentalGuidelines

²Guía de BC: <http://www.bcairquality.ca/reports/pdfs/aqotable.pdf>

Parámetros	EA-1C	EA-2B	EA-3B	EA-4A	EA-5A	EA-6	EA-7A	Guía de BC
Sólidos Totales	35.94	21.26	34.41	152.69	7.08	1.67	4.59	
Partículas sedimentables totales mg/(dm ² *día) ²	11.98	7.09	11.47	50.90	2.36	0.56	1.53	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., 2016.

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

NO₂:

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

Partículas Sedimentables Totales

Cuatro 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 (50.90 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-1C presenta un valor de 11.98 mg/(dm² x día), el cual puede estar influenciado por los vientos del sector, la proximidad a un campo de foot ball 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 0.56 mg/(dm² x día) y 1.53 mg/(dm² x día) respectivamente. En el caso de la estación EA-7A la baja concentración de PST se puede atribuir a las medidas que toman dentro del Proyecto para reducir el polvo, consistiendo en el riego de caminos de terracería. 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-2B, EA-3B y EA-5A presentan valores de $7.09 \text{ mg}/(\text{dm}^2 \times \text{día})$, $11.47 \text{ mg}/(\text{dm}^2 \times \text{día})$ y $2.36 \text{ mg}/(\text{dm}^2 \times \text{día})$ 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-5A, se encuentra cerca la carretera hacia Mataquescuintla (pavimentada) y cerca de una fábrica de block.

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: Diciembre, 12 al 15 de 2016
Fecha de análisis: Diciembre, 19 de 2016
Emisión del reporte: Diciembre, 21 de 2016

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.

Reporte Analítico RA-16-11660

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 (Sept., 2016)			20-21	20-21	20-21	21-22	21-22	21-22	22-23
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	11	10	< 9	< 9
	ppm	0.005	< 0.005	0.005	< 0.005	0.006	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			CDL		
	Unidades	DEA-3B	DEA-5A	Unidades	Teórica	Real
SO ₂	µg/m ³	NA	< 13	µg	15.5	15.9
	ppm	NA	< 0.005			
NO ₂	µg/m ³	< 9	NA	µg/mL	1.000	1.010
	ppm	< 0.005	NA			

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 0.1µg/mL de NO₂, respectivamente. NA: No Aplica. DEA-3B: duplicado de la estación EA-3B. DEA-5A: duplicado de la estación EA-5A.

Anexos:

Anexo 1. Cadena de custodia R-02-000870

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:
J.J.	Dic., 21/16	D.S.	Dic., 21/16	A.G.J.	Dic., 21/16	01

[illegible]

Reporte Analítico RA-17-11667

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: Diciembre 13 de 2016 – Enero 13 de 2017
Lugar de muestreo: San Rafael las Flores, Santa Rosa, Guatemala
Fecha de análisis: Enero, 26 al 30 de 2017
Emisión del reporte: Febrero, 16 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.

Reporte Analítico RA-17-11667

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, transito 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.

Reporte Analítico RA-17-11667

Cuadro 2: Resultados Partículas Sedimentables Totales (PST)

No.	Identificación de la muestra	Tasa de sedimentación			
		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	34.15	1.79	35.94	11.98
2	EA-2B	20.51	0.75	21.26	7.09
3	EA-3B	33.04	1.37	34.41	11.47
4	EA-4A	145.94	6.75	152.69	50.90
5	EA-5A	6.70	0.39	7.08	2.36
6	EA-6	1.32	0.35	1.67	0.56
7	EA-7A	4.19	0.40	4.59	1.53

LDM: límite de detección del método. **g:** gramos; **mg:** miligramos. **m²:** metros cuadrados. **dm²:** decímetro cuadrado

Anexos:

Anexo 1. Cadena de Custodia R-02-000873

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:
D.S.	Enero, 31/17	J.J.	Febrero, 16/17	A.G.J.	Febrero, 16/17	02

11.3.4 Presión Sonora

ER-1

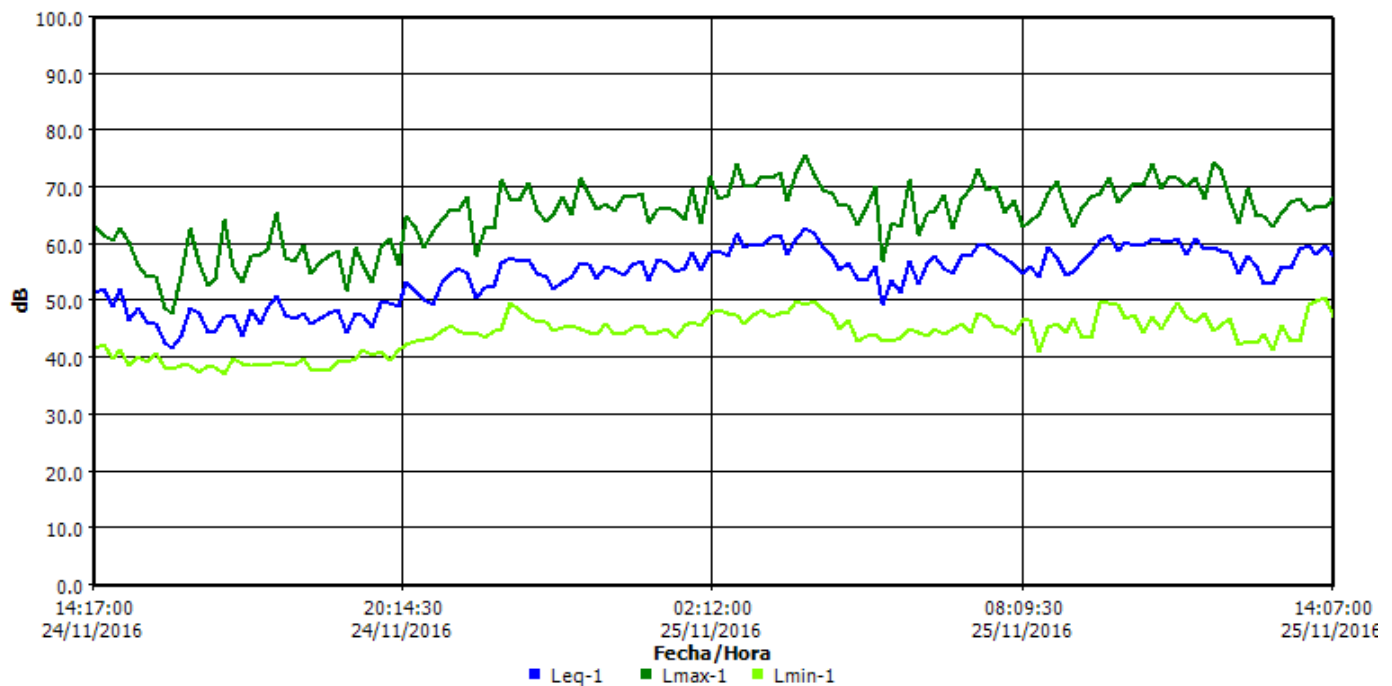
Panel de información

Ubicación	Depósito de suelos norte, a inmediaciones de Aldea Los Planes
Nombre	ER-1
Sesión padre	S169
Hora de inicio	Jueves, 24 de Noviembre de 2016 14:07:00
Hora de paro	Viernes, 25 de Noviembre de 2016 14:07:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	37.1 dB	Lmax	1	75.8 dB
Lpk	1	97.2 dB	Leq	1	56.6 dB

Gráfica de datos de registro



ER-1A

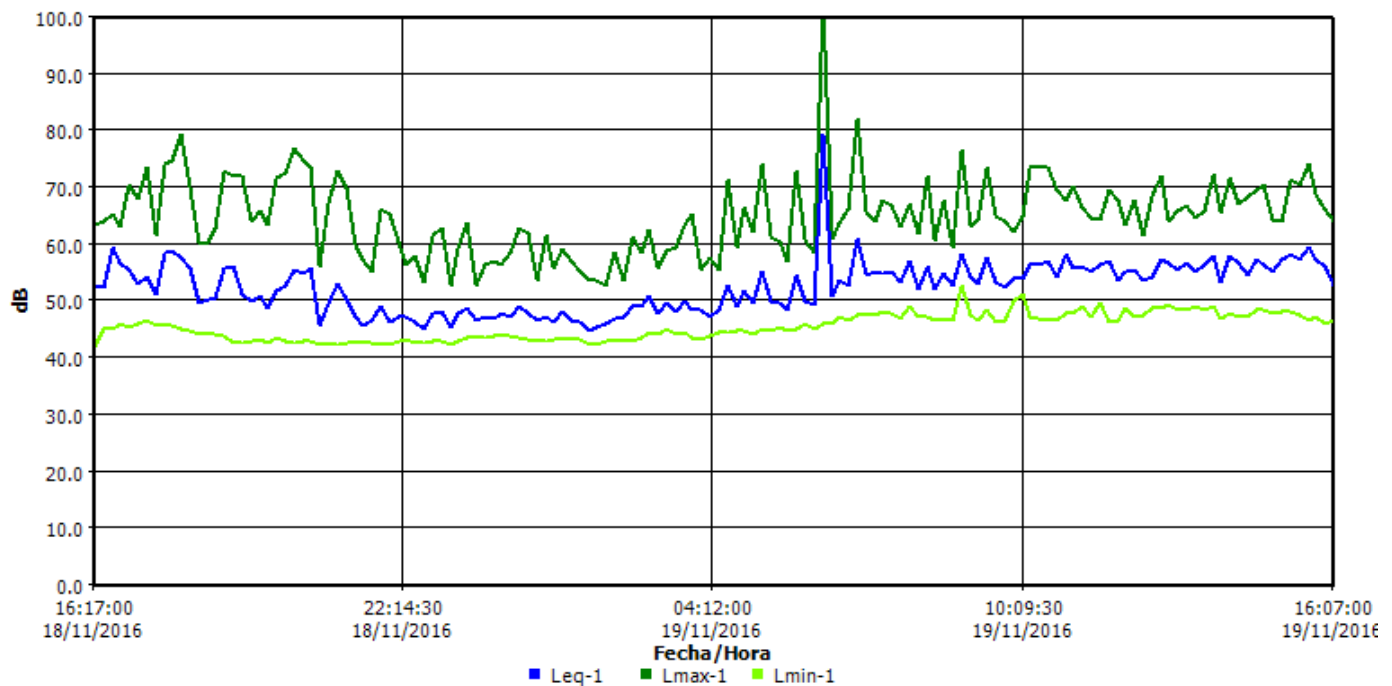
Panel de información

Ubicación	San Rafael las Flores
Nombre	ER-1A
Sesión padre	S256
Hora de inicio	Viernes, 18 de Noviembre de 2016 16:07:00
Hora de paro	Sábado, 19 de Noviembre de 2016 16:07:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	41.9 dB	Lmax	1	102.5 dB
Lpk	1	115.6 dB	Leq	1	59.2 dB

Gráfica de datos de registro



ER-2

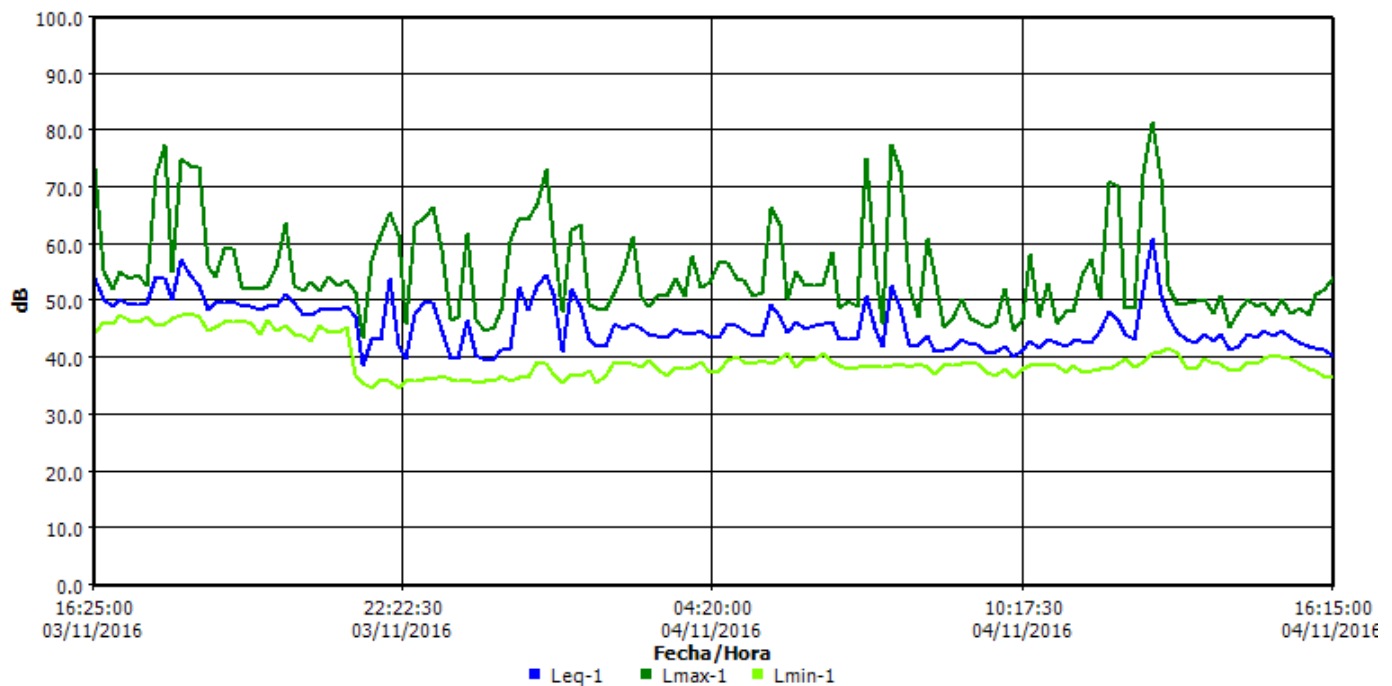
Panel de información

Ubicación	Aldea La Cuchilla
Nombre	ER-2
Sesión padre	S251
Hora de inicio	Jueves, 03 de Noviembre de 2016 16:15:00
Hora de paro	Viernes, 04 de Noviembre de 2016 16:15:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	34.6 dB	Lmax	1	81.6 dB
Lpk	1	116 dB	Leq	1	48.3 dB

Gráfica de datos de registro



ER-3

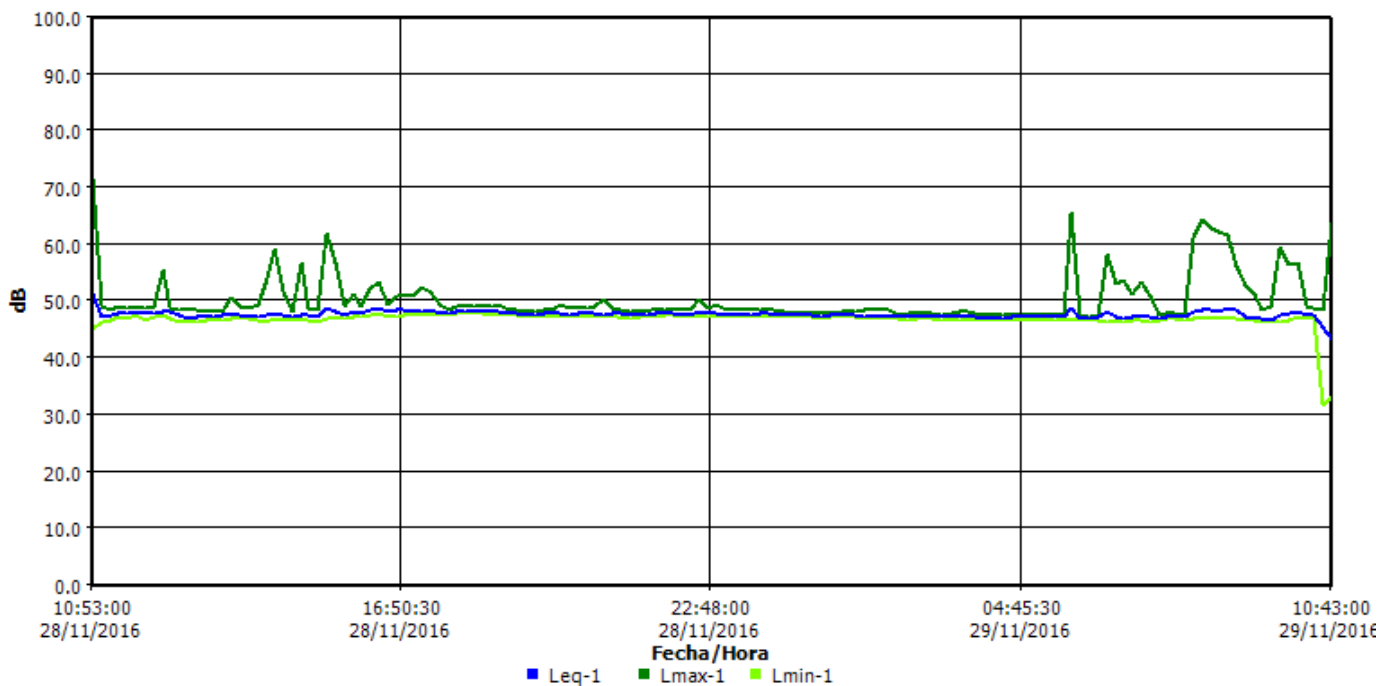
Panel de información

Ubicación	Aledaño a Aldea El Fucio
Nombre	ER-3
Sesión padre	S170
Hora de inicio	Lunes, 28 de Noviembre de 2016 10:43:00
Hora de paro	Martes, 29 de Noviembre de 2016 10:43:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	31.5 dB	Lmax	1	71.4 dB
Lpk	1	98.4 dB	Leq	1	47.6 dB

Gráfica de datos de registro



ER-4A

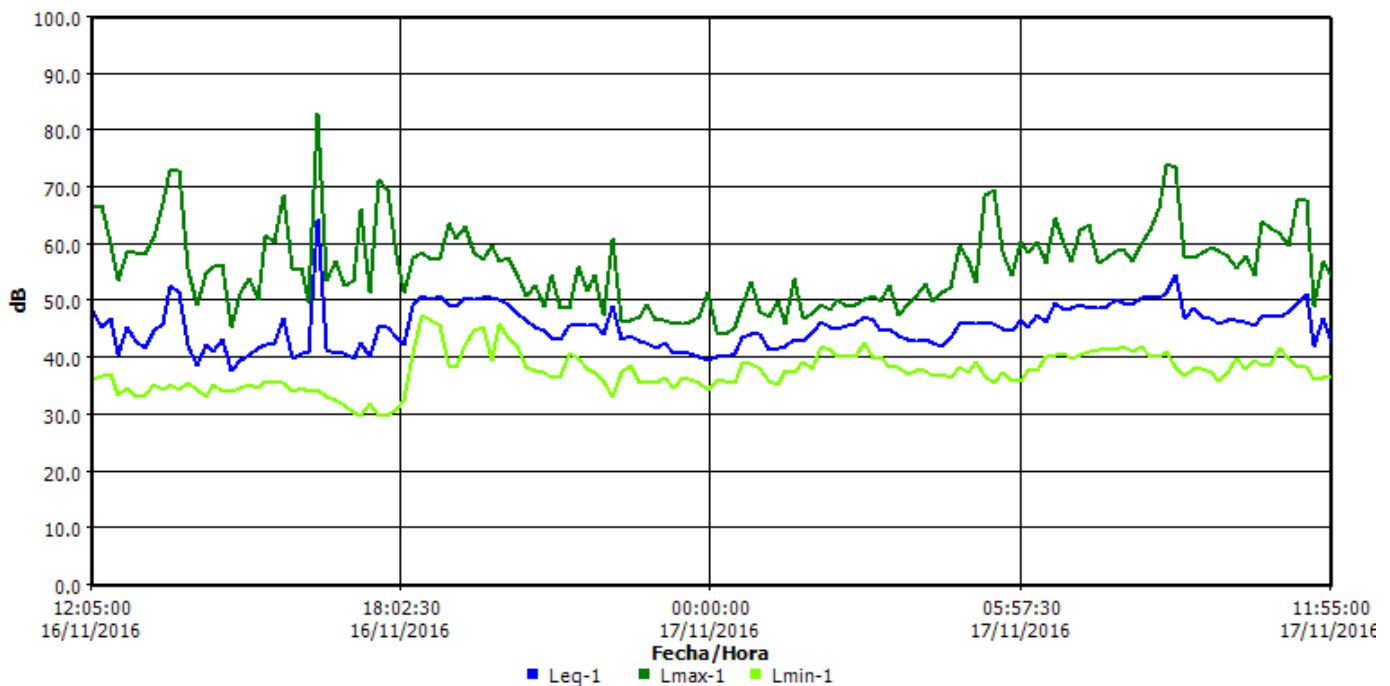
Panel de información

Ubicación	Caserío El Portón de los Angeles
Nombre	ER-4A
Sesión padre	S255
Hora de inicio	Miércoles, 16 de Noviembre de 2016 11:55:00
Hora de paro	Jueves, 17 de Noviembre de 2016 11:55:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	29.7 dB	Lmax	1	83 dB
Lpk	1	112.9 dB	Leq	1	48.1 dB

Gráfica de datos de registro



ER-5A

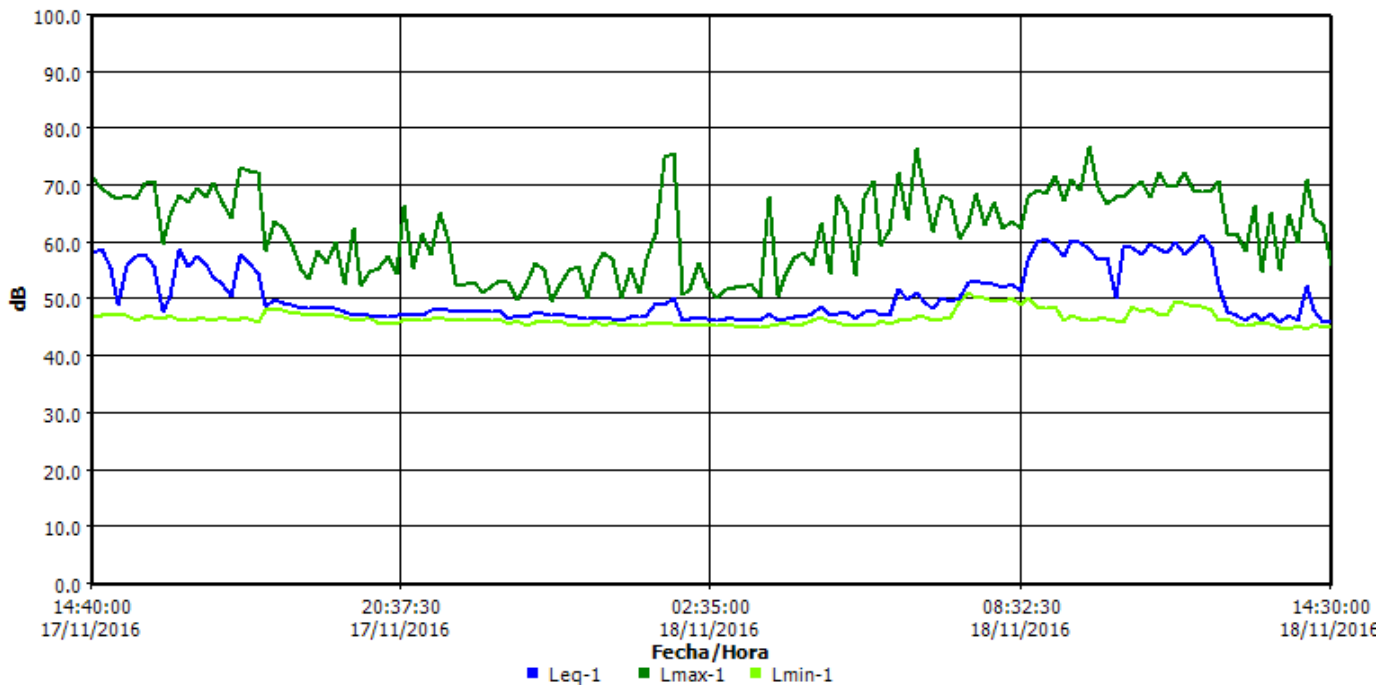
Panel de información

Ubicación Aldea Sabana Redonda
Nombre ER-5A
Sesión padre S042
Hora de inicio Jueves, 17 de Noviembre de 2016 14:30:00
Hora de paro Viernes, 18 de Noviembre de 2016 14:30:00
Nombre del usuario EvQ

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Lmin	1	44.3 dB
Lmax	1	76.9 dB	Lpk	1	96.4 dB
Leq	1	53.6 dB			

Gráfica de datos de registro



ER-6

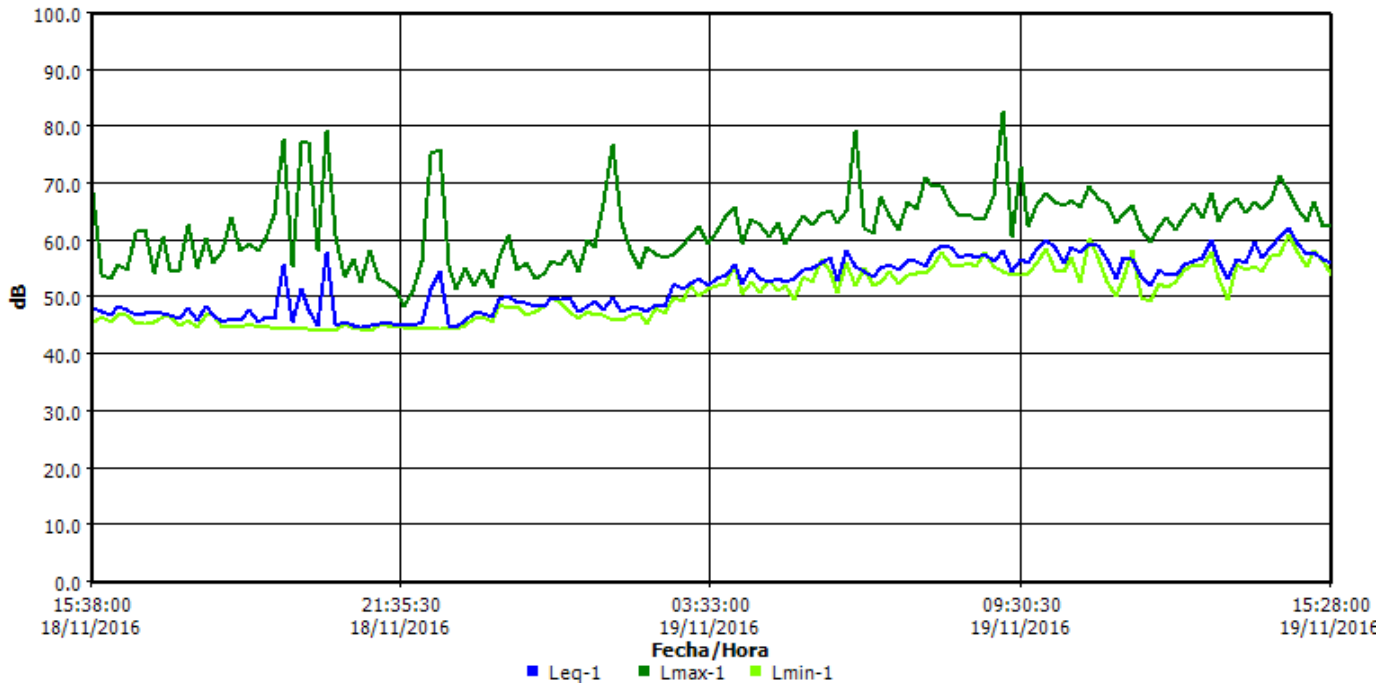
Panel de información

Ubicación	Al norte del proyecto, ruta a Mataquescuintla
Nombre	ER-6
Sesión padre	S043
Hora de inicio	Viernes, 18 de Noviembre de 2016 15:28:00
Hora de paro	Sábado, 19 de Noviembre de 2016 15:28:00
Nombre del usuario	EvQ

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Lmin	1	43.9 dB
Lmax	1	82.7 dB	Lpk	1	95.4 dB
Leq	1	54.5 dB			

Gráfica de datos de registro



ER-7A

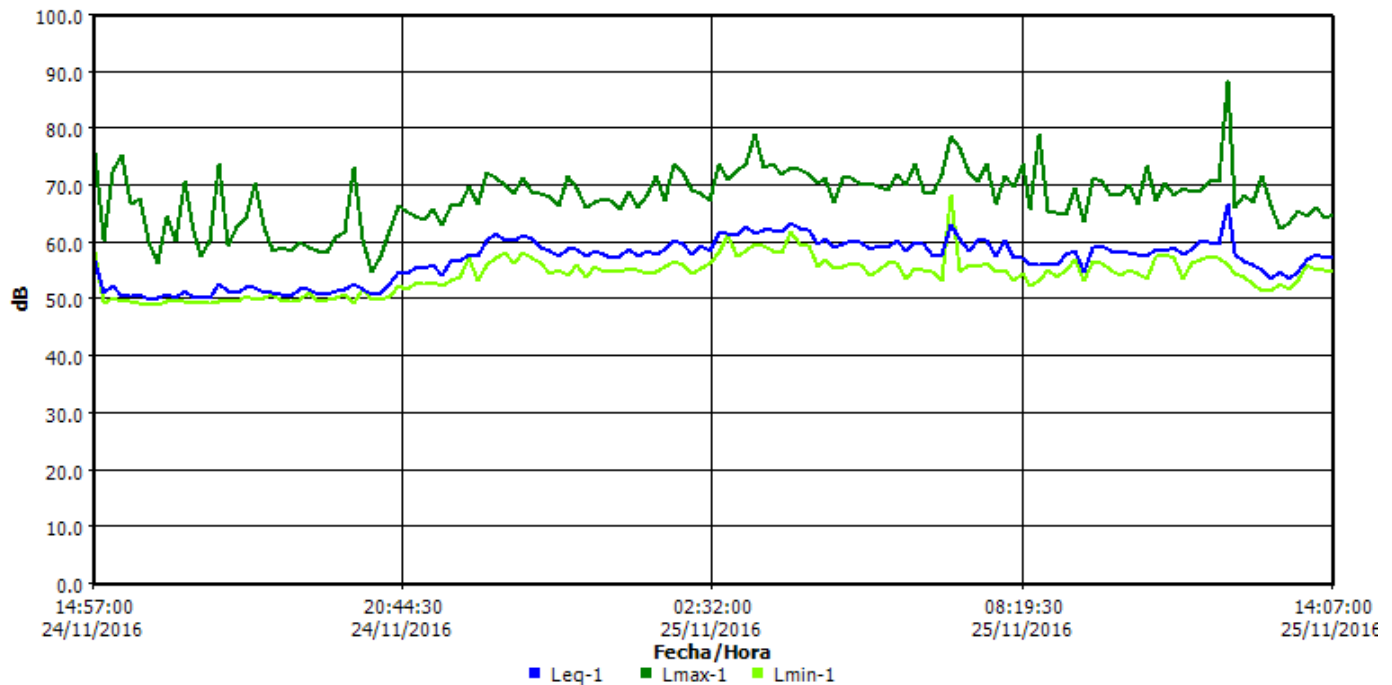
Panel de información

Ubicación	Aledaño a Aldea Los Planes
Nombre	ER-7A
Sesión padre	S044
Hora de inicio	Jueves, 24 de Noviembre de 2016 14:47:00
Hora de paro	Viernes, 25 de Noviembre de 2016 14:47:00
Nombre del usuario	EvQ

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Lmin	1	48.3 dB
Lmax	1	88.6 dB	Lpk	1	106.9 dB
Leq	1	58.4 dB			

Gráfica de datos de registro



ER-7A

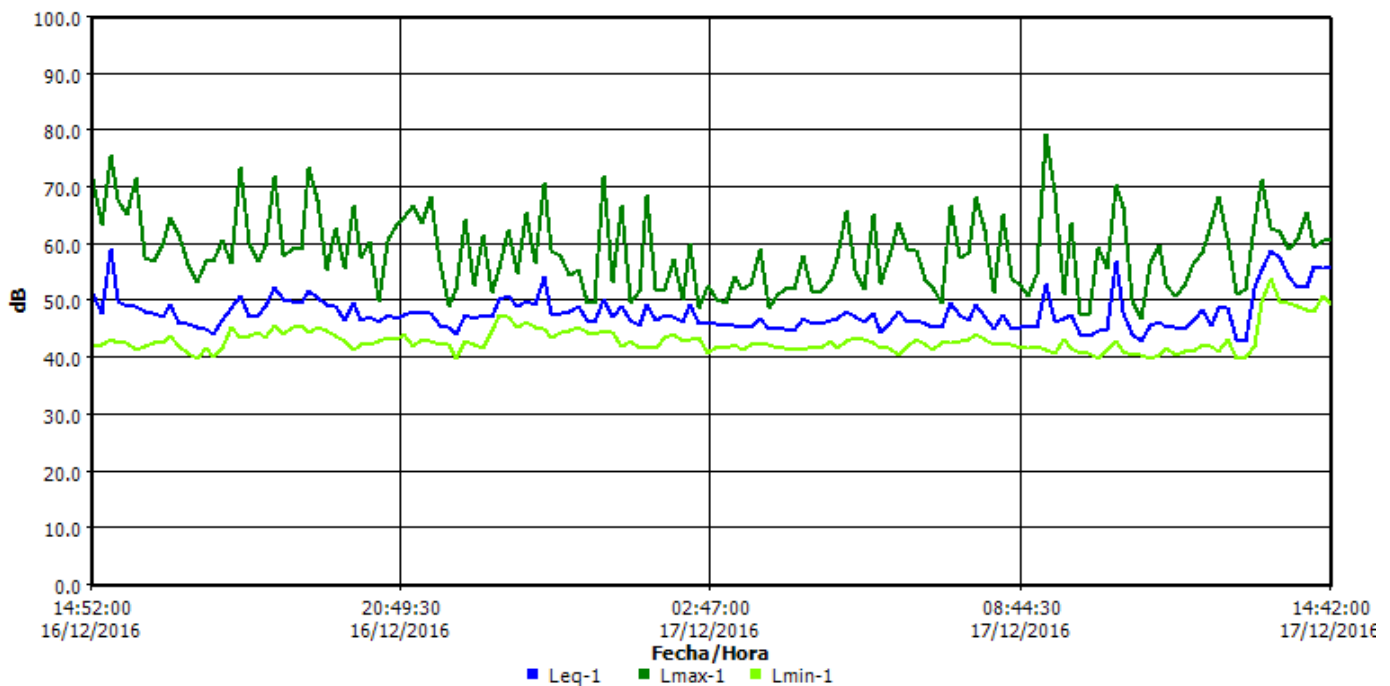
Panel de información

Ubicación	Aledaño a Aldea Los Planes
Nombre	ER-7A
Sesión padre	S262
Hora de inicio	Viernes, 16 de Diciembre de 2016 14:42:00
Hora de paro	Sábado, 17 de Diciembre de 2016 14:42:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	39.8 dB	Lmax	1	79.4 dB
Lpk	1	111 dB	Leq	1	49.5 dB

Gráfica de datos de registro



ER-3

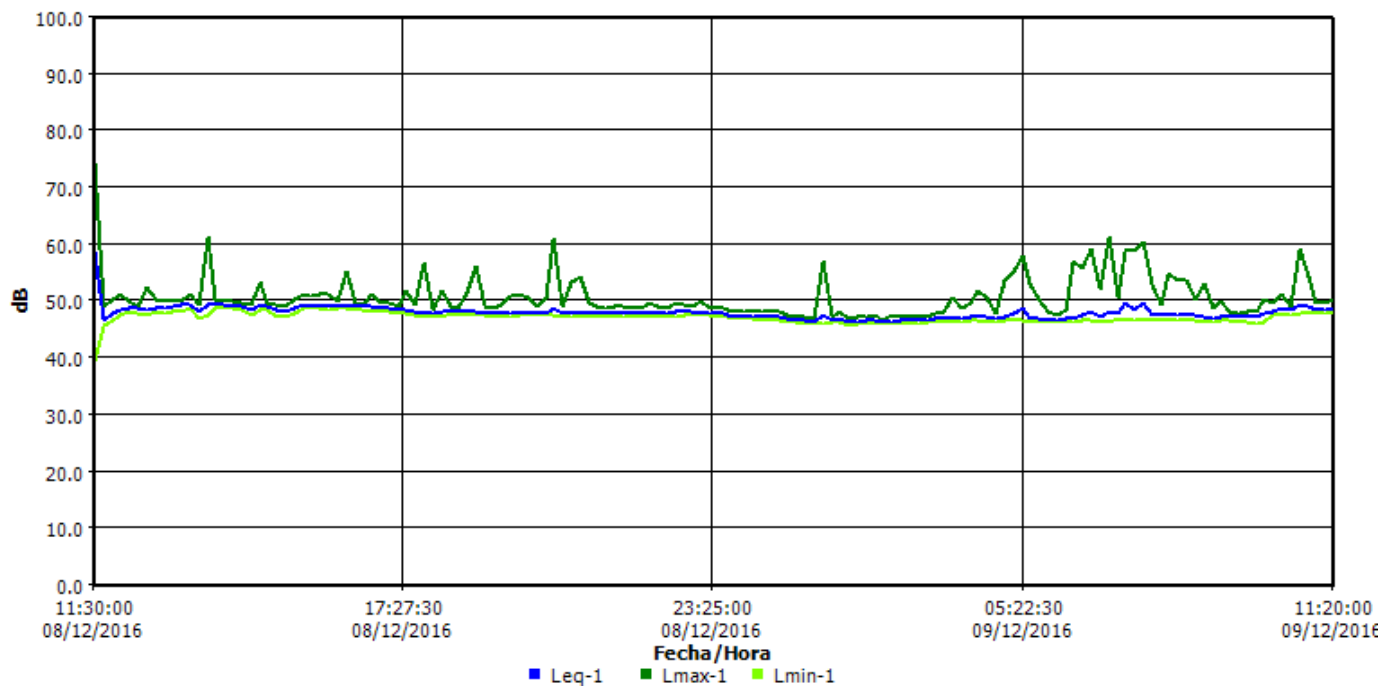
Panel de información

Ubicación	Aledaño a Aldea El Fucio
Nombre	ER-3
Sesión padre	S261
Hora de inicio	Jueves, 08 de Diciembre de 2016 11:20:00
Hora de paro	Viernes, 09 de Diciembre de 2016 11:20:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	39.5 dB	Lmax	1	74.2 dB
Lpk	1	104 dB	Leq	1	48.3 dB

Gráfica de datos de registro



ER-2

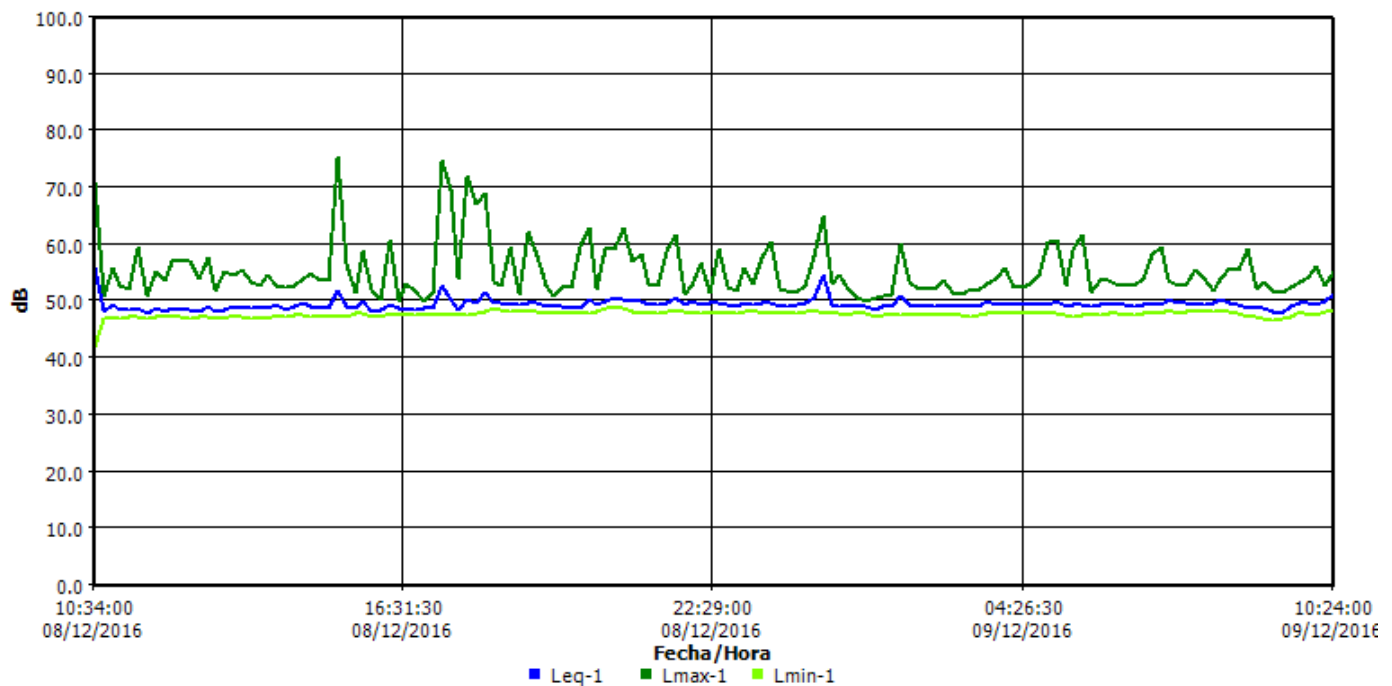
Panel de información

Ubicación	Aldea La Cuchilla
Nombre	ER-2
Sesión padre	S171
Hora de inicio	Jueves, 08 de Diciembre de 2016 10:24:00
Hora de paro	Viernes, 09 de Diciembre de 2016 10:24:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	41.9 dB	Lmax	1	75.3 dB
Lpk	1	110.9 dB	Leq	1	49.5 dB

Gráfica de datos de registro



ER-1A

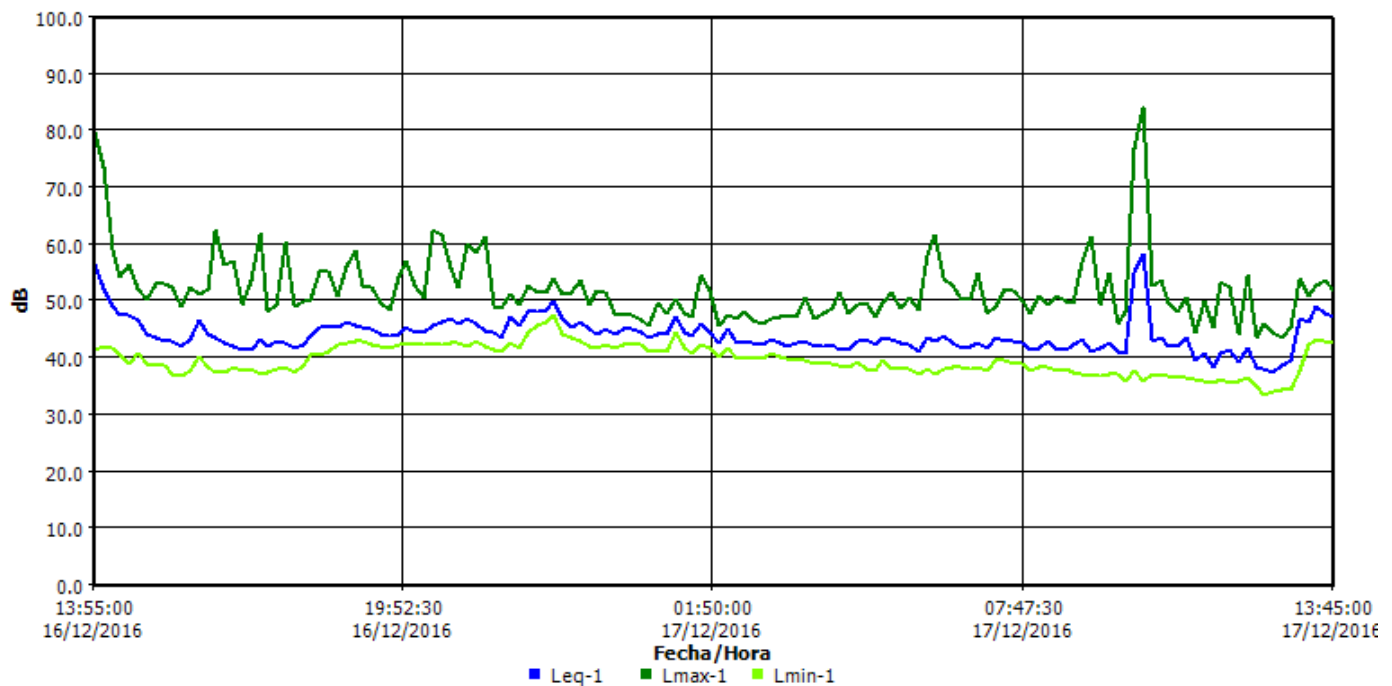
Panel de información

Ubicación	San Rafael las Flores
Nombre	ER-1A
Sesión padre	S172
Hora de inicio	Viernes, 16 de Diciembre de 2016 13:45:00
Hora de paro	Sábado, 17 de Diciembre de 2016 13:45:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	33.4 dB	Lmax	1	84.2 dB
Lpk	1	107.3 dB	Leq	1	45.7 dB

Gráfica de datos de registro



ER-7A

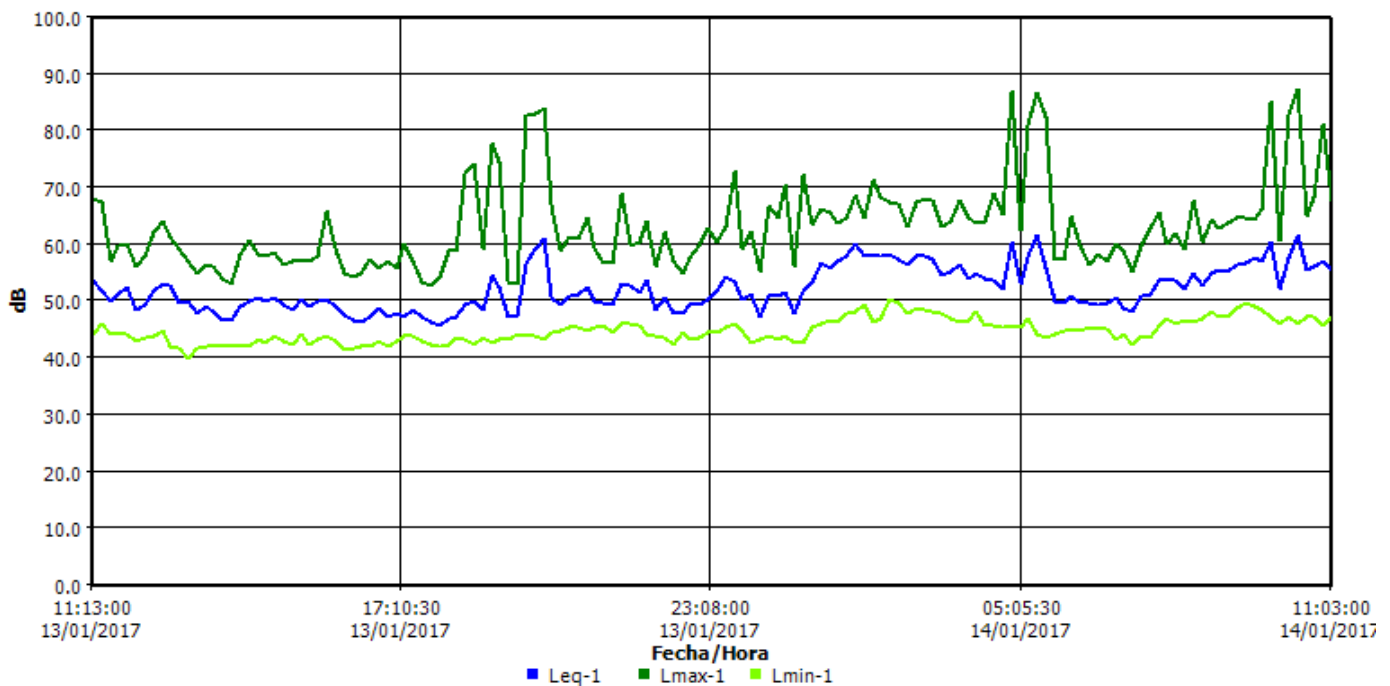
Panel de información

Ubicación Aledaño a Aldea Los Planes
Nombre ER-7A
Sesión padre S263
Hora de inicio Viernes, 13 de Enero de 2017 11:03:00
Hora de paro Sábado, 14 de Enero de 2017 11:03:00
Nombre del usuario

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	39.9 dB	Lmax	1	87.4 dB
Lpk	1	119.6 dB	Leq	1	53.9 dB

Gráfica de datos de registro



ER-3

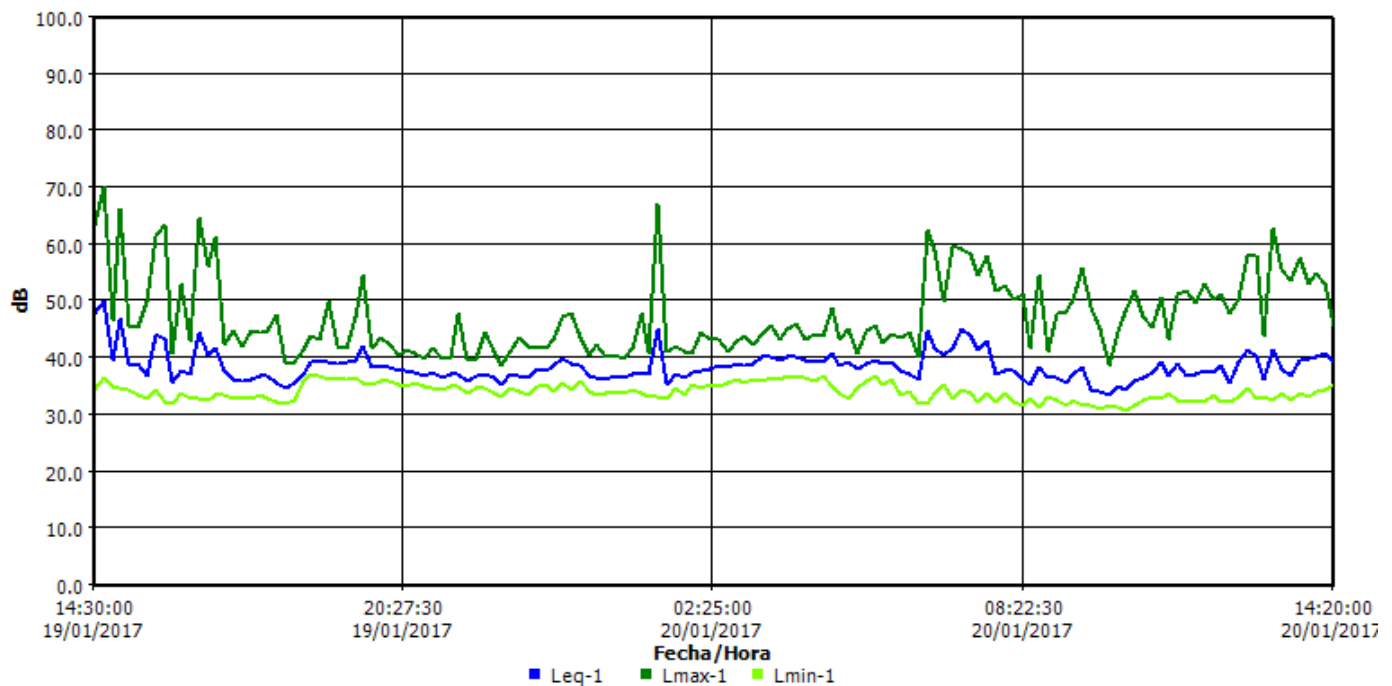
Panel de información

Ubicación	Aledaño a Aldea El Fucio
Nombre	ER-3
Sesión padre	S264
Hora de inicio	Jueves, 19 de Enero de 2017 14:20:00
Hora de paro	Viernes, 20 de Enero de 2017 14:20:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	80 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	30.6 dB	Lmax	1	70.3 dB
Lpk	1	99.6 dB	Leq	1	39.6 dB

Gráfica de datos de registro



ER-2

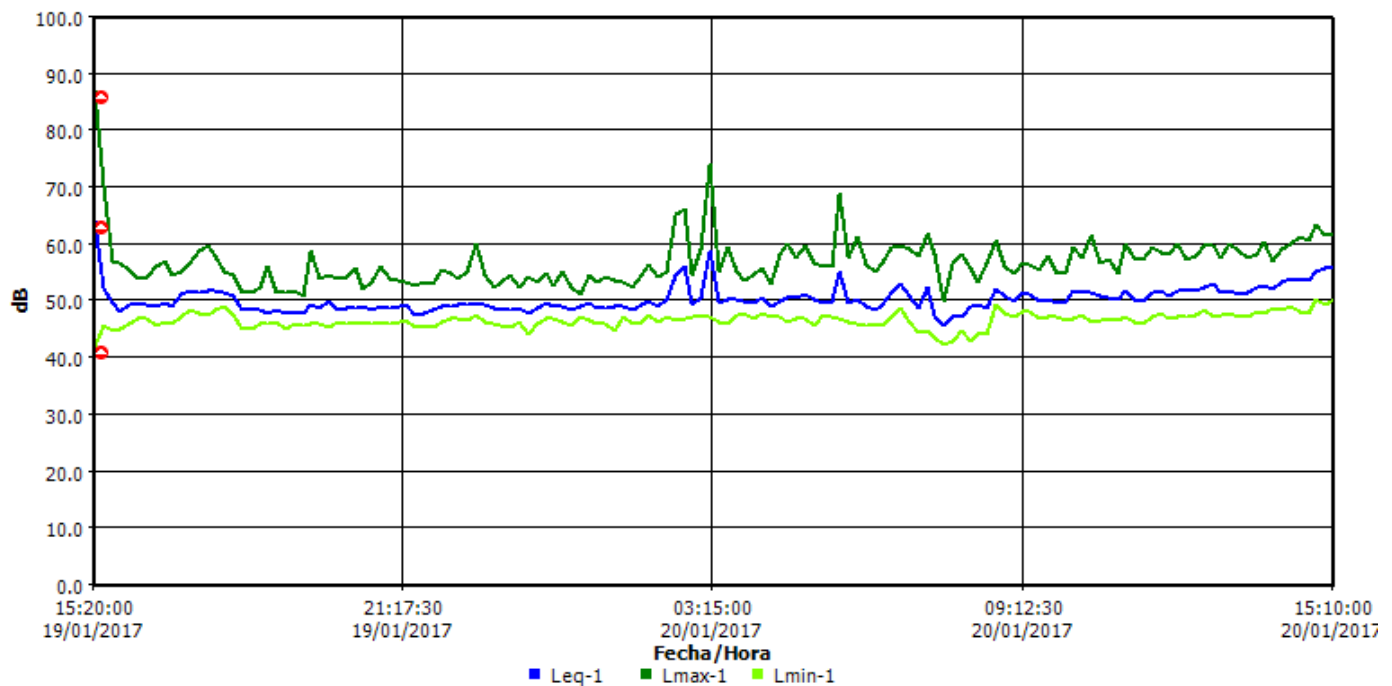
Panel de información

Ubicación	Aldea La Cuchilla
Nombre	ER-2
Sesión padre	S176
Hora de inicio	Jueves, 19 de Enero de 2017 15:10:00
Hora de paro	Viernes, 20 de Enero de 2017 15:10:00
Nombre del usuario	

Panel general de datos

Descripción	Medidor/Sensor	Valor	Descripción	Medidor/Sensor	Valor
Índice de intercambio	1	3 dB	Umbral int.	1	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	42.1 dB	Lmax	1	87.1 dB
Lpk	1	113 dB	Leq	1	51.4 dB

Gráfica de datos de registro



ER-1

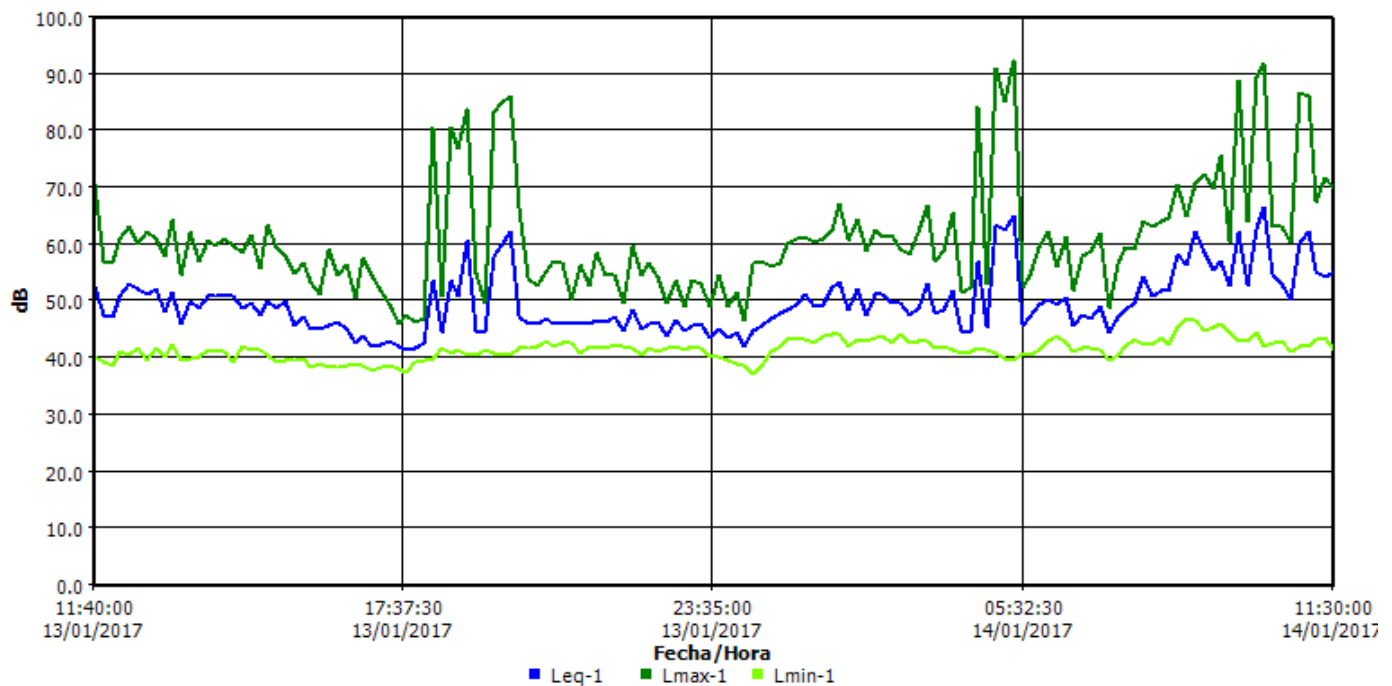
Panel de información

Ubicación Depósito de suelos norte, a inmediaciones de Aldea Los Planes
Nombre ER-1
Sesión padre S175
Hora de inicio Viernes, 13 de Enero de 2017 11:30:00
Hora de paro Sábado, 14 de Enero 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	100 dB
Ponderación	1	A	Respuesta	1	SLOW
Lmin	1	37.2 dB	Lmax	1	92.6 dB
Lpk	1	125.2 dB	Leq	1	54.2 dB

Gráfica de datos de registro



11.4 Certificados de verificación de los equipos utilizados

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

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 TriCal Indicated	% Error	Average %
Abs. P	Room	Qa	Flow			
Crit. Vent.	TEMP	Flow	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 Tri Cal Indicated	% Error	Average %
Abs. P	Room	Qa	Flow			
Crit. Vent.	TEMP	Flow	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 TriCal Indicated	% Error	Average %
Abs. P	Room	Qa	Flow			
Crit. Vent.	TEMP	Flow	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.

3.41P

14-Jun-2017 E. Albuja Pre recent

BP= 748.5 mm of Hg

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

Serial No.

508

Reading		CV			
Abs. P		Qa	Qa		
Crit. Vent.	Room	Flow	TriCal	% Error	
mm of Hg	TEMP	Lpm	Indicated		
199.19	26.4	7.94	7.94	-0.06	
409.11	26.4	16.53	16.40	-0.80	Average %
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			
Abs. P		Qa	Qa		
Crit. Vent.	Room	Flow	Tri Cal	% Error	
mm of Hg	TEMP	Lpm	Indicated		
140.0	26.3	1.58	1.58	-0.04	
303.4	26.3	3.49	3.45	-1.07	Average %
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			
Abs. P		Qa	Qa		
Crit. Vent.	Room	Flow	TriCal	% Error	
mm of Hg	TEMP	Lpm	Indicated		
234.7	26.4	0.434	0.432	-0.42	
440.95	26.4	0.842	0.85	0.98	Average %
614.46	26.4	1.185	1.189	0.34	0.30

**CERTIFICADO DE VERIFICACIÓN DE CALIBRACIÓN DE
SONÓMETROS**
oct-16

Certificado Numero: 1914

Características del Equipo

Nombre de equipo: Sound Level Meter
Modelo: SoundPro SE/DL
Fabricante: Quest Technologies
Unidades de medición: Decibeles
0.5 dB a 25°C; 1.0 dB arriba del rango de temperatura de -10°C a 50°C.
Precisión: Segundo Detector de picos: 1.5dB desde 40 hasta +10dB relativo al límite superior del rango. Análisis en frecuencia desde 16Hz hasta 16KHz en bandas de octavas y desde 12.5Hz hasta 20KHz en tercios de bandas de octavas
Rango de medición: 4 hz (-3dB) a 50kHz (-3dB) en carga lineal únicamente.



Información de la Calibración

Equipo No.:	3	Fecha de Verificación de Calibración:	19/10/2016	m/d/a
Número de Serie :	BGK080007	Vigencia:	30 Días	

Valores Ambientales	
Temperatura °C	21.00
Presión (Pulg. Hg)	24.35
Humedad Relativa (%):	61.00

Lectura de Calibración	114.00	dB
Relectura	114.00	dB

Estado del Equipo: CALIBRADO

Características del Equipo de Calibración

Equipo: QC-10 Calibrator
Numero Serie: QIC100169
Fabricante: Quest Technologies
Rango: 94-114 dB
Fecha Emisión: 12/05/2016
Certificado No.: ICA- 4863114

Responsables

Falla reportada

Cliente solicita revisión y mantenimiento general.

Observaciones

Corrida de prueba de 72 hrs.

Diagnostico

Después de revisar el equipo, se encontró que el equipo solo necesita mantenimiento general.

Trabajos realizados

Mantenimiento de los siguientes componentes:

- Revisión y mantenimiento general de consola de muestreo y kit outdoor.

Al finalizar el mantenimiento se efectuaron las siguientes verificaciones:

- Calibración del equipo.
- Verificación de funciones.
- Test de muestreo de sonido.
- Revisión de kit outdoor.



Repuestos utilizados

- Bateria 12V42AH.
- Empaque Viton 036.
- Rueda derecha kit outdoor.

Responsables:



Luis Rey
Responsable



Ing. Hasan Zolata
Supervisor

Reporte de sesión

25/10/2016

Información general

Nombre S037_BGK080007_25102016_081446

Comentarios

Hora de inicio 19/10/2016 03:30:50 p.m.

Hora de paro 22/10/2016 03:30:50 p.m.

Duración: 3.00:00:00

Tipo de modelo SoundPro DL

Número de serie BGK080007

Revisión del firmware del dispositivo R.13F

Nombre de la compañía

Descripción

Ubicación

Nombre del usuario

Datos de resumen

Descripción	Medidor	Valor	Descripción	Medidor	Valor
Dosis	1	0.3 %	Pdose (8:00)	1	0 %
Lavg	1	--	Lpk	1	104.2 dB
Leq	1	50.2 dB	Promedio ponderado 1 de tiempo (TWA)		59.8 dB
UL, tiempo límite superior	1	00:00:00	SEL	1	104.4 dB
Segundos de exp.	1	11 Pa ² -Sec	ProjectedTWA (8:00)	1	50.2 dB
Mntime	1	19/10/2016 05:20:08 p.m.	Mxtime	1	21/10/2016 08:18:13 a.m.
PKtime	1	19/10/2016 03:30:54 p.m.			
Weighting	1	--	Range Ceiling	1	--
Criterion Level	1	--	ULL	1	--
Dynamic Range	1	--	Exchange Rate	1	--
Response	1	--	Int Threshold	1	--
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	--			
Dosis	2	0.1 %	Pdose (8:00)	2	0 %
Lavg	2	--	Lpk	2	104.2 dB
Leq	2	50.2 dB	Promedio ponderado 2		59.7 dB

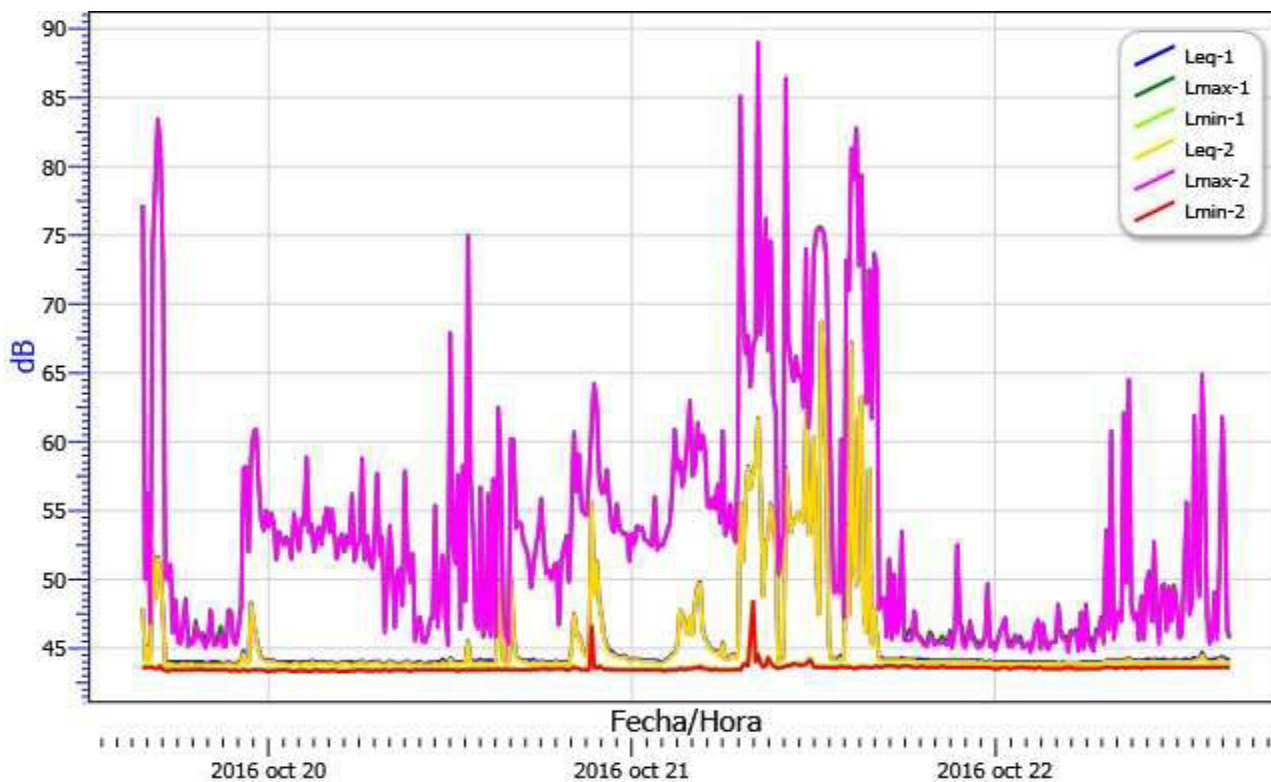
Descripción	Medidor	Valor	Descripción	Medidor	Valor
de tiempo (TWA)					
UL, tiempo límite superior	2	00:00:00	SEL	2	104.3 dB
Segundos de exp.	2	10.8 Pa ² -Sec	ProjectedTWA (8:00)	2	51.9 dB
Mntime	2	19/10/2016 10:40:08 p.m.	Mxtime	2	21/10/2016 08:18:13 a.m.
PKtime	2	19/10/2016 03:30:54 p.m.			
Ponderación	2	A	Range Ceiling	2	--
Nivel de criterio	2	90 dB	ULL	2	115 dB
Dynamic Range	2	--	Índice de intercambio	2	3 dB
Respuesta	2	FAST	Umbral de integración	2	81 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	--			

Historial de calibración

Fecha	Acción de calibración	Nivel	Tipo de modelo del calibrador	Número de serie	Fecha de certificación
19/10/2016 03:29:13 p.m.	Calibración	114.0			

Gráfica de datos de registro

S037_BGK080007_25102016_081446: Gráfica de datos de registro - Read Only



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

oct-16

Certificado Numero: 1913

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.:	3	Fecha de Verificación de Calibración:	18/10/2016
Número de Serie :	083R	Vigencia:	30 Días

Valores Ambientales	
Temperatura (°C)	20.10
Presión (Pulg.Hg)	24.34
Humedad Relativa (%)	65.00

Parámetro	Lectura Calibración PQ200	Lectura Patrón
Flujo (LPM)	16.70	16.72*
Temperatura Ambiente (°C)	20.52	20.50*
Temperatura Filtro (°C)	20.52	20.50*
Barómetro (Pulg.Hg)	24.35	24.34*

Test de vacio		
SP (cm H ₂ O) ₂	35.00	SP < 33
Pi - Vacio inicial (cm H O)	103.00	ΔP < 5
Pf - Vacio final (cm H O)	102.00	

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

Cliente solicita revisión y mantenimiento general.

Observaciones

Revisar sistema de carga.

Diagnostico

Después de cargar al 100% el equipos, se procedió a correr una prueba de 24 hrs. configurado a 16.7 LPM, encontrando que el equipo no llegó al tiempo programado. Se revisará sistema de carga. Se realizará mantenimiento general de todos sus componentes.

Trabajos realizados

Mantenimiento de los siguientes componentes:

- Bomba de vacio (diatragmas, valvulas, ejes)
- Motor eléctrico
- Sensor de flujo másico
- Conexiones del circuito de vacio
- 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

- Empaque Viton 036.
- Batería 12V17AH.

Responsables:



Luis Rey
Responsable



Ing. Hasan Zolata
Supervisor

BGI PQ200 Air Sampling System

Downloaded 2016 24 oct 16:23:43

Job Details:

Job Name:
 Version: 5.62
 Serial No: 083r
 Pump Time: 2688:51
 Flags:

Job Code: 1

Site Name: CTA
 Station Code: LABEL
 Operators: LREY
 User1:
 User2:

	Max	Min	Avg	Units
BP	621	615	619	mmHg
TA	21.2	13.5	16.7	°C
Q	---	---	16.71	Lpm
QCV			0.65	%
Max overheat			25.5	°C
occured		24-oct 16:23:02		

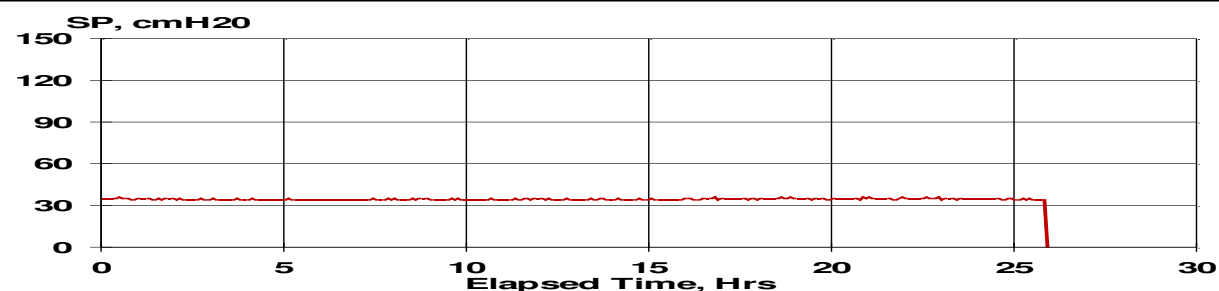
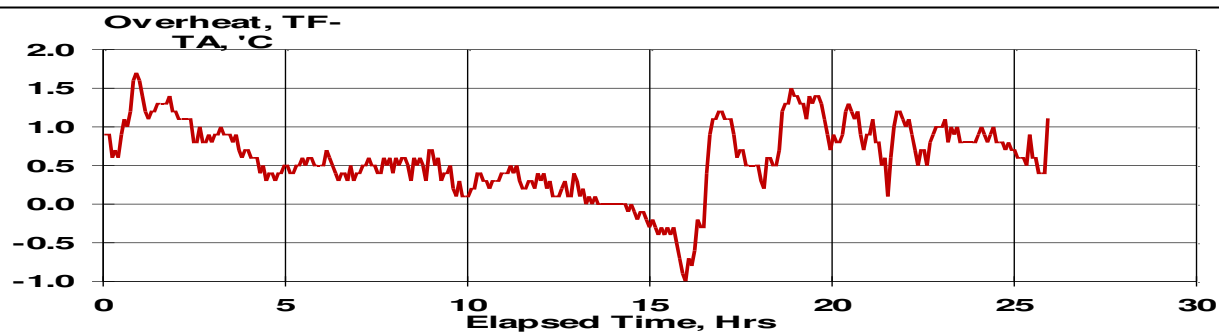
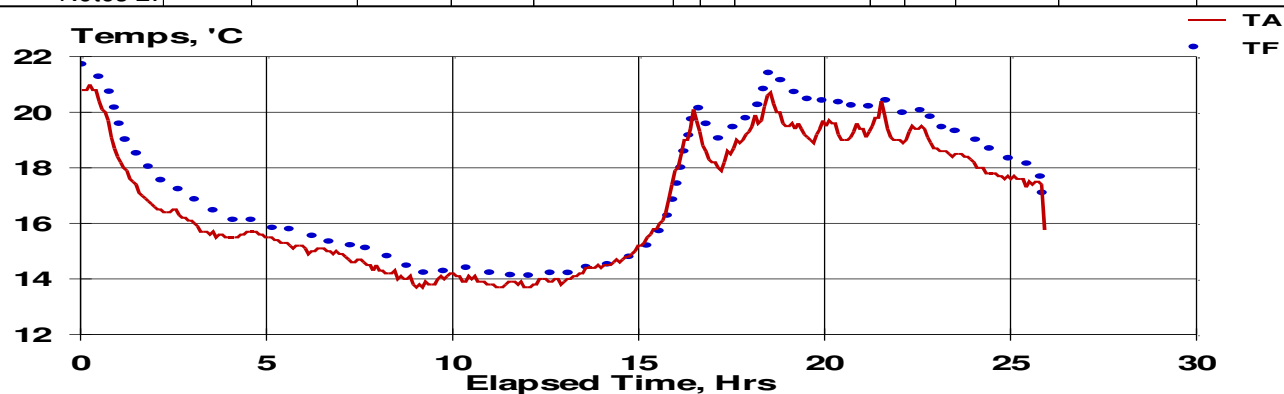
Timer Information:

Date
 dd-mmm
 Start: 16-21-oct
 Stop: 16-22-oct
 ET: 26:00:00
 Time
 hh:mm:ss
 15:50:08
 17:51:05

Mass Concentration Data:

Filter ID:
 Final Wt: mg
 Initial Wt: mg
 Delta Wt: 0.000 mg
 Total Vol: 26.061 m³
 Mass Conc: 0 µg/m³

Notes 1: BATT nueva
 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
16-21-oct	15:55:08	618	20.1	21.1	1.1	35	16.72
16-21-oct	16:55:08	618	17.3	18.6	1.3	35	16.71
16-21-oct	17:55:08	619	16.3	17.3	0.9	34	16.70
16-21-oct	18:55:08	619	15.7	16.5	0.8	34	16.71
16-21-oct	19:55:08	620	15.6	16.1	0.5	34	16.71
16-21-oct	20:55:08	620	15.3	15.8	0.5	34	16.71
16-21-oct	21:55:08	620	15.0	15.5	0.4	34	16.72
16-21-oct	22:55:08	620	14.6	15.1	0.5	34	16.72
16-21-oct	23:55:08	619	14.1	14.7	0.5	35	16.72
16-22-oct	00:55:08	619	13.9	14.3	0.3	34	16.72
16-22-oct	01:55:08	619	14.0	14.3	0.3	34	16.73
16-22-oct	02:55:08	619	13.8	14.1	0.3	34	16.72
16-22-oct	03:55:08	619	13.9	14.1	0.2	34	16.71
16-22-oct	04:55:08	619	14.2	14.3	0.1	34	16.71
16-22-oct	05:55:08	620	14.7	14.6	-0.1	34	16.71
16-22-oct	06:55:08	620	15.9	15.5	-0.4	34	16.71
16-22-oct	07:55:08	620	18.9	19.0	0.1	35	16.71
16-22-oct	08:55:08	621	18.5	19.3	0.8	35	16.72
16-22-oct	09:55:08	621	20.0	20.7	0.8	35	16.72
16-22-oct	10:55:08	620	19.3	20.6	1.3	35	16.71
16-22-oct	11:55:08	620	19.4	20.3	1.0	35	16.71
16-22-oct	12:55:08	620	19.5	20.3	0.8	35	16.72
16-22-oct	13:55:08	619	19.2	20.0	0.8	35	16.71
16-22-oct	14:55:08	619	18.5	19.4	0.9	35	16.72
16-22-oct	15:55:08	620	17.9	18.7	0.9	35	16.71
16-22-oct	16:55:08	620	17.5	18.1	0.6	34	16.71

11.5 Informe Original de los Resultados Analíticos obtenidos de muestras de agua del Laboratorio ACZ Laboratories, INC. Correspondiente al Monitoreo de Diciembre de 2016

11.5.1 Muestras de Agua Superficial (SW)

December 22, 2016

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

Project ID: Escobal

ACZ Project ID: L34542

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on December 09, 2016. This project has been assigned to ACZ's project number, L34542. 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 L34542. 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.

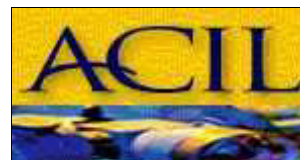
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after January 21, 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.

December 22, 2016

Project ID: Escobal

ACZ Project ID: L34542

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 10 miscellaneous samples from Tahoe Resources, Inc. on December 9, 2016. 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 L34542. 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: SW11

ACZ Sample ID: **L34542-01**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/14/16 14:56	bce
Cyanide, WAD	SM4500-CN I- distillation								12/12/16 18:03	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 11:47	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 15:40	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 14:57	bsu
Total Hot Plate Digestion	M200.2 ICP								12/14/16 10:14	aeb
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 12:43	mfm

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW11

ACZ Sample ID: **L34542-01**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

Sample Matrix: Surface Water

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.06	B		mg/L	0.03	0.2	12/12/16 22:16	aeb
Aluminum, total	M200.7 ICP	1	0.17	B		mg/L	0.03	0.2	12/15/16 14:57	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0184			mg/L	0.0004	0.002	12/13/16 19:31	enb
Antimony, total	M200.8 ICP-MS	1	0.0173			mg/L	0.0004	0.002	12/15/16 19:13	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0094			mg/L	0.0002	0.001	12/13/16 19:31	enb
Arsenic, total	M200.8 ICP-MS	1	0.009			mg/L	0.0002	0.001	12/15/16 19:13	mfm
Barium, dissolved	M200.7 ICP	1	0.047			mg/L	0.003	0.02	12/13/16 16:01	aeb
Barium, total	M200.7 ICP	1	0.052			mg/L	0.003	0.02	12/16/16 13:57	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:16	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 14:57	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:16	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 14:57	aeb
Boron, dissolved	M200.7 ICP	1	0.15			mg/L	0.01	0.05	12/12/16 22:16	aeb
Boron, total	M200.7 ICP	1	0.14			mg/L	0.01	0.05	12/16/16 13:57	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:31	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:13	mfm
Calcium, dissolved	M200.7 ICP	1	380		*	mg/L	0.1	0.5	12/12/16 22:16	aeb
Calcium, total	M200.7 ICP	1	370			mg/L	0.1	0.5	12/15/16 14:57	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:16	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 13:57	gss
Cobalt, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/12/16 22:16	aeb
Cobalt, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 14:57	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:16	aeb
Copper, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 14:57	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:16	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 14:57	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/12/16 22:16	aeb
Iron, total	M200.7 ICP	1	0.03	B		mg/L	0.02	0.05	12/16/16 13:57	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0007			mg/L	0.0001	0.0005	12/13/16 19:31	enb
Lead, total	M200.8 ICP-MS	1	0.0014			mg/L	0.0001	0.0005	12/15/16 19:13	mfm
Lithium, dissolved	M200.7 ICP	1	0.101			mg/L	0.008	0.04	12/12/16 22:16	aeb
Lithium, total	M200.7 ICP	1	0.106			mg/L	0.008	0.04	12/15/16 14:57	aeb
Magnesium, dissolved	M200.7 ICP	1	18.8			mg/L	0.2	1	12/12/16 22:16	aeb
Magnesium, total	M200.7 ICP	1	19.1			mg/L	0.2	1	12/15/16 14:57	aeb
Manganese, dissolved	M200.7 ICP	1	0.058			mg/L	0.005	0.03	12/12/16 22:16	aeb
Manganese, total	M200.7 ICP	1	0.071			mg/L	0.005	0.03	12/16/16 13:57	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 11:27	pta
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:47	scp
Molybdenum, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.02	0.1	12/12/16 22:16	aeb
Molybdenum, total	M200.7 ICP	1	0.05	B		mg/L	0.02	0.1	12/15/16 14:57	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:16	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 14:57	aeb
Potassium, dissolved	M200.7 ICP	1	12.9			mg/L	0.2	1	12/12/16 22:16	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW11

ACZ Sample ID: **L34542-01**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	12.7			mg/L	0.2	1	12/15/16 14:57	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:16	aeb
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 14:57	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0014			mg/L	0.0001	0.0003	12/13/16 19:31	enb
Selenium, total	M200.8 ICP-MS	1	0.0013			mg/L	0.0001	0.0003	12/15/16 19:13	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 19:31	enb
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/15/16 19:13	mfm
Sodium, dissolved	M200.7 ICP	1	92.4			mg/L	0.2	1	12/12/16 22:16	aeb
Sodium, total	M200.7 ICP	1	92.5			mg/L	0.2	1	12/15/16 14:57	aeb
Strontium, dissolved	M200.7 ICP	1	4.33			mg/L	0.005	0.03	12/12/16 22:16	aeb
Strontium, total	M200.7 ICP	1	4.29			mg/L	0.005	0.03	12/16/16 13:57	gss
Thallium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/13/16 19:31	enb
Thallium, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/15/16 19:13	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/12/16 22:16	aeb
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	12/15/16 14:57	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:16	aeb
Titanium, total	M200.7 ICP	1		U		mg/L	0.005	0.03	12/15/16 14:57	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:31	enb
Uranium, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/15/16 19:13	mfm
Vanadium, dissolved	M200.7 ICP	1	0.009	B		mg/L	0.005	0.03	12/12/16 22:16	aeb
Vanadium, total	M200.7 ICP	1	0.011	B		mg/L	0.005	0.03	12/15/16 14:57	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:16	aeb
Zinc, total	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/15/16 14:57	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW11

ACZ Sample ID: **L34542-01**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	37.3		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	37.3		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			2.0			%			12/22/16 0:00	calc
Sum of Anions			24.0			meq/L			12/22/16 0:00	calc
Sum of Cations			25			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 10:42	sck
Chloride	SM4500Cl-E	1	78.9		*	mg/L	0.5	2	12/15/16 15:11	spl
Conductivity @25C	SM2510B	1	1990		*	umhos/cm	1	10	12/10/16 22:17	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:21	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 16:47	bce
Fluoride	SM4500F-C	1	1.25		*	mg/L	0.05	0.3	12/13/16 16:57	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		1030			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	5	4.1		*	mg/L	0.1	0.5	12/16/16 22:13	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/21/16 12:48	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.6		*	mg/L	0.1	0.5	12/16/16 0:23	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.5		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/15/16 0:56	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	12/09/16 20:09	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.02	B	*	mg/L	0.02	0.05	12/15/16 0:09	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	1760		*	mg/L	10	20	12/09/16 16:26	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 12:56	emk
Residue, Total (TS) @105C	SM2540B	1	1810		*	mg/L	10	20	12/09/16 16:05	sck
Sulfate	D516-02/-07 - Turbidimetric	100	1000		*	mg/L	100	500	12/20/16 15:45	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 14:56	emk
TDS (calculated)	Calculation		1610			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.09						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW2A-E

ACZ Sample ID: **L34542-02**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/14/16 15:04	bce
Cyanide, WAD	SM4500-CN I- distillation								12/12/16 18:12	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 11:58	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 15:55	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:14	bsu
Total Hot Plate Digestion	M200.2 ICP								12/14/16 10:27	aeb
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 12:53	mfm

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW2A-E

ACZ Sample ID: **L34542-02**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

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	12/12/16 22:19	aeb
Aluminum, total	M200.7 ICP	1	0.18	B		mg/L	0.03	0.2	12/15/16 15:00	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0184			mg/L	0.0004	0.002	12/13/16 19:35	enb
Antimony, total	M200.8 ICP-MS	1	0.0175			mg/L	0.0004	0.002	12/15/16 19:16	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0097			mg/L	0.0002	0.001	12/13/16 19:35	enb
Arsenic, total	M200.8 ICP-MS	1	0.0094			mg/L	0.0002	0.001	12/15/16 19:16	mfm
Barium, dissolved	M200.7 ICP	1	0.048			mg/L	0.003	0.02	12/13/16 16:04	aeb
Barium, total	M200.7 ICP	1	0.052			mg/L	0.003	0.02	12/16/16 14:00	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:19	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:00	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:19	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:00	aeb
Boron, dissolved	M200.7 ICP	1	0.15			mg/L	0.01	0.05	12/12/16 22:19	aeb
Boron, total	M200.7 ICP	1	0.14			mg/L	0.01	0.05	12/16/16 14:00	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:35	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:16	mfm
Calcium, dissolved	M200.7 ICP	1	385		*	mg/L	0.1	0.5	12/12/16 22:19	aeb
Calcium, total	M200.7 ICP	1	371			mg/L	0.1	0.5	12/15/16 15:00	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:19	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:00	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:19	aeb
Cobalt, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:00	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:19	aeb
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/15/16 15:00	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:19	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:00	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/12/16 22:19	aeb
Iron, total	M200.7 ICP	1	0.06			mg/L	0.02	0.05	12/16/16 14:00	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0007			mg/L	0.0001	0.0005	12/13/16 19:35	enb
Lead, total	M200.8 ICP-MS	1	0.0015			mg/L	0.0001	0.0005	12/15/16 19:16	mfm
Lithium, dissolved	M200.7 ICP	1	0.104			mg/L	0.008	0.04	12/12/16 22:19	aeb
Lithium, total	M200.7 ICP	1	0.106			mg/L	0.008	0.04	12/15/16 15:00	aeb
Magnesium, dissolved	M200.7 ICP	1	19.1			mg/L	0.2	1	12/12/16 22:19	aeb
Magnesium, total	M200.7 ICP	1	19.0			mg/L	0.2	1	12/15/16 15:00	aeb
Manganese, dissolved	M200.7 ICP	1	0.059			mg/L	0.005	0.03	12/12/16 22:19	aeb
Manganese, total	M200.7 ICP	1	0.073			mg/L	0.005	0.03	12/16/16 14:00	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:16	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:50	scp
Molybdenum, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.02	0.1	12/12/16 22:19	aeb
Molybdenum, total	M200.7 ICP	1	0.05	B		mg/L	0.02	0.1	12/15/16 15:00	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:19	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:00	aeb
Potassium, dissolved	M200.7 ICP	1	13.1			mg/L	0.2	1	12/12/16 22:19	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW2A-E

ACZ Sample ID: **L34542-02**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	12.8			mg/L	0.2	1	12/15/16 15:00	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:19	aeb
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:00	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0013			mg/L	0.0001	0.0003	12/13/16 19:35	enb
Selenium, total	M200.8 ICP-MS	1	0.0013			mg/L	0.0001	0.0003	12/15/16 19:16	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 19:35	enb
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/15/16 19:16	mfm
Sodium, dissolved	M200.7 ICP	1	94.5			mg/L	0.2	1	12/12/16 22:19	aeb
Sodium, total	M200.7 ICP	1	92.8			mg/L	0.2	1	12/15/16 15:00	aeb
Strontium, dissolved	M200.7 ICP	1	4.43			mg/L	0.005	0.03	12/12/16 22:19	aeb
Strontium, total	M200.7 ICP	1	4.31			mg/L	0.005	0.03	12/16/16 14:00	gss
Thallium, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	12/13/16 19:35	enb
Thallium, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/15/16 19:16	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/12/16 22:19	aeb
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	12/15/16 15:00	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:19	aeb
Titanium, total	M200.7 ICP	1		U		mg/L	0.005	0.03	12/15/16 15:00	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:35	enb
Uranium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:16	mfm
Vanadium, dissolved	M200.7 ICP	1	0.006	B		mg/L	0.005	0.03	12/12/16 22:19	aeb
Vanadium, total	M200.7 ICP	1	0.011	B		mg/L	0.005	0.03	12/15/16 15:00	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:19	aeb
Zinc, total	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/15/16 15:00	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW2A-E

ACZ Sample ID: **L34542-02**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	37.8		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	37.8		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			4.2			%			12/22/16 0:00	calc
Sum of Anions			23.0			meq/L			12/22/16 0:00	calc
Sum of Cations			25			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 11:03	sck
Chloride	SM4500Cl-E	1	78.8		*	mg/L	0.5	2	12/15/16 15:11	spl
Conductivity @25C	SM2510B	1	1990		*	umhos/cm	1	10	12/10/16 22:26	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:22	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 16:48	bce
Fluoride	SM4500F-C	1	1.29		*	mg/L	0.05	0.3	12/13/16 17:00	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		1040			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	2	4.19		*	mg/L	0.04	0.2	12/16/16 22:16	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/21/16 12:53	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.6		*	mg/L	0.1	0.5	12/16/16 0:24	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.5		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/15/16 0:59	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	12/09/16 20:13	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.02	B	*	mg/L	0.02	0.05	12/15/16 0:12	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	1770		*	mg/L	10	20	12/09/16 16:28	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 12:58	emk
Residue, Total (TS) @ 105C	SM2540B	1	1800		*	mg/L	10	20	12/09/16 16:06	sck
Sulfate	D516-02/-07 - Turbidimetric	100	952		*	mg/L	100	500	12/20/16 15:45	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 14:59	emk
TDS (calculated)	Calculation		1570			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.13						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW10

ACZ Sample ID: **L34542-03**

Date Sampled: 12/06/16 12:00

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/14/16 15:19	bce
Cyanide, WAD	SM4500-CN I- distillation								12/19/16 10:49	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 12:09	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 16:09	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:31	bsu
Total Hot Plate Digestion	M200.2 ICP								12/14/16 11:04	aeb
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 13:04	mfm

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW10

ACZ Sample ID: **L34542-03**

Date Sampled: 12/06/16 12:00

Date Received: 12/09/16

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	12/12/16 22:22	aeb
Aluminum, total	M200.7 ICP	1	0.04	B		mg/L	0.03	0.2	12/15/16 15:10	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/13/16 19:38	enb
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/15/16 19:19	mfm
Arsenic, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	12/13/16 19:38	enb
Arsenic, total	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	12/15/16 19:19	mfm
Barium, dissolved	M200.7 ICP	1		U	*	mg/L	0.003	0.02	12/13/16 16:08	aeb
Barium, total	M200.7 ICP	1		U		mg/L	0.003	0.02	12/16/16 14:10	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:22	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:10	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:22	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:10	aeb
Boron, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:22	aeb
Boron, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:10	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:38	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:19	mfm
Calcium, dissolved	M200.7 ICP	1	0.3	B		mg/L	0.1	0.5	12/12/16 22:22	aeb
Calcium, total	M200.7 ICP	1		U		mg/L	0.1	0.5	12/15/16 15:10	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:22	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:10	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:22	aeb
Cobalt, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:10	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:22	aeb
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/15/16 15:10	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:22	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:10	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/12/16 22:22	aeb
Iron, total	M200.7 ICP	1		U		mg/L	0.02	0.05	12/16/16 14:10	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:38	enb
Lead, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:19	mfm
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:22	aeb
Lithium, total	M200.7 ICP	1	0.010	B		mg/L	0.008	0.04	12/15/16 15:10	aeb
Magnesium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	12/12/16 22:22	aeb
Magnesium, total	M200.7 ICP	1		U		mg/L	0.2	1	12/15/16 15:10	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:22	aeb
Manganese, total	M200.7 ICP	1		U		mg/L	0.005	0.03	12/16/16 14:10	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:19	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:51	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/12/16 22:22	aeb
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	12/15/16 15:10	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:22	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:10	aeb
Potassium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	12/12/16 22:22	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW10

ACZ Sample ID: **L34542-03**

Date Sampled: 12/06/16 12:00

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1		U	mg/L	0.2	1	12/15/16 15:10	aeb
Scandium, dissolved	M200.7 ICP	1		U	mg/L	0.1	0.5	12/12/16 22:22	aeb
Scandium, total	M200.7 ICP	1		U	mg/L	0.1	0.5	12/15/16 15:10	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	12/13/16 19:38	enb
Selenium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	12/15/16 19:19	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	12/13/16 19:38	enb
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	12/15/16 19:19	mfm
Sodium, dissolved	M200.7 ICP	1		U	mg/L	0.2	1	12/12/16 22:22	aeb
Sodium, total	M200.7 ICP	1		U	mg/L	0.2	1	12/15/16 15:10	aeb
Strontium, dissolved	M200.7 ICP	1	0.006	B	mg/L	0.005	0.03	12/12/16 22:22	aeb
Strontium, total	M200.7 ICP	1		U	mg/L	0.005	0.03	12/16/16 14:10	gss
Thallium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/13/16 19:38	enb
Thallium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/15/16 19:19	mfm
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	12/12/16 22:22	aeb
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	12/15/16 15:10	aeb
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	12/12/16 22:22	aeb
Titanium, total	M200.7 ICP	1		U	mg/L	0.005	0.03	12/15/16 15:10	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/13/16 19:38	enb
Uranium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/15/16 19:19	mfm
Vanadium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	12/12/16 22:22	aeb
Vanadium, total	M200.7 ICP	1		U	mg/L	0.005	0.03	12/15/16 15:10	aeb
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	12/12/16 22:22	aeb
Zinc, total	M200.7 ICP	1	0.01	B	mg/L	0.01	0.05	12/15/16 15:10	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW10

ACZ Sample ID: **L34542-03**

Date Sampled: 12/06/16 12:00

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			n/a			%			12/22/16 0:00	calc
Sum of Anions			N/A			meq/L			12/22/16 0:00	calc
Sum of Cations				U		meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 11:10	sck
Chloride	SM4500Cl-E	1		U	*	mg/L	0.5	2	12/15/16 16:04	spl
Conductivity @25C	SM2510B	1	3.3	B	*	umhos/cm	1	10	12/10/16 22:42	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:24	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/20/16 20:57	pjb
Fluoride	SM4500F-C	1		U	*	mg/L	0.05	0.3	12/13/16 17:07	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		0.749	B		mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	1	0.04	B	*	mg/L	0.02	0.1	12/16/16 21:47	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/21/16 12:54	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/16/16 0:25	pjb
pH (lab)	SM4500H+ B									
pH		1	6.5	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.4		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/15/16 1:01	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	12/09/16 20:14	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/15/16 0:14	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	12	B	*	mg/L	10	20	12/09/16 16:34	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 13:04	emk
Residue, Total (TS) @ 105C	SM2540B	1	12	B	*	mg/L	10	20	12/09/16 16:08	sck
Sulfate	D516-02/-07 - Turbidimetric	1		U	*	mg/L	1	5	12/20/16 15:32	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 15:02	emk
TDS (calculated)	Calculation		0.306			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		39.22						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW8-E

ACZ Sample ID: **L34542-04**

Date Sampled: 12/06/16 09:15

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/14/16 15:35	bce
Cyanide, WAD	SM4500-CN I- distillation								12/19/16 11:08	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 12:21	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 16:16	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:39	bsu
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 13:15	mfm
Total Hot Plate Digestion	M200.2 ICP								12/14/16 11:16	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW8-E

ACZ Sample ID: **L34542-04**

Date Sampled: 12/06/16 09:15

Date Received: 12/09/16

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	12/12/16 22:25	aeb
Aluminum, total	M200.7 ICP	1	0.30			mg/L	0.03	0.2	12/15/16 15:13	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.002			mg/L	0.0004	0.002	12/13/16 19:41	enb
Antimony, total	M200.8 ICP-MS	1	0.0018	B		mg/L	0.0004	0.002	12/15/16 19:22	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0044			mg/L	0.0002	0.001	12/13/16 19:41	enb
Arsenic, total	M200.8 ICP-MS	1	0.0045			mg/L	0.0002	0.001	12/15/16 19:22	mfm
Barium, dissolved	M200.7 ICP	1	0.138			mg/L	0.003	0.02	12/13/16 16:11	aeb
Barium, total	M200.7 ICP	1	0.138			mg/L	0.003	0.02	12/16/16 14:13	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:25	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:13	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:25	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:13	aeb
Boron, dissolved	M200.7 ICP	1	0.04	B		mg/L	0.01	0.05	12/12/16 22:25	aeb
Boron, total	M200.7 ICP	1	0.03	B		mg/L	0.01	0.05	12/16/16 14:13	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:41	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:22	mfm
Calcium, dissolved	M200.7 ICP	1	99.9			mg/L	0.1	0.5	12/12/16 22:25	aeb
Calcium, total	M200.7 ICP	1	102			mg/L	0.1	0.5	12/15/16 15:13	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:25	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:13	gss
Cobalt, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/12/16 22:25	aeb
Cobalt, total	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/15/16 15:13	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:25	aeb
Copper, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:13	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:25	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:13	aeb
Iron, dissolved	M200.7 ICP	1	0.07			mg/L	0.02	0.05	12/12/16 22:25	aeb
Iron, total	M200.7 ICP	1	0.28			mg/L	0.02	0.05	12/16/16 14:13	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/13/16 19:41	enb
Lead, total	M200.8 ICP-MS	1	0.001			mg/L	0.0001	0.0005	12/15/16 19:22	mfm
Lithium, dissolved	M200.7 ICP	1	0.020	B		mg/L	0.008	0.04	12/12/16 22:25	aeb
Lithium, total	M200.7 ICP	1	0.027	B		mg/L	0.008	0.04	12/15/16 15:13	aeb
Magnesium, dissolved	M200.7 ICP	1	9.1			mg/L	0.2	1	12/12/16 22:25	aeb
Magnesium, total	M200.7 ICP	1	9.4			mg/L	0.2	1	12/15/16 15:13	aeb
Manganese, dissolved	M200.7 ICP	1	0.136			mg/L	0.005	0.03	12/12/16 22:25	aeb
Manganese, total	M200.7 ICP	1	0.151			mg/L	0.005	0.03	12/16/16 14:13	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:20	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:54	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/12/16 22:25	aeb
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	12/15/16 15:13	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:25	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:13	aeb
Potassium, dissolved	M200.7 ICP	1	9.1			mg/L	0.2	1	12/12/16 22:25	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW8-E

ACZ Sample ID: **L34542-04**

Date Sampled: 12/06/16 09:15

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	9.2			mg/L	0.2	1	12/15/16 15:13	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:25	aeb
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:13	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0003	12/13/16 19:41	enb
Selenium, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0003	12/15/16 19:22	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 19:41	enb
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/15/16 19:22	mfm
Sodium, dissolved	M200.7 ICP	1	33.7			mg/L	0.2	1	12/12/16 22:25	aeb
Sodium, total	M200.7 ICP	1	34.2			mg/L	0.2	1	12/15/16 15:13	aeb
Strontium, dissolved	M200.7 ICP	1	0.959			mg/L	0.005	0.03	12/12/16 22:25	aeb
Strontium, total	M200.7 ICP	1	0.939			mg/L	0.005	0.03	12/16/16 14:13	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:41	enb
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:22	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/12/16 22:25	aeb
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	12/15/16 15:13	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:25	aeb
Titanium, total	M200.7 ICP	1	0.015	B		mg/L	0.005	0.03	12/15/16 15:13	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/13/16 19:41	enb
Uranium, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/15/16 19:22	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:25	aeb
Vanadium, total	M200.7 ICP	1	0.007	B		mg/L	0.005	0.03	12/15/16 15:13	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:25	aeb
Zinc, total	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/15/16 15:13	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW8-E

ACZ Sample ID: **L34542-04**

Date Sampled: 12/06/16 09:15

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	111		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	111		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.7			%			12/22/16 0:00	calc
Sum of Anions			7.5			meq/L			12/22/16 0:00	calc
Sum of Cations			7.6			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1	18	B	*	mg/L	10	20	12/16/16 11:31	sck
Chloride	SM4500Cl-E	1	28.2		*	mg/L	0.5	2	12/15/16 16:04	spl
Conductivity @25C	SM2510B	1	680		*	umhos/cm	1	10	12/10/16 22:52	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:25	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/20/16 20:59	pjb
Fluoride	SM4500F-C	1	0.30		*	mg/L	0.05	0.3	12/13/16 17:11	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		287			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	1	3.93		*	mg/L	0.02	0.1	12/16/16 21:48	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1	1.70		*	mg/L	0.05	0.2	12/21/16 12:55	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	2	3.0		*	mg/L	0.2	1	12/16/16 0:26	pjb
pH (lab)	SM4500H+ B									
pH		1	7.9	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.4		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		1.02			mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.33		*	mg/L	0.02	0.05	12/15/16 1:02	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.31	H	*	mg/L	0.02	0.05	12/09/16 20:15	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.41		*	mg/L	0.02	0.05	12/15/16 0:15	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	520		*	mg/L	10	20	12/09/16 16:36	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1	8.0	B	*	mg/L	5	20	12/12/16 13:06	emk
Residue, Total (TS) @ 105C	SM2540B	1	556		*	mg/L	10	20	12/09/16 16:10	sck
Sulfate	D516-02/-07 - Turbidimetric	20	211		*	mg/L	20	100	12/20/16 15:47	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 15:05	emk
TDS (calculated)	Calculation		462			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.13						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW6-E

ACZ Sample ID: **L34542-05**

Date Sampled: 12/06/16 07:20

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/14/16 15:43	bce
Cyanide, WAD	SM4500-CN I- distillation								12/19/16 11:27	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 12:43	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 16:24	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:48	bsu
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 13:26	mfm
Total Hot Plate Digestion	M200.2 ICP								12/14/16 11:29	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW6-E

ACZ Sample ID: **L34542-05**

Date Sampled: 12/06/16 07:20

Date Received: 12/09/16

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	12/12/16 22:34	aeb
Aluminum, total	M200.7 ICP	1	0.25			mg/L	0.03	0.2	12/15/16 15:16	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/13/16 19:45	enb
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/15/16 19:25	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.004			mg/L	0.0002	0.001	12/13/16 19:45	enb
Arsenic, total	M200.8 ICP-MS	1	0.0043			mg/L	0.0002	0.001	12/15/16 19:25	mfm
Barium, dissolved	M200.7 ICP	1	0.074			mg/L	0.003	0.02	12/13/16 16:20	aeb
Barium, total	M200.7 ICP	1	0.074			mg/L	0.003	0.02	12/16/16 14:16	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:34	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:16	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:34	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:16	aeb
Boron, dissolved	M200.7 ICP	1	0.26			mg/L	0.01	0.05	12/12/16 22:34	aeb
Boron, total	M200.7 ICP	1	0.26			mg/L	0.01	0.05	12/16/16 14:16	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:45	enb
Cadmium, total	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	12/15/16 19:25	mfm
Calcium, dissolved	M200.7 ICP	1	17.8			mg/L	0.1	0.5	12/12/16 22:34	aeb
Calcium, total	M200.7 ICP	1	17.8			mg/L	0.1	0.5	12/15/16 15:16	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:34	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:16	gss
Cobalt, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/12/16 22:34	aeb
Cobalt, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:16	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:34	aeb
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/15/16 15:16	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:34	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:16	aeb
Iron, dissolved	M200.7 ICP	1	0.14			mg/L	0.02	0.05	12/12/16 22:34	aeb
Iron, total	M200.7 ICP	1	0.26			mg/L	0.02	0.05	12/16/16 14:16	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:45	enb
Lead, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/15/16 19:25	mfm
Lithium, dissolved	M200.7 ICP	1	0.088			mg/L	0.008	0.04	12/12/16 22:34	aeb
Lithium, total	M200.7 ICP	1	0.093			mg/L	0.008	0.04	12/15/16 15:16	aeb
Magnesium, dissolved	M200.7 ICP	1	3.4			mg/L	0.2	1	12/12/16 22:34	aeb
Magnesium, total	M200.7 ICP	1	3.4			mg/L	0.2	1	12/15/16 15:16	aeb
Manganese, dissolved	M200.7 ICP	1	0.044			mg/L	0.005	0.03	12/12/16 22:34	aeb
Manganese, total	M200.7 ICP	1	0.047			mg/L	0.005	0.03	12/16/16 14:16	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:21	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:54	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/12/16 22:34	aeb
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	12/15/16 15:16	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:34	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:16	aeb
Potassium, dissolved	M200.7 ICP	1	4.3			mg/L	0.2	1	12/12/16 22:34	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW6-E

ACZ Sample ID: **L34542-05**

Date Sampled: 12/06/16 07:20

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	4.3		mg/L	0.2	1	12/15/16 15:16	aeb
Scandium, dissolved	M200.7 ICP	1		U *	mg/L	0.1	0.5	12/12/16 22:34	aeb
Scandium, total	M200.7 ICP	1		U *	mg/L	0.1	0.5	12/15/16 15:16	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	12/13/16 19:45	enb
Selenium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	12/15/16 19:25	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	12/13/16 19:45	enb
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	12/15/16 19:25	mfm
Sodium, dissolved	M200.7 ICP	1	25.7		mg/L	0.2	1	12/12/16 22:34	aeb
Sodium, total	M200.7 ICP	1	26.0		mg/L	0.2	1	12/15/16 15:16	aeb
Strontium, dissolved	M200.7 ICP	1	0.134		mg/L	0.005	0.03	12/12/16 22:34	aeb
Strontium, total	M200.7 ICP	1	0.126		mg/L	0.005	0.03	12/16/16 14:16	gss
Thallium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/13/16 19:45	enb
Thallium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/15/16 19:25	mfm
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	12/12/16 22:34	aeb
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	12/15/16 15:16	aeb
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	12/12/16 22:34	aeb
Titanium, total	M200.7 ICP	1	0.012	B	mg/L	0.005	0.03	12/15/16 15:16	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/13/16 19:45	enb
Uranium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/15/16 19:25	mfm
Vanadium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	12/12/16 22:34	aeb
Vanadium, total	M200.7 ICP	1	0.006	B	mg/L	0.005	0.03	12/15/16 15:16	aeb
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	12/12/16 22:34	aeb
Zinc, total	M200.7 ICP	1	0.01	B	mg/L	0.01	0.05	12/15/16 15:16	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW6-E

ACZ Sample ID: **L34542-05**

Date Sampled: 12/06/16 07:20

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	58.2		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	58.2		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-4.0			%			12/22/16 0:00	calc
Sum of Anions			2.6			meq/L			12/22/16 0:00	calc
Sum of Cations			2.4			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 11:38	sck
Chloride	SM4500Cl-E	1	31.4		*	mg/L	0.5	2	12/15/16 16:04	spl
Conductivity @25C	SM2510B	1	262		*	umhos/cm	1	10	12/10/16 23:00	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:26	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/20/16 21:01	pjb
Fluoride	SM4500F-C	1	0.15	B	*	mg/L	0.05	0.3	12/13/16 17:15	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		58			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	0.07	B	*	mg/L	0.02	0.1	12/16/16 21:50	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/21/16 12:57	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.2	B	*	mg/L	0.1	0.5	12/16/16 0:28	pjb
pH (lab)	SM4500H+ B									
pH		1	8.0	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.5		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		0.09	B		mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	12/15/16 1:05	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.03	BH	*	mg/L	0.02	0.05	12/09/16 20:16	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	12/15/16 0:18	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	202		*	mg/L	10	20	12/09/16 16:39	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 13:09	emk
Residue, Total (TS) @ 105C	SM2540B	1	212		*	mg/L	10	20	12/09/16 16:11	sck
Sulfate	D516-02/-07 - Turbidimetric	1	25.7		*	mg/L	1	5	12/20/16 15:32	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 15:08	emk
TDS (calculated)	Calculation		144			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.40						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW9-E

ACZ Sample ID: **L34542-06**

Date Sampled: 12/06/16 08:10

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/16/16 11:10	bce
Cyanide, WAD	SM4500-CN I- distillation								12/19/16 11:37	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 13:05	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 16:31	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:56	bsu
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 13:37	mfm
Total Hot Plate Digestion	M200.2 ICP								12/14/16 11:41	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW9-E

ACZ Sample ID: **L34542-06**

Date Sampled: 12/06/16 08:10

Date Received: 12/09/16

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	12/12/16 22:38	aeb
Aluminum, total	M200.7 ICP	1	0.25			mg/L	0.03	0.2	12/15/16 15:19	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0012	B		mg/L	0.0004	0.002	12/13/16 19:48	enb
Antimony, total	M200.8 ICP-MS	1	0.0007	B		mg/L	0.0004	0.002	12/15/16 19:28	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0052			mg/L	0.0002	0.001	12/13/16 19:48	enb
Arsenic, total	M200.8 ICP-MS	1	0.0049			mg/L	0.0002	0.001	12/15/16 19:28	mfm
Barium, dissolved	M200.7 ICP	1	0.086			mg/L	0.003	0.02	12/13/16 16:23	aeb
Barium, total	M200.7 ICP	1	0.087			mg/L	0.003	0.02	12/16/16 14:19	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:38	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:19	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:38	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:19	aeb
Boron, dissolved	M200.7 ICP	1	0.16			mg/L	0.01	0.05	12/12/16 22:38	aeb
Boron, total	M200.7 ICP	1	0.16			mg/L	0.01	0.05	12/16/16 14:19	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:48	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:28	mfm
Calcium, dissolved	M200.7 ICP	1	45.4			mg/L	0.1	0.5	12/12/16 22:38	aeb
Calcium, total	M200.7 ICP	1	46.7			mg/L	0.1	0.5	12/15/16 15:19	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:38	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:19	gss
Cobalt, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/12/16 22:38	aeb
Cobalt, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:19	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:38	aeb
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/15/16 15:19	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:38	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:19	aeb
Iron, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.02	0.05	12/12/16 22:38	aeb
Iron, total	M200.7 ICP	1	0.14			mg/L	0.02	0.05	12/16/16 14:19	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:48	enb
Lead, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/15/16 19:28	mfm
Lithium, dissolved	M200.7 ICP	1	0.053			mg/L	0.008	0.04	12/12/16 22:38	aeb
Lithium, total	M200.7 ICP	1	0.061			mg/L	0.008	0.04	12/15/16 15:19	aeb
Magnesium, dissolved	M200.7 ICP	1	7.8			mg/L	0.2	1	12/12/16 22:38	aeb
Magnesium, total	M200.7 ICP	1	8.1			mg/L	0.2	1	12/15/16 15:19	aeb
Manganese, dissolved	M200.7 ICP	1	0.015	B		mg/L	0.005	0.03	12/12/16 22:38	aeb
Manganese, total	M200.7 ICP	1	0.023	B		mg/L	0.005	0.03	12/16/16 14:19	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:22	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:55	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/12/16 22:38	aeb
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	12/15/16 15:19	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:38	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:19	aeb
Potassium, dissolved	M200.7 ICP	1	6.1			mg/L	0.2	1	12/12/16 22:38	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW9-E

ACZ Sample ID: **L34542-06**

Date Sampled: 12/06/16 08:10

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	6.2			mg/L	0.2	1	12/15/16 15:19	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:38	aeb
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:19	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	12/13/16 19:48	enb
Selenium, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0003	12/15/16 19:28	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 19:48	enb
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/15/16 19:28	mfm
Sodium, dissolved	M200.7 ICP	1	31.6			mg/L	0.2	1	12/12/16 22:38	aeb
Sodium, total	M200.7 ICP	1	32.5			mg/L	0.2	1	12/15/16 15:19	aeb
Strontium, dissolved	M200.7 ICP	1	0.435			mg/L	0.005	0.03	12/12/16 22:38	aeb
Strontium, total	M200.7 ICP	1	0.437			mg/L	0.005	0.03	12/16/16 14:19	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:48	enb
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:28	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/12/16 22:38	aeb
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	12/15/16 15:19	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:38	aeb
Titanium, total	M200.7 ICP	1	0.011	B		mg/L	0.005	0.03	12/15/16 15:19	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:48	enb
Uranium, total	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/15/16 19:28	mfm
Vanadium, dissolved	M200.7 ICP	1	0.005	B		mg/L	0.005	0.03	12/12/16 22:38	aeb
Vanadium, total	M200.7 ICP	1	0.009	B		mg/L	0.005	0.03	12/15/16 15:19	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:38	aeb
Zinc, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:19	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW9-E

ACZ Sample ID: **L34542-06**

Date Sampled: 12/06/16 08:10

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	94.3		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	94.3		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-1.1			%			12/22/16 0:00	calc
Sum of Anions			4.6			meq/L			12/22/16 0:00	calc
Sum of Cations			4.5			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 11:45	sck
Chloride	SM4500Cl-E	1	31.5		*	mg/L	0.5	2	12/15/16 16:04	spl
Conductivity @25C	SM2510B	1	457		*	umhos/cm	1	10	12/10/16 23:09	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:47	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/20/16 21:02	pjb
Fluoride	SM4500F-C	1	0.27	B	*	mg/L	0.05	0.3	12/13/16 17:30	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		145			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	1.49		*	mg/L	0.02	0.1	12/16/16 21:55	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/21/16 12:58	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.2	B	*	mg/L	0.1	0.5	12/16/16 0:31	pjb
pH (lab)	SM4500H+ B									
pH		1	8.2	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.6		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		0.65			mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.21		*	mg/L	0.02	0.05	12/15/16 1:07	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.22	H	*	mg/L	0.02	0.05	12/09/16 20:17	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.22		*	mg/L	0.02	0.05	12/15/16 0:20	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	356		*	mg/L	10	20	12/09/16 16:41	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 13:11	emk
Residue, Total (TS) @ 105C	SM2540B	1	360		*	mg/L	10	20	12/09/16 16:13	sck
Sulfate	D516-02/-07 - Turbidimetric	5	84.8		*	mg/L	5	25	12/20/16 15:38	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 15:12	emk
TDS (calculated)	Calculation		265			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.34						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW5-E

ACZ Sample ID: **L34542-07**

Date Sampled: 12/06/16 09:34

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/16/16 11:50	bce
Cyanide, WAD	SM4500-CN I- distillation								12/19/16 11:46	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 13:16	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 16:38	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 16:04	bsu
Total Hot Plate Digestion	M200.2 ICP								12/14/16 11:54	aeb
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 13:47	mfm

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW5-E

ACZ Sample ID: **L34542-07**

Date Sampled: 12/06/16 09:34

Date Received: 12/09/16

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	12/12/16 22:41	aeb
Aluminum, total	M200.7 ICP	1	0.10	B		mg/L	0.03	0.2	12/15/16 15:28	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/13/16 19:58	enb
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/15/16 19:31	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0018			mg/L	0.0002	0.001	12/13/16 19:58	enb
Arsenic, total	M200.8 ICP-MS	1	0.0016			mg/L	0.0002	0.001	12/15/16 19:31	mfm
Barium, dissolved	M200.7 ICP	1	0.059			mg/L	0.003	0.02	12/13/16 16:27	aeb
Barium, total	M200.7 ICP	1	0.063			mg/L	0.003	0.02	12/16/16 14:28	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:41	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:28	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:41	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:28	aeb
Boron, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/12/16 22:41	aeb
Boron, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:28	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:58	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:31	mfm
Calcium, dissolved	M200.7 ICP	1	10.7			mg/L	0.1	0.5	12/12/16 22:41	aeb
Calcium, total	M200.7 ICP	1	10.8			mg/L	0.1	0.5	12/15/16 15:28	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:41	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:28	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:41	aeb
Cobalt, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:28	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:41	aeb
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/15/16 15:28	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:41	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:28	aeb
Iron, dissolved	M200.7 ICP	1	0.07			mg/L	0.02	0.05	12/12/16 22:41	aeb
Iron, total	M200.7 ICP	1	0.15			mg/L	0.02	0.05	12/16/16 14:28	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:58	enb
Lead, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/15/16 19:31	mfm
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:41	aeb
Lithium, total	M200.7 ICP	1	0.012	B		mg/L	0.008	0.04	12/15/16 15:28	aeb
Magnesium, dissolved	M200.7 ICP	1	1.9			mg/L	0.2	1	12/12/16 22:41	aeb
Magnesium, total	M200.7 ICP	1	1.9			mg/L	0.2	1	12/15/16 15:28	aeb
Manganese, dissolved	M200.7 ICP	1	0.026	B		mg/L	0.005	0.03	12/12/16 22:41	aeb
Manganese, total	M200.7 ICP	1	0.027	B		mg/L	0.005	0.03	12/16/16 14:28	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:22	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:56	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/12/16 22:41	aeb
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	12/15/16 15:28	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:41	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:28	aeb
Potassium, dissolved	M200.7 ICP	1	3.0			mg/L	0.2	1	12/12/16 22:41	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW5-E

ACZ Sample ID: **L34542-07**

Date Sampled: 12/06/16 09:34

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	3.1		mg/L	0.2	1	12/15/16 15:28	aeb
Scandium, dissolved	M200.7 ICP	1		U *	mg/L	0.1	0.5	12/12/16 22:41	aeb
Scandium, total	M200.7 ICP	1		U *	mg/L	0.1	0.5	12/15/16 15:28	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	12/13/16 19:58	enb
Selenium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	12/15/16 19:31	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	12/13/16 19:58	enb
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	12/15/16 19:31	mfm
Sodium, dissolved	M200.7 ICP	1	7.0		mg/L	0.2	1	12/12/16 22:41	aeb
Sodium, total	M200.7 ICP	1	7.1		mg/L	0.2	1	12/15/16 15:28	aeb
Strontium, dissolved	M200.7 ICP	1	0.091		mg/L	0.005	0.03	12/12/16 22:41	aeb
Strontium, total	M200.7 ICP	1	0.086		mg/L	0.005	0.03	12/16/16 14:28	gss
Thallium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/13/16 19:58	enb
Thallium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/15/16 19:31	mfm
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	12/12/16 22:41	aeb
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	12/15/16 15:28	aeb
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	12/12/16 22:41	aeb
Titanium, total	M200.7 ICP	1	0.006	B	mg/L	0.005	0.03	12/15/16 15:28	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/13/16 19:58	enb
Uranium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/15/16 19:31	mfm
Vanadium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	12/12/16 22:41	aeb
Vanadium, total	M200.7 ICP	1	0.005	B	mg/L	0.005	0.03	12/15/16 15:28	aeb
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	12/12/16 22:41	aeb
Zinc, total	M200.7 ICP	1	0.01	B	mg/L	0.01	0.05	12/15/16 15:28	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW5-E

ACZ Sample ID: **L34542-07**

Date Sampled: 12/06/16 09:34

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	31.5		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	31.5		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			12/22/16 0:00	calc
Sum of Anions			1.1			meq/L			12/22/16 0:00	calc
Sum of Cations			1.1			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 11:52	sck
Chloride	SM4500Cl-E	1	2.3		*	mg/L	0.5	2	12/15/16 16:04	spl
Conductivity @25C	SM2510B	1	119		*	umhos/cm	1	10	12/10/16 23:18	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:48	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/20/16 21:02	pjb
Fluoride	SM4500F-C	1	0.08	B	*	mg/L	0.05	0.3	12/13/16 17:40	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		35			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	1	0.09	B	*	mg/L	0.02	0.1	12/16/16 21:56	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/21/16 13:01	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.1	B	*	mg/L	0.1	0.5	12/16/16 0:32	pjb
pH (lab)	SM4500H+ B									
pH		1	7.9	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.7		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/15/16 1:08	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	12/09/16 20:20	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/15/16 0:21	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	104		*	mg/L	10	20	12/09/16 16:44	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 13:14	emk
Residue, Total (TS) @ 105C	SM2540B	1	104		*	mg/L	10	20	12/09/16 16:15	sck
Sulfate	D516-02/-07 - Turbidimetric	1	20.1		*	mg/L	1	5	12/20/16 15:56	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 15:21	emk
TDS (calculated)	Calculation		64.5			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.61						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4A-E

ACZ Sample ID: **L34542-08**

Date Sampled: 12/06/16 10:30

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/16/16 12:30	bce
Cyanide, WAD	SM4500-CN I- distillation								12/19/16 11:56	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 13:28	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 16:45	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 16:13	bsu
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 13:58	mfm
Total Hot Plate Digestion	M200.2 ICP								12/14/16 12:06	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4A-E

ACZ Sample ID: **L34542-08**

Date Sampled: 12/06/16 10:30

Date Received: 12/09/16

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	12/12/16 22:50	aeb
Aluminum, total	M200.7 ICP	1	0.21			mg/L	0.03	0.2	12/15/16 15:31	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0079			mg/L	0.0004	0.002	12/13/16 20:08	enb
Antimony, total	M200.8 ICP-MS	1	0.0067			mg/L	0.0004	0.002	12/15/16 19:34	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0076			mg/L	0.0002	0.001	12/13/16 20:08	enb
Arsenic, total	M200.8 ICP-MS	1	0.0068			mg/L	0.0002	0.001	12/15/16 19:34	mfm
Barium, dissolved	M200.7 ICP	1	0.123			mg/L	0.003	0.02	12/13/16 16:30	aeb
Barium, total	M200.7 ICP	1	0.126			mg/L	0.003	0.02	12/16/16 14:31	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:50	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:31	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:50	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:31	aeb
Boron, dissolved	M200.7 ICP	1	0.09			mg/L	0.01	0.05	12/12/16 22:50	aeb
Boron, total	M200.7 ICP	1	0.08			mg/L	0.01	0.05	12/16/16 14:31	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 20:08	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:34	mfm
Calcium, dissolved	M200.7 ICP	1	248			mg/L	0.1	0.5	12/12/16 22:50	aeb
Calcium, total	M200.7 ICP	1	243			mg/L	0.1	0.5	12/15/16 15:31	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:50	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:31	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:50	aeb
Cobalt, total	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/15/16 15:31	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:50	aeb
Copper, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:31	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:50	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:31	aeb
Iron, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.02	0.05	12/12/16 22:50	aeb
Iron, total	M200.7 ICP	1	0.10			mg/L	0.02	0.05	12/16/16 14:31	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0005	12/13/16 20:08	enb
Lead, total	M200.8 ICP-MS	1	0.0007			mg/L	0.0001	0.0005	12/15/16 19:34	mfm
Lithium, dissolved	M200.7 ICP	1	0.051			mg/L	0.008	0.04	12/12/16 22:50	aeb
Lithium, total	M200.7 ICP	1	0.056			mg/L	0.008	0.04	12/15/16 15:31	aeb
Magnesium, dissolved	M200.7 ICP	1	16.8			mg/L	0.2	1	12/12/16 22:50	aeb
Magnesium, total	M200.7 ICP	1	17.3			mg/L	0.2	1	12/15/16 15:31	aeb
Manganese, dissolved	M200.7 ICP	1	0.117			mg/L	0.005	0.03	12/12/16 22:50	aeb
Manganese, total	M200.7 ICP	1	0.131			mg/L	0.005	0.03	12/16/16 14:31	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:25	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:57	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/12/16 22:50	aeb
Molybdenum, total	M200.7 ICP	1	0.03	B		mg/L	0.02	0.1	12/15/16 15:31	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:50	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:31	aeb
Potassium, dissolved	M200.7 ICP	1	10.9			mg/L	0.2	1	12/12/16 22:50	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4A-E

ACZ Sample ID: **L34542-08**

Date Sampled: 12/06/16 10:30

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	11.1			mg/L	0.2	1	12/15/16 15:31	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:50	aeb
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:31	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0003	12/13/16 20:08	enb
Selenium, total	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0003	12/15/16 19:34	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 20:08	enb
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/15/16 19:34	mfm
Sodium, dissolved	M200.7 ICP	1	57.7			mg/L	0.2	1	12/12/16 22:50	aeb
Sodium, total	M200.7 ICP	1	57.8			mg/L	0.2	1	12/15/16 15:31	aeb
Strontium, dissolved	M200.7 ICP	1	2.54			mg/L	0.005	0.03	12/12/16 22:50	aeb
Strontium, total	M200.7 ICP	1	2.52			mg/L	0.005	0.03	12/16/16 14:31	gss
Thallium, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/13/16 20:08	enb
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:34	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/12/16 22:50	aeb
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	12/15/16 15:31	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:50	aeb
Titanium, total	M200.7 ICP	1	0.007	B		mg/L	0.005	0.03	12/15/16 15:31	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	12/13/16 20:08	enb
Uranium, total	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	12/15/16 19:34	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:50	aeb
Vanadium, total	M200.7 ICP	1	0.008	B		mg/L	0.005	0.03	12/15/16 15:31	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:50	aeb
Zinc, total	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/15/16 15:31	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4A-E

ACZ Sample ID: **L34542-08**

Date Sampled: 12/06/16 10:30

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	87.9		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	87.9		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			3.0			%			12/22/16 0:00	calc
Sum of Anions			16			meq/L			12/22/16 0:00	calc
Sum of Cations			17			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 11:59	sck
Chloride	SM4500Cl-E	1	54.6		*	mg/L	0.5	2	12/15/16 16:04	spl
Conductivity @25C	SM2510B	1	1400		*	umhos/cm	1	10	12/10/16 23:27	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:50	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/20/16 21:03	pjb
Fluoride	SM4500F-C	1	0.72		*	mg/L	0.05	0.3	12/13/16 17:44	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		688			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	4	6.50		*	mg/L	0.08	0.4	12/16/16 22:18	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1	0.23		*	mg/L	0.05	0.2	12/21/16 13:03	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.8		*	mg/L	0.1	0.5	12/16/16 0:35	pjb
pH (lab)	SM4500H+ B									
pH		1	8.0	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.8		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		0.74			mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.24		*	mg/L	0.02	0.05	12/15/16 1:09	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.25	H	*	mg/L	0.02	0.05	12/09/16 20:22	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.29		*	mg/L	0.02	0.05	12/15/16 0:22	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	1170		*	mg/L	10	20	12/09/16 16:47	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 13:17	emk
Residue, Total (TS) @ 105C	SM2540B	1	1190		*	mg/L	10	20	12/09/16 16:18	sck
Sulfate	D516-02/-07 - Turbidimetric	50	607		*	mg/L	50	250	12/20/16 16:06	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 15:24	emk
TDS (calculated)	Calculation		1050			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.11						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4-E

ACZ Sample ID: **L34542-09**

Date Sampled: 12/06/16 11:10

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/16/16 12:50	bce
Cyanide, WAD	SM4500-CN I- distillation								12/19/16 12:06	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 13:39	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 16:52	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 16:21	bsu
Total Hot Plate Digestion	M200.2 ICP								12/14/16 12:18	aeb
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 14:09	mfm

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4-E

ACZ Sample ID: **L34542-09**

Date Sampled: 12/06/16 11:10

Date Received: 12/09/16

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	12/12/16 22:53	aeb
Aluminum, total	M200.7 ICP	1	0.17	B		mg/L	0.03	0.2	12/15/16 15:34	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0054			mg/L	0.0004	0.002	12/13/16 20:11	enb
Antimony, total	M200.8 ICP-MS	1	0.0048			mg/L	0.0004	0.002	12/15/16 19:38	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0082			mg/L	0.0002	0.001	12/13/16 20:11	enb
Arsenic, total	M200.8 ICP-MS	1	0.0073			mg/L	0.0002	0.001	12/15/16 19:38	mfm
Barium, dissolved	M200.7 ICP	1	0.144			mg/L	0.003	0.02	12/13/16 16:39	aeb
Barium, total	M200.7 ICP	1	0.144			mg/L	0.003	0.02	12/16/16 14:34	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:53	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:34	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:53	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:34	aeb
Boron, dissolved	M200.7 ICP	1	0.08			mg/L	0.01	0.05	12/12/16 22:53	aeb
Boron, total	M200.7 ICP	1	0.07			mg/L	0.01	0.05	12/16/16 14:34	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 20:11	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:38	mfm
Calcium, dissolved	M200.7 ICP	1	206			mg/L	0.1	0.5	12/12/16 22:53	aeb
Calcium, total	M200.7 ICP	1	217			mg/L	0.1	0.5	12/15/16 15:34	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:53	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:34	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:53	aeb
Cobalt, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:34	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:53	aeb
Copper, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/15/16 15:34	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:53	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:34	aeb
Iron, dissolved	M200.7 ICP	1	0.05			mg/L	0.02	0.05	12/12/16 22:53	aeb
Iron, total	M200.7 ICP	1	0.10			mg/L	0.02	0.05	12/16/16 14:34	gss
Lead, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	12/13/16 20:11	enb
Lead, total	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0005	12/15/16 19:38	mfm
Lithium, dissolved	M200.7 ICP	1	0.038	B		mg/L	0.008	0.04	12/12/16 22:53	aeb
Lithium, total	M200.7 ICP	1	0.045			mg/L	0.008	0.04	12/15/16 15:34	aeb
Magnesium, dissolved	M200.7 ICP	1	15.2			mg/L	0.2	1	12/12/16 22:53	aeb
Magnesium, total	M200.7 ICP	1	16.0			mg/L	0.2	1	12/15/16 15:34	aeb
Manganese, dissolved	M200.7 ICP	1	0.183			mg/L	0.005	0.03	12/12/16 22:53	aeb
Manganese, total	M200.7 ICP	1	0.204			mg/L	0.005	0.03	12/16/16 14:34	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:26	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:58	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/12/16 22:53	aeb
Molybdenum, total	M200.7 ICP	1	0.03	B		mg/L	0.02	0.1	12/15/16 15:34	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:53	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:34	aeb
Potassium, dissolved	M200.7 ICP	1	11.1			mg/L	0.2	1	12/12/16 22:53	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4-E

ACZ Sample ID: **L34542-09**

Date Sampled: 12/06/16 11:10

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	11.1			mg/L	0.2	1	12/15/16 15:34	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:53	aeb
Scandium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:34	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0003	12/13/16 20:11	enb
Selenium, total	M200.8 ICP-MS	1	0.0004			mg/L	0.0001	0.0003	12/15/16 19:38	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 20:11	enb
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/15/16 19:38	mfm
Sodium, dissolved	M200.7 ICP	1	47.8			mg/L	0.2	1	12/12/16 22:53	aeb
Sodium, total	M200.7 ICP	1	49.6			mg/L	0.2	1	12/15/16 15:34	aeb
Strontium, dissolved	M200.7 ICP	1	1.98			mg/L	0.005	0.03	12/12/16 22:53	aeb
Strontium, total	M200.7 ICP	1	2.05			mg/L	0.005	0.03	12/16/16 14:34	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 20:11	enb
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:38	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/12/16 22:53	aeb
Tin, total	M200.7 ICP	1		U		mg/L	0.04	0.2	12/15/16 15:34	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:53	aeb
Titanium, total	M200.7 ICP	1	0.007	B		mg/L	0.005	0.03	12/15/16 15:34	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/13/16 20:11	enb
Uranium, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/15/16 19:38	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:53	aeb
Vanadium, total	M200.7 ICP	1	0.007	B		mg/L	0.005	0.03	12/15/16 15:34	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:53	aeb
Zinc, total	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/15/16 15:34	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW4-E

ACZ Sample ID: **L34542-09**

Date Sampled: 12/06/16 11:10

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	93.4		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	93.4		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			12/22/16 0:00	calc
Sum of Anions			14			meq/L			12/22/16 0:00	calc
Sum of Cations			14.0			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 12:06	sck
Chloride	SM4500Cl-E	1	47.7		*	mg/L	0.5	2	12/15/16 16:04	spl
Conductivity @25C	SM2510B	1	1250		*	umhos/cm	1	10	12/10/16 23:36	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:51	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/20/16 21:06	pjb
Fluoride	SM4500F-C	1	0.58		*	mg/L	0.05	0.3	12/13/16 17:47	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		577			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	4	6.85		*	mg/L	0.08	0.4	12/16/16 22:19	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1	0.10	B	*	mg/L	0.05	0.2	12/21/16 13:04	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.5		*	mg/L	0.1	0.5	12/16/16 0:36	pjb
pH (lab)	SM4500H+ B									
pH		1	8.1	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.7		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		1.15			mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.37		*	mg/L	0.02	0.05	12/15/16 1:10	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.41	H	*	mg/L	0.02	0.05	12/09/16 20:41	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.35		*	mg/L	0.02	0.05	12/15/16 0:23	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	1040		*	mg/L	10	20	12/09/16 16:49	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 13:19	emk
Residue, Total (TS) @ 105C	SM2540B	1	1050		*	mg/L	10	20	12/09/16 16:20	sck
Sulfate	D516-02/-07 - Turbidimetric	50	489		*	mg/L	50	250	12/20/16 16:08	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 15:27	emk
TDS (calculated)	Calculation		877			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.19						12/22/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW1-E

ACZ Sample ID: **L34542-10**

Date Sampled: 12/06/16 17:15

Date Received: 12/09/16

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/16/16 13:10	bce
Cyanide, WAD	SM4500-CN I- distillation								12/19/16 12:15	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/14/16 13:50	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 17:00	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 16:30	bsu
Total Hot Plate Digestion	M200.2 ICP-MS								12/14/16 14:41	mfm
Total Hot Plate Digestion	M200.2 ICP								12/14/16 12:31	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW1-E

ACZ Sample ID: **L34542-10**

Date Sampled: 12/06/16 17:15

Date Received: 12/09/16

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	12/12/16 22:57	aeb
Aluminum, total	M200.7 ICP	1	0.10	B		mg/L	0.03	0.2	12/15/16 15:37	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0004	0.002	12/13/16 20:14	enb
Antimony, total	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0004	0.002	12/15/16 19:53	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0027			mg/L	0.0002	0.001	12/13/16 20:14	enb
Arsenic, total	M200.8 ICP-MS	1	0.0031			mg/L	0.0002	0.001	12/15/16 19:53	mfm
Barium, dissolved	M200.7 ICP	1	0.132			mg/L	0.003	0.02	12/13/16 16:42	aeb
Barium, total	M200.7 ICP	1	0.138			mg/L	0.003	0.02	12/16/16 14:37	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:57	aeb
Beryllium, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:37	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/12/16 22:57	aeb
Bismuth, total	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/15/16 15:37	aeb
Boron, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:57	aeb
Boron, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:37	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 20:14	enb
Cadmium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:53	mfm
Calcium, dissolved	M200.7 ICP	1	41.3			mg/L	0.1	0.5	12/12/16 22:57	aeb
Calcium, total	M200.7 ICP	1	44.4			mg/L	0.1	0.5	12/15/16 15:37	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:57	aeb
Chromium, total	M200.7 ICP	1		U		mg/L	0.01	0.05	12/16/16 14:37	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:57	aeb
Cobalt, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:37	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/12/16 22:57	aeb
Copper, total	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/15/16 15:37	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/12/16 22:57	aeb
Gallium, total	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/15/16 15:37	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/12/16 22:57	aeb
Iron, total	M200.7 ICP	1	0.02	B		mg/L	0.02	0.05	12/16/16 14:37	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 20:14	enb
Lead, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/15/16 19:53	mfm
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:57	aeb
Lithium, total	M200.7 ICP	1	0.013	B		mg/L	0.008	0.04	12/15/16 15:37	aeb
Magnesium, dissolved	M200.7 ICP	1	4.2			mg/L	0.2	1	12/12/16 22:57	aeb
Magnesium, total	M200.7 ICP	1	4.4			mg/L	0.2	1	12/15/16 15:37	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/12/16 22:57	aeb
Manganese, total	M200.7 ICP	1		U		mg/L	0.005	0.03	12/16/16 14:37	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:27	scp
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/15/16 10:59	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/12/16 22:57	aeb
Molybdenum, total	M200.7 ICP	1		U		mg/L	0.02	0.1	12/15/16 15:37	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/12/16 22:57	aeb
Nickel, total	M200.7 ICP	1		U		mg/L	0.008	0.04	12/15/16 15:37	aeb
Potassium, dissolved	M200.7 ICP	1	4.6			mg/L	0.2	1	12/12/16 22:57	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW1-E

ACZ Sample ID: **L34542-10**

Date Sampled: 12/06/16 17:15

Date Received: 12/09/16

Sample Matrix: Surface Water

Potassium, total	M200.7 ICP	1	4.9		mg/L	0.2	1	12/15/16 15:37	aeb
Scandium, dissolved	M200.7 ICP	1		U *	mg/L	0.1	0.5	12/12/16 22:57	aeb
Scandium, total	M200.7 ICP	1		U *	mg/L	0.1	0.5	12/15/16 15:37	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	12/13/16 20:14	enb
Selenium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0003	12/15/16 19:53	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	12/13/16 20:14	enb
Silver, total	M200.8 ICP-MS	1		U	mg/L	0.00005	0.0003	12/15/16 19:53	mfm
Sodium, dissolved	M200.7 ICP	1	9.8		mg/L	0.2	1	12/12/16 22:57	aeb
Sodium, total	M200.7 ICP	1	10.3		mg/L	0.2	1	12/15/16 15:37	aeb
Strontium, dissolved	M200.7 ICP	1	0.183		mg/L	0.005	0.03	12/12/16 22:57	aeb
Strontium, total	M200.7 ICP	1	0.182		mg/L	0.005	0.03	12/16/16 14:37	gss
Thallium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/13/16 20:14	enb
Thallium, total	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/15/16 19:53	mfm
Tin, dissolved	M200.7 ICP	1		U	mg/L	0.04	0.2	12/12/16 22:57	aeb
Tin, total	M200.7 ICP	1		U	mg/L	0.04	0.2	12/15/16 15:37	aeb
Titanium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	12/12/16 22:57	aeb
Titanium, total	M200.7 ICP	1	0.007	B	mg/L	0.005	0.03	12/15/16 15:37	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U	mg/L	0.0001	0.0005	12/13/16 20:14	enb
Uranium, total	M200.8 ICP-MS	1	0.0001	B	mg/L	0.0001	0.0005	12/15/16 19:53	mfm
Vanadium, dissolved	M200.7 ICP	1		U	mg/L	0.005	0.03	12/12/16 22:57	aeb
Vanadium, total	M200.7 ICP	1	0.006	B	mg/L	0.005	0.03	12/15/16 15:37	aeb
Zinc, dissolved	M200.7 ICP	1		U	mg/L	0.01	0.05	12/12/16 22:57	aeb
Zinc, total	M200.7 ICP	1	0.01	B	mg/L	0.01	0.05	12/15/16 15:37	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW1-E

ACZ Sample ID: **L34542-10**

Date Sampled: 12/06/16 17:15

Date Received: 12/09/16

Sample Matrix: Surface Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	104		*	mg/L	2	20	12/10/16 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	12/10/16 0:00	sck
Total Alkalinity		1	104		*	mg/L	2	20	12/10/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			12/22/16 0:00	calc
Sum of Anions			3			meq/L			12/22/16 0:00	calc
Sum of Cations			3			meq/L			12/22/16 0:00	calc
Chemical Oxygen Demand	M410.4	1		U	*	mg/L	10	20	12/16/16 12:27	sck
Chloride	SM4500Cl-E	1	6.0		*	mg/L	0.5	2	12/15/16 16:04	spl
Conductivity @25C	SM2510B	1	293		*	umhos/cm	1	10	12/10/16 23:45	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/16/16 23:52	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/20/16 21:07	pjb
Fluoride	SM4500F-C	1	0.14	B	*	mg/L	0.05	0.3	12/13/16 17:50	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		120			mg/L	0.2	5	12/22/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	1	0.18		*	mg/L	0.02	0.1	12/16/16 22:00	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/21/16 13:05	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.1	B	*	mg/L	0.1	0.5	12/16/16 0:37	pjb
pH (lab)	SM4500H+ B									
pH		1	8.3	H	*	units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.7		*	C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		00.19	B		mg/L	0.06	0.2	12/22/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.06		*	mg/L	0.02	0.05	12/15/16 1:11	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.08	H	*	mg/L	0.02	0.05	12/09/16 20:42	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.06		*	mg/L	0.02	0.05	12/15/16 0:24	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	222		*	mg/L	10	20	12/09/16 16:52	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/12/16 13:22	emk
Residue, Total (TS) @ 105C	SM2540B	1	222		*	mg/L	10	20	12/09/16 16:21	sck
Sulfate	D516-02/-07 - Turbidimetric	5	32.9		*	mg/L	5	25	12/20/16 16:19	bsu
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/12/16 14:34	emk
TDS (calculated)	Calculation		163			mg/L			12/22/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.36						12/22/16 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: **L34542**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-01	WG414598	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.
	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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).
	WG414844	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414948	Cyanide, total	M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
	WG414685	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).
	WG414655	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
	WG414867	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).
	WG414541	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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).
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	Sulfate	D516-02/-07 - Turbidimetric	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG414588	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).

REPAD.15.06.05.01

Tahoe Resources, Inc.

ACZ Project ID: **L34542**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG414541	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L34542**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-02	WG414598	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.
	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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).
	WG414844	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414948	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).
	WG414685	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).
	WG414655	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
	WG414867	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).
	WG414541	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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).
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	Sulfate	D516-02/-07 - Turbidimetric	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG414588	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.

REPAD.15.06.05.01

Tahoe Resources, Inc.ACZ Project ID: **L34542**

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).
	WG414541	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L34542**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-03	WG414632	Barium, dissolved	M200.7 ICP	IA	Internal standard recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL.
	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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).
	WG414844	Chloride	SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414948	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).
	WG415096	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).
	WG414655	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
	WG414867	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).
	WG414541	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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).
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	Sulfate	D516-02/-07 - Turbidimetric	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG414588	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.

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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).
	WG414541	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-04	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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.
	WG414844	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414948	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).
	WG415096	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).
	WG414655	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
	WG414867	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.
			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).
	WG414541	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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).
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	Sulfate	D516-02/-07 - Turbidimetric	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG414588	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

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG414541	Total Alkalinity	SM2320B - Titration		sample is too low for accurate evaluation (< 10x MDL).
				Q6	Sample was received above recommended temperature.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-05	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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.
	WG414844	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414948	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).
	WG415096	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).
	WG414655	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
	WG414867	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.
			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).
	WG414541	pH pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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).
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	Sulfate	D516-02/-07 - Turbidimetric	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			D516-02/-07 - Turbidimetric	Q6	Sample was received above recommended temperature.
	WG414588	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

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG414541	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 ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-06	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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.
	WG414844	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414949	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).
				Q6	Sample was received above recommended temperature.
	WG415096	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).
	WG414655	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).
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
				Q6	Sample was received above recommended temperature.
	WG414867	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.
			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).
	WG414541	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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).
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	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.
	WG414588	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).
	WG414541	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-07	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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.
	WG414844	Chloride	SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414949	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).
	WG415096	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).
	WG414655	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).
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
	WG414867	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.
			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).
	WG414541	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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.
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	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.
	WG414588	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.

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			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).
	WG414541	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-08	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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.
	WG414844	Chloride	SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414949	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).
				Q6	Sample was received above recommended temperature.
	WG415096	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).
	WG414655	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).
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
				Q6	Sample was received above recommended temperature.
	WG414867	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.
			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).
	WG414541	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
			SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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.
	WG414778	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).
				Q6	Sample was received above recommended temperature.
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	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.
	WG414588	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.

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			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).
	WG414541	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

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ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-09	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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.
	WG414844	Chloride	SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414949	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).
	WG415096	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).
	WG414655	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).
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
	WG414867	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.
			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).
	WG414541	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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.
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	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.
	WG414588	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.ACZ Project ID: **L34542**

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).
	WG414541	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L34542**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-10	WG414541	Bicarbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414878	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.
	WG414844	Chloride	SM4500CI-E	Q6	Sample was received above recommended temperature.
	WG414541	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG414949	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).
	WG415096	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).
	WG414655	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).
	WG414541	Hydroxide as CaCO ₃	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG414947	Nitrate/Nitrite as N	M353.2 - H ₂ SO ₄ preserved	Q6	Sample was received above recommended temperature.
	WG414997	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).
	WG414867	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.
			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).
	WG414541	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG414779	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).
	WG414534	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.
	WG414778	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).
	WG414511	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG414576	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).
	WG414523	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.
	WG415080	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.
	WG414589	Sulfide as S	SM4500S2-D	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.ACZ Project ID: **L34542**

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).
	WG414541	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: SW11

ACZ Sample ID: **L34542-01**
 Date Sampled: 12/06/16 15:50
 Date Received: 12/09/16
 Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415043

Analyst: mmn
 Extract Date: 12/12/16 13:31
 Analysis Date: 12/19/16 14:22

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	101.3		1.02	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW11

ACZ Sample ID: **L34542-01**

Date Sampled: 12/06/16 15:50

Date Received: 12/09/16

Sample Matrix: *Surface Water*

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 13:45

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: SW2A-E

ACZ Sample ID: **L34542-02**
 Date Sampled: 12/06/16 15:50
 Date Received: 12/09/16
 Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415043

Analyst: mmn
 Extract Date: 12/12/16 13:33
 Analysis Date: 12/19/16 14:49

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	104.7		0.94	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW2A-E

ACZ Sample ID: **L34542-02**
Date Sampled: 12/06/16 15:50
Date Received: 12/09/16
Sample Matrix: *Surface Water*

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**
Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 14:02

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.05	*	mg/L	2.1	10.5

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW10

ACZ Sample ID: **L34542-03**

Date Sampled: 12/06/16 12:00

Date Received: 12/09/16

Sample Matrix: *Surface Water*

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**

Extract Method: **M3520**

Workgroup: WG415043

Analyst: mmn

Extract Date: 12/12/16 13:36

Analysis Date: 12/19/16 15:45

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	95.7		0.99	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW10

ACZ Sample ID: **L34542-03**

Date Sampled: 12/06/16 12:00

Date Received: 12/09/16

Sample Matrix: *Surface Water*

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 14:19

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: SW8-E

ACZ Sample ID: **L34542-04**
 Date Sampled: 12/06/16 9:15
 Date Received: 12/09/16
 Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415043

Analyst: mmn
 Extract Date: 12/12/16 13:38
 Analysis Date: 12/19/16 16:12

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	113.2		0.95	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW8-E

ACZ Sample ID: **L34542-04**

Date Sampled: 12/06/16 9:15

Date Received: 12/09/16

Sample Matrix: *Surface Water*

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 14:36

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: SW6-E

ACZ Sample ID: **L34542-05**
 Date Sampled: 12/06/16 7:20
 Date Received: 12/09/16
 Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415043

Analyst: mmn
 Extract Date: 12/12/16 13:41
 Analysis Date: 12/19/16 16:40

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	100.8		1.02	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW6-E

ACZ Sample ID: **L34542-05**

Date Sampled: 12/06/16 7:20

Date Received: 12/09/16

Sample Matrix: *Surface Water*

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 14:53

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: SW9-E

ACZ Sample ID: **L34542-06**
 Date Sampled: 12/06/16 8:10
 Date Received: 12/09/16
 Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415043

Analyst: mmn
 Extract Date: 12/12/16 13:44
 Analysis Date: 12/19/16 17:07

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	99.5		0.93	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW9-E

ACZ Sample ID: **L34542-06**
Date Sampled: 12/06/16 8:10
Date Received: 12/09/16
Sample Matrix: Surface Water

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**
Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 15:10

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: SW5-E

ACZ Sample ID: **L34542-07**
 Date Sampled: 12/06/16 9:34
 Date Received: 12/09/16
 Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415043

Analyst: mmn
 Extract Date: 12/12/16 13:46
 Analysis Date: 12/19/16 17:35

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	99.3		0.93	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW5-E

ACZ Sample ID: **L34542-07**

Date Sampled: 12/06/16 9:34

Date Received: 12/09/16

Sample Matrix: *Surface Water*

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 15:27

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: SW4A-E

ACZ Sample ID: **L34542-08**
 Date Sampled: 12/06/16 10:30
 Date Received: 12/09/16
 Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415043

Analyst: mmn
 Extract Date: 12/12/16 13:49
 Analysis Date: 12/19/16 18:02

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	100.6		1.05	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW4A-E

ACZ Sample ID: **L34542-08**
Date Sampled: 12/06/16 10:30
Date Received: 12/09/16
Sample Matrix: Surface Water

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**
Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 15:44

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: SW4-E

ACZ Sample ID: **L34542-09**
 Date Sampled: 12/06/16 11:10
 Date Received: 12/09/16
 Sample Matrix: Surface Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415043

Analyst: mmn
 Extract Date: 12/12/16 13:52
 Analysis Date: 12/19/16 18:30

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.2	J	1.01	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	104.3		1.01	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SW4-E

ACZ Sample ID: **L34542-09**
Date Sampled: 12/06/16 11:10
Date Received: 12/09/16
Sample Matrix: *Surface Water*

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**
Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 16:01

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: SW1-E

ACZ Sample ID: **L34542-10**

Date Sampled: 12/06/16 17:15

Date Received: 12/09/16

Sample Matrix: *Surface Water*

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**

Extract Method: **M3520**

Workgroup: WG415043

Analyst: mmn

Extract Date: 12/12/16 13:54

Analysis Date: 12/19/16 18:57

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1.09	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	103.6		1.09	*	%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SW1-E

ACZ Sample ID: **L34542-10**

Date Sampled: 12/06/16 17:15

Date Received: 12/09/16

Sample Matrix: *Surface Water*

Oil & Grease, Total Recoverable

Analysis Method: **1664A - Gravimetric**

Extract Method:

Workgroup: **WG415129**

Analyst: ITM

Extract Date:

Analysis Date: 12/21/16 16:18

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
Oil and Grease			U	1.08	*	mg/L	2.2	10.8


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: **L34542**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34542-01	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-02	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-03	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-04	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-05	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-06	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-07	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-08	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-09	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.
L34542-10	WG415043	*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.
	WG415129	Oil and Grease	1664A - Gravimetric	Q6	Sample was received above recommended temperature.

Tahoe Resources, Inc.

ACZ Project ID: **L34542**

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: L34542
Date Received: 12/09/2016 11:17
Received By:
Date Printed: 12/9/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Samples/Containers

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

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?
4130	8.4	<=6.0	15	N/A
4260	9.1	<=6.0	14	N/A
4572	6.9	<=6.0	14	N/A
4809	9.1	<=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: L34542

Date Received: 12/09/2016 11:17

Received By:

Date Printed: 12/9/2016

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).

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Bulvar los Proceres, 18 calle 24-69 zona 16
Company: Tahoe Resources Inc.	Empresarial, zona Pradera, Torre IV Oficina 1406
E-mail: M.Berganza@sanrafael.com.gt	Telephone: (502) 59 51 52 48

Copy of Report to:

Name:		E-mail:
Company:		Telephone:

Invoice to:

Name: Miguel Berganza	<div> <div>Address:</div> <div></div> <div>Telephone:</div> </div>
Company: Tahoe Resources inc.	
E-mail: M.Berganza@sanrafael.com.gt	

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

NC

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:** _____

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

Quote #: <i>Water Quality</i>					# of Containers	3	2								
PO#: <i>ESCOBAL</i>															
Reporting state for compliance testing:															
Check box if samples include NRC licensed material?															
SAMPLE IDENTIFICATION		DATE:TIME	Matrix												
<i>SW11</i>		<i>06/12/16 15:50</i>	<i>SW</i>	<i>10</i>	<i>✓</i>										
<i>SW2A-E</i>		<i>06/12/16 15:50</i>	<i>SW</i>	<i>10</i>	<i>✓</i>										
<i>SW10</i>		<i>06/12/16 12:00</i>	<i>SW</i>	<i>10</i>	<i>✓</i>										
<i>Pileta 3</i>		<i>01/12/16 08:05</i>	<i>SW</i>	<i>1</i>			<i>✓</i>								
<i>Pileta 2</i>		<i>05/12/16 11:05</i>	<i>SW</i>	<i>1</i>			<i>✓</i>								
<i>Pileta 3</i>		<i>05/12/16 10:45</i>	<i>SW</i>	<i>1</i>			<i>✓</i>								
<i>WW9</i>		<i>01/12/16 08:14</i>	<i>WW</i>	<i>1</i>			<i>✓</i>								
<i>WW9</i>		<i>05/12/16 12:00-11:30</i>	<i>WW</i>	<i>1</i>			<i>✓</i>								
<i>WW10</i>		<i>05/12/16 12:00</i>	<i>WW</i>	<i>1</i>			<i>✓</i>								

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 include samples for CN analysis in a separate report, and the samples for SW analysis in a report along with the other 4 chains of custody.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
<i>[Signature]</i>	11:05 07-12-2016	<i>[Signature]</i> BJP	2.12.16 11:05 12/9/16 1116

**Laboratories, Inc.**

L34542

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza

Company: Tahoe Resources Inc.

E-mail: M.Berganza@sanrafael.com.gt

Address: Bulevar los Proceres, 18 calle 24-69 Zona 10

Empresarial, Zona Proceres, Torre 18 Oficinal 406

Telephone: (502) 59 51 5248

Copy of Report to:

Name:

Company:

E-mail:

Telephone:

Invoice to:

Name: Miguel Berganza

Company: Tahoe Resources Inc.

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:

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 #: water quality

PO#: ESCOBAL

Reporting state for compliance testing:

Check box if samples include NRC licensed material?

of Containers

SAMPLE IDENTIFICATION**DATE:TIME****Matrix**

SW8-E

06/12/16 9:15

SW

10

SW6-E

06/12/16 7:20

SW

10

SW9-E

06/12/16 8:10

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 #2/4

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:**DATE:TIME****RECEIVED BY:****DATE:TIME**

[Signature]

11:05

07/12/2016

[Signature]

DTP

7.12.16 11:05

12/9/16 11:16

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Boulevard los Próceres, 18 calle 24-69 Zona 10
Company: Tahoe Resources Inc.	Empresarial Zona Pradera, Torre 10 Oficina 1406
E-mail: M.Berganza@sanrafael.com.gt	Telephone:

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name: Miguel Berganza	Address:
Company: Tahoe Resources Inc.	
E-mail: M.Berganza@Sanrafael.com.gt	
	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:** _____

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

[illegible]

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
<i>[Signature]</i>	11:05 07-12-2016	<i>[Signature]</i> DJP	7.11.16 11: 12/9/16 11/6

CHAIN of CUSTODY

Report to:

Name: Miguel Berganza	Address: Bulvar los Próceres, 1a calle 24-64 zona 1A
Company: Tahoe Resources Inc.	Empresarial, zona Pradera, Torre IV Oficina 1466
E-mail: M.Berganza@sanrafael.com.gt	Telephone: (502) 59515248

Copy of Report to:

Name:		E-mail:
Company:		Telephone:

Invoice to:

Name: Miguel Berganza	<div> <div>Address:</div> <div></div> <div>Telephone:</div> </div>
Company: Tahoe Resources Inc.	
E-mail: M.Berganza@santafuel.com.gt	

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)

[illegible]

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC # 4/4 - Please include WW12 and SW13 samples analysis in a different report.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
<i>[Signature]</i>	11:05 07/16/16	<i>[Signature]</i> bjs	7.12.16 11:00 7/9/16 11/6

REG 016 Resultados de Análisis

Muestra: 7 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: 061216
Fecha de ingreso de muestras: 061216
Fecha de análisis: 061216-151216
Fecha de informe: 151216

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)
6677	SW4A-E	21	< 1	< 10	< 25	N.D.	920
6678	SW4-E	10	< 1	< 10	< 25	N.D.	3.5 x 10 ³
6679	SW5-E	17	< 1	< 10	< 25	N.D.	2.2 x 10 ³
6680	SW6-E	27	< 1	< 10	< 25	N.D.	2.2 x 10 ³
6681	SW8-E	31	< 1	< 10	< 25	N.D.	1.6 x 10 ⁴
6682	SW9-E	25	< 1	< 10	< 25	N.D.	9.2 x 10 ³
6683	SW10-E	2	< 1	< 10	< 25	N.D.	< 1.8

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 referido a laboratorio acreditado.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

REG 016 Resultados de Análisis

Muestra: 3 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: 061216
Fecha de ingreso de muestras: 071216
Fecha de análisis: 071216-151216
Fecha de informe: 151216

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)
6696	SW-11	< 1	< 1	< 10	< 25	N.D.	1.3 x 10 ³
6697	SW1-E	< 1	< 1	< 10	< 25	N.D.	23
6698	SW2A-E	< 1	< 1	< 10	< 25	N.D.	7.0 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 referido a laboratorio acreditado.



Ing. Oscar Páez
Gerente Técnico



VoBo Ing. Fernando Fuentes
Gerente de Calidad

11.5.2 Muestras de Agua Subterránea (GW) pozos de monitoreo y suministro

January 09, 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

Project ID: Escobal

ACZ Project ID: L34772

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on December 22, 2016. This project has been assigned to ACZ's project number, L34772. 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 L34772. 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.

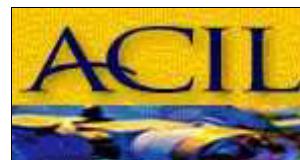
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after February 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.

January 09, 2017

Project ID: Escobal

ACZ Project ID: L34772

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 4 ground water samples from Tahoe Resources, Inc. on December 22, 2016. 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 L34772. 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. both 5 mg/L. PQL has been adjusted to reflect this. No further action was taken. 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: **L34772-01**

Date Sampled: 12/13/16 15:20

Date Received: 12/22/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation		-						12/27/16 14:14	bce
Cyanide, WAD	SM4500-CN I- distillation								12/28/16 7:34	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								01/06/17 10:33	bsu
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 15:40	bsu/bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 14:42	bsu/bce

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.11	B		mg/L	0.03	0.2	01/03/17 18:26	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0008	B	*	mg/L	0.0004	0.002	01/05/17 0:51	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0059			mg/L	0.0002	0.001	01/03/17 16:20	mfm
Barium, dissolved	M200.7 ICP	1	0.134			mg/L	0.003	0.02	01/03/17 18:26	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:26	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	01/03/17 18:26	gss
Boron, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	01/04/17 18:04	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:51	enb
Calcium, dissolved	M200.7 ICP	1	17.9			mg/L	0.1	0.5	01/03/17 18:26	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:26	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/04/17 18:04	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:26	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/03/17 18:26	gss
Iron, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.02	0.05	01/03/17 18:26	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:51	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/03/17 18:26	gss
Magnesium, dissolved	M200.7 ICP	1	3.2			mg/L	0.2	1	01/03/17 18:26	gss
Manganese, dissolved	M200.7 ICP	1	0.029	B		mg/L	0.005	0.03	01/04/17 18:04	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	01/06/17 11:12	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	01/03/17 18:26	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/03/17 18:26	gss
Potassium, dissolved	M200.7 ICP	1	1.9			mg/L	0.2	1	01/03/17 18:26	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/03/17 18:26	gss
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	01/05/17 0:51	enb
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	01/05/17 0:51	enb
Sodium, dissolved	M200.7 ICP	1	8.3			mg/L	0.2	1	01/03/17 18:26	gss
Strontium, dissolved	M200.7 ICP	1	0.148			mg/L	0.005	0.03	01/03/17 18:26	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:51	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	01/03/17 18:26	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/03/17 18:26	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:51	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/03/17 18:26	gss
Zinc, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.01	0.05	01/03/17 18:26	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: GW 2

ACZ Sample ID: **L34772-01**

Date Sampled: 12/13/16 15:20

Date Received: 12/22/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	51.5	H		mg/L	2	20	12/28/16 0:00	emk
Carbonate as CaCO ₃		1		UH		mg/L	2	20	12/28/16 0:00	emk
Hydroxide as CaCO ₃		1		UH		mg/L	2	20	12/28/16 0:00	emk
Total Alkalinity		1	51.5	H	*	mg/L	2	20	12/28/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			3.2			%			01/09/17 0:00	calc
Sum of Anions			1.5			meq/L			01/09/17 0:00	calc
Sum of Cations			1.6			meq/L			01/09/17 0:00	calc
Chloride	SM4500Cl-E	1	4.1			mg/L	0.5	2	01/05/17 16:26	bsu
Conductivity @25C	SM2510B	1	172			umhos/cm	1	10	12/28/16 3:39	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		UH	*	mg/L	0.003	0.01	12/28/16 21:40	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		UH	*	mg/L	0.003	0.01	12/28/16 22:43	pjb
Fluoride	SM4500F-C	1	0.17	B		mg/L	0.05	0.3	12/29/16 12:50	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		58			mg/L	0.2	5	01/09/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	3.96			mg/L	0.06	0.3	01/05/17 0:00	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	01/03/17 13:10	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1	0.4	B	*	mg/L	0.1	0.5	01/06/17 19:15	pjb
pH (lab)	SM4500H+ B									
pH		1	7.9	H		units	0.1	0.1	12/28/16 0:00	emk
pH measured at		1	21.3			C	0.1	0.1	12/28/16 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus		0.09	B		mg/L	0.06	0.2	01/09/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	01/04/17 23:28	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.03	BH	*	mg/L	0.02	0.05	12/22/16 20:33	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.05		*	mg/L	0.02	0.05	01/04/17 22:32	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	164	H	*	mg/L	10	20	12/27/16 13:14	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1	6.0	BH	*	mg/L	5	20	12/27/16 10:45	sck
Residue, Total (TS) @ 105C	SM2540B	1	140	H	*	mg/L	10	20	12/22/16 16:25	sck
Sulfate	D516-02/-07 - Turbidimetric	1	14.5		*	mg/L	1	5	01/04/17 14:43	spl
Sulfide as S	SM4500S2-D	1		UH	*	mg/L	0.02	0.1	12/27/16 15:36	sck
TDS (calculated)	Calculation		81.8			mg/L			01/09/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		2.00						01/09/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: GW 3

ACZ Sample ID: **L34772-02**

Date Sampled: 12/13/16 14:05

Date Received: 12/22/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/27/16 14:25	bce
Cyanide, WAD	SM4500-CN I- distillation								12/28/16 8:24	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								01/06/17 10:41	bsu
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 15:49	bsu/bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 14:52	bsu/bce

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	01/03/17 18:29	gss
Antimony, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0004	0.002	01/05/17 0:54	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0021			mg/L	0.0002	0.001	01/05/17 0:54	enb
Barium, dissolved	M200.7 ICP	1	0.132			mg/L	0.003	0.02	01/03/17 18:29	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:29	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	01/03/17 18:29	gss
Boron, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	01/04/17 18:07	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:54	enb
Calcium, dissolved	M200.7 ICP	1	81.2			mg/L	0.1	0.5	01/03/17 18:29	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:29	gss
Cobalt, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	01/04/17 18:07	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:29	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/03/17 18:29	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	01/03/17 18:29	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:54	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/03/17 18:29	gss
Magnesium, dissolved	M200.7 ICP	1	18.7			mg/L	0.2	1	01/03/17 18:29	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/04/17 18:07	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	01/06/17 11:13	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	01/03/17 18:29	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/03/17 18:29	gss
Potassium, dissolved	M200.7 ICP	1	10.1			mg/L	0.2	1	01/03/17 18:29	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/03/17 18:29	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0006			mg/L	0.0001	0.0003	01/05/17 0:54	enb
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	01/05/17 0:54	enb
Sodium, dissolved	M200.7 ICP	1	24.0			mg/L	0.2	1	01/03/17 18:29	gss
Strontium, dissolved	M200.7 ICP	1	0.422			mg/L	0.005	0.03	01/03/17 18:29	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:54	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	01/03/17 18:29	gss
Titanium, dissolved	M200.7 ICP	1	0.005	B		mg/L	0.005	0.03	01/03/17 18:29	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:54	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/03/17 18:29	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:29	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: GW 3

ACZ Sample ID: **L34772-02**

Date Sampled: 12/13/16 14:05

Date Received: 12/22/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	75.9	H		mg/L	2	20	12/28/16 0:00	emk
Carbonate as CaCO ₃		1		UH		mg/L	2	20	12/28/16 0:00	emk
Hydroxide as CaCO ₃		1		UH		mg/L	2	20	12/28/16 0:00	emk
Total Alkalinity		1	75.9	H	*	mg/L	2	20	12/28/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			2.2			%			01/09/17 0:00	calc
Sum of Anions			6.6			meq/L			01/09/17 0:00	calc
Sum of Cations			6.9			meq/L			01/09/17 0:00	calc
Chloride	SM4500Cl-E	1	19.4			mg/L	0.5	2	01/05/17 16:26	bsu
Conductivity @25C	SM2510B	1	675			umhos/cm	1	10	12/28/16 3:48	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		UH	*	mg/L	0.003	0.01	12/28/16 21:41	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		UH	*	mg/L	0.003	0.01	12/28/16 22:44	pjb
Fluoride	SM4500F-C	1	0.17	B		mg/L	0.05	0.3	12/29/16 12:57	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		280			mg/L	0.2	5	01/09/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	4	5.95			mg/L	0.08	0.4	01/05/17 0:02	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	01/03/17 13:12	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	01/06/17 19:16	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H		units	0.1	0.1	12/28/16 0:00	emk
pH measured at		1	21.3			C	0.1	0.1	12/28/16 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	01/09/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	01/04/17 23:29	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.03	BH	*	mg/L	0.02	0.05	12/22/16 20:36	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	01/04/17 22:33	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	536	H	*	mg/L	10	20	12/27/16 13:17	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		UH	*	mg/L	5	20	12/27/16 10:48	sck
Residue, Total (TS) @ 105C	SM2540B	1	528	H	*	mg/L	10	20	12/22/16 16:26	sck
Sulfate	D516-02/-07 - Turbidimetric	10	214		*	mg/L	10	50	01/04/17 14:55	spl
Sulfide as S	SM4500S2-D	1		UH	*	mg/L	0.02	0.1	12/27/16 15:41	sck
TDS (calculated)	Calculation		414			mg/L			01/09/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.29						01/09/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: GW 11

ACZ Sample ID: **L34772-03**

Date Sampled: 12/13/16 14:05

Date Received: 12/22/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/27/16 14:36	bce
Cyanide, WAD	SM4500-CN I- distillation								12/28/16 9:13	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								01/06/17 10:58	bsu
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 15:59	bsu/bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 15:01	bsu/bce

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	01/03/17 18:38	gss
Antimony, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0004	0.002	01/05/17 0:57	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0021			mg/L	0.0002	0.001	01/05/17 0:57	enb
Barium, dissolved	M200.7 ICP	1	0.127			mg/L	0.003	0.02	01/03/17 18:38	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:38	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	01/03/17 18:38	gss
Boron, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	01/04/17 18:16	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:57	enb
Calcium, dissolved	M200.7 ICP	1	78.0			mg/L	0.1	0.5	01/03/17 18:38	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:38	gss
Cobalt, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	01/04/17 18:16	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:38	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/03/17 18:38	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	01/03/17 18:38	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:57	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/03/17 18:38	gss
Magnesium, dissolved	M200.7 ICP	1	17.8			mg/L	0.2	1	01/03/17 18:38	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/04/17 18:16	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	01/06/17 11:14	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	01/03/17 18:38	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/03/17 18:38	gss
Potassium, dissolved	M200.7 ICP	1	9.8			mg/L	0.2	1	01/03/17 18:38	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/03/17 18:38	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0003	01/05/17 0:57	enb
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	01/05/17 0:57	enb
Sodium, dissolved	M200.7 ICP	1	23.2			mg/L	0.2	1	01/03/17 18:38	gss
Strontium, dissolved	M200.7 ICP	1	0.406			mg/L	0.005	0.03	01/03/17 18:38	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:57	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	01/03/17 18:38	gss
Titanium, dissolved	M200.7 ICP	1	0.005	B		mg/L	0.005	0.03	01/03/17 18:38	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 0:57	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/03/17 18:38	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:38	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: GW 11

ACZ Sample ID: **L34772-03**

Date Sampled: 12/13/16 14:05

Date Received: 12/22/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	75.9	H		mg/L	2	20	12/28/16 0:00	emk
Carbonate as CaCO ₃		1		UH		mg/L	2	20	12/28/16 0:00	emk
Hydroxide as CaCO ₃		1		UH		mg/L	2	20	12/28/16 0:00	emk
Total Alkalinity		1	75.9	H	*	mg/L	2	20	12/28/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			2.3			%			01/09/17 0:00	calc
Sum of Anions			6.4			meq/L			01/09/17 0:00	calc
Sum of Cations			6.7			meq/L			01/09/17 0:00	calc
Chloride	SM4500Cl-E	1	19.2			mg/L	0.5	2	01/05/17 16:26	bsu
Conductivity @25C	SM2510B	1	678		*	umhos/cm	1	10	12/28/16 4:06	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		UH	*	mg/L	0.003	0.01	12/28/16 21:44	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		UH	*	mg/L	0.003	0.01	12/28/16 22:45	pjb
Fluoride	SM4500F-C	1	0.19	B	*	mg/L	0.05	0.3	12/29/16 13:03	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		268			mg/L	0.2	5	01/09/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	5.89			mg/L	0.06	0.3	01/05/17 0:20	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	01/03/17 13:13	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	01/06/17 19:19	pjb
pH (lab)	SM4500H+ B									
pH		1	7.8	H		units	0.1	0.1	12/28/16 0:00	emk
pH measured at		1	21.1			C	0.1	0.1	12/28/16 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	01/09/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	01/04/17 23:30	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.03	BH	*	mg/L	0.02	0.05	12/22/16 20:38	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	01/04/17 22:34	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	540	H	*	mg/L	10	20	12/27/16 13:19	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		UH	*	mg/L	5	20	12/27/16 10:50	sck
Residue, Total (TS) @105C	SM2540B	1	524	H	*	mg/L	10	20	12/22/16 16:28	sck
Sulfate	D516-02/-07 - Turbidimetric	10	206		*	mg/L	10	50	01/04/17 14:59	spl
Sulfide as S	SM4500S2-D	1		UH	*	mg/L	0.02	0.1	12/27/16 15:47	sck
TDS (calculated)	Calculation		401			mg/L			01/09/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.35						01/09/17 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: GW 10

ACZ Sample ID: **L34772-04**

Date Sampled: 12/13/16 12:00

Date Received: 12/22/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/27/16 14:46	bce
Cyanide, WAD	SM4500-CN I- distillation								12/28/16 10:02	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								01/06/17 11:15	bsu
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 16:18	bsu/bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 15:11	bsu/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	01/03/17 18:41	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	01/03/17 16:41	mfm
Arsenic, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	01/03/17 16:41	mfm
Barium, dissolved	M200.7 ICP	1	0.004	B		mg/L	0.003	0.02	01/03/17 18:41	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:41	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	01/03/17 18:41	gss
Boron, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	01/04/17 18:19	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/03/17 16:41	mfm
Calcium, dissolved	M200.7 ICP	1		U		mg/L	0.1	0.5	01/03/17 18:41	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:41	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/04/17 18:19	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:41	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/03/17 18:41	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	01/03/17 18:41	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/03/17 16:41	mfm
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/03/17 18:41	gss
Magnesium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	01/03/17 18:41	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/04/17 18:19	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	01/06/17 11:15	scp
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	01/03/17 18:41	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/03/17 18:41	gss
Potassium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	01/03/17 18:41	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/03/17 18:41	gss
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	01/03/17 16:41	mfm
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	01/03/17 16:41	mfm
Sodium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	01/03/17 18:41	gss
Strontium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/03/17 18:41	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/03/17 16:41	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	01/03/17 18:41	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/03/17 18:41	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/03/17 16:41	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/03/17 18:41	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/03/17 18:41	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: GW 10

ACZ Sample ID: **L34772-04**

Date Sampled: 12/13/16 12:00

Date Received: 12/22/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	2.3	BH		mg/L	2	20	12/28/16 0:00	emk
Carbonate as CaCO ₃		1		UH		mg/L	2	20	12/28/16 0:00	emk
Hydroxide as CaCO ₃		1		UH		mg/L	2	20	12/28/16 0:00	emk
Total Alkalinity		1	2.3	BH	*	mg/L	2	20	12/28/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			n/a			%			01/09/17 0:00	calc
Sum of Anions				U		meq/L			01/09/17 0:00	calc
Sum of Cations				U		meq/L			01/09/17 0:00	calc
Chloride	SM4500Cl-E	1		U		mg/L	0.5	2	01/05/17 16:26	bsu
Conductivity @25C	SM2510B	1	6.8	B	*	umhos/cm	1	10	12/28/16 4:12	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		UH	*	mg/L	0.003	0.01	12/28/16 21:45	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		UH	*	mg/L	0.003	0.01	12/28/16 22:46	pjb
Fluoride	SM4500F-C	1		U	*	mg/L	0.05	0.3	12/29/16 13:29	sck
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation			U		mg/L	0.2	5	01/09/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	01/05/17 21:10	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	01/03/17 13:18	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	01/06/17 19:21	pjb
pH (lab)	SM4500H+ B									
pH		1	6.7	H		units	0.1	0.1	12/28/16 0:00	emk
pH measured at		1	21.3			C	0.1	0.1	12/28/16 0:00	emk
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	01/09/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	01/04/17 23:33	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	12/22/16 20:39	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	01/04/17 22:35	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	16	BH	*	mg/L	10	20	12/27/16 13:22	sck
Residue, Non-Filterable (TSS) @105C	SM2540D	1		UH	*	mg/L	5	20	12/27/16 10:53	sck
Residue, Total (TS) @ 105C	SM2540B	1		UH	*	mg/L	10	20	12/22/16 16:29	sck
Sulfate	D516-02/-07 - Turbidimetric	1		U	*	mg/L	1	5	01/04/17 15:08	spl
Sulfide as S	SM4500S2-D	1		UH	*	mg/L	0.02	0.1	12/27/16 15:52	sck
TDS (calculated)	Calculation		1.4			mg/L			01/09/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		11.43						01/09/17 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: **L34772**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34772-01	WG415686	Antimony, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		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	ZA	Poor recovery for Silver quality control is accepted due to low Silver solubility in samples, digestates, or extracts that do not contain sufficient Hydrochloric acid.
	WG415394	Cyanide, total	M335.4 - Colorimetric w/ distillation	H1	Sample prep or analysis performed past holding time. See case narrative.
			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).
	WG415395	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	H1	Sample prep or analysis performed past holding time. See case narrative.
			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).
	WG415542	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).
	WG415845	Nitrogen, total Kjeldahl	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).
	WG415695	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).
	WG415232	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).
	WG415693	Phosphorus, total	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).
	WG415256	Residue, Filterable (TDS) @180C	SM2540C	H3	Sample was received and analyzed past holding time.
			SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415254	Residue, Non-Filterable (TSS) @105C	SM2540D	H3	Sample was received and analyzed past holding time.
			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).
	WG415225	Residue, Total (TS) @ 105C	SM2540B	H3	Sample was received and analyzed past holding time.
	WG415651	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.
	WG415284	Sulfide as S	SM4500S2-D	H3	Sample was received and analyzed past holding time.
			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).
	WG415293	Total Alkalinity	SM2320B - Titration	H1	Sample prep or analysis performed past holding time. See case narrative.

Tahoe Resources, Inc.

ACZ Project ID: **L34772**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34772-02	WG415686	Antimony, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		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	ZA	Poor recovery for Silver quality control is accepted due to low Silver solubility in samples, digestates, or extracts that do not contain sufficient Hydrochloric acid.
	WG415394	Cyanide, total	M335.4 - Colorimetric w/ distillation	H1	Sample prep or analysis performed past holding time. See case narrative.
			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).
	WG415395	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	H1	Sample prep or analysis performed past holding time. See case narrative.
			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).
	WG415542	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).
	WG415845	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415695	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).
	WG415232	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).
	WG415693	Phosphorus, total	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).
	WG415256	Residue, Filterable (TDS) @180C	SM2540C	H3	Sample was received and analyzed past holding time.
			SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415254	Residue, Non-Filterable (TSS) @105C	SM2540D	H3	Sample was received and analyzed past holding time.
			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).
	WG415225	Residue, Total (TS) @ 105C	SM2540B	H3	Sample was received and analyzed past holding time.
	WG415651	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.
	WG415284	Sulfide as S	SM4500S2-D	H3	Sample was received and analyzed past holding time.
			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).
	WG415293	Total Alkalinity	SM2320B - Titration	H1	Sample prep or analysis performed past holding time. See case narrative.

Tahoe Resources, Inc.

ACZ Project ID: **L34772**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34772-03	WG415686	Antimony, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		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	ZA	Poor recovery for Silver quality control is accepted due to low Silver solubility in samples, digestates, or extracts that do not contain sufficient Hydrochloric acid.
	WG415293	Conductivity @25C	SM2510B	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415394	Cyanide, total	M335.4 - Colorimetric w/ distillation	H1	Sample prep or analysis performed past holding time. See case narrative.
			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).
	WG415395	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	H1	Sample prep or analysis performed past holding time. See case narrative.
			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).
	WG415400	Fluoride	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).
	WG415542	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).
	WG415845	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415695	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).
	WG415232	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).
	WG415693	Phosphorus, total	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).
	WG415256	Residue, Filterable (TDS) @180C	SM2540C	H3	Sample was received and analyzed past holding time.
			SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415254	Residue, Non-Filterable (TSS) @105C	SM2540D	H3	Sample was received and analyzed past holding time.
			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).
	WG415225	Residue, Total (TS) @ 105C	SM2540B	H3	Sample was received and analyzed past holding time.
			SM2540B	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415651	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.
	WG415284	Sulfide as S	SM4500S2-D	H3	Sample was received and analyzed past holding time.
			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).
	WG415293	Total Alkalinity	SM2320B - Titration	H1	Sample prep or analysis performed past holding time. See case narrative.
			SM2320B - Titration	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated

REPAD.15.06.05.01

Tahoe Resources, Inc.ACZ Project ID: **L34772**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
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sample is too low for accurate evaluation (< 10x MDL).

Tahoe Resources, Inc.

ACZ Project ID: **L34772**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34772-04	WG415293	Conductivity @25C	SM2510B	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415394	Cyanide, total	M335.4 - Colorimetric w/ distillation M335.4 - Colorimetric w/ distillation	H1	Sample prep or analysis performed past holding time. See case narrative.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415395	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation SM4500-CN I,E-Colorimetric w/ distillation	H1	Sample prep or analysis performed past holding time. See case narrative.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415400	Fluoride	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).
	WG415777	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).
	WG415542	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).
	WG415845	Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester M351.2 - TKN by Block Digester	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415695	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).
	WG415232	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415693	Phosphorus, total	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).
	WG415256	Residue, Filterable (TDS) @180C	SM2540C SM2540C	H3	Sample was received and analyzed past holding time.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415254	Residue, Non-Filterable (TSS) @105C	SM2540D SM2540D	H3	Sample was received and analyzed past holding time.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415225	Residue, Total (TS) @ 105C	SM2540B SM2540B	H3	Sample was received and analyzed past holding time.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415665	Sulfate	D516-02/-07 - Turbidimetric 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.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415284	Sulfide as S	SM4500S2-D SM4500S2-D	H3	Sample was received and analyzed past holding time.
				RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415293	Total Alkalinity	SM2320B - Titration SM2320B - Titration	H1	Sample prep or analysis performed past holding time. See case narrative.
				RA	Relative 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: GW 2

ACZ Sample ID: **L34772-01**
 Date Sampled: 12/13/16 15:20
 Date Received: 12/22/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415698

Analyst: mmn
 Extract Date: 12/27/16 18:09
 Analysis Date: 01/04/17 22:50

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			UH	1.02	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	91.6		1.02		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: GW 3

ACZ Sample ID: **L34772-02**

Date Sampled: 12/13/16 14:05

Date Received: 12/22/16

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**

Extract Method: **M3520**

Workgroup: WG415698

Analyst: mmn

Extract Date: 12/27/16 18:10

Analysis Date: 01/04/17 23:18

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			UH	0.94	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	88.8		0.94		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: GW 11

ACZ Sample ID: **L34772-03**
 Date Sampled: 12/13/16 14:05
 Date Received: 12/22/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415698

Analyst: mmn
 Extract Date: 12/27/16 18:12
 Analysis Date: 01/05/17 0:13

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			UH	0.93	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	89.6		0.93		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: GW 10

ACZ Sample ID: **L34772-04**
Date Sampled: 12/13/16 12:00
Date Received: 12/22/16
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415698

Analyst: mmn
Extract Date: 12/27/16 18:13
Analysis Date: 01/05/17 0:41

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			UH	0.94	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	93.7		0.94		%	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: **L34772**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34772-01	WG415698	TPH C10 to C28	M8015D GC/FID	H3	Sample was received and analyzed past holding time.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34772-02	WG415698	TPH C10 to C28	M8015D GC/FID	H3	Sample was received and analyzed past holding time.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34772-03	WG415698	TPH C10 to C28	M8015D GC/FID	H3	Sample was received and analyzed past holding time.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34772-04	WG415698	TPH C10 to C28	M8015D GC/FID	H3	Sample was received and analyzed past holding time.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.ACZ Project ID: **L34772**

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: L34772
Date Received: 12/22/2016 12:50
Received By:
Date Printed: 12/22/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Samples/Containers

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

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?
3787	4.5	<=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: L34772
Date Received: 12/22/2016 12:50
Received By:
Date Printed: 12/22/2016

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.

134772

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza
 Company: Tahoe Resources Inc
 E-mail: M.Berganza@Sanrafael.Com.GH

Address: Buickar los procesos. 18 calle 24-69 zona 10
Empresaria zona Pradera Torre IV Oficina 406
 Telephone: (502) 5951 5248

Copy of Report to:

Name: _____
 Company: _____

E-mail: _____
 Telephone: _____

Invoice to:

Name: Miguel Berganza
 Company: Tahoe Resources Inc.
 E-mail: M.Berganza@Sanrafael.Com.GH

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/BH 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 #: Water Quality

PO#: ESCO 601

Reporting state for compliance testing: _____

Check box if samples include NRC licensed material? ☐

SAMPLE IDENTIFICATION			DATE:TIME	Matrix	# of Containers	TPH	GW	CN	TOTAL								
1. GW 2			13/12/16 15:20	GW	8	/											
2. GW 3			13/12/16 14:05	GW	8	/											
3. GW 11			13/12/16 14:05	GW	8	/											
4. GW 10			13/12/16 12:00	GW	8	/											
Pile 1A 3			09/12/16 08:16	SW	1		/										
Pile 1A 3			12/12/16 08:00	SW	1		/										
Pile 1A 1			12/12/16 09:05	SW	1		/										
CP-10			12/12/16 12:00	SW	1		/										

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

All GW samples to be reported in a single document.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
<u>Wlra Fernanda Barmes</u>	<u>20/12/16 08:05</u>	<u>[Signature]</u>	<u>20.12.16 11:18</u>



Guatemala December 12th 2016

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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Ref 2413-16

Pág 1/1

REG 016 Resultados de Análisis

Muestras: 4 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: 131216
Fecha de ingreso de muestra: 141216
Fecha de análisis: 141216-221216
Fecha del informe: 221216

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)
6835	GW-2	46	< 1	N.D.	49
6836	GW-3	< 1	< 1	N.D.	1.6×10^3
6837	GW-11	< 1	< 1	N.D.	< 1.8
6838	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. Silvia Argueta
Directora



December 19, 2016

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.

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Project ID: Escobal

ACZ Project ID: L34478

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on December 07, 2016. This project has been assigned to ACZ's project number, L34478. 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 L34478. 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.

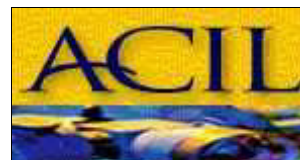
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after January 18, 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.

December 19, 2016

Project ID: Escobal

ACZ Project ID: L34478

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 4 ground water samples from Tahoe Resources, Inc. on December 7, 2016. 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 L34478. 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-3

ACZ Sample ID: **L34478-01**

Date Sampled: 12/04/16 16:20

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 12:33	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 11:07	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 14:55	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/16/16 12:47	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/12/16 18:10	bsu

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	12/09/16 12:23	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/12/16 15:22	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0024			mg/L	0.0002	0.001	12/12/16 15:22	mfm
Barium, dissolved	M200.7 ICP	1	0.038			mg/L	0.003	0.02	12/09/16 12:23	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:23	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/09/16 12:23	aeb
Boron, dissolved	M200.7 ICP	1	0.07			mg/L	0.01	0.05	12/09/16 12:23	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:22	mfm
Calcium, dissolved	M200.7 ICP	1	80.5			mg/L	0.1	0.5	12/09/16 12:23	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:23	aeb
Cobalt, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/09/16 12:23	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:23	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:23	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/09/16 12:23	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:22	mfm
Lithium, dissolved	M200.7 ICP	1	0.015	B		mg/L	0.008	0.04	12/09/16 12:23	aeb
Magnesium, dissolved	M200.7 ICP	1	9.6			mg/L	0.2	1	12/09/16 12:23	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:23	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 10:11	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/09/16 12:23	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:23	aeb
Potassium, dissolved	M200.7 ICP	1	4.0			mg/L	0.2	1	12/09/16 12:23	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:23	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0003			mg/L	0.0001	0.0003	12/14/16 0:33	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	12/14/16 0:33	mfm
Sodium, dissolved	M200.7 ICP	1	27.7			mg/L	0.2	1	12/09/16 12:23	aeb
Strontium, dissolved	M200.7 ICP	1	0.750			mg/L	0.005	0.03	12/09/16 12:23	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:22	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/09/16 12:23	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:23	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/12/16 15:22	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:23	aeb
Zinc, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.01	0.05	12/09/16 12:23	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-3

ACZ Sample ID: **L34478-01**

Date Sampled: 12/04/16 16:20

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	82.2			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	82.2			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			1.6			%			12/19/16 0:00	calc
Sum of Anions			6			meq/L			12/19/16 0:00	calc
Sum of Cations			6.2			meq/L			12/19/16 0:00	calc
Chloride	SM4500Cl-E	1	18.6		*	mg/L	0.5	2	12/14/16 13:59	spl
Conductivity @25C	SM2510B	1	599			umhos/cm	1	10	12/08/16 18:06	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:28	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:33	bce
Fluoride	SM4500F-C	1	0.76		*	mg/L	0.05	0.3	12/08/16 15:27	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		241			mg/L	0.2	5	12/19/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	2.76			mg/L	0.02	0.1	12/14/16 23:21	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:08	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U		mg/L	0.1	0.5	12/13/16 23:30	pjb
pH (lab)	SM4500H+ B									
pH		1	7.7	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.6			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		00.25			mg/L	0.06	0.2	12/19/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.08		*	mg/L	0.02	0.05	12/16/16 15:28	bsu
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.10	H	*	mg/L	0.02	0.05	12/08/16 20:02	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.08			mg/L	0.02	0.05	12/13/16 17:42	spl
Residue, Filterable (TDS) @180C	SM2540C	1	484			mg/L	10	20	12/08/16 13:58	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 13:56	emk
Residue, Total (TS) @ 105C	SM2540B	1	520			mg/L	10	20	12/08/16 13:42	emk
Sulfate	D516-02/-07 - Turbidimetric	5	179		*	mg/L	5	25	12/16/16 11:17	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/07/16 17:06	sck
TDS (calculated)	Calculation		371			mg/L			12/19/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.30						12/19/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-21

ACZ Sample ID: **L34478-02**

Date Sampled: 12/04/16 16:20

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 12:51	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 11:26	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 15:07	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/16/16 13:05	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/12/16 18:16	bsu

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	12/09/16 12:26	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0007	B		mg/L	0.0004	0.002	12/12/16 15:37	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0024			mg/L	0.0002	0.001	12/12/16 15:37	mfm
Barium, dissolved	M200.7 ICP	1	0.039			mg/L	0.003	0.02	12/09/16 12:26	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:26	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/09/16 12:26	aeb
Boron, dissolved	M200.7 ICP	1	0.07			mg/L	0.01	0.05	12/09/16 12:26	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:37	mfm
Calcium, dissolved	M200.7 ICP	1	81.6			mg/L	0.1	0.5	12/09/16 12:26	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:26	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:26	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:26	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:26	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/09/16 12:26	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:37	mfm
Lithium, dissolved	M200.7 ICP	1	0.015	B		mg/L	0.008	0.04	12/09/16 12:26	aeb
Magnesium, dissolved	M200.7 ICP	1	9.7			mg/L	0.2	1	12/09/16 12:26	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:26	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 10:13	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/09/16 12:26	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:26	aeb
Potassium, dissolved	M200.7 ICP	1	4.1			mg/L	0.2	1	12/09/16 12:26	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:26	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0003			mg/L	0.0001	0.0003	12/12/16 15:37	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	12/14/16 0:36	mfm
Sodium, dissolved	M200.7 ICP	1	28.5			mg/L	0.2	1	12/09/16 12:26	aeb
Strontium, dissolved	M200.7 ICP	1	0.766			mg/L	0.005	0.03	12/09/16 12:26	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:37	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/09/16 12:26	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:26	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/12/16 15:37	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:26	aeb
Zinc, dissolved	M200.7 ICP	1	0.03	B		mg/L	0.01	0.05	12/09/16 12:26	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-21

ACZ Sample ID: **L34478-02**

Date Sampled: 12/04/16 16:20

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	81.7			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	81.7			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			3.3			%			12/19/16 0:00	calc
Sum of Anions			5.9			meq/L			12/19/16 0:00	calc
Sum of Cations			6.3			meq/L			12/19/16 0:00	calc
Chloride	SM4500Cl-E	1	18.4		*	mg/L	0.5	2	12/14/16 13:59	spl
Conductivity @25C	SM2510B	1	600			umhos/cm	1	10	12/08/16 18:14	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:30	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:35	bce
Fluoride	SM4500F-C	1	0.76		*	mg/L	0.05	0.3	12/08/16 15:42	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		244			mg/L	0.2	5	12/19/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	2.77			mg/L	0.02	0.1	12/14/16 23:27	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:09	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U		mg/L	0.1	0.5	12/13/16 23:31	pjb
pH (lab)	SM4500H+ B									
pH		1	7.7	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.9			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		00.25			mg/L	0.06	0.2	12/19/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.08		*	mg/L	0.02	0.05	12/16/16 15:30	bsu
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.10	H	*	mg/L	0.02	0.05	12/08/16 20:03	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.08			mg/L	0.02	0.05	12/13/16 17:43	spl
Residue, Filterable (TDS) @180C	SM2540C	1	490		*	mg/L	10	20	12/08/16 14:04	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 13:58	emk
Residue, Total (TS) @ 105C	SM2540B	1	508			mg/L	10	20	12/08/16 13:46	emk
Sulfate	D516-02/-07 - Turbidimetric	5	177		*	mg/L	5	25	12/16/16 11:18	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/07/16 17:09	sck
TDS (calculated)	Calculation		371			mg/L			12/19/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.32						12/19/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-11

ACZ Sample ID: **L34478-03**

Date Sampled: 12/04/16 16:45

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 13:09	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 11:36	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 15:44	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/16/16 13:22	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/12/16 18:23	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.17	B		mg/L	0.03	0.2	12/09/16 12:29	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0006	B		mg/L	0.0004	0.002	12/12/16 15:40	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0032			mg/L	0.0002	0.001	12/12/16 15:40	mfm
Barium, dissolved	M200.7 ICP	1	0.026			mg/L	0.003	0.02	12/09/16 12:29	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:29	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/09/16 12:29	aeb
Boron, dissolved	M200.7 ICP	1	0.18			mg/L	0.01	0.05	12/09/16 12:29	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:40	mfm
Calcium, dissolved	M200.7 ICP	1	235			mg/L	0.1	0.5	12/09/16 12:29	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:29	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:29	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:29	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:29	aeb
Iron, dissolved	M200.7 ICP	1	1.21			mg/L	0.02	0.05	12/09/16 12:29	aeb
Lead, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/12/16 15:40	mfm
Lithium, dissolved	M200.7 ICP	1	0.080			mg/L	0.008	0.04	12/09/16 12:29	aeb
Magnesium, dissolved	M200.7 ICP	1	34.1			mg/L	0.2	1	12/09/16 12:29	aeb
Manganese, dissolved	M200.7 ICP	1	0.020	B		mg/L	0.005	0.03	12/09/16 12:29	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 10:14	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/09/16 12:29	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:29	aeb
Potassium, dissolved	M200.7 ICP	1	4.3			mg/L	0.2	1	12/09/16 12:29	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:29	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0003	12/12/16 15:40	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	12/14/16 0:40	mfm
Sodium, dissolved	M200.7 ICP	1	68.4			mg/L	0.2	1	12/09/16 12:29	aeb
Strontium, dissolved	M200.7 ICP	1	2.19		*	mg/L	0.005	0.03	12/09/16 12:29	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:40	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/09/16 12:29	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:29	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0005	12/12/16 15:40	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:29	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:29	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-11

ACZ Sample ID: **L34478-03**

Date Sampled: 12/04/16 16:45

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	134			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	134			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			12/19/16 0:00	calc
Sum of Anions			18.0			meq/L			12/19/16 0:00	calc
Sum of Cations			18			meq/L			12/19/16 0:00	calc
Chloride	SM4500Cl-E	1	62.3		*	mg/L	0.5	2	12/14/16 13:59	spl
Conductivity @25C	SM2510B	1	1510			umhos/cm	1	10	12/08/16 18:23	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:32	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:37	bce
Fluoride	SM4500F-C	1	2.69		*	mg/L	0.05	0.3	12/08/16 15:45	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		727			mg/L	0.2	5	12/19/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U		mg/L	0.02	0.1	12/14/16 23:28	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:14	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:34	pjb
pH (lab)	SM4500H+ B									
pH		1	8.0	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	23.0			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	12/19/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/16/16 15:32	bsu
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	12/08/16 20:05	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U		mg/L	0.02	0.05	12/13/16 17:44	spl
Residue, Filterable (TDS) @180C	SM2540C	1	1260		*	mg/L	10	20	12/08/16 14:06	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 14:04	emk
Residue, Total (TS) @ 105C	SM2540B	1	1290			mg/L	10	20	12/08/16 13:50	emk
Sulfate	D516-02/-07 - Turbidimetric	20	642		*	mg/L	20	100	12/16/16 11:41	spl
Sulfide as S	SM4500S2-D	1	0.09	B	*	mg/L	0.02	0.1	12/07/16 17:11	sck
TDS (calculated)	Calculation		1130			mg/L			12/19/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.12						12/19/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: PSA-1

ACZ Sample ID: **L34478-04**

Date Sampled: 12/04/16 17:15

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 13:18	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 11:45	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 16:09	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/16/16 13:31	bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/12/16 18:30	bsu

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	12/09/16 12:38	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/12/16 15:43	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0062			mg/L	0.0002	0.001	12/12/16 15:43	mfm
Barium, dissolved	M200.7 ICP	1	0.022			mg/L	0.003	0.02	12/09/16 12:38	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:38	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/09/16 12:38	aeb
Boron, dissolved	M200.7 ICP	1	0.11			mg/L	0.01	0.05	12/09/16 12:38	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:43	mfm
Calcium, dissolved	M200.7 ICP	1	196			mg/L	0.1	0.5	12/09/16 12:38	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:38	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:38	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:38	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:38	aeb
Iron, dissolved	M200.7 ICP	1	2.38			mg/L	0.02	0.05	12/09/16 12:38	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:43	mfm
Lithium, dissolved	M200.7 ICP	1	0.085			mg/L	0.008	0.04	12/09/16 12:38	aeb
Magnesium, dissolved	M200.7 ICP	1	35.4			mg/L	0.2	1	12/09/16 12:38	aeb
Manganese, dissolved	M200.7 ICP	1	0.048			mg/L	0.005	0.03	12/09/16 12:38	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 10:15	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/09/16 12:38	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:38	aeb
Potassium, dissolved	M200.7 ICP	1	4.6			mg/L	0.2	1	12/09/16 12:38	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:38	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	12/12/16 15:43	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	12/14/16 0:43	mfm
Sodium, dissolved	M200.7 ICP	1	46.7			mg/L	0.2	1	12/09/16 12:38	aeb
Strontium, dissolved	M200.7 ICP	1	1.88		*	mg/L	0.005	0.03	12/09/16 12:38	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/12/16 15:43	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/09/16 12:38	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:38	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0006			mg/L	0.0001	0.0005	12/12/16 15:43	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:38	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:38	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: PSA-1

ACZ Sample ID: **L34478-04**

Date Sampled: 12/04/16 17:15

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	156			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	156			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			12/19/16 0:00	calc
Sum of Anions			15			meq/L			12/19/16 0:00	calc
Sum of Cations			15			meq/L			12/19/16 0:00	calc
Chloride	SM4500Cl-E	1	44.2		*	mg/L	0.5	2	12/14/16 13:59	spl
Conductivity @25C	SM2510B	1	1260			umhos/cm	1	10	12/08/16 18:32	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:33	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:38	bce
Fluoride	SM4500F-C	1	2.62		*	mg/L	0.05	0.3	12/08/16 17:00	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		635			mg/L	0.2	5	12/19/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U		mg/L	0.02	0.1	12/14/16 23:29	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:15	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:39	pjb
pH (lab)	SM4500H+ B									
pH		1	8.1	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.7			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	12/19/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/16/16 15:33	bsu
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	12/08/16 20:06	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U		mg/L	0.02	0.05	12/13/16 17:45	spl
Residue, Filterable (TDS) @180C	SM2540C	1	994		*	mg/L	10	20	12/08/16 14:09	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 14:06	emk
Residue, Total (TS) @ 105C	SM2540B	1	1040			mg/L	10	20	12/08/16 13:54	emk
Sulfate	D516-02/-07 - Turbidimetric	20	504		*	mg/L	20	100	12/16/16 11:41	spl
Sulfide as S	SM4500S2-D	1	0.13		*	mg/L	0.02	0.1	12/07/16 17:14	sck
TDS (calculated)	Calculation		933			mg/L			12/19/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.07						12/19/16 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: **L34478**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34478-01	WG414684	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.
	WG414714	Chloride	SM4500Cl-E	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG414690	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).
	WG414520	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).
	WG414418	Fluoride	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).
	WG414650	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).
	WG414935	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).
	WG414376	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).
	WG414434	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).
	WG414888	Sulfate	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).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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: **L34478**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34478-02	WG414684	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.
	WG414714	Chloride	SM4500Cl-E	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG414690	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).
	WG414520	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).
	WG414418	Fluoride	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).
	WG414650	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).
	WG414935	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).
	WG414376	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414888	Sulfate	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).
	WG414373	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: **L34478**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34478-03	WG414684	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.
	WG414487	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.
	WG414714	Chloride	SM4500Cl-E	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG414690	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).
	WG414520	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).
	WG414418	Fluoride	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).
	WG414650	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414935	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).
	WG414376	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414888	Sulfate	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).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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: **L34478**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34478-04	WG414684	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.
	WG414487	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.
	WG414714	Chloride	SM4500Cl-E	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG414690	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).
	WG414520	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).
	WG414453	Fluoride	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).
	WG414650	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414935	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).
	WG414376	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414888	Sulfate	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).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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-3

ACZ Sample ID: **L34478-01**

Date Sampled: 12/04/16 16:20

Date Received: 12/07/16

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**

Extract Method: **M3520**

Workgroup: WG414855

Analyst: rgt

Extract Date: 12/08/16 15:31

Analysis Date: 12/13/16 16:22

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.4	J	0.95	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	99.3		0.95		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-21

ACZ Sample ID: **L34478-02**

Date Sampled: 12/04/16 16:20

Date Received: 12/07/16

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**

Extract Method: **M3520**

Workgroup: WG414855

Analyst: rgt

Extract Date: 12/08/16 15:33

Analysis Date: 12/13/16 16:50

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.4	J	0.97	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	99.1		0.97		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-11

ACZ Sample ID: **L34478-03**
 Date Sampled: 12/04/16 16:45
 Date Received: 12/07/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG414855

Analyst: rgt
 Extract Date: 12/08/16 15:35
 Analysis Date: 12/13/16 17:17

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	97.1		0.93		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: PSA-1

ACZ Sample ID: **L34478-04**

Date Sampled: 12/04/16 17:15

Date Received: 12/07/16

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**

Extract Method: **M3520**

Workgroup: WG414855

Analyst: rgt

Extract Date: 12/08/16 15:37

Analysis Date: 12/13/16 17:45

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	97.1		0.97		%	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: **L34478**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34478-01	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34478-02	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34478-03	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34478-04	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.ACZ Project ID: **L34478**

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: L34478
Date Received: 12/07/2016 11:32
Received By:
Date Printed: 12/7/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9) Are all labels on containers and are they intact and legible?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11) For preserved bottle types, was the pH checked and within limits? ¹	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

L34478-01 Container B1785735 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample to adjust the pH to the appropriate range.

L34478-03 Container B1785758 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample. The pH is 8

L34478-04 Container B1785766 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample. The pH is 8

12) Is there sufficient sample volume to perform all requested work?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13) Is the custody seal intact on all containers?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14) Are samples that require zero headspace acceptable?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
15) Are all sample containers appropriate for analytical requirements?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16) Is there an Hg-1631 trip blank present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17) Is there a VOA trip blank present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18) Were all samples received within hold time?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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?
4737	4.7	<=6.0	15	N/A

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L34478
Date Received: 12/07/2016 11:32
Received By:
Date Printed: 12/7/2016

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.

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).

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Boulevard los Próceres 18 calle 24-69 zona 10
Company: Tahde Resources Inc.	Empresarial, Zona Pradera, Torre IV oficina 1406
E-mail: M.Berganza@santafael.com.gt	Telephone: (502) 5951 5248

Copy of Report to:

Name:		E-mail:
Company:		Telephone:

Invoice to:

Name: Miguel Berganza	<div> <div>Address:</div> <div></div> <div>Telephone:</div> </div>
Company: Tuhoo Resources Inc.	
E-mail: MBerganza@scmrafael.com.gt	

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: <u>LF</u>	Sampler's Site Information	State	Zip code	Time Zone
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***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)[illegible]

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC # 2/3

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
<i>[Signature]</i>	05.12.2016 10:45	<i>[Signature]</i> PWS	05.12.16 10:45 12/7/16 1132

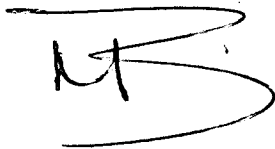
Guatemala December 5th, 2016

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).

Best regards,

A handwritten signature in black ink, appearing to be the initials 'MB' followed by a large, stylized flourish.

Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.

December 19, 2016

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

Project ID: Escobal

ACZ Project ID: L34479

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on December 07, 2016. This project has been assigned to ACZ's project number, L34479. 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 L34479. 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.

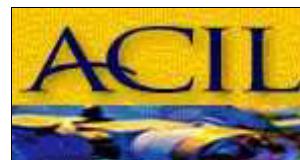
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after January 18, 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.

December 19, 2016

Project ID: Escobal

ACZ Project ID: L34479

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 4 ground water samples from Tahoe Resources, Inc. on December 7, 2016. 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 L34479. 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: **L34479-01**

Date Sampled: 12/04/16 14:00

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 13:27	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 11:55	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 16:33	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 14:21	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:14	bsu

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	12/09/16 12:42	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0007	B		mg/L	0.0004	0.002	12/13/16 16:00	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0024			mg/L	0.0002	0.001	12/13/16 16:00	enb
Barium, dissolved	M200.7 ICP	1	0.380			mg/L	0.003	0.02	12/09/16 12:42	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:42	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/09/16 12:42	aeb
Boron, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/09/16 12:42	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:00	enb
Calcium, dissolved	M200.7 ICP	1	27.9			mg/L	0.1	0.5	12/09/16 12:42	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:42	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:42	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:42	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:42	aeb
Iron, dissolved	M200.7 ICP	1	0.04	B		mg/L	0.02	0.05	12/09/16 12:42	aeb
Lead, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/13/16 16:00	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:42	aeb
Magnesium, dissolved	M200.7 ICP	1	8.6			mg/L	0.2	1	12/09/16 12:42	aeb
Manganese, dissolved	M200.7 ICP	1	0.010	B		mg/L	0.005	0.03	12/09/16 12:42	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 11:13	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/09/16 12:42	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:42	aeb
Potassium, dissolved	M200.7 ICP	1	8.1			mg/L	0.2	1	12/09/16 12:42	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:42	aeb
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	12/13/16 16:00	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 16:00	enb
Sodium, dissolved	M200.7 ICP	1	17.3			mg/L	0.2	1	12/09/16 12:42	aeb
Strontium, dissolved	M200.7 ICP	1	0.190		*	mg/L	0.005	0.03	12/09/16 12:42	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:00	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/09/16 12:42	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:42	aeb
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:00	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:42	aeb
Zinc, dissolved	M200.7 ICP	1	0.26			mg/L	0.01	0.05	12/09/16 12:42	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-7

ACZ Sample ID: **L34479-01**

Date Sampled: 12/04/16 14:00

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	103			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	103			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-3.1			%			12/19/16 0:00	calc
Sum of Anions			3.3			meq/L			12/19/16 0:00	calc
Sum of Cations			3.1			meq/L			12/19/16 0:00	calc
Chloride	SM4500Cl-E	1	14.4		*	mg/L	0.5	2	12/14/16 14:00	spl
Conductivity @25C	SM2510B	1	313			umhos/cm	1	10	12/08/16 18:49	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:34	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:39	bce
Fluoride	SM4500F-C	1	0.15	B	*	mg/L	0.05	0.3	12/08/16 17:04	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		105			mg/L	0.2	5	12/19/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	1.73			mg/L	0.02	0.1	12/14/16 23:30	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:16	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:41	pjb
pH (lab)	SM4500H+ B									
pH		1	7.2	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.6			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	12/19/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/15/16 0:42	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.04	BH	*	mg/L	0.02	0.05	12/08/16 21:19	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/14/16 23:19	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	280		*	mg/L	10	20	12/08/16 14:11	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 14:09	emk
Residue, Total (TS) @ 105C	SM2540B	5	290			mg/L	50	100	12/08/16 13:58	emk
Sulfate	D516-02/-07 - Turbidimetric	1	38.6			mg/L	1	5	12/16/16 11:11	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/07/16 17:22	sck
TDS (calculated)	Calculation		178			mg/L			12/19/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.57						12/19/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-6

ACZ Sample ID: **L34479-02**

Date Sampled: 12/04/16 14:35

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 13:36	bce
Cyanide, WAD	SM4500-CN I- distillation		-						12/09/16 12:04	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 16:45	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 14:36	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:31	bsu

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	12/09/16 12:45	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0004	0.002	12/13/16 16:03	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0022			mg/L	0.0002	0.001	12/13/16 16:03	enb
Barium, dissolved	M200.7 ICP	1	0.105			mg/L	0.003	0.02	12/09/16 12:45	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:45	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/09/16 12:45	aeb
Boron, dissolved	M200.7 ICP	1	0.06			mg/L	0.01	0.05	12/09/16 12:45	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:03	enb
Calcium, dissolved	M200.7 ICP	1	184			mg/L	0.1	0.5	12/09/16 12:45	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:45	aeb
Cobalt, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/09/16 12:45	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:45	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:45	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/09/16 12:45	aeb
Lead, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/13/16 16:03	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:45	aeb
Magnesium, dissolved	M200.7 ICP	1	19.7			mg/L	0.2	1	12/09/16 12:45	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:45	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 11:13	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/09/16 12:45	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:45	aeb
Potassium, dissolved	M200.7 ICP	1	9.0			mg/L	0.2	1	12/09/16 12:45	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:45	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0007			mg/L	0.0001	0.0003	12/13/16 16:03	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 16:03	enb
Sodium, dissolved	M200.7 ICP	1	39.3			mg/L	0.2	1	12/09/16 12:45	aeb
Strontium, dissolved	M200.7 ICP	1	0.873		*	mg/L	0.005	0.03	12/09/16 12:45	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:03	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/09/16 12:45	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:45	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	12/13/16 16:03	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:45	aeb
Zinc, dissolved	M200.7 ICP	1	0.15			mg/L	0.01	0.05	12/09/16 12:45	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-6

ACZ Sample ID: **L34479-02**

Date Sampled: 12/04/16 14:35

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	60.9			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	60.9			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			12/19/16 0:00	calc
Sum of Anions			13			meq/L			12/19/16 0:00	calc
Sum of Cations			13			meq/L			12/19/16 0:00	calc
Chloride	SM4500Cl-E	1	41.6		*	mg/L	0.5	2	12/14/16 14:00	spl
Conductivity @25C	SM2510B	1	1150			umhos/cm	1	10	12/08/16 18:57	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:35	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:40	bce
Fluoride	SM4500F-C	1	0.15	B	*	mg/L	0.05	0.3	12/08/16 17:08	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		541			mg/L	0.2	5	12/19/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	10	8.2			mg/L	0.2	1	12/14/16 23:50	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:18	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:42	pjb
pH (lab)	SM4500H+ B									
pH		1	7.4	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.5			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		0.12	B		mg/L	0.06	0.2	12/19/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	12/15/16 0:44	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.06	H	*	mg/L	0.02	0.05	12/08/16 21:20	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	12/14/16 23:21	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	982		*	mg/L	10	20	12/08/16 14:14	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1	10.0	B	*	mg/L	5	20	12/08/16 14:11	emk
Residue, Total (TS) @ 105C	SM2540B	1	1010			mg/L	10	20	12/08/16 14:02	emk
Sulfate	D516-02/-07 - Turbidimetric	20	486			mg/L	20	100	12/16/16 14:14	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/07/16 17:30	sck
TDS (calculated)	Calculation		818			mg/L			12/19/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.20						12/19/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-5

ACZ Sample ID: **L34479-03**

Date Sampled: 12/04/16 15:13

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 13:45	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 12:14	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 16:58	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 14:50	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:39	bsu

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	12/09/16 12:48	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0005	B		mg/L	0.0004	0.002	12/13/16 16:07	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0009	B		mg/L	0.0002	0.001	12/13/16 16:07	enb
Barium, dissolved	M200.7 ICP	1	0.042			mg/L	0.003	0.02	12/09/16 12:48	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:48	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/09/16 12:48	aeb
Boron, dissolved	M200.7 ICP	1	0.05			mg/L	0.01	0.05	12/09/16 12:48	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:07	enb
Calcium, dissolved	M200.7 ICP	1	137			mg/L	0.1	0.5	12/09/16 12:48	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:48	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:48	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:48	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:48	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/09/16 12:48	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:07	enb
Lithium, dissolved	M200.7 ICP	1	0.008	B		mg/L	0.008	0.04	12/09/16 12:48	aeb
Magnesium, dissolved	M200.7 ICP	1	17.6			mg/L	0.2	1	12/09/16 12:48	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:48	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 11:14	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/09/16 12:48	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:48	aeb
Potassium, dissolved	M200.7 ICP	1	7.6			mg/L	0.2	1	12/09/16 12:48	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:48	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0006			mg/L	0.0001	0.0003	12/13/16 16:07	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 16:07	enb
Sodium, dissolved	M200.7 ICP	1	29.8			mg/L	0.2	1	12/09/16 12:48	aeb
Strontium, dissolved	M200.7 ICP	1	0.516		*	mg/L	0.005	0.03	12/09/16 12:48	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:07	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/09/16 12:48	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:48	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0005	12/13/16 16:07	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:48	aeb
Zinc, dissolved	M200.7 ICP	1	0.05			mg/L	0.01	0.05	12/09/16 12:48	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-5

ACZ Sample ID: **L34479-03**

Date Sampled: 12/04/16 15:13

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	97.7			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	97.7			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			0.0			%			12/19/16 0:00	calc
Sum of Anions			9.8			meq/L			12/19/16 0:00	calc
Sum of Cations			9.8			meq/L			12/19/16 0:00	calc
Chloride	SM4500Cl-E	1	26.0		*	mg/L	0.5	2	12/14/16 14:00	spl
Conductivity @25C	SM2510B	1	924			umhos/cm	1	10	12/08/16 19:05	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:37	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:41	bce
Fluoride	SM4500F-C	1	0.24	B	*	mg/L	0.05	0.3	12/08/16 17:11	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		415			mg/L	0.2	5	12/19/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	4	7.41			mg/L	0.08	0.4	12/14/16 23:52	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:21	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:43	pjb
pH (lab)	SM4500H+ B									
pH		1	7.5	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.5			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		0.09	B		mg/L	0.06	0.2	12/19/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	12/15/16 0:46	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.05	H	*	mg/L	0.02	0.05	12/08/16 21:22	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	12/14/16 23:23	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	748		*	mg/L	10	20	12/08/16 14:17	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1	7.0	B	*	mg/L	5	20	12/08/16 14:14	emk
Residue, Total (TS) @ 105C	SM2540B	1	788			mg/L	10	20	12/08/16 14:06	emk
Sulfate	D516-02/-07 - Turbidimetric	10	336			mg/L	10	50	12/16/16 12:41	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/07/16 17:33	sck
TDS (calculated)	Calculation		614			mg/L			12/19/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.22						12/19/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-8

ACZ Sample ID: **L34479-04**

Date Sampled: 12/04/16 15:35

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 13:54	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 12:24	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 17:10	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 14:57	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:48	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1	0.09	B		mg/L	0.03	0.2	12/09/16 12:58	aeb
Antimony, dissolved	M200.8 ICP-MS	1	0.0009	B		mg/L	0.0004	0.002	12/13/16 16:10	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0014			mg/L	0.0002	0.001	12/13/16 16:10	enb
Barium, dissolved	M200.7 ICP	1	0.067			mg/L	0.003	0.02	12/09/16 12:58	aeb
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:58	aeb
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/09/16 12:58	aeb
Boron, dissolved	M200.7 ICP	1	0.04	B		mg/L	0.01	0.05	12/09/16 12:58	aeb
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:10	enb
Calcium, dissolved	M200.7 ICP	1	99.0			mg/L	0.1	0.5	12/09/16 12:58	aeb
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:58	aeb
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:58	aeb
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:58	aeb
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:58	aeb
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/09/16 12:58	aeb
Lead, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/13/16 16:10	enb
Lithium, dissolved	M200.7 ICP	1	0.009	B		mg/L	0.008	0.04	12/09/16 12:58	aeb
Magnesium, dissolved	M200.7 ICP	1	15.3			mg/L	0.2	1	12/09/16 12:58	aeb
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:58	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 11:15	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/09/16 12:58	aeb
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/09/16 12:58	aeb
Potassium, dissolved	M200.7 ICP	1	6.3			mg/L	0.2	1	12/09/16 12:58	aeb
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/09/16 12:58	aeb
Selenium, dissolved	M200.8 ICP-MS	1	0.0005			mg/L	0.0001	0.0003	12/13/16 16:10	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 16:10	enb
Sodium, dissolved	M200.7 ICP	1	24.3			mg/L	0.2	1	12/09/16 12:58	aeb
Strontium, dissolved	M200.7 ICP	1	0.360		*	mg/L	0.005	0.03	12/09/16 12:58	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 16:10	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/09/16 12:58	aeb
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:58	aeb
Uranium, dissolved	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	12/13/16 16:10	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/09/16 12:58	aeb
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/09/16 12:58	aeb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-8

ACZ Sample ID: **L34479-04**

Date Sampled: 12/04/16 15:35

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	75.2			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	75.2			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			2.7			%			12/19/16 0:00	calc
Sum of Anions			7.1			meq/L			12/19/16 0:00	calc
Sum of Cations			7.5			meq/L			12/19/16 0:00	calc
Chloride	SM4500Cl-E	1	20.7		*	mg/L	0.5	2	12/14/16 14:15	spl
Conductivity @25C	SM2510B	1	689			umhos/cm	1	10	12/08/16 19:13	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:38	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:42	bce
Fluoride	SM4500F-C	1	0.17	B	*	mg/L	0.05	0.3	12/08/16 17:27	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		310			mg/L	0.2	5	12/19/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	3	5.10			mg/L	0.06	0.3	12/14/16 23:55	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:24	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:45	pjb
pH (lab)	SM4500H+ B									
pH		1	7.5	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.6			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		0.12	B		mg/L	0.06	0.2	12/19/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	12/15/16 0:47	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.06	H	*	mg/L	0.02	0.05	12/08/16 21:23	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	12/14/16 23:26	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	566		*	mg/L	10	20	12/08/16 14:19	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 14:17	emk
Residue, Total (TS) @ 105C	SM2540B	1	596			mg/L	10	20	12/08/16 14:10	emk
Sulfate	D516-02/-07 - Turbidimetric	10	236			mg/L	10	50	12/16/16 12:41	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/07/16 17:35	sck
TDS (calculated)	Calculation		448			mg/L			12/19/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.26						12/19/16 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: **L34479**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34479-01	WG414487	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.
	WG414714	Chloride	SM4500Cl-E	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG414690	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).
	WG414520	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).
	WG414453	Fluoride	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).
	WG414650	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414779	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).
	WG414463	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).
	WG414776	Phosphorus, total	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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: **L34479**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34479-02	WG414487	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.
	WG414714	Chloride	SM4500CI-E	M1	Matrix spike recovery was high, 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).
	WG414690	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).
	WG414520	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).
	WG414453	Fluoride	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).
	WG414650	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414779	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).
	WG414463	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).
	WG414776	Phosphorus, total	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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: **L34479**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34479-03	WG414487	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.
	WG414714	Chloride	SM4500CI-E	M1	Matrix spike recovery was high, 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).
	WG414690	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).
	WG414520	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).
	WG414453	Fluoride	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).
	WG414650	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414779	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).
	WG414463	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).
	WG414776	Phosphorus, total	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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: **L34479**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34479-04	WG414487	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.
	WG414714	Chloride	SM4500CI-E	M1	Matrix spike recovery was high, 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).
	WG414690	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).
	WG414520	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).
	WG414453	Fluoride	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).
	WG414650	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414779	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).
	WG414463	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).
	WG414776	Phosphorus, total	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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-7

ACZ Sample ID: **L34479-01**

Date Sampled: 12/04/16 14:00

Date Received: 12/07/16

Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

Analysis Method: **M8015D GC/FID**

Extract Method: **M3520**

Workgroup: WG414855

Analyst: rgt

Extract Date: 12/08/16 15:40

Analysis Date: 12/13/16 18:13

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.4	J	0.99	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	95.3		0.99		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-6

ACZ Sample ID: **L34479-02**
 Date Sampled: 12/04/16 14:35
 Date Received: 12/07/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG414855

Analyst: rgt
 Extract Date: 12/08/16 15:42
 Analysis Date: 12/13/16 18:40

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.49	J	0.93	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	101.6		0.93		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-5

ACZ Sample ID: **L34479-03**
 Date Sampled: 12/04/16 15:13
 Date Received: 12/07/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG414855

Analyst: rgt
 Extract Date: 12/08/16 15:44
 Analysis Date: 12/13/16 19:08

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.42	J	0.93	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	99.7		0.93		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-8

ACZ Sample ID: **L34479-04**
 Date Sampled: 12/04/16 15:35
 Date Received: 12/07/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG414855

Analyst: rgt
 Extract Date: 12/08/16 15:46
 Analysis Date: 12/13/16 20:03

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	94.4		1.01		%	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: **L34479**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34479-01	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34479-02	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34479-03	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34479-04	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.

ACZ Project ID: **L34479**

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: L34479
Date Received: 12/07/2016 11:32
Received By:
Date Printed: 12/7/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples? A change was made in the Sample Date:Time Line 3 section prior to ACZ custody.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9) Are all labels on containers and are they intact and legible?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11) For preserved bottle types, was the pH checked and within limits? ¹ L34479-01 Container B1785779 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample. The pH is 8 L34479-02 Container B1785795 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample to adjust the pH to the appropriate range. L34479-03 Container B1785803 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample. The pH is 9 L34479-04 Container B1785824 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample. The pH is 9	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
12) Is there sufficient sample volume to perform all requested work?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13) Is the custody seal intact on all containers?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14) Are samples that require zero headspace acceptable?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
15) Are all sample containers appropriate for analytical requirements?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16) Is there an Hg-1631 trip blank present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17) Is there a VOA trip blank present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18) Were all samples received within hold time? Some parameters were received past hold time.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Chain of Custody Related Remarks

Client Contact Remarks

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L34479
Date Received: 12/07/2016 11:32
Received By:
Date Printed: 12/7/2016

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
-----	-----	-----	-----	-----
4617	4.7	<=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.

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).

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Boulevard Los Pinos, 18 Calle 24-69 Zona 14
Company: Tahoe Resources Inc.	Empresarial, Zona Pinar, Torre IV Oficina 404
E-mail: M.Berganza@sunrafin.com.gt	Telephone: (502) 59515248

Copy of Report to:

Name:		E-mail:
Company:		Telephone:

Invoice to:

Name: Miguel Berganza	Address:
Company: Tahoe Resources Inc.	
E-mail: M.Berganza@sanrafael.com.gt	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:** _____

PROJECT INFORMATION

ANALYSES REQUESTED (attach list or use quote number)

[illegible]

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC #1/3

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
<i>[Signature]</i>	05-12-2016 10:45	<i>[Signature]</i> DJP	5:12.16 10 12/7/16 182

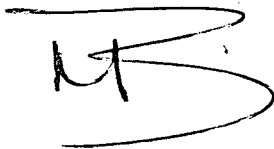
Guatemala December 5th, 2016

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).

Best regards,

A handwritten signature in black ink, appearing to be the initials 'MB' followed by a stylized flourish.

Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.

December 21, 2016

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

Project ID: Escobal

ACZ Project ID: L34480

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on December 07, 2016. This project has been assigned to ACZ's project number, L34480. 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 L34480. 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.

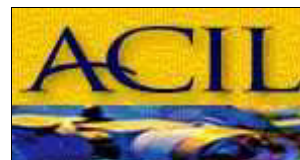
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after January 20, 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.

December 21, 2016

Project ID: Escobal

ACZ Project ID: L34480

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 3 ground water samples from Tahoe Resources, Inc. on December 7, 2016. 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 L34480. 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-4

ACZ Sample ID: **L34480-01**

Date Sampled: 12/04/16 17:20

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 14:03	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 12:33	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 17:22	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 15:04	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 15:56	bsu

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	12/08/16 17:21	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/13/16 19:18	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0025			mg/L	0.0002	0.001	12/13/16 19:18	enb
Barium, dissolved	M200.7 ICP	1	0.021			mg/L	0.003	0.02	12/08/16 17:21	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:21	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/08/16 17:21	gss
Boron, dissolved	M200.7 ICP	1	0.05			mg/L	0.01	0.05	12/08/16 17:21	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:18	enb
Calcium, dissolved	M200.7 ICP	1	70.7		*	mg/L	0.1	0.5	12/08/16 17:21	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:21	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:21	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:21	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/08/16 17:21	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/08/16 17:21	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:18	enb
Lithium, dissolved	M200.7 ICP	1	0.012	B		mg/L	0.008	0.04	12/08/16 17:21	gss
Magnesium, dissolved	M200.7 ICP	1	7.6		*	mg/L	0.2	1	12/08/16 17:21	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:21	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 11:16	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/08/16 17:21	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/08/16 17:21	gss
Potassium, dissolved	M200.7 ICP	1	3.9			mg/L	0.2	1	12/08/16 17:21	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/08/16 17:21	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0003			mg/L	0.0001	0.0003	12/13/16 19:18	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 19:18	enb
Sodium, dissolved	M200.7 ICP	1	24.8			mg/L	0.2	1	12/08/16 17:21	gss
Strontium, dissolved	M200.7 ICP	1	0.623			mg/L	0.005	0.03	12/08/16 17:21	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:18	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/08/16 17:21	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:21	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0001	B		mg/L	0.0001	0.0005	12/13/16 19:18	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:21	gss
Zinc, dissolved	M200.7 ICP	1	0.01	B		mg/L	0.01	0.05	12/08/16 17:21	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-4

ACZ Sample ID: **L34480-01**

Date Sampled: 12/04/16 17:20

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	85.1			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	85.1			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			1.9			%			12/21/16 0:00	calc
Sum of Anions			5.2			meq/L			12/21/16 0:00	calc
Sum of Cations			5.4			meq/L			12/21/16 0:00	calc
Chloride	SM4500Cl-E	1	15.4		*	mg/L	0.5	2	12/14/16 14:15	spl
Conductivity @25C	SM2510B	1	541			umhos/cm	1	10	12/08/16 19:22	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:39	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:42	bce
Fluoride	SM4500F-C	1	0.87		*	mg/L	0.05	0.3	12/08/16 17:35	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		208			mg/L	0.2	5	12/21/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	2.77			mg/L	0.02	0.1	12/14/16 23:38	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:25	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:46	pjb
pH (lab)	SM4500H+ B									
pH		1	7.7	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	21.7			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		00.22			mg/L	0.06	0.2	12/21/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.07		*	mg/L	0.02	0.05	12/15/16 0:48	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.09	H	*	mg/L	0.02	0.05	12/08/16 21:24	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.07		*	mg/L	0.02	0.05	12/14/16 23:27	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	438		*	mg/L	10	20	12/08/16 14:22	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 14:19	emk
Residue, Total (TS) @ 105C	SM2540B	2	476			mg/L	20	40	12/08/16 14:14	emk
Sulfate	D516-02/-07 - Turbidimetric	5	145			mg/L	5	25	12/16/16 12:33	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/07/16 17:38	sck
TDS (calculated)	Calculation		321			mg/L			12/21/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.36						12/21/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-9

ACZ Sample ID: **L34480-02**

Date Sampled: 12/04/16 18:00

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 14:12	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 12:43	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 17:35	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 15:12	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 16:04	bsu

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	12/08/16 17:24	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/13/16 19:22	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.001			mg/L	0.0002	0.001	12/13/16 19:22	enb
Barium, dissolved	M200.7 ICP	1	0.042			mg/L	0.003	0.02	12/08/16 17:24	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:24	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/08/16 17:24	gss
Boron, dissolved	M200.7 ICP	1	0.02	B		mg/L	0.01	0.05	12/08/16 17:24	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:22	enb
Calcium, dissolved	M200.7 ICP	1	56.8		*	mg/L	0.1	0.5	12/08/16 17:24	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:24	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:24	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:24	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/08/16 17:24	gss
Iron, dissolved	M200.7 ICP	1	0.36			mg/L	0.02	0.05	12/08/16 17:24	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:22	enb
Lithium, dissolved	M200.7 ICP	1	0.011	B		mg/L	0.008	0.04	12/08/16 17:24	gss
Magnesium, dissolved	M200.7 ICP	1	8.7		*	mg/L	0.2	1	12/08/16 17:24	gss
Manganese, dissolved	M200.7 ICP	1	0.093			mg/L	0.005	0.03	12/08/16 17:24	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 11:17	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/08/16 17:24	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/08/16 17:24	gss
Potassium, dissolved	M200.7 ICP	1	4.3			mg/L	0.2	1	12/08/16 17:24	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/08/16 17:24	gss
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	12/13/16 19:22	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 19:22	enb
Sodium, dissolved	M200.7 ICP	1	25.5			mg/L	0.2	1	12/08/16 17:24	gss
Strontium, dissolved	M200.7 ICP	1	0.398			mg/L	0.005	0.03	12/08/16 17:24	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:22	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/08/16 17:24	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:24	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:22	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:24	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:24	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-9

ACZ Sample ID: **L34480-02**

Date Sampled: 12/04/16 18:00

Date Received: 12/07/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	164			mg/L	2	20	12/08/16 0:00	emk
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1	164			mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			1.1			%			12/21/16 0:00	calc
Sum of Anions			4.7			meq/L			12/21/16 0:00	calc
Sum of Cations			4.8			meq/L			12/21/16 0:00	calc
Chloride	SM4500Cl-E	1	9.0		*	mg/L	0.5	2	12/14/16 14:15	spl
Conductivity @25C	SM2510B	1	447			umhos/cm	1	10	12/08/16 19:31	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:40	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:43	bce
Fluoride	SM4500F-C	1	0.61		*	mg/L	0.05	0.3	12/08/16 17:42	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		178			mg/L	0.2	5	12/21/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	0.18			mg/L	0.02	0.1	12/14/16 23:43	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U		mg/L	0.05	0.2	12/21/16 12:20	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:47	pjb
pH (lab)	SM4500H+ B									
pH		1	8.3	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.5			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		0.12	B		mg/L	0.06	0.2	12/21/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.04	B	*	mg/L	0.02	0.05	12/15/16 0:52	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.05	H	*	mg/L	0.02	0.05	12/09/16 19:47	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.07		*	mg/L	0.02	0.05	12/14/16 23:28	pjb
Residue, Filterable (TDS) @180C	SM2540C	10	340		*	mg/L	100	200	12/08/16 14:24	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 14:22	emk
Residue, Total (TS) @ 105C	SM2540B	5	350		*	mg/L	50	100	12/08/16 14:22	emk
Sulfate	D516-02/-07 - Turbidimetric	5	56.1			mg/L	5	25	12/16/16 12:35	spl
Sulfide as S	SM4500S2-D	1	0.07	B	*	mg/L	0.02	0.1	12/07/16 17:41	sck
TDS (calculated)	Calculation		262			mg/L			12/21/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.30						12/21/16 0:00	calc

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: MW-20

ACZ Sample ID: **L34480-03**

Date Sampled: 12/04/16 12:00

Date Received: 12/07/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								12/12/16 14:21	bce
Cyanide, WAD	SM4500-CN I- distillation								12/09/16 13:02	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								12/12/16 17:47	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								12/14/16 15:19	bsu
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								12/13/16 16:13	bsu

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	12/08/16 17:27	gss
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	12/13/16 19:25	enb
Arsenic, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	12/13/16 19:25	enb
Barium, dissolved	M200.7 ICP	1		U		mg/L	0.003	0.02	12/08/16 17:27	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:27	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	12/08/16 17:27	gss
Boron, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:27	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:25	enb
Calcium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/08/16 17:27	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:27	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:27	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:27	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/08/16 17:27	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	12/08/16 17:27	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:25	enb
Lithium, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/08/16 17:27	gss
Magnesium, dissolved	M200.7 ICP	1		U	*	mg/L	0.2	1	12/08/16 17:27	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:27	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	12/13/16 11:18	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	12/08/16 17:27	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	12/08/16 17:27	gss
Potassium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	12/08/16 17:27	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	12/08/16 17:27	gss
Selenium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	12/13/16 19:25	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	12/13/16 19:25	enb
Sodium, dissolved	M200.7 ICP	1		U		mg/L	0.2	1	12/08/16 17:27	gss
Strontium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:27	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:25	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	12/08/16 17:27	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:27	gss
Uranium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	12/13/16 19:25	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	12/08/16 17:27	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	12/08/16 17:27	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: MW-20

ACZ Sample ID: **L34480-03**

Date Sampled: 12/04/16 12:00

Date Received: 12/07/16

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	12/08/16 0:00	emk
Carbonate as CaCO3		1		U		mg/L	2	20	12/08/16 0:00	emk
Hydroxide as CaCO3		1		U		mg/L	2	20	12/08/16 0:00	emk
Total Alkalinity		1		U		mg/L	2	20	12/08/16 0:00	emk
Cation-Anion Balance	Calculation									
Cation-Anion Balance			n/a			%			12/21/16 0:00	calc
Sum of Anions			N/A			meq/L			12/21/16 0:00	calc
Sum of Cations				U		meq/L			12/21/16 0:00	calc
Chloride	SM4500Cl-E	1		U	*	mg/L	0.5	2	12/14/16 14:15	spl
Conductivity @25C	SM2510B	1	3.3	B		umhos/cm	1	10	12/08/16 19:39	emk
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/13/16 18:41	bce
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	12/09/16 16:45	bce
Fluoride	SM4500F-C	1		U	*	mg/L	0.05	0.3	12/08/16 17:49	emk
Hardness as CaCO3 (dissolved)	SM2340B - Calculation			U		mg/L	0.2	5	12/21/16 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U		mg/L	0.02	0.1	12/14/16 23:44	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	12/13/16 12:53	splo
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	12/13/16 23:48	pjb
pH (lab)	SM4500H+ B									
pH		1	6.7	H		units	0.1	0.1	12/10/16 0:00	sck
pH measured at		1	22.8			C	0.1	0.1	12/10/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	12/21/16 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/15/16 0:53	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	12/14/16 21:02	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	12/14/16 23:29	pjb
Residue, Filterable (TDS) @180C	SM2540C	1		U	*	mg/L	10	20	12/08/16 14:27	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	12/08/16 14:24	emk
Residue, Total (TS) @ 105C	SM2540B	1		U	*	mg/L	10	20	12/08/16 14:26	emk
Sulfate	D516-02/-07 - Turbidimetric	1		U		mg/L	1	5	12/16/16 12:27	spl
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/07/16 17:44	sck
TDS (calculated)	Calculation					mg/L			12/21/16 0:00	calc
TDS (ratio - measured/calculated)	Calculation		n/a						12/21/16 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: **L34480**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34480-01	WG414411	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.
		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.
	WG414714	Chloride	SM4500CI-E	M1	Matrix spike recovery was high, 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).
	WG414690	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).
	WG414520	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).
	WG414453	Fluoride	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).
	WG414650	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414779	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).
	WG414463	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).
	WG414776	Phosphorus, total	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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: **L34480**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34480-02	WG414411	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.
		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.
	WG414714	Chloride	SM4500CI-E	M1	Matrix spike recovery was high, 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).
	WG414690	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).
	WG414520	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).
	WG414453	Fluoride	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414779	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).
	WG414534	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).
	WG414776	Phosphorus, total	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414435	Residue, Total (TS) @ 105C	SM2540B	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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: **L34480**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34480-03	WG414411	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.
		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.
	WG414714	Chloride	SM4500CI-E	M1	Matrix spike recovery was high, 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).
	WG414690	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).
	WG414520	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).
	WG414453	Fluoride	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).
	WG414650	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).
	WG414692	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414779	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).
	WG414775	Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	H3	Sample was received and analyzed past holding time.
	WG414776	Phosphorus, total	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).
	WG414432	Residue, Filterable (TDS) @180C	SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414434	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).
	WG414435	Residue, Total (TS) @ 105C	SM2540B	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG414373	Sulfide as S	SM4500S2-D	QB	Method-specified preservation criteria cannot be met due to sample matrix.
			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-4

ACZ Sample ID: **L34480-01**
 Date Sampled: 12/04/16 17:20
 Date Received: 12/07/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG414855

Analyst: rgt
 Extract Date: 12/08/16 15:48
 Analysis Date: 12/13/16 20:31

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.3	J	1.03	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	99		1.03		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-9

ACZ Sample ID: **L34480-02**
 Date Sampled: 12/04/16 18:00
 Date Received: 12/07/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG414855

Analyst: rgt
 Extract Date: 12/08/16 15:50
 Analysis Date: 12/13/16 20:58

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28		0.96		0.93	*	mg/L	0.09	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	97.6		0.93		%	70	130

Tahoe Resources, Inc.

Project ID: Escobal
 Sample ID: MW-20

ACZ Sample ID: **L34480-03**
 Date Sampled: 12/04/16 12:00
 Date Received: 12/07/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG414855

Analyst: rgt
 Extract Date: 12/08/16 15:52
 Analysis Date: 12/13/16 21:26

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			U	1	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	98		1		%	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: **L34480**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34480-01	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34480-02	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.
L34480-03	WG414855	TPH C10 to C28	M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.ACZ Project ID: **L34480**

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: L34480
Date Received: 12/07/2016 11:34
Received By:
Date Printed: 12/7/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9) Are all labels on containers and are they intact and legible?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11) For preserved bottle types, was the pH checked and within limits? ¹	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
L34480-01 Container B1785816 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample. The pH is 8			
L34480-02 Container B1785840 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample. The pH is 8			
L34480-03 Container B1785848 (TAN): Added 1 mls 5N sodium hydroxide and 1 mls zinc acetate to the sub-sample. The pH is 8			
12) Is there sufficient sample volume to perform all requested work?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13) Is the custody seal intact on all containers?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14) Are samples that require zero headspace acceptable?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
15) Are all sample containers appropriate for analytical requirements?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16) Is there an Hg-1631 trip blank present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17) Is there a VOA trip blank present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18) Were all samples received within hold time?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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?
4641	3.5	<=6.0	15	N/A

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L34480
Date Received: 12/07/2016 11:34
Received By:
Date Printed: 12/7/2016

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.

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).

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza	Address: Buena Vista Proceres, 18 calle 24-69 zona 16
Company: Tahoe Resources Inc.	Empresarial, Zona Proceres, Torre IV Oficina 1406
E-mail: m.berganza@sanrafael.com.gt	Telephone: (502) 59515248

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name: MIGUEL BARGANZA	Address:
Company: Tahoe Resources Inc.	
E-mail: M.Barganza@sunsafari.com.gt	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)

[illegible]

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

COC #3/3

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
V. C. T.	05-12-2016	Conny	5.12.16 10
	10:45	EJS	12/7/16 1134

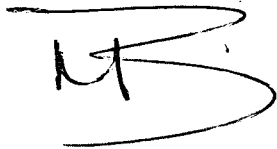
Guatemala December 5th, 2016

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).

Best regards,

A handwritten signature in black ink, appearing to be 'MB' with a large, sweeping flourish underneath.

Miguel Berganza
Environment Department.
Mina El Escobal
Minera San Rafael, S.A.



ECOSISTEMAS
PROYECTOS AMBIENTALES

LABORATORIO AMBIENTAL E INDUSTRIAL

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Ref 2305-16

Pág 1/1

REG 016 Resultados de Análisis

Muestras: 11 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: 041216
Fecha de ingreso de muestra: 051216
Fecha de análisis: 051216-121216
Fecha del informe: 121216

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)
6653	MW-4	6	< 1	N.D.	< 1.8
6654	MW-21	< 1	< 1	N.D.	< 1.8
6655	MW-11	140	< 1	N.D.	< 1.8
6656	PSA-1	318	< 1	N.D.	< 1.8
6657	MW7	12	< 1	N.D.	< 1.8
6658	MW3	2	< 1	N.D.	< 1.8
6659	MW-20	< 1	< 1	N.D.	< 1.8
6660	MW-6	11	< 1	N.D.	4.5
6661	MW-5	11	< 1	N.D.	< 1.8
6662	MW-8	< 1	< 1	N.D.	< 1.8
6663	MW-9	75	< 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. Colorimétrico Merck

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.

Ing. Oscar Páez
Gerente Técnico

VoBo Ing. Fernando Fuentes
Gerente de Calidad

January 17, 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: L34833

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on December 29, 2016. This project has been assigned to ACZ's project number, L34833. 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 L34833. 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.

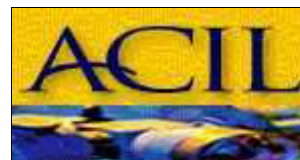
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after February 16, 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.

January 17, 2017

Project ID: Escobal

ACZ Project ID: L34833

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 1 ground water sample from Tahoe Resources, Inc. on December 29, 2016. The sample was received in good condition. Upon receipt, the sample custodian removed the sample from the cooler, inspected the contents, and logged the sample into ACZ's computerized Laboratory Information Management System (LIMS). The sample was assigned ACZ LIMS project number L34833. 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.

TPH on L34833-01 (N1) - The sample prep was performed past method holding time. It was received with four days remaining on the holding time, but three of those four days fell on a long holiday weekend (ACZ observed New Years on Jan 2). Holding time ran out on Jan 2 and samples were extracted on Jan 3 when the laboratory re-opened after the long weekend.

Sample Analysis

This sample was analyzed for inorganic, organic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: HW-1

ACZ Sample ID: **L34833-01**

Date Sampled: 12/26/16 09:40

Date Received: 12/29/16

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								01/06/17 11:15	bce
Cyanide, WAD	SM4500-CN I- distillation								01/09/17 10:38	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								01/06/17 12:13	bsu
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								01/04/17 17:35	bsu/bce
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 13:24	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	01/05/17 19:51	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0006	B	*	mg/L	0.0004	0.002	01/05/17 18:30	enb
Arsenic, dissolved	M200.8 ICP-MS	1	0.0105			mg/L	0.0002	0.001	01/05/17 18:30	enb
Barium, dissolved	M200.7 ICP	1	0.075			mg/L	0.003	0.02	01/05/17 19:51	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/05/17 19:51	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	01/05/17 19:51	gss
Boron, dissolved	M200.7 ICP	1	0.09			mg/L	0.01	0.05	01/05/17 19:51	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 18:30	enb
Calcium, dissolved	M200.7 ICP	1	84.7		*	mg/L	0.1	0.5	01/05/17 19:51	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/05/17 19:51	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/05/17 19:51	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/05/17 19:51	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/05/17 19:51	gss
Iron, dissolved	M200.7 ICP	1	0.03	B	*	mg/L	0.02	0.05	01/05/17 19:51	gss
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 18:30	enb
Lithium, dissolved	M200.7 ICP	1	0.119			mg/L	0.008	0.04	01/05/17 19:51	gss
Magnesium, dissolved	M200.7 ICP	1	5.7			mg/L	0.2	1	01/05/17 19:51	gss
Manganese, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/05/17 19:51	gss
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	01/16/17 15:43	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	01/05/17 19:51	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/05/17 19:51	gss
Potassium, dissolved	M200.7 ICP	1	2.4			mg/L	0.2	1	01/05/17 19:51	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/05/17 19:51	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0003			mg/L	0.0001	0.0003	01/05/17 18:30	enb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	01/05/17 18:30	enb
Sodium, dissolved	M200.7 ICP	1	71.1			mg/L	0.2	1	01/05/17 19:51	gss
Strontium, dissolved	M200.7 ICP	1	3.7		*	mg/L	0.005	0.03	01/05/17 19:51	gss
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	01/05/17 18:30	enb
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	01/05/17 19:51	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/05/17 19:51	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	01/05/17 18:30	enb
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/05/17 19:51	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/05/17 19:51	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: HW-1

ACZ Sample ID: **L34833-01**

Date Sampled: 12/26/16 09:40

Date Received: 12/29/16

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	142			mg/L	2	20	12/30/16 0:00	sck
Carbonate as CaCO ₃		1		U		mg/L	2	20	12/30/16 0:00	sck
Hydroxide as CaCO ₃		1		U		mg/L	2	20	12/30/16 0:00	sck
Total Alkalinity		1	142			mg/L	2	20	12/30/16 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-0.6			%			01/17/17 0:00	calc
Sum of Anions			8.1			meq/L			01/17/17 0:00	calc
Sum of Cations			8			meq/L			01/17/17 0:00	calc
Chloride	SM4500Cl-E	1	4.3		*	mg/L	0.5	2	01/09/17 16:45	krh
Conductivity @25C	SM2510B	1	747			umhos/cm	1	10	12/30/16 2:34	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	01/06/17 23:48	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	01/09/17 16:25	bce
Fluoride	SM4500F-C	1	0.72			mg/L	0.05	0.3	01/05/17 12:19	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		235			mg/L	0.2	5	01/17/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	0.56		*	mg/L	0.02	0.1	01/06/17 23:06	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	01/09/17 14:35	spl
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	01/06/17 19:31	pjb
pH (lab)	SM4500H+ B									
pH		1	8.2	H		units	0.1	0.1	12/30/16 0:00	sck
pH measured at		1	22.6			C	0.1	0.1	12/30/16 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus		0.09	B		mg/L	0.06	0.2	01/17/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	01/04/17 23:44	pjb
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1	0.03	BH	*	mg/L	0.02	0.05	01/04/17 21:03	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1	0.03	B	*	mg/L	0.02	0.05	01/10/17 22:42	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	554			mg/L	10	20	12/29/16 15:18	emk
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U		mg/L	5	20	12/29/16 16:39	emk
Residue, Total (TS) @ 105C	SM2540B	1	590			mg/L	10	20	12/29/16 15:58	emk
Sulfate	D516-02/-07 - Turbidimetric	10	242		*	mg/L	10	50	01/09/17 13:26	krh
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	12/30/16 14:23	sck
TDS (calculated)	Calculation		501			mg/L			01/17/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.11						01/17/17 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: **L34833**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34833-01	WG415750	Aluminum, dissolved	M200.7 ICP	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG415747	Antimony, 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.
	WG415750	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.
		Iron, 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.
		Strontium, 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.
	WG415891	Chloride	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).
	WG415847	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).
	WG415908	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).
	WG415846	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).
	WG415882	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).
	WG415845	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	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG415695	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).
	WG415692	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).
	WG415990	Phosphorus, total	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).
	WG415877	Sulfate	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).
	WG415493	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: HW-1

ACZ Sample ID: **L34833-01**
 Date Sampled: 12/26/16 9:40
 Date Received: 12/29/16
 Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG415822

Analyst: mmn
 Extract Date: 01/03/17 15:01
 Analysis Date: 01/05/17 21:35

Compound	CAS	Result	QUAL	Dilution	XQ	Units	MDL	PQL
TPH C10 to C28			UH	1	*	mg/L	0.1	0.5
Surrogate Recoveries	CAS	% Recovery		Dilution	XQ	Units	LCL	UCL
OTP	84-15-1	91.7		1		%	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: **L34833**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34833-01	WG415822	TPH C10 to C28	M8015D GC/FID	N1	See Case Narrative.
			M8015D GC/FID	Q9	Insufficient sample received to meet method QC requirements.

Tahoe Resources, Inc.

ACZ Project ID: **L34833**

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: L34833
Date Received: 12/29/2016 09:35
Received By:
Date Printed: 12/29/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Samples/Containers

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

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?
4721	5.4	<=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: L34833
Date Received: 12/29/2016 09:35
Received By:
Date Printed: 12/29/2016

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. L34833

CHAIN of CUSTODY

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Berganza
Company: Tahoe Resources Inc.
E-mail: MBerganza@sanrafael.com.gt

Address: Boulevard Los Próceres 18 calle 24-69 zona 10
Empresarial Zona Pradera Torre IV oficina 1406
Telephone: (502) 5951 5248

Copy of Report to:

Name: Luisa Fernanda Barrios
Company: LBarrios@sanrafael.com.gt

E-mail: LBarrios@sanrafael.com.gt
Telephone: (502) 56 96 4268

Invoice to:

Name: Miguel Berganza
Company: Tahoe Resources Inc.
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: L F 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 #: Water Quality

PO#: Escobal

Reporting state for compliance testing:

Check box if samples include NRC licensed material?

SAMPLE IDENTIFICATION	DATE TIME	Matrix	# of Containers	SW	TOTAL CIV	GW + TPT						
Pilda 3	26-12-16 07:58	SW	10	/	/							
EP- 10	26-12-16 12:00	WW	10	/	/							
Pilda 3	22-12-16 09:15	SW	1		/							
WW 9	22-12-16 08:10	WW	1		/							
WW 9	25-12-16 08:26	WW	1		/							
Agua de Proceso	26-12-16 11:10	WW	1		/							
WW 14	26-12-16 08:17:00	WW	1		/							
HW-1	26/12/16 09:40	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 results for HW-1 in a different 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	28/12/16 08:00	Barrios	27/12/16 9:35
		Barrios	12/29/16 9:35

134833-1701170921

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FRMAD050.06.14.14

White - Return with sample.

Yellow - Retain for your records.



34833 Chain of Custody

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
Fechas de muestreo: 261216
Fecha de ingreso de muestra: 271216
Fecha de análisis: 271216-090117
Fecha del informe: 090117

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)
6964	HW-1	< 1	< 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 límite de detección.

Límites de detección: Cromo hexavalente (0.05 mg/l)

El resultado obtenido corresponde 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

January 26, 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: L34997

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on January 12, 2017. This project has been assigned to ACZ's project number, L34997. 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 L34997. 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.

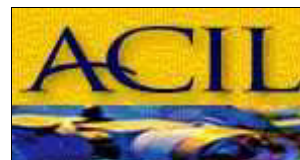
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after February 25, 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: PSASR

ACZ Sample ID: **L34997-01**

Date Sampled: 01/09/17 10:10

Date Received: 01/12/17

Sample Matrix: Ground Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								01/13/17 15:32	bce
Cyanide, WAD	SM4500-CN I- distillation								01/16/17 10:36	bce
Nitrogen, total Kjeldahl	M351.2 - Block Digestor								01/19/17 13:26	bce
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid Digestion								01/20/17 12:09	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/16/17 14:54	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	01/19/17 1:02	gss
Antimony, dissolved	M200.8 ICP-MS	1	0.0008	B		mg/L	0.0004	0.002	01/24/17 16:42	mfm
Arsenic, dissolved	M200.8 ICP-MS	1	0.0155			mg/L	0.0002	0.001	01/20/17 11:48	mfm
Barium, dissolved	M200.7 ICP	1	0.076			mg/L	0.003	0.02	01/19/17 1:02	gss
Beryllium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/19/17 1:02	gss
Bismuth, dissolved	M200.7 ICP	1		U	*	mg/L	0.04	0.2	01/19/17 1:02	gss
Boron, dissolved	M200.7 ICP	1	0.10			mg/L	0.01	0.05	01/19/17 1:02	gss
Cadmium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	01/20/17 11:48	mfm
Calcium, dissolved	M200.7 ICP	1	103			mg/L	0.1	0.5	01/19/17 1:02	gss
Chromium, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/19/17 1:02	gss
Cobalt, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/19/17 1:02	gss
Copper, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/19/17 1:02	gss
Gallium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/19/17 1:02	gss
Iron, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.05	01/20/17 15:45	aeb
Lead, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	01/20/17 11:48	mfm
Lithium, dissolved	M200.7 ICP	1	0.147			mg/L	0.008	0.04	01/19/17 1:02	gss
Magnesium, dissolved	M200.7 ICP	1	6.2			mg/L	0.2	1	01/19/17 1:02	gss
Manganese, dissolved	M200.7 ICP	1	0.030			mg/L	0.005	0.03	01/20/17 15:45	aeb
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	01/24/17 16:11	pta
Molybdenum, dissolved	M200.7 ICP	1		U		mg/L	0.02	0.1	01/19/17 1:02	gss
Nickel, dissolved	M200.7 ICP	1		U		mg/L	0.008	0.04	01/19/17 1:02	gss
Potassium, dissolved	M200.7 ICP	1	1.9			mg/L	0.2	1	01/19/17 1:02	gss
Scandium, dissolved	M200.7 ICP	1		U	*	mg/L	0.1	0.5	01/19/17 1:02	gss
Selenium, dissolved	M200.8 ICP-MS	1	0.0004			mg/L	0.0001	0.0003	01/24/17 16:42	mfm
Silver, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.00005	0.0003	01/25/17 20:10	enb
Sodium, dissolved	M200.7 ICP	1	86.5			mg/L	0.2	1	01/19/17 1:02	gss
Strontium, dissolved	M200.7 ICP	1	4.77			mg/L	0.005	0.03	01/19/17 1:02	gss
Thallium, dissolved	M200.8 ICP-MS	1		U	*	mg/L	0.0001	0.0005	01/20/17 11:48	mfm
Tin, dissolved	M200.7 ICP	1		U		mg/L	0.04	0.2	01/19/17 1:02	gss
Titanium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/19/17 1:02	gss
Uranium, dissolved	M200.8 ICP-MS	1	0.0003	B		mg/L	0.0001	0.0005	01/24/17 16:42	mfm
Vanadium, dissolved	M200.7 ICP	1		U		mg/L	0.005	0.03	01/19/17 1:02	gss
Zinc, dissolved	M200.7 ICP	1		U		mg/L	0.01	0.05	01/19/17 1:02	gss

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: PSASR

ACZ Sample ID: **L34997-01**

Date Sampled: 01/09/17 10:10

Date Received: 01/12/17

Sample Matrix: Ground Water

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO ₃	SM2320B - Titration									
Bicarbonate as CaCO ₃		1	169		*	mg/L	2	20	01/14/17 0:00	sck
Carbonate as CaCO ₃		1		U	*	mg/L	2	20	01/14/17 0:00	sck
Hydroxide as CaCO ₃		1		U	*	mg/L	2	20	01/14/17 0:00	sck
Total Alkalinity		1	169		*	mg/L	2	20	01/14/17 0:00	sck
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-1.0			%			01/26/17 0:00	calc
Sum of Anions			9.8			meq/L			01/26/17 0:00	calc
Sum of Cations			9.6			meq/L			01/26/17 0:00	calc
Chloride	SM4500Cl-E	1	4.3		*	mg/L	0.5	2	01/17/17 16:38	spl
Conductivity @25C	SM2510B	1	874		*	umhos/cm	1	10	01/14/17 19:12	sck
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	01/14/17 18:59	pjb
Cyanide, WAD	SM4500-CN I,E- Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	01/18/17 0:50	pjb
Fluoride	SM4500F-C	1	0.80		*	mg/L	0.05	0.3	01/17/17 13:14	emk
Hardness as CaCO ₃ (dissolved)	SM2340B - Calculation		283			mg/L	0.2	5	01/26/17 0:00	calc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	0.05	B	*	mg/L	0.02	0.1	01/21/17 0:10	pjb
Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	1		U	*	mg/L	0.05	0.2	01/17/17 11:42	bce
Nitrogen, total Kjeldahl	M351.2 - TKN by Block Digester	1		U	*	mg/L	0.1	0.5	01/20/17 10:36	spl
pH (lab)	SM4500H+ B									
pH		1	8.2	H	*	units	0.1	0.1	01/14/17 0:00	sck
pH measured at		1	21.6		*	C	0.1	0.1	01/14/17 0:00	sck
Phosphate	Calculation based on dissolved Phosphorus			U		mg/L	0.06	0.2	01/26/17 0:00	calc
Phosphorus, dissolved	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	01/20/17 15:46	spl
Phosphorus, ortho dissolved	M365.1 - Automated Ascorbic Acid	1		UH	*	mg/L	0.02	0.05	01/13/17 23:50	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	1		U	*	mg/L	0.02	0.05	01/17/17 23:10	pjb
Residue, Filterable (TDS) @180C	SM2540C	1	630		*	mg/L	10	20	01/13/17 14:09	abd
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	01/16/17 12:25	emk
Residue, Total (TS) @ 105C	SM2540B	1	646		*	mg/L	10	20	01/12/17 16:51	emk
Sulfate	D516-02/-07 - Turbidimetric	10	300		*	mg/L	10	50	01/18/17 15:25	bce
Sulfide as S	SM4500S2-D	1		U	*	mg/L	0.02	0.1	01/13/17 16:07	emk
TDS (calculated)	Calculation		611			mg/L			01/26/17 0:00	calc
TDS (ratio - measured/calculated)	Calculation		1.03						01/26/17 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: **L34997**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34997-01	WG416556	Cadmium, dissolved	M200.8 ICP-MS	LA	Recovery for target analyte in the control sample (LCS or LFB) exceeded the acceptance criteria. Target analyte was not detected in the sample [$< MDL$].
			M200.8 ICP-MS	VC	CCV recovery was above the acceptance limits. Target analyte was not detected in the sample [$< MDL$].
		Lead, dissolved	M200.8 ICP-MS	VC	CCV recovery was above the acceptance limits. Target analyte was not detected in the sample [$< MDL$].
	WG416872	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	ZA	Poor recovery for Silver quality control is accepted due to low Silver solubility in samples, digestates, or extracts that do not contain sufficient Hydrochloric acid.
	WG416556	Thallium, dissolved	M200.8 ICP-MS	VC	CCV recovery was above the acceptance limits. Target analyte was not detected in the sample [$< MDL$].
	WG416210	Bicarbonate as $CaCO_3$	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as $CaCO_3$	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG416371	Chloride	SM4500Cl-E	Q6	Sample was received above recommended temperature.
	WG416210	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG416206	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 ($< 10x MDL$).
	WG416383	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 ($< 10x MDL$).
	WG416313	Fluoride	SM4500F-C	Q6	Sample was received above recommended temperature.
	WG416210	Hydroxide as $CaCO_3$	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG416646	Nitrate/Nitrite as N	M353.2 - H_2SO_4 preserved	Q6	Sample was received above recommended temperature.
	WG416319	Nitrogen, ammonia	M350.1 Auto Salicylate w/gas diffusion	Q6	Sample was received above recommended temperature.
	WG416594	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 ($< 10x MDL$).
	WG416210	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG416635	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 ($< 10x MDL$).
	WG416207	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 ($< 10x MDL$).
	WG416381	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 ($< 10x MDL$).
	WG416187	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
			SM2540C	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation ($< 10x MDL$).
	WG416250	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
	WG416132	Residue, Total (TS) @ 105C	SM2540B	Q6	Sample was received above recommended temperature.

REPAD.15.06.05.01

Tahoe Resources, Inc.

ACZ Project ID: **L34997**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG416400	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.
	WG416174	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).
	WG416210	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.
			SM2320B - Titration	RP	The duplicate originally assigned to this sample could not be used for precision assessment because the titrant normality was too weak or too strong for the sample alkalinity. Another duplicate in the batch was used to assess precision. Method required duplicate frequency was not met.

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: PSASR

ACZ Sample ID: **L34997-01**
Date Sampled: 01/09/17 10:10
Date Received: 01/12/17
Sample Matrix: Ground Water

Diesel Range Organics (C10-C28)

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

Workgroup: WG416267

Analyst: mmn
Extract Date: 01/12/17 16:24
Analysis Date: 01/16/17 17:47

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	96.1		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: **L34997**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34997-01	WG416267	*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.

Tahoe Resources, Inc.

ACZ Project ID: **L34997**

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: L34997
Date Received: 01/12/2017 10:01
Received By:
Date Printed: 1/12/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A change was made in the Sample Date:Time Line 5 section prior to ACZ custody.			

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9) Are all labels on containers and are they intact and legible?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11) For preserved bottle types, was the pH checked and within limits? ¹	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12) Is there sufficient sample volume to perform all requested work?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13) Is the custody seal intact on all containers?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14) Are samples that require zero headspace acceptable?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
15) Are all sample containers appropriate for analytical requirements?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16) Is there an Hg-1631 trip blank present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17) Is there a VOA trip blank present?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18) Were all samples received within hold time?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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?
4304	9.9	<=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: L34997
Date Received: 01/12/2017 10:01
Received By:
Date Printed: 1/12/2017

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).

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Report to:

Name: Miguel Baganza	Address: Blvd los Próceros 18 calle 74-69 Z10
Company: J Minera San Rafael	Empresarial, 2 Píedera, Torre IV Oficina 1406
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 Baganza	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)

[illegible]

Matrix	SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)
--------	--

REMARKS

Please elaborate 3 reports: #1 with sample PS&R, #2 with indicated samples and #3 with the rest of the samples without number.

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE-TIME	RECEIVED BY:	DATE-TIME
Wilsa Fernanda Camilo	10/1/2017 08:00	Comez	10.1.17 10:18
		NOT	1/12/17 1007

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

Fechas de muestreo: 090117

Fecha de ingreso de muestra: 100117

Fecha de análisis: 100117-190117

Fecha del informe: 190117

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)
7009	PSASR	< 1	< 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 límite de detección.

Límites de detección: Cromo hexavalente (0.05 mg/l)

El resultado obtenido corresponde 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

11.6 Informes Originales de los Resultados Analíticos obtenidos del muestreo de sedimentos, Diciembre de 2016

January 25, 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: L34871

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on January 03, 2017. This project has been assigned to ACZ's project number, L34871. 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 L34871. 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.

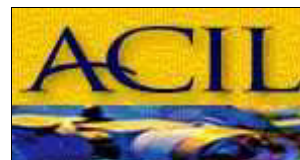
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after February 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.

January 25, 2017

Project ID: Escobal

ACZ Project ID: L34871

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 9 sediment samples from Tahoe Resources, Inc. on January 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 L34871. 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: SED1

ACZ Sample ID: **L34871-01**

Date Sampled: 12/06/16 17:15

Date Received: 01/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 15:09	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 14:49	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	10100	11200		*	mg/Kg	10	50	01/23/17 14:28	enb
Antimony, total (3050)	M6020 ICP-MS	505	0.5	B	*	mg/Kg	0.2	1	01/19/17 13:13	enb
Arsenic, total (3050)	M6020 ICP-MS	505	9.8		*	mg/Kg	0.1	0.5	01/19/17 13:13	enb
Barium, total (3050)	M6020 ICP-MS	505	153		*	mg/Kg	0.3	1	01/19/17 13:13	enb
Boron, total (3050)	M6010B ICP	101		U		mg/Kg	1	5	01/18/17 12:17	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.25	B	*	mg/Kg	0.05	0.3	01/19/17 13:13	enb
Calcium, total (3050)	M6010B ICP	101	3290		*	mg/Kg	10	50	01/18/17 12:17	aeb
Chromium, total (3050)	M6020 ICP-MS	505	3.1			mg/Kg	0.3	1	01/19/17 13:13	enb
Copper, total (3050)	M6020 ICP-MS	505	10.6		*	mg/Kg	0.3	1	01/19/17 13:13	enb
Iron, total (3050)	M6010B ICP	101	13500		*	mg/Kg	2	5	01/18/17 12:17	aeb
Lead, total (3050)	M6020 ICP-MS	505	10.4		*	mg/Kg	0.05	0.3	01/19/17 13:13	enb
Magnesium, total (3050)	M6010B ICP	101	1190		*	mg/Kg	20	100	01/18/17 12:17	aeb
Manganese, total (3050)	M6020 ICP-MS	10100	524		*	mg/Kg	5	30	01/23/17 14:28	enb
Mercury, total	M7471A CVAA	214		UH	*	mg/Kg	0.04	0.2	01/20/17 16:48	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	01/18/17 12:17	aeb
Nickel, total (3050)	M6020 ICP-MS	505	4.8		*	mg/Kg	0.3	2	01/19/17 13:13	enb
Potassium, total (3050)	M6010B ICP	101	1660			mg/Kg	20	100	01/18/17 12:17	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.11			mg/Kg	0.05	0.1	01/19/17 13:13	enb
Silver, total (3050)	M6020 ICP-MS	505	0.13		*	mg/Kg	0.03	0.1	01/24/17 10:51	enb
Zinc, total (3050)	M6020 ICP-MS	505	43		*	mg/Kg	1	3	01/19/17 13:13	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	74.5		*	%	0.1	0.5	01/08/17 13:03	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:14	emk
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 13:52	bcc
Digestion - Hot Plate	M3050B ICP								01/16/17 13:52	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 12:30	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	10.3		UH	*	mg/Kg	0.06	0.2	01/11/17 21:51	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	102	0.0242	H	*	%	0.00102	0.0051	01/10/17 20:48	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SED2A

ACZ Sample ID: **L34871-02**

Date Sampled: 12/06/16 15:50

Date Received: 01/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 15:17	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 15:05	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	21600	31800		*	mg/Kg	20	100	01/23/17 14:31	enb
Antimony, total (3050)	M6020 ICP-MS	540	4.1		*	mg/Kg	0.2	1	01/19/17 13:16	enb
Arsenic, total (3050)	M6020 ICP-MS	540	35.7		*	mg/Kg	0.1	0.5	01/19/17 13:16	enb
Barium, total (3050)	M6020 ICP-MS	540	244		*	mg/Kg	0.3	1	01/19/17 13:16	enb
Boron, total (3050)	M6010B ICP	108	2	B		mg/Kg	1	5	01/18/17 12:23	aeb
Cadmium, total (3050)	M6020 ICP-MS	540	6.02		*	mg/Kg	0.05	0.3	01/19/17 13:16	enb
Calcium, total (3050)	M6010B ICP	108	14500		*	mg/Kg	10	50	01/18/17 12:23	aeb
Chromium, total (3050)	M6020 ICP-MS	540	8.1			mg/Kg	0.3	1	01/19/17 13:16	enb
Copper, total (3050)	M6020 ICP-MS	540	32.7		*	mg/Kg	0.3	1	01/19/17 13:16	enb
Iron, total (3050)	M6010B ICP	108	19400		*	mg/Kg	2	5	01/18/17 12:23	aeb
Lead, total (3050)	M6020 ICP-MS	540	290		*	mg/Kg	0.05	0.3	01/19/17 13:16	enb
Magnesium, total (3050)	M6010B ICP	108	3800		*	mg/Kg	20	100	01/18/17 12:23	aeb
Manganese, total (3050)	M6020 ICP-MS	21600	3150		*	mg/Kg	10	50	01/23/17 14:31	enb
Mercury, total	M7471A CVAA	278		UH	*	mg/Kg	0.06	0.3	01/20/17 16:49	pta
Molybdenum, total (3050)	M6010B ICP	108	3	B		mg/Kg	2	10	01/18/17 12:23	aeb
Nickel, total (3050)	M6020 ICP-MS	540	6.7		*	mg/Kg	0.3	2	01/19/17 13:16	enb
Potassium, total (3050)	M6010B ICP	108	1940			mg/Kg	20	100	01/18/17 12:23	aeb
Selenium, total (3050)	M6020 ICP-MS	540	0.25			mg/Kg	0.05	0.1	01/19/17 13:16	enb
Silver, total (3050)	M6020 ICP-MS	540	23.7		*	mg/Kg	0.03	0.1	01/19/17 13:16	enb
Zinc, total (3050)	M6020 ICP-MS	540	512		*	mg/Kg	1	3	01/19/17 13:16	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	50.0		*	%	0.1	0.5	01/08/17 18:30	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:16	emk
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 14:14	bcc
Digestion - Hot Plate	M3050B ICP								01/16/17 14:14	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 12:41	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	11	0.23	H	*	mg/Kg	0.07	0.2	01/11/17 22:22	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	98	0.0250	H	*	%	0.00098	0.0049	01/10/17 21:34	pjb

Tahoe Resources, Inc.

Project ID: Escobal
Sample ID: SED4

ACZ Sample ID: **L34871-03**

Date Sampled: 12/06/16 11:10

Date Received: 01/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 15:25	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 15:22	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	21400	18500		*	mg/Kg	20	100	01/23/17 14:35	enb
Antimony, total (3050)	M6020 ICP-MS	535	1.9		*	mg/Kg	0.2	1	01/19/17 13:29	enb
Arsenic, total (3050)	M6020 ICP-MS	535	15.5		*	mg/Kg	0.1	0.5	01/19/17 13:29	enb
Barium, total (3050)	M6020 ICP-MS	535	205		*	mg/Kg	0.3	1	01/19/17 13:29	enb
Boron, total (3050)	M6010B ICP	107	2	B		mg/Kg	1	5	01/18/17 12:26	aeb
Cadmium, total (3050)	M6020 ICP-MS	535	0.87		*	mg/Kg	0.05	0.3	01/19/17 13:29	enb
Calcium, total (3050)	M6010B ICP	107	5480		*	mg/Kg	10	50	01/18/17 12:26	aeb
Chromium, total (3050)	M6020 ICP-MS	535	6.3			mg/Kg	0.3	1	01/19/17 13:29	enb
Copper, total (3050)	M6020 ICP-MS	535	18.9		*	mg/Kg	0.3	1	01/19/17 13:29	enb
Iron, total (3050)	M6010B ICP	107	14400		*	mg/Kg	2	5	01/18/17 12:26	aeb
Lead, total (3050)	M6020 ICP-MS	535	34.1		*	mg/Kg	0.05	0.3	01/19/17 13:29	enb
Magnesium, total (3050)	M6010B ICP	107	1260		*	mg/Kg	20	100	01/18/17 12:26	aeb
Manganese, total (3050)	M6020 ICP-MS	535	657		*	mg/Kg	0.3	1	01/19/17 13:29	enb
Mercury, total	M7471A CVAA	341		UH	*	mg/Kg	0.07	0.3	01/20/17 16:50	pta
Molybdenum, total (3050)	M6010B ICP	107		U		mg/Kg	2	10	01/18/17 12:26	aeb
Nickel, total (3050)	M6020 ICP-MS	535	3.7		*	mg/Kg	0.3	2	01/19/17 13:29	enb
Potassium, total (3050)	M6010B ICP	107	1870			mg/Kg	20	100	01/18/17 12:26	aeb
Selenium, total (3050)	M6020 ICP-MS	535	0.32			mg/Kg	0.05	0.1	01/19/17 13:29	enb
Silver, total (3050)	M6020 ICP-MS	535	1.22		*	mg/Kg	0.03	0.1	01/19/17 13:29	enb
Zinc, total (3050)	M6020 ICP-MS	535	103		*	mg/Kg	1	3	01/19/17 13:29	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	51.8		*	%	0.1	0.5	01/08/17 23:57	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:18	emk
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 14:35	bcc
Digestion - Hot Plate	M3050B ICP								01/16/17 14:35	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 12:52	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	10.6	0.11	BH	*	mg/Kg	0.06	0.2	01/11/17 21:52	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	116	0.0365	H	*	%	0.00116	0.0058	01/10/17 20:50	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SED4A

ACZ Sample ID: **L34871-04**

Date Sampled: 12/06/16 10:30

Date Received: 01/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 15:33	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 15:38	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	10100	7280		*	mg/Kg	10	50	01/23/17 14:38	enb
Antimony, total (3050)	M6020 ICP-MS	505	1.4		*	mg/Kg	0.2	1	01/19/17 13:32	enb
Arsenic, total (3050)	M6020 ICP-MS	505	10.4		*	mg/Kg	0.1	0.5	01/19/17 13:32	enb
Barium, total (3050)	M6020 ICP-MS	505	98.6		*	mg/Kg	0.3	1	01/19/17 13:32	enb
Boron, total (3050)	M6010B ICP	101	1	B		mg/Kg	1	5	01/18/17 12:29	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.24	B	*	mg/Kg	0.05	0.3	01/19/17 13:32	enb
Calcium, total (3050)	M6010B ICP	101	2830		*	mg/Kg	10	50	01/18/17 12:29	aeb
Chromium, total (3050)	M6020 ICP-MS	505	3.3			mg/Kg	0.3	1	01/19/17 13:32	enb
Copper, total (3050)	M6020 ICP-MS	505	5.1		*	mg/Kg	0.3	1	01/19/17 13:32	enb
Iron, total (3050)	M6010B ICP	101	9270		*	mg/Kg	2	5	01/18/17 12:29	aeb
Lead, total (3050)	M6020 ICP-MS	505	13.1		*	mg/Kg	0.05	0.3	01/19/17 13:32	enb
Magnesium, total (3050)	M6010B ICP	101	830		*	mg/Kg	20	100	01/18/17 12:29	aeb
Manganese, total (3050)	M6020 ICP-MS	505	917		*	mg/Kg	0.3	1	01/19/17 13:32	enb
Mercury, total	M7471A CVAA	170		UH	*	mg/Kg	0.03	0.2	01/20/17 16:54	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	01/18/17 12:29	aeb
Nickel, total (3050)	M6020 ICP-MS	505	2.3		*	mg/Kg	0.3	2	01/19/17 13:32	enb
Potassium, total (3050)	M6010B ICP	101	1500			mg/Kg	20	100	01/18/17 12:29	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.10			mg/Kg	0.05	0.1	01/19/17 13:32	enb
Silver, total (3050)	M6020 ICP-MS	505	0.32		*	mg/Kg	0.03	0.1	01/19/17 13:32	enb
Zinc, total (3050)	M6020 ICP-MS	505	46		*	mg/Kg	1	3	01/19/17 13:32	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	01/09/17 5:24	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:20	emk
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 14:57	bcc
Digestion - Hot Plate	M3050B ICP								01/16/17 14:57	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 13:03	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	10.1		UH	*	mg/Kg	0.06	0.2	01/11/17 21:53	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	100	0.0136	H	*	%	0.001	0.005	01/10/17 20:51	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SED5

ACZ Sample ID: **L34871-05**

Date Sampled: 12/06/16 09:34

Date Received: 01/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 15:42	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 15:54	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	10100	6410		*	mg/Kg	10	50	01/23/17 14:47	enb
Antimony, total (3050)	M6020 ICP-MS	505	0.6	B	*	mg/Kg	0.2	1	01/19/17 13:35	enb
Arsenic, total (3050)	M6020 ICP-MS	505	16.5		*	mg/Kg	0.1	0.5	01/19/17 13:35	enb
Barium, total (3050)	M6020 ICP-MS	505	115		*	mg/Kg	0.3	1	01/19/17 13:35	enb
Boron, total (3050)	M6010B ICP	101		U		mg/Kg	1	5	01/18/17 12:32	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.17	B	*	mg/Kg	0.05	0.3	01/19/17 13:35	enb
Calcium, total (3050)	M6010B ICP	101	1090		*	mg/Kg	10	50	01/18/17 12:32	aeb
Chromium, total (3050)	M6020 ICP-MS	505	1.5			mg/Kg	0.3	1	01/19/17 13:35	enb
Copper, total (3050)	M6020 ICP-MS	505	2.9		*	mg/Kg	0.3	1	01/19/17 13:35	enb
Iron, total (3050)	M6010B ICP	101	11600		*	mg/Kg	2	5	01/18/17 12:32	aeb
Lead, total (3050)	M6020 ICP-MS	505	8.70		*	mg/Kg	0.05	0.3	01/19/17 13:35	enb
Magnesium, total (3050)	M6010B ICP	101	430		*	mg/Kg	20	100	01/18/17 12:32	aeb
Manganese, total (3050)	M6020 ICP-MS	505	385		*	mg/Kg	0.3	1	01/19/17 13:35	enb
Mercury, total	M7471A CVAA	180	0.06	BH	*	mg/Kg	0.04	0.2	01/20/17 16:55	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	01/18/17 12:32	aeb
Nickel, total (3050)	M6020 ICP-MS	505	0.8	B	*	mg/Kg	0.3	2	01/19/17 13:35	enb
Potassium, total (3050)	M6010B ICP	101	1600			mg/Kg	20	100	01/18/17 12:32	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.08	B		mg/Kg	0.05	0.1	01/19/17 13:35	enb
Silver, total (3050)	M6020 ICP-MS	505	0.03	B	*	mg/Kg	0.03	0.1	01/19/17 13:35	enb
Zinc, total (3050)	M6020 ICP-MS	505	30		*	mg/Kg	1	3	01/19/17 13:35	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	87.5		*	%	0.1	0.5	01/09/17 10:51	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:22	emk
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 15:18	bcc
Digestion - Hot Plate	M3050B ICP								01/16/17 15:18	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 13:15	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	8.17		UH	*	mg/Kg	0.05	0.2	01/11/17 22:23	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	44.4	0.00877	H	*	%	0.00044	0.00222	01/10/17 20:52	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SED6

ACZ Sample ID: **L34871-06**

Date Sampled: 12/06/16 07:20

Date Received: 01/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 15:50	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 16:11	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	10100	6150		*	mg/Kg	10	50	01/23/17 14:51	enb
Antimony, total (3050)	M6020 ICP-MS	505	0.3	B	*	mg/Kg	0.2	1	01/19/17 13:38	enb
Arsenic, total (3050)	M6020 ICP-MS	505	5.7		*	mg/Kg	0.1	0.5	01/19/17 13:38	enb
Barium, total (3050)	M6020 ICP-MS	505	95.3		*	mg/Kg	0.3	1	01/19/17 13:38	enb
Boron, total (3050)	M6010B ICP	101	1	B		mg/Kg	1	5	01/18/17 12:35	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.16	B	*	mg/Kg	0.05	0.3	01/19/17 13:38	enb
Calcium, total (3050)	M6010B ICP	101	1190		*	mg/Kg	10	50	01/18/17 12:35	aeb
Chromium, total (3050)	M6020 ICP-MS	505	4.3			mg/Kg	0.3	1	01/19/17 13:38	enb
Copper, total (3050)	M6020 ICP-MS	505	4.6		*	mg/Kg	0.3	1	01/19/17 13:38	enb
Iron, total (3050)	M6010B ICP	101	10900		*	mg/Kg	2	5	01/18/17 12:35	aeb
Lead, total (3050)	M6020 ICP-MS	505	6.09		*	mg/Kg	0.05	0.3	01/19/17 13:38	enb
Magnesium, total (3050)	M6010B ICP	101	770		*	mg/Kg	20	100	01/18/17 12:35	aeb
Manganese, total (3050)	M6020 ICP-MS	505	356		*	mg/Kg	0.3	1	01/19/17 13:38	enb
Mercury, total	M7471A CVAA	240		UH	*	mg/Kg	0.05	0.2	01/20/17 16:55	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	01/18/17 12:35	aeb
Nickel, total (3050)	M6020 ICP-MS	505	1.5	B	*	mg/Kg	0.3	2	01/19/17 13:38	enb
Potassium, total (3050)	M6010B ICP	101	1130			mg/Kg	20	100	01/18/17 12:35	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.07	B		mg/Kg	0.05	0.1	01/19/17 13:38	enb
Silver, total (3050)	M6020 ICP-MS	505	0.05	B	*	mg/Kg	0.03	0.1	01/19/17 13:38	enb
Zinc, total (3050)	M6020 ICP-MS	505	25		*	mg/Kg	1	3	01/19/17 13:38	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	77.6		*	%	0.1	0.5	01/09/17 16:18	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:24	emk
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 15:40	bcc
Digestion - Hot Plate	M3050B ICP								01/16/17 15:40	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 13:26	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	7.06		UH	*	mg/Kg	0.04	0.1	01/11/17 21:55	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	74.4	0.00942	H	*	%	0.00074	0.00372	01/10/17 20:56	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SED8

ACZ Sample ID: **L34871-07**

Date Sampled: 12/06/16 09:15

Date Received: 01/03/17

Sample Matrix: Sediment

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 15:58	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 16:27	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	21000	14600		*	mg/Kg	20	100	01/23/17 14:54	enb
Antimony, total (3050)	M6020 ICP-MS	525	1.2		*	mg/Kg	0.2	1	01/19/17 13:42	enb
Arsenic, total (3050)	M6020 ICP-MS	525	11.6		*	mg/Kg	0.1	0.5	01/19/17 13:42	enb
Barium, total (3050)	M6020 ICP-MS	525	164		*	mg/Kg	0.3	1	01/19/17 13:42	enb
Boron, total (3050)	M6010B ICP	105	1	B		mg/Kg	1	5	01/18/17 12:44	aeb
Cadmium, total (3050)	M6020 ICP-MS	525	0.77		*	mg/Kg	0.05	0.3	01/19/17 13:42	enb
Calcium, total (3050)	M6010B ICP	105	3270		*	mg/Kg	10	50	01/18/17 12:44	aeb
Chromium, total (3050)	M6020 ICP-MS	525	4.6			mg/Kg	0.3	1	01/19/17 13:42	enb
Copper, total (3050)	M6020 ICP-MS	525	13.4		*	mg/Kg	0.3	1	01/19/17 13:42	enb
Iron, total (3050)	M6010B ICP	105	11200		*	mg/Kg	2	5	01/18/17 12:44	aeb
Lead, total (3050)	M6020 ICP-MS	525	35.3		*	mg/Kg	0.05	0.3	01/19/17 13:42	enb
Magnesium, total (3050)	M6010B ICP	105	1160		*	mg/Kg	20	100	01/18/17 12:44	aeb
Manganese, total (3050)	M6020 ICP-MS	525	748		*	mg/Kg	0.3	1	01/19/17 13:42	enb
Mercury, total	M7471A CVAA	281		UH	*	mg/Kg	0.06	0.3	01/20/17 16:56	pta
Molybdenum, total (3050)	M6010B ICP	105		U		mg/Kg	2	10	01/18/17 12:44	aeb
Nickel, total (3050)	M6020 ICP-MS	525	3.1		*	mg/Kg	0.3	2	01/19/17 13:42	enb
Potassium, total (3050)	M6010B ICP	105	1590			mg/Kg	20	100	01/18/17 12:44	aeb
Selenium, total (3050)	M6020 ICP-MS	525	0.28			mg/Kg	0.05	0.1	01/19/17 13:42	enb
Silver, total (3050)	M6020 ICP-MS	525	2.03		*	mg/Kg	0.03	0.1	01/19/17 13:42	enb
Zinc, total (3050)	M6020 ICP-MS	525	99		*	mg/Kg	1	3	01/19/17 13:42	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	48.5		*	%	0.1	0.5	01/09/17 21:46	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:26	emk
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 16:01	bcc
Digestion - Hot Plate	M3050B ICP								01/16/17 16:01	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 13:37	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	11.4		UH	*	mg/Kg	0.07	0.2	01/11/17 21:56	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	151	0.0443	H	*	%	0.00151	0.00755	01/10/17 20:57	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SED9

ACZ Sample ID: **L34871-08**

Date Sampled: 12/06/16 08:10

Date Received: 01/03/17

Sample Matrix: *Sediment*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 16:06	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 16:43	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	10100	7180		*	mg/Kg	10	50	01/23/17 14:57	enb
Antimony, total (3050)	M6020 ICP-MS	505	0.4	B	*	mg/Kg	0.2	1	01/19/17 13:45	enb
Arsenic, total (3050)	M6020 ICP-MS	505	5.8		*	mg/Kg	0.1	0.5	01/19/17 13:45	enb
Barium, total (3050)	M6020 ICP-MS	505	99.5		*	mg/Kg	0.3	1	01/19/17 13:45	enb
Boron, total (3050)	M6010B ICP	101		U		mg/Kg	1	5	01/18/17 12:47	aeb
Cadmium, total (3050)	M6020 ICP-MS	505	0.19	B	*	mg/Kg	0.05	0.3	01/19/17 13:45	enb
Calcium, total (3050)	M6010B ICP	101	1620		*	mg/Kg	10	50	01/18/17 12:47	aeb
Chromium, total (3050)	M6020 ICP-MS	505	3.9			mg/Kg	0.3	1	01/19/17 13:45	enb
Copper, total (3050)	M6020 ICP-MS	505	4.7		*	mg/Kg	0.3	1	01/19/17 13:45	enb
Iron, total (3050)	M6010B ICP	101	10700		*	mg/Kg	2	5	01/18/17 12:47	aeb
Lead, total (3050)	M6020 ICP-MS	505	6.05		*	mg/Kg	0.05	0.3	01/19/17 13:45	enb
Magnesium, total (3050)	M6010B ICP	101	980		*	mg/Kg	20	100	01/18/17 12:47	aeb
Manganese, total (3050)	M6020 ICP-MS	505	456		*	mg/Kg	0.3	1	01/19/17 13:45	enb
Mercury, total	M7471A CVAA	183		UH	*	mg/Kg	0.04	0.2	01/20/17 16:57	pta
Molybdenum, total (3050)	M6010B ICP	101		U		mg/Kg	2	10	01/18/17 12:47	aeb
Nickel, total (3050)	M6020 ICP-MS	505	1.8	B	*	mg/Kg	0.3	2	01/19/17 13:45	enb
Potassium, total (3050)	M6010B ICP	101	1150			mg/Kg	20	100	01/18/17 12:47	aeb
Selenium, total (3050)	M6020 ICP-MS	505	0.08	B		mg/Kg	0.05	0.1	01/19/17 13:45	enb
Silver, total (3050)	M6020 ICP-MS	505	0.09	B	*	mg/Kg	0.03	0.1	01/19/17 13:45	enb
Zinc, total (3050)	M6020 ICP-MS	505	31		*	mg/Kg	1	3	01/19/17 13:45	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	71.3		*	%	0.1	0.5	01/10/17 3:13	jlv

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:28	emk
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 16:23	bcc
Digestion - Hot Plate	M3050B ICP								01/16/17 16:23	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 13:48	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	8.62		UH	*	mg/Kg	0.05	0.2	01/11/17 21:57	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	74.4	0.0105	H	*	%	0.00074	0.00372	01/10/17 20:58	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: SED11

ACZ Sample ID: **L34871-09**

Date Sampled: 12/06/16 15:50

Date Received: 01/03/17

Sample Matrix: Sediment

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9013 - Manual Distillation								01/10/17 16:15	krh
Phosphorus, total	M365.1 - Auto Ascorbic Acid Digestion								01/09/17 16:59	bsu

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, total (3050)	M6020 ICP-MS	51500	31700		*	mg/Kg	50	300	01/23/17 15:00	enb
Antimony, total (3050)	M6020 ICP-MS	515	7.7		*	mg/Kg	0.2	1	01/19/17 13:48	enb
Arsenic, total (3050)	M6020 ICP-MS	515	35.8		*	mg/Kg	0.1	0.5	01/19/17 13:48	enb
Barium, total (3050)	M6020 ICP-MS	515	264		*	mg/Kg	0.3	1	01/19/17 13:48	enb
Boron, total (3050)	M6010B ICP	103	3	B		mg/Kg	1	5	01/18/17 12:50	aeb
Cadmium, total (3050)	M6020 ICP-MS	515	7.08		*	mg/Kg	0.05	0.3	01/19/17 13:48	enb
Calcium, total (3050)	M6010B ICP	103	13300		*	mg/Kg	10	50	01/18/17 12:50	aeb
Chromium, total (3050)	M6020 ICP-MS	515	9.2			mg/Kg	0.3	1	01/19/17 13:48	enb
Copper, total (3050)	M6020 ICP-MS	515	40.6		*	mg/Kg	0.3	1	01/19/17 13:48	enb
Iron, total (3050)	M6010B ICP	103	20200		*	mg/Kg	2	5	01/18/17 12:50	aeb
Lead, total (3050)	M6020 ICP-MS	515	317		*	mg/Kg	0.05	0.3	01/19/17 13:48	enb
Magnesium, total (3050)	M6010B ICP	103	4000		*	mg/Kg	20	100	01/18/17 12:50	aeb
Manganese, total (3050)	M6020 ICP-MS	51500	3320		*	mg/Kg	30	100	01/23/17 15:00	enb
Mercury, total	M7471A CVAA	312		UH	*	mg/Kg	0.06	0.3	01/20/17 16:58	pta
Molybdenum, total (3050)	M6010B ICP	103	3	B		mg/Kg	2	10	01/18/17 12:50	aeb
Nickel, total (3050)	M6020 ICP-MS	515	7.3		*	mg/Kg	0.3	2	01/19/17 13:48	enb
Potassium, total (3050)	M6010B ICP	103	1900			mg/Kg	20	100	01/18/17 12:50	aeb
Selenium, total (3050)	M6020 ICP-MS	515	0.28			mg/Kg	0.05	0.1	01/19/17 13:48	enb
Silver, total (3050)	M6020 ICP-MS	51500	63		*	mg/Kg	3	10	01/23/17 19:42	enb
Zinc, total (3050)	M6020 ICP-MS	515	611		*	mg/Kg	1	3	01/19/17 13:48	enb

Soil Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	D2216-80	1	49.7		*	%	0.1	0.5	01/10/17 8:40	jlw

Soil Preparation

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972								01/04/17 10:29	emk
Digestion - Hot Plate	M3050B ICP								01/16/17 16:44	bcc
Digestion - Hot Plate	M3050B ICP-MS								01/16/17 16:44	bcc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2								01/06/17 14:00	emk

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M9012B - Automated Colorimetric	15.2	0.10	BH	*	mg/Kg	0.09	0.3	01/11/17 21:59	pjb
Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	69.5	0.0221	H	*	%	0.0007	0.00348	01/10/17 20:59	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: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34871-01	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Arsenic, 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.
		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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Cadmium, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	Calcium, 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.
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	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.
	WG416446	Lead, total (3050)	M6020 ICP-MS	BB	Target analyte detected in calibration blank at or above acceptance limit. Sample value was > 10X the concentration in the calibration blank.
			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.
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416598	Manganese, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416611	Mercury, total	M7471A CVAA	H1	Sample prep or analysis performed past holding time. See case narrative.
			M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG416446	Nickel, 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.
	WG416732	Silver, 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.
	WG416446	Zinc, 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.
				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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.

REPAD.15.06.05.01

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
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Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34871-02	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Arsenic, 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.
		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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	Calcium, 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.
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	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.
	WG416446	Lead, total (3050)	M6020 ICP-MS	BB	Target analyte detected in calibration blank at or above acceptance limit. Sample value was > 10X the concentration in the calibration blank.
			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.
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416598	Manganese, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416611	Mercury, total	M7471A CVAA	H1	Sample prep or analysis performed past holding time. See case narrative.
			M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG416446	Nickel, 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.
			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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Silver, 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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
			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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).

REPAD.15.06.05.01

Tahoe Resources, Inc.ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34871-03	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Arsenic, 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.
		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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Cadmium, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	Calcium, 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.
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	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.
	WG416446	Lead, 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.
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416446	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.
	WG416611	Mercury, total	M7471A CVAA	H1	Sample prep or analysis performed past holding time. See case narrative.
			M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG416446	Nickel, 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.
		Silver, 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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Zinc, 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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34871-04	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Arsenic, 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.
		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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Cadmium, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	Calcium, 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.
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	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.
	WG416446	Lead, 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.
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416446	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.
	WG416611	Mercury, total	M7471A CVAA	H1	Sample prep or analysis performed past holding time. See case narrative.
			M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG416446	Nickel, 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.
		Silver, 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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Zinc, 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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34871-05	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Arsenic, 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.
		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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Cadmium, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
				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.
	WG416337	Calcium, 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.
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	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.
	WG416446	Lead, 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.
				ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416446	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.
				H1	Sample prep or analysis performed past holding time. See case narrative.
	WG416611	Mercury, total	M7471A CVAA	Q6	Sample was received above recommended temperature.
			M7471A CVAA	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.
	WG416446	Nickel, 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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Silver, 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.
				ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Zinc, 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.
				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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION	
L34871-06	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.	
			M6020 ICP-MS	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.	
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.	
		Arsenic, 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.	
		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.	
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.	
		Cadmium, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.	
	WG416337	Calcium, 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.	
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.	
	WG416337	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.	
	WG416446	Lead, 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.	
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.	
	WG416446	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.	
	WG416611	Mercury, total	M7471A CVAA	H1	Sample prep or analysis performed past holding time. See case narrative.	
			M7471A CVAA	Q6	Sample was received above recommended temperature.	
	WG416446	Nickel, 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.	
		Silver, 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.	
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.	
	Zinc, 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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.	
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.	
			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).	
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.	

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34871-07	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Arsenic, 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.
		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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Cadmium, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	Calcium, 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.
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	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.
	WG416446	Lead, 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.
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416446	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.
	WG416611	Mercury, total	M7471A CVAA	H1	Sample prep or analysis performed past holding time. See case narrative.
			M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG416446	Nickel, 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.
		Silver, 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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	Zinc, 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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34871-08	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Arsenic, 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.
		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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Cadmium, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	Calcium, 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.
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	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.
	WG416446	Lead, 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.
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416446	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.
	WG416611	Mercury, total	M7471A CVAA	H1	Sample prep or analysis performed past holding time. See case narrative.
			M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG416446	Nickel, 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.
		Silver, 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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Zinc, 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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34871-09	WG416598	Aluminum, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416446	Antimony, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
		Arsenic, 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.
		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.
			M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
		Cadmium, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	Calcium, 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.
	WG416446	Copper, total (3050)	M6020 ICP-MS	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416337	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.
	WG416446	Lead, 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.
	WG416337	Magnesium, total (3050)	M6010B ICP	ZH	Serial Dilution exceeded the acceptance criteria. Matrix interference [physical or chemical] is suspected.
	WG416598	Manganese, total (3050)	M6020 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M6020 ICP-MS	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.
	WG416611	Mercury, total	M7471A CVAA	H1	Sample prep or analysis performed past holding time. See case narrative.
			M7471A CVAA	Q6	Sample was received above recommended temperature.
	WG416446	Nickel, 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.
	WG416716	Silver, total (3050)	M6020 ICP-MS	B7	Target analyte detected in prep / method blank at or above acceptance limit. Sample value is > 10X the concentration in the method blank.
			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.
	WG416446	Zinc, 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.
	WG416063	Cyanide, total	M9012B - Automated Colorimetric	H3	Sample was received and analyzed past holding time.
			M9012B - Automated Colorimetric	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			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).
	WG415989	Phosphorus, total	M365.1 - Auto Ascorbic Acid (digest)	H1	Sample prep or analysis performed past holding time. See case narrative.

REPAD.15.06.05.01

Tahoe Resources, Inc.

ACZ Project ID: **L34871**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
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Tahoe Resources, Inc.

ACZ Project ID: **L34871**

Soil Analysis

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

Solids, Percent

D2216-80

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: L34871
Date Received: 01/03/2017 10:08
Received By:
Date Printed: 1/3/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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 1-9 section prior to ACZ custody.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Samples/Containers

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

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
NA25334	9.2	<=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: L34871
Date Received: 01/03/2017 10:08
Received By:
Date Printed: 1/3/2017

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).



Guatemala December 26th 2016

QUARANTINE STATEMENT

To whom it may concern:

Minera San Rafael, S.A is sending a case with samples of sediments, which requires quarantine documentation and USDA due its organic content. These samples will be analyzed by ACZ Laboratories Inc. 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

United States Department of Agriculture
Animal and Plant Health Inspection Service
4700 River Road
Riverdale, MD 20737

**Permit to Receive Soil
Regulated by 7 CFR 330**

This permit was generated electronically via the ePermits system.

PERMITTEE NAME:	Brett Dalke	PERMIT NUMBER:	P330-15-00088
COMPANY:	ACZ Labs	APPLICATION NUMBER:	P525-141027-003
RECEIVING ADDRESS:	2773 Downhill Drive Steamboat Springs, CO 80487	DATE ISSUED:	03/30/2015
MAILING ADDRESS:	2773 Downhill Drive Steamboat Springs, CO 80487		
PHONE:	(970) 879-6590 Ext. 611	EXPIRES:	03/30/2018
FAX:			

PORTS OF ARRIVAL/PLANT INSPECTION STATIONS: AK, Anchorage; AL, Huntsville; AL, Mobile; AZ, Douglas; AZ, Lukeville; AZ, Naco; AZ, Nogales; AZ, Phoenix; AZ, San Luis; AZ, Tucson; CA, Calexico; CA, El Segundo; CA, Fresno; CA, Long Beach; CA, Oakland; CA, Ontario; CA, Otay Mesa; CA, Port Hueneme; CA, Sacramento; CA, San Diego; CA, San Francisco; CA, San Jose; CA, San Ysidro; CA, Tecate; CO, Denver; CT, Hartford; CT, New Haven; DE, Dover; DE, Wilmington; FL, Ft. Lauderdale; FL, Ft. Myers; FL, Ft. Pierce; FL, Jacksonville; FL, Key West; FL, Miami; FL, Orlando; FL, Pensacola; FL, Port Canaveral; FL, Port Everglades; FL, Sanford; FL, Tampa; FL, West Palm Beach; GA, Atlanta; GA, Savannah; GU, Agana; HI, Hilo; HI, Honolulu; HI, Kahului; HI, Kailua-Kona; HI, Lihue; ID, Eastport; IL, Chicago; IN, Indianapolis; KY, Louisville; MA, South Boston; MD, Baltimore; MD, Beltsville; ME, Bangor; ME, Calais; ME, Houlton; ME, Portland; MI, Detroit; MI, Port Huron; MI, Romulus; MI, Sault Saint Marie; MN, Duluth; MN, Grand Portage; MN, International Falls; MN, Minneapolis; MO, Kansas City; MO, St. Louis; MP, Commonwealth of the Northern Mariana Islands; MS, Gulfport; MS, Port Bienville; MT, Raymond; MT, Roosville; MT, Sweetgrass; NC, Raleigh; NC, Wilmington; ND, Dunseith; ND, Pembina; ND, Portal; NJ, Linden; NJ, Newark; NM, Albuquerque; NM, Columbus; NM, SantaTeresa; NV, Las Vegas; NY, Albany; NY, Alexandria Bay; NY, Brooklyn; NY, Buffalo; NY, Champlain; Rouses Point; NY, Jamaica; NY, Jamaica; NY, Newburgh; OH, Ashtabula; OH, Cincinnati; OH, Cleveland; OH, Columbus; OH, Toledo; OH, Wilmington; OK, Oklahoma City; OR, Portland; PA, Allentown; PA, Harrisburg; PA, Philadelphia; PA, Pittsburgh; PA, Scranton; PR, Aguadilla; PR, Carolina; PR, Fajardo; PR, Mayaguez; PR, Ponce; RI, Warwick/Providence; SC, Charleston; TN, Memphis; TN, Nashville; TX, Austin; TX, Brownsville; TX, Corpus Christi; TX, Dallas; TX, Del Rio; TX, Eagle Pass; TX, El Paso; TX, Fabens; TX, Falcon; TX, Fort Hancock; TX, Galveston; TX, Hidalgo; TX, Humble; TX, Laredo; TX, Los Indios; TX, Pharr; TX, Port Arthur; TX, Presidio; TX, Progresso; TX, Rio Grande City; TX, Roma; TX, San Antonio; TX, Victoria; UT, Salt Lake City; VA, Dulles; VA, Norfolk; VI, St. Croix; VI, St. Thomas; VT, Berlin; WA, Blaine; WA, Oroville; WA, Port Angeles; WA, SeaTac; WA, Sumas; WI, Green Bay; WI, Milwaukee

HAND CARRY: No

Under the conditions specified, this permit authorizes the following:

Quantity of Soil per Shipment and Treatment
Over 3 lbs - Your facility MUST be inspected and approved to receive this soil

SPECIAL INSTRUCTIONS TO INSPECTORS

See permit conditions below

Permit Number P330-15-00088

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE
FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS.


Mark A. Stull

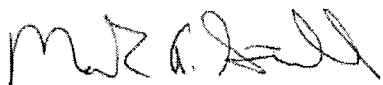
DATE

03/30/2015

WARNING: Any alteration, forgery, or unauthorized use of this Federal Form is subject to civil penalties of up to \$250,000 (7 U.S.C.s 7734(b)) or punishable by a fine of not more than \$10,000, or imprisonment of not more than 5 years, or both (18 U.S.C.s 1001)

2. The permit holder verifies United States residency by initialing and accepting these permit conditions. If you are not a United States resident, it is unlawful for you to initial or accept these permit conditions because a USDA 525 soil Permit can only be issued to United States residents.
3. The permit holder is solely responsible for ensuring compliance with all statutory requirements and specifically listed permit conditions. Failure to comply with the terms and conditions of this permit is cause for the following: (a) cancellation of this permit, (b) cancellation of other permits issued to the permit holder, (c) seizure and/or destruction of regulated organisms, (d) denial of future permit applications by this permit holder, (e) liability for civil penalties, and (f) criminal prosecution under provisions in the Plant Protection Act.
4. Any alteration, forgery, unauthorized use of this permit and/or associated Federal Forms are subject to civil and criminal penalties including fines and imprisonment.
5. This permit must not be used for the movement or use of plant pathogens listed in the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. If any organism listed as a Select Agent is identified from materials associated with this research, the permit holder is required to notify APHIS, Agricultural Select Agent Program (ASAP) within one business day by phone at 301-851-3300, and within seven (7) days submit APHIS/CDC Form 4 (Report of Identification of a Select Agent or Toxin in a Clinical or Diagnostic Laboratory) to APHIS, ASAP; 4700 River Rd, Unit 2, Riverdale, MD 20737 (see instructions at: http://www.aphis.usda.gov/programs/ag_selectagent/index.shtml). Failure to comply with this requirement is a violation of the Agricultural Bioterrorism Protection Act of 2002.
6. If a regulated organism is received in this shipment, the permit holder must take all prudent measures to contain the organism(s) and notify the permit unit within one business day by calling 866-524-5421 or by e-mail to pest.permits@aphis.usda.gov. The permit holder must immediately notify the permit unit of the destruction of regulated organisms received under this permit, as above. Similarly, the permit holder must immediately notify the permit unit if facilities are destroyed or decommissioned for any reason.
7. You as the permit holder are responsible for maintaining a valid permit for as long as the soil is in your possession. APHIS does not issue extensions or renewals of existing permits; the permit holder must submit a new permit application at least three months prior to the expiration of this permit, and obtain a new permit to continue uninterrupted authorization for the soil approved under this permit.
8. If an accidental release into the environment occurs, notification must be made within one business day to APHIS, PPQ, 4700 River Rd., unit 133; Riverdale, MD 20737; 866-524-5421. A written report of the incident must be submitted identifying: (a) the name of the permit holder (responsible person), (b) the permit number, (c) the country or State of origin of the soil, (d) the nature of the release, and (e) measures already taken to contain, reduce or limit the effects of the accidentally released soil. Any plans prepared to contain, reduce or limit the effects of the accidentally released soil may be submitted as developed.
9. Without prior notice and during reasonable hours, authorized PPQ and/or State regulatory officials shall be allowed to inspect the conditions associated with the regulated soil authorized under this permit.
10. The permit holder must maintain an official permanent work assignment at the address identified on this permit. If the permit holder ceases assignment/affiliation at the address identified on this permit, or personnel circumstances change in any way, then a compliance officer must be notified at the PPQ permit unit immediately (that is, within one business day) by either (a) email to pest.permits@aphis.usda.gov, (b) fax to 301-734-4300 or 8700/5392, or (c) conventional mail to USDA PPQ Permit Unit, 4700 River Road, Riverdale, MD 20737. Should the permit holder depart from the organization/facility, the permit holder must either (a) request cancellation of this permit and comply with all permit-specific termination conditions, (b) apply for and receive a permit to move the soil to a new facility, or (c) relinquish control of the regulated soil to a qualified individual who obtained a permit for the continued use of this regulated soil prior to this permit holder's departure.
11. A copy of this permit must accompany all shipments authorized under this permit.
12. CBP-AI and PPQ have the authority to order and approve treatment, re-exportation or destruction of a shipment, a portion of a shipment or any other material associated with the shipment (i.e. pallets, packaging, and means of conveyance). If an official of CBP-AI or PPQ determines that the shipment requires treatment as a condition of entry, is contaminated with a quarantine plant pest or pests, is commingled with prohibited plant material or the required documentation is incomplete or missing, then that official may order and approve treatment, re-exportation or destruction of a shipment, a portion of a shipment or any other material associated with the shipment (i.e. pallets,

Permit Number P330-15-00088

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS.	DATE
 Mark A. Stull	03/30/2015

WARNING: Any alteration, forgery or unauthorized use of this Federal Form is subject to civil penalties of up to \$250,000 (7 U.S.C.s 7734(b)) or punishable by a fine of not more than \$10,000, or imprisonment of not more than 5 years, or both (18 U.S.C.s 1001)

Time starts when the entire sample reaches the required temperature, and a suitable temperature probe must be used for verification.

Autoclave soil and other material using the following conditions:

- a. Soil must be autoclaved at 121 degrees Centigrade (250 degrees Fahrenheit) for a minimum of 30 minutes at 15 psi.
- b. Autoclave tape or other indicators must be placed on each bag or sharps container prior to treatment. The autoclave tape or other indicator on each container must be checked to verify color change before disposal.
- c. The autoclave log must be completed by each user for each autoclave cycle. All parameters must be noted as listed on the log for each autoclave load.
- d. If the autoclave does not attain the minimum time and/or temperature or the autoclave tape does not change color, a notation must be made in the comment section of the autoclave log. The load must then be re-autoclaved after placing new tape on the material. If minimum time and temperature is not attained on the second cycle, users must contact the person responsible for maintaining the unit to initiate repairs. Waste must then be treated at an alternate autoclave facility that is approved by USDA.
- e. Thermometers on the autoclave must be calibrated annually, and a written record must be maintained. This must be done by an authorized autoclave service company during routine servicing.
- f. Every 6 months, you should use a commercially available test indicator kit that uses bacterial spores *Bacillus stearothermophilus* that are rendered unviable at 250 degrees F or 121 degrees C. For the test, ampules of *B. stearothermophilus* are autoclaved along with a load of waste. Upon completion of the cycle, the ampules are incubated for 48 hours and then observed for any sign of growth, which indicates insufficient sterilization. If any growth is observed, you must have the autoclave serviced and retested.

Incineration:

With the exception of metal and glass containers, all regulated and associated material must be reduced completely to ash at the end of the incineration cycle.

27. Equipment and supplies used to conduct operations or that have contacted the soil must be decontaminated using one of the following methods:

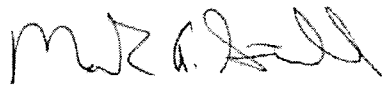
- (a) Material can be soaked in a fresh bleach solution of 10 percent (1:10) for at least 30 minutes. (1:10 is a convention that means 1 in 10 or 1 part 9 parts = 10 parts total, which is a 10 percent solution)
- (b) Material can be soaked in 70 percent ethanol
- (c) Flamed with ethanol
- (d) Treated with quaternary ammonium compounds.

Note also that autoclaving, hydroclave, incineration, and dry heat sterilization are also acceptable sterilization/decontamination methods.

28. Upon issuance of this permit (i.e., a signed PPQ 525), you will need to request the PPQ Form 550 Black/White labels at least 5 days in advance. If you applied online using ePermits, you may request the labels using the My Shipments/Labels feature. Otherwise, send your request to BlackWhiteGreenYellowlabelrequest@aphis.usda.gov. All email requests must come from the permit holder or appointee, if requested by the appointee the permit holder must be Ccd on all requests. Specify the approved port as listed on the permit and the total number of labels needed in multiples of four. You may request additional labels the same way. We will send you the labels by email as a pdf.

A label must be attached with clear tape to the exterior of each package being imported under this permit. The labels will include detailed shipping instructions. You are responsible for instructing your shipper to carefully follow these instructions. You are responsible for each import shipping label issued under this permit. All labels must be printed in color. Failure to do so may result in refused entry or destruction of your package.

Permit Number P330-15-00088

<p>THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS.</p>  <p>Mark A. Stull</p>	<p>DATE</p> <p>03/30/2015</p>
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INSTRUCTIONS TO DHS CBP INSPECTORS FOR IMPORTED SOIL SHIPMENTS ROUTED TO RECEIVING FACILITY:

For hand carry of soil, an official of CBP Agricultural Programs and Trade Liaison (APTL) would have been notified to document and facilitate the entry of the soil (See hand carry conditions below if stipulated). Otherwise:

1. Validate the permit in ePermits using the CBP search feature by logging on to: <https://epermits.aphis.usda.gov/epermits>
2. Confirm that the shipment is being routed directly to a USDA APHIS PPQ Inspected Facility authorized to receive soil by logging on to: <https://web01.aphis.usda.gov/PPQ/AuthSoilLabs.nsf/web?openform>
3. Confirm that the imported shipment has a valid USDA PPQ Form 550 Black/White label.
4. Confirm that the carrier of the shipment imported under this USDA PPQ 525 permit is commercially bonded.
5. For questions or concerns, contact the USDA APHIS PPQ Permit Unit in Riverdale, MD, at 866-524-5421 and ask to speak with a compliance officer.

PERMIT GUIDANCE

Receipt or use of foreign isolates or samples from countries under sanctions requires specific permission from the U.S. Department of Treasury (see <http://www.treasury.gov/resource-center/sanctions/Programs/Pages/Programs.aspx> for current country/regional listings) for current country listings.

This permit does not authorize importation, interstate movement, possession, and/or use of strains of genetically engineered regulated organisms (created by the use of recombinant DNA technology).

If an animal pathogen is identified in your shipment, to ensure appropriate safeguarding, please refer to: http://www.aphis.usda.gov/import_export/animals/animal_import/animal_imports_anproducts.shtml.

If a human pathogen is identified, please see the CDC Etiologic Agent Import Permit Program at <http://www.cdc.gov/od/eaipp/>

This permit does not fulfill the requirements of other federal or state regulatory authorities. As appropriate, please contact the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the U.S. Food and Drug Administration, the Centers for Disease Control and Prevention, the APHIS Veterinary Services unit, or your State's Department of Agriculture to ensure proper permitting.

If you are considering renewal of this permit, an application should be submitted at least 90 days prior to the expiration date of this permit to ensure continued coverage. Permits requiring containment facilities may take a longer period of time to process.

This permit authorizes the importation of soil from all foreign sources (except countries with sanctions or embargoes by U.S. State Department) only for chemical/ physical analysis in a controlled laboratory environment at the named facility on the permit.


PERMIT CONDITIONS

This permit authorizes the importation of soil from all foreign sources (except countries with sanctions or embargoes by U.S. State Department), and interstate/ domestic movement of soil from Hawaii, the contiguous U.S., the continental U.S., and all U.S. territories for chemical/ physical analysis including the isolation and/or culture of Deoxyribonucleic Acid (DNA) or Ribonucleic Acid (RNA) in a controlled laboratory environment at the named facility on the permit.

1. This permit is issued only for the named permit holder at the address(s) identified on this permit. This permit cannot be transferred or assigned.

Permit Number P330-15-00088

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS:


Mark A. Stull

DATE

03/30/2015

WARNING: Any alteration, forgery, or unauthorized use of this Federal Form is subject to civil penalties of up to \$250,000 (7 U.S.C.s 7734(b)) or punishable by a fine of not more than \$10,000, or imprisonment of not more than 5 years, or both (18 U.S.C.s 1001)

United States Department of Agriculture
Animal and Plant Health Inspection Service
4700 River Road
Riverdale, MD 20737

**Permit to Receive Soil
Regulated by 7 CFR 330**

This permit was generated electronically via the ePermits system.

PERMITTEE NAME:	Brett Dalke	PERMIT NUMBER:	P330-15-00088
COMPANY:	ACZ Labs	APPLICATION NUMBER:	P525-141027-003
RECEIVING ADDRESS:	2773 Downhill Drive Steamboat Springs, CO 80487	DATE ISSUED:	03/30/2015
MAILING ADDRESS:	2773 Downhill Drive Steamboat Springs, CO 80487		
PHONE:	(970) 879-6590 Ext. 611	EXPIRES:	03/30/2018
FAX:			

PORTS OF ARRIVAL/PLANT INSPECTION STATIONS: AK, Anchorage; AL, Huntsville; AL, Mobile; AZ, Douglas; AZ, Lukeville; AZ, Naco; AZ, Nogales; AZ, Phoenix; AZ, San Luis; AZ, Tucson; CA, Calexico; CA, El Segundo; CA, Fresno; CA, Long Beach; CA, Oakland; CA, Ontario; CA, Otay Mesa; CA, Port Hueneme; CA, Sacramento; CA, San Diego; CA, San Francisco; CA, San Jose; CA, San Ysidro; CA, Tecate; CO, Denver; CT, Hartford; CT, New Haven; DE, Dover; DE, Wilmington; FL, Ft. Lauderdale; FL, Ft. Myers; FL, Ft. Pierce; FL, Jacksonville; FL, Key West; FL, Miami; FL, Orlando; FL, Pensacola; FL, Port Canaveral; FL, Port Everglades; FL, Sanford; FL, Tampa; FL, West Palm Beach; GA, Atlanta; GA, Savannah; GU, Agaña; HI, Hilo; HI, Honolulu; HI, Kahului; HI, Kailua-Kona; HI, Lihue; ID, Eastport; IL, Chicago; IN, Indianapolis; KY, Louisville; MA, South Boston; MD, Baltimore; MD, Beltsville; ME, Bangor; ME, Calais; ME, Houlton; ME, Portland; MI, Detroit; MI, Port Huron; MI, Romulus; MI, Sault Ste Marie; MN, Duluth; MN, Grand Portage; MN, International Falls; MN, Minneapolis; MO, Kansas City; MO, St. Louis; MP, Commonwealth of the Northern Mariana Islands; MS, Gulfport; MS, Port Bienville; MT, Raymond; MT, Roosville; MT, Sweetgrass; NC, Raleigh; NC, Wilmington; ND, Dunseith; ND, Pembina; ND, Portal; NJ, Linden; NJ, Newark; NM, Albuquerque; NM, Columbus; NM, Santa Teresa; NV, Las Vegas; NY, Albany; NY, Alexandria Bay; NY, Brooklyn; NY, Buffalo; NY, Champlain; Rouses Point; NY, Jamaica; NY, Jamaica; NY, Newburgh; OH, Ashtabula; OH, Cincinnati; OH, Cleveland; OH, Columbus; OH, Toledo; OH, Wilmington; OK, Oklahoma City; OR, Portland; PA, Allentown; PA, Harrisburg; PA, Philadelphia; PA, Pittsburgh; PA, Scranton; PR, Aguadilla; PR, Carolina; PR, Fajardo; PR, Mayaguez; PR, Ponce; RI, Warwick/Providence; SC, Charleston; TN, Memphis; TN, Nashville; TX, Austin; TX, Brownsville; TX, Corpus Christi; TX, Dallas; TX, Del Rio; TX, Eagle Pass; TX, El Paso; TX, Fabens; TX, Falcon; TX, Fort Hancock; TX, Galveston; TX, Hidalgo; TX, Humble; TX, Laredo; TX, Los Indios; TX, Pharr; TX, Port Arthur; TX, Presidio; TX, Progresso; TX, Rio Grande City; TX, Roma; TX, San Antonio; TX, Victoria; UT, Salt Lake City; VA, Dulles; VA, Norfolk; VI, St. Croix; VI, St. Thomas; VT, Berlin; WA, Blaine; WA, Oroville; WA, Port Angeles; WA, SeaTac; WA, Sumas; WI, Green Bay; WI, Milwaukee

HAND CARRY: No

Under the conditions specified, this permit authorizes the following:

Quantity of Soil per Shipment and Treatment

Over 3 lbs - Your facility MUST be inspected and approved to receive this soil

SPECIAL INSTRUCTIONS TO INSPECTORS

See permit conditions below.

Permit Number P330-15-00088

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE
FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS

Mark A. Stull
Mark A. Stull

DATE

03/30/2015

WARNING: Any alteration, forgery, or unauthorized use of this Federal Form is subject to civil penalties of up to \$250,000 (7 U.S.C. 7734(b)) or punishable by a fine of not more than \$10,000, or imprisonment of not more than 5 years, or both (18 U.S.C. 1001).

packaging, means of conveyance).

13. All solid wood packing material (SWPM) accompanying the shipment must be in compliance with ISPM 15 treatment regulations and IPPC stamp requirements and enforcement. Noncompliant shipments will be treated, re-exported or destroyed at the consignee's expense.

14. All costs and arrangements for safeguarding and transportation of the cargo are the responsibility of the importer, broker or other parties associated with the shipment.

15. All operations must be consistent with information submitted in association with the above listed APHIS-PPQ inspected facility and subject to the conditions below.

16. Soil must be shipped in a securely closed, watertight container (primary container, test tube, vial, etc.) which must be enclosed in a second, durable watertight container (secondary container).

17. The shipment must be free from foreign matter or debris, plants and plant parts including noxious weeds and infestations by other macroorganisms such as insects, Cyst nematodes, mollusks, and acari. Authorized material found to be commingled with unauthorized material will be subject to the same action (i.e. re-export, destruction) as unauthorized material.

18. The imported article can be released without treatment at the port of entry to the permittee's address listed on the permit or label or to an authorized user only if the final destination is an approved facility listed at <https://web01.aphis.usda.gov/PPQ/AuthSoilLabs.nsf/web?openform>.

19. The soil must not be used in field research or release into the environment before sterilization.

The soil must not be used for isolation or culture of organisms, or for extracting and concentrating organisms from the soil.

The soil must not be used as a growing medium.

20. Further distribution of soil is not allowed without prior approval from Federal officials [State Plant Health Director or designee] (or from Federal officials with State concurrence). Access the website at <http://www.aphis.usda.gov/ppq/sphd/> for a list of State Plant Health Offices. Access the website at <http://nationalplantboard.org/member/index.html> for a list of State Plant Regulatory Officials.

21. While in storage, all soil must be kept locked (e.g. in freezer, cabinet) in the approved lab with access limited to authorized personnel or they will be in a restricted access building that requires a key card entry and access is restricted to authorized personnel only; or it must be in locked room restricted to authorized personnel only.

22. The soil must be handled as quarantined material until sterilized. This will include keeping the soil enclosed in containers when not in use and labeling all containers and/or storage areas: "Quarantine Soil-Sterilize Before Disposal"

23. All packing material, media, substrate, and shipping containers must be sterilized or destroyed as approved and prescribed by the permit conditions after removing the soil.

24. All unconsumed soil, containers and effluent must be autoclaved, incinerated or properly sterilized by the permittee at the conclusion of the project as approved and prescribed by the permit conditions.

25. Any water residues (effluent) from the processing of soil samples must be treated by an approved sterilization procedure such as hydroclave or autoclave.

26. All soil residues must be dry-heated, incinerated or autoclaved.

Dry Heat Treatment: use one of the following schedules:

110-120.5 degrees C (230-249 F) for 16 hours

121-154 degrees C (250-309 F) for 2 hours


154.4-192.5 degrees C (310-379 F) for 30 minutes

193-220 degrees C (380-429 F) for 4 minutes

221-232 degrees C (430-450) for 2 minutes

Permit Number: P330-15-00088

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE
FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS:


Mark A. Stull

DATE

03/30/2015

WARNING: Any alteration, forgery, or unauthorized use of this Federal Form is subject to civil penalties of up to \$250,000 (7 U.S.C. § 7734(b)) or punishable by a fine of not more than \$10,000, or imprisonment of not more than 5 years, or both (18 U.S.C. § 1001)

2. The permit holder verifies United States residency by initialing and accepting these permit conditions. If you are not a United States resident, it is unlawful for you to initial or accept these permit conditions because a USDA 525 soil Permit can only be issued to United States residents.
3. The permit holder is solely responsible for ensuring compliance with all statutory requirements and specifically listed permit conditions. Failure to comply with the terms and conditions of this permit is cause for the following: (a) cancellation of this permit, (b) cancellation of other permits issued to the permit holder, (c) seizure and/or destruction of regulated organisms, (d) denial of future permit applications by this permit holder, (e) liability for civil penalties, and (f) criminal prosecution under provisions in the Plant Protection Act.
4. Any alteration, forgery, unauthorized use of this permit and/or associated Federal Forms are subject to civil and criminal penalties including fines and imprisonment.
5. This permit must not be used for the movement or use of plant pathogens listed in the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. If any organism listed as a Select Agent is identified from materials associated with this research, the permit holder is required to notify APHIS, Agricultural Select Agent Program (ASAP) within one business day by phone at 301-851-3300, and within seven (7) days submit APHIS/CDC Form 4 (Report of Identification of a Select Agent or Toxin in a Clinical or Diagnostic Laboratory) to APHIS, ASAP, 4700 River Rd, Unit 2, Riverdale, MD 20737 (see instructions at: http://www.aphis.usda.gov/programs/ag_selectagent/index.shtml). Failure to comply with this requirement is a violation of the Agricultural Bioterrorism Protection Act of 2002.
6. If a regulated organism is received in this shipment, the permit holder must take all prudent measures to contain the organism(s) and notify the permit unit within one business day by calling 866-524-5421 or by e-mail to pest.permits@aphis.usda.gov. The permit holder must immediately notify the permit unit of the destruction of regulated organisms received under this permit, as above. Similarly, the permit holder must immediately notify the permit unit if facilities are destroyed or decommissioned for any reason.
7. You as the permit holder are responsible for maintaining a valid permit for as long as the soil is in your possession. APHIS does not issue extensions or renewals of existing permits; the permit holder must submit a new permit application at least three months prior to the expiration of this permit, and obtain a new permit to continue uninterrupted authorization for the soil approved under this permit.
8. If an accidental release into the environment occurs, notification must be made within one business day to APHIS, PPQ, 4700 River Rd., unit 133, Riverdale, MD 20737; 866-524-5421. A written report of the incident must be submitted identifying: (a) the name of the permit holder (responsible person), (b) the permit number, (c) the country or State of origin of the soil, (d) the nature of the release, and (e) measures already taken to contain, reduce or limit the effects of the accidentally released soil. Any plans prepared to contain, reduce or limit the effects of the accidentally released soil may be submitted as developed.
9. Without prior notice and during reasonable hours, authorized PPQ and/or State regulatory officials shall be allowed to inspect the conditions associated with the regulated soil authorized under this permit.
10. The permit holder must maintain an official permanent work assignment at the address identified on this permit. If the permit holder ceases assignment/affiliation at the address identified on this permit, or personnel circumstances change in any way, then a compliance officer must be notified at the PPQ permit unit immediately (that is, within one business day) by either (a) email to pest.permits@aphis.usda.gov, (b) fax to 301-734-4300 or 8700/5392, or (c) conventional mail to USDA PPQ Permit Unit, 4700 River Road, Riverdale, MD 20737. Should the permit holder depart from the organization/facility, the permit holder must either (a) request cancellation of this permit and comply with all permit-specific termination conditions, (b) apply for and receive a permit to move the soil to a new facility, or (c) relinquish control of the regulated soil to a qualified individual who obtained a permit for the continued use of this regulated soil prior to this permit holder's departure.
11. A copy of this permit must accompany all shipments authorized under this permit.
12. CBP-AI and PPQ have the authority to order and approve treatment, re-exportation or destruction of a shipment, a portion of a shipment or any other material associated with the shipment (i.e. pallets, packaging and means of conveyance). If an official of CBP-AI or PPQ determines that the shipment requires treatment as a condition of entry, is contaminated with a quarantine plant pest or pests, is commingled with prohibited plant material or the required documentation is incomplete or missing, then that official may order and approve treatment, re-exportation or destruction of a shipment, a portion of a shipment or any other material associated with the shipment (i.e. pallets,

Permit Number: P330-15-00086

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE
FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS.

Mark A. Stull

DATE

03/30/2015

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Enclose the following supplemental information in each shipment:

- Permittee Name
- Permit number
- Label number

Underlying packaging/wrapping must carry the address, billing, and any other information required to direct the shipment to its final destination (i.e., the permit holder's address; N.B., USDA APHIS does not defray any additional shipping costs incurred for transiting the shipment through an inspection station as the initial US destination).

29. Underlying packaging/wrapping must carry the address, billing, and any other information required to direct the shipment to its final destination (i.e., the permit holder's address; Please note: USDA APHIS does not defray any additional shipping costs incurred for transiting the shipment through an inspection station as the initial US destination).

END OF PERMIT CONDITIONS

Permit Number P330-15-00088

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE
FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS.

Mark A. Stull

Mark A. Stull

DATE

03/30/2015

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Time starts when the entire sample reaches the required temperature, and a suitable temperature probe must be used for verification.

Autoclave soil and other material using the following conditions:

- a. Soil must be autoclaved at 121 degrees Centigrade (250 degrees Fahrenheit) for a minimum of 30 minutes at 15 psi.
- b. Autoclave tape or other indicators must be placed on each bag or sharps container prior to treatment. The autoclave tape or other indicator on each container must be checked to verify color change before disposal.
- c. The autoclave log must be completed by each user for each autoclave cycle. All parameters must be noted as listed on the log for each autoclave load.
- d. If the autoclave does not attain the minimum time and/or temperature or the autoclave tape does not change color, a notation must be made in the comment section of the autoclave log. The load must then be re-autoclaved after placing new tape on the material. If minimum time and temperature is not attained on the second cycle, users must contact the person responsible for maintaining the unit to initiate repairs. Waste must then be treated at an alternate autoclave facility that is approved by USDA.
- e. Thermometers on the autoclave must be calibrated annually, and a written record must be maintained. This must be done by an authorized autoclave service company during routine servicing.

f. Every 6 months, you should use a commercially available test indicator kit that uses bacterial spores *Bacillus stearothermophilus* that are rendered unviable at 250 degrees F or 121 degrees C. For the test, ampules of *B. stearothermophilus* are autoclaved along with a load of waste. Upon completion of the cycle, the ampules are incubated for 48 hours and then observed for any sign of growth, which indicates insufficient sterilization. If any growth is observed, you must have the autoclave serviced and retested.

Incineration:

With the exception of metal and glass containers, all regulated and associated material must be reduced completely to ash at the end of the incineration cycle.

27. Equipment and supplies used to conduct operations or that have contacted the soil must be decontaminated using one of the following methods:

- (a) Material can be soaked in a fresh bleach solution of 10 percent (1:10) for at least 30 minutes. (1:10 is a convention that means 1 in 10 or 1 part 9 parts = 10 parts total, which is a 10 percent solution).
- (b) Material can be soaked in 70 percent ethanol.
- (c) Flamed with ethanol.
- (d) Treated with quaternary ammonium compounds.


Note also that autoclaving, hydroclaving, incineration, and dry heat sterilization are also acceptable sterilization/decontamination methods.

28. Upon issuance of this permit (i.e., a signed PPQ 525), you will need to request the PPQ Form 550 Black/White labels at least 5 days in advance. If you applied online using ePermits, you may request the labels using the My Shipments/Labels feature. Otherwise, send your request to BlackWhiteGreenYellowlabelrequest@aphis.usda.gov. All email requests must come from the permit holder or appointee, if requested by the appointee the permit holder must be Ccd on all requests. Specify the approved port as listed on the permit and the total number of labels needed in multiples of four. You may request additional labels the same way. We will send you the labels by email as a pdf.

A label must be attached with clear tape to the exterior of each package being imported under this permit. The labels will include detailed shipping instructions. You are responsible for instructing your shipper to carefully follow these instructions. You are responsible for each import shipping label issued under this permit. All labels must be printed in color. Failure to do so may result in refused entry or destruction of your package.

Permit Number: P330-15-00088

THIS PERMIT HAS BEEN APPROVED ELECTRONICALLY BY THE
FOLLOWING PPQ HEADQUARTER OFFICIAL VIA EPERMITS:


Mark A. Stull

DATE

03/30/2015

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11.7 Informes Originales de los Resultados Analíticos obtenidos del Efluente en los meses de Noviembre de 2016 a Enero de 2017

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
Fechas de muestreo: 101116
Fecha de ingreso de muestra: 111116
Fecha de análisis: 111116-221116
Fecha del informe: 221116

Identificación de la muestra: WW10

Correlativo Ecosistemas: 6437

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	6.91	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 Suspendedos	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

					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	4.5	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

LABORATORIO AMBIENTAL E INDUSTRIAL

17 avenida 2-39 zona 4 Mixco | Guatemala | Ofibodegas Zaragoza 2 | Bodega 2

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laboratorio@ecosistemas.com.gt | info@ecosistemas.com.gt | www.ecosistemas.com.gt

Ref 2136-16

Pág 1/2

REG 016 Resultados de Análisis

Muestra: 1 muestra de agua compuesta (según información del cliente)

Alicuota 1: 07:51 horas

Alicuota 2: 10:51 horas

Alicuota 3: 14:16 horas

Alicuota 4: 16:51 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

Fechas de muestreo: 101116

Fecha de ingreso de muestra: 111116

Fecha de análisis: 111116-221116

Fecha del informe: 221116

Identificación de la muestra: WW9

Correlativo Ecosistemas: 6438

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	7.64	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	0.36	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	0.008	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	LÍMITE DE DETECCIÓN	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	22	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.

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*** 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

November 23, 2016

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

Project ID: Escobal

ACZ Project ID: L34257

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on November 21, 2016. This project has been assigned to ACZ's project number, L34257. 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 L34257. 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.

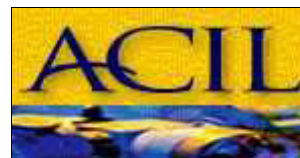
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after December 23, 2016. 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: WW9

ACZ Sample ID: **L34257-03**

Date Sampled: 11/10/16 16:51

Date Received: 11/21/16

Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								11/22/16 12:38	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	11/22/16 22:38	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW10

ACZ Sample ID: **L34257-04**

Date Sampled: 11/11/16 12:00

Date Received: 11/21/16

Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								11/22/16 12:45	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	11/22/16 22:39	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)

<i>B</i>	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
<i>H</i>	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
<i>L</i>	Target analyte response was below the laboratory defined negative threshold.
<i>U</i>	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: **L34257**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34257-01	WG413699	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).
L34257-02	WG413699	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).
L34257-03	WG413699	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).
L34257-04	WG413699	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: **L34257**

No certification qualifiers associated with this analysis

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L34257
Date Received: 11/21/2016 10:16
Received By:
Date Printed: 11/21/2016

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A change was made in the Sample Date:Time Line 1 section prior to ACZ custody.			

Samples/Containers

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

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4158	8.1	<=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: L34257
Date Received: 11/21/2016 10:16
Received By:
Date Printed: 11/21/2016

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).



ECOSISTEMAS
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Ref 010-17

Pág 1/2

REG 016 Resultados de Análisis

Muestra: 1 muestra de agua compuesta (según información del cliente)

Alicuota 1: 08:00 horas (191216)

Alicuota 2: 14:30 horas (191216)

Alicuota 3: 17:30 horas (191216)

Alicuota 4: 07:20 horas (201216)

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

Fechas de muestreo: 191216-201216

Fecha de ingreso de muestra: 201216

Fecha de análisis: 201216-060117

Fecha del informe: 060117

Identificación de la muestra: WW9

Correlativo Ecosistemas: 6882

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	7.28	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 Suspendedos	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	0.002	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	LÍMITE 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	26	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	110	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*

REG 016 Resultados de Análisis

Muestra: 1 muestra 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: 191216
Fecha de ingreso de muestra: 201216
Fecha de análisis: 201216-060117
Fecha del informe: 060117

Identificación de la muestra: WW10
Correlativo Ecosistemas: 6883

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	6.30	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

					Límites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
PARAMETRO	DIMENSIONAL	LÍMITE DE DETECCIÓN	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



ECOSISTEMAS
PROYECTOS AMBIENTALES

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Ref 012-17

Pág 1/2

REG 016 Resultados de Análisis

Muestra: 1 muestra de agua compuesta (según información del cliente)

Alicuota 1: 08:00 horas (191216)

Alicuota 2: 14:30 horas (191216)

Alicuota 3: 17:30 horas (191216)

Alicuota 4: 07:20 horas (201216)

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

Fechas de muestreo: 191216-201216

Fecha de ingreso de muestra: 201216

Fecha de análisis: 201216-060117

Fecha del informe: 060117

Identificación de la muestra: WW11

Correlativo Ecosistemas: 6884

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	7.13	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	0.002	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	N.D.	SMWW 3111B	10
Color Aparente	UC HZ equiv. Unid. Pt-Co	1	12	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	220	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

February 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: L35355

Miguel Berganza:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on February 03, 2017. This project has been assigned to ACZ's project number, L35355. 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 L35355. 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.

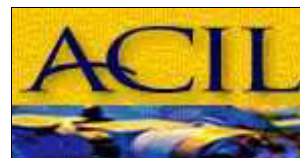
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after March 10, 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: **L35355-01**

Date Sampled: 01/30/17 12:00

Date Received: 02/03/17

Sample Matrix: Surface Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								02/07/17 14:38	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	02/07/17 22:03	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW 11

ACZ Sample ID: **L35355-02**

Date Sampled: 01/31/17 03:45

Date Received: 02/03/17

Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								02/07/17 15:49	bce

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5	0.003	B	*	mg/L	0.003	0.01	02/07/17 22:04	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW 9

ACZ Sample ID: **L35355-03**

Date Sampled: 01/31/17 03:45

Date Received: 02/03/17

Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								02/07/17 17:00	bce

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5	0.003	B	*	mg/L	0.003	0.01	02/07/17 22:04	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: **L35355**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L35355-01	WG417492	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).
L35355-02	WG417492	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).
L35355-03	WG417492	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: **L35355**

No certification qualifiers associated with this analysis

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L35355
Date Received: 02/03/2017 10:35
Received By:
Date Printed: 2/3/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A change was made in the Remarks section prior to ACZ custody.			

Samples/Containers

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

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4689	8.9	<=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: L35355
Date Received: 02/03/2017 10:35
Received By:
Date Printed: 2/3/2017

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. L35355

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Miguel Berganza
Company: Tahoe Resources Inc.
E-mail: M.Berganza@sanrafael.com.gt

Address: P.O. Box 105, Progreso, 18 Calle 24, 692016
Financiamiento, zona industrial, Torre IV Original HCB
Telephone: (502) 59 51 5248

Copy of Report to:

Name: Luisa Fernanda Barrios
Company: L.Barrios@SanRafael.com.gt

E-mail:
Telephone: (502) 5696 4268

Invoice to:

Name: Miguel Berganza
Company: Tahoe Resources Inc.
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: L.F. / ENQ 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#:	Reporting state for compliance testing:	Check box if samples include NRC licensed material?	SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	SW	LN	TO	TA	SL	SO	OL	Other
Water Quality	Escobal			WW 9	30-31-1-17 10:40-08:45	WW	10	✓							
				WW 10	30-01-17 12:00	SW	10	✓							
				WW 9	25-01-17 07:35	WW	1		✓						
				WW 10	30-01-17 12:00	SW	1		✓						
				WW 11	30-31-1-17 10:40-08:45	WW	1		✓						
				WW 9	30-31-1-17 10:40-08:45	WW	1		✓						
				WW 6	24-01-17 16:35	WW	1		✓						
				Pileta 1	22-01-17 09:15	SW	1		✓						
				Pileta 2	22-01-17 09:10	SW	1		✓						
				Pileta 3	22-01-17 09:00	SW	1		✓						

Matrix SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please report the three indicated granule results in one report. The rest of the results of this shipment (two coolers), please present only 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
Juan Aguilar

31/01/17 08:00
31/01/2017 08:15

Correos
DJP

31/17 10:48
21/3/17 1035



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Ref 142-17

Pág 1/2

REG 016 Resultados de Análisis

Muestra: 1 muestra de agua

Análisis solicitado por: Ing. Miguel Berganza

Dirección: Km. 97.5 carretera Mataquescuintla, Aldea Sabana Redonda, San Rafael Las Flores. Santa Rosa

Procedencia de la muestra: Proyecto Escobal

Fecha de muestreo: 090117

Fecha de ingreso de muestra: 100117

Fecha de análisis: 100117-190117

Fecha del informe: 190117

Identificación de la muestra: WW10

Correlativo Ecosistemas: 7003

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	6.38	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



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Ref 142-17

Pag 2/2

					Límites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
PARAMETRO	DIMENSIONAL	LÍMITE DE DETECCIÓN	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



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Ref 143-17

Pág 1/2

REG 016 Resultados de Análisis

Muestra: 1 muestra de agua compuesta (según información del cliente)

Alicuota 1: 07:45 horas

Alicuota 2: 10:45 horas

Alicuota 3: 13:45 horas

Alicuota 4: 16:45 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: 090117

Fecha de ingreso de muestra: 100117

Fecha de análisis: 100117-190117

Fecha del informe: 190117

Identificación de la muestra: WW9

Correlativo Ecosistemas: 7004

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	7.63	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	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
* Níquel Ni	mg/l	0.05	N.D.	SMWW 3111B	2



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Ref 143-17

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					Límites Máximos Permisibles Entes Generadores Nuevos Acuerdo 236-2006
PARAMETRO	DIMENSIONAL	LÍMITE DE DETECCIÓN	RESULTADO	METODOLOGIA	descarga a cuerpo receptor
* Plomo Pb	mg/l	0.05	N.D.	SMWW 3111B	0.4
* Zinc Zn	mg/l	0.01	0.10	SMWW 3111B	10
Color Aparente	UC HZ equiv. Unid. Pt-Co	1	60	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	500
Color Real	UC HZ equiv. Unid. Pt-Co	1	4	Colorimétrico Merck, análogo APHA 2120B, DIN 53409	
** Coliformes Fecales	NMP/100ml	1.8	130	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.

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** 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

January 20, 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: L34999

Miguel Berganza:

Enclosed are revised analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on January 12, 2017 and originally reported on January 18, 2017. Refer to the case narrative for an explanation of the changes. This project was assigned to ACZ's project number, L34999. 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 L34999. 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.

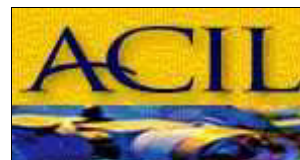
This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after February 17, 2017. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than \$10/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 reports for five 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.

January 20, 2017

Project ID: Escobal

ACZ Project ID: L34999

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 2 miscellaneous samples from Tahoe Resources, Inc. on January 12, 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 L34999. 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.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports.

This report was revised on 01/20/17 to report the re-analysis of total cyanide for sample L34999-02 (WW9). The re-analysis did not confirm the original value. It appears the may have been a sample switch on the original analysis.

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW10

ACZ Sample ID: **L34999-01**

Date Sampled: 01/09/17 12:00

Date Received: 01/12/17

Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								01/13/17 16:10	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	01/14/17 19:05	pjb

Tahoe Resources, Inc.

Project ID: Escobal

Sample ID: WW9

ACZ Sample ID: **L34999-02**

Date Sampled: 01/09/17 16:45

Date Received: 01/12/17

Sample Matrix: Waste Water

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								01/19/17 10:58	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	01/19/17 23:06	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: **L34999**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L34999-01	WG416206	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).
L34999-02	WG416580	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: **L34999**

No certification qualifiers associated with this analysis

Tahoe Resources, Inc.
Escobal

ACZ Project ID: L34999
Date Received: 01/12/2017 10:01
Received By:
Date Printed: 1/12/2017

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2) Is the Chain of Custody form or other directive shipping papers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) Does this project require special handling procedures such as CLP protocol?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4) Are any samples NRC licensable material?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5) If samples are received past hold time, proceed with requested short hold time analyses?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6) Is the Chain of Custody form complete and accurate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Samples/Containers

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

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
4304	9.9	<=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: L34999

Date Received: 01/12/2017 10:01

Received By:

Date Printed: 1/12/2017

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).

